Storno

FM900 UNATTENDED REPEATER

RADIO COMBINATION NUMBER

DIGIT 0-1-2	DIGIT 3	DIGIT 4	DIGIT 5	DIGIT 6	DIGIT 7-8-9	DIGIT 10	DIGIT 11	DIGIT 12	DIGIT 13	DIGIT 14	DIGIT 15	DIGIT 16
PRODUCT CODE	TX FREQ. RANGE	RX FREQ. RANGE	CHANNEL SPACING	RADIO TYPE	RF POWER	FREQ. CAPA-CITY	CONTROL	VERSION	OSC. STABI-LITY	PACK. SIZE	SYSTEM VOLTAGE	RECEIVER TYPE
FM9	3 66-88 MHz	3 66-88 MHz	2 25 kHz	D DUPLEX	006 6 W	A Synthe-sized	U Unat-tended	A STAS EXP	0 Stand.	0 Stand.	0 Stand.	0 Stand.
	1 138-174 MHz	1 138-174 MHz	3 20 kHz		010 10 W	B Non-Synth.		D STAS	A ±2 ppm -25/+55°C		B 12 V Battery	
	6 403-470 MHz	6 403-470 MHz	4 12.5 kHz		018 18 W	C Multiplier		E SLTD	B ±5 ppm -30/+60°C		H 24 V Battery	
					025 25 W			F STOF	D ±10 ppm -25/+55°C		L 110 V AC	
								G STEL	E ±5.3 ppm -20/+55°C		M 220/240 V AC	
								S STAB				

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FM900 UNATTENDED REPEATER

STRUCTURED OPTIONS

A Number of TX Freq.	B Number of RX Freq.	J Repeater Function	L Transmitt. Isolator	N CG Notch	P High IM Attenuation	T Tone System	U Earth. M. supply
0 None	0 None	1 Seq. or single tone	0 None	0 None	0 Standard	0 None	0 None w. euro plug
A 1 CH	A 1 CH	2 CG Activation	1 Isolator	N CG Notch	P High IM Attenuation	1 ZVEI	U 3 wire cable without plug
Z Synthesized	Z Synthesized	3 Carrier Activation	2 Prep. for Isolator			2 CCIR	
		4 CG + seq. or single tone				3 EEA	

NOTE
OPTION T ONLY IF OPTION J IS 1 OR 4.

FM9110 UNATTENDED REPEATER

MODULE SURVEY

Part Number	Radio Type / Module	A Synthesized			B XS-Version			C Multiplier			Remarks
		25	20	12½	25	20	12½	25	20	12½	
19D900072G3	AA901	X	X		X	X		X	X		
19D900072G4	AA902			X			X			X	
19J707758G1	AS903	X	X	X	X	X	X	X	X	X	
19L855061G1	BF911	X	X	X	X	X	X	X	X	X	
19M905411G1-G8	CF901	X	X	X	X	X	X	X	X	X	
19C850537G2	CG903	X	X	X	X	X	X	X	X	X	CF with. CG
19L855281G2	DC911	X	X	X	X	X	X	X	X	X	
19M905224G1	EX911	X	X	X	X	X	X				
19M905387G1	EX912							X	X	X	
19M905216G1	FG912	X	X	X	X	X	X				
19M905398G1	FG913							X	X	X	
19L855386G1	FN903	X	X	X	X	X	X	X	X	X	with CG
19C850527G2	FS902	X		X							
19C850527G3	FS903		X								
19C850520G2	IA902	X			X			X			Omit IA907
19C850520G3	IA903		X			X			X		Omit IA908
19C850520G4	IA904			X			X			X	Omit IA909
19M905348G1	IA907	X			X			X			Omit IA902
19M905348G2	IA908		X			X			X		Omit IA903
19M905348G3	IA909			X			X			X	Omit IA904
19D900007G2	JP901	X	X	X	X	X	X	X	X	X	
19D900184G3	PA911	X	X	X	X	X	X	X	X	X	6/10 W
19D900184G4	PA913	X	X	X	X	X	X	X	X	X	18/25 W
19M905332G1-G4	PS901	X	X	X	X	X	X	X	X	X	110/220 V AC
19M905093G1	RC911	X	X	X	X	X	X	X	X	X	
19L855013G1	VR901	X	X	X	X	X	X	X	X	X	
19L855018G1	VR902	X	X	X	X	X	X	X	X	X	24 V Battery
19C850524G1	XS901				X	X	X				

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FM9330 UNATTENDED REPEATER

MODULE SURVEY

Part Number	Radio Type / Module	A Synthesized			B XS-Version			C Multiplier			Remarks
		25	20	12½	25	20	12½	25	20	12½	
19D900072G3	AA901	X	X		X	X		X	X		
19D900072G4	AA902			X			X			X	
19J707758G1	AS903	X	X	X	X	X	X	X	X	X	
19M905411G1-G8	CF901	X	X	X	X	X	X	X	X	X	
19C850537G2	CG903	X	X	X	X	X	X	X	X	X	CF with. CG
19L855281G3	DC931	X	X	X	X	X	X	X	X	X	
19M905360G1	EX931	X	X	X	X	X	X				
19M905604G1	EX932							X	X	X	
19M905374G1	FG932	X	X	X	X	X	X				
19M905601G1	FG933							X	X	X	
19L855386G1	FN903	X	X	X	X	X	X	X	X	X	with CG
19C850527G2	FS902	X		X							
19C850527G3	FS903		X								
19C850520G2	IA902	X			X			X			Omit IA907
19C850520G3	IA903		X			X			X		Omit IA908
19C850520G4	IA904			X			X			X	Omit IA909
19M905348G1	IA907	X			X			X			Omit IA902
19M905348G2	IA908		X			X			X		Omit IA903
19M905348G3	IA909			X			X			X	Omit IA904
19D900007G2	JP901	X	X	X	X	X	X	X	X	X	
19D900461G1	PA931	X	X	X	X	X	X	X	X	X	6 W
19D900461G2	PA932	X	X	X	X	X	X	X	X	X	18 W
19D905686G1	PA933	X	X	X	X	X	X	X	X	X	25 W
19M905332G1-G4	PS901	X	X	X	X	X	X	X	X	X	110/220 V AC
19M905214G1	RC931	X	X	X	X	X	X	X	X	X	
19L855013G1	VR901	X	X	X	X	X	X	X	X	X	
19L855018G1	VR902	X	X	X	X	X	X	X	X	X	24 V Battery
19C850524G1	XS901				X	X	X				

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FM9660 UNATTENDED REPEATER

MODULE SURVEY

Part Number	Radio Type / Module	A Synthesized 25	A Synthesized 20	A Synthesized 12½	B XS-Version 25	B XS-Version 20	B XS-Version 12½	C Multiplier 25	C Multiplier 20	C Multiplier 12½	Remarks
19D900072G3	AA901	X	X		X	X		X	X		
19D900072G4	AA902			X			X			X	
19J707758G1	AS903	X	X	X	X	X	X	X	X	X	
19M905071G1	BF961	X	X	X	X	X	X	X	X	X	
19M905411G1-G8	CF901	X	X	X	X	X	X	X	X	X	
19C850537G2	CG903	X	X	X	X	X	X	X	X	X	CF with. CG
19L855281G1	DC961	X	X	X	X	X	X	X	X	X	
19M905493G1	EX961							X	X	X	
19M905497G1	FG961							X	X	X	
19L855386G1	FN903	X	X	X	X	X	X	X	X	X	with CG
19C850527G2	FS902	X		X							
19C850527G3	FS903		X								
19C850520G2	IA902	X			X			X			Omit IA907
19C850520G3	IA903		X			X			X		Omit IA908
19C850520G4	IA904			X			X			X	Omit IA909
19M905348G1	IA907	X			X			X			Omit IA902
19M905348G2	IA908		X			X			X		Omit IA903
19M905348G3	IA909			X			X			X	Omit IA904
19D900007G2	JP901	X	X	X	X	X	X	X	X	X	
19D900093G11	PA961	X	X	X	X	X	X	X	X	X	6 W
19D900093G7	PA962	X	X	X	X	X	X	X	X	X	18 W
19D900093G9	PA963	X	X	X	X	X	X	X	X	X	25 W
19M905002G1	PL961	X	X	X	X	X	X				
19M905003G1	PL962	X	X	X	X	X	X				
19M905332G1-G4	PS901	X	X	X	X	X	X	X	X	X	110/220 V AC
19M905018G1	RC961	X	X	X	X	X	X	X	X	X	
19L855013G1	VR901	X	X	X	X	X	X	X	X	X	
19L855018G1	VR902	X	X	X	X	X	X	X	X	X	24 V Battery
19C850524G1	XS901				X	X	X				

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FM9550 UNATTENDED REPEATER

MODULE SURVEY

Part Number	Radio Type / Module	A Synthesized			B XS-Version			C Multiplier			Remarks
		25	20	12½	25	20	12½	25	20	12½	
19D900072G3	AA901	X	X		X	X		X	X		
19D900072G4	AA902			X			X			X	
19J707758G1	AS903	X	X	X	X	X	X	X	X	X	
19M905649G1	BF951	X	X	X	X	X	X	X	X	X	
19M905411G1-G8	CF901	X	X	X	X	X	X	X	X	X	
19C850537G2	CG903	X	X	X	X	X	X	X	X	X	CF with. CG
19L855386G1	FN903	X	X	X	X	X	X	X	X	X	with CG
19C850527G2	FS902,	X		X							
19C850527G3	FS903		X								
19C850520G2	IA902	X			X			X			Omit IA907
19C850520G3	IA903		X			X			X		Omit IA908
19C850520G4	IA904			X			X			X	Omit IA909
19M905348G1	IA907	X			X			X			Omit IA902
19M905348G2	IA908		X			X			X		Omit IA903
19M905348G3	IA909			X			X			X	Omit IA904
19D900007G2	JP901	X	X	X	X	X	X	X	X	X	
19D900093G13	PA953	X	X	X	X	X	X	X	X	X	25 W
19M905002G3	PL951	X	X	X							
19M905003G3	PL952	X	X	X							
19M905332G1-G4	PS901	X	X	X	X	X	X	X	X	X	110/220 V AC
19L855055G2	RC953	X	X	X	X	X	X	X	X	X	
19L855013G1	VR901	X	X	X	X	X	X	X	X	X	
19L855018G1	VR902	X	X	X	X	X	X	X	X	X	24 V Battery
19C850524G1	XS901				X	X	X				

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OVERTONE OSCILLATOR SURVEY

STAB.	X-TAL PART NO.	RADIO TYPE		TX SIDE				RX SIDE		
				OSCILLATOR TYPE	OSCILLATOR PART NO.	X-TAL FREQ. RANGE IN MHz	EX/FG MODULES	X-TAL FREQ. RANGE IN MHz	OSCILLATOR TYPE	OSCILLATOR PART NO.
(B) ±5.3 ppm/-30 to +60°C	J707566P5	S	SIMPLEX	XO908	A701453G41	41.725 - 52.89	FG911	34.60 - 45.75	XO905	A701453G6
			To obtain the three following radio types add the following slave oscillators							
		R	RX side step					34.60 - 45.75	XO907	A701453G18
		T	TX side step	XO908	A701453G41	41.725 - 52.89				
		W	RX/TX side step	XO908	A701453G41	41.725 - 52.89		34.60 - 45.75	XO907	A701453G18
		D	DUPLEX	XO906	A701453G39	41.725 - 52.89	EX911 FG912	34.60 - 45.75	XO905	A701453G6
			Multiplier simplex	XO906	A701453G40	46.000 - 58.00	EX912 FG913	38.25 - 50.87	XO905	A701453G8
			Multiplier duplex	XO908	A701453G42	46.000 - 58.00		38.25 - 50.87	XO907	A701453G20
(E) ±5.3 ppm/-20 to +55°C	J707566P5	S	SIMPLEX	XO908	A701453G41	41.725 - 52.89	FG911	34.60 - 45.75	XO909	A701453G30
			To obtain the three following radio types add the following slave oscillators							
		R	RX side step					34.60 - 45.75	XO907	A701453G18
		T	TX side step	XO908	A701453G41	41.725 - 52.89				
		W	RX/TX side step	XO908	A701453G41	41.725 - 52.89		34.60 - 45.75	XO907	A701453G18
		D	DUPLEX	XO9010	A701453G37	41.725 - 52.89	EX911 FG912	34.60 - 45.75	XO909	A701453G30
			Multiplier simplex	XO9010	A701453G38	46.000 - 58.00	EX912 FG913	38.25 - 50.87	XO909	A701453G32
			Multiplier duplex	XO908	A701453G42	46.000 - 58.00		38.25 - 50.87	XO907	A701453G20
(D) ±10 ppm/-25 to +55°C	J707566P3	S	SIMPLEX	XO908	A701453G41	41.725 - 52.89	FG911	34.60 - 45.75	XO909	A701453G30
			To obtain the three following radio types add the following slave oscillators							
		R	RX side step					34.60 - 45.75	XO907	A701453G18
		T	TX side step	XO908	A701453G41	41.725 - 52.89				
		W	RX/TX side step	XO908	A701453G41	41.725 - 52.89		34.60 - 45.75	XO907	A701453G18
		D	DUPLEX	XO9010	A701453G37	41.725 - 52.89	EX911 FG912	34.60 - 45.75	XO909	A701453G30
			Multiplier simplex	XO9010	A701453G38	46.000 - 58.00	EX912 FG913	38.25 - 50.87	XO909	A701453G32
			Multiplier duplex	XO908	A701453G42	46.000 - 58.00		38.25 - 50.87	XO907	A701453G20

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OVERTONE OSCILLATOR SURVEY

OSC. TYPE	RADIO TYPE		OSCILLATOR PART NO.	CRYSTAL FREQUENCY RANGE IN MHz	CRYSTAL PART NO. FOR STABILITY (D)+ ±10 ppm/ -25 to +55°C	(E)+ ±5.3 ppm/ -20 to +55°C
XO931	SIMP/DUP	TX	D900455G1	41.0 - 50.4	J707566P3	J707566P5
XO932		RX	D900455G2	51.7 - 61.10		
XO933	ONLY MULT.	TX	D900455G3	16.5 - 22.0	J707568P3	J707568P4
XO934		RX	D900455G4	43.7 - 54.7	J707566P3	J707566P5

+ This letter shall be placed as DIGIT 13 in combination number of radio equipment.

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OVERTONE OSCILLATOR SURVEY

STAB.	X-TAL PART NO.	RADIO TYPE		TX SIDE: OSCILLATOR TYPE	TX SIDE: OSCILLATOR PART NO.	TX SIDE: X-TAL FREQ. RANGE IN MHz	EX/FG MODULES		RX SIDE: X-TAL FREQ. RANGE IN MHz	RX SIDE: OSCILLATOR TYPE	RX SIDE: OSCILLATOR PART NO.
(B) ±5.3 ppm, -30/+60°C	J707566P5	B/D	SIMP/DUP	XO906	A701453G11	43.10 - 50.62	PL961	PL962	40.8 - 48.35	XO905	A701453G5
		B (C)	MULT/SIMP	XO906	A701453G12	44.77 - 52.22	EX961	FG961	42.4 - 49.5	XO905	A701453G7
		"	"	XO908	A701453G24	44.77 - 52.22	"	"	42.4 - 49.5	XO907	A701453G19
(E) ±5.3 ppm, -20/+55°C	J707566P5	B/D	SIMP/DUP	XO9010	A701453G35	43.10 - 50.62	PL961	PL962	40.8 - 48.35	XO909	A701453G29
		B (C)	MULT/SIMP	XO9010	A701453G36	44.77 - 52.22	EX961	FG961	42.4 - 49.5	XO909	A701453G31
		"	"	XO908	A701453G24	44.77 - 52.22	"	"	42.4 - 49.5	XO907	A701453G19
(D) ±10 ppm, -25/+55°C	J707566P3	B/D	SIMP/DUP	XO9010	A701453G35	43.10 - 50.62	PL961	PL962	40.8 - 48.35	XO909	A701453G29
		B (C)	MULT/SIMP	XO9010	A701453G36	44.77 - 52.22	EX961	FG961	42.4 - 49.5	XO909	A701453G31
		"	"	XO908	A701453G24	44.77 - 52.22	"	"	42.4 - 49.5	XO907	A701453G19
(A) ±2 ppm, -25/+55°C		B/D	SIMP/DUP	XO902	A707948G1	43.0 - 52.33	PL961	PL962	40.67 - 50.0	XO901	A707948G2
		B (C)	MULT/SIMP	XO902	A707948G1	43.0 - 52.33	EX961	FG961	40.67 - 50.0	XO901	A707948G2

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OVERTONE OSCILLATOR SURVEY

STAB.	X-TAL PART NO.	RADIO TYPE		TX SIDE				RX SIDE		
				OSCILLATOR TYPE	OSCILLATOR PART NO.	X-TAL FREQ. RANGE IN MHz	MODULES	X-TAL FREQ. RANGE IN MHz	OSCILLATOR TYPE	OSCILLATOR PART NO.
(B) ±5.3 ppm, -30/+60°C	J707566P5	B/D	SIMP/DUP	XO906	A701453G85	37.5 - 45.00	PL951 PL952	34.60 - 45.75	XO905	A701453G6
(A) ±2 ppm, -25/+55°C		B/D	SIMP/DUP	XO902	A707948G3	37.46 - 44.13	PL951 PL952	35.00 - 41.76	XO901	A707948G4

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FUNDAMENTAL OSCILLATOR SURVEY

	OSCILLATOR TYPE	OSCILLATOR PART No.	CRYSTAL STABILTY	CRYSTAL FREQ. RANGE MHz	CRYSTAL PART No.	OSCILLATOR+ STABILITY
FS90x	XO9011	D900065G21	10 ppm	12.8 10.24	J707568P5 J707568P7	D or E
	XO9012	D900065G13	5 ppm	12.8 10.24	J707568P6 J707568P7	A or B
XS901	XO9011 Master and slave	D900065G21 D900065G23	10 ppm	10.24-12.8 12.8-17.3	J707568P3	D
	XO9011 Master and slave	D900065G21 D900065G23	5 ppm	10.24-12.8 12.8-17.3	J707568P4	E
	XO9012 Master	D900065G13 D900065G14	5 ppm	10.24-12.8 12.8-17.3	J707568P4	A or B
	XO9013 Slave	D900065G19	5 ppm	12.8-17.3	J707568P4	A or B

+OSCILLATOR STABILITY

A = ± 2 ppm, -25°C to +55°C

B = ± 5.3 ppm, -30°C to +60°C

D = ± 10 ppm, -25°C to +55°C

E = ± 5.3 ppm, -20°C to +55°C

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TECHNICAL SPECIFICATIONS

FM9xxx

EIA= Electric Industries Association (USA).
CEPT= Conférence Européenne des Administrations des Postes et Télécommunications (Europe).
FTZ= Fernmelde Technisches Zentralamt (Germany). (20 dB SINAD without filter, 70% Δf max).

The stated values are guaranteed minimum performance specifications unless otherwise noted.

Dimensions

Type/power W	Height mm	Depth mm	Volume L
Duplex/6	81.0	286	8.73
Duplex/18-25	81.0	286	10.75

(height 80.6 mm is with mounting plate)

Battery Voltage

220 V nom.	176 V - 264 V
240 V nom.	192 V - 250 V
110 V nom.	88 V - 132 V
13.6 V nom.	10.8 V - 15.6 V
26.4 V nom.	21.6 V - 31.2 V

Power consumption (Amp.)

	MAINS		BATTERY	
	220 V	110 V	12 V	24 V
Standby	<0.1	<0.2	<0.7	<0.35
TX 6 W	<0.5	<1.0	<4.0	<2.5
TX 18 W	<0.95	<1.9	<7.0	<4.4
TX 25 W	-	-	<11.0	-

Duty Cycle (EIA)

Duplex: TX Continuous
RX Continuous

Temperature Range

$-30^{o}C$ to $+60^{o}C$

The temperature range depends of the XO module and the X-tal used in the oscillator.

Humidity (EIA)

90-95% at $50^{o}C$ and S-Q-3B

RECEIVER SPECIFICATIONS

Frequency Range

FM911x:	138-174 MHz
FM933x:	66-88 MHz
FM966x:	403-470 MHz
FM955x:	360-420 MHz

Channel Spacing

FM9xx2:	25 kHz
FM9xx3:	20 kHz
FM9xx4:	12.5 kHz

Frequency Stability

The stability depends upon the X-tal used in the oscillator.

SINAD SENSITIVITY

EIA:	12 dB ($\frac{1}{2}$ emf)
CEPT:	20 dB psophometric

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High intermodulation attenuation
Duplex: 0.45 uV (EIA), 1.1 uV (CEPT, FTZ)

20 dB QUIETING SENSITIVITY

High intermodulation attenuation (RC9x1) EIA
Duplex: 0.63 uV

Modulation Acceptance Bandwidth
FM9112: ±7.0 kHz (EIA, CEPT)
FM9113: ±6.0 kHz (FTZ)
FM9114: ±3.0 kHz (EIA, CEPT)

ADJACENT CHANNEL SELECTIVITY

FM9112/FM9332: 95 dB (EIA, CEPT)+
FM9113/FM9333: 92 dB (EIA, FTZ)+
FM9114/FM9334: 75 dB (EIA, CEPT)

FM9662/FM9552: 90 dB (EIA, CEPT)+
FM9663/FM9553: 85 dB (EIA, FTZ)+
FM9664/FM9554: 75 dB (EIA, CEPT)

+ Degraded by 5 dB when a channel synthesizer is used in the system.

INTERMODULATION EIA/CEPT/FTZ

		CHANNEL GENERATOR		RECEIVER FRONT-END			
		FS90x	XS901	RC91x	RC93x	RC96x	RC95x
CHANNEL SPACING		SYNTHE-SIZER	CRYSTAL OSC.	HIGH INTERMODULATION ATTENUATION			
2	25 kHz	x		80 dB	80 dB	80 dB	80 dB
			x	85 dB	80 dB	84 dB	85 dB
3	20 kHz	x		78/72 dB	80/74 dB	80/74 dB	80/74 dB
			x	82/70 dB	80/74 dB	82/76 dB	82/76 dB
4	12.5 kHz	x		75 dB	75 dB	75 dB	75 dB
			x	75 dB	75 dB	75 dB	75 dB

2= EIA and CEPT measuring standard
3= EIA/FTZ measuring standards
4= EIA and CEPT measuring standard

SPURIOUS REJECTION EIA/CEPT

EIA/FTZ:
Duplex TX keyed: 85 dB
Duplex TX unkeyed: 100 dB

CEPT:
Duplex TX keyed: 77 dB
Duplex TX unkeyed: 92 dB

Co-Channel Rejection, CEPT
Better than 8 dB

Conducted Spurious, CEPT, FTZ
2.0 nW (~ -57 dBm)

Radiated Spurious, CEPT, FTZ
2.0 nW (~ -57 dBm)

Duplex spacing
from 4.5 MHz to 12 MHz

MAX. RX CHANNEL BANDWITH

MODE / DUPLEX	RECEIVER FRONT - END 1 dB DEGRADATION[1]			RECEIVER FRONT - END 3 dB DEGRADATION[1]			RECEIVER FRONT - END 6 dB DEGRADATION[1]		
	RC91x	RC93x	RC96x	RC91x	RC93x	RC96x	RC91x	RC93x	RC96x
	HIGH INTERMODDUALTION ATTENUATION								
4.5 MHz	1.0 MHz	0.7 MHz	1.0 MHz	1.2 MHz	1.0 MHz	1.2 MHz	1.6 MHz	1.4 MHz	1.6 MHz
6 MHz	1.1 MHz	0.9 MHz	1.1 MHz	1.5 MHz	1.2 MHz	1.5 MHz	2.0 MHz	1.6 MHz	2.0 MHz
8 MHz	1.3 MHz	1.0 MHz	1.3 MHz	1.6 MHz	1.3 MHz	1.6 MHz	2.3 MHz	1.7 MHz	2.3 MHz
10-12 MHz	1.3 MHz	1.0 MHz	1.3 MHz	1.6 MHz	1.3 MHz	1.6 MHz	2.3 MHz	1.7 MHz	2.3 MHz

[1] Degradation with respect to sensitivity

Nominal Input Impedance

50 ohm

Critical Squelch Sensitivity SINAD

4.0 dB at 25°C

10.0 dB at -40°C +70°C

10.0 dB nominally adjusted

Maximum Squelch Sensitivity

20 dB Quieting

≤1.5 uV (RF Input)

Squelch Hysteresis

(between squelch opening and closing) >0.5 dB

Squelch Blocking

25 kHz Channel Spacing > ±5.0 kHz (EIA, CEPT)

20 kHz Channel Spacing > ±4.0 kHz (FTZ)

12.5 kHz Channel Spacing > ±2.5 kHz (EIA, CEPT)

Squelch tail, Speaker Audio Squelch (EIA):

RF input	SQ setting	Reaction time
Critical Opening Treshold	critical	<300 ms
>30 dB quieting	critical	<20 ms
30 dB quieting	maximum	<10 ms

Receiver attack time, at Speaker

RF input	SQ setting	Reaction time
Critical Opening Treshold	critical	<200 ms
>30 dB quieting	critical	<40 ms
30 dB quieting	maximum	<40 ms

Fast squelch logic control (EIA)

RF input	SQ setting	Reaction time
Critical Opening Treshold at +6 dB	critical	<10 ms
>30 dB quieting	critical	<5.0 ms
30 dB quieting	maximum	<5.0 ms

Audio Distortion at Rated Output

EIA at 1 kHz: <3%

CEPT: <10% (includes extremes at 2.00 W)

FTZ: <5%

Audio Frequency Response at Speaker

20/25 kHz channel spacing

(dB relative to -6 dB/octave deemphasis)

400 - 2700 Hz: +1 dB, -1.5 dB (FTZ)

300 - 3000 Hz: +1 dB, -3.0 dB (CEPT, FTZ)

With CG filter relative to 1000 Hz (EIA)

70 - 204 Hz: <-16 dB

67 - 210.4 Hz: <-13 dB

12.5 kHz channel spacing (CEPT)
(dB relative to -6 dB/octave deemphasis)
300 - 2500 Hz: +0.5 dB, -3.0 dB

With CG filter relative to 1000 Hz (EIA)
70 - 204 Hz: <-16 dB
67 - 210.4 Hz: <-13 dB

Duty Cycle at Rated Audio
Continuous

FM Hum and Noise
20 - 25 kHz:
Squelched: -80 dB (EIA, CEPT), -75 dB (FTZ)
Unsquelched: -60 dB (EIA, CEPT), -55 dB (FTZ)

12.5 kHz:
Squelched: -70 dB (EIA, CEPT), -65 dB (FTZ)
Unsquelched: -54 dB (EIA, CEPT), -49 dB (FTZ)

TRANSMITTER SPECIFICATIONS

Frequency Range
FM911x: 138-174 MHz
FM933x: 66-88 MHz
FM966x: 403-470 MHz
FM955x: 360-420 MHz

Power Output
Continous Duty: 25/18/6 W
Adjustable down to: 8/ 5/3 W

Load Impedance
50 ohm

Duplex spacing
from 4.5 MHz to 12 MHz

PA Protection to Load Variation
No damage for 0 to ∞ impedance loads and all phase angles.

