



DRAKE

SERVICE MANUAL

RR3

H.F. RECEIVER

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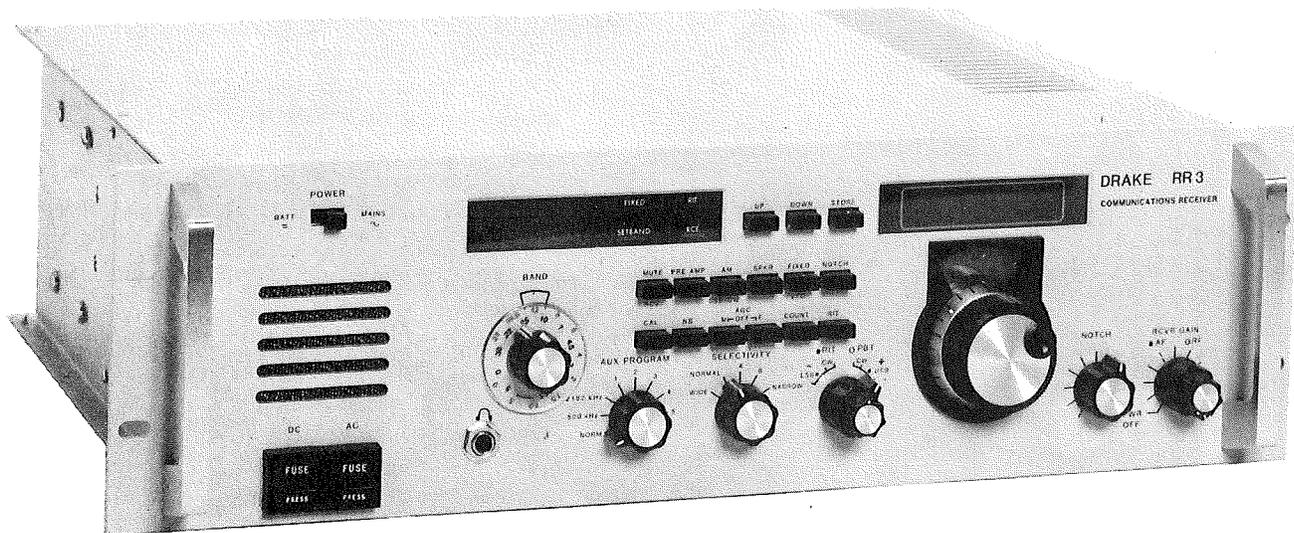
SECTION 1
OPERATION

Fig. 1-1 RR3 H.F. Receiver

1-1. DESCRIPTION

The RR3 is a solid-state, broadband, SSB/CW/AM marine reserve receiver which embodies several unique state-of-the-art design features. Due to its unique design, the RR3 offers excellent sensitivity and selectivity, very high dynamic range and digital frequency readout combined with general coverage capability.

A front panel switch allows the operator to select any of five receiver selectivities. Standard bandwidth is 2.3 kHz, and other bandwidths are established using easily installed optional crystal filters.

The front panel passband tuning (PBT) control is a valuable aid in reducing or eliminating interfering signals. The PBT control electronically shifts the receiver intermediate frequency (IF). In addition, the third mixer injection frequency is simultaneously shifted, thus maintaining the operating frequency to which the receiver is tuned. Since the crystal filter passband is fixed, this allows the operator to electronically move interfering signals out of the receiver passband, providing maximum utilization

of the excellent selectivity characteristics afforded by the eight pole crystal filters in the IF strip.

A high level double balanced mixer is used as the first receiver mixer in an up-conversion mode. The use of this device assures the reduction of both front-end overload and intermodulation to a minimum. Careful attention to filter matching and losses in the input circuit keeps the receiver noise figure low to insure good sensitivity.

The RR3 features a high-stability linear permeability tuned VFO and frequency synthesizer for accurate frequency control. Both analog and digital frequency readouts are featured for maximum operator convenience and flexibility. The digital readout circuitry includes a store function. This function, selected by front panel pushbutton, allows the operator to store a frequency on the six-digit front panel LED display for later reference. In addition, two other pushbutton controls allow the RR3 synthesizer to be stepped up or down in frequency in 500 kHz increments, thus allowing continuous frequency coverage from 10 kHz to 30 MHz.

For fixed frequency operation, the auxiliary programming board, the AUX7, is installed in the RR3. Two crystal controlled fixed frequencies are selected in the AUX Program switch positions marked 500 kHz and 2182 kHz with the FIXED pushbutton depressed. This board also enables reception of up to six (6) additional fixed frequencies or 500 kHz band segments outside the standard marine bands without using the UP/DOWN pushbuttons.

The digital display reads out the received frequency to the nearest 100 Hz. It may also be used as a 150 MHz frequency counter by depressing the COUNT button on the front panel.

While normal receiver sensitivity will usually be more than adequate, an internal preamp may be switched in for reception of satellites, use with an external low-gain VHF receiving converter, shortened or non-resonant antennas, or other extraordinary receiving conditions. The preamp increases receiver gain by about 10 dB and typically improves sensitivity by 5 to 6 dB.

The RR3 has a built-in receiver protector (RP700) between the MAIN antenna input and the bandpass filter module. The receiver also includes a Line Amplifier (LA7) capable of driving an isolated 600 ohm audio line.

Other features include a notch filter for eliminating interfering heterodynes, switchable AGC with three selectable time constants with an OFF position, a built-in 25 kHz calibrator, speaker ON/OFF switch, provision for an accessory noise blanker (NB7A), a special low distortion AM detector, receiver incremental tuning and operation on either AC or DC supply voltage. In the standard configuration, DC operation is possible from either 11 - 16 VDC or 20-28 VDC supply voltage with the negative input grounded (non-isolated). Isolated DC operation is possible from 20-28 VDC with the IN-7 accessory installed.

The modular construction of the RR3 reduces service time to a minimum. Each module is designed to perform a specific function, thus simplifying any required alignment and troubleshooting.

SPECIFICATIONS

Frequency Range:	10 kHz to 30 MHz
Modes of Operation:	USB, LSB, CW, RTTY, AM
Frequency Read Out:	Digital readout to 100 Hz plus analog dial read out with accuracy better than ± 1 kHz when calibrated to nearest calibrator marker.
External Counter Mode:	
Maximum Input Frequency:	150 MHz
Input Level Range:	50 mV to 2 V, rms.
Frequency Selection:	Band switched in 11 bands. Incrementally stepped up and down in 500 kHz increments within each band. Continuous tune over each of the 500 kHz ranges.
Frequency Stability:	Less than 1 kHz first hour. Less than 150 Hz per hour after 1 hour warm up. Less than 100 Hz $\pm 10\%$ line voltage change.
Sensitivity:	Input Required for 10 dB (S+N)/N at frequency of:

	PREAMP	0.01 to 1.5 MHz	1.8 to 30 MHz
(SSB, 2.3 kHz BW)	ON	NA	<0.2 μ V
	OFF	<1.0 μ V	<0.5 μ V
(AM, 10 kHz BW, 30% Mod.)	ON	NA	<2.0 μ V
	OFF	<6.0 μ V	<3.0 μ V
(AM, 4 kHz BW,* 30% Mod.)	ON	NA	<1.2 μ V
	OFF	<4.0 μ V	<2.0 μ V

*Optional Filter

Selectivity:	Position	IF Bandwidth (kHz)	
		-6 dB	-60 dB
	NORMAL	2.3	4.2
	WIDE	10.0	60.0
	A B NARROW	Positions A, B and Narrow same as WIDE. These positions are available for optional accessory filters.	
Ultimate Selectivity:	Greater than 100 dB		
IF and Image Rejection:	Greater than 80 dB		
RF Blocking:	Greater than 100 dB relative to 1 μ V (desired signal at 60 dB above 1 μ V with blocking signal removed 20 kHz and its amplitude adjusted to reduce desired signal 3 dB).		
Cross Modulation:	90 dB relative to 1 μ V (desired signal at 50 dB above 1 μ V with undesired signal removed 20 kHz and its amplitude adjusted for cross modulation products 30 dB lower than desired signal).		
Intermodulation:	80 dB relative to 1 μ V. (To produce an output equivalent to that resulting from a 30 μ V wanted signal, each of two equal level input test signals, each separated by at least 30 kHz from the wanted signal, must be at least 10 millivolts.)		
Automatic Volume Control:	Audio output rises less than 6 dB for RF input change from 3 μ V to 30 mV (100 dB). Attack time: 1 millisecond. Three selectable release times: 2 seconds, 400 milliseconds, and 75 milliseconds. Also AVC OFF.		
Antenna Input Impedance:	Nominal 50 ohms (200 ohms on .01-5 MHz range).		
Audio Output:	2.5 watts with less than 10% THD.		
Hum and Noise:	Greater than 60 dB below rated output.		
Power Requirements:	100/120/200/240 VAC \pm 10% 50/60 Hz, 60 watts; or 20-28 VDC or 11-16 VDC, 65 watts, negative grounded or 20-28 VDC isolated with IN-7 accessory.		
Size and Weight:	5.25"H x 19"W x 14"D (13.3 x 48 x 35.6 cm); 19 lbs. (8.6 kg)		
Accessories:	Selectivity Filters, BW's of 300 Hz, 500 Hz, 1800 Hz, 4000 Hz, or 6000 Hz at -6 dB.		
	NB7A Noise Blanker		
	DC to DC Isolation Power Supply		
	Cabinet for Desk Mounting the RR3.		

1-2. ACCESSORIES

The following accessory items provide additional operating capability and flexibility for the RR3 and are available through R. L. Drake Company dealers.

NOISE BLANKER, MODEL 1532

Provision has been made in the RR3 for plug-in installation of the NB7A Noise Blanker. The NB7A is useful in eliminating or reducing impulse (such as ignition noise) and some other types of interference (such as LORAN). Complete operating and installation instructions are supplied with the unit.

EXTERNAL SPEAKER MS-7, MODEL 1531

The MS-7 External Speaker is intended for use in lieu of the speaker built into the RR3 in fixed station operation. The impedance of the MS-7 is 4 ohms, and connection to the RR3 is accomplished via a single plug.

ACCESSORY CRYSTAL FILTERS

Several accessory crystal filters are available for the RR3 as follows:

MODEL	6 dB BANDWIDTH	60 dB BANDWIDTH	USE
7024 (Drake SL6000)	6 kHz	12 kHz	AM
7026 (Drake SL4000)	4 kHz	8 kHz	AM
7023 (Drake SL1800)	1.8 kHz	3.6 kHz	SSB, RTTY (Wide Shift)
7022 (Drake SL500)	0.5 kHz	1.1 kHz	CW, RTTY (170 Hz Shift)
7021 (Drake SL300)	0.3 kHz	0.7 kHz	CW

These filters may be easily installed in the RR3 in any combination of four units. Each filter is supplied with complete installation instructions. For the RR3, install filters as shown in figure 1-2. Actual filter selection will then correspond to selectivity switch markings. The RR3, as it is presently shipped, has 150 ohm, 1/2 W resistors installed in positions marked WIDE, A, B and NARROW.

In choosing an accessory filter for AM reception, the following should be considered: the synchronphase AM detector, unlike conventional AM envelope detectors, allows the user to select either the upper or lower sideband of the transmitted AM signal, without causing distortion. The 4.0 kHz (SL4000) filter will allow for maximum utilization of this feature. When a strong adjacent channel interfering signal

is present, the sideband furthest away from the interfering signal may be selected by adjustment of the PBT control. Using the 4.0 kHz filter with the PBT control properly set, the audio response will extend to approximately 3000 Hz. The 6.0 kHz (SL6000) filter may be used in the RR3 in place of the SL4000. This filter will allow wider audio frequency response as may be desired when receiving U.S. AM broadcast stations. Tuning is also less critical with the SL6000, although, as mentioned above, the SL4000 may be used to advantage in very severe

interference situations.

DC-DC CONVERTER, IN-7

The IN-7 DC-DC converter allows isolated DC operation of the RR3. Both the positive and negative input terminals are DC isolated from the receiver cabinet. The IN-7 converts DC voltages in the 20-28 VDC range to 17-24 VDC.

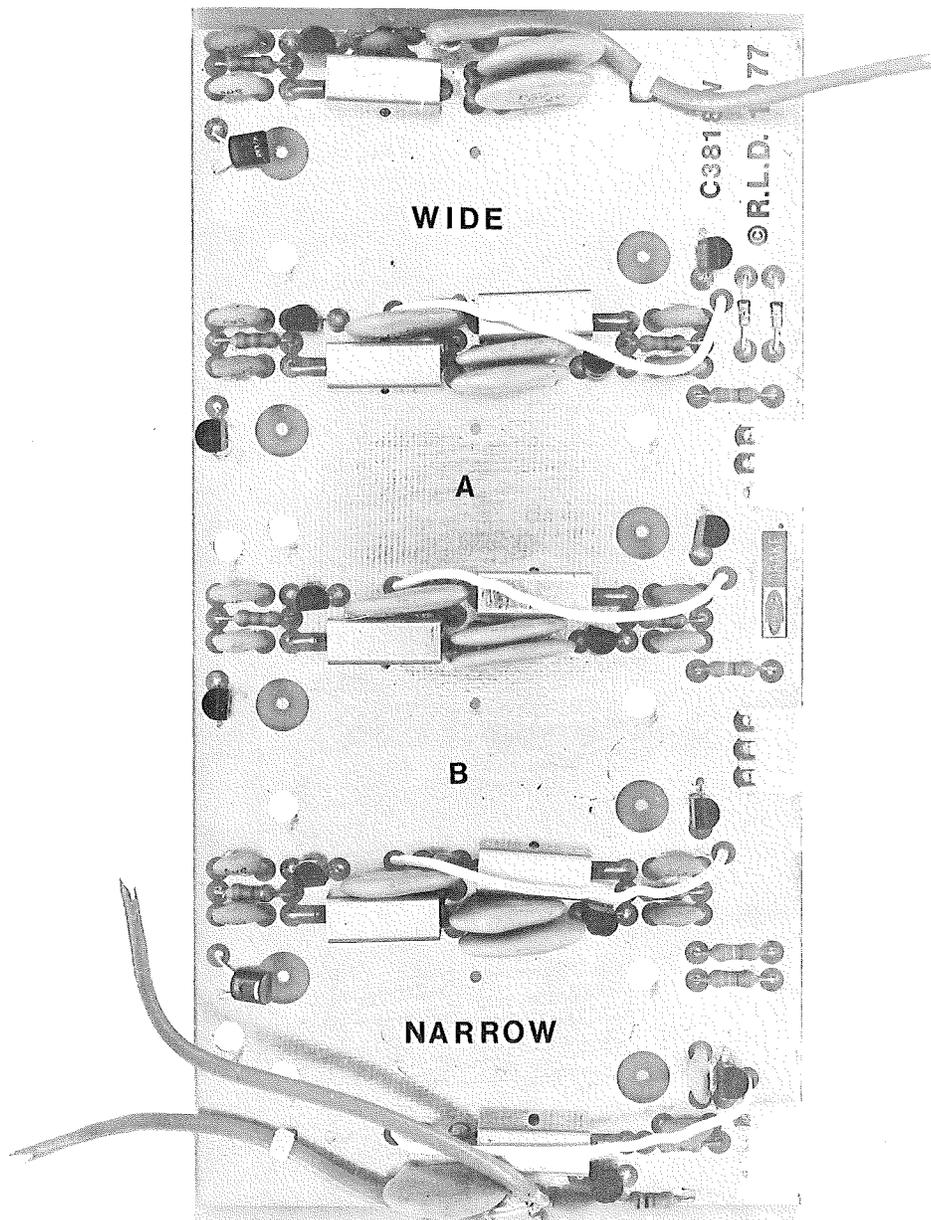


Fig. 1-2 IF Selectivity Board

1-3. UNPACKING

Carefully remove the RR3 from the shipping carton and examine it for evidence of damage. If any damage is found, immediately contact the transportation company responsible for delivery of the unit or return the unit to the dealer where it was purchased. Keep the shipping carton and all packing material for the transportation company to inspect. The original carton and packing material will make it much easier to return the unit if necessary. Inspect the packing material for any accessories or printed matter before storing. Locate the registration card, fill out immediately, and return to the R. L. Drake Company to insure registration and validation of the warranty.

1-4. LOCATION

The location of the RR3 is not critical. However, care should be taken to insure that adequate clearance is provided to allow free circulation of air around the power supply compartment. Do not cover the vents on top of the cabinet with books, papers, or other equipment as overheating may result.

In addition, if a separate external speaker will not be used, be sure to provide clearance around the opening on the left-hand front side of the cabinet to insure adequate sound dispersion.

1-5. ANTENNA REQUIREMENTS

Install the antenna as recommended by the antenna manufacturer. Connect a 50 ohm coaxial cable from the antenna to the MAIN antenna connector at the rear of the RR3.

1-6. POWER REQUIREMENTS

The RR3 receiver is designed to operate on 100 VAC, 120 VAC, or 240 VAC \pm 10%, 50/60 Hz. It can also be

operated on a DC voltage of 20-28 VDC or 11-16 VDC without the isolating DC-DC converter installed (IN-7 Accessory). The correct DC operating voltage may be selected with the switch located on the rear panel near the MAIN antenna input connector (see figure 1-8). Voltages outside the programmed AC or DC ranges may either damage the receiver or cause improper operation.

The correct AC supply voltage may be selected with two switches located on the rear panel (see figures 1-3 and 1-4). To change the AC line voltage programming, remove the two screws holding the cover plate that secures the programming switches. Referring to figure 1-3, set the two switches for the correct voltage. Reinstall the cover plate. If programming is correct, the proper voltage will show through the cut-out in the plate. It is recommended that the receiver not be operated without the cover plate in place to prevent inadvertent movement of the line voltage programming switches.

A DC input connector is also located on the rear panel (figure 1-6). This connector is used to supply voltage to the receiver for DC operation.

Note that an AC/DC power switch is located on the front panel (figure 1-5) so that selection of either AC or DC operation is possible without disconnecting any cables from the receiver.

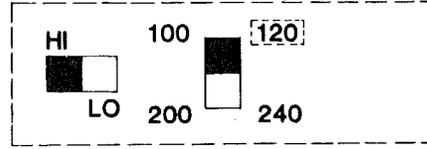
1-7. EXTERNAL SPEAKER REQUIREMENTS

The RR3 contains a built-in speaker; however, in some installations a remotely located speaker is desirable. In these instances, an external speaker is recommended. The MS-7 Speaker is designed for this application. See figure 1-6 for location of the external speaker jack.

If a speaker other than the MS-7 is used, be sure that it is a 3.2 ohm or higher impedance speaker, capable of handling at least 2.5 watts of audio. The internal speaker is automatically disabled when an external speaker is connected.



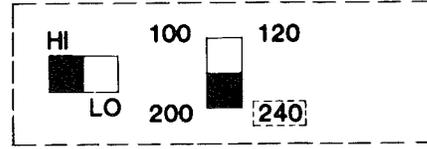
100V Programming



120V Programming



200V Programming



240V Programming

Fig. 1-3 RR3 Power Connection

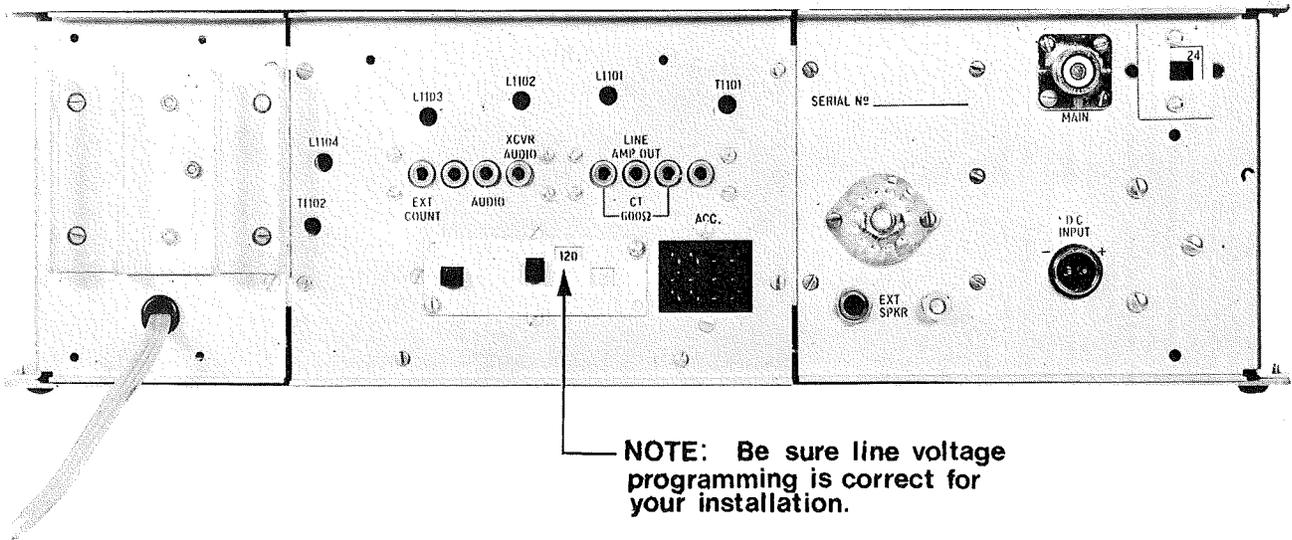


Fig. 1-4 RR3 Power Connector Location

1-8. FRONT PANEL CONTROLS

A. METER - Indicates relative level of received signals. Each S-unit is approximately 5 dB, with S9 equal to approximately 50 μ V (Preamp OFF).

B. STATUS INDICATORS -

1. **FIXED** - Indicates fixed receive mode has been selected.
2. **SET BAND** - Indicates the need to set the bandswitch to the proper range when using AUX7 program switch.
3. **RIT** - Indicates that Receiver Incremental Tuning is enabled.
4. **RCT** - Indicates that Remote Control Transmit is enabled. This is a mode not utilized in the normal operation of the RR3.

C. MUTE SWITCH - With button depressed, receiver is muted.

D. PREAMP SWITCH - Depressing button enables a 10 dB gain preamp following the input antenna filters. It is operational from 1.5 to 30 MHz and improves sensitivity approximately 5-6 dB. The receiver dynamic range is reduced slightly with the preamp on and thus it should be turned off when not needed. S-meter indication will increase approximately 2 S-units or 10 dB with preamp on with a signal applied. Preamp does not increase calibrator reading.

E. AM/SSB/CW SWITCH - Depressing button enables AM mode of receiver operation.

F. SPKR SWITCH - When depressed, internal or external speaker is disconnected. However, headphone jack is always operational in either switch position.

G. FIXED/VFO SWITCH - Determines the source of frequency control for the RR3. Depressing the switch selects receive crystal control as labelled. In the out position, the receiver reverts to VFO control.

NOTE: If crystals are not installed in a given position, this switch must be in the out position for proper RR3 operation.

H. NOTCH SWITCH - Enables notch control allowing IF null to be tuned approximately \pm 3.0 kHz from IF center frequency.

I. UP CONTROL - Each time this momentary contact pushbutton is depressed, the RR3 operating frequency will increase 500 kHz. This action will continue until the upper limit of the selected band range (black number on BAND switch, V) is reached, at which point the bandswitch must be reset to allow further increase.

J. DOWN CONTROL - Operation exactly the same as the UP control (I), except that the operating frequency is decreased 500 kHz for each switch actuation.

K. STORE CONTROL - When depressed, this control will store the current operating frequency on the six digit display. Control of the operating frequency remains variable, and the analog dial must be used. This feature is useful as a 'scratch pad.'

NOTE: Each time power is initiated to the radio with the STORE button already depressed, the display will be blank. Merely release the button for display operation.

L. FREQUENCY READOUT - Presents a digital display of operating frequency to the nearest 100 Hz when the front panel COUNT switch is in the out position. When the front panel switch is in the COUNT position, the display reads the frequency (150 MHz maximum) of a signal source connected to the rear panel EXT COUNT jack. For frequencies over 100 MHz, the hundred MHz digit is implied; i.e., 146.9400 MHz will be displayed as 46940.0.

M. RF GAIN - Controls the R.F. gain of the receiver. Normally used in the fully clockwise position for maximum gain.

N. AF GAIN - Controls the receiver audio gain. Turn fully counterclockwise to turn off the RR3.

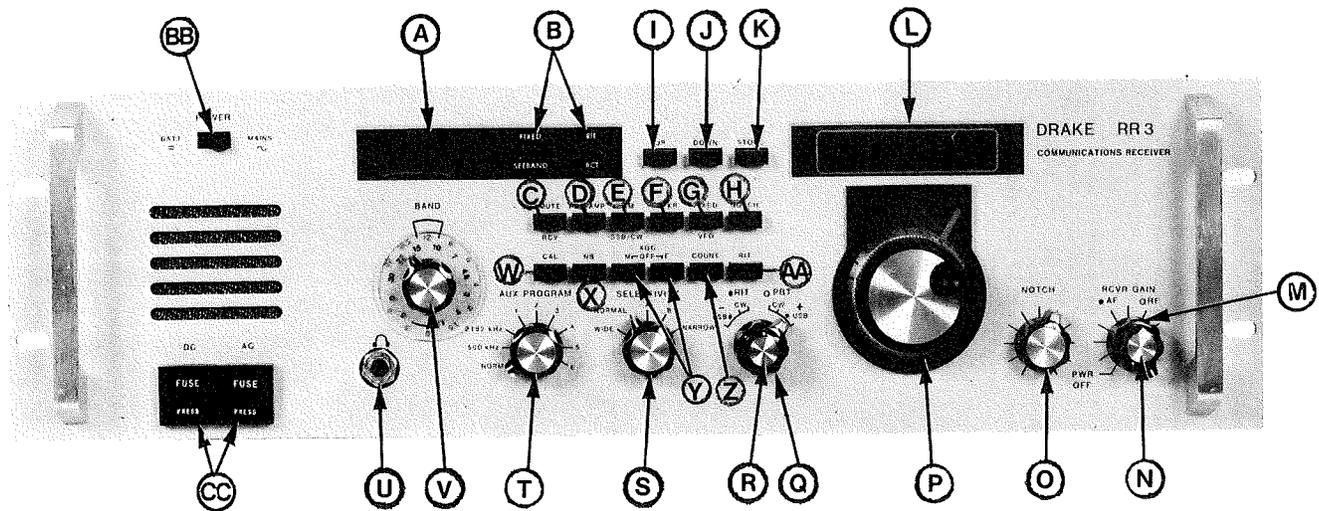


Fig. 1-5 Front Panel Controls and Connections

- O. NOTCH - With NOTCH pushbutton depressed, this controls the IF null frequency. Merely tune for minimum interference from the unwanted CW and heterodyne signals by listening for the audio null and observing the S-meter dip. The knob rotation sense is such that when the PBT control is CW of center, the notch control is CW of center and vice versa. Although the S-meter dip indicates only 20 dB notch depth, the actual audio null can be adjusted to approximately 40 dB depth.
- P. TUNING DIAL - Adjusts frequency of receiver. See Section 1-10 of the manual for detailed description of dial readings.
- Q. PBT CONTROL - Shifts the receiver 2nd IF and 3rd IF injection together (BFO constant frequency), thus maintaining a constant receiver operating frequency. Since the crystal filter passband is fixed, this control can be used to position interfering signals outside the receiver passband. Front panel markings indicate nominal settings for various modes. When using accessory crystal filters, position the receiver passband for the most pleasing receiver audio response and/or best interference rejection.
- R. RIT CONTROL - When the RIT switch (AA) is depressed, this control allows the receiver frequency to be varied over a nominal ± 3 kHz range.
- S. SELECTIVITY SWITCH - Selects receiver passband width independent of mode or passband tuning position.
- T. AUX PROGRAM SWITCH - Selects the desired auxiliary 500 kHz range and/or fixed frequency crystal for up to eight positions. In the RR3, the fixed frequency 500 kHz and 2182 kHz channels are selected by placing the AUX PROGRAM switch in the desired position and depressing the FIXED/VFO switch (G).

U. HEADPHONES - Provides a connection for headphones. Internal or external speaker is not muted when this jack is used. An internal 220 ohm resistor is installed in series with this jack. This jack is "hot" regardless of "SPKR" switch position.

V. BAND SWITCH - Selects the desired band of operation. The black numbers within the black bracket indicate the total range which can be covered in any given bandswitch position. The red numerals in the center of the brackets indicate the lowest frequency of the 500 kHz range which is automatically selected when the bandswitch is turned to this position. Other 500 kHz ranges are selected using the UP and DOWN pushbuttons (I & J).

W. CAL SWITCH - Enables the built-in 25 kHz calibrator. Due to the nature of the calibrator signal, it is normal to experience some receiver intermodulation and spurious response when the calibrator is enabled.

X. NB SWITCH - Enables the optional NB7A Noise Blanker.

Y. AGC SWITCHES - Selects one of the three AGC speeds and an OFF position. In the AGC "OFF" position, receiver gain must be controlled by the RF Gain control.

SWITCH "M"	SWITCH "F"	AGC RESPONSE
OUT	OUT	SLOW
IN	OUT	MEDIUM
OUT	IN	FAST
IN	IN	OFF

Z. COUNT SWITCH - Depressing this switch converts the digital readout into a 150 MHz counter. RF input port is on rear panel marked EXT COUNT.

NOTE: This switch must be in the "OUT" position for display to indicate receiver operating frequency.

AA. RIT SWITCH - Enables the front panel RIT control.

BB. AC/DC POWER SWITCH - Selects either AC MAINS voltage or Battery back-up mode of operation without connecting or disconnecting any power cables to effect changeover.

CC. AC/DC FUSES - Unit is to be fused according to the following chart:

AC FUSING

100/120 VAC - 3/4 Amp, 250 VAC Slo-Blo
 200/240 VAC - 3/8 Amp, 250 VAC Slo-Blo

DC FUSING

Input Voltage Range	Non-Isolated Configuration	IN-7 Isolated Configuration
11-16 VDC	3 amp, 32 V	4 amp, 32 V
20-28 VDC	3 amp, 32 V	

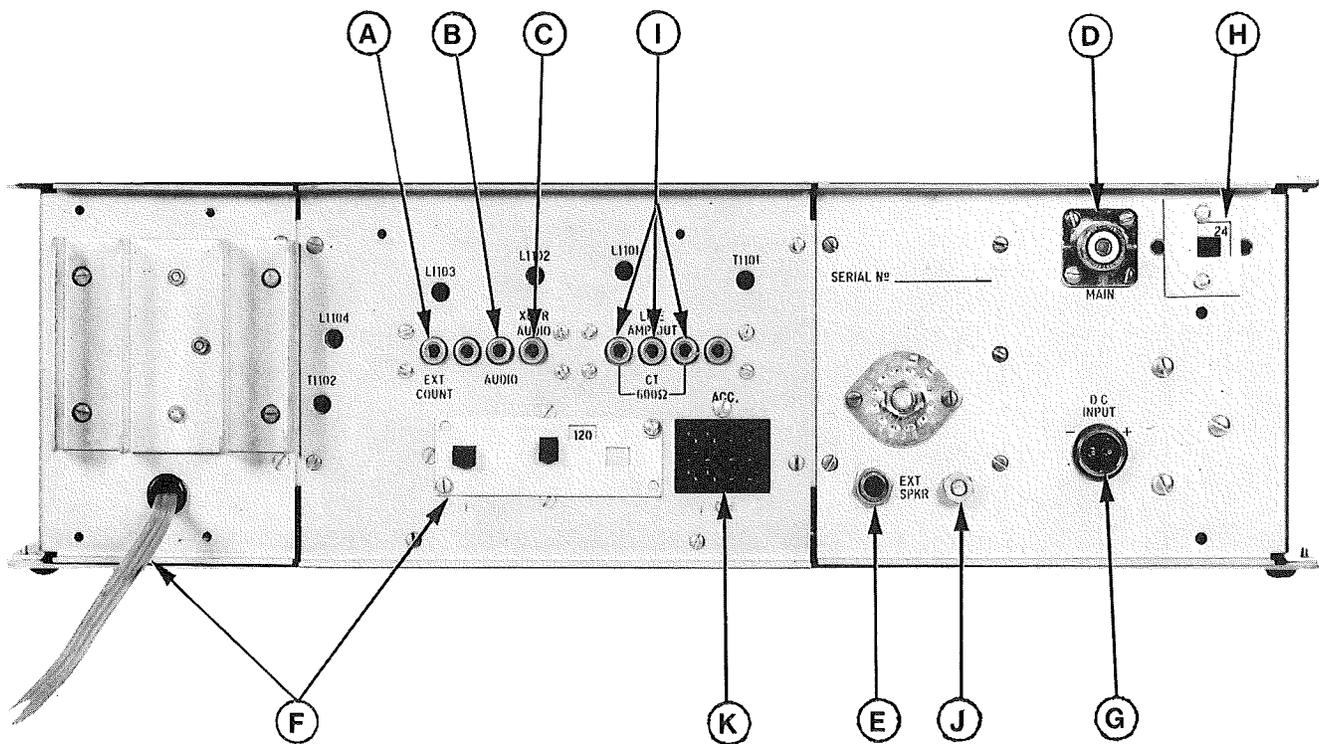


Fig. 1-6 Rear Panel Controls and Connections

1-9. REAR PANEL CONTROLS AND CONNECTIONS

- A. EXT COUNT JACK** - This port accepts a signal to be measured up to 150 MHz. By depressing the COUNT switch on the front panel, the display converts to a frequency counter. Sensitivity is 50 mV, and maximum input is 2 V.
- B. AUDIO JACK** - Connected to the top of the AF GAIN control. As such, this jack can be used for audio input to the receiver audio amplifier or audio output to accessories such as tape recorders or RTTY terminal units. Output level is nominally 0.5 volts RMS at high impedance.
- C. XCVR AUDIO JACK** - Connected through resistive padding and summed with the internal audio from the volume control. As such, this jack can be used for audio mixing of internal audio and external audio.
- D. MAIN JACK** - As its name implies, this jack is the RR3 receiver antenna input. It is connected to the RP700 receiver protector. The output of the receiver protector is connected to the bandpass filters.
- E. EXTERNAL SPEAKER** - Connection for an external 4 ohm speaker rated at 2.5 watts or more, such as the MS-7. Internal speaker is automatically muted when external speaker is connected. Plug should be wired so tip is 'hot.'
- F. POWER INPUT** - Primary AC power is provided to the receiver via the line cord. The programming plate window should indicate the proper supply operating voltage (See figure 1-3).
- G. DC INPUT CONNECTOR** - The receiver can be powered via this input in the event of primary AC power failure. As the RR3 is shipped, a DC input of 20-28 VDC (3 amp) at this connector will operate the receiver in a non-isolated configuration. Observe proper polarity.
- H. DC POWER PROGRAMMING PLATE** - As the RR3 is shipped standard, the switch is set to the 24 VDC position. This voltage is indicated as it appears in the plate window. To select 12 VDC

operation, merely remove the (2) two screws securing the plate and set the switch to the 12 V side. Replace the plate so that the 12 V marking appears in the plate window and secure the plate in place using the previously removed screws.

I. **LINE AMPLIFIER OUTPUTS** - Provides a nominal 0 dBm audio level into a 600 ohm balanced line. The CT socket is not connected to the receiver cabinet.

J. **GROUND** - Provides for grounding the receiver cabinet to a good earth or water pipe ground.

K. **ACCESSORIES** - Mates with a P-312-CCT plug. In normal RR3 operation this connection will most likely not be utilized. The socket is installed to provide for any future interconnect or remote operation requirements.

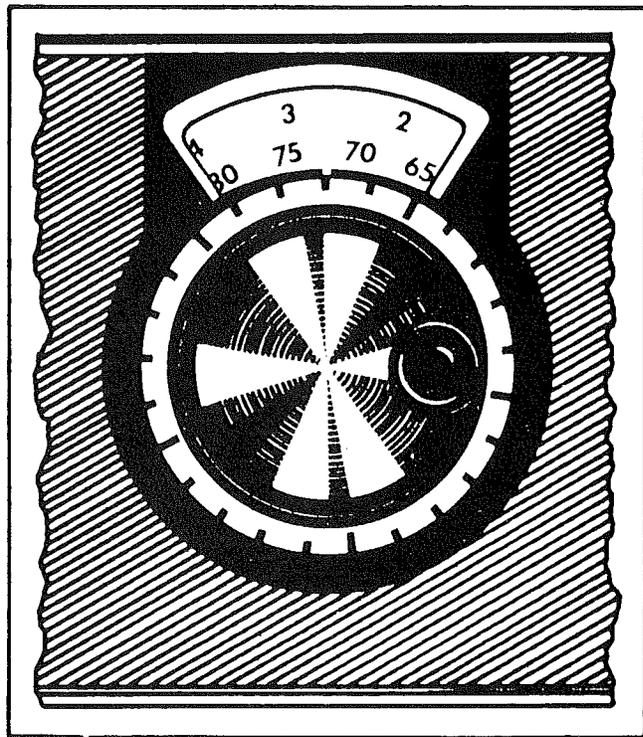


Fig. 1-7 Main Tuning Dial

1-10. VFO DIAL

This dial consists of two concentric discs, which rotate at different speeds, and the skirt on the main tuning knob. Zero to 100 kHz in 5 kHz increments is indicated on one disc and hundreds of kHz on the other. The knob skirt is calibrated in one kHz increments. The operating frequency is the sum of the frequencies indicated by the BAND switch and the VFO dial.

The VFO dial is illustrated in figure 1-7. In this illustration, the dial is read as follows:

100 kHz dial	.200 MHz
+ 5 kHz dial	.070 MHz
+ Knob Skirt	<u>.002 MHz</u>
	.272 MHz

Therefore, adding 0.272 MHz to the BAND setting will result in the operating frequency of the RR3.

The dial may be calibrated over a short range by the following procedure:

- A. Depress the CAL switch (calibrator on).
- B. Rotate the tuning knob to the nearest 25 kHz increment (0, 25, 50, or 75).
- C. Hold the knob skirt stationary and rotate the knob until the calibrator signal is zero beat.
- D. Turn off the calibrator.

1-12

1-11. GENERAL OPERATING INFORMATION

For normal SSB/CW receiver operation, preset the receiver controls as follows:

All 15 pushbuttons:	Out position
AUX PROGRAM:	NORM
SELECTIVITY:	NORMAL
PBT Knob:	USB or LSB as desired
RF GAIN:	Fully Clockwise
AF GAIN:	Adjust for comfortable listening level.

If the frequency display of the RR3 is blank when the receiver is first turned on, check to be sure that the STORE and COUNT buttons are in the out position. If the LED frequency readout is displaying randomly varying numbers, check to be sure the AUX PROGRAM knob is either in the NORM position, or is set to a channel programmed for the proper band as selected by the band switch. Also check that the FIXED/VFO switch is in the proper position. If no audio is heard with the RF and AF gain controls set at normal listening level, check to be sure that the MUTE and SPKR switches are in the out position.

The PBT (Passband Tuning) control may be adjusted to emphasize the high or low frequencies on a received SSB signal. The adjustment of this control is largely one of operator preference, and should be one that produces the most pleasing audio response with minimum interference. In particular, use of the accessory 1.8 kHz filter in conjunction with careful adjustment of the PBT control will often greatly improve reception of SSB signals under conditions of heavy interference.

For receiving AM under high interference conditions, the 4 kHz accessory filter may be useful. The PBT control is tuned to select either the upper or lower sideband, depending on interference. The 4 kHz filter may also be useful for quality SSB reception under strong signal conditions.

For AM reception within the 0.5 to 1.5 MHz range (U.S.A. broadcast) the following applies. Because of the wide variation in antennas used on this range, an attenuator pot (R1502), located on the input filter module (#15), is provided to allow the RR3 to be optimized for the particular antenna in use. This adjustment is factory preset to the middle of its range, and as such, reduces the sensitivity within this band. To increase or decrease the sensitivity simply adjust the pot (accessible from top of radio after removing the top cover) while observing the S-meter reading. For instance, if the RR3 is connected to a long wire antenna resulting in some cross modulation, adjust the pot until interference disappears. Conversely, sensitivity can be increased for distant DX reception when shorter antennas are used.

1-12. RECEIVER SECTION

Incoming signals from the antenna first pass through the RP700 receiver protector and then through a bandswitched bandpass filter module, the limits of which are defined by the black numerals on the front panel BAND switch.

The bandpass filter output is routed to a preamplifier which may be switched in or out as desired. The output of the preamp along with the 25 kHz calibrator output is connected to the input of the Up-Converter. Signals at the input of the Up-Converter module are mixed with the output of the synthesizer VCO to create a 48.05 MHz intermediate frequency

(IF) signal. Conversion is accomplished by a high-level, double balanced mixer to provide a very wide dynamic range. The output of this mixer is amplified by a low-noise, high dynamic range junction FET amplifier to insure adequate receiver sensitivity. This stage is followed by a four-pole monolithic 48.05 MHz crystal filter. The purpose of this filter is to attenuate signals removed more than ± 4 kHz from 48.05 MHz, thus protecting the remaining stages of the receiver from strong interfering signals. In this manner, optimum receiver dynamic range is preserved while providing excellent sensitivity.

The output of the Up-Converter module is routed to the input of the 2nd Mixer module. This module provides additional gain at the 48.05 MHz 1st IF frequency and converts this signal to the 5.645 MHz 2nd IF frequency. Additional gain is provided at 5.645 MHz in the selectivity positions designated B and NARROW. This is to offset the loss added by these narrow accessory filters. Automatic gain control (AGC) voltage is applied to the 1st IF amplifier to supplement the control range supplied by later stages.

The 5.645 MHz signal from the 2nd Mixer module is routed through the noise blanker module to the IF Selectivity module. When installed, the accessory NB7A noise blanker acts on noise pulses prior to the IF crystal filters to prevent ringing in these filters from stretching the pulses. Maximum noise blanker effectiveness is thus assured. If the accessory NB7A is not installed the 2nd IF signal is passed through a jumper board in the same location for interconnection.

The IF Selectivity module contains provisions for 4 accessory crystal filters in addition to the standard 2.3 kHz filter. These filters determine the overall bandwidth of the receiver, and are selected by PIN diode switching controlled from the receiver front panel. Careful attention has been given to the switching circuit design and physical layout of this module to minimize stray coupling paths which would degrade the ultimate selectivity of the receiver. The result is extremely high rejection of unwanted off-channel signals.

Following the IF Selectivity module, the 5.645 MHz signal is routed to the 2nd/3rd IF/AGC module. This module amplifies the 5.645 MHz signal and converts it to 50 kHz, after which it passes through

the notch filter circuitry and further amplification. The signal is then demodulated using an AM or product detector, depending on mode.

The demodulated signal is then amplified to a level sufficient to drive a speaker by an integrated circuit audio amplifier. AGC voltage, developed prior to demodulation, is used to control the gain of the IF stages. The same AGC signal is used to drive the S-meter circuit to provide signal strength indication. AGC decay time constants are selected by the front panel AGC switches.

1-13. FREQUENCY CONTROL

The RR3 features synthesizer control of the operating frequency. This allows the receiver to cover a wide frequency range without the use of range crystals or other frequency determining circuits.

The reference for the synthesizer is generated by a 40 MHz crystal oscillator on the PBT/Reference Oscillator module. The output of this oscillator is divided by 80 to produce 500 kHz. These two signals (40 MHz and 500 kHz) are routed to the synthesizer modules, which are described later in this section. When the Cal switch is depressed, the 500 kHz signal is divided by 20 to produce a 25 kHz signal which is rich in harmonics. This signal is connected to the input of the Up-Converter module, and produces calibration marker signals at 25 kHz intervals.

The passband tuning control is connected to a 13.695 MHz voltage-controlled crystal oscillator (VCXO). By adjustment of this control, the frequency of the oscillator is moved over a limited range (approximately ± 3 kHz) centered on 13.695 MHz. This signal is then mixed with the 40 MHz crystal oscillator signal to produce 53.695 MHz. The 13.695 MHz signal is also mixed with an 8 MHz signal derived from the 40 MHz divider chain to produce 5.695 MHz. The BFO, derived from the 40 MHz divider chain, is a fixed frequency 50 kHz signal.

The 53.695 MHz signal is used for injection to the 2nd Mixer module, where it converts the 48.05 MHz IF signal to 5.645 MHz. The 5.695 MHz signal is fed to the third mixer, converting the 5.645 MHz second IF signal down to the third IF, 50 kHz. Since the

13.695 MHz oscillator is used to generate both signals, it can be moved in frequency without changing the receiver operating frequency. Therefore, as the third mixer injection frequency is changed (by changing the PBT control voltage), the 53.695 MHz injection signal is changed by an equal amount. This allows the 2nd IF to be positioned anywhere within a ± 3 kHz range with respect to the crystal filter passband while the receiver remains tuned to the incoming signal. This technique provides the passband tuning feature.

Injection for the Up-Converter module is supplied by the VCO module. This module includes a voltage-controlled oscillator (VCO) which operates over the range of 48.05 MHz to 78.05 MHz. When mixed with the 0-30 MHz incoming signals, the result is the 48.05 MHz IF frequency. The VCO is tuned by a filtered control voltage derived from a Phase Detector which compares the frequency and phase of the 500 kHz reference from the PBT/Reference Oscillator module and a 500 kHz signal from the Translator module.

The Translator module combines the 40 MHz reference signal and the 5.05-5.55 MHz output of the permeability-tuned oscillator (PTO) which is controlled by the main tuning dial. The resulting 45.05-45.55 MHz signal is filtered and mixed with the VCO signal to produce a 3.0-33.0 MHz signal, depending on operating frequency. This signal is filtered, amplified, and applied to a programmable divider ($\div N$) which is programmed by the Digital Control Module. The output of the $\div N$ is exactly 500 kHz when the VCO is tuned to the correct frequency, thus satisfying the phase detector and locking the synthesizer loop.

The Digital Control module generates programming information for the $\div N$ by processing information from both the BAND switch and the frequency programmer on the DR-7 display module. The BAND switch information generates the proper $\div N$ load number for the frequency range indicated by the white bandswitch numerals. The DR-7 frequency programmer is then used to increment this load number UP or DOWN by the desired amount.

The following example will help to illustrate the operation of the synthesizer:

Operating Frequency	12.2835 MHz
	<u>+48.0500 MHz</u>
VCO Frequency:	60.3335 MHz
PTO Frequency:	
5.05 MHz + 0.2835 MHz =	5.3335 MHz
	<u>+40.0000 MHz</u>
Variable Reference Frequency:	45.3335 MHz
+N Input Frequency:	
(60.335 MHz - 45.335 MHz) =	15 MHz
+N Output:	.5 MHz
(Load Number = 30)	

It can be seen from the above that each time the +N load number is increased or decreased by one, the VCO frequency will be forced to change by 500 kHz to satisfy the Phase Detector and maintain phase lock.

The DR7 Frequency Display module contains a counter with a six digit LED readout. In the normal mode, this counter is connected to the VCO output and is programmed to subtract 48.05 MHz from the resulting count. In this manner, operating frequency is displayed on the LED readout. In the COUNT mode, the 48.05 MHz subtraction is removed, and the counter input is connected to the rear panel counter input jack, resulting in a 150 MHz six digit counter for test purposes.

1-14. SERVICE INFORMATION

The RR3 Receiver utilizes sophisticated circuitry which requires elaborate test equipment for troubleshooting. It is therefore suggested that any unit displaying abnormal operating characteristics be returned to the R. L. Drake Company or an authorized service center.

Before returning the unit for repair, remove the top and bottom covers. Check for broken or pinched wires, blown fuses, and be sure that all circuit boards are properly seated in their respective sockets. Check all external connections to be sure that the receiver is properly interconnected to other equipment. Refer to figure 1-8 for placement and description of various boards and modules within the RR3.

