Cobra 148GTL DX Service Manual
Pages 1 to 31 Early Version

SERVICE MANUAL
SERVICE MANUAL

SERVICE MANUAL 148 GTLDX

(EARLY & LATE VERSIONS)

COBRA COMMUNICATIONS
PRODUCTION GROUP
DYNASCAN CORPORATION
6460 W. CORTLAND ST.
CHICAGO, ILLINOIS 60635

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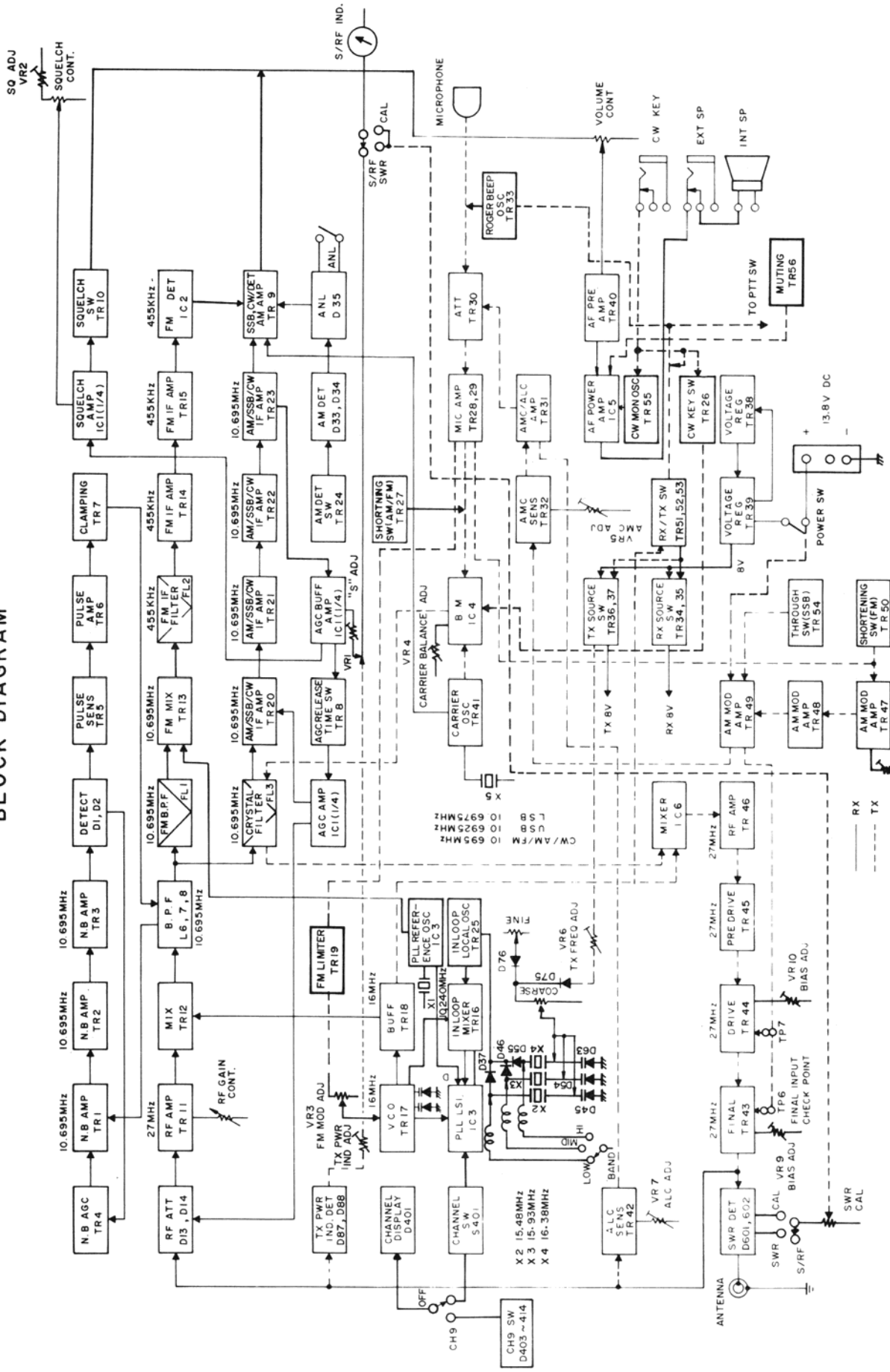
BLOCK DIAGRAM



C148GTL DX ALIGNMENT PROCEDURE

ALIGNMENT OF PLL AND CARRIER OSCILLATOR SECTION.

1. Test Equipment Required:

   a) Oscilloscope
   b) DC Voltmeter
   c) Frequency Counter

Effectivity: S/N 03000001-4498
S/N 13000001-1504

EARLY
VERSION

2. Alignment Procedure.

STEP	PRESET TO	ADJUSTMENT	REMARKS
1	CH :19 RX Mode Mode AM Voice Lock: Center Band: MID	L14	Connect Oscilloscope to TP4 (lead of R83). Adjust for maximum indication on Oscilloscope.
2	Same as above, except: CH : 40	L15	Connect DC Voltmeter to TP2 (lead of R93). Adjust for 5.4V reading on DC Voltmeter.
3	Same as Step 1	L16	Connect Oscilloscope to TP3 (lead of R101). Adjust for maximum indication on Oscilloscope.
4	Same as Step 1	L31	Connect Frequency Counter to TP3 (lead of R101). Adjust for 16.490MHz + or - 20Hz.
5	Same as Step 1 CH : 40 Mode : USB	L32	Adjust for 16.4925MHz + or - 20Hz.
6	Same as Step 1 CH : 40 Mode : LSB	L33	Adjust for 16.4875MHz + or - 20Hz.
7	Same as Step 6, CH : 40 TX Mode	VR6	Adjust for 16.4875MHz + or - 20Hz.
8	Same as Step 1 CH : 40 Band : Low	L22	Adjust for 16.040MHz + or - 20Hz.

Note: Two TP4 are noted on procedure. One is R83 and the other one is R114.

STEP	PRESET TO	ADJUSTMENT	REMARKS
9	Same as Step 8, CH : 40 Mode : USB	L23	Adjust for 16.0425MHz + or - 20Hz.
10	Same as Step 9, CH : 40 Mode : LSB	L24	Adjust for 16.0375MHz + or - 20Hz.
11	Same as Step 1 CH : 40 Band : HI	L40	Adjust for 16.940MHz + or - 20Hz.
12	Same as Step 11 CH : 40 Mode : USB	L41	Adjust for 16.9425MHz + or - 20Hz.
13	Same as Step 12 CH : 40 Mode : LSB	L42	Adjust for 16.9375MHz + or - 20Hz.
14	Same as Step 1 CH : 40 TX Mode	L47	Connect Frequency Counter to TP4 (R114). Adjust for 10.695MHz + or - 5Hz.
15	Same as Step 1 CH : 40 Mode : USB	L48	Connect Frequency Counter to TP5 (lead of R39). Adjust for 10.6925MHz +5Hz - 0Hz.
16	Same as Step 15 CH : 40 Mode : LSB	L49	Adjust for 10.6975MHz +0Hz -5Hz.

Note: Two TP4 are noted on Precedure. One is R83 and the other one is R114.

C148GLT DX ALIGNMENT PROCEDURE

ALIGNMENT OF RECEIVER PORTION

1. Test Equipment Required

   a) SG, 27MHz Band.
   b) Oscilloscope.
   c) AF VTVM (Across 8oz. speaker).
   d) Deviation Meter.

2. Alignment Procedure

STEP	PRESET TO	ADJUSTMENT	REMARKS
1	CH : 19 Band : Mid AM Mode Tone : HI NB/ANL : OFF AF VR : CW RF Gain: CW Coarse : Center SQ VR : CCW CH 9 SW: OFF		Set the VR settings as noted in left.
2	Same as Step 1	L4	Turn the Core of L4 to the bottom.
3	Same as Step 1	L3, L5, L6 L7, L8, L17, L18 and L4.	Adjust for maximum reading and readjust L4 for maximum reading.
4	Same as Step 1 except: NB/ANL : ON	L1 and L2	Set the SG on Mid, CH18, 27.175MHz (unit is CH19) with no modulation. Connect Oscilloscope to lead of D2 and adjust coils for maximum reading. Then set the level of SG to 5uV, then readjust this step (D2 is TP1).
5	Same as Step 1 except: SQ VR: CW	VR2	Set the SG to Mid, CH19, 27.185MHz, 30% AM modulation with 1000uV. Then turn the VR2, so that the AF signal will appear on Oscilloscope (Tight squelch Adj.).

STEP	PRESET TO	ADJUSTMENT	REMARKS
6	Same as Step 1	VR11	Set the SG output level to 100uV with No-modulation. Then adjust VR1 for S-9 reading on radio's meter.
7	Same as step 1 except: Mode: FM	L9 and L10	Set the SG to 10uV with No-Modulation. Connect Oscilloscope to lead of R279, and adjust coils for maximum reading(Pin 1&2 of IC 2).
8	Same as Step 7	L11	Set the SG to 1mV with 1.5kHz deviation of 1kHz. Adjust L11 for maximum sign-wave output on Oscilloscope.

