

**NCS-C150**  
**INSTRUCTION MANUAL**  
**Rev D**



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**d.b.a. NCS**

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**CO**  **comm inc**

<b>Revision History</b>			
<b>Rev</b>	<b>Description</b>	<b>Date</b>	<b>Approved</b>
0	Initial Release	03/02/12	CIF
A	Update to add Accessory Kit	10/02/13	JFP
B	Update to add Tx Audio clarification & other corrections	10/6/15	JFP
C	Clarified footer & DC wire size (para 2)	1/7/16	JFP
D	Removed 125mVpp AGC Reference	3/27/17	JFP

**Model No.:** NCS-C150

**Serial No. :** \_\_\_\_\_

### **Accessory Kit**

<b>Item #</b>	<b>Description</b>	<b>QTY</b>
1	10' DC Power Cable	1
2	Power Cable Clamp	1
3	Extra Housing Screws	4
4	Mounting Feet	4
5	Mounting Bracket (x2) Kit	1

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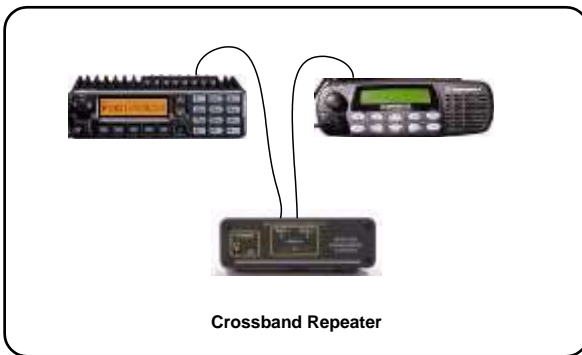
## 1.0 Introduction

The C150 provides a method of connecting two radios together for purposes of in-band or cross-band repeating.

Almost any radio can be used with the C150. Either VOX or COR can be used as a "busy" signal and COR polarity can be either + or -. Receive audio levels do not need adjustment due to built-in AGC circuits for both radios. Transmit audio levels can be adjusted independently for each radio.

A separate record output is provided that records audio transmitted on either radio. A record control output is included to control an external recorder

### Typical Application



## 2.0 Safety Information

The C150 is an electrical device requiring appropriate safety measures during installation and operation. The following safety precautions should be observed:

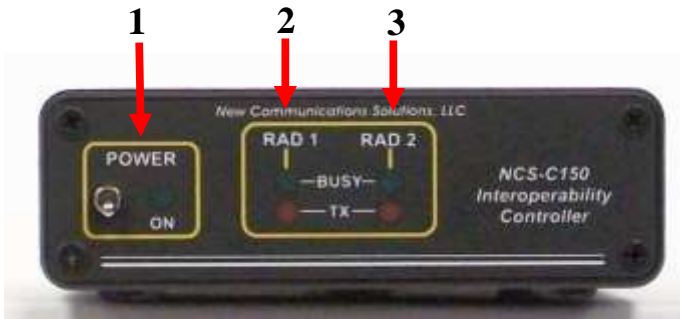
When connecting the unit to a DC power source, a minimum wire size of 24 AWG should be used. When using in a mobile environment, automotive grade wire should be used.

Do not route cables or wires through areas that may cause the insulation to be worn resulting in shorting of the wires to ground or to each other.

Do not attempt to operate this equipment while driving a vehicle. For safety, pull over to the side of the road when making adjustments.

**NEVER** connect this device to an AC voltage source. Death or injury could occur and/or the unit can be badly damaged. Connect this device only to a DC power source with a voltage output of 9-16 volts and a current capability of at least 25 ma.

### 3.0 Front Panel Controls



Item	Description
1	Power Switch with Green Indicator
2	Radio 1 Indicators: Red = Transmit and Green = Receive
3	Radio 2 Indicators: Red = Transmit and Green = Receive

### 4.0 Radio Requirements

#### 4.1 Receive Audio

Receive Audio input levels from the radio are not critical. The Busy lights activate (when using VOX) at approximately 150mV. Receive audio input levels are automatically adjusted by an AGC circuit. The AGC circuit for each radio will produce an output of 1.25Vpp.

