DEPARTMENT OF THE ARMY TECHNICAL MANUAL

OPERATOR'S MANUAL:

DATA AND VOICE COMMUNICATION

OPERATING PROCEDURES

GUIDED MISSILE AIR DEFENSE

SYSTEM AN/TSQ-73

H E A D Q U A R T E R S , D E P A R T M E N T O F T H E A R M Y
1 AUGUST 1978

This copy is a reprint which includes current pages from Changes 1 through 14.

Change
No. 14

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, DC, *5 March 1996*

OPERATOR'S MANUAL: DATA AND VOICE COMMUNICATION OPERATING PROCEDURES

GUIDED MISSILE AIR DEFENSE SYSTEM AN/TSQ-73

Current to Tape Version 34.1

TM 9-1430-652-10-4, 1 August 1978, is changed as follows:

1. This change include coverage for Mobile Subscriber Equipment (MSE) applications.

2. Remove old pages and insert new pages as indicated below. New or changed material is indicated by the applicable change number, i.e., Change 14, at the bottom of the page adjacent to the page number. Revised text will have a vertical bar in the margin next to the changed area. Revised illustrations will have a suffix letter added to the identification number.

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Change
No. 13

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, DC, *10 August 1992*

OPERATOR'S MANUAL: DATA AND VOICE COMMUNICATION OPERATING PROCEDURES

GUIDED MISSILE AIR DEFENSE SYSTEM AN/TSQ-73

Current to Tape Version 34.1

TM 9-1430-652-10-4, 1 August 1978, is changed as follows:

1. Remove old pages and insert new pages as indicated below. New or changed material is indicated by the applicable change number, i.e., Change 13, at the bottom of the page adjacent to the page number. Revised text will have a vertical bar in the margin next to the changed area. Revised illustrations will have a suffix change letter added to the identification number.

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Change ..... 1 ..... 6 Nov 78
Change ..... 2 ..... 15 Jan 79
Change ..... 3... . 15 Aug 79
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Change ..... 5 ..... 22 Feb 83
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TECHNICAL MANUAL
No. 9-1430-652-10-4

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, DC, *1 August 1978*

OPERATOR'S MANUAL: DATA AND VOICE COMMUNICATION OPERATING PROCEDURES
GUIDED MISSILE AIR DEFENSE SYSTEM AN/TSQ-73
Current to Tape Version 34.1

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CHAPTER 10

DATA AND VOICE COMMUNICATION

Section I. INTRODUCTION

10-1. Scope. This volume provides the AN/TSQ-73 operator the information required to establish and maintain data and voice communications during air defense operations. Procedures assume that the requirements presented in TM 9-1430-651-12 (Emplacement and Preparation for Travel) and TM-1430-652-10-3 (Initialization and Operating Procedures) have been complied with, i.e., the system is installed, initialized, and is operational. Control and indicator information for data and voice communication equipment is provided in TM 9-1430-652-10-2. Maintenance and troubleshooting information is provided in TM 9-1430-655-20-7.

10-2. Reporting Equipment Publications Improvements. You can help improve this publication. If you **f**ind any mistakes, or if you know of a way to improve the procedures, please let us know. Mail your letter, DA Form 2028 (Recommended Changes to Publications and Blank Forms) direct to: Commander, U.S. Army Missile Command, ATTN: AMSMI-MMC-LS-LP, Redstone Arsenal, AL 35898-5238. You may also send in your comments electronically to our e-mail address: ls-lp@redstone.emh2.army.mil or by fax 205-842-6546/DSN 788-6546.

Section II. DESCRIPTION AND DATA

10-3. General. The communications equipment (fig.10-1) consists of two independent functional groups, voice communication and data communication equipment, which share the use of the communications patching panel. When used in the Mobile Subscriber Equipment/Air Defense Interface (MSE/ADI) (for ANI/SQ-73 system equipped with MSE/ADI), an Operator Interface (OI) is provided to control voice and data communication links to the MSE network, via the communications patching panel. These equipments are discussed in the following paragraphs.

10-4. Voice Communication Equipment Description.

a. *General.* The voice communication equipment consists of a Voice Communication Central (VCC) and Voice Communication Stations (VCS). Normally four VCSs are utilized in Guided Missile Air Defense System AN/TSQ-73; however, up to 10 stations may be utilized with the addition of printed circuit boards. One VCS is located in each display console and two are wall mounted on the roadside of the shelter above the maintenance bench near the keyboard printer.

b. *VCC Description.* The VCC is located in the communications cabinet assembly on the roadside of the shelter above the power cabinet and provides the switching, signaling, and interfacing capability required to establish voice communications between VCS operators and personnel external to the AN/TSQ-73 system (fig. 10-1). The VCC consists of a control panel assembly and a wired card cage for printed circuit boards. All controls and indicators on the VCC, with the exception of the power switches, are oriented toward fault isolation and maintenance particularly in the area of analog circuitry.

c. *VCS Description.* The VCSs provide the operator access to the voice communications system and consist of an electronics enclosure assembly and a front panel assembly. The electronics enclosure assembly houses four circuit cards and wiring, and the front panel assembly houses the controls and indicators required to provide operators with rapid access to the voice network. Front panel controls are divided into three functional groups consisting of a station control group, command control group, and subscriber select/indicator control group. The primary communications end-instrument for the VCS in the wall mount configuration is a handset with a push-to-talk switch. A jack is also available for the option of using a headset in conjunction with, or instead of, a handset. In the headset configuration, a push-to-talk switch is not provided and requires a continuous hot microphone operation under control of a voice operated squelch. In the handset configuration, the operator can select the option of continuous hot microphone operation or push-to-talk under switch control. The primary communication end-instrument for the console mounted configuration is a headset with a separate push-to-talk foot switch. A second headset jack provides the option of using two headsets per terminal. The operator can select the option of continuous hot microphone or push-to-talk under switch control.

10-5. Data Communication Equipment Description. The data communication equipment consists of a data terminal set which is made up of a control panel assembly, lower modem assembly, upper modem assembly, and card cage assembly. All parts of the data terminal set are located in equipment rack 2. Functionally, the data terminal set is divided into oscillator common timing, modems, and a control panel. The oscillator common timing circuitry is located in the card cage assembly. Twenty modems are used in a battalion configuration and 12 are used in a brigade configuration. Wiring and space are provided for a total of 32 modems with the addition of circuit cards. Each modem consists of eight circuit cards including a modem control panel for individual channel control of power, format, bit rate, and attenuation. Six power supply modules are also provided with the data terminal set for supplying power to the modems in a battalion configuration and four are provided in a brigade configuration. The data terminal set provides for the exchange of digital data between the Automatic Data Processor (ADP) and up to 20 battalion configuration remote stations or 12 brigade configuration remote stations by using multiple bit rates and modulation techniques. With expansion capabilities, up to 32 remote stations may be connected. The data terminal set operates in conjunction with the communications patching panel which is shared with the voice communication equipment to provide monitoring and patching capabilities for maintenance and test functions.