ALIGNMENT OF TRANSMITTER PORTION.

1. Test Equipment Required

a) DC Ammeter.
b) Power meter.
c) RF VTVM
d) Oscilloscope.
e) Deviation Meter.
f) 50 ohm Dummy Load.
g) Frequency counter.

2. Alignment Precedure

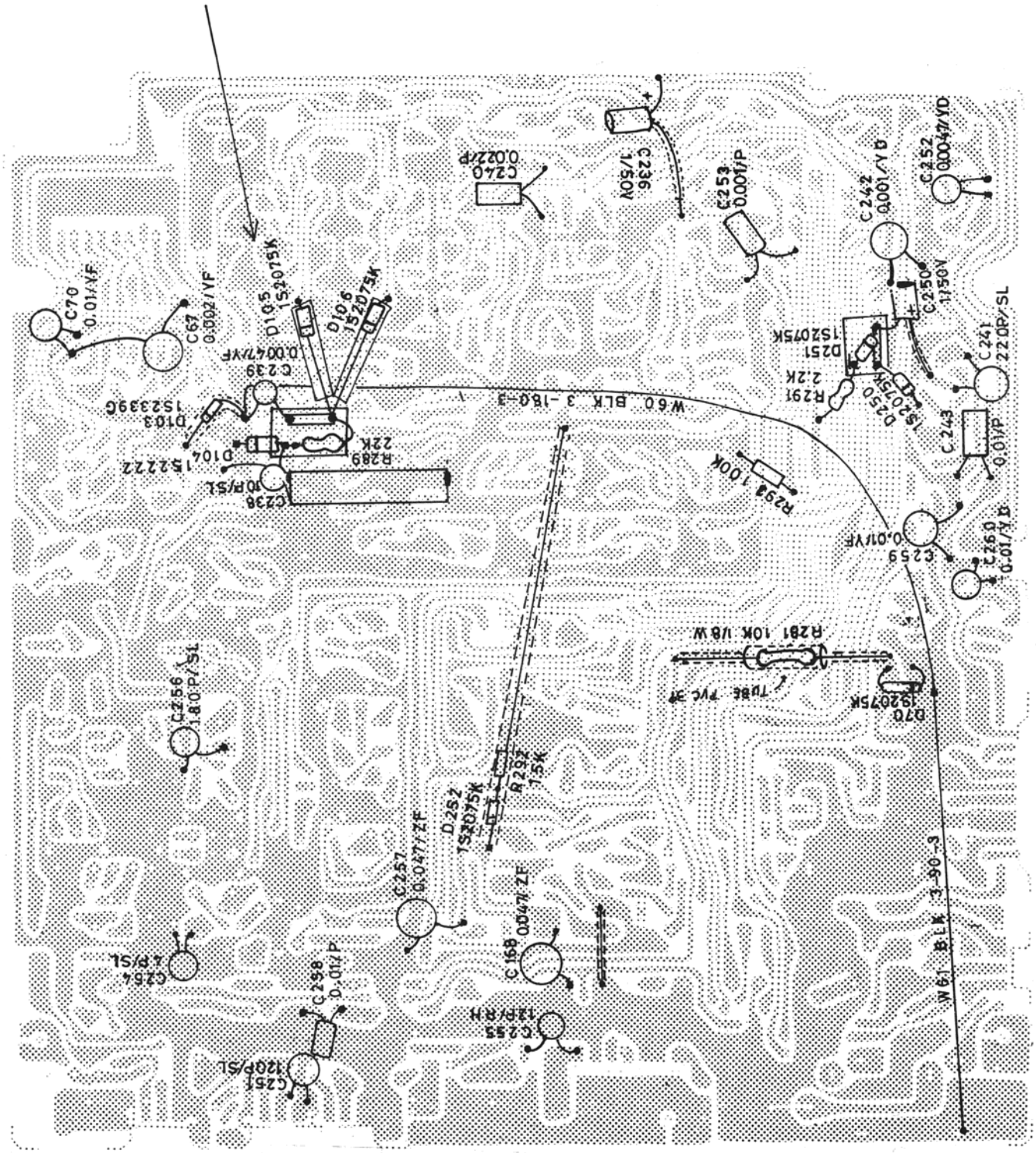
STEP	PRESET TO	ADJUSTMENT	REMARKS
1	CH : 19 TX Mode Mode : USB Mic Gain: Min.	VR10	Remove PC-843 (PCB) and connect Ammeter to TP8 (+) and TP7 (-). Adjust for 8mA reading.
2	Same as Step 1	VR9	Connect DC Ammeter to TP8 (+) and TP6 (-) and adjust for 100mA reading.

STEP	PRESET TO	ADJUSTMENT	REMARKS
3	Same as Step 1, except: Mic Input: 30mV 1KHz	L65	Restore PC-834. Turn the core to the bottom.
4	Same as Step 3	L64, L66, and L67.	Adjust for maximum reading on RF VTVM (across 50ohm Dummy Load).
5	Same as Step 3	L65	Set the Band: HI, CH 40. And adjust for maximum reading on RF VTVM. Then turn the Band: Low, CH 1. Readjust for equalized output power.
6	Same as Step 1, except: Mode : AM Mic Input 90%	L54	Adjust for maximum reading on RF VTVM (Final Output Adj.).
7	Same as Step 3	VR7	Adjust ALC for 24.5V reading on RF VTVM (12w/50ohm Single tone).
8	Same as Step 1	VR4	Adjust for minimum reading on Oscilloscope for both USB abd LSB (minimum carrier Adj.).
9	Same as Step 1, except: Mode : AM	VR11	Adjust for 5.0W reading on RF Power Meter (AM carrier output adj.).
10	Mic Input: 30mV 1KHz	VR8	Set the meter SWto S/RF position. Adjust the VR8 so that the radio's meter reads 5W(between Green zone and Red zone), "S" meter adj.
11	Same as Step 1, except: AM Mode Mic Input: 30mV 1KHz	VR5	Adjust for 90% modulation on Oscilloscope (AM modulation adj.).

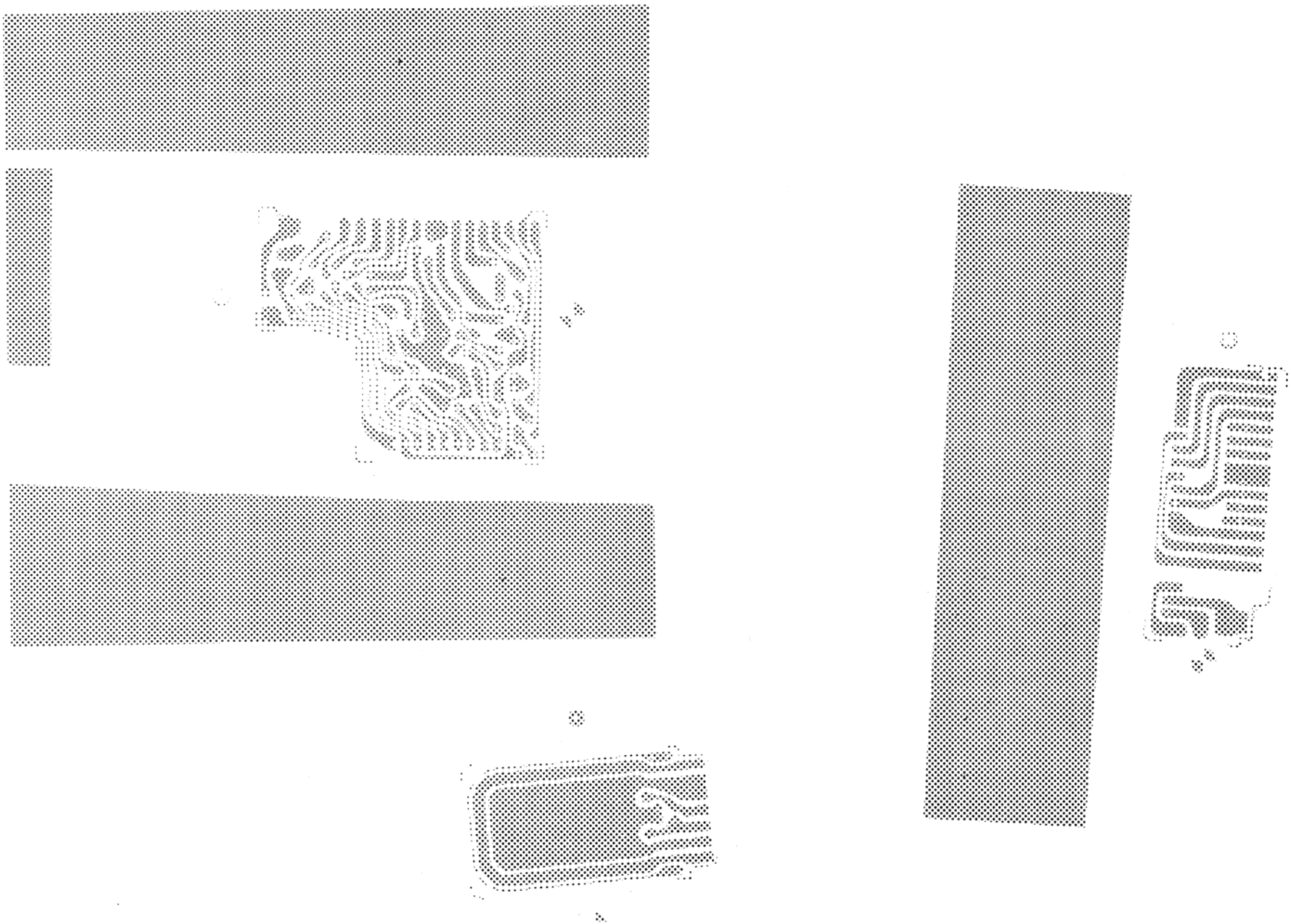
STEP	PRESET TO	ADJUSTMENT	REMARKS
12	Same as Step 1, except: Mode : FM Band : Low 40 Mic Input: 30mV 1kHz	VR3	Adjust for 4.5kHz deviation (FM Deviation Adj.).
13	Same as Step 12 except: Mode : CW	VR12	Adjust 0.2V reading on AF VTVM when CW key is keyed. Side tone adj.
14	Same as Step 1, except: CH 9 CW: CH 9		Check that the output frequency is 27.065 MHz on Frequency Counter.

