INSTRUCTION MANUAL

Serial Number _____

TYPE 129 POWER SUPPLY PLUG-IN UNIT

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070-409

WARRANTY

All Tektronix instruments are warranted against defective materials and workmanship for one year. Tektronix transformers, manufactured in our own plant, are warranted for the life of the instrument.

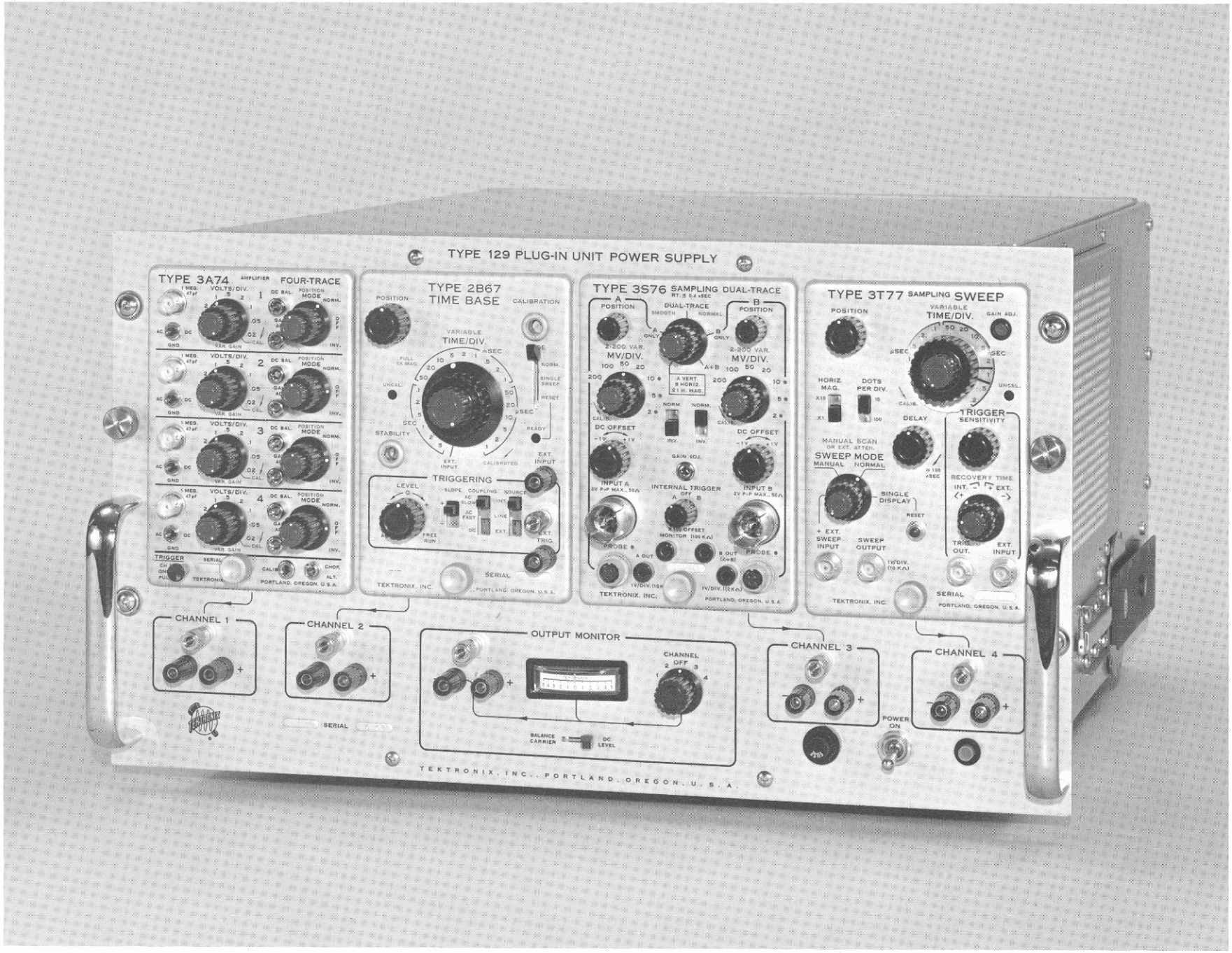
Any questions with respect to the warranty mentioned above should be taken up with your Tektronix Field Engineer.

Tektronix repair and replacement-part service is geared directly to the field, therefore all requests for repairs and replacement parts should be directed to the Tektronix Field Office or Representative in your area. This procedure will assure you the fastest possible service. Please include the instrument Type and Serial number with all requests for parts or service.

Specifications and price change privileges reserved.

CONTENTS

A list of abbreviations and symbols used in this manual will be found on page 5-1. Change information, if any, is located at the rear of the manual.



Type 129 Plug-In Unit Power Supply.

SECTION 1
CHARACTERISTICS AND OPERATING INFORMATION

Introduction

The Type 129 powers up to four Tektronix 2- and 3-Series plug-in units. See Table 1-1. For most applications, the plug-in unit in each compartment must be connected to the front- and rear-panel output terminals with a selected output-circuit card installed in the bottom of the Type 129. Two different output-circuit cards, one active and one passive, providing three different output configurations are presently available.

Typical applications of the Type 129 system include amplification employing Tektronix 2A- and 3A-Series plug-in units. 3S- and 3T-Series sampling units used in pairs extend the system usefulness into the gigacycle region. The Type 3C66 Carrier Amplifier provides an output voltage representative of mechanical phenomenon when used with transducers which convert mechanical quantities into changes in resistance, capacitance, or inductance.

The output signals from the Type 129 may be used to drive a wide variety of loads including one or more oscilloscopes, moving-chart recorders, X-Y plotters, tape recorders, etc.

A more complete description of the Type 129 system versatility is beyond the scope of this manual. For further information about applications involving a particular plug-in unit, consult the latest Tektronix catalog or the instruction manual for your plug-in unit.

CAUTION

At turn-on, and during the first several seconds of warmup, the voltage at the various output connectors on the Type 129 may be as high as 100 volts. Any load which could be damaged by this voltage should be disconnected until the system has stabilized. After warmup, there may be an output of up to 100 volts from any channel operating with an output-circuit card, but without a plug-in unit.

Cathode-Follower Output-Circuit Card

Provides an attenuated push-pull signal output from pins 17 and 21 of any 2- or 3-Series plug-in unit to front- and rear-panel connectors. See Fig. 1-1. Bandwidth is dc to about 300 kc with external load capacitances of 100 pf or less per side except when otherwise limited by the plug-in unit. For each "division" [1] of signal output from the plug-in unit, there is a 1-volt output per side (2 volts differentially) at the front- and rear-panel connectors when the plug-in unit gain control has been properly set. Special circuitry on the card holds the average output dc level near zero volts. Maximum output swing for linear operation is about ±4 volts peak per side. [2] Output impedance is about 500 Ω per side and minimum load resistance is 2 kΩ per side.

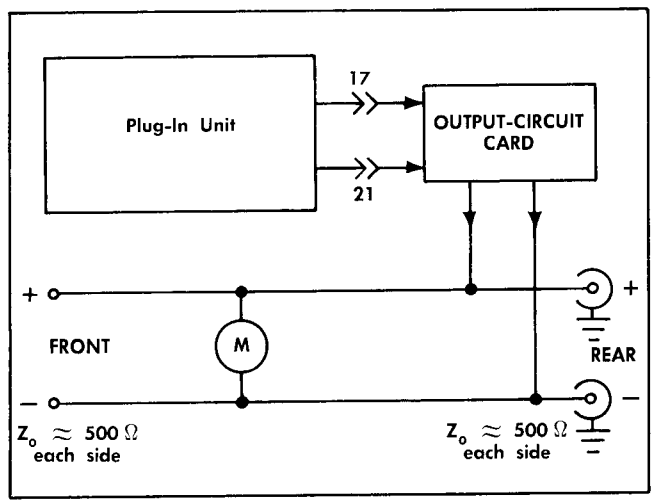


Fig. 1-1. Cathode-Follower Output-Circuit Card.

Passive Output-Circuit Card

Used only with plug-in units other than sampling and signal-generating types. See Table 1-1. The card can be installed with either SIDE A or SIDE B visible from the bottom of the instrument.

SIDE A—When visible, a push-pull signal is obtained from the front-panel connectors only. This signal is an attenuated sample of the signal at pins 17 and 21 of the plug-in unit. See Fig. 1-2. Output resistance of the front-panel signal is about 250 kΩ per side and is intended only for driving the OUTPUT MONITOR meter on an uncalibrated basis. Very high-impedance external devices may be connected, but this is not recommended since any external load may change the meter reading.

A single-ended signal is available from the rear-panel + connector direct from pin 11 of the plug-in unit. Bandwidth is dc to about 100 kc with an external load capacitance of 100 pf or less except when otherwise limited by the plug-in unit. For each "division" [1] of signal output from the plug-in unit, there is about 2.5 volts output available from the rear-panel + connector, depending upon the plug-in unit gain control setting. Output dc level is adjustable to zero volts by a calibration control within the plug-in unit (see the plug-in unit instruction manual). Maximum output swing for linear operation is about ±10 volts peak.

[1] The specific definition of "division" as it pertains to this manual is discussed later in this section under "General Output Characteristics of Tektronix 2- and 3-Series Plug-In Units".

[2] ±3 volts with Type 3A1 Plug-In Units below serial number 4328.

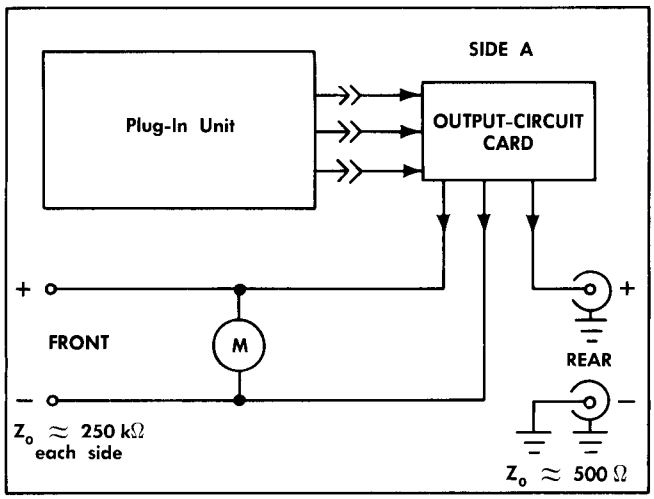


Fig. 1-2. Passive-Circuit Card — SIDE A.

Output impedance is about 500 Ω and minimum load resistance is 2 kΩ.

SIDE B—When visible, the output characteristics of the + connectors on the front and rear panels are the same as those described previously under "SIDE A" for the rear-panel + connector. See Fig. 1-3.

General Output Characteristics of Tektronix 2- and 3-Series Plug-In Units

Rear connector pins 17 and 21 of all 2- and 3-Series plug-in units provide the push-pull output signal to the crt deflection plates when the unit is used in an oscilloscope. The front panel of each plug-in unit indicates various units of voltage, time, or other quantity per "division". This refers to crt graticule divisions on a Tektronix 560-Series Oscilloscope. For each output "division", there is a potential difference of about 17.5 to 24 volts between pins 17 and 21. Exact magnitude depends upon the plug-in unit gain control setting. See your plug-in unit manual. Output dc level for the various plug-in types ranges from about +160 to about +200 volts. The output-circuit card in the Type 129 alters these characteristics to the values listed previously in this section.

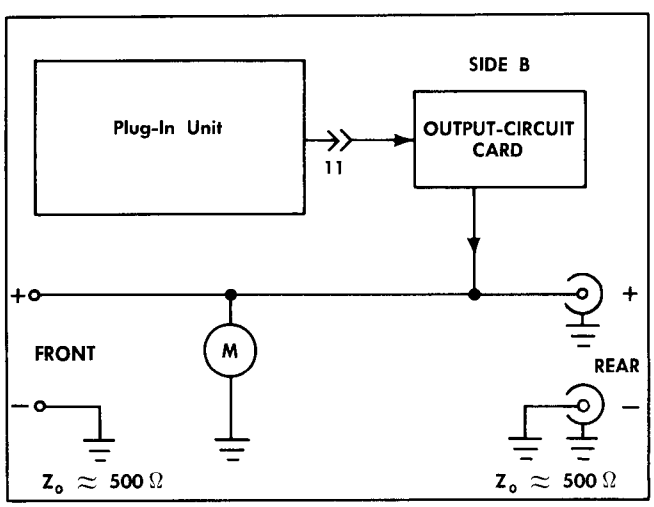


Fig. 1-3. Passive-Circuit Card — SIDE B.

Rear-connector pin 11 of all units except sampling and signal-generating units provides an output signal for internally triggering a companion time-base unit.[3] In the Type 129, this signal can also be made available at the output connectors. For each output "division", there is about 2.5 volts change at pin 11. This voltage can be varied somewhat by setting the plug-in unit gain control. The output dc level at pin 11 is adjustable to zero volts by a calibration control within the plug-in unit when the potential difference between pins 17 and 21 is zero volts. See your plug-in unit instruction manual.

Other rear connector pins provide for special input and output signals for certain plug-in unit types. The only provision made for their use is the empty connector holes in the rear panel of the Type 129. If you intend to use these connections, it is suggested that you first carefully analyze the plug-in unit circuits involved to determine the requirements and limitations of the modification.

Channel Selection

There are interconnections between Channel 1 and 2 and between Channel 3 and 4 in the Type 129. Channel 1 and 3 are each equivalent to the left-hand compartment of a Tektronix 560-Series Oscilloscope such as the Type 561A, and Channel 2 and 4 are each equivalent to the right-hand compartment. The interconnections are necessary for sampling unit operation where 3S- and 3T-Series units must be used together. In general, the interconnections will permit plug-in unit pairs to perform any basic function which they could perform in an oscilloscope.

Output Monitor

The output monitor meter can be switched to the front-panel output of each channel. The two-position switch below the meter selects the meter function:

DC LEVEL — Indicates the dc level to ±10 volts full scale of the + connector with respect to the — connector. This simplifies setting of the plug-in unit position and other controls. When a cathode-follower circuit card is used, the meter will indicate the dc average differential output in "divisions" with each "division" equal to 1 volt single-ended or 2 volts differential output. When SIDE B of a passive-circuit card is used, multiplying the meter reading in "divisions" by 2 provides the average output dc level in volts. When SIDE A is used, the meter is useful only for dc-balance indication.

[3] In certain units, pin 12 provides a complementary signal for push-pull output.

TABLE 1-1

Type	General Class	Output-Circuit Card	Special Features and Other Information	Maximum Gain With Single-Ended Output From Active Circuit Card
2A60	Amplifier	Active or passive	General purpose	X20
2A61	Amplifier	Active or passive	High ac gain with selectable bandpass	$X10^5$ (ac)
2A63	Amplifier	Active or passive	High gain, dc to 300 kc	$X10^3$
3A1	Amplifier	Active or passive	Dual channel wide band [4]	$X10^2$
3A3	Amplifier	Active or passive [4 5]	Dual differential high gain channels with high common-mode rejection [4]	$X10^4$
3A72	Amplifier	Active or passive	Dual channel [4]	$X10^2$
3A74	Amplifier	Active or passive	Four channel wide band [4]	X50
3A75	Amplifier	Active or passive	Wide band	X20
2B67	Time Base	Active only	Triggerable sawtooth output with single-sweep provision	
3B1	Time Base	Active only	Triggerable sawtooth and delayed sawtooth	
3B3	Time Base	Active only	Triggerable sawtooth and delayed sawtooth	
3C66	Carrier amplifier	Active or passive [6]	Mechanical input via resistive, capacitive, or inductive transducers	
3S3	Sampling amplifier	Active only [6 7]	Dual channel dc to 1 gc, must be used with 3-TSeries unit	
3S76	Sampling amplifier	Active only [6 7]	Dual channel dc to 800 mc, must be used with 3-T Series unit	
3T77	Sampling sweep	Active only [6 7]	Triggerable timing unit for use with 3S-Series unit	

[4] Chopped-mode multitrace operation not applicable to the Type 129.

[5] If Type 3A3 plug-in units are to be operated in both Channel 1 and Channel 2 (or in Channel 3 and Channel 4), only active output-circuit cards can be used in those channels.

[6] Plug-in unit has a front-panel output jack which may be used instead of an output-circuit card.

[7] When the plug-in unit front-panel output jack is used, SIDE A of a passive-circuit card may be used to drive the output monitor meter. No connection should be made to the rear-panel output connectors for that channel.

BALANCE CARRIER — Ac couples the meter to permit nulling the input bridge of a Type 3C66 Carrier Amplifier plug-in unit. The needle will approach zero from the right as the plug-in unit output amplitude decreases.

Power Supply

Electronically regulated for stable operation with as much as −10% to +7% variation from design-center line voltage. The instrument is wired for the design-center line voltage indicated on the rear panel. Changes can be made in the internal wiring to permit operation with design-center line voltages of 110, 117, 124, 220, 234, or 248 volts. The transformer primary connections for each voltage are indicated on the diagram attached to the power transformer. Fan connections are indicated in Fig. 1-4. Be certain that the proper fuse size is used as indicated on the rear panel.

Power Consumption

About 575 watts maximum under full load.

Environmental Conditions

The Type 129 can be operated at maximum load with both an upper-limit line voltage and an ambient air temperture of +50°C at sea level if the instrument has been installed to provide the ventilation clearances listed on the dimensional drawing at the end of Section 6.

Power Output Connector

J780 on the rear panel is provided to power future accessories for the Type 129 as well as other devices. A mating plug is available through your Tektronix Field En-

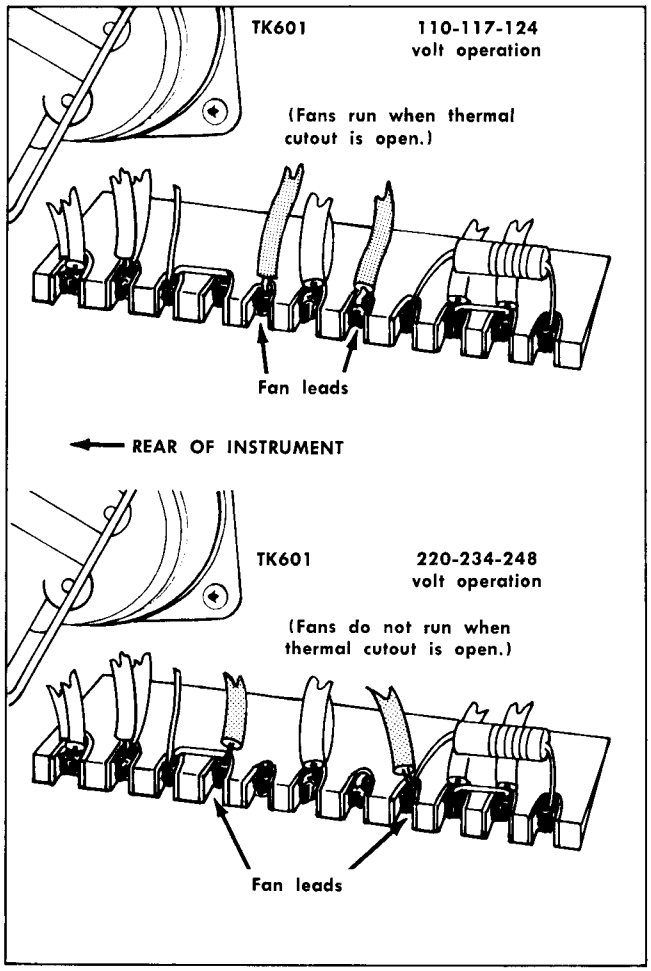


Fig. 1-4. Fan power connections located on ceramic strip in bottom right rear corner of instrument.

gineer or Field Office; order by Tektronix part number 134-049. The following is available except when two or more Type 3A75 Plug-In Units are used:

Voltage	Current	Voltage Pin No.	Ground Return Pin No.
—100 v	40 ma	H	J
—12.2 v	360 ma	E	F
+125 v	20 ma	B	J
+300 v	20 ma	A	J
+420 v unreg.	10 ma*	K	J
6.3 vac	1 amp	C	D

*30 ma if the +300-volt supply is not loaded externally.

