ERICSSON

Mobile Communications

MASTR® II 851-870 MHz, EDACS™ TRANSMITTER

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Specifications 2
Exciter LBI-31800
Power Amplifier LBI-38134

Maintenance Manual

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SPECIFICATIONS*

Power Output	100 Watts (Adjustable from 10 watts to rated power output)
FCC Filing	KT-259-A2
Crystal Multiplication Factor	48
Frequency Stability	±0.0001% (-30°C to +60°C)
Spurious And Harmonic Emission (Per EIA RS-152-B, Par. 4)	At least 66.0 dB below full rated power output. (Conducted)
	At least 53.0 dB below full rated power output. (Radiated)
Modulation	Adjustable from 0 to ±5 kHz swing with instantaneous modulation limiting.
Modulation Sensitivity	50 to 115 Millivolts
Audio Frequency Characteristics	Within +1 dB to -3 dB of a 6 dB/octave pre-emphasis from 300 to 3000 Hz per EIA standards. Post limiter filter per FCC and EIA.
Distortion	Less than 2%
Deviation Symmetry	0.5 kHz maximum
Duty Cycle	Continuous
RF Output Impedance	50 ohms

*These specifications are intended primarily for the use during servicing. Refer to the appropriate Specification Sheet for the complete specifications.

WARNING

Although the highest DC voltage supplied to the transmitter is +24 VDC, high currents may be drawn under short circuit conditions. These currents can possibly heat metal objects such as tools, rings, watchbands, etc., enough to cause burns. Be careful when working near energized 24 Volt circuits!

High-level RF energy in the transmitter Power Amplifier assembly can cause RF burns upon contact. KEEP AWAY FROM THESE CIRCUITS WHEN THE TRANSMITTER IS ENERGIZED!

DESCRIPTION

The 850-870 MHz, MASTR®II EDACS™ Transmitter is a phase-locked-loop, Synthesizer-controlled transmitter (Figure 1). It is designed for single-frequency operation. The transmitter utilizes both integrated circuits (ICs) and discrete components contained in the following modules:

- Synthesizer-Exciter -- this is one of the main circuit card assemblies used in the transmitter. It contains Audio Processor and Reference Oscillator modules, along with the 800 MHz voltage-controlled oscillator (VCO), phase-locked-loop (PLL) synthesizer, and the exciter amplifier module.
- Power Amplifier (PA) assembly -- used to bring the exciter output to rated output power. This assembly contains the amplifier drivers and finals, and the power-control circuitry required for power amplification.

MAINTENANCE

DISASSEMBLY

A complete mechanical parts breakdown is given in the station Maintenance Manual. Access the transmitter (synthesizer-exciter and power amplifier) from the font of the station as follows:

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

a. Synthesizer-Exciter Board Removal & Replacement:

1. Unplug cables P101 ad J902 from the Synthesizer-Exciter board.
2. Remove the four screws and two stand-offs which hold the Synthesizer-Exciter board to the mounting frame.
3. Lift the Synthesizer-Exciter board out of the station.
4. Replace in reverse order.

b. Power Amplifier (PA) Assembly Removal & Replacement:

WARNING

The rf power transistors used in the Power Amplifier (PA) assembly 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 the transistors when working on the PA assembly.

CAUTION

Component placement and connections on the Power Amplifier (PA) are very critical. It is recommended that the entire PA assembly be returned to the factory for servicing.

1. Disconnect the PA rf input cable from J101.
2. Disconnect the red and black dc input power leads.
3. Use a phillips head screwdriver to remove the screw securing the rf cable to the PA assembly.
4. Unplug the rf output cable from J202 on the lowpass filter.
5. Remove the two end screws securing the hinged PA assembly to the chassis.
6. Remove the PA assembly.
7. Replace the PA assembly 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 140 Watts @ 800 MHz).

