MAINTENANCE MANUAL

RF MODULE TEST FIXTURE

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GENERAL

STATIC HANDLING PRECAUTIONS

The modules being tested using the TQ-0650 contain Metal Oxide Semiconductor (MOS) devices which are vulnerable to damage from Electro-Static Discharge (ESD). As a result, extra care must be taken when handling or testing the devices, modules, or the assemblies in which they are used.

To prevent damage from ESD, observe the following precautions:

- Service the modules only at a static free work station or on a grounded mat.
- Perform diagnostics to isolate a faulty assembly or component. Do not use canned coolant for fault isolation.
- Discharge static voltage from your body by wearing a grounded antistatic wrist strap where possible. Where ground straps can not be used, touch a grounded item prior to handling a module.
- Avoid touching any electrically conductive parts of circuit modules with your hands. When you must handle components, pick them up by the body and avoid touching the leads.
- Do not remove static sensitive devices from their protective packaging until you are ready to install them. Ground the package, to dissipate any accumulated charge, prior to removing the component.
- Ground all electrically powered test equipment. Ground test equipment leads prior to connecting to a circuit and connect the ground lead prior to connecting the test probe. Disconnect the probe before removing the ground lead.
- When soldering, be sure soldering iron is grounded using a three prong cord connected to an outlet with a known good earth ground.
- Use only metalized or ESD protective vacuum-type desoldering tools.

NOTE

This symbol is used to identify circuitry using Electrostatic sensitive devices. Be sure to follow Static Handling Procedures when working near these devices.

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Printed in U.S.A.

EQUIPMENT LIST

The following equipment is included in the Test Fixture TQ-0650, package:

- RF Module Test Fixture (344A4153P1)
- Wall Mount Power Supply (16.8 Vac, 770 mA) (19A705998P7)
- DB25-DB25 PC Interface Cable (344A4136P1)
- PC Programming Software (344A4148P1)

  RFTEST.EXE - executable for loading Synthesizer Modules
  RFTEST.OVL - default parameters

- Instruction Manual, LBI-38805

APPLICATION

This test fixture allows the technician to perform out of system testing on the following MASTR III RF modules:

- Transmit Synthesizer, 19D902780
- Receive Synthesizer, 19D902781
- Rx Front End RF Module, 19D902782
- IF Module, 19D902783
- Power Amplifier, 19D902797

PREPARATION FOR USE

FIXTURE SETUP

1. Plug in the Wall Mount Transformer to the AC power source and connect the output cable to the POWER IN connector, J10, on the Text Fixture.
2. When testing the Synthesizer Module, connect the PC Interface Cable between the connector labeled COMPUTER (J11) and the Parallel Printer Port (LPT1 or LPT2) on a PC.
3. To use programming software, insert the disk in the A drive and type:
   A:RFTEST <Return>

MODULE TEST SETUPS

Use the appropriate module setup for the module under test. Refer to the applicable module maintenance manual for details on alignment, tuning and troubleshooting.

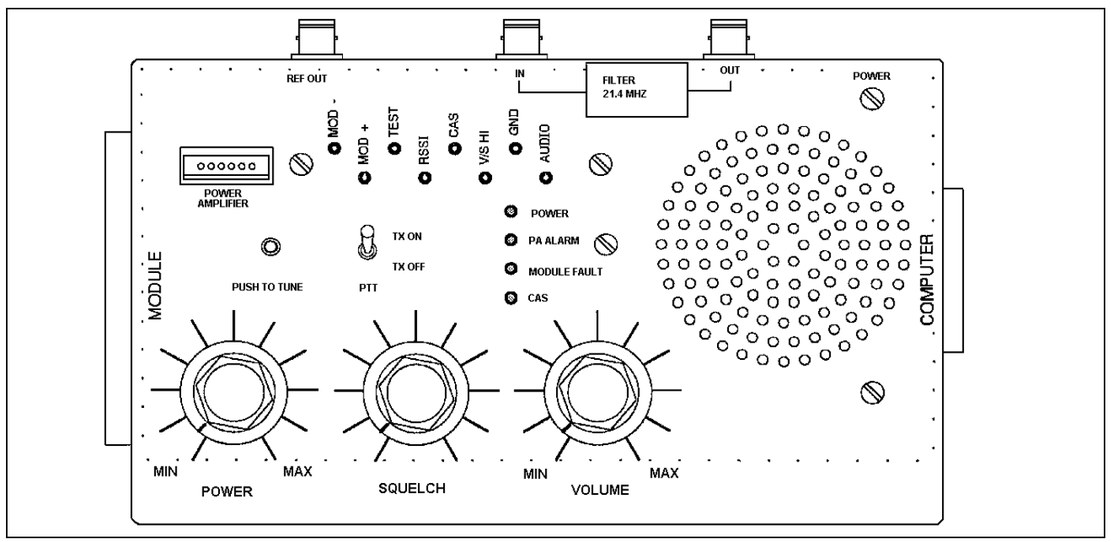
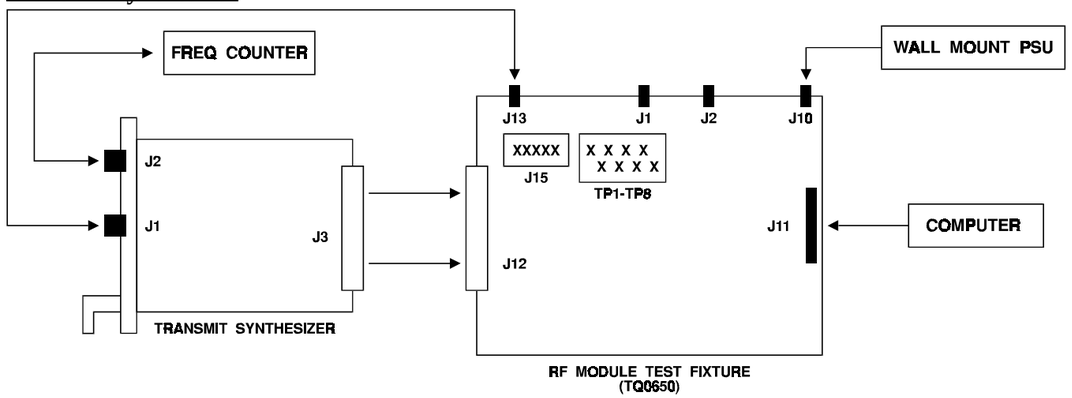


