APPENDIX B - PUBLICATION EXTRACTS

FM 11-32, October 1990.
FM 24-18, September 1987.
TC 24-24, October 1988.

Use the above publication extract to take this subcourse. At the time we wrote this subcourse, this was the current publication. In your own work situation, always refer to the latest official publication.

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Tactical Single-Channel Radio Communications Techniques

PREFACE

Purpose and Scope

This manual provides information and guidance to all personnel who are involved with and use single-channel radio in tactical situations.

To ensure your understanding of all the material presented, this manual includes a brief discussion of radio fundamentals, antennas, and radio-wave propagation. It also covers procedures and techniques that have been used effectively during tactical operations to include: site selection and reliability factors; operation in the several transmission modes and under unusual conditions; field expedients; electronic warfare techniques and reporting; and other aspects of the practical applications of single-channel radio. There are other items pertinent to single-channel radio operations listed in the appendixes.

User Information

The proponent of this publication is HQ TRADOC. You are encouraged to submit comments and recommended changes to improve this manual. Submit you comments on DA Form 2028 (Recommended Changes to Publications and Blank Forms) and key them to the pages, paragraphs, and lines of text to which they apply. If DA Form 2028 is not available, a letter is acceptable. Provide reasons for your comments to ensure complete understanding and proper evaluation. Forward your comments to the Commander, United States Army Signal Center and Fort Gordon, ATTN: ATZH-DTL, Fort Gordon, Georgia 30905-5070.

The provisions of this publication are the subject of the following international agreement(s): STANAG 2019 (Military Symbols).

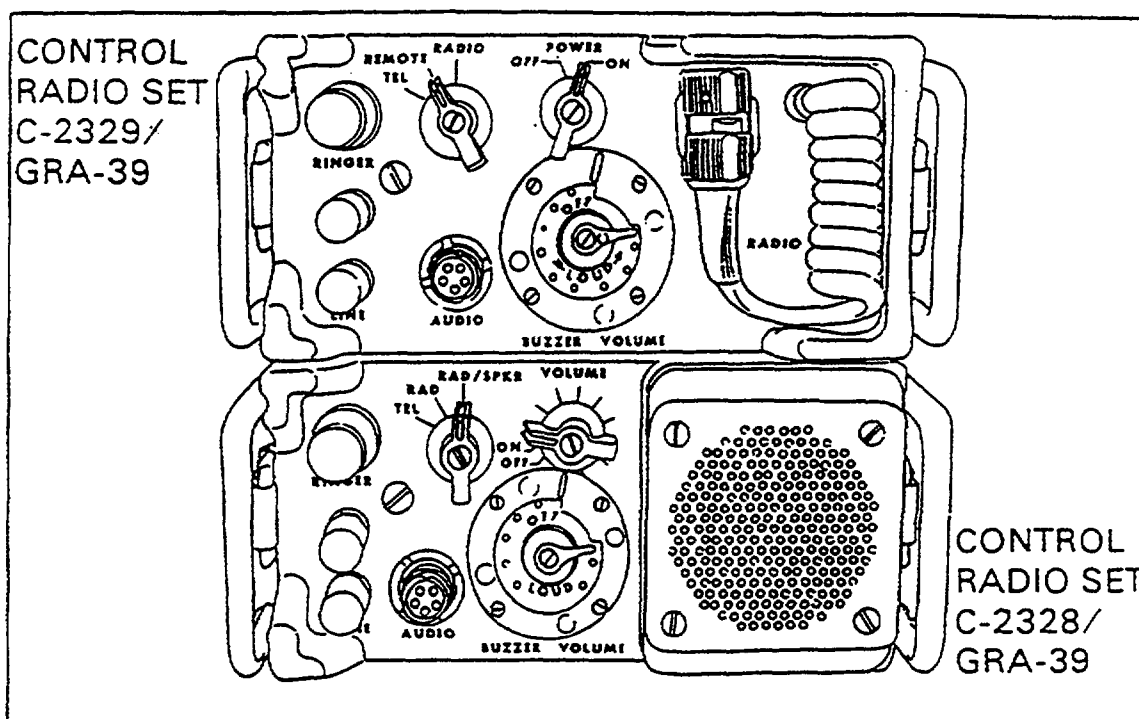*This manual supersedes FM 24-18, 13 December 1984.

