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Broadcast Products
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TSA100DS

100W SOLID STATE S-BAND DIGITAL POWER AMPLIFIER

MDS • MMDS • ITFS • LPTV
North America • South America • Europe • Asia • Australia • Africa
Since 1960

TSA100DS

100W SOLID STATE
S-BAND DIGITAL
POWER AMPLIFIER

03/98

IMPORTANT

Transmitter Cooling

In order to gain access to the various circuits of the TSA100DS Power Amplifier, it is necessary to remove the drawer cover. Please be advised that this cover is an integral part of the drawer cooling and may not be removed from the drawer for more than five minutes of amplifier operation. Any period longer than this could cause overheating and catastrophic damage to the 30 watt amplifier modules.

To provide adequate ventilation, a minimum of one rack space (1 3/4") must be left vacant below the TSA100DS drawer.

IMPORTANT

Transient Overvoltage Protection

Transient overvoltage of micro- and nano-seconds durations are a continuous threat to all solid-state circuitry. The resulting costs of both equipment repairs and system downtime make preventative protection the best insurance against these sudden surges. Types of protection range from isolation transformers and uninterruptible power supplies to the more cost effective AC power line protectors. As transient culprits are most often lightning induction and switching surges, AC power line protectors are the most practical solution. An effective AC power line protector is one capable of dissipating impulse energy at a low enough voltage to ensure the safety of the electronic components it is protecting. The protection unit should be across the AC line at **all** times even during periods of total blackout. It should also reset immediately and automatically to be 100% ready for repeated transients.

OVERVIEW

SECTION I

INTRODUCTION

SECTION I

THE TSA100DS POWER AMPLIFIER

1.1 Amplifier Description:

The EMCEE TSA100DS 100W Amplifier is a state of the art S-Band power amplifier capable of amplifying MMDS/ITFS digital signals on any FCC specified channel from 2150 to 2700MHz. The amplifier's rated output is 100W average digital power when driven by the TTS20DS Transmitter. The TSA100DS uses the latest in solid state device and microwave circuit technologies. The result is an amplifier with superior performance and reliability. Control and monitoring of the amplifier is provided by the TTS20DS Digital Control/Display Assembly.

1.2 Specifications:

1.2a Electrical Performance:

Output Power	100 Watts Average
Emission	6M00D7W
Modulation Mode	16/64/256 QAM 4/8/16 VSB
Output Frequency	2150-2700MHz
Spectral Regrowth[1]	<-40dB at channel edge <-60dB ± 3MHz from channel edge
Spurious Products	<-60dB
AM to AM Conversion	≤1%
AM to PM Conversion	≤±1°
Envelope Delay[1]	≤±15ns
Frequency Response[1]	±0.2dB
Error Vector Magnitude[1]	≤2%
Output Power Stability	±0.3dB

[1] Measured at Output of Filter/Channel Combiner with TTS20DS Driver.

Digital Signal to Noise[1]	≥30dB
Hum and Noise	<-60dB
Harmonic Output	<-60dB
Minimum Gain	8dB
Input Impedance	50 Ohm/N
Output Impedance	50 Ohm/N

1.2b General/Mechanical:

Operating Temperature	0 to +50°C
Maximum Relative Humidity	95%
Dimensions	10.5"H x 19"W x 23.5"D
Weight	150 lb.
Power Requirements	220Vac, 50/60Hz
Power Consumption	2300W
Power Factor	0.95

1.3 Installation:

After unpacking the transmitter and/or 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. If the TSA100DS Power Amplifier and TTS20DS Transmitter Driver were shipped together as a complete system, perform the instructions in Section 1.3a, New System. If the TSA100DS is being added to a TTS20DS that is already in operation, follow the installation procedure in Section 1.3b, TTS20DS Upgrade.

1.3a New System (TTS100DS):

1. If the transmitter/driver and amplifier were shipped individually, mount both drawers in a heavy-duty rack with the slides provided. Place the transmitter and amplifier in a clean, weatherproof environment providing adequate ventilation for the exhaust fans at the rear of

[1] Measured at Output of Filter/Channel Combiner with TTS20DS Driver.

the drawers. Also, a minimum of one rack space (1 3/4") must be left vacant below the TSA100DS drawer for additional air entry. It is important to maintain the transmission site ambient temperature within the 0°C and +50°C limits.

2. Place the equipment near an ac mains receptacle that supplies both 110Vac for the TTS20DS Transmitter and 220Vac for the TSA100DS Amplifier. The ac sources should have minimum power capacities of 900VA for the 110Vac source and 2400VA for the 220Vac outlet. If both the transmitter and amplifier have been delivered in a prewired rack, then a 220Vac, three-prong Hubbell twist lock receptacle, capable of at least 3300VA, will be required.

IMPORTANT

Keep the house mains breaker off and insure the transmitter and amplifier ac switches are off. Do not apply ac power to the equipment at this time since the transmitter's RF output must be properly loaded before being placed in operation.

3. Place an appropriate ac power line protector (surge suppressor) across the ac line that supplies the transmitter and amplifier.

NOTE: If the transmitter was received mounted in a prewired rack, check all cable connections to insure they are secure and skip to step #6.

4. With the LMR 400 N to N cable (EMCEE supplied), connect the RF OUTput (J2) of the TTS20DS to the RF INput (J1) of the 100W amplifier.

5. Using the cable with 25 pin D-sub connectors at each end, (EMCEE supplied), connect PC1J2 INTERFACE jack of the TSA100DS to the INTERFACE jack J3 of the TTS20DS. Lock each connector in place using the associated slide latch.

6. 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 each TTS100DS RF OUTput (J2) to the appropriate input ports of the combiner network. If the transmitter is being used as a standalone unit, connect J2 to the accompanying spectral mask filter and connect the filter output to the antenna transmission line.

