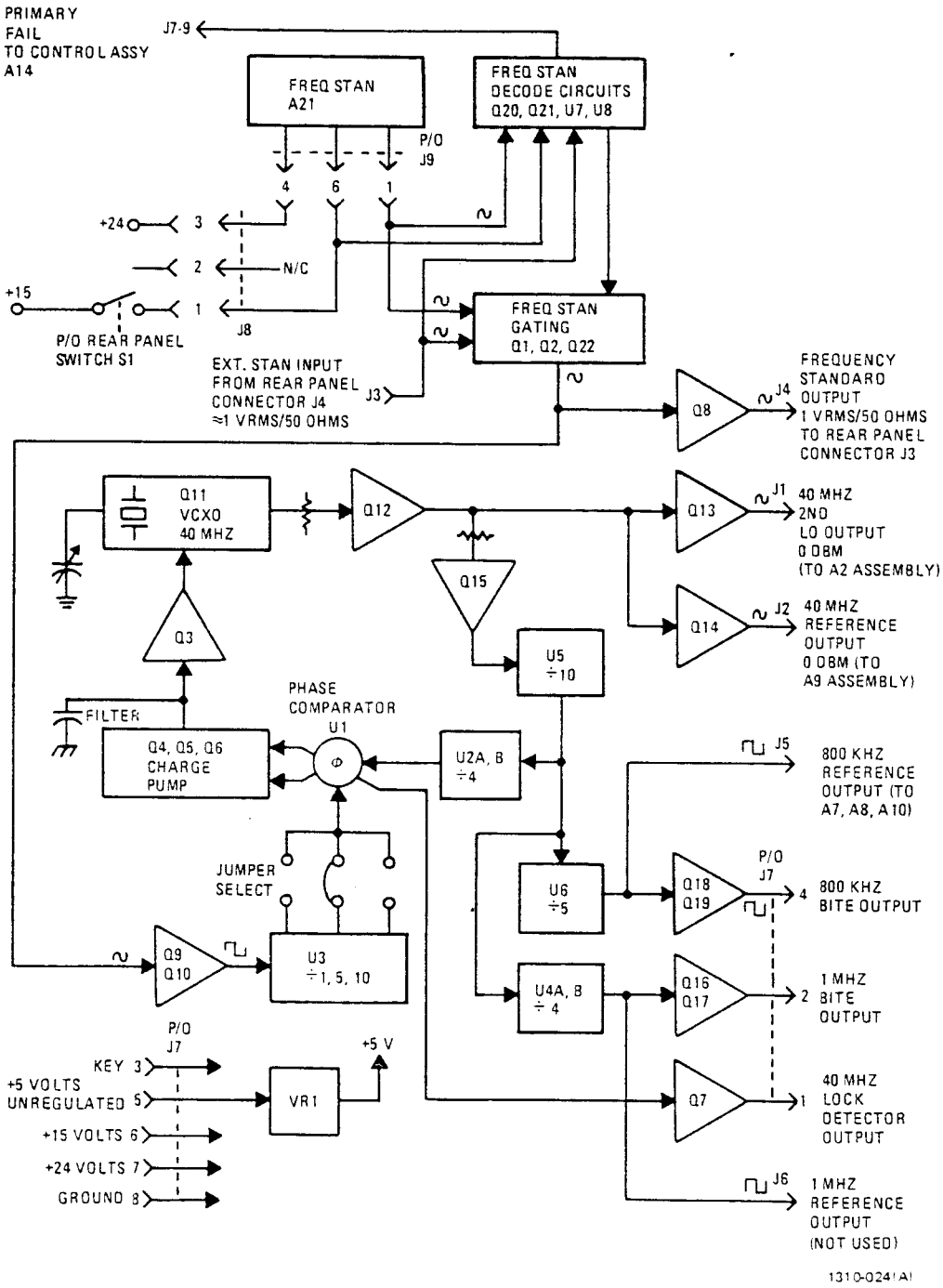
A12/A21
REFERENCE GENERATOR AND FREQUENCY STANDARD ASSEMBLIES



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REFERENCE GENERATOR

AND FREQUENCY STANDARD ASSEMBLIES A12/A21

1. GENERAL DESCRIPTION

Reference Generator Assembly A12, shown in figure 1, contains a 40 MHz phased locked loop (PLL) circuit, locked to either:

- An internal standard, supplied with the exciter
- An external standard, supplied by the operator, if so desired

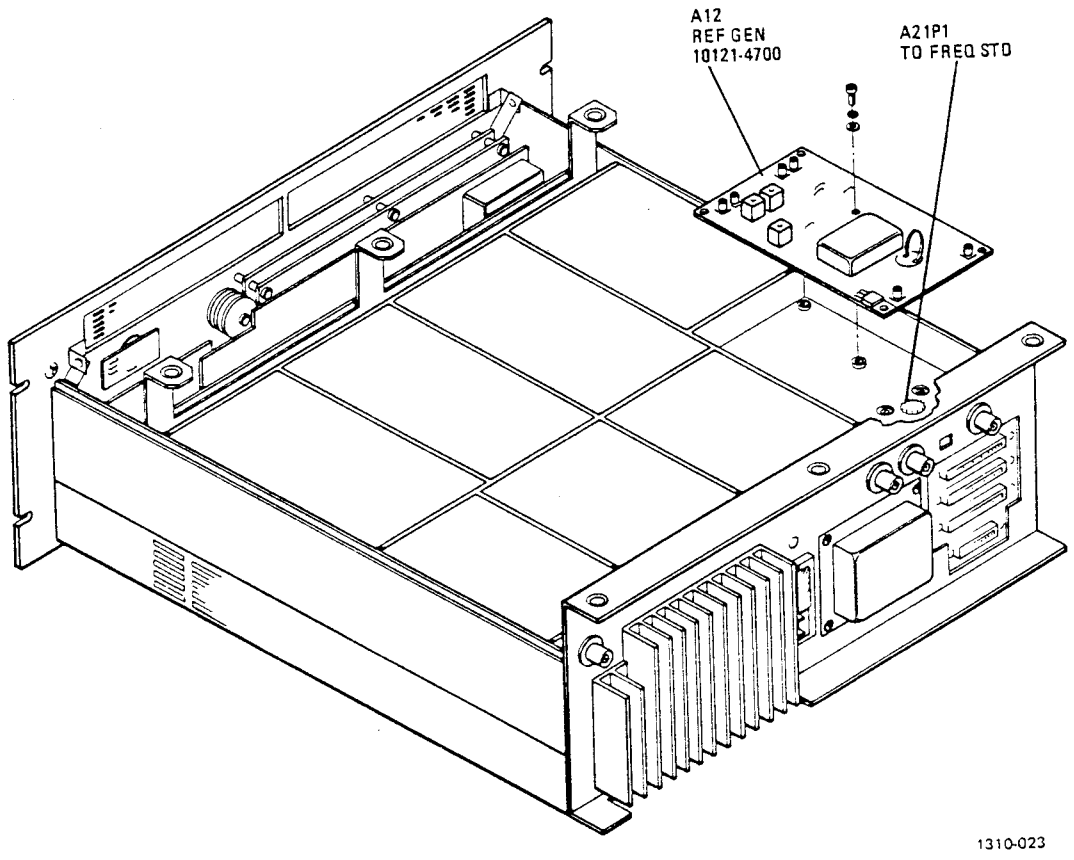


Figure 1. Reference Generator Assembly A12/Frequency Standard Assembly A21 Location

All reference signals required to tune the exciter are then derived from this assembly. These signals are:

- 40 MHz, 0 dBm to Converter Assembly A2
- 40 MHz, 0 dBm to PLL 4 Assembly A9
- 800 kHz, TTL to PLL 2 Assembly A7

- 800 kHz TTL to PLL 3 Assembly A8
- 800 kHz, TTL to PLL 5 Assembly A10

Frequency standard selection is accomplished via rear panel INT/EXT standard select switch S1. An external standard input connector (J4 on rear panel) allows for a 50-ohm, 0.5 to 1 V_{rms} external standard input. Rear panel connector J3 provides a buffered 50-ohm, 0.5 to 1 V_{rms} signal derived from the standard selected.

The standard selected via the INT/EXT switch S1 is referred to as the primary standard. The standard not selected (if connected) is referred to as the secondary standard. Automatic switchover from primary to secondary standards occurs in the event of a primary failure.

Note that both standards must be the same frequency. A jumper connection on this assembly allows either 1, 5, or 10 MHz standards to be used.