Audio Sensitivity for Rated Deviation (1000 Hz)
100 mV ±1 dB (EIA/CEPT, FTZ) at 25°C

Adjacent Channel Power
EIA/CEPT
20 - 25 kHz: -70 dB
12.5 kHz: -60 dB

Maximum Frequency Deviation
25 kHz Channel spacing:
EIA/CEPT max. ±5 kHz
FTZ max. ±4 kHz

20 kHz Channel spacing:
EIA max. ±4 kHz

12.5 kHz Channel spacing:
CEPT max. ±2.5 kHz

MAXIMUM TX CHANNEL BANDWITH

MODE / DUPLEX	FREQUENCY GENERATOR FULL SPECIFICATION			FREQUENCY GENERATOR 1 dB DEGRADATION[1)]				
	FM911x	FM933x	FM966x	FM911x	FM933x	FM966x		
						25 kHz	20 kHz	12.5 kHz
4.5 MHz	1.0 MHz	0.7 MHz	0.8 MHz	1.2 MHz	0.9 MHz		1.2 MHz	
6 MHz	1.1 MHz	0.9 MHz	1.3 MHz	1.3 MHz	1.1 MHz		1.8 MHz	
8 MHz	1.3 MHz	1.1 MHz	2.0 MHz	1.5 MHz	1.3 MHz	3.0 MHz	2.56 MHz	3.0 MHz
10-12 MHz	1.5 MHz	1.5 MHz	2.5 MHz	1.8 MHz	1.7 MHz	3.5 MHz	2.56 MHz	3.2 MHz

[1)] Degradation with respect to RF output power.

Frequency Stability

The stability depends upon the X-tal used in the oscillator.

Conducted Spurious

Harmonics: 0.25 uW (EIA, CEPT), -36 dBm (FTZ)
Other: 0.20 uW (EIA, CEPT), -37 dBm (FTZ)

Radiated Spurious

0.20 uW (EIA, CEPT), -37 dBm (FTZ)

FM Hum and Noise (EIA/CEPT)

	With XS	With FS
25 kHz channel spacing:	70 dB	55 dB
20 kHz channel spacing:	65 dB	55 dB
12.5 kHz channel spacing:	60 dB	45 dB

This specification is degraded by 15 dB when a channel synthesizer is used in the system.

AM Hum and Noise (EIA)

-50 dB

Audio Response

(Ref. +6 dB/Octave Preemphasis)

20 - 25 kHz:

400 - 2700 Hz: +1.0 dB, -1.5 dB (FTZ)

300 - 3000 Hz: +1.0 dB, -3.0 dB (CEPT, FTZ)

12.5 kHz:

300 - 2500 Hz: +0.5 dB, -3.0 dB (CEPT)

Audio Distortion

(At 60% Rated deviation w/o CG)

At 1000 Hz:

EIA <3%

CEPT <10%

At 300 - 3000 Hz:

EIA <5%

CEPT <10%

Transmit Attack Time

With Relay Antenna Switch: 20 ms
With Duplexer or Solid State Antenna Switch at 25 Watts or less: 5 ms

Transmit Decay Time

With Relay Antenna Switch: 20 ms
With Duplexer or Solid State Antenna Switch at 25 Watts or less: 5 ms

Storno

REPEATER UNIT

CF901

The CF901 is a hardware module used in Stornophone 900 unattended repeater stations. The module is available in eight different versions each with various options.

The versions are:

Version G1 Channel spacing 20/25 kHz. Repeater function activated upon reception of 4/5-tone sequential signal or single tone signal and squelch signal present. The tone series used is ZVEI. A carrier control timer (CCT) circuit closes the repeater transmitter after a preset time.

Version G2 Same as version G1 but with CCIR tones.

Version G3 Same as version G1 but with EEA tones.

Version G4 Same as version G1 but with Squelch signal activation only.

Version G5 Same as version G1 but for 12.5 kHz channel spacing.

Version G6 Same as version G2, but for 12.5 kHz channel spacing.

Version G7 Same as version G3 but for 12.5 kHz channel spacing.

Version G8 Same as version G4 but for 12.5 kHz channel spacing.

The module is built on one printed wiring board which is mounted on the place normally occupied by the control logic (CL) and the audio amplifier (AA) modules. A strapping arrangement on the module allows different options regarding timing of the functions to be selected and setting of tone codes and channel code. (refer to schematic diagram and coding instructions).

FUNCTIONAL DESCRIPTION

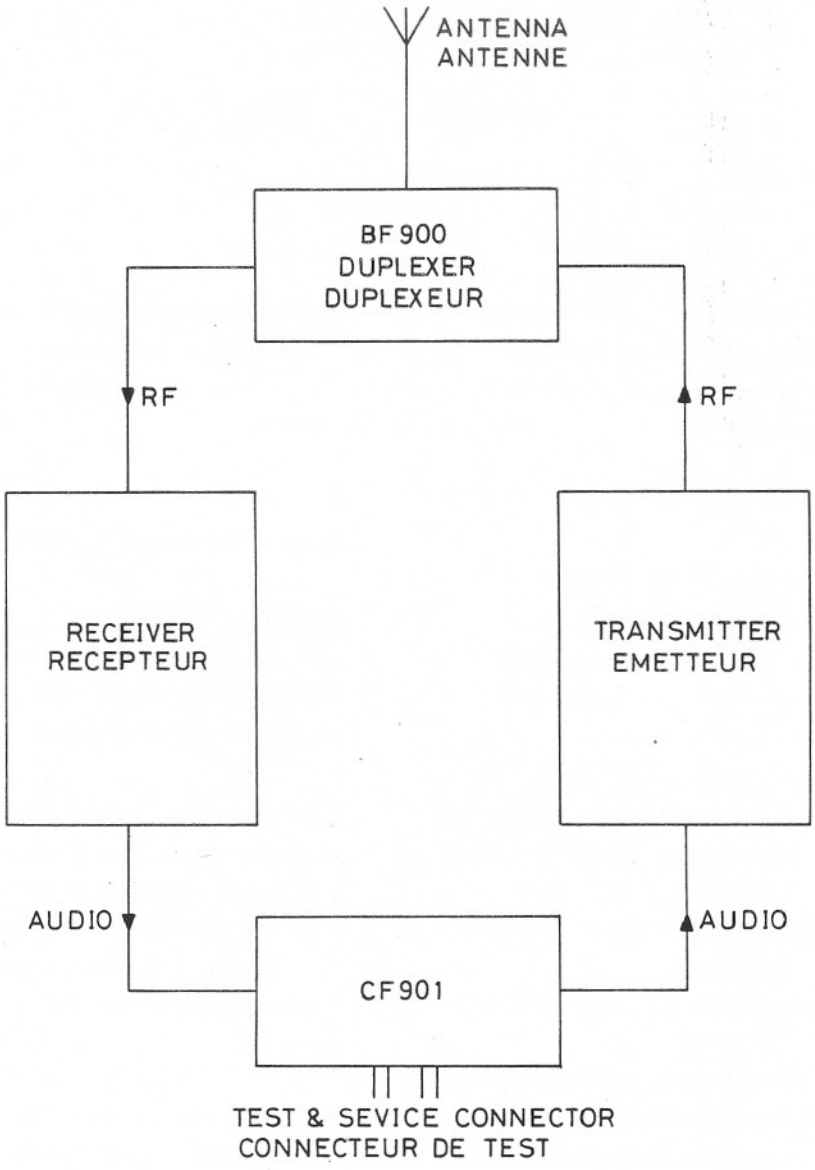
The Stornophone 900 unattended repeater station operates in the duplex mode and the CF901 module modulates the transmitter with the received audio signal for retransmission.

The transmitter can be activated by the squelch circuit alone or by a combinations of the squelch signal and reception of a tone signal which can be either a sequential tone signal or a single tone signal. A squelch delay circuit closes the transmitter after a preset time if no carrier is being received.

A carrier control timer (CCT) circuit is an option which limits the time of one transmission period. Two different time limits can be selected. Combined with an attention tone circuit the user will hear a tone when the repeater is about to close the transmitter. A delay circuit ensures that a preset time must elapse before the transmitter again can be activated.

CF901 is connected to the channel guard CG903 detect output, to the TX audio and to the discriminator audio. There is access to CF901's command and control functions from the front connector of the station. This is used for service and maintenance.

3



CF 901

D403.270

CIRCUIT DESCRIPTION

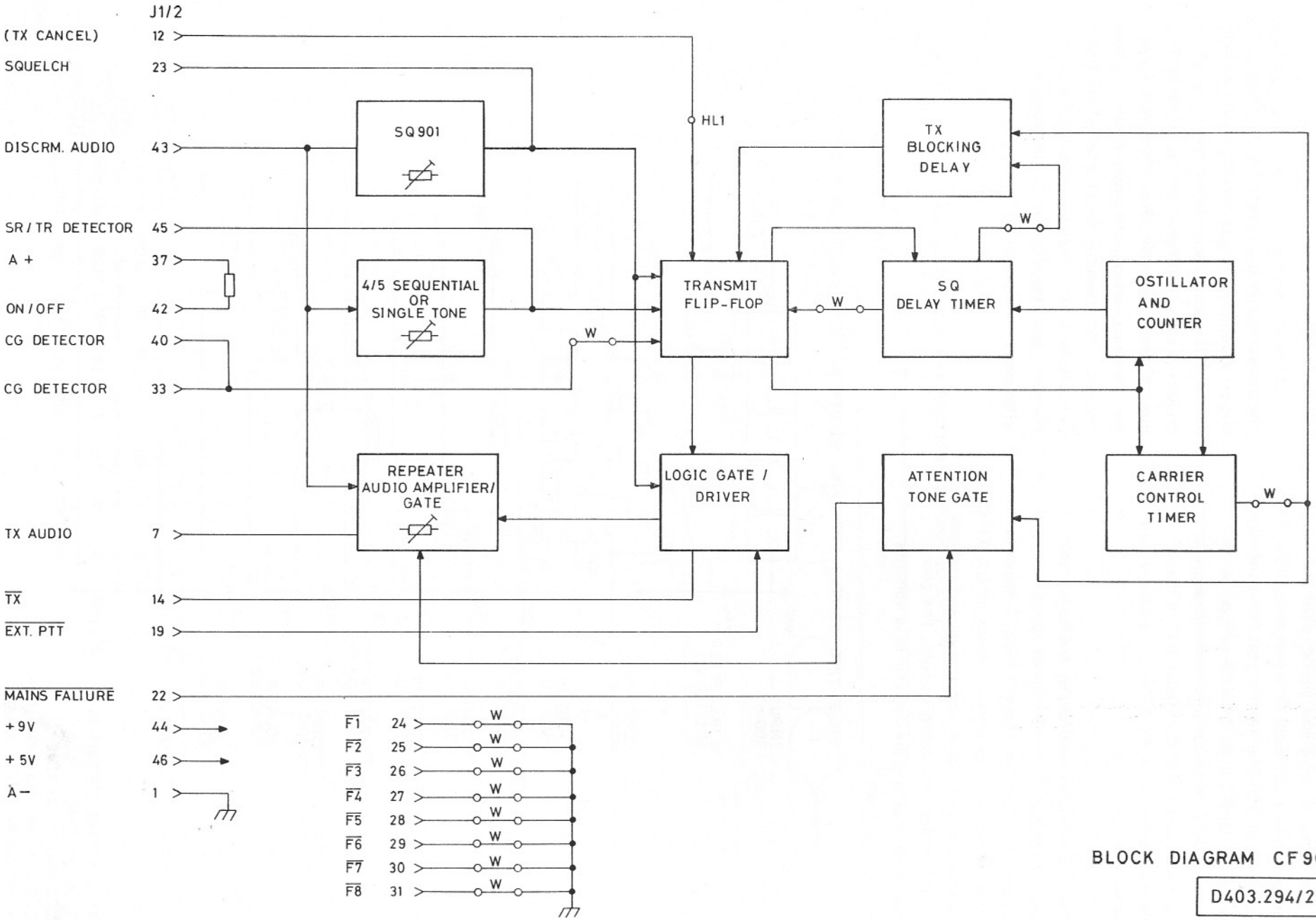
4/5 SEQUENTIAL TONE-OR SINGLE TONE RECEIVER

INPUT AMPLIFIER AND LIMITER

Transistors Q1, Q2, and Q3 form a differential input amplifier/limiter, and Q4 is the resonant circuit driver. The received tone signal is amplified, the gain being constant and determined by the ratio of R6 to R7. Signal levels higher than the minimum sensitivity (approx. 150 mV) will cause limiting. The tone signal is then applied to the driver Q4. Transistor Q4 operates as current generator with its collector connected to a separate winding on the tone coil. The sensitivity (and thus the sequential tone receiver bandwidth) is adjustable with R12.

RESONANT CIRCUIT

The band pass filter consists of tone coil L1 and capacitor C5.
The signal from the input amplifier is coupled to the parallel resonant circuit via the coupling link. The colour coded wires from the tone gates switch the tone coil taps into the circuit in parallel with capacitor C5.



BLOCK DIAGRAM CF901

D403.294/2

Storno

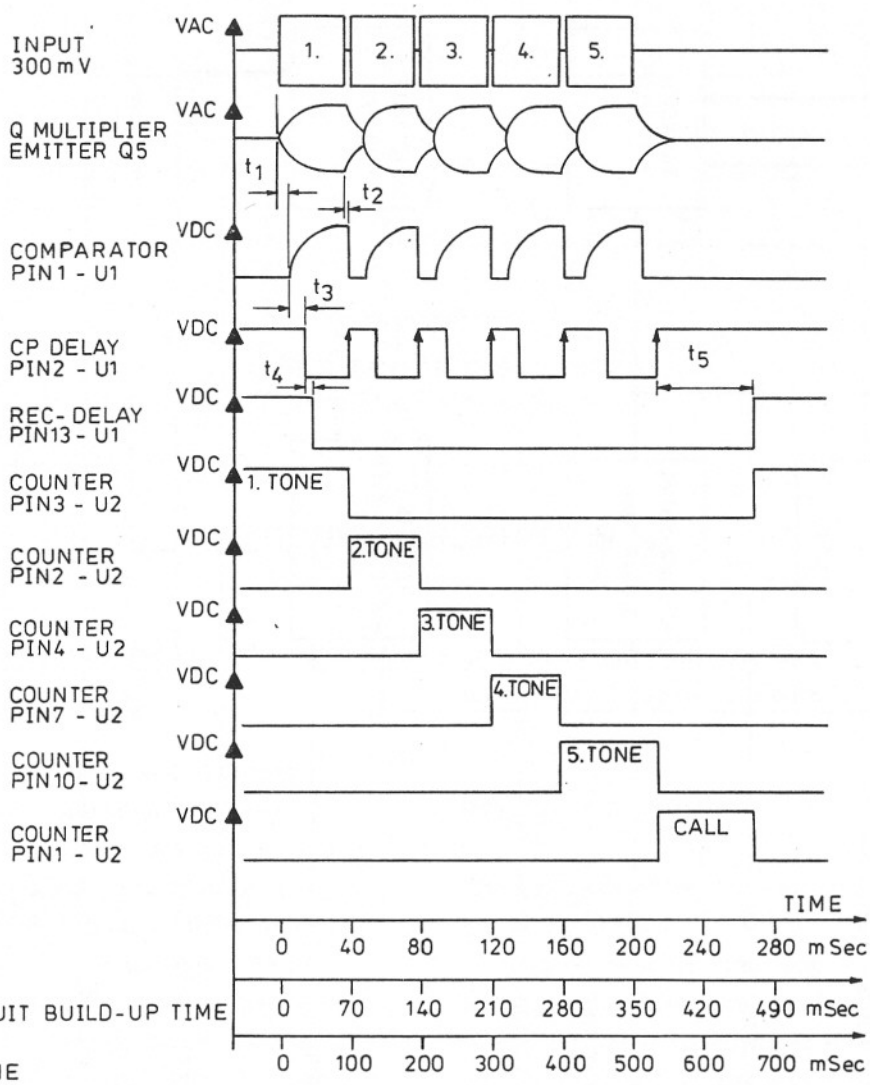
A part of the selected tone signal is fed via the Q-multiplier Q5 back to the coupling link and in phase with the input signal. This increases the bandpass filter Q-factor to approx. 30. Resistor R16 linearizes this factor throughout the band, and the NTC resistor R15 in the Q5 emitter compensates the Q-factor variations with ambient temperature.

The tone signal is rectified by transistor Q8 and the resultant d.c. voltage is applied to comparator U1a. The signal voltage across the resonant circuit is amplitude limited by Q7. This gives a constant signal output level and reduces the decay time for strong signals. The gate transistor bias and the detector bias voltages are derived from Q6.

COMPARATOR

The comparator is built around U1a and its trigger reference level is determined by voltage divider R22-R23. The rectified tone signal increases the d.c. voltage to the non-inverting input of the comparator. When the level exceeds the reference voltage, the output of U1a changes from short to ground to the off state. This state persists for a time determined by the length of the tone. After the tone period, the output will revert to form a ground path.

PULSE-TIME DIAGRAM FOR 5TONE SEQUENTIAL TONE RECEPTION IN CF901



t_1: SELECTIVE CIRCUIT BUILD-UP TIME
t_2: DECAY TIME
t_3: CLOCK-DELAY TIME
t_4: RECOVERY CHARGING TIME
t_5: RECOVERY DELAY TIME

CF 901

D403.295

CLOCK-DELAY AND CLOCK GENERATOR

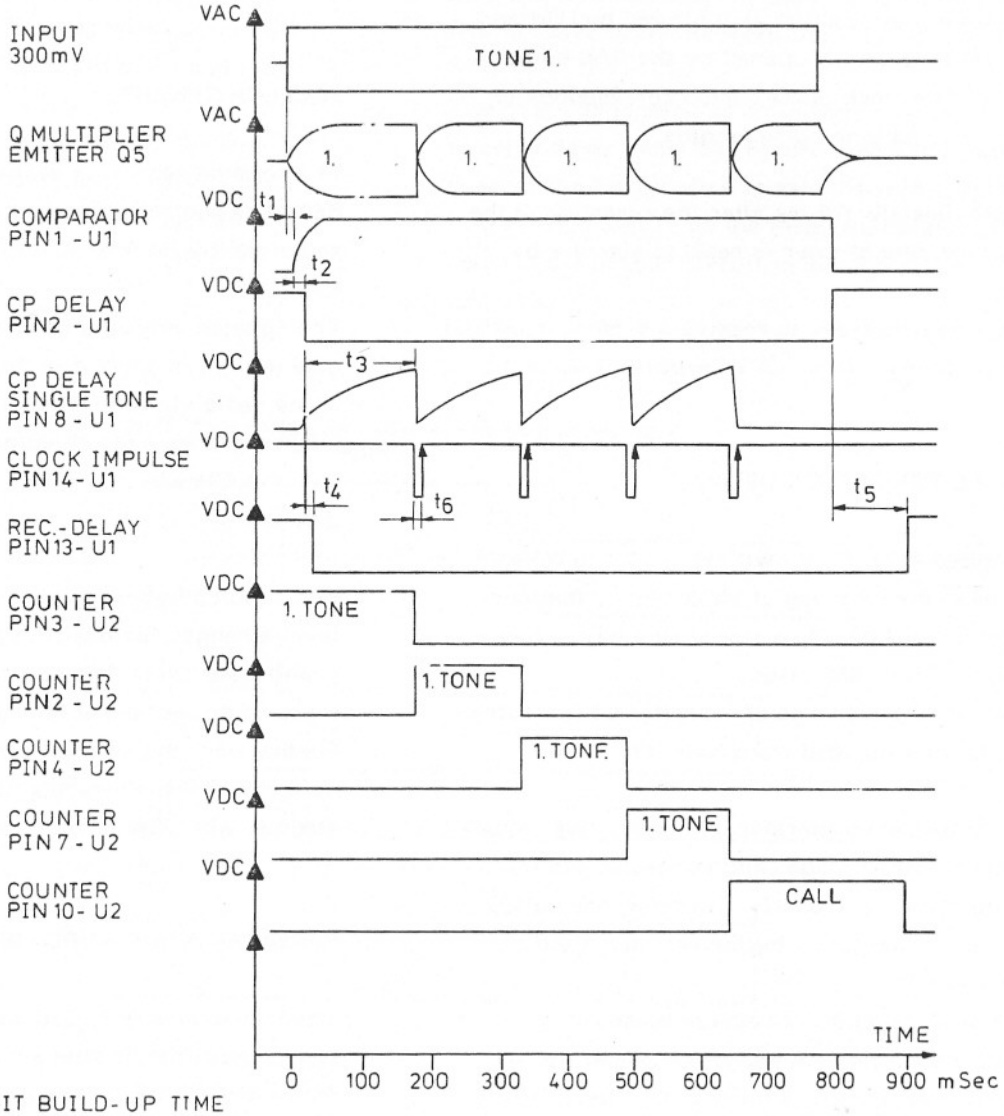
The clock-delay is determined by R24 and C7. In standby the charge of capacitor C7 is neutral due to the discharge through the output of U1a, and the clock generator U1b is inhibited in its off position. The reference voltage, via voltage divider R25, R26, R27, is applied to the non-inverting input. When the comparator U1a is activated, the voltage across C7 will start to go positive. After 20 ms (clock-delay) the Schmitt trigger U1b will be activated and the output voltage will drop to 0 V. At the end of the tone, C7 discharges via U1a.

This produces a positive going voltage edge at the U1b output, which is applied via jumper W9 to the clock input of counters U2. Their outputs switch the circuit to the next tone gate. If the comparator detects a new tone the procedure is repeated as previously described.

RECOVERY DELAY

Comparator U1d is controlled by the Schmitt trigger U1b. In standby the charge of C9 is neutral because D1 is reverse biased.

PULSE-TIME DIAGRAM FOR SINGLE TONE RECEPTION



t_1 : SELETIVE CIRCUIT BUILD-UP TIME
t_2 : SEQUENTIAL CLOCK DELAY TIME
t_3 : SINGLE TONE CLOCK DELAY TIME
t_4 : RECOVERY CHARGING TIME
t_5 : RECOVERY DELAY TIME
t_6 : SINGLE TONE RECHARGING TIME

CF901
D403.296

The output level of U1d corresponds to the supply voltage, 9 V, and counter U2 is cleared and set to the 1st tone gate. Triggering U1b enables C9 to be discharged via D1 and R34. When the voltage has fallen to the reference level, U1d changes its output to 0 V and releases counter U2. U2 is then ready to receive the clock pulses.

COUNTER AND TONE GATES

The outputs of U2 control the tone gates, Q10-Q14.

In standby the counter is inhibited by U1d and the 1st tone gate is opened by the first output pin 3. The clock pulse period corresponds to the received tone pulse lengths.

Approximately 120 ms after the cessation of the last tone, the counter is reset to standby by U1d.
The time necessary to receive a 5-tone sequential signal appears from the time-pulse diagrams.

SINGLE TONE CLOCK DELAY

Strapped accordingly with wires W1 to W5 soldered to the same tag of the tonecoil, the tone receiver will decode a single tone with a tone-length of min. 850 msec.
In standby the charge of capacitor C8 is neutral, due to the saturated transistor Q9.

The output of comparator U1c is positive, equal to the supply voltage, and connected via W32 to the clock input of U2. The reference voltage to U1c is determined by the resistor divider R32 and R37.
Diodes D2 and D3 are reverse biased.
When the single tone appears, comparator U1b is activated and Q9 is turned off. The voltage across C8 will increase untill it equals the reference voltage, which causes the output of U1c to drop to 0 V. The diodes D2 and D3 will be forward biased and turn U1c off again. The positive going voltage edge, at the output of U1c, switches the counter to the next tone gate transistor. The procedure is repeated until 4 tone gates has been activated.

The wire jumper W11 is used for 5 seq. tone call. W10 is used for 4 seq. tone call and single tone call. The width of the call pulse depends upon the time of the recovery delay, which vary between the different tone rows. The tone call, together with the SQ - or CG903 detect signal, is used to trigger the TX flip-flop U4a/U4b.
The call pulse is supplied to the front connector of the radio via connector pin 45 of the CF901 module, for service purposes.

SQUELCH CIRCUIT

The squelch control is set by the potentiometer R62. The control voltage is temperature compensated via the resistor network R64, R65 and R66.
The squelch output is connected to the invertor gate U6b. It is applied to the front connector of the radio via connector pin 23, for service purposes. The squelch output is delayed via R71 and C16 and via R70 connected to selecter-gate U4c.

The squelch hybrid SQ901 indicates the signal level strength, before activating the TX flip-flop (nand-gate U4c). The squelch tail must be longer than the decay time of the sequential tone receiver. Furthermore the squelch controls the squelch delay timer U8. U8 resets flip-flop U4a/U6c to standby when the traffic has ended.

REPEATER AUDIO AMPLIFIER - AND GATE CIRCUIT

The transistors Q15, Q16 and Q17 form a differential amplifier to shape the discriminator signal for re-transmitting. The gain of the amplifier is determined by the de-emphasis network R54 and C12. The output audio level, TX audio, can be adjusted by the potentiometer R53 to nominal microphone modulation input. The discriminator signal is gated via transistor Q18

and is connected to the input of the modulation amplifier and to the front connector of the radio (external microphone connection).
The repeater gate Q18 is turned on by Q19, which base is connected to gate U5b. When external microphone is used (service etc.) the output of gate U5c is high, due to the Ext. $\overline{PTT}$ input, which affects gate U5b and mutes Q18.

TRANSMIT FLIP-FLOP AND LOGIC GATE/DRIVER

The "Q" output of the TX flip-flop U4a/U4c, is connected to the base of Q20 and gate U7b. It is 0 V in standby. The opposite output "$\overline{Q}$" is connected to the reset input of U9 and U10. It is 5 V in standby.
The TX combination is selected via the wire jumper W15. If one of the input to U4c is 0 V, the output is 5 V. This does not affect the TX flip-flop.

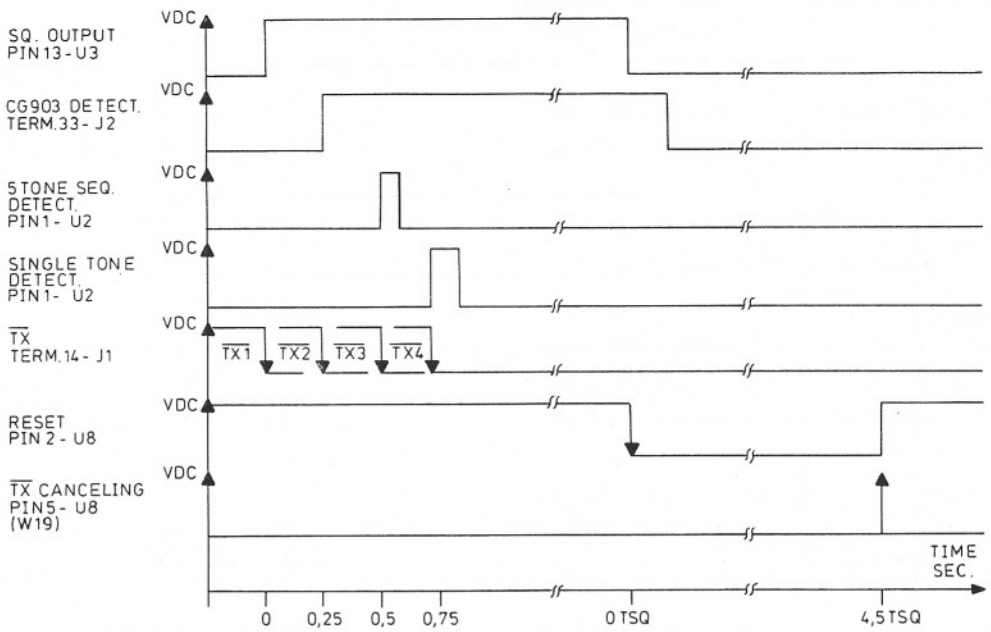
A low output from U4c sets the TX flip-flop and the following functions will be enabled:

- Astable multivibrator anc prescaler U10.
- PA module via Q20.
- Squelch delay timer U8, depending of the SQ output.
- Carrier control timer U9.

If the CG903 detect output is used as TX condition, the wire jumper W15 is inserted after which the delay timer U8 depends only upon the CG decoder.

When the supply voltage is removed or failure arises in the mains power supply, the TX flip-flop is reset by the network D6, C17, R76 and R77.
The gate U5a is used as an inverter for the squelch delay timer U8. External access to the reset of the TX flip-flop is established by drilling the hole, HL1, on the PWB. Be careful to connect the proper circuit to the input (TX CANCEL).

