DESCRIPTION AND MAINTENANCE

851-870 MHz, 100 WATT MASTR® II/GE MARC V STATION TRANSMITTER

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DESCRIPTION

The 851-870 MHz, 100 Watt transmitter is a crystal controlled, phase modulated transmitter designed for single frequency operation. The transmitter may be used in MASTR® II or GE MARC V Station Systems. The transmitter utilizes both integrated circuit (ICs) and discrete components and consists of the following modules:

- Synthesizer-Exciter; with Audio Processor, Reference Oscillator, VCO, PLL Synthesizer, and Exciter Amplifier.
- Power Amplifier; with power control, RF isolator, and cooling fan.

Figure 1 is a Block Diagram of the 851-870 MHz transmitter, showing the exciter, and the Power Amplifier boards.

The PA assembly uses five RF power transistors to provide Rated Power output. The output power is adjustable over a range of 10 to 100 watts.

The Power Control Board located on the PA Assembly allows the output power to be adjusted over the range of 10 to 100 watts.

MAINTENANCE

DISASSEMBLY

For a more complete mechanical parts breakdown refer to the station MAINTENANCE MANUAL. To service the transmitter exciter from the front of the station:

1. Turn the two latching knobs on the front of the radio housing counterclockwise to unlatch the radio housing front door.
2. Swing the door down.
3. Remove cover from the radio housing.

To remove Exciter Board.

1. Unplug the cables P101 and J902 from the Exciter.
2. Remove the four screws and two stand-offs holding the exciter board to the mounting frame and gently lift the exciter board out of the radio.

POWER AMPLIFIER ASSEMBLY REMOVAL AND REPLACEMENT

NOTE

Component placement and connections on the printed wire board are very critical on the PA. For this reason it is recommended that the entire PA assembly be returned to the factory for servicing.