Internal Frequency Standard Assembly A21 (supplied with the exciter) is a self-contained, sealed unit which plugs directly into the A12 assembly via nine-pin connector J9. To remove the A21 assembly:

a. Remove the A12 assembly (five mounting screws).

b. Pull the A12 assembly away from the chassis using the loop provided on the assembly.

c. Remove the four mounting nuts that hold the A21 assembly to the chassis.

2. INTERFACE CONNECTIONS

Table 1 details the A12 input/output connections and other relevant data.

Table 1. Reference Generator A12 Interface Connection

Connector	Function	Characteristics
J1	Second LO Output	40 MHz, 0 dBm, 50 ohms
J2	40 MHz Reference	40 MHz, 0 dBm, 50 ohms
J3	External Standard Input	Approximately 1 V_{rms}, 50 ohms
J4	Primary Standard Output	Approximately 1 V_{rms}, 50 ohms
J5	800 kHz Reference Output	TTL
J6	1 MHz Reference Output	TTL
J7-1	40 MHz Lock Detector Output	+5 V = failure
J7-2	1 MHz BITE Output	+5 V = failure
J7-3	Key	
J7-4	800 kHz BITE Output	+5 V = failure

Table 1. Reference Generator A12 Interface Connection (Cont.)

Connector	Function	Characteristics
J7-5	+ 5 Volts Unregulated	200 mA
J7-6	+ 15 Volts	30 mA
J7-7	+ 24 Volts	10 mA
J7-8	Ground	
J7-9	Primary Failure	+ 5 V = failure
J8-1	1) INT/EXT Standard Select A21 2) TXCO power	+ 15 V = Internal Standard. Also provides power for nonovenized internal frequency standard options.
J8-2	Key	
J8-3	A21 XTAL Oven Power	+ 24 (provides up to 300 mA; depends upon internal frequency standard option installed.)
J9-1	Frequency Standard A21 Output	0.5 V_{rms}, 1, 5, or 10 MHz
J9-2, 3	Ground	
J9-4	Same as J8-3	
J9-5	Ground	
J9-6	Same as J8-1	
J9-7, 8, 9	Spare	

3. CIRCUIT DESCRIPTION

Voltage controlled crystal oscillator (VCXO) stage Q11 free runs at 40 MHz and provides all the outputs listed in section 1 after the required buffering and/or frequency division. The VCXO acquires its stability by providing a 1 MHz IF to one port of phase comparator U1 where phase comparison of the 1 MHz reference signal derived from the frequency standard occurs. Any difference in phase and/or frequency between these two signals produces an error signal from the phase comparator which causes the VCXO to tune in the direction which will reduce the error. In so doing, the VCXO frequency of 40 MHz acquires the stability and accuracy of the much lower frequency supplied by the frequency standard.

3.1 Frequency Standard Assembly A21

The frequency standard supplied with the exciter is a self contained, sealed unit which plugs directly into A12 connector J9. The following frequency standards are available:

- 0.01 ppm stability, 1 MHz, part number; 0759-3906

Reference Generator Assembly connector J9 is a nine pin socket. It provides power (+ 24 V and + 15 V) and RF output connections.

3.2 Primary/Secondary Frequency Standard Switchover Circuitry

Automatic switchover is provided from the internal standard to an external standard (and vice versa) in the event of a failure of the standard selected. A simplified block diagram of this function is provided in figure 2.

Signal detectors Q21 and Q20 monitor the internal standard and external standard signal lines, respectively, and produce a dc signal at their outputs if the signals are present. Comparators U7-D and U7-B monitor the detector outputs, and produce a + 15 V output if their signal input has sufficient amplitude.

U8-D, U8-B, and U7-A perform decode functions to route the frequency standard signals through gates Q1 and Q2. This routing depends on the position of internal/external (INT/EXT) standard select switch S1 and the state of the two signal sources. The selected signal is fed to two places:

a. RF amplifier Q9, which boosts the signal level and feeds driver Q10. Q10 output is a square wave at the selected standard frequency. Phase Comparator U1 requires a 1 MHz signal, so divider U3 provides divide-by-5 and divide-by-10 factors if the frequency standard is 5 or 10 MHz, respectively. A jumper field at the U3 output allows selection for the frequency in use.

b. RF output amplifier Q8, which boosts the level to approximately 1 V_{rms} and feeds rear panel connector J3. This signal is a buffered version of the selected frequency standard, to be used by the operator (if needed) for auxiliary purposes.

The primary failure line output at J7-9 is normally 0 Vdc if the primary standard is functional. If the selected standard should fail, this line will go high (5 V) to indicate primary failure, and the decode logic will automatically switch over to the designated secondary standard. Table A on page 1 of the schematic lists the signal provided at the divider U3 input, and the primary failure status, as a function of:

- The position of the INT/EXT standard select switch
- The status of the frequency standards connected

If an external and an internal standard are connected, and the INT/EXT switch S1 is set for internal (therefore the internal standard is designated primary), operation occurs as follows:

a. Q20 and Q21 outputs will be a positive voltage, greater than + 0.2 Vdc. U7-D and U7-B outputs will therefore be + 15 V.

b. Exclusive OR gate U8-D output will be low.

c. + 15 V will be applied to both inputs of U8-B, from INT/EXT standard switch S1, (indicating internal standard selected) and the U7-B output. Exclusive OR gate U8-B output will therefore be low (0 Vdc), causing comparator U8-A output to be high (+ 15 V).

d. U7-A output at + 15 V reverse biases CR12 to cause the Q2 gate to sit at 6 Vdc. Q2 is biased for maximum channel conduction, and passes the internal standard signal to Q9 and Q8. Q9 drives Q10, which produces a square wave at the standard frequency. Q10 is divided by U3 (if necessary) prior to application to phase comparator U1 reference input.

e. U7-A output at + 15 V turns on Q22, which pulls the Q1 gate to approximately 0 Vdc. This causes Q1 to turn off, and the external standard signal is blocked.

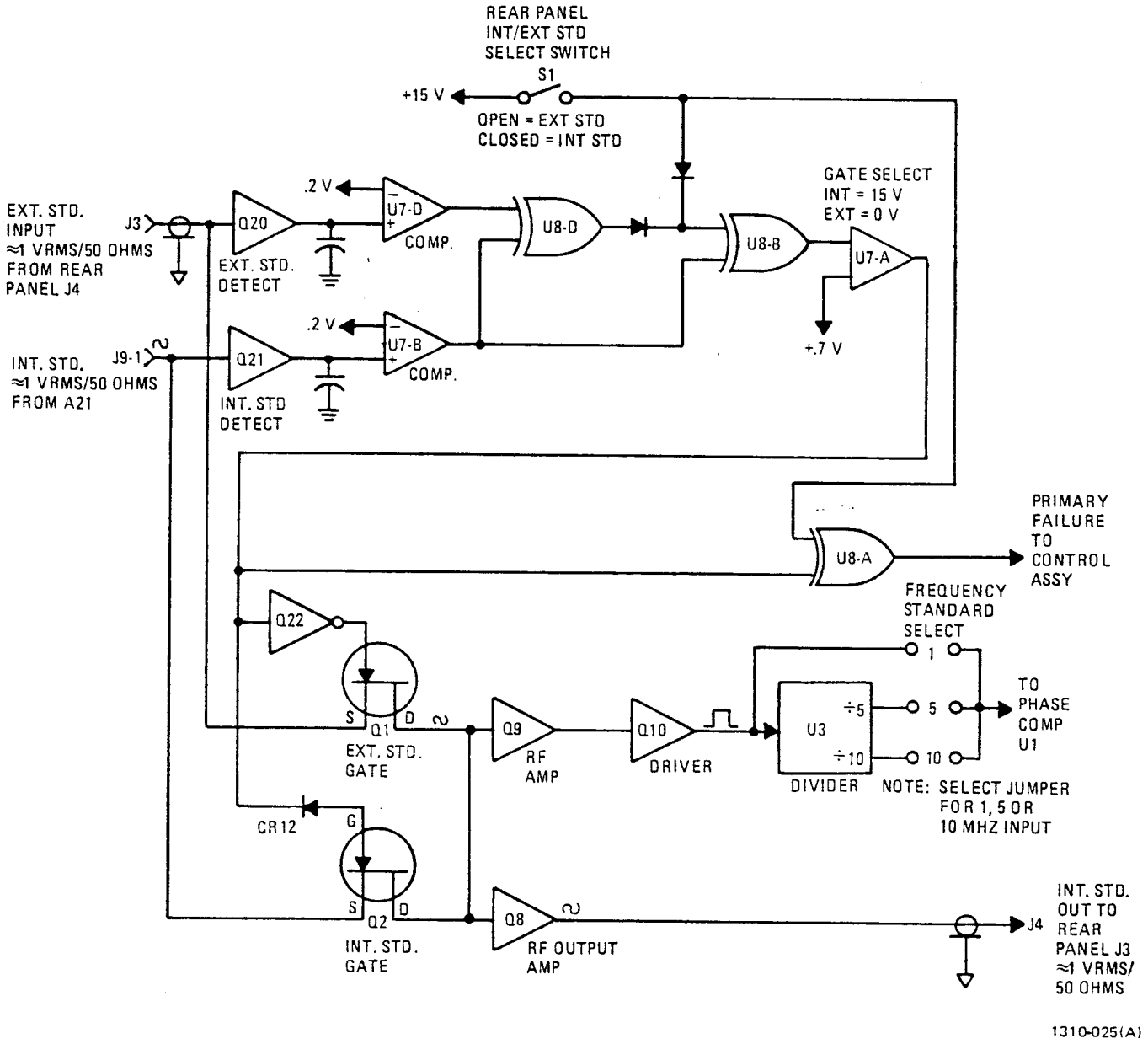


Figure 2. Frequency Standard Switchover Circuit Simplified Block Diagram

f. Since both inputs of exclusive OR gate U8-A are + 15 V, the primary failure output will be 0 Vdc, indicating no failure.

