

# IMPORTANT RULES FOR SAFE OPERATION

## Note to CATV System Installer

This reminder is provided to call the CATV system installer's attention to Article 820-40 of the NEC that provides guidelines for proper grounding and, in particular, specifies that the CATV cable ground shall be connected to the grounding system of the building, as close to the point of cable entry as practical.



This symbol is intended to alert you that uninsulated voltage within the unit may have sufficient magnitude to cause electric shock. Therefore, it is dangerous to make any kind of contact with any inside part of the unit.



**CAUTION:** To reduce the risk of electric shock, do not remove cover (or back). No user-serviceable parts inside. Refer servicing to qualified service personnel.

## WARNING

**TO PREVENT FIRE OR ELECTRIC SHOCK, DO NOT EXPOSE THIS UNIT TO RAIN OR MOISTURE.**



This symbol is intended to alert you to important operating, maintenance, servicing, and safety instructions in the literature accompanying the equipment.

- 1. Read Instructions** – All the safety and operating instructions should be read before this product is operated.
- 2. Retain Instructions** – The safety and operating instructions should be retained for future reference.
- 3. Heed Warnings** – All warnings on the product and in the operating instructions should be adhered to.
- 4. Follow Instructions** – All operating and use instructions should be followed.
- 5. Cleaning** – Unplug this product from the wall outlet before cleaning. Do not use liquid cleaners or aerosol cleaners. Use a damp cloth for cleaning.
- 6. Attachments** – Do not use attachments not recommended by Scientific-Atlanta as they may cause hazards.
- 7. Water and Moisture** – Do not use this product near water – for example, near a bathtub, wash bowl, kitchen sink, or laundry tub, in a wet basement, or near a swimming pool, and the like.
- 8. Accessories** – Do not place this product on an unstable cart, stand, bracket, or table. The product may fall, causing serious injury to a child or adult, and serious damage to the product. Use only with a cart, stand, bracket, or table recommended by Scientific-Atlanta. Any mounting of the product should follow the instructions, and should use a mounting accessory recommended by Scientific-Atlanta.
- 8A. An appliance and cart combination should be moved with care.** Quick stops, excessive force, and uneven surfaces may cause the appliance and cart combination to overturn.
- 9. Ventilation** – Openings in the cabinet are provided for ventilation and to ensure reliable operation of the product and to protect it from overheating, and these openings must not be blocked or covered. The openings should never be blocked by placing the product on a bed, sofa, rug, or other similar surface. This product should never be placed near or over a radiator or heat register. This product should not be placed in a built-in installation such as a bookcase or rack unless proper ventilation is provided or the instructions have been adhered to.



operate from battery power, or other sources, refer to the operating instructions.

11. **Grounding and Polarization** - This product is equipped with a 3-wire grounding-type plug, a plug having a third (grounding) pin. This plug will only fit into a grounding-type power outlet. This is a safety feature. If you are unable to insert the plug into the outlet, contact your electrician to replace your obsolete outlet. Do not defeat the safety purpose of the grounding-type plug.

12. **Power-Cord Protection** - Power-Supply cords should be routed so that they are not likely to be walked on or pinched by items placed upon or against them, paying particular attention to cords at plugs, convenience receptacles, and the point where they exit from the appliance.

13. **Lightning** - For added protection for this product during a lightning storm or when it is left unattended and unused for long periods of time, unplug it from the wall outlet and disconnect the antenna or cable system. This will prevent damage to the product due to lightning and power-line surges.

14. **Power Lines** - An outside antenna system should not be located in the vicinity of overhead power lines or other electric light or power circuits, or where it can fall into such power lines or circuits. When installing an outside antenna system, extreme care should be taken to keep from touching such power lines or circuits as contact with them might be fatal.

15. **Overloading** - Do not overload wall outlets and extension cords as this can result in a risk of fire or electric shock.

17. **Servicing** - Do not attempt to service this product yourself as opening or removing covers may expose you to dangerous voltage or other hazards. Refer all servicing to qualified service personnel.

18. **Damage Requiring Service** - Unplug this product from the wall outlet and refer servicing to qualified service personnel under the following conditions:

a. When the power-supply cord or plug is damaged.

b. If liquid has been spilled, or objects have fallen into the product.

c. If the product has been exposed to rain or water.