7. Plug the power cord of the transmitter rack into a 220Vac electrical outlet that is capable of supplying more than 3300VA for each TTS100DS Transmitter. If the transmitter and amplifier were received without a rack, see step #2 above for individual ac power requirements.

This completes the installation of the transmitter. Continue with Section 1.4, Operation.

1.3b TTS20DS Upgrade:

1. Place the amplifier in a clean, weatherproof environment providing adequate ventilation for the exhaust fans at the rear of the amplifier. Provide a minimum of one rack space (1 3/4")

below the TSA100DS drawer for additional air entry. It is important to maintain the amplifier's ambient temperature within the 0°C and +50°C limits.

2. Rack the amplifier with the TTS20DS Transmitter/Driver near an ac receptacle that supplies 220Vac. The 220Vac source should have a minimum power capacity of 2400VA for the TSA100DS Amplifier. Plug the amplifier into the 220Vac outlet.

IMPORTANT

Insure that the house mains, transmitter and amplifier ac breakers are all off. Do not apply ac power to the amplifier at this time since its RF output must be properly loaded before being placed in operation.

3. Place an appropriate ac power line protector (surge suppressor) across the ac line that supplies the amplifier. A line protector should already be in place for the transmitter.

4. Connect a 30dB attenuator and power meter to the RF OUTput (J2) of the TTS20DS as shown in Figure 3–3 of the TTS20DS manual.

5. Reduce the output power of the TTS20DS by turning R6 of the IF Upconverter fully counterclockwise. The top cover of the transmitter will have to be removed to gain access to this adjustment.

6. Place the mains circuit breaker on and close the AC POWER switch on the rear panel of the TTS20DS. With the transmitter in STDBY, go to the Control Menu and shut the AGC OFF.

7. Place the TTS20DS into OPerate and verify that its output power is less than 10 watts average.

8. Place the TTS20DS into STDBY and then open the AC POWER switch.

9. Remove the 30dB attenuator and power meter. With the LMR 400 N to N cable (EMCEE supplied), connect the RF OUTput (J2) of the TTS20DS to the RF INput (J1) of the TSA100DS Amplifier.

10. Using the wire harness with 25-pin D-Sub connectors at each end (EMCEE supplied), connect PC1J2 INTERFACE jack of the TSA100DS to the INTERFACE jack J3 of the TTS20DS Transmitter.

11. Plug the TSA100DS Amplifier power cord into a 220Vac electrical outlet that supplies a minimum of 2400VA.

12. Connect the 30dB/150W attenuator and power meter to the RF OUTput (J2) of the TSA100DS as shown in Figure 3–3 of this manual.

13. Close the TSA100DS and TTS20DS ac circuit breakers and place the TTS20DS to OPerate.

14. Slowly adjust R6 in the transmitter's IF Upconverter for a power meter reading of 100 watts average.

15. From the transmitter Control Menu, turn the AGC ON.

16. Place the TTS20DS to STDBY and remove the 30dB attenuator and power meter from the amplifier output connector.

17. If appropriate, connect the channel combiner(s) to the antenna transmission line and, using an N to N 1/2" Heliax (LDF4-50A) or Superflex (FSJJ4-50B) cable, connect the TTS100DS Transmitter 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 spectral mask filter and connect the filter output to the antenna cable.

This completes the installation of the amplifier. Continue with Section 1.4, Operation.

1.4 Operation:

Once the installation instructions of Section 1.3 have been completed and the TSA100DS Amplifier has been properly installed, proceed with the following steps to place the transmitter in operation.

1. Switch the ac breaker CB1, located on the lower left-hand side of the TSA100DS amplifier rear panel, to the ON position.

2. Switch the AC POWER breaker, located on the right-hand side of the TTS20DS Transmitter rear panel, to the ON position.

3. On the TTS20DS front panel press the OP/STDBY button so that its LED is green (OPerate) and proceed to Section 1.4 of the TTS20DS manual for further operation information.

1.5 Warranty and Parts Ordering:

Warranty – EMCEE warrants its equipment to be free from defects in material and workmanship for a period of one year after delivery to the customer. Equipment or components returned as defective (prepaid) will be, at our option, repaired or replaced at no charge as long as the equipment or component part in question has not been improperly used or damaged by external causes (e.g., water, ac line transients, or lightning). Semiconductors are excepted from this warranty and shall be warranted for a period of not more than ninety (90) days from date of shipment. Equipment or component parts sold or used by EMCEE, but manufactured by others, shall carry the same warranty as extended to EMCEE by the original manufacturer.

Equipment Returns – If the customer desires to return a unit, drawer, or module to EMCEE for repair, follow the procedure described below:

1. Contact EMCEE Customer Service Department by phone or fax for a Return Authorization Number.

2. Provide Customer Service with the following information:

   Equipment model and serial numbers.
   Date of purchase.
   Unit input and output frequencies.
   Part number (PN) and Schematic Diagram designator if a module is being sent.
   Detailed information concerning the nature of the malfunction.

The customer shall designate the mode of shipping desired (e.g., Air Freight, UPS, Fed Ex, etc.). EMCEE will not be responsible for damage to the material while in transit. Therefore, it is of utmost importance that the customer insure the returned item is properly packed.

Parts Ordering – If the customer desires to purchase parts or modules, utilize the following procedure:

1. Contact EMCEE Customer Service by phone or fax indicating the customer's purchase order number. If the purchase order number is provided by phone, written confirmation of the order is required.

