



ADDENDUM TO IB-8027269-P
Series 700/1000 Transmitters
150 MHz Band

150 MHz SERIES 1000 BASE STATION TRANSMITTER

GENERAL INFORMATION

This addendum provides tuning and servicing information for Series 1000, 150 MHz Band Base Station transmitters. This document must be used together with IB-8027269-P for complete schematic coverage of the modules in Series 1000 units.

This document replaces IB-8027269-PC.

REPLACEMENT PARTS

Parts common to Series 700 and 1000 units appear in IB-8027351-P and associated addenda.

INTERCONNECTION

Interconnection Diagrams of the Transmitter Panel are shown in Figures 6 and 7. For details of the wiring between panels in the station, refer to the appropriate System instruction book.

TUNING/ADJUSTMENTS

IMPORTANT NOTE

If you have a Series 700 unit, use the tuning and adjustment information in IB-8027269-P. If you have a Series 1000 mobile unit, use the tuning and adjustment procedures in IB 8027269-PB. If you have a Series 1000 base station unit, use the tuning and adjustment procedures in this addendum.

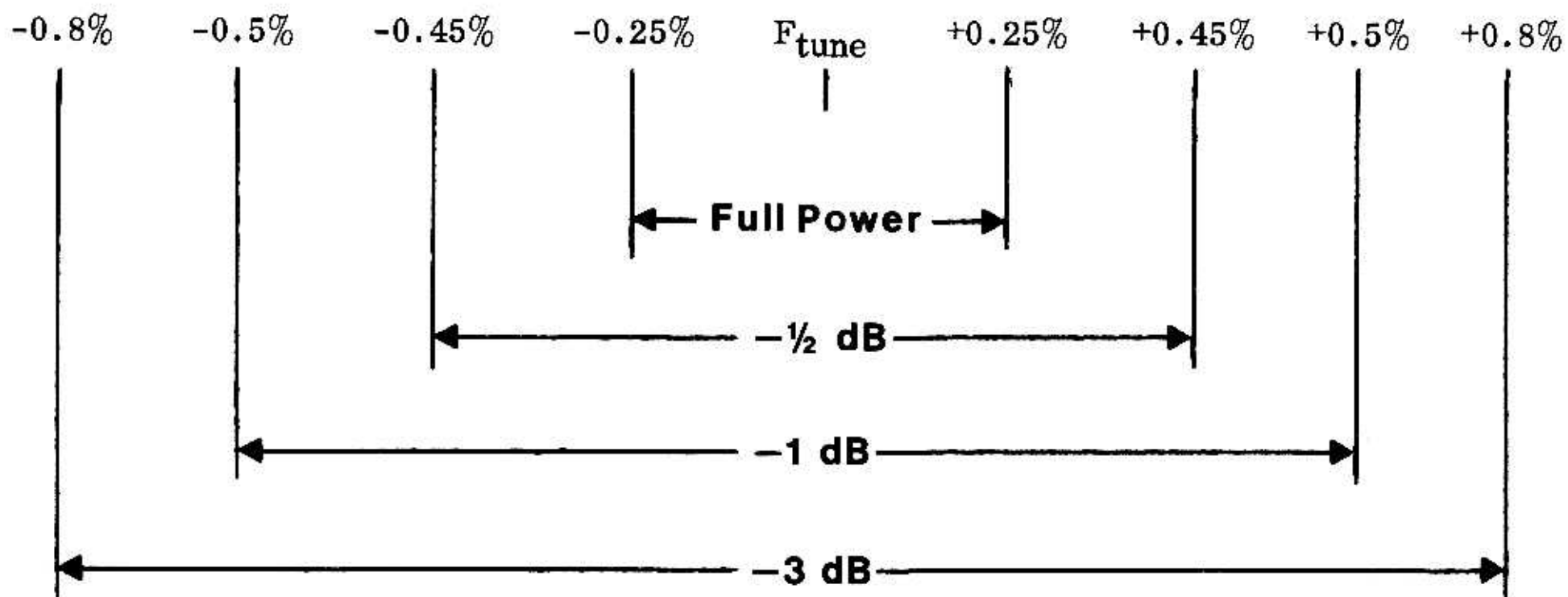
SPECIFICATIONS

Frequencies

	<u>Transmit</u>	<u>TCXO (Oscillator)</u>	<u>Multiplication Factor</u>
Commercial:	148-174 MHz	12.3-14.5 MHz	12x
Government:	136-148 MHz	11.3-12.3 MHz	12x

Standard systems provide 1 or 2 frequency operation.

Multi-Channel Spacing



Recommended F_{tune} : Center Frequency Alignment Oscillator, Catalog No. MI-559408

Alternate F_{tune} : Frequency closest to center frequency

Frequency Stability

Standard: $\pm 0.0005\%$ (-30°C to +60°C, with $\pm 15\%$ input voltage variation)

Optional: $\pm 0.0002\%$ (-30°C to +60°C, with $\pm 15\%$ input voltage variation)

Nominal Antenna Impedance

50 ohms

Modulation

Phase, ± 5 kHz @ 1.0 VRMS input

Audio Response

Within $+1$ dB, -3 dB of 6 dB/octave pre-emphasis from 300 to 3000 Hz

FM Hum and Noise

70 dB (EIA) DC Supply only

-55 dB AC Supply

Duty Cycle

Continuous duty capability

RCA Type Number

See System Index

FCC Type Designation

CT2002 ($\pm 0.0005\%$ frequency stability - 30 watt output)

CT2002A ($\pm 0.0002\%$ frequency stability - 30 watt output)

CT2002B ($\pm 0.0005\%$ frequency stability - 60 watt output)

CT2002C ($\pm 0.0002\%$ frequency stability - 60 watt output)

DC Power Input to PA

120 watts maximum (60 watt version)

60 watts maximum (30 watt version)

Power Output to 50 ohm Antenna

60 watts

30 watts (with simple tuning change)

Spurious Emissions

-85 dB (EIA Spec. RS-152B, para. 4)

Power Requirements (Transmitter Panel)

Standby: less than 20 mA

Transmit: 16-18A @ +13.4 VDC (60 watt version)

11-13A @ +13.6 VDC (30 watt version)

INITIAL ADJUSTMENTS

The only tuning necessary at the time of installation is antenna loading.

1. Read "TRANSMITTER TUNING, General". Then, perform "TRANSMITTER TUNING, Preliminary" step 2.
2. Connect 100 watt in-line wattmeter between antenna jack and antenna.
3. Connect CX-40 test adapter to VOM, and TRANSMITTER plug to test socket on PA board.
4. Alternately peak (18) and (19) for maximum power.
5. Perform steps 17, 17A, and 18 in "TRANSMITTER TUNING TABLE".

TRANSMITTER TUNING

General

To perform initial tuning at the time of installation, see "INITIAL ADJUSTMENTS". To set deviation, see IB-8027269-P "Maintenance - Exciter Circuit Board". Also, refer in this addendum to these sections, for other adjustments: "ANTENNA SWITCH/VSWR SENSOR"; "DC VOLTAGE CONTROL MODULE".

This transmitter is tuned for maximum RF output, as well as proper DC input. Therefore, an RF wattmeter is essential for proper tuning.

NOTE: FCC rules specify that all tuning adjustments to the transmitter must be made by, or under the supervision of, a holder of a current FIRST- or SECOND-CLASS Commercial Radio Operator License.

