NCS-C200
INSTRUCTION MANUAL

Rev N/C

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collcomm inc

Revision History			
Rev	**Description**	**Date**	**Approved**
N/C	Initial Release	10/2/15	JFP

UNIT CONFIGURATION

Model Number: NCS-C200

Serial Number: _____

Audio Busy Detection Mode

Unless specified, the unit comes from the factory with each RAD Port (RAD1 – RAD4) configured for COR LOW. The following ports checked below have been set for COR HIGH or VOX:

RAD1	RAD2	RAD3	RAD4
COR HIGH	COR HIGH	COR HIGH	COR HIGH
VOX	VOX	VOX	VOX

Table of Contents

1.0 Introduction

The C200 provides a method of switching one microphone and two speakers to multiple radios.

A DTMF microphone is supplied with the C200 and controls the functions and selections of the unit.

Separate speaker outputs are provided for Selected and Unselected audio with individual volume controls and mute functions.

A voice-operated cross-band repeater/range extender supports out-of-vehicle operation and cross-patching of 2, 3 or 4 radio channels.

TYPICAL APPLICATION

2.0 Safety Information

The C200 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 18 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 place your ears in close proximity to the local speakers or PA speaker at high volume settings. Your hearing could be impaired as a result.
- 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 12-16 volts and a current capability of at least 0.5A.

3.0 Included Hardware & Accessory Kit

The C200 is provided with the following items:

1. DTMF Microphone; Model No. NCS-E219M; Qty One (1)
2. Amplified Speakers; Model No. NCS-7220M; Qty Two (2)
3. Accessory Kit; Qty One (1)

An Accessory Kit is packed with the C200. The following items are included in the Kit:

Item	Qty	Description
Whine Filter	1	Model No. NCS-A525M
Velcro Strips	1	Used to mount Whine Filter
Power Cable “A”, DC	1	10 foot cable for connecting C200 to Whine Filter.
Power Cable “B”, DC	1	10 foot cable for connecting Whine Filter to DC Power Source
Clamp, Power Connector	2	Used to clamp the C200 Power Cable “A” to Whine Filter & Whine Filter to DC Power Cable “B.”
Mounting Bracket Kit	1	2 brackets & Screws
Shunts, Black	10	Used to adjust COR/VOX settings.
Mounting Feet	4	Used for table-top installation.

The Mounting Brackets can be used to mount the NCS-C200 to a flat surface. The Brackets may be mounted such that it is oriented on the topside or bottom-side of the NCS-C200.

4.0 Front Panel Controls/Indicators

Item	Description
1	Microphone Jack , RJ12 Modular
2	Power Switch with Green LED Indicator- Latching
3	Radio LEDs with Red /Selected and Green/Busy Indicators
4	Multi-Cast Switch with Green Indicator - Momentary
5	Repeater selection LED with Red (RPT) Indicator
6	Volume Controls for Selected Audio (SEL) and Unselected Audio (UNSEL)
7	Mute Function LEDs with Yellow Indicators

5.0 Radio, Speaker and Microphone Requirements

5.1 Radio

5.1.1 Receive Audio

Receive Audio input levels from the radio should be from 200mVp-p to 500mVp-p. The Busy lights activate at approximately 150mV. Receive audio input levels are either fixed levels or adjusted using the Volume Controls on the radios (when using speaker level).

CAUTION: When using radios with bridged audio speaker outputs, connect only one of the speaker output lines to the C200. Leave the other speaker output line disconnected and preferably insulated with shrink tubing. The receive audio return path is via the ground connection between the radio and the C200.

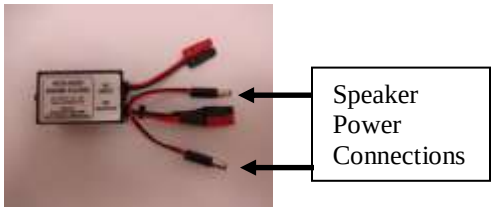
5.1.2 Transmit Audio
Transmit audio levels are separately adjustable for each radio and sufficient gain is available to drive nearly any radio.

5.1.3 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.

Some radios use a single line to combine PTT and other control functions. These radios may not be compatible with the PTT circuitry of the C200. Contact NCS for information on use of these radios.

5.2 Speaker
Two (2) amplified 8Ω speakers are provided with each C200.

The power line of each speaker must be connected to the NCS-A525M Whine Filter. See below.



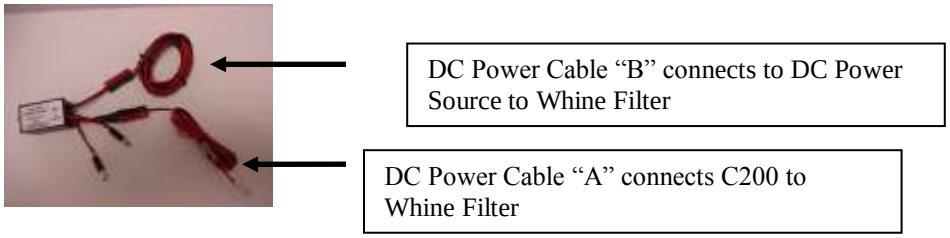
The audio connector should be connected to the corresponding speaker jack on the C200.