If problems persist, advise the factory of the difficulties and obtain authorization to return the unit for service. Address your request for authorization to:

R. L. DRAKE COMPANY
 540 Richard St.
 Miamisburg, OH 45342
 ATTN: Customer Service Department
 TELEPHONE: (513) 866-3211
 TELEX NO.: 288-017

NOTES:

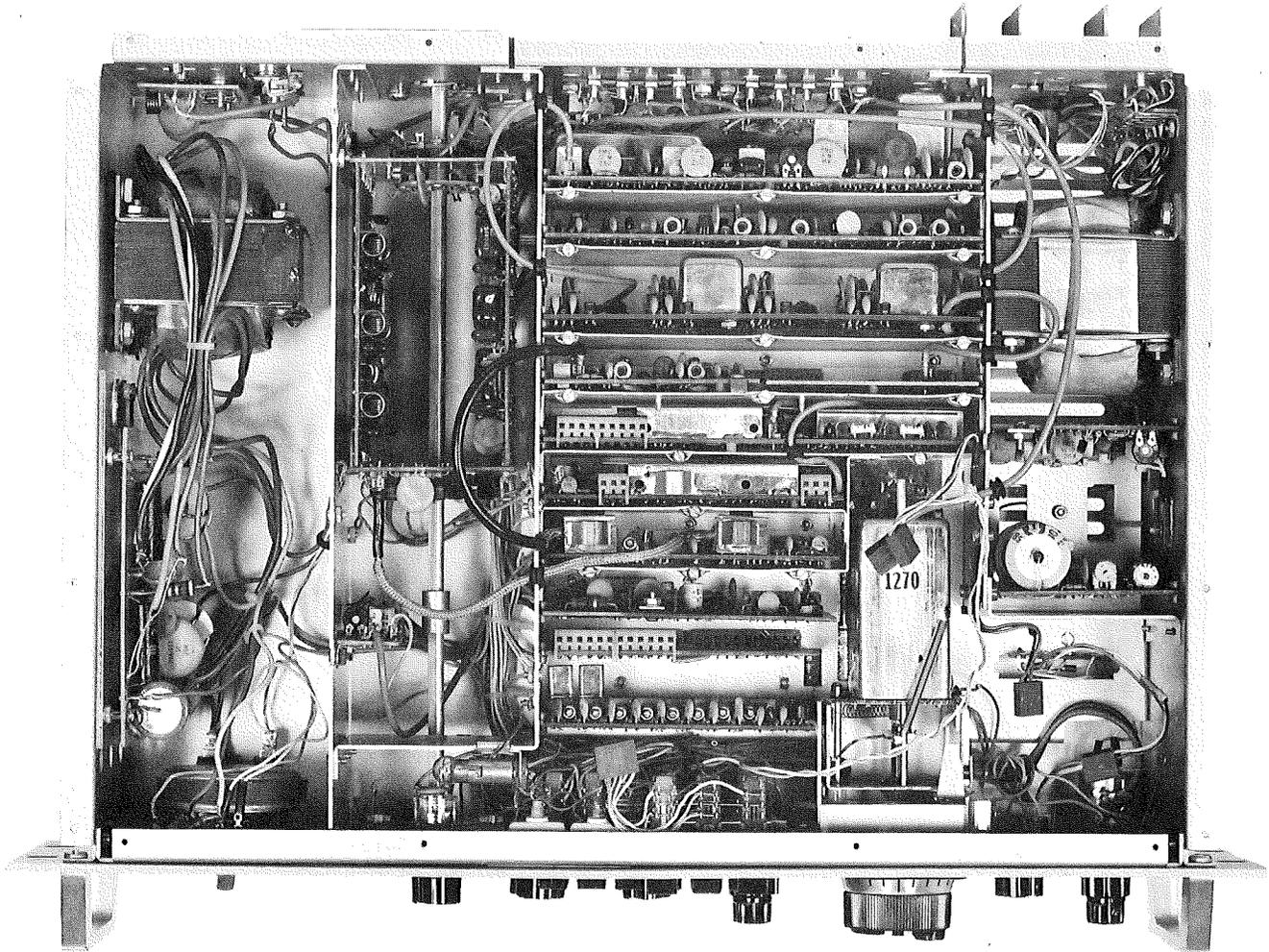


Fig. 1-8 Top View (Covers Removed)

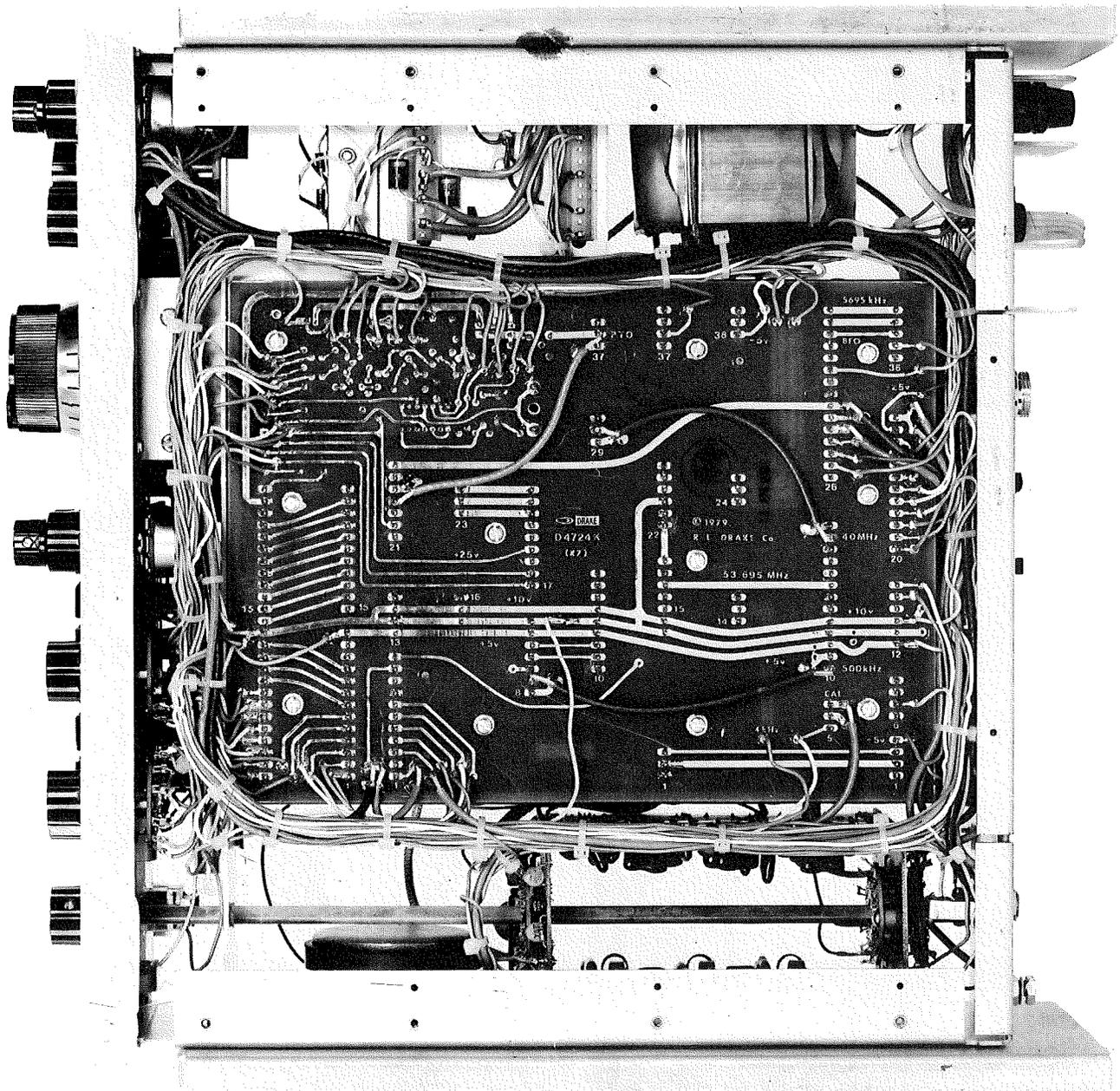


Fig. 1-9 RR3 Bottom View (Covers Removed)

NOTES:

SECTION 2

BASIC SERVICE INFORMATION

2-1. USING THE RR3 SERVICE MANUAL

The remainder of this manual is written with the assumption that the preceding portions of the manual have been read and understood by the user.

Section 2 is introductory in nature and provides a general discussion of operating theory, module location, troubleshooting techniques and tool requirements.

Section 3 contains complete information on each functional element of the RR3. This information includes detailed circuit description, parts list, component location and schematic diagram. This section of the manual is divided by functional element such as circuit board, module, chassis, etc. for the purpose of rapid circuit, component and problem identification.

Section 4 is a complete alignment procedure for the RR3, and includes test equipment requirements/recommendations and test point locations.

2-2. LOCATING A MALFUNCTION

The modular design of the RR3 allows easy exchange of most of the printed circuit boards. All modules are easily removed with the exception of the Bandpass Filter Module and the PTO.

The first step in troubleshooting the RR3 should be isolation of the malfunction to the module or board level. Refer to Section 2-3 for a general discussion of theory of operation and determine which module (or modules) would cause the problem at hand. In most cases, the problem will involve only one board, and substituting a board known to be in good operating condition will easily isolate the problem. Locating problems on the filter module may require removing these boards from the chassis by removing the bandswitch shaft and unsoldering the harness connections.

Once the problem has been isolated, refer to the appropriate portion of Section 3 for a full scale description of the circuit.

2-3. GENERALIZED THEORY OF OPERATION

The following discussion covers the theory of operation of the RR3 in a general manner. Detailed circuit descriptions are found in Section 3 of the manual. Refer to figure 2-2 (RR3 Block Diagram) and figure 2-3 (RR3 Module Locations) for aid in following this discussion. The discussion is divided into two sections (receiver and frequency control) for clarity.

2-3.1 RECEIVER SECTION

An incoming signal from the MAIN antenna receptacle is first routed through the RP700 receiver protector.

The signal is then sent through a bandswitched bandpass filter module, the limits of which are defined by the black numerals on the front panel BAND switch.

The bandpass filter output is routed to a preamplifier which may be switched in or out as desired. The output of the preamp along with the 25 kHz calibrator output is connected to the input of the Up-Converter. Signals at the input of the Up-Converter module are mixed with the output of the synthesizer VCO to create a 48.05 MHz intermediate frequency (IF) signal. Conversion is accomplished by a high-level, double-balanced mixer to provide a very wide dynamic range. The output of this mixer is amplified by a low-noise, high dynamic range junction FET amplifier to insure adequate receiver sensitivity. This stage is followed by a four-pole monolithic 48.05 MHz crystal filter. The purpose of this filter is to attenuate signals removed more than ± 4 kHz from 48.05 MHz, thus protecting the remaining stages of the receiver from strong interfering signals. In this manner, optimum receiver dynamic range is preserved while providing excellent sensitivity.

The output of the Up-Converter module is routed to the input of the 2nd Mixer module. This module provides additional gain at the 48.05 MHz 1st IF frequency and converts this signal to the 5.645 MHz 2nd IF frequency. Additional gain is provided at 5.645 MHz in the selectivity positions designated .5 kHz and .3 kHz. This is to offset the loss added by these narrow accessory filters. Automatic gain control (AGC) voltage is applied to the 1st IF amplifier to supplement that control range supplied by later stages.

The 5.645 MHz signal from the 2nd Mixer module is routed through the noise blanker module to the IF Selectivity Module. When installed, the accessory NB7A noise blanker acts on noise pulses prior to the IF crystal filters to prevent ringing in these filters from stretching the pulses. Maximum noise blanker effectiveness is thus assured. If the accessory NB7A is not installed, the 2nd IF signal is passed through a jumper board in the same location for inter-connection.

The IF Selectivity module contains provisions for 4 accessory crystal filters in addition to the standard 2.3 kHz filter. These filters determine the overall bandwidth of the receiver, and are selected by PIN diode switching controlled from the receiver front panel. Careful attention has been given to the switching circuit design and physical layout of this module to minimize stray coupling paths which would degrade the ultimate selectivity of the receiver. The result is extremely high rejection of unwanted off-channel signals.

Following the IF Selectivity module, the 5.645 MHz signal is routed to the 2nd IF module. This module amplifies the 5.645 MHz signal and converts it to 50 kHz, after which it passes through the notch filter circuitry and further amplification. The signal is then demodulated using an AM or product detector, depending on mode.

The demodulated signal is then amplified to a level sufficient to drive a speaker by an integrated circuit audio amplifier. AGC voltage, developed prior to demodulation, is used to control the gain of the IF stages. The same AGC signal is used to drive the S-meter circuit to provide signal strength indication. AGC decay time constants are selected by the front panel AGC switches.

2-3.2 FREQUENCY CONTROL

The RR3 features synthesizer control of the received frequency. This allows the receiver to cover a wide frequency range without the use of range crystals or other frequency determining elements.

The reference for the synthesizer is generated by a 40 MHz crystal oscillator on the PBT/Reference board. The output of this oscillator is first divided by 5 to produce 8 MHz. The 8 MHz output is then divided by 16 to produce 500 kHz. The 500 kHz is divided by 10 to produce 50 kHz, and finally, the 50 kHz is divided by 2 to produce 25 kHz.

The 40 MHz and 500 kHz signals are routed to the synthesizer boards, which are described later in this section. When CAL is depressed, the 25 kHz signal is derived which is rich in harmonics. This signal is injected into the input of the Up-Converter board and produces calibration markers at 25 kHz intervals.

The passband tuning control is connected to a 13.695 MHz voltage-controlled crystal oscillator (VCXO). By adjustment of this control the frequency of the oscillator is moved over a limited range (approximately ± 3 kHz) centered on 13.695 MHz. This signal is then mixed with the 40 MHz crystal oscillator signal to produce 53.695 MHz. The 13.695 MHz signal is also mixed with an 8 MHz signal derived from the 40 MHz divider chain to produce 5.695 MHz. The BFO, derived from the 40 MHz divider chain, is a fixed frequency 50 kHz signal.

The 53.695 MHz (nominal) signal is the injection for the 2nd Mixer board, which converts the 48.05 MHz 1st IF signal to 5.645 MHz (nominal), 2nd IF. This signal is then mixed with the 5.695 MHz (nominal) 3rd L.O. to produce 50 kHz, 3rd IF. Since the 13.695 MHz (nominal) oscillator is used to generate both signals, it can be moved in frequency without changing the receiver operating frequency. Therefore, as the third mixer injection frequency is changed (by changing the PBT control voltage), the 53.695 MHz (nominal) injection signal is changed by an equal amount. This allows the 2nd IF to be positioned anywhere within ± 3 kHz range with respect to the crystal filter passband while the receiver remains

tuned to the incoming signal. This technique provides the passband tuning feature.

Injection for the Up-Converter board is supplied by the VCO board. This board includes a voltage controlled oscillator (VCO) which operates over the range of 48.05 MHz to 78.05 MHz. When mixed with the 0-30 MHz incoming signals, the result is the 48.05 MHz 1st IF frequency. The VCO is tuned by a filtered control voltage derived from a phase detector which compares the frequency and phase of the 500 kHz reference from the PBT/Reference board and the 500 kHz from the Translator Board.

The Translator board combines the 40 MHz reference signal and the 5.05-5.55 MHz output of the permeability-tuned oscillator (PTO) which is controlled by the main tuning dial. The resulting 45.05 MHz to 45.55 MHz signal is filtered and mixed with the VCO signal to produce a 3 MHz to 33 MHz signal, depending on operating frequency. This signal is filtered, amplified and applied to the programmable divider ($\div N$) which is programmed by the digital control board. The output of the $\div N$ is exactly 500 kHz when the VCO is tuned to the correct frequency, thus satisfying the phase detector and locking the loop.

The Digital Control board generates programming information for the $\div N$ by processing information from both the band switch and the frequency programmer on the DR7 display board. The band switch information generates the proper $\div N$ load number for the frequency range indicated by the red bandswitch numerals. The DR7 frequency programmer is then used to increment this load number UP or DOWN by the desired amount.

The following example will help to illustrate the operation of the synthesizer:

Operating Frequency:	12.2835 MHz
	+48.0500 MHz
VCO Frequency:	60.3335 MHz
PTO Frequency:	
5.05 MHz + 0.2835 MHz =	5.3335 MHz
	+40.0000 MHz
Variable Reference Frequency:	45.3335 MHz
$\div N$ Input Frequency:	
60.3335 MHz - 45.3335 MHz =	15 MHz
$\div N$ Output	.5 MHz
(Load Number = 30)	

It can be seen from the above that for each time the $\div N$ load number is increased or decreased by one, the VCO frequency will be forced to change by 500 kHz to satisfy the phase detector and maintain a locked condition. By the same token, as the PTO is tuned, the VCO must follow exactly to maintain phase lock.

The DR7 Frequency Display module contains a counter with a six-digit LED readout. In the normal mode, this counter is connected to the VCO output and is programmed to subtract 48.05 MHz from the resulting count. In this manner, operating frequency is displayed on the LED readout. In the external mode, the 48.05 MHz subtraction is removed, and the counter input is connected to the rear panel counter input jack, resulting in a 150 MHz six-digit counter for test purposes.

2-4. SPECIAL TOOLS AND FIXTURES

A special set of tools and fixtures is available for servicing the RR3. This set includes all unique board extenders, a jumper board, and alignment tools needed to troubleshoot and align the receiver. This kit is available from the R. L. Drake Company for a nominal fee.

2-4.1 BOARD EXTENDERS

In order to extend a circuit card out of the card cage for servicing, refer to figure 2-1 and select the proper board extenders from the table. Remove the circuit card to be tested, install the board extenders so that each pin of each circuit card connector is extended, and reinstall the circuit card on the extenders. To service a card located underneath the DR7, remove the DR7 (see Section 3-18) and replace it with the jumper board included in the service kit.

NOTE

Performance of the RR3 will be degraded when some cards are extended. After replacing a faulty component or otherwise correcting a problem, the receiver should be realigned in accordance with Section 4 with all the boards in place in the card cage.

EXTENDER TYPE AND NUMBER REQUIRED

CIRCUIT CARD	3 PIN	4 PIN	5 PIN	6 PIN	9 PIN
Aux Program Bd.		1	1	1	1
Digital Control (See Note 1)		1	1	1	1
Audio/PTO Buffer (See Note 2)	1	2	1	1	
Up-Converter	2				
VCO (See Note 2)	1	1			1
Translator (See Note 3)	2				1
2nd Mixer	2	1			
IF Jumper or Noise Blanker		1		1	
IF Selectivity	3				
PBT/Reference	1	1		1	2
2nd/3rd IF/AGC	1	2	1	1	1
+13.8 VDC Regulator				2	
+25, +10, +5, -5 VDC Power Supply (See Note 4)				2	

NOTES

1. Use a 9 pin extender on translator end of jumper board.
2. Extend jumper board with (2) 6 pin and (1) 9 pin extenders.
3. Use (2) 6 pin extenders on Digital Control end of jumper board.
4. Limit operating time to 15 minutes due to lack of heat sink.

Fig. 2-1 Board Extender Selection Chart

NOTES:

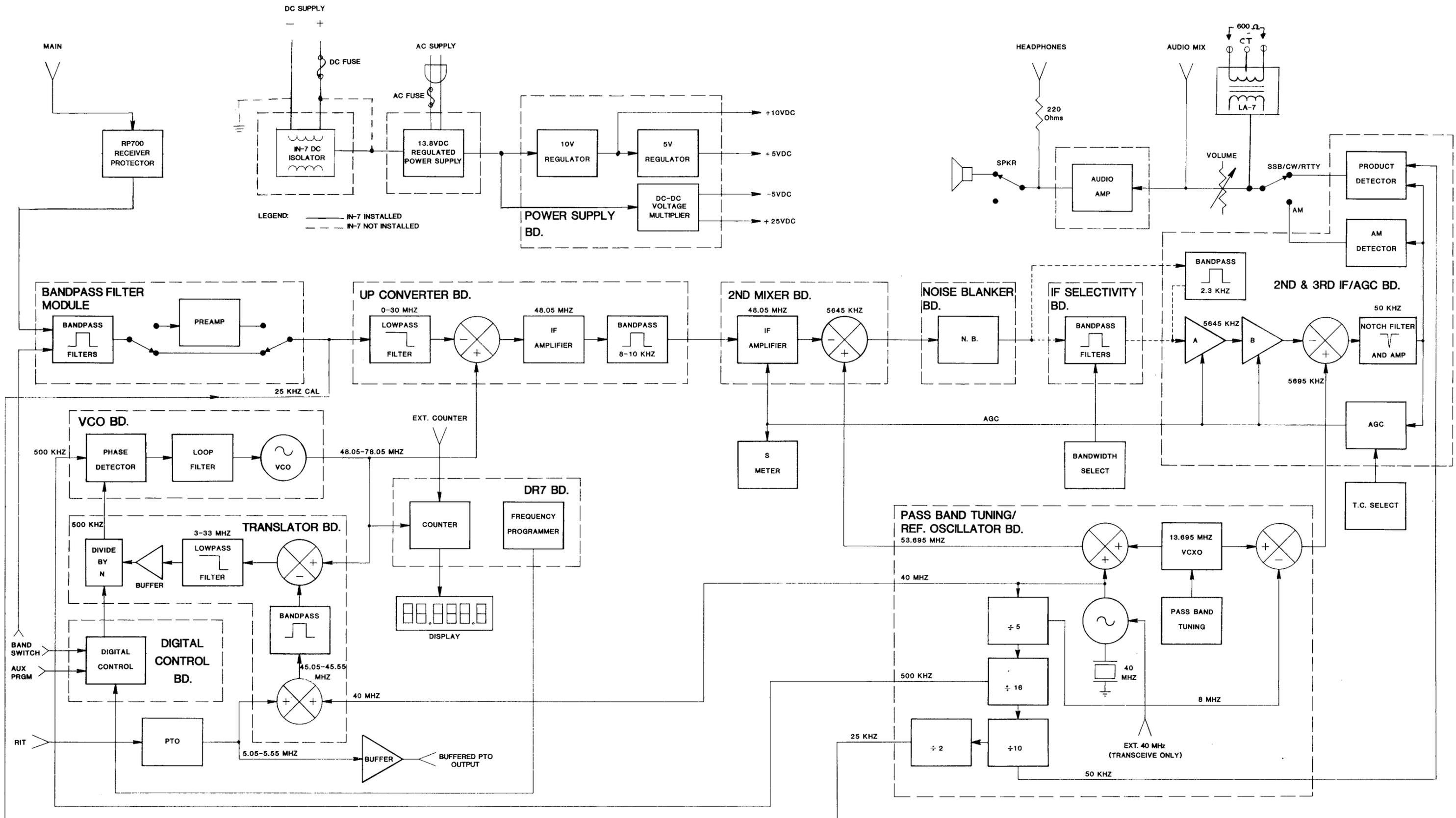


Fig. 2-2 RR3 Block Diagram

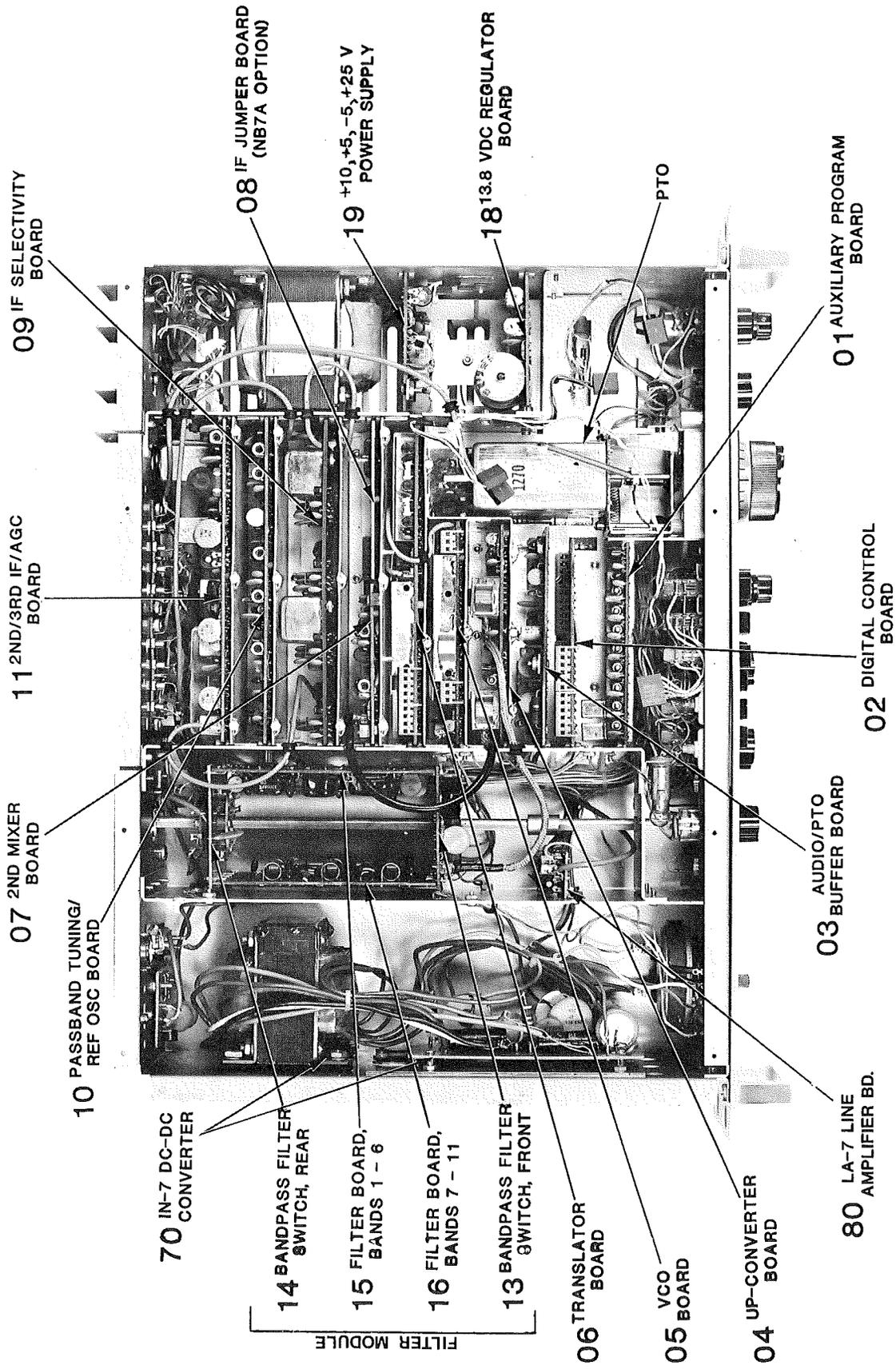


Fig. 2-3 RR3 Module Locations

NOTES:

SECTION 3

CIRCUIT DESCRIPTION

3-1. PARENT BOARD/CHASSIS

The Parent Board and Chassis (Wiring Harness) combine to interconnect the various circuit cards and modules in the RR3. Refer to figure 3-3 for schematic and figure 3-1 and 3-2 for parts location information. Figure 3-1 also identifies the major interconnection circuits on the Parent Board as an aid for troubleshooting and alignment.

Each circuit board/module has been assigned an identifying number for circuit description and parts identification purposes in accordance with the following list:

IDENTIFICATION PREFIX	CIRCUIT BOARD/ MODULE
00	Parent Board
01	Auxiliary Program
02	Digital Control
03	Audio/PTO Buffer
04	Up-Converter
05	PLL/VCO
06	Translator
07	2nd Mixer
08	IF Jumper or Noise Blanker (Accessory)
09	IF Selectivity
10	Passband Tuning/ Reference
11	2nd/3rd/ IF/AGC
12	Jumper
13	Band Pass Filter Switch, Front
14	Band Pass Filter Switch, Rear
15	Band Pass Filter, Bands 1 - 6
16	Band Pass Filter, Bands 7-11
18	+13.8 VDC Regulator
19	+25, +10, +5, -5 VDC Regulator
80	LA-7 (Line Amp Module)
90	DR7 (Digital Readout/ Counter)
85	RP-700 Receiver Protector

The identification prefix is used whenever referring to a particular circuit card. For example, the designator for resistor number 25 on the Passband Tuning/Reference Board is R1025. Pin 16 on the

same card is numbered 10/16. Figures 3-3 and 3-4 include these identification prefixes for reference.

Refer to figure 2-2 to aid in following the signal flow through figures 3-3 and 3-4. Note that several power and/or control lines are identified by function. For example, the notation +10 CAL indicates that +10 VDC is present on this line when the calibrator is enabled. It is possible to isolate a large number of faults to the board level by making the necessary measurements on the Parent Board, utilizing figures 3-1, 3-2 and 3-3 for location information.

The PTO switching circuitry selects the frequency controlling signal of the RR3 and applies this signal to pin 38 of the translator board. Frequency control can be derived from one of three sources: the internal PTO, the crystal controlled oscillator on the AUX7 (for fixed frequency operation), or pin 7 of the accessory connector on the rear panel. Pin diodes CR6 through CR9 select the desired signal and couple it through C6 to the Translator board. Since R33 is a common DC return for all the pin diode switches, back bias is automatically applied to the unused signal paths.

The RIT function is controlled by U1, which switches the RIT control line between the front panel RIT control (R3A) and the internal RIT centering control (R24). When the RIT function is not selected the RIT line is controlled by R24 in both receive and in transceive transmit operation. When transceiving, Q6 and Q4 inhibit the RIT from operating in the transmit mode.

The muting circuit is comprised of Q2 and Q3 with associated circuitry. The RR3 will mute when the front panel mute button is depressed.

R17/C2 and R18/C1 are the slow AGC timing components selected via the front panel switches S5C and S5D. These switches provide fast, medium and slow AGC speeds depending upon the combination selected by the front panel switches.

NOTES:

PARENT BOARD/CHASSIS

REF DES	DESCRIPTION	PART NO.
C1	Capacitor, Tantalum, .22 μ F \pm 10%, 35 V	3183100
C2	Capacitor, Tantalum, .22 μ F \pm 10%, 35 V	3183100
C3	Capacitor, Disc, .05 .22 μ F + 80%, 16 V	3161600
C4	Capacitor, Tantalum, .22 μ F \pm 10%, 35 V	3183100
C5	Capacitor, Disc, 100 μ F \pm 10%, 500 V	3161070
C6	Capacitor, Disc, .01 μ F + 80%, 25 V	3161490
C7	Capacitor, Disc, .01 μ F + 80%, 25 V	3161490
C8	Capacitor, Disc, .01 μ F + 80%, 25 V	3161490
C9	Capacitor, Disc, .01 μ F + 80%, 25 V	3161490
C10	Capacitor, Disc, .01 μ F + 80%, 25 V	3161490
C11	Capacitor, Disc, .01 μ F + 80%, 25 V	3161490
C12	Capacitor, Disc, .01 μ F + 80%, 25 V	3161490
C13	Capacitor, Disc, .01 μ F + 80%, 25 V	3161490
C14	Capacitor, Disc, .001 μ F μ 20%, Z5U	3161490
C15	Capacitor, Disc, .001 μ F μ 20%, Z5U	3161490
CR1	Diode, M4G5	3020260
CR2	Diode, M4G5	3020260
CR3	Diode, 1N4005	3020220
CR4	Diode, MR501	3020270
CR5	Diode, MPN3404	3020265
CR6	Diode, MPN3404	3020265
CR7	Diode, MPN3404	3020265
CR8	Diode, MPN3404	3020265
CR9	Diode, 1N4148	3020090
DS1	Lamp, Miniature	3471905
DS2	Lamp, Miniature	3471905
DS3	Lamp, Miniature	3471905
DS4	Lamp, Miniature	3471905
DS5	Lamp, #53	3470053
DS6	Lamp, #53	3470053
F1	Fuse, 3/4 Amp Slo-Blo, 3AG (120,100 VAC)	3420080
F1	Fuse, 3/8 Amp Slo-Blo, 3AG (240,200 VAC)	3420050
F2	Fuse, 5 Amp Standard, 3AG (24 VDC)	3420170
F2	Fuse, 8 Amp Standard, 3AG (12 VDC)	3420185
J1	Jack, Phone, L12A	3281040
J2	Jack, DC Input	3281732
J3	Receptacle, Phono, 4 P 174	3281710
J4	Receptacle, Phono, 4 P 174	3281710
J5	Receptacle, Phono, 4 P 174	3281710
J6	Receptacle, Phono, 4 P 174	3281710
J7	Receptacle, Phono, 4 P 174	3281710
J8	Receptacle, Phono, 4 P 174	3281710
J9	Receptacle, Phono, 4 P 174	3281710
J10	Receptacle, Phono, 4 P 174	3281710
J11	Connector, Socket, S312AB	3280560
J12	Jack, Phone, Close Circuit 12A	3221030
M1	Meter, RR3	3580300
Q1	Transistor, TIP33	3030390
Q2	Transistor, 2N3904	3030105
Q3	Transistor, 2N3904	3030105
Q4	Transistor, 2N3904	3030105

REF DES	DESCRIPTION	PART NO.
Q5	Transistor, 2N3904	3030105
Q6	Transistor, 2N3904	3030105
Q7	Transistor, 2N3904	3030105
R1	Resistor, Wire Wound, 5 Ω , 5 W	3250100
R2	Resistor, Wire Wound, 5 Ω , 5 W	3250100
R3	Resistor, Variable, Dual Section, 10K/10K	3260648
R4	Resistor, Carbon Film, 100 Ω \pm 5%, 1/4 W	3220055
R5	Resistor, Carbon Film, 82 Ω \pm 5%, 1/4 W	3220050
R7	Resistor, Carbon Film, 1 K Ω \pm 5%, 1/4 W	3220160
R8	Resistor, Carbon Film, 100 Ω \pm 5%, 1/4 W	3220055
R9	Resistor, Carbon Film, 10 K Ω \pm 5%, 1/4 W	3220235
R10	Resistor, Carbon Film, 3.3 K Ω \pm 5%, 1/4 W	3220200
R11	Resistor, Variable, Dual Section, 3K/10K	3260646
R12	Resistor, Carbon Film, 100 Ω \pm 5%, 1/4 W	3220055
R13	Resistor, Carbon Film, 220 Ω \pm 5%, 1/4 W	3220075
R14	Resistor, Carbon Film, 12 K Ω \pm 5%, 1/4 W	3220240
R15	Resistor, Variable, 10 K Ω	3260710
R16	Resistor, Carbon Film, 3.9 K Ω \pm 5%, 1/4 W	3220205
R17	Resistor, Carbon Film, 33 K Ω \pm 5%, 1/4 W	3220275
R18	Resistor, Carbon Film, 33 K Ω \pm 5%, 1/4 W	3220275
R19	Resistor, Carbon Film, 1 K Ω \pm 5%, 1/4 W	3220160
R20	Resistor, Carbon Film, 10 K Ω \pm 5%, 1/4 W	3220235
R21	Resistor, Carbon Film, 10 K Ω \pm 5%, 1/4 W	3220235
R22	Resistor, Carbon Film, 1 K Ω \pm 5%, 1/4 W	3220160
R23	Resistor, Carbon Film, 8.2 K Ω \pm 5%, 1/4 W	3220230
R24	Resistor, Variable, 10 K Ω	3260180
R25	Resistor, Carbon Film, 4.7 K Ω \pm 5%, 1/4 W	3220210
R26	Resistor, Carbon Film, 100 K Ω \pm 5%, 1/4 W	3220315
R27	Resistor, Carbon Film, 100 K Ω \pm 5%, 1/4 W	3220315
R28	Resistor, Carbon Film, 100 K Ω \pm 5%, 1/4 W	3220315
R29	Resistor, Carbon Film, 100 K Ω \pm 5%, 1/4 W	3220315
R30	Resistor, Carbon Film, 8.2 K Ω \pm 5%, 1/4 W	3220230
R31	Resistor, Carbon Film, 4.7 K Ω \pm 5%, 1/4 W	3220210
R32	Resistor, Carbon Film, 100 K Ω \pm 5%, 1/4 W	3220315
R33	Resistor, Carbon Film, 470 Ω \pm 5%, 1/4 W	3220110
R34	Resistor, Wire Wound, 2 Ω , 15 W, 5%	3250070
RFC1	Choke, 270 μ H, MUD271	3520590
RFC2	Choke, 270 μ H, MUD271	3520590
S1	Switch, Slide, DPDT	3670520
S2	Switch, Slide, DPDT	3670520
S3	Part of R11	
S4	Switch, Pushbutton, 6 Station	3670076
S5	Switch, Pushbutton, 6 Station	3670076
S6	Switch, Rotary, Aux. Program	3661000
S7	Switch, Rotary, IF Selectivity	3661072
S8	Switch, Slide, DPDT, SS50 1/2	3670525
S9	Switch, Slide, DPDT, SS50 11/32	3670520
T1	Transformer, Power	3690430
U1	I.C., MC14016BCP	3041025
F1	Fuse Holders, 348677	3421020
F2	Fuse Holders, 348677	3421020

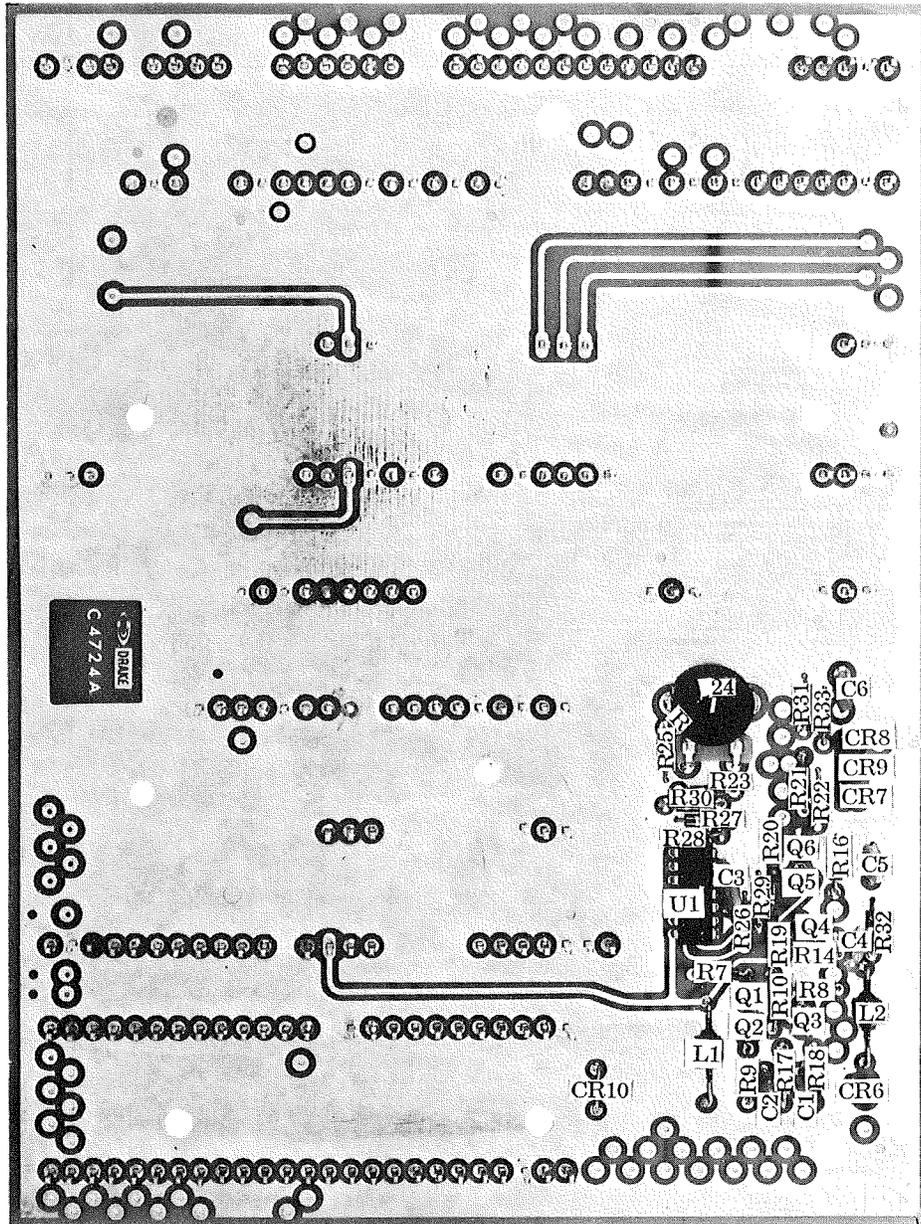
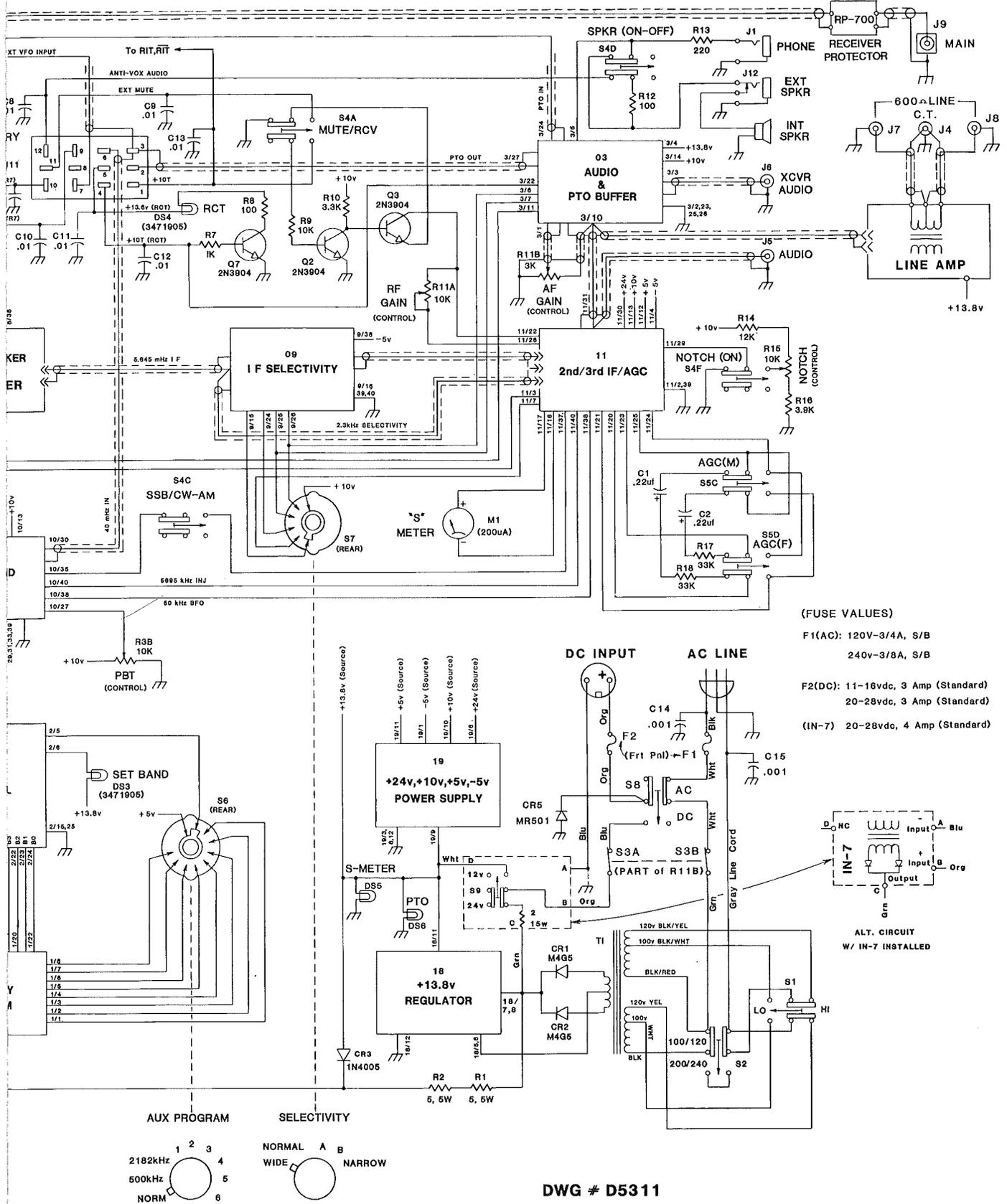


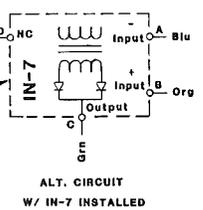
Fig. 3-1 Parent Board Pictorial (Top View)

NOTES:

NOTES:



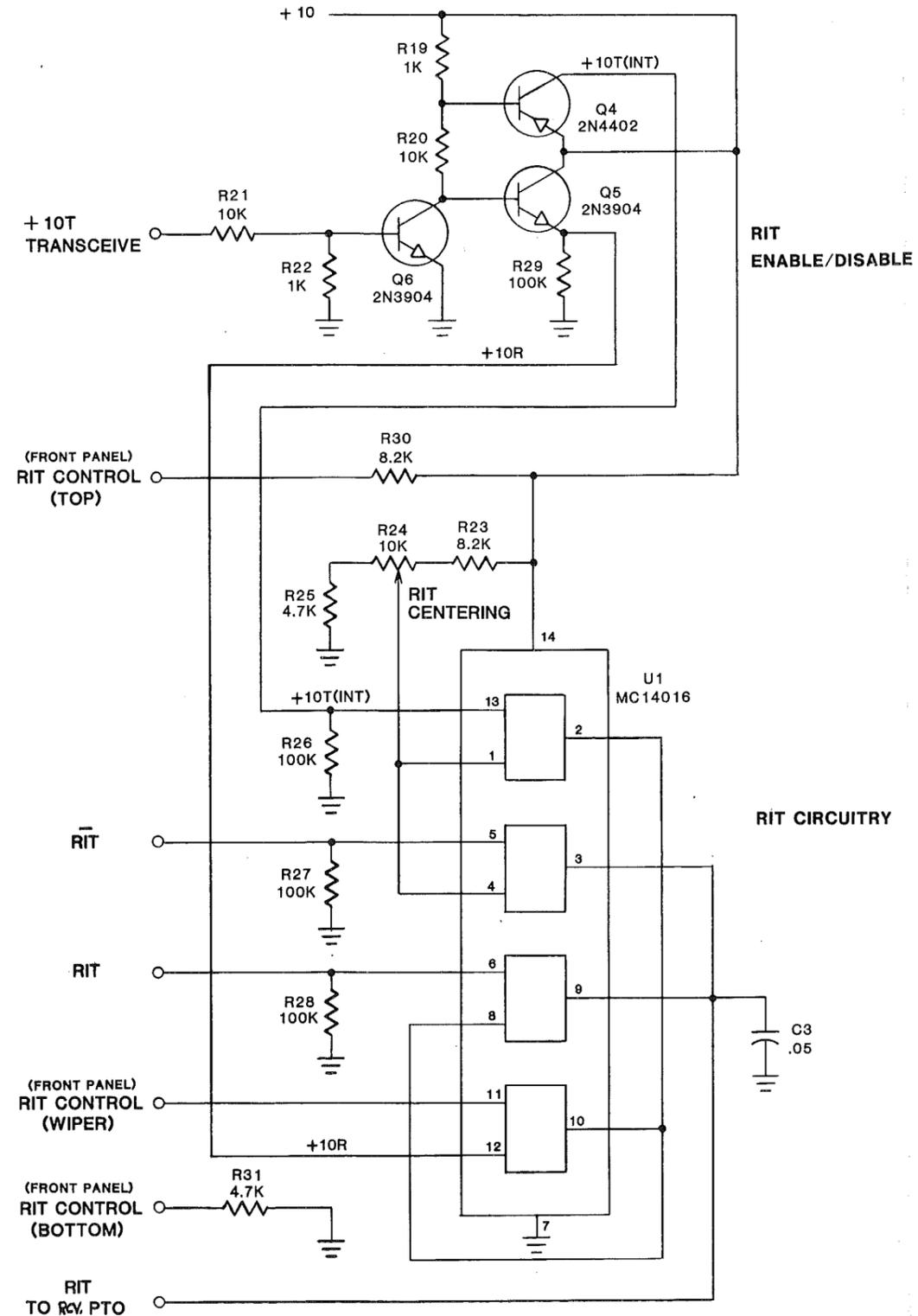
- (FUSE VALUES)
- F1(AC): 120V-3/4A, S/B
 - 240V-3/8A, S/B
 - F2(DC): 11-16vdc, 3 Amp (Standard)
 - 20-28vdc, 3 Amp (Standard)
 - (IN-7) 20-28vdc, 4 Amp (Standard)



DWG # D5311
RR-3 Interconnection Schematic Diagram

Fig. 3-3 Chassis and Parent Board Schematic





NOTE: All Components Shown Are Located On PARENT BD

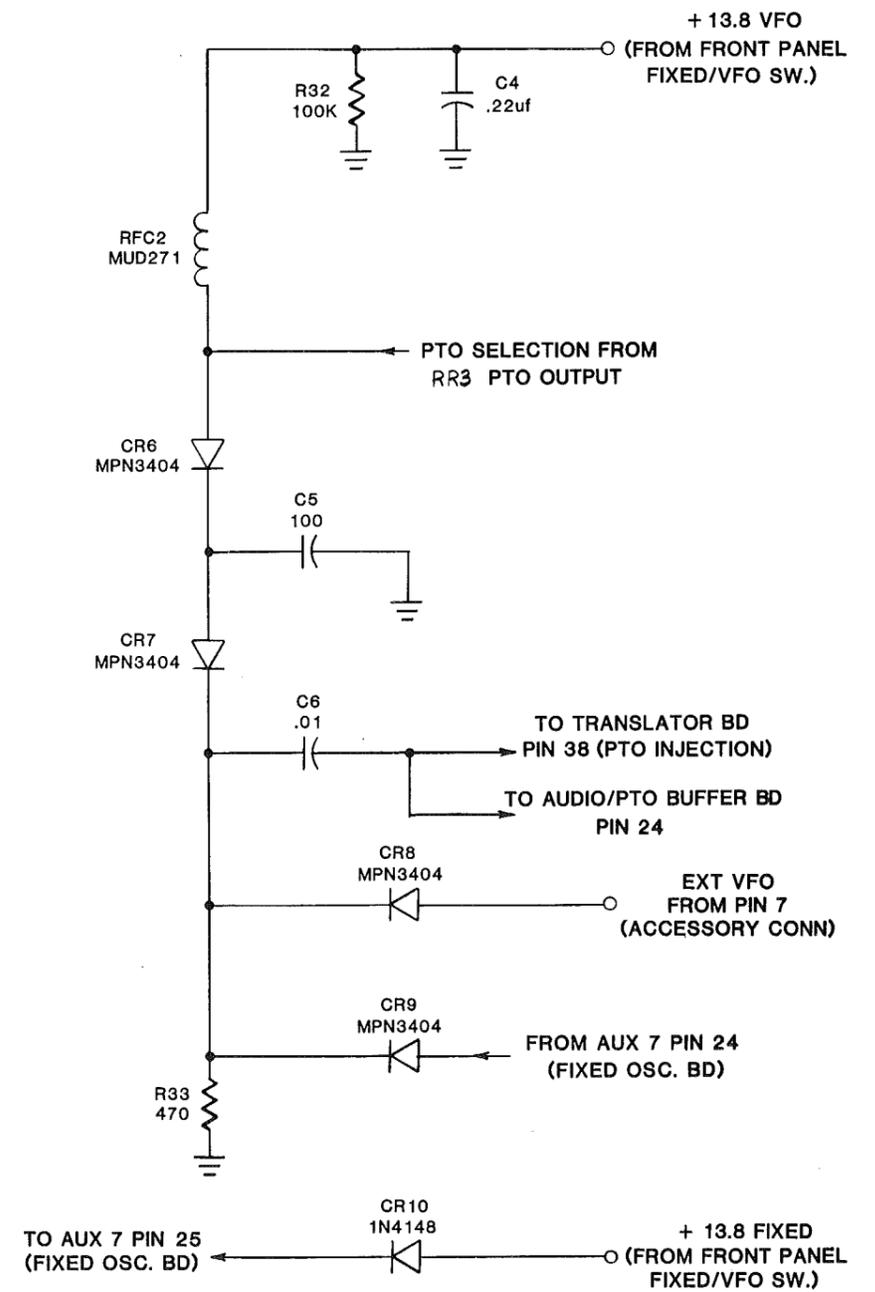


Fig. 3-4 RIT & PTO Switching Schematic

C=Cut off pin

RANGE	MODULE PIN NUMBERS													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
*0.0-0.5	C				C	C	C	C			C		C	C
*0.5-1.0			C		C	C	C	C			C		C	C
*1.0-1.5	C	C			C	C	C	C			C		C	C
1.5-2.0				C	C	C	C	C			C		C	C
2.0-2.5	C			C	C	C	C	C					C	C
2.5-3.0			C	C	C	C	C	C					C	C
3.0-3.5	C	C	C	C	C	C	C	C			C	C		C
3.5-4.0			C	C					C		C	C		C
4.0-4.5	C	C	C						C		C			C
4.5-5.0					C					C		C		C
5.0-5.5	C				C				C			C		C
5.5-6.0			C		C				C			C		C
6.0-6.5	C	C			C				C			C		C
6.5-7.0				C	C				C			C		C
7.0-7.5	C			C	C				C		C			C
7.5-8.0			C	C	C				C		C			C
8.0-8.5	C	C	C	C					C		C			C
8.5-9.0			C	C		C			C		C			C
9.0-9.5	C	C	C			C			C		C			C
9.5-10.0					C	C			C		C			C
10.0-10.5	C				C	C			C					C
10.5-11.0			C		C	C			C					C
11.0-11.5	C	C			C	C			C					C
11.5-12.0				C	C	C			C					C
12.0-12.5	C			C	C	C			C					C
12.5-13.0			C	C	C	C			C					C
13.0-13.5	C	C	C	C	C	C			C					C
13.5-14.0			C	C				C	C					C
14.0-14.5	C	C	C					C	C					C
14.5-15.0					C			C	C					C
15.0-15.5	C				C			C	C		C	C	C	
15.5-16.0			C		C			C	C		C	C	C	
16.0-16.5	C	C			C			C	C		C	C	C	
16.5-17.0				C	C			C	C		C	C	C	
17.0-17.5	C			C	C			C	C		C	C	C	
17.5-18.0			C	C	C			C	C		C	C	C	
18.0-18.5	C	C	C	C	C			C	C		C	C	C	
18.5-19.0			C	C		C		C	C		C	C	C	
19.0-19.5	C	C	C			C		C	C		C	C	C	
19.5-20.0					C	C		C	C		C	C	C	
20.0-20.5	C				C	C		C	C		C	C	C	
20.5-21.0			C		C	C		C	C		C	C	C	
21.0-21.5	C	C			C	C		C	C		C	C	C	
21.5-22.0				C	C	C		C	C		C	C	C	
22.0-22.5	C			C	C	C		C	C		C	C	C	
22.5-23.0			C	C	C	C		C	C		C	C	C	
23.0-23.5	C	C	C	C		C		C	C		C	C	C	
23.5-24.0			C	C				C	C		C	C	C	
24.0-24.5	C	C	C					C	C		C	C	C	
24.5-25.0					C			C	C		C	C	C	
25.0-25.5	C				C			C	C		C	C	C	
25.5-26.0			C		C			C	C		C	C	C	
26.0-26.5	C	C			C			C	C		C	C	C	
26.5-27.0				C	C			C	C		C	C	C	
27.0-27.5	C			C	C			C	C		C	C	C	
27.5-28.0			C	C	C			C	C		C	C	C	
28.0-28.5	C	C	C	C				C	C		C	C	C	
28.5-29.0			C	C		C		C	C		C	C	C	
29.0-29.5	C	C	C			C		C	C		C	C	C	
29.5-30.0					C			C	C		C	C	C	
0.0-0.5	RR3 ONLY	C			C	C	C	C						
0.5-1.0			C		C	C	C	C			C	C		
1.0-1.5		C	C		C	C	C	C			C			

COMMON PIN. DO NOT REMOVE.

