TM 55-1730-229-12
TO 35C2-3-473-1

TECHNICAL MANUAL

OPERATOR AND ORGANIZATIONAL MAINTENANCE MANUAL

FOR

POWER UNIT, AVIATION, MULTI-OUTPUT GTED ELECTRICAL, HYDRAULIC, PNEUMATIC (AGPU) WHEEL MOUNTED, SELF-PROPELLED, TOWABLE

AC - 400 Hz, 3 PH, 0.8 PF, 115/200V, 30 KW
DC 28VDC 700 AMPS
PNEUMATIC - 60 LBS/MIN. AT 40 PSIG
HYDRAULIC - 15 GPM AT 3300 PSIG

PART NUMBER	AC OUTPUT	DC OUTPUT	NSN
83 - 360A	30 KW (37.5 KVA)	700 AMPS	1730-01-144-1897
83 - 360D	38.4 KW (48 KVA)	250 AMPS	1730-01-466-9371

DISTRIBUTION STATEMENT A: Approved for public release. Distribution is unlimited

PUBLISHED UNDER THE AUTHORITY OF THE DEPARTMENT OF THE ARMY AND THE AIR FORCE
HEADQUARTERS, DEPARTMENT OF THE ARMY

1 DECEMBER 1986

URGENT

TM 55-1730-229-12
TO 35C2-3-473-1
C 10

CHANGE
NO. 10

HEADQUARTERS, DEPARTMENTS OF
THE ARMY AND THE AIR FORCE
WASHINGTON, D.C. 14 November 2006

OPERATOR AND ORGANIZATIONAL MAINTENANCE MANUAL

FOR

**POWER UNIT, AVIATION, MULTI-OUTPUT GTED ELECTRICAL,
HYDRAULIC, PNEUMATIC (AGPU)
WHEEL MOUNTED, SELF-PROPELLED, TOWABLE**

**AC - 400 Hz, 3 PH, 0.8 PF, 115/200V, 30 KW
DC 28VDC 700 AMPS
PNEUMATIC - 60 LBS/MIN. AT 40 PSIG
HYDRAULIC - 15 GPM AT 3300 PSIG**

PART NUMBER	AC OUTPUT	DC OUTPUT	NSN
83 - 360A	30 KW (37.5 KVA)	700 AMPS	1730-01-144-1897
83 - 360D	38.4 KW (48 KVA)	250 AMPS	1730-01-466-9371

REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

You can improve this manual. If you find mistakes or if you know of a way to improve these procedures, please let us know. Mail your letter or DA Form 2028 (Recommended Changes to Publications and Blank Forms) located at the back of this manual, directly to: Commander, U.S. Army Aviation and Missile Command, ATTN: AMSAM-MMC-MA-NP, Redstone Arsenal, AL 35898-5000. A reply will be furnished to you. You may also provide DA Form 2028 information to AMCOM via e-mail, fax or the World Wide Web. Our fax number is: DSN 788-6546 or Commercial (256) 842-6546. Our e-mail address is 2028@redstone.army.mil. Instructions for sending an electronic 2028 may be found at the back of this manual immediately preceding the hard copy 2028. For the World Wide Web use: https://amcom2028.redstone.army.mil.

HAZARDOUS MATERIAL INFORMATION

This document has been reviewed for the presence of SOLVENTS containing hazardous materials as defined by the EPCRA 302 and 313 lists by the AMCOM G-4 (Logistics) Environmental Division. As of the base document through C8, dated 22 November 2002, all references to SOLVENTS containing hazardous materials have been removed from this document by substitution with non-hazardous or less hazardous materials where possible.

OZONE DEPLETING CHEMICALS INFORMATION

This document has been reviewed for the presence of Class I Ozone Depleting Chemicals by the AMCOM G-4 (Logistics) Environmental Division. As of the base document through C8, dated 22 November 2002, all references to Class I Ozone Depleting Chemicals have been removed from this document by substitution with chemicals that do not cause atmospheric ozone depletion EXCEPT Bromotrifluoromethane (CF3BR); Fire Extinguisher Agent (Halon 1301).

DISTRIBUTION STATEMENT A: Approved for public release. Distribution is unlimited

TM 55-1730-229-12
TO 35C2-3-473-1
C 10

TM 55-1730-229-12/TO 35C2-3-473-1, 1 December 1986, is changed as follows:

1. Remove and insert pages as indicated below. New or changed text material is indicated by a vertical bar in the margin. An illustration change is indicated by a miniature pointing hand.

Remove Pages	Insert Pages
a and b	a and b
A and B	A and B
C and D	C/(D Blank)
i through x	i through xi/(xii Blank)
2-19 and 2-20	2-19 and 2-20
3-1 through 3-12	3-1 through 3-12
3-13 and 3-14	(3-13 Blank)/3-14
3-19 through 3-22	3-19 through 3-22
4-1 through 4-4	4-1 through 4-4
4-273 and 4-274	4-273 and 4-274
4-301 and 4-302	4-301 and 4-302
B-1/(B-2 Blank)	B-1/(B-2 Blank)
C-9 and C-10	C-9 and C-10
C-15 and C-16	C-15 and C-16
FP-1/(FP-2 Blank)	FP-1/(FP-2 Blank)
Cover	Cover

2. Retain this sheet in front of manual for reference purposes.

By Order of the Secretary of the Army:

PETER J. SCHOOMAKER
General, United States Army
Chief of Staff

Official:



JOYCE E. MORROW
Administrative Assistant to the Secretary of the Army
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TM 55-1730-229-12
TO 35C2-3-473-1
C 9

CHANGE
NO. 9

HEADQUARTERS, DEPARTMENTS OF
THE ARMY AND THE AIR FORCE
WASHINGTON, D.C. 15 December 2004

OPERATOR AND ORGANIZATIONAL MAINTENANCE MANUAL
FOR
POWER UNIT, AVIATION, MULTI-OUTPUT GTED ELECTRICAL, HYDRAULIC, PNEUMATIC (AGPU)
WHEEL MOUNTED, SELF-PROPELLED, TOWABLE
AC - 400 Hz, 3PH, 115/200V, 0.8 PF
DC - 28V
PNEUMATIC - 60 LBS/MIN. AT 40 PSIG
HYDRAULIC - 15 GPM AT 3300 PSIG

PART NUMBER	AC OUTPUT	DC OUTPUT	NSN
83 - 360A	30 KW (37.5 KVA)	700 AMPS	1730-01-144-1897
83 - 360D	38.4 KW (48 KVA)	250 AMPS	1730-01-466-9371

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Remove Pages	Insert Pages
A and B	A and B
C and D	C/(D Blank)
i through xii	i through x
2-27 through 2-32	2-27 through 2-32
2-32.1/(2-32.2 Blank)	2-32.1 and 2-32.2
	2-32.3/(2/32.4 Blank)
2-33 and 2-34	2-33 and 2-34
3-10.1/(3-10.2 Blank)	3-10.1/(3-10.2 Blank)
4-15 and 4-16	4-15 and 4-16
4-175 and 4-176	4-175 and 4-176
4-203 and 4-204	4-203 and 4-204
4-231 and 4-232	4-231 and 4-232
4-271 and 4-272	4-271 and 4-272

TM 55-1730-229-12
TO 35C2-3-473-1
C 9

Remove Pages	Insert Pages
4-306.1/(4-306.2 Blank)	4-306.1 and 4-306.2
4-306.1/(4-306.2 Blank)	

2. Retain this sheet in front of manual for reference purposes.

By Order of the Secretaries of the Army and the Air Force:

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General, United States Army
Chief of Staff

Official:

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Administrative Assistant to the
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TM 55-1730-229-12
TO 35C2-3-473-1
C 8

CHANGE
No. 8

HEADQUARTERS, DEPARTMENTS OF
THE ARMY AND THE AIR FORCE
WASHINGTON, D.C. 22 November 2002

OPERATOR AND ORGANIZATIONAL MAINTENANCE MANUAL
FOR
POWER UNIT, AVIATION, MULTI-OUTPUT GTED ELECTRICAL, HYDRAULIC, PNEUMATIC (AGPU)
WHEEL MOUNTED, SELF-PROPELLED, TOWABLE
AC – 400 Hz, 3PH, 115/200V, 0.8 PF
DC – 28V
PNEUMATIC – 60 LBS/MIN. AT 40 PSIG
HYDRAULIC – 15 GPM AT 3300 PSIG

PART NUMBER	AC OUTPUT	DC OUTPUT	NSN
83 - 360A	30 KW (37.5 KVA)	700 AMPS	1730-01-144-1897
83 - 360D	38.4 KW (48 KVA)	250 AMPS	1730-01-466-9371

OZONE DEPLETING CHEMICAL INFORMATION

This document has been reviewed for the presence of Class I Ozone Depleting Chemicals. As of the base through change 07, dated 28 February 1996, all references to Class I Ozone Depleting Chemicals have been removed from this document by substitution with chemicals that do not cause atmospheric ozone depletion. Engineering, Environment, and Logistics Oversight Office.

DISTRIBUTION STATEMENT A Approved for public release. Distribution is unlimited.

TM 55-1730-229-12/ TO 35C2-3-473-1, 1 December 1986, is changed as follows:

1. Remove and insert pages as indicated below. New or changed text material is indicated by a vertical bar in the margin. An illustration change is indicated by a minute pointing hand.

Remove Pages	Insert Pages
———	A through D
i through xii	i through xii
1-1 and 1-2	1-1 through 1-2
———	1-2.1/(1-2.2 blank)
1-5 and 1-6	1-5 and 1-6
———	1-6.1/(1-6.2 blank)
1-7 and 1-8	1-7 and 1-8
1-13 and 1-14	1-13 and 1-14
———	1-14.1/(1-14.2 blank)
1-15 through 1-24	1-15 through 1-24
2-5 and 2-6	2-5 and 2-6
———	2-6.1/(2-6.2 blank)
2-7 and 2-8	2-7 and 2-8
———	2-8.1 and 2-8.2
2-21 through 2-32	2-21 through 2-32

TM 55-1730-229-12
TO 35C2-3-473-1
C 8

Remove Pages	Insert Pages
2-32.1/(2-32.2 blank)	2-32.1/(2-32.2 blank)
2-33 and 2-34	2-33 and 2-34
	2-34.1 and 2-34.2
2-35 and 2-36	2-35 and 2-36
3-23/(3-24 blank)	3-23 and 3-24
	3-25/(3-26 blank)
4-159 and 4-160	4-159 and 4-160
	4-160.1/(4-160.2 blank)
4-163 and 4-164	4-163 and 4-164
	4-164.1/(4-164.2 blank)
4-183 and 4-184	4-183 and 4-184
4-205 through 4-212	4-205 through 4-212
	4-212.1/(4-212.2 blank)
4-217 through 4-220	4-217 through 4-220
	4-220.1 and 4-220.2
4-227 and 4-228	4-227 and 4-228
	4-228.1/(4-228.2 blank)
4-244.1/(4-244.2 blank)	4-244.1/(4-244.2 blank)
4-247 and 4-248	4-247 and 4-248
	4-248.1/(4-248.2 blank)
Cover	Cover

2. Retain this sheet in front for reference purposes.

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Official:

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Chief of Staff

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TM 55-1730-229-12
TO 35C2-3-473-1
C7

CHANGE
No. 7

HEADQUARTERS, DEPARTMENTS OF
THE ARMY AND THE AIR FORCE
WASHINGTON, D.C., 28 February 1996

Operator and Organizational Maintenance Manual

POWER UNIT, AVIATION, MULTI-OUTPUT GTED ELECTRICAL, HYDRAULIC, PNEUMATIC (AGPU) WHEEL MOUNTED, SELF-PROPELLED, TOWABLE

AC 400 Hz, 3 PH, 0.8 PF, 115/200V, 30 KW
DC 28VDC 700 AMPS
PNEUMATIC 60 LBS/MIN.AT 40 PSIG
HYDRAULIC 15 GPM AT 3300 PSIG

DOD MODEL	CLASS	HERTZ	NSN
MEP-360A	PRECISE	400	1730-01-144-1897

DISTRIBUTION STATEMENT A: Approved for public release; distribution is unlimited.

TM 55-1730-229-12/ TO 35C2-3473-1) 1 December 1986, is changed as follows:

1. Marine Corps Technical Manual No. TM 1730-12/1 has been deleted from this manual.

2. Remove and insert pages as indicated below. New or changed text material is indicated by a vertical bar in the margin. An illustration change is indicated by a miniature pointing hand.

Remove pages	Insert pages
a and b	a and b
1-1 and 1-2	1-1 and 1-2
1-21 and 1-22	1-21 and 1-22
1-25 through 1-28	1-25 through 1-28
2-32.1/(2-32.2 Blank)	2-32.1/(2-32.2 Blank)
3-9 and 3-10	3-9 and 3-10
3-19 and 3-20	3-19 and 3-20
4-51 and 4-52	4-51 and 4-52
4-101 and 4-102	4-101 and 4-102
4-237 through 4-240	4-237 through 4-240

TM 55-1730-229-12
TO 35C2-3-473-1
C 7

Remove pages	Insert pages
4-305 and 4-306	4-305 through 4-306.1/(4-306.2 Blank)
A-1 and A-2	A-1 and A-2
C-15 and C-16	C-15 and C-16
2028 and Envelopes	2028 and Envelopes
Cover	Cover

3. Retain this sheet in front of manual for reference purposes.

By Order of the Secretaries of the Army and Air Force:

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TM 55-1730-229-12/
AG 320A0-OMM-000/
TO 35C2-3-473-1/TM 1730-12/1
C 6

CHANGE
NO. 6

HEADQUARTERS, DEPARTMENTS OF
THE ARMY, NAVY AND THE AIR FORCE AND
HEADQUARTERS, U.S. MARINE CORPS
WASHINGTON, D.C., 30 SEPTEMBER 1992

OPERATOR AND ORGANIZATIONAL MAINTENANCE MANUAL

POWER UNIT, AVIATION, MULTI-OUTPUT GTED
ELECTRICAL, HYDRAULIC, PNEUMATIC (AGPU)
WHEEL MOUNTED, SELF-PROPELLED, TOWABLE

AC 400 Hz, 3PH, 0.8PF, 115/200V, 30 KW
DC 28VDC 700 AMPS
PNEUMATIC 60 LBS/MIN. at 40 PSIG
HYDRAULIC 15 GPM AT 3300 PSIG

DOD MODEL	CLASS	HERTZ	NSN
MEP-360A	PRECISE	400	1730-01-144-1897

TM 55-1730-229-12/AG 320A0-0MM-000/TO 35C2-3-473-1/TM 1730-12/1, 1 December 1986, is changed as follows:

1. The Navy (AG 320A0-0MM-000) is no longer a user of this publication.

2. Remove and insert pages as indicated below. New or changed text material is indicated by a vertical bar in the margin. An illustration change is indicated by a miniature pointing hand.

Remove pages	Insert pages
1-23 through 1-26	1-23 through 1-26
2-33 and 2-34	2-33 and 2-34
	2-34.1/2-34.2
2-35 through 2-38	2-35 through 2-38
2-38.1/2-38.2	2-38.1 and 2-38.2
2-39 and 2-40	2-39 and 2-40
2-40.1/2-40.2	2-40.1/2-40.2
3-5 through 3-10	3-5 through 3-10
3-10.1/3-10.2	3-10.1/3-10.2
4-229 and 4-230	4-229 and 4-230
FP-5/FP-6	FP-5/FP-6

3. Retain this sheet in front of manual for reference purposes.

DISTRIBUTION STATEMENT A: Approved for public release; distribution is unlimited.

TM 55-1730-229-12/
AG 320A0-OMM-000/
TO 35C2-3-473-1/TM 1730-12/1
C 6

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URGENT

TM 55-1730-229-12
AG 320A0-OMM-000
TO 35C2-3-473-1
TM 1730-12/1
C 5

CHANGE NO. 5

HEADQUARTERS
DEPARTMENTS OF THE ARMY, NAVY, AIR FORCE AND MARINECORPS
WASHINGTON, D.C., 15 May 1991

OPERATOR AND ORGANIZATIONAL MAINTENANCE MANUAL

POWER UNIT, AVIATION, MULTI-OUTPUT GTED
ELECTRICAL, HYDRAULIC, PNEUMATIC (AGPU)
WHEEL MOUNTED, SELF-PROPELLED, TOWABLE

AC 400 Hz, 3PH, 0.8PF, 115/200V, 30 KW
DC 28VDC 700 AMPS
PNEUMATIC 60 LBS/MIN. AT 40 PSIG
HYDRAULIC 15 GPM AT 3300 PSIG

DOD MODEL	CLASS	HERTZ	NSN
MEP-360A	PRECISE	400	1730-01-144-1897

TM 55-1730-229-12, AG 320A0-OMM-000, TO 35C2-3-473-1 and TM 1730-12/1, 1 December 1986, is changed as follows:

1. Remove and insert pages as indicated below. New or changed text material is indicated by a vertical bar in the margin. An illustration change is indicated by a miniature pointing hand.

Remove pages	Insert pages
1-1 and 1-2	1-1 and 1-2
1-11 and 1-12	1-11 and 1-12
2-29 through 2-32	2-29 through 2-32
2-39 and 2-40	2-39 and 2-40
3-1 and 3-2	3-1 and 3-2
3-7 and 3-8	3-7 and 3-8
2028's and Envelopes	2028's and Envelopes

2. Retain this sheet in front of manual for reference purposes.

URGENT

TM 55-1730-229-12
AG 320A0-OMM-000
TO 35C2-3-473-1
TM 1730-12/1
C 5

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General, United States Army
Chief of Staff

Official:

PATRICIA P. HICKERSON
Colonel, United States Army
The Adjutant General

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Official:

CHARLES C. MCDONALD
General, USAF, Commander, Air Force
Logistics Command

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TM 55-1730-229-12
AG 320A0-OMM-000
TO 35C2-3-473-1
TM 1730-12/1
C 4

CHANGE NO. 4

HEADQUARTERS
DEPARTMENTS OF THE ARMY, NAVY, AIR FORCE AND MARINE CORPS
WASHINGTON, D.C., 5 September 1990

OPERATOR AND ORGANIZATIONAL MAINTENANCE MANUAL

POWER UNIT, AVIATION, MULTI-OUTPUT GTED
ELECTRICAL, HYDRAULIC, PHEUMATIC (AGPU)
WHEEL MOUNTED, SELF-PROPELLED, TOWABLE

AC 400 Hz, 3PH, 0.8PF, 115/200V, 30KW
DC 28VDC 700 AMPS
PNEUMATIC 60 LBS/MIN. AT 40 PSIG
HYDRAULIC 15 GPM AT 3300 PSIG

DOD MODEL	CLASS	HERTZ	NSN
MEP-360A	PRECISE	400	1730-01-144-1897

TM 55-1730-229-12, AG 320A0-OMM-000, TO 35C2-3-473-1 and TM 1730-12/1, 1 December 1986, is changed as follows:

1. Remove and insert pages as indicated below. New or changed text material is indicated by a vertical bar in the margin. An illustration change is indicated by a miniature pointing hand.

Remove pages	Insert pages
A through C/D	- - - -
xi and xii	xi and xii
1-1 and 1-2	1-1 and 1-2
4-59 and 4-60	4-59 and 4-60
A-1 and A-2	A-1 and A-2
FP-7/FP-8	FP-7/FP-8

2. Retain this sheet in front of manual for reference purposes.

TM 55-1730-229-12
AG 320A0-OMM-000
TO 35C2-3-473-1
TM 1730-12/1
C 4

By Order of the Secretaries of the Army and the Air Force:

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Chief of Staff

Official:

THOMAS F. SIKORA
Brigadier General, United States Army
The Adjutant General

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General, USAF, Commander Air Force
Logistics command

DISTRIBUTION:
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TM 55-1730-229-12
AG 320A0-OMM-000
TO 35C2-3-473-1
TM 1730-12/1
C3

CHANGE NO. 3

HEADQUARTERS
DEPARTMENTS OF THE ARMY, NAVY, AIR FORCE AND MARINE CORPS
WASHINGTON, D.C., 30 March 1990

OPERATOR AND ORGANIZATIONAL MAINTENANCE MANUAL

POWER UNIT, AVIATION, MULTI-OUTPUT GTED
ELECTRICAL, HYDRAULIC, PNEUMATIC (AGPU)
WHEEL MOUNTED, SELF-PROPELLED, TOWABLE

AC 400 Hz, 3PH, 0.8 PF, 115/200V, 30KW
DC 28VDC 700 AMPS
PNEUMATIC 60 LBS/MIN. AT 40 PSIG
HYDRAULIC 15 GPM AT 3300 PSIG

DOD MODEL	CLASS	HERTZ	NSN
MEP-360A	PRECISE	400	1730-01-144-1897

TM 55-1730-229-12, AG 320A0-OMM-000, TO 35C2-3-473-1 and TM 1730-12/1, 1 December 1986, is changed as follows:

1. Remove and insert pages as indicated below. New or changed text material is indicated by a vertical bar in the margin. An illustration change is indicated by a miniature pointing hand.

Remove pages	Insert pages
3-21 and 3-22	3-21 and 3-22

2. Retain this sheet in front of manual for reference purposes.

By Order of the Secretaries of the Army and the Air Force:

CARL E. VUONO
General, United States Army
Chief of Staff

Official:

WILLIAM J. MEEHAN II
Brigadier General, United States Army
The Adjutant General

LARRY D. WELCH, General, USAF
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CHARLES C. MCDONALD
General, USAF, Commander, Air Force
Logistics Command

DISTRIBUTION:
To be distributed in accordance with DA Form 12-31, -10 & CL, AVUM and AVIM Maintenance requirements for All Fixed and Rotary Wing Aircraft.

CHANGE NO. 2

HEADQUARTERS
DEPARTMENTS OF THE ARMY, NAVY, AIR FORCE AND MARINE CORPS
WASHINGTON, D.C., 25 July 1989

OPERATOR AND ORGANIZATIONAL MAINTENANCE MANUAL

POWER UNIT, AVIATION, MULTI-OUTPUT GTED ELECTRICAL, HYDRAULIC, PNEUMATIC (AGPU) WHEEL MOUNTED, SELF-PROPELLED, TOWABLE

AC 400 Hz, 3PH, 0.8 PF, 115/200V, 30KW
DC 28VDC 700 AMPS
PNEUMATIC 60 LBS/MIN. AT 40 PSIG
HYDRAULIC 15 GPM AT 3300 PSIG

DOD MODEL	CLASS	HERTZ	NSN
MEP-360A	PRECISE	400	1730-01-144-1897

TM 55-1730-229-12, AG 320A0-OMN-000, TO 35C2-3-473-1 and TM 1730-12-1, 1 December 1986, is changed as follows:

1. Remove and insert pages as indicated below. New or changed text material is indicated by a vertical bar in the margin. An illustration change is indicated by a miniature pointing hand.

Remove pages	Insert pages
i and ii	i and ii
v through xii	v through xii
1-3 through 1-6	1-3 through 1-6
1-11 through 1-14	1-11 through 1-14
1-23 through 1-26	1-23 through 1-26
- - -	2-8.1/2-8.2
2-19 and 2-20	2-19 and 2-20
- - -	2-20.1/2-20.2
2-37 and 2-38	2-37 and 2-38
2-38.1/2-38.2	2-38.1/2-38.2
2-39 and 2-40	2-39 and 2-40
3-11 and 3-12	3-11 and 3-12
- - -	3-12.1/3-12.2
3-15 through 3-18	3-15 through 3-18
- - -	3-18.1/3-18.2
4-9 and 4-10	4-9 and 4-10
4-13 and 4-14	4-13 and 4-14
4-51 and 4-52	4-51 and 4-52
4-101 and 4-102	4-101 and 4-102
4-143 and 4-144	4-143 and 4-144

TM 55-1730-229-12P
AG 320A0-OMN-000
TO 35C2-3-473-1
TM 1730-12/1
C-2

Remove pages	Insert pages
4-185 and 4-186	4-185 and 4-186
4-231 through 4-236	4-231 through 4-236
- - -	4-236.1 through 4-236.3/4-236.4
4-241 through 4-244	4-241 through 4-244
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2. Retain this sheet in front of manual for reference purposes.

By Order of the Secretaries of the Army and the Air Force:

CARL E. VUONO
General, United States Army
Chief of Staff

Official:

WILLIAM J. MEEHAN II
Brigadier General, United States Army
The Adjutant General

CHARLES A. GABRIEL, General, USAF
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Official:

EARL T. O'LOUGHLIN
General, USAF, Commander, Air Force
Logistics Command

DISTRIBUTION:
To be distributed in accordance with DA Form 12-31, -10 & CL, AVUM, and AVIM Maintenance requirements for All Fixed and Rotary Wing Aircraft.

CHANGE NO. 1

HEADQUARTERS
DEPARTMENTS OF THE ARMY, NAVY, AIR FORCE & MARINE CORPS
WASHINGTON, D.C., 11 October 1988

OPERATOR AND ORGANIZATIONAL MAINTENANCE MANUAL

POWER UNIT, AVIATION, MULTI-OUTPUT GTED ELECTRICAL, HYDRAULIC, PNEUMATIC (AGPU) WHEEL MOUNTED, SELF-PROPELLED, TOWABLE

AC 400H2, 3PH, 0.8PF, 115/200V, 30KW
DC 28 VDC 700 AMPS
PNEUMATIC 60 LBS/MIN. AT 40 PSIG
HYDRAULIC 15 GPM AT 3300 PSIG

DOD MODEL	CLASS	HERTZ	NSN
MEP-360A	PRECISE	400	1730-01-144-1897

TM 55-1730-229-12, AG 320A0-OMN-000, TO 35C2-3-473-1 and TM 1730-12/1, 1 December 1986, is changed as follows:

1. Cover page shall be changed as shown above.

2. Remove and insert pages as indicated below. New or changed text material is indicated by a vertical bar in the margin. An illustration change is indicated y a miniature pointing hand.

Remove pages	Insert pages
A and B,	A and B
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i through xii	i through xii
l-l and 1-2	1-1 and 1-2
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TM 55-1730-229-12
AG 320A0-OMM-000
TO 35C2-3-473-1
TM 1730-12/1
C 1

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----	D-l through D-7/D-8

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General, USAF, Commander, Air Force
Logistics Command

DISTRIBUTION:
To be distributed in accordance with DA Form 12-31, -10 & CL, AVUM and AVIM requirements for all Fixed and Rotary Wing Aircraft.

WARNING

An operating or maintenance procedure, practice, condition, statement, etc., which if not strictly observed, could result in injury to or death of personnel.

CAUTION

An operating or maintenance procedure, practice, condition, statement, etc., which if not strictly observed, could result in damage to, or destruction of, equipment or loss of mission effectiveness or long term health hazards to personnel.

NOTE

An essential operating or maintenance procedure, condition, or statement, which must be highlighted.

WARNING

PRECAUTIONARY DATA

Personnel performing instructions involving operations, procedures, and practices which are included or implied in this technical manual shall observe the following instructions. Disregard of these warnings and precautionary information can cause serious injury, death, or an aborted mission.

WARNINGS, CAUTIONS, and NOTES are means of attracting attention to essential or critical information in a manual.

WARNING

HIGH VOLTAGE

High voltage is produced when this AGPU is in operation.

WARNING

DEATH

Death or severe burns may result if personnel fail to observe safety precautions. Do not operate the AGPU until the ground stud has been connected to a suitable ground. Disconnect the battery connector before removing and installing components. Remove all rings, watches, and other jewelry when performing maintenance on this equipment. Do not attempt to service or otherwise make any adjustments, connections, or reconnections of wires or cables until AGPU is shut-down and completely deenergized. Never connect or disconnect power cables with ac or dc energized.

WARNING

DANGEROUS GASES

Batteries generate explosive gas during charging: therefore, utilize extreme caution, do not smoke, or use open flame in the vicinity of the AGPU when servicing batteries.

Exhaust discharge contains noxious and deadly flames and is very hot. Do not operate AGPU in enclosed areas unless exhaust discharge is properly vented to the outside. Do not operate under overhangs, helicopter blades, or trees.

To avoid sparking between filler nozzle and fuel tank, always maintain metal to metal contact between filler nozzle and fuel tank when filling fuel tank.

Do not smoke or use open flame in the vicinity of the AGPU while refueling.

WARNING

HYDRAULIC FLUID

Hydraulic fluid under high pressure is generated (up to 3300 psi) as a result of operation of the AGPU. Do not expose any part of the body to a high pressure leak in the hydraulic system. Never attempt to connect or disconnect hydraulic fittings under high pressure. Ensure that hoses are in good condition, not kinked, and securely connected to aircraft before applying hydraulic power. Wear gloves and eye protection (goggles or face shield) when operating hydraulic systems.

WARNING

EXTREMELY HOT AIR

Extremely hot air under pressure is generated by the AGPU pneumatic system. Allow pneumatic hose and fitting to cool before touching. Wear gloves and eye protection (goggles or face shield) when operating pneumatic system.

Never set PNEUMATIC POWER switch to ON unless pneumatic hose fitting is securely attached to aircraft. The hose will attempt to straighten out with power applied, and whip around violently if not securely attached to aircraft.

WARNING

NOISE

Operating level of this generator can cause hearing damage. Ear protectors, as recommended by the medical or safety officer, must be worn when working near the AGPU. Require all personnel within 9.1 meters of the AGPU to wear army approved hearing protectors, earplugs or noise muffs, when the turbine engine is operating.

WARNING

DEGREASING SOLVENT, MIL-PRF-680

Degreasing Solvent, MIL-PRF-680 is combustible and toxic to eyes, skin, and respiratory tract. Wear protective gloves and goggles/face shield. Avoid repeated or prolonged contact. Use only in well-ventilated areas (or use approved respirator as determined by local safety/industrial hygiene personnel). Keep away from open flames or other sources of ignition.

WARNING

ACCESS DOORS

Open access doors may be blown shut if AGPU is operated in close proximity to hovering or taxiing aircraft.

LIST OF EFFECTIVE PAGES

Insert latest changed pages. Dispose of superseded pages in accordance with regulations.

NOTE: On a changed page, the portion of the text affected by the latest change is indicated by a vertical line, or other change symbol, in the outer margin of the page. Changes to illustrations are indicated by miniature pointing hands. Changes to wiring diagrams are indicated by shaded areas.

Dates of issue for original and changed pages are:

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Change 2	25 July 1989	Change 8	22 November 2002
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Technical Manual
No. 55-1730-229-12

HEADQUARTERS, DEPARTMENTS OF
THE ARMY AND THE AIR FORCE
WASHINGTON, D.C. 1 December 1986

OPERATOR AND ORGANIZATIONAL MAINTENANCE MANUAL

FOR

POWER UNIT, AVIATION, MULTI-OUTPUT GTED ELECTRICAL, HYDRAULIC, PNEUMATIC (AGPU) WHEEL MOUNTED, SELF-PROPELLED, TOWABLE

AC - 400 Hz, 3 PH, 0.8 PF, 115/200V, 30 KW
DC 28VDC 700 AMPS
PNEUMATIC - 60 LBS/MIN. AT 40 PSIG
HYDRAULIC - 15 GPM AT 3300 PSIG

PART NUMBER	AC OUTPUT	DC OUTPUT	NSN
83 - 360A	30 KW (37.5 KVA)	700 AMPS	1730-01-144-1897
83 - 360D	38.4 KW (48 KVA)	250 AMPS	1730-01-466-9371

REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

You can improve this manual. If you find mistakes or if you know of a way to improve these procedures, please let us know. Mail your letter or DA Form 2028 (Recommended Changes to Publications and Blank Forms) located at the back of this manual, directly to: Commander, U.S. Army Aviation and Missile Command, ATTN: AMSAM-MMC-MA-NP, Redstone Arsenal, AL 35898-5000. A reply will be furnished to you. You may also provide DA Form 2028 information to AMCOM via e-mail, fax or the World Wide Web. Our fax number is: DSN 788-6546 or Commercial (256) 842-6546. Our e-mail address is 2028@redstone.army.mil. Instructions for sending an electronic 2028 may be found at the back of this manual immediately preceding the hard copy 2028. For the World Wide Web use: https://amcom2028.redstone.army.mil.

HAZARDOUS MATERIAL INFORMATION

This document has been reviewed for the presence of SOLVENTS containing hazardous materials as defined by the EPCRA 302 and 313 lists by the AMCOM G-4 (Logistics) Environmental Division. As of the base document through C8, dated 22 November 2002, all references to SOLVENTS containing hazardous materials have been removed from this document by substitution with non-hazardous or less hazardous materials where possible.

OZONE DEPLETING CHEMICALS INFORMATION

This document has been reviewed for the presence of Class I Ozone Depleting Chemicals by the AMCOM G-4 (Logistics) Environmental Division. As of the base document through C8, dated 22 November 2002, all references to Class I Ozone Depleting Chemicals have been removed from this document by substitution with chemicals that do not cause atmospheric ozone depletion EXCEPT Bromotrifluoromethane (CF3BR); Fire Extinguisher Agent (Halon 1301).

DISTRIBUTION STATEMENT A: Approved for public release. Distribution is unlimited

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CHAPTER 1

INTRODUCTION

Section I. GENERAL

1-1. SCOPE

a. This manual is for use in operating and maintaining the Multi-Output Aviation Power Unit, P/N 83-360A and P/N 83-360D, referred to as the Aviation Ground Power Unit (AGPU), as allocated by the maintenance allocation chart. It provided information on the operation, preventative maintenance checks and services (PMCS), and organizational maintenance of the equipment.

b. The P/N 83-360D has been modified by application of MWO 55-1730-229-50-2. This MWO is applied only to AGPU's that support the AH-64D, Longbow Apache Helicopter. While these power units have been assigned a new part number and NSN because of the changes in AC and DC output ratings, there are only minor changes to the operation and maintenance of the modified AGPU's.

1-2. LIMITED APPLICABILITY.

Some portions of this publication are not applicable to all services. These portions are prefixed to indicate the services to which they pertain. (A) for Army, (F) for air Force, (N) for Navy, and (MC) for Marine Corps. Positions not prefixed are applicable to all services.

1-3. MAINTENANCE FORMS AND RECORDS.

a. The following forms and records are required for maintaining and reporting the aviation ground power unit (AGPU). DA PAM 738-750, AR 700-138, and TB 43-0211 are the applicable references.

(1) DA Form 2404 (Equipment Inspection and Maintenance Worksheet): used to record results of the operator before, during and after PMCS. Used to record deficiencies noted from the operator PMCS and also used as an itemized checklist for Organizational Maintenance requirements. DA Form maintained in AGPU logbook.

(2) DD Form 314 (Preventive Maintenance Schedule and Record): Used to record Organizational PMCS (weekly/40 hours, monthly/100 hours, semi-annual/500 hours and per hour of operation requirements)on the front side. AOAP sampling requirements are to be included on this form. Used to record NMC days on the backside as required by DA PAM 738-750 and AR 700-138. DD Form maintained in AGPU logbook.

(3) DA Form 2408-20 (Oil Analysis Log): used to record oil sample results for the hydraulic system (30 days) and the engine (50 hours/180 days).

(4) DD Form 2026 (Oil Analysis Request): Used to submit the Hydraulic system and engine oil samples to the oil laboratory (maintain last completed 2026 IAW TB 43-0211).

(5) DA Form 2408-5 (Equipment Modification Record): used to record Modification Work Order (MWO) applications. Complete heading IAW PAM 738-750 and maintain in AGPU logbook.

(6) DA Form 2406 (Materiel Condition Status): used to record monthly readiness status for the AGPU IAW AR 700-138 Appendix B.

(7) For units/facilities utilizing ULLS-G, refer to PAM 738-750 and the ULLS-G user manual for the automated equivalency Forms and Records and use as directed.

b. (F) Maintenance forms and records used by Air Force personnel are prescribed in AFM-66-1 and the applicable 00-2- Series Technical Orders.

c. (N) Navy users should refer to their peculiar directives to determine applicable maintenance forms and records to be used.

1-4. REPORTING OF ERRORS.

Reports of errors, omissions, and recommendations for improvement of this publication by the individual user is encouraged. Reports should be submitted as follows:

a. (A) Army – DA Form 2028 directly to: Commander, U. S. Army Aviation and Missile Command. ATTN: AMSAM-MMC-MA-NP, Redstone Arsenal, AL. 35898-5230.

b. (F) Air Force – AFTO Form 22 directly to: SAALC/TIRT, Kelly AFB TX. 78241.

c. (N)Navy – by letter directly to: Commanding Officer, U.S. Navy, Ships Parts Control Center, ATTN: Code 783. Mechanicsburg, PA 17055.

d. (MC) Marine Corps – NAVMC Form 10772 directly to: Commandant, Headquarters, U. S. Marine Corps, ATTN: Code LMA-1, Washington D.C. 20380. (Narrative manuals only).

1-5. LEVELS OF MAINTENANCE ACCOMPLISHMENT.

a. (A, MC) Army and Marine Corps users shall refer to the Maintenance Allocation Chart for tasks and levels of maintenance to be performed.

b. (F) Air Force users shall accomplish maintenance at the user level consistent with their capability in accordance with policies established in AFM 66-1.

c. (N) Navy users shall determine their maintenance levels in accordance with their service directives.

d. (MC) Maintenance forms and records sued by Marine Corps personnel are prescribed in TM 4700-15/1.

1-6. (A,MC) DESTRUCTION OF MATERIAL TO PREVENT ENEMY USE. Army and Marine Corp personnel shall refer to TM 750-244-3 as a source for procedures for the destruction of material to prevent enemy use.

1-7. (A,F,MC) ADMISISTRATIVE STORAGE. Army personnel shall refer to TM 1-1500-204-23 (Series) General Aircraft Maintenance Manual for procedures for storage of this equipment. Air Force personnel shall refer to TO 35-1-4, Processing and Inspection of Aerospace Ground Equipment, for storage and shipment of this equipment. Marine Corps personnel shall refer to MCO P4450.7.

1-8. PREPARATION FOR SHIPMENT AND STORAGE.

a. (A) Army refer to TB 740-97-2 and TM 1-1500-204-23 (Series).

b. (F) Air Force - Refer to TO 35-1-4 for the end item Generator Sets and to TO 38-1-5 for installed engine.

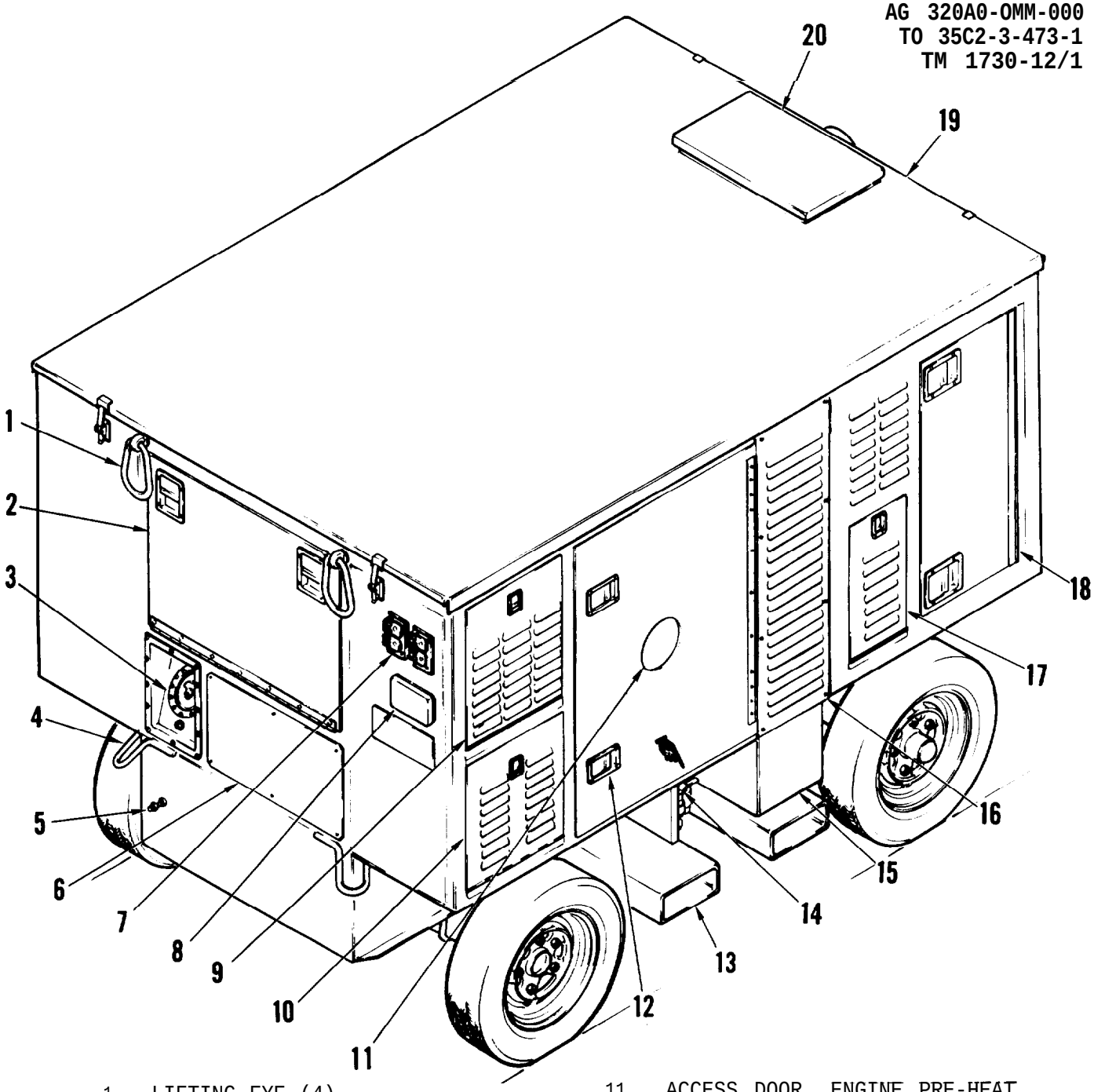
c. (N, MC) Navy and Marine Corps refer to individual service directives for requirements.

Section II. DESCRIPTION AND DATA

1-9. DESCRIPTION.

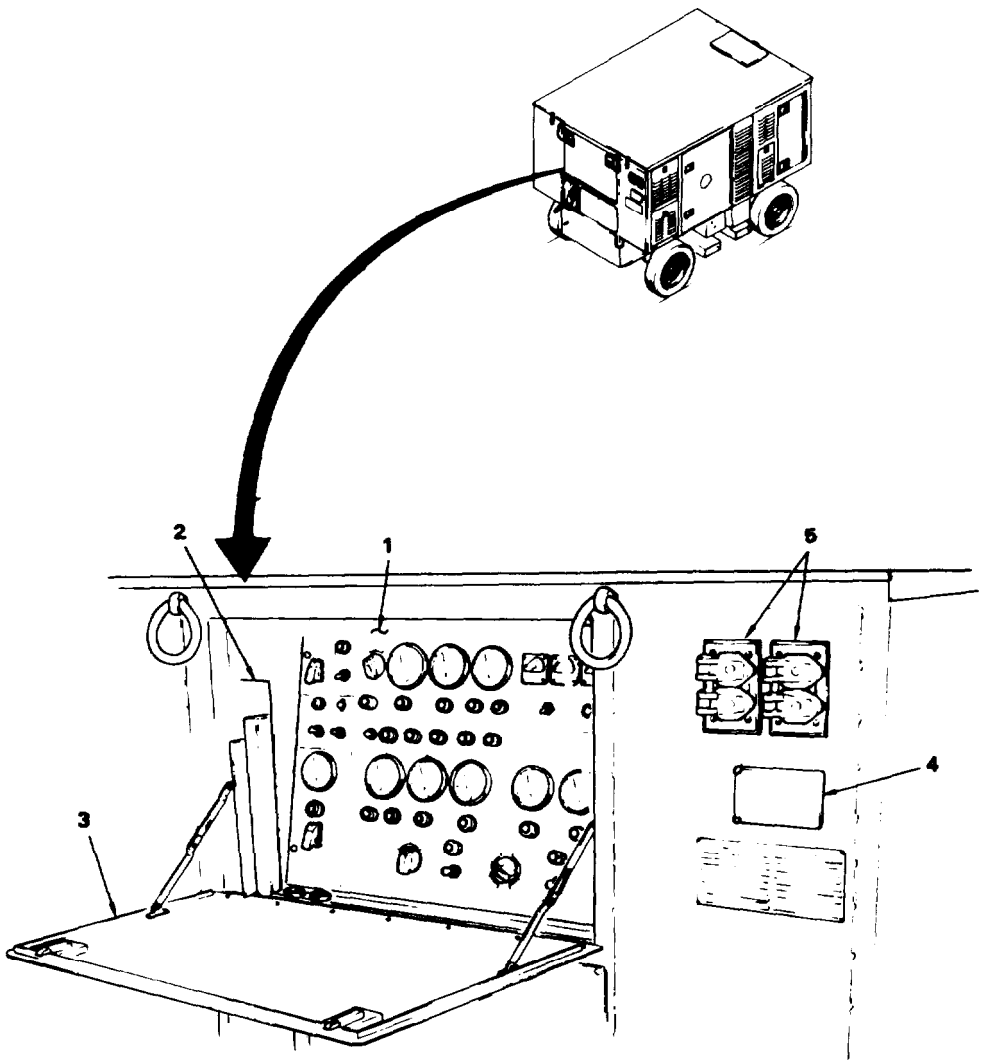
a. General. The Aviation Ground Power Unit (AGPU) P/N 83-360A and P/N 83-360D is a gas turbine engine-driven, wheel mounted, self-propelled (up to 3 mpg on flat surface), enclosed unit. The AGPU can be towed (20 mph maximum), and is air transportable. The AGPU provides ac/dc electrical, hydraulic, and pneumatic power. The power is available individually, or in any combination. The AGPU provides the ground power requirements for aircraft such as the following: AH-1, AH-64, C-12, CH-47, OH-6, OH-58, OV-1, U-21, UN-1, UH-60. Control and regulation of the AGPU electrical and pneumatic systems is semi-automatic. Electronic devices monitor and regulate electrical voltage, frequency, and current; as well as pneumatic outputs. Control of the hydraulic system is semi-automatic, in that the operator must set hydraulic pressure, and select operating modes.

b. Exterior Features. A view of the AGPU from the right rear is shown in Fig. 1-1. Fig. 1-2 through 1-5 show interior views with the rear and right side access doors open. Fig. 1-6 shows a view of the left front.



1. LIFTING EYE (4)
2. ACCESS DOOR, CONTROL PANEL
3. FUEL FILL
4. TIEDOWN (4)
5. GROUND STUD
6. ACCESS COVER, BATTERY CHARGER
7. CONVENIENCE OUTLETS (400 HZ)
8. SLAVE RECEPTACLE
9. ACCESS DOOR, ELECTRICAL TRAYS
10. ACCESS DOOR, BATTERY
11. ACCESS DOOR, ENGINE PRE-HEAT
12. ACCESS DOOR, ENGINE
13. FORKLIFT POCKET (2)
14. FOUR-WAY VALVE
15. COVER, AIR CLEANER EXHAUST
16. COVER, AIR INTAKE
17. ACCESS DOOR, HYD FILTERS
18. ACCESS DOOR, HYD CONTROL PANEL
19. ROOF
20. EXHAUST FLAPPER

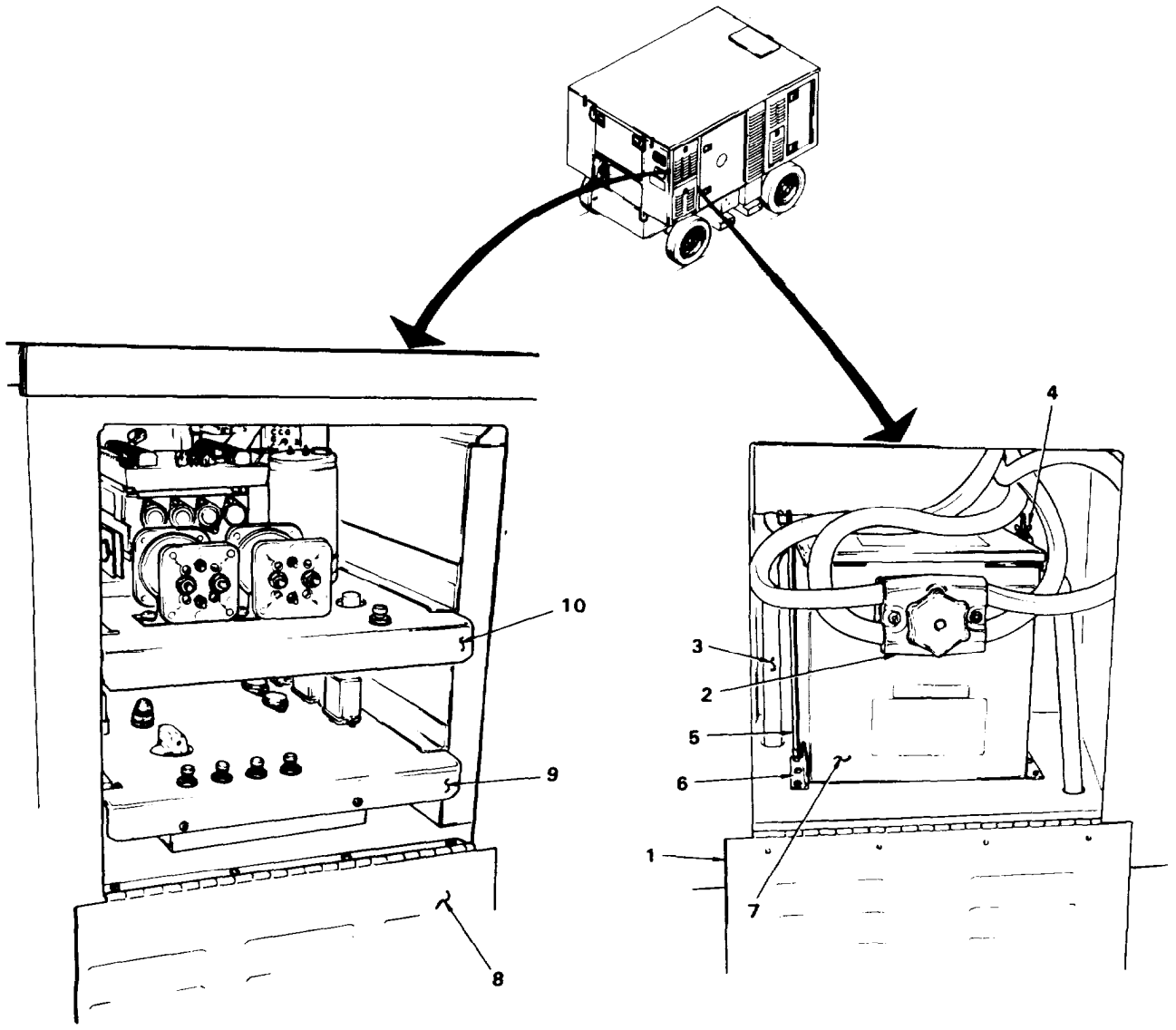
Figure 1-1. AGPU, Right Rear Three Quarter View



12-1-2

1. CONTROL PANEL
2. COMPARTMENT, MANUALS
3. ACCESS DOOR
4. SLAVE RECEPTACLE
5. OUTLETS (115 VAC, 400 HZ)

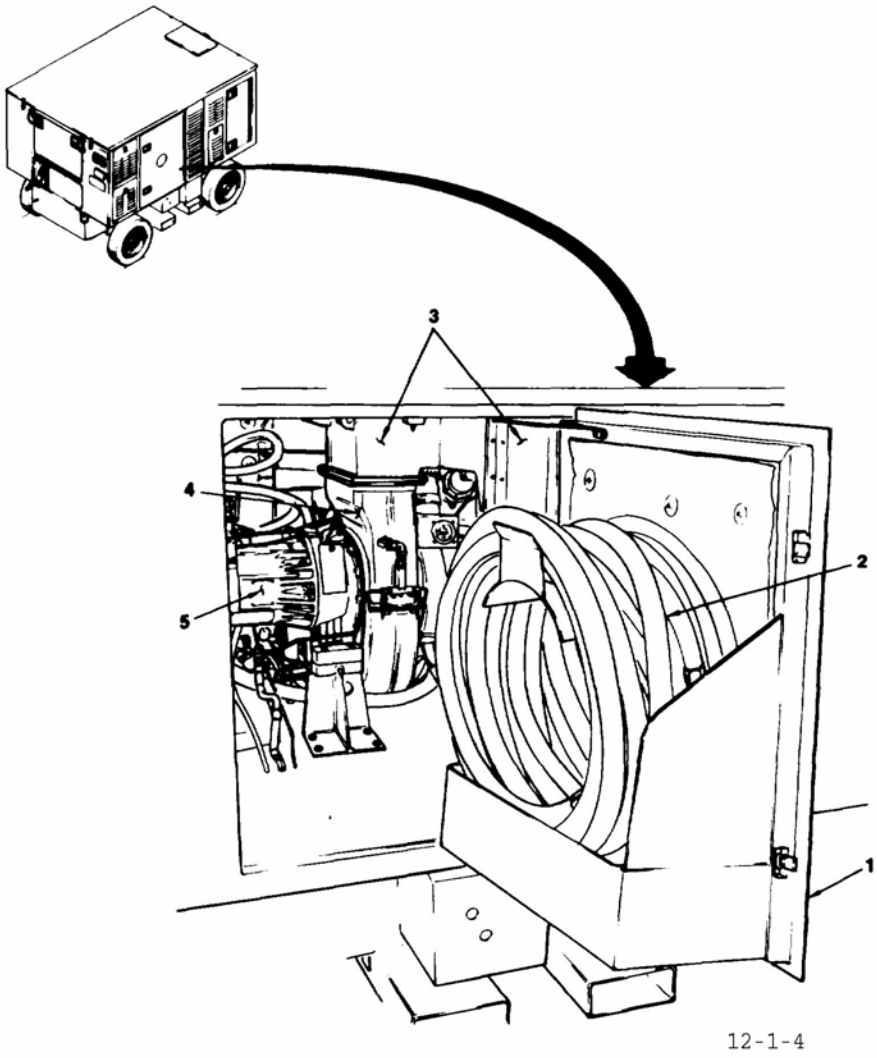
Figure 1-2. Control Panel and Electrical Outlets



12-1-3

1. ACCESS DOOR (OPEN)
2. CONNECTOR, BATTERY
3. VENT TUBE
4. WING NUT
5. HOLDDOWN ROD
6. GUIDE
7. BATTERY. (WITH COVER)
8. ACCESS DOOR (OPEN)
9. LOWER TRAY
10. UPPER TRAY

Figure 1-3. Electrical and Battery Compartments



1. DOOR, ACCESS
2. HYDRAULIC HOSES (STORAGE)
3. AIR INTAKE DUCT ASSY
4. ENGINE
5. GENERATOR

Figure 1-4. Engine Compartment

C. **Engine/Gearcase.** The gas turbine engine (GTE), Fig. 1-8, provides pneumatic power, and shaft power to drive an AC/DC generator and a hydraulic pump The generator and pump are mounted on pads on the gearcase. Fuel for operation of the engine can be supplied from an tegral fuel tank or an external source. Selection of fuel source is controlled the four-way valve, Fig. 1-1. Once started, the engine runs up to 100% governed speed of 58, 737 rpm, and automatically maintains that speed until shutdown. Engine air intake is through an air cleaner/duct assembly, Fig. 1-9 to the engine. Engine exhaust is through an exhaust ejector, and out the roof through an exhaust flapper.

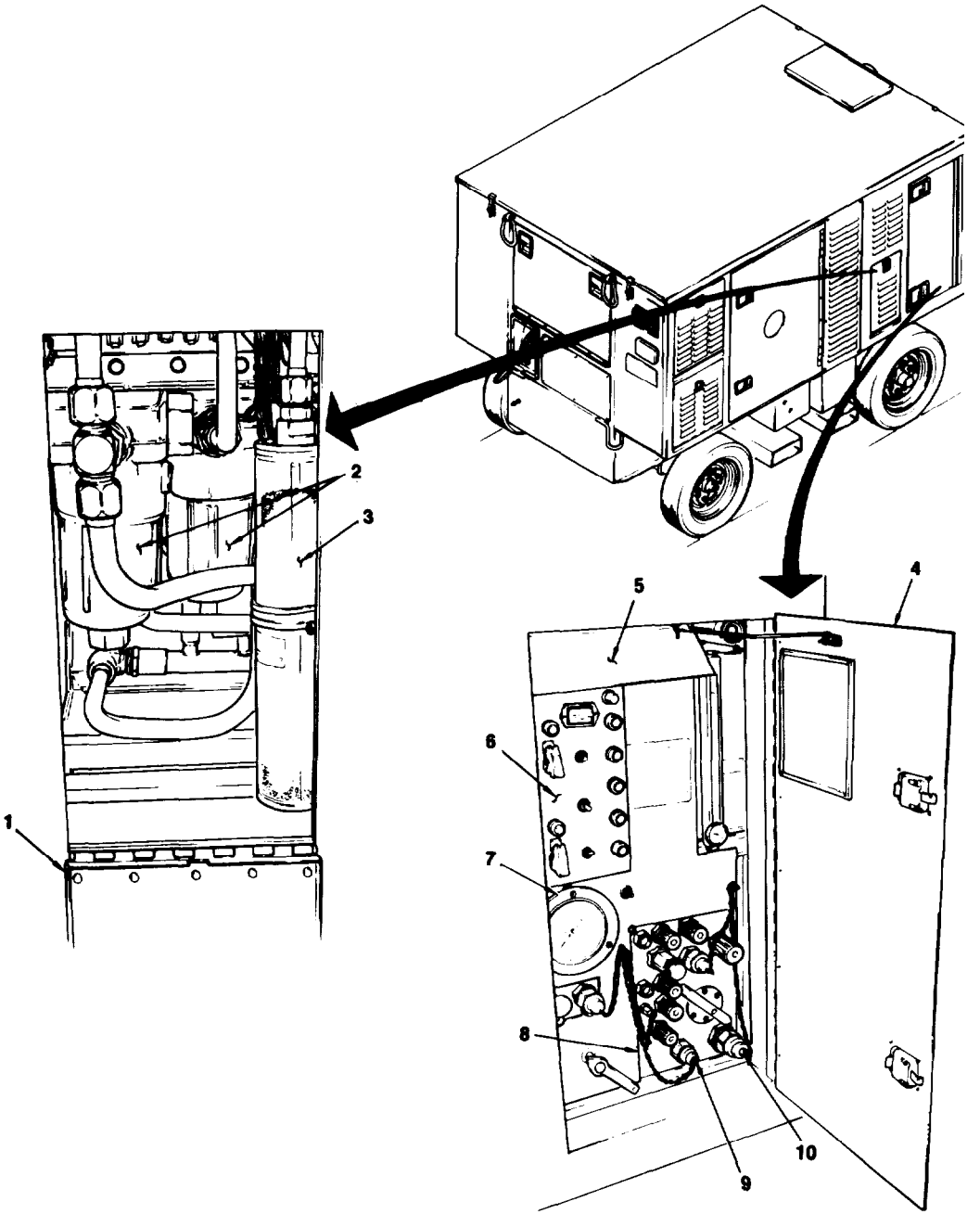
NOTE

tube, items 1 and 2, Fig. 1-8, are being replaced with a low back-pressure exhaust installation will be incorporated in a 83-360D AGPU and on other AGPUs whenever replacement of the current ejector assembly is required.

c. Engine/Gearcase. The gas turbine engine (GTE), Fig. 1-8, provides pneumatic power, and shaft power to drive an AC/DC generator and a hydraulic pump. The generator and pump are mounted on pads on the gearcase. Fuel for operation of the engine can be supplied from an integral fuel tank or an external source. Selection of fuel source is controlled by the four-way valve. Fig. 1-1. Once started, the engine runs up to 100% governed speed of 58,737 rpm, and automatically maintains that speed until shutdown. Engine air intake is through an air cleaner/duct assembly, Fig. 1-9, to the engine. Engine exhaust is through an exhaust ejector, and out the roof through an exhaust flapper.

NOTE

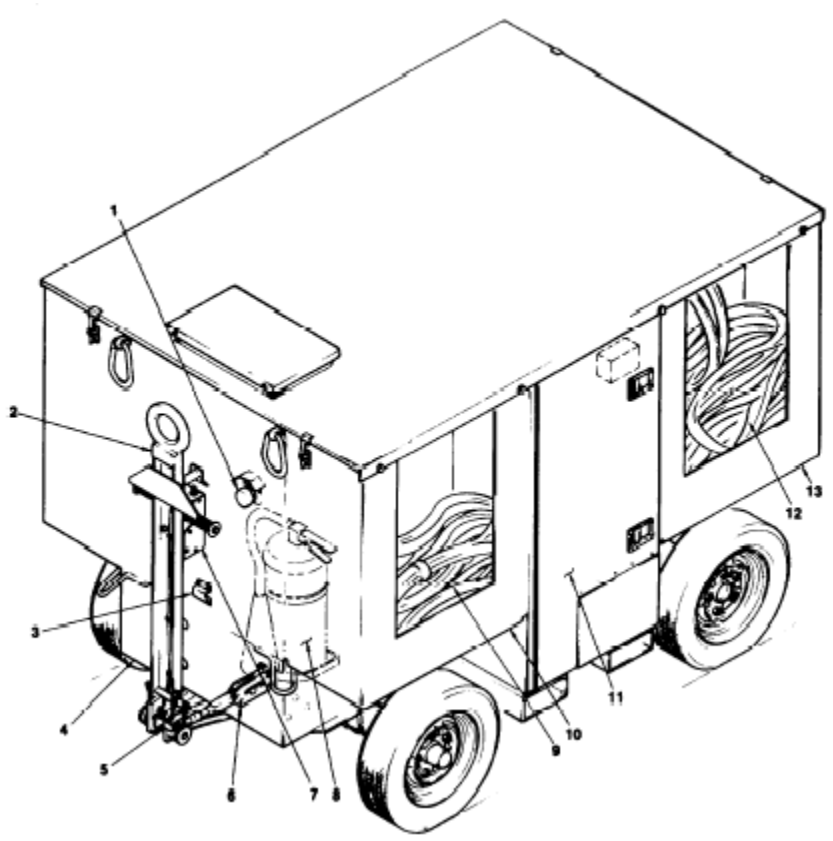
The exhaust ejector inlet tube, items 1 and 2, Fig. 1-8, are being replaced with a low back-pressure exhaust installation (not shown). This installation will be incorporated in a 83-360D AGPU and on other AGPUs whenever replacement of the current ejector assembly is required.



12-1-5

1. ACCESS DOOR, HYD FILTERS
2. HYDRAULIC FILTERS
3. VENT DRYER
4. ACCESS DOOR, HYD CONTROL PANEL
5. RAIN SHIELD
6. ELECTRICAL PANEL
7. PRESSURE GAUGE
8. HYDRAULIC MANIFOLD
9. FITTING, HIGH PRESSURE
10. FITTING, RETURN

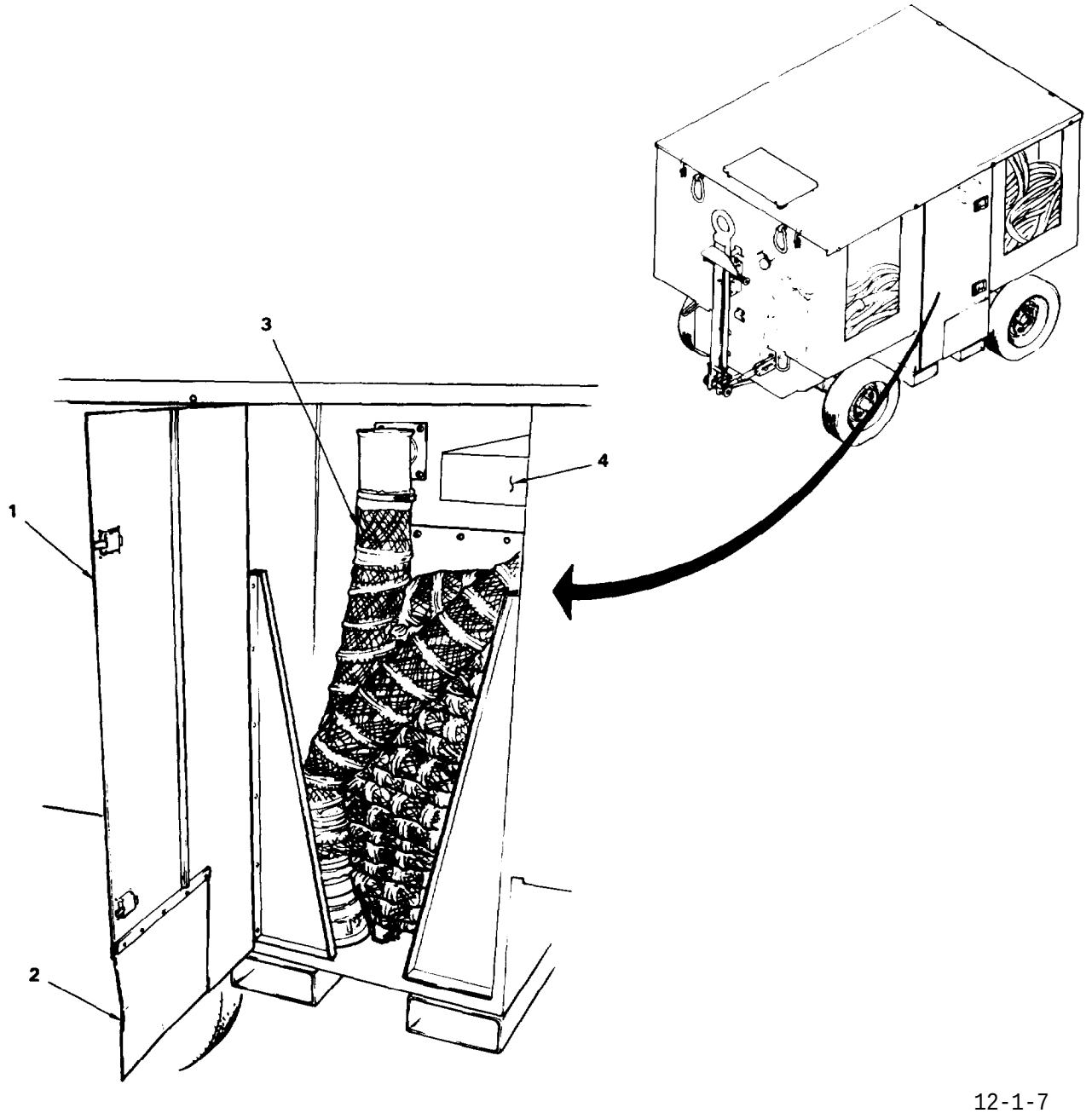
Figure 1-5. Hydraulic Filters and Control Panel



12-1-6

1.	EMERGENCY STOP SWITCH	8.	FIRE EXTINGUISHER
2.	TOW BAR	9.	AC CABLE
3.	DRAIN COVER, EXHAUST EJECTOR	10.	STORAGE COMPARTMENT
4.	FUEL TANK	11.	ACCESS DOOR, PNEUMATIC HOSE
5.	TOW BAR LATCH	12.	DC CABLE
6.	PARKING BRAKE	13.	STORAGE COMPARTMENT
7.	SPEED/DIRECTION CONTROL ASSY	14.	28 VDC TRU(not illustrated)

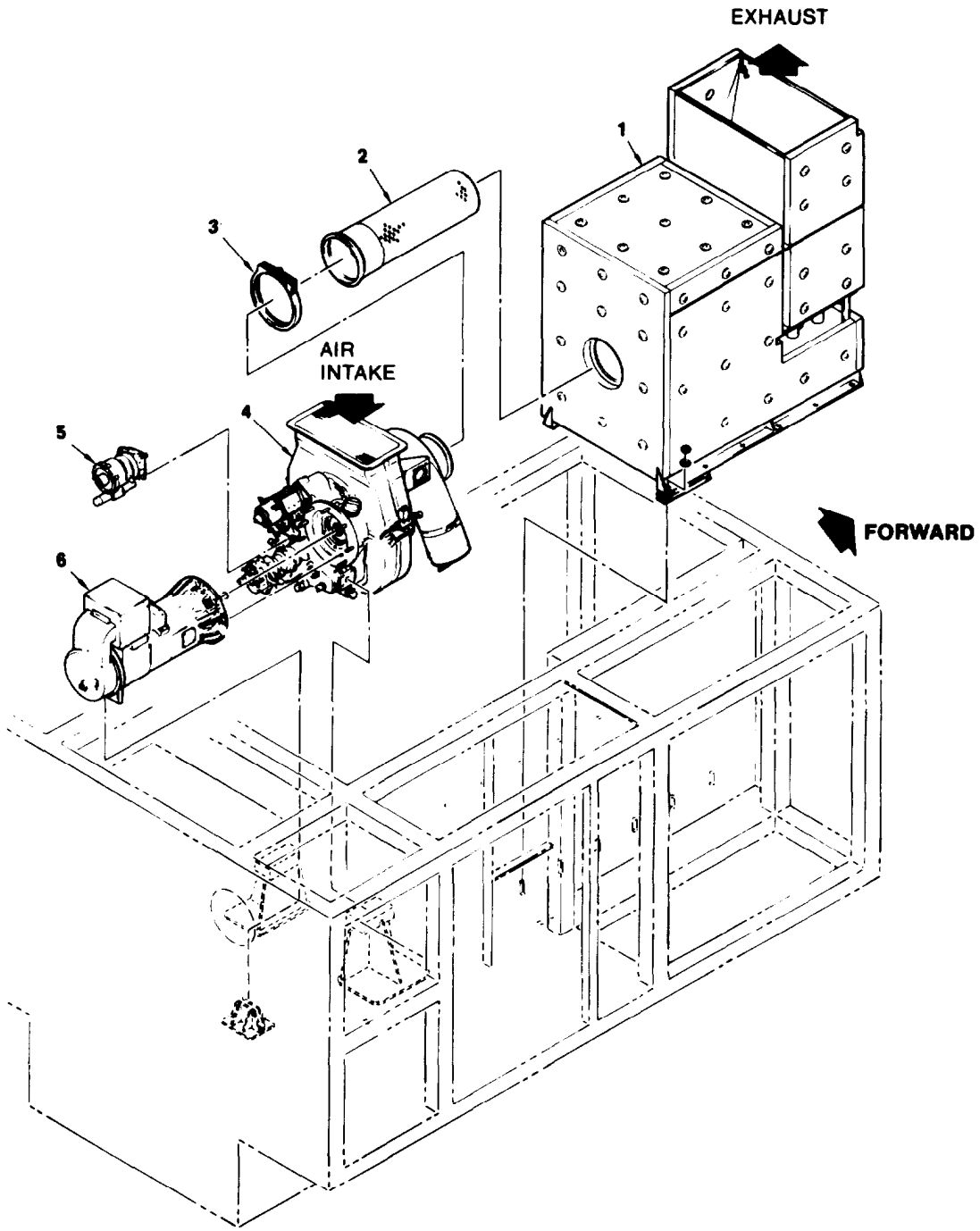
Figure 1-6. AGPU, Left Front, Three Quarter View



12-1-7

1. DOOR, ACCESS
2. FLAP, FLEXIBLE RUBBER
3. PNEUMATIC HOSE
4. INVERTER (115 VAC, 60 Hz CONVENIENCE RECEPTACLES)

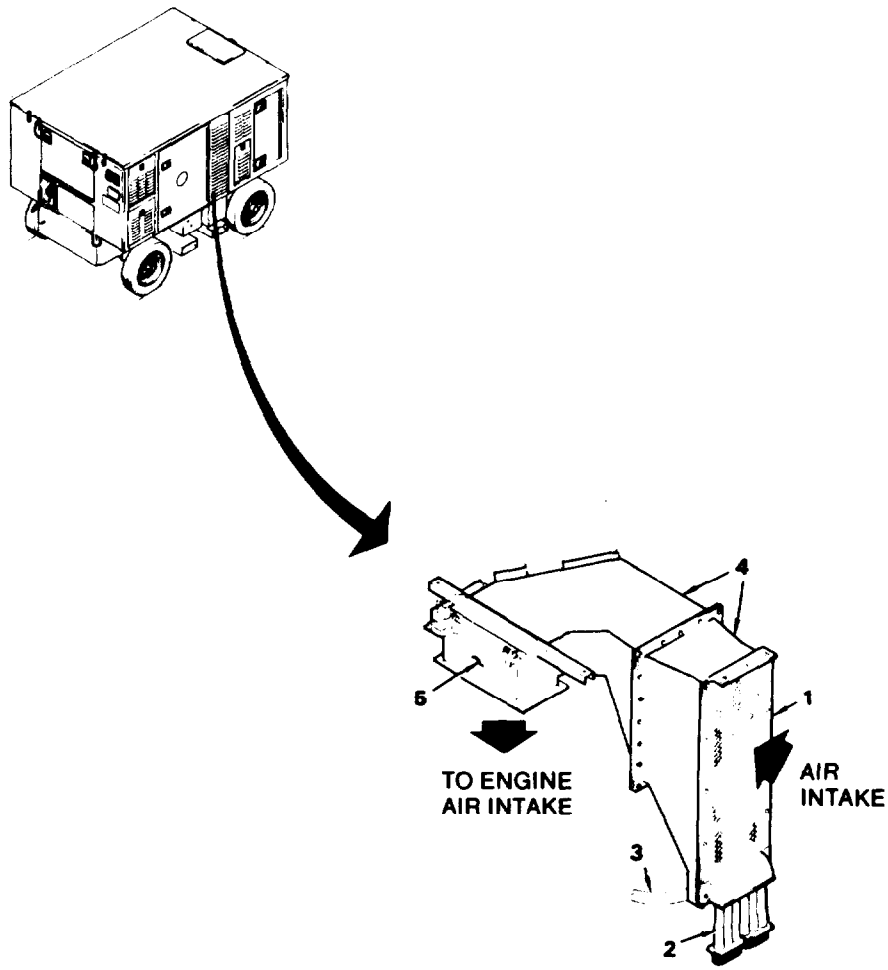
Figure 1-7. Pneumatic Hose Storage



12-1-8

1. EXHAUST EJECTOR
2. INLET TUBE
3. RING, COUPLING
4. GAS TURBINE ENGINE (GTE)
5. HYDRAULIC PUMP
6. GENERATOR

Figure 1-8. Engine, Generator, Hydraulic Pump and Exhaust Ejector



1. AIR CLEANER ASSEMBLY
2. SCAVENGE TUBES
3. BLEED AIR HOSE (FROM ENGINE)
4. AIR INTAKE DUCT ASSEMBLY
5. BYPASS DOOR

Figure 1-9. Engine Air Intake System

d. Generator. The generator (figure 1-8) is a self-cooled, continuous duty, ac/dc, self-excited, brushless unit. It includes a permanent magnet stator and rotor, an exciter stator and rotor, and a main dc rotating field and ac stator. The main ac stator incorporates three sets of three phase windings. One set of main stator windings provides the 115/200 vac output. The ac outputs of the other two windings are full-wave rectified to provide 28 vdc output. The permanent magnet provides a three phase output whenever the generator is driven by the engine. When the engine reaches 95 percent speed, a relay connects the permanent magnet output to the generator control unit (GCU), located behind the control panel. The GCU rectifies this ac voltage to provide dc control voltage for the GCU and dc excitation voltage for the generator exciter field. The exciter provides a three phase output which varies in magnitude with the field excitation.

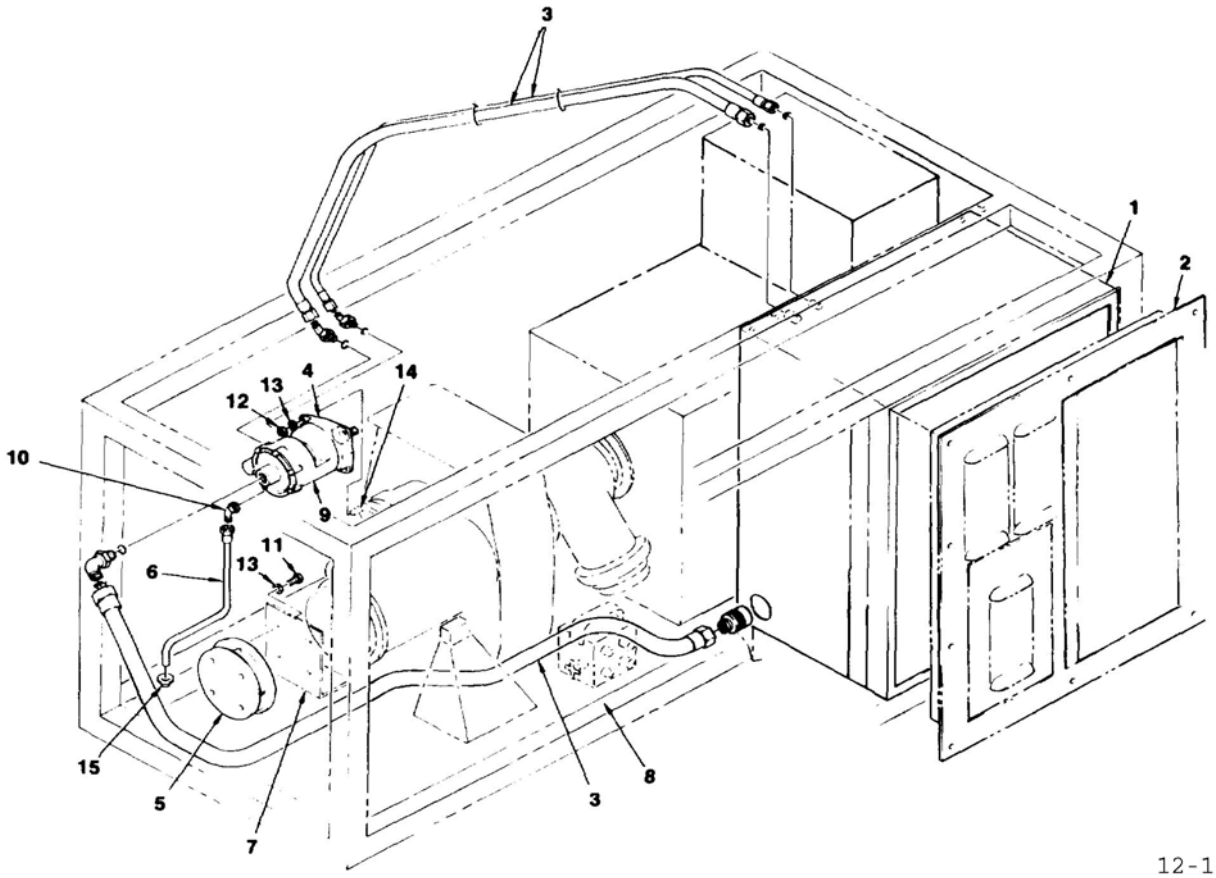
The exciter voltage is half-wave rectified and applied to the generator main dc rotating field. The magnitude of the three phase voltage generated in the main stator windings is a function of the ampere turns of the field windings which is, in turn, a function of the exciter field excitation The GCU monitors the generator ac or dc output (depending upon which output is selected at the AGPU control panel) and controls the exciter field as required to keep the selected output within limits.

e. Hydraulic System. The hydraulic system, figure 1-10, consists of a hydraulic pump, interconnecting lines and hoses, and a hydraulic module. The hydraulic pump is mounted on an engine gearcase pad, and is driven by the engine. The hydraulic pump output pressure is controlled by a switch on the hydraulic control panel. The hydraulic module controls the application of hydraulic fluid to an aircraft for power, filling, or flushing requirements. The hydraulic module contains a control panel, a reservoir, an accumulator, a cooler (heat exchanger), a manifold, filters (2), and hydraulic lines, fittings, and valves.

f. Propulsion System. The propulsion system, figure 1-11, provides suspension, steering, brakes, and drive power for the AGPU. A speed/direction control assembly mounted on a tow bar allows the operator to control the forward/reverse directions and speed (up to 3 mph on flat surface) in self-propulsion mode. The tow bar is also used to steer the AGPU when using self-propulsion mode. Drive power is provided by a dc traction motor driving a conventional rear axle assembly. An electric brake assembly is provided. The electric brake prevents the rear wheels turning with the clutch engaged until electrical power is applied to the traction motor and electric brake. Application of dc drive power to the traction motor is controlled by a motor controller and relays located on the upper tray in the electrical compartment. The motor controller receives signals from the speed/direction control assembly. The drive train consists of a gear box, a chain drive, a manual clutch, and a rear axle assembly. A dead man switch on the speed/direction control assembly must be held in while operating the propulsion system. If the switch is released (intentionally or accidentally) during operation, power is removed from the traction motor and the electric brake. Removing electrical power applies the electric brake. Additionally, the speed/direction control assembly contains a mercury switch which deactivates the propulsion system when the tow bar is raised. Conventional drum brakes are provided by the rear wheels. The brakes are set by a lever on the front of the AGPU, which is connected to the brake assemblies by a cable assembly

g. Pneumatic System. The pneumatic provides pneumatic power (60 pounds/minute, at psig). The pneumatic system consists of a load control valve (LCV) mounted on the engine, ducts, and a pneumatic hose (figure 1-7). An optional deicer kit, figure 1-12, is supplied with some units. The kit consists of a fifty-foot hose assembly, a supply valve, and a deicer nozzle assembly. The supply valve connects to a normally capped outlet on the left interior bulkhead of the AGPU.

1-10. TABULATED DATA. Tabulated data is contained in table l-l. Refer to table 1-2 for stencilling nomenclature and instruction plates, and table 1-3 for torque specifications.



12-1-10

1. HYDRAULIC MODULE
2. FRONT PANEL ASSEMBLY
3. HOSE
4. HYDRAULIC PUMP
5. SPACER
6. DRAIN TUBE
7. STORAGE BRACKET
8. ENGINE COMPARTMENT
9. ELECTRICAL CONNECTOR, P16
10. PUMP FITTING
11. BOLT
12. NUT
13. WASHER
14. GEARCASE PAD
15. GROMMET
16. DUAL SERVICE MODULE (NOT ILLUSTRATED)

Figure 1-10. Hydraulic Module, Pump, Lines and Hoses

1-11. DIFFERENCES BETWEEN SERIAL NUMBERS.

a. Part Number 83-360A. This is the original AGPU having a combined AC/DC generator and for which this technical manual was originally written. There are two sets of serial numbers for the AGPU. Serial numbers 001 through 659 were produced by what is now BAE Systems, Ontario CA. Serial numbers 1001 through 1155 were produced by Engineered Air Systems, St. Louis, MO.

(1) Battery Charger. Serial number 001, 002, 004, 005, and 009 have 20 amp battery chargers instead of the 50 amp battery chargers supplied with all other AGPUs.

(2) Mounting Hardware. There are minor differences in component mounting hardware (screws, nuts, rivets) and frame and housing components (doors, panels, covers) between the AGPU serial numbers 001 through 020, and serial numbers 021 and on.

These differences should be noted prior to any maintenance or repair actions.

(3) Locating the CURRENT LIMIT SELECTOR switch to the 30 KW setting in addition to the 45 KW setting, will cause the surge control valve to open on serial numbers 1012, 1032, and 1036 through 1155. The con- tinuous bleed of GTE compressor out- put through a 1/4 inch diameter hole in the union at the input to the su- rge control valve has also been eli- minated on these same serial num- bered AGPUs.

b. Part Number 83-360D. This new part number has been assigned to selected AGPUs used to support the AH-64D, Longbow Apache helicopter that have been modified by MWO 1-1730-229-50-2 to upgrade the 400 Hertz, AC, output and the gas tur- bine engine performance. The up gra- ded AGPU has a new AC generator, a modified generator control Unit (GCU), a transformer rectifier Unit (TRU), a modified exhaust ejector, and associated wiring changes. Se- rial numbers are not changed when MWO 1-1730-229-50-2 is applied.

(1) The primary hardware change in corporated by MWO 55-1730-229-50-2 is replacement of the generator, which has a combined 37.5 KVA AC and 700 amp DC output, with 48 KVA AC generator. The 83-360D generator has no DC output. The AC generator is also a self-cooled, continuous duty, self-excited, brushless unit, but doesn't have the two windings used to provide 28 VDC output. The rectangular box on the top of the gen- nerator is eliminated. It contained the DC output terminals and the gen- nerator control unit (GCU) con- nector, which is located onto the primary housing of the AC generator. The connections to the output ter- minals are changed to maintain the proper direction of rotation. (See Figure 4-39a.)

(2) The GCU has been modified to control the larger capacity AC gen- erator. While the current limits may change, this modified GCU may be used still be used with the com- bined AC/DC generator on the P/N 83-360A. Since AC power is still need- ed, even when only DC is being sup- plied by the TRU, the CURRENT LIMIT SELECTOR switch is rewired so that the GCU is always monitoring the AC output.

(3) An aircraft (AH-64A) type, 400 Hertz to 28 VDC, transformer rectifier unit (TRU) is used on the 83-360D to power the battery char- ger, the 60-Hertz inverter and to start or service DC aircraft. The TRU is mounted to the front side of the DC cable storage bay. A rubber flap is attached to the lid to re- duce exposure of the TRU to rain or snow. The TRU out-put is connected to the DC contactor as shown on FO-5D.

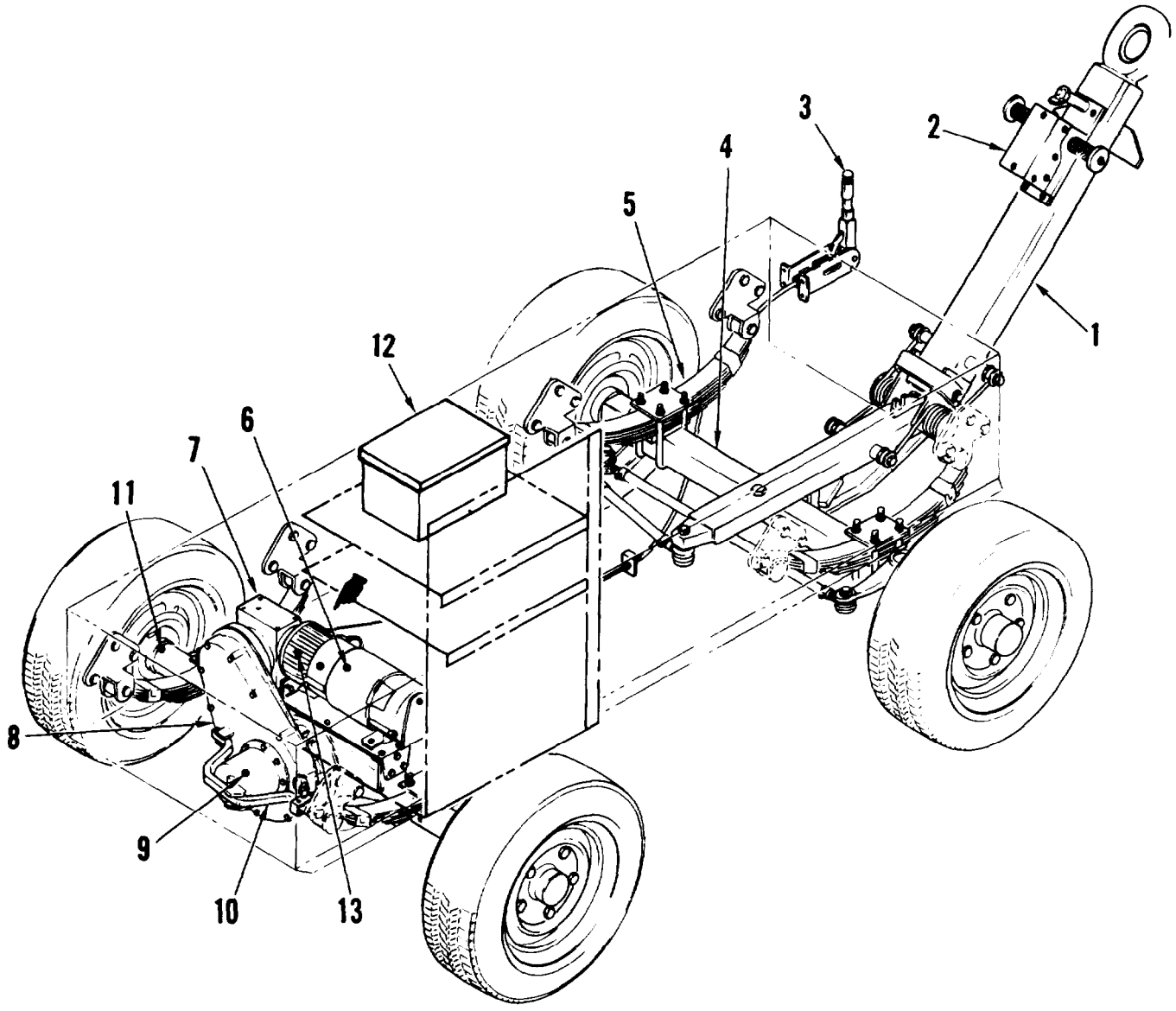
(4) The exhaust ejector assembly on the 83-360D has also been modi- fied to reduce the back-pressure. This improves the GTE efficiency, thereby increasing shaft horsepower, increaseing the pneumatic output and reducing fuel consumption.

(5) The continuous bleed of GTE compressor output on all P/N 83-360D, is plugged and the jumper in- stalled on the current limit switch for serial numbers 1012, 1032, and 1036 through 1155 is removed. The surge control valve opens only when the CURRENT LIMIT switch is set at the AH-64D/90KVA setting. The set- ting of the pneumatic system switch no longer controls the function of the surge control valve. A muffler has been added to the outlet of the surge control valve.

(6) The marking on the current limit selector on the control panel have been changed to identify the higher AC limits and to indicate that the DC current limiting and DC VOLTAGE FAULT indicator has been disabled. The TRU has only limited output. A "MAX. CONT. 350 AMP" la- bels has been applied to the con- trol panel to indicate the reduced DC output. A "MAX. CONT. 130%" label has been applied to indicate the in- creased AC rating.

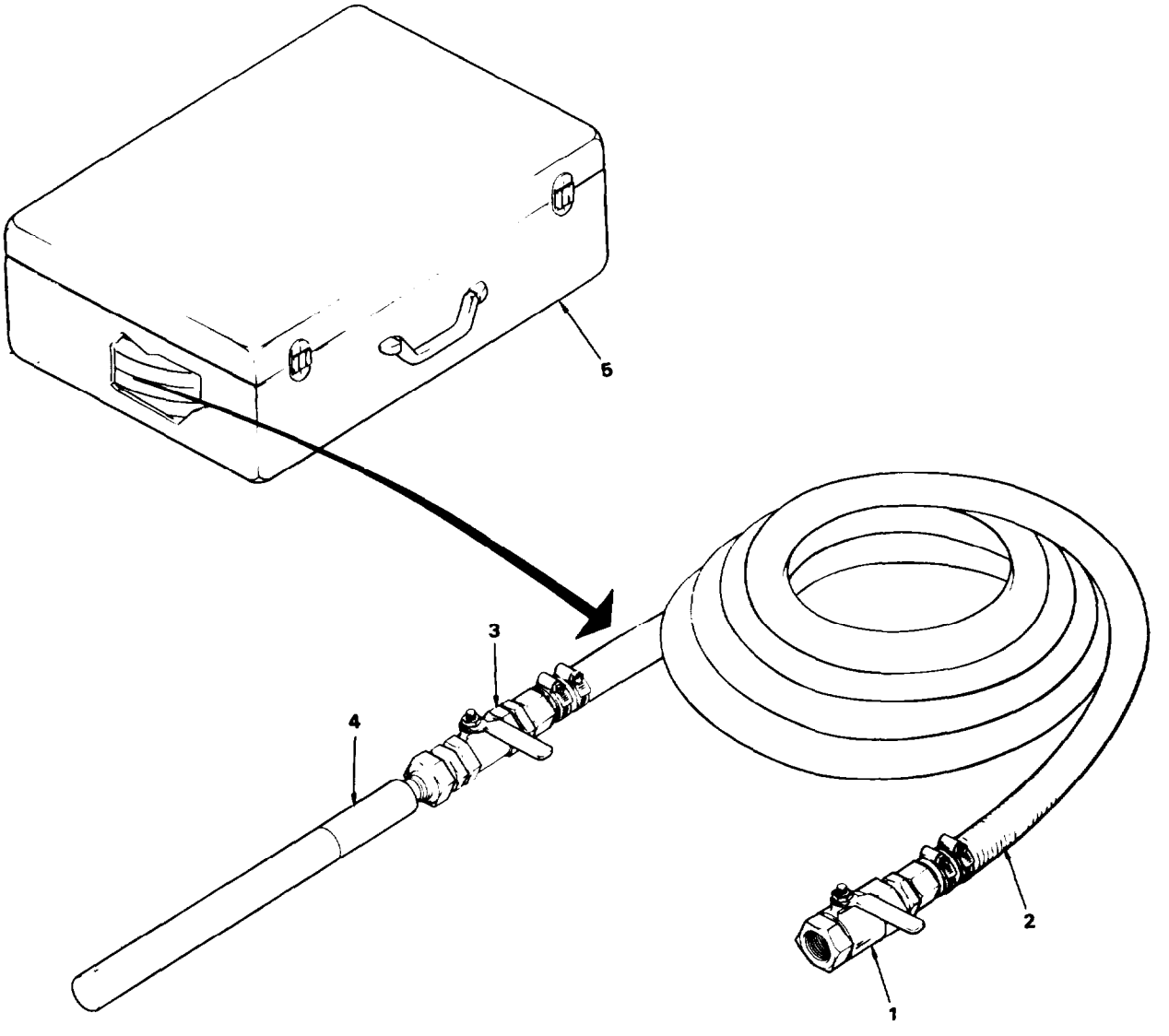
NOTE

There are only minor changes with the exterior of the AGPU. The 83-360D can be identified by ammo identification plate located just below the nameplate and revised labeling the control panel. The TRU can be seen on the upper left of the DC cableway, just under a 6-inch flexible flap marked "83--360D".



1. TOW BAR
2. SPEED DIRECTION CONTROL ASSEMBLY
3. BRAKE LEVER
4. FRONT AXLE ASSEMBLY
5. SPRING
6. TRACTION MOTOR
7. GEAR DRIVE
8. CHAIN DRIVE ASSEMBLY
9. CLUTCH ASSEMBLY
10. CLUTCH LEVER
11. REAR AXLE ASSEMBLY
12. CONTROLLER (LOCATED ON UPPER TRAY IN ELECTRICAL COMPARTMENT
13. ELECTRIC BRAKE

Figure 1-11. Propulsion System



12-1-12

1. SHUTOFF VALVE, HOSE
2. HOSE
3. SHUTOFF VALVE, NOZZLE
4. NOZZLE
5. CASE, STORAGE

Figure 1-12. Deicer Kit (Optional)

Table 1-1. Tabulated Data

1. Aviation Ground Power Unit (AGPU).

Manufacturer: BAE System Aircraft Controls, Inc.
(Serial No. 0001-0659) (Cage 63631)

Manufacturer: Engineered Air Systems Inc.
(Serial No. 1001-1155 (Cage 90598)

Operating Environment Capabilities:

Temperature: -65°F to 95°F (-54°C to 35°C)
Up to 10,000 feet (3048m) elevation

-65°F to 107°F (-54°C to 42°C)
Up to 5,000 feet (1524m) elevation

-65°F to 125°F (-54°C to 52°C) at sea level

AC voltage output: 400 Hertz, 3 phase, 0.8 power factor, 115/200v
4-wire output cable, 60 foot (18.3m)

AC power output:

Part number 83-360A: NSN: 1730-10-144-1897

30 KW continuous (45 KW for 30 seconds) with no DC
27.5 KW continuous with 50 amperes DC from battery charger.

Part number 83-360D: NSN: 1730-01-466-9371

38.4 KW (48.0 KVA) continuous
30.0 KW (37.5 KVA) continuous with 250 amperes 28 VDC output from the TRU
66.0 KW (82.5 KVA) for 30 seconds

DC power output:
2-wire output cable, 60-foot (18.3m)

Part number 83-360A: NSN: 1730-10-144-1897

28vdc 700 amperes (1,000 amperes for 30 seconds) with no AC
28 vdc 50 amperes from battery charger with 27.5 KW AC

Part number 83-360D: NSN: 1730-01-466-9371

DC power output:

250 amperes continuous at 26 volt minimum

Table 1-1. Tabulated Data (continued)

350 amperes continuous at 25 volts minimum
500 amperes for 1 minute
1000 amperes for 5 seconds

Pneumatic output:

60 lb/minute at 40 psig (sea level)- Temperature 450°F (232°C)
26.5 lb/minute at 24 psig, 10,000 (3048m) feet altitude - Temperature 420°F (232°C)
3.5 inch (8.9 cm) diameter output hose, 30 ft. length (9.1m)

Hydraulic output:

15 gpm at 500 to 3,300 psig
Hydraulic fluid or MIL-H-83282 or MIL-H-5606
30-foot (9.1m) pressure and return hoses
Aircraft Interface - single or dual connections

Operating Attitude: Up to 15 degrees from horizontal any azimuth

Noise level: Less than 85 dBA at 23 foot (7 meter) radius
Less than 90/93 dBA at operator panel
Less than 103/105 dBA at GTE air inlet

Capacities (Liquids):

Fuel Tank	65 gallons (246 liters)
Engine Oil Sump	2.3 quarts (2.2 liters)
Hydraulic System	9 gallons (34 liters)

Dimensions and Weights:

Overall length	90 inches (229 centimeters)
Overall width	58 inches (147 centimeters)
Overall height	60 inches (152 centimeters)
Weight empty	3550 pounds (1610 kilograms)
Weight filled-fluid	4275 pounds (1939 kilograms)
Shipping weight	3620 pounds (1642 kilograms)
Cubage	181 cubic feet (5.1 cubic meters)

2. Engine.

Manufacturer: Garrett Turbine Engine Co. (FSCM 99193)

Model: GTCP36-50(H)

Type: Gas Turbine Engine (GTE), Pneumatic and Shaft Power

Table 1-1. Tabulated Data (continued)

2. Engine (continued)

Dry Weight:	130 pounds (59 kilograms)
Dimensions:	
Height:	24.8 inches (63 centimeters)
Length:	32.8 inches (83.3 centimeters)
Width:	20.8 inches (52.8 centimeters)
Shaft Horsepower (sea level):	
With bleed air:	46 shp minimum
Without bleed air:	62 shp minimum
Engine Speeds:	
Nominal full-load governed speed:	58,737 rpm (100 percent)
Full-load governed speed limits:	58,167 to 59,034 rpm (99 to 100.5 percent)
Gearcase output drive pads (clockwise rotation):	
Generator drive pad:	8,000 rpm
Hydraulic pump drive pad:	8,000 rpm
Electrical system voltage:	28 vdc nominal
Lubrication system:	
Oil	MIL-L-23699 or MIL-L-7808
Capacity	2.3 U.S. quarts (2.2 liters)
Filter	Replaceable element
Starter motor:	
Voltage	28 vdc nominal
Current	Approximately 800 ampere initial start to approximately 200 ampere at 60% GTE rotor speed

Table l-l. Tabulated Data (continued)

2. Engine (continued)

Automatic shutdown features:

Overspeed	110 ± 1 percent (64,587 rpm)
Overtemperature	1300°F (704°C) above 60% rotor speed 1255°F (679°C) at 100% speed
Overcurrent	4.0 ampere maximum
Low oil pressure (10 seconds above 95%)	31 psig minimum (normal 45 ± 10 psig)
High oil temperature (1 second delay)	275°F (135°C) maximum
Loss of EGT sensing	
Loss of rpm sensing	

Fuel:

MIL-T-5624 Grade JP-4	-65°F (-54°C) to #135°F (57°C)
MIL-T-5624 Grade JP-5, or MIL-T-83133 Grade JP-8	-40°F (-40°C) to 135°F (57°C)
Commercial Jet A	-40°F (-40°C) to 135°F (57°C)

*Sea level, 115°F (46°C) at 10,000 feet (3048m)

Emergency Fuel (25 hrs maximum) Diesel MIL-G-5572 or W-F-800

Fuel Consumption (approximate):

With bleed air	125 lb/hr (19 gph)
Without bleed air	110 lb/hr (17 gph)

Exhaust Gas Temperature Limits:

Allowable below 60% rotor speed during start cycle	1600°F (871°C) for 30 seconds maximum l600°F to 1800°F (871°C to 982°C) for 2 seconds maximum

Table 1-1. Tabulated Data (continued)

2. Engine (continued)

Exhaust Gas Temperature Limits: (continued)

Allowable above 60% rotor speed	1300°F (704°C) maximum
Allowable at 100% Speed	1255°F (679°C) maximum

3. Battery.

Type:	Lead-acid MIL-B-83769D, or optional NiCad MS24498
Voltage:	24 vdc
Amp-Hours:	53

4. Battery Charger.

Manufacturer:	Leland Electrosystems, Smith Industries, Aerospace (Cage 07639)
Model:	DSH831-1A
Voltage:	Output selectable at 28.5, 30.5, or 32 vdc
Output:	50 amperes nominal – battery 20 amperes nominal – control circuits

5. Generator and Generator Control Unit (GCU).

Manufacturer:	Leland Electrosystems, Smith Industries, Aerospace (Cage 07639)
P/N 83-360A:	AGH815-1 (Generator) CSV 3370-2 (Generator Control Unit)

Rated-continuous duty, single mode:

AC 30 KW, 3 phase, 400 Hertz, 115/200V, 0.8 power factor
DC700 amperes, 28vdc

P/N 83-360D:	AGH815-3 (Generator) CSV 3370-3 (Generator Control Unit)

Rated-continuous duty, single mode:

AC 38.4 KW, 3 phase, 400 Hertz, 115/200V, 0.8 power factor

Table 1-1. Tabulated Data (continued)

5.1 Transformer Rectifier Unit (TRU), (P/N 83-360D only).

Manufacturer:	Allied Signal Inc., Aerospace Equipment Systems (Cage 83298)
Model	9B40-15D
Output	250 amperes continuous at 26 volts minimum 350 amperes continuous at 25 volts minimum 500 amperes for 1 minute 1000 amperes for 5 seconds

TRU features:
- Silicon diode rectifiers
- Fan cooled continuous duty
- 22 amp input at 250 amp output (85% efficiency)
- 1.5 volt maximum ripple

6. Auxiliary Fuel Pump.

Manufacturer:	Weldon Tool Co. (Cage 64560)
Model:	A8016-B
Type:	Electric Motor (28 vdc) driven, continuous duty, 3A max.
Output:	20 psi

7. Auxiliary Fuel Filter.

Manufacturer:	Raycor Div., Parker Hannifin Corp (Cage 55752)
Model:	660R-10
Filtering:	10 micron
Element:	Replaceable cartridge (R60T)

8. Air Cleaner.

Manufacturer:	Paul Land and Marine Corp. (Cage 60047)
Model:	AE-A212-4
Type:	Inertial particle separator type, bleed air scavenged

9. Hydraulic Pump.

Table 1-1. Tabulated Data (continued)

Manufacturer:	Garrett (FSCM 70210)
Model:	411612-3
Type:	Axial piston, variable displacement, pressure-compensated
Output:	500 to 3300 psig at 15 gpm at aircraft interface (SAE - AS5440, Type II)

10. Hydraulic Module.

Manufacturer:	Pneudraulics Inc. (FSCM 06177)
Model:	06177-83-14631
Reservoir:	Vented through dryer. Nine gallon capacity.
Suction Fill System:	Four gpm from 55-gallon drum.
Filtration:	High pressure: 2 micron absolute at 20 gpm. Return: 5 micron at 20 gpm.

11. Running Gear.

Wheel mounted, pneumatic tires (P195/75R15, or equivalent)

Tire pressure 28 psig

Tow bar, pintle heights between 6 and 36 inches (15 to 91 cm) above ground

Tow speeds:

20 mph (32kph) maximum on improved road surfaces.
10 mph (16kph) maximum on rough unimproved terrain

Turning radius approximately 11 feet (3.4m)

Parking brake on rear wheels

Ground clearance 7 inches (18cm) under axles

Table 1-1. Tabulated Date (continued)

12. Propulsion.

28 vdc, 3 hp drive motor, 83-14501-01 (FSCM 63631) with electric brake, 304198-32 (FSCM 4V298)
Variable speed 0 to 3 mph on level terrain
½ mph on 15 degree slope
Manual clutch
Twist-grip speed/direction control, spring loaded to off
Dead-man control

Table 1-2 Stenciling Nomenclature and Instruction Plates

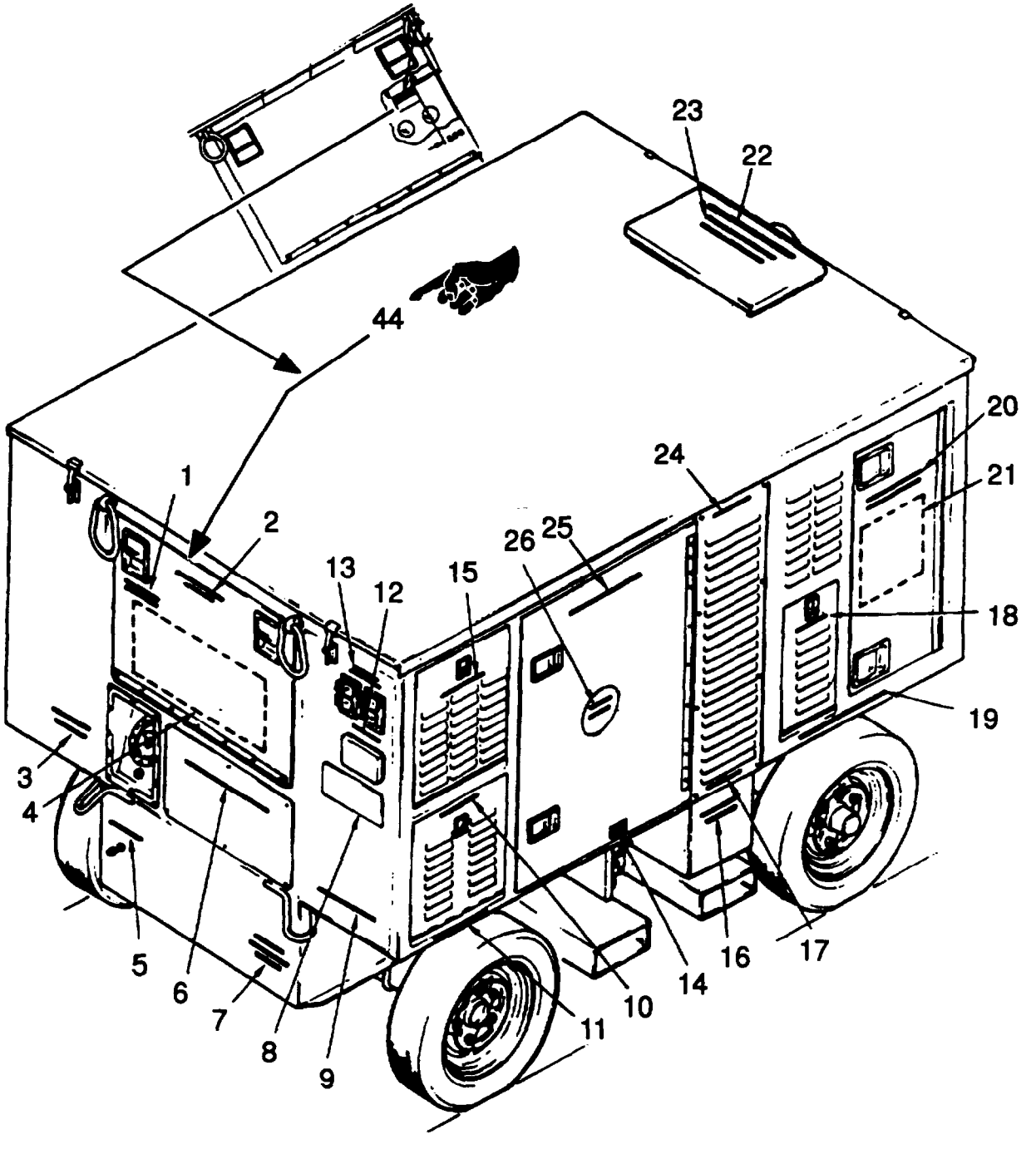
Figure 1-13 Reference	Nomenclature	Character Size (inches) (Color – Black)
1	MANUAL COMPARTMENT	.5
2	CONTROL PANEL	.5
3	JP-4 FUEL 65 GAL	.5
4	INSTRUCTION PLATE	__
5	GROUND	.5
6	BATTERY CHARGER ACCESS	.5
7	CLUTCH LEVER PULL TO DRIVE PUSH TO TOW	.5
8	IDENTIFICATION PLATE	__
8A	MWO ID PLATE (83-360D)only	__
9	BATTERY VENT	.5
10	BATTERY	.5
11	INFLATE TO 28 PSIG	.5

Table 1-2. Stenciling Nomenclature and Instruction Plates (continued)

Figure 1-13 Reference	Nomenclature	Character Size (inches) (Color - Black)
12	28 VDC	.5
13	115 VAC l PHASE 400 HZ	.5
14	FUEL VALVE INT OFF 1 EXT	.5
15	ELECTRICAL TRAYS	.5
16	AIR CLEANER EXHAUST ACCESS	.5
17	DO NOT BLOCK	.5
18	HYDRAULIC FILTERS	.5
19	INFLATE TO 28 PSIG	.5
20	HYDRAULIC CONTROL PANEL	.5
21	Instruction Plate	_
22	CAUTION	1.0
23	ENGINE EXHAUST	.5
24	ENGINE AIR lNTAKE	.5
25	ENGINE ACCESS	.5
26	PREHEAT ACCESS	.5
27	EMERGENCY STOP	1.0
28	FUEL-2/3	.5
29	FUEL-l/3	.5
30	HOT	.5

Table 1-2. Stenciling Nomenclature and Instruction Plates (continued)

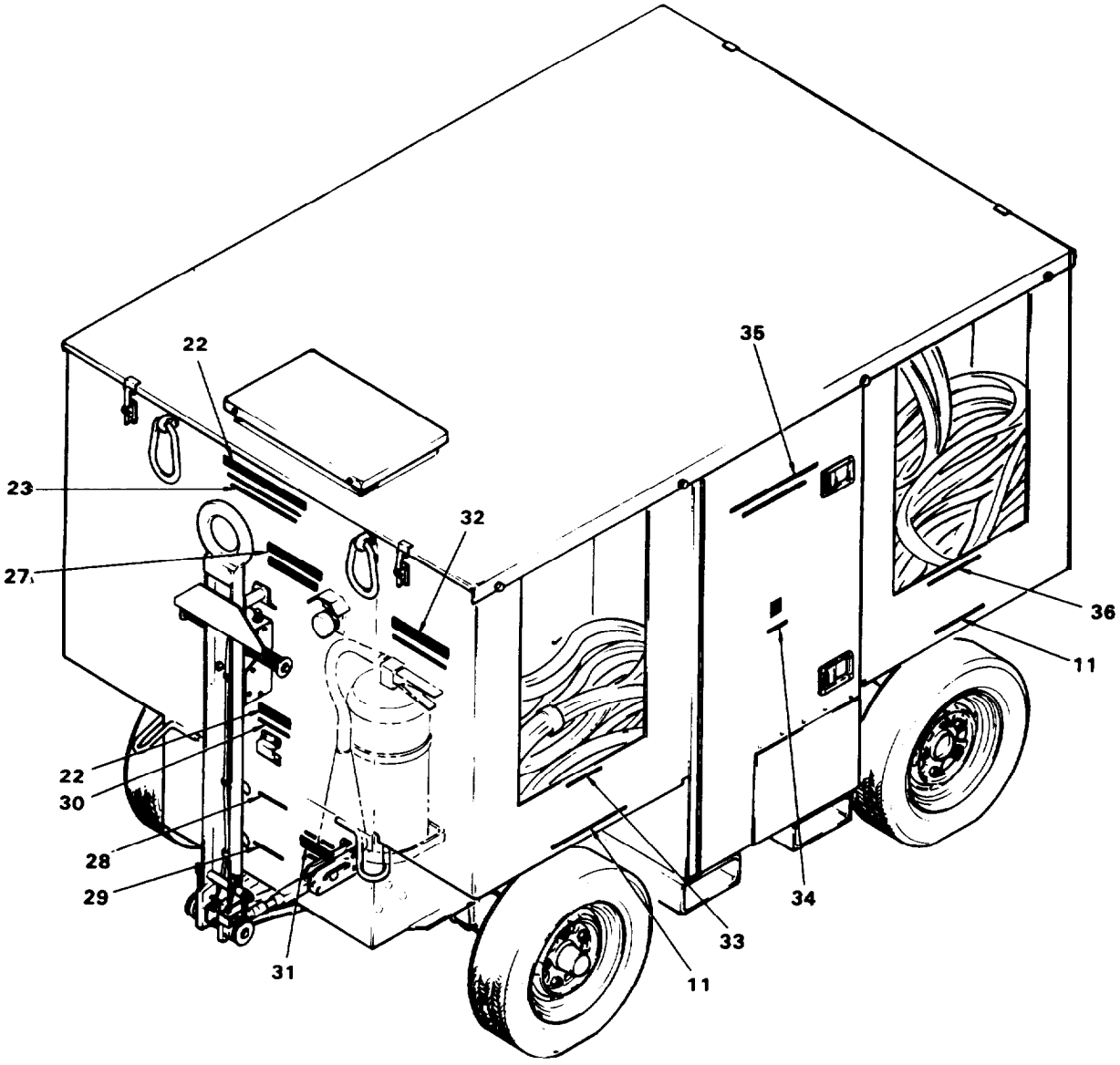
Figure 1-13 Reference	Nomenclature	Character Size (inches) (Color - Black)
31	OFF BRAKE ON	.5 1.0 .5
32	FIRE EXTINGUISHER	1.0
33	A. C. CABLE	.5
34	CG	.5
35	PNEUMATIC HOSE	.5
36	D.C. CABLE	.5
37	CAUTION ENGINE BLEED AIR 37 PSIG, 400°F	.5
38	EXHAUST ACCESS	.5
39	ENGINE ACCESS	.5
40	HYDRAULIC ACCESS	.5
41	FUEL ACCESS	.5
42	FUEL DRAIN VALVE	.5
43	DO NOT TOW WHEN LIGHTED CLUTCH ENGAGED	.5
44	CAUTION HIGH INTENSITY NOISE HEARING PROTECTION REQUIRED	.5 .25
45	CAUTION DISENGAGE DRIVE CLUTCH BEFORE TOWING	.5 .25



NOTE: SEE TABLE 1-2 FOR NOMENCLATURE

12-1-13(1)

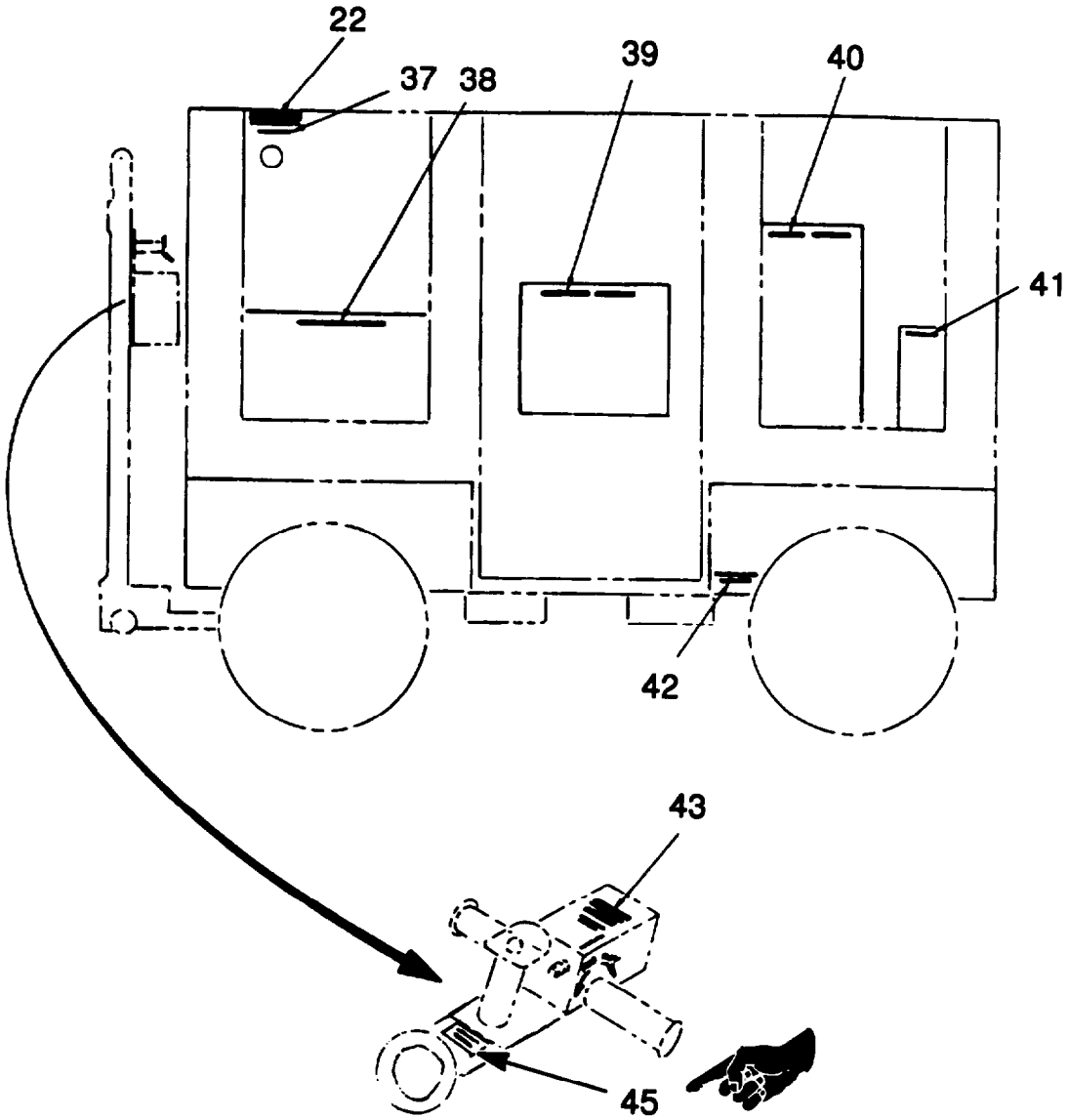
Figure 1-13. Location of Stenciling and Instruction Plates (sheet 1 of 3)



NOTE: SEE TABLE 1-2 FOR NOMENCLATURE

12-1-13(2)

Figure 1-13. Location of Stenciling and Instruction Plates (sheet 2 of 3)



NOTE: SEE TABLE 1-2 FOR NOMENCLATURE

Figure 1-13. Location of Stenciling and Instruction Plates (sheet 3 of 3)

Table 1-3. Torque Specifications

Item	Torque Required	Paragraph
Igniter plug	100 inch-pounds	4-81
Igniter plug lead	35 inch-pounds	4-82
Ignition unit mounting bolts	50 inch-pounds	4-83
Starter assembly mounting bolts	100 inch-pounds	4-84
Oil filter cover mounting bolts	50 inch-pounds	4-86
Combustor assembly bolts	50 inch-pounds	4-100
Fuel Control Unit (FCU) clamp nut	20 inch-pounds	4-67
Fuel Nozzle mounting bolts	50 inch-pounds	4-68
Load Control Valve (LCV) clamp nut	20 inch-pounds	4-75
Hydraulic Pump mounting nuts	190 inch-pounds	4-3
Wheel nuts	45 foot-pounds	4-112

1-12. (Army only) REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATIONS (EIR). EIR will be prepared using DA Form 2407, Maintenance Request. Instructions for preparing EIRs are provided in DA PAM 738-751, The Army Maintenance Management System. EIRs should be mailed directly to:

Commander, AVSCOM
ATTN: AMSAV-MPSD
4300 Goodfellow Boulevard
St. Louis, Mo. 63120-1798

A reply will be furnished directly to you.

CHAPTER 2

OPERATING INSTRUCTIONS

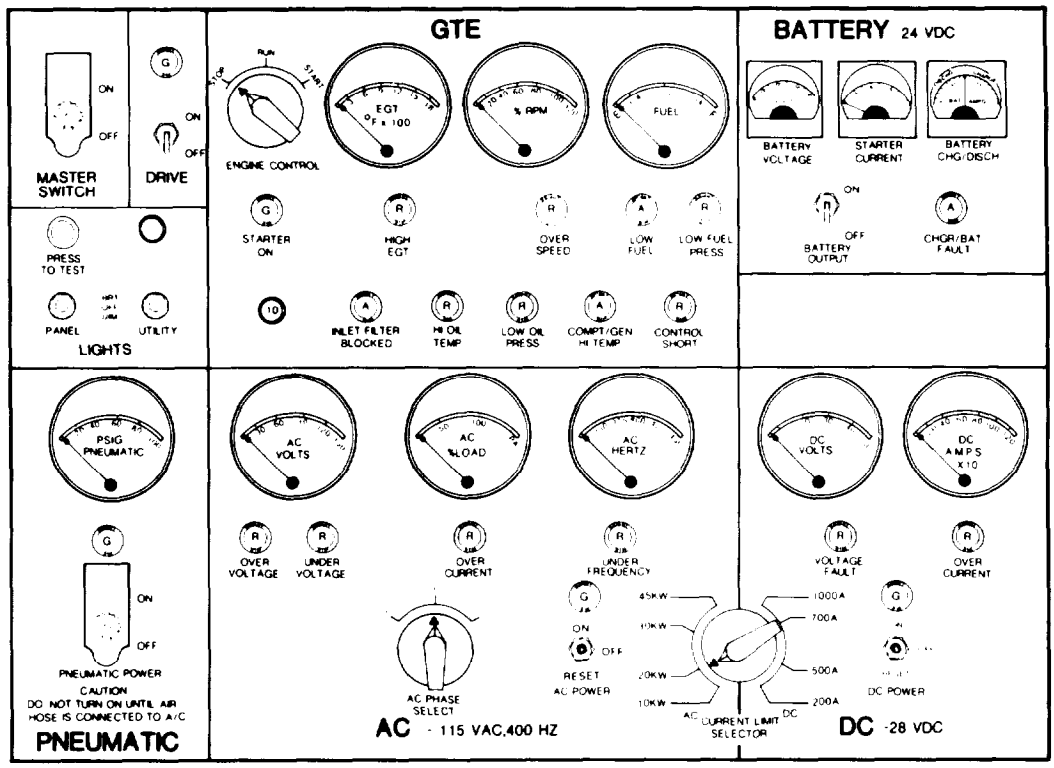
Section I. OPERATING PROCEDURES

2-1. GENERAL. This section contains instructions for operating the AGPU under normal conditions.

2-2. CONTROLS AND INSTRUMENTS. Tables 2-1 through 2-5 describe the use and function of operating controls and indicators. Learn the locations and function of all controls and indicators before operating the AGPU.

Table 2-1. Control Panel, Controls and Indicators

Control or Indicator	Description	Function
Control Panel (figure 2-1)		
MASTER and DRIVE switches		
MASTER switch (S2)	Two-position (ON-OFF) toggle switch (guarded)	Controls dc power (battery or charger) to all dc power control systems, except slave receptacle.
DRIVE switch (S3)	Two-position (ON-OFF) toggle switch	Controls dc control power to propulsion system motor speed controller. Dc power is available when master switch is on, clutch is engaged, tow bar is lowered, speed/direction control grip actuated, dead man switch pressed, and motor thermal switch closed.
DRIVE indicator (DS1)	Green indicator light	Illuminates when DRIVE switch, MASTER switch, BATTERY OUTPUT or DC POWER switch are on, and clutch is engaged.
LIGHTS Section		
7.5 circuit breaker (CB1)	7.5 AMP push-pull circuit breaker.	Protects against overloads in lighting, fuel indication, and penumatic control circuits.



12-2-1

Figure 2-1. Control Panel

Table 2-1. Control Panel, Controls and Indicators (continued)

Control or Indicator	Description	Function
LIGHTS Section (continued)		
PRESS TO TEST switch (S4)	Pushbutton switch	Tests all control panel indicator lights. Dc voltage is available when MASTER SWITCH and 7.5 circuit breaker are on.
PANEL lights switch (S6)	Three-position (BRT/OFF/DIM) toggle switch	Controls intensity of lights above control panel, and shuts lights off.
UTILITY lights switch (S7)	Three-position (BRT/OFF/DIM) toggle switch	Controls intensity of lights in engine compartment, fuel receiver, and hydraulic control panel, and shuts lights off.

Table 2-1. Control Panel, Controls and Indicators (continued)

Control or Indicator	Description	Function
GTE Section		
10 circuit breaker (CB2)	10 AMP push-pull circuit breaker.	Protects against overloads in engine dc circuits.
ENGINE CONTROL switch (S1)	Three-position (STOP/RUN/START) rotary switch. Switch is spring-loaded to return to RUN position when released from START position.	START position (momentary) - Applies battery voltage to GTE start relay. Battery voltage is available when MASTER SWITCH and GTE 10 circuit breaker are on. RUN position - Holds start relay energized, which maintains voltage to ECU. STOP position - Deenergizes GTE start relay.
STARTER ON indicator (DS2)	Green indicator light	Illuminates when GTE starter contactor is energized.
EGT ^{o}FX100 meter (M1)	0 to 18 ^{o}FX100 (0 to 1800^{o}F) scale Green band below 1275^{o}F, yellow band at 1275-1295^{o}F, and red band above 1295^{o}F.	Indicates GTE exhaust gas temperature (EGT) in ^{o}F.
HIGH EGT indicator (DS3)	Red warning indicator light	Illuminates if GTE is shut down because of high EGT.
% RPM meter (M2)	0 to 120% linear scale. Green band at 95-105%, yellow band at 105-108%, and red band above 108%.	Indicates GTE speed as percentage of governed speed.
OVER SPEED indicator (DS4)	Red warning indicator light	Illuminates if GTE shuts down because of overspeed.
FUEL gauge (M3)	E(empty) to F(ful1) scale with l/8-tank divisions. F(ful1) = 65 gallons.	Indicates fuel level.

Table 2-1. Control Panel, Controls and Indicators (continued)

Control or Indicator	Description	Function
GTE Section (continued)		
LOW FUEL indicator (DS5)	Amber caution indicator light	Illuminates when 15 to 30 minutes of fuel remains.
LOW FUEL' PRESS indicator (DS6)	Red warning Indicator light	Illuminates if GTE shuts down because of low fuel pressure. (No output from auxiliary fuel pump.)
INLET FILTER (AIR CLEANER) BLOCKED indicator (DS8)	Amber caution indicator light	Illuminates if GTE inlet air flow is restricted, causing bypass door to open.
HI OIL TEMP indicator (DS9)	Red warning indicator light	Illuminates if GTE shuts down because of high oil temperature.
LOW OIL PRESS indicator (DS10)	Red warning indicator light	Illuminates if GTE shuts down because of low oil pressure. (Oil pressure must be low for 10 seconds after GTE rpm reaches 95% before GTE is shut down.)
COMPT/GEN HI TEMP indicator (DS11)	Amber caution indicator light	Illuminates if electrical bay temperature or generator ac winding temperature is high.
CONTROL SHORT indicator (DS12)	Red warning indicator light	Illuminates if GTE shuts down because of overcurrent condition in ECU circuits. (Overcurrent condition must exist for 3 seconds before ECU shuts down GTE.)
BATTERY 24 VDC Section		
BATTERY VOLTAGE meter (M4)	0 to 40 volt, with 2 volt divisions. Green band at 24-32 volts.	Indicates battery voltage when MASTER SWITCH is on.
STARTER CURRENT meter (M5)	0 to 12 AMPS x 100 (0-1200 AMPS) scale.	Indicates GTE starter current when starter is energized. (The starter can be run from the AGPU battery or from an external source connected to the AGPU slave receptacle.)

Table 2-1. Control Panel, Controls and Indicators (continued)

Control or Indicator	Description	Function
BATTERY 24 VDC Section (continued)		
BATTERY CHG/ DISCH meter (M6)	0 to 50 AMP discharge scale (yellow), and 0 to 50 AMP charge scale (green) 5 AMP divisions).	Indicates battery charge/discharge current.
BATTERY OUTPUT switch (S5)	Two-position (ON/OFF) toggle switch	Used to connect battery/charger to external dc cable. (DC POWER switch must be set to OFF.)
CHRGR/BAT FAULT indicator (DS7)	Amber caution indicator light	Illuminates when battery charger output is low (less than 50 milliamps), or if battery/charger transfer relay is not energized.
DC 28 VDC Section		
DC POWER switch (S12)	Three-position (ON/OFF/RESET) toggle switch	ON position - Energizes dc contactor to apply dc voltage to load. OFF position - Deenergizes dc contactor. RESET position - Resets GCU dc fault logic (extinguishes dc red warning indicator lights).
DC POWER indicator (DS21)	Green indicator light	Illuminates when dc contactor is closed.
DC VOLTS meter (M11)	0 to 50 volts scale. Green band at 22-32 volts.	Indicates generator dc output voltage.
VOLTAGE FAULT indicator (DS18)	Red warning indicator light	Illuminates if GCU opens dc contactor, or removes generator field excitation due to low or high voltage, high ripple, or an overcurrent condition.

Table 2-1. Control Panel, Controls and Indicators (continued)

Control or Indicator	Description	Function
VOLTAGE FAULT indicator (DS18)	Red warning indicator light	On the 83-360D AGPU, the DC section of the GCU has been disconnected and a label applied stating this indicator is DISABLED.
DC AMPS X 10 meter (M12)	0 to 120 AMP x 10 (0 to 1200 AMP) scale. Green hand below 700 amps, yellow hand at 700-1000 amps, and red band above 1000 amps.	Indicates dc output load current. On the 83-360D AGPU, the green, yellow, and red bands are no longer correct. A label "MAX CONT. 350 AMP" has been applied below this gage to indicate the green band. The yellow band should be from 350-500 amps and the red bands should be above 500 amps.
OVER CURRENT Indicator (DS19)	Red warning indicator light.	Illuminates when current exceeds 1000 amps. (Current may exceed 1000 amps for 30 seconds when voltage is in limits, or 4 to 7 seconds if voltage is low.) On the 83-360D AGPU, the current is not limited by the GCU. This is now used to indicate an overheat condition in the TRU, which is an indication of DC over current or cooling fan failure.
CURRENT LIMIT SELECTOR switch (S11)	Rotary four-position switch (200A, 500A, 700A, and 1000A)	Selects generator maximum dc current output. On the 83-360D, the DC side of this switch is not used. DC current is limited only by the capacity of the TRU. All DC setting have been masked. DC output is available at any of the newly marked settings.
AC 115 VAC, 400 Hz Section		
AC POWER switch (S10)	Three-position (ON/OFF/RESET) switch	ON position – Energizes ac contactor to apply ac voltage to load. OFF position – deenergizes ac contactor.

Table 2-1. Control Panel, Controls and Indicators (continued)

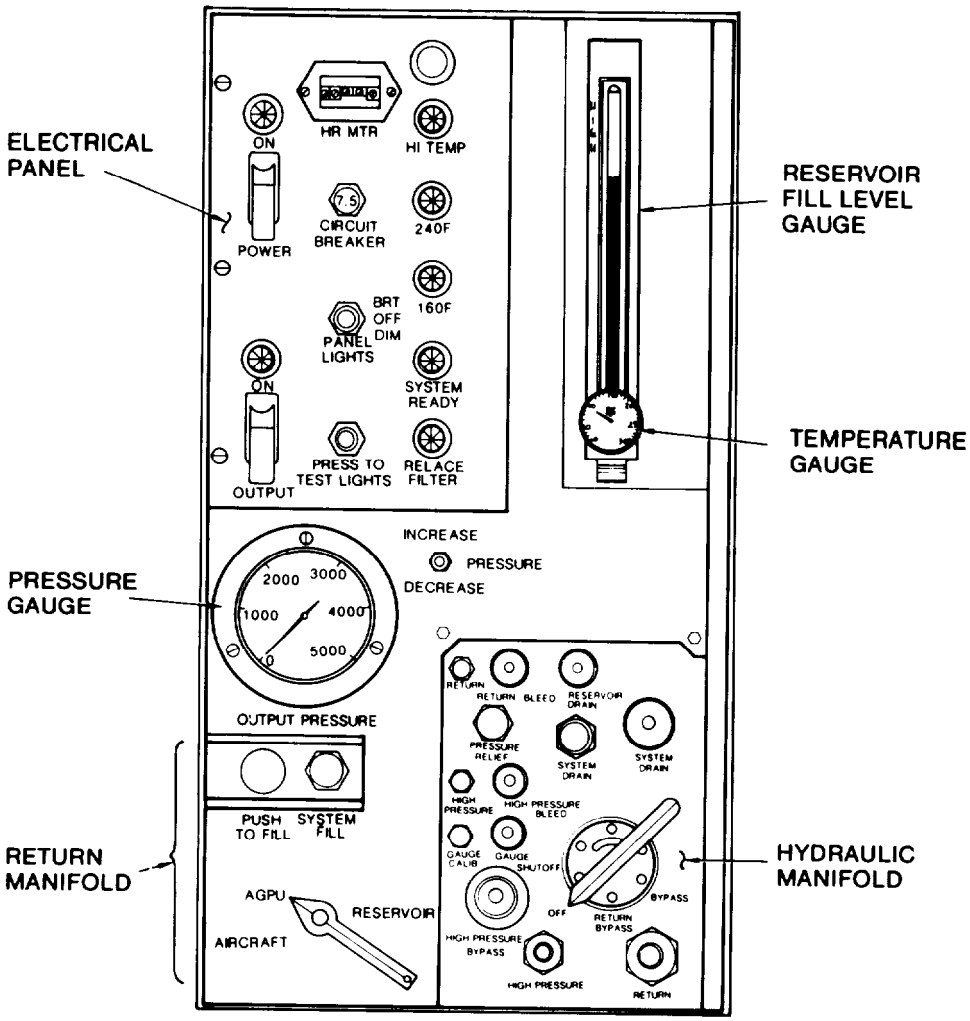
Control or Indicator	Description	Function
AC POWER switch (S10)(cont.)	Three-position (ON/OFF/RESET) switch	RESET position – Resets GCU as fault logic circuit (extinguishes as red warning indicator lights).
AC POWER indicator (DS20)	Green indicator light	Illuminated when ac contactor is closed.
AC PHASE SELECT switch (S9)	Three-position (A/B/C) rotary switch	Connect selected phase to AC VOLTS, AC % LOAD, and AC HERTZ meters.
AC VOLTS meter (M8)	0 to 150 volts scale. Green band at 108-118 volts.	Indicates voltage of selected phase.
OVER VOLTAGE indicator (DS14)	Red warning indicator light.	Illuminates when GCU opens ac contactor because of over voltage.

Table 2-1. Control Panel, Controls and Indicators (continued)

Control or Indicator	Description	Function
AC 115 VAC, 400 Hz Section (continued)		
UNDER VOLTAGE indicator (DS15)	Red warning indicator light.	Illuminates when GCU opens ac contactor or removes generator field excitation due to low voltage or an overcurrent condition.
AC % LOAD meter (M9)	0 to 150% scale. Green band below 100% and yellow band above 100%.	Indicates ac external load of selected phase. On the 83-360D, the AC % LOAD readings are not correct. A label "MAX. CONT. 130%" has been applied below this gage to indicate the continuous AC output power rating of the upgraded units.
OVER CURRENT indicator (DS16)	Red warning indicator light	Illuminates when load exceeds 45 KW (162 amp, 1 phase)on the 83-360A. On the 83-360D, this light illuminates when the load exceeds 53 KW (191 amp, 1 phase). (Load may exceed 45 KW for 30 seconds when voltage is in limits, or 4 to 7 seconds if voltage is low.)
CURRENT LIMIT SELECTOR switch (S11)	Rotary switch with four AC positions (10 KW, 20 KW, 30 KW, and 45 KW)	Selects generator maximum ac output for all phases. (If the switch is set for 30 KW, the maximum output per phase is 10 KW, or 100% of the AC % LOAD meter.) On the 83-360D, the AC current limit selections are: 17 KVA, 59 KVA (AH-64A/H-60), and 90 KVA (AH-64D). When the CURRENT LIMIT SELECTOR switch is set at 45 KW and 1000 AMP on the 83-360A, or AH-64D/90 KVA on the 83-360D this switch also opens a surge control valve to increase available shaft horsepower.

Table 2-1. Control Panel, Controls and Indicators (continued)

Control or Indicator	Description	Function
AC HERTZ meter (M10)	350 to 450 Hz scale, green band at 393-407 yellow band at 375-393 and 407-425, and red band below 375 and above 425	Indicates frequency
UNDER FREQUENCY indicator (DS17)	Red warning indicator light	Illuminates when GCU opens ac contactor due to under frequency.
PNEUMATIC Section		
PNEUMATIC POWER switch (S8)	Two-position (ON/OFF) toggle switch (guarded)	Activates GTE load control valve (LCV). Also closes normally open (N. O.) dump solenoid valve.
PNEUMATIC POWER indicator (DS13)	Green indicator light.	Illuminates when PNEUMATIC POWER switch is on.
PSIG PNEUMATIC gauge	0 to 100 PSIG scale. Green band at 24-60 psig.	Indicates pressure in pneumatic output hose.



12-2-2

Figure 2-2. Hydraulic Control Panel

Table 2-1A. Fuel System, Controls and Indicators

Control or Indicator	Description	Function
Fuel Supply System (figure 2-2A)		
Four-way valve OFF, INTL, EXT	Four position rotary valve (three positions only used)	Provides facility for operating engine on an external fuel supply

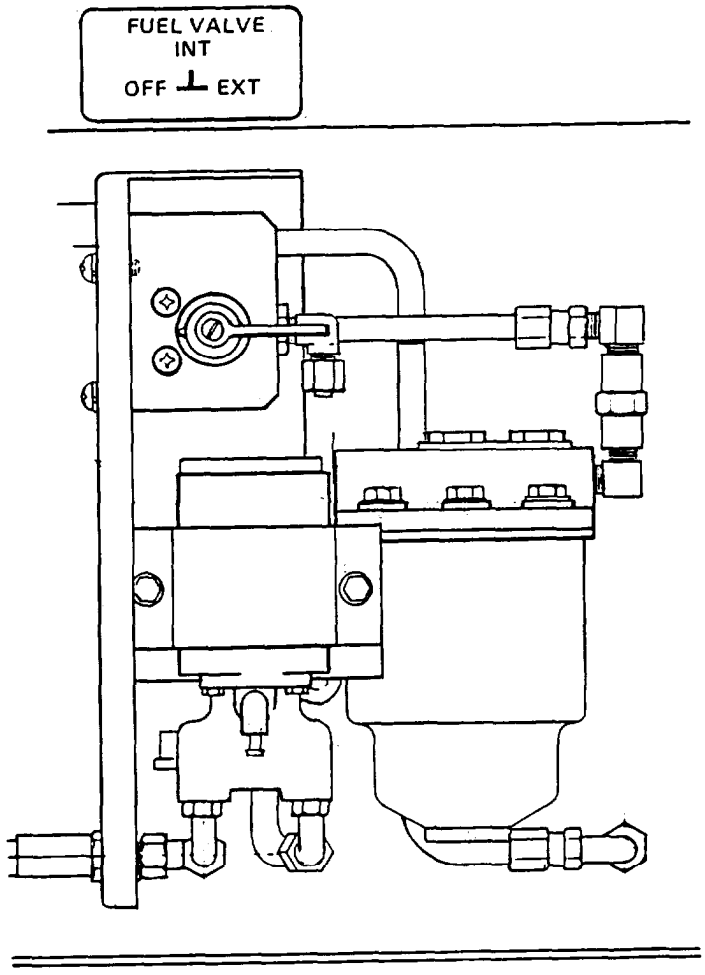


Figure 2-2A. Fuel Supply System

Table 2-2. Hydraulic Control Panel, Controls and Indicators

Control or Indicator	Description	Function
Hydraulic Control Panel (figure 2-2)		
Electrical Panel		
POWER switch (S1)	Two-position (ON/off) toggle switch (guarded)	Controls dc power to hydraulic module circuits.
POWER ON indicator (DS2)	Green indicator light	Illuminates when hydraulic module POWER switch is set to ON.
HR MTR running time indicator (M1)	S-digit time indicator	Indicates the hours of hydraulic module operation. Starts when POWER switch is set to ON.
HI TEMP indicator (DS1)	Red warning light	Illuminates when hydraulic fluid temperature exceeds 275°F (135°C).
CIRCUIT BREAKER (CB1)	7.5 amp, push-pull, circuit breaker.	Protects against overloads in the panel light circuit and in circuits controlled by POWER switch (S1).
240°F indicator (DS3)	Amber indicator light	Illuminates when hydraulic fluid temperature exceeds 240°F (ll6°C).
160°F indicator (DS4)	Amber indicator light	Illuminates when hydraulic fluid temperature exceeds 160°F (7l°C).
PANEL LIGHTS switch (S2)	Three position (BRT/OFF/DIM) toggle switch	Controls panel lights.
SYSTEM READY indicator (DS5)	Green indicator light	Illuminates when hydraulic fluid temperature exceeds 70°F (21°C).
REPLACE FILTER indicator (DS7)	Amber indicator light	Illuminates when hydraulic fluid filters are dirty.
PRESS TO TEST LIGHTS switch (S3)	Two-position toggle switch. Spring loaded to off (up) position.	Tests all indicator lamps on hydraulic control panel.

Table 2-2. Hydraulic Control Panel, Controls and Indicators (continued)

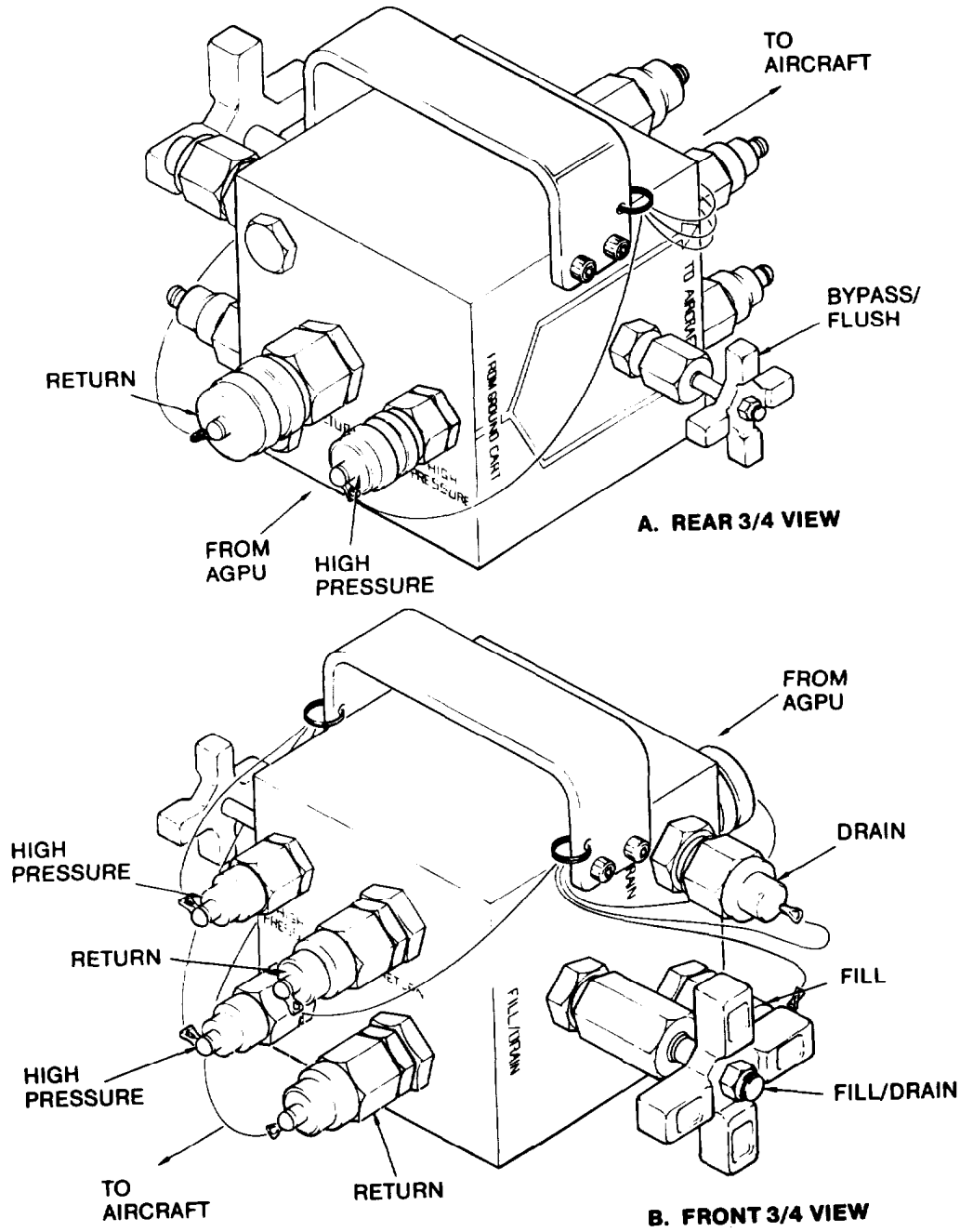
Control or Indicator	Description	Function
Electrical Panel (continued)		
OUTPUT switch (S4)	Two-position (ON/off) toggle switch (guarded)	Controls hydraulic power to load (aircraft) by actuating output solenoid valve.
OUTPUT ON indicator (DS6)	Green indicator light	Illuminates when power is applied to hydraulic fluid output solenoid valve.
Reservoir/Temperature Gauge		
Reservoir Fill Level Gauge	Glass tube containing hydraulic fluid from reservoir	Indicates level of fluid in hydraulic reservoir.
Hydraulic Fluid Temperature Gauge	Round thermometer with needle pointer	Indicates temperature of fluid in hydraulic reservoir.
Output Pressure Gauge		
OUTPUT PRESSURE gauge	0 to 5,000 PSI Bourdon tube gauge	Indicates hydraulic fluid pressure.
Pressure Switch		
PRESSURE switch	Three-position (INCREASE/center/ DECREASE) toggle switch. Spring loaded to center position.	Increases or decreases pressure adjustment at the hydraulic pump. Release switch when desired pressure is obtained.
Return Manifold		
SYSTEM FILL connector	Male fitting	Fitting used for filling reservoir.
PUSH TO FILL valve	Spring loaded, normally closed cartridge valve.	Opens and closes reservoir fill valve.
RESERVOIR selection valve	Four-port rotary valve. Two position (AGPU and AIRCRAFT)	Connects either the AGPU or aircraft hydraulic fluid reservoir to pump input line.

Table 2-2. Hydraulic Control Panel, Controls and Indicators (continued)

Control or Indicator	Description	Function
Hydraulic Manifold		
RETURN fluid observation window	Site glass	Permits viewing fluid that passes through RETURN BLEED valve.
RETURN BLEED valve	Cartridge shutoff valve (manual)	Permits (when open) bleeding of air bubbles from fluid return circuit.
RESERVOIR DRAIN valve	Cartridge shutoff valve (manual)	Permits (when open) draining the reservoir while retaining fluid in remainder of system.
PRESSURE RELIEF valve	Adjustable relief valve (manual)	Permits setting of maximum system pressure allowable for the specific aircraft being powered. Pump (with pressure compensator) will maintain the fluid pressure to which the PRESSURE RELIEF valve has been set.
SYSTEM DRAIN connector	Threaded connector	Permits connection of drain hose during reservoir or system draining.
SYSTEM DRAIN valve	Cartridge shutoff valve (manual)	Permits (when open) draining the system of fluid.
HIGH PRESSURE fluid obser-vation window	Site glass	Permits viewing fluid that passes through HIGH PRESSURE BLEED valve.
HIGH PRESSURE BLEED valve	Cartridge shutoff valve (manual)	Permits (when open) bleeding of air bubbles from fluid in high pressure circuit.
GAUGE CALIB connector	Threaded connector	Permits connection of separate test gauge in parallel with OUTPUT PRESSURE gauge for calibration when gauge shutoff is closed.
GAUGE SHUTOFF valve	Cartridge shutoff valve (manual)	Isolates (when closed) the OUTPUT PRESSURE gauge from the high pressure lines. Applies (when open) high pressure fluid to gauge to permit measurement.

Table 2-2. Hydraulic Control Panel, Controls and Indicators (continued)

Control or Indicator	Description	Function
Hydraulic Manifold (continued)		
HIGH PRESSURE BYPASS valve	Cartridge shutoff valve (manual)	Permits (when open) routing high pressure fluid into the return circuit without passing through the load select valve and aircraft. Permits fluid warm-up prior to applying hydraulic power to aircraft.
RETURN BYPASS valve	Two-position (OFF/BYPASS) rotary valve (manual)	In OFF position a 65 psi relief valve is in the fluid return circuit. This back-pressure is required when servicing certain aircraft. In BYPASS position, the 65 psi relief valve is bypassed and no back-pressure is provided.
HIGH PRESSURE connector	Male quick-disconnect fitting	Provides for connecting the high pressure output hose to the aircraft to be serviced, or to dual manifold.
RETURN connector	Male quick-disconnect fitting	Provides for connecting the low pressure return hose to the aircraft being serviced, or to dual manifold.



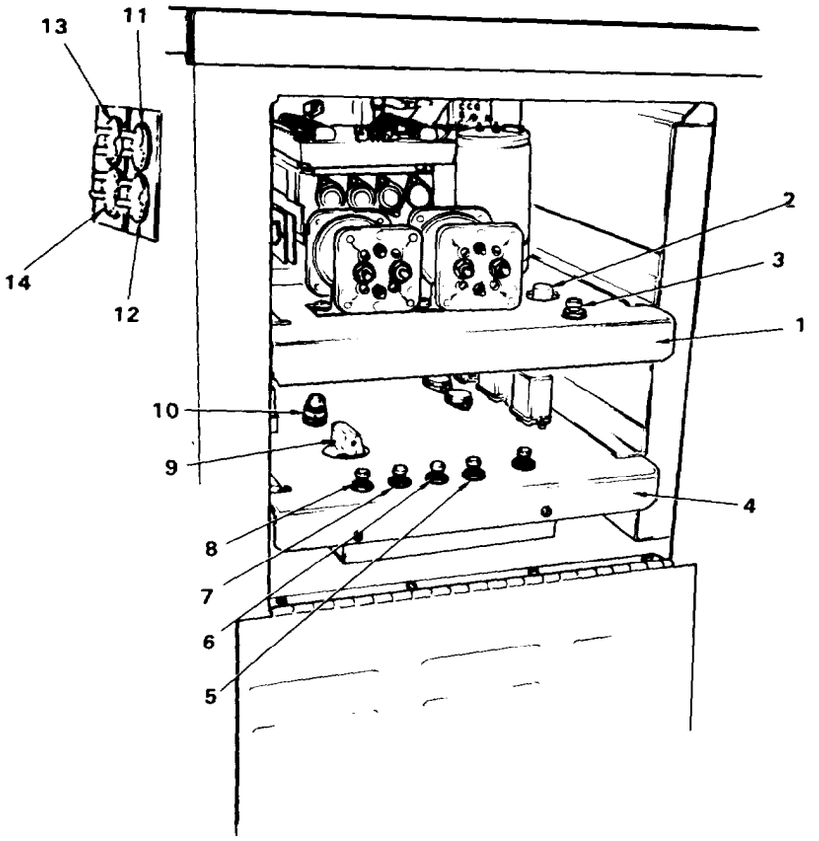
12-2-3

Figure 2-3. Hydraulic Dual Manifold

Table 2-3. Hydraulic Dual Manifold, Controls

Control or Indicator	Description	Function
Hydraulic Dual Manifold (figure 2-3)		
BYPASS/FLUSH valve	Manually operated needle valve	Connects (when open) high pressure input line to return line. These high pressure and return connectors are on rear of manifold.
HIGH PRESSURE connectors (2)	Male quick-disconnects with check valves	Provide for connecting dual manifold output to aircraft being serviced.
RETURN connectors (2)	Male quick-disconnects with check valves	Provide for connecting aircraft return fluid line back to dual manifold.
DRAIN connector	Threaded male connector with cap and check valve	Provides for connecting drain hose to dual manifold.
FILL connector	Male quick-disconnect with check valve	Provides for connecting fill hose to dual manifold.
FILL/DRAIN valve	Manually operated needle valve	Connects (when open) the FILL and DRAIN ports to the return aide of the AGP/aircraft hydraulic circuit.
HIGH PRESSURE connector	Female quick-disconnect with check valve	Provides for connecting high pressure output from hydraulic module to dual manifold input.
RETURN connector	Female quick-disconnect with check valve	Provides for connecting return fluid line from dual manifold back to hydraulic module.

/



12-2-4

1. UPPER TRAY
2. CB1 (70 AMP)
3. CB2 (35 AMP)
4. LOWER TRAY
5. CB3 (15 AMP)
6. CB4 (15 AMP)
7. CB5 (15 AMP)
8. CB6 (15 AMP)
9. S1 (28.5/30.5/32.0)
10. F1 (TOW BAR LIGHT)
11. J1
12. J2
13. J3
14. J4

Figure 2-4. Electrical Trays

Table 2-4. Electrical Trays, Controls and Indicators

Control or Indicator	Description	Function
Upper Tray (figure 2-4)		
BATTERY CHARGER circuit breaker (CB2)	35 AMP push-pull circuit breaker.	Protects against overloads in 20 amp (control power) section of battery charger.
BATTERY CHARGER circuit breaker (CB1)	70 AMP circuit breaker	Protects against overloads in 50 amp section of battery charger.
Lower Tray (figure 2-4)		
Circuit breakers OUTLETS - 115 VAC, 400 Hz (CB3-CB6)	15 AMP push-pull circuit breakers.	Protect against overloads in ac convenience outlets as follows: CB3 - J1 CB4 - J2 CB5 - J3 CB6 - J4
BATTERY CHARGER output selector switch (S1)	Three-position (28.5 VDC, 30.5 VDC, and 32.0 VDC) rotary switch	Selects battery charger output voltage. This switch should be set for the type and condition of battery as indicated on tray and below: 28.5 VDC - for lead acid battery (hot or cold), or NI-CAD battery (hot). 30.5 VDC - for NI-CAD battery (normal). 32.0 VDC - for NI-CAD battery (cold). Note: Cold, normal, and hot refer to ambient temperature ranges as follows: Cold: -65°F to 35°F (-54°C to 2°C) Normal: 35°F to 80°F (2°C to 27°C) Hot: 80°F to 125°F (27°C to 52°C)
Fuse (F1) (Tow Bar Light)	2 AMP fuse	Protects against overload in propulsion control circuits.