5.3 Microphone
A DTMF Microphone (NCS-E219M) is provided with each C200 and connects to the mic port on the front of the C200.

6.0 Power Supply

6.1 Power Requirements
The NCS-C200 will operate with any 12-16 VDC power supply capable of providing at least 0.5A continuous.

6.2 Power Connection
Power is supplied to the connector on the rear of the unit. As part of the accessory kit, 2 ten foot 10 foot power cables are supplied with appropriate mating connectors attached. Connect DC Power Cable “A” to the C200 & Whine Filter. Connect DC Power Cable “B” to the Whine Filter & to a 12-16 VDC source capable of supplying at least 0.5 A. See below.



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

6.4 Fusing
The power supply line is internally protected against overload with a PTC Resettable Fuse. If an overload occurs, the fuse will open. It will automatically re-close when the power is removed from the unit. This is not a replaceable or serviceable item.

6.5 Using an AC Power Supply
The C200 can be operated from any well-regulated 12-16 VDC power supply capable of delivering a minimum of 0.5 Amperes. Voltages higher than 16V may result in damage to the circuitry.

6.6 Power Cable Clamp
Two (2) Power Cable Clamps are used to keep the 2 Power Cables (A & B) from separating from the Whine Filter while in mobile use.

7.0 Features

7.1 Hookswitch
The NCS-C200 is supplied with a Hookswitch feature. This feature allows a Hookswitch or microphone "hang-up" signal to be sent from the microphone through the C200 to the radios. In operation, the Hookswitch line of all Unselected radios is pulled "low". When a radio is selected, that radio's Hookswitch line is released unless the microphone connected to the C200 is hung up on a grounded hook. In this case the Hookswitch line for the Selected Radio is pulled "low".

One example of use of this feature is to activate radios' scan functions. In this application, all radios scan continuously. When the mic is lifted off its grounded hook, the Selected radio stops scanning. Scanning on the Selected radio resumes when the mic is placed back on its grounded hook.

The Hookswitch feature uses an input line from the Mic connectors to activate the Hookswitch function. The state of the signal is determined by the resistance between the Hookswitch line and ground as follows:

On-Hook: < 1000 Ohms Off-Hook: > 5000 Ohms

The Hookswitch signals to the radios are on Pin 7 of the modular Radio connectors. These signal levels are:

On Resistance: < 10 Ohms Off Resistance: > 1 Megohm

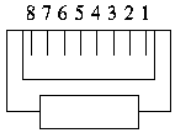


Figure 1:
End view of RJ45 Plug

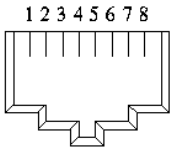


Figure 2:
Looking into an RJ45 Jack

RAD1-RAD4 Modular Radio Connector. Pin 7 is the Hookswitch Signal Line.

Maximum Load Imposed by the Radio:

Off Voltage: < 60 V On Current: < 200mA

7.2 Mode and Selected Radio Memory
The current Mode and the Radio Selections for all modes are automatically saved in memory so the C200 will stay in the same Mode and Radio Selection when powered off and back on. Power failures will not affect the saved state of the C200.

7.3 Watchdog Timers
Each Radio's PTT incorporates a Watchdog Timer that disables a Radio's PTT after 3 minutes of continuous transmission. To reset the Watchdog Timer and resume transmission, PTT must be released briefly. In RPT Mode, the received signal being retransmitted must stop briefly. The Watchdog Timer also resets automatically after 30 seconds even if PTT is still keyed or the received signal has not stopped. This is helpful in the event of a radio problem or other malfunction.

8.0 Rear Panel Connections

<table>
<tr><th>NAME</th><th>PINOUT</th><th>NOTES</th></tr>
<tr><td>DC Power</td><td>Mating Connector:
AMP/Tyco 172165-1

Contacts:
Tyco 770986-1 (22-26 AWG)</td><td>Keyed, Use DC Power Cable “A” to connect to Whine Filter</td></tr>
<tr><td>RAD 1 - RAD 4