LEAVE PIN ON MODULE FOR TRANSMIT. REMOVED AT FACTORY ON RRM7.

*Use VLF antenna input (pin 7 on accessory connector) for reception on these ranges. Transmission is not possible between 0.0 and 1.5 MHz. Band switch may be set to 1.5 MHz to extinguish set band indicator.

Fig. 3-5 RRM & RTM Module Programming

AUX-7 AUXILIARY PROGRAM BOARD

REF DES	DESCRIPTION	PART NO.
C101	Capacitor, Disc, .01 μ F + 80%, 25 V PT	3161500
C102	Capacitor, Disc, .01 μ F + 80%, 25 V PT	3161500
C103	Capacitor, Variable, 5-20 pF	3205375
C104	Capacitor, Disc, .01 μ F + 80%, 25 V PT	3161500
C105	Capacitor, Disc, 27 pF \pm 5%, NPO	3160650
C106	Capacitor, Variable, 5-20 pF	3205375
C107	Capacitor, Disc, .01 μ F + 80%, 25 V PT	3161500
C108	Capacitor, Disc, 27 pF \pm 5%, NPO	3160650
C109	Capacitor, Variable, 5-20 pF	3205375
C110	Capacitor, Disc, .01 μ F + 80%, 25 V PT	3161500
C111	Capacitor, Disc, 27 pF \pm 5%, NPO	3160650
C112	Capacitor, Variable, 5-20 pF	3205375
C113	Capacitor, Disc, .01 μ F + 80%, 25 V PT	3161500
C114	Capacitor, Disc, 27 pF \pm 5%, NPO	3160650
C115	Capacitor, Variable, 5-20 pF	3205375
C116	Capacitor, Disc, .01 μ F + 80%, 25 V PT	3161500
C117	Capacitor, Disc, 27 pF \pm 5%, NPO	3160650
C118	Capacitor, Variable, 5-20 pF	3205375
C119	Capacitor, Disc, .01 μ F + 80%, 25 V PT	3161500
C120	Capacitor, Disc, 27 pF \pm 5%, NPO	3160650
C121	Capacitor, Variable, 5-20 pF	3205375
C122	Capacitor, Disc, .01 μ F + 80%, 25 V PT	3161500
C123	Capacitor, Disc, 27 pF \pm 5%, NPO	3160650
C124	Capacitor, Variable, 5-20 pF	3205375
C125	Capacitor, Mica, 500 pF \pm 10%, DM-15	3170420
C126	Capacitor, Mica, 210 pF \pm 5%, DM-15	3170230
C127	Capacitor, Disc, .01 μ F + 80%, 25 V PT	3161500
C128	Capacitor, Disc, .01 μ F + 80%, 25 V PT	3161500
C129	Capacitor, Disc, .01 μ F + 80%, 25 V PT	3161500
C130	Capacitor, Disc, .01 μ F + 80%, 25 V PT	3161500
C131	Capacitor, Disc, 100 pF \pm 10%, X5F	3161070
C132	Capacitor, Tantalum, .22 μ F \pm 10%, 35 V	3183100
CR101	Diode, 1N4148	3020090
CR102	Diode, 1N4148	3020090
CR103	Diode, 1N4148	3020090
CR104	Diode, 1N4148	3020090
CR105	Diode, 1N4148	3020090
CR106	Diode, 1N4148	3020090
CR107	Diode, 1N4148	3020090
CR108	Diode, 1N4148	3020090
CR109	Diode, MPN3404	3020265
L101	Choke, 270 μ H, MUD271	3520590
Q101	Transistor, 2N3563	3030060
Q102	Transistor, 2N3563	3030060
R101	Resistor, Carbon Film, 1.0 K Ω \pm 5%, 1/4 W	3220160
R102	Resistor, Carbon Film, 1.0 K Ω \pm 5%, 1/4 W	3220160
R103	Resistor, Carbon Film, 1.0 K Ω \pm 5%, 1/4 W	3220160
R104	Resistor, Carbon Film, 1.0 K Ω \pm 5%, 1/4 W	3220160
R105	Resistor, Carbon Film, 1.0 K Ω \pm 5%, 1/4 W	3220160
R106	Resistor, Carbon Film, 1.0 K Ω \pm 5%, 1/4 W	3220160
R107	Resistor, Carbon Film, 1.0 K Ω \pm 5%, 1/4 W	3220160

REF DES	DESCRIPTION	PART NO.
R108	Resistor, Carbon Film, 1.0 K Ω \pm 5%, 1/4 W	3220160
R109	Resistor, Carbon Film, 18 K Ω \pm 5%, 1/4 W	3220255
R110	Resistor, Carbon Film, 47 K Ω \pm 5%, 1/4 W	3220285
R111	Resistor, Carbon Film, 1.0 K Ω \pm 5%, 1/4 W	3220160
R112	Resistor, Carbon Film, 2.7 K Ω \pm 5%, 1/4 W	3220195
R113	Resistor, Carbon Film, 2.7 K Ω \pm 5%, 1/4 W	3220195
R114	Resistor, Carbon Film, 180 K Ω \pm 5%, 1/4 W	3220070
R115	Resistor, Carbon Film, 100 K Ω \pm 5%, 1/4 W	3220055
R116	Resistor, Carbon Film, 10 K Ω \pm 5%, 1/4 W	3220005
R117	Resistor, Carbon Film, 100 K Ω \pm 5%, 1/4 W	3220055
R118	Resistor, Carbon Film, 1.0 K Ω \pm 5%, 1/4 W	3220315
U101	I.C., BC-1206 Diode Array	3042100
U102	I.C., BC-1206 Diode Array	3042100
Y101	Crystal, 5.050 MHz	3120114
Y102	Crystal, 5.232 MHz	3120117
	Socket, Crystal	3282020
	Socket, I.C.	3282104

NOTES:

3-3. DIGITAL CONTROL BOARD

The Digital Control Board decodes the binary coded bandswitch information to provide frequency range programming and band control. In addition, it selects between normal and auxiliary frequency range programming. Refer to figure 3-9 for schematic and figure 3-8 for parts location information.

Binary coded band information from the bandpass filter module rear switch board is connected to Digital Control board pins 1 through 4 via the Parent Board. This information is coded as follows (L=Low, H=High):

BAND	PIN 1	PIN 2	PIN 3	PIN 4	DECIMAL CODE
0	H	H	H	H	15
0.5	L	L	H	H	12
1.0	H	L	H	H	13
1.5	L	H	L	L	2
2.0	H	H	L	L	3
4.0	L	L	H	L	4
6.0	H	L	H	L	5
8.0	L	H	H	L	6
12.0	H	H	H	L	7
16.5	L	L	L	H	8
22.0	H	L	L	H	9

This data is connected to the address inputs of a 32 x 8 PROM, U201, which directly converts the data to

the correct synthesizer range programming numbers corresponding to the red numbers on the band switch.

When the front panel AUX PROGRAM switch is in the NORM position, 5 volts is applied to module pin 5. This allows Q201 to provide a switched ground to pin 15 of U201. In this normal state, U201 pins 1 through 7 and 9, output preprogrammed range information to the synthesizer via the DR7 or Jumper Board.

When one of the eight AUX PROGRAM channels is selected, module pin 5 is disconnected from 5 volts, thus switching U201 outputs to the high impedance state. This action allows the information (from the AUX7) on the AUX INPUT lines 17 through 24 to program the synthesizer frequency range. At the same time, band information from the AUX-7 (pins 7-10) is compared with the bandswitch information in the quad exclusive - or, U202. When both sets of data are equal, the outputs are all low, thus yielding a high output at U203 pin 1. This action causes a low output on U203 pin 13, thus turning off Q202 and extinguishing the SET BAND lamp. In the NORM mode, pin 9 of U203 is held in the HIGH state, forcing the output pin 13 of the NOR gate to stay low at all times, thus causing the SET BAND light to remain off.

The Digital Control board does not require alignment.

NOTES:

DIGITAL CONTROL BOARD

REF DES	DESCRIPTION	PART NO.
Q201	Transistor, 2N3904	3030105
Q202	Transistor, 2N3904	3030105
R201	Resistor, Carbon File, 1 K Ω \pm 5%, 1/4 W	3220160
R202	Resistor, Carbon File, 10 K Ω \pm 5%, 1/4 W	3220235
R203	Resistor, Carbon File, 10 K Ω \pm 5%, 1/4 W	3220235
R204	Resistor, Carbon File, 10 K Ω \pm 5%, 1/4 W	3220235
R205	Resistor, Carbon File, 10 K Ω \pm 5%, 1/4 W	3220235
R206	Resistor, Carbon File, 1 K Ω \pm 5%, 1/4 W	3220160
R207	Resistor, Carbon File, 10 K Ω \pm 5%, 1/4 W	3220235
R208	Resistor, Carbon File, 10 K Ω \pm 5%, 1/4 W	3220235
R209	Resistor, Carbon File, 10 K Ω \pm 5%, 1/4 W	3220235
R210	Resistor, Carbon File, 10 K Ω \pm 5%, 1/4 W	3220235
R211	Resistor, Carbon File, 3.9 K Ω \pm 5%, 1/4 W	3220205
U201	I.C., 32 x 8 PROM - Marine Band Programming	3040083
U202	I.C., MC14070BCP	3041059
U203	I.C., MC14002BCP	3041005

NOTES:

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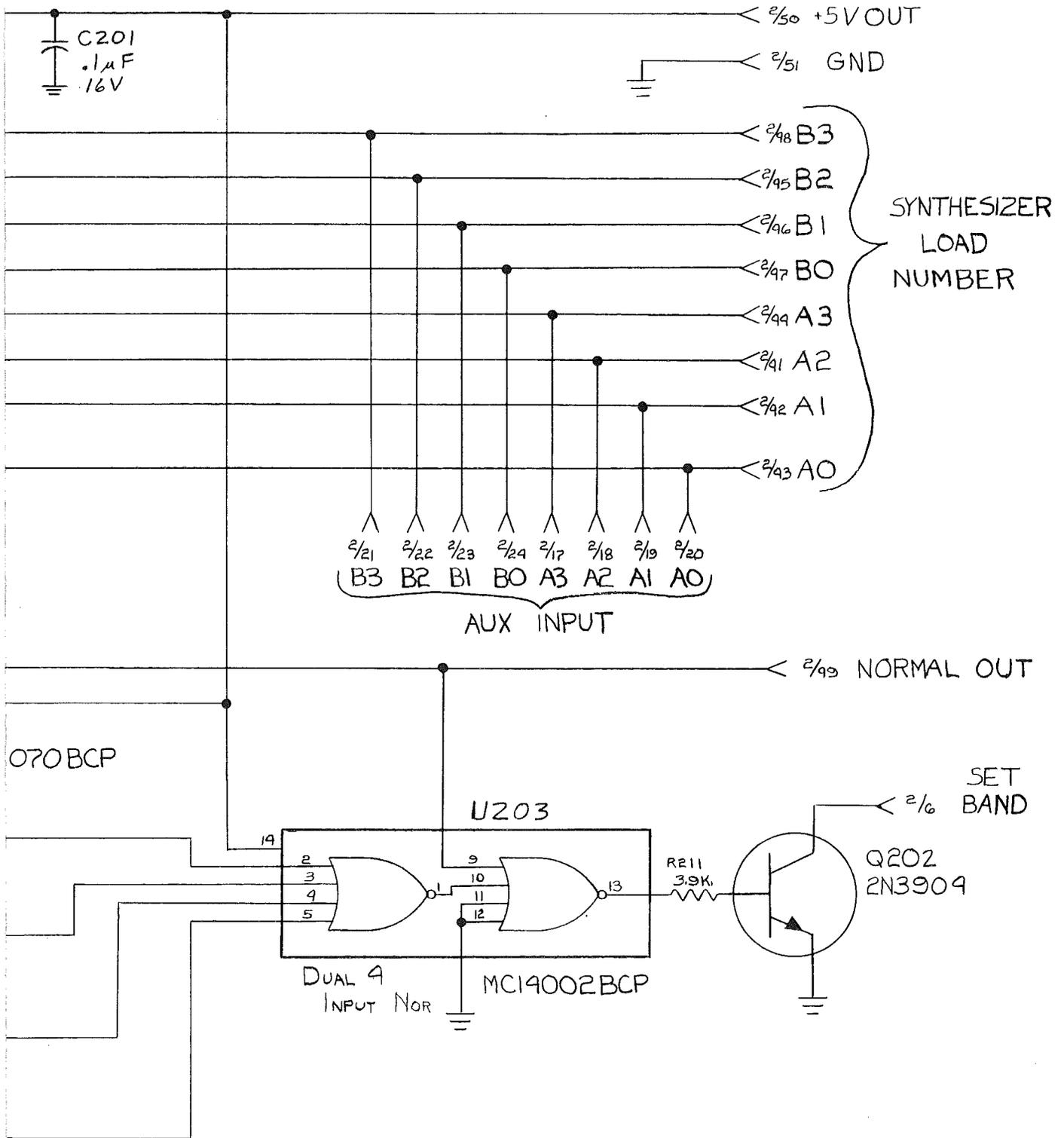


Fig. 3-9 Digital Control Board Schematic



3-4. AUDIO/PTO BUFFER BOARD

This board contains circuitry for the final audio amplification, audio high frequency roll-off in the selectivity switch positions marked B and NARROW, and buffering of the internal PTO signal for use in accessory equipment. In the RR3, the PTO buffering function and associated components are not utilized. Refer to figure 3-11 for schematic and figure 3-10 for parts location information.

The audio amplifier portion of the schematic is centered around the audio amplifier integrated circuit, U301. Audio from the front panel volume control wiper is applied to module pin 1. C316, R311, R310, C306 and C308 provide audio shaping before amplification. R307, R308 and C309 provide feedback affecting circuit gain. C313 and R309 provide circuit stability with varying speaker loads. External audio from the XCVE AUDIO connector is padded by

R315, R314, R313 and R312, and mixed with the internal RR3 audio.

When the front panel SELECTIVITY switch is placed in the B or NARROW positions, +10 VDC is present on module pins 3/6 or 3/7 respectively. This action causes the 5.645 MHz amplifier (located on the 2nd Mixer Board, Section 3-8) to switch to an increased gain mode. At the same time, Q302 is switched on, connecting C314 across the audio input to the top of the volume control. This action lowers the overall high frequency audio response.

Q301 and associated circuitry form a buffer amplifier to provide PTO output to external equipment. This feature is not utilized in the RR3.

NOTES:

NOTES:

AUDIO/PTO BUFFER BOARD

REF DES	DESCRIPTION	PART NO.
C301	Capacitor, Disc, .001 μ F \pm 20%, Z5U	3161380
C302	Capacitor, Tantalum, .22 μ F \pm 10%, 35 V	3183100
C303	Capacitor, Mica, 490 pF \pm 5%, DM-15	3170410
C304	Capacitor, Mica, 490 pF \pm 5%, DM-15	3170410
C305	Capacitor, Disc, .01 μ F \pm 20%, Z5U	3161510
C306	Capacitor, Disc, .05 μ F \pm 80%, M16V	3161600
C307	Capacitor, Tantalum, .22 μ F \pm 10%, 35 V	3183100
C308	Capacitor, Disc, 68 pF \pm 5%, NPO	3161950
C309	Capacitor, Electrolytic, 47 μ F \pm 16 V	3180125
C310	Capacitor, Electrolytic, 100 μ F \pm 15 V	3180290
C311	Capacitor, Electrolytic, 100 μ F \pm 15 V	3180290
C312	Capacitor, Disc, .01 μ F \pm 20%, Z5U	3161510
C313	Capacitor, Disc, .1 μ F \pm 80%, Y5T	3161650
C314	Capacitor, Tantalum, .1 μ F \pm 10%, 35 V	3183098
C315	Capacitor, Disc, .01 μ F \pm 20%, Z5U	3161510
C316	Capacitor, Disc, .05 μ F \pm 80%, Z5U	3161630
C317	Capacitor, Disc, .005 μ F \pm 20%, Z5U	3161470
C318	Capacitor, Disc, 47 pF \pm 5%, NPO	3160840
C319	Capacitor, Electrolytic, 1 μ F \pm 50 V	3180008
CR301	Diode, MPN3404	3020265
CR302	Diode, 1N4148	3020090
CR303	Diode, 1N4148	3020090
L301	Coil, Axial, 2.2 μ H	3524208
Q301	Transistor, 2N3904	3030105
Q302	Transistor, 2N3904	3030105
R301	Resistor, Carbon Film, 100 K Ω \pm 5%, 1/4 W	3220315
R302	Resistor, Carbon Film, 18 K Ω \pm 5%, 1/4 W	3220255
R303	Resistor, Carbon Film, 10 K Ω \pm 5%, 1/4 W	3220235
R304	Resistor, Carbon Film, 150 K Ω \pm 5%, 1/4 W	3220065
R305	Resistor, Carbon Film, 100 K Ω \pm 5%, 1/4 W	3220315
R306	Resistor, Carbon Film, 15 K Ω \pm 5%, 1/4 W	3220245
R307	Resistor, Carbon Film, 180 K Ω \pm 5%, 1/4 W	3220070
R308	Resistor, Carbon Film, 5.1 K Ω \pm 5%, 1/4 W	3220003
R309	Resistor, Carbon Film, 3.3 K Ω \pm 5%, 1/4 W	3220002
R310	Resistor, Carbon Film, 47 K Ω \pm 5%, 1/4 W	3220285
R311	Resistor, Carbon Film, 27 K Ω \pm 5%, 1/4 W	3220270
R312	Resistor, Carbon Film, 47 K Ω \pm 5%, 1/4 W	3220285
R313	Resistor, Carbon Film, 10 K Ω \pm 5%, 1/4 W	3220235
R314	Resistor, Carbon Film, 100 K Ω \pm 5%, 1/4 W	3220315
R315	Resistor, Composition, 15 K Ω \pm 10%, 1 W	3240010
RFC301	Choke, Assy., 270 μ H, MUD271	3520590
RFC302	Choke, Assy., 270 μ H, MUD271	3520590
T301	Inductor, Toroid	2510028

NOTES:

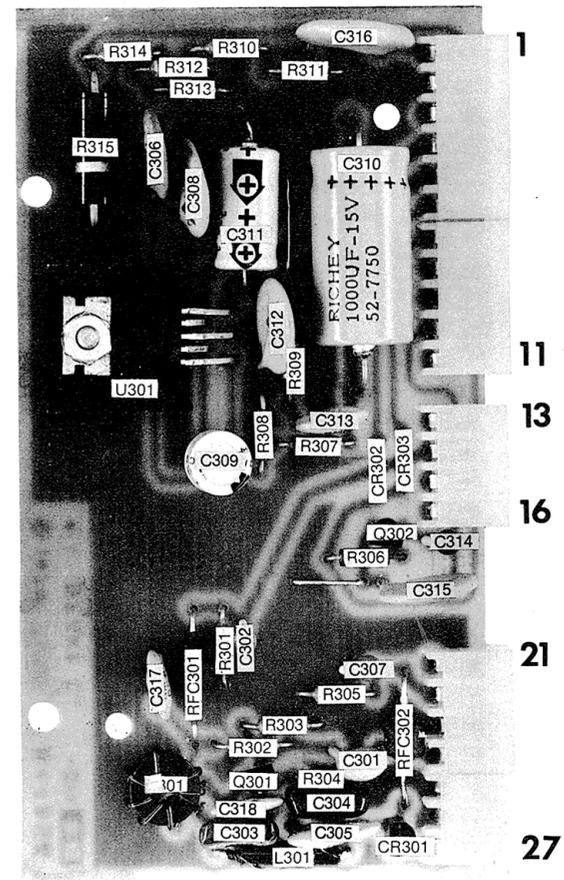


Fig. 3-10 Audio/PTO Buffer Board Pictorial

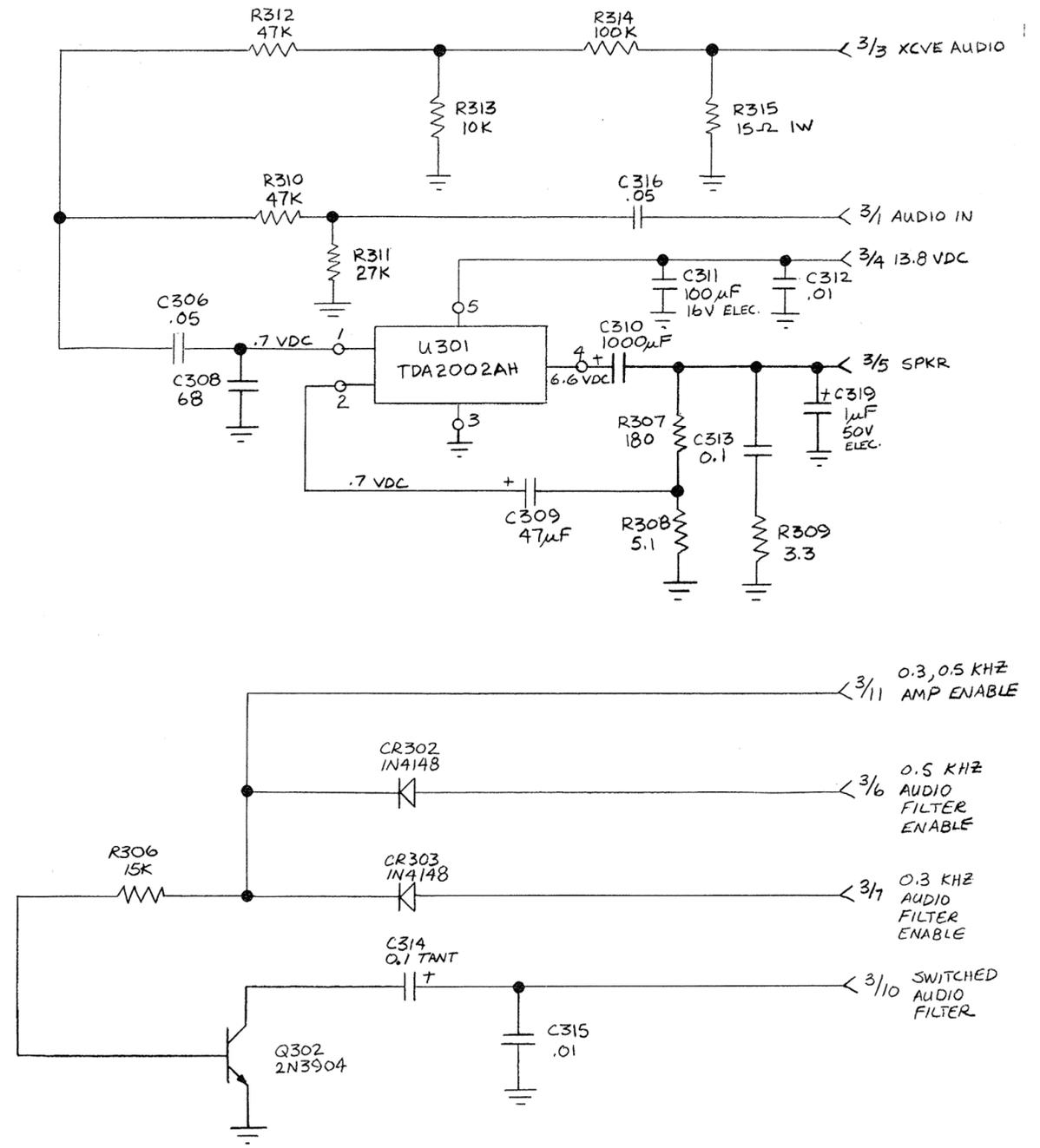
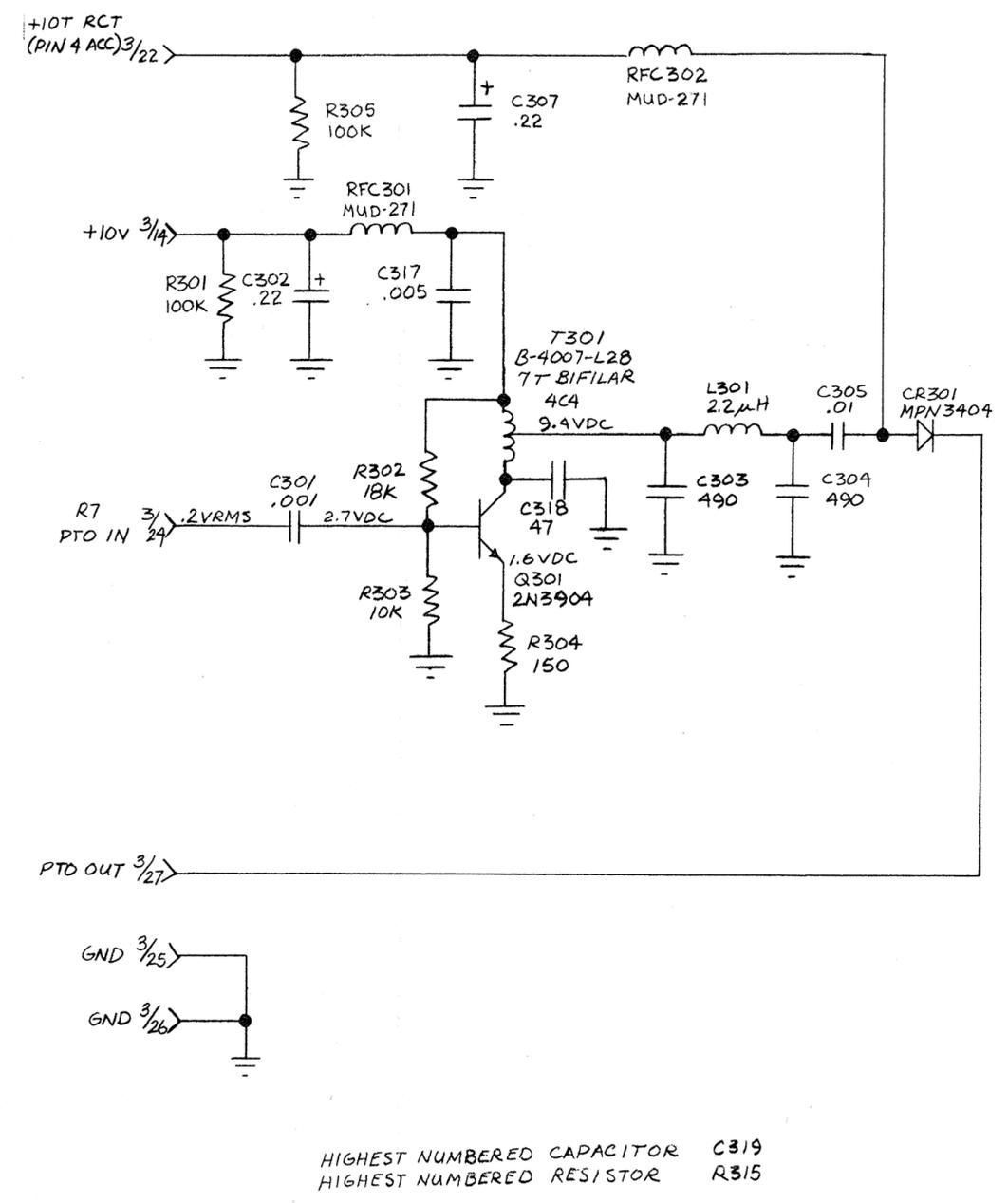


Fig. 3-11 Audio/PTO Buffer Board Schematic

3-5. UP-CONVERTER BOARD

The Up-Converter board converts incoming received signals to the 1st IF of 48.05 MHz using the output of the synthesizer VCO. Refer to figure 3-13 for schematic and figure 3-12 for parts location information.

Received signals from the antenna are routed to the Up-Converter via the receiver protector module and the Band Pass Filter module. These signals first pass through a master low pass filter consisting of C408-C415 and L402 and L404. This filter is employed to improve image and spurious response performance, and has a cut-off frequency of approximately 35 MHz. The output of this filter is connected to the signal input of a high-level double balanced mixer, which is a packaged, diode-ring device. The injection input of this mixer is driven by an amplifier, Q401, whose input is the output of the synthesizer VCO. Q401 is a broadband amplifier, with a flat passband over the 48-78 MHz injection range. R407, R408 and R409 form a pad to insure proper termination of both the amplifier and the mixer.

The 48.05 MHz difference signal is coupled from the IF port of the mixer to the source of IF amplifier Q402 through capacitor C416, C418 and the primary

of T402 tune the output of Q402, and this signal is coupled to the 48.05 MHz filter through the secondary of T402.

The 48.05 MHz filter module consists of two monolithic filter elements, each of which is a two-pole filter. Matching is accomplished by C419, C420 and L405 on one end, and C421, C422 and L406 on the other end. L405 and L406 are tuned at the factory using sophisticated equipment, and should not require readjustment unless a filter element is replaced. Nominal bandwidth of this filter is 8-12 kHz.

Due to the high frequencies involved, proper grounding is very important on this module. If any shields are removed for servicing, be sure that they are replaced and soldered as originally produced. In addition, be sure that all eight grounding clips are properly installed. These clips may be soldered to the shield if necessary. Proper attention to these details will insure that spurious responses are minimized.

Alignment of this module is covered in Section 4.

NOTES:

NOTES:

UP-CONVERTER BOARD

REF DES	DESCRIPTION	PART NO.
C401	Capacitor, Disc, .001 μ F \pm 20%, Z5U	3161380
C402	Capacitor, Disc, .01 μ F + 80%, M25V	3161500
C403	Capacitor, Disc, .001 μ F \pm 20%, Z5U	3161380
C404	Capacitor, Disc, .001 μ F \pm 20%, Z5U	3161380
C405	Capacitor, Disc, .001 μ F \pm 20%, Z5U	3161380
C406	Capacitor, Disc, .001 μ F \pm 20%, Z5U	3161380
C407	Capacitor, Tantalum, 10 μ F \pm 20%, 25 V	3183030
C408	Capacitor, Disc, .05 μ F + 80%, M16V	3161600
C409	Capacitor, Disc, 100 pF \pm 5%, N750	3161060
C410	Capacitor, Disc, 68 pF \pm 5%, N750	3160990
C411	Capacitor, Disc, 33 pF \pm 5%, NPO	3160700
C412	Capacitor, Disc, 100 pF \pm 5%, N750	3161060
C413	Capacitor, Disc, 150 pF \pm 5%, N750	3161150
C414	Capacitor, Disc, 39 pF \pm 5%, NPO	3160760
C415	Capacitor, Disc, 82 pF \pm 5%, N750	3161040
C416	Capacitor, Disc, .01 μ F + 80%, M25V	3161500
C417	Capacitor, Disc, .005 μ F \pm 20%, Z5U	3161470
C418	Capacitor, Variable Trimmer, 5.0-20 pF	3205375
C419	Capacitor, Disc, 9 pF \pm 5%, NPO	3160320
C420	Capacitor, Disc, 3.9 pF, 39, NPO5/32	3160090
C421	Capacitor, Disc, 3.9 pF, 39, NPO5/32	3160090
C422	Capacitor, Disc, 9 pF \pm 5%, NPO	3160320
L401	Inductor, Choke, Wide Band	2512526
L402	Inductor, Toroid	2510019
L403	Inductor, Toroid	2510019
L404	Inductor, Toroid	2510010
L405	Coil, Variable, 16-1/2 T	3524106
L406	Coil, Variable, 16-1/2 T	3524106
L407	Inductor, Choke, Wide Band	2512526
L408	Choke Assy., 5.6 μ H, L56G	3520510
Q401	Transistor, 2N3866	3030095
Q402	Transistor, J-310	3030501
R401	Resistor, Carbon Film, 270 Ω \pm 5%, 1/4 W	3220085
R402	Resistor, Carbon Film, 2.7 Ω \pm 5%, 1/4 W	3220195
R403	Resistor, Carbon Film, 680 Ω \pm 5%, 1/4 W	3220140
R404	Resistor, Carbon Film, 22 Ω \pm 5%, 1/4 W	3220015
R405	Resistor, Carbon Film, 10 Ω \pm 5%, 1/4 W	3220005
R406	Resistor, Carbon Film, 10 Ω \pm 5%, 1/4 W	3220005
R407	Resistor, Carbon Film, 270 Ω \pm 5%, 1/4 W	3220085
R408	Resistor, Carbon Film, 22 Ω \pm 5%, 1/4 W	3220015
R409	Resistor, Carbon Film, 270 Ω \pm 5%, 1/4 W	3220085
R410	Resistor, Carbon Film, 10 Ω \pm 5%, 1/4 W	3220005
R411	Resistor, Carbon Film, 100 Ω \pm 5%, 1/4 W	3220055
R412	Resistor, Carbon Film, 6.8 Ω \pm 5%, 1/4 W	3220220
T401	Inductor, Toroid	2510003
T402	Inductor, Toroid	2510002
Y401	Crystal Filter Set	3140125

NOTES:

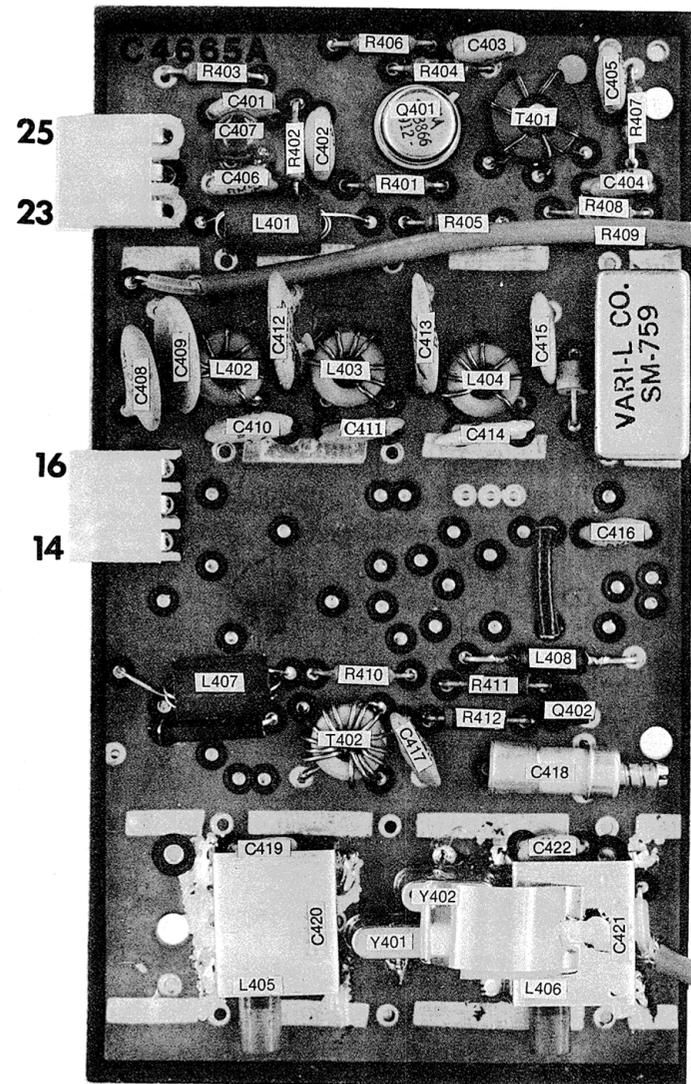


Fig. 3-12 Up-Converter Board Pictorial

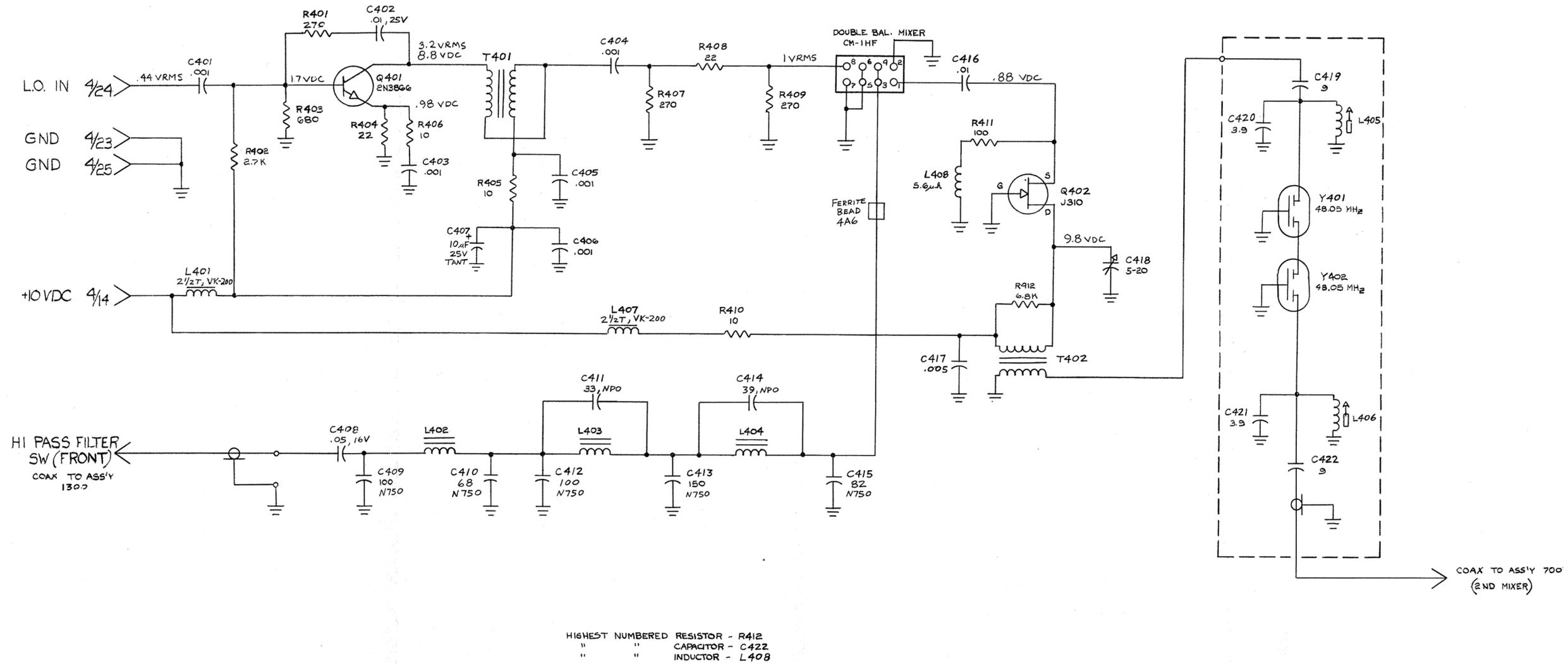


Fig. 3-13 Up-Converter Board Schematic

3-6. VCO BOARD

The VCO Board provides the injection signal to the Up-Converter board (Section 3-5), and includes the phase detector and loop filter portions of the synthesizer. Refer to figure 3-15 for schematic and figure 3-14 for parts list information.

The VCO actually consists of two oscillators; one for low band (0-15 MHz) operation, and one for high band (15-30 MHz) operation. The two oscillators are quite similar in design, and the following discussion of the low band VCO can be applied to the high band VCO as well.

Q501 and Q502 form a push-pull oscillator which is tuned by L501 and varactors CR503-CR506. The high band VCO uses one less varactor, since the operating frequency is higher. Power for the oscillator is obtained from the VCO select line, which comes from the bandswitch. A 5 VDC regulator, U501, is used to insure a well regulated and filtered power source. CR503-CR505 are controlled by the coarse tune line from the phase detector circuitry, and CR506 is controlled by the fine tune line. Two control lines are required to insure that the VCO will always tune to the correct frequency.

The VCO output is coupled through a buffer stage, Q503, and a PIN diode, CR507, to T503, which provides additional isolation between the VCO and other circuits in the transceiver. A sample of the output of T503 is connected through R514 to the DR7 for frequency readout purposes. T504 splits the output of T503, and the resulting outputs drive the Up-Converter and Translator boards.

The low band VCO tunes between 48.05 and 63.05 MHz, corresponding to an operating range of 0 to 15 MHz. The high band VCO tunes between 63.05 and 78.05 MHz, corresponding to an operating range of 15 to 30 MHz.

Phase detector U503 compares the 500 kHz reference from the PBT/Reference board (Section 3-7). The phase detector output is filtered by R521, R522 and C538, and amplified, inverted and filtered by U504A and associated components. The output of U504A is the fine tune line.

U504B is biased by R538 and R539 to amplify the fine tune line when it exceeds 15 volts, indicating that it is approaching the end of its range. The output of U504B is the coarse tune line. Large excursions of this line cause CR515/517 or CR516/518 to conduct, allowing R533 and C524 to filter the coarse tune line.

When the synthesizer loop is out of lock, pulses are produced by the phase detector at pin 1. These pulses are amplified by Q507, and integrated by R527 and C543 to produce a DC level. C539 is used to filter noise spikes from the output of Q507 during the locked state. The DC level produced by this circuit is used to turn on Q508, thus providing a ground at pin 10 of the circuit board during out-of-lock conditions.

Alignment of the VCO board consists of setting L501 and L502 for proper oscillator range, and is covered in Section 4. If parts replacement is required, be sure to replace the shield and ground clip exactly as installed at the factory to insure proper synthesizer operation. In addition, note that the oscillator transistors must be replaced in matched pairs in the high and low band VCOs.