Preliminary

1. Equipment needed:
 - a. RCA CX-40 Test Adapter (catalog number MI-559234) for Simpson VOM, and a properly calibrated Simpson Model 260 or 270 VOM (or equivalent 50 uA, 5000 ohm meter).
 - b. Hexagonal alignment tool for Exciter tuning: 0.1" across flats RCA Stock Number 228788), supplied in clip on Receiver.
 - c. Hexagonal alignment tool for Multiplier tuning: 0.075" across flats (RCA Stock Number 244885), supplied in clip on Receiver.
 - d. Non-metallic screwdriver (for PA tuning).
 - e. In-line wattmeter with 100 watt (minimum) element - Bird Model 43 or equivalent.
 - f. Dummy load, 50 ohm, 100 watt minimum capability.

g. Multi-frequency transmitters, if transmit frequencies are widely spaced (see "SPECIFICATIONS, Multi-Channel Spacing"): Center Frequency Alignment Oscillator (catalog number MI-559408 - see Replacement Parts IB-8027351-P for ordering information).

2. Multi-frequency transmitters (see "SPECIFICATIONS, Multi-Channel Spacing"):

a. If highest and lowest transmit frequencies are less than $\pm 0.25\%$ of center frequency apart, set Frequency Selector for channel closest to center frequency.

b. If highest and lowest transmit frequencies are more than $\pm 0.25\%$ of center frequency apart:

1. Preferred procedure: remove F1 TCXO from Exciter board, plug in Center Frequency Alignment Oscillator (CFAO), and set Frequency Selector to "F1".

2. Alternate procedure. if CFAO is not available: set Frequency Selector for channel closest to center frequency. This method may degrade performance at the frequency extremes.

3. Connect in-line wattmeter and dummy load to Antenna jack.

4. Connect CX-40 adapter to VOM, and cables to radio unit: RECEIVER/EXCITER to socket above receiver, and TRANSMITTER to socket near Multiplier board. Use 50 μ A range on VOM. (NOTE: If CX-40 is not available, use 50 μ A input on VOM, and connect VOM probes to test socket pins as shown in Tuning Table. A 50 μ A meter is required for accurate calculation of DC input power.)

5. Perform these steps ONLY if transmitter frequencies are being changed, or if unit is severely out of alignment:

a. Preset all Exciter and Multiplier board slugs (① through ⑨) to tops of coil forms.

b. Make sure Multiplier board has the proper plug-in capacitors:

136-148 MHz	C19 = 15 pF	C24 = 10 pF
148-162 MHz	C19 = 6 pF	C24 = 7 pF
162-174 MHz	C19 Not Used	C24 Not Used

c. Turn ⑩ through ⑲ fully clockwise until snug (torque: 20 inch ounces). Then turn ⑩ ⑪, ⑫, ⑬, ⑭, ⑮, ⑱ counter-clockwise ONE turn and ⑯, ⑰ counter-clockwise THREE turns.

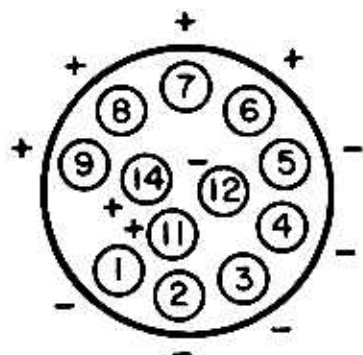
6. Turn ON/OFF switch ON.

7. During tuning, key transmitter with Test Microphone P-T-T Switch.

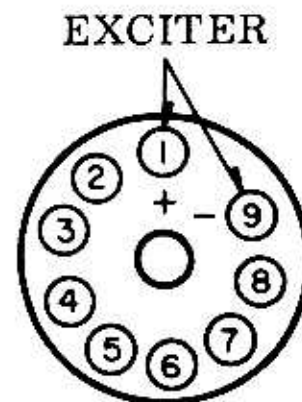
NOTE: During tuning, lowered-efficiency operation results in considerable heat dissipation, which may cause a small reduction in power output - this is normal. Because of this, key only when making an adjustment. Use of a cooling blower is recommended.

8. Proceed to Tuning Table.

TRANSMITTER TEST
SOCKETS
(TOP VIEW)



RECEIVER TEST
SOCKET
(TOP VIEW)



ANTENNA SWITCH/VSWR SENSOR

Variable controls on this module are factory-set, and should not normally require adjustment.

Antenna Switch Adjustment Procedure

CAUTION: Do not key transmitter during this procedure.

1. Transmitter and receiver should be properly tuned, and heat sink cool to the touch.
2. Pull leads from PA board output pins (near tuning adjustments (18) and (19)).
3. Connect RF signal generator to leads.
4. Connect 50 ohm load (100 watt capability) to Antenna jack.
5. Connect VOM to CX-40 Test Adapter, and RECEIVER/EXCITER plug to receiver test socket 1J3. Switch to position 8. (Alternate: connect leads from a 50 A, 5000 ohm meter to test socket pins 8 (+) and 9 (-).
6. Set signal generator to receive frequency (or to center frequency in multi-channel receivers).
7. Adjust generator output for 1/4-scale deflection on test meter.
8. Dip 27C2 for minimum meter reading. Reduce generator output as necessary and repeat.
9. Restore original connections.

*Ic 25 mA
Ee
Ir 270 mA*

TRANSMITTER TUNING TABLE

Step	Adjustment	CX-40 Switch	Typical Reading - uA or Watts	Reading This Unit	Socket Pins		Description
					+	-	
1	PERFORM STEPS IN "TRANSMITTER TUNING PRELIMINARY" BEFORE ALIGNING UNIT.						
RECEIVER/EXCITER TEST SOCKET 1J3							
2	Phase Mod.	1	10-35		1	9	Peak (1) and (2).
TRANSMITTER TEST SOCKET 2J3							
3	Tripler	6 A	15-50		14	12	Peak (3). Dip (4) to minimum.
4	1st Doubler	A	20-40 <i>28</i>	<i>29</i>	11	5	Peak (5). Repeak (1), (2), (3), (4), (5). Tune (6) for slight dip.
5	2nd Doubler	B	20-40 <i>13</i>		9	4	Peak (7) and (6). Tune (8) for slight dip.
6	Move TRANSMITTER test plug to Test Socket 26J2 (on Power Amp.).						
TRANSMITTER TEST SOCKET 26J2 (on POWER AMPLIFIER)							
7	2nd Doubler	A	25-40	<i>27</i>	14	12	Peak (10), (9), (8).
8	1st Amp	B	25-40	<i>26</i>	11	5	Peak (11).
9	2nd Amp	C	10-20		9	4	Alternately peak (12) and (13).
10	3rd Amp	D	25-40	<i>20</i>	8	3	Alternately peak (14) and (15).
11	4th Amp	E	35-50 10W	<i>46</i>	7	2	Turn (16) clockwise for peak.
12	Output	-	25W		-	-	Alternately peak (18) and (19) for maximum power.
13	4th Amp	-	60W		-	-	Turn (17) clockwise in small steps, each time peaking (16) for max. power, until optimum settings are found.
14	Output	-	70W		-	-	Alternately peak (18) and (19) for max. power.
15	3rd Amp	-	75-80W		-	-	Repeak (14) and (15) for max. power.
16	Output	-	75-80W		-	-	Disconnect load; connect antenna. Alternately peak (18) and (19) for max. power.
17	PA Current	F	10	<i>10</i>	6	1	If reading is over 10: Observing both wattmeter and test meter, turn (19) clockwise for minimum on test meter without a power drop. Turn (18) clockwise for 10 reading. (Wattmeter should read slightly lower than in step 16.) NOTE: 1 uA on meter = 1 amp Ic.
17a	30W VERSION	-	+8 VDC	<i>See IB 8027049 PAR 1 Sec 2</i>	1		30 WATT UNITS ONLY: Set 22R32 and 22R33 fully clockwise. Connect VOM between PA test socket pin 1 and ground. Adjust 22R14 for +8 VDC reading.
18	DC Input	-	+12 VDC		1		Measure voltage between PA test socket pin 1 and ground. 60 watt units: for input power, multiply voltage by reading in step 17 (e.g. +12 VDC x 10A = 120 watts). 30 watt units: for input power, switch CX-40 to "F" and multiply reading by voltage (e.g. +8 VDC x 7.5A = 60 watts).