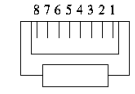
RJ45 Connectors on Rear Panel</td><td> 

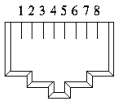
Figure 1:
End view of RJ45 Plug
 

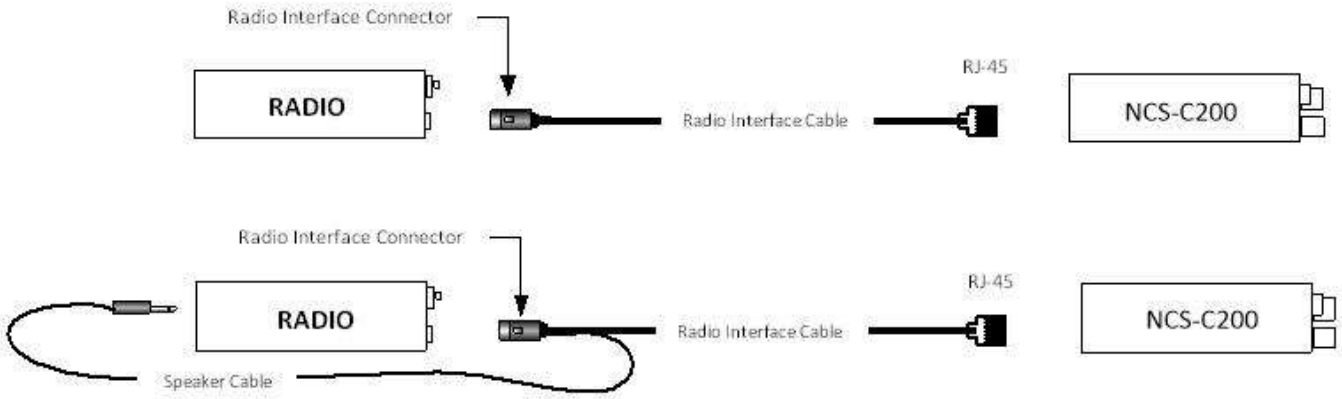
Figure 2:
Looking into an RJ45 Jack

<table><tr><th>Pin</th><th>Signal</th><th>Note</th></tr><tr><td>1</td><td>Transmit Audio</td><td>To Radio Mic Input</td></tr><tr><td>2</td><td>Transmit Audio Common</td><td>To Radio Mic Input Common or Gnd</td></tr><tr><td>3</td><td>PTT</td><td>To Radio PTT Input</td></tr><tr><td>4</td><td>GND</td><td>Signal Ground</td></tr><tr><td>5</td><td>Receive Audio</td><td>From Radio Audio (Speaker) Output</td></tr><tr><td>6</td><td>GND</td><td>Signal Ground</td></tr><tr><td>7</td><td>Hookswitch</td><td>Out to Radio</td></tr><tr><td>8</td><td>COR</td><td>In from Radio</td></tr></table></td><td>Refer to Section 9.0 for cable information.</td></tr>
<tr><td>SPEAKERS</td><td>Mating Connector:
3.5 mm plug</td><td>Select & Unselect Speaker Connections labeled</td></tr>
</table>

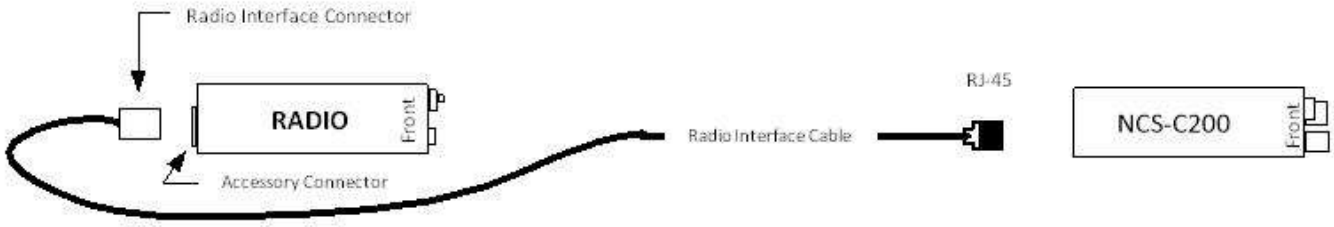
9.0 Radio Interface Cables

A Radio Interface Cable is required for each radio interfaced to the C200. 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 C200 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.

There are two general cable configurations. The first is for radios that have the receive audio available on the microphone connector or accessory connector and the second is for radios with a separate mic connector and speaker jack. The two configurations are shown below.



Most commercial radios have an accessory connector that usually has mic audio, receive audio and PTT connections available and usually is the preferred interface to the NCS-C200.



9.1 Specifying Radio Interface Cables

NCS can supply Radio Cables for most any radios. 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. A document describing Cable Specification is available on our website at

http://www.collcomminc.com/cable-instruction-sheets.html

10.0 Opening Unit to Perform Adjustments

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

Front Panel Screws (4 plcs)

