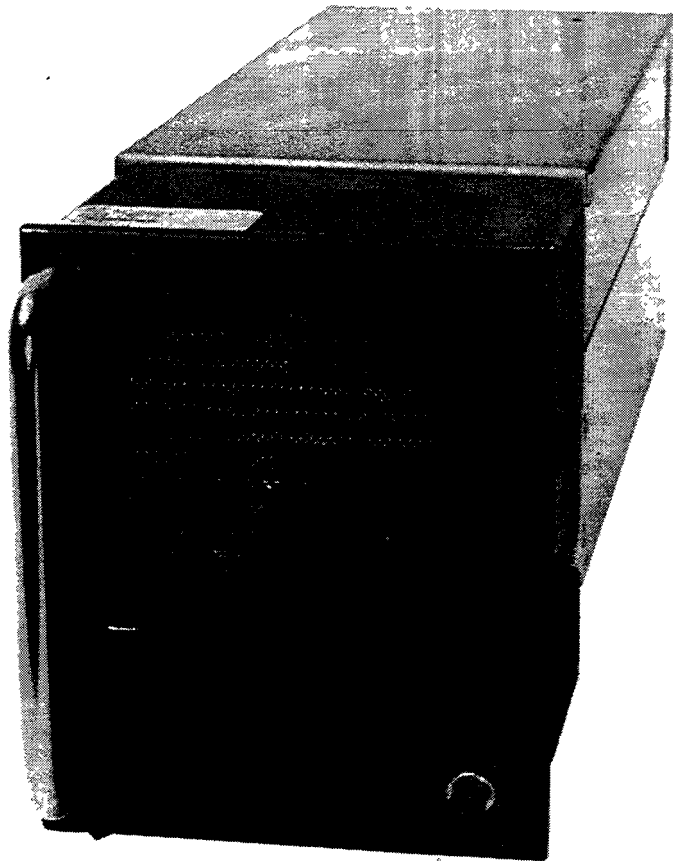




Mobile Communications



**45 WATT PA CELLULAR RADIO
45 WATT PA MODULE SHELF
45 WATT PA POWER AND SIGNAL
DISTRIBUTION BOARD
45 WATT PA POWER
DISTRIBUTION PANEL**

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DESCRIPTION

The 45 Watt Power Option provides the customer with a means of extending his coverage area by increasing the normal 4.5 watt output from the CRCU to 45 watts per channel. The equipment options and related part numbers available to configure a typical 45 watt system are identified in Table 1 below.

Table 1 - 45- Watt PA Equipment Identification List

OPTION	PART NO.	DESCRIPTION
TAPAMS	19D903801G1	45 Watt PA Module Shelf
TAPACM	19D903800G1	45 Watt PA Module
TAPAS8	19D903692C3	45 Watt PA Shelf & Power Distribution Panel with 8 Circuit Breakers
TAPAS1	19D903692C4	45 Watt Shelf & Power Distribution Panel with 1 Circuit Breaker

The 45-Watt CRCU Power Amplifier equipment receives 4.5 watt RF input signal from the CRCU module through 50 ohm coax cable W4 at input connector J5 and

amplifies this signal to provide a 45 watt RF output signal to the transmitter/combiner and to the antenna through output connector J6. All signals are on a per channel basis.

Control data for the 45-watt power amplifier are received from each CRCU module and applied to the Power/Signal Distribution board housed in the PA Module shelf through PA control cable W3 and input connectors J5 through J8 on the PA Module Shelf. These data are also provided on a per channel basis.

**45 WATT PA MODULE SHELF
(19D903801G1)**

The 45 Watt PA module shelf is a 3-rack unit (5.25 inches) shelf that mounts in standard 19-inch relay racks. The PA shelf houses up to four PA modules and provides +24 Vdc power and ground as well as the control, alarm and power sense signals for each PA through interconnecting cable W3.