If the internal standard fails:

a. The Q21 output is 0 V, and U7-B output goes to 0 Vdc.

b. U8-D output goes high.

c. Since both inputs of U8-B are different, U8-B output is high, and U7-A output goes low.

d. U7-A output at 0 Vdc forward biases CR12, pulling Q2 gate low, and turns Q2 off. No internal standard signal can now pass.

e. Q22 will turn off, placing Q1 gate at + 6 V. Q1 will pass external standard signal to Q8 and Q9.

f. Since U8-A inputs are different, the primary failure line will go to + 5 Vdc, which will be read as a failure during the BITE test.

3.3 Phase Comparison Circuits

Phase comparator U1 compares the frequency standard derived 1 MHz reference signal to a VCO derived 1 MHz IF signal. When these two signals are equal in frequency and phase, U1 outputs at TP2 and TP3 are essentially 5 Vdc. This holds all transistors in the charge pump circuit (Q4, Q5, Q6) off. The dc voltage across C16 is constant, Q3 is conducting, and the control voltage developed across R13 at TP1 is constant. This holds the VCO frequency constant and equal to a multiple of the frequency standard.

Assume that the VCO frequency decreases due to temperature variations. This causes the 1 MHz IF frequency to decrease. Comparison at U1, pins 1 and 3, causes TP2 to pulse low, and in so doing, turns on Q6 since the Q6 base-emitter circuit is now forward biased. Q5 remains off. Q6 collector voltage drops and forward biases the Q4 base-emitter junction turning Q4 on. Q4 now starts driving charge into C16, raising the C16 potential. This in turn causes Q3 to conduct more current, and the control voltage developed across R13 at TP1 increases. As the control voltage increases, the VCO frequency increases until the IF frequency is again equal to the reference frequency at the U1 inputs. At this point, TP2 switches to + 5 Vdc and equilibrium is obtained. C16 holds this higher dc level to maintain the new higher VCO frequency.

Assume that the VCO frequency increases. This causes the 1 MHz IF frequency to increase. Comparison at U1, pins 1 and 3, causes TP3 to pulse low, and in so doing, biases Q5 into conduction. (Q6 and Q4 remain off.) C16 now has a low impedance discharge path and charge is drawn out. This drops its voltage. This causes Q3 to conduct less, and less control voltage is developed across R13. As this voltage decreases, the VCO frequency decreases until the inputs at U1 are again equal in frequency/phase. At this point, TP3 switches to + 5 Vdc and equilibrium is obtained. C16 holds this lower dc level to maintain the new lower VCO frequency.

3.4 VCXO Operation and Control

A charge pump circuit consisting of Q4, Q5, and Q6 in conjunction with filter network C16, C17, and R14 converts the two phase comparator outputs into an analog dc control voltage. Buffer amplifier Q3 applies this control voltage to varactor diodes CR7 and CR8 in the VCXO. As the capacitance of these diodes change due to control voltage fluctuations, JFET oscillator stage Q11 shifts in frequency. This stage is crystal controlled by Y1 and operates at a nominal frequency of 40.000000 MHz. VCXO output passes through amplifier stages Q12, Q15, and into divide-by-10 counter U5. The 4 MHz from U5 is applied to divide-by-4 counter U2 which applies a 1 MHz signal to the second port of phase comparator U1 to complete the feedback loop.

3.5 A12 Reference Generator Outputs

The 40.000000 MHz from amplifier stage Q12 is amplified to 0 dBm by Q13 and applied through J1 to Converter Assembly A2 mixer U1 where it functions as a second local oscillator (LO) for the exciter.

Q12 also feeds amplifier stage Q14 which routes a 40.000000 MHz, 0 dBm signal to PLL 4 Assembly A9 mixer U1 as a LO injection.

The 4 MHz from divider U5 is applied to divide-by-5 counter U6. U6 TTL output at 800 kHz is fed through J5 to function as a reference signal for phase comparators on the A7, A8, and A10 assemblies. U5 also feeds 4 MHz to divide-by-4 counter U4. U4 TTL output at 1 MHz is fed through U6 to function as a reference output for any options which might require a 1 MHz TTL signal.

3.6 BITE Circuits

Q7 monitors the U1 phase comparator outputs. If either output goes low and remains low for a period of time exceeding the time constant of R19-C19, one of the two diodes (CR5 or CR6) will conduct. This turns Q7 on and develops a + 5 Vdc level indicating an out of lock condition. This immediately flags the BITE monitoring circuits on Control Board Assembly A14 to display a front panel fault light indicator.

The 800 kHz TTL signals from U6 feed detector stage Q18/Q19, and 1 MHz TTL signals from U4B feed detector stage Q16/Q17. Both these detectors will provide a 0 Vdc level when the 800 kHz and 1 MHz reference signals are present, and a + 5 Vdc level when they are not. These two signals are checked only when the BITE self-test is actuated.

4. MAINTENANCE

The following adjustments should not be performed as a routine maintenance procedure, but only when a failure indicates a definite need. Perform all tests with all connections in normal contact unless otherwise specified. It is assumed that the rest of the exciter is functional.

4.1 40 MHz Outputs Adjustment

Perform the following procedure to adjust the 40 MHz outputs.

a. Connect equipment as shown in figure 3.

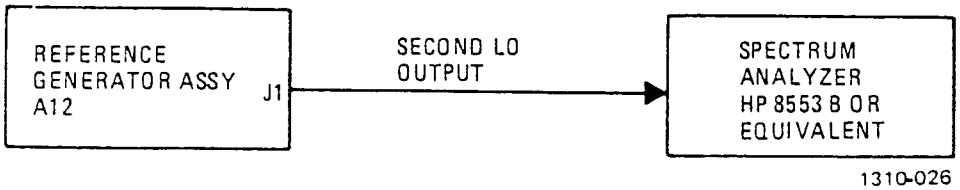


Figure 3. 40 MHz Outputs Adjustment

b. Set INT/EXT standard select switch to INT.

c. Monitor J1 and adjust T3 and then T4 for a peak indication at 40 MHz (approximately 0 dBm).

d. Monitor J2 and adjust T5 for a peak indication at 40 MHz. (Approximately 0 dBm). Test is now complete. Reconnect J1 and J2.

4.2 A21 Frequency Standard Adjustment

a. Connect equipment as shown in figure 4. Set INT/EXT standard switch to INT.

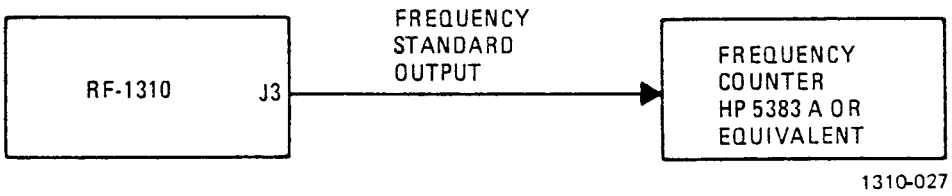


Figure 4. A21 Frequency Standard Adjustment

NOTE

The exciter should be on for at least 24 hours prior to this alignment. The frequency selection jumper field should be set for the frequency of the internal standard (1, 5, or 10 MHz).

b. Remove the screw on top of the A21 assembly to gain access to the frequency adjustment. Adjust this control (using a JFD-type nonmetallic alignment tool) to the frequency stamped on top of the assembly. (The accuracy of this setting is crucial to the VCO adjustment, so perform this test carefully.)

c. Test is complete. Replace screw in A21 assembly.