Front View of Unit –Note the four (4) mounting screws

1. After removing the four (4) screws. pull the front panel & Circuit Card Assembly (CCA) from the enclosure

2. Slide the whole assembly out of the enclosure.

Ready for Adjustments

11.0 Adjustments

11.1 COR/VOX Setup

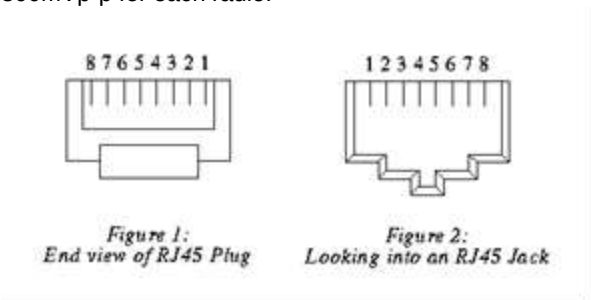
The NCS-C200 is supplied with a COR feature. This feature causes the Busy Lights and the Repeater function to be controlled by digital Busy signals from the radios. The sense of the busy signals from the radios is selectable either "High = Busy" or "Low = Busy". Unless identified on Page 3 of this manual, all Radio Ports (R1, R2, R3, R4) are set for COR LOW.

11.1.1 COR Logic Level

The COR feature uses a logic level input from the radios to illuminate the Busy lights and to operate the Repeater function. The Busy signals from the radios are on Pin 8 of the modular Radio connectors. Signal levels from the radios are:

Low: < 1.0 VDC
High: > 1.5 VDC

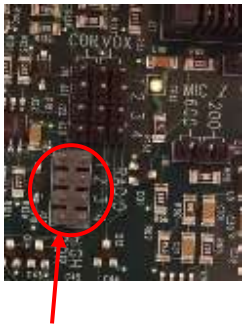
NOTE: When utilizing the COR feature, receive input levels should be set using audio voltage measurements to 200mVp-p - 300mVp-p for each radio.



RAD1-RAD4 Modular Radio Connector. Pin 8 is the COR Signal Line.

11.1.2 COR Polarity

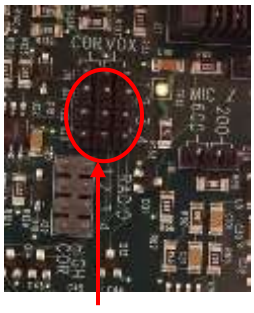
The sense of the Radios' Busy signals can be individually selected using the jumper block shown below. Absence of a jumper means that a "Low" signal indicates "Busy". The presence of a shunt on the jumper block means that a "High" signal indicates "Busy".



Add Jumper for "High" Busy signal. Do Not Add Jumper for "Low" Busy signal.

11.1.3 VOX Enable

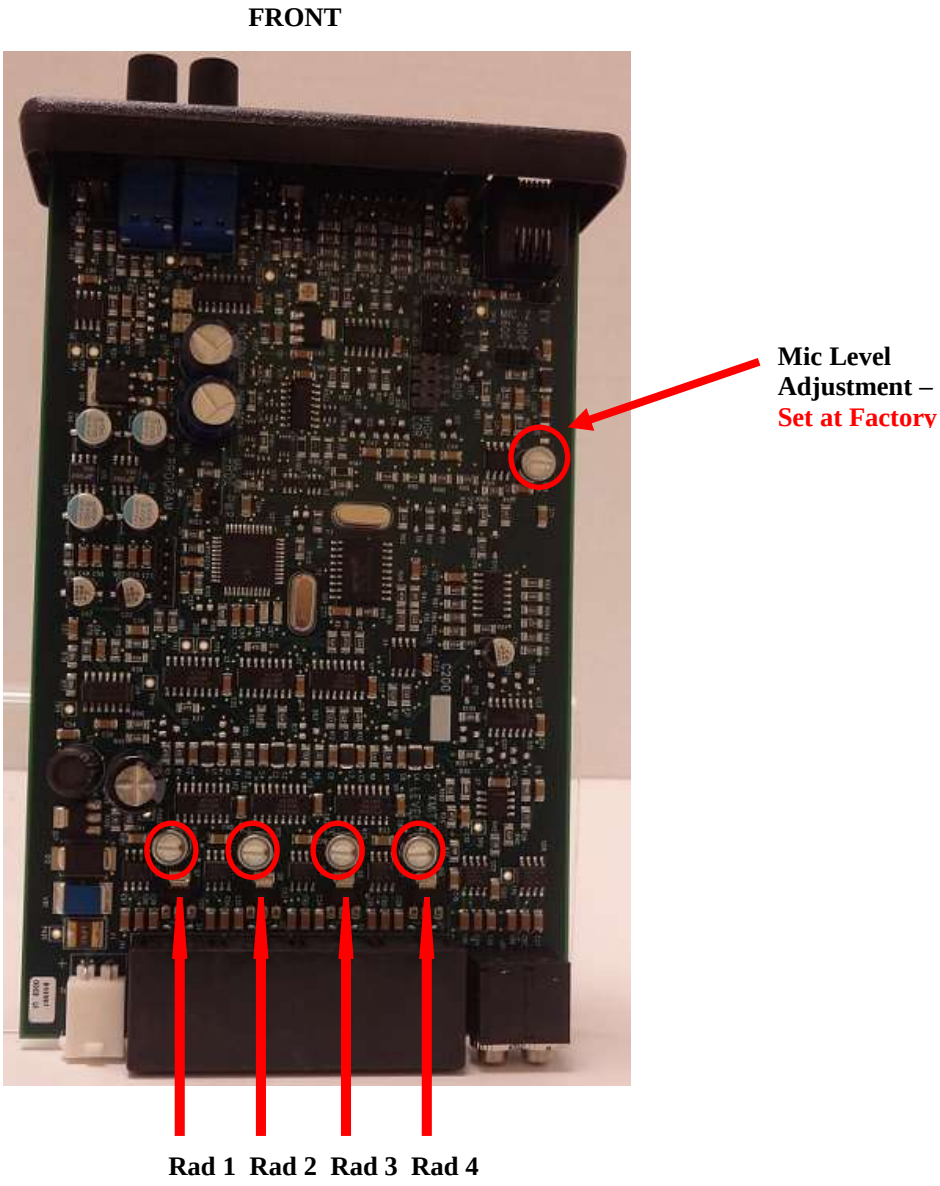
To enable VOX on one or more Radio Ports (R1, R2, R3, R4), install a shunt on the respective VOX pins on the PC Board. Radio Receive Audio levels should be a minimum of 120mV(p-p) to trip the VOX circuit.