VSWR Sensor Adjustment Procedure

1. Transmitter should be properly tuned, and heat sink cool to the touch.
2. Connect 50 ohm load (100 watt capability) to Antenna jack.
3. Connect CX-40 test adapter to VOM, and TRANSMITTER plug to test socket 2J3 (near Multiplier board). Switch to position E.
4. Turn 27C5 and 27C8 counter-clockwise to near minimum value.
5. Key transmitter and dip 27C5 to minimum, as seen on meter. This sets reverse power sensor.
6. Remote 50 ohm load from antenna jack. Pull leads from PA board output pins (near tuning adjustments (18) and (19)) and connect leads to dummy load.
7. Using shortest cable length possible, connect PA board output to Antenna jack.
8. Switch CX-40 to position D.
9. Key transmitter and dip 27C8 to minimum, as seen on meter. This sets forward power sensor.
10. Restore original connections.

DC VOLTAGE CONTROL MODULE

Variable controls on this module are factory-set, and should not require adjustment unless parts are replaced.

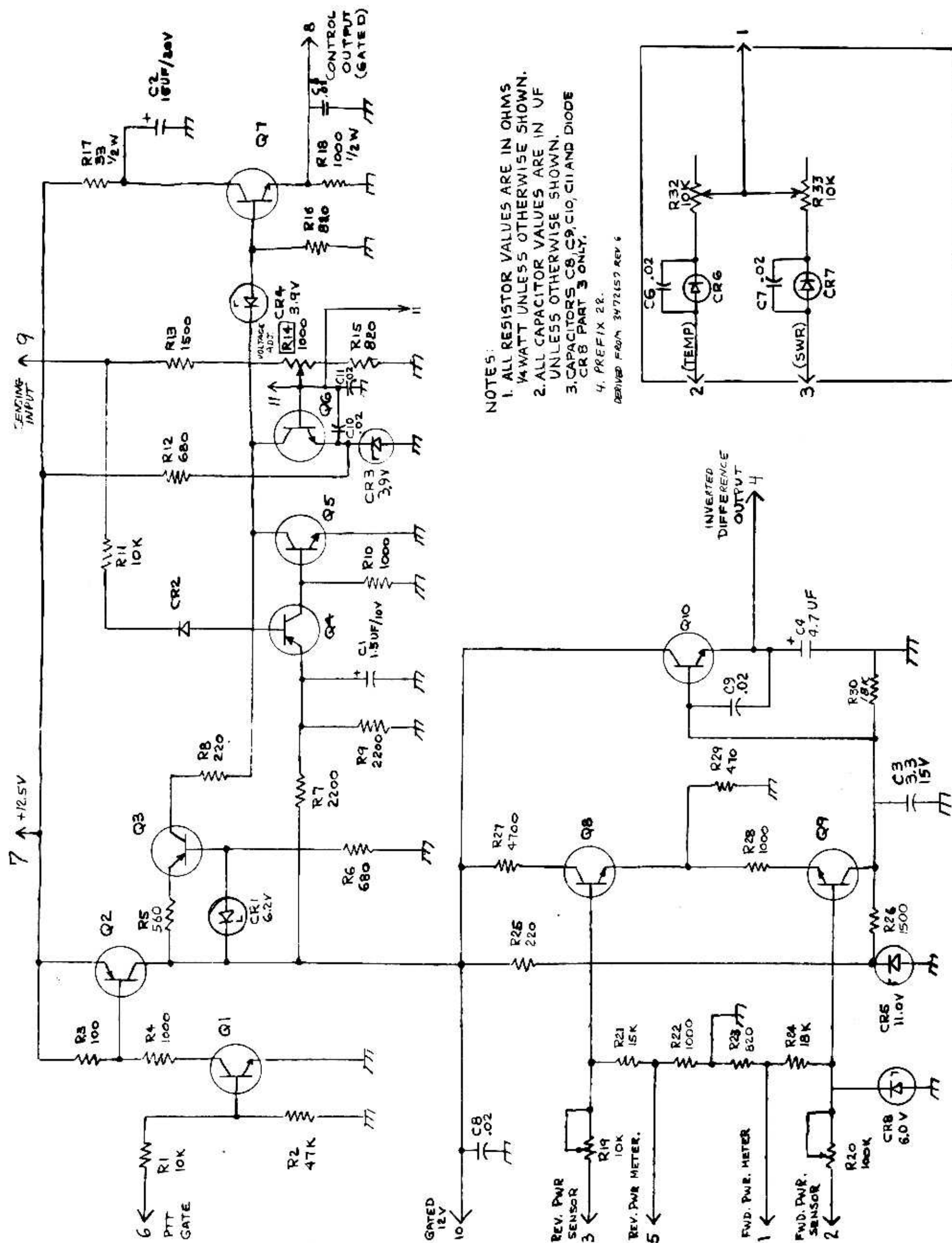
Adjustment Procedure

1. Transmitter should be properly tuned, and heat sink cool to the touch. Input voltage should be maintained at +13.4 VDC.
2. Preset controls:
 - 22R14 fully clockwise
 - 22R32 fully clockwise
 - 22R33 fully clockwise
 - 22R19 fully counter-clockwise
 - 22R20 fully counter-clockwise
3. Connect VOM between DC Control board pin 9 and ground. (Do not remove lead from pin 9.) Use +12 VDC scale.
4. If voltage is higher than +12 VDC, adjust 22R14 for +12 VDC reading. If voltage is at or below +12 VDC, adjust 22R14 until voltage just starts to drop.
5. Adjust 22R20 until voltage just starts to drop.
6. Pull lead from DC Control board pin 2. Adjust 22R32 for +7 VDC reading. Replace lead.

7. Connect a 560 ohm resistor between these 2 points: Regulator board (located next to receiver) pin 13; Level Control board (piggybacked on DC Control board) pin 2. Do not remove leads normally on pins 13 and 2. Adjust 22R33 for +9 VDC reading. Remove resistor.

8. 22R19 remains fully counter-clockwise, and is not adjusted.