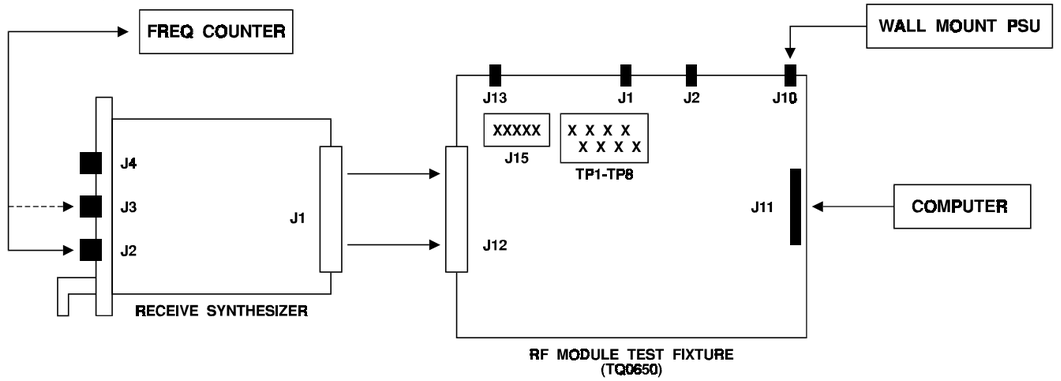
Figure 1 - Test Fixture Front Panel

Transmit Synthesizer



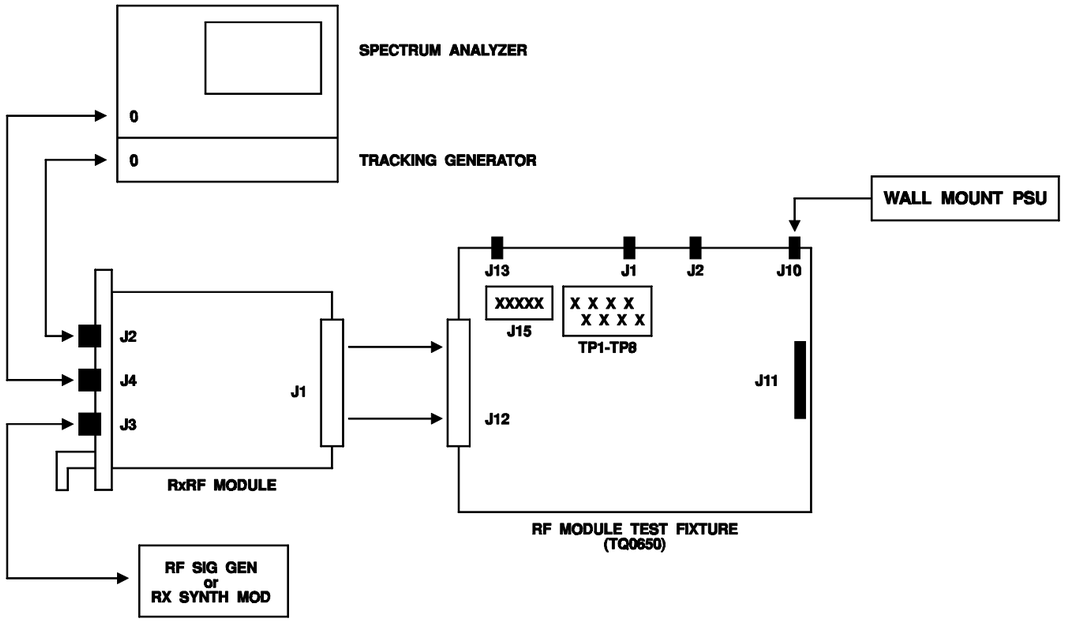
1. Set/adjust the module for the correct frequency.
2. Load the Transmit Synthesizer Module with the correct frequency.
3. Check that the red "MODULE FAULT" LED is not lit.
4. Verify that the output frequency and level are correct at J2.
5. Apply the modulating frequency at (MOD+,MOD-) and adjust module for the required deviation

Receive Synthesizer



1. Load the Receive Synthesizer Module with the correct frequency.
2. Press "PUSH TO TUNE" and adjust the tuning capacitor on the module to produce 6 Vdc at TP 3 (TEST) or until the frequency at J2 is at the correct frequency ±50 kHz.
3. Reload the Receive Synthesizer Module with the correct frequency.
4. Check that the red "MODULE FAULT" LED is not lit.
5. Verify that the output frequency and level are correct at J2.
6. Verify that the reference frequency and level are correct at J3.