4.3 VCO Adjustment

Perform the following procedure to adjust the VCO.

a. Make sure that the INT/EXT standard switch is in the INT position and that the A21 frequency standard is properly adjusted on frequency.

b. Remove the shield can over the VCO circuitry. Monitor TP1 with a digital voltmeter. Adjust C36 for 8.0 Vdc. Replace shield can. Test is now complete.

5. PARTS LIST, COMPONENT LOCATIONS, AND SCHEMATIC DIAGRAMS

All replaceable components of Reference Generator Assembly A12 are listed in table 2. Component locations are shown in figure 5. The Reference Generator Assembly is shown schematically in figure 6.

A21 is a self-contained assembly and is replaced as a unit. Therefore the parts list, component location diagram, and schematic diagram for A21 are not included in this manual.

Table 2. Reference Generator Assembly A12 Parts List

Ref. Desig.	Part Number	Description
A12	10121-4700	REF GENERATOR ASSEMBLY
	10073-7116	CAN RECT DEEP DRAWN
	MP-0121	CLIP, MTG, SPRING STEEL
	10073-7113	SHIELD, COIL
	E70-0001-002	INSL BEO TO-5 X.030 THK
C1	M39014/02-1320	CAP .47UF 10% 50V CER-R
C2	M39014/02-1320	CAP .47UF 10% 50V CER-R
C3	M39014/02-1310	CAP .1UF 10% 100V CER-R
C4	M39014/02-1310	CAP .1UF 10% 100V CER-R
C5	M39014/02-1310	CAP .1UF 10% 100V CER-R
C6	M39014/02-1310	CAP .1UF 10% 100V CER-R
C7	M39014/02-1310	CAP .1UF 10% 100V CER-R
C8	M39014/02-1310	CAP .1UF 10% 100V CER-R
C9	M39014/02-1310	CAP .1UF 10% 100V CER-R
C10	M39014/02-1310	CAP .1UF 10% 100V CER-R
C11	M39014/02-1310	CAP .1UF 10% 100V CER-R
C12	M39014/02-1310	CAP .1UF 10% 100V CER-R
C13	C26-0035-100	CAP 10UF 20% 35V TANT
C14	M39014/02-1310	CAP .1UF 10% 100V CER-R
C15	C26-0035-470	CAP 47UF 20% 35V TANT
C16	C26-0025-339	CAP 3.3UF 20% 25V TANT
C17	M39014/02-1310	CAP .1UF 10% 100V CER-R
C18	M39014/02-1310	CAP .1UF 10% 100V CER-R
C19	C25-0001-301	CAP 1.0UF 20% 20V TANT
C20	M39014/02-1310	CAP .1UF 10% 100V CER-R
C21	M39014/02-1310	CAP .1UF 10% 100V CER-R
C22	M39014/02-1310	CAP .1UF 10% 100V CER-R
C23	M39014/02-1310	CAP .1UF 10% 100V CER-R
C24	M39014/02-1310	CAP .1UF 10% 100V CER-R
C25	M39014/02-1310	CAP .1UF 10% 100V CER-R
C26	CK06BX473K	CAP .047UF 10% 100V CER
C27	CK06BX473K	CAP .047UF 10% 100V CER
C28	C26-0025-339	CAP 3.3UF 20% 25V TANT
C29	M39014/02-1310	CAP .1UF 10% 100V CER-R

Table 2. Reference Generator Assembly A12 Parts List (Cont.)

Ref. Desig.	Part Number	Description
C30	CK05BX102K	CAP 1000PF 10% 200V CER
C31	CK05BX102K	CAP 1000PF 10% 200V CER
C32	M39014/02-1310	CAP .1UF 10% 100V CER-R
C33	C26-0025-680	CAP 68UF 20% 25V TANT
C34	CK06BX103K	CAP .01UF 10% 200V CER
C35	CM05CD150J03	CAP 15PF 5% 500V MICA
C36	C85-0001-002	CAPACITOR .8-10 PF
C37	CK06BX103K	CAP .01UF 10% 200V CER
C38	CK06BX103K	CAP .01UF 10% 200V CER
C39	CM04ED470J03	CAP 47PF 5% 500V MICA
C40	CK06BX103K	CAP .01UF 10% 200V CER
C41	M39014/02-1310	CAP .1UF 10% 100V CER-R
C42	CK06BX103K	CAP .01UF 10% 200V CER
C43	M39014/02-1310	CAP .1UF 10% 100V CER-R
C44	CK06BX103K	CAP .01UF 10% 200V CER
C45	CM04ED560J03	CAP 56PF 5% 500V MICA
C46	CK06BX103K	CAP .01UF 10% 200V CER
C47	CK06BX103K	CAP .01UF 10% 200V CER
C48	CK06BX103K	CAP .01UF 10% 200V CER
C49	CK06BX103K	CAP .01UF 10% 200V CER
C50	M39014/02-1310	CAP .1UF 10% 100V CER-R
C51	CK06BX103K	CAP .01UF 10% 200V CER
C52	CM04ED560J03	CAP 56PF 5% 500V MICA
C53	CK06BX103K	CAP .01UF 10% 200V CER
C54	CK06BX103K	CAP .01UF 10% 200V CER
C55	M39014/02-1310	CAP .1UF 10% 100V CER-R
C56	CK06BX103K	CAP .01UF 10% 200V CER
C57	CK06BX103K	CAP .01UF 10% 200V CER
C58	CK06BX103K	CAP .01UF 10% 200V CER
C59	M39014/02-1310	CAP .1UF 10% 100V CER-R
C60	M39014/02-1310	CAP .1UF 10% 100V CER-R
C61	M39014/02-1310	CAP .1UF 10% 100V CER-R
C62	M39014/02-1310	CAP .1UF 10% 100V CER-R
C63	M39014/02-1310	CAP .1UF 10% 100V CER-R
C64	M39014/02-1310	CAP .1UF 10% 100V CER-R
C65	M39014/02-1310	CAP .1UF 10% 100V CER-R
C66	M39014/02-1310	CAP .1UF 10% 100V CER-R
C67	M39014/02-1310	CAP .1UF 10% 100V CER-R
C68	C26-0025-100	CAP 10UF 20% 25V TANT
C69	M39014/02-1310	CAP .1UF 10% 100V CER-R
C70	M39014/02-1310	CAP .1UF 10% 100V CER-R
C71	C26-0050-100	CAP 10UF 20% 50V TANT
C72	M39014/02-1310	CAP .1UF 10% 100V CER-R
C73	M39014/02-1310	CAP .1UF 10% 100V CER-R
C74	C26-0025-470	CAP 47UF 20% 25V TANT

Table 2. Reference Generator Assembly A12 Parts List (Cont.)

Ref. Desig.	Part Number	Description
C75	M39014/02-1310	CAP .1UF 10% 100V CER-R
C76	CK05BX102K	CAP 1000PF 10% 200V CER
C77	CK06BX103K	CAP .01UF 10% 200V CER
C78	M39014/02-1310	CAP .1UF 10% 100V CER-R
C79	CK05BX102K	CAP 1000PF 10% 200V CER
C80	CK06BX103K	CAP 1000PF 10% 200V CER
C81	CK06BX103K	CAP 1000PF 10% 200V CER
C82	CK06BX103K	CAP 1000PF 10% 200V CER
C83	M39014/02-1310	CAP .1UF 10% 100V CER-R
C84	CK06BX103K	CAP .01UF 10% 200V CER
C85	CK06BX103K	CAP .01UF 10% 200V CER
C86	CK06BX103K	CAP .01UF 10% 200V CER
C87	10121-4720	CAP, TEMP COMP, 10
CR1	1N3064	DIODE 75mA 75V SW
CR2	1N3064	DIODE 75mA 75V SW
CR3	1N3064	DIODE 75mA 75V SW
CR4	1N3064	DIODE 75mA 75V SW
CR5	1N3064	DIODE 75mA 75V SW
CR6	1N3064	DIODE 75mA 75V SW
CR7	10073-7118	DIODE, HYPERABRUPT
CR8	10073-7118	DIODE, HYPERABRUPT
CR9	1N3064	DIODE 75mA 75V SW
CR10	1N3064	DIODE 75mA 75V SW
CR11	1N3064	DIODE 75mA 75V SW
CR12	1N3064	DIODE 75mA 75V SW
J1	J-0031	CONN SMB VERT PCB
J2	J-0031	CONN SMB VERT PCB
J3	J-0031	CONN SMB VERT PCB
J4	J-0031	CONN SMB VERT PCB
J5	J-0031	CONN SMB VERT PCB
J6	J-0031	CONN SMB VERT PCB
J7	J46-0032-010	HEADER, 10 PIN DISCRETE
J8	J46-0032-001	RECEPTACLE,3 PIN
J9	10073-7045	CONNECTOR, 9 PIN
JMP1	MP-1142	CIRCUIT JUMPER
L1	MS75085-19	COIL 1000UH 10% FXD RF
L2	MS75085-19	COIL 1000UH 10% FXD RF
L3	MS75084-12	COIL 10UH 10% FXD RF
L4	MS75083-9	COIL 60UH 10% FXD RF
L5	MS75084-12	COIL 10UH 10% FXD RF
L6	MS75084-5	COIL 2.7UH 10% FXD RF
L7	MS75084-12	COIL 10UH 10% FXD RF
L8	MS75084-12	COIL 10UH 10% FXD RF
L9	MS75085-7	COIL 100UH 10% FXD RF

Table 2. Reference Generator Assembly A12 Parts List (Cont.)