Figure F-14. Radio Set Control Group AN/GRA-39.

NRI call originating from a telephone subscriber.

> NOTE: In the following discussion, you are presumed to be the 1-77 Infantry Battalion NRI operator. The commander of the 1-77 Infantry Battalion desires an NRI call to the commander A/1-77 Infantry Battalion. (Telephone subscriber does not have the radio call signs). Unclassified unit designators will not be linked with call signs.

When a call comes from a telephone network user, your TA-312 buzzer will buzz.

You can answer with either the TA-312 handset or the handset connected to the PHONE jack. Obtain the required information and tell the caller to stand by.

| NRI OP: | "SERVANT 134". |
| TEL SUB: | "This is SERVANT 106, SERVANT 140 please." |

| NRI OP: | "Roger—Wait—OUT." |

> NOTE: NRI operator determines necessary call signs and contacts requested party. In the event the requested party is not operating on your frequency, you must enter his net and request he meet you on your frequency.

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NRI OP:	"C46, this is A81—OVER."
RADIO SUB:	"A81, this is C46—OVER."
`NRI OP	"This is A81, stand by for A46—OUT."

NOTE: NRI operator provides telephone subscriber with the necessary call signs and reminds him to use proper radiotelephone procedures.

NRI OP: "Sir, you are A46, your party is C46. You must use proper radiotelephone procedures. This circuit is not secure. Go ahead with your call—OUT."

Set the switch on the AN/GSA-7 to RADIO & MON-T.

Any one of three conditions will occur.

The telephone subscriber will be able to control the transmitter from his or her telephone set. This happens if the subscriber's telephone is set for local battery (LB) and is connected to the same switchboard as the NRI rig. In this condition, just monitor the call.

The second possible condition is that the transmitter will key as soon as the switch is moved to RADIO & MON-T for the telephone subscriber to talk and unkeyed by setting the switch to TEL-T for him to listen.

The third possible condition is that the subscriber will be unable to key the transmitter from his or her telephone set and it does not key when the AN/GSA-7 is set to RADIO & MON-T. This occurs if the AN/TTC-38, or SB-3082 switch is used, or if the call comes over a multichannel system. In this condition, leave the AN/GSA-7 switch in TEL-T. Key the transmitter with the switch on the TA-312 handset, or the handset connected to the PHONE jack, for the telephone subscriber to talk. Unkey it for the subscriber to listen.

NOTE: If you can find out beforehand what type telephone system is in your area (CB, LB, automatic switch), you should be able to tell how the transmitter is to be keyed.

Monitor the call. If feedback from the speaker causes erratic keying or squealing, turn off the speaker and monitor with the handset.

When the call is over, ring the switchboard operator and tell him or her to disconnect. Return the switch on the AN/GSA-7 to TEL-T.

NRI call originating from a radio station.

NOTE: In the following discussion, you are the brigade NRI operator. The B/1-77 Infantry Communications Chief (radio subscriber) desires an NRI call to the 1st Brigade COMSEC Officer. Unclassified unit designator will not be linked with call signs.

If necessary, the radio subscriber requests permission to leave his net.

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Radio subscriber contacts the BDE NRI station on the BDE NRI frequency.

RADIO SUB: "W6T81, this is H8Q48—Request permission to enter net—OVER."

NRI OP: "H8Q48, this is W6T81—Identify your station—OVER."

RADIO SUB: "W6T81, this is H8Q48—Refer to Bravo Juliet—OVER."

NOTE: The NRI operator may elect to use abbreviated call signs once the station has been identified.

NRI OP: "Q48, this is T81—authenticate, Juliet Lima—OVER."