ADDED PARTS - MAIN PCB (Bottom View)

PC-879AB

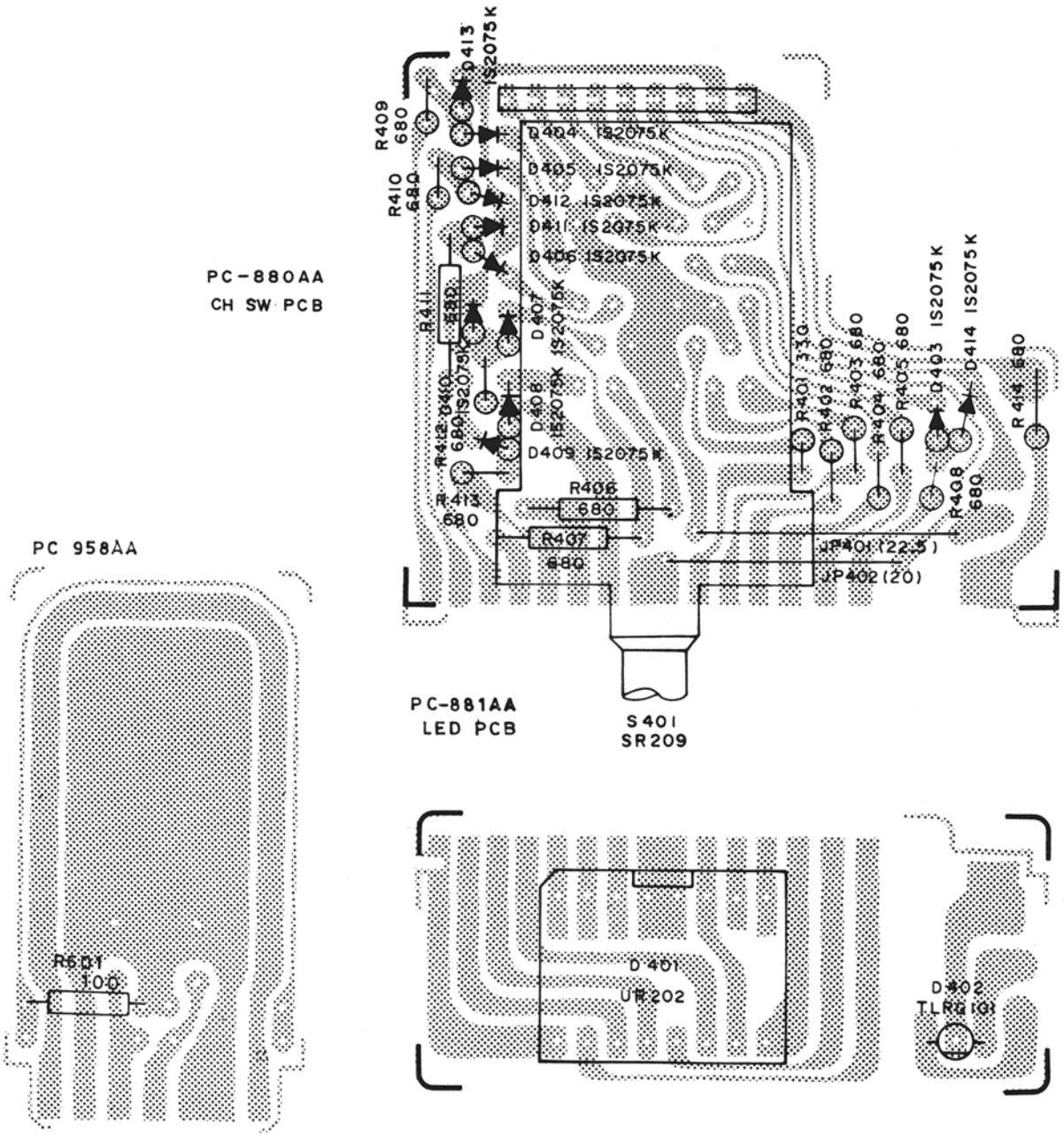


COPPER PATTERN SWR PCB CH SW PCB LED PCB



PARTS LAYOUT SUB. ASSY. PCB's (Top View)

E24-3326

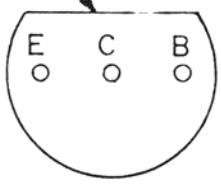


SEMI CONDUCTOR PIN CONFIGURATION

TRANSISTOR

NOTE: B: BASE
E: EMITTER
C: COLLECTOR

MARKING SIDE



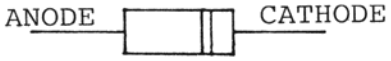
2SC945A-Q
2SC1674L
2SC1675L
2SC1730L
2SA733P

1N60-AM
1SS97
1S2075K
MC-301

1S2688EB
MV-201

RD75EB2

KB262



1N4003

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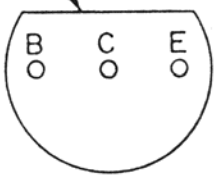
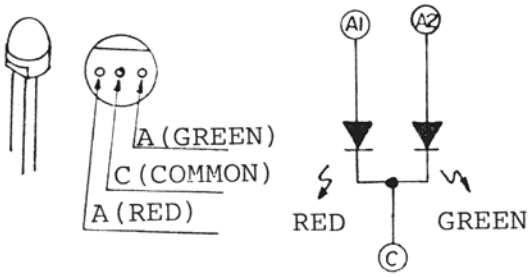


2SC1312F
2SC2086D
2SB525C

TLRG-101



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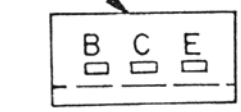
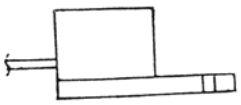
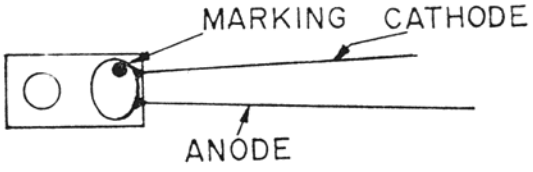


