INSTRUCTION MANUAL ADDENDUM

TTS50DS

SOLID STATE
S-BAND TRANSMITTER

ANALOG OPERATION

04/98

ADDENDUM

THE TTS50DS TRANSMITTER ANALOG OPERATION

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SECTION I

THE TTS50DS TRANSMITTER ANALOG OPERATION

A.1 Transmitter Description:

The EMCEE TTS50DS is a state of the art S-Band transmitter capable of broadcasting MMDS/ITFS digital signals on any FCC specified channel from 2150 to 2700MHz. The transmitter's rated digital power is 50 watts average. The TTS50DS is also capable of broadcasting analog signals at 100 watts peak combined service, for those looking to the digital future but have not yet made the transition. The TTS50DS uses the latest in solid state device and microwave circuit technologies and employs advanced ergonomic controls. The result is a transmitter with superior performance and reliability. Combined with a digital or analog modulator, the TTS50DS is easy to operate and requires minimal service. Dual upconversion eliminates the need for RF alignment. The TTS50DS is LAN capable and can be monitored and controlled remotely. The transmitter can also be upgraded to output 100 watts of average digital power by adding an EMCEE TSA100DS external power amplifier.

A.2 Specifications:

Visual:

Output Power	100W peak
Emission	5M75C3
Color Transmission	NTSC, PAL, or SECAM
Output Frequency Range	2150-2700MHz
Frequency Stability	Visual Carrier ±1kHz
Visual Output Power Stability	±0.3dB
Spurious Products[1]	60dB below peak sync
Harmonics[1]	65dB below peak sync
Intermodulation Products (IM_3)	<-60dB
RF Regulation	≤2%
Hum and Noise	≤-55dB

[1]Measured at Output of Channel Combiner/Filter

Video Signal to Noise	<-55dB
K Factor (2T)	≤2%
ICPM	≤3°
Differential Gain	≤2%
Differential Phase	±2°
Low Frequency Linearity	≤2%
Frequency Response	±0.5dB
Sideband Response[1]	Better than FCC 74.936(b)
Envelope Delay	Better than FCC 73.687(a)(3)
Output Impedance	50 ohms (type N connector)
IF Input Level	-10dBm ± 6dB
IF Input Impedance	75 Ohm/BNC

Aural:

Output Power	2.5W average (-16dB re. visual)
Emission	250KF3E
Frequency Tolerance	Aural Carrier ±100Hz
Frequency Response	±1dB
Pre-emphasis	75 microseconds
Deviation	25kHz Mono 50kHz Stereo
IF Input Level	-26dBm ± 6dB
Audio Distortion	<1.0%
Aural FM Noise	<-60dB
Aural AM Noise	<-60dB

[1] Measured at Output of Channel Combiner/Filter

General/Mechanical:

Operating Temperature	0 to +50°C
Maximum Relative Humidity	95%
Dimensions	10.5"H x 19"W x 26.5"D
Weight	45 lb.
Power Requirements	90 to 270Vac, 47 to 63Hz
Power Consumption	1900W
Power Factor	0.9

A.3 Installation:

The connectors and terminals mentioned in the following instructions are located on the rear of the equipment. It is assumed that the installation of the TTS20DS driver transmitter has been completed as in section 1.3 of the TTS20DS manual. If any of the connections referred to in this section are already made, check them to ensure that they did not loosen during shipment and tighten if necessary.

1. After unpacking the amplifier, a thorough inspection should be conducted to reveal any damage which may have occurred during shipment. If damage is found, immediately notify the shipping agency and advise EMCEE Broadcast Products (Customer Service) or its field representative. Also check to see that any connectors, cables or miscellaneous equipment, which may have been ordered separately, are included.

2. Place the amplifier in a clean, weatherproof environment providing adequate ventilation for the exhaust fans at the rear of the amplifier. It is important to maintain the amplifier's ambient temperature within the 0°C and +50°C limits.

3. Place the amplifier in its permanent location near an ac mains receptacle that supplies 90-270Vac at 47-63Hz and the TTS20DS that is driving it. The ac source should have a minimum power capacity of 2100VA for the total TTS50DS Transmitter.

> **IMPORTANT**
>
> Do not apply ac power to the amplifier at this time since its RF output must be properly loaded before being placed in operation.

4. Place the amplifier's ac power switch to OFF.

5. Place an appropriate ac power line protector (surge suppressor) across the ac line that will supply the amplifier and plug in the amplifier line cord.

6. Place the TTS20DS Transmitter that will be used as the driver into Standby, and then switch off its AC breaker.

7. If the output of the TTS20DS is connected to a channel combiner or antenna, disconnect it. With the appropriate cable (EMCEE supplied), connect the RF OUTput of the TTS20DS to the RF INput of the 50W amplifier.

8. If appropriate, connect the channel combiner(s) to the antenna transmission line and then, using an N to N 1/2" Heliax (LDF4-50A) or Superflex (FSJJ4-50B) cable, connect the TTS50DS RF OUTput (J2) to the appropriate input port of the combiner network. If the transmitter is being used as a standalone unit, connect J2 to the transmitting antenna cable.