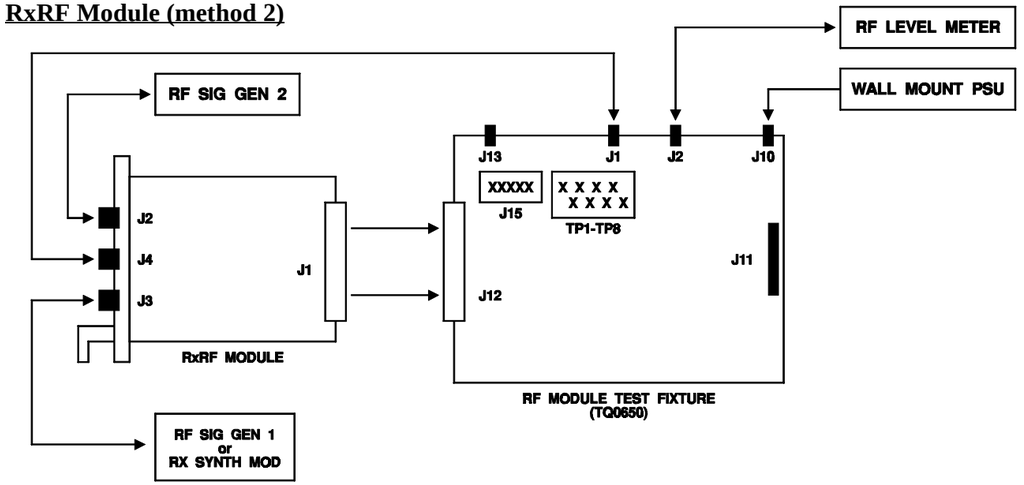
RxRF Module (method 1)



NOTE

The output from J4 is about 30 dB less than the input level to J2.

RxRF Module (method 2)



1. Set the Signal Generator 1 with 0 dBm output level (or load the Receive Synthesizer Module) to the appropriate local oscillator frequency.

2. Set the Signal Generator 2 with 0 dBm output level to the corresponding receiver input frequency.

3. Sequentially set L1 through L5 of the module to the heights in Table 2 of the Maintenance Manual for the desired input frequency.

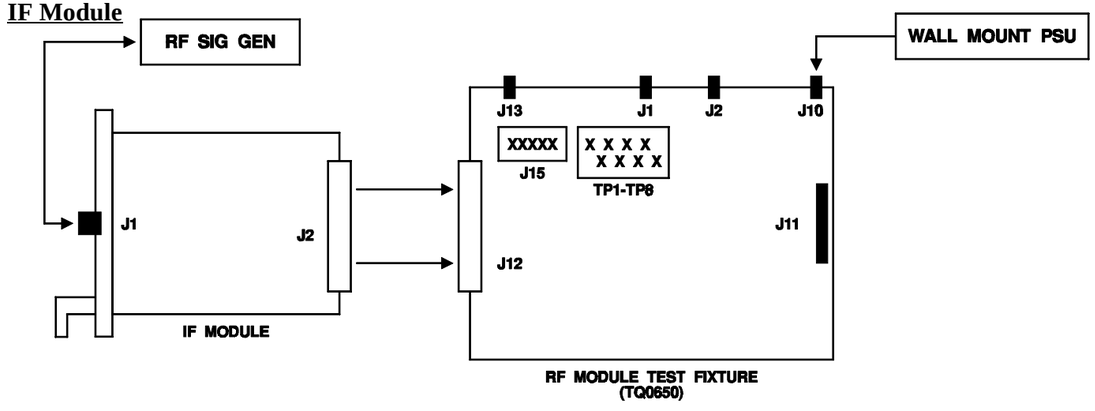
4 Sequentially adjust L1 through L5 of the module to give the maximum output level on the RF Level Meter, then lock the tuning screws.