9. Connect 100 watt in-line wattmeter between antenna jack and antenna. Detune until RF output power drops by 20 watts. Adjust 22R20 so that voltage on VOM just starts to drop. Peak (16) for maximum RF output. (16)



NOTES:
 1. ALL RESISTOR VALUES ARE IN OHMS
 1/4 WATT UNLESS OTHERWISE SHOWN.
 2. ALL CAPACITOR VALUES ARE IN UF
 UNLESS OTHERWISE SHOWN.
 3. CAPACITORS C8, C9, C10, C11 AND DIODE
 CR8 PART 3 ONLY.
 4. PREFIX 22.

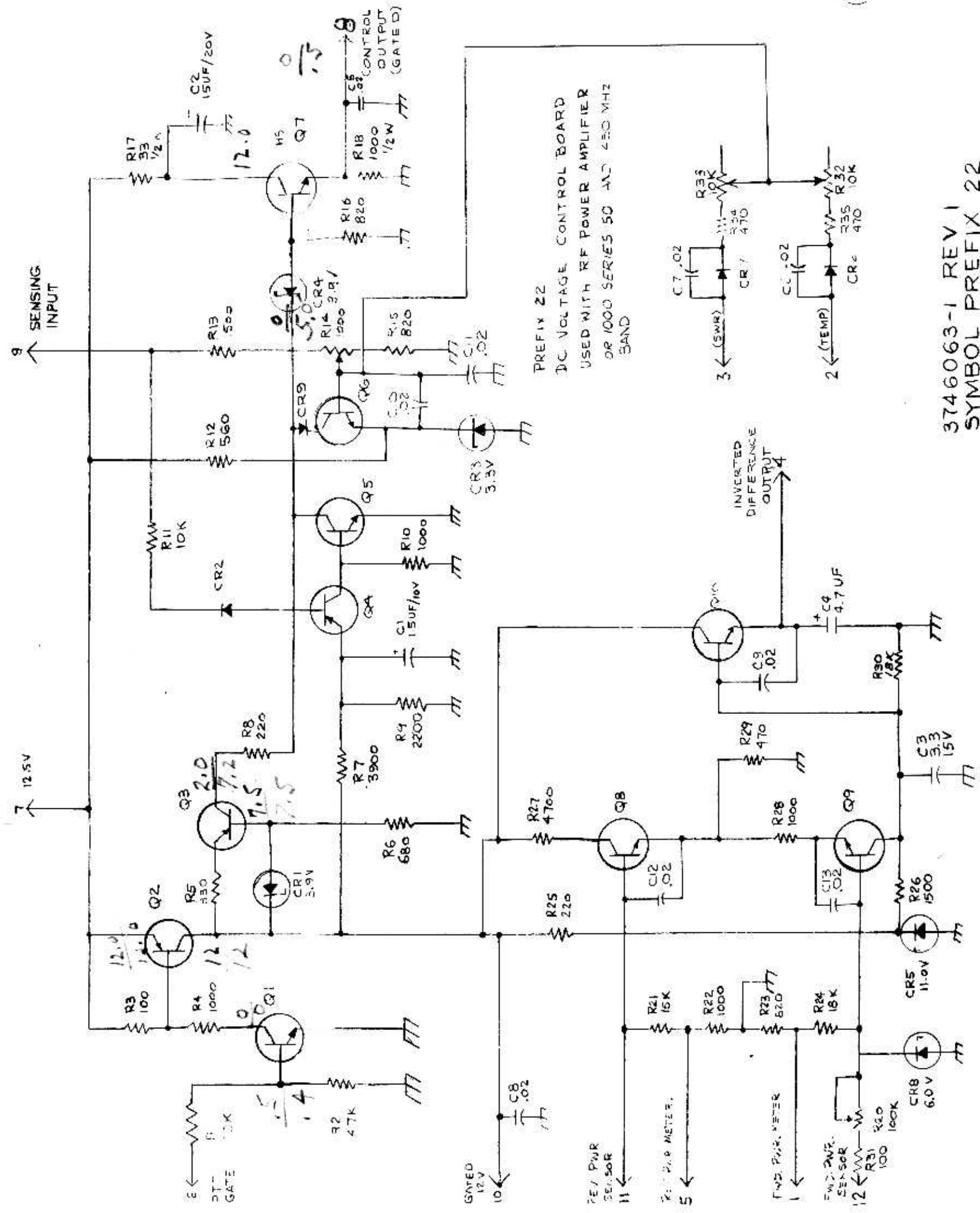
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Figure 1. DC Voltage Control Module and Control Level Module -
 CODE A Transmitter Panels

34J7873

C 12V 12
 1.2 0 0
 CAP 0 .5

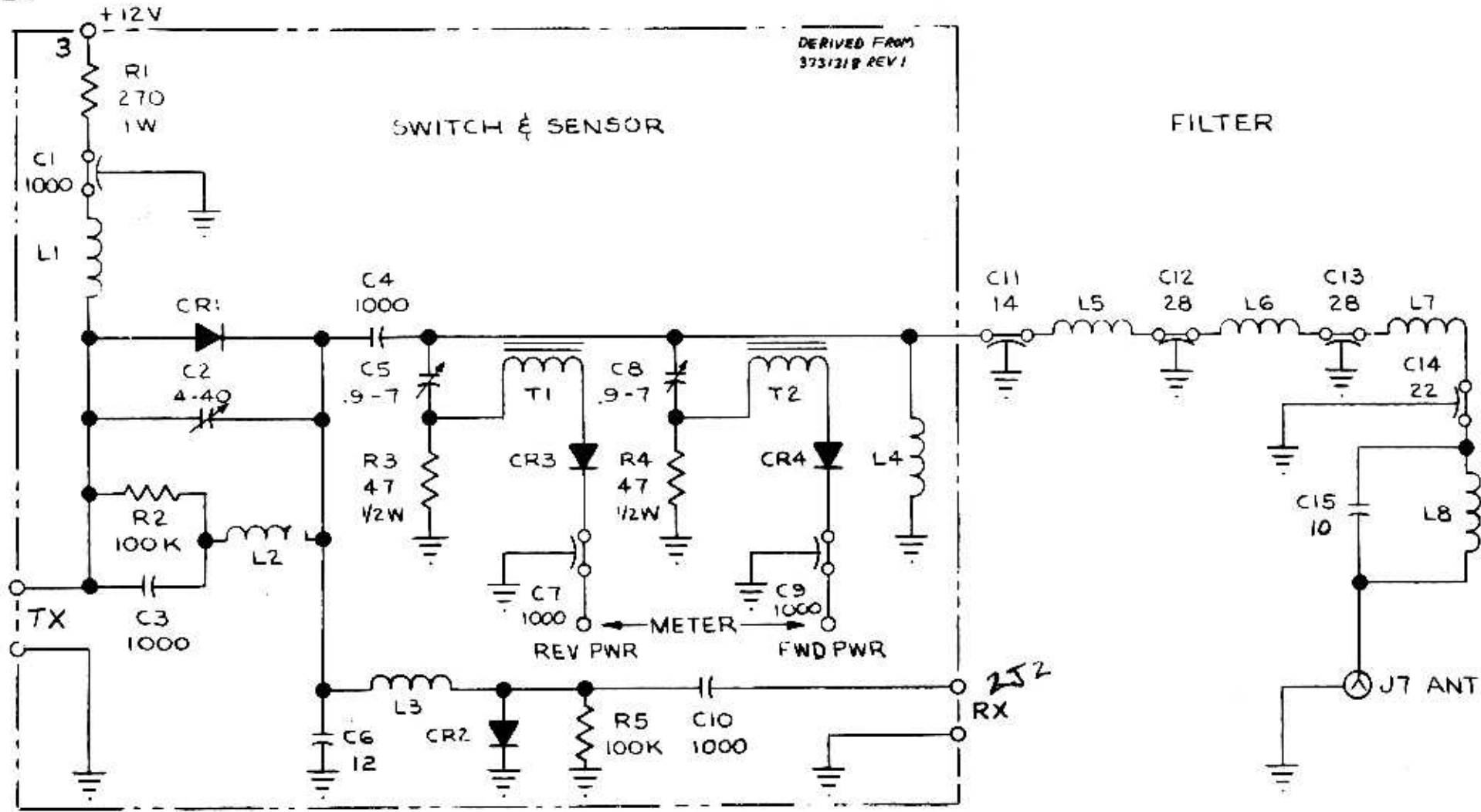
NOTES:
 1. ALL RESISTOR VALUES ARE IN OHMS
 1/4 WATT UNLESS OTHERWISE SHOWN.
 2. ALL CAPACITOR VALUES ARE IN UF
 UNLESS OTHERWISE SHOWN.