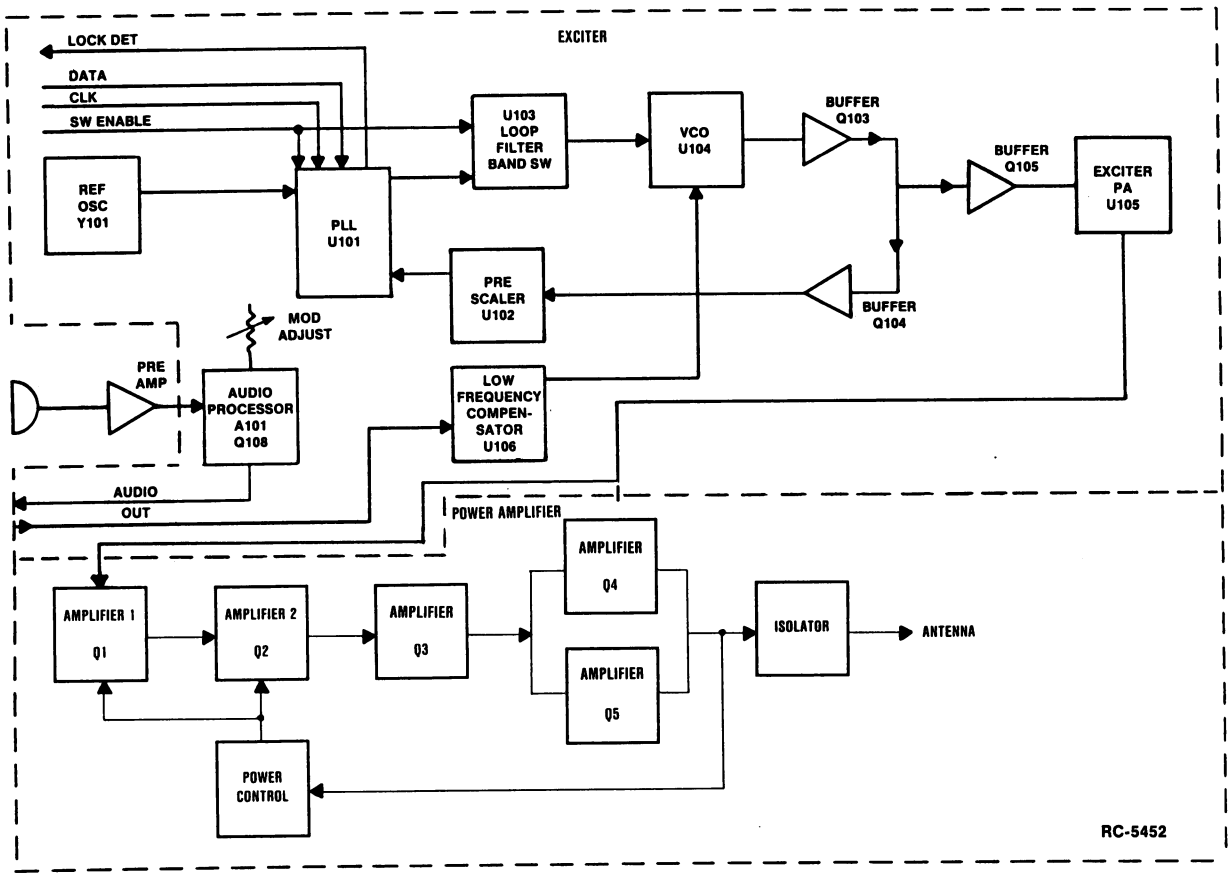


Figure 1 - Block Diagram

WARNING

The RF Power Transistors used in the transmitter contain Beryllium Oxide, a TOXIC substance. If the ceramic, or other encapsulation is opened, crushed, broken or abraded, the dust may be hazardous if inhaled. Be extremely careful to avoid damaging transistor when working with the PA Assembly.

PA ASSEMBLY REMOVAL AND REPLACEMENT

To remove PA assembly:

1. Disconnect the PA RF input cable from J1.
2. Disconnect the Antenna cable from U1-J2.
3. Disconnect the Red and Black DC input power leads.
4. Remove the six screws securing the PA Assembly to the rack and remove the PA assembly.

To replace the PA assembly, perform the above procedure in reverse order.

TRANSMITTER ALIGNMENT

Equipment Required

1. 50-Ohm Wattmeter (capable of reading 75 mW and 100 Watts @ 800 MHz), HP435 or equivalent.
2. Frequency Counter (capable of operating at 800 MHz).
3. 50-Ohm Dummy Load (capable of dissipating 150 Watts @ 800 MHz).
4. 20 dB Directional Coupler (calibrated @ 850-870 MHz).
5. GE Test Set Model 4EX3A11 or Test Kit 4EX8K12.

Preliminary Checks and Adjustments

The following checks and adjustments should be performed before placing the transmitter into operation for the first time or after servicing. A typical test equipment setup is shown in Figure 2.

1. Plug the Reference Oscillator module into the Synthesizer-Exciter board (if not already installed).
2. Connect the output of the Synthesizer/Exciter (J101) to a 50 ohm load through the 20 dB directional coupler.
3. Connect the Wattmeter to the -20 dB port of the directional coupler, or
4. Connect the Frequency Counter to the -20 dB port of the directional coupler.
5. Set DIP switches S2-1 thru 4 and S1-1 thru 7 on the GETC board for the desired transmitter frequency. See the GETC Maintenance Manual for a listing of transmit frequencies and corresponding switch settings.
6. Push the FREQUENCY RESET button to load frequency data into the synthesizer.

Transmitter Alignment Procedure

This alignment procedure should be performed after servicing the PA or exciter. Refer to Figure 2 for test equipment setup.

CAUTION

All adjustments are performed with the transmitter keyed. Keep the transmitter keyed for the shortest times possible to avoid damage to the transmitter and dummy load.

NOTE

Allow a three-minute warm-up before checking the transmitter operating temperature, and for the oscillator to stabilize.

1. Key the transmitter and monitor the output frequency.
2. The Frequency Counter display will be constant if the synthesizer is locked. If frequency varies, press the RESET button on the GETC.

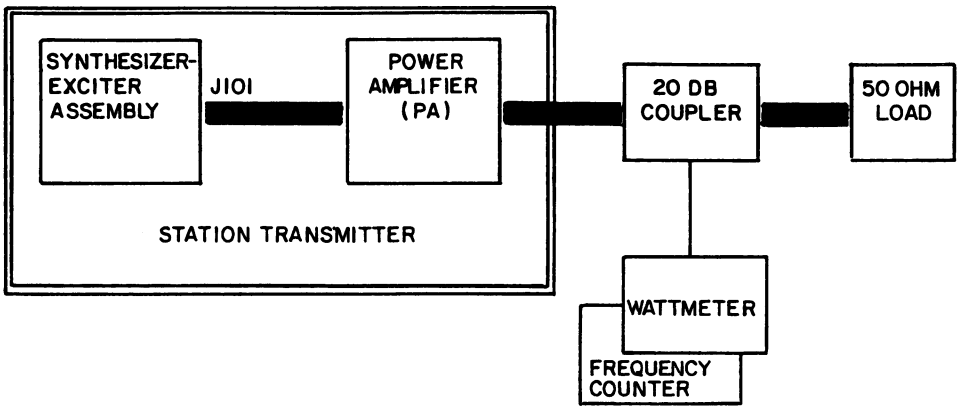
NOTE

If the transmitter frequency is greater than ±3 PPM of the frequency set on the GETC board, a problem in the Synthesizer-Exciter board is indicated. Do not attempt to adjust the oscillator trim more than ±3 PPM of the displayed frequency.