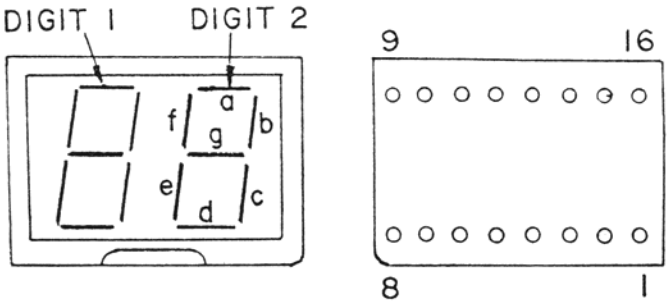


2SC1969B
2SC2166C
2SA473O
2SA1012O

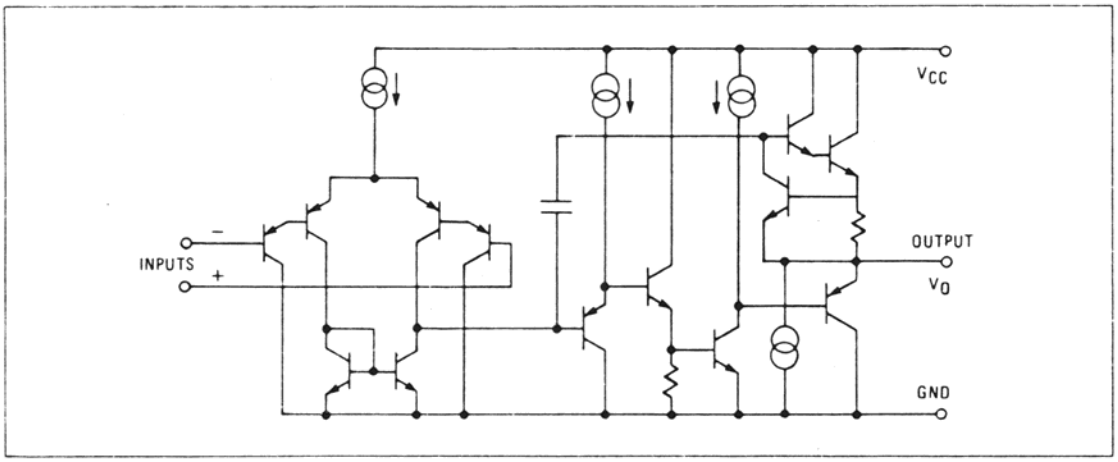
UR-202

MV1Y

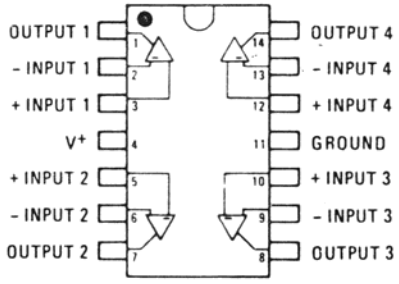




SCHEMATIC DIAGRAM



CONNECTION INFORMATION

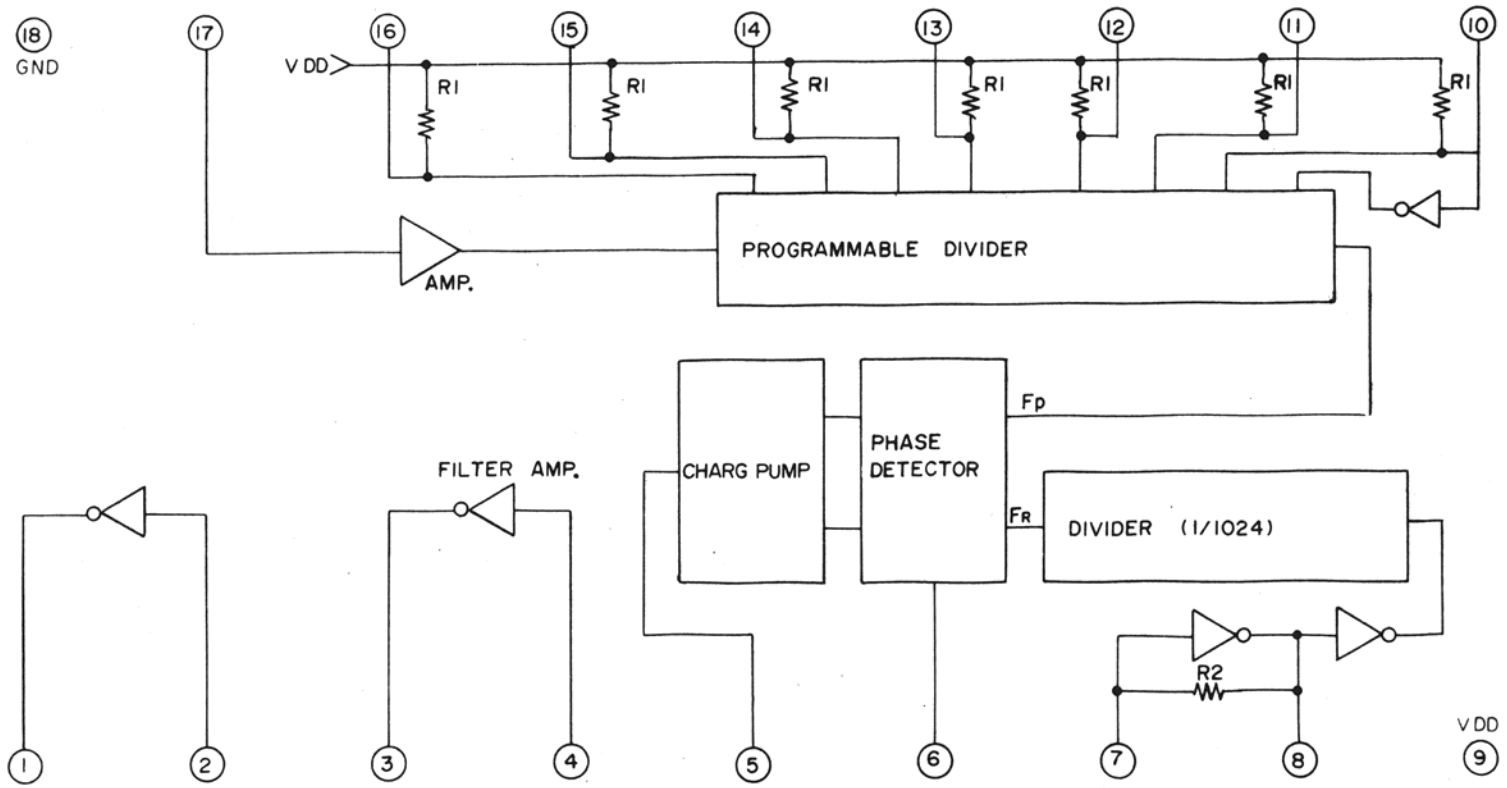


DB and DC
Dual In-Line Packages
(Top View)

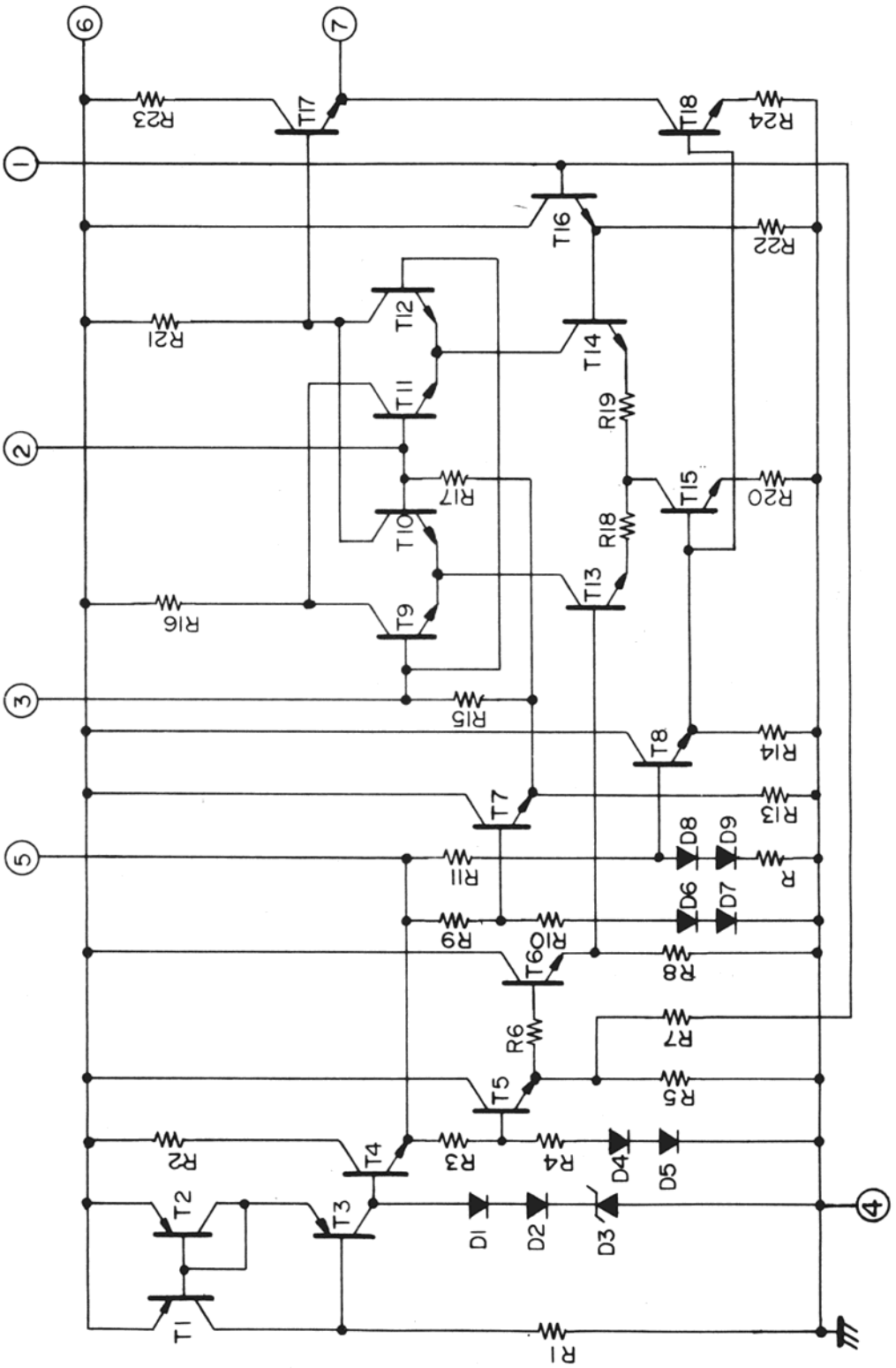
Order Part Nos.:
LM124D, LM224D, LM324D, LM2902D,
LM224N, LM324N, LM2902N