9. With the appropriate cable (EMCEE supplied), connect PC1J2 Interface jack of the TSA50DS to the Interface jack J3 of the TTS20DS.

10. Plug the power cord of the transmitter cabinet into an appropriate electrical outlet that supplies the correct ac voltage and current (2100VA per TTS50DS).

This completes the installation of the amplifier. Continue with subsection A.4, Operation.

A.4 Operation:

Once the installation instructions of subsection A.3 have been completed and the TTS50DS has been properly installed, proceed with the following steps to place the transmitter in operation. The pictorial figures and operation of the LCD mentioned below can be found in the TTS20DS Instruction Manual.

1. Switch the AC breaker, located on the lower right-hand side of the TSA50DS amplifier rear panel, to the ON position.

2. Switch the AC breaker, located on the right-hand side of the TTS20DS Transmitter rear panel, to the ON position. The display in Figure 1–1, the Turn-On Display, will come up on the LCD for about 5 seconds and then will change to Figure 1–2, the Main Menu. The Main Menu display shows the transmitter's actual forward and reflected power in a bar graph format.

3. If the transmitter comes up in Operate Mode, the LED in the top right corner of the OPERATE/STANDBY key is green, press the OPERATE/STANDBY key to place the transmitter into Standby. The key's LED will be red when the transmitter is in Standby, and no Forward or Reflected power will be shown on the Main Menu power bars.

4. Press the soft key, at the bottom of the display, that is labeled CONT MENU. The display in Figure 1–10, Control Menu, will appear.

5. Press the PWR ADJ soft key to get the display in Figure 1–11, Power Adjust Menu. Verify that the FORWARD power is at the desired level. If not, use the arrow keys at the right of the display and/or the 50% and 100% keys to set the power if necessary.

6. Press the FREQ ADJ key to get the display in Figure 1–12, Frequency Select Menu. Verify the frequency setting. If necessary, use the left and right arrow soft keys, select the digit to be changed and use the up and down arrow keys to set the digit. Repeat for all digits to be changed. Press the ENTER key.

7. Press the CONT MENU key to return to the display in Figure 1–10 . Press the FAULT ADJ key to get the display in Figure 1–13, Fault Level Adjust Menu. Verify that the fault levels are at the desired values. To adjust the major forward fault level, press the MAJ FWD key to set the point at which a major fault will occur due to the output power dropping below this level. The letters MAJ FWD, above the key, will be highlighted when the key is pressed. Use the up and down arrows to set the fault level. The major forward fault level is represented by the solid block in the FWD bar. The minor fault level is represented by the outlined block. Set the MIN FWD, MAJ REFL and MIN REFL fault levels in the same manner. The MAJor Fault levels are the points at which the transmitter will go into Standby and request backup.

8. Press the CONT MENU key to return to the Control Menu. If Faults are disabled, press the ENA FAULT key. If AGC is on, press the AGC OFF key.

9. If the transmitter is being used in a multiple transmitter system that is using the LAN capability, ensure that the transmitter is in the REMOTE mode indicated by the LED in the upper right corner of the LOCAL/REMOTE key being extinguished. If it is not, press the LOCAL/REMOTE key.

10. Press the OP/STDBY key to the left of the display. You should observe the following:

    a. The LED in the top right corner of the OP/STDBY should be illuminated green indicating that the transmitter is in Operate.

    b. The red FAULT and VSWR indicators and the yellow TEMP indicator, at the top of the display, should be extinguished.

    c. The green SYNTH LOCK indicator at the top of the display should be illuminated.

11. Press the MAIN MENU key to return to the Main Menu. The FWD power bar should show the correct 100% output level.

12. Press the STAT MENU key to get to the Status Menu as shown in Figure 1–3. All statuses should be OK.

13. Press the PWR SPLY key to check power supply voltage levels in the display as in Figure 1–7, Power Supply Menu.

14. Since an external power amp is being used, such as the EMCEE TSA50DS, return to the Main Menu and press the PWR AMP key to check the status of the power amplifier's modules and its power supplies, as in Figure 1–8, Power Amplifier Status Menu.

A.5 Periodic Maintenance Schedule:

OPERATION	RECOMMENDATION
ALIGNMENT	NONE
OUTPUT POWER CALIBRATION	Upon installation and at one-year intervals thereafter (see subsection A.8).
FANS	Inspect as often as possible (at least monthly) and clean when necessary. No lubrication needed.