PULSE-TIME DIAGRAM FOR $\overline{TX}$ COMBINATION AND SQUELCH $\overline{TX}$ CANCELING DELAY
(WIRE JUMBER W9, W11, W12, W16 AND W19 ARE USED)



$\overline{TX1}$: TX COMBINATION = SQ OUTPUT ONLY
$\overline{TX2}$: TX COMBINATION = CG DETECT ONLY
$\overline{TX3}$: TX COMBINATION = SQ AND 5 SEQ. TONE
$\overline{TX4}$: TX COMBINATION = SQ AND SINGLE TONE

CF 901
D403.297

SQUELCH DELAY TIMER AND ATTENTION TONE CIRCUIT

The time period of the counter U10, output Q4 is 976 usec. = 1025 Hz and output Q14 is 1 sec. The gate U6a generates an attention tone of 1025 Hz every 0.5 sec. The attention tone is applied to the input of the repeater audio amplifier via R56 and C14.
The gate U5d mutes the attention tone and can be enabled externaly by grounding the MAINS FAILURE input, or internally by the CCT timer gate U7c and via R83.

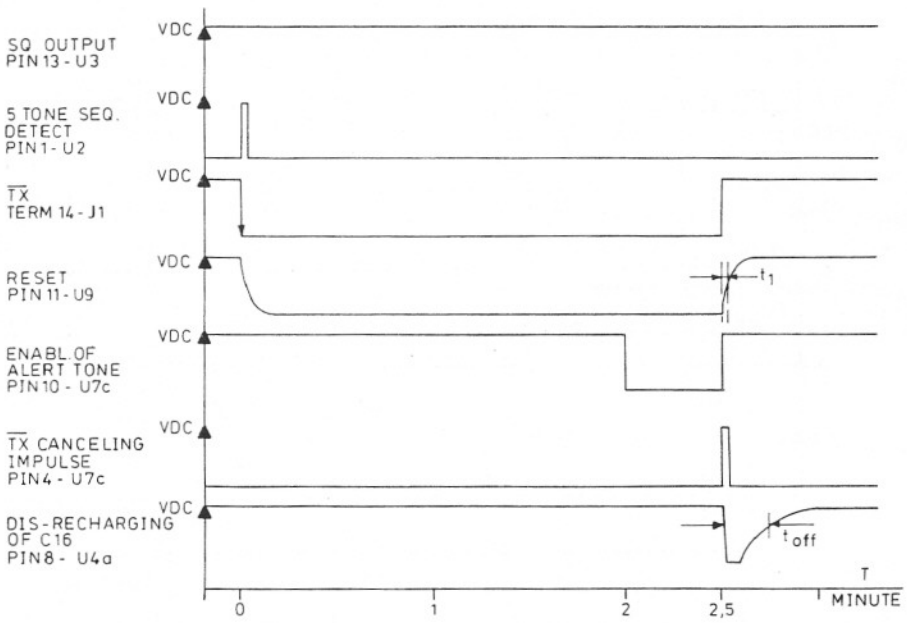
The clock input period of the squelch delay timer U8, is 250 msec. giving 3 different squelch delays: 4 sec., 8 sec. and 16 sec. by inserting one of the wire jumpers W19, W18 or W17.
When the traffic is over, U8 is enabled by the squelch circuit, U3 via gate U6d and U7d, and the TX flip-flop will be reset when the selected counter output Q5, Q6 or Q7 switches from 0 V to 5 V.
The TX flip-flop is reset and only the right TX combination, is able to key the transmitter for a new traffic.

When the squelch delay timer U8 ran out the TX flip-flop is blocked, for about 8 sec., which can be selected by insertion of W16.

CARRIER CONTROL TIMER CIRCUIT

The mode of operation for CCT-timer is identical with the mode of operation of the squelch delay timer. Two different periods of time can be chosen by inserting wire jumper W21 (2.6 min) or W20 (4.8 min).
When the TX flip-flop is activated the CCT-timer is enabled and starts counting.
When the counter output Q8 or Q9 switches from 0 V to 5 V, the gate U7c enables the attention tone gate U5d. The tone will be heard for about 0.5 min before the gates U7a, triggers the blocking flip-flop U4b and U7b. When Q21 is activated it discharges the capacitor C16 within 5 msec. The TX flip-flop is reset and locked for about 8 sec. Afterwards, the transmitter can be keyed again.

PULSE-TIME DIAGRAM FOR CARRIER CONTROL TIMER
(WIRE JUMPER W9, W11, W12, W16 AND W21 ARE USED)



t_1 : PULSE WIDTH OF $\overline{TX}$ CANCELING IMPULSE (DISCHARGING OF C17 ≅ 8 m Sec
t_{off} : BLOCKING PERIODE $\overline{TX}$ FLIP-FLOP ≅ 5 Sec

CF 901
D403.298

OPTIONAL CHANNEL SELECTION JUMPERS

A 8 bit channel code can be established by inserting the wire jumper W23 to W30. When the binary code for the synthesizer is inserted, a 1 is equal to open circuit and only the 0-bit positions require wire jumpers.
W23= LSB and W30= MSB of the binary frequency code.

SPECIFICATIONS

INTERFACE

Pin 43
Nom. input to CF901: 300 mVRMS at 1 kHz

Input to seq. tone - or single tone receiver, flat response: 300 m VRMS ±6 dB

Input impedance, DC-isolation: ≥5 Kohm.

Pin 7
TX audio output, load capability: 600 ohm, pull-up to 9 V.

Pin 14
$\overline{TX}$ transmit output, open collector: 5 mA sink capability.

Logic input specification for terminals 19, 22 and 33: Logic high ≥4 VDC
Logic low ≤1 VDC

POWER SUPPLY

Pin 37
Supply voltage: 10.7-16.7 VDC
Current consumption: max. 17 mA

Pin 44
Supply voltage: 9 VDC ±5%
Current consumption: ≤12 mA

Pin 46
Supply voltage: 5 VDC ±5%
Current consumption: ≤0.6 mA

PERFORMANCE

4/5 seq. tone - on single tone receiver
Input frequency characteristics:
Low pass, 1 dB cross-over, 3 kHz
Input signal distortion: ≤20%
The tone receiver can be strapped for 4 and 5 tones burst or single tone.
Input tone length for single tone: 650 ±210 ms
Frequency accuracy typical (2δ): 1%
Frequency accuracy max.: ≤1.4%

Tone frequencies, ZVEI II
885, 970, 1060, 1160, 1270, 1400, 1530, 1670, 1830, 2000, 2200, 2400, 2600, 2800 Hz.

Response time/tone element: 30 ±10 ms
Recovery time: 120 ±40 ms

The tone receiver responds to tones with a frequency deviation less than: ±1.5%

The tone decoder is not sensitive to adjacent tones or other tones of the same standard series.

The tone receiver will accept a noise level corresponding to SINAD= 5 dB, as measured in the speech channel of the 900 radio.

Tone frequencies, CCIR
(960, 1022), 1124, 1197, 1275, 1358, 1446, 1540, 1640, 1747, 1860, 1981, 2110 Hz.

Response time/tone element: 35 ±12 ms
Recovery time: 150 ±50 ms

The tone receiver responds to tones with a frequency deviation less than: ±1.5%

The tone decoder is not sensitive to adjacent tones or other tones of the same standard series.

Tone frequencies, EEA
(960, 1022), 1124, 1197, 1275, 1358, 1446, 1540, 1640, 1747, 1860, 1981, 2110 Hz.

Response time 1 tone element: 20 ±10 ms
Recovery time: 85 ±30 ms

The tone receiver responds to tones with a frequency deviation less than: ±1.5%

The tone decoder is not sensitive to adjacent tones or other tones of the same standard series.

Signal to Noise Conditions
The tone receiver will accept a noise level corresponding to SINAD= 6 dB as measured in the speech channel of the 900 radio.

Repeater audio amplifier and gate
Frequency response related to a slope of -6 dB/octav.

67 - 80 Hz	-1/-4 dB
80 - 120 Hz	-1/-3 dB
120 - 300 Hz	0/-2 dB
300 - 1000 Hz	0/-1 dB
1000 Hz	0 dB
1000 - 2500 Hz	+1/0 dB
2500 - 3000 Hz	+3/+1 dB

Signal distortion at 1 kHz, 100 mV output and 600 ohm load, pin 7: $\leq$1%

Repeater mute attenuation at 300 mV input signal, 1 kHz and 600 ohm load, pin 7: $\geq$60 dB

Attenuation tone output signal approx.:
25 mV at 1100 Hz.

Environmental specification
Working temperature range mounted in an unattended repeater station: -25°C to +60°C
Functional temperature range: -30°C to +75°C

ADJUSTMENT

MEASUREMENT INSTRUMENTS

Multimeter 20 /V
2 power supplies 10 - 20 V
AF generator 0 - 5 kHz $\leq$100 ohm
Distortion meter

SQUELCH OPENING ADJUSTMENT

The discriminator noise output of IA902 is set to 10 dB sinad, by adjusting the RF generator output level. Connect the discriminator output to terminal 43.
Turn R62 full clock-wise (max. DC voltage on pin 6 of SQ901 hybrid).
Connect the multimeter, scale 10 VDC, to terminal 23.
Squelch output: $\leq$0.5 VDC
Turn R62 counter - clockwise until the squelch output just switches to 5 VDC. Verify the squelch adjustment.

REPEATER AUDIO AMPLIFIER GAIN ADJUSTMENT

The AF generator output level is set to 300 mV RMS at 1 kHz. Connect the AF generator to terminal 43.
The multimeter (scale 300 m VRMS) is connected together with the distortion meter.
Adjust R53 until 100 ±5 mV RMS is measured on the multimeter. The distortion must not exceed 1%.

CODING INSTRUCTIONS

The sequential tone decoder is able to receive 4 or 5 tone in a decade system, in which each digit is represented by a specific tone.
The colored wires W1 to W5 indicate the order of the tone gates. Each wire soldered to the tag of the tone coil represents one digit of the call number.
The wires W7, W6 and W8 are common connections to the coupling link and are always soldered to the same tags of the tone coil:

W6, blue wire
soldered to tag no. 18 of the tone coil

W7, violet wire
soldered to tag no. 17 of the tone coil

W8, grey wire
soldered to tag no. 19 of the tone coil

Sequential tone decoder
If the actual call number contains two identical digits following each other, a repeat tone is used for the latter. The procedure is repeated if more than 2 identical digits are used. As an example the number 33333 is coded 3R3R3.

Wire connections	5-tone call	4-tone call
W1, Brown wire 1st tone	1st digit	1st digit
W2, Read wire 2nd tone	2nd digit	2nd digit
W3, Orange wire 3rd tone	3rd digit	3rd digit
W4, Yellow wire 4th tone	4th digit	4th digit
W5, Green wire 5th tone	5th digit	4th digit

The tone code 1R480 is shown on fig. 1.

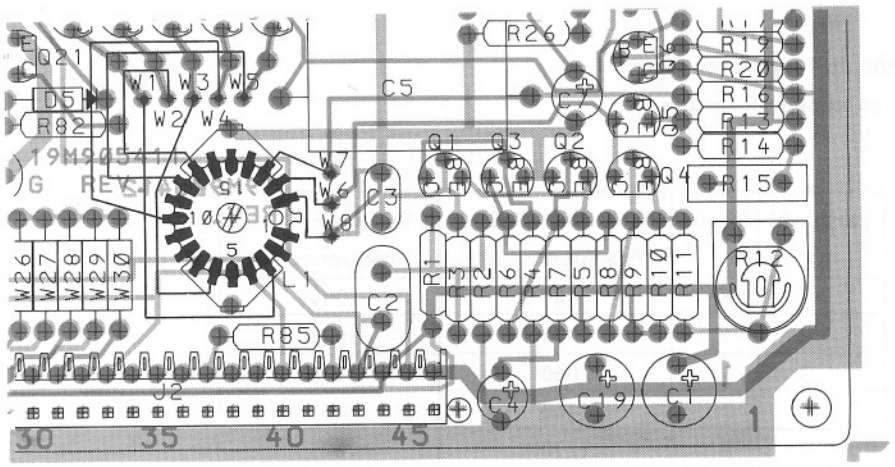


Fig. 1. Tone code 1R480

CF901
D403.308

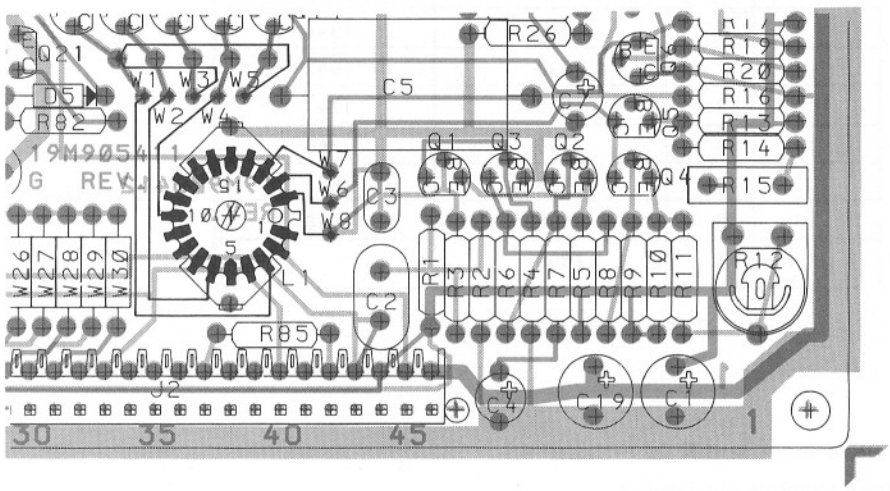


Fig. 2. Tone code 14181

CF901
D403.308

If the tone code contains identical digits, the wire connection can be done on the PWB as shown on fig. 2.

If the seq. tone decoder is strapped for single tone reception, i.e. W9 is removed and W32 is inserted, the wire connection can be done on the PWB as shown on fig. 3.

Single tone code= 1 digit.

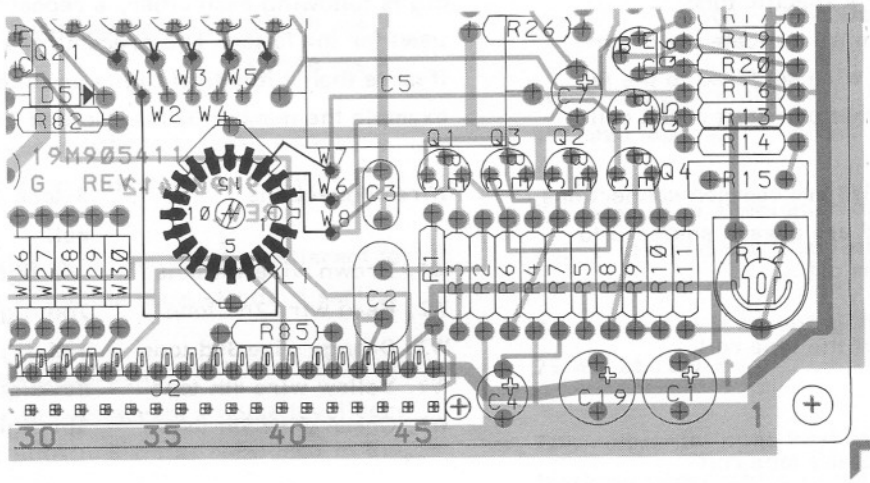


Fig. 3. Single tone code

CF 901
D403.308

Tone coil

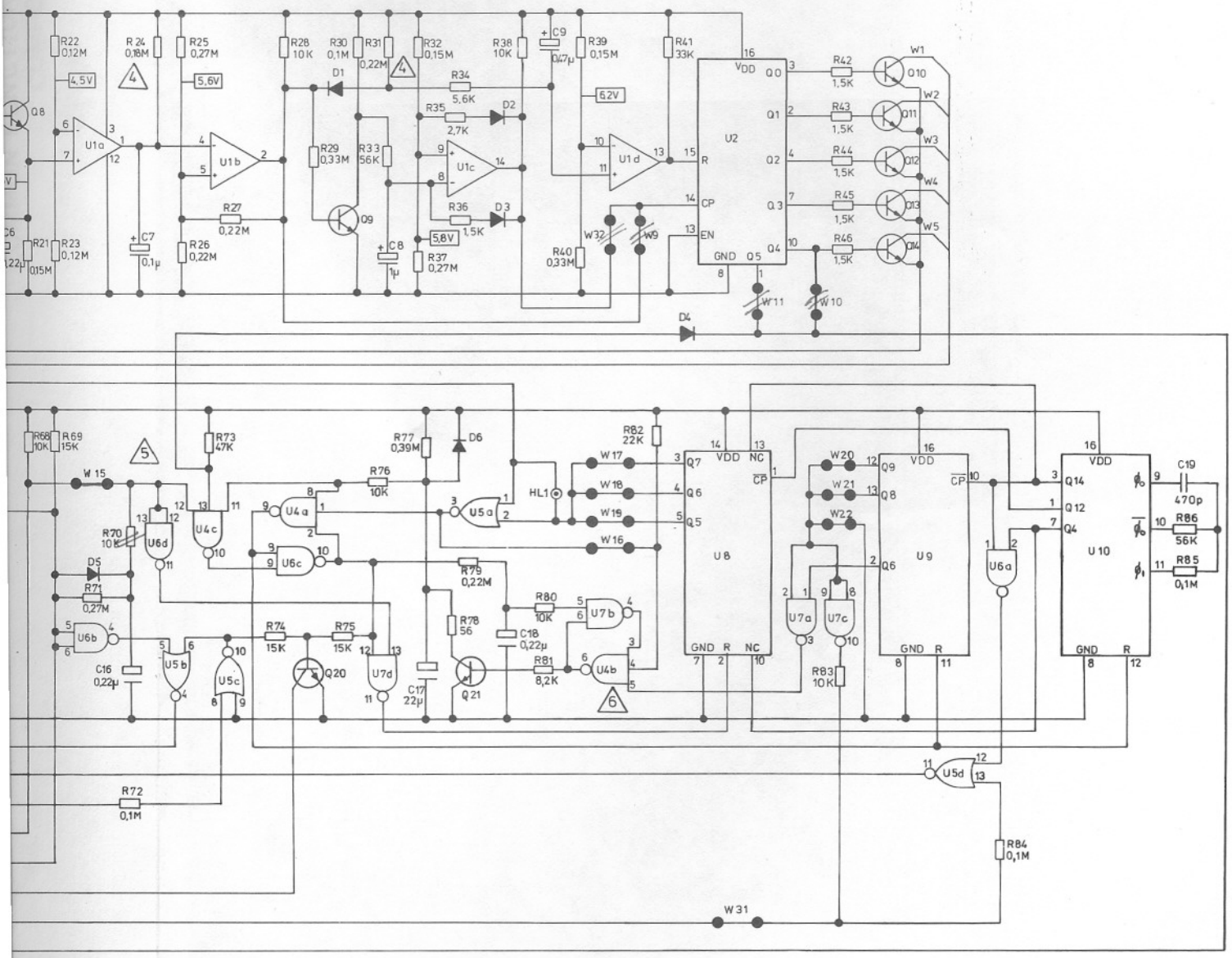
Terminal numbers on the tone coil tags and their related digits and frequencies appear from the table.

Terminal	Digit	STORNO ZVEI Frequency, Hz	CCIR/EEA Frequency, Hz
1	X	885	960
2	Y	970	1022
3	1	1060	1124
4	2	1160	1197
5	3	1270	1275
6	4	1400	1358
7	5	1530	1446
8	6	1670	1540
9	7	1830	1640
10	8	2000	1747
11	9	2200	1860
12	0	2400	1981
13	R	2600	2110
14	A	2800	

R= Repeat tone.

A= Alarm

X and Y: Special tones, used for A and R in 12.5 kHz channel spacing equipment.



2.G3.G6 AND G7

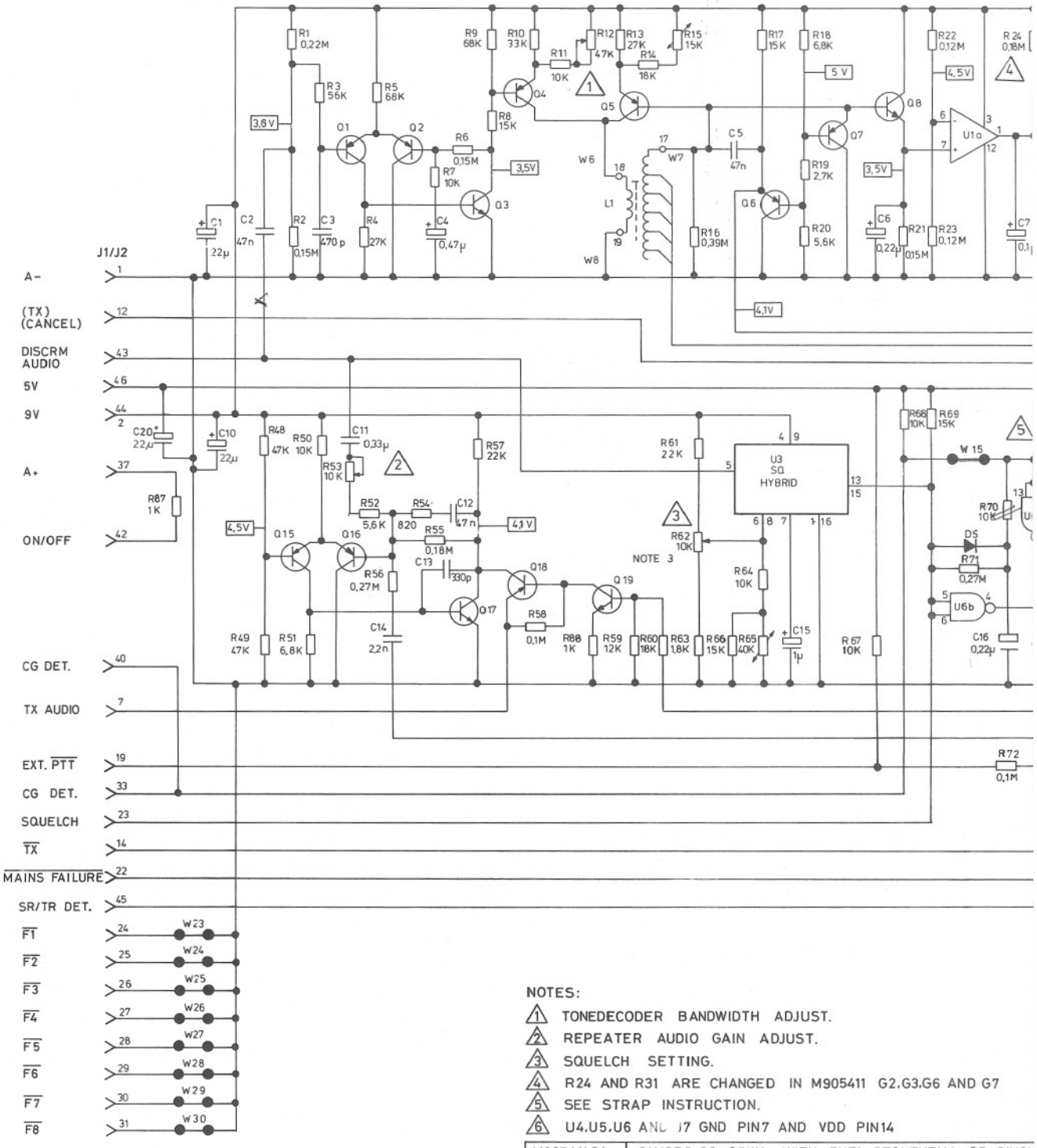
QUENTIAL-OR SINGLE TONE DECODER
QUENTIAL-OR SINGLE TONE DECODER
QUENTIAL-OR SINGLE TONE DECODER
QUENTIAL-OR SINGLE TONE DECODER
QUENTIAL-OR SINGLE TONE DECODER
QUENTIAL-OR SINGLE TONE DECODER

COMMON FUNCTIONS UNIT CF901

REV.B

D403.253/2

Storno

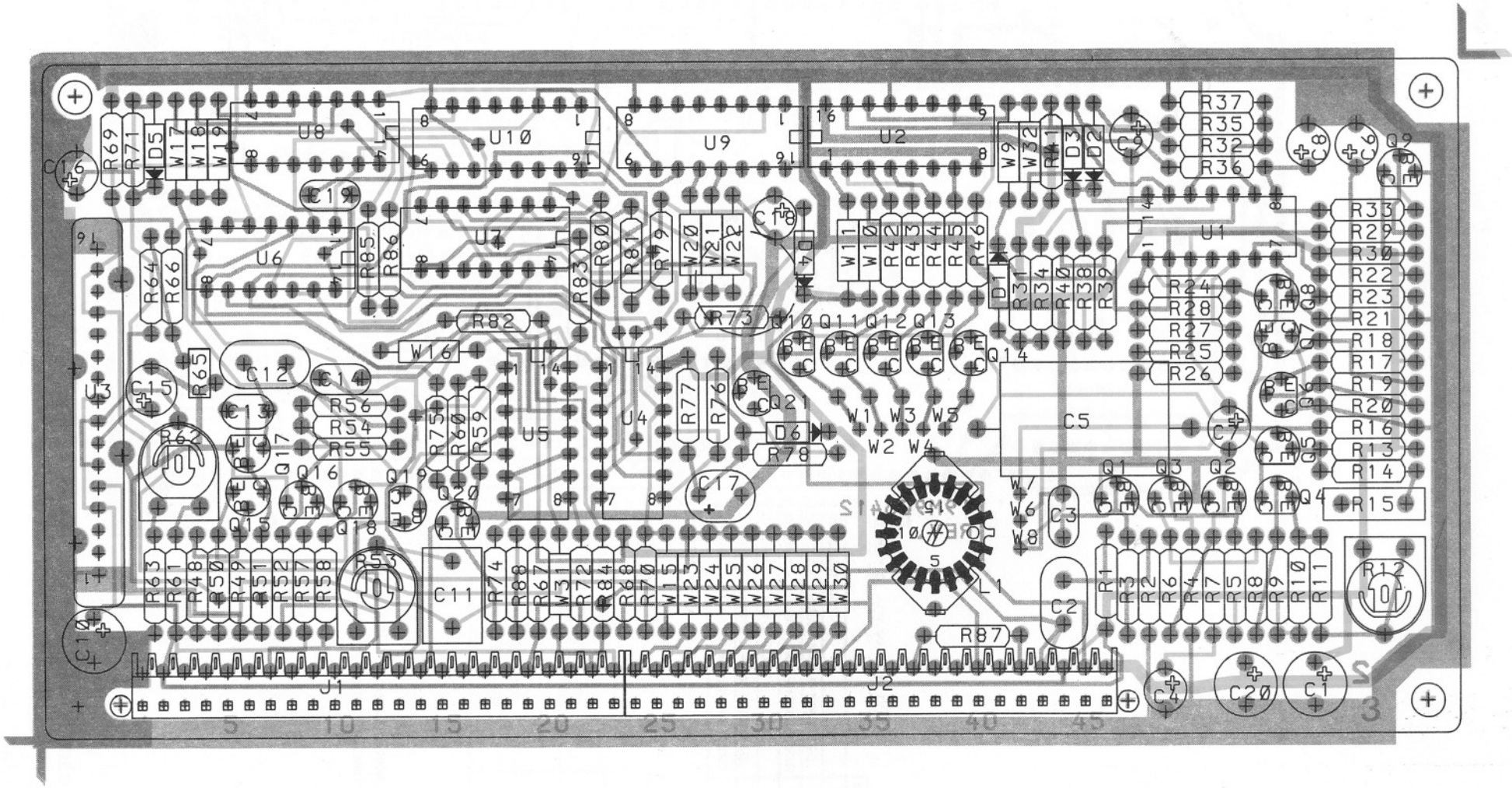


NOTES:

1. TONEDECODER BANDWIDTH ADJUST.
2. REPEATER AUDIO GAIN ADJUST.
3. SQUELCH SETTING.
4. R24 AND R31 ARE CHANGED IN M905411 G2,G3,G6 AND G7
5. SEE STRAP INSTRUCTION.
6. U4,U5,U6 AND U7 GND PIN7 AND VDD PIN14