INTERNAL DIAGRAM - IC's

MB8719

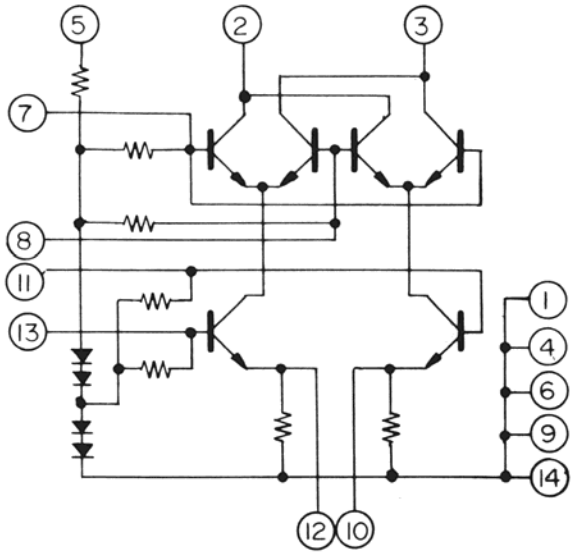


INTERNAL DIAGRAM - IC's



INTERNAL DIAGRAM - IC's

S042P



VOLTAGE CHART

148GTL-DX Early Version

	Mode		Base	Collector	Emitter
TR 1	RX	CW	0	0	0
		FM	0	0	0
		AM	0	0	0
		USB	0	0	0
		LSB	0	0	0
		NB/ON	1.8	7.8	1.1
	TX	CW	0	0	0
		FM	0	0	0
		AM	0	0	0
		USB	0	0	0
		LSB	0	0	0
TR 2	RX	CW	0	0	0
		FM	0	0	0
		AM	0	0	0
		USB	0	0	0
		LSB	0	0	0
		NB/ON	0.7	2.5	0
	TX	CW	0	0	0
		FM	0	0	0
		AM	0	0	0
		USB	0	0	0
		LSB	0	0	0
TR 3	RX	CW	0	0	0
		FM	0	0	0
		AM	0	0	0
		USB	0	0	0
		LSB	0	0	0
		NB/ON	2.6	7.8	1.8
	TX	CW	0	0	0
		FM	0	0	0
		AM	0	0	0
		USB	0	0	0
		LSB	0	0	0
TR 4	RX	CW	0	8.2	0
		FM	0	0	0
		AM	0	0	0
		USB	0	0	0
		LSB	0	0	0
		NB/ON	0	0	1.1
	TX	CW	0	0.1	0
		FM	0	0.2	0
		AM	0	0	0
		USB	0	0.1	0
		LSB	0	0	0

	Mode		Base	Collector	Emitter
TR 5	RX	CW	0	0	0
		FM	0	0	0
		AM	0	0	0
		USB	0	0	0
		LSB	0	0	0
		NB/ON	0	7.6	0
	TX	CW	0	0	0
		FM	0	0	0
		AM	0	0	0
		USB	0	0	0
		LSB	0	0	0
TR 6	RX	CW	0	0	0
		FM	0	0	0
		AM	0	0	0
		USB	0	0	0
		LSB	0	0	0
		NB/ON	7.6	11	8.3
	TX	CW	0	0	0
		FM	0	0	0
		AM	0	0	0
		USB	0	0	0
		LSB	0	0	0
TR 7	RX	CW	0	0	0
		FM	0	0	0
		AM	0	0	0
		USB	0	0	0
		LSB	0	0	0
		NB/ON	0	0	0
	TX	CW	0	0	0
		FM	0	0	0
		AM	0	0	0
		USB	0	0	0
		LSB	0	0	0
TR 8	RX	CW	0.7	0	0
		FM	0	0	0
		AM	0	0	0
		USB	0.7	0	0
		LSB	0	0	0
	TX	CW	0.7	0	0
		FM	0	0	0
		AM	0	0	0
		USB	0.7	0	0
		LSB	0	0	0

	Mode		Base	Collector	Emitter
TR 9	RX	CW	1.3	5.0	0.7
		FM	1.3	5.0	0.7
		AM	1.3	5.0	0.7
		USB	1.3	5.0	0.7
		LSB	1.3	5.0	0.7
	TX	CW	1.3	5.0	0.7
		FM	1.3	5.0	0.7
		AM	1.3	5.0	0.7
		USB	1.3	5.0	0.7
		LSB	1.3	5.0	0.7
TR 10	RX	CW	0	0	0
		FM	0	0	0
		AM	0	0	0
		USB	0	0	0
		LSB	0	0	0
		SQ(CW)	0.7	0	0
	TX	CW	0	0	0
		FM	0	0	0
		AM	0	0	0
		USB	0	0	0
		LSB	0	0	0
TR 11	RX	CW	2.1	7.8	1.4
		FM	2.1	7.8	1.4
		AM	2.1	7.8	1.4
		USB	2.1	7.8	1.4
		LSB	2.1	7.8	1.4
	TX	CW	0	0.1	0
		FM	0	0.1	0
		AM	0	0.1	0
		USB	0	0.1	0
		LSB	0	0.1	0
TR 12	RX	CW	1.0	7.9	0.3
		FM	1.0	7.9	0.3
		AM	1.0	7.9	0.3
		USB	1.0	7.9	0.3
		LSB	1.0	7.9	0.3
	TX	CW	0	0.1	0
		FM	0	0.1	0
		AM	0	0.1	0
		USB	0	0.1	0
		LSB	0	0.1	0

	Mode		Base	Collector	Emitter
TR 13	RX	CW	0	0	0
		FM	0.7	7.7	0.1
		AM	0	0	0
		USB	0	0	0
		LSB	0	0	0
	TX	CW	0	0	0
		FM	0.6	7.6	0.1
		AM	0	0	0
		USB	0	0	0
		LSB	0	0	0
TR 14	RX	CW	0	0	0
		FM	0.7	2.4	0
		AM	0	0	0
		USB	0	0	0
		LSB	0	0	0
	TX	CW	0	0	0
		FM	0.7	2.1	0
		AM	0	0	0
		USB	0	0	0
		LSB	0	0	0
TR 15	RX	CW	0	0	0
		FM	2.4	8.1	1.7
		AM	0	0	0
		USB	0	0	0
		LSB	0	0	0
	TX	CW	0	0	0
		FM	2.1	7.9	1.8
		AM	0	0	0
		USB	0	0	0
		LSB	0	0	0
TR 16	RX	CW	1.4	4.5	1.2
	LOW	FM	1.4	4.5	1.2
		AM	1.4	4.5	1.2
		USB	1.4	4.5	1.2
		LSB	1.4	4.5	1.2
	MID	CW	1.4	4.5	1.1
		FM	1.4	4.5	1.1
		AM	1.4	4.5	1.1
		USB	1.4	4.5	1.1
		LSB	1.4	4.5	1.1
	HI	CW	1.4	4.6	1.1
		FM	1.4	4.6	1.1
		AM	1.4	4.6	1.1
		USB	1.4	4.6	1.1
		LSB	1.4	4.6	1.1

VOLTAGE CHART

	Mode		Base	Collector	Emitter
TR 16	TX LOW	CW	1.4	4.5	1.2
		FM	1.3	4.5	1.2
		AM	1.3	4.5	1.2
		USB	1.4	4.5	1.2
		LSB	1.4	4.5	1.2
	MID	CW	1.4	4.5	1.1
		FM	1.3	4.5	1.1
		AM	1.3	4.5	1.1
		USB	1.4	4.5	1.1
		LSB	1.4	4.5	1.1
	HI	CW	1.4	4.6	1.1
		FM	1.4	4.6	1.1
		AM	1.4	4.6	1.1
		USB	1.4	4.6	1.1
		LSB	1.4	4.6	1.1
TR 17	RX LOW	CW	2.1	7.3	1.5
		FM	2.1	7.3	1.5
		AM	2.1	7.3	1.5
		USB	2.1	7.3	1.5
		LSB	2.1	7.3	1.5
	MID	CW	2.1	7.3	1.5
		FM	2.1	7.3	1.5
		AM	2.1	7.3	1.5
		USB	2.1	7.3	1.5
		LSB	2.1	7.3	1.5
	HI	CW	2.1	7.4	1.5
		FM	2.1	7.4	1.5
		AM	2.1	7.4	1.5
		USB	2.1	7.4	1.5
		LSB	2.1	7.4	1.5
	TX LOW	CW	2.1	7.3	1.5
		FM	2.1	7.1	1.4
		AM	2.1	7.1	1.4
		USB	2.1	7.3	1.5
		LSB	2.1	7.3	1.5
	MID	CW	2.1	7.3	1.5
		FM	2.1	7.1	1.4
		AM	2.1	7.1	1.4
		USB	2.1	7.3	1.5
		LSB	2.1	7.3	1.5
	HI	CW	2.1	7.4	1.5
		FM	2.1	7.1	1.4
		AM	2.1	7.1	1.4
		USB	2.1	7.1	1.5
		LSB	2.1	7.1	1.5