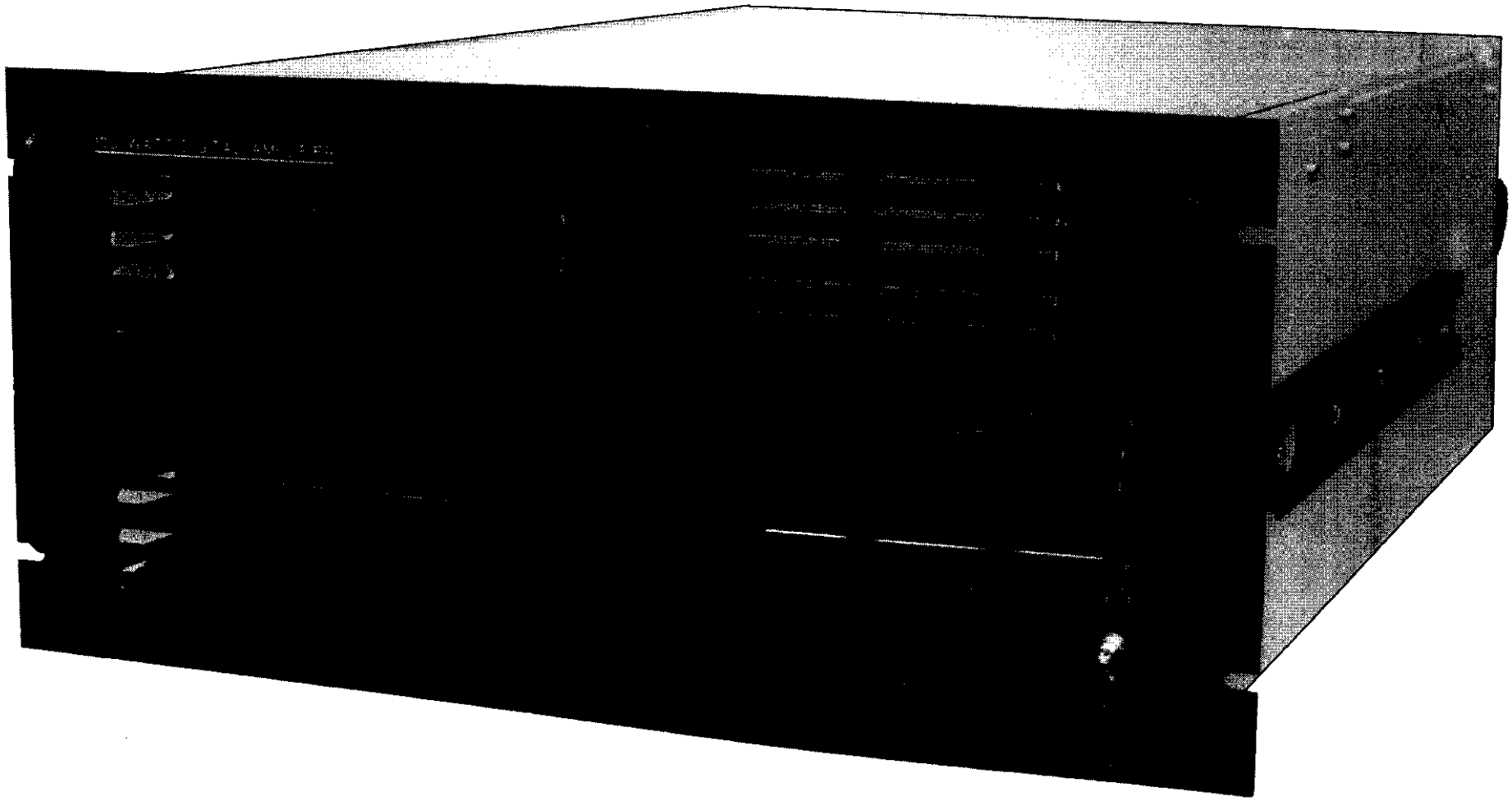
2. Also provide:

   The equipment model and serial number.
   The unit input and output frequencies.
   The quantity, description, vendor, number, and designation of the parts needed as found in the Spare Modules and Components Lists subsection of this manual.
   If a module is required, give the part number (PN) and Schematic Diagram designator (e.g., 30389116).
   Designate the mode of shipping desired (e.g., Air Freight, UPS, Fed Ex, etc.).
   Shipping and billing addresses.