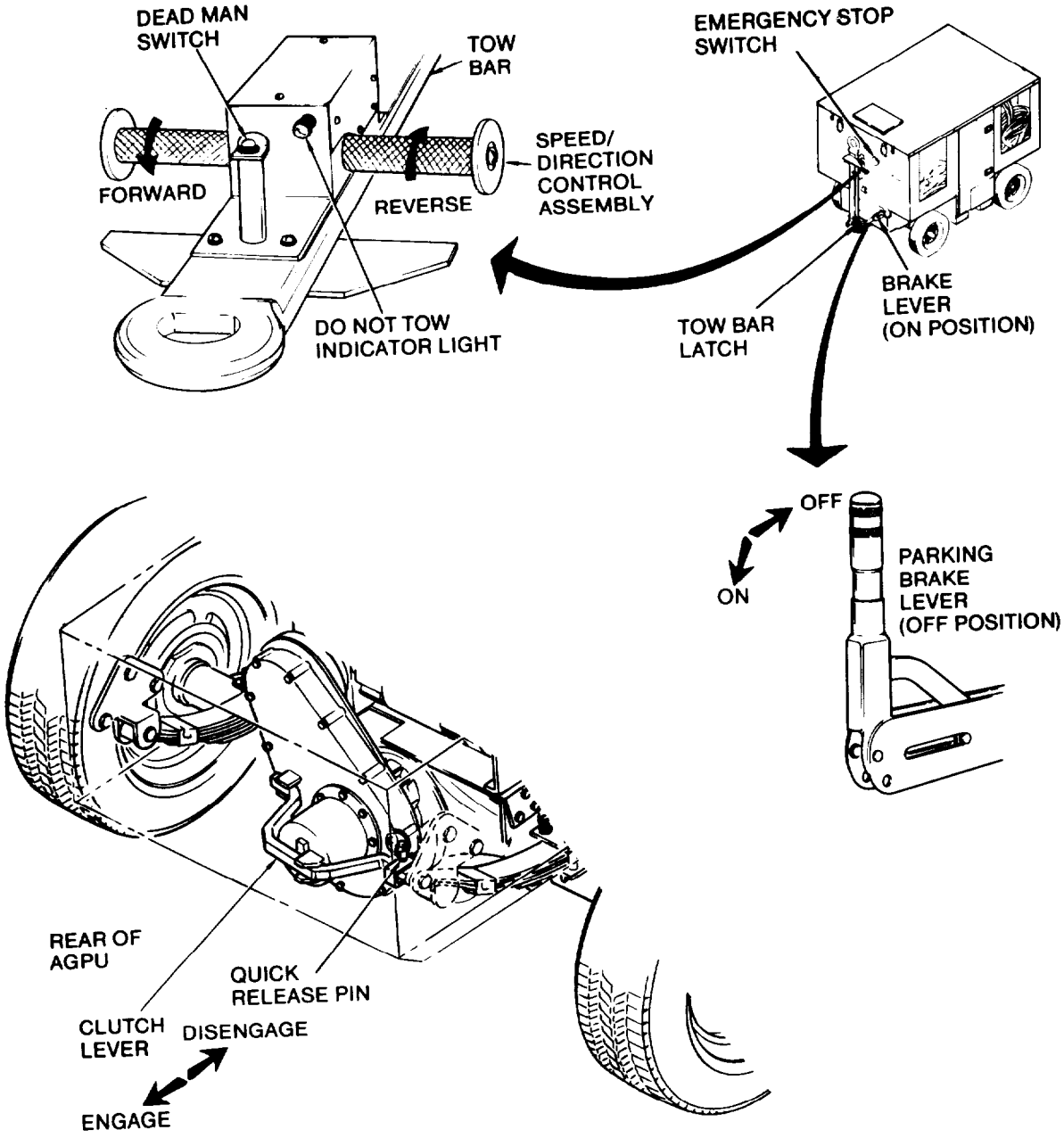


Figure 2-5. Propulsion Controls and Emergency Stop Switch

Table 2-5. Propulsion Controls and Indicators, and Emergency Stop Switch

Control or Indicator	Description	Function
Propulsion Controls (figure 2-5)		
Clutch Lever	Manual Lever	Located on rear axle assembly. Connects drive (traction) motor power to rear axle. To engage clutch, quick release pin must be removed and clutch lever pulled toward the rear. Pushing the lever forward and installing the quick release pin disengages the drive.
DO NOT TOW Light	Indicator Light	Located on speed/direction control assembly. Illuminates when the clutch mechanism is engaged.
DEAD MAN Switch (S2)	Pushbutton Switch	Located on speed/direction control assembly. Press-and-hold switch that completes the connection of power to the propulsion system.
Speed and Direction Control	Twist Grips	Located on speed/direction control assembly. Controls the speed and direction of AGPU by twisting the control grips In the proper direction. To move the AGPU forward, twist either grip as shown by arrow in figure 2-5. To move in reverse, twist either grip in opposite direction. To stop the AGPU, release the grip, allowing it to return to its spring-loaded centered (off) position, and AGPU will coast to a stop.
Parking Brake Lever	Pull-to-Release Lever	Located on lower right front of AGPU. Sets the rear wheel brakes. Brakes are applied when the lever is in the horizontal position and disengaged when the lever is raised to the vertical position.
Tow Bar Latch	Manual Latch	Foot operated latch. Releases tow bar from vertical stowed position.
EMERGENCY STOP Switch		
EMERGENCY STOP switch (S2E)	Push-button switch (Red)	Located on front of AGPU. Deengegizes ECU and results in engine shutdown. Also shuts down electrical, hydraulic, and/or pneumatic outputs (does not shut down battery output).

2-3. PLACING THE AGPU IN OPERATION.

a. Prestart Procedure. Observe all warnings and precautions on warning pages located in front of manual.

CAUTION

Do not put AGPU under a main rotor blade. Main rotor blade damage may occur from extreme heat of AGPU exhaust.

(1) Positioning AGPU. Position the AGPU next to the aircraft as identified in the aircraft TM, as applicable. Location must provide access to aircraft ground servicing connections and a tested static ground.

WARNING

Do not operate the AGPU until ground stud has been connected to a suitable ground.

(2) Ground the AGPU. Ground the AGPU in accordance with paragraph 4-2c and as shown on figure 4-1a.

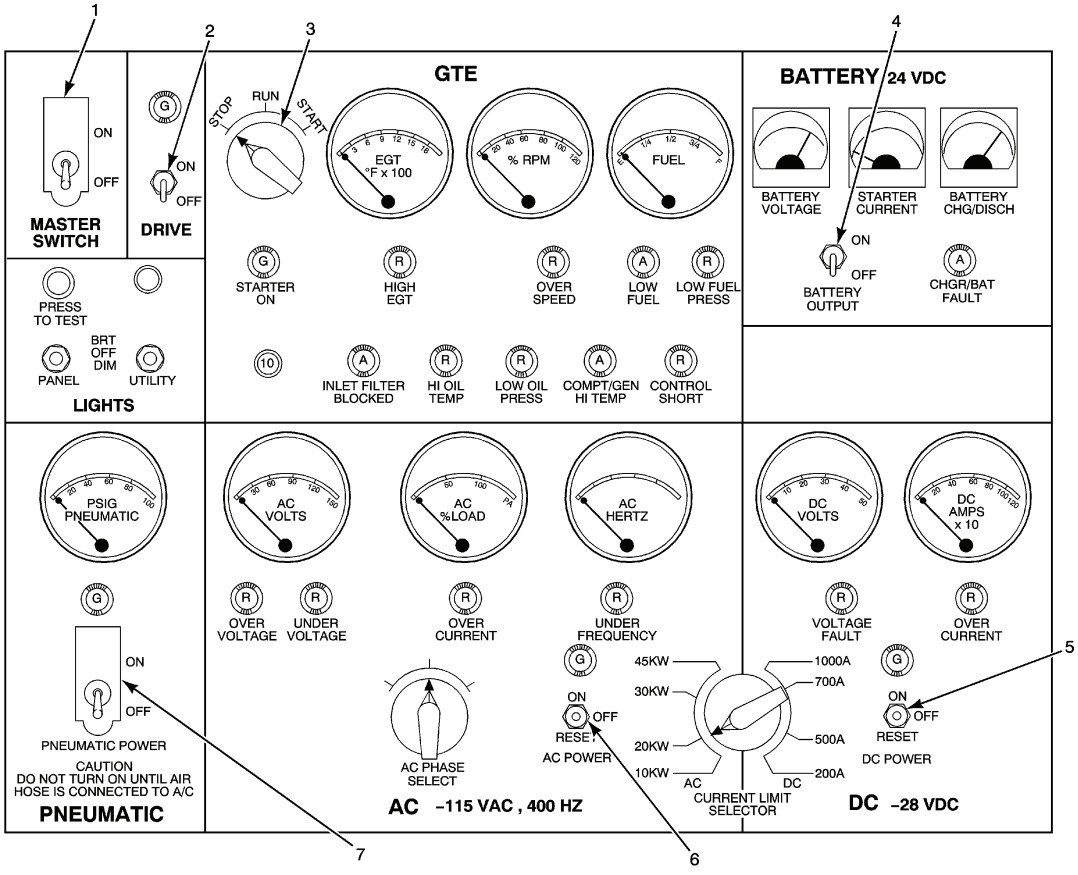
(3) Perform the Before Operation (B) PMCS in table 3-2.

CAUTION

Check that hydraulic reservoir is at least 3/4 full. Low fluid level could result in hydraulic pump damage. Ensure that hydraulic module RESERVOIR selector is set to AGPU position.

CAUTION

If any or all AGPU systems are connected to an aircraft, the AGPU operator must be in intercom communication with the aircraft pilot or maintenance personnel.



1. MASTER switch to OFF
2. DRIVE switch to OFF
3. ENGINE CONTROL switch to STOP
4. BATTERY OUTPUT switch to OFF
5. DC POWER switch to OFF
6. AC POWER switch to OFF
7. PNEUMATIC POWER switch to OFF

Figure 2-6. Prestart Switch Settings – Control Panel.

(4) Set switches on control panel as shown in figure 2-6.

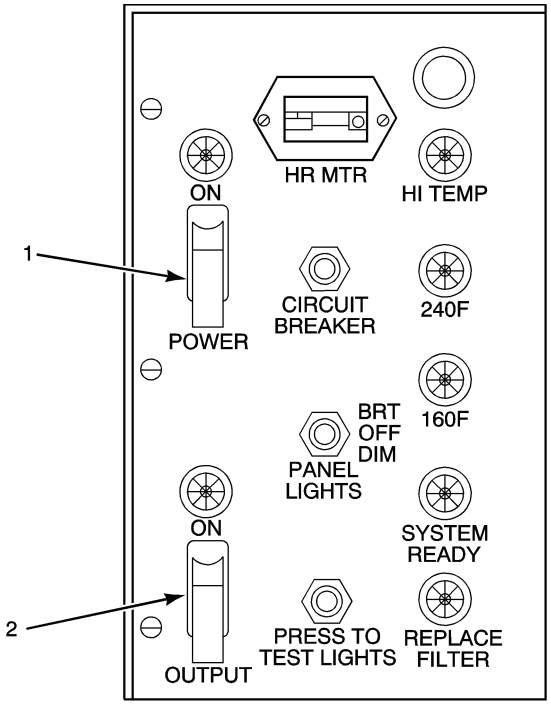
(5) Check that switches are set on hydraulic control panel as shown in figure 2-7.

(6) Set fuel system four-way valve, figure 4-46 as follows:

(a) If internal fuel supply is to be used, set four-way valve control handle to INTL.

(b) If external fuel supply is connected and is to be used, set four-way valve control handle to EXT.

(c) If external fuel supply is to be connected and used, remove cap nut and connect external fuel supply. Set four-way valve control handle to EXT. Bleed fuel system of air in accordance with chapter 4, paragraph 4-1.k.



1. POWER switch to OFF
2. OUTPUT switch to OFF

Figure 2-7. Prestart Switch Settings – Hydraulic Control Panel.

b. Start Procedure Precautions. Observe all warnings and precautions on warning pages located in front of manual.

CAUTION

If engine exhaust is a gray fog during the starting procedure and the GTE EGT meter does not show an increase, set the ENGINE CONTROL switch to STOP. Do not attempt to restart until problem is resolved. Excessive fuel could cause booming or flaming start and damage engine.

CAUTION

Starter Duty Cycle. Observe the following:

Never attempt to start until engine has completely stopped turning. Starter/gearcase damage may result.

Unsuccessful Start Attempts. Three consecutive attempts (30 seconds each maximum) are allowed. After three attempts, wait a minimum of 20 minutes for starter to cool down before a fourth attempt. Notify your supervisor if engine will not start in four attempts.

Successive Starts. Six successive starts in a one hour period at 10 minute intervals are allowed. After this period, one hour starter cooldown time is required.

CAUTION

Set the ENGINE CONTROL switch to STOP to prevent damage to AGPU if any of the following occurs:

BATTERY STARTER CURRENT meter reads more than 800 amps after initial cranking.

GTE RPM meter appears hung up at some speed below 95%.

CAUTION

GTE EGT meter reads above 1600°F for more than 30 seconds.

GTE STARTER ON light illuminated for more than 30 seconds.

GTE EGT meter reads abnormally low (500°F or below) with no load. ECU may have a malfunction which could result in severe damage to engine when load is applied.

CAUTION

OUTPUT PRESSURE gauge on hydraulic control panel does not indicate a minimum of 500 psig immediately after engine start (unless hydraulic pump spacer is installed). Hydraulic pump will be damaged if run without hydraulic fluid pressure. Immediately shut down engine

Unusual noises heard.

Fuel or oil leakage observed.

NOTE

Refer to PMCS table 3-2 for indicators and meters that must be monitored during (D) operation.

c. Engine Start Procedure.

(1) Perform prestart procedures in paragraph a, and observe precautions in paragraph b.

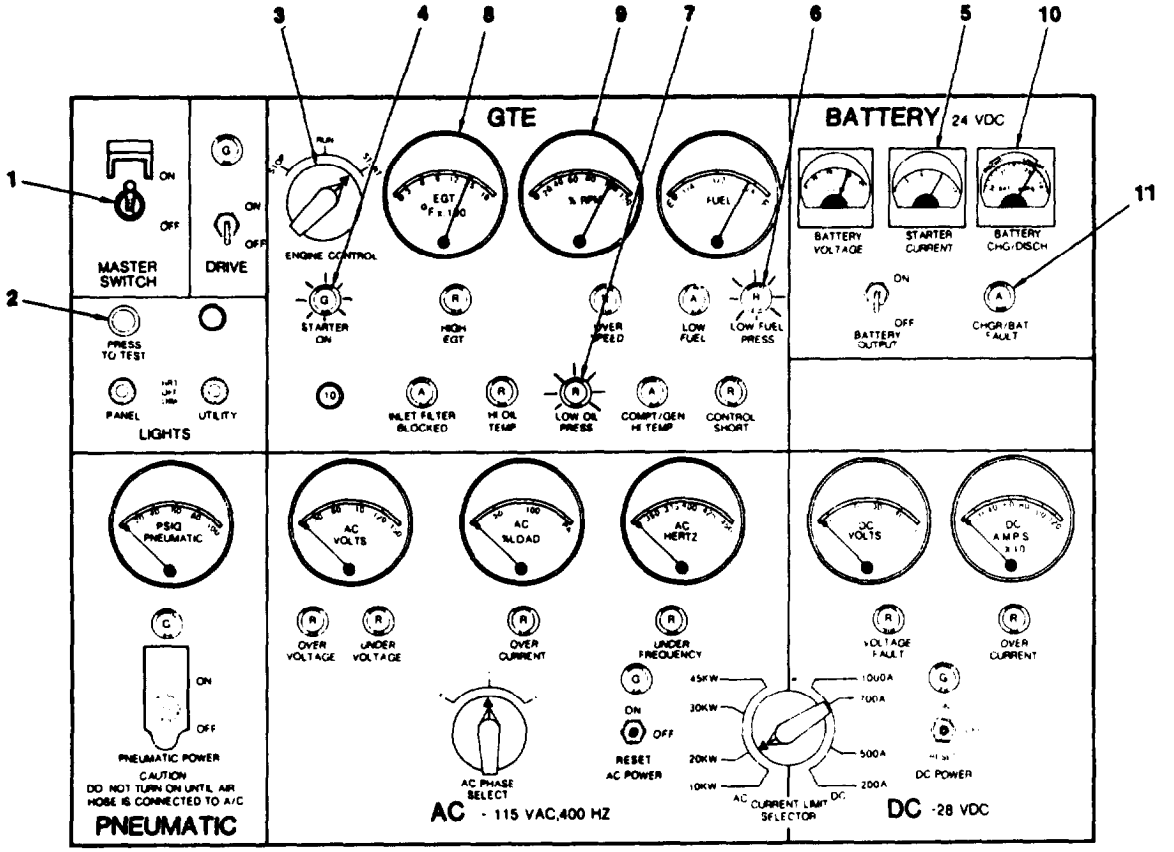


Figure 2-8. Engine Start Procedure 12-2-8

(2) MASTER SWITCH (1) to ON.

(3) Push PRESS TO TEST pushbutton (2) and check that all indicator lights on control panel illuminate.

NOTE

On the 83-360D, the DC voltage monitoring function of the GCU has been disabled. The DC VOLTAGE FAULT will not illuminate when the PRESS TO TEST button is pushed.

(4) Momentarily set ENGINE CONTROL switch (3) to START and then release to RUN, and observe the following:

(a) STARTER ON light (4) illuminated green.

(b) STARTER CURRENT meter (5) indicates 500 amp to 800 amp during cranking.

(c) LOW FUEL PRESS light (6) goes out within 10 seconds after initiating start sequence.

(d) LOW OIL PRESS light (7) goes out within 10 seconds after engine reaches 95% speed.

(e) EGT meter (8) increases at combustion after engine % RPM meter reads above 10%.

(f) % RPM meter (e) reads more than 60% within 30 seconds after step (2).

(g) STARTER CURRENT meter (5) reads zero when % RPM meter exceeds 60%.

(h) STARTER ON light (4) goes out when % RPM meter exceeds 60%.

(i) EGT meter (8) reads in green band within 60 seconds of initiating start sequence.

(j) % RPM meter (9) reads in green band.

(k) BATTERY CHG/DISCH meter (10) indicates CHARGE.

(1) CHG/BAT fault indicator light (11) goes out.

CAUTION

Check that OUTPUT PRESSURE gauge on hydraulic control panel indicates a minimum of 500 psig (unless hydraulic pump spacer is installed). If less than 500 psig, immediately set ENGINE CONTROL switch to STOP to prevent damage to hydraulic pump.

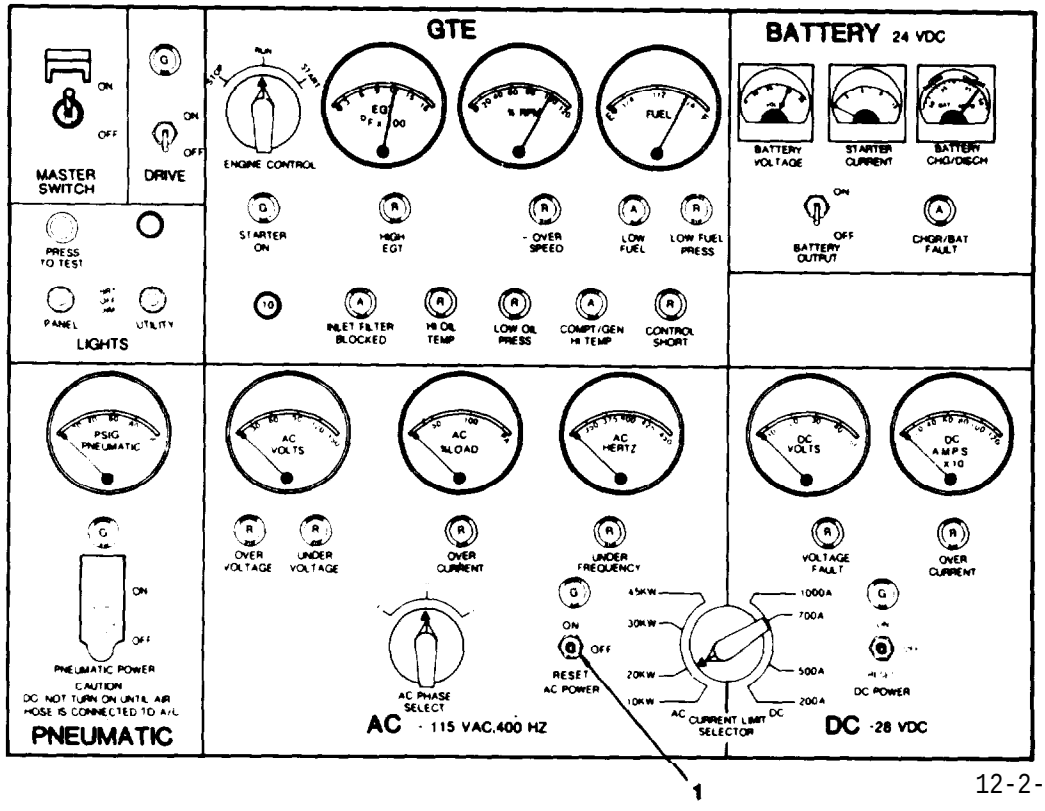
2-4. AC MODE. OPERATION.

CAUTION

During the conduct of this procedure the operator of the AGPU must be in intercom communication with the aircraft pilot or mechanic at all times.

a. Load Connection.

(1) Perform start procedure in paragraph 2-3 if engine is not running.



12-2-9

Figure 2-9. AC Load Connection - Control Panel Functions

WARNING

Never attempt to connect or disconnect power cables to/from aircraft with power applied, or without a proper ground on the AGPU ground stud and aircraft, otherwise severe arching may occur, causing burns.

(2) Ensure that AC POWER switch (1, fig. 2-9) is set to OFF.

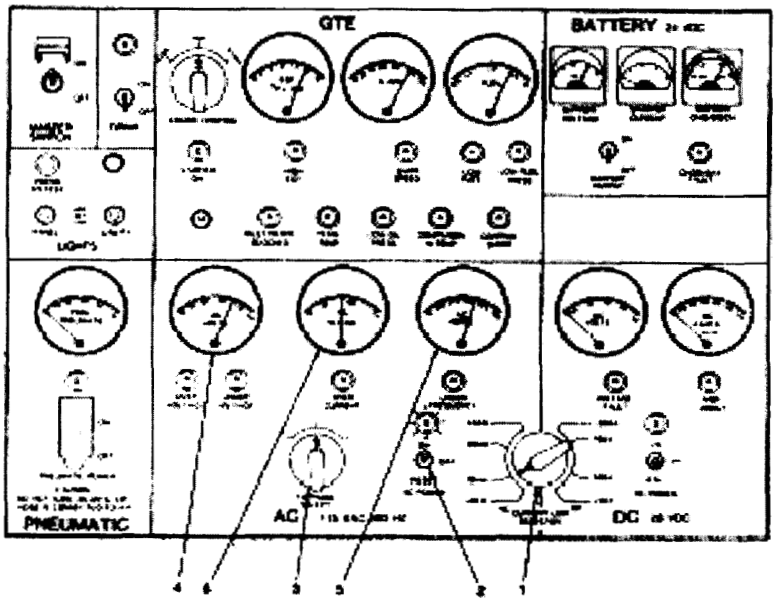
(3) Remove AC cable from storage compartment on forward left side of AGPU.

(4) Connect AC cable to connector on aircraft.

b. AC Power Application.

(1) Set aircraft AC load control switches to OFF.

(2) Set CURRENT LIMIT SELECTOR switch (1, fig. 2-10) for correct aircraft.



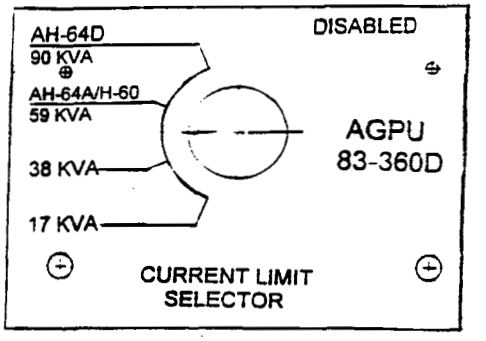


Figure 2-10. AC Power Application - Control Panel Function

(2) On the 83-360D, set CURRENT LIMIT SELECTOR switch (1, FIG. 2-10 above) to the type of aircraft to be supported or the desired current limit.

(3) Set AC POWER switch (2) to ON (check that green indicator light illuminates).

(4) Set AC PHASE SELECT switch (3) to A, B, and C positions and observe that AC VOLTS (4) AC HERTZ (5) meters read in green band for all three phases.

(5) Set aircraft AC load control switches to ON.

(6) Set AC PHASE SELECT switch to A, B, and C positions and observe that AC % LOAD meter (6) reads in green for all three phases.

NOTE

If an overload or malfunction occurs and AC power is automatically shutdown, observe AC malfunction indicator lights. Record any lights illuminated before setting AC POWER switch to RESET, or MASTER SWITCH to OFF.

(7) Remove AC power from aircraft by performing steps (8) through (10).

(8) Set aircraft AC load control switches to OFF.

(9) Set AC POWER switch (2) to OFF.

(10) Disconnect AC cable from aircraft.

2-5. DC OPERATION, 83-360D.

NOTE

The 83-360D only operates in the AC mode. All DC output power is obtained by converting AC. The CURRENT LIMIT SELECTOR switch should be set to one of the four marked locations (left side of switch) for AC, DC, or combined AC and DC output.

CAUTION

During the conduct of this procedure the operator of the AGPU must be in intercom communication with the aircraft pilot or mechanic at all times.

a. Load Connection.

(1) Perform start procedure in paragraph 2-3 if engine is not running.

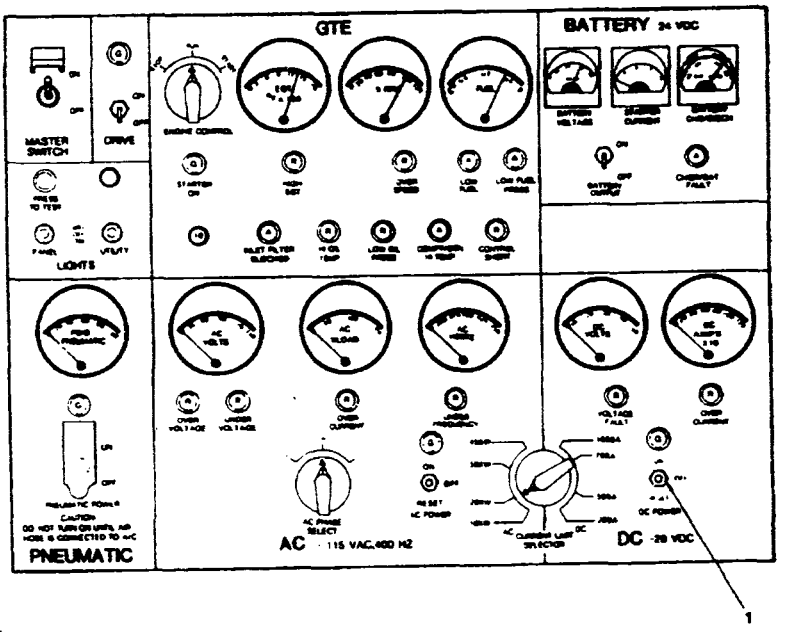


Figure 2-11. DC Load Connection - Control Panel Functions

WARNING

Never attempt to connect or disconnect power cable to/from aircraft with power applied, otherwise sever arcing may occur, causing burns.

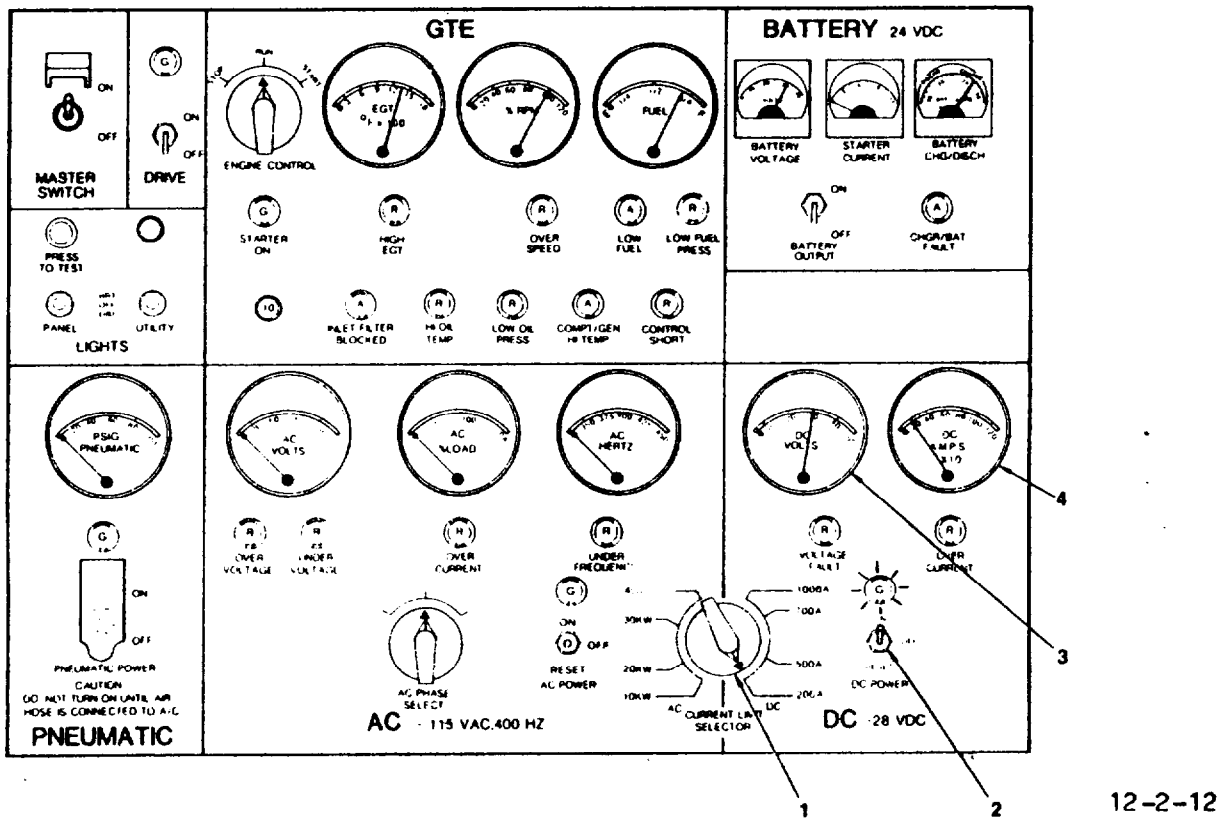
(2) Ensure that DC POWER switch (1, Fig. 2-11) is set to OFF.

(3) Remove DC cable from storage compartment on rear left side of AGPU.

(4) Connect DC cable to connector on aircraft.

b. DC Power Application.

(1) Set aircraft DC load control switches to OFF.



12-2-12

Figure 2-12. DC Power Application - Control Panel Functions

(2) Set CURRENT LIMIT SELECTOR switch (1, figure 2-12) set to desired DC range. On the 83-360D, DC may be supplied with the CURRENT LIMIT SELECTOR switch (1, Fig. 2-12) at any of the AC setting.

(3) Set DC POWER switch (2) to ON (check that green indicator light illuminates).

(4) Check that DC VOLTS meter (3) reads in green range.

(5) Set aircraft DC load control switches to ON.

(6) Observe that DC AMPS meter (4) does not read in red range. On the 83-360D, insure that the DC AMPS meter (4) does not read above 350 AMPS except during aircraft starting (or slave start of another AGPU.

CAUTION

The 83-360D does not monitor or regulate the DC output of the TRU. The TRU output is not protected from an overload. When operating at high DC output the DC AMPS meter and the DC VER CURRENT light must be closely monitored to protect the TRU from overload.

NOTE

If an overload or malfunction occurs and DC power is automatically shutdown, observe DC malfunction indicator lights. Record any lights illuminated before setting DC POWER to RESET, or MASTER SWITCH to OFF.

(7) Remove DC power from aircraft by performing steps (8) through (10).

(8) Set aircraft DC load control switches to OFF.

(9) Set DC POWER switch (2) to OFF.

(10) Disconnect DC cable from aircraft.

2-6. PNEUMATIC SYSTEM OPERATION.

During the conduct of this procedure the operator of the AGPU must be in intercom communication with the aircraft pilot or mechanic at all times.

a. Load Connection.

(1) Perform start procedure in paragraph 2-3 if engine is not running

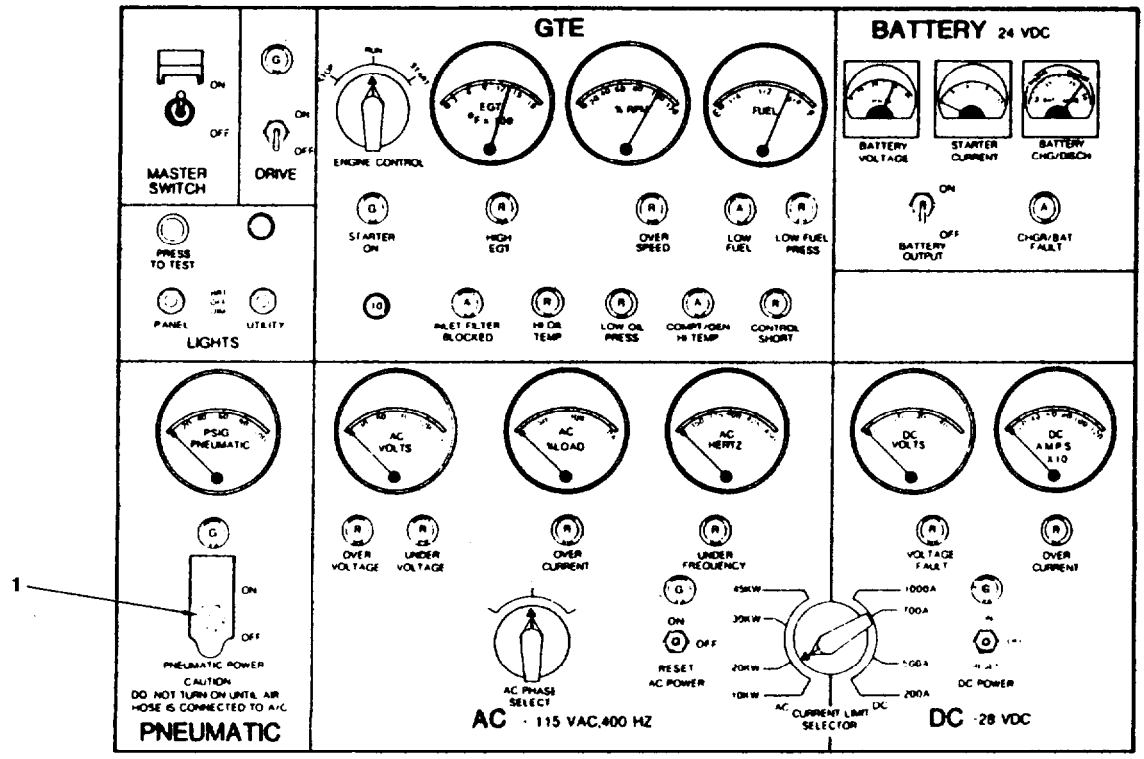


Figure 2-13. Pneumatic Load Connection - Control Panel Functions 12-2-13

WARNING

Pneumatic hose and adapter fitting become extremely hot when pneumatic power is applied. Never touch hose or adapter fitting until pneumatic power is removed and hose and adapter fitting have cooled. Wear proper gloves and eye protection (goggles or face shield) when operating pneumatic system.

(2) Ensure that PNEUMATIC POWER switch (1, figure 2-13) is set to OFF.

CAUTION

Handle hose with care so spiral wrap and netting are not damaged. Keep hose off ground if wet or muddy (use suitable supports).

(3) Open access door and remove pneumatic hose from storage compartment. Route hose out of compartment so access door can be closed, and hose is routed under rubber flap at bottom of door.

(4) Straighten out hose to remove any kinks.

(5) Connect pneumatic hose fitting to aircraft.

b. Pneumatic Power Application.

WARNING

Never set PNEUMATIC POWER switch to ON unless pneumatic hose fitting is securely attached to aircraft. The hose will attempt to straighten out with power applied, and whip around violently if not securely attached to aircraft. Wear proper gloves and eye protection (goggles or face shield) when operating pneumatic system.

NOTE

The air output is reduced when the surge control valve is open. Do not attempt to cool the AH-64A or ground air start any aircraft when the CURRENT LIMIT SELECTOR switch is in the "AH-64D" setting.

(1) Set PNEUMATIC POWER switch (1, Fig. 2-14) to ON (check that green indicator light illuminates).

(2) Observe that PSIG PNEUMATIC gauge (2) indicates in green range.

NOTE

Pneumatic pressure may modulate engine EGT becomes too high (load control valve will auto-automatically reduce pneumatic output until engine EGT is lowered to acceptable level).

(3) Remove pneumatic power from aircraft by performing steps (4) through (7).

(4) Set PNEUMATIC POWER switch (1) to off.

WARNING

Pneumatic hose and adapter fitting become extremely hot when pneumatic power is applied. Never touch hose or adapter fitting until pneumatic power is removed and hose and adapter have cooled. Wear proper gloves.

CAUTION

Handle hose with care so spiral wrap and netting are not damaged.

(5) Disconnect pneumatic hose fitting from aircraft.

(6) Open access door and carefully store hose in compartment.

(7) Close access door.

2.7. HYDRAULIC SYSTEM OPERATION.

a. Flushing/Purging of Hydraulic System.

Hose Connections.

NOTE

Ensure all hydraulic hose connectors on the AGPU control panel, the dual service manifolds, and hoses are protected from contamination with a cap or plug. When making connections, reconnect the removed plug to protect against contamination while hoses are being used. The following hose connections and flushing/purging operation requires the dual manifold to be modified for runaround use. This modification is directed by MWO 1-1730-229-50-3.

(a) Remove the appropriate hydraulic hoses and the appropriate adapter hose listed in Table 2-6 from storage rack behind engine access door.

(b) Layout entire lengths of hoses. Straighten hoses to eliminate loops and kinks.

Table 2-6. Hydraulic Adapter Hoses.

Aircraft	Output (High Pressure Hose)		Return (Low Pressure Hose)	
	Part Number	Quantity Needed	Part Number	Quantity
AH-64 (Apache)	83-14831	2	83-14825	2
AH-1 (Huey Cobra)	83-14831	2	83-14825	2
OH-58 (Kiowa)	83-14831	2	83-14825	2
UH-1 (Iroquois)	83-14831	1	83-14825	1
UH-60 (Blackhawk)	83-14831	2	83-14825	2
CH-47 (Chinook)	83-14831	1	83-14825	1

(c) Remove the dual service manifold from its storage location in the AGPU engine compartment and place on a large drip pan or other clean surface.

(d) Remove protective cap from AGPU hydraulic module HIGH PRESSURE output connector and LOW PRESSURE connector. See Figure 2-16 and 2-17.

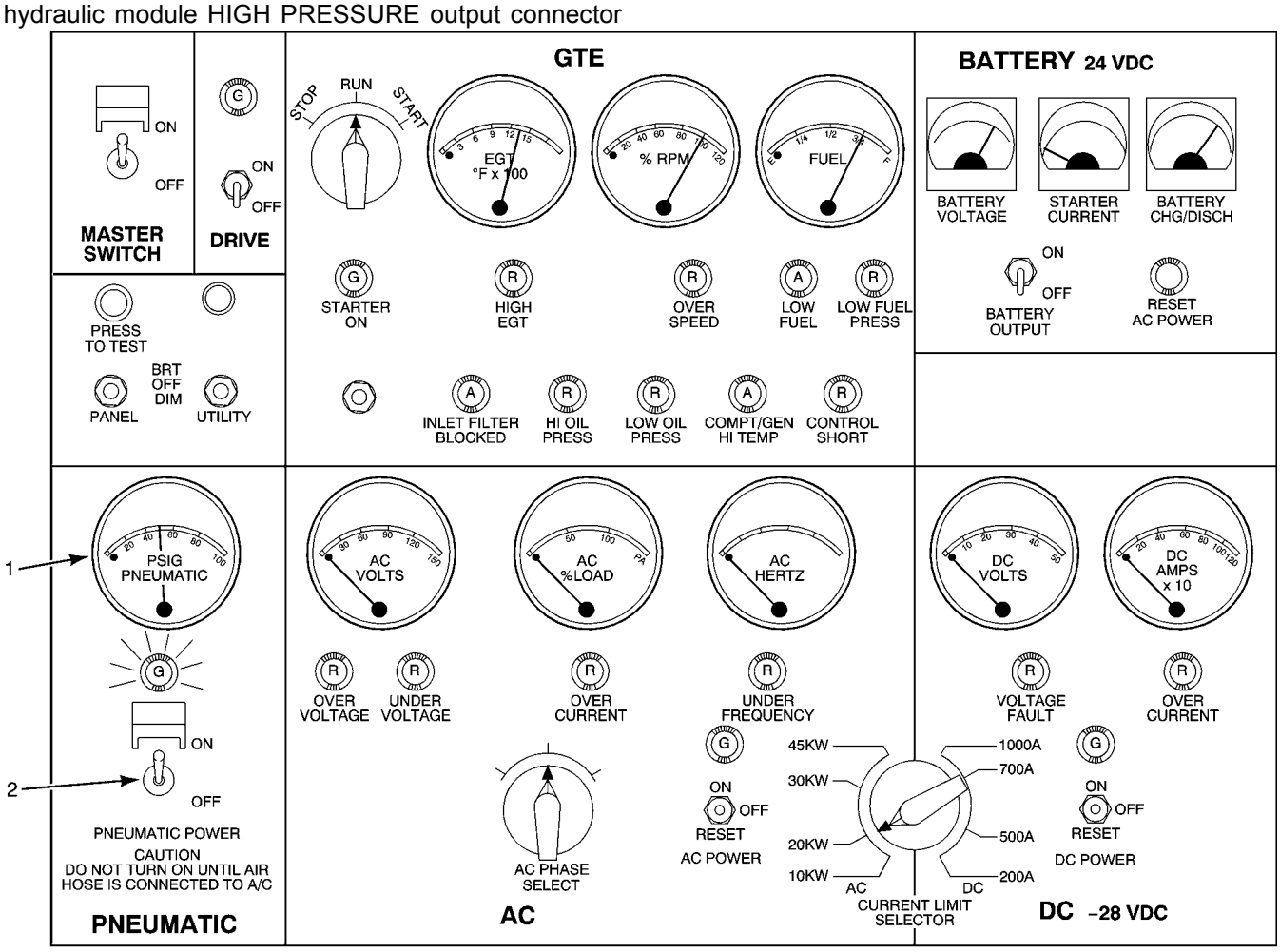


Figure 2-14. Pneumatic Power Application - Control Panel Functions.

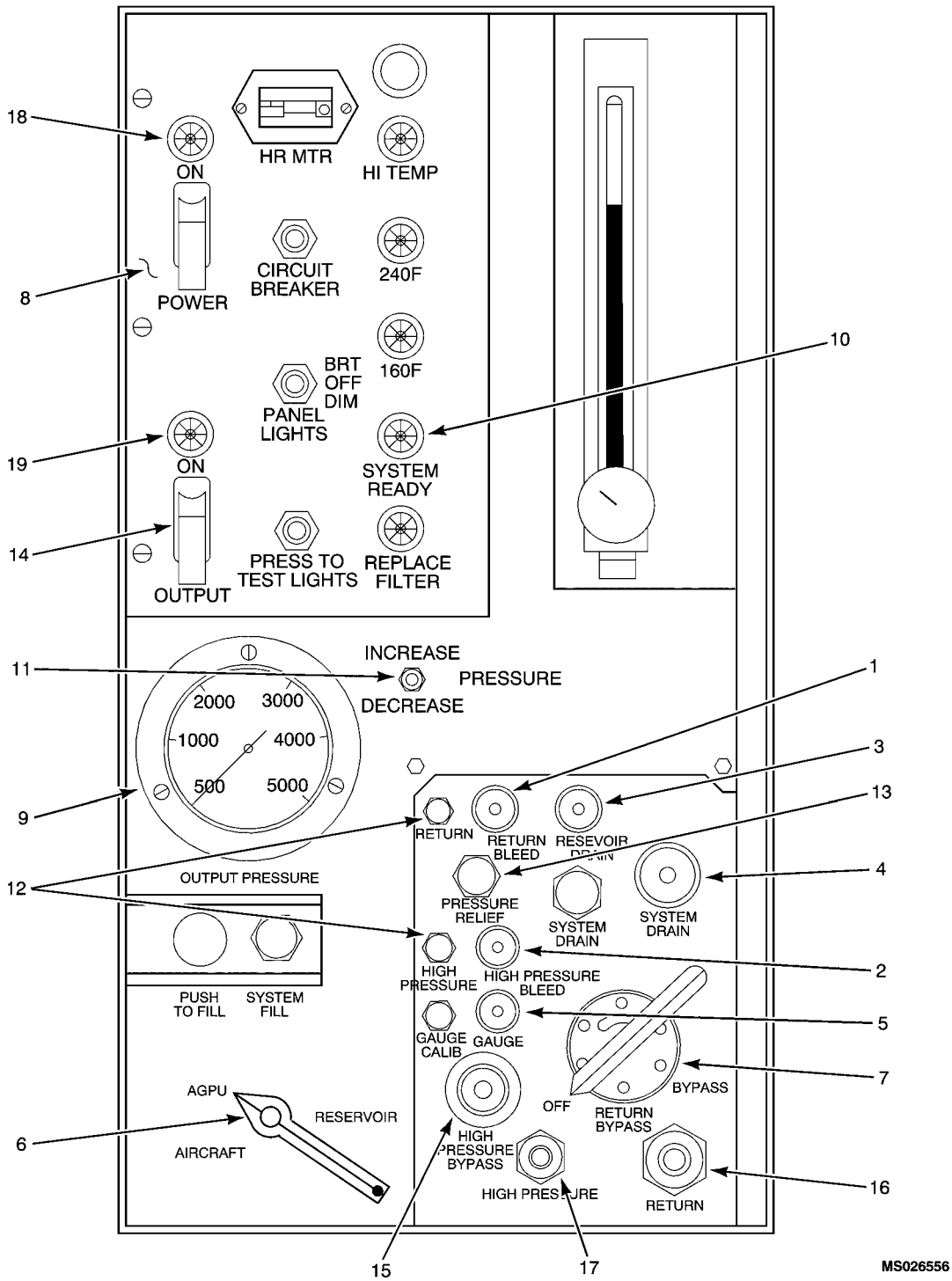
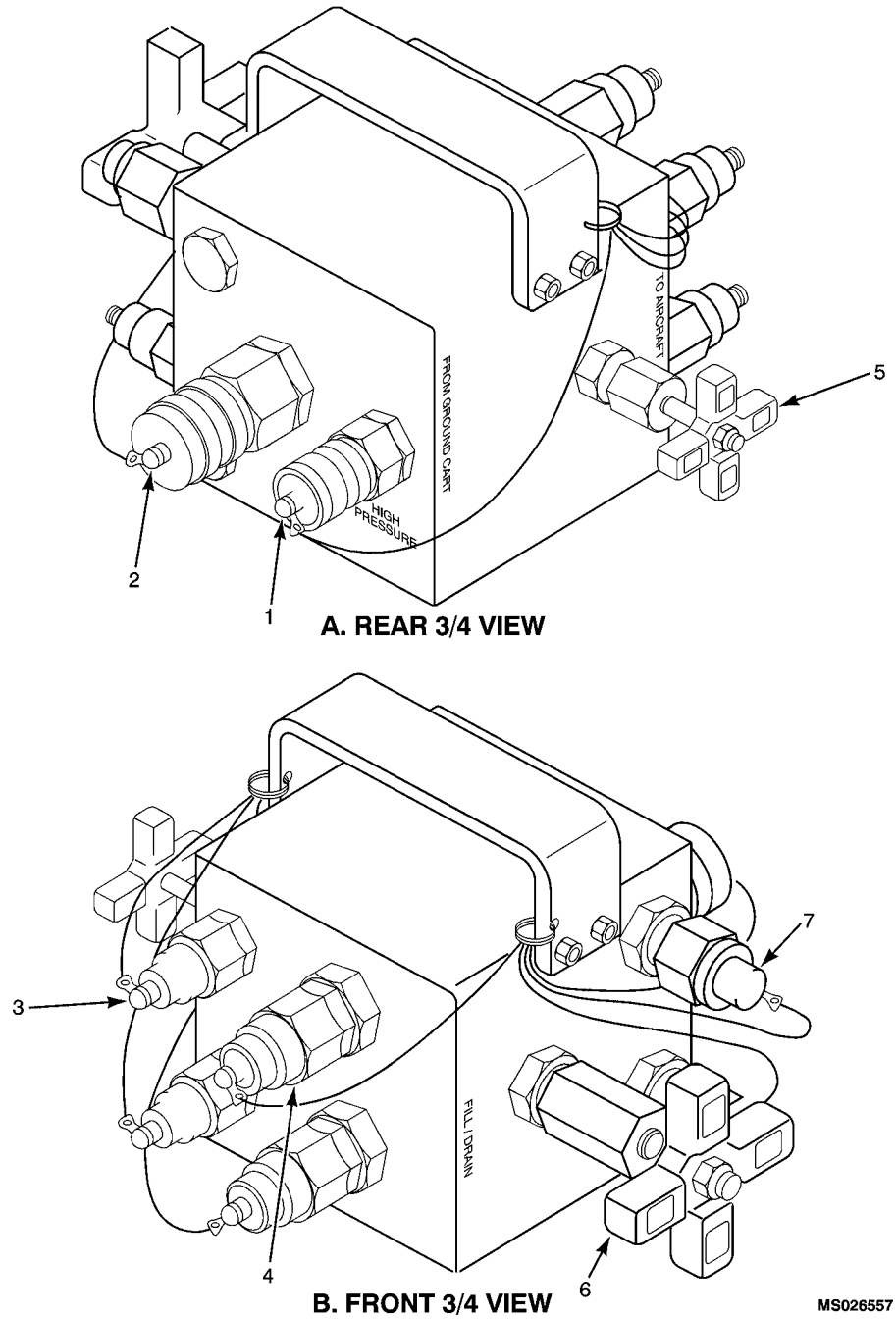
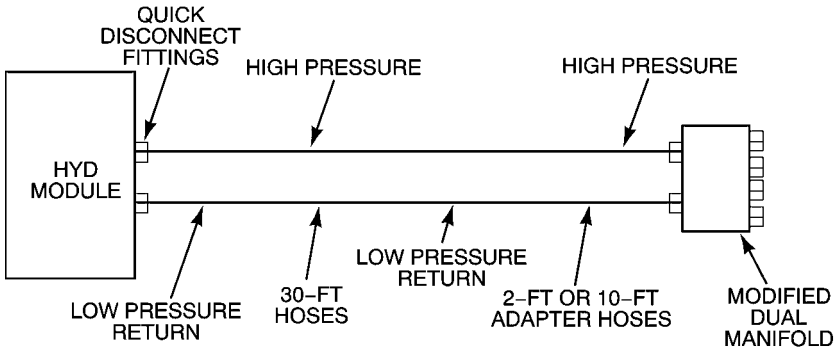


Figure 2-15. Hydraulic Power Operation - Hydraulic Control Panel Functions.

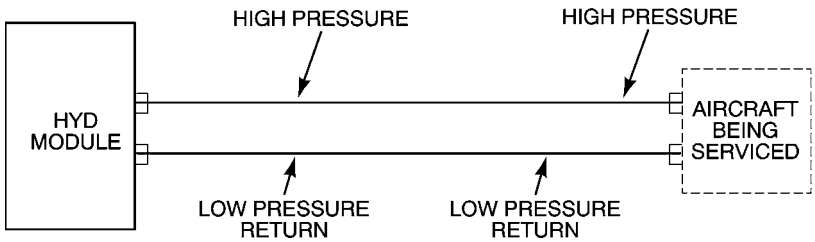


1. HIGH PRESSURE from AGPU
2. RETURN from AGPU
3. HIGH PRESSURE to Aircraft
4. RETURN to Aircraft
5. BYPASS/FLUSH
6. FILL/DRAIN
7. DRAIN

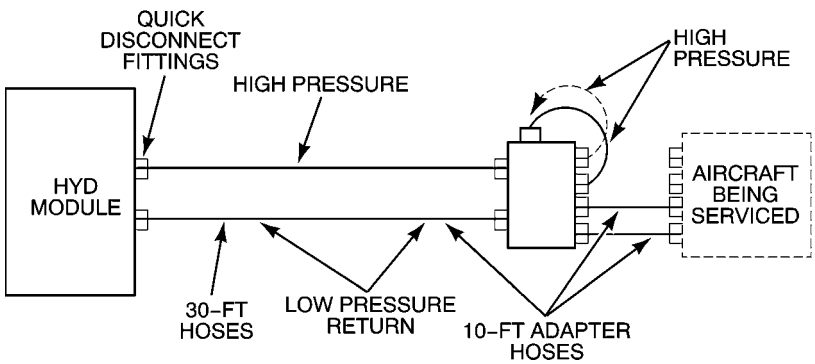
Figure 2-16. Hydraulic Load Connections - Dual Manifold Functions.



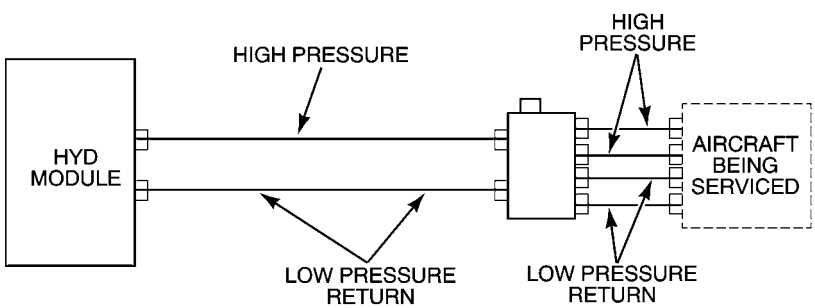
FLUSHING/PURGE FOR SINGLE SYSTEM SERVICING



SINGLE SYSTEM SERVICING



FLUSHING/PURGE FOR DUEL SYSTEM SERVICING



DUEL SYSTEM SERVICING

MS026558

Figure 2-17. Dual System Servicing.

CAUTION

Inspect and remove all foreign matter from quick disconnects, before connecting hose to AGPU and dual manifold block.

(e) Close BYPASS/FLUSH valve (item 5, figure 2-16) and FILL/DRAIN valve (item 6, figure 2-16) on dual manifold.

WARNING

If Dual Manifold drain cap (item 7, figure 2-16) is not tighten prior to operation it may cause bodily injury.

(f) Check that dual manifold DRAIN cap (item 7, figure 2-16) is tight.

WARNING

Ensure AGPU GTE is in the stop position and the master switch is in the off position prior to hose connecting.

(g) Connect one end of the appropriate LOW PRESSURE hose to the RETURN port on the AGPU hydraulic control panel (item 16, figure 2-15). Connect the other end of the LOW PRESSURE hose to the RETURN port (item 2, figure 2-16) on the dual manifold block.

(h) Connect one end of the appropriate HIGH PRESSURE hose to the HIGH PRESSURE port on the AGPU hydraulic control panel (item 17, figure 2-15). Connect the other end of the HIGH PRESSURE hose to the HIGH PRESSURE port (item 1, figure 2-16).

b. Flush/Purge Operation.

WARNING

When hydraulic power is turned on, the hydraulic hose will be under extremely high pressure. Make sure that all quick disconnect fittings are secure, and hoses are not kinked. Injury from flailing hoses could result. Wear proper gloves and eye protection (goggles or face shield) when operating hydraulic equipment.

Hydraulic control panel setting prior to start.

(a) Verify reservoir level is at the ¾ to HIGH level.

(b) Close RETURN BLEED valve (item 1, figure 2-15).

(c) Close HIGH PRESSURE BLEED valve (item 2, figure 2-15).

(d) Close RESERVOIR DRAIN VALVE (item 3, figure 2-15).

(e) Close SYSTEM DRAIN valve (item 4, figure 2-15).

(f) Close GAUGE SHUTOFF valve (item 5, figure 2-15) and reopen approximately ¼ turn.

(g) Set RESERVOIR SELECTOR valve (item 6, figure 2-15) to AGPU position.

(h) Set RETURN BYPASS SELECTOR valve (item 7, figure 2-15) to BYPASS position.

c. Startup Flush/Purge Operation.

CAUTION

The reservoir selector must be set to AGPU prior to startup or damage to the AGPU pump will occur.

(1) Start AGPU's GTE, operating procedures, per paragraph 2-3.

(2) Check OUTPUT PRESSURE gauge (item 9, figure 2-15) for an indication of approximately 500 to 700 psig. If no pressure is indicated verify that the RESERVOIR SELECTOR valve (item 6, figure 2-15) is set to AGPU and that the GAUGE SHUTOFF valve (item 5, figure 2-15) is open approximately ¼ to ½ turn.

CAUTION

If there is still no indication of pressure immediately shutdown the AGPU GTE and notify maintenance.

(3) Set POWER switch (item 8, figure 2-15) to the ON position and ensure power on INDICATOR (item 18, figure 2-15) illuminates.

(4) Hold pressure switch (item 11, figure 2-15) to the INCREASE position until the OUTPUT PRESSURE gauge (item 9, figure 2-15) reads 1000 psig.

(5) Open RETURN bleed valve (item 1, figure 2-15) ¼ turn.

(6) Open HIGH PRESSURE BLEED VALVE (item 2, figure 2-15) ¼ turn.

(7) Observe the RETURN and HIGH PRESSURE site glasses (item 12, figure 2-15) when all evidence of air bubbles in the system have disappeared, close RETURN and HIGH PRESSURE bleed valve (item 1 and 2, figure 2-15).

(8) Check that SYSTEM READY indicator (item 10, figure 2-15) is illuminated. If not perform steps (1) through (13) in paragraph d. (Hydraulic Fluid Warm-up).

(9) Increase PRESSURE RELIEF setting by holding pressure switch (item 11, figure 2-15) to INCREASE position until the OUTPUT PRESSURE reaches 2500 psig.

(10) If PRESSURE RELIEF setting is higher than 2500 psig, unlock PRESSURE RELIEF valve lock knob (item 13, figure 2-15) and turn PRESSURE RELIEF valve counterclockwise until the OUTPUT PRESSURE drops to 2500 PSIG. Lock PRESSURE RELIEF valve (item 13, figure 2-15) with locking knob.

(11) If pressure relief setting is below 2500 psig, unlock PRESSURE RELIEF valve lock knob (item 13, figure 2-15) and turn PRESSURE RELIEF valve clockwise until the OUTPUT PRESSURE increases to 2500 psig. If pressure stops increasing before the required pressure is reached, repeat step (11). Lock PRESSURE RELIEF valve (item 13, figure 2-15) with locking knob.

(12) Set OUTPUT switch (item 14, figure 2-15) to ON and observe the OUTPUT light (item 19, figure 2-15) illuminates. (This opens the load select valve that applies AGPU hydraulic power to the dual manifold).

(13) Open the BYPASS/FLUSH (smaller) valve (item 5, figure 2-16) on the side of the dual manifold ½ turn. Open FILL DRAIN valve (item 6, figure 2-16) ½ turn (larger). The SYSTEM READY light (item 10, figure 2-15) on the hydraulic control panel may go out because of temperature drop caused by cold hose fluid.

(14) Wait until SYSTEM READY light (item 10, figure 2-15) illuminates.

(15) Continue operations for approximately 5 minutes. If the hydraulic module has not been operated in the last 30 days or if contamination is suspected, continue operation for 30 minutes.

(16) Close the BYPASS/FLUSH (smaller) valve (item 5, figure 2-16) and FILL DRAIN valve (larger) (item 6, figure 2-16) on the dual manifold.

(17) Set OUTPUT switch (item 14, figure 2-15) to off (down position) and observe that output light goes out.

(18) Hold PRESSURE switch (item 11, figure 2-15) to the DECREASE position while watching the OUTPUT PRESSURE gauge (item 9, figure 2-15). Reduce pressure to 500 to 700 psig.



Failure to reduce system pressure prior to shutting down the hydraulic power can cause damage to the pressure compensator motor on the hydraulic pump and the limit switches.

(19) Set POWER switch (item 8, figure 2-15) to off and observe that power light (item 18, figure 2-15) goes out.

(20) Set RETURN BYPASS valve (item 7, figure 2-15) to off position.

(21) Shut down GTE in accordance with (IAW) paragraph 3–13.

d. Hydraulic Fluid Warm-up.

NOTE

This operation is performed only if required by step (8) in paragraph c. Load connections to dual manifold must be made as indicated in paragraph a.

(1) Close (turn fully clockwise) the HIGH PRESSURE BYPASS valve (item 1, figure 2-18).

NOTE

If 2,000 psig cannot be obtained in the following step, adjust PRESSURE RELIEF valve (item 2, figure 2-18) by loosening lock nut and turning valve clockwise.

(2) Hold PRESSURE switch (item 3, figure 2-18) to the INCREASE position until the OUTPUT PRESSURE gauge reading stabilizes at approximately 2,000 psig, and then release switch.

(3) Open HIGH PRESSURE BYPASS valve (item 1, figure 2-18) ¼ turn.

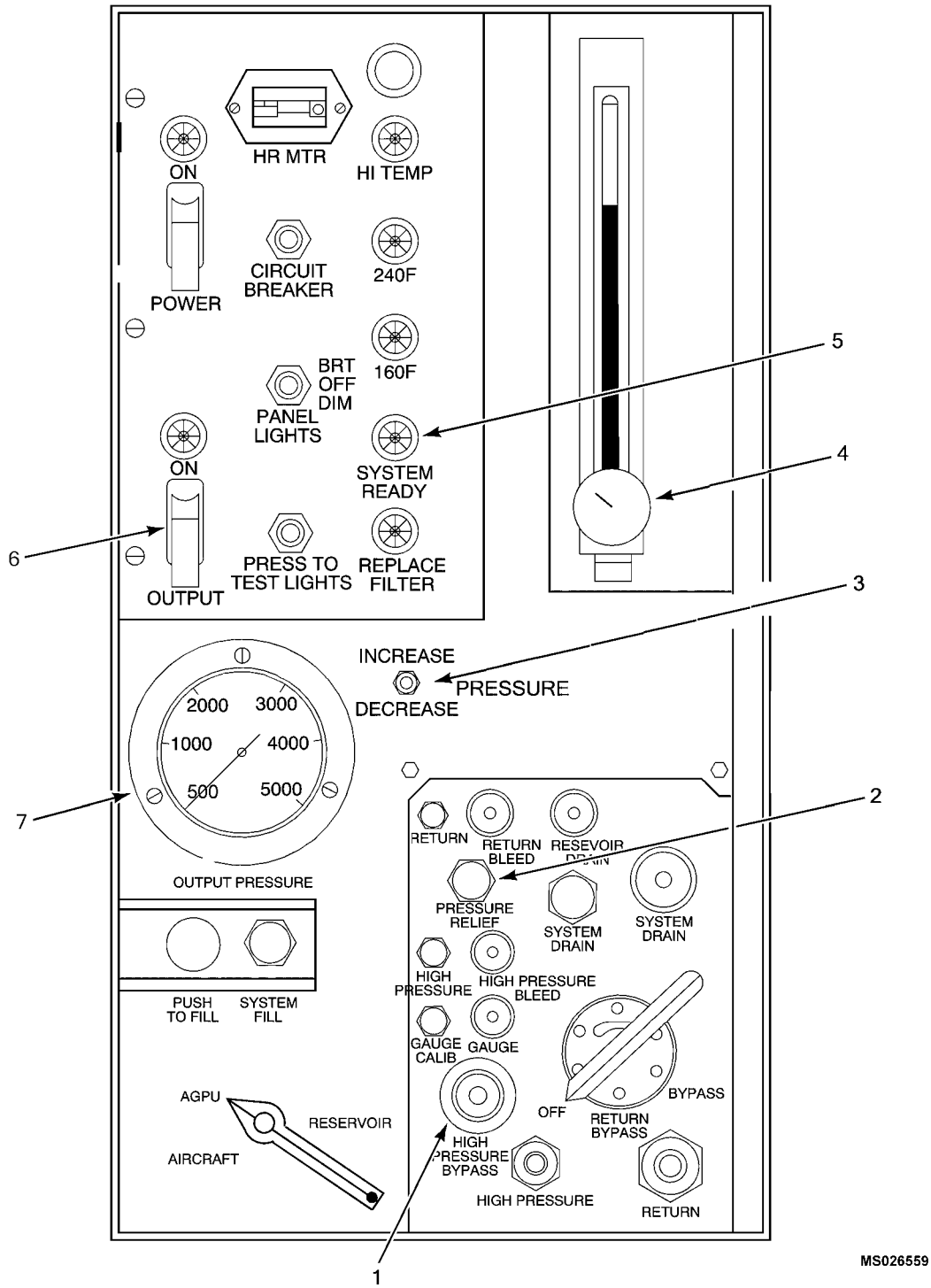


Figure 2-18. Hydraulic Fluid Warmup-Hydraulic Control Panel Functions.

(4) Observe temperature gauge (item 4, figure 2-18) for an increase of approximately 10 degrees.

(5) Repeat steps (3) and (4) until fluid temperature is high enough to illuminate the SYSTEM READY light (item 5, figure 2-18) (at 70 degrees F).

(6) Close the HIGH PRESSURE BYPASS valve (item 1, figure 2-18).

(7) Ensure that hydraulic load connections have been made as described in paragraph 2-7a.

(8) Set OUTPUT switch (item 6, figure 2-18) to ON and observe that output light illuminates. (This opens the load select valve that applies AGPU hydraulic power to the dual manifold).

(9) Open the BYPASS/FLUSH (smaller) valve (item 5, figure 2-16) on the side of the dual manifold ½ turn. The SYSTEM READY light (item 5, figure 2-18) on the hydraulic control panel may go out because of temperature drop caused by cold hose fluid.

(10) Wait until SYSTEM READY light (item 5, figure 2-18) illuminates.

(11) Close the BYPASS/FLUSH (smaller) valve (item 5, figure 2-16) on the dual manifold.

(12) Set OUTPUT switch (item 6, figure 2-18) to OFF (down position) and observe that output light goes out.

(13) Hold PRESSURE switch (item 3, figure 2-18) to the DECREASE position while watching the OUTPUT PRESSURE gauge (item 7, figure 2-18). Reduce pressure to 500 psig.

e. Dual Manifold/Aircraft.

WARNING

When hydraulic power is turned on, the hydraulic hose will be under extremely high pressure. Make sure that all quick disconnect fittings are secure, and hoses are not kinked. Injury from flailing hoses could result. Wear proper gloves and eye protection (goggles or face shield) when operating hydraulic equipment.

(1) Verify that all hoses connections are secure.

(2) Verify that RESERVOIR selector valve (item 6, figure 2-15) is set to AGPU, RETURN/BYPASS valve (item 7 figure 2-15) is set to BYPASS, and the dual manifold BYPASS/FLUSH valve is closed.

(3) Set OUTPUT switch (item 14, figure 2-15) to ON.

(4) Set hydraulic pressure by placing PRESSURE switch to the INCREASE position until pressure reaches 2500 PSIG as indicated on the OUTPUT PRESSURE gauge.

(5) Open BYPASS/FLUSH valve on the Dual Service Manifold until pressure drops to 2000 psig.

(6) Continue operations for approximately 5 minutes. If the hydraulic module has not been operated in the last 30 days or if contamination is suspected, continue operation for 30 minutes.

WARNING

Failure to reduce system pressure prior to shutting down the hydraulic power can cause damage to the pressure compensator motor on the hydraulic pump and the limit switch.

(7) Reduce system pressure to 500 - 700 psi.

(8) Set OUTPUT switch to OFF.

(9) Set RETURN BYPASS position to OFF. If dual servicing is required go to step 13.

(10) Remove the cap from the high-pressure GSE port on the aircraft to be serviced. Disconnect the high-pressure adapter hose from the dual manifold and immediately connect to the aircraft without putting the connector down or exposing it to contamination.

(11) Remove the cap from the return ground ports on the aircraft to be serviced. Disconnect the return adapter hose from the dual manifold and reconnect to the aircraft.

(12) Replace caps and plugs in the dual manifold and return to the AGPU.

(13) If the aircraft servicing operation requires dual system operation, purge the 2 additional high pressure adapters hoses using the following steps:

(a) Remove the caps from the two RETURN ports (item 4, figure 2-16) on the aircraft side of the dual manifold and the aircraft return GSE port. Remove protective plugs from the return adapter hoses and connect between the dual manifold and the aircraft. Connect removed cap and plug.

(b) Remove the caps from the two HIGH PRESSURE ports (item 3, figure 2-16) on the aircraft side of the dual manifold. Remove protective plugs from the mating quick disconnects on the two HIGH PRESSURE adapter hoses and connect to the dual manifold. Connect removed cap and plug.

(c) Remove the caps from the ½ inch quick disconnect located in the DRAIN port (item 7, figure 2-16) on the side of the dual manifold. Remove protective plug from the quick disconnects on aircraft end of the HIGH PRESSURE adapter hoses and connect to the dual manifold. Connect the removed cap and plug.

(d) Verify that both the BYPASS and DRAIN valves on the dual manifold are closed.

CAUTION

During this procedure high pressure will be applied to one of the aircraft hydraulic systems. The operator of the AGPU must be in intercom communications with the aircraft pilot or mechanic at all times

(e) Repeat the flush procedure in (1) - (9) above except that the drain valve is opened until the pressure drops to 2000 psi and the only a 1 - 2 minute flush is required.

(f) Remove the cap from the high-pressure GSE port on the aircraft to be serviced. Disconnect the high-pressure adapter hose from the dual manifold and immediately connect to the aircraft without putting the connector down or exposing it to contamination.

(g) Repeat step (e) above using the high pressure adapter hose for the other aircraft system.

f. Application of Hydraulic Power to Aircraft.

CAUTION

During the conduct of this procedure the operator of this procedure must be in intercom communication with the aircraft pilot or the mechanic at all times.

CAUTION

RESERVOIR and RETURN BYPASS selectors must be in accordance with Table 2-7 to prevent depletion or overflow of the aircraft reservoirs.

(1) Verify that RESERVOIR selector is in AGPU position and set RETURN BYPASS to the OFF position.

Table 2-7. Aircraft Hydraulic Power Requirements.

Aircraft Type	Maximum Operating Pressure (psig)	Pressure Relief Setting (psig)	Reservoir Selection	Return Bypass Position
AH-64 (Apache)	3,000	3,300	AGPU	*OFF
UH-60 (Blackhawk)	3,000	3,300	AGPU	BYPASS
**CH-47 (Chinook) (Utility)	3,600	3,750	AIRCRAFT	BYPASS
Models D, MH47-E (Flt Cont)	3,000	3,300	AIRCRAFT	BYPASS
AH-1 (Huey Cobra)	1,500	1,700	AGPU	BYPASS
UH-1 (Iroquois)	1,000	1,100	AGPU	BYPASS
OH-58A (Kiowa)	600	700	AGPU	BYPASS
OH-58D	1,000	1,100	AGPU	BYPASS

* When using the return bypass in the OFF position, the aircraft reservoir may fill to the full position. This is satisfactory for hydraulic operation.

** On CH-47D model aircraft the RESERVOIR selector valve (item 6, figure 2-15), must be in the AGPU position until the OUTPUT switch (item 14, figure 2-15), is set on the ON position. The aircraft will then be supplied with hydraulic power. The Reservoir Selector valve is then placed in the AIRCRAFT position and the Return Bypass to BYPASS position. When hydraulic operations are completed, the Reservoir Selector valve is set to AGPU position and the bypass valve is cycled to the OFF position to fill aircraft reservoir, to the BYPASS position to drain aircraft reservoir, to bring the aircraft reservoir to operating range.

(2) Set OUTPUT switch to ON. Observe that output light illuminates.

(3) When using aircraft reservoir (CH-47D) place the RETURN BYPASS to the BYPASS position and then place the RESERVOIR selector valve to the AIRCRAFT position.

(4) On the AH-64 move the RETURN BYPASS is in the OFF position.

(5) On the UH-60 move the RETURN BYPASS is in the BYPASS position or its reservoirs will overflow.

(6) Hold the PRESSURE switch to INCREASE position until the specified aircraft operation pressure per Table 2-7 is reached.

g. Shut Down Hydraulic System.



Failure to reduce system pressure prior to shutting down the hydraulic power can cause damage to the pressure compensator motor on the hydraulic pump and limit switched.

To prevent damage to the AGPU AGPU hydraulic pump, the RESERVOIR selector must always be set to AGPU on completion of servicing with AIRCRAFT reservoir (CH-47D).

(1) Check the aircraft reservoir levels.

(2) If overfilled move RETURN BYPASS selector to BYPASS to drain. If the level is low move the selector to OFF.

(3) When proper reservoir levels are restored simultaneously switch both the RETURN BYPASS and OUTPUT to OFF.

(4) Open HIGH PRESSURE BLEED valve 1/4 turn. Hold PRESSURE switch (11) to DECREASE position until the OUTPUT PRESSURE drops to 500 to 700 psig.

(5) Close HIGH PRESSURE BLEED valve.

(6) Disconnect hoses, reinstall all caps and plugs in stow in AGPU.

h. Flush Aircraft Flight Control System.

NOTE

Dual service manifold is used on both single and dual hydraulic systems.

(1) The AGPU must have been properly sampled and cleared for operation. Ensure the reservoir is full.

(2) Flush hoses and connect AGPU to aircraft GSE connectors in accordance with paragraphs 2-7a through e, above.

(3) Locate a clean 10-gallon or larger drum.

(4) Connect a hose to drain connector on the AGPU dual service manifold drain port and place opposite end of hose in drum. (Any AGPU adapter hose can be used as the drain hose by removing the quick disconnect couplings at both ends.)

(5) Ensure bypass/flush and fill/drain valves are closed.

NOTE

Personnel are required to use the aircraft intercom communication system to maintain voice communications between the person operating the flight controls and the AGPU operator.

(6) Apply external power to the aircraft and establish voice communication via intercom communication system.

(7) Apply external air to aircraft (AH-64 only).

(8) Recheck the AGPU reservoir fill level gauge on the hydraulic control panel to ensure the reservoir is full. Add fluid if necessary.

(9) Open AGPU dual hydraulic service manifold drain valve and drain aircraft reservoir.

(10) Discharge aircraft hydraulic accumulators.

(11) On the AGPU hydraulic control panel set RETURN BYPASS selector to OFF and make sure RESERVOIR selector is set to AGPU.

(12) Set hydraulic POWER switch to ON. Set OUTPUT switch to ON. Set aircraft system pressure in accordance with Table 2-7.

NOTE

AGPU fluid level will decrease to between 1/2 and 1/3 full on the reservoir level gauge. Do not allow the reservoir level to decrease below 1/3 full. (5-7 gallons flushed)

CAUTION

Do not let the reservoir go empty. Extensive damage to the AGPU hydraulic will occur.

(13) While monitoring AGPU fluid level cycle flight controls (cyclic, collective, and pedals) 5 cycles each.

(14) Shut off AGPU dual manifold drain port.

(15) Cycle flight controls two additional cycles.

(16) Flush is complete.

(17) Shut down AGPU as in paragraph 2-7f above.

2-8. COMBINED OUTPUT OPERATION.

CAUTION

During the conduct of this procedure the operator of the AGPU must be in intercom communication with the aircraft pilot or mechanic at all times.

a. Combined output operation is the same as described in paragraphs 2-3 through 2-7. Electrical, hydraulic, and pneumatic power may be used simultaneously. There are, however, certain restrictions and limitations as described below.

(1) On the 83-360A AGPU there is a restriction on simultaneous use of AC and DC power. The CURRENT LIMIT SELECTOR switch on the control panel select either ac or dc output from the generator. When set to DC positions, no ac power is available. When set to AC positions, no dc power is available (from generator). However, when operating in the AC mode, 50 amps dc power is available from the battery /battery charger circuits (if AC load is less than 27.5 KW). Opera- Operation in this mode is described in table 2-8 and paragraph c.

(2) On the 83-360D AGPU all the DC comes from the TRU, which is powered by the AC output generator, its input load requirement is not available as AC output. The CURRENT LIMIT SELECTOR switch position selected must consider both the AC and DC output loads. The generator control unit can no longer regulate the DC output so its control over the DC contactor has been bypassed. Also on the 83-360D, the AH-64D position of the CURRENT LIMIT SELECTOR switch opens the surge control valve, which reduces the available airflow.

(3) There are limitations on maximum outputs under combined output operations. Maximum outputs under combined operations are:

(a.) Condition 1.

AC 20 KW .08 pf, or DC 200 Amp Hydraulic: 3,000 psig at 6.0 GPM Pneumatic: 34 lb/min at 35 psig.

(b.) Condition 2.

AC 20 KW .8 pf, or DC 200 Amp Hydraulic: 3,300 psig at 15 GPM.

(c.) Condition 3. (83-360D only)

AC 36 KW 0.8pf, Hydraulic: 3,000 psig at 6.5 GPM, Pneumatic: ON, only surge control valve open.

NOTE

While 83-360D still has the capacity of providing 50 amps DC output from the battery charger in combination with AC, this operation is not recommended. Using normal DC output procedures, the TRU can deliver 5-7 times the DC with no danger of overloading and burning out the battery charger. For the 83-360D, DC power output is obtained in the same way, whether in combination with AC power (lb.) or with no AC power (1c). Settings in 1c of the table are used.

b. Combined Output Operation. Refer to table 2-8 and perform the following steps.

(1) Select desire output from column 1.

(2) Make load connections by performing applicable steps referenced in column 4.

CAUTION

When applying power under combined output operation, observe the sequence specified in applicable aircraft TM.

(4) Apply power to aircraft by performing applicable steps referreferenced in column 4.

(5) Remove power from aircraft by performing applicable steps referenced in column 5.

c. To obtain DC power (50 amps maximum) while operating in AC mode, perform the following steps as specified I table 2-8:

(1) Set CURRENT LIMIT SELECTOR switch to AC 10KW, 20KW, or 30KW position.

(2) Ensure that DC POWER switch is set to OFF.

NOTE

Battery power cannot be uses if DC POWER switch is set to ON.

(3) Set BATTERY OUTPUT switch to ON.

2-9. SLAVE START OPERATION. Slave start may be accomplished by two methods: (1) from a dc generator supplying 220 to 32 vdc, 800 amp minimum; or (2) from an external 24 vdc battery.

a. Slave Start From DC Generator.

NOTE

DC generator used to start AGPU in this procedure may be another AGPU, or any generator set capable of supsupplying between 22 to 32 vdc, 800 amp minimum current. Generator set must have electrical (slave) cable that will mate with AGPU slave receptacle.

(1) On AGPU to be started, perform steps in Prestart Procedure, paragraph 2-3.a.

CAUTION

Ensure that BATTERY OUTPUT switch on AGPU remains in OFF position at all times when starting from a DC DC generator.

(2) On dc generator, ensure that DC power switch is set to off.

(3) Connect slave cable from DC generator to slave receptacle on AGPU.

Table 2-8. Combined Output Operation

1. Desired Outputs	2. Load Connections Steps	3. Pre Power Application Steps	4. Power Application Steps	5. Remove Power Steps
a. AC Power	Para. 2-4.a Steps (1) through (4)	Para. 2-4.b Steps (1) and (2)	Para. 2-4.b Steps (3) through (6)	Para. 2-4.b Steps (8) through (10)
b. DC Power (in combination with AC Power)	Para. 2-5.a Steps (1) through (4)	Para. 2-8.c Steps (1) and (2)	Para. 2-8.c Step (3)	Para. 2-5.b Step (8), then set BATTERY OUTPUT switch to OFF, and Step (10)
c. DC Power (No AC Power)	Para 2-5.a Steps (1) through (4)	Para. 2-5.b Steps (1) and (2)	Para. 2-5.b Steps (3) through (6)	Para. 2-5.b Steps (8) through(10)
d. Pneumatic Power	Para. 2-6.a Steps (1) through (5)	—	Para. 2-6.b Steps (1) and (2)	Para. 2-6.b Steps (4) through (7)
e. Hydraulic Power	Para. 2-7.a Steps (1) through (17)	Para. 2-7.b Steps (1) through (21)	Para. 2-7.b steps (22) and (23)	Para. 2-7.b Steps (24) through (28)

(4) On dc generator, set current limit selector (if applicable) to maximum position.

(5) Start dc generator.

(6) On dc generator, set dc power output switch to on position.

CAUTION

Observe the following AGPU starter duty cycle when starting AGPU from a dc generator, otherwise AGPU starter will overheat.

(7) Observe following start duty cycle for AGPU:

(a) Two consecutive unsuccessful start attempts for a maximum of 15 seconds each are allowed.

(b) After two unsuccessful start attempts, a minimum of 20 minutes off time is required. After 20 minutes, two additional 15 second start attempts may be made consecutively. After this, 40 minutes off time is required before any additional attempts can be made.

(8) On AGPU, perform Start Procedure as outlined in paragraph 2-3.b.

(9) When AGPU has been started, set dc power output switch on dc generator to off, and disconnect dc generator slave cable from slave receptacle.

b. Slave Start From Battery Power.

NOTE

External 24 vdc battery used to start AGPU in this procedure may be located in another AGPU, a generator set, or other power source with an electrical (slave) cable that will mate with AGPU slave receptacle.

(1) On AGPU, perform steps in Pm-start Procedure, paragraph 2-3.a.

CAUTION

If external24 vdc battery power source is from a generator set, ensure that dc power output switch on generator is set to off position at all times when starting from battery power.

(2) On generator set, ensure that battery output switch is set to off position.

(3) Connect generator set slave cable to slave receptacle on AGPU.

(4) Set battery output switch on generator set to on position.

CAUTION

Observe the following AGPU starter duty cycle when starting from an external battery, otherwise AGPU starter will overheat.

(5) Observe the following start duty cycle for AGPU:

(a) Three consecutive unsuccessful start attempts for a maximum of 30 seconds each are allowed.

(b) After three unsuccessful start attempts, a minimum of 20 minutes off time is required. After 20 minutes, two additional 30-second start attempts may be made consecutively. After two start attempts, 40 minutes off time is required before any additional attempts can be made.

(c) Six successful starts can be made in a one hour period at ten minute intervals. After this period, one hour off time is required.

(6) On AGPU, perform Start Procedure as outlined in paragraph 2-3.b.

(7) When the AGPU has been started, set battery output switch on generator set to off position, and disconnect dc power cable from slave receptacle.

2-9.1. SLAVE START OPERATION (Failing Battery Charger).

NOTE

If AGPU battery can start the GTE, skip step a.

a. Use another AGPU, battery cart or 24 VDC source, connected to the Slave Start receptacle on the rear panel of the AGPU. Follow procedures as identified in TM 55-1730-229-12, Para 2-9.

b. Once the GTE has been started the AGPU low battery may be charged by the following steps:

(1) Insert the AGPU DC cable into the SLAVE START receptacle of the same AGPU.

(2) Set the CURRENT LIMIT SELECTOR switch to the DC 200 AMP position.

(3) Set the DC POWER switch to ON.

(4) Note the rate of charge of the battery on the DC AMP METER.

(5) Continue the charging until the rate of charge reduces to approximately 15 A.

(6) Set the DC POWER switch to OFF.

(7) Remove the AGPU DC cable from the SLAVE START receptacle.

c. The battery should be capable of up to 9 additional hours of operation or less, depending upon the number of starts during the operating period.

d. While operating without a functional battery charger, AGPU operators should charge the battery as shown in Step b above for approximately 30 minutes prior to shutdown of the GTE to assure capability to restart.

2-10. PROPULSION SYSTEM OPERATION.

NOTE

The propulsion system may be operated in two modes. The primary mode is with the engine running to charge the battery. The alternate mode is without engine running, operating on battery power. The primary mode should be used for movement in excess of 500 feet.

a. Primary Mode Propulsion (GTE Operating).

(1) Start engine in accordance with paragraph 2-3.c.

(2) Remove quick release pin and engage the rear axle drive mechanism by pulling the clutch lever directly to the rear. Reinstall the quick release pin.

(3) Set BATTERY POWER switch to ON.

(4) Delete.

(5) Set DRIVE switch to the ON position, and check that DRIVE indicator illuminates.

(6) Release the tow bar latch by pressing down on the latch release lever. Lower the tow bar to the desired position.

NOTE

If clutch is engaged, DO NOT TOW light should illuminate when tow bar is lowered to approximately 60 degrees from horizontal.

(7) Release the brake lever by moving it to the vertical position.

WARNING

Before depressing the "deadman" switch in preparation for self-propulsion, personnel must ascertain that the speed control moves freely and recenters when released. If the speed control appears to be binding, extreme caution must be exercised while moving unit under its own power.

(8) Press down and hold the DEADMAN switch located on the speed/direction control assembly. Listen for audible click from electric brake to ensure electric brake is released.

WARNING

A ground guide is required when operating AGPU in reverse.

(9) To move the AGPU forward, slowly twist either of the speed/direction twist grips forward To reverse direction, turn either of the grips in the opposite direction. Operate controls from left side of tow bar.

WARNING

Remain clear of downgrade side of AGPU if operating on a slope.

(10) To steer the AGPU, move the tow bar from side to side.

CAUTION

Under normal operations, release deadman switch only after the AGPU has come to a complete stop. Release of the deadman switch while the AGPU is in motion, instantaneously applies the electric brake. While this feature is needed in an emergency, stopping the AGPU in this manner can damage the rear axle mounts.

(11) To stop the drive movement, release the hand grip. An internal spring mechanism will return the grip to the centered or "off" position (releasing Dead-Man switch will also stop AGPU drive and apply the electric brake).

(12) To secure the AGPU, perform the following steps:

(a) Raise the tow bar to the vertical locked position.

(b) Pull the brake lever down to a horizontal position to set the rear brakes.

(c) Set the DRIVE switch to the off position and check that the light goes out.

(d) Set the DC POWER switch to off and observe that the DC power indicator goes out. _

(e) Set ENGINE CONTROL switch to STOP position.

(f) Set MASTER SWITCH to OFF position.

(g) Remove the quick release pin and push in the clutch lever at the rear of the AGPU to disengage the drive mechanism.

(h) Reinstall the quick release pin.

(i) Set four-way valve control handle to OFF.

b. Motor Controlled Adjustment

(1) Remove quick release pin and engage the rear axle drive mechanism by pulling the clutch lever directly to the rear and reinstall the quick release pin.

NOTE

Roof must be removed before motor controller can be adjusted. See paragraph 4-16.

(2) Set MASTER switch to ON.

(3) Set BATTERY OUTPUT switch to ON and observe that battery voltage meter reads in green range.

(4) Set DRIVE switch to ON, and check that drive indicator is illuminated.

NOTE

Two people are required for motor controller adjustment. One person to operate the speed/directional control and one person to adjust the motor controller.

(5) Release the tow bar and lower it to the desired position.

(6) Press down and hold the dead-man switch located on the speed/direction control assembly.

(7) Slowly twist the speed/direction twist grips forward l/4 turn and hold it in the forward position until the VOLTS ADJUSTMENT is complete.

(8) Motor controller adjustments.

NOTE

Perform all trimpot adjustments in order shown.

(a) VOLTS ADJUST. Adjust volts. Adjust trimpot so motor whines but does not turn when twist grips are first twisted forward.

(b) CURRENT LIMITER. Turn current limiter trimpot the full direction of the arrow.

(c) ACCELERATOR. Turn accelerator trimpot the full direction of the arrow, and then approximately 1/2 turn in the reverse direction.

(d) MAX BRAKE. Turn max brake trimpot the full direction of the arrow, and then in the reverse direction approximately l/2 turn.

(e) BRAKE. Turn brake trimpot full OPPOSITE direction of the arrow to start. Turn up l/8 inch in the direction of the arrow. The objective of the adjustment is to have a smooth start with enough brake to stop the unit without a violent stop when reversing directions. The unit should be able to stop and reverse on an incline or level ground without violent movement. Move unit forward and reverse and adjust brake trimpot until the correct adjustment is made.

(9) To secure the AGPU, perform the following steps:

(a) Raise the tow bar to the vertical locked position.

(b) Pull the brake lever down to a horizontal position to set the rear brakes.

(c) Set the BATTERY and DRIVE switches to the OFF position.

(d) Set MASTER SWITCH to OFF position.

(e) Remove the quick release pin and push in the clutch lever at the rear of the AGPU to disengage the drive mechanism and reinstall the quick release pin.

NOTE

Install roof IAW paragraph 4-16b.

2.11. TOWING.

WARNING

A ground guide is required at all times when backing the AGPU with a two vehicle to prevent personnel injury and equipment damage.

CAUTION

Maximum towing speed on improved surfaces is 20 mph. Maximum offroad speed is 10 mph. Maximum turn angle is 20°. Do not make sharp turns forward or back while towing.

CAUTION

Battery must be connected prior to moving AGPU. This will ensure the No Tow Warning system will be activated Failure to connect the battery could result in severe damage to the AGPU drive unit.

a To tow the AGPU, release the tow bar latch and lower the tow bar to the towing position.

CAUTION

Towing AGPU with clutch lever engaged will damage drive mechanism.

b. Verify that the clutch lever is pushed in to disengage the drive mechanism, and quick-release pin is installed.

c. Check that DO NOT TOW light is out.

d. Engage the tow bar ring with the pintle on the towing vehicle.

e. Release the AGPU parking brake.

f. Ensure that all doors are closed and secure prior to towing.

2-12. REMOVE AGPU FROM OPERATION.

a. Ensure that control panel DC POWER, AC POWER, and PNEUMATIC POWER switches are set to OFF and check that associated indicator lights are out.

b. Check that BATTERY OUTPUT switch is set to OFF.

c. Set hydraulic control panel OUTPUT switch to OFF and check that output light goes out.

d. Hold hydraulic control panel PRESSURE switch to DECREASE position to reduce hydraulic pressure to approximately 500 psig.

e. Open hydraulic control panel HIGH PRESSURE BYPASS valve.

f. Set hydraulic control panel POWER switch to OFF and check that POWER ON light goes out.

2-13. AGPU SHUTDOWN.

a. Engine Shutdown.

(1) Set control panel ENGINE CONTROL switch to STOP.

(2) Check that control panel LOW FUEL PRESSURE, LOW OIL PRESSURE, and BAT CHG/DISCH lights illuminate,

(3) Set control panel MASTER switch to OFF, and leave battery connected.

b. Emergency Engine Shutdown.

NOTE

Engine shutdown can only be accomplished by removing fuel source. If shutdown fuel solenoid or associated control circuit should fail, engine shutdown can he accomplished by setting control panel MASTER SWITCH to OFF (this removes voltage from auxiliary fuel pump, and stops fuel flow).

(1) Set control panel ENGINE CONTROL switch to STOP, or push red EMERGENCY STOP pushbutton switch on front of AGPU.

(2) If step (1) fails to shutdown engine, set control panel MASTER SWITCH to OFF.

(3) If step (2) fails to shutdown engine, pull 10 AMP circuit breaker then open battery compartment door and disconnect battery connector.

c. Securing AGPU After Operation. Perform after (A)PMCS steps in table 3-2.

Section II. OPERATION OF AUXILIARY EQUIPMENT

2-14. DEICING KIT.

WARNING

Ear protection, goggles, and hand protection (gloves) must be worn when operating deicing kit.

a. Installation. (See figure 2-l9.)

(1) If engine is running, shut system down.

(2) Remove cap from engine bleed air fitting (located on bulkhead in AC cable compartment).

(3) Loosen hose coupling nut (2) and remove hose shutoff valve (1).

(4) Install hose shutoff valve (1) on engine bleed air fitting. Tighten hand tight.

(5) Attach hose to hose shutoff valve (1), and tighten coupling nut hand tight.

(6) Attach hose to nozzle shutoff valve (5), and tighten hose coupling nut hand tight.

(7) Set shutoff levers (3, 6) to off position.

(8) Layout hose to remove kinks.

b. Operation. (See figure 2-19.)

(1) Start AGPU.

(2) Slowly turn shutoff lever (3) on hose shutoff valve (1) to open position.

WARNING

Heat protective gloves (supplied with kit) must be worn when operating deicing kit.

(3) Put on heat protective gloves supplied with kit.

WARNING

High velocity hot air (250°F) can cause injury or damage. Never direct hot air at another person.

(4) Grasp nozzle securely at hand hold area (8) and slowly turn shutoff lever (6) to open position.

CAUTION

Keep nozzle at least 8 inches away from area being deiced. Slowly move nozzle around area being deiced to prevent excessive heat buildup in one area.

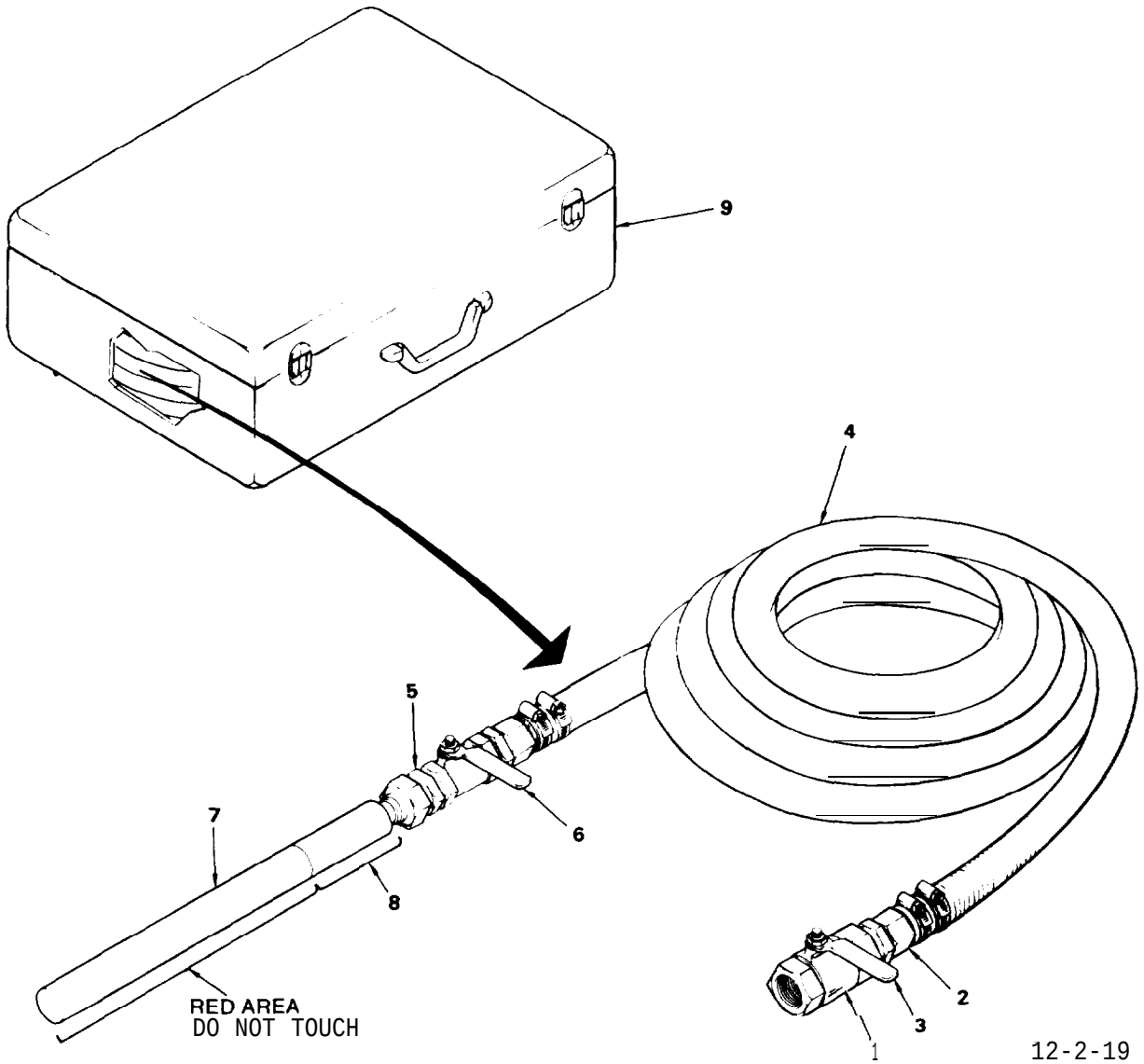
c. Shutdown. (See figure 2-19.)

(1) Set shutoff lever (6) on nozzle shutoff valve to off position.

(2) Set shutoff lever (3) on hose shutoff valve to off position.

(3) Shutdown AGPU and allow at least five minutes cooldown.

(4) Loosen hose coupling nut (2) and remove hose (4) from hose shutoff valve (1).



1. SHUTOFF VALVE, HOSE
2. COUPLING NUT, HOSE
3. SHUTOFF LEVER (SHOWN IN OFF POSITION)
4. HOSE
5. SHUTOFF VALVE, NOZZLE
6. SHUTOFF LEVER (SHOWN IN OFF POSITION)
7. NOZZLE
8. HAND HOLD AREA
9. CASE, STORAGE

Figure 2-19. Deicer Kit

(5) Remove hose shutoff valve (1) from engine bleed air fitting, and install on hose (4). Store deicer kit.

(6) Install deicer outlet cap on deicer air outlet, and tighten hand tight.

Section III. OPERATION UNDER UNUSUAL CONDITIONS

2-15. GENERAL.

a. In addition to normal preventive maintenance service, special care in cleaning and lubrication must be observed where extremes of temperature, humidity, and terrain conditions are present. Proper cleaning, lubrication, and storage and handling of fuels and lubricants will ensure the proper operation and functioning of the AGPU. These procedures will also prevent excessive wear of working parts and deterioration of the AGPU performance.

b. Refer to Lube Order 55-1730-229-12 for lubrication under unusual conditions. Refer to chapter 3 for preventive maintenance checks and maintenance procedures to be performed by the operator.

2-16. EMERGENCY OPERATION.

a. Automatic Shutdown. Built-in protective circuits and sensors will automatically shutdown the AGPU if design limits are exceeded, or if a sensor fails. The AGPU cannot be restarted until problem is corrected.

b. Emergency Shutdown. See paragraph 2-13.b for emergency engine shutdown.

c. Fuel. Diesel fuel MIL-G-5572 or VV-F-800 may be used for emergency fuel. Do not use for more than 25 hours engine operation. After using diesel fuel for 25 hours the following inspection will be accomplished:

(1) Inspect the combustor can for caking or buildup of carbon. Clean with glass beads or suitable abrasive.

(2) Remove and inspect the fuel nozzle. If caked or heavily carbonized it should be replaced.

(3) Both fuel filters (cart and engine) must be replaced.

(4) The cart and engine fuel system must be purged by opening the fuel input line to the combuster. Turn on A.C. power switch. Put selector switch to start, motor engine over until a minimum of 2 quarts of fuel is Collected from the fuel system output. Do not exceed starter crank time.

d. Fire.

(1) If fire starts inside AGPU, immediately set control panel MASTER SWITCH to OFF (or press red EMERG STOP pushbutton switch on front of AGPU).

(2) Do not immediately open engine access door. Insert nozzle of fire extinguisher through round ENGINE PRE HEAT ACCESS door (in center of engine access door) and operate fire extinguisher.

(3) Once fire is extinguished, open battery access door and disconnect battery connector.

(4) Open all access doors and use fire extinguisher on hot spots if required.

2-17. OPERATION IN EXTREME HEAT.

a. General. Continuous operation of the AGPU may cause the engine exhaust gas temperature (EGT) to reach upper limit, thereby shuting down engine. The generator may also overheat, shuting down output. Avoid continuous use whenever possible. Be alert for overheating, and shutdown the AGPU for a cooling-off period whenever necessary and the tactical situation permits.

b. Battery. In hot weather, check level of electrolyte in cells daily and replenish with pure distilled water. The electrolyte should be 3/8 inch above the battery plates. If distilled water is not available, rain or drinking water may be used in an emergency. Use of water with a high mineral content will damage the battery, causing premature failure.

c. Lubrication. Lubricate the AGPU in accordance with the current lubrication order.

d. Fuel System. Do not fill tank to capacity when fueling. Allow sufficient room for expansion of fuel. Ensure that fuel is clean, and not contaminated with water. Any water that forms in the fuel tank will be carried to the auxiliary fuel filter. It may be necessary to drain the auxiliary fuel filter more frequently than under normal conditions. Open fuel tank drain, and drain out a small amount of fuel into a container. Check for water in fuel. If water is present, continue draining until fuel is clean.

e. Body and Chassis. Paint pitting and blistering will occur in hot climates. Protect all exposed exterior painted .surfaces from deterioration by touchup painting. Electrical cables should not be continuously exposed to direct sunlight and heat.

2-18. OPERATION IN EXTREME COLD (Below 0 degrees F) (-18 degrees C).

a. General. Extreme cold will cause lubricants to thicken or congeal; freeze batteries or prevent them from furnishing sufficient current for cold-weather starting; crack insulation and cause electrical short circuits; prevent fuel from vaporizing and properly combining with air to form a combustible mixture for starting. Extreme cold will also cause the various materials or components to become hard, brittle, and easily damaged or broken. The operator must always be on the alert for indication of the effects of cold weather on the AGPU. The operator must be very cautious when starting, towing or operating the AGPU after a shutdown for extended periods of time. Congealed lubricants may cause failure of parts. Tires may be frozen to the ground or frozen in the shape of a flat spot while under-inflated. Brakeshoes may be frozen fast. Each condition must be taken into account by the operator in order to prevent damage to the AGPU.

b. Parking. When halted for short shutdown periods, park the AGPU in a sheltered spot out of the wind if possible. For long shutdown periods, if high, dry ground is not available, prepare a footing of planks. Chock in place if necessary. Also, under extreme cold conditions, below -25°F (-32°C), exercise care to park the vehicle on a level surface to relieve distortion or body twist. For overnight or extended parking in temperatures at -5O°F (-46°C) or lower, overinflate tires to 45 psig to reduce flat spots. Reduce pressure to normal (28 psig) before moving AGPU.

c. Lubrication. Lubricate the AGPU in accordance with the current lubrication order. It is not necessary to drain engine oil (subzero) as it will remain fluid even though unheated.

d. Battery. Ensure that battery is fully charged at all times. The battery should be removed and stored in a warm place if AGPU is not going to be used for several days.

e. Electrical System. Before starting the engine, ensure that electrical components are free of ice and snow. Do not disturb the wiring since it becomes brittle with extreme cold.

f. Exhaust System. Ensure that exhaust flapper is not frozen shut before attempting to start engine.

CAUTION

If AGPU must be started/run with iced air cleaner inlet, open GTE access door until ice melts from air cleaner inlet. This allows air duct bypass door to draw outside air into engine. Failure to do this will cause excessive heat buildup in AGPU interior (exhaust gases will be recirculated).

g. Air Intake System. Ensure that air intake louvered cover and air cleaner are not obstructed with ice or snow.

h. Fuel System. Keep the fuel tank as full as possible at all times to prevent condensation. Use JP-4 for temperatures below -40°F (-40°C).

i. System Preheat. The prolonged storage of the AGPU under extreme cold conditions, below -25°F (-32°C), may require preheating the system prior to operation. This can be accomplished by moving the AGPU to a warm building, or using a heating unit with hose inserted through the engine PRE HEAT ACCESS door. The deicing air system from another AGPU can also be used for preheating.

2-19. OPERATION UNDER RAINY OR HUMID CONDITIONS. Start engine daily and operate for 30 minutes to dry out systems. Keep the fuel tank full to prevent the forming of condensation. Check fuel for water daily by draining off a. small amount of fuel into a container. If water is present, continue draining until fuel is clean.

2-20. OPERATION IN DUSTY AND SANDY AREAS.

a. Protection. Keep all doors closed, and covers installed. Keep the unit as clean as possible, paying special attention to air cleaner, controls, and moveable parts.

b. Lubrication. In dusty or sandy areas, filters and strainers must be serviced more frequently than under normal conditions. Change engine oil and filter more frequently in dusty areas. Clean all lubrication points carefully before and after lubrication. Be sure that all lubricant containers *are* tightly sealed and stored in an area as free as possible from dust and sand.

c. Fuel System. Take all necessary precautions to keep dirt and grit out of the fuel tank. Fuel filters should be serviced more frequently.

2-21. OPERATION IN SALT WATER AREAS.

a. General. Salt water causes corrosive action on metal. Care must be taken to avoid contact with salt water. If the unit is exposed to salt water or spray, wash the unit thoroughly with clean, fresh water.

b. Protection. Keep unit clean, and free from dirt and grease that can trap salt water. If possible, wash unit down with fresh water weekly.

2-22. OPERATION AT HIGH ALTITUDES.

a. The AGPU is designed to operate at elevations up to 10,000 feet (3048 meters) above sea level.

b. Above 10,000 feet (3048 meters) the AGPU output power output will be reduced . Additionally, the engine exhaust gas temperature (EGT) will be higher. Automatic shutdown of engine may occur under heavy loads. Keep air cleaner serviced.

2-23. OPERATION UNDER SNOWY CONDITIONS.

a. General. Procedures for operation under snowy conditions are very similar to procedures required to operate in extreme cold. Prior to starting the engine, clear snow accumulation from the exhaust ejector flap. When operating the AGPU in snow, make certain that the chassis remains clear of snow and ice. Keep doors and panels free of snow and ice to allow the free flow of air to the unit.

b. After-operation Procedures. Remove accumulations of ice and snow from under the AGPU. Specific attention should be given to the following areas: wheels, axles, steering knuckles and arms, clutch lever, brake cable and lever, and air intake louvered panel.

CHAPTER 3
OPERATOR/CREW MAINTENANCE INSTRUCTIONS

SECTION I. CONSUMABLE OPERATING AND MAINTENANCE SUPPLIES

3-1. CONSUMABLE SUPPLIES. Table 3-1 lists all consumable supplies and the required quantities necessary for operating and maintaining the AGPU.

Table 3-1. Consumable Operating and Maintenance Supplies.

Component Application	National Stock Number	Description	Qty Req. for Initial Operation	Qty. Req. for 8 Hours Operation	Notes
Tank, Fuel	9130-00-256-8613 9130-00-273-2379 9130-01-031-5816	Fuel JP-4, JP-5, MIL-T-5624 or JP-8, MIL-T-83133	65 Gal. (246 liters)	144 Gal. (545 liters)	
Engine, Gearcase	9150-00-985-7099 9150-00-782-2627	Oil, Lubricating, LGT, MIL-L-23699 or MIL-L-7808	2.3 Qt. (2.2 liters)		
Reservoir, Hydraulic	9150-00-149-7431 9150-00-252-6383	Fluid, Hydraulic, OHA, MIL-H-83282 or MIL-H-5606	9 Gal (34 liters)	As Required	
Vent Dryer, Hydraulic Reservoir	6850-00-680-2233	Desiccant, Silica Gel, Self Indicating, Blue, MIL-D-3716	Approx. 1 Qt. (0.9 liter)		
Battery, Lead-Acid	6810-00-249-9354	Electrolyte			
Generator	9150-01-117-2928	Grease, Lithium Base, High Temp DOD-G-24508	As Required		
Differential, Rear Axle		Lube Oil, Gear, Multipurpose, GO, MIL-L-2105	2.5 pints (1.2 liters) or until overflow		
Chaincase		Lube Oil, Gear, Multipurpose, GO, MIL-L-2105	2.5 pints (1.2 liters) or until overflow		
Wheel Bearings	9150-00-149-1593	Grease, Ball, and Roller Bearings DOD-G-24508	As Required		
Chassis	9150-00-065-0029	Grease, Automotive and Artillery, GAA, MIL-G-10924	As Required		
Hinges, Latches, and Linkages		Oil, Lubricating MIL-L-2104	As Required		

Table 3-1. Consumable Operating and Maintenance Supplies. — Continued

Component Application	National Stock Number	Description	Qty Req. for Initial Operation	Qty. Req. for 8 Hours Operation	Notes
Fuel Solenoid and Starter Bolts		Anti-seize compound, MIL-L-25681 (Liquid-Moly NV)	As Required		
Igniter Plug and Combustor bolts		High Temperature Compound, MIL-A-907 (Fel-Pro C5-A)	As Required		
Fuel Sensors		RTV Red Gasket Marker (Permatex 26B)	As Required		
Engine		Lockwire MS20995C20	As Required		
General Cleaning	6850-01-474-2317	Degreasing Solvent MIL-PRF-680	As Required		

SECTION II. LUBRICATION INSTRUCTIONS

3-2. GENERAL. To prevent excessive wear and ensure continued operation, lubrication of certain moving parts on the AGPU is required. This Lubrication Order reproduced in this section shows the areas of the AGPU which require lubrication, the proper lubricant to be used, and the frequency of lubrication.

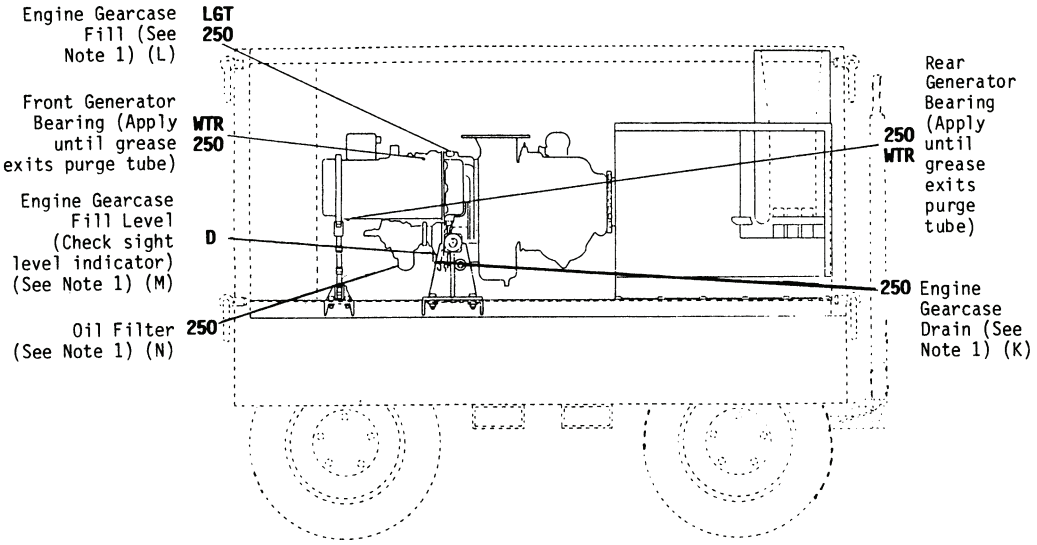
3-3. LUBRICATION.

a. Hard time intervals and the related man-hour times are based on normal operation. The man-hour time specified is that time you need to do all the services prescribed for a particular interval. Change the interval if your lubricants are contaminated or if you are operating the equipment under adverse operating conditions, including longer-than-usual operating hours. The interval may be extended during periods of low activity. If extended, adequate preservation precautions must be taken.

b. Oil changes shall be determined by hard-time intervals.

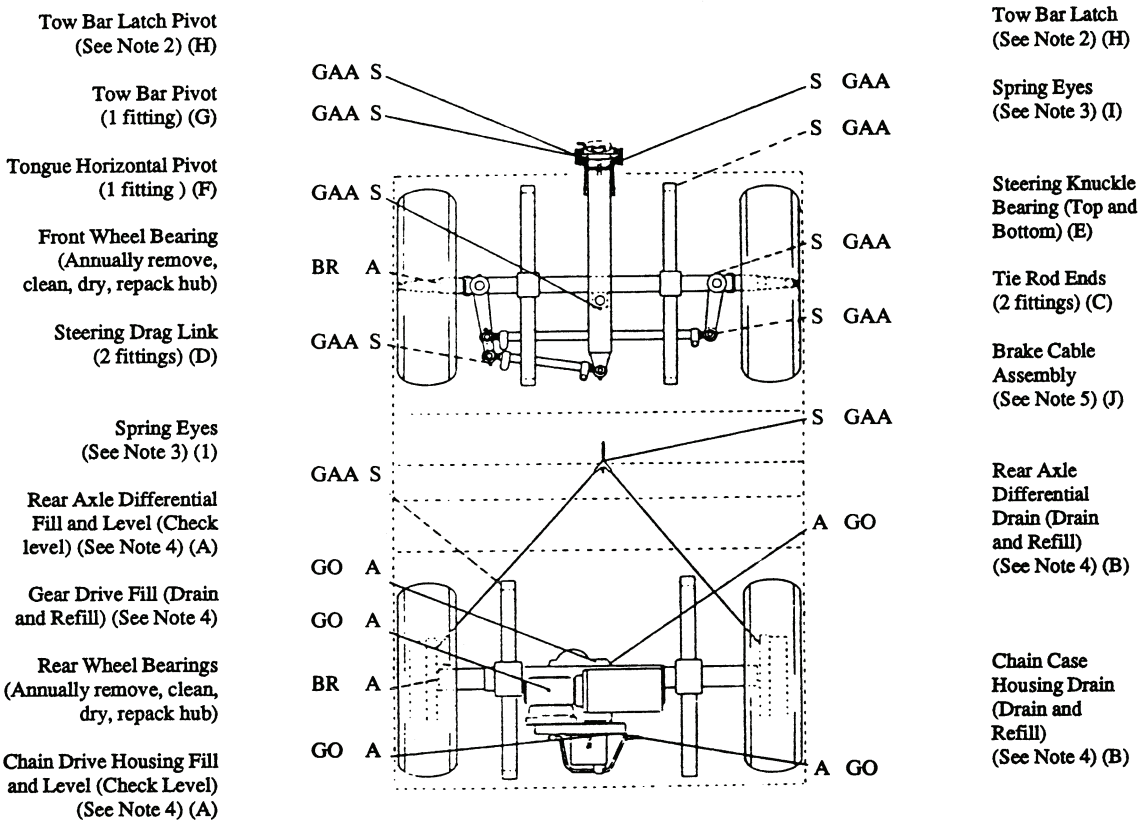
c. Engine oil and filter change, and generator lubrication shall be determined by hard-time intervals.

d. Clean fittings before lubricating. Lubricate points indicated by dotted arrow shaft on both sides of equipment. Clean parts with degreasing solvent, MIL-PRF-680. Dry before lubricating. Drain gearcases when HOT. Fill and check level. The lowest level of maintenance authorized to lubricate a point is indicated by one of the following (C) Operator/Crew or (O) Organizational Maintenance.



TOTAL MAN-HOURS	
INTERVAL	MAN-HOURS
D	0.1
S	1.5
A	6.0
250	1.5

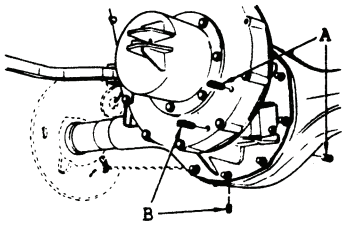
Figure 3-1. Lubrication. (Sheet 1 of 3)



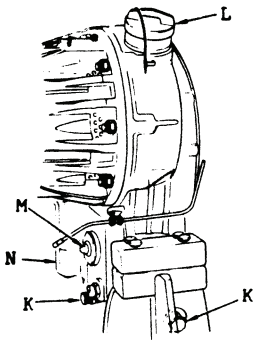
NOTES

1. ENGINE GEARCASE AND OIL FILTER. Drain gearcase and replace oil filter semiannually or every 250 engine operating hours, whichever occurs first. Drain only when hot after operation. Inspect magnetic drain plug and oil filter for metal particles. The presence of metal particles may indicate internal engine damage. Refill with MIL-L-23699 to full mark on gearcase fill level indicator (2.3 qts). Run engine for 15 minutes and recheck oil level.
2. TOW BAR LATCH. Semiannualy lubricate tow bar latch lever bearing surfaces sparingly with OE/HDO. Coat latching surfaces with a thin coat of GAA.
3. SPRING EYES. Semiannually lubricate spring eyes with OE/HDO.
4. DRIVE GEARCASES. Drain gearcases annually. Drain only when unit is warm after operation. Check level at axle differential. Level should be within 1/2 inch of plug opening when cold, and at plug level when at operating temperature.
5. BRAKE CABLE ASSEMBLY. Semiannually lubricate brake cable connection points with a thin coat of GAA. Lubricate brake lever bearing surfaces with OE/HDO.
6. OIL CAN POINTS. Semiannually lubricate all hinges, latches, and clutch and brake linkages with OE/HDO.
7. CLUTCH PUSH ROD. Semiannually lubricate. Remove hinge pin and quick release pin from the square rod clutch level. Move lever away and pull out the push rod until the rubber seal shows. Wipe clean. Coat push rod lightly with Dow Corning, FSCM 71984 Molykote G-RAPID Spray. Reassemble. Replace cotter pin.
8. HYDRAULIC SYSTEM. Semiannually drain and re-fill hydraulic reservoir and change both high and low pressure filters with new type filters 3 and 5 micron. Refill system with MIL-H-83232.

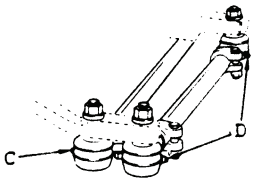
Figure 3-1. Lubrication. (Sheet 2 of 3)



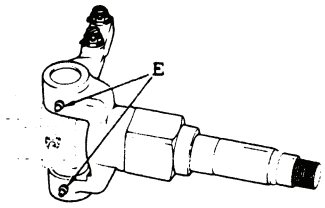
REAR AXLE CASES



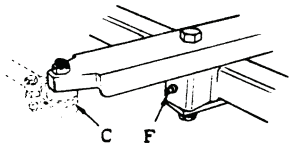
ENGINE



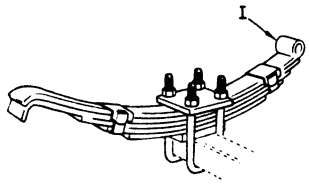
TIE RODS



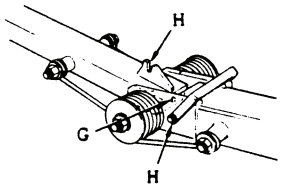
STEERING KNUCKLE



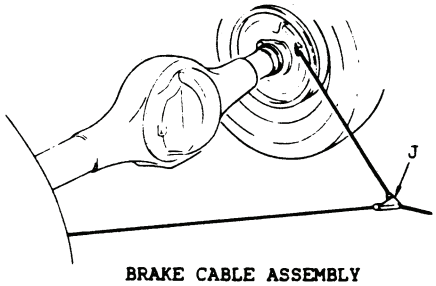
TONGUE HORIZONTAL PIVOT



SPRING EYE



TOW BAR LATCH



BRAKE CABLE ASSEMBLY

FIGURE 3-1 (SHEET 3 OF 4)

Figure 3-1. Lubrication. (Sheet 3 of 3)

LUBRICANTS		CAPACITIES	EXPECTED TEMPERATURES			INTERVALS
			Above +32°F (Above 0°C)	40°F to -10°F (+4°C to -23°C)	0°F to -65°F (-18°C to -54°C)	
MIL-H-83232	HYDRAULIC system	10 Gal	MIL-H-83232			50 Hours
LGT (MIL-L-23699) or MIL-L-7808)	LUBRICATING Oil, Engine					250 Hours (See Note)
	Engine Gearcase	2.3 qts. (2.2L)	MIL-L-23699 MIL-L-7808	MIL-L-23699 MIL-L-7808	MIL-L-7808	
GL/GOS (MIL-L-2105) (MIL-L-10324)	LUBRICANT, Gear Universal					
	Gear Drive	2 pints (1.1 L)	GO 80/90	GO 75	Gos (Conoco DN-600)	A - Annually
	Rear Axle Differential	2.5 pints (1.2 L)	GO 80/90	GO 75	Gos (Conoco DN-600)	
	Chain Drive Housing	2.5 pints (1.2 L)	GO 80/90	GO 75	Gos (Conoco DN-600)	
GAA (MIL-G-10924)	GREASE Lube, Auto-motive and Artillery					
	Propulsion System General Lubrication	As Required	ALL TEMPERATURES			S - Semi-annually
OE/HDO (MIL-L-2104)	Oil, Lubricating, Chassis					
	Hinges, Latches, Levers, & Linkages	As Required	ALL TEMPERATURES			S - Semi-Annually
DOD-G-24508	GREASE, Lithium Base, High Temp					
	Generator Spline	As Required	ALL TEMPERATURES			250 Hours (See Note)
MIL-G-81322	Generator Bearings	As Required	ALL TEMPERATURES			250 Hours (See Note)

NOTES:

1. Hours based upon engine Running Time Meter reading
2. For arctic operating refer to FM 9-207

SECTION III. PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS)

3-4. GENERAL.

a. To ensure that the AGPU is ready for operation at all times, it must be inspected systematically so defects may be discovered and corrected before they result in serious damage or failure. The necessary preventive maintenance checks and services that are to be performed by Operator/Crew personnel are listed and described in table 3-2.

b. Defects discovered during operation will be noted for future correction, and reported to maintenance supervisor. Stop operation immediately if a deficiency is noted which would damage the equipment. All deficiencies and short-comings will be recorded together with the corrective actions taken on the applicable form. Air Force users shall refer to the applicable inspection manuals and work card sets in the TO 35C2–3 series for periodic requirements and table 3-2 for detailed procedures. Marine Corps users should refer to current issue of TM 11275-15/1.

3-5. (A, N, MC) PREVENTIVE MAINTENANCE CHECKS AND SERVICES. Before (B), During (D), and After (A), Preventive Maintenance Checks and Services. Table 3-2 contains a tabulated listing of PMCS thath shall be performed by the Operator/Crew.

For reporting the overall capability of the AGPU system, use the following symbols. (FMC) Fully Mission Capable, (NMC) Non-Mission Capable, (NMCS) Non-Mission Capable Supply, (NMCM) Non-Mission Capable Maintenance and (PMC) Partially Mission Capable, this symbol will be used if one or more of the sub-systems are NMC.

Table 3-2. PREVENTIVE MAINTENANCE CHECKS AND SERVICES.

Internal	B- Before Operation D- During Operation A- After Operation	* Perform if hydraulic system was not used for two weeks or contamination is suspected.
	Daily – 8 Hours	Total M/H: 1.2

Operator			Items to be Inspected Inspection Procedures	Equipment Will Be Reported Not Ready/Available if:
B	D	A		
1			**AGPU** Make sure AGPU is free of tools, equipment, and fluid leaks (fuel, engine oil, and hydraulic fluid), dirt and corrosion. Clean as required. Check that parking brake is set (lowered). Check that clutch lever is disengaged and quick-release pin is installed.	
2			**EXHAUST** Make sure area above exhaust flapper is clear of obstructions that may be ignited or damaged by extremely hot exhaust gases. Check exhaust flapper for proper operation.	Exhaust leaks or missing or broken parts, loose or missing insulation and tape.
3			**GROUNDING** Inspect ground stud for secure mounting. Check that AGPU is properly grounded.	Ground stud missing.
4			**FRAME AND HOUSING** a. Inspect frame, covers, and panels for dents, cracks, punctures, corrosion, and security. b. Check that four lifting eyes are in place and not damaged. c. Inspect access doors for damage, and ensure that latches and hinges operate properly.	Any internal panel, or top cover missing, or damaged.
5			**CONTROL PANEL** a. Inspect switches, circuit breakers, and indicators for missing parts, damage, or corrosion. b. Inspect meters and gages for cracked glass or signs of corrosion.	Missing or broken circuit breakers, switches, and gages.
6			**BATTERY** a. Inspect battery compartment, battery, battery holddown and guide for damage or corrosion. Check that vent drain tubes are in place, and holddowns are tight. b. Ensure that battery cables and connectors are checked per paragraph 3-8. c. Check that battery charger selector switch on lower tray in electrical compartment is set to proper position (See table 2-4).	Batteries that will not hold a charge, leaking fluid, or hold downs missing. Connectors missing or loose. Switch will not turn or knob is missing.

Table 3-2. PREVENTIVE MAINTENANCE CHECKS AND SERVICES. — Continued

Internal	B- Before Operation D- During Operation A- After Operation	* Perform if hydraulic system was not used for two weeks or contamination is suspected.
	Daily – 8 Hours	Total M/H: 1.2

Operator			Items to be Inspected Inspection Procedures	Equipment Will Be Reported Not Ready/Available if:
B	D	A		
7			**ENGINE COMPARTMENT**	
			a. Check for proper lubricating oil level, add as required (refer to para 3-3)	Oil level cannot be seen in 3/4 of sight glass view of GTE.
			b. Inspect interior of engine compartment for damage, signs of fuel or oil leaks, dirt, and corrosion. Clean as required.	Signs of oil, fuel leakage more than a class I.
			c. Inspect air intake duct assembly for punctures, corrosion, and loose mounting screws. Check operation of spring-loaded bypass door by pushing in on door.	Damaged or missing mounting springs on bypass door.
			d. Check that drain tubes are connected to engine drain valves, fuel control unit, and hydraulic pump.	Any signs of fuel leakage, or loose mounting hardware.
			e. Check that bolts on engine mounts are secure, and lockwired. Check that bolts on generator support are secure and lockwired.	Bolts or hardware missing or loose.
			f. Inspect hourmeter for damage, and security of installation.	Hour meter missing.
			g. Inspect starter assembly to ensure power cables are secure.	Loose or missing mounting hardware or cables.
			h. Inspect hydraulic hoses for cuts and splits, inspect fittings for damage and freedom of dirt and corrosion.	Loose or leaking lines or fittings.
			i. Inspect hydraulic pump for security, damage, leaks, or loose fittings	Missing or loose mounting hardware.
8			**HYDRAULIC MODULE**	
			a. Check that hydraulic reservoir is at least 3/4 full.	Less than 3/4 full.
			b. Inspect hydraulic control panel switches and indicators for missing or loose parts, or corrosion.	Loose or missing controls, leaking fluid from controls.
			c. Inspect reservoir gauge and thermometer, and pressure gauge for leaks or cracked glass.	Pressure gage inoperative.
			d. Remove protective caps and inspect hydraulic fittings for gouges, cracks, and corrosion.	
			e. Inspect hydraulic filter housing assembly, filter head indicator, and wiring for cracks, damage or leaks.	Fluid leaks, broken, or frayed wiring.
			f. Inspect vent dryer desiccant for blue indication. If less than 25% blue, notify maintenance supervisor.	
	*8.1	*8.1	g. AGPU Hydraulic System recommended self-filtering and purging operation. Ref. para. 3-10.	White or milky fluid.

Table 3-2. PREVENTIVE MAINTENANCE CHECKS AND SERVICES. — Continued

Internal	B- Before Operation D- During Operation A- After Operation	* Perform if hydraulic system was not used for two weeks or contamination is suspected.
	Daily – 8 Hours	Total M/H: 1.2

Operator			Items to be Inspected Inspection Procedures	Equipment Will Be Reported Not Ready/Available if:
B	D	A		
			HYDRAULIC MODULE (Continued)	
*8.2		*8.2	h. When it is suspected that the AGPU has serviced a contaminated aircraft hydraulic system. Ref. para. 3-10.	White or milky fluid, burned smell, or low reservoir.
		*8.3	i. Check to see that all hose connectors are protected with metal dust caps or environmental plugs	
		*8.4	j. Check reservoir vent tube and plug to insure the reservoir is sealed.	
9			**AC AND DC POWER CABLES**	
			Inspect cables for damage to insulation, and inspect electrical connectors for damage and freedom from dirt and corrosion.	Open cuts that expose wires or damaged connectors.
10			**PNEUMATIC HOSE**	
			Check that hose clamp on AGPU is secure, inspect hose for split or cuts, inspect connector fitting for damage and freedom from dirt and corrosion.	Damaged or broken clamps. Splits or cuts in internal hose.
11			**PROPULSION SYSTEM**	
			a. Inspect front axle assembly for bent or broken components, loose or missing components, and leakage of lubricant.	Leaf springs broken or missing. Class II leakage of oil.
			b. Inspect tires and wheel for condition (excessive wear, cuts, or foreign objects). Inspect wheels for missing lug nuts.	Flat tire on one or more wheels.
			c. Inspect tow bar speed/direction control assembly for damage and loose or missing components, and dented housing.	
			d. Inspect brake cable assembly for broken strands, missing or loose fasteners, and improper operation.	Broken cable or missing fasteners.
			e. Inspect rear axle assembly for cracked or dented housing; bent, missing or broken components; loose or missing fasteners; broken or missing lubrication fittings; and lubricant leaks.	Rear axle broken or cracked.
			f. Inspect springs for bent or broken spring leaves, and missing or loose components.	Broken Springs or loose components.
			g. Inspect traction motor for housing damage; lose or missing fasteners, broken or loose terminals; loose or missing brush covers and corrosion or contamination.	
			h. Inspect clutch assembly for bent or cracked main housing, bent or broken components, and loose or missing components.	

Table 3-2. PREVENTIVE MAINTENANCE CHECKS AND SERVICES. — Continued

Internal	B- Before Operation D- During Operation A- After Operation	* Perform if hydraulic system was not used for two weeks or contamination is suspected.
	Daily – 8 Hours	Total M/H: 1.2

Operator			Items to be Inspected Inspection Procedures	Equipment Will Be Reported Not Ready/Available if:
B	D	A		
			j. **PROPULSION SYSTEM (Continued)**	
			i. Inspect gear drive assembly for dented or cracked housing, and lubricant leaks.	
			Inspect electric brake housing for damage; damage or distortion of strain relief connector and missing or lose fasteners. Prepare AGPU propulsion system for operation in the Alternate Propulsion Mode and check electric brake for operation.	If electric brake is Inoperatable , discontinue use of propulsion system.
12			**ELECTRICAL CHECKS**	
			Set control panel MASTER switch to ON, and perform following checks:	
			a. Check that BATTERY VOLTAGE meter indicates in green band.	If meter indicates in red band.
			b. Push PRESS TO TEST pushbutton and check that all indicator lights on control panel illuminate.	Any light that does not Illuminate.
			c. Check reading on FUEL gauge, add fuel as required.	Fuel level must be full before Hydraulic system operation.
			d. On hydraulic control panel, push PRESS TO TEST LIGHTS and check that all indicator lights illuminate.	Any light that does not Illuminate.
			e. Set MASTER SWITCH to off.	
13			**MONITOR CONTROL PANEL METERS/INDICATORS**	
			a. Check hydraulic pressure on hydraulic control panel pressure gauge immediately after engine start. Shut down engine if pressure reading is less than 500 psig.	If less than 450 to 500 PSIG stop operation.
			b. EGT meter reads in yellow band. Action – Remove or reduce load As Required.	If EGT stays in yellow band or exceeds 125°F.
			c. LOW FUEL indicator illuminated. Action - Shutdown and refuel unless operations can be completed in 30 minutes.	
			d. INLET FILTER BLOCKED indicator illuminated. Action – Shutdown and determine cause of problem, check air intake louvered panel for obstructions.	If light continues to stay illuminated.
			e. COMPT/GEN HI TEMP indicator illuminated. Action – Remove or reduce load	If light continues to stay illuminated.
			f. Fault indicator illuminated. Action – If automatic shutdown occurs, record lamp indication prior to setting MASTER SWITCH to OFF.	If light continues to stay illuminated.

Table 3-2. PREVENTIVE MAINTENANCE CHECKS AND SERVICES. — Continued

Internal	B- Before Operation D- During Operation A- After Operation	* Perform if hydraulic system was not used for two weeks or contamination is suspected.
	Daily – 8 Hours	Total M/H: 1.2

Operator			Items to be Inspected Inspection Procedures	Equipment Will Be Reported Not Ready/Available if:
B	D	A		
			MONITOR CONTROL PANEL METERS/INDICATORS (Continued)	
			g. Hydraulic control panel red HI TEMP indicator illuminated. Action – Remove or reduce hydraulic load.	If light continues to stay illuminated.
		14	After hydraulic operations are complete, reduce pressure to approximately 500 psig by holding panel switch to DECREASE.	If pressure will not reduce.
		15	After shutdown, open hydraulic HIGH PRESSURE BYPASS valve to release pressure	If pressure will not reduce.
		16	Store hydraulic hoses on rack on back of engine access door, Wipe hoses clean, and install protective caps prior to storage.	
		17	Store AC and DC power cables in storage bins. Wipe cables clean prior to storage.	
		18	Carefully store pneumatic hose in storage bin. Check, that butterfly shutter inside fitting is clean and closed.	
		19	Fill fuel tank to prevent water condensation.	
		20	Check engine for proper lubricating oil level, add as required. Refer to para 3-3.	
		21	Check hydraulic reservoir fluid level (3/4 or more full), add hydraulic fluid as required. Refer to para 3-9.	

3-6. INTRODUCTORY INFORMATION.

a. This section contains troubleshooting information for locating and correcting operating troubles which may develop in the AGPU. Each malfunction for an individual component unit, or system is followed by a list of tests or inspections which will help you to determine probable causes and corrective action to take. You should perform the test/inspections and corrective actions in the order listed.

b. This manual cannot list all malfunctions that may occur, nor all tests or inspections and corrective actions. If a malfunction is not listed or cannot be corrected by listed corrective action, notify maintenance supervisor.

Table 3-3. Operator/Crew Troubleshooting.

NOTE

Before you use this table, be sure you have performed the Pre-start Procedure in paragraph 2-3.a, and the before (B) PMCS steps in table 3-2.

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION
1. ENGINE FAILS TO MOTOR (CRANK) WHEN ENGINE CONTROL SWITCH IS SET TO START/RUN.
Step 1. Check to see if green STARTER ON light is illuminated. If light is illuminated, check starter for secure electrical connections. If light is not illuminated, check battery and cables (paragraph 3–8).
Step 2. Check GTE indicators. If CONTROL SHORT, HIGH EGT, or HI OIL TEMP are red indicating malfunction in control circuits, notify maintenance supervisor.
2. ENGINE MOTORS (CRANKS) TO APPROXIMATELY 10% THEN SHUTS DOWN.
Check GTE CONTROL SHORT indicator. If red, notify your supervisor. If not red, attempt restart. If not successful, notify maintenance supervisor.

Table 3-3. Operator/Crew Troubleshooting (continued)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION
3. ENGINE MOTORS ABOVE l0%, BUT NO LIGHT OFF.
a. Check position of four-way valve control handle. Ensure set to INTL or EXT as required.
b. Attempt restart. If not successful, notify maintenance supervisor.
4. ENGINE HANGS DURING START - LOWER THAN NORMAL EGT.
Check for amber LOW FUEL or red LOW FUEL PRESS indicator.
a. If LOW FUEL PRESS indicator is red (longer than 10 seconds) indicates low fuel supply, or dirty filter/lines. Check fuel supply.
b. Add fuel if required, and attempt restart. If not successful, notify maintenance supervisor.
5. ENGINE ACCELERATES TO 95%, THEN SHUTS DOWN IN 10 SECONDS.
Step 1. Check for red LOW OIL PRESS indicator.
Step 2. Check engine/gearcase oil level.
Add oil if required (refer to L.O.), and attempt restart, If not successful, notify maintenance supervisor.
6. ENGINE AT 100% WITH PNEUMATIC LOAD, LOW PNEUMATIC FLOW, HIGH EGT.
Check pneumatic hoses for secure installation, cuts, or tears.
If hose is loose or damaged, notify maintenance supervisor.
7. LOW OIL PRESS LIGHT BLINKING DURING NORMAL OPERATION.
Check engine/gearcase oil level.
Add oil if required (refer to L.O.). If symptom continues, shutdown engine, notify maintenance supervisor.
8. AUTOMATIC ENGINE SHUTDOWN DURING NORMAL OPERATION.
Check and record all illuminated indicators on control panel before setting MASTER SWITCH to OFF.
Notify maintenance supervisor.

Table 3-3. Operator/Crew Troubleshooting (continued)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION
9. INLET FILTER BLOCKED INDICATOR ILLUMINATES.
Check for obstruction or blockage on air intake louvered panel, and/or air cleaner.
Remove obstruction or blockage.
ELECTRICAL
10. AC OR DC OVER CURRENT, AC UNDER VOLTAGE, OR DC VOLTAGE FAULT INDICATOR ILLUMINATES.
Check for proper setting on CURRENT LIMIT SELECTOR switch.
Set switch to proper range, if this does not correct problem, notify maintenance supervisor.
PNEUMATIC
11. PNEUMATIC PRESSURE LOW.
Step 1. Check pneumatic hose for cuts, tears, or obstructions, and check hose end coupler for proper operation of shutter.
Step 2. Check aircraft pneumatic system obstruction.
Notify maintenance supervisor.
HYDRAULIC
NOTE
Steps 12 through 21 not applicable if hydraulic spacer is installed.
12. 500 PSIG HYDRAULIC PRESSURE NOT DEVELOPED AFTER ENGINE START.
Step 1. Shut down engine.
Step 2. Check that hydraulic reservoir is 3/4 full of fluid.
Step 3. RESERVOIR selector not set to AGPU.
Reposition selector valve.

Table 3-3. Operator/Crew Troubleshooting (continued)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION
13. OUTPUT PRESSURE GAUGE INDICATION ALWAYS ZERO.
GAUGE SHUTOFF valve closed.
Open valve l/4 turn.
14. HYDRAULIC ELECTRICAL POWER ON LAMP DOESN'T COME ON.
CIRCUIT BREAKER on hydraulic electrical panel tripped.
Reset CIRCUIT BREAKER.
15. TEMPERATURE AND SYSTEM READY INDICATOR LIGHTS STAY OFF.
Cold hydraulic fluid.
Perform procedure of paragraph 2-7.c.
Temperature sensor defective.
Notify supervisor.
16. OUTPUT PRESSURE INDICATION WILL NOT INCREASE.
PRESSURE RELIEF valve set too low.
Re-adjust PRESSURE RELIEF valve.
Pump or pump controls not working properly.
Notify maintenance supervisor.
17. PRESSURE RELIEF VALVE DOESN'T TURN.
Valve lock set.
Release lock.
18. PRESSURE DOES NOT RESPOND TO PRESSURE (INCREASE/DECREASE) SWITCH.
Control circuit or pump defective.
Check electrical connections. Notify maintenance supervisor.

Table 3-3. Operator/Crew Troubleshooting (continued)

MALFUNCTION TEST OR INSPECTION	CORRECTIVE ACTION
19. REPLACE FILTER INDICATOR ILLUMINATED.	
Dirty filter	Notify maintenance supervisor.
20. HOSE CONNECTIONS LOOSE.	
Worn or damaged connectors.	Replace hose, if hose connector is worn. Notify supervisor If problem is AGPU bulkhead connector.
21. HYDRAULIC FLUID FROM AIRCRAFT DRAINS INTO AGPU.	
Proper procedural sequence not being followed.	
Check valve defective.	Notify maintenance supervisor.
	PROPULSION
22. AGPU DOES NOT DRIVE IN PRIMARY OR ALTERNATE PROPULSION MODE.	
Step 1. Check clutch is engaged and quick release pin installed.	
Step 2. Check switches set to correct position.	
Step 3. Check brake lever is in the vertical position and brakes are released.	
Step 4. Check Dead-Man switch is depressed.	
Step 5. Check operation of electric brake.	
	Notify maintenance supervisor.

Section V. OPERATOR/CREW MAINTENANCE INSTRUCTIONS

3-7. GENERAL. This section contains operator/crew maintenance and servicing instructions referenced by table 3-2 or 3-3. Operator/crew maintenance is limited to servicing battery, hydraulic module reservoir, and engine gearcase (see L.O.). Call organizational maintenance for any other maintenance requirements on the AGPU.

3-8. BATTERY AND CABLES INSPECTION AND SERVICING.

WARNING

Do not attempt to service NiCad battery. Never add water or electrolyte.

WARNING

Remove all rings, watches and other jewelry when performing maintenance on battery. Wear protective gear, including goggles.

a. Disconnect battery cable terminal adapter (1, figure 3-2) from battery terminal block (7) by turning knob (15) counterclockwise.

b. Remove wing nuts (2) and washers (3) from tie-down rods (4), and remove battery cover (6). Disconnect vent tubes (8) and remove battery.

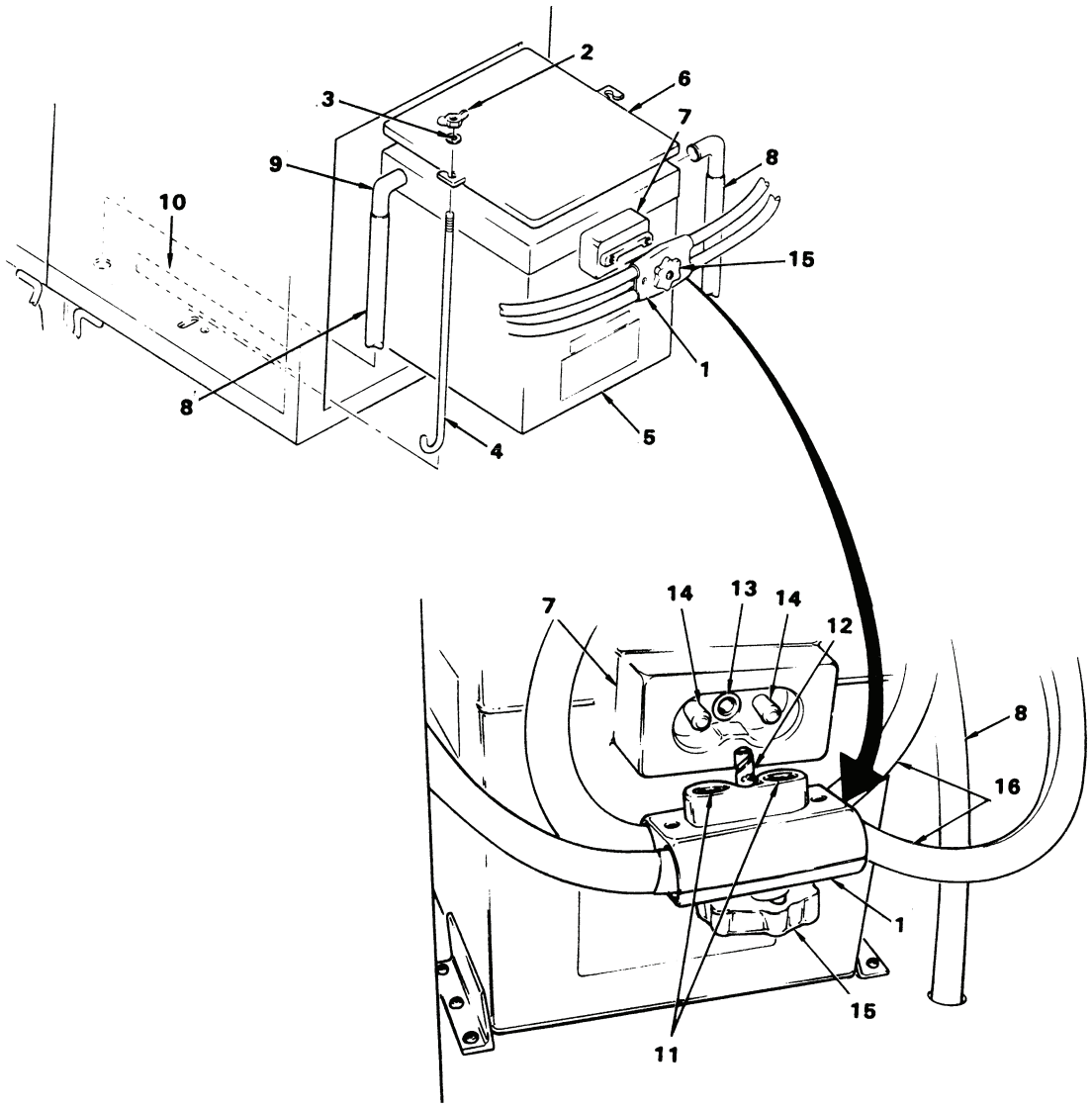


FIGURE 3-2

1. BATTERY TERMINAL ADAPTER
2. WING NUT
3. WASHER
4. TIE-DOWN ROD
5. BATTERY
6. BATTERY COVER
7. BATTERY TERMINAL BLOCK
8. VENT TUBE
9. VENT ADAPTER
10. BATTERY GUIDE
11. TERMINAL POST RECEPTACLES
12. MOUNTING SCREW
13. MOUNTING SCREW RECEPTACLE
14. TERMINAL POST
15. KNOB
16. ELECTRICAL CABLE

Figure 3-2. Battery Inspection and Servicing.

c. Inspect battery (5) for cracked or broken case.

d. Remove vent plug from each cell in top of battery and check electrolyte level. Add distilled water to each cell as necessary to bring electrolyte level to bottom of split ring. Install all vent plugs securely.

e. Inspect electrical cables (16) for damaged insulation.

f. Inspect vent tubes (8) for cracks or splits. Check for proper vent tube routing.

NOTE

Clean lead acid battery components with a baking soda and water solution.

Cleaning of Ni-Cad Battery components – use a nylon brush and a solution of mild vinegar and water.

g. Inspect terminal posts (14) and receptacles (11) for corrosion, damage, signs of burning, or excessive wear. Clean posts and receptacles.

h. Inspect mounting screw (12) on cable terminal adapter and mating receptacle (13) on terminal block for damage or corrosion. Clean screw and receptacle.

i. Install battery as follows:

(1) Set battery into battery compartment between guides (10) with battery terminal block (7) facing out. Attach vent tubes (8) to battery.

(2) Place cover (6) on battery.

(3) Secure battery cover (6) with tie-down rods (4), washers (3), and wing nuts (2). Before tightening wing nuts, check that tie-down rods are vertical.

(4) Route vent tubes (8) through holes in floor of battery compartment.

(5) Connect battery cable terminal adapter (1) to battery terminal block (7), and secure by turning knob (15) clockwise. Make sure connection is secure.

3-9. HYDRAULIC SYSTEM SERVICING.

NOTE

Air purges automatically from the reservoir while filling according to the following procedures. Air purge from hoses, tubing and hydraulic module components is performed during normal operation per paragraph 2-7.

a. Hydraulic Fluid Fill at RETURN quick disconnect.

(1) Connect reservoir serving unit (tool 18-C) to RETURN port using quick disconnect adapter (tool 19-C).

(2) Set RESERVOIR select to AGPU, RETURN BYPASS to BYPASS, and remove plug from reservoir breather vent.

(3) Pump reservoir servicing unit until reservoir is to desired level.

(4) Disconnect reservoir serving unit.

(5) Replace RETURN dust cap and reservoir breather vent plug.

(6) Wipe up any fluid spillage.

b. Hydraulic Fluid Fill at Reservoir Breather Vent.

(1) Connect reservoir servicing unit (tool 18-C) to Reservoir Breather Vent using bulkhead union (tool 20-C).

NOTE

You should hear the reservoir relief valve open. This is normal.

(2) Pump reservoir servicing unit until reservoir is to desired level.

(3) Disconnect reservoir servicing unit.

(4) Replace plug on reservoir breather vent.

(5) Wipe up any fluid spillage.

c. Hydraulic Fluid Fill Using External Fill Tube.

(1) Remove cap from reservoir breather vent at top of reservoir.

(2) Remove cap from SYSTEM DRAIN port.

(3) Remove fill extension tube from bracket inside hydraulic control panel access door.

(4) Remove protective caps from fill extension tube and attach short section of tube to the SYSTEM DRAIN port.

(5) Open RESERVOIR DRAIN valve.

(6) Using a funnel, slowly pour hydraulic fluid into extension tube until reservoir fluid level is 3/4 to 7/8 full.

(7) Close RESERVOIR DRAIN valve.

(8) Loosen the fill extension tube and swivel fill tube to the left to drain excess fluid into a container. Remove fill extension tube.

(9) Install reservoir breather vent and SYSTEM DRAIN port caps.

(10) Replace protective caps onto both ends of fill extension tube and store on inside of hydraulic control panel access door.

(11) Wipe up any fluid spillage.

d. Hydraulic Fluid Fill Using Suction Method.

CAUTION

This procedure requires that at least one inch of fluid is visible in the reservoir level gauge and that the hydraulic system is known to be operational. Attempts to fill by this method when hydraulic pump is not primed will damage the pump.

(1) Remove cap from reservoir breather vent at top of reservoir.

(2) Remove cap from SYSTEM FILL port.

(3) Remove fill extension tube from bracket inside hydraulic control panel access door.

(4) Remove protective caps from fill extension tube and attach short section of extension tube to SYSTEM FILL port. Long section of extension tube should point downward.

(5) Attach a length of hose to the downward directed section of the extension tube. This hose must reach to bottom of container (source of hydraulic fluid).

(6) Establish hydraulic module operation (without output hose connections) by performing steps of 2-7.a.(1) through (3) and 2-7.b.(2) through (18). Set pressure to between 1,800 and 2,000 psi in step 2-7.b.(18).

CAUTION

The source of hydraulic fluid must not be permitted to run dry during this procedure. This will cause pump cavitation and damage pump. The AGPU reservoir holds approximately 9 gallons, so the capacity of the fluid source must exceed that amount.

(7) Place hose from extension tube into the container holding the hydraulic fluid for reservoir filling.

(8) Open HIGH PRESSURE BLEED valve 1/4 turn. This setting is critical. Opening this valve too much will cause pump cavitation.

CAUTION

In the following steps the two operations must be performed in the sequence stated and must be performed quickly. While performing these operations watch the OUTPUT PRESSURE gauge. Read and understand the next two steps thoroughly before proceeding.

(9) Press in on PUSH TO FILL valve and hold while rapidly switching RESERVOIR selector valve from AGPU to AIRCRAFT positions. If OUTPUT PRESSURE gauge indication fluctuates excessively, immediately return the RESERVOIR selector valve to the AGPU position and then release the PUSH TO FILL valve. Then close HIGH PRESSURE BLEED valve 1/8 turn. If OUTPUT PRESSURE gauge indication is stable proceed to step (10).

(10) Hold PUSH TO FILL valve in while watching the reservoir level gauge. When the reservoir is between 3/4 and 7/8 full, set the RESERVOIR selector to AGPU and release the PUSH TO FILL valve.

(11) Remove hose from fill extension tube.

(12) Disconnect fill extension tube. Cap and store fill extension tube.

(13) Install reservoir breather vent and SYSTEM FILL port caps.

(14) Wipe up any fluid spillage.

(15) Proceed with operations or secure the hydraulic system by performing steps 2-7.b.(25) through (27).

e. Hydraulic Fluid Drain.

(1) Remove cap from breather vent at top of reservoir.

(2) Remove cap from SYSTEM DRAIN port and place container below drain port.

(3) Open RESERVOIR DRAIN valve.

(4) When reservoir fluid level gauge is empty of fluid and flow stops, replace caps on SYSTEM DRAIN port and breather vent port.

(5) Close RESERVOIR DRAIN valve.

(6) Wipe up any fluid spillage.

3-10. HYDRAULIC SYSTEM FLUSH AND INSPECTION PROCEDURES.

a. Inspection Procedures.

1. The following initial hydraulic fluid sampling procedures must be performed on all AGPUs.

(a) Inspect AGPU reservoir vent dryer to ensure 25 percent of the full canister contains some desiccant that is blue in color. If not, replace with new desiccant NSN 6650-00-680-2233 or NSN 6650-00-290-0042.

(b) Inspect AGPU accessories to ensure that the set of 30-foot pressure and return hoses, the two sets of 10-foot pressure and return adapter hoses and the dual service manifold is available and serviceable.

(c) Ensure all hydraulic hose connectors on the AGPU hydraulic control panel, the dual service manifold, and hoses are protected from contamination with a cap or plug.

(d) Remove the dual service manifold from its storage location in the AGPU engine compartment and place on a large drip pan or other clean surface about 30 feet from the AGPU hydraulic control panel.

(e) Connect hoses to dual manifold in accordance with paragraph 2-7. Inspecting each hose coupling for visible contamination and wipe clean prior to making the connection.

(f) Connect removed plugs to removed caps at each connection to prevent contamination.

(g) Insure that the BYPASS/FLUSH valve on the dual manifold is closed.

NOTE

Operation of the AGPU is to be performed only by a trained/qualified operator. Refer to instruction plate on hydraulic control panel door for important setup and shutdown procedures for the AGPU hydraulic system.

(h) Start the AGPU. Observe starting instructions on the main control panel door and on the hydraulic module panel door.

(i) Set RETURN/BYPASS lever to BYPASS, set RESERVOIR lever to AGPU.

(j) Set the AGPU hydraulic panel power switch to ON. If SYSTEM READY light (green) is not on, it maybe necessary to follow cold weather start procedures in paragraph 2-7c.

(k) Turn pressure relief valve to maximum (clockwise).

(l) Set hydraulic pressure by placing PRESSURE switch to the INCREASE position until pressure reaches 2800 PSIG as indicated on the OUTPUT PRESSURE gauge.

(m) Turn PRESSURE RELIEF valve counter clockwise until gauge pressure drops slightly and tighten lock nut.

(n) Set the PRESSURE switch to DE-CREASE until the pressure gauge reads 2500 PSIG.

(o) Set the OUTPUT switch to ON.

(p) Open BYPASS/FLUSH valve on the dual service manifold until pressure drops to 2000 PSIG.

(q) Continue operations for 30 minutes.

(r) Close BYPASS/FLUSH valve on dual manifold.

(s) Set OUTPUT switch to OFF.

(t) Set pressure switch to DECREASE until pressure reads 500 PSIG.

(u) Set POWER switch to OFF

(v) Set ENGINE CONTROL switch to STOP to shut down AGPU.

(w) Complete shut down pro-procedures and immediately take a sample of the hydraulic fluid.

NOTE

General instructions for taking proper hydraulic fluid samples is contain in TM 1-1500-204-23, Volume 2, Pneudraulics Maintenance and Procedures.

(x) Remove cap from SYSTEM DRAIN fitting.

(y) Open RESERVOIR DRAIN valve, drain line, and collect a mid stream fluid sample.

(z) Close RESERVOIR DRAIN valve completely.

(aa) Reinstall and tighten SYSTEM DRAIN fitting cap.

(bb) Place samples into sample mailer kit, NSN: 8125-01-193-3440, and send to the unit's AOAP laboratory for analysis. The data gathered from these samples will be analyzed to determine future inspections or corrective action.

2. If notified by the AOAP laboratory of a contaminated hydraulic sample, conduct a second sample using the above procedures.

3. Recurring samples may be taken from the SYSTEM DRAIN fitting without operating the AGPU.

b. Flush Aircraft Flight Control System:

(1) The AGPU must have been properly sampled and cleared for operation. Ensure the reservoir is full.

NOTE

Dual service manifold is used on both single and dual dual hydraulic systems.

(2) Flush hoses and connect AGPU to aircraft GSE connectors in accordance with paragraphs 2-7a through c, above.

(3) Locate a clean 10-gallon or larger drum.

(4) Connect a hose to drain connector on the AGPU dual service manifold drain port and place opposite end of hose in drum. (Any AGPU adapter hose can be used as the drain hose by removing the quick disconnect couplings at both ends.)

(5) Ensure bypass/flush and fill/drain valves are closed.

NOTE

Personnel are required to use the aircraft intercom communication system to maintain voice communications between the person operating the flight controls and the AGPU operator.

(6) Apply external power to the aircraft and establish voice communi-communication via intercom communication system.

(7) Apply external air to aircraft (AH-64 only).

(8) Recheck the AGPU reservoir fill level gauge on the hydraulic control panel to ensure the reservoir is full. Add fluid if necessary.

(9) Open AGPU dual hydraulic service manifold drain valve and drain aircraft reservoir.

(10) Discharge aircraft hydraulic accumulators.

(11) On the AGPU hydraulic control panel set return/bypass lever to off and make sure reservoir lever is set to AGPU.

(12) Set hydraulic power switch to on and set pressure relief valve and aircraft system pressure in accordance with Table 2-7.

(13) Set the AGPU hydraulic output switch to on.

NOTE

AGPU fluid level will decrease to between 1/2 and 1/3 full on the reservoir level gauge. Do not allow the reservoir level to decrease below 1/3 full. (5-7 gallons flushed)

CAUTION

Do not let the reservoir go empty. Extensive damage to the AGPU hydraulic will occur.

(14) While monitoring AGPU fluid level cycle flight controls (cyclic, collective, and pedals) 5 cycles each.

(15) Shut off AGPU dual manifold drain port.

(16) Cycle flight controls two additional cycles.

(17) Flush is complete.

(18) Switch AGPU hydraulic output to off. Decrease hydraulic pressure to 500 psi. Switch hydraulic power to off.

(19) While monitoring utility manifold reservoir level, move the return bypass to bypass until the proper reservoir level is reached then switch back to the off position.

(20) Shut down AGPU. Disconnect and store hoses and manifold.