10-5.1. Operator Interface Description. For AN/TSQ-73 system equipped with MSE/ADI, the OI permits the operator to establish up to nine communication channels to control the transfer of Frequency Shift Keying (FSK) modem data and analog voice signals to other subscriber stations over the MSE network. The OI is located inside the AN/TSQ-73 shelter on the roadside wall above the maintenance bench. The unit contains a power on/off switch and associated indicator, a 16-character keypad, and a 32-character display (16 columns by 2 rows). The keypad provides channel configuration, channel selection, Built-in-Test (BIT), and subscriber dialing. The display provides visual status of the channel configuration for all nine channels (voice or data), the channel and subscriber numbers

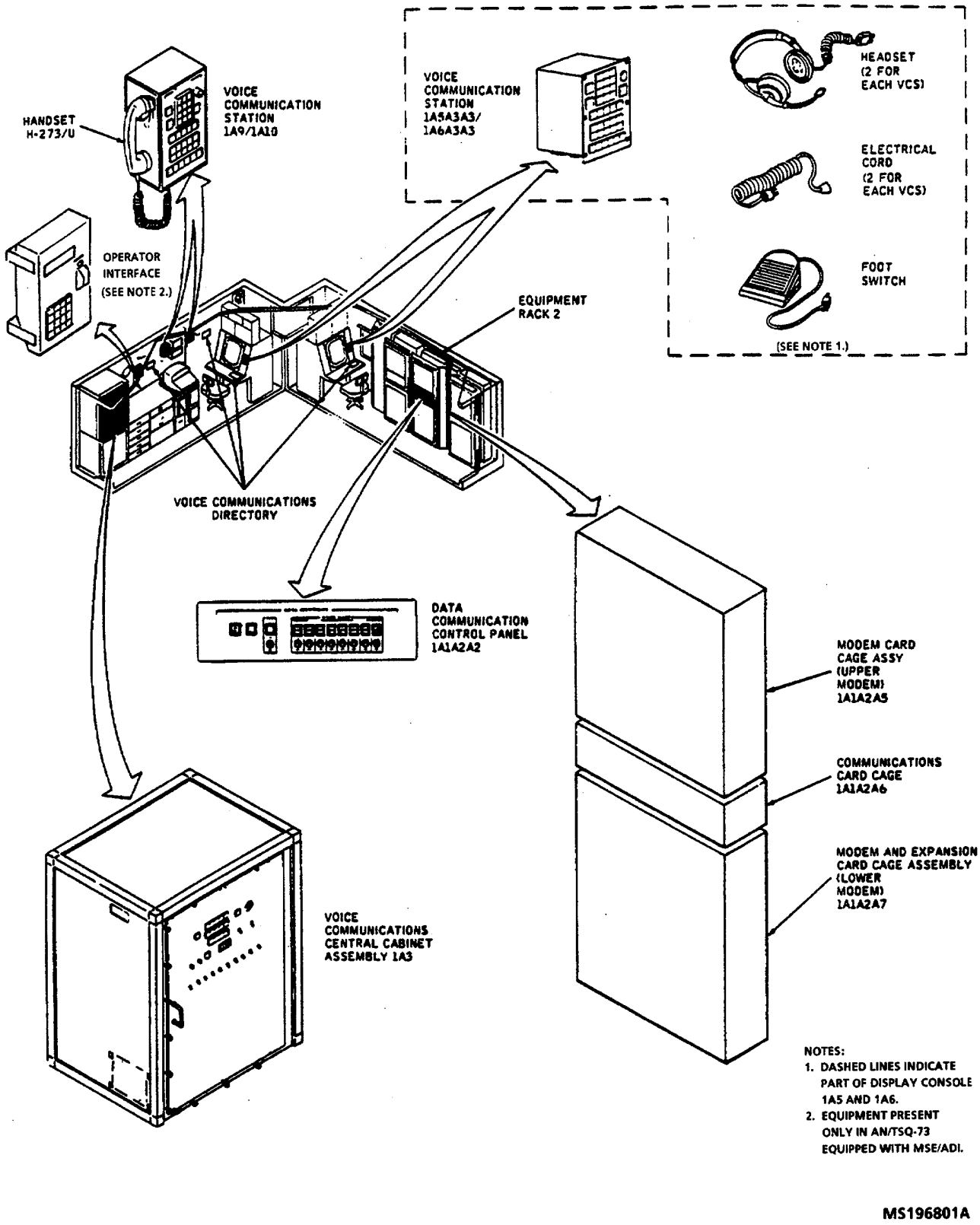


Figure 10-1. Communications Equipment, Major Units and Assemblies (Sheet 1 of 2)