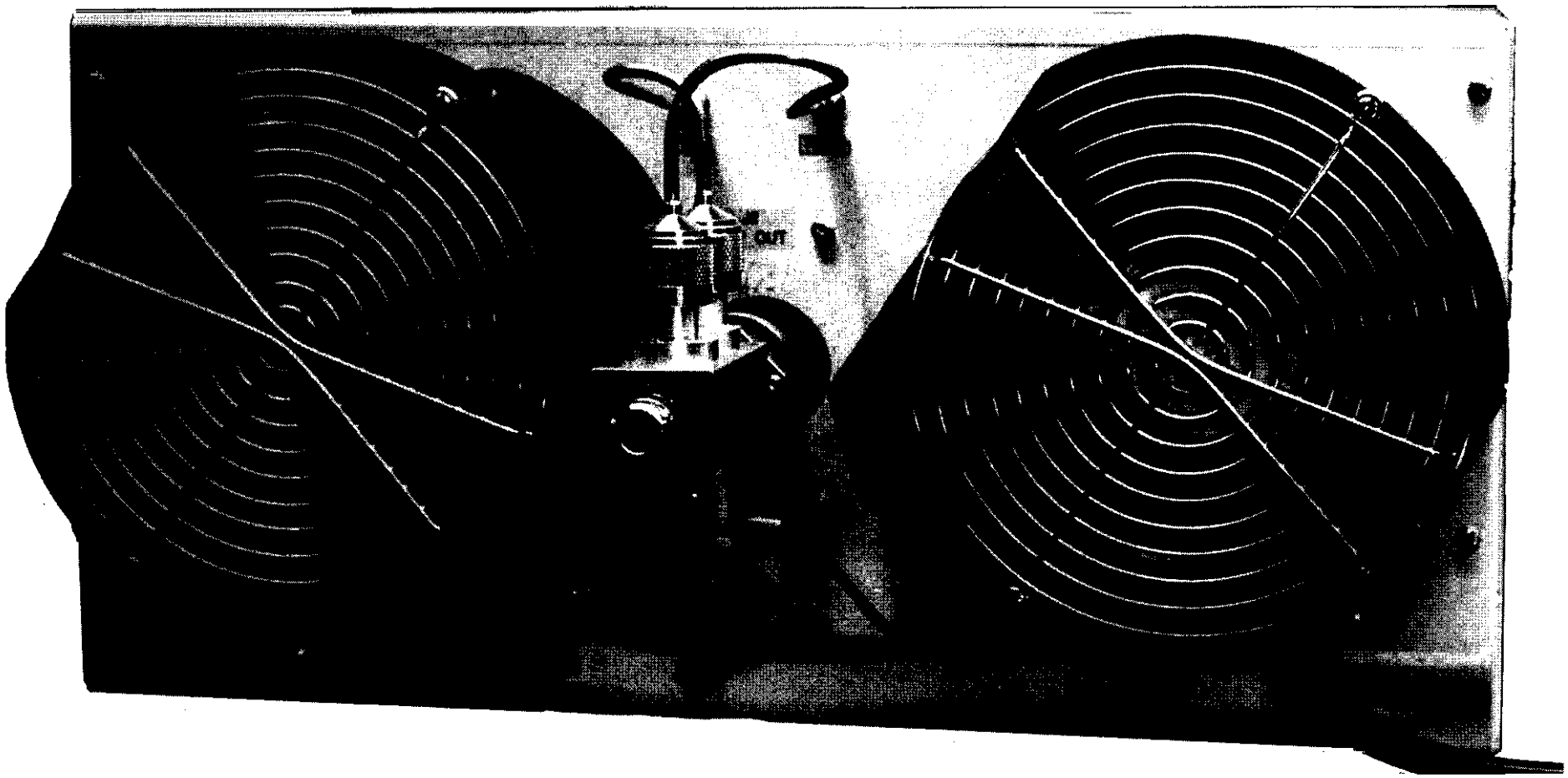
Spare and Replacement Modules and Components – The Spare Modules and Components section of this manual provides a listing of the modules and some discrete components contained within the transmitter. The list contains those modules or components considered to be essential bench-stock items and should be available to the maintenance technician at all times. The Schematic or Interconnection Diagram is the governing document of this manual. Should there be a discrepancy between a modules or components list and a diagram, the diagram takes precedence. Such a discrepancy is possible since manufacturing changes cannot always be incorporated immediately into the instruction manual.

Component Referencing – The transmitter consists of drawers containing modules and components. Each drawer is given a reference designator starting with A1. Components and modules located in a drawer are referred to by their respective designators, preceded by the designator of the drawer in which they reside. Hence, the designator A1PS2 refers to power supply PS2 in drawer A1. This standard applies for all modular levels, i.e., A1A6A3 represents module A3, located in module A6, located in drawer A1. Components mounted directly to the cabinet take only a component reference designator. In the circuit description, Section 2, the full reference designator is given only with the schematic or interconnection diagram. In the text, the modules are referred to by their module number only unless a module is mentioned that is located in a different drawer. Module designators on interconnect diagrams do not take the drawer designators.

For EMERGENCY technical assistance, EMCEE offers a toll free, 24-hour, 7-day-a-week customer service hot line: 1-800-233-6193.



TSA100DS Front Panel
Figure 1-1



TSA100DS Rear Panel
Figure 1-2

SECTION II

CIRCUIT DESCRIPTION

SECTION II

CIRCUIT DESCRIPTION

2.1 4-Way Splitter:

Schematic Diagram 10389120/Rev 51 ★ CP1

Insertion Loss (J1-J2, J1-J3, J1-J4, J1-5)	<6.5dB
Amplitude Balance	±0.25dB
Phase Balance	±1°

The 4-Way Splitter (CP1) takes the RF signal from the transmitter driver and provides four signals of equal phase and amplitude, each approximately 6.5dB lower than the input. The four signals are used to drive the four 30W Power Amplifiers.

2.2 30 Watt Power Amplifier:

Schematic Diagram 40389140/Rev 53 ★ A1, A2, A3, A4

Gain (J1-J2)	+10dB
Current Draw (Q1, Q2, Q3, Q4, Q5, Q6)	6.3A @ 12Vdc

The 30 Watt Power Amplifier (A1, A2, A3, A4) provides approximately 10dB of gain to the RF signal provided at its input (J1) from the 4-Way Splitter. Amplification is achieved using six FET power transistors operating in class A mode. The transistors' drain bias voltage and current are supplied by the drawer's +12V Power Supplies (PS1, PS2, PS3, PS4). Each supply is allocated to power one 30W Amplifier module creating a fully redundant system. The current draw of the six FETs, the module input power, module output power, and the module temperature are all monitored with the resulting voltages available on connector J3. The current draws of Q1 through Q6 are represented as proportional dc voltages on pins J3-1 through J3-6, respectively. Likewise, dc voltages corresponding to input power, output power and temperature are provided on J3-7, J3-8 and J3-9. These nine dc levels are sent to the Transmitter Interface board (PC1).