#### 4.2 Transmit Audio

Transmit audio levels are separately adjustable for each radio and sufficient gain is available to drive nearly any radio.

#### 4.3 PTT

PTT is via an Open-Drain output. This signal pulls the PTT line of the radio low and will key any radio with a low-true PTT requirement. Maximum switching capacity of the PTT output is 100V, 1.5A DC.

## **5.0 Power Supply**

### **5.1 Power Requirements**

The NCS-C150 will operate with any 9-16 VDC power supply capable of providing at least 25mA continuous.

### **5.2 Power Connection**

Power is supplied to the cable on the rear of the unit. The connector is an Anderson Powerpole PP-15.

### **5.3 Polarity**

Power cable polarity is: Red = +, Black = - (or chassis).

### **5.4 Fusing**

The C150 uses an internal self-resetting fuse. If the fuse opens, there is likely to be an internal malfunction and the unit should be repaired by a qualified technician.

## 6.0 Opening Unit to Perform Adjustments

Follow the procedure shown below to open the unit up to perform settings and adjustments:



*Rear View of Unit -The white round objects are pop-in/pop-out fasteners*

1. Pull the rear panel to pop out the fasteners



2. Slide the whole assembly out of the enclosure.

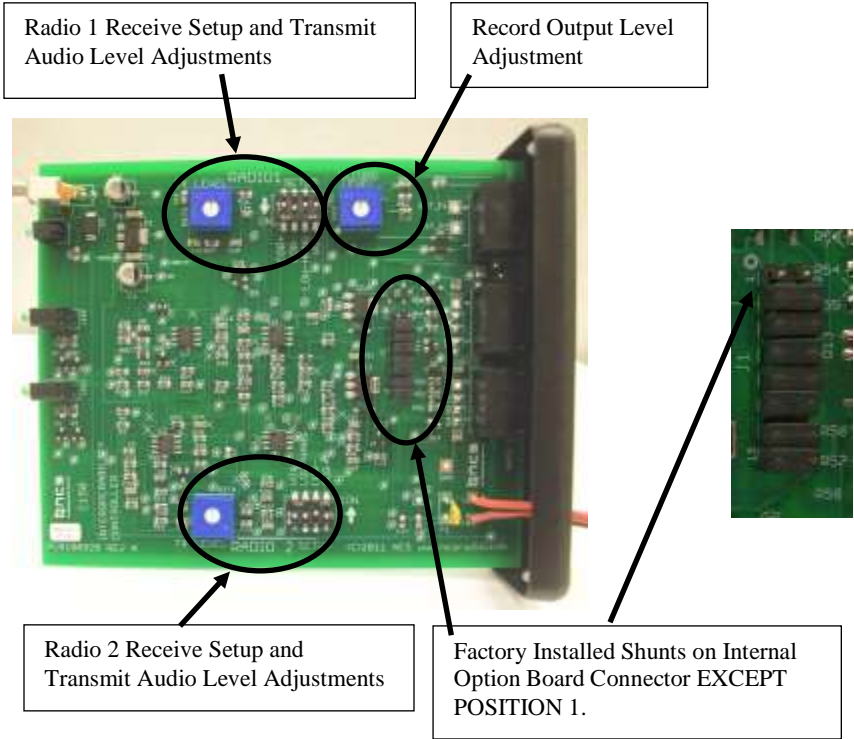


3. Ready for Adjustment



## 7.0 Internal Setup and Adjustments

The printed circuit board assembly inside the C150 has provisions for setting up COR/VOX, COR Polarity and VOX Hang time. To setup these functions, remove the rear cover of the C150, slide the PCB Assembly out of the enclosure and refer to the diagram below for the locations of settings and adjustments.