CHAPTER 4
ORGANIZATIONAL MAINTENANCE

SECTION I. SERVICE UPON RECEIPT OF EQUIPMENT

4-1. INSPECTION AND SERVICING THE EQUIPMENT.

a. Inspect AGPU by performing applicable weekly (W) and monthly (M) inspection procedures in PMCS table 4-1.

b. Prepare battery for service by performing procedures in paragraph 4-25.c.

c. Check that equipment log book is in manual storage compartment next to control panel.

d. Drain lubricating oil from engine/gearcase and refill in accordance with paragraph 4-8.a. and paragraph 3-3.

e. Grease generator bearing in accordance with paragraph 3-3.

f. Perform all lubrication checks and services for chassis and running gear (front and rear axle assemblies) in accordance with paragraph 3-3.

CAUTION

Running engine with an inadequate supply of hydraulic fluid in hydraulic system may damage hydraulic pump.

g. Service hydraulic module in accordance with procedures in paragraph 3-9. If hydraulic reservoir contains fluid, drain and replenish with new fluid.

h. Check desiccant in hydraulic module vent dryer. Desiccant should be blue, if less than 25 percent blue, service vent dryer in accordance with paragraph 4-92.

i. Position AGPU so that fuel tank drain valve is at lowest position relative to tank. Use a container and open drain valve to drain any water and/or fuel from tank. Close drain valve.

j. Add fuel to fuel tank.

k. Purge fuel line to engine fuel control unit and shutdown solenoid as follows:

(1) Disconnect battery. Disconnect positive cable from starter and secure cable so accidental contact with frame or engine (ground) cannot occur. Reconnect battery.

(2) Disconnect flexible inlet fuel hose (3, figure 4-48) from fuel control unit. Direct fuel line into a suitable container.

(3) Set control panel MASTER SWITCH to ON.

(4) Momentarily set ENGINE CONTROL switch to START and then release to RUN.

NOTE

The auxiliary fuel pump on the lower right side of the AGPU will operate and pump fuel.

(5) Allow approximately 1/2 cup of fuel to be pumped into suitable container, and set ENGINE CONTROL switch and MASTER SWITCH to OFF.

(6) Reconnect flexible fuel line to fuel control unit.

(7) Disconnect stainless steel fuel line from input side of shutdown solenoid. Direct fuel line into a container. See figure 4-50 for location of shutdown solenoid (item 8).

(8) Set MASTER SWITCH to ON. Momentarily set ENGINE CONTROL switch to ON and then release to RUN.

(9) Allow approximately 1/2 cup of fuel to be pumped into a suitable container.

(10) Set ENGINE CONTROL switch and MASTER SWITCH to OFF.

(11) Reconnect fuel line to shutdown solenoid.

(12) Reconnect positive cable to starter.

4-2. INSTALLATION.

WARNING

Do not operate AGPU in an indoor location. Engine exhaust fumes contain deadly gases.

a. Location. The AGPU should be positioned in an outdoor site clear of obstacles, with a minimum of 10 feet clearance on all sides. Ensure that there are no obstacles over the exhaust ejector flap (such as tree limbs or helicopter blades). Additionally, the AGPU should be within easy assess of an approved static ground. Installation, marking, and testing of earth ground is covered in TM 1-1500-204-23-1.

b. Leveling. The AGPU is designed to operate up to 15 degrees out-of-level. Set up the AGPU as level as possible and keep it level as possible during operation.

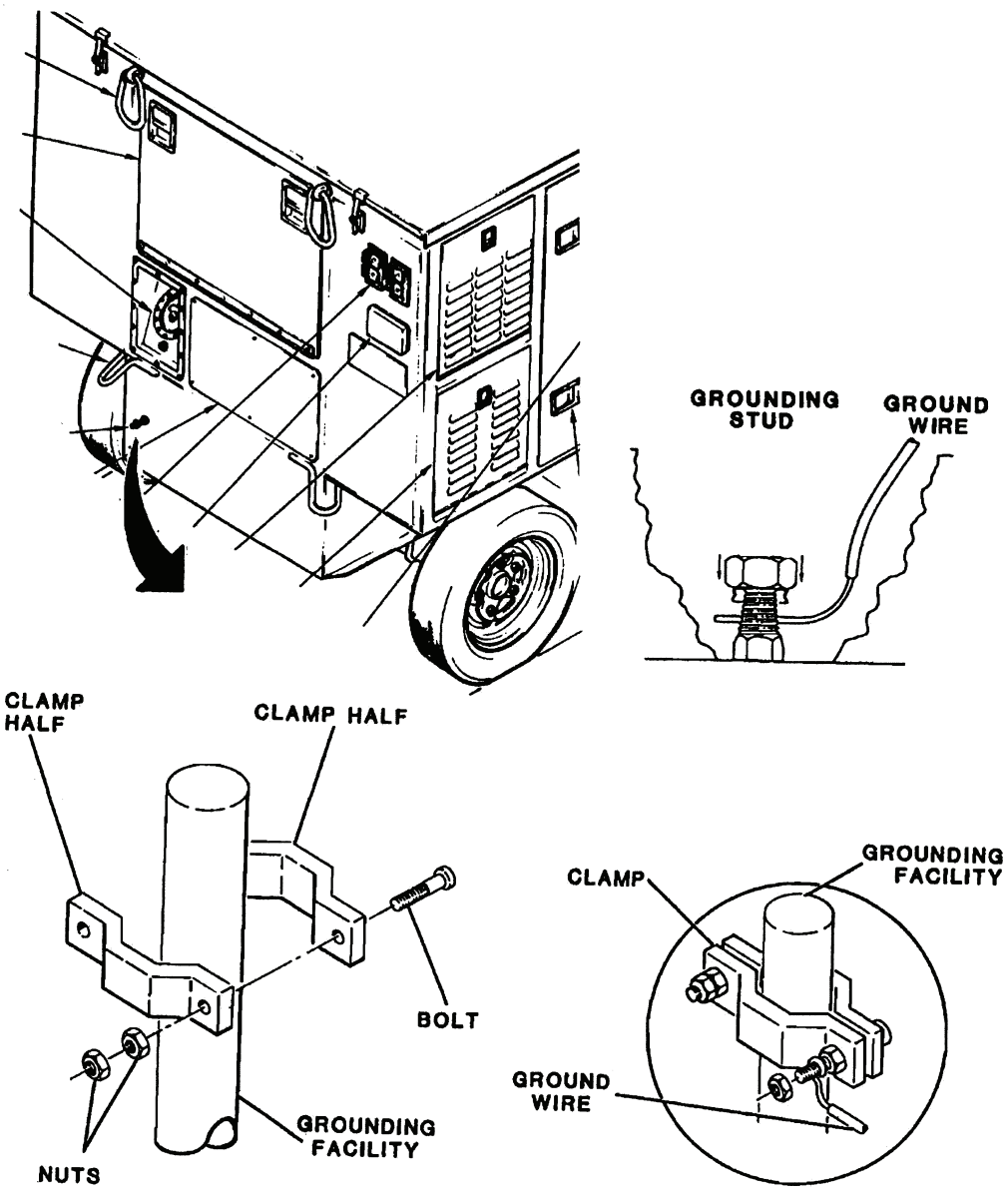


Figure 4-1a. Grounding AGPU.

c. Grounding. The AGPU must be grounded prior to operation. Connect ground cable from suitable ground to grounding stud on AGPU as shown on figure 4-1a. If necessary, fabricate a static grounding cable assembly as shown in TM 1-1500-204-23-1, Figure 3-1, except the bonding plug is not required.

4-3. EQUIPMENT CONVERSION.

NOTE

If hydraulic power is not required for an extended period of time, the pump should be disconnected from the GTE. This is done by installing a spacer between the hydraulic pump and the engine/gearcase pad. This disconnects the pump driveshaft from the gearcase output-saving wear on pump and reducing load on engine.

a. Installation of Hydraulic Pump Spacer. (See figure 1-10.)

(1) Disconnect battery connector from battery.

(2) Open engine access door.

(3) Remove DC cable from storage compartment and remove hydraulic access cover (figure 4-6).

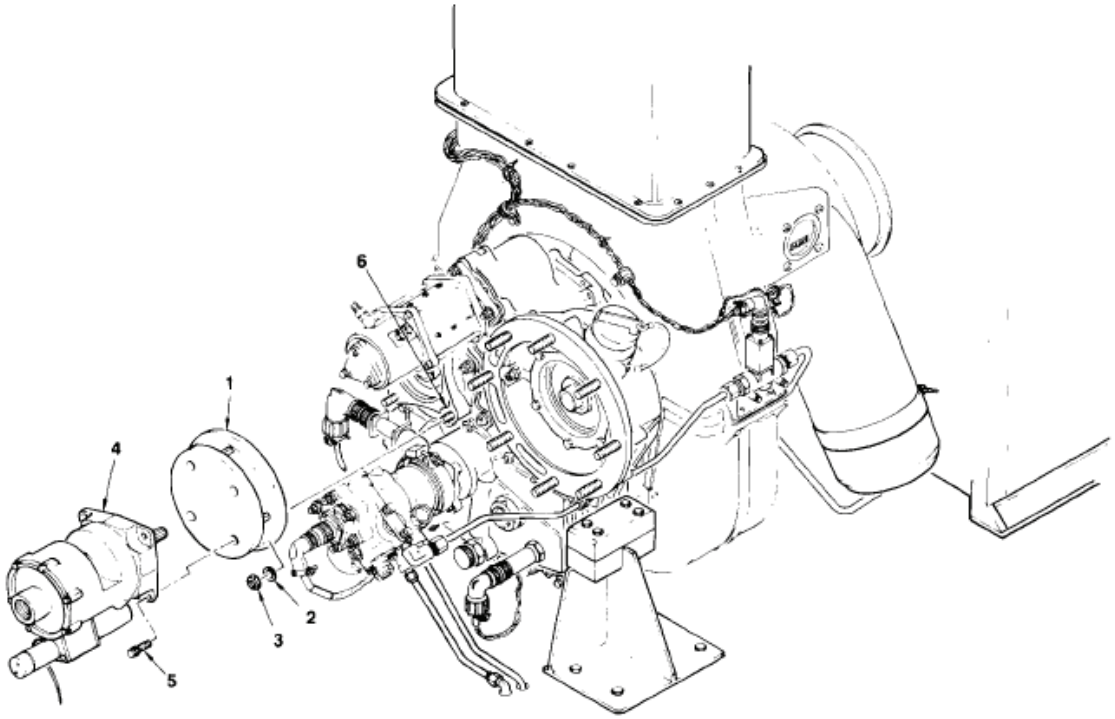
(4) Remove spacer (5, figure 1-10) from storage bracket (7) inside engine compartment (8) by removing four bolts (11).

(5) Remove drain tube (6) from fitting (10) on hydraulic pump (4).

(6) Lift drain tube (6) up and out of grommet (15).

(7) Support hydraulic pump and remove four nuts (3, figure 4-1) and washers (2) that secure pump on gearcase pad (6).

(8) Move hydraulic pump (4) back approximately four inches.



1. SPACER
2. WASHER
3. NUT
4. HYDRAULIC PUMP
5. BOLT
6. GEARCASE PAD

Figure 4-1b. Installation of Hydraulic Pump Spacer.

(9) Insert spacer (1) between hydraulic pump (4) and gearcase pad (6). Ensure that flat side of spacer (1) is against the gearcase pad (6).

(10) Install four nuts (3) and washers (2) that were removed in step (7). This will attach spacer to gearcase pad.

(11) Install four bolts (5) that were removed in step (4). This will attach pump to spacer.

(12) Connect drain tube (6, figure 1–10) to fitting (10) on hydraulic pump (4) and route tube through grommet (15).

(13) Replace hydraulic access cover, and store DC cable in storage compartment.

(14) Connect battery connector to battery.

b. Removal of Hydraulic Pump Spacer. (See figure 1-10.)

(1) Disconnect battery connector from battery.

(2) Open engine access door.

(3) Remove DC cable from storage compartment and remove hydraulic access cover (figure 4-6).

(4) Remove drain tube (6, figure 1-10) from fitting (10) on pump (4), and remove tube from grommet (15).

(5) Support hydraulic pump and remove four bolts (5, figure 4-1) which attach pump (4) to spacer (1).

(6) Remove four nuts (3) and washers (2) which attach spacer (1) to gearcase pad (6), and remove spacer.

(7) Lubricate splines on hydraulic pump shaft and internal splines on gearcase drive pad with a thin coat of grease MIL-G-21164C.

NOTE

If pump does not go all the way in against pad easily, turn spline shaft on pump.

(8) Hold pump (4, figure 1-10) in position on gearcase pad (14) studs and install four nuts (12) and washers (13). Torque nuts to 190 inch-pounds.

(9) Connect drain tube (6) to fitting (10) on hydraulic pump (4) and route tube through grommet (15).

(10) Install spacer (5) on storage bracket (7) using four bolts (11) removed in step (5).

(11) Replace hydraulic access cover, and store DC cable in storage compartment.

(12) Connect battery connector to battery.

SECTION II. MOVEMENT TO A NEW WORKSITE

4-4. PREPARATION FOR MOVEMENT.

a. Preparation for Ground Movement.

(1) Store all cables and hoses.

(2) Close and latch all doors.

(3) Disconnect ground cable.

(4) If self-propulsion mode is used, perform the applicable steps in paragraph 2-10.a or 2-10.b.

(5) If AGPU is to be towed, perform the steps in paragraph 2-11.

b. Preparation for Airlift-Internal Air Transport (IAT). Prepare AGPU for IAT by CH-47 helicopter as follows:

(1) Prepare AGPU for airlift.

(a) Store all cables and hoses.

(b) Close and latch all doors.

(c) Disconnect ground cable.

(d) Ensure that fuel tank is not more than 3/4 full. Drain off some fuel if required.

(2) Prepare helicopter.

(a) Stow the troop seats in the folded position.

(b) Lower the helicopter ramp and position the auxiliary ramps.

(c) Obtain following shoring materials:

Two 2-inch by 12 inch by 4-foot boards.

Two 2-inch by 12 inch by 9-foot boards.

Two 2-inch by 12 inch by 14-foot boards.

(d) Lay the shoring on the helicopter's ramps and cargo compartment floor for the AGPU to roll on during loading.

(3) Prepare AGPU for self-propulsion mode in accordance with applicable steps in paragraph 2-10.b.

(4) Load AGPU into Helicopter.

(a) Position one man to the rear of AGPU to observe lateral clearances. Position another man in front of the AGPU to observe clearances and give hand signals to the AGPU operator.

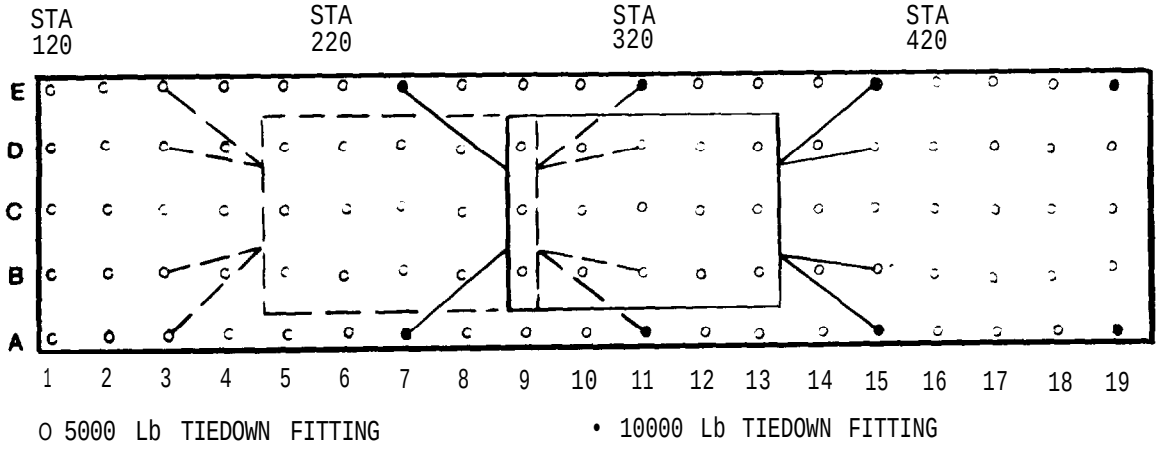
(b) Using propulsion controls on AGPU back the AGPU up the helicopter ramp into the cargo compartment. stop when the AGPU is centered at station 320, figure 4-2, sheet 1 of 2.

(c) When AGPU is in position at station 320, set parking brake.

(d) Set DRIVE switch, DC POWER and MASTER SWITCH on AGPU control panel to OFF positions. Disengage clutch, and latch tow bar to stored position-

NOTE

The AGPU is resting on and supported by the parking shoring during transport. Remove the rolling shoring and secure it inside the helicopter cargo compartment.



DESCRIPTION OF ITEM	ITEM FACING	LOCATION OF R.P.		APPROX WT(LB)
		R.P.	STA	
AVIATION GROUND POWER UNIT(AGPU)	AFT	CENTERED	320	4000

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Figure 4-2. Tiedown of AGPU for IAT (sheet 1 of 2)

Tiedown Fitting No.	Capacity in 1000 lbs: Fitting (A/C)	Capacity in 1000 lbs: Tiedown (MB-1)	Directions
A-7	10	10	Pass the chain and grabhook across to and through the right rear frame tie-down point. Engage a link of the chain in the grabhook.
E-7	10	10	Pass the chain and grabhook across to and through the left rear frame tie-down point. Engage a link of the chain in the grabhook.
A-15	10	10	Pass the chain and grabhook across to and through the right front frame tiedown point. Engage a link of the chain in the grabhook.
E-15	10	10	Pass the chain and grabhook across to and through the left front frame tie-down point. Engage a link of the chain in the grabhook.
B-15	5	10	Pass the chain and grabhook through the right front lift ring. Engage a link of the chain in the grabhook.
D-15	5	10	Pass the chain and grabhook through the left front lift ring. Engage a link of the chain in the grabhook.
NOTE: The following two tiedowns are required for AFT restraint if the AGPU is not centered at station 320, as illustrated on sheet 1.			
B-3	5	10	Pass the chain and grabhook through the right rear lift ring. Engage a link of the chain in the grabhook.
D-3	5	10	Pass the chain and grabhook through the left rear lift ring. Engage a link of the chain in the grabhook.

Figure 4-2. Tiedown of AGPU for IAT (sheet 2 of 2)

(5) Tiedown AGPU.

(a) Prepare eight MB-l tiedown devices.

(b) Connect tiedown devices to AGPU tiedown brackets as shown in figure 4-2.

c. Preparation for Airlift - External Air Transport (EAT). Prepare ACPU for EAT by UH-60, CH-47, and CH-54B helicopters as follows :

NOTE

The load of 4,190 pounds is suitable for UH-60 and CH-47 helicopters at airspeeds of 110 knots and 90 knots, respectively, for single-point hookup. Dual-point hookup for CH-47D is suitable for airspeed of 100 knots.

(1) Materials Required are as follows:

(a) Sling set (10,000 pound capacity) - 1 each (1670-01-027-2902) or Sling, Nylon and Chain, Multi-leg (15,000 pound capacity).

(b) Tiedown Assembly, CGU-l/B - 4 each.

(c) Cord, Nylon, Type III - as required.

(d) Tape, adhesive, pressure sensitive, 2 inch wide roll - as required.

(e) Nylon, tubular - as required.

(f) Cotton Webbing, 80-pound - as required.

(g) Additional apex fitting assembly required for dual-point hookup.

(2) Prepare AGPU for EAT by UH-60, CH-47 and CH-54B helicopters as follows:

(a) Stow and secure the tow bar with l/2-inch tubular nylon.

(b) Close all doors, secure handles with tape, and attach four CGU-1/B tiedown straps as illustrated in figure 4-2A; straps to be through forklift guides and secure roof.

(c) Secure all equipment inside the unit with Type III nylon cord.

CAUTION

Particular attention should be given to securing the exhaust cover to preclude possible damage during flight. If cover cannot be adequately secured then it should be removed.

(d) Secure exhaust cover with 2-inch tape.

(e) Ensure that fuel tank is not more than three-fourths full. Inspect fuel tank cap, oil filler caps, and battery caps for proper installation and that they are secure.

(f) Engage the parking brake and disengage the clutch lever.

(3) Rigging (verify lift rings are fully seated and secure) as follows:

(a) Route outer sling legs 1 and 2 to the rear of the AGPU.

(b) Route inner sling legs 3 and 4 to the front of the AGPU.

(c) Loop the chain end of all sling legs through their respective lift ring and place link number 3 in the grabhook assembly.

(d) Cluster and tie off all sling legs with 80-pound cotton webbing or tape to prevent fouling during hookup.

(e) Dual hook rigging procedures are identical except that two apex clevis assemblies are used. Sling legs 1 and 2 on the rear of the AGPU go to the rear apex fitting assembly. Sling legs 3 and 4 on the front of the AGPU go to the front apex fitting assembly.

(4) Hookup is as follows: Hookup team should kneel on top of load. Assistant hookup person discharges static electricity with the static probe. Hookup person then places apex on the aircraft cargo hook. If performing dual-point hookup, the front sling leg apex should be hooked first to aircraft cargo hook No. 1 and the rear sling leg apex should be hooked to aircraft cargo hook No. 3. Both persons carefully dismount but remain close to the load as helicopter removes slack in sling legs. When successful hookup is assured, hookup team briskly exits the area underneath the helicopter.

4-5. REINSTALLATION AFTER MOVEMENT. Refer to paragraph 4-2.

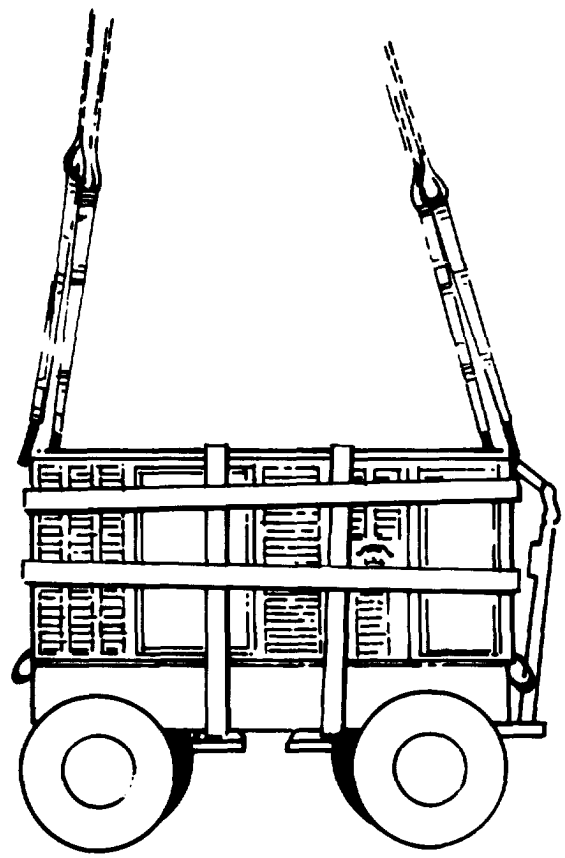


Figure 4-2A. Airlift Hookup

Section III. REPAIR PARTS; SPECIAL TOOLS; SPECIAL TEST; MEASUREMENT AND DIAGNOSTIC EQUIPMENT (TMDE); AND SPECIAL SUPPORT EQUIPMENT

4-6. TOOLS AND EQUIPMENT. Special tools, TMDE or support equipment required for organizational maintenance of the AGPU is as follows:

Oil drain fitting/hose, part number DB 75-108 (TEDESLO)

4-7. MAINTENANCE REPAIR PARTS. Repair parts and equipment are listed and illustrated in the repair parts and special tools list manual TM 55-1730-229-24P covering organizational maintenance for the AGPU.

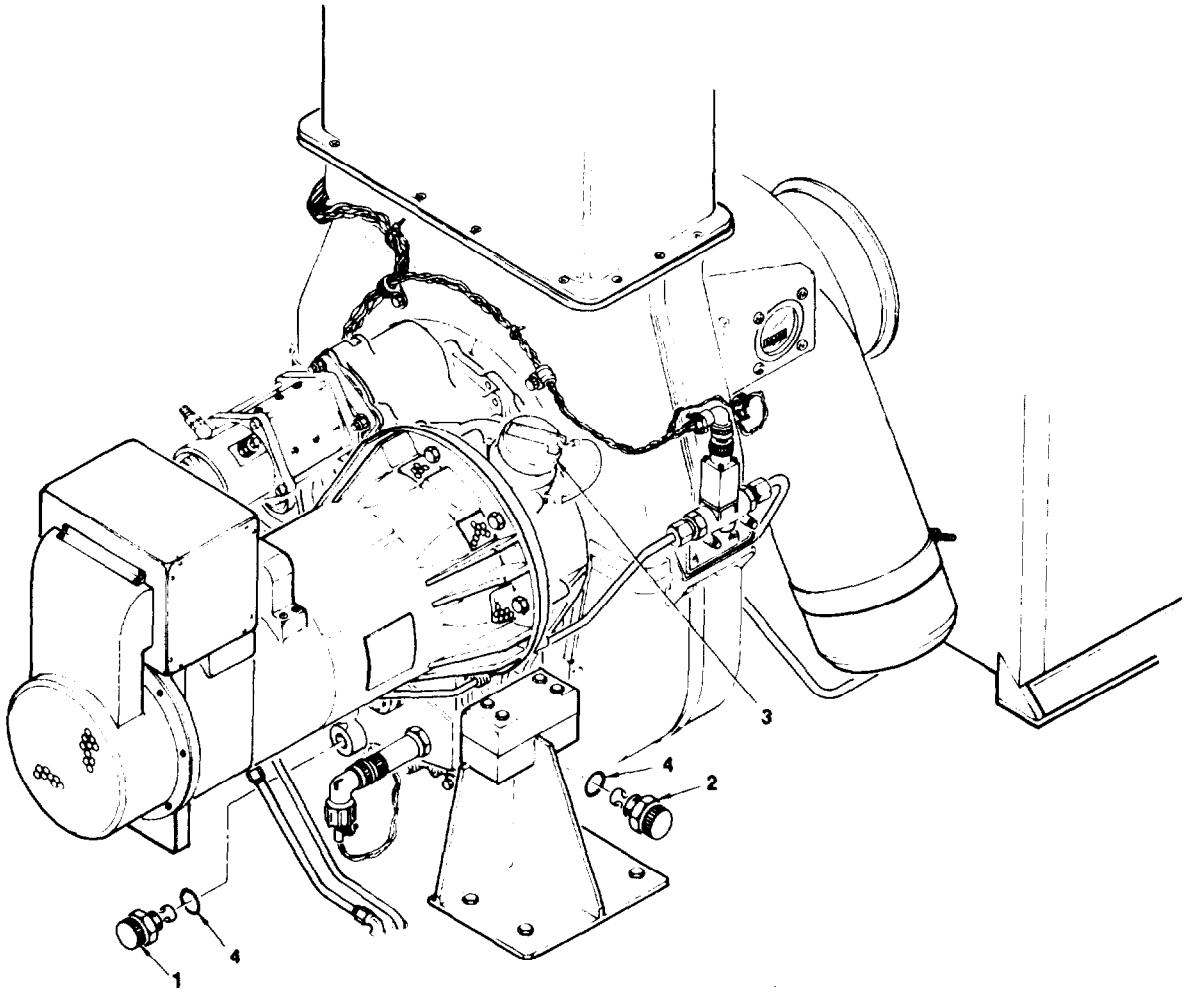
Section IV. LUBRICATION INSTRUCTIONS

4-8. GENERAL. Army personnel should refer to DA Pam 310-1 and Marine Corps personnel to SL-1-3 to ensure the latest edition of LO is used.

Lubrication instructions for the AGPU are contained in LO 55-1730-229-12.

a. Engine Oil Change. (See figure 4-3.)

(1) Start and operate engine for 15 minutes, then shutdown engine and proceed with oil change while oil is hot.



12-4-2

1. MAGNETIC DRAIN PLUG (GEARCASE)
2. MAGNETIC DRAIN PLUG (OVERFLOW TUBE)
3. OIL FILLER CAP
4. PACKING

Figure 4 -3. Engine Oil Change

(2) Remove magnetic drain plug (1) by pushing in and turning counterclockwise to unlock, then remove drain plug. (Note: the drain plug element is a self-closing bayonet type.)

(3) Inspect magnetic drain plug for metal particles which may indicate internal damage to engine. If metal particles are present on drain plug, notify maintenance supervisor.

(4) Remove oil filler cap (3).

(5) Connect oil drain fitting/hose to drain fitting and drain oil into a container.

(6) Remove, inspect, and install new oil filter element and seals in accordance with paragraph 4-86.

(7) Remove drain fitting/hose and install magnetic drain plug (1), with new packing (4) .

(8) Remove overflow tube magnetic drain plug (2) by pushing in and turning counterclockwise.

(9) Connect oil drain fitting/hose to overflow tube drain fitting and drain any oil in overflow tube into a container.

(10) Add oil per lube order (approximately 2.3 quarts) until oil from overflow tube begins to flow from oil drain fitting/hose.

(11) Wait approximately two minutes for excess oil to drain and remove drain fitting/hose and install magnetic drain plug (2), with new packing (4).

Propulsion System Lubrication. (See figure 4-4 .)

(1) Change lubricant in rear axle housing (3).

(a) Place container under rear axle housing (3) and remove fill plug (2) and drain plug (1).

(b) Drain housing.

(c) Install drain plug (1) , and add lubricant per L.O.

(d) Install fill plug (2).

(2) Change lubricant in chain drive housing (6).

(a) Place container under chain drive housing (6) and remove fill plug (5) and drain plug (4).

(b) Drain housing.

(c) Install drain plug (4) and add lubricant per L.O.

(d) Install fill plug (5).

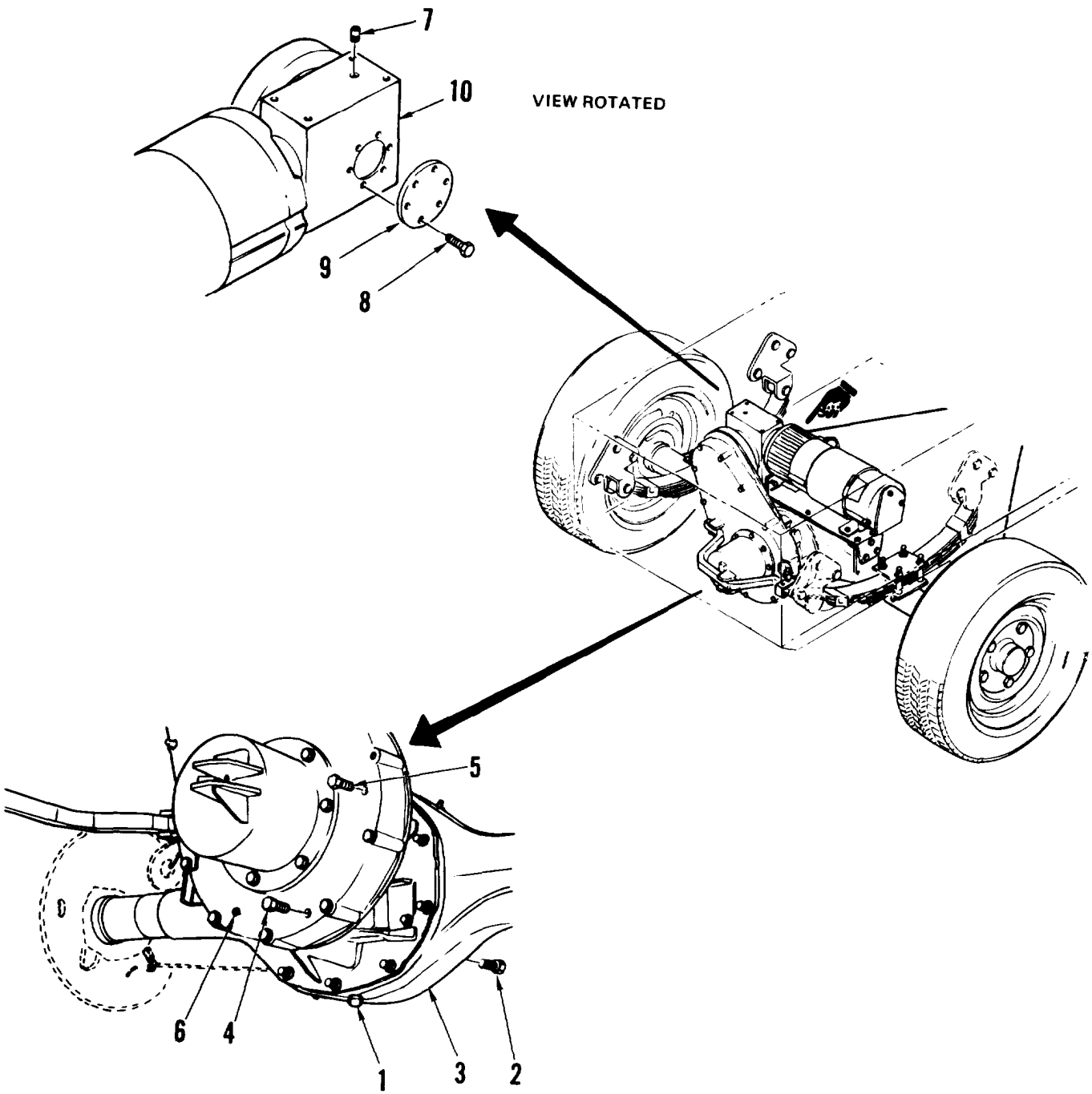
(3) Change lubricant in gear drive (10).

(a) Place container under gear drive (10) and remove fill plug (7). Loosen six bolts (8) so inspection plate (9) can be pryed open at bottom to drain lubricant.

(b) Tighten six bolts (8) and add lubricant per L.O.

(c) Install fill plug (7).

(4) Wipe up any spilled lubricant and check for leaks.



1.	DRAIN PLUG	6.	CHAIN DRIVE HOUSING
2.	FILL PLUG	7.	FILL PLUG
3.	AXLE HOUSING	8.	BOLT
4.	DRAIN PLUG	9.	INSPECTION PLATE
5.	FILL PLUG	10.	GEAR DRIVE

Figure 4-4. Propulsion System Lubrication

Section V. PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS)

4-9. GENERAL.

a. To ensure that the AGPU is ready for operation at all times, it must be inspected systematically so defects may be discovered and corrected before they result in serious damage or failure. The necessary preventive maintenance checks and services that are to be performed by Organizational personnel are listed and described in table 4-1.

b. Defects discovered during operation will be noted for future correction. Stop operation immediately If a deficiency is noted which would damage the equipment. All deficiencies and short-comings will be recorded together with the corrective action taken on the applicable form. Air Force users shall refer to the applicable Inspection manuals and work card sets in the TO 35C2-3 series and table 4-1 for detailed procedures. Marine Corps users should refer to current issue of TM 11275-15/1.

Determining (PMCS) Intervals. Organizational PMCS on the AGPU should be- performed on a weekly (W) basis, monthly (M) basis, semi annual (S) basis, and per-hour-of-operation (H) basis as indicated in table 4-1. The running time meter on the GTE is used to determine AGPU operating time.

d. PMCS for Units in Continuous Operation. For PMCS performed on an operating time basis, perform PMCS as close as possible to the time intervals indicated. For units in continuous operation, perform PMCS before starting operation if continuous operation will extend service past that which is shown.

e. (A, N, MC) Preventive Maintenance Checks and Services. Table 4-1 contains a tabulated listing of PMCS which shall be performed by Organizational personnel. The item numbers are listed consecutively and Indicate the sequence of minimum requirements.

Table 4-1. Organizational Preventive Maintenance Checks and Services

Interval		
	W - Weekly (40 Hrs)	Total M/H: 0.3
	M - Monthly (100 Hrs)	Total M/H: 1.6
	S - Semi Annual (500 Hrs)	Total M/H: 2.6
	H - Per-hour-of-operation	

Organization				Inspection Procedures	Work Time M/H
W	M	S	H		
	1			**CONTROL PANEL AND ELECTRICAL COMPARTMENT** (1) Lower control panel for maintenance (paragraph 4-24) and inspect control panel wiring harness for loose wiring connections and damaged or burned wires. (2) Inspect components mounted on bulkhead behind control panel: (a) Inspect AC and DC main cantactors for damage or loose connections.	0.2

Table 4-1. Organizational Preventive Maintenance Checks and Services (continued)

Organizational				Inspection Procedures	Work Time M/H
W	M	S	H		
				CONTROL PANEL AND ELECTRICAL COMPARTMENT (continued) (b) Inspect starter and external dc contactors for damage or loose connections. (c) Inspect generator control unit (GCU) for signs of corrosion. Check that cable connections are secure. (d) Inspect engine electronic control unit (ECU) for signs of corrosion. Check that cable connections are secure. (3) Inspect portion of main wiring harness extending into electrical compartment for frayed or damaged wires, loose wire connections, and burned wires.	
	2			**BATTERY CHARGER** Remove screws securing cover below control panel and remove cover. Inspect battery charger for signs of corrosion. Check that cable connections are secure.	0.1
1				**BATTERY** Test specific gravity (see paragraph 4-25.b).	0.3
	3			**AIR CLEANER** Remove louvered cover and inspect air cleaner for missing tubes, or damage. Remove debris and vacuum out all tubes and face of cleaner. Replace louvered cover.	0.2
	4			**GENERATOR** Open GTE access door and inspect generator (paragraph 4 -56).	0.1

Table 4-1. Organizational Preventive Maintenance Checks and Services (continued)

Organizational				Inspection Procedures	Work Time M/H
W	M	S	H		
	5			**EXHAUST EJECTOR** Open GTE access door and inspect exhaust ejector for security of installation, damage, and loose or missing insulation retaining washers.	0.1
	6			**INTERIOR INSULATION** Open GTE access door and inspect interior insulation for damage, and loose or missing retaining washers.	0.1
	7			**MAIN WIRING HARNESS AND CURRENT TRANSFORMERS** (1) Open GTE access door and inspect main wiring harness for frayed or damaged wires, loose wires at connectors, burned wiring, and loose or missing harness brackets. (2) Inspect current transformers (3) for security of installation, loose connections, and damage.	0.1
	8			**ENGINE AND ENGINE MOUNTED COMPONENTS** (1) Open GTE access door and inspect engine and gearcase for damage, cracks, fluid leaks, and security of installation. (2) Inspect engine inlet duct screen by opening bypass door. Remove any foreign material from screen. (3) Inspect fuel control unit (FCU) and shutdown fuel solenoid for security of installation, leaks, loose components, and damage. (4) Inspect load control valve (LCV) for security of installation, leaks, loose components, and damage. Inspect bleed air duct hoses for splits, punctures, and loose clamps. Inspect pressure transducer and tubing for security of installation, and loose fittings.	0.2

Table 4-1. Organizational Preventive Maintenance Checks and Services (continued)

Organizational				Inspection Procedures	Work Time M/H
W	M	S	H		
				ENGINE AND ENGINE MOUNTED COMPONENTS (continued)	
				(5) Inspect ignition unit for damage, signs of corrosion, and security of installation. Inspect Igniter plug lead for damage and security of installation.	
				(6) Inspect following engine mounted components for security of installation, damage, and proper electrical connections: Speed sensor Low oil pressure switch High oil temperature switch Thermocouple	
				(7) Inspect engine wiring harness for frayed or loose wires, missing or loose brackets, and burned wires.	
	9			**AUXILIARY FUEL PUMP AND FILTER**	0.3
				Inspect fuel pump, filter and four-way valve for security of installation, dents, cracks and fuel leaks.	
	9.1			Drain fuel filter/water separator just prior to operation of the AGPU.	
	10			**FUEL LEVEL SENSORS**	0.1
				Inspect tank at fuel level sensor and low fuel sensor for leaks, security of installation, and proper wiring connections.	
	11			**BLEED AIR SOLENOID VALVE**	0.1
				Inspect bleed air solenoid valve in accordance with paragraph 4-77.	
		1		**FRONT AXLE ASSEMBLY**	0.4
				Lubricate in accordance with L.O.	

Table 4-1. Organizational Preventive Maintenance Checks and Services (continued)

Organizational				Inspection Procedures	Work Time M/H
W	M	S	H		
		2		**WHEEL BEARINGS**	1.0
				Refer to paragraph 4-112 for inspection procedure. Repack in accordance with L.O.	
		3		**BRAKE CABLE ASSEMBLY**	0.2
				Inspect brake cable assembly in accordance with paragraph 4-115. Lubricate in accordance with L.O.	
		4		**REAR AXLE**	0.4
				Check differential lubrication level, and add if required in accordance with L.O. Drain and refill in accordance with paragraph 4-8.b and L.O.	
		5		**GEAR DRIVE ASSEMBLY**	0.3
				Check lubrication level and add if required in accordance with L.O. Drain and refill in accordance with paragraph 4-8.b and L.O.	
		6		**CHAIN DRIVE ASSEMBLY**	0.3
				Check lubrication level and add if required in accordance with L.O. Drain and refill in accordance with paragraph 4-8.b and L.O.	
			1	**GENERATOR**	0.2
				Lubricate in accordance with L.O. every 250 hours.	
			2	**ENGINE FUEL FILTERS**	0.3
				Inspect and replace auxiliary and FCE fuel filters every 250 operating hours in accordance with paragraphs 4-66 and 4-69.	
			3	**IGNITER PLUG**	0.2
				Remove, inspect, and reinstall every 100 operating hours in accordance with paragraph 4-81.	

Table 4-1. Organizational Preventive Maintenance Checks and Services (continued)

Organizational				Inspection Procedures	Work Time M/H
W	M	S	H		
			4	**ENGINE OIL FILTER** Remove, inspect, and replace every 250 operating hours in accordance with paragraph 4-86.	0.3
			5	**ENGINE OIL CHANGE** Drain and refill every 250 operating hours (refer to L.O. and paragraph 4-8.a).	0.2
			6	**ENGINE DRAIN CHECK VALVES** Remove, inspect, clean, and reinstall every 250 operating hours in accordance with paragraph 4-98. Check that drain hoses are unobstructed.	0.3
			7	**ENGINE COMBUSTOR ASSEMBLY - DELETE**	
			8	**ENGINE FUEL NOZZLE** Inspect, clean, and reinstall every 500 operating hours in accordance with paragraph 4-68.	0.5
			9	**ENGINE TURBINE SECTION (HOT SECTION INTERSECTION) - DELETE**	
			10	**ENGINE TURBINE SECTION (DETAILED HOT SECTION INSPECTION) - DELETE**	
			11	**HYDRAULIC FLUID FILTER ELEMENTS** Remove and replace. Replace filter elements every 50 hours of operation of the hydraulic module or annually	0.5

Section VI. TROUBLESHOOTING

4-10. INTRODUCTORY INFORMATION.

a. This section contains troubleshooting information for locating and correcting operating troubles which may develop in the AGPU. Each malfunction for an individual component, unit, or system is followed by a list of tests or inspections which will help you to determine probable causes and corrective actions to take. You should perform the tests/inspections and corrective actions in the order listed.

b. This manual cannot list all malfunctions that may occur, nor all tests or inspections and corrective actions. If a malfunction is not listed or cannot be corrected by listed corrective actions, notify maintenance supervisor.

c. Following is an index of malfunctions in table 4-2:

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NOTE

Before you use this table, be sure you have performed all applicable operating checks.

Table 4-2. Organizational Troubleshooting

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

1. BATTERY VOLTAGE METER READS LOW (MASTER SWITCH ON, engine not running).

Step 1. Set MASTER SWITCH to OFF, and disconnect battery. Measure voltage across battery terminal posts.

a. If battery voltage is good (22 to 26 volts), go to step 2.

b. If battery voltage is low (less than 22 volts), test battery (paragraph 4-25). Charge or replace battery as required. Make sure that resistance between battery cable terminal adapter receptacles is greater than 40k (with MASTER SWITCH off) before connecting battery.

Step 2. Lower control panel (paragraph 4-24.a).

WARNING

Battery power may be present at terminals on back of control panel when battery is connected. Do not touch any bare terminals.

Step 3. Connect battery. Set MASTER SWITCH to ON, and measure dc voltage between positive (+) and negative (-) terminals of BATTERY VOLTAGE meter 1M4 (see FO-1).

Table 4-2. Organizational Troubleshooting (continued)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION
1. (continued)
a. If no voltage, do step 4.
b. If voltage is good (22 to 26 vdc), disconnect battery, replace BATTERY VOLTAGE meter 1M4 (paragraph 4-107.b), and perform operational check.
Step 4. With battery connected and MASTER SWITCH on, measure dc voltage between positive (+) terminal of BATTERY VOLTAGE meter 1M4 and ground.
a. If voltage is good (22 to 26 vdc), go to step 9.
b. If no voltage continue with step 5.
Step 5. Measure dc voltage at slave receptacle. Disconnect battery.
a. If no voltage, replace battery terminal adapter (paragraph 4-261, and perform operational check.
b. If voltage was good (22 to 26 vdc), continue with next step.
Step 6. Check battery cables P33A1/0 (positive receptacle of battery terminal adapter to starter shunt R2) and P44A1/ON (negative receptacle of battery terminal adapter to dc ground stud) for continuity.
a. If no continuity, replace cables (paragraph 4-26), and perform operational check.
b. If continuitv checks are good, continue with next step.
Step 7. Check for continuity between the two large screws on shunt R2 (28 and 29, figure 4-18).
a. If no continuity, replace shunt (paragraph 4-30), and perform operational checks.
b. If continuity, continue with next step.
Step 8. Remove battery charger access cover (5, figure 4-5), and disconnect main harness connector P7 from control panel connector J7. Check for continuity between P7-1R and shunt R2, and between J7-1L and positive terminal of BATTERY VOLTAGE meter 1M4.

Table 4-2. Organizational Troubleshooting (continued)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

1. (continued)

Replace open wire (P41D20 or P41E20), and perform operational check.

Step 9. Set MASTER SWITCH to OFF and disconnect battery. Test MASTER SWITCH 1S2 (malfunction 79).

a. Replace switch if defective (paragraph 4-104.c), and perform operational check.

b. If switch tests good, do step 10.

Step 10. Check for continuity between the following points (see FO-1 and FO-5):

Check continuity From	To	If no continuity, replace wire no.
1M4(-)	1 S2-9	P45B20
1S2-8	1DS21(-)	P53A20N
1DS21(-)	1DS19(-)	P53B20N
1DS19(-)	1DS18(-)	P53C20N
1DS18(-)	1M11(-)	P53D2ON
GND TB	DC GND STUD	P50A12N

See figure 4-20 (2) for GND TB location.

a. If no continuity, replace indicated wire, and perform operational check.

b. If all continuity checks good, do step 11.

Step 11. Remove battery charger access cover (5, figure 4-5), and disconnect main harness connector P5 from control panel connector J5. Check for continuity between J5-23R and 1M11(-), and between P5-23L and GND TB (2, figure 4-20).

Replace open wire (P53G20N or P53H2ON), and perform operational check.

2. CHRG/BAT FAULT INDICATOR NOT LIT (MASTER SWITCH ON, engine not running).

Step 1. Push PRESS TO TEST switch.

Table 4-2. Organizational Troubleshooting (continued)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION
2. (continued)
a. If BATTERY CHG/DISCH indicator does not illuminate, see malfunction 6.
b. If indicator illuminates, do step 2.
Step 2. Set MASTER SWITCH to OFF and disconnect battery. Test diode TB3-CR5 (FO-1) (malfunction 82).
a. If diode tests good, do step 3.
b. Replace diode if defective (paragraph 4-33), and perform operational check.
Step 3. Disconnect wire from TB3-10 (ANODE). Measure resistance between TB3-10 (ANODE) and TB3-10 (CATHODE).
a. If resistance is between 80 and 120 ohms, reconnect wire and go to step 4.
b. If resistance is not between 80 and 120 ohms, replace resistor TB3-R1 (paragraph 4-33), and perform operational check.
Step 4. Disconnect main harness connector P5 from control panel connector J5. Check for continuity of wire P29B20 (J5-20L to 1DS7+), and wire P29C20 (P5-20R to TB3-10 ANODE).
a. If either wire is open, replace wire and perform operational check.
b. If both wires are good, reconnect P5 to J5 and continue with next step.
Step 5. Disconnect main harness connector P18 from lower tray connector J18. Check for continuity of wire P33K20 (P18-E and TB3-9 ANODE).
a. If no continuity, replace wire P33K20 and perform operational check.
b. If continuity, do step 6.

Table 4-2. Organizational Troubleshooting (continued)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION
2. (continued)
Step 6. Open electrical tray access door, and remove battery/charger transfer relay 3K3 from socket (paragraph 4-36.b). Refer to FO-1 and check continuity of wire P33H20 (between relay socket pins A3 and D3) and wire P33J20 (from J18-E to relay socket pin D2). a. If no continuity, replace wire or notify maintenance supervisor. Re-install relay 3K3 (paragraph 4-36.c). b. If continuity, replace relay 3K3 with new relay (paragraph 4-36.c). c. After replacing wire or relay, reconnect all connectors and wires, and perform operational check.
3. CHRG/BAT FAULT INDICATOR LIT (engine running at 100% RPM).
Step 1. Set DC POWER switch to ON, check DC POWER ON indicator, and set DC POWER switch to OFF. a. If DC POWER ON indicator lit, go to step 2. b. If indicator did not light, see malfunction 42.
Step 2. Open electrical trays access door and check that circuit breakers 2CB1 and 2CB2 on upper tray are closed (pushed in). a. If circuit breakers are closed, go to step 3. b. If either circuit breaker is open, reset by pushing in. If circuit breaker remains in, go to step 3. If circuit breaker opens again, shut down engine, disconnect battery, and do malfunction 81 step 5.c (2CB1) or step 6.c (2CB2).
Step 3. Shut down engine and disconnect battery. Check for continuity between terminals of 2CB1, and between terminals of 2CB2. a. If continuity checks good, do step 4. b. If no continuity, replace circuit breaker 2CB1 or 2CB2 (paragraph 4-35), and perform operational check.

Table 4-2. Organizational Troubleshooting (continued)

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

3. (continued)

Step 4. Check battery/charger transfer relay (malfunction 85).

a. If relay tests good, do step 5 below.

b. If relay test is not good, check wiring as instructed in malfunction 85, step 1.k.

Step 5. Remove battery charger access cover. Disconnect main harness connectors P1 (4, figure 4-17) and P2 (6) from battery charger connectors J1 (5) and J2 (7). Disconnect harness connector P9 from lower tray J9. Check for continuity between the following points (see FO-1):

Check continuity From	To	If no continuity, replace wire no.
P1 -H	2CB2	P24A12
P1-I	2CB2	P23A12
P2-A	P9-S	P30A18
P2-B	GND TB	P31A18N
P9-L	GND TB	P49C20N
Charger J4(+)	2CB1	P22A2
Charger J4(-)	Charger J3(-)	P21A6N
Charger J4(-)	DC ground stud	P21B2N
Charger J3(+)	Shunt R3(-)	P32A6
2CB1	K2-A1	P2B2
2CB2	K2-A1	P2C8

a. If no continuity, replace indicated wire.

b. If all continuity checks good, replace battery charger (paragraph 4-28).

C. Reconnect all connectors and wires, and perform operational check.

Table 4-2. Organizational Troubleshooting (continued)

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

4. BATTERY VOLTAGE METER READS LOW (engine running).

Step 1. Check BATTERY CHG/DISCH meter.

a. If CHG/DISCH meter reads in green band, shut down engine and test battery (paragraph 4-25). Charge or replace battery as required, and perform operational check.

b. If CHG/DISCH meter reads in yellow band, do step 2.

Step 2. Shut down engine and disconnect battery. Lower control panel (paragraph 4-24.a) and remove battery charger access cover. Check for continuity between the following points (see FO-1):

From	To	Replace wire no.
R3-	Bat Chrg J3+	P32A6
Bat Chrg J4-	Bat Chrg J3-	P21A6N
Bat Chrg J4-	DC GND	P21B2N

a. If no continuity, replace indicated wire, and perform operational check.

b. If all continuity checks good, check battery charger (malfunction 81).

5. BATTERY VOLTAGE METER READS HIGH (engine running).

NOTE

The BATTERY VOLTAGE meter may read slightly high when the battery charger output switch on lower electrical tray is in the 30.5 VDC or 32.0 VDC position. Maximum meter readings for the charger output switch settings are:

Charger Output Control Setting	Maximum BATTERY VOLTAGE Meter Reading
28.5 VDC	31 VDC
30.5 VDC	33 VDC
32.0 VDC	34.5 VDC

Table 4-2. Organizational Troubleshooting (continued)

MALFUNCTION TEST OR INSPECTION	CORRECTIVE ACTION
5. (continued) If BATTERY VOLTAGE meter reading exceeds maximum limits, check battery charger circuits (see malfunction 81).	Replace battery charger or charger output select switch as required. Reconnect all connectors and wires, and perform operational check.
6. CONTROL PANEL INDICATOR LIGHT TEST FAILS - ONE INDICATOR DOES NOT LIGHT.	
Step 1. Disconnect battery.	
Step 2. Remove indicator lens and check bulb.	a. Replace bulb if defective, and perform operational check. b. If bulb is good, do step 3.
Step 3. Refer to FO-2 and locate diode associated with indicator light. Test diode (malfunction 82).	a. If diode tests good, do step 4. b. Replace diode if defective, and perform operational check.
Step 4. Refer to FO-2 and check indicator light wiring.	a. Replace or repair any defective wiring. b. If all wiring is good, replace lamp socket (paragraph 4-106). c. Perform operational check.
7. CONTROL PANEL INDICATOR LIGHT TEST FAILS - NO INDICATORS LIGHT.	
Step 1. Check that indicator lenses are not closed.	Open lenses by turning counter-clockwise.
Step 2. Check BATTERY VOLTAGE meter.	a. If meter does not read in green zone, see malfunction 1 or 4.

Table 4-2. Organizational Troubleshooting (continued)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION
7. (continued) b. If meter reads in green zone, do step 3. step 3. Check LIGHTS 7.5 circuit breaker on control panel (figure 2-1). a. If circuit breaker is closed (pushed in), go to step 4. b. If circuit breaker is open (out), reset by pushing in. If circuit breaker continues to open, disconnect battery and check all circuits fed by circuit breaker 1CB1 (see FO-1) for shorts. Step 4. Set LIGHTS PANEL switch to BRT. a. If panel lights above control panel light, set switch to OFF and do step 5. b. If panel lights above control panel do not light, set switch to OFF and go to step 6. Step 5. Disconnect battery and test PRESS TO TEST switch 1S4 (malfunction 79). a. Replace switch if defective (paragraph 4-104.d), and perform operational check. b. If switch tests good, check switch wiring (refer to FO-2). Replace any defective wiring, and perform operational check. Step 6. Disconnect battery and lower control panel (paragraph 4-24.a). Check for continuity between positive receptacle of battery terminal adapter and terminal 2 on MASTER SWITCH 1S2 (refer to FO-1). a. If continuity, continue with step 7. b. If no continuity, go to step 9. Step 7. With battery disconnected, set MASTER SWITCH to ON and check for continuity between switch terminals 2 and 3. Set switch to OFF. a. If no continuity, replace switch (paragraph 4-104.c), and perform operational check.

Table 4-2. Organizational Troubleshooting (continued)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION
7. (continued)
b. If continuity, do step 8.
Step 8. Check for continuity between terminals of LIGHTS 7.5 circuit breaker 1CH1.
a. If no continuity, replace circuit breaker (paragraph 4-105), and perform operational check.
b. If continuity, check wire P36A20 between circuit breaker and MASTER SWITCH.
Step 9. Check for continuity between shunt R2+ terminal (large top screw) and Shunt R3+ terminal (large left screw).
a. If no continuity, replace P33C6, and perform operational check.
b. If continuity, do next step.
Step 10. Check for continuity between large terminals of shunt R3.
a. If no continuity, replace shunt R3 (paragraph 4-30), and perform operational check.
b. If continuity, do next step.
Step 11. Open electrical trays access door and pull tray out. Disconnect main harness connector P9 from lower tray connector J9. Check for continuity between P9-R and shunt R3- (large right screw).
a. If no continuity, replace wire P33D18. Reconnect P9 to J9, and perform operational check.
b. If continuity, do next step.
Step 12. Remove battery charger access cover. Disconnect main harness connector P5 from control panel connector J5. Check for continuity between P9-P and P5-21R.
a. If no continuity, replace wire P34C20. Reconnect all connectors, and perform operational check.

Table 4-2. Organizational Troubleshooting (continued)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

7. (continued)

b. If continuity, do next step.

Step 13. Check for continuity between J5-21L and terminal 2 of MASTER SWITCH 1S2.

a. If no continuity, replace wire P34D20. Reconnect all connectors, and perform operational check.

b. If continuity, test battery/charger transfer relay 3K3 and wiring (malfunction 85, step 1).

8. FUEL METER READING INACCURATE.

Step 1. Push control panel PRESS TO TEST switch and check that LOW FUEL indicator lights.

a. If LOW FUEL indicator lights, do step 2.

b. If LOW FUEL indicator does not light, see malfunction 6 or 7.

Step 2. Disconnect battery and lower control panel (paragraph 4-24.a). Disconnect wire from negative (-) terminal of FUEL meter 1M3 (see FO-4). Tape wire terminal lug to prevent shorting.

WARNING

Battery power may be present at terminals on back of control panel when battery is connected. Do not touch any bare terminals.

Step 3. Connect battery. Set MASTER switch to ON. Measure dc voltage between positive (+) terminal of FUEL meter 1M3 and ground. Set MASTER SWITCH to OFF, and disconnect battery.

a. If voltage was between 4.6 vdc and 5.6 vdc (normal), go to step 7.

b. If voltage was 0 vdc, reconnect wire to negative (-) terminal of meter 1M3, and go to step 5.

c. If voltage was between 22 and 26 vdc, reconnect wire to negative (-) terminal of meter 1M3, and continue with next step.

Table 4-2. Organizational Troubleshooting (continued)

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

8. (continued)

Step 4. Check for continuity between TB1-14 (ANODE) and ground. See figures 4-20 and 4-21 for TB location.

a. If continuity, replace zener diode TB3-CR1 (paragraph 4-33), and perform operational check.

b. If no continuity, replace wire between TB1-14 (ANODE) and ground TB, or notify maintenance supervisor.

Step 5. Disconnect wire from TB1-15 (anode). Measure resistance between TB1-15 (anode) and TB1-15 (CATHODE). See figures 4-20 and 4-21 for TB location. Reconnect wire to TB1-15 (ANODE).

a. If resistance was between 170 and 270 ohms (normal), do step 6.

b. If resistance was not between 170 and 270 ohms, replace resistor TB1-R1 (paragraph 4-33), and perform operational check.

Step 6. Remove battery charger access cover. Disconnect main harness connector P5 from control panel connector J5. Check for continuitv between the points listed below (see FO-4):

Check continuity From	To	If no continuity, replace wire no.
J5-12L	1M3(+)	Q2B20
J5-12R	1DS5(+)	Q1C20
P5-12L	TB1-15 (ANODE)	Q1D20
P5-12R	TB1-15 (CATHODE)	Q2A20

a. If no continuity, replace indicated wire.

b. If all continuity checks good, check for short between TBl-15 (CATHODE) and ground.

C. Reconnect P5 to J5, and perform operational check.

Table 4-2. Organizational Troubleshooting (continued)

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

8. (continued)

Step 7. Check resistance between wire Q6A20 (disconnected from FUEL meter 1M3) and ground. Resistance should be between 33 ohms (fuel tank full) and 240 ohms (fuel tank empty). Reconnect wire to negative (-) terminal of meter 1M3.

a. If resistance was normal (33 to 240 ohms), suspect FUEL meter 1M3 (see note in paragraph 4-107).

b. If circuit was open, do next step.

Step 8. Remove battery charger access cover. Disconnect main harness connector P5 from control panel connector J5. Check for continuity between the points listed below (see FO-4):

Check continuity From	To	If no continuity, replace wire no.
J5-14R	1M3(-)	Q6A20
P5-14L	MT1(+)	Q6B20
Ground	MT1(-)	Q7C20N

Fuel level transmitter (or sensor) MT1 is item 4 in figure 4-51.

a. If no continuity, replace indicated wire.

b. If all continuity checks good, replace fuel level transmitter MT1 (paragraph 4-71).

c. Reconnect P5 to J5, and perform operational check.

9. HYDRAULIC CONTROL PANEL INDICATOR LIGHT FAILS - ONE INDICATOR DOES NOT LIGHT.

Step 1. Remove indicator lens and check bulb.

a. Replace bulb if defective, and perform operational check.

b. If bulb is good, do step 2.

Table 4-2. Organizational Troubleshooting (continued)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION
9. (continued)

NOTE

Diodes and wiring associated with each indicator light are as follows (see FO-9):

Indicator	Diode	Wiring
4DS1	4D4	C116B16
4DS2	4D8	C104116
4DS3	4D5	C114B16
4DS4	4D6	C113B16
4DS5	4D7	C112B16
4DS6	4D1	C103F16 and C120A16
4DS7	4D3	C118C16

Step 2. Refer to FO-9 and locate diode associated with indicator light. Test diode as follows:

a. Disconnect battery.

b. Remove hydraulic module front panel assembly (2, figure 1-10).

C. Remove hydraulic electrical panel (paragraph 4-90). Disconnect lead containing diode from positive terminal on indicator socket.

d. Using an analog multimeter (AN/PSM4 or equivalent), on X1 scale, measure resistance from diode anode (multimeter positive lead) to diode cathode (meter negative lead). (Diode cathode is marked with black band.) If resistance is greater than 1 ohm, replace diode, and perform operational check.

e. Set meter to X10,000 scale and measure resistance from diode cathode (multimeter positive lead) to diode anode (meter negative lead). If resistance is less than 10K ohm, replace diode, and perform operational check.

f. If diode tests good, do step 3.

Table 4-2. Organizational Troubleshooting (continued)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

9. (continued)

Step 3. Refer to FO-9 and check indicator wiring.

a. Replace or repair any defective wiring.

b. Connect lead containing diode to positive terminal on indicator socket. If all wiring is good, replace lamp socket (paragraph 4-91).

c. Perform operational check.

10. HYDRAULIC CONTROL PANEL INDICATOR LIGHT TEST FAILS - NO INDICATORS LIGHT.

Step 1. Check that indicator lenses are not closed, and that MASTER SWITCH is on.

Open lenses by turning counterclockwise.

Step 2. Check hydraulic panel CIRCUIT BREAKER.

a. If circuit breaker is closed (pushed in), go to step 3.

b. If circuit breaker is open (out), reset by pushing in. If circuit breaker continues to open, check all circuit breaker loads (see FO-9) for shorts.

Step 3. Connect battery and set MASTER SWITCH to ON. On hydraulic panel, set PANEL LIGHTS switch to BRT position and check hydraulic module panel lights. Set PANEL LIGHTS and MASTER SWITCH to OFF.

a. If panel lights lit, do step 4.

b. If panel lights did not come on, go to step 5.

Step 4. Disconnect battery and test hydraulic panel PRESS TO TEST LIGHTS switch 4S3 (see malfunction 80).

a. Replace switch if defective (paragraph 4-90).

b. If switch tests good, remove hydraulic module front panel assembly (2, figure 1-10). Check wiring between switch 4S3 and diodes 4D1 through 4D8 for continuity (see FO-9). Replace any defective wiring.

Table 4-2. Organizational Troubleshooting (continued)

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

10. (continued)

c. Perform operational check.

Step 5. Check MASTER SWITCH 1S2 (see malfunction 79).

a. Replace switch if defective (paragraph 4-104.c), and perform operational check.

b. If switch is good, do step 6.

Step 6. Check battery/charger transfer relay 3K3 (see malfunction 85, step 1).

a. If relay is good, do step 7 below.

b. If relay test is not good, check wiring as directed in malfunction 85, step 1.k.

Step 7. Remove roof (paragraph 4-16), Check for continuity between the following points (see FO-1 and FO-9):

Check continuity From	To	If no continuity, replace wire no.
P9-M	P7-4L	C1018
J7-4R	1S2-11	C1E18
J7-5L	1S2-12	C1F18
P7-5R	P14-J	C1C20
P14-I	GND TB (2, figure 4-20)	C2A20N

a. If no continuity, replace indicated wire, and perform operational check.

b. If all continuity checks good, do step 8.

Step 8. On hydraulic module, check wires between 4TB1-2 and 4S3, and between 4TB1-12 and the indicator light negative terminals (see FO-9) for continuity.

a. Replace any defective wires, and perform operational check.

Table 4-2. Organizational Troubleshooting (continued)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION
10. (continued) b. If all continuity checks were good, wires inside the hydraulic module (between J1-J and 4TB1-2, or between J1-I and 4TB1-12) are open. These wires are not accessible at organizational level. Notify maintenance supervisor.
11. PANEL LIGHT OPERATION DEFECTIVE. Step 1. Connect battery and set MASTER SWITCH to ON. Set PANEL LIGHT switch to BRT and check panel lights. Set PANEL LIGHT switch to DIM and check panel lights. Set switch to OFF. (See figure FO-2.1) a. If neither light was on in BRT or DIM position, do steps 2 through 7. b. If lights were on in BRT position only, do steps 8 and 9. C. If lights were on in DIM position only, do steps 10 and 11. d. If one light only was on, do steps 12 and 13. Step 2. Push PRESS TO TEST switch (momentarily). a. If control panel indicators lit, do step 3. b. If control panel indicators did not light, see malfunction 7. Step 3. Set UTILITY LIGHTS switch to BRT and check fuel utility light at fuel filler (5, figure 1-1). Set UTILITY LIGHTS switch to OFF. a. If fuel utility light was lit, do step 4. b. If fuel utility light did not light, set MASTER SWITCH to OFF and disconnect battery. Lower control panel (paragraph 4-24.a). Check wire L1A20 between 1CB1 (FO-1) and 1S6-2 (FO-2). Replace defective wire and perform operational check. Step 4. Set MASTER SWITCH to OFF and disconnect battery. Check panel light bulbs. a. Replace defective bulbs with good bulbs, and perform operational check.

Table 4-2. Organizational Troubleshooting (continued)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION
11. (continued)
b. If bulbs were good, do step 5.
Step 5. Test PANEL LIGHTS switch 1S6 (see malfunction 79).
a. Replace switch if defective (paragraph 4-104.c), and perform operational check.
b. If switch test was good, do step 6.
Step 6. Check wire L6B20N between right panel lamp socket negative terminal, and GND TB (2, figure 4-20).
a. Replace wire if defective, and perform operational check.
b. If wire is good, do step 7.
Step 7. Disconnect main harness connector P8 from lower tray connector J8. Check wire L3C20 between P8-T and right panel lamp socket positive terminal.
Replace defective wire. Reconnect connector, and perform operational check.
Step 8. Set MASTER SWITCH to OFF and disconnect battery. Test PANEL LIGHTS switch 1S6 (see malfunction 79).
a. Replace switch if defective (paragraph 4-104.c), and perform operational check.
b. If switch is good, do step 9.
Step 9. Check voltage regulator 3VR1 and wiring as follows:
a. Open electrical trays access door and extend lower electrical tray (paragraph 4-24.b). Using an analog multimeter (AN/PSM4 or equivalent) on Xl scale, measure resistance between voltage regulator 3VR1 mounting screw (6, figure 4-28) and either of two pins (10). If resistance is greater than 25 ohms, replace regulator 3VR1 (paragraph 4-37), and perform operational check. If resistance is less than 25 ohms (regulator good), check wiring per step b.

Table 4-2. Organizational Troubleshooting (continued)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

11. (continued)

b. Remove battery charger access cover. Disconnect main harness connector P6 from control panel connector J6, and disconnect harness connector P8 from lower tray connector J8. Check for continuity between the following points:

Check continuity From	To	If no continuity, replace wire no.
1S6-1	J6-N	L2A20
P6-N	P8-S	L2B20
58-S	3VR1-pin	G5G20
J8-T	3VR1-screw	G19A20

Replace open wire. After replacement, reconnect all connectors, and perform operational check.

Step 10. Test PANEL LIGHTS switch 1S6 (see malfunction 79).

a. Replace switch if defective (paragraph 4-104.c), and perform operational check.

b. If switch is good, do step 11.

Step 11. Check wiring between switch 1S6-3 and right panel lamp socket positive terminal.

Replace defective wiring and perform operational check.

Step 12. Set MASTER SWITCH to OFF and disconnect battery. Check panel light bulb.

a. Replace defective bulb with good bulb, and perform operational check.

b. If bulb is good, do step 13.

Step 13. Check wires (L3D20 and L6A20N) between left and right panel light sockets.

a. Replace defective wiring.

Table 4-2. Organizational Troubleshooting (continued)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION
11. (continued) b. If wiring is good, replace socket for failed light. c. Perform operational check.
12. UTILITY LIGHT OPERATION DEFECTIVE. Step 1. Connect battery and set MASTER SWITCH to ON. Set UTILITY LIGHTS switch to BRT and check utility lights (41, 47, 50, figure 4-12). Set UTILITY LIGHTS switch to DIM and check utility lights. Set switch to OFF. (See figure FO-2.) a. If no utility light was on in BRT or DIM position, do steps 2 through 5. b. If lights were on in BRT position only, do steps 6 and 7. c. If lights were on in DIM position only, do steps 8 and 9. d. If one or two utility lights only were on, do steps 10 and 11. Step 2. Set PANEL LIGHTS switch to BRT and check panel lights. Set PANEL LIGHTS switch to OFF. a. If panel lights lit, do step 3. b. If panel lights did not light, see malfunction 11. Step 3. Set MASTER SWITCH to OFF and disconnect battery. Test UTILITY LIGHTS switch 1S7 (see malfunction 79). a. Replace switch if defective (paragraph 4-104.c), and perform operational check. b. If switch test was good, do step 4. Step 4. Check wire L1B20 between switches 1S7-2 and 1S6-2. a. Replace wire if defective, and perform operational check. b. If wire is good, do step 5.

Table 4-2. Organizational Troubleshooting (continued)

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

12. (continued)

Step 5. Disconnect main harness connector P9 from lower tray connector J9. Check wire L5C20 between P9-B and engine oil utility lamp socket (47, figure 4-12) positive (+) terminal.

Replace defective wire, and perform operational check.

Step 6. Set MASTER SWITCH to OFF and disconnect battery. Test UTILITY LIGHTS switch 1S7 (see malfunction 79).

a. Replace switch if defective (paragraph 4-104.c), and perform operational check.

b. If switch test was good, do step 7.

Step 7. Check voltage regulator 3VR2 and wiring as follows:

a. Open electrical trays access door and extend lower electrical tray (paragraph 4-24.b). Using an analog multimeter (AN/PSM4 or equivalent) on X1 scale, measure resistance between voltage regulator 3VR2 mounting screw (6, figure 4-28) and either of two pins (10). If resistance is greater than 25 ohms, replace regulator 3VR2 (paragraph 4-371, and perform operational check. If resistance is less than 25 ohms (regulator good), check wiring per step b.

b. Remove battery charger access cover. Disconnect main harness connector P6 from control panel connector J6, and disconnect harness connector P9 from lower tray connector J9. Check for continuity between the following points:

Check continuity From	To	If no continuity, replace wire no.
1S7-1	J6-R	L4A20
P6-R	P9-A	L4B20
J9-A	3VR2-pin	G6G20
J9-B	3VR2-screw	G20A20

Replace open wire. After replacement, reconnect all connectors, and perform operational check.

Table 4-2. Organizational Troubleshooting (continued)

MALFUNCTION TEST OR INSPECTION	CORRECTIVE ACTION
12. (continued)	
Step 8. Test UTILITY LIGHTS switch 1S7 (see malfunction 79).	a. Replace switch if defective (paragraph 4-104.c), and perform operational check. b. If switch is good, do step 9.
Step 9. Check wiring between switch 1S7-3 and engine oil utility lamp socket positive (+) terminal.	Replace defective wiring, and perform operational check.
Step 10. Set MASTER SWITCH to OFF and disconnect battery. Check utility light bulb.	a. Replace defective bulb with good bulb, and perform operational check. b. If bulb is good, do step 11.
Step 11. Check wiring between utility light socket positive terminals, and between socket negative terminals and ground.	a. Replace defective wiring. b. If wiring is good, replace socket for failed light. c. Perform operational check.
13. GTE LOW OIL PRESS INDICATOR NOT LIT - MASTER SWITCH ON AND ENGINE NOT RUNNING.	
Step 1. Test low oil pressure switch (malfunction 89).	a. Replace switch if defective (paragraph 4-41), and perform operational check. b. If switch tests good, do step 2.

Table 4-2. Organizational Troubleshooting (continued)

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

13. (continued)

Step 2. Test diode TB3-CR8 (malfunction 82).

a. Replace diode if defective (paragraph 4-33.b), and perform operational check.

b. If diode is good, continue with next step.

Step 3. Check that battery is disconnected. Lower control panel (paragraph 4-24.a) and remove battery charger access cover. Disconnect main harness connector P5 from control panel connector J5, and disconnect harness connector P4 from ECU connector J1 (see FO-3 sheet 2). Check for continuity between the points listed below:

Check continuity From	To	If no continuity, replace wire no.
J5-7L	DS10(-)	E12B20
P5-7R	TB3-2 (ANODE)	E12C20
TB3-2 (ANODE)	TB3-6 (ANODE)	E12E20
P4-L	TB3-6 (CATHODE)	E12D20

a. If no continuity, replace indicated wire. Reconnect all connectors, and perform operational check.

b. If all continuity checks good, do next step.

Step 4. Disconnect engine harness connector P2 from ECU connector J2, and disconnect engine harness P8 from low oil pressure switch. Check wires K0A20 (P2-F to P8-A) and K9A20N (P2-B to P8-B) for continuity.

a. If either wire is open, replace wire.

b. If wiring is good, replace ECU (paragraph 4-31).

C. Reconnect all connectors, and perform operational check.

14. GTE LOW FUEL PRESS INDICATOR NOT LIT - MASTER SWITCH ON AND ENGINE NOT RUNNING.

Set MASTER SWITCH to OFF and disconnect battery. Lower control panel (paragraph 4-24.a) and remove battery charger access cover. -Disconnect main harness connector P5 from control panel connector J5. Check for continuity between the following points (see FO-4).

Table 4-2. Organizational Troubleshooting (continued)

MALFUNCTION TEST OR INSPECTION	CORRECTIVE ACTION

14. (continued)

Check continuity From	To	If no continuity, replace wire no.
J5-13L	1DS6(-)	Q5A20
P5-13R	S5	Q5B20
S5	GND TB	Q7B20N

See figure 4-53 (10) for pressure sensor S5 location, and figure 4-20 (2) for GND TR location.

a. If no continuity, replace indicated wire.

b. If all continuity checks good, replace fuel pressure sensor S5 (paragraph 4-73).

c. Reconnect connectors, and perform operational check.

15. ENGINE DOES NOT MOTOR WITH ENGINE CONTROL SWITCH HELD IN START POSITION (MASTER SWITCH ON AND ALL OTHER SWITCHES OFF).

Step 1. Check GTE 10 AMP circuit breaker.

a. If circuit breaker is closed (pushed in), go to Step 2.

b. If circuit breaker is opened (popped out), reset (push in). If circuit breaker continues to open, disconnect battery and check all GTE circuit breaker loads (see FO-1 and F0-3 sheet 1) for shorts.

Step 2. Check GTE indicator lights.

a. If CONTROL SHORT, HIGH EGT, HIGH OIL TEMP, or OVER SPEED indicator light is illuminated, see malfunctions 30 through 33.

b. If CONTROL SHORT, HIGH EGT, HI OIL TEMP, and OVER SPEED indicators are all extinguished, continue with step 3.

Step 3. Test starter circuits as follows:

a. Disconnect battery and remove roof.

Table 4-2. Organizational Troubleshooting (continued)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION
15. (continued)
b. Connect multimeter between positive terminal on starter (9, figure 4-58) and dc ground stud. Positive terminal is on side of starter. Set meter to read 24 vdc.
c. Connect battery and set MASTER SWITCH to ON.
d. Set ENGINE control switch to START and check multimeter reading, STARTER ON indicator, and STARTER CURRENT meter. Set ENGINE CONTROL to STOP, MASTER SWITCH to OFF, and disconnect battery.
e. If STARTER CURRENT meter exceeded 800 amps after initial surge, see malfunction 17.
f. If starter voltage was ok (greater than 16 vdc) and starter did not operate, replace starter and perform operational check.
g. If starter voltage was low (less than 16 vdc) but STARTER ON indicator was lit, check cables P33A1/0 (FO-1), P41C1/0 (F0-3, sheet 1), P19A1/0, and P20A1/0N for clean and tight connections. Clean or tighten connections as required and perform operational check.
h. If STARTER ON indicator did not light, do step 4.
Step 4. Disconnect battery and lower control panel (paragraph 4-24.a). Check for continuity between shunt R3- (large right screw) and terminal 5 of MASTER SWITCH 1S2 (see FO-1).
a. If continuity, go to step 6.
b. If no continuity, continue with next step.
Step 5. Remove battery charger access cover. Disconnect main harness connector P5 from control panel connector J5, and disconnect harness connector P9 from lower tray connector J9. Check wires P35F18 and P35E18 between lower tray and MASTER switch (see FO-1) for continuity .
a. If either wire is open, replace wire, and perform operational check.

Table 4-2. Organizational Troubleshooting (continued)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION
15. (continued)
b. If wiring is good, test battery/charger transfer relay 3K3 and wiring as instructed in malfunction 85.
Step 6. Check for continuity between terminal 6 of MASTER SWITCH 1S2 and GTE circuit breaker 1CB2.
a. If no continuity, replace wire P37A18, and perform operational check.
b. If continuity, do step 7.
Step 7. Check for continuity between terminals of circuit breaker 1CB2.
a. If no continuity, replace circuit breaker, and perform operational check.
b. If continuity, continue with next step.
Step 8. Test control panel MASTER SWITCH 1S2 (FOO1), ENGINE CONTROL switch 1S1 (F0-3 sheet 1), PNEUMATIC POWER switch 1S8, AC POWER switch 1S10, and DC POWER switch 1.S12 (malfunction 79).
a. Replace any defective switch (paragraph 4-104), and perform operational check.
b. If all switches test good, do next step.
Step 9. Test hyadraulic control panel power switch 4S1 (malfunction 80).
a. Replace switch if defective (paragraph 4-90), and perform operational check.
b. If switch tests good, continue with next step.
Step 10. Test diode TB1-CR1 (malfunction 82).
a. Replace diode if defective (paragraph 4-33.b), and perform operational check.
b. If diode is good, do step 11.

Table 4-2. Organizational Troubleshooting (continued)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

15. (continued)

Step 11. Test starter latch relay 3K2 (malfunction 84).

a. Replace relay if defective (paragraph 4-36), and perform operational check.

b. If relay tests good, continue.

Step 12. Test starter contactor K4 (malfunction 86).

a. Replace contactor if defective (paragraph 4-29), and perform operational check.

b. If contactor tests good, do next step.

Step 13. Remove roof (paragraph 4-16). Disconnect P14 from hydraulic module connector J1. Check for continuity between J1-F and J1-E (see F0-3 sheet 1).

a. If continuity, do step 14.

b. If no continuity, go to step 15.

Step 14. Disconnect cables as required and check for continuity between wires listed below (see FO-1 and FO-3, sheet 1):

Check continuity From	To	If no continuity, replace wire no.
1CB2 load	1S1-1	E2A18
1S1-1	1S1-7	E2D18
1S1-6	J5-1L	E3B20
P5-1R	TB1-1 (ANODE)	E3C20
TB1-1 (CATHODE)	P8-P	E3D20
1CB2 load	J5-2L	E4G18
P5-2R	P18-B	L4H18
P8-B	Ground	E36C20N
P8-M	P4-A	E4H18
P4-J	K4-X1	E16A20
K4-X2	P14-E	E26A20
P5-11L	P14-F	E28A20

Table 4-2. Organizational Troubleshooting (continued)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

15. (continued)

Check continuity From	To	If no continuity, replace wire no.
J5-11R	1S8-4	E28B20
1S8-5	1S10-8	E27A20
1S10-7	1S12-7	E32A20
1S12-8	J5-1OL	E39A20N
P5-10R	Ground	E39B20N

a. If no continuity, replace indicated wire.

b. If all continuity checks good, replace ECU (paragraph 4-31).

b. Perform operational check.

Step 15. Remove hydraulic module front panel (2, figure 1-10) for access to terminal boards 4TB1 through 4TB3. Remove hydraulic electrical panel (paragraph 4-90) for access to switch 4S1. Check for continuity between 4TB1-7 and 4S1-5, and between 4TB1-6 and 4S1-4 (see FO-3, sheet 1).

a. If no continuity, replace wire c110C16 or C106A16.

b. If continuity wires (C106C16, C106B16, C110A16, or C110B16) are open. These wires are not accessible at organizational level. Notify maintenance supervisor.

16. ENGINE MOTORS WHEN ENGINE CONTROL SWITCH IS HELD IN START POSITION BUT STOPS WHEN SWITCH IS RELEASED TO RUN POSITION.

Step 1. Test ENGINE CONTROL switch 1S1 (see malfunction 79).

a. Replace switch if defective (paragraph 4-104.a), and perform operational check.

b. If switch tests good, do step 2.

Step 2. Test starter latching relay 3K2 (see malfunction 84).

a. Replace relay if defective (paragraph 4-36), and perform operational check.

Table 4-2. Organizational Troubleshooting (continued)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION
16. (continued) b. If relay tests good, do step 3. Step 3. Test EMERG STOP switch (see malfunction 93). a. Replace switch if defective (paragraph 4-47), and perform operational check. b. If switch tests good, do step 4. Step 4. Check wires E2E18 (1S1-11 to 1S1-12) and E2B18 (1S1-11 to J5-1R) between ENGINE CONTROL switch 1S1 and J5-1R (see FO-3 sheet 1). a. Replace or repair open wire. b. If wiring is good, replace starter latching relay 3K2 (paragraph 4-36). c. Perform operational check after replacing wire or relay.
17. STARTER CURRENT METER EXCEED 800 AMPS. Check cable P19A1/0 (FO-3 sheet 1) for shorted condition. a. Replace cable if shorted. b. If cable is not shorted, replace starter (paragraph 4-84). c. Perform operational check. NOTE If STARTER CURRENT meter still reads greater than 800 amps during engine start , engine may be overloading starter. Notify supervisor.
18. GTE % RPM METER INDICATION DEFECTIVE. Step 1. Test GTE speed sensor (see malfunction 88). a. Replace speed sensor if defective (paragraph 4-40), and perform operational check.

Table 4-2. Organizational Troubleshooting (continued)

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

18. (continued)

b. If speed sensor tests OK, continue with next step.

Step 2. Check that battery is disconnected and lower control panel (paragraph 4-24 .a). Remove battery charger access cover. Disconnect harness connector P4 from ECU and disconnect P5 from control panel. Check for continuity between the following points (see FO-3, sheet 2):

Check continuity From	To	If no continuity, replace wire no.
P4-M	P5-L	E9A20
P4-c	P5-R	E10A20
J5-5R	1M2(+)	E9B20
J5-5L	1M2(-)	B10B20

a. If no continuity, replace indicated wire, and perform operational check.

b. If continuity, ECU or meter 1M2 is defective. Replace ECU (paragraph 4-31) or contact instrument repair shop (see note in paragraph 4-107) .

C. Perform onerational check after replacement of ECU or meter.

19. GTE EGT.METER INDICATION DEFECTIVE.

Test thermocouple (see malfunction 91).

20. ENGINE MOTORS BUT NO LIGHT' OFF - SHUT ENGINE CONTROL SWITCH OFF.

Check GTE indicator lights.

a. If CONTROL SHORT, HIGH EGT, HI OIL TEMP , or OVER SPEED indicator light is illuminated, see malfunctions 30 through 33.

b. If CONTROL SHORT, HIGH EGT, HI OIL TEMP, and OVER SPEED indicator lights are all extinguished, attempt restart. If' all indications are the same, see malfunction 29.

Table 4-2. Organizational Troubleshooting (continued)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION	
21. ENGINE MOTORS ABOVE 10% RPM BUT NO LIGHT OFF.	
Step 1.	Check that four-way valve control handle is set to correspond to fuel delivery source. If correctly set, continue with the next step.
Step 1.1	Check for draining from combuster drain line. If fuel is present continue with step 2.
Step 1.2	Inspect auxiliary fuel filter (paragraph 4-65) and FCU fuel filter (paragraph 4-69).
	a. Service or replace filters as required. and perform operational check.
	b. If filters are ok continue with next step.
Step 2.	Disconnect connector from ignition unit fuel control unit and shutdown solenoid. Inspect connector pins for corrosion. clean as required reconnect connectors .
	If still no light off, do step 3.
Step 3.	Test ignition unit (see malfunction 96).
	a. Replace ignition unit if defective (paragraph 4-83). and perform operational check.
	b. If ignition unit is ok, continue with next step.
Step 4.	Test fuel control unit (see malfunction 97).
	a. Replace fuel control unit if defective (paragraph 4-67), and perform operational check.
	b. If fuel control unit is ok, continue with next step.
Step 5.	Remove, inspect, and clean fuel nozzle (paragraph 4-68).
	a. Replace nozzle if defective, and perform operational check.
	b. If nozzle tests ok, continue with next step.
Step 6.	Test N shutdown shutdown solenoid (see malfunction 98).
	a. Replace shutdown solenoid if defective (paragraph 4-70). and perform operational check.
	b. If solenoid tests ok, continue with next step.

Table 4-2. Organizational Troubleshooting (continued)

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

21. (continued)

Step 7. Check that battery is disconnected, and lower control panel (paragraph 4-24.a). Disconnect engine harness connectors P2 from ECU, P4 from fuel shutoff solenoid, P7 from ignition unit, and P9 from fuel control unit torque motor. See FO-3, sheet 2. Check for continuity between the following points:

Check continuity From	To	If no continuity, replace wire no.
P2-J	P4 -A	G78A20
P2-U	P4-B	G8A20N
P2-N	P7-B	46A20N
P2-F	P7-A	19A20
P2-E	P9-1	Q19A20
P2-W	P9-3	Q20A20N

a. If no continuity, replace indicated wire.

b. If all continuity checks good, replace ECU (paragraph 4-31).

c. Perform operational check.

22. ENGINE HANGS DURING START - EGT LESS THAN NORMAL.

Step 1. Check GTE LOW FUEL PRESS indicator.

a. If indicator is off while engine is operating, go to step 4 of malfunction 21.

b. If indicator is on (red), do next step.

Step 2. Check auxiliary fuel pump.

a. If voltage is present between fuel pump leads when ENGINE CONTROL switch is set to START and pump does not run, replace fuel pump, and perform operational check.

b. If voltage was not present between fuel pump leads, do step 3.

Table 4-2. Organizational Troubleshooting (continued)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

22. (continued)

Step 3. Disconnect battery, lower control panel (paragraph 4-24.a), and remove battery charger access cover. Disconnect main harness connector P8 from lower tray connector J8. Check for continuity between P8-N and TB4-13, and between TB4-14 and dc ground stud (see F0-3 sheet 1).

a. If no continuity, replace wire (E31C20 or E41A20N), or notify maintenance supervisor.

b. If continuity checks good, replace lower tray harness wire E31A20 or notify maintenance supervisor.

23. ENGINE HANGS DURING START - EGT HIGHER THAN NORMAL.

Step 1. Check position of load control valve (paragraph 4-75) with engine operating.

a. If valve is not fully closed, see malfunction 61.

b. If valve is closed, continue with next step.

Step 2. Remove, inspect and clean fuel nozzle (paragraph 4-68).

a. Replace nozzle if defective.

b. If nozzle tests ok, notify maintenance supervisor. Other possible causes of malfunction are a hot section or slipping starter clutch.

24. FLAMING OR BOOMING ENGINE STARTS.

Remove, inspect and clean fuel nozzle (paragraph 4-68). Test ignition unit (see malfunction 96) and fuel control unit (malfunction 97).

a. Replace any defective component.

b. If no defective components are found, check for water in fuel.

c. Perform operational check.

Table 4-2. Organizational Troubleshooting (continued)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

25. ENGINE ACCELERATES TO 95% RPM AND THEN SHUTS DOWN.

Check GTE indicator lights.

a. If CONTROL SHORT, HIGH EGT, HI OIL TEMP, or OVER SPEED indicator light is illuminated, see malfunctions 30 through 33.

b. If CONTROL SHORT, HIGH EGT, HI OIL TEMP, and OVER SPEED indicator lights are all extinguished, attempt restart. If all indications are the same, see malfunction 29.

26. ENGINE SHUTS DOWN AT APPROXIMATELY 10 SECONDS AFTER REACHING 95% RPM.

Check GTE indicator lights.

a. If any GTE warning (red) indicator light is on, refer to appropriate malfunction (30 through 33).

b. If all GTE warning lamps are extinguished, see malfunction 29.

27. ENGINE ACCELERATES TO 100% RPM BUT RPM AND EGT FLUCTUATE (PNEUMATIC POWER OFF).

Step 1. Check GTE LOW FUEL PRESS indicator.

a. If indicator is extinguished while engine is operating, go to step 4.

b. If indicator is illuminated, continue with next step.

Step 2. Check auxiliary fuel pump.

a. If voltage is present between fuel pump leads when ENGINE CONTROL switch is Set to START and pump does not run, replace pump, and perform operational check.

b. If voltage was not present between fuel pump leads, do step 3.

Step 3. Disconnect battery, lower control panel (paragraph 4-24.a), and remove battery charger access cover. Disconnect main harness connector P8 from lower tray connector J8. Remove relay 3K2 from socket (paragraph 4-36.b). Check for continuity between P8-N and TB4-13, between TB4-14 and do ground stud and between J8N and relay 3K2 socket B2. (See F0-3 sheet 1).

Table 4-2. Organizational Troubleshooting (continued)

MALFUNCTION TEST OR INSPECTION	CORRECTIVE ACTION
27. (continued)	
	If no continuity, replace wire (E31C20 or E41A20N or E31A20), and perform operational check.
Step 4. Remove, inspect and clean fuel nozzle (paragraph 4-68). Test ignition unit (see malfunction 96), GTE Speed sensor (see malfunction 88), and fuel control unit (see malfunction 97).	
	a. Replace any defective components.
	b. If all components and wiring test good, replace ECU (paragraph 4-31).
	c. Perform operational check.
28. ENGINE OIL CONSUMPTION OR SMOKE EXCESSIVE.	
	Notify maintenance supervisor if oil consumption is 1 quart (or more) per 5-hour period, or if low oil pressure light on in 5 hours.
29. ENGINE SHUTS DOWN DURING NORMAL OPERATION.	
Step 1. Check GTE warning (red) indicator lights.	
	a. If any GTE red indicator is illuminated, refer to appropriate malfunction 30 through 33.
	b. If all GTE warning indicators are extinquished, continue with next step.
Step 2. Test power diodes 3CR7 through 3CR9 (see malfunction 85, step 2).	
	a. Replace defective diodes (paragraph 4-38), and perform operational check.
	b. If diodes are good, continue with step 3.
Step 3. Check diodes TB3-CR3 through TB3-CR7 (see malfunction 82).	
	a. Replace any defective diodes (paragraph 4-33.b), and perform operational check.
	b. If all diodes are good, continue with next step.

Table 4-2. Organizational Troubleshooting (continued)

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

29. (continued)

Step 4. Check that battery is disconnected, and lower control panel (paragraph 4-24.a). Refer to F0-3 sheet 2. Check wiring between diodes (TB3-CR3 through CR7) and indicator lamps, and between diodes and P4 as follows:

Check continuity From	To	If no continuity, replace wire no.
TB3 -3 ANODE	P5-8L	E13C20
TB3 -2 ANODE	P5-7R	E12C20
TB3 -6 ANODE	TB3 -2 ANODE	E12E20
TB3 -1 ANODE	P5-6R	E11C20
TB3 -4 ANODE	P5-9L	E14C20
TB3 -5 ANODE	P5-9R	E15C20
TB3 -3 CATHODE	P4-H	E13A20
TB3 -2 CATHODE	P4-D	E12A20
TB3 -6 CATHODE	P4-L	E12D20
TB3 -1 CATHODE	P4-G	E11A20
TB3 -4 CATHODE	P4-F	E14A20
TB3 -5 CATHODE	P4-E	E15A20
1DS9 (-)	J5-8R	E13B20
1DS10 (-)	J5-7L	E12B20
1DS12 (-)	J5-6L	E11B20
1DS4 (-)	J5-9R	E14820
1DS3 (-)	J5-9L	E15B20

a. Replace any open wires, and perform operational check.

b. If all wiring is good, continue with next step.

Step 5. Test fuel shutdown solenoid (see malfunction 98).

a. Replace fuel shutdown solenoid if defective (paragraph 4-70).

b. If fuel shutdown solenoid is good, replace ECU (paragraph 4-31).

c. Perform operational check.

Table 4-2. Organizational Troubleshooting (continued)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

30. GTE CONTROL SHORT INDICATOR LIT - ENGINE SHUT DOWN.

Step 1. If engine will not motor, disconnect battery and lower control panel. Disconnect main harness connector P4 from ECU and measure resistance from pin J of harness connector P4 to ground (figure FO-3 sheet 1).

a. If resistance is less than 10 ohms, starter contactor K4 or wire E16A20 is shorted. Replace as necessary.

b. If resistance is 10 ohms or more, replace ECU (paragraph 4-31).

c. Perform operational check.

Step 2. If no light off above 10% and no increase in EGT, turn ENGINE CONTROL switch to STOP. Set MASTER SWITCH off and disconnect engine harness connector P7 from ignition unit (paragraph 4-83). Restart engine.

a. If engine now motors beyond 10%, test ignition unit (malfunction 96).

b. If CONTROL SHORT indicator still illuminates at 10% rpm, do step 3.

Step 3. Set MASTER SWITCH off and disconnect engine harness connector P4 from fuel shutoff solenoid (paragraph 4-70). Restart engine.

a. If engine now motors beyond 10% rpm, test fuel shutdown solenoid (malfunction 98). If not, do step b.

b. Disconnect leads from hourmeter (8, figure 4-70). Restart engine. If engine now motors normally, replace hourmeter. If not, do step c.

c. If CONTROL SHORT indicator still illuminates at 10% rpm, disconnect battery and check engine harness wiring to ignition unit, hourmeter, and fuel shutdown solenoid. If wiring is not shorted to ground, replace ECU (paragraph 4-31).

d. Perform operational check.

Table 4-2. Organizational Troubleshooting (continued)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION
30. (continued)
Step 4. If engine shuts down at 95% rpm, disconnect battery and lower control panel. Disconnect main harness connector P4 from ECU and measure resistance from pin S of harness connector P4 and ground (figure FO-3 sheet 2). a. If resistance is leas than 200 ohms, 95% enable relay 3K1, or wire E17A20 (P4-S to P8-A) or E17B20 (3K1-X2 to J8-A) is shorted to ground. Replace as necessary. b. If resistance is 200 ohms or more, replace ECU (paragraph 4-31). c. Perform operational check.
Step 5. If engine shuts down when PNEUMATIC POWER switch is turned on, Set MASTER SWITCH off and disconnect engine harness connector P5 from load control valve (paragraph 4-75). Measure resistance between pins A and C of load control valve. a. If resistance is less than 30 ohms, replace load control valve (paragraph 4-75). b. If resistance is 38 ohms or more, disconnect battery and check engine harness wires M1A20 (P2-T to P5-C) and M2820N (P2-X to P5-A). If wiring is not shorted to ground, replace ECU (paragraph 4-31). c. Perform operational check.
Step 6. If engine shuts down during normal operation, set MASTER SNITCH off and disconnect engine harness connector P4 from fuel shutdown solenoid (paragraph 4-70). Measure resistance between pins A and B of fuel shutdown solenoid. a. If resistance is less than 20 ohms, replace fuel shutdown solenoid (paragraph 4-70). b. If resistance is present check engine harness wires G7A20 (P2-J to P4-A) and G8A20N (P2-U to P4-B). If wiring is good, replace ECU (paragraph 4-31). c. Perform operational check.

Table 4-2. Organizational Troubleshooting (continued)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

31. GTE HIGH EGT INDICATOR LIT - ENGINE SHUT DOWN.

Step 1. Place MASTER SWITCH in off position and check visual position on aide of LCV (5, figure 4-56).

a. If valve is fully closed, go to step 2.

b. If valve is not fully closed, replace LCV (paragraph 4-75), and perform operational check.

Step 2. Test thermocouple (see malfunction 91).

a. Replace thermocouple if defective (paragraph 4-43), and perform operational check.

b. If thermocouple tests Rood, continue with next step,.

Step 3. Set MASTER SWITCH off and disconnect engine wiring harness connector P5 from load control valve (LCV) (paragraph 4-75). Check resistance between pins A and C of LVC. Resistance should be between 30 and 38 ohms.

a. If resistance is ok, check engine harness wires M1A20 (P2-T to P5-C) and M2820N (P2-X to P5-A) for continuity. Replace wiring if defective. If wiring is good, replace ECU (paragraph 4-31).

b. If resistance is not ok, replace LCV (paragraph 4-75).

c. Perform operational check.

32. GTE HI OIL TEMP INDICATOR LIT - ENGINE SHUT DOWN.

Step 1. Check oil level.

Add oil if required.

Step 2. Test high oil temperature (HOT) switch (see malfunction 90).

a. Replace switch if defective (paragraph 4-42), and perform operations check.

b. If switch is good, fault may be due to overloaded engine. Notify maintenance supervisor.

Table 4-2. Organizational Troubleshooting (continued)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION
33. GTE OVER SPEED INDICATOR LIT - ENGINE SHUT DOWN. Test fuel control unit (see malfunction 97). a. Replace fuel control unit if defective (paragraph 4-67). b. If fuel control unit tests good, replace ECU (paragraph 4-31). c. Perform operational check.
34 l GTE LOW OIL PRESS INDICATOR LIT - ENGINE SHUT DOWN. Step 1. Check oil level. Add oil if required. Step 2. Check oil filter element (7, figure 4-61). Replace filter if required. Step 3. Check low oil pressure switch (see malfunction 89). a. Replace switch if defective (paragraph 4-41), and perform operational check. b. If switch is good, fault may be due to defective engine oil pump or pressure regulator. Notify maintenance supervisor.
35. GTE WARNING INDICATOR (CONTROL SHORT, HIGH EGT, OVER SPEED, HI OIL TEMP OR LOW OIL PRESS) LIT - ENGINE CONTINUES TO RUN. Shut engine down, and restart. If fault indicator remains on, shut system down. Replace ECU (paragraph 4-31) or notify maintenance supervisor.
36. GTE EGT METER READS IN RED BAND AND ENGINE CONTINUES TO RUN ABOVE 95% RPM. Check GTE EGT indicator light. a. If EGT light is lit, see malfunction 35.

Table 4-2. Organizational Troubleshooting (continued)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION
36. (continued)
b. If EGT light is off replace ECU (paragraph 4-31) or EGT meter 1M1 (paragraph 4-107.a). Perform operational check.
37. GTE %RPM METER READS IN RED BAND.
Check GTE OVER SPEED indicator light.
a. If OVER SPEED light is lit, see malfunction 35.
b. If OVER SPEED light is off, replace ECU (paragraph 4-31) or %RPM meter 1M2 (paragraph 4-107.a). Perform operational check.
38. GTE INLET FILTER BLOCKED INDICATOR LIT.
Check switch (see malfunction 92).
a. Replace switch if defective (paragraph 4-44), and perform operational check.
b. If switch tests good, inspect engine air cleaner (paragraph 4-19).
39. GTE COMPT/GEN HI TEMP INDICATOR LIT (AC POWER SWITCH OFF).
CAUTION If temperature in electrical bay near ECU exceeds 160°F, the COMPT/GEN HI TEMP indicator should be lit. Continued operation could damage ECU.
Step 1. Shut down engine, disconnect battery, and lower control panel (paragraph 4-24.a). Place thermometer on electrical bay subfloor (11, figure 4-12) near ECU.
a. Leave thermometer in place, replace control panel, and start engine. Operate system under same conditions that originally caused malfunction.
b. If COMPT/GEN HI TEMP indicator light comes on, go immediately to step 2.

Table 4-2. Organizational Troubleshooting (continued)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION
39. (continued)
c. If light does not come on, continue operation as required. When operation is complete, disconnect battery and remove thermometer.
NOTE Do steps 2 through 4 as quickly as possible before system cools down.
Step 2. Shut down engine. Disconnect battery and lower control panel. Check thermometer.
a. If thermometer indicates less than 155°F, go immediately to step 3.
b. If thermometer indicates 155°F or higher, allow system to cool before operating. Continued operation could damage ECU.
Step 3. Disconnect main harness connector P12 (36, figure 4-38) from generator control unit. Check resistance between pins G and H Of harness connector P12 (see FO-6 sheet 1).
a. If continuity between pins G and H of P12, the thermal switch in generator is closed, indicating an overtemp condition. If unit has been recently run with heavy ac load, allow unit to cool before operating. If unit has not been run with ac load, generator is defective. Notify maintenance supervisor.
b. If resistance between pins G and H of P12 is greater than 10K, reconnect P12 to GCU, and do step 4.
Step 4. Remove battery charger access cover. Disconnect main harness connector P5 from control panel connector J5 (see FO-3 sheet 2). Check for open circuit between pins 10L and 6L of P5.
a. If continuity between pins 10L and 6L of P5, replace compartment temperature switch S1 (paragraph 4-32).
b. If open circuit between pins 10L and 6L of P5, replace GCU (paragraph 4-54).

Table 4-2. Organizational Troubleshooting (continued)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION
39. (continued) c. Perform operational check.
40. ENGINE DOES NOT SHUT DOWN WHEN EMERG STOP SWITCH IS PRESSED. Step 1. Set ENGINE CONTROL switch to STOP. a. If engine now stops, replace EMERG STOP switch S2 (paragraph 4-47), and perform operational check. b. If engine continues to run, do step 2. Step 2. Set MASTER SWITCH to OFF. a. If engine now stops, go to step 3. b. If engine keeps running, pull GTE 10 AMP circuit breaker. If engine now stops, multiple faults exist. Test ENGINE CONTROL switch and MASTER switch (malfunction 79), and EMERG STOP switch (malfunction 93). c. If engine continues to run, fuel shutdown solenoid is defective. Wait until engine stops and replace fuel shutdown solenoid (paragraph 4-70). Step 3. Check starter latch relay 3K2 (malfunction 84). a. Replace relay 3K2 if defective (paragraph 4-36). b. If relay tests good, replace ECU (paragraph 4-31). c. Perform operational check.
41. ENGINE IS NOISY ON SHUTDOWN. Probable faults are fuel control unit, binding generator or engine, gear case, or hydraulic pump. Notify maintenance supervisor.
42. DC POWER ON INDICATOR OFF (ENGINE UP TO SPEED AND DC POWER SWITCH ON). Step 1. Check DC VOLTS meter. a. If DC VOLTS meter reads 0, go to step 3.

Table 4-2. Organizational Troubleshooting (continued)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION
42. (continued)
b. If DC VOLTS meter reads in green band, continue with next step.
Step 2. Disconnect battery. Lower control panel (paragraph 4-24.a) and remove battery charger access cover. Disconnect main harness connector P5 from control panel connector J5 (see FO-5). Check for continuity between P5-21L and dc contactor K2-B2, and between J5-21R and DC POWER ON indicator 1DS21(+).
a. If no continuity, replace open wire (P46A20 or P46B20).
b. If continuity checks good, replace dc contactor K2 (paragraph 4-52).
c. Reconnect P5 to J5, and perform operational check.
Step 3. Check DC VOLTAGE FAULT indicator.
a. If indicator is lit, see malfunction 43.
b. If indicator is not lit, do step 4.
Step 4. Test dc contactor K2 (malfunction 94).
a. Replace contactor if defective (paragraph 4-52), and perform operational check.
b. If contactor tests good, continue with step 5.
Step 5. Check for continuity between X2 of contactor K2 (figure FO-5) and ground.
a. If continuity (less than 1 ohm), go to step 7.
b. If no continuity, do step 6.
Step 6. Test DC POWER switch 1S12 (malfunction 79).
a. Replace switch if defective (paragraph 4-104.c).

Table 4-2. Organizational Troubleshooting (continued)

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

42. (continued)

b. If switch tests good, remove battery charger access cover and disconnect main harness connector P7 from control panel connector J7. Check for continuity between the following points (see FO-5):

Check continuity From	To	If no continuity, replace wire no.
P7-5L	K2-X2	P38B20
J7-5R	1S12-6	P38A20
1S12-5	1S2-9	P45A20

Replace any defective wire.

c. Perform operational check.

Step 7. Test 95% enable relay 3K1 (malfunction 83).

a. Replace relay if defective (paragraph 4-36), and perform operational check.

b. If relay tests good, do step 8.

Step 8. Remove 95% enable relay from socket (paragraph 4-36.f). Install control panel and start engine. After engine reaches 95% rpm, measure voltage (+28 vdc nominal) between X1 (positive) of relay socket and ground.

a. If +28 vdc is present, go to step 10.

b. If +28 vdc is not present, do step 9.

Step 9. Shut down engine and disconnect battery. Lower control panel. Disconnect main harness connector P8 from lower tray connector J8, and disconnect harness connector P4 from ECU connector J1 (5, figure 4-19). Check for continuity between the following points (see FO-3 sheet 2):

Table 4-2. Organizational Troubleshooting (continued)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

42. (continued)

Check continuity From	To	If no continuity, replace wire no.
J8-A	3K1 socket X1	E17B20
J8-B	3K1 socket X2	E38B20N
P8-A	P4-S	E17A20
P8-B	Dc ground stud	E35C20N

a. If no continuity, replace indicated wire.

b. If all continuity checks good, replace ECU (paragraph 4-31).

c. Perform operational check.

Step 10. Measure voltage (26 vac nominal) between 3K1 relay socket pins A1 and B1, between B1 and C1, and between A1 and C1 (figure FO-5). Shut engine down, disconnect battery, and install relay.

a. If voltages were normal, go to step 12.

b. If voltages were not present, do step 11.

Step 11. Disconnect main harness connector P8 from lower tray connector J8. Open engine access door and disconnect harness connector P13 from generator connector J1 (5, figure 4-39). Check for continuity between the following points (see FO-5):

Check continuity From	To	If no continuity, replace wire no.
P8-G	P13-E	P4A20
P8-E	P13-H	P5A20
P8-C	P13-J	P6A20

a. If no continuity, replace indicated wire no., and perform operational check.

b. If all continuity checks good, the generator is defective. Notify maintenance supervisor.

Table 4-2. Organizational Troubleshooting (continued)

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

42. (continued)

Step 12. Disconnect main harness connector P8 from lower tray connector, and disconnect harness connector P12 from GCU connector J1 (37, figure 4-38). Check for continuity between the following points (see FO-5):

Check continuity From	To	If no continuity, replace wire no.
P8-H	P12-W	P13A20
P8-F	P12-X	P12A20
P8-D	P12-Z	P11A20
K2-X1	P12-H	P14A20

a. If no continuity, replace indicated wire.

b. If all continuity checks good, replace ECU (paragraph 4-31).

c. Perform operational check.

43. DC VOLTAGE FAULT INDICATOR LIT.

Step 1. While observing DC meters and indicators, momentarily set DC POWER switch to RESET, then return to ON.

a. If DC VOLTAGE FAULT indicator turns off (momentarily), go to step 4.

b. If indicator does not turn off, do step 2.

Step 2. Test DC POWER switch 1S12 (malfunction 79).

a. Replace switch if defective (paragraph 4-104.c) and perform operational check.

b. If switch tests good, do step 3.

Table 4-2. Organizational Troubleshooting (continued)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

43. (continued)

Step 3. Shut down engine and disconnect battery. Remove battery charger access cover. Disconnect main harness connector P7 from control panel connector J7. Lower control panel (paragraph 4-24.a), and disconnect harness connector P12 (36, figure 4-38) from GCU. Check for continuity between the following points (see FO-6 sheet 2):

Check continuity From	To	If no continuity, replace wire no.
1S12-2	1S10-2	X20C20
1S10-2	J7-13R	X20B20
P7-13L	P12-S	X20A20

a. If no continuity, replace indicated wire.

b. If all continuity checks good, replace GCU (paragraph 4-54).

c. Perform operational check.

Step 4. Check DC VOLTAGE FAULT indicator.

a. If indicator is now off, continue operation if no abnormal indications are observed.

b. If DC VOLTAGE FAULT lights again, perform applicable steps based on indications following:

c. If DC VOLTS meter registered no voltage and DC POWER ON indicator did not light before voltage fault, do step 5.

d. If DC OVER CURRENT indicator lit before voltage fault, do step 9.

e. If DC VOLTS meter read in or above green band before voltage fault, go to step 10.

f. If DC VOLTS meter read low (less than 20 vdc) before voltage fault, go to step 13.

Table 4-2. Organizational Troubleshooting (continued)

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

43. (continued)

Step 5. Test dc contactor K2 (malfunction 94).

a. Replace contactor if defective (paragraph 4-52), and perform operational check.

b. If contactor tests good, continue with step 6.

Step 6. Check for continuity between X2 of contactor K2 (figure FO-5) and ground.

a. If continuity (less than 1 ohm), go to step 8.

b. If no continuity, do step 7.

Step 7. Test DC POWER switch 1S12 (malfunction 79).

a. Replace switch if defective (paragraph 4-104.c), and perform operational check.

b. If switch tests good, remove battery charger access cover and disconnect main harness connector P7 from control panel connector J7. Check for continuity between the following points (see FO-5):

Check continuity From	To	If no continuity, replace wire no.
P7-5L	K2-X2	P38B20
J7-5R	1S12-6	P38A20
1S12-5	1S2-9	P45A20

Replace any defective wire, and perform operational check.

Step 8. Disconnect main harness connector P12 from GCU connector J1 (37, figure 4-38). Open engine access panel and disconnect harness connector P13 from generator connector J1 (5, figure 4-39). Check for continuity between the following points (see FO-5, and FO-6 sheet 1):

Table 4-2. Organizational Troubleshooting (continued)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

43. (continued)

Check continuity From	 To	If no continuity, replace wire no.
P13-A	P12-T	P7A20
P13-B	P12-V	P8A20
P13-C	P12-Y	P9A20
P13-D	P12-D	X5A20
P13-F	P12-F	X6A20
K2-X1	P12-H	P14A20
K2-A1	K2-B1	P2D20
K2-B1	P12-M	P2E20
K2-A1	Generator dc + terminal	P2A4/0
Dc ground stud	Generator dc - terminal	P1A4/ON

a. If no continuity, replace indicated wire, and perform operational check.

b. If all continuity checks good, most probable cause of fault is GCU. The generator is also a possible cause of fault. Replace GCU (paragraph 4-54) or notify maintenance supervisor.

Step 9. Shut down unit and disconnect battery. Check load and dc output power cables for possible shorts.

a. Correct load or replace cables as required.

b. If DC AMPS meter reading did not exceed 1070 during over current fault, and load and output cables are not shorted, replace GCU (paragraph 4-54).

c. Perform operational check.

Step 10. Check CHRG/BAT FAULT indicator.

a. If indicator is lit (with engine running), see malfunction 3.

b. If indicator is not lit, do step 11.

Table 4-2. Organizational Troubleshooting (continued)

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

43. (continued)

Step 11. Shut down engine and disconnect battery. Open electrical trays access door. Remove one wire from generator dc load resistor R4 (11, figure 4-25). Check resistance across load resistor terminals (see FO-1).

a. If resistance is between 4 and 6 ohms, reconnect wire to resistor and do step 12.

b. If resistance is not between 4 and 6 ohms, replace resistor R4 (paragraph 4-34), and perform operational check.

Step 12. Check wires P23B8 (between dc load resistor R4 and 2CB2) and P21D8N (between dc load resistor R4 and dc ground stud) for continuity.

a. If no continuity, replace wire (P23B8 or P21D8N).

b. If continuity checks good, probable cause of fault is GCU. The generator is also a possible cause of fault. Replace GCU (paragraph 4-54), or notify maintenance supervisor.

c. Perform operational check.

Step 13. Test CURRENT LIMIT SELECTOR switch 1S11 (see malfunction 79).

a. Replace switch if defective (paragraph 4-104.b), and perform operational check.

b. If switch tests good, do step 14.

Step 14. Remove battery charger access cover and disconnect main harness connector P7 from control panel connector J7. Lower control panel (paragraph 4-24.c) and disconnect harness connector P12 (36, figure 4-38) from GCU. Check for continuity between the following points (see FO-6 sheet 2):

Check continuity From	To	If no continuity, replace wire no.
1S11B-6	J7-24R	XS1B20
1S11B-7	J7-24L	X50620
1S11B-8	J7-23R	X49B20

Table 4-2. Organizational Troubleshooting (continued)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

43. (continued)

Check continuity From	To	If no continuity, replace wire no.
1S11B-C	J7-A	X53B20
P7-24L	P12-T	X51A20
P7-24R	P12-U	X50A20
P7-23L	P12-V	X49A20
P7-A	P12-W	X53A20

a. If no continuity, replace indicated wire.

b. If all continuity checks good, reconnect harness connector P7 to control panel J7. Replace GCU and connect harness connector P12 to GCU. Perform operational check.

44. DC VOLTS METER READS 0 (DC POWER ON INDICATOR LIT).

Step 1. Check for voltage (+28 vdc) between + and - pins of dc output cable connector. Shut down engine and disconnect battery.

a. If voltage at output cable, go to step 3.

b. If no voltage at output cable, do step 2.

Step 2. Test dc contactor K2 (see malfunction 94).

a. Replace contactor if defective (paragraph 4-52).

b. If contactor tests good, check cable P3A4/0 between contactor K2 and shunt R1 (see FO-5) for continuity. Replace cable if defective.

c. Perform operational check.

Step 3. Lower control panel (paragraph 4-24.a), and remove battery charger access cover. Disconnect main harness connector P5 from control panel connector J5. Check for continuity between the following points (see FO-5):

Table 4-2. Organizational Troubleshooting (continued)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

44. (continued)

Check continuity From	To	If no continuity, replace wire no.
J5-23R	1M11(-)	P53G20N
J5(-)	1M11(+)	P3D20
P5(-)	R1(+)	P3C20

a. If no continuity, replace indicated wire.

b. If all continuity checks good, replace DC VOLTS meter 1M11 (paragraph 4-107.a).

c. Perform operational check.

45. DC AMPS METER READS 0 (DC POWER ON INDICATOR LIT AND DC POWER CABLE CONNECTED TO LOAD).

Step 1. Check load.

a. If load is drawing current, go to step 2.

b. If load is not drawing current, shut down engine and disconnect battery. Check load and AGPU dc output cable.

c. Check for continuity between the two large screws on shunt RI (23, figure 4-18). If no continuity, replace shunt.

Step 2. Shut down engine and disconnect battery. Lower control panel (paragraph 4-24.a) and remove battery charger access cover. Disconnect main harness connector P5 from control panel connector J5. Check for continuity between the following points (see FO-5):

Check continuity From	To	If no continuity, replace wire no.
J5-C	1M12(-)	P17C20
J5(+)	1M12(+)	P18C20
P5-C	R1(-)	P17B20
P5(+)	R1(+)	P18B20

a. If no continuity, replace indicated wire or notify maintenance supervisor.

Table 4-2. Organizational Troubleshooting (continued)

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

45. (continued)

b. If all continuity checks good, replace DC AMPS meter 1M12 (paragraph 4-107.a).

c. Perform opertional check.

46. DC OVER CURRENT INDICATOR DOES NOT LIGHT WHEN DC AMPS METER READS MORE THAN 1070 AMPS.

Step 1. Set DC POWER switch off. Shut down engine and disconnect battery. Check diode 1CR10 (see malfunction 99).

a. Replace diode if defective (paragraph 4-108.b), and perform operational check.

b. If diode is good, do step 2.

Step 2. Remove battery charger access cover. Disconnect main harness connector P5 from control panel connector J5, and disconnect harness connector P12 from GCU connector. Check for continuity between the following points (see FO-5):

Check continuity From	To	If no continuity, replace wire no.
P5-19R	P12-E	P15A20
P12-J	R1(+)	P18A20
P12-Y	R1(-)	P17A20

a. If no continuity, replace indicated wire.

b. If all continuity checks good, the GCU is defective or the DC AMPS meter is reading high. Replace GCU (paragraph 4-54) or DC AMPS meter (paragraph 4-107.a), or notify maintenance supervisor.

c. Perform operational check.

47. DC VOLTAGE FAULT INDICATOR DOES NOT LIGHT FOLLOWING A DC OVER CURRENT FAULT.

Step 1. Note DC POWER ON indicator. If off, set DC POWER switch off.

a. Push PRESS TO TEST switch. Replace bulb if bad. If bulb is good, do step 2.

Table 4-2. Organizational Troubleshooting (continued)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

47. (continued)

b. If DC POWER ON indicator is on, set DC POWER switch off and do step 4.

Step 2. Shut down engine and disconnect battery. Check diode 1CR11 (see malfunction 99).

a. Replace diode if defective (paragraph 4-108.b), and perform operational check.

b. If diode is good, do step 3.

Step 3. Check for continuity between P5-19R and P12-E (figure FO-5).

a. If no continuity, replace wire P15A20.

b. If continuity, replace GCU (paragraph 4-54).

c. Perform operational check.

Step 4. Test dc contactor K2 (malfunction 94).

a. Replace contactor if defective (paragraph 4-52).

b. If contactor tests good, replace GCU (paragraph 4-54).

c. Perform operational check.

48. DC VOLTAGE FAULT INDICATOR DOES NOT LIGHT WHEN DC AMPS METER READING EXCEEDS MAXIMUM ALLOWABLE FOR THE CURRENT SELECTOR SWITCH SETTING.

NOTE

Maximum allowable current is:

MAXIMUM CURRENT	CURRENT LIMIT SELECTOR SWITCH SETTING
280	200A
700	500A
1000	700A

Table 4-2. Organizational Troubleshooting (continued)

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

48. (continued)

Step 1. Note DC POWER ON indicator and set DC POWER switch off.

If DC POWER ON indicator was off (before DC POWER switch was set to off), go to step 2 of malfunction 47. If not, continue with step 2 below.

Step 2. Test dc contactor K2 (malfunction 94).

a. Replace contactor if defective (paragraph 4-52), and perform operational check.

b. If contactor tests good, continue with step 3.

Step 3. Test CURRENT LIMIT SELECTOR switch 1S11 (malfunction 79).

a. Replace switch if defective (paragraph 4-104.b), and perform operational check.

b. If switch tests good, do step 4.

Step 4. Remove battery charger access cover. Lower control panel (paragraph 4-24.a). Disconnect main harness connector P7 from control panel connector J7, and disconnect harness connector P12 (36, figure 4-38) from generator control unit (GCU). Check for continuity between the following points (see FO-6 sheet 2):

Check continuity From	To	If no continuity, replace wire no.
1S11B-6	J7-24R	X51B20
1S11B-7	J7-24L	X50B20
1S11B-8	J7-23R	X49B20
1S11B-C	J7-A	X53B20
P7-24L	P12-T	X51A20
P7-24R	P12-U	X50A20
P7-23L	P12-V	X49A20
P7-A	P12-W	X53A20

a. If no continuity, replace indicated wire.

b. If all continuity checks good, replace GCU (paragraph 4-54).

Table 4-2. Organizational Troubleshooting (continued)

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

48. (continued)

c. Perform operational check.

49. DC V0LTAGE FAULT INDICATOR DOES NOT LIGHT WHEN DC VOLTS METER READS LESS THAN +20 VOLTS OR MORE THAN +32 VOLTS.

Do steps 1 through 4 of malfunction 47.

50. AC POWER ON INDICATOR OFF (ENGINE UP TO SPEED AND AC POWER SWITCH ON).

Step 1. Check AC VOLTS meter.

a. If AC VOLTS meter reads 0, go to step 3.

b. If AC VOLTS meter reads in green band, continue with step 2.

Step 2. Shut down engine and disconnect battery. Lower control panel (paragraph 4-24.a) and remove battery charger access cover. Disconnect main harness connector P7 from control panel connector J7, disconnect harness connector P12 (36, figure 4-38) from GCU, and disconnect harness connector P11 (32, figure 4-38) from ac contactor K1. Check for continuity between the following points (see FO-6 sheet 2):

Check continuity From	To	If no continuity, replace wire no.
J7-8L	1DS20(-)	X38B20
P7-8R	P11-C	X38A20
P11-D	GND TB	X35A20N

a. If no continuity, replace indicated wire.

b. If all continuity checks good, replace ac contactor K1 (paragraph 4-53).

c. Perform operational check.

Step 3. Check control panel AC warning (red) indicators.

a. If any red indicator is lit, refer to malfunction 51 or 52.

b. If all red indicators are off, do step 4.

Table 4-2. Organizational Troubleshooting (continued)

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

50. (continued)

Step 4. Test AC POWER switch 1S10 and CURRENT LIMIT SELECTOR switch 1S11 (malfunction 79).

a. Replace AC POWER or CURRENT LIMIT SELECTOR switch if defective (paragraph 4-104), and perform operational check.

b. If both switches test good, do step 5.

Step 5. Test ac contactor K1 (malfunction 95).

a. Replace contactor if defective (paragraph 4-53), and perform operational check.

b. If contactor test good, do step 6.

Step 6. Check that battery is disconnected. Lower control panel (paragraph 4-24 .a). Remove battery charger access cover. Disconnect main harness connector P7 from control panel connector J7, disconnect harness connector P12 (36, figure 4-38) from GCU connector J1, and disconnect harness connector P11 (32, figure 4-38) from ac contactor K1 connector J1. Check for continuity between the following points (see FO-6 sheet 2):

Check continuity From	To	If no continuity, replace wire no.
J7-13L	1S10-5	X36B20
J7-22R	1S11-AC	X47B20
J7-23L	1S11-A4	X48B20
1S11-A4	1S11-A3	X48C20
1S11-A3	1S11-A2	X48D20
1S11-A2	1S11-A1	X48E20
P7-13R	P11-B	X36A20
P7-22L	P12-P	X47A20
P7-23R	P12-E	X48A20
P11-A	P12-Q	X18A20

a. If no continuity, replace indicated wire and perform operational check.

b. If all continuity checks good, do step 7.

Table 4-2. Organizational Troubleshooting (continued)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

50. (continued)

Step 7. Check dc mode operation.

a. If dc mode operation is normal, replace CCU (paragraph 4-54), and perform operational check.

b. If dc mode operation is not normal, go to step 7 of malfunction 42.

51. AC OVER VOLTAGE, OR AC UNDER FREQUENCY INDICATOR LIT.

Step 1. Set AC POWER switch to RESET, then return to ON.

a. If all AC warning (red) indicators did not turn off (momentarily), go to step 2.

b. If all AC warning indicators are now off, continue operation if no other abnormal indications are observed.

c. If same warning indicator (AC OVER VOLTAGE or UNDER FREQUENCY) lights again, the most probable cause of fault is GCU. The generator is also a possible cause of fault, especially if COMPT/GEN HI TEMP indicator is illuminated. Replace GCU (paragraph 4-54), or notify maintenance supervisor. Perform operational check.

Step 2. Test AC POWER switch 1S10 (malfunction 79).

a. Replace switch if defective (paragraph 4-104.c), and perform operational check.

b. If switch tests good, do step 3.

Step 3. Shut down engine and disconnect battery. Lower control panel (paragraph 4-24.a), and remove battery charger access cover. Disconnect main harness connector P7 from control panel connector J7, and disconnect harness connector P12 (36, figure 4-38) from GCU. Check for continuity between P7-13L and P12-S, and between J7-13R and 1S10-2 (see FO-6 sheet 2).

a. If no continuity replace defective wire (X20A20 or X20B20).

Table 4-2. Organizational Troubleshooting (continued)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

51. (continued)

b. If all continuity checks good, replace GCU (paragraph 4-54).

c. Perform operational check.

52. AC UNDER VOLTAGE INDICATOR LIT.

Step 1. While observing AC indicators, set AC POWER switch to RESET, then return to on.

a. If UNDER VOLTAGE indicator did not turn off (momentarily), go to step 2 of malfunction 51.

b. If UNDER VOLTAGE indicator turns off and remains off, continue operation if no other abnormal indications are observed.

c. If OVER CURRENT indicator lit before UNDER VOLTAGE indication, see step 2. If not, go to step 3.

Step 2. Shut down unit and set MASTER SWITCH off. Check load and ac output power cables for possible shorts.

a. Correct load or replace cables as required.

b. If load and output cables are not shorted, see step 3.

Step 3. If UNDER VOLTAGE fault recurs, GCU is most probable cause of fault. The generator is also a possible cause of fault, especially if COMPT/GEN HI TEMP indicator is illuminated (see malfunction 39).

Replace GCU (paragraph 4-54) or notify maintenance supervisor of problem. Perform operational check.

53. AC VOLTS METER READS 0 (AC POWER ON INDICATOR LIT).

Step 1. Check AC VOLTS meter indication for each setting of AC PHASE SELECT switch.

a. If AC VOLTS meter reads normal for one or more positions of AC PHASE SELECT switch, do step 2.

Table 4-2. Organizational Troubleshooting (continued)

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

53. (continued)

b. If AC VOLTS meter reads 0 for all positions of AC PHASE SELECT switch, go to step 5.

Step 2. Measure 115 vac at convenience receptacles J1 through J4).

a. If voltage is not present at all receptacles, replace ac contactor K1 (paragraph 4-53), and perform operational check.

b. If voltage is present at ac convenience receptacles, do step 3.

Step 3. Test AC PHASE SELECT switch 1S9 (malfunction 79).

a. Replace switch if defective (paragraph 4-104.b), and perform operational check.

b. If switch tests good, do step 4.

Step 4. Check that battery is disconnected. Remove battery charger access cover. Disconnect main harness connector P7 from control panel connector J7. Check for continuity between the following points (see FO-6 sheet 2):

Check continuity From	To	If no continuity, replace wire no.
J7-22R	1S9-1	X31C20A
J7-21L	1S9-2	X32C20B
J7-20R	1S9-3	X33C2OC
P7-21L	K1-A2	X31B20A
P7-21R	K1-B2	X32B20B
P7-20L	K1-C2	X33B2OC

If no continuity, replace indicated wire, and perform operational check.

Step 5. Shut down engine. Disconnect battery and lower control panel (paragraph 4-24.a). Check for continuity between S9-B1-C and 1M8(+) (see FO-6 sheet 2).

Table 4-2. Organizational Troubleshooting (continued)

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

53. (continued)

a. If no continuity, replace wire X41A20, and perform operational check.

b. If continuity, do step 6.

Step 6. Test AC PHASE SELECT switch 1S9 (malfunction 79).

a. Replace switch if defective (paragraph 4-104.b), and perform operational check.

b. If switch test good, do step 7.

Step 7. Test ac contactor K1 (malfunction 95).

a. Replace contactor if defective (paragraph 4-53).

b. If contactor tests good, replace AC VOLTS meter 1M80

c. Perform operational check.

54. AC HERTZ METER READS 0 (AC VOLTS METER READS NORMAL).

Shut down engine. Disconnect battery and lower control panel (paragraph 4-24.a). Remove battery charger access cover. Disconnect main harness connector P7 from control panel connector J7, and disconnect harness connectors P9 and P18 from lower tray connectors J9 and J18. Check for continuity between the following points (see FO-6 sheet 2):

Check continuity From	To	If no continuity, replace wire no.
P7-16R	P18-A	X9N20N
P7-7R	P9-J	X41C20
P7-14L	P9-H	X9J20H
P7-15R	P9-G	X59B20
J9-J	Frequency transducer (22, figure 4-41) 115 VAC (+)	X41D20
J9-H	Frequency transducer MTR (-)	X9K20N

Table 4-2.Organizational Troubleshooting (continued)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

54. (continued)

Check continuity From	To	If no continuity, replace wire no.
J9-G	Frequency transducer MTR (+)	X59A20
J18-A	Frequency transducer 115 VAC (-)	X9T20
J7-16L	1M8(-)	X9P20N
J7-7L	1M8(+)	X41B20
J7-14R	1M10(-)	X9H20N
J7-15L	1M10(+)	X59C20

a. If no continuity, replace indicated wire.

b. If all continuity checks good, replace frequency transducer (paragraph 4-60) and AC HERTZ meter 1M10 (paragraph 4-107.a).

c. Perform operational check.

55. AC %LOAD METER READS 0 (AC POWER ON INDICATOR LIT AND AC POWER CABLE CONNECTED TO LOAD).

Step 1. Check load.

a. If load is drawing current, go to step 2.

b. If load is not drawing current shut down engine and disconnect battery. Check load and AGPU ac output cable.

Step 2. Check %LOAD meter for each setting of AC PHASE SELECT switch. Shut down engine and disconnect battery.

a. If %LOAD meter reads normal for one or more positions of AC PHASE SELECT switch, go to step 6.

b. If %LOAD meter reads 0 for all positions of AC PHASE SELECT switch, continue with step 3.

Step 3. Test AC PHASE SELECT switch 1S9 (malfunction 79).

a. Replace switch if defective (paragraph 4-104.b), and perform operational check.

Table 4-2. Organizational Troubleshooting (continued)

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

55. (continued)

b. If switch tests good, do step 4.

Step 4. Remove battery charger access cover. Lower control panel (paragraph 4-24.a). Disconnect main harness connector P7 from control panel connector J7, and disconnect harness connector P11 (32, figure 4-38) from ac contactor K1. Check for continuity between the following points (see FO-6 sheet 2):

Check continuity From	To	If no continuity, replace wire no.
J7-17L	1S9-A1-C	X37B20
J7-15R	1M9(-)	X34B20
P7-17R	P11-E	X37A20
P7-15L	P11-F	X34A20
1S9-A2-C	1M9(+)	X40A20

a. If no continuity, replace indicated wire and perform operational check.

b. If all continuity checks good, do step 5.

Step 5. Test ac contactor K1 (malfunction 95).

a. Replace contactor if defective (paragraph 4-53).

b. If contactor tests good, replace AC %LOAD meter 1M9 (paragraph 4-107.a).

c. Perform operational check.

Step 6. Test AC PHASE SELECT switch 1S9 (malfunction 79).

a. Replace switch if defective (paragraph 4-104.b), and perform operational check.

b. If switch tests good, do step 7.

Step 7. Test current transformers T2 through T4 as follows:

a. Remove battery charger access cover. Disconnect main harness connector P7 from control panel connector J7.

Table 4-2. Organizational Troubleshooting (continued)

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

55. (continued)

b. Check resistance between P7-17L and P7-19R (see FO-6 sheet 2). If resistance is more than 1 ohm, replace current transformer T4 (paragraph 4-57).

c. Check resistance between P7-18R and P7-19L. If resistance is more than 1 ohm, replace current transformer T3.

d. Check resistance between P7-20R and P7-18L. If resistance is more than 1 ohm, replace current transformer T2.

e. After replacing any transformer, perform operational check.

f. If all resistance checks were less than 1 ohm, do step 8.

Step 8. Check for continuity between the following points:

Check continuity From	To	If no continuity, replace wire no.
J7-17R	1S9-A1-3	X3OB20
J7-18L	1S9-A1-2	X28B20
J7-18R	1S9-A1-1	X26B20
J7-19L	1S9-A2-6	X29B20
J7-19R	1S9-A2-5	X27B20
J7-20L	1S9-A2-4	X25B20

If no continuity, replace indicated wire and perform operational check.

56. AC UNDER VOLTAGE INDICATOR DOES NOT LIGHT FOLLOWING AN AC OVER CURRENT FAULT.

Step 1. Note AC POWER ON indicator. If off, set AC POWER switch off.

a. Push PRESS TO TEST switch. Replace bulb if had. If bulb is good, do step 2.

b. If AC POWER ON indicator is on, set AC POWER switch off and do step 4.

Table 4-2. Organizational Troubleshooting (continued)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

56. (continued)

Step 2. Shut down engine and disconnect battery. Check diode 1CR2 (see malfunction 99).

a. Replace diode if defective (paragraph 4-108.b), and perform operational check.

b. If diode is good, do step 3.

Step 3. Check for continuity between P7-11R and P12-D (see FO-6 sheet 2).

a. If no continuity, replace wire X23A20.

b. If continuity, replace GCU (paragraph 4-54).

c. Perform operational check.

Step 4. Test ac contactor K1 (malfunction 95).

a. Replace contactor if defective (paragraph 4-53).

b. If contactor tests good, replace GCU (paragraph 4-54).

c. Perform operational check.

57. AC UNDER VOLTAGE INDICATOR DOES NOT LIGHT WHEN %LOAD METER EXCEEDS MAXIMUM ALLOWABLE FOR THE CURRENT SELECTOR SWITCH SETTING.

NOTE

Maximum allowable %LOAD is:

MAXIMUM %LOAD	CURRENT LIMIT SELECTOR SWITCH SETTING
46%	10KW
94%	20KW
140%	30KW

Table 4-2. Organizational Troubleshooting (continued)

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

57. (continued)

Step 1. Note AC POWER ON indicator and set AC POWER switch off.

If AC POWER ON indicator was off (before AC POWER switch was set to off), go to step 2 of malfunction 56. If not continue with step 2 below.

Step 2. Test ac contactor K1 (malfunction 95).

a. Replace contactor if defective (paragraph 4-53), and perform operational check.

b. If contactor tests good, continue with step 3.

Step 3. Test CURRENT LIMIT SELECTOR switch 1S11 (malfunction 79).

a. Replace switch if defective (paragraph 4-104.b), and Perform operational check.

b. If switch tests good, do step 4.

Step 4. Remove battery charger access cover. Disconnect main harness connector P7 from control panel J7, and disconnect harness connector P12 (36, figure 4-38) from GCU. Check for continuity between the following points (see FO-6 sheet 2):

Check continuity From	To	If no continuity, replace wire no.
1S11B-1	J7-(-)	X58B20
1S11B-2	57-(+)	X57B20
1S11B-3	J7-C	X56B20
P7-(-)	P12-S	X58A20
P7-(+)	P12-R	X57A20
P7-C	P12-Q	X56A20

a. If no continuity, replace indicated wire and perform operational check.

b. If all continuity checks good, do step 5.

Table 4-2. Organizational Troubleshooting (continued)

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

57. (continued)

Step 5. Test current transformer T1 as follows:

a. Refer to figure 4-38. Tag and disconnect Wires from terminals T1 (45), T2 (46), and T3 (47).

b. Check resistance between terminal N (44) and each of the other terminals (T1, T2, and T3). If resistance between N and any other terminal is greater than 1 ohm, replace transformer (paragraph 4-55).

c. Check for continuity between terminals T1 and T2, T2 and T3, and T1 and T3. If no continuity, replace transformer.

d. If transformer is replaced, perform operational check.

e. If checks in steps b and c were good, do step 6.

Step 6. Disconnect main harness connector P12 from GCU. Check for continuity between the following points (see FO-6 sheet 1):

Check continuity From	To	If no continuity, replace wire no.
P12-G	T1-N	X13A20
P12-L	T1-T3	X12A20
P12-K	T1-T2	X11A20
P12-J	T1-T1	X10A20

a. If no continuity, replace indicated wire.

b. If all continuity checks good, replace GCU (paragraph 4-54).

c. Perform operational check.

58. AC OVER VOLTAGE INDICATOR DOES NOT LIGHT WHEN AC VOLTS METER READS MORE THAN 118 VOLTS.

Step 1. Note AC POWER ON indicator and set AC POWER switch off.

If AC POWER ON indicator was off (before AC POWER switch was set to off) do step 2. If not, go to step 4.

Table 4-2. Organizational Troubleshooting (continued)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION
58. (continued) Step 2. Shut down engine and disconnect battery. Check diode 1CR1 (malfunction 99). a. Replace diode if defective (paragraph 4-108.b), and perform operational check. b. If diode is good, do step 3. Step 3. Remove battery charger access cover, and lower control panel (paragraph 4-24.a). Disconnect P7 from J7, and disconnect P12 (36, figure 4-38) from GCU. Check for continuity between P7-12R and P12-C (see FO-6 sheet 2). a. If no continuity, replace wire X24A20. b. If continuity, replace GCU (paragraph 4-54). c. Perform operational check. Step 4. Test ac contactor K1 (malfunction 95). a. Replace contactor if defective (paragraph 4-53). b. If contactor tests good, replace GCU (paragraph 4-54). c. Perform operational check.
59. AC UNDER FREQUENCY INDICATOR DOES NOT LIGHT WHEN AC HERTZ METER READS LESS THAN 375 HZ. Step 1. Note AC POWER ON indicator and set AC POWER switch off. If AC POWER ON indicator was off (before AC POWER switch was set to off) do step 2. If not, go to step 4. Step 2. Shut down engine and disconnect battery. Check diode 1CR4 (malfunction 99). a. Replace diode if defective (paragraph 4-108.b), and perform operational check. b. If diode is good, do step 3.

Table 4-2. Organizational Troubleshooting (continued)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

59. (continued)

Step 3. Remove battery charger access cover, and lower control panel (paragraph 4-24.a). Disconnect P7 from J7, and disconnect P12 (36, figure 4-38) from GCU. Check for continuity between P7-9R and P12-B (see FO-6 sheet 2).

a. If no continuity, replace wire X21A20.

b. If continuity, replace GCU (paragraph 4-54).

c. Perform operational check.

Step 4. Test ac contactor K1 (malfunction 95).

a. Replace contactor if defective (paragraph 4-53).

b. If contactor is good, replace GCU (paragraph 4-54).

c. Perform operational check.

60. PNEUMATIC POWER ON INDICATOR NOT LIT (MASTER SWITCH AND PNEUMATIC POWER SWITCH ON).

Test PNEUMATIC POWER switch 1S8 (malfunction 79).

a. Replace switch if defective (paragraph 4-104.c).

b. Remove battery charger access cover. Disconnect main harness connector P6 from control panel connector J6. Check for continuity between the following points (see FO-7). If no continuity, replace indicated wire and perform operational check.

Check continuity From	To	If no continuity, replace wire no.
J6-D	1DS13(-)	H4B20N
P6-D	GND TB	H4A20N
1S8-3	1DS13(+)	H7A20

Table 4-2. Organizational Troubleshooting (continued)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION
61. PSIG PNEUMATIC METER INDICATES PRESSURE (PNEUMATIC POWER SWITCH OFF).
Step 1. Remove engine access cover. Check visual position indicator on side of load control valve (5, figure 4-56). a. If valve is fully closed, go to step 5. b. If valve is not fully closed, continue with step 2.
Step 2. Shut down engine and set MASTER SWITCH off. a. If load control valve is now not fully closed, replace valve (paragraph 4-75), and perform operational check. b. If valve is now fully closed, continue with next step.
Step 3. Disconnect battery and lower control panel (paragraph 4-24.a). Disconnect main harness connector P4 from ECU. Check for open circuit from P4-T to P4-Z (figure FO-7). a. If circuit is open, reconnect harness connector P4 to ECU and install control panel. If load control valve is still full open when engine is started, replace ECU (paragraph 4-31), and perform operational check. b. If circuit is not open, continue with next step.
Step 4. Test PNEUMATIC POWER switch 1S8 in OFF position (malfunction 79). a. Replace switch if defective (paragraph 4-104.c). b. If switch tests good, check all wires and switches between pins T and Z of harness connector P4 for shorted condition (figure FO-7). Replace or repair any shorted wire or switch. c. If switch and wiring is good, replace PSIG PNEUMATIC meter 1M7 (paragraph 4-107.a). d. Perform operational check.
Step 5. Test PNEUMATIC POWER switch 1S8 in OFF position (malfunction 79). a. Replace switch if defective (paragraph 4-104.c).

Table 4-2. Organizational Troubleshooting (continued)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION
61. (continued) b. If switch is good, replace PSIG PNEUMATIC meter 1M7 (paragraph 4-107.a.). c. Perform operational check.
62. PSIG PNEUMATIC METER READS 0 OR LOW (PNEUMATIC POWER SWITCH ON, ENGINE UP TO SPEED, AND EGT LESS THAN 1200°F). Step 1. Check visual position indicator on side of load control valve (5, figure 4-56). a. If valve is fully open, go to step 7. b. If valve is not fully open, continue with next step. Step 2. Shut down engine. Disconnect battery and lower control panel (paragraph 4-24.a). Disconnect main harness connector P4 from ECU. Set PNEUMATIC POWER switch to on, and check for continuity between pins T and Z of harness connector P4 (figure FO-7). a. If continuity, reconnect harness connector P4 to ECU and go to step 5. b. If no continuity, continue with next step. Step 3. Test EMERG STOP switch S2 (malfunction 93) l a. Replace switch or associated wiring if defective (paragraph 4-47), and perform operational check. b. If switch and wiring are good, do next step. Step 4. Test PNEUMATIC POWER switch 1S8 (malfunction 79). a. Replace switch if defective (paragraph 4-104.c). b. If switch tests good, remove battery charger access cover. Disconnect main harness connectors P5 and P6 from control panel connectors J5 and J6, and disconnect harness connector P4 from ECU. Check for continuity between the following points (see FO-7). Replace any defective wire.

Table 4-2. Organizational Troubleshooting (continued)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

62. (continued)

Check continuity From	 To	If no continuity, replace wire no.
J5-11L	1S8-8	E29A20
J6-T	1S8-9	E30A20
P6-T	P4-Z	E30B20

c. Perform operational check.

Step 5. Disconnect engine harness connector P5 from load control valve (2, figure 4-56). Operate system in pneumatic mode. Measure +28 vdc between pins C (positive meter lead) and A of harness connector P5 (figure FO-7). Shut down engine and disconnect battery.

a. If voltage was present, replace load control valve (paragraph 4-75), and perform operational check.

b. If voltage was not present, do step 6.

Step 6. Check engine harness wires M1A20 (P2-T to P5-C) and M2820N (P2-X to P5-A).

a. Replace or repair any defective wires.

b. If wiring is good, replace ECU (paragraph 4-31).

c. Perform operational check.

Step 7. Observe pneumatic output hose.

a. If hose is inflated, go to step 11.

b. If hose is not inflated, continue with next step.

Step 8. Shut down engine. Inspect pneumatic hose for any damage or loose connections that could cause leakage.

a. Replace or repair hose, and tighten hose clamps as required.

b. If no hose leaks were evident, continue with next step.

Table 4-2. Organizational Troubleshooting (continued)

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

62. (continued)

Step 9. Test PNEUMATIC POWER switch 1S8 (malfunction 79).

a. Replace switch if defective (paragraph 4-104.c), and perform operational check.

b. If switch tests good, do step 10.

Step 10. Remove battery charger access cover. Disconnect main harness connector P6 from control panel connector J6. Check for continuity between the following points (see FO-7).

Check continuity From	To	If no continuity, replace wire no.
J6-E	1S8-11	H6A20
P6-E	Pressure relief valve L1 NO	H6B20
GND TB	Pressure relief valve L1 GND	H9A20N

See (2, figure 4-20) for GND TB location and (23, figure 4-55) for pressure relief valve (solenoid) L1 location.

a. If no continuity, replace indicated wire.

b. If all continuity checks good, replace pressure relief valve L1 (paragraph 4-77).

c. Perform operational check.

Step 11. Test pressure transducer MT2 (malfunction 100).

a. Replace pressure transducer if defective (paragraph 4-78), and perform operational check.

b. If pressure transducer tests good, continue with next step.

Step 12. Shut down engine and disconnect battery. Lower control panel. Disconnect wire from TB1-13 ANODE (see figure 4-21). Measure resistance between disconnected wire and TB1-13 CATHODE.

Table 4-2. Organizational Troubleshooting (continued)

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

62. (continued)

a. If resistance is between 20 and 30 ohms, reconnect wire and do step 13.

b. If resistance is not between 20 and 30 ohms, replace resistor R6 (paragraph 4-33), and perform operational check.

Step 13. Test PNEUMATIC POWER switch 1S8 (malfunction 79).

a. Replace switch if defective (paragraph 4-104.c), and perform operational check.

b. If switch tests good, do step 14.

Step 14. Remove battery charger access cover. Disconnect main harness connector P6 from control panel connector J6. Check for continuity between the following points (see FO-7):

Check continuity From	To	If no continuity, replace wire no.
S8-2	S8-11	H1D20
S8-12	J6-A	H1A20
P6-A	TB1-13 ANODE	H1C20
P6-B	TB1-13 CATHODE	H2B20
J6-B	1M7(+)	H2A20
J6-C	1M7(-)	H3A20
P6-C	Pressure transducer MT2(+)	H3B20
GND TB	Pressure transducer MT2(-)	H10A20N

See (2, figure 4-20) for GND TB location, and (19, figure 4-55) for pressure transducer MT2 location.

a. If no continuity, replace indicated wire or notify maintenance supervisor.

b. If all continuity checks good, replace PSIG PNEUMATIC meter 1M7 (paragraph 4-107.a).

Table 4-2. Organizational Troubleshooting (continued)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

63. PSIG PNEUMATIC METER READS LOW (PNEUMATIC POWER SWITCH ON, ENGINE UP TO SPEED, AND EGT MORE THAN 1200°F).

Shut down unit. Inspect pneumatic system for any damage or loose connections that could cause leakage.

a. Correct any condition that could cause leakage.

b. If no leakage is found, engine hot section fault is indicated. Notify maintenance supervisor.

64. PSIG PNEUMATIC METER READS HIGH.

Test pressure transducer (malfunction 100).

a. Replace pressure transducer if defective (paragraph 4-78).

b. If pressure transducer tests good, replace zener diode TB1-CR1 (paragraph 4-33.b).

c. Perform operational check.

65. ENGINE SPEED DROOPS WHEN PNEUMATIC POWER IS TURNED ON.

Step 1. Check GTE LOW FUEL PRESS indicator.

a. If indicator is illuminated (with engine running), go to step 2 of malfunction 22.

b. If indicator is extinguished (with engine running), continue with next step below.

Step 2. Test fuel control unit (malfunction 97).

a. Replace fuel control unit if defective (paragraph 4-67), and perform operational check.

b. If fuel control unit is ok, an engine hot section fault is indicated. Notify maintenance supervisor.

Table 4-2. Organizational Troubleshooting (continued)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION
66. HYDRAULIC OUTPUT PRESSURE GAUGE PROVIDES NO OR FAULTY INDICATION DURING OTHERWISE NORMAL OPERATION. Check that GAUGE SHUTOFF valve is open 1/4-turn. a. Open GAGE SHUTOFF valve. If malfunction still exists, check that pump is connected and check wiring. b. If malfunction still exists, troubleshooting of gauge, shutoff valve and associated tubing is required. Notify maintenance supervisor.
67. PROPER RESPONSE NOT OBSERVED WHEN ANY HYDRAULIC MODULE SWITCH IS ACTIVATED. Step 1. Test the switch in question (malfunction 80). a. Replace any defective switch (paragraph 4-90), and perform operational check. b. If switches test good, do step 2. Step 2. Refer to FO-9 and check wiring. Repair or replace any defective wiring, and perform operational check.
68. HYDRAULIC MODULE REPLACE FILTER INDICATOR LIT. Replace elements in both low and high pressure filter bowls (paragraph 4-94).
69. HYDRAULIC MODULE HI TEMP LIGHT ILLUMINATES DURING OPERATION. Possible faults are fluid level, leaks, short to ground, heat exchanger and tubing, by-pass valve open, reservoir temperature gage. Repair or notify maintenance supervisor.
70. HYDRAULIC FLUID LEAKAGE (GREATER THAN EXPECTED). Step 1. Inspect quick-disconnect fittings and flexible lines. a. Tighten any fittings where possible.

Table 4-2. Organizational Troubleshooting (continued)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION
70. (continued) b. Notify maintenance supervisor of any leaks that cannot be corrected. Step 2. Visually inspect rigid tubing, connectors, valves, and other hydraulic components. a. Wipe away leakage to see if leakage persists. b. Notify maintenance supervisor of leakage that cannot be corrected.
71. DRIVE POWER ON INDICATOR DOES NOT LIGHT WHEN PROPULSION MODE OPERATION ATTEMPTED. Step 1. Check operating procedure (paragraph 2-10). a. If DRIVE power on indicator lights during primary propulsion mode operation (paragraph 2-10.a) but not during alternate mode (paragraph 2-10.b), go to step 6. b. If DRIVE indicator lights during alternate mode but not during primary mode, go to step 4. c. If DRIVE indicator does not light during primary or alternate mode, continue with step 2. Step 2. Test DRIVE switch (malfunction 79). a. Replace switch if defective (paragraph 4-104.c), and perform operational check. b. If switch tests good, do step 3. Step 3. Check that battery is disconnected. Remove battery charger access cover. Disconnect main harness connector P6 from control panel connector J6. Check for continuity between the following points (see FO-5 and FO-8):

Table 4-2. Organizational Troubleshooting (continued)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

71. (continued)

Check continuity From	To	If no continuity, replace wire no.
K2-A2	R1(+)	P3A4/0
R1(-)	TB4-11	G2F20
P6-H	TB4-10	G2C20
J6-H	1S3-3	G2B20
1DS1(+)	1S3-2	G2A20
1DS1(-)	J6-J	G4A20N
P6-J	T133-11	G4B20

a. If no continuity, replace indicated wire, and perform operational check.

b. If all continuity checks good clutch switch S4 or wiring is defective. Notify maintenance supervisor.

Step 4. Operate system in DC mode (paragraph 2-5).

a. If DC VOLTS meter 1M11 reads in green band, do step 5.

b. If DC VOLTS meter reads 0, see malfunction 42.

Step 5. Set DC POWER switch to OFF and shut down engine. Test diode TB3-CR3 (malfunction 82).

a. Replace diode if defective (paragraph 4-33.b).

b. If diode tests good, replace wire G25A20 between diode (TB3-11 CATHODE) and K2-X2 (18, figure 4-38, FO-8).

c. Perform operational check.

Step 6. Connect battery, set MASTER SWITCH to ON, set DC POWER switch to OFF, and set BATTERY OUTPUT switch to ON.

a. If DC VOLTS meter 1M11 reads in green band, do step 7.

b. If DC VOLTS meter reads 0, test battery output contactor K3 and wiring (malfunction 87).

Table 4-2. Organizational Troubleshooting (continued)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

71. (continued)

Step 7. Set DC POWER and MASTER switch off, and disconnect battery. Test diode TB3-CR4 (malfunction 82).

a. Replace diode if defective (paragraph 4-33.b).

b. If diode tests good, replace wire G26A20 between diode (TB3-12 CATHODE) and K3-X2 (6, figure 4-18) (see FO-8).

c. Perform operational check.

72. DO NOT TOW INDICATOR DOES NOT LIGHT WHEN TOW BAR IS LOWERED AND CLUTCH LEVER IS ENGAGED. See TM 55-1730-229-34 (paragraph 10-6, step 7).

Step 1. Press to test the tow bar indicator.

a. If indicator does not light, go to step 3.

b. If indicator lights, continue with step 2.

Step 2. Disconnect battery. On speed/direction control assembly (5, figure 4-93), check for continuity between terminals 6 and 10, and between terminals 5 and 9 (see FO-8).

a. If no continuity, replace wire (G28A20 or G29A20), and perform operational check.

b. If continuity checks good, mercury switch, or light switch in speed/direction control assembly is defective. Notify maintenance supervisor.

Step 3. Disconnect battery. Check fuse F1 on lower electrical tray.

a. Replace fuse if defective, and perform operational check.

b. If fuse is good, do step 4.

Step 4. Check wiring between terminal 6 on speed/direction control assembly (see FO-8) and shunt R3 (see FO-1).

a. Replace any defective wiring, and perform operational check.

Table 4-2. Organizational Troubleshooting (continued)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

72. (continued)

b. If all wiring is good. clutch switch is defective. Notify maintenance supervisor.

73. DO NOT TOW INDICATOR LIT WHEN CLUTCH LEVER IS RELEASED.
See TM 55-1730-229-34 (paragraph 10-6. step 7).

74. AGPU DOES NOT DRIVE WHEN REMOTE SPEED CONTROLLER HANDGRIPS ROTATED IN EITHER DIRECTION (CONDITIONS PROPER FOR OPERATION - PARAGRAPH 2-10).

Step 1. Listen for audible click from electric brake when Dead-Man switch is pressed.

Step 2. If electric brake is not functioning correctly, see TM 55-1730-229-34.

75. DC POWER NOT AVAILABLE AT SLAVE RECEPTACLE.

Step 1. Set MASTER SWITCH to ON and check BATTERY VOLTAGE meter.

a. If BATTERY VOLTAGE meter does not read in green band. see malfunction 1.

b. If BATTERY VOLTAGE meter reads in green band, do step 2.

Step 2. Set MASTERS and disconnect battery. Check cable between (+) battery terminal adapter (3. figure 4-16) and (+) slave receptacle terminal screw (18, figure 4-15) for continuity. Check cable between (-) battery terminal adapter (4, figure 4-16) and (-) slave receptacle (20. figure 4-15) for continuity. (see FO-1).

a. Replace cables if defective (paragraph 4-26).

b. If cables are good, replace slave receptacle (paragraph 4-27).

c. Perform operational check.

76. DC VOLTS METER READS 0 IN BATTERY OUTPUT MODES.

Step 1. Check that MASTERS SWITCH and BATTERY OUTPUT switch are ON, and DC POWER switch is OFF.

Step 2. Check BATTERY VOLTAGE meter.

a. If battery voltage meter reads 0, see malfunction 1.

b. If battery voltage mater in green band, test battery output contactor and wiring (malfunction 87).

Table 4-2. Organizational Troubleshooting (continued)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

77. AC POWER NOT AVAILABLE AT CONVENIENCE RECEPTACLES (engine running and AC POWER switch ON).

Step 1. Check circuit breakers 3CB3 through 3CB6 on lower tray.

a. If circuit breakers are open (out), reset by pushing in. If breakers continue to open, check loads for shorts.

b. If circuit breakers are closed (pushed in), do step 2.

Step 2. Check AC POWER ON indicator.

a. If indicator is not lit, see malfunction 50.

b. If indicator is lit, do step 3.

Step 3. Check AC VOLTS meter for each position of the AC PHASE SELECT switch.

a. If meter does not read in green band for all switch positions, shut down engine and replace AC contactor K1 (paragraph 4-53). Perform operational check.

b. If meter reads in green band for all switch positions, do step 4.

Step 4. Shut down engine and disconnect battery. Check wiring between the ac convenience receptacle and ac contactor K1 (see FO-6 sheet 1).

Replace any defective wiring and perform operational check.

78. AC POWER NOT AVAILABLE AT DC-TO-AC INVERTER RECEPTACLES (engine running and DC POWER switch ON).

Step 1. Check DC VOLTS meter.

a. If meter reads 0, see malfunction 42.

b. If meter reads in green band, do step 2.

Step 2. Shut down engine and disconnect battery. Remove inverter output fuse (paragraph 4-63.c). Check fuse.

Table 4-2. Organizational Troubleshooting (continued)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION
78. (continued) a. If fuse is blown, install new fuse, and perform operational check. b. If fuse is good, install same fuse and do step 3. Step 3. Check for continuity between inverter positive terminal and shunt R1 (23, figure 4-18), and between inverter negative terminal and dc ground stud (see FO-5). a. If no continuity, replace wire P54A10 or P55A10N, and perform operational check. b. If continuity checks good, do step 4. Step 4. Remove inverter (paragraph 4-63.a), and remove internal fuse (paragraph 4-63.e). Check fuse. a. If fuse is blown, install new fuse. b. If fuse is good, install new inverter (paragraph 4-63.b). c. Perform operational check.
79. CONTROL PANEL SWITCH AND CIRCUIT BREAKER MALFUNCTIONS. If any control panel switch or circuit breaker is suspected of malfunction, test the switch or circuit breaker as follows: a. Shut down engine and disconnect battery. b. Lower control panel (paragraph 4-24.a). c. Remove battery charger access cover if necessary. d. Locate switch or circuit breaker to be tested in table 4-3, column (A). e. Disconnect connectors or wires as indicated in column (B).