M905411G1	CH/SPC 20-25KHz WITH ZVEI SEQUENTIAL-OR SINGL
M905411G2	CH/SPC 20-25KHz WITH CCIR SEQUENTIAL-OR SINGL
M905411G3	CH/SPC 20-25KHz WITH EEA SEQUENTIAL-OR SINGL
M905411G4	CH/SPC 20-25KHz
M905411G5	CH/SPC 12,5KHz WITH ZVEI SEQUENTIAL-OR SINGL
M905411G6	CH/SPC 12,5KHz WITH CCIR SEQUENTIAL-OR SINGL
M905411G7	CH/SPC 12,5KHz WITH EEA SEQUENTIAL-OR SINGL
M905411G8	CH/SPC 12,5KHz

Storno

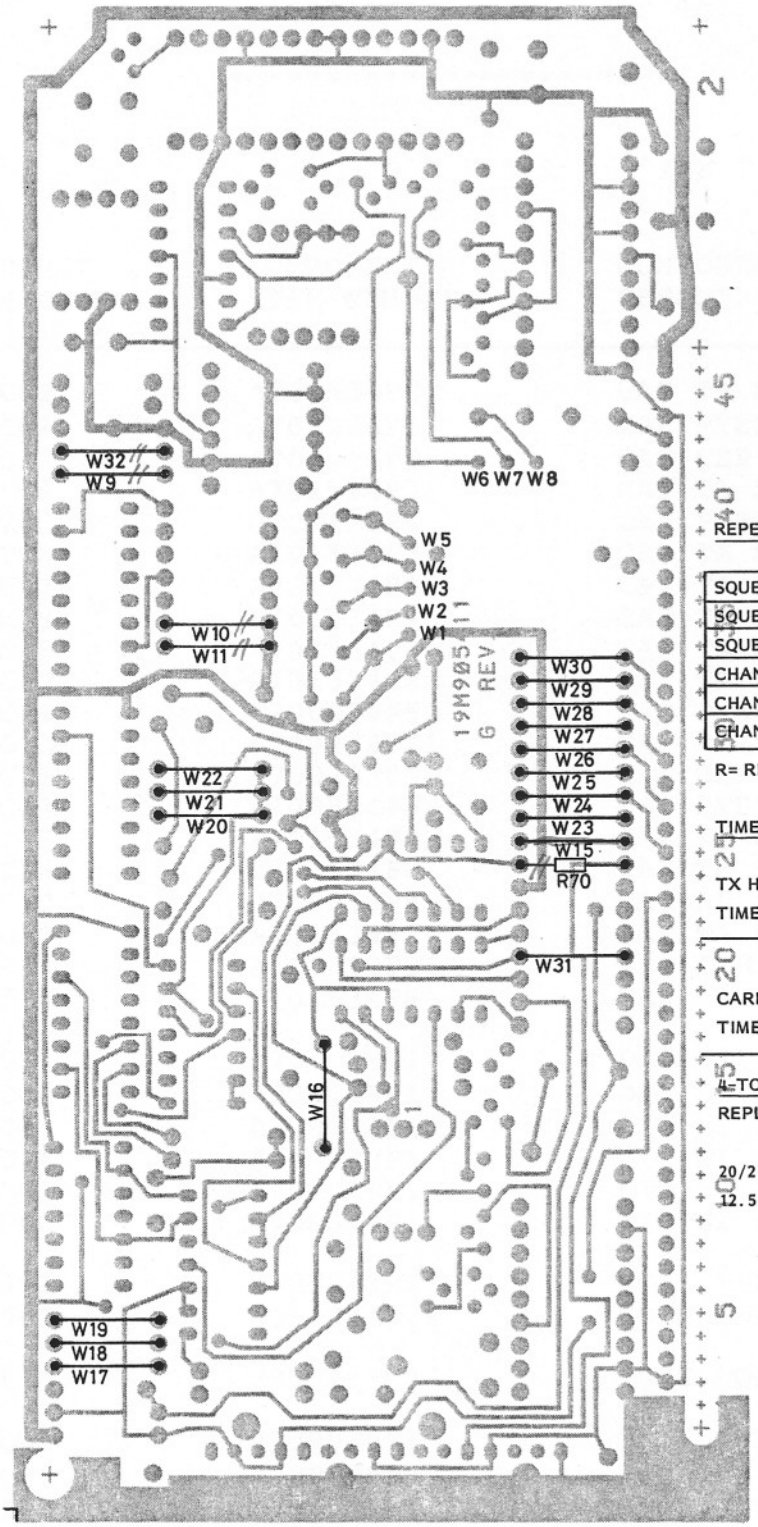


COMMON FUNCTIONS UNIT CF901
COMPONENT LAYOUT

REV. 3

D403.254/3

Storno



REPEATER ACTIVATION ($\overline{Tx}$)

	R70	W32	W9	W10	W11	W15
SQUELCH SIGNAL	I	R	R	R	R	R
SQUELCH SIGNAL AND 5-TONE SEQ.	I	R	I	R	I	R
SQUELCH SIGNAL AND SINGLE TONE	I	I	R	I	R	R
CHANNEL GUARD TONE	R	R	R	R	R	I
CHANNEL GUARD AND 5-TONE SEQ.	R	R	I	R	I	I
CHANNEL GUARD AND SINGLE TONE	R	I	R	I	R	I

R= REMOVE; I= INSERT

TIMER SETTINGS

TX HANG TIME DELAY	W19	W18	W17
TIME IN SECOND (WEIGTH)	4	8	16
CARRIER CONTROL TIMER	W22	W21	W20
TIME IN MINUTES (WEIGTH)	0	2.5	5

4-TONE SEQ.

REPLACE W11 WITH W10

20/25 kHz: SQUELCH MODULE= D900067G3

12.5 kHz: SQUELCH MODULE= D900067G4

UNATTENDED REPEATER
COMMON FUNCTIONS CF901
STRAP INSTRUCTIONS

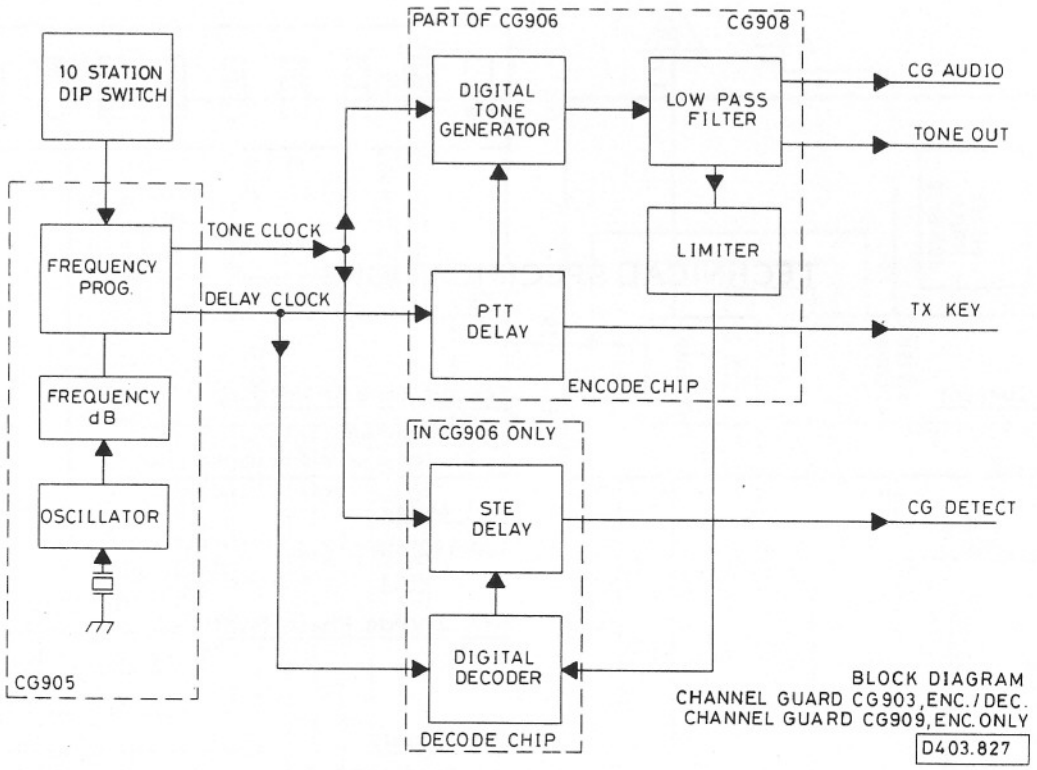
D403.629

Storno

CG903

CHANNEL GUARD

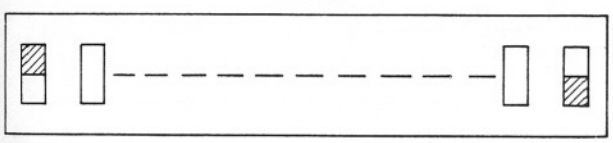
CG903 provides hardware channel guard encode/decode functions. It uses monolithic custom IC's mounted in two hybrids, CG905 and CG906. The desired channel guard frequency is programmed in 0.25 Hz steps. Squelch tail elimination (STE) circuitry is included for both encode and decode.



PROGRAMMING

The CG903 is programmed by a 10 station DIP switch, for single tone use.

PROGRAMMING SWITCH



STATION CLOSED OR 0

STATION OPEN OR 1

Channel guard frequencies are determined by a 10 bit binary code word. To determine the correct code word for a given frequency, use the divide by 2 binary formula plus the fractional bits, see chart below.

First division always corresponds to switch station 3.

Example: determine the code for 134.7 Hz. Set stations 1, 2 from the fractional part chart set stations 3-10 by the divide by 2 formula.

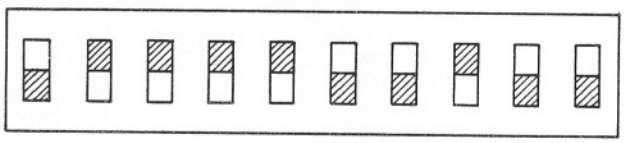
FRACTIONAL PART CHART

FROM - TO	1	2
0.00 - 0.12	0	0
0.13 - 0.37	1	0
0.38 - 0.62	0	1
0.63 - 0.87	1	1

By inspection, 0.7 is between 0.63 and 0.87. Set station 1 and station 2 on the Dip switch to 1 (open).

	REMAINDER	BIT POSITION
134 divide by 2= 67	0	3
67 divide by 2= 33	1	4
33 divide by 2= 16	1	5
16 divide by 2= 8	0	6
8 divide by 2= 4	0	7
4 divide by 2= 2	0	8
2 divide by 2= 1	0	9
1 divide by 2= 0	1	10

Therefore the code for 134.7 Hz is 1000011011. (Bit position 1 is to the right).



TECHNICAL SPECIFICATIONS

Input Voltage/Current
9 V DC ±5%, 40 mA
5 V DC ±5%, 5 mA

Decoder Input Level
≥16.5 mV
≤45 mV

Decoder Bandwidth
±1.3% minimum
±2.4% maximum

Decoder Response Time
250 ms, Frequency >100 Hz

Decoder Activation Time
100 ms maximum

Decoder Release Time
125-180 ms

Encode Output Level
100 to 210 mV

Encode Tone Distortion
1.5% maximum

PTT Delay
160-190 ms

STE Encode Phase Shift
135°

Data Inputs
V_{IH} ≥3.5 V DC, or open circuit
V_{IL} ≤1.5 V DC

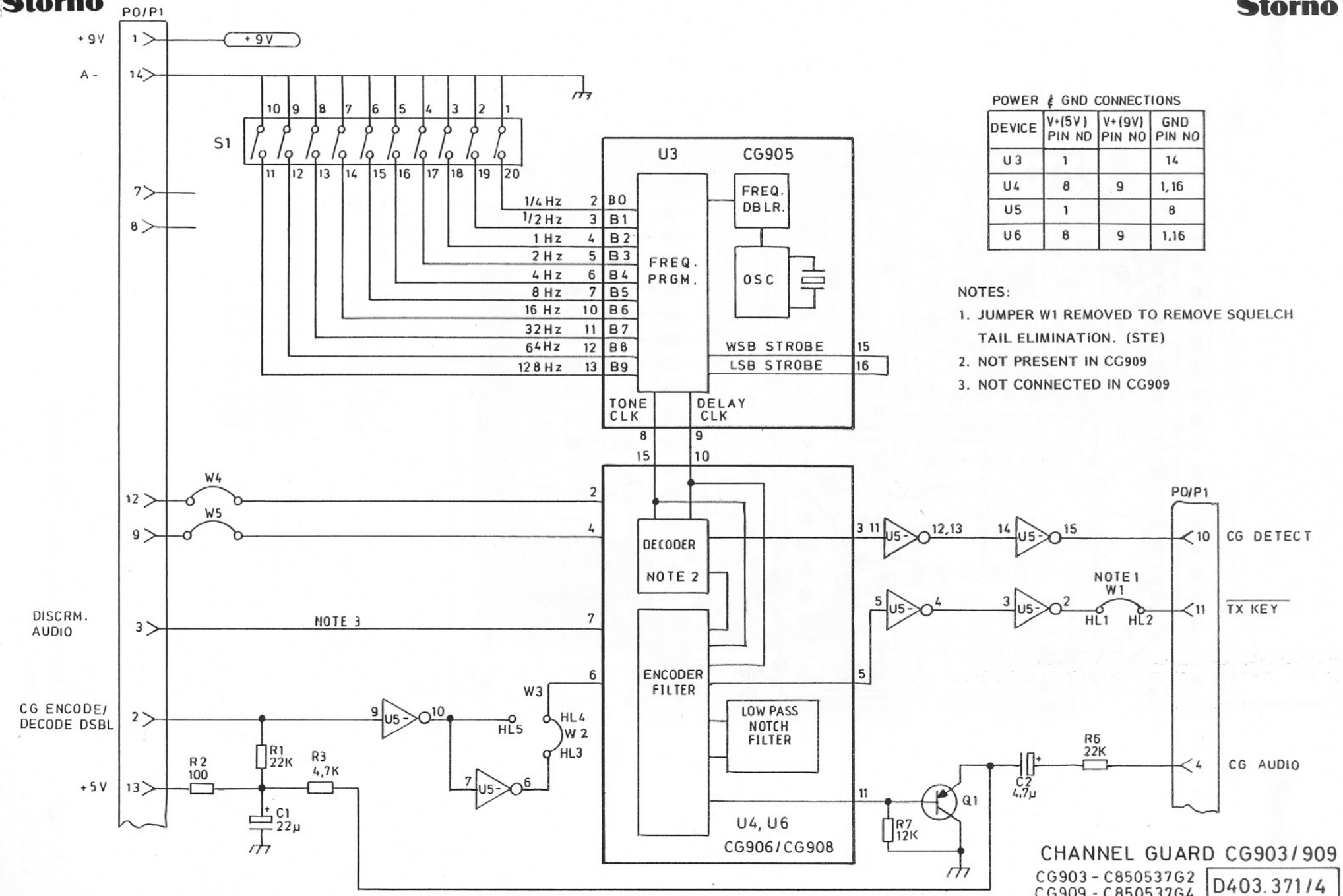
CG Detect
V_{OH} ≥3.5 V DC, at 0.35 mA
V_{OL} ≤0.5 V DC at 2.0 mA

(signal is high for on frequency tone)

Temperature Range
-40°C to +85°C

Storno

Storno



POWER & GND CONNECTIONS

DEVICE	V+(5V) PIN ND	V+(9V) PIN NO	GND PIN NO
U3	1		14
U4	8	9	1,16
U5	1		8
U6	8	9	1,16

NOTES:

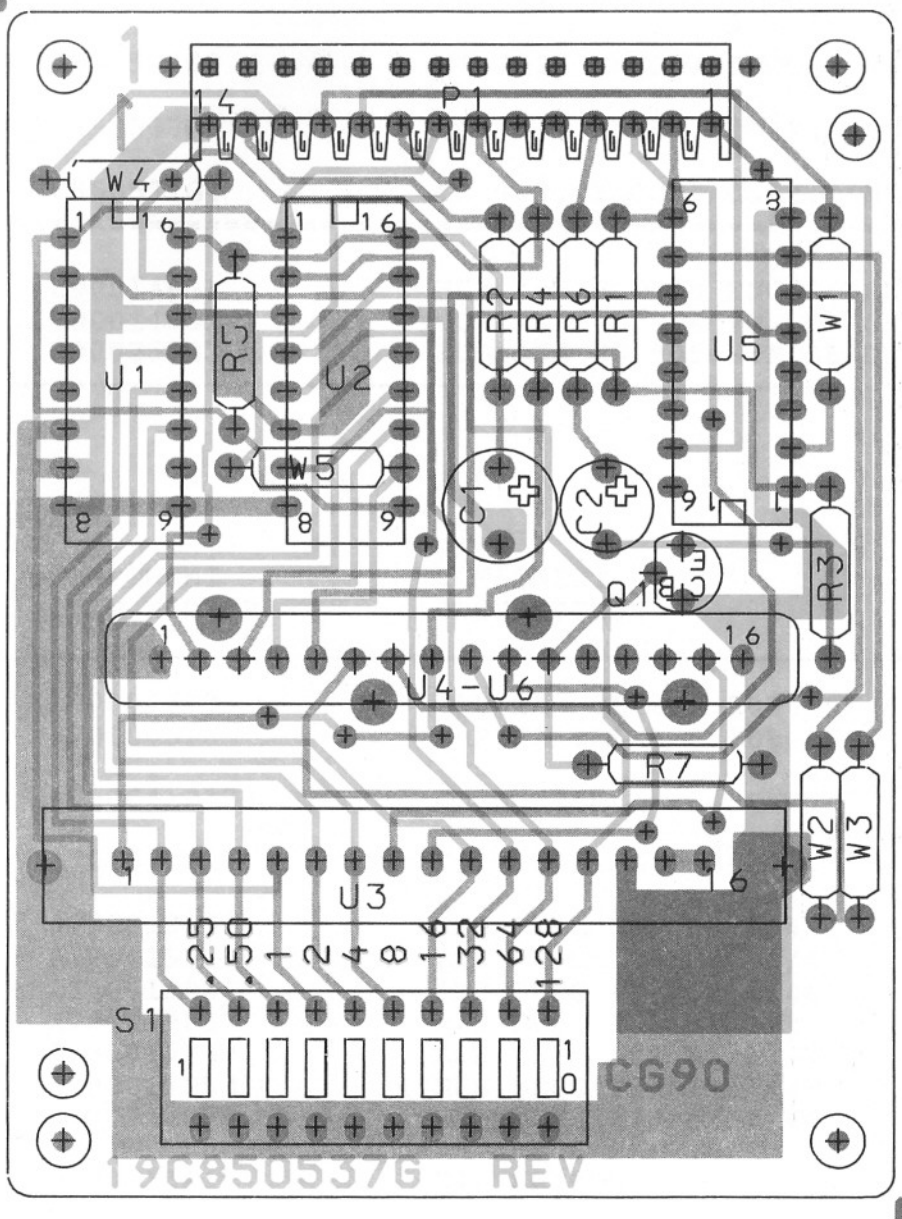
1. JUMPER W1 REMOVED TO REMOVE SQUELCH TAIL ELIMINATION. (STE)
2. NOT PRESENT IN CG909
3. NOT CONNECTED IN CG909

CHANNEL GUARD CG903/909

CG903 - C850537G2
CG909 - C850537G4

D403.371/4

Storno



NOTE :
U1 - U2 : CG901/4 ONLY
S1 : CG903/9 ONLY

19C850537G1 - CG 901
" " " G2 - CG 903
" " " G3 - CG 904
" " " G4 - CG 909

CHANNEL GUARD CG901/904, CG903/909
COMPONENT LAYOUT

D403.370/2

Storno

DC9x1

DIRECTIONAL COUPLER

DC9x1 is used in FM9xxx to avoid signal intermodulation. The module is mounted between the power amplifier and the branching filter.

DC9x1 is ordered as an option when "L" for transmitter isolator is ordered.

Each frequency band has its particular DC module.

- DC911 VHF band 138 - 174 MHz
- DC931 VHF band 66 - 88 MHz
- DC961 UHF band 403 - 470 MHz

DC9x1 consists of a circulator, a resistor, 6 variable capacitors for matching the circulator to the terminals and a filter for damping harmonic products.

TECHNICAL SPECIFICATIONS

Input impedance
50 ohm

Output impedance
50 ohm

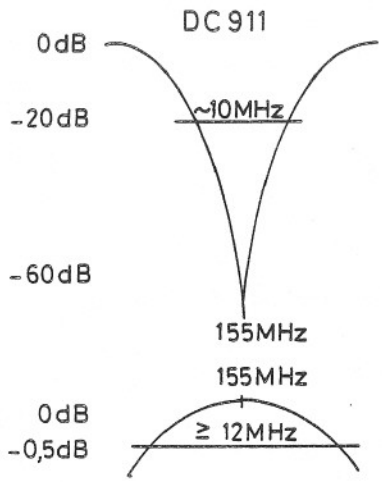
Max. power handling
25 W

Temperature
from -40^{o}C to $+85^{o}$C

Dimensions
L x W x H: 65 mm x 65 mm x 32 mm

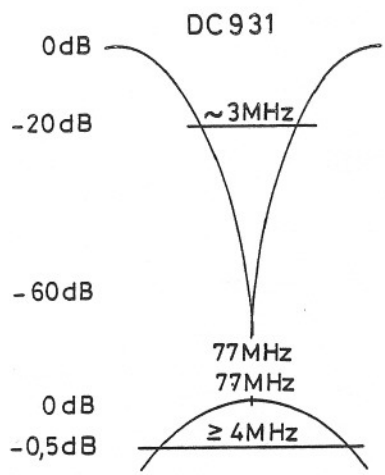
Insertion loss and Isolation

	DC911	DC931	DC961
Bandwith	6 MHz	2 MHz	15 MHz
Insertion loss	$\leq$0.7 dB	$\leq$1.0 dB	$\leq$0.6 dB
Isolation, room temperature	$\geq$20 dB	$\geq$20 dB	$\geq$20 dB
Isolation, extreme temperature	$\geq$16 dB	$\geq$12 dB	$\geq$16 dB



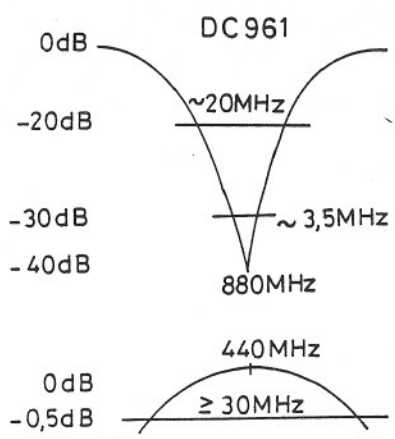
TYPICAL FILTER CURVE FROM ANTENNA TO TRANSMITTER

TYPICAL FILTER CURVE FROM TRANSMITTER TO ANTENNA



TYPICAL FILTER CURVE FROM ANTENNA TO TRANSMITTER

TYPICAL FILTER CURVE FROM TRANSMITTER TO ANTENNA

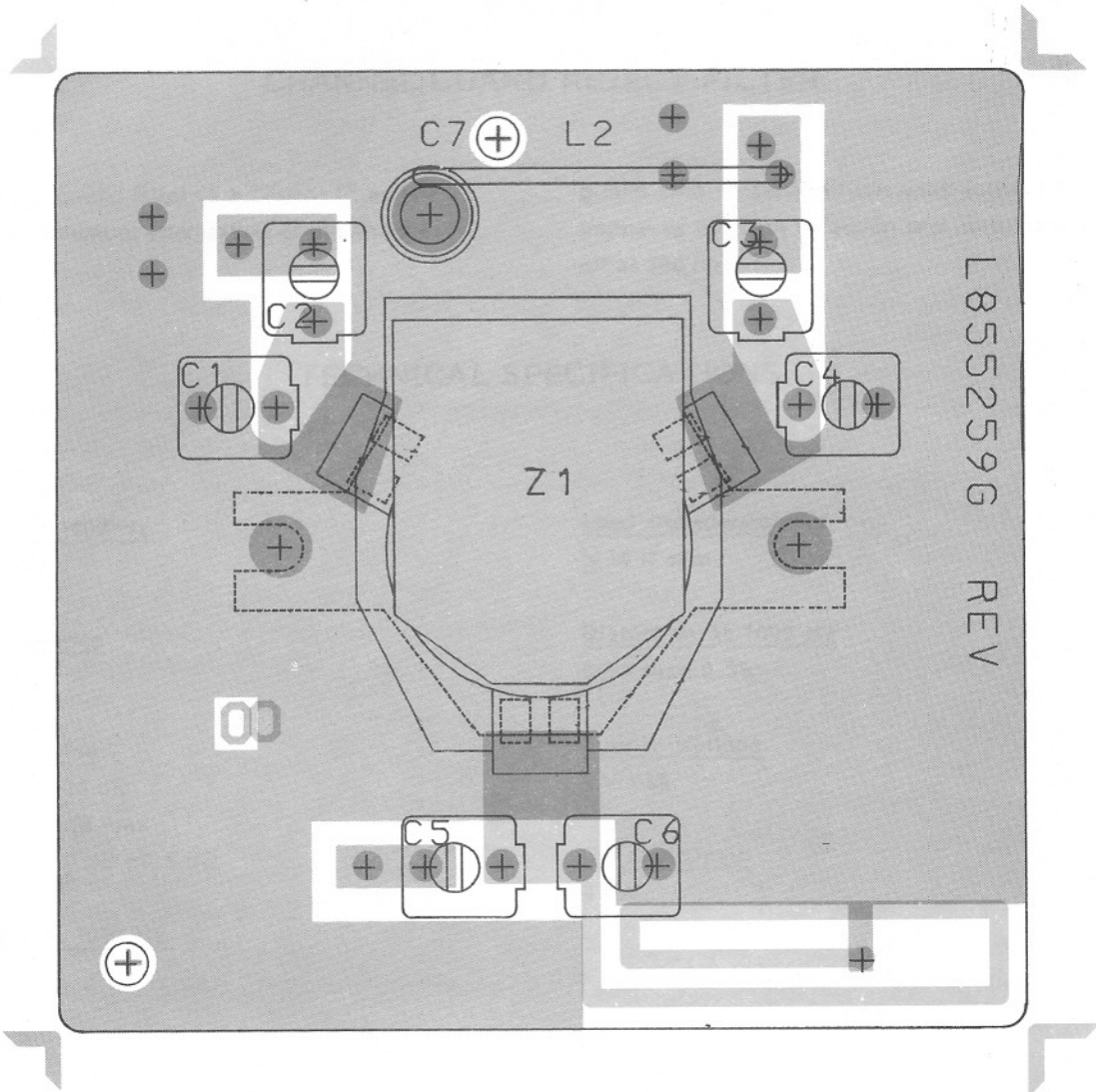


TYPICAL FILTER CURVE FROM ANTENNA TO TRANSMITTER

TYPICAL FILTER CURVE FROM TRANSMITTER TO ANTENNA

FILTER CURVE, DC911/DC931/DC961 D403.829/2

Storno



MODULE CODE NO.	MOUNTED BOARD CODE NO.	
L855802G4 L855802G1	L855259G2 L855259G1	DC95x DC96x

DIRECTIONAL COUPLER DC951/952/961/962
COMPONENT LAYOUT

D404.215

Storno

FN903

CHANNEL GUARD REJECT FILTER

The channel guard filter is a "Twin-T" active filter with maximum attenuation of the channel guard tone. A second high pass active filter improves the tone rejection and minimizes roll-off at 300 Hz.