NOTE

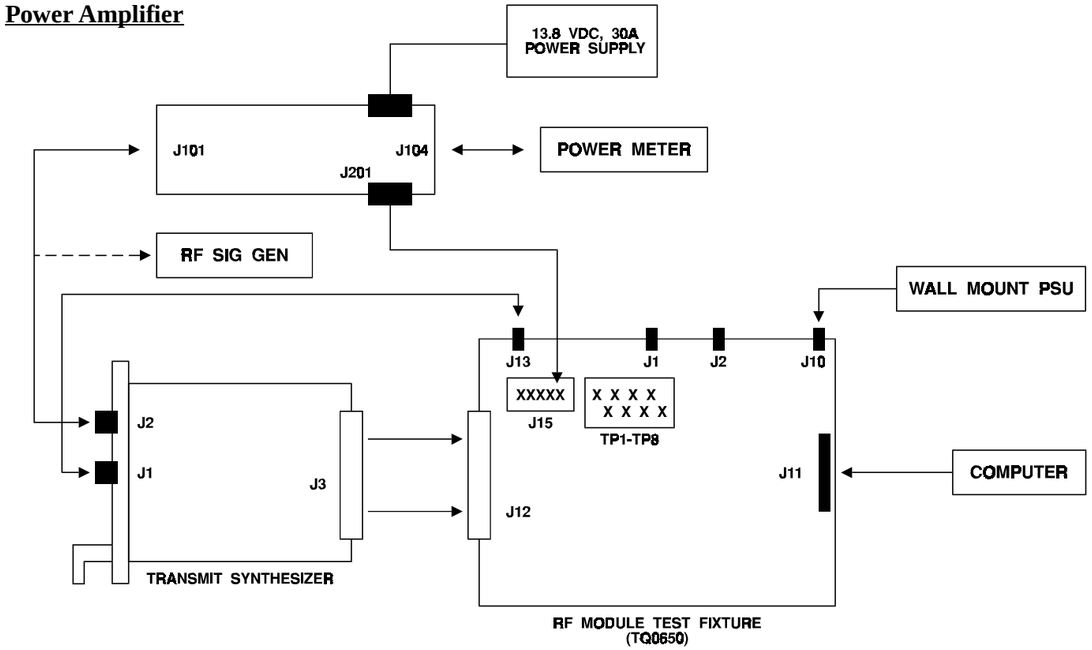
When tuned in this manner the module will have a tuning bandwidth of about 2 MHz, but the 2 MHz of tuning bandwidth will be below the optimized frequency. If it is desired to have this centered around the desired frequency then set Signal Generators 1 & 2 to about 1 MHz above the desired center frequency.

5. Check that the red "MODULE FAULT" LED is not lit.

IF Module



Power Amplifier



3. Check that the red "MODULE FAULT" LED is not lit.

To use Transmit Synthesizer as signal source:

1. Load the Transmit Synthesizer Module with the correct frequency.
2. Set test fixture switch to "TX-ON".
3. Adjust "POWER SET" for maximum.
4. Adjust VR217 on the Power Amplifier board to produce the maximum desired output power.
5. Check that the red "PA ALARM" LED is not lit.
6. Disconnect J104 from the power meter and check that the red "PA ALARM" LED is lit.

To use Signal Generator as signal source:

1. Set Signal Generator to the correct frequency with an output level of +10 dBm.

MASTR III - BACKPLANE (RF CONNECTOR)

PIN	ROW A	ROW B	ROW C	
1	INT OSC	TEST 1	AGND	
2	AGND	TEST 2	CLOCK	
3	LAN 1	TEST 3	DATA	TX SYNTH
4	AGND	TEST 4	ENABLE	RX SYNTH
5	LAN 2	TEST 5	AGND	
6	AGND	TEST 6	A0 (LSB)	1 0
7	AGND	TEST 7	A1	1 1
8	AGND	AGND	A2 (MSB)	0 0
9	AGND	AGND	AGND	
10	AGND	AGND	FLAG 0	
11	RF SPARE 4	AGND	FLAG 1	
12	RF SPARE 5	AGND	FLAG 2	
13	ANT RELAY	AGND	FLAG 3	
14	AGND	AGND	RF SPARE 3	
15	+12V	+12V	+12V	
16	+13.8VF	+13.8VF	+13.8VF	
17	AGND	AGND	AGND	
18	+5V	+5V	+5V	
19	AGND	AGND	AGND	
20	-12V	AGND	RX MTR +	
21	AGND	AGND	AGND	
22	TEST 8	AGND	TX AUDIO LO	
23	TEST 9	AGND	TX AUDIO HI	
24	RF SPARE 6	AGND	AGND	
25	RF SPARE 1	AGND	AGND	
26	TEST 10	AGND	CAS	
27	TEST 11	AGND	SQ-ARM	
28	AGND	AGND	AGND	
29	RF SPARE 2	AGND	AGND	
30	TEST 12	AGND	VOL/SQ LO	
31	TEST 13	AGN	VOL/SQ HI	
32	TEST 14	AGND	AGND	

CIRCUIT DESCRIPTION

The RF Test Fixture (TQ0650) provides all of the regulated supplies required to power the RF Modules. A wall mount transformer steps down the AC line voltage to 22 Vac and connects to J10. This voltage is full-wave rectified by diodes D1 through D4 and filtered by C27 and C29. The filtered output then drives a series of regulators to provide +13.8VF (actually 15 Vdc), +12 Vdc and +5 Vdc. Diodes D5 and D6 rectify the AC from J10 at a negative potential to drive the negative voltage regulator, U18 which provides -12 Vdc.

The DB-25 Connector (J11) interfaces with an IBM PC Compatible Computer. U13 provides buffering and protection for the computer's parallel printer port and drives the appropriate data lines for the Synthesizer modules through J12.