A.6 Recommended Test Equipment:

EQUIPMENT	MANUFACTURER	MODEL #
Digital Multimeter	HEWLETT PACKARD	E2378A
Oscilloscope	TEKTRONIX	2232
VHF Sweep Generator	WAVETEK	2001
50 Ohm RF Detector	TELONIC BERKELEY	8553
30dB, 150W Attenuator	NARDA	769-30
Power Meter	HEWLETT PACKARD	435B
Frequency Counter	HEWLETT PACKARD	5386A
Spectrum Analyzer	HEWLETT PACKARD	8594E

A.7 Preprogrammed Fault Levels:

Module	Quantity	MINor low	MINor high	MAJor low	MAJor high
30 Watt Amplifier (A1, A2)	Q1 I	5.5A	7.0A	5.0A	----
	Q2 I	5.5A	7.0A	5.0A	----
	Q3 I	5.5A	7.0A	5.0A	----
	Q4 I	5.5A	7.0A	5.0A	----
	Q5 I	5.5A	7.0A	5.0A	----
	Q6 I	5.5A	7.0A	5.0A	----
	GAIN	+9dB	----	+8dB	----
	TEMP	----	+80°C	----	+90°C

A.8 Output Power Calibration:

To insure correct transmission parameters, the FORWARD % power bar graph display setting in the Power Adjust Menu and the FORWARD and REFLECTED bar graph % power displays in the Main Menu should be checked and calibrated using the transmitter's actual output power as measured by an external power meter. The TSA50DS Amplifier and TTS50DS Transmitter are factory calibrated for 50W average output at a FWD output power setting of 100%. For analog operation, the TTS20DS is calibrated for 100 watts peak power at a FWD bar graph setting of 100%.

A.8a Forward Power:

1. Place the transmitter into STANDBY. Remove the top cover of the TSA50DS Amplifier drawer. Set up the test equipment in Figure 3–3.

2. Using the Control Menu, press the DISABLE FAULT soft key.

3. From the Power Adjust Menu, set the FWD power bar graph to 100% using the 100% soft key. This is the percentage of the transmitter's rated output power at which we want to transmit and is the same as the upper left numerical percentage POWER in the Control Menu. It may be different, however, from the FWD percent bar graph display in the Main Menu which is the actual output of the transmitter shown as a percentage of the transmitter's rated output power. Place the transmitter into OPERATE, with the modulator providing only the appropriate visual IF signal (0% APL/Sync only).

4. The external power meter connected to the transmitter output should now read 59.5 watts, taking into consideration the 30dB attenuator. If the external power meter reads other than 59.5 watts, adjust the FWD power, using the Front Panel up/down arrows, for a correct reading.

5. Using the modulator, reinstate the aural carrier and adjust the modulator AURAL CARRIER LEVEL control for a 62 watt indication on the external power meter (59.5 average visual @ 0% APL + 2.5W average aural @ -16dB re visual = 62 watts.)

6. Now, using a voltmeter, measure the dc voltage at test point TP1 in the Metering Detector. It is accessible through the hole marked TP1 on the cover of the Metering Detector. Adjust potentiometer R12, which is accessible through the hole marked R12, for voltmeter reading of +4.0V at TP1. The FORWARD bar graphs in both the Main Menu and Power Adjust Menu should now show 100%.

A.8b Reflected Power:

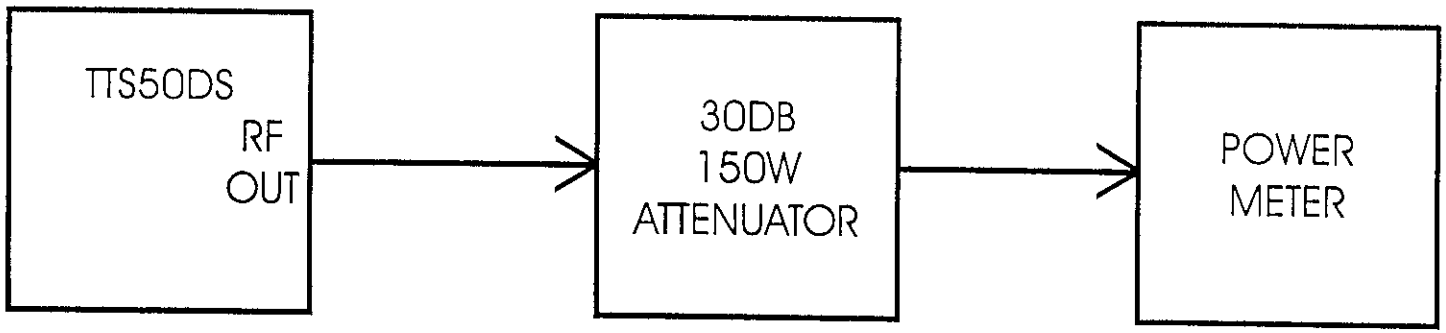
7. Go to the Fault Level Adjust Menu and increase the MAJor REFLected trip level to its maximum value (25%) by pressing the MAJ REFL soft key and then using the up arrow.

8. From the Power Adjust Menu, adjust the FWD power for an external power meter reading of 15.5W (25% of the average output power at black).

9. Go to the Main Menu LCD Display.

10. Disconnect the attenuator from the RF OUTput of the amplifier and leave it open. With a voltmeter, measure the dc voltage at test point TP2, accessible through the appropriate hole in the top of the TSA50DS Metering Detector (A3). Adjust R31 of A3, accessible through the appropriate hole in the cover of A3, for a +4.0Vdc meter reading at TP2.

11. Place the transmitter into Standby. Replace the top cover. Reconnect an appropriate load to the RF OUTput of the amplifier. Place the transmitter into Operate.



OUTPUT POWER CALIBRATION TEST EQUIPMENT SET UP

FIGURE 3-3