FOR LIST OF PARTS SEE
 DWG 3720681-504

3746063-1 REV 1
 SYMBOL PREFIX 22

Figure 2. DC Voltage Control Module - CODE B Transmitter Panels



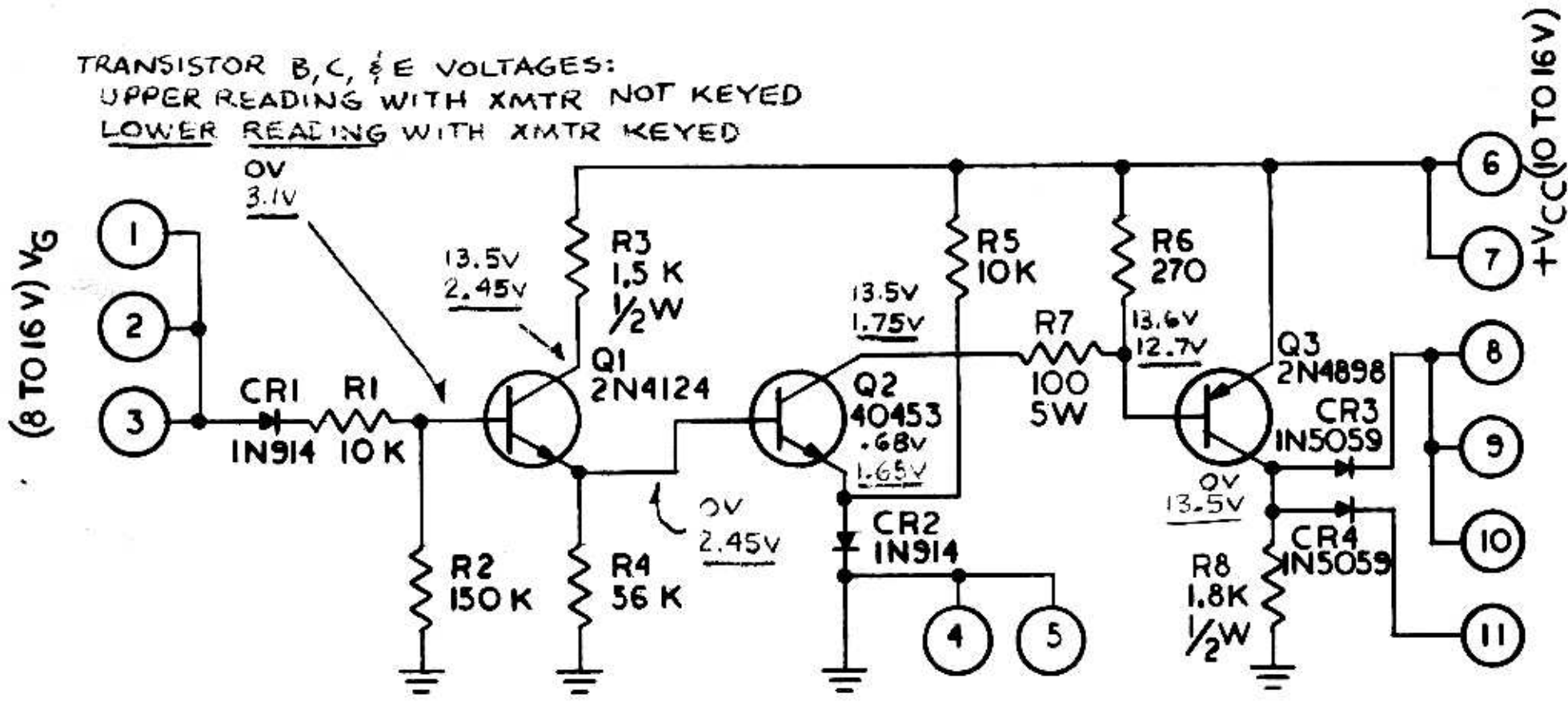
NOTES:

1. ALL RESISTORS ARE 1/4 W, WITH VALUES IN OHMS, UNLESS OTHERWISE SPECIFIED.
2. ALL CAPACITOR VALUES ARE IN PF.
3. PREFIX 27.