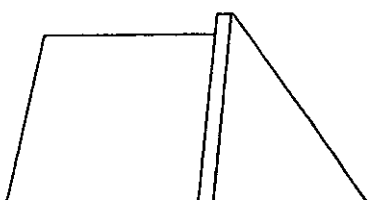
d. If the product does not operate normally by following the operating instructions. Adjust only those controls that are covered by the operating instructions as an improper adjustment of other controls may result in damage and will often require extensive work by a qualified technician to restore the product to its normal operation.

e. If the product has been dropped or the cabinet has been damaged.

f. When the product exhibits a distinct change in performance - this indicates a need for service.

19. **Replacement Parts** - When replacement parts are required, be sure the service technician has used replacement parts specified by Scientific-Atlanta or have the same characteristics as the original part. Unauthorized substitutions may result in fire, electric shock or other hazards.

21. **Outdoor Antenna**  
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connected to the  
antenna or cable  
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This product is to be  
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## WARRANTY

All items that we manufacture are warranted to be free from defects in material and workmanship and to conform to our currently published specifications. The warranty period is one year from the date of shipment. Written notice of defects must be received by us within the warranty period. Our liability is limited to servicing or adjusting any item returned to the factory for that purpose, including replacing any defective parts therein. Customer must pay packing, crating, and transportation costs to and from the factory. At customer's request, we will make reasonable efforts to provide warranty service at the customer's premises, provided the customer pays our then current rates for field services and the associated travel and living expenses. If a fault has been caused by improper installation, maintenance or use, or by abnormal conditions of operation, repairs will be billed at normal rates.

If any fault develops, the following steps should be taken:

- A. Notify us by giving the item model number, serial number and details of the difficulty. On receipt of this information, you will be given service data or shipping instructions.
- B. On receipt of shipping instructions, forward the item prepaid. If the item or the fault is not covered by warranty, an estimate of charges will be furnished before work begins.

WE DISCLAIM STATUTORY AND IMPLIED WARRANTIES, SUCH AS WARRANTIES OF MERCHANTABILITY AND FITNESS FOR PURPOSE.

IN NO EVENT SHALL SCIENTIFIC-ATLANTA BE LIABLE, IN CONTRACT OR IN TORT OR UNDER ANY OTHER LEGAL THEORY, FOR INCIDENTAL, INDIRECT, SPECIAL OR CONSEQUENTIAL DAMAGES, REGARDLESS OF WHETHER WE WERE INFORMED ABOUT THE POSSIBILITY OF SUCH DAMAGES, AND IN NO EVENT SHALL SCIENTIFIC-ATLANTA'S LIABILITY EXCEED AN AMOUNT EQUAL TO THE SALES PRICE.

for a Class A  
provide reasonable  
commercial  
energy and, if not  
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at his own expense.

to

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## FCC COMPLIANCE

This equipment has been tested and found to comply with the applicable limits for a Class A digital device, pursuant to Part 15 of FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

### CAUTION

Any changes or modification to this equipment not expressly approved by Scientific-Atlanta could void the user's authority to operate this equipment.

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# **INSTRUCTION MANUAL ADDENDUM**

**TTS20DS**

**SOLID STATE  
S-BAND TRANSMITTER**

**ANALOG OPERATION**



ADDENDUM  
THE TTS20DS TRANSMITTER  
ANALOG OPERATION

- -

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# SECTION I

## THE TTS20DS TRANSMITTER ANALOG OPERATION

### **A.1 Transmitter Description:**

The EMCEE TTS20DS 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 20 watts average. The TTS20DS is also capable of broadcasting analog signals at 50 watts peak combined service, for those looking to the digital future but have not yet made the transition. The TTS20DS 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 TTS20DS is easy to operate and requires minimal service. Dual upconversion eliminates the need for RF alignment. The TTS20DS is LAN capable and can be monitored and controlled remotely. The transmitter can also be upgraded to output 50 or 100 watts of average digital power by adding an EMCEE TSA50DS or TSA100DS external power amplifier.

### **A.2 Specifications:**

#### **Visual:**

Output Power	50W peak
Emission	5M75C3
Color Transmission	NTSC, PAL, or SECAM
Output Frequency Range	2150-2700MHz
Frequency Stability	Visual Carrier $\pm 1$ kHz
Visual Output Power Stability	$\pm 0.3$ dB
Spurious Products <sup>1</sup>	60dB below peak sync
Harmonics <sup>1</sup>	65dB below peak sync
Intermodulation Products (IM <sub>3</sub> )	< -60dB
RF Regulation	$\leq 2\%$
Hum and Noise	$\leq -55$ dB

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<sup>1</sup>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 <sup>1</sup>	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	1.25W 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

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<sup>1</sup> Measured at Output of Channel Combiner/Filter



### General/Mechanical:

Operating Temperature	0 to +50°C
Maximum Relative Humidity	95%
Dimensions	5.25"H x 19"W x 23.5"D
Weight	45 lb.
Power Requirements	90 to 270Vac, 47 to 63Hz
Power Consumption	600W
Power Factor (Power Factor Correction Optional)	0.7

### A.3 Installation:

The connectors and terminals mentioned in the following instructions are located on the rear of the equipment. If the connections mentioned in this section are already made, check to ensure they did not loosen during shipment and tighten if necessary.