	Mode		Base	Collector	Emitter
TR 18	RX LOW	CW	2.3	7.8	1.9
		FM	2.3	7.8	1.9
		AM	2.3	7.8	1.9
		USB	2.3	7.8	1.9
		LSB	2.3	7.8	1.9
	MID	CW	2.3	7.8	1.9
		FM	2.3	7.8	1.9
		AM	2.3	7.8	1.9
		USB	2.3	7.8	1.9
		LSB	2.3	7.8	1.9
	HI	CW	2.5	7.8	1.9
		FM	2.3	7.8	1.9
		AM	2.3	7.8	1.9
		USB	2.3	7.8	1.9
		LSB	2.3	7.8	1.9
	TX LOW	CW	2.2	7.7	1.9
		FM	2.4	7.4	1.8
		AM	2.4	7.4	1.8
		USB	2.2	7.7	1.9
		LSB	2.2	7.7	1.9
	MID	CW	2.5	7.7	1.9
		FM	2.4	7.4	1.8
		AM	2.4	7.4	1.8
		USB	2.5	7.7	1.9
		LSB	2.5	7.7	1.9
	HI	CW	2.5	7.8	1.9
		FM	2.4	7.5	1.8
		AM	2.4	7.5	1.8
		USB	2.5	7.8	1.9
		LSB	2.5	7.8	1.9
TR 19	RX	CW	0	0	0
		FM	6.5	8.2	5.9
		AM	0	0	0
		USB	0	0	0
		LSB	0	0	0
	TX	CW	0	0	0
		FM	6.4	8.2	6.0
		AM	0	0	0
		USB	0	0	0
		LSB	0	0	0

	Mode		Base	Collector	Emitter
TR 20	RX	CW	1.6	8.1	0.9
		FM	1.6	8.1	0.9
		AM	1.6	8.1	0.9
		USB	1.6	8.1	0.9
		LSB	1.6	8.1	0.9
	TX	CW	2.3	8.2	7.4
		FM	2.3	8.2	7.4
		AM	2.3	8.2	7.4
		USB	2.3	8.2	7.4
		LSB	2.3	8.2	7.4
TR 21	RX	CW	0.7	3.6	0
		FM	0.7	3.6	0
		AM	0.7	3.6	0
		USB	0.7	3.6	0
		LSB	0.7	3.6	0
	TX	CW	0	0.1	0
		FM	0	0.1	0
		AM	0	0.1	0
		USB	0	0.1	0
		LSB	0	0.1	0
TR 22	RX	CW	3.6	7.1	3.0
		FM	3.6	7.1	3.0
		AM	3.6	7.1	3.0
		USB	3.6	7.1	3.0
		LSB	3.6	7.1	3.0
	TX	CW	0.1	0.1	0
		FM	0.1	0.1	0
		AM	0.1	0.1	0
		USB	0.1	0.1	0
		LSB	0.1	0.1	0
TR 23	RX	CW	3.0	7.2	2.3
		FM	3.0	7.2	2.3
		AM	3.0	7.2	2.3
		USB	3.0	7.2	2.3
		LSB	3.0	7.2	2.3
	TX	CW	0	0.1	0
		FM	0	0.1	0
		AM	0	0.1	0
		USB	0	0.1	0
		LSB	0	0.1	0

	Mode		Base	Collector	Emitter
TR 24	RX	CW	0	1.0	0
		FM	0	1.2	0
		AM	0.7	0	0
		USB	0	1.0	0
		LSB	0	1.0	0
	TX	CW	0	0	0
		FM	0	0	0
		AM	0.7	0	0
		USB	0	0	0
		LSB	0	0	0
TR 25	RX	CW	3.8	6.5	3.1
		FM	3.8	6.5	3.1
		AM	3.8	6.5	3.1
		USB	3.8	6.5	3.1
		LSB	3.8	6.5	3.1
	TX	CW	3.8	6.5	3.1
		FM	3.8	6.5	3.1
		AM	3.8	6.5	3.1
		USB	3.8	6.5	3.1
		LSB	3.8	6.5	3.1
TR 26	RX	CW	8.2	8.2	7.8
		FM	0	0	0.2
		AM	0	0	0.2
		USB	0	0	0.2
		LSB	0	0	0.2
	TX	CW	8.2	8.2	7.6
		FM	0	0	0.2
		AM	0	0	0.2
		USB	0	0	0.1
		LSB	0	0	0.1
TR 27	RX	CW	0.7	0	0
		FM	0.7	0	0
		AM	0.7	0	0
		USB	0	3.0	0
		LSB	0	3.0	0
	TX	CW	0.7	0	0
		FM	0.7	0	0
		AM	0.7	0	0
		USB	0	2.9	0
		LSB	0	2.9	0

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	Mode		Base	Collector	Emitter
TR 28	RX	CW	1.7	3.6	1.1
		FM	1.7	3.6	1.1
		AM	1.7	3.6	1.1
		USB	1.7	3.6	1.1
		LSB	1.7	3.6	1.1
	TX	CW	1.7	3.6	1.1
		FM	1.6	3.6	1.1
		AM	1.6	3.6	1.1
		USB	1.7	3.6	1.1
		LSB	1.7	3.6	1.1
TR 29	RX	CW	1.0	1.7	0.4
		FM	1.0	1.7	0.4
		AM	1.0	1.7	0.4
		USB	1.0	1.7	0.4
		LSB	1.0	1.7	0.4
	TX	CW	1.0	1.7	0.4
		FM	1.0	1.6	0.4
		AM	1.0	1.6	0.4
		USB	1.0	1.7	0.4
		LSB	1.0	1.7	0.4
TR 30	RX	CW	0.6	0	0
		FM	0.6	0	0
		AM	0.6	0	0
		USB	0.6	0	0
		LSB	0.6	0	0
	TX	CW	0	0	0
		FM	0	0	0
		AM	0	0	0
		USB	0	0	0
		LSB	0	0	0
TR 31	RX	CW	8.3	0.7	8.3
		FM	8.3	0.7	8.3
		AM	8.3	0.7	8.3
		USB	8.3	0.7	8.3
		LSB	8.3	0.7	8.3
	TX	CW	8.3	0	8.3
		FM	8.1	0	8.1
		AM	8.1	0	8.1
		USB	8.3	0	8.3
		LSB	8.3	0	8.3

	Mode		Base	Collector	Emitter
TR 32	RX	CW	1.1	8.3	4.1
		FM	1.1	8.3	4.1
		AM	1.1	8.3	4.1
		USB	1.1	8.3	4.3
		LSB	1.1	8.3	4.3
	TX	CW	1.1	8.3	3.9
		FM	1.1	8.1	3.5
		AM	1.1	8.1	3.5
		USB	1.1	8.3	4.3
		LSB	1.1	8.3	4.3
TR 33	RX	CW	0.7	1.5	0
		FM	0.7	1.5	0
		AM	0.7	1.5	0
		USB	0.7	1.5	0
		LSB	0.7	1.5	0
	TX	CW	0	0	0
		FM	0	0	0
		AM	0	0	0
		USB	0	0	0
		LSB	0	0	0
TR 34	RX	CW	7.6	8.2	8.3
		FM	7.6	8.2	8.3
		AM	7.6	8.2	8.3
		USB	7.6	8.2	8.3
		LSB	7.6	8.2	8.3
	TX	CW	7.7	0.1	8.3
		FM	7.6	0	8.0
		AM	7.6	0	8.0
		USB	7.7	0.1	8.3
		LSB	7.7	0.1	8.3
TR 35	RX	CW	4.1	7.6	3.5
		FM	4.1	7.6	3.5
		AM	4.1	7.6	3.5
		USB	4.1	7.6	3.5
		LSB	4.1	7.6	3.5
	TX	CW	4.2	7.7	7.5
		FM	4.1	7.6	7.4
		AM	4.1	7.6	7.4
		USB	4.2	7.7	7.5
		LSB	4.2	7.7	7.5