Move Jumper from COR side to VOX side for corresponding radio.

11.2 Transmit Audio

Transmit Adjustments are made after removing the PC Board from the housing of the C200. The image below show the adjustment locations.



Adjustments on the C200 PC Board

Transmit Audio Adjustment Procedure

i. Adjust each radio for proper operation using its standard microphone.

ii. Connect NCS Radio Cables between the C200 and each radio.

iii. Do not adjust the Mic Level control (pre-set at factory).

iv. Preset all Radio level controls to midrange (clockwise).

v. Select each radio in turn, press the Mic PTT, and adjust the respective output level control for proper transmitter operation.

11.3 Receive Audio

11.3.1 When using Radio Fixed Level Audio Output
When using fixed level audio output make sure the audio level is a minimum of 1.4 V.

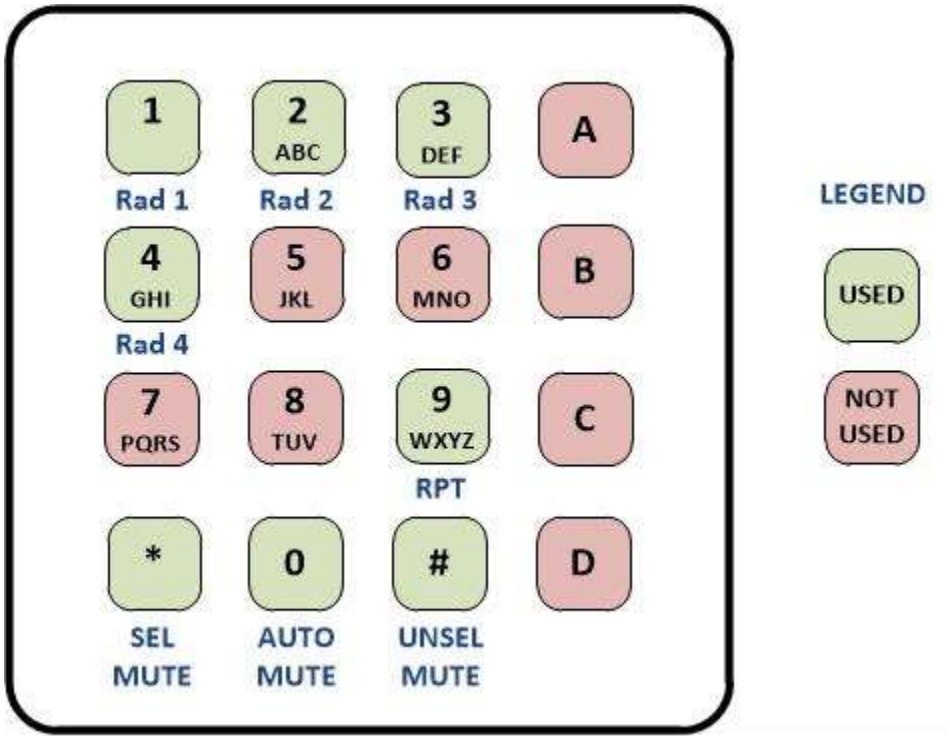
11.3.2 When using Radio Speaker Audio Output
If using speaker level audio, adjust the volume control on each radio so that the Busy light on the C200 associated with that radio lights with the lowest level normal received audio.

This completes setup and adjustment of the C200.