TECHNICAL SPECIFICATIONS

AF input at 1000 Hz
300 mV RMS

Input Impedance
25 K ohm

Audio Response
67-210 Hz: - 26 dB
300 Hz: - 4 dB max.
350-300 Hz: 0 dB ±0.5 dB

AF output at 1000 Hz
-0.8 dB

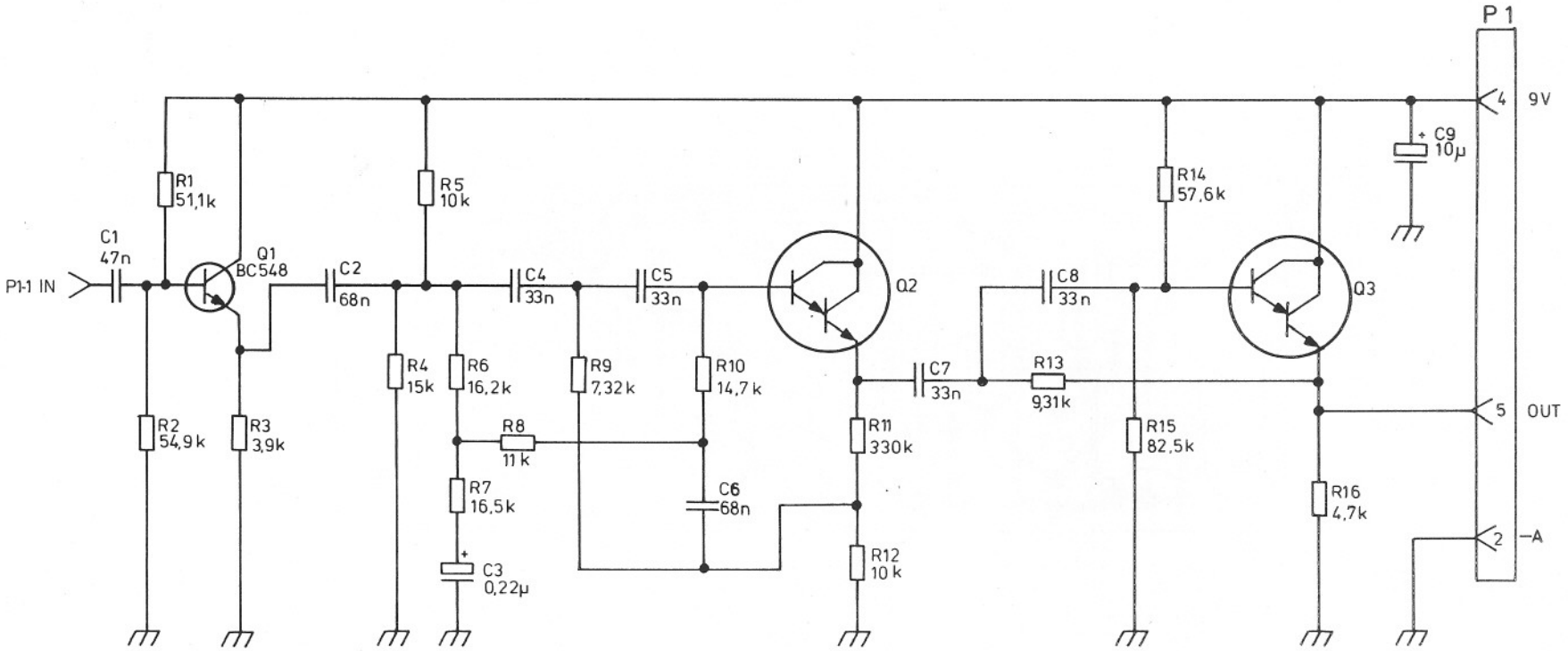
Load Impedance
≥ 10 K ohm

Distortion at 1000 Hz
Less than 0.3%

Supply Voltage
9 V ±5%

Current Drain
4 mA

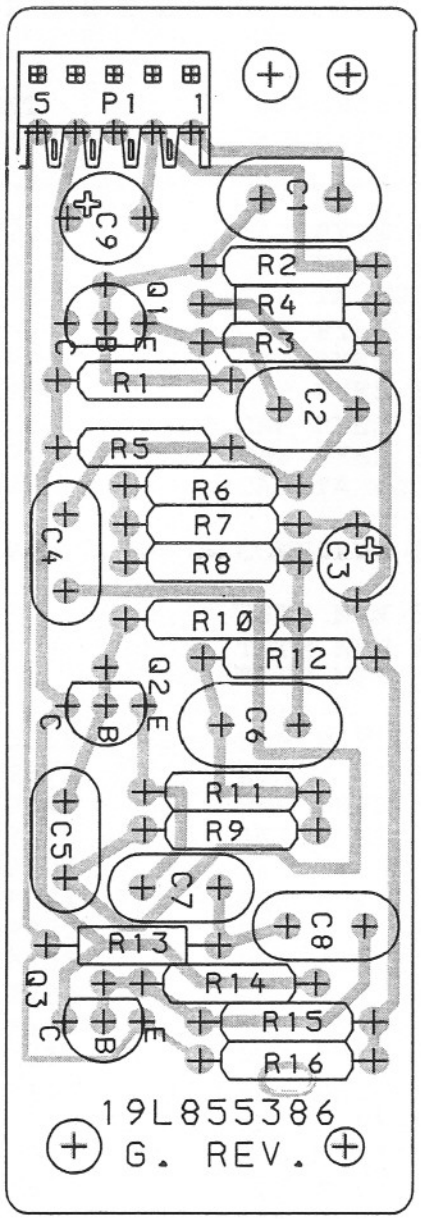
Storno



FILTER NETWORK FN903

CODE NO. L855386G1 D403.661

Storno



FILTER NETWORK FN903
COMPONENT LAYOUT

CODE NO. L855386G1 | D403.662

Storno

JP901

INTERCONNECT BOARD

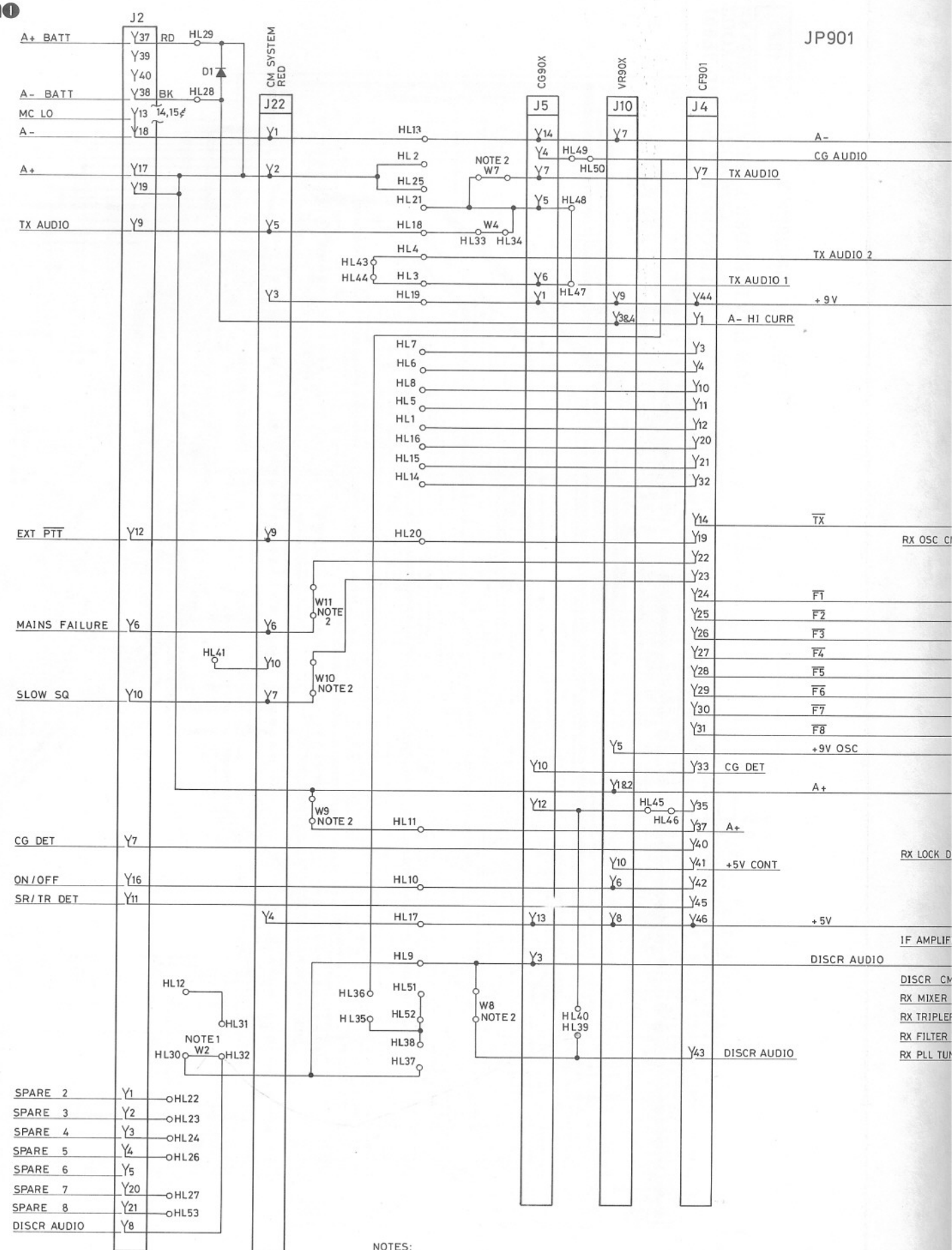
The interconnect board provides all connections between the modules except for RF signals.
The board is used in duplex stations and are universal for all configurations of modules.
The modules plug onto connectors and guide pins ensure proper insertion.
The front connector for the control cable is mounted on the board and protrude through the front plate.
The board has a number of holes and straps for special options.

The connectors for RF modules have built-in feed-through capacitors in order to reduce any unintentional coupling and radiation.

Three central metering connectors are located on the board and are accessible from the radio's RF side.

Storno

JP901

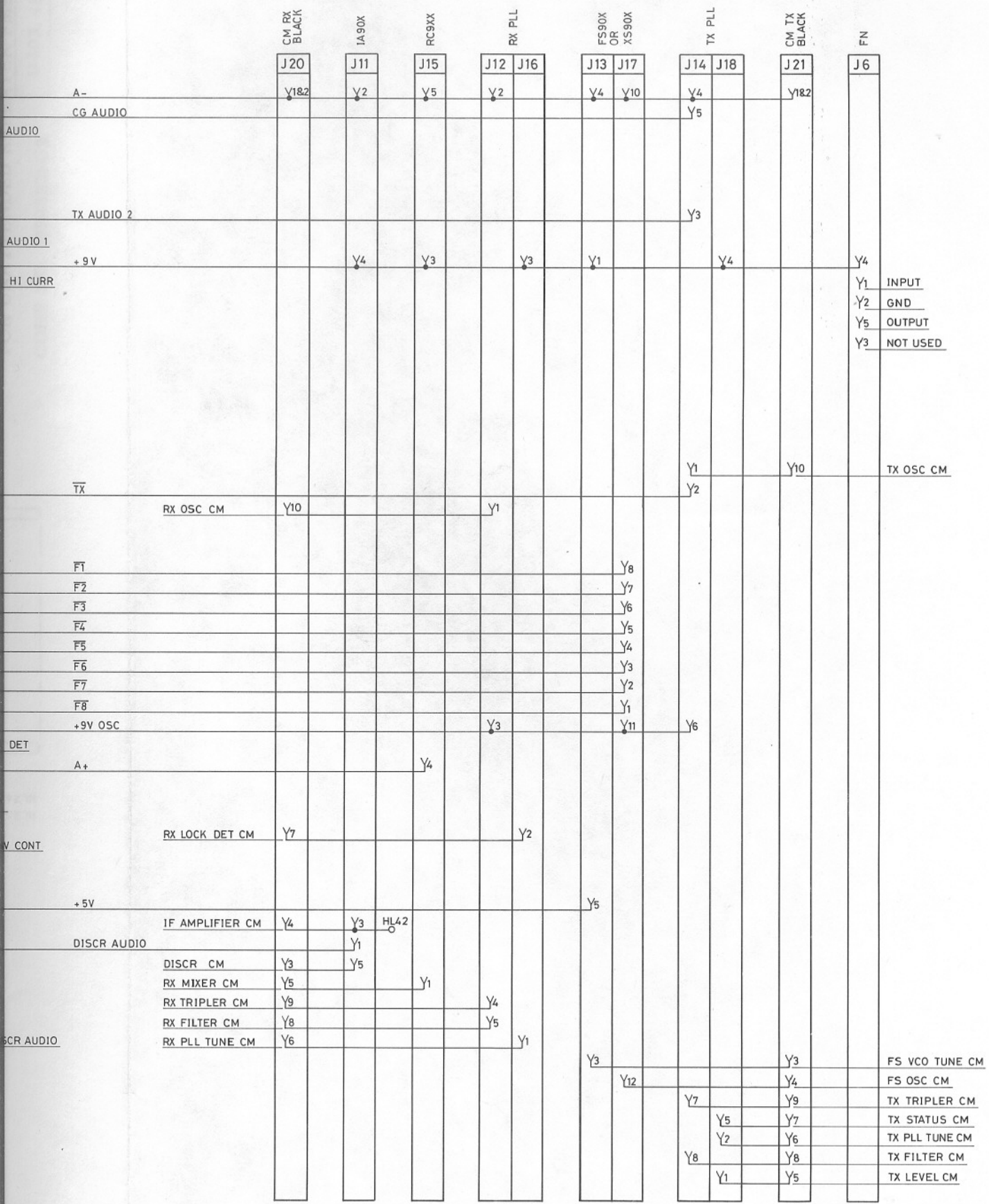


NOTES:

1. WIRE JUMPER W2 IS PRESENT, DISCRIMINATOR AUDIO IS CONNECTED TO J2, PIN 8.
2. WIRE JUMPERS W7-W11 SLEEVED WIRE CONNECTION.

Storno

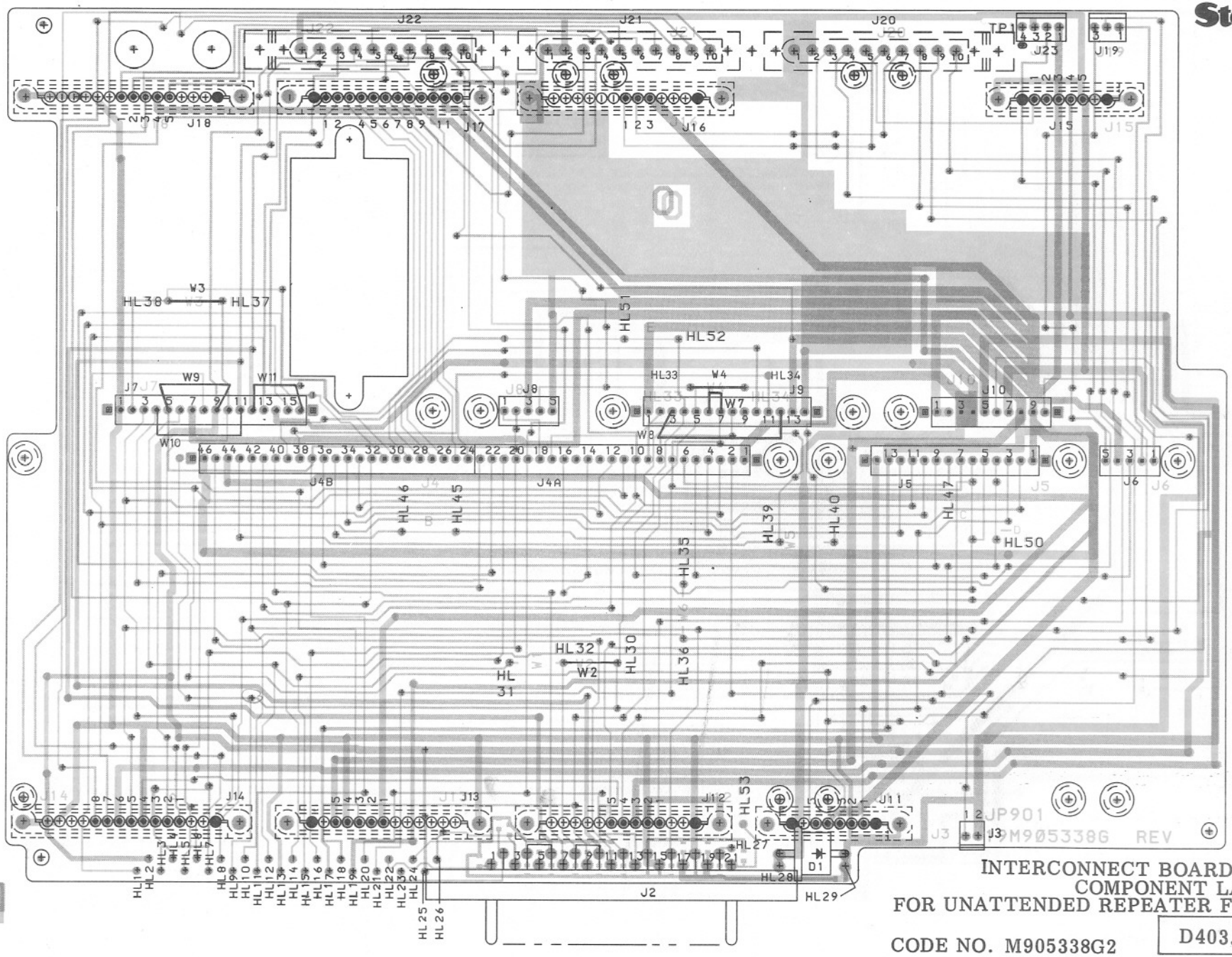
JP901



JUNCTION PANEL JP901
UNATTENDED REPEATER

D403.640

Storno

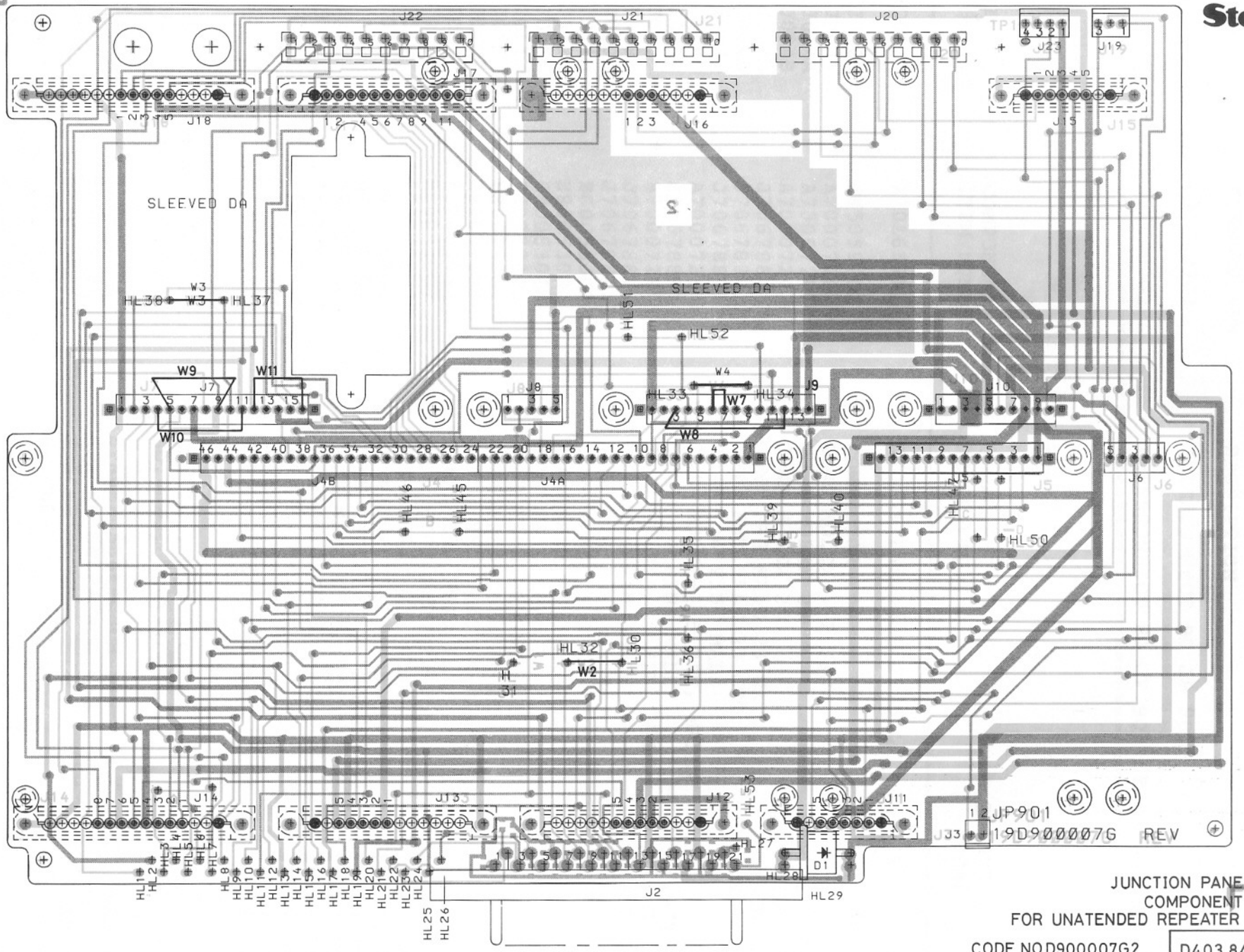


INTERCONNECT BOARD JP901
COMPONENT LAYOUT
FOR UNATTENDED REPEATER FM9xxx

CODE NO. M905338G2

D403.485

Storno



JUNCTION PANEL JP901
COMPONENT LAYOUT
FOR UNATENDED REPEATER EM9XXX

CODE NO.D900007G2

D403.844

Storno

POWER SUPPLY

PS901

PS901 is a power supply unit used in Stornophone 900 Compact Base stations.
It is a switchmode power supply which converts 220 V/110 V AC to 13.6 V DC at a maximum load of 8 A.
The PS901 interfaces the Compact Base station to the mains and can be strapped for either 220 V AC or 110 V AC operation and can deliver up to 8 Amperes continuously. The power supply can stand a continuous short circuit of the output or overloading for a short period.
The power supply output can be connected to a 12 V battery without damaging the regulator circuit if the mains is disconnected or switched off.

MODE OF OPERATION

The power supply module is a step-down, switch mode circuit operating directly from the mains with a switch frequency of 25 kHz.

Refer to block diagram.
The mains (220 V AC or 110 V AC) is rectified, filtered and converted to approximately 24 V AC by a 25 kHz power converter and a transformer. The 24 V AC is rectified and filtered in an LC-filter to obtain 13.6 V at the output.

A voltage comparator circuit senses the output voltage and sends information to a circuit that controls the duty cycle of the power switch.
The output voltage is a function of the input voltage, the duty cycle of the power switch and the transformer ratio.
The voltage comparator and the control circuit maintain a constant output voltage, independent of varying input voltage and load.
A current sensor reduces the duty cycle of the power switch if the maximum current limit is exceeded and thus protects the power supply against overload and short circuit.

CIRCUIT DESCRIPTION

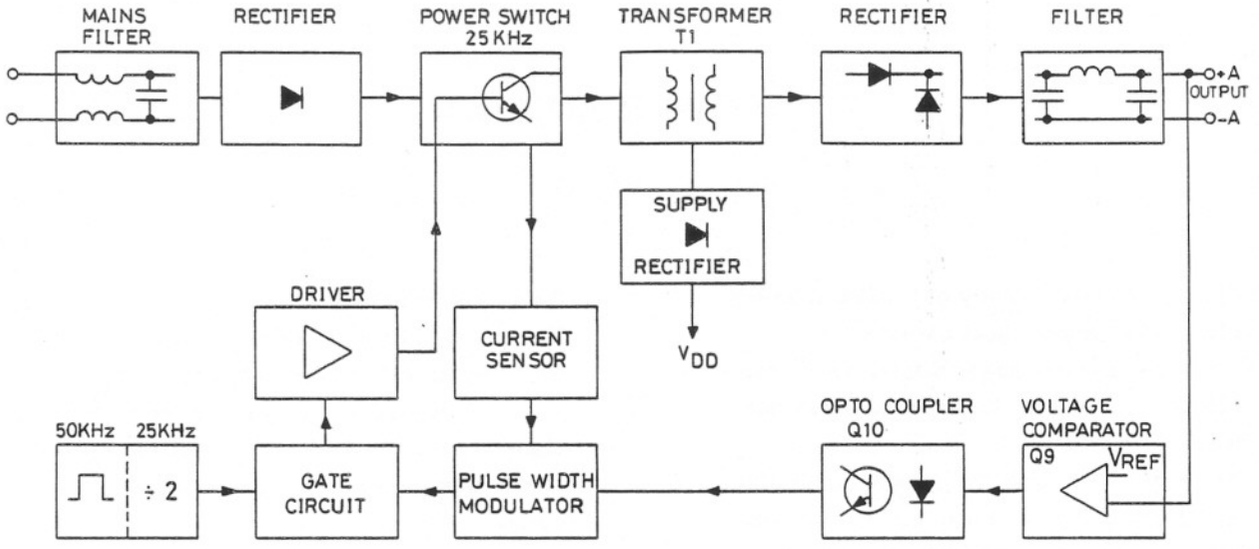
INPUT FILTER AND RECTIFIER

The mains rectifier is either a bridge rectifier for 220 V AC or a voltage doubler for 110 V AC. Changing the circuit from 220 V AC to 110 V AC is made by inserting a single jumper, W1. The rectified AC is always close to 300 V DC at which the power switch is operating.
The input filter coil L1 together with surrounding capacitors take care of damping of spikes from the mains and also prevent noise being conducted to the mains.
R34 discharges capacitors C1 and C16 when mains is turned off.

Capacitors C5 and C6 are the reservoir for the rectified mains and hold the DC voltage within the operating limits of the power converter even if one period of the mains voltage is missing.

POWER CONVERTER AND TRANSFORMER

The power converter is a forward type consisting of a power switch transistor and a transformer. When the power switch transistor Q3 is on the electrical energy is transformed by



BLOCK DIAGRAM PS901
D403.264

transformer T1, diode D10 is conducting and the transformed energy is stored in L2 and C12 from which it is delivered to the output. When Q3 is turned off the negative voltage swing across L2 forces diode D11 to conduct and L2 and C12 deliver energy to the output.

The energy stored in the primary inductance of T1 makes D5 conduct and feed the energy back to the reservoir capacitors. When all energy stored in T1 is gone a new cycle begins. The power converter is driven at 25 kHz which is the optimum frequency for switch transistor Q3. The supply voltage for the drive circuit is taken from T1 and is proportional to the input voltage. Switch transistor Q3 in driven as a non-saturated switch by means of a Baker clamp (diodes D7-D8) and with excessive current by Q1, R3-R4, C9-Q2 when turned on.

REGULATION CIRCUIT

The regulation circuit consists of a start circuit, a multivibrator, a pulsewidth modulator, a voltage feed-back circuit and a current sense circuit.

When power is turned on C8 charges through R6 to start the PS901. When the voltage across C8 reaches approx. 14 V Q5 and Q11 switch on and turn on Q4. Q4 feeds power to the drive and regulation circuit and the converter is started. Once started the power converter transformer T1 delivers the supply for the drive and regulation circuit and a boot strap effect is obtained. The voltage for the driver is proportional to the mains voltage and when that becomes too 10 W (approx. 60% of nominal voltage) Q5 turns off and Q4 switches the supply to the drive circuit off so that the converter is stopped.

Gates U3.4, U3.3 and U3.2 form a multivibrator running at 50 kHz which frequency is divided by 2 in Flip-Flop U1.1 to give a 25 kHz drive signal with 50% duty cycle.

The drive signal is gated by the signal from Flip-Flop U1.2 which is controlled by the current sense circuit (R7-Q7) and the voltage feedback to give a pulsewidth modulated signal. This signal is used to drive switch transistor Q3 via U2, Q6-Q1, Q2.

The output voltage is compared to the reference voltage across D15 by Q9 whose output is feedback to the the regulation circuit via optocoupler Q10. The current through the optocoupler is amplified by Q8 and gated with the current sense signal in Q7.
The output from Q7 is fed to Flip-Flop U1.2 which controls the oscillator's duty cycle.