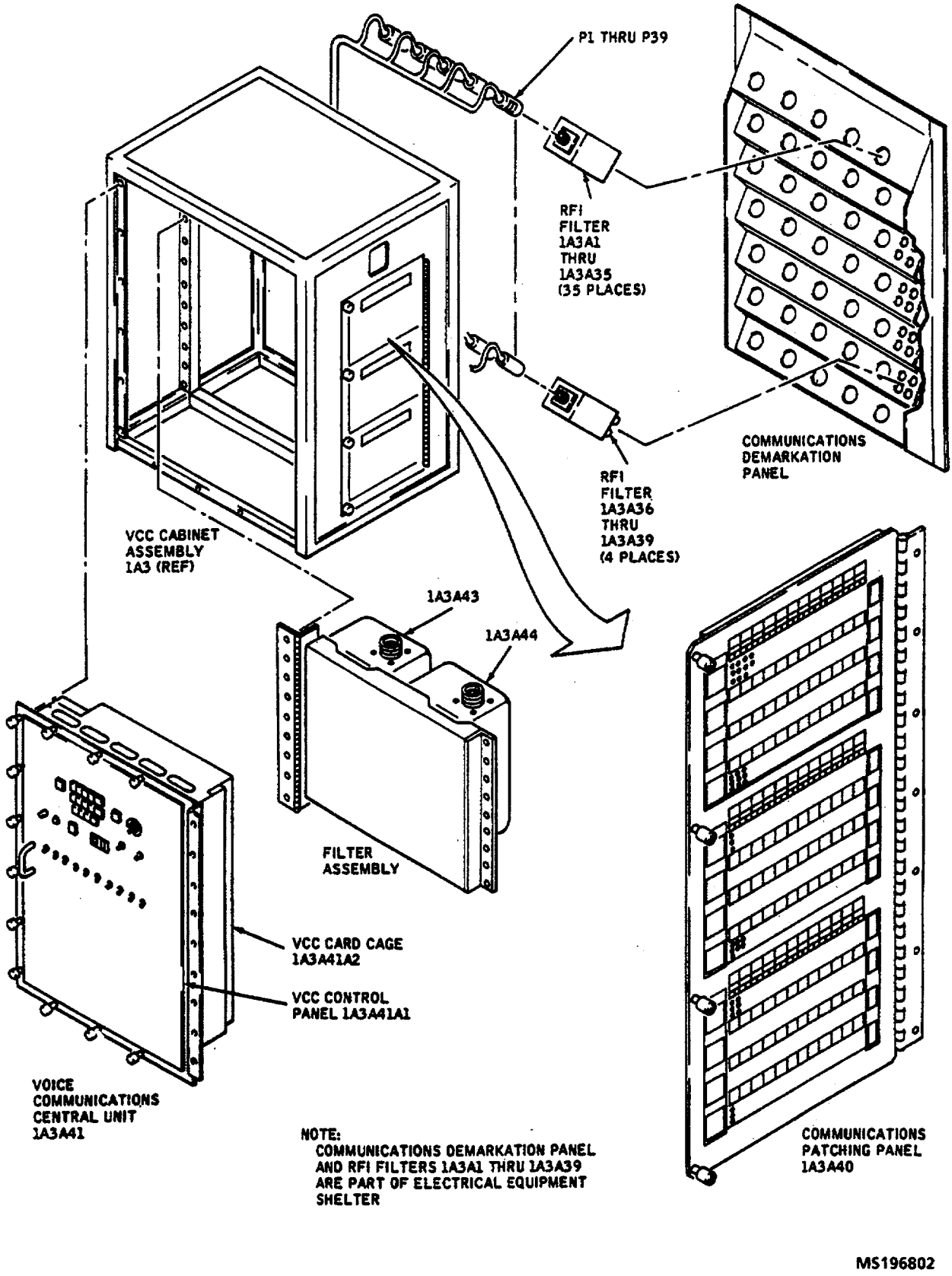


Figure 10-1. Communications Equipment, Major Units and Assemblies (Sheet 2 of 2)

selected for a specific call, traffic status, and error messages.

10 6. Voice Communication Performance Characteristics.

a. *Four-Wire Line Audio Input/Output Impedance.* 600 (±60) ohms balanced to ground over the frequency range of 300 to 3500 Hz.

b. *Four-Wire Line Signaling.*

(1) *Ring-in.* 1600 (±30) Hz at a minimum level of -20 dbm and a minimum duration of 1.0 second.
(2) *Ring-out.* 1600 (±30) Hz at a level of-8 (±4) dbm for 1.25 ±0.26) seconds.

c. *Two-Wire Line Audio Input/Output Impedance.* 600 (±120) ohms over the frequency range of 300 to 3500 Hz.

d. *Ring Impedance.* 4000 ohms at a frequency of 20 Hz.

e. *Ring-Down Signaling.*

(1) *Ring-out.* 20 (±6) Hz for a minimum of 1.0 second.
(2) *Ring-in.* 20 (±5) Hz at a level of 12 vrms minimum.

f. *VCC Power Requirements.* ±135 vdc (normal and emergency power).

g. *Audio Channel Insertion Loss.* 0 (±3) db at 1 kHz.

h. *Audio Channel Frequency Response.* Within ±3 db with respect to the attenuation at 1000 Hz for frequencies between 300 and 3500 db.

i. *Audio Channel Crosstalk Loss.* Greater than 50 db over the frequency range of 300 to 3500 Hz.

j. *Audio Channel Limiting.* 0 for signals of ±3.0 dbm or less.

k. *VCS Power Requirements*

(1) ± 15 vdc at 0.2 ampere.
(2) -15 vdc at 0.2 ampere.
(3) ±5 vdc at 3.0 amperes (logic only).
(4) ±5 vdc at 1.8 amperes (lamp power).

10-7. Data Communication Performance Characteristics.

a. *ADP Interface Signals*

(1) *Information lines (bidirectional).* Nine lines for data signals, address selection and device control with the ninth line (line 8) containing the byte odd parity bit. The data terminal set modem checks nine-line parity for odd parity in transmitted data and generates parity in received data.
(2) *Request lines (to ADP).* Two request lines (modulator and demodulator) for each modem.
(3) *Enable line (from ADP).* Used in conjunction with information lines to perform address selection.
(4) *Command line (from ADP).* Used in conjunction with information lines to perform address selection.
(5) *Indicator line (to ADP).* Acknowledge receipt of a special command and initiate a device interrupt.
(6) *Logic levels*
(a) Logic 1: 0 (±0.5)v.
(b) Logic 0: 4.5 (±1.0)v or open.

b. *Power Requirements.* ±135 vdc at 1190 watts maximum. (Emergency mode ±135 vdc at 250 watts maximum.)

c. *Modem Input Signal Level.* 0 to -40 dbm.

d. *Modem Output Signal Level.* -2 (± 2) dbm.

e. *Modem Bit Rate.* Selectable for 600, 750, 1200, or 1500 bps.

f. *Modem Modulation Frequency*
(1) 600 bps = 1300/1700 Hz with a center frequency of 1500 Hz.
(2) 750 bps = 1126/1875 Hz\ with a center frequency of 1500 Hz.
(3) 1200 bps = 1300/2100 Hz with a center frequency of 1700 Hz.
(4) 1500 bps = 1125/2625 Hz with a center frequency of 1876 Hz.

g. *Modem Channel Bandwidth.* 1200 bps and up is 4 kHz.