45 WATT POWER AMPLIFIER MODULE (19D903800G1)

The 45 Watt PA module (PA) is an external RF power amplifier unit that provides 10dB gain to the RF output of the CRCU module. The PA utilizes a linear A/B design and obtains its input RF drive from the CRCU module. The linearity of the PA allows for a 28dB dynamic range in the output RF power level.

The PA is designed to operate over the 869-894 MHz cellular frequency spectrum and meets the requirements of the FCC, DOC and TIA standards for cellular land stations.

The PA slides into the 45W PA module shelf. Connector J5 of the PA module provides a secure connection for the RF input to the PA. Connector J6 (Type N female) of the PA module provides the connection for the RF output of the PA. Connector P1 provides for the +24 Vdc source voltage and ground connection as well as control, alarm and power sense signal connections for the PA.

Since the PA requires forced air cooling, each PA is equipped with a temperature controlled variable speed fan. Front panel indicator CR1 indicates the presence of an RF output from the PA.

POWER AND SIGNAL DISTRIBUTION BOARD (19D903664G1)

Internal to each PA shelf is a power and signal distribution board that provides power distribution from the main power source and a ground input at connector J9 to each of the connectors (J1, J2, J3 and J4). The control, alarm and power sense signals between each CRCU module and its respective PA are interconnected through the power and signal distribution board connectors (J5, J6, J7 and J8) and connectors (J1, J2, J3 and J4).

45 WATT PA SHELF POWER DISTRIBUTION PANEL (19D903692G3 & G4)

The 45 Watt PA Power Distribution (PA-PD) panels are 2-rack unit (3.5 inch) panels that mount in standard 19-inch relay racks. The group 4 PA-PD panel provides +24 Vdc power distribution to a single 45W PA module shelf. The group 3 board provides power distribution for up to eight (8) module shelves.

CIRCUIT ANALYSIS

45 WATT PA SHELF POWER DISTRIBUTION PANEL (19D903692G3 & G4)

+24 Vdc Power Distribution

The 30 ampere +24 Vdc circuit for each PA shelf has up to a 200 ampere primary source and is applied to the PA-PD panel at bus bar WT 1. The ground return is attached to bus bar at WT 2, thereby distributing the +24 Vdc power through circuit breaker CB1 (G4) and CB1 through CB8 (G3) to a 45 watt PA module shelf (or shelves) through connector J1 (G4) or J1 through J8 (G3). Circuit breaker CB1 (G4) or CB1 through CB8 (G3) provide(s) over-current protection for the rack wiring to the 45 Watt PA module shelf as well as the on-off function for the 45 watt PA module.

POWER AMPLIFIER BOARD (19D903396G1)

The 45-Watt CRCU Power Amplifier module receives 7 mW - 4.5 Watt RF input signal from the CRCU module at input connector J5 and amplifies this signal to provide a 45 Watt RF output signal to the transmitter/combiner through output connector J6. Refer to the 45 Watt Power Amplifier Block Diagram, Figure 1.

The CRCU module output is applied to PA input jack J5 through a 50 ohm coax cable, and to J1 on the RF power amplifier board through RF cable W2. The input RF detector, consisting of the stripline coupler, capacitors C3, C5 and C10, resistors R1, R3 and R16, and diodes D1 and D2, provide a DC reference voltage proportional to the input RF signal. This signal is then coupled through resistor R9 to amplifier U1C. The amplifier gain is determined by resistors R12 and R8. The input RF detector provides the reference voltage for RF amplifier loop-gain control amplifier U1A through resistor R34.

The RF input at J1 is coupled to the base of RF amplifier Q3 through a 5dB input matching pad AT1 and capacitor C44. Transistor Q5 provides the bias voltage to the base of RF amplifier transistor Q3 and potentiometer R18. R18 adjusts the bias voltage. RF amplifier transistor Q3 provides an RF gain of approximately 8dB.

