

INSTRUCTIONS FOR OPERATING  
TYPE CMS EQUIPMENT

Unpack the CMS Equipment

Each Equipment Should Include the Following:

- 1 Instruction book
- 1 CMS-R Receiver with 3 - 3S4 tubes in place
- 1 CMS-T Transmitter
- 3 - 6L6 Tubes
- 3 - 6V6GT Tubes
- 1 - 3S4 Tube
- 1 - 1/4 watt neon lamp
- 2 - #14 flash bulbs
- 1 - Resonance indicator
- 3 Antenna coils for transmitter
- 2 Antenna reels each with 132 feet of wire
- 4 Antenna insulators
- 1 Pair 600 ohm phones
- 1 Key with knob, cord and plug, and vinylite shield
- 1 Calibration chart in lid of case
- 1 Circuit diagram
- 1 Tool kit containing 1 pair side-cutters, 1 pair long nose pliers, 1 screw driver, and 1 soldering iron tip
- 1 Piece solder
- 1 Piece Vinylite tubing
- 1 Cord and receptacle for receiver
- 1 Cord and receptacle for transmitter
- 1 - 10,000 ohm resistor (voltmeter Multiplier)
- 1 - 390,000 ohm resistor (voltmeter Multiplier)

Receiver Operation

Erect antenna for the receiver between the two points selected. Plug antenna connector into antenna socket #1.

Connect 600 ohm headphone tips to phone connector on receiver - one tip to "C", the other to #1. If 2000 ohm phones are used, connect to "C" and #2; if crystal phones are used connect to "C" and #3.

Connect batteries to short four-wire cable. 3 volts to leads marked A+ and A-; 45 volts to leads marked +45 and -B.

Plug 4-prong male receiver power cable into this short cable connector for battery operation, or to connector on hand generator or power pack.

Turn on filament switch.

Set band switch to frequency range desired (refer to calibration curves for exact dial setting for any frequency within the range of the receiver).

Turn "REGEN" control clockwise until a slight rushing sound is heard in the phones. Adjust tuning dial until station is heard. Adjust the regeneration control to the most sensitive operation of the receiver.

The antenna should be connected to antenna terminal #2 when receiving loud local stations or for monitoring the transmitter output.

Transmitter Operation

Erect antenna for the transmitter between the two points selected. For initial tuning up, plug antenna connector into antenna socket #1.

Insert key connector into key receptacle on the transmitter.

Connect three-wire short cable to batteries if battery operation is to be used.

Insert correct tubes in sockets on top of transmitter: 6V6GT tubes for low power hand generator operation - 6L6 tubes for power pack operation.

Determine the frequency to be used for transmitting. Refer to calibration curves and determine the correct antenna coil to be used for that frequency. Select the proper antenna coil and insert it in coil socket on the top of the transmitter. Set the band switch to the correct position - "LO" for frequencies 3.1 to 6.5 Mc. - "HI" for 6 to 13.5 Mc.

Open the key. Connect transmitter three-wire power cable to battery cable for battery operation, or to hand generator or power pack.

Switch at top right-hand corner of transmitter should be pushed toward "MO" for Master Oscillator operation.

Turn on plate switch in lower right-hand corner. This switch is in the plate circuit of the oscillator only. Set the oscillator dial to the correct setting as determined from the calibration curves, or by monitoring the signal in the receiver, and checking the frequency from the calibration of the receiver.

For Crystal Control push switch at top right-hand corner of the transmitter to "XTAL." Insert proper crystal in XTAL socket. Select the proper OSC. coil switch setting from the calibration curve for the crystal to be used.

Adjust OSC tuning dial counterclockwise from zero until the lowest meter reading is indicated. Tuning the oscillator dial past the correct point the plate current will suddenly rise, indicating that the crystal has stopped oscillating. If this occurs, repeat the tuning adjustment until a minimum reading is obtained.

Set the "AMP" tuning dial to the setting indicated on the calibration curve for the antenna coil previously selected.

Press the key and adjust the "AMP" tuning dial for a minimum meter reading.

Loosely couple the tuning indicator, with a #14 flashlight bulb in the socket, to the antenna coil (Be careful not to burn out by getting bulb too close). Maximum brillance of the bulb and minimum plate current should occur at approximately the same setting of the "AMP" tuning dial.

The Plate current, as read on the meter with the key depressed should be about 75 MA. with 6V6GT tubes with 250 volts from the power source.

If 6L6 tubes are used with 425 volts from the power source, the plate current should be approximately 125 - 140 MA. If these values are not obtained it indicates incorrect antenna loading, therefore, connect transmitting antenna to terminal socket #2, #3 or #4 on the transmitter, each time adjusting the "AMP" tuning dial for minimum plate current.

The antenna taps provided on the transmitter are for matching antenna impedances, as follows:

Tap #1	-	70	-	150 ohms
Tap #2	-	150	-	500 ohms
Tap #3	-	500	-	1500 ohms
Tap #4	-	1500	-	4000 ohms

Since the impedance of an antenna is dependent upon its length, height and surrounding objects, a given length will present various impedances depending on the frequency of the transmitter, therefore, numerous taps are provided for suitable matching to almost any antenna condition.

The transmitter is neutralized at the factory; however, should the amplifier oscillate or should energy from the oscillator output appear in the antenna when the key is not pressed, remove the plug on the rear of the transmitter and re-neutralize the amplifier as follows:

Insert the correct antenna coil for the frequency of the oscillator. Turn on transmitter - DO NOT press the key. Rotate the "AMP" tuning control over its entire range. Note any change in plate current. Using a fibre or bakelite screw driver, adjust the small screw visible through the hole in the rear of the transmitter. As this screw is being turned, rotate the "AMP" tuning control back and forth over its entire range. The screw should be tuned until no change is noted in the meter reading when the "AMP" tuning control is turned over its entire range.