Table 4-2. Organizational Troubleshooting (continued)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION
79. (continued) f. Set switch or breaker to each position listed in column (C). and check continuity between terminals listed in column (D) for normal indication of column (E). g. If any continuity check is not normal, replace switch or circuit breaker (paragraph 4-104 or 4-105). h. If all continuity checks are normal, switch or circuit breaker is good. Reconnect any wires or connectors that were disconnected for test.
80. HYDRAULIC CONTROL PANEL SWITCH AND CIRCUIT BREAKER MALFUNCTIONS. If any hydraulic control panel switch or circuit breaker is suspected of malfunction, test the switch or circuit breakers as follows: a. Shut down engine. b. Refer to paragraph 4-90, and do steps a(l) through a(5). c. Locate switch or circuit breaker to be tested in table 4-4, column (A). Remove hydraulic electrical panel (paragraph 4-90). d. Disconnect wires as indicated in column (B). e. Set switch or breaker to each position listed in Column (C), and check continuity between terminals listed in column (D) for normal indications of column (E). f. If any continuity check is not normal, replace switch or circuit breaker (paragraph 4-90) and perform operational check. g. If all continuity checks are normal, switch or circuit breaker is good. Reconnect any wires that were disconnected for test.

Table 4-2. Organizational Troubleshooting (continued)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

81. CHARGER CIRCUIT MALFUNCTION.

Step 1. If a battery charger malfunction is suspected, test the battery charger and related circuits as follows (see FO-1):

a. Start engine (paragraph 2-3). After engine reaches 95% rpm, set DC POWER switch to ON, check DC POWER ON indicator, set DC POWER switch to OFF, and shut down engine. If DC POWER ON indicator lit, continue with step b. If DC POWER ON indicator did not light, see malfunction 42.

b. Disconnect battery, lower control panel (paragraph 4-24.a). remove battery charger access cover, and open electrical trays access door.

c. Check that battery charger circuit breakers 2CB1 and 2CB2 on upper tray are closed (pushed in).

d. Disconnect cable P32A6 (20, figure 4-17) from 50 amp output terminal J3+ (21). Tape the terminal lug on the wire to prevent shorting.

e. Disconnect harness connector P2 (6) from battery charger 20 amp output connector J2 (7).

NOTE

A test wire made from 18 gage wire is required for step f. Terminate one end of wire with a female connector pin, and the other end with a clip.

f. Connect an 18 gage wire between pin B of charger connector J2 and dc ground.

Table 4-2. Organizational Troubleshooting (continued)

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

81. (continued)

CAUTION

During this procedure, the engine will be running while the battery charger is disconnected. The procedure should be performed in the shortest possible time to prevent unnecessary drain on battery.

g. Connect battery and start engine (paragraph 2-3).

h. Note if CHRG/BAT FAULT light is lit. (Light should be lit to indicate no charger load.) Continue with step i.

i. Set charger output control 3S1 (on lower electrical tray) to each position, and measure the voltage between the terminals (21, 23, figure 4-17) of the charger 50 amp output connector J3 l Record measured voltages below:

Charger Output Control 3Sl Setting	Charger 50 Amp Output Voltage (J3) Measured	Limits
28.5	_____	26 to 31 vdc
30.5	_____	28 to 33 vdc
32.0	_____	29.5 to 34.5 vdc

CAUTION

Do not short pins of J2 against each other or against connector shell.

j. Measure voltage between pins A (positive meter lead) and B of charger 20 amp output connector J2 (7, figure 4-17). Record measured voltage below:

	Measured	Limits
Charger 20 Amp Output Voltage (J2)	_____	22 to 32 vdc

Table 4-2. Organizational Troubleshooting (continued)

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

81. (continued)

k. Shut down engine and disconnect battery.

l. Disconnect test wire from charger connector J2.

m. Compare the indications observed or measured in steps h through j above with indications listed in the following chart, and do the indicated test or inspection procedure.

Battery Charger Indications			Test or Inspection Step
CHGR/BAT FAULT lamp (step 1 .h)	Charger 50 Amp Output (step 1.i)	Charger 20 Amp Output (step 1.j)	
ON	Voltage in limits for all settings of charger output control	Voltage in limits	2
OFF	Voltage in limits for all settings of charger output control	NA	3
NA	No output, or voltage out of limits for one or more settings of charger output control	No output, or voltage out of limits	4
NA	No output	Voltage present	5
NA	Voltage present	No output	6
NA	Voltage present	Voltage present but not in limits	Replace battery charger (paragraph 4-28)
NA	Voltage present but out of limits for one or more settings of charger output control	Voltage present	7

Table 4-2. Organizational Troubleshooting (continued)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

81. (continued)

Step 2. If the CHRG/BAT FAULT lamp was on (step 1.h) and all voltage measurements (steps 1.i and 1.j). were in limits, the battery charger is functioning properly. Reconnect connector P2 and cable P32A6 to battery charger.

Step 3. This step is applicable if CHRG/BAT fault lamp was off (step 1.h). and all 50 amp output voltages (step 1.i) were in limits.

a. Connect battery and set MASTER SWITCH to ON. If CHRG/BAT FAULT light does not light, see malfuntion 2. If light comes on, do step b.

b. Set MASTER SWITCH to OFF and disconnect battery. Check diode TB3-CR4 (malfunction 82). Replace diode if defective. If diode tests good, do step c.

c. Disconnect harness connector P1 from battery charger. Check for continuity between P1-G and TB3-8 ANODE (FO-1). If no continuity, replace wire P29A20. If continuity, replace battery charger (paragraph 4-28).

Step 4. This step is applicable if one or more of the 50 amp output voltages (step 1.i) and the 20 amp output voltage (step 1.j). were out of limits.

a. Disconnect battery.

b. Check for continuity between battery charger J4- terminal and dc ground stud. If no continuity, replace cable P21B2N. If continuity, replace battery charger (paragraph 4-28).

Step 5. This step is applicable if all 50 amp output voltages (step 1.i). were 0, and the 20 amp output voltage (step 1.j). was present.

a. Disconnect battery.

b. Check circuit breaker 2CB1 on upper electrical tray. If breaker is open, do step c. If breaker is closed, go to step d.

Table 4-2. Organizational Troubleshooting (continued)

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

81. (continued)

c. Check cable P22A2 (between circuit breaker and battery charger) for shorted condition. Replace cable if shorted. If cable is good, replace battery charger (paragraph 4-28).

d. Check for continuity between the following points (see FO-1 and FO-5) :

Check continuity From	To	If no continuity, replace
K2-A1	2CB1	cable P2B2
2CB1 LINE	2CBl load	2CBl
2CB1	Bat Chrg J4+	cable P22A2
DC GND	Bat Chrg J4-	cable P21B2N

If no continuity, replace indicated cable or component. If all continuitY checks good, replace battery charger (paragraph 4-28).

Step 6. This step is applicable if the 20 amp output voltage (step 1.j). was 0, and the 50 amp output voltages were present.

a. Disconnect battery.

b. Check circuit breaker 2CB2 on upper electrical tray. If breaker is open, do step c. If breaker is closed, go to step d.

c. Check wires P24A12, P23A12, and P23B8 (connected to circuit breaker) for shorted condition. Replace any shorted cable. If cables are good, replace batterY charger (paragraph 4-28).

d. Check for continuity between the following points (see FO-1 and FO-5) :

Check continuity From	To	If no continuity, rep lace
2CB2	K2-A1	wire P2C8
2CB2 LINE	2CB2 load	2CB2
2CB2	P1-H	wire P24A12
2CB2	P1-I	wire P3A12

Table 4-2. Organizational Troubleshooting (continued)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

81. (continued)

If no continuity, replace indicated wire or component. If all continuity checks good, replace battery charger (Paragraph 4-28).

Step 7. This step is applicable if the 50 amp output voltages (step 1.1) are present but out of limits, and the 20 amp output voltage (step 1.j) is present.

a. Disconnect battery.

b. Lower control panel (paragraph 4-24.a).

c. Disconnect main harness connector P9 from lower tray connector J9.

d. Check battery charger output control switch 3S1 as indicated in table 4-5.

e. If any continuity check is not normal, replace switch 3S1 (paragraph 4-39).

f. If all switch continuity checks good, disconnect main harness connector P1 from battery charger. Check for continuity between the following points:

Check continuity		If no continuity,
From	To	replace wire no.
P9-F	P1-A	P25A20
P9-C	P1-B	P26A20
P9-D	P1-C	P27A20
P9-E	P1-D	P28A20
J9-F	3S1-C	P25B20
J9-C	3S1-1	P26B20
J9-D	3S1-2	P27B20
J9-E	3S1-3	P28B20

If no continuity, replace indicated wire. If all continuity checks good, replace battery charger (paragraph 4-28).

Table 4-2. Organizational Troubleshooting (continued)

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

82. TERMINAL BOARD DIODE MALFUNCTIONS.

If the diodes mounted on terminal boards TB1 through TB3 are suspected of malfunction, test the diodes. This test is applicable to the following diodes:

No.	Location	Type	Fig. Ref.
CR1	TBI-1	MR756	4-21
CR2	TB2-15	1N5061	4-22
CR3	TB3-1	1N5061	4-23
CR4	TB3-2	1N5061	4-23
CR5	TB3-3	1N5061	4-23
CR6	TB3-4	1N5061	4-23
CR7	TB3-5	lN5061	4-23
CR8	TB3-6	lN5061	4-23
CR1	TB2-1	MR756	4-22
CR2	TB2-2	MR756	4-22
CR3	TB3-11	1N5061	4-23
CR4	TB-12	lN5061	4-23
CR3	TB2-14	1N5061	4-22
CR4	TB2-4	lN5061	4-22
CR5	TB2-5	lN5061	4-22
CR6	TB2-6	1N5061	4-22
CR7	TB2-7	lN5061	4-22
CR8	TB2-8	1N5061	4-22
CR9	TB2-9	lN5061	4-22
CR10	TB2-10	1N5061	4-22
CR11	TB2-11	IN5061	4-22
CR12	TB2-12	lN5061	4-22
CR13	TB2-13	1N5061	4-22
CR14	TB2-3	1N5061	4-22
CR18	TB1-11	1N5061	4-21
CR19	TB1-10	lN5061	4-21
CR20	TB1-9	lN5061	4-21
CR21	TB1-8	lN5061	4-21
CR22	TB1-7	1N5061	4-21
CR24	TB1-4	1N5061	4-21
CR25	TB1-3	1N5061	4-21
CR26	TBl-2	1N5061	4-21
CR27	TBl-6	lN5061	4-21
CR4	TB3-8	1N5061	4-23
CR5	TB3-9	1N5061	4-23

Table 4-2. Organizational Troubleshooting (continued)

MALFUNCTION TEST OR INSPECTION	CORRECTIVE ACTION
82. (continued)	
	a. Disconnect battery.
	b. If diode to be tested is on TBl (8, 9, figure 4-20), lower control panel (paragraph 4-24.a). Disconnect control panel support cable and lower control panel onto access door.
	c. If diode to be tested is on TB2 (10, 11, figure 4-20) or TB3 (4, 5), remove battery charger access panel.
	NOTE The teat procedure is the same for any diode type 1N5061 or MR756. Diode TB3-CR1 (3, figure 4-21). is illustrated.
	d. Remove terminal screw (1) and one lead of diode (3).
	e. Using an analog multimeter (AN/PSM 4 or equivalent) on X1 scale, measure resistance from diode anode lead (9) (meter positive lead) to diode cathode lead (11). If resistance is greater than 25 ohms, replace diode.
	f. Set meter to X10,000 scale and measure resistance from diode cathode lead (11) (meter positive lead) to diode anode lead (9). If resistance is less than 10K ohms, replace diode.
	g. If diode is good, reconnect diode lead to terminal board.
83. 95% ENABLE RELAY 3Kl MALFUNCTION.	
	If the 95% enable relay 3K1 is suspected of malfunction, teat relay and associated wiring as follows:
	a. Disconnect battery and lower control panel (paragraph 4-24 .a).
	b. Open electrical trays access door.
	C. Disconnect main harness connector P8 from electrical tray connector J8.
	d. Perform tests indicated in table 4-6 for relay in deactivated state (see FO-3, sheet 2, FO-5, and FO-9).

Table 4-2. Organizational Troubleshooting (continued)

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

83. (continued)

NOTE

Two teat wires made from 20 gage wire are required for step e. Each lead should be terminated on one end with a female connector pin, and with a clip on other end.

e. Connect one teat wire between pin A of connector J8 and positive terminal screw on back of slave receptacle. Connect other test wire between pin B of J8 and negative terminal screw of slave receptacle.

f. Connect battery.

g. Do tests indicated in table 4-6 for relay in activated state.

h. Disconnect battery.

i. Disconnect test wires.

j. If all indications in table 4-6 were normal, relay is good. Reconnect harness connector P8 to tray connector J8.

k. If any indication in table 4-6 was not normal, remove relay from socket (paragraph 4-36.b). Check for continuity between the following points (see FO-3 sheet 2, FO-5, and FO-9):

Check continuity From	To	If no continuity, replace wire no.
J8-A	3K1 socket Xl	El7B20
J8-B	3K1 socket X2	E35B20N
J8-G	3K1 socket Cl	P4B20
J8-E	3K1 socket Bl	P5B20
J8-C	3K1 socket Al	P6B20
J8-H	3K1 socket C2	P13B20
J8-F	3K1 socket B2	P12B20
J8-D	3K1 socket A2	P11B20
J8-J	3K1 socket Dl	P33B20
J8-K	3K1 socket D2	P34B20

Table 4-2. Organizational Troubleshooting (continued)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION
83. (continued) If no continuity, replace indicated wire. If all continuity checks good, replace relay 3K1 with new relay (paragraph 4-36).
84. STARTER LATCH RELAY 3K2 MALFUNCTION. If the starter latch relay 3K2 is suspected of malfunction, test relay and associated wiring as follows: a. Disconnect battery and lower control panel (paragraph 4-24.a). b. Open electrical trays access door. c. Disconnect main harness connectors P8 and P18 from electrical tray connectors J8 and J18. d. Perform tests indicated in table 4-7 for relay in deactivated state (see FO-3 sheet 1). NOTE Two test wires made from 20 gage wire are required for step e. Each lead should be terminated on one end with a female connector pin, and with a clip on the other end. e. Connect one test wire between pin P of J8 and positive terminal screw on back of slave receptacle. Connect other test wire betwen pin B of J8 and negative terminal screw on slave receptacle. f. Connect battery and do tests indicated in table 4-7 for relay in activated state. g. Disconnect battery. h. Disconnect test wires. i. If all indications in table 4-7 were normal, relay is good. Reconnect harness connectors P8 and P18 to tray connectors J8 and J18.

Table 4-2. Organizational Troubleshooting (continued)

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

84. (continued)

j. If any indication in table 4-7 was not normal, remove relay from socket (paragraph 4-36.b). Check for continuity between the following points (see FO-3 sheet 1):

Check continuity From	To	If no continuity, replace wire no.
J8-P	3K2 socket Xl	E3E20
J8-B	3K2 socket X2	E36B20N
J8-L	3K2 socket Al	E25C18
J8-M	3K2 socket B2	E4B18
J8-N	3K2 socket B2	E31A20
J18-B	3K2 socket B1	L4J18
3K2 socket Xl	3K2 socket A2	E3F20

If no continuity, replace indicated wire or notify maintenance supervisor. If all continuity checks good, replace relay 3K2 with new relay (paragraph 4-36).

85. BATTERY/CHARGER TRANSFER RELAY AND POWER DIODE MALFUNCTIONS.

Step 1. Perform this step if the battery/charger transfer relay is suspected of malfunction.

a. Disconnect battery and lower control panel (paragraph 4-24.a).

b. Open electrical tray access door.

c. Disconnect main harness connectors P9 and P18 from electrical tray connectors J9 and J18.

d. Perform tests indicated in table 4-8 for relay in deactivated state.

NOTE

Two test wires made from 20 gage wire are required for step e. Each wire should be terminated on one end with a male connector pin, and a clip on the other end.

Table 4-2. Organizational Troubleshooting (continued)

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

85. (continued)

e. Connect one test wire between pin S of J9 and positive terminal of slave receptacle. Connect other test wire between pin L of J9 and negative terminal of slave receptacle.

f. Connect battery and do tests indicated in table 4-8 for relay in activated state.

g. Disconnect battery.

h. Disconnect test wires.

i. If all indications in table 4-8 were normal, relay is good. Unless power diodes are to be checked (step 21, reconnect harness connectors P9 and P18 to tray connectors J9 and J18.

j. If voltage was not present at pin J9-N (relay activated), do step 2. If any other indication in table 4-8 was not normal, continue with step k below.

k. Remove relay 3K3 from socket (paragraph 4-36.b). Check for continuity between the points listed below (see FO-1). If no continuity, replace indicated wire. If all continuity checks good, replace relay 3K3 with new relay.

Check continuity		If no continuity,
From	To	replace wire no.
J9-R	3K3 socket C3	P33E18
J9-S	3K3 socket C1	P30B18
J9-L	3K3 socket X2	P49B20N
J9-N	3K3 socket B2	P35B18
J9-P	3K3 socket A2	P34B20
J9-M	3K3 socket C2	C1B20
J18-E	3K3 socket D2	P33J20
3K3 socket X1	3K3 socket A1	P30E20
3CR7 terminal lug (top)	3K3 socket A1	P30D20
3CR7 terminal lug (top)	3K3 socket C1	P30C20
3K3 socket D3	3K3 socket A3	P33H20
3K3 socket B3	3K3 socket A3	P33G20
3K3 socket B3	3K3 socket C3	P33F20

Table 4-2. Organizational Troubleshooting (continued)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

85. (continued)

Step 2. Perform this step if power diodes (3CR7 through 3CR9). are suspected of malfunction.

a. If not already done, do steps 1.a through 1.c, and 1.k.

NOTE

Use an analog multimeter (AN/PSM 4 or equivalent) on Xl00 scale to check diodes.

b. Measure resistance between relay socket pins Cl (positive meter lead) and B1. If resistance is not between 400 and 1500 ohms, replace diode 3CR7 or wires (P3OC20 or P30N18) between diode and relay socket.

c. Measure resistance between the mounting stud of diode 3CR8 (positive meter lead) and relay socket pin B2. If resistance is not between 400 and 1500 ohms, replace diode 3CR9 or wires (P33N18 or P33M18) between diodes and relay socket.

d. Measure resistance between mounting stud of 3CR8 (positive meter lead) and relay socket pin D3. If resistance is not between 500 and 2000 ohms, replace diode 3CR8.

e. If resistance measurements of steps b through d above were good, power diodes are good. Install relay, and reconnect harness connectors.

86. GTE STARTER RELAY K4 MALFUNCTION.

If the GTE starter relay is suspected of malfunction, teat the relay as follows:

a. Set all control panel switches to OFF.

b. Disconnect battery and lower control panel (paragraph 4-24.a).

c. Refer to figure 4-18. Remove terminal shield (2) from contactor K4 (17).

Table 4-2. Organizational Troubleshooting (continued)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

86. (continued)

d. Tag and disconnect cables from terminals A1 (15) and Xl (13). Tape lugs on end of cables to prevent shorting.

WARNING

Battery power may be present at terminals on back of control panel and electrical bay when battery is connected. Do not touch any bare terminals.

e. Connect battery.

f. Measure for 0 vdc from terminal A1 of contactor to ground (see FO-3 sheet 2). If +24 vdc is present, replace contactor (paragraph 4-29).

g. Disconnect battery.

h. Connect jumper wire (gage 20 or larger) between terminals A2 and Xl. Connect jumper wire (gage 20 or larger) between terminal X2 and ground.

i. Connect battery.

j. Measure for +24 vdc between terminal A1 of contactor and ground. If voltage is not present, replace contactor (paragraph 4-29).

k. Disconnect battery.

l. Remove jumper wires.

m. If measurements in steps f and j were good, contactor is good. Reconnect cables and replace terminal shield.

87. BATTERY OUTPUT/TRACTION MOTOR CONTACTOR K3 MALFUNCTION.

If the battery output/traction motor contactor is suspected of malfunction, teat the relay as follows:

a. Set all control panel switches to OFF.

Table 4-2. Organizational Troubleshooting (continued)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION
87. (continued)

b. Disconnect battery and lower control panel (paragraph 4-24.a).

WARNING

Battery power may be present at terminals on back of control panel and electrical bay when battery is connected. Do not touch any bare terminals.

c. Connect battery.

d. See figures 4-18 and F0-1 . Measure for +24 vdc between terminals A2 of contactor K3 (12, figure 4-18) and ground. If voltage is present, go to step e. If not, disconnect battery and check cable P41B1/0 (between contactor K3 and shunt R2) for continuity. Replace cable if defective.

e. Measure for +24 vdc between terminal X1 of contactor K3 and ground. If voltage is present, go to step f. If not, disconnect battery and check wire (P41A20) between terminals A2 and Xl for continuity. Replace wire if defective.

f. Measure for +24 vdc between terminal X2 of contactor K3 and ground. If voltage is present, go to step h. If not, do step g.

g. Disconnect battery and test BATTERY OUTPUT switch 1S5 (malfunction 79). If switch checks good, replace contactor K3 (paragraph 4-29).

h. Measure for 0 vdc between terminal A1 of contactor K3 and ground. If 0 vdc is measured, go to step i. If +24 vdc is present, disconnect battery and replace contactor K3.

i. Set MASTER SWITCH and BATTERY OUTPUT switches to ON. Measure for +24 vdc between terminal Al of contactor and ground. If voltage is present, contactor is good (set switches off and disconnect battery). If not, continue with step j.

j. Measure 0 vdc between terminal X2 of contactor K3 and ground. If 0 vdc is present, disconnect battery and replace contactor (paragraph 4-29). If +24 vdc is present, do step k.

Table 4-2. Organizational Troubleshooting (continued)

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

87. (continued)

k. Disconnect battery and check control panel switches 1S5 (BATTERY OUTPUT), 1S12 (DC POWER), and 1S2 (MASTER SWITCH) (see malfunction 79). Replace any defective switch. If all switches test good, do step 1.

1. Teat diode 1CR6 (malfunction 99). Replace diode if defective. If diode tests good, do step m.

m. Remove battery charger access cover. Disconnect main harness connector P7 from control panel connector J7. Check for continuity between the following points (see FO-1 and FO-5):

Check continuity From	To	If no continuity, replace wire no.
P7-1L	K3-X2	P40B20
1S5-3	1S12-4	P39A20
1S2-9	1S12-5	P45A20
1S2-8	1DS21(-)	P53A20N

Replace any open wire.

88. SPEED SENSOR MALFUNCTION.

If the speed sensor is suspected of malfunctioning, teat the sensor and engine harness as follows:

a. Disconnect battery.

b. Remove engine access cover (paragraph 4-15).

c. Cut and remove lockwire from speed sensor electrical connector (1, figure 4-31).

d. Check resistance between pins A and C of speed sensor. Resistance should he less than 20 ohms. If resistance is greater than 20 ohms, replace speed sensor (paragraph 4-40).

e. Check resistance between pin B of speed sensor and housing. If resistance is greater than 1 ohm, replace speed sensor.

Table 4-2. Organizational Troubleshooting (continued)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

88. (continued)

f. Lower control panel and disconnect engine harness connector P2 from ECU. Check engine harness for continuity from P2-C to P6-C, and from P2-D to P6-A (see FO-3, sheet 2). Replace defective wiring or notify maintenance supervisor.

g. If wiring is good, reconnect engine harness connectors P2 and P6. Lockwire connector P6.

89. LOW OIL PRESSURE SWITCH MALFUNCTION.

If the low oil pressure is suspected of malfunctioning, teat the switch as follows:

a. Disconnect battery.

b. Remove engine and hydraulic access covers (paragraph 4-15).

c. Cut and remove lockwire from low oil pressure switch electrical connector (6, figure 4-31).

d. Check resistance between pins A and B of low oil pressure switch. Reading should be 0 ohms. If resistance is greater than 1 ohm, replace switch (paragraph 4-41).

NOTE

The low oil pressure switch should remain closed until engine oil pressure exceeds 31 psig. Above 31 psig, the switch should open.

90. HIGH OIL TEMPERATURE SWITCH MALFUNCTION.

If a high oil temperature (HOT) switch malfunction is suspected, teat the switch and engine harness as follows (see FO-3 sheet 2):

a. Disconnect battery and lower control panel (paragraph 4-24 .a).

b. Disconnect engine harness connector P2 from ECU.

Table 4-2. Organizational Troubleshooting (continued)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION	
90. (continued)	
c. Check resistance betwewen P2-J and P2-Y. If resistance is greater than 1 ohm, wait for engine oil to cool.	
d. After engine oil cools, recheck resistance between P2-J and P2-Y. If resistance is now leas than 1 ohm, switch and harness are good. If resistance is still greater than 1 ohm, do step e.	
e. Open engine access door. Cut and remove lockwire from high oil temperature switch connector P10 (9, figure 4-31). Disconnect electrical connector from high oil temperature switch (10). Check engine harness wires A14A20 (P2-J to P10-B) and A14A20N (P2-Y to P10-A) for continuity (see F0-3 sheet 2). Replace any defective wiring or notify maintenance supervisor. If wiring is good, replace high oil temperature switch (paragraph 4-42).	
91. THERMOCOUPLE MALFUNCTION.	
If a thermocouple malfunction is suspected, teat the thermocouple as follows:	
a. Disconnect battery.	
b. Tag and disconnect wires from posts of thermocouple (14, figure 4-31).	
c. Measure resistance across thermocouple posts. Resistance should be leas than 10 ohms. Reading should remain steady when posts are wiggled. If resistance is greater than 10 ohms or does not remain steady when posts are wiggled, replace thermocouple (paragraph 4-43).	
d. Measure resistance from each thermocouple post to the case. Insulation resistance reading should be greater than 10K ohms. If not, replace thermocouple.	
e. Lower control panel and disconnect engine harness connector P2 from ECU. Check (see FO-3 sheet 2) engine harness Wiring between P2-G and thermocouple no. 8 (CR), and between P2-H and thermocouple no. 10 (AL). Replace any defective wiring. If wiring is good, reconnect P2 to ECU.	

Table 4-2. Organizational Troubleshooting (continued)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

91. (continued)

f. Reconnect wires to thermocouple.

92. INLET FILTER BLOCKED SWITCH MALFUNCTION.

If an inlet filter blocked switch malfunction is suspected, test the switch and wiring as follows:

a. Disconnect battery, and remove roof (paragraph 4-16).

b. Open bypass door (9, figure 4-32) and check that switch actuates (indicated by click) when door is open (at bottom) between 1/4 and 1/2 inch. If switch actuates normally, go to step d. If switch does not actuate normally, adjust per step c.

c. If necessary adjust switch. To adjust, loosen nuts (1), slide switch (6) up or down on bracket (7), and tighten nuts. Move switch down if actuation occurs when bypass door opening is less than 1/4 inch. Move switch up if actuation occurs when bypass door opening is greater than 1/2 inch.

d. Connect battery and turn MASTER SWITCH on.

e. Verify that INLET FILTER BLOCKED indicator light on control panel is off when bypass door is closed. If light is off, go on to step g. If light is lit do step f.

f. Set MASTER SWITCH off and disconnect battery. Disconnect one wire from switch (6), and check for open circuit between switch outer terminals. If continuity exists between switch outer terminals, replace switch (paragraph 4-44). and perform operational check.

g. Open bypass door (9) to actuate switch and have assistant check that INLET FILTER BLOCKED indicator light is lit. If light is lit, switch and wiring is good (turn MASTER SWITCH to off and disconnect battery). If light is not lit, continue with next step.

h. Actuate PRESS TO TEST switch on control panel (MASTER SWITCH on). If INLET FILTER BLOCKED indicator does not light, refer to malfunction 6 or 7. If light does light during lamp test, do step i.

Table 4-2. Organizational Troubleshooting (continued)

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

92. (continued)

i. Set MASTER SWITCH off, and disconnect battery. Disconnect one wire from switch (6), and check for continuity between switch outer terminals with switch actuated (bypass door open). If continuity exists between switch outer terminals, check switch wires E22A20 P5-8R to 1S3-C or E40A20N (1S3-NC to ground) (figure FO-3, sheet 2) for open condition. If no continuity between switch terminals, replace switch (paragraph 4-44). After replacing switch or wires, perform operational check.

93. EMERGENCY STOP SWITCH MALFUNCTION.

If an emergency switch malfunction is suspected, teat the switch and wiring as follows:

a. Disconnect battery, lower control panel (paragraph 4-24.a). and remove battery charger access cover.

b. Disconnect main harness connectors P4, P5, and p8 from ECU, control panel harness, and lower electrical tray harness. Check for continuity between main harness connector pins as follows (see FO-3 sheet 1 and FO-7):

Measure From	To	With EMERG STOP Switch	Normal Indication
P5-1L	P8-L	Not pressed	Continuity
P5-1L	P8-L	Pressed	Open
P5-11R	P4-T	Not pressed	Continuity
P5-11R	P4-T	Pressed	Open

If all measurements are normal, the emergency atop switch and main wiring harness are good. If any measurement is not normal, continue with next step.

c. Remove emergency atop switch (paragraph 4-47), and check for continuity between switch terminals as follows:

Table 4-2. Organizational Troubleshooting (continued)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

93. (continued)

Measure From	Measure To	Swtich Condition	Normal Indication
NC1	NC2	Not pressed	Continuity
NC1	NC2	Pressed	Open
NC5	NC6	Not pressed	Continuity
NC5	NC6	Pressed	Open

If any measurement was not normal, install new switch (paragraph 4-47). If all measurements are normal, switch is good, do next step.

d. Check for continuity between the points listed below (see FO-3 sheet 1 and FO-7). If no continuity, replace indicated wire.

Check continuity From	To	If no continuity, replace wire no.
P5-1L	S2-2	E2C18
P8-L	S2-1	E25D18
P5-11R	S2 -6	E29B20
P4-T	S2-5	E6A20

94. DC CONTRACTOR K2 MALFUNCTION.

Do the following teat if a dc contactor malfunction is suspected:

a. Disconnect battery and lower control panel (paragraph 4-24 .a).

b. Remove terminal shield (21, figure 4-38) from ac output contactor K1 (35). Tag and disconnect cables from terminals A2 (25), B2 (26), and C2 (27). This is necessary to gain access to dc contactor K2 (18).

C. Tag and disconnect all cables and wires from terminals A2 (15), B2 (6), and Xl (4) of dc output contactor K2 (18).

Table 4-2. Organizational Troubleshooting (continued)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

94. (continued)

d. Check for open circuit between contactor K2 terminals Al and A2, and between terminals B1 and B2. If both sets of terminals are open, go to step e. If not replace contactor (paragraph 4-52).

e. Position all disconnected cables and wires (or wrap cable and wire terminals with tape) to prevent possible shorting.

f. Connect jumpers (20 gage or larger) between K2-X1 and the positive terminal screw on back of slave receptacle, and between K2-X2 and negative terminal screw on slave receptacle.

WARNING

Battery power may be present at terminals on back of control panel and electrical bay when battery is connected. Do not touch any bare terminals.

a. Connect battery.

h. Check for continuity between K2 contactor terminals Al and A2, and between terminals B1 and B2.

i. Disconnect battery, and remove jumpers.

j. If either set of contactor terminals were open (step h), replace contactor. If both sets of contactor terminals were closed (contactor good), reconnect all cables and wires, and replace terminal shield on ac contactor K1.

95. AC CONTACTOR K1 MALFUNCTION.

Do the following test if an ac contactor malfunction is suspected.

a. Disconnect battery and lower control panel (paragraph 4-24.a).

b. Remove terminal shields (21, figure 4-38) from ac output contactor K1 (35). Tag and disconnect cables from terminals A2 (25), B2 (26), C2 (27), A1 (28), B1 (29), and C1 (30). Disconnect P11 (32) from contactor connector J1 (33). See F0-6 sheet 2.

Table 4-2. Organizational Troubleshooting (continued)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

95. (continued)

c. Perform tests indicated in table 4-9 for contactor in deactivated state.

NOTE

Two test leads made from 20 gage wire are required to step d. Each lead should be terminated on one end with a female connector pin, and with a clip on other end.

d. Connect one test lead between pin A on the contactor electrical connector J1 and the positive terminal screw on back of slave receptacle. Connect other lead between pin B on contactor connector and negative terminal on slave receptacle.

e. Connect battery.

f. Perform tests indicated in table 4-9 for contactor in activated state.

g. Disconnect battery.

h. Disconnect test leads.

i. If all indications in table 4-9 were normal, reconnect wires and connector to contactor, and install terminal shields. If any condition was not normal, install new relay.

96. IGNITION UNIT MALFUNCTION.

If the ignition unit is suspected of malfunction, test the unit as follows (see FO-3, sheet 2):

a. Disconnect battery. Disconnect electrical connector from ignition unit and connect voltmeter to pin A (negative) and pin B (positive) of electrical connector.

CAUTION

Do not exceed starter duty cycle.

Table 4-2. Organizational Troubleshooting (continued)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

96. (continued)

b. Connect battery and set MASTER SWITCH to ON. Set ENGINE CONTROL switch to START and hold while observing GTE %RPM meters.

c. At approximately 10% reading on meter, voltmeter should indicate a reading between 16 and 28 vdc.

d. Set ENGINE CONTROL switch to STOP when GTE %RPM meter indicates approximately 20% speed. Set MASTER SWITCH to OFF and disconnect battery.

e. If reading obtained in step c indicated no voltage present at 10% speed, check engine harness wires 19A20 (P2-F to P7-A). and 46A20N (P2-N to P7-B) (see FO-3 sheet 2). Replace wires if open. If wiring is good, replace ECU (paragraph 4-31).

f. If reading obtained in step c was correct, remove ignition unit, igniter plug lead, and igniter plug and bench test as follows:

WARNING

The output of the ignition unit is approximately 5000 volts. Do not touch igniter plug during test.

g. Apply battery voltage (28 vdc). to ignition unit. Connect positive voltage to P7-B, and negative (ground) P7-A.

h. Igniter plug spark rate should be approximately 360 sparks per minute.

i. If igniter plug spark rate is not correct, replace ignition unit.

97. FUEL CONTROL UNIT MALFUNCTION.

If the fuel control unit is suspected of malfunction, test unit as follows:

a. Disconnect battery. Disconnect electrical connector (4, figure 4-48) from FCU.

Table 4-2. Organizational Troubleshooting (continued)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

97. (continued)

b. Check resistance between pin 5 on FCU torque motor receptacle and case of torque motor using a multimeter set to lowest range. Multimeter should indicate zero ohms. If not, replace FCU (paragraph 4-67).

c. Check resistance between pins 1 and 3 on FCU torque motor receptacle (FO-3, sheet 2). Resistance should be 30 to 37.5 ohms. If not, replace FCU (paragraph 4-67).

d. Disconnect fuel line (9, figure 4-50) from fuel shutdown solenoid (8). Install tee part number 969176-1 in shutdown solenoid and connect fuel line (9). to tee. Connect a 0 to 600 psig pressure gauge to other fitting on tee.

e. Disconnect electrical connector P7 from ignition unit (6, figure 4-58), and connect multimeter (set to read +28 vdc) between pins A(-). and B(+) on ignition unit connector.

f. Disconnect fuel solenoid electrical connector P9 (5, figure 4-50).

CAUTION

Observe starter duty cycle.

g. Perform engine start procedure while observing multimeter and pressure gauge. At 10 percent rpm, multimeter should indicate 28 vdc and pressure gauge should indicate IO psig minimum. At 20 percent rpm pressure gauge should indicate 22 psig minimum. Record readings obtained at 10 percent rpm and 20 percent rpm. When readings are obtained set ENGINE CONTROL switch to STOP and MASTER SWITCH OFF. Disconnect battery.

h. Replace FCU if requirements of step g were not met.

i. Reconnect electrical connector of FCU.

j. Perform engine start procedure and record reading on pressure gauge at 20 percent rpm. When reading is obtained set ENGINE CONTROL switch to STOP, and MASTER SWITCH OFF. Disconnect battery.

Table 4-2. Organizational Troubleshooting (continued)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

97. (continued)

k. Reading obtained in step j at 20 percent rpm should be at least 10 psig higher than reading obtained in step g at 20 percent rpm. Replace FCU if reading obtained is less than 10 psig higher.

l. Reconnect electrical connectors to ignition unit and fuel solenoid. Lockwire connectors.

m. Start engine and note readings on pressure gauge. At no-load condition reading should be between 230 and 250 psig. At full load reading should be between 250 and 280 psig.

n. After engine shutdown, disconnect pressure gauge, remove tee, and reconnect fuel line removed in step d.

98. FUEL SHUTDOWN SOLENOID MALFUNCTION.

If the fuel shutdown solenoid is suspected of malfunction, test the solenoid as follows:

a. Disconnect battery. Disconnect electrical connector from fuel solenoid (FO-3 sheet 2).

b. Check resistance between pins A and B of fuel solenoid. Resistance should be 25 to 35 ohms. If not, replace solenoid (paragraph 4-70).

c. If solenoid is good check wire G78A20 from P4-8 to P2-U. If wiring is good, replace ECU (paragraph 4-31).

99. CONTROL PANEL WIRING HARNESS DIODE MALFUNCTIONS.

Diodes are installed in some wires in the control panel harness. If these diodes are suspected of malfunctioning, test the diodes as follows:

a. Disconnect battery and lower control panel.

Table 4-2. Organizational Troubleshooting (continued)

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

99. (continued)

b. Use an analog multimeter to check resistance between the points listed below. The meter should read less than 25 ohms when the meter is connected with positive lead on connector pin, and should read greater than 10K ohms when meter is connected with negative lead on connector pin. If not the diode or wire is defective.

Measure From	Measure To	If reading not as specified, replace	Fig. Ref.
J5-6R	1DS11(+)	1CR9 or wire E21A20	F0-3 sheet 2
J5-19L	1DS18(+)	1CR11 or wire P15B20	FO-5
J5-20R	1DS19(+)	1CR10 or wire P16B20	FO-5
J7-9L	1DS17(+1	1CR4 or wire X21B20	F0-6 sheet 2
J7-10L	1DS16(+)	1CR3 or wire X22B20	F0-6 sheet 2
J7-1R	1S5-2	1CR6 or wire P4OA20	FO-1
J7-22L	1DS11(+)	1CR5 or wire X46B20	F0-6 sheet 2
J7-12L	lDS14(+)	1CR1 or wire X24B20	F0-6 sheet 2
J7-11L	lDS15(+)	1CR2 or wire X23B20	F0-6 sheet 2

100. PRESSURE TRANSDUCER MALFUNCTION

If the pressure transducer is suspected of malfunctioning, test the transducer as follows.

a. Disconnect battery.

b. Disconnect one wire from the transducer (19, figure 4-55).

c. Check resistance between transducer terminals. Resistance should be approximately 73 ohms with no pneumatic output. If resistance is not approximately 73 ohms, replace transducer.

d. Connect battery and operate system with pneumatic output (paragraph 2-6). Measure resistance between transducer terminals, then shut down system.

e. If resistance was not approximately 10 ohms with pneumatic output, replace transducer.

Table 4-3. Control Panel Switch and Circuit Breaker Continuity Checks

(A) Switch	(B) Disconnect	(C) Switch Position	(D) Check Continuity From (see note 3)	(D) Check Continuity To	(E) Normal Indication	(F) Fig. Ref.
ENGINE CONTROL (1S1).	P5 from control panel 1J5	STOP	1S1-1	1S1-6	Open	FO-3
			1S1-7	1S1-12	Open	
			1S1-7	1S1-11	Open	
		RUN	1S1-1	1S1-6	Open	
			1S1-7	1S1-11	Continuity	
		START	1S1-1	1S1-6	Continuity	
			1S1-7	1S1-12	Continuity	
MASTER SWITCH (1S2)	Wires from switch terminals 1S2-2, -5, -8 , and -11	OFF	1S2-2	1S2-3	Open	FO-1
			1S2-5	1S2-6	Open	FO-1
			1S2-8	1S2-9	Open	FO-5
			1S2-11	1S2-12	Open	FO-1
		ON	1S2-2	1S2-3	Continuity	FO-1
			1S2-5	1s2-6	Continuity	FO-1
			1s2-8	1S2-9	Continuity	FO-5
			1S2-11	1S2-12	Continuity	FO-1
DRIVE (1S3)	Wires from switch terminals 1S3-2 and 1S3-5	OFF	1S3-2	1S3-3	Open	FO-8
			lS3-5	lS3-6	Open	
		ON	1S3-2	1S3-3	Continuity	
			1S3-5	1S3-6	Continuity	
PRESS TO TEST (1S4)	P6 from control panel 1J6	Released	1S4-C1 (wire L30A20N).	1S4-NO1 (wire L27A20).	Open	FO-2
			1S4-C2 (wire L1C20).	1S4-NO2 (wire L28A20).	Open	
		Pressed	1S4-C1	1S4-NO1	Continuity	
			1S4-C2	1S4-NO2	Continuity	

Table 4-3. Control Panel Switch and Circuit Breaker Continuity Checks (continued)

(A) Switch	(B) Disconnect	(C) Switch Position	(D) Check Continuity From (see note 3)	(D) Check Continuity To (see note 3)	(E) Normal Indication	(F) Fig. Ref.
BATTERY OUTPUT (1S5)	Wire from switch terminal 1S5-2	OFF	1S5-2	1S5-3	Open	FO-1
		ON	1S5-2	1S5-3	Continuity	
PANEL (1S6)	Wires from switch terminal 1S6-2	OFF	1S6-2	1S6-1	Open	FO-2
			1S6-2	lS6-3	Open	
		DIM	1S6-2	1S6-3	Open	
			1S6-2	1S6-1	Continuity	
		BRT	1S6-2	1S6-3	Continuity	
			1S6-2	1S6-1	Open	
UTILITY (1S7)	Wire from switch terminal 1S7-2	OFF	1S7-2	1S7-1	Open	FO-2
			1S7-2	1S7-3	Open	
		DIM	1S7-2	1S7-3	Open	
			1S7-2	1S7-1	Continuity	
		BRT	1S7-2	1S7-3	Continuity	
			1S7-2	1S7-1	Open	
PNEUMATIC POWER (1S8)	Wires from switch terminals 1S8-3, -5 -8, and -12	OFF	1S8-2	1S8-3	Open	FO-7
			1S8-4	1S8-5	Continuity	FO-3 sheet 1
			1S8-8	1S8-g	OPen	FO-7
			1S8-11	1S8-12	Open	FO-7
		ON	1S8-2	1S8-3	Continuity	
			1S8-4	1S8-5	Open	
			1S8-8	1S8-g	Continuity	
			1S8-11	1S8-12	Continuity	

Table 4-3. Control Panel Switch and Circuit Breaker Continuity Checks (continued)

(A) Switch	(B) Disconnect	(C) Switch Position	(D) Check Continuity From (see note 3)	(D) Check Continuity To (see note 3)	(E) Normal Indication	(F) Fig. Ref.
AC PHASE SELECT (1S9) (see note 1)	P7 from control panel 1J7	A	1S9A1-C (wire X37B20)	1S9A-1 (wire X26B20)	Continuity	FO-6 sheet 2
			1S9A1-C	1S9A-2	Open	
			1S9A1-C	1S9A-3	Open	
			1S9A2-C (wire X40A20)	1S9A-4 (wire X25B20)	Continuity	
			1S9A2-C	1S9A-5	Open	
			1S9A2-C	1S9A-6	Open	
			1S9B1-C (wire X41A20)	1S9B-1 (wire X31C20A)	Continuity	
			1S9B1-C	1S9B-2	Open	
			1S9B1-C	1S9B-3	Open	
		B	1S9A1-C	1S9A-1	Open	
			1S9A1-C	1S9A-2	Continuity	
			1S9A1-C	1S9A-3	Open	
			1S9A2-C	1S9A-4	Open	
			1S9A2-C	1S9A-5	Continuity	
			1S9A2-C	1S9A-6	Open	
			1S9B1-C	1S9B-1	Open	
			1S9B1-C	1S9B-2	Continuity	
			1S9B1-C	1S9B-3	Open	
		C	1S9A1-C	1S9A-1	Open	
			1S9A1-C	1S9A-2	Open	
			1S9A1-C	1S9A-3	Continuity	
			1S9A2-C	1S9A-4	Open	
			1S9A2-C	1S9A-5	Open	
			1S9A2-C	1S9A-6	Continuity	
			1S9B1-C	1S9B-1	Open	
			1S9B1-C	1S9B-2	Open	
			1S9B1-C	1S9B-3	Continuity	

Table 4-3. Control Panel Switch and Circuit Breaker Continuity Checks (continued)

(A) Switch	(B) Disconnect	(C) Switch Position	(D) Check Continuity From (see note 3)	(D) Check Continuity To	(E) Normal Indication	(F) Fig. Ref.
AC POWER (1S10)	Wires from switch terminals 1S10-2, -5, and -8	OFF	1S10-2	1S10-1	Open	F0-6 sheet 2
			1S10-5	1S10-6	Open	F0-6 sheet 2
			1S10-8	1S10-7	Continuity	F0-3 sheet 1
		ON	1S10-2	1S10-1	Open	
			1S10-5	1S10-6	Continuity	
			1S10-8	1510-7	Open	
		RESET	1S10-2	1S10-1	Continuity	
			1S10-5	1S10-6	Open	
CURRENT SELECTOR (1S11) (see note 2)	P7 from control panel 1J7	10KW	1S11A-C (wire X47B20)	1S11A-1 (wire X48E20)	Continuity	F0-6 sheet 2
			1S11B-C (wire X53B20)	1S11B-1 (wire X58B20)	Continuity	
			1S11B-C	1S11B-2/ 3/6/7/8	Open	
		20KW	1S11A-C	1S11A-2	Continuity	
			1S11B-C	1S11B-2	Continuity	
			1S11B-C	1S11B-1/ 3/6/7/8	Open	
		30KW	1S11A-C	1S11A-3	Continuity	
			1S11B-C	1S11B-3	Continuity	
			1S11B-C	1S11B-1/ 2/6/7/8	Open	
		45KW	1S11A-C	1S11A-4	Continuity	
			1S11B-C	1S11B-1/ 2/3/6/7/8	Open	
		1000A	1S11A-C	1S11A-4	Open	
			1S11B-C	1S11B-1/ 2/3/6/7/8	Open	

Table 4-3. Control Panel Switch and Circuit Breaker Continuity Checks (continued)

(A) Switch	(B) Disconnect	(C) Switch Position	(D) Check Continuity From (see note 3)	(D) Check Continuity To (see note 3)	(E) Normal Indication	(F) Fig. Ref.
CURRENT SELECTOR (1S11) (cont)		700A	1S11A-C	1S11A-4	Open	
			1S11B-C	1S11B-6	Continuity	
			1S11B-C	1S11B-1/ 2/3/7/8	Open	
		500A	1S11A-C	1S11A-4	Open	
			1S11B-C	1S11B-7	Continuity	
			1S11B-C	1S11B-1/ 2/3/6/8	Open	
		200A	1S11A-C	1S11A-4	Open	
			1S11B-C	1S11B-8	Continuity	
			1S11B-C	1S11B-1/ 2/3/6/7	Open	
DC POWER (1S12)	Wires from switch terminals 1S12-2, -5, and -8	OFF	1S12-2	1S12-1	Open	FO-6 sheet 2
			1S12-5	1S12-4	Continuity	FO-5
			1S12-5	1S12-6	Open	FO-5
			1S12-8	1S12-7	Continuity	FO-3 sheet 1
		ON	1S12-2	1S12-1	Open	
			1S12-5	1S12-4	Open	
			1S12-5	1S12-6	Continuity	
			1S12-8	1S12-7	Open	
		RESET	1S12-2	1S12-1	Continuity	
			1S12-5	1S12-4	Continuity	
			1S12-5	1S12-6	Open	
			1S12-8	1S12-7	Continuity	
LIGHTS 7.5 (1CB1)	Wire P36A20 from 1CB1	Open (out)	1CB1-LINE	1CB1 -load	Open	FO-1
		Closed (in)	1CB1-LINE	1CB1 -load	Continuity	

Table 4-3. Control Panel Switch and Circuit Breaker Continuity Checks (continued)

(A) Switch	(B) Disconnect	(C) Switch Position	(D) Check Continuity From (see note 3)	(D) Check Continuity To (see note 3)	(E) Normal Indication	(F) Fig. Ref.
GTE 10 (1CB2)	Wire P37A18 from 1CB2	Open (out)	1CB2-LINE	1CB2 -load	Open	FO-1
		Closed (in)	1CB2-LINE	1 CB2-load	Continuity	

NOTES: 1. 1S9 is a two-section switch. Section A is section nearest panel. Each section has two poles. The pole 1 C (common) terminal is adjacent to terminal 1. The pole 2 C terminal is adjacent to terminal 4.

2. 1511 is a three-section switch. Section A is nearest panel.

3. The terminals of some switches are not identified on the switch. In such cases, wire numbers are listed in column (D) to assist in locating the switch terminals.

Table 4-4. Hydraulic Control Panel
Switch and Circuit Breaker Continuity Checks

(A)	(B)	(C)	(D)		(E)	(F)
			Check Continuity			
Switch	Disconnect	Switch Position	From	To	Normal Indication	Fig. Ref.
POWER SWITCH (4S1)	Wires from switch terminals 4S1-2, -5, -8, and -11	OFF	4S1-2	4S1-1	Continuity	F0-9
			4S1-2	4S1-3	Open	F0-9
			4S1-5	4S1-4	Continuity	F0-3 sheet 1
			4S1-8	4S1-7	Continuity	F0-9
			4S1-8	4S1-9	Open	F0-9
			4S1-11	4S1-12	Open	
		ON	4S1-2	4S1-1	Open	
			4S1-2	4S1-3	Continuity	
			4S1-5	4S1-4	Open	
			4S1-8	4S1-7	Open	
			4S1-8	4S1-9	Continuity	
			4S1-11	4S1-12	Continuity	
PANEL LIGHTS (4S2)	Wire from switch terminal 4S2-2	OFF	4S2-2	4S2-1	Open	F0-9
			4S2-2	4S2-3	Open	
		DIM	4S2-2	4S2-1	Continuity	
			4S2-2	4S2-3	Open	
		BRT	4S2-2	4S2-1	Open	
			4S2-2	4S2-3	Continuity	
PRESS TO TEST (4S3)	Wire from switch terminal 4S3-N0	Released	4S3-1	4S3-2	Open	F0-9
		Pressed	4S3-1	4S3-2	Continuity	
OUTPUT SWITCH (4S4)	Wire from switch terminal 4S4-C	OFF	4S4-1	4S4-2	Open	F0-9
		ON	4S4-1	4S4-2	Continuity	

Table 4-4. Hydraulic Control Panel
Switch and Circuit Breaker Continuity Checks (continued)

(A)	(B)	(C)	(D) Check Continuity		(E)	(F)
Switch	Disconnect	Switch Position	From	To	Normal Indication	Fig. Ref.
PRESSURE SWITCH (4S5) (see note 1)	Wires from switch terminals 4S5-2 and -5	OFF	4S5-2	4S5-1	Open	F0-9
			4S5-2	4S5-3	Open	
			4S5-5	4S5-4	Open	
			4S5-5	4S5-6	Open	
		INCREASE	4S5-2	4S5-1	Open	
			4S5-2	4S5-3	Continuity	
			4S5-5	4S5-4	Open	
			4S5-5	4S5-6	Continuity	
		DECREASE	4S5-2	4S5-1	Continuity	
			4S5-2	435-3	Open	
			4S5-5	4S5-4	Continuity	
			4S5-5	4S5-6	Open	
CIRCUIT BREAKER (4CB1)	Wire from circuit breaker terminal 4CB1 -LINE	Open (out)	4CB1 -LINE	4CB1-load	Open	F0-9
		Closed (in)	4CB1-LINE	4CB1-load	ContinuitY	

NOTE 1. The pressure switch must be removed to reach the switch terminals. Switch removal requires that the vent dryer and hydraulic pressure gage be removed. These components are not removed at organizational level. If the switch requires checking , notify maintenance supervisor.

Table 4-5. Battery Charger Output Control Switch 3S1 Continuity Checks

Switch Position	Check Resistance		Normal Indication
	From	To	
28.5VDC	3S1-C	3S1-1	Continuity
		3S1-2	Open
		3S1-3	Open
30.5VDC	3S1-C	3S1-1	Open
		3S1-2	Continuity
		3S1-3	Open
32 .0VDC	3S1-C	3S1-1	Open
		3S1-2	Open
		3S1-3	Continuity

Table 4-6. 95% Enable Relay 3K1 Test

Relay State	Measure		Normal Indication
	From	To	
Deactivated	J8-K	J8-J	Open
	J8-H	J8-G	Open
	JB-F	J8-E	Open
	J8-D	J8-C	Open
	J8-A	J8-B	200 to 300 ohms
Activated	J8-K	J8-J	Continuity
	J8-H	J8-G	Continuity
	J8-F	J8-E	Continuity
	J8-D	J8-C	Continuity

Table 4-7. Starter Latching Relay 3K2 Test

Relay State	Measure		Normal Indication
	From	To	
Deactivated	J8-M	J18-B	Open
	J8-P	J18-L	Open
	J8-P	J8-B	125 to 200 ohms
Activated	J8-M	J18-B	Continuity
	J8-N	J18-B	Continuity
	J8-L	Ground	+24 vdc

Table 4-8. Battery/Charger Transfer Relay 3K3 Test

Relay State	Measure		Normal Indication
	From	To	
Deactivated	J9-M	J9-R	Continuity
	J9-M	J9-S	Open
	J9-N	J9-R	Continuity
	J9-N	J9-S	Open
	J9-P	J9-R	Continuity
	J9-P	J9-S	Open
	J18-E	J9-R	Continuity
	J9-S	J9-L	90 to 130 ohms
Activated	J9-M	Ground	+24 vdc
	J9-N	Ground	+24 vdc
	J9-P	Ground	+24 vdc
	J18-E	Ground	0 vdc

Table 4-9. Ac Output Contactor K1 Test

Contactor State	Measure		Normal Indication
	From	To	
Deactivated	J1-A	J1-B	Less than 2 ohms
	J1-C	J1-D	Open
	J1-E	J1-F	Open
	Terminal Al	Terminal A2	Open
	Terminal B1	Terminal B2	Open
	Terminal Cl	Terminal C2	Open
Activated	J1-C	J1-D	Continuity
	J1-E	J1-F	Continuity
	Terminal A1	Terminal A2	Continuity
	Terminal B1	Terminal B2	Continuity
	Terminal C1	Terminal C2	Continuity

Section VII. RADIO INTERFERENCE SUPPRESSION

4-11. GENERAL METHODS USED TO ATTAIN PROPER SUPPRESSION. Essentially, suppression is attained by providing a low resistance path to ground for stray currents. The methods used include shielding the ignition and high-frequency wires, grounding the frame with bonding straps, and using filtering systems.

4-12. INTERFERENCE SUPPRESSION COMPONENTS.

a. Primary Suppression Components. The primary suppression components are those whose primary function is to suppress radio interference. These components include:

(1) Bonding straps to frame.

(2) Shielded ignition unit and ignition wire to igniter plug.

(3) Shielded generator control unit and battery charger.

(4) Filter unit installed on generator.

(5) Welded one-piece frame and housing assembly with latching access door.

(6) Ground stud on frame to ground via ground strap.

b. Secondary Suppression Components. These components have radio interference suppression functions which are incidental or secondary to their primary function. They are the lockwashers used on the fuel pump, electronic control unit, generator control unit, and battery charger.

Section VIII. MAINTENANCE OF FRAME AND HOUSING

4-13. GENERAL.

a. Frame and Housing Components. The frame and housing (figures 1-1 and 1-6) consists of a frame (one-piece welded), panels (welded to frame), lifting eyes, covers, access doors, battery holddown, exhaust ejector assembly, air cleaner assembly, ground stud, and drain hoses/lines.

b. Frame Construction. The frame is constructed of steel channel pieces welded together to form a unitized, one-piece assembly. Steel panels are welded to the frame assembly to form the housing. Four lifting eyes (6, figure 4-5) are attached to the frame assembly. A roof assembly (2) is attached to the housing by four latches (1). An exhaust flapper (11) is attached to the roof, which is opened by exhaust gas from the exhaust ejector when the engine is started.

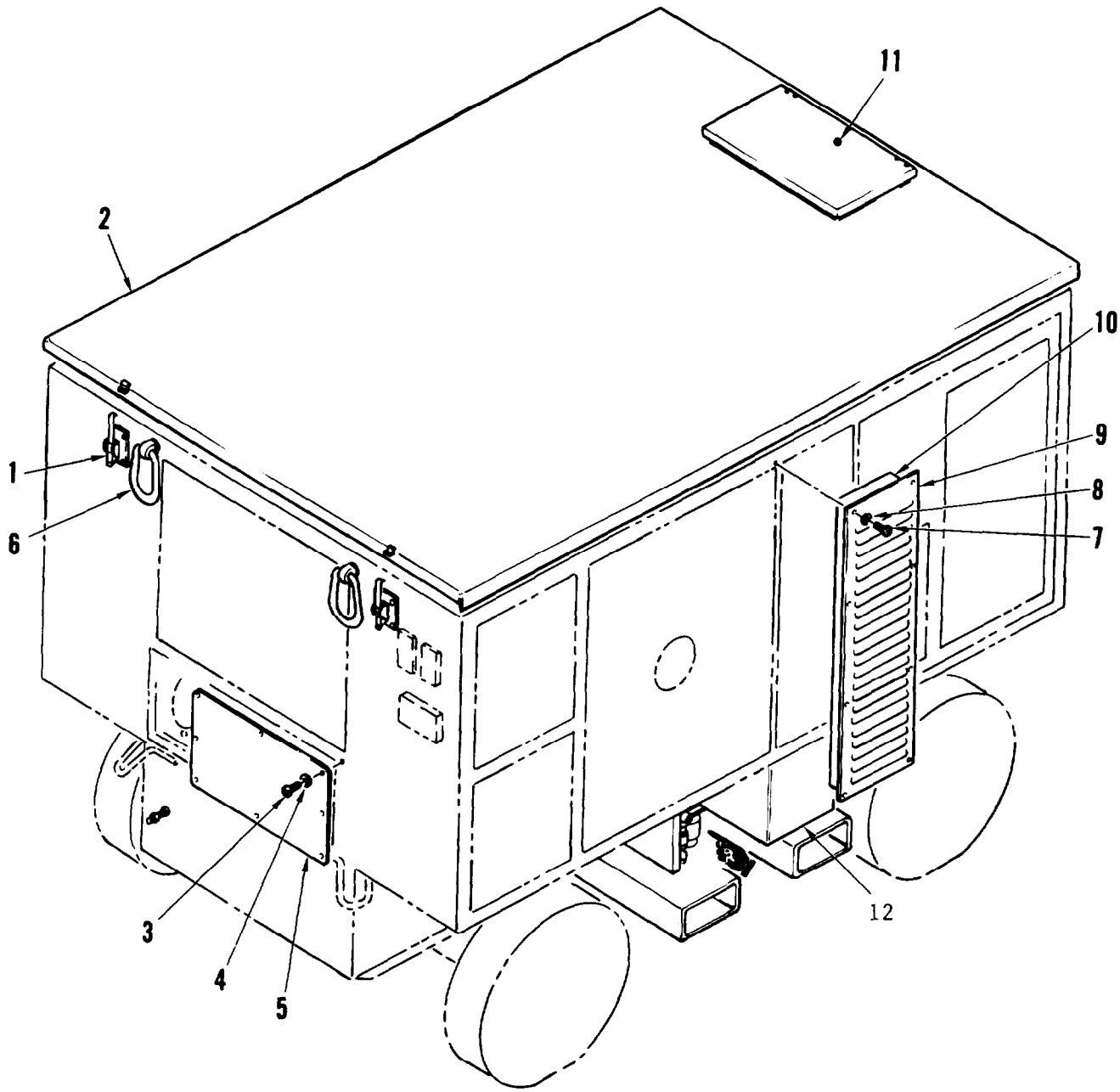
c. Covers. Covers (and shields) are shown in figures 4-5 and 4-6.

d. Access Doors. There are seven access doors plus an exhaust flapper, figure l-l and 1-6. These include:

(1) Control panel access door (rear of AGPU).

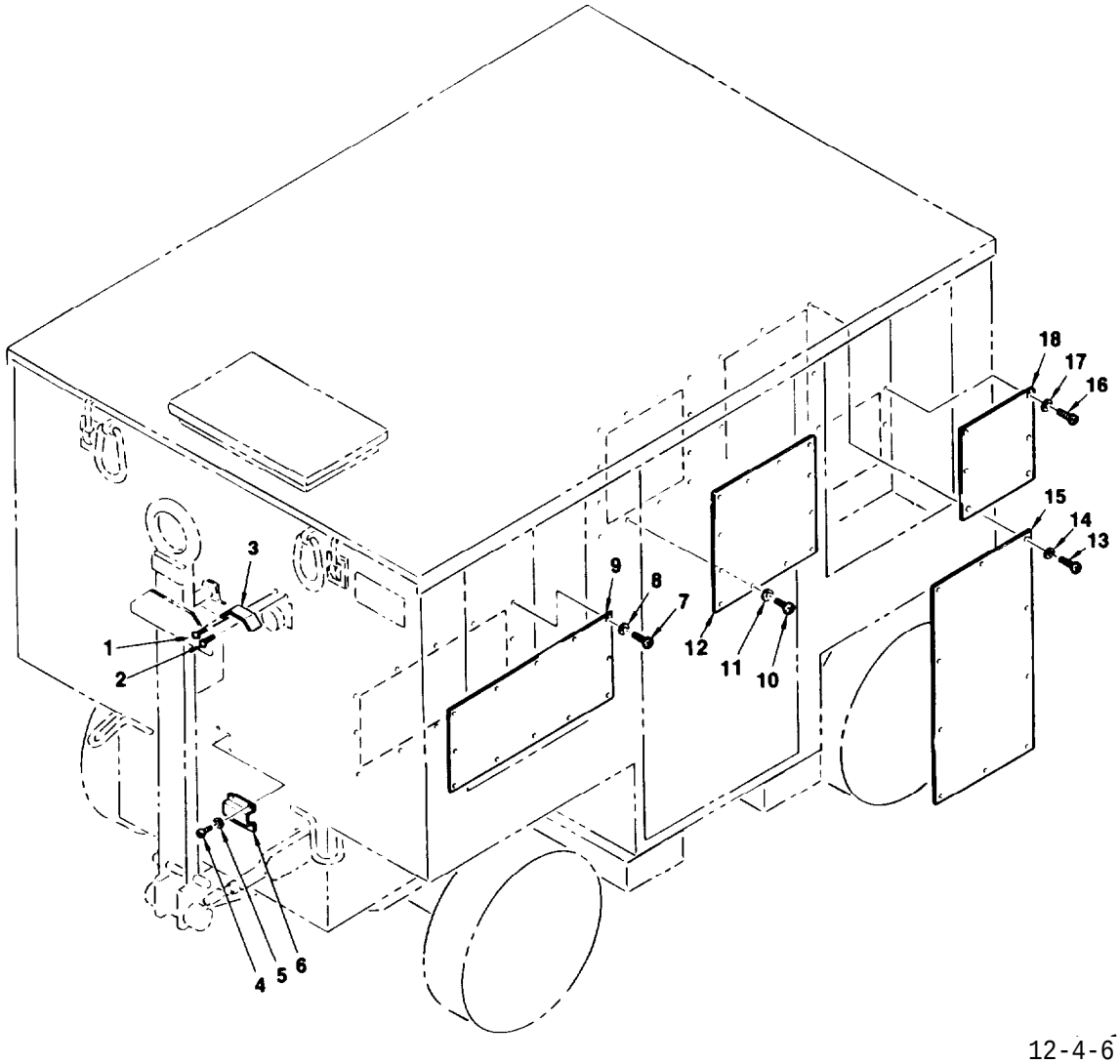
(2) Electrical trays access door (right upper rear of AGPU).

(3) Battery access door (right lower rear of AGPU).



1. LATCH
2. ROOF
3. SCREW
4. WASHER
5. COVER, BATTERY CHARGER ACCESS
6. LIFTING EYE
7. SCREW
8. WASHER
9. COVER, AIR INTAKE
10. SHROUD
11. EXHAUST FLAPPER
12. COVER, AIR CLEANER EXHAUST

Figure 4-5. Frame and Housing Covers, Right Rear Three Quarter View



12-4-6

1. RIVET
2. RIVET
3. SHIELD, EMERGENCY STOP SWITCH
4. SCREW
5. WASHER
6. SHIELD, EXHAUST EJECTOR DRAIN
7. SCREW
8. WASHER
9. COVER, EXHAUST ACCESS
10. SCREW
11. WASHER
12. COVER, ENGINE ACCESS
13. SCREW
14. WASHER
15. COVER, HYDRAULIC ACCESS
16. SCREW
17. WASHER
18. COVER, FUEL ACCESS

Figure 4-6. Frame and Housing Covers, Left Front Three Quarter View

(4) Engine access door (right center of AGPU).

(5) Hydraulic filter access door (located in hydraulic module front panel, right front of AGPU) .

(6) Hydraulic control panel access door (located in hydraulic module front panel, right front of AGPU).

(7) Pneumatic hose access door (left center of AGPU) .

e. Air Cleaner. The air cleaner is located behind a louvered intake cover, (9, figure 4-5). The air cleaner functions as an inertial inlet air particle separator. A cutaway view of the air cleaner is shown in figure 4-7. Outside (dirty) air is drawn through air cleaner tubes mounted in the housing. The air cleaner tubes contain fixed vanes that spin the air, throwing dirt particles to the walls of the tubes. The dirt is expelled out of openings in the tubes and is pulled out of the air cleaner housing by a scavenge air system. The scavenge air system consists of six nozzles mounted in the bottom of the air cleaner housing. A small amount of bleed air is routed from the engine compressor through hoses to the nozzles. The bleed air is forced through the six nozzles into six ejector tubes. This effectively creates a partial vacuum in the housing to eject the dirt particles out of the ejector tubes.

4-14. LIFTING EYES.

a. Remove. (See figure 4-5.) Remove lifting eye (6) by unscrewing lifting bolt from frame.

Install.
Install lifting eye (6) by threading attached bolt into frame.

4-15. COVERS.

a. Remove. (See figures 4-5 and 4-6.)

(1) Remove battery charger access cover (5, figure 4-5) by removing eight screws (3) and washers (4).

(2) Remove exhaust access cover (9, figure 4-6) by first removing AC power cable from storage compartment, and then removing twelve screws (7) and washers (8).

(3) Remove engine access cover (12) by first opening pneumatic hose access door and removing pneumatic hose, and then removing twelve screws (10) and washers (11).

(4) Remove hydraulic access cover (15) by first removing DC power cable from storage compartment, and then removing twelve screws (13) and washers (14).

(5) Remove fuel access cover (18) by first removing DC power cable from storage compartment, and then removing four screws (16) and washers (17).

Install. (See figures 4-5 and 4-6.)

(1) Install battery charger access cover (5, figure 4-5) with eight screws (3) and washers (4).

(2) Install exhaust access cover (9, figure 4-6) with twelve screws (7) and washers (8). Replace AC power cable in storage compartment.

(3) Install engine access cover (12) with twelve screws (10) and washers (11). Replace pneumatic hose and close access door.

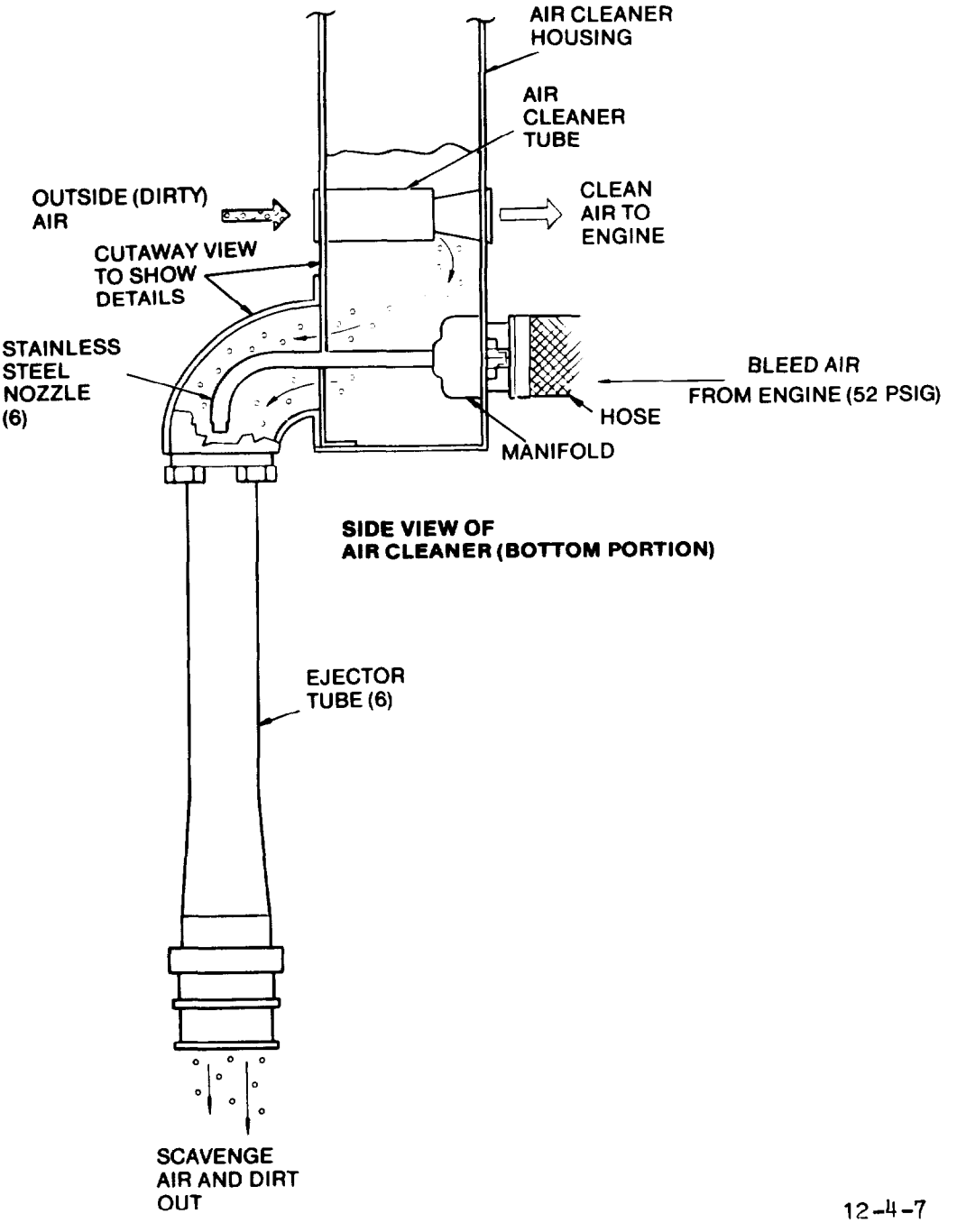


Figure 4-7. Air Cleaner Operation

(4) Install hydraulic access cover (15) with twelve screws (13) and washers (14). Replace DC power cable in storage compartment.

(5) Install fuel access cover (18) with four screws (16) and washers (17). Replace DC power cable in storage compartment.

4-16. ROOF.

a. Removal. (See figure 4-5.)

CAUTION

During removal of the roof, one person should be stationed at each corner of the roof to prevent warping or damage to the roof.

(1) Release four latches (1) securing roof (2) to ACPU.

(2) With one person at each corner, lift the roof assembly to clear the top of the AGPU and walk the roof to the front or rear of the AGPU until roof is clear. Set the roof on a flat surface.

b. Install. (See figure 4-5.)

(1) With one person at each corner of the roof (2) walk the roof to the AGPU and place the roof on top of the AGPU.

(2) Secure the roof (2) to the top of the AGPU with four latches (1).

4-17. BATTERY HOLDDOWN.

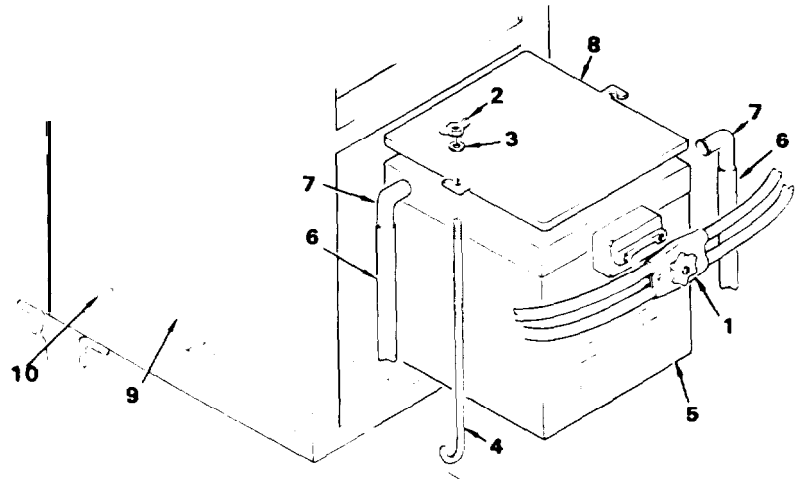
a. Remove. (See figure 4-8.)

(l) Disconnect battery connector.

(2) Remove wing nuts (2) and washers (3). Remove holddown rod (4) from slot in floor of battery compartment.

b. Install. (See figure 4-8.)

(1) Ensure that battery is disconnected.



12-4-8

1. BATTERY CONNECTOR
2. NUT, WING
3. WASHER
4. HOLDDOWN ROD
5. BATTERY
6. DRAIN TUBE
7. DRAIN FITTING
8. BATTERY COVER
9. BATTERY GUIDE (2)
10. DRAIN TUBE HOLE (2)

Figure 4-8. Battery Holddown

(2) Insert curved end of holddown rod (4) into slot in floor of battery compartment. Position threaded end of holddown rod (4) into slot in battery cover (8). Secure holddown rod in place with washer (3) and wing nut (2).

(3) Connect battery connector.

4-18. EXHAUST EJECTOR ASSEMBLY. Inspect as follows:

a. Open engine access door.

b. Inspect exhaust ejector assembly, figure 1-8, for security of installation, damaged insulation, and missing or loose insulation retaining washers. Small cracks, dents, and cuts in insulation are acceptable. Open exhaust flapper and use flashlight to inspect interior of assembly for damage, cracks, and erroded housing.

4-19. AIR CLEARER ASSEMBLY.

a. Inspect. (See figure 4-9.)

(1) Remove intake cover (9, figure 4-5) and shroud (10) by removing eight screws (7) and washers (8).

(2) Inspect air cleaner assembly (14, figure 4-9) for missing or damaged tubes (21). Remove debris and vacuum out all tubes and face of cleaner. Replace cleaner assembly if tubes are missing or damaged.

b. Remove. (See figure 4-9.)

(1) Remove intake cover and shroud by performing step a. (1).

(2) Open engine access door.

(3) Remove ejector tube cover (3) by removing four screws (1), washers (2), and two lockwashers (4), and two nuts (5).

(4) Remove two ejector tube assemblies (20, sheet 2) by removing eight bolts (18) and four brackets (19).

(5) Loosen two hose clamps (6) and disconnect two bleed air hoses (7) from fittings on bottom of air cleaner (14).

(6) Remove four screws (8), lockwashers (9), and flat washers (10) from bottom of outer duct (17).

(7) Remove air cleaner (14) by removing twelve screws (11), lockwashers (12), and flat washers (13).

(8) Inspect gaskets (15, 16) for cuts, tears or other damage. Reuse gasket if not damaged.

(9) Inspect six air cleaner nozzles (22) for cracks or deformation. Replace air cleaner if damaged.

(10) Inspect six nozzles (22) for clogged openings. If clogged, use small wire to remove obstruction (do not enlarge openings).

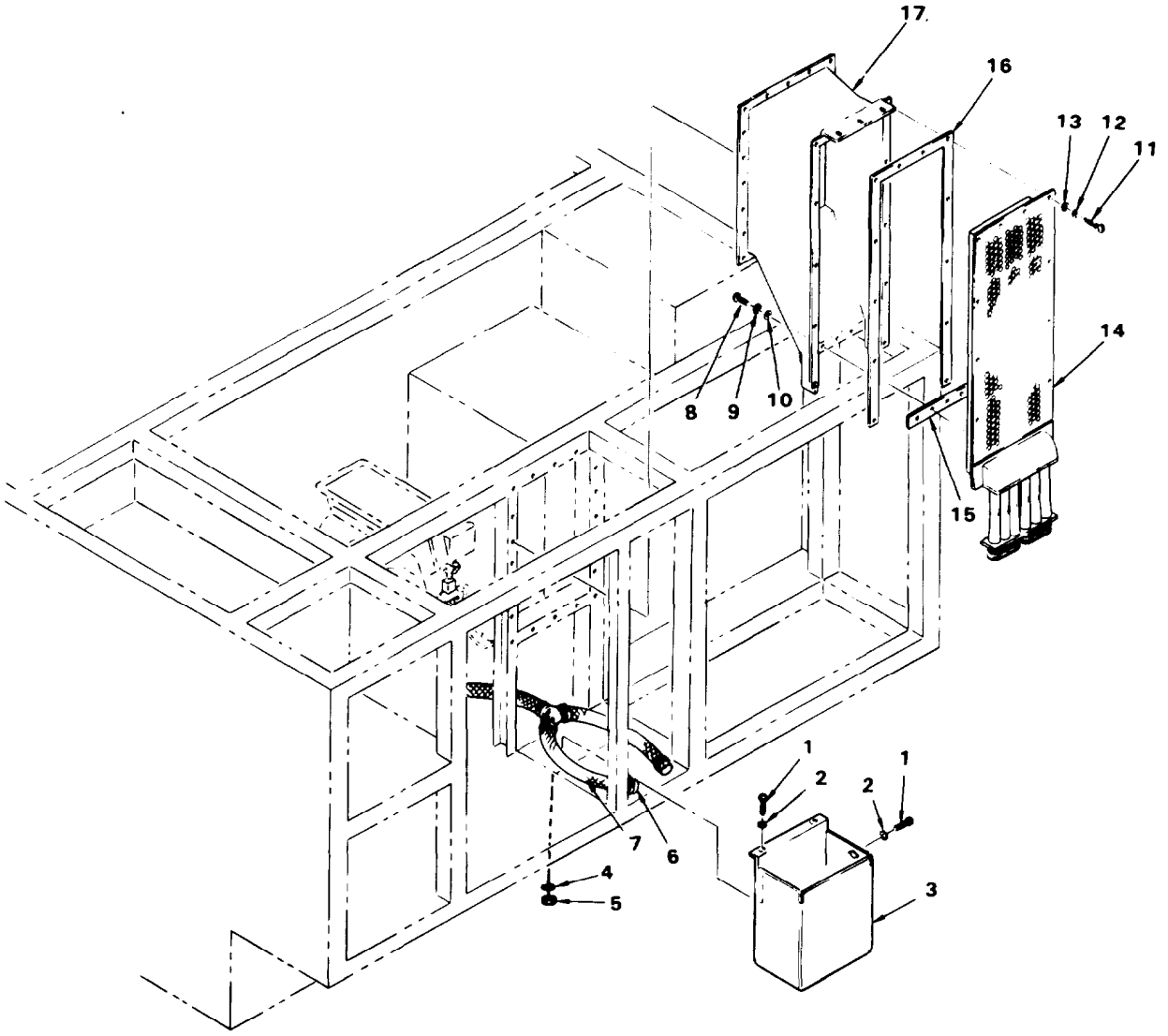
c. Repair. Inspect air cleaner for missing or damaged tubes (21, figure 4-9). Replace air cleaner if tubes are missing or damaged. Replace broken or cracked ejector tube assemblies (20, figure 4-9).

d. Install. (See figure 4-9.)

(1) Ensure gaskets (15, 16) are in position on outer duct (17).

(2) Install air cleaner (14) and secure with twelve screws (11), lockwasher (12), and flat washers (13).

(3) Install four screws (8), lockwashers (9), and flat washers (10) at bottom of outer duct (17).



12-4-9(1)

1. SCREW
2. WASHER, FLAT
3. EJECTOR TUBE COVER
4. WASHER
5. NUT
6. CLAMP HOSE
7. HOSE 'BLEED AIR
8. SCREW
9. WASHER, LOCK
10. WASHER, FLAT
11. SCREW
12. WASHER, LOCK
13. WASHER, FLAT
14. AIR CLEANER
15. GASKET, SMALL
16. GASKET, LARGF
17. DUCT, OUTER
18. BOLT
19. BRACKET
20. EJECTOR TUBE ASSEMBLY
21. TUBES
22. NOZZLE

Figure 4-9. Air Cleaner and Air Intake Duct Assemblies (sheet 1 of 2)

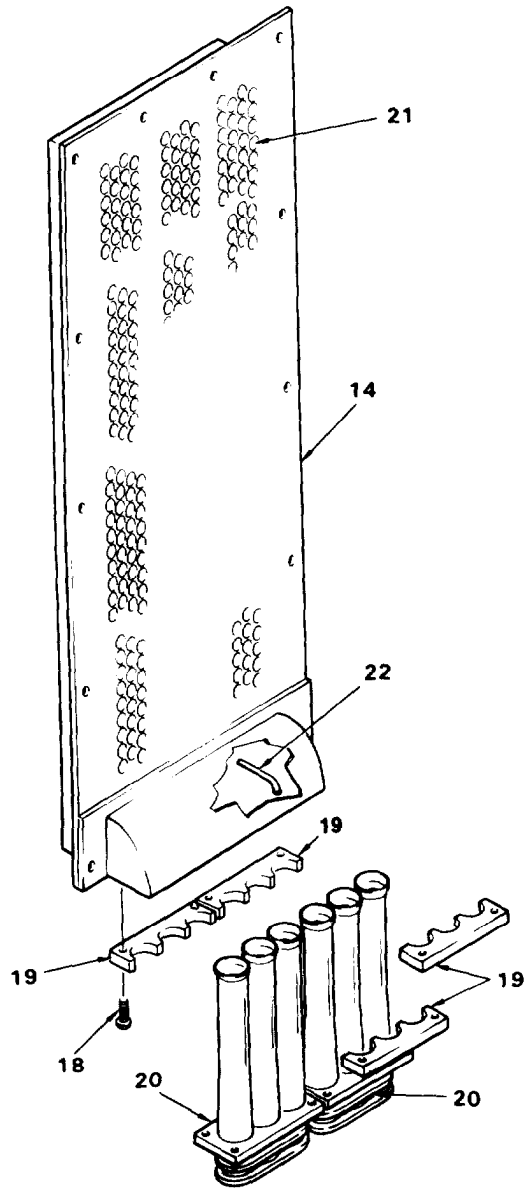


Figure 4-9. Air Cleaner and Air Intake Duct Assemblies (sheet 2 of 2)

(4) Connect two bleed air hoses (7) to fittings on bottom of air cleaner (14), and secure by tightening two hose clamps (6).

(5) Install two ejector tube assemblies (20) with four brackets (19) and eight bolts (18).

(6) Install ejector tube cover (3) with four screws (1), washers (2), and two lockwashers (4), and two nuts (5).

(7) Install intake cover (9, figure 4-5) and shroud (10) with eight screws (7) and washers (8).

4-20. GROUND STUD.

Remove. (See figure 4-10.) Remove nut (1) washer (2), star washer (3), and remove ground stud (5) with star washer (4).

b. Install. (See figure 4-10.) Ensure that area around hole in chassis is clean and free from corrosion. Install star washer (4) on ground stud (5) and install in hole in chassis. Install washer (2), star washer (3), and nut (1).

4-21. DRAIN TUBES.

a. Remove. (See figure 4-11.)

(1) Remove exhaust ejector drain tube (4) by unthreading tube, after removal of cover (3) and four attaching screws (1) and washers (2).

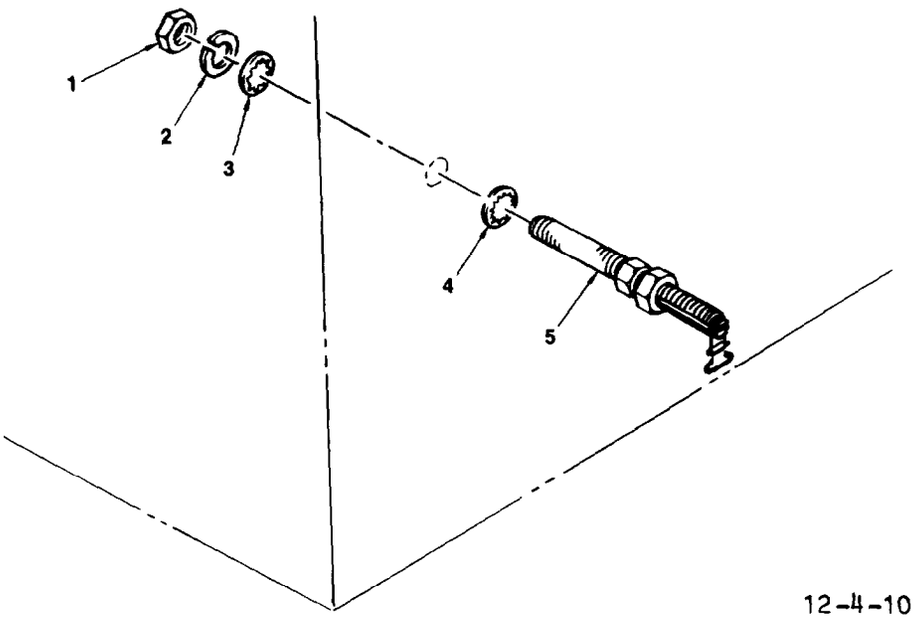
(2) Open engine access door (12, figure 1-1).

(3) Remove two engine drain tubes (5 and 7, figure 4-11).

(4) Remove fuel control unit (FCU) drain tube (10).

(5) Remove gearcase drain tube (14).

(6) Remove hydraulic pump drain tube (18).



1. NUT
2. WASHER, LOCK
3. WASHER, STAR
4. WASHER, STAR
5. GROUND STUD

Figure 4-10. Ground Stud Installation

b. Install. (See figure 4-11.)

(1) Install exhaust ejector drain tube (4) by threading tube into ejector. Install cover (3) with four attaching screws (1) and washers (2).

(2) Install two engine drain tubes (5, 7). Route tubes through floor grommets.

(3) Install fuel control unit (FCU) drain tube (10). Route tube through floor grommet.

(4) Install gearcase drain tube (14). Route tube through floor grommet.

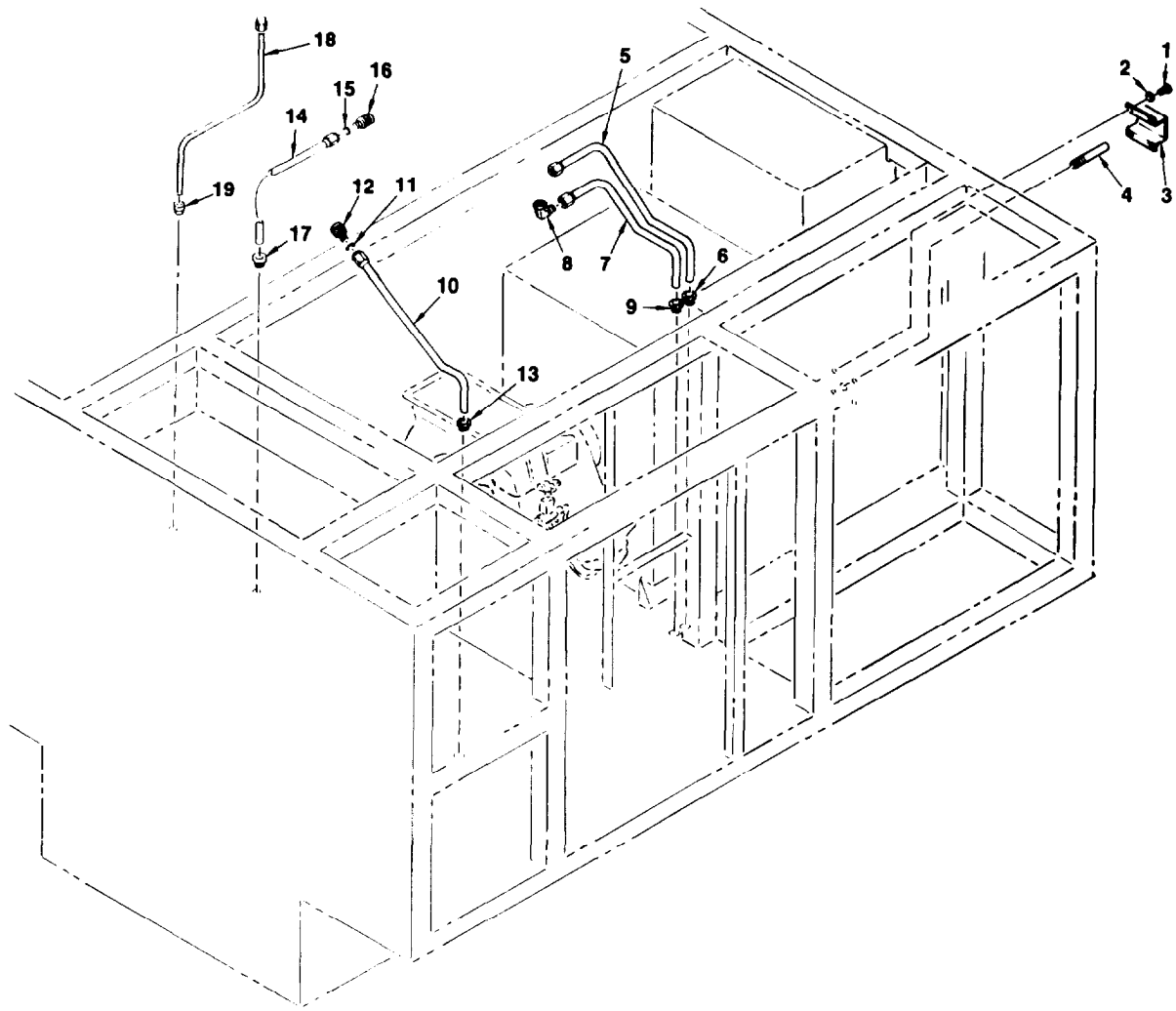
(5) Install hydraulic pump drain tube (18).

(6) Close engine access door.

4-22. INSULATION. Open GTE access door and inspect interior insulation for damage, and loose or missing retaining washers. Minor damage to insulation such as dents, minor cuts or abrasion is allowed. Notify maintenance supervisor if portions of insulation are missing, or retaining washers are missing.

Section IX. MAINTENANCE OF DC ELECTRICAL AND CONTROL SYSTEM

4-23. GENERAL. The major components of the dc electrical and control system are listed in table 4-10, with location and figure references.



1. SCREW
2. WASHER, FLAT
3. COVER
4. TUBE, EXHAUST DRAIN
5. TUBE, TURBINE DRAIN
6. GROMMET
7. TUBE, COMBUSTOR DRAIN
8. ELBOW, SWIVEL
9. GROMMET
10. TUBE, FCU DRAIN
11. PACKING
12. NUT, COUPLING
13. GROMMET
14. TUBE, GEARCASE DRAIN
15. PACKING
16. NUT, COUPLING
17. GROMMET
18. TUBE, HYDRAULIC PUMP DRAIN
19. GROMMET

Figure 4-11. Drain Tubes and Fittings

Table 4-10. Dc Electrical and Control System Major Components

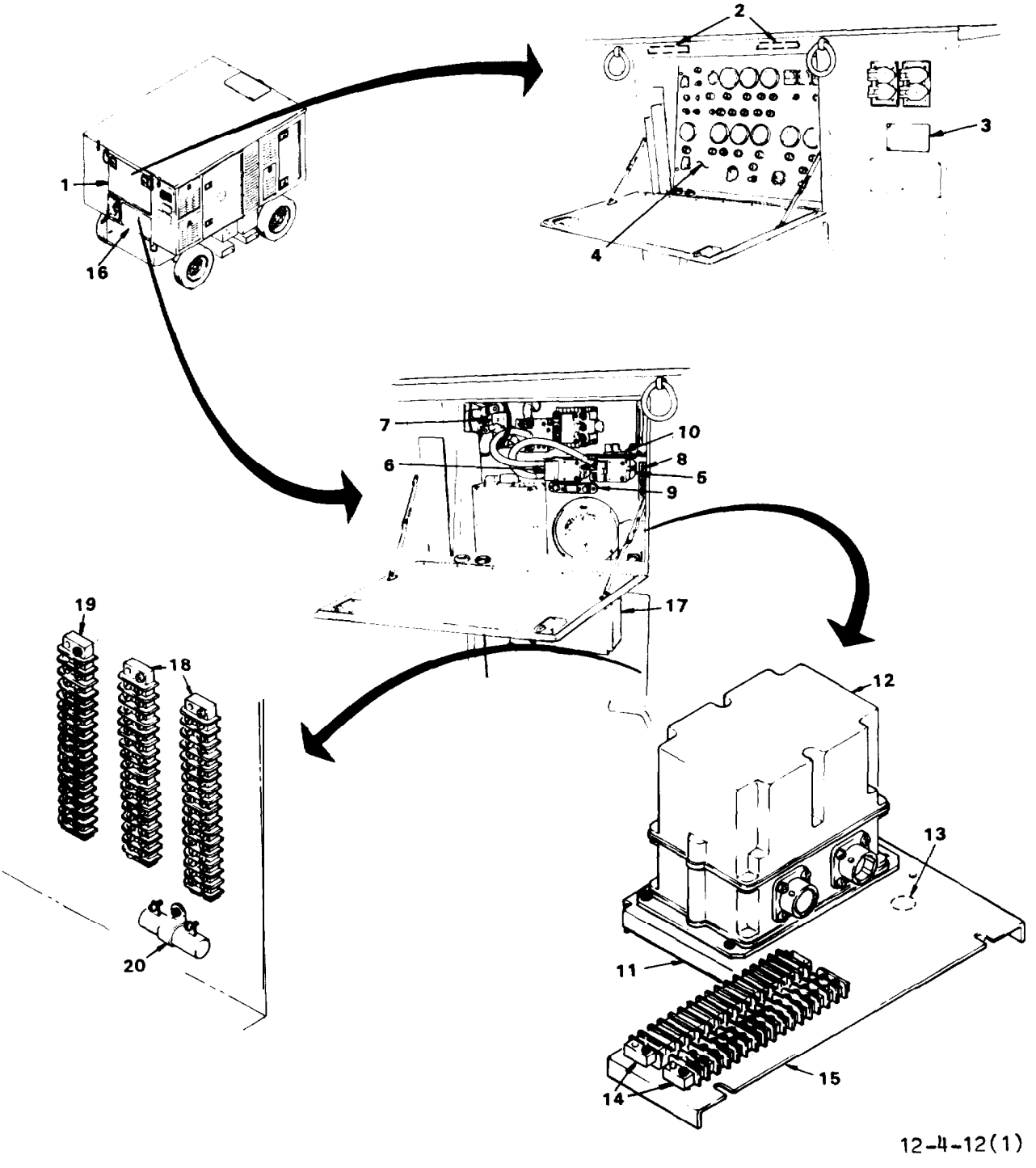
Component	Location (Figure 4-12 Legend)	Installation Fig. Ref.	Schematic/ Wiring Diagram Fig. Ref.
Control panel access door (ref.)	1		
Control panel lamps	2	4-33	F0-2
Slave receptacle (J19)	3	4-15	F0-1
Control panel (ref.)	4		
GTE starter contactor (K4)	5	4-18	F0-1, F0-3(1)
Battery output/Traction Motor contactor (K3)	6	4-18	F0-1
Dc output shunt (R1)	7	4-18	F0-1, F0-5
Starter shunt (R2)	8	4-18	F0-1
Battery shunt (R3)	9	4-18	F0-1
Ground terminal board	10	4-20, 4-24	F0-1, F0-2, F0-3(1), F0-3(2), F0-4, F0-5, F0-6(2), F0-7, F0-9
Electrical bay subfloor (ref.)	11		
Electronic control unit (ECU) (A2)	12	4-19	F0-3
Electrical compartment temperature switch (S1)	13	4-19	F0-3(2)
Terminal board TB1	14	4-20, 4-21	F0-2, F0-3(1), F0-4, F0-7
Terminal board TB2	15	4-20, 4-22	F0-2, F0-3(1), F0-3(2), F0-8
Battery charger access cover (ref.)	16		

Table 4-10. DC Electrical and Control System Major Components (continued)

Component	Location (Figure 4-12 Legend)	Installation Fig. Ref.	Schematic/ Wiring Diagram Fig. Ref.
Battery charger (A3)	17	4-17	
Terminal board TB3	18	4-20, 4-23	FO-1, FO-3(1), FO-3(2), FO-8
Terminal board TB4	19	4-20	FO-3(1), FO-8
Resistor R6	20	4-20	FO-7
Electrical trays access door (ref.)	21		
Upper tray (ref.)	22		
Battery charger circuit breaker (35 amp) (3CB2)	23	4-26	FO-1
Battery charger circuit breaker (70 amp) (3CB1)	24	4-26	FO-1
Lower tray (ref.)	25		
95% enable relay (3K1)	26	4-27	FO-3(1), FO-5, FO-9
Starter latching relay (3K2)	27	4-27	FO-3(1)
Battery/charger transfer relay (3K3)	28	4-27	FO-1
Panel lamp voltage regulator (3VR1)	29	4-28	FO-2
Utility lamp voltage regulator (3VR2)	30	4-28	FO-2
Power diodes			
(3CR7P)	31	4-29	FO-1
(3CR8P)	32	4-29	FO-1
(3CR9P)	33	4-29	FO-1
Battery charger output select switch (3S1)	34	4-30	FO-1

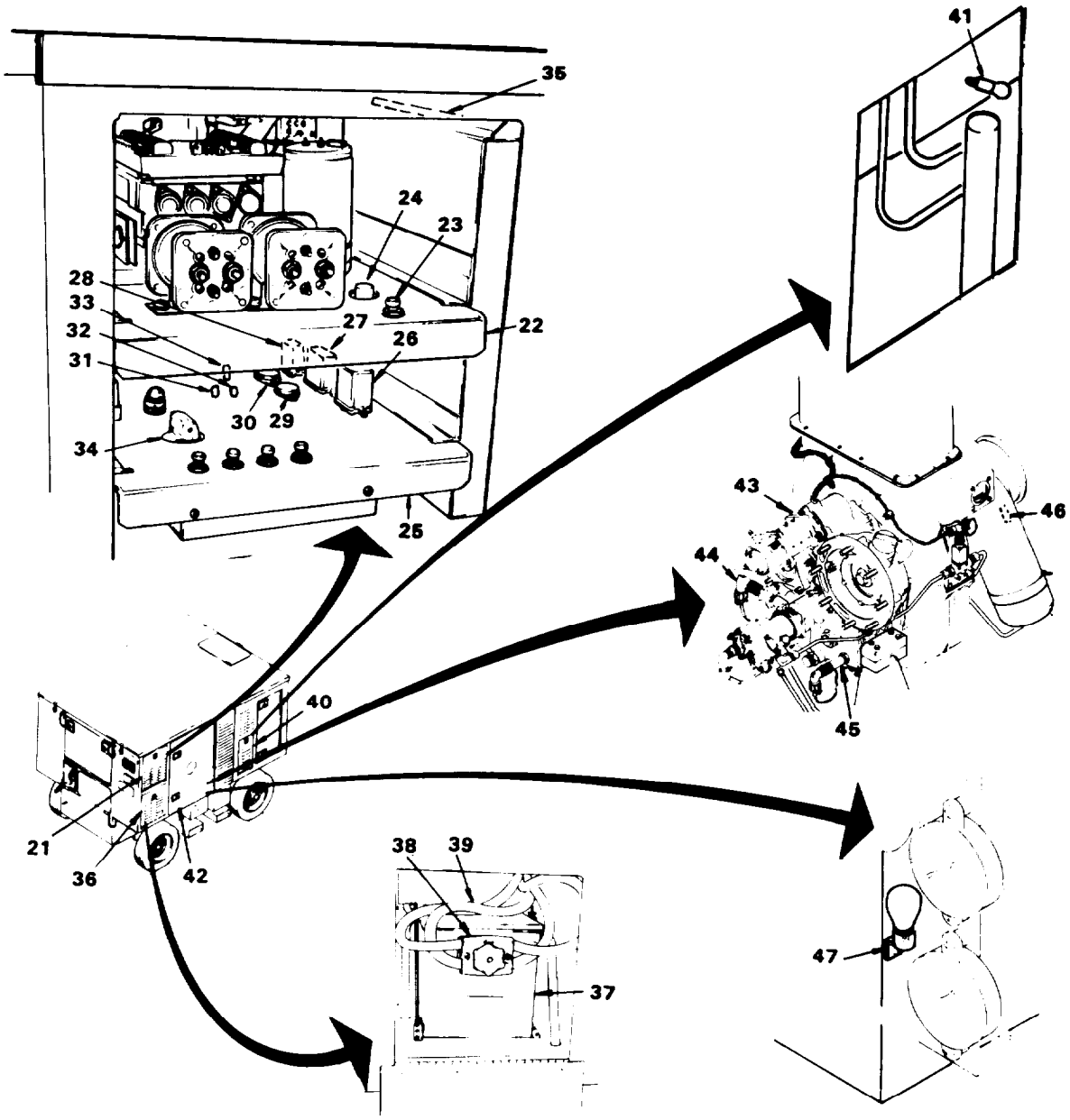
Table 4-10. Dc Electrical and Control System Major Components (continued)

Component	Location (Figure 4-12 Legend)	Installation Fig. Ref.	Schematic/ Wiring Diagram Fig. Ref.
Generator dc load resistor (R4)	35	4-25	FO-1
Battery access door (ref.)	36		
Battery (BT1)	37	4-15	FO-1
Battery terminal adapter (PI7)	38	4-16	FO-1
Battery cables	39	4-16	FO-1
Hydraulic filter access door (ref.)	40		
Hydraulic utility lamp	41	4-33	FO-2
Engine access door (ref.)	42		
GTE speed sensor	43	4-31	FO-3(2)
Low oil pressure switch	44	4-31	FO-3(2)
High oil pressure switch	45	4-31	FO-3(2)
Thermocouple	46	4-31	FO-3(2)
Engine utility lamp	47	4-33	FO-2
Dc cable compartment (ref.)	48		
Fuel access cover (ref.)	49		
Fuel utility lamp	50	4-33	FO-2
Inlet filter blocked switch (S3)	51	4-32	FO-3(2)
Emergency stop switch (S2)	52	4-34	FO-3(1), FO-7



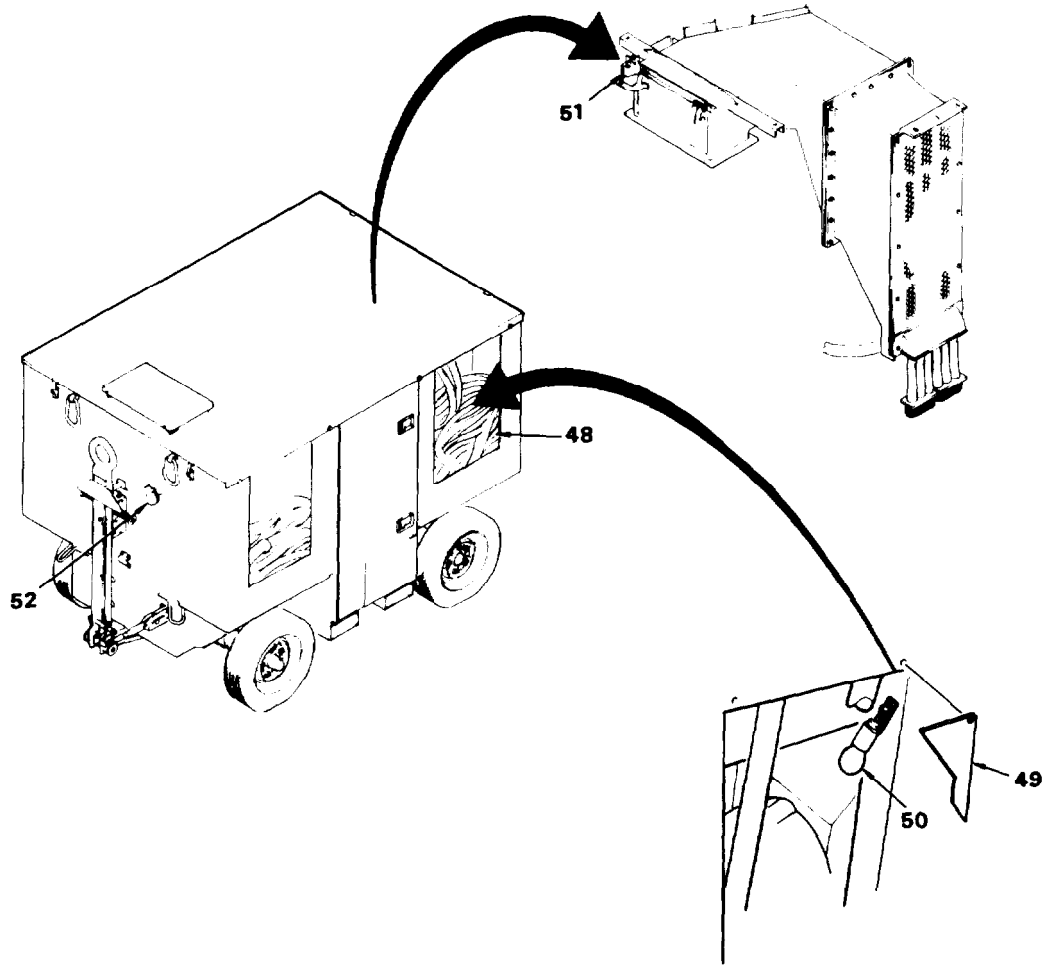
NOTE: See table 4-10 for legend.

Figure 4-12. Dc Electrical and Control System Components (sheet 1 of 3)



NOTE : See table 4-10 for legend.

Figure 4-12. DC Electrical and Control System Components (sheet 2 of 3)



12-4-12(3)

NOTE: See table 4-10 for legend.

Figure 4-12. DC Electrical and Control System Components (sheet 3 of 3)

(1) Electrical components are identified on schematics and wiring diagrams by reference designators. Reference designators include one or two letters followed by one or more numbers, such as K1. The letter K identifies the component type (relay), and the number 1 identifies a specific relay. Some electrical components are mounted directly to the AGPU mainframe, while others are mounted on removable assemblies with unit designators. AGPU unit designators include unit 1 (control panel), unit 2 (upper electrical tray), and unit 3 (lower electrical tray). Throughout these procedures, reference designators are preceded by the unit designator where applicable. For example K1 identifies a relay mounted on the AGPU mainframe (electrical bulkhead in this instance), and 3K1 identifies a relay mounted on the lower electrical tray.

(2) The DC electrical and control system includes the master DC power control; lights control; and the electrical control portions of the GTE (gas turbine engine), fuel, and pneumatic systems.

NOTE

The control panel controls and instruments associated with these systems are described with this section. Maintenance of the control panel controls and instruments is provided in section XVII.

a. Master DC Power Control System. (See Fig. FO-1.) The master DC power control system includes, the battery, slave receptacle J19, battery output/traction motor, contactor K3, DC output shunt R1, starter shunt R2, battery charge/discharge shunt R3, battery charger transfer relay 3K3, battery charger, charger input circuit breakers 2CB1 and 2CB2, charger output select switch 3S1, resistors (R4 and TB3-R1), associated control panel switches and instruments.

(1) Battery power is applied directly to slave receptacle J19. Battery power is applied via shunt R3, battery/charger transfer relay 3K3, diode TB3-CR5P, and resistor TB3-R1 to illuminate CHRG/BAT FAULT light 1DS7. Battery power is also applied via shunt R3 to the propulsion system (section XVIII). All other battery and charger power is controlled by the control panel MASTER SWITCH 1S2. When switch 1S2 is turned on, battery power is applied via shunt R3, relay 3K3, and 1S2 to control panel circuit breakers 1CB1 and 1CB2, and to the hydraulic system (section XV). GTE circuit breaker 1CB2 controls dc power to the GTE control system, and LIGHTS circuit breaker 1CB1 controls dc power to the lights, fuel system and pneumatic control system. The current through shunt R3 is indicated on control panel BATTERY CHG/DISCH meter 1M6. Switch 1S2 also grounds control panel BATTERY VOLTAGE meter 1M4 which indicates battery voltage.

(2) When the MASTER SWITCH is on and other switches are in the proper positions for engine start, the GTE control circuits activate starter contactor K4 (see FO-3). Battery power is then applied via starter shunt R2 and contactor K4 to engine starter motor MG1. The current through the starter shunt is indicated on the control panel STARTER CURRENT meter 1M5 (FO-1). Contactor K4 is deactivated when engine speed reaches 60%.

NOTE

On the 83-360D, the generator output is provided directly to the TRU at the line side of the ac contactor. The TRU output is then connected to the battery charger and controls as described in the rest of this section.

(3) When engine speed reaches 95%, the generator provides a 28 vdc output. The generator DC output is applied via circuit breaker 2CB1 to the battery charger 50 amp section and via 2CB2 to the charger 20 amp section. The charger 50 amps section supplies and output regulated at 28.5, 30.5, or 32 vdc (±1 vdc), as selected by charger output select switch 3S1. The charger 20 amp selection supplies a 22 to 32 vdc output. The 20 amp output activates battery/charger transfer relay 3K3. When activated, relay 3K3 removes battery power from the dc control circuits and applies the 20 amps section output to the control circuits. Relay 3K3 also removes battery power from the CHRG/BAT FAULT light. The charger 50 amp output section is used to charge the battery. If the battery charge rate is less than 50 milliamps, the charger a 28 vdc signal diode

TB3-CR4 and resistor TB3-R1 to illuminate the CHGR/Bat FAULT light.

(4) The battery charger serves as a component of the generator DC output filter. When the battery is fully charged, the full load of the charger is not sufficient to keep the ripple on the generator DC output within limits. Therefore, load resistor R4 is connected in parallel with the charger 20 amp section input to increase the load and keep the ripple within limits.

(5) The battery output (or combined battery and charger output if engine is running) can be connected to the AGPU dc output cable, or made available to the propulsion system traction motor. This occurs when control panel DC POWER switch 1S12 is OFF and BATTERY OUTPUT switch 1S5 is ON, which activates battery output/traction motor contactor K3.

(6) Power diodes 3CR7 through 3CR9 prevent the GTE control circuits from shutting down the engine because of a generator dc output or battery charger failure. If the generator dc output or charger 20 amp section fails, the 20 amp section output decays gradually. Battery/charger transfer relay 3K3 does not drop out until the potential across the relay coil drops to approximately 18 vdc. If diodes 3CR7 through 3CR9 were not connected as shown, the GTE dc control power could drop to 18 vdc before relay 3K3 drops out and switches to battery power. The GTE ECU (electronic control unit) is designed to shut down the engine if the GTE dc control power drops to approximately 18 vdc. For this reason, battery voltage is connected via diodes CR8 and CR9 to the GTE control circuits. The voltage drop across zener diode 3CR8 (4.3v) and diode 3CR9 (0.7v) reduces battery voltage (24 vdc) to 19 vdc. The 19 vdc battery voltage is sufficient to keep the engine running when the charger output drops below 19 vdc, but is lower than the normal charger output so that no GTE control power is drawn from the battery when the charger is operating normally. Steering diode 3CR9 prevents the charger normal output (relay 3K3 activated) from seeking the lower voltage level at the anode of 3CR8. Steering diode 3CR7 prevents the 19 vdc battery voltage from holding relay 3K3 on when the charger output drops below the normal 18 vdc level required to keep the relay activated.

b. Lights Control System. (See figure FO-2.) The lights control system includes panel lamps DS101 and DS102, utility lamps DS103 through DS105, control panel indicator lamps 1DS1 through 1DS21, a steering diode for each indicator lamp, voltage regulators 3VR1 and 3VR2, and control panel switches (1S4, 1S6, and 1S7). DC power is available whenever the MASTER switch and LIGHTS circuit breaker 1CB1 are on.

(1) DC power is applied directly to the panel lights (located above main control panel) when PANEL switch 1S6 is in the BRT position. Power is applied to the panel lamps via 3VR1 when the switch is in the DIM position. 3VR1 limits the panel lamp voltage to 14 vdc to reduce lamp intensity.

(2) DC power is applied directly to the utility lamps (fuel, engine, and hydraulic) when UTILITY switch 1S7 is in the BRT position. Power is applied to the utility lamps via 3VR2 when the switch is in the DIM position. 3VR2 limits the utility lamp voltage to 14 vdc.

(3) Some of the control panel indicator lamps (IDS1, 1DS2, 1DS7, 1DS11, 1DS13 through 1DS19, and 1DS21) are permanently grounded. During operation the associated control circuit applies a voltage to the lamp positive terminal to illuminate the lamp. PRESS TO TEST switch 1S4 (when pressed) applies dc power via steering diodes to illuminate all of the permanently grounded lamps. The diodes prevent a voltage input to one lamp from illuminating other lamps.

(4) The other control panel indicator lamps (1DS3 through 1DS6, 1DS8 through 1DS10, 1DS12, and 1DS20) are permanently connected to dc power (after MASTER SWITCH is turned on). During operation, the associated indicator lamp control provides a ground return at the lamp negative terminal to illuminate the lamp. The PRESS TO TEST switch (when pressed) provides a ground return to illuminate all the lamps. The diodes prevent a voltage to one lamp from illuminating other lamps.

c. GTE Control System. (See figure FO-3.1 The control system consists of the electronic control unit (ECU), starter latching relay 3K2, starter contactor K4, 95 percent enable relay 3K1, compartment temperature switch S1, speed sensor, low oil pressure switch, hot oil temperature switch, thermocouple, steering diodes (TB1-CR1, TB2-CR2, TB3-CR3 through CR8, and 1CR9) and associated control panel switches and instruments.

(1) When system power output switches (control panel PNEUMATIC POWER 1S8, AC POWER 1S10, and DC POWER 1S12, and hydraulic module POWER switch 4S1) are all off, a ground return is provided for the starter contactor K4 coil. Engine start is then initiated by momentarily setting ENGINE CONTROL switch 1S1 to the START position which applies dc control power to activate starter latch relay 3K2. DC control power is then applied via the latch relay to the auxiliary fuel pump and the ECU. When the ENGINE CONTROL switch is released to the RUN position, dc control power is applied by EMERG STOP switch S2 and relay 3K2 to latch the relay on. The ECU applies dc power to activate starter contactor K4. Contactor K4 then connects the battery output to the engine starter which motors (cranks) the engine. The contactor also applies battery power via diode TB2-CR2 to illuminate control panel STARTER ON light 1DS2.

(2) Throughout engine start and run operations, the ECU monitors the engine low oil pressure (LOP) switch, high oil temperature (HOT) switch, exhaust gas temperature (EGT) thermocouple, and monopulse speed sensor. Prior to engine start, the LOP switch is closed and provides a ground return (via diode TB3-CR8) to illuminate the control panel LOW OIL PRESS lamp 1DS10. When the engine is started and engine oil pressure rises to 31 psi, the LOP switch opens to extinguish the LOW OIL PRESS lamp. The HOT switch is closed when engine oil temperature is below 275°F, and opens above 275°F. The thermocouple generates a small voltage proportional to engine EGT. The ECU temperature sensor and EGT readout circuit amplifies the thermocouple output to the level required to drive the control panel EGT meter 1M1. The EGT meter indicates exhaust gas temperature in degrees fahrenheit. The monopole speed sensor generates a signal proportional in frequency to engine speed. The ECU converts the speed sensor frequency to a dc voltage to drive the control panel %RPM meter 1M2. The %RPM meter indicates engine speed as a percentage of normal full-load speed (58,667 rpm).

(3) The ECU uses engine speed to control start and run events as follows :

Engine Speed (rpm>	Event
10%	Opens fuel shutdown solenoid (section XI> Activates engine ignition unit (section XIII)
25-95%	Modulates fuel control torque motor (section XI)
60%	Deactivates starter contactor K4 (section XIII)
95%	Enables load control valve (LCV) (section XII) Disables engine ignition unit (section XIII) Activates 95% enable relay which enables generator (section X) Enables engine hour meter

The ECU includes fault logic which closes the fuel shutdown solenoid and disables the engine ignition unit if any of the following faults occur:

(a) Low oil pressure (less than 31 psi) for more than 10 seconds after the engine reaches 95% rpm.

(b) High oil temperature (greater than 275°F) for more than 1 second.

(c) Engine speed exceeds 110% rpm.

(d) Loss of speed sensing (no output from monopole speed sensor) after 95% rpm has been reached.

(e) EGT exceeds 1300°F at engine speed above 60% rpm, or exceeds 1255°F at 100% engine speed.

(f) Loss of EGT sensing (no output from thermocouple).

(g) Current in ECU output circuits (ignition unit, LCV solenoid, fuel shutdown solenoid, starter contactor K4, or 95% generator enable relay 3K1) exceeds limits for more than 3 seconds.

(4) If any of the above faults occur, the engine is automatically shut down. The ECU fault shutdown latch provides a ground on one of five lines: LOP, HOT, O/C (overcurrent), O/S (engine overspeed), and O/T (EGT overtemperature). This ground illuminates the appropriate control panel fault lamp. The ground is latched on until dc power is removed from the ECU. Diodes TB3-CR3 through CR8 are connected in the fault lamp circuits to prevent the ECU from shutting down the engine during a lamp test. As described in paragraph b, a ground is applied to the negative terminals on the fault lamps when the PRESS TO TEST switch is pressed. If diodes TB3-CR3 through CR8 were not present, the ECU fault logic would see the lamp test grounds as faults, and would shut down the engine.

(5) Temperatures above 160°F may cause damage to the printed circuit boards within the ECU. Temperature sensor S1 is mounted in the electrical compartment next to the ECU. If the temperature exceeds 160°F, the sensor connects dc power to illuminate the control panel COMPT/GEN HI TEMP caution lamp 1DS11. This lamp is also illuminated when the temperature of the generator ac windings exceeds limits (section X).

(6) Control panel INLET FILTER BLOCKED caution lamp 1DS8 is illuminated when switch S3 mounted on the engine air-inlet duct closes. The switch is closed when the air-inlet bypass door is opened, indicating that the air cleaner is blocked.

(7) The engine is normally shut down by setting the ENGINE CONTROL switch to OFF. The engine can also be shut down by setting the MASTER SWITCH to OFF, opening the GTE 10 amp circuit breaker, or pressing the EMERG STOP switch. In any case, the starter latching relay is unlatched and removes dc power from the ECU.

d. Fuel Indication System (See figure FO-4). The fuel indication system consists of fuel level sensor (transmitter) MT1, low fuel level sensor switch S4, low fuel pressure sensor switch S5, resistor TB1-R1, zener diode TB1-CR1, meter 1M3, and indicator lamps 1DS5 and 1DS6. Maintenance of the fuel sensors (all located in the fuel tank) is covered in section XI.

FUEL meter 1M3 indicates the fuel level in the tank. When the MASTER SWITCH is ON, dc power is applied via current limiting resistor TB1-R1 to the meter positive terminal. Zener diode limits the voltage across the meter to 5.1

Vdc. The circuit is completed to ground via fuel level sensor (transmitter) MT1. The fuel level sensor is a variable resistor. The resistance changes with the level of fuel in the fuel tank. The value of resistance for a given level of fuel controls the amount of voltage applied to the meter. As the fuel level changes, the resistance changes and the meter indication changes. Low fuel level switch S1Q closed when there is 17 gallons or less of fuel, remaining, and illuminates LOW FUEL caution lamp 1DS5. Low fuel pressure switch S5 closes when fuel pressure drops below 2 psi, and illuminates LOW FUEL PRESS lamp 1DS6.

e. Pneumatic Control System. (See Fig. FO-7) The pneumatic control system consists of meter 1M7, resistor R6, zener diode TB1-CR1, pressure transducer MT2, pressure relief valve L1, and load control valve. Maintenance of the load control valve, pressure relief valve, and pressure transducer is covered in section XII.

(1) All AGPUs are equipped with a surge control valve. The surge control valve is used to bleed off a portion of the GTE compressor output to delay the onset of compressor stall. This increased the available shaft horsepower for high electrical or hydraulic loads. The surge control valve is opened when the CURRENT LIMIT SELECTOR switch S11 is set to the highest current limits.

(2) On the 83-360D, power to operate the surge control valve is routed through the PNEUMATIC POWER switch 1S8 to the 45 KW and 1000 amp pins on the CURRENT LIMIT SELECTOR switch. On serial numbers 1036 and higher, the surge control valve also opens at the 30 KW setting if the CURRENT LIMIT SELECTOR switch S11. On the 83-360A the surge control valve will not open if the PNEUMATIC POWER 1S8 is ON. On the 83-360D, a jumper is installed on the PNEUMATIC POWER 1S8 allowing the surge control valve L1H-2 to open even when the pneumatic system is on. The surge control valve does not open at 30 KW setting of the CURRENT LIMIT SELECTOR switch S11 on the 83-360D.

(3) The load control valve is enabled (grounded) when the PNEUMATIC POWER switch 1S8 is set to ON. Operation of the load control valve is then controlled by the electronic control unit as a function of EGT (engine exhaust gas temperature). The PNEUMATIC POWER switch applied dc power to illuminate PNEUMATIC POWER light 1DS13, and to close pressure relief valve L1. The switch also applies dc power via current limiting resistor R6 to PSIG PNEUMATIC meter 1M7. Zener diode TB1-CR1 limits the voltage across the meter to +12 vdc. The circuit is completed to ground via pressure transducer MT2. The resistance of the pressure transducer and thus the meter indication is a function of pressure in the pneumatic output hose.

4-24. PREPARING DC ELECTRICAL AND CONTROL SYSTEM FOR MAINTENANCE.

WARNING

Battery power (24 vdc) may be present at terminals of electrical components whenever battery is connected. Ac power (115 vac) may be present when engine is running. To prevent shock hazard, flash burns, or equipment damage, observe the following precautions:

1. Shut down engine and disconnect battery before opening control panel or extending lower electrical tray.

2. Shut down engine and disconnect battery before contacting any electrical terminal with body or tools.

3. Temporarily install control panel before starting engine.

WARNING

Remove all rings, watches and other jewelry when performing maintenance on this equipment.

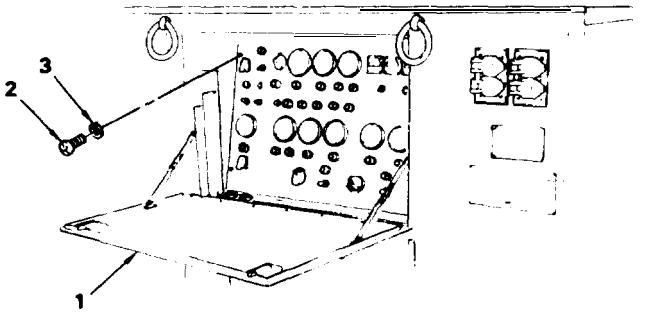
a. Lower Control Panel for Maintenance. When required by specific maintenance procedure, proceed as follows:

(1) Shut down engine and disconnect battery.

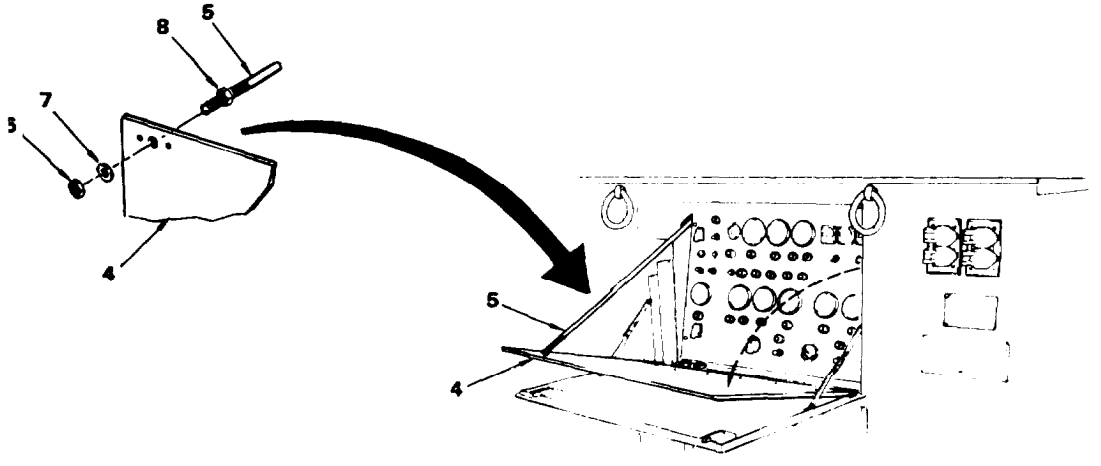
(2) Open control panel access door (1, Fig. 4-13).

(3) While holding control panel (4) in place remove four screws (2) and washers (3).

(4) Grasp control panel at top by toggle switches and carefully pull top by toggle switches and carefully pull top of panel back. Lower panel so that panel is supported by cable (5).



A. CONTROL PANEL IN OPERATING POSITION



B. CONTROL PANEL IN MAINTENANCE POSITION

12-4-13

1. CONTROL PANEL ACCESS DOOR
2. SCREW
3. WASHER
4. CONTROL PANEL
5. SUPPORT CABLE
6. NUT
7. WASHER
8. JAM NUT

Figure 4-13. Control Panel Lowered for Maintenance

NOTE

Some maintenance tasks may be easier with control panel flat on access cover. If so, do step (5).

(5) Remove nut (6) and washer (7) from support cable (5), and lower control panel onto access cover.

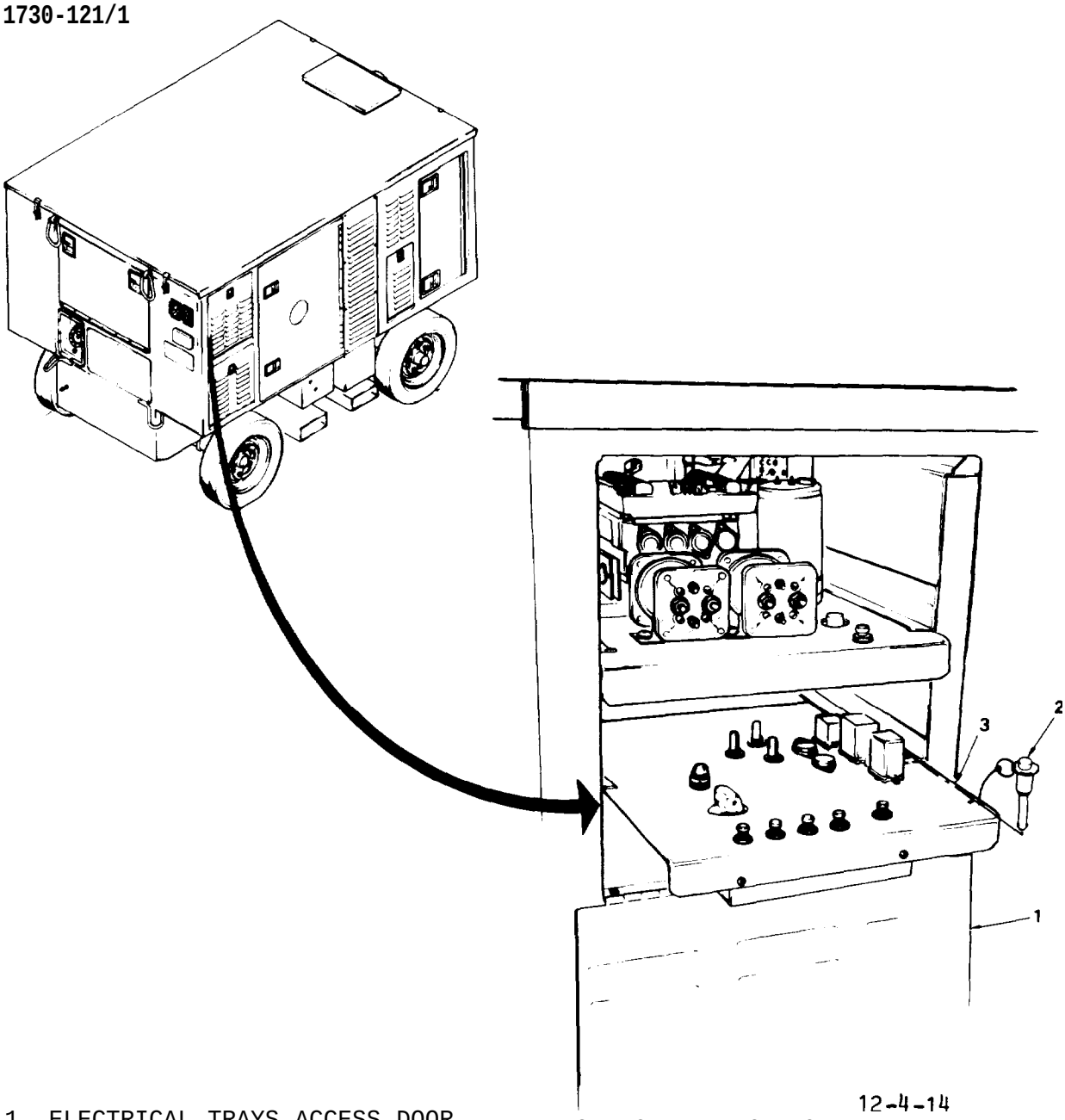
(6) When maintenance task is completed, attach support cable (5) to control panel with washer (7) and nut (6). Place control panel into operating position, and secure with four washers (3) and screws (2).

b. Extend Lower Electrical Tray for Maintenance. When required by specific maintenance procedure, extend lower tray as follows:

(1) Shut down engine and disconnect battery.

(2) Open electrical trays access door (1, figure 4-14).

(3) Remove two quick release pins (2).



1. ELECTRICAL TRAYS ACCESS DOOR
2. QUICK RELEASE PIN
3. LOWER ELECTRICAL TRAY

Figure 4-14. Lower Electrical Tray Extended for Maintenance

(4) Carefully extend lower electrical tray (3) as required for maintenance. If there is any abnormal resistance to tray movement, lower control Panel (paragraph a) and check for restrictions. It may be necessary to remove some cable ties to extend tray.

(5) If necessary for access to upper tray, carefully pull lower tray all the way out of slides and let tray hang down, supported by electrical harness.

(6) When maintenance task is completed, install lower tray and secure with quick release pins.

4-25. BATTERY (BT1) .

WARNING

Remove all rings, watches and other jewelry when performing maintenance on this equipment.

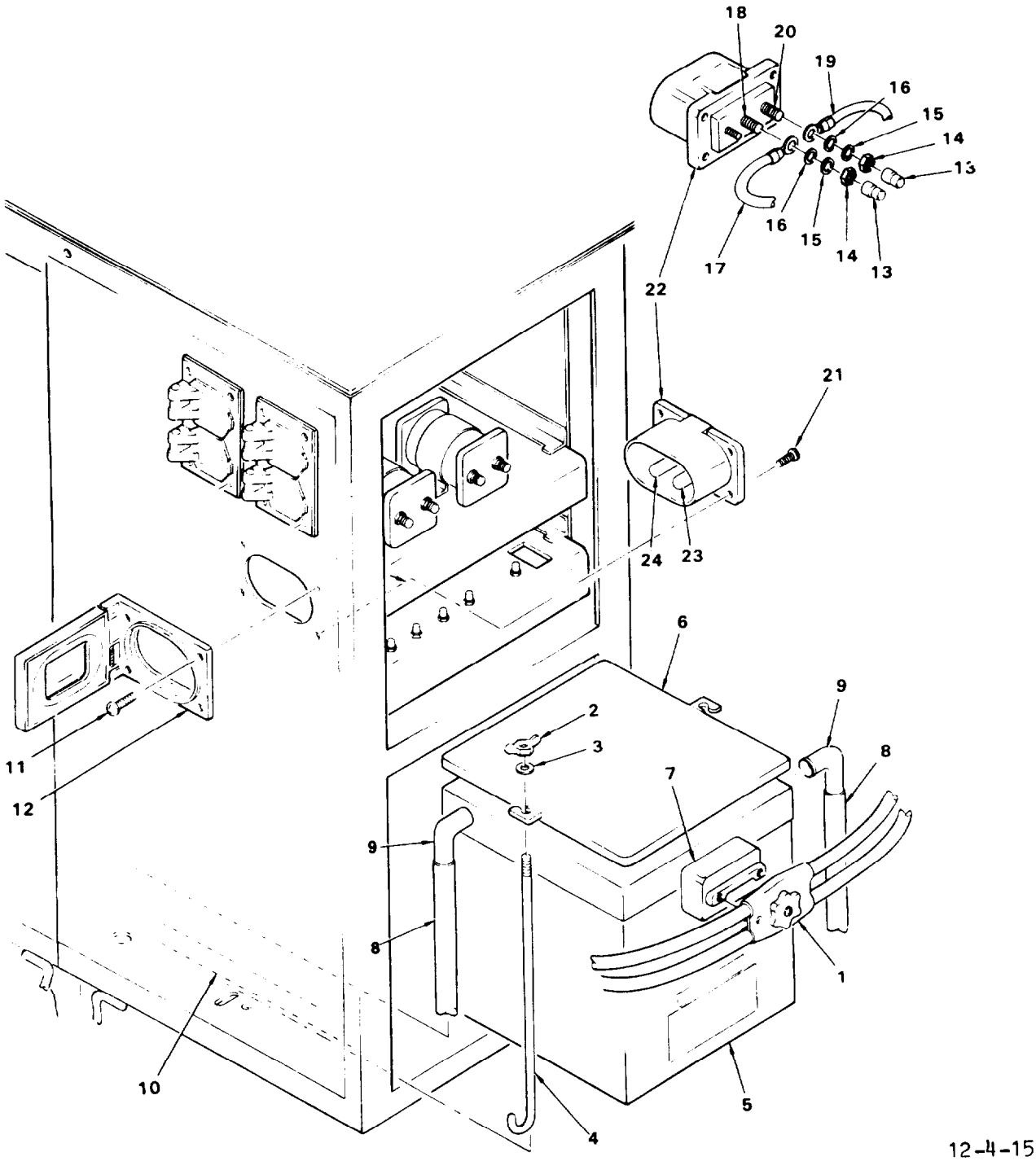


Figure 4-15. Battery and Slave Receptacle

LEGEND FOR FIGURE 4-15:

1. BATTERY TERMINAL ADAPTER
2. WING NUT
3. WASHER
4. TIE-DOWN ROD
5. BATTERY
6. BATTERY COVER
7. BATTERY TERMINAL BLOCK
8. VENT TUBE
9. VENT ADAPTER
10. BATTERY GUIDE
11. SCREW
12. COVER PLATE
13. TERMINAL SCREW COVER
14. NUT
15. LOCKWASHER
16. WASHER
17. POSITIVE SLAVE CABLE
18. POSITIVE TERMINAL
19. NEGATIVE SLAVE CABLE
20. NEGATIVE TERMINAL
21. SCREW
22. SLAVE RECEPTACLE
23. POSITIVE TERMINAL POST
24. NEGATIVE TERMINAL POST

a. Remove. (See figure 4-15.)

(1) Disconnect battery terminal adapter (1) from battery terminal block (7).

(2) Remove wing nuts (2) and washers (3) from battery tie-down rods (4).

(3) Remove cover (6) from battery (5).

(4) Pull vent tubes (8) up through holes in battery compartment floor.

(5) Remove battery from battery compartment.

b. Check.

WARNING

Battery electrolyte can cause severe burns to the skin. Flush exposed Parts of the skin with water as quickly as possible.

(1) Remove the vent plugs from each cell and check fluid level.

(2) If fluid level is at or below the plate level, fill with distilled water (do not use tap water) to bottom of split ring.

(3) Install vent, plugs tightly into cells.

(4) Test specific gravity of each cell using a hydrometer.

(a) Remove vent plug from one cell and draw fluid from cell into hydrometer.

(b) Read hydrometer, then return fluid to same cell and replace vent plug.

(c) Correct hydrometer reading for ambient temperature by adding 0.004 for each 10°F above 80°F and subtracting 0.004 for each lO°F below 80°F.

(d) If corrected hydrometer reading is less than 1.280, the battery should be charged.

(5) If one or more cells will not take a charge, replace battery.

c. Prepare New Battery for Service.

(1) Ensure that battery is clean and undamaged.

(2) Remove battery top cover.

(3) Remove vent plugs from top of battery. Remove seals (if present) from cells.

WARNING

Battery electrolyte can cause severe burns to the skin. Flush exposed parts of skin with water as quickly as possible. Observe all precautions on electrolyte container.

(4) Fill each cell to bottom of split ring with 1.285 specific gravity electrolyte. Follow instructions provided with electrolyte.

(5) Gently rock battery from side to side to release any trapped air. Add more electrolyte if necessary.

(6) Install vent plugs tightly into cells.

(7) Remove any electrolyte spilled on battery using a suitable neutralizing agent (baking soda or equivalent).

WARNING

Do not smoke around gassing batteries. Gas is highly explosive.

(8) Charge battery at a 3 amp rate until all cells are gassing freely, then reduce charging rate to 1.5 amps. At this time, check specific gravity (see step b) at one hour intervals. When specific gravity is between 1.285 and 1.295 for three successive readings, battery is fully charged.

(9) If electrolyte level needs to be adjusted, add or remove electrolyte as required, and charge for one hour.

d. Install. (See figure 4-15.)

(1) Make sure that all vent plugs are tightly installed in top of battery.

(2) Check that vent adapters (9) and tubes (8) are securely attached to battery vent ports.

(3) Set battery into battery compartment between guides (10) with battery terminal block (7) facing out.

(4) Place cover (6) on battery.

(5) Secure battery cover (6) with tie-down rods (4), washers (3), and wing nuts (2). Before tightening wing nuts, check that tie-down rods are vertical.

(6) Route vent tubes (8) through holes in floor of battery compartment.

(7) Connect battery cable terminal adapter (1) to battery terminal block (7).

(8) Check resistance between positive and negative terminals of battery cable terminal adapter (1). If resistance is less than 40K (with MASTER switch off), check cables for shorts.

4-26. BATTERY CABLES AND TERMINAL ADAPTER.

WARNING

Remove all rings, watches and other jewelry when performing maintenance on this equipment.

NOTE

See table 4-2, Malfunction 1 (steps 5 and 6) for test.

a. Remove. (See figure 4-16.)

(1) Check that battery is disconnected.

(2) Remove two screws (9) and separate halves of terminal adapter (1).

(3) Remove nut (12) and washer (13) from terminal screws (10) and (11) as required to disconnect cable to be removed.

(4) If removing slave positive cable (5) or negative cable (7):

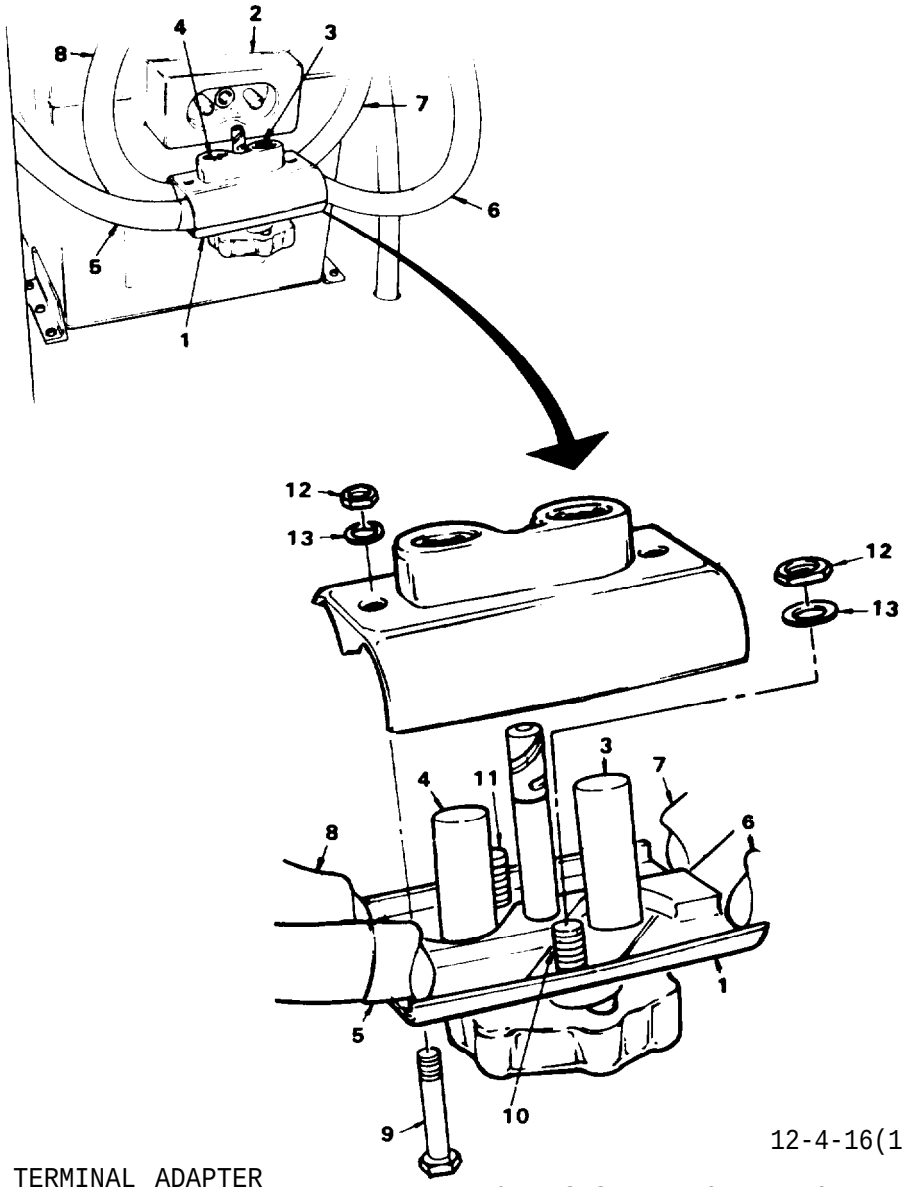
(a) Open electrical trays access door (9, figure 1-1).

(b) Pull rubber cover (18, figure 4-16) from slave receptacle positive terminal (22) or negative terminal (23) screw.

(c) Remove nut (19), lockwasher (20), washer (21), and slave cable (5) or (7).

(5) If removing system positive cable (6):

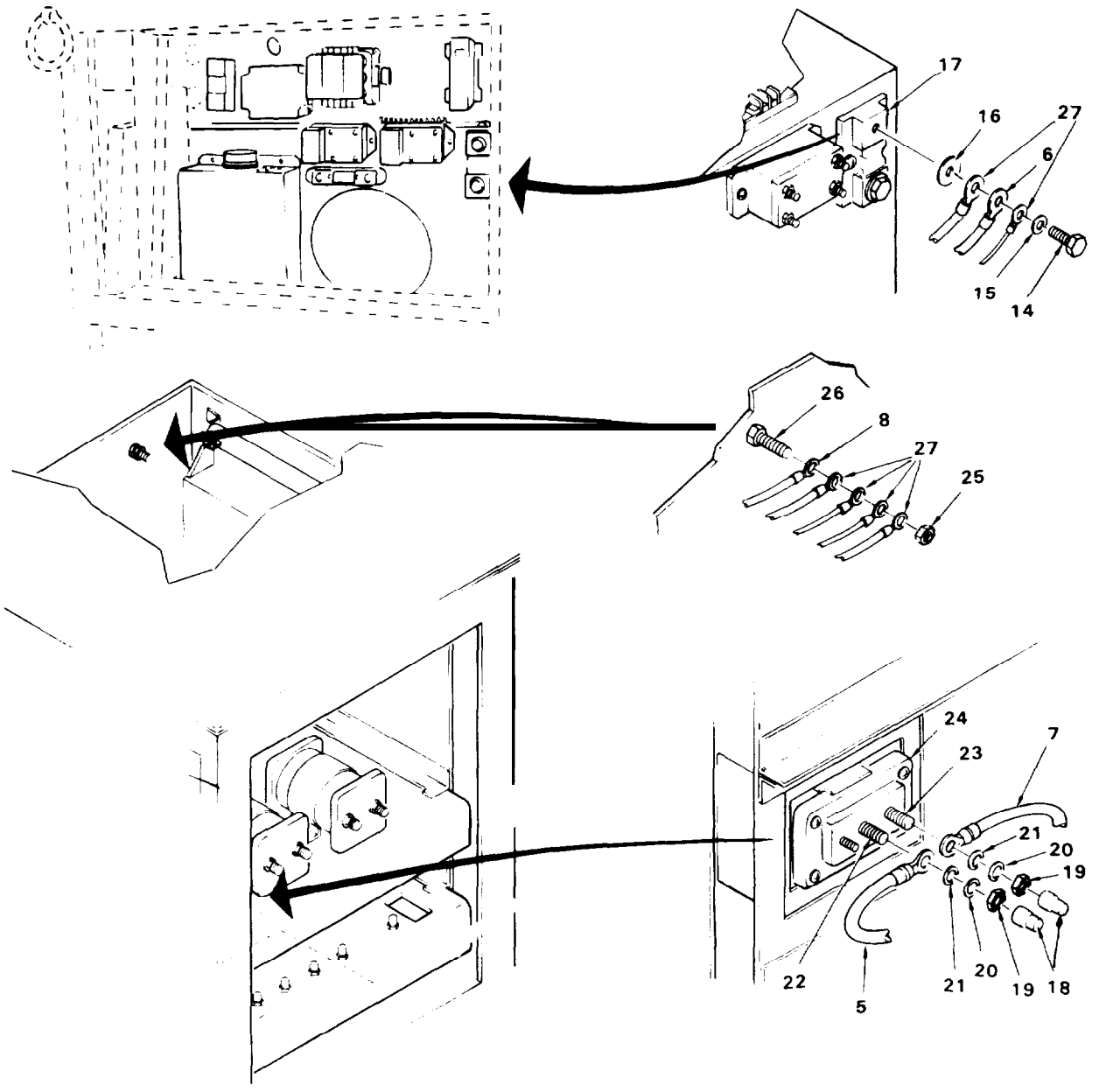
(a) Lower control panel (paragraph 4-24).



12-4-16(1)

1. BATTERY TERMINAL ADAPTER
2. BATTERY TERMINAL BLOCK
3. POSITIVE TERMINAL POST RECEPTACLE
4. NEGATIVE TERMINAL POST RECEPTACLE
5. SLAVE POSITIVE CABLE
6. SYSTEM POSITIVE CABLE
7. SLAVE NEGATIVE CABLE
8. SYSTEM NEGATIVE CABLE
9. SCREW
10. POSITIVE TERMINAL SCREW
11. NEGATIVE TERMINAL SCREW
12. NUT
13. WASHER

Figure 4-16. Battery Cables and Terminal Adapter (sheet 1 of 2)



12-4-16(2)

14. TERMINAL SCREW
15. LOCKWASHER
16. WASHER
17. SHUNT R2
18. TERMINAL COVER
19. NUT
20. LOCKWASHER
21. WASHER
22. TERMINAL (+)
23. TERMINAL (-)
24. SLAVE RECEPTACLE
25. NUT
26. GROUND STUD
27. CABLES

Figure 4-16. Battery Cables and Terminal Adapter (sheet 2 of 2)

(b) Remove terminal screw (14, figure 4-16) and disconnect positive system cable.

(6) If removing system negative cable (8):

(a) Remove roof (paragraph 4-16).

(b) Remove nut (25) and negative system cable (8) from ground stud (26).

(7) Remove any cable ties or clamps as necessary and remove cable.

b. Install. (See figure 4-16.)

(1) If terminal adapter (1) is being replaced, remove two screws (9) and separate terminal halves.

(2) If any cable is being replaced, route replacement cable in the same manner as cable removed.

(3) If replacing slave cable:

(a) Connect positive cable (5) to screw of positive terminal (22) on slave receptacle.

(b) Connect negative slave cable (6) to screw of negative terminal (23).

(c) Install washers (21), lockwashers (20), nuts (19), and rubber covers (18) on terminal screws.

(4) If replacing positive system cable (6), install cables on shunt R2 (17). Remove terminal screw (14). Install (in order) on terminal screw, lockwasher (15), three cables (smaller cable first), and washer (16). Thread terminal screw into shunt.

(5) If replacing negative system cable (8), install cables on ground stud (26). Install all cables removed from stud (larger cables first) and secure with the nut (25).

CAUTION

Make sure that all cables are connected with correct polarity.

(6) As necessary, connect cables (5, 6, 7 and 8) to terminal screws (10 and 11) as shown, and secure with washers (13) and nuts (12).

(7) Assemble halves of terminal adapter (1) and secure with two screws (9).

(8) Replace any cable ties or clamps removed in step b.

(9) Replace control panel and roof, and close electrical tray access door, as required.

4-27. SLAVE RECEPTACLE.

WARNING

Remove all rings, watches and other jewelry when performing maintenance on this equipment.

NOTE

See table 4-2, Malfunction 75 for test.

a. Remove. (See figure 4-15.)

(1) Disconnect battery.

(2) Open electrical tray access door (11, figure 1-1).

(3) Pull rubber covers (13, figure 4-15) from terminal screws (18 and 20).

(4) Remove nuts (14), lockwashers (15), and washers (16). Tag and disconnect cables (17 and 19) from terminal screws (18 and 20).

(5) Remove four screws (21) and slave receptacle (22).

b. Install. (See figure 4-15.)

(1) Install slave receptacle (22) and secure with four screws (21).

(2) Install cables (17 and 19) to terminal screws (18 and 20). Secure cables with two washers (16), lockwashers (15) and nuts (14).

(3) Install two rubber covers (13) on terminal screws (18 and 20).

(4) Close electrical tray access door (11, figure 1-1).

4-28. BATTERY CHARGER (A3).

WARNING

Remove all rings, watches and other jewelry when performing maintenance on this equipment.

NOTE

See table 4-2, Malfunction 81 for test.

a. Inspect. (See figure 4-17.)

(1) Disconnect battery.

(2) Remove battery charger access cover (5, figure 4-5).

(3) Inspect battery charger (11 , figure 4-17) for signs of overheating or corrosion.

(4) Check that connectors P1 (4) and P2 (6) are securely attached to battery charger. Tighten locking collars (3).

(5) Check that cable connections to J4 terminals (17 and 19) and J3 terminals (21 and 23) are tight. Tighten nuts (12) if required.

b. Remove. (See figure 4-17.)

(1) Disconnect battery.

(2) Remove battery charger access panel (6, figure 1-1).

(3) Lower control panel (paragraph 4-24).

(4) Remove battery charger cover screw (1, figure 4-17) and cable clamp (2). Replace cover screw.

(5) Turn locking collar (3) counterclockwise and remove harness connector P1 (4) from battery charger connector J1 (5).

(6) Remove harness connector P2 (6) from battery charger connector J2 (7).

(7) Hold battery charger (11) in place and remove four screws (10).

(8) Move main harness cables (8) and control panel harness cables (9) out of way. Pull bottom of battery charger back toward edge of compartment floor and tilt top of charger forward against panel.

NOTE

An 8 or 10 inch no. 2 magnetic screw driver or screw starter is required for battery charger mounting screws.

(9) Tag and remove cables from negative (17) and positive (19) terminals of J4.

(10) Tag and remove cables from negative (23) and positive (21) terminals of J3.

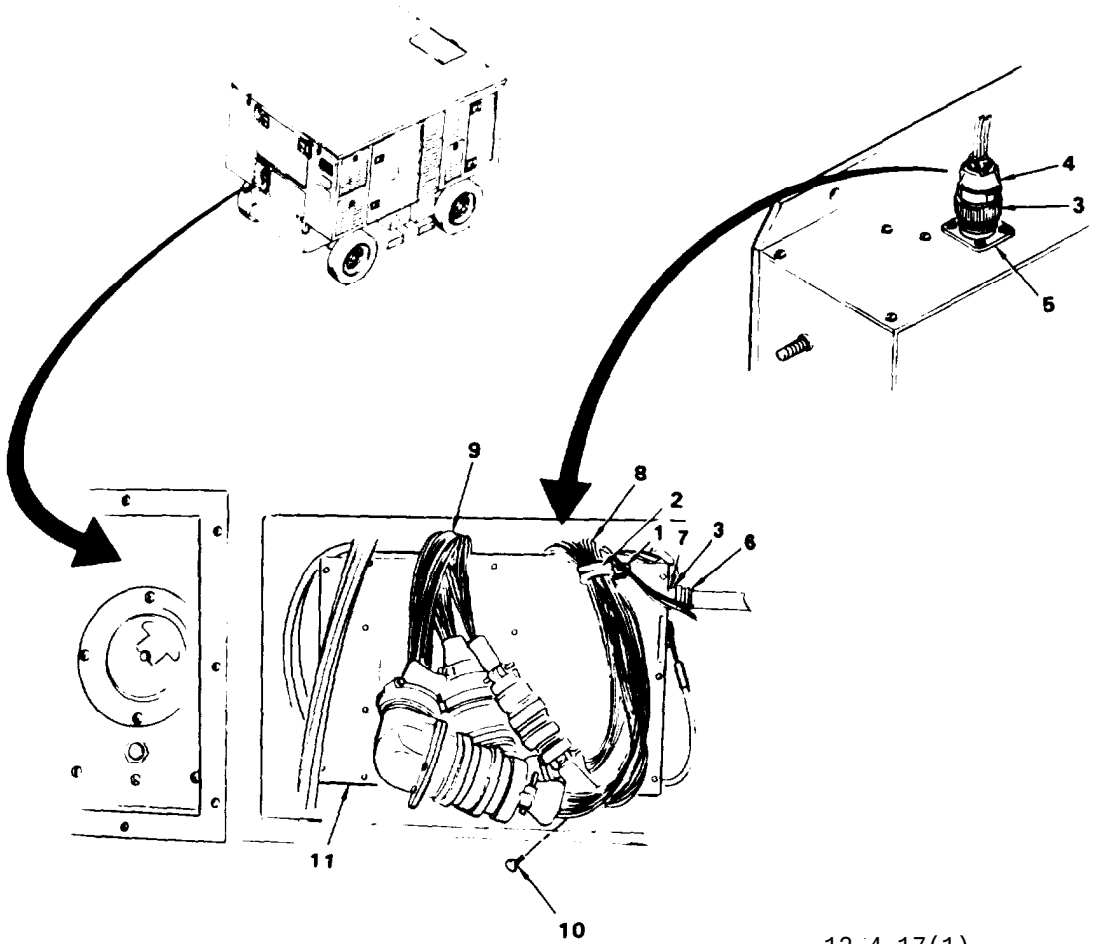
(11) Remove ground wire from case ground terminal (27) .

(12) Remove battery charger (11) from compartment.

C. Install. (See figure 4-17.)

(1) Check nutplates on bulkhead panel. If any of the four nutplates is missing or damaged, notify supervisor.

(2) Set replacement battery charger (11) on compartment floor with connector J1 (5) up. Move all harnesses and cables from behind charger. Tilt top of charger forward against panel.



12-4-17(1)

1. COVER SCREW	5. CONNECTOR J1	9. CONTROL PANEL CABLES
2. CABLE CLAMP	6. CONNECTOR P2	10. SCREW
3. LOCKING COLLAR	7. CONNECTOR J2	11. BATTERY CHARGER
4. CABLE CLAMP	8. MAIN HARNESS CABLES	

Figure 4-17. Battery Charger (sheet 1 of 2)

(3) Install ground wire P2120N (26), washer (25), and nut (24) on battery charger case ground terminal (27).