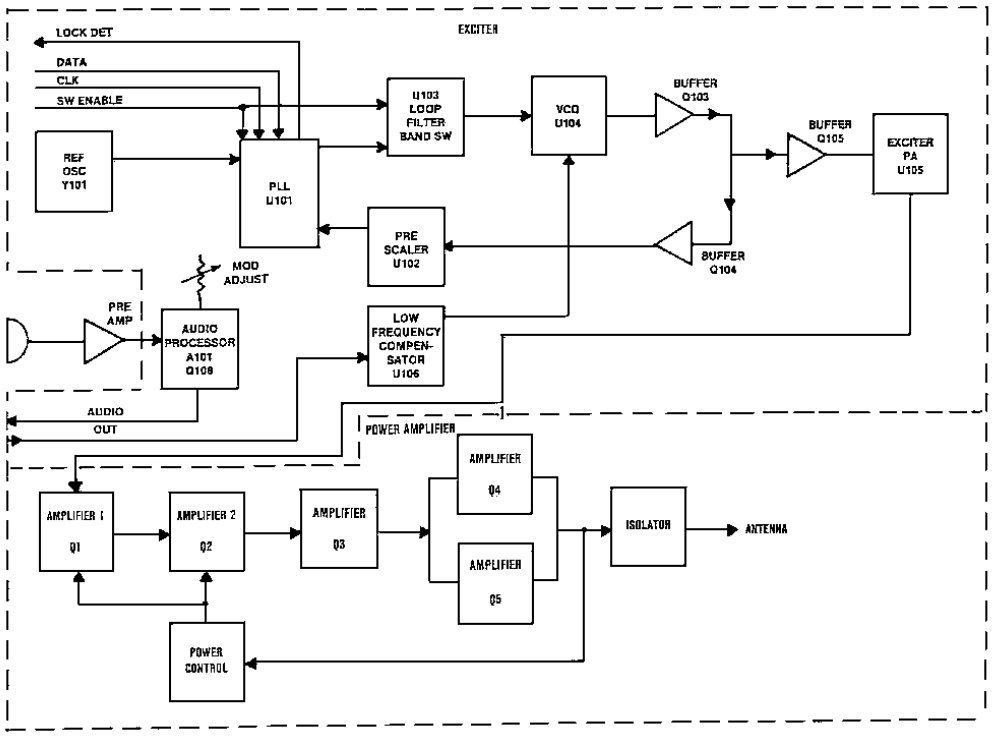


Figure 1 - Transmitter Block Diagram

4. 20 dB Directional Coupler (calibrated @ 850-870 MHz)

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).

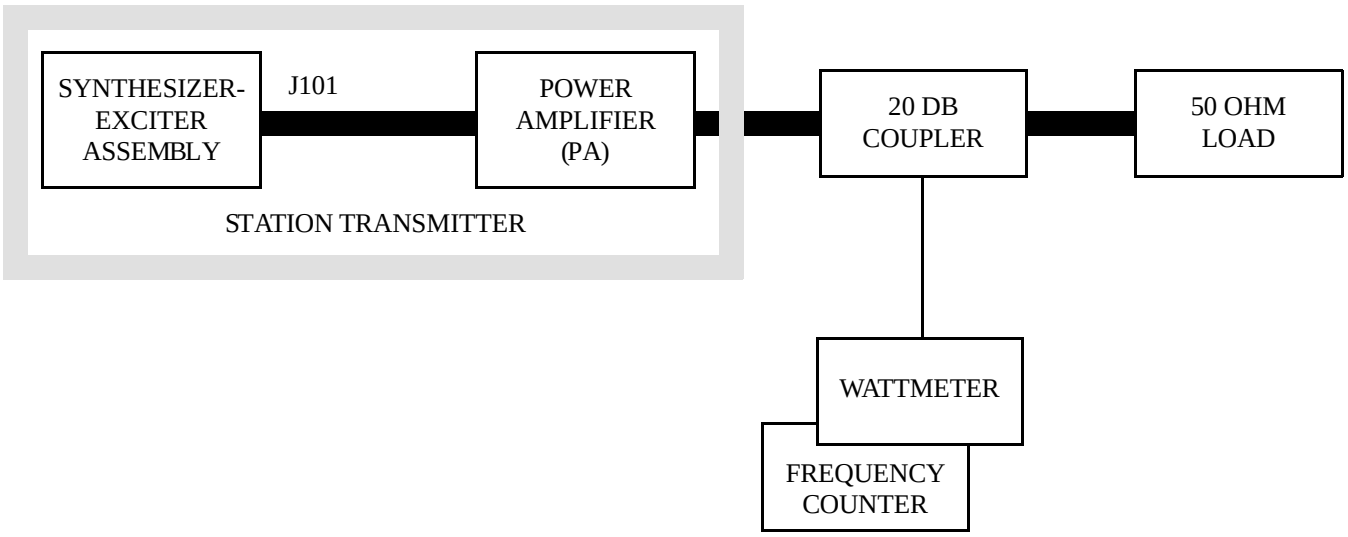
2. Connect the output of the Synthesizer/Exciter (J101) to a 50 ohm load through the 20 dB directional coupler.