Mechanical Characteristics

10.5-inches high
19-inches wide
23.4-inches deep overall
46-pounds net weight

Accessories Included

	Tektronix Part No.
2—Instruction Manuals	070-409
1—Power Cord	161-013
1—3-Wire to 2-Wire Adapter	103-013

Optional Accessories

	Tektronix Part No.
Cathode-Follower Circuit Card	018-001
Passive-Circuit Card	018-002

SECTION 2

CIRCUIT DESCRIPTION

CATHODE-FOLLOWER OUTPUT-CIRCUIT CARD

The output dc level of the various plug-in unit amplifiers ranges from about +160 to +200 volts. The cathode-follower output-circuit card reduces the dc level to approximately zero volts and provides a low output resistance.

The capacitance-compensated resistive dividers on the cards are returned to a controlled negative voltage. This voltage automatically assumes the correct value to offset the positive output dc level of a particular plug-in unit. Control is provided by the three transistors and their associated circuitry.

There is essentially no signal voltage at the R759-R769 junction since the equal-amplitude cathode signals are of opposite polarity and therefore cancel one another. C772 filters whatever signal may remain due to slight dynamic imbalance in the cathode-follower circuitry. However, a dc common-mode signal can exist at the R759-R769 junction.

A negative-feedback path exists within the circuit which causes the Q774-Q784 difference amplifier to seek a condition of equal base voltages. The path is from the Q774 base to the R751-R761 junction and back to the Q774 base via the cathode followers. Since the Q784 base is grounded, the Q774 base must seek zero volts. When this condition is attained, the average dc level of each cathode-follower output will be essentially zero volts.

POWER SUPPLY

The Type 129 Power Supply consists of two positive and two negative interdependent, accurately-regulated supplies and three unregulated supplies. The most negative supply, —100 volts, is regulated by reference to a gas tube while the remaining regulated supplies are referenced to the regulated —100 volts. All but the +300-volt supply are dependent on one another for part of their error amplifier operating power.

The basic operating principle of the supplies is illustrated in Fig. 2-1. A variable resistance, in series with the load across an unregulated source, is varied as required so the supplied current will produce the proper voltage across the load. Control of series resistance element, a tube or transistor, is provided by the error amplifier which constantly compares the voltage across the load to a reference voltage. The error amplifier must detect a constant relationship between the output and reference voltages and will adjust the series resistance as required to maintain that relationship.

With a line voltage near the center of the instrument operating range, the voltage across C612A in the —100-volt supply is about 210 volts dc. Of this voltage, 100 volts is across the load and the remainder is across V627A. Since the V627A current is also the load current, its magnitude determines the output voltages across the load.

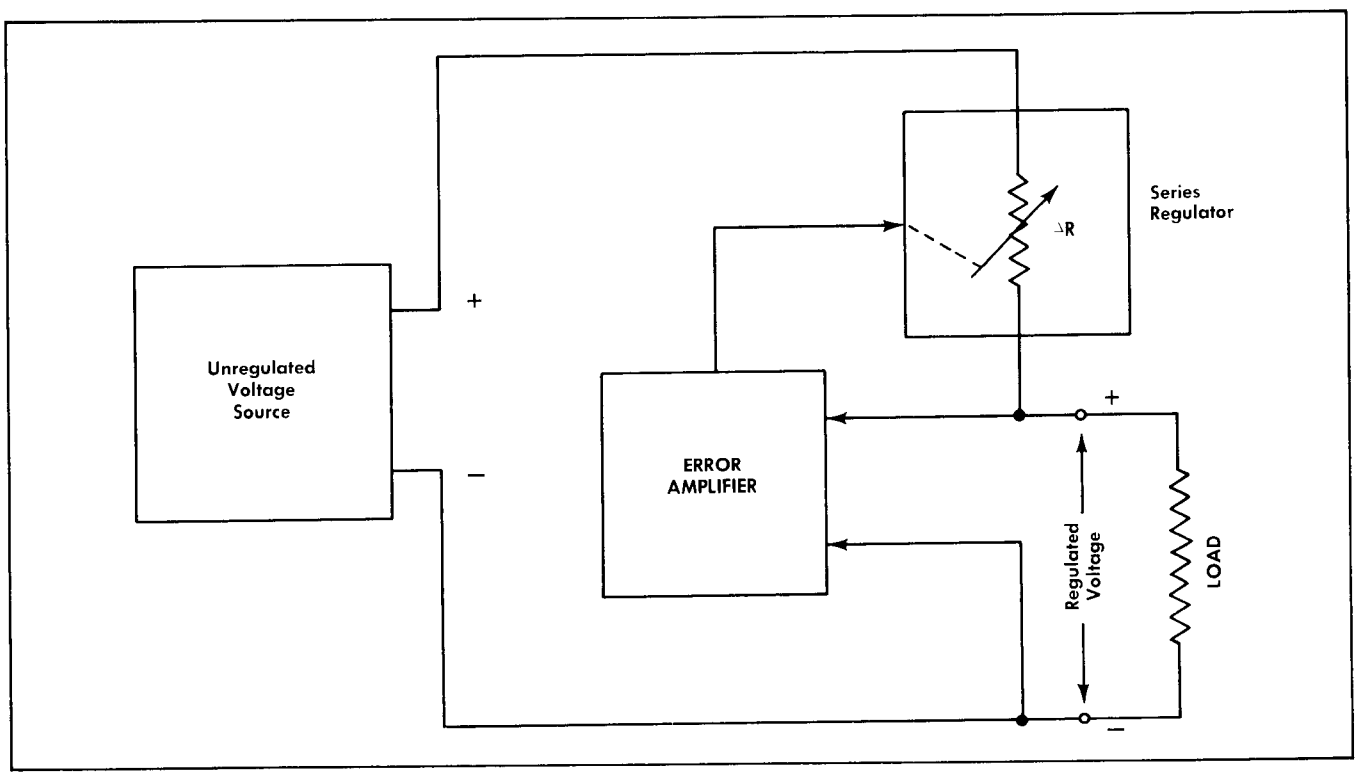


Fig. 2-1. Regulated supply principle.

Voltage reference tube V639 applies a stable voltage of about —81 volts to the A grid of long-tailed difference amplifier V634 and thereby establishes a fixed cathode voltage for both V634A and V634B. A sample of the supply output voltage is obtained from the —100 VOLTS control R624 and is applied to the B grid of the difference amplifier. The V634 comparator seeks a condition of equal grid voltages due to high-gain negative feedback within the supply. Any change in the V634B grid voltage is amplified by the V634 comparator and by V614. The amplified change increases or decreases the conduction level of V627A as required and thereby cancels the original output voltage change.

It is important to note that the V634 voltage comparator will have equal grid voltage with any setting of the R624 —100 VOLTS control even though the output voltage may not be exactly —100 volts. To obtain a —100-volt output, R624 is set so that the resistive voltage-division ratio of R623-R624-R625 equals the ratio of the 81-volt reference to the desired 100-volt output.

The dc voltage across C612A bears a substantial amount of ripple. A sample of this ripple is applied to the screen grid of V614 which acts as a second signal grid and aids in eliminating the ripple from the supply output. C629 and C636 also aid in eliminating ripple by offering less attenuation to ac error signals than the resistive voltage dividers. C626 lowers the supply output impedance.

R621 and R622 are particularly important elements in the —100-volt supply. It would be impractical to pass all current required by the load through the series regulator tube. Since the line-voltage and load-current variation limits are known, the series regulator tube need carry only enough current to allow for these variations. When moderate to heavy current is required by a plug-in unit, part of the current will be supplied through R621 or R622 in parallel with V627A. Thus, depending on the current required, the connection within the plug-in unit will be one of the following:

1. No connection to pin 22 of the plug-in unit interconnecting plug (low current demand).

2. A resistor connected between pins 22 and 9 (moderate current demand).

3. A wire connected between pins 22 and 9 (maximum current demand).

The reference for the —12.2-volt supply is provided by the —100-volt supply via R643 and R644 with a small range for adjustment provided by R641. Any voltage error at the emitter of Q644 is amplified, but not inverted, and applied to the base of Q654. Q654 amplifies and inverts the error signal, providing the necessary drive for series regulator Q657. C647 and R647 provide phase correction which stabilizes the regulator and C657 lowers the supply input impedance.

The —12.2-volt supply does not employ shunt resistors. All load current passes through Q657 which is protected from overload by F640.

The +125- and +300-volt supplies operate similarly to the —100-volt supply with two notable differences. The —100-volt supply provides the regulation reference rather than additional gas tubes and, since these are positive supplies, one less signal-inverting error-amplifier stage is required.

SECTION 3

MAINTENANCE

PREVENTIVE MAINTENANCE

Cleaning the Interior

Internal cleaning should precede calibration since the cleaning process could alter the calibration control settings.

One way to clean the interior is by vacuum and/or low-pressure compressed air (high-velocity air could damage certain components). Hardened dirt may be removed with a soft paint brush, cotton-tipped swab, or cloth dampened with a water and mild detergent solution.

Lubrication

The contacts on the plug-in unit interconnecting jacks and plugs should be lightly lubricated with an oil of the type used on rotary-switch contacts (e.g. Beacon No. 2008-1). To extend the life of the contacts, clean and relubricate if the oil becomes contaminated with abrasive dust.

Visual Inspection

The instrument should be inspected occasionally for such defects as poor connections, broken or damaged ceramic terminal strips, improperly seated tubes or transistors, and heat-damaged parts. The remedy for most visible defects is obvious. But damage due to overheating is usually a symptom of unseen trouble and unless the cause is determined before parts are replaced, the damage may be repeated.

Tube and Transistor Checks

Periodic preventive maintenance checks on the tubes and transistors used in the instrument are not recommended. The circuits within the instrument generally provide the most satisfactory means of checking tube or transistor useability. Performance of the circuits is checked during recalibration so that substandard tubes and transistors will usually be detected at that time.

Recalibration

To insure accurate measurements, the instrument calibration should be checked after each 500 hours of operation or every six months if used intermittently. Complete calibration instructions are contained in section 4 of this manual.

The calibration procedure can be helpful in isolating major troubles in the instrument. Moreover, minor troubles not apparent during regular operation may be revealed and corrected during calibration.

Cleaning the Exterior

Loose dust may be removed with a cloth and a dry paint brush. Water and mild detergents such as Kelite or Spray White may be used, but abrasive cleansers should not.

CORRECTIVE MAINTENANCE

Standard Parts

Many components in the instrument are standard electronic parts available locally. However, all parts can be obtained through your Tektronix Field Engineer or Field Office. Before purchasing or ordering, consult the parts list to determine the value, tolerance, and rating required.

Special Parts

Some parts are manufactured or selected by Tektronix to satisfy particular requirements, or are manufactured for Tektronix to our specifications.. These and most mechanical parts should be ordered directly from your Tektronix Field Engineer or Field Office. See "Parts Ordering Information" and "Special Notes and Symbols" on the first page of the parts list.

Soldering

Special silver-bearing solder is used to establish a bond to the ceramic terminal strips in Tektronix instruments. This bond may be broken by repeated use (especially if ordinary tin-lead solder is used) or by excessive heating. Solder containing about 3% silver is recommended. A small supply of this solder is provided on a spool mounted in the bottom of the instrument near the —100 VOLTS adjustment control. Additional silver-bearing solder is usually available locally or may be purchased in one-pound rolls through your Tektronix Field Engineer or Field Office; order by part number 251-514.

The following procedure is recommended:

1. Use a wedge-shaped soldering iron tip about 1/8-inch wide. This will allow you to apply heat directly to the solder in the terminal without touching the ceramic, thereby reducing the amount of heat required.

2. Maintain a clean, properly tinned tip.

3. Use a hot iron for a short time. A 50- to 75-watt iron having good heat storage and transfer properties is adequate.

4. Avoid putting pressure on the strip with the soldering iron or other tools. Excess pressure may cause the strip to crack or chip.

Ceramic Terminal Strips

Fig. 3-1 shows an assembled ceramic terminal strip. Replacement strips with studs attached are supplied under a single part number and spacers under another number. The original spacers may be reused if undamaged.

Usually, a strip can be pried out of the chassis or pulled out with a pair of pliers. In some cases, you may choose to

use a hammer and punch to drive out the studs from the opposite side of the chassis.

When the damaged strip has been removed, place new (or used, but undamaged) spacers in the chassis holes. Then carefully force the studs of the new strip into the spacers until they are completely seated. If necessary, use a soft-faced mallet, tapping lightly directly over the stud area of the strip.

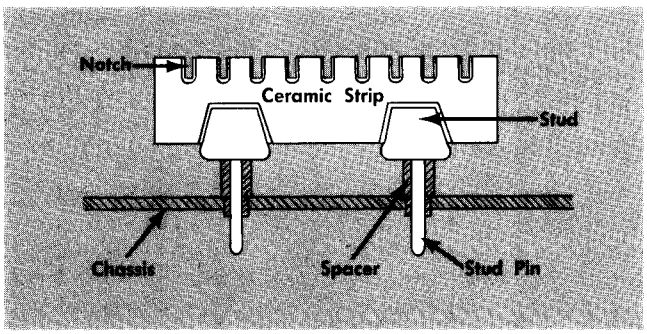


Fig. 3-1. Ceramic terminal strip assembly.

Switch Replacement

Individual wafers normally are not replaced in switch assemblies. Replacement switches may be ordered from Tektronix either unwired or with the associated wires and components attached. See the parts list in Section 5.

When soldering leads to a switch, do not let solder flow around and beyond the terminal rivet as this may destroy the contact spring tension.

Tubes and Transistors

Tubes and transistors should not be replaced unless actually defective. When a defect is suspected, it is suggested that circuit conditions be checked first to be certain that a replacement tube or transistor will not be immediately destroyed. In some cases, these checks will also show whether or not the tube or transistor is at fault.

When circuit conditions are known to be safe, install a tube or transistor of the same type which is known to be good and check for proper operation. If the original tube or transistor is thus proved acceptable, return it to the socket from which it came so that unnecessary recalibration can be avoided.

Troubleshooting Aids

This manual and the instrument contain many features intended to speed and simplify maintenance. The schematic diagrams in the back of this manual give the circuit reference number for each electrical component as well as important operating voltages and conditions for their measurement.

Most of the wire in the instrument is color striped to aid in circuit tracing. All regulated low-voltage power supply leads are coded as follows:

1. The basic wire color indicates regulated-voltage polarity: tan for negative, white for positive.
2. The stripe colors indicate supply voltages according to the standard EIA color code. Stripes are read in order of decreasing width.

For example, the —100-volt supply leads are tan wire (negative) bearing stripes of brown (one), black (zero, and brown (one zero). The +125 volt supply is coded as +120 to avoid four digits.

The instrument contains several stable metal-film reistors identified by their gray background color and color coding. If a resistor value has three significant figures and a multiplier, it will be EIA color coded. If is has four significant figures and a multiplier, the value will be printed on the resistor. For example, a 333 k resistor will be color coded, but a 333.5 k resistor will have its value printed on the resistor body. The color coding sequence is shown in Table 3-1 and Fig. 3-2.

TABLE 3-1
Color Code Sequence

Color	1st Sig. Fig.	2nd Sig. Fig.	3rd Sig. Fig.	Multiplier	(±) % Tolerance
Black	0	0	0	1	—
Brown	1	1	1	10	1
Red	2	2	2	100	2
Orange	3	3	3	1,000	—
Yellow	4	4	4	10,000	—
Green	5	5	5	100,000	0.50
Blue	6	6	6	1,000,000	0.25
Violet	7	7	7	10,000,000	0.10
Gray	8	8	8	100,000,000	0.05
White	9	9	9	1,000,000,000	—
Gold				0.1	5
Silver				0.01	—
No Color					10

Switch wafers shown on the circuit diagrams are coded to indicate the physical positions of the wafers on a rotary switch. The number portion of the code refers to the wafer position as counted from the front or driven end of the switch shaft. Letters F and R indicate whether the front or rear of the wafer is used to perform the particular switching function.

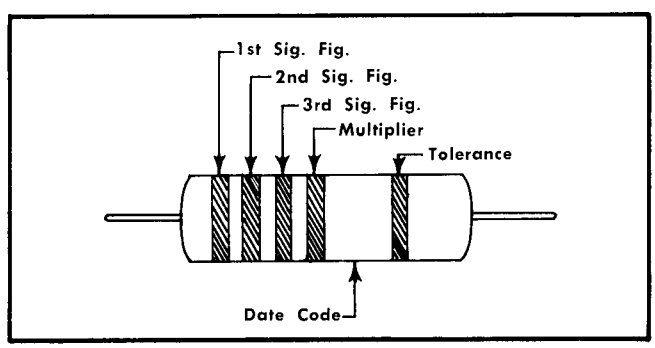


Fig. 3-2. Standard EIA color code for metal-film resistors.

SECTION 4

CALIBRATION

Introduction

This section of the manual contains a procedure for checking and calibrating the power supplies of the Type 129. A step describing the cathode-follower output-circuit card high-frequency compensation adjustment is also included. The instrument will not require frequent calibration, but occasional adjustments will be necessary as components age or are replaced.

Calibration is a valuable part of preventive maintenance, since many minor troubles may thus be discovered and corrected before they become serious enough to disable the instrument. Major troubles are often more easily isolated by attempting calibration.

Equipment Required

1. Autotransformer such as Variac or Powerstat. The output voltage range should be continuously variable between zero volts and the design-center operating voltage of the Type 129 (indicated on the rear panel). A minimum rating of 800 volt-amperes is required.