28006

Figure 3. Antenna Switch/VSWR Sensor

TRANSISTOR B, C, & E VOLTAGES:
 UPPER READING WITH XMTR NOT KEYPED
 LOWER READING WITH XMTR KEYPED



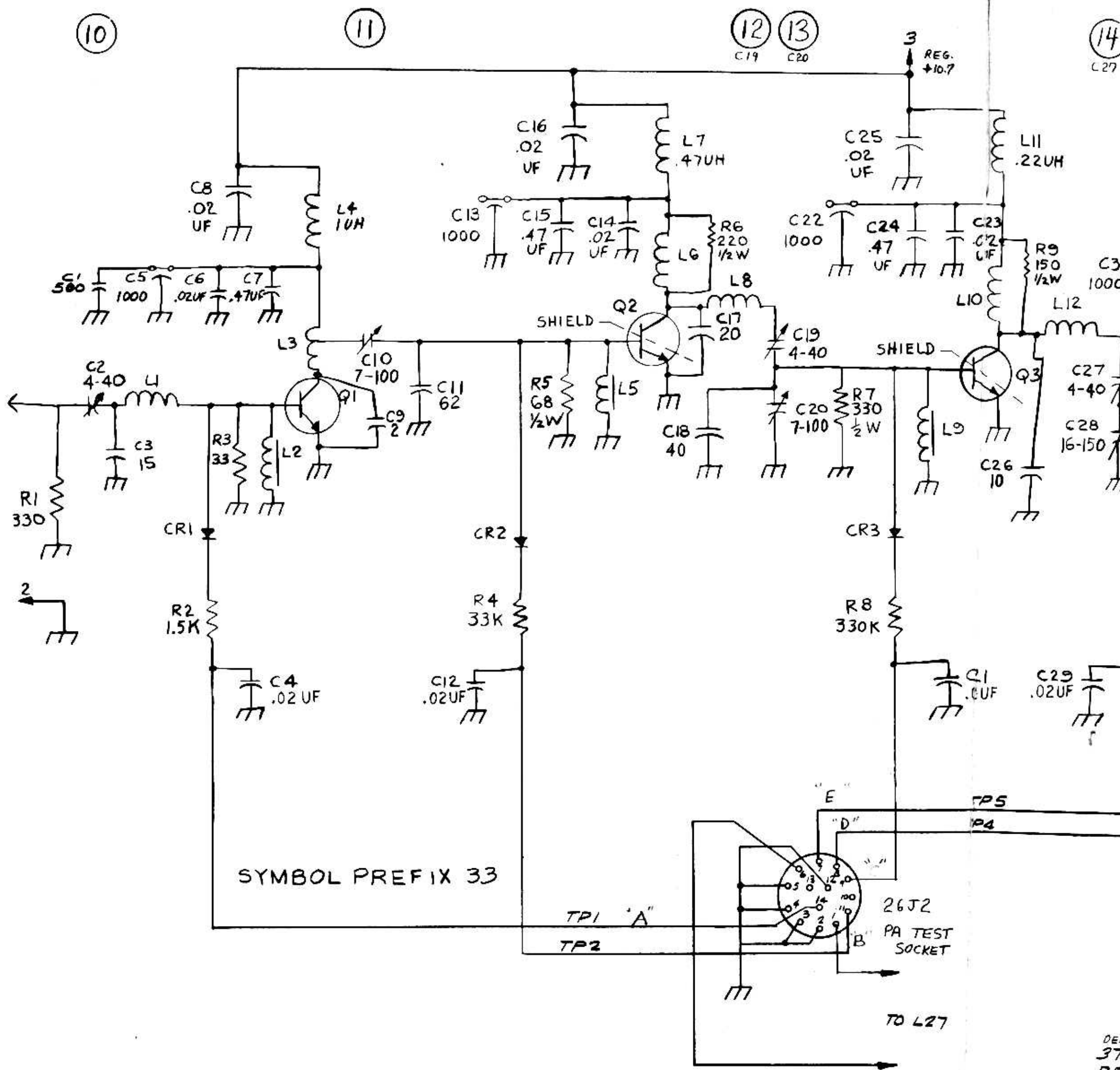
NOTE:

ALL RESISTORS ARE 1/4 W ± 10% UNLESS OTHERWISE SPECIFIED

3720796 Rev 2

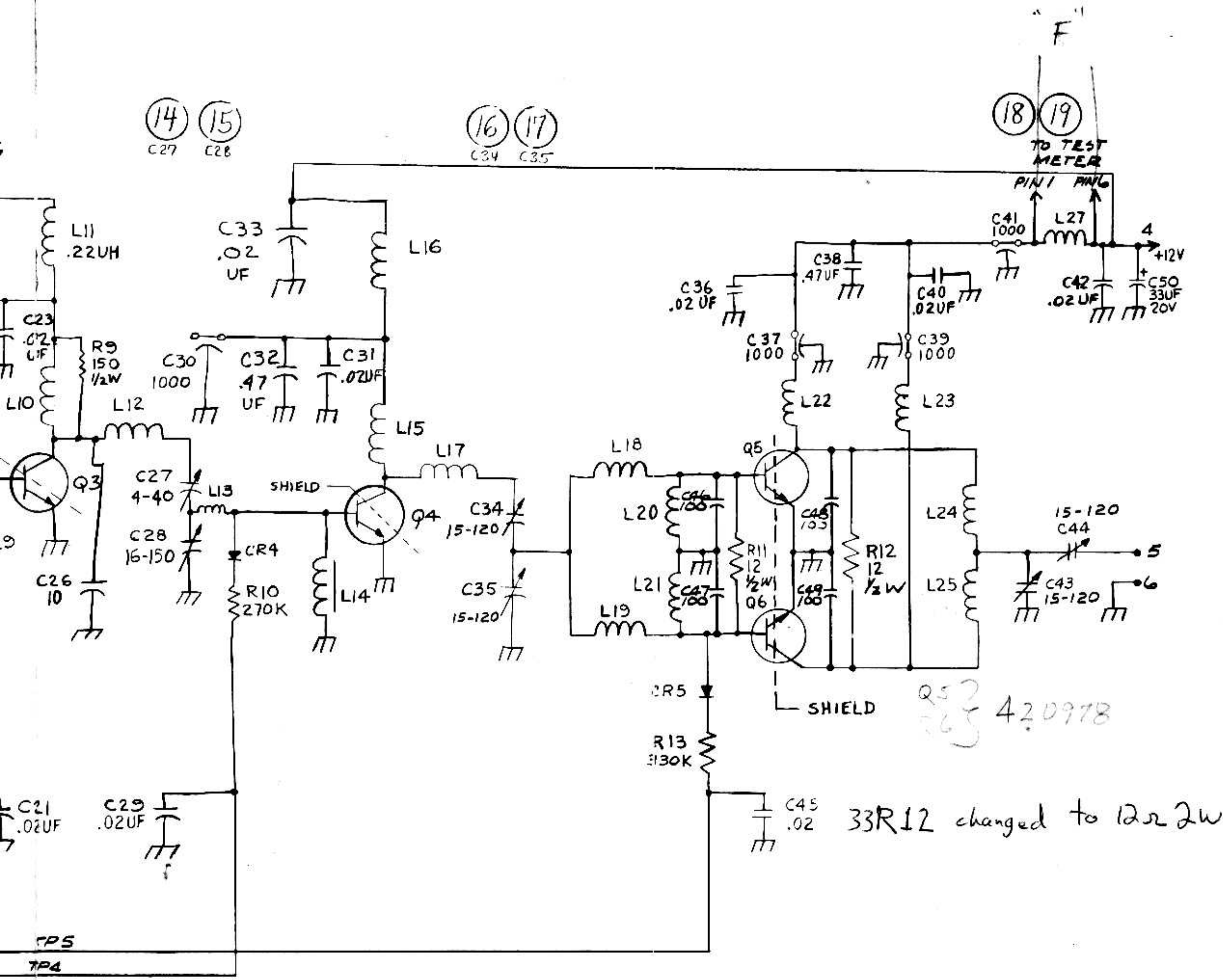
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Figure 4. Control Driver



