

HAMTRONICS® CC-(VHF) RECEIVING CONVERTERS INSTALLATION & MAINTENANCE INSTRUCTIONS

GENERAL DESCRIPTION.

The CC-() series VHF Receiving Converter modules are designed to amplify and convert the frequency of vhf signals in specific bands to 28-30 MHz.

The input and output connectors are BNC type when the unit is supplied in a case and RCA type when the unit is supplied without a case.

The Converter is used to convert vhf frequencies in a block down to 28-30 MHz so they can be heard on a 10 meter receiver.

CRYSTALS.

The converter uses crystals in HC-50/u (wire lead) holders. They are soldered to the board.

We can provide either standard or special frequency crystals for the converter. Crystals are cut for parallel resonance with 32pf load capacitance. The following table gives crystal frequencies for standard models.

Model	Crystal	Formula
CC50	22.0000	X = RF-IF
CC144	12.8889	X = (RF-IF)/9
CC145	13.0000	X = (RF-IF)/9
CC146	13.1111	X = (RF-IF)/9
CC222	21.5556	X = (RF-IF)/9

For purposes of determining crystal, substitute the frequency of the low end of the band of interest. I.e., the lowest frequency in the input band is "RF" and the lowest output frequency is "IF". For example, for the CC144, 144 MHz is the bottom end of the input band and this is translated to 28 MHz in the output band; so those frequencies are used for the formula.

Hamtronics stocks crystals for the popular frequency schemes (listed above), and we will be glad to order any special crystals.

MOUNTING AND INTERCONNECTIONS.

If the unit was not ordered with optional case, the pc board is easily mounted to a chassis or panel with 4-40 screws and threaded standoffs using the holes provided in the four corners. A mounting kit is available (see rear of catalog).

The i-f output should be connected to the antenna input of the hf receiver.

+13.6Vdc should be connected to power pad E1.

INSTALLATION.

Installation depends on the type of converter ordered. Connect J1 to the vhf antenna and J2 to the input of the receiver used for listening. RCA plugs are used for boards without a case. BNC plugs are used for units supplied with a case.

Always use best quality low-loss coax at uhf frequencies. We sell very good rf-type RCA plugs, called by part number A5. These are highly recommended for best performance.

The power terminal on the pc board or the feedthrough terminal on the front of the case should be soldered to a source of +12 to +14 Vdc, preferably a regulated power supply.

Be sure that the same power supply is not connected to any devices which could produce damaging voltage transients, for example, motors or relay coils. Reverse diodes should be used across such devices to limit transient pulses. The converter draws about 25 mA.

ALIGNMENT AND TESTING.

The most difficult part of alignment is obtaining a stable test signal. If you don't have access to a vhf signal generator, it is possible to use a strong signal on the air.

▶ A tuning tool of the proper type must be used to avoid cracking the slugs in the coils. This is a .060" square slot type tool. The slugs are teflon coated; so they turn easily. However, if a loosely fitting tool or a tool only partially inserted in the slot is allowed to slip in the slot, the sideways force cracks the powdered iron slug. Should this happen, the slug must be drilled out and replaced. Variable capacitor C15 is adjusted with an insulated tool with a small metal (slot type) bit in the end. (See A2 and A28 Tuning Tools in catalog.)

a. Connect a source of +12 to +13.6Vdc to E1.

b. Connect signal source to J1, and connect J2 to receiver used as an i-f. Set both to the center of the range you want to use. Note that gain will be greatest at and near the frequency used for alignment; so if you want to emphasize one end of the band, tune in the center of the range you want to emphasize, for instance for 144-145 operation, use

144.5MHz for alignment.

c. Connect dc voltmeter to TP1, which is a pad in the center of the board.

d. Adjust oscillator coils L7 and L8 alternately for a peak (about 1 to 2.5 Vdc). Note that indication may be zero when tuning far off peak on either side.

e. With a moderately strong signal applied to the converter, tune in the signal on the receiver.

f. Alternately adjust multiplier coils L9 and L10, rf coils L2, L3, and L4, and IF coils L5 and L6 for maximum response.

Repeat adjustment to work out any interactions between coils. Reduce input signal to a fairly low level for final adjustment. There may be some benefit to readjusting input coil L2 slightly for best noise figure, which you can do by ear by tuning for best quieting on a weak signal.

g. After initial alignment, try detuning L7 and L8 alternately to find the combination resulting in the best sensitivity. Sometimes, less drive to Q4 results in better noise figure because the mixer injection is optimized.

h. If a frequency counter is available, or if you have another way of applying an accurate frequency at the input, adjust variable capacitor C15 to trim the oscillator exactly on frequency.