2.3 4-Way Combiner:

Mechanical Diagram 30389233 ★ CP2

Insertion Loss (J1-J5, J2-J5, J3-J5, J4-J5)	<0.3dB
Amplitude Balance	±0.25dB
Phase Balance	±1°

The 4-Way Combiner (CP2) is a radial type combiner that joins the four carriers from 30W Amplifiers A1, A2, A3 and A4 into a single 100W signal to be delivered to the Directional Coupler. This combiner exhibits very low loss characteristics with excellent phase and amplitude balance.

2.4 Directional Coupler:

Schematic Diagram N/A ★ DC1

Insertion Loss (J1-J2)	<0.5dB
Forward Sample (J1-J3)	-30dB ± 1dB
Reflected Sample (J1-J4)	-30dB ± 1dB

The Directional Coupler (DC1) is a four-port module that performs two functions. The first function is to pass the amplified S-Band signal with minimal insertion loss to the output of the amplifier drawer. The second function is to provide a sample of the forward and reflected output signals which are used by the Metering Detector (A6).

2.5 Metering Detector:

Schematic Diagram 30389116/Rev 53 ★ A5

The Metering Detector (A5) takes the coupled FWD PWR and REFL PWR signals from the Directional Coupler (DC1) as its inputs. Each input is used to create a proportional dc level which is provided to the TTS20DS transmitter driver via the Transmitter Interface board (PC1).

The forward power input (J1) is attenuated and split. One of the resulting signals is further attenuated and buffered by a monolithic amplifier to provide the SAMPLE OUT (J3) signal, which is on channel and 48dB below the RF OUTput of the TTS100DS. The other signal from the splitter is rectified with the resulting dc level amplified by an absolute voltage gain that is variable between 3.4 and 5 using potentiometer R12. When the output of the amplifier drawer is at 100 watts average, R12 should be adjusted to provide a +4Vdc voltage reading at TP1. The dc FWD PWR voltage is provided at J2-B via filter FL2.

The reflected power input (J2) is treated similarly to the forward power signal. It is attenuated, rectified and then amplified before being provided as a dc REFL PWR voltage at J2-C. This level is calibrated by adjusting R31 for a 4Vdc voltage reading at TP2 with 25W avg reflected power. The REFL PWR voltage is provided at plug J4-C via filter FL3.

2.6 Transmitter Interface:

Schematic Diagram 30389112/Rev A ★ PC1

The purpose of the Transmitter Interface board (PC1) is to gather information from the Metering Detector (A5) and the four 30 Watt Amplifier modules (A1, A2, A3, A4) in the TSA100DS Amplifier drawer and forward that information to the TTS20DS Transmitter for manipulation and display. Forty separate analog voltages representing various functions within the four amplifier modules are brought to five Dual 4 to 1 Analog Multiplexer chips via J1. Here the voltages are placed on ten data lines during specific time periods dictated by the 0 to 3 count provided on the EXT MUX 0 (J2-23) and EXT MUX 1 (J2-10) control lines from the transmitter. As the transmitter micro-processor polls the ten voltages during each count, it determines the value and status of each and displays the information on its front panel LCD. The information provided to the transmitter includes individual transistor currents (J2-14, -2, -16, -3, -8, -12), amplifier module temperatures (J2-15), and the input/output power of each module (J2-1, -17) used by the transmitter

(J2-15), and the input/output power of each module (J2-1, -17) used by the transmitter microprocessor to calculate module gain. FWD PWR (J1-5) and REFL PWR (J1-6) voltages from the Metering Detector (A5), indicating total power at the amplifier drawer output, are also brought to the Interface board but are immediately sent to the transmitter via J2-6 (TOTAL EXT OUT) and J2-20 (TOTAL EXT REFL). Quad Buffer chip U6 controls the activation/deactivation of the four 12V Power Supplies contained in the amplifier drawer. A TTL level, supplied by the transmitter at J2-11 (12V PS ENABLE), is applied to four buffers which individually drive the enable lines of PS1, PS2, PS3 and PS4 to turn the power supplies on or off.

2.7 +5, ±15V Power Supply:

Schematic Diagram N/A ⋆ PS5

Outputs

+5V	@	3A Max.
+15V	@	1.5A Max.
-15V	@	0.35A Max.

This power supply (PS5) provides +5Vdc and ±15Vdc to the various circuits within the amplifier drawer. It is a high efficiency, switching type with output overload protection. The +15V portion is used to power the Metering Detector (A5) and, in conjunction with +5V, the Transmitter Interface (PC1). More importantly, -5V is utilized to provide bias for the power FETs in each 30 Watt Amplifier module (A1, A2, A3, A4).

The power supply is not field repairable. If defective, return it to EMCEE for repair or replacement.