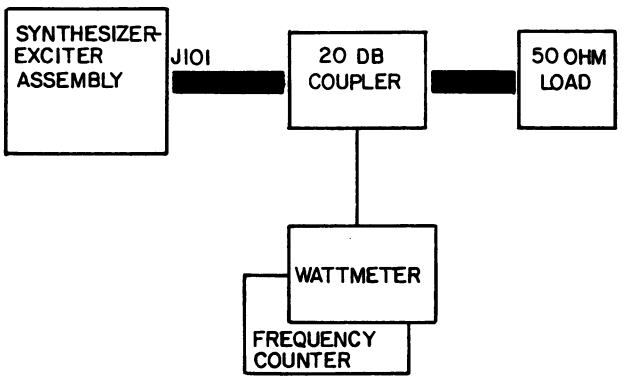
3. Key the transmitter, and read the frequency displayed by the counter. The frequency should be stable and within ±3 PPM of the transmitter frequency setting. Adjust the transmitter frequency (if required) using the frequency trim on the Reference Oscillator.

   The oscillator frequency can be monitored by connecting a frequency counter to U101-3 using a x10 scope probe. The frequency should be 10 MHz ±0.5 Hz.

4. Key the transmitter, and read the RF output power of the Synthesizer-Exciter using the wattmeter connected to the -20 dB port. Power output should be minimum of 75 mW. If power output is below 75 mW, a problem is indicated in the Synthesizer-Exciter assembly.



TEST EQUIPMENT SETUP FOR TRANSMITTER MEASUREMENTS



TEST EQUIPMENT SETUP FOR EXCITER MEASUREMENTS

HIGH-LEVEL SIGNAL

— – 20 dB OF OUTPUT

RC-7211

Figure 2 - Test Equipment Setup

5. Disconnect the wattmeter (directional coupler and dummy load) from J101 of the Synthesizer-Exciter.

6. Connect the PA input cable to J101 of the Synthesizer-Exciter.

7. Connect the wattmeter (frequency counter and 50 ohm load) to the output connector of the PA using the 20 dB coupler.

8. Reset Power Adjust Control R24 (if necessary) for rated output from the PA.

9. Unkey the transmitter, and disconnect the wattmeter, and 50 ohm load from the PA output connector.

TROUBLESHOOTING

NOTE

Component placement and connections on the printed wire board are very critical on the PA. For this reason it is recommended that the entire PA assembly be returned to the factory for servicing.

Before troubleshooting the transmitter, become familiar with the theory of operation and refer to the schematics, outline drawings, and block diagrams provided. Table 1 is a troubleshooting/test guide that may be followed in sequence to help isolate a problem to a component or stage.

Suggested Test Equipment:

- Digital voltmeter
- Oscilloscope (good to 800 MHz)
- Digital frequency counter (good to 800 MHz)
- Dummy load (100 watt dissipation)
- High-impedance scope probe
- Alignment tools

WARNING

High energy radiation is emitted by the transmitter. Observe extreme caution when working on energized RF circuits to avoid possible RF burns or injury to body tissues (eyes) caused by fundamental or harmonic radiation (in a misaligned transmitter).

TABLE 1 - TROUBLESHOOTING

SYMPTON/ MEASUREMENT	MEASUREMENT POINT	CORRECTIVE ACTION
EXCITER		
No RF output	J101	Check U105, U104, Q106, Q107, U108, and U109.
Low RF output	J101	Check U104, U105, Q103, Q105, U108, and U109.
Frequency unstable	J101	Check Y101, U101, U104, U103, U102, Q108 thru Q110, Q101, GETC Control Board Switch, and U107 thru U109.
Frequency below desired range	J101	Check Y101, U101 thru U104, Q101, Q108 thru Q110, U107, and U108.
Measure 7.8 ±0.2 Vdc	U109-2 U108-2	Check U109 and associated U108-2 components.
Measure 5.1 ±0.2 Vdc Using X10 high-impedance probe and oscilloscope, monitor for 10 MHz sine wave, 2-3 Vp-p.	U107-1 U101-2	Check U107 and associated components. Check Y101
Use a voltmeter to monitor voltage at pin 4 (7.8 Vdc), pin 1 (7.6 Vdc), and pin 3 (+3 to +7 Vdc), depending on VCO frequency).	U104	Check U104, U101, Q101, and U103
Use an oscilloscope and high-impedance probe to observe pulses at VCO FREQ/ 128.	U102-5	Check U101 and associated components.
Use and oscilloscope and observe pulsed waveform at 12.5 kHz.	U102-7	Check U104, U101, associated components.

GE Mobile Communications

General Electric Company
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