10-7.1. MSE/ADI Performance Characteristics. (For AN/TSQ-73 system equipped with MSE/ADI.)

a. *Analog-to-Digital Converter (ADC)*

(1) Signaling characteristics
(a) Insertion loss: 0 ±3 db at 1 kHz for audio channels.
(b) Crosstalk isolation: 40 db between transmit and receive pairs of a channel over the frequency range of 0.3 to 3.0 kHz.
(2) Analog signaling characteristics
(a) Synchronous full duplex voice or data (FSK).
(b) FSK frequencies: 1300 Hz = 1 (Mark).
2100 Hz = 0 (Space).
(c) FSK frequency tolerance: ±5%
(d) Terminal impedance: 600 ohms.
(3) Digital signaling characteristics
(a) Synchronous full duplex conditioned diphase at 16 kHz ±0.1%.

(b) Transmitted signal: 3V p-p ±0.3%.
(c) Received signal: 150 mV relative to common mode voltage in a noise free environment.
(d) Bit error rate: one bit per million.
(e) Terminal impedance: 125 ohms.

(4) Power requirements
(a) Input voltages: 115 vac.
(b) Input frequencies: 60, 50, 400 Hz
(c) Input current: 0.6 amp (max).

b. *Operator Interface*

(1) Signal characteristics and format
(a) Transmitted signals: RS-422A at 1200 b/s (asynchronous).
(b) Received signals: RS-422A at 1200 b/s (asynchronous).
(c) Character format: 1 Start Bit
8 Data Bits
1 Stop Bit

(2) Power requirements
(a) Input voltage: 115 vac.
(b) Input frequencies: 60, 50, 400 Hz.
(c) Input current: 1.5 amp (max).

c. Secure Line Termination Unit (SLTU)

(1) Performance characteristics
(a) Modulation: Dipulse.
Diphase.
(b) Data rate: 16 kb/s.
32 kb/s.
(c) Group rate:

Group Rate	Number of Channels/Channel Rate
256 kHz	16/16 kHz (one channel required for synchronization)

(2) Power requirements - line termination unit (LTU)
(a) DC power input: 19 to 33 volts.
(b) AC power input: 103.5 to 253 volts, 47.5 to 63 Hz, or 103.5 to 126.5 volts, 360 to 440 Hz.

(3) Power requirements - trunk encryption device (TED)
(a) Input voltage: 19 to 55 vdc (28 to 48 vdc nominal).
(b) Power consumption: 28 watts (max).

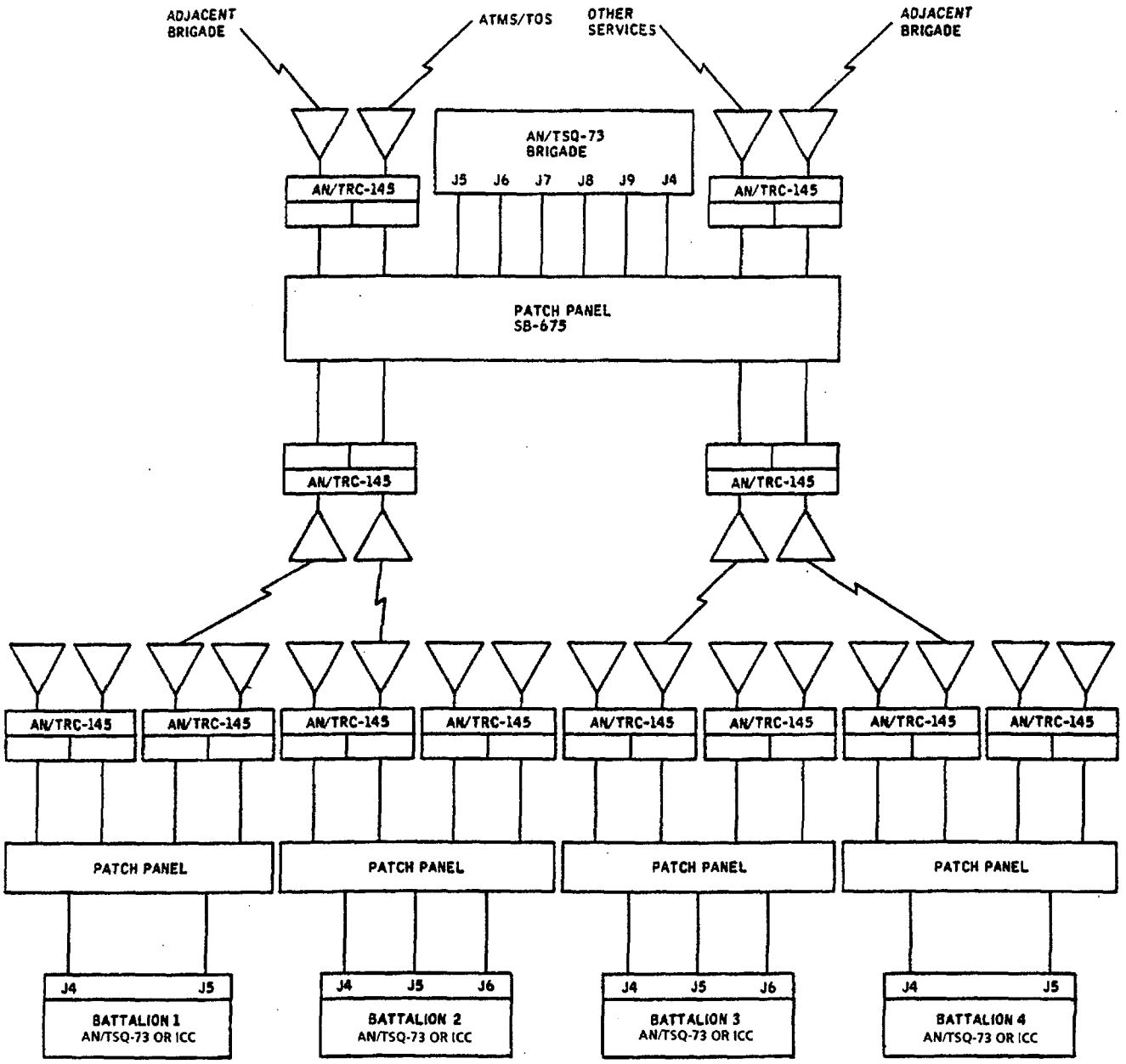
(4) Power requirements - universal power supply (UPS)
(a) DC power input: 28 volts.
(b) AC power input: 1151230 volts, 47.5 to 63 Hz, or 115 volts at 400 Hz.