38008

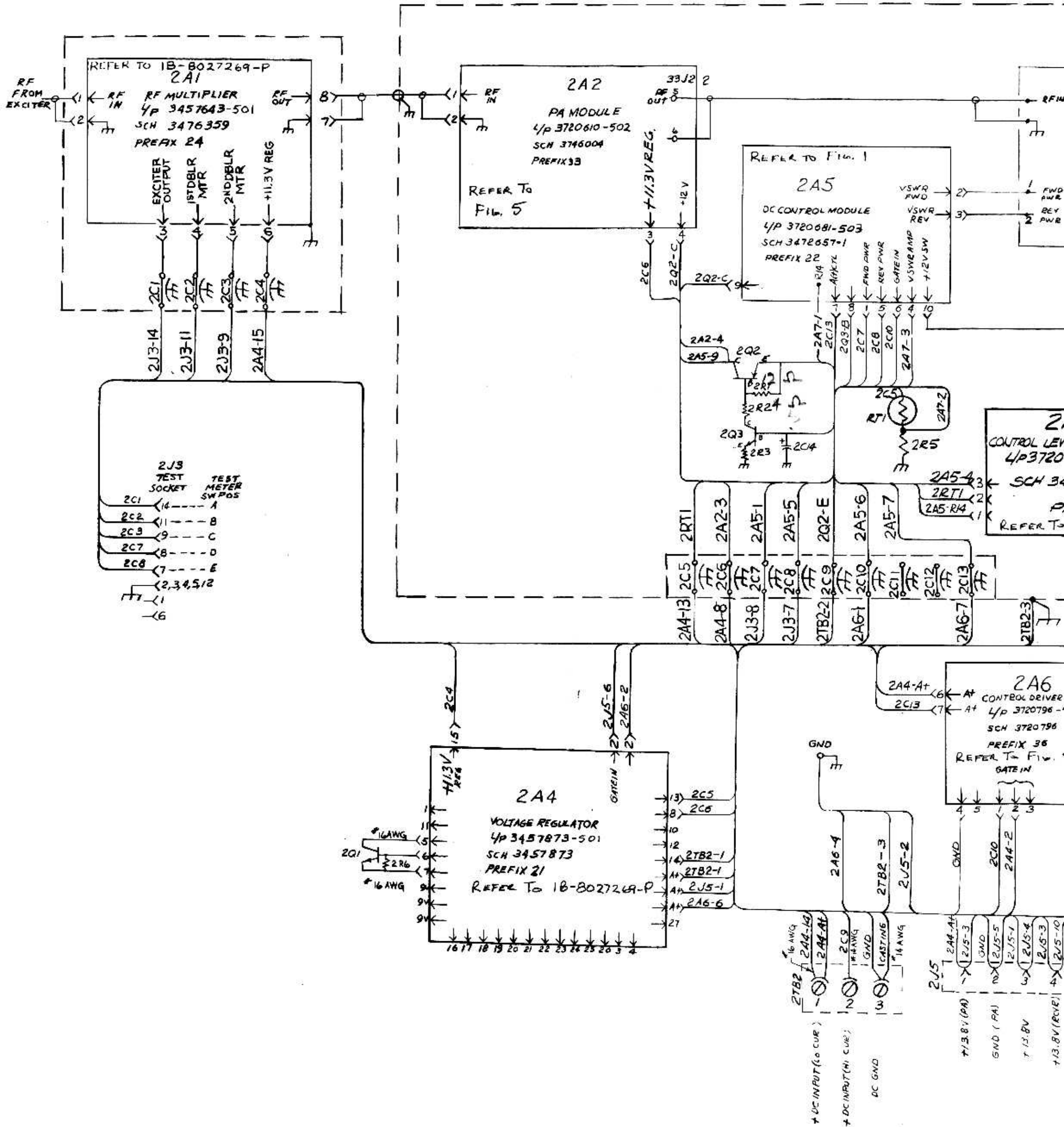
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NOTES:
ALL RESISTORS IN OHMS & 1/4 WATT UNLESS OTHERWISE NOTED.
ALL CAPACITORS TO BE IN PF UNLESS OTHERWISE NOTED.

Figure 5. Power Amplifier



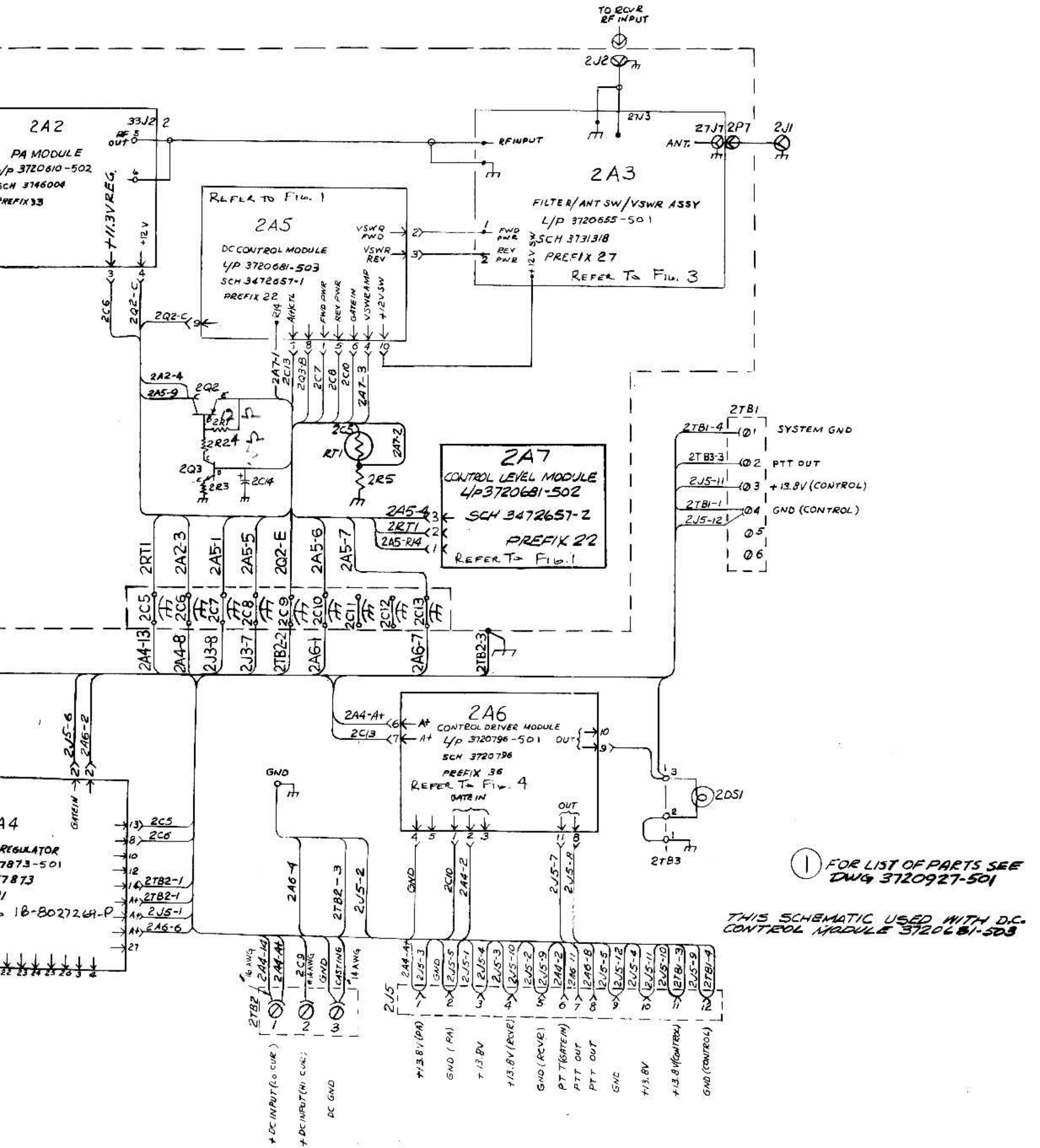
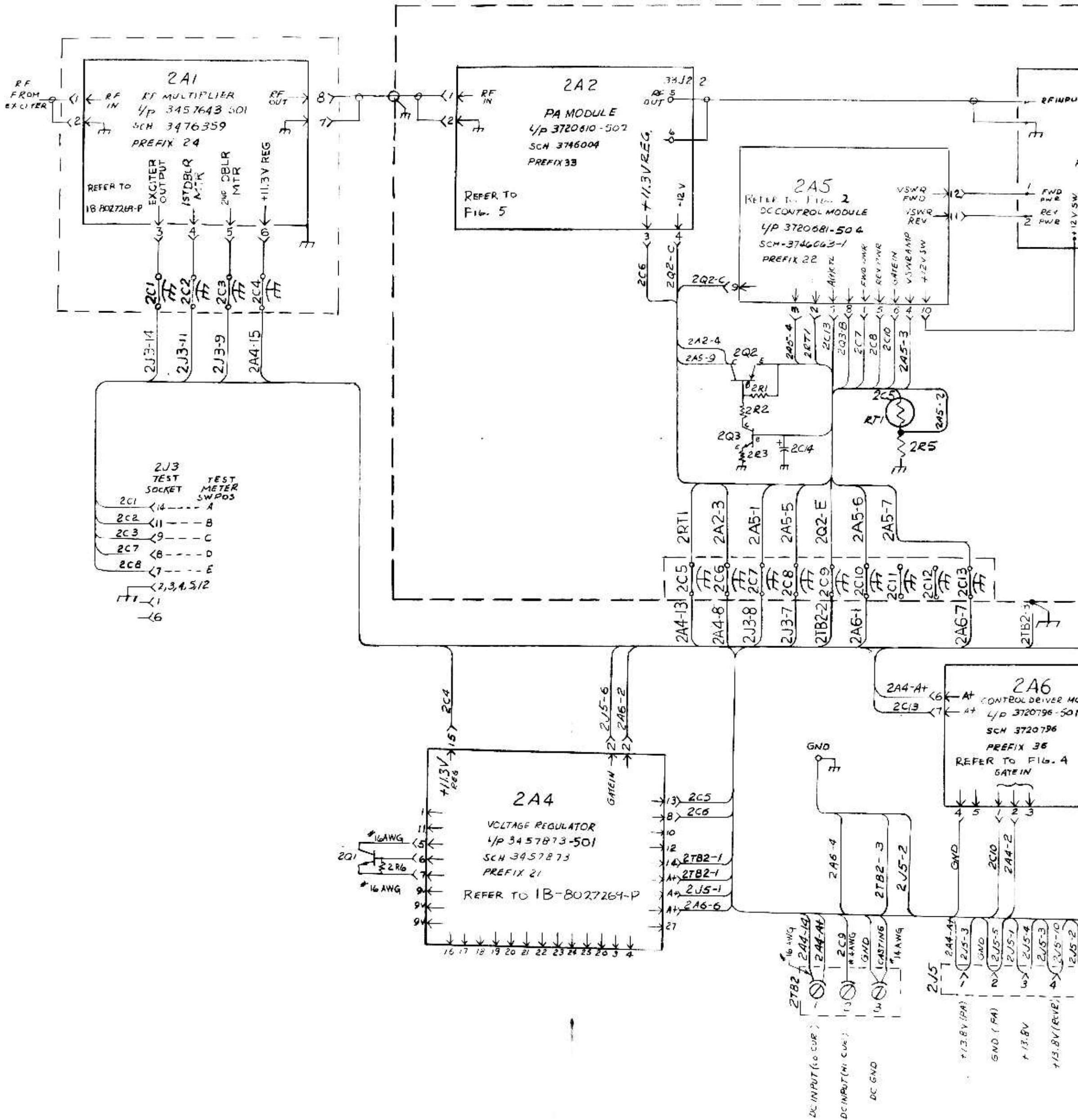