12.0 Operating the C200

12.1 Microphone Setup

The DTMF microphone buttons must be used to control the functions of the C200. The diagram below shows the DTMF buttons that correspond to the front panel indicators on the C200:



To control the C200 functions press the appropriate key on the microphone without pressing the PTT button on the mic. All functions are enabled or disabled by a short push on the corresponding key with the exception of the RPT (Repeat – 9 key) key. This key requires a long push to enable and a short push to disable.

For example:

- **A. To Select a Radio (in order to transmit on the radio) - Push the corresponding key for the appropriate radio (RAD1 through RAD4)**
- **B. To De-select a Radio (in order to prevent transmitting on the radio) - Push the corresponding key for the appropriate selected radio (RAD1 through RAD4)**
- **C. To Enable or Disable a MUTE function - Push the corresponding key for the appropriate Mute function (SEL, AUTO, UNSEL)**
- **D. To Enable the Repeat (RPT) function - Push the 9 key for several seconds to enable (RPT)**
- **E. To Disable the Repeat (RPT) function - Push the 9 key to disable (RPT)**

12.2 Normal Mode

12.2.1 Mode Description
In this mode any combination of radios can be selected, unless the MultiCast Option is disabled (see 12.3). If Multi-Cast is disabled only one radio at a time can be selected. Receive Audio from the Selected radio(s) is (are) connected to the Selected Audio Speaker Output and microphone audio is connected to the Selected radio(s). Receive Audio from all Unselected Radios is mixed together and sent to the Unselected Speaker Output. Keying the mic will transmit on the Selected radio(s). The Selected radio(s) will be heard on the Selected speaker and all other radios will be heard on the Unselected speaker.

12.2.2 Selecting Normal Mode
In Normal mode, the RPT indicator is not lit. If the light is on, the unit is in RPT mode, push the 9 key on the mic to return the C200 to Normal Mode.

12.2.3 Selecting a Radio
To select or deselect a radio, momentarily press the desired key on the mic (RAD1-RAD4). The associated SEL (red) indicator will light when the radio is Selected. The BUSY (green) indicator will light when audio is received.

12.2.4 MultiCast Function
The C200 comes with a MultiCast feature enabled. The Multi-Cast feature allows the operator to select two or more radios at the same time so as to be able to transmit as well as receive on multiple radios. Receive audio from all radios selected using the Multicast mode will be heard from the Select speaker channel. Keying the mic and transmitting will cause all selected radios to be keyed and audio from the mic will be transmitted over all selected radios. The factory default for this function is ON.

To disable the MultiCast feature follow the steps below:

Step 1 - Verify that the only LEDs illuminated are the power switch (PWR) and MultiCast switch.
Step 2 -
a. Press the SEL MUTE key (*) on the microphone. The SEL MUTE LED should illuminate.
b. Press the AUTO MUTE key (0) on the microphone. The AUTO MUTE LED should illuminate.
c. Press the UNSEL MUTE key (#) on the microphone. The UNSEL MUTE LED should illuminate.
Step 3 - Press the MULTICAST switch on the front of the C200 then press the PTT switch on the microphone until the RPT LED is illuminated.
Step 4 - Release the MultiCast switch and the PTT switch. The RAD 3 LED should be illuminated.
Step 5 - Apply a short press on the PTT switch and release. Confirm that the RAD 3 SEL LED extinguishes.
Step 6 - Recycle power by turning the front panel power switch to the OFF then ON position.

MULTI-CAST should be disabled.

To enable the MultiCast feature follow the steps below:

Step 1 - Verify that the only LED illuminated is the power switch (PWR).
Step 2 -
a. Press the SEL MUTE key (*) on the microphone. The SEL MUTE LED should illuminate.
b. Press the AUTO MUTE key (0) on the microphone. The AUTO MUTE LED should illuminate.
c. Press the UNSEL MUTE key (#) on the microphone. The UNSEL MUTE LED should illuminate.
Step 3 - Press the MULTICAST switch on the front of the C200 then press the PTT switch on the microphone until the RPT LED is illuminated.
Step 4 - Release the MultiCast switch and the PTT switch. The RAD 3 LED should be extinguished.
Step 5 - Apply a short press on the PTT switch and release. Confirm that the RAD 3 SEL LED is illuminated.
Step 6 - Recycle power by turning the front panel power switch to the OFF then ON position.

MULTICAST should be enabled.

12.3 RPT Mode

12.3.1 RPT Mode Description
In this mode, received audio from one radio is retransmitted through another radio. Retransmitting is controlled by activation of the Busy indicators which operate by detecting a digital busy signal from a radio (COR) or received audio (VOX). If received audio is too low in volume, these indicators won't light and the RPT function won't work.

12.3.2 Selecting RPT Mode
Press and hold the 9 key on the microphone (RPT) until the RPT (red) indicator illuminates on the C200.

12.3.3 Using RPT Mode
Any number of radios can be selected at the same time in RPT Mode. To select a radio, momentarily press corresponding key on the mic (1-4) for the desired radio(s).