Volume/Squelch High is provided at TP6. R15 and C17 de-emphasises the audio and U15 provides 6 dB of gain and buffering to provide de-emphasised audio at TP7. U16 amplifies the de-emphasised audio to provide about 1/2 W of audio drive for the speaker.

An on-board frequency reference (U14) delivers sufficient drive for the Transmit Synthesizer "REF IN" input at a frequency of 12.8 MHz.

The control voltage for the RF Power Amplifier is set by R27 and buffered with U17B to provide about 4 - 8 volts of DC for power control. A comparator, U17A drives the "PA ALARM" LED and is set to illuminate the LED when the PA "Power Sense" Output drops below 2.5 volts.

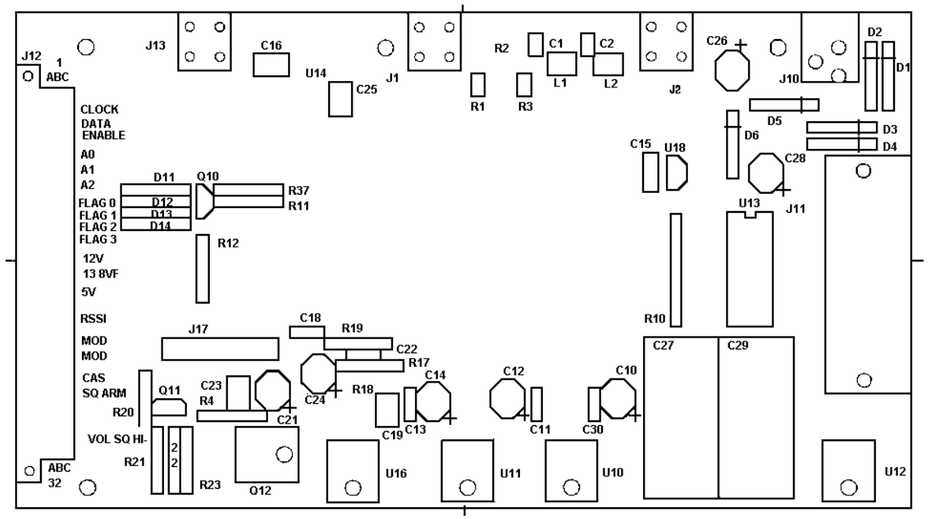
A Low Pass Filter comprising L1, L2, C1 and C2 can be used to filter the IF Output from the RxRF Module to provide accurate measurement for Front End tuning.

RF MODULE TEST FIXTURE
344A4153P1
ISSUE 1

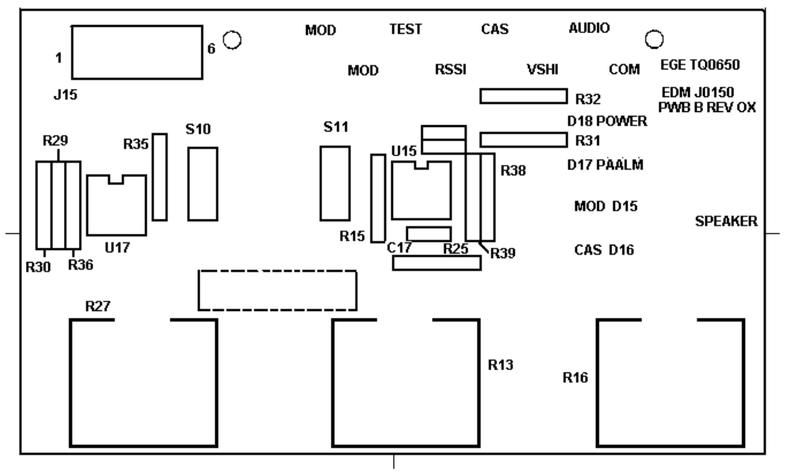
SYMBOL	PART NO.	DESCRIPTION
		- - - - - CAPACITORS - - - - -
C1	19A702236P48	Ceramic Chip 82pF.
C2	19A702236P54	Ceramic Chip 150pF.
C10		Electrolytic 220µF, 25V.
C11		Mylar 0.1µF, 50V.
C12		Electrolytic 220µF, 25V.
C13		Mylar 0.1µF, 50V.
C14		Electrolytic 220µF, 25V.
C15		Mylar 0.1µF, 50V.
C16		Disk Ceramic 27pF.
C17 and C18		Mylar 0.1µF, 50V.
C19		Tantalum 10µF, 10V.
C21		Electrolytic 220µF, 25V.
C22 and C23		Mylar 0.1µF, 50V.
C24		Electrolytic 220µF, 25V.
C25		Mylar 0.1µF, 50V.
C26		Electrolytic 330µF, 35V.
C27		Electrolytic 2200µF, 35V.
C28		Electrolytic 330µF, 35V.
C29		Electrolytic 2200µF, 35V.
C30 and C31		Mylar 0.1µF, 50V.
		- - - - - DIODES - - - - -
D1 thru D6	T324ADP1041	IN4004.
D11 thru D14	19A700028P1	1N4148.
D15		LED T1 (red).
D16		LED T1 (yellow).
D17		LED T1 (red).
D18		LED T1 (green).
		- - - - - CONNECTORS - - - - -
J1 and J2	19B115938P24	Connector BNC R/A Female.
J10		Power Connector 2.4mm.
J11		Connector DB25 R/A Male.
J12	19B801587P5	Connector 96-DIN R/A Female.
J13	19B115938P24	Connector BNC R/A Female.
J15	19A704852P32	Connector Molex 6-pin.
J19		Connector 2x10 Header.
		- - - - - COILS - - - - -
L1	19A705470P18	Coil Chip 270 nH.
L2	19A705470P15	Coil Chip 150 nH.
		- - - - - TRANSISTORS - - - - -
Q10	19A700022P2	PNP 2N3906.
Q11	19A700023P2	NPN 2N3904.
Q12		PNP Darlington TIP116.