TECHNICAL SPECIFICATION

Input voltage
50/60 Hz, 110 V/220 V, ±20%

Output voltage
at nominal input voltage with 0.5 A load
nominal output: 13.6 V ±0.5 V

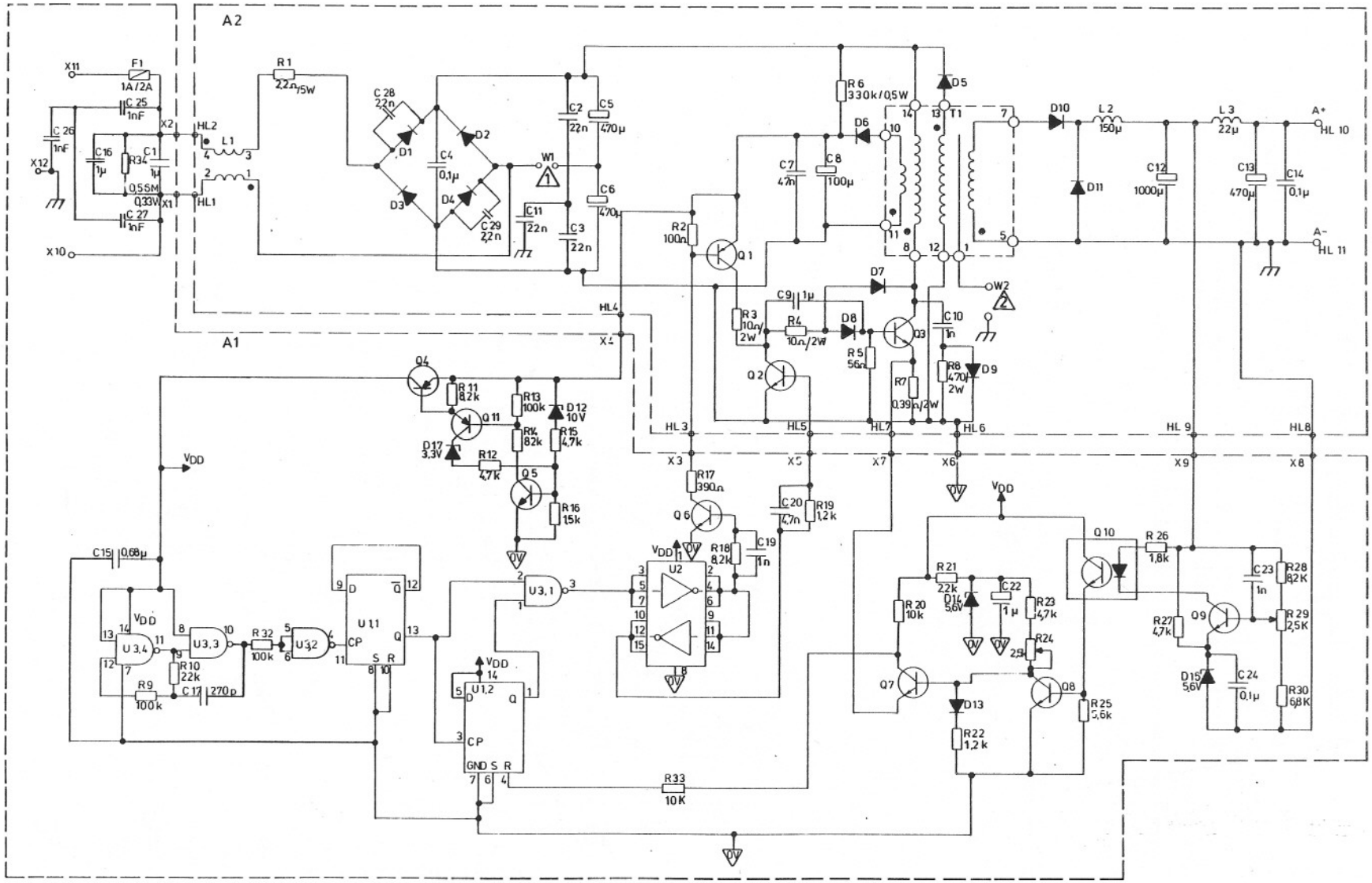
Output current
Continuous: 8.0 A
Maximum: 9.0 A

Ripple output voltage
≤100 mV (RMS)

Temperature
$-30^{o}C/+75^{o}C$

Volume
1.6 l

Storno



NOTES

1. W1 IS ONLY USED IN 19M905315G2 (PS 901, 110V)
2. W2 IS INSERT, IF GROUDING OF TRANSFORMER SAFETY SHIELD BETWEEN PRIMARY AND SECUNDARY WINDING IS NEEDED

MODUL CODE NO.

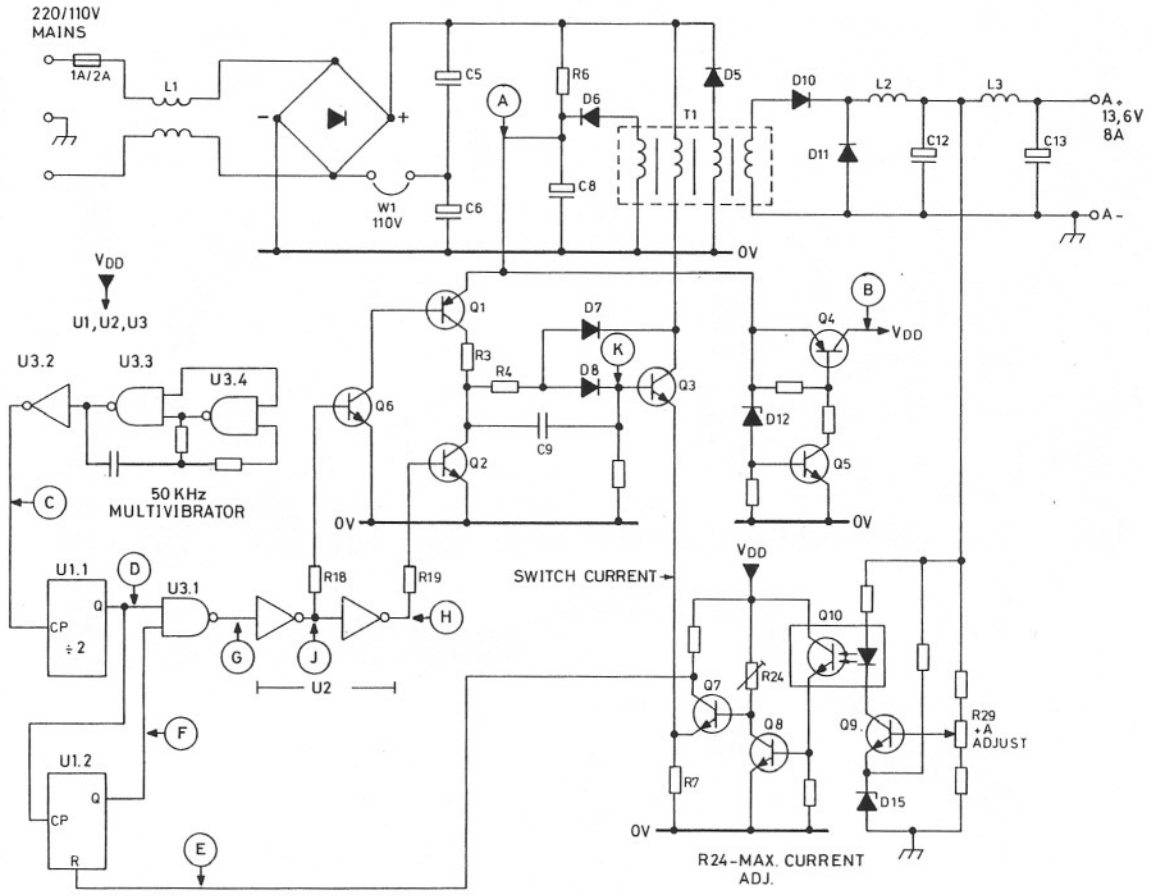
M905332G1-220V

M905332G2-110V

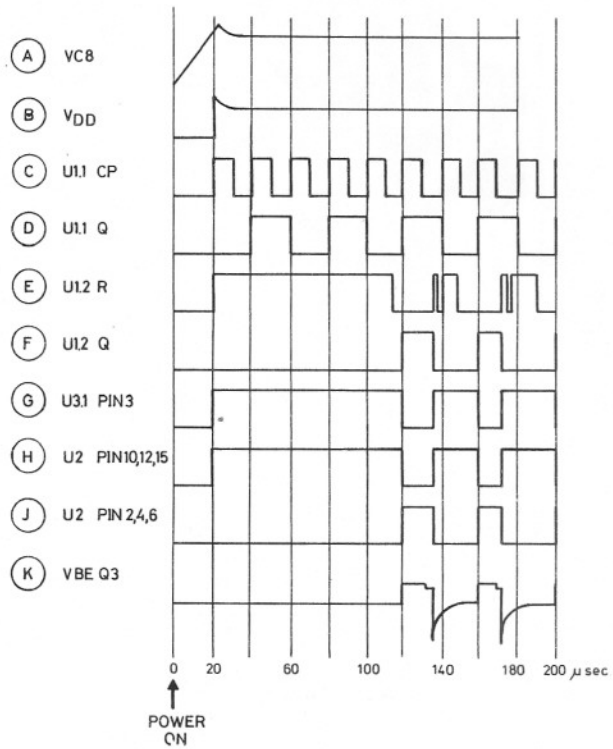
POWER SUPPLY PS901

REV. D D403.258/2

Storno



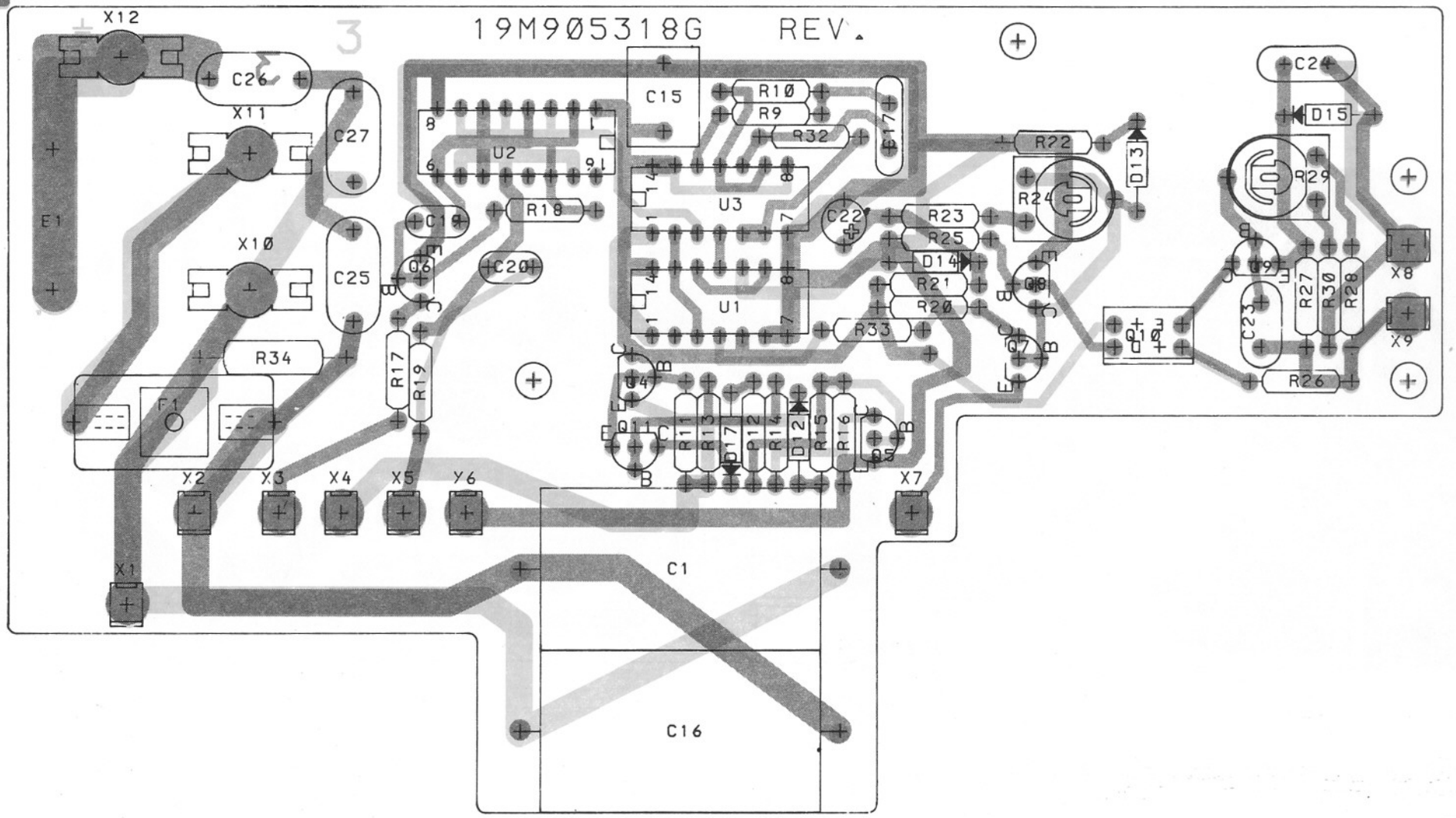
NOT ALL COMPONENTS ARE SHOWN
FOR REASONS OF SIMPLICITY



POWER SUPPLY PS901
FUNCTIONAL DIAGRAM

D403.263

Storno



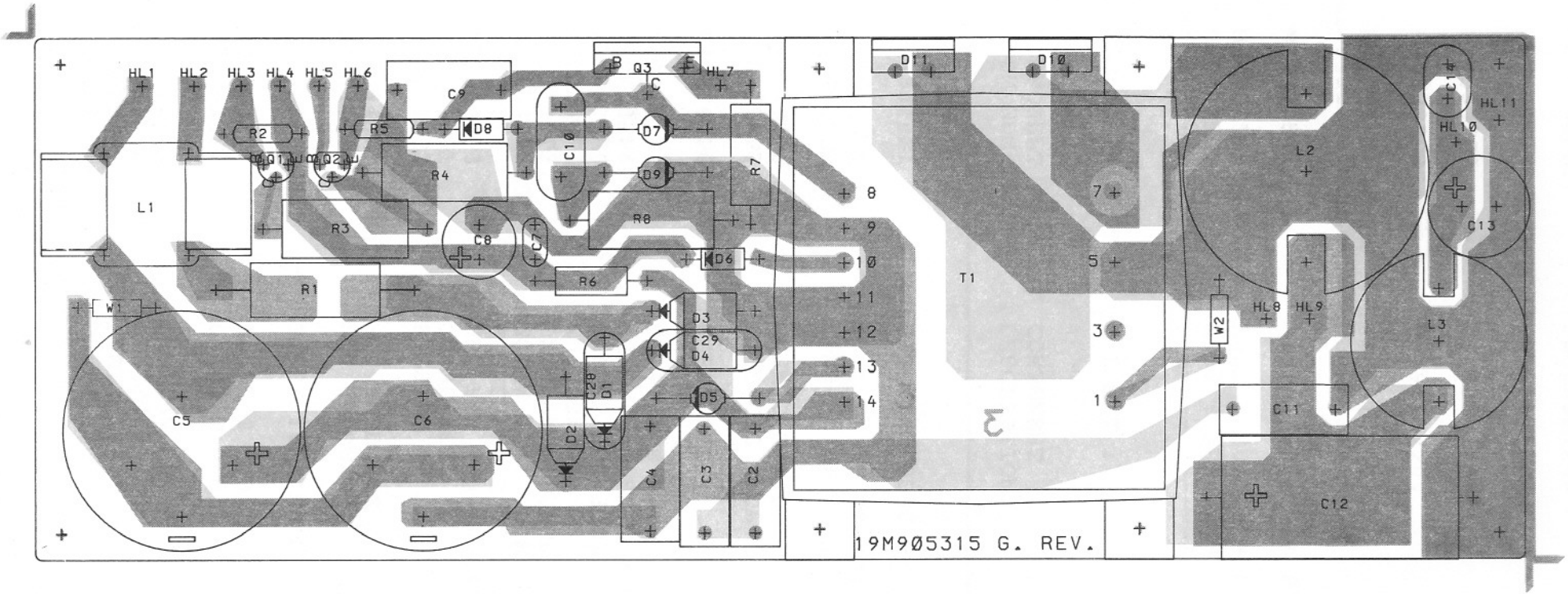
MOUNTED BOARD CODE NO.

A1-M905318G1-220V/110V

POWER SUPPLY PS901
COMPONENT LAYOUT

D403.259/2

Storno



MOUNTED BOARD CODE NO.

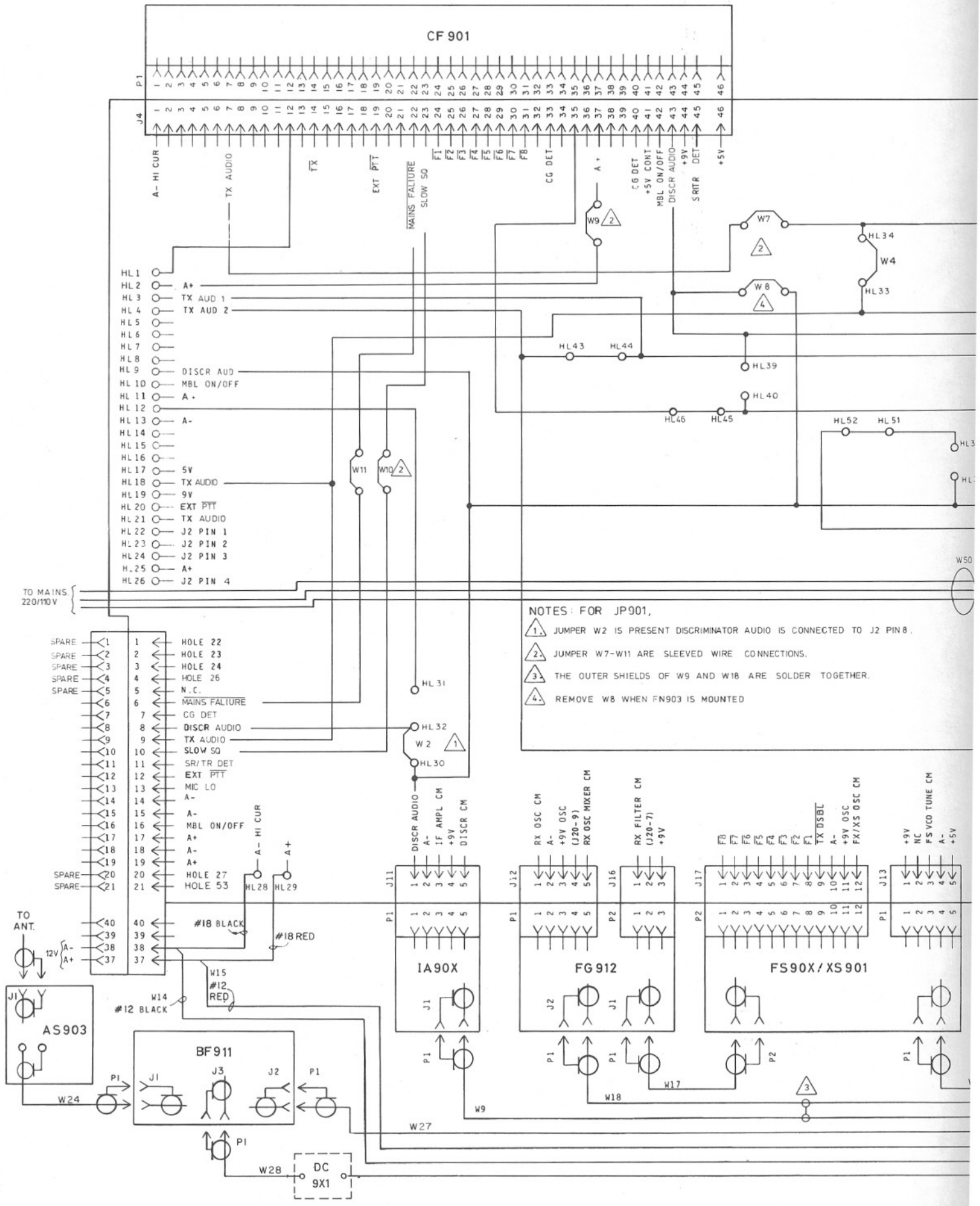
A2-M905315G1-220V

A2-M905315G2-110V

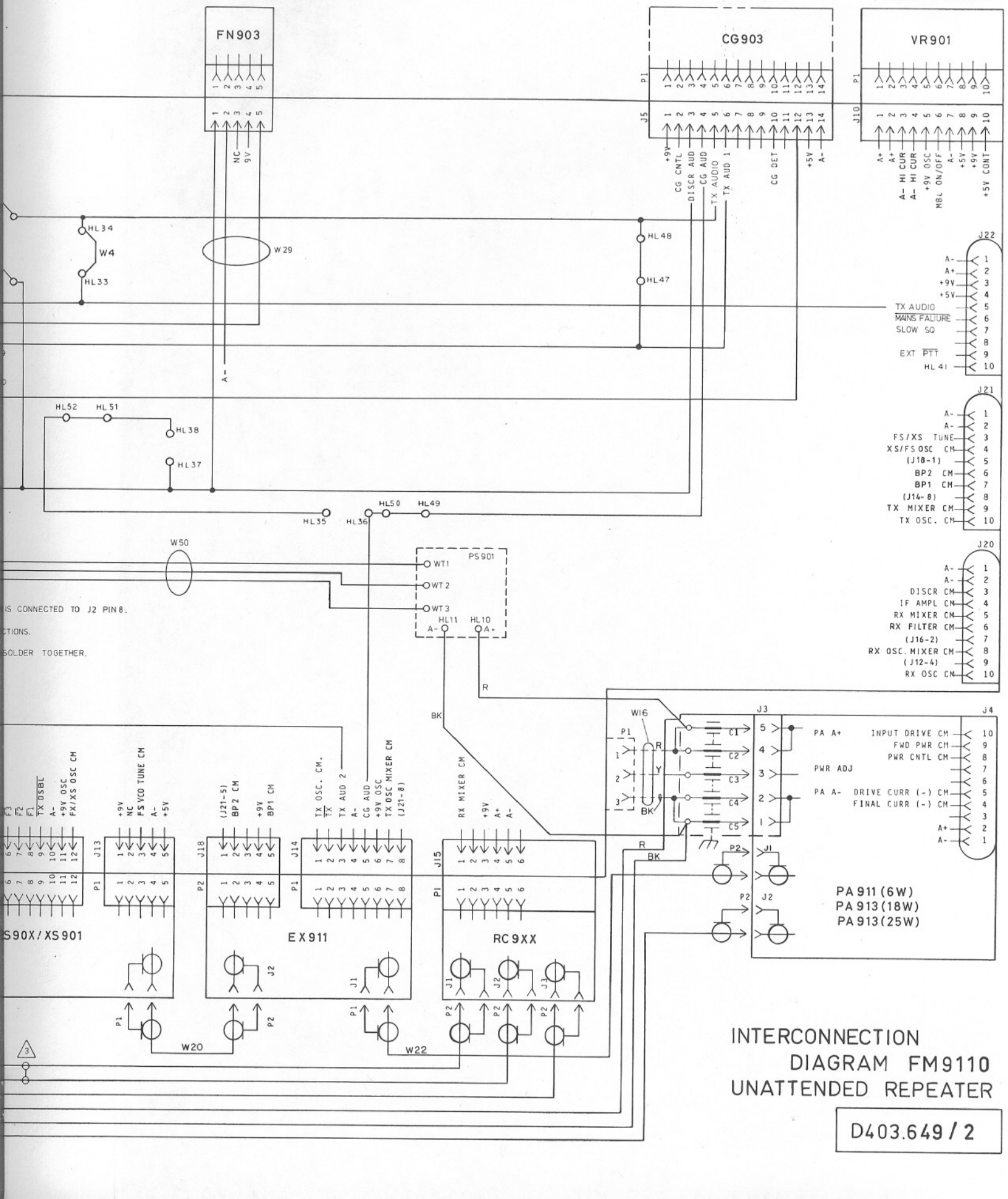
POWER SUPPLY PS901
COMPONENT LAYOUT

D403.260/2

Storno


CF 901
P1
J4
A- HI CUR
TX AUDIO
TX
EXT PTT
MAINS FALTURE
SLOW SQ
F1
F2
F3
F4
F5
F6
F7
F8
CG DET
A +
CG DET
+5V CONT
MBL ON/OFF
DISCR AUDIO
+9V
SR/TR DET
+5V
W9
W7
W4
W8
HL34
HL33
HL1 HL2 A+ HL3 TX AUD 1 HL4 TX AUD 2 HL5 HL6 HL7 HL8 HL9 DISCR AUD HL10 MBL ON/OFF HL11 A+ HL12 HL13 A- HL14 HL15 HL16 HL17 5V HL18 TX AUDIO HL19 9V HL20 EXT PTT HL21 TX AUDIO HL22 J2 PIN 1 HL23 J2 PIN 2 HL24 J2 PIN 3 HL25 A+ HL26 J2 PIN 4
HL43
HL44
HL39
HL40
HL46
HL45
HL52
HL51
W11
W10
W50
TO MAINS 220/110 V
NOTES: FOR JP901,
1. JUMPER W2 IS PRESENT DISCRIMINATOR AUDIO IS CONNECTED TO J2 PIN 8.
2. JUMPER W7-W11 ARE SLEEVED WIRE CONNECTIONS.
3. THE OUTER SHIELDS OF W9 AND W18 ARE SOLDER TOGETHER.
4. REMOVE W8 WHEN FN903 IS MOUNTED
SPARE SPARE SPARE SPARE SPARE HOLE 22 HOLE 23 HOLE 24 HOLE 26 N.C. MAINS FALTURE CG DET DISCR AUDIO TX AUDIO SLOW SQ SR/TR DET EXT PTT MIC LO A- A- MBL ON/OFF A+ A- A+ HOLE 27 HOLE 53
HL31
HL32
W2
HL30
HL28
HL29
A- HI CUR
A+
TO ANT.
12V A- A+
#18 BLACK
#18 RED
W15 #12 RED
W14 #12 BLACK
DISCR AUDIO A- IF AMPL CM +9V DISCR CM
RX OSC CM A- +9V OSC (J20-9) RX OSC MIXER CM
RX FILTER CM (J20-7) +9V
F8 F7 F6 F5 F4 F3 F2 F1 TX DSBL A- +9V OSC FX/XS OSC CM
+9V NC FS VCO TUNE CM A- +5V
J11 J12 J16 J17 J13
IA90X
FG912
FS90X/XS901
AS903
BF911
J1 J3 J2
W24
W17
W18
W9
W27
W28
DC 9X1