NOTES:

VCO BOARD

REF DES	DESCRIPTION	PART NO.
C501	Capacitor, Disc, 15 pF ± 5%, NPO	3160510
C502	Capacitor, Disc, 15 pF ± 5%, NPO	3160510
C503	Capacitor, Disc, 390 pF ± 5%, DM-15	3170370
C504	Capacitor, Disc, 390 pF ± 5%, DM-15	3170370
C505	Capacitor, Disc, .001 μF ± 20%, Z5U	3161380
C506	Capacitor, Tantalum, 47 μF ± 20%, 6V	3183070
C507	Capacitor, Electrolytic, 1 μF ± 20%, 50 V	3180008
C508	Capacitor, Disc, .01 μF ± 20%, 50 V	3161380
C509	Capacitor, Electrolytic, 22 μF ± 20%, 16 V	3180105
C510	Capacitor, Disc, .001 μF ± 20%, Z5U	3161380
C511	Capacitor, Disc, 51 pF ± 5%, N750	3160860
C512	Capacitor, Disc, 150 pF ± 20%, Z5U	3161170
C513	Capacitor, Disc, 470 pF ± 20%, Z5U	3161350
C514	Capacitor, Disc, 8.2 pF ± 5%, NPO	3160300
C515	Capacitor, Disc, 8.2 pF ± 5%, NPO	3160300
C516	Capacitor, Mica, 180 pF ± 5%, DM-15	3170180
C517	Capacitor, Mica, 180 pF ± 5%, DM-15	3170180
C518	Capacitor, Disc, .001 μF ± 20%, Z5U	3161380
C519	Capacitor, Tantalum, 47 μ- 20%, 6 V	3183070
C520	Capacitor, Electrolytic, 1 μF ± 20%, 50 V	3180008
C521	Capacitor, Disc, .001 μF ± 20%, Z5U	3161380
C522	Capacitor, Electrolytic, 22 μF ± 20%, 16 V	3180150
C523	Capacitor, Disc, .001 μF ± 20%, Z5U	3161380
C524	Capacitor, Tantalum, 1 μ- 20%, 35 V	3183010
C525	Capacitor, Disc, .001 μF ± 20%, Z5U	3161380
C526	Capacitor, Disc, 51 pF ± 5%, N750	3160860
C527	Capacitor, Disc, 150 pF ± 20%, Z5U	3161170
C528	Capacitor, Disc, 470 pF ± 20%, Z5U	3161350
C529	Capacitor, Disc, 470 pF ± 5%, Z5U	3161350
C530	Capacitor, Disc, .001 μF ± 20%, Z5U	3161380
C531	Capacitor, Disc, .001 μF ± 20%, Z5U	3161380
C532	Capacitor, Disc, 51 pF ± 5%, N750	3160860
C533	Capacitor, Disc, .005 μF ± 20%, Z5U	3161470
C534	Capacitor, Electrolytic, 10 μF ± 20%, 25 V	3180062
C535	Capacitor, Electrolytic, 10 μF ± 20%, 25 V	3180062
C536	Capacitor, Disc, .001 μF ± 20%, Z5U	3161380
C537	Capacitor, Disc, .001 μF ± 20%, Z5U	3161380
C538	Capacitor, Disc, 500 pF ± 10%, X5F	3161360
C539	Capacitor, Disc, .01 μF ± 80%, M25V	3161500
C540	Capacitor, Electrolytic, 1 μF ± 20%, 50 V	3180008
C541	Capacitor, Film, .01 μF	3184040
C542	Capacitor, Disc, .01 μF ± 80%, M25V	3161500
C543	Capacitor, Electrolytic, 10 μF ± 20%, 25 V	3180062
C544	Capacitor, Disc, 470 pF ± 20%, Z5U	3161350
C545	Capacitor, Tantalum, .1 μ- 10%, 35 V	3183098
C546	Capacitor, Disc, .01 μF ± 80%, M25V	3161500
C547	Capacitor, Electrolytic, 1 μF ± 20%, 50 V	3180008
C548	Capacitor, Electrolytic, 1 μF ± 20%, 50 V	3180008
C549	Capacitor, Disc, .005 μF ± 20%, Z5U	3161470
C550	Capacitor, Disc, .01 μF ± 80%, M25U	3161500
C551	Capacitor, Disc, 6.2 pF ± 5%, NPO	3160200
C552	Capacitor, Disc, 6.2 pF ± 5%, NPO	3160200
CR501	Diode, 1N4148	3020090
CR502	Diode, 1N4148	3020090
CR503	Diode, MV104	3020274
CR504	Diode, MV104	3020274

REF DES	DESCRIPTION	PART NO.
CR505	Diode, MV104	3020274
CR506	Diode, MV2098	3020278
CR507	Diode, MPN3404	3020265
CR508	Diode, 1N4148	3020090
CR509	Diode, 1N4148	3020090
CR510	Diode, MV104	3020274
CR511	Diode, MV104	3020274
CR512	Diode, MV209	3020278
CR513	Diode, MPN3404	3020265
CR514	Diode, 1N4148	3020090
CR515	Diode, 1N4148	3020090
CR516	Diode, 1N4148	3020090
CR517	Diode, 1N4148	3020090
CR518	Diode, 1N4148	3020090
L501	Inductor, Variable	2513003
L502	Inductor, Variable	2513003
Q501	Transistor, SPF796, Matched FET	3030355
Q502	Transistor, SPF796, Matched FET	3030355
Q503	Transistor, J310	3030501
Q504	Transistor, SPF796, Matched FET	3030355
Q505	Transistor, SPF796, Matched FET	3030355
Q506	Transistor, J310	3030501
Q507	Transistor, 2N4125	3030110
Q508	Transistor, 2N3904	3030105
R501	Resistor, Carbon Film, 1 M Ω \pm 5%, 1/4 W	3220355
R502	Resistor, Carbon Film, 1 M Ω \pm 5%, 1/4 W	3220355
R503	Resistor, Carbon Film, 33 Ω \pm 5%, 1/4 W	3220025
R504	Resistor, Carbon Film, 10 M Ω \pm 5%, 1/4 W	3220380
R505	Resistor, Carbon Film, 33 Ω \pm 5%, 1/4 W	3220025
R506	Resistor, Carbon Film, 4.7 K Ω \pm 5%, 1/4 W	3220210
R507	Resistor, Carbon Film, 1 M Ω \pm 5%, 1/4 W	3220355
R508	Resistor, Carbon Film, 1 M Ω \pm 5%, 1/4 W	3220355
R509	Resistor, Carbon Film, 33 Ω \pm 5%, 1/4 W	3220025
R510	Resistor, Carbon Film, 10 M Ω \pm 5%, 1/4 W	3220380
R511	Resistor, Carbon Film, 33 Ω \pm 5%, 1/4 W	3220025
R512	Resistor, Carbon Film, 4.7 K Ω \pm 5%, 1/4 W	3220210
R513	Resistor, Carbon Film, 100 Ω \pm 5%, 1/4 W	3220055
R514	Resistor, Carbon Film, 470 Ω \pm 5%, 1/4 W	3220110
R515	Resistor, Carbon Film, 5.1 Ω \pm 5%, 1/4 W	3220003
R516	Resistor, Carbon Film, 220 Ω \pm 5%, 1/4 W	3220075
R517	Resistor, Carbon Film, 220 Ω \pm 5%, 1/4 W	3220075
R518	Resistor, Carbon Film, 100 Ω \pm 5%, 1/4 W	3220055
R519	Resistor, Carbon Film, 2.7 K Ω \pm 5%, 1/4 W	3220195
R520	Resistor, Carbon Film, 2.7 K Ω \pm 5%, 1/4 W	3220195
R521	Resistor, Carbon Film, 4.7 K Ω \pm 5%, 1/4 W	3220210
R522	Resistor, Carbon Film, 4.7 K Ω \pm 5%, 1/4 W	3220210
R523	Resistor, Carbon Film, 22 K Ω \pm 5%, 1/4 W	3220260
R524	Resistor, Carbon Film, 2.7 K Ω \pm 5%, 1/4 W	3220195
R525	Resistor, Carbon Film, 8.2 K Ω \pm 5%, 1/4 W	3220230
R526	Resistor, Carbon Film, 8.2 K Ω \pm 5%, 1.4 W	3220230
R527	Resistor, Carbon Film, 47 K Ω \pm 5%, 1/4 W	3220285
R528	Resistor, Carbon Film, 3.9 K Ω \pm 5%, 1/4 W	3220205
R529	Resistor, Carbon Film, 15 Ω \pm 5%, 1/4 W	3220010
R530	Resistor, Carbon Film, 2.7 K Ω \pm 5%, 1/4 W	3220195
R531	Resistor, Carbon Film, 4.7 K Ω \pm 5%, 1/4 W	3220210

REF DES	DESCRIPTION	PART NO.
R532	Resistor, Carbon Film, 100 K $\Omega \pm 5\%$, 1/4 W	3220315
R533	Resistor, Carbon Film, 10 M $\Omega \pm 5\%$, 1/4 W	3220380
R534	Resistor, Carbon Film, 4.7 K $\Omega \pm 5\%$, 1/4 W	3220210
R535	Resistor, Carbon Film, 100 $\Omega \pm 5\%$, 1/4 W	3220055
R536	Resistor, Carbon Film, 5.1 $\Omega \pm 5\%$, 1/4 W	3220003
R537	Resistor, Carbon Film, 100 K $\Omega \pm 5\%$, 1/4 W	3220315
R538	Resistor, Carbon Film, 8.2 K $\Omega \pm 5\%$, 1/4 W	3220230
R539	Resistor, Carbon Film, 3.9 K $\Omega \pm 5\%$, 1/4 W	3220205
RFC501	Choke Assy., 5.6 μ H, L56G	3520510
RFC502	Choke Assy., 5.6 μ H, L56G	3520510
RFC503	Choke Assy., 5.6 μ H, L56G	3520510
RFC504	Choke Assy., 5.6 μ H, L56G	3520510
RFC505	Choke Assy., 5.6 μ H, L56G	3520510
RFC506	Choke Assy., 5.6 μ H, L56G	3520510
RFC507	Choke Assy., 270 μ H, MUD271	3520590
RFC508	Choke Assy., 270 μ H, MUD271	3520590
T501	Transformer, Toroid	2510007
T502	Transformer, Toroid	2510006
T503	Transformer, Toroid	2510003
T504	Transformer, Toroid	2510003
U501	I.C., 78L05A	3040030
U502	I.C., 78L05A	3040030
U503	I.C., MC14046B	3041046
U504	I.C., UA739PC	3020535

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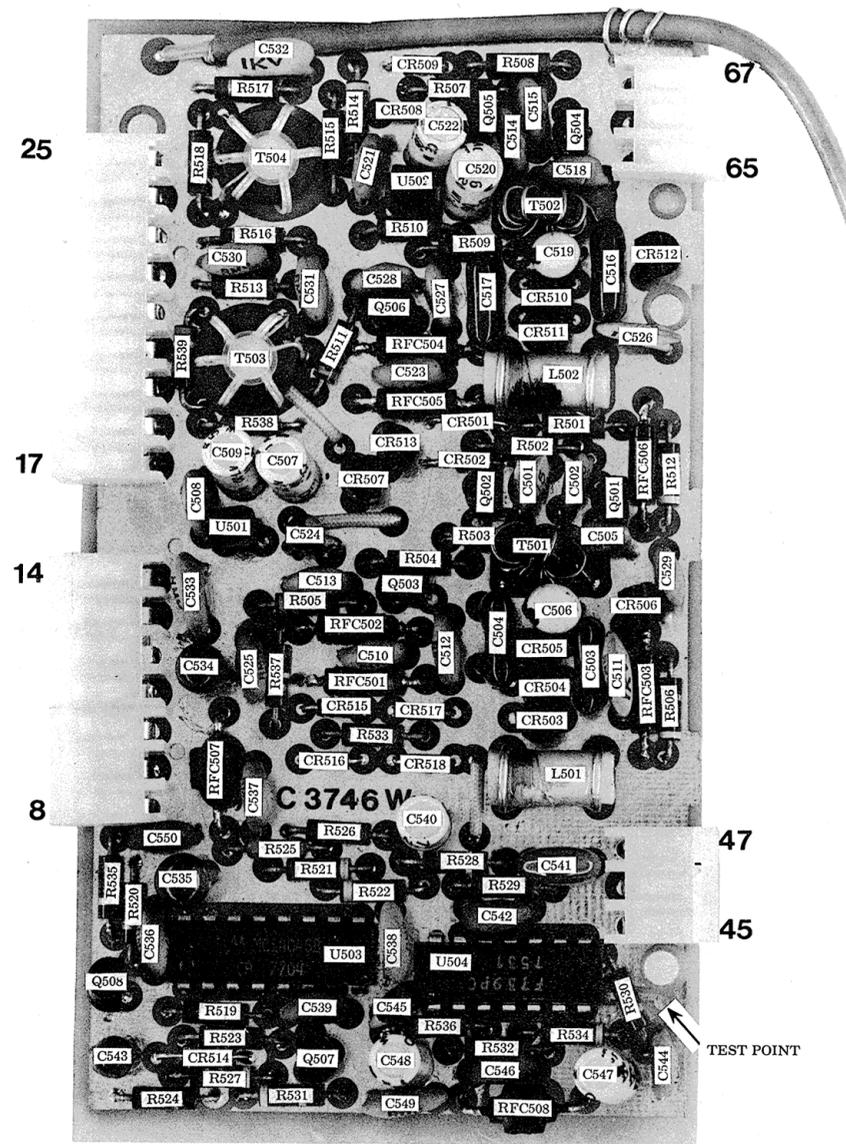


Fig. 3-14 VCO Board Pictorial

C	533	501 534	536 537	502 515 535	503 516 504 517	505 518	508 521 506 509 520 522	538	539	510 523 524	525	540	511 526 542 543 541	513 528	544 529	530	531 546	547 550	532	548	551 552	549	
R	501 507	502 508		519 520		503 504		521 523 522	524		525	526 527	528 504 529	505 511 530 512	506 538	539	531 535 513 532	516 536 515 517	533	514 537		518	
L													501 502										

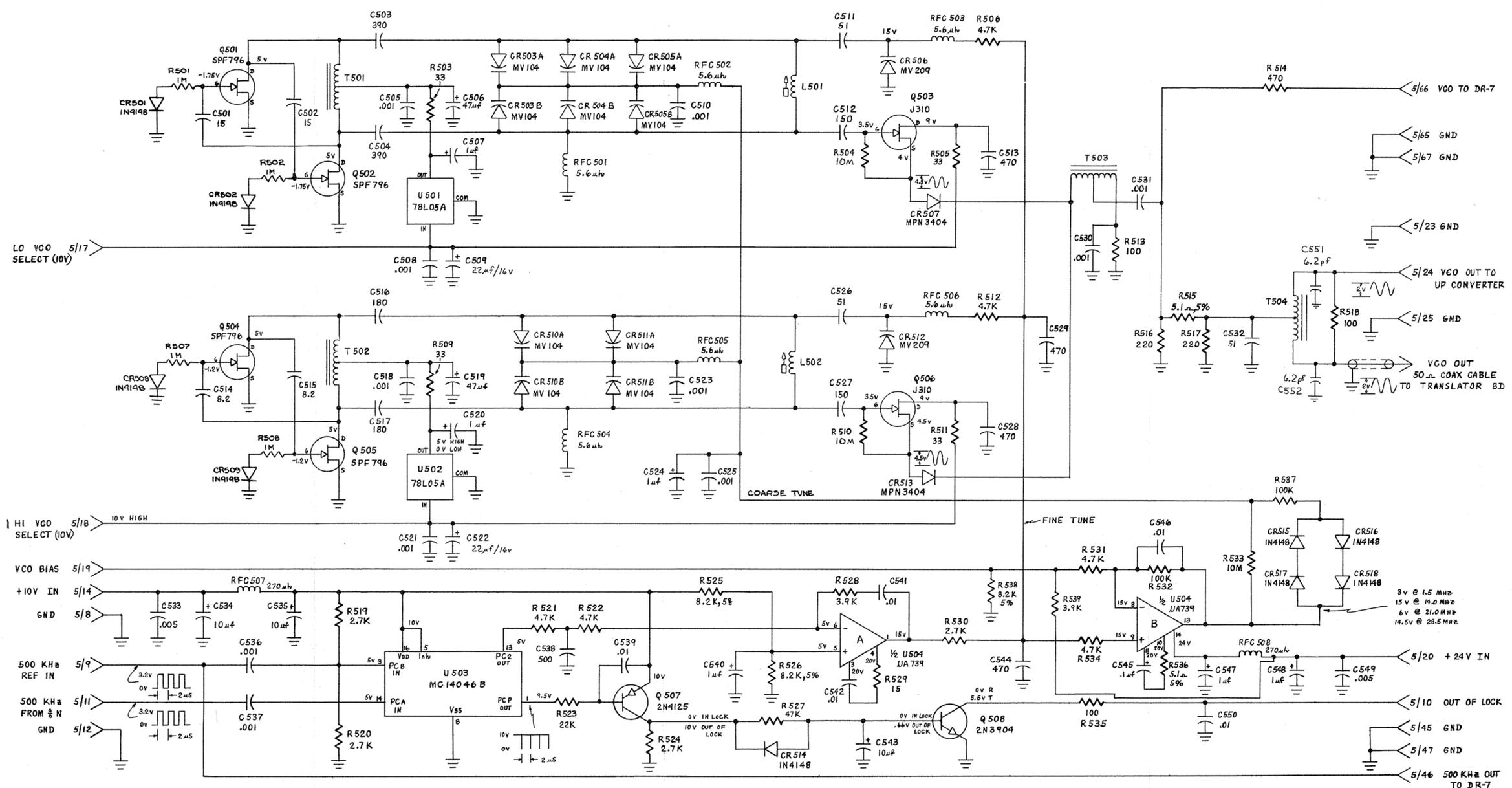


Fig. 3-15 VCO Board Schematic

3-7. TRANSLATOR BOARD

The Translator board combines the 50 MHz signal from the Passband Tuning/Reference board, the 5.05-5.55 MHz PTO output and the 48.05-78.05 MHz VCO signal to create an input to the programmable divider. The output of this divider is routed to the phase detectors on the VCO board (Section 3-6) for frequency and phase correction of the VCO. Refer to figure 3-17 for schematic and figure 3-16 for parts list information.

The 5.05-5.55 MHz PTO signal is applied to one input of a double balanced mixer consisting of T604, T605 and CR605-608. The 40 MHz signal from the PBT/Reference board is amplified by Q604 and applied to the other input of this mixer. The resulting 45.05-45.55 MHz signal is filtered by a bandpass filter consisting of L609-L611 and C623-C629, and routed to one input of a double balanced mixer consisting of T602, T603, and CR601-CR604. The other input of this double balanced mixer is connected to the output of the VCO board, which varies from 48.05-78.05 MHz.

The output of this mixer is a signal which varies from 3 to 32.5 MHz depending on the range of operation. This signal remains at a constant frequency for any selected 500 kHz segment, since the VCO frequency is forced by the phase detector to track the PTO frequency.

The 3-32.5 MHz signal is passed through a low-pass filter to remove undesired mixing products, amplified by Q603 and Q602 and buffered by Q601. This signal processing is required in order to achieve a sufficient level to drive the programmable divider.

The programmable divider is comprised of U601 through U604, and is programmed to divide by a whole integer between 6 and 65, depending on the 500 kHz range selected. Programming information comes from the Digital Control board (Section 3-3) and is modified by the DR7 frequency programmer when this accessory is installed. Load number information to the Translator board is present on pins 41-49 (the top connector) and is coded in BCD. The least significant digit of the load number is connected to pins 41-44, and the most significant digit to pins 46-49.

The output of the programmable divider, which is 500 kHz when the synthesizer is locked, is connected via the Parent board to the phase detector on the VCO board.

Alignment of the Translator board consists of aligning the 45.05-45.55 MHz bandpass filter, and is covered in Section 4. Note that the shields on the board need not be removed for alignment. If parts replacement is required, be sure to replace all shields and ground clips to insure proper performance.

NOTES:

TRANSLATOR BOARD

REF DES	DESCRIPTION	PART NO.
C601	Capacitor, Tantalum, .22 μ F \pm 10%, 35 V	3183100
C602	Capacitor, Tantalum, .22 μ F \pm 10%, 35 V	3183100
C603	Capacitor, Tantalum, .22 μ F \pm 10%, 35 V	3183100
C604	Capacitor, Tantalum, .22 μ F \pm 10%, 35 V	3183100
C605	Capacitor, Tantalum, .22 μ F \pm 10%, 35 V	3183100
C606	Capacitor, Tantalum, 10 μ F \pm 20%, 25 V	3183030
C608	Capacitor, Disc, 68 pF \pm 5%, N750	3160990
C609	Capacitor, Disc, .005 μ F \pm 20%, Z5U	3161470
C610	Capacitor, Tantalum, .22 μ F \pm 10%, 35 V	3183100
C611	Capacitor, Mica, 190 pF \pm 5%, DM-15	3170190
C612	Capacitor, Mica, 68 pF \pm 5%, DM-15	3170060
C613	Capacitor, Mica, 120 pF \pm 5%, DM-15	3170130
C614	Capacitor, Mica, 150 pF \pm 5%, DM-15	3170150
C615	Capacitor, Mica, 130 pF \pm 5%, DM-15	3170140
C616	Capacitor, Mica, 90 pF \pm 5%, DM-15	3170090
C617	Capacitor, Disc, .01 μ F + 80%, M25V	3161500
C618	Capacitor, Disc, .01 μ F + 80%, M25V	3161500
C619	Capacitor, Disc, .01 μ F + 80%, M25V	3161500
C620	Capacitor, Tantalum, .22 μ F \pm 10%, 35 V	3183100
C621	Capacitor, Disc, .01 μ F + 80%, M25V	3161500
C622	Capacitor, Disc, .005 μ F \pm 20%, Z5U	3161470
C623	Capacitor, Disc, 12 pF \pm 5%, NPO	3160430
C624	Capacitor, Mica, 68 pF \pm 5%, DM-15	3170060
C625	Capacitor, Tubular, 2.7 pF, NPO	3185060
C626	Capacitor, Disc, 82 pF \pm 5%, N750	3161040
C627	Capacitor, Tubular, 2.7 pF, NPO	3185060
C628	Capacitor, Mica, 68 pF \pm 5%, DM-15	3170060
C629	Capacitor, Disc, 12 pF \pm 5%, NPO	3160430
C630	Capacitor, Mica, 100 pF \pm 5%, DM-15	3170110
C631	Capacitor, Disc, .001 μ F \pm 20%, Z5U	3161380
C632	Capacitor, Disc, .01 μ F + 80%, M25V	3161500
C633	Capacitor, Disc, .01 μ F + 80%, M25V	3161500
C634	Capacitor, Disc, .01 μ F + 80%, M25V	3161500
C635	Capacitor, Tantalum, 1 μ F \pm 20%, 35 V	3183010
C636	Capacitor, Disc, 27 pF \pm 5%, NPO	3160650
C637	Capacitor, Mica, 68 pF \pm 5%, DM-15	3170060
C638	Capacitor, Disc, 47 pF \pm 5%, NPO	3160840
C639	Capacitor, Disc, 51 pF \pm 5%, N750	3160860
C640	Capacitor, Disc, 6.2 pF \pm .25, N150	3160200
CR601	Diode, MBD101	3020263
CR602	Diode, MBD101	3020263
CR603	Diode, MBD101	3020263
CR604	Diode, MBD101	3020263
CR605	Diode, 1N4148	3020090
CR606	Diode, 1N4148	3020090
CR607	Diode, 1N4148	3020090
CR608	Diode, 1N4148	3020090
L602	Ferrite Bead	3523207
L603	Inductor, Toroid	2510017
L604	Inductor, Toroid	2510016
L605	Inductor, Toroid	2510015
L607	Inductor, Toroid	2510015
L609	Inductor, Variable	3524100
L610	Inductor, Variable	3524100
L611	Inductor, Variable	3524100
Q601	Transistor, 2N4125	3030110

REF DES	DESCRIPTION	PART NO.
Q602	Transistor, 2N3563	3030060
Q603	Transistor, 2N3563	3030060
Q604	Transistor, 2N3563	3030060
R601	Resistor, Carbon Film, 47 Ω \pm 5%, 1/4 W	3220035
R602	Resistor, Carbon Film, 1 K Ω \pm 5%, 1/4 W	3220160
R603	Resistor, Carbon Film, 1 K Ω \pm 5%, 1/4 W	3220160
R604	Resistor, Carbon Film, 38 Ω \pm 5%, 1/4 W	3220030
R605	Resistor, Carbon Film, 150 Ω \pm 5%, 1/4 W	3220065
R606	Resistor, Carbon Film, 470 Ω \pm 5%, 1/4 W	3220110
R607	Resistor, Carbon Film, 470 Ω \pm 5%, 1/4 W	3220110
R608	Resistor, Carbon Film, 4.7 K Ω \pm 5%, 1/4 W	3220210
R609	Resistor, Carbon Film, 2.2 K Ω \pm 5%, 1/4 W	3220190
R610	Resistor, Carbon Film, 150 Ω \pm 5%, 1/4 W	3220065
R611	Resistor, Carbon Film, 270 Ω \pm 5%, 1/4 W	3220085
R612	Resistor, Carbon Film, 1.8 K Ω \pm 5%, 1/4 W	3220180
R613	Resistor, Carbon Film, 8.2 K Ω \pm 5%, 1/4 W	3220230
R614	Resistor, Carbon Film, 1.2 K Ω \pm 5%, 1/4 W	3220170
R615	Resistor, Carbon Film, 2.2 K Ω \pm 5%, 1/4 W	3220190
R616	Resistor, Carbon Film, 68 Ω \pm 5%, 1/4 W	3220045
R617	Resistor, Carbon Film, 5.1 Ω \pm 5%, 1/4 W	3220003
R618	Resistor, Carbon Film, 10 Ω \pm 5%, 1/4 W	3220005
R619	Resistor, Carbon Film, 220 Ω \pm 5%, 1/4 W	3220075
R620	Resistor, Carbon Film, 5.1 Ω \pm 5%, 1/4 W	3220003
R622	Resistor, Carbon Film, 15 Ω \pm 5%, 1/4 W	3220010
R623	Resistor, Carbon Film, 150 Ω \pm 5%, 1/4 W	3220065
R626	Resistor, Carbon Film, 22 Ω \pm 5%, 1/4 W	3220015
R627	Resistor, Carbon Film, 10 Ω \pm 5%, 1/4 W	3220005
R628	Resistor, Carbon Film, 33 Ω \pm 5%, 1/4 W	3220035
R629	Resistor, Carbon Film, 8.2 K Ω \pm 5%, 1/4 W	3220230
R630	Resistor, Carbon Film, 2.2 K Ω \pm 5%, 1/4 W	3220190
RFC601	Choke, RFC	2512506
RFC602	Choke Assy., 270 μ H, MUD217	3520590
RFC603	Choke Assy., 270 μ H, MUD217	3520590
T601	Transformer, Toroid	2510009
T602	Transformer, Toroid	2510002
T603	Transformer, Toroid	2510002
T604	Transformer, Toroid	2510004
T605	Transformer, Toroid	2510014
U601	I.C., SN74S113N	3040495
U602	I.C., SN74196	3040470
U603	I.C., SN74196	3040470
U604	I.C., SN74S11N	3040485

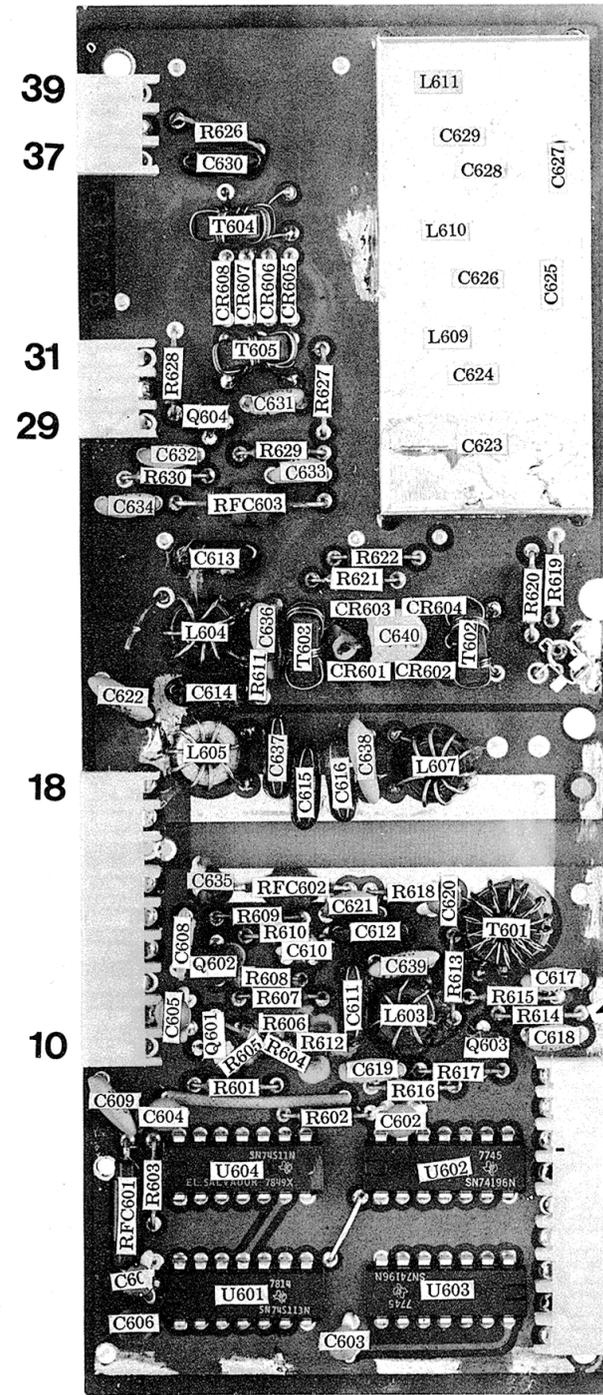


Fig. 3-16 Translator Board Pictorial

C	601	602	603 640	604	623 613	636 624	614 625	626 615	627 628	605 608	616 629	609 611	630	610 619	611	620 629	612	621	631	622	633 632	635	634
R	619	620	601	622	623	603	604	605	612	607	617	608	609 615	610 616	617	626	618	627	628	629	630		
L				604	609	605	610	607	611			602		603									

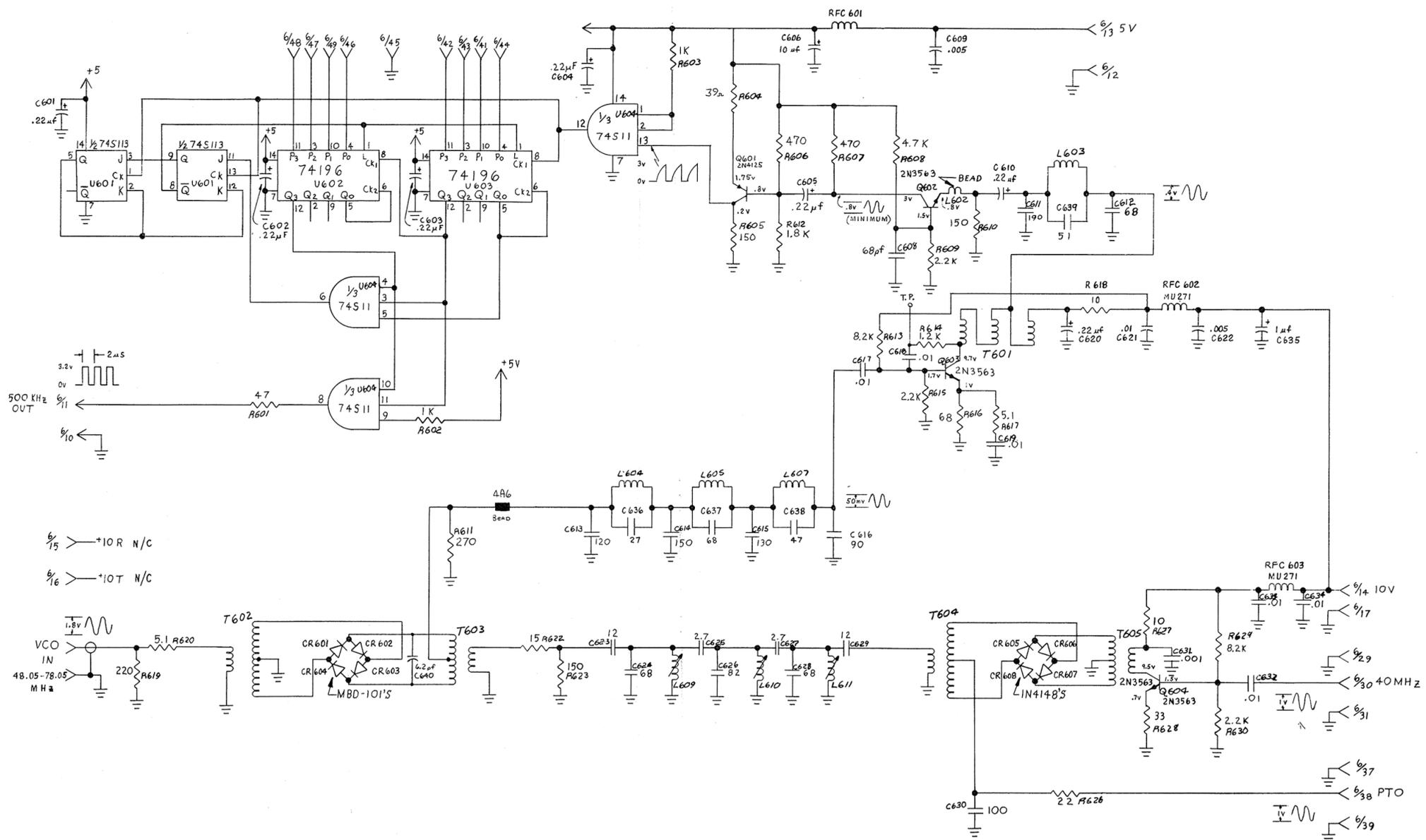


Fig. 3-17 Translator Board Schematic

TEST POINT

49

41

3-8. 2ND MIXER BOARD

The 2nd Mixer board boosts the 48.05 MHz 1st IF signal level in a gain-controlled amplifier and converts it to the 5.645 MHz 2nd IF. Refer to figure 3-9 for schematic and figure 3-18 for parts location information.

48.05 MHz 1st IF signals from the Up-Converter are coupled through C704 to the input of amplifier Q702. C705, C706 and L701 form an input matching network. AGC is applied to Q702 via R707. The output of Q702 is tuned by C715, C716 and L705 and coupled to one input of a double balanced mixer.

The injection for the mixer is a 53.695 MHz (nominal) signal which is developed on the PBT board (See Section 3-11). This signal is amplified by Q701, the output of which is tuned by C713, C714 and L703, connected to the injection input of the mixer via

R715, R716 and R717 which form a pad to insure proper termination of both amplifier and mixer.

The double balanced mixer is a diode ring type, consisting of CR701 through CR704 and R722 and transformers T701 and T702. The output of the mixer is the difference of the 53.695 MHz injection and the 48.05 MHz IF signal, or 5.645 MHz. This signal is coupled to Q703 and C717. Q703 provides gain at 5.645 MHz. R719 sets the stage gain with normal selectivity filters. To compensate for the additional loss of narrow selectivity filters, CR703 is forward biased with +10 volts via R721. This switches in C719, which provides gate bypassing, thus increasing stage gain. The output of Q703 is tuned via L706, C720 and C721.

Alignment of the 2nd Mixer board is covered in Section 4 of this manual.

NOTES:

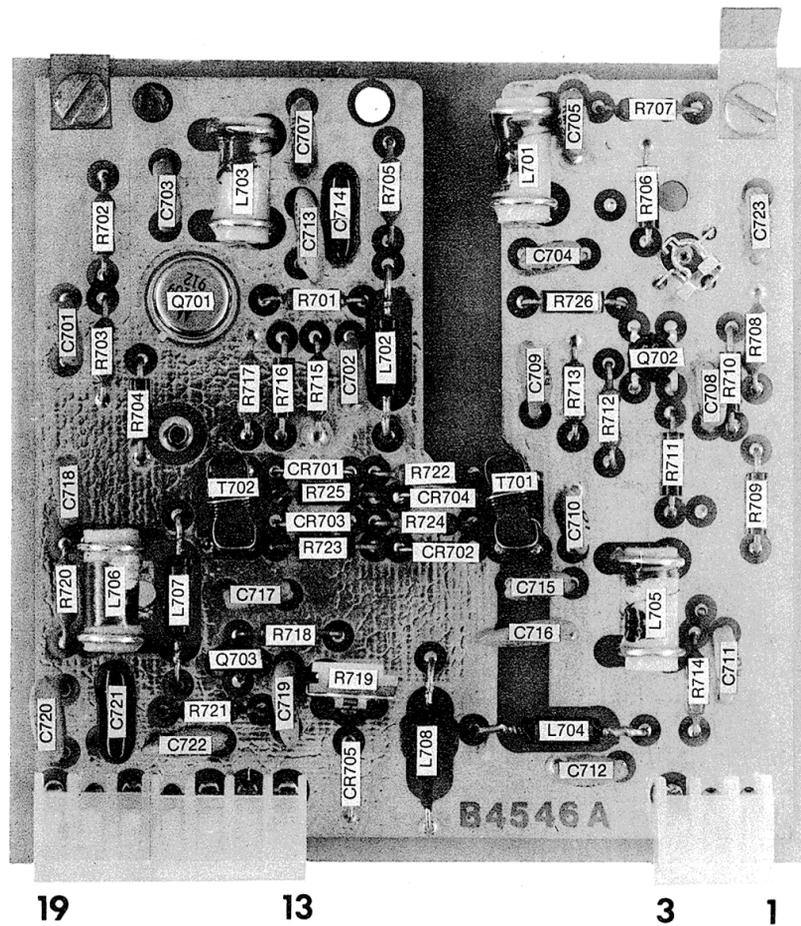
NOTES:

2ND MIXER BOARD

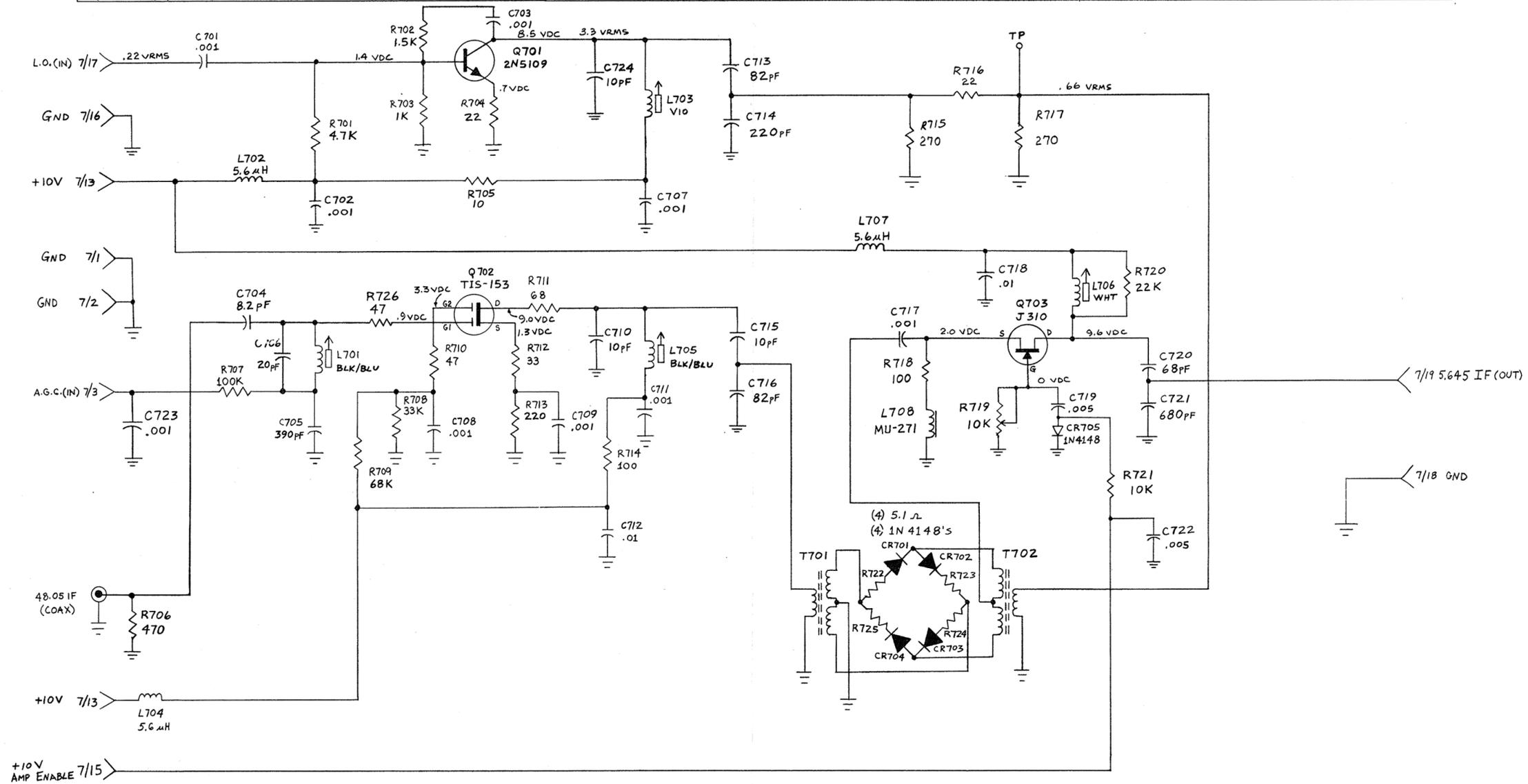
REF DES	DESCRIPTION	PART NO.
C701	Capacitor, Disc, .001 μ F \pm 20%, Z5U	3161380
C702	Capacitor, Disc, .001 μ F \pm 20%, Z5U	3161380
C703	Capacitor, Disc, .001 μ F \pm 20%, Z5U	3161380
C704	Capacitor, Disc, 8.2 pF \pm .25, N750	3160290
C705	Capacitor, Disc, 390 pF \pm 10%, X5F	3161320
C706	Capacitor, Disc, 20 pF \pm 5%, NPO	3160580
C707	Capacitor, Disc, .001 μ F \pm 20%, Z5U	3161380
C708	Capacitor, Disc, .001 μ F \pm 20%, Z5U	3161380
C709	Capacitor, Disc, .001 μ F \pm 20%, Z5U	3161380
C710	Capacitor, Disc, 10 pF \pm 5%, NPO	3160360
C711	Capacitor, Disc, .001 μ F 20%, Z5U	3161380
C712	Capacitor, Disc, .01 μ F + 80%, M25V	3161500
C713	Capacitor, Disc, 82 pF + 5%, N750	3161040
C714	Capacitor, Mica, 220 pF \pm 5%, DM-15	3170240
C715	Capacitor, Disc, 10 pF \pm 5%, NPO	3160360
C716	Capacitor, Disc, 82 pF \pm 5%, N750	3161040
C717	Capacitor, Disc, .001 μ F \pm 20%, Z5U	3161380
C718	Capacitor, Disc, .01 μ F + 80%, M25V	3161500
C719	Capacitor, Disc, .005 μ F \pm 20%, Z5U	3161470
C720	Capacitor, Disc, 68 pF \pm 5%, N750	3160990
C721	Capacitor, Mica, 680 pF \pm 5%, DM-15	3170500
C722	Capacitor, Disc, .005 μ F \pm 20%, Z5U	3161470
C723	Capacitor, Disc, .001 μ F \pm 20%, Z5U	3161380
C724	Capacitor, Disc, 10 pF \pm 5%, NPO	3160360
CR701	Diode, 1N4148	3020090
CR702	Diode, 1N4148	3020090
CR703	Diode, 1N4148	3020090
CR704	Diode, 1N4148	3020090
CR705	Diode, 1N4148	3020090
L701	Inductor, Var., blk/blu	2513014
L702	Choke Assy., 5.6 μ H, L56G	3520510
L703	Inductor, Var., Violet	2513012
L704	Choke Assy., 5.6 μ H, L56G	3520510
L705	Inductor, Var., blk/blu	2513014
L706	Inductor, Var., white	2513007
L707	Choke Assy., 5.6 μ H, L56G	3520510
L708	Choke Assy., 270 μ H, MUD271	3520590
Q701	Transistor, 2N5109	3030137
Q702	Transistor, TIS-153	3030400
Q703	Transistor, J310	3030501
R701	Resistor, Carbon Film, 4.7 K Ω \pm 5%, 1/4 W	3220210
R702	Resistor, Carbon Film, 1.5 K Ω \pm 5%, 1/4 W	3220175
R703	Resistor, Carbon Film, 1 K Ω \pm 5%, 1/4 W	3220160
R704	Resistor, Carbon Film, 22 Ω \pm 5%, 1/4 W	3220015
R705	Resistor, Carbon Film, 10 Ω \pm 5%, 1/4 W	3220005
R706	Resistor, Carbon Film, 470 Ω \pm 5%, 1/4 W	3220110
R707	Resistor, Carbon Film, 100 K Ω \pm 5%, 1/4 W	3220315
R708	Resistor, Carbon Film, 33 K Ω \pm 5%, 1/4 W	3220275
R709	Resistor, Carbon Film, 68 K Ω \pm 5%, 1/4 W	3220300
R710	Resistor, Carbon Film, 47 Ω \pm 5%, 1/4 W	3220035
R711	Resistor, Carbon Film, 68 Ω \pm 5%, 1/4 W	3220045
R712	Resistor, Carbon Film, 33 Ω \pm 5%, 1/4 W	3220025
R713	Resistor, Carbon Film, 220 Ω \pm 5%, 1/4 W	3220075
R714	Resistor, Carbon Film, 100 Ω \pm 5%, 1/4 W	3220055
R715	Resistor, Carbon Film, 270 Ω \pm 5%, 1/4 W	3220085
R716	Resistor, Carbon Film, 22 Ω \pm 5%, 1/4 W	3220015

REF DES	DESCRIPTION	PART NO.
R717	Resistor, Carbon Film, 270 $\Omega \pm 5\%$, 1/4 W	3220085
R718	Resistor, Carbon Film, 100 $\Omega \pm 5\%$, 1/4 W	3220055
R719	Resistor, Variable, 10 K Ω	3260665
R720	Resistor, Carbon Film, 22 K $\Omega \pm 5\%$, 1/4 W	3220260
R721	Resistor, Carbon Film, 10 K $\Omega \pm 5\%$, 1/4 W	3220235
R722	Resistor, Carbon Film, 5.1 $\Omega \pm 5\%$, 1/4 W	3220003
R723	Resistor, Carbon Film, 5.1 $\Omega \pm 5\%$, 1/4 W	3220003
R724	Resistor, Carbon Film, 5.1 $\Omega \pm 5\%$, 1/4 W	3220003
R725	Resistor, Carbon Film, 5.1 $\Omega \pm 5\%$, 1/4 W	3220003
R726	Resistor, Carbon Film, 47 $\Omega \pm 5\%$, 1/4 W	3220035
T701	Inductor, Toroid	2510002
T702	Inductor, Toroid	2510002

NOTES:



C	723	701	704	705	702		708	703	709	724	710	711	713	715	717	717	718	719	720	721	722
R	706	707	701	709	710	702	711	704	713	712	715		718	722	723	717	719		720	721	722
L	704	702	701									703	705		707	708		706			



HIGHEST NUMBERED CAPACITOR - C724
 " " RESISTOR - R726
 " " DIODE - CR705

ALL CAPACITOR VALUES IN μ F UNLESS SPECIFIED OTHERWISE
 ALL RESISTOR " " OHMS " " " " " "

Fig. 3-18 2nd Mixer Board Pictorial

Fig. 3-19 2nd Mixer Board Schematic

3-9. IF JUMPER BOARD

The IF Jumper Board provides the 5.645 MHz IF signal interconnect between module pin 22 and the coax of the IF Selectivity board, when the optional NB7A noise blanker is not installed. Refer to figure 3-21 for schematic and figure 3-20 for board pictorial.

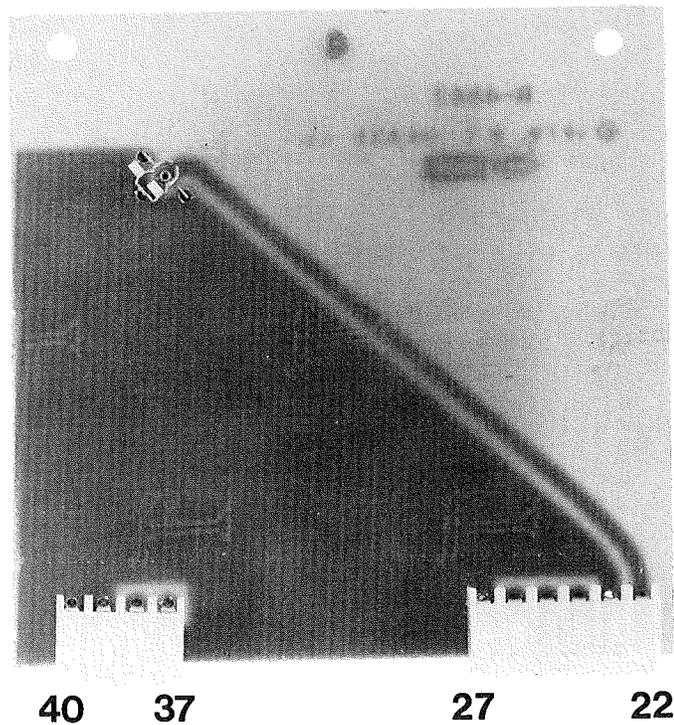


Fig. 3-20 IF Jumper Board Pictorial



Fig. 3-21 IF Jumper Board Schematic

NOTES:

3-10. IF SELECTIVITY BOARD

The IF Selectivity board provides for the installation of up to four 5.645 MHz accessory crystal filters of various bandwidths in the RR3. The standard 2.3 kHz filter (6 dB bandwidth), supplied with the unit, is located on the 2nd/3rd IF/AGC board (Section 3-12). Each of the filter positions is identical, with the same circuitry used for selection. However, for actual IF bandwidth of the RR3 to coincide with the front panel Selectivity switch markings, make sure that accessory filters are installed in positions indicated in the IF Selectivity board pictorial, figure 3-22. Refer to figure 3-23 for schematic information.

In the RR3, +10 V is routed to module pin 15 via the front panel Selectivity switch when the position marked WIDE is selected. This voltage turns on series diodes CR903 (via R903, RFC901 and R922). The same voltage back biases shunt diodes CR904 and CR905. In the unselected positions (NORMAL, A, B and NARROW, in this case), -5 volts from pin 38 causes the shunt diodes to conduct and the series diodes to be back biased. This has the effect of opening and isolating all signal paths except the desired

path through the wide filter. A 5.645 MHz signal from the noise blanker or IF Jumper board is coupled through C930 to a common input line. In addition, a second coax is tied at the input side of C930 and is routed to the input coax connector at C1102 (2nd/3rd IF/AGC Board - Section 3-12). Since the series diodes in positions A, B and NARROW on the IF Selectivity board, and the series diodes in position 2.3 (NORMAL) on the 2nd/3rd IF/AGC board are all back biased, the signal is routed through CR906, C908 and C907 to the wide filter. After filtering, the signal is coupled through C904, C902, CR903 and C901 to the output of the board, a coax to the 2nd/3rd IF/AGC board at T1101 input coax connector.

When servicing the IF Selectivity board, be sure to replace all shields and grounds, if removed, in the original locations. Failure to do so may seriously degrade the ultimate selectivity of the crystal filter, resulting in signals outside the desired passband 'leaking around' the filters.