Unless VOX detection is selected, RPT operation is COR based. When COR is used, a busy signal generated by the radio light a radio's Busy indicator and will key the PTT for the other Selected radio(s) and retransmit received audio. When VOX is used, an audio level that is sufficient to light a radio's Busy indicator will key the PTT for the other Selected radio(s) and retransmit received audio.

When in RPT Mode, keying the Mic's PTT causes all selected radios to transmit microphone audio. This can be used for transmitting on multiple radios simultaneously where legal and appropriate.

12.4 SELECT/UNSELECT Audio Control

Receive audio from the Selected radio will be heard on the Selected Speaker and receive audio from all Unselected radios will be heard on the Unselected Speaker.

The SEL Volume Control controls volume of the Selected radio(s). Note that the SEL Volume Control doesn't completely shut off all audio when turned all the way down. This is normal. To completely shut off all audio from the Selected radio, press the SEL MUTE key on the mic (*).

The UNSEL Volume Control controls the volume of the Unselected radios. Note that the UNSEL Volume Control doesn't completely shut off all audio when turned all the way down. This is normal. To completely shut off all audio from the Unselected radios, press the UNSEL MUTE key on the mic (#).

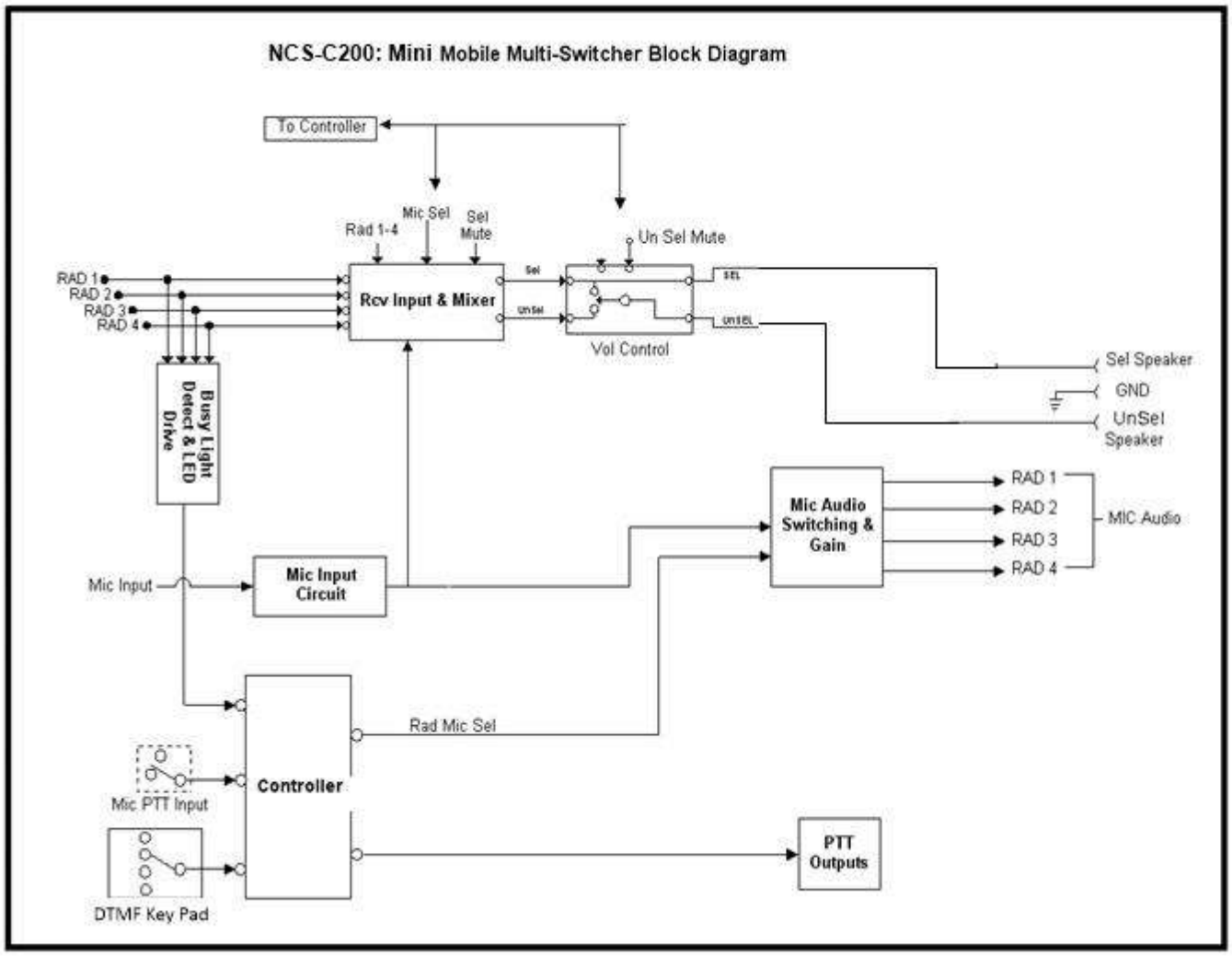
12.5 Mute Functions

12.5.1 SEL MUTE
To mute the Select radio, momentarily press the SEL MUTE key on the mic (*). The associated yellow indicator will light and the Selected audio will be silenced.