RADIO SUB: "T81, this is Q48—I authenticate, Whiskey—OVER."

NRI OP: "This is T81—Roger—OVER."

NOTE: In the event the requested party is not served by the NRI operator's switchboard, the full call sign and item number identifier will be given.

RADIO SUB: "This is Q84—Request contact with T36—OVER."

NRI OP: "This is T81 Roger—Wait—OUT."

NOTE: NRI operator determines switchboard designator and number and establishes contact with requested party.

SWBD OP: "SHAMROCK."

NRI OP: "SHAMROCK 167 please."

TEL SUB: "SHAMROCK 167."

NRI OP: "This is SHAMROCK 134. You have a radio call from H8Q48. Refer to Bravo Juliet. You are T36. You must use proper radiotelephone procedures. This circuit is not secure. Do you have any questions? Stand by—OUT."

NRI OP: "Q48, this is T81. Go ahead with your Call—OUT."

Switch the AN/GSA-7 to RADIO & MON-T. Refer to the previous sequence for difference in transmitter keying with CB, LB, or automatic switches.

When the call is completed, return the AN/GSA-7 switch to TEL-T. Ring the switchboard to tell him to disconnect the call.

Using the AN/GRA-39.

NRI hookup. The following equipment will be needed: Radio Set Control Group AN/GRA-39, Switchboard SB-22/PT, Radio Set AN/VRC-49 or Receiver-Transmitter RT-524, 18 Batteries BA-30/U, Connector U-182/U or Connector U-229/U, and 1 meter (about 3 feet) of 2-wire cable. Have your

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F-14. Location

This equipment is designed to be mounted in a vehicle along with the radio set with which it is being used. Space requirements are illustrated in Figure F-20. When the C-6709/G is used with some radio sets (such as the AN/VRC-12), it uses the radio set power supply. In some cases, an external 24 volts DC power supply is needed. The C-6709/G is normally mounted so the operator has easy access to the radio set. The use of an external 24 volts DC power supply will be required when using any radio/crypto sets other than the AN/VRC-12. The connection for these radio/crypto sets will be made to a pair of binding posts on the front panel of the C-6709/G. The wire/cable and the connectors (for example, alligator clips for 24 volts DC vehicle battery) are not supplied as a component with the equipment when used with the list of radio/crypto sets other than the AN/VRC-12.
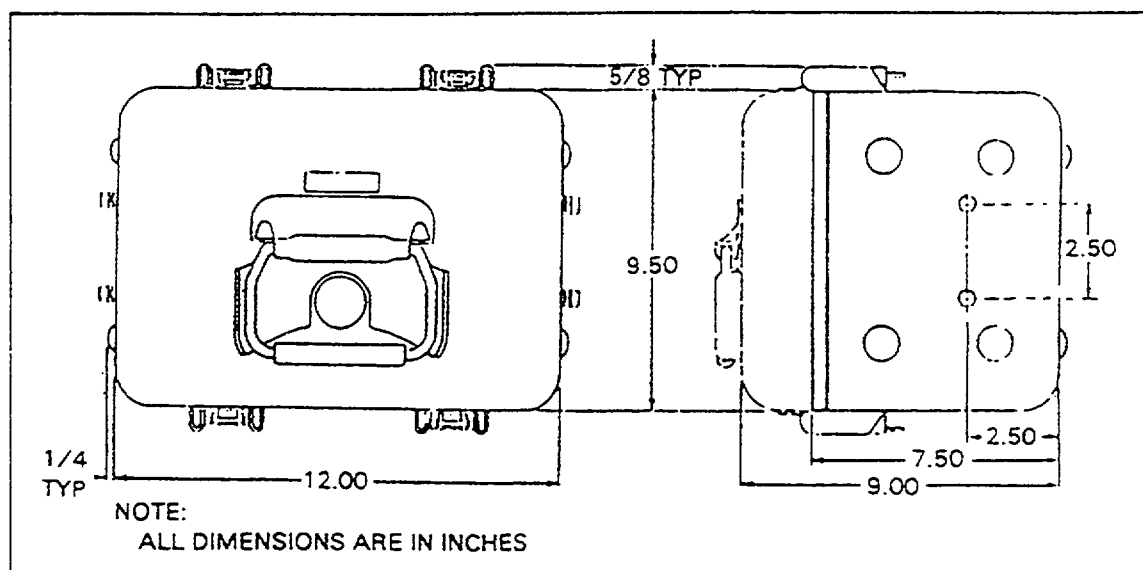

Figure F-20. Vehicle space requirements for C-6709.