	Mode		Base	Collector	Emitter
TR 36	RX	CW	5.5	7.8	7.5
		FM	5.5	7.8	7.5
		AM	5.5	7.8	7.5
		USB	5.5	7.8	7.5
		LSB	5.5	7.8	7.5
	TX	CW	1.4	0.8	0.7
		FM	1.4	0.8	0.7
		AM	1.4	0.8	0.7
		USB	1.4	0.8	0.7
		LSB	1.4	0.8	0.7
TR 37	RX	CW	7.8	0	8.2
		FM	7.8	0	8.2
		AM	7.8	0	8.2
		USB	7.8	0	8.2
		LSB	7.8	0	8.2
	TX	CW	7.5	8.2	8.2
		FM	7.5	8.2	8.2
		AM	7.5	8.2	8.2
		USB	7.5	8.2	8.2
		LSB	7.5	8.2	8.2
TR 38	RX	CW	1.6	13.0	1.0
		FM	1.6	13.0	1.0
		AM	1.6	13.0	1.0
		USB	1.6	13.0	1.0
		LSB	1.6	13.0	1.0
	TX	CW	1.6	12.8	1.0
		FM	1.6	12.8	1.0
		AM	1.6	12.8	1.0
		USB	1.6	12.8	1.0
		LSB	1.6	12.8	1.0
TR 39	RX	CW	13.0	8.3	13.8
		FM	13.0	8.3	13.8
		AM	13.0	8.3	13.8
		USB	13.0	8.3	13.8
		LSB	13.0	8.3	13.8
	TX	CW	12.8	8.3	13.7
		FM	12.8	8.3	13.0
		AM	12.8	8.3	13.0
		USB	12.8	8.3	13.7
		LSB	12.8	8.3	13.7

	Mode		Base	Collector	Emitter
TR 40	RX	CW	0.9	3.2	0.3
		FM	0.9	3.2	0.3
		AM	0.9	3.2	0.3
		USB	0.9	3.2	0.3
		LSB	0.9	3.2	0.3
	TX	CW	0.9	3.2	0.3
		FM	0.9	3.2	0.3
		AM	0.9	3.2	0.3
		USB	0.9	3.2	0.3
		LSB	0.9	3.2	0.3
TR 41	RX	CW	3.1	6.9	2.6
		FM	0	0	0
		AM	0	0	0
		USB	3.1	6.9	2.6
		LSB	3.1	6.9	2.6
	TX	CW	3.1	6.9	2.6
		FM	3.1	6.6	2.6
		AM	3.1	6.6	2.6
		USB	3.1	6.9	2.6
		LSB	3.1	6.9	2.6
TR 42	RX	CW	0	0.8	7.0
		FM	0	0.8	5.1
		AM	0	0.8	5.7
		USB	0	0.8	7.0
		LSB	0	0.8	7.0
	TX	CW	0	0.8	7.0
		FM	0	0.8	4.5
		AM	0	0.8	4.7
		USB	0	0.8	7.0
		LSB	0	0.8	7.0
TR 43	RX	CW	0	13.2	0
		FM	0	13.2	0
		AM	0	13.2	0
		USB	0	13.8	0
		LSB	0	13.8	0
	TX	CW	0.7	12.4	0
		FM	2.8	10.2	0
		AM	2.8	10.2	0
		USB	0.7	13.7	0
		LSB	0.7	13.7	0

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	Mode		Base	Collector	Emitter
TR 44	RX	CW	0	13.2	0
		FM	0	13.2	0
		AM	0	13.2	0
		USB	0	13.8	0
		LSB	0	13.8	0
	TX	CW	0.6	12.4	0
		FM	0.5	10.2	0
		AM	0.5	10.2	0
		USB	0.6	13.7	0
		LSB	0.6	13.7	0
TR 45	RX	CW	0	0	0
		FM	0	0	0
		AM	0	0	0
		USB	0	0	0
		LSB	0	0	0
	TX	CW	1.4	8.1	0.8
		FM	1.3	7.8	0.8
		AM	1.3	7.8	0.8
		USB	1.4	8.1	0.8
		LSB	1.4	8.1	0.8
TR 46	RX	CW	0	0	0
		FM	0	0	0
		AM	0	0	0
		USB	0	0	0
		LSB	0	0	0
	TX	CW	1.4	6.6	0.7
		FM	1.4	6.5	0.7
		AM	1.4	6.5	0.7
		USB	1.4	6.6	0.7
		LSB	1.4	6.6	0.7
TR 47	RX	CW	6.1	13.2	13.2
		FM	6.1	13.2	13.2
		AM	6.1	13.2	13.2
		USB	6.1	13.8	13.8
		LSB	6.1	13.8	13.8
	TX	CW	6.1	12.4	12.4
		FM	6.1	11.5	11.3
		AM	6.1	11.5	11.3
		USB	6.1	13.7	13.7
		LSB	6.1	13.7	13.7

	Mode		Base	Collector	Emitter
TR 48	RX	CW	13.2	13.2	13.3
		FM	13.2	13.2	13.3
		AM	13.2	13.2	13.3
		USB	13.8	13.8	13.1
		LSB	13.8	13.8	13.1
	TX	CW	12.4	12.4	13.1
		FM	11.3	11.3	11.8
		AM	11.3	11.3	11.8
		USB	13.7	13.7	13.0
		LSB	13.7	13.7	13.0
TR 49	RX	CW	13.3	13.2	13.8
		FM	13.3	13.2	13.8
		AM	13.3	13.2	13.8
		USB	13.1	13.8	13.8
		LSB	13.1	13.8	13.8
	TX	CW	13.1	12.4	13.7
		FM	11.8	11.3	13.2
		AM	11.8	11.3	13.2
		USB	13.0	13.7	13.7
		LSB	13.0	13.7	13.7
TR 50	RX	CW	0.7	0	0
		FM	0.7	0	0
		AM	0	0	0
		USB	0.6	0	0
		LSB	0.6	0	0
	TX	CW	0.7	0	0
		FM	0.6	0	0
		AM	0	0	0
		USB	0.6	0	0
		LSB	0.6	0	0
TR 51	RX	CW	0	7.5	0
		FM	0	7.5	0
		AM	0	7.5	0
		USB	0	7.5	0
		LSB	0	7.5	0
	TX	CW	0	0.7	0
		FM	0	0.7	0
		AM	0	0.7	0
		USB	0	0.7	0
		LSB	0	0.7	0

	Mode		Base	Collector	Emitter
TR 52	RX	CW	0	7.5	0
		FM	0	7.5	0
		AM	0	7.5	0
		USB	0	7.5	0
		LSB	0	7.5	0
	TX	CW	0	0.7	0
		FM	0	0.7	0
		AM	0	0.7	0
		USB	0	0.7	0
		LSB	0	0.7	0
TR 53	RX	CW	0	0	0
		FM	0	0	0
		AM	0	0	0
		USB	0	0	0
		LSB	0	0	0
	TX	CW	0	0	0
		FM	0	0	0
		AM	0	0	0
		USB	0	0	0
		LSB	0	0	0
TR 54	RX	CW	0	13.3	0
		FM	0	13.3	0
		AM	0	13.3	0
		USB	6.5	13.1	5.8
		LSB	6.5	13.1	5.8
	TX	CW	0	13.1	0
		FM	0	11.8	0
		AM	0	11.8	0
		USB	6.5	13.0	5.8
		LSB	6.5	13.0	5.8
TR 55	RX	CW	8.0	8.2	8.2
		FM	0	0	0
		AM	0	0	0
		USB	0	0	0
		LSB	0	0	0
	TX	CW	8.0	8.2	8.2
		FM	0	0	0
		AM	0	0	0
		USB	0	0	0
		LSB	0	0	0

	Mode		Base	Collector	Emitter
TR 56	RX	CW	7.7	1.1	6.2
		FM	7.6	1.1	6.2
		AM	7.6	1.1	6.2
		USB	7.6	1.1	6.2
		LSB	7.6	1.1	6.2
	TX	CW	7.7	1.1	0.2
		FM	4.0	4.6	4.6
		AM	4.0	4.6	4.6
		USB	4.0	4.6	4.6
		LSB	4.0	4.6	4.6