Ref. Desig.	Part Number	Description
L10	MS75084-12	COIL 10UH 10% FXD RF
L11	L08-0001-001	CHOKE W B 50 MHZ
L12	L08-0001-001	CHOKE W B 50 MHZ
L13	L08-0001-001	CHOKE W B 50 MHZ
L14	MS75084-3	COIL 1.8UH 10% FXD RF
L15	MS75085-13	COIL 330UH 10% FXD RF
L16	MS75085-13	COIL 330UH 10% FXD RF
L17	MS75085-13	COIL 330UH 10% FXD RF
Q1	2N4393	XSTR JFET N-CH TO-18
Q2	2N4393	XSTR JFET N-CH TO-18
Q3	Q05-0001-000	XSTR JFET N-CH
Q4	2N2907A	XSTR SS/GP PNP TO-18
Q5	2N2222A	XSTR SS/GP NPN TO-18
Q6	2N2222A	XSTR SS/GP NPN TO-18
Q7	2N2907A	XSTR SS/GP PNP TO-18
Q8	2N3866	XSTR SS/RF NPN TO-39
Q9	Q-0153	XSTR SS/RF PNP, 2N4258
Q10	2N2369A	XSTR SS/RF NPN TO-52
Q11	Q35-0003-000	XSTR U310 JFET HIGH GM
Q12	Q35-0003-000	XSTR U310 JFET HIGH GM
Q13	Q35-0003-000	XSTR U310 JFET HIGH GM
Q14	Q35-0003-000	XSTR U310 JFET HIGH GM
Q15	Q35-0003-000	XSTR U310 JFET HIGH GM
Q16	2N2907A	XSTR SS/GP PNP TO-18
Q17	2N2222A	XSTR SS/GP NPN TO-18
Q18	2N2907A	XSTR SS/GP PNP TO-18
Q19	2N2222A	XSTR SS/GP NPN TO-18
Q20	2N2222A	XSTR SS/GP NPN TO-18
Q21	2N2222A	XSTR SS/GP NPN TO-18
Q22	2N2222A	XSTR SS/GP NPN TO-18
R1	R65-0003-510	RES,51 5% 1/4W CAR FILM
R2	R65-0003-101	RES,100 5% 1/4W CAR FILM
R3	R65-0003-102	RES,1.0K 5% 1/4W CAR FILM
R4	R65-0003-510	RES,51 5% 1/4W CAR FILM
R5	R65-0003-101	RES,100 5% 1/4W CAR FILM
R6	R65-0003-102	RES,1.0K 5% 1/4W CAR FILM
R7	R65-0003-123	RES,12K 5% 1/4W CAR FILM
R8	R65-0003-123	RES,12K 5% 1/4W CAR FILM
R9	R65-0003-273	RES,27K 5% 1/4W CAR FILM
R10	RN55D6810F	RES,681.0 1% 1/8W MET FLM
R11	R65-0003-101	RES,100 5% 1/4W CAR FILM
R12	RN55D6810F	RES,681.0 1% 1/8W MET FLM
R13	R65-0003-272	RES,2.7K 5% 1/4W CAR FILM
R14	RN55D2211F	RES,2210 1% 1/8W MET FLM

Table 2. Reference Generator Assembly A12 Parts List (Cont.)

Ref. Desig.	Part Number	Description
R15	RN55D6810F	RES,681.0 1% 1/8W MET FLM
R16	RN55D2002F	RES,20.0K 1% 1/8W MET FLM
R17	RN55D3321F	RES,3320 1% 1/8W MET FLM
R18	RN55D6810F	RES,681.0 1% 1/8W MET FLM
R19	R65-0003-472	RES,4.7K 5% 1/4W CAR FILM
R20	R65-0003-472	RES,4.7K 5% 1/4W CAR FILM
R21	R65-0003-472	RES,4.7K 5% 1/4W CAR FILM
R22	R65-0003-102	RES,1.0K 5% 1/4W CAR FILM
R23	R65-0003-100	RES,10 5% 1/4W CAR FILM
R24	R65-0003-201	RES,200 5% 1/4W CAR FILM
R25	R65-0003-272	RES,2.7K 5% 1/4W CAR FILM
R26	R65-0003-102	RES,1.0K 5% 1/4W CAR FILM
R27	R65-0003-180	RES,18 5% 1/4W CAR FILM
R28	R65-0003-470	RES,47 5% 1/4W CAR FILM
R29	R65-0003-472	RES,4.7K 5% 1/4W CAR FILM
R30	R65-0003-562	RES,5.6K 5% 1/4W CAR FILM
R31	R65-0003-241	RES,240 5% 1/4W CAR FILM
R32	R65-0003-270	RES,27 5% 1/4W CAR FILM
R33	R65-0003-331	RES,330 5% 1/4W CAR FILM
R34	R65-0003-332	RES,3.3K 5% 1/4W CAR FILM
R35	R65-0003-391	RES,390 5% 1/4W CAR FILM
R36	R65-0003-102	RES,1.0K 5% 1/4W CAR FILM
R37	R65-0003-201	RES,200 5% 1/4W CAR FILM
R38	R65-0003-201	RES,200 5% 1/4W CAR FILM
R39	R65-0003-101	RES,100 5% 1/4W CAR FILM
R40	R65-0003-201	RES,200 5% 1/4W CAR FILM
R41	R65-0003-202	RES,2.0K 5% 1/4W CAR FILM
R42	R65-0003-101	RES,100 5% 1/4W CAR FILM
R43	R65-0003-202	RES,2.0K 5% 1/4W CAR FILM
R44	R65-0003-201	RES,200 5% 1/4W CAR FILM
R45	R65-0003-751	RES,750 5% 1/4W CAR FILM
R46	R65-0003-751	RES,750 5% 1/4W CAR FILM
R47	R65-0003-201	RES,200 5% 1/4W CAR FILM
R48	R65-0003-302	RES,3.0K 5% 1/4W CAR FILM
R49	R65-0003-101	RES,100 5% 1/4W CAR FILM
R50	R65-0003-201	RES,200 5% 1/4W CAR FILM
R51	R65-0003-101	RES,100 5% 1/4W CAR FILM
R52	R65-0003-101	RES,100 5% 1/4W CAR FILM
R53	R65-0003-201	RES,200 5% 1/4W CAR FILM
R54	R65-0003-102	RES,1.0K 5% 1/4W CAR FILM
R55	R65-0003-104	RES,100K 5% 1/4W CAR FILM

Table 2. Reference Generator Assembly A12 Parts List (Cont.)