Figure 6. CODE A Transmitter Panel Interconnections



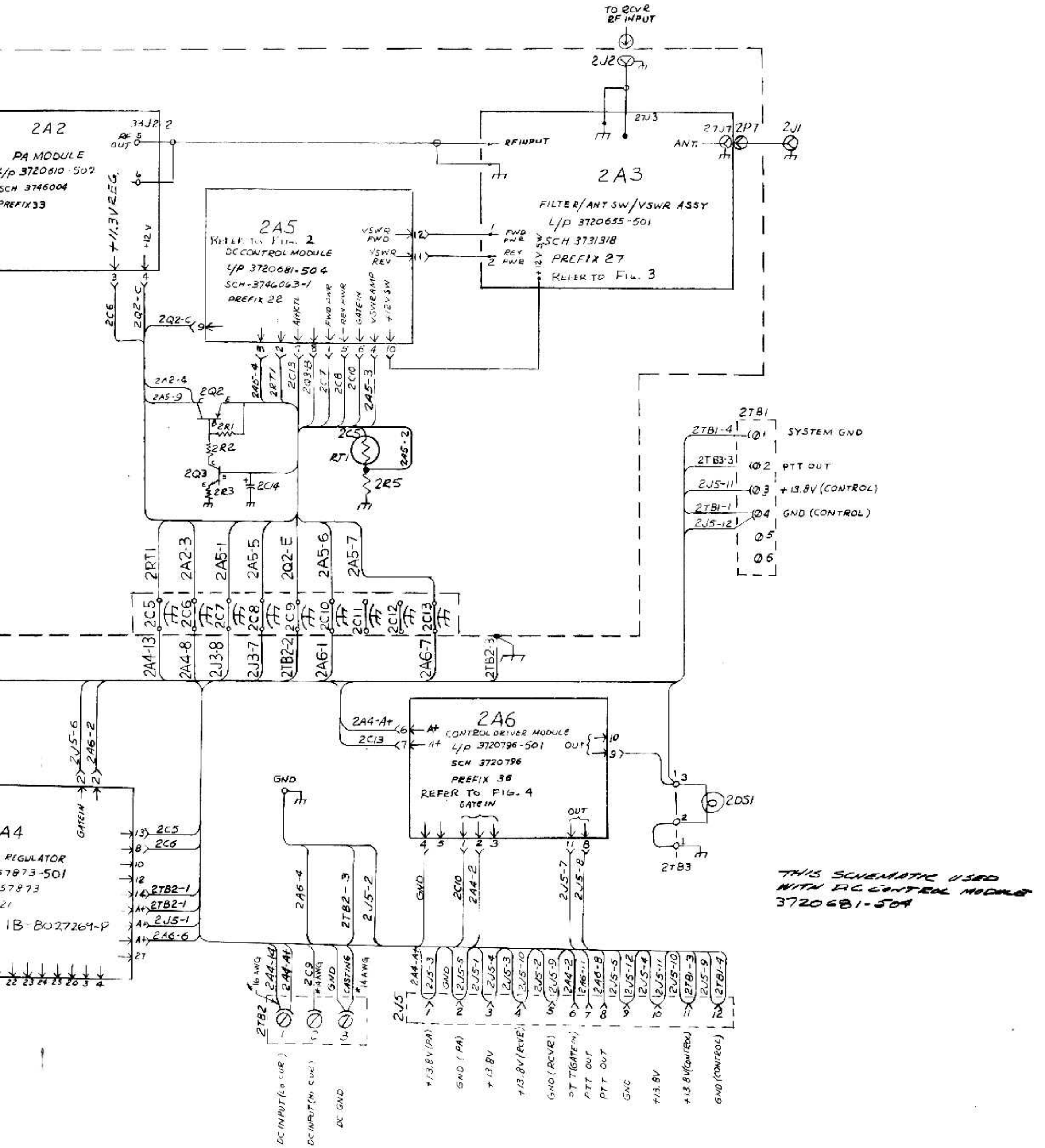


Figure 7. CODE B Transmitter Panel Interconnections