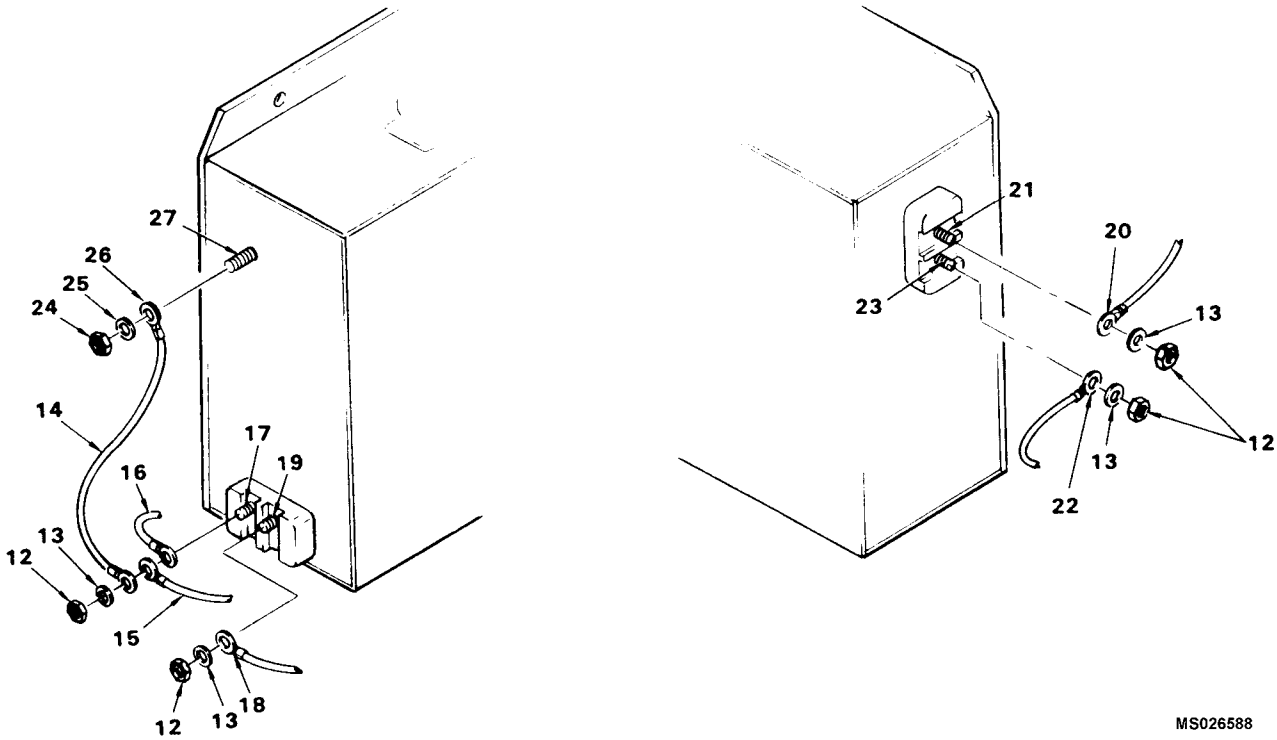
(4) Install cable P32A6 (20), washer (13) and nut (12) on J3 positive terminal (21).

(5) Install cable P21A6N (22), washer (13) and nut (12) on J3 negative terminal (23).

(6) Install cable P21B2N (16), cable P21A6N (15), and wire P2lC20N (14) on J4 negative terminal (17).

(7) Install cable P22A2 (18), washer (13) and nut (12) on J4 positive terminal (19).

(8) Position battery charger (11) in place against bulkhead panel and fasten with four screws (10).



12. NUT
13. WASHER
14. WIRE P21C20N
15. CABLE P21A6N
16. CABLE P21B2N
17. 50 AMP INPUT J4 (-) TERMINAL
18. CABLE P22A2
19. 50 AMP INPUT J4 (+) TERMINAL
20. CABLE P32A6
21. 50 AMP OUTPUT J3 (+) TERMINAL
22. CABLE P21A6N
23. 50 AMP OUTPUT J3 (-) TERMINAL
24. NUT
25. WASHER
26. WIRE P21C20N
27. CASE GROUND TERMINAL

Figure 4-17. Battery Charger (sheet 2 of 2).

(9) Install harness connector P2 (6) on battery charger connector J2 (7). Turn locking collar (3) clockwise.

(10) Install harness connector P1 (4) to battery charger connector J1 (5). Turn locking collar (3) clockwise.

(11) Install cable clamp (2) around main harness cables (8). Attach clamp to charger with charger cover screw (1).

(12) Replace battery charger access cover.

(13) Replace control panel and close control panel access door.

4-28.1. INSPECTING ELECTRICAL CONNECTORS FOR SHORTS.

a. Electrical connectors P-1 and P-6 (battery charger voltage adjustments plug and in-line connector to the lower tray), located behind the main control panel, should be removed from their mating connectors and inspected for possible shield-wire shorts as described below:

(1) Remove AGPU battery connector P-17 in battery compartment.

(2) Remove mounting screws on the Main Control Panel and place in maintenance position (figure 4-13) to provide access to the electrical area.

(3) Disconnect connector P-1 (item 4, figure 4-17) from the top of battery charger.

(4) Remove the cable restraint and backshell from the back of P-1 and identify the black 4-wire neoprene covered, shielded cable.

(5) Remove the heat shrink material that covers the black 4-wire cable and locate the wire soldered to the shield which connects to pin E of P-1. Due to compression of the heat-shrink material and the cable restraint, the soldered portion of this lead has been found to penetrate the insulation of one or more of the adjacent wires.

(6) Inspect each of the four wires for any apparent damage to the insulation. If any of the wires have damaged or cut insulation each wire must be protected by sleeving or tape. If no damage is apparent, the bundle must be protected with a layer of tape.

(7) Place tape or sleeving around the soldered portion of the jumper from the shielding to Pin E to further assure insulation of the circuit.

(8) Reassemble connector by reinstalling cable restrain and backshell of P-1.

(9) Reconnect P-1 into J-1 (5) of the Battery Charger.

b. Remove and inspect in-line connector P-9 from lower tray connector J-9 as follows:

NOTE

The shielding on the black neoprene cable is not connected to any pin of P-9. It should be trimmed and insulated. The cable should be inspected for breaks or cuts in the insulation which could cause shield-to-wire shorting.

(1) Remove cable restraint and backshell from P-9.

(2) Locate and inspect the four wires that extend from the trimmed neoprene cable for broken or cut insulation or any apparent damage to the insulation. If any of the wires have damaged or cut insulation each wire must be protected by sleeving or tape. If no damage is apparent, the bundle must be protected with a layer of tape.

(3) Reassemble connector by reinstalling cable restrain and backshell of P-9.

(4) Reconnect P-9 into J-9 of lower tray assembly.

c. Return the main control panel to the operating position and secures, see figure 4-13.

WARNING

Remove all rings, watches and other jewelry when performing maintenance on this equipment.

NOTE

See table 4–2, Malfunctions 86 and 87 for test.

4.29. CONTACTOR (K3 AND K4).

a. Inspect. (See figure 4-18).

(1) Disconnect battery.

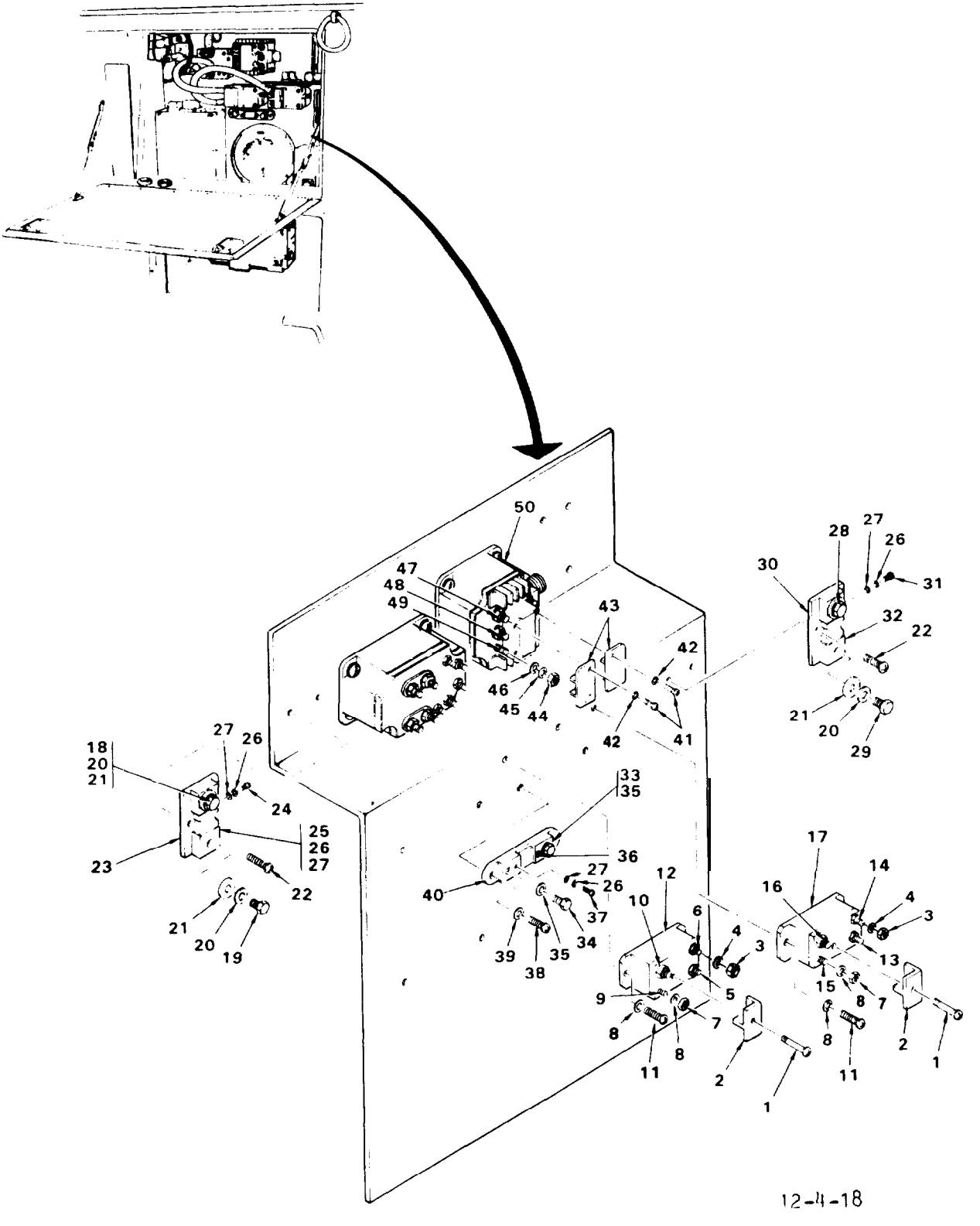


Figure 4-18. Starter Contractors and Shunts

LEGEND FOR FIGURE 4-18:

1. SCREW
2. TERMINAL SHIELD
3. NUT
4. WASHER
5. TERMINAL X1 (K3)
6. TERMINAL X2 (K3)
7. NUT
8. WASHER
9. TERMINAL A1 (K3)
10. TERMINAL A2 (K3)
11. SCREW
12. BATTERY OUTPUT/TRACTION MOTOR CONTACTOR K3
13. TERMINAL X1 (K4)
14. TERMINAL X2 (K4)
15. TERMINAL A1 (K4)
16. TERMINAL A2 (K4)
17. GTE STARTER CONTACTOR K4
18. LOAD TERMINAL (R1+)
19. LOAD TERMINAL (R1-)
20. LOCKWASHER
21. WASHER
22. SCREW
23. OUTPUT SHUNT R1
24. METER TERMINAL (R1+)
25. METER TERMINAL (R1-)
26. LOCKWASHER
27. WASHER
28. LOAD TERMINAL (R2+)
29. LOAD TERMINAL (R2-)
30. STARTER SHUNT R2
31. METER TERMINAL (R2+)
32. METER TERMINAL (R2-)
33. LOAD TERMINAL (R3-)
34. LOAD TERMINAL (R3+)
35. WASHER
36. METER TERMINAL (R3-)
37. METER TERMINAL (R3+)
38. SCREW
39. WASHER
40. SHUNT R3
41. SCREW
42. LOCKWASHER
43. TERMINAL SHIELD
44. NUT
45. LOCKWASHER
46. WASHER
47. TERMINAL A2 (K1)
48. TERMINAL B2 (K1)
49. TERMINAL C2 (K1)
50. AC CONTACTOR K1

(2) Lower control panel (paragraph 4-24).

(3) Inspect contactor K3 (12, figure 4-18) and contactor K4 (17) for signs of overheating or corrosion.

(4) Check that all cable and wire connections at contactor terminals screws (5, 6, 9, 10, 13, 14, 15 and 16) are tight.

b. Remove. (See figure 4-18.)

NOTE

Removal and installation procedures are the same for contactors K3 and K4. K3 is illustrated.

(1) Disconnect battery.

(2) Lower control panel (paragraph 4-24).

(3) Remove screw (1, figure 4-18) and terminal shield (2).

(4) Tag and remove all wires and cables from contactor terminals (5, 6, 9, and 10).

(5) Remove two screws (11) and contactor K3 (12).

d. Install. (See figure 4-18.)

(1) Check nutplates on bulkhead panel. If either nutplate is missing or damaged, notify supervisor.

(2) Remove screw (1) and terminal shield (2) from replacement contactor (12).

(3) Hold contactor (12) in position with Xl (5) and X2 (6) terminals to right. Fasten contactor to nutplates with two screws (11).

(4) Remove nuts (3) and washers (4) from contactor terminals Xl (5) and X2 (6). Use ID tags and install wires on terminals Xl and X2. Secure wires with washers and nuts.

(5). Remove nuts (7) and washers (8) from contactor terminals A1 (9) and A2 (10). Use ID tags and install cables and wires on terminals A1 and A2. If a cable and wire is installed on same terminal, install cable first. Secure wires and cables with washers and nuts.

(6) Replace terminal shield (2) and screw (1).

(7) Replace control panel.

4-30. SHUNTS (R1-R3).

WARNING

Remove all rings, watches and other jewelry when performing maintenance on this equipment.

a. Inspect. (See figure 4-18.)

(1) Disconnect battery.

(2) Lower control panel (paragraph 4-24).

(3) Inspect shunts (figure 4-18) R1 (23), R2 (30) and R3 (40) for signs of overheating or corrosion.

(4) Check that all shunt cable and wire connections are tight.

Remove Shunt R1. (See figure 4-18.)

NOTE

See table 4-2, Malfunction 45 (step 1) for test.

(1) Disconnect battery.

(2) Lower control panel (paragraph 4-24).

(3) Remove screws (41, figure 4-18), washers (42) and terminal shield (43) from ac contactor K1 (50). Tag and remove cables and wires from terminals A2 (47), B2 (48) and C2 (49). Removing these cables is necessary for access to shunt R1.

(4) Tag and remove cables and wire from shunt load terminals (18 and 19).

(5) Remove two screws (22) and shunt R1 (23).

(6) Tag and remove all wires from shunt meter terminals (24 and 25).

C. Install Shunt R1. (See figure 4-18.)

(1) Check nutplates on bulkhead panel. If any nutplate is missing, notify maintenance supervisor.

(2) Remove meter terminal screws (24 and 25) from shunt (23). Using ID tags, install (in order) on each screw, lockwasher (26), washer (27), and wire or wires. Thread screws into shunt.

(3) Fasten shunt R1 (23) to panel with two screws (22).

(4) Remove load terminal screws (18 and 19) from shunt (23). Using ID tags, install (in order) on each screw, lockwasher (20), cable or cables (with smaller cable first), and washer (21). Thread screws into shunt.

(5) Using ID tags, install cables first and then wires to contractor terminals A2 (47), B2 (48), and C2 (49). Install washer (46), lockwasher (45), and nut (44) on each terminal.

(6) Install terminal shield (43), washers (42), and screws (41).

(7) Replace control panel.

d. Remove Shunt R2. (See figure 4-18.)

NOTE

See table 4-2, Malfunction 1 (step 7) for test.

(1) Disconnect battery.

(2) Lower control panel (paragraph 4-24).

(3) Tag and remove cables and Wire from shunt load terminals (28 and 29).

(4) Remove two screws (22) and shunt R2 (30).

(5) Tag and remove wires from shunt meter terminals (31 and 32).

e. Install Shunt R2. (See figure 4-18.)

(1) Check nutplates on bulkhead panel. If any nutplate is missing, notify maintenance supervisor.

(2) Remove meter terminal screws (31 and 32) from shunt (30). Using ID tags, install (in order) on each screw, lockwasher (26), washer (27), and wire or wires (with smaller wire first). Thread screw into shunt.

(3) Fasten shunt R2 (30) to panel with two screws (22).

(4) Remove load terminal screws (28 and 29). Using ID tags, install (in order) on each screw, lockwasher (20), cable or cables (with smaller cable first), and washer (21). Thread screws into shunt.

(5) Replace control panel.

f. Remove Shunt R3. (See figure 4-18.)

(1) Disconnect battery.

(2) Lower control panel (paragraph 4-24).

(3) Tag and remove wires from meter terminal screws (36 and 37, figure 4-18).

(4) Tag and remove cables and wires from load terminal screws (33 and 34).

(5) Remove two screws (38), washers (39), and shunt R3 (40).

g. Install Shunt R3. (See figure 4-18.)

(1) Check nutplates on bulkhead panel. If any nutplate is missing, notify maintenance supervisor.

(2) Fasten shunt R3 (40) to panel with two washers (39) and screws (38). If either load terminal screw (33 or 34) is marked with a + (plus), mount shunt with plus (+) screw to left.

(3) Remove meter terminal screws (36 and 37) from shunt. Using ID tags, install (in order) on each screw, lockwasher (26), washer (27), and wire. Thread screws into shunt (40) l

(4) Remove load terminal screws (33 and 34) from shunt. Using ID tags, install (in order) on each screw, washer (35), wire on screw (33) only, and cable. Thread screws into shunt.

(5) Replace control panel.

4-31. ELECTRONIC CONTROL UNIT (ECU) (A2).

WARNING

Remove all rings, watches and other jewelry when performing maintenance on this equipment.

NOTE

See table 4-2, Malfunctions 13, 15, 18, 21, 27, 29, 30, 31, 33, 35, 36, 37, 40, 42, and 62 for test.

a. Inspect. (See figure 4-19.)

(1) Disconnect battery.

(2) Lower control panel (paragraph 4-24).

(3) Inspect ECU (7, figure 4-19) for cracks. Replace if cracked.

(4) Check that unit is tightly sealed. Tighten any loose screws.

(5)' Check for security of installation. Tighten three mounting screws (6) as required.

(6) Check that harness connector P2 (2) and harness connector P4 (4) are securely connected to ECU. Tighten locking collars (1).

b. Remove. (See figure 4-19.)

(1) Disconnect battery.

(2) Lower control panel (paragraph 4-24). Disconnect control panel support cable and lower control panel onto access door.

(3) Turn locking collar (1, figure 4-19) counterclockwise and disconnect harness connectors P4 (4) from ECU connector J1 (5).

(4) Disconnect wiring harness connector P2 (2) from ECU connector J2 (3).

(5) Remove three screws (6). Lift ECU (7) from electrical bay subfloor.

c. Install. (See figure 4-19.)

(1) Inspect nutplates on electrical bay subfloor. If any of three nutplates is missing or damaged, notify supervisor.

(2) Set ECU (7) on electrical bay subfloor so that connectors J1 (5) and J2 (3) are accessible. Fasten ECU to subfloor with three screws (6).

(3) Install harness connector P4 (4) on ECU J1 (5). Turn locking collar (1) clockwise.

(4) Install harness connector P2 (2) on ECU J2 (3). Turn locking collar (1) clockwise.

4-32. COMPARTMENT TEMPERATURE SWITCH (S1).

WARNING

Remove all rings, watches and other jewelry when performing maintenance on this equipment.

NOTE

See table 4-2, Malfunction 39 for test.

a. Inspect. (See figure 4-19.)

(1) Disconnect. battery.

(2) Remove battery charger access cover (6, figure 1-1).

(3) Inspect switch (12, figure 4-19) for obvious damage. Replace switch if damaged.

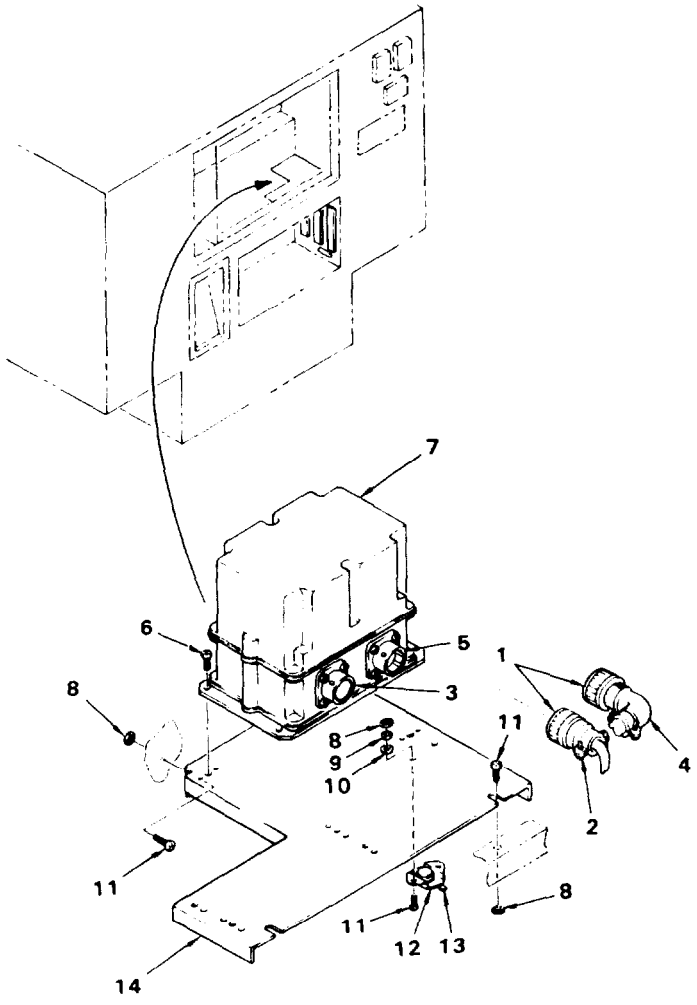
(4) Check that wires are securely attached (soldered) to switch, terminals (13).

(5) Check switch for security of installation. Tighten screws (11) as required.

b. Remove. (See figure 4-19.)

(1) Disconnect battery.

(2) Lower control panel (paragraph 4-24).



12-4-19

1.	LOCKING COLLAR	6.	SCREW	11.	SCREW
2.	CONNECTOR P2	7.	ELECTRONIC CONTROL UNIT	12.	COMPARTMENT TEMPERATURE SWITCH
3.	CONNECTOR J2	8.	NUT		
4.	CONNECTOR P4	9.	LOCKWASHER NUT	13.	SOLDER LUG
5.	CONNECTOR J1	10.	WASHER	14.	TRAY

Figure 4-19. Electronic Control Unit and Compartment Temperature Switch

(3) Remove battery charger access panel (6, figure 1-1).

(4) See figure 4-19. Remove two nuts (8), lockwashers (9), washers (10), screws (11) and switch (12).

(5) Unsolder wires from switch terminal lugs (13).

(6) Discard switch.

C. Install. (See figure 4-19.)

(1) Solder wires removed in step b to terminal lugs (13) of new switch (12). Either wire may be connected to either terminal.

(2) Install switch (12) on underside of electrical bay subfloor. Use two screws (11), washers (10), lockwashers (9) and nuts (8) to fasten switch to subfloor.

(3) Replace battery charger access panel and control panel.

4-33. TERMINAL BOARDS (TB) AND COMPONENTS.

WARNING

Remove all rings, watches and other jewelry when performing maintenance on this equipment.

NOTE

See table 4-2, Malfunctions 2 (step 3), 8 (steps 4 and 5), 64, and 82 for test.

a. Inspect . (See figure 4-20.)

(1). Disconnect battery.

(2) Lower control panel (paragraph 4-24) and remove battery charger access cover (5, figure 4-5).

(3) See figure 4-20. Inspect all terminal boards (2, 3, 4, 5, 8, 9, 10 and 11) for obvious damage.

(4) Replace any cracked or broken terminal board.

(5) Inspect terminal boards for security of installation. Tighten mounting screws (1 and 7) as required.

(6) Check that all terminal board components are installed (see figures 4-21 through 4-24).

b. Remove Terminal Board Electrical Components. (See figures 4-20 through 4-23.)

(1) Disconnect battery.

(2) If component to be removed is on TB1 (8 and 9, figure 4-20), lower control panel (paragraph 4-24). Disconnect control panel support cable and lower control panel onto access door.

(3) If component to be replaced is on TB2 (10 and 11) or TB3 (4 and 5), remove battery charger access panel (6, figure 1-1) .

NOTE

Removal and installation procedures are the same for all electrical components installed on terminal boards. Diode TB1-CR1 (3, figure 4-21) is illustrated.

(4) Remove two terminal screws (1) and diode (3).

c. Install Terminal Board Electrical Components. (See figure 4-21.)

(1) Shape leads of replacement component to match removed component.

(2) Install replacement component on terminal board and attach with two screws (1). Diodes must be installed with cathode toward terminal board identified as cathode.

NOTE

The cathode of the diodes may be identified by a black band (11) or a bar (12) at the end of an arrow. If markings are missing or not legible, measure resistance between diode leads in both directions before installation. The diode resistance is near 0 when the multimeter negative lead is on the diode cathode.

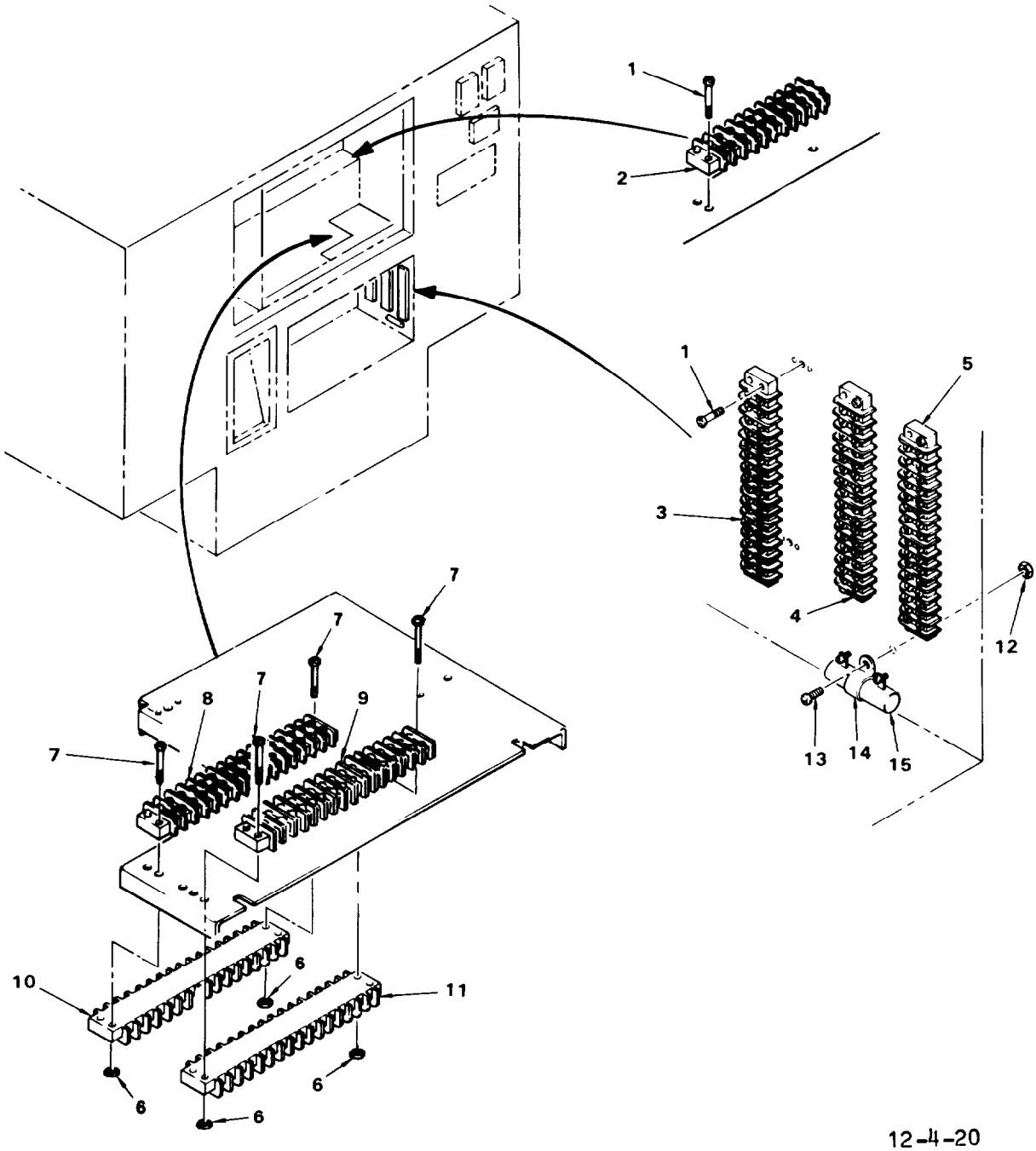
d. Remove Resistor R6. (See figure 4-20.)

NOTE

See table 4-2, Malfunction 62 (step 12) for test.

(1) If necessary for access to nut (12), remove battery (paragraph 4-25.a).

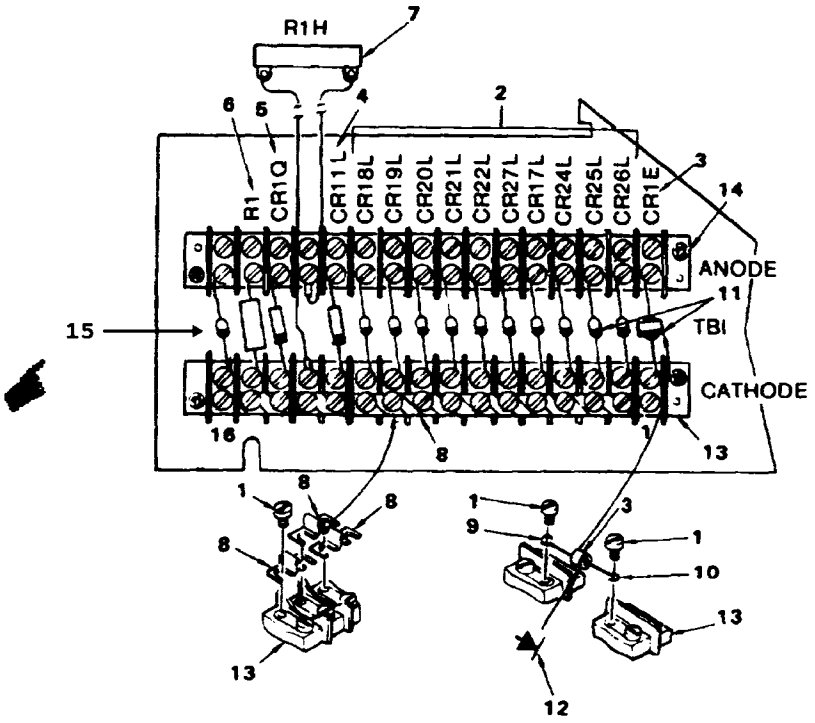
(2) Remove battery charger access cover (5, figure 4-5).



12-4-20

1. SCREW	6. NUT	11. TB2 (ANODE)
2. GROUND TB	7. SCREW	12. NUT
3. TB4	8. TB1 (ANODE)	13. SCREW
4. TB3 (ANODE)	9. TB1 (CATHODE)	14. CLAMP
5. TB3 (CATHODE)	10. TB2 (CATHODE)	15. RESISTOR R6

Figure 4-20. Terminal Boards



12-4-21

1. TERMINAL SCREW	6. RESISTOR, 25 OHM, 5W	11. CATHODE BAND
2. DIODE 1N5061	7. RESISTOR, 25 OHM, 25W (LOCATED ON BATTERY COMPARTMENT WALL)	12. CATHODE SYMBOL
3. DIODE MR756		13. CATHODE TERMINAL BOARD
4. ZENER DIODE 1N5349, 12V	8. JUMPER	14. ANODE TERMINAL BOARD
5. ZENER DIODE 1N5338A, 5.1V	9. ANODE LEAD	15. DIODE 1N5061 (83-360D ONLY)
	10. CATHODE LEAD	

Figure 4-21. Terminal Board TB1 Components

(3) Tag and unsolder wires from solder terminals on resistor (15, figure 4-20).

(4) Remove nut (12), screw (13), clamp (14), and resistor (15).

e. Install Resistor R6. (See figure 4-20).

(1) Install clamp (14) on resistor (15).

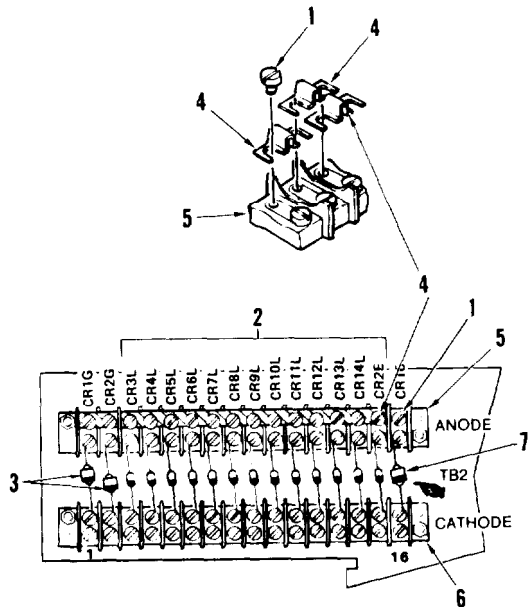
(2) Position resistor/clamp assembly with resistor solder lugs up. Attach clamp to battery compartment wall with screw (13) and nut (12).

(3) Use ID tags and solder wires to solder lugs on resistor.

(4) If removed, install battery (paragraph 4-25.d).

f. Remove Terminal Boards.

(1) Disconnect battery.



1. TERMINAL SCREW
2. DIODE 1N5061
3. DIODE MR756
4. JUMPER
5. ANODE TERMINAL BOARD
6. CATHODE TERMINAL BOARD
7. DIODE MR752

Figure 4-22. Terminal Board TB2 Components

(2) Lower control panel (paragraph 4-24) if ground TB (2, figure 4-20), TB1 (8 or 9), or TB2 (10 or 11) is to be removed.

(3) Disconnect control panel support cable and lower control panel onto access door if TB1 (8 or 9) or TB2 (10 or 11) is to be removed.

(4) If TB1 (8 or 9), TB2 (10 or 11), TB3 (4 or 5), or TB4 (3) is to be removed, remove battery charger access cover (5, figure 4-5).

(5) Remove Ground TB, TB3 Anode, TB3 Cathode, or TB4. (See figure 4-20).

(a) Tag and remove all wires from ground TB (2), TB4 (3), TB3 anode (4), or TB3 cathode (5).

(b) If removing TB3 anode (4) or cathode (5), tag and disconnect all components from TB.

(c) Remove screws (1) and TB (2, 3, 4, or 5).

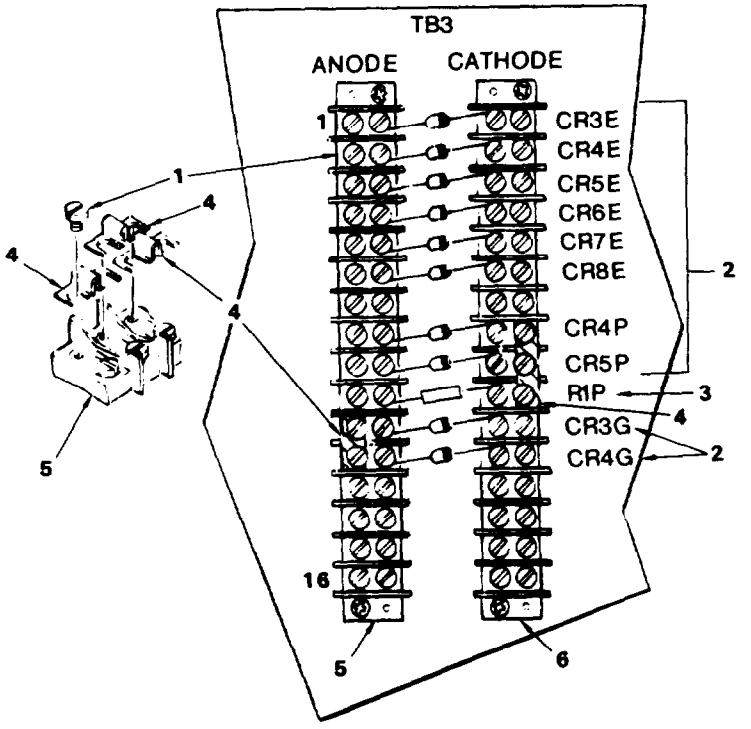
(6) Remove TB1 Anode, TB1 Cathode, TB2 Anode, or TB2 Cathode. (See figure 4-20).

(a) Tag and remove all Wires from TB1 anode (8), TB1 cathode (9), TB2 cathode (10), or TB2 anode (11).

(b) Remove nuts (6), screws (7), and TB (8, 9, 10, or 11).

g. Install Terminal Boards.

(1) Install Ground TB, TB3 Anode, TB3 Cathode, or TB4. (See figure 4-20).



12-4-23

1. TERMINAL SCREW
2. DIODE 1N5061
3. RESISTOR, 100 OHM, 1/2W
4. JUMPER
5. ANODE TERMINAL BOARD
6. CATHODE TERMINAL BOARD

Figure 4-23. Terminal Board TB3 Components

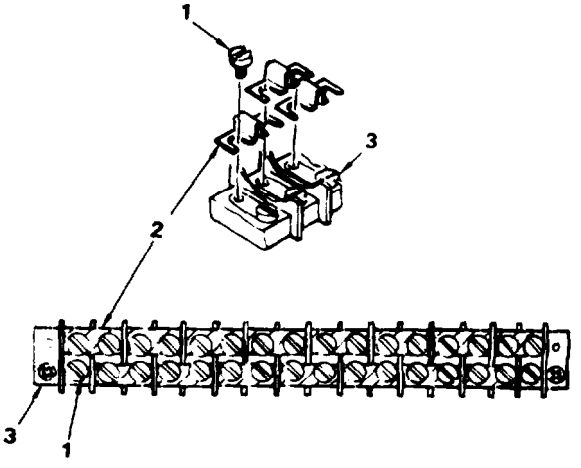
(a) Check nutplates on panel. If any nutplate is missing, notify maintenance supervisor.

(b) If installing TB3 anode (4) or cathode (5), install jumpers (4) at positions indicated (4, figure 4-23).

(c) If installing ground TB (2, figure 4-20), install jumpers (2) at positions indicated (2, figure 4-24).

(d) Attach terminal board (2, 3, 4, or 5, figure 4-20) to panel with two screws (1).

(e) If installing TB3 (4 or 5), install electrical components to TB. Use ID tags and figure 4-23 for reference.



12-4-24

1. TERMINAL SCREW
2. JUMPER
3. TERMINAL BOARD

Figure 4-24. Ground Terminal Board Components

(f) Use ID tags and install wires to TB.

(2) Install TB1 Anode, TB1 Cathode, TB2 Anode, and TB2 Cathode. (See figure 4-20).

(a) If installing TB1 cathode (9), install jumpers at positions indicated (8, figure 4-21).

(b) If installing TB2 anode (11, figure 4-20), install jumpers (4) at positions indicated (4, figure 4-22).

(c) Install terminal board (8, 9, 10, or 11, figure 4-20) with two screws (7) and nuts (6).

(d) Install electrical components on TB. Use ID tags and figure 4-21 (TB1) or figure 4-22 (TB2) for reference.

(e) Use ID tags and install wires to TB.

4-34. GENERATOR DC LOAD RESISTOR (R4).

WARNING

Remove all rings, watches and other jewelry when performing maintenance on this equipment.

NOTE

See table 4-2, Malfunction 43 (step 11) for test.

a. Inspect. (See figure 4-25).

(1) Disconnect battery.

(2) Open electrical trays access door (9, figure 1-1).

(3) Inspect resistor (11, figure 4-25) on step above upper electrical tray for obvious damage. Replace resistor if cracked.

(4) Check resistor for security of installation. Tighten mounting screws (8) as required.

(5) Check that wires (5) are securely connected to resistor terminals. Tighten terminal nuts (1) as required.

b. Remove.

(1) Check that battery is disconnected.

(2) Remove roof (see paragraph 4-16).

(3) Disconnect wires from resistor by removing two nuts (1), lockwashers (2), screws (3), and washers (4).

(4) Remove two nuts (6), lockwashers (7), screws (8), washers (9), brackets (10), and resistor (11).

c. Install. (See figure 4-25.)

(1) Insert brackets (10) into ends of resistor (11).

(2) Attach brackets to tray compartment wall using two washers (9), screws (8), lockwashers (7), and nuts (6).

(3) Install wires (5) disconnected in step b. to resistor terminals using screws (3), washers (4), lockwashers (2), and nuts (1).

(4) Install roof (paragraph 4-16).

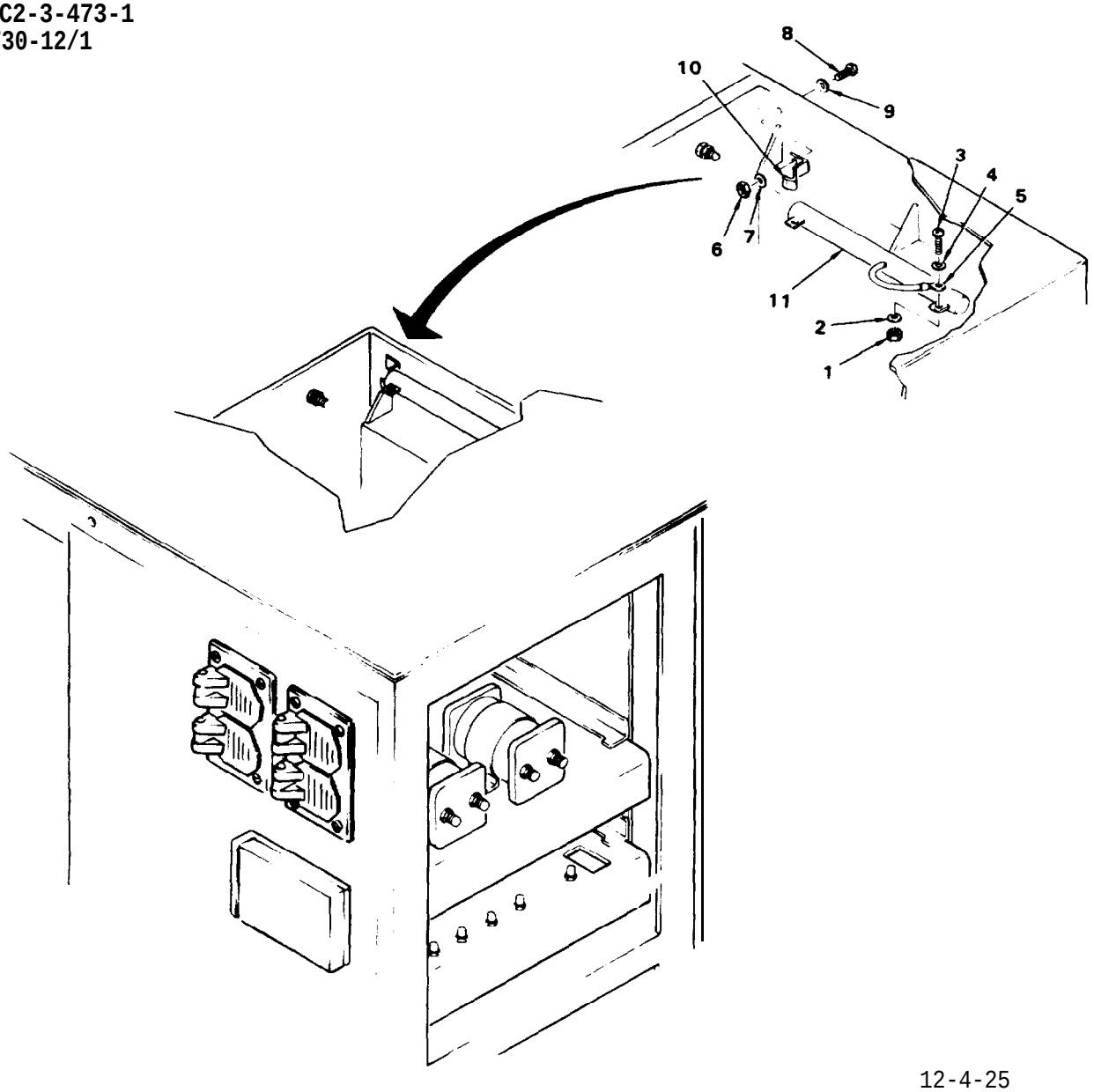
4-35. BATTERY CHARGER CIRCUIT BREAKERS (2CB1-2cB2).

WARNING

Remove all rings, watches and other jewelry when performing maintenance on this equipment.

a. Inspect. (See figure 4-26.)

(1) Disconnect battery.



1.	NUT	5.	WIRE	9.	WASHER
2.	LOCKWASHER	6.	NUT	10.	BRACKET
3.	SCREW	7.	LOCKWASHER	11.	GENERATOR DC LOAD RESISTOR
4.	WASHER	8.	SCREW		

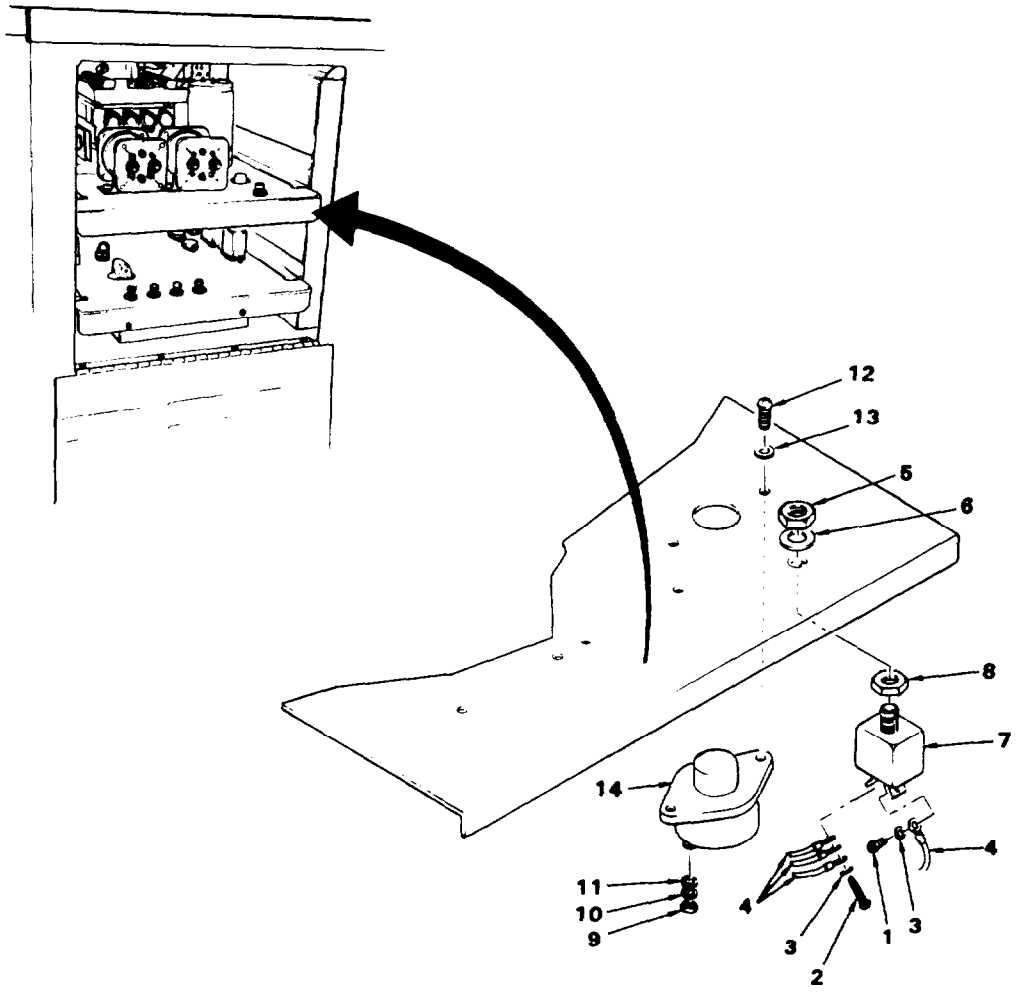
Figure 4-25. Generator DC Load Resistor

(2) Open electrical trays access door (9, figure 1-1).

(3) Inspect circuit breakers (7 and 14, figure 4-26) on upper electrical tray for obvious damage. Replace any circuit breaker with broken or bent parts.

(4) Check that circuit breaker is securely mounted to tray. Tighten retaining nut (8) or screws (12) as required.

(5) Check that wires are securely connected to the circuit breaker. Tighten terminal screws (1 and 2) nuts (9) as required.



12-4-26

1.	SCREW	7.	35 AMP CIRCUIT BREAKER	11.	WASHER
2.	SCREW (LONG)	8.	HEIGHT ADJUSTMENT NUT	12.	SCREW
3.	LOCKWASHER	9.	NUT	13.	LOCKWASHER
4.	WIRE	10.	LOCKWASHER	14.	70 AMP CIRCUIT BREAKER
5.	NUT				
6.	LOCKWASHER				

Figure 4-26. Battery Charger Circuit Breaker

b. Remove 35 Amp Circuit Breaker (2CB2).

NOTE

See table 4-2, Malfunction 81 (step 6) for test.

(1) Disconnect battery and extend lower electrical tray (paragraph 4-24.b). Carefully pull tray all the way out of slides and let tray hang down out of way, supported by cables.

(2) See figure 4-26. Remove terminal screws (1 and 2) and lo&washers

(3). Tag and remove all wires from circuit breaker (7). Keep longer screw (2) for reinstallation.

(3) Remove nut (5), lockwasher (6), and circuit breaker (7).

(4) Note position of height adjustment nut (8) on threaded shaft of circuit breaker.

c. Install 35 Amp Circuit Breaker. (See figure 4-26).

(1) Remove nut (5), lockwasher (6), and keywasher (not shown) from replacement circuit breaker (7). The keywasher is not used for circuit breaker installation.

(2) Set height adjustment nut (8) on replacement circuit breaker shaft to same position as adjustment nut on old circuit breaker.

(3) Install replacement circuit breaker (7) from underside of tray and secure with lockwasher (6) and nut (5). One or two threads on shaft of circuit breaker should be visible from top of tray. If not, loosen retaining nut (5), reset adjustment nut (8) as required, and tighten retaining nut.

(4) Remove terminal screws (1) and lockwashers (3) from circuit breaker. Using ID tags, install wires (4) on circuit breaker. Fasten single wire to circuit breaker with lockwasher (3) and screw (1) supplied with circuit breaker. Use lockwasher (3), and long screw (2) removed from old circuit breaker on the terminal with three wires. Install the three wires with larger wire closest to circuit breaker body.

(5) If no other maintenance is required on upper tray, replace lower tray and secure with quick release pins.

d. Remove 70 Amp Circuit Breaker (2CB1). (See figure 4-26.)

NOTE

See table 4-2, Malfunction 81 (step 5) for test.

(1) Disconnect battery and extend lower tray (paragraph 4-24.b). Carefully pull tray all the way out of slides and let tray hang down out of way, supported by cables.

(2) See figure 4-26. Remove terminal nuts (9) and washers (10 and 11). Tag and remove wires from circuit breaker (14).

(3) Remove two screws (12), washers (13), and circuit breaker (14).

e. Install 70 Amp Circuit Breaker. (See figure 4-26.)

(1) Install replacement circuit breaker (14) from underside of tray and secure with two washers (13) and screws (12).

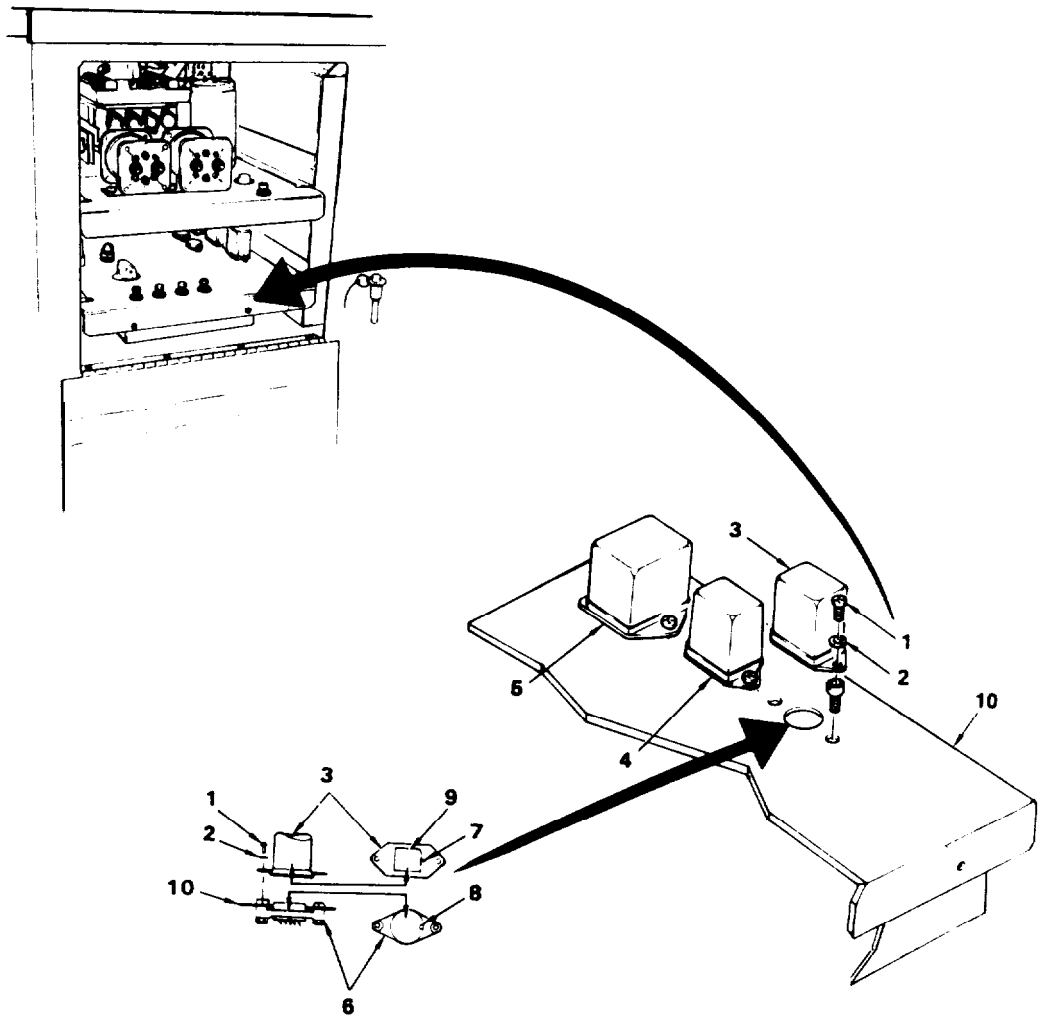
(2) Remove nuts (9) and washers (10 and 11) from circuit breaker terminal screws. Using ID tags, install wires on circuit breaker. Fasten wires with washers (11), lockwashers (10), and nuts (9).

(3) If no other maintenance is required on upper tray, replace lower tray and secure with quick release pins.

4-36. CONTROL RELAYS (3K1-3K3).

WARNING

Remove all rings, watches and other jewelry when performing maintenance on this equipment.



12-4-27

1. SCREW
2. LOCKWASHER
3. 95% ENABLE RELAY 3K1
4. STARTER LATCHING RELAY 3K2
5. BATTERY/CHARGER TRANSFER RELAY 3K3
6. RELAY SOCKET
7. RELAY LOCATING PIN
8. SOCKET LOCATING PIN
9. SEAL
10. LOWER ELECTRICAL TRAY

Figure 4-27. Control Relay

NOTE

See table 4-2, Malfunctions 83, 84, and 85 for test.

a. Inspect. (See figure 4-27.)

(1) Extend lower electrical tray (paragraph 4-24.b).

(2) Inspect relays (3, 4, and 5, figure 4-27) for dents or punctures. Replace damaged relays.

(3) Check that relays are securely mounted. Tighten mounting screws (1) as required.

(4) Check that solder connections to relay sockets (6) are secure. Make sure that no bare wires are touching.

NOTE

Removal and installation procedures are the same for control relays 3K1 through 3K3. 3K1 is illustrated.

b. Remove Control Relays (3K1-3K3). (See figure 4-27.)

(1) Disconnect battery and extend lower electrical tray (paragraph 4-24.b).

(2) Remove screws (1) and lockwashers (2). Pull relay (3) straight up from socket (6).

c. Install Control Relays (3K1-3K3). (See figure 4-27.)

(1) Check that seal (9) on replacement relay is not damaged.

(2) Hold replacement relay (3) so that relay locating pin (7) is aligned with socket locating pin hole (8). Insert relay into relay socket and push firmly into place.

(3) Secure relay to socket with lockwashers (2) and screws (1).

(4) Push lower electrical tray in and secure with quick release pins.

4-37. VOLTAGE REGULATORS (3VR1 and 3VR2).

WARNING

Remove all rings, watches and other jewelry when performing maintenance on this equipment.

NOTE

See table 4-2, Malfunctions 11 (step 9) and 12 (step 7) for test.

a. Inspect. (See figure 4-28.)

(1) Extend lower electrical tray (paragraph 4-24.b).

(2) Inspect voltage regulators (7 and 8, figure 4-28) for dents or punctures. Replace damaged regulators.

(3) Check that regulators are securely mounted. Tighten mounting screws (6) as required.

(4) Check that wire connections to regulators are secure.

(5) Check that silicon rubber sealant (12) around regulators is not separated from regulators of trays.

b. Remove. (See figure 4-28.)

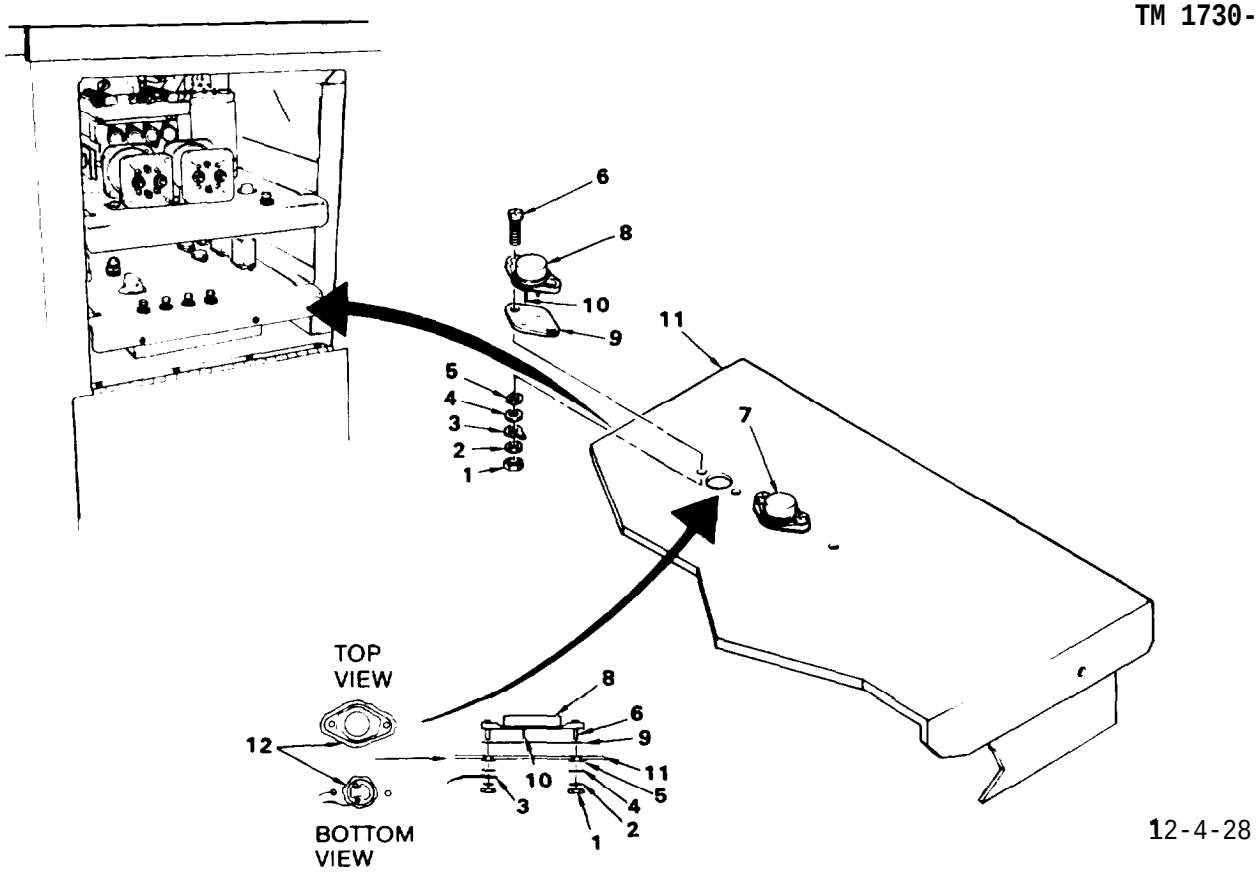
NOTE

Removal and installation procedures are the same for voltage regulators 3VR1 and 3VR2. 3VR1 is illustrated.

(1) Disconnect battery and extend lower electrical tray (paragraph 4-24.b).

(2) Remove silicon rubber sealant (12) from regulator and tray.

(3) Unsolder wire from pin (10) on underside of regulator.



1. NUT
2. LOCKWASHER
3. WIRE TERMINAL LUG
4. WASHER
5. SHOULDER WASHER
6. SCREW
7. PANEL LAMP VOLTAGE REGULATOR 3VR1
8. UTILITY LAMP VOLTAGE REGULATOR 3VR2
9. INSULATOR
10. PIN (CATHODE)
11. LOWER ELECTRICAL TRAY
12. SILICONE RUBBER SEALANT

Figure 4-28. Voltage Regulator

(4) Remove two nuts (1), lockwashers (2), wire terminal lug (3), washers (4), and shoulder washers (5) from underside of tray. Remove screws (6), regulator (7), and insulator (9) from top of tray.

c. Install. (See figure 4-28.)

CAUTION

The regulator case and mounting hardware must be insulated from tray. Make sure the insulator and shoulder washers are properly installed.

NOTE

Items (1) through (6) and (9) are provided in a mounting kit.

(1) Set replacement regulator (7) in place on top of tray with insulator (9) between regulator and tray.

(2) Insert two mounting screws (6) through holes in regulator (7), insulator (9), and tray (11). Install a shoulder washer (5) on each screw with small end of washer toward tray. Slide washers up on screws and fit small ends of washers into holes in tray. Make sure that screws are not touching tray.

(3) Install on screws (6) , washer (4), wire terminal lug (3) (on one screw only), lockwasher (2), and nut (1). Tighten nuts.

(4) Solder other wire to either pin (10) on regulator.

(5) Apply silicon rubber sealant (12) to regulators on both sides of tray.

(6) Push lower electrical tray in and secure with quick release pins.

4-38. POWER DIODES (3CR7P-3CR9P).

WARNING

Remove all rings, watches and other jewelry when performing maintenance on this equipment.

NOTE

See table 4-2, Malfunction 85 for test.

a. Inspect . (See figure 4-29.)

(1) Extend lower electrical tray (paragraph 4-24.b).

(2) Inspect diodes (5, 6, and 7, figure 4-29) for obvious damage. Replace damaged diodes.

(3) Check that diodes are securely mounted. Tighten nuts (1) as required.

(4) Check that wire connections to diodes are secure.

(5) Check that silicon rubber sealant (11) around diodes is not separated from diodes or tray.

b. Remove. (See figure 4-29.)

(1) Disconnect battery and extend lower electrical tray (paragraph 4-24.b).

(2) Remove silicon rubber sealant (11, figure 4-29) from diode and tray.

(3) Unsolder wire from diode terminal lug (9).

(4) Remove nut (1), lockwasher (2), wire terminal lug (3), and shoulder washer (4) from underside of tray. Remove diode (5) and insulator (8) from top of tray.

NOTE

Removal and installation procedures are the same for power diodes 3CR7P through 3CR9P. 3CR9P is illustrated.

c. Install. (See figure 4-29.)

CAUTION

The diode case and mounting hardware must be insulated from tray. Make sure the insulator and shoulder washers are properly installed.

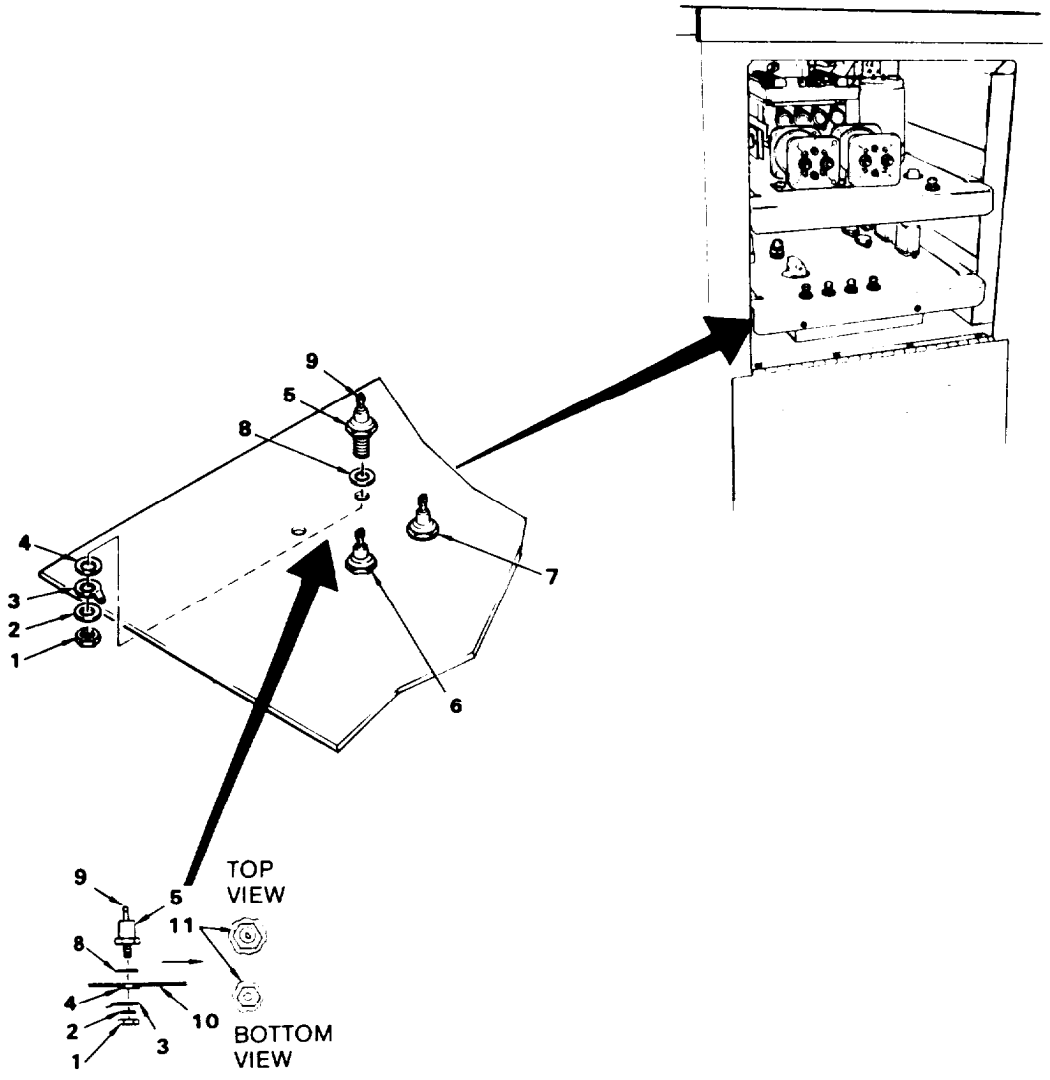
NOTE

Items (1) through (4) and (8) are provided in mounting kit.

(1) Install insulator (8) on mounting stud of diode (5).

(2) Insert diode mounting stud through hole in tray.

(3) Install shoulder washer (4) on diode mounting stud with small end of washer toward tray. Slide washer up on stud and fit small end of washer into hole in tray. Make sure that diode mounting stud is not touching tray.



12-4-29

NOTE

Diode terminal lug (9) is cathode on 3CR8 (6). Terminal lug is anode on 3CR7 (7) and 3CR9 (5).

1. NUT
2. LOCKWASHER
3. WIRE TERMINAL LUG
4. SHOULDER WASHER
5. DIODE 3CR9P
6. ZENER DIODE 3CR8P
7. DIODE 3CR7P
8. INSULATOR
9. DIODE TERMINAL LUG
10. LOWER ELECTRICAL TRAY
11. SILICON RUBBER SEALANT

Figure 4-29. Power Diode

(4) Install wire terminal lug (3), lo&washer (2), and nut (1) on diode mounting stud. Tighten nut securely.

(5) Apply silicon rubber sealant (11) to diode on both sides of tray.

(6) Push lower electrical tray in and secure with quick release pins.

4-39. BATTERY CHARGER OUTPUT SWITCH (3S1).

WARNING

Remove all rings, watches and other jewelry when performing maintenance on this equipment.

NOTE

See table 4-2, Malfunction 81 (step 7) for test.

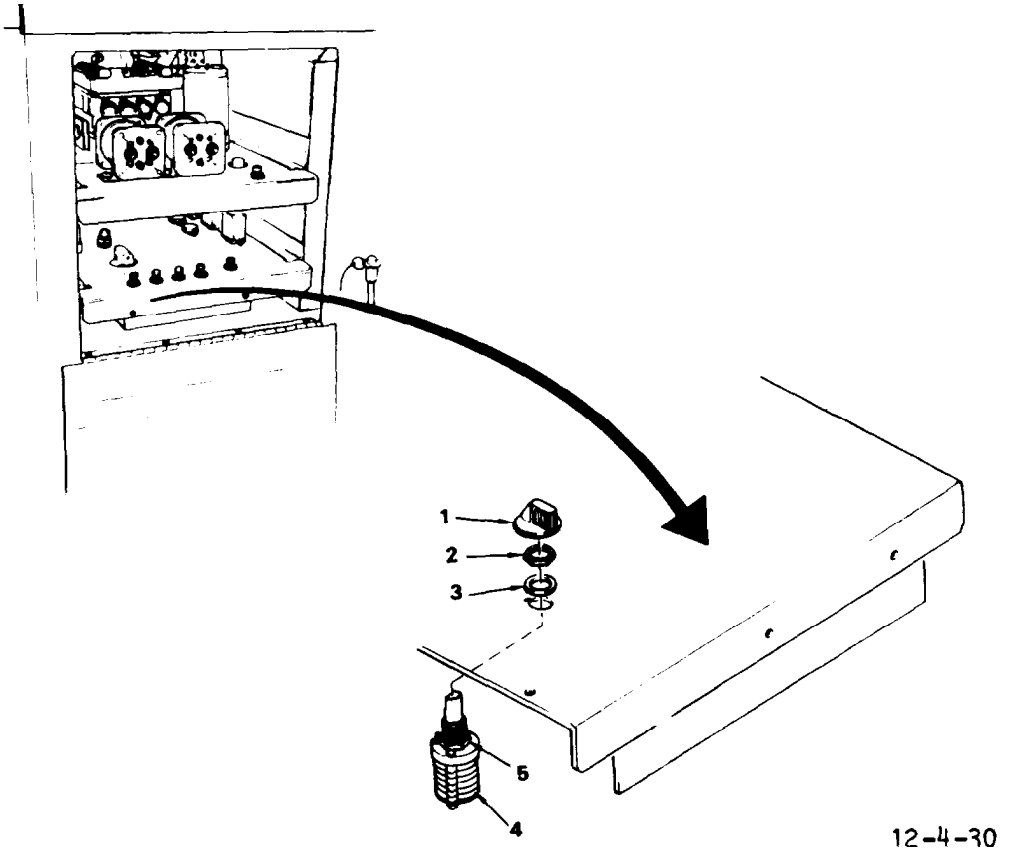
a. Inspect. (See figure 4-30.)

(1) Extend lower electrical tray (paragraph 4-24.b).

(2) Inspect switch (4) and knob (1) for obvious damaged. Replace broken knob or switch.

(3) Check that switch (4) is securely mounted to tray. If not, remove knob (1) and tighten retaining nut (2). Replace knob.

(4) Turn knob (1) to full counterclockwise position. If knob is loose, tighten setscrews in knob. Replace missing setscrews.



1. KNOB
2. NUT
3. LOCKWASHER
4. SWITCH
5. SWITCH ASSEMBLY NUT

Figure 4-30. Battery Charger Output Switch

(5) Check that knob points to 28.5VDC position when turned to full counterclockwise position. If not, loosen setscrews, turn knob to 28.5 VDC position, and tighten setscrews. Tighten setscrew opposite to knob pointer first.

(6) Check that wire connections to switch solder lugs are secure.

b. Remove. (See figure 4-30.)

(1) Disconnect battery and extend lower electrical tray (paragraph 4-24.b).

(2) Loosen two setscrews in switch knob (1, figure 4-30) and remove knob.

(3) Tag and unsolder all wires from terminal lugs on switch (4).

(4) Remove nut (2), lockwasher (3), and switch (4).

c. Install. (See figure 4-30.)

CAUTION

The nut (5) against the switch body is the switch assembly nut. Do not remove this nut.

(1) Remove nut (2) and lockwasher (3) from replacement switch (4). If two nuts remain on switch, remove outer nut. Do not remove switch assembly nut (5).

(2) Install replacement switch (4) from underside of tray, and secure with lockwasher (3) and nut (2).

(3) Use ID tags and solder wires to solder lugs on switch.

(4) Position knob (1) on shaft of switch (4) so that the setscrew opposite knob pointer can be tightened against the flat of switch shaft. Tighten the setscrew opposite knob pointer first, then tighten other setscrew.

4-40. SPEED SENSOR (GTE).

WARNING

Remove all rings, watches and other jewelry when performing maintenance on this equipment.

NOTE

See table 4-2, Malfunction 88 for test.

a. Remove. (See figure 4-31.)

(1) Cut and remove lockwire from speed sensor electrical connector (1).

(2) Disconnect electrical connector from speed sensor (3).

CAUTION

Use care when removing speed sensor, since shim is reusable if not damaged.

(3) Remove bolt (2), then remove speed sensor (3) with packing (4) and shim set (5). Retain shim set to install speed sensor.

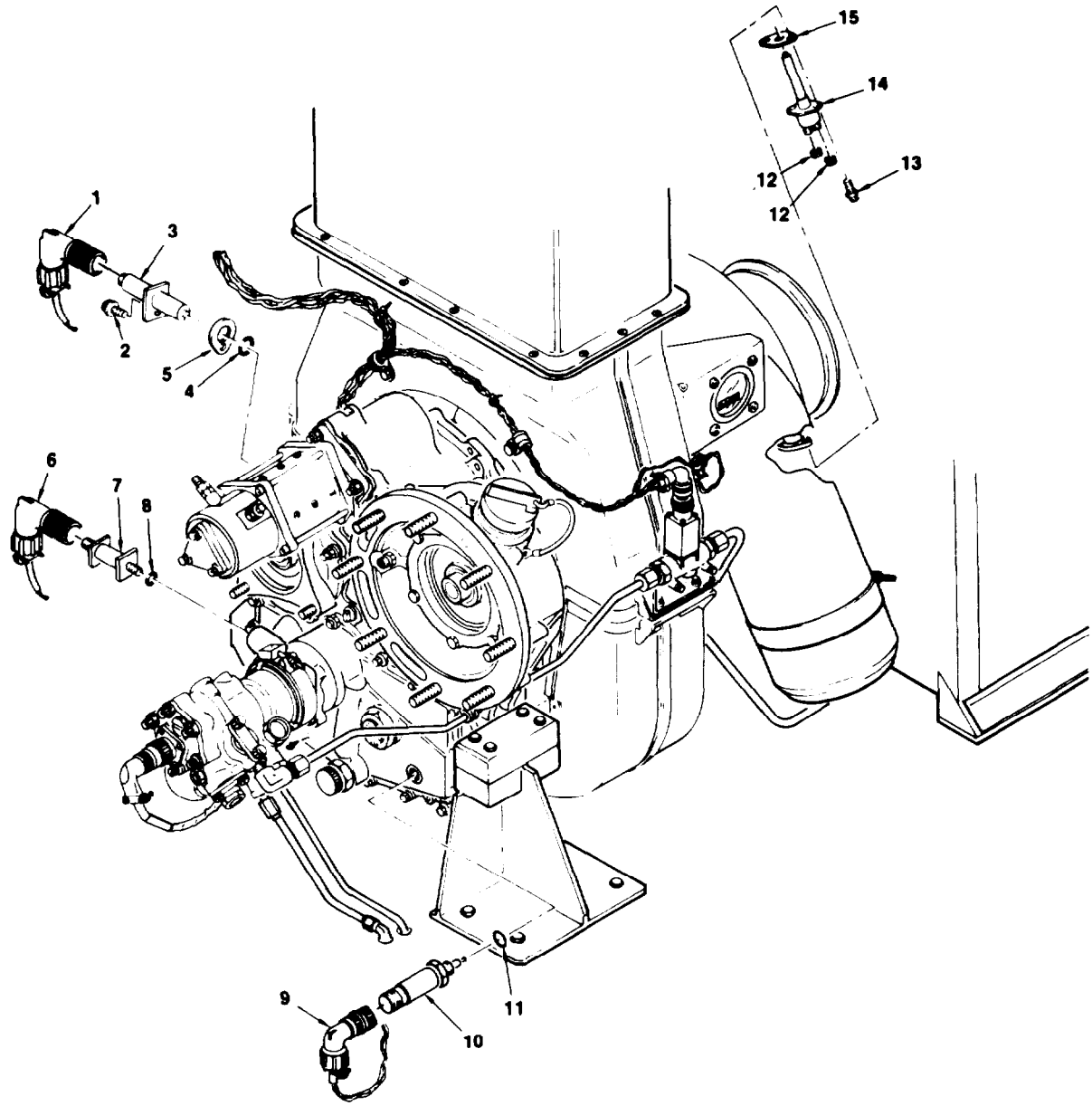
b. Inspect.

(1) Inspect sensor housing for dents and cracks. No dents or cracks are allowed.

(2) Inspect connector for bent, or damaged pins. No bent or damaged pins are allowed.

(3) Inspect mounting flange for cracks and distorted mounting holes. No cracks or distortion is allowed.

(4) Inspect shim set (5) for heavily marred surfaces and/or separated laminations. If shim is damaged, discard and proceed to step c.(1). If shim is usable, proceed to step c.(2).



12-4-31

1. ELECTRICAL CONNECTOR
2. BOLT
3. SPEED SENSOR
4. PACKING
5. SHIM SET
6. ELECTRICAL CONNECTOR
7. LOW OIL PRESSURE SWITCH
8. PACKING
9. ELECTRICAL CONNECTOR
10. HIGH OIL TEMPERATURE SWITCH
11. PACKING
12. LOCK NUTS
13. BOLTS
14. THERMOCOUPLE
15. GASKET

Figure 4-31. Engine DC Control Components

c. Install. (See figure 4-31.)

(1) If a new shim set is required, contact direct support. If shim set passes inspection in step b.(4), proceed to step (2).

CAUTION

Improper shim thickness could result in damage to speed sensor and/or gearteeth.

(2) Install shim set (5), removed in step a.(3), and packing (4) on speed sensor (3).

(3) Install speed sensor (3) with assembled items into gearbox and secure with bolt (2). Tighten bolt to a torque value of 35 inch-pounds.

(4) Connect electrical connector to speed sensor (3) and lockwire connector.

(5) Install engine access cover. Refer to paragraph 4-15.b.

4-41. LOU OIL PRESSURE SWITCH.

WARNING

Remove all rings, watches and other jewelry when performing maintenance on this equipment.

NOTE

See table 4-2, Malfunction 89 for test.

a. Inspect. (See figure 4-31.)

(1) Remove engine and hydraulic access covers. Refer to paragraph 4-15.

(2) Inspect switch (7) for damage.

(3) Check that switch is securely mounted to engine.

(4) Check that electrical connector (6) is securely attached to switch.

b. Remove. (See figure 4-31.)

(1) Cut and remove lockwire from low oil pressure electrical connector (6).

(2) Disconnect electrical connector (6) from low oil pressure switch (7).

(3) Cut and remove lockwire from low oil pressure switch (7).

(4) Remove switch (7) with packing (8). Discard packing.

c. Install. (See figure 4-31.)

(1) Install low oil pressure switch (7) with new packing (8). Lockwire low oil pressure switch (7).

(2) Connect electrical connector (6) to switch (7). Lockwire electrical connector (6).

(3) Install engine and hydraulic access covers. Refer to paragraph 4-15.

4-42. HIGH OIL TEMPERATURE SWITCH.

WARNING

Remove all rings, watches and other jewelry when performing maintenance on this equipment.

NOTE

See table 4-2, Malfunction 90 for test.

a. Inspect. (See figure 4-31.)

(1) Inspect switch (10) for damage.

(2) Check that switch is securely mounted to engine.

(3) Check that electrical Connector (9) is securely attached to switch=

b. Remove. (See figure 4-31.)

(1) Drain oil from gearcase before removing high oil temperature switch in accordance with steps (2) through (6) of paragraph 4-8.a.

(2) Cut and remove lockwire from high oil temperature switch electrical connector (9).

(3) Disconnect electrical connector (9) from switch (10).

(4) Cut and remove lockwire from high oil temperature switch.

(5) Remove switch (10) with packing (11). Discard packing.

c. Install. (See figure 4-31.)

(1). Install high oil temperature switch (10) with new packing (11).

(2) Lockwire high oil temperature switch.

(3) Connect electrical connector (9) to switch.

(4) Lockwire electrical connector.

(5) Add oil to gearcase assembly in accordance with steps (7) through (10) of paragraph 4-8.a.

4-43. THERMOCOUPLE.

WARNING

Remove all rings, watches and other jewelry when performing maintenance on this equipment.

NOTE

See table 4-2, Malfunction 91 for test.

a. Remove. (See figure 4-31.)

(1) Remove lock nuts (12) and tag and disconnect electrical leads from thermocouple (14).

(2) Remove bolts (13), and remove thermocouple (14) and gasket (15). Discard gasket.

b. Inspect. (See figure 4-31.)

(1) Inspect thermocouple for damaged or worn threads on terminal posts. No damaged or worn threads are allowed.

(2) Inspect thermocouple for distorted flange tube or tube holes. No distortion is allowed.

c. Install. (See figure 4-31.)

(1) Apply a light coat of high temperature compound MIL-A-907 (Fel-Pro C5-A) to threads of bolts (13).

(2) Install gasket (15) and thermocouple (14) and secure using bolts (13). Tighten bolts to a torque value of 35 inch-pounds.

(3) Connect electrical leads to thermocouple (14), and secure with lock nuts (12).

4-44. INLET FILTER BLOCKED SWITCH (S3).

WARNING

Remove all rings, watches and other jewelry when performing maintenance on this equipment.

NOTE

See table 4-2, Malfunction 92 for test.

a. Inspect. (See figure 4-32.)

(1) Remove roof (refer to paragraph 4-16).

(2) Inspect switch (6) for obvious damage. Replace switch if case is cracked.

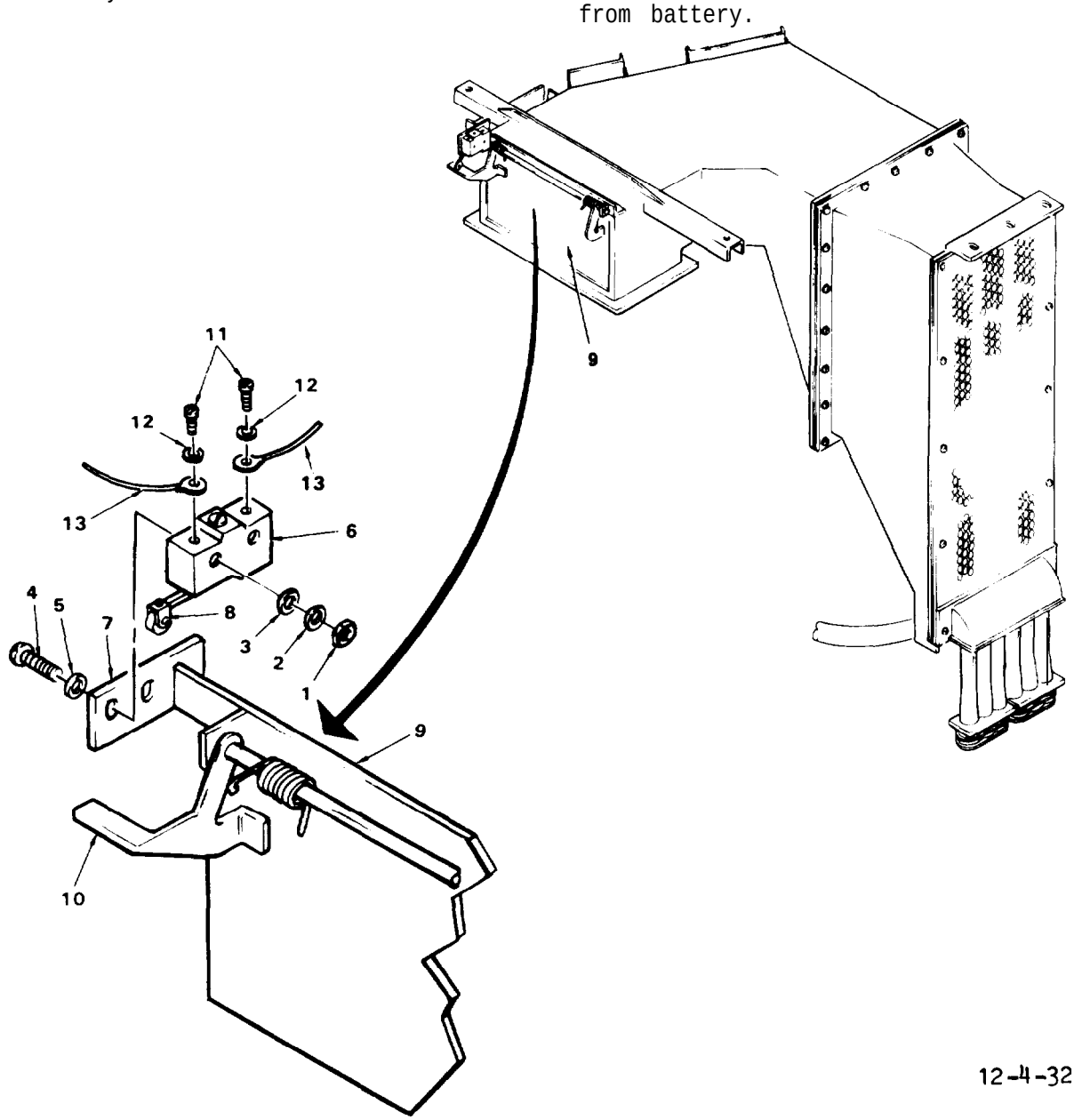
(3) Check that switch actuating lever (8) is present and loaded against bypass door control arm (10).

(4) Check that switch mounting hardware is secure. Tighten screws (4) if necessary.

(5) Check that wire connections to switch terminal screws are secure. Tighten terminal screws if necessary.

b. Remove. (See figure 4-32.)

(1) Disconnect battery connector from battery.



1. NUT
2. LOCK WASHER
3. WASHER
4. SCREW
5. WASHER
6. INLET FILTER SWITCH
7. SWITCH BRACKET
8. SWITCH ACTUATING LEVER
9. BYPASS DOOR
10. CONTROL ARM
11. SCREW
12. WASHER
13. WIRE

Figure 4-32. Inlet Filter Blocked Switch

(2) Tag and disconnect wires (13) from switch terminals by removing two screws (11) and washers (12).

(3) Remove two screws (4), washers (5), washers (3), lock washers (2), and nuts (1) and remove switch (6) from mounting bracket (7).

c. Install. (See figure 4-32.)

(1). Attach switch to mounting bracket (7) with two screws (4), washers (5), washers (3), lockwashers (2), and nuts (1).

(2) Center switch vertically on bracket (7) and tighten nuts (1).

(3) Connect wires (13) to switch terminals using two screws (11) and washers (12).

(4) Open bypass door (9) and check that switch actuates (indicated by click) when door is open (at bottom) between 1/4 and 1/2 inch. If necessary, ad just switch position. To adjust, loosen nuts (1), slide switch (6) up or down on bracket (7), and tighten nuts. Move switch down if switch actuation occurs when bypass door opening is less than 1/4 inch. Move switch up if actuation occurs when bypass door opening is greater than 1/2 inch.

4-45. PANEL AND UTILITY LAMPS.

WARNING

Remove all rings, watches and other jewelry when performing maintenance on this equipment.

NOTE

See table 4-2, Malfunctions 11 (Step 12) and 12 (step 10) for test.

a. Remove.

(1) Disconnect battery.

(2) See figure 4-12 and:

(a) Open control panel access door (1) to reach control panel lamps (2).

(b) Open hydraulic filters access door (40) to reach hydraulic utility lamp (41).

(c) Open engine access door (42) to reach engine utility lamp (47).

(d) Remove cable from storage compartment (48) and remove fuel access cover (49) to reach fuel utility lamp (50).

(3) See figure 4-33. Remove lamp (1) from socket (4) by pressing in on lamp and turning counterclockwise.

b. Install. Place lamp (1) in socket (4). Press lamp and turn clockwise to lock in place. Replace access panel or close access door.

4-46. PANEL AND UTILITY LAMP SOCKETS.

WARNING

Remove all rings, watches and other jewelry when performing maintenance on this equipment.

NOTE

See table 4-2, Malfunctions 11 (step 13) and 12 (step 11) for test.

a. Remove. (See figure 4-33.)

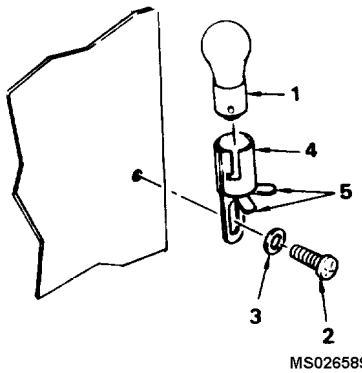
(1) Remove lamp (paragraph 4-45 .a).

(2) Remove screw (2), washer (3) and socket (4).

(3) Remove heat shrink insulator from wires connected to lamp socket. Unsolder wires from solder lugs (5).

b. Install. (See figure 4-33.)

(1) Install heat shrink insulator on wires and solder wires to solder lugs (5). Use heat gun to shrink insulator.



1. LAMP
2. SCREW
3. WASHER
4. SOCKET
5. SOLDER LUGS

Figure 4-33. Panel or Utility Lamp (Typical).

(2) Attach socket (4) to frame with washer (3) and screw (2).

(3) Install lamp (paragraph 4-45.b).

4-47. EMERGENCY STOP SWITCH (S2).

WARNING

Remove all rings, watches and other jewelry when performing maintenance on this equipment.

NOTE

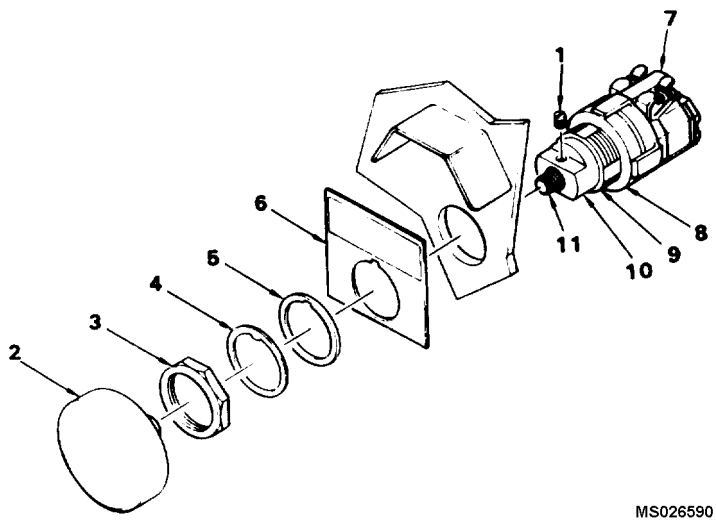
See table 4-2, Malfunction 93 for test.

a. Remove. (See figure 4-34).

(1) Disconnect battery.

(2) Remove AGPU roof (paragraph 4-16).

(3) Remove setscrew (item 1, figure 4-34).



1. SETSCREW
2. KNOB
3. NUT
4. KEYWASHER
5. WASHER
6. NAMEPLATE
7. SWITCH
8. SPACER WASHER
9. MOUNTING SHAFT
10. PLUNGER
11. THREADED STUD

Figure 4-34. Emergency Stop Switch.

(4) Hold flat of switch plunger (10) with wrench and remove knob (2) by turning counterclockwise.

(5) Hold switch (7) by hand, and loosen nut (3). Remove nut, keywasher (4), washer (5), and nameplate (6).

(6) Lift switch (7) to top of AGPU. Tag and disconnect wires from switch terminals.

b. Install. (See figure 4-34).

(1) Connect wires to switch terminals as follows:

Wire No.	Switch Terminal
E2C18	NC2
E6A20	NC5
E25D18	NC1
E29B20	NC6

(2) If switch knob and hardware is assembled, disassemble as follows:

(a) Remove setscrew (1).

(b) Hold flat of switch plunger (10) with wrench and remove knob (2) by turning counterclockwise.

(c) Hold switch (7) by hand and loosen nut (3). Remove nut, keywasher (4), washer (5), and nameplate (6).

(3) Check spacer washers (8). Five washers are provided with new switch. Remove any washers in excess of four.

(4) Insert switch mounting shaft (9) through panel from behind.

(5) Place nameplate (6), washer (5), and keywasher (4) on mounting shaft from front of panel. Position switch, nameplate, and washer with keyway up. Position keywasher so that key tab fits into keyway of washer, nameplate, and switch mounting shaft.

(6) Install nut (3) on switch mounting shaft (9). Hold switch by hand and tighten nut.

(7) Thread knob (2) into threaded stud (11) on switch plunger.

(8) Install setscrew (1).

(9) Install roof (paragraph 4-16).

4-48. WIRING HARNESS (MAIN HARNESS AND ELECTRICAL TRAY HARNESSES). Inspect wire harness as follows:

WARNING

Remove all rings, watches and other jewelry when performing maintenance on this equipment.

a. Set MASTER SWITCH to OFF, and disconnect battery.

b. Inspect wiring harness for damaged insulation and broken wires. See figures FO-15 through FO-18 for wire identification and connections.

c. Check that all terminal connections are secure.

d. Inspect harness connectors for damage.

4-49. WIRING HARNESS REPAIR. For repair of wiring harness, refer to TM 11-600-1 (Wheeled Vehicle Maintenance), or TM 55-1500-323-24 (Aviation Maintenance).

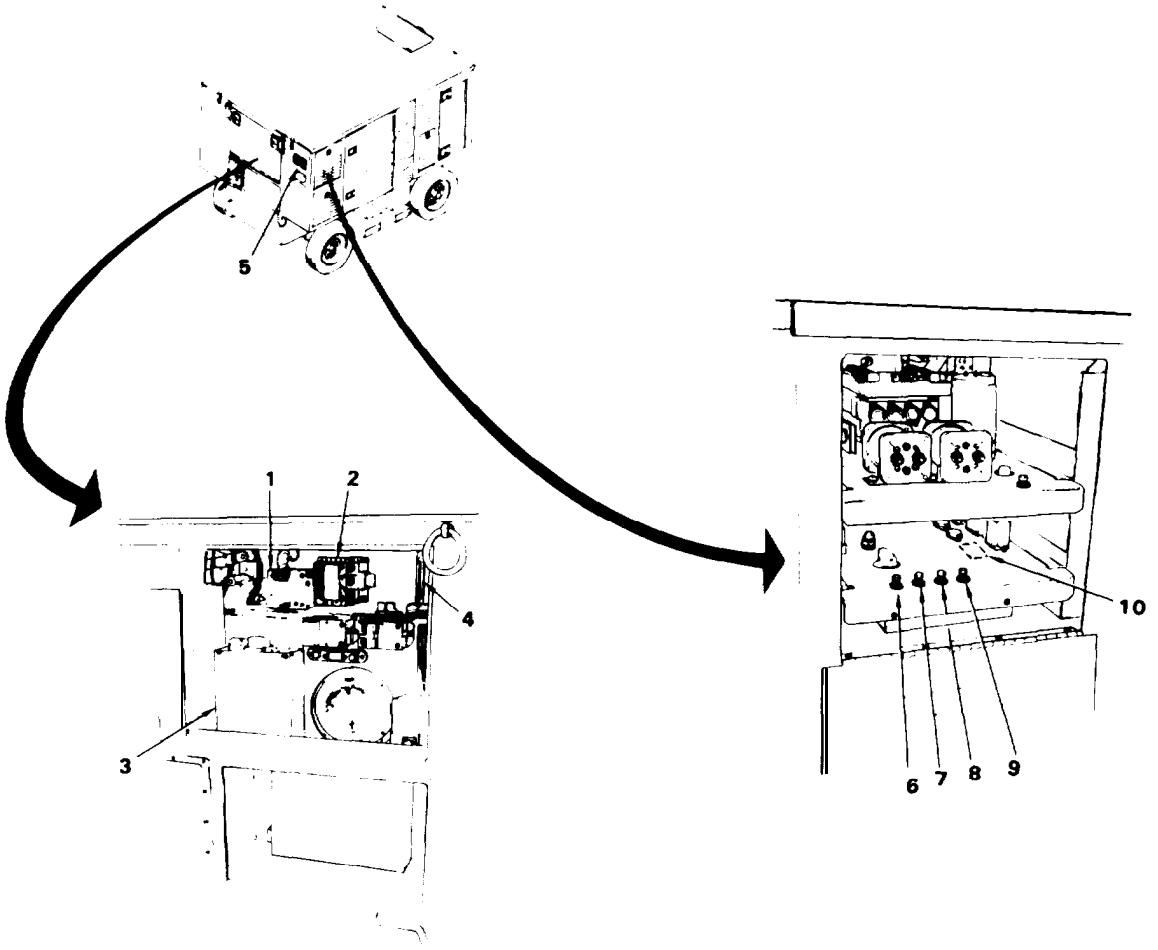
Section X. MAINTENANCE OF ELECTRICAL POWER GENERATION AND CONTROL SYSTEM

4-50. GENERAL. The major components control systems are listed in Table 4-11, of the electrical power generation and with location and figure references.

Table 4-11. Electrical Power Generation and Control System

Component	Location	Installation Fig. Ref.	Schematic/ Wiring Diagram Fig. Ref.
DC contactor (K2)	Fig. 4-35, item 1	4-38	FO-1, FO-5
AC contactor (K1)	Fig. 4-35, item 2	4-38	FO-6
Generator Control Unit (GCU) (A1)	Fig. 4-35, item 3	4-38	FO-5, FO-6
Current transformers, AC output (T2-T4)	Fig. 4-36, items 2 through 4	4-39	FO-6 (1)
Current transformer, GCU Input (T1)	Fig. 4-35, item 4	4-38	FO-6 (1)
AC/DC Generator (G1)	Fig. 4-36, item 1	4-39	FO-5, FO-6(1)
AC Generator (G1) (83-360D only)	Fig. 4-36, item 5	4-39a	FO-5D, FO-6D (1)
AC to DC Transformer Rectifier Unit (TRU) (83-360D only)	Fig. 4-37, item 4	4-39a (sheet 3)	FO-2D, FO-5D, FO-6D (1)
AC convenience receptacles (J1-J4)	Fig. 4-35, item 5	4-40	FO-6 (1)
AC Circuit Breakers (3CB303CB6)	Fig. 4-35, items 6 through 9	4-41	FO-6 (1)
Frequency Transducer	Fig. 4-35, item 10	4-41	FO-6 (2)
DC output power cable (W11)	Fig. 4-37, item 2	4-42	FO-5
AC output power cable (W6)	Fig. 4-37, item 1	4-42	FO-6 (1)
DC-to-AC inverter	Fig. 4-37, item 3	4-43	FO-5

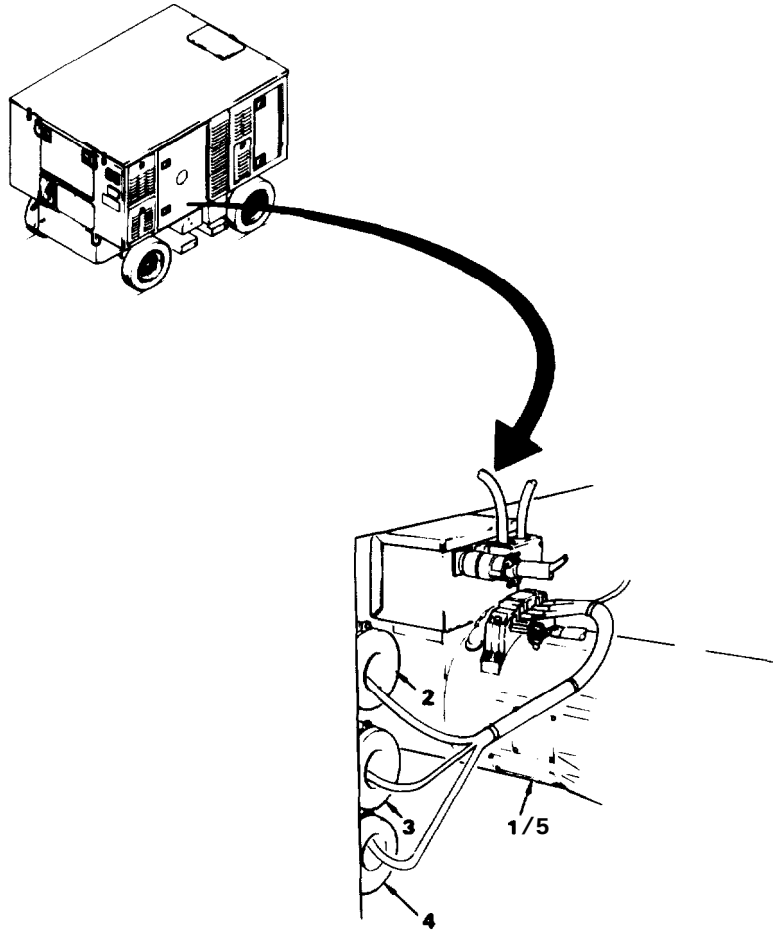
Electrical components are identified by reference designators. Refer to paragraph 4-23 for explanation of reference designators.



12-4-35

1. DC CONTACTOR (K2)
2. AC CONTACTOR (K1)
3. GENERATOR CONTROL UNIT (A2)
4. CURRENT TRANSFORMER T1
5. AC CONVENIENCE RECEPTACLES
6. CIRCUIT BREAKER 3CB6
7. CIRCUIT BREAKER 3CB5
8. CIRCUIT BREAKER 3CB4
9. CIRCUIT BREAKER 3CB3
10. FREQUENCY TRANSDUCER (MOUNTED TO UNDERSIDE OF TRAY)

Figure 4-35. Electrical Bay and Electrical Tray Compartment



12-4-36

1. AC/DC GENERATOR (G1)
2. AC OUTPUT 0A CURRENT TRANSFORMER (T2)
3. AC OUTPUT UC CURRENT TRANSFORMER (T3)
4. AC OUTPUT 0B CURRENT TRANSFORMER (T4)
5. AC GENERATOR (83-360D ONLY)

Figure 4-36. Generator and AC Output Current Transformers

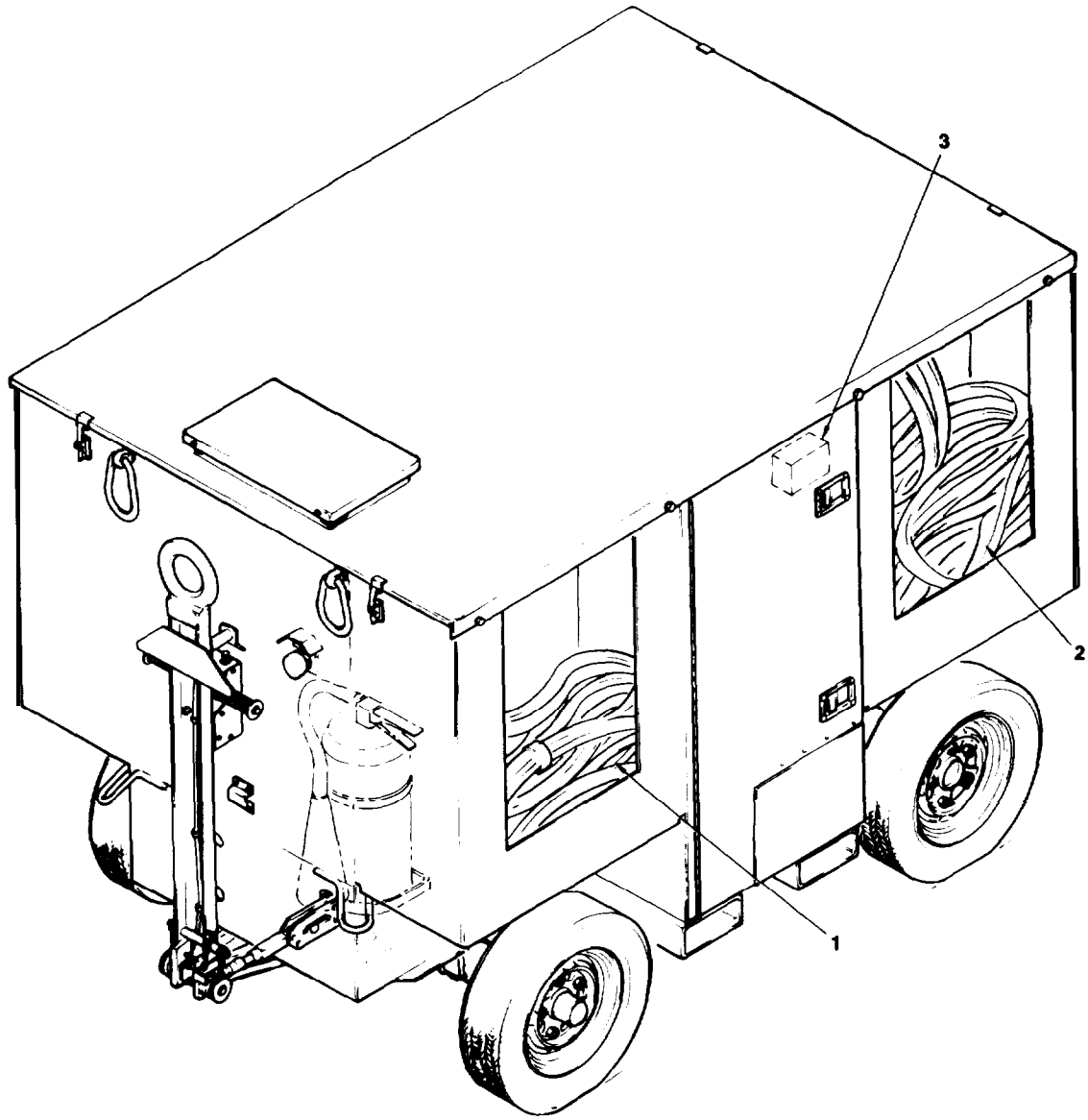
The electrical power generation and control system components are grouped in two functional systems: dc power generation and control, and ac power generation and control.

NOTE

The control panel controls and instruments associated with these systems are described in this section. Maintenance of the control panel components is covered in section XVII.

a. DC Power Generation and Control. This system is shown schematically in the figure FO-5. The dc system includes the dc sections of the ac/dc generator and generator control unit (GCU), dc output contactor K2, shunt R1, 95% enable relay 3K1, dc-to-ac inverter, and associated control panel switches and instruments. (Maintenance of shunt R1 and relay 3K1, AC to DC transformer rectifier unit (83-360D only) is provided in section IX.)

(1) The generator includes two permanent magnet (PM) stator windings, an exciter field, and two stator



1. AC OUTPUT POWER CABLE
2. DC OUTPUT POWER CABLE
3. INVERTER
4. TRU (Not Illustrated)

Figure 4-37. Output Power Cables, 400 Hz AC-to-DC TRU, and DC-to-60 Hz Inverter

windings and rectifier unit (not shown) which provides the generator dc output. Whenever the engine is running, the PM stator windings provide three phase ac voltage. The output of one PM winding is rectified and regulated by GCU circuits to provide 15 vdc operating and control voltage for the GCU loqic circuits. When engine speed reaches 95% rpm, relay 3K1 is activated and connects the ouput of the other PM winding to the GCU. This ac voltage is rectified and enables the GCU exciter field control amplifier. The amplifier varies the generator exciter field as required to keep the voltage of the generator at 28 vdc. On the 83-360D, the only DC output of the generator is from the two permanent magnet stator winding, which is rectified to provide power to the GCU.

(2) If the control panel CURRENT LIMIT SELECTOR switch 1S11 is in a DC position and there are no dc voltage or over current faults, the GCU system logic applies 28 vdc to the coil of dc output contactor K2. When the DC POWER switch 1S12 is set to ON, the contactor is energized and connects the generator 28 vdc output to the dc output cable. The contactor also applies the 28 vdc to illuminate the DC POWER ON lamp 1DS21. DC output voltage is indicated on the DC VOLTS meter 1M11 and dc output current is indicated on DC AMPS meter 1M12. On the 83-360D, all the AGPU's DC output power is supplied by the TRU, which is powered from the AC output of the generator. The GCU on the 83-360D must remain in the AC mode to regulate this AC output. The GCU has been disconnected from the DC contactor K2 and a jumper has been installed to allow the contactor to close whenever the DC POWER switch is set to ON.

(3) The GCU monitors the generator dc output continuously for the following possible faults: under voltage, over voltage, over current, or high ripple. On the 83-360D, the GCU can only operate in the AC mode. DC current limiting and DC voltage fault monitoring are not provided.

(4) The under voltage limit is set at 22 vdc and the over voltage is set at 32 vdc. The ripple limit is 2 to 3 volts (peak to mean) from 10 Hz to 40 KHz. The over current limit is set by control panel CURRENT LIMIT SELECTOR switch 1S11 at 200, 500, 700, or 1000 amps. When a fault is detected, the GCU system logic deactivates the dc contactor or removes generator field excitation to protect the generator and output circuits. The GCU logic also illuminates the appropriate control panel fault lamp (VOLTAGE FAULT DS18 or OVERCURRENT 1DS19). The TRU used on the 83-360D, is a rugged solid-state power converter currently used on the AH-64A helicopter to provide essential DC power. It has a minimum continuous output voltage of 26 vdc at a 250 amp and 25 vdc at a 350 amp output. Ripple is 1.5 volt maximum. Maximum output is 500 amps for 1 minute, 1000 amps for 6 seconds.

(5) The possible generator dc faults are summarized in table 4-12 along with the protective action and fault lamp indications. After a fault occurs, the GCU system fault logic is latched until the control panel DC POWER switch 1S12 is set (momentarily) to RESET, or MASTER switch is set to OFF. The TRU on the 83-360D is protected by an overheat indicator. Activation of this switch will illuminate the DC OVER CURRENT light (DS19) on the control panel. Neither the TRU nor the GCU can open the DC contactor to prevent continued overheating of the TRU. Activation of the overheat indicator is most often caused by a failure of the TRU cooling fan. Table 4-12 is not applicable to the 83-360D.

(6) The dc-to-ac inverter converts dc power (generator dc output or battery power) to 115 vac 60 Hz power (500 watts). The inverter provides for operation of low power ac equipment that cannot be operated form generator 400 Hz ac output.

b. Ac Power Generation and Control. This system is shown schematically in figure FO-6. The ac system includes the ac sections of the ac/dc generator and generator control unit (GCU), ac output contactor K1, current transformers T1-T4, frequency transducer, circuit breakers 3CB3-3CB6, ac convenience receptacles J1-J4, and associated control panel controls and instruments.

(1) As described in paragraph a., the generator includes PM stator windings that provide power for GCU operation and generator field excitations. When the control panel CURRENT LIMIT SELECTOR switch is in any AC position, the GCU varies the generator exciter field as required to keep the generator ac output voltage within limits. A thermal switch near the ac winding provides an indication when the temperature of the ac winding exceeds normal

limits. If the switch closes, the GCU system logic illuminates COMPT/GEN HI caution lamp 1DS11. This lamp is also illuminated when the electrical compartment temperature switch S1E is closed.

(2) If the CURRENT LIMIT SELECTOR switch 1S11 is in any AC position and there are no ac voltage or over-current faults, the GCU system logic applies 28 vdc to the coil of ac output contactor K1. When the AC POWER switch 1S10 is set to ON, the contactor is energized and connects the generator ac outputs to the ac output cable, and to convenience receptacles J1-J4. Each convenience receptacle is protected by a 15 amp circuit breaker. The contactor also provides a ground to illuminate AC POWER ON lamp 1DS20.

Table 4-12. Generator DC Faults, 83-360A Only.

Fault					Protective Action	Fault Lamp Indication During Fault	Fault Lamp Indication (latched) After Fault
Voltage	Current for CURRENT LIMIT SELECTOR Switch Settings						
	200A	500A	700A	1000A			
Normal (22-32 vdc)	>200 <1000	>500 <1000	>700 <1000		None (see note)	None	None
	>1000	>1000	>1000	>1000	Field excitation remove after 30 seconds	OVER CURRENT	VOLTAGE FAULT after 5 second delay
<22 vdc	≤200	≤500	≤700	≤1000	DC contactor opened after 4-7 seconds	None	VOLTAGE FAULT
	>200 <1000	>500 <1000	>700 <1000			OVER CURRENT	
	>1000	>1000	>1000	>1000			
>32 vdc					DC contactor opened	None	VOLTAGE FAULT
Ripple High					DC contactor opened	None	VOLTAGE FAULT

Note: When voltage is within nominal limits and output current is less than 1000 amps, the generator will continue to operate regardless of CURRENT LIMIT SELECTOR switch setting. The GCU will reduce field excitation to reduce generator voltage as current increases above the selected limit. The voltage will drop below the normal limit (21 ±1 vdc) and the GCU will open the dc contactor when current exceeds the values listed below:

CURRENT LIMIT SELECTOR Switch Setting	Actual Current Limit
200A	255 to 280 amps
500A	635 to 700 amps
700A	955 to 1000 amps

Note: > indicates greater than, < indicates less than, ≤ indicates equal to or less than.

(3) Current transformer T1 provides voltages to the GCU proportional to the current in each phase of the generator output. Each of the current transformers T2-T4 provides a voltage output proportional to current in one phase of the generator ac output. One of the transformers, depending on the position of the AC PHASE SELECT switch 1S9, is connected to the AC %LOAD meter M9 when the ac contactor is activated. Also, one phase of the frequency transducer is connected, the frequency transducer drived AC HERZ meter 1M10.

(4) The GCU monitor the generator ac output continuously for the following possible faults: under voltage, over voltage, over current, or under frequency.

(5) The under voltage limit is set at 108 vrms and the over voltage limit is set at 118 vrms. The under frequency is set at 375 Hz. The over current is set by control panel CURRENT LIMIT SELECTOR 1S11 at 10KW, 20 KW, 30KW, or 45 KW. On the 83-360D the current limit settings are: 17KVA, 38 KVA, 59 KVA (AH-64A.H-60), and 90 KVA (AH-64D). When a fault is detected, the GCU system logic deactivates the ac contactor or removes generator field excitation to protect the generator and output circuits. The GCU logic also illuminates the appropriate control panel fault lamp (OVER VOATAGE 1DS14, UNDER VOLTAGE 1DS15, OVER CURRENT 1DS16, or UNDER FREQUENCY 1DS17).

(6) The possible generator ac faults are summarized in Table 4-13 along with the protective action and fault lamp indications. After a fault occurs, the GCU system logic is latched until the control panel AC POWER switch 1DS10 is set (momentarily) to RESET, or MASTER switch is set to OFF.

4-51. PREPARING ELECTRICAL POWER GENERATION AND CONTROL SYSTEM FOR MAINTENANCE.

WARNING

Battery power (24 vdc) may be present at terminals of electrical components whenever battery is connected. AC power (115 vac) may be present when engine is running. To prevent shock hazard, flash burns, or prevent damage, observe the following precautions:

1. Shut down engine and disconnect battery before opening control panel or extending lower electrical tray.

2. Shut down engine and disconnect battery before contacting any electrical terminal with body or tools.

3. Temporarily install control panel before starting engine.

WARNING

Remove all rings, watches and other jewelry when performing maintenance on this equipment.

NOTE

Some maintenance procedures require that the control panel be lowered, or that the lower electrical tray be extended. Refer to paragraph 4-24 for these procedures.

4-52. DC OUTPUT CONTACTOR (K2).

WARNING

Remove all rings, watches and other jewelry when performing maintenance on this equipment.

Table 4-13. Generator AC Faults, 83-360A Only

Fault					Protective Action	Fault Lamp Indication During Fault	Indication (latched) After Fault
Voltage/ Frequency	Current for CURRENT LIMIT SELECTOR Switch Settings						
	10KW (36A/Ø)	20KW (72A/Ø)	30KW (108A/ Ø)	45KW (162A/ Ø)			
Voltage Normal (108-118 vrms)	>10 <45	>20 <45	>30 <25		None (see note)	None	None
	>45	>45	>45	>45	Field excitation removed after 30 seconds	OVER CURRENT	UNDER VOLTAGE After 5 second delay
Voltage <108 vrms	<10	<20	<30	<45	AC contactor opened after 4-7 seconds	None	UNDER VOLTAGE
	>10 <45	>20 <45	>30 <45				
	>45	>45	>45	>45		OVER CURRENT	
Voltage >118 vrms					AC contactor opened	None	OVER VOLTAGE
Voltage <375 Hz					AC contactor opened	None	UNDER FREQUENCY

Note: When voltage is within normal limits and output power is less than 45 KW, the generator will continue to operate regardless of CURRENT LIMIT SELECTOR switch setting. The GCU will reduce field excitation to reduce generator voltage as current increases above the selected limit. The voltage will drop below the normal limit (104 ±4 vac) and the GCU will open the ac contactor when current exceeds the values listed below:

CURRENT LIMIT SELECTOR Switch Setting	Actual Current Limit
10 KW (36 A/Ø)	13.25 to 14.35 KW (48 to 52 A/Ø)
20 KW (72 A/Ø)	26.5 to 28.7 KW (96 to 104 A/Ø)
30 KW (108 A/Ø)	39-75 to 42.78 KW (144 to 155 A/Ø)

Note: > indicates greater than, < indicates less than, ≤ indicates equal to or less than.

Table 4-13.a Generator AC Faults, 83-360D Only

Fault					Protective Action	Fault Lamp Indication During Fault	Indication (latched) After Fault
Voltage/ Frequency	Current for CURRENT LIMIT SELECTOR Switch Settings						
Voltage Normal (108-118 vrms)	>50 <191	>110 <191	>170 <191		None (see note)	None	None
	>191	>191	>191	>191	Field excitation removed after 30 seconds	OVER CURRENT	UNDER VOLTAGE after 5 second delay
Voltage <108 vrms	= or<50	= or<110	= or<170	=or<259	AC contactor opened after 4-7 seconds	None	UNDER VOLTAGE
	>50 <191	>110 <191	>170 <191				
	>191	>191	>191	>191		OVER CURRENT	
Voltage >108 vrms					AC contactor opened	None	OVER VOLTAGE
Frequency <375 Hz					AC contactor opened	None	UNDER FREQUENCY

Note: When voltage is within normal limits and output power is less than 66 KVA, the generator will continue to operate regardless of the CURRENT LIMIT SELECTOR switch setting. The GCU will reduce field excitation to reduce generator voltage as current increases above the selected limit. The voltage will drop below the normal limit (104 ±4 vac) and the GCU will open the AC contactor when current exceeds the values listed.

Note: > indicates greater than, < indicates less than.

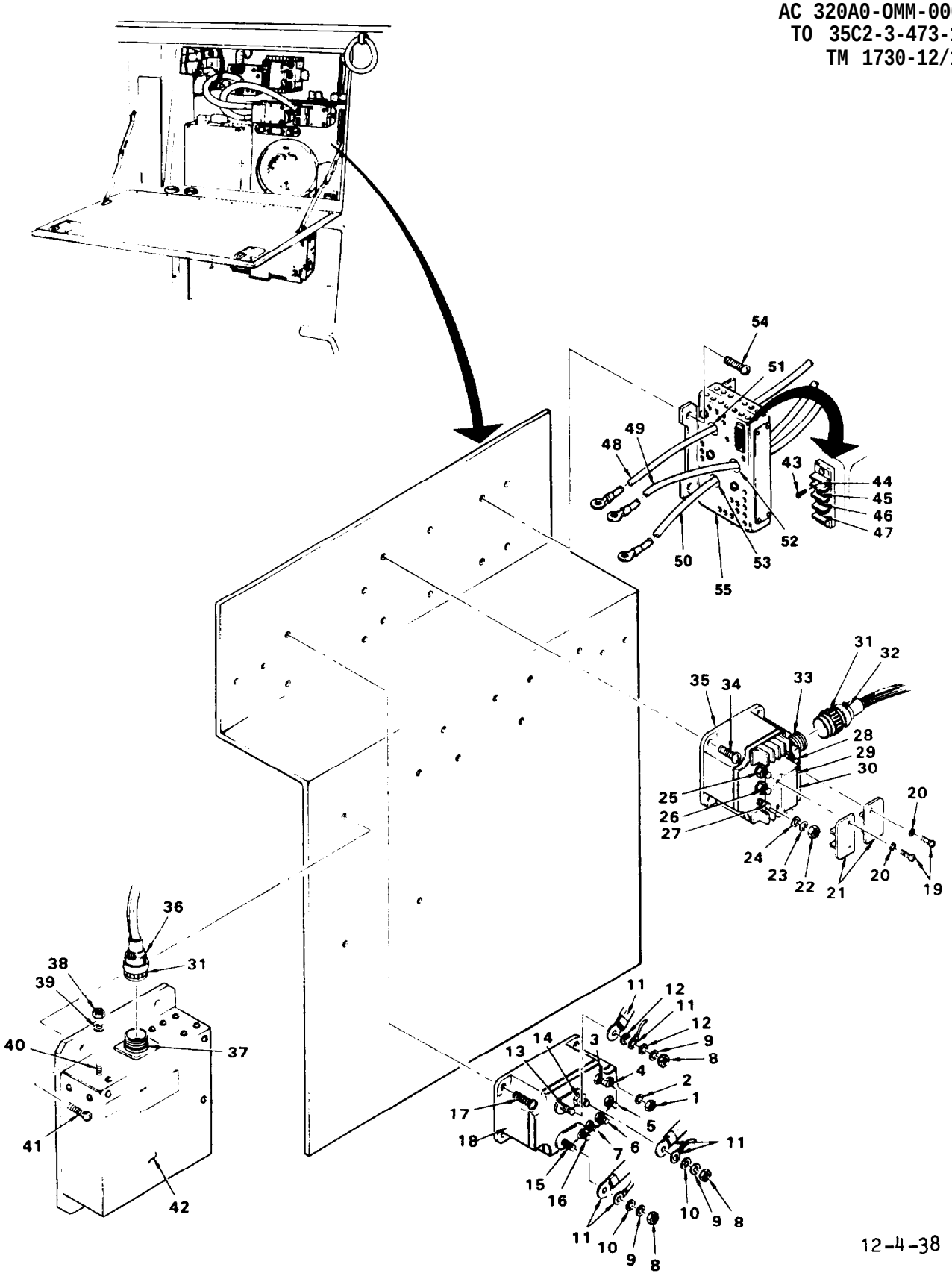


Figure 4-38. Output Contactors, GCU, and GCU Input Current Transformer

LEGEND FOR FIGURE 4-38:

1. NUT
2. LOCKWASHER
3. TERMINAL B1 (K2)
4. TERMINAL X1 (K2)
5. TERMINAL X2 (K2)
6. TERMINAL B2 (K2)
7. TERMINAL B3 (K2) (NOT USED)
8. NUT
9. LOCKWASHER
10. WASHER
11. WIRE
12. SPACER WASHER
13. TERMINAL A1 -LEFT (K2)
14. TERMINAL A1-RIGHT (K2)
15. TERMINAL A2-LEFT (K2)
16. TERMINAL A2-RIGHT (K2) (NOT USED)
17. SCREW
18. DC OUTPUT CONTACTOR K2
19. SCREW
20. LOCKWASHER
21. TERMINAL SHIELD
22. NUT
23. LOCKWASHER
24. WASHER
25. TERMINAL A2 (K1)
26. TERMINAL B2 (K1)
27. TERMINAL C2 (K1)
28. TERMINAL Al
29. TERMINAL B1
30. TERMINAL C1
31. LOCKING COLLAR
32. CONNECTOR P11
33. CONNECTOR J1
34. SCREW
35. CONTACTOR K1
36. CONNECTOR P12
37. CONNECTOR J1
38. NUT
39. WASHER
40. GROUND SCREW
41. SCREW
42. GENERATOR CONTROL UNIT
43. SCREW
44. METER TERMINAL N
45. METER TERMINAL T1
46. METER TERMINAL T2
47. METER TERMINAL T3
48. CABLE X1A4A
49. CABLE X2A4B
50. CABLE X3A4C
51. LOAD T1
52. LOAD T2
53. LOAD T3
54. SCREW
55. TRANSFORMER T1

NOTE

See table 4-2, Malfunction 94 for test.

a. Inspect. (See figure 4-38.)

(1) Disconnect battery.

(2) Lower control panel (paragraph 4-24.a).

(3) Inspect dc output contactor K2 (18, figure 4-38) for signs of overheating or corrosion.

(4) Check that all contactor cable and wire connections are tight.

b. Remove. (See figure 4-38.)

(1) Disconnect battery.

(2) Lower control panel (paragraph 4-24 .a).

(3) Remove two screws (19, figure 4-38), washers (20) and terminal shield (21) from left side of ac contactor K1 (35). Tag and remove cables and wires from terminals A2 (25), B2 (26) and C2 (27). Removing these cables is necessary for access to dc output contactor K2.

(4) Tag and remove all wires and cables from contactor terminals (3, 4, 5, 6, 13, 14 and 15). Save spacer washers (12) on terminal Al-left (13) for reinstallation.

(5) Support contactor K2 (18), and remove four screws (17) and contactor.

C. Install. (See figure 4-38.)

(1) Check nutplates on panel. If any of the four nutplates is missing or damaged, notify supervisor.

(2) Hold contactor K2 (18) in position against panel with small terminals (3 through 7) to right. Fasten contactor to nutplates with four screws (17).

(3) Remove nuts (1) and lockwashers (2) from contactor terminals B1 (3), X1 (4), X2 (5) and B2 (6). Use ID tags and install wires on terminals B1, X1, X2, and B2. Secure wires with lockwashers and nuts.

(4) Remove nuts (8), lockwashers (9) and washers (10) from contactor terminals Al-left (13), Al-right (14), and A2-left (15). Use ID tags, install wires and hardware (in order) on contactor terminals as follows:

(a) On terminal Al-left (13), install large wire, spacer washer (12)) small wire, spacer washer (12), lockwasher (9) and nut (8).

(b) On terminal Al-right (14), install large wire, small wire, washer (10), lockwasher (9), and nut (8).

(c) On terminal A2-left (15), install large wire, smaller wire, washer (10), lockwasher (9), and nut (8) l

(5) Using ID tags, install wires (large wires first) on terminals A2 (25), B2 (26), and C2 (27) of ac contactor K1. Install washer (24), lockwasher (23) and nut (22) on each terminal.

(6) Install terminal shield (21), lockwashers (20) and screws (19).

(7) Replace control panel and close control panel access door.

4-53. AC OUTPUT CONTACTOR (K1).

WARNING

Remove all rings, watches and other jewelry when performing maintenance on this equipment.

NOTE

See table 4-2, Malfunction 95 for test.

a. Inspect. (See figure 4-38.)

(1) Disconnect battery.

(2) Lower control panel (paragraph 4-24.a).

(3) Inspect ac output contactor K1 (35, figure 4-38) for signs of overheating or corrosion.

(4) Check that all contactor cable and wire connections are tight.

b. Remove. (See figure 4-38.)

(1) Disconnect battery.

(2) Lower control panel (paragraph 4-24.a).

(3) Remove screws (19), lockwashers (20) and terminal shields (21).

(4) Tag and remove all wires and cables from contactor.

(5) Turn locking collar (31) counterclockwise and remove harness connector P11 (32) from contactor connector J1 (33).

(6) Support contactor. Remove screws (34) and contactor (35).

C. Install. (See figure 4-38.)

(1) Check nutplates on panel. If any of the four nutplates is damaged or missing, notify supervisor.

(2) Remove four screws (19), lockwashers (20) and terminal shields (21) from replacement contactor.

(3) Hold contactor K1 (35) in position against panel with electrical connector J1 (33) to right. Fasten contactor to nutplates with four screws (34).

(4) Install harness connector P11 (32) to contactor connector (33).

(5) Use ID tags and install wires (large wires first) on contactor terminals (25, 26, 27, 28, 29 and 30). Install washer (24), lockwasher (23) and nut (22) on each terminal.

(6) Install terminal shields (21, lockwashers (20) and screws (19).

(7) Replace control panel and close control panel access door.

4-54. GENERATOR CONTROL UNIT (GCU) (A1).

WARNING

Remove all rings, watches and other jewelry when performing maintenance on this equipment.

NOTE

See table 4-2, Malfunctions 43, 46, 47, 48, 50, 51, 52, 56, 57, 58, and 59 for test.

a. Inspect. (See figure 4-38.)

(1) Disconnect battery.

(2) Lower control panel (paragraph 4-24).

(3) Remove battery charger cover panel (6, figure 1-1).

(4) Inspect GCU (42, figure 4-38) for signs of overheating or corrosion.

(5) Check that harness connector P12 (36) is securely connected to GCU connector J1 (37).

(6) Check GCU for security of installation. Tighten mounting screws (41) as required.

b. Remove. (See figure 4-38.)

(1) Disconnect battery.

(2) Lower control panel (paragraph 4-24 .a).

(3) Remove battery charger access cover (6, figure 1-1).

(4) Turn locking collar (31, figure 4-38) counterclockwise and remove harness connector P12 (36) from GCU connector J1 (37).

(5) Remove nut (38) and lockwasher (39), and remove ground wire from ground screw (40).

(6) Support GCU. Remove four screws (41), and GCU (42).

C. Install. (See figure 4-38.)

(1) Check nutplates on panel. If any of the four nutplates is missing or damaged, notify supervisor.

(2) Hold GCU (42) in place against panel with electrical connector (37) up. Fasten GCU to nutplates with four screws (41).

(3) Install ground wire on GCU case ground screws (40). Install lockwasher (39) and nut (38) on screw.

(4) Install harness connector P12 (36) on GCU connector (37). Turn locking collar (31) clockwise.

(5) Replace control panel and close control panel access door.

(6) Replace battery charger access panel.

4-55. CURRENT TRANSFORMER (T1) (GCU INPUT).

WARNING

Remove all rings, watches and other jewelry when performing maintenance on this equipment.

NOTE

See table 4-2, Malfunction 57 (step 5) for test.

a. Inspect. (See figure 4-38.

(1) Disconnect battery.

(2) Lower control panel (paragraph 4-24).

(3) Inspect transformer (55, figure 4-38) for signs of overheating or corrosion.

(4) Check that all transformer wire connections are secure.

b. Remove. (See figure 4-38.)

(1) Disconnect battery.

(2) Lower control panel (paragraph 4-24).

(3) Tag and disconnect all wires from transformer meter terminals (44 through 47, figure 4-38).

(4) Remove screws (19), lockwashers (20) and terminal shield (21) from right side of ac output contactor K1 (35).

(5) Disconnect cables (48, 49 and 50) from contactor K1 terminals (28, 29 and 30).

(6) Remove four screws (54) and slide transformer (55) off cables.

c. Install. (See figure 4-38.)

(1) Check nutplates on panel. If any of the four nutplates is missing or damaged, notify maintenance supervisor.

(2) Hold replacement transformer (55) with meter terminals (44 through 47) at top left. Insert cable X1A4A (48) through transformer hole marked T1 (51), cable X2A4B (49) through hole marked T2 (52) and cable X3A4C (50) through hole marked T3 (53).

(3) Fasten transformer to panel nutplates with four screws (54).

(4) Use ID tags and install wires (large wire first) on contactor terminals (28, 29 and 30). Install washer (24), lo&washer (23) and nut (22) on each terminal.

(5) Install terminal shield (21), lockwashers (20) and screws (19).

(6) Use ID tags and connect wires to terminals (44 through 47) on transformer (55). Attach each wire with screw (43).

(7) Replace control panel and close control panel access door.

4-56. AC/DC GENERATOR (G1).

WARNING

Remove all rings, watches and other jewelry when performing maintenance on this equipment.

NOTE

See table 4-2, Malfunctions 42 (step 11, 43 (steps 8 and 12), and 51 (step 1) for test.

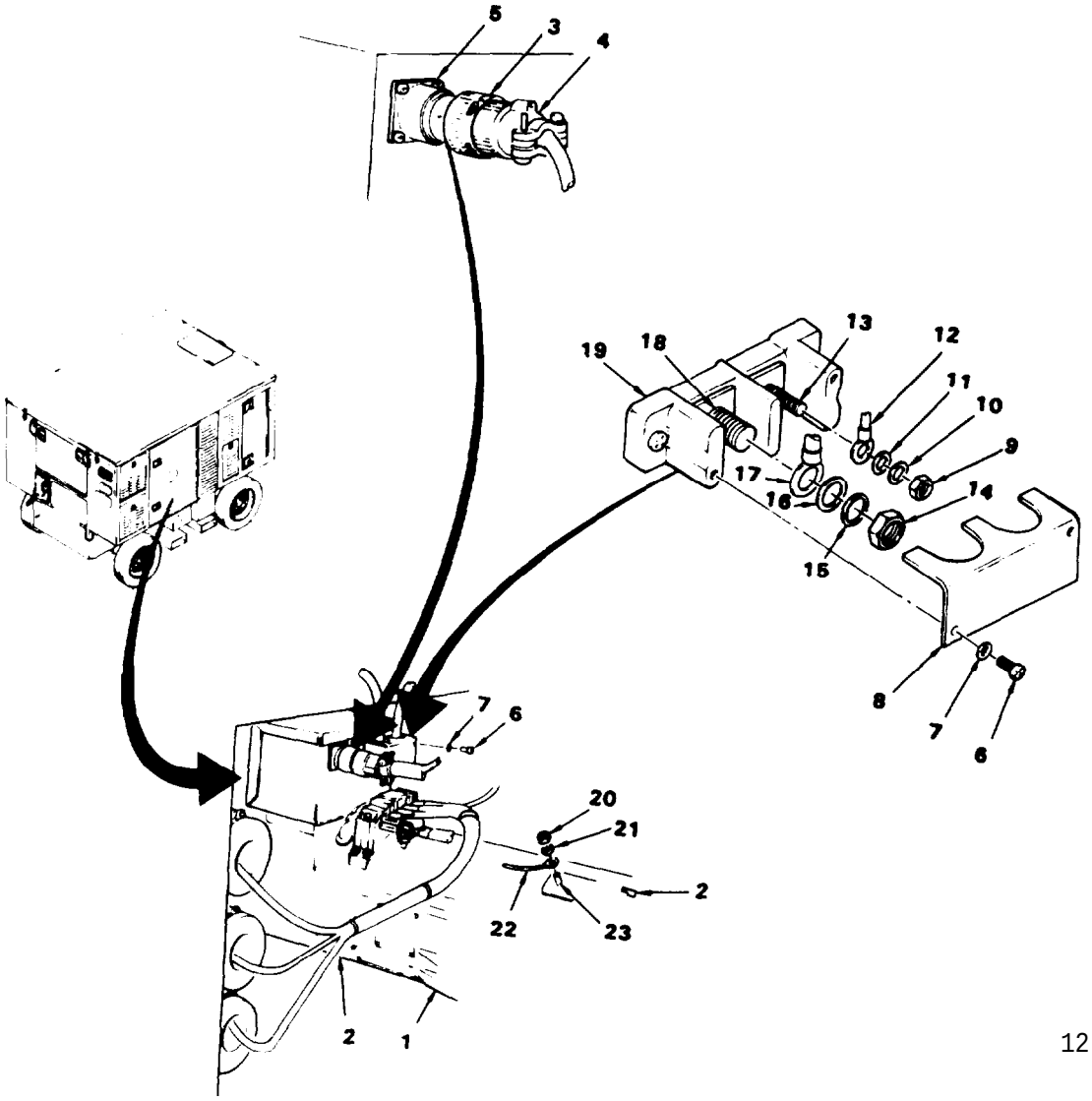
a. Inspect. (See figure 4-39.)

(1) Disconnect battery.

(2) Open engine access door (12, figure 1-1).

(3) Inspect generator (1, figure 4-39) for obvious damage, or loose or missing parts.

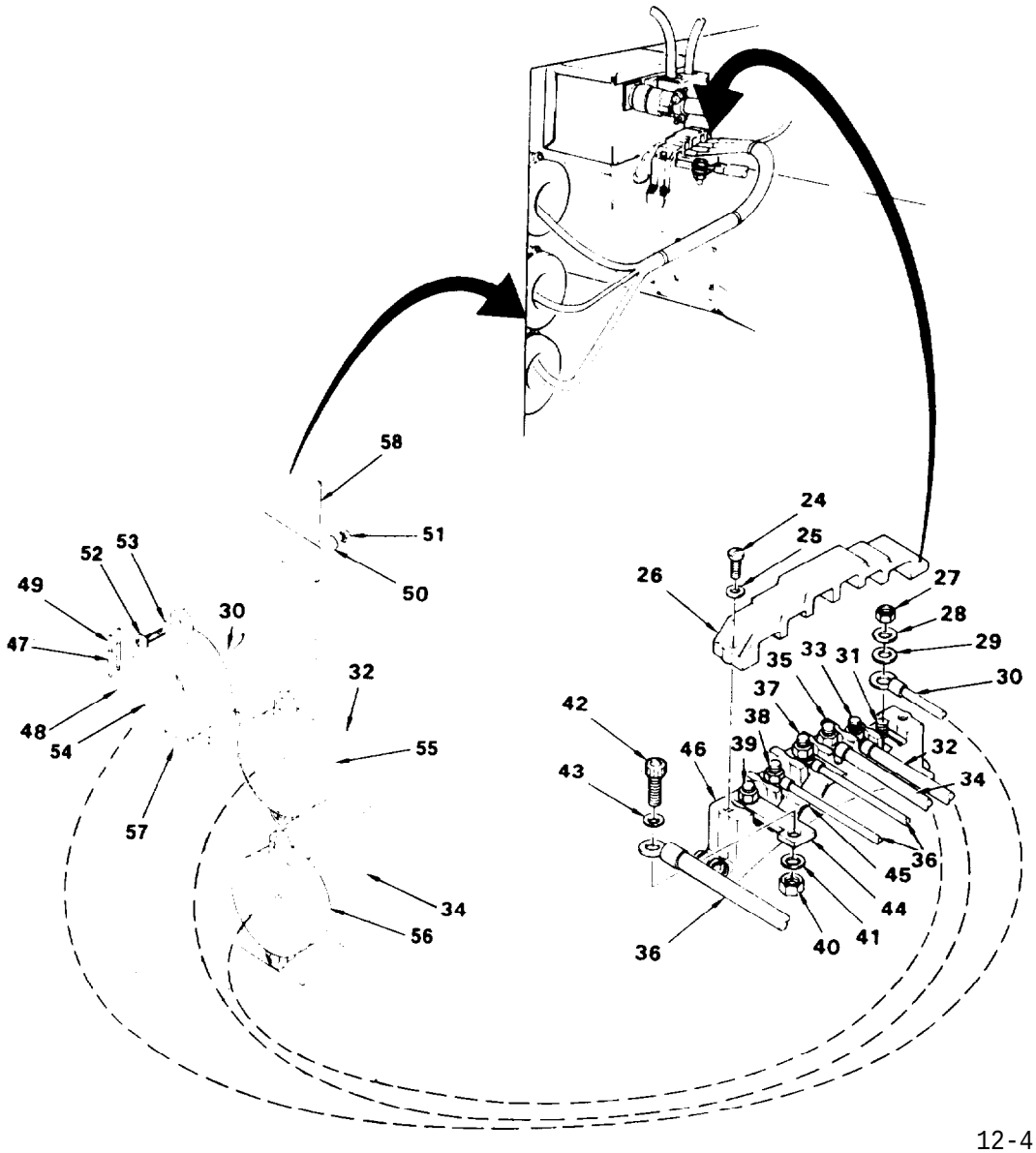
(4) Check that harness connector P13 (4) is securely connected to generator connector J1 (5). Tighten locking collar (3) if required.



12-4-39(1)

1. AC/DC GENERATOR G1
2. GREASE FITTING
3. LOCKING COLLAR
4. HARNESS CONNECTOR P13
5. GENERATOR CONNECTOR J1
6. SCREW
7. LOCKWASHER
8. DC TERMINAL COVER
9. NUT
10. LOCKWASHER
11. WASHER
12. DC OUTPUT CABLE (-)
13. DC TERMINAL STUD (-)
14. NUT
15. LOCKWASHER
16. WASHER
17. DC OUTPUT CABLE (+)
18. DC TERMINAL STUD (+)
19. DC TERMINAL BLOCK
20. NUT
21. LOCKWASHER
22. GROUND WIRE
23. CASE GROUND STUD

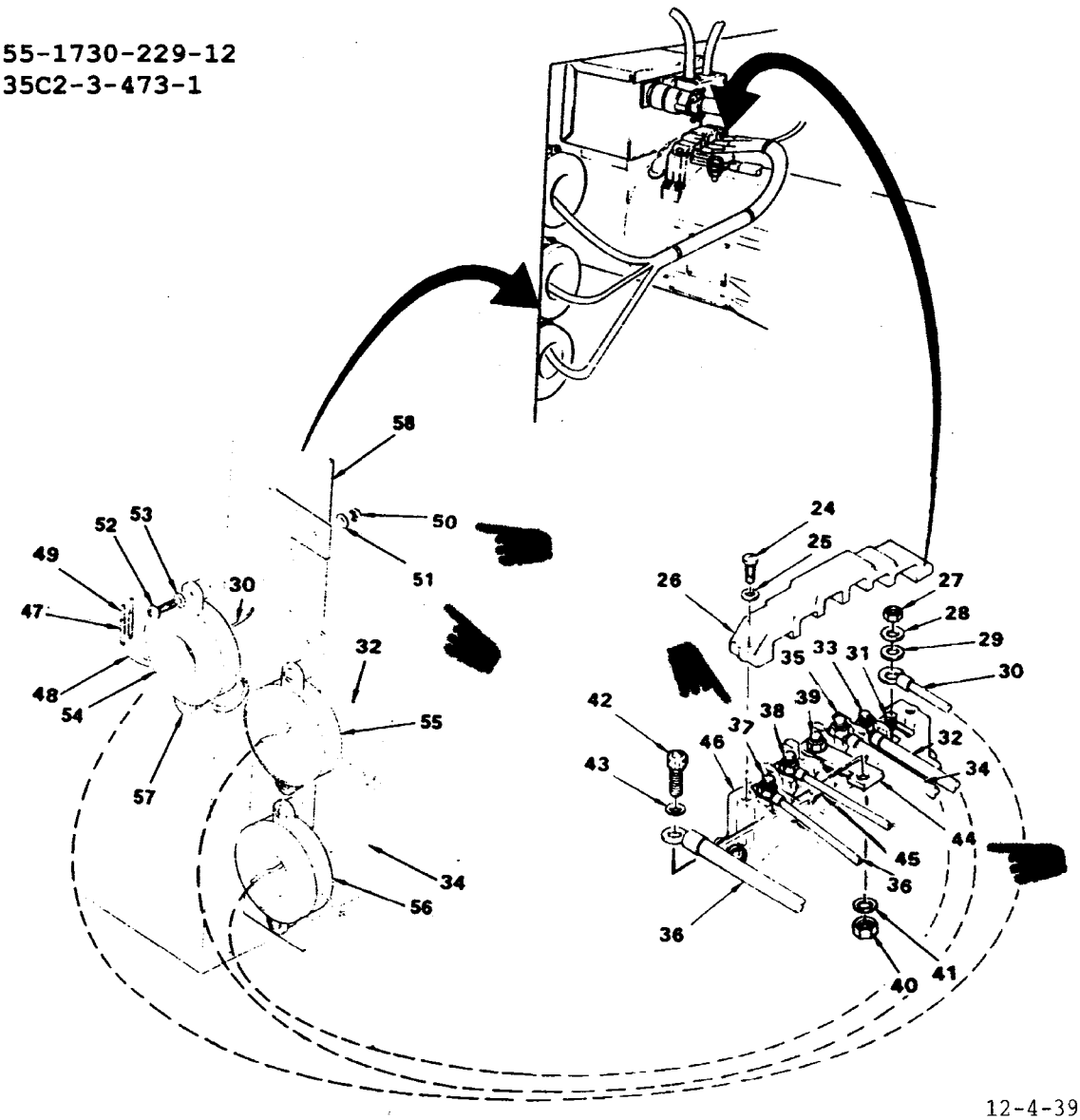
Figure 4-39. AC/DC Generator and AC Output Current Transformers, 83-360D Only (sheet 1 of 2)



12-4-39(2)

24.	SCREW	36.	AC 0N CABLES	47.	SPLICE
25.	LOCKWASHER	37.	AC 0N TERMINAL STUD T4	48.	TRANSFORMER LEADS
26.	AC TERMINAL COVER	38.	AC 0N TERMINAL STUD T5	49.	MAIN HARNESS WIRES
27.	NUT	39.	AC 0N TERMINAL STUD T6	50.	NUT
28.	LOCKWASHER	40.	NUT	51.	LOCKWASHER
29.	WASHER	41.	LOCKWASHER	52.	SCREW
30.	AC 0A CABLE X1A4A	42.	SCREW	53.	WASHER
31 l	AC 0A TERMINAL STUD T1	43.	WASHER	54.	TRANSFORMER T2
32.	AC 0B CABLE X2A4B	44.	TERMINAL T6 EXTENSION BAR	55.	TRANSFORMER T3
33.	AC 0B TERMINAL STUD T2	45.	AC 0N TERMINAL JUMPER	56.	TRANSFORMER T4
34.	AC 0C CABLE X3A4C	46.	AC TERMINAL BLOCK	57.	MOUNTING LUG
35.	AC 0C TERMINAL STUD T3			58.	MOUNTING BRACKET

Figure 4-39. AC/DC Generator and AC Output Current Transformers (sheet 2 of 2)



12-4-39(2)

24.	SCREW	36.	AC 0N CABLES	47.	SPLICE
25.	LOCKWASHER	37.	AC 0N TERMINAL STUD T4	48.	TRANSFORMER LEADS
26.	AC TERMINAL COVER	38.	AC 0N TERMINAL STUD T5	49.	MAIN HARNESS WIRES
27.	NUT	39.	AC 0N TERMINAL STUD T6	50.	NUT
28.	LOCKWASHER	40.	NUT	51.	LOCKWASHER
29.	WASHER	41.	LOCKWASHER	52.	SCREW
30.	AC 0A CABLE X1A4A	42.	SCREW	53.	WASHER
31.	AC 0A TERMINAL STUD T1	43.	WASHER	54.	TRANSFORMER T2
32.	AC 0B CABLE X2A4B	44.	TERMINAL T6 EXTENSION BAR	55.	TRANSFORMER T3
33.	AC 0B TERMINAL STUD T2	45.	AC 0N TERMINAL JUMPER	56.	TRANSFORMER T4
34.	AC 0C CABLE X3A4C	46.	AC TERMINAL BLOCK	57.	MOUNTING LUG
35.	AC 0C TERMINAL STUD T3			58.	MOUNTING BRACKET

Figure 4-39a. AC Generator and AC Output Current Transformers, 83-360D Only

(5) Remove two screws (6), lock washers(7) and dc terminal cover (8). Check that cable connections to the dc output terminal studs (3) and (18) are secure. Tighten terminal nuts (9) and (14) if required. Inspect cables (12) and (17) and terminals for signs of burning. Replace cover (8), lock washer (7) and screw (6).

(6) Remove two screws (24), lock washers(25) and ac output terminal cover (26). Check that cable connections to the ac output terminal studs(31, 33, 35, 37, 38 and 39) are secure. Tighten terminal nuts (27 and 40) if required. Inspect cables (30, 32, 34, and 36) and terminals for signs of burning. Replace cover (26), lock washers (25) and screws (24).

(7) Check that ground wire (22) connection to generator case ground stud(23) is tight. Tighten nut (20) if necessary.

(8) Check that grease fittings (2) are secure, undamaged, and not contaminated.

b. Remove Generator Grease Fitting.(See figure 4-39.)

(1) Clean area around grease fitting(2).

(2) Remove fitting by turning counterclockwise.

c. Install Generator Grease Fitting. Install replacement fitting (2)and position for easy access with grease gun.

4-56.1 TRANSFORMER RECTIFIER UNIT (TRU).

a. Inspect. (See figure 4-42a.)

(1) Disconnect battery.

(2) Slide AGPU roof panel back to get clear access to the DC cable bay.

(3) Check to see that cooling air inlet to the TRU is clear.

(4) Check that AC input connector is secured.

(5) Check to see DC output cables connections are secure and not corroded.

b. Removal. (See figure 4-42a.)

(1) Disconnect battery.

(2) Slide AGPU roof panel back to get clear access to the DC cable bay.

(3) Remove AC input connector J20.

(4) Remove DC output cables from positive and negative lug of the TRU.

(5) Support the TRU and remove the four bolts (2), eight flat washers (3), four lock washers (4), and four nuts (5) securing the TRU to the side wall of the DC cable bay.

(6) Remove the TRU.

c. Install. (See figure 4-42a.)

(1) Disconnect battery.

(2) Slide AGPU roof panel back to get clear access to the DC cable bay.

(3) Secure the TRU to the side-wall of the DC cable bay using the four bolts (2), eight flat washers (3), four lock washers (4), and four nuts (5).

(4) Install AC input connector J20.

(5) Install DC outputcables to positive and negative lug of the TRU.

(6) Secure AGPU roof.

4-57. CURRENT TRANSFORMERS (T2-T4) (AC OUTPUT).

WARNING

Remove all rings, watches and other jewelry when performing maintenance on this equipment.

NOTE

See table 4-2, Malfunction 55 (step 7) for test.

a. Inspect. (See figure 4-39.)

(1) Disconnect battery.

(2) Open engine access door (12, figure 1-1).

(3) Check that transformers (54, 55 and 56, figure 4-39) are not punctured or otherwise damaged.

(4) Check that transformer covering is in place.

(5) Inspect transformers for security of installation. Tighten mounting screws (52) as required.

NOTE

Removal and installation procedures are the same for current transformers T2 through T4. T2 is illustrated.

b. Remove. (See figure 4-39.)

(1) Disconnect battery.

(2) Open engine access door (12, figure 1-1).

(3) See figure 4-39. Remove screws (24), lock washer (25) and ac terminal cover (26).

(4) Disconnect cable X1A4A (30) running through transformer T2 (54) from generator ac output terminal T1 (31).

(5) Locate splices (47) between transformer leads (48) and main harness wires (49). Tag wires and disconnect transformer leads from main harness by removing splice.

(6) Remove nuts (50), lock washers (51), screws (52) and washers (53), and slide transformer (54) off cable.

c. Install. (See figure 4-39.)

(1) Insert generator output cable X1A4A (30) through center of replacement transformer T2 (54).

(2) Wrap transformer leads (48) around transformer body, between body and mounting lugs (57).

(3) Install transformer on mounting bracket using washers (53), screws (52), lockwashers (51) and nuts (50).

(4) Insert heat shrink tubing over transformer leads (48). Use ID tags and splice (47), connect transformer leads (48) to main harness wiring (49). Slide heat shrink tubing over splice and apply heat to tubing.

(5) Install cable X1A4A (30) to generator ac otuput terminal T1 (31). Secure cable with washer (29), lockwasher (28) and nut (27).

(6) Install ac terminal cover (26), two lockwashers (25) and screws (24).

(7) Close engine access door.

4-58. AC CONVENIENCE RECEPTACLES (J1-J4).

WARNING

Remove all rings, watches and other jewelry when performing maintenance on this equipment.

NOTE

The ac convenience receptacles are common dual units. J1 and J2 are one unit, and J3 and J4 are one unit. Removal and installation instructions are the same for the J1/J2 and J3/J4 units. The J3/J4 unit is illustrated.

NOTE

See table 4-2, Malfunction 77 for test.

a. Remove. (See figure 4-40.)

(1) If running, shut down AGRU (paragraph 2-51).

(2) Remove four screws (1), cover plate (2), and gasket (3).

(3) Remove two screws (4), and retract receptacle J3/J4 (5) far enough to reach wires.

(4) Tag and remove four wires (7) by removing screws (6 and 8).

b. Install. (See figure 4-40.)

(1) If installing a new receptacle, cut the terminal strip (9) between the two brass (hot) terminal screws (8). After cutting terminal strip, verify open circuit between the two short (hot) slots (10 and 11).

(2) Use ID tags and connect wires to replacement receptacle terminal screws (6 and 8).

(3) Inspect nut plates on panel. There should be two nut plates for receptacle mounting screws, and four nut plates for cover plate screws. If any nut plate is damaged or missing, notify maintenance supervisor.

(4) Attach receptacle (5) to panel with two screws (4).

(5) Inspect gasket (3) and cover plate (2). Replace gasket and cover plate if damaged.

(6) Install gasket (3) and cover plate (2) over receptacle. Secure cover plate with four screws (1).

4-59. AC CONVENIENCE RECEPTACLE CIRCUIT BREAKERS (3CB3-3CB6).