F-15. Operation

Call originating from a radio station.

NOTE: In the following discussion you are the 1-77 Infantry Battalion NRI operator. The Commander, 1-77 Infantry Battalion desires an NRI call to the Commander A/1-77 Infantry Battalion. (Telephone subscriber does not have the Radio call signs.) Unclassified unit designators will not be linked with call signs.

You receive a call from a radio station. You will hear the call in your H-250 handset or H-325 headset microphone. You may hear the call over the radio speaker, if the radio set is so equipped.

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RADIO SUB: "A81, this is A46—OVER."

 If the C-6709/G has been placed in the proper standby condition, you need only to key the transmitter to answer the call. If you are using the H-250 handset, key the radio by depressing the push-to-talk (PTT) switch and unkey it by releasing the PTT switch. If you are using the H-325/TTC headset microphone, you key the radio by depressing key number 1 on the C-6709/G keysender and unkey by depressing key number 3. If the C-6709/G is not in the proper standby condition, you must place the C-6709/G MODE switch to the OPER position; this permits you to key your radio on and off. You next depress the C-6709/G OPER CONNECT RADIO pushbutton; this connects the C-6709/G to the NRI transmitter-receiver. You may now key your radio on and off as outlined above.

NRI OP: "This is A81—OVER."

NOTE: In the event the requested party is not served by the NRI operator's switchboard, the full call sign and item number identifier will be given.

RADIO SUB: "This is A46. Request contact with C46—OVER."

NRI OP: "This is A81—Roger—Wait—OUT."

You consult the SOI and telephone directory to determine the telephone number for the desired party.

You depress the C-6709/G OPER CONNECT SWBD pushbutton; this connects the C-6709/G to the automatic switchboard. The C-6709/G SVC REQ/BUSY lamp will come on and remain lit and you will receive a dial tone from the switchboard. You then key the number of the desired party on the keysender of the C-6709/G.

NOTE: If you misdial the number, depress the C-6709/G RLSE pushbutton; this disconnects the C-6709/G from the switchboard and places it in a standby condition. The C-6709/G SVC REQ/BUSY lamp will go out. Again depress the C-6709/G OPER CONNECT SWBD pushbutton and proceed as above.

When the telephone is answered, get the desired party on the line and tell him or her there is an incoming NRI call. Because a telephone user doesn't usually have an SOI, you will have to give the subscriber the call sign to use. You and the subscriber now must determine the type of radio transmitter keying control the subscriber will use. If the subscriber is using a telephone handset that has a push-to-talk (PTT) switch, the SF (PTT) position of the C-6709/G MODE switch may be used. In this position the transmitter is keyed when the PTT switch is depressed and held, and is unkeyed when the PTT switch is released. If the subscriber has a telephone with a keysender, the DTMF 1/3 position of the C-6709/G MODE switch may be used. In this position, the transmitter is keyed when the subscriber presses key number 1 on the keysender and is unkeyed when key number 3 is pressed. The subscriber may choose, as an alternative, to use the AVOX position of the C-6709/G MODE switch. In this position, the transmitter is keyed when the subscriber is speaking and is unkeyed when he or she is silent. You must remember the type of transmitter control used. The switchboard subscriber is then told to stand by for the NRI call.