2. Ac voltmeter, calibrated in rms, for monitoring the autotransformer output. 2% accuracy required at the middle and the lower limit of the Type 129 operating line-voltage range.

3. Four 2- and/or 3-Series plug-in units which are known to be in proper operating condition. If high-frequency compensation adjustments are to be made on cathode-follower output-circuit cards (step 3), one of these four plug-in units should be a calibrated 2A- or 3A-Series unit with a bandwidth of at least 500 kc.

   No more than two Type 3A75 Plug-In Units should be used.

4. Dc voltmeter such as the Fluke Model 803. Accuracy should be within 0.25% at 12.2, 100, 125, and 300 volts.

5. Load bank (see Fig. 4-2) or optional loads as described in step 2 of the procedure.

6. Oscilloscope such as the Tektronix Types 561A/2B67/2A63. Sensitivities of 5 and 50 mv per major graticule division are desireable.

7. Tektronix X1 probe such as the P6028 for use in step 2 of the procedure.

8. (Optional) Tektronix Type 3A75 or similar wide-band plug-in unit for use with item 6 in step 3 of the procedure. Bandwith should be at least 1 mc.

9. (Optional) Tektronix X10 probe such as the P6006 for use with item 8.

10. (Optional) 10-kc square-wave generator having a rise-time of 50 nsec or less such as the Tektronix Type 105 (for use in step 3 of the procedure). If a Type 105 is used, the output should be terminated in 50 Ω. (BNC termination unit, Tektronix part number 011-049, recommended.)

PRELIMINARY INSTRUCTIONS

1. Remove the bottom cover of the Type 129.

2. Connect the ac voltmeter and the Type 129 to the autotransformer output.

3. Connect the autotransformer to the appropriate line-voltage source as indicated on the rear panel of the instrument. Set the output to 117 vac or the design-center line voltage for which the instrument is wired.

4. Install the four 2- or 3-Series plug-in units. If time-base units are used, set their controls so that no sweep signal is produced. Do not install any output-circuit cards at this time.

5. Turn on the Type 129 and allow several minutes for warmup.

PROCEDURE

1. Power Supply Voltage Accuracy

Check each supply at the test points shown in Fig. 4-1 for the voltage accuracy listed in Table 4-1. (The values given for the ±12-volt unregulated supply are for the no-load condition which always exists when no output-circuit cards are installed.)

If the voltage of any regulated supply is out of tolerance, adjustment of the appropriate voltage control will be necessary. Adjustments should be made in the order listed in Table 4-1 and when completed, the accuracy of each regulated supply should be rechecked.

TABLE 4-1

Supply	Tolerance	Adjustment
−100 v	−99 to −101 v	−100 VOLTS R624
+125 v	+123.8 to +126.2 v	+125 VOLTS R671
+300 v	+297 to +303 v	+300 VOLTS R691
−12.2 v	−12.1 to −12.3 v	−12.2 VOLTS R641
+12 v unreg.	+13.5 to +16.5 v	none
−12 v unreg.	−13.5 to −16.5 v	none

2. Power Supply Voltage Regulation

Regulation is checked by measuring the line-frequency related ripple voltage on each of the regulated supplies with the instrument operating at the lower line-voltage limit for which it is wired. The supplies should be operated under maximum load conditions to provide the

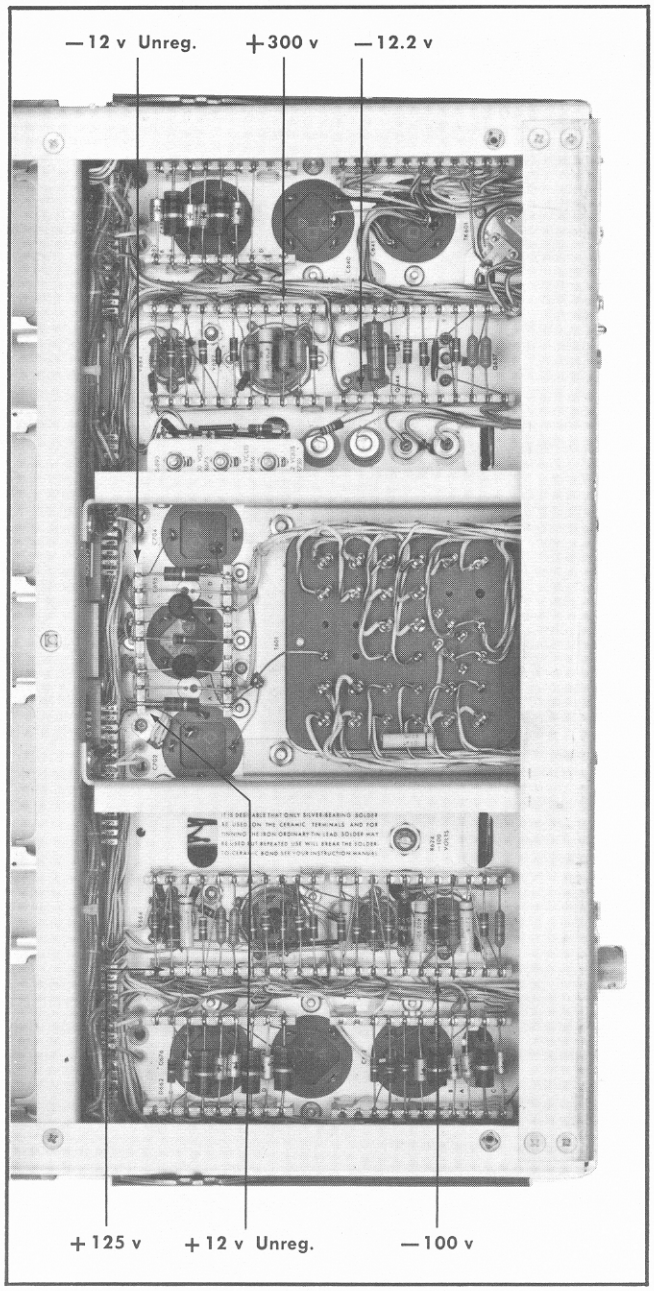
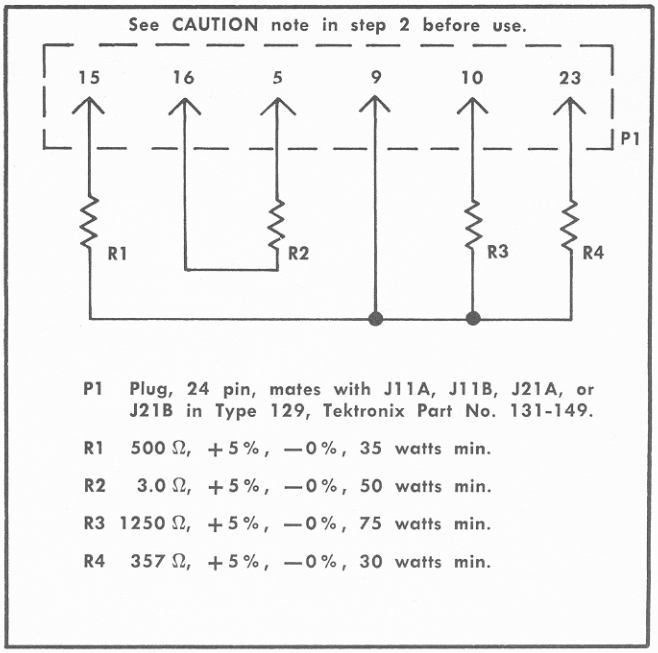


Fig. 4-1. Power supply test points.



P1 Plug, 24 pin, mates with J11A, J11B, J21A, or J21B in Type 129, Tektronix Part No. 131-149.

R1 500 Ω, +5%, —0%, 35 watts min.

R2 3.0 Ω, +5%, —0%, 50 watts min.

R3 1250 Ω, +5%, —0%, 75 watts min.

R4 357 Ω, +5%, —0%, 30 watts min.

Fig. 4-2. Load bank for Type 129.

most demanding test of regulation. To establish maximum load, it is suggested that all plug-in units, output-circuit cards, and auxiliary loads be disconnected and replaced by a special load bank (see Fig. 4-2). However, a satisfactory test can be made without the special load bank if the supplies loaded by the same plug-in units, output-circuit cards, and auxiliary loads (if any) which will be used with the Type 129 following calibration.

CAUTION

Whenever the Type 129 is operated with the special load bank, the line voltage must be kept at or below the rated lower limit after a 1-minute warmup at the design-center line voltage. (When wired for a 117-volt design-center range, the lower limit value is 105 volts.) Higher voltages can cause damage due to excessive dissipation within the series regulating elements of the various supplies.

To make the regulation test, first set the autotransformer for no output. Connect the selected loads to the Type 129 and increase the autotransformer output to the design-center line voltage for 1 minute. Then reduce the line voltage to the lower limit of the operating range. Use a test oscilloscope to measure the peak-to-peak ripple on each regulated supply at the test points shown in Fig. 4-1. Maximum ripple values are indicated in Table 4-2.

NOTE

The ripple checks can produce erroneous indications unless ground-loop hum is minimized. Minimize the hum by powering the Type 129 and test oscilloscope from the same convenience outlet. It should also be noted that proper power-supply operation at the lower line-voltage limit required line-voltage sine-wave distortion of less than about 3%.

TABLE 4-2

Supply	Maximum Peak-to-Peak Ripple
—100 v	5 mv
+125 v	10 mv
+300 v	100 mv
—12.2 v	5 mv

3. Cathode Follower-Circuit Card High-Frequency Compensation

Install the calibrated wide-band amplifier unit (see "Equipment Required", item 3) in the CHANNEL 1 compartment of the Type 129. Install a cathode-follower circuit card for CHANNEL 1. Allow several minutes for warmup and then adjust the plug-in unit controls for proper dc balance.

Set the Type 129 CHANNEL 1 plug-in unit controls for an input sensitivity of 0.5 volts/div. Temporarily connect the square-wave generator to the test oscilloscope and establish a 1-volt peak-to-peak output at 10 kc. Then connect the square-wave generator to the input of the Type 129 CHANNEL 1 plug-in unit.

Connect the X10 probe to the test oscilloscope and compensate it for proper high-frequency response. Then connect the probe to the Type 129 CHANNEL 1 + output.

Obtain a triggered display on the test oscilloscope of the Type 129 output signal.

The piston-trimmer capacitor on the cathode-follower circuit-card which is farthest from the left edge of the instrument affects the + output signal. Adjust it to obtain the best square-wave display on the test oscilloscope. Move the probe to the — output connector and adjust the other capacitor in the same manner. Remember that the oscilloscope display is now inverted and that the generated square wave may be reasonably square at only one peak.

Make these same adjustments for each remaining cathode follower-output circuit card.

NOTES

SECTION 5

PARTS LIST and DIAGRAMS

PARTS ORDERING INFORMATION

Replacement parts are available from or through your local Tektronix Field Office.

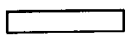
Changes to Tektronix instruments are sometimes made to accommodate improved components as they become available, and to give you the benefit of the latest circuit improvements developed in our engineering department. It is therefore important, when ordering parts, to include the following information in your order: Part number including any suffix, instrument type, serial number, and modification number if applicable.

If a part you have ordered has been replaced with a new or improved part, your local Tektronix Field Office will contact you concerning any change in part number.

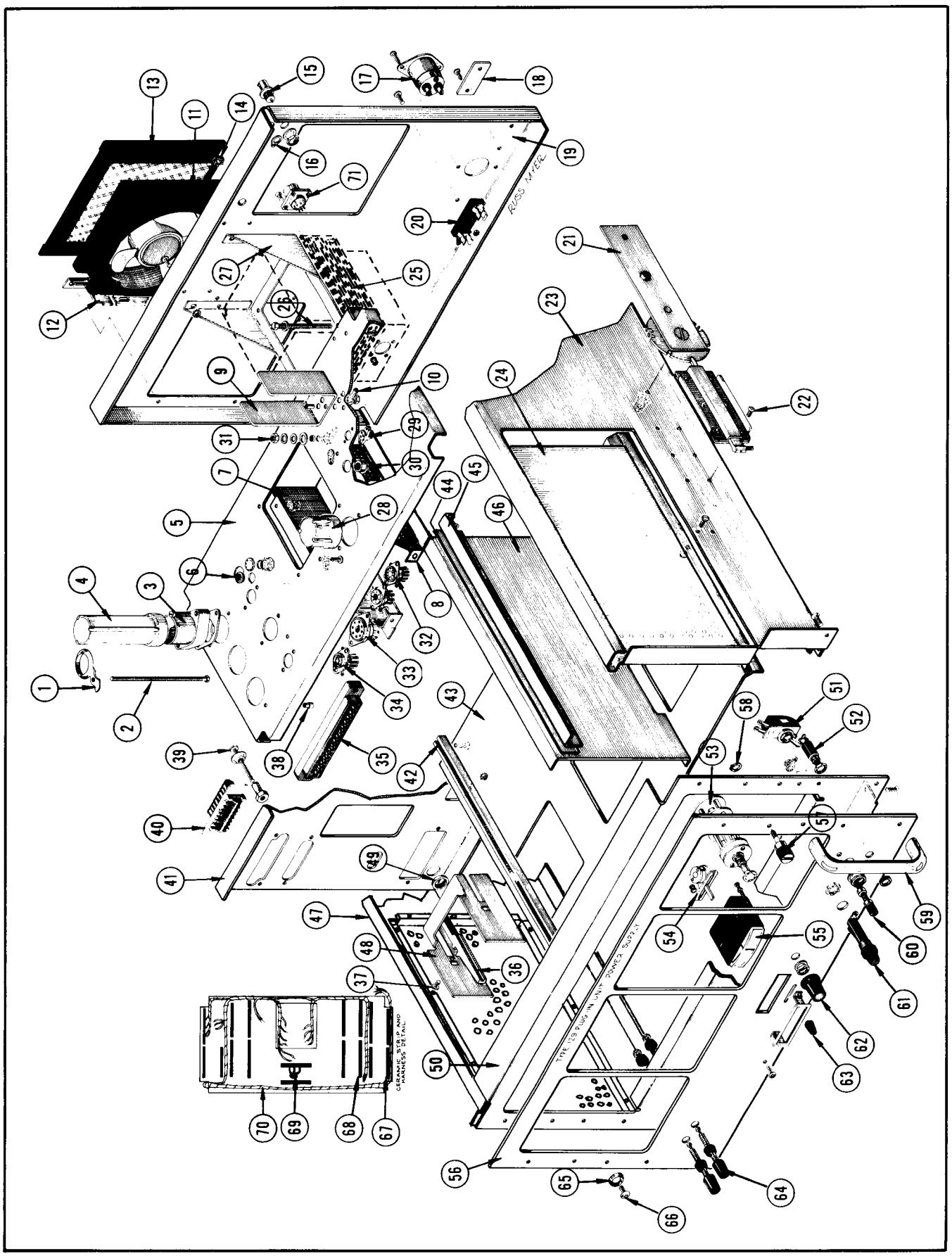
ABBREVIATIONS AND SYMBOLS

a or amp	amperes
BHS	binding head steel
C	carbon
cer	ceramic
cm	centimeter
comp	composition
cps	cycles per second
crt	cathode-ray tube
CSK	counter sunk
dia	diameter
div	division
EMC	electrolytic, metal cased
EMT	electroyltic, metal tubular
ext	external
f	farad
F & I	focus and intensity
FHS	flat head steel
Fil HS	fillister head steel
g or G	giga, or 10^9
Ge	germanium
GMV	guaranteed minimum value
h	henry
hex	hexagonal
HHS	hex head steel
HSS	hex socket steel
HV	high voltage
ID	inside diameter
incd	incandescent
int	internal
k or K	kilohms or kilo (10^3)
kc	kilocycle
m	milli, or 10^{-3}
mc	megacycle
mm	millimeter
meg or M	megohms or mega (10^6)
met.	metal
μ	micro, or 10^{-6}
n	nano, or 10^{-9}
Ω	ohm
OD	outside diameter
OHS	oval head steel
p	pico, or 10^{-12}
PHS	pan head steel
piv	peak inverse voltage
plstc	plastic
PMC	paper, metal cased
poly	polystyrene
Prec	precision
PT	paper tubular
PTM	paper or plastic, tubular, molded
RHS	round head steel
rms	root mean square
sec	second
Si	silicon
S/N	serial number
t or T	tera, or 10^{12}
TD	toroid
THS	truss head steel
tub.	tubular
v or V	volt
Var	variable
w	watt
w/	with
w/o	without
WW	wire-wound

SPECIAL NOTES AND SYMBOLS

X000	Part first added at this serial number.
000X	Part removed after this serial number.
*000-000	Asterisk preceding Tektronix Part Number indicates manufactured by or for Tektronix, or reworked or checked components.
Use 000-000	Part number indicated is direct replacement.
	Internal screwdriver adjustment.
	Front-panel adjustment or connector.