Ref. Desig.	Part Number	Description
R56	R65-0003-103	RES,10K 5% 1/4W CAR FILM
R57	R65-0003-472	RES,4.7K 5% 1/4W CAR FILM
R58	R65-0003-103	RES,10K 5% 1/4W CAR FILM
R59	R65-0003-472	RES,4.7K 5% 1/4W CAR FILM
R60	R65-0003-222	RES,2.2K 5% 1/4W CAR FILM
R61	R65-0003-472	RES,4.7K 5% 1/4W CAR FILM
R62	R65-0003-103	RES,10K 5% 1/4W CAR FILM
R63	R65-0003-103	RES,10K 5% 1/4W CAR FILM
R64	R65-0003-472	RES,4.7K 5% 1/4W CAR FILM
R65	R65-0003-222	RES,2.2K 5% 1/4W CAR FILM
R66	R65-0003-224	RES,220K 5% 1/4W CAR FILM
R67	R65-0003-304	RES,300K 5% 1/4W CAR FILM
R68	R65-0003-203	RES,20K 5% 1/4W CAR FILM
R69	R65-0003-271	RES,270 5% 1/4W CAR FILM
R70	R65-0003-304	RES,300K 5% 1/4W CAR FILM
R71	R65-0003-103	RES,10K 5% 1/4W CAR FILM
R72	R65-0003-473	RES,47K 5% 1/4W CAR FILM
R73	R65-0003-473	RES,47K 5% 1/4W CAR FILM
R74	R65-0003-473	RES,47K 5% 1/4W CAR FILM
R75	R65-0003-473	RES,47K 5% 1/4W CAR FILM
R76	R65-0003-473	RES,47K 5% 1/4W CAR FILM
R77	R65-0003-162	RES,1.6K 5% 1/4W CAR FILM
R78	R65-0003-152	RES,1.5K 5% 1/4W CAR FILM
T1	10073-7006	TRANSFORMER, RF, FIXED
T2	10073-7007	TRANSFORMER, RF, FIXED
T3	10073-7009	TRANSFORMER, RF, VARIABLE
T4	10073-7009	TRANSFORMER, RF, VARIABLE
T5	10073-7009	TRANSFORMER, RF, VARIABLE
TP1	J-0071	TP PWB BRN TOP ACCS .080"
TP2	J-0066	TP PWB RED TOP ACCS .080"
TP3	J-0069	TP PWB ORN TOP ACCS .080"
TP4	J-0070	TP PWB YEL TOP ACCS .080"
TP5	J-0068	TP PWB GRN TOP ACCS .080"
U1	IC-0430	IC MC4044 CERAMIC CMOS
U2	I05-0000-074	IC 74LS74 PLASTIC TTL
U3	I05-0000-090	IC 74LS90 PLASTIC TTL
U4	I05-0000-074	IC 74LS74 PLASTIC TTL
U5	I65-0004-001	IC 12013 PLASTIC ECL
U6	I05-0000-090	IC 74LS90 PLASTIC TTL
U7	I30-0003-000	IC 324 OP AMP PLASTIC
U8	I01-0000-022	IC 4070B PLASTIC CMOS
VR1	I11-0001-001	IC VR 7805 + 5V 1.5A 4%
Y1	10073-4720	CRYSTAL, 40 MHZ

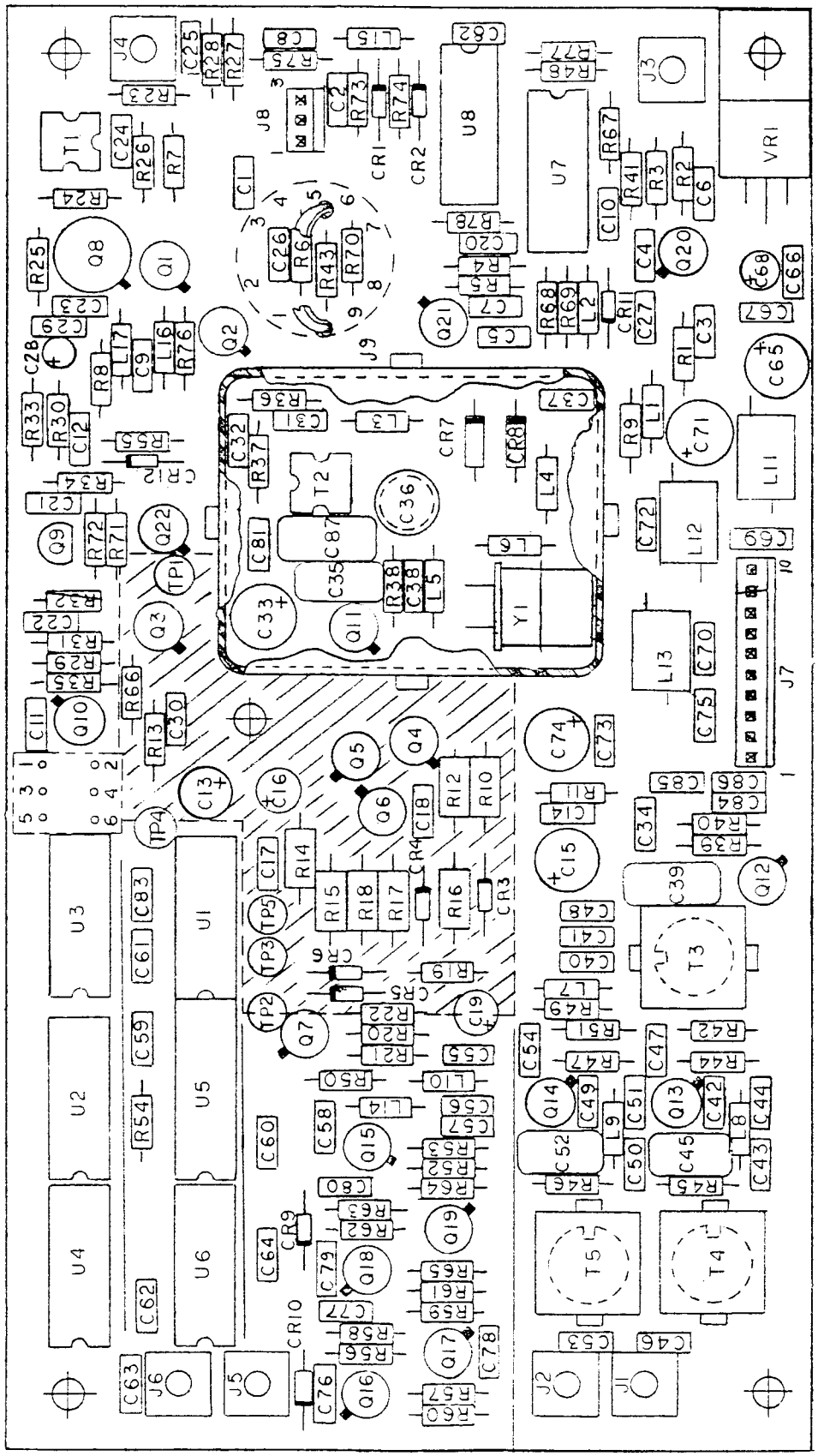
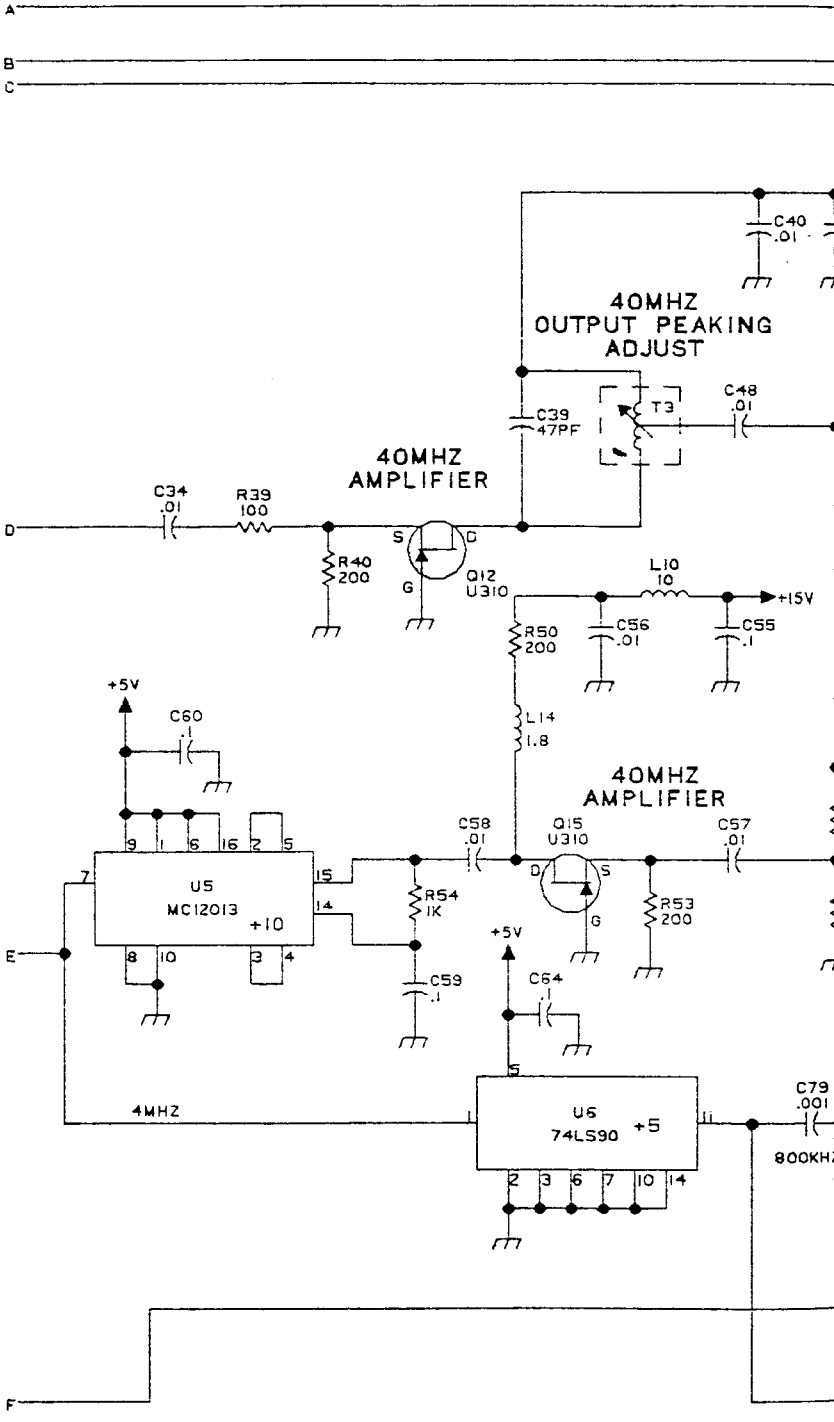