10-8. Communications System Interface. The following paragraphs describe interface requirements for voice and data communications. Typical communications configurations are shown in figures 10-2 and 10-3 for standard applications. For AN/TSQ-73 system equipped with MSE/ADI, communications configurations for the MSE/ADI are shown in figure 10-3.1. A typical site cabling plan for both the standard and MSE/ADI configurations is provided in figure 10-4 and the overall communications equipment interconnection diagram is shown in figure 10-5.

a. *Voice Communications Interface.* The AN/TSQ-73 voice communication system provides flexible and rapid access voice communications to system operations. The configuration can accommodate the communication requirements of four VCS operators. Each VCS can access up to 60 external net subscribers, five lines to a local communications section and a six-line intercom for operator to operator and within the consolidated area around the system (generator, guard posts, command posts, etc.) communications. The VCS is the operator's interface with the communications system and may be located within the shelter as a wall mounted station or as an integral part of a display console. The system is partitioned so that is can be expanded from 4 VCSs to 10; additionally, the net subscribers can be increased from 60 to 96 merely by the addition of printed circuit cards for which connectors and wiring are included.

(1*) External interface.* External audio (and data) lines enter the shelter via the communications demarkation panel. Connectors J 1 thru J32 each contain three voice and one data line (4-wire circuits) from the external communications facilities. External digital communications facilities are digital data terminal equipment for communicating with Tactical Operations System (TOS) and other services and comparable equipment when communicating with TAG/TADS, ATDL-1, FUs, and other AN/TSQ-73s. Voice communications interface can be via currently used modes of traffic, such as wire, radio, or integration methods which use both modes. Connectors J34 and J35 contain five voice lines (4-wire circuits, 1600 Hz signaling). Terminals E1 - thru E16 handle the external 2-wire intercom circuits. Up to eight field phones (TA-312) or four equivalent 2-wire loads can be tied on the terminals.

(2) *Voice Comm Central (VCC) interface.* The external inputs to the comm demarkation panel (J1)

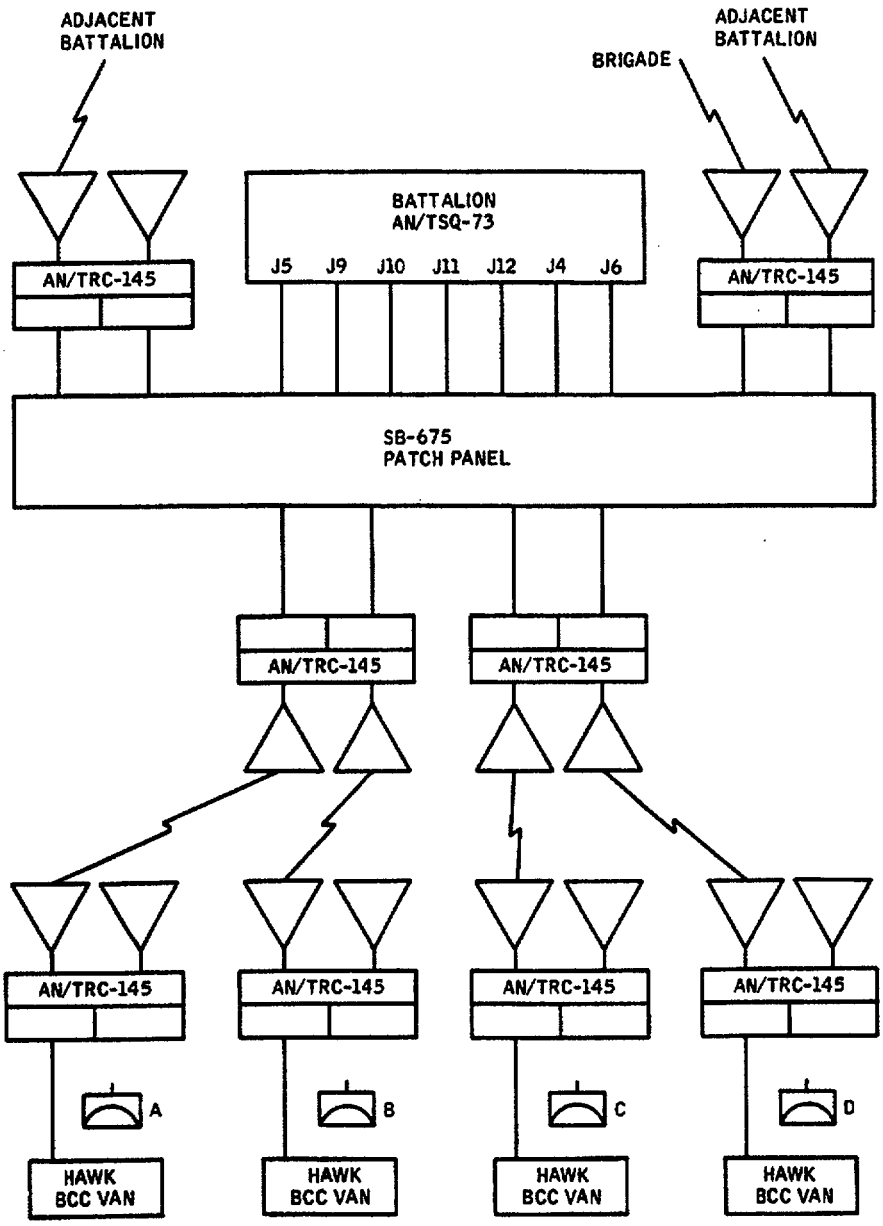


NOTES:

1. FROM BRIGADE TO EACH BATTALION:
   1 ADL CIRCUIT
   3 VOICE NET CIRCUITS
2. ALL CIRCUITS 4W.
3. VOICE CIRCUITS 1600 HZ SIGNALING. NO SIGNALING CONVERSION REQUIRED IN AN/TRC-145 CV-1548.
4. LOCAL COMM 4W 1600 HZ MAY BE USED FROM BRIGADE TO BATTALION AN/TSQ-73.
5. AT BATTALION: J4 TO BRIGADE, J5 AND J6 TO ADJACENT BATTALIONS.
6. AT BRIGADE: J4 AND J5 TO ADJACENT BRIGADE, J6 THRU J9 TO BATTALIONS.

MS196718B

Figure 10-2. Typical Brigade to Battalion Configuration



NOTES:

1. FROM BATTALION TO EACH BATTERY
   1 ADL CIRCUIT
   3 VOICE NET CIRCUITS
2. ADL CIRCUIT IS 4 WIRE, NO SIGNALING REQUIRED.
3. AT BATTALION J4 TO BRIGADE, J5 AND J6 TO ADJACENT BATTALION, J9 THRU J12 TO BATTERIES.