The final sensitivity of the converter should be about 0.1 to 0.2 uV for 12 dB sinad after tuning, assuming an i-f receiver of good sensitivity is used with the converter.

OPERATION.

Operation is so simple, it is hardly necessary to describe it. However, some explanation of the way broadband converters operate may be helpful to you if you have not used one before.

The converter operates by heterodyning (mixing) an entire block of frequencies down to a new band of frequencies which your receiver is already capable of hearing. It does this by mixing an oscillator/multiplier signal with the incoming signals to produce the difference of the two frequencies.

Thus, all the frequencies in the incoming band are converted to new frequencies a set value away from

the original frequencies. All the frequencies still have the same relationship to each other in the new spectrum.

As an example, use the CC144 Converter frequency scheme. To listen to 144.000 MHz, you would tune your receiver to 28.000 MHz. To hear 144.100 MHz, tune to 28.100; to hear 144.105, tune to 28.105, etc.

TROUBLESHOOTING.

The usual troubleshooting techniques of checking dc voltages at transistor elements and tracing oscillator injection signals with an rf probe and voltmeter are appropriate for this converter.

Current drain is typically about 10-20mA; this is a very good indication of any problems on the B+ line.

If no voltage is measured at TP1, the emitter of the multiplier stage, that is an indication that the rf level from the oscillator is too low to drive the base of the transistor into conduction.

Probably the most common troubles, based on our experience, is blown transistors or voltage regulator ic due to reverse polarity or transients on the B+ line. Any relay coils connected across the B+ line should have a reverse diode connected directly across the relay coil to absorb the reverse transient produced when the relay is unkeyed.

Typical Dc Voltages.

Following are positive dc voltages with respect to ground, measured with an fet voltmeter on a sample unit operating on 13.6Vdc. While readings can vary widely without necessarily indicating trouble, these readings can be used in conjunction with an organized troubleshooting plan to help isolate the trouble.

XSTR	E(S)	B(G1)	G2	C(D)
Q1	0	0	3.3	6.7
Q2	0	0	0	7.1
Q3	1.5	2.2	-	7.0
Q4	1.5	0	-	7.3

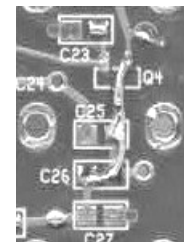
PARTS LIST FOR CC144, CC145, CC146.

Ref Desig	Value
C1	27pf
C2	56pf
C3-C4	.001μf
C5	18pf
C6	0.5pf
C7	18pf
C8	.001μf
C9	.01μf

C10	47pf
C11	4pf
C12	62pf
C13	220pf
C14	.001μf
C15	20pf red variable cap
C16	27pf
C17-C18	150pf
C19	.001μf
C20	68pf
C21	1pf
C22	62pf
C23-C24	.001μf
C25	27pf
C26	0.5pf
C27	27pf
C28	0.1μf
C29	100μf electrolytic
C30-C31	.001μf
J1-J2	RCA jacks
L1	0.33μH rf choke
L2-L4	2½ turn (red) coil
L5-L6	14½ turn (yel) coil
L7-L8	6½ turn (blu) coil
L9-L10	2½ turn (red) coil
Q1-Q2	BF-998 f.e.t.
Q3-Q4	MSC3130 rf xstr
R1	100K
R2	not used
R3-R4	100K
R5	10K
R6	22K
R7	1K
R8	680Ω
R9	100Ω
R10-R11	47Ω
R12-R14	100Ω
U1-U5	not assigned
U6	78L08
Y1	Crystal (see chart)

PARTS WHICH DIFFER FOR CC50 CONVERTER.

Ref Desig	Value
C1	82pf
C2	220pf
C5	56pf
C6	1pf
C7	62pf
C14	n/u
C20	82pf
C21	1pf
C22	82pf
L1	15μH choke
L2-L4	6½ turn coils
L7-L8	14½ turn coils
Y1	22.000 MHz



Note: The following parts are not used: Q4, C24-C27, L9-L10, R7, R14. Instead, a jumper wire must be tack soldered to the bottom of the board along the path from what normally is the base of Q4 down through C25 and C26, with a dog leg to cover both pads of C26 as shown here.

PARTS WHICH DIFFER FOR CC222 CONVERTER.

Ref Desig	Value
C1	5pf
C2	not used
C5	6pf
C6	not used
C7	5pf
C20	39pf
C21	0.5pf
C22	39pf
C25	5pf
C26	not used
C27	7pf
Y1	21.5556 MHz

CC-(vhf) CONVERTER
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