Figure 5. Reference Generator Assembly A12 Component Location Diagram (10121-4700)


A
B
C
D
E
F
40MHZ
OUTPUT PEAKING
ADJUST
C40
.01
C39
47PF
T3
C48
.01
40MHZ
AMPLIFIER
C34
.01
R39
100
R40
200
Q12
U310
L10
10
+15V
R50
200
C56
.01
C55
.1
L14
1.8
+5V
C60
.1
40MHZ
AMPLIFIER
C58
.01
Q15
U310
C57
.01
U5
MC12013
+10
R54
1K
R53
200
C59
.1
+5V
C64
.1
4MHZ
U6
74LS90
+5
C79
.001
800KH

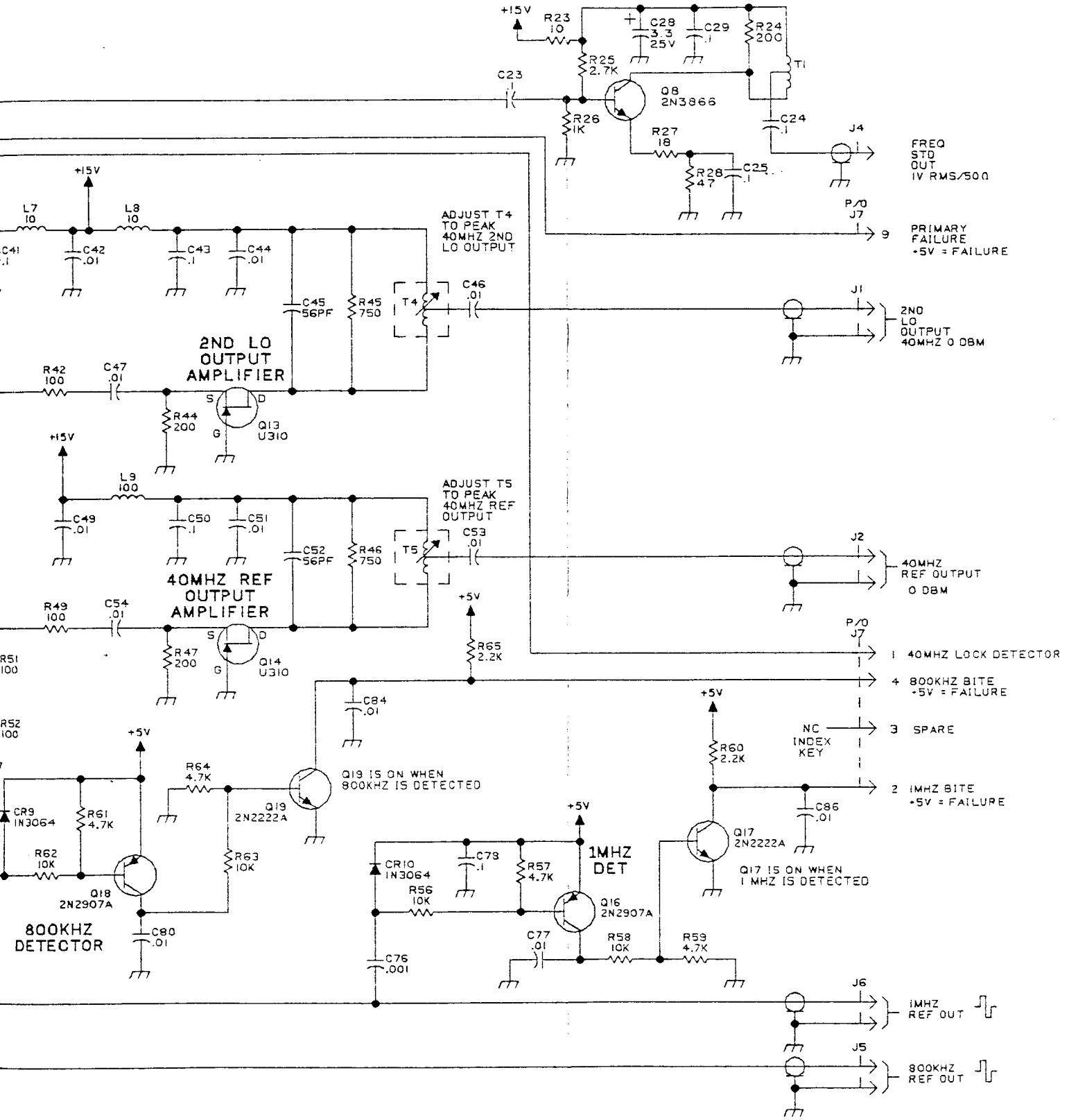


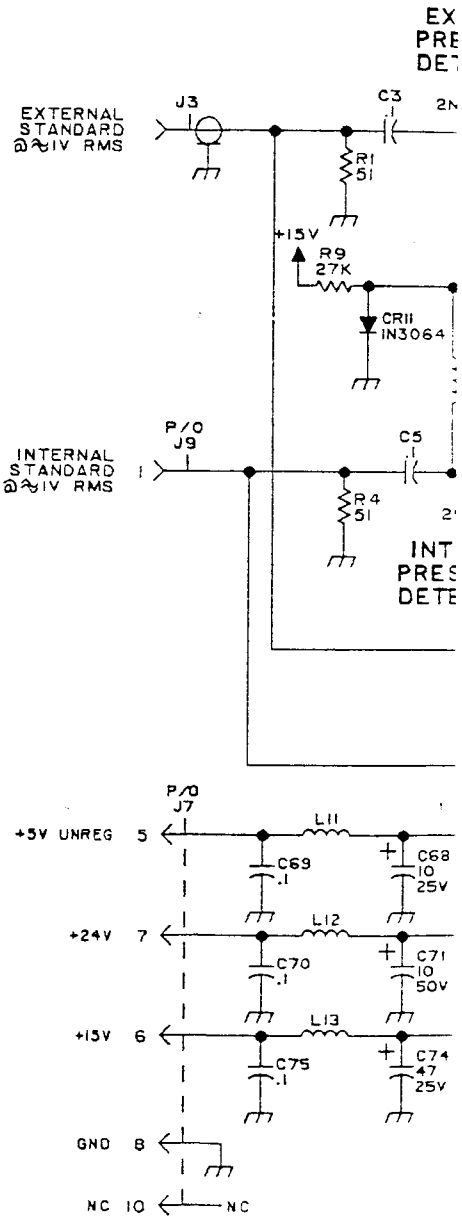
Figure 6. Reference Generator Assembly A12 Schematic Diagram (10121-4701 Rev. F) (Sheet 2 of 2)

NOTE: UNLESS OTHERWISE SPECIFIED:

1. PARTIAL REFERENCE DESIGNATIONS ARE SHOWN. FOR A COMPLETE DESIGNATION, PREFIX WITH UNIT NO. AND/OR ASSEMBLY NO. DESIGNATION.
2. ALL RESISTOR VALUES ARE IN OHMS, 1/4W, ±5%.
3. ALL CAPACITOR VALUES ARE IN MICROFARADS.
4. VENDOR PART NO. CALLOUTS ARE FOR REFERENCE ONLY. COMPONENTS ARE SUPPLIED PER PART NO. IN PARTS LIST.
5. OPTIONAL JUMPERING REQUIRED:
   CONNECT 1 TO 2 WHEN USING 1MHZ STANDARD.
   CONNECT 3 TO 4 WHEN USING 5MHZ STANDARD
   CONNECT 5 TO 6 WHEN USING 10MHZ STANDAR
6. ALL INDUCTOR VALUES ARE IN MICROHENRIES.