SYMBOL	PART NO.	DESCRIPTION
		- - - - - RESISTORS - - - - -
R1	19B800607P331	Resistor 330 ohms.
R2	19B800607P180	Resistor 18 ohms.
R3	19B800607P331	Resistor 330 ohms.
R10	19A701630P2	Resistor Network 9x10k ohms.
R11	H212CRP347C	Resistor 1/4W 5% CF 47k ohms.
R12	H212CRP156C	Resistor 1/4W 5% CF 560 ohms.
R13		Variable Resistor 10k ohms Bournes PCW1JB24BAB103.
R14	H212CRP247C	Resistor 1/4W 5% CF 4.7k ohms.
R15	19A701250P285	Resistor 1/4W 1% CF 7.5k ohms.
R16		Variable Resistor 1k ohms LOG Bournes PCW1JB24BAD102.
R17	H212CRP118C	Resistor 1/4W 5% CF 180 ohms.
R18	H212CRP015C	Resistor 1/4W 5% CF 15 ohms.
R19	H212CRP910C	Resistor 1/4W 5% CF 1.0 ohms.
R20	H212CRP310C	Resistor 1/4W 5% CF 10k ohms.
R21	H212CRP347C	Resistor 1/4W 5% CF 47k ohms.
R22 and R23		
R24	H212CRP910C	Resistor 1/4W 5% CF 1.0 ohms.
R25	H212CRP210C	Resistor 1/4W 5% CF 1k ohms.
R26	H212CRP282C	Resistor 1/4W 5% CF 8.2k ohms.
R27		Variable Resistor 10k ohms Bournes PCW1JB24BAB103.
R28	H212CRP282C	Resistor 1/4W 5% CF 8.2k ohms.
R29 and R30	H212CRP310C	Resistor 1/4W 5% CF 10k ohms.
R31 thru R35	H212CRP210C	Resistor 1/4W 5% CF 1k ohms.
R36	H212CRP410C	Resistor 1/4W 5% CF 100k ohms.
R37	H212CRP156C	Resistor 1/4W 5% CF 560 ohms.
R38 thru R40	H212CRP310C	Resistor 1/4W 5% CF 10k ohms.
		- - - - - SWITCHES - - - - -
SW10		Push Switch C&K EP11 SD1V3BE.
SW11		SPST Switch C&K ET01 SD1V3B3.
		- - - - - TEST POINTS - - - - -
TP1 thru TP8		Tip Connector, Johnson 105-2203-201.
		- - INTEGRATED CIRCUITS - -
U10	19A134717P2	IC 12V Regulator 7812.
U11	19A134717P1	IC 5V Regulator 7805.
U12		IC 15V Regulator 7815.
U13	19A703471P1	IC LSTTL Buffer 74LS244.
U14	19B801351P12	Module TCXO 12.8 MHz.
U15	19A700086P4	IC Op-amp MC4558.
U16	19A701830P2	IC Audio Amp TDA2003.
U17	19A134764P2	IC Comparator LM393.
U18		IC -12V Regulator 79L12.
		- - - - - MISCELLANEOUS - - - - -
LS1		Speaker 8 ohms, 1 W.