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Figure 10-3. Typical Battalion to Battery Configuration

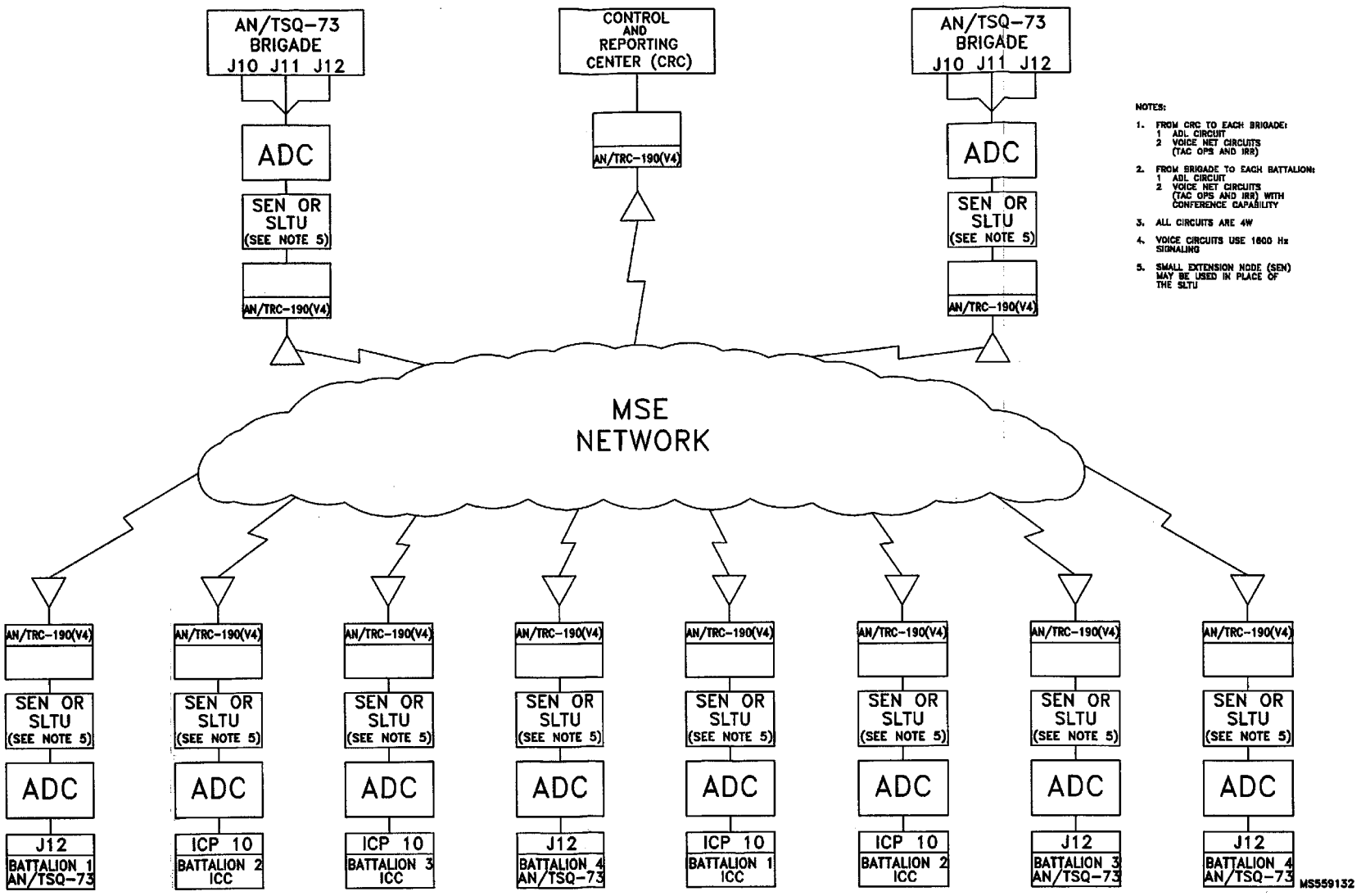


Figure 10.3.1 Typical MSE/ADI CRC to Brigade and Brigade to Battalion Configuration

thru J35 and E1 thru E16) are wired directly to the patch panel. From here the audio lines are channeled through to specific connectors on the VCC. Two connectors, each containing sixteen 4-wire circuits, are provided for each of the three nets (operation-control J3 and J4, maintenance-test J5 and J6, and command administrative J7 and J8). A seventh connector (J11) contains the five 4-wire local signal section lines, and four lines for external 2-wire interior subscriber. There are 101 4-wire lines terminating at the VCC; additionally, there are four 2-wire external subscriber lines. The 4-wire lines of each net are numbered 1 thru 32 to correspond with the numbering of the connector on the communication demarkation panel on which they enter and leave the shelter. These numbers serve as subscriber addresses and are subsequently used in operator dialing procedures to gain access to selected lines. For example, connector J7 on the demarkation panel contains the line 7 audio of each net, and 07 is the number dialed by an operator wishing to ring line 7 on a selected net.

b. *Automatic Data Link (ADL) Function*. The ADL function generates digital data link messages to be transmitted and processes digital data link messages which are received. The ADL function initiates message transmission and enables message reception through device interfaces with the Data Terminal Set (DTS). The ADL function provides digital communications capabilities using the ATDL-1 and TADIL B message standards and conventions.

(1) The AN/TSQ-73 battalion system can process, store, and exchange ADL information with one brigade system, two adjacent battalion systems, a Tactical Operations System (TOS), an Air Traffic Management System (ATMS), and two Remote Radar systems. In addition, designated battalion system may, by activating their TADIL B links, function as Reporting Units (RUs) and, using the master battalion command, a battalion can provide command and coordination to other battalions.

(2) The brigade system exchanges information with two adjacent brigade systems, six battalion systems, or PATRIOT ICC, a TOS, an ATMS, and up to eight other-service systems (TADIL B links).