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TEL SUB:	"SERVANT 140."
NRI OP:	"This is SERVANT 134. You have a call from A46. What type of telephone equipment are you using?"
TEL SUB:	"TA-312."
NRI OP:	"Your call is from A46. You are C46. You must use proper radiotelephone procedure. This circuit is not secure. Stand by—OUT."

You depress the C-6709/G OPER CONNECT RADIO pushbutton; this transfers the connection of the NRI operator from the switchboard subscriber to the radio transmitter.

> NOTE: The C-6709/G SVC REQ/BUSY lamp will remain lit, indicating that the C-6709/G is still connected to the switchboard subscriber Using the H-250 handset or H-325/TTC headset microphone, establish contact with the radio station. Tell the radio subscriber to then go ahead with the call.

NRI OP: "A46 this is A81. Go ahead with your call—OUT."

You set the C-6709/G MODE switch to the AVOX position.

> NOTE: At this time the C-6709/G MODE switch will be set to one of the three positions, as determined by you and the switchboard subscriber

You then depress the C-6709/G CALL CONNECT OPER IN pushbutton. This disconnects you from the switchboard subscriber, and connects the switchboard subscriber and the radio station to a common talk path within the C-6709/G. When the C-6709/G CALL CONNECT OPER IN pushbutton is depressed, you can monitor both sides of the NRI talk path. You cannot transmit to either party.

Monitor the NRI talk path to ensure that the switchboard subscriber can key the transmitter on and off and that good communications between the two parties has been established. If for some reason the switchboard subscriber cannot key the transmitter, you must set the C-6709/G MODE switch to the OPER position and key the transmitter on and off at the appropriate times for the switchboard subscriber. After a good NRI connection has been made, you must monitor to ensure proper radio procedure is being used.

> NOTE: As long as the NRI call is in progress, the C-6709/G SVC REQ/BUSY lamp will remain lit.

When the NRI call has been completed and the switchboard subscriber hangs up the handset, the C-6709/G SVC REQ/BUSY lamp will go out, and the C-6709/G is automatically placed in a standby condition. When this occurs, you should place the C-6709/G MODE switch to the OPER position and depress the OPER CONNECT RADIO pushbutton. You are now ready to answer the next service request. If it is by radio, you need only key the transmitter to answer. If the request is by telephone, you need only to depress the C-6709/G OPER CONNECT SWBD pushbutton to answer.

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If the C-6709/G SVC REQ/BUSY lamp does not go out within a reasonable time, you should depress the C-6709/G CALL CONNECT OPER IN pushbutton. This will enable you to monitor the NRI talk path. If the call has been completed, you should then depress the C-6709/G RLSE pushbutton. This will disconnect the C-6709/G from the switchboard and place the C-6709/G into a standby position. You should then place the C-6709/G MODE switch to the OPER position and depress the OPER CONNECT RADIO pushbutton. You are then ready for the next service request, as outlined above.

Call originating from switchboard subscriber.

You receive a call from a switchboard subscriber. This is indicated on the C-6709/G by the audible alarm and flashing SVC REQ/BUSY lamp.

Depress the C-6709/G OPER CONNECT SWBD pushbutton. This connects you to the switchboard subscriber. The audible alarm will go off and the SVC REQ/BUSY lamp stops flashing and remains lit.

Answer the call by using the H-325/TTC headset microphone or H-250 handset. Obtain from the subscriber the individual or station the caller desires. Because a telephone user does not usually have a CEOI, you will have to look up the call signs and frequency and give the call sign to the subscriber. You and the subscriber will have to determine the type of radio transmitter keying control the subscriber will use. If the subscriber is using a telephone that has a push-to-talk switch, the SF (PTT) position of the C-6709/G MODE switch may be used. In this position the transmitter is keyed when the PTT switch is depressed and held, and is unkeyed when the PTT switch is released. If the subscriber has a telephone with a keysender, the DTMF 1/3 position of the C-6709/G MODE switch may be used. In this position, the transmitter is keyed when the subscriber depresses key number 1 on the keysender and is unkeyed when the subscriber depresses key number 3. Alternately, the subscriber may choose to use the AVOX position of the C-6709/G MODE switch. In this position the transmitter is keyed when the subscriber speaks and is unkeyed when he or she is silent. Remember the type of transmitter control used. Tell the switchboard subscriber to standby while the desired party is contacted by radio.