EXPLODED VIEW



EXPLODED VIEW

REF. NO.	PART NO.	SERIAL NO. EFF.	SERIAL NO. DISC.	QTY.	DESCRIPTION
1	343-074			2	CLAMP, tube top hat
	- - - -			-	Mounting Hardware For Each: (not included)
	210-008			1	LOCKWASHER, int. #8
	210-409			2	NUT, hex, 8-32 x 5/16 inch
2	355-070			1	STUD, 8-32 x 4 3/4 inch
3	432-048			3	BASE, capacitor mtg.
	- - - -			-	Mounting Hardware For Each: (not included)
	211-532			2	SCREW, 6-32 x 3/4 inch Fil HS
	386-254			1	PLATE, fiber, large
4	200-259			1	COVER, capacitor, polyethylene
5	441-538			1	CHASSIS, power
	- - - -			-	Mounting Hardware: (not included)
	210-458			4	NUT, keps, 8-32 x 11/32 inch
	212-004			9	SCREW, 8-32 x 5/16 inch BHS
6	348-004			1	GROMMET, rubber 3/8 inch
7	406-986•			1	BRACKET, alum. left
	- - - -			-	Mounting Hardware: (not included)
	210-458			1	NUT, keps, 8-32 x 11/32 inch
	212-004			3	SCREW, 8-32 x 5/16 inch BHS
8	406-987			1	BRACKET, alum. left
	- - - -			-	Mounting Hardware: (not included)
	210-458			1	NUT, keps, 8-32 x 11/32 inch
	212-004			3	SCREW, 8-32 x 5/16 inch BHS
9	406-985			1	BRACKET, alum. heat sink
10	- - - -			-	Transistor Mounting Hardware
	210-206			1	LUG, solder, SE10
	220-411			1	NUT, hex, #10
11	119-031			2	BLOWER, 1 1/2 x 4 3/4 inch ball bearing
	- - - -			-	Mounting Hardware For Each: (not included)
	213-068			2	SCREW, thread forming, 6-32 x 5/16 inch FHS
12	351-046			2	GUIDE, fan clip
13	378-761			2	SCREEN, fan snapin
14	134-067			16	PLUG, D hole nylon gray
15	131-126			10	CONNECTOR BNC 1 contact
16	210-241			4	LUG, solder coax
17	131-150			1	CONNECTOR, chassis mt. motor base
	- - - -			-	Consisting Of:
	129-041			1	POST, ground, 4-40 thread one end
	200-185			1	COVER, 3 wire motor base
	205-014			1	SHELL, mounting
	210-003			2	LOCKWASHER, ext. #4
	210-551			2	NUT, hex 4-40 x 1/4 inch
	211-015			1	SCREW, 4-40 x 1/2 inch RHS
	377-041			1	INSERT, black urea
	214-078			2	PIN, connecting
	- - - -			-	Mounting Hardware: (not included)
	213-104			2	SCREW, thread forming, 6-32 x 3/8 inch THS
18	334-649			1	TAG, voltage rating 117 volts
	- - - -			-	Mounting Hardware: (not included)
	213-044			2	SCREW, thread forming, 5-32 x 3/16 inch PHS
19	387-885			1	PLATE, frame, rear
	- - - -			-	Mounting Hardware: (not included)
	210-458			8	NUT, keps, 8-32 x 11/32 inch
	212-070			8	SCREW, 8-32 x 5/16 inch FHS 100° CSK
20	352-031			1	HOLDER, fuse single
	- - - -			-	Mounting Hardware: (not included)
	210-407			1	NUT, hex, 6-32 x 1/4 inch
	211-507			1	SCREW, 6-32 x 5/16 inch BHS
21	351-027			1	SLIDE, chassis track 3 3/8 x 12 inch 1 pair

EXPLODED VIEW *(Cont'd)*

REF. NO.	PART NO.	SERIAL NO. EFF.	SERIAL NO. DISC.	QTY.	DESCRIPTION
	- - - -			-	Mounting Hardware For Each Slide
22	212-036			6	SCREW, 8-32 x 3/8 inch THS
23	387-889			1	PLATE, side right, alum.
	- - - -			-	Mounting Hardware: (not included)
	210-458			4	NUT, keps, 8-32 x 11/32 inch
	212-004			4	SCREW, 8-32 x 5/16 inch BHS
24	387-890			2	PLATE, alum., ventilation
	- - - -			-	Mounting Hardware For Each: (not included)
	210-457			6	NUT, keps, 6-32 x 5/16 inch
	211-507			6	SCREW, 6-32 x 5/16 inch BHS
25	- - - -			-	Transformer Mounting Hardware
	210-010			4	LOCKWASHER, int. #10
	210-564			4	NUT, hex, 10-32 x 3/8 x 1/8 inch thick double chamfer
	210-812			4	WASHER, fiber #10
26	212-540			4	SCREW, 10-32 x 4 1/2 inch hex HS
27	406-851			1	BRACKET, alum.
	- - - -			-	Mounting Hardware For Bracket
	210-804			4	WASHER, 8S x 3/8 inch flat
	210-458			4	NUT, keps, 8-32 x 11/32 inch
	212-004			4	SCREW, 8-32 x 5/16 inch BHS
28	200-260			1	COVER, capacitor polyethylene
29	131-161			2	SOCKET, 3 pin transistor
	- - - -			-	Mounting Hardware For Each: (not included)
	213-113			2	SCREW, 5-32 x 3/16 inch RHS
30	- - - -			-	Capacitor Mounting Hardware
	354-068			2	RING, securing polyethylene
31	- - - -			-	Diode Mounting Hardware
	210-010			1	LOCKWASHER, int. #10
	210-805			1	WASHER, plain #10 flat
	210-909			2	WASHER, mica flat
	210-910			1	WASHER, insulator teflon
	220-411			1	NUT, hex #10
	210-224			1	LUG, solder #10 plain
32	136-015			1	SOCKET, STM9G
	- - - -			-	Mounting Hardware: (not included)
	213-044			2	SCREW, 5-32 x 3/16 inch Pan HS
33	136-011			2	SOCKET, STM8 ground
	- - - -			-	Mounting Hardware For Each: (not included)
	210-006			2	LOCKWASHER, int. #6
	210-407			2	NUT, hex, 6-32 x 1/4 inch
	211-506			2	SCREW, 6-32 x 1/4 inch FHS
34	136-008			3	SOCKET, STM7G
	- - - -			-	Mounting Hardware For Each: (not included)
	213-044			2	SCREW, 5-32 x 3/16 inch Pan HS
35	131-327			4	CONNECTOR, chassis mt. 30 pin
	- - - -			-	Mounting Hardware For Each: (not included)
	211-014			2	SCREW, 4-40 x 1/2 inch BHS
36	351-059			2	GUIDE, printed circuit board
	- - - -			-	Mounting Hardware For Guide: (not included)
37	211-504			1	SCREW, 6-32 x 1/4 inch BHS
38	348-031			8	GROMMET, snap-in polyethylene
39	- - - -			-	Resistor Mounting Hardware
	210-462			1	NUT, hex alum., 8-32 x 1/2 inch
	210-809			1	WASHER, brass centering
	212-037			1	SCREW, 8-32 x 1 3/4 inch Fil HS
40	131-148			4	CONNECTOR, chassis mt. 24 pin
	- - - -			-	Mounting Hardware For Each: (not included)
	210-006			2	LOCKWASHER, int. #6
	210-406			2	NUT, hex, 4-40 x 3/16 inch
	211-011			2	SCREW, 4-40 x 5/16 inch BHS

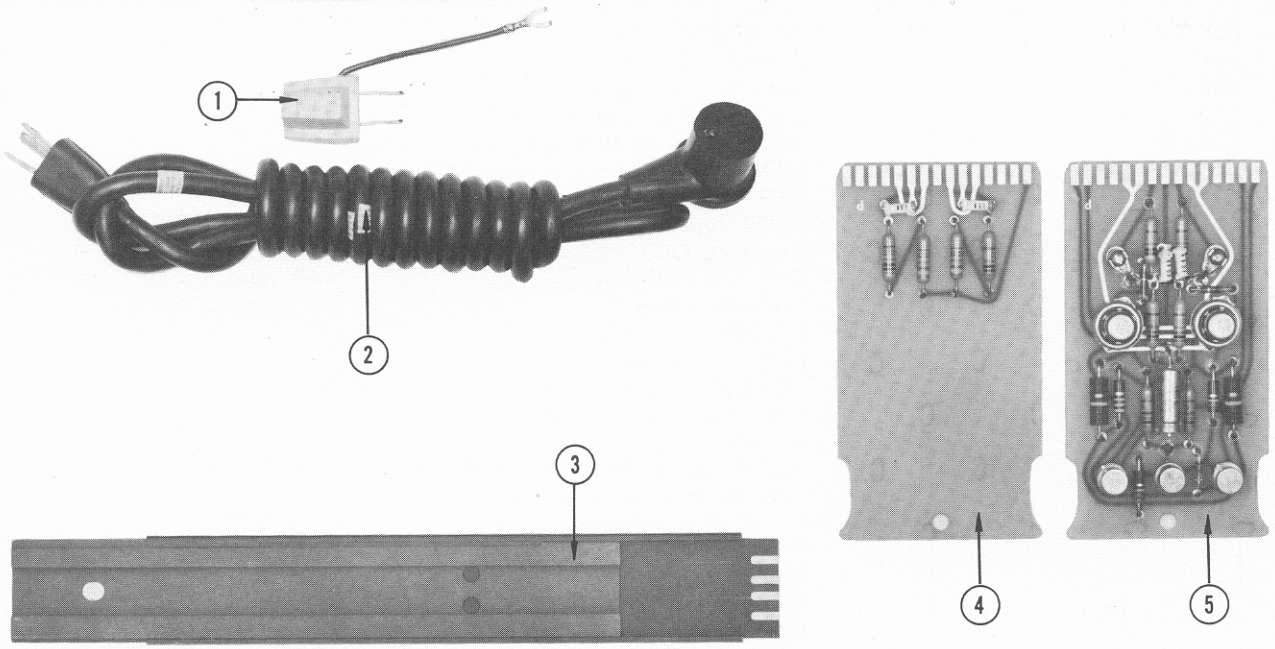
EXPLODED VIEW *(Cont'd)*

REF. NO.	PART NO.	SERIAL NO. EFF.	SERIAL NO. DISC.	QTY.	DESCRIPTION
41	387-886			1	PLATE, center bulkhead alum.
	- - - -			-	Mounting Hardware: (not included)
	210-458			10	NUT, keps, 8-32 x $^{11}/_{32}$ inch
	212-023			8	SCREW, 8-32 x $^{3}/_{8}$ inch BHS
	212-070			2	SCREW, 8-32 x $^{5}/_{16}$ inch FHS
42	351-038			4	GUIDE, plug-in
	- - - -			-	Mounting Hardware For Each: (not included)
	211-507			2	SCREW, 6-32 x $^{5}/_{16}$ inch BHS
43	387-887			1	PLATE, support alum.
	- - - -			-	Mounting Hardware: (not included)
	211-507			6	SCREW, 6-32 x $^{5}/_{16}$ inch BHS
44	381-236			3	BAR, spacer alum.
45	406-984			3	BRACKET, divider alum.
	- - - -			-	Mounting Hardware For Each: (not included)
	210-451			1	NUT, keps, 6-32 x $^{5}/_{16}$ inch
	211-538			1	SCREW, 6-32 x $^{5}/_{16}$ inch FHS
	212-002			3	SCREW, 8-32 x $^{1}/_{4}$ inch FHS
46	387-891			3	PLATE, divider, alum
	- - - -			-	Mounting Hardware For Each: (not included)
	211-507			3	SCREW, 6-32 x $^{5}/_{16}$ inch
47	387-888			1	PLATE, side left alum.
	- - - -			-	Mounting Hardware: (not included)
	210-458			4	NUT, keps 8-32 x $^{11}/_{32}$ inch
	212-004			4	SCREW, 8-32 x $^{5}/_{16}$ inch BHS
48	337-614			4	SHIELD, printed circuit board, alum.
	- - - -			-	Mounting Hardware For Each: (not included)
	211-507			2	SCREW, 6-32 x $^{5}/_{16}$ inch BHS
49	348-006			2	GROMMET, rubber $^{3}/_{4}$ inch
50	387-884			1	PLATE, subpanel alum.
51	260-134			1	SWITCH, power on-off (unwired)
	- - - -			-	Mounting Hardware: (not included)
	210-414			1	NUT, hex, $^{15}/_{32}$-32 x $^{9}/_{16}$ inch
	210-473			1	NUT, $^{15}/_{32}$-32 x $^{9}/_{16}$ inch 12 sided
	354-055			1	RING, locking switch
52	150-019			1	BULB, neon with translucent lens in holder
53	262-643			1	SWITCH, channel wired
	- - - -			-	Includes:
	260-586			1	SWITCH, channel unwired
	- - - -			-	Mounting Hardware: (not included)
	210-012			1	LOCKWASHER, pot int. $^{3}/_{8}$ x $^{1}/_{2}$ inch
	210-413			1	NUT, hex, $^{3}/_{8}$-32 x $^{1}/_{2}$ inch
	210-840			1	WASHER, pot flat
54	260-587			1	SWITCH, balance carrier DC level unwired
	- - - -			-	Mounting Hardware: (not included)
	210-004			2	LOCKWASHER, int. #4
	210-406			2	NUT, hex, 4-40 x $^{3}/_{16}$ inch
55	- - - -			-	Meter Mounting Hardware
	210-406			2	NUT, hex, 4-40 x $^{3}/_{16}$ inch
	211-018			2	SCREW, 4-40 x $^{7}/_{8}$ inch RHS
56	333-802			1	PANEL, front 129
	- - - -			-	Mounting Hardware: (not included)
	210-457			4	NUT, keps, 6-32 x $^{5}/_{16}$ inch
	211-537			4	SCREW, 6-32 x $^{3}/_{8}$ inch THS
57	214-239			2	FASTENER, thumb screw $1^{5}/_{32}$ inch with 10-32 threads
	- - - -			-	Mounting Hardware For Each: (not included)
58	354-048			1	RING, securing
59	167-032			2	HANDLE, 4$^{9}/_{16}$ inch nickel plated
	- - - -			-	Mounting Hardware For Each: (not included)
	212-559			2	SCREW, 10-32 x $^{5}/_{8}$ inch FHS

EXPLODED VIEW *(Cont'd)*

REF. NO.	PART NO.	SERIAL NO. EFF.	SERIAL NO. DISC.	QTY.	DESCRIPTION
60	129-020			5	POST, binding assembly
	- - - -			-	Consisting Of:
	200-072			1	CAP, binding post knurled
	210-010			1	LOCKWASHER, steel int. #10
	210-410			1	NUT, hex, brass 10-32 x 5/16 inch
	355-503			1	STEM, binding post
	210-206			1	LUG, solder SE10 long
61	352-002			1	HOLDER, fuse assembly
	- - - -			-	Consisting Of:
	200-015			1	CAP, fuse 3AG
	210-873			1	WASHER, rubber
	352-010			1	HOLDER, fuse 3AG
	NO NUMBER			1	NUT, fuse holder
	200-237			1	COVER, fuse polyethylene
62	366-173			1	KNOB, channel off charcoal
	- - - -			-	Includes:
	213-004			1	SCREW, set, 6-32 x 3/16 inch HSS allen head
63	366-215			1	KNOB, balance carrier DC level snapon
64	129-065			10	POST, binding assembly
	- - - -			-	Consisting Of:
	129-064			1	POST, binding charcoal futed cap
	210-457			1	NUT, keps, 6-32 x 5/16 inch
	358-181			1	BUSHING, nylon charcoal
65	210-833			4	WASHER, steel finishing #10
66	212-039			4	SCREW, 8-32 x 3/8 inch THS
67	124-090			6	STRIP, ceramic 9 notches
	- - - -			-	Mounting Hardware For Each: (not included)
	361-009			2	SPACER, nylon
68	124-091			11	STRIP, ceramic 11 notches
	- - - -			-	Mounting Hardware For Each: (not included)
	361-009			2	SPACER, nylon
69	179-862			1	CABLE, harness —100 V adjust
70	179-866			1	CABLE, harness power
71	136-089			1	CONNECTOR, 9 pin
	- - - -			-	Mounting Hardware: (not included)
	210-004			4	LOCKWASHER, int. #4
	210-406			4	NUT, hex, 4-40 x 3/16 inch
	211-023			4	SCREW, 4-40 x 1/4 inch FHS

ACCESSORIES



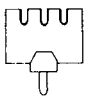
REF. NO.	PART NO.	SERIAL NO. EFF.	SERIAL NO. DISC.	QTY.	DESCRIPTION
1	103-013			1	ADAPTER, power cord 3 wire to 2 wire
2	161-013			1	CORD, power 18 gauge 8 ft. angle female plug
3	351-006			1	GUIDE, cabinet, 3⅜ x 20 inch one pair left and right
4	670-061			4	CIRCUIT CARD, passive assembly
5	670-062			4	CIRCUIT CARD, cathode-follower output assembly
	- - - -			-	Each Includes:
	136-125			2	SOCKET, 5 pin
	136-150			3	SOCKET, 3 pin
	- - - -			-	Mounting Hardware For 3 Pin Socket
	387-603			1	PLATE, insulator, teflon

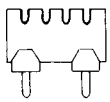
CERAMIC STRIPS

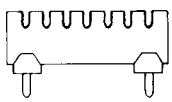
3/4 inch

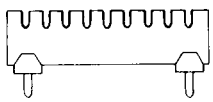

1 notch 124-100

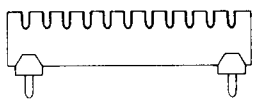

2 notch 124-086


3 notch 124-087


4 notch 124-088


7 notch 124-089


9 notch 124-090

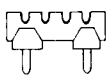

11 notch 124-091

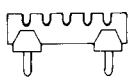
7/16 inch

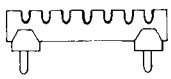

1 notch 124-118

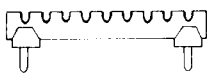

2 notch 124-119

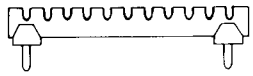

3 notch 124-092


4 notch 124-120

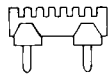

5 notch 124-093

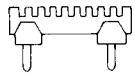

7 notch 124-094

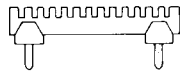

9 notch 124-095

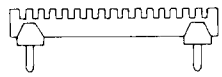

11 notch 124-106

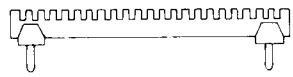
7/16 inch SMALL NOTCH —Short Stud


7 notch 124-149

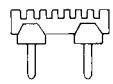

9 notch 124-148

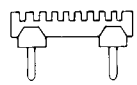

13 notch 124-147

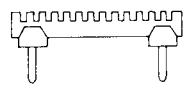

16 notch 124-146

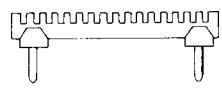

20 notch 124-145

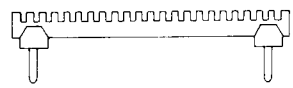
7/16 inch SMALL NOTCH —Tall Stud


7 notch 124-158


9 notch 124-157


13 notch 124-156


16 notch 124-155


20 notch 124-154

MOUNTINGS


Stud, nylon, short..355-046


Stud, nylon, tall .. 355-082


Spacer, $^{11}/_{32}$ inch..361-039


Spacer, $^{3}/_{8}$ inch .. 361-009


Spacer, $^{1}/_{4}$ inch...361-008


Spacer, $^{5}/_{32}$ inch...361-007

Ceramic strips include studs, but spacers must be ordered separately by part no.

ELECTRICAL PARTS

Values are fixed unless marked Variable.