NOTES:

NOTES:

IF SELECTIVITY BOARD

REF DES	DESCRIPTION	PART NO.
C901	Capacitor, Disc, .01 μ F + 80%, M25V	3161500
C902	Capacitor, Disc, .01 μ F + 80%, M25V	3161500
C903	Capacitor, Disc, .02 μ F \pm 80%, Z5U	3161580
C904	Capacitor, Disc, .01 μ F + 80%, M25V	3161500
C905	Capacitor, Disc, .02 μ F \pm 80%, Z5U	3161580
C906	Capacitor, Disc, .02 μ F \pm 80%, Z5U	3161580
C907	Capacitor, Disc, .01 μ F + 80%, M25V	3161500
C908	Capacitor, Disc, .01 μ F + 80%, M25V	3161500
C909	Capacitor, Disc, .01 μ F + 80%, M25V	3161500
C910	Capacitor, Disc, .02 μ F \pm 80%, Z5U	3161580
C911	Capacitor, Disc, .01 μ F + 80%, M25V	3161500
C912	Capacitor, Disc, .02 μ F \pm 80%, Z5U	3161580
C913	Capacitor, Disc, .02 μ F \pm 80%, Z5U	3161580
C914	Capacitor, Disc, .01 μ F + 80%, M25V	3161500
C915	Capacitor, Disc, .01 μ F + 80%, M25V	3161500
C916	Capacitor, Disc, .01 μ F + 80%, M25V	3161500
C917	Capacitor, Disc, .02 μ F \pm 80%, Z5U	3161580
C918	Capacitor, Disc, .01 μ F + 80%, M25V	3161500
C919	Capacitor, Disc, .02 μ F \pm 80%, Z5U	3161580
C920	Capacitor, Disc, .02 μ F \pm 80%, Z5U	3161580
C921	Capacitor, Disc, .01 μ F + 80%, M25V	3161500
C922	Capacitor, Disc, .01 μ F + 80%, M25V	3161500
C923	Capacitor, Disc, .01 μ F + 80%, M25V	3161500
C924	Capacitor, Disc, .02 μ F \pm 80%, Z5U	3161580
C925	Capacitor, Disc, .01 μ F + 80%, M25V	3161500
C926	Capacitor, Disc, .02 μ F \pm 80%, Z5U	3161580
C927	Capacitor, Disc, .02 μ F \pm 80%, Z5U	3161580
C928	Capacitor, Disc, .01 μ F + 80%, M25V	3161500
C929	Capacitor, Disc, .01 μ F + 80%, M25V	3161500
C930	Capacitor, Disc, .01 μ F + 80%, M25V	3161500
CR901	Diode, IN4148	3020090
CR902	Diode, IN4148	3020090
CR903	Diode, MPN3404	3020265
CR904	Diode, MPN3404	3020265
CR905	Diode, MPN3404	3020265
CR906	Diode, MPN3404	3020265
CR907	Diode, MPN3404	3020265
CR908	Diode, MPN3404	3020265
CR909	Diode, MPN3404	3020265
CR910	Diode, MPN3404	3020265
CR911	Diode, MPN3404	3020265
CR912	Diode, MPN3404	3020265
CR913	Diode, MPN3404	3020265
CR914	Diode, MPN3404	3020265
CR915	Diode, MPN3404	3020265
CR916	Diode, MPN3404	3020265
CR917	Diode, MPN3404	3020265
CR918	Diode, MPN3404	3020265
R901	Resistor, Carbon Film, 1 K Ω \pm 5%, 1/4 W	3220160
R902	Resistor, Carbon Film, 3.3 K Ω \pm 5%, 1/4 W	3220200
R903	Resistor, Carbon Film, 1 K Ω \pm 5%, 1/4 W	3220160
R904	Resistor, Carbon Film, 3.9 K Ω \pm 5%, 1/4 W	3220205
R905	Resistor, Carbon Film, 1 K Ω \pm 5%, 1/4 W	3220160
R906	Resistor, Carbon Film, 3.3 K Ω \pm 5%, 1/4 W	3220200
R907	Resistor, Carbon Film, 3.3 K Ω \pm 5%, 1/4 W	3220200
R908	Resistor, Carbon Film, 1 K Ω \pm 5%, 1/4 W	3220160

REF DES	DESCRIPTION	PART NO.
R909	Resistor, Carbon Film, 3.9 K Ω \pm 5%, 1/4 W	3220205
R910	Resistor, Carbon Film, 1 K Ω \pm 5%, 1/4 W	3220160
R911	Resistor, Carbon Film, 3.3 K Ω \pm 5%, 1/4 W	3220200
R912	Resistor, Carbon Film, 3.3 K Ω \pm 5%, 1/4 W	3220200
R913	Resistor, Carbon Film, 1 K Ω \pm 5%, 1/4 W	3220160
R914	Resistor, Carbon Film, 3.9 K Ω \pm 5%, 1/4 W	3220160
R915	Resistor, Carbon Film, 1 K Ω \pm 5%, 1/4 W	3220160
R916	Resistor, Carbon Film, 3.3 K Ω \pm 5%, 1/4 W	3220200
R917	Resistor, Carbon Film, 3.3 K Ω \pm 5%, 1/4 W	3220200
R918	Resistor, Carbon Film, 1 K Ω \pm 5%, 1/4 W	3220160
R919	Resistor, Carbon Film, 3.9 K Ω \pm 5%, 1/4 W	3220205
R920	Resistor, Carbon Film, 1 K Ω \pm 5%, 1/4 W	3220160
R921	Resistor, Carbon Film, 3.3 K Ω \pm 5%, 1/4 W	3220200
R922	Resistor, Carbon Film, 1 K Ω \pm 5%, 1/4 W	3220160
R923	Resistor, Carbon Film, 150 Ω \pm 5%, 1/2 W	3230125
R924	Resistor, Carbon Film, 150 Ω \pm 5%, 1/2 W	3230125
R925	Resistor, Carbon Film, 150 Ω \pm 5%, 1/2 W	3230125
R926	Resistor, Carbon Film, 150 Ω \pm 5%, 1/2 W	3230125
RFC901	Choke Assy., 270 μ H, MUD271	3520590
RFC902	Choke Assy., 270 μ H, MUD271	3520590
RFC903	Choke Assy., 270 μ H, MUD271	3520590
RFC904	Choke Assy., 270 μ H, MUD271	3520590
RFC905	Choke Assy., 270 μ H, MUD271	3520590
RFC906	Choke Assy., 270 μ H, MUD271	3520590
RFC907	Choke Assy., 270 μ H, MUD271	3520590
RFC908	Choke Assy., 270 μ H, MUD271	3520590

NOTES:

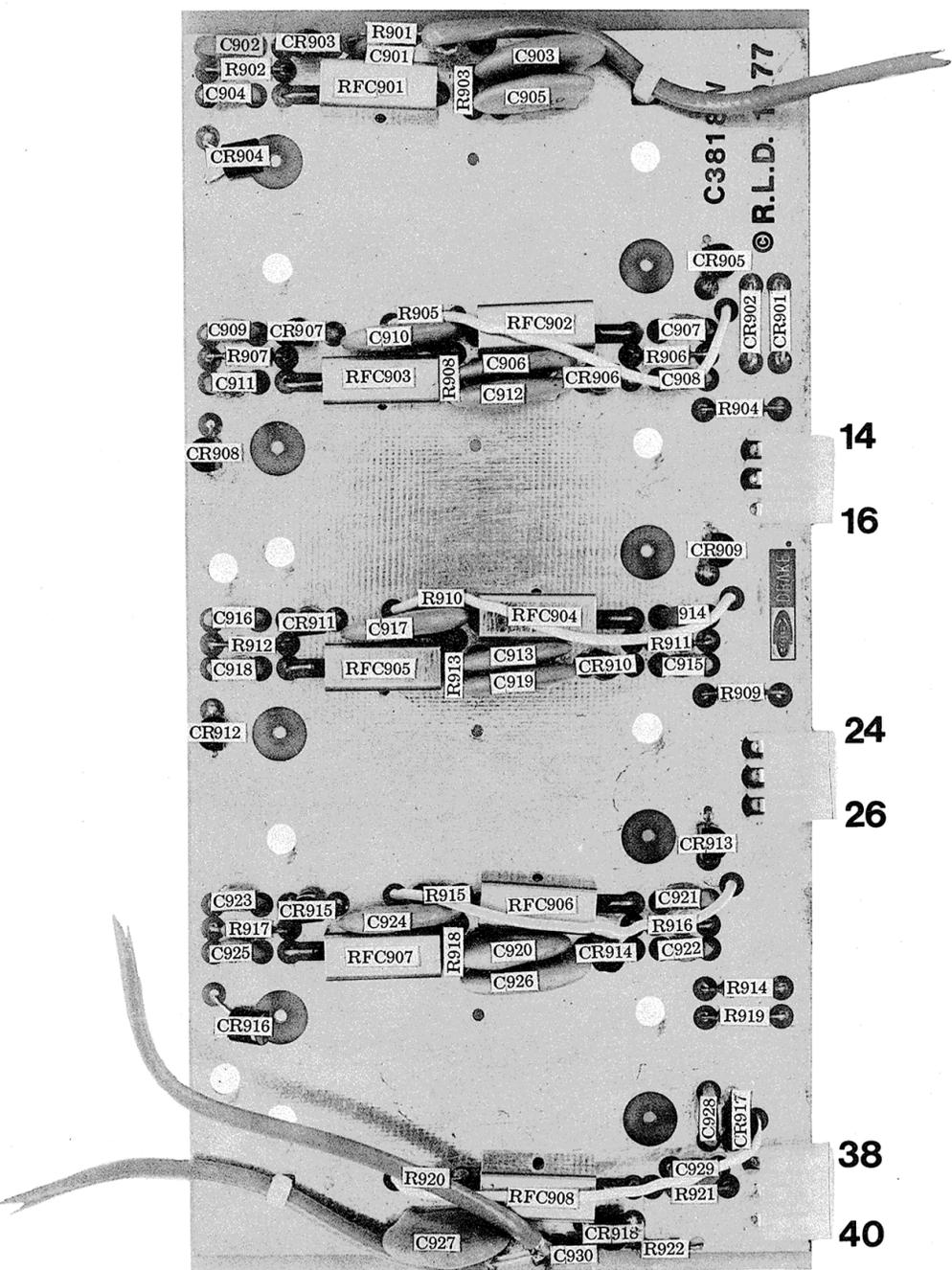


Fig. 3-22 IF Selectivity Board Pictorial

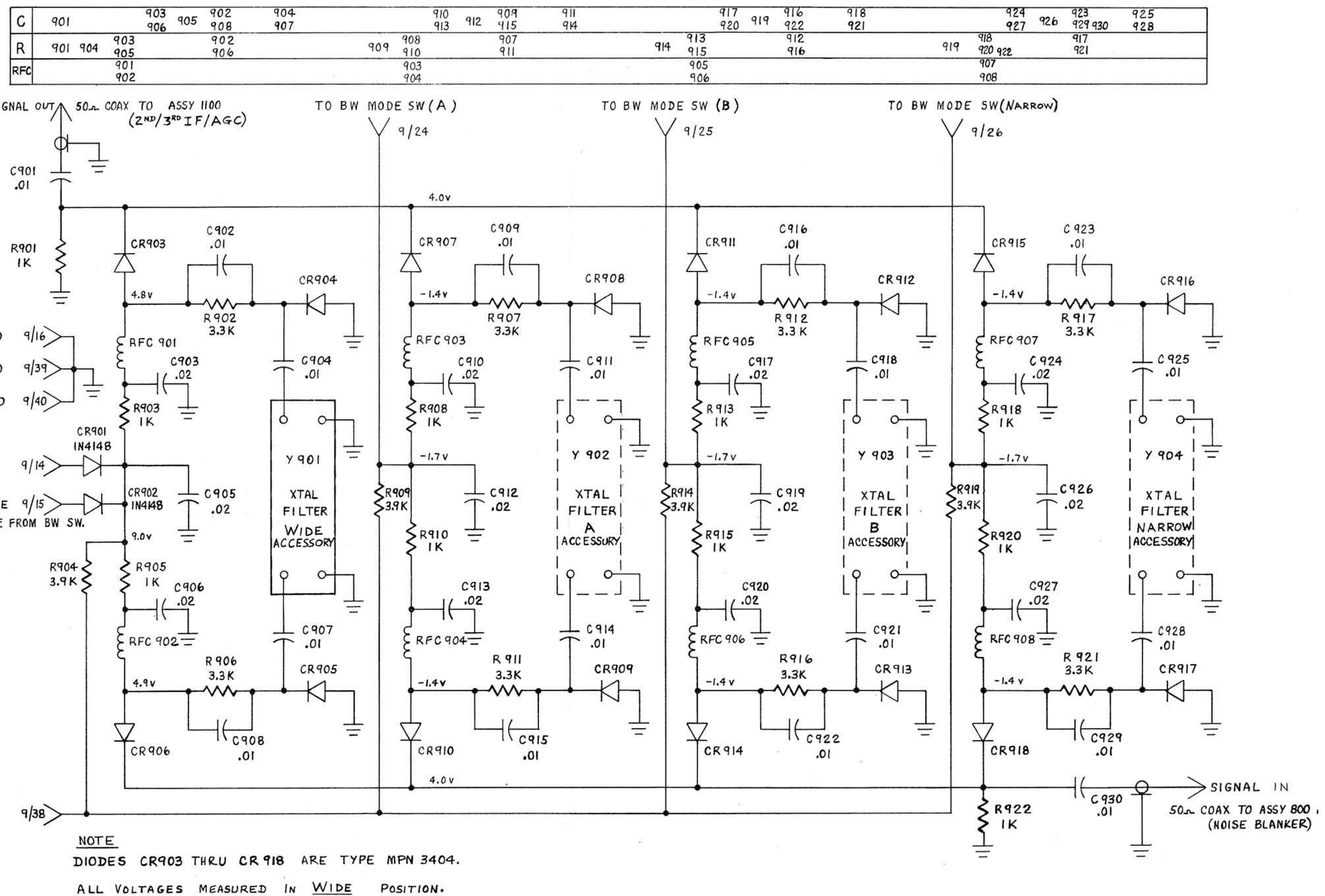


Fig. 3-23 IF Selectivity Board Schematic

3-11. PBT/REFERENCE BOARD

The Passband Tuning/Reference Board contains a 40 MHz crystal oscillator (master reference), a 13.695 MHz (nominal) VCXO and dividers to obtain 500 kHz (reference), 50 kHz (BFO) and 25 kHz (calibrator) signals. In addition, the board includes mixers to generate the 53.695 MHz 2nd L.O. and 5.695 MHz 3rd L.O. signal in addition to circuitry to accomplish the electronic passband tuning. Refer to figure 3-25 for schematic and figure 3-24 for parts location information.

Q1001 is a highly stable 40 MHz crystal oscillator. The oscillator is set to exactly 40 MHz with L1001, and is designed to maintain this adjustment over long periods of time. The output of the oscillator is buffered by Q1002 to reduce the effects of varying load impedance on frequency. The output of the buffer is tuned by L1006, and coupled through C1014 to all associated circuitry.

500 kHz for the synthesizer phase detector (Section 3-6) is derived from the 40 MHz reference by coupling the reference signal to driver transistor Q1004 through C1013. The output of Q1004 drives the +5 section of U1001, which drives U1002, a +16. At the QD output of U1002, the 500 kHz reference is obtained and is connected to board pin 10 through R1063 for use in the synthesizer, and is also routed to U1003A, 50 kHz is derived and is connected through R1030, C1029 and CR1005 to board pin 38 for use as the 50 kHz BFO signal.

When the calibrator is activated by application of 10 volts to board pin 5, Q1007 grounds the clear input, pin 14, of U1003B. This allows the +10 section of U1003A to drive the +2 section of U1003B. The result is a 25 kHz signal at the QA output of U1003B, pin 13. This 25 kHz signal is rich in harmonics and is injected into the antenna input of the receiver when the calibrator is enabled, and produces a calibration marker every 25 kHz.

10 volts is applied to board pin 35 in both SSB and CW, which enables Q1008, thus grounding the clear input, pin 2, of U1003A. In AM this 10 volts is removed, thus causing the output of Q1008 to go high, inhibiting U1003A, which removes the 50 kHz BFO for AM reception. However, when the calibra-

tor 10 volts is applied, CR1007 forward biases and applies 10 volts back onto the 10 SSB/CW line, enabling Q1008 and U1003A for proper calibrator operation. Also in AM operation, 10 volts is applied on the 50 kHz BFO line which back biases the diode switch CR1006. This blocks the BFO signal from being applied to board pin 38 when the calibrator is activated.

The 40 MHz reference signal is also coupled to a power splitter, T1001. One output of this splitter is connected to board pin 21 for use by the Translator board (Section 3-7). The other output of T1001 drives buffer stage Q1005, which boosts the signal to a sufficient level to drive one input of a double balanced mixer consisting of T1002, T1003 and CR1002 through CR1005. The second input to the mixer is the output of 13.695 MHz (nominal) VCXO. This oscillator consists of Q1009 and buffer stage Q1010. The frequency is controlled by Y1002, a 13.695 MHz crystal which is pulled approximately ± 3 kHz by a varactor, CR1001 and L1004. The varactor is controlled by a voltage derived from the front panel passband tuning control. This control will tune the VCXO from approximately 13.692 to 13.698 MHz. This control is enabled all the time.

The output of the double balanced mixer, 2nd L.O., is the sum of the reference and VCXO signals, or 53.695 MHz (nominal). The exact frequency, of course, depends on the position of the front panel passband control. This signal is filtered by L1007 and C1027 and amplified by Q1006. The output of Q1006 is tuned by L1010 and C1033. C1034 and C1035 provide a capacitive tap matching to module pin 17, thereby feeding the 53.695 MHz (nominal) signal to the 2nd Mixer board (Section 3-8).

A third L.O. of 5.695 MHz (nominal) is also generated from the 13.695 MHz (nominal) VCXO. A portion of the VCXO signal is coupled through C1040, filtered by L1005 and C1041, and is coupled through C1042 to gate 2 of Q1011, an autodyne converter. 8 MHz is coupled through C1020 and R1039 from the QC output of U1001 and applied to gate one of Q1008. The difference between 13.695 MHz (nominal), and 8 MHz is 5.695 MHz (nominal), which appears at the drain of Q1008. The output is tuned by C1046 and L1008, filtered by C1047, L1009 and C1048 then coupled to board pin 40 for connection to

the 2nd/3rd IF/AGC board (Section 3-12). R1054, R1055 and R1056 form a fixed attenuator pad for the line.

Troubleshooting of the Passband Tuning/Reference board is straightforward. The 40 MHz oscillator should be checked first, since it affects all outputs. The 13.695 MHz VCXO should be checked next, and then the autodyne converter. In any case, an analysis of which outputs are missing will isolate any problems to an individual oscillator.

Alignment of the board should be exactly in the sequence given in Section 4, which is:

1. 40 MHz Oscillator
2. 13.695 MHz (nominal) VCXO

Failure to observe this sequence will almost certainly result in improper RR3 operation due to frequency error and incorrect passband centering.

NOTES:

PBT/REFERENCE BOARD

REF DES	DESCRIPTION	PART NO.
C1001	Capacitor, Disc, .001 μ F \pm 20%, Z5U	3161380
C1002	Capacitor, Disc, .001 μ F \pm 20%, Z5U	3161380
C1003	Capacitor, Disc, .01 μ F + 80%, M25V PT	3161500
C1004	Capacitor, Mica, 50 pF \pm 5%, DM-20	3170040
C1005	Capacitor, Disc, .001 μ F \pm 20%, Z5U	3161380
C1006	Capacitor, Disc, 35 pF \pm 5%, NPO	3160730
C1007	Capacitor, Disc, .001 μ F \pm 20%, Z5U	3161380
C1008	Capacitor, Disc, 27 pF \pm 5%, NPO	3160640
C1009	Capacitor, Disc, .05 μ F + 80%, M16V	3161600
C1010	Capacitor, Disc, .001 μ F \pm 20%, Z5U	3161380
C1011	Capacitor, Disc, 10 pF \pm 5%, NPO	3160350
C1012	Capacitor, Disc, 15 pF \pm 5%, NPO	3160510
C1013	Capacitor, Mica, 220 pF \pm 5%, DM-15	3170240
C1014	Capacitor, Disc, 15 pF \pm 5%, NPO	3160510
C1015	Capacitor, Disc, .01 μ F + 80%, M25V	3161500
C1016	Capacitor, Disc, .01 μ F + 80%, M25V PT	3161500
C1017	Capacitor, Disc, .001 μ F \pm 20%, Z5U	3161380
C1018	Capacitor, Mica, 100 pF \pm 5%, DM-15	3170110
C1019	Capacitor, Disc, 330 pF \pm 10%, Y5E	3161300
C1020	Capacitor, Disc, .001 μ F \pm 20%, Z5U	3161380
C1021	Capacitor, Disc, .01 μ F \pm 20%, Z5U	3161510
C1022	Capacitor, Disc, .01 μ F \pm 20%, Z5U	3161510
C1023	Capacitor, Electrolytic, 22 μ F \pm 20%, 16 V	3180105
C1024	Capacitor, Disc, .001 μ F \pm 20%, Z5U	3161380
C1025	Capacitor, Disc, .001 μ F \pm 20%, Z5U	3161380
C1026	Capacitor, Disc, 12 pF \pm 5%, NPO	3160430
C1027	Capacitor, Mica, 68 pF \pm 5%, DM-15	3170060
C1028	Capacitor, Disc, 12 pF \pm 5%, NPO	3160430
C1029	Capacitor, Mica, 390 pF \pm 5%, DM-15	3170370
C1030	Capacitor, Disc, 100 pF \pm 10%, X5F	3161070
C1031	Capacitor, Disc, .001 μ F \pm 20%, Z5U	3161380
C1032	Capacitor, Disc, .001 μ F \pm 20%, Z5U	3161380
C1033	Capacitor, Mica, 68 pF \pm 5%, DM-15	3170060
C1034	Capacitor, Disc, 39 pF \pm 5%, NPO	3160760
C1035	Capacitor, Disc, 68 pF \pm 5%, N750	3160990
C1036	Capacitor, Disc, 180 pF \pm 5%, N1500	3161200
C1037	Capacitor, Disc, 33pF \pm 5%, N750	3160705
C1038	Capacitor, Disc, .005 μ F \pm 20%, Z5U	3161470
C1039	Capacitor, Disc, .005 μ F \pm 20%, Z5U	3161470
C1040	Capacitor, Disc, 6.2 pF \pm .25, N750	3160200
C1041	Capacitor, Disc, 51 pF \pm 5%, N750	3160860
C1042	Capacitor, Mica, 150 pF \pm 5%, DM-15	3170150
C1043	Capacitor, Disc, .1 μ F + 80%, Y5T	3161650
C1044	Capacitor, Disc, .01 μ F + 80%, M25V	3161500
C1045	Capacitor, Disc, .001 μ F \pm 20 %, Z5U	3161380
C1046	Capacitor, Mica, 220 pF \pm 5%, DM-15	3170240
C1047	Capacitor, Tubular, 4.5 pF, NPO	3185100
C1048	Capacitor, Mica, 220 pF \pm 5%, DM-15	3170240
C1049	Capacitor, Disc, 57 pF \pm 5%, NPO	3160900
C1050	Capacitor, Disc, .001 μ F \pm 20%, Z5U	3161380
C1051	Capacitor, Electrolytic, 22 μ F \pm 20%, 16 V	3180105

REF DES	DESCRIPTION	PART NO.
C1052	Capacitor, Disc, .001 μ F \pm 20%, Z5U	3161380
C1053	Capacitor, Disc, 470 pF \pm 20%, Z5U	3161350
CR1001	Diode, MV209	3020278
CR1002	Diode, 1N4148	3020090
CR1003	Diode, 1N4148	3020090
CR1004	Diode, 1N4148	3020090
CR1005	Diode, 1N4148	3020090
CR1006	Diode, 1N4148	3020090
CR1007	Diode, 1N4148	3020090
L1001	Inductor, Var., blk.	2513001
L1102	Inductor, Choke RFC	2512511
L1003	Inductor, Var., wht.	2513007
L1005	Inductor, Var., blk	2513001
L1006	Inductor, Var., yel.	2513003
L1007	Inductor, Var., vio.	2513012
L1008	Inductor, Var., grn.	2513004
L1009	Inductor, Var., grn.	2513004
L1010	Inductor, Var., vio.	2513012
L1011	Inductor, Var., blk.	2513001
Q1001	Transistor, 2N3563	3030060
Q1002	Transistor, 2N3563	3030060
Q1003	Transistor, 2N3563	3030060
Q1004	Transistor, 2N4125	3030110
Q1005	Transistor, 2N3563	3030060
Q1006	Transistor, 2N3563	3030060
Q1007	Transistor, 2N3904	3030105
Q1008	Transistor, 2N3904	3030105
Q1009	Transistor, 2N3904	3030105
Q1010	Transistor, 2N3563	3030060
Q1011	Transistor, TIS-153	3030480
Q1012	Transistor, 2N4402	3030120
R1001	Resistor, Carbon Film, 10 Ω \pm 5%, 1/4 W	3220005
R1002	Resistor, Carbon Film, 2.2 K Ω \pm 5%, 1/4 W	3220190
R1003	Resistor, Carbon Film, 27 Ω \pm 5%, 1/4 W	3220020
R1004	Resistor, Carbon Film, 18 K Ω \pm 5%, 1/4 W	3220255
R1005	Resistor, Carbon Film, 10 K Ω \pm 5%, 1/4 W	3220235
R1006	Resistor, Carbon Film, 470 Ω \pm 5%, 1/4 W	3220110
R1007	Resistor, Carbon Film, 68 Ω \pm 5%, 1/4 W	3220045
R1008	Resistor, Carbon Film, 68 Ω \pm 5%, 1/4 W	3220045
R1009	Resistor, Carbon Film, 18 K Ω \pm 5%, 1/4 W	3220255
R1010	Resistor, Carbon Film, 10 K Ω \pm 5%, 1/4 W	3220235
R1011	Resistor, Carbon Film, 10 K Ω \pm 5%, 1/4 W	3220005
R1012	Resistor, Carbon Film, 470 Ω \pm 5%, 1/4 W	3220110
R1013	Resistor, Carbon Film, 22 Ω \pm 5%, 1/4 W	3220015
R1014	Resistor, Carbon Film, 270 Ω \pm 5%, 1/4 W	3220085
R1015	Resistor, Carbon Film, 39 Ω \pm 5%, 1/4 W	3220030
R1016	Resistor, Carbon Film, 150 Ω \pm 5%, 1/4 W	3220065
R1017	Resistor, Carbon Film, 100 Ω \pm 5%, 1/4 W	3220055
R1018	Resistor, Carbon Film, 2.2 K Ω \pm 5%, 1/4 W	3220190
R1019	Resistor, Carbon Film, 8.2 K Ω \pm 5%, 1/4 W	3220230
R1020	Resistor, Carbon Film, 33 Ω \pm 5%, 1/4 W	3220025
R1021	Resistor, Carbon Film, 10 Ω \pm 5%, 1/4 W	3220005
R1022	Resistor, Carbon Film, 10 Ω \pm 5%, 1/4 W	3220005

REF DES	DESCRIPTION	PART NO.
R1023	Resistor, Carbon Film, 220 Ω \pm 5%, 1/4 W	3220075
R1024	Resistor, Carbon Film, 2.2 K Ω \pm 5%, 1/4 W	3220190
R1025	Resistor, Carbon Film, 8.2 K Ω \pm 5%, 1/4 W	3220230
R1026	Resistor, Carbon Film, 33 Ω \pm 5%, 1/4 W	3220025
R1027	Resistor, Carbon Film, 10 K Ω \pm 5%, 1/4 W	3220235
R1028	Resistor, Carbon Film, 10 K Ω \pm 5%, 1/4 W	3220235
R1029	Resistor, Carbon Film, 10 K Ω \pm 5%, 1/4 W	3220235
R1030	Resistor, Carbon Film, 15 K Ω \pm 5%, 1/4 W	3220245
R1031	Resistor, Carbon Film, 3.3 K Ω \pm 5%, 1/4 W	3220200
R1032	Resistor, Carbon Film, 3.3 Ω \pm 5%, 1/4 W	3220002
R1033	Resistor, Carbon Film, 10 Ω \pm 5%, 1/4 W	3220005
R1034	Resistor, Carbon Film, 10 K Ω \pm 5%, 1/4 W	3220235
R1035	Resistor, Carbon Film, 100 Ω \pm 5%, 1/4 W	3220055
R1036	Resistor, Carbon Film, 22 K Ω \pm 5%, 1/4 W	3220060
R1037	Resistor, Carbon Film, 10 K Ω \pm 5%, 1/4 W	3220235
R1038	Resistor, Carbon Film, 10 K Ω \pm 5%, 1/4 W	3220235
R1039	Resistor, Carbon Film, 4.7 K Ω \pm 5%, 1/4 W	3220210
R1040	Resistor, Carbon Film, 8.2 K Ω \pm 5%, 1/4 W	3220230
R1041	Resistor, Carbon Film, 10 K Ω \pm 5%, 1/4 W	3220235
R1042	Resistor, Carbon Film, 5.6 K Ω \pm 5%, 1/4 W	3220215
R1043	Resistor, Carbon Film, 470 Ω \pm 5%, 1/4 W	3220110
R1044	Resistor, Carbon Film, 180 Ω \pm 5%, 1/4 W	3220070
R1045	Resistor, Carbon Film, 5.6 K Ω \pm 5%, 1/4 W	3220215
R1046	Resistor, Carbon Film, 56 K Ω \pm 5%, 1/4 W	3220295
R1047	Resistor, Carbon Film, 470 K Ω \pm 5%, 1/4 W	3220345
R1048	Resistor, Carbon Film, 1 M Ω \pm 5%, 1/4 W	3220355
R1049	Resistor, Carbon Film, 100 Ω \pm 5%, 1/4 W	3220055
R1050	Resistor, Carbon Film, 68 Ω \pm 5%, 1/4 W	3220045
R1051	Resistor, Carbon Film, 510 Ω \pm 5%, 1/4 W	3220115
R1052	Resistor, Carbon Film, 82 Ω \pm 5%, 1/4 W	3220050
R1053	Resistor, Carbon Film, 10 Ω \pm 5%, 1/4 W	3220005
R1054	Resistor, Carbon Film, 68 Ω \pm 5%, 1/4 W	3220045
R1055	Resistor, Carbon Film, 120 Ω \pm 5%, 1/4 W	3220060
R1056	Resistor, Carbon Film, 68 Ω \pm 5%, 1/4 W	3220045
R1057	Resistor, Carbon Film, 100 K Ω \pm 5%, 1/4 W	3220315
R1058	Resistor, Carbon Film, 68 K Ω \pm 5%, 1/4 W	3220300
R1059	Resistor, Carbon Film, 47 K Ω \pm 5%, 1/4 W	3220285
R1061	Resistor, Carbon Film, 1 K Ω \pm 5%, 1/4 W	3220160
R1062	Resistor, Carbon Film, 6.8 K Ω \pm 5%, 1/4 W	3220220
R1063	Resistor, Carbon Film, 330 Ω \pm 5%, 1/4 W	3220090
R1064	Resistor, Carbon Film, 180 Ω \pm 5%, 1/4 W	3220070
R1065	Resistor, Carbon Film, 1.8 K Ω \pm 5%, 1/4 W	3220180
RFC1001	Choke Assy., 270 μ H, MUD 271	3520590
RFC1002	Choke Assy., 270 μ H, MUD 271	3520590
RFC1003	Choke Assy., 5.6 μ H, L56G	3520510
RFC1004	Choke Assy., 5.6 μ H, L56G	3620510
RFC1005	Choke Assy., 270 μ H, MUD 271	3520590
RFC1006	Choke Assy., 5.6 μ H, L56G	3520510
RFC1007	Choke Assy., 33 μ H	2512506
T1001	Inductor, Toroid	2510003
T1002	Inductor, Toroid	2510002
T1003	Inductor, Toroid	2510002
T1004	Inductor, Toroid	2510029

REF DES	DESCRIPTION	PART NO.
U1001	I.C., SN74S196N	3040471
U1002	I.C., SN75LS197	3040473
U1003	I.C., SN74LS390	3040478
Y1001	Crystal, 40.000 MHz	3120283
Y1002	Crystal, 13.695 MHz	3120282

NOTES:

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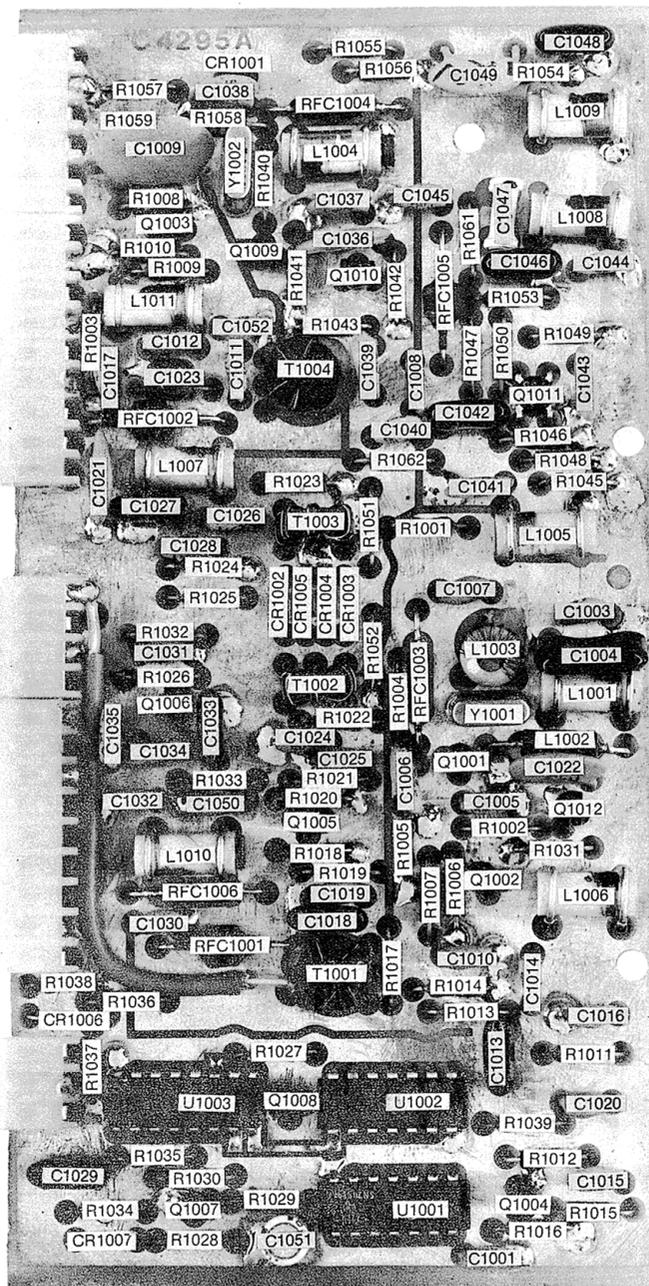
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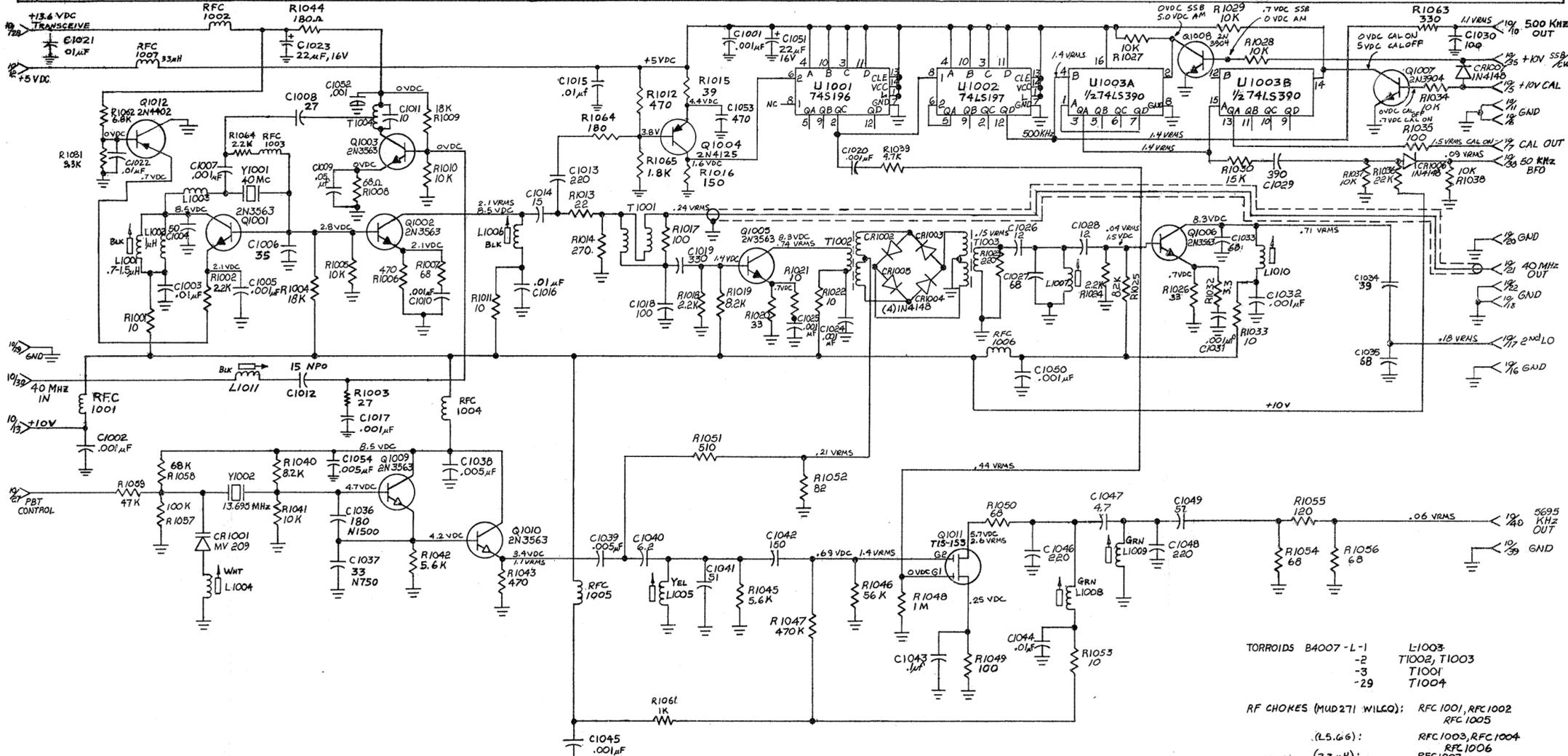
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R	1031	1032	1033	1034	1035	1036	1037	1038	1039	1040	1041	1042	1043	1044	1045	1046	1047	1048	1049	1050	1051	1052	1053	1054	1055	1056	1057	1058	1059	1060
G	1021	1022	1023	1024	1025	1026	1027	1028	1029	1030	1031	1032	1033	1034	1035	1036	1037	1038	1039	1040	1041	1042	1043	1044	1045	1046	1047	1048	1049	1050
L	1001	1002	1003	1004	1005	1006	1007	1008	1009	1010	1011	1012	1013	1014	1015	1016	1017	1018	1019	1020	1021	1022	1023	1024	1025	1026	1027	1028	1029	1030



HIGHEST NUMBERED COMPONENT

Q-1054	CR-1007
R-1045	U-1003
Q-1012	Y-1002
T-1004	RFC-1007
L-1012	

ALL RESISTORS IN OHMS, UNLESS SPECIFIED OTHERWISE
ALL CAPACITORS IN PF, UNLESS SPECIFIED OTHERWISE

- TORROIDS B4007-L-1
 - 2 L1003
 - 3 T1002, T1003
 - 29 T1001
 - T1004
- RF CHOKES (MUD271 WILCO): RFC1001, RFC1002, RFC1005
- (L5.G6): RFC1003, RFC1004, RFC1006, RFC1007
- COILS: (33μH): A2505-L-1 L1001, L1005, L1011
A2505-L-3 L1006
A2505-L-4 L1008, L1009
A2505-L-7 L1004
A2505-L-12 L1007, L1010
A3315-L-1 L1002

Fig. 3-25 PBT/Reference Board Schematic

3-12. 2ND/3RD IF/AGC BOARD

The 2nd/3rd IF/AGC Board provides AGC controlled 5.645 MHz gain, signal conversion to 50 kHz IF, notch filtering, signal demodulation and S-meter functions. It also includes the standard 2.3 kHz, 8-pole IF crystal filter and corresponding circuitry. See figure 3-27 for schematic and figure 3-26 for parts location information.

The 5.645 MHz 2nd IF signals from the output of the IF Jumper board (common with input to the IF Selectivity board) are connected to the input coax connector at C1102. With the front panel Selectivity switch set at NORMAL (2.3 kHz) +10V is present on module pin 7. This voltage turns on series diodes CR1103 (via R1190, RFC1104 and R1109) and CR1113 (via R1189, RFC1103 and R1191). The same voltage back biases shunt diodes CR1111 and CR1112. The signal path is through C1102, CR1103, C1164, C1161 to the 2.3 kHz filter. After filtering, the signal is coupled through C1160, C1162, CR1113 and C1167 to the primary of T1101. With the front panel selectivity switch set at any position other than NORMAL, the 5.645 MHz 2nd IF signals from the output of the IF Selectivity board are connected to the input coax connector at T1101.

Regardless of the selectivity filter signal path, T1101 matches the input signal to the first stage of amplification, Q1101. The output of Q1101 is tuned by L1101 and coupled to the input of the second stage of gain, Q1102, through C1110. The output of Q1102 is tuned by L1102 and coupled to the input of the 3rd mixer, Q1193, through C1120. The injection for the mixer is a 5.695 MHz (nominal) signal which is developed on the PBT board (Section 3-11) and amplified by Q1109 and tuned by L1105. It is then coupled through C1135 to gate 2 of Q1103. The output of Q1103 is tuned to 50 kHz by L1103 and applied to the notch filter circuitry. The mixer conversion gain is adjusted by R1138. The notch filter employs an operational amplifier, U1101, in a differential amplifier configuration. For signal frequencies other than the parallel resonant frequency of the circuit comprised of L1104, C1133, CR1108 and CR1109, the voltage gain from the output of Q1103 to pin 6 of U1101 is approximately two. However, at the resonant notch frequency, the signal level appearing at pin 2 of U1101 is exactly equal to that level appearing at pin 3. The voltage gain in that case is zero, thus producing the null. CR1108 and CR1109 are varactor diodes whose capacitance is

adjusted by DC voltage. L1104 is adjustable to allow for centering of the front panel notch control when the 3rd IF frequency is 50 kHz. R1147 adjusts the circuit gain to insure the best possible signal null at resonance. The output of the notch filter is coupled to gate one of Q1104 through C1134 and R1154. With the receiver operational, module pin 22 is a switched ground, thus allowing drain current to flow. Amplifier gain is approximately 20 dB in this case. When the receiver is muted, ground is removed from module pin 22, reducing amplifier gain to zero. The output of Q1104 is tuned to 50 kHz by T1102, with a sampling of the signal sent to the AGC detector and the transformer secondary driving the AM and product detectors.

Thus AGC is developed prior to detection by sampling the output of Q1104 through R1145 and C1125. This signal is applied to the base of Q1105 which is biased to a point just below conduction. As the output of Q1104 increases (with increasing signal input to the receiver), Q1105 starts to conduct, applying AGC voltage to the gates of Q1101 and Q1102. Stronger input signals cause Q1105 to conduct harder, thus developing a higher AGC voltage. This action holds the output of Q1104 essentially constant, which controls the drive to the detectors, holding the audio output of the receiver to a constant level.

AGC release time constants are controlled by switching in resistor-capacitor networks consisting of R18-C1 (Parent Board mounted), R17-C2 (Parent Board mounted), R1121-C1113 and R1139-C1119 via the front panel AGC pushbutton switches. In SLOW AGC, the discharging of C1 and C2 through R1133 determines the release time. In MEDIUM AGC, the discharging of C1113 and C1119 through R1133 determines the release time. In FAST AGC, the discharging of C1114 and C1118 through R1133 determines the release time. Diodes CR1104 and CR1105 provide a slight amount of hysteresis to the AGC line to prevent the developed AGC voltage from following the audio envelope present at the detector, Q1105. In the AGC OFF mode, all networks determining decay time are shorted out and diodes CR1114 through CR1116 clamp the AGC line. IF gain is controlled solely by the front panel RF GAIN control in this mode. A sample of the AGC voltage is coupled through R1111 to control the gain of the first IF amplifier (Section 3-8). In addition, the control

signal is coupled through R1120 to a source follower, Q1106, to drive the S-meter. R1106 is used to set +60 over S9 meter indication and R1119 is used to establish the S-meter no signal indication. A small pedestal voltage is set by R1127 to allow the receiver to run a maximum gain under no signal conditions. Adjustment of these controls is described in the alignment procedure (Section 4). It is important to follow the exact sequence of adjustments to avoid improper AGC operation.

The secondary of T1102 couples signal through C1156 to the signal input ports of balanced demodulator, U1102, and through C1159-R1193 to an amplifier stage, Q1107. In the SSB/CW mode, amplifier stage Q1107 is turned off, but Q1108 amplifies the 50

kHz BFO signal (present at module pin 38) to a level sufficient to drive the carrier ports of U1102. The demodulated audio appears at U1102, pin 12, and is amplified by Q1110 and coupled out to module pin 31 through C1147. In the AM mode, +10V appears at module pin 37, enabling Q1107 and back biasing diode CR1006 (located on PBT Board) to block any residual BFO from the PBT Board. The AM signal is routed through C1156 to U1102 signal port, and is also amplified by Q1107 and Q1108 to a level sufficient to drive the carrier ports of U1102. As in SSB/CW, the AM demodulated audio appears at U1102 pin 12.

Alignment of the 2nd/3rd IF/AGC Board is covered in Section 4.

NOTES:

2ND/3RD IF/AGC BOARD

REF DES	DESCRIPTION	PART NO.
C1101	Capacitor, Disc, .001 μ F \pm 20%, Z5U	3161380
C1102	Capacitor, Disc, .01 μ F \pm 80%, M25V	3161500
C1103	Capacitor, Mica, 330 pF \pm 5%, DM-15	3170320
C1104	Capacitor, Disc, 470 pF \pm 20%, Z5U	3161350
C1105	Capacitor, Disc, .005 μ F \pm 20%, Z5U	3161470
C1106	Capacitor, Tantalum, 10 μ F \pm 20%, 25V	3183030
C1107	Capacitor, Disc, .01 μ F \pm 20%, Z5U	3161520
C1108	Capacitor, Disc, .01 μ F \pm 20%, Z5U	3161520
C1109	Capacitor, Disc, .005 μ F \pm 20%, Z5U	3161470
C1110	Capacitor, Disc, 470 pF \pm 20%, Z5U	3161350
C1111	Capacitor, Mica, 390 pF \pm 5%, DM-15	3170370
C1112	Capacitor, Disc, .001 μ F \pm 20%, Z5U	3161380
C1113	Capacitor, Disc, .05 μ F \pm 80%, Z5U	3161630
C1114	Capacitor, Disc, .005 μ F \pm 20%, Z5U	3161470
C1115	Capacitor, Disc, .01 μ F \pm 20%, Z5U	3161520
C1116	Capacitor, Tantalum, 10 μ F \pm 20%, 25V	3183030
C1117	Capacitor, Mica, 390 pF \pm 5%, DM-15	3170370
C1118	Capacitor, Disc, .005 μ F \pm 20%, Z5U	3161470
C1119	Capacitor, Disc, .05 μ F \pm 80%, Z5U	3161630
C1120	Capacitor, Disc, 470 pF \pm 20%, Z5U	3161350
C1121	Capacitor, Mica, .05 μ F \pm 80%, Z5U	3161630
C1122	Capacitor, Disc, .1 μ F \pm 20%, 16 V	3161680
C1123	Capacitor, Disc, .0024 μ F \pm 20%, Z5U	3161430
C1124	Capacitor, Tantalum, 1.0 μ F \pm 20%, 35 V	3183010
C1125	Capacitor, Disc, .01 μ F \pm 20%, Z5U	3161520
C1126	Capacitor, Tantalum, 1 μ F \pm 20%, 35 V	3183010
C1127	Capacitor, Mica, 220 pF \pm 5%, DM-15	3170240
C1128	Capacitor, Disc, .005 μ F \pm 20%, Z5U	3161470
C1129	Capacitor, Tantalum, 1 μ F \pm 20%, 35 V	3183010
C1130	Capacitor, Tantalum, 1 μ F \pm 20%, 35 V	3183010
C1131	Capacitor, Tantalum, 10 μ F \pm 20%, 25 V	3183030
C1132	Capacitor, Mica, 180 pF \pm 5%, DM-15	3170180
C1133	Capacitor, Mica, 390 pF \pm 5%, DM-15	3170370
C1134	Capacitor, Disc, .005 μ F \pm 20%, Z5U	3161470
C1135	Capacitor, Disc, .01 μ F \pm 20%, Z5U	3161520
C1136	Capacitor, Mica, 180 pF \pm 5%, DM-15	3170180
C1137	Capacitor, Mica, 180 pF \pm 5%, DM-15	3170180
C1138	Capacitor, Disc, .01 μ F \pm 20%, Z5U	3161520
C1139	Capacitor, Disc, .01 μ F \pm 20%, Z5U	3161520
C1140	Capacitor, Disc, .01 μ F \pm 20%, Z5U	3161520
C1141	Capacitor, Disc, .01 μ F \pm 20%, Z5U	3161520
C1142	Capacitor, Disc, .01 μ F \pm 20%, Z5U	3161520
C1143	Capacitor, Electrolytic, 10 μ F \pm 20%, 25 V	3180062
C1144	Capacitor, Electrolytic, 10 μ F \pm 20%, 25V	3180062
C1145	Capacitor, Disc, .01 μ F \pm 20%, Z5U	3161520
C1146	Capacitor, Tantalum, 22 μ F \pm 20%, 15 V	3183050
C1147	Capacitor, Tantalum, .47 μ F \pm 10%, 35 V	3183110
C1148	Capacitor, Disc, .005 μ F \pm 20%, Z5U	3161470
C1149	Capacitor, Disc, .005 μ F \pm 20%, Z5U	3161470
C1150	Capacitor, Tantalum, 1 μ F \pm 20%, 35 V	3183110
C1151	Capacitor, Disc, .01 μ F \pm 20%, Z5U	3161520
C1152	Capacitor, Disc, .01 μ F \pm 20%, Z5U	3161520
C1153	Capacitor, Disc, .05 μ F \pm 80%, Z5U	3161630
C1154	Capacitor, Tantalum, 1 μ F \pm 20%, 35 V	3183010
C1155	Capacitor, Disc, .02 μ F \pm 80%, Z5U	3161580

REF DES	DESCRIPTION	PART NO.
C1156	Capacitor, Disc, .05 μ F + 80%, Z5U	3161630
C1157	Capacitor, Disc, .01 μ F \pm 20%, Z5U	3161520
C1158	Capacitor, Disc, .01 μ F \pm 20%, Z5U	3161520
C1159	Capacitor, Disc, .005 μ F \pm 20%, Z5U	3161470
C1160	Capacitor, Disc, .01 μ F + 80%, M25V	3161500
C1161	Capacitor, Disc, .01 μ F + 80%, M25V	3161500
C1162	Capacitor, Disc, .01 μ F + 80%, M25V	3161500
C1163	Capacitor, Disc, .02 μ F + 80%, Z5U	3161580
C1164	Capacitor, Disc, .01 μ F + 80%, M25V	3161500
C1165	Capacitor, Disc, .02 μ F + 80%, Z5U	3161580
C1166	Capacitor, Disc, .02 μ F + 80%, Z5U	3161580
C1167	Capacitor, Disc, .01 μ F + 80%, M25V	3161500
C1168	Capacitor, Disc, .005 μ F \pm 20%, Z5U	3161470
CR1101	Diode, 1N4148	3020090
CR1102	Diode, 1N4148	3020090
CR1103	Diode, MPN3404	3020265
CR1104	Diode, 1N4148	3020090
CR1105	Diode, 1N4148	3020090
CR1106	Diode, 1N4148	3020090
CR1107	Diode, 1N4148	3020090
CR1108	Diode, MVAM-109	3020272
CR1109	Diode, MVAM-109	3020272
CR1110	Diode, 1N4148	3020090
CR1111	Diode, MPN3404	3020265
CR1112	Diode, MPN3404	3020265
CR1113	Diode, MPN3404	3020265
CR1114	Diode, 1N4148	3020090
CR1115	Diode, 1N4148	3020090
CR1116	Diode, 1N4148	3020090
L1101	Inductor, Variable Can	2511021
L1102	Inductor, Variable Can	2511021
L1103	Inductor, Variable Can, IF Xfmr.	2511061
L1104	Inductor, Variable Can	2511030
L1105	Inductor, Variable	2513004
Q1101	Transistor, TIS-153	3030480
Q1102	Transistor, TIS-153	3030480
Q1103	Transistor, TIS-153	3030480
Q1104	Transistor, TIS-153	3030480
Q1105	Transistor, 2N4402	3030120
Q1106	Transistor, TIS-153	3030480
Q1107	Transistor, 2N3904	3030105
Q1108	Transistor, 2N3904	3030105
Q1109	Transistor, 2N3904	3030105
Q1110	Transistor, 2N3904	3030105
R1101	Resistor, Carbon Film, 1 K Ω \pm 5%, 1/4 W	3220160
R1102	Resistor, Carbon Film, 6.8 K Ω \pm 5%, 1/4 W	3220220
R1103	Resistor, Carbon Film, 22 K Ω \pm 5%, 1/4 W	3220260
R1104	Resistor, Carbon Film, 27 Ω \pm 5%, 1/4 W	3220020
R1105	Resistor, Carbon Film, 470 K Ω \pm 5%, 1/4 W	3220345
R1106	Resistor, Variable, 10 K Ω	3260665
R1107	Resistor, Carbon Film, 2.2 K Ω \pm 5%, 1/4 W	3220190
R1108	Resistor, Carbon Film, 820 Ω \pm 5%, 1/4 W	3220145
R1109	Resistor, Carbon Film, 1 K Ω \pm 5%, 1/4 W	3220160
R1110	Resistor, Carbon Film, 68 Ω \pm 5%, 1/4 W	3220045
R1111	Resistor, Carbon Film, 2.2 M Ω \pm 5%, 1/4 W	3220360
R1112	Resistor, Carbon Film, 100 Ω \pm 5%, 1/4 W	3220055
R1113	Resistor, Carbon Film, 22 K Ω \pm 5%, 1/4 W	3220260

REF DES	DESCRIPTION	PART NO.
R1114	Resistor, Carbon Film, 1 K Ω \pm 5%, 1/4 W	3220160
R1115	Resistor, Carbon Film, 470 K Ω \pm 5%, 1/4 W	3220345
R1116	Resistor, Carbon Film, 22 K Ω \pm 5%, 1/4 W	3220260
R1117	Resistor, Carbon Film, 27 Ω \pm 5%, 1/4 W	3220020
R1118	Resistor, Carbon Film, 1 K Ω \pm 5%, 1/4 W	3220160
R1119	Resistor, Variable, 500 Ω	3260650
R1120	Resistor, Composition, 10 M Ω \pm 10%, 1/4 W	3220380
R1121	Resistor, Carbon Film, 180 K Ω \pm 5%, 1/4 W	3220325
R1122	Resistor, Carbon Film, 820 Ω \pm 5%, 1/4 W	3220145
R1123	Resistor, Carbon Film, 6.8 K Ω \pm 5%, 1/4 W	3220220
R1124	Resistor, Carbon Film, 1 M Ω \pm 5%, 1/4 W	3220355
R1125	Resistor, Carbon Film, 68 Ω \pm 5%, 1/4 W	3220045
R1126	Resistor, Carbon Film, 150 Ω \pm 5%, 1/4 W	3220065
R1127	Resistor, Variable, 5 K Ω	3220660
R1128	Resistor, Carbon Film, 2.2 M Ω \pm 5%, 1/4 W	3220360
R1129	Resistor, Carbon Film, 180 K Ω \pm 5%, 1/4 W	3220325
R1130	Resistor, Carbon Film, 1 M Ω \pm 5%, 1/4 W	3220355
R1131	Resistor, Carbon Film, 470 K Ω \pm 5%, 1/4 W	3220345
R1132	Resistor, Carbon Film, 56 K Ω \pm 5%, 1/4 W	3220295
R1133	Resistor, Carbon Film, 10 M Ω \pm 10%, 1/4 W	3220380
R1134	Resistor, Carbon Film, 15 K Ω \pm 5%, 1/4 W	3220245
R1135	Resistor, Carbon Film, 1 K Ω \pm 5%, 1/4 W	3220160
R1136	Resistor, Carbon Film, 68 Ω \pm 5%, 1/4 W	3220045
R1137	Resistor, Carbon Film, 680 Ω \pm 5%, 1/4 W	3220140
R1138	Resistor, Variable, 10 K Ω	3260665
R1139	Resistor, Carbon Film, 33 K Ω \pm 5%, 1/4 W	3220275
R1140	Resistor, Carbon Film, 10 K Ω \pm 5%, 1/4 W	3220235
R1141	Resistor, Carbon Film, 47 K Ω \pm 5%, 1/4 W	3220285
R1142	Resistor, Composition, 10 M Ω \pm 10%, 1/4 W	3220380
R1143	Resistor, Carbon Film, 150 Ω \pm 5%, 1/4 W	3220065
R1144	Resistor, Carbon Film, 150 Ω \pm 5%, 1/4 W	3220065
R1145	Resistor, Carbon Film, 22 K Ω \pm 5%, 1/4 W	3220260
R1146	Resistor, Carbon Film, 68 K Ω \pm 5%, 1/4 W	3220300
R1147	Resistor, Variable, 20 K Ω	3260140
R1148	Resistor, Carbon Film, 680 K Ω \pm 5%, 1/4 W	3220350
R1149	Resistor, Carbon Film, 470 Ω \pm 5%, 1/4 W	3220110
R1150	Resistor, Carbon Film, 220 Ω \pm 5%, 1/4 W	3220075
R1151	Resistor, Carbon Film, 22 K Ω \pm 5%, 1/4 W	3220260
R1152	Resistor, Carbon Film, 470 K Ω \pm 5%, 1/4 W	3220345
R1153	Resistor, Carbon Film, 100 K Ω \pm 5%, 1/4 W	3220315
R1154	Resistor, Carbon Film, 22 K Ω \pm 5%, 1/4 W	3220260
R1155	Resistor, Carbon Film, 150 K Ω \pm 5%, 1/4 W	3220320
R1156	Resistor, Carbon Film, 220 K Ω \pm 5%, 1/4 W	3220330
R1157	Resistor, Carbon Film, 3.3 Ω \pm 5%, 1/4 W	3220002
R1158	Resistor, Carbon Film, 4.7 K Ω \pm 5%, 1/4 W	3220210
R1159	Resistor, Carbon Film, 100 Ω \pm 5%, 1/4 W	3220055
R1160	Resistor, Carbon Film, 22 K Ω \pm 5%, 1/4 W	3220260
R1161	Resistor, Carbon Film, 8.2 K Ω \pm 5%, 1/4 W	3220230
R1162	Resistor, Carbon Film, 47 Ω \pm 5%, 1/4 W	3220035
R1163	Resistor, Carbon Film, 3.3 K Ω \pm 5%, 1/4 W	3220200
R1164	Resistor, Carbon Film, 10 K Ω \pm 5%, 1/4 W	3220235
R1165	Resistor, Carbon Film, 100 Ω \pm 5%, 1/4 W	3220055
R1166	Resistor, Carbon Film, 1.5 K Ω \pm 5%, 1/4 W	3220175
R1167	Resistor, Carbon Film, 3.3 K Ω \pm 5%, 1/4 W	3220200
R1168	Resistor, Carbon Film, 47 K Ω \pm 5%, 1/4 W	3220285
R1169	Resistor, Carbon Film, 4.7 K Ω \pm 5%, 1/4 W	3220210
R1170	Resistor, Carbon Film, 1.2 K Ω \pm 5%, 1/4 W	3220170

REF DES	DESCRIPTION	PART NO.
R1171	Resistor, Carbon Film, 4.7 K Ω \pm 5%, 1/4 W	3220210
R1172	Resistor, Carbon Film, 1 K Ω \pm 5%, 1/4 W	3220160
R1173	Resistor, Carbon Film, 4.7 K Ω \pm 5%, 1/4 W	3220210
R1174	Resistor, Carbon Film, 820 Ω \pm 5%, 1/4 W	3220145
R1175	Resistor, Carbon Film, 1 K Ω \pm 5%, 1/4 W	3220160
R1176	Resistor, Carbon Film, 4.7 K Ω \pm 5%, 1/4 W	3220210
R1177	Resistor, Carbon Film, 1 K Ω \pm 5%, 1/4 W	3220160
R1178	Resistor, Carbon Film, 4.7 K Ω \pm 5%, 1/4 W	3220210
R1179	Resistor, Carbon Film, 1.5 K Ω \pm 5%, 1/4 W	3220175
R1180	Resistor, Carbon Film, 100 Ω \pm 5%, 1/4 W	3220055
R1181	Resistor, Carbon Film, 47 K Ω \pm 5%, 1/4 W	3220285
R1182	Resistor, Carbon Film, 4.7 K Ω \pm 5%, 1/4 W	3220210
R1183	Resistor, Carbon Film, 1.5 K Ω \pm 5%, 1/4 W	3220175
R1184	Resistor, Carbon Film, 270 Ω \pm 5%, 1/4 W	3220085
R1185	Resistor, Carbon Film, 47 K Ω \pm 5%, 1/4 W	3220285
R1186	Resistor, Carbon Film, 10 K Ω \pm 5%, 1/4 W	3220235
R1187	Resistor, Carbon Film, 3.3 K Ω \pm 5%, 1/4 W	3220200
R1188	Resistor, Carbon Film, 3.3 K Ω \pm 5%, 1/4 W	3220200
R1189	Resistor, Carbon Film, 1 K Ω \pm 5%, 1/4 W	3220160
R1190	Resistor, Carbon Film, 1 K Ω \pm 5%, 1/4 W	3220160
R1191	Resistor, Carbon Film, 1 K Ω \pm 5%, 1/4 W	3220160
R1192	Resistor, Carbon Film, 3.9 K Ω \pm 5%, 1/4 W	3220205
R1193	Resistor, Carbon Film, 1.8 K Ω \pm 5%, 1/4 W	3220180
RFC1101	Choke, 270 μ H, MUD271	3520590
RFC1102	Choke, 270 μ H, MUD271	3520590
RFC1103	Choke, 270 μ H, MUD271	3520590
RFC1104	Choke, 270 μ H, MUD271	3520590
T1101	Transformer, Input	2511041
T1102	Transformer, Output	2511050
U1101	I.C., MC1741S-CPI	3040101
U1102	I.C., MC1496P	3040112
Y1101	Crystal Filter, 2.3 kHz, 8 Pole	3140280

NOTES:

3-13. JUMPER BOARD

The Jumper Board consists of 2 CMOS integrated circuits, U1201 and U1202. These IC's are high current hex buffers. They buffer the CMOS output levels of the Digital Control board which in turn drives the Translator Board. Note the input code (12 pin

connector) should be the same as the output code (9 pin connector). However, the output pin directly across from the input is not necessarily the same code bit. See figure 3-29 for schematic and figure 3-28 for parts location information.