The output of Q3 is coupled through capacitor C12 to a Wilkinson divider consisting of a quarter-wavelength transmission stripline and resistor R29. Trimmer

capacitor C53 is used to improve the coupling between the output of Q3 and the input to the Wilkinson divider. Resistor R29 provides isolation of the two signal paths.

The outputs of the Wilkinson divider are coupled to the base of RF power amplifiers Q1 and Q2 through capacitors C45 and C46. RF power amplifiers Q1 and Q2 are displaced by a 90 degree offset to improve intermodulation performance. Trimmer capacitors C51 and C52 are used to improve the coupling between the outputs of Q1 and Q2 and the inputs to the Wilkinson combiner. The RF signal is coupled to the inputs of the Wilkinson combiner through capacitors C38 and C39.

The Wilkinson combiner at the output of power amplifiers Q1 and Q2 consists of quarter-wavelength transmission stripline and resistor R30. The combiner sums the output power of each stage to provide an RF gain of approximately 6dB. Intermodulation is improved by the quarter-wave stripline that effectively shifts the phase of the close-in intermodulation products in one side of the final amplifier by 180 degrees. This results in cancellation of these products at the summing port. Transistor Q4 provides the bias voltage to the base of power amplifiers Q1 and Q2 and potentiometer R19 is used to adjust this bias voltage.

The output of the Wilkinson combiner is connected to a dual-section isolator A2. If the antenna load should either be disconnected or shorted, the isolator will sink the RF output into a 60-watt load integral to the isolator. The addition of this isolator, with a reverse transmission loss of 40 dB, decreases the intermodulation products of the 45 watt PA module to approximately 60 dB.

The output RF detector, consisting of stripline coupler, capacitors C2, C4 and C18, resistors R2, R4 and R17 and diodes D3 and D4, provide a DC voltage relative to the RF output signal that is coupled through resistor R11 to amplifier U2A. The gain of amplifier U2A is determined by resistors R14 and R10.

The output of amplifier U2A is fed to the non-inverting input of loop-gain control amplifier U1A through potentiometer R20 and resistor R36. Potentiometer R20 is used to adjust the loop gain. The output of amplifier U1A is coupled to comparator U1D through resistor R38. Diode D10 provides the reference voltage for comparator U1D. The output of U1D is coupled through resistor R39 to the base of transistor Q7. This output operates pass transistor Q6. Transistor Q6 controls the voltage supplied to the first RF amplifier stage Q3.

Test-Operate jumper J7 is used during factory test and alignment, it must be in the operate position for normal operation.

8 Volt Regulator

Regulator U4 receives +24 Vdc source voltage from the Power Distribution Panel and provides regulated 8 Vdc to the RF power amplifier board.

Power Amplifier Thermal Shutdown

Thermistor RT2 is mounted to the PA heat sink with a mounting screw. By controlling the operation of amplifier U1B and transistor switch Q12 the circuit provides a shutdown condition for the PA for ambient temperatures above 70 degrees centigrade. Conduction of transistor Q12 shuts down transistor Q7, immediately switching off RF power amplifier Q3.

Fan Alarm Circuit

Resistors R50 and R51 develop an AC sensing voltage for the fan alarm circuitry. The fan alarm circuit consists of transistors Q9, Q10 and Q11. The AC sensing voltage developed across resistors R50 and R51 is coupled to transistor Q9 through capacitor C56, amplified by transistor Q9 and rectified by diode pair D7. Transistor Q10 is normally turned off, keeping transistor Q11 turned on. If the fan fails, the AC sensing voltage disappears and transistor Q10 is turned on, turning Q11 off. With Q11 turned off, an alarm condition exists on the lead HI PWR ALARM1 to the CRCU module through connector P1.

Fan Speed Control

Thermistor RT1 provides ambient temperature sensing for variable speed control of the fan located in the PA module front housing.

Transmit On Indicator

Voltage amplifier U2B in conjunction with the RF output detector circuitry described above controls the operation of transistor switch Q8. Q8, in turn, controls TX ON indicator CR1 located in the PA module front housing.



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