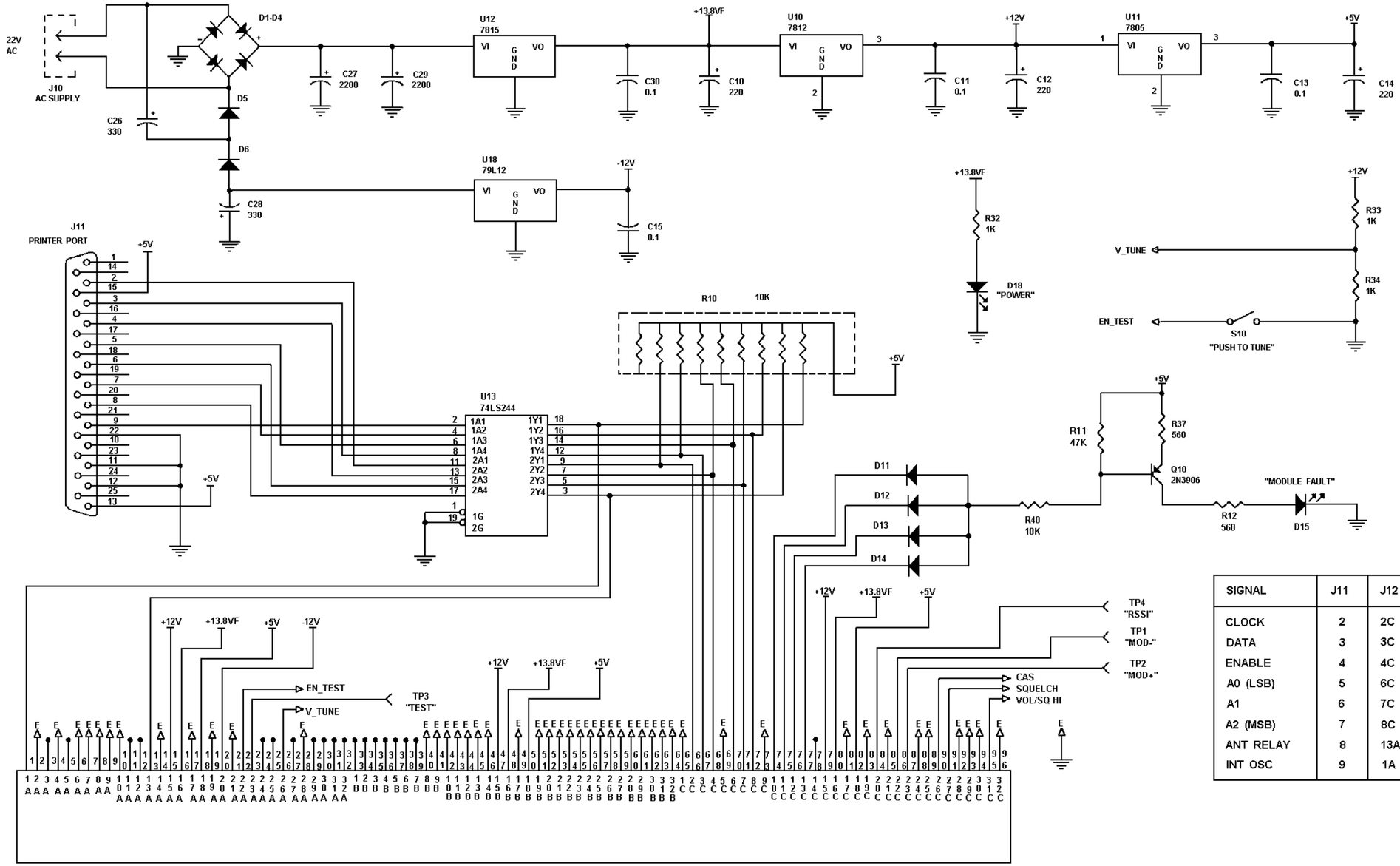
*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES



PRINTED WIRING BOARD A



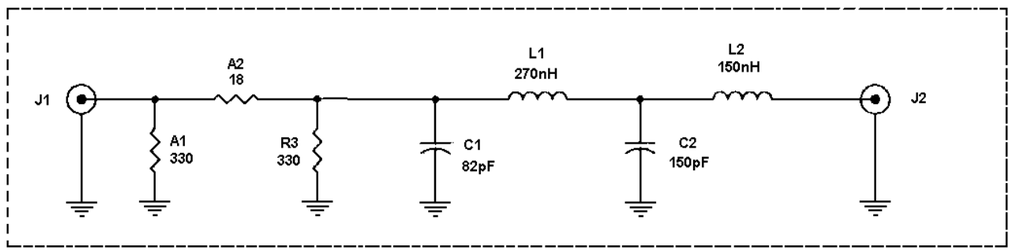
PRINTED WIRING BOARD B



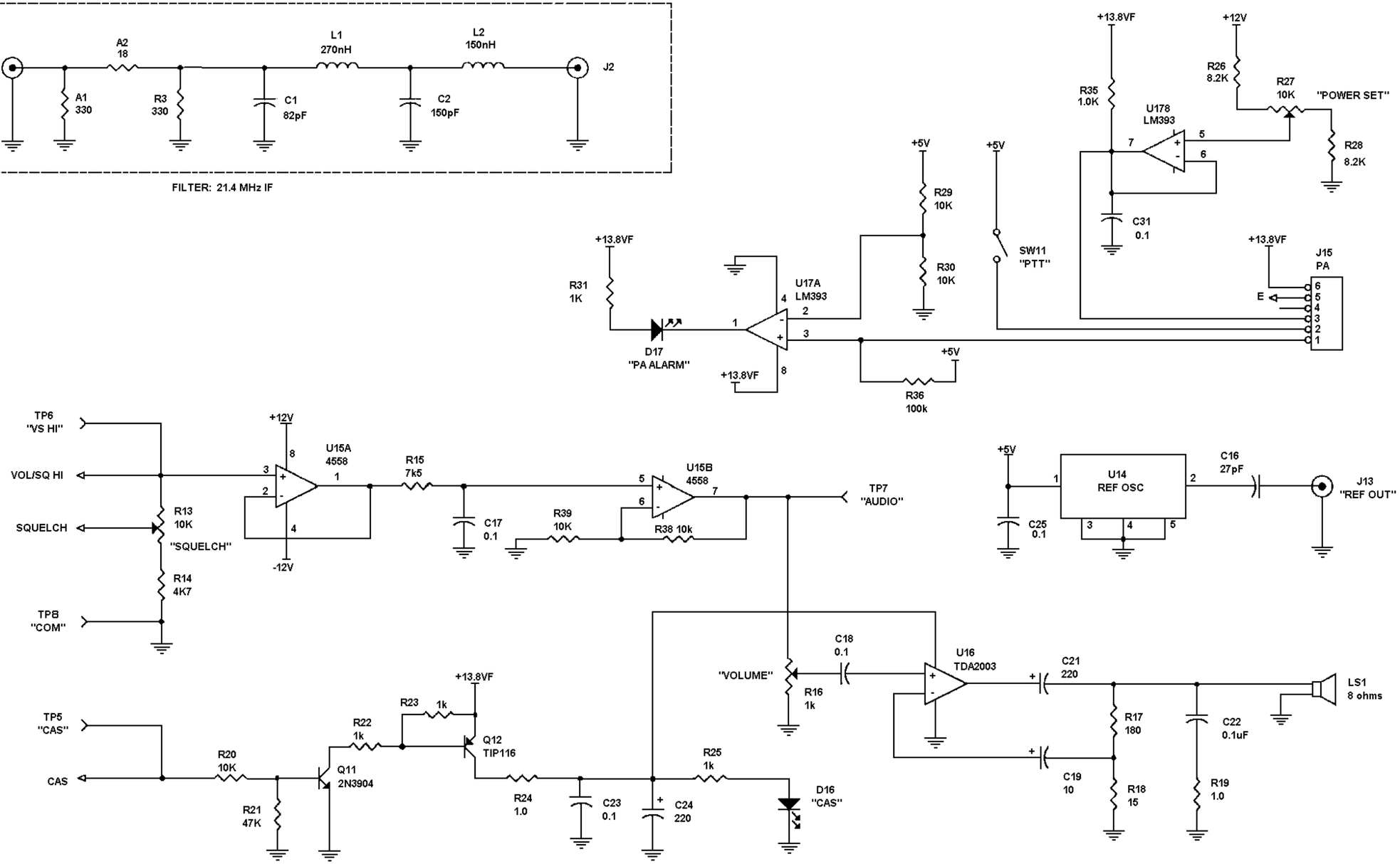
SIGNAL	J11	J12
CLOCK	2	2C
DATA	3	3C
ENABLE	4	4C
A0 (LSB)	5	6C
A1	6	7C
A2 (MSB)	7	8C
ANT RELAY	8	13A
INT OSC	9	1A

PRINTED WIRING BOARD A

(19C852239, Sh. 1, Rev. 0)



FILTER: 21.4 MHz IF



PRINTED WIRING BOARD B

(19C852239, Sh. 2, Rev. 0)

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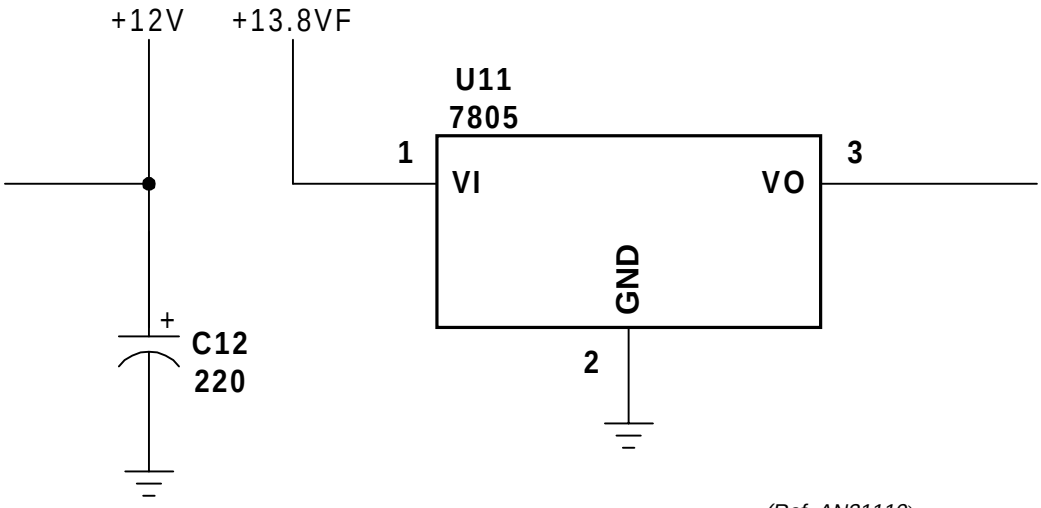
This addendum to RF Module Test Fixture *(TQ-0650)* Maintenance Manual LBI-38805A corrects the Schematic Diagram as follows:

Voltage regulator U11, Pin 1 is removed from the +12V point and connected to the +13.8VF point.

The Schematic Diagram 19C852239 changes as shown below:



(Ref. AN21110)