NOTES:

NOTES:

JUMPER BOARD

REF DES	DESCRIPTION	PART NO.
C1201	Capacitor, Disc, .01 μ F + 80%, M25V	3161500
R1201	Resistor, Carbon Film, 100 K Ω \pm 5%, 1/4 W	3220315
R1202	Resistor, Carbon Film, 100 K Ω \pm 5%, 1/4 W	3220315
R1203	Resistor, Carbon Film, 100 K Ω \pm 5%, 1/4 W	3220315
R1204	Resistor, Carbon Film, 100 K Ω \pm 5%, 1/4 W	3220315
R1205	Resistor, Carbon Film, 100 K Ω \pm 5%, 1/4 W	3220315
R1206	Resistor, Carbon Film, 100 K Ω \pm 5%, 1/4 W	3220315
R1207	Resistor, Carbon Film, 100 K Ω \pm 5%, 1/4 W	3220315
R1208	Resistor, Carbon Film, 100 K Ω \pm 5%, 1/4 W	3220315
U1201	I.C., MC14050B	3041050
U1202	I.C., MC14050B	3041050

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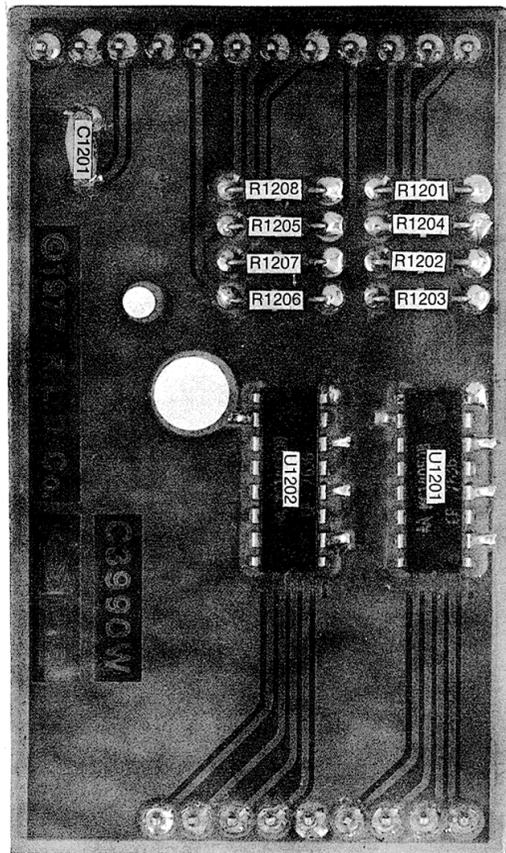


Fig. 3-28 Jumper Board Pictorial

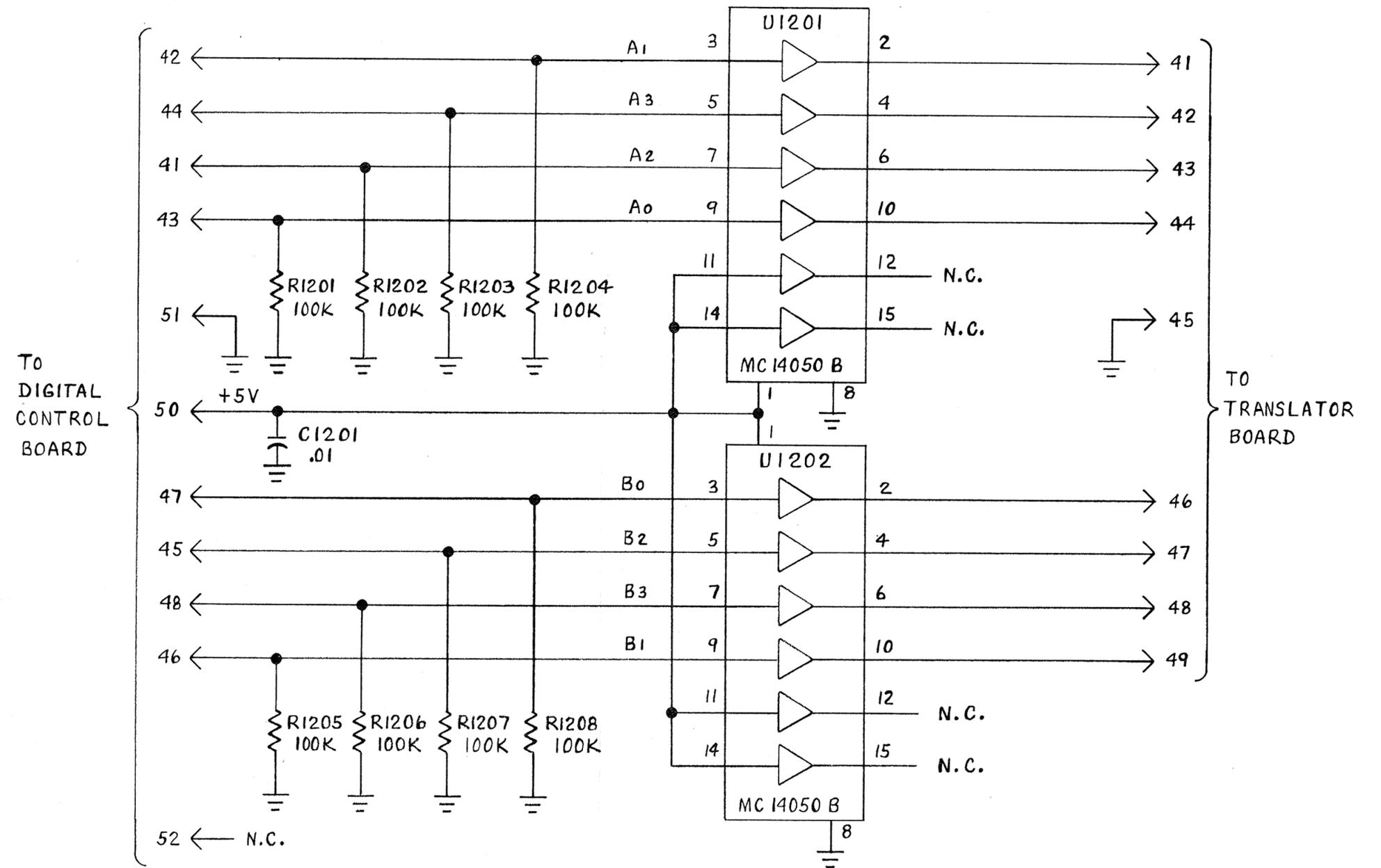


Fig. 3-29 Jumper Board Schematic

3-14. BANDPASS FILTER MODULE

The Bandpass Filter module consists of four printed circuit boards; a front switch board (assy. 1300), a rear switch board (assy. 1400), a BAND 1-6 filter board (assy. 1500), and a BAND 7-11 filter board (assy. 1600). Refer to figure 3-34 for schematic and figures 3-30 through 3-33 for parts location information.

The rear switch board accepts signals from the RP700 receiver protector and routes them through C1401 (front) to one of ten filters. S1401 is positioned by the bandswitch shaft. S1401 (rear) provides a momentary ground impulse for band change information to the DR7. Also mounted to this board assembly is S1402 (front and rear) which provides binary coded information to the Digital Control board (Section 3-3). S1402 is also positioned by the bandswitch shaft.

On the front switch board, S1301 (front) connects to one of ten filters and routes the signal through the normally closed relay contacts of K1301 and through C1303 to the Up-Converter module (Section 3-5). The preamplifier is enabled by applying +13.8 VDC to the relay when a DC current path to ground is supplied through R1303, S1301 (front) and first coil encountered in bandpass filters 4-11. Thus the preamp is disabled on bands 1-3 by C1532 and C1533. With K1301 energized, a signal routed through S1301 and through one pole of K1301, normally open contacts, is applied to the base of Q1302, amplified and sent through C1307 and second pole of normally open contacts to C1303 and Up-Converter input.

The 25 kHz calibrator signal, applied electrically following the preamp, is connected to the Up-Converter input via switching diodes CR1301 and CR1302 in the calibrate mode, S1301 (rear) provides +10 VDC to the LO VCO line for frequencies below 15 MHz (Bands 1-9). For the two bandswitch positions above 15 MHz, +10 VDC is switched to the HI VCO line and removed from the LO VCO line.

Bands 1-6 filter board (assy. 1500) contains five filters. Each filter corresponds to one bandswitch position except for Bands 2 and 3 (0.5-1.5 MHz), which share one filter. Filters on bands 1 and 2-3 are of the

lowpass variety. On band 2-3 filter, R1502 may be adjusted for increased filter loss to eliminate any AM broadcast interference that may occur.

Bands 7-11 filter board (assy 1600) contains five bandpass filters. Each filter corresponds to one bandswitch position. The approximate cut-off frequencies of the ten filters are:

BAND	FREQUENCY RANGE	CUT-OFF FREQUENCIES	
		LOWER	UPPER
1	10 kHz - 0.5 MHz	-	0.5 MHz
2 & 3	0.5 MHz - 1.5 MHz	-	1.65 MHz
4	1.5 MHz - 2.0 MHz	1.75 MHz	2.2 MHz
5	2.0 MHz - 3.0 MHz	2.0 MHz	3.0 MHz
6	3.0 MHz - 4.5 MHz	2.8 MHz	4.8 MHz
7	4.5 MHz - 7.0 MHz	4.4 MHz	7.5 MHz
8	7.0 MHz - 10.0 MHz	6.9 MHz	10.3 MHz
9	10.0 MHz - 15.0 MHz	9.8 MHz	16.0 MHz
10	15.0 MHz - 22.0 MHz	14.5 MHz	23.0 MHz
11	22.0 MHz - 30.0 MHz	21.0 MHz	30.5 MHz

Note that the lower cut-off frequency of the band 4 filter is above the lowest frequency of interest. This is necessary to provide sufficient rejection to strong AM broadcast signals which can create interfering intermodulation products in the 160 meter amateur band. As a result, sensitivity may be degraded below 1.75 MHz in this bandswitch position.

Removal of the Bandpass Filter Module is accomplished by removing the bandswitch shaft and unsoldering the wires connected to the front and rear switch board assemblies. Be sure to label each lead so that it can be correctly reinstalled. Remove the two screws holding the bandswitch detent in the rear panel. Loosen the rear setscrew in the bandswitch coupler. Then slide the switch shaft straight back until it clears the front and rear switch wafers. The module must then be slid toward the side of the radio so that the rubber grommet in assembly 1500 slides off of the locating metal standoff. The module can then be pulled up out the top of the chassis. Reverse this procedure to install the module. Be sure to orient the notch in the switch wafers in the proper direction when reinstalling the bandswitch shaft. In addition, do not force the switch shaft into the rotor or damage will result.

The above procedure is somewhat time-consuming, and it is recommended only in those cases that absolutely require removal of the module. Note that most repairs can be accomplished in the radio, due to the

open construction.

The Bandpass Filter Module does not require alignment.

NOTES:

BAND PASS FL. SW., FRONT

REF DES	DESCRIPTION	PART NO.
C1301	Capacitor, Disc, 330 pF \pm 10%, Y5E	3161300
C1302	Capacitor, Disc, .001 μ F \pm 20%, Z5U	3161370
C1303	Capacitor, Disc, .05 μ F + 80%, Z5U	3161630
C1304	Capacitor, Disc, .005 μ F \pm 20%, Z5U	3161460
C1305	Capacitor, Disc, .005 μ F \pm 20%, Z5U	3161460
C1306	Capacitor, Disc, .005 μ F \pm 20%, Z5U	3161460
C1307	Capacitor, Disc, .005 μ F \pm 20%, Z5U	3161460
C1308	Capacitor, Disc, 47 pF \pm 5%, NPO	3160840
CR1301	Diode, MPN3404	3020265
CR1302	Diode, MPN3404	3020265
CR1303	Diode, IN4005/B5G5	3020220
K1302	Relay, DPDT	3620110
L1301	Inductor, Toroid	2510030
Q1301	Transistor, 2N4125	3030110
Q1302	Transistor, 2N5109	3030137
R1301	Resistor, Carbon Film, 1 K Ω \pm 5%, 1/4 W	3220160
R1302	Resistor, Carbon Film, 1 K Ω \pm 5%, 1/4 W	3220160
R1303	Resistor, Carbon Film, 4.7 K Ω \pm 5%, 1/4 W	3220210
R1304	Resistor, Carbon Film, 470 Ω \pm 5%, 1/4 W	3220110
R1305	Resistor, Carbon Film, 270 Ω \pm 5%, 1/4 W	3220085
R1306	Resistor, Carbon Film, 22 Ω \pm 5%, 1/4 W	3220015
R1307	Resistor, Carbon Film, 1 K Ω \pm 5%, 1/4 W	3220160
R1308	Resistor, Carbon Film, 4.7 K Ω \pm 5%, 1/4 W	3220210
RFC1301	Choke Assy., 270 μ H, MUD271	3520590
S1301	Wafer #1, Band Switch	4660010

BAND PASS FL. SW., REAR

REF DES	DESCRIPTION	PART NO.
C1401	Capacitor, Disc, .05 μ F + 80%, Z5U	3161630
S1401	Wafer #2, Band Switch	4660011
S1402	Wafer #3, Band Switch—Binary Coded Band Info.	4660012

NOTES:

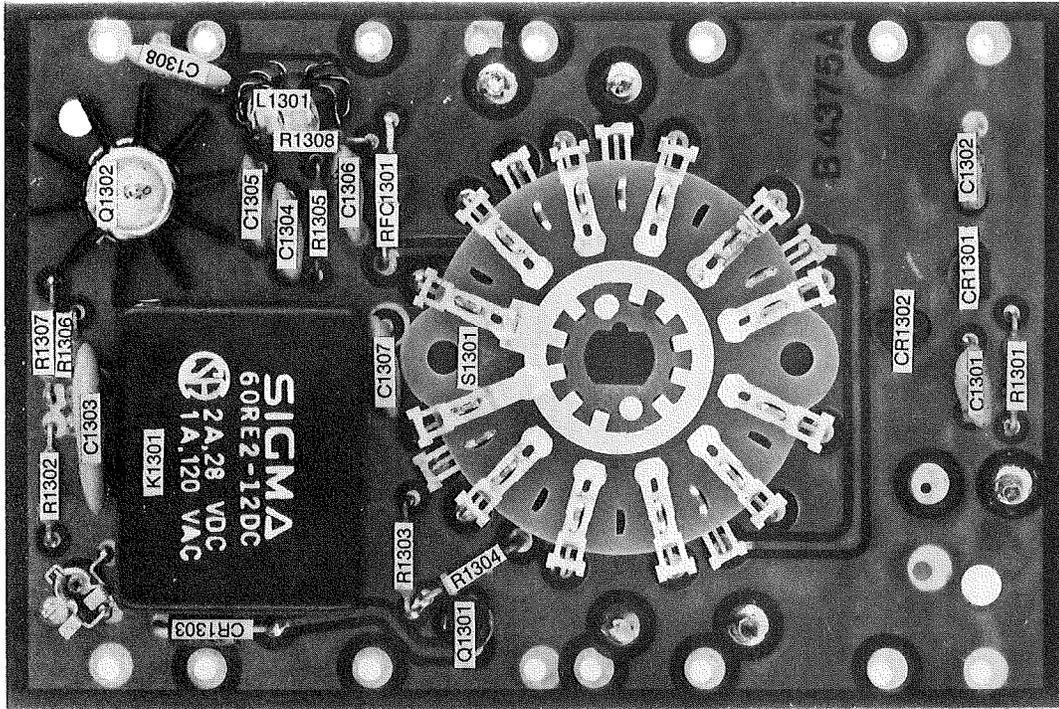


Fig. 3-30 Band Pass Filter Switch, Front

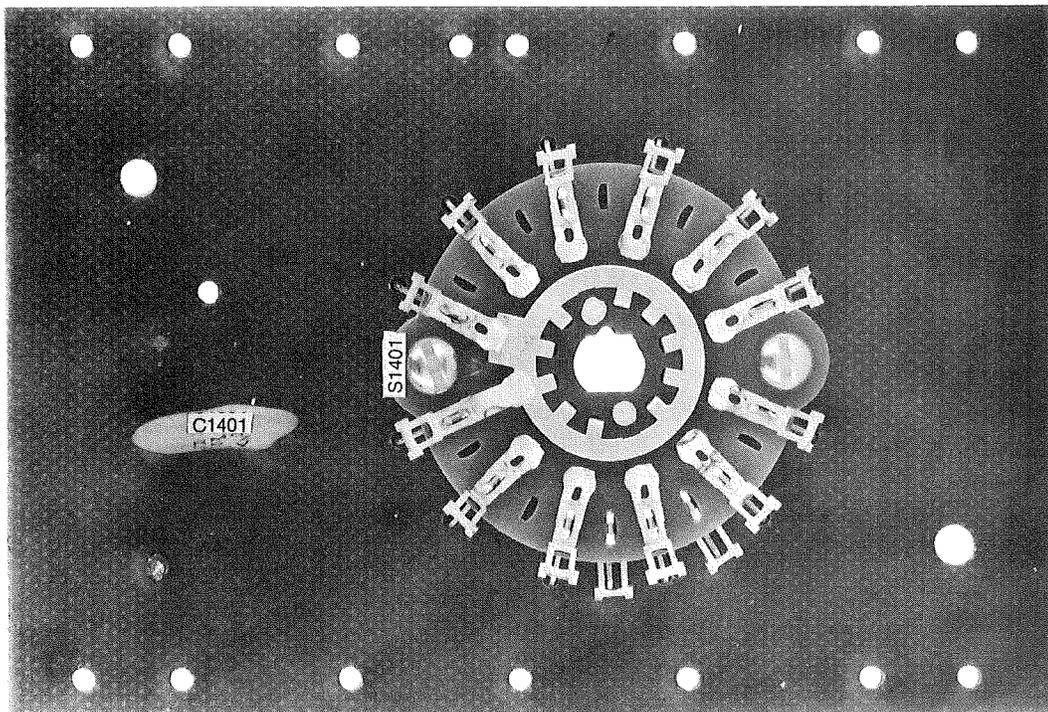


Fig. 3-31 Band Pass Filter Switch, Rear

NOTES:

BAND PASS FILTERS, BANDS 1 - 6

REF DES	DESCRIPTION	PART NO.
C1501	Capacitor, Mica, 1000 pF \pm 2%, DM-15	3170560
C1502	Capacitor, Mica, 600 pF \pm 5%, DM-19	3170480
C1503	Capacitor, Mica, 490 pF \pm 5%, DM-15	3170410
C1504	Capacitor, Mica, 600 pF \pm 5%, DM-19	3170480
C1505	Capacitor, Mica, 1600 pF \pm 2%, DM-19	3170620
C1506	Capacitor, Mica, 600 pF \pm 5%, DM-19	3170480
C1507	Capacitor, Mica, 1600 pF \pm 2%, DM-19	3170620
C1508	Capacitor, Disc, .001 μ F \pm 20%, Z5U	3613700
C1509	Capacitor, Mica, 680 pF \pm 5%, DM-19	3170510
C1510	Capacitor, Disc, .001 μ F \pm 20%, Z5U	3161370
C1511	Capacitor, Mica, 3000 pF \pm 5%, DM-19	3170670
C1512	Capacitor, Mica, 1300 pF \pm 2%, DM-19	3170600
C1513	Capacitor, Mica, 1000 pF \pm 2%, DM-15	3170560
C1514	Capacitor, Mica, 1300 pF \pm 2%, DM-19	3170600
C1515	Capacitor, Mica, 3000 pF \pm 5%, DM-19	3170670
C1516	Capacitor, Mica, 1300 pF \pm 2%, DM-19	3170600
C1517	Capacitor, Mica, 5000 pF \pm 1%, DM-19	3170700
C1518	Capacitor, Mica, 1300 pF \pm 2%, DM-19	3170600
C1519	Capacitor, Mica, 865 pF \pm 5%, DM-20	3170540
C1520	Capacitor, Disc, .0024 μ F \pm 20%, Z5U	3161430
C1521	Capacitor, Disc, .001 μ F \pm 20%, Z5U	3161370
C1522	Capacitor, Disc, .0024 μ F \pm 20%, Z5U	3161430
C1523	Capacitor, Disc, .001 μ F \pm 20%, Z5U	3161370
C1524	Capacitor, Mica, 865 pF \pm 5%, DM-20	3170540
C1525	Capacitor, Mica, 3000 pF \pm 5%, DM-19	3170670
C1526	Capacitor, Mica, 3000 pF \pm 5%, DM-19	3170670
C1527	Capacitor, Mica, 3000 pF \pm 5%, DM-19	3170670
C1528	Capacitor, Mica, 1300 pF \pm 2%, DM-19	3170600
C1529	Capacitor, Mica, 3000 pF \pm 5%, DM-19	3170670
C1530	Capacitor, Mica, 1300 pF \pm 2%, DM-19	3170600
C1531	Capacitor, Mica, 2000 pF \pm 1%, DM-20	3170640
C1532	Capacitor, Disc, .05 μ F \pm 80%, Z5U	3161630
C1533	Capacitor, Disc, .05 μ F \pm 80%, Z5U	3161630
L1501	Coil, Axial, 1.5 μ H	3524207
L1502	Coil, Axial, 1.5 μ H	3524207
L1503	Coil, Axial, 1.5 μ H	3524207
L1504	Coil, Axial, 2.2 μ H	3524208
L1505	Coil, Axial, 2.2 μ H	3524208
L1506	Coil, Axial, 2.2 μ H	3524208
L1507	Coil, Axial, 2.2 μ H	3524208
L1508	Coil, Axial, 3.3 μ H	3524209
L1509	Coil, Axial, 1.2 μ H	3524206
L1510	Coil, Axial, 1.2 μ H	3524206
L1511	Coil, Axial, 1.2 μ H	3524206
L1512	Coil, Axial, 6 μ H	3524210
L1513	Coil, Axial, 6 μ H	3524210
L1514	Coil, Axial, 10 μ H	3524211
L1515	Coil, Axial, 6 μ H	3524210
L1516	Coil, Axial, 82 μ H	3524214
L1517	Coil, Axial, 51 μ H	3524213
L1518	Coil, Axial, 47 μ H	3524212
R1501	Resistor, Carbon Film, 150 Ω \pm 5%, 1/4 W	3220065
R1502	Resistor, Variable, 1 K Ω	3260690

NOTES:

NOTES:

BAND PASS FILTERS, BANDS 7 - 11

REF DES	DESCRIPTION	PART NO.
C1600	Capacitor, Mica, 150 pF \pm 5%, DM-15	3170150
C1601	Capacitor, Mica, 90 pF \pm 5%, DM-15	3170090
C1602	Capacitor, Mica, 90 pF \pm 5%, DM-15	3170090
C1603	Capacitor, Mica, 220 pF \pm 5%, DM-15	3170240
C1604	Capacitor, Mica, 220 pF \pm 5%, DM-15	3170240
C1605	Capacitor, Mica, 250 pF \pm 5%, DM-20	3170270
C1606	Capacitor, Mica, 120 pF \pm 5%, DM-15	3170130
C1607	Capacitor, Mica, 120 pF \pm 5%, DM-15	3170130
C1608	Capacitor, Mica, 120 pF \pm 5%, DM-15	3170130
C1609	Capacitor, Mica, 250 pF \pm 5%, DM-20	3170270
C1610	Capacitor, Mica, 330 pF \pm 5%, DM-15	3170320
C1611	Capacitor, Mica, 180 pF \pm 5%, DM-15	3170180
C1612	Capacitor, Mica, 150 pF \pm 5%, DM-15	3170150
C1613	Capacitor, Mica, 180 pF \pm 5%, DM-15	3170180
C1614	Capacitor, Mica, 330 pF \pm 5%, DM-15	3170320
C1615	Capacitor, Mica, 600 pF \pm 5%, DM-19	3170480
C1616	Capacitor, Mica, 270 pF \pm 5%, DM-15	3170280
C1617	Capacitor, Mica, 300 pF \pm 5%, DM-15	3170300
C1618	Capacitor, Mica, 270 pF \pm 5%, DM-15	3170280
C1619	Capacitor, Mica, 910 pF \pm 5%, DM-19	3170545
C1620	Capacitor, Mica, 300 pF \pm 5%, DM-15	3170300
C1621	Capacitor, Mica, 600 pF \pm 5%, DM-19	3170480
C1622	Capacitor, Mica, 390 pF \pm 5%, DM-15	3170370
C1623	Capacitor, Mica, 220 pF \pm 5%, DM-15	3170240
C1624	Capacitor, Mica, 390 pF \pm 5%, DM-15	3170370
C1625	Capacitor, Mica, 1000 pF \pm 2%, DM-15	3170560
C1626	Capacitor, Mica, 390 pF \pm 5%, DM-15	3170370
L1600	Coil, 3-1/2T, .14 μ H	3524077
L1601	Coil, 3-1/2T, .14 μ H	3524077
L1602	Coil, 3-1/2T, .14 μ H	3524077
L1603	Coil, 5-1/2T, .26 μ H	3524076
L1604	Coil, 5-1/2T, .26 μ H	3524076
L1605	Coil, 5-1/2T, .26 μ H	3524076
L1606	Coil, 7-1/2T, .40 μ H	3524075
L1607	Coil, 7-1/2T, .40 μ H	3524075
L1608	Coil, 7-1/2T, .40 μ H	3524075
L1609	Coil, 9-1/2T, .50 μ H	3524074
L1610	Coil, 9-1/2T, .50 μ H	3524074
L1611	Coil, 9-1/2T, .50 μ H	3524074
L1612	Coil, Axial, 1.1 μ H	3524205
L1613	Coil, Axial, 1.1 μ H	3524205
L1614	Coil, Axial, 1.1 μ H	3524205
L1615	Coil, Axial, 1.1 μ H	3524205
L1616	Coil, Axial, 1.2 μ H	3524206

NOTES:

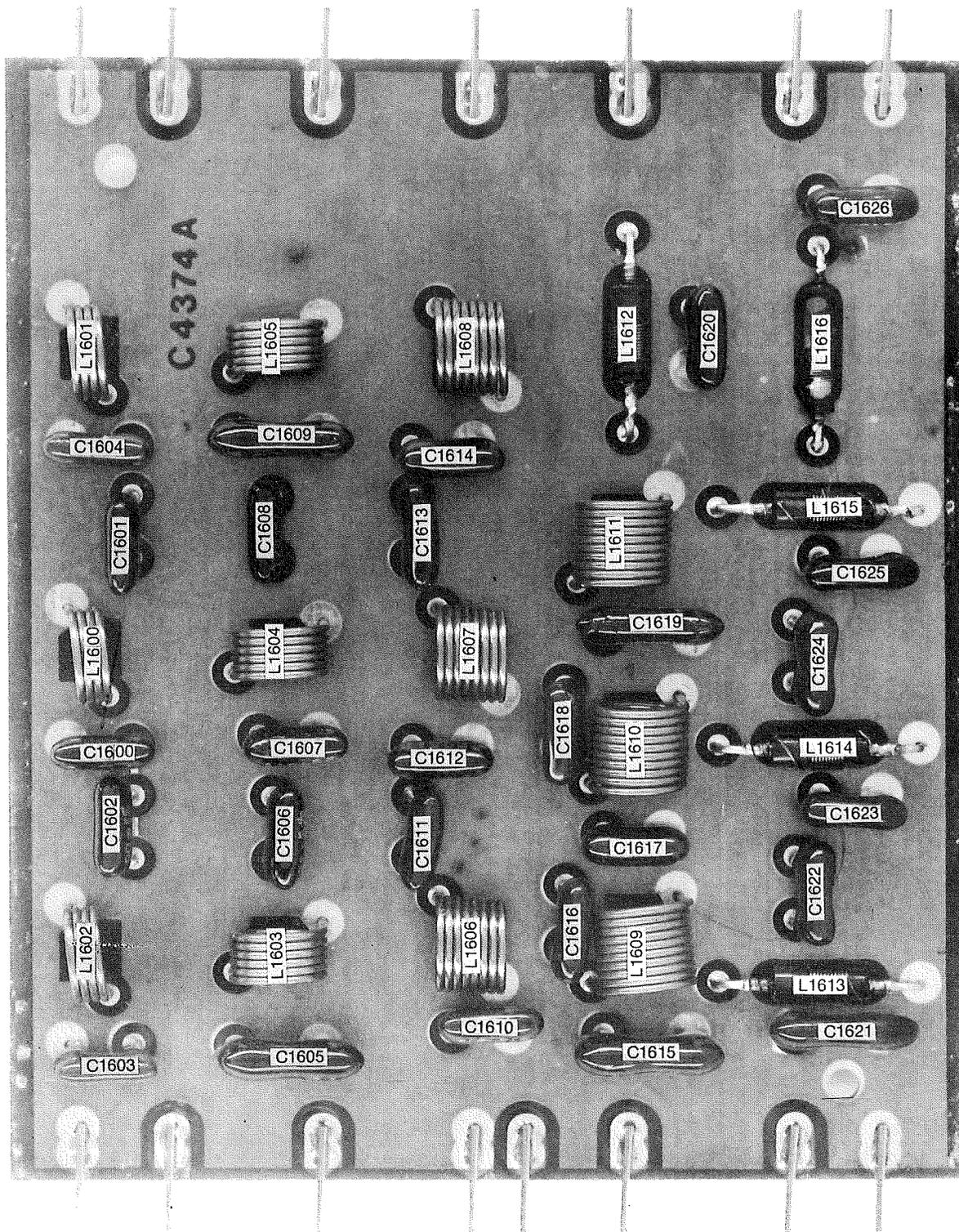


Fig. 3-33 Bandpass Filters, Bands 7-11

NOTES:

C	1301 1307 1303	1302	1306 1305 1304	1523 1526 1533 1519 1532 1525	1524 1610 1527 1605 1528 1603 1529 1603	1522 1611 1525 1606 1526 1602 1527 1602 1528 1615	1527 1617 1528 1612 1529 1607 1530 1600 1531 1623	1528 1521	1529 1613 1529 1608 1529 1601 1529 1601 1529 1604 1529 1604 1529 1604	1530 1619 1530 1614 1530 1609 1530 1604 1530 1604 1530 1604	1524 1620 1524 1618 1524 1612 1524 1606 1524 1606 1524 1606	1501
L	1301				1523 1606 1524 1613 1525 1616 1526 1627				1511 1608 1512 1608 1513 1608 1514 1608 1515 1608 1516 1608	1515 1612 1516 1612 1517 1612 1518 1612 1519 1612 1520 1612		
R	1301 1303 1308 1304 1304 1305 1302 1307			1501					1511 1608 1512 1608 1513 1608 1514 1608 1515 1608 1516 1608	1515 1612 1516 1612 1517 1612 1518 1612 1519 1612 1520 1612	1502	

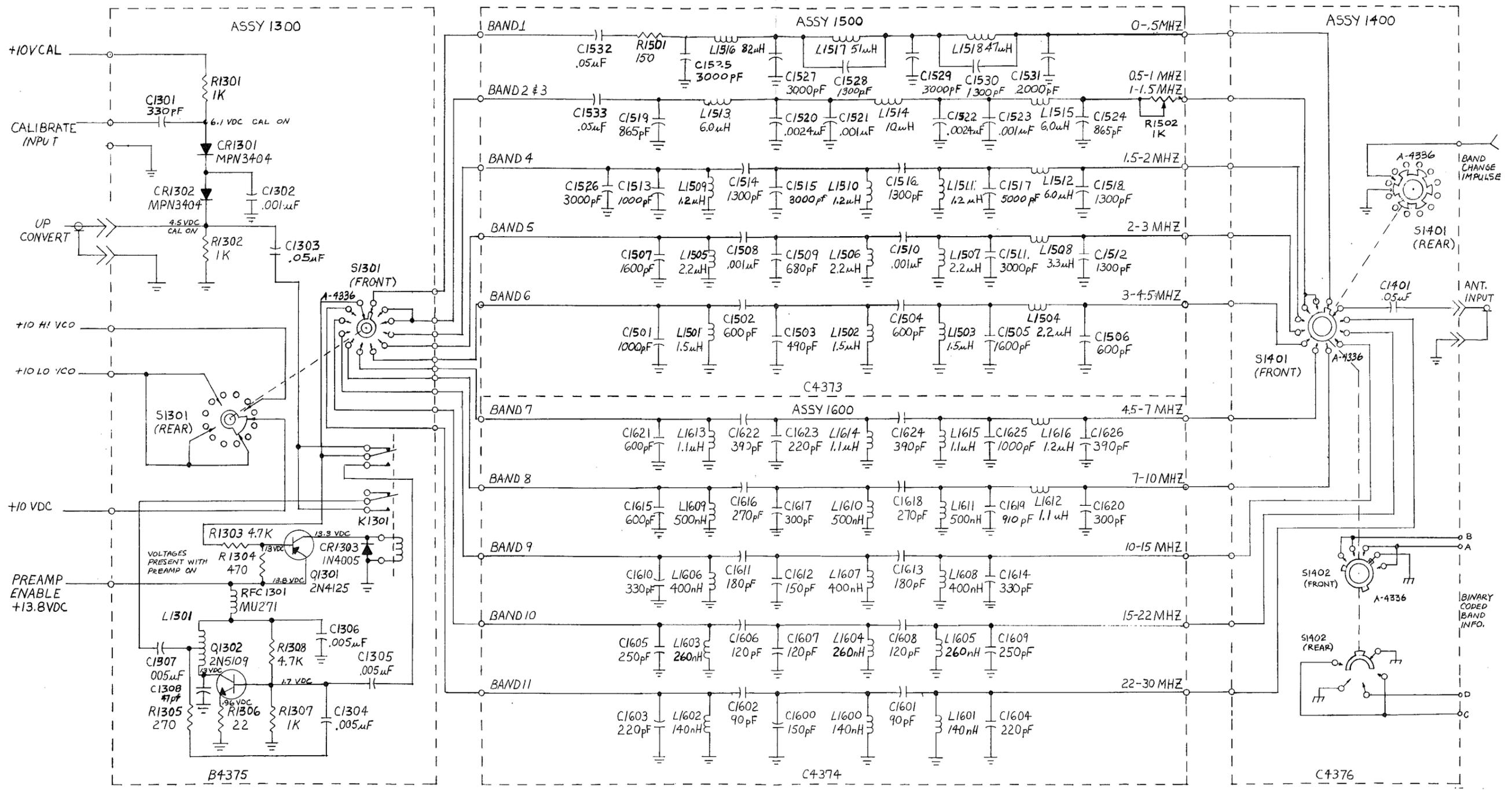


Fig. 3-34 Bandpass Filter Module Schematic

3-15. +13.8 VDC REGULATOR BOARD

The +13.8 VDC Regulator board accepts an unregulated DC input voltage and outputs a regulated DC voltage adjustable to +13.8 VDC. The board contains all the regulator circuitry except the series pass transistor, Q1. Refer to figure 3-36 for schematic and figure 3-35 for parts location information.

Incoming line voltage is fed through programming switches S1 and S2 to the transformer primary, T1. The secondary voltage is rectified by CR1 and CR2 and fed to filter capacitor C1801. Q1801 is used as a current amplifier whose base current is regulated by integrated circuit voltage regulator, U1801. The collector current of Q1801 is the base drive for the externally heat sunk power transistor, Q1. Resistors R1803 and R1804 in series form a current sensing resistor, which, together with R1805 and R1806 form a foldback current limiting action under output short circuit conditions. At normal load currents, the voltage at U1801 pin 10 is only slightly higher than the voltage at pin 3, with the divider action of R1805 and R1806 causing the voltage at pin 2 to approximately equal the voltage at pin 3. Any action that causes the voltage at pin 2 to exceed that

of pin 3 (to a maximum of approximately 0.6 VDC), will reduce the base drive at pin 11, thus reducing the load current handled by Q1. As the load current increases beyond the limiting current value, the voltage at pin 10 and thus at pin 2, begins to increase above that at pin 3. With current drive to Q1801 decreasing, the output voltage will decrease. Less output current is now required to keep the voltages at pin 10 and 2 at a level sufficient to further reduce current drive at Q1801 base. The output current will continue to "foldback" as the output voltage decreases, until an output short circuit current level is reached when the output voltage is zero. Thus the current under shorted output conditions is actually a value less than the normal operating current. R1808 adjusts the regulated output voltage level. Unregulated DC voltage is coupled through R1 and R2 to the DR7 regulators when the RR3 is operating from the AC line. In the RR3 configuration, the output of the DC-DC Converter (IN-7) connects to the junction of CR1, CR2 and C1801.

The only alignment required of this board is the setting of R1808 to yield +13.8 VDC output. This is mentioned in Section 4.

NOTES:

NOTES:

+13.8 VDC REGULATOR BOARD

REF DES	DESCRIPTION	PART NO.
C1801	Capacitor, Electrolytic, 4700 μ F @ 35VDC	3180352
C1802	Capacitor, Disc, .01 μ F \pm 20%, Z5U	3161520
C1803	Capacitor, Disc, .005 μ F \pm 20%, Z5U	3161470
C1804	Capacitor, Mica, 500 pF \pm 10%, DM-15	3170420
C1805	Capacitor, Disc, .01 μ F \pm 20%, Z5U	3161520
C1806	Capacitor, Electrolytic, 220 μ F @ 16V	3180212
CR1801	Diode, IN4005/B5G5	3020220
Q1801	Transistor, TIP-30	3030371
R1801	Resistor, Carbon Film, 100 Ω \pm 5%, 1/4 W	3220055
R1802	Resistor, Composition, 68 Ω \pm 10%, 1/2 W	3230105
R1803	Resistor, Wire Wound, .15 Ω \pm 10%, 2 W	3250010
R1804	Resistor, Wire Wound, .15 Ω \pm 10%, 2 W	3250010
R1805	Resistor, Carbon Film, 33 Ω \pm 5%, 1/4 W	3220025
R1806	Resistor, Carbon Film, 820 Ω \pm 5%, 1/4 W	3220145
R1807	Resistor, Carbon Film, 6.8 K Ω \pm 5%, 1/4 W	3220220
R1808	Resistor, Variable, 5 K Ω	3260660
R1809	Resistor, Carbon Film, 10 K Ω \pm 5%, 1/4 W	3220235
U1801	I.C., MC1723CP	3040100

NOTES:

NOTES:

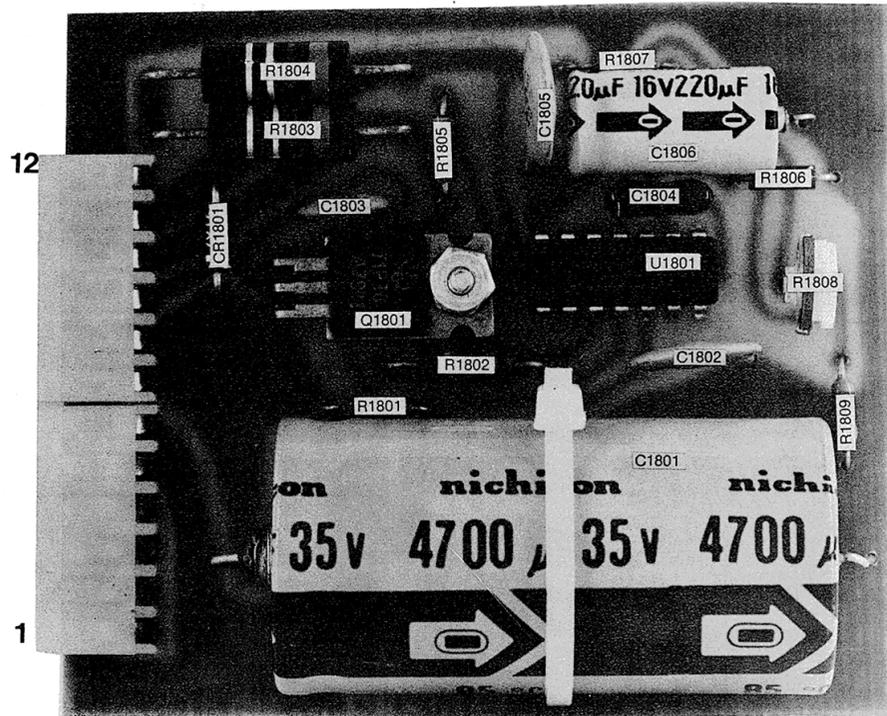


Fig. 3-35 +13.8 VDC Regulator Board Pictorial

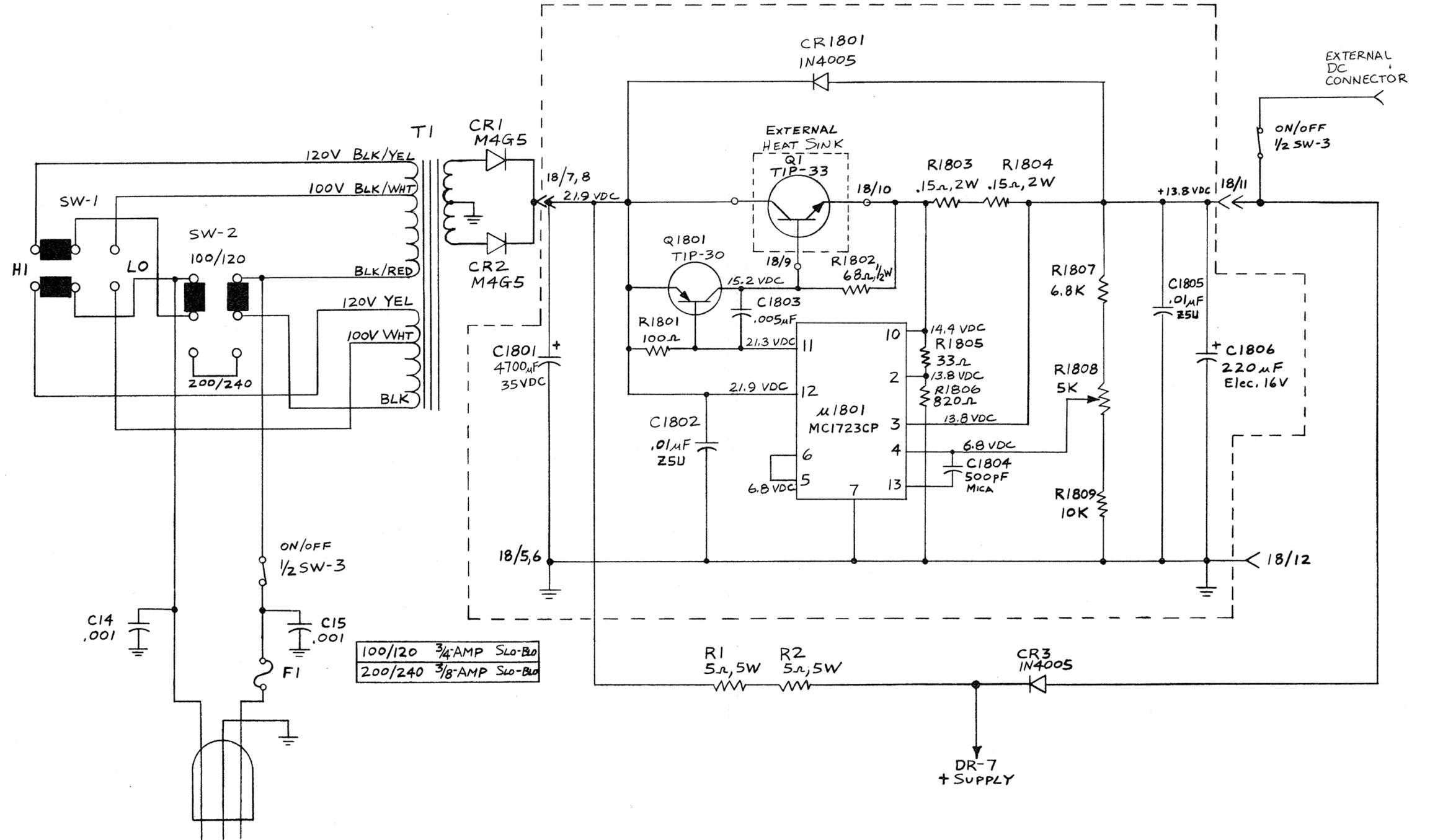


Fig. 3-36 +13.8 VDC Regulator Board Schematic

3-16. POWER SUPPLY BOARD

The Power Supply Board provides +10, +5, +24 VDC regulated and -5 VDC unregulated. Refer to figure 3-38 for schematic and figure 3-37 for parts location information.