12.5.2 UNSEL MUTE
To mute the Unselect radios, momentarily press the UNSEL MUTE key on the mic (#). The associated yellow indicator will light and the Unselect audio will be silenced.

12.5.3 AUTOMUTE
This function automatically mutes the UNSEL audio when PTT is keyed. To enable the function, momentarily press the AUTO MUTE key on the mic (0). The associated yellow indicator will light and the Unselect audio will be silenced when the mic PTT is keyed. To disable the function, momentarily press the AUTO MUTE key on the mic (0)

13.0 Block Diagram



14.0 Troubleshooting

The C200 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 any difficulties.

14.1 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 C200 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 C200 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.

14.2 Noise

Excessive noise can be caused by many factors. The C200 uses state-of-the-art low noise amplifier ICs. Nevertheless, 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 C200. In some cases, increasing the radio’s own mic gain and decreasing the levels from the C200 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.

14.3 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 C200 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.

15.0 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. Here you will find the latest instruction manuals, any factory developed modifications and Frequently Asked Questions.

2. Email us at support@ncsradio.com. Be sure to include all pertinent information, e.g. make and model of radios, how they’re connected to the C200, detailed description of any problems, antenna and grounding configurations, etc.

3. Telephone us toll-free at 888-883-5788. Be near your equipment and have the manuals for your radios available. We will do our best to help you using our technical expertise.

16.0 C200 Specifications - PRELIMINARY

General Specifications

Dimensions	1.25”H x 4.25"W x 7.13"D 3.2cm x 10.8cm x 18.1cm
Weight	0.8 lb (0.36 kg)
Temp Range	0° to +50° C
Memory Protection	Radio Selection preserved in non-volatile memory
Power Requirements	12 to 16 VDC @ 0.5A typical
Audio Output Power	**Selected & Unselected:**

Rear Panel Connections

Radio Interface Connectors (1-4)	RJ-45 Modular Jack
Speakers	3.5 mm
DC Power	Amp/Tyco 2 Cond, P/N 1-770966-0

Front Panel

Microphone	RJ-11 Modular Jack
Power On/Off	Latching Switch with Green LED Indicator
Radio Select (RAD1-RAD4)	DTMF Tone Selectable with Green LED "Busy" Indicator and Red LED "Selected" Indicator
RPT Select	DTMF Tone Selectable with Red LED "RPT" Indicator
Selected Audio Mute	DTMF Tone Selectable with Yellow LED Indicator
Automatic Mute	DTMF Tone Selectable with Yellow LED Indicator
Unselected Audio Mute	DTMF Tone Selectable with Yellow LED Indicator
Selected Audio Volume	Volume Control
Unselected Audio Volume	Volume Control

Accessory Kit

Whine Filter	NCS-A525M
Velcro Strips	For Mounting Whine Filter
Power Cable “A”	10 foot, 24 AWG wire terminated with mating connectors
Power Cable “B”	10 foot, 24 AWG wire terminated with mating connector
Power Cable Clamps	Qty 2, Used to keep Power Cables from separating from Whine Filter in Mobile use.
Mounting Bracket Kit	Qty 2 brackets & Screws
Shunts	Qty 10
Mounting Feet	Qty 4 Self Adhesive

COR

Radio Connector Pin #	Pin 8
Signal Levels	**COR Logic Input from Radio:** Low: < 1.0 VDC High: > 1.5 VDC
COS Sense	Selectable Low or High

Hookswitch

Radio Connector Pin #	Pin 7
Signal Levels	**Hookswitch Input Resistance to Ground:** On-Hook: < 1K Ohms Off-Hook: > 5K Ohms **Output Switching Resistance to Ground:** On: < 10 Ohms Off: > 1 Mohm **Max Load Imposed by Radio:** Off Voltage: < 60 V On Current: < 200mA
Microphone Pin #	Pin 3

17.0 Warranty

Collcomm Inc. d.b.a. NCS
Limited Product Warranty

All products manufactured by Collcomm 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.

EXCEPT FOR THE EXPRESS WARRANTIES STATED IN THIS WARRANTY, WHICH ARE EXCLUSIVE, NCS DISCLAIMS ALL WARRANTIES ON PRODUCTS SOLD HEREUNDER, INCLUDING ALL IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. UNDER NO CIRCUMSTANCE IS NCS LIABLE FOR CONSEQUENTIAL DAMAGES TO PERSON OR PROPERTY AS A RESULT OF THE USE OF ANY NCS PRODUCTS.

The Customer may have additional rights beyond those specifically outlined in this document based on individual state laws.