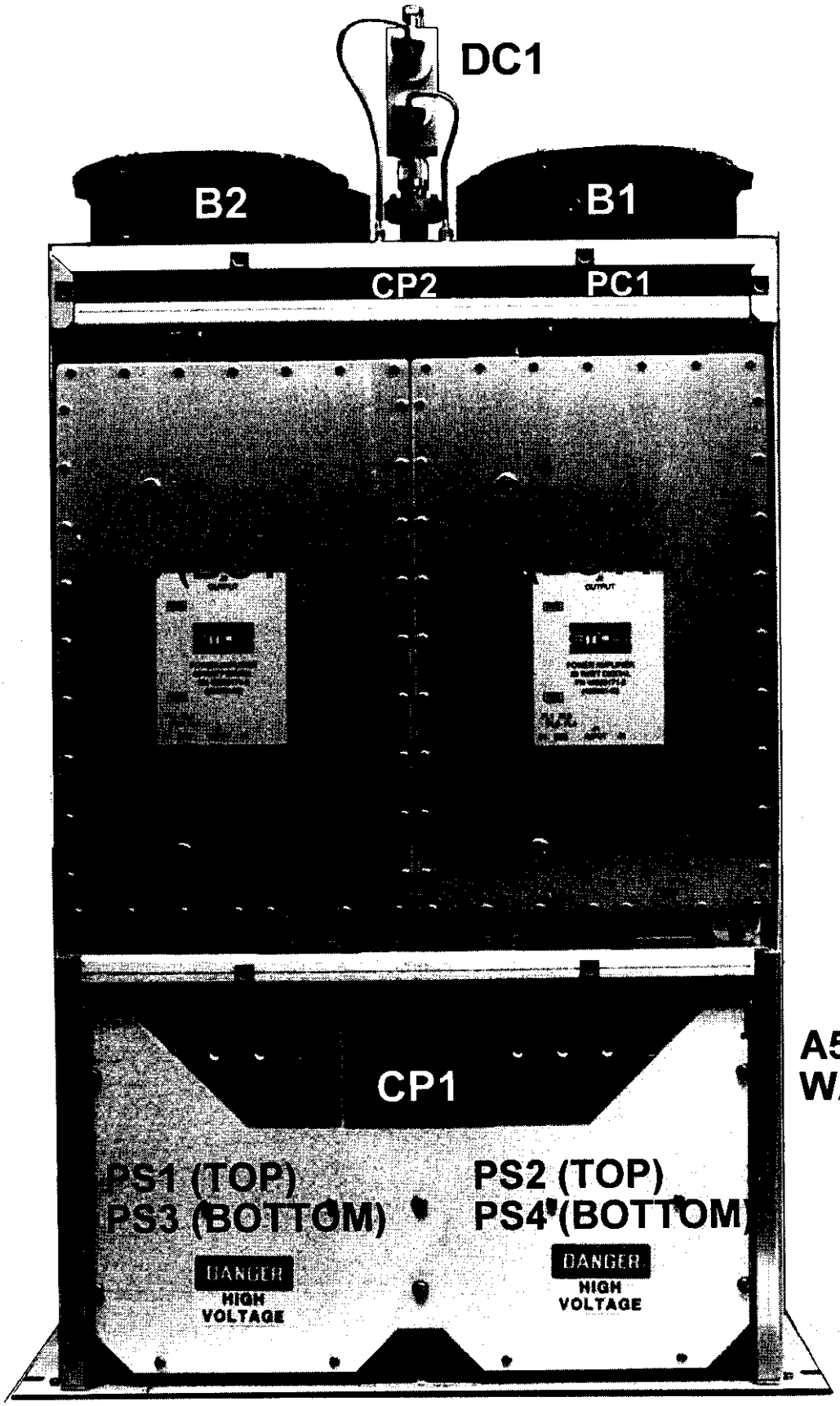
2.8 +12V Power Supply:

Schematic Diagram N/A ⋆ PS1, PS2, PS3, PS4

Output +12Vdc @ 42A

To provide maximum redundancy each 30 Watt Digital Power Amplifier (A1, A2, A3, A4) is furnished with its own +12V Power Supply (PS1, PS2, PS3, PS4). Each supply is a high current, high efficiency switching type with power factor correction, output overload protection and an ENABLE line that is TTL compatible. The PS ENABLE signals are generated by U6 of the Transmitter Interface (PC1) which is controlled by the TTS20DS EXT AMPL ENABLE signal.

The power supplies are not field repairable. If defective, return to EMCEE for repair or replacement.



TSA100DS Internal View

Figure 2-1

SECTION III

MAINTENANCE

SECTION III

MAINTENANCE

3.1 Periodic Maintenance Schedule:

OPERATION	RECOMMENDATION
OUTPUT POWER CALIBRATION	Upon installation and at one-year intervals thereafter (see section 3.4).
FANS	Inspect as often as possible (at least monthly) and clean when necessary. No lubrication needed.

3.2 Recommended Test Equipment:

EQUIPMENT	MANUFACTURER	MODEL #
Digital Multimeter	HEWLETT PACKARD	E2378A
30dB 150W Attenuator	NARDA	769-30
Power Meter	HEWLETT PACKARD	435B
Frequency Counter	HEWLETT PACKARD	5386A
QAM Analyzer	HEWLETT PACKARD	8594Q

3.3 Preprogrammed Fault Levels:

Module	Quantity	MAJor low	MAJor high
30 Watt Amplifier (A1, A2, A3, A4)	Q1 I	5.0A	----
	Q2 I	5.0A	----
	Q3 I	5.0A	----
	Q4 I	5.0A	----
	Q5 I	5.0A	----
	Q6 I	5.0A	----
	GAIN	+8dB	----
	TEMP	----	+90°C

3.4 Output Power Calibration:

To insure correct transmission parameters, the following items should be checked and calibrated if necessary: the amplifier output power as measured by an external power meter, the transmitter's FORWARD % power bar graph display in the Power Adjust Menu, and FORWARD and REFLECTED bar graph % power displays in the Main Menu. Unless requested otherwise, the TTS100DS Transmitter is factory calibrated for 100W average output at a FORWARD output power setting of 100%.

3.4a Forward Power:

1. Place the transmitter into STANDBY. Set up the test equipment in Figure 3–3.

2. Using the Control Menu, press the DISable FAULT and AGC OFF soft keys.

3. From the Power Adjust (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 numerical percentage POWER in the Control Menu. It is, however, different 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 digital modulator providing the appropriate IF signal.

4. The external power meter connected to the transmitter output should now read 100W, taking into consideration the 30dB attenuator. If the external power meter reads other than 100W, adjust the FWD power, using the Front Panel up/down arrows, for a meter reading of 100W. Remove the top cover of the TSA100DS Amplifier and, using a voltmeter, measure the dc voltage at test point TP1 in the Metering Detector accessible through the hole marked TP1 on its cover. Adjust potentiometer R12, which is accessible through the hole marked R12,

for a voltmeter reading of +4.0V at TP1. The FORWARD bar graphs in both the Main Menu and Power Adjust Menu should now show 100%.