Unregulated 11-16 VDC is applied to board pin 9. Q1901, Q1902, and U1901 comprise the 10 volt regulator circuit. Q1901 is the pass transistor while Q1902 provides the base drive boost from U1901 to Q1901. R1909 and R1910 provide short circuit sensing. If the 10 VDC buss is shorted to ground, the voltage drop across R1909 and R1910 increases. At 0.7 VDC, Q1903 turns on, which forces U1901 to clamp the drive to Q1902, which in turn holds Q1901 at a fixed output of 5 amperes maximum short circuit current.

R1912, R1903 and R1902 provide the error voltage feedback path to allow U1901 to maintain +10 VDC out. CR1901 is for temperature compensation. As the output line changes, the above components form a voltage divider network which allows U1901 to compare an internal reference of approximately 7 VDC to the error voltage from the wiper of R1903. +10 VDC output is on pin 10. +5 VDC regulated is provided by U1902 and is derived from the +10 VDC line. +5 VDC output is on pin 11.

The +24 VDC regulated and -5 VDC unregulated supplies are created by a DC to DC voltage multiplier circuit. The voltage multiplier consists of three sections: an oscillator, an amplifier and the voltage multiplier section itself. Supply voltage for these three major circuit elements is the unregulated 11-16 VDC input at pin 9. RFC1901, C1912 and C1913 decouple the amplifier and voltage multiplier from the 11-16 VDC line. Q1904 and associated components form a sine wave oscillator. The frequency of this sine wave is approximately 10 kHz. It is coupled through C1911 to U1903, an audio amplifier, which is biased by R1918 and R1919 to provide a slightly clipped sine wave to the actual voltage multiplier section. The multiplication factor is (3) three; with C1916, CR1903, CR1902, and C1921 comprising section one. C1917, CR1904, CR1905 and C1922 form section two. The third and final section, made up of C1918, CR1906, CR1907 and C1923, outputs the multiplied DC voltage to the input pin of the voltage regulator IC, U1904. R1922 and R1923 program the IC to output a regulated +24 VDC at module pin 6. -5 VDC is generated by coupling the output of U1903 through C1919 to a half wave rectifier, CR1908. The output of CR1908 is filtered and applied to pin 1.

The only alignment required of this board is the setting of R1903 to yield +10 VDC output. This is mentioned in Section 4.

NOTES:

NOTES:

POWER SUPPLY BOARD

REF DES	DESCRIPTION	PART NO.
C1901	Capacitor, Disc, .01 μ F + 80%, M25V PT	3161500
C1902	Capacitor, Disc, .01 μ F \pm 20%, Z5U	3161520
C1903	Capacitor, Disc, .01 μ F + 80%, M25V PT	3161500
C1904	Capacitor, Electrolytic, 22 μ F \pm 20%, 16 V	3180105
C1905	Capacitor, Tantalum, .22 μ F \pm 10%, 35 V	3183100
C1906	Capacitor, Tantalum, .22 μ F \pm 10%, 35 V	3183100
C1907	Capacitor, Electrolytic, 10 μ F \pm 20%, 35 V	3180062
C1908	Capacitor, Disc, .01 μ F \pm 20%, Z5U	3161520
C1909	Capacitor, Disc, .005 μ F \pm 20%, Z5U	3161470
C1910	Capacitor, Disc, .005 μ F \pm 20%, Z5U	3161470
C1911	Capacitor, Disc, .05 μ F + 80%, M16V PT	3161600
C1912	Capacitor, Electrolytic, 220 μ F @ 16 V	3180212
C1913	Capacitor, Electrolytic, 220 μ F @ 16 V	3180212
C1914	Capacitor, Electrolytic, 10 μ F \pm 20%, 35 V	3180062
C1915	Capacitor, Electrolytic, 22 μ F \pm 20%, 16 V	3180105
C1916	Capacitor, Electrolytic, 10 μ F \pm 20%, 35 V	3180062
C1917	Capacitor, Electrolytic, 10 μ F \pm 20%, 35 V	3180062
C1918	Capacitor, Electrolytic, 1 μ F \pm 20%, 50 V	3180008
C1919	Capacitor, Electrolytic, 10 μ F \pm 20%, 35 V	3180062
C1920	Capacitor, Electrolytic, 10 μ F \pm 20%, 35 V	3180062
C1921	Capacitor, Electrolytic, 10 μ F \pm 20%, 35 V	3180062
C1922	Capacitor, Electrolytic, 10 μ F \pm 20%, 35 V	3180062
C1923	Capacitor, Electrolytic, 1 μ F \pm 20%, 50 V	3180008
C1924	Capacitor, Electrolytic, 10 μ F \pm 20%, 35 V	3180062
CR1901	Diode, 1N4148	3020090
CR1902	Diode, 1N4148	3020090
CR1903	Diode, 1N4148	3020090
CR1904	Diode, 1N4148	3020090
CR1905	Diode, 1N4148	3020090
CR1906	Diode, 1N4148	3020090
CR1907	Diode, 1N4148	3020090
CR1908	Diode, 1N4148	3020090
Q1901	Transistor, 2N5986	3030205
Q1902	Transistor, 2N3904	3030105
Q1903	Transistor, 2N4125	3030110
Q1904	Transistor, 2N3904	3030105
R1901	Resistor, Carbon Film, 1.5 K Ω \pm 5%, 1/4 W	3220175
R1902	Resistor, Carbon Film, 3.3 K Ω \pm 5%, 1/4 W	3220200
R1903	Resistor, Variable, PT10H 2.5 1K Lin.	3260655
R1904	Resistor, Carbon Film, 220 Ω \pm 5%, 1/4 W	3220075
R1905	Resistor, Composition, 68 Ω \pm 10%, 1/2 W	3230105
R1906	Resistor, Carbon Film, 10 K Ω \pm 5%, 1/4 W	3220235
R1907	Resistor, Composition, 100 Ω \pm 10%, 1/2 W	3230115
R1908	Resistor, Carbon Film, 2.2 K Ω \pm 5%, 1/4 W	3220190
R1909	Resistor, Wire Wound, .27 Ω \pm 5%, 1/4 W	3250025
R1910	Resistor, Wire Wound, .27 Ω \pm 5%, 1/4 W	3250025
R1911	Resistor, Carbon Film, 10 K Ω \pm 5%, 1/4 W	3220235
R1912	Resistor, Carbon Film, 1 K Ω \pm 5%, 1/4 W	3220160
R1913	Resistor, Carbon Film, 2.2 K Ω \pm 5%, 1/4 W	3220190
R1914	Resistor, Carbon Film, 22 Ω \pm 5%, 1/4 W	3220015
R1915	Resistor, Carbon Film, 4.7 K Ω \pm 5%, 1/4 W	3220210
R1916	Resistor, Carbon Film, 4.7 K Ω \pm 5%, 1/4 W	3220210
R1917	Resistor, Carbon Film, 820 Ω \pm 5%, 1/4 W	3220145
R1918	Resistor, Carbon Film, 150 Ω \pm 5%, 1/4 W	3220065
R1919	Resistor, Carbon Film, 5.1 Ω \pm 5%, 1/4 W	3220003
R1920	Resistor, Carbon Film, 82 Ω \pm 5%, 1/4 W	3220050

REF DES	DESCRIPTION	PART NO.
R1921	Resistor, Carbon Film, 10 K Ω \pm 5%, 1/4 W	3220235
R1922	Resistor, Carbon Film, 220 Ω \pm 1%, 1/4 W	3220075
R1923	Resistor, Carbon Film, 3.9 K Ω \pm 1%, 1/4 W	3220205
RCF1901	Choke Assy., 33 μ H	2512506
RCF1902	Choke Assy., 5.6 μ H, L56G	3520510
U1901	I.C., MC1723CP	3040100
U1902	I.C., MC7805CP	3040160
U1903	I.C., TDA2002AH	3040550
U1904	I.C., LM317LZ	3040092

NOTES:

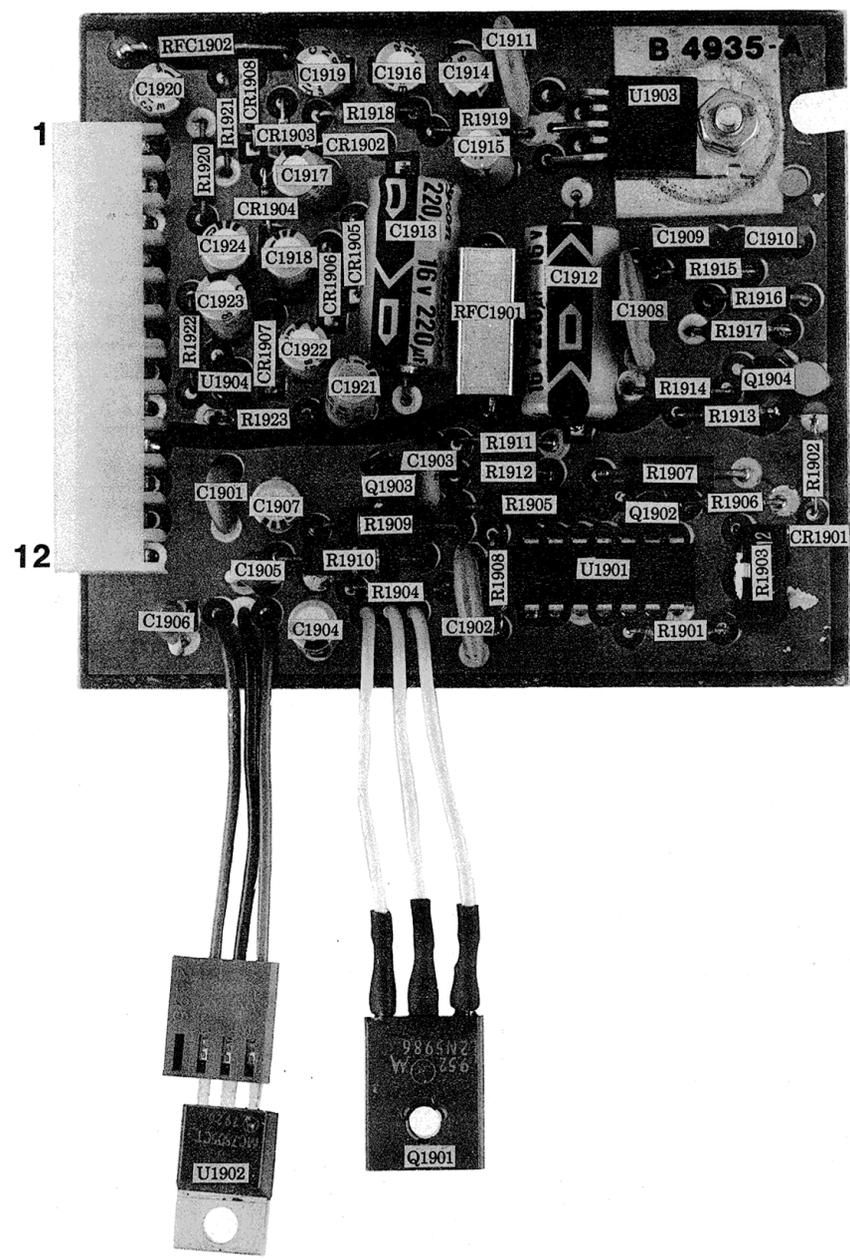
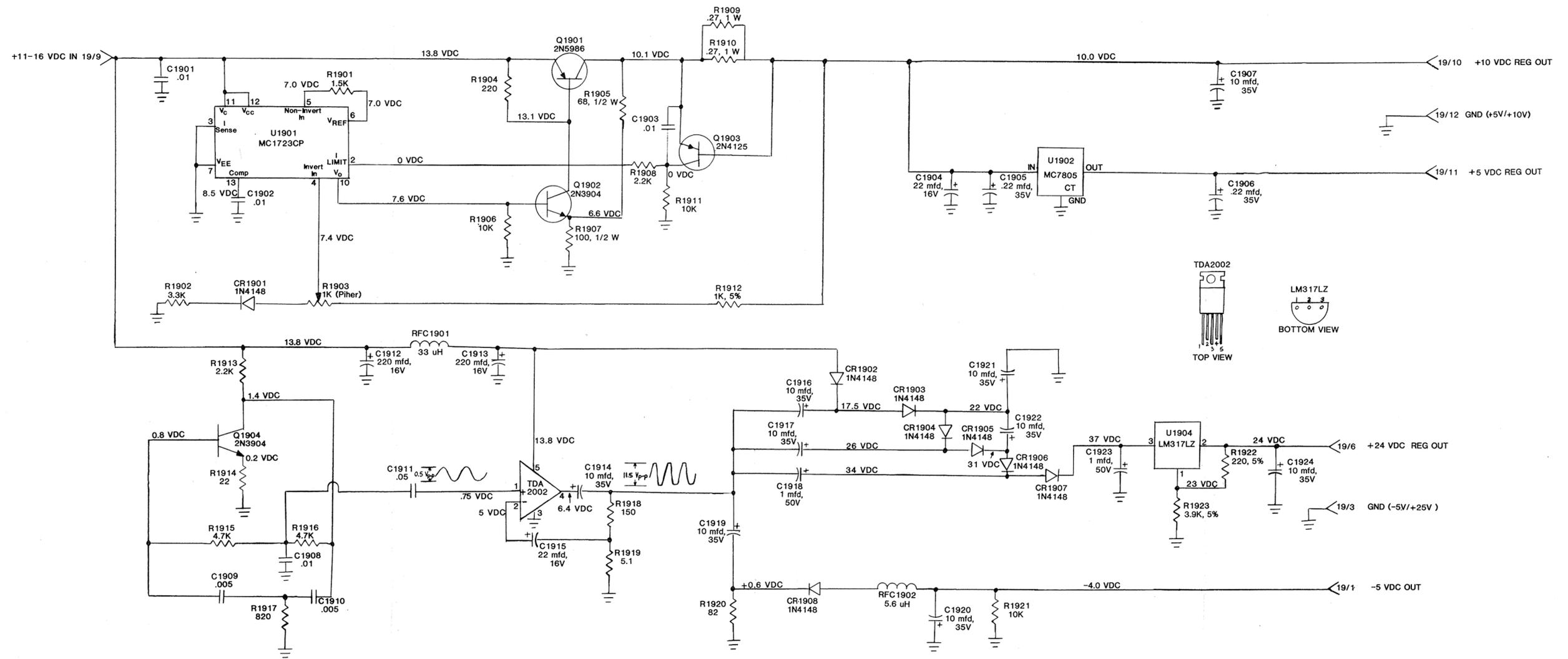


Fig. 3-37 Power Supply Board Pictorial

R	R1902	R1913	R1917	R1901	R1904	R1907	R1905	R1908	R1911	R1909	R1921	R1923	R1922											
C	C1901	C1909	C1902	C1908	C1910	C1912	C1911	C1913	C1914	C1915	C1903	C1919	C1916	C1917	C1918	C1920	C1904	C1905	C1921	C1922	C1923	C1907	C1906	C1924
CR	CR1901												CR1902	CR1908	CR1903	CR1904	CR1905	CR1906	CR1907					



NOTES:
 1. All resistors in Ohms.
 2. All resistors 1/4 W, 10% unless noted otherwise.
 3. All capacitors are mfd.

HIGHEST NUMBER RESISTOR - R1923
 " " CAPACITOR - C1924
 " " TRANSISTOR - Q1904
 " " IC - U1904
 " " DIODE - CR1908
 " " RFC - RFC1902

0226805000

Fig. 3-38 Power Supply Board Schematic

3-17. LINE AMPLIFIER BOARD

This board contains circuitry for amplifying and transformer isolating the receiver internal audio prior to the volume control. The audio output from this board is capable of delivering a 0 dBm level into a 600 ohm line. Refer to figure 3-40 for schematic and figure 3-39 for parts location information.

Audio prior to the volume control is coupled through R8002 and C8001 to the amplifier stages Q8001 and Q8002. The 1200 ohm primary of T8001 is in the collector circuit of Q8002. The amplified audio is transformer coupled to the 600 ohm secondary and hence the output. R8010 is used to adjust the audio output level into a 600 ohm line. This is mentioned in Section 4.

NOTES:

NOTES:

LINE AMPLIFIER BOARD

REF DES	DESCRIPTION	PART NO.
C8001	Capacitor, Electrolytic, 1 μ F \pm 20%, 50 V	3180008
C8002	Capacitor, Electrolytic, 10 μ F \pm 20%, 35 V	3180062
C8003	Capacitor, Electrolytic, 10 μ F \pm 20%, 35 V	3180062
C8004	Capacitor, Disc, .01 μ F + 80%, M25V	3161500
Q8001	Transistor, 2N3904	3030105
Q8002	Transistor, 2N3904	3030105
R8001	Resistor, Carbon Film, 100 Ω \pm 5%, 1/4 W	3220055
R8002	Resistor, Carbon Film, 100 K Ω \pm 5%, 1/4 W	3220315
R8003	Resistor, Carbon Film, 47 K Ω \pm 5%, 1/4 W	3220285
R8004	Resistor, Carbon Film, 4.7 K Ω \pm 5%, 1/4 W	3220210
R8005	Resistor, Carbon Film, 2.7 K Ω \pm 5%, 1/4 W	3220195
R8006	Resistor, Carbon Film, 100 Ω \pm 5%, 1/4 W	3220055
R8007	Resistor, Carbon Film, 18 K Ω \pm 5%, 1/4 W	3220255
R8008	Resistor, Carbon Film, 3.9 K Ω \pm 5%, 1/4 W	3220205
R8009	Resistor, Carbon Film, 100 Ω \pm 5%, 1/4 W	3220055
R8010	Resistor, Variable, PT10H, 2.5 1 K Lin.	3260655
R8011	Resistor, Carbon Film, 2.2 K Ω \pm 5%, 1/4 W	3220190
T8001	Transformer, Audio M7934-ND	3690305

NOTES:

NOTES:

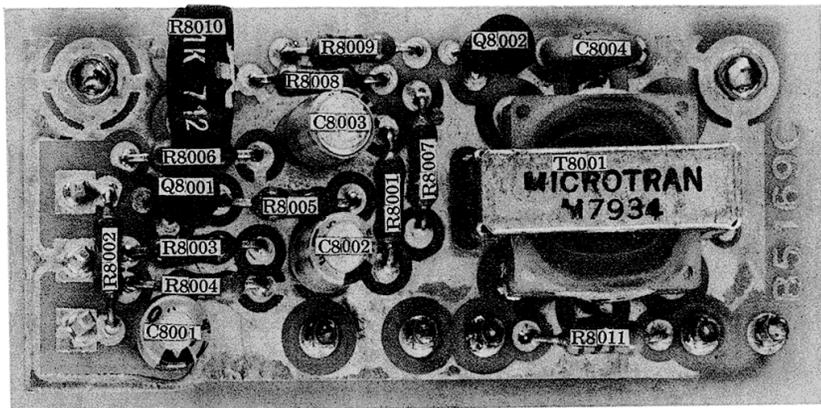


Fig. 3-39 Line Amplifier Board Pictorial

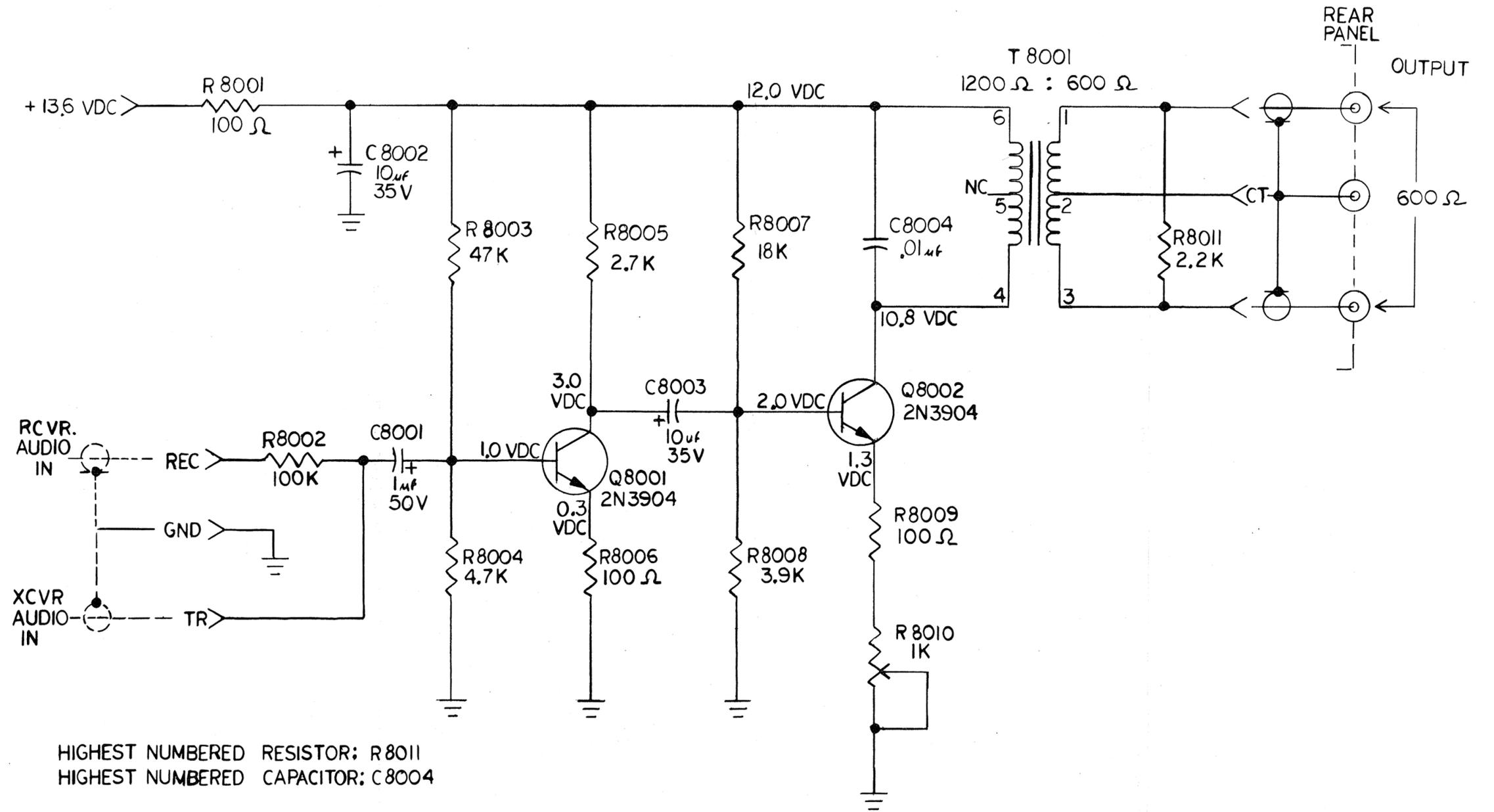


Fig. 3-40 Line Amplifier Board Schematic

3-18. DR7 DIGITAL READOUT BOARD

The DR7 provides two major functions for the RR3 -full receiver coverage from 10 kHz-30 MHz and digital frequency display. The two sections are completely independent. A failure in one section will not usually affect the other. A careful observation of the symptoms and a few measurements will isolate the fault to a major section. See table 3-1 before removing the DR7. Refer to figure 3-42 for the parts location and figure 3-43 for the schematic.

All waveforms on the schematic are taken with the RR3 tuned to 1.9500 MHz. All waveforms are taken with the oscilloscope set to AC trigger on the first edge shown on the schematic, i.e.: rising or falling edge. An oscilloscope with at least a 100 MHz bandwidth is required to faithfully reproduce some signals. Some signals, especially in the counter and display section, may be displayed with jitter when viewed on an oscilloscope without trigger hold-off. All levels are 0 V low and 5 V high unless noted otherwise.

Section 3-18.1 contains the detailed theory of operation for full coverage section and 3-18.2 for the digital frequency display. U9001 (6) refers to I.C. #9001, pin 6. Ground and supply connections are #7 and #14 for 14 pin I.C.'s, #8 and #16 for 16 pin I.C.'s, and #12 and #24 for 24 pin I.C.'s, unless noted otherwise.

If trouble is suspected with the full coverage section, remove the DR7 (See page 3-107) and replace it with the Jumper board for verification. If a component must be removed, USE CARE. Wicking braid and a low wattage, grounded soldering iron are recommended for component removal.

LED displays are matched for brightness. If a failure is determined to be in the display, replacement of both is advised. The recommended procedure to remove the display is to cut the connector pins close to the DR7 P.C. Board. Remove the pins and clear the holes of solder. To replace the display, solder the displays to a new connector. The displays should be flush with the connector. The two digit and four digit displays are spaced apart one pin. Insert the display and connector assembly into the DR7 board. Space the connector body .1 inch (.254 cm) using a drill bit or other spacer. Solder the connector to the DR7 board and remove the spacer.

TABLE 3-1

TROUBLESHOOTING GUIDE

Check For:

- Proper DR7 Installation (See P. 3-107)
- Loose or improperly installed connectors
- Proper function of COUNT switch
- Proper operation of STORE pushbutton
- Symptom - digits and decimal point blanked
 - Check - U9019, U9038, Q9013, Q9011
- Symptom - digits blanked but decimal point on
 - Check - U9031, U9029, U9016, U9032, Q9002, Q9003
- Symptom - random counting, synthesizer unlocked
 - Check - full coverage section of RR3
- Symptom - random counting, synthesizer locked
 - Check - U9016, U9012, U9011
- Symptom - one segment on or off in all digits
 - Check - U9032, U9029, LED Display
- Symptom - One digit incorrect
 - Check - counter and latch for that digit

3-18.1 FULL COVERAGE SECTION

The major functions of all the full coverage section are to take the synthesizer load number provided by the digital control board and increment the load number with the UP or DOWN front panel switches within the limits of the input bandpass filters. When the bandswitch is changed from one band to another, U9002 (1) is momentarily grounded via the wire going to the bandpass filter module. If the AUX PROGRAM switch is in NORM, U9002 (3) will go high and trigger U9004, a one shot. The negative pulse out of the one shot will cause U9002 (4) to go high, latching the BCD load number present at pins 2/31 through 2/38 into the programmable up-down counters U9005 and U9006. The one shot insures that the data from the band switch is valid before latching the number. In AUX PROGRAM switch positions 1-8 U9002 (6) is held low, causing U9002 (4) to stay high. This allows any load number at the counter inputs to be fed directly to the outputs. The outputs of the counters are buffered by the high current drivers U9007 and U9008 and applied to the divide by N inputs of the translator board. When the UP and DOWN pushbutton is depressed, a negative pulse is generated at the output of one shot U9004 (7) and applied to the clock inputs of the counters. When the DOWN pushbutton is depressed U9002 (11)

remains low, the counters will decrement by one and the VCO frequency will increase. The load number is fed to the inputs of READ ONLY MEMORY U9003. When a load number corresponding to a band edge is programmed, U9003 (12) and/or U9003 (1) will go low and disable the UP or DOWWN latches. Refer to the example given in paragraph 2-3.2 to determine the proper load number for a particular 500 kHz segment.

3-18.2 COUNTER SECTION

The counter circuit can be divided into three major sections: the time base divider, the counter, and the display. The time base divider generates the signals required to gate the input signal into the counter, store the contents of the counters, and control the multiplexed information to the display section. The display section decodes and buffers the multiplexed information from the counter and drives the LED display.

The TIME BASE DIVIDER is comprised of U9014, U9015, U9019, U9022, U9026, U9028 and U9016. The 500 kHz synthesizer reference signal is divided by 5 by U9014 producing 10 μ S pulses. The 10 μ S pulses are applied to the divide by 10,000 circuit consisting of U9016, U9019, and U9022, and to flipflop U9026. After 100 mS, U9016 (13) will go low. At the next pulse from U9014, U9026 (1) will go low and U9026 (1) and U9015 (2) will go high, generating a strobe pulse at U9015 (10). On the second pulse from U9014 after the strobe pulse, a time base reset/load pulse is generated at U9016 (3). On the second pulse from U9014 after the reset pulse, a time base reset pulse is generated at U9016 (1). This pulse resets the dividers and sets U9026 (13) high. On the next pulse, U9026 (1) goes high and the sequence starts again. During the 100 mS gate time, the BCD output of U9019 is fed to 1 of 10 decoder U9028. The outputs of U9028 are used to multiplex the BCD information stored in the latches to the display section.

The COUNTER CIRCUIT consists of input amplifiers U9009 and U9010, gating circuits U9011 and U9012, and counting circuits U9013, U9017 through U9021, U9023 through U9025, U9027, and U9030. The VCO signal is amplified by U9010. The external input signal is amplified by U9009. U9011 selects which signal is applied to the gate circuit. When U9012 (7) goes high, U9012 (3) will go low on the next rising edge of the selected input signal allowing the

signal to be passed to decade divider U9013. The outputs of U9013 are buffered and applied to Q9002, which amplifies the ECL level signal to a TTL level. The TTL signal is applied to decade counter U9017 and then to U9019. The output of U9019 is applied to the programmable decade counter chain U9020, U9023, U9025, and U9027. The outputs of all of the counters feed latches. At the end of the gate time the BCD information is stored in latches U9018, U9021, and U9025 by the strobe signal from the time base divider section. After the strobe signal, the counters are either reset to all zeroes or loaded with an offset number by the reset/load pulse.

When the DR7 is operating in the normal mode, COUNT pushbutton out, the reset/load pulse is applied to pin 1 of the programmable counters and U9016 (5). U9016 (6) is grounded by the COUNT switch preventing the load/reset pulse from re-setting the counters. The counters will be preset to 5195, which will subtract the 48.05 MHz First IF from the VCO frequency. In the COUNT mode the reset/load pulse is applied to both pin 1 and pin 9 of the programmable counters setting them to zero. When operating in the COUNT mode and the input frequency exceeds 99.999 MHz, U9039 (12) will go high and U9030 (1) will be latched high by the strobe pulse. When the STORE pushbutton is depressed, the strobed pulse is grounded and the information in the latches is not updated by the counters.

The DISPLAY SECTION is composed of U9028, U9029, U9031, U9032, Q9005 through Q9013, and the LED display. When U9028 (2) goes low, the BCD information stored in latch U9025B is applied to the BCD to 7-segment decoder U9029. The outputs of U9029 are applied to U9032. The outputs of U9032 sink current from the common anode LED display. At the same time, the outputs of U9025B are enabled, Q9005 is turned on by U9028 (2) supplying current to the leftmost digit of the display. After D1 has been lit for 100 mS, U9028 (2) will go high and U9028 (3) will go low, turning on Q9006 and enabling the information stored in U9028A to be decoded and applied to the cathodes. Each digit will be enabled sequentially for 100 μ S at a 1 kHz rate. Q9012 is turned on at D5 to illuminate the decimal point. If D1 is zero, U9029 (4), U9021 (1) and, if the counter has not exceeded 99.9999 MHz, U9029 (5) will go low and the leading zero will be blanked.

U9031 (1) will remain low until a number other than BCD "0" is applied to the inputs of U9029. When the counter is operating in COUNT and the frequency exceeds 99.9999 MHz, leading zeroes are not

blanked. 100 MHz will display 0000.0 kHz. If power is applied without the 500 kHz input or if a failure should occur in the time base divider circuitry, the pulse at U9028 (1) will go away, causing Q9013 to turn off. When Q9013 turns off, Q9011, which supplies the ground to the display driver, will turn off preventing damage to the display.

NOTES:

DR7 REMOVAL (Refer to Pictorial Fig. 3-41)

1. Unplug (5) five connectors (P1 through P5) from the DR7 board. Position cables carefully so that they will be free of the DR7 Board when it is lifted out. Remove the retaining screw and lockwasher (adjacent to U9006).
2. Unplug the coax and blue wire from the filter module. Slide the grommet off of the coax and blue wire.
3. Using the card puller supplied with the radio, hook one end under the front edge of the large hole adjacent to U9008 (shown in figure 3-41). Grasp the tool and pull upwards firmly, but slowly, to disengage one 12 pin, one 9 pin and two 3 pin connectors. Once the connectors have been disengaged, remove the card puller.
4. Grasping the board along both sides, tilt the rear portion of the board upwards at an angle sufficient to fully disengage the connectors and slide the board toward the rear of the radio. As this is done, note that the display LEDs should slide out of the aluminum bezel at the front panel.
NOTE: Do not tilt the board excessively before the display LEDs are free of the locating aluminum bezel, or damage will result to either the displays or the DR7 board.
5. Once the display and connectors are free, lift the DR7 board straight up, allowing the coax to slide out of the clearance hole provided for it.
6. Now either the DR7 or Jumper Board can be plugged in on extender cards and the coax plugged into the filter module to service the radio.

DR7 INSTALLATION (Refer to Pictorial Figure 3-41)

1. Position (5) five connectors (P1 through P5) and associated cables to be free of DR7 board during installation. Check that all 27 connector pins on the DR7 board are straightened and perpendicular to the board.
2. Thread the Up-Converter coax through the hole in the DR7 (adjacent to C9015). Tilt the display LED portion of the DR7 board downward and slide the LEDs into the locating aluminum bezel at the front panel.
3. Start the 12 pin connector on the DR7 board (adjacent to U9006) into the receptacle on the Digital Control Board, noting visually that the connector pins are aligned properly with the receptacle.
4. With the 12 pin connector sufficiently engaged, start the 9 pin connector (adjacent to U9003) into the receptacle in the Translator board, again noting visually that the connector pins are aligned properly with the receptacle. Note that even though the alignment of the two 3 pin connectors cannot be visually inspected, their alignment will be proper if the pins were straightened and the 12 and 9 pin connectors are properly aligned.
5. Press down firmly, but carefully, on the DR7 board to fully seat all connectors.
6. Install the retaining screw and lockwasher (adjacent to U9006). Plug in all (5) five connectors (P1 through P5). Slide the grommet over the coax and blue wire. Plug the coax and blue wire into the filter module, position the grommet in the chassis wall cutout.

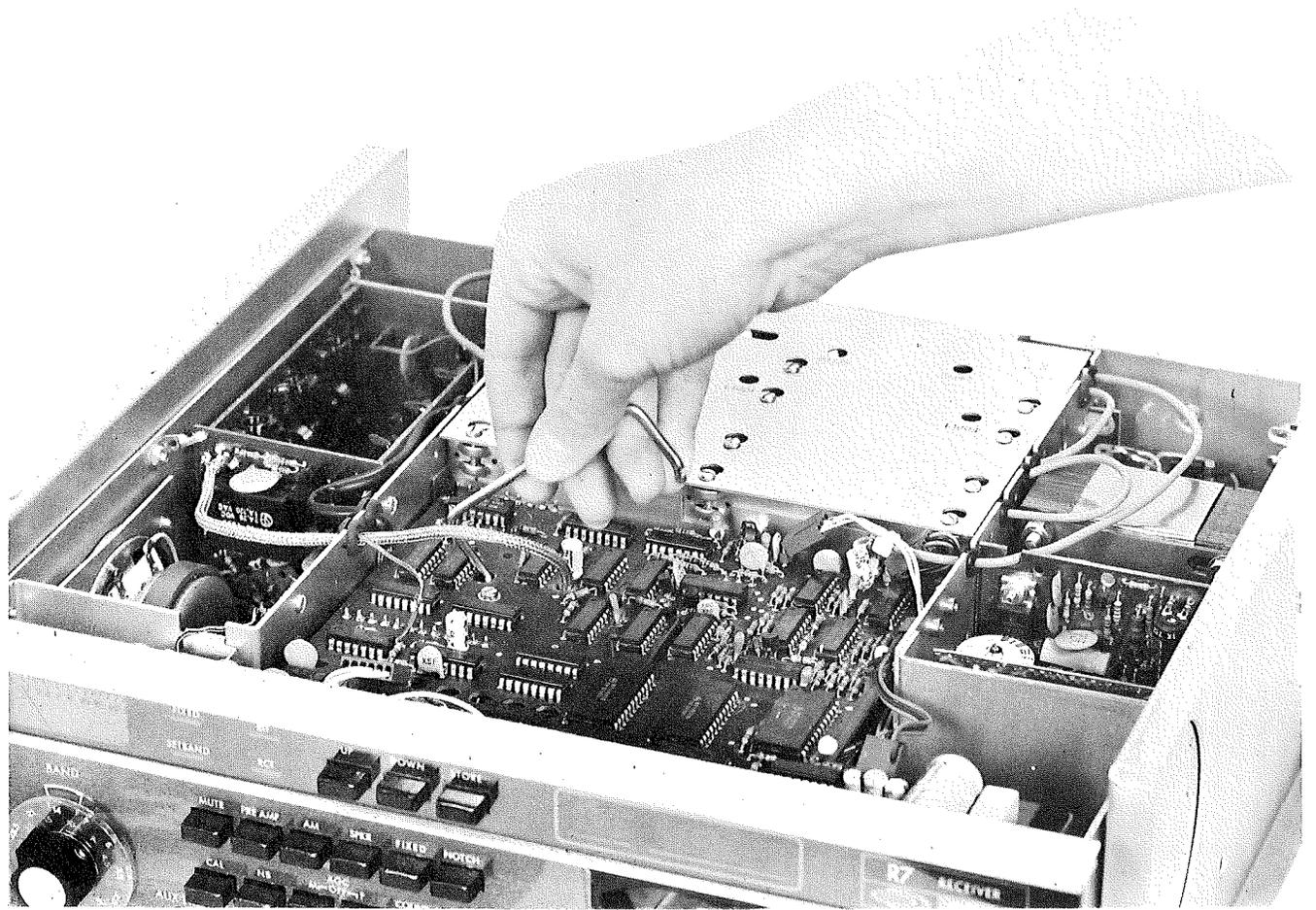


Fig. 3-41 DR7 Board Removal

NOTES:

DR-7 DIGITAL READOUT

REF DES	DESCRIPTION	PART NO.
C9001	Capacitor, Disc, .1 μ F + 80%, Y5T	3161660
C9002	Capacitor, Disc, .1 μ F + 80%, Y5T	3161660
C9003	Capacitor, Disc, 100 pF \pm 10%, X5F	3161070
C9004	Capacitor, Electrolytic, 10 μ F \pm 20%, 25 V	3180062
C9005	Capacitor, Disc, .005 μ F \pm 20%, Z5U	3161470
C9006	Capacitor, Disc, .005 μ F \pm 20%, Z5U	3161470
C9007	Capacitor, Disc, .005 μ F \pm 20%, Z5U	3161470
C9008	Capacitor, Tantalum, .22 μ F \pm 10%, 35 V	3183100
C9009	Capacitor, Electrolytic, 10 μ F \pm 20%, 25 V	3180062
C9010	Capacitor, Disc, .001 μ F \pm 20%, Z5U	3161380
C0911	Capacitor, Tantalum, .22 μ F \pm 10%, 25 V	3183100
C0912	Capacitor, Tantalum, .22 μ F \pm 10%, 25 V	3183100
C9013	Capacitor, Electrolytic, 10 μ F \pm 20%, 25 V	3180062
C9014	Capacitor, Electrolytic, 1 μ F \pm 20%, 50 V	3180008
C9015	Capacitor, Electrolytic, 10 μ F \pm 20%, 25 V	3180062
C9016	Capacitor, Disc, 220 pF \pm 20%, Z5U	3161270
C0917	Capacitor, Tantalum, 10 μ F \pm 20%, 25 V	3183030
C0918	Capacitor, Tantalum, .22 μ F \pm 10%, 35 V	3183100
C0919	Capacitor, Tantalum, 47 μ F \pm 20%, 6 V	3183070
C0920	Capacitor, Tantalum, 47 μ F \pm 20%, 6 V	3183070
C0921	Capacitor, Tantalum, 10 μ F \pm 20%, 25 V	3183030
C9022	Capacitor, Disc, 220 pF \pm 20%, Z5U	3161270
C9023	Capacitor, Disc, 51 pF \pm 5%, N750	3160860
C9024	Capacitor, Electrolytic, 10 μ F \pm 20%, 25 V	3180062
C9025	Capacitor, Electrolytic, 1 μ F \pm 20%, 25 V	3180008
C9026	Capacitor, Electrolytic, 10 μ F \pm 20%, 25 V	3180062
C9027	Capacitor, Electrolytic, 1000 μ F, 16 V	3180292
CR9001	Diode, 1N270	3020010
CR9002	Diode, 1N270	3020010
CR9003	Diode, 1N270	3020010
CR9004	Diode, 1N270	3020010
CR9005	Diode, 1N270	3020010
CR9006	Diode, 1N270	3020010
CR9007	Diode, 1N4148	3020090
P9001	Connector, Rt. Angle, 4 Circuit	3290714
P9002	Connector, Rt. Angle, 4 Circuit	3290714
P9003	Connector, Rt. Angle, 4 Circuit	3290714
P9004	Connector, Rt. Angle, 4 Circuit	3290714
P9005	Connector, Rt. Angle, 6 Circuit	3290716
Q9001	Transistor, 2N3904	3030105
Q9002	Transistor, 2N4125	3030110
Q9003	Transistor, 2N3904	3030105
Q9004	Transistor, 2N3904	3030105
Q9005	Transistor, 2N4402	3030120
Q9006	Transistor, 2N4402	3030120
Q9007	Transistor, 2N4402	3030120
Q9008	Transistor, 2N4402	3030120
Q9009	Transistor, 2N4402	3030120
Q9010	Transistor, 2N4402	3030120
Q9011	Transistor, 92PU01	3030323
Q9012	Transistor, 2N3904	3030105
Q9013	Transistor, 2N4402	3030120
R9001	Resistor, Carbon Film, 100 K Ω \pm 5%, 1/4 W	3220315
R9002	Resistor, Carbon Film, 100 K Ω \pm 5%, 1/4 W	3220315
R9003	Resistor, Carbon Film, 100 K Ω \pm 5%, 1/4 W	3220315
R9004	Resistor, Carbon Film, 100 K Ω \pm 5%, 1/4 W	3220315

REF DES	DESCRIPTION	PART NO.
R9005	Resistor, Carbon Film, 100 K Ω \pm 5%, 1/4 W	3220315
R9006	Resistor, Carbon Film, 100 K Ω \pm 5%, 1/4 W	3220315
R9007	Resistor, Carbon Film, 100 K Ω \pm 5%, 1/4 W	3220315
R9008	Resistor, Carbon Film, 100 K Ω \pm 5%, 1/4 W	3220315
R9009	Resistor, Carbon Film, 100 K Ω \pm 5%, 1/4 W	3220315
R9010	Resistor, Carbon Film, 100 K Ω \pm 5%, 1/4 W	3220315
R9011	Resistor, Carbon Film, 100 K Ω \pm 5%, 1/4 W	3220315
R9012	Resistor, Carbon Film, 1 M Ω \pm 5%, 1/4 W	3220355
R9013	Resistor, Carbon Film, 560 Ω \pm 5%, 1/4 W	3220125
R9014	Resistor, Carbon Film, 560 Ω \pm 5%, 1/4 W	3220125
R9015	Resistor, Carbon Film, 560 Ω \pm 5%, 1/4 W	3220125
R9016	Resistor, Carbon Film, 150 Ω \pm 5%, 1/4 W	3220065
R9017	Resistor, Carbon Film, 470 Ω \pm 5%, 1/4 W	3220110
R9018	Resistor, Carbon Film, 330 Ω \pm 5%, 1/4 W	3220090
R9019	Resistor, Carbon Film, 560 Ω \pm 5%, 1/4 W	3220125
R9020	Resistor, Carbon Film, 560 Ω \pm 5%, 1/4 W	3220125
R9021	Resistor, Carbon Film, 560 Ω \pm 5%, 1/4 W	3220125
R9022	Resistor, Carbon Film, 560 Ω \pm 5%, 1/4 W	3220125
R9023	Resistor, Carbon Film, 560 Ω \pm 5%, 1/4 W	3220125
R9024	Resistor, Carbon Film, 50 Ω \pm 5%, 1/4 W	3220125
R9025	Resistor, Carbon Film, 100 Ω \pm 5%, 1/4 W	3220055
R9026	Resistor, Carbon Film, 100 Ω \pm 5%, 1/4 W	3220055
R9027	Resistor, Carbon Film, 560 Ω \pm 5%, 1/4 W	3220125
R9028	Resistor, Carbon Film, 560 Ω \pm 5%, 1/4 W	3220125
R9029	Resistor, Carbon Film, 2.2 K Ω \pm 5%, 1/4 W	3220190
R9030	Resistor, Carbon Film, 2.2 K Ω \pm 5%, 1/4 W	3220190
R9031	Resistor, Carbon Film, 220 Ω \pm 5%, 1/4 W	3220075
R9032	Resistor, Carbon Film, 2.2 K Ω \pm 5%, 1/4 W	3220190
R9033	Resistor, Carbon Film, 560 Ω \pm 5%, 1/4 W	3220125
R9034	Resistor, Carbon Film, 560 Ω \pm 5%, 1/4 W	3220125
R9035	Resistor, Carbon Film, 560 Ω \pm 5%, 1/4 W	3220125
R9036	Resistor, Carbon Film, 560 Ω \pm 5%, 1/4 W	3220125
R9037	Resistor, Carbon Film, 1 K Ω \pm 5%, 1/4 W	3220160
R9038	Resistor, Carbon Film, 47 Ω \pm 5%, 1/4 W	3220035
R9039	Resistor, Carbon Film, 150 Ω \pm 5%, 1/4 W	3220065
R9040	Resistor, Carbon Film, 47 Ω \pm 5%, 1/4 W	3220035
R9041	Resistor, Carbon Film, 10 K Ω \pm 5%, 1/4 W	3220235
R9042	Resistor, Carbon Film, 1 K Ω \pm 5%, 1/4 W	3220160
R9043	Resistor, Carbon Film, 10 K Ω \pm 5%, 1/4 W	3220235
R9044	Resistor, Carbon Film, 2.2 K Ω \pm 5%, 1/4 W	3220190
R9045	Resistor, Carbon Film, 2.2 K Ω \pm 5%, 1/4 W	3220190
R9046	Resistor, Carbon Film, 2.2 K Ω \pm 5%, 1/4 W	3220190
R9047	Resistor, Carbon Film, 2.2 K Ω \pm 5%, 1/4 W	3220190
R9048	Resistor, Carbon Film, 15 K Ω \pm 5%, 1/4 W	3220245
R9049	Resistor, Carbon Film, 10 K Ω \pm 5%, 1/4 W	3220235
R9050	Resistor, Carbon Film, 10 K Ω \pm 5%, 1/4 W	3220235
R9051	Resistor, Carbon Film, 10 K Ω \pm 5%, 1/4 W	3220235
R9052	Resistor, Carbon Film, 10 K Ω \pm 5%, 1/4 W	3220235
R9053	Resistor, Carbon Film, 100 K Ω \pm 5%, 1/4 W	3220315
R9054	Resistor, Carbon Film, 100 K Ω \pm 5%, 1/4 W	3220315
R9055	Resistor, Carbon Film, 100 K Ω \pm 5%, 1/4 W	3220315
R9056	Resistor, Carbon Film, 100 K Ω \pm 5%, 1/4 W	3220315
R9057	Resistor, Carbon Film, 10 K Ω \pm 5%, 1/4 W	3220235
R9058	Resistor, Carbon Film, 10 K Ω \pm 5%, 1/4 W	3220235
R9059	Resistor, Carbon Film, 22 K Ω \pm 5%, 1/4 W	3220260
R9060	Resistor, Carbon Film, 10 K Ω \pm 5%, 1/4 W	3220235
R9061	Resistor, Carbon Film, 22 K Ω \pm 5%, 1/4 W	3220260
R9062	Resistor, Carbon Film, 22 K Ω \pm 5%, 1/4 W	3220260