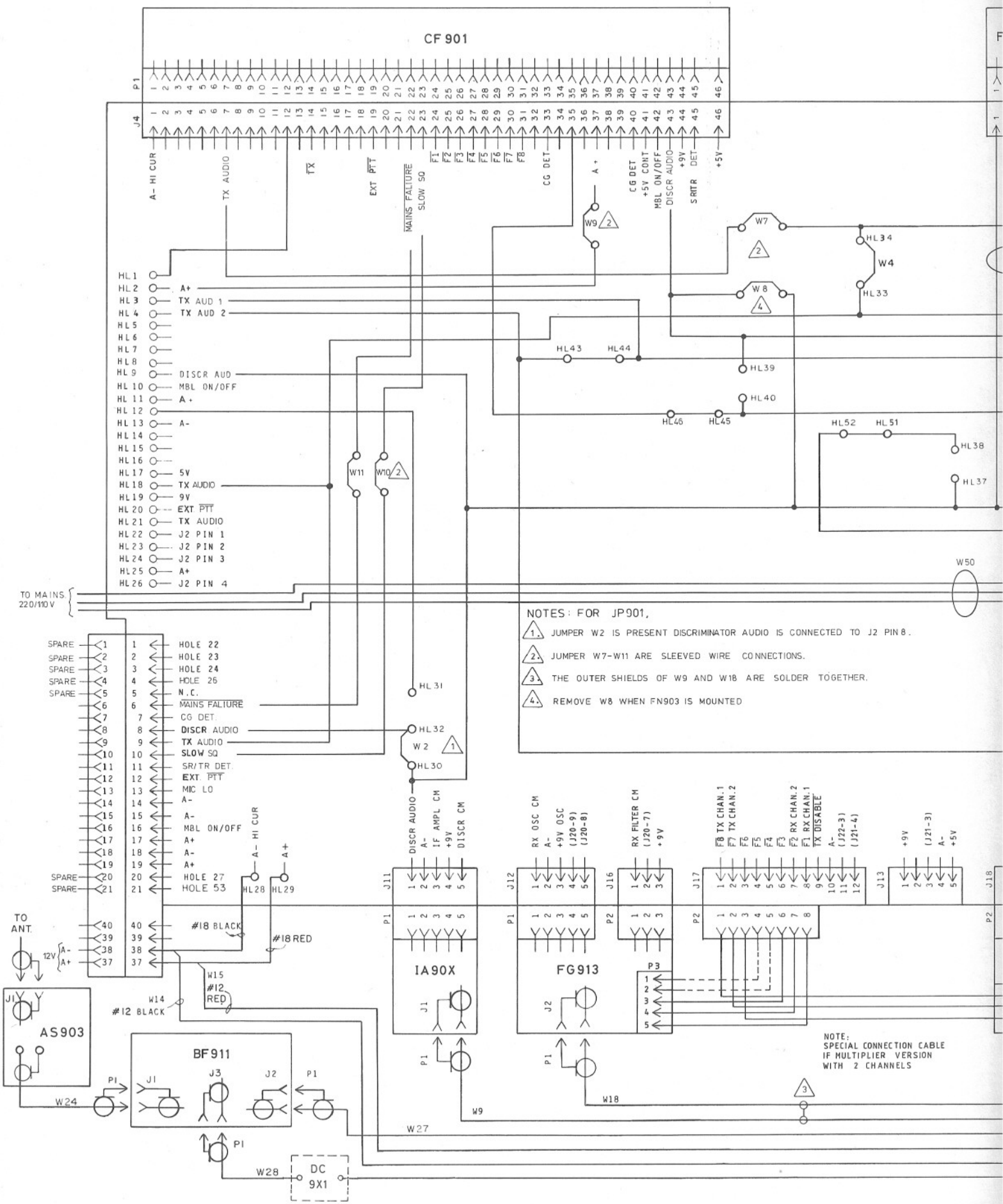
Storno



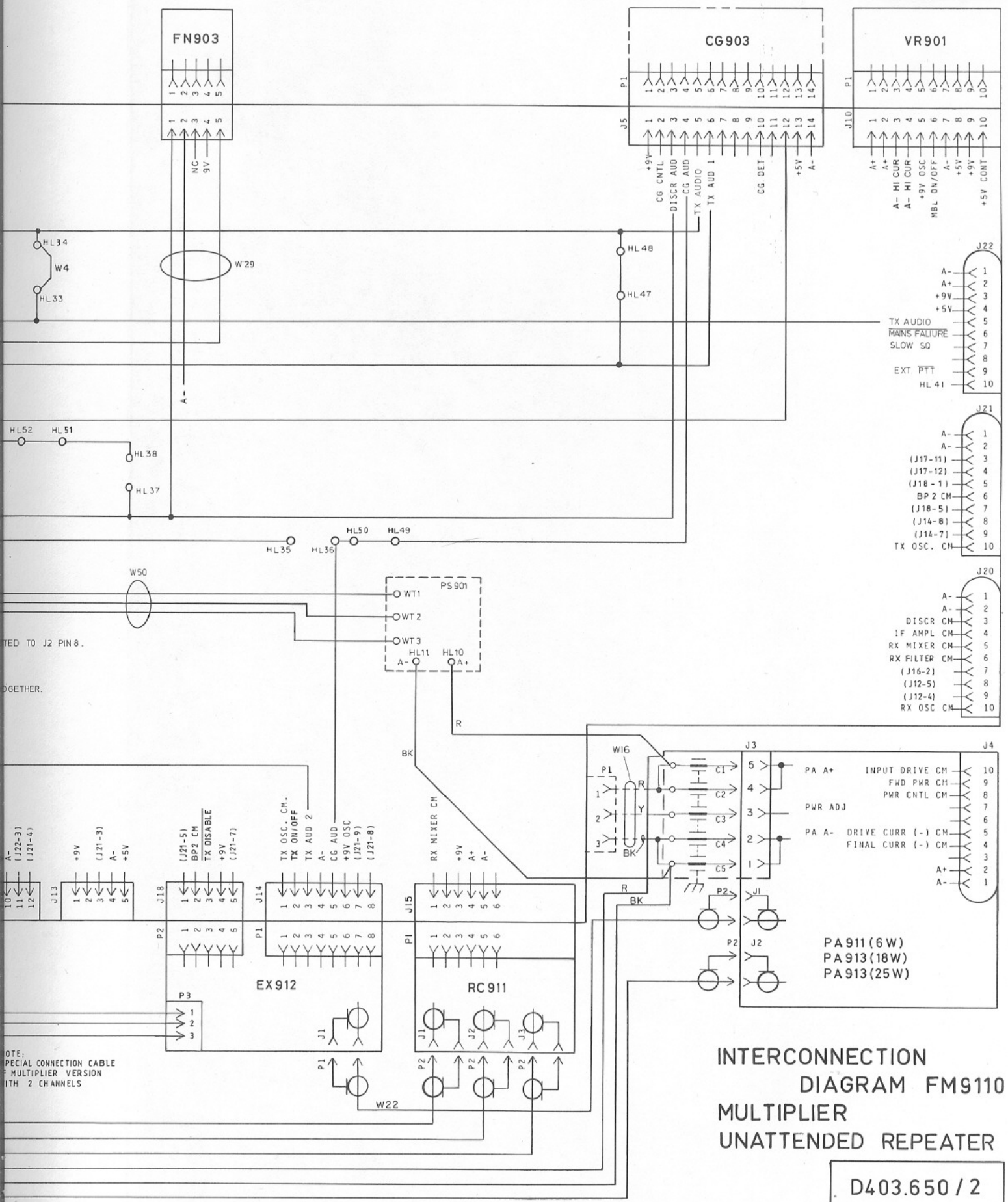
INTERCONNECTION
DIAGRAM FM9110
UNATTENDED REPEATER

D403.649/2

Storno


CF 901
P1
J4
A- HI CUR
TX AUDIO
TX
EXT PTT
MAINS FALTURE
SLOW SQ
F1
F2
F3
F4
F5
F6
F7
F8
CG DET
A+
CG DET
+5V CONT
MBL ON/OFF
DISCR AUDIO
+9V
SRITR DET
+5V
W9
W7
W8
W4
HL34
HL33
HL1
HL2 A+
HL3 TX AUD 1
HL4 TX AUD 2
HL5
HL6
HL7
HL8
HL9 DISCR AUD
HL10 MBL ON/OFF
HL11 A+
HL12
HL13 A-
HL14
HL15
HL16
HL17 5V
HL18 TX AUDIO
HL19 9V
HL20 EXT PTT
HL21 TX AUDIO
HL22 J2 PIN 1
HL23 J2 PIN 2
HL24 J2 PIN 3
HL25 A+
HL26 J2 PIN 4
HL43
HL44
HL39
HL40
HL46
HL45
HL52
HL51
HL38
HL37
W11
W10
W50
TO MAINS 220/110 V
SPARE
HOLE 22
HOLE 23
HOLE 24
HOLE 26
N.C.
MAINS FALTURE
CG DET.
DISCR AUDIO
TX AUDIO
SLOW SQ
SR/TR DET.
EXT. PTT
MIC LO
A-
A-
MBL ON/OFF
A+
A-
A+
HOLE 27
HOLE 53
HL31
HL32
W2
HL30
A- HI CUR
A+
HL28
HL29
TO ANT.
12V
#18 BLACK
#18 RED
W15
#12 RED
W14
#12 BLACK
AS903
J1
BF911
J3
J2
P1
W24
W27
W28
DC 9X1
DISCR AUDIO
A-
IF AMPL CM
+9V
DISCR CM
J11
J12
RX OSC CM
A-
+9V OSC
(J20-9)
(J20-8)
J16
RX FILTER CM
(J20-7)
+9V
J17
F8 TX CHAN.1
F7 TX CHAN.2
F6
F5
F4
F3
F2 RX CHAN.2
F1 RX CHAN.1
TX DISABLE
A-
(J22-3)
(J21-4)
J13
+9V
(J21-3)
A-
+5V
J18
IA90X
FG913
P3
W18
W9
NOTE:
SPECIAL CONNECTION CABLE
IF MULTIPLIER VERSION
WITH 2 CHANNELS
NOTES: FOR JP901,
1. JUMPER W2 IS PRESENT DISCRIMINATOR AUDIO IS CONNECTED TO J2 PIN 8.
2. JUMPER W7-W11 ARE SLEEVED WIRE CONNECTIONS.
3. THE OUTER SHIELDS OF W9 AND W18 ARE SOLDER TOGETHER.
4. REMOVE W8 WHEN FN903 IS MOUNTED

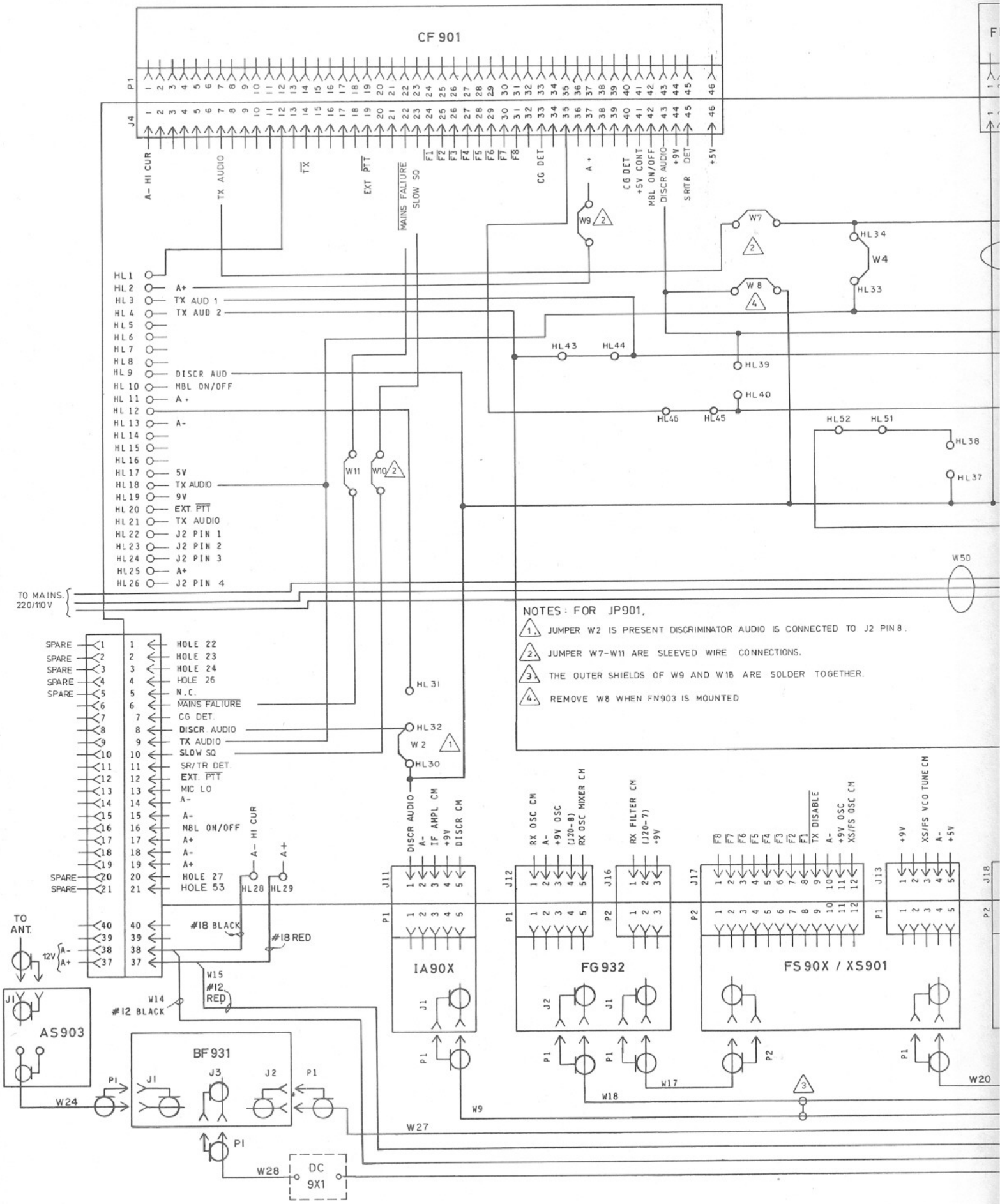
Storno



INTERCONNECTION DIAGRAM FM9110 MULTIPLIER UNATTENDED REPEATER

D403.650/2

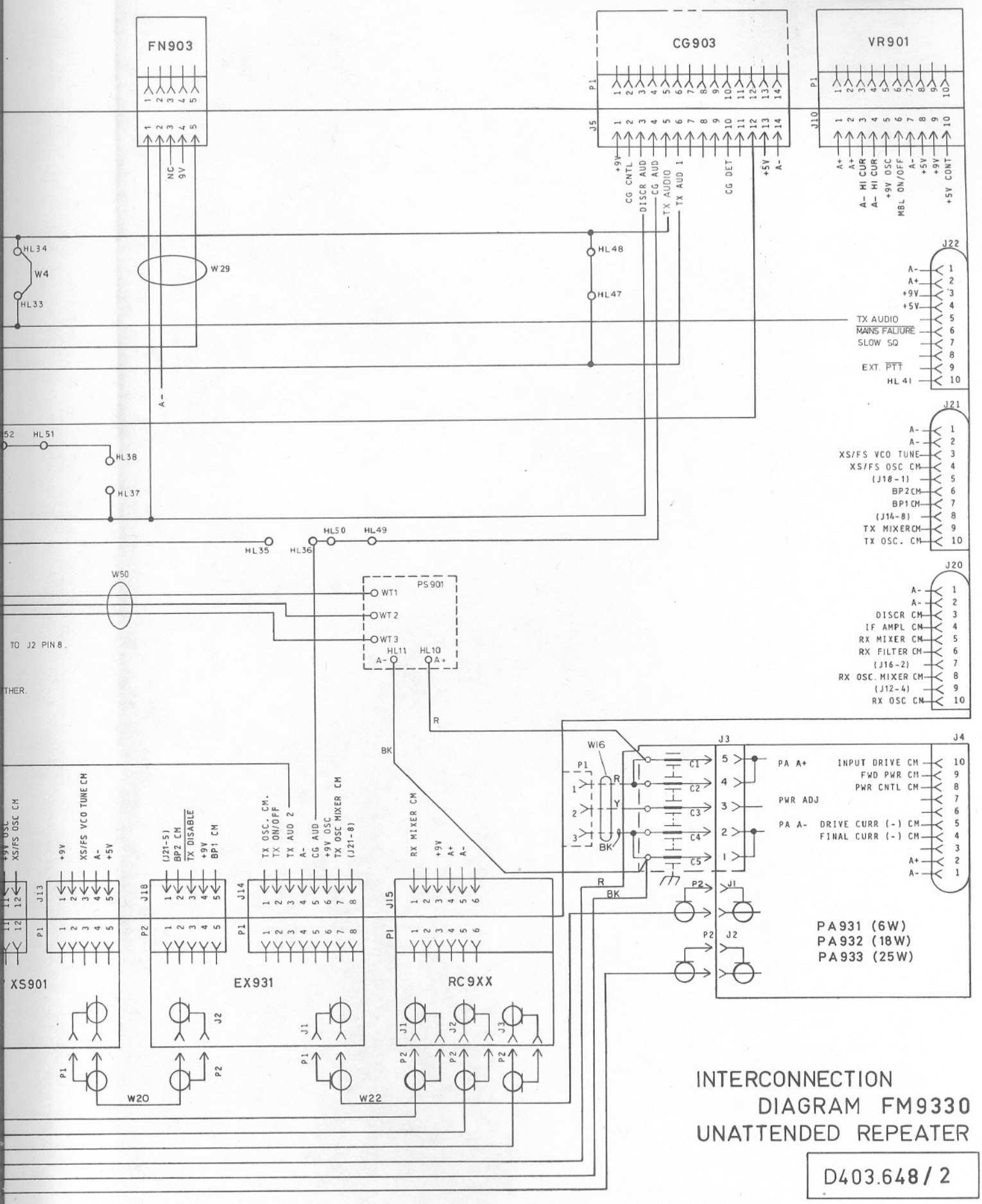
Storno



NOTES: FOR JP901,

1. JUMPER W2 IS PRESENT DISCRIMINATOR AUDIO IS CONNECTED TO J2 PIN 8.
2. JUMPER W7-W11 ARE SLEEVED WIRE CONNECTIONS.
3. THE OUTER SHIELDS OF W9 AND W18 ARE SOLDER TOGETHER.
4. REMOVE W8 WHEN FN903 IS MOUNTED