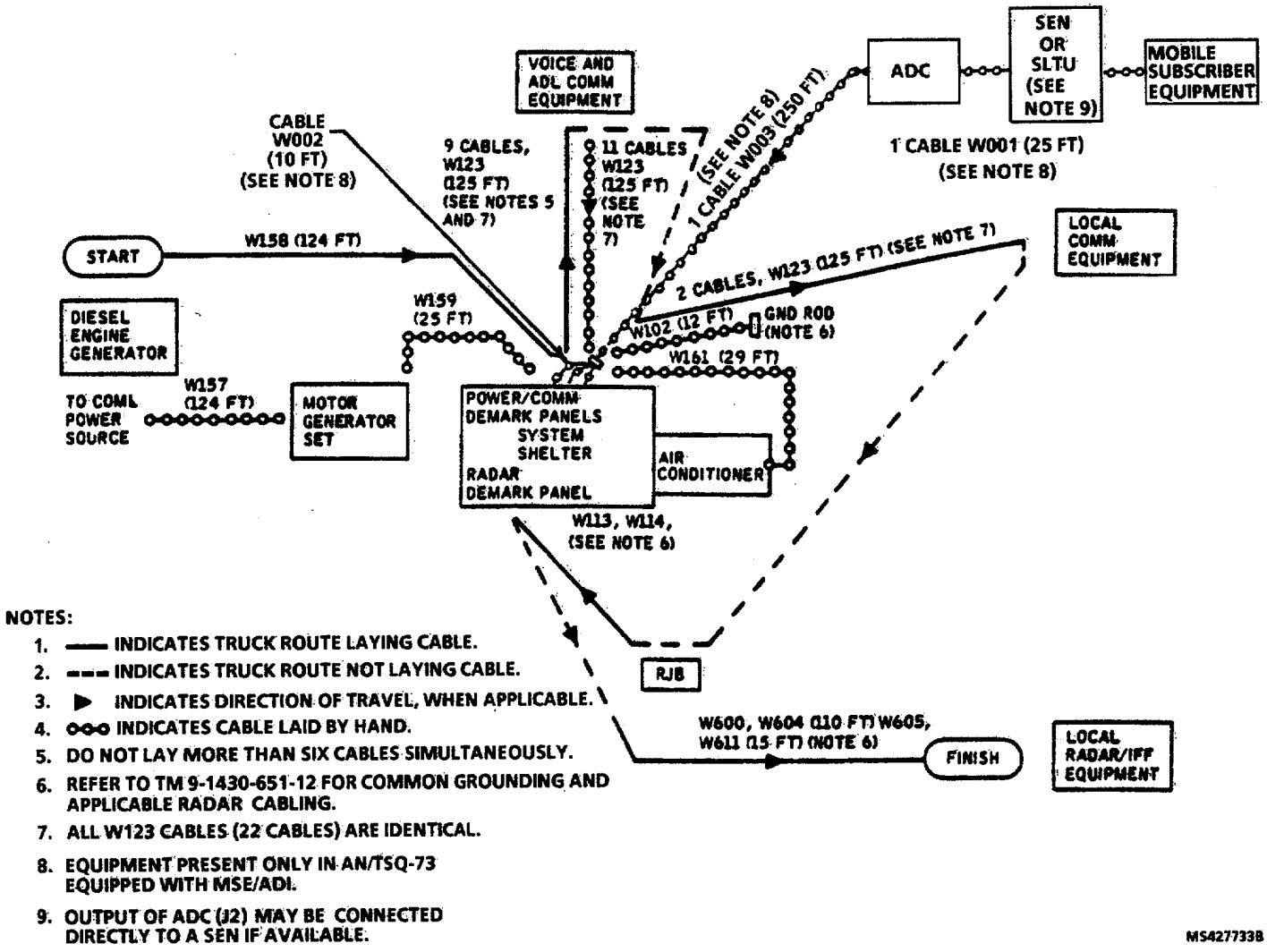
(3) Communications with all Army systems uses the ATDL-1 message standards and conventions. Communications with systems of other services use the TADIL B message standards and conventions. These links are called remote sources data links. The battalion system communicates with HAWK Fire Units (FUs) using the ATDL-1 message standards and conventions.

(4) The Executive function inputs timed activation requests to the ADL function for test message generation and for link minimum cycle time measurement. The test message delta time is constant and equal for all ATDL-1 and TADIL B data links in operation, and the Executive function automatically resets the test message time interval for activation when the previous interval has elapsed. The minimum cycle time value is constant and equal, but independent for all ATDL-1 and TADIL B data links, and is reset only by interface between the ADL function and the Executive function. The delta time constant for generation of a test message for ATDL-1 and TADIL B links is 10 seconds.

(5) The Tracking function requests the ADL function to transmit specific message(s) on specific tracks when the Tracking function determines that the conditions have been met for transmission of the message(s). The transmission requests indicate whether the transmission is priority or not priority and contains all information required by the ADL function to initiate formation and transmission of the message(s). The Tracking function interfaces with the TEWA/TEBA function to initiate operation of the threat evaluation portion of TEWA/TEBA, to activate the Weapon/Battalion Assignment portion of TEWA/TEBA, and to determine the highest priority unassigned threat in the system.

(6) The Data Processing (DP) function requests the ADL function to transmit specific message(s) on specific tracks. The transmission requests indicate whether the transmission is priority or not priority and contains all information required by the ADL function to initiate formation and transmission of the message(s). Hold Fire messages are requested as a result of friendly protection checks. Cease Fire messages are requested when an engaged track enters a Hold Zone or an engaged unknown track enters a Tight Zone and no action command was received from higher echelon.

(7) The Threat Evaluation and Weapons Assign (TEWA) function requests the engagement of a particular air track by a particular non-PATRIOT FU, with a recommended method of fire if the FU is HAWK, when the TEWA function determines that the track is eligible for TEWA-initiated engagement. The Threat Evaluation and Battalion Assign (TEBA) function requests a particular battalion or PATRIOT ICC to direct the engagement of a particular air track when the TEBA function determines that the track is eligible for TEBA-initiated engagement. The master battalion uses a combination of TEBA and TEWA to select the best FU to engage a hostile track. One or all battalions may enter the CC 143 command and restructure their communication links in accordance with the SOP. Table 10-1 describes the three types of TEBA processing for the brigade, TEWA processing for the battalion, and TEWA/TEBA processing for the master battalion.



NOTES:

1. —— INDICATES TRUCK ROUTE LAYING CABLE.
2. - - - INDICATES TRUCK ROUTE NOT LAYING CABLE.
3. ▶ INDICATES DIRECTION OF TRAVEL, WHEN APPLICABLE.
4. ooo INDICATES CABLE LAID BY HAND.
5. DO NOT LAY MORE THAN SIX CABLES SIMULTANEOUSLY.
6. REFER TO TM 9-1430-651-12 FOR COMMON GROUNDING AND APPLICABLE RADAR CABLING.
7. ALL W123 CABLES (22 CABLES) ARE IDENTICAL.
8. EQUIPMENT PRESENT ONLY IN AN/TSQ-73 EQUIPPED WITH MSE/ADI.
9. OUTPUT OF ADC (J2) MAY BE CONNECTED DIRECTLY TO A SEN IF AVAILABLE.