REF DES	DESCRIPTION	PART NO.
R9063	Resistor, Carbon Film, 22 K Ω \pm 5%, 1/4 W	3220260
R9064	Resistor, Carbon Film, 100 K Ω \pm 5%, 1/4 W	3220315
R9065	Resistor, Carbon Film, 47 Ω \pm 5%, 1/4 W	3220035
R9066	Resistor, Carbon Film, 1 K Ω \pm 5%, 1/4 W	3220160
R9067	Resistor, Carbon Film, 47 Ω \pm 5%, 1/4 W	3220035
R9068	Resistor, Carbon Film, 1 K Ω \pm 5%, 1/4 W	3220160
R9069	Resistor, Carbon Film, 47 Ω \pm 5%, 1/4 W	3220035
R9070	Resistor, Carbon Film, 1 K Ω \pm 5%, 1/4 W	3220160
R9071	Resistor, Carbon Film, 47 Ω \pm 5%, 1/4 W	3220035
R9072	Resistor, Carbon Film, 1 K Ω \pm 5%, 1/4 W	3220160
R9073	Resistor, Carbon Film, 47 Ω \pm 5%, 1/4 W	3220035
R9074	Resistor, Carbon Film, 1 K Ω \pm 5%, 1/4 W	3220160
R9075	Resistor, Carbon Film, 47 Ω \pm 5%, 1/4 W	3220035
R9076	Resistor, Carbon Film, 1 K Ω \pm 5%, 1/4 W	3220160
R9077	Resistor, Carbon Film, 33 Ω \pm 5%, 1/4 W	3220025
R9078	Resistor, Carbon Film, 33 Ω \pm 5%, 1/4 W	3220025
R9079	Resistor, Carbon Film, 33 Ω \pm 5%, 1/4 W	3220025
R9080	Resistor, Carbon Film, 33 Ω \pm 5%, 1/4 W	3220025
R9081	Resistor, Carbon Film, 33 Ω \pm 5%, 1/4 W	3220025
R9082	Resistor, Carbon Film, 33 Ω \pm 5%, 1/4 W	3220025
R9083	Resistor, Carbon Film, 33 Ω \pm 5%, 1/4 W	3220025
R9084	Resistor, Carbon Film, 1 K Ω \pm 5%, 1/4 W	3220160
R9085	Resistor, Carbon Film, 22 Ω \pm 5%, 1/4 W	3220260
R9086	Resistor, Carbon Film, 220 Ω \pm 5%, 1/4 W	3220075
R9087	Resistor, Carbon Film, 33 Ω \pm 5%, 1/4 W	3220025
R9088	Resistor, Carbon Film, 22 K Ω \pm 5%, 1/4 W	3220260
R9089	Resistor, Carbon Film, 1 K Ω \pm 5%, 1/4 W	3220160
R9090	Resistor, Carbon Film, 1 K Ω \pm 5%, 1/4 W	3220160
R9091	Resistor, Carbon Film, 820 Ω \pm 5%, 1/4 W	3220145
R9092	Resistor, Wire Wound, 5 Ω 5 W	3250100
T9001	Transformer	2510014
U9001	Integrated Circuit, 14023 CMOS	3041035
U9002	Integrated Circuit, 14011 CMOS	3041010
U9003	Integrated Circuit, PROM TTL	3040015
U9004	Integrated Circuit, 14528 CMOS	3041130
U9005	Integrated Circuit, 14510 CMOS	3041105
U9006	Integrated Circuit, 14510 CMOS	3041105
U9007	Integrated Circuit, 14050 CMOS	3041050
U9008	Integrated Circuit, 14050 CMOS	3041050
U9009	Integrated Circuit, 10116 ECL	3040610
U9010	Integrated Circuit, 10116 ECL	3040610
U9011	Integrated Circuit, 10102 ECL	3040600
U9012	Integrated Circuit, 10131 ECL	3040620
U9013	Integrated Circuit, 10138 ECL	3040630
U9014	Integrated Circuit, 14017 CMOS	3041030
U9015	Integrated Circuit, 14017 CMOS	3041030
U9016	Integrated Circuit, 14081 CMOS	3041070
U9017	Integrated Circuit, 74LS390 TTL	3040478
U9018	Integrated Circuit, 14508 CMOS	3041100
U9019	Integrated Circuit, 14518 CMOS	3041115
U9020	Integrated Circuit, 14510 CMOS	3041105
U9021	Integrated Circuit, 14508 CMOS	3041100
U9022	Integrated Circuit, 14518 CMOS	3041115
U9023	Integrated Circuit, 14510 CMOS	3041105
U9024	Integrated Circuit, 14510 CMOS	3041105
U9025	Integrated Circuit, 14508 CMOS	3041100
U9026	Integrated Circuit, 14013 CMOS	3041020
U9027	Integrated Circuit, 14510 CMOS	3041105

REF DES	DESCRIPTION	PART NO.
U9028	Integrated Circuit, 74LS145 TTL	3040509
U9029	Integrated Circuit, 14558 CMOS	3041138
U9030	Integrated Circuit, 14013 CMOS	3041020
U9031	Integrated Circuit, 14013 CMOS	3041020
U9032	Integrated Circuit, ULN2003A	3040539
U9033	Integrated Circuit, Linear, 7805C	3040160
U9034	Integrated Circuit, Linear, 7805C	3040160
	2-Digit LED Display	3080021
	4-Digit LED Display	3080022
	25 Pin Connector	3290715

NOTES:

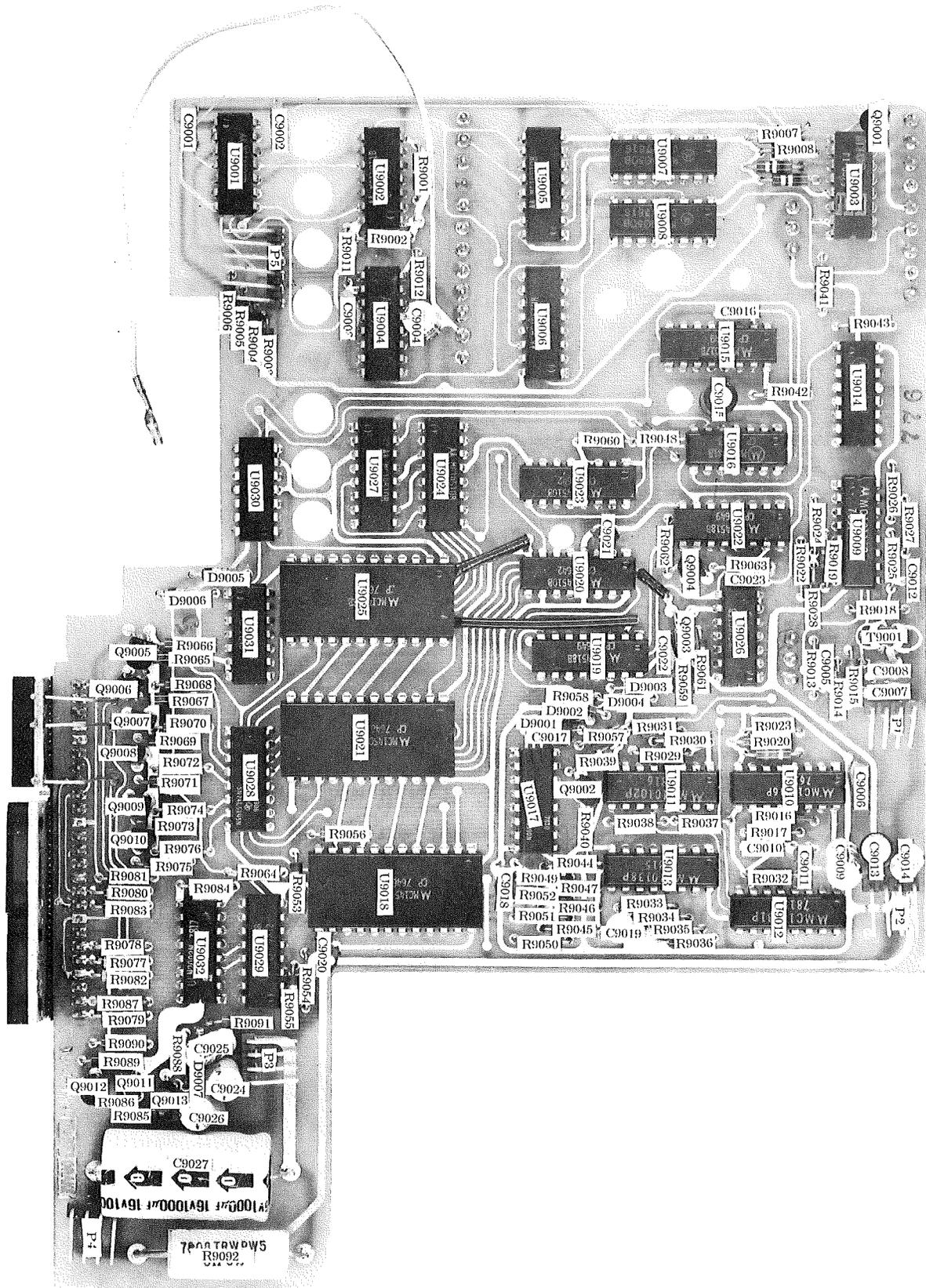
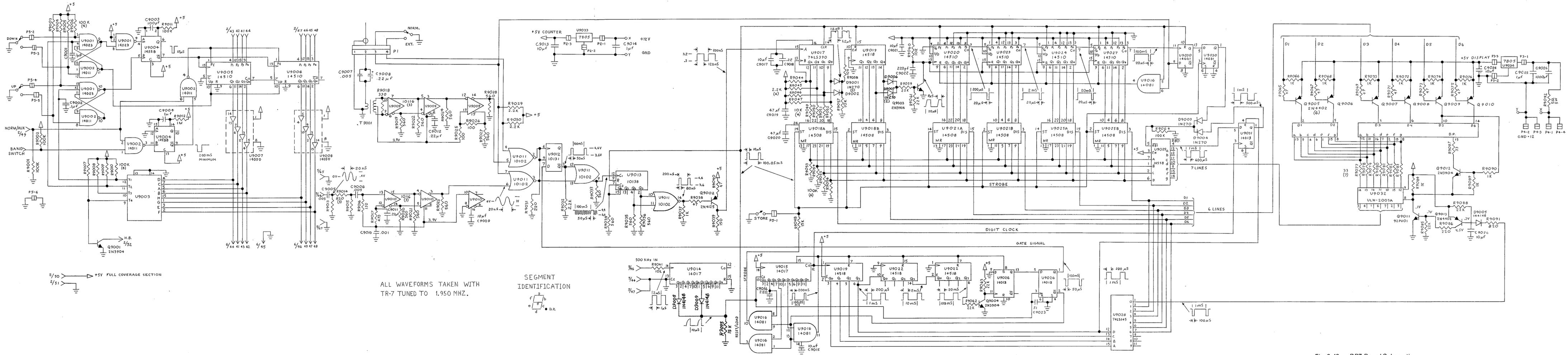


Fig. 3-42 DR7 Board Pictorial

NOTES:

R	9001 9002	9003 9004 9005	9006 9007 9008 9009 9010	9011 9012	9013 9014 9015 9016 9017	9018 9019 9020	9021 9022	9023 9024	9025 9026 9027	9028 9029 9030	9031	9032	9033 9034	9035 9036	9041	9037 9038 9039 9040	9043 9044 9045 9046 9047	9049 9050 9051 9052 9053 9054 9055 9056 9057 9058	9059 9060 9061	9062 9063	9064	9065 9066	9067 9068	9069 9070 9071 9072 9073 9074 9075 9076 9077 9078 9079	9080 9081 9082	9083 9084	9085 9086 9087 9088	9089 9090 9091	9026 9024 9026 9027	9034
C	9001 9002	9003 9004	9005 9006 9007 9008	9009 9010	9011 9012 9013 9014	9015 9016 9017	9018 9019 9020 9021 9022	9023 9024 9025 9026 9027	9028 9029 9030 9031	9032 9033	9034 9035 9036	9037 9038 9039 9040	9041 9042 9043 9044 9045 9046 9047	9048 9049 9050 9051 9052 9053 9054 9055 9056 9057 9058	9059 9060 9061	9062 9063 9064	9065 9066 9067 9068 9069 9070 9071 9072 9073 9074 9075 9076 9077 9078 9079	9080 9081 9082	9083 9084	9085 9086 9087 9088	9089 9090 9091	9026 9024 9026 9027	9034							
U	9001 9002	9003 9004	9005 9006 9007 9008	9009 9010	9011 9012 9013 9014	9015 9016 9017	9018 9019 9020 9021 9022	9023 9024 9025 9026 9027	9028 9029 9030 9031	9032 9033	9034 9035 9036	9037 9038 9039 9040	9041 9042 9043 9044 9045 9046 9047	9048 9049 9050 9051 9052 9053 9054 9055 9056 9057 9058	9059 9060 9061	9062 9063 9064	9065 9066 9067 9068 9069 9070 9071 9072 9073 9074 9075 9076 9077 9078 9079	9080 9081 9082	9083 9084	9085 9086 9087 9088	9089 9090 9091	9026 9024 9026 9027	9034							



ALL WAVEFORMS TAKEN WITH TR-7 TUNED TO 1.950 MHZ.

SEGMENT IDENTIFICATION

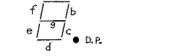


Fig. 3-43 DR7 Board Schematic

3-19. PTO

The Permeability-Tuned Oscillator (PTO) provides a 5.05-5.55 MHz injection signal to the synthesizer circuitry of the RR3. The VCO (Section 3-6) tracks the frequency of the PTO, thus allowing the operator to tune through any 500 kHz range via the front panel tuning control. The PTO has been very carefully calibrated and temperature compensated at the factory, and any attempt at repair or replacement of components will very likely destroy the calibration and/or compensation. It is highly recommended, therefore, that any PTO which requires attention be returned to the factory for proper repair.

It is possible to adjust the knob torque required to tune the PTO, should this become necessary. This is accomplished as follows:

1. Remove the DR7. See Section 3-18 (P. 3-107) for removal instructions.
2. Loosen forward set screw on bandshaft coupler. Pull shaft with bandswitch dial still attached out front of radio.
3. Remove handles from front panel via (4) four screws.
4. Remove the top two screws on each side holding the front panel to the side rails, and loosen the bottom screws. Also remove the top screw at the metal partition (between speaker and S-meter) and loosen the bottom screw of the same partition.
5. The front panel will now hinge down, exposing the PTO.
6. Refer to figure 3-44 and identify the wrench access hole in the rear of the PTO cover. Insert a long (at least 3") 3/32" ALLEN wrench straight through this hole, seating the wrench in the ALLEN set screw which serves as the shaft bearing. The proper wrench is available from the factory. Be sure to insert the wrench straight through the access hole, to avoid damaging any components inside the PTO.
7. Carefully adjust the set screw for the desired knob torque. Overtightening the adjustment screw must be avoided to prevent bearing damage.
8. Reverse the above procedure to reassemble the RR3.

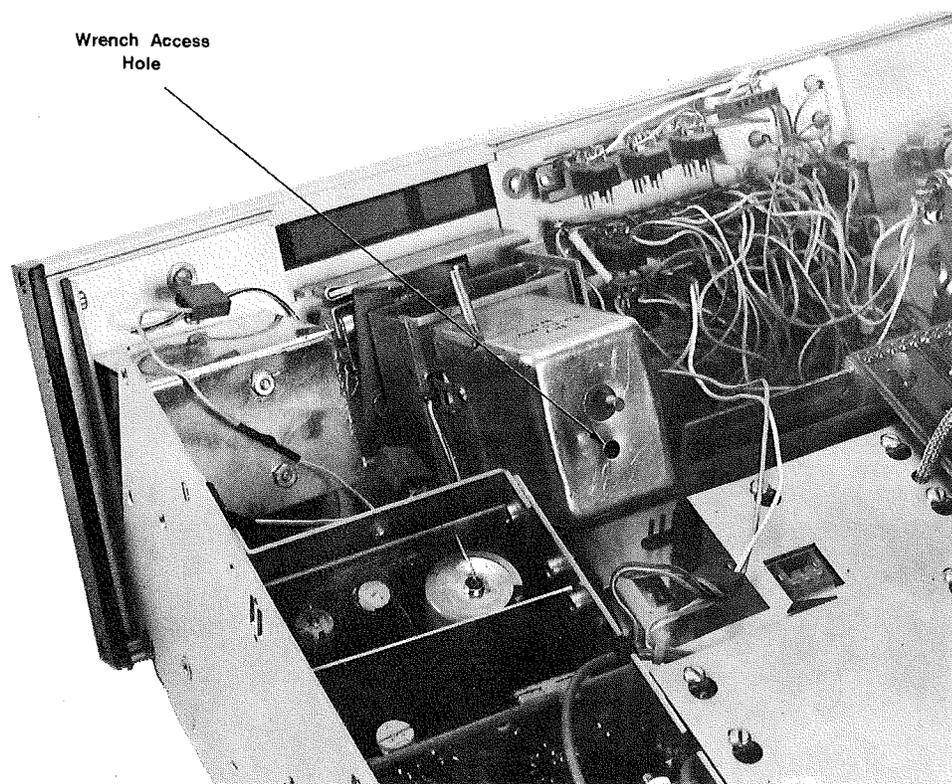


Fig. 3-44 PTO Torque Adjustment

NOTES:

3-20. RP700 RECEIVER PROTECTOR

The RP700 Receiver Protector offers receiver protection necessary to allow operation in close proximity to high-power transmitters. The solid state circuitry furnishes protection to all RF signals, even those in the microwave band.

With the RP700 the receiver is protected at all times, even when in the off position or tuned to other fre-

quencies. The protector is inserted in the transmission line between the antenna and the receiver and limits the signal level applied to the receiver while providing very low insertion loss under lower signal conditions.

Refer to figure 3-46 for schematic and figure 3-45 for parts location information.

NOTES:

NOTES:

RP700 RECEIVER PROTECTOR

REF DES	DESCRIPTION	PART NO.
C8501	Capacitor, Disc, .05 F + 80%, Z5U	3161630
C8502	Capacitor, Disc, .05 F + 80%, Z5U	3161630
C8503	Capacitor, Disc, 150 pF ± 20%, Z5U	3161160
CR8501	Diode, 1N4148	3020090
CR8502	Diode, 1N4148	3020090
CR8503	Diode, 1N4148	3020090
CR8504	Diode, UM9401	3020330
CR8505	Diode, 1N4148	3020090
CR8506	Diode, 1N4148	3020090
CR8507	Diode, 1N4148	3020090
CR8508	Diode, UM9401	3020330
L8501	Inductor, Air 4-1/4T	2514090

NOTES:

NOTES:

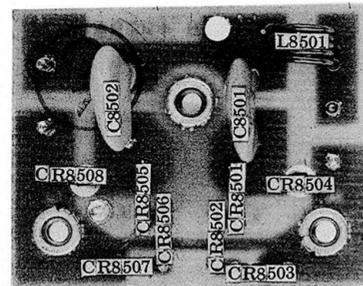
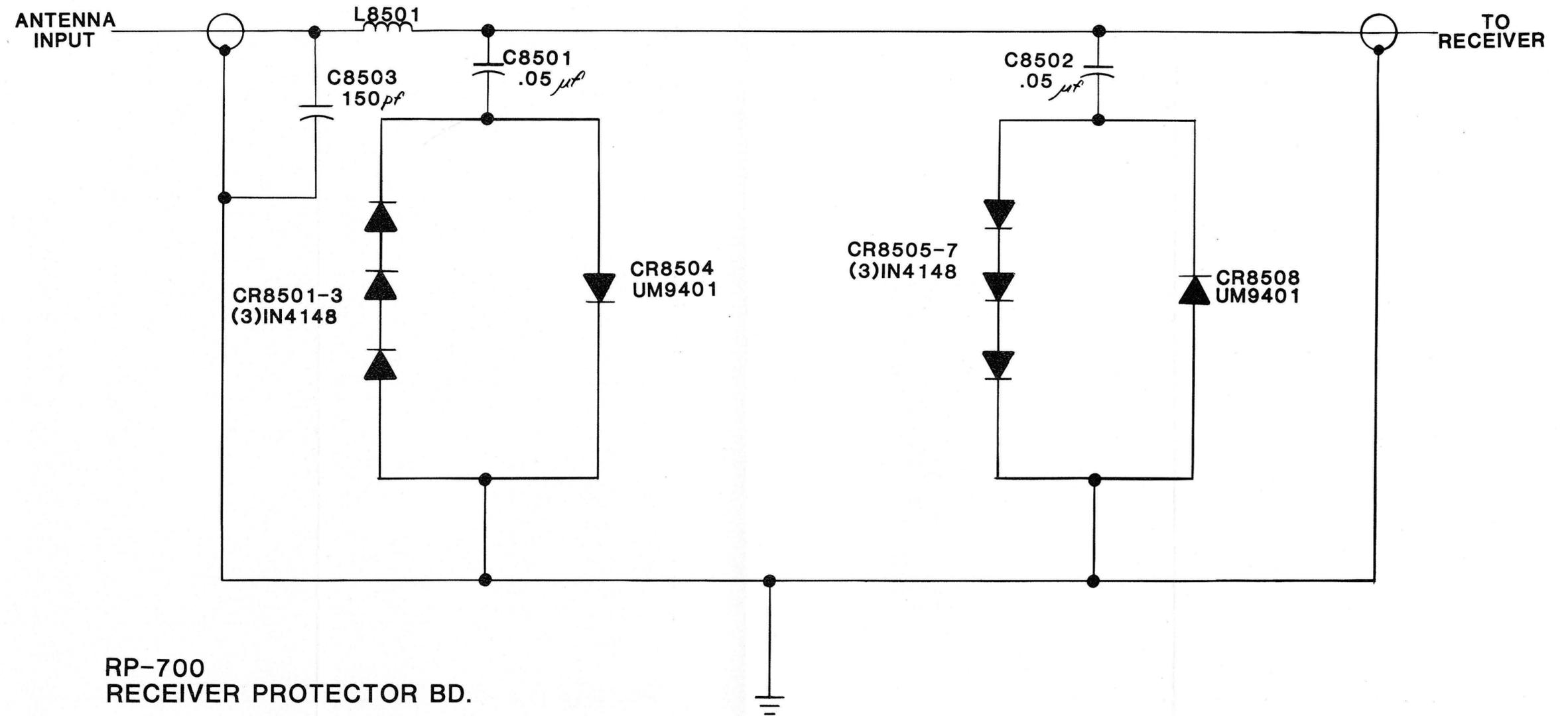


Fig. 3-45 RP700 Board Pictorial



RP-700
RECEIVER PROTECTOR BD.

Fig. 3-46 RP700 Board Schematic

SECTION 4

ALIGNMENT PROCEDURE

The following alignment procedure can be accomplished with a VTVM, RF voltmeter, audio voltmeter, 60 MHz frequency counter and a signal generator with well calibrated output level. In addition, a good high-frequency (30-50 MHz) oscilloscope is recommended, but not required.

The procedure is structured in such a manner that it may be entered at any point and followed to conclusion. That is, if you are sure that all adjustments preceding those of interest are correct, you may start at the section which addresses the problem at hand. However, all sections following the starting point must be completed to insure proper operation. If any doubt exists, it is recommended that the entire procedure be executed.

It is not necessary to use the board extenders for any of the following adjustments. In fact, use of the extenders will distort alignment settings. The board extenders should only be used for troubleshooting and repair.

4-1. 13.8 VOLT ADJUSTMENT

Using an accurate voltmeter, adjust R1808 on the +13.8 V Regulator board (Section 3-15) for 13.8 VDC ± 0.2 VDC, measured at S-meter pilot lamp socket. Although the voltage setting is not critical, a setting considerably higher than +13.8 V will shorten pilot lamp life; a setting considerably lower will limit maximum audio output power.

4-2. 10 VOLT ADJUSTMENT

Using an accurate voltmeter, adjust R1903 on the Power Supply board (Section 3-16) for exactly 10 VDC, measured on the 10 volt trace of the Parent board (Section 3-1). Note that adjusting the 10 volt regulator will affect all circuits in the transceiver, thus requiring a full alignment.

4-3. 40 MHz OSCILLATOR ALIGNMENT

Adjust L1006 on the PBT/Reference Board (Section 3-11) for maximum 40 MHz output on pin 21. Use an

RF voltmeter, and measure this level on the Parent board. A level of about .25 volts can be expected.

Connect an accurate frequency counter through a 470 Ω , 1/4 W, 10% resistor to pin 21 of the PBT/Reference board and adjust L1001 for exactly 40 MHz. Note that any error in this adjustment will result in a calibration and readout accuracy discrepancy. Do not connect directly to pin 21 for this frequency adjustment, since the load of the counter may cause the 40 MHz oscillator to shift frequency slightly.

Although adjustment with a frequency counter is preferred, it is possible to set the 40 MHz oscillator using WWV. Peak L1006 as described above and turn to the strongest available WWV signal in your area. Place the radio in the AM mode, and wait until WWV is transmitting an unmodulated carrier. Enable the calibrator and carefully adjust L1001 for exact zero beat with WWV. This method requires that WWV be of comparable signal strength with the calibrator. As such, it may be necessary to select the proper time of day as well as frequency for your area to achieve the desired results.

4-4. 13.695 MHz VCXO ADJUSTMENT

This adjustment should be performed accurately and exactly as outlined below to insure that the passband tuning is correct. Be sure that the 40 MHz oscillator is on frequency before attempting this adjustment.

- a) Position the front panel PBT control at the center of rotation (indicator straight up).
- b) Connect a frequency counter to pin 17 of the PBT/Reference board and adjust L1004 for exactly 53.695 MHz. This is the 2nd L.O. frequency, which is the sum of the 40 MHz and 13.695 oscillators, thus it is important that the 40 MHz oscillator be on frequency.
- c) Connect an RF voltmeter to pin 17 of the PBT/Reference board and tune L1013 and L1014 for maximum output. A level of approximately 200 mV RMS can be expected.

4-5. 5.695 MHz 3RD L.O. TUNING

These adjustments include no frequency determining elements as the 5.695 MHz injection is derived from the previously set 40 MHz and 13.695 oscillators. With rear card cage top cover removed, merely tune L1005, L1008 and L1009 for maximum output level at pin 40 of PBT/Reference board, as measured with an RF voltmeter. A level of approximately 30 mV RMS can be expected.

4-6. VCO ALIGNMENT

The alignment of the high and low VCO can be checked very quickly with the DR7 installed. Set the AUX PROGRAM switch to NORM, the BAND switch to 12 MHz, and press the FIXED button. The display should count up in frequency, and go to approximately 17 MHz. Set the BAND to 16.5 and press the FIXED button. The display should go to approximately 32 MHz. If these results are obtained, the VCO does not require alignment.

If alignment is indicated, perform the following steps to align the VCO. Refer to figure 3-14 for parts location information.

- a) Remove the DR7 board. See Section 3-18 for removal instructions. Also remove the front circuit card shield cover. Replace the DR7 with the Jumper board using one 12 pin and one 9 pin card extender.
- b) For this VCO alignment, temporarily program two unused AUX-7 positions for the following band segments: (1) for the range 14.0-14.5 MHz, and (1) for the range 28.5-29.0 MHz using (2) diode array chips (3042100) supplied in the service kit. See figure 3-5 for AUX-7 programming information.
- c) Set the BAND switch to the 10-15 MHz range, set the AUX-7 switch to the 14.0-14.5 MHz programmed range, and set the PTO to 500.
- d) The VTVM should indicate 16.0 ± 0.5 VDC. If not, adjust L501 for exactly 16 VDC.
- e) Set the BAND switch to the 22-30 MHz range, set the AUX-7 switch to the 28.5-29.0 MHz pro-

grammed range, and leave PTO at 500.

- f) The VTVM should indicate 15.0 ± 0.5 VDC. If not, adjust L502 for exactly 15 VDC.

4-7. TRANSLATOR ALIGNMENT

Translator alignment should be necessary only when parts on the circuit board have been replaced. Remove the DR7 and front circuit card shield cover, and install the Jumper board (on card extenders) in place of the DR7. Perform the following steps in the order listed to insure correct alignment. Refer to figure 3-16 for parts location.

- a) Set BAND switch to 1.5 MHz and set PTO to 500.
- b) Connect an RF voltmeter to the alignment test point indicated in figure 3-16.
- c) Back out the slug in L610 two turns, or until RF voltage decreases by 50%.
- d) Peak L609 and L611 for maximum.
- e) Peak L610 for maximum - do not retune L609 and L611.

4-8. 2ND/3RD IF/AGC ALIGNMENT

The following procedure describes a coarse tune of the 2nd/3rd IF/AGC board and will be required if parts in the IF stages have been changed or board has been mistuned for any reason.

- a) Remove rear card cage cover.
- b) With RR3 operational, set SELECTIVITY switch to NORMAL, FAST AGC button depressed, all other buttons out, RF GAIN fully clockwise and AUXILIARY PROGRAM switch to NORM.
- c) Set AGC bias pot (R1127) in the middle of its range.
- d) Turn S-meter zero pot (R1119) until the meter moves upscale slightly and then back it down to S-2.
- e) Turn RF GAIN control fully counterclockwise and set 60 dB/S9 meter set pot (R1106) for full

scale meter reading. Return RF gain control to fully clockwise.

- f) Set IF GAIN pot for full clockwise.
- g) Set SELECTIVITY switch to WIDE position (whether filter is installed or not).
- h) Feed in 5.645 MHz signal from signal generator into IF board input terminal located at upper left hand corner of board as viewed from front of radio. Internal connection to this board will, of course, have to be unplugged (AGC should remain on FAST).
- i) Adjust generator level for about 1/3 scale S-meter reading and adjust T1101, L1101, L1102, L1103 and T1102 for maximum S-meter reading. Keep reducing generator level as cans are tuned to maintain 1/3 scale meter reading.
- j) Adjust L1105 for maximum S-meter reading.

Remove generator, reconnect internal IF input coax and set SELECTIVITY switch to NORMAL position.

4-9. UP-CONVERTER AND 2ND MIXER TUNING

The following procedure describes both a coarse and fine tune for the Up-Converter board and 2nd Mixer board. All steps will be required if parts have been changed on either board or boards have been mistuned for any reason. If an accessory crystal filter has been installed in the 0.5 or 0.3 kHz selectivity positions, make adjustments according to step e.

- a) Attach scope or RF voltmeter to test point post on 2nd Mixer board. Adjust L703 for maximum indication. A level of approximately 0.9 V RMS can be expected. Remove probe from test point.
- b) Feed in a 12.3 MHz signal into the antenna terminal and tune in for zero beat. The SSB/CW-AM button should be in the SSB/CW position, and the passband tuning control should be in the center. Selectivity switch should be in the NORMAL position.
- c) Adjust generator level to give about 1/3 scale reading on S-meter. If a signal generator is not available, the internal calibrator signal can be

used instead for this adjustment.

- d) Set R719 to end of rotation at maximum gain (full CCW). Adjust C418 on Up-Converter board, and L701 and L705 on 2nd Mixer board for maximum S-meter reading. Keep reducing generator output level as these adjustments are made to keep S-meter reading about 1/3 scale.
- e) If an accessory crystal is installed in either or both positions marked 'B' or 'NARROW' set selectivity switch to one of these used positions. Adjust L706 for maximum S-meter reading. Note the reading and switch to NORMAL position, noting that reading. The difference, if any, between the readings should be less than 1/2 S-unit. If not, switch between NORMAL and 'B' or Narrow filter positions, adjusting R719 slightly to minimize difference. If a 0.3 or 0.3 kHz filter is not available, peak L706 in the NORMAL (2.3 kHz) bandwidth position; then adjust R719 for 1/2 S-unit drop from maximum gain point.

4-10. AGC, IF GAIN AND S-METER FINAL ADJUSTMENT

The following procedure describes the fine tune of the 2nd/3rd IF/AGC and 2nd Mixer boards. The rear card cage cover must be removed for these adjustments.

- a) Connect an audio voltmeter across RR3 speaker terminals.
- b) Adjust AGC bias pot (R1127) fully clockwise.
- c) Apply a 0.5 μ V signal at 12.3 MHz to the MAIN antenna input. Place radio in the NORMAL, SSB/CW mode. Tune PTO for maximum audio output. Peak L701 (cover removed). Turn IF gain pot (R1138) clockwise until audio output no longer increases with additional increase in pot setting. Then turn pot counter-clockwise until audio output decreases 3 dB.
- d) Increase signal generator input to 1 μ V and adjust S-meter zero pot (R1119) for a reading of S1-1/2 on S-meter.
- e) Increase signal generator input to 50,000 μ V and adjust 60 dB over S9 meter set pot (R1106) for 60 dB over S9 on meter.

- f) Repeat steps d and e until no further change is noted.
- g) Install rear card cage cover. Repeak L701 with signal generator level of approximately $1 \mu V$.

4-11. NOTCH TUNING

- a) Turn on calibrator and tune in for zero beat at any 100 kHz point.
- b) Position both NOTCH and PBT pots exactly in the center. Depress NOTCH pushbutton.
- c) Adjust notch coil L1104 and notch depth pot R1147 located on 2nd IF board for maximum notch depth.

- d) Tune PTO to yield 800 Hz (approximately) tone. Adjust notch control on front panel and depth pot (R1147) for least audio tone output.

4-12. RIT CENTERING ADJUSTMENT

Zero beat the calibrate signal with the RIT on and set to the center of its range (indicator straight up). Turn off the RIT and adjust R24 on the Parent board for zero beat. This pot is accessible through a hole in the bottom of the Parent board.

4-13. LINE AMPLIFIER ADJUSTMENT

With a 600 ohm resistive load attached across the line amplifier output and a calibrator signal tuned in for an approximate 1 kHz audio tone, adjust the pot (R8005) to yield a 0 dBm (600 Ω) level as measured on an AC voltmeter.

NOTES:

SECTION 5
ACCESSORIES

5-1. NB7A NOISE BLANKER

The NB7A Noise Blanker, unlike noise clippers or limiters commonly found in communication equipment, is an advanced noise blanker which mutes the receiver for the duration of the noise pulse. Between noise pulses full receiver gain is restored, and receiver AGC is affected only by the desired signal and not by noise. The NB7A is most effective on strong, periodic noise impulses such as automobile ignition noise and LORAN.

5-1.1 CIRCUIT DESCRIPTION

This noise blanker system is composed of the three major networks described below. Refer to the schematic diagram (figure 5-2) to follow this circuit description.

5-1.2 TRANSMIT PATH

In transmit, diode CR815 is turned on with +10T via RFC812 and RFC813 from pin 37. The 5.645 MHz double sideband transmit signal is fed to the output coax connector through C833, CR815 and C838. When CR815 is on, CR814 will be reversed biased, thus holding the receive path off. This path is not used when the blanker is used in the RR3 receiver.

5-1.3 RECEIVE PATH

In receive, diode CR814 is turned on with +10R via RFC810 and RFC811 from pin 24. The receive signal is applied to pin 22 and passes through filter Y810. Q816 amplifies the signal to make up for the loss in Y810. The output of stage Q816 is applied to the blanking gate comprised of T810, CR812, CR813 and T811, then through C830, CR814 and C838 to the output coax connector. C844 provides input matching. When CR814 is on, CR815 will be reverse biased, thus holding the transmit path off.

5-1.4 NOISE PROCESSOR

The Noise Amplifiers consist of Q810, Q811, and U810 cascaded and tuned to 5.645 MHz by L810, L811 and L812 respectively. The output of the noise amplifier string is split by C828 to the pulse detector and C827 to the noise amplifier AGC circuit. Q812 and associated circuitry comprise the noise amplifier AGC detector and amplifier. The AGC voltage is applied to gate 1 of Q810 and Q811 via R826 and R829 respectively.

The pulse detector, CR811, responds only to the positive half of the amplified bipolar input pulse. The network of R839, C831 and C835 waveshape the pulse at the base of the pulse amplifier Q813. Again, the output pulse of Q813 is shaped by R847 and C840 and is applied to the gate driver, Q814. Resistor network R842 and R843 provide fixed reverse bias for the blanking gate. Q815 is a DC switch for +10R and +10NB.

5-1.5 THEORY OF OPERATION

The 5.645 MHz receive signal, with noise pulses, is applied to pin 22. Filter Y810 removes undesired responses that could affect the blanker AGC but has adequate bandwidth to prevent lengthening of noise pulses. Amplifier Q816 amplifies the signal and noise pulses. Tuned amplifiers Q810, Q811 and U810 amplify this low level signal up to a high level to drive the pulse detector CR811.

This detector responds only to the positive going portion of each noise pulse from the output of U810. Following the detector is an RC network which shapes the pulses for driving the level shifter Q813. Again, on the output of Q813 is still another RC network for waveshaping. The gate driver transistor Q814 responds to the negative going pulse from Q813 which allows the blanking gate to turn off, thus muting the receive path and blanking the noise pulse.

Since the noise amplifiers run such high gain, Q812

NB7A NOISE BLANKER

REF DES	DESCRIPTION	PART NO.
C810	Capacitor, Disc, .001 μ F \pm 20%, Z5U	3161380
C811	Capacitor, Disc, .01 μ F \pm 20%, Z5U	3161520
C812	Capacitor, Mica, 390 pF \pm 5%, DM-15	3170370
C813	Capacitor, Disc, .001 μ F \pm 20%, Z5U	3161380
C814	Capacitor, Disc, .01 μ F + 80%, M25V	3161500
C815	Capacitor, Mica, 290 pF \pm 5%, DM-15	3170370
C817	Capacitor, Tantalum, 10 μ F \pm 20%, 25 V	3183030
C818	Capacitor, Disc, .01 μ F + 80%, M25V	3161500
C819	Capacitor, Mica, 390 pF \pm 5%, DM-15	3170370
C820	Capacitor, Disc, .01 μ F + 80%, M25V	3161500
C821	Capacitor, Disc, .0024 μ F \pm 20%, Z5U	3161440
C822	Capacitor, Disc, .01 μ F + 80%, M25V	3161500
C823	Capacitor, Disc, .01 μ F + 80%, M25V	3161500
C824	Capacitor, Disc, .01 μ F + 80%, M25V	3161500
C825	Capacitor, Tantalum, 1 μ F \pm 20%, 35 V	3183010
C826	Capacitor, Disc, .001 μ F \pm 20%, Z5U	3161380
C827	Capacitor, Mica, 180 pF \pm 5%, DM-15	3170180
C828	Capacitor, Disc, .001 μ F \pm 20%, Z5U	3161380
C831	Capacitor, Disc, .05 μ F \pm 20%, M16V	3161600
C834	Capacitor, Tantalum, 1 μ F \pm 20%, 35 V	3183010
C835	Capacitor, Disc, 330 pF \pm 10%, Y5E	3161300
C836	Capacitor, Tantalum, 1 μ F \pm 20%, 35 V	3183010
C838	Capacitor, Disc, .01 μ F + 80%, M25V	3161500
C839	Capacitor, Disc, .001 μ F \pm 20%, Z5U	3161380
C840	Capacitor, Disc, .01 μ F + 80%, M25V	3161500
C841	Capacitor, Tantalum, 10 μ F \pm 20%, 25 V	3183030
C842	Capacitor, Disc, 470 pF \pm 20%, Z5U	3161350
C843	Capacitor, Disc, 470 pF \pm 20%, Z5U	3161350
C845	Capacitor, Disc, 82 pF \pm 5%, N750	3161040
C846	Capacitor, Mica, 680 pF \pm 5%, DM-15	3170500
C847	Capacitor, Disc, 82 pF \pm 5%, N750	3161040
C848	Capacitor, Mica, 680 pF \pm 5%, DM-15	3170500
C849	Capacitor, Disc, 82 pF \pm 5%, N750	3161040
C850	Capacitor, Mica, 680 pF \pm 5%, DM-15	3170500
C851	Capacitor, Disc, .005 μ F \pm 20%, Z5U	3161460
CR810	Diode, 1N4148	3020090
CR811	Diode, AN119/1N541	3020040
CR812	Diode, AA119/1N541	3020040
CR813	Diode, AA119/1N541	3020040
CR816	Diode, 1N4148	3020090
L810	Inductor, Variable Can	2511021
L811	Inductor, Variable Can	2511021
L812	Inductor, Variable Can	2511021
L813	Inductor, Variable, Wht.	2513007
L814	Inductor, Variable, Wht.	2513007
L815	Inductor, Variable, Wht.	2513007
Q810	Transistor, TIS-153	3030480
Q811	Transistor, TIS-153	3030480
Q812	Transistor, 2N4402	3030120
Q813	Transistor, 2N3904	3030105
Q814	Transistor, 2N3904	3030105
Q815	Transistor, 2N4402	3030120
Q816	Transistor, J-310	3030501
R810	Resistor, Carbon Film, 6.8 K Ω \pm 5%, 1/4 W	3220220
R811	Resistor, Carbon Film, 22 K Ω \pm 5%, 1/4 W	3220260
R812	Resistor, Carbon Film, 27 K Ω \pm 5%, 1/4 W	3220020

REF DES	DESCRIPTION	PART NO.
R813	Resistor, Carbon Film, 100 Ω \pm 5%, 1/4 W	3220055
R814	Resistor, Carbon Film, 22 K Ω \pm 5%, 1/4 W	3220260
R815	Resistor, Carbon Film, 100 Ω \pm 5%, 1/4 W	3220055
R816	Resistor, Carbon Film, 100 Ω \pm 5%, 1/4 W	3220055
R817	Resistor, Carbon Film, 100 Ω \pm 5%, 1/4 W	3220055
R818	Resistor, Carbon Film, 68 Ω \pm 5%, 1/4 W	3220045
R819	Resistor, Carbon Film, 47 K Ω \pm 5%, 1/4 W	3220285
R820	Resistor, Carbon Film, 27 Ω \pm 5%, 1/4 W	3220020
R821	Resistor, Carbon Film, 6.8 K Ω \pm 5%, 1/4 W	3220220
R822	Resistor, Carbon Film, 820 Ω \pm 5%, 1/4 W	3220145
R823	Resistor, Carbon Film, 27 Ω \pm 5%, 1/4 W	3220020
R824	Resistor, Carbon Film, 1.5 K Ω \pm 5%, 1/4 W	3220175
R825	Resistor, Carbon Film, 5.6 K Ω \pm 5%, 1/4 W	3220215
R826	Resistor, Carbon Film, 330 K Ω \pm 5%, 1/4 W	3220340
R828	Resistor, Carbon Film, 820 K Ω \pm 5%, 1/4 W	3220145
R829	Resistor, Carbon Film, 330 K Ω \pm 5%, 1/4 W	3220340
R830	Resistor, Carbon Film, 100 K Ω \pm 5%, 1/4 W	3220315
R831	Resistor, Carbon Film, 2.2 K Ω \pm 5%, 1/4 W	3220190
R832	Resistor, Carbon Film, 8.2 K Ω \pm 5%, 1/4 W	3220230
R833	Resistor, Carbon Film, 100 K Ω \pm 5%, 1/4 W	3220315
R834	Resistor, Carbon Film, 330 K Ω \pm 5%, 1/4 W	3220340
R835	Resistor, Composition, 4.7 M Ω \pm 5%, 1/4 W	3220208
R836	Resistor, Carbon Film, 1 K Ω \pm 5%, 1/4 W	3220160
R837	Resistor, Carbon Film, 470 K Ω \pm 5%, 1/4 W	3220345
R838	Resistor, Carbon Film, 100 K Ω \pm 5%, 1/4 W	3220315
R839	Resistor, Carbon Film, 1 M Ω \pm 5%, 1/4 W	3220355
R840	Resistor, Carbon Film, 1 M Ω \pm 5%, 1/4 W	3220355
R841	Resistor, Carbon Film, 680 K Ω \pm 5%, 1/4 W	3220350
R842	Resistor, Carbon Film, 15 K Ω \pm 5%, 1/4 W	3220245
R843	Resistor, Carbon Film, 2.2 K Ω \pm 5%, 1/4 W	3220190
R845	Resistor, Carbon Film, 36 K Ω \pm 5%, 1/4 W	3220280
R846	Resistor, Carbon Film, 10 K Ω \pm 5%, 1/4 W	3220235
R847	Resistor, Carbon Film, 100 K Ω \pm 5%, 1/4 W	3220315
R848	Resistor, Carbon Film, 330 Ω \pm 5%, 1/4 W	3220090
R849	Resistor, Carbon Film, 1.5 K Ω \pm 5%, 1/4 W	3220175
R850	Resistor, Carbon Film, 10 K Ω \pm 5%, 1/4 W	3220235
R851	Resistor, Carbon Film, 100 K Ω \pm 5%, 1/4 W	3220315
R852	Resistor, Carbon Film, 10 K Ω \pm 5%, 1/4 W	3220235
R853	Resistor, Carbon Film, 100 Ω \pm 5%, 1/4 W	3220055
R854	Resistor, Carbon Film, 100 Ω \pm 5%, 1/4 W	3220055
T810	Inductor, Toroid	2510023
T811	Inductor, Toroid	2510023
U810	I.C., MC1350P	3040110
Y810	Crystal Filter	3140282

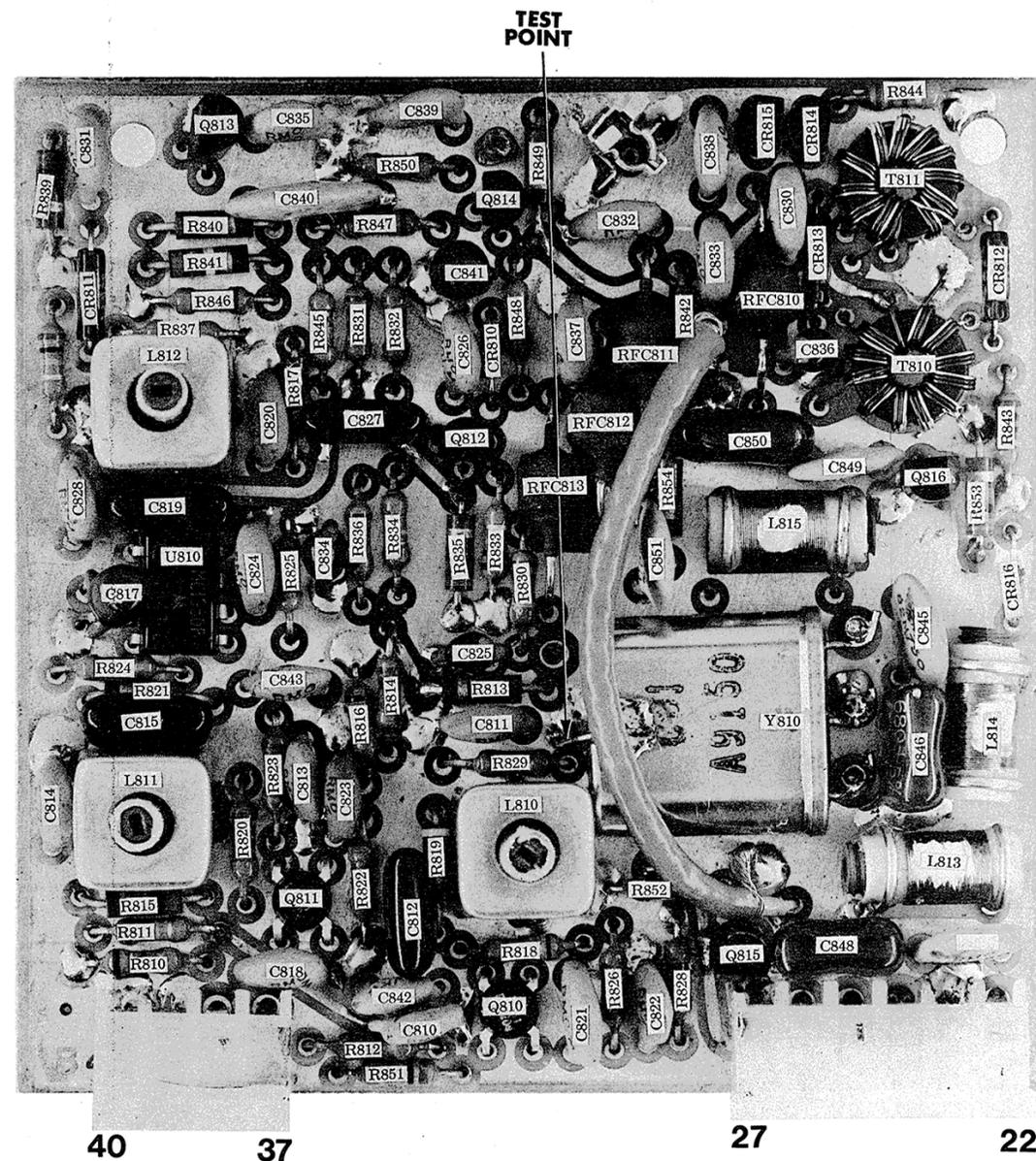


Fig. 5-1 NB7A Board Pictorial

R	810	826	811	818	813	820	819	814	829	830	821	823	815	851	834	824	816	836	839	837	817	838	840	841	845
C	810	847	821	825	811	849	822	812	842	813	832	823	824	814	815	843	824	834	839	835	828	840	819	820	
L	813	815	814	810								811									812				

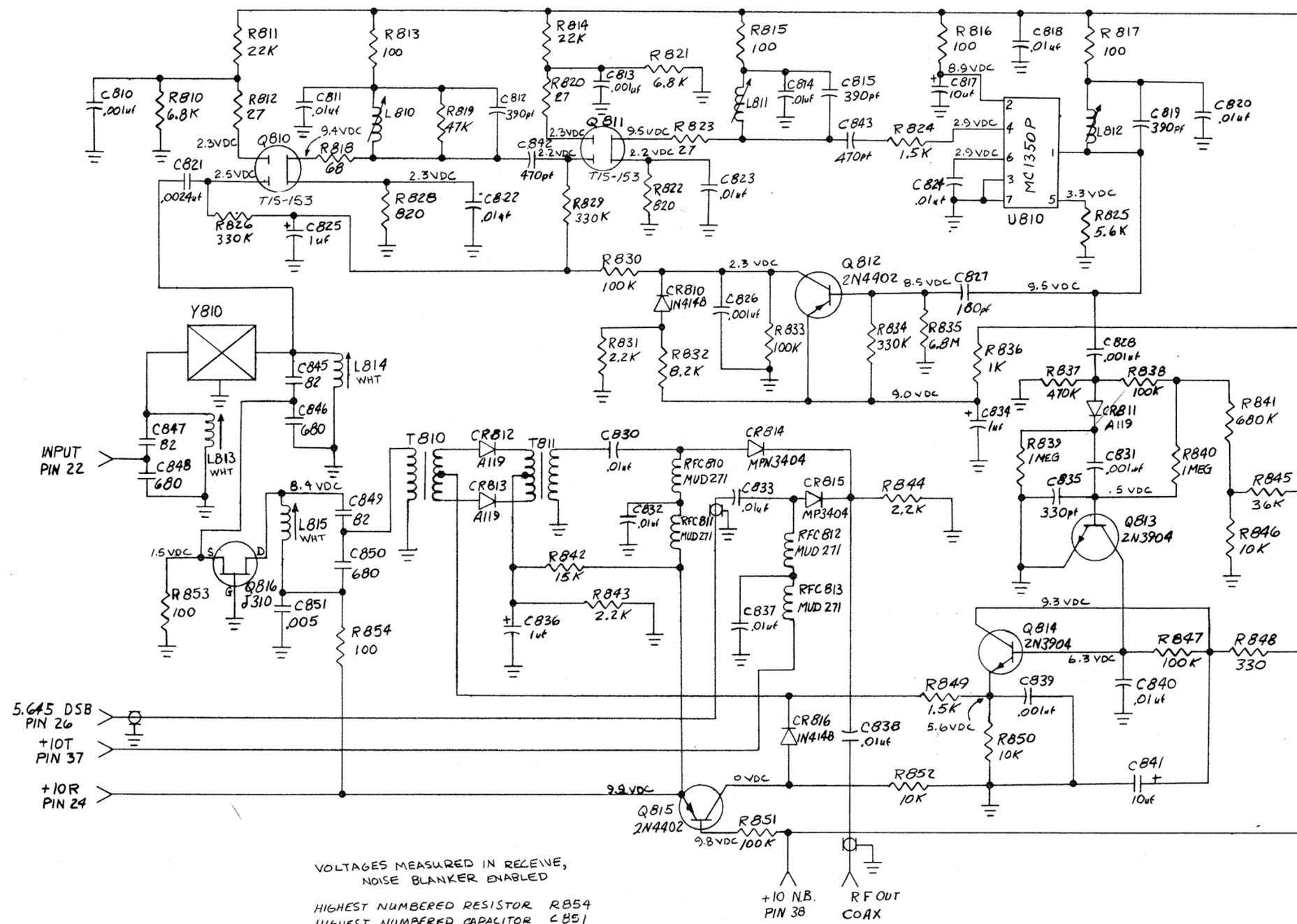


Fig. 5-2 NB7A Board Schematic