Ckt. No.	Tektronix Part No.	Description		S/N Range
		Bulb		
B601	150-019	Neon w/translucent lens in holder		
		Capacitors		
Tolerance of all electrolytic capacitors as follows (with exceptions):				
3V — 50V = −10%, +250%				
51V — 350V = −10%, +100%				
351V — 450V = −10%, +50%				
C611	285-604	0.01 μf	PTM	400 v
C612A,B	290-182	300μf/40 μf	EMC	300 v/150 v
C629	285-604	0.01 μf	PTM	400 v
C632	285-604	0.01 μf	PTM	400 v
C636	285-604	0.01 μf	PTM	400 v
C640	290-174	4500 μf	EMC	25 v
C641	290-174	4500 μf	EMC	25 v
C644	290-201	100 μf	EMT	25 v
C647	283-012	0.1 μf	Cer	100 v
C657	290-215	100 μf	EMT	25 v
C662	290-169	400 μf	EMC	250 v
C672	285-604	0.01 μf	PTM	400 v
C676A,B	290-013	2 x 40 μf	EMC	450 v
C682	290-169	400 μf	EMC	250 v
C692	285-604	0.01 μf	PTM	400 v
C696A,B	290-013	2 x 40 μf	EMC	450 v
C702	290-029	2000 μf	EMC	20 v
C704	290-029	2000 μf	EMC	20 v
C791	283-012	0.1 μf	Cer	100 v
		Connectors		
J11A	131-148	24 pin contact		
J11B	131-148	24 pin contact		
J21A	131-148	24 pin contact		
J21B	131-148	24 pin contact		
J31	131-327	30 pin contact		
J41	131-327	30 pin contact		
J51	131-327	30 pin contact		
J61	131-327	30 pin contact		
P601	131-150	3 wire Motor base		
J780	136-089	Socket, 9 pin chassis mount		

Diodes

Ckt. No.	Tektronix Part No.	Description	S/N Range
D612A,B,C,D	152-066	Silicon 1N3194	
D622	152-107	Silicon Texas Instr. TI60	
D642A	152-113	Silicon RCA 40108	
D642B	152-113	Silicon RCA 40108	
D662A,B,C,D	152-066	Silicon 1N3194	
D672	152-107	Silicon Texas Instr. TI60	
D682A,B,C,D	152-066	Silicon 1N3194	
D692	152-107	Silicon Texas Instr. TI60	
D702A,B,C,D	152-035	Silicon 1N1563A	
D792	*152-075	Germanium Tek Spec	
D794	152-095	Silicon 1N625	
D795	152-095	Silicon 1N625	

Meter

M797	149-021	50-0-50 μamps	

Fuses

F601	159-011	6.25 Amp 3AG Slo-Blo 117 v oper.	
F640	159-017	4 Amp 3AG Fast-Blo	

Transistors

Q644	151-040	2N1302	
Q654	151-042	2N1378	
Q657	151-132	2N2156	

Resistors

Resistors are fixed, composition, ±10% unless otherwise indicated.

R601	302-104	100 k	½ w				
R609	302-104	100 k	½ w				
R610	306-100	10 Ω	2 w				
R611	306-100	10 Ω	2 w				
R613	302-683	68 k	½ w				
R614	302-104	100 k	½ w				
R615	302-224	220 k	½ w				
R616	302-105	1 meg	½ w				
R617	302-183	18 k	½ w				
R618	302-392	3.9 k	½ w				
R619	302-102	1 k	½ w				
R621	308-285	2.6 k	25 w			WW	5%
R622	308-285	2.6 k	25 w			WW	5%
R623	323-369	68.1 k	½ w			Prec	1%
R624	311-015	10 k			Var	WW	—100 VOLTS

Resistors *(Cont'd)*

Ckt. No.	Tektronix Part No.		Description			S/N Range
R625	323-303	14 k	½ w	Prec	1%	
R628	302-224	220 k	½ w			
R629	302-102	1 k	½ w			
R631	302-153	15 k	½ w			
R632	302-104	100 k	½ w			
R634	302-274	270 k	½ w			
R636	302-335	3.3 meg	½ w			
R637	302-125	1.2 meg	½ w			
R639	302-562	5.6 k	½ w			
R640	302-823	82 k	½ w			
R641	311-068	500 k	.2 w	Var	—12.2 VOLTS	
R642	302-394	390 k	½ w			
R643	322-223	2.05 k	¼ w	Prec	1%	
R644	324-306	15 k	1 w	Prec	1%	
R645	302-334	330 k	½ w			
R646	302-272	2.7 k	½ w			
R647	302-271	270 Ω	½ w			
R654	308-076	300 Ω	3 w	WW		
R657	308-231	220 Ω	3 w	WW	5%	
R660	306-150	15 Ω	2 w			
R661	306-150	15 Ω	2 w			
R662	306-150	15 Ω	2 w			
R663	302-273	27 k	½ w			
R664	302-683	68 k	½ w			
R665	302-474	470 k	½ w			
R666	302-225	2.2 meg	½ w			
R667	302-102	1 k	½ w			
R669	302-102	1 k	½ w			
R670	302-685	6.8 meg	½ w			
R671	311-068	500 k	.2 w	Var	+125 VOLTS	
R672	323-430	294 k	½ w	Prec	1%	
R673	323-418	221 k	½ w	Prec	1%	
R675	302-474	470 k	½ w			
R676	302-100	10 Ω	½ w			
R677	308-285	2.6 k	25 w	WW	5%	
R678	308-285	2.6 k	25 w	WW	5%	
R680	306-100	10 Ω	2 w			
R681	306-100	10 Ω	2 w			
R683	302-154	150 k	½ w			
R684	302-333	33 k	½ w			
R685	302-154	150 k	½ w			
R686	302-105	1 meg	½ w			
R687	302-102	1 k	½ w			
R688	302-102	1 k	½ w			
R689	302-102	1 k	½ w			
R690	308-223	35 Ω	3 w	WW	5%	

Resistors *(Cont'd)*

Ckt. No.	Tektronix Part No.		Description				S/N Range
R691	308-223	35 Ω	3 w		WW	5%	
R692	323-483	105 meg	½ w		Prec	1%	
R693	322-609	333 k	¼ w		Prec	1%	
R694	302-825	8.2 meg	½ w				
R695	311-068	500 k	.2 w	Var		+300 VOLTS	
R696	302-100	10 Ω	½ w				
R697	308-285	2.6 k	25 w		WW	5%	
R698	308-285	2.6 k	25 w		WW	5%	
R702	304-561	560 Ω	1 w				
R704	304-561	560 Ω	1 w				
R792	302-104	100 k	½ w				
R794	323-384	97.6 k	½ w		Prec	1%	
R795	322-249	3.83 k	¼ w		Prec	1%	
R797	323-384	97.6 k	½ w		Prec	1%	
R801	302-470	47 Ω	½ w				
R802	302-470	47 Ω	½ w				
R803	302-470	47 Ω	½ w				
R804	302-470	47 Ω	½ w				
R805	302-470	47 Ω	½ w				
R806	302-470	47 Ω	½ w				
R807	302-470	47 Ω	½ w				
R808	302-470	47 Ω	½ w				

Switches

	Unwired	Wired			
SW601	260-276		Toggle	POWER ON	
SW790	260-586	*262-643	Rotary	CHANNEL SELECTOR	
SW797	260-587		Lever	BALANCE CARRIER DC LEVEL	
TK601	260-336			Thermo Cutout 150°F	±5° F

Transformer

T601	*120-333	Power

Electron Tubes

V614	154-022	6AU6
V627	154-423	6336A
V634	154-278	6BL8
V639	154-370	ZZ1000
V664	154-022	6AU6
V684	154-022	6AU6
V697	154-423	6336A

Passive Circuit Card (Optional)

Ckt. No.	Tektronix Part No.	Description			Model No.
	*018-002	Complete Card			
		Capacitors			
C750	281-528	82 pf	Cer	500 v	10%
C760	281-528	82 pf	Cer	500 v	10%
		Resistors			
R750	323-617	700 k	½ w	Prec	1%
R751	323-442	392 k	½ w	Prec	1%
R760	323-617	700 k	½ w	Prec	1%
R761	323-442	392 k	½ w	Prec	1%

Cathode Follower Card (Optional)

	*018-001	Complete Card			
		Capacitors			
C750	281-027	0.7-3 pf	Tub. Var		
C751	281-578	18 pf	Cer	500 v	5%
C760	281-027	0.7-3 pf	Tub. Var		
C761	281-578	18 pf	Cer	500 v	5%
C772	290-138	330 μf	EMT	6 v	
		Diode			
D772	152-008	Germanium			
		Transistors			
Q774	151-070	2N1377			
Q783	151-040	2N1302			
Q784	151-070	2N1377			
		Resistors			
R750	323-611	900 k	½ w	Prec	1%
R751	323-387	105 k	½ w	Prec	1%
R752	316-101	100 Ω	¼ w		
R753	303-223	22 k	1 w		5%
R759	323-335	30.1 k	½ w	Prec	1%

Resistors *(Cont'd)*

Ckt. No.	Tektronix Part No.		Description			Model No.
R760	323-611	900 k	½ w	Prec	1%	
R761	323-387	105 k	½ w	Prec	1%	
R762	316-101	100 Ω	¼ w			
R763	303-223	22 k	1 w		5%	
R769	323-335	30.1 k	½ w	Prec	1%	
R773	302-563	56 k	½ w			
R774	302-683	68 k	½ w			
R783	302-333	33 k	½ w			

Electron Tubes

V753	154-323	6CW4/7586
V763	154-323	6CW4/7586

SECTION 6
INSTALLATION

Introduction

The Type 129 will fit most 19-inch wide racks having dimensions that conform to EIA/RETMA specifications. It is intended to be mounted on the slide-out tracks provided with the instrument and no provisions have been made for other mounting configurations.

The dimensonal drawings on the last fold-out page in this section show the minimum clearances required around the instrument for proper cooling. Both the top and bottom covers should be in place when the Type 129 is operated for prolonged periods so that balanced air flow and efficient cooling is obtained. Remember that the instrument fans will only circulate heated air within a closed cabinet rack unless the rack has adequate air exhaust and intake provisions.

CAUTION

When the Type 129 is pulled out to the fully extended position, its weight exerts considerable leverage on the rack. It may be necessary to add a counter-weight to the rear of the rack or to bolt the rack to the floor to prevent it from tipping.

Two basic factors govern how the slide-out tracks should be assembled and mounted:

1. The means available for rear support of the tracks.
2. The type of mounting holes in the rack rails; tapped 10-32, 10-24, 12-24, untapped $^{7}/_{32}$ inch, etc.

Rear Support

Rear mounting rails in the rack which are located $18^{1}/_{4}$ to $20^{3}/_{4}$ inches behind the front mounting rails can provide rear support for the slide-out tracks. (In some racks, the rear rail can be moved for the proper spacing.) If the rear rails are not useable or have not been provided in your rack, another means of rear support must be devised.

Mounting Holes

The small hardware components included with the Type 129 are shown below. This hardware is compatable with:

1. Rail holes tapped for 10-32 machine screws or with any larger hole, tapped or untapped.
2. Rail holes located on EIA/RETMA/Western Electric or Universal spacing.

Because of this compatability, some small parts will not be used.

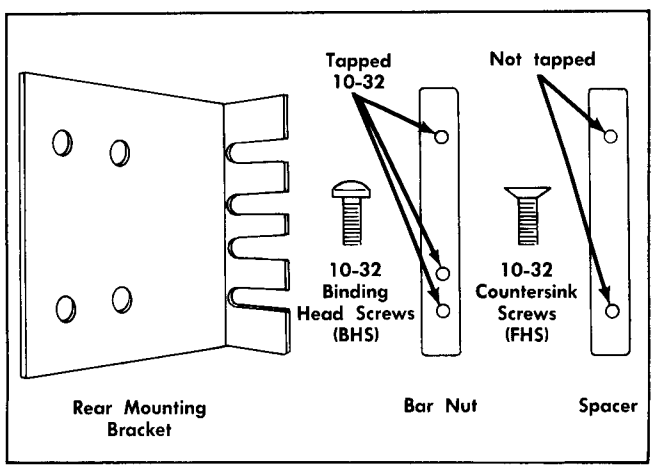


Fig. 6-1. Small mounting-hardware components.

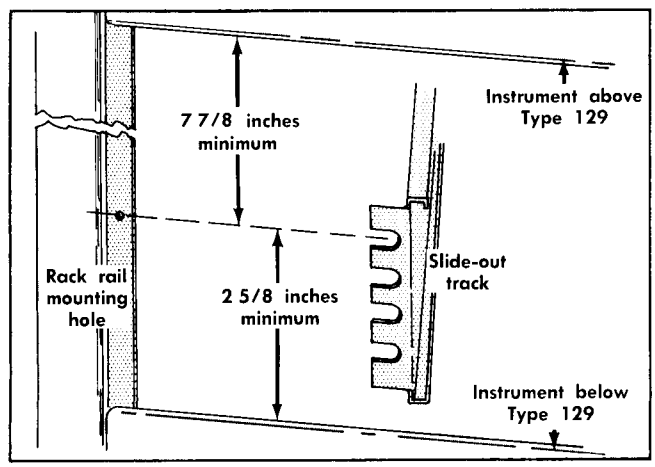


Fig. 6-2. Mounting hole location.

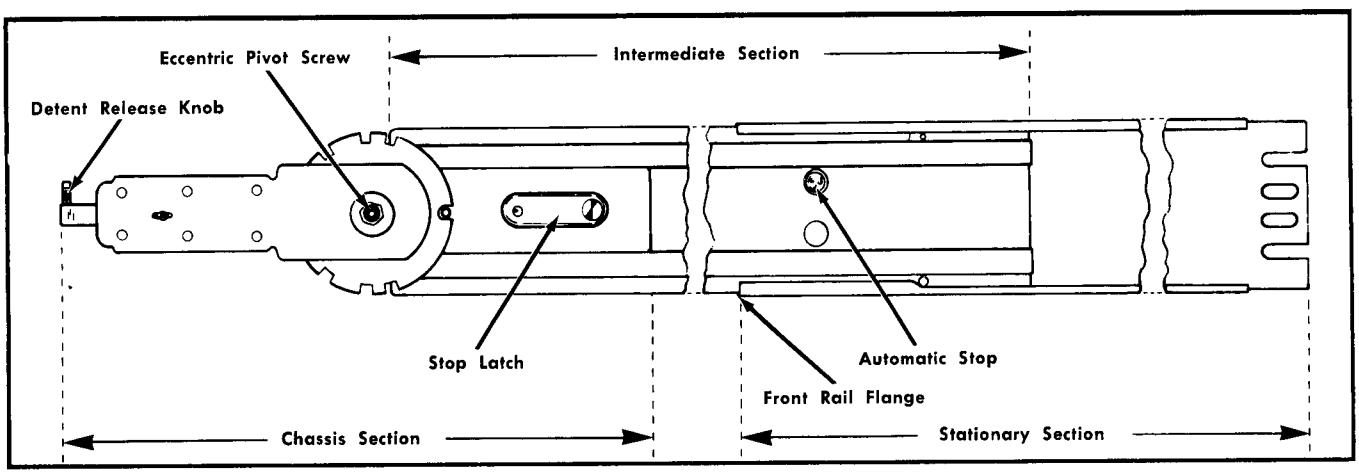


Fig. 6-3. Slide-out track assembly.

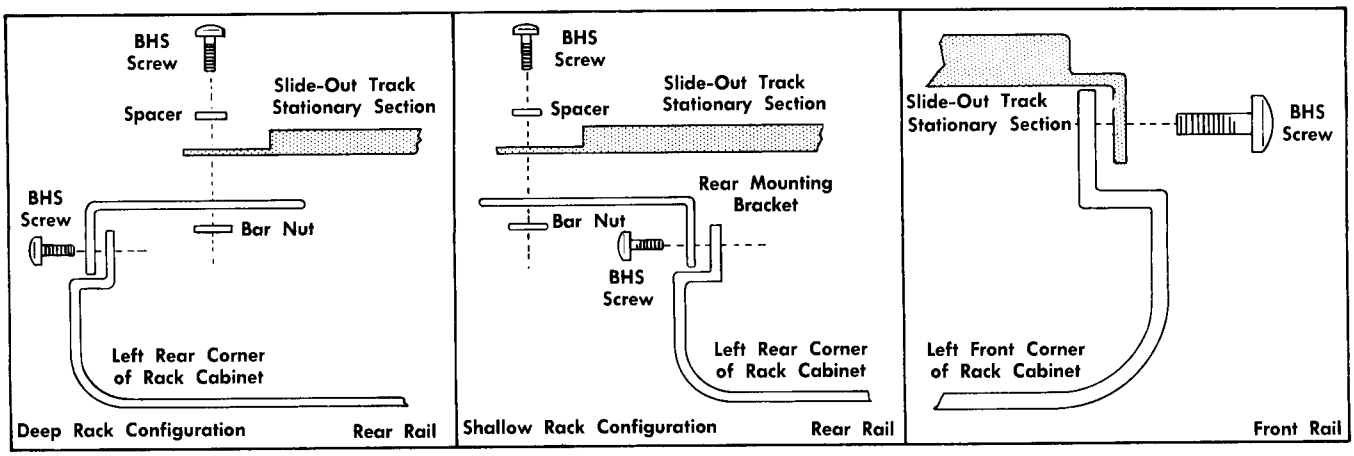


Fig. 6-4. Rack rails tapped for 10-32 machine screws.

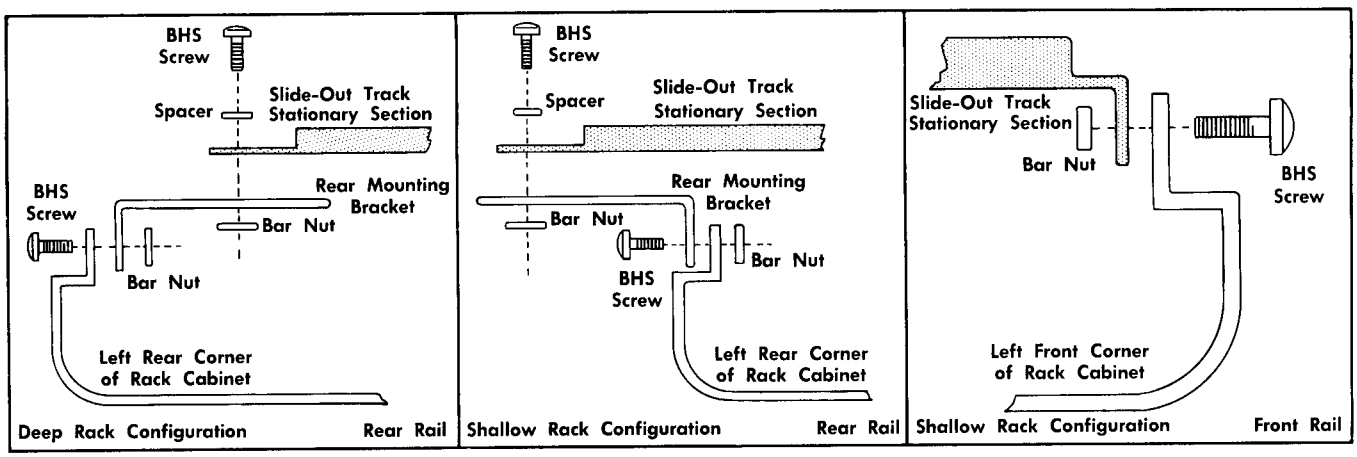


Fig. 6-5. Rack rails not tapped for 10-32 machine screws.