NRI OP:	"SERVANT 134."
TEL SUB:	"This is SERVANT 106, connect me with SERVANT 140."
NRI OP:	"What type of telephone equipment are you using?"
TEL SUB:	"TA-838."
NRI OP:	"Roger—Wait—OUT."

Depress the C-6709/G OPER CONNECT RADIO pushbutton. This transfers you from the switchboard subscriber to the NRI radio receiver-transmitter. Note that the C-6709/G SVC REQ/BUSY lamp will remain lit, indicating that the C-6709/G is still connected to the switchboard subscriber. Set the radio to the frequency of the desired party. Place the C-6709/G MODE switch in the OPER position. You may now key the radio on and off. If you are using handset H-250, key the radio by pressing the PTT switch

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and unkey the radio by releasing the PTT switch. If you are using headset microphone H-325/TTC, the transmitter is keyed when you depress key number 1 on the C-6709/G keysender and is unkeyed when you depress key number 3.

NRI operator determines necessary call signs and contacts requested party. In the event the requested party_is not operating on your frequency, you must enter his net and request he meet you on your frequency.

NRI OP: "C46, this is A81—OVER."

RADIO SUB: "This is C46—OVER."

NRI OP: "This is A81—Stand by for a call from A46—OUT."

Depress the C-6709/G OPER CONNECT SWBD pushbutton. This disconnects you from the receiver-transmitter and makes connection to the switchboard subscriber. Provide the telephone subscriber with the necessary call signs and remind him to use proper radiotelephone procedure.

NRI OP: "Sir, you are A46. Your party is C46. You must use proper radiotelephone procedure. This circuit is not secure. Go ahead with your call—OUT."

Set the C-6709/G MODE switch to the AVOX position.

> NOTE: At this time the C-6709/G MODE switch will be set to one of the three positions, as determined by you and the switchboard subscriber earlier.

Depress the C-6709/G CALL CONNECT OPER IN pushbutton. This disconnects you from the switchboard subscriber, and connects the switchboard subscriber and radio station to a common talk path within the C-6709/G. When the C-6709/G CALL CONNECT OPER IN pushbutton is depressed, you can monitor both sides of the NRI talk path. You cannot transmit to either party.

Monitor the NRI talk path to ensure that the switchboard subscriber can key the transmitter on and off and that good communications between the two parties has been established. If for some reason the switchboard subscriber cannot key the transmitter, you must set the C-6709/G MODE switch to the OPER position and key the transmitter on and off at the appropriate times for the switchboard subscriber. After a good NRI connection has been made, you must monitor to ensure proper radio procedure is being used.

> NOTE: As long as the NRI call is in progress, the C-6709/G SVC REQ/BUSY lamp will remain lit.

When the NRI call has been completed and the switchboard subscriber hangs up the handset, the C-6709/G SVC REQ/BUSY lamp will go out. The C-6709/G is automatically placed in a standby condition. When this occurs, place the C-6709/G MODE switch to the OPER position and depress the OPER CONNECT RADIO pushbutton. You are now ready to answer the next service request. If it is by radio, you need only to key the transmitter to answer. If the request is by telephone, you need only to depress the C-6709/G OPER CONNECT SWBD pushbutton to answer.

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If the C-6709/G SVC REQ/BUSY lamp does not go out within a reasonable time, depress the C-6709/G CALL CONNECT OPER IN pushbutton. This will enable you to monitor the NRI talk path. If the call has been completed, depress the C-6709/G RLSE pushbutton. This will disconnect the C-6709/G from the switchboard and place the C-6709/G into a standby condition. Place the C-6709/G MODE switch to the OPER position and depress the OPER CONNECT RADIO pushbutton. You are now ready for the next service request as outlined above.