Turning the screw clockwise increases the capacity of the neutralizing condenser. Its adjustment is critical and should be adjusted slowly.

Should voice operation be desired, plug a single button microphone of 50 to 200 ohms impedance into jack marked "MIC."

#### Miscellaneous

To facilitate service of type CMS equipment, the transmitter is equipped with a special meter. The meter has two current ranges. The meter movement, with a range of 0 - 1.5 Milliamperes, is connected between terminal studs stamped (C) and (+). A 150 MA. shunt is connected between terminals (C) and (S). For transmitter operation, terminals (+) and (S) are connected together for 0 - 150 MA.

Should the services of a continuity meter be needed for testing for open circuits, disconnect the leads from the meter. Connect one lead of a 1000 ohm 1 watt resistor to the (+) terminal of the meter. Connect the (C) lead of the meter to the shell of a 1½ volt flashlight battery. The second lead of the resistor and the (+) lead of the battery can now be used to check the continuity of circuits or can be calibrated for use as an ohmmeter.

The meter may be used as a 0 - 15 volt D.C. voltmeter by using the 10,000 ohm resistor as a multiplier as follows:

Connect one lead of the resistor to the (+) terminal of the meter. The (C) lead of the meter and the second lead of the resistor are then used as the test leads to the 0 - 15 voltmeter. The correct voltage being measured will be 1/10 of the scale reading.

The meter may also be used as a 0 - 600 volt D.C. voltmeter by connecting as follows:

Series the two resistors by connecting one end of the 10,000 ohm resistor to one end of the 390,000 ohm resistor; connect the second end of the 390,000 ohm resistor to the (+) terminal of the meter. The second lead of the 10,000 ohm resistor and the (C) terminal are then used as the test leads to the 0 - 600 V. meter.

The correct voltage being measured will be 4 times the scale reading.

The receiver is very sensitive and may produce a fringe howl at the point of oscillation above 15 M.C. This may be reduced, with slight loss of sensitivity, by connecting a resistor of 50,000 to 150,000 ohms across terminals 3 and 4 of the first audio transformer T1.

# "Precise"

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## PARTS LIST

### Receiver

94H

- C-1 - 3 mmfd. approx. antenna coupling condenser
- C-2 - 1500 mmfd. air tuning condenser
- C-3 - 100 mmfd. - 600 V. - mica-grid condenser
- C-4 - 150 mmfd. air regeneration condenser
- C-5 - 100 mmfd. - 600 V. - mica R.F. bypass condenser
- C-6 - .5 mfd. - 600 V. - paper - plate decoupling condenser
- C-7 - .5 mfd. - 600 V. - paper - grid decoupling condenser
- R2 - 5100 ohm, 1 watt carbon plate dropping resistor
- R3 - 510 ohm, 1 watt carbon grid bias resistor
- V1 - 3S4 detector tube
- V2 - 3S4 A.F. amplifier tube
- V3 - 3S4 A.F. output tube
- T1 - Type 0-5 interstage audio transformer
- T2 - Type 0-5 interstage audio transformer
- T3 - Special output transformer 8000 - 600/2000/8000 ohm
- L1 - Feedback coil - band 1
- L2 - Feedback coil - band 2
- L3 - Feedback coil - band 3
- L4 - Grid coil - band 1
- L5 - Grid coil - band 2
- L6 - Grid coil - band 3
- L7 - Antenna coil - band 1
- L8 - Antenna coil - band 2
- L9 - Antenna coil - band 3
- RFC1 - 2.5 MH. R.F. choke
- J1 - Power cord and plug (4 pin)
- J2 - Power cord and receptacle (4 conductor)
- SW1 - Band switch - "HI" - "LO"
- SW2 - Filament switch - "OFF" "ON"

### Transmitter

94H

- C1 - 100 mmfd. 600 v. mica oscillator feedback condenser
- C2 - .002 mfd. 600 V. mica oscillator plate bypass condenser
- C3 - 176 mmfd. air oscillator tuning condenser
- C4 - 3-30 mmfd. mica neutralizing condenser
- C5 - 100 mmfd. 600 V. mica amplifier grid coupling condenser
- C6 - .002 mfd. 600 V. mica amplifier plate bypass condenser
- C7 - .002 mfd. 1200 V. mica amplifier plate blocking condenser
- C8 - 176 mmfd. air amplifier plate tuning condenser
- R1 - 20,000 ohm 1 watt carbon oscillator grid resistor
- R2 - 6,000 ohm 10 watt wirewound oscillator plate dropping resistor
- R3 - 15,000 ohm 2 watt carbon amplifier grid resistor
- V1 - 6V6GT or 6L6 oscillator tube
- V2 - 6V6GT or 6L6 amplifier tube
- L1 - Oscillator plate coil - Band "LO"
- L2 - Oscillator plate coil - Band "HI"
- L3 - Amplifier plate coil - Band "LO"
- L4 - Amplifier plate coil - Band "MED"
- L5 - Amplifier plate coil - Band "HI"
- J1 - Microphone jack
- J2 - Key receptacle
- J3 - Power cord and plug (3 pin)
- J4 - Power cord and receptacle (3 conductor)
- SW1 - Crystal-master oscillator switch "XTAL" - "MO"
- SW2 - Oscillator band switch "HI" - "LO"
- SW3 - Oscillator plate switch "ON" - "OFF"
- RFC1 - 2.5 MH. R.F. Choke