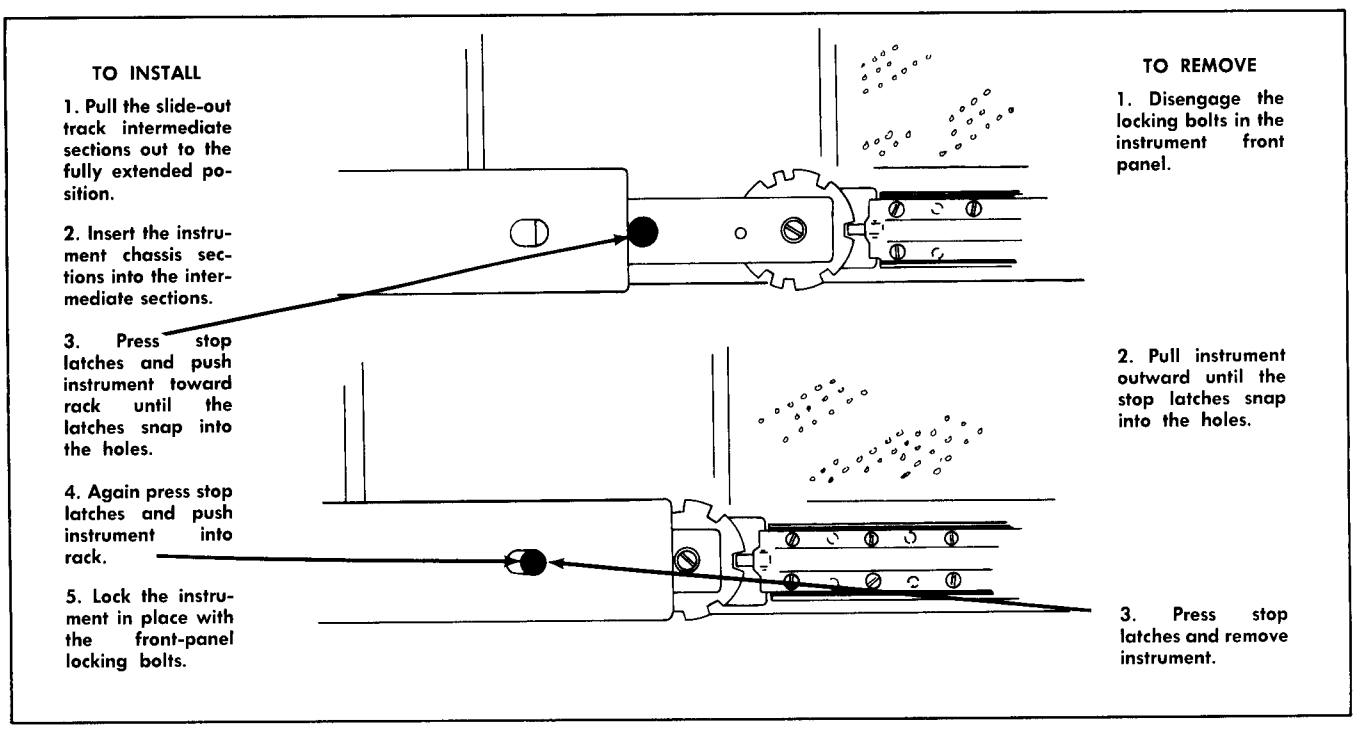


Fig. 6-6. Instrument installation and removal.

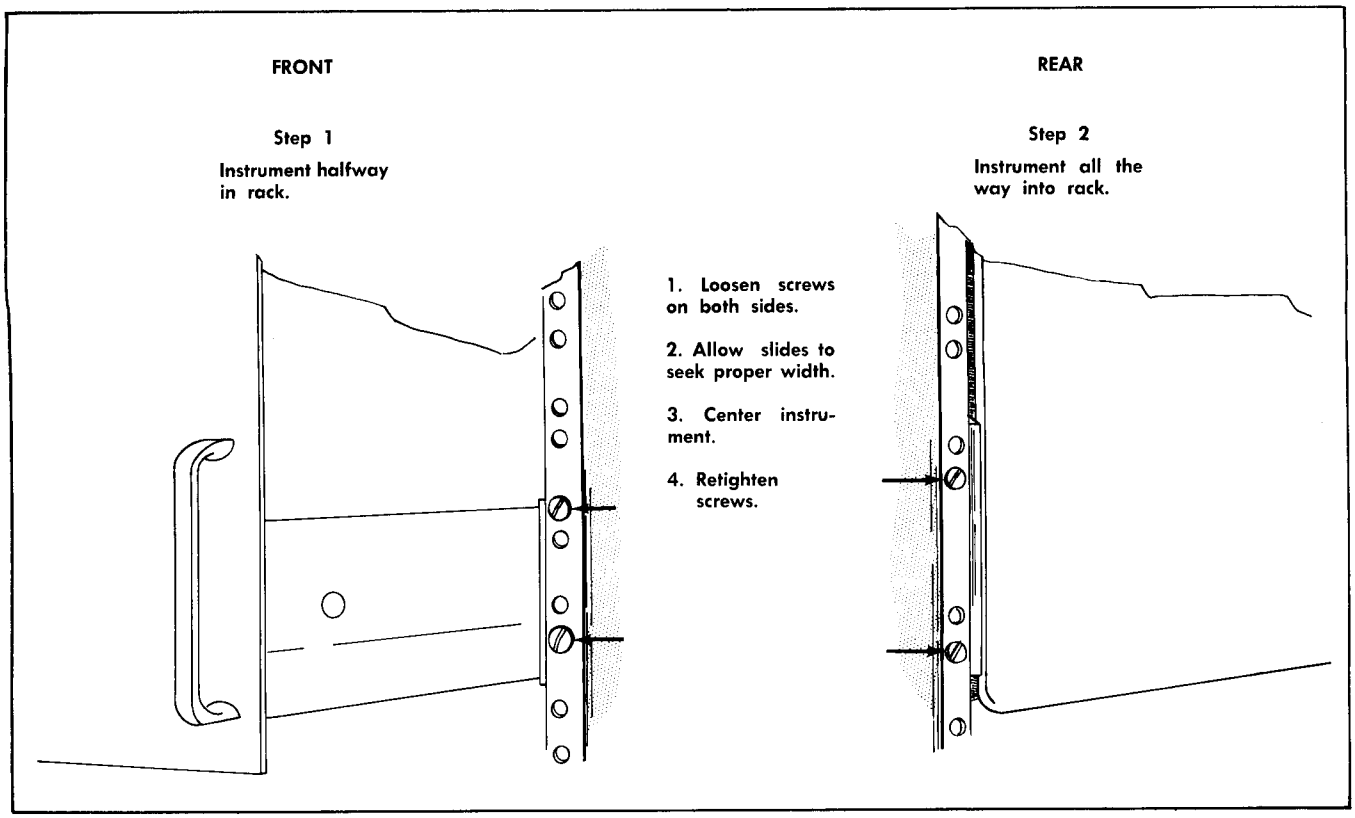


Fig. 6-7. Slide-out track adjustment for smooth operation.

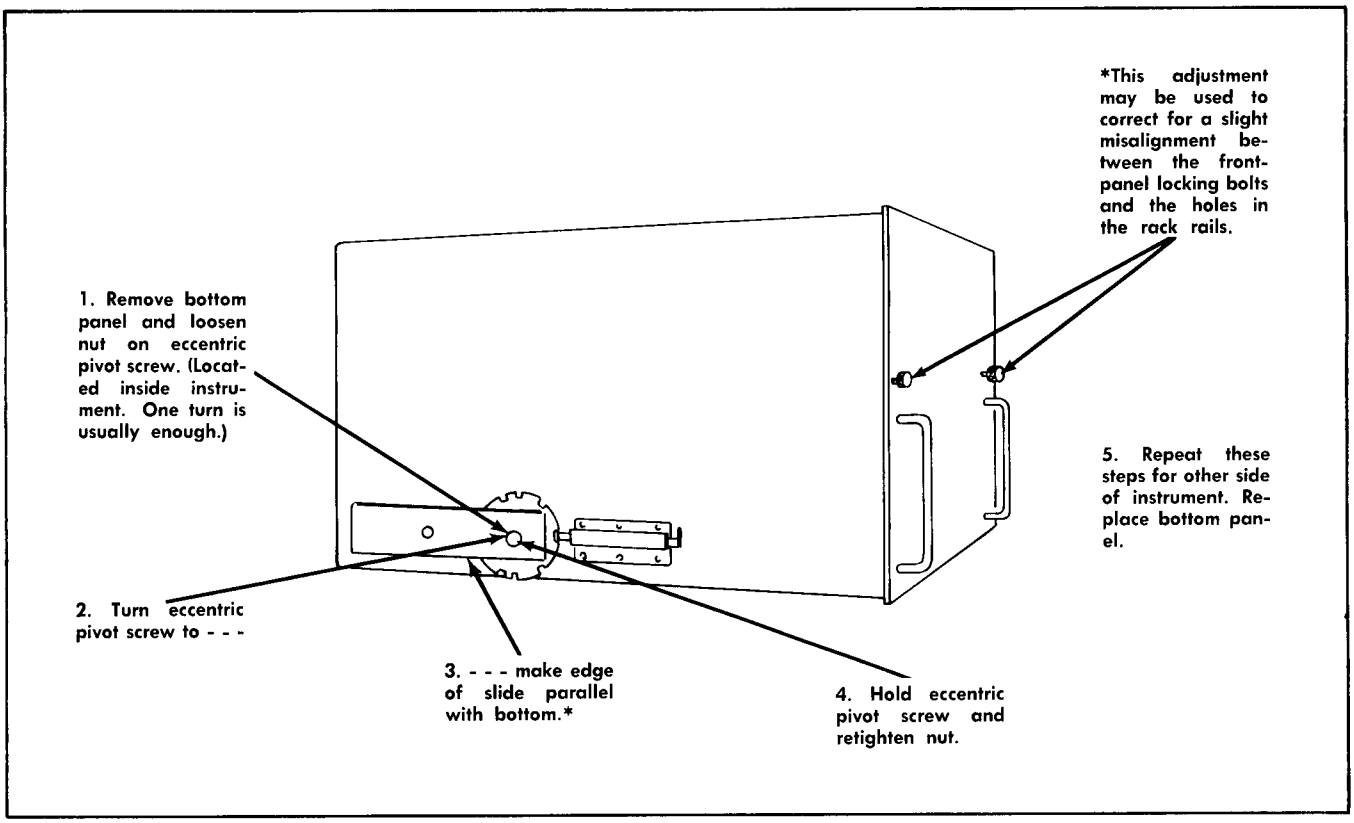
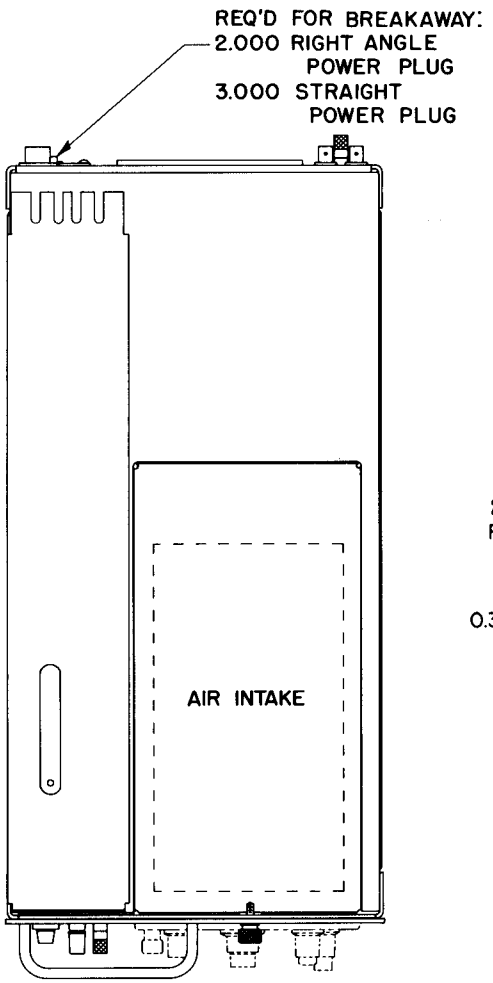
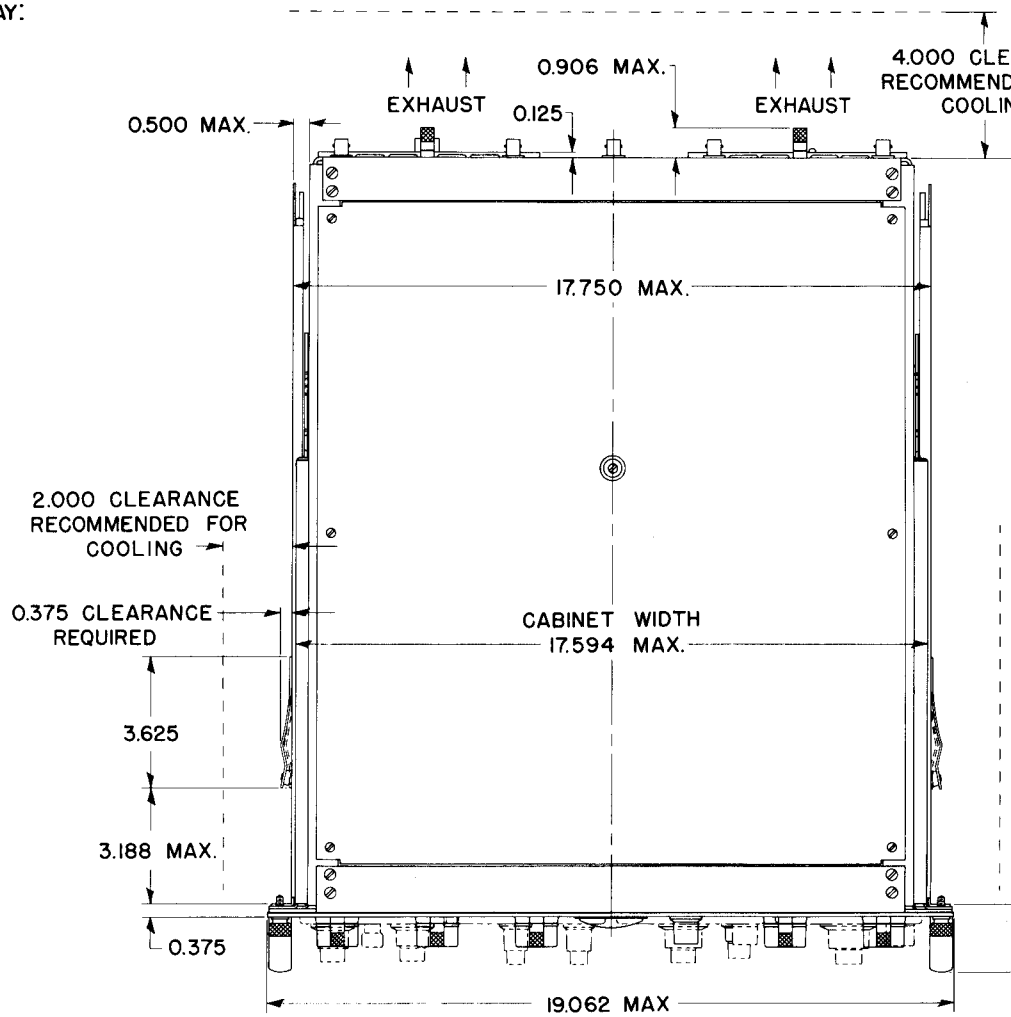
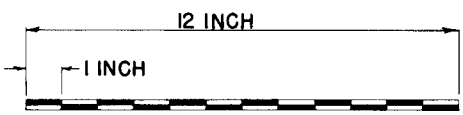
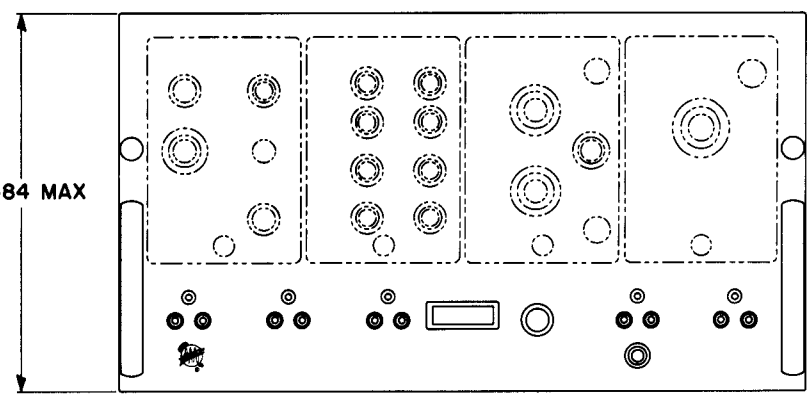


Fig. 6-8. Adjusting the slide-out track chassis section for smooth operation.