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	Mode		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
IC 1	RX	CW	-	-	-	8.3	0	0	0	0	2.8	1.4	0	0.3	0.3	0.6				
		FM	-	-	-	8.3	0.1	0.1	0.2	0	2.8	1.4	0	0.3	0.3	0.6				
		AM	-	-	-	8.3	0	0	0	0	2.8	1.4	0	0.3	0.3	0.6				
		USB	-	-	-	8.3	0	0	0	0	2.8	1.4	0	0.3	0.3	0.6				
		LSB	-	-	-	8.3	0	0	0	0	2.8	1.4	0	0.3	0.3	0.6				
		SQ(CW)	-	-	-	-	-	-	-	6.9	-	4.0	-	-	-	-				
	TX	CW	-	-	-	8.3	0	0	0	0	2.8	1.0	0	0.3	0.3	0.6				
		FM	-	-	-	8.0	0	0	0	0	2.8	1.0	0	0.3	0.3	0.6				
		AM	-	-	-	8.0	0	0	0	0	2.8	1.0	0	0.3	0.3	0.6				
		USB	-	-	-	8.3	0	0	0	0	2.8	1.0	0	0.3	0.3	0.6				
		LSB	-	-	-	8.0	0	0	0	0	2.8	1.0	0	0.3	0.3	0.6				
IC 2	RX	CW	0	0	1.9	0	0.6	0.6	0											
		FM	1.3	1.3	7.1	0	3.2	3.3	0											
		AM	0	0	0	0	0	0	0											
		USB	0	0	1.9	0	0.6	0.6	0											
		LSB	0	0	1.9	0	0.6	0.6	0											
	TX	CW	0	0	1.9	0	0.6	0.6	0											
		FM	1.3	1.4	6.8	0	3.3	3.3	4.3											
		AM	0	0	0	0	0	0	0											
		USB	0	0	1.9	0	0.6	0.6	0											
		LSB	0	0	1.9	0	0.6	0.6	0											
IC 3	RX	CW	3.0	4.6	6.1	3.4	3.4	8.2	4.5	4.9	8.2	-	8.2	0	0	8.2	0.5	8.2	3.8	0
	L	FM	3.0	4.6	6.1	3.4	3.4	8.2	4.5	4.9	8.2	-	8.2	0	0	8.2	0.5	8.2	3.8	0
	O	AM	3.0	4.6	6.1	3.4	3.4	8.2	4.5	4.9	8.2	-	8.2	0	0	8.2	0.5	8.2	3.8	0
	W	USB	3.0	4.6	6.1	3.4	3.4	8.2	4.5	4.9	8.2	-	8.2	0	0	8.2	0.5	8.2	3.8	0
		LSB	3.0	4.6	6.1	3.4	3.4	8.2	4.5	4.9	8.2	-	8.2	0	0	8.2	0.5	8.2	3.8	0
	TX	CW	4.2	4.3	4.4	3.8	3.8	8.2	4.5	4.9	8.2	-	8.2	0	0	8.2	0.5	8.2	3.8	0
	M	FM	4.2	4.3	4.4	3.8	3.8	8.2	4.5	4.9	8.2	-	8.2	0	0	8.2	0.5	8.2	3.8	0
	I	AM	4.2	4.3	4.4	3.8	3.8	8.2	4.5	4.9	8.2	-	8.2	0	0	8.2	0.5	8.2	3.8	0
	D	USB	4.2	4.3	4.4	3.8	3.8	8.2	4.5	4.9	8.2	-	8.2	0	0	8.2	0.5	8.2	3.8	0
		LSB	4.2	4.3	4.4	3.8	3.8	8.2	4.5	4.9	8.2	-	8.2	0	0	8.2	0.5	8.2	3.8	0

	Mode		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
IC 3 (con't)	RX	CW	3.4	4.5	5.5	3.6	3.6	8.2	4.5	4.9	8.2	-	8.2	0	0	8.2	0.5	8.2	3.8	0
	H	FM	3.4	4.5	5.5	3.6	3.6	8.2	4.5	4.9	8.2	-	8.2	0	0	8.2	0.5	8.2	3.8	0
	I	AM	3.4	4.5	5.5	3.6	3.6	8.2	4.5	4.9	8.2	-	8.2	0	0	8.2	0.5	8.2	3.8	0
		USB	3.4	4.5	5.5	3.6	3.6	8.2	4.5	4.9	8.2	-	8.2	0	0	8.2	0.5	8.2	3.8	0
		LSB	3.4	4.5	5.5	3.6	3.6	8.2	4.5	4.9	8.2	-	8.2	0	0	8.2	0.5	8.2	3.8	0
	TX	CW	3.0	4.6	6.1	3.4	3.4	8.2	4.5	4.9	8.2	-	8.2	0	0	8.2	0.5	8.2	3.8	0
	L	FM	3.0	4.5	5.9	3.3	3.3	8.0	4.5	4.9	7.8	-	8.0	0	0	7.9	0.5	7.9	3.8	0
	O	AM	3.0	4.5	5.9	3.3	3.3	8.0	4.5	4.9	7.8	-	8.0	0	0	7.9	0.5	7.9	3.8	0
	W	USB	3.0	4.6	6.1	3.4	3.4	8.2	4.5	4.9	8.2	-	8.2	0	0	8.2	0.5	8.2	3.8	0
		LSB	3.0	4.6	6.1	3.4	3.4	8.2	4.5	4.9	8.2	-	8.2	0	0	8.2	0.5	8.2	3.8	0
		CW	4.2	4.3	4.4	3.8	3.8	8.2	4.5	4.9	8.2	-	8.2	0	0	8.2	0.5	8.2	3.8	0
	M	FM	4.2	4.2	4.2	3.7	3.7	8.0	4.5	4.9	7.9	-	8.0	0	0	8.0	0.5	7.9	3.8	0
	I	AM	4.2	4.2	4.2	3.7	3.7	8.0	4.5	4.9	7.9	-	8.0	0	0	8.0	0.5	7.9	3.8	0
	D	USB	4.2	4.3	4.4	3.8	3.8	8.2	4.5	4.9	8.2	-	8.2	0	0	8.2	0.5	8.2	3.8	0
		LSB	4.2	4.2	4.4	3.8	3.8	8.2	4.5	4.9	8.2	-	8.2	0	0	8.2	0.5	8.2	3.8	0
		CW	3.4	4.5	5.5	3.6	3.6	8.2	4.5	4.9	8.2	-	8.2	0	0	8.2	0.5	8.2	3.8	0
	H	FM	3.4	4.4	5.4	3.5	3.6	8.1	4.5	4.9	8.0	-	8.1	0	0	8.1	0.5	8.0	3.8	0
	I	AM	3.4	4.4	5.4	3.5	3.6	8.1	4.5	4.9	8.0	-	8.1	0	0	8.1	0.5	8.0	3.8	0
		USB	3.4	4.5	5.5	3.6	3.6	8.2	4.5	4.9	8.2	-	8.2	0	0	8.2	0.5	8.2	3.8	0
		LSB	3.4	4.5	5.5	3.6	3.6	8.2	4.5	4.9	8.2	-	8.2	0	0	8.2	0.5	8.2	3.8	0
IC 4	RX	CW	0	3.4	3.4	0	6.0	7.5	7.6											
		FM	0	3.4	3.4	0	6.0	7.5	7.6											
		AM	0	3.4	3.4	0	6.0	7.5	7.6											
		USB	3.0	3.4	3.4	0	6.0	7.5	7.6											
		LSB	3.0	3.4	3.4	0	6.0	7.5	7.6											
	TX	CW	0	3.3	3.3	0	5.9	7.4	7.0											
		FM	0	3.3	3.3	0	5.8	7.0	3.7											
		AM	0	3.3	3.3	0	5.8	7.0	3.7											
		USB	2.9	3.3	3.3	0	5.9	7.4	4.0											
		LSB	2.9	3.3	3.3	0	5.9	7.4	4.0											

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	Mode		1	2	3	4	5	6	7	8	9	10	11	12	13	14
IC 5	RX	CW	13.8	6.6	0	0	1.1	1.1	0	0	7.0	13.1				
		FM	13.8	6.6	0	0	1.1	1.1	0	0	7.0	13.1				
		AM	13.8	6.6	0	0	1.1	1.1	0	0	7.0	13.1				
		USB	13.8	6.6	0	0	1.1	1.1	0	0	7.0	13.1				
		LSB	13.8	6.6	0	0	1.1	1.1	0	0	7.0	13.1				
	TX	CW	13.7	6.6	0	0	1.1	1.1	0	0	6.9	13.0				
		FM	13.4	6.0	0	0.4	1.8	1.8	0	0	0	10.9				
		AM	13.4	6.0	0	0.4	1.8	1.8	0	0	0	10.9				
		USB	13.7	6.6	0	0.3	1.8	1.8	0	0	0	11.4				
		LSB	13.7	6.6	0	0.3	1.8	1.8	0	0	0	11.4				
IC 6	RX	CW	0	0	0	0	0	0	0	0	0	0	-0.5	0	-0.5	0
		FM	0	0	0	0	0	0	0	0	0	0	-0.5	0	-0.5	0
		AM	0	0	0	0	0	0	0	0	0	0	-0.5	0	-0.5	0
		USB	0	0	0	0	0	0	0	0	0	0	-0.5	0	-0.5	0
		LSB	0	0	0	0	0	0	0	0	0	0	-0.5	0	-0.5	0
	TX	CW	0	7.8	7.8	0	7.9	0	2.8	2.8	0	1.3	1.3	1.3	1.3	0
		FM	0	7.8	7.8	0	7.8	0	2.7	2.7	0	1.3	1.3	1.3	1.3	0
		AM	0	7.8	7.8	0	7.8	0	2.7	2.7	0	1.3	1.3	1.3	1.3	0
		USB	0	7.8	7.8	0	7.9	0	2.8	2.8	0	1.3	1.3	1.3	1.3	0
		LSB	0	7.8	7.8	0	7.9	0	2.8	2.8	0	1.3	1.3	1.3	1.3	0