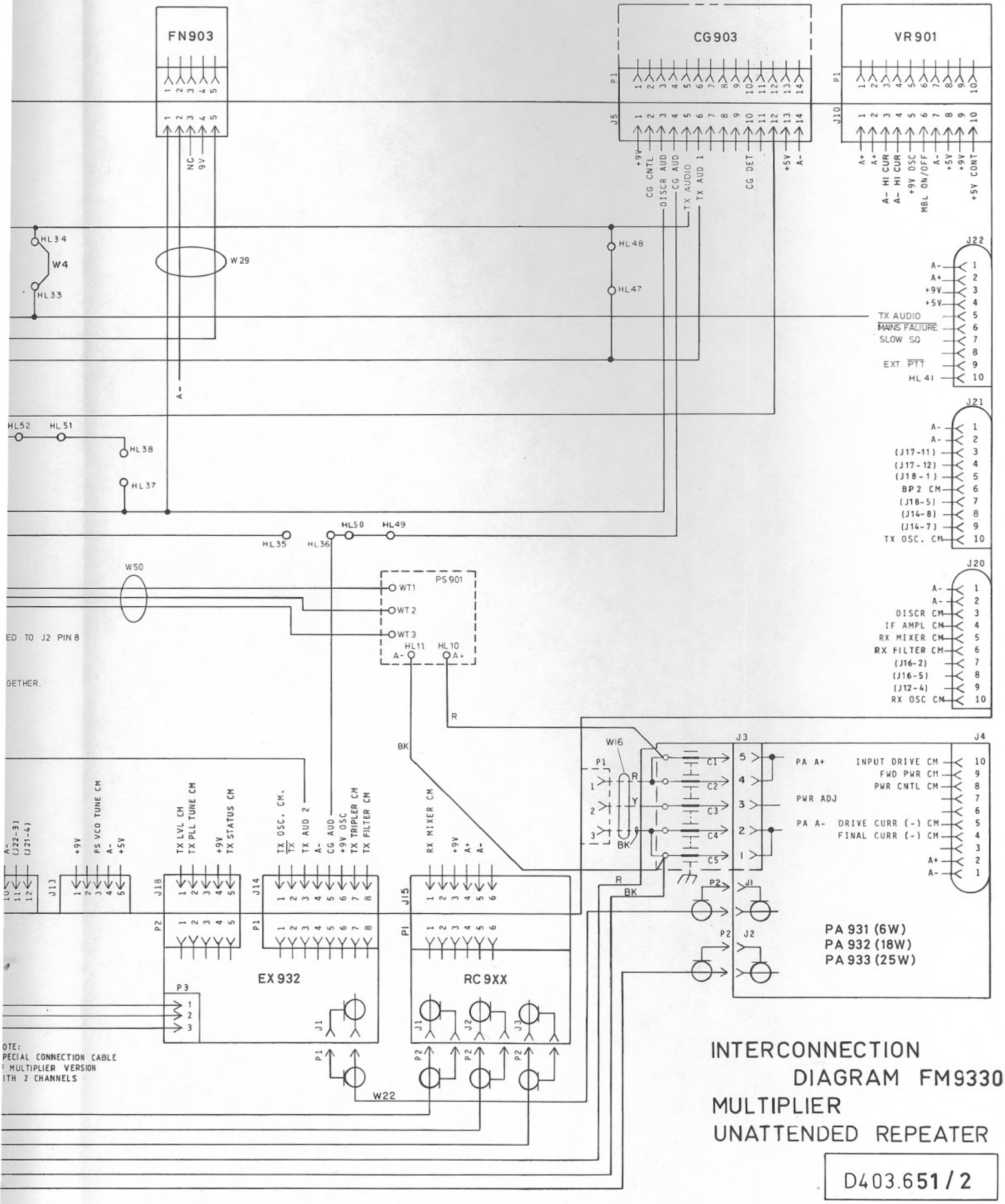
Storno



INTERCONNECTION DIAGRAM FM9330 UNATTENDED REPEATER

D403.648/2

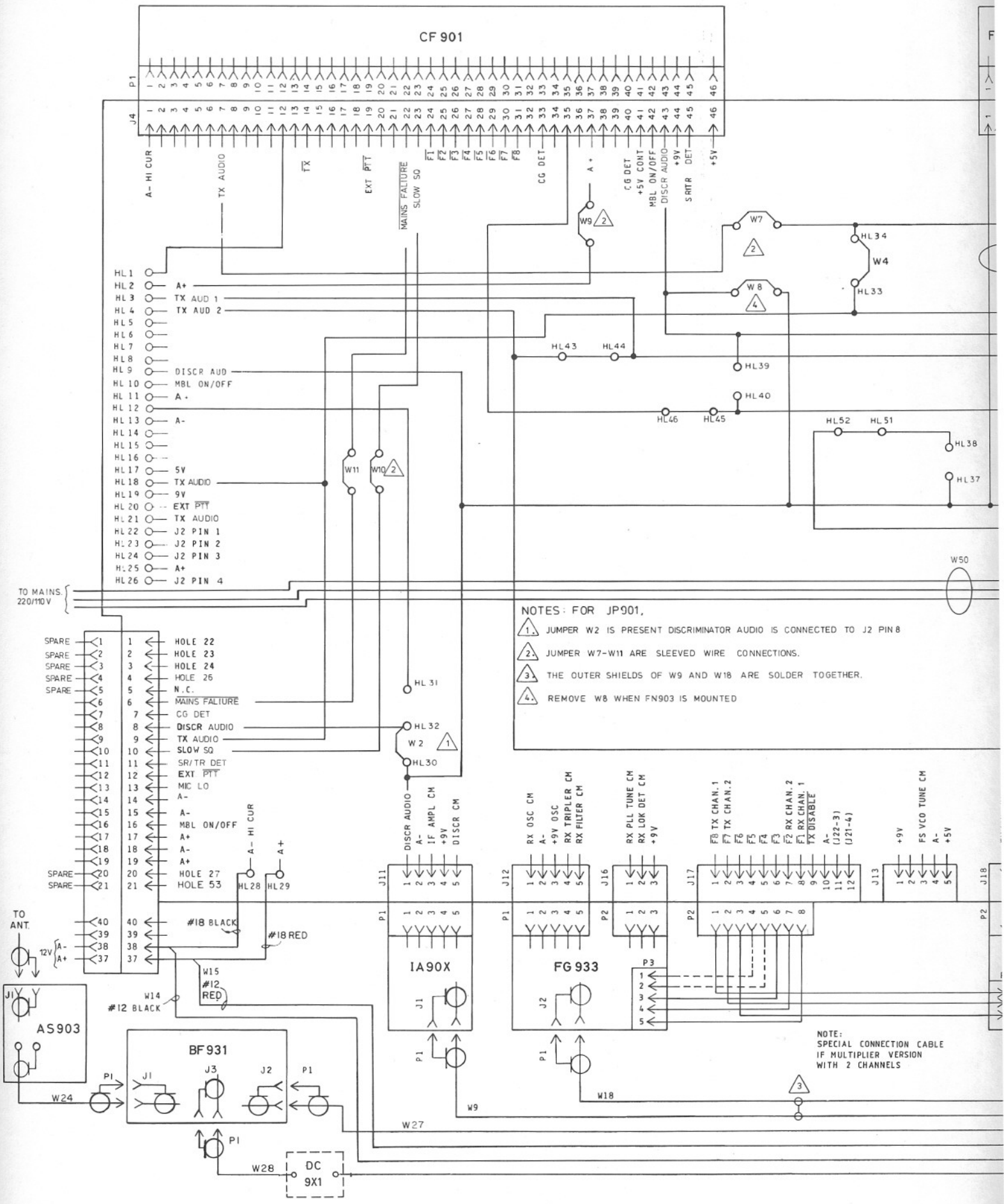
Storno



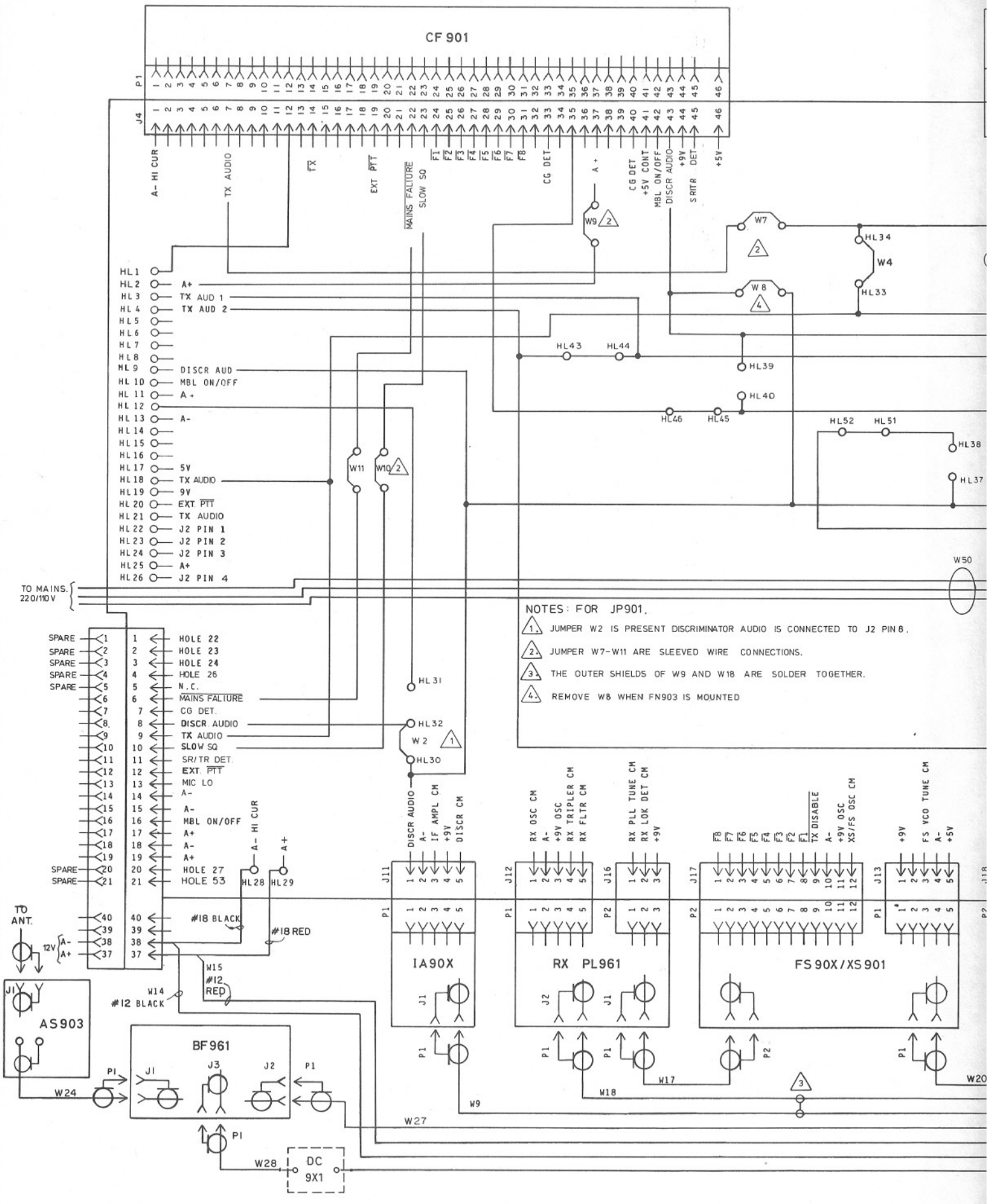
INTERCONNECTION DIAGRAM FM9330 MULTIPLIER UNATTENDED REPEATER

D403.651/2

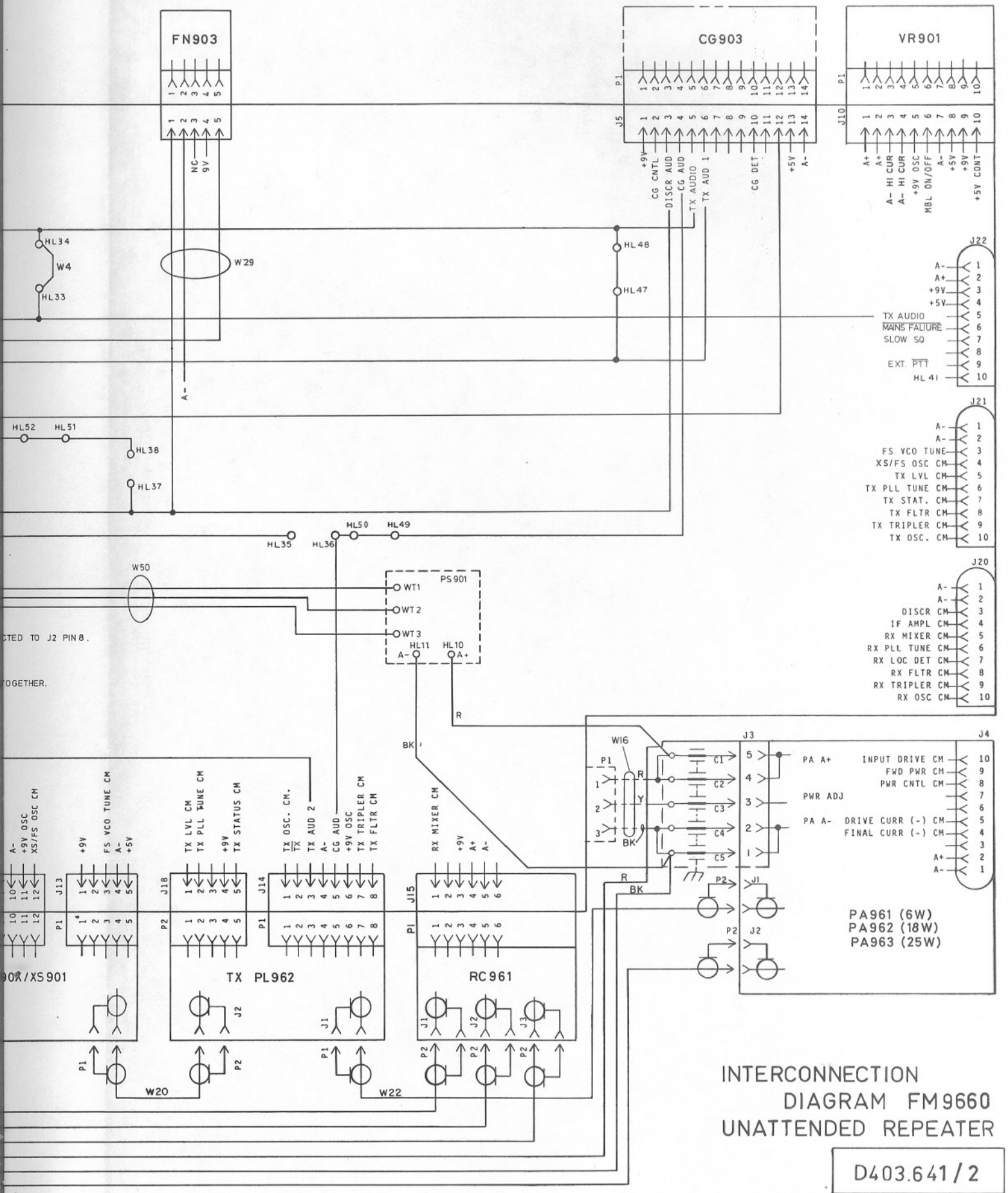
Storno


CF 901
P1
J4
A- HI CUR
TX AUDIO
TX
EXT PTT
MAINS FALIURE
SLOW SQ
F1
F2
F3
F4
F5
F6
F7
F8
CG DET
A +
CG DET
+5V CONT
MBL ON/OFF
DISCR AUDIO
+9V
SR/TR DET
+5V
W9
W7
W8
W4
HL34
HL33
HL1
HL2 A+
HL3 TX AUD 1
HL4 TX AUD 2
HL5
HL6
HL7
HL8
HL9 DISCR AUD
HL10 MBL ON/OFF
HL11 A +
HL12
HL13 A-
HL14
HL15
HL16
HL17 5V
HL18 TX AUDIO
HL19 9V
HL20 EXT PTT
HL21 TX AUDIO
HL22 J2 PIN 1
HL23 J2 PIN 2
HL24 J2 PIN 3
HL25 A+
HL26 J2 PIN 4
HL43
HL44
HL39
HL40
HL46
HL45
HL52
HL51
HL38
HL37
W11
W10
W50
TO MAINS 220/110 V
NOTES: FOR JP901,
1. JUMPER W2 IS PRESENT DISCRIMINATOR AUDIO IS CONNECTED TO J2 PIN 8
2. JUMPER W7-W11 ARE SLEEVED WIRE CONNECTIONS.
3. THE OUTER SHIELDS OF W9 AND W18 ARE SOLDER TOGETHER.
4. REMOVE W8 WHEN FN903 IS MOUNTED
SPARE
HOLE 22
HOLE 23
HOLE 24
HOLE 26
N.C.
MAINS FALIURE
CG DET
DISCR AUDIO
TX AUDIO
SLOW SQ
SR/TR DET
EXT PTT
MIC LO
A-
MBL ON/OFF
A+
HOLE 27
HOLE 53
HL31
HL32
W2
HL30
HL28
HL29
A- HI CUR
A+
TO ANT.
12V
#18 BLACK
#18 RED
W15 #12 RED
W14 #12 BLACK
J11
J12
J16
J17
J13
J18
DISCR AUDIO
IF AMPL CM
DISCR CM
RX OSC CM
RX TRIPLER CM
RX FILTER CM
RX PLL TUNE CM
RX LOK DET CM
TX CHAN.1
TX CHAN.2
RX CHAN.2
RX CHAN.1
TX DISABLE
FS VCO TUNE CM
IA90X
FG 933
P3
AS903
BF931
J1
J3
J2
W24
W9
W18
W27
W28
DC 9X1
NOTE:
SPECIAL CONNECTION CABLE
IF MULTIPLIER VERSION
WITH 2 CHANNELS

Storno


CF 901
P1
J4
A- HI CUR
TX AUDIO
FX
EXT PTT
MAINS FAILURE
SLOW SQ
F1
F2
F3
F4
F5
F6
F7
F8
CG DET
A +
CG DET
+5V CONT
MBL ON/OFF
DISCR AUDIO
+9V
SR/TR DET
+5V
HL1
HL2 A+
HL3 TX AUD 1
HL4 TX AUD 2
HL5
HL6
HL7
HL8
HL 9 DISCR AUD
HL 10 MBL ON/OFF
HL 11 A +
HL 12
HL 13 A-
HL 14
HL 15
HL 16
HL 17 5V
HL 18 TX AUDIO
HL 19 9V
HL 20 EXT. PTT
HL 21 TX AUDIO
HL 22 J2 PIN 1
HL 23 J2 PIN 2
HL 24 J2 PIN 3
HL 25 A+
HL 26 J2 PIN 4
W9
W7
W8
W4
HL34
HL33
HL43
HL44
HL39
HL40
HL46
HL45
HL52
HL51
HL38
HL37
W11
W10
W50
TO MAINS 220/110 V
SPARE
HOLE 22
HOLE 23
HOLE 24
HOLE 26
N.C.
MAINS FALTURE
CG DET.
DISCR AUDIO
TX AUDIO
SLOW SQ
SR/TR DET.
EXT. PTT
MIC LO
A-
A-
MBL ON/OFF
A+
A-
A+
HOLE 27
HOLE 53
HL31
HL32
W2
HL30
HL28
HL29
A- HI CUR
A+
TO ANT.
12V
#18 BLACK
#18 RED
W15 #12 RED
W14 #12 BLACK
J11
J12
J16
J17
J13
DISCR AUDIO
A-
IF AMPL CM
+9V
DISCR CM
RX OSC CM
A-
+9V OSC
RX TRIPLER CM
RX FLTR CM
RX PLL TUNE CM
RX LOK DET CM
+9V
F8
F7
F6
F5
F4
F3
F2
F1
TX DISABLE
A-
+9V OSC
XS/FS OSC CM
+9V
FS VCO TUNE CM
A-
+5V
IA90X
RX PL961
FS 90X/XS 901
AS903
BF961
W24
W17
W18
W9
W27
W28
DC 9X1
W20
NOTES: FOR JP901.
1. JUMPER W2 IS PRESENT DISCRIMINATOR AUDIO IS CONNECTED TO J2 PIN 8.
2. JUMPER W7-W11 ARE SLEEVED WIRE CONNECTIONS.
3. THE OUTER SHIELDS OF W9 AND W18 ARE SOLDER TOGETHER.
4. REMOVE W8 WHEN FN903 IS MOUNTED

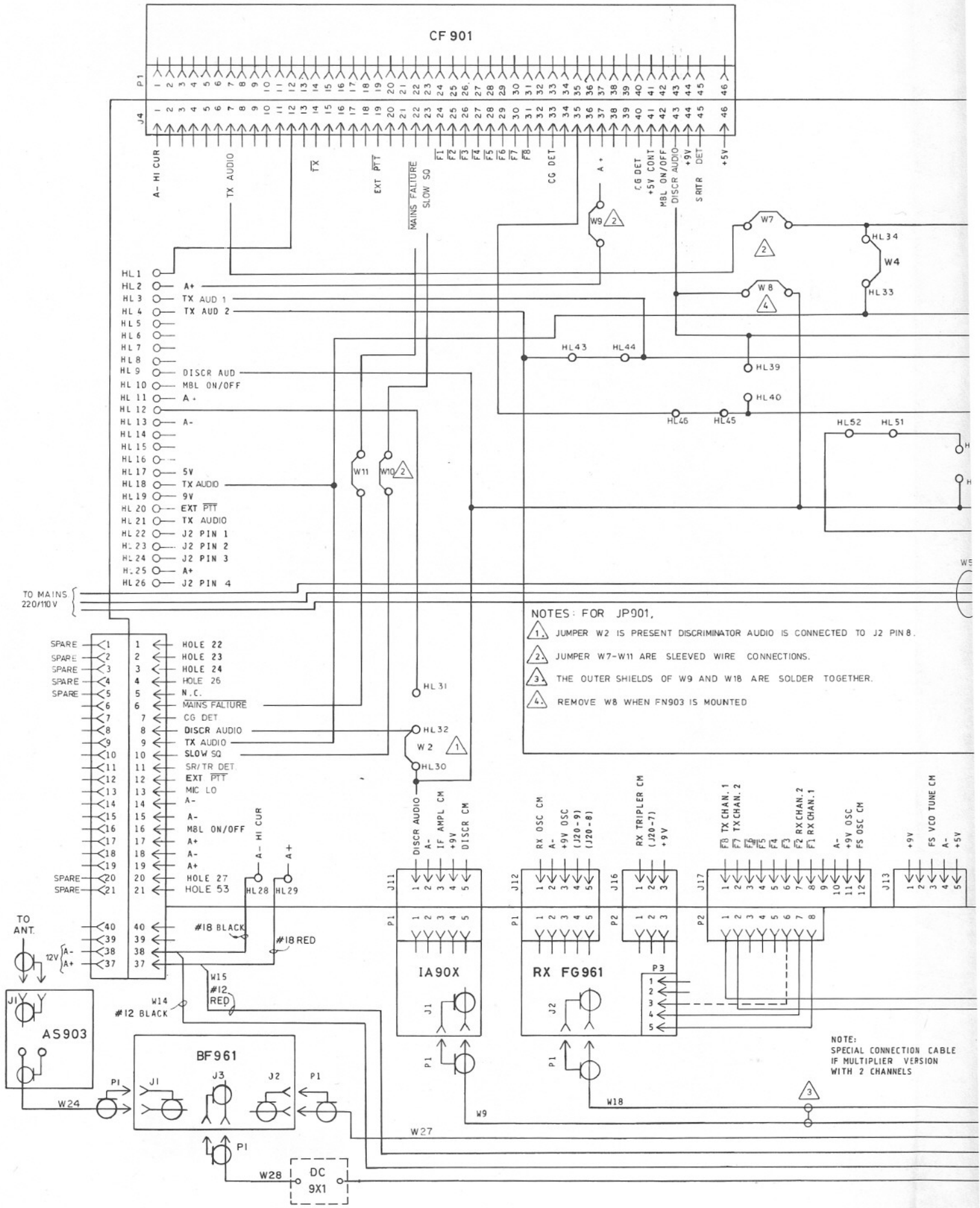
Storno



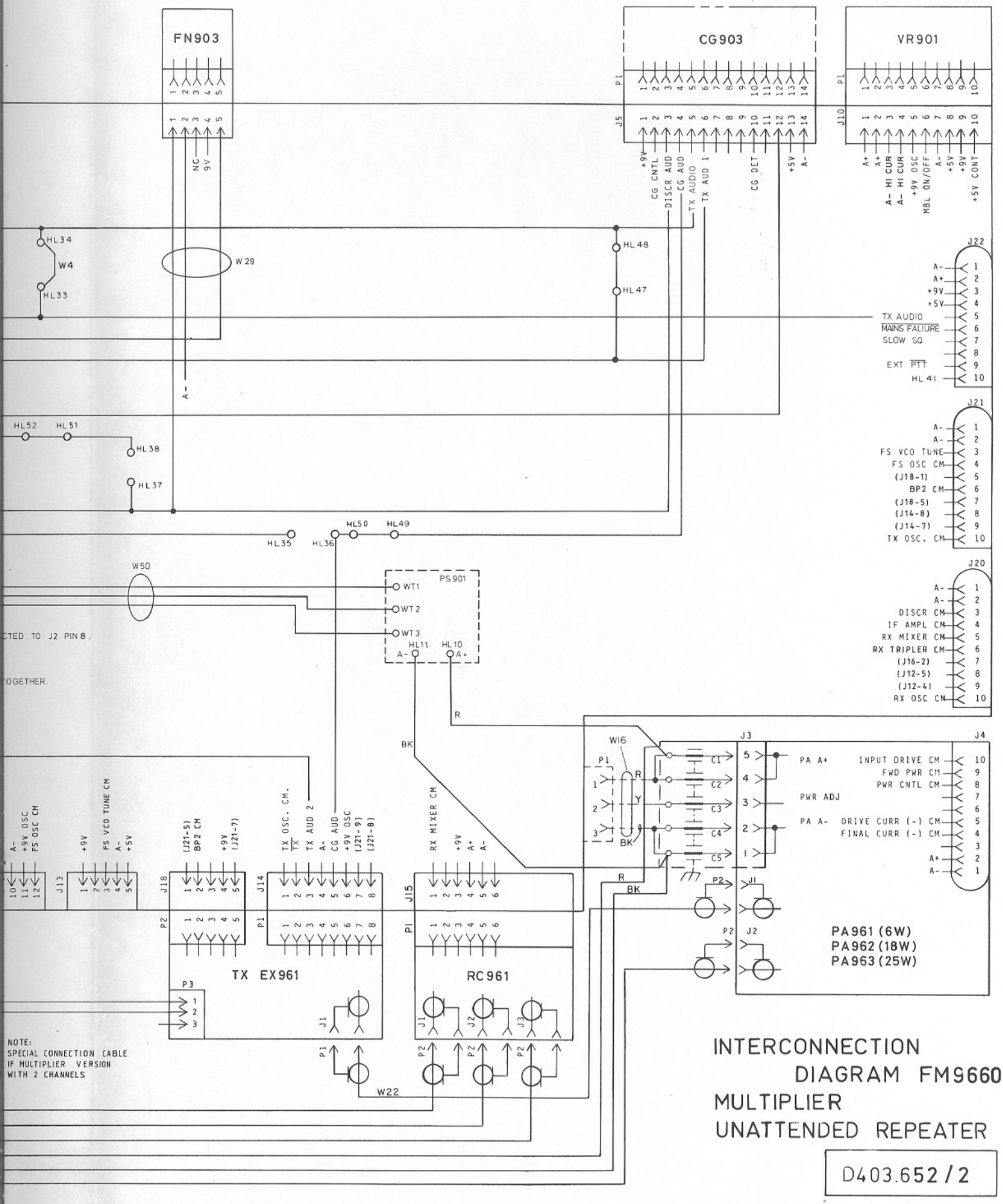
INTERCONNECTION
DIAGRAM FM9660
UNATTENDED REPEATER

D403.641/2

Storno


CF 901
P1
J4
A- HI CUR
TX AUDIO
TX
EXT PTT
MAINS FALTURE
SLOW SQ
F1
F2
F3
F4
F5
F6
F7
F8
CG DET
A +
CG DET
+5V CONT
MBL ON/OFF
DISCR AUDIO
+9V
SR/TR DET
+5V
W9
W7
W8
W4
HL34
HL33
HL1
HL2 A+
HL3 TX AUD 1
HL4 TX AUD 2
HL5
HL6
HL7
HL8
HL9 DISCR AUD
HL10 MBL ON/OFF
HL11 A +
HL12
HL13 A-
HL14
HL15
HL16
HL17 5V
HL18 TX AUDIO
HL19 9V
HL20 EXT PTT
HL21 TX AUDIO
HL22 J2 PIN 1
HL23 J2 PIN 2
HL24 J2 PIN 3
HL25 A+
HL26 J2 PIN 4
HL43
HL44
HL39
HL40
HL46
HL45
HL52
HL51
W11
W10
TO MAINS 220/110V
SPARE
HOLE 22
HOLE 23
HOLE 24
HOLE 26
N.C.
MAINS FALTURE
CG DET
DISCR AUDIO
TX AUDIO
SLOW SQ
SR/TR DET
EXT PTT
MIC LO
A-
HOLE 27
HOLE 53
HL31
HL32
W2
HL30
NOTES: FOR JP901,
1. JUMPER W2 IS PRESENT DISCRIMINATOR AUDIO IS CONNECTED TO J2 PIN 8.
2. JUMPER W7-W11 ARE SLEEVED WIRE CONNECTIONS.
3. THE OUTER SHIELDS OF W9 AND W18 ARE SOLDER TOGETHER.
4. REMOVE W8 WHEN FN903 IS MOUNTED
DISCR AUDIO
A-
IF AMPL CM
+9V
DISCR CM
RX OSC CM
A-
+9V OSC (J20-9)
(J20-8)
RX TRIPLER CM (J20-7)
+9V
F8 TX CHAN. 1
F7 TX CHAN. 2
F6
F5
F4
F3
F2 RX CHAN. 2
F1 RX CHAN. 1
A-
+9V OSC
FS OSC CM
+9V
FS VCO TUNE CM
A-
+5V
J11
J12
J16
J17
J13
P1
P2
HL28
HL29
A- HI CUR
A+
TO ANT.
12V
#18 BLACK
#18 RED
W15
#12 RED
W14
#12 BLACK
IA90X
RX FG961
P3
J1
J2
AS903
BF961
J3
W24
W18
W9
W27
W28
DC 9X1
NOTE:
SPECIAL CONNECTION CABLE
IF MULTIPLIER VERSION
WITH 2 CHANNELS

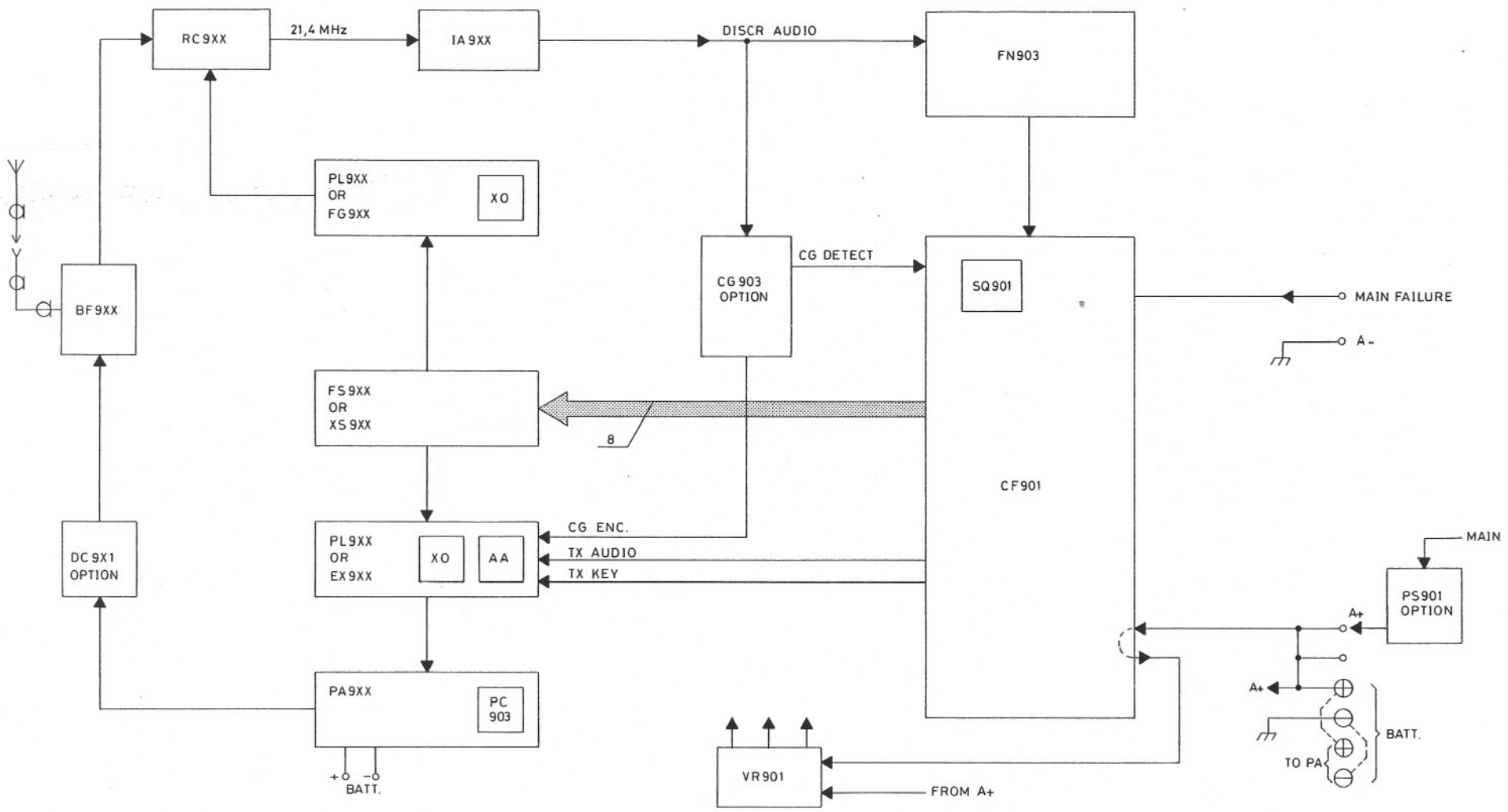
Storno



INTERCONNECTION DIAGRAM FM9660 MULTIPLIER UNATTENDED REPEATER

D403.652/2

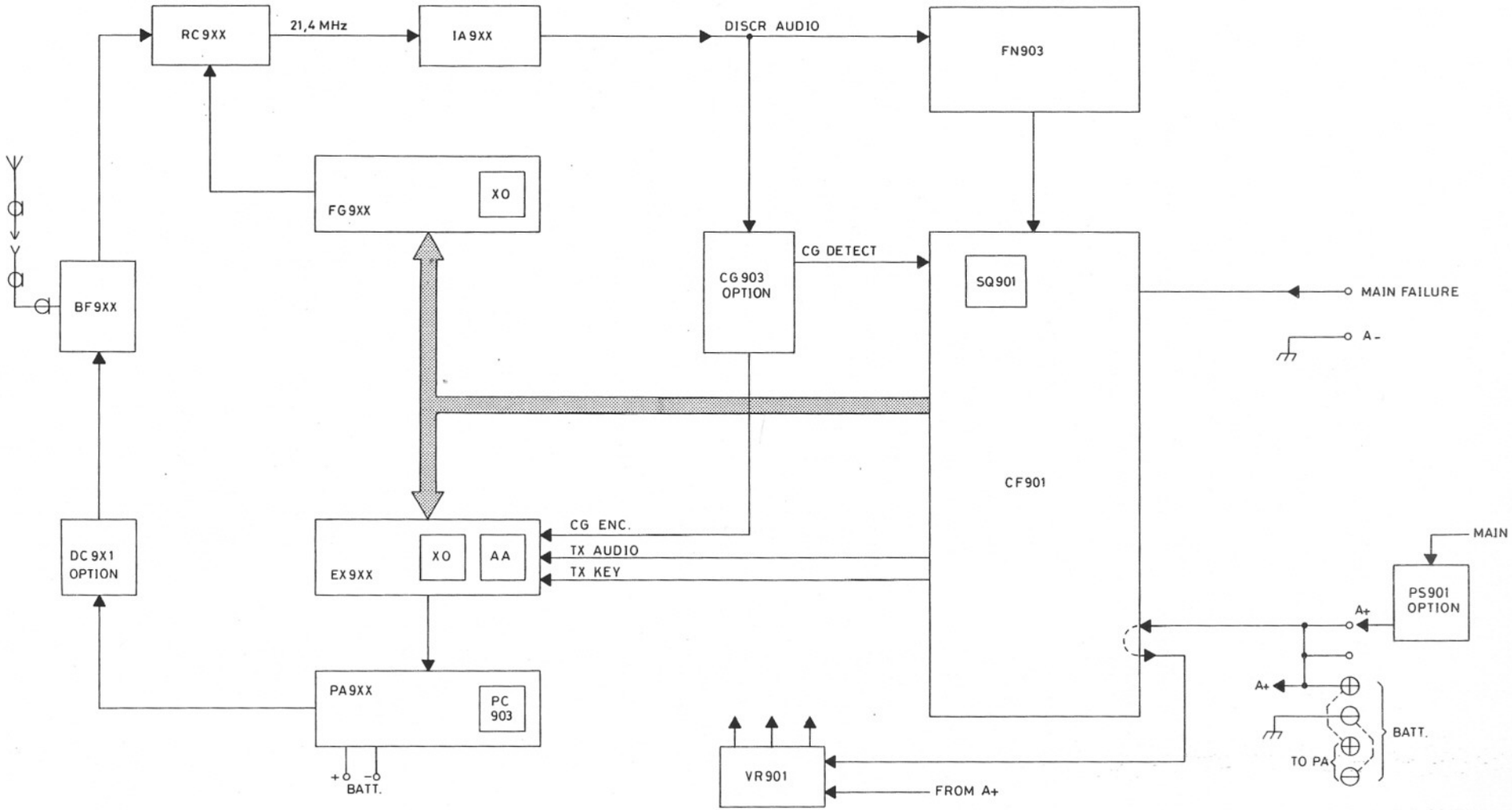
Storno



BLOCK DIAGRAM FM9XXX (1CH)
UNATTENDED REPEATER

D403.828

Storno



BLOCK DIAGRAM FM9XXX (1CH)
MULTIPLIER UNATTENDED REPEATER

D403.830

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STORNOPHONE 900
UNATTENDED REPEATER
FM9xxx