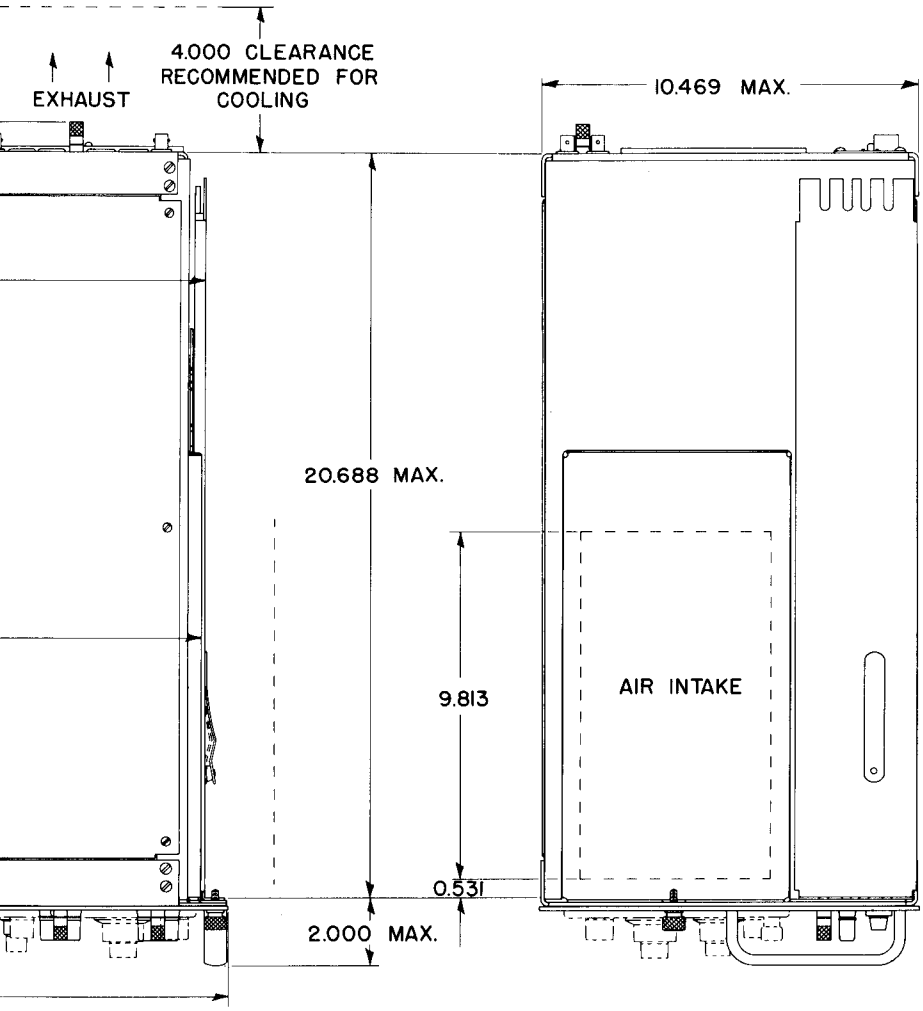


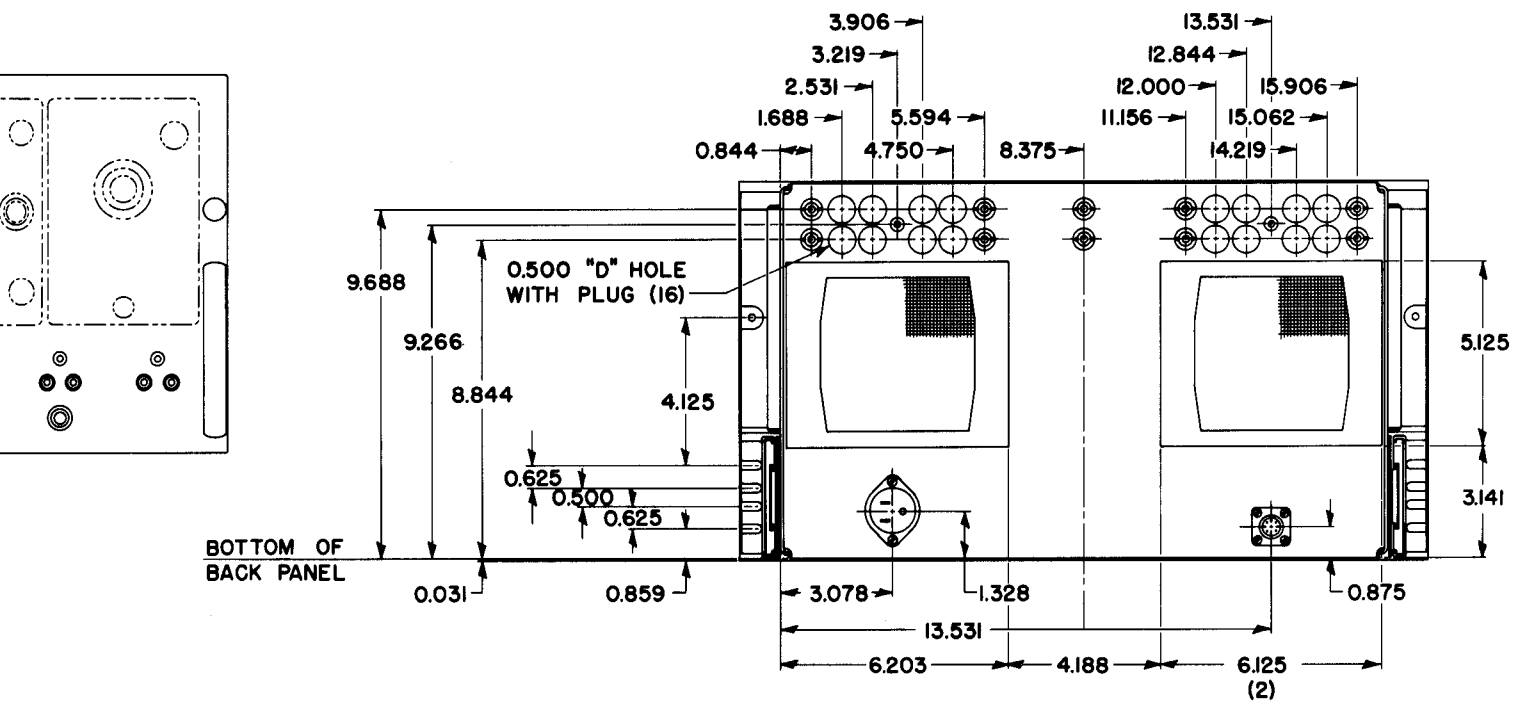




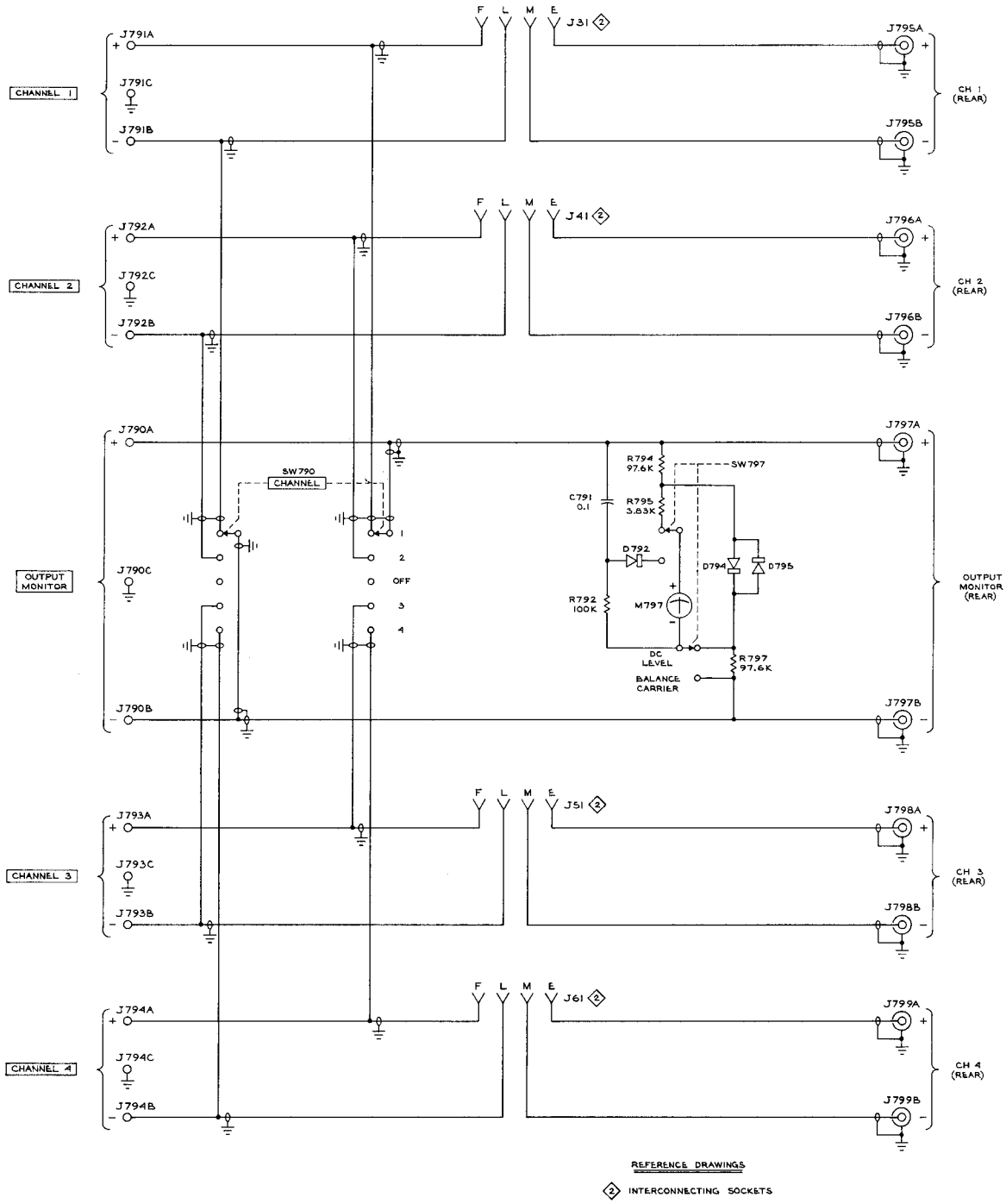


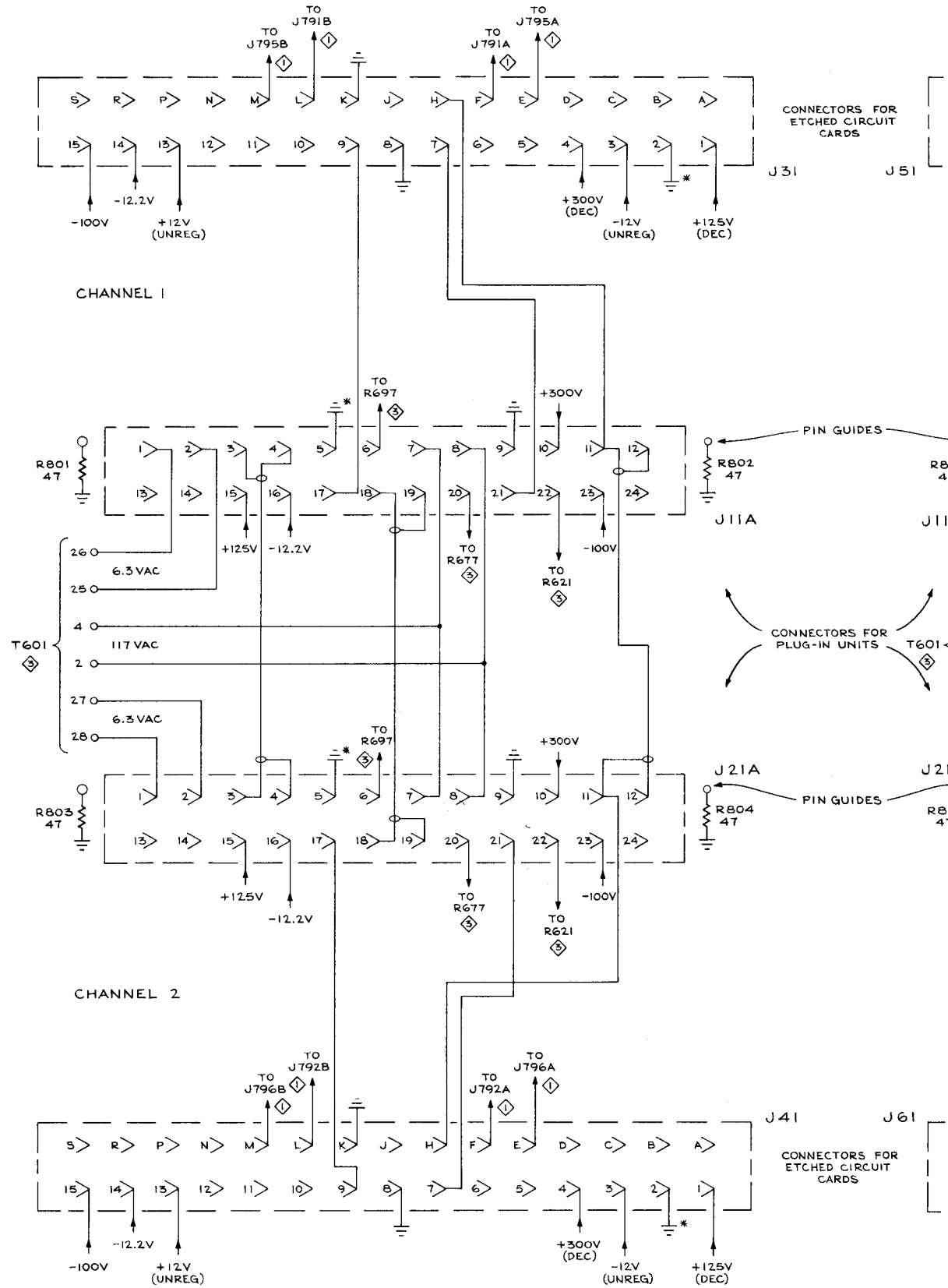
BOTTOM
BACK P


4.000 CLEARANCE
RECOMMENDED FOR
COOLING
EXHAUST
10.469 MAX.
20.688 MAX.
9.813
AIR INTAKE
0.531
2.000 MAX.


3.906
3.219
2.531
1.688
0.844
5.594
4.750
8.375
13.531
12.844
12.000
11.156
15.906
15.062
14.219
0.500 "D" HOLE
WITH PLUG (16)
9.688
9.266
8.844
4.125
5.125
3.141
0.625
0.500
0.625
BOTTOM OF
BACK PANEL
0.031
0.859
3.078
1.328
0.875
13.531
6.203
4.188
6.125
(2)

REAR VIEW


CHANNEL 1
J791A
J791C
J791B
F L M E J31 2
J795A
J795B
CH 1 (REAR)
CHANNEL 2
J792A
J792C
J792B
F L M E J41 2
J796A
J796B
CH 2 (REAR)
OUTPUT MONITOR
J790A
J790C
J790B
SW790 CHANNEL
1
2
OFF
3
4
R794 97.6K
SW797
C791 0.1
R795 3.83K
D792
D794
D795
R792 100K
M797
DC LEVEL
BALANCE CARRIER
R797 97.6K
J797A
J797B
OUTPUT MONITOR (REAR)
CHANNEL 3
J793A
J793C
J793B
F L M E J51 2
J798A
J798B
CH 3 (REAR)
CHANNEL 4
J794A
J794C
J794B
F L M E J61 2
J799A
J799B
CH 4 (REAR)
REFERENCE DRAWINGS
2 INTERCONNECTING SOCKETS



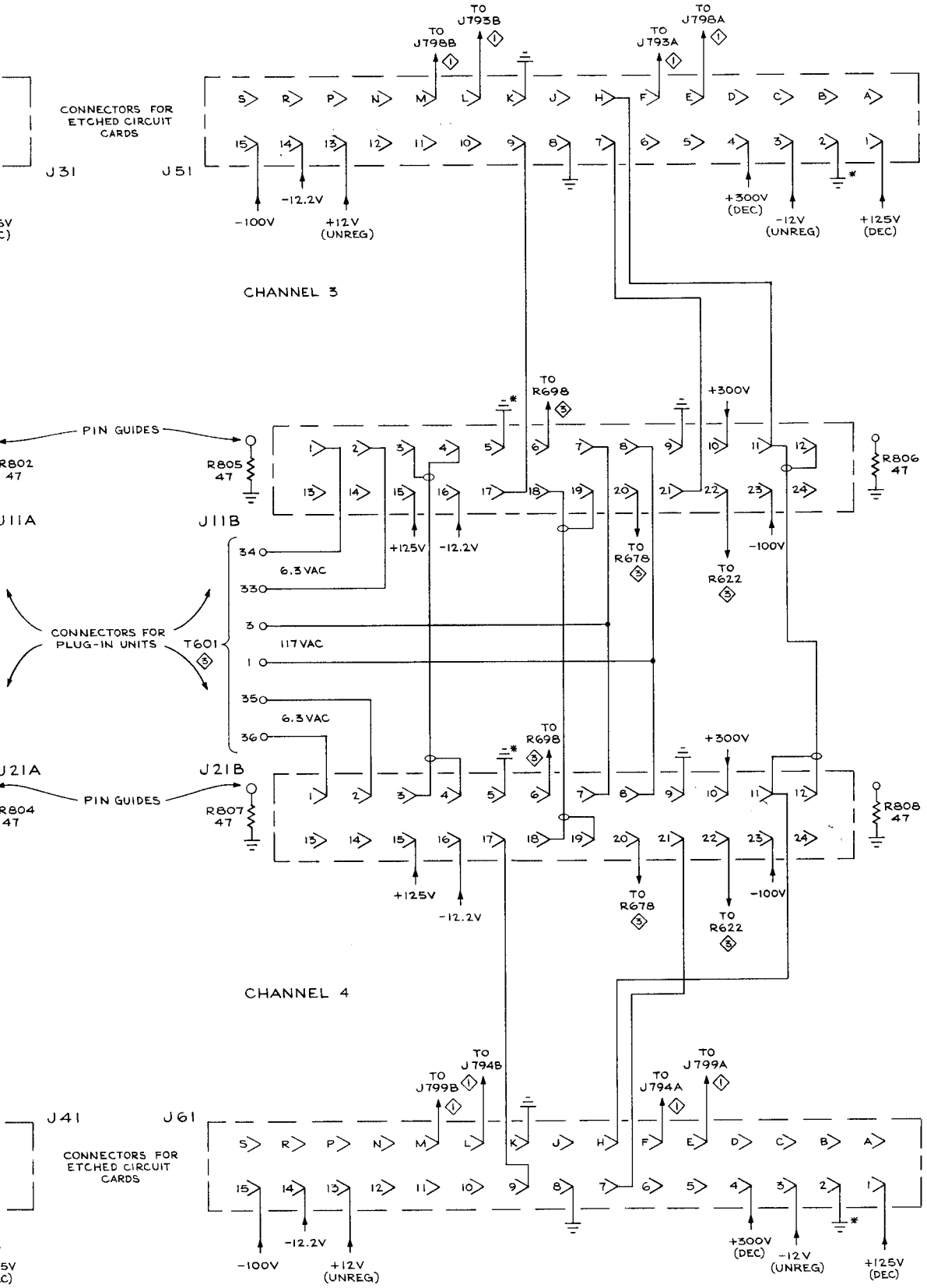
REFERENCE DRAWINGS

① OUTPUT & MONITOR CIRCUIT

③ POWER SUPPLY

TYPE 129 PLUG-IN POWER SUPPLY

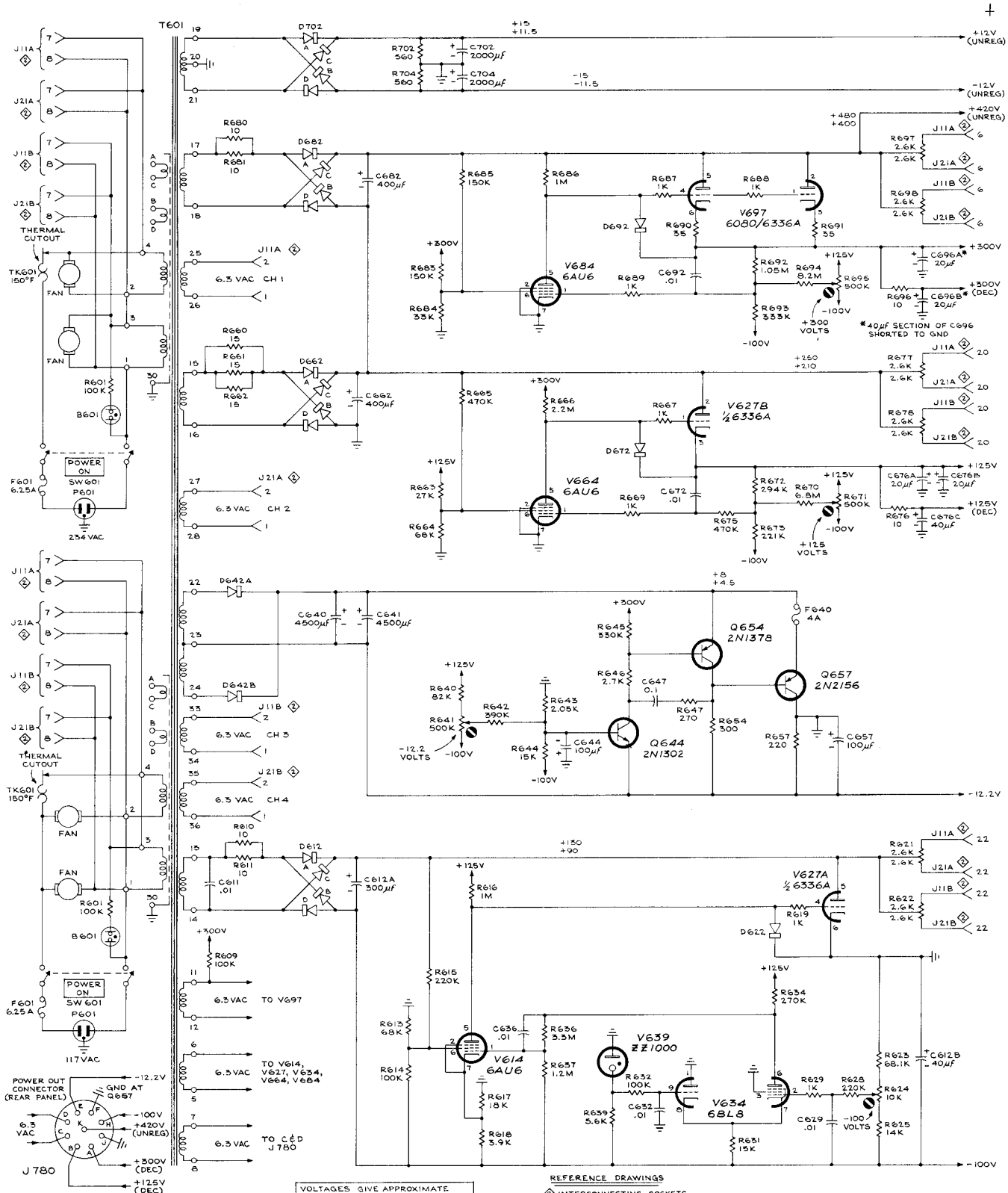
A



* GROUNDS RETURNED TO CHASSIS AT COLLECTOR OF Q657 ⑤

INTERCONNECTING SOCKETS ② DON 164

A



VOLTAGES GIVE APPROXIMATE RANGE FOR VARIOUS LOADS WITH THE 60 CPS DESIGN-CENTER LINE VOLTAGE MARKED ON REAR PANEL.