1. After unpacking the transmitter, 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 transmitter in a clean, weatherproof environment providing adequate ventilation for the exhaust fans at the rear of the transmitter. It is important to maintain the transmitter's ambient temperature within the 0°C and +50°C limits.
3. Place the transmitter in its permanent location near an ac mains receptacle that supplies 90-270Vac at 47-63Hz. The ac source should have a minimum power capacity of 1000VA for the TTS20DS.

#### **IMPORTANT**

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

4. Place the transmitter's rear panel ac power switch to OFF.
5. Place an appropriate ac power line protector (surge suppressor) across the ac line that supplies the transmitter.

6. With the appropriate cables (customer supplied), apply baseband video and audio to the modulator's corresponding inputs as described in the installation procedure of the modulator instruction manual.
7. Using the BNC to F cable supplied by EMCEE (accessories box), apply the modulator's IF output signal to the transmitter's IF IN connector (J1). Since the transmitter will be operating in combined service, the visual and aural carrier "loop-thrus" on the rear panel of the modulator must be connected.
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 TTS20DS RF OUTPUTS (J2) to the appropriate input ports of the combiner network. If the transmitter is being used as a standalone unit, connect J2 to the transmitting antenna cable.

**NOTE:** If your transmitter is being used in a multiple transmitter system and the LAN capability is being used, continue with step #9; otherwise, proceed to step #12.

9. If the transmitter is the first on the network and no pc is present or the transmitter is the last transmitter on the network, connect the RS485 cable of the adjacent transmitter to J3 of the Network Termination, leave J2 open and place S1 to the closed position. Otherwise, set S1 to the open position and connect the appropriate cables to J2 and J3 of the RS485 Network Termination (PC1).
10. Verify that the Node Address dip switch (S1) of the Digital Interface Assembly (A2PC3) is set to the correct number. The Node Address switch represents the node number as an 8-bit Binary Coded Decimal with the first switch position being the least significant bit. If the transmitter is to be the master, set the node address to 1. Node Address 1 is reserved for the master transmitter. If additional backup transmitters are being used, assign their node numbers sequentially following the master. The system can accommodate a maximum of 7 additional backup transmitters. Immediately following the last backup or the master if no other backups are present, begin assigning node numbers to the transmitters that are normally broadcasting. These transmitters should be assigned node numbers according to their priority. The lowest transmitter node number has the highest priority for backing up. Priority then decreases with ascending node number. Hence, if only one emergency backup unit is present in the system and it has replaced node 15, and the transmitter at node 12 fails, the backup transmitter will switch over to the programming on node 12. Whereas, if the transmitter at node 25 then fails, it will not be automatically replaced because it has a lower priority than node 12.
11. If the transmitter is the master, verify that the fifth dip switch of S2 on the Digital Interface Assembly (A2PC3) is set to the ON position; otherwise, it should be set to the OFF position.
12. Plug the power cord of the transmitter cabinet into an appropriate electrical outlet that supplies the correct ac voltage and current (1000VA per transmitter).

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

## A.4 Operation:

Once the installation instructions of subsection A.3 have been completed and the modulator is receiving the appropriate baseband signals, proceed with the following steps to place the transmitter in operation.

1. Switch the AC breaker, located on the right-hand side of the 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 actual forward and reflected output power in a bar graph format.
2. 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.
3. 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.
4. 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.
5. 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.
6. 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.
7. 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.
8. 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.
9. 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.
10. Press the MAIN MENU key to return to the Main Menu. The FWD power bar should show the correct 100% output level.
  11. Press the STAT MENU key to get to the Status Menu as shown in Figure 1-3. All statuses should be OK.
  12. Press the PWR SPLY key to check power supply voltage levels in the display as in Figure 1-7, Power Supply Menu.
  13. If an external power amp is being used, such as the EMCEE TSA50DS or TSA100DS, 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, 50W Attenuator	NARDA	765-30
Power Meter	HEWLETT PACKARD	435B
Frequency Counter	HEWLETT PACKARD	5386A
Spectrum Analyzer	HEWLETT PACKARD	8594E