TABLE "A"

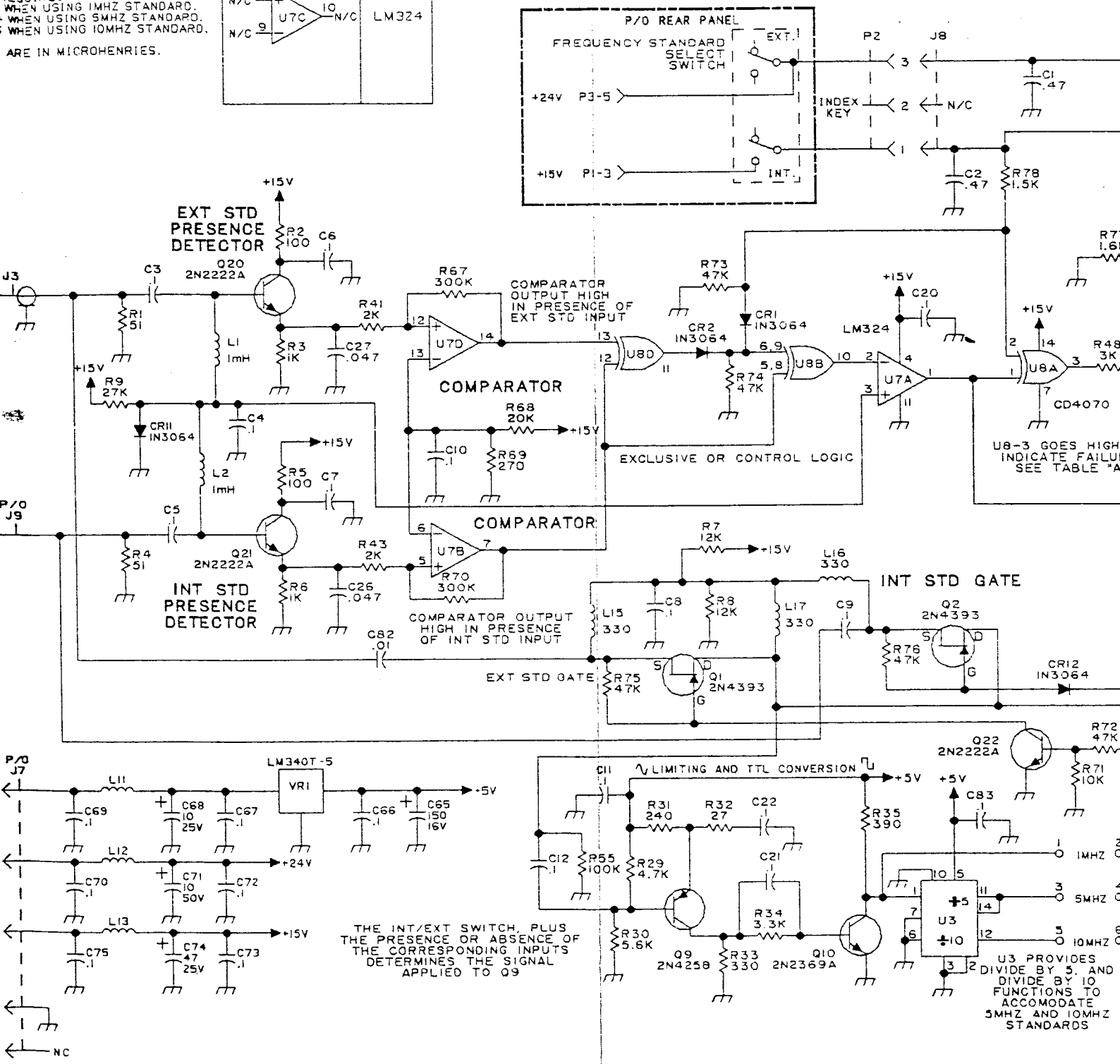
INT/EXT SW POS	STANDARD SOURCE	SIGNAL AT U3 PIN 1	PRIMARY FAIL (1=FAIL)
INT	INT ONLY	INT	0
INT	INT AND EXT	INT	0
INT	EXT ONLY	EXT	1
INT	NONE	NONE	1
EXT	EXT ONLY	EXT	0
EXT	INT AND EXT	EXT	0
EXT	INT ONLY	INT	1
EXT	NONE	NONE	1



REQUIRED:
WHEN USING IMHZ STANDARD.
WHEN USING 5MHZ STANDARD.
WHEN USING 10MHZ STANDARD.

ARE IN MICROHENRIES.

UNUSED GATES	PT. NO.
N/C 8, N/C 9, U7C, 10 N/C	LM324



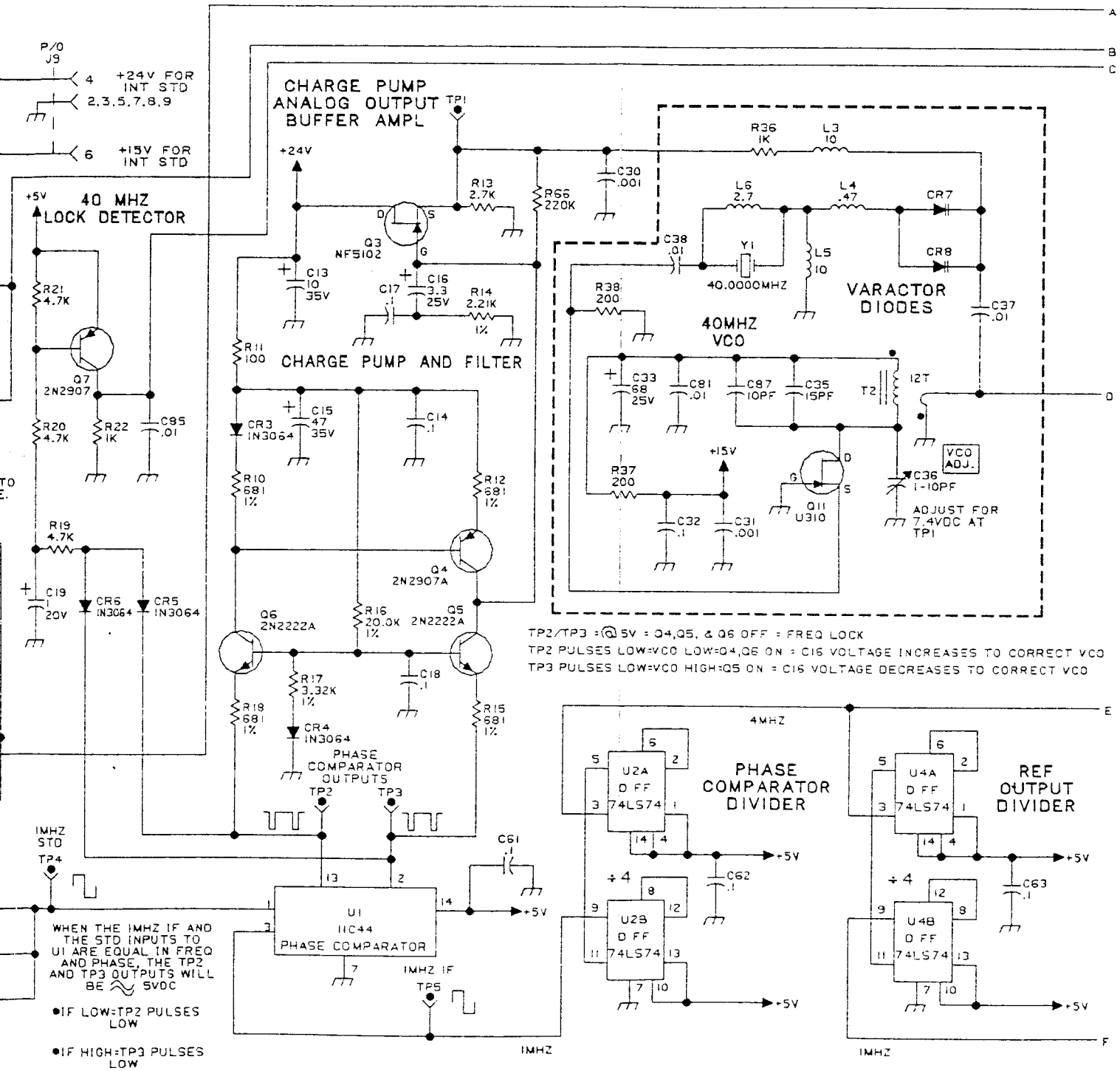


Figure 6. Reference Generator Assembly A12 Schematic Diagram (10121-4701 Rev. F) (Sheet 1 of 2)