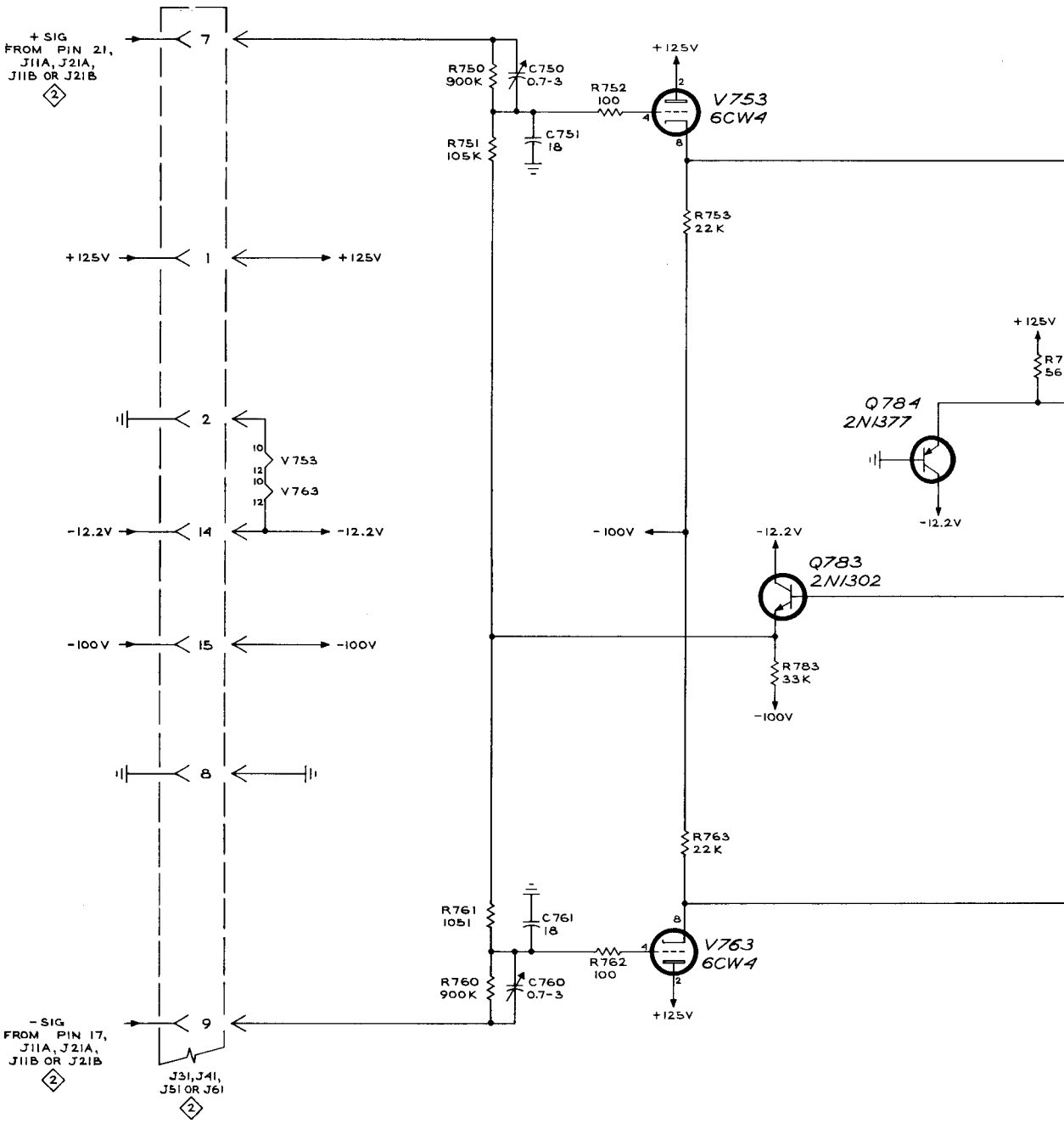
REFERENCE DRAWINGS

② INTERCONNECTING SOCKETS

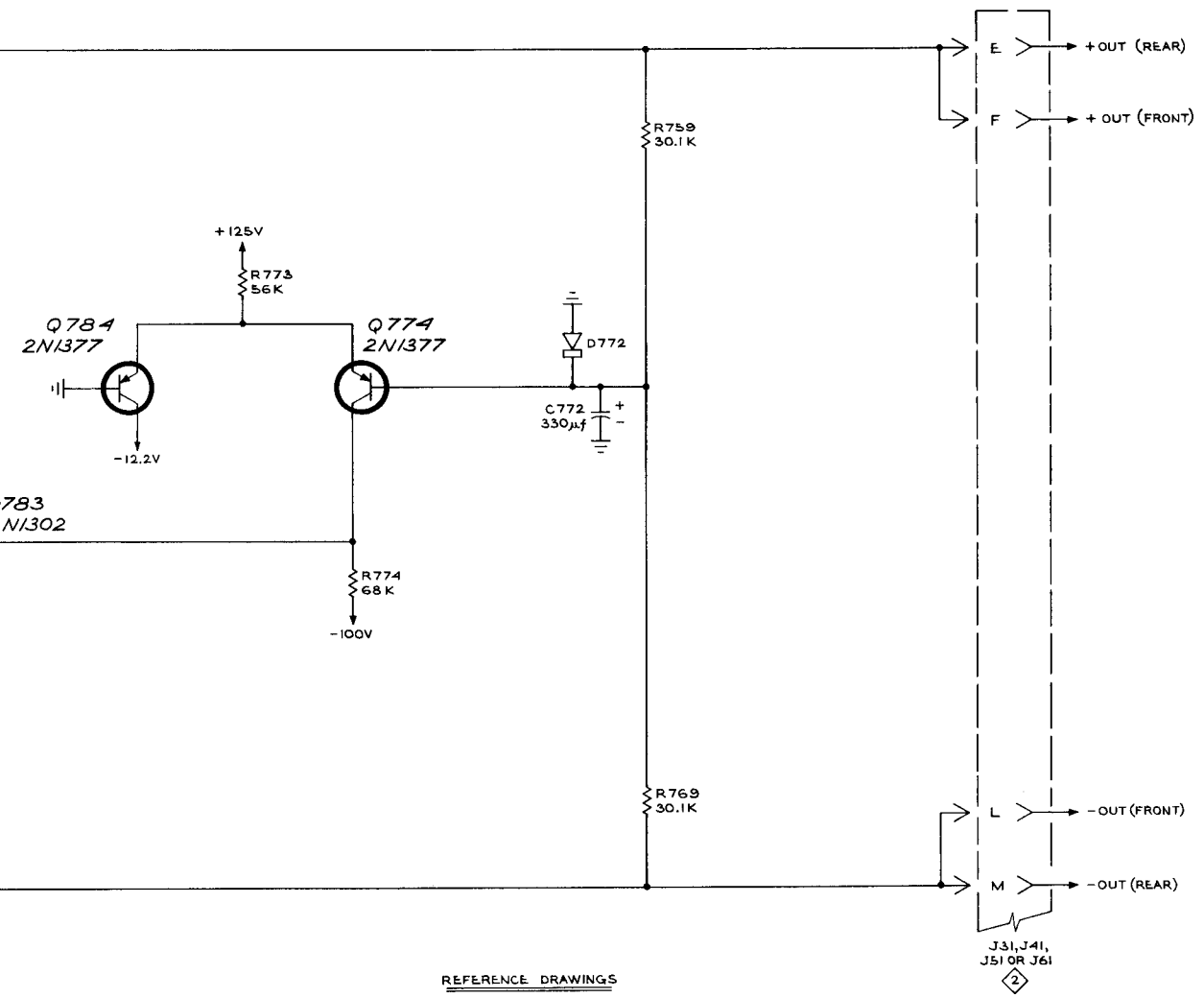
TYPE 129 PLUG-IN POWER SUPPLY

A

POWER SUPPLY ② DON 164



TYPE 129 PLUG-IN POWER SUPPLY



REFERENCE DRAWINGS

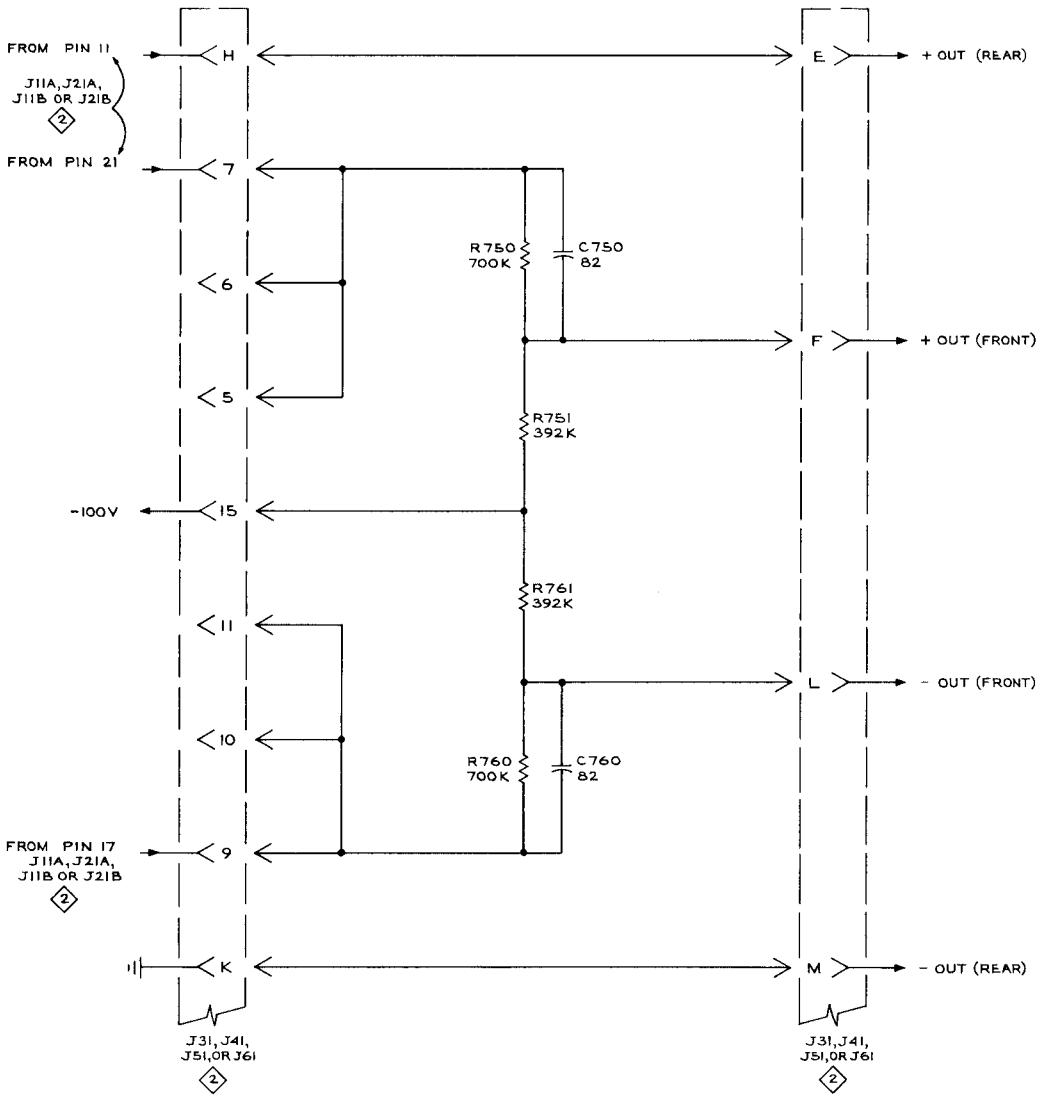
2 INTERCONNECTING SOCKETS

CMD
164

A

CATHODE FOLLOWER CARD 4

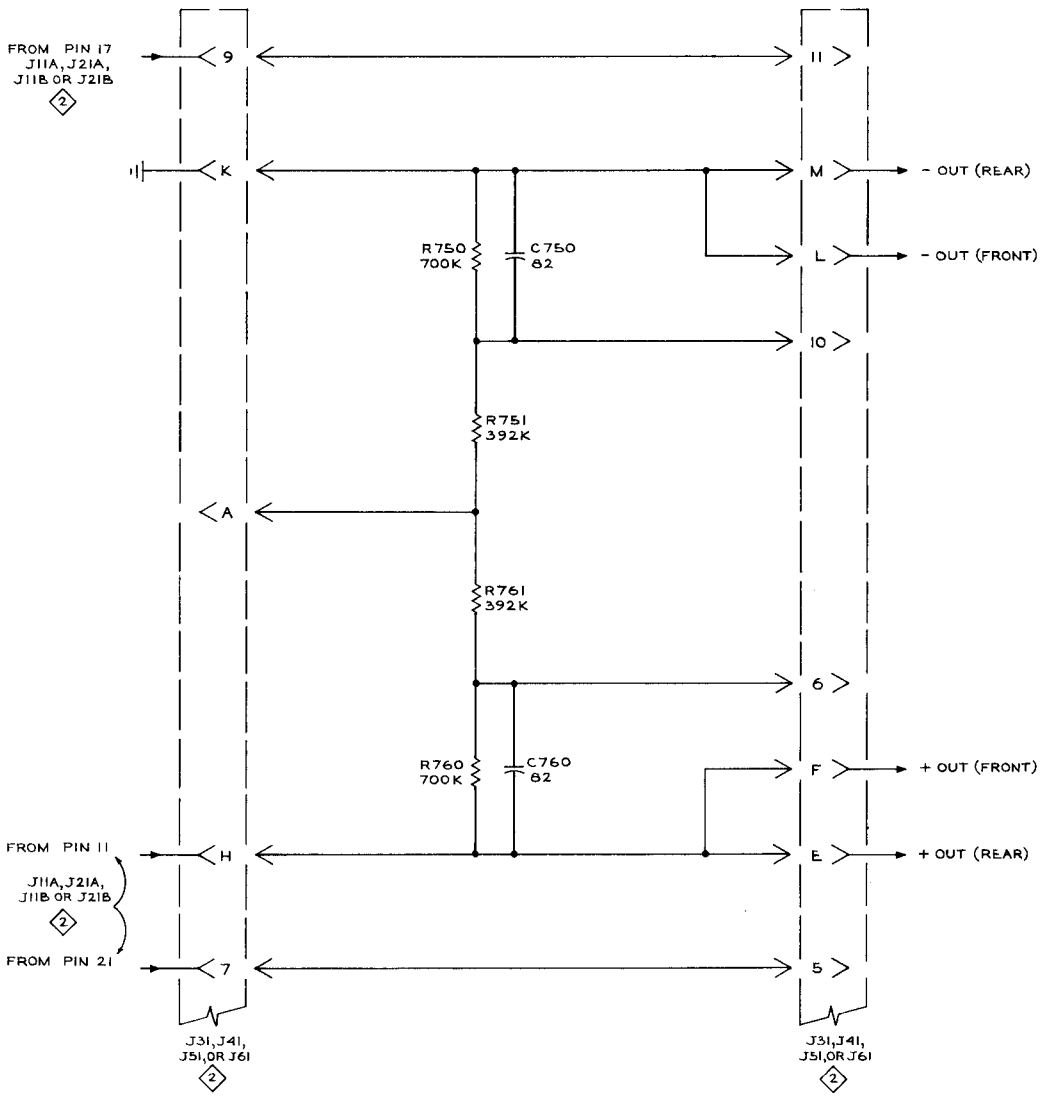
SIDE A



TYPE 129 PLUG-IN POWER SUPPLY

A

SIDE B



REFERENCE DRAWINGS

2 INTERCONNECTING SOCKETS

CMD 164

A

PASSIVE-CIRCUIT CARD 5

MANUAL CHANGE INFORMATION

At Tektronix, we continually strive to keep up with latest electronic developments by adding circuit and component improvements to our instruments as soon as they are developed and tested.

Sometimes, due to printing and shipping requirements, we can't get these changes immediately into printed manuals. Hence, your manual may contain new change information on following pages. If it does not, your manual is correct as printed.