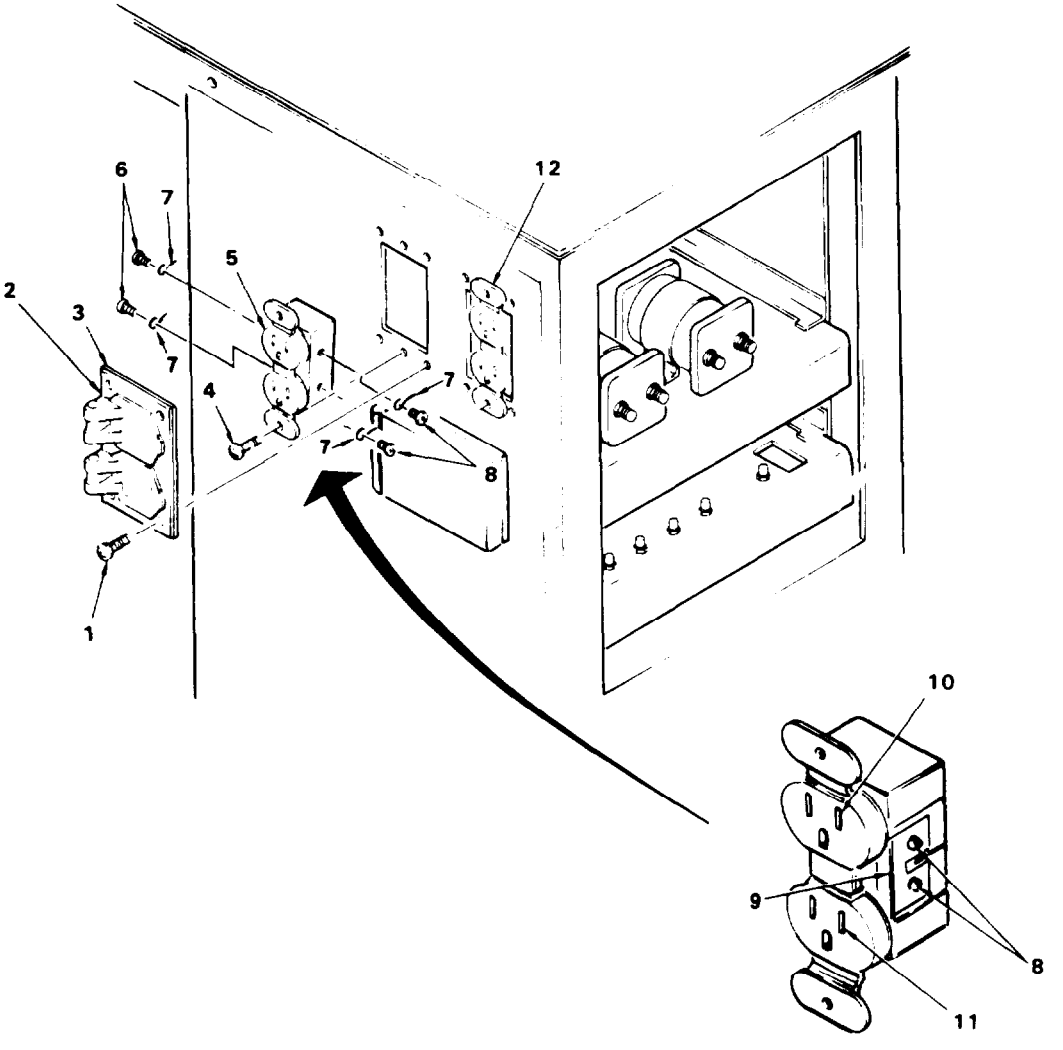
WARNING

Remove all rings, watches and other jewelry when performing maintenance on this equipment.

a. Remove. (See figure 4-41.)

NOTE

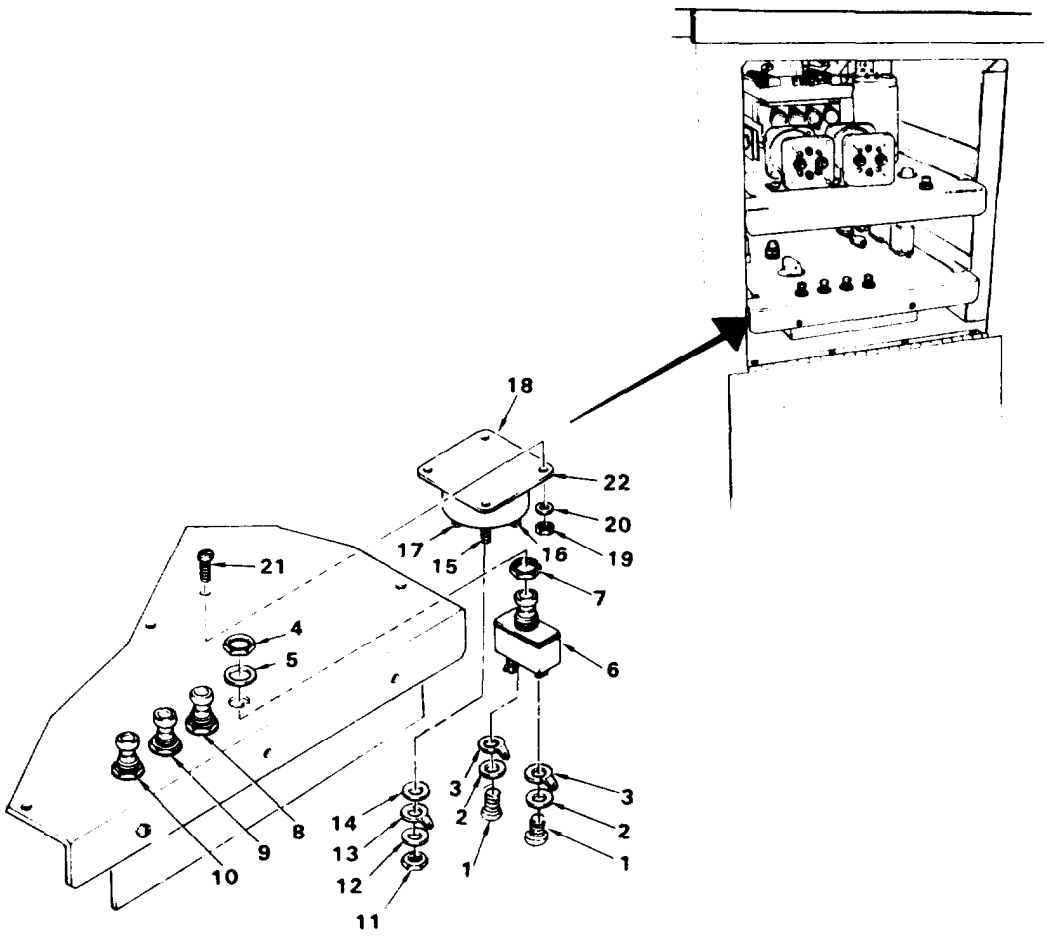
Removal and installation procedures are the same for circuit breakers 3CB3 through 3CB6. 3CB3 is illustrated.



12-4-40

1. SCREW
2. COVER PLATE
3. GASKET
4. SCREW
5. RECEPTACLE J3/J4 (J3 TOP)
6. NEUTRAL (SILVER) TERMINAL SCREWS
7. WIRE
8. HOT (BRASS) TERMINAL SCREWS
9. TERMINAL STRIP
10. J3 HOT SLOT
11. J4 HOT SLOT
12. RECEPTACLE J1/J2 (J1 TOP)

Figure 4-40. AC Convenience Receptacle



12-4-41

1. SCREW
2. LOCKWASHER
3. WIRE
4. NUT
5. LOCKWASHER
6. 15 AMP CIRCUIT BREAKER 3CB3
7. HEIGHT ADJUSTMENT NUT
8. 15 AMP CIRCUIT BREAKER 3CB4
9. 15 AMP CIRCUIT BREAKER 3CB5
10. 15 AMP CIRCUIT BREAKER 3CB6
11. NUT
12. WASHER
13. WIRE
14. WASHER
15. MTR (+) TERMINAL
16. MTR (-) TERMINAL
17. 115V (+) TERMINAL
18. 115V (-) TERMINAL (NOT SHOWN)
19. NUT
20. LOCKWASHER
21. SCREW
22. FREQUENCY TRANSDUCER

Figure 4-41. AC Convenience Receptacle Circuit Breakers and Frequency Transducer

NOTE

See table 4-2, Malfunction 77 for test.

(1) Disconnect battery and extend lower electrical tray (paragraph 4-24.b).

(2) Tag wires (3, figure 4-41). Remove screws (1) and lockwashers (2), and disconnect wires from circuit breaker 3CD3 (6).

(3) Remove nut (4), lockwasher (5), and circuit breaker (6)

(4) Note position of height adjustment nut (7) on threaded shaft of circuit breaker.

b. Install. (See figure 4-41.)

(1) Remove nut (4), lockwasher (5), and keywasher (not shown) from replacement circuit breaker (6).

(2) Set height adjustment nut (7) on replacement circuit breaker shaft to same position as adjustment on old circuit breaker.

(3) Install replacement circuit breaker (6) from underside of tray and secure with lockwasher (5) and nut (4). One or two threads on shaft of circuit breaker should be visible from top of tray. If not, loosen retaining nut (4), reset adjustment nut (7) as required, and tighten retaining nut.

(4) Use ID tags and install wires (3), lockwashers (2) and screws (1) on circuit breaker.

(5) Replace lower tray and close electrical tray access door.

4-60. FREQUENCY TRANSDUCER.

WARNING

Remove all rings, watches and other jewelry when performing maintenance on this equipment.

NOTE

See table 4-2, Malfunction 54 for test.

a. Inspect. (See figure 4-41.)

(1) Disconnect battery and extend lower electrical tray (paragraph 4-24.b).

(2) Inspect frequency transducer (22, figure 4-41) for punctures or dents.

(3) Check that transducer is securely mounted. Tighten mounting screws (21) as required.

(4) Check that wire connections to transducer are secure. Tighten nuts (19) as required.

b. Remove. (See figure 4-41.)

(1) Disconnect battery and extend lower electrical tray (paragraph 4-24.b).

(2) Tag and disconnect wires (13, figure 4-41) from terminals (15 through 18) on underside of transducer (22).

(3) Remove four nuts (19), lockwashers (20), screws (21) and frequency transducer (22).

c. Install. (See figure 4-41.)

(1) Position frequency transducer (22) under tray with electrical terminals (15 and 16) marked MTR toward front of tray.

(2) Attach transducer to tray with four screws (21), lockwashers (200, and nuts (19).

(3) Use ID tags and install wires to frequency transducer terminals (15 through 18). On each terminal, install washer (14), wire (13), washer (12) and nut 11).

4-61. AC POWER CABLE.

WARNING

Remove all rings, watches and other jewelry when performing maintenance on this equipment.

NOTE

See table 4-2, Malfunction 55 for test.

a. Remove. (See figure 4-42.)

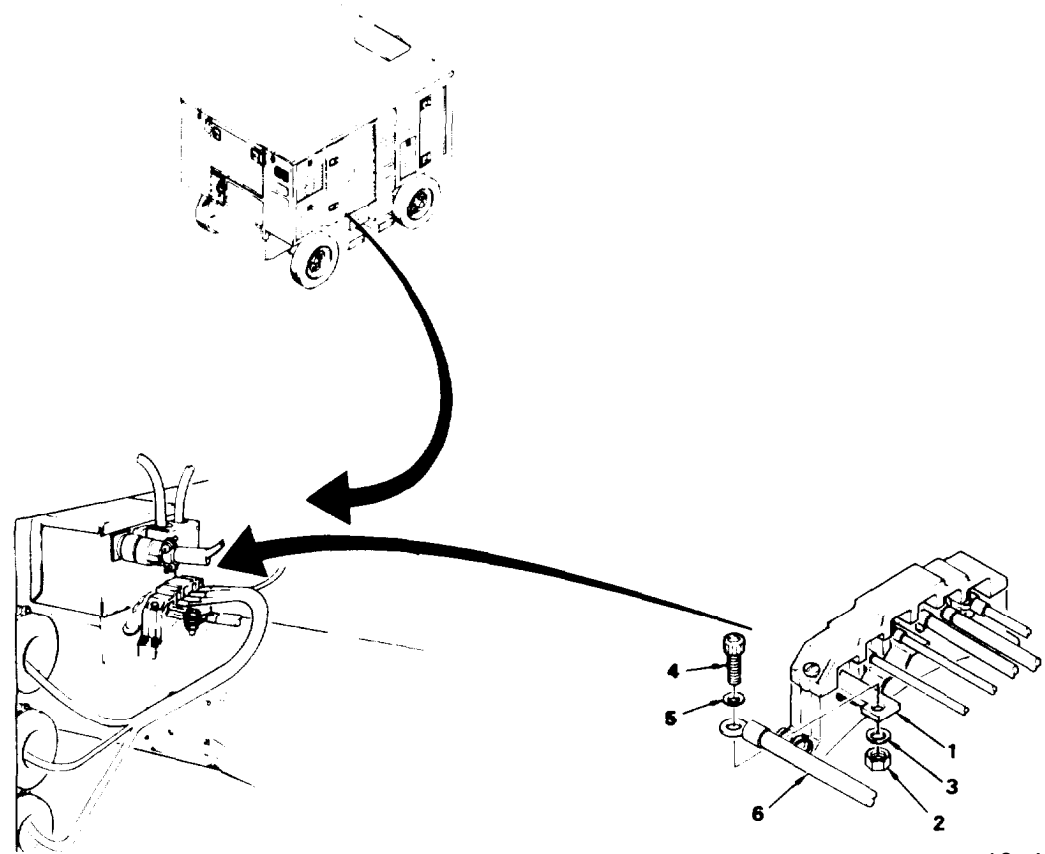
(1) Remove roof (paragraph 4-16).

(2) Lower control panel (paragraph 4-24 .a).

(3) Open engine access door (12, figure 1-1).

(4) Disconnect neutral cable from generator ac output terminal T6 extension bar (1, figure 4-42).

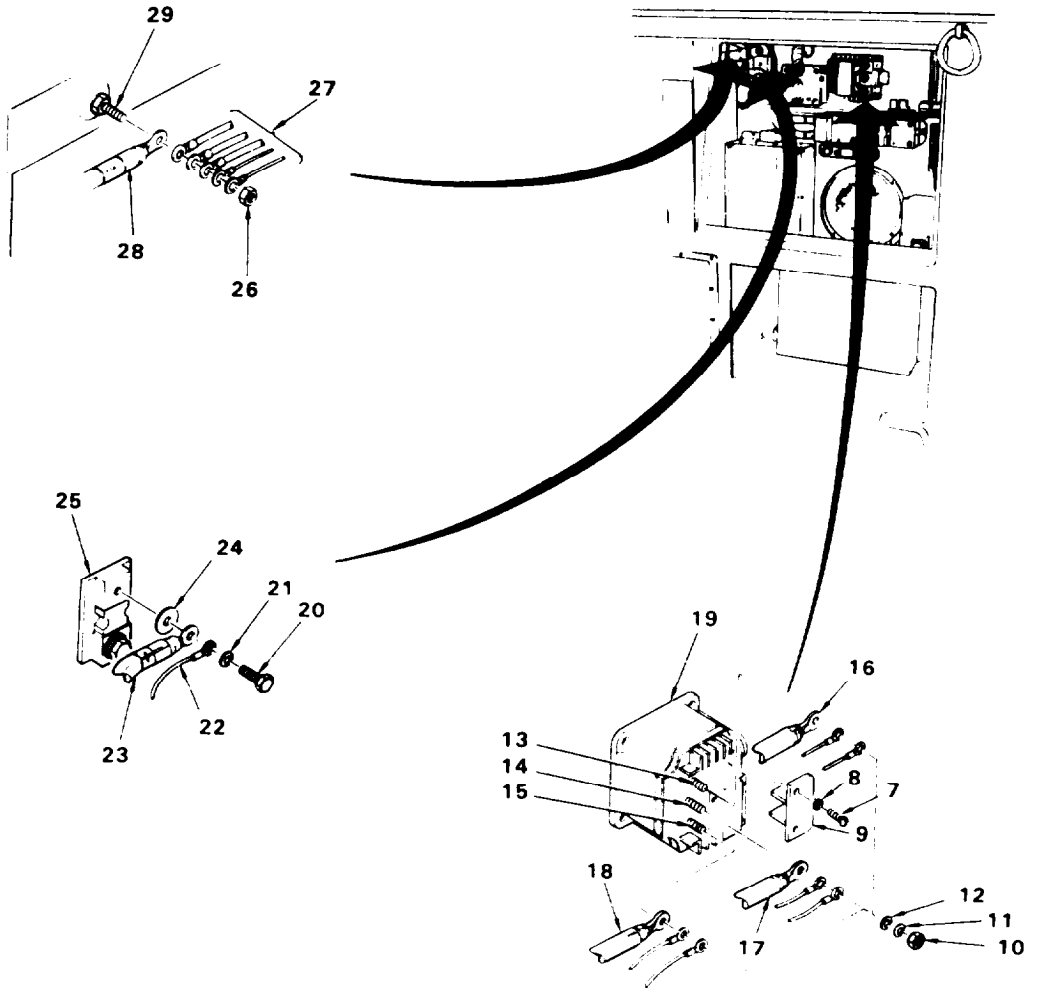
(5) Remove screw (7), lockwasher (8) and terminal shield (9) from left side of ac contactor K1 (19).



12-4-42(1)

1. TERMINAL T6 EXTENSION BAR
2. NUT
3. LOCKWASHER
4. SCREW
5. WASHER
6. AC NEUTRAL (N) CABLE

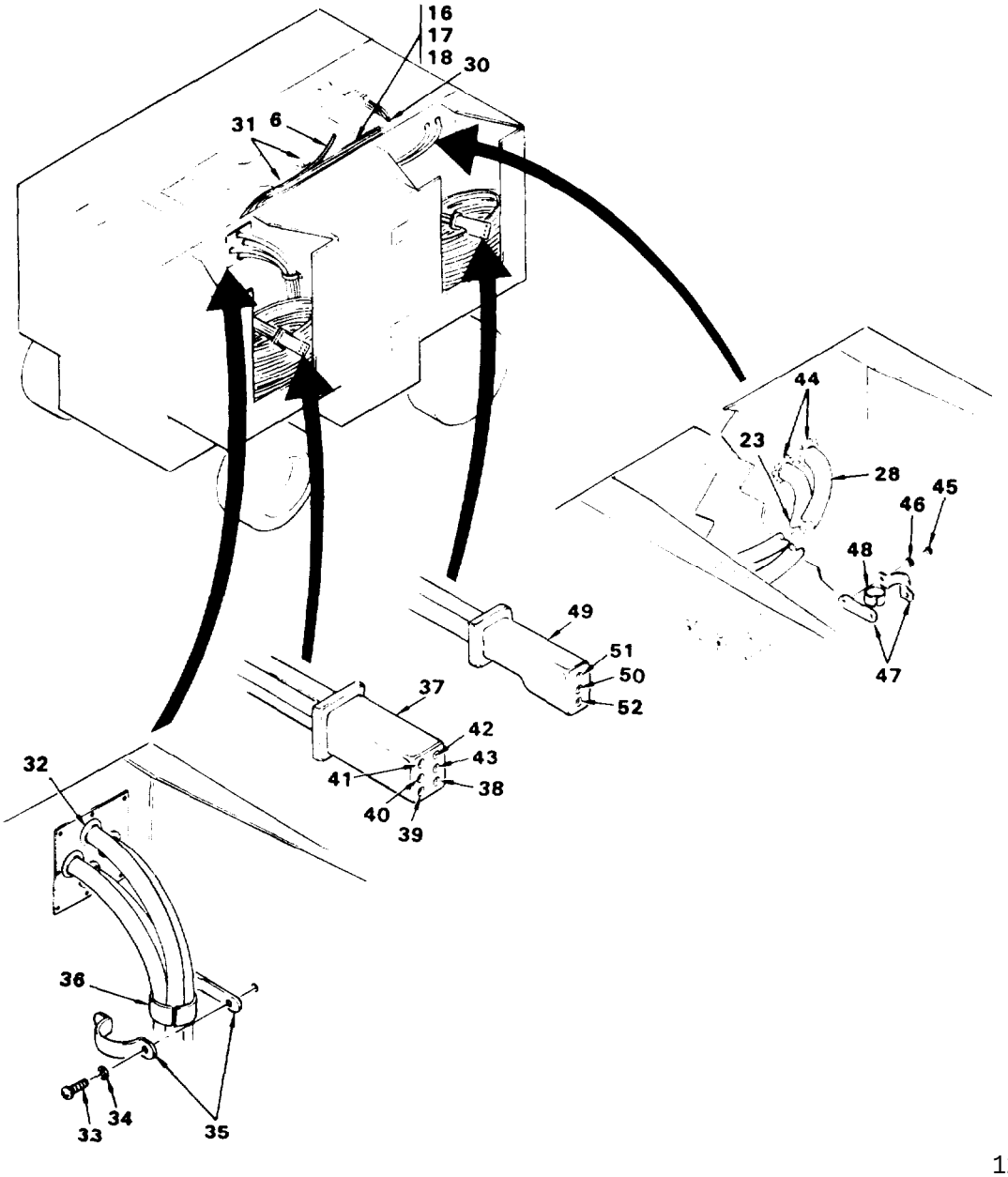
Figure 4-42. AC and DC Power Cables (sheet 1 of 3)



12-4-42(2)

7. SCREW
8. LOCKWASHER
9. TERMINAL SHIELD
10. NUT
11. LOCKWASHER
12. WASHER
13. TERMINAL A2
14. TERMINAL B2
15. TERMINAL C2
16. AC 0A CABLE
17. AC 0B CABLE
18. AC 0C CABLE
19. AC CONTACTOR K1
20. TERMINAL SCREW
21. LOCKWASHER
22. WIRE
23. DC POSITIVE (+) CABLE
24. WASHER
25. DC OUTPUT SHUNT R1
26. NUT
27. GROUND WIRES
28. DC NEGATIVE (-) CABLE
29. GROUND STUD

Figure 4-42. AC and DC Power Cable (sheet 2 of 3)



12-4-42(3)

30. AC CABLE GROMMET
31. CABLE TRAY
32. AC CABLE GROMMETS
33. SCREW
34. WASHER
35. CLAMP
36. CUSHION
37. AC CABLE CONNECTOR
38. PIN A
39 l PIN B
40. PIN C
41. PIN N
42. PIN E
43. PIN F
44. DC CABLE GROMMET
45. SCREW
46. WASHER
47. CUSHION
48. CLAMP
49. DC CABLE CONNECTOR
50. PIN +
51. PIN -
52. PIN R

Figure 4-42 AC and DC Power Cables (sheet 3 of 3)

TM 55-1730-229-12
TO 35C2-3473-1

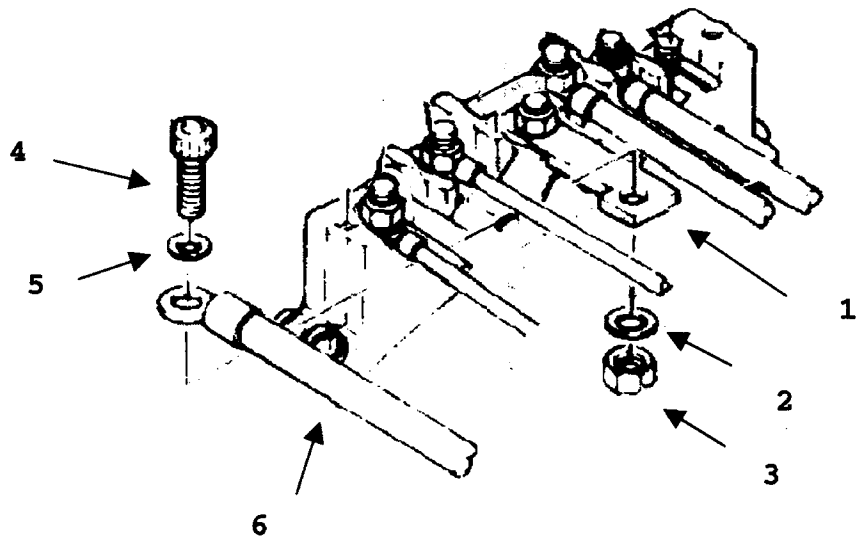


Figure 4-42a. AC Power Cables, 83-360D Only

1. TERMINAL T6 EXTENSION BAR
2. NUT
3. LOCKWASHER
4. SCREW
5. WASHER
6. AC NEUTRAL (N) CABLE

(6) Tag and remove cables and wires from contactor terminals A2 (13), B2 (14), and C2 (15).

(7) Remove Screws (33), washers (34), clamp (35) and cushion (36) from ac cables.

(8) Note location of any plastic cable ties, and remove ties.

(9) Carefully pull cables through grommets (30 and 32) in electrical bay bulkhead panel and cable compartment panel.

b. Install. (See figure 4-42.)

(I) Inspect grommets (30 and 32) in ac power cable compartment panel, and in electrical bay bulkhead panel. Replace grommets if damaged.

(2) Route ac cables through grommets (32) in cable compartment panel, and through tray (31). Further route the 0A, QB, and 0C cables through grommet (30) in electrical bay bulkhead panel.

(3) Connect the 0A, 0B, and 0C cables to contactor K1 terminals A2 (13), B2 (14), and C2 (15), respectively. Use ID tags and connect other wires to contactor terminals (13 through 15). Install washer (12), lockwasher (11), and nut (10) on each terminal.

(4) Install terminal shield (9), lockwashers (8), and screws (7) on contactor.

(5) Connect ac neutral cable (6) to terminal T6 extension bar (1) generator. Attach cable to bar using washer (5), screw (4), lockwasher (3) and nut (2).

(6) Pull cables back through grommets as necessary to remove excessive slack.

(7) Replace any cable ties removed in step a.(8).

(8) Install cushion (36) and clamp (35) around the four ac cables. Secure clamp to cable compartment wall with washers (34) and screws (33).

(9) Install control panel.

(10) Close engine access door.

(11) Install roof (paragraph 4-16).

4-62. DC POWER CABLE.

WARNING

Remove all rings, watches end other jewelry when performing maintenance on this equipment.

NOTE

See table 4-2, Malfunction 45 for test.

a. Remove. (See figure 4-42.)

(1) Disconnect battery and lower control panel (paragraph 4-24.a).

(2) Remove roof (paragraph 4-16).

(3) Tag and disconnect wires from lower terminal screw (20, figure 4-42) on shunt R1.

(4) Tag and disconnect wires from AGPU ground stud (29).

(5) Remove screws (45), washers (46), clamps (47), from dc cable clamps (6). Spread clamps and remove from cables and cushions (48).

(6) Carefully pull dc cables through grommets (44) in cable Compartment panel.

b. Install. (See figure 4-42.)

(1) Inspect grommets (44) in dc power cable compartment panel. Replace grommets if damaged.

(2) Route dc cables through grommets (44).

(3) Install in order on terminal screw (20), lockwasher (21), wire (22). dc (+) cable (23), and washer (24). Thread terminal screw (20) into shunt R1 (25).

(4) Install dc negative (-) cable (28) and other wires (larger wires first) on the AGPU ground stud (29).

(5) Install cushions (48) and cable clamps (47) around dc cables. Secure clamps to compartment wall with washers (46) and screws (45).

(6) Install control panel.

(7) Install roof (paragraph 4-16).

4-63. DC-TO-AC INVERTER.

WARNING

Remove all rings, watches and other jewelry when performing maintenance on this equipment.

NOTE

See table 4-2, Malfunction 78 for test.

a. Remove. (See figure 4-43.)

(1) Disconnect battery.

(2) Open pneumatic access door (11, figure 1-6).

(3) Pull rubber terminal covers (1 and 2, figure 4-43) off screws of terminals (6 and 8), and slide covers down wires (5 and 7).

(4) Remove nut (3), lockwasher (4) and wire (5) from negative terminal screw (6).

(5) Remove nut (3). lockwasher (4) and wire (7) from positive screw of terminal (8).

(6) Remove two nuts (9). two lockwashers (10), and retaining bar (11) from mounting studs (12).

(7) Remove rubber strip (13) from top of inverter (14).

(8) Lift inverter (14) from mounting tray (15).

b. Install. (See figure 443.)

(1) Install rubber material on back of inverter case (if not originally installed) to protect input power leads.

(2) Set inverter (14) on mounting tray (15), centered between mounting studs (12).

(3) Place retaining bar (11) on mounting studs (12). Place rubber strip (13) between retaining bar and top of inverter.

(4) Install two lockwashers (10) and nuts (9) on mounting studs (12).

(5) Install wire (7) with red rubber cover (2) on positive screw of terminal (8). Install lockwasher (4) and nut (3) on screw of terminal. Slide rubber cover (2) up wire and install over terminal screw.

(6) Install wire (5) with black rubber cover (1) on negative screw of terminal (6). Install lockwasher (4) and nut (3) on screw of terminal. Slide rubber cover (1) up wire and install over terminal screw.

(7) Install roof (paragraph 4-16).

(8) Close pneumatic access door.

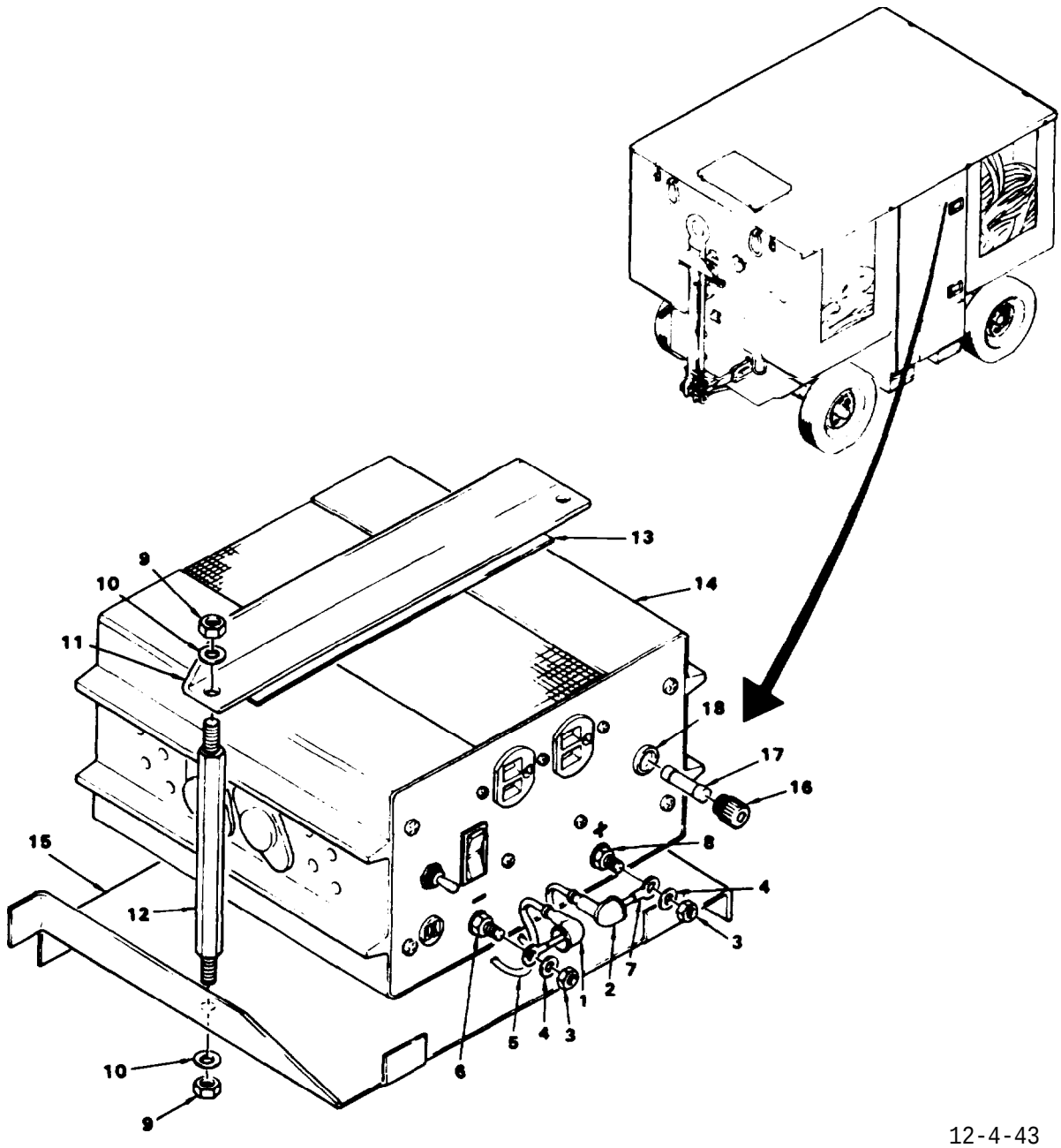
c. Remove Inverter Output Fuse.

(1) Disconnect battery.

(2) Open pneumatic access door (11, figure 1-6).

(3) Remove fuse cap (16, figure 4-43) by pressing in and turning counterclockwise.

(4) Remove fuse (17) from fuse cap (16).



12-4-43

1. BLACK TERMINAL COVER	7. POSITIVE WIRE	13. RUBBER STRIP
2. RED TERMINAL COVER	8. POSITIVE (+) TERMINAL	14. DC-TO-AC INVERTER
3. NUT	9. NUT	15. MOUNTING TRAY
4. LOCKWASHER	10. LOCKWASHER	16. FUSE CAP
5. NEGATIVE WIRE	11. RETAINING BAR	17. FUSE (25 AMP)
6. NEGATIVE (-) TERMINAL	12. MOUNTING STUD	18. FUSE HOLDER

Figure 4-43. Dc-to-Ac Inverter

d. Install Inverter Output Fuse. (See figure 4-43).

(1) Install fuse (17) in cap (16).

(2) Insert fuse into fuze holder (18), press fuse cap and turn cap clockwise.

(3) Close pneumatic access door.

e. Remove Inverter Internal Fuse. (See figure 4-44).

(1) Remove inverter (step a.).

(2) Place inverter (item 1, figure 4-44) on work surface with top side down.

(3) Remove four screws (2) from inverter backplate (3).

(4) Slide backplate (3) back just enough to remove bottom screen (4).

(5) Remove fuse cover (5) by twisting plastic tabs.

(6) Remove fuse (6) from fuse clips (7).

f. Install Inverter Internal Fuse. (See figure 4-44).

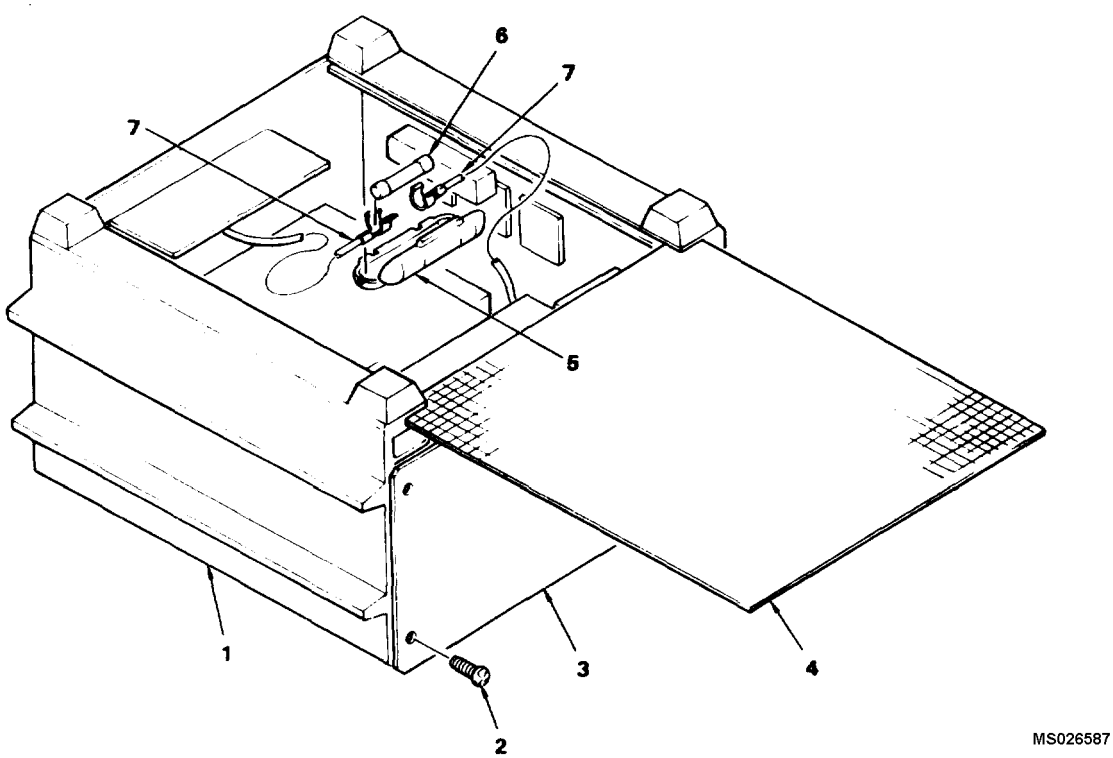
(1) Insert fuse (6) into fuse clips (7).

(2) Install fuse cover (5) around fuse and press cover to snap in place.

(3) Install bottom screen (4).

(4) Position backplate (3) in place and install four screws (2).

(5) Install inverter (step b.).



1. DC-TO-AC INVERTER
2. SCREW
3. BACKPLATE
4. BOTTOM SCREEN
5. FUSE COVER
6. FUSE (4 AMP)
7. FUSE CLIPS

Figure 4-44. DC-to-AC Inverter Internal Fuse.

SECTION XI. MAINTENANCE OF FUEL SYSTEM

4-64. GENERAL. The fuel system, figure 4-45, consists of: a fuel tank (4), a fuel filter (auxiliary) (9), a fuel pump (auxiliary) (10), a fuel control unit (FCU) (20), a shutdown fuel solenoid (26), a fuel nozzle (28) and a four-way fuel valve (35).

a. Fuel Tank. The fuel tank (4) is fitted with a low fuel sensor (7) and a fuel level sensor (5). The low fuel sensor is electrically connected to an amber LOW FUEL indicator light of the control panel. The LOW FUEL indicator illuminates when approximately 30 minutes of engine operating time remains. The fuel level sensor is electrically connected to a FUEL meter on the control panel.

a.1. Four-way Fuel Valve. The four–way fuel valve (35) enables an external fuel source to be connected to AGPU for operation of the engine. Three of the four valve positions are used, the fourth position is blanked. The four-way valve also acts as a shut-off cock isolating the engine from the fuel source.

b. Auxiliary Fuel Pump and Filter. The auxiliary fuel pump (10) is activated by +28 vdc (battery voltage) when the GTE ENGINE CONTROL switch on control panel is set to START (and RUN) position. The fuel pump draws fuel from the tank through an auxiliary filter (9), and provides low pressure fuel to the fuel control unit (FCU) (20).

c. Fuel Control Unit (FCU). The fuel control unit (20 is mounted on the front of the gearcase oil pump housing assembly. The fuel control unit consists of a fuel inlet filter (14), high pressure pump (16), strainer element (17), torque motor (18), metering valve (21), relief valve (23), differential pressure valve (24), and a filter bypass valve (13). Fuel entering the fuel control unit passes through the inlet filter (14) and to the high pressure pump (16). Fuel leaving the pump branches to the metering valve (21), differential pressure valve (24), and relief valve (23). The differential pressure valve maintains a constant pressure drop across the metering valve (21) so the flow is proportional to the valve area. Valve area is modulated by the torque motor (18) electrical signal inputs from the electronic control unit (ECU). Fuel flow passes from the metering valve and out the metered fuel outlet (25) to the shutdown fuel solenoid (26).

d. Shutdown Fuel Solenoid. The shutdown fuel solenoid (26) controls the flow (on/off) of fuel to the fuel nozzle. The solenoid is normally closed (n.c.) with no +28 vdc power applied, shutting off fuel to the fuel nozzle. The solenoid is controlled by the electronic control unit (ECU). During engine start/run operations, the ECU applies +28 vdc to open the fuel solenoid when the engine reaches 10% speed, and maintains the voltage during normal engine operation. Removing +28 vdc from the fuel solenoid is the only way to immediately shut down engine, since the engine requires no ignition once it reaches governed (100%) speed. The fuel solenoid is closed by removal of +28 vdc by any one (or combination of) the following conditions:

(1) EMERG STOP pushbutton switch pressed.

(2) Control panel MASTER SWITCH set to OFF.

(3) Control panel ENGINE CONTROL switch set to OFF (normal method of engine shutdown).

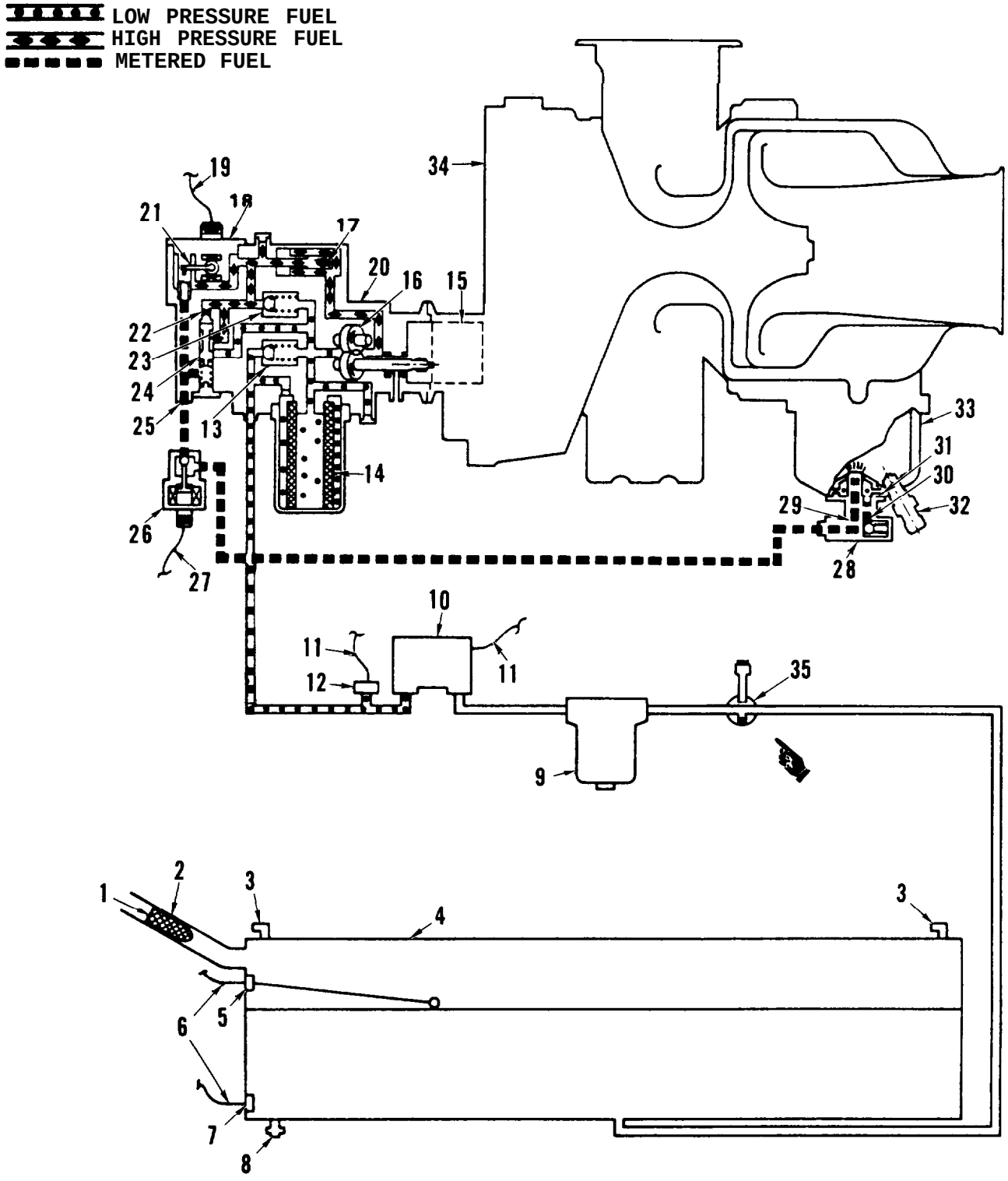


Figure 4-45. Fuel System Diagram

LEGEND FOR FIGURE 4-45:

1. FUEL FILL
2. STRAINER
3. VENT HOSE FITTING
4. FUEL TANK
5. FUEL LEVEL SENSOR
6. WIRING TO CONTROL PANEL
7. LOW FUEL SENSOR
8. DRAIN
9. AUXILIARY FUEL FILTER
10. AUXILIARY FUEL PUMP
11. WIRING TO CONTROL PANEL
12. PRESSURE SENSOR
13. FILTER BYPASS VALVE
14. INLET FILTER
15. OIL PUMP ASSEMBLY
16. HIGH PRESSURE PUMP
17. STRAINER ELEMENT
18. TORQUE MOTOR
19. WIRING TO ECU
20. FUEL CONTROL UNIT (FCU)
21. METERING VALVE
22. ORIFICE
23. ULTIMATE RELIEF VALVE
24. DIFFERENTIAL PRESSURE
25. METERED FUEL OUTLET
26. FUEL SOLENOID, SHUTDOWN
27. WIRING TO ECU
28. FUEL DIVIDER AND FUEL NOZZLE
29. PRIMARY FLOW
30. SECONDARY FLOW
31. COMPRESSOR AIR
32. IGNITER PLUG
33. COMBUSTOR
34. ENGINE
35. FOUR-WAY VALVE

(4) Automatic shutdown by electronic control unit (ECU) for: overspeed, high exhaust gas temperature (EGT), low oil pressure, high oil temperature, overcurrent (related to solenoid, ignition unit, LCV torque motor, start relay coil, or generator interlock circuits).

e. Fuel Nozzle. The fuel nozzle (28) is mounted on the combustion chamber cap. Fuel delivered to the nozzle assembly is sprayed into the combustion chamber and mixes with compressor discharge air. The fuel-air mixture is ignited by the igniter plug (32) and burns, creating hot combustion gasses required to drive the turbine rotor.

4-65. FUEL PUMP, AUXILIARY.

NOTE

See table 4-2, Malfunction 22 (step 2) for test.

a. Inspect. (See figure 4-46.)

(1) DELETED.

(2) Inspect fuel pump for dents, cracks, or other damage. No dents or cracks are allowed.

(3) Inspect fuel pump fittings and lines for leaks. If tightening fitting does not stop leak, replace fitting or line.

(4) DELETED.

b. Remove. (See figure 4-46.)

(1) Set four-way valve (1) to OFF.

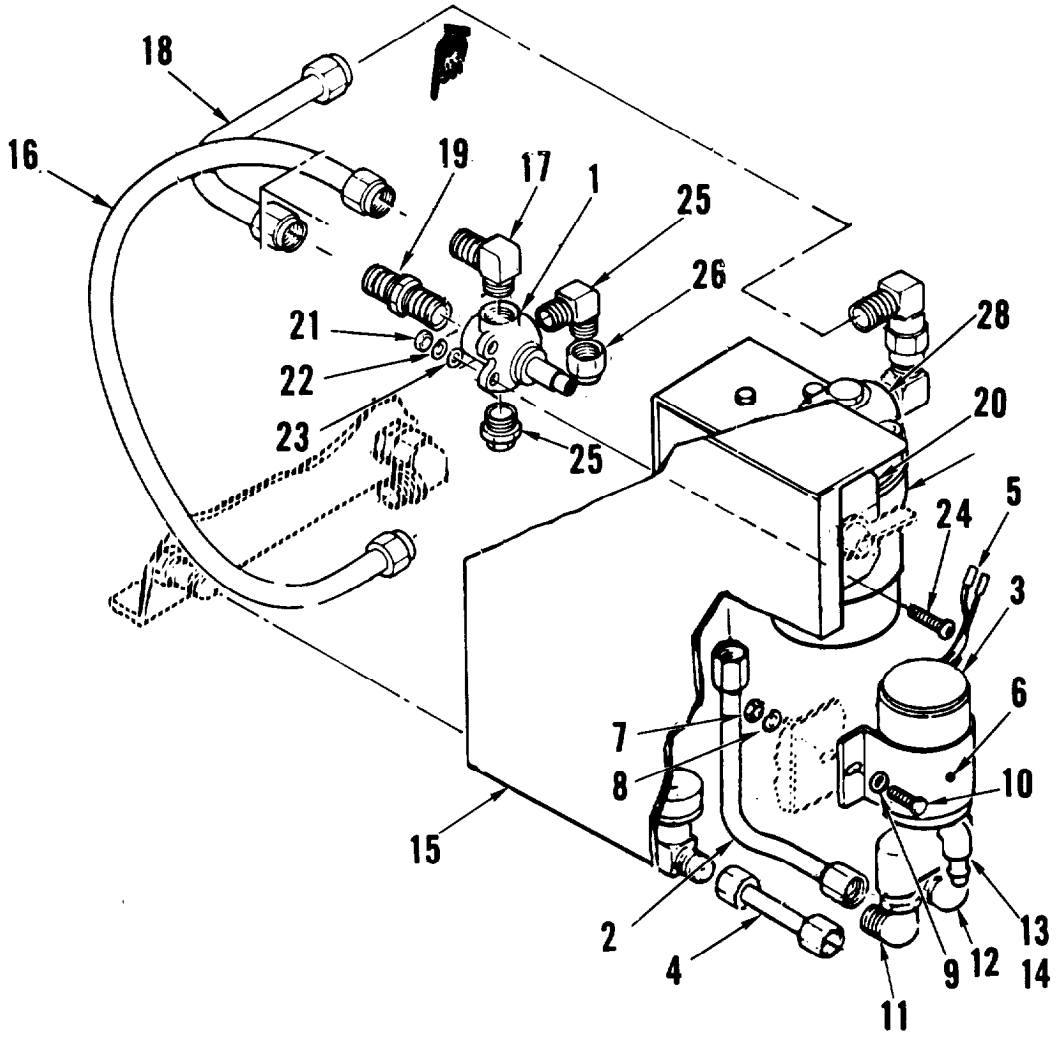
WARNING

Aviation fuel is flammable and irritant to skin, eyes and respiratory tract. Avoid repeated or prolonged skin contact. Handle only in well ventilated areas. Keep away from sparks, open flames or other sources of ignition.

(2) Open drain valve (1, figure 4-47). Catch draining fuel in a suitable container.

(3) Disconnect fuel tube (2, figure 4-46) from fuel pump (3) inlet and fuel tube (4) from fuel pump outlet.

(4) Tag two white leads of cable (5) and cut at crimp connection.



1. FOUR-WAY VALVE
2. FUEL TUBE
3. FUEL PUMP
4. FUEL TUBE
5. CABLE
6. FUEL PUMP SUPPORT CLAMP
7. NUT
8. LOCK WASHER
9. WASHER
10. CAP SCREW
11. ELBOW
12. ELBOW
13. DRAIN ELBOW
14. ADAPTER
15. FUEL PUMP SUPPORT BRACKET
16. HOSE ASSEMBLY
17. TUBE ADAPTER
18. HOSE ASSEMBLY
19. STRAIGHT ADAPTER
20. VALVE SUPPORT
21. NUT
22. LOCK WASHER
23. WASHER
24. SCREW
25. ELBOW
26. CAP NUT
27. PLUG
28. FUEL FILTER WATER SEPARATOR

Figure 4-46. Fuel Supply System

(5) Remove fuel pump support clamp (6) by removing two nuts (7), lock washers (8), washers (9) and cap screws (10)l

(6) Remove fuel pump (3).

(7) Remove elbows (11, 12), drain elbow (13) and adapter (14) for installation in replacement fuel pump.

c. Install. (See figure 4-46.)

(1) Apply thread sealant, part number LH-150, to threads and install elbows (11, 12), drain elbow (13) and adapter (14) in replacement fuel pump (3) l

(2) Position fuel pump (3) in place on fuel pump support bracket (15) and install fuel pump support clamp (6). Secure with two cap screws (10), washers (9), lockwashers (8) and nuts (7).

(3) Remove tags and connect two white leads of cable (5) to fuel pump (3). Ensure correct size butt splice and crimp.

(4) Connect fuel tube (4) to fuel pump (3) outlet and fuel tube (2) to fuel pump inlet. Torque connectors 120 +20 inch-pounds.

(5) Close drain valve (1, figure 4-47). Set four-way valve (1, figure 4-46) to INTL.

WARNING

Aviation fuel is flammable and irritant to skin, eyes and respiratory tract. Avoid repeated or prolonged skin contact. Handle only in well ventilated areas. Keep away from sparks, open flames or other sources of ignition.

(6) Bleed the fuel system of air in accordance With paragraph 4-1, step k. Continue bleeding until an air-free flow of fuel is attained.

4-65.1. FOUR-WAY VALVE.

a. Inspect. (See figure 4-46.)

(1) Inspect four-way valve (1) for cracks, surface damage, corrosion or obvious damage. No cracks, corrosion or damage is permitted.

(2) Inspect four-way valve fittings, hose assemblies and connections for evidence of fuel leakage. No leaks are permitted. If tightening connections and/or fittings does not stop leakage, replace leaking components.

(3) Inspect attaching hardware for security. Tighten loose attaching hardware. Replace missing hardware.

b. Remove. (See figure 4-46.)

WARNING

Aviation fuel is flammable and irritant to skin, eyes and respiratory tract. Avoid repeated or prolonged skin contact. Handle only in well ventilated areas. Keep away from sparks, open flames or other sources of ignition.

(1) Drain fuel tank.

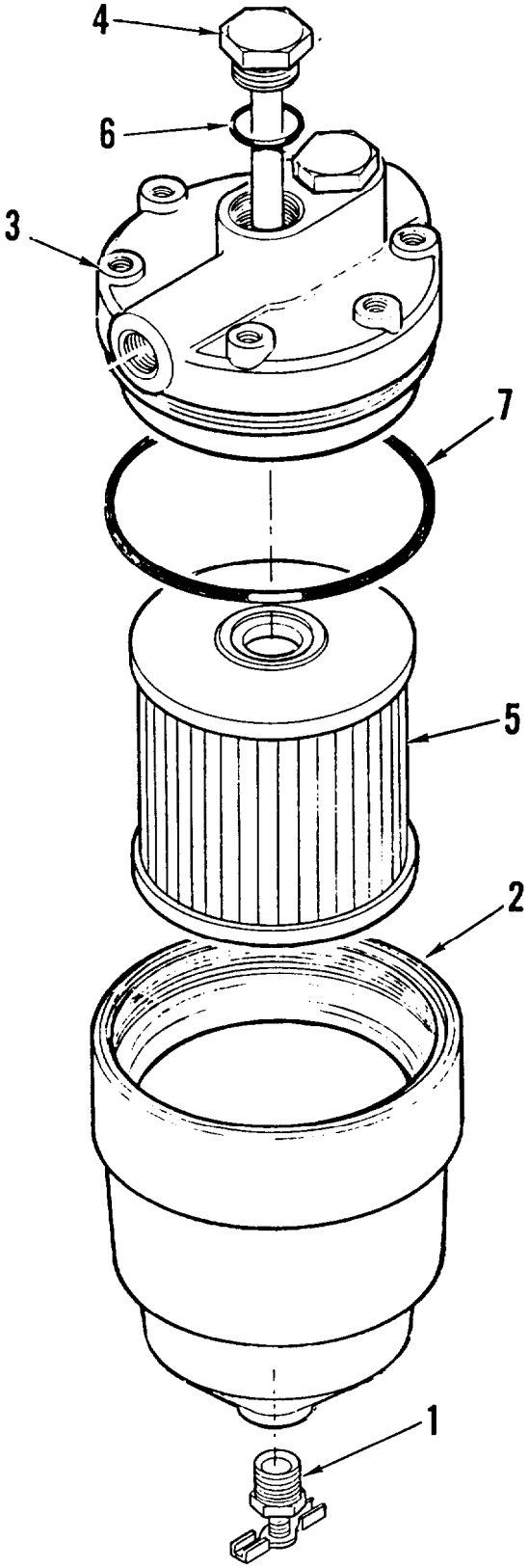
(2) Open drain valve (1, figure 4-47). Catch draining fuel in a suitable container.

(3) Disconnect hose assembly (16, figure 4-46) from tube adapter (17).

(4) Disconnect hose assembly (18) from straight adapter (19).

(5) Remove four-way valve (1) from valve support (20) by removing nuts (21), lock washers (22), washers (23) and screws (24).

(6) Remove tube adapter (17), straight adapter (19), elbow (25) with cap nut (26) and plug (27) for installation in replacement four-way valve. Clean all traces of pipe sealant from adapters , plugs and elbow.



1. DRAIN VALVE
2. SHELL ASSEMBLY
3. HEAD
4. BLIND PROBE
5. FILTER ELEMENT
6. O-RING
7. GASKET

Figure 4-47. Auxiliary Fuel Filter, Cartridge Replacement

c. Install. (See figure 4-46.)

(1) Apply pipe sealant, part number LH-150, to interface threads of tube adapter (17), straight adapter (19) elbow (25) and plug (27).

(2) Install tube adapter (17), straight adapter (19), elbow (25) and plug (27) in four-way valve (1).

(3) Install cap nut (26) on elbow (25).

(4) Install assembled four-way valve (1) and secure to valve support (20) by installing screws (24) washers (23), lock washers (22) and nuts (21).

(5) Connect hose assembly (16) to tube adapter (17). Torque hose assembly end fitting 120 ±20 inch-pounds.

(6) Connect hose assembly (18) to straight adapter (19). Torque hose assembly end fitting 120 ±20 inch-pounds.

(7) Close drain valve (1, figure 4-47).

WARNING

Aviation fuel is flammable and irritant to skin, eyes and respiratory tract. Avoid repeated or prolonged skin contact. Handle only in well ventilated areas. Keep away from sparks, open flames or other sources of ignition.

(8) Fill fuel tank with aviation fuel.

(9) Set four-way valve (1, figure 4-46) to INTL.

(10) Bleed fuel system of air in accordance with paragraph 4-1, step k. Continue bleeding until an air-free flow of fuel is attained.

4-66. FUEL FILTER, AUXILIARY.

a. Inspect. (See figure 4-46.)

(1) DELETED.

(2) Inspect fuel filter water separator (28) for dents, cracks, or other damage. No dents or cracks are allowed.

(3) Inspect filter fittings and lines for leaks. If tightening fitting does not stop leak, replace fitting or line.

(4) DELETED.

b. Replace Cartridge. (See figure 4-47.)

(1) Set four-way valve (1, figure 4-46) to OFF.

WARNING

Aviation fuel is flammable and irritant to skin, eyes and respiratory tract. Avoid repeated or prolonged skin contact. Handle only in well ventilated areas. Keep away from sparks, open flames or other sources of ignition.

(2) Open drain valve (1, figure 4-47). Catch draining fuel in a suitable container.

(3) Remove shell assembly (2) from head (3) by unscrewing blind probe (4).

(4) Remove and discard filter element (5), O-ring (6) and gasket (7).

(5) Install new filter element (5) and gasket (7) in shell assembly (2).

(6) Install assembled shell assembly (2). Secure to head (3) using blind probe (4) with new O-ring (6).

(7) Close drain valve (1). Set four-way valve (1, figure 4-46) to INTL.

(8) Bleed fuel system of air in accordance with paragraph 4-1, step k. Continue bleeding until an air-free flow of fuel is attained.

(4) Clean body assembly, and install drain plug (1).

(5) If not damaged install original lower cartridge gasket (7). new cartridge assembly (6). and original upper cartridge gasket (5) into groove of head (9).

(6) Inspect head gasket (8). If deformed, cut, damaged, replace head gasket.

(7) Install body assembly in place on head (9) and secure with cap screw (2) and gasket (3).

(8) Install enclosure (5, figure 4-46) using four screws (1). washers (3 and 4). and nuts (2).

4-67. FUEL CONTR0L UNIT (FCU).

NOTE

See table 4-2, Malfunction 97 for test.

a. Inspect. (see figure 4-48.)

(1) Inspect FCU for security of installation or loose components. Tighten loose fittings.

(2) Inspect FCU for cracks. dents. a leaks. No damage is allowed.

b. Remove. (See figure 4-48.)

(1) Disconnect fuel line (1) at elbow (13).

(2) Disconnect drain tube (2).

(3) Disconnect fuel hose (3).

(4) Disconnect electrical connector (4).

(5) Loosen clamp (5), and carefully remove FCU (6) in a straight line to avoid damage to shaft (8).

(a) Remove and discard packing (7).

(7) Remove shaft (8), spring (9). and spacer (10).

(8) Inspect shaft (8) and spacer (10) for cracks. nicks. or burrs. No damage is allowed.

(9) Inspect spring for deformation. No damage is allowed.

C. Install. (See figure 4-48.)

(1) Install spacer (10) and spring (9) into oil Pump housing (11).

(2) Install packing (7), shaft (8), and clamp (5) onto FCU (6).

(3) Carefully position FCU (6) over alignment pin of FCU adapter (12), and tighten clamp (5) to 20 inch-pounds.

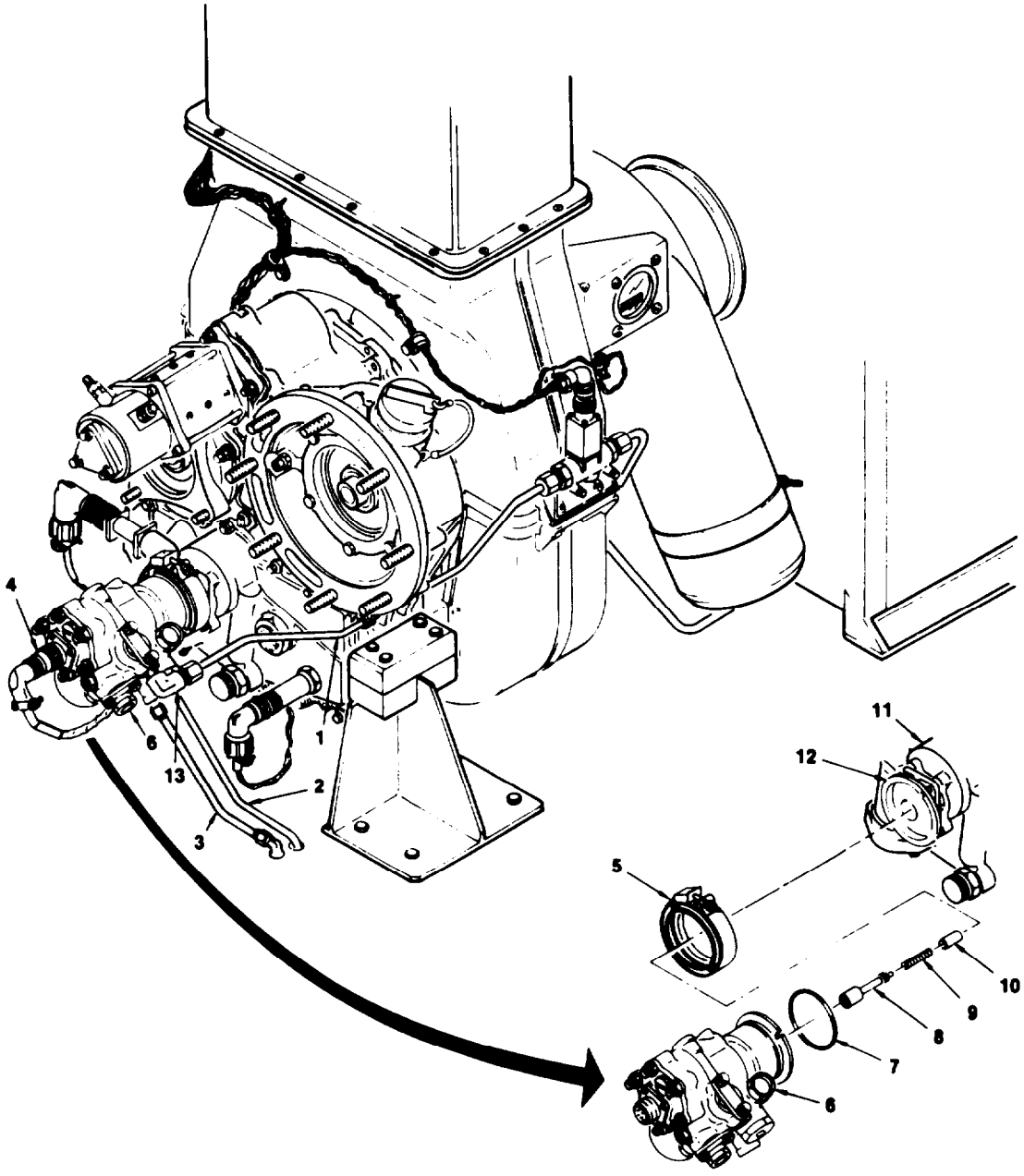
(4) Connect electrical connector (4) and lockwire.

(5) Connect fuel hose (3).

(6) Connect drain tube (2).

(7) Connect fuel line (1) to elbow (13),

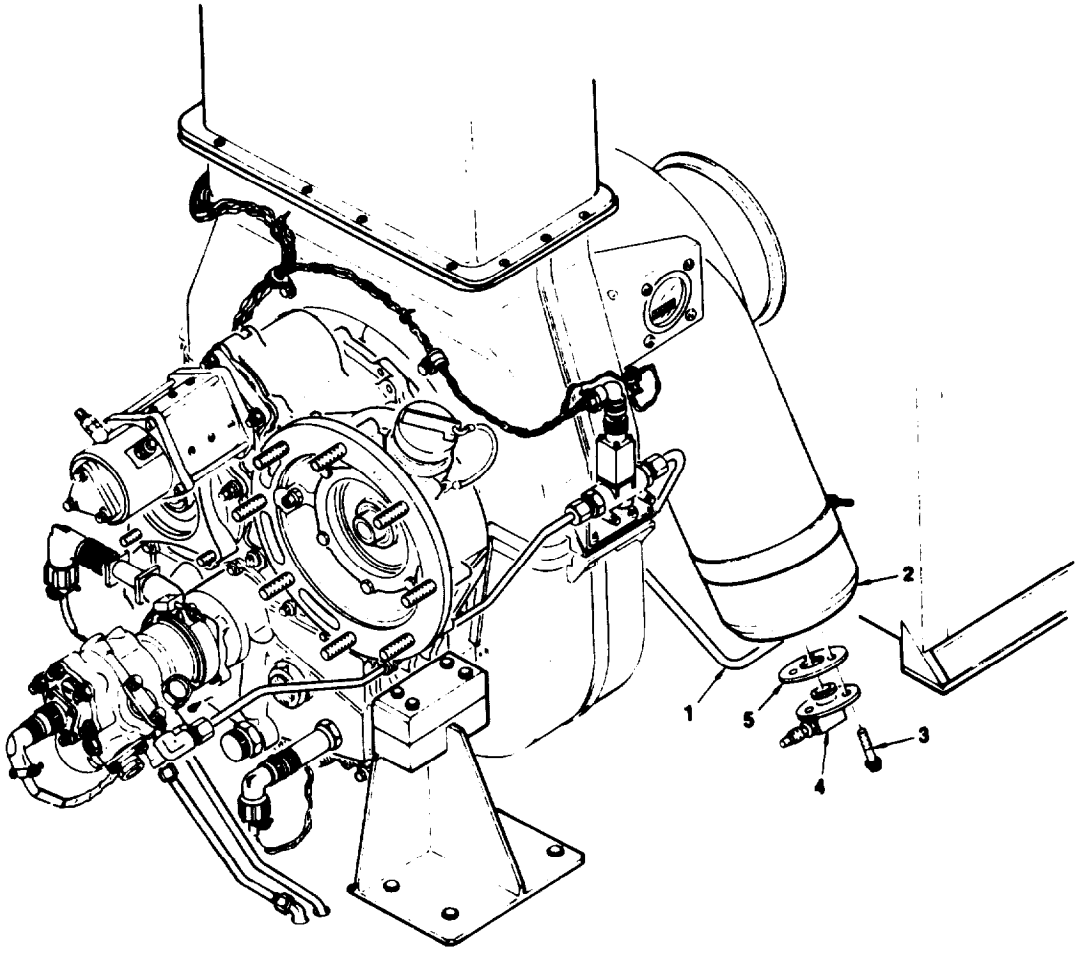
4-68. FUEL NOZZLE. (See figure 4-100.) Inspect fuel nozzle (4) for security of installation. lighten fuel line (1) if required.



12-4-48

1. FUEL LINE
2. DRAIN TUBE
3. FUEL HOSE
4. ELECTRICAL CONNECTOR
5. CLAMP
6. FUEL CONTROL UNIT (FCU)
7. PACKING
8. SHAFT
9. SPRING
10. SPACER
11. OIL PUMP HOUSING
12. FCU ADAPTER
13. ELBOW

Figure 4-48. Fuel Control Unit (FCU)



12-4-49

1. FUEL LINE
2. COMBUSTION CHAMBER CAP
3. BOLT
4. FUEL NOZZLE
5. GASKET

Figure 4-49. Fuel Nozzle

4-69. FUEL FILTER, FCU.

a. Inspect. (See figure 4-50.)

(1) Remove hydraulic access cover (refer to paragraph 4-15).

(2) Inspect filter cover (2) for dents. cracks, a other damage. No dent or cracks are allowed.

b. Remove. (See figure 4-50.)

(1) Loosen bolts (1). and rotate filter cover to disengage. Remove filter cover (2) with packing (3) and filter assembly (4).

(2) Remove packing (3) and filter assembly (4) from filter cover (2). Discard packing and filter assembly.

C. Install. (See figure 4-50.)

(1) clean filter cover (2).

(2) Insert filter assembly (4) into fuel control unit (FCU).

(3) Install filter cover (2) with packing (3) onto FCU, and rotate to engage cover.

(4) Tighten bolts.

(5) Install hydraulic access cover (refer to paragraph 4-15).

4-70. FUEL SOLENOID, SHUTDOWN.

NOTE

See table 4-2. Malfunction 98 for test.

a Inspect. (See figure 4-50.)

(1) Open engine access door (12. figure 1-1).

(2) Inspect fuel solenoid (8) for dents a cracks. No dents cracks are allowed

(3) Inspect for security of installation. Tighten mounting bolts or fuel line connections if required.

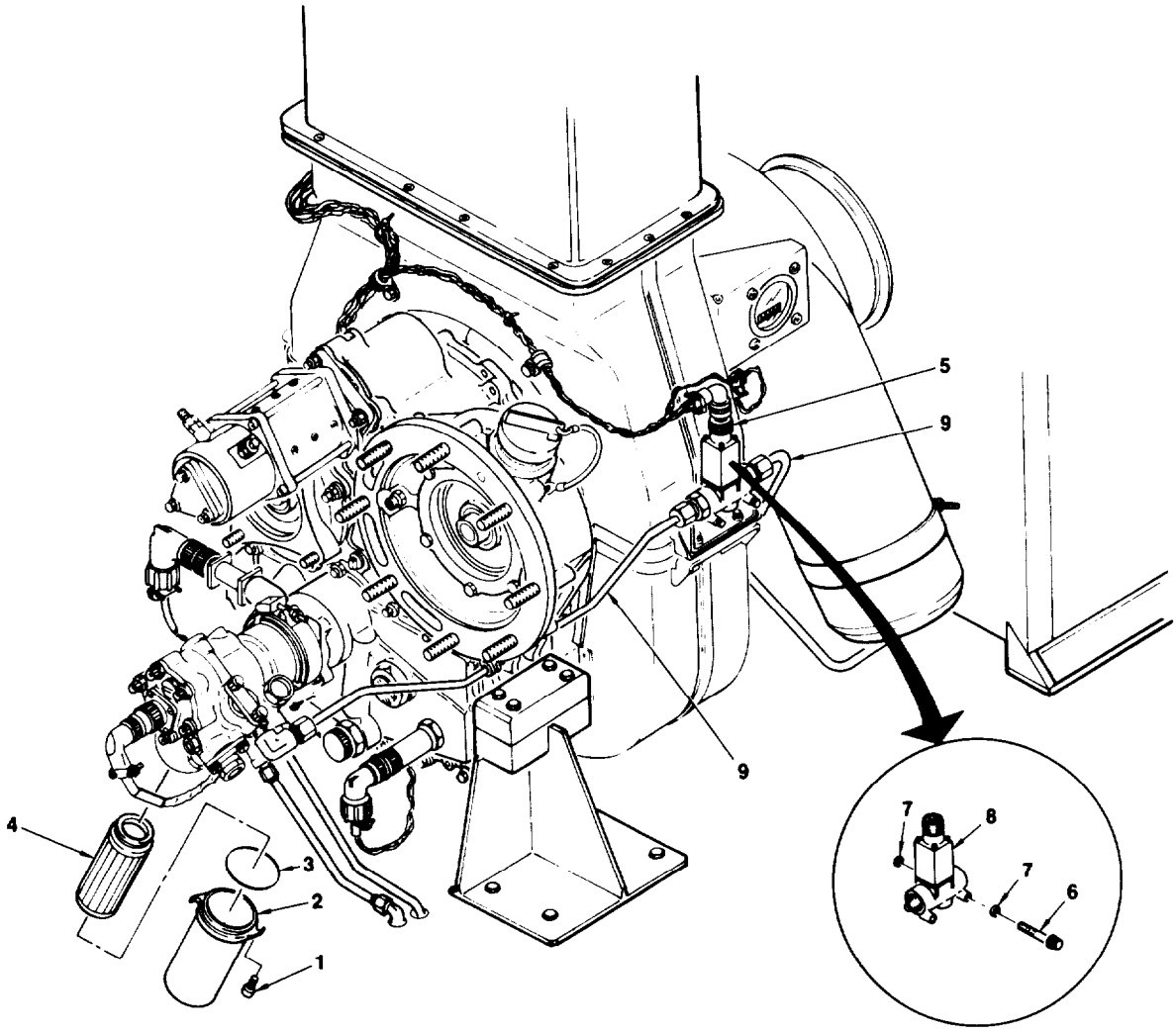
b. Remove. (See figure 4-50.)

(1) Disconnect fuel lines (9) and elecirical connector (5) from fuel solenoid (8).

(2) Remove bolts (6). washers (7). and fuel solenoid from bracket.

CAUTION

When starting engine for first time after replacement of fuel solenoid, be prepared to shutdown engine by setting control panel MASTER SWITCH to OFF (to remove power from auxiliary pump) should engine overspeed occur or engine fail to shutdown in normal manner.



12-4-50

NOTE: GENERATOR SHOWN REMOVED FOR CLARITY

1. BOLT
2. FILTER COVER
3. PACKING
4. FILTER ASSEMBLY
5. ELECTRICAL CONNECTOR
6. BOLT
7. WASHER
8. SHUTDOWN FUEL SOLENOID
9. FUEL LINES

Figure 4-50. Engine FCU Fuel Filter and Shutdown Fuel Solenoid

c. Install. (See figure 4-50.)

(1) Apply a thin coat of anti-seize compound MIL-L-25681 to the threads of the bolts (6).

(2) Install bolts (6), washers (7), through fuel solenoid body (8), and secure to bracket.

CAUTION

Do not overtighten fuel line connections.

(3) Attach fuel lines (9) and electrical connector (5) to fuel solenoid. Lockwire electrical connector.

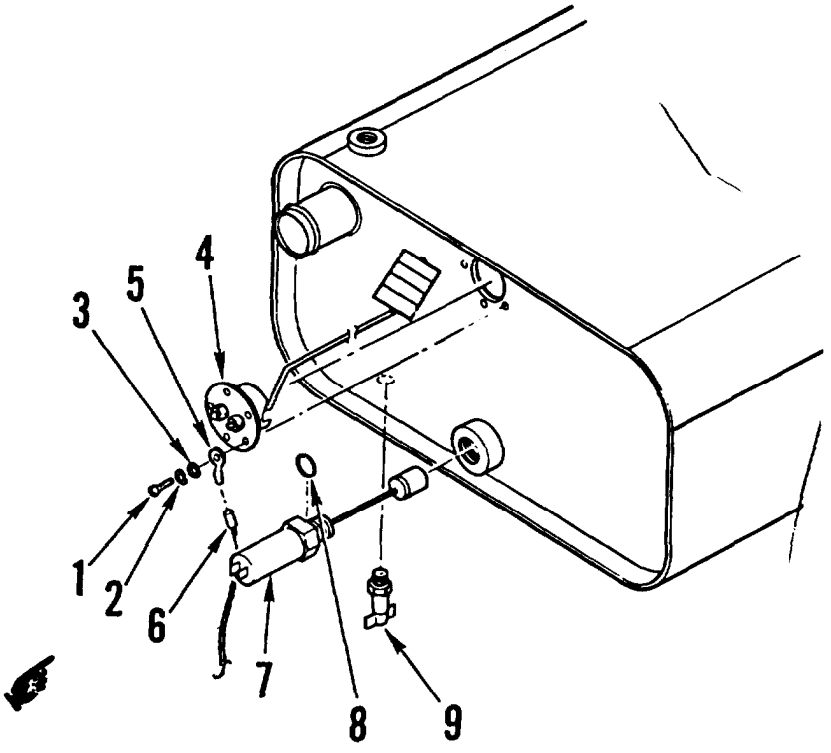
4-71. SENSOR, FURL LEVEL.

NOTE

See table 4-2, Malfunction 8 (step 8) for test.

a. Remove. (See figure 4-51.)

(1) Ensure that fuel tank is less than 2/3 full. If tank is full, drain fuel into suitable container until tank is less than 2/3 full.



12-4-51

1. SCREW
2. LOCK WASHER
3. FLAT WASHER
4. FUEL LEVEL SENSOR WITH GASKET
5. LUG (2)
6. WIRING
7. MINIATURE LIGUID LEVEL SWITCH
8. O-RING
9. DRAIN VALVE

Figure 4-51. Fuel Level Sensors

(2) Tag and disconnect lugs (5) from fuel level sensor (4).

(3) Remove screws (1) and washers (2, 3).

(4) Carefully remove fuel level sensor (4) from tank. Turn sensor to ensure sensor arm and float clear tank hole.

(5) Check that float arm moves freely up and down, and no binding is evident. Replace if damaged or binding occurs. Check resistance between full and empty position. Resistance should vary smoothly between approximately 35 ohms (full position) and 240 ohms (empty position).

b. Install. (See figure 4-51)

(1) Clean tank and fuel level sensor (4) interface joint. Remove all traces of old gasket material.

(2) DELETED.

(3) Carefully install fuel level sensor (4) in tank mounting hole. Rotate fuel level sensor to align bolt mounting pattern. Ensure fuel level sensor is correctly positioned to allow up-and-down movement of the float.

(4) Install screws (1) and washers (2, 3), and tighten screws securely.

(5) Reconnect lugs (5) to sensor terminals.

(6) DELETED.

(7) Check for leaks after tank is filled.

4-72. SENSOR, LOW FUEL LEVEL.

NOTE

See table 4-2, Malfunction 14 for test.

a. Remove. (See figure 4-51.)

(1) Ensure that fuel tank is empty or near empty. If tank is not empty, drain remaining fuel into suitable container.

(2) Tag and disconnect wiring.

(3) DELETED.

(4) Remove low fuel level sensor (4) from tank.

(5) DELETED.

b. Install. (See figure 4-51.)

(1) Clean low fuel level sensor (4) to tank interface mounting.

(2) DELETED.

(3) DELETED.

(4) DELETED.

(5) Install O-ring (8) on low fuel level sensor (4).

(6) Install low fuel level sensor (4) in tank mounting hole. Ensure arrow and UP, NC are pointing up.

(7) DELETED.

(8) Connect low fuel level sensor (4) wiring. Remove tags.

(9) DELETED.

(10) Check for leaks after tank is filled.

4-73. FUEL TUBE AND HOSE ASSEMBLIES, AND FITTINGS.

a. Remove. (See figures 4-52 and 4-53.)

(1) Loosen clamps (1, 7 and 9, figure 4-52) and remove hoses (2, 10), screen strainer (3) and fuel pipe (8).

(2) Remove screws (11) and lock washers (12). Loosen clamps (14, 15, 17, 19, 21) and remove vent hoses (16, 18, 22), Y-vent tube (20) and fuel hose coupler (23).

(3) Loosen clamps (24, 25) and remove fuel vent breather assembly (26), flat washer (27) and hose (28). Remove lock nut (29), screw (30) and clamp (31) and remove hose (32).

(4) Remove tube assemblies (2) figure 4-53) and hose assembly (9) by unscrewing coupling nuts.

(5) Remove bulkhead unions (4) and elbow (7) by removing retaining nuts (3).

(b) Tag and electrically disconnect wires to pressure sensor (10). Remove pressure sensor (10) by unscrewing from fitting (11).

b. Install. (See figures 4-52 and 4-53.)

NOTE

Use RTV Red gasket maker (Permatex 26B) when installing hoses (2, 10, 16, 18, 22, figure 4-53).

(1) Install hoses (2, 10, figure 4-52), screen strainer (3) and fuel pipe (8). Secure with clamps (1, 7, 9).

(2) Install vent hoses (16, 18, 22), Y-vent tube (20) and fuel hose coupler (23). Secure with clamp (14, 15, 17, 19, 21). Secure loop cushion clamps (13), screws (11) and lock washers (12).

(3) Install flat washer (27) on smaller end of fuel vent breather assembly (26). Secure fuel vent breather assembly to hose (28) using clamp (24).

(4) Install hose (32) to far side of plenum. Ensure hose is fully extended below AGPU. Secure to fuel vent breather assembly (26) with clamp (25).

(5) Install loop clamp (31) on hose (33) and secure to AGPU skirt with screw (30) and lock nut (29).

(6) Install bulkhead unions (4, figure 4-53 and elbow (7). Secure with retaining nuts (3).

(7) Install tube assemblies (2) and hose assembly (9). Torque coupling nuts to 120 ±20 inch-pounds.

(8) Install pressure sensor (10) in fitting (11). Remove tags and electrically connect wires to pressure sensor (10).

Section XII. MAINTENANCE OF PNEUMATIC SYSTEM

4-74. GENERAL. The pneumatic system (Figures 4-54 and 4-55) consists of a pneumatic hose, two solenoid valves, a pressure transducer, a load control valve (LCV), hoses, couplers, clamps, adapters, and fittings.

a. Pneumatic System. Figure 4-54 is a simplified diagram of the pneumatic system. Bleed air (3) is taken from the engine compressor section and routed through a load control valve (LCV) to the aircraft through a pneumatic hose. The LCV controls application of pneumatic power to the aircraft by opening and closing a shutter. Bleed air is only applied to the aircraft when the PNEUMATIC POWER switch on the control panel is set to ON.

1. CLAMP, HOSE
2. HOSE (3-INCH)
3. SCREEN STRAINER
4. SCREW
5. WASHER, LOCK
6. FUEL FILL PLENUM
7. CLAMP
8. FUEL PIPE
9. CLAMP
10. HOSE (S-INCH)
11. SCREW
12. WASHER, LOCK
13. CLAMP, LOOP CUSHIONED
14. CLAMP
15. CLAMP
16. HOSE (123-INCH)
17. CLAMP
18. HOSE (40-INCH)
19. CLAMP
20. Y-VENT TUBE
21. CLAMP
22. HOSE (5-INCH)
23. FUEL HOSE COUPLER
24. CLAMP
25. CLAMP
26. FUEL VENT BREATHER ASSEMBLY
27. WASHER
28. HOSE
29. LOCKNUT
30. SCREW
31. CLAMP
32. HOSE

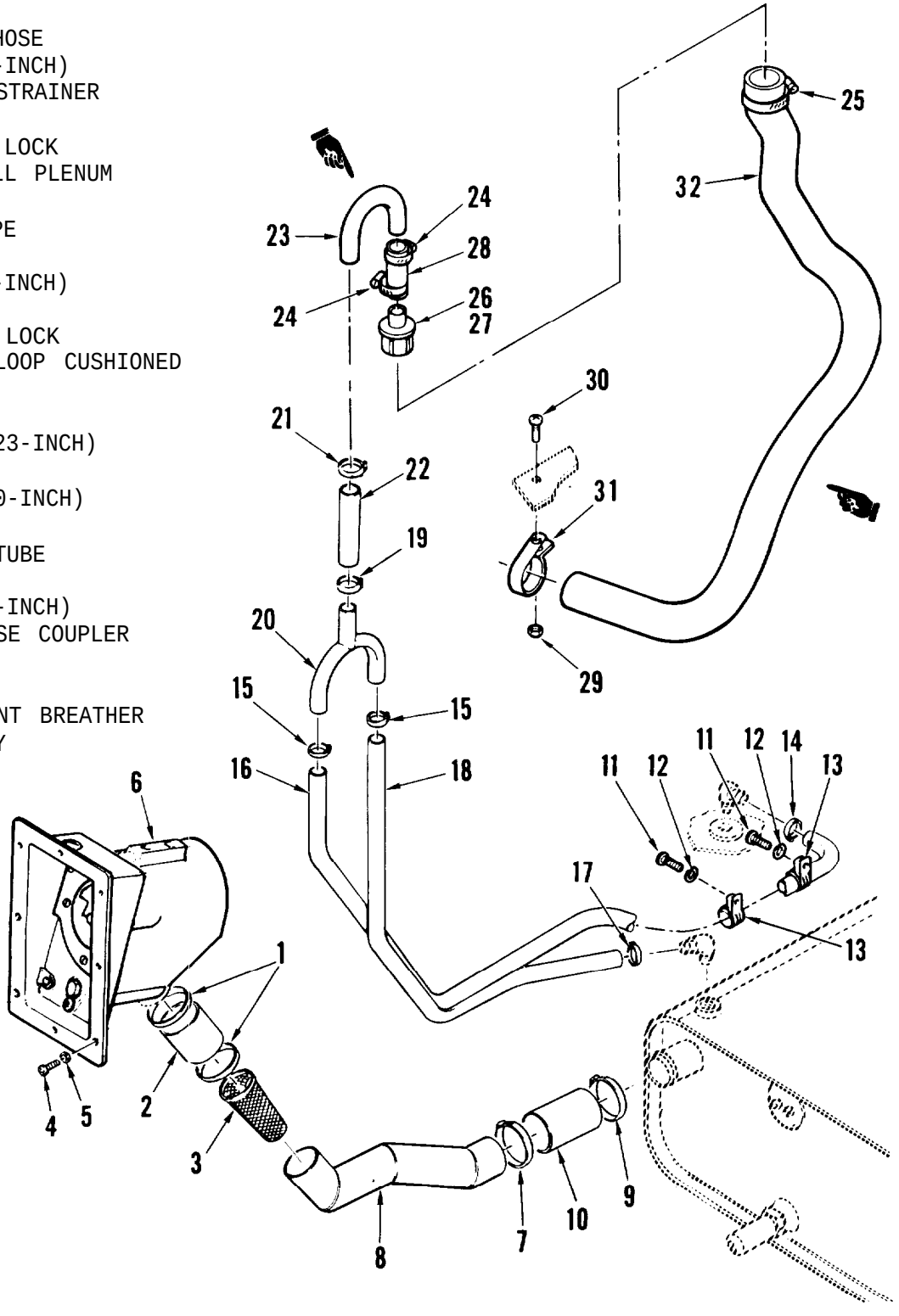
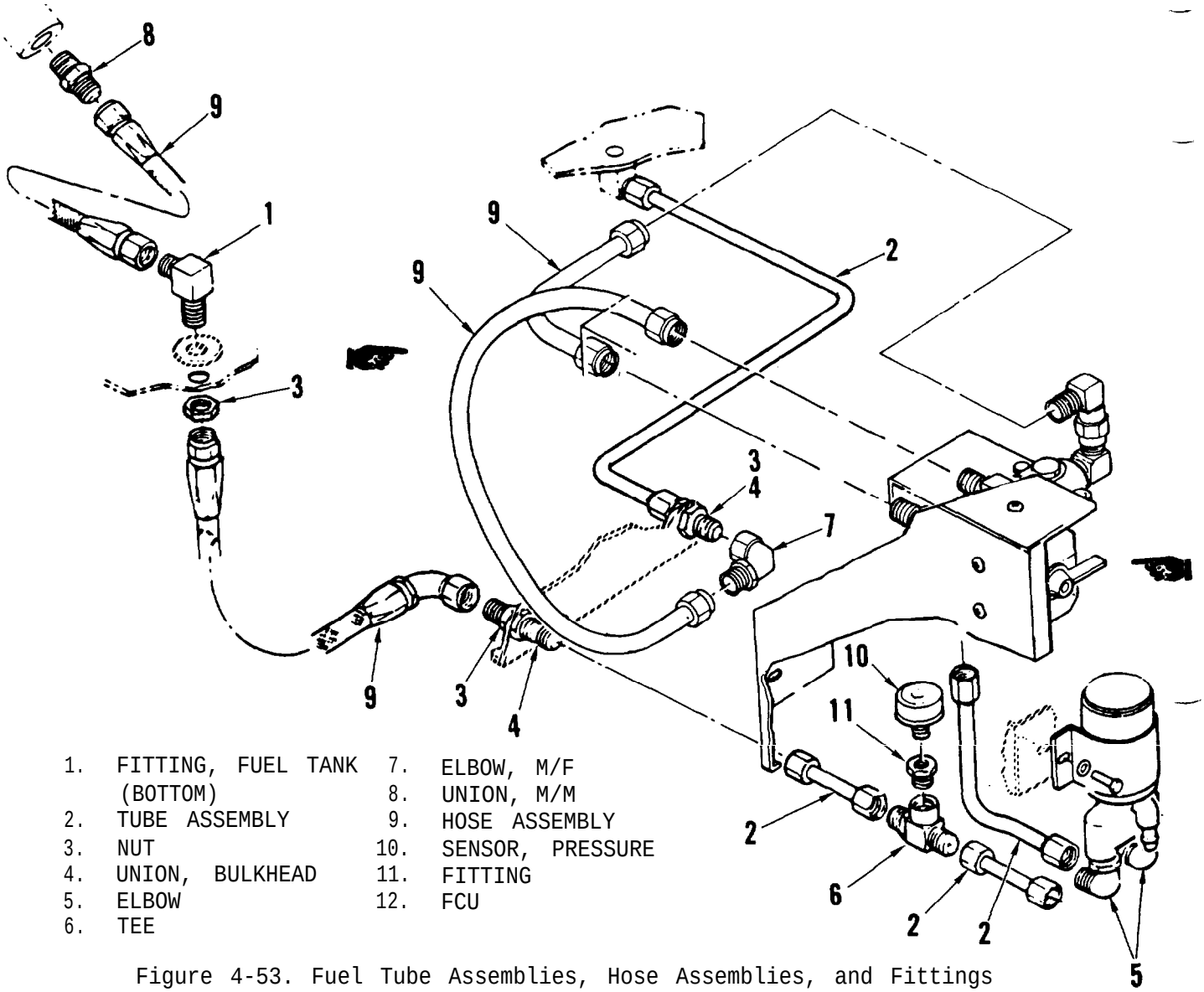


Figure 4-52. Fuel Fill and Vent Hoses and Fittings

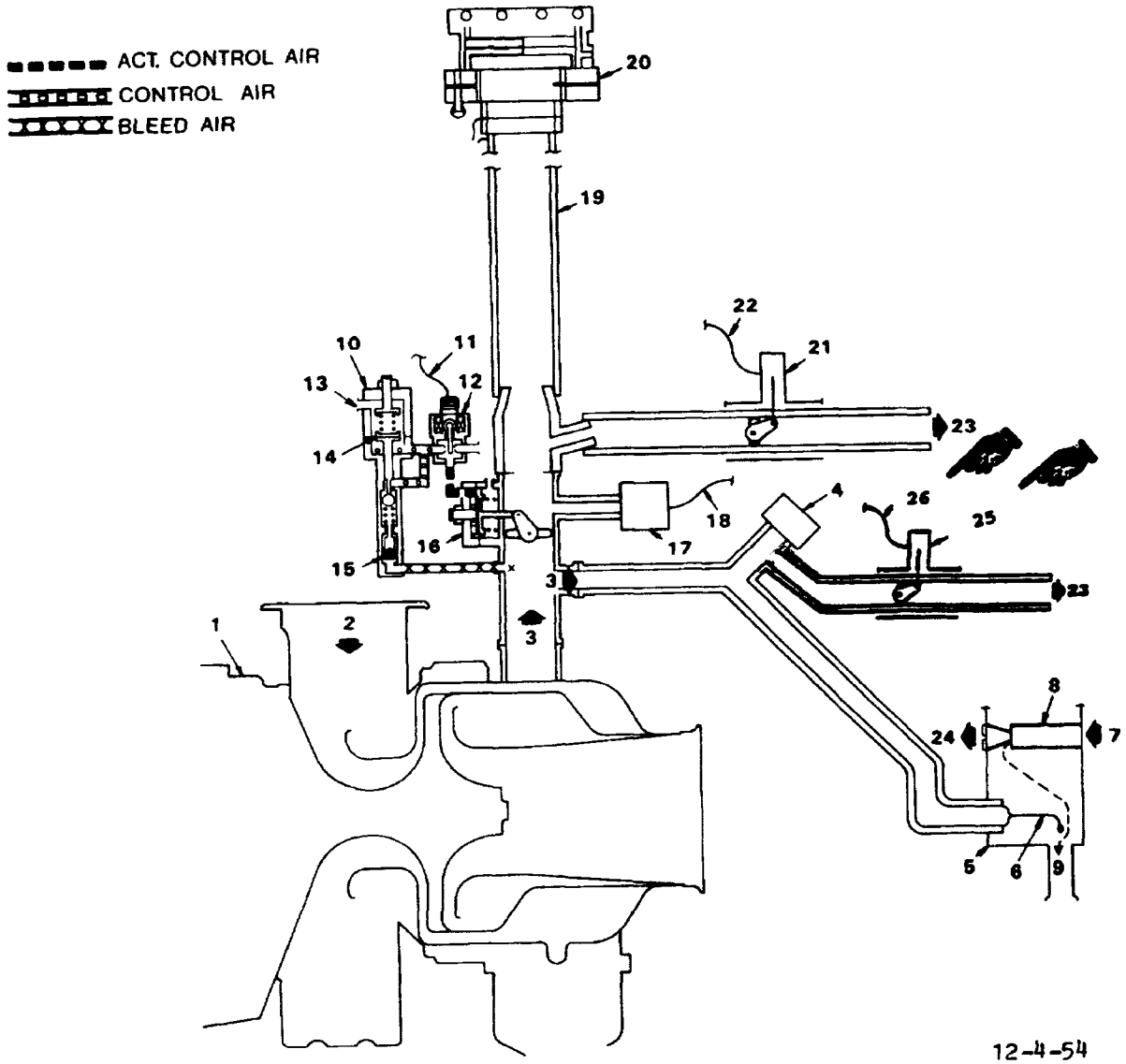


1. FITTING, FUEL TANK (BOTTOM)
2. TUBE ASSEMBLY
3. NUT
4. UNION, BULKHEAD
5. ELBOW
6. TEE
7. ELBOW, M/F
8. UNION, M/M
9. HOSE ASSEMBLY
10. SENSOR, PRESSURE
11. FITTING
12. FCU

Figure 4-53. Fuel Tube Assemblies, Hose Assemblies, and Fittings

b. Scavenge Bleed Air. A small amount of bleed air is continually used by the air cleaner (5) when the engine is running. Bleed air is routed to six nozzles (6) on the bottom of the air cleaner. Air flowing through these nozzles creates a partial vacuum inside the air cleaner housing. This pulls dirt separated by the centrifugal air cleaner tubes (8) out of the housing, and expels the dirt out scavenge tubes (9) on the bottom air cleaner.

c. Load Control Valve (LCV). The LCV is controlled by the electronic control unit (ECU). The ECU receives a signal to open the LCV when the PNEUMATIC POWER switch on the control panel is set to ON position. The LCV consists of a housing containing a filter (15), a control pressure regulator (14), a restrictor, a rate control orifice, a torque motor (12), and a pneumatic actuator (16). Compressor bleed air enters through a passage in the valve housing



1. ENGINE
2. COMPRESSOR AIR INLET
3. BLEED AIR
4. DEICER FITTING
5. AIR CLEANER
6. NOZZLE (6)
7. AIR INTAKE
8. AIR CLEANER TUBE
9. SCAVENGE AIR AND DIRT OUT
10. LOAD CONTROL VALVE (LCV)
11. WIRING TO ECU
12. TORQUE MOTOR
13. AMBIENT SENSING
14. CONTROL PRESSURE REGULATOR
15. FILTER
16. PNEUMATIC ACTUATOR
17. PRESSURE TRANSDUCER
18. WIRING TO CONTROL PANEL
19. HOSE
20. COUPLER
21. SOLENOID VALVE (AIR DUMP)
22. WIRING TO CONTROL PANEL
23. AIR DUMP TO EXHAUST EJECTOR
24. CLEAN AIR TO ENGINE
25. SOLENOID VALVE (SURGE CONTROL)
26. WIRING TO CONTROL PANEL

Figure 4-54. Pneumatic System Diagram

and through a filter to the spring and ambient pressure regulated control pressure regulator. Regulated air pressure is routed through a restrictor and a rate control orifice and across a torque motor controlled valve. The torque motor control valve applies the regulated air to a pneumatic actuator, which opens or closes the attached valve plate.

d. Overtemperature Protection. During full-load operations using electrical and/or hydraulic power plus pneumatic power, the LCV functions to prevent excessive engine exhaust gas temperatures. When the PNEUMATIC POWER switch is set to ON, the LCV will maintain a full open position until exhaust gas temperature (EGT) approaches the control point (1230°F/666°C). At this time the ECU applies a signal to the LCV torque motor to adjust the valve plate to maintain the control point EGT. The sequence will provide a nearly constant bleed air pressure at a reduced value in the event of over temperature conditions. Without this capability, the EGT would be exceeded, and the ECU would shutdown engine.

e. Hose Air Dump Solenoid Valve. This solenoid valve (21) is open when the PNEUMATIC POWER switch is set to OFF. Setting switch to ON applies a voltage to the solenoid, closing the valve. The purpose of this solenoid valve is to relieve pneumatic hose pressure prior to disconnecting hose from aircraft.

f. Pressure Transducer. A pressure transducer (17) monitors pneumatic pressure to aircraft. Pressure is converted to an electrical signal, which is sent to a meter on the control panel.

g. Surge Control Valve (SCV). This solenoid valve (31) opens when the CURRENT LIMIT SELECTOR switch S11 is set to 45KW or 1000 A on the 83-360A and when set to AH-64D on the 83-360D. On the 83-360A the 28 vdc signal to open the valve is routed through both the PNEUMATIC POWER switch S8 and the CURRENT LIMIT SELECTOR switch S11 so that the surge control valve will not open whenever pneumatic power is ON. On the 83-360D the 28 vdc signal is routed directly to the CURRENT LIMIT SELECTOR switch S11, which then operates the surge control valve, whether the pneumatic power is ON or OFF. This valve is needed to off load the GTE compressor to eliminate stall. This is necessary when large shaft horsepower is required.

4-75. LOAD CONTROL VALVE (LCV)

NOTE

See Table 4-2, Malfunction 62 (step 5) for test.

a. Inspect. (See Figure 4-56)

(1) Remove roof (paragraph 4-16).

(2) Inspect load control valve (LCV) (2) for security of installation, loose components, and for damage. Replace LCV if cracked or dented.

(3) Check visual position indicator on left side of LCV below solenoid (with engine shutdown). Indicator should be in the closed position. Replace LCV if indicator is not in closed position.

b. Remove. (See Figure 4-55).

(1) Open pneumatic hose access door.

(2) Remove engine access cover (paragraph 4-15).

(3) Disconnect two hoses (11) connected to manifold (12).

(4) Disconnect tubing assembly (22) from fitting (16) on manifold (12).

(5) Cut and remove lockwire, and disconnect electrical connector (3, Figure 4-56) from LCV.

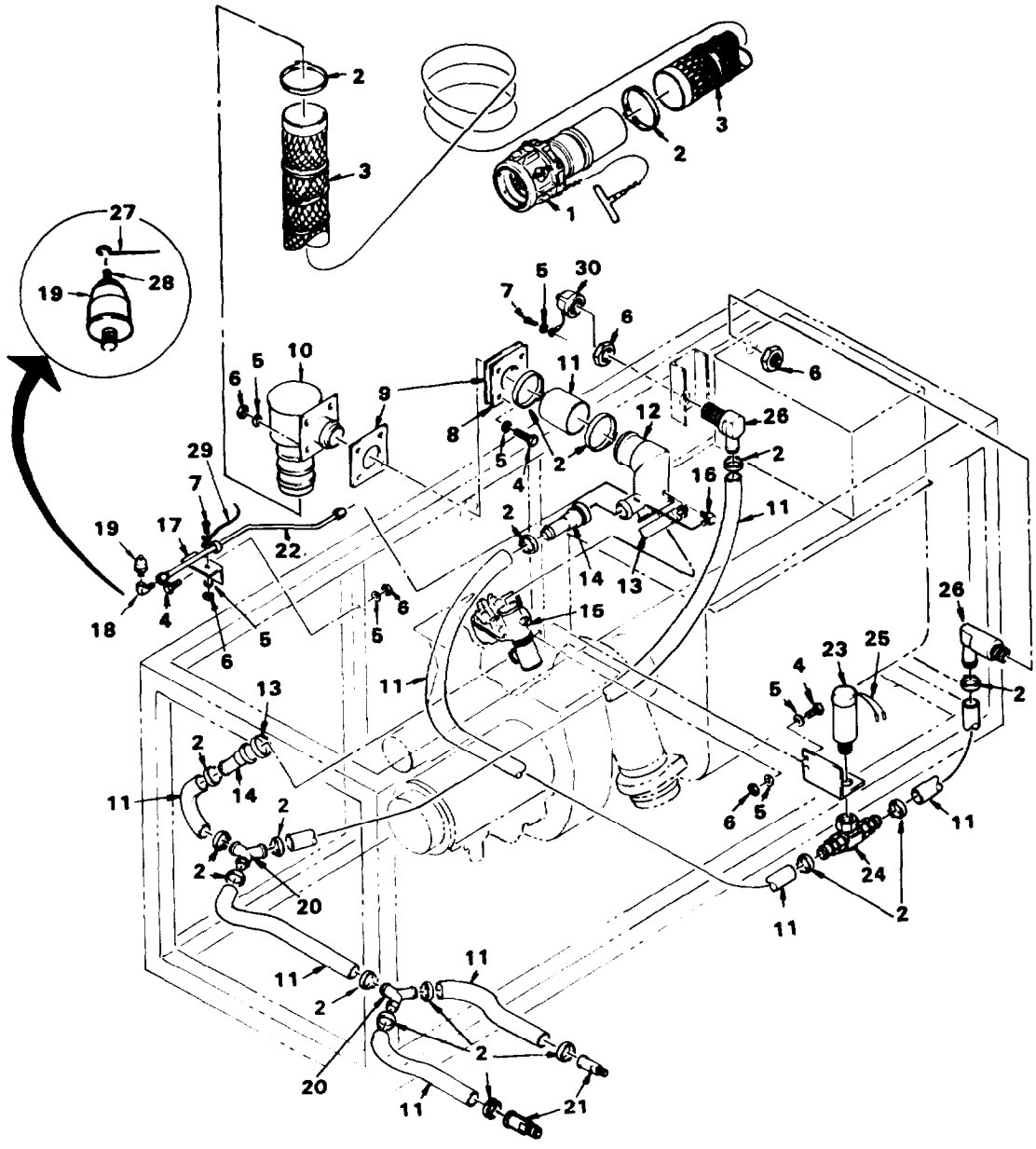
(6) Loosen marmon clamp (1, Figure 4-55) and remove manifold (12) from LCV (15).

(7) Loosen marmon clamp (1, Figure 4-56) holding LCV.

(8) Remove LCV (2).

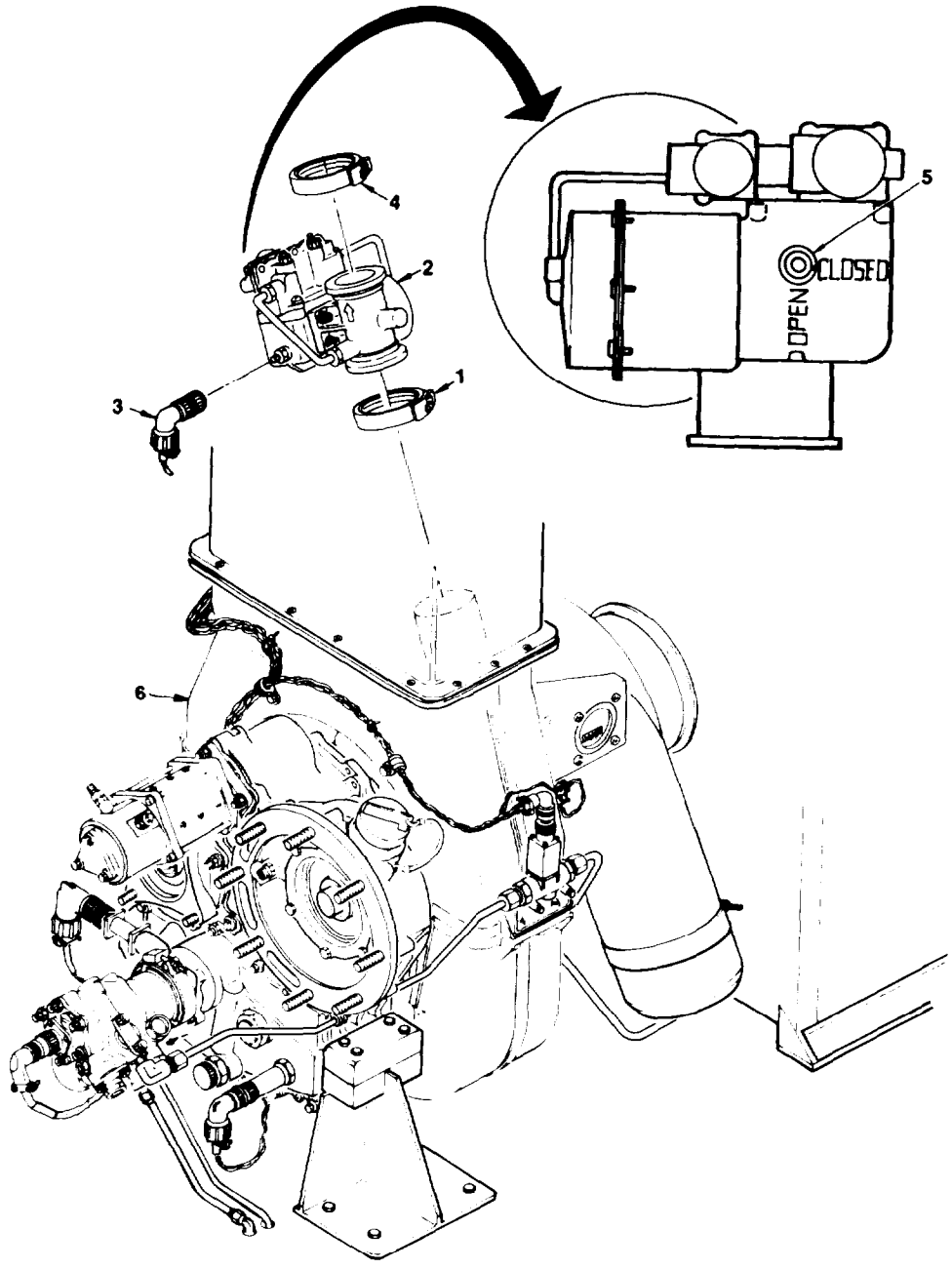
c. Install. (See Figure 4-55).

(1) Position LCV on engine and install marmon clamp (1, Figure 4-56). Tighten clamp to 40 inch-pounds of torque.



1. COUPLER
2. CLAMP, HOSE
3. HOSE, PNEUMATIC
4. BOLT
5. WASHER
6. NUT
7. SCREW
8. FLANGE
9. GASKET, BULKHEAD
10. ELBOW, BULKHEAD
11. HOSE
12. MANIFOLD, LCV ADAPTER
13. CLAMP, MARMON
14. FLANGE, ADAPTER
15. LCV
16. FITTING
17. BRACKET
18. ELBOW
19. TRANSDUCER, PRESSURE
20. Y FITTING
21. FITTING, AIR CLEANER
22. TUBE ASSEMBLY
23. SOLENOID HOUSING
24. VALVE
25. ELECTRICAL LEADS
26. ELBOW, BULKHEAD
27. WIRE
28. TERMINAL
29. WIRE, GROUND
30. CAP

Figure 4-55. Pneumatic System



12-4-56

1. CLAMP, MARMON
2. LCV
3. ELECTRICAL CONNECTOR
4. CLAMP, MARMON
5. INDICATOR
6. ENGINE

Figure 4-56. Load Control Valve (LCV)

(2) Connect electrical connector (3) to LCV and lockwire.

(3) Install marmon clamp (13, figure 4-55) and manifold (12) on LCV. Tighten clamp to 40 inch-pounds of torque.

(4) Connect tube assembly (22) to fitting (16) on manifold (12).

(5) Connect two hoses (11) to manifold (12), and tighten clamps (2).

(6) Reinstall cover and roof.

4-76. PNEUMATIC HOSES AND FITTINGS.

a. Inspect. (See figure 4-55.)

(1) Remove roof (paragraph 4-16), engine access cover and exhaust access cover (paragraph 4-15).

(2) Inspect hoses (3 ,11) for cracks or splits.

(3) Check that all hoses (3,11) are securely attached to fittings and secured with clamps (2).

(4) Check 18 hose clamps (2) for 65 plus or minus 5 inch pounds of torque.

b. Remove. (See figure 4-55.)

(1) To remove hoses (3,11) loosen clamp (2) on each end of hose and remove hose. Save clamps for installing replacement hose.

(2) To remove bulkhead elbow (10), first loosen hose clamp (2) on each fitting and disconnect hoses (3,11), then remove four bolts (4), washers (5), and nuts (6) to allow removal of elbow (10), gaskets (9) and flange (8).

c. Install. (See figure 4-55.)

(1) To install hoses (3,11) slip loosened clamps (2) on hose and install hose on fittings. Position clamps and torque to 65 plus or minus 5 inch pounds.

(2) To install bulkhead elbow (10), install gaskets (9) and flange (8), and then install elbow (10) with four bolts (4), washers (5), and nuts (6).

(3) Reinstall roof and panels.

4-77. **SOLENOID VALVE, BLEED AIR.**

NOTE

See table 4-2, Malfunction 62 (step 10) for test.

a. Inspect. (See figure 4-57.)

(1) Remove exhaust and engine access covers (paragraph 4-15).

(2) Inspect hose (2) for cracks or tears. No cracks or tears are allowed. Ensure that hose clamp (1) is tight.

(3) Inspect solenoid wiring (4) for cut or abraded insulation. Repair wiring if damaged.

(4) Inspect solenoid cap (7), case (11) and valve body (3) for dents or cracks. No dents or cracks are allowed.

b. Remove. (See figure 4-57.)

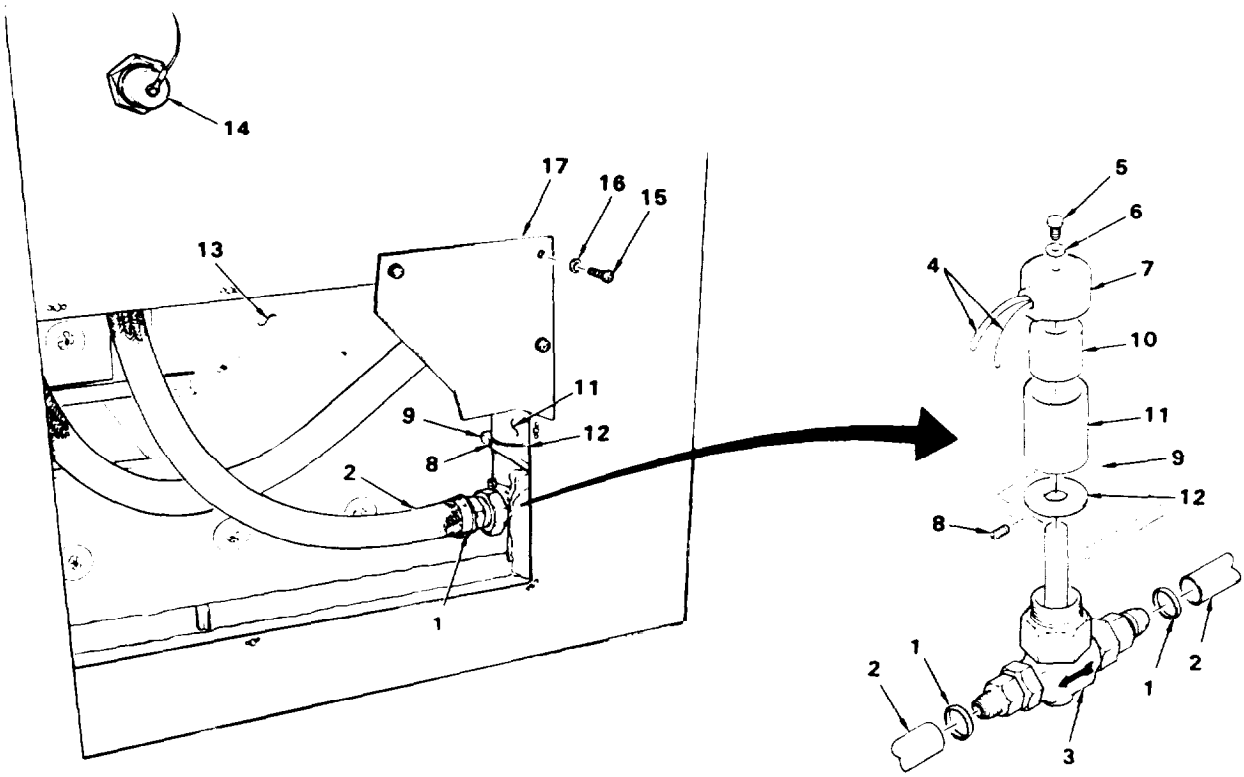
(1) Remove exhaust access cover and engine access cover (paragraph 4-15).

(2) Loosen hose clamps (1) on hoses (2) connecting to. valve body (3) and disconnect hoses from valve body.

(3) Disconnect two wires (4) by cutting at splice.

(4) Remove screw (5) and washer (6) from cap (7).

(5) Remove solenoid case (11) and winding (10) from valve body (3), and remove washer (12).



1.	CLAMP, HOSE	7.	CAP	13.	EXHAUST EJECTOR
2.	HOSE	8.	SETSCREW	14.	DEICER OUTLET CAP
3.	VALVE WIRING BODY	9.	BRACKET	15.	SCREW
4.	WIRING	10.	SOLENOID WINDING	16.	WASHER
5.	SCREW	11.	CASE	17.	COVER, ACCESS
6.	WASHER	12.	WASHER		

Figure 4-57. Solenoid Valve, Bleed Air

(6) Loosen setscrew (8) installed in bracket (9).

(7) Remove valve body (3).

c. Install. (See figure 4-57.)

(1) Install valve body (3) through bottom of hole on bracket, and install washer (12). Ensure that arrow on valve body is pointing toward front of AGPU.

(2) Install setscrew (8) through threaded hole in bracket (9) to hold valve.

(3) Install solenoid case (11), winding (10), and cap (7) over valve fitting and secure with screw (5) and washer (6). Ensure that wiring out of cap is as shown in figure 4-57.

(4) Reconnect wiring (4).

(5) Install hoses (2) on valve body (3) fittings and secure with clamps (1).

(6) Install two access covers.

4-78. PRESSURE TRANSDUCER.

NOTE

See table 4-2, Malfunction 100 for test.

a. Inspect. (See figure 4-55.)

(1) Inspect pressure transducer (19) for cracks or dents. No cracks or dents are allowed.

(2) Inspect tube assembly (22) and fitting (16) and elbow (18) for cracks or bent tubing. Replace if damaged.

b. Remove. (See figure 4-55.)

(1) Disconnect wire (27) from transducer (19) by unsoldering wire from terminal (28).

(2) Remove transducer (19) by unthreading from elbow (18).

c. Install. (See figure 4-55.)

(1) Thread transducer (19) onto elbow (18).

(2) Solder wire (27) to transducer terminal (28).

4-79. PNEUMATIC OUTPUT HOSE AND COUPLER.

a. Remove. (See figure 4-55.)

(1) Loosen clamp (2) to remove coupler (1). Save clamp for installing replacement coupler.

(2) Remove hose (3) from bulkhead elbow (10) by loosening clamp (2). Save clamp for installing replacement hose.

b. Install. (See figure 4-55.)

(1) To install hose (3), slip clamp (2) on hose and install hose on bulkhead elbow (10). Position clamp and tighten securely.

(2) To install coupler (l), slip clamp on hose (3) and install hose on coupler. Position clamp and tighten securely.

Section XIII. MAINTENANCE OF IGNITION SYSTEM

4-80. GENERAL. The ignition system, figure 4-58, consists of: an ignition unit, an igniter plug, a starter assembly, control circuits, switches, relays, and contactors.

a. Ignition Unit and Igniter Plug. The ignition unit, figure 4-59, is energized by application of +28 vdc from the ECU control circuit. Power (+28 vdc) is applied to an ECU Al driver and limiter when the ENGINE CONTROL switch is set to START/RUN positions. Note that an electronic switch in the ECU prevents power from being applied to the ignition unit until the engine reaches 10% speed during the start cycle. Another switch in the ECU removes power from the ignition unit when the engine reaches 95% speed. When energized, the ignition unit provides intermittent high voltage pulses to create a spark across the air gap of the igniter plug. The igniter plug ignites the air/fuel mixture in the engine combustion chamber during the start cycle.

b. Starter Assembly. The starter is energized by a starter contactor when the ENGINE CONTROL switch is set to START position. The circuit path, figure 4-59, that energizes the starter contactor is from the battery, through a 10 AMPS circuit breaker, through the ENERG STOP switch (normally closed), through the latched contacts of relay K2, to the ECU. The +28 vdc is applied to A2 driver and limiter circuit in the ECU through an electronic switch that opens when the engine reaches 60% speed during the start cycle. The circuit path to ground through the starter contactor coil is through auxiliary contacts on four control switches: DC POWER, AC POWER, PNEUMATIC POWER, and HYD MAIN POWER. All four of these switches must be set to the OFF position to provide a ground circuit.

4-81. **IGNITER PLUG.**

a. Remove. (See figure 4-58.)

(1) Open engine access door (12, figure 1-1).

(2) Cut and remove lockwire on igniter plug lead.

(3) Disconnect igniter plug lead (1) from igniter plug (2).

(4) Remove igniter plug (2) and washer (3).

b. Inspect. (See figure 4-58.)

(1) Inspect ceramic insulation of igniter plug (2) for cracks and chips. No cracks or chips are allowed.

(2) Inspect electrode for distortion and erosion. Electrode shall not be less than 0.010 inch above ceramic insulator. Replace igniter plug if electrode is distorted or eroded.

(3) Inspect connector for damaged or burned contact, and damaged or worn threads. No damage, burned contacts, or worn threads are allowed.

(4) Inspect housing for cracks. No cracks are allowed.

c. Install. (See figure 4-58.)

(1) Coat threads of igniter plug (2) with high temperature compound MIL-A-907 (Fel-Pro (C5-A).

(2) Install igniter plug (2) with washer (3). Tighten igniter plug to a torque value of 100 inch-pounds.

(3) Connect igniter plug lead (1) to igniter plug (2) and tighten to a torque value of 35 inch-pounds. Lockwire igniter plug lead.

4-82. **IGNITER PLUG LEAD.**

a. Inspect. (See figure 4-58.)

(1) Inspect coupling nuts on igniter plug lead (1) for cracks, corrosion, and damaged threads. No cracks, or damaged threads are allowed.

(2) Inspect outer shielding for chafing. Check for cracks or separation between shielding and terminal end. No cracks or separations are allowed.

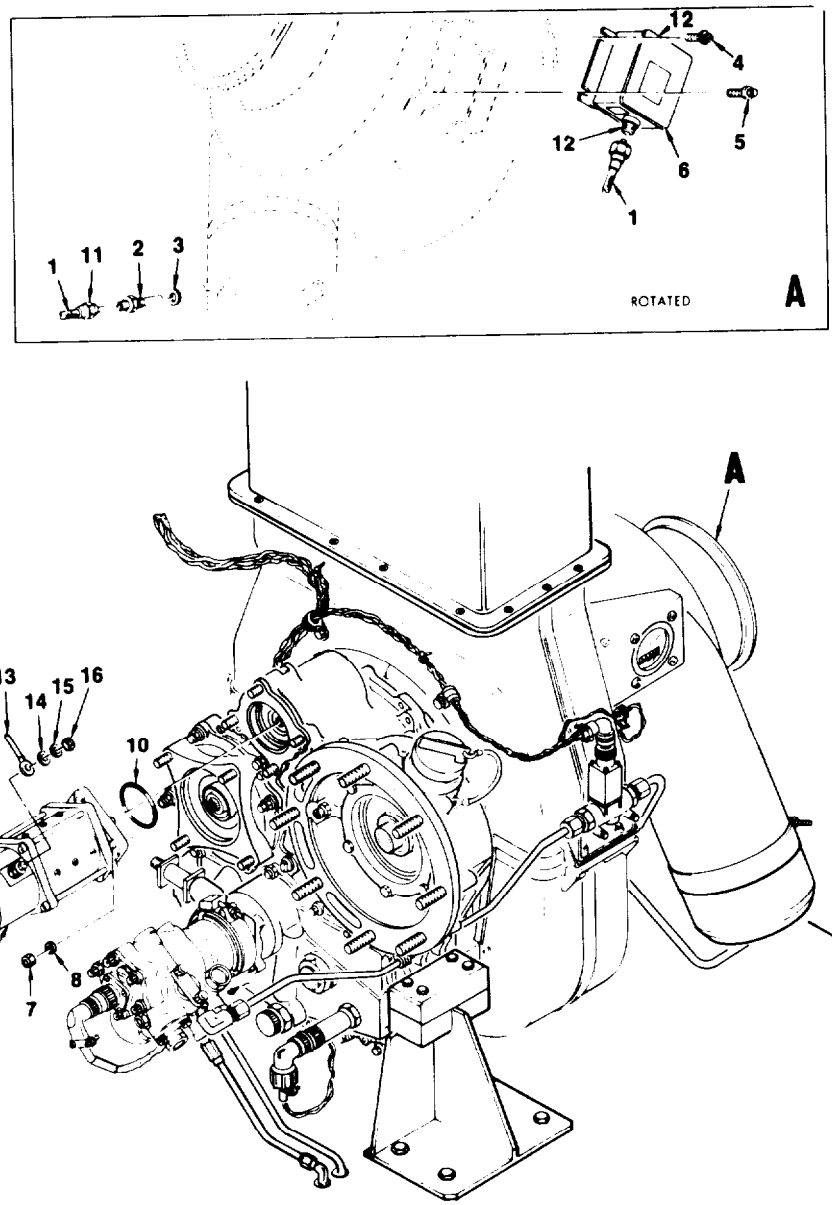
b. Remove. (See figure 4-58.)

(1) Cut and remove lockwire on both connectors.

(2) Loosen both coupling nuts.

(3) Disconnect igniter plug lead (1) from igniter plug (2) and ignition unit (6).

(4) Inspect teflon or silicone grommet (11) that surrounds insulation for cracks and distortion. No cracks or distortion are allowed.



1. IGNITER PLUG LEAD
2. IGNITER PLUG
3. WASHER
4. BOLT
5. BOLT
6. IGNITION UNIT
7. NUT
8. WASHER
9. STARTER ASSEMBLY
10. PACKING
11. INSULATOR GROMMET
12. CONNECTOR
13. ELECTRICAL LEAD
14. WASHER, FLAT
15. WASHER, LOCK
16. NUT

Figure 4-58. Engine Ignition System Components

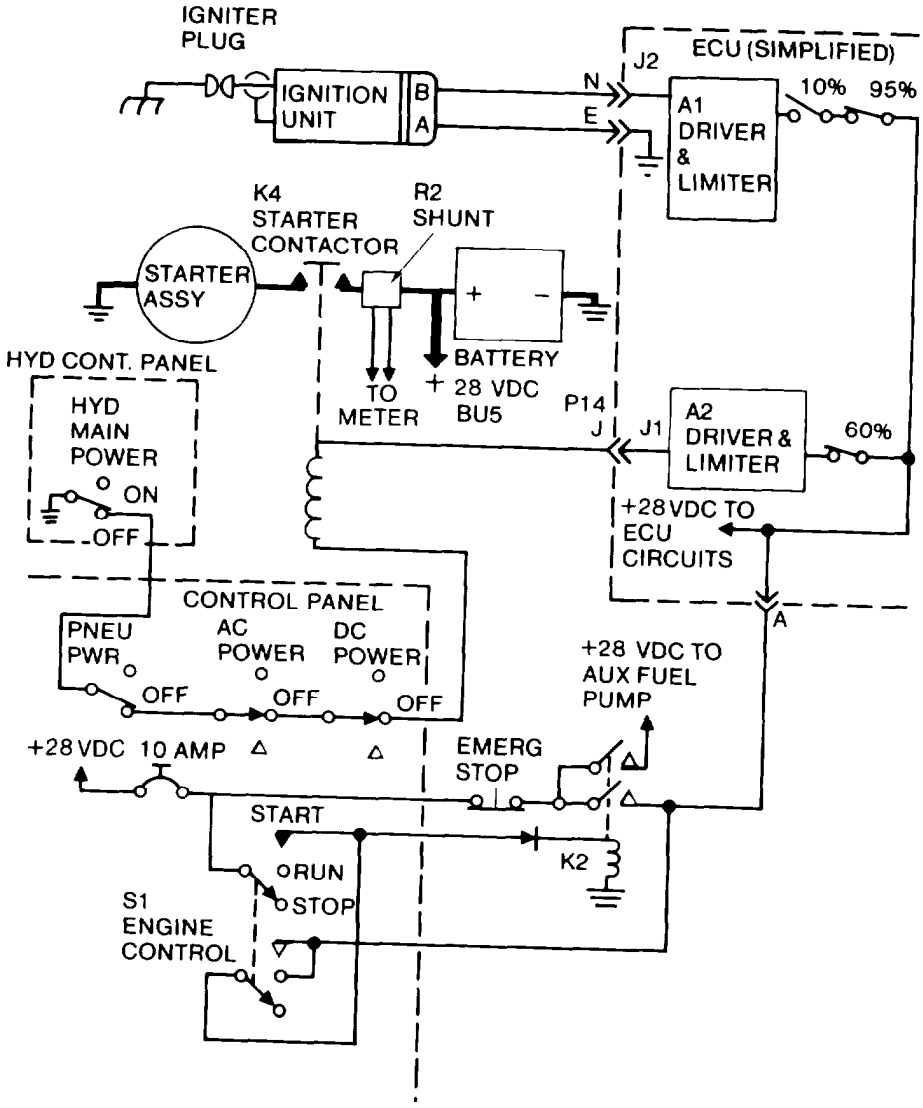


Figure 4-59. Ignition and Starter Circuits

c. Install. (See figure 4-58.)

(1) Connect igniter plug lead (1) to igniter plug (2) and ignition unit (6). Tighten hand tight.

(2) Tighten both connectors of igniter plug lead to a torque value of 35 inch-pounds. Lockwire both connectors.

4-83. IGNITION UNIT.

NOTE

See table 4-2, Malfunction 96 for test.

a. Inspect. (See figure 4-58.)

(1) Remove engine access cover (paragraph 4-15).

(2) Inspect case of ignition unit (6) for dents or cracks. No dents or cracks are allowed.

(3) Inspect brackets on ignition unit for cracks and security of mounting. No cracks are allowed.

(4) Inspect electrical connectors (12) for burned or damaged contacts, and worn or damaged threads. No damage is allowed.

b. Remove. (See figure 4-58.)

(1) Disconnect electrical connector and igniter plug lead (1) from ignition unit (6).

(2) Remove bolts (4,5) and ignition unit (6) from brackets on turbine plenum assembly.

c. Install. (See figure 4-58.)

(1) Apply a light coat of high temperature compound MIL-A-907 (Fel-Pro C5-A) to threads of bolts (4,5).

(2) Place ignition unit (6) on brackets and secure with bolts (4,5). Tighten bolts to a torque value of 50 inch-pounds.

(3) Connect electrical connector and igniter plug lead (1) to ignition unit (6). Tighten igniter plug connector to a torque value of 35 inch-pounds. Lockwire igniter plug lead.

4-84. STARTER ASSEMBLY.

NOTE

See table 4-2, Malfunction 15 (step 3) for test.

a. Remove. (See figure 4-58.)

(1) Remove roof (paragraph 4-16).

(2) Tag starter assembly electrical leads.

(3) Disconnect two electrical leads (13) from starter assembly (9) by removing two nuts (16), lockwasher (15), and flat washers (14).

(4) Remove nuts (7) and washers (8).

(5) Remove starter assembly and packing (10). Discard packing.

(6) Inspect sprag clutch for damage, and check for rough rotation in the overrunning direction. If rotation is rough, or if the clutch is seized, it must be replaced. Notify maintenance supervisor.

b. Install. (See figure 4-58.)

(1) Install new packing (10) in place on starter assembly (9).

(2) Apply a light coat of anti-seize compound MIL-L-25681 (Liqui-Moly NV) to the threads of nuts (7).

(3) Install starter assembly and secure with washers (8) and nuts (7). Tighten nuts to a torque value of 100 inch-pounds.

(4) Reconnect two electrical leads (13) to starter assembly, using tags for identification.

(5) Install two flat washers (14), lockwashers (15), and nuts (16).

(6) Install roof (paragraph 4-16).

Section XIV. MAINTENANCE OF LUBRICATION SYSTEM

4-85. GENERAL.

a. The engine lubrication system, figure 4-60, is comprised of a rotary oil pump assembly, an oil pressure regulating valve, an oil filter element, an oil distribution manifold, a pickup and strainer, a sight level indicator, and two magnetic drain plugs. Also associated with the lubrication system are a low oil pressure switch, and a high oil temperature switch (covered in paragraphs 4-41 and 4-42).

b. The rotary oil pump assembly is located in the oil pump housing on the gearcase assembly. The pump assembly receives oil from the oil sump through a suction tube connected to a pickup and strainer. The pump supplies oil under pressure to the oil pressure regulating valve, which regulates the oil pressure to 35 to 55 psig by bypassing some of the oil back to the oil sump.

c. Oil is routed to an oil distribution manifold through a replaceable oil filter element. The oil distribution manifold is mounted in the compressor section and delivers oil to the meshing points of the planetary gear system. Oil is routed through internal passages to provide lubrication at the main shaft bearings, gear meshing points, and the starter clutch. Oil from the lubrication points flows back into the oil sump to replenish the constantly circulating oil supply.

4-86. OIL FILTER ELEMENT AND SEALS.

a. Remove. (See figure 4-61.)

(1) Cut and remove lockwire from oil pressure tap plug (1).

(2) Place container under filter cover to catch draining oil.

(3) Remove oil pressure tap plug (1) with packing (2) from filter cover (5) Discard packing (2).

(4) Remove two bolts (3), washers (4), filter cover (5), with packings (6, 8), and oil filter element (7). Discard packings (6, 8) and oil filter element (7).

b. Inspect.

(1) Inspect oil filter element (7) for metal particles and other foreign material which may indicate internal engine damage. If metal particles are present, change oil and oil filter element, and then operate engine for a minimum of 15 minutes. If oil filter element is free of metal particles or foreign material, engine is acceptable for continued service.

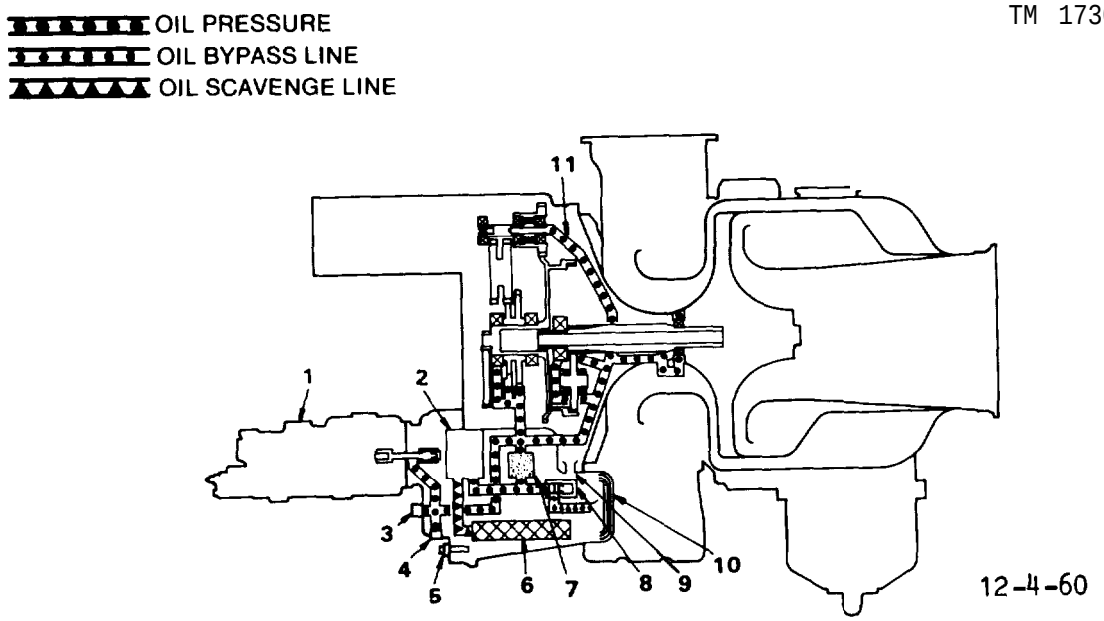
(2) If metal particles or foreign material is present on oil filter element after 15 minutes of operation, internal damage is indicated. Notify maintenance supervisor.

(3) Inspect filter cover packing grooves for nicks, scratches, or burring. No damage is allowed.

c. Install. (See figure 4-61.)

(1) Install new oil filter element (7), new packings (6, 8), and filter cover (5) into oil filter housing.

(2) Attach filter cover (5) with two washers (4) and bolts (3). Tighten bolts to a torque value of 50 inch-pounds.



1. FUEL CONTROL ASSEMBLY
2. ROTARY PUMP ASSEMBLY
3. LOW OIL PRESSURE (LOP) SWITCH
4. HIGH OIL TEMP (HOT) SWITCH
5. MAGNETIC DRAIN PLUG (2)
6. SCAVENGE SCREEN PICKUP AND STRAINER
7. OIL FILTER ELEMENT
8. OIL PRESS REG VALVE
9. RETURN OIL
10. COOLING FINS
11. OIL DISTRIBUTION MANIFOLD

Figure 4-60. Lubrication System Schematic

(3) Install oil pressure tap plug (1), with new packing (2) into filter cover (5). Lockwire plug.

NOTE

After replacing oil filter element, engine oil supply must be replenished.

4-87. SIGHT LEVEL INDICATOR.

a. Remove. (See figure 4-61.)

(1) Drain oil to a level below sight level indicator (9).

(2) Disconnect fuel line (13) at both ends and move it down to gain access to sight level indicator.

(3) Cut and remove lockwire from sight level indicator.

(4) Remove sight level indicator (9) and packing (10). Discard packing.

b. Install. (See figure 4-61.)

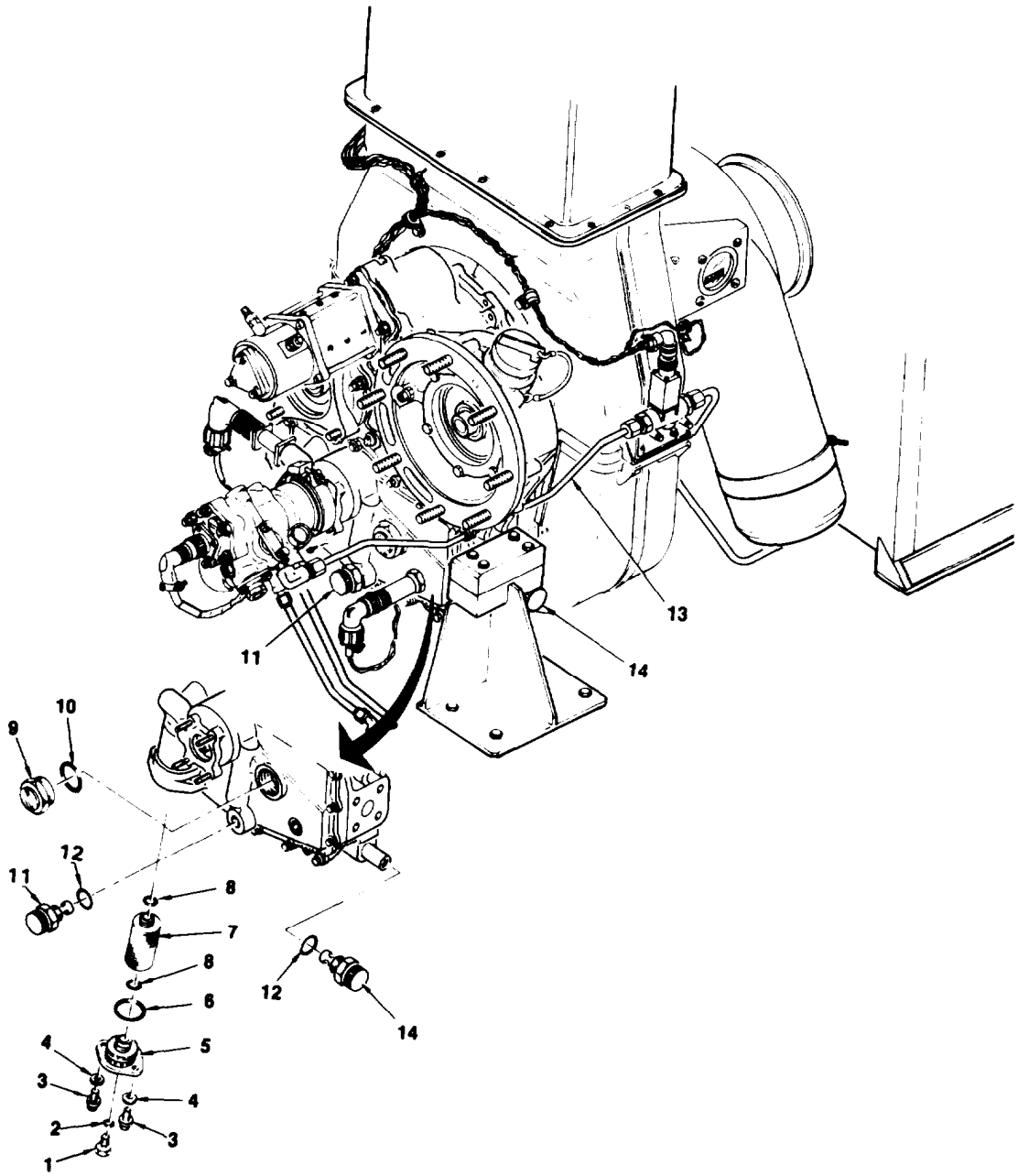
(1) Install sight level indicator (9) with new packing (10).

(2) Lockwire sight level indicator.

(3) Connect fuel line (13) at both ends.

NOTE

After replacing sight level indicator, engine oil supply must be replenished.



1. TAP PLUG
2. PACKING
3. BOLT
4. WASHER
5. FILTER COVER
6. PACKING
7. FILTER ELEMENT
8. PACKING
9. SIGHT LEVEL INDICATOR
10. PACKING
11. MAGNETIC DRAIN PLUG (GEARCASE)
12. PACKING
13. FUEL LINE
14. MAGNETIC DRAIN PLUG (OVERFLOW TUBE)

Figure 4-61. Engine Lubrication System Components

4-88. MAGNETIC DRAIN PLUG.

Inspect. (See figure 4-61.) Inspect drain plugs (11, 14) for proper installation.

b. Remove. (See figure 4-61.)

NOTE

There are two drain plugs. Drain plug (11) is used to drain qear-case, while drain plug (14) is used to drain overflow tube in gearcase.

(1) Remove drain plugs (11, 14) by pushing in and turning counterclockwise (ccw) to unlock plug.

(2) Inspect packing (12), and replace if damaged.

c. Install. Install drain plugs (11, 14) by pushing in and turning clockwise (cw) to lock.

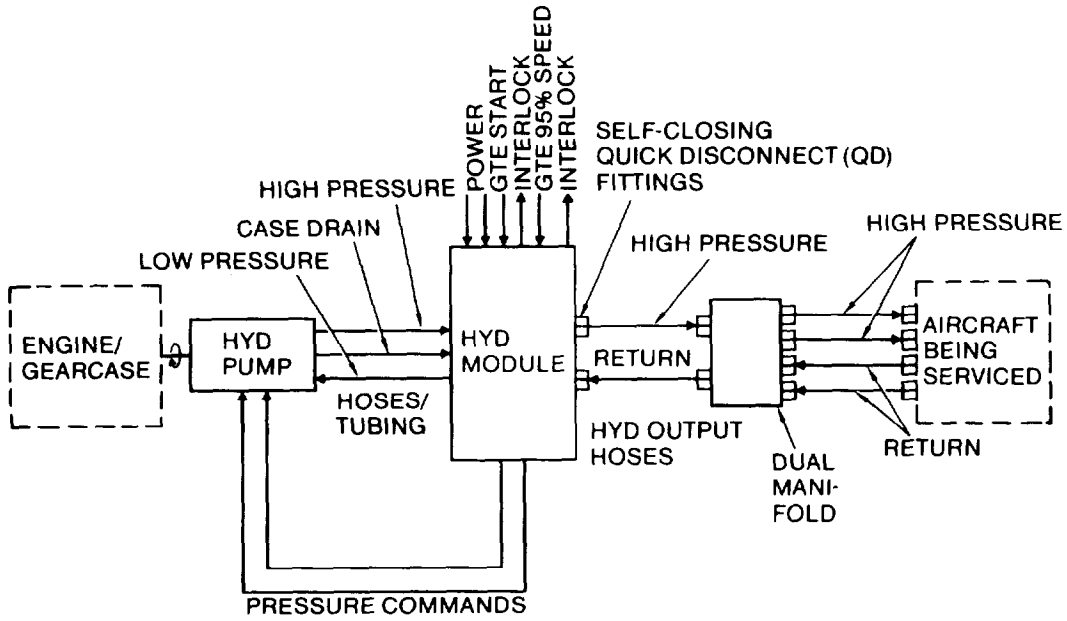
Section XV. MAINTENANCE OF HYDRAULIC SYSTEM

4-89. GENERAL. The hydraulic system, figure 4-62, consists of: a hydraulic pump (mounted on engine gearcase), a hydraulic module, a dual manifold, and hydraulic hoses and lines.

The hydraulic system provides adjustable high pressure hydraulic power up to 3,300 psig at 15 gpm to an aircraft. This hydraulic power can be used to drive aircraft hydraulic systems, fill aircraft reservoirs, or flush aircraft hydraulic systems. Output pressure to the aircraft is adjusted by the operator at the hydraulic module control panel. Hydraulic pressure, once set, remains constant regardless of the flow rate demanded by the aircraft (up to the maximum flow rate of 15 gpm). The hydraulic system uses fluid MIL-H-83282, or MIL-H-5606. Fluid MIL-H-83282 is limited to low temperature of -40°F.

a. Hydraulic Pump. The hydraulic pump (with pressure compensation controls enclosed) bolts to the engine/gearcase pump mounting pad. The pump is driven by the enqine/gearcase at approximately 8,000 rpm. For units not requiring hydraulic power, a spacer is provided to bolt between the engine/gearcase and pump. This spacer disconnects the pump from the drive gear. This eliminates unnecessary wear on pump, and reduces load on engine (since the pump must maintain a minimum 500 psig pressure for self-lubrication). The hydraulic system must never be operated without sufficient hydraulic fluid, or pump will be damaged. The pump receives a low pressure fluid from the hydraulic module reservoir and supplies high pressure hydraulic power. The pump is designed to allow hydraulic fluid to leak through the bearings for cooling and lubrication. This fluid is routed from the pump case drain back to the reservoir. The pump receives electrical commands, set by the operator, from the hydraulic module control panel for an increase or decrease of output fluid pressure.

b. Hydraulic Module. The hydraulic module, figure 4-63, contains all controls (fluid and electrical) for the hydraulic system. The module contains a nin -gallon reservoir with attachments for manual filling, and draining, overflow, and removal of moisture from vent air that enters as fluid level changes. High pressure (3 micron) and return (10 micron) filters have throw-away elements. The filters have built-in electrical circuits that illuminate the CHANGE FILTER light on the control panel when the filter elements need changing.



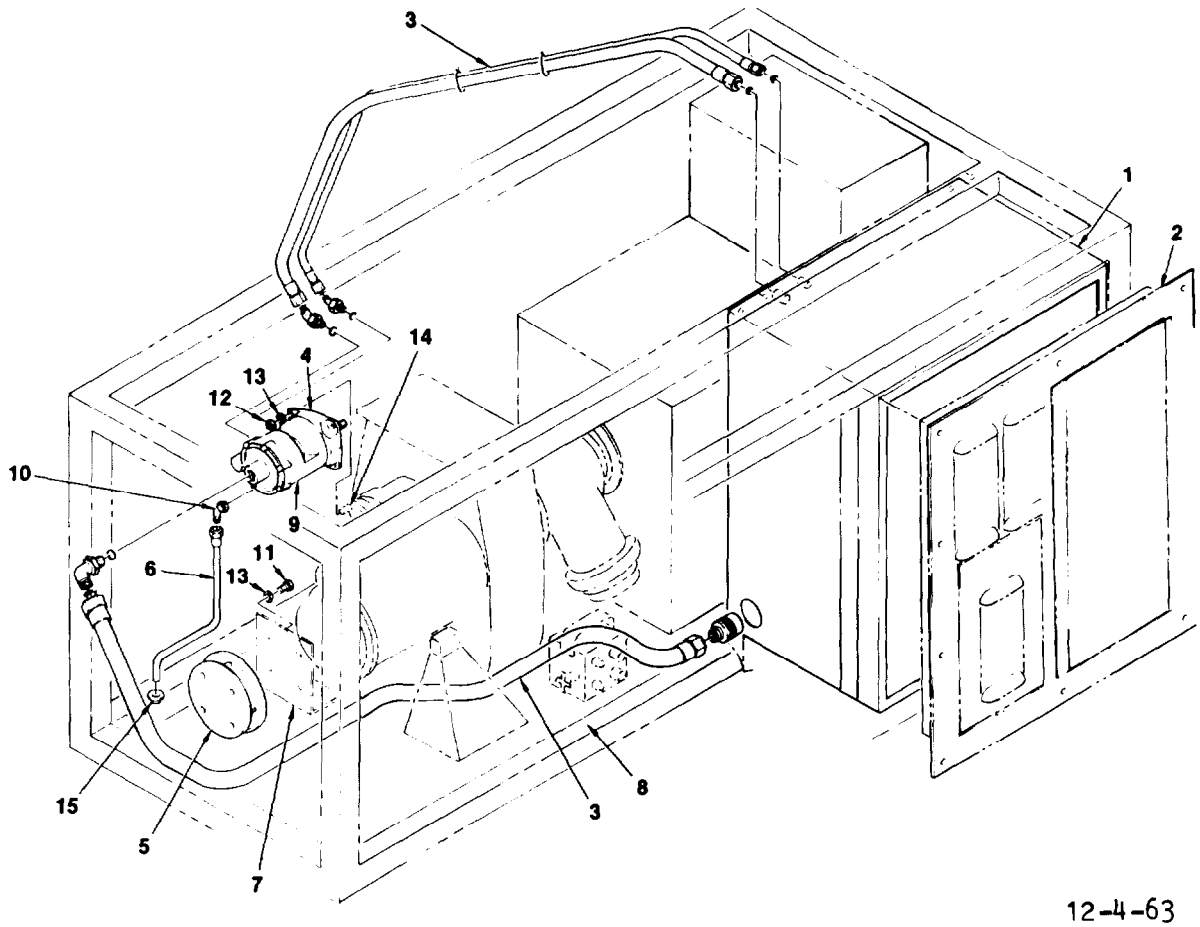
NOTE: DUAL MANIFOLD NOT USED FOR SERVICING CH-47 CHINOOK AIRCRAFT. TWO SPECIAL ADAPTER HOSES (2 FOOT) ARE PROVIDED TO MATCH HIGH PRESSURE AND RETURN HOSES TO CH-47 CONNECTORS.

Figure 4-62. Hydraulic System, Simplified

c. Dual Manifold. A separate dual manifold, figure 4-64, is included in the hydraulic system to accommodate the need for dual outlet and return connections. The single input is branched to two equal output lines, and two returns are combined into a single return path. Valves and fluid ports are provided for filling and draining hoses. If dual manifold is damaged beyond repair, replace with a serviceable unit.

d. Hoses and Lines. Plumbing between the pump and module consists of fixed tubing with sections of hose at the end near the pump. The hoses between the hydraulic module and dual manifold are 30 feet long. The output (high pressure) hose is 1/2-inch diameter and the return (low pressure) hose is 3/4 inch diameter. The four (two output and two return) adapter hoses are ten feet long.

e. Hydraulic System Function. The most common hydraulic system operating mode is that of supplying hydraulic power to an aircraft. The hydraulic flow diagram for this mode is on foldout FO-10. A schematic of the hydraulic system electrical controls and indicators is shown on figure FO-9. Hydraulic flow diagrams for other modes of operation are shown on figures FO-11 (servicing aircraft using aircraft reservoir), figure FO-12 (warming fluid in module), figure FO-13 (warming fluid in hoses), and figure FO-14 (bleeding air).



1. HYDRAULIC MODULE
2. FRONT PANEL ASSEMBLY
3. HOSES
4. HYDRAULIC PUMP
5. SPACER
6. DRAIN TUBE
7. STORAGE BRACKET
8. ENGINE COMPARTMENT
9. ELECTRICAL CONNECTOR, P16
10. PUMP FITTING
11. BOLT
12. NUT
13. WASHER
14. GEARCASE PAD
15. GROMMET

Figure 4 -63. Hydraulic Module, Pump, Lines and Hoses

(1) As seen on figure FO-10, hydraulic fluid from the AGPU reservoir is routed through a reservoir selector valve and passes four temperature sensors to the hydraulic pump. The temperature sensors (TS1 through TS4 on figure FO-9) are set to close at various temperatures. The 70°F sensor (TS1) causes SYSTEM READY light DS5 to illuminate. This indicates that the hydraulic fluid is at the minimum temperature for operation. Sensors TS2 and TS3 illuminate 1600F and 2400F indicator lights. If hydraulic fluid reaches 275OF, TS4 activates to illuminate HI TEMP light. Activation of TS4 also interrupts the circuit to the load valve pilot solenoid, and shuts down hydraulic power to aircraft.

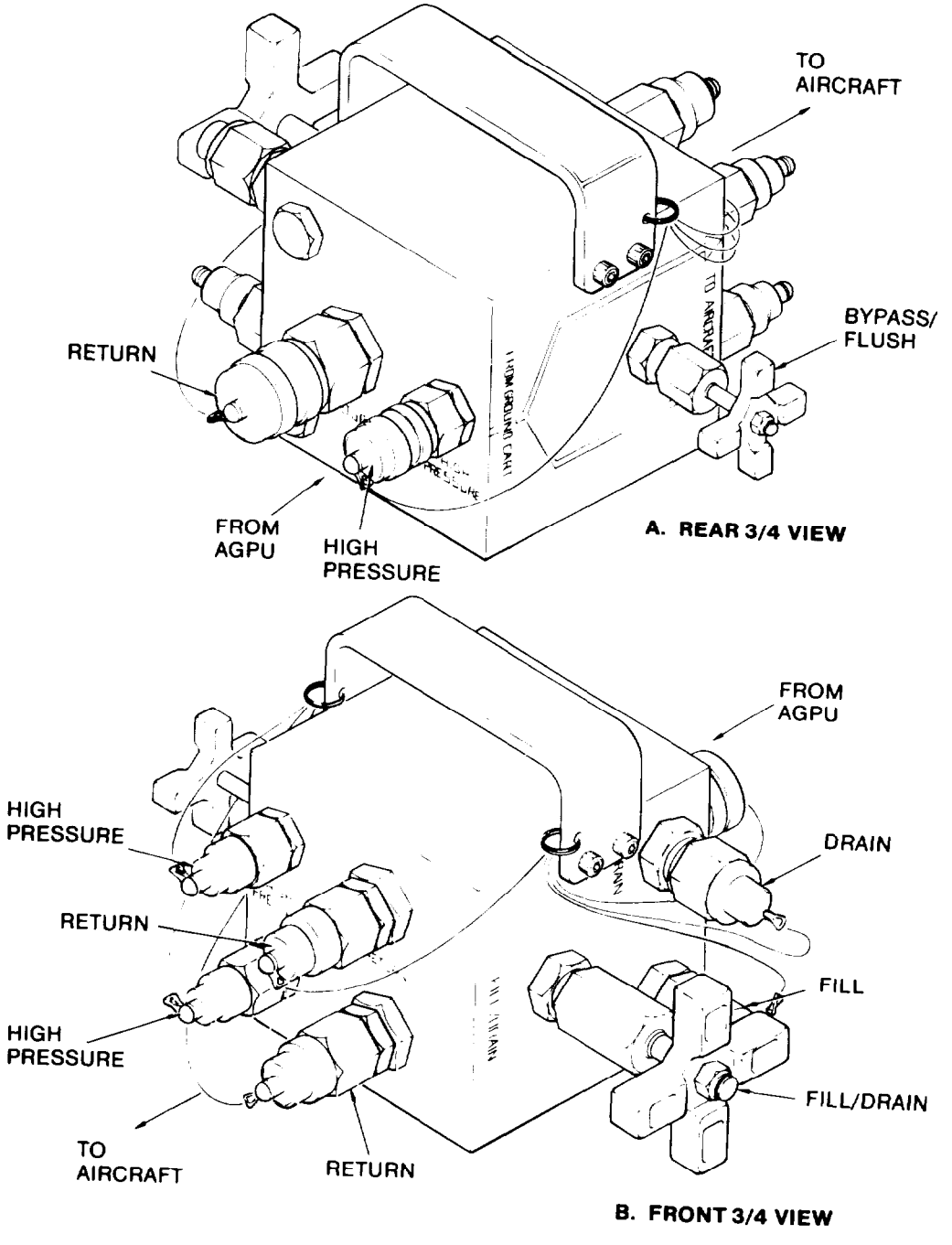


Figure 4-64. Dual Manifold

(2) The pump provides hydraulic pressure as commanded by the PRESSURE switch, figure FO-9. The two pressure command lines to the pump carry 28 vdc which positions the pressure adjustment mechanism inside the pump. When output connector pin G is at 28 vdc (pin H is the return) the pump mechanism operates to increase pressure. When the applied voltage is reversed on the pump input leads, the mechanism operates to decrease pressure. The PRESSURE switch is spring loaded to its unconnected center position. So the pump pressure mechanism remains in the last position it was set to by the operator unless power to the hydraulic module is turned off. When POWER switch S1 is set to OFF, output connector pin H is connected to 28 vdc and pin G becomes the return line. This causes the pump pressure mechanism to move to the position of minimum pressure (500 psig).

(3) Prior to servicing an aircraft the PRESSURE RELIEF valve (figure FO-10) is set to the maximum allowable pressure for that particular aircraft. If the operator increases the pump pressure beyond the allowable maximum, the PRESSURE RELIEF valve will open to prevent excess pressure.

(4) A high and low pressure filter is provided to remove any solid contamination in the hydraulic fluid. A switch is connected across each filter. If the filter gets dirty and the difference between input and output fluid pressure exceeds 50 psi the switch closes. As shown on figure FO-9, closure of either pressure switch DS1 or DS2 causes the REPLACE FILTER light to illuminate.

(5) The accumulator, figure FO-10, stores hydraulic pressure and reduces pressure fluctuations at aircraft input ports. The OUTPUT PRESSURE gauge provides the operator with an indication of pressure being applied. The HIGH PRESSURE BYPASS valve provides a path for circulation of hydraulic fluid when either the load valve is closed or when hoses to the aircraft (or dual manifold) are not connected. Restrictions in the HIGH PRESSURE BYPASS valve line and in the dual manifold bypass line provide a back-pressure of 500 psi when the bypass valve is open. This back-pressure is required for proper pump operation.

(6) Application of hydraulic power to the aircraft is controlled by the load select valve. As shown in figure 4-65, operation of the load select valve involves three steps as follows:

(a) OUTPUT switch S4 is set to ON which applies 28 vdc to the pilot valve solenoid and OUTPUT ON indicator.

(b) Activation of the solenoid pushes the pilot valve against the spring allowing high pressure fluid to be applied to the load valve.

(c) Fluid pressure pushes the load valve against its spring allowing hydraulic system output to be applied to the aircraft.

(7) When the OUTPUT switch is set to OFF, the solenoid, pilot and load valves all return to their original positions and the fluid pressure trapped between the valves is released back to the reservoir. The output and return hoses are each 30 feet in length. The output hose is 1/2 inch in diameter and the return hose is 3/4 inch. Quick disconnects containing check valves on each end hold the fluid in the hose so it will not drain out between uses. Protective caps are attached to keep quick disconnect fittings clean when hoses are not in use.