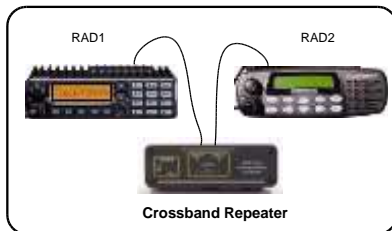


RADIO1 Setup switches set for Low-going COR (COR- = ON) and normal Hang-time (LOW-HANG = OFF).



RADIO2 Setup switches set for Low-going COR (COR- = ON) and normal Hang-time (LOW-HANG = OFF).





- 7.1 Connect one radio to the RAD1 jack and the other radio to the RAD2 jack on the rear panel of the C150 using radio-specific Radio Cables. Connect the power cable to 12VDC.
- 7.2 Set the COR, VOX and Hang-time settings as required for each radio. Factory default setting is COR LOW (-).
- 7.3 Turn On the Power switch. The Green “ON” indicator should illuminate.
- 7.4 Transmit a signal to the radio connected to the RAD1 jack. The green BUSY indicator for RAD1 should light up and the red TX indicator for RAD2 should light up. This will cause the radio connected to the RAD2 jack to transmit. Adjust the RAD2 TX level control using a service monitor or another radio. Stop transmitting.
- 7.5 Transmit a signal to the radio connected to the RAD2 jack. The green BUSY indicator for RAD2 should light up and the red TX indicator for RAD1 should light up. This will cause the radio connected to the RAD1 jack to transmit. Adjust the RAD1 TX level control using a service monitor or another radio. Stop transmitting.
- 7.6 This completes Setup.
- 7.7 Reinstall the circuit board inside the enclosure as follows:
  1. Slide the circuit board into the **BOTTOM SLOT** on the rear of the enclosure. Make sure both sides of the circuit board slide into the bottom slot on each side of the enclosure



- Slide the assembly all the way into the enclosure making sure the power switch fits through the hole on the front panel



- When the assembly is all the way into the enclosure, press the 4 white snap fasteners so they pop into place in the housing's panel mounting holes.



**Note: You should replace the 4 white snap fasteners with the 4 screws provided in the Accessory Kit when set-up is completed.**

## 8.0 Radio Interface Cables

A Radio Interface Cable is required for each radio interfaced to the C150. This cable contains mic audio, receive audio and PTT signals. It can be fabricated from the documentation supplied in the instruction manual or obtained from NCS. The cable consists of an RJ-45, 8 pin modular connector on one end for mating to the C150 and a radio interface connector on the other end. Un-terminated cables are also available that require the customer to attach the radio interface connector.

Most commercial radios have an accessory connector that usually has mic audio, receive audio and PTT connections available. This is the preferred interface to the NCS-C150.

### Specifying Radio Interface Cables

NCS can supply Radio Cables for almost any radio. Standard cable length is six feet, however, custom lengths are available. Since there are numerous connector types for interfacing to various commercial and amateur radio transceivers, the radio model and connector type should be specified at the time of purchase.