3. Connect the Wattmeter to the -20 dB port of the directional coupler, or

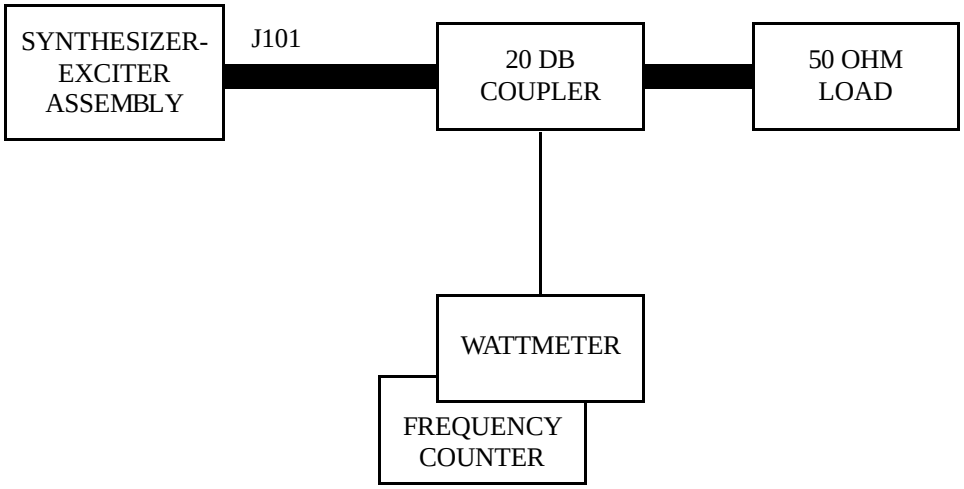
4. Connect the Frequency Counter to the -20 dB port of the directional coupler.

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 GETC RESET button to load frequency data into the synthesizer.



TEST EQUIPMENT SETUP FOR TRANSMITTER MEASUREMENTS



TEST EQUIPMENT SETUP FOR EXCITER MEASUREMENTS

HIGH-LEVEL SIGNAL PATH

-20 dB OF OUTPUT

Figure 2 - Typical Test Equipment Setup

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 frquency 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 a minimum of 75 mW. If power output is below 75 mW, a problem is indicated in the Synthesizer-Exciter assembly.
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. Adjust Control R11 (if necessary) on the Power Control board for desired PA output.
9. Unkey the transmitter, and disconnect the wattmeter, and 50 ohm load from the PA output connector.

Deviation Adjustment

Transmitter deviation is adjusted differently for NPSPAC and non-NPSPAC stations. Adjust MOD ADJ R52 and CG ADJ R50 on Exciter Board as required.

Adjust non-NPSPAC stations for:

±4.5 kHz for stations without Channel Guard

±3.75 kHz for stations with Channel Guard
(adjust Channel Guard deviation for ±0.75 kHz)

Adjust NPSPAC stations for:

±4 kHz for stations without Channel Guard

±3.25 kHz for stations with Channel Guard
(adjust Channel Guard deviation for ±0.75 kHz)

TROUBLESHOOTING

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. The transmitter alignment procedure may also be used as a troubleshooting aid.

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

SYMPTOM/ 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	U107-1	Check U107 and associated components
Using X10 high-impedance probe and oscilloscope, monitor for 10 MHz sine wave, 2-3 Vp-p.	U101-2	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 an oscilloscope and observe pulsed waveform at 12.5 kHz.	U102-7	Check 104, U101, associated components.

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