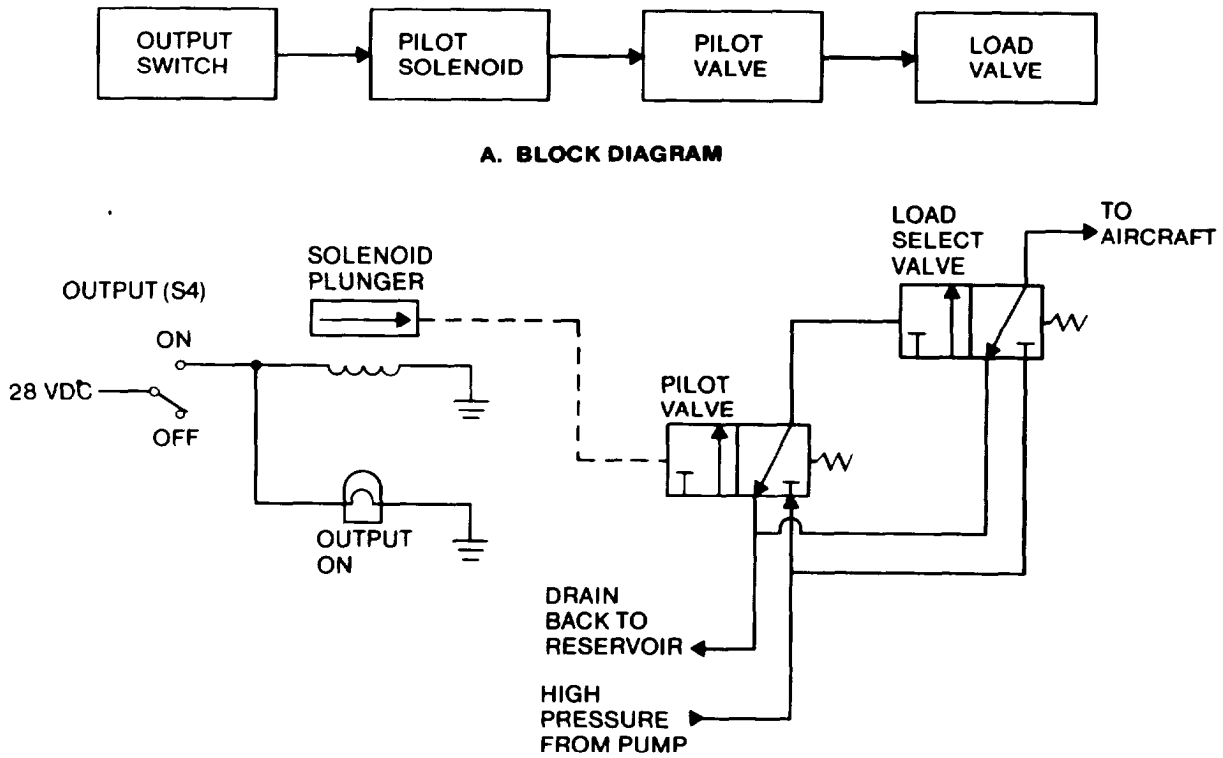


Figure 4-65. Load Valve Operation

(8) The dual manifold is provided because some aircraft require two high pressure and two return connections. This need is satisfied by dual connections on the manifold and the use of lo-foot adapter hoses. The dual manifold provides additional fill and drain ports and valves. Quick disconnects with check valves minimize fluid loss.

(9) Return line components include the RETURN BYPASS valve and heat exchanger. The RETURN BYPASS valve (when set to the OFF position) provides 65 psi of back-pressure to the aircraft. This is required for proper servicing of certain aircraft. In the BYPASS position, no back-pressure is provided. The heat exchanger cools the hydraulic fluid by transferring heat from the fluid to ambient air. The heat exchanger is located at the back of the hydraulic module allowing for escape of heated air. A 10 psi relief valve is parallel to the heat exchanger to allow cool fluid to bypass the heat exchanger. This relief valve is inside the heat exchanger and not separately replaceable.

(10) Attachments to the hydraulic module reservoir permit filling and allow the system to vent. When filling the system with hydraulic fluid (at either the SYSTEM FILL, dual manifold FILL, or extra fill ports) the air in the reservoir is allowed to escape through the overflow channel. This is also true of excess hydraulic fluid in the reservoir. Air coming into the reservoir (when hydraulic fluid level drops) passes through the filter drier. This unit removes moisture and other contamination from the air before it enters the reservoir.

(11) Figure FO-11 shows the main flow path when hydraulic fluid is supplied by the reservoir in the aircraft being serviced. Figures FO-12 and FO-13 show how cold fluid is circulated through the system to warm it to operating temperature. Warming is accomplished by opening the HIGH PRESSURE BYPASS valve slightly--heat is generated by the friction of forcing the fluid through a small opening. Figure FO-14 shows the flow while bleeding air from the system. This same flow applies when filling or adding fluid to the system.

4-90. SWITCHES AND CIRCUIT BREAKER.

NOTE

See table 4-2, Malfunction 80 for test.

a. Remove. (See figure 4-66.)

(1) Disconnect battery. Refer to paragraph 4-25.

(2) Open hydraulic control panel access door.

(3) Remove three screws (1) securing right side of electrical panel (22) to frame.

(4) Remove three bolts (2) and standoffs (3) securing left side of panel (22).

(5) Tilt electrical panel (22) to the right to gain access to switch and circuit breaker terminals.

(6) Tag and remove wires from switch (1, figure 4-67) or circuit breaker (12).

(7) Remove retaining nut (2) and washers (3) and remove switch or circuit breaker from panel.

b. Install. (See figure 4-67.)

(1) On new switch (1) or circuit breaker (12), set adjustment nut (5) to same position as switch removed for proper protrusion through control panel.

(2) Check switch (1) or circuit breaker (12) orientation and install positioning washer (4) on top of nut (5).

(3) Insert switch (1) or circuit breaker (12) through hole in panel. Ensure that positioning washer (4) tab engages positioning hole in panel.

(4) Install washer (3) and nut (2).

(5) Connect wires to switch (1) or circuit breaker (12).

(6) Position electrical panel (22, figure 4-66) and install three bolts (21, and standoffs (3).

(7) Install three screws (1) to secure right side of panel (22) to frame.

(81 Close hydraulic control panel access door.

(9) Reconnect battery cable.

4-91. INDICATOR LIGHTS AND LAMPS, AND HOURMETER.

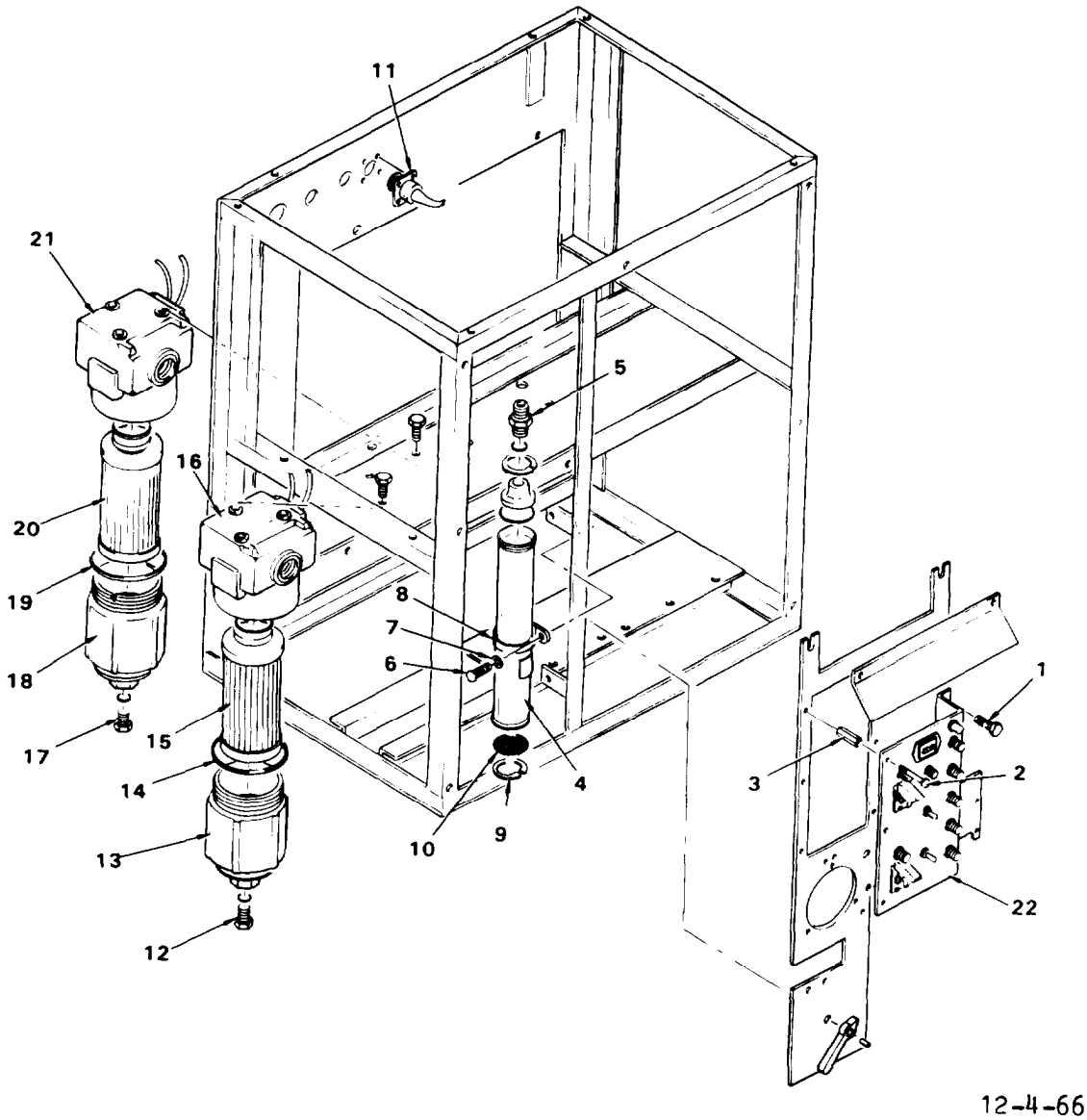
NOTE

See table 4-2, Malfunctions 9 and 10 for test.

a. Remove Indicators. (See figure 4-67.)

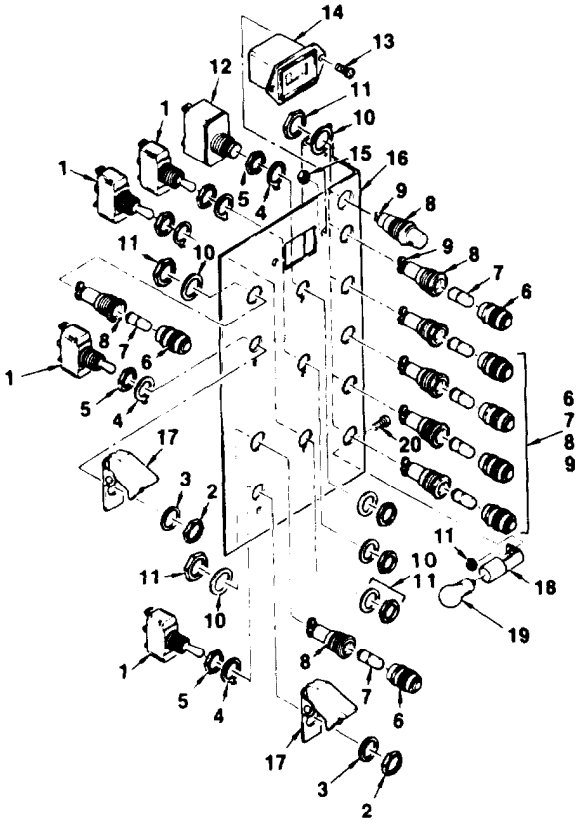
(1) Disconnect battery. Refer to paragraph 4-25.

(2) Perform steps (2) through (5) in paragraph 4-90.a.



1. SCREW
2. BOLT
3. STANDOFF
4. VENT DRYER
5. FITTING
6. BOLT
7. WASHER
8. CLAMP
9. FILTER RETAINING RING
10. WAFER FILTER
11. CONNECTOR
12. DRAIN PLUG, LOW PRESSURE
13. FILTER BOWL, LOW PRESSURE
14. PACKING
15. FILTER ELEMENT, LOW PRESSURE
16. FILTER HEAD, LOW PRESSURE
17. DRAIN PLUG, HIGH PRESSURE
18. FILTER BOWL, HIGH PRESSURE
19. PACKING
20. FILTER ELEMENT, HIGH PRESSURE
21. FILTER HEAD, HIGH PRESSURE
22. ELECTRICAL PANEL

Figure 4 -66. Hydraulic Module Subassemblies



12-4-67

1.	SWITCH	10.	WASHER
2.	NUT	11.	NUT
3.	WASHER	12.	CIRCUIT BREAKER
4.	WASHER, POSITIONING	13.	SCREW
		14.	HOURMETER
5.	NUT, ADJUSTMENT	15.	NUT
		16.	PANEL
6.	LENS	17.	SWITCH GUARD
7.	LAMP	18.	SOCKET, LAMP
8.	SOCKET, LAMP	19.	LAMP, UTILITY
9.	SCREWS	20.	SCREW

Figure 4-67. Hydraulic Module Electrical Panel

(3) Tag and remove wires from lamp socket (8).

(4) Remove retaining nut (11) and washer (10) and remove lamp socket (8) from panel (16).

Install Indicators. (See figure 4-67).

(1) Insert lamp socket (8) through hole in panel (16).

(2) Install washer (10) and nut (11).

(3) Connect wires to lamp socket (8).

(4) Install lamp (7) and lens (6) (if not already installed in lamp socket).

(5) Perform steps (6) through (8) in paragraph 4-90.b.

(6) Reconnect battery cable.

c. Remove Hourmeter. (See figure 4-67).

(1) Perform steps (1) through (5) in paragraph 4-90.a.

(2) Tag and remove wires from hourmeter (14).

(3) Remove two screws (13) and remove hourmeter (14) from panel (16).

d. Install Hourmeter. (See figure 4-67.)

(1) Insert hourmeter (14) through hole in panel (16).

(2) Secure hourmeter to panel with two screws (13).

(3) Connect wires to hourmeter (14).

(4) Perform steps (6) through (9) in paragraph 4-90.b.

4-92. VENT DRYER (FILTER).

a. Remove. (See figure 4-66.)

(1) Open hydraulic filter access door.

(2) Remove tube connector from fitting (5) on top of vent dryer (4). Use wrench to hold fitting (5) when loosening tube connector.

(3) Tilt vent dryer forward and lift up and out of clamp.

(4) Remove filter retaining rings (9) and wafer filters (10) from vent dryer acrylic housing.

(5) Pour out and discard desiccant.

b. Install. (See figure 4-66.)

(1) If not done previously, fill vent dryer housing with fresh desiccant MIL-D-3716.

(2) Install wafer filters (10) and retaining rings (9). Replace gasket, if disturbed.

(3) Place vent dryer in position inside hydraulic module.

(4) Install tube connector on fitting (5) at top of vent dryer (4).

(5) Close hydraulic filter access door.

4-93. HYDRAULIC MODULE WIRING HARNESS.

NOTE

Wiring connections between the hydraulic module and other system components are provided by the AGPU main wiring harness.

a. Inspect. (See figure 4-66.)

(1) Remove AGPU roof to gain access to hydraulic module connector (11). Refer to paragraph 4-16.

(2) Set MASTER SWITCH on control panel (figure 2-6) to OFF.

(3) Inspect wiring for damaged insulation and broken wires.

(4) Inspect harness connector (11, figure 4-66) at rear of hydraulic module for damage.

b. Repair.

(1) Repair broken wires by splicing. Refer to TM 11-600-1 and TM 11-600-2.

(2) If harness repair cannot be accomplished by simple splicing, notify supervisor.

4-94. FILTER ASSEMBLIES AND FILTER ELEMENTS.

Remove Element. (See figure 4-6.)

(1) Set RESERVOIR SELECT valve (figure 2-17) to the AIRCRAFT position.

(2) Drain oil from the low pressure filter bowl (13, figure 4-66) by removing drain plug (12).

(3) Unscrew filter bowl (13) and carefully lower it to clear element (15) which will remain in the filter head (16).

(4) Remove element (15) from low pressure filter head (16), and remove and discard packing (14).

(5) Drain oil from the high pressure filter bowl (18) by removing drain plug (17).

(6) Unscrew filter bowl (18) and carefully lower it to clear element (20) which will remain in the filter head (21).

(7) Remove element (20) from high pressure filter head (21), and remove and discard packing (19).

b. Install Element. (See figure 4-66).

(1) Wipe inside of filter bowls (13, 18) with a clean lint-free cloth.

(2) Wipe bottom of both filter heads (16, 21) with a clean lint-free cloth.

(3) Obtain new filter elements (15, 20)

NOTE

The low pressure filter is a 5-micron filter (Parker P/N 935853Q 5Q TL) and the high pressure filter is a 2-micron filter (Parker P/N 935852Q 2QH TJ). Both of these filters come with a packing around the top. Both of these filters come with a packing around the top.

(4) Lubricate high pressure filter packing (19).

(5) Install high pressure filter element (20) in high pressure filter head (21).

(6) Install packing (19) and high pressure filter bowl (18).

(7) Install drain plug (17).

(8) Lubricate low pressure filter packing (14).

(9) Install low pressure filter element (15) in low pressure filter head (16).

(10) Install packing (14) and low pressure filter bowl (13).

(11) Install drain plug (12).

(12) Set RESERVOIR SELECT valve (figure 2-17) to the AGPU position.

SECTION XVI. MAINTENANCE OF ENGINE

4-95. GENERAL.

a. Engine. The gas turbine engine (GTE), figure 4-68, provides pneumatic power in the form of clean compressed air for operation of the aircraft main engine start system, environmental system, and other equipment or systems. The engine also provides mechanical power in the form of rotational shaft power for driving a generator and a hydraulic pump. The engine delivers pneumatic and shift power either simultaneously or independently.

(1) Once started, the engine runs up to 100 percent governed speed of 58,737 rpm (+300 rpm, −570 rpm) and automatically maintains that speed until shutdown. Constant speed is maintained by the fuel control unit (9), which varies fuel supplied to the combustion chamber via the fuel nozzle (18). Engine speed is determined by a speed sensor (5) which supplies electrical pulses to an electronic control unit. The electronic control units sends electrical commands to the fuel control unit to increase or decrease fuel to the combustion chamber (10, figure 4-69).

(2) Engine power is developed through compression of outside air by a single entry centrifugal compressor. The compressed air, when mixed with fuel and ignited, drives a radial inward-flow turbine rotor. The rotating shaft power of the turbine rotor drives the compressor and the output drive shaft to the gearcase assembly.

b. Compressor Section. The compressor section, figure 4-69, consists of an inlet housing (9), a compressor housing assembly, a single stage centrifugal compressor rotor (15), and a diffuser. The compressor provides compressed air to the turbine section, and for external use as bleed air. The inlet housing assembly houses a planetary gear set (19) which drives the gear train in the gearcase assembly (1).

c. Turbine Section. The turbine section, figure 4-69, consists of a turbine plenum (11), a torus scroll, a deswril assembly (14), a turbine nozzle, a turbine rotor (13), a labyrith seal assembly, and a combustion chamber (10). Compressed air from the compressor section passes through the deswirl deflector and enters the turbine plenum assembly where combustion takes places. The combustion gases flow through the torus scroll and the turbine nozzle to the turbine rotor causing rotation and driving the planetary gear system, which drives the gear train in the gearcase assembly. A containment ring (17) is provided to protect personnel if the blades of the turbine were to disintegrate because of an overspeed or over temperature condition.

d. Gearcase Assembly. The gearcase assembly (item 4, figure 4-64) provides pads (7, 14) for mounting and driving a hydraulic pump and a generator. The gearcase assembly also provides mounting bosses for a low oil pressure switch (8), a speed sensor (5), and a high oil temperature switch (12). An oil pump housing is located on the lower front of the gearcase assembly. It encloses a rotary oil pump assembly and provides a mounting pad for the fuel control unit (9), and mounting bosses for magnetic drain plugs (10,13).

4-96. ENGINE ASSEMBLY.

a. Inspect engine for leakage at fuel and hydraulic line fittings. Tighten loose fittings.

b. Inspect wiring harness for cuts or abraded wires. Inspect electrical connectors for security of installation, damage, and corrosion.

c. Inspect engine accessories for security of installation, damage, and corrosion.

4-97. INLET DUCT AND SCREEN. Inspect inlet duct (3 and 15, figure 4-68) for cracks, holes, or damage. Inspect inlet duct screen (1) for damage by opening bypass door. Remove any foreign material from screen. Inspect lower duct (15) for loose rivets and damaged nut plates.

4-98. CHECK VALVES.

NOTE

There are two check valves, as shown in figure 4-70, View A.

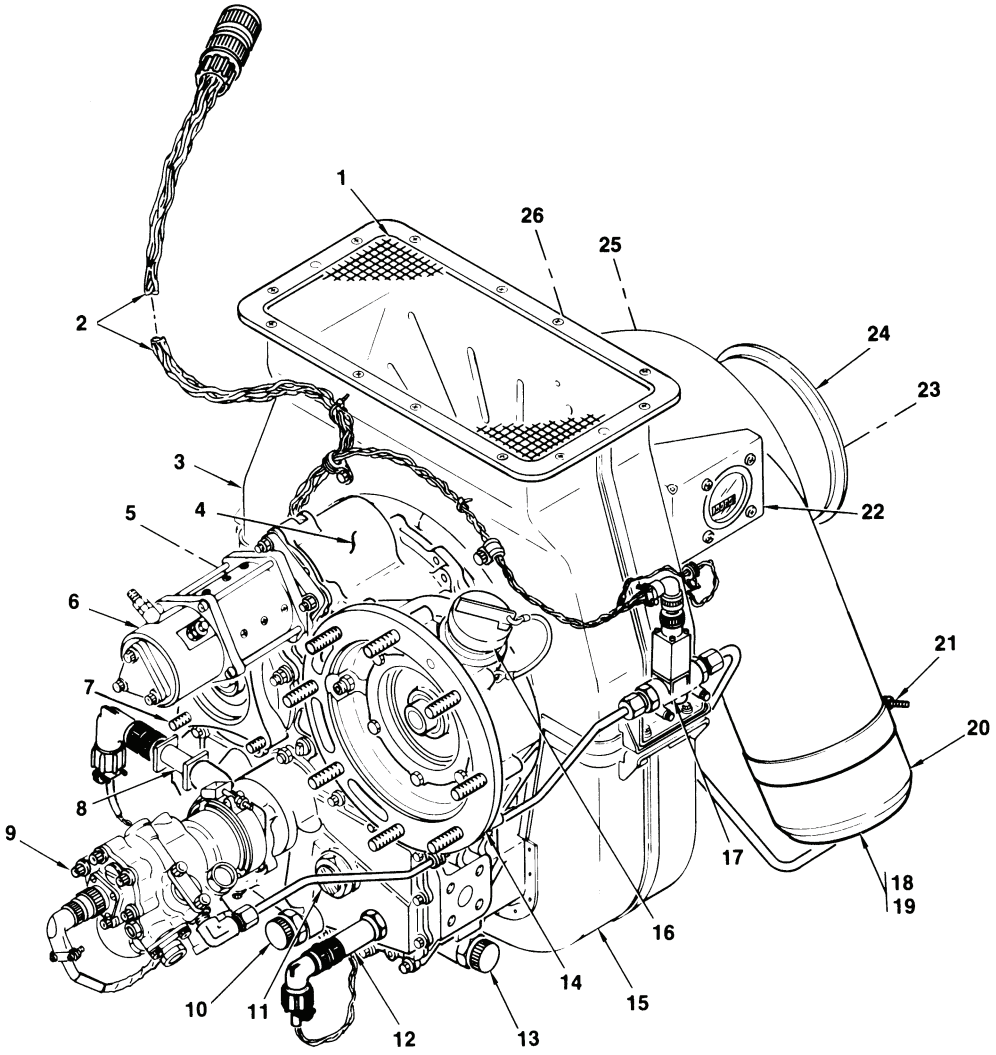
a. Remove. (See figure 4-70).

(1) Loosen clamps (1) and disconnect drain lines (2) from check valves (3).

(2) Remove two check valves (3) with packing (4). Discard packing.

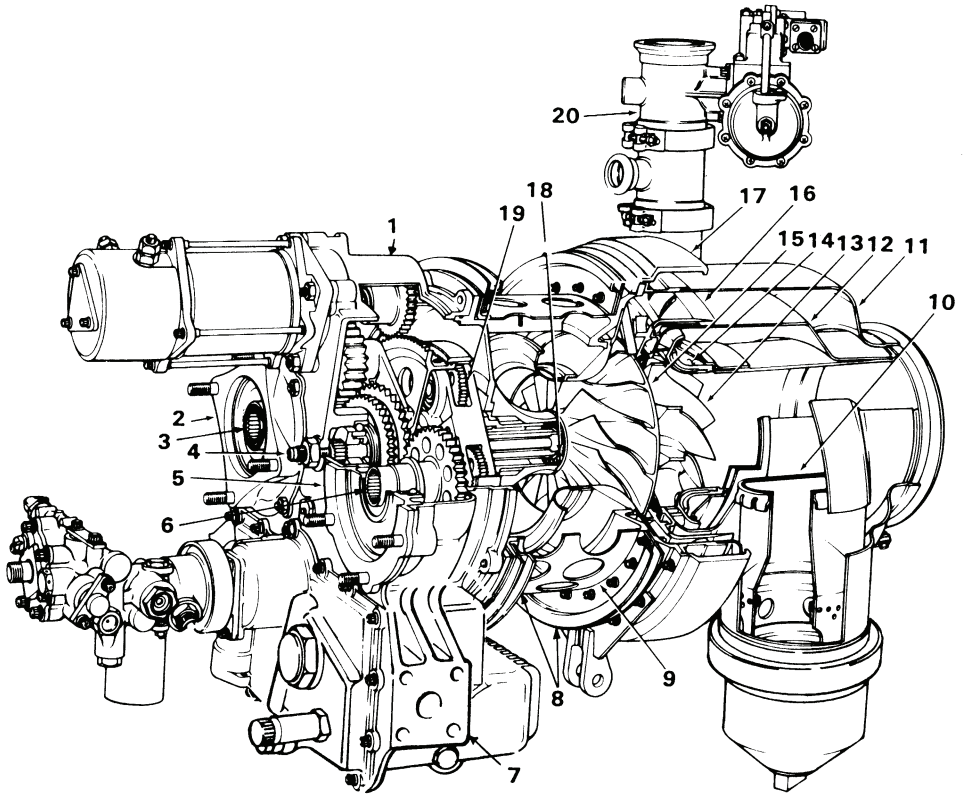
b. Inspect.

(1) Inspect check valve for damage that would prevent internal valve mechanism from operating. No damage is allowed.



1. INLET DUCT SCREEN
2. WIRING HARNESS
3. INLET DUCT (UPPER HALF)
4. GEARCASE ASSEMBLY
5. SPEED SENSOR (NOT SHOWN)
6. STARTER ASSEMBLY
7. HYDRAULIC PUMP PAD
8. LOW OIL PRESSURE SWITCH
9. FUEL CONTROL UNIT (FCU)
10. MAGNETIC DRAIN PLUG (GEARCASE)
11. SIGHT LEVEL INDICATOR (OIL)
12. HIGH OIL TEMPERATURE SWITCH
13. MAGNETIC DRAIN PLUG (OVERFLOW)
14. GENERATOR PAD
15. INLET DUCT (LOWER HALF)
16. OIL FILL CAP
17. FUEL SOLENOID
18. FUEL NOZZLE (NOT SHOWN)
19. IGNITER PLUG (NOT SHOWN)
20. COMBUSTOR CAP
21. COMBUSTOR CLAMP
22. HOURMETER
23. THERMOCOUPLE (NOT SHOWN)
24. EXHAUST NOZZLE
25. IGNITION UNIT (NOT SHOWN)
26. LOAD CONTROL VALVE (LCV) (NOT SHOWN)

Figure 4-68. Gas Turbine Engine (GTE).



1. GEARCASE ASSEMBLY
2. HYDRAULIC PUMP PAD
3. HYDRAULIC PUMP SPLINED DRIVE
4. VENT
5. GENERATOR PAD
6. GENERATOR SPLINED DRIVE
7. SIDE MOUNTING PAD (2)
8. INLET DUCT FITTING
9. COMPRESSOR INLET HOUSING
10. COMBUSTOR CHAMBER
11. TURBINE PLENUM
12. TORUS SCROLL
13. TURBINE ROTOR
14. DESWIRL ASSEMBLY
15. COMPRESSOR ROTOR
16. DEFLECTOR
17. CONTAINMENT RING
18. COMPRESSOR BEARING
19. PLANETARY GEAR SET
20. LOAD CONTROL VALVE (LCV)

Figure 4-69. Engine/Gearcase Assembly, Cutaway View.

(2) Inspect threaded fittings on both ends of check valve for damage. No damage is allowed.

c. Service.

WARNING

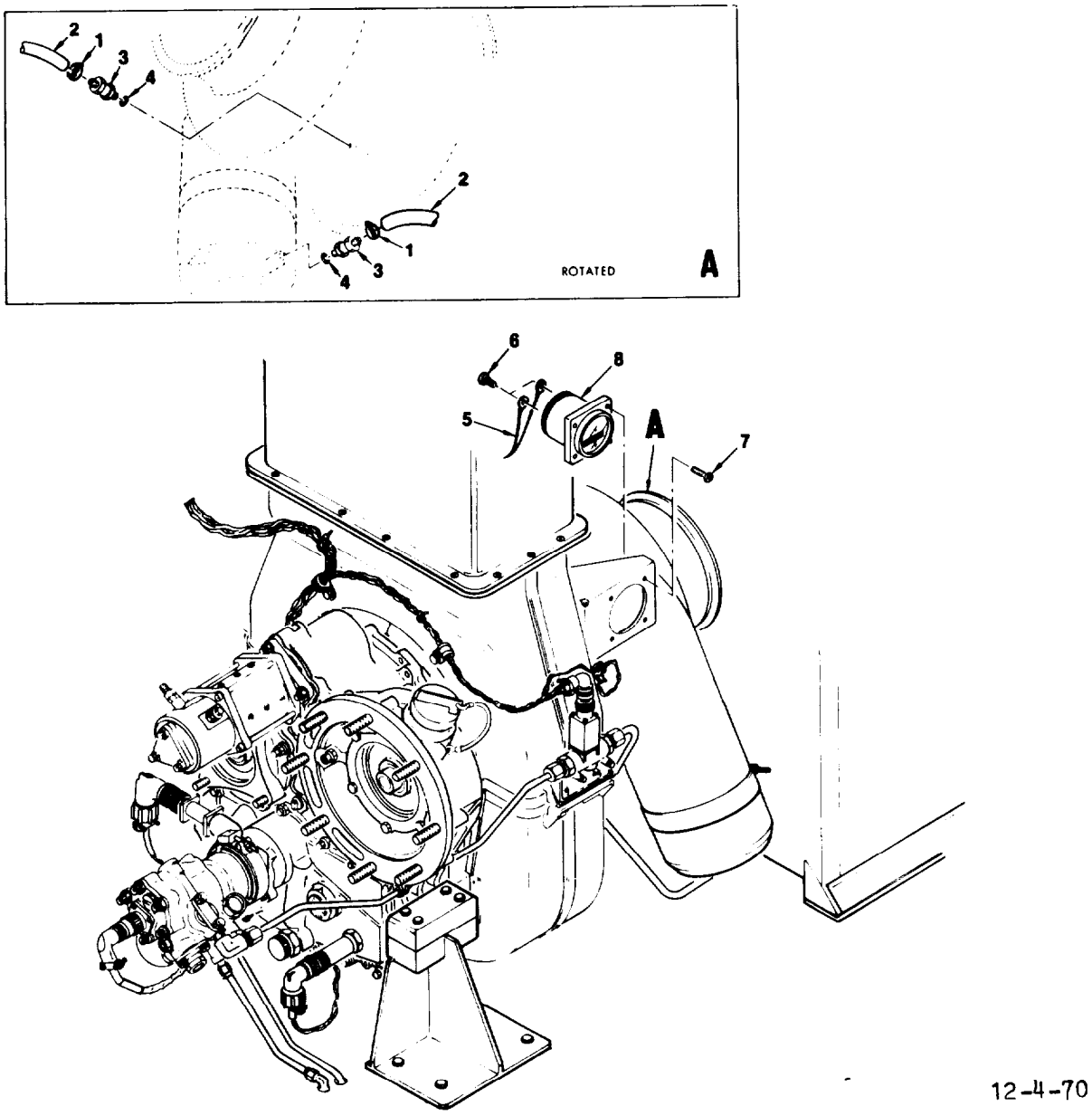
Degreasing Solvent, MIL-PRF-680, is combustible and toxic to eyes, skin, and respiratory tract. Wear protective gloves and goggles/face shield. Avoid repeated or prolonged contact. Use only in well ventilated ares (or use approved respirator as determined by local safety/industrial hygiene personnel). Keep away from open flames or other sources of ignition.

Inspect interior of check valve. If interior appears dirty or contaminated, clean by dipping in degreasing solvent, MIL-PRF-680.

b. Install. (See figure 4-70.)

(1) Install check valves (3) with new packing (4). Ensure that arrow on valve body points into drain tube.

(2) Connect drain lines (2) to check valves (3) and secure with clamps (1).



1. CLAMP
2. DRAIN LINE
3. CHECK VALVE
4. PACKING
5. ELECTRICAL CONNECTIONS
6. SCREW
7. SCREW
8. HOURMETER

Figure 4-70. Engine Components

4-99. HOURMETER.

a. Remove. (See figure 4-70.)

(1) Tag electrical connections (5) to hourmeter.

(2) Disconnect electrical connections (5) from hourmeter (8) by removing two screws (6).

(3) Remove four screws (7) from hourmeter (8) and remove hourmeter from bracket.

b. Install. (See figure 4-70.)

(I) Position hourmeter (8) in bracket and secure with four screws (7). Tighten screws to a torque value of 35 inch-pounds.

(2) Attach electrical connections (5) to hourmeter using two screws (6).

4-100. COMBUSTOR ASSEMBLY.

a. Remove. (See figure 4-71.)

(1) Disconnect fuel line (1) from fuel nozzle (5).

(2) Remove igniter plug (paragraph 4-81) and combustor check valve (paragraph 4-98).

(3) Remove nut (2) and clamp (3), then remove combustor assembly from engine.

(4) Remove bolts (4), fuel nozzle (5), and gasket (6) from combustion chamber cap (7).

(5) Separate combustion chamber cap (7) from combustion chamber (8).

b. Inspect. (See figure 4-71.)

(1) Inspect clamp (3) for cracks, distortion, and damaged threads. No cracks, distortion, or damaged threads are allowed.

(2) Inspect combustion chamber cap (7) for cracks, deformation, and damaged threads. No cracks, deformation, or damaged threads are allowed.

(3) Inspect combustion chamber for conformance to the following requirements. Replace combustion chamber if the inspection requirements are not met. (Refer to figure 4-72.)

(a) Check for cracks (1) in igniter grommet retain welds or retainer. No cracks allowed.

(b) Check for metal thinning (2). Notify maintenance supervisor if metal thinning below 0.016 inch due to corrosion or erosion is indicated.

(c) Check for cracks (3). Notify maintenance supervisor if cracks separated by less than 0.25 inch are indicated.

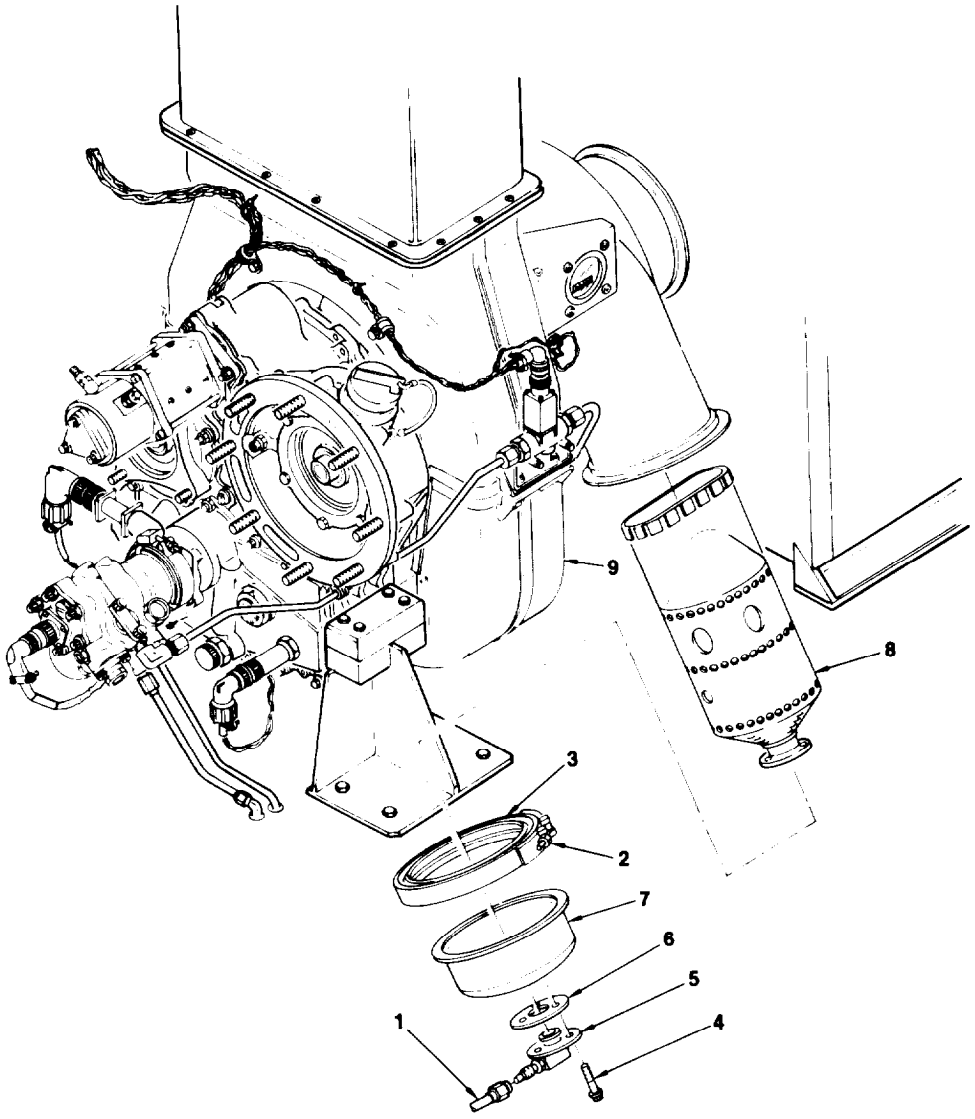
(d) Check for cracks (4) at tabs. No cracks allowed.

(e) Check for cracks (5) which could cause material breakaway. Notify maintenance supervisor if cracks are indicated.

(f) Check for distortion (6) of cooling ring. Cooling ring distortion greater than one-half of normal gap not allowed.

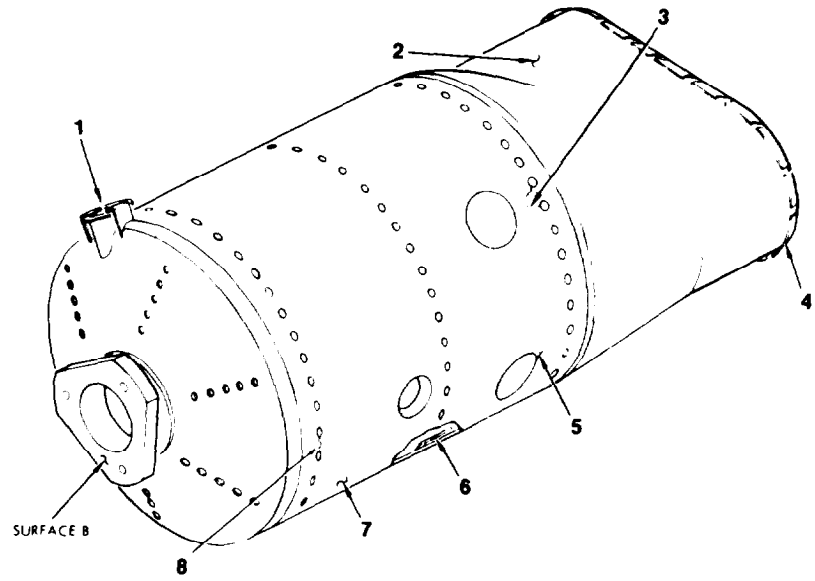
(g) Check for deformation (7). Deformation greater than 0.125 inch not allowed.

(h) Check for cracks (8) connecting any two holes. Notify maintenance supervisor if cracks are indicated.



1. FUEL LINE
2. NUT
3. CLAMP
4. BOLT
5. FUEL NOZZLE
6. GASKET
7. COMBUSTION CHAMBER CAP
8. COMBUSTION CHAMBER
9. ENGINE

Figure 4-71. Combustor Assembly



12-4-72

Figure 4-72. Combustion Chamber Inspection/Check

c. Install. (See figure 4-71.)

(1) Apply a thin coat of high temperature compound MIL-A-907 (Fel-Pro C5-A) to threads of bolts (4).

(2) Place combustion chamber cap (7) over combustion chamber (8), aligning igniter plug boss of combustion chamber cap (7) with igniter plug hole in combustion chamber (8).

(3) Install gasket (6), fuel nozzle (51, and bolts (4) to combustion chamber cap (7). Tighten bolts to a torque value of 50 inch-pounds. Lockwire bolts.

(4) Install assembled items (4 through 8) into engine, and tighten clamp (2) to a torque value of 45 inch-pounds.

(5) Install igniter plug (paragraph 4-81) and combustor check valve (paragraph 4-98).

(6) Reconnect fuel line (1) to fuel nozzle (5).

4-101. ENGINE WIRING HARNESS.

NOTE

The engine wiring harness connects between the ECU (P2) and all engine-mounted components.

a. Inspect.

(1) Set MASTER SWITCH to OFF.

(2) Inspect wiring harness for damaged insulation and broken wires. See figure FO-3 for wiring identification and connections.

(3) Check that all terminal connections are secure.

(4) Inspect harness connectors for damage.

b. Repair. Repair broken wires by splicing. Refer to TM 11-600-1 (Wheeled Vehicle Maintenance), or TM 55-1500-323-24 (Aviation Maintenance).

4-101.1 PLUMBING AND WIRING HARNESSES REMOVAL/INSTALLATION, INSPECTION, AND REPAIR.

a. Inspect Plumbing Components. (See figure 4-72A and 4-72B.)

(1) Inspect tube assembly (5) as follows:

(a) Visually inspect tubing for distortion, corrosion, splits, pits, cracks, nicks, dents, scratches and kinks.

(b) Visually inspect sleeves for splits, cracks, galling, corrosion, nicks and dents.

(c) Visually inspect nuts and threaded bushings for galled, crossed, stripped or worn threads and for corrosion and rounded wrenching flats.

(2) Inspect adapters, unions, elbows, tees, plugs and caps as follows:

(a) Visually inspect fittings for galled, crossed, stripped or worn threads.

(b) Visually inspect fittings for cracks, nicks, dents and corrosion.

(c) Visually inspect fittings for rounded wrenching flats and torn or closed lockwire holes.

b. Inspect Wiring Harness Assembly. (See figure 4-72C.)

(1) Visually inspect sleeving for chafing, tears and deterioration.

(2) Visually inspect insulation for cracks, chafing, deterioration and exposed wires.

(3) Visually inspect electrical connectors as follows:

(a) Check connectors for security to wiring.

(b) Check connectors for broken, burned, corroded or bent contacts.

(c) Check connectors for cracks, corrosion, distortion, nicks and burrs.

(4) Visually inspect identification straps for security and legibility.

(5) Check braiding for security and deterioration.

c. Repair Wiring Harness Assembly. (See figure 4-72C.)

(1) Remove defective connectors as follows:

(a) Loosen connector plug screws. Pull back backshell.

(b) Remove all teflon tape from back of connector, contacts and wires.

(c) Heat contacts of connector to melt solder and disconnect wires as necessary to remove defective connector.

(2) Remove damaged wires as follows:

(a) Remove damaged wire from insulation sleeving.

(b) Measure the cut replacement wire.

(c) Insert replacement wire through insulation sleeving.

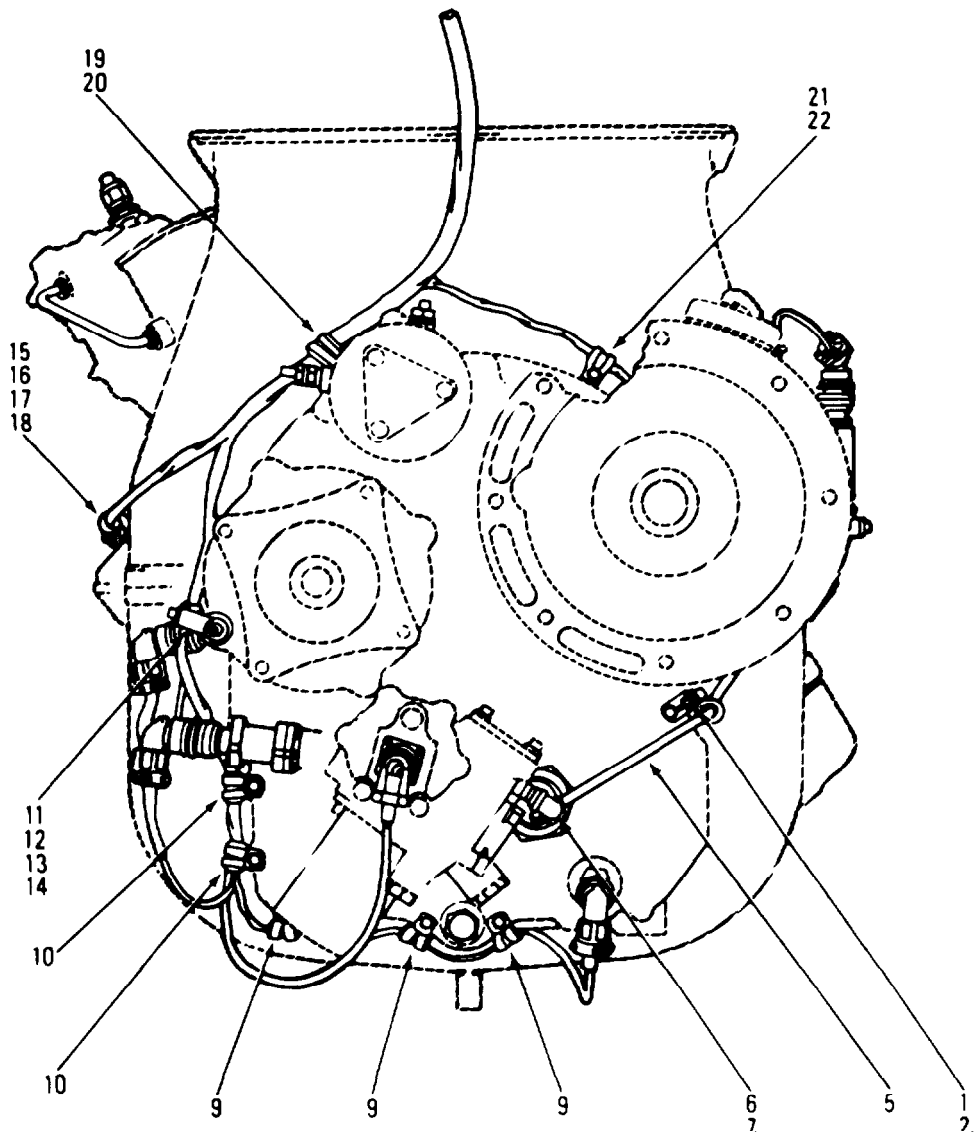
(3) Install connectors as follows:

(a) Connect wires and electrical cables to connector. Solder wires and electrical cables using silver solder in accordance

with MIL-STD-454, Requirement 5 using solder in accordance with QQ-B-654, Grade V.

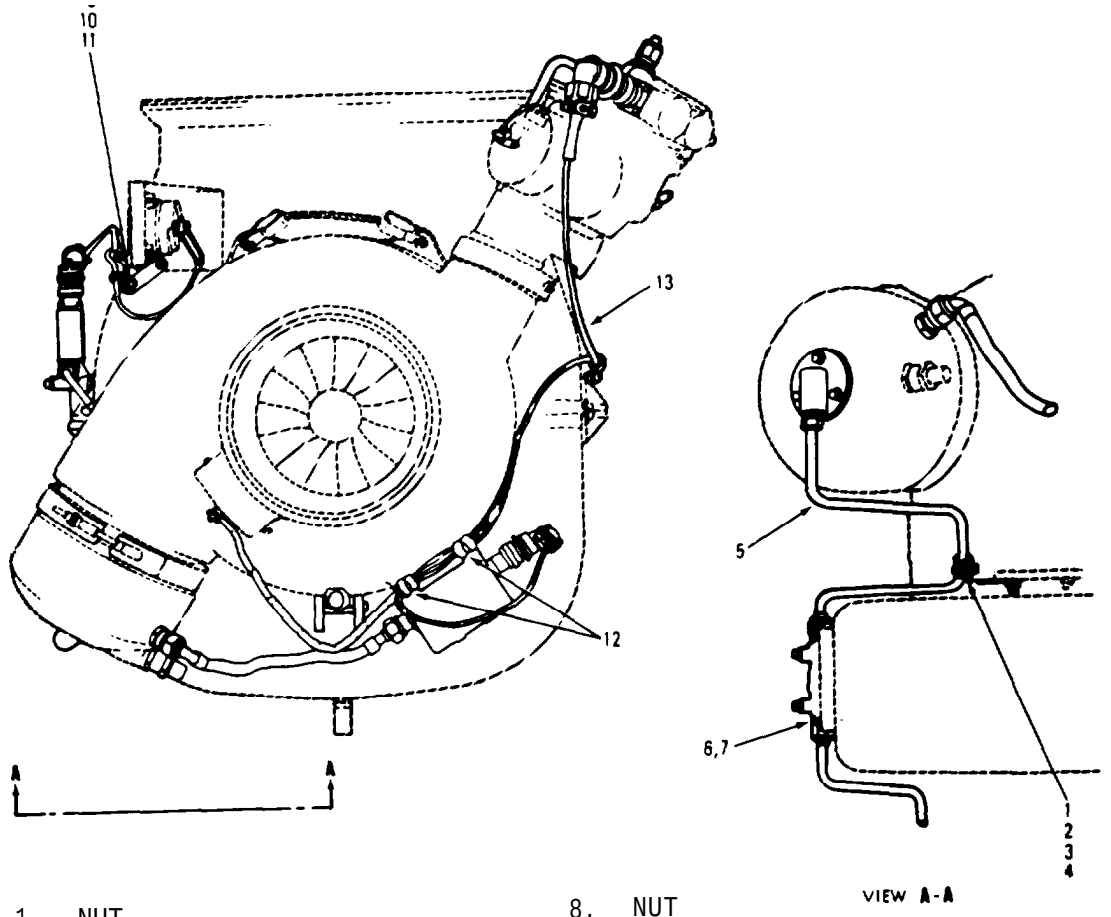
(b) Apply teflon tape (E125-10 Type B, Dodge Fluorgraph, Div. Oak Industries, McCaffrey St., Hoosisk Falls, NY 12090 or equivalent) to fill space inside clamp or connector.

(c) Slide back backshell and secure with connector plug screws.



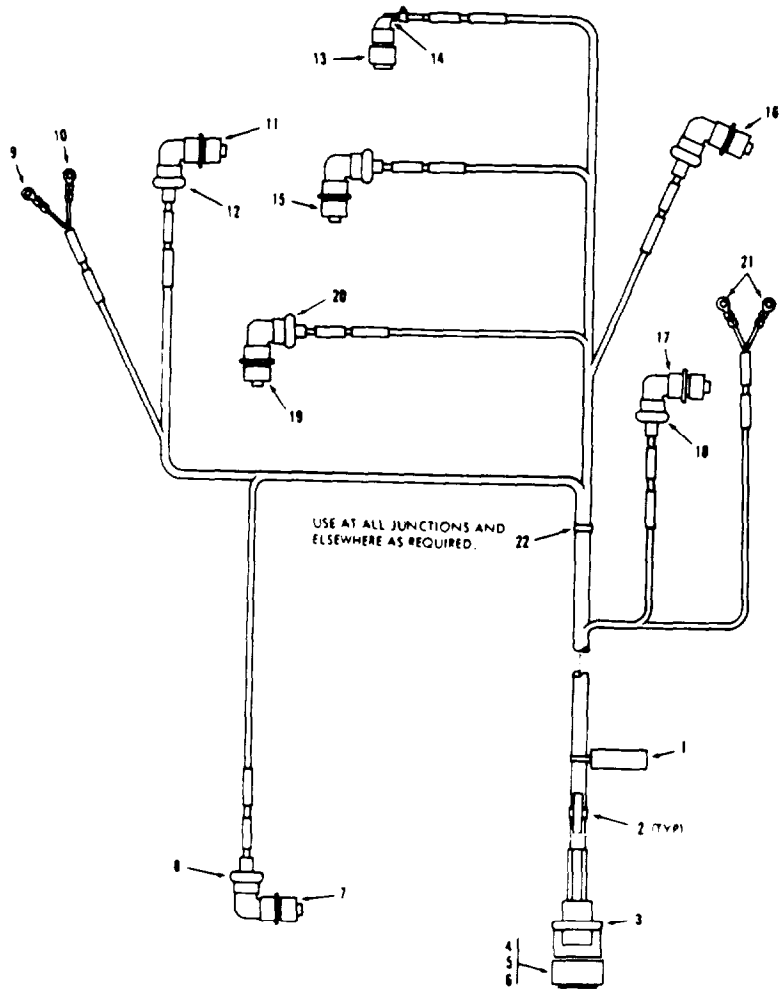
1. NUT
2. BOLT
3. CLAMP
4. BRACKET
5. TUBE ASSEMBLY
6. ELBOW
7. NUT
8. PACKING
9. CLAMP
10. CLAW
11. NUT
12. BOLT
13. CLAMP
14. BRACKET, ANGLE
15. NUT
16. BOLT
17. CLAMP
18. BRACKET
19. BOLT
20. CLAMP
21. BOLT
22. CLAMP

Figure 4-72A Engine Plumbing and Wiring Harness Installation, Front View



1. NUT
2. BOLT
3. CLAMP
4. BRACKET
5. TUBE ASSEMBLY
6. UNION
7. PACKING
8. NUT
9. BOLT
10. CLAMP
11. BRACKET
12. CLAMP
13. HARNESS ASSEMBLY, WIRING

Figure 4-72B Engine Plumbing and Wiring Harness Installation, Rear View



1. IDENTIFICATION STRAP
2. IDENTIFICATION STRAP
3. BACKSHELL
4. CONNECTOR
5. CONTACT
6. CONTACT
7. CONNECTOR
8. BACKSHELL
9. TERMINAL
10. TERMINAL
11. CONNECTOR
12. BACKSHELL
13. CONNECTOR
14. BACKSHELL
15. CONNECTOR
16. CONNECTOR
17. CONNECTOR
18. BACKSHELL
19. CONNECTOR
20. BACKSHELL
21. TERMINAL
22. RETAINING STRAP

Figure 4-72C Wiring Harness Assembly

Section XVII. MAINTENANCE OF CONTROLS AND INSTRUMENTS

4-102. GENERAL. This section provides maintenance instructions for the control panel, figure 4-73, located at the rear of the AGPU. The controls and instruments are arranged in functional groups on front of control panel as shown in figure 4-74. All controls and instruments are described briefly in chapter 2, table 2-1. Each group of controls and instruments is described relative to system functions controlled or monitored as follows:

Control/Instrument Group	Paragraph Reference
MASTER SWITCH	4-23a
BATTERY 24VDC	4-23a
DC 28VDC	4-50a
GTE	4-2c and 4-23d
LIGHTS	4-23b
AC 115 VAC 400HZ	4-50b
PNEUMATIC	4-23e
DRIVE	4-110

Electrical components are identified by reference designators. Refer to paragraph 4-23 for explanation of reference designators.

4-103. PREPARING CONTROL PANEL FOR MAINTENANCE.

WARNING

Battery power (24 vdc) may be present at terminals on back of control panel whenever battery is connected. Ac power (115 vac) may be present when engine is running.

a. To prevent shock hazard, flash burns, or equipment damage, observe the following precautions for all control panel maintenance:

(1) Shut down engine and disconnect battery before opening control panel, or contacting any electrical terminals with body or tools.

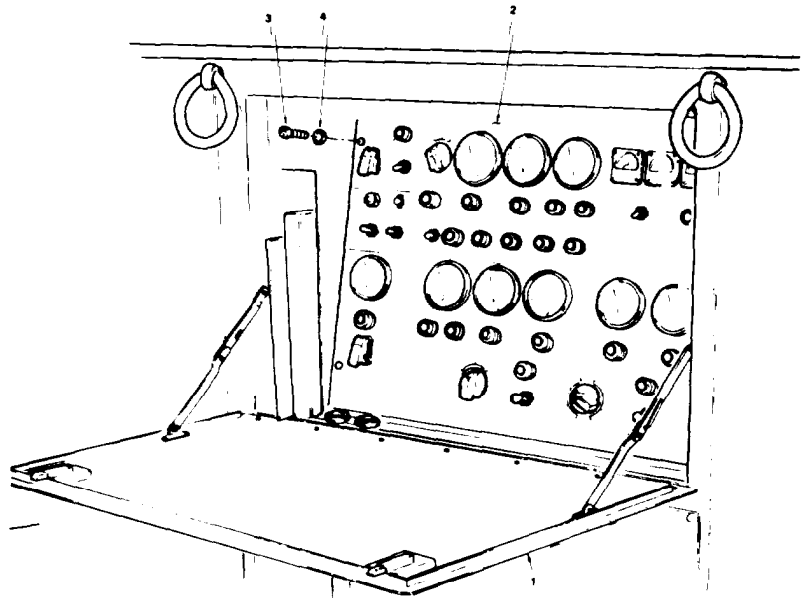
(2) Temporarily install control panel before starting engine to verify corrective action.

b. Open control panel access door (1, figure 4-73.)

c. While holding control panel (2) in place, remove four screws (3) and washers (4).

d. Carefully lift control panel and rest lower edge of panel on ledge below panel. Lower top of panel until panel is supported by cable.

e. Remove battery charger access panel below control panel. Refer to paragraph 4-15.



1. ACCESS DOOR
2. CONTROL PANEL
3. SCREW
4. WASHER

Figure 4-73. Control Panel

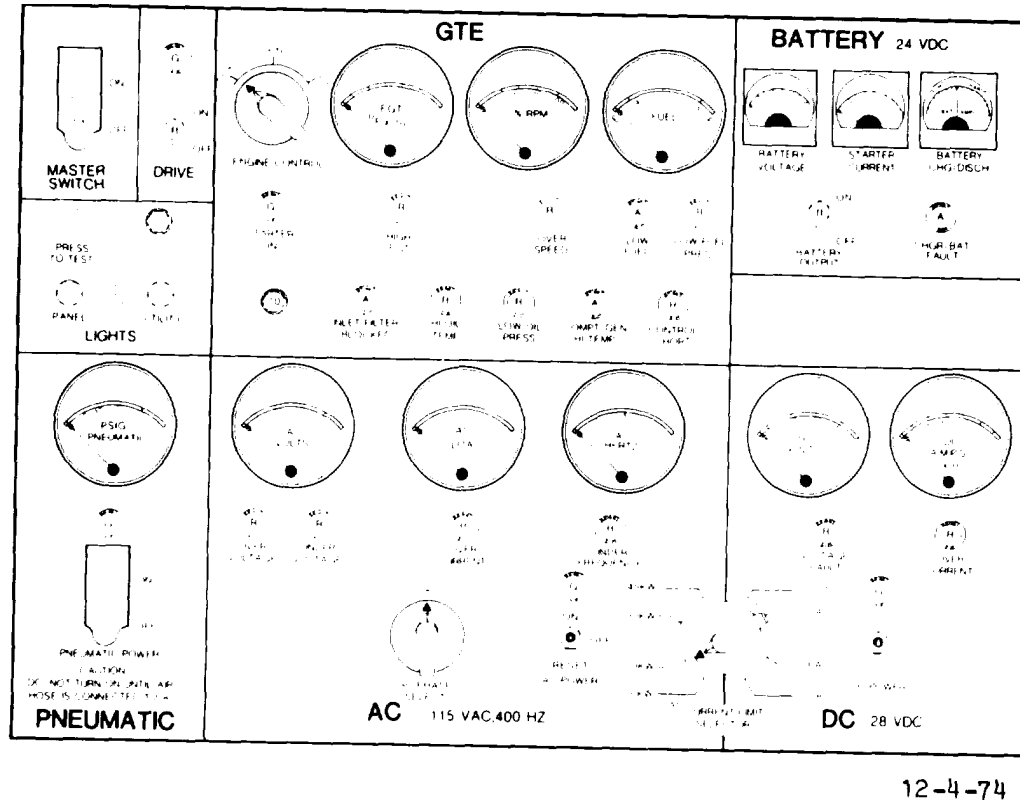


Figure 4-74. Control Panel Front View

4-104. CONTROL PANEL SWITCHES (1S1-1S12).

NOTE

See table 4-2, Malfunction 79 for test.

NOTE

Procedures in this section require that wires be disconnected from control panel terminals. Before disconnecting wires from more than one terminal, make sure that wire numbers are legible. If not, use tape to identify wires. Refer to figure FO-16.

a. ENGINE CONTROL Switch (1S1) Installation.

(1) Remove. (See figure 4-75.)

(a) Loosen two setscrews in switch knob (1) and remove knob.

(b) Unsolder all wires from terminal lugs on back of switch (4). Use care not to shorten wires any more than necessary.

(c) Remove nut (2), lockwasher (3), and switch (4).

(d) Measure length of switch shaft for reference.

(2) Install. (See figure 4-75.)

(a) Using hacksaw, cut shaft of replacement switch to same length as shaft of old switch. Remove any burrs from shaft end.

(b) Remove nut (2) and lockwasher (3) from replacement switch (4).

(c) Install replacement switch (4) from back of panel, and secure with lockwasher (3) and nut (2).

(d) Solder all wires removed in step (1) to solder lugs on switch.

(e) Position knob (1) on shaft of switch and tighten setscrews in knob.

(f) Rotate knob to full counterclockwise position. If knob is not pointing to STOP position, loosen setscrews, position knob to point to STOP position, and tighten both setscrews in knob.

b. AC PHASE SELECT (1S9) and CURRENT SELECTOR (1S11) Switch Installation.

(1) Remove. (See figure 4-76.)

(a) Loosen two setscrews in switch knob (1) and remove knob.

(b) Unsolder all wires from terminal lugs on back of switch (4). Use care not to shorten wires any more than necessary.

(c) Remove nut (2), lockwasher (3), and switch (4).

(2) Install. (See figure 4-76.)

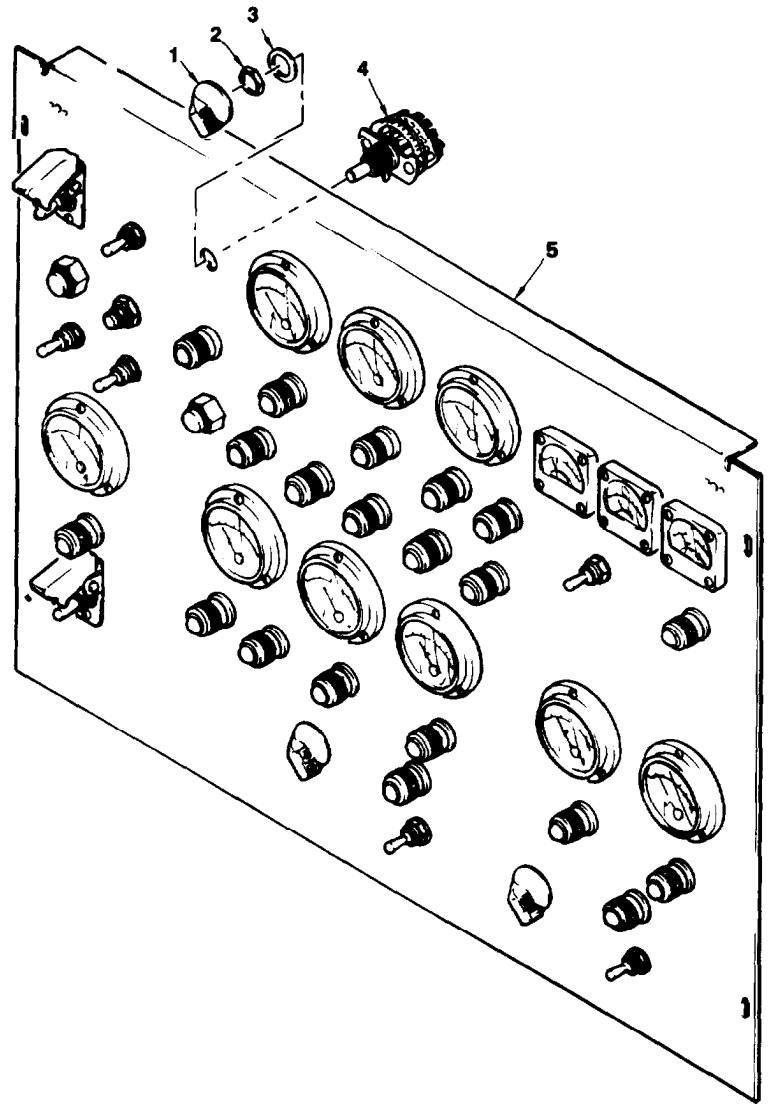
CAUTION

The nut against the switch body is the switch assembly nut (5). Do not remove this nut.

(a) Remove nut (2) and lockwasher (3) from replacement switch (4). If two nuts remain on switch, remove outer nut. Do not remove switch assembly nut (5).

(b) Install replacement switch (4) from back of panel, and secure with lockwasher (3) and nut (2).

(c) Solder all wires removed in step (1) to solder lugs on switch.



1. KNOB
2. NUT
3. LOCKWASHER
4. ENGINE CONTROL SWITCH (1S1)
5. PANEL

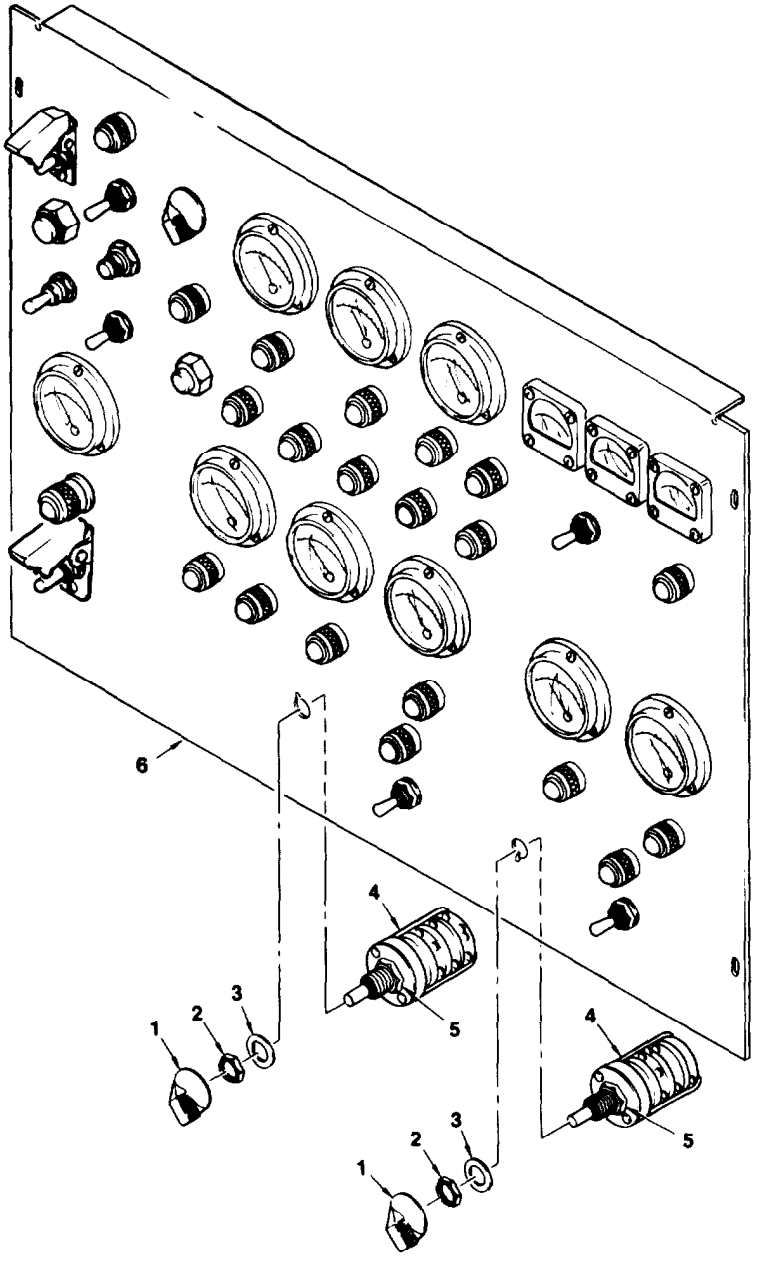
Figure 4-75. Control Panel ENGINE CONTROL Switch

(d) Position knob (1) on shaft of switch (4) so that the setscrew opposite knob pointer can be tightened against the flat of switch shaft. Tighten the setscrew opposite knob pointer first, then tighten other setscrew.

c. Toggle Switch Installation.

NOTE

This procedure covers the following switches: MASTER SWITCH 1S2, DRIVE 1S3, BATTERY OUTPUT 1S5, PANEL 1S6, UTILITY 1S1, PNEUMATIC POWER 1S8, AC POWER 1S10, and DC POWER 1S12.



1. KNOB
2. NUT
3. LOCKWASHER
4. SWITCH (1S9 AND 1S11)
5. SWITCH ASSEMBLY NUT
6. PANEL

Figure 4-76. Control Panel AC PHASE SELECT and CURRENT SELECTOR Switch

(1) Remove. (See figure 4-77.)

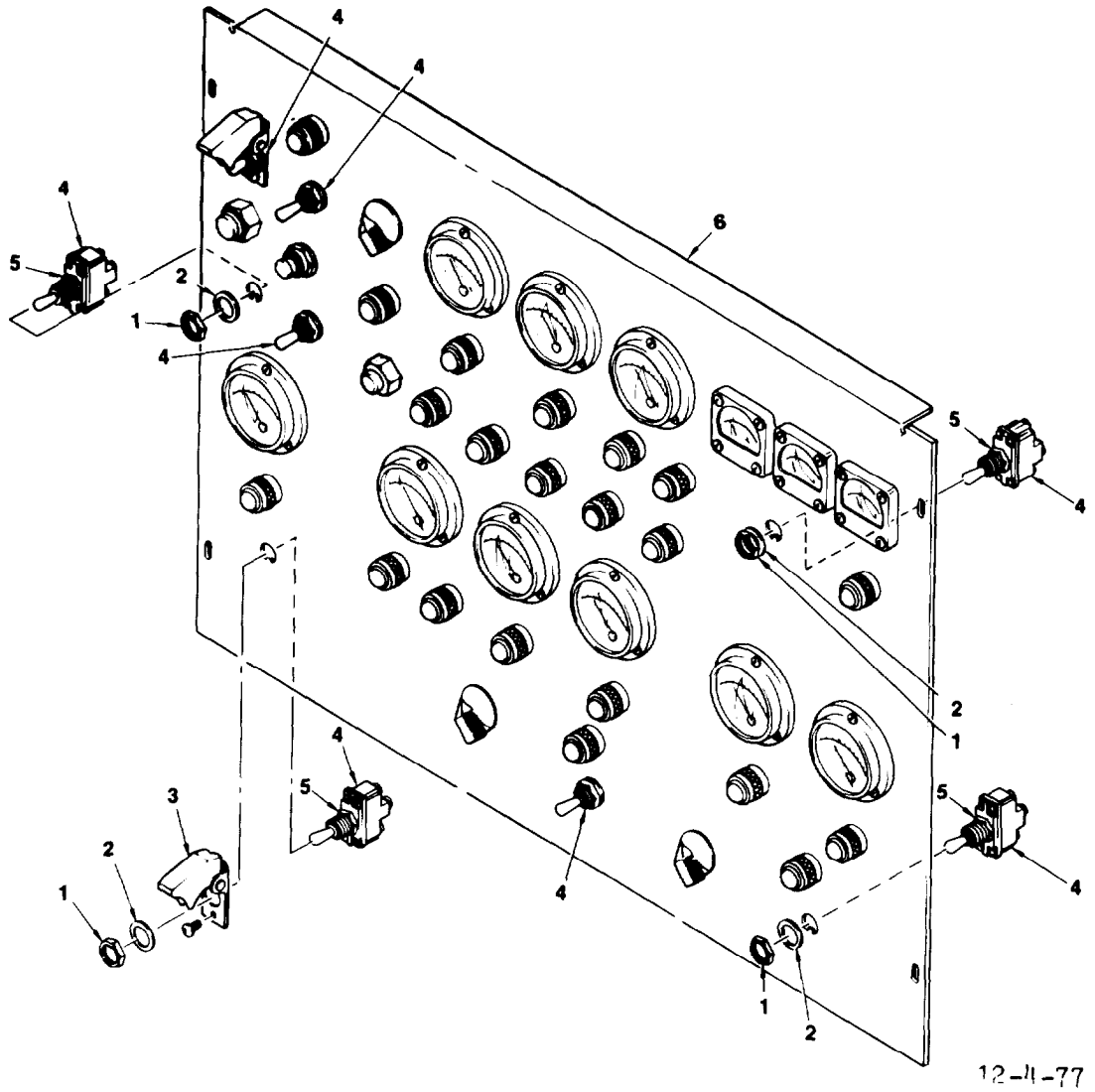
(a) Remove terminal screws and lockwashers as required to disconnect all wires from back of switch (4). Replace lockwashers and terminal screws.

(b) Remove nut (1), lockwasher (2), switch guard (3) (applicable to MASTER SWITCH and PNEUMATIC POWER switch only), and switch (4).

(c) Note position of height adjustment nut (5) on threaded shaft of switch.

(2) Install. (See figure 4-77.)

(a) Remove nut (1), lockwasher (2), and keywasher (not shown) from replacement switch (4). The keywasher is not used for switch installation.



1. NUT
2. LOCKWASHER
3. SWITCH GUARD
4. SWITCH, TOGGLE
5. HEIGHT ADJUSTMENT NUT
6. PANEL

Figure 4-77. Control Panel Toggle Switches

(b) Set height adjustment nut (5) on replacement switch shaft to same position as adjustment nut on old switch.

(c) Install replacement switch (4) from back of panel.

(d) On MASTER SWITCH or PNEUMATIC POWER switch, position switch guard (3) on shaft of switch.

(e) Secure switch (4) to panel with lockwasher (2) and nut (1). One or two threads on shaft of switch should be visible from front of panel. If not, loosen retaining nut (1), reset adjustment nut (5) as required, and tighten retaining nut.

(f) Remove terminal screws and lockwashers from switch as required to connect all wires removed in step (1) Replace lockwashers and terminal screws.

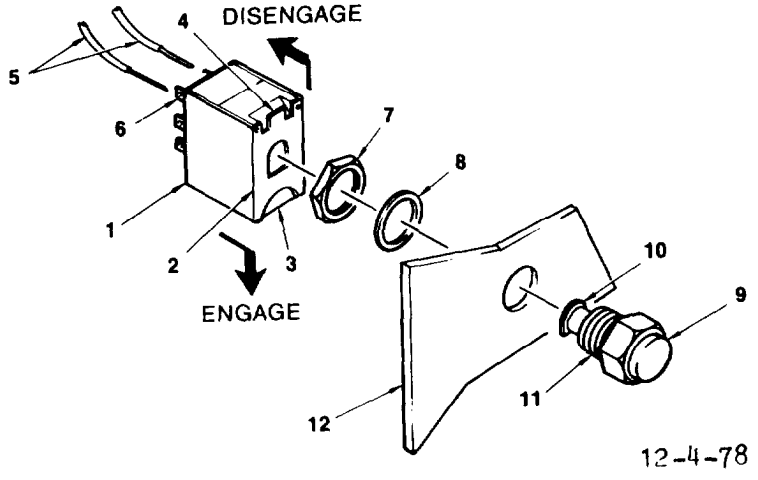
d. PRESS TO TEST Switch (1S4) Installation.

(1) Remove. (See figure 4-78.)

(a) Pull switch spring (3) away from switch bracket (2), and move switch (1) in direction indicated to disengage switch bracket from pushbutton flange (10). Slight rotation of switch may be necessary.

(b) Unsolder all wires (5) from terminal posts (6) on switch. Use care not to shorten wires any more than necessary.

(c) Remove nut (7), lockwasher (8), and pushbutton (9).



1. SWITCH
2. BRACKET
3. SPRING
4. ADJUSTMENT TAB
5. WIRE
6. TERMINAL POSTS
7. NUT
8. LOCKWASHER
9. PUSHBUTTON
10. FLANGE
11. SEAL
12. PANEL

Figure 14 -78. Control Panel PRESS TO TEST Switches

(2) Install. (See figure 4-78.)

(a) Remove nut (7) and lockwasher (8) from replacement pushbutton (9).

(b) Install pushbutton (9) with seal (11) from front of panel, and secure with lockwasher (8) and nut (7).

(c) Solder all wires (5) removed in step (1) to terminal posts (6) on replacement switch (1).

CAUTION

Do not rotate switch against pushbutton more than a few degrees during assembly. Greater rotation may damage pushbutton.

(d) Align hole in switch bracket (2) with pushbutton flange (10). Press switch against pushbutton so that pushbutton flange (10) engages hole in bracket (2), and slide switch in direction indicated to lock in place. Slight rotation of switch may be necessary.

(e) If switch does not work, check for excessive looseness between switch and pushbutton. To eliminate looseness, remove switch, bend tab (4) on switch bracket slightly toward pushbutton, and reinstall switch.

4-105. CONTROL PANEL CIRCUIT BREAKERS (1CB1 AND 1CB2).

a. Remove. (See figure 4-79.)

(1) Disconnect battery cable from battery.

(2) Remove terminal screws and lockwashers as required to disconnect all wires from back of circuit breaker (3). Replace lockwashers and terminal screws.

(3) Remove nut (1), lockwasher (2), and circuit breaker (3).

(4) Note position of height adjustment nut (4) on threaded shaft of switch.

b. Install. (See figure 4-79.)

(1) Remove nut (1) and lockwasher (2), and keywasher (not shown) from replacement circuit breaker (3). The keywasher is not used for circuit breaker installation.

(2) Set height adjustment nut (4) on replacement circuit breaker shaft to same position as adjustment nut on old circuit breaker.

(3) Install replacement circuit breaker (3) from back of panel and secure with lockwasher (2) and nut (1). One or two threads on shaft of circuit breaker should be visible from front of panel. If not, loosen retaining nut (1), reset adjustment nut (4) as required, and tighten retaining nut.

(4) Remove terminal screws and lockwashers from circuit breaker as required to connect all wires removed in step b. Replace lockwashers and terminal screws.

4-106. CONTROL PANEL INDICATOR LAMP SOCKETS (1DS1 - 1DS21).

NOTE

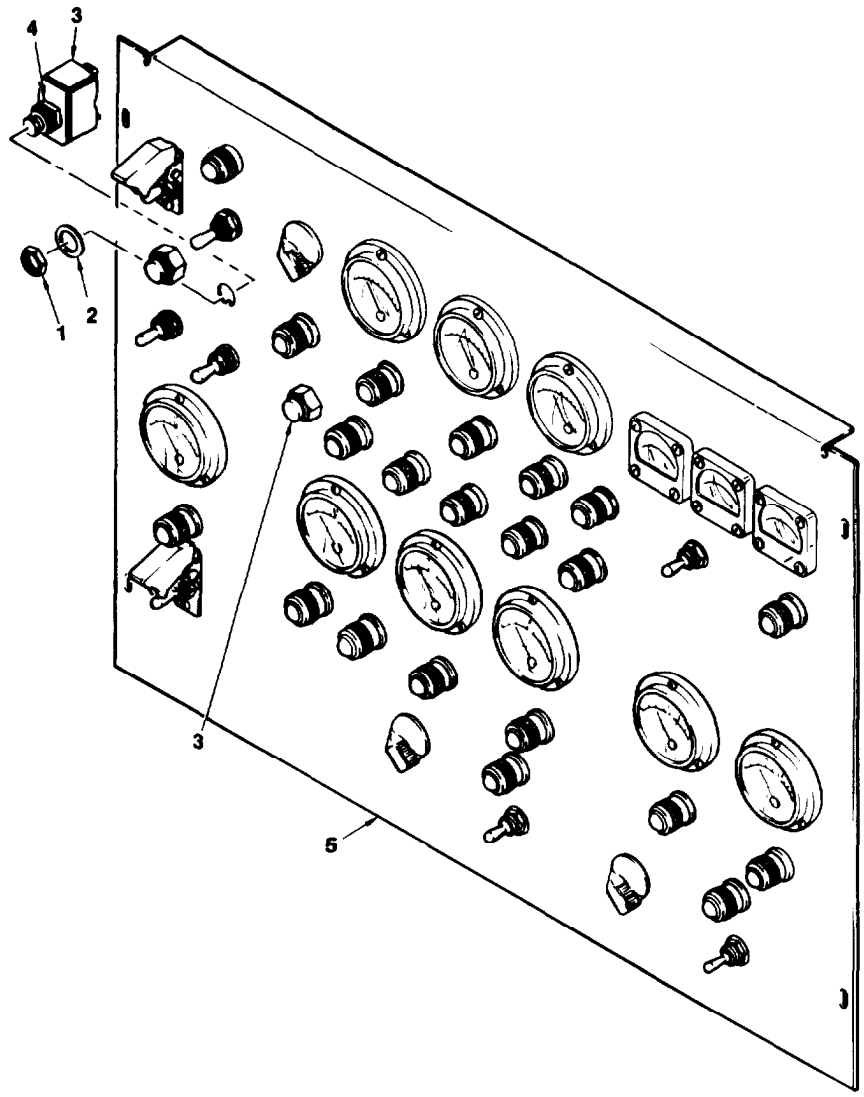
See table 4-2, Malfunctions 6 and 7 for test.

a. Remove. (See figure 4-80.)

(1) Disconnect battery cable from battery.

(2) Remove lens (1) by turning counterclockwise.

(3) Remove lamp (2) by pushing in and turning counterclockwise.



1. NUT
2. LOCKWASHER
3. CIRCUIT BREAKER (1CB1 AND 1CW)
4. HEIGHT ADJUSTMENT NUT
5. PANEL

Figure 4 -79. Control Panel Circuit Breakers

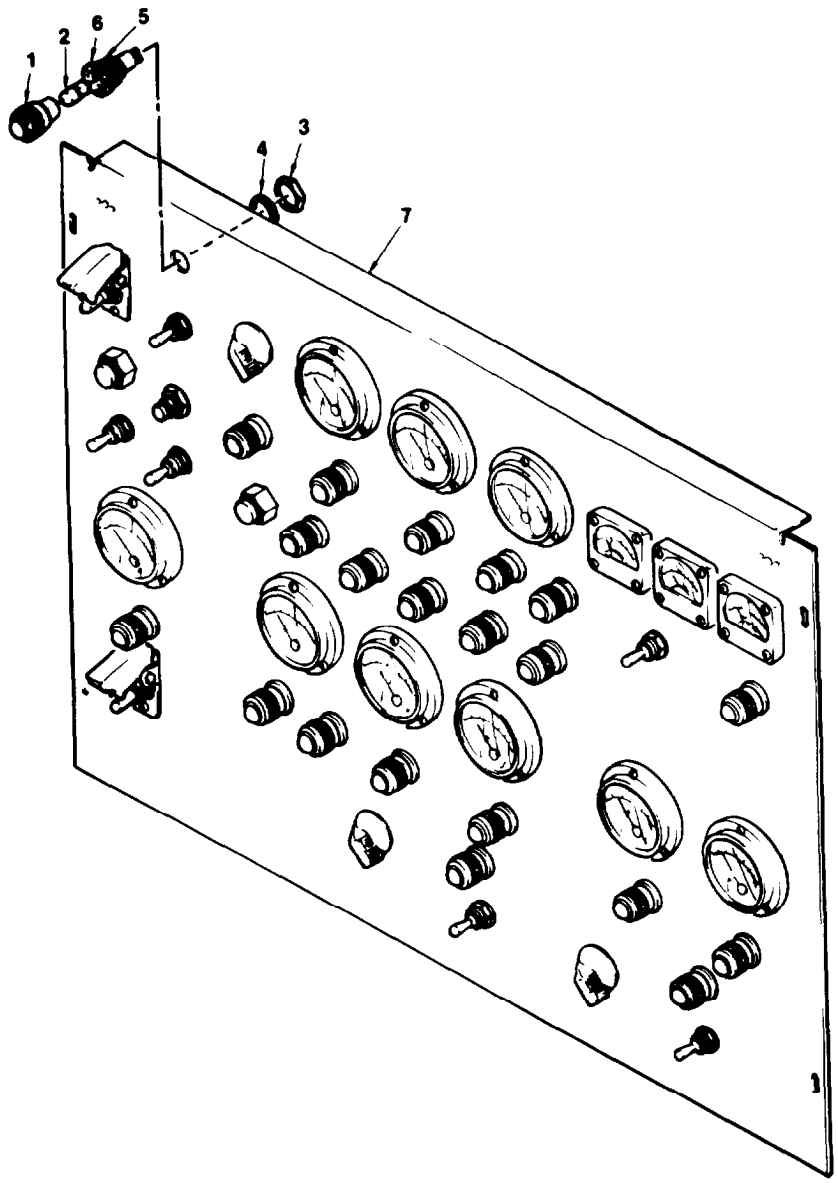
(4) Remove terminal screws and disconnect all wires from lamp socket (5).

(5) Remove nut (3), lockwasher (4). and lamp socket (5), from panel (7).

b. Install. (See figure 4-80.)

(1) Remove nut (3) and lockwasher (4) from replacement lamp socket (5).

(2) Install replacement lamp socket (5) with seal (6) from front of panel. Position socket so that positive terminal is to left (as viewed from back of socket). Secure socket to panel with lockwasher (4) and nut (3).



1. LENS
2. LAMP
3. NUT
4. LOCKWASHER
5. LAMP SOCKET (1DS1)
6. SEAL
7. PANEL

Figure 4-80. Control Panel Indicator Lamps/Sockets

(3) Remove terminal screws from socket, connect all wires removed in step b, and replace terminal screws.

(4) Place lamp (2) in socket (5). Press lamp and turn clockwise to lock in place.

(5) Install lens (1) in socket (5) by turning lens clockwise. Turn lens until force required increases. Any further clockwise rotation of lens will cause lamp to dim.

4-107. CONTROL PANEL METERS (1M1-1M12).

NOTE

If a meter is suspected to be malfunctioning, inoperable, or inaccurate contact appropriate instrument repair shop.

a. Round (Large) Meter Installation

NOTE

This procedure covers the following meters: EGT 1M1, %RPM 1M2, FUEL 1M3, PSIG PNEUMATIC 1M7, AC VOLTS 1M8, AC %LOAD 1M9, AC HERTZ 1M10, DC VOLTS 1M11, and DC AMPS 1M12.

(1) Remove. (See figure 4-81.)

(a) Tag wires. Remove two terminal nuts (10) and washers (11) as required to disconnect all wires (12) from back of meter (4). Replace washers and nuts.

(b) Remove three nuts (1), three lockwashers (2), three screws (3), and meter (4).

(2) Install. (See figure 4-81.)

(a) Install meter (4) from front of panel and secure with three screws (3), three lockwashers (2), and three nuts (1).

(b) Remove nuts and washers from terminals on back of meter (4). Connect all wires (12) disconnected in step (1). Replace two terminal washers (11) and nuts (10).

b. Square (Small) Meter Installation.

NOTE

This procedure covers the following meters: BATTERY VOLTAGE 1M4, STARTER CURRENT 1M5, and BATTERY CHG/DISCH 1M6.

(1) Remove. (See figure 4-81.)

(a) Tag wires. Remove two terminal nuts (10) and washers (11) as required to disconnect all wires (12) from back of meter (4). Replace washers and nuts.

(b) Remove four nuts (5), four lo&washers (6), four screws (7), and meter (9).

(2) Install. (See figure 4-81.)

(a) Install meter (9) with gasket (8) from front of panel and secure with four screws (7), four lockwashers (6), and four nuts (5).

(b) Remove nuts and washers from terminals on back of meter (9). Connect all wires (12) disconnected in step (I). Replace two terminal washers (11) and nuts (10).

4-108. CONTROL PANEL WIRING HARNESS.

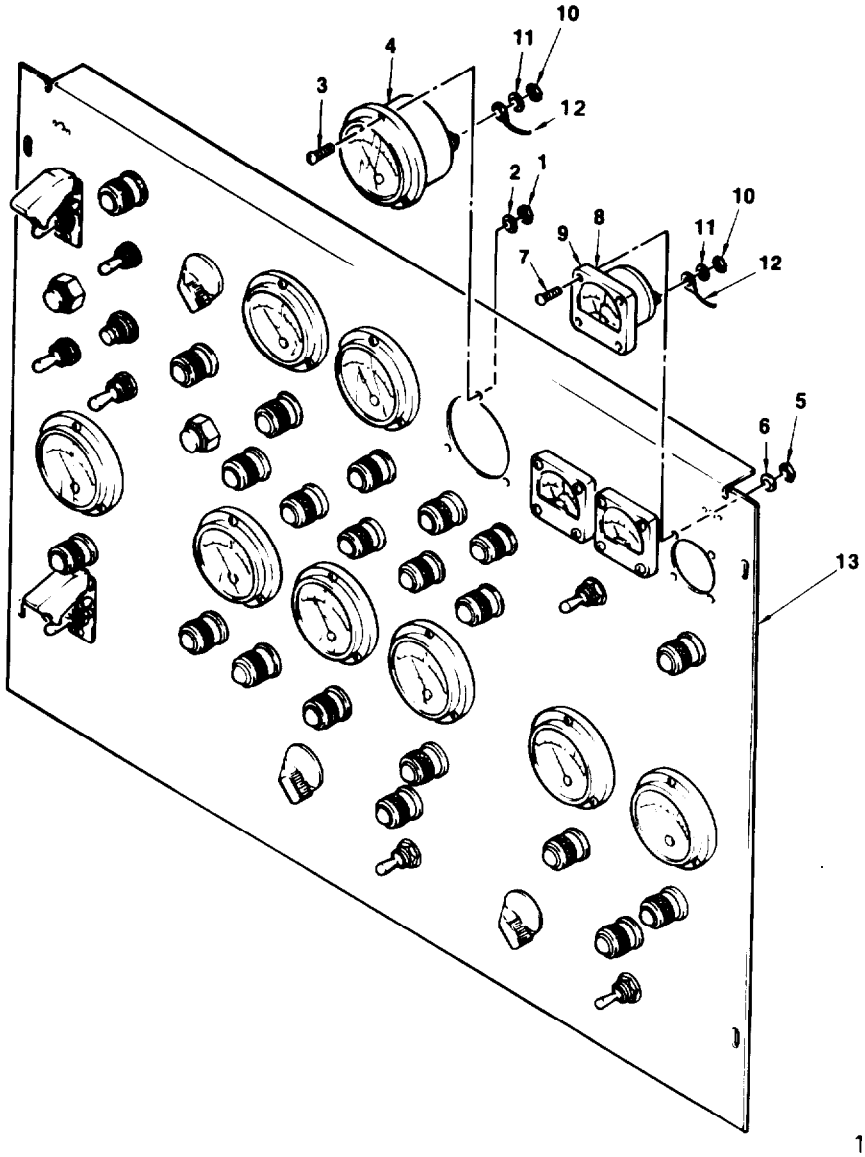
a. Inspect. (See figure 4-82.)

(1) Inspect wiring harness (5) for damaged insulation and broken wires.

(2) Check that cable clamps (3) are secure. Tighten clamp screws (1) if required.

(3) Check that all terminal connections are secure.

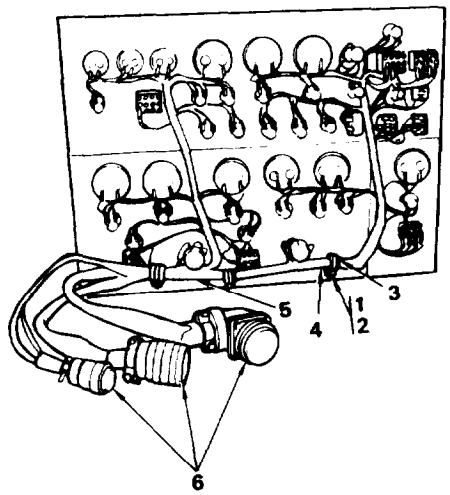
(4) Inspect harness connectors (6) for damage.



1. NUT
2. LOCKWASHER
3. SCREW
4. METER (1M3)
5. NUT
6. LOCKWASHER
7. SCREW
8. CASKET
9. METER (1M6)
10. NUT
11. WASHER
12. WIRE
13. PANEL

NOTE: ALL ROUND METER INSTALLATIONS SAME AS SHOWN FOR 1M3 AND ALL SQUARE METER INSTALLATIONS SAME AS SHOWN FOR 1M6.

Figure 4-81. Control Panel Meters



12-4-82

1.	SCREW	4.	SPACER
2.	WASHER	5.	HARNESS
3.	CLAMP	6.	CONNECTORS

Figure 4-82. Control Panel Wiring Harness

b. Repair.

(I) Refer to paragraph 4-49 for wiring and connector repair procedures.

(2) If a diode is defective, cut defective diode from wire and install new diode using splices. Install diode with cathode (black band) toward terminal lug end of wire. Use heat shrinkable sleeving over diode and splices to prevent shorting. Refer to paragraph 4-49a for splicing instructions.-

c. Remove. (See figure 4-82.)

(1) Disconnect mating connectors from control panel connectors 1J5, 1J6, and 1J7 (6).

(2) If a work space is available, remove control panel and move to work space.

(3) Note routing of wire bundles for reference.

(4) Disconnect wires from control panel terminals. As wires are disconnected, replace terminal washers, screws, and nuts to prevent loss.

(5) Remove screws (I), lo&washers (2), and cable clamps (3).

d. Install. (See figure 4-82.)

(1) Layout harness on panel with wire bundles routed as noted in step c.(3).

(2) Connect harness wires to control panel terminals (see figure FO-16).

(3) Install cable clamps (3) on harness (5). Attach clamps to spacers (4) with lockwashers (2) and screws (1).

(4) Replace control panel and mate control panel harness connectors (6) with main wiring harness.

4-109. CONTROL PANEL.

a. Remove.

(1) Disconnect battery.

(2) Remove battery charger access cover (paragraph 4-15).

(3) Disconnect main harness connectors from control panel connectors IJ5, 1J6, and 1J7.

(4) Remove four screws (2, figure 4-13), and washers (3) and lower control panel so that panel is supported by cable (5).

(5) Remove nut (6) and washer (7) from support cable (5).

(6) Remove control panel (4).

b. Repair. Replace damaged components or wiring harness as required.

c. Install.

(1) Position control panel (4, figure 4-13) with lower edge of panel resting on ledge beneath panel opening in rear of AGPU.

(2) Attach support cable (5) to control panel using washers (7) and nut (6).

(3) Connect main harness connectors to control panel connectors 1J5, 1J6, and 1J7.

(4) Raise panel into position and secure with four washers (3) and screws (2).

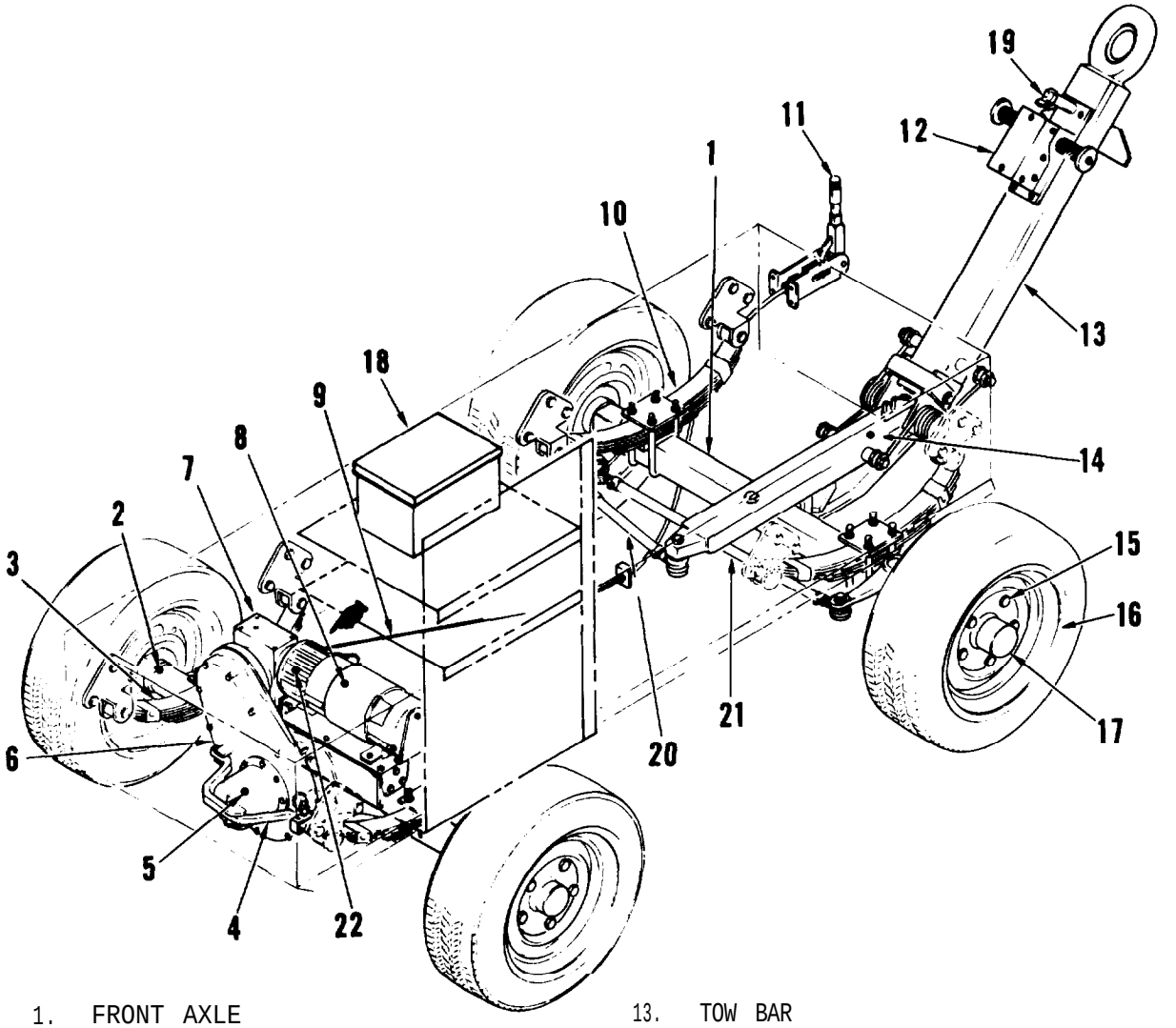
(5) Install battery charger access cover (paragraph 4-15).

Section XVIII. MAINTENANCE OF PROPULSION SYSTEM

4-110. GENERAL. The propulsion system, figure 4-83, provides suspension, steering, brakes, and drive power for the AGPU. A speed/direction control assembly (12) mounted on a tow bar (13) allows the operator to control the forward/reverse directions and speed (up to 3 mph on flat surface) in self-propulsion mode. The tow bar is also used to steer the AGPU when using self-propulsion mode. Drive power is provided by a dc traction motor (8) driving a conventional rear axle assembly. An electric brake assembly (22) is provided. Application of dc drive power to the traction motor is controlled by a motor controller (18) and relays located on the upper tray in the electrical compartment. The motor controller receives signals from the speed/direction control assembly. The drive train consists of a gear box (7), a chain drive (6), a manual clutch (5), and a rear axle assembly (2). A dead man switch (19) on the speed/direction control assembly must be held in while operating the propulsion system. If the switch is released (intentionally or accidentally) during operation, power is removed from the traction motor and the electric electric brake. Removing electrical power applies the electric brake. Additionally, the speed/direction control assembly contains a mercury switch which deactivates the propulsion system when the tow bar is raised. Conventional drum brakes are provided on the rear wheels. The brakes are set by a lever (11) on the front of the AGPU which is connected to the brake assemblies by a cable assembly (9).

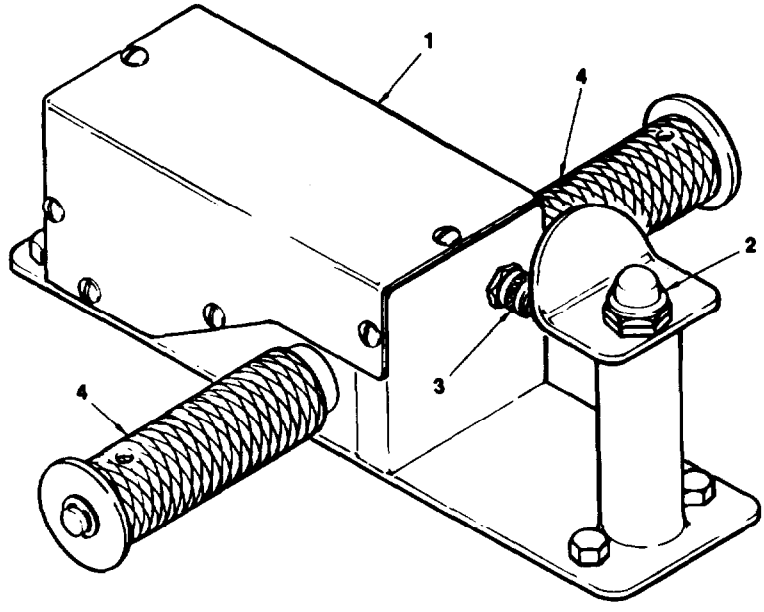
a. Motor Controller. The motor controller (18) and the forward and reverse relays are mounted on the upper tray in the electrical compartment. The motor controller receives +28 vdc from the control panel and control signals from the speed/direction control unit. It sends dc drive voltage to the traction motor armature and speed control signals to the traction motor field windings. The control signals from the speed/direction control assembly consist of forward or reverse relay activation signals from internal micro switches and variable speed control signals from the internal variable resistors. Both sets of signals are selected by the twist grips.

b. Speed/Direction Control Assembly. (See figure 4-84.) The speed/direction control assembly provides both the direction (forward and reverse) and the speed commands to the AGPU propulsion motor. The assembly mounts on the tow bar (1), close to the lunette eye. It is connected to the motor by a wiring harness that runs under the tow bar and is protected by the tow bar channel. Forward and reverse selection as well as speed are determined by the position



1. FRONT AXLE
2. REAR AXLE
3. REAR LEAF SPRING
4. CLUTCH LEVER
5. CLUTCH HOUSING
6. CHAIN DRIVE HOUSING
7. GEAR CASE
8. TRACTION MOTOR
9. BRAKE CABLE
10. FRONT LEAP SPRING
11. BRAKE LEVER
12. SPEED/DIRECTION CONTROL ASSEMBLY
13. TOW BAR
14. TONGUE
15. NUT, LUG
16. WHEEL
17. HUB
18. CONTROLLER (LOCATED ON UPPER TRAY IN ELECTRICAL COMPARTMENT)
19. DEAD MAN SWITCH
20. STEERING ROD
21. TIE ROD
22. ELECTRIC BRAKE

Figure 4-83. Propulsion System



1. SPEED/DIRECTION CONTROL ASSEMBLY
2. DEAD MAN SWITCH
3. DO NOT TOW INDICATOR LIGHT
4. TWIST GRIP

Figure 4-84. Tow Bar Controls

of the control twist grips (5). The twist grips can be actuated from either side of the tow bar. The twist grips are spring loaded to a neutral, no-propulsion position. The twist grips rotate in either direction, one way controlling forward direction and speed, and the other way reverse direction and speed. The controller contains an emergency dead man switch that must be depressed to operate the speed/direction controls. Release of the switch disconnects all power to the traction motor. A mercury switch is in the same line as the dead man switch. The mercury switch opens the power system supply when the tow bar is raised to approximately 60 degrees or more from horizontal. The assembly also incorporates an indicator light (4) with a press-to-test feature that is illuminated when the propulsion motor clutch is engaged.

c. Brake Assembly. The AGPU uses rear-wheel brakes that are controlled by an operator-activated mechanical lever connected to the brakes on a cable. The brakes are standard, automotive-type drum units using replaceable brake shoes.

4-111. FRONT AXLE ADJUSTMENTS.

a. Toe-In Adjustment. If original tie-rod (21, figure 4-83) length is unknown, it will be necessary to perform toe-in adjustment. To adjust toe-in, the AGPU should be sitting on a level surface. The tires should be properly inflated. Using a steel tape measure, measure and record the exact distance from the front center bead of the left tire tread to the front center bead of the right tire tread. Now measure and record the same measurement between the

rear center beads of the tires. If the front measurement is longer, the long tie-rod connecting the two front wheels must be lengthened by unscrewing the tie rod ends. If the front measurement is shorter, the tie-rod must be shortened by screwing the tie-rod ends a few turns and measure the toe-in distances again. Several adjustments may be necessary in order to equalize the front and rear distances. The proper toe-in adjustment of the AGPU is zero degrees, or an equal distance between front and rear of the tires.

b. Steering Rod Adjustment. After toe-in adjustment, it may be necessary to adjust the steering rod to center the steering.

(1) Release and lower tow bar (13, figure 4-83), and lower tow bar to floor and hold in place.

(2) Measure from left and right outside corners of AGPU chassis wheel wells to front end of tow bar lunette eye.

(3) Move tow bar until both measurements of step (2) are the same. Tow bar is now centered with AGPU chassis.

(4) Measure distance from AGPU chassis to inside edge of each tire bead.

(5) If measurements made in step (4) are unequal, adjust steering rod (20, figure 4-83) until equal measurements are obtained.

4-112. WHEELS AND TIRES.

a. Remove. (See figure 4-83.).

(1) Position AGPU on level surface. Chock wheels opposite those to be removed. Apply parking brake.

(2) Loosen lug nuts (15) on wheels (16) to be removed. Nuts should be loosened no more than one (1) full turn.

NOTE

If all four wheels are to be removed, support the AGPU with jack stands at each corner prior to removing wheels.

(3) Raise AGPU with floor jack until the wheels (16) to be removed are off the ground. Support the AGPU with jack stands.

(4) Remove the five lug nuts (15). Remove the wheel (16).

b. REPAIR. **DELETE.**

C. Install. (See figure 4-83 .)

(1) Position the wheel (16) against the hub so that the five lug bolts protrude through the wheel. Install the five lug nuts (15) and tighten to 45 foot-pounds.

(2) Raise the AGPU with floor jack. Remove jack stands and lower AGPU.

(3) Remove wheel chocks.

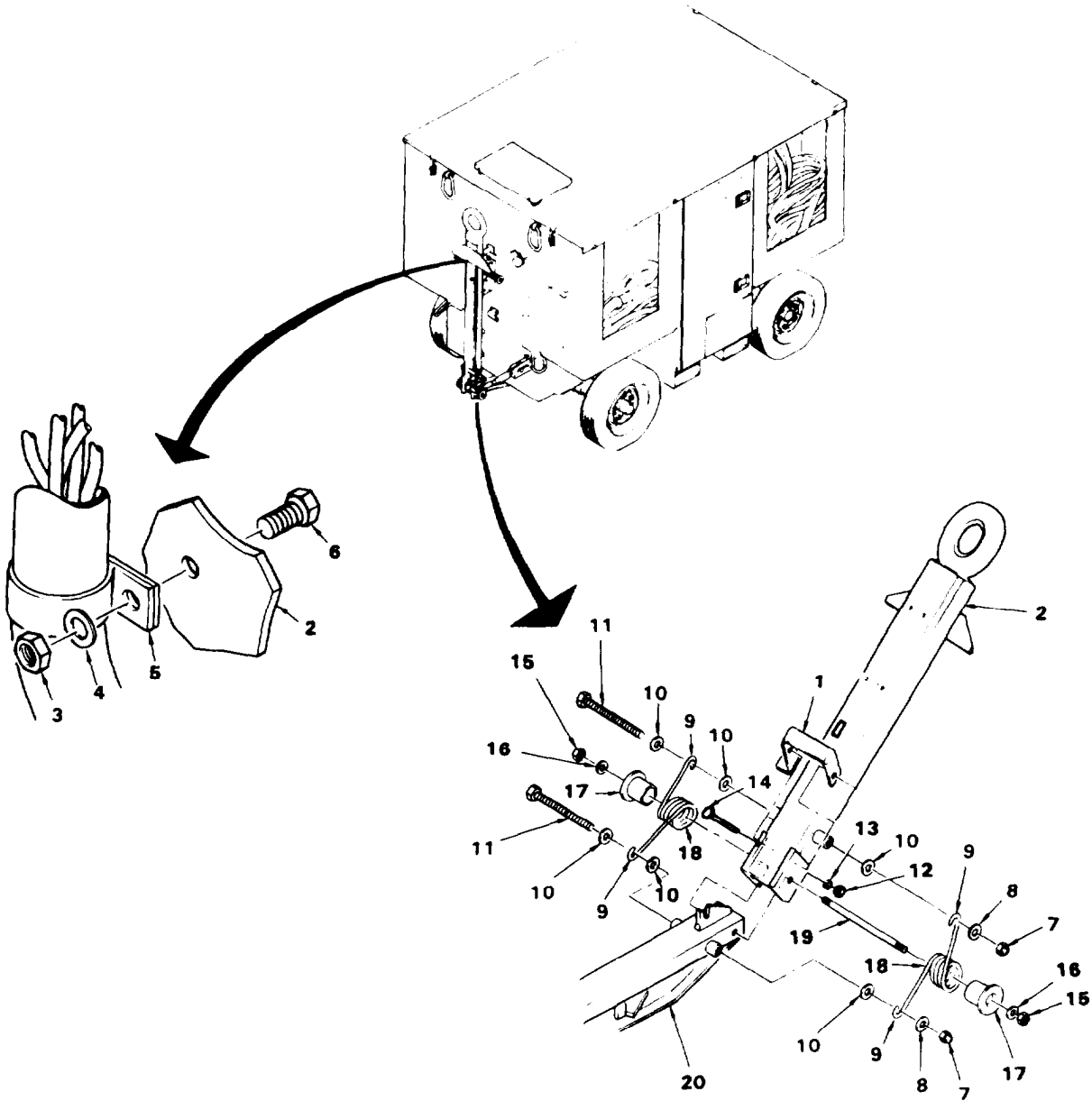
4-113. TOW BAR ASSEMBLY.

a. Remove. (See figure 4-85.)

(1) Position AGPU on level surface. Place chocks against rear wheels and apply parking brake.

(2) Disconnect battery.

(3) Depress tow bar release latch assembly (1) while supporting tow bar assembly (3). Lower tow bar.



12-4-85

1. LATCH ASSEMBLY	8. FLAT WASHER	15. LOCK NUT
2. TOW BAR ASSEMBLY	9. SPRING LOOPS	16. WASHER
3. NUT	10. FLAT WASHER	17. SLEEVE
4. FLAT WASHER	11. BOLT	18. SPRING
5. CLAMP	12. NUT	19. SHAFT
6. SCREW	13. WASHER	20. TONGUE
7. LOCK NUT	14. BOLT	

Fiqure 4-85. Tow Bar

(4) Remove speed/direction control assembly (paragraph 4-118).

(5) Raise tow bar assembly (2) to vertical position to relieve tension from springs (18).

(6) Remove two nuts (3), two washers (4), two clamps (5), and two screws (6) securing wiring harness to underside of tow bar assembly (2).

(7) On tow bar (2) and tongue (20), remove lock nuts (7) and washers (8) from bolts (11).

(8) Remove bolts (ll), and washers (10) to release spring loops (9).

(9) Remove nut (12), washer (13), and bolt (14) that lock shaft (19) in place.

(10) Remove two lock nuts (15), two washers (16), two sleeves (17), and two springs (18) from shaft (19).

(11) Support tow bar (2) and remove shaft (19). Remove tow bar.

b. Install. (See figure 4-85.)

(1) Raise tow bar and install shaft (19) through holes in tow bar assembly (2), aligning with holes in tongue (20). Lock shaft in place with bolt (14), washer (13), and nut (12).

(2) Place springs (18), sleeves (17), washers (16) and lock nuts (15) onto shaft (19).

(3) Raise tow bar to vertical position to remove tension from springs (18).

(4) On tow bar (2) and tongue (20) install bolts (11), and washers (10) to secure spring loops (9).

(5) Install washers (8), and lock nuts (7) on bolts (11).

(6) Secure wire harness with clamps (5) to tow bar (2) with two screws (6), two washers (4), and two nuts (3).

(7) Install speed/direction control assembly (paragraph 4-118).

(8) Connect battery.

4-114. BRAKE CABLE ASSEMBLY.

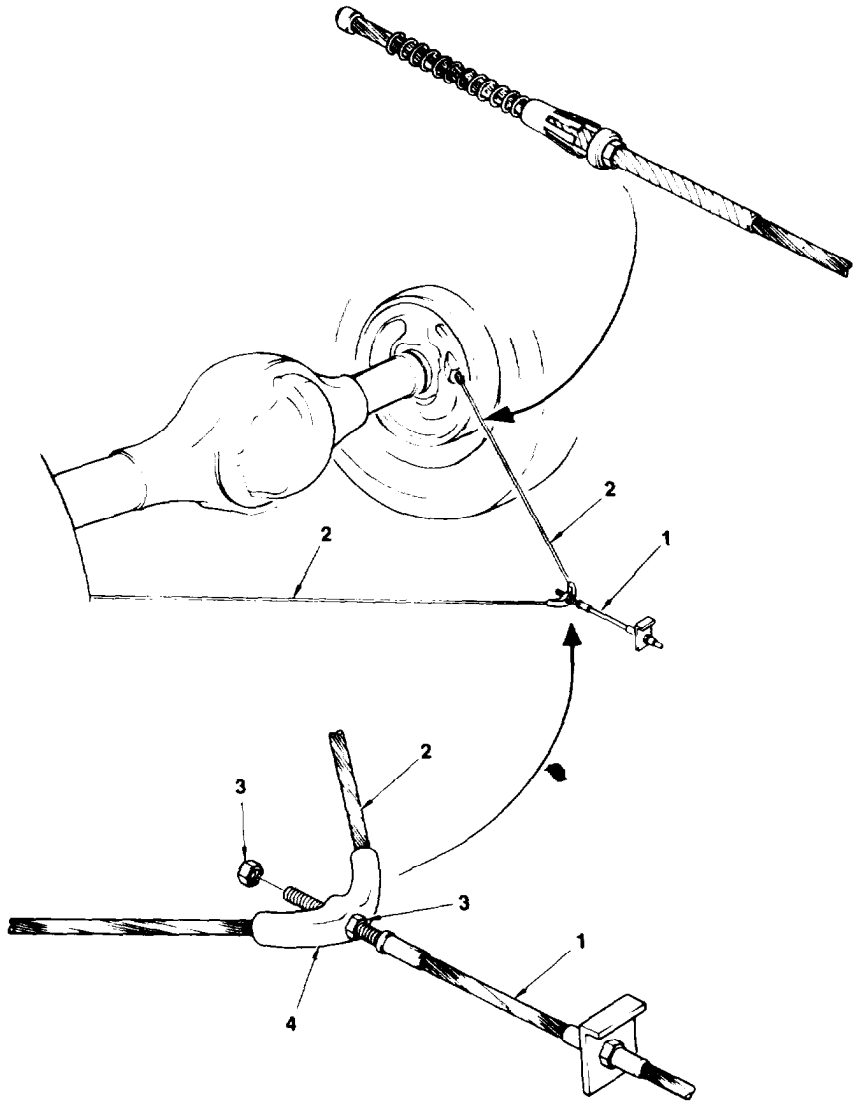
a. Inspect. (See figures 4-86 and 4-87.)

(1) Inspect front and rear brake cables (1 and 2, figure 4-86), and cable fixture (4) for broken strands, missing or loose fasteners or mounting hardware and improper operation.

(2) Inspect brake lever assembly (17, figure 4-87) for bent or broken components, loose or missing fasteners, improper operation and corrosion.

(3) Remove rear wheels and tires (paragraph 4-112).

(4) Inspect rear wheels brake assembly (see paragraph 4-115 for removal) for loose fasteners, broken components, worn shoes and corrosion.



12-4-86

1. FRONT BRAKE CABLE
2. REAR BRAKE CABLE
3. ADJUSTMENT NUT
4. CABLE FIXTURE

Figure 4-86. Brake Cables

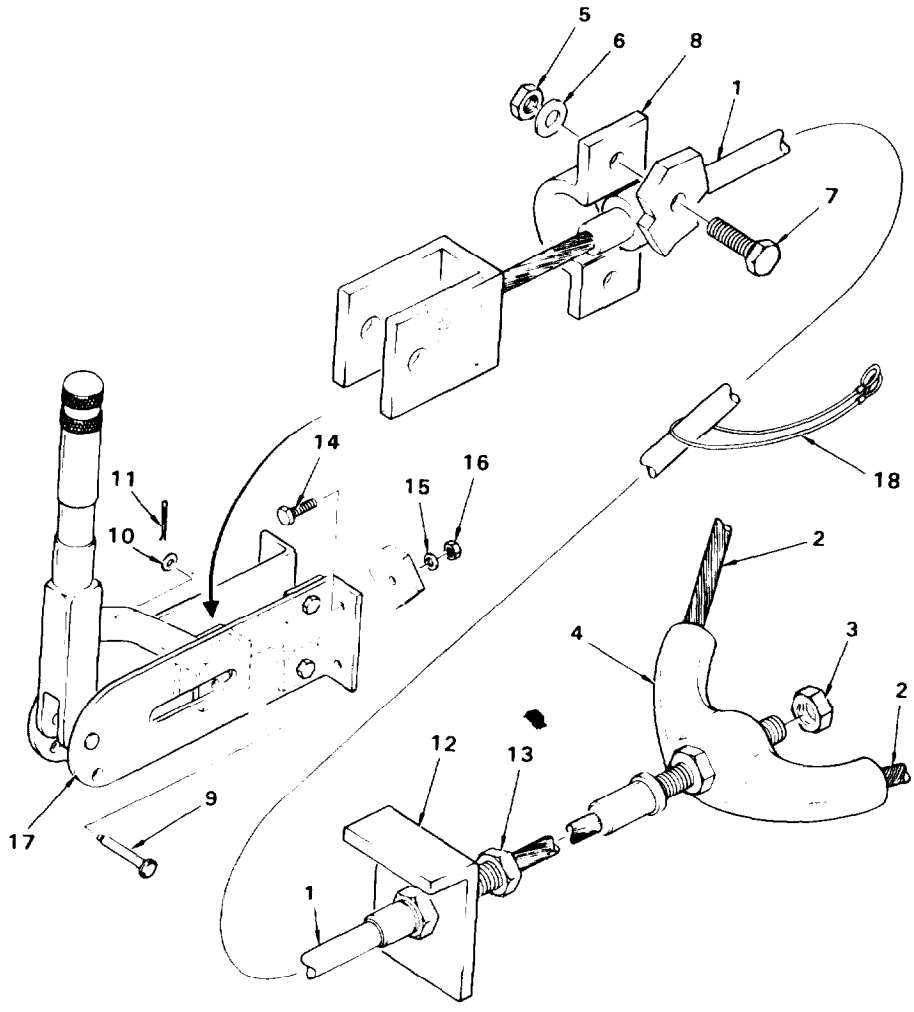
Removal. (See figures 4-86 and 4-87.)

(1) Raise AGPU rear wheels and place jack stands under rear axle.

(2) Release parking brake (17, figure 4-87). Pull front brake cable (1) from cable fixture (4).

(3) Disconnect rear brake cables (2, figure 4-86) from brake levers (see paragraph 4-115) on each rear wheel.

(4) Remove front brake cable (1, figure 4-86) from brake lever assembly (17, figure 4-87) by removing nut (5), lockwasher (6), bolt (7), cotter pin (11), washer (10) and pin (9).



1.	CABLE, FRONT		BOLT	13.	NUT
2.	CABLE, REAR		CLAMP	14.	BOLT
3.	NUT	9.	PIN	15.	WASHER, LOCK
4.	CABLE FIXTURE	10.	WASHER, FLAT	16.	NUT
5.	NUT	11.	COTTER PIN	17.	BRAKE LEVER ASSEMBLY
6.	WASHER, LOCK	12.	L-BRACKET	18.	LANYARD

Figure 4-87. Brake Lever Assembly

(5) Remove nut (13) from front brake cable (1) and remove from L-bracket (12).

(6) To remove brake lever assembly (17) remove nut (16), lockwasher (15) and bolt (14).

c. Installation. (See figures 4-8 and 4-87.)

(1) Position brake lever assembly (17, figure 4-87) and install bolt (14), lockwasher (15) and nut (16).

(2) Position front brake cable (1) on brake lever assembly (17) and install pin (9), clamp (8), bolts (7), lockwashers (6), nuts (5) and cotter pin (11).

(3) Position front brake cable (1) through hole in L-bracket (12) and install nut (13).

(4) Connect rear brake cables (2, figure 4-86) to brake levers (paragraph 4-115) on each rear wheel.

(5) Position front brake cable (1) through cable fixture (4) and install nut (3).

(6) Install brake assembly in accordance with paragraph 4-115.

(7) Install wheel and tire assembly in accordance with paragraph 4-112.

NOTE

Do not remove from jack stands.

(8) Tighten nut (3) a few turns at a time, checking the rear wheels for free rotation each time. When the cable has been tightened sufficiently to begin engaging the rear brakes, loosen the adjustment nut three full turns. Engage parking brake (17, figure 4-87) to ensure brakes will lock rear wheels.

(9) Raise AGPU. Remove jack stands and lower AGPU.

4-115. BRAKE ASSEMBLY.

Disassembly. (See figure 4-88.)

(1) Remove rear wheels and tires in accordance with paragraph 4-112.

(2) Remove plastic dust cap (1) from backing plate (2). Adjust brake shoes for maximum clearance from brake drum by placing adjusting spoon in slot located on backing plate. Move adjusting spoon in an upward motion until adjusting assembly will no longer turn.

(3) Mark the drums so they are replaced on the same side as removed. Remove brake drum (3) by tapping with a mallet until drum is loose. If drum will not break loose by tapping with mallet, use a wheel puller to remove drum.

(4) Remove return spring (4), washer (5), spring retainers (6), springs (7), spring retainers (8) and pins (9).

(5) Remove brake cable (10) from brake lever (11) compress the brake cable captive fittings and pull the brake cables out of the rear wheel backing plates (2).

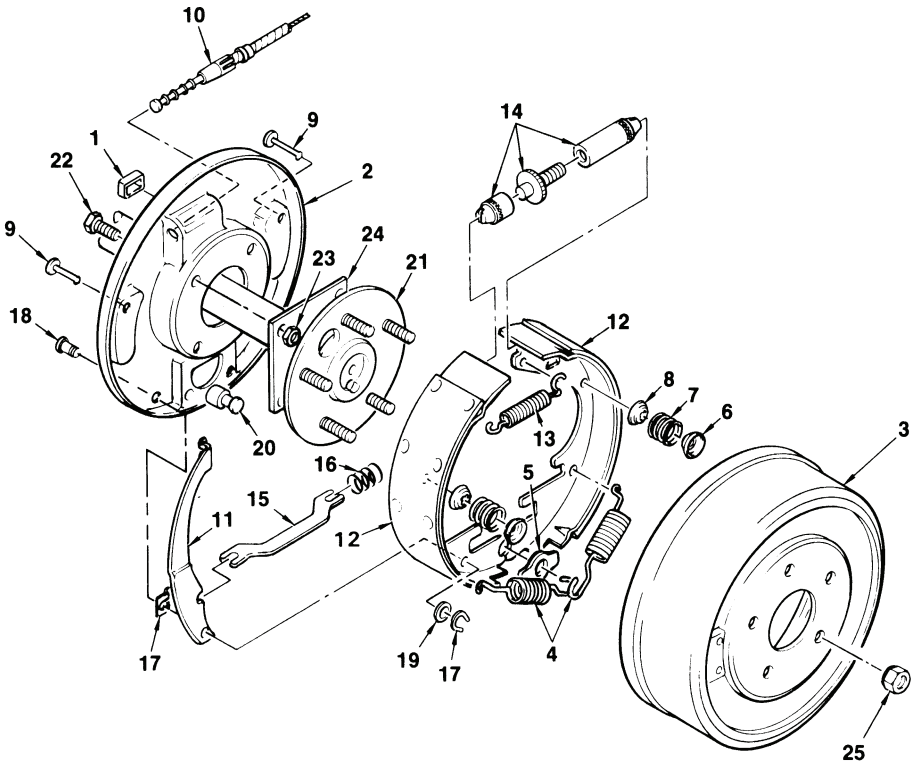
(6) Spread brake shoes (12) leaving spring (13) and adjustment assembly (14) in place. Remove brake link (15) and brake link spring (16). Remove brake shoes.

(7) Remove retainer clip (17), pin (18), and washer (19) to remove brake lever (11) from brake shoes (12).

b. Cleaning.

WARNING

Avoid inhaling dust and residue from the brake shoe lining. The linings are made of asbestos, a known cancer-causing substance. Cover the mouth and nose with a fabric mask when cleaning the brake assembly.



1. DUST CAP
2. BACKING PLATE
3. BRAKE DRUM
4. RETURN SPRING
5. WASHER
6. SPRING RETAINER
7. SPRING
8. SPRING RETAINER
9. PIN
10. BRAKE CABLE
11. BRAKE LEVER
12. BRAKE SHOE
13. SPRING
14. ADJUSTMENT ASSEMBLY
15. BRAKE LINK
16. BRAKE LINK SPRING
17. RETAINER CLIP
18. PIN
19. WASHER
20. BACKING PLATE STUD
21. AXLE
22. BOLT
23. NUT
24. RETAINER PLATE
25. NUT

Figure 4-88. B rake Assembly.

WARNING

Degreasing Solvent, MIL-PRF-680, is combustible and toxic to eyes, skin, and respiratory tract. Wear protective gloves and goggles/face shield. Avoid repeated or prolonged contact. Use only in well ventilated ares (or use approved respirator as determined by local safety/industrial hygiene personnel). Keep away from open flames or other sources of ignition.

(1) Blow dust and contamination from backing plates using a maximum of 300 psi air pressure. Use degreasing solvent, MIL-PRF-680, and a stiff bristle brush to clean the backing plates and brake components of grease, oil and dirt.

(2) Before installing new parts, remove any preservative materials such as rust-preservative materials such as rust-preventive compound or protective grease. Remove glaze from the faces of brake shoe linings with a coarse file. If brake shoes are replaces, slightly bevel the edges of the linings with a fine file before the shoes are installed.

b. Inspection and Repair.

(1) Inspect brake components for physical damage. Check brake surface of drum for scoring, cracks, and being out-of-round. If drum scoring is minor, the drum may be turned on a brake lathe. If scoring is deep, the drum must be replaced. If brake linings are excessively worn, they must be replaced.

(2) Check brake springs for cracks or other physical damage. If springs are weak or worn, they should be replaced. Check brake lever and link for cracks or other damage. Inspect adjustment components for damage threads. Replace if damaged.

c. Assembly. (See figure 4-88.)

(1) Position brake lever (11) on brake shoe (12) and intall washer (19), pin (18) and retainer clip (17).

(2) Lay brake shoes (12) on flat surface and install adjustment assembly (14) and spring (13) on brake shoes.

(3) Pull brake cable (10) through hole in backing plate (2) until spring fingers released on outer side of backing plate and lock cable in place. Hook the brake cable to the brake lever (11).

(4) Position brake shoes (12) on backing plate (2). Spread brake shoes and install brake link spring (16), brake link (15) in slots on brake shoes. Connect parking brake cable (10) to brake lever (11).

(5) Install brake shoe pins (9) through backing plate (2) and brake shoes (12). Secure with spring retainers (6), springs (7) and spring retainers (8).

(6) Install washer (5) and connect return springs (4) to backing plate stud (20). Check brake shoes (12) for alignment and security. Install brake drum (3).

(7) Install wheel and tires in accordance with paragraph 4-112.

(8) Position brake adjustment spoon into slot on backing plate (2). With downward motion adjust brake shoes while rotating the tire by hand until the brake shoes drag on brake drum. Back off three clicks on adjustment. Install dust cap (1).

4-116. CONTROL RELAYS.

a. Remove. (See figure 4–89).

(1) Disconnect battery (paragraph 4-25).

(2) Remove roof (paragraph 4-16).

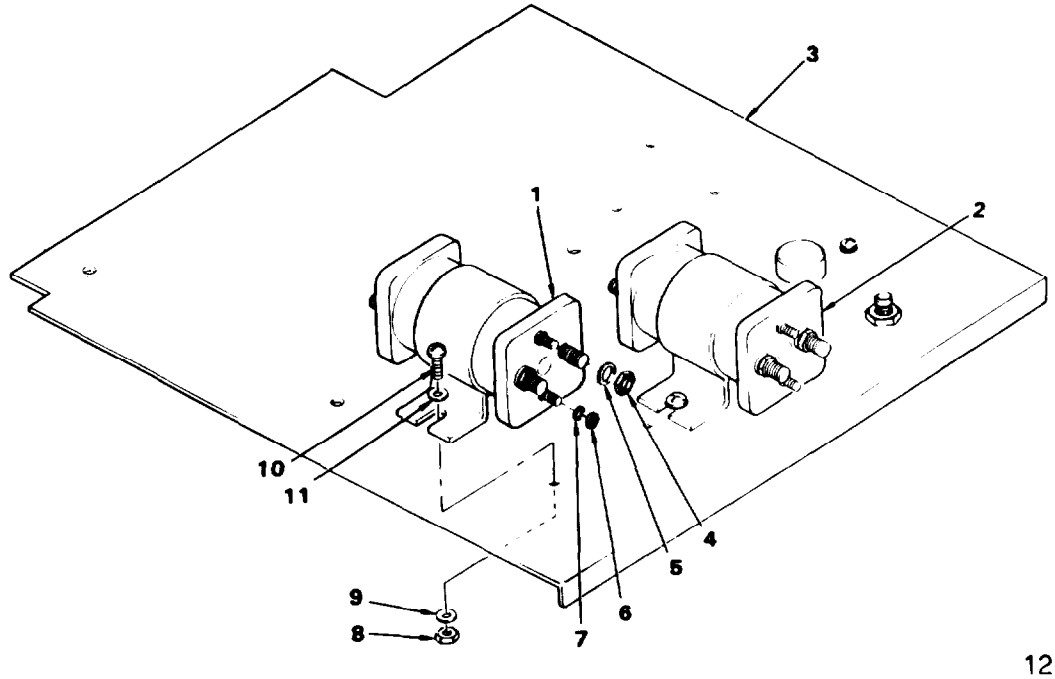
(3) Open electrical trays access door.

(4) K-1 and K-2 control relays (1 and 2) are located on front of upper tray assembly (3).

(5) Remove nuts (4), lockwashers (5), nuts (6), lockwashers (7) from front of K-1 and K-2 control relays (1 and 2).

(6) Tag and remove wires from front of K-1 and K-2 control relays (1 and 2).

(7) Remove nuts (4), lockwashers (5) from rear of K-1 and K-2 control relays (1 and 2).



12-4-89

NOTE: OTHER TRAY COMPONENTS NOT SHOWN.

1.	RELAY K-1	7.	WASHER, LOCK
2.	RELAY K-2	8.	NUT
3.	UPPER TRAY	9.	WASHER, LOCK
4.	NUT	10.	SCREW
5.	WASHER, LOCK	11.	WASHER, FLAT
6.	NUT		

Figure 4-89. Control Relays K1 and K2

(8) Tag and remove wires from rear of K-1 and K-2 control relays (1 and 2).

(9) Remove nuts (8), lockwashers (9), screws (10), and flat washers (11), securing K-1 and K-2 control relays (1 and 2) from electrical compartment upper tray (3).

b. Install. (See figure 4-89.)

(1) Position K-l and K-2 control relays (1 and 2) on upper tray (3). Ensure relays are properly positioned (front and rear).

(2) Install flat washers (11) on screws (10) and install screws through holes in upper tray (3). Install lockwashers (9) and nuts (8) on screw (10).

(3) Connect external wires to rear of K-1 (1) and K-2 (2) control relays. See figure 4-90 for proper connections.

(4) Install lockwashers (5) and nuts (4).

(5) Connect external wires to front of K-1 and K-2 control relays (1 and 2).

(6) Install lockwashers (5 and 7), nuts (4 and 6).

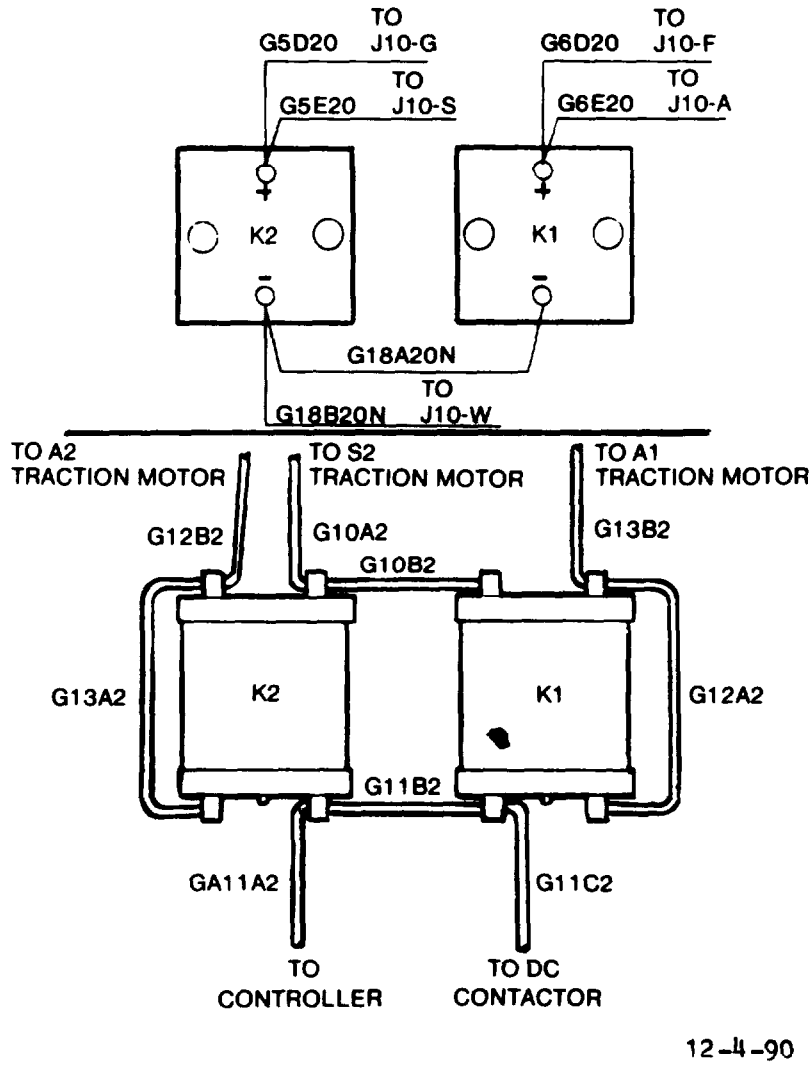


Figure 4-90. Control Relays K1 and K2 Connections

4-117. MOTOR CONTROLLER.

a. Remove. (See figure 4-91.)

(1) Disconnect battery (paragraph 4-25).

(2) Remove roof (paragraph 4-16).

(3) Open electrical trays access door.

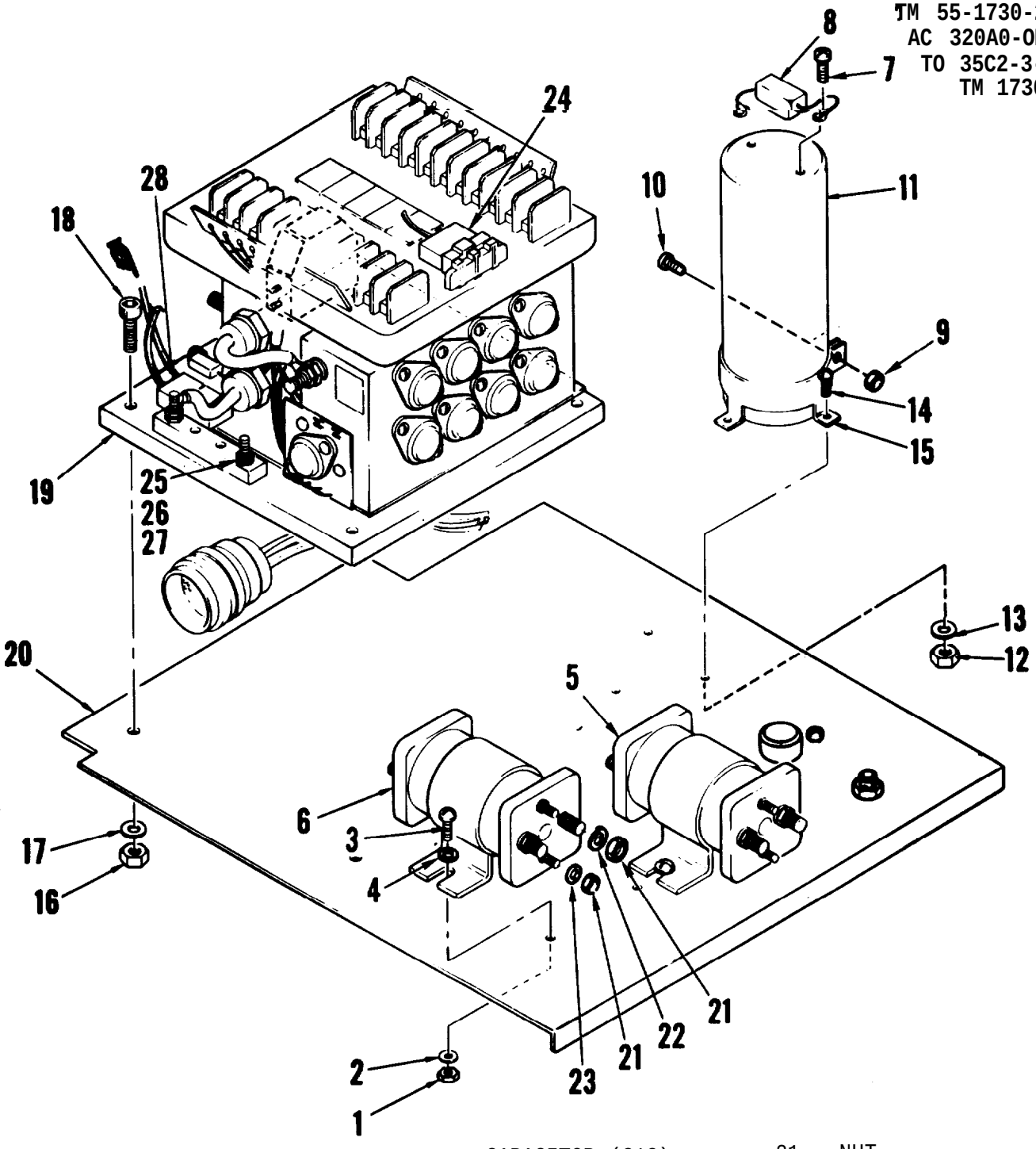
(4) Remove nuts (25), lockwashers (26) and flat washers (27) from terminals S-1, S-2, POS, and NEG.

(5) Tag and remove wire from terminals S-l, S-2, POS, and NEG.

(6) Tag and remove slide in wire from 28V keyswitch input terminal (28).

CAUTION

It is necessary to push wires and cables toward front of AGPU to allow space for motor controller to be removed. Do not pick up motor controller by small component parts or breakage may occur.



1. NUT
2. LOCKWASHER
3. SCREW
4. WASHER
5. FORWARD RELAY (K1)
6. REVERSE RELAY (K2)
7. SCREW
8. RESISTOR (R1G)
9. NUT
10. SCREW
11. CAPACITOR (C1G)
12. NUT
13. WASHER
14. SCREW
15. MOUNTING CLAMP
16. NUT
17. WASHER
18. SCREW
19. MOTOR CONTROLLER
20. UPPER TRAY
21. NUT
22. WASHER, LOCK
23. WASHER, FLAT
24. CONNECTOR, ELECTRICAL
25. NUT
26. WASHER, LOCK
27. WASHER, FLAT
28. 28V KEYSWITCH INPUT

Figure 4-91. Upper Electrical Tray Components

(7) Tag and remove cable (G12B2. figure 4-92).

(8) Tag and remove electrical connector (24) from top of controller.

(9) Remove nuts (16). lockwashers (17). screws (18). Remove motor controller (19) from upper tray (20).

b. Install. (See figure 4-91.)

(1) Place motor controller (19) in proper position on upper tray (20). Insert screws (18) through mounting holes in motor controller and upper tray. Install lockwashers (17) and nuts (16) cm screws. Tighten nuts securely.

(2) Install electrical connector (24) to top of controller. (See figure 4-92 for proper connections.)

(3) Install cable (G12B2, figure 4-92.)

(4) Install slide in wires (1 and 8) to 28V keyswitch terminal.

(5) Connect wires to terminals S-l. S-2, POS and NEG.

(6) Install flat washers (27. figure 4-91). lockwashers (26). and nuts (25) to terminals S-1. S-2, POS and NEG.

(7) Adjust motor controller as follows:

(a) Insure the AGPU switches and traction motor are set to the alternate (battery) propulsion mode (see TM 55-1730-229-12, paragraph 2-10.b).

NOTE

Removal of the roof will allow easy access to the motor controller far the adjustments.

NOTE

Two people are required for the motor controller adjustments. One person to operate the speed/direction handgrip assembly and one to make adjustments at the motor controller.

(b) Set the drive switch to ON and check that the drive lamp is illuminated.

(c) Release the tow bar and lower it to the operating position.

(d) Press down and hold the dead-man switch.

(e) Rotate the speed/directional handgrip assembly in the forward direction only enough to engage the forward direction only enough to engage the forward relay (K1) on the upper tray. Do not rotate the speed/directional handgrip assembly after engaging the relay. Hold the speed/directional handgrip assembly at this position until the volts adjustment is completed.

CAUTION

Performs all trim pot adjustments in the order shown. Adjustments are made to the trim pots located on the top of the motor controller.

(f) Volts adjust: With the speed/direction handgrip assembly set per paragraph (e), adjust the volts adjust trim pot in the direction of the arrow until you hear the propulsion motor start to whine. The motor should whine and attempt to crawl the AGPU forward. Do not adjust further.

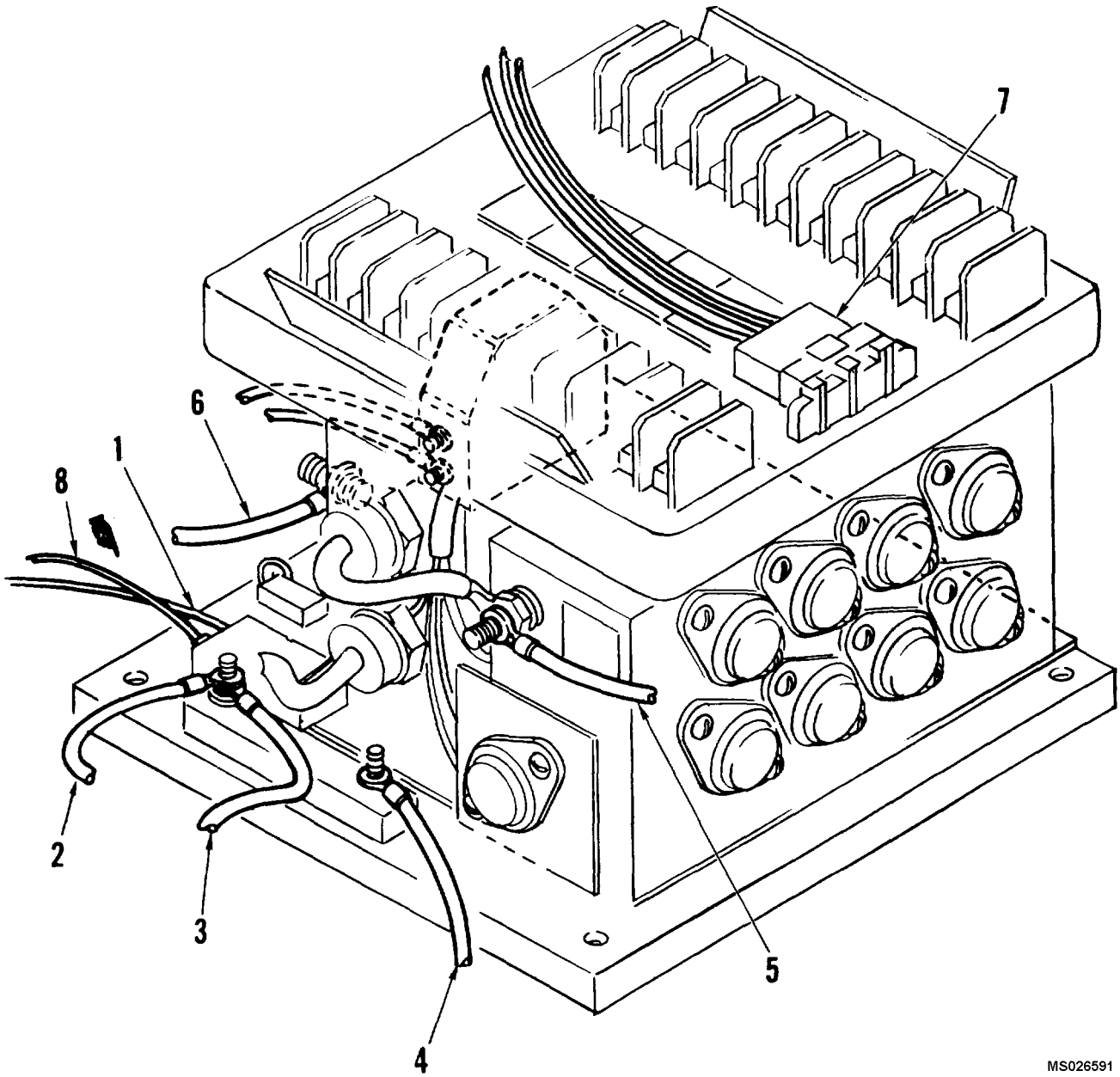
NOTE

The speed/direction handgrip assembly must be released to perform the remaining adjustments.

(g) Current Limiter: Turn the current limiter trim pot the full direction of the arrow.

(h) Accelerator: Turn the accelerator trim pot in the full direction of the arrow and then approximately 1/2 turn in the reverse direction

(i) Max Brake: Turn the max brake trim pot in the full direction of the arrow and then 1/2 turn in the reverse direction.



1. G3G20
2. G15A2 TO S2 OF TRACTION MOTOR
3. G10A2
4. G21A2N TO GND STUD
5. TO S1 OF TRACTION MOTOR
6. G11A2 TO K2
7. CONNECTOR TO SPEED/DIRECTION CONTROL ASSEMBLY
8. G30A20 TO TB2–16

Figure 4-92. Motor Controller Connections.

NOTE

The trim pots are very sensitive so make your adjustments accordingly.

(j) Brake: Turn the brake trim pot approximately ½ to ¾ turn in the direction of the arrow. The operator at the speed/direction handgrip assembly should attempt to engage the propulsion motor at this time. The AGPU should propel in a slow smooth manner. The operator should verify the AGPU will brake properly by turning the speed/direction handgrip assembly and then releasing the handgrip momentarily and then reversing the handgrip assembly. The AGPU, if adjusted properly, will slow, stop, and reverse without violent movement. Should the AGPU fail to slow, stop, and reverse smoothly, adjust the brake trip pot in the direction of the arrow until the unit brakes smoothly. If the movement is violent (e.g. the wires squeal while trying to reverse), turn the brake trim pot in the opposite direction of the arrow.

4-118. SPEED/DIRECTION CONTROL ASSEMBLY.

a. Remove. (See figure 4-93.)

(1) Remove screws (1) and cover (3) from speed/direction control assembly.

(2) Remove wiring harness by tagging and disconnecting wires from terminal board (4).

(3) Tag and cut black, white and brown (KWN) wire at splice.

(4) Remove wiring harness from speed/direction control assembly (5) by pulling harness through hole on under side of tow bar (6).

(5) Remove speed/direction control assembly (5) by removing nuts (7), lockwashers (8).

b. Disassembly. (See figure 4-93.)

(1) Remove and tag wires. Remove two micro switches (13) by removing two nuts (14), and screws (15) from speed/direction control assembly (5).

(2) Remove and tag wires. Remove light assembly (16) by removing light lens (17), bulb (18), nut (19), and washer (20) from speed/direction control assembly (5).

c. Assembly.

(1) Position two micro switches (13) on speed/direction control assembly (5). Install screws (15) and nuts (14). Connect wires.

(2) Position light assembly (16) on speed/direction control assembly (5). Install nut (19), washer (20), bulb (18) and lens (17). Connect wires.

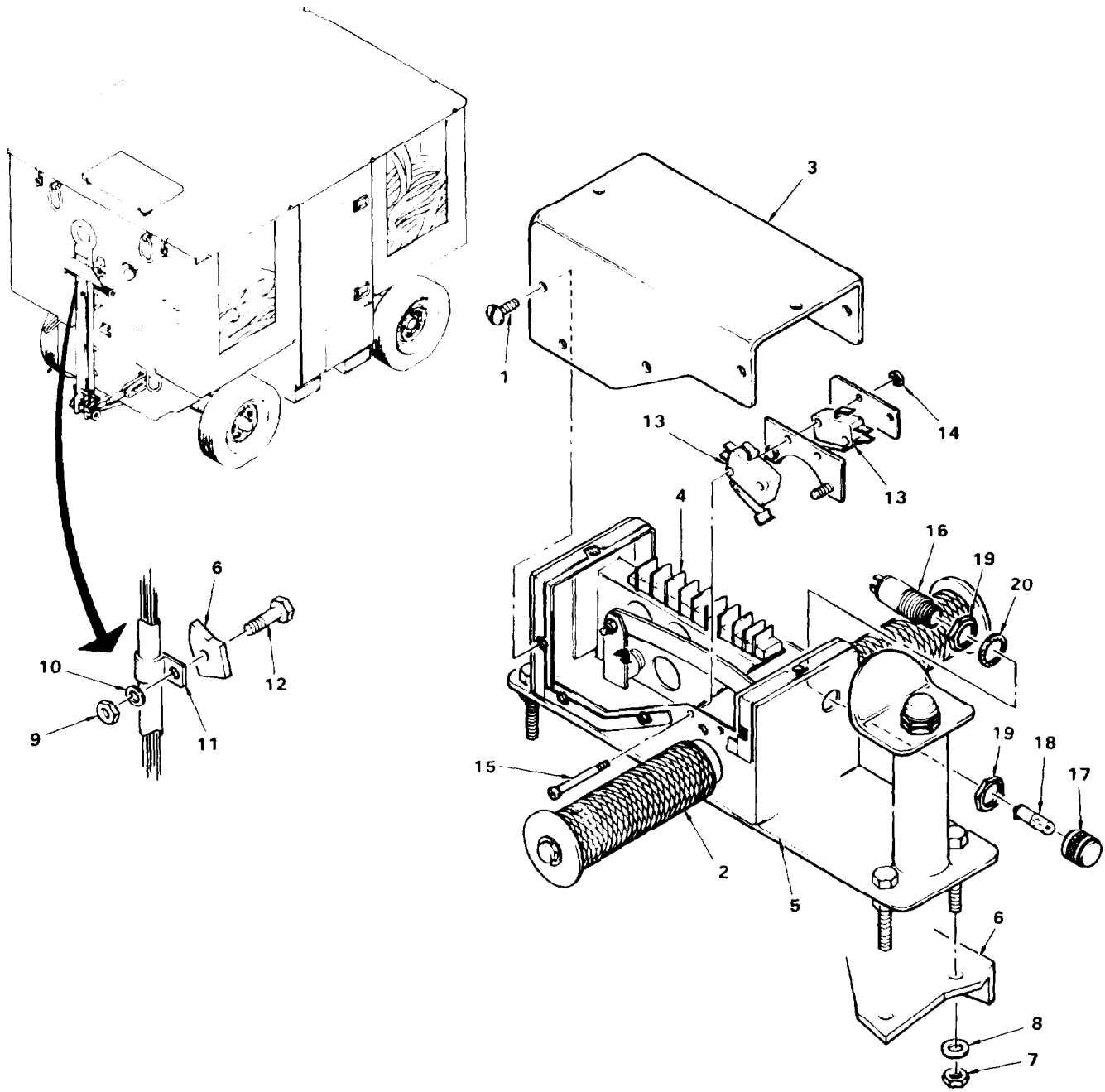
d. Install. (See figure 4-93.)

(1) Position the speed/direction control assembly (5) on the tow bar (6) and secure with lockwashers (8) and nuts (7).

(2) Insert wiring harness through hole in bottom of tow bar (6) into speed/direction control assembly (5).

(3) Connect wires on terminal board (4) and splice the KWN wire to marked wire.

(4) Install cover (3) and screws (1) on speed/direction control assembly.



1. SCREW
2. TWIST GRIP
3. COVER
4. TERMINAL BOARD
5. SPEED/DIRECTION CONTROL ASSEMBLY
6. TOW BAR
7. NUT
8. WASHER, LOCK
9. NUT
10. WASHER
11. CLAMP
12. SCREW
13. MICRO SWITCH
14. NUT, LOCK
15. SCREW
16. LIGHT ASSEMBLY
17. LENS
18. BULB
19. NUT
20. WASHER

Figure 4-93. Speed/Direction Control Assembly

APPENDIX A

REFERENCES

A-1. This appendix contains a list of reference manuals that may be used in conjunction with this TM in the operation and maintenance of the AGPU. Those manuals not coded are applicable for use by all services. The manuals are coded (A) for Army use, (F) Air Force use, (N) Navy use, and (MC) Marine Corps use.