3.4b Reflected Power:

5. Go to the Fault Level Adjust Menu via the Control Menu (FAULT ADJ) 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.

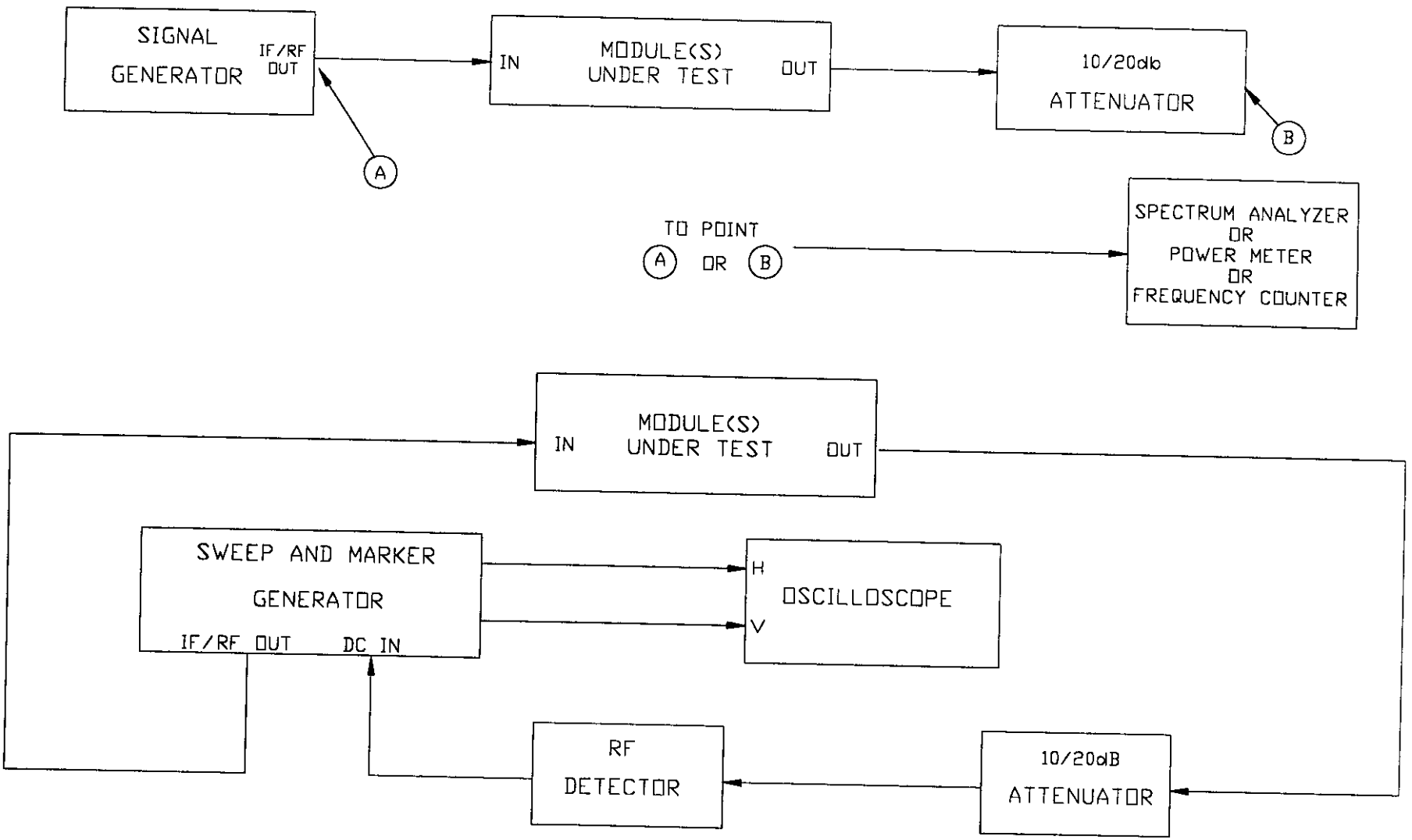
6. Return to the Control Menu and from the Power Adjust Menu, adjust the FWD power for an external power meter reading of 25W (25% of rated average power).

7. Go to the Main Menu display.

8. Remove the Metering Detector (A5) cable from the REFL port of the Directional Coupler (DC1) and connect it to the INCIDENT port (DC1J3) of the coupler. This will simulate 25W/25% returned power at the REFL PWR input of the Metering Detector.

9. With a voltmeter, measure the dc voltage at test point TP2, accessible through the marked hole in the top of the TSA100DS Metering Detector (A5). Adjust R31 of A5, also accessible through the hole indicated on the cover of the detector, for a +4.0Vdc meter reading at TP2.

10. Place the transmitter into Standby. Replace the top cover. Reconnect the RF OUTput to the antenna or channel combiner. Return the transmitter to OPerate.



