

Radio Systems

CP-15 Coupler Manual

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Introduction

The CP-15 coupler is a matching device with impedance compensation and reactance cancellation capability, along with a high pass filter for carrier current operation.

A cascaded impedance correction system uses two highly permeability ferrite coils (T2 and T3) to provide three and five impedance taps for a total of 15 ranges which are selected through two switches (S5 and S6). Each reactance cancellation is accomplished by selecting combinations of high voltage mica capacitors (C3 through C10) which are switched in series with the RF output by two decade-type switches (S3 and S4). Finally, capacitors (C11, C12 and C13) block the 60 cycle energy from entering the coupler (when used for carrier current applications) and fuses (F1, F2 and F3) protect the line in case of capacitor failure and provide a convenient way of eliminating a phase.

The "Match-Operate" switch (S1) activates the bridge circuitry and, through a transformer (T1) which lowers the bridge driving impedance, dummy loads 90% of the RF input power for protection during setup. The "Forward-Reverse" switch (S2) enables the DC milliammeter to look at reflected or forward power through the bridge so that SWR can be optimized by selecting the proper cancellation components. The calibration pot (R8) enables calculation of actual SWR by setting a forward power reading reference point.

Installation and Operating Instructions

Coupler performance and radio reception are highly dependent on proper system design and proper pre-installation tests. Application notes outlining these procedures are available from Radio Systems on request.

1. Connect RF and AC cables as described on the following pages.
2. Turn on building circuit breakers if using CP-15 for carrier current.
3. Place S1 in Match position
4. Place S2 in Forward (FWD) position. Meter should indicate full scale. If not, adjust R8 to achieve full scale reading.
5. Place S2 in reflect (REF) position.
6. Set S3, S4, S5, and S6 for minimum meter reading. A patient, systematic approach must be taken to test all possible combinations of impedance compensation and capacitance cancellation to achieve the lowest meter reading.
7. Determine the SWR.
Set S2 in forward (FWD).

Adjust R8 for full scale (1.0)

Set S2 in reflect (REF), note reading and calculate.

$$\frac{1.0 + \text{reading}}{1.0 - \text{reading}} = \text{SWR}$$

For example, if reading is 0.2:

$$\frac{1.0 + 0.2}{1.0 - 0.2} = 1.5, \text{ so the SWR is } 1.5:1$$

NOTE: The meter reading in REF must be approx.. 0.3 or lower (2:1 or better SWR) for proper transmitter operation.

8. Set S1 to Operate
9. Reduce transmitter RF power to the minimum necessary for desired area coverage.

Carrier Current Broadcasting

Carrier current refers to the use of an existing network of conductors, usually a building's AC electrical system, as a broadcast antenna for non-licensed, limited area broadcasting.

The CP-15 coupler is specifically designed to compensate for the inefficiencies of these makeshift antennas, and to provide an acceptable transmitter to antenna match. Specifically, the coupler functions to:

1. Isolate the transmitter from high voltage through the use of high pass capacitors and fuses.
2. Compensate for antenna impedance mismatch through the use of multi-tap toroidal transformers.
3. Compensate for antenna stray reactance through the use of a decade system of capacitor combinations.

An internal VSWR metering system indicates when the proper combination of corrective settings has been selected for optimum signal transfer.

Because of the many variables in building wiring systems, signal quality can vary radically, and the following parameters should be carefully tested prior to system final installation. These tests can only be made by temporarily installing a transmitter and coupler, adjusting for proper antenna match, applying audio signal and evaluating signal quality on various radios through the intended coverage area.

Free-Radiate Broadcasting

Free-radiate refers to the use of a standard broadcast antenna (intentional

radiator) for non-licensed (or, in the case of T.I.S., licensed) broadcasting. Since 1990, the FCC has allowed educational institutions to broadcast over the air on their own campuses. Refer to FCC Rules and Regulations Part 15.209 for more details.

The CP-15 coupler is used for antenna applications as a lightning arrestor and to correct impedance mismatches. Most center-loaded antennas have an impedance less than 50 ohms, so the CP-15 functions perfectly to match the transmitter's 50 ohm output to the antenna's input.

Specifications

Power Input	20 Watts RMS maximum
Input Impedance	50 ohms unbalanced
Output Impedance	1 to 50 ohms in 15 ranges with built-in capacitance decades
Matching Circuit	Two staged, multifilar wound ferrite transformers
Metering	VSWR bridge, forward and reflected readings
AC Line Connection	500V maximum, line to line and ground
Size	9"W, 9"H, 3"D
Weight	5.5 lbs

Warranty

Radio Systems, Inc., warrants this equipment to be free from defects in materials and workmanship for a period of one (1) year after purchase.

This warranty extends to first users of the product and future owners who purchase the product within the warranty period.

The terms of this warranty are null and void if this product is stored or operated in an environment not conducive to electronic equipment, or shows signs of misuse or modifications which affect the proper functioning of the product. This warranty does not apply to damage caused by fire, smoke, flood, lightning, or acts of nature and physical abuse.

Radio Systems, Inc., and its associated companies, authorized distributors, and personnel are not liable for loss of revenues or other damages, or effects to the broadcast signal quality or coverage which may result from the improper functioning of this product.

Repair Policy

Technical assistance is available at any time, at no charge, by phone or correspondence.

During the warranty period, there will be no charge for parts or service made to units which show no sign of misuse by customer or lightning caused damage. The customer is responsible for the cost of shipping their unit back to Radio Systems for repair.

During the warranty period, shipment of small parts and assemblies will be made at no charge to the user. Emergency, next day shipments of replacement parts and circuits will also be made at no charge at the user's request. Chargeable services will be made COD or on Net-30 day terms to users with established accounts.

During the warranty period, users must return defective parts upon request to receive no-charge warranty services. Return shipping expenses are the responsibility of the user.

Return Instructions

Contact Radio Systems at +1-856-467-8000 for a return authorization number.

Pack all items carefully and ship prepaid, via UPS insured, to:

Radio Systems, Inc.
Attn: R.A. # _____
601 Heron Drive
Bridgeport, NJ 08014-0458

Enclose a note which includes your name, company, phone number, the serial number, return address (no box numbers), and a complete description of the problem.