1. FIRE PROTECTION

TB 5-4200-200-10 (A)	Hand Portable Fire Extinguishers Approved for Army Use
TB MED 251	Noise and Conservation of Hearing

2. LUBRICATION

C9100-IL	Petroleum, Petroleum Base Products and Related Materials
C6800-IL	Chemicals and Chemical Products
LO 55-1730-229-12 (A)	Lubrication Order

3. PAINTING

T.O. 35-1-3 (F)	Painting and Marking of USAF Aerospace Ground Equipment
TM 43-0139 (A)	Painting Instructions for Field Use

4. RADIO SUPPRESSION

TM 11-483 (A)	Radio Interference Suppression
T.O. 31-1-141-13(F)	Basic Electronic Technology

5. MAINTENANCE

DA PAM 738-751(A)	Functional Users Manual for The Army Maintenance Management System - Aviation (TAMMS-A)
TM 9-6140-200-1(A)	Maintenance of Storage Batteries; Lead Acid Type
T.O. 36Y-4-1-194 (F)	Maintenance of NI-CAD Batteries
T.O. 8D2-3-1 (F)	Repair of External Power Cables, Aerospace Ground Equipment
T.O. 00-25-225 (F)	General Shop Practice Requirements for the Repair, Maintenance, and Test of Electronic Equipment
T.O. 00-25-234 (F)	Installation Practices for Aircraft Electric and Electronic Wiring
NAVWEPS 01-1A-505 (N)	
T.O. 1-1A-14 (F)	
TM 55-1500-323-24 (A)	

5. MAINTENANCE (Continued)

T.O. 36-1-7	Operation in Cold Weather Areas
T.O. 36Y32-1-142 (F) TM 9-2610-200-24 (A)	Organizational Care, Maintenance and Repair of Pneumatic Tires and Inner Tubes
TM 55-1730-229-24P (A) T.O. 35C2-3-473-4 (F) AG 320AO-IPB-OOO (N) TM 1730-24P/3 (MC)	Organizational, and Intermediate (Field) (Direct Support and General Support) Maintenance Repair Parts and Special Tools List
TM 55-1730-229-34(A) T.O. 35C2-3-473-2 (F) AG 320AO-MME-000 (N) TM 1730-34/1 (MC)	Intermediate (Field) (Direct and General Support) Maintenance Manual
TB 750-126	Use of Material Condition Tags and Labels on Army Aeronautical and Air Delivery Equipment

6. SHIPMENT AND STORAGE

TM 38-230-1(A)	Preservation, Packaging and Packing of Military Supplies and Equipment
TM 38-230-2(A)	General Aircraft Maintenance Manual
TM 1-1500-204-23 (Series)	Processing and Inspection of Aerospace Ground Equipment for Storage and Shipment
T.O. 35-1-4(F)	

7. DESTRUCTION TO PREVENT ENEMY USE

TM 750-244-3 (A)	Procedures for Destruction of Equipment to Prevent Enemy Use

APPENDIX B
BASIC ISSUE ITEMS LIST AND TROOP INSTALLED OR AUTHORIZED ITEMS LIST

1.	1730-01-144-1897	TM 55-1730-229-12 Operator and Organizational Maintenance Manual
2.	1730-01-144-1897	TM 55-1730-229-34 DS/GS Maintenance Manual
3.	1730-01-144-1897	TM 55-1730-229-24P Repair Parts and Special Tools Manual
4.	Fire Extinguisher	NSN 4210-01-388-7854
5.	Hoses	NSN

APPENDIX C

MAINTENANCE ALLOCATION CHART

Section I. INTRODUCTION

C-1. GENERAL.

a. This section provides a general explanation of all maintenance and repair functions authorized at various maintenance levels.

b. Section II designates overall responsibility for the performance of maintenance functions on the identified end item or component. The implementation of the maintenance functions upon the end item or component will be consistent with the assigned maintenance functions.

c. Section III lists the tools and equipment required for each maintenance function as referenced from Section II.

d. Section IV contains supplemental instructions, explanatory notes and/or illustrations required for a particular maintenance function.

C-2. EXPLANATION OF COLUMNS IN SECTION II.

a. Group Number, Column 1. The assembly group is a numerical group assigned to each assembly in a top down breakdown sequence. The applicable assembly groups are listed on the MAC in disassembly sequence beginning with the first assembly removed in a top down disassembly sequence.

b. Assembly Group, Column 2. This column contains a brief description of the components of each assembly group.

c. Maintenance Functions, Column 3. This column lists the various maintenance functions (A through K) and indicates the lowest maintenance category authorized to perform these functions. The symbol designations for the various maintenance categories are as follows:

C - Operator or crew
O - Organizational maintenance
F - Direct support maintenance
H - General support maintenance
D - Depot maintenance

The maintenance functions are defined as follows:

A - Inspect. To determine serviceability of an item by comparing its physical, mechanical, and electrical characteristics with established standards.

B - Test. To verify serviceability and to detect electrical or mechanical failure by use of test equipment.

C - Service. To clean, to preserve, to charge, and to add fuel, lubricants, cooling agents, and air. If it is desired that elements, such as painting and lubricating, be defined separately, they may be so listed.

D - Adjust. To rectify to the extent necessary to bring into proper operating range.

E - Align. To adjust specified variable elements of an item to bring to optimum performance.

F -Calibrate. To determine the corrections to be made in the readings of instruments or test equipment used in precise measurement. Consists of the comparison of two instruments, one of which is a certified standard of known accuracy, to detect and adjust any

discrepancy in the accuracy of the instrument being compared with the certified standard.

G - Install. To setup for use in an operational environment such as an emplacement, site, or vehicle.

H - Replace. To replace unserviceable items with serviceable like items.

I - Repair. Those maintenance operations,necessary to restore an item to serviceable condition through correction of material damage or a specific failure. Repair may be accomplished at each category of maintenance.

J - Overhaul. Normally, the highest degree of maintenance performed by the Army in order to minimize time work in process is consistent with quality and economy of operation. It consists of that maintenance necessary to restore an item to completely serviceable condition as prescribed by maintenance Stan dard in technical publications for each item of equipment. Overhaul normally does not return an item to like new, zero mileage, or zero hour condition.

K - Rebuild. The highest degree of material maintenance. It consists of restoring equipment as nearly as possible to new conditions in accordance with original manufacturing standards. Rebuild is performed only when required by operational considerations or other paramount factors and then only at the depot maintenance category. Rebuild reduces to zero the hours or miles the equipment, or component thereof, has been in use.

d. Symbols. The uppercase letter placed in the appropriate column indicates the lowest level at which that particular maintenance function is to be performed.

e. Tools and Equipment, Column 4. This column is provided for referencing by code, the special tools and test equipment (Section III), required to perform the maintenance functions (Section II).

f. Remarks, Column 5. This column is provided for referencing by code, the remarks (Section IV) pertinent to the maintenance functions.

C-3. EXPLANATION OF COLUMNS IN SECTION III.

a. Reference Code. This column consists of a number and a letter separated by a dash. The number references the T and TE requirements column on the MAC. The letter represents the specific maintenance function the item is to be used with. The letter is representative of columns A through K on the MAC.

b. Maintenance Category. This column shows the lowest level of maintenance authorized to use the special tool or test equipment.

c. Nomenclature. This column lists the name or identification of the tool or test equipment.

d. Tool Number. This column lists the manufacturer's code and part number, or National Stock Number of tools and test equipment.

C-4. EXPLANATION OF COLUMNS IN SECTION IV.

a. Reference Code. This column consists of two letters separated by dash, both of which are references to Section II. The first letter references column 5 and the second letter references a maintenance function, column 3, A through K.

b. Remarks. This column lists information pertinent to the maintenance function being performed, as indicated on the MAC, Section II.

Section II. MAINTENANCE ALLOCATION CHART (CONT)

(1) GROUP NO.	(2) ASSEMBLY GROUP	(3) MAINTENANCE FUNCTIONS A INSPECT	B TEST	C SERVICE	D ADJUST	E ALIGN	F CALIBRATE	G INSTALL	H REPLACE	I REPAIR	J OVERHAUL	K REBUILD	(4) TOOLS AND EQUIPMENT	(5) REMARKS
01	FRAME AND HOUSING													
	Frame and Panels	C								F				A-A, I-I
	Lifting Eye(s)	C							O					A-A
	Covers	C							O	F				A-A,I-I
	Roof	C							O	F				A-A,I-I
	Access Doors	C							F	F				A-A,I-I
	Battery Holddown	C							O					A-A
	Exhaust Ejector Assy	O							F	F			1-I	A-A,J-I
	Ejector Inlet Tube	F							F					A-A
	Air Cleaner Assy	O							O	O				A-A
	Air Intake Duct Assy	C							F	F				A-A,I-I
	Ground Stud	C							O					A-A
	Drain Hoses/Lines	C							O					A-A

Section II. MAINTENANCE ALLOCATION CHART (CONT)

(1) GROUP NO.	(2) ASSEMBLY GROUP	(3) MAINTENANCE FUNCTIONS A INSPECT	B TEST	C SERVICE	D ADJUST	E ALIGN	F CALIBRATE	G INSTALL	H REPLACE	I REPAIR	J OVERHAUL	K REBUILD	(4) TOOLS AND EQUIPMENT	(5) REMARKS
01	Cont'd													
	Engine/Generator Mounts	C							F					A-A
	Insulation	O							F	F			1-H	A-A,J-I
02	DC ELECTRICAL AND CONTROL SYSTEM													
	Battery, Lead Acid	C	O	C					O	F			2-B	A-A,B-B, K-C
	Battery, NiCad	C	F	F					O	F				A-A
	Battery Cables	C	O	C					O	O			3-B	A-A,C-B, F-C
	Slave Receptacle	C	O						O				3-B	A-A,C-B
	Battery Charger	O	O						O	D	D		3-B	A-A,C-B, D-B
	Contactors	O	O						O				3-B	A-A,C-B
	Shunts	O	O						O				3-B	A-A,C-B

Section II. MAINTENANCE ALLOCATION CHART (CONT)

(1) GROUP NO.	(2) ASSEMBLY GROUP	(3) MAINTENANCE FUNCTIONS											(4) TOOLS AND EQUIPMENT	(5) REMARKS
		A INSPECT	B TEST	C SERVICE	D ADJUST	E ALIGN	F CALIBRATE	G INSTALL	H REPLACE	I REPAIR	J OVERHAUL	K REBUILD		
02	Cont'd													
	Wiring Harness	O	O						F	O			3-B	A-A,C-B
	Speed Sensor (GTE)	O	O						O				3-B,16-H	A-A,C-B, D-B
	Low Oil Pressure Switch	O	O						O				3-B	A-A,C-B, D-B
	High Oil Temperature Switch	O	O						O				3-B	A-A,C-B, D-B
	Thermocouple	O	O						O				3-B, 16-H	A-A,C-B
	Control Relays	O	O						O				3-B	A-A,C-B
	Protective Relays	O	O						O				3-B	A-A,C-B
	Electronic Control Unit (ECU) (Engine)	O	O						O	D			3-B	A-A,C-B, D-B
	Circuit Breakers	C	O						O				3-B	A-A,C-B
	Switches	C	O						O				3-B	A-A,C-B
	Utility Lights	C	O						O				3-B	A-A,C-B

Section II. MAINTENANCE ALLOCATION CHART (CONT)

(1) GROUP NO.	(2) ASSEMBLY GROUP	(3) MAINTENANCE FUNCTIONS A INSPECT	B TEST	C SERVICE	D ADJUST	E ALIGN	F CALIBRATE	G INSTALL	H REPLACE	I REPAIR	J OVERHAUL	K REBUILD	(4) TOOLS AND EQUIPMENT	(5) REMARKS
02	Cont'd													
	Lamps, Incandescent	C							O					A-A
	Diodes	O	O						O				3-B	A-A,C-B
03	ELECTRICAL POWER GENERATION & CONTROL SYSTEM													
	Generator Assembly	O	O	O					F	F	D		3-B	A-A,C-B, D-B,L-I, M-C
	Grease Fittings	O							O					A-A
	Generator Control Unit (GCU)	O	O						O	D			3-B	A-A,C-B, D-B
	Current Transformers	O	O						O				3-B	A-A,C-B, D-B
	Main Contactors	O	O						O				3-B	A-A,C-B
	AC Power Cable	C	O						O				3-B	A-A,C-B
	DC Power Cable	C	O						O				3-B	A-A,C-B

Section II. MAINTENANCE ALUXATION CHART (CONT)

(1) GROUP NO.	(2) ASSEMBLY CROUP	(3) MAINTENANCE FUNCTIONS A INSPECT	B TEST	C SERVICE	D ADJUST	E ALIGN	F CALIBRATE	G INSTALL	H REPLACE	I REPAIR	J OVERHAUL	K REBUILD	(4) TOOLS AND EQUIPMENT	(5) REMARKS
03	Cont'd													
	Inverter	C	O						O	O			3-B	A-A,C-B, D-B
04	FUEL SYSTEM													
	Fuel Pump	O	O						O				3-B	A-A,C-B, D-B
	Four-way Valve	O							O					A-A,D-B
	Fuel Control Unit (FCU)	O	O						O	D	D		3-B,4-B	A-A,C-B, D-B
	Fuel Filter Assy	O		O					O					
	Fuel Filter (Water Separator)	O		O					O	O				A-A,E-C
	Fuel Solenoid, Shutdown	O	O						O	D			3-B	A-A,C-B D-B
	Fuel Tank	C		C					F	F				A-A
	Fuel Level Sensors	O	O						O				3-B	A-A,C-B D-B
	Fuel Lines, Valves, Fittings	C							O					A-A,D-B
	Fuel Nozzle	O		F					F				5-C	A-A,D-B F-C

Section B. MAINTENANCE ALLOCATION CHART (CONT)

(1) GROUP NO	(2) ASSEMBLY GROUP	(3) MAINTENANCE FUNCTIONS A INSPECT	B TEST	C SERVICE	D ADJUST	E ALIGN	F CALIBRATE	G INSTALL	H REPLACE	I REPAIR	J OVERHAUL	K REBUILD	(4) TOOLS AND EQUIPMENT	(5) REMARKS
05	PNEUMATIC SYSTEM													
	Load Control Valve (LCV)	O	O						O	D	D		3-B	A-A,C-B, D-B
	Bleed Air Duct Assy	O							O					A-A
	Pneumatic Connector	C							O					A-A
	Pneumatic Hose	C							O					A-A
	Bleed Air Solenoid Valve	O	O						O				3-B	A-A,C-B, D-B
	Pressure Transducer	O	O						O				3-B	A-A,C-B, D-B
06	IGNITION SYSTEM													
	Igniter Plug	O	O	O					O					A-A,D-B, F-C
	Igniter Plug Lead	O	O						O					A-A,D-B
	Ignition Unit	O	O						O				3-B	A-A,D-B
	Starter Assembly	C	O						O	F	D		3-B	A-A,C-B, D-B,N-I

Section II. MAINTENANCE ALLOCATION CHART (CONT)

(1) GROUP NO.	(2) ASSEMBLY GROUP	(3) MAINTENANCE FUNCTIONS A INSPECT	B TEST	C SERVICE	D ADJUST	E ALIGN	F CALIBRATE	G INSTALL	H REPLACE	I REPAIR	J OVERHAUL	K REBUILD	(4) TOOLS AND EQUIPMENT	(5) REMARKS
07	LUBRICATION SYSTEM													
	Pump Assembly, Rotary Oil	D	D						D	D				
	Oil Pressure Regulating Valve	D	D		D				D	D				
	Pickup & Strainer	D							D					
	Oil Filter Element	O							O					A-A,E-H
	Sight Level Indicator	C							O					A-A
	Magnetic Drain Plugs	O							O					A-A
08	HYDRAULIC SYSTEM													
	Hydraulic Module	C	F	C					F	F			6-B,7-B, 8-B,9-B	A-A,G-B
	Frame	F								F				A-A,I-I

Section II. MAINTENANCE ALLOCATION CHART (CONT)

(1) GROUP NO.	(2) ASSEMBLY GROUP	(3) MAINTENANCE FUNCTIONS A INSPECT	B TEST	C SERVICE	D ADJUST	E ALIGN	F CALIBRATE	G INSTALL	H REPLACE	I REPAIR	J OVERHAUL	K REBUILD	(4) TOOLS AND EQUIPMENT	(5) REMARKS
08	Cont'd													
	Control Panel	C							F	F				A-A
	Reservoir Sight Glass/Temperature Gage	C							F					A-A
	Hydraulic Pressure Gauge	C					F		F					A-A, Calibrate TB 43-180
	Sight Glasses	C							F					A-A
	Valves	C							F					A-A
	Switches	C	O						O				3-B	A-A,C-B
	Indicator Lights	C	O						O					A-A,C-B
	Hourmeter	C							O					A-A
	Lamps	C							O					A-A
	Hydraulic Connectors	C							F					A-A
	Reservoir	F		C					F	F			18-C, 19-C, 20-C	A-A,O-C

Section II. MAINTENANCE ALLOCATION CHART (CONT)

(1)	(2)	(3) MAINTENANCE *FUNCTIONS*											(4)	(5)
		A	B	C	D	E	F	G	H					
GROUP NO.	ASSEMBLYGROUP	INSPECT	TEST	SERVICE	ADJUST	ALIGN	CALIBRATE	INSTALL	REPLACE	REPAIR	OVERHAUL	REBUILD	TOOLS AND EQUIPMENT	REMARKS
08	Cont'd													
	Vent Dryer Assy (Filter)	C		O					O	O				A-A,H-C
	Accumulator	F		F					F	F				A-A
	Cooler (Heat Exchanger)	F		F					F	F				A-A,F-C
	Manifolds, Lines and Fittings	F	F						F	O				A-A,G-B
	Wiring Harness	O							F	O				A-A,C-B
	Filter Assemblies	C	F						F	F				A-A,G-B
	Filter Element								O					E-H
	Check Valves	F							F	F				A-A
	Temperature Sensors	F							F					A-A
	Solenoid Valve	F							F	F				A-A
	Pump Assembly, Hydraulic	O	D						F	D	D			A-A

Section II. MAINTENANCE ALLOCATION CHART (CONT)

(1) GROUP NO.	(2) ASSEMBLY GROUP	(3) MAINTENANCE FUNCTIONS A INSPECT	B TEST	C SERVICE	D ADJUST	E ALIGN	F CALIBRATE	G INSTALL	H REPLACE	I REPAIR	J OVERHAUL	K REBUILD	(4) TOOLS AND EQUIPMENT	(5) REMARKS
08	Cont'd													
	Hoses, Lines, Fittings	O							F					A-A
	Manifold, Dual	C	F						O	F			10-B	A-A,G-B
09	ENGINE													
	Engine and Gearcase Assembly	C		C					F	O	D			A-A,P-C
	Check Valves	O		O					O					A-A,F-C
	Hourmeter	C	O						O				3-B	A-A,C-B
	Engine Assembly	O							F	O	D		11-H	A-A
	Plumbing and Wiring Harness	O	F						O	O			3-B	A-A,C-B
	Combustion Section	O							O	H			12-H	A-A
	Compressor Inlet Duct & Screen	O							F	F				A-A

Section II. MAINTENANCE ALLOCATION CHART (CONT)

(1) GROUP NO.	(2) ASSEMBLY GROUP	(3) MAINTENANCE FUNCTIONS A INSPECT	B TEST	C SERVICE	D ADJUST	E ALIGN	F CALIBRATE	G INSTALL	H REPLACE	I REPAIR	J OVERHAUL	K REBUILD	(4) TOOLS AND EQUIPMENT	(5) REMARKS
09	Cont'd													
	Compressor/Turbine Section (Hot Section)	D							D	D			13-A,14-H, 15-H,16-H	A-A,Q-A
	Containment Ring	D							D					A-A
	Turbine Plenum	D							D	D				A-A
	Turbine Housing Scroll	D							D	D				A-A
	Deflector Assy	D							D	D				A-A
	Turbine Nozzle	D							D	D				A-A
	Gearcase Assembly	O		C					D	D	D		17-C	A-A,P-C
	Housing	O							D	D				A-A
	Accessory Drive Pads	F							D	D				A-A
10	CONTROLS & INSTRUMENTS													
	Control Panel	C							O	O				A-A

Section II. MAINTENANCE ALLOCATION CHART (CONT)

(1) GROUP NO.	(2) ASSEMBLY GROUP	(3) MAINTENANCE FUNCTIONS											(4)	(5)
		INSPECT	TEST	SERVICE	ADJUST	ALIGN	CALIBRATE	INSTALL	REPLACE	REPAIR	OVERHAUL	REBUILD		
10	Cont'd													
	Switches	C	O						O				3-B	A-A,C-B
	Meters	C	O						O				3-B	A-A, Calibrate TB
	Gages	C	O						O				3-B	A-A,C-B
	Indicator Lights	C	O						O				3-B	A-A,C-B
	Circuit Breakers	C	O						O				3-B	A-A,C-B
	Wiring Harness	O	O						O	O			3-B	A-A,C-B
11	PROPULSION SYSTEM													
	Front Axle Assembly	C		O	O				F	O				A-A,M-C, R-D
	Wheels & Tires	C		O					O	F				A-A,S-C
	Tow Bar Assembly	C							O	F				A-A
	Brake Cable Assembly	C		O					O					A-A,M-C

Section II. MAINTENANCE ALLOCATION CHART (CONT)

(1) GROUP NO.	(2) ASSEMBLY GROUP	(3) MAINTENANCE FUNCTIONS A INSPECT	B TEST	C SERVICE	D ADJUST	E ALIGN	F CALIBRATE	G INSTALL	H REPLACE	I REPAIR	J OVERHAUL	K REBUILD	(4) TOOLS AND EQUIPMENT	(5) REMARKS
11	Cont'd													
	Brake Assembly	O								O				A-A
	Springs Leaf	C							F	F				A-A
	Gear Drive Assy (Running Gear)	C	F	O					F	F				
	Traction Motor	C	F						F	F			3-B	A-A, C-B, D-B
	Electric Brake	O	O						F	F			3-B	A-A, C-B, D-B
	Gear Box	C							F					
	Drive Disengage	C	F				F		F	F				A-A, D-B,
	Chain Drive Assembly	O	F	O					F	F				A-A, D-B
	Rear Axle Assembly	C		O					F	F				A-A, P-C
	Motor Controller	C	O		O				O	D			3-B	A-A, C-B, D-B
	Control Relays	C	O						O				3-B	A-A, C-B, D-B
	Speed/Direction Control Assembly	C	O						O	O			3-B	A-A, C-B, D-B

SECTION III. TOOLS, TEST AND SUPPORT EQUIPMENT REQUIREMENTS

REFERENCE CODE	MAINTE-NANCE CAT-EGORY	NOMENCLATURE	TOOL NUMBER
1-H	F	Pin Welder, Erico Jones PW 500 (or equivalent)	
2-B	O	Tester, Battery Electrolyte Solution	6630-171-5126
3-B	O	Multimeter	6625-581-2036
4-B	O	Gauge	
5-C	O	Brush, Brass	
6-B	F	Hydraulic Pressure Supply 0-5000 PSI	
7-B	F	Gauge, Hydraulic 0-5000 PSIG	
8-B	F	28 VDC Power Supply	
9-B	F	Gauge, Hydraulic 0-300 PSIG	
10-B	F	Hand Pump, Hydraulic 5000 PSI Max.	
11-H	F	Stand, Maintenance 83-15011 (2 required)	
12-H	O	Socket, Deep 3/8”, 3/8” Drive	
13-A	D	Fiberscope (FS-100)	
14-H	D	Puller, Scroll Housing 291984-1	
15-H	D	Puller, Turbine Plenum 293171-1	
16-H	O, F, D	Socket, 12-point, 1/4”, 1/4” Drive	
17-C	C	Drain Fitting and Hose (DB 75-108) and NSN 4720-00-018-2416	
18-C	C	Reservoir Servicing Unit	(59603) 06-5022-6500-A7 NSN 4940-01-504-5279
19-C	C	Fill Adapter, Return Port	c/o 4730-01-449-9702 4730-00-719-2789 4730-00-808-6848 5340-00-790-8423
20-C	C	Fill Adapter, Vent	c/o 4730-00-825-0587 4730-00-808-6848 (2 ea)

Section IV. EXPLANATION OF REFERENCE CODES

REFERENCE CODE	REMARKS
A-A	Visual Inspection
B-B	Hydrometer Test
C-B	Continuity Check/Voltage Measurement
D-B	Operational Check
E-C, E-H	Replace Elements
F-C	Clean
G-B	Pressure Test
H-C	Replace Desiccant
I-I	Straighten and Weld
J-I	Replace Weld Pins/Insulation
K-C	Add Electrolyte
L-I	Replace Grease Fittings
M-C	Grease
N-I	Replace Brushes
O-C	Add Hydraulic Fluid
P-C	Add Oil
Q-A	Fiberscope Inspection
R-D	Adjust Toe-In
S-C	Check Pressure/Add Air

APPENDIX D.
STANDARD TORQUE TABLE

D-1. STANDARD TORQUE LIMIT APPLICATION.

a. Refer to tables D-l through D-6 for standard torque limits for threaded fasteners, hose and tube coupling nuts, bulkhead fittings, and pipe thread fittings, and the minimum breakaway torque values for determining reusability of self-locking nuts. These standard torque values apply only when special torque values are not specified in procedures. General instructions for installation and fit of threaded fasteners are as follows:

(1) Thread shall not be in bearing when thickness of sheet or fitting is 3/32-inch or less. If thickness is more than 3/32-inch, a maximum of two threads in bearing is permissible.

(2) In shear applications, thread shall not be in bearing regardless of material thickness.

(3) Washers are used for the following purposes:

(a) To compensate for differences in bolt grip length and material thickness due to manufacturing tolerances, protective coating, and other surface variances.

(b) To distribute bearing load over a greater area to prevent damage to material under a bolt head or nut.

(c) To protect the material surface when a bolt or nut is tightened.

(d) Prevent galling of aluminum or other soft material when bolt or nut is tightened.

(e) To insulate dissimilar metals to prevent corrosion. The washer material should be similar to the material on which it rests rather than the bolt or nut material. This insures that if corrosion occurs, it will be between the bolt and washer, which can be replaced.

(4) When nut-bolt assemblies are installed, the nut shall not engage the first incomplete thread next to the bolt shank.

(5) Nuts are properly installed when all threads are engaged and the bolt chamfer extends thru the nut. When flat-end bolts are used, the threaded end must extend at least 1/32 inch thru the nut.

(6) Threads shall be clean and dry before installation. If threads are lubricated, torque limits are reduced by 30 percent.

(7) The tightening sequence in multiple fitting installation is as follows:

(a) Finger tighten all bolts or nuts.

(b) Snug up opposite bolts or nuts all around.

(c) Tighten opposite bolts or nuts all around to proper torque. Do not torque adjacent bolts or nuts in sequence.

(8) All-metal self-locking nuts shall be replaced with new identical parts at each installation. If new nuts are not available, all metal self-locking nuts may be reused. The reused nuts must meet the required minimum friction torque. See Fiction Torque in Inch-Pounds for Threaded Fasteners, Table D-2.

b. Additional standards to be followed are outlined below.

(1) Torque limits apply to nut tightening only. When tightening bolt, the higher limit ± 10 percent is used.

(2) Torque values are for dry (unlubricated) threads. If threads are lubricated, limit is 70 percent unlubricated value.

(3) Maximum torque allowed for cotter pin hole alignment. If limit is exceeded, discard nut and bolt and inspect parts secured by the nut and bolt.

(4) Torque limits apply only to tightening nut on stud.

Table D-1. Standard Torque Limits In Inch-Pounds for Threaded Fasteners

Standard Torque Limits in Inch-Pounds for Threaded Fasteners

CAUTION

Overtightening fasteners can cause equipment damage of failure of fastener.

BOLT & NUT MATERIAL	STEEL & CORROSION RESISTANT STEEL					ALUMINUM	
NUT TYPE	SELF-LOCKING NUTS, PLATENUTS, CASTELLATED NUTS. 12 POINT NUTS						
	TENSION	SHEAR	TENSION	SHEAR	SHEAR	TENSION	SHEAR
Nut Part Number Examples	AN310 AN315 MS20161 MS21069 MS21071 MS20365 MS21072 MS21044 MS21073 MS21045 NAS679 MS20500 NAS1021 MS21055 NAS1068 MS21056 BACN10MK MS21059 BACN110JZ MS21060 BACN 10FX MS21076 BACN10HY	AN320 AN316 AN315C MS21083 NAS1022 MS51967 MS51966 MS51971	MS17825	MS17826 MS21224	MS21244	AN310 AN315 MS21044	AN320 MS21038
TORQUE LIMITS (INCH-POUNDS)							
THREAD SIZE	SEE NOTE 1	SEE NOTE 3	SEE NOTE 1	SEE NOTE 3	SEE NOTE 5	SEE NOTE 5			
8-32	12-15	20	7-9	12	-	-	-	-	-
10-32	20-25	40	12-15	25	25-35	15-20	15-20	-	-
1/4-28	50-70	100	30-40	60	55-80	30-45	35-50	35-40	20-25
5/16-24	100-140	225	60-85	140	120-170	60-90	70-100	95-100	55-65
3/8-24	160-190	390	95-110	240	230-325	85-125	130-190	150-165	90-100
7/16-20	450-500	840	270-300	500	370-530	155-220	210-300	225-250	135-150
1/2-20	480-690	1100	290-410	660	580-830	195-280	315-450	300-375	180-225
9/16-18	800-1000	1600	480-600	960	770-1100	280-400	460-660	400-500	240-300
5/8-18	1100-1300	2400	660-780	1400	1120-1600	420-600	660-940	550-650	300-390
3/4-16	2300-2500	5000	1300-1500	3000	1400-2500	950-1100	1310-1560	1150-1250	590-750
7/8-14	2500-3000	7000	1500-1800	4200	2300-3000	1500-1800	2075-2500	1750-2000	1050-1200
1-12 or 1-14	3700-5500	10000	2200-3300	6000	3400-5500	2000-3000	2275-3410	2325-3000	1400-1800
1 1/8-12	5000-7000	15000	3000-4200	9000	5000-7000	-	-	2900-3900	1740-2340

TORQUE WRENCHES

5-50 Inch-Pounds
30-150 Inch-Pounds
100-750 Inch-Pounds

700-1600 Inch-Pounds
0-600 Foot-Pounds

(5) When tightening self-locking castellated nuts MS21224, MS17825, and MS17826, first tighten to minimum torque. If slot in nut is aligned with cotter pin hole in bolt, tighten nut an additional 60 degrees (one castellation) and install cotter pin. If slot in nut is not aligned with cotter pin hole in bolt, tighten nut until aligned and install cotter pin. In either case, maximum torque must not be exceeded.

CAUTION

Do not apply antiseize compound to bolt or nut threads.

(6) Apply a coating of antiseize compound (E75) or equivalent to the bushing OD on bolts 114R3650 series only.

Table D-2. Friction Torque in Inch-Pounds for Threaded Fortenors

THREAD SIZE	MINIMUM FRICTION TORQUE
8-32	1.5
10-32	2.0
1/4-28	3.5
5/16-24	6.5
3/8-24	9.5
7/16-20	14.0
1/2-20	18.0
9/16-18	24.0
5/8-18	32.0
3/4-16	50.0
7/8-14	70.0
1-12	90.0
1-1/8-12	117.0
1-1/4-12	143.0

NOTE

To determine friction torque, thread the nut onto the screw or bolt until at least two threads protrude. The nut shall not make contact with a mating part. Stop the nut. The torque necessary to begin turning the nut again is the breakaway torque. Do not reuse self-locking nuts that do not meet minimum friction torque.

TORQUE WRENCHES

5 to 50 Inch-Pounds
30 to 150 Inch-Pounds

D-2 SELF-RETAINING BOLTS INSTALLATION

WARNING

Standard bolts must not be substituted for self-retaining bolts at any connection where self-retaining bolts are installed.

a. Two types of self-retaining bolts are used. They are positive retention bolts and impedance bolts. Both types have a fail-safe feature which prevents loss of bolt, if nut comes off. A nut, safetied with a cotter pin, must be installed on each self-retaining bolt.

b. Positive retention bolts have a pawl at threaded end of bolt shank. The pawl is spring loaded to an extended position. When extended, the pawl prevents the nut from being removed. Finger pressure compresses the pawl for removal of the nut and for removal of the bolt from the parts. Some of the bolts contain a heat shrunk bushing which replaces the sliding bushing in the fastener build-up. This prevents installation of the bolt without the bushing being installed. Placards are installed at each location for positive retention bolts.

c. Impedance bolts have either spring-1oaded balls, or a spring ring on the bolt shank above the threads. These retaining elements extend beyond the diameter of the bolt and prevent it from sliding from the parts.

d. Remove positive retention bolts as follows:

(1) Remove cotter pin.

(2) Backoff nut until it is next to pawl.

(3) Depress pawl and backoff nut from bolt.

(4) Depress pawl and remove washer.

(5) Pull bolt out until pawl is next to lug.

(6) Depress pawl and pull bolt out until pawl is inside lug.

(7) Hold parts stack-up together and pull bolt out.

NOTE

If stack-up separates while removing bolt, pawl may extend and catch on edge of fastener, bearing, or bushing. If pawl extends while removing bolt, use a thin piece of metal such as knife edge or rule to depress pawl. Do not hammer bolt out.

e. Install positive retention bolts as follows:

(1) Place countersink washer under bolt head. Make sure countersink is next to bolt head. The positive retension bolt bushing assembly does not have a washer under the head.

CAUTION

Do not apply antiseize compound on thread of bolt or nut.

(2) Apply a coat of antiseize compound (E75) to od of bushing and shank of bolt on bolts 114R3650 series.

(3) Align bearing, lugs, bolt, and bushing. Install bolt.

(4) Place washer(s) on the bolt. Use thick or thin washers as necessary for cotter pin installation.

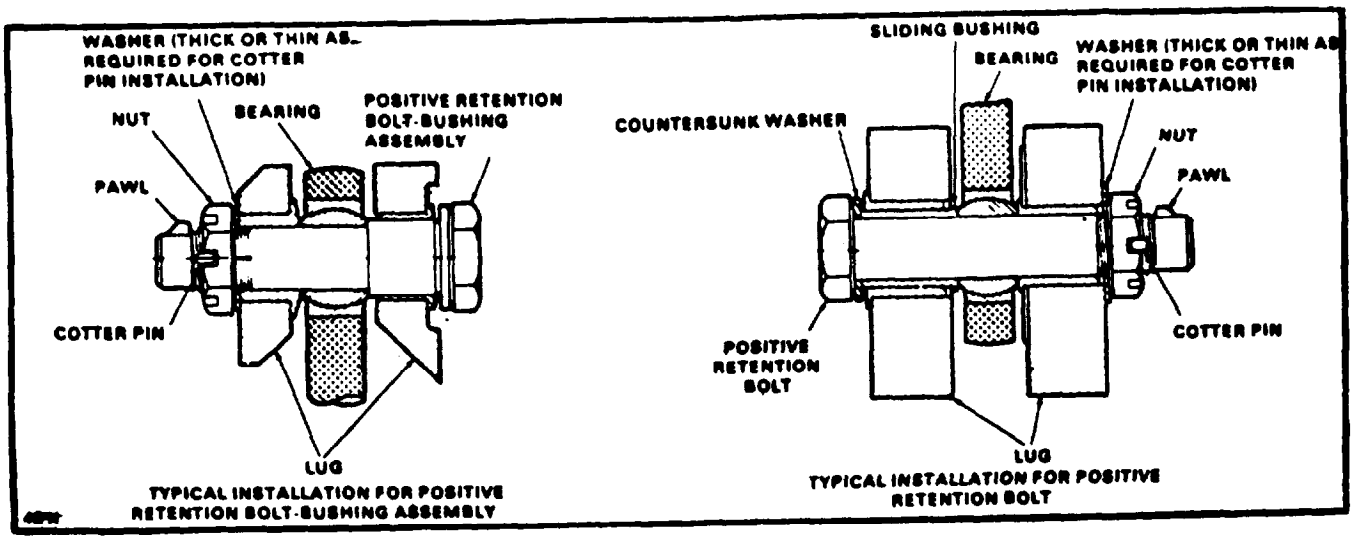

WASHER (THICK OR THIN AS REQUIRED FOR COTTER PIN INSTALLATION)
NUT
BEARING
POSITIVE RETENTION BOLT-BUSHING ASSEMBLY
PAWL
COTTER PIN
LUG
TYPICAL INSTALLATION FOR POSITIVE RETENTION BOLT-BUSHING ASSEMBLY
SLIDING BUSHING
BEARING
WASHER (THICK OR THIN AS REQUIRED FOR COTTER PIN INSTALLATION)
COUNTERSUNK WASHER
NUT
PAWL
COTTER PIN
POSITIVE RETENTION BOLT
LUG
TYPICAL INSTALLATION FOR POSITIVE RETENTION BOLT

Table D-3. Standard Torque Limits in Inch-Pounds for Hose and Tube Coupling Nuts

Standard Torque Limits in Inch-Pounds for Hose and Tube Coupling Nuts

TUBE OD	HOSE SIZE	NUT HEX	A	B	C	D	E
1/4	-4	9/16	105-115	135-145	50-65	135-150	100-120
1/8	-6	11/16	160-180	255-285	100-125	270-300	210-250
1/2	-8	7/8	265-295	475-525	210-250	450-500	340-420
5/8	-10	1	355-375	665-735	300-350	650-700	400-480
3/4	-12	1 1/4	430-470	855-945	425-500	900-1000	725-850
1	-16	1 1/2	715-785		600-700	1200-1400	900-1150
1 1/4	-20	2	855-945		680-800	1200-1400	950-1150

Overtightening of hose and tube coupling nuts will cause thread and seal damage resulting in fitting leakage. Torque values are for threads lubricated with hydraulic fluid (E197). antiseize compound (E75). petrolatum (E274). or aircraft and instrument grease (E 189). as applicable.

NOTE

This table not applicable to permaswage nuts coupled to Rosan fittings.

TORQUE WRENCHES

30 to 150 Inch-Pounds
100 to 750 Inch-Pounds

700 to 1600 Inch-Pounds

KEY

A-Aluminum Permaswage tube coupling nuts.
B-Steel Permaswage tube coupling nuts.
C-Steel or aluminum flared fitting nuts, AN818, AN924, NAS591-593, and NAS594-596: used on aluminum tube'
D-Steel or aluminum flared fitting nuts, AN818, AN924, NAS591-593, and NAS594-596: used on steel tube'
E-Steel or aluminum flared fitting hose coupling nuts'

'Where use of a torque wrench would be difficult, use a conventional wrench to tighten coupling nuts. Tighten until a distinct increase in the torque required is noted. Continue tightening an additional 1/6 of a turn. Back off the nut. Again tighten until a distinct increase in the torque required is noted. Continue tightening an additional 1/6 to 1/3 of a turn.

Table D-4. Standard Torque limits **In** *Inch-Pounds for Connecting Coupling Nuts to Rosan Fittings*

TUBE OD	HOSE SIZE	NUT HEX	STEEL	ALUMINUM
1/4	-4	9/16	140-150	140-150
3/8	-6	11/16	290-300	250-260
1/2	-8	7/8	525-575	410-430
5/8	-10	1	735-805	530-550
3/4	-12	1 1/4	960-1000	660-690
1	-16	1 1/2	1360-1400	1110-1150

I **NOTES**

1. Rosan fittings are used on the following hydraulic system components:
   - Utility Pressure Module
   - Utility Return Module
   - Apu Start Module
   - Apu Start Accumulator
   - Utility Cooler Reservoir
   - Flight Control Cooler Reservoir
   - Flight Control Power Control Module
   - Lower Controls Module
   - ILCA Manifold
   - Apu Motor Pump
2. Torque values are for fittings lubricated with hydraulic fluid (E197).

TORQUE WRENCHES

30 to 150 Inch-Pounds
100 to 750 Inch-Pounds

700 to 1600 Inch-Pounds

Table D-5. Standard Torque Limits In Inch-Pounds for Pipe Thread Fittings

Standard Torque Limits in Inch-Pounds for Pipe Thread Fittings

CAUTION

Be careful when tightening pipe fittings. Overtightening causes distortion, cracking, and leaks.

THREAD SIZE	WORKING TORQUE[1]	MAXIMUM TORQUE[1]
1/8-27	100	175
1/4-18	150	300
3/8-18	225	450

TORQUE WRENCHES

30 to 150 Inch-Pounds
100 to 750 Inch-Pounds

[1] Antiseize compound (E75) shall be used on threads to prevent seizing and to aid in sealing. The compound shell be applied ıo the male fitting so that it does not contaminate the fluid in the system. Male and female fittings should be of different materials

Table D-6. Bulkhead Fitting Hole Diameter, Washer Thickness, and Nut Torque Limits

CAUTION

Be careful when tightening pipe fittings. Overtightening causes distortion, cracking, and leaks.

TUBE SIZE	TUBE FITTING OD (IN.)	TUBE FITTING THREAD	BULKHEAD HOLE DIA (IN.) MIN	BULKHEAD HOLE DIA (IN.) MAX	WASHER THICKNESS (IN.)	TORQUE (IN-LB) AN924 NUT MIN	TORQUE (IN-LB) AN924 NUT MAX
-4	1/4	7/16-20	.443	.463	.063	85	105
-5	5/16	1/2-20	.505	.525	.063	105	125
-6	3/8	9/10-18	.568	.588	.063	120	150
-8	5/8	7/8-14	.880	.990	.090	320	280
-10	1/2	3/4-16	.755	.775	.090	240	380
-12	3/4	1-1/16-12	1.068	1.088	.090	500	600
-16	1.0	1-5/16-12	1.318	1.338	.090	720	880
-20	1-1/4	1-5/8-12	1.630	1.650	.090	960	1200

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I

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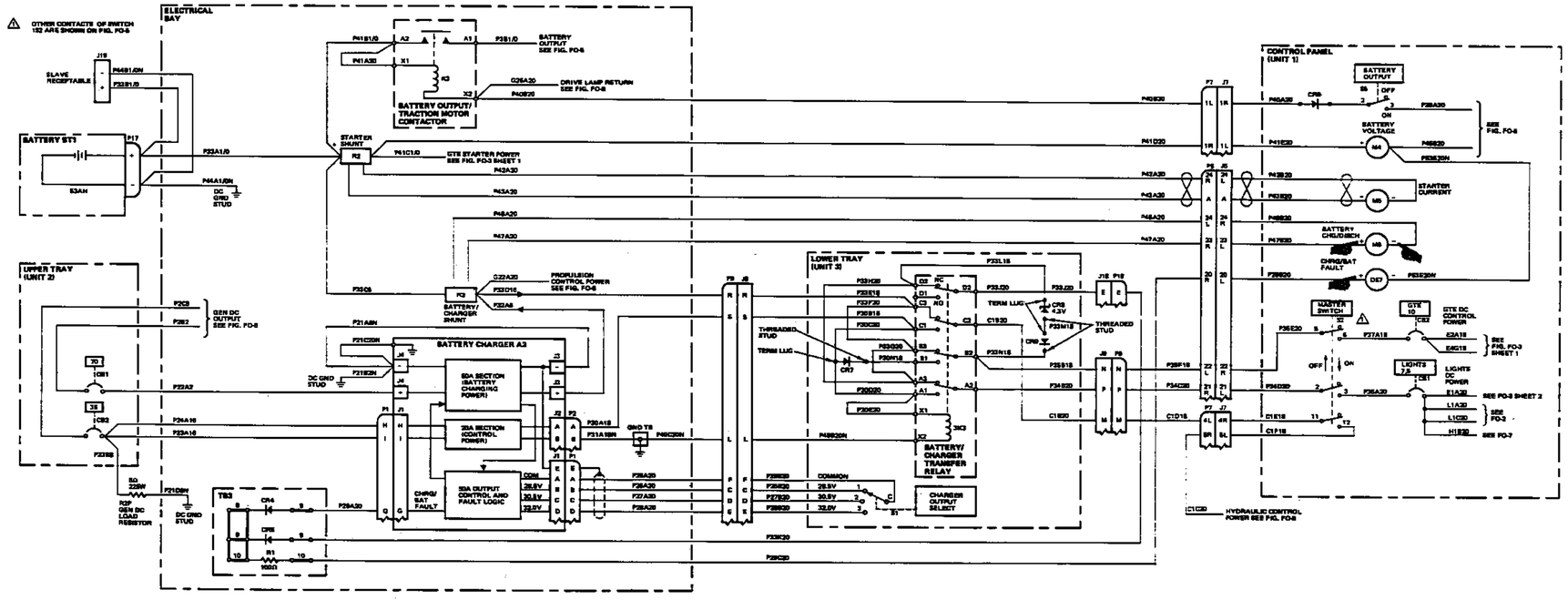
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ELECTRICAL BAY
OTHER CONTACTS OF SWITCH 152 ARE SHOWN ON FIG. FO-5
SLAVE RECEPTACLE
J19
P44B1J0N
P33B1J0
BATTERY ST1
53AH
P17
P33A1J0
P44A1J0N
DC GND STUD
BATTERY OUTPUT/ TRACTION MOTOR CONTACTOR
P41B1J0
A2
A1
X1
X2
K3
P33B1J0
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C26A30
DRIVE LAMP RETURN SEE FIG. FO-5
P40B20
STARTER SHUNT
R2
P41C1J0
STR STARTER POWER SEE FIG. FO-3 SHEET 1
P42A30
P43A30
P46A20
P47A20
P33D5
R3
BATTERY/ CHARGER SHUNT
G22A20
PROPULSION CONTROL POWER SEE FIG. FO-5
P33D16
P32A5
P21A6N
BATTERY CHARGER A3
P21C20N
P21B20N
J4
J3
J2
J1
P1
P2
50A SECTION (BATTERY CHARGING POWER)
30A SECTION (CONTROL POWER)
50A OUTPUT CONTROL AND FAULT LOGIC
CHRG/ BAT FAULT
P30A18
P31A18N
GND TB
P46C20N
COM
28.5V
30.5V
32.0V
P28A30
P27A30
P26A30
UPPER TRAY (UNIT 2)
P2C3
P28E2
GEN DC OUTPUT SEE FIG. FO-6
70
1CB1
35
CR2
P22A2
P24A16
P23A16
P23B5
50-75W
R2P GEN DC LOAD RESISTOR
P21D6N
DC GND STUD
TB3
CR4
CR5
R1
1000Ω
P29A30
P9
P8
J9
J8
LOWER TRAY (UNIT 3)
P33H28
P33E18
P33F20
P30E28
P33G28
P30H18
P30G20
P30E30
P49B20N
P23L18
D3
D2
D1
C3
C2
C1
S3
S2
S1
A3
A2
A1
X1
X2
2K3
BATTERY/ CHARGER TRANSFER RELAY
CHARGER OUTPUT SELECT
P33D20
TERM LUG
CR8
4.3V
P33H18
THREADED STUD
C1B20
P33H20
P33E20
P30H20
P30G30
P33G20
P30H30
P30G18
P30E20
P33E18
P33D20
P33H18
P33F18
P33G18
P30H28
P30G28
P30E18
P30H38
P30G38
P30E38
P33E18
P33D18
P33F18
P33G18
P30H18
P30G18
P30E18
P30H28
P30G28
P30E28
P33H28
P33F28
P33G28
P30H38
P30G38
P30E38
P33H38
P33F38
P33G38
P30H48
P30G48
P30E48
P33H48
P33F48
P33G48
P30H58
P30G58
P30E58
P33H58
P33F58
P33G58
P30H68
P30G68
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P33G68
P30H78
P30G78
P30E78
P33H78
P33F78
P33G78

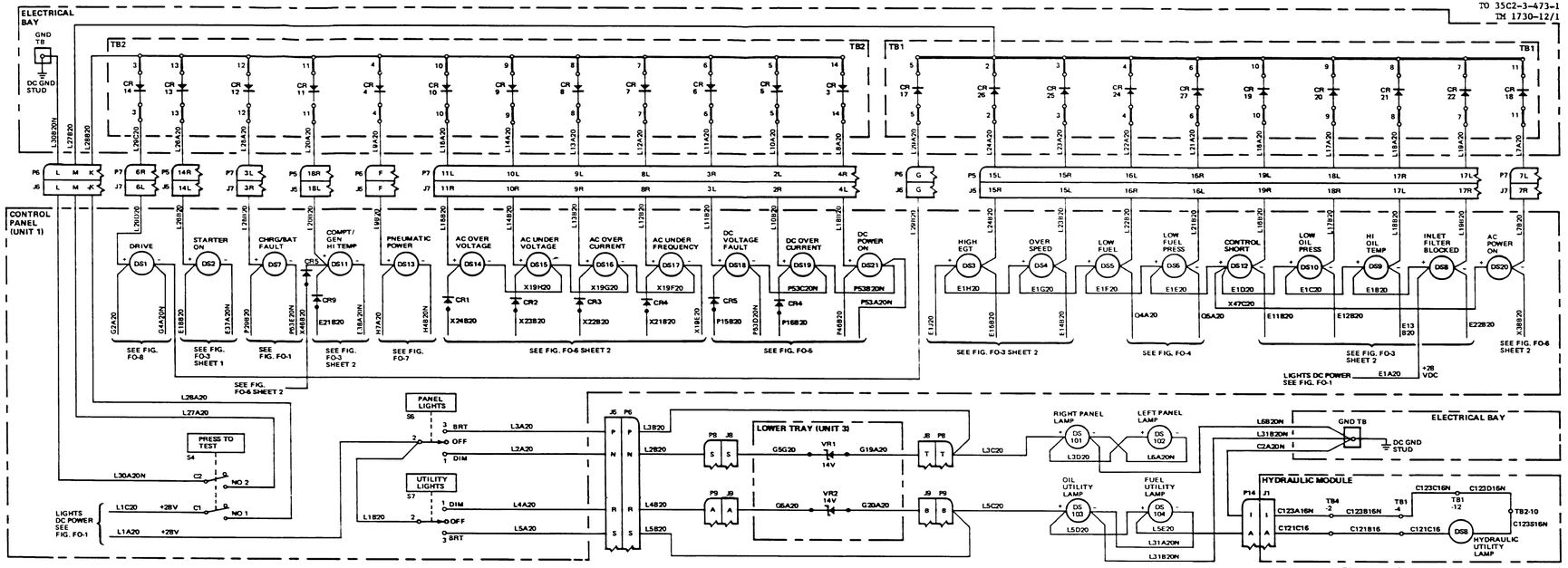


Figure FO-2, Lighting System Schematic/ Wiring Diagram

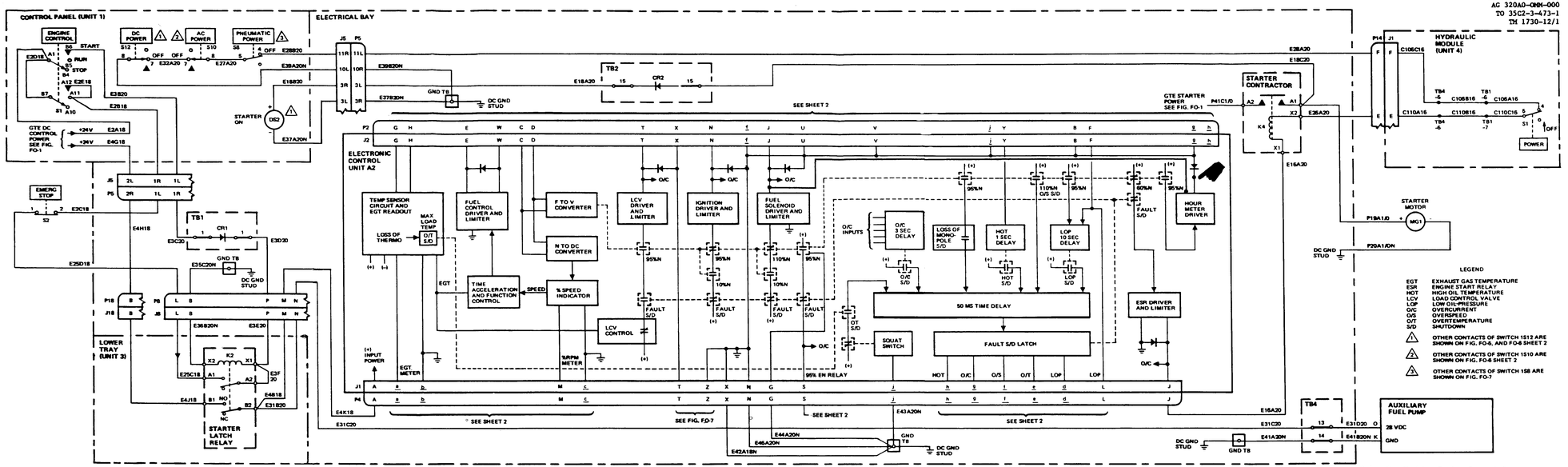


Figure FO-3. Gas Turbine Engine Control System Schematic/Wiring Diagram (Sheet 1 of 2)

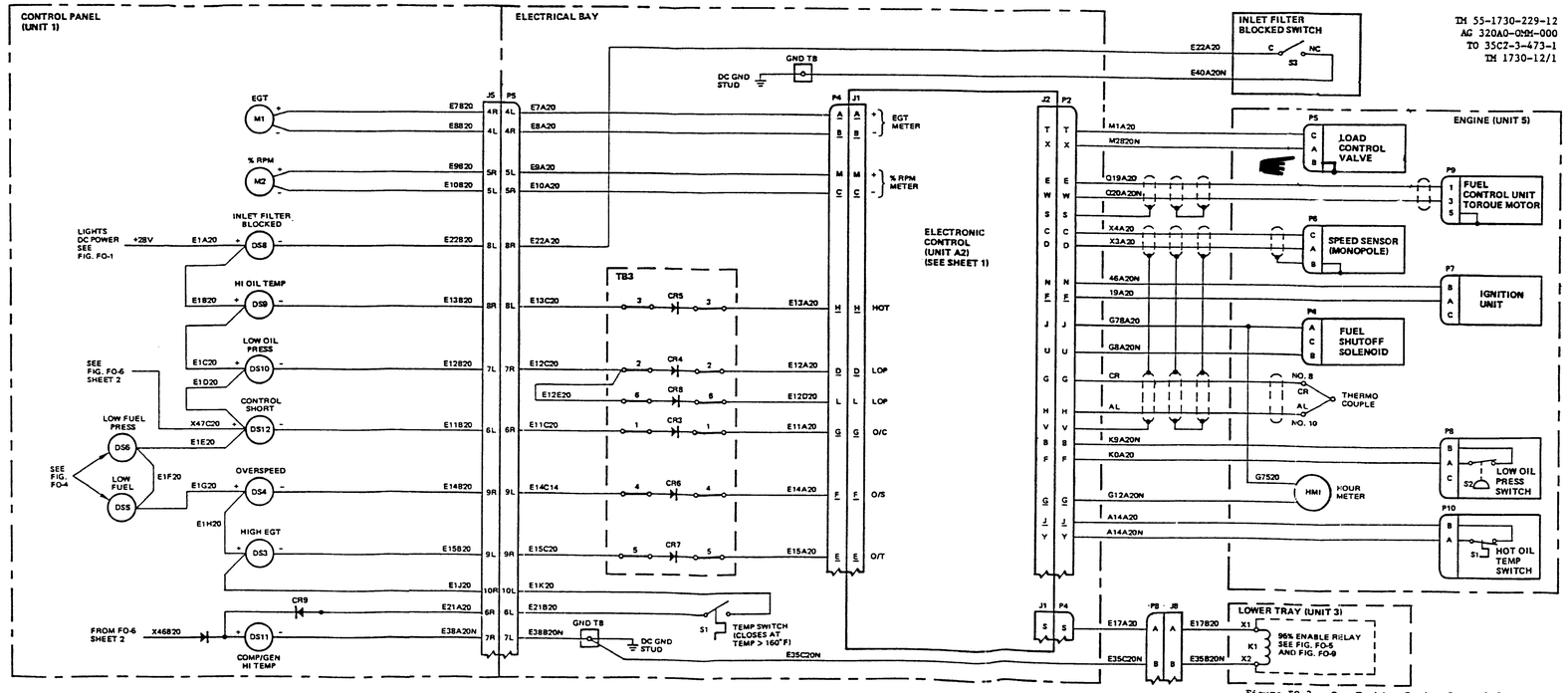


Figure FO-3. Gas Turbine Engine Control System Schematic/Wiring Diagram (Sheet 2 of 2)

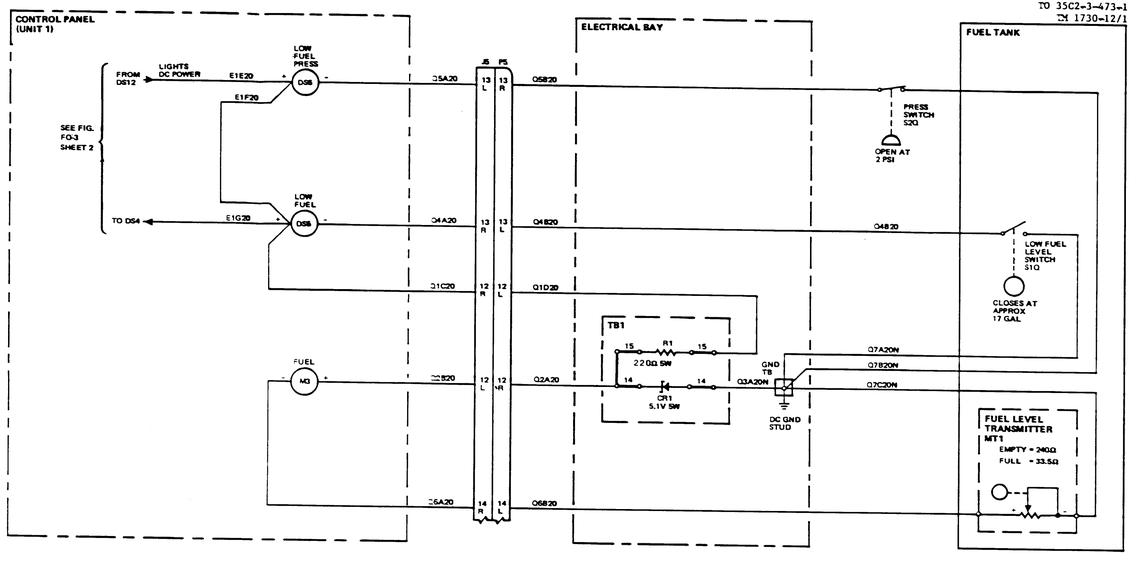


Figure FO-4, Fuel Indication Control System Schematic/Wiring Diagram

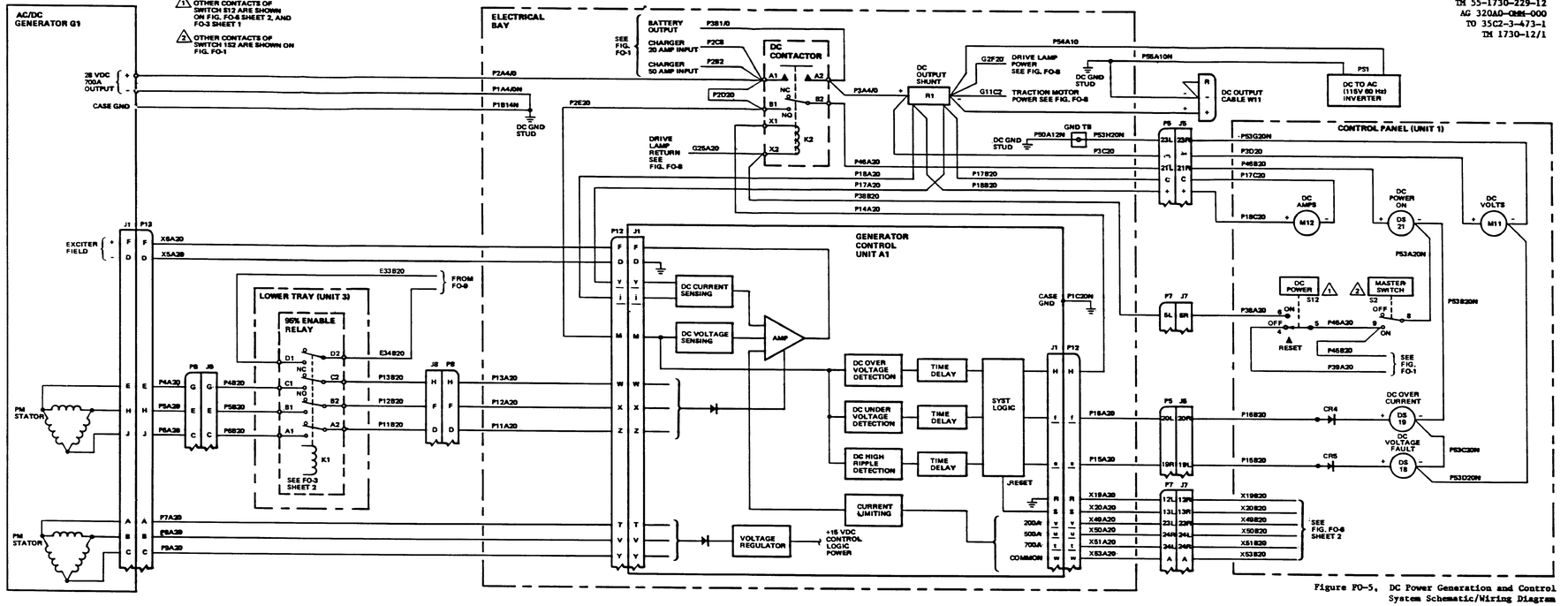


Figure FO-5. DC Power Generation and Control System Schematic/Wiring Diagram

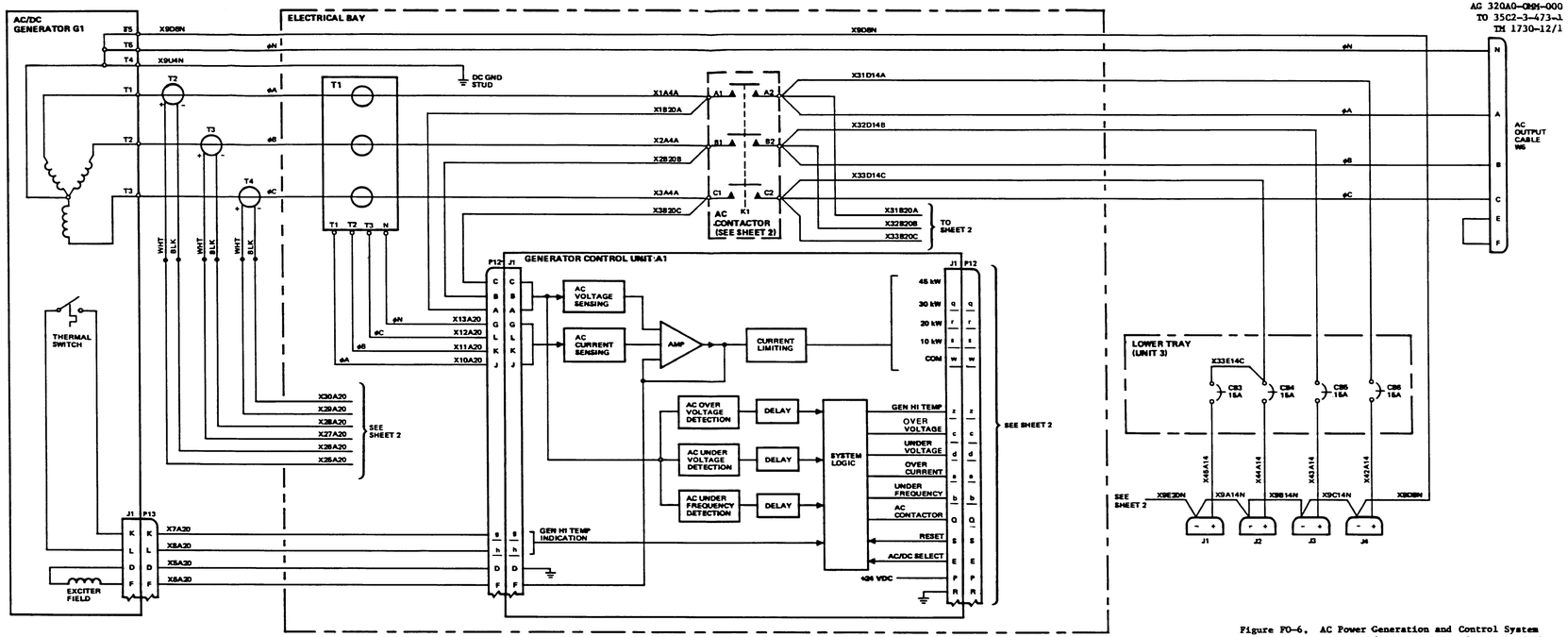


Figure FO-6. AC Power Generation and Control System Schematic/Wiring Diagram (Sheet 1 of 2)

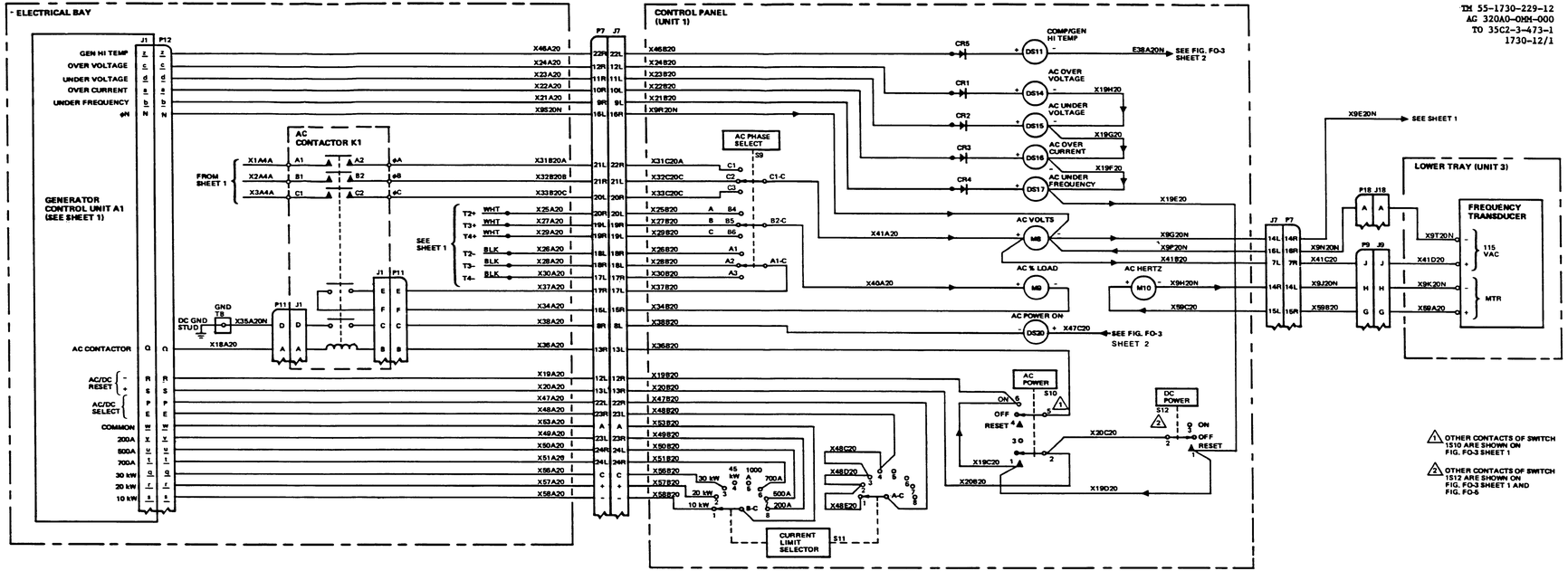


Figure FO-6. AC Power Generation and Control System Schematic/Wiring Diagram (Sheet 2 of 2)

⚠1 OTHER CONTACTS OF SWITCH 1SB ARE SHOWN ON FIG. FO-3 SHEET 1

⚠2 OTHER CONTACTS OF SWITCH S2 ARE SHOWN ON FIG. FO-3 SHEET 1

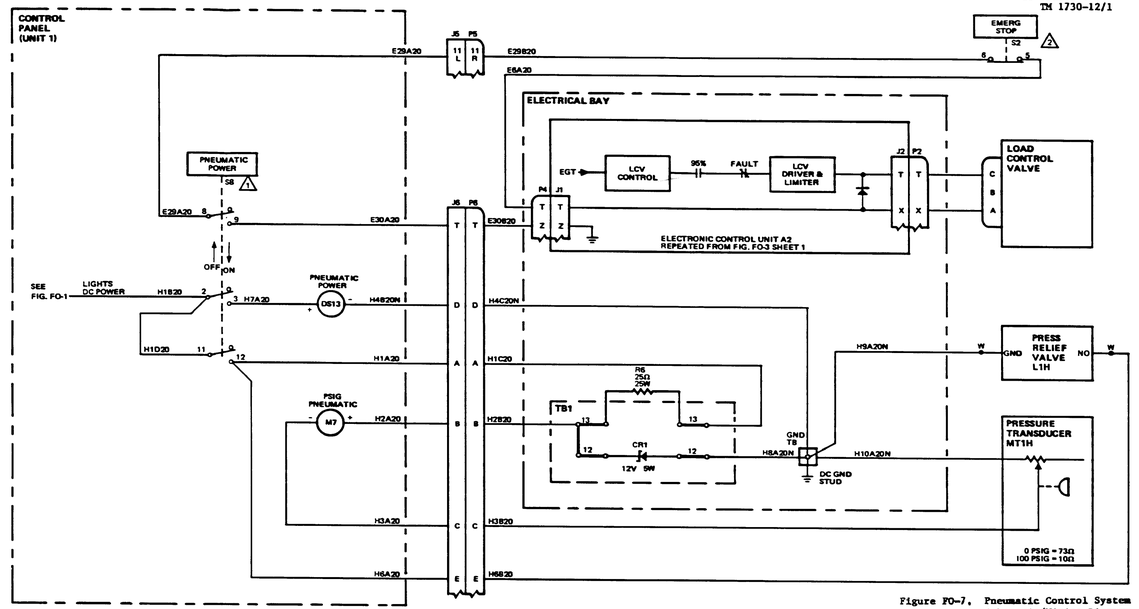


Figure FO-7. Pneumatic Control System Schematic/Wiring Diagram

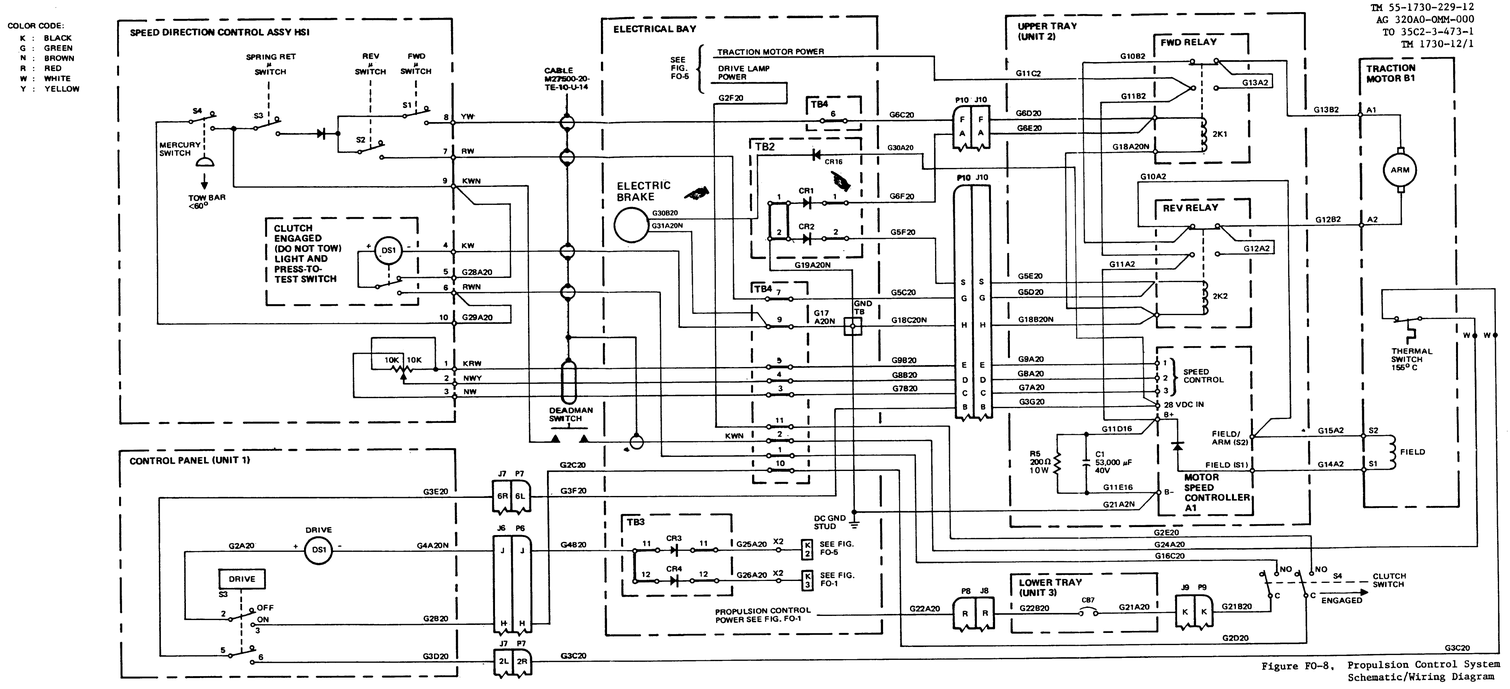


Figure FO-8. Propulsion Control System Schematic/Wiring Diagram

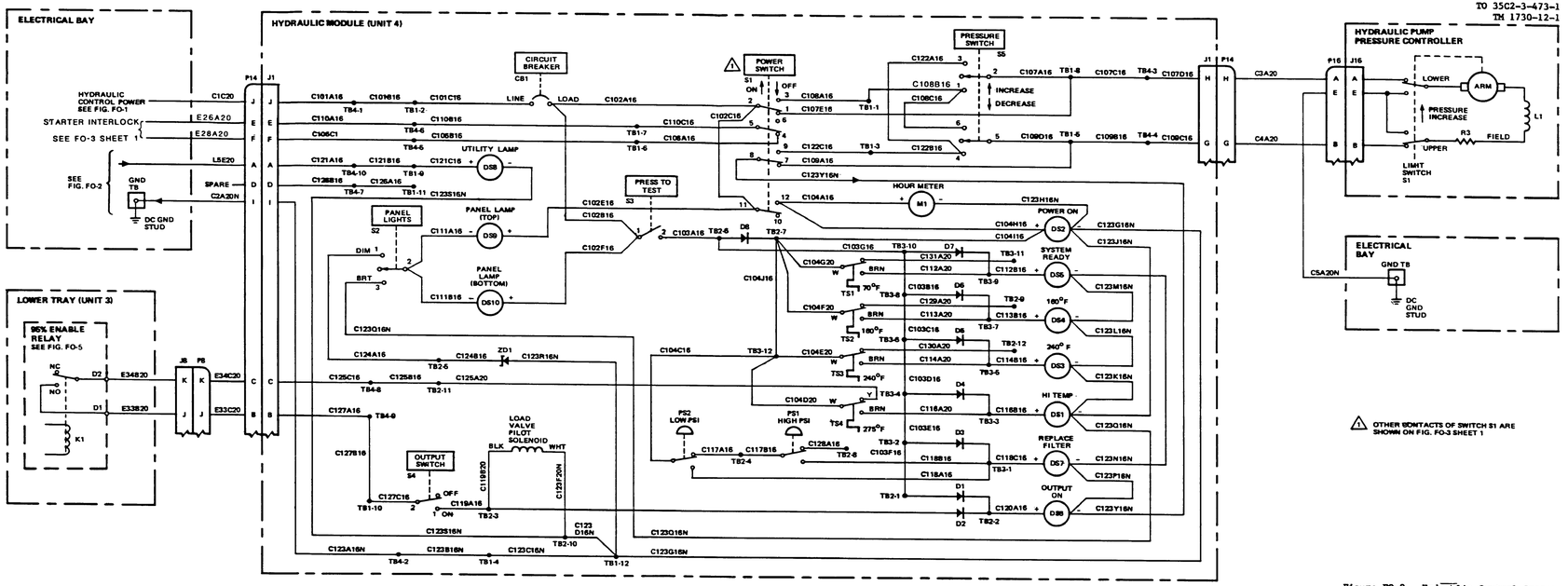
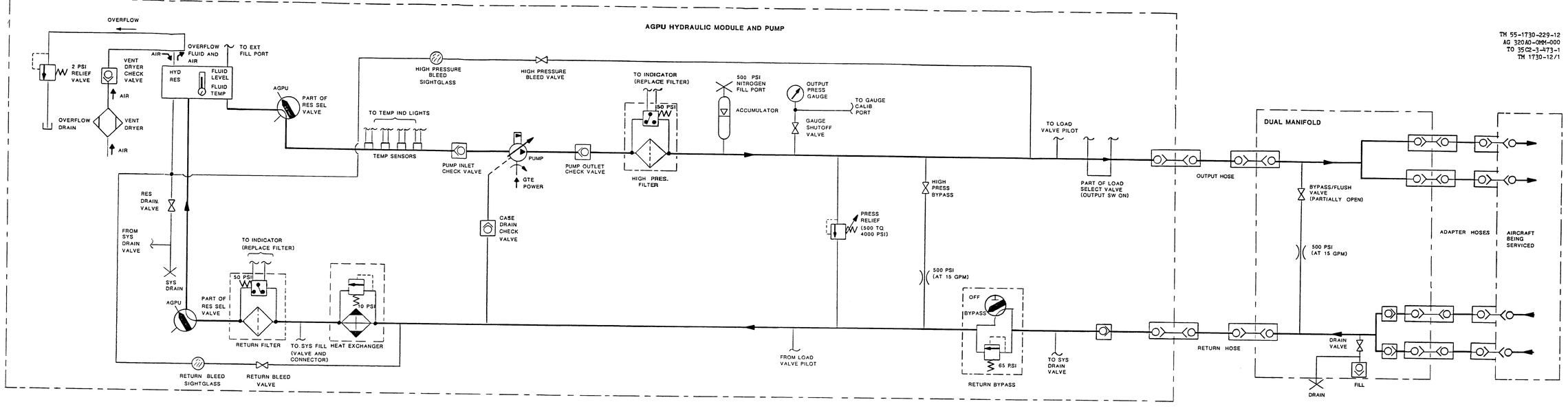
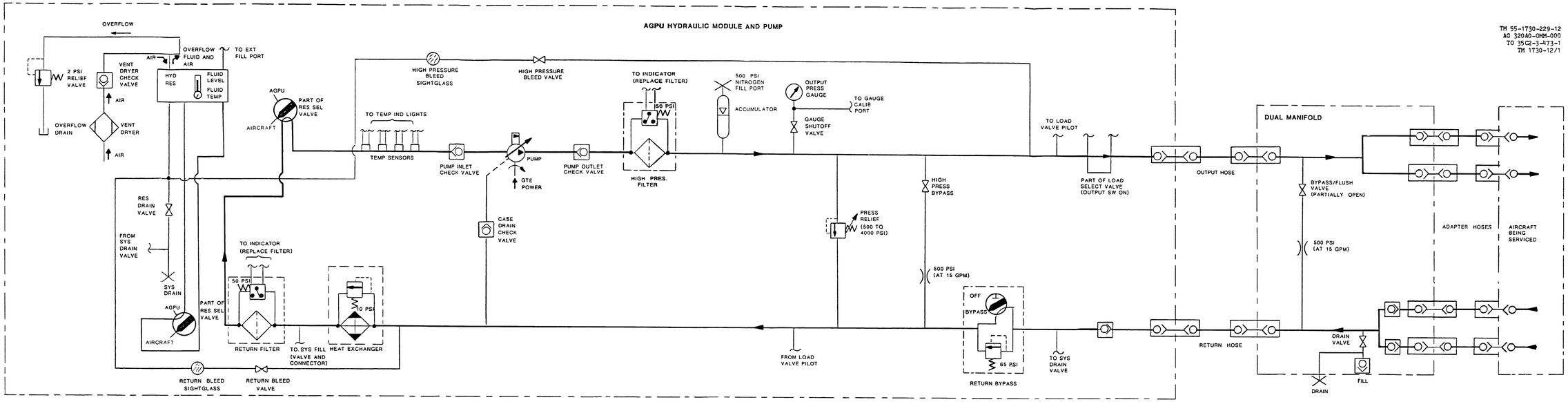


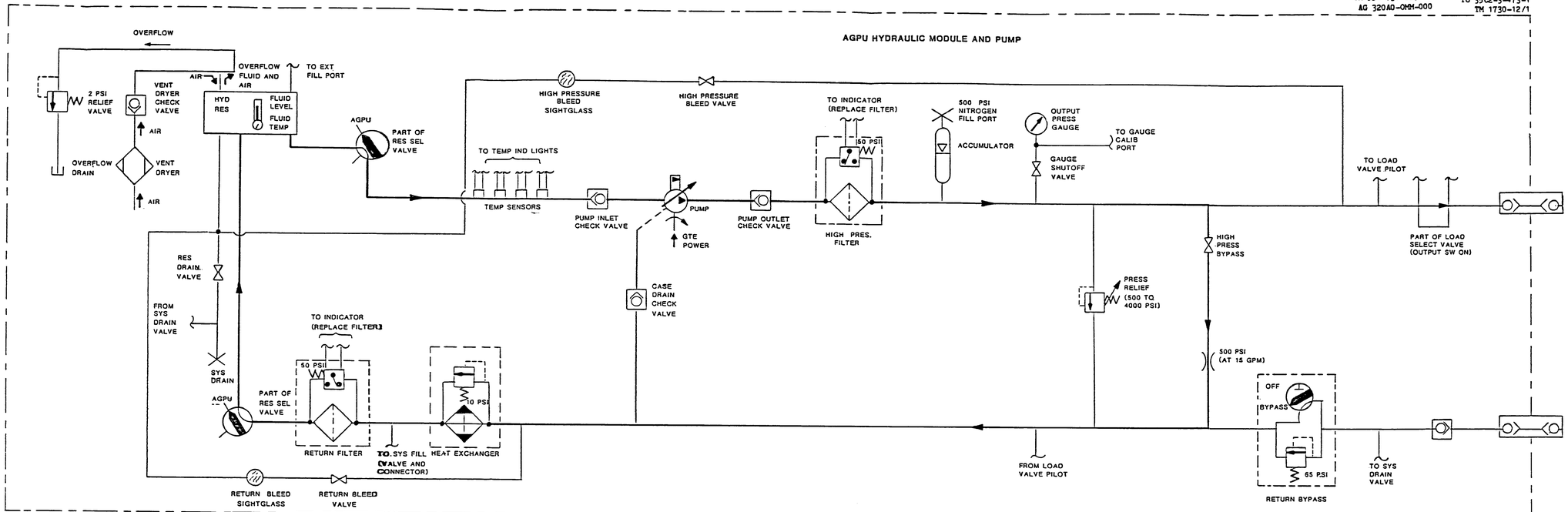
Figure FO-9, Hydraulic Control System Schematic/Wiring Diagram



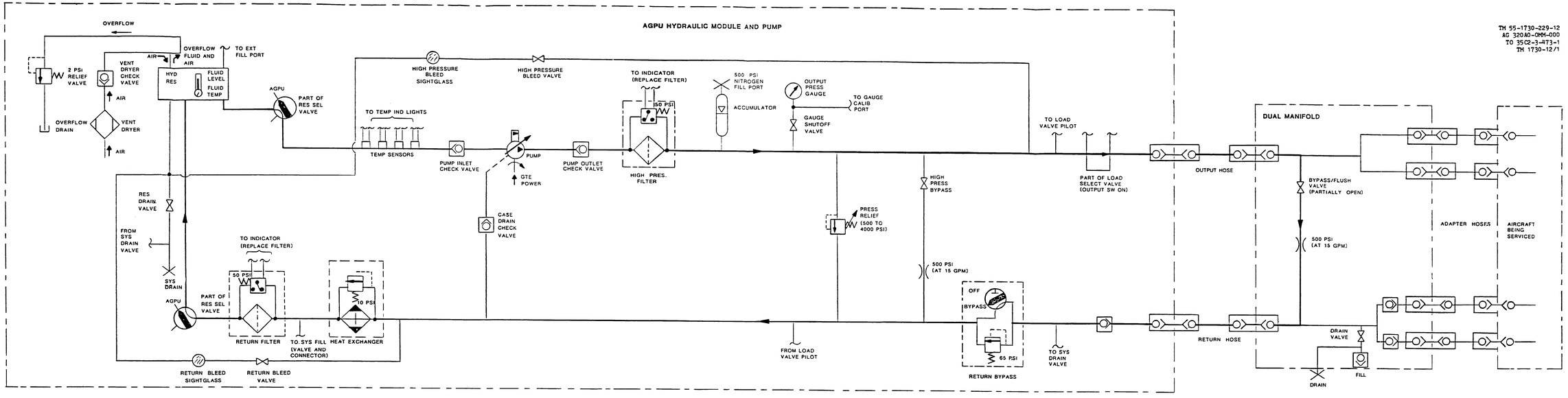
FO-10. Hydraulic System - Servicing Aircraft (Using Module Reservoir)



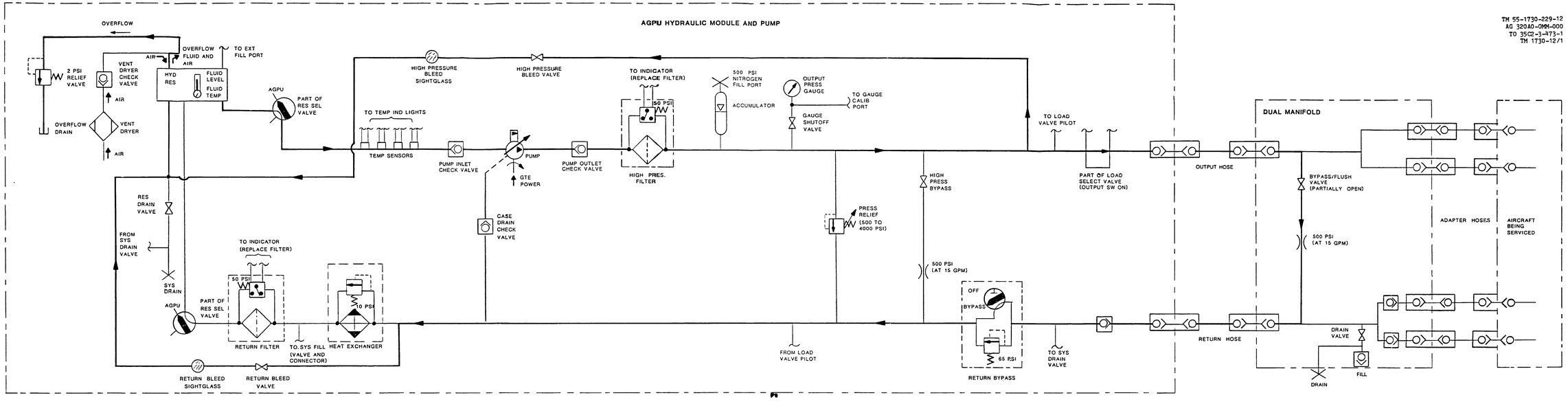
FO-11. Hydraulic System - Servicing Aircraft (Using Aircraft Reservoir)



FO-12. Hydraulic System - Warming Fluid in Module



FO-13. Hydraulic System - Warming Fluid in Hoses



FO-14. Hydraulic System - Air Bleed

WIRE LIST	DCD PROJECT MANAGER-MOBILE ELECTRIC POWER WASHINGTON, D.C.	WL 83-14625	REV. E	PAGE 1 OF 12
TITLE PRIMARY, WIRING HARNESS				
MODEL: A.G.P.U.	WIRING HARNESS: 83-14625			
	NEXT ASSY 83-14508			

NOTES:

1. ALL SOLDERING TERMINALS AT CONNECTORS MUST HAVE SLEEVING OR HEAT SHRUNK TUBING.

2. ON P5 & P7, VENDOR TO LOCK THE THREADED SLEEVE TO ITS FLANGE WITH LOCTITE "A" OR EQUIV.

3. WIRE REQUIREMENTS

A) 20 AWG WIRE P/N M22759/16-20-9 = 950'
B) 20 AWG WIRE P/N M22759/16-20-2 = 4'
C) 20 AWG WIRE P/N M22759/16-20-5 = 4'
D) 20 AWG WIRE P/N M22759/16-20-0 = 4'
E) 18 AWG WIRE P/N M22759/16-18-9 = 55'
F) 16 AWG WIRE P/N M22759/16-16-9 = 16'
G) 14 AWG WIRE P/N M22759/16-14-9 = 39'
H) 12 AWG WIRE P/N M22759/16-12-9 = 3'
J) 8 AWG WIRE P/N M22759/16-8-9 = 8'
K) 6 AWG WIRE P/N M22759/16-6-9 = 5'
L) 2 AWG WIRE P/N M22759/16-2-9 = 44'

4. WIRE SHALL BE SUPPLIED LOOSE BY VENDOR & INSTALLED BY LSI/DS.

5. ALL PIN CONNECTORS SHALL BE IDENTIFIED P1, P2, ETC. VENDOR SHALL IDENTIFY EACH CONNECTOR WITH AN ADJACENT PLASTIC TAG. EITHER HOT STAMPED MARKER TIES OR PANDUIT P/N PLM2S (OR EQUIV.) WITH NEAT PERMANENT, BLACK INK MARKINGS ARE ACCEPTABLE.

LTR.	ECO NO.	DATE	BY	AUTH.
E	INCORP. E/O #10102 REVISED AND REDRAWN			

WL 83-14625 REV. E PAGE 1 OF 12

WIRE LIST	DCD PROJECT MANAGER-MOBILE ELECTRIC POWER WASHINGTON, D.C.	WL 83-14625	REV. E	PAGE 1A OF 12
TITLE PRIMARY, WIRING HARNESS				
MODEL: A.G.P.U.	WIRING HARNESS: 83-14625			
	NEXT ASSY 83-14508			

NOTES:

5. (CONTINUED)
P1 CONNECTOR, MS3106A-20-16S-P80
P2 CONNECTOR, MS3106A-14S-2P-P80
P4 CONNECTOR, M 83723-13R-18-32N
P5 CONNECTOR, MS3101A-36-403P
P6 CONNECTOR, MS3101E-20-29P
P7 CONNECTOR, MS3108B-36-403S
P8 CONNECTOR, MS3106B-20-29S
P9 CONNECTOR, MS3101E-20-29P
P10 CONNECTOR, MS3101E-20-29P
P11 CONNECTOR, MS3106B-20-29S
P12 CONNECTOR, MS3106E-36-10S-P80
P13 CONNECTOR, MS3106E-20-33P-P80
P14 CONNECTOR, MS3108E-18-1S-P80
P16 CONNECTOR, MS3126-P10-6S FOR S/N 0001-0199
P16 CONNECTOR, MS3476W10-6S FOR S/N 0200 AND UP
P18 CONNECTOR, MS3106E-14S-6S

6. INDIVIDUAL WIRES SHALL BE IDENTIFIED AT 3" FROM THEIR TERMINATION. IDENTIFICATION SHALL BE ON SLEEVES OR SHRINK TUBING. IF SHRINK TUBING WILL NOT SLIDE ON THE WIRE INSULATION, ADD IDENTIFICATION AT 6" AND 9" FROM ALL TERMINAL LUGS.

7. MARK PER MIL-STD-130, WITH 83-14625 AND LATEST REVISION LETTER.

8. TWISTED PAIR (BY VENDOR), 2 TWISTS PER INCH.

9. CONNECTOR P7 TO HAVE INSERT KEYWAY 180° FROM ELBOW.

10. WIRE SHALL BE SUPPLIED & INSTALLED BY LSI/DS.

LTR.	ECO NO.	DATE	BY	AUTH.

WL 83-14625 REV. E PAGE 1A OF 12

FO-15. Main Harness Wire List
(sheet 1 of 5)

WIRE LIST CONTINUATION PAGE

WIRE NO.	SIZE	COLOR	LENGTH	FROM	TO	REMARKS
P25A20	20	RED	36"	P1-A	P9-F	4 COND. SHIELD WIRE
P26A20	20	BLACK	36"	P1-B	P9-C	4 COND. SHIELD WIRE
P27A20	20	GREEN	36"	P1-C	P9-D	4 COND. SHIELD WIRE
P28A20	20	WHITE	36"	P1-D	P9-E	4 COND. SHIELD WIRE
SHIELD GND		NONE	A/R	WIRE SHIELDS	P1-E	4 COND. SHIELD WIRE
P29A20	20	WHT	42"	P1-G	TB3-8	ANODE
P24A16	16	↑	67"	P1-H	2CB2-L	#8 LUG
P23A16	16		66"	P1-I	2CB2-L	#8 LUG
P30A18	18		37.5"	P2-A	P9-S	
P31A18N	18		36.5"	P2-B	GND TB	#6 LUG
E2C18	18		146"	P5-1L (2)	S2E-2	EMER. SWITCH #6 LUG
E3C20	20		29"	P5-1R	TB1-1	ANODE, #6 LUG
E4H18	18		44"	P5-2R	P18-B	
E18A20	20		30"	P5-3L	TB2-15	CATHODE, #6 LUG
E37B20N	20		40.5"	P5-3R	GND TB	#6 LUG
E7A20	20		43.5"	P5-4L	P4-R	
E8A20	20		43.5"	P5-4R	P4-T	
E9A20	20		43.5"	P5-5L	P4-M	
E10A20	20		43.5"	P5-5R	P4-S	
E21A20	20		36.5"	P5-6L	S1E,THERM SWITCH	BARE WIRE
E11C20	20		41"	P5-6R	TB3-1	ANODE, #6 LUG
E12C20	20		40"	P5-7R	TB3-2	#6 LUG
E13C20	20		41.5"	P5-8L	TB3-3	ANODE, #6 LUG
E22A20	20		104.5"	P5-8R	S3E-NC, S3E	INLET FILTER SW. AIR STARVATION SW.
E14C20	20		41"	P5-9L	TB3-4	ANODE, #6 LUG
E15C20	20	↑	41.5"	P5-9R	TB3-5	ANODE, #6 LUG
E1K20	20	WHT	36.5"	P5-10L (2)	S1F-NO	BARE WIRE

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WIRE LIST CONTINUATION PAGE

WIRE NO.	SIZE	COLOR	LENGTH	FROM	TO	REMARKS
E39B20N	20	WHT	39.5"	P5-10R (2)	GND TB	#6 LUG
E28A20	20	↑	118.5"	P5-11L	P14-F	
E29B20	20		147"	P5-11R	S2E-6	EMER. SW., #6 LUG
Q1D20	20		31"	P5-12L	TB1-15	ANODE, R1Q RESISTOR, #6 LUG
Q2A20	20		39"	P5-12R	TB1-14	DIODE, ZENER, #6 LUG CATHODE
Q4B20	20		76"	P5-13L	S1Q	BARE WIRE,FUEL LEV. SW.
Q5B20	20		87"	P5-13R	S2Q	FUEL PRES SW, #8 LUG
Q6B20	20		71"	P5-14L	MT1Q(+)	FUEL LEV SEND. FLOAT SW., #12 LUG
L26A20	20		29"	P5-14R	TB2-13	CATHODE, #6 LUG
L24A20	20		31"	P5-15L	TB1-2	ANODE, #6 LUG
L23A20	20		30"	P5-15R	TB1-3	ANODE, #6 LUG
L22A20	20		30"	P5-16L	TB1-4	ANODE, #6 LUG
L21A20	20		29"	P5-16R	TB1-6	ANODE, #6 LUG
L19A20	20		30"	P5-17L	TB1-7	ANODE, #6 LUG
L18A20	20		29"	P5-17R	TB1-8	ANODE, #6 LUG
L17A20	20		29"	P5-18L	TB1-9	ANODE, #6 LUG
L20A20	20		28"	P5-18R	TB2-11	CATHODE, #6 LUG
L16A20	20		29"	P5-19L	TB1-10	ANODE, #6 LUG
P15A20	20		54"	P5-19R	P12-R	
P16A20	20		54"	P5-20L	P12-S	
P46A20	20		52"	P5-21L	K2-B2	DC CONTACTOR,#12 LUG
P34C20	20		42.5"	P5-21R	P9-P	
P35P18	18		42.5"	P5-22L	P9-N	
P53B20N	20		39.5"	P5-23L	GND TB	#6 LUG
P47A20	20		35.5"	P5-23R	R3(-)	SHUNT METER(-),#8 LUG
P48A20	20	↓	38"	P5-24L	R3(+)	SHUNT METER(+),#8 LUG
P42A20 (8)	20	WHT	33.5"	P5-24R (2)	R2(-)	#8 LUG (TWISTED PAIR)

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WIRE LIST CONTINUATION PAGE

WIRE NO.	SIZE	COLOR	LENGTH	FROM	TO	REMARKS
P43A20 (4)	20	WHT	36"	P5-A (2)	R2(+)	#8 LUG (TWISTED PAIR)
P17B20	20	↑	60"	P5-C	R1(-)	#8 LUG
P18B20	20		62"	P5-(+)	R1(+)	#8 LUG
P3C20	20		64"	P5-(-) (2)	R1(+)	#8 LUG
E44A20N	20		35.5"	P4-G	GND TB	#6 LUG
E16A20	20		32"	P4-J	K4-X1	#8 LUG
E45A20N	20		37"	P4-N	GND TB	#6 LUG
E17A20	20		41"	P4-S	P8-A	
E6A20	20		147.5"	P4-T	S2K-5	EMER. SHUTOFF SW., #6 LUG
E42A18N	18		42"	P4-X	GND TB	#6 LUG
E30B20	20		43"	P4-Z	P6-T	
E43A20N	20		42"	P4-J	GND TB	#6 LUG
H1C20	20		32"	P6-A	TB1-13	R1H RESISTOR(+), ANODE, #6 LUG
H2B20	20		38"	P6-B	TB1-13	R1H RESISTOR(-), CATHODE #6 LUG
H3B20	20		96"	P6-C	MT1H-(+)	BARE WIRE, PRESSURE TRANSDUCER ENGINE
H4C20N	20		44"	P6-D	GND TB	#6 LUG
H6B20	20		119"	P6-E	L1H-1-NO	BARE WIRE,PNEU. VALVE LCV
L9A20	20		32"	P6-F	TB2-4	CATHODE, #6 LUG
L29A20	20		28.5"	P6-G	TB1-5	ANODE, #6 LUG
G2C20	20		45.5"	P6-H	TB4-10	#6 LUG
G4B20N	20		44.5"	P6-J	TB3-11	ANODE, #6 LUG
L28B20	20		43.5"	P6-K	TB2-3	ANODE, #6 LUG
L30B20N	20		41"	P6-L	GND TB	#6 LUG
L27B20	20	↓	39"	P6-M	TB1-2	CAGHODE, #6 LUG
L2B20	20	WHT	42"	P6-N	P8-S	

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FO-15. Main Harness Wire List
(sheet 2 of 5)

WIRE LIST CONTINUATION PAGE

WIRE NO.	SIZE	COLOR	LENGTH	FROM	TO	REMARKS
L3B20	20	WHT	42"	P6-P	P8-T	
L4B20	20		42.5"	P6-R	P9-A	
L5B20	20		42.5"	P6-S	P9-B	
E35C20N	20		32.5"	P8-B	GND TB	#6 LUG
P6A20	20		60.5"	P8-C	P13-J	
P11A20	20		45.5"	P8-D	P12-Z	
P3A20	20		60.5"	P8-E	P13-N	
P12A20	20		45.5"	P8-F	P12-X	
P4A20	20		60.5"	P8-G	P13-E	
P13A20	20		45.5"	P8-H	P12-W	
E33C20	20		110"	P8-J	P14-B	
E34C20	20		110"	P8-K	P14-C	
E25D18	18		141"	P8-L	S2E-1	EMER SW., #6 LUG
E31C20	20		42"	P8-N	TB4-13	FUEL BOOST PUMP, #6
G5F20	20		29.5"	TB2-2	P10-S	CRIG CATHODE, #6 LUG
G6F20	20		30.5"	TB2-1	P10-A	CRIG CATHODE, #6 LUG
X59B20	20		41.5"	P9-G	P7-15R ⚠2	
X9J20N	20		41.5"	P9-H	P7-14L ⚠2	
X41C20	20		42"	P9-J	P7-7R ⚠2	
X9N20N	20		43.5"	P18-A	P7-16R ⚠2	
P49C20N	20		65.75"	P9-L	GND TB	#6 LUG
C1C20	20		118.5"	P7-5R ⚠2	P14-J	
P3D16	16		26.5"	P9-R	R3(-)	3/8" LUG
P41D20	20		32.5"	P7-1R ⚠2	R2(-)	#8 LUG
P40B20	20		19"	P7-1L	K3-X2	#8 LUG
L10A20	20		27"	P7-2L	TB2-5	CATHODE, #6 LUG
L11A20	20		30"	P7-3R	TB2-6	CATHODE, #6 LUG
L25A20	20	WHT	28"	P7-3L ⚠2	TB2-12	CATHODE, #6 LUG

WIRE LIST CONTINUATION PAGE

WIRE NO.	SIZE	COLOR	LENGTH	FROM	TO	REMARKS
L8A20	20	WHT	29"	P7-4R ⚠2	TB2-14	CATHODE, #6 LUG
L7A20	20		30"	P7-7L	TB1-11	ANODE, #6 LUG
X38A20	20		63.5"	P7-8R	P11-C	
L12A20	20		31"	P7-8L	TB2-7	CATHODE, #6 LUG
X21A20	20		54"	P7-9R	P12-U	
L13A20	20		29"	P7-9L	TB2-8	CATHODE, #6 LUG
X22A20	20		54"	P7-10R	P12-A	
L14A20	20		30"	P7-10L	TB2-9	CATHODE, #6 LUG
X23A20	20		54"	P7-11R	P12-d	
L15A20	20		29"	P7-11L	TB2-10	CATHODE, #6 LUG
X24A20	20		54"	P7-12R	P12-C	
X19A20	20		54"	P7-12L	P12-R	
X36A20	20		63.5"	P7-13R	P11-B	
X20A20	20		54"	P7-13L	P12-S	
X34A20	20		63.5"	P7-15L	P11-F	
X9S20N	20		54"	P7-16L	P12-K	
X37A20	20	WHT	63.5"	P7-17R	P11-E	
X10A20	20	BLK	61"	P7-17L	T4(-)	BARE WIRE
X28A20	20	BLK	58"	P7-18R	T3(-)	BARE WIRE
X26A20	20	BLK	54"	P7-18L	T2(-)	BARE WIRE
X29A20	20	WHT	61"	P7-19R	TR(+)	BARE WIRE
X27A20	20		58"	P7-19L	T3(+)	BARE WIRE
X25A20	20		54"	P7-20R	T2(+)	BARE WIRE
X33B20C	20		53"	P7-20L	K1-C2	3/8" LUG
X32B20B	20		54.5"	P7-21R	K1-B2	3/8" LUG
X31B20A	20		55.5"	P7-21L	K1-A2	3/8" LUG
X46A20	20		54"	P7-22R	P12-F	
X47A20	20		54"	P7-22L	P12-P	
X48A20	20		54"	P7-23R	P12-E	
X49A20	20	WHT	54"	P7-23L ⚠2	P12-L	

WIRE LIST CONTINUATION PAGE

WIRE NO.	SIZE	COLOR	LENGTH	FROM	TO	REMARKS
X50A20	20	WHT	54"	P7-24R ⚠2	P12-M	
X51A20	20		54"	P7-24L	P12-S	
X53A20	20		54"	P7-A	P12-T	
X56A20	20		54"	P7-C	P12-U	
X57A20	20		54"	P7-(+)	P12-V	
X58A20	20		54"	P7-(-) ⚠2	P12-W	
G3F20	20		42.5"	P10-B	P7-6L	
G7B20	20		40"	P10-C	TB4-3	#6 LUG
G8B20	20		41"	P10-D	TB4-4	#6 LUG
G9B20	20		41"	P10-E	TB4-5	#6 LUG
G6C20	20		41"	P10-F	TB4-6	#6 LUG
G5C20	20		42"	P10-G	TB4-7	PROPULSION CONTROLLER, #6 LUG
G18C20N	20		34.5"	P10-H	GND TB	#6 LUG
G16C20	20		64"	TB4-1	S4G-1-NC	#6 LUG, CLUTCH SW.
X18A20	20		28"	P11-A	P12-Q	
X35A20N	20		39"	P11-D	GND TB	#6 LUG
X1B20A	20		21.5"	P12-A	K1-A1	3/8" LUG
X2B20B	20		20.5"	P12-B	K1-B1	3/8" LUG
X3B20C	20		19"	P12-C	K1-C1	3/8" LUG
X5A20	20		59"	P12-D	P13-D	
X6A20	20		59"	P12-F	P13-F	
X13A20	20		36"	P12-G	T1-N	#4 LUG
P14A20	20		18"	P12-H	K2-X4	#8 LUG
X10A20	20		36"	P12-J	T4-T4	#4 LUG
X11A20	20	WHT	36"	P12-K	T1-T2	#4 LUG

FO-15. Main Harness Wire List
(sheet 3 of 5)

FP-37/(FP-38 blank)

WIRE LIST CONTINUATION PAGE

WIRE NO.	SIZE	COLOR	LENGTH	FROM	TO	REMARKS
X12A20	20	WHT	36"	P12-L	T1-T3	#4 LUG
P2E20	20		18"	P12-M	K2-B1	#8 LUG
P7A20	20		59"	P12-T	P13-A	
P8A20	20		59"	P12-V	P13-B	
P9A20	20		59"	P12-Y	P13-C	
X7A20	20		59"	P12-K	P13-K	
X8A20	20		59"	P12-S	P13-L	
P18A20	20		15"	P12-J	R1(+)	#8 LUG
P17A20	20		13"	P12-Y	R1(-)	#8 LUG
P50A12N (4)	12		24"	GND TB	DC GND STUD	1/2" LUG
H8A20N	20		26"	TB1-12	GND TB	ANODE, #6 LUG
H9A20N	20		91.5"	L1H-1-GND	GND TB	PNEU. VALVE, #6 LUG
H10A20N	20		67"	MT1H-(-)	GND TB	PRES.XDUCER, #6 LUG
Q3A20N	20		24"	TB1-14	GND TB	CR1Q, ANODE, #6 LUG
G19A20N	20		33"	TB2-2	GND TB	CR2G, ANODE, #6 LUG
L6B20N	20		77.5"	GDS2-(-)	GND TB	#6 LUG
L6A20N (4)	20		36"	DS101-(-)	DS102-(-)	BARE WIRE
L3D20 (4)	20		36"	DS101-(+)	DS102-(+)	BARE WIRE
L5D20	20		83"	DS103-(+)	DS104-(+)	BARE WIRE
L5E20	20		132"	DS104-(+)	P14-A	
L31A20N	20		83"	DS104-(-)	DS103-(-)	BARE WIRE
L3JB20N	20		47.5"	DS103-(-)	GND TB	#6 LUG
G17A20N	20		41"	TB4-9	GND TB	#6 LUG
E26A20	20		109"	P14-E	K4-X2	#8 LUG
C4A20	20		137.5"	P14-G	P16-B	
C3A20	20		137.5"	P14-H	P16-A	
C2A20N	20		98"	P14-I	GND TB	#6 LUG
C5A20N	20		78"	P16-E	GND TB	#6 LUG
Q7A20N	20	WHT	70"	S1Q-(NO)	GND TB	FUEL LEV. SW.,#6 LUG

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WIRE LIST CONTINUATION PAGE

WIRE NO.	SIZE	COLOR	LENGTH	FROM	TO	REMARKS
Q7B20N	20	WHT	81"	S2Q-(NO)	GND TB	FUEL PRES. SW., GND
					TB, #6 LUG
Q7C20N	20		65"	MT1Q-(-)	GND TB	FUEL LEVEL SENDER,
					#6 LUG
P41A20 (4)	20		6"	K3-A2	K3-X1	3/8" LUG, #8 LUG
E40A20N	20		83"	S3E-C	GND TB	S3E INLET SW., AIR
					STARV. SW., #6 LUG
E41A20N	20		52"	TB4-14	GND TB	#6 LUG, #6 LUG
G11C2 (4)	2		44"	R1-(-)	2K1-NO	1/2",3/8",R1(-)DC CBL SIDE
G11B2	2		2"	2K1-NO	2K2-NO	3/8", 3/8"
G11A2	2		19"	2K2-NO	2A1-B+POS	3/8", 3/8"
G13A2	2		7"	2K1-NO	2K1-NC	3/8", 3/8"
G13B2	2		80"	2K1-NC	B1G-A1	3/8", 3/8", PROP MOTOR
G10B2	2		7"	2K1-NC	2K2-NC	3/8", 3/8"
G10A2	2		10"	2K2-NC	2A1-(S2)	3/8", 3/8", ARM/FLD
G12A2	2		7"	2K2-NO	2K2-NC	3/8", 3/8"
G12B2	2		80"	2K2-NC	B1G-A2	3/8", 3/8", PROP MOTOR
G14A2	2		80"	B1G-S1	2A1-S1	3/8", 3/8"
G15A2	2		80"	B1G-S2	2A1-S2	3/8", 3/8"
G21A2N	2		14"	DC GND STUD	2A1-B-NEG	1/2", 3/8"
P33C6	6		13"	R2(+)	R3(+)	1/2", 1/2"
P32A6	6		20"	R3(-)	J3(+) BAT CHGR	1/2", 1/4", BAT CHGR
P21A6N	6		24"	J4(-) BAT CHGR	J3(-) BAT CHGR	1/4", 1/4", BAT CHGR
P21B2N (4)	2		36"	J4(-) BAT CHGR	DC GND STUD	1/4", 1/2", BAT CHGR
X31D14A	14		72"	K1-A2	3CB6-B	3/8" LUG, #10 LUG
X32D14B	14		72"	K1-B2	3CB5-B	3/8" LUG, #10 LUG
X33D14C	14		72"	K1-C2	3CB4-B	3/8" LUG, #10 LUG
X33E14C (4)	14		6"	3CB3-B	3CB4-B	#10 LUG, #10 LUG
X42A14 (4)	14		48"	3CB6-L	J4(+) AC OUTLET	BARE WIRE, #10 LUG
X43A14 (4)	14	WHT	48"	3CB5-L	J3(+) AC OUTLET	BARE WIRE, #10 LUG

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WIRE LIST CONTINUATION PAGE

WIRE NO.	SIZE	COLOR	LENGTH	FROM	TO	REMARKS
X44A14 (4)	14	WHT	48"	3CB4-L	J2(+) AC OUTLET	BARE WIRE, #10 LUG
X45A14 (4)	14		48"	3CB3-L	J1(+) AC OUTLET	BARE WIRE, #10 LUG
X9B14N (4)	14		6"	J3(-) AC OUTLET	J2(-) AC OUTLET	BARE WIRE, #10 LUG
X9D8N (4)	8		66"	J4(-) AC OUTLET	G1X-N	#10 LUG, 1/4 LUG
X9E20N	20		59.5"	J1(-) AC OUTLET	P7-J-4R (2)	BARE WIRE
E3D20	20		40"	TB1-1 CATHODE	P8-P	#6 LUG
E11A20	20		43"	TB3-1 CATHODE	P4-B	CATHODE, #6 LUG
E12A20	20		43"	TB3-2 CATHODE	P4-U	CATHODE, #6 LUG
E12E20 (4)	20		6"	TB3-2 ANODE	TB3-6 ANODE	#6 LUG, #6 LUG
E12D20	20		45"	TB3-6 CATHODE	P4-L	CATHODE, #6 LUG
E13A20	20		43"	TB3-3 CATHODE	P4-J	CATHODE, #6 LUG
E14A20	20		43.5"	TB3-4 CATHODE	P4-T	CATHODE, #6 LUG
E15A20	20		44"	TB3-5 CAHTODE	P4-M	CATHODE, #6 LUG
C1D1B (4)	18		42"	P7-4L	P9-M (2)	
P22A2 (4)	2		68"	J4(+) BAT CHGR	3CB1-L	1/4", 1/4"
P2B2 (4)	2		34"	3CB1-B	K2-A1	1/4", 3/8"
P38B20	20		51"	P7-5L	K2-X2	#8 LUG
P2C8 (4)	8		36"	3CB2-B	K2-A1	3/8" LUG, #8 LUG
E18C20	20		36"	K4-A1	TB2-15 ANODE	ANODE, 3/8"LUG, #6 LUG
P2D20 (4)	20		6"	K2-A1	K2-B1	3/8" & 3/8"
L5C20	20		62"	DS103(+)	P9-B	BARE WIRE
G24A20	20		54"	TB4-2	B1G TEMP SW	PROP MOTOR, BARE WIRE
G22A20	20		26"	R3(-)	P8-R	3/8" LUG, SHUNT
G21D20	20		65"	S4G-1-COM	P9-K	BARE WIRE, CLUTCH SW.
G25A20	20		65"	TB3-11 CATHODE	K2-X2	CATHODE
G11D20 (4)	20		24"	C1G(+)	2A1G-B(+) POS	BARE WIRE, #10 LUG
G11E20 (4)	20		24"	C1G(-)	2A1G-B(-) NEG	BARE WIRE, #10 LUG
L3C20	20	WHT	52.5"	P8-T	DS101(+) PANEL LT	BARE WIRE

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FO-15. Main Harness Wire List
(sheet 4 of 5)

WIRE LIST CONTINUATION PAGE

WIRE NO.	AWG SIZE	COLOR	LENGTH		FROM	TO	REMARKS
C2A20W	20		3½"	98	P14-1	GND TB	# 6 LUG
C5A20W	20		3"	78	P16-E	GND TB	# 6 LUG
Q7A20W	20		2½"	26	S10-(NO)	GND TB	FUEL LEVEL SW, # 6 LUG
Q7B20W	20		22½"	125	S20-(NO)	GND TB	FUEL PRESS SW, GND TB, # 6 LUG
Q7C20W	20		4"	75	MT10-(-)	GND TB	FUEL LEVEL SENDER, # 6 LUG
P41A20	20			6	K3-A2	K3-A1	3/8" LUG, # 8 LUG
E40A20W	20			63	S3C-C	GND TB	S3C INLET SW, AIR STARV. SW, # 6 LUG
E41A20W	20			68	TB4-14	GND TB	#6 & #6
G11C2	2			42	R1-(-)	2K1-NO	¼ ¼, R1-(-) DC CABLE SIDE
G11B2	2			12	2K1-NO	2K2-NO	¼ ¼
G11A2	2			30	2K2-NO	2A1-B+ POS	¼ ¼
G13A2	2			10	2K1-NO	2K1-NC	¼ ¼
G12B2	2			96	2K1-NC	B1G-A1	¼ ¼, PROP MOTOR
G10B2	2			12	2K1-NC	2K2-NC	¼ ¼
G10A2	2			24	2K2-NC	2A1-(-SZ)	¼ ¼, RAM/FLD
G12A2	2			10	2K2-NO	2K2-NC	¼ ¼
G12B2	2			80	2K2-NC	B1G-A2	¼ ¼, PROP MOTOR
G14A2	2			80	B1G-S1	2A1-S1	¼ ¼
G15A2	2			80	B1G-S2	2A1-S2	¼ ¼
G21A2N	2			20	DC GND STUD	2A1-B - NEG	¼ ¼
P33C6	6			24	R2(+)	R3(+)	¼ ¼
* P32A6	6			24	R3(-)	J3-(+) BAT CHGR	¼ ¼, BAT CHGR
* P21A6N	6			24	J4-(-) BAT CHGR	J3-(-) BAT CHGR	¼ ¼, BAT CHGR
* P21B2N	2			96	J4-(-) BAT CHGR	DC GND STUD	¼ ¼, BAT CHGR
X31D14A	14			72	K1-A2	3CB6-B	3/8" LUG , # 10 LUG
X32D14B	14			72	K1-B2	3CB5-B	3/8" LUG , # 10 LUG
X33D14C	14			72	K1-C2	3CB4-B	3/8" LUG , # 10 LUG

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WIRE LIST CONTINUATION PAGE

WIRE NO.	AWG SIZE	COLOR	LENGTH		FROM	TO	REMARKS
X33E14C	14			6	3CB3-B	3CB4-B	# 10 LUG, # 10 LUG
Y42A14	14			48	3CB6-L	J4-(+) AC OUTLET	BARE WIRE, # 10 LUG
X43A14	14			48	3CB5-L	J3-(+) AC OUTLET	BARE WIRE , # 10 LUG
X44A14	14			48	3CB4-L	J2-(+) AC OUTLET	BARE WIRE, # 10 LUG
X45A14	14			48	3CB3-L	J1-(+) AC OUTLET	BARE WIRE, # 10 LUG
X98BN	not done at RCE			6	J3-(-) AC OUTLET	J2-(-) AC OUTLET	BARE WIRE, # 10 LUG
X90BN				36	J4-(-) AC OUTLET	G1A-N	BARE WIRE, ¼ & #10 LUG
X9E20W	20			735	J1-(-) AC OUTLET	P7-14R	BARE WIRE
E3D20	20		12"	41	TB1-1 CATHODE	P8-P	# 6 LUG
E11A20	20		16"	51	TB3-1 CATHODE	P4-g	CATHODE, # 6 LUG
E12A20	20		16½"	504	TB3-2 CATHODE	P4-d	CATHODE, # 6 LUG
E12E20	20			6	TB3-2 ANODE	TB3-6 ANODE	ANODE, CATHODE, # 6 LUG; #6 LUG
E12D20	20		8"	49	TB3-6 CATHODE	P4-L	CATHODE, # 6 LUG
E13A20	20		16½"	504	TB3-3 CATHODE	P4-h	CATHODE, # 6 LUG
E14A20	20		17½"	493	TB3-4 CATHODE	P4-f	CATHODE, # 6 LUG
E15A20	20		17 3/4"	498	TB3-5 CATHODE	P4-E	CATHODE, # 6 LUG
C1D18	18			42	P7-4L	P8-M	
*P22A2	not done at RCE			54	J4-(+) BAT CHGR	3CB1-L	¼" & ¼"
*P2B2	2			48	3CB1-B	K2-A1	¼" & ¼"
P38B20	20		74"	504	P7-5L	K2-A2	# 8 LUG
P2C8	8			80	3CB2-B	K2-A1	3/8" LUG , # 8 LUG
E18C20	20		11"	39	K4-A1	TB2-15 ANODE	ANODE, 3/8" LUG, # 6 LUG
P2D20	20			6	K2-A1	K2-B1	3/8" & 3/8"
L5C20	20			62	40S3-(+)	P8-B	BARE WIRE
G24A20	20			34	TB4-2	B1G TEMP SW	PROP MOTOR, *BAREWIRE*
G22A20	20		3"	29	B3(-)	P8-B	3/8" LUG, SHUNT
G21B20	20			172	S4C - COM	P9-K	BARE WIRE, CLUTCH SW
G25A20	20			72	TB3-11 CATHODE	K2-A2	CATHODE
G30A20	20	WHT	30"		28 VDC INPUT	TB2-16 ANODE	20 AWG RECEPTACLE #6 LUG
G30B20	20	WHT	48"		TB2-16 CATHODE	ELECTRIC BRAKE	#6 LUG IN LINE SPLICE
G31A20W	20	WHT	24"		ELECTRIC BRAKE	TB4-9	IN LINE SPLICE #6 LUG

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FO-15. Main Harness Wire List (sheet 5 of 6)

WIRE LIST	DOD PROJECT MANAGER-MOBILE ELECTRIC POWER WASHINGTON, D.C.	WL 83-14626	REV. D	PAGE 1 OF 8
TITLE HARNESS, WIRING - CONTROL PANEL				
MODEL: A.G.P.U.	WIRING HARNESS: 83-14626			
	NEXT ASSY 83-14591			

NOTES:

1. WIRE NUMBER MARKING TO BE AT 3" FROM EACH END.
2. PIN ASSIGNMENT ON J5, J6 & J7 ARE SEEN BY LOOKING AT THE CONNECTOR'S FRONT VIEW (NOT AT THE CONNECTOR WIRE SIDE).
3. ALL PIN CONNECTORS SHALL BE IDENTIFIED J5, J6 ETC. VENDOR SHALL IDENTIFY EACH CONNECTOR WITH AN ADJACENT PLASTIC TAG. EITHER HOT STAMPED MARKER TIES OR PANDUIT P/N PLM2S OR EQUIV.) WITH NEAT, PERMANENT BLACK INK MARKINGS ARE ACCEPTABLE.
   J5 CONNECTOR, MS3108A-36-403S
   J6 CONNECTOR, MS3106E-20-29S
   J7 CONNECTOR, MS3101A-36-403P
4. ALL SOLDERING TERMINALS AT J5, J6 & J7 CONNECTORS MUST HAVE SLEEVING OR HEAT SHRUNK TUBING.
5. LUGS TO BE APPLIED BY VENDOR.
6. MARK PER MIL-STD-130 WITH 83-14626 AND LATEST REVISION LETTER.
7. ON J5 & J7, VENDOR SHALL LOCK THE THREADED SLEEVE TO ITS FLANGE WITH LOCTITE "A" OR EQUIV.
8. WIRE REQUIREMENTS:
   A) 20 AWG WIRE P/N M22759/16-20-9 = 478.00'
   B) 18 AWG WIRE P/N M22759/16-18-9 = 17.00'

LTR.	ECO NO.	DATE	BY	AUTH.
C	INCORP. E.O. #10115 COMPLETELY REVISED & REDRAWN			
D	INCORP. E/O #10272			

WL 83-14626 REV. D PAGE 1 OF 8

WIRE LIST CONTINUATION PAGE

WIRE NO.	SIZE	COLOR	LENGTH	FROM	TO	REMARKS
E2B18	18	WHT	50"	S1-A11-RUN	J5-1R (7)	BARE WIRE
E3B20	20	"	50"	S1-B6-START	J5-1L	BARE WIRE
E4G18	18		48"	CB2-L	J5-2L	#8 LUG
E18B20	20		49"	DS2(+)	J5-3R	#4 LUG
E37A20N	"		49"	DS2(-)	J5-3L	#4 LUG
E7B20			54"	M1(+)	J5-4R	TWISTED PAIR 1/4" LUG
E8B20			54"	M1(-)	J5-4L	TWISTED PAIR 1/4" LUG
E9B20			57"	M2(+)	J5-5R	TWISTED PAIR 1/4" LUG
E10B20			57"	M2(-)	J5-5L	TWISTED PAIR 1/4" LUG
E21B20			41"	CR9E- ANODE	J5-6R	#4 LUG
E11B20			39"	DS12(-)	J5-6L	#4 LUG
E12B20			53"	DS10(-)	J5-7L	#4 LUG
E13B20			51"	DS9(-)	J5-8R	#4 LUG
E22B20			49"	DS8(-)	J5-8L	#4 LUG
E14B20			54"	DS4(-)	J5-9R	#4 LUG
E15B20			52"	DS3(-)	J5-9L	#4 LUG
E1J20			52"	DS3(+)	J5-10R	#4 LUG
E39A20N			34"	S12-(8)	J5-10L	#6 LUG
E28B20			39"	S8-(4)	J5-11R	#6 LUG
E29A20			39"	S8-(8)	J5-11L	#6 LUG
Q1C20			42"	DS5(+)	J5-12R	#4 LUG
Q2B20			42"	M3(+)	J5-12L	#1/4 LUG
Q4A40			42"	DS5(-)	J5-13R	#4 LUG
Q5A20			40"	DS6(-)	J5-13L	#4 LUG
Q6A20			42"	M3(-)	J5-14R	#1/4 LUG
L26B20			49"	DS2(+)	J5-14L	#4 LUG
L24B20			52"	DS3(-)	J5-15R	#4 LUG
L23B20	"	"	54"	DS4(-)	J5-15L	#4 LUG
L22B20	20	WHT	42"	DS5(-)	J5-16R	#4 LUG

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WIRE LIST CONTINUATION PAGE

WIRE NO.	SIZE	COLOR	LENGTH	FROM	TO	REMARKS
L21B20	20	WHT	40"	DS6(-)	J5-16L	#4 LUG
L19B20	"	"	49"	DS8(-)	J5-17R	#4 LUG
L18B20			51"	DS9(-)	J5-17L	#4 LUG
L17B20			53"	DS10(-)	J5-18R	#4 LUG
L20B20			41"	DS11(+)	J5-18L	#4 LUG
L16B20			39"	DS12(-)	J5-19R	#4 LUG
P15B20			33"	CR11P- ANODE	J5-19L	#4 LUG
P16B20			36"	CR10P- ANODE	J5-20R	#4 LUG
P29B20			44"	DS7(+)	J5-20L	#4 LUG
P46B20	"		34"	DS21(+)	J5-21R	#4 LUG
P34D20	20		54"	S2-2	J5-21L	#6 LUG
P35D18	18		54"	S2-5	J5-22R	#6 LUG
P53G20N	20		34"	M11(-)	J5-23R	#1/4 LUG
P47B20	"		45"	M6(+)	J5-23L	#6 LUG
P48B20			45"	M6(-)	J5-24R	#6 LUG
P48B20			45"	M5(-)	J5-24L	TWISTED PR 1/4" LUG
P43B20			45"	M5(+)	J5-A	TWISTED PR 1/4" LUG
P17C20			37"	M12(-)	J5-C	#1/4 LUG
P18C20			37"	M12(+)	J5(+)	#1/4 LUG
P3D20			34"	M11(+)	J5(-)	#1/4 LUG
P41E20			39"	M4(+)	J7-1L (7)	#4 LUG
P40A20			40"	CR6P- ANODE	J7-1R	#4 LUG
L10B20			36"	DS19(+)	J7-2R	#4 LUG
L11B20			34"	DS18(+)	J7-3L	#4 LUG
L25B20	"	"	44"	DS7(+)	J7-3R	#4 LUG
L18B20	20	WHT	33"	DS21(+)	J7-4L	#4 LUG

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FO-16. Control Panel Harness Wire List (sheet 1 of 3)

FP-43/(FP-44 blank)

WIRE LIST CONTINUATION PAGE

WIRE NO.	SIZE	COLOR	LENGTH	FROM	TO	REMARKS
E37C20N	20	WHT	40"	DS11(-)	DS2(-)	BAREWIRE, BAREWIRE
P38A20	↓	↓	21"	S12-6	J7-5R	#6 LUG
L29D20			65"	DS1(+)	J7-6L	#4 LUG
X41B20			42"	M8(+)	J7-7L	#1/4 LUG
L7B20			33"	DS20(-)	J7-7R	#4 LUG
X38B20			33"	DS20(-)	J7-8L	#4 LUG
L12B20			32"	DS17(+)	J7-8R	#4 LUG
X21B20			31"	CR4X- ANODE	J7-9L	#4 LUG
L13B20			46"	DS16(+)	J7-9R	#4 LUG
X22B20			45"	CR3X- ANODE	J7-10L	#4 LUG
L14B20			44"	DS15(+)	J7-10R	#4 LUG
X23B20			43"	CR2X- ANODE	J7-11L	#4 LUG
L15B20			42"	DS14(+)	J7-11R	#4 LUG
X24B20			41"	CR1X- ANODE	J7-12L	#4 LUG
X19B20			28"	S10(6)	J7-12R	#6 LUG
X36B20			28"	S10(5)	J7-13L	#6 LUG
X20B20			28"	S10(2)	J7-13R	#6 LUG
X9G20N			42"	M8(-)	J7-14L	#1/4 LUG
X9H20N			35"	M10(-)	J7-14R	#1/4 LUG
X59C20			35"	M10(+)	J7-15L	#1/4 LUG
X34B20			45"	M9(-)	J7-15R	#1/4 LUG
X9F20N			42"	M8(-)	J7-16L	#1/4 LUG
X9R20N			42"	M8(-)	J7-16R	#1/4 LUG
X37B20	↓	↓	32"	S9-A-COM	J7-17L	BARE WIRE
X30B20	20	WHT	32"	S9-A-3	J7-17R	BARE WIRE

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WIRE LIST CONTINUATION PAGE

WIRE NO.	SIZE	COLOR	LENGTH	FROM	TO	REMARKS
X28B20	20	WHT	32"	S9-A-2	J7-18L	BARE WIRE
X26B20	↓	↓	32"	S9-A-1	J7-18R	BARE WIRE
X29B20			32"	S9-B-6	J7-19L	BARE WIRE
X27B20			32"	S9-B-5	J7-19R	BARE WIRE
X25B20			32"	S9-B-4	J7-20L	BARE WIRE
X33C20C			32"	S9-C-3	J7-20R	BARE WIRE
X32C20C			32"	S9-C-2	J7-21L	BARE WIRE
X31C20A			32"	S9-C-1	J7-21R	BARE WIRE
X46B20			39"	CR5X- ANODE	J7-22L	#4 LUG
X47B20			25"	S11-A-COM	J7-22R	BARE WIRE
X48B20			25"	S11-4	J7-23L	BARE WIRE
X49B20			25"	S11-B-8	J7-23R	BARE WIRE
X50B20			25"	S11-B-7	J7-24L	BARE WIRE
X51B20			25"	S11-B-6	J7-24R	BARE WIRE
X53B20			25"	S11-B-COM	J7-A	BARE WIRE
X56B20			25"	S11-B-3	J7-C	BARE WIRE
X57B20			25"	S11-B-2	J7-(+)	BARE WIRE
X58B20			25"	S11-B-1	J7-(-)	BARE WIRE
N12Z0			38"	S8-12	J6-A	#6 LUG
N2A20			44"	M7(+)	J6-B	#1/4 LUG
N3A20			44"	M7(-)	J6-C	#1/4 LUG
N4B20N			40"	DS13(-)	J6-D	#4 LUG
N6A20			38"	S8-12	J6-E	#6 LUG
L9B20			40"	DS13(+)	J6-F	#4 LUG
L29B20	↓	↓	50"	DS1(-)	J6-G	#4 LUG
G2B20	20	WHT	49"	S3-3	J6-H	#6 LUG

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WIRE LIST CONTINUATION PAGE

WIRE NO.	SIZE	COLOR	LENGTH	FROM	TO	REMARKS
G4A20N	20	WHT	50"	DS1(-)	J6-J	#4 LUG,
L28A20	↓	↓	50"	S4-N01	J6-K	BARE WIRE
L30A20N			50"	S4-COM2	J6-L	BARE WIRE
L27A20			50"	S4-N02	J6-M	BARE WIRE
L2A20			47"	S6-1	J6-N	#6 LUG
L3A20			47"	S6-3	J6-P	#6 LUG
L4A20			45"	S7-1	J6-R	#6 LUG
L5A20			45"	S7-3	J6-S	#6 LUG
E30A20	20		38"	S8-9	J6-T	#6 LUG
F2A18	18		7.5"	CB2-L	S1-A1-COM	#8 LUG, BARE WIRE
E2D18	18		6"	S1-A1-COM	S1-B7-COM	BARE WIRE, BARE WIRE
E2E18	18		6"	S1-A11-RUN	S1-A12-START	BARE WIRE, BARE WIRE
E1A20	20		7"	CB1-L	DS8(+)	#8 LUG, #4 LUG
E1B20	↓		5.5"	DS8(+)	DS9(+)	#4 LUG, #4 LUG
E1C20			5.5"	DS9(+)	DS10(+)	#4 LUG, #4 LUG
E1D20			40"	DS10(+)	DS12(+)	#4 LUG, #4 LUG
E1E20			7"	DS12(+)	DS6(+)	#4 LUG, #4 LUG
E1F20			5"	DS6(+)	DS5(+)	#4 LUG, #4 LUG
E1G20			46.5"	DS5(+)	DS4(+)	#4 LUG, #4 LUG
F1H20			5.5"	DS4(+)	DS3(+)	#4 LUG, #4 LUG
E27A20			15"	S8-(5)	S10-(8)	#6 LUG, #6 LUG
E32A20			13.5"	S10-(7)	S12-(7)	#6 LUG, #6 LUG
X48C20			6.5"	S11-A-4	S11-A-3	BARE WIRE, BARE WIRE
X48D20	↓	↓	6.5"	S11-A-3	S11-A-2	BARE WIRE, BARE WIRE
X48E20	20	WHT	6.5"	S11-A-2	S11-A-1	BARE WIRE, BARE WIRE

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FO-16. Control Panel
Harness Wire List
(sheet 2 of 3)

WIRE LIST CONTINUATION PAGE

WIRE NO.	SIZE	COLOR	LENGTH	FROM	TO	REMARKS
X47C20	20	WHT	15"	DS12(+)	DS20(+)	#4 LUG, #4 LUG
X20C20	〃	〃	15"	S10-2	S12-2	#6 LUG, #6 LUG
X19C20			5.5"	S10-6	S10-1	#6 LUG, #6 LUG
X19D20			15.5"	S10-1	S12-1	#6 LUG, #6 LUG
X19E20			11.5"	S12-1	DS17(-)	#6 LUG, #4 LUG
X19F20			31"	DS17(-)	DS16(-)	#4 LUG, #4 LUG
X19G20			5.25"	DS16(-)	DS15(-)	#4 LUG, #4 LUG
X19H20			5.25"	DS15(-)	DS14(-)	#4 LUG, #4 LUG
X40A20			19"	S9-B-COM	M9(+)	BARE WIRE, #1/4 LUG
X41A20			16.5"	S9-C-COM	M8(+)	BARE WIRE, #1/4 LUG
P53A20N			37"	S2-8	DS21(-)	#6 LUG, #4 LUG
P53B20N			13.5"	DS21(-)	DS19(-)	#4 LUG, #4 LUG
P53C20N			6"	DS19(-)	DS18(-)	#4 LUG, #4 LUG
P53D20N			4"	DS18(-)	M11(-)	#4 LUG, #1/4 LUG
P53E20N	〃	〃	8.25"	M4(-)	DS7(-)	#4 LUG, #4 LUG
P36A20	20		6"	S2-3	CB1-B	#6 LUG, #8 LUG
P37A18	18		10"	S2-6	CB2-B	#6 LUG, #8 LUG
P45A20	20		39"	S2-9	S12-5	#6 LUG, #6 LUG
P39A20	〃		21"	S2-4	S5-3	#6 LUG, #6 LUG
H1B20			13"	CB1-L	S8-2	#8 LUG, #6 LUG
H7A20			7.5"	S8-3	DS13(+)	#6 LUG, #4 LUG
G2A20			5.25"	S3-2	DS1(+)	#6 LUG, #4 LUG
L1A20	〃	〃	8"	CB1-L	S6-2	#8 LUG, #6 LUG
L1B20	20	WHT	6.25"	S6-2	S7-2	#6 LUG, #6 LUG

WIRE LIST CONTINUATION PAGE

WIRE NO.	SIZE	COLOR	LENGTH	FROM	TO	REMARKS
L1C20	20	WHT	5"	CB1-L	S4-COM-1	#8 LUG, BARE WIRE
P45B20	20		42.5"	S2-9	M4(-)	#6 LUG, #4 LUG
C1E18	18		51"	J7-4R	S2-11	——— , #6 LUG
C1F18	18		51"	J7-5L	S2-12	——— , #6 LUG
H1D20	20		5.5"	S8-2	S8-11	#6 LUG, #6 LUG
G3D20	20		48"	J7-2L	S3-6	——— , #6 LUG
G3E20	20		48"	J7-6R	S3-5	——— , #6 LUG
H4D20	20		24"	S8-10	S11-C-COM	BARWIRE, BAREWIRE
H5A20	20		2"	S11-C-5	S11-C-4	BARWIRE, BAREWIRE
H5B20	20	WHT	36"	S11-C-4	J5-7R	BAREWIRE, BARWIRE

FO-16. Control Panel Harness Wire List (sheet 3 of 3)

WIRE LIST

DOD PROJECT MANAGER-MOBILE ELECTRIC POWER WASHINGTON, DC

TITLE: HARNESS, WIRING - UPPER TRAY

MODEL: A.G.P.U.

WIRING HARNESS: 83-14627

NEXT ASSY: 83-14692

NOTES:

1. WIRE NUMBER MARKING TO BE AT 3" FROM EACH END.
2. ALL PIN CONNECTORS SHALL BE IDENTIFIED J10, 2P1, ETC. VENDOR SHALL IDENTIFY EACH CONNECTOR WITH AN ADJACENT PLASTIC TAG. EITHER HOT STAMPED MARKER TIES OR PANDUIT P/N PLM2S(OR EQUIV.) WITH NEAT, PERMANENT BLACK INK MARKINGS ARE ACCEPTABLE.
   J10 CONNECTOR, MS3106E-20-29S
   2P1 CONNECTOR, 207360-1
   28VDC CONNECTOR, 61429-1
3. ALL SOLDERING TERMINALS AT J10 CONNECTOR MUST HAVE SLEEVING OR HEAT SHRINK TUBING.
4. MARK PER MIL-STD-130 WITH 83-14627 AND LATEST REVISION LETTER.
5. WIRE REQUIREMENTS:
   20 AWG WIRE P/N M22759/16-20-9 = 30.00''

WL 83-14627 | REV C | PAGE 1 OF 2

LTR	ECO NO.	DATE	BY	AUTH
B	INCORP. E.O. #10114 COMPLETELY REVISED & REDRAWN.			
C	INCORP. E/O #10273			

WL 83-14627 | REV C | PAGE 1 OF 2

WIRE LIST CONTINUATION PAGE

WIRE NO.	SIZE	COLOR	LENGTH	FROM	TO	REMARKS
G6E20	20	WHT	36"	J-10-A (3)	2K1(+)	#10 LUG
G3G20			24.5"	-B	28VDC INPUT	ON MOTOR CONTROLLER
G7A20			36"	-C	2P1-3	
G8A20			36"	-D	2P1-2	
G9A20			36"	-E	2P1-1	
G6D20			36"	-F	2K1(+)	#10 LUG
G5D20			36"	-G	2K2(+)	#10 LUG
G18B20N			36"	-H	2K2(+)	#10 LUG
G5E20			36"	J-10-S (3)	2K2(+)	#10 LUG
G18A20N	20	WHT	8"	2K1(-)	2K2(-)	#10 LUG, #10 LUG

WL 83-14627 | PAGE 2 OF 2

FO-17. Upper Tray Wiring Harness Wire List

WIRE LIST	DCO PROJECT MANAGER-MOBILE ELECTRIC POWER WALTHAM/BOSTON, D.C.	WL 83-14628	REV. D	PAGE 1 OF 5
TITLE HARNESS, WIRING, LOWER TRAY		C	INCORP. E.O. 10116 COMPLETELY REVISED & REDRAWN	
MODEL: A.G.P.U.	WIRING HARNESS: 83-14628	D	INCORP. E/O 10274	
	NEXT ASSY 83-14692			

NOTES:

1. WIRE NUMBER MARKING TO BE OUT AT 3" FROM EACH END.

B 2. ALL PIN CONNECTORS SHALL BE IDENTIFIED J8, J9 ETC. VENDOR SHALL IDENTIFY EACH CONNECTOR WITH AN ADJACENT PLASTIC TAG. EITHER HOT STAMPED MARKER TIES OR PANDUIT P/N PLM2S(OR EQUIV.) WITH NEAT, PERMANENT BLACK INK MARKINGS ARE ACCEPTABLE.

   J8 CONNECTOR, MS3101A-20-29P
   J9 CONNECTOR, MS3106A-20-29S
   J18 CONNECTOR, MS3101E-14S-6P

3. ALL SOLDERING TERMINALS AT J8,J9 & J18 CONNECTORS MUST HAVE SLEEVING OR HEAT SHRUNK TUBING.

4. WRAP ELECTRICAL TAPE AROUND WIRE HARNESS, AT POINT OF CONTACT WITH ENDBELL OF INTERGRAL CABLE CLAMP J18, PROVIDING GREATER CLAMPING ABILITY FOR WIRE HARNESS.

5. LUGS TO BE APPLIED BY VENDOR.

6. UNLESS OTHERWISE SPECIFIED ALL WIRE SHALL TERMINATE WITH BAREWIRE.

B 7. MARK PER MIL-STD-130 WITH 83-14628 AND LATEST REVISION LETTER.

LTR.	ECO NO.	DATE	BY	AUTH.

WL 83-14628 REV. D PAGE 1 OF 5

WIRE LIST	DCO PROJECT MANAGER-MOBILE ELECTRIC POWER WALTHAM/BOSTON, D.C.	WL 83-14628	REV. D	PAGE 1A OF 5
TITLE HARNESS, WIRING, LOWER TRAY				
MODEL: A.G.P.U.	WIRING HARNESS: 83-14628			
	NEXT ASSY 83-14692			

NOTES:

B 8. WIRE REQUIREMENTS:
   A) 20 AWG WIRE P/N M22759/16-20-9 = 92.00'
   B) 18 AWG WIRE P/N M22759/16-18-9 = 17.00'

LTR.	ECO NO.	DATE	BY	AUTH.

WL 83-14628 REV. D PAGE 1A OF 5

WIRE LIST CONTINUATION PAGE

	WIRE NO.	SIZE	COLOR	LENGTH	FROM	TO	REMARKS
B	E17B20	20	WHT	31"	J8 -A (1)	3XK1-X1	BARE WIRE
	E35B20N	↑	↑	31"	-B	3XK1-X2	SEE E36B20N,
	P6B20			31"	-C	3XK1-A1	BARE WIRE
	P11B20			31"	-D	3XK1-A2	↑
	P5B20			31"	-E	3XK1-B1	
	P12B20			31"	-F	3XK1-B2	
	P4B20			31"	-G	3XK1-C1	
	P13B20			31"	-H	3XK1-C2	
	E33B20	↓		31"	-J	3XK1-D1	
	E34B20	20		31"	-K	3XK1-D2	↓
	E25C18	18		31"	-L	3XK2-A1	BARE WIRE
	E4B18	18		31"	-M	SPLICE	SEE PG. 5 FIG. 5
	E31B20	20		31"	-N	SPLICE	SEE PG. 5 FIG. 5
	E3E20	↓		31"	-P	SPLICE	SEE PG. 5 FIG. 4
	G22B20			35.5"	-R	3F1(+)	
	G5G20			26"	-S	3VR1+	BARE WIRE
	G19A20 (2)			26"	J8 -T	3VR1-	#6 LUG
	G6G20			26"	J9 -A	3VR2(+)	BARE WIRE
	G20A20 (2)			26"	-B	3VR2(-)	#6 LUG
	P26B20			32"	-C	3S1-1	BARE WIRE
	P27B20			32"	-D	3S1-2	↑
	P28B20			32"	-E	3S1-3	↓
	P25B20			32"	-F	3S1-COMM	BARE WIRE
	X59A20 (2)			31"	-G	FTMTR(+)	#1/4 LUG
	X9K20N (2)			31"	J9 -H (3)	FTMTR(-)	#1/4 LUG
	E3F20	↑		8"	E3E20, SPLICE	3XK2-X1	SEE PG. 5 FIG. 4
	E3G20	20		8"	E3E20, SPLICE	3XK2-A2	SEE PG. 5 FIG. 4
	E4A18	18	↓	8"	E4B18, SPLICE	3XK2-B2	SEE PG. 5 FIG. 5
B	E36B20N	20	WHT	8"	3XK1-X2	3XK2-X2	

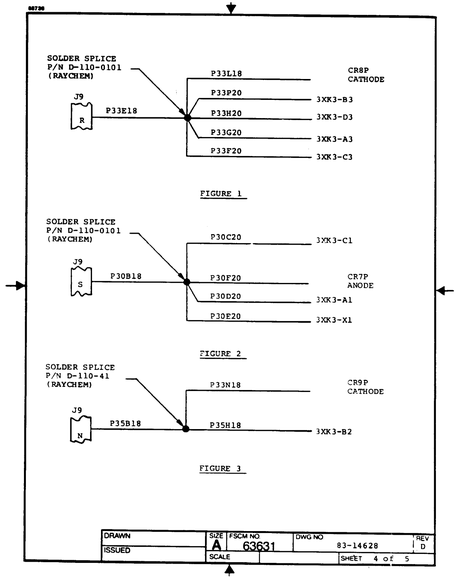
WL 83-14628 PAGE 2 OF 5

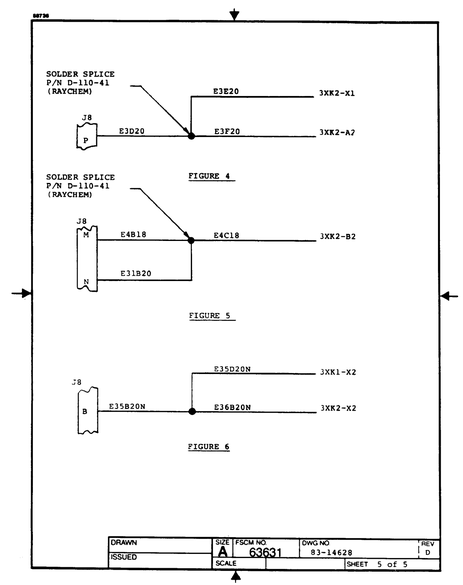
FO-18. Lower Electrical Tray Harness Wire List (sheet 1 of 2)

WIRE LIST CONTINUATION PAGE

WIRE NO.	SIZE	COLOR	LENGTH	FROM	TO	REMARKS
B X41D20	20	WHT	30"	J9 -J ⚠1	FT115VAC(+)	#1/4 LUG ⚠5
G21A20	20		31"	-K	3F1(-)	BARE WIRE
P49B20N	20		27"	-L	3XK3-X2	
C1B20	20		27"	-M	3XK3-C2	
P35B18	18		13"	-N	SPLICE	SEE PG. 1 FIG. 3
P34B20	20		27"	-P	3XK3-A2	
P33E18	18		12"	-R	SPLICE	SEE PG. 1 FIG. 1
P30B18	18		12"	J9 -S ⚠1	SPLICE	SEE PG. 1 FIG. 2
P33F20	20		8"	P33E18, SPLICE	3XK3-C3	SEE PG. 1 FIG. 1
P33G20	20		8"	P33E18, SPLICE	3XK3-A3	SEE PG. 1 FIG. 1
P30C20	20		8"	P30B18, SPLICE	3XK3-C1	SEE PG. 1 FIG. 2
P30D20	20		8"	P30B18, SPLICE	3XK3-A1	SEE PG. 1 FIG. 2
P30E20	20		8"	P30B18, SPLICE	3XK3-X1	SEE PG. 1 FIG. 2
X9T20N	20		31"	J18-A ⚠4 ⚠1	FT115VAC(-)	#1/4 LUG 5
E4J18	18		33"	J18-B	3XK2-B1	BARE WIRE
P33H20	20		8"	P33E18, SPLICE	3XK3-D3	SEE PG. 1 FIG. 1
P33J20	20		27"	3XK3-D2	J18-E	BARE WIRE
P33L18	18		8"	P33E18, SPLICE	CR8P-CATHODE	SEE PG. 1 FIG. 1
P33M18	18		10"	3CR8P-ANODE	3CR9P-ANODE	JUMPER,3CR9P:20A DIODE
P33N18			10"	3CR9P-CATHODE	3XK3-B2	JUMPER,3CR9P:20A DIODE
P30N18	18		8"	P35B18, SPLICE	CR9P-CATHODE	SEE PG. 1 FIG. 3
P30P20	20		8"	P30B18, SPLICE	CR7P-ANODE	SEE PG. 1 FIG. 2
P33P20	20		8"	P33E18, SPLICE	3XK3-B3	SEE PG. 1 FIG. 1
B P35H18	18	WHT	8"	P35B18, SPLICE	3XK3-B2	SEE PG. 1 FIG. 3

WL 83-14628 PAGE 3 OF 5





FO-18. Lower Electrical Tray Harness Wire List (sheet 2 of 2)

These are the instructions for sending an electronic 2028

The following format must be used if submitting an electronic 2028. The subject line must be exactly the same and all fields must be included; however only the following fields are mandatory: 1, 3, 4, 5, 6, 7, 8, 9, 10, 13, 15, 16, 17, and 27.

From: "Whomever" <whomever@wherever.army.mil>
To: 2028@redstone.army.mil

Subject: DA Form 2028

1. ***From:*** Joe Smith
2. *Unit:* home
3. ***Address:*** 4300 Park
4. ***City:*** Hometown
5. ***St:*** MO
6. ***Zip:*** 77777
7. ***Date Sent:*** 19−OCT−93
8. ***Pub no:*** 55−2840−229−23
9. ***Pub Title:*** TM
10. ***Publication Date:*** 04−JUL−85
11. *Change Number:* 7
12. *Submitter Rank:* MSG
13. ***Submitter FName:*** Joe
14. *Submitter MName:* T
15. ***Submitter LName:*** Smith
16. ***Submitter Phone:*** 123−123−1234
17. ***Problem:*** **1**
18. *Page:* 2
19. *Paragraph:* 3
20. *Line:* 4
21. *NSN:* 5
22. *Reference:* 6
23. *Figure:* 7
24. *Table:* 8
25. *Item:* 9
26. *Total:* 123
27. ***Text:***

This is the text for the problem below line 27.

RECOMMENDED CHANGES TO PUBLICATIONS AND BLANK FORMS For use of this form, see AR 25–30; the proponent agency is ODISC4.	Use Part II (*reverse)* for Repair Parts and Special Tool Lists (RPSTL) and Supply Catalogs/ Supply Manuals (SC/SM)	DATE 8/30/02
TO: (*Forward to proponent of publication or form)(Include ZIP Code)* Commander, U.S. Army Aviation and Missile Command ATTN: AMSAM–MMC–MA–NP Redstone Arsenal, AL 35898	FROM: (*Activity and location)(Include ZIP Code)* MSG, Jane Q. Doe 1234 Any Street Nowhere Town, AL 34565	

PART 1 – ALL PUBLICATIONS (EXCEPT RPSTL AND SC/SM) AND BLANK FORMS

PUBLICATION/FORM NUMBER	DATE	TITLE
TM 9–1005–433–24	16 Sep 2002	Organizational, Direct Support, And General Support Maintenance Manual for Machine Gun, .50 Caliber M3P and M3P Machine Gun Electrical Test Set Used On Avenger Air Defense Weapon System

ITEM NO.	PAGE NO.	PARA–GRAPH	LINE NO. *	FIGURE NO.	TABLE NO.	RECOMMENDED CHANGES AND REASON
1	WP0005 PG 3		2			Test or Corrective Action column should identify a different WP number.

EXAMPLE

** Reference to line numbers within the paragraph or subparagraph.*

TYPED NAME, GRADE OR TITLE	TELEPHONE EXCHANGE/ AUTOVON, PLUS EXTENSION	SIGNATURE
MSG, Jane Q. Doe, SFC	788–1234	

TO: (*Forward direct to addressee listed in publication)*	**FROM:** (*Activity and location) (Include ZIP Code)*	**DATE**
Commander, U.S. Army Aviation and Missile Command ATTN: AMSAM–MMC–MA–NP Redstone Arsenal, AL 35898	MSG, Jane Q. Doe 1234 Any Street Nowhere Town, AL 34565	8/30/02

PART II – REPAIR PARTS AND SPECIAL TOOL LISTS AND SUPPLY CATALOGS/SUPPLY MANUALS

PUBLICATION NUMBER	DATE	TITLE

PAGE NO.	COLM NO.	LINE NO.	NATIONAL STOCK NUMBER	REFERENCE NO.	FIGURE NO.	ITEM NO.	TOTAL NO. OF MAJOR ITEMS SUPPORTED	RECOMMENDED ACTION

PART III – REMARKS (*Any general remarks or recommendations, or suggestions for improvement of publications and blank forms. Additional blank sheets may be used if more space is needed.)*

EXAMPLE

TYPED NAME, GRADE OR TITLE	TELEPHONE EXCHANGE/AUTOVON, PLUS EXTENSION	SIGNATURE
MSG, Jane Q. Doe, SFC	788–1234	

RECOMMENDED CHANGES TO PUBLICATIONS AND BLANK FORMS For use of this form, see AR 25–30; the proponent agency is ODISC4.	Use Part II (*reverse)* for Repair Parts and Special Tool Lists (RPSTL) and Supply Catalogs/ Supply Manuals (SC/SM)	DATE
TO: (*Forward to proponent of publication or form)(Include ZIP Code)* Commander, U.S. Army Aviation and Missile Command ATTN: AMSAM-MMC-MA-NP Redstone Arsenal, AL 35898	FROM: (*Activity and location)(Include ZIP Code)*	

PART 1 – ALL PUBLICATIONS (EXCEPT RPSTL AND SC/SM) AND BLANK FORMS

PUBLICATION/FORM NUMBER	DATE	TITLE

ITEM NO.	PAGE NO.	PARA–GRAPH	LINE NO. *	FIGURE NO.	TABLE NO.	RECOMMENDED CHANGES AND REASON

** Reference to line numbers within the paragraph or subparagraph.*

TYPED NAME, GRADE OR TITLE	TELEPHONE EXCHANGE/ AUTOVON, PLUS EXTENSION	SIGNATURE

TO: (*Forward direct to addressee listed in publication)* Commander, U.S. Army Aviation and Missile Command ATTN: AMSAM-MMC-MA-NP Redstone Arsenal, AL 35898	**FROM:** (*Activity and location) (Include ZIP Code)*	**DATE**

PART II – REPAIR PARTS AND SPECIAL TOOL LISTS AND SUPPLY CATALOGS/SUPPLY MANUALS

PUBLICATION NUMBER	DATE	TITLE

PAGE NO.	COLM NO.	LINE NO.	NATIONAL STOCK NUMBER	REFERENCE NO.	FIGURE NO.	ITEM NO.	TOTAL NO. OF MAJOR ITEMS SUPPORTED	RECOMMENDED ACTION

PART III – REMARKS (*Any general remarks or recommendations, or suggestions for improvement of publications and blank forms. Additional blank sheets may be used if more space is needed.)*

TYPED NAME, GRADE OR TITLE	TELEPHONE EXCHANGE/AUTOVON, PLUS EXTENSION	SIGNATURE

The Metric System and Equivalents

Linear Measure

1 centimeter = 10 millimeters = .39 inch
1 decimeter = 10 centimeters = 3.94 inches
1 meter = 10 decimeters = 39.37 inches
1 dekameter = 10 meters = 32.8 feet
1 hectometer = 10 dekameters = 328.08 feet
1 kilometer = 10 hectometers = 3,280.8 feet

Weights

1 centigram = 10 milligrams = .15 grain
1 decigram = 10 centigrams = 1.54 grains
1 gram = 10 decigram = .035 ounce
1 decagram = 10 grams = .35 ounce
1 hectogram = 10 decagrams = 3.52 ounces
1 kilogram = 10 hectograms = 2.2 pounds
1 quintal = 100 kilograms = 220.46 pounds
1 metric ton = 10 quintals = 1.1 short tons

Liquid Measure

1 centiliter = 10 milliters = .34 fl. ounce
1 deciliter = 10 centiliters = 3.38 fl. ounces
1 liter = 10 deciliters = 33.81 fl. ounces
1 dekaliter = 10 liters = 2.64 gallons
1 hectoliter = 10 dekaliters = 26.42 gallons
1 kiloliter = 10 hectoliters = 264.18 gallons

Square Measure

1 sq. centimeter = 100 sq. millimeters = .155 sq. inch
1 sq. decimeter = 100 sq. centimeters = 15.5 sq. inches
1 sq. meter (centare) = 100 sq. decimeters = 10.76 sq. feet
1 sq. dekameter (are) = 100 sq. meters = 1,076.4 sq. feet
1 sq. hectometer (hectare) = 100 sq. dekameters = 2.47 acres
1 sq. kilometer = 100 sq. hectometers = .386 sq. mile

Cubic Measure

1 cu. centimeter = 1000 cu. millimeters = .06 cu. inch
1 cu. decimeter = 1000 cu. centimeters = 61.02 cu. inches
1 cu. meter = 1000 cu. decimeters = 35.31 cu. feet

Approximate Conversion Factors

To change	*To*	*Multiply by*	*To change*	*To*	*Multiply by*
inches	centimeters	2.540	ounce-inches	Newton-meters	.007062
feet	meters	.305	centimeters	inches	.394
yards	meters	.914	meters	feet	3.280
miles	kilometers	1.609	meters	yards	1.094
square inches	square centimeters	6.451	kilometers	miles	.621
square feet	square meters	.093	square centimeters	square inches	.155
square yards	square meters	.836	square meters	square feet	10.764
square miles	square kilometers	2.590	square meters	square yards	1.196
acres	square hectometers	.405	square kilometers	square miles	.386
cubic feet	cubic meters	.028	square hectometers	acres	2.471
cubic yards	cubic meters	.765	cubic meters	cubic feet	35.315
fluid ounces	milliliters	29,573	cubic meters	cubic yards	1.308
pints	liters	.473	milliliters	fluid ounces	.034
quarts	liters	.946	liters	pints	2.113
gallons	liters	3.785	liters	quarts	1.057
ounces	grams	28.349	liters	gallons	.264
pounds	kilograms	.454	grams	ounces	.035
short tons	metric tons	.907	kilograms	pounds	2.205
pound-feet	Newton-meters	1.356	metric tons	short tons	1.102
pound-inches	Newton-meters	.11296			

Temperature (Exact)

℉	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	℃

PIN: 060922-000