TEST EQUIPMENT SETUPS FOR MEASURING THE GAIN OR LOSS OF THE MODULES COMPRISING THE RF AMPLIFIER CHAIN

FIGURE 3-1

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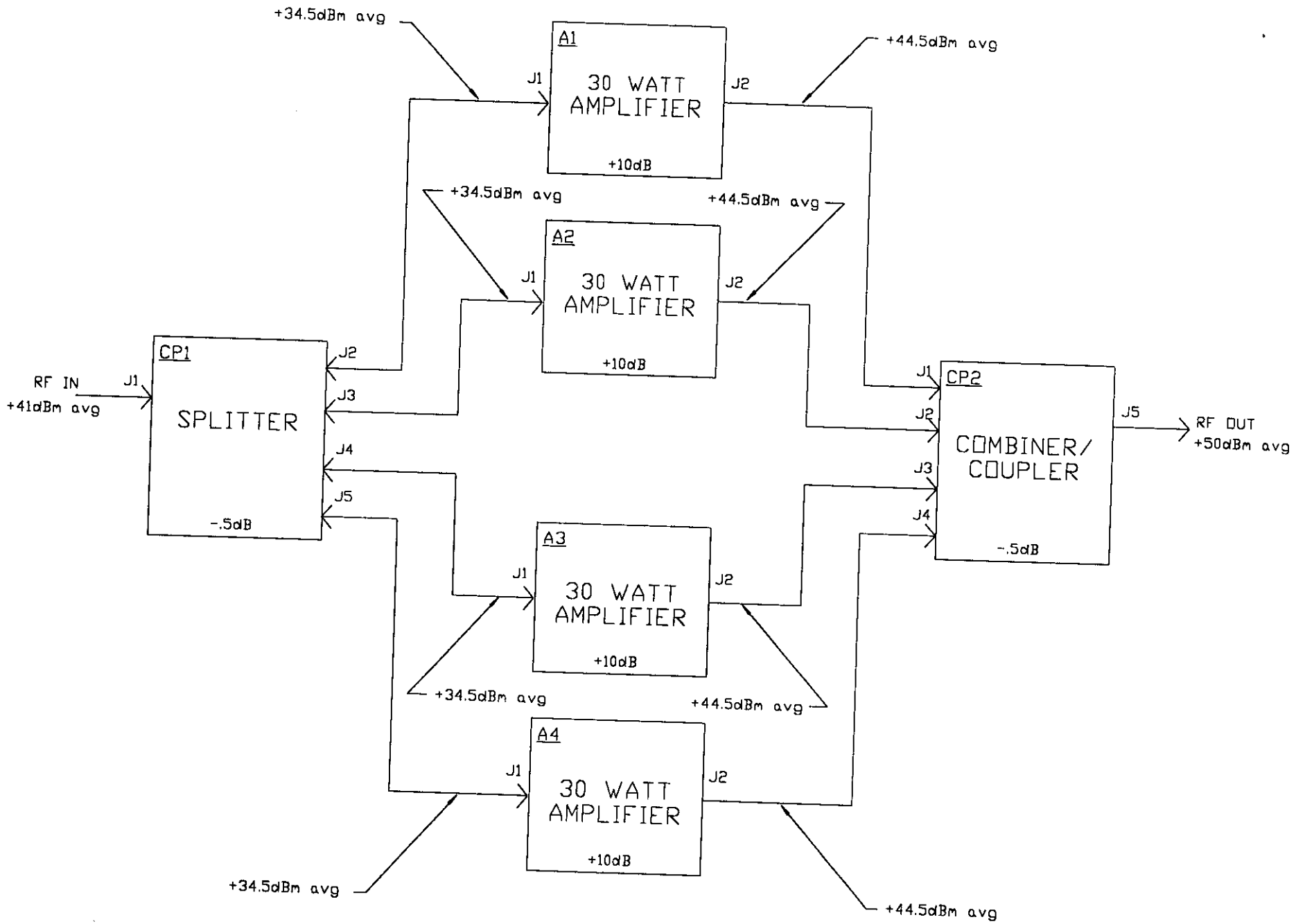

TSA100DS SIGNAL FLOW DIAGRAM
FIGURE 3-2

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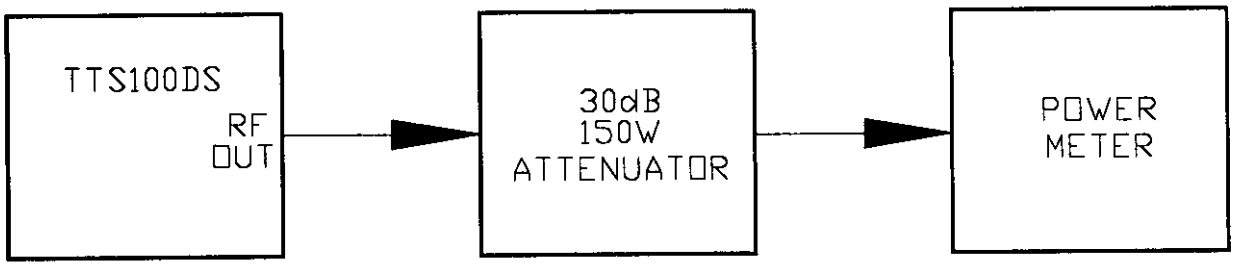

OUTPUT POWER CALIBRATION TEST EQUIPMENT SET UP
FIGURE 3-3

3.5 Spare Modules and List:

The following contains the description, vendor, part number, and designator of each module found in the TSA100DS Amplifier which EMCEE considers to be essential bench-stock items. These modules should be available to the technician at all times.

TSA100DS SPARE MODULES LIST
INTERCONNECTION DIAGRAM 40389004 (REV 51)

DESCRIPTION	VENDOR/PART #	DESIGNATOR
30W Amplifier	EMCEE/40389171-2	A1, A2, A3, A4
Transmitter Interface	EMCEE/30389114-1	PC1
Metering Detector	EMCEE/30389129-1	A5
Splitter	EMCEE/20389125-1	CP1
Combiner/Coupler	EMCEE/12316	CP2
+5V/±15V Power Supply	Condor/GLC40B	PS5
+12V Power Supply	Deltron/FT-12B3-00	PS1, PS2, PS3, PS4
Fan 6", 300CFM, 220V	Rotron/031844	B1, B2
Surge Suppressor	Harris/V250LA40	E1