## 8.1 Radio Interface and AUX Jack Pin-outs

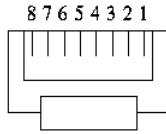


Figure 1:  
End view of RJ45 Plug

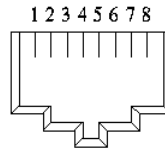


Figure 2:  
Looking into an RJ45 Jack

### RJ45 RAD and AUX Connector Pin-out

NAME	PINOUT		
<b>RAD1, RAD2</b>  RJ45 Connec tors on Rear Panel	<b>Pin</b>	<b>Signal</b>	<b>Note</b>
	1	TX AUDIO	To Radio Mic Input
	2	TX AUD COMMON	To Radio Mic Input Common or Gnd
	3	PTT	To Radio PTT Input
	4	GND	Signal Ground
	5	RX AUDIO	From Radio Audio (Speaker) Output
	6	GND	Signal Ground
	7	----	Not Used
8	COR	In From Radio	
<b>AUX</b>  RJ45 Connec tor on Rear Panel	<b>Pin</b>	<b>Signal</b>	<b>Note</b>
	1	DISABLE_1	Not Used
	2	DISABLE_2	Not Used
	3	GND	Signal Ground
	4	EXT_P4	Spare/Factory Use
	5	RECORD OUT	RX AUDIO MIXED FROM BOTH RADs
	6	GND	Signal Ground
	7	RECORD PTT	KEYS EXTERNAL RECORDER WHEN EITHER RAD IS BUSY
8	EXT_P8	Spare/Factory Use	

## 9.0 Troubleshooting

The C150 was designed with care and uses high quality components and construction. You should not experience any operating difficulties when you follow the setup and use instructions in this manual. If you do experience problems, here is some information that may help you resolve the issues.

### Hum

Magnetically induced hum can be caused to any modern piece of audio equipment by too close proximity to unshielded power transformers or other equipment that radiates strong AC magnetic fields. You can tell if you have this type of hum by rotating the C150 left/right, up/down and moving its position. If the hum increases and decreases, then you are experiencing magnetic coupling from an unshielded power transformer or other equipment. The C150 should be several inches away from equipment that radiates AC magnetic fields.

Another source of hum can be a ground loop. This is a situation when pieces of audio equipment that are connected together do not have their grounds well connected. This results in a voltage difference between the equipment grounds and can be a safety hazard as well as introducing electrical problems. The solution to this problem is to tie all your equipment grounds (usually case or chassis) together with a low impedance RF connection. The best choice for connecting material is a wide braid or copper strap.

### Noise

Excessive noise can be caused by many factors. The C150 uses state-of-the-art low noise amplifier ICs. However, even these components can add a bit of noise or “hiss” to an audio signal if not adjusted properly. If you seem to have excessive “hiss” type noise, review the setup and level adjustments you’ve made to the C150. In some cases, increasing the radio’s own mic gain and decreasing the levels from the C150 may improve the noise level.

Excessive noise can also be caused by ground loops. See the previous “hum” discussion for information on eliminating ground loops.

### Distortion

Distorted audio can be caused by one of two situations. The first and most common is improper adjustment of audio levels. Be sure you’ve adjusted the Radio and C150 level controls as recommended in this manual and that your radio’s mic gain control is properly adjusted. Setting the Volume Controls at too high a level can also cause distortion.

RF at the operating position can also cause distorted audio. To determine whether this is the problem, connect your transmitter to a dummy load. If the distortion disappears, then you have RF entering the interface cables. To eliminate RF problems, first make sure you have set up the jumpers and radio cables correctly. Then check that you have a good ground between all pieces of equipment and that your RF ground is low impedance.

## **In-band Repeating**

In-band repeating requires special attention to prevent one radio from interfering with or desensitizing the other. Many techniques are available including increasing vertical and horizontal separation of antennas, shielding one antenna from the other and using different polarizations for each antenna. The specific solution will be determined by the installation environment and the overall operation conditions. Experimentation will be required.

## **10.0 Contacting NCS**

NCS wants you to experience trouble free operation of our equipment. If you have any questions, comments or need technical help, please use the following resources:

1. Go to the web site, [www.collcomminc.com](http://www.collcomminc.com). Here you will find the latest instruction manuals, any factory developed modifications and Frequently Asked Questions. Schematics for all NCS products are available. Please inquire.
2. Email us at [support@ncsradio.com](mailto:support@ncsradio.com). Be sure to include all pertinent information, e.g. make and model of radios, how they're connected to the C150, detailed description of any problems, antenna and grounding configurations, etc.
3. Telephone us toll-free at 888-883-5788.

Note: Be near your equipment and have the manuals for your radios available. We will do our best to help you using our technical expertise.