## A.7 Preprogrammed Fault Levels:

<u>Module</u>	<u>Quantity</u>	<u>MINor low</u>	<u>MINor high</u>	<u>MAJor low</u>	<u>MAJor high</u>
Filter/Amplifier (A1A4)	U2 I	70mA	90mA	65mA	----
	U3 I	70mA	90mA	65mA	----
Driver Amplifier (A1A5)	Q1 I	130mA	170mA	120mA	----
	Q2 I	130mA	170mA	120mA	----
	Q3 I	750mA	900mA	700mA	----
	GAIN	+24dB	----	+22dB	----
20 Watt Amplifier (A6)	Q1 I	3.5A	4.5A	3.0A	----
	Q2 I	3.5A	4.5A	3.0A	----
	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	+22dB	----	+20dB	----
	TEMP	----	+80°C	----	+90°C

## A.8 Output Power Calibration:

To insure correct transmission parameters, the % FWD power bar graph display setting in the PWR ADJ Menu and the % FWD power and % REFL power bar graph 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 TTS20DS transmitter is factory calibrated for 20W average output at a FWD bar graph output power setting of 100%. For analog operation, the TTS20DS is calibrated for 50 watts peak power at a FWD bar graph setting of 100%.

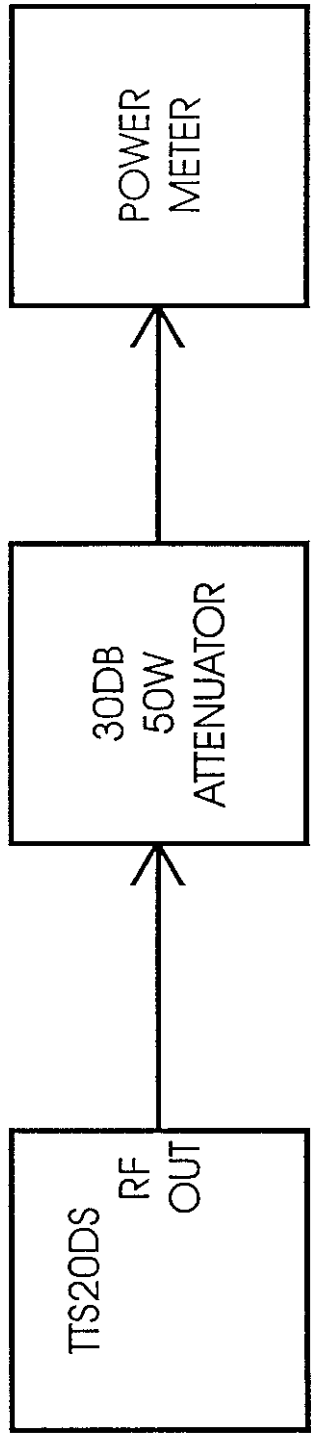
### A.8a Forward Power:

1. Place the transmitter into STANDBY. Remove the top cover of the transmitter. Set up the test equipment in Figure 3-3.
2. Using the CONTROL MENU, press the DISABLE FAULTS soft key if faults are enabled.
3. Access the PWR ADJ 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 power. Place the transmitter into Operate, with the modulator producing only the appropriate visual IF signal (0% APL/Sync only).
4. The external power meter should now read 29.75mW, taking into consideration the 30dB attenuator. If necessary, slowly adjust R6 of the IF Upconverter (A1A3), accessible through the hole labeled R6, for the proper external meter reading.
5. Using the modulator, reinstate the aural carrier and adjust the AURAL CARRIER LEVEL control for a 31.0mW indication on the external power meter (29.75W average visual @ 0% APL + 1.25W average aural @ -16dB re visual - 30dB attenuator = 31mW).
6. Change the LCD Display to the MAIN MENU. The FWD power bar should be at 100%. If not, slowly adjust R98, the Final Output Mon. adjust, accessible through the appropriate hole in the top of the 20W Amplifier (A6) by removing the hole plug. After adjusting for a 100% reading, replace the hole plug.

### 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 PWR ADJ Menu, adjust the FWD power for an external power meter reading of 4W (12.5% 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 transmitter and leave it open. Slowly adjust R87, accessible through the appropriate hole in the top of the 20W Amplifier (A6) by removing the hole plug, for a 12.5% REFlected power reading, 1/4 of the REFlected bar. Replace the hole plug.
11. Place the transmitter into Standby. Replace the top cover. Reconnect the RF OUTput to the antenna or channel combiner. Place the transmitter into Operate.



OUTPUT POWER CALIBRATION TEST EQUIPMENT SET UP

FIGURE 3-3