## 11.0 C150 Specifications

<b>General</b>				
Dimensions	1.3"H x 4.0"W x 5.0"D 4.6cm x 16.3cm x 18.0cm			
Weight	0.5 lb (0.91kg)			
Temp Range	-20°C to + 65°C			
Power Consumption	9 to 16 VDC @ 25mA max. Nominal 12VDC @ 18.5mA			
	9VDC Battery:			
	Type	Total Capacity	Estimated Max Runtime Standby	Estimated Max Runtime 50% Duty Cycle
	Carbon-Zinc	400 mAh	20 hours	10 hours
	Alkaline	565 mAh	28 hours	14 hours
Lithium	1200 mAh	60 hours	30 hours	
<b>Front Panel</b>				
Power On/Off	Toggle Switch with Green LED Indicator			
Indicators	Green LED "Busy" Indicator and Red LED "Transmit" Indicator for each Radio			
<b>Rear Panel</b>				
Radio IF Connectors RAD1, RAD2	RJ-45 Modular Jack			
AUX	RJ-45 Modular Jack			
DC Power	Four inch pigtail terminated in an Anderson PowerPole PP-15 connector.			
<b>Signal Levels</b>				
COR from Radio	COR + → Active High COR - → Active Low Low = < 1.0VDC; High >2.0VDC			
PTT to Radio	Active Low, <5 Ohm @ 1A, Max Rating 1.5A, 100V			
TX Audio	Adjustable, 0 → 1.25Vpp or 0-125mVpp (See page 2)			
RX Audio	Speaker or Line Out from Radio, 75mVpp → 5Vpp			

## 12.0 Warranty

All products manufactured by Colcomm Inc. (hereafter referred to as NCS) and purchased from an authorized dealer or purchased directly from NCS will be warranted to be free from defects in material and workmanship for a period of one (1) year from the date of purchase.

NCS' liability under this warranty and the Customer's exclusive remedy is limited to repairing, servicing or adjusting, and/or replacing the defective product returned to NCS within the warranty period. Whether the defective product is repaired or replaced will be at the sole discretion of NCS. The warranty will be voided for products that have been abused, misused, or subjected to abnormal operating conditions as determined by NCS. Further, products damaged by lightning, power surges or force majeure events are not covered under this warranty.

If, in the Customer's estimation the product appears to be defective and is within the warranty period NCS should be notified as to the nature of the defect. If the product appears to be covered by the terms of the warranty, NCS will promptly communicate a return authorization number and shipping instructions to the Customer. When returning a product for repair/replacement under warranty the proof of purchase or a copy thereof must be returned with the defective product. NCS at its discretion may deny warranty in the absence of proof of purchase. Acceptable proof of purchase includes bill of sale, cancelled check or credit card receipt. Evidence of alteration of the proof of purchase document shall be reason to immediately void the terms of the warranty.

For those products returned that prove to be defective and covered under the warranty, the Customer will bear the cost of shipment for the return of the product to NCS. Collect shipments will not be accepted. NCS will bear the cost of shipment for return of the product to the Customer after repair/replacement. Mode of shipment for return to the Customer will be determined by NCS. Should examination reveal that the product is not defective, NCS will notify the Customer and request return shipping instructions and NCS will be due all shipping expenses. In the event that the examination reveals that the product is defective, but for any reason is excluded from this warranty, NCS will prepare a quotation of the cost to repair, and will communicate same to the Customer. In the latter event, NCS will be due all shipping charges incurred for return of the product to the Customer.

The Customer may attempt to repair a defective product under warranty provided authorization to do so is received from NCS Technical Support. NCS will supply replacement parts free of charge for authorized Customer repairs provided that the defective part along with the proof of purchase is submitted to NCS. NCS will pay postage and handling for replacement parts provided the above terms are met. The product warranty under these circumstances will remain in force for the life of the warranty.

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