Figure 10-4. Typical Site Cabling Plan

Table 10-1. TEWA/TEBA Processing

System configuration	Periodic processing	Hooked track processing	ADL engage command receipt processing
Brigade	Manual Assign: TEBA called once every 10 seconds. Threat priority queue (TPQ) rebuilt and highest unassigned threat determined. Auto Assign: TEBA called once every 10 seconds. TPQ rebuilt. All TEBA PADS fire units are checked for eligibility for assignment to all tracks on TPQ. The system will consider as ineligible, for the following two WAS cycles, all fire units reported on up to two data links which have rejected or ignored a previous engagement command on the track. Tracks in Hold Zone are not eligible for auto assignment. Engage command sent to directly tied unit reporting selected fire unit.	All TEBA PADS FUs in central fire are examined for eligibility for engagement to hooked track. The system will consider as ineligible, for the following two WAS cycles, all fire units reported on up to two data links which have rejected or ignored a previous engagement command on the track. No recommendation made if track is in Hold zone, or unknown in a Tight Zone. Up to two best FUs are selected for recommendations, if possible, and the unit reporting the FUs is stored for display.	*Manual Assign*: Engage alert is posted at console. Operator takes appropriate steps. *Auto Assign*: All TEBA PADS FUs in central file are checked for eligibility for assignment to track. The system will consider as ineligible, for the following two WAS cycles, all fire units reported on up to two data links which have rejected or ignored a previous engagement command on the track. If an assignment is possible, an Engage command is transmitted to the site reporting the selected FU. An automatic WILCO is returned to the source of the ADL Engage command. No automatic retransmission is made, and an operator alert is posted if any of the following conditions exist: a. The received ADL command is Cover or Investigate/Assign. b. The track is in a Hold Zone, or Unknown in a Tight Zone. c. The engagement is outside the limits established by the operator (speed, altitude, range, threat priority/missile count). d. A Hold Fire condition exists on the track.

Table 10-1. TEWA/TEBA Processing
-Continued

System configuration	Periodic processing	Hooked track processing	ADL engage command receipt processing
Battalion	*Manual Assign*: TEWA called once every radar scan or once every other scan if the scan time <6 seconds. TPQ rebuilt and the highest unassigned threat determined. *Auto Assign*: TEWA called once every radar scan or once every other scan if the scan time <6 seconds. TPQ rebuilt. All local TEWA PADS FUs are checked for eligibility for assignment to all tracks on the TPQ. The system will consider as ineligible, for the following two WAS cycles, all fire units reported on up to two data links which have rejected or ignored a previous engagement command on the track. Tracks in a Hold Zone are not eligible for auto assignment. Assignments are made to one or two FUs, where possible, and Engage/Engage ripple commands transmitted.	All local subordinate TEWA PADS FUs are examined for eligibility for engagement to hooked track. The system will consider as ineligible, for the following two WAS cycles, all fire units reported on up to two data links which have rejected or ignored a previous engagement command on the track. No recommendation made if track is in Hold Zone, or an Unknown in a Tight Zone. Primary and secondary recommendations, if possible, are stored for display with recommended method of fire.	*Manual Assign*: Engage alert is posted at console. Operator takes appropriate steps. *Auto Assign*: All local subordinate TEWA PADS FUs are checked for eligibility for assignment to track. The system will consider as ineligible, for the following two WAS cycles, all fire units reported on up to two data links which have rejected or ignored a previous engagement command on the track. If an assignment is possible, an Engage/Engage ripple command is transmitted to the selected FUs. An automatic WILCO is returned to the source of the ADL Engage Command. No automatic retransmission is made and an operator alert is posted if any of the following conditions exist. a. The received ADL command is Cover or Investigage/Assign. b. The track is in a Hold Zone, or Unknown in a Tight Zone. c. The engagement is outside the limits established by the operator (speed, altitude, range, threat priority/missile count). d. A Hold Fire condition exists on the track.

Table 10-1. TEWA/TEBA Processing
-Continued

System configuration	Periodic processing	Hooked track processing	ADL engage command receipt processing
Master battalion	*Manual Assign*: TEBA called once every radar scan, or once every other scan if scan time <6 seconds. TPQ rebuilt and highest unassigned threat determined. *Auto Assign*: TEBA called once every other scan if scan time <6 seconds. TPQ rebuilt and highest unassigned threat determined. All TEBA PADS fire units are checked for eligibility for assignment to all tracks on the TPQ. The system will consider as ineligible, for the following two WAS cycles, all fire units reported on up to two data links which have rejected or ignored a previous engagement command on the track. Tracks in a Hold zone are not eligible for auto assignment. For TPQ tracks not assigned to a TEBA PADS unit, all TEWA PADS FUs are checked for eligibility for assignment to theses tracks. Assignments are made to sites reporting remote FUs, or to local fire units, where possible, and Engage/Engage ripple commands are transmitted.	All TEBA PADS FUs are examined for eligibility for engagement to hooked track. If no recommendation can be made, local TEWA PADS FUs are examined for eligibility. The system will consider as in eligible, for the following two WAS cycles, all fire units reported on up to two data links which have rejected or ignored a previous engagement command on the track. No recommendation made if track is in Hold zone, or unknown in a Tight zone. Primary and secondary recommendations are stored for display with recommended method of fire. If local fire unit selected, FU address is stored. If remote FU is selected, address of site reporting FU is stored.	*Manual Assign:* Engage alert is posted at console. Operator takes appropriate steps. *Auto Assign:* All TEBA PADS FUs are checked for eligibility for assignment to track. The system will consider as ineligible, for the following two WAS cycles, all fire units reported on up to two data links which have rejected or ignored a previous engagement command on the track. If an assignment cannot be found, local TEWA PADS FUs are checked for eligibility. If an assignment is possible, an Engage command is transmitted to the local selected FU, or to the address reporting the selected remote FU. An automatic WILCO is returned to the source of the ADL Engage command. No automatic retransmission is made and an operator alert is posted if any of the following conditions exist: a. The received ADL command is Cover or Investigate/Assign. b. The Track is in a Hold zone, or Unknown in a Tight zone. c. The engagement is outside the limits established by the operator (speed, altitude, range, threat priority/missile count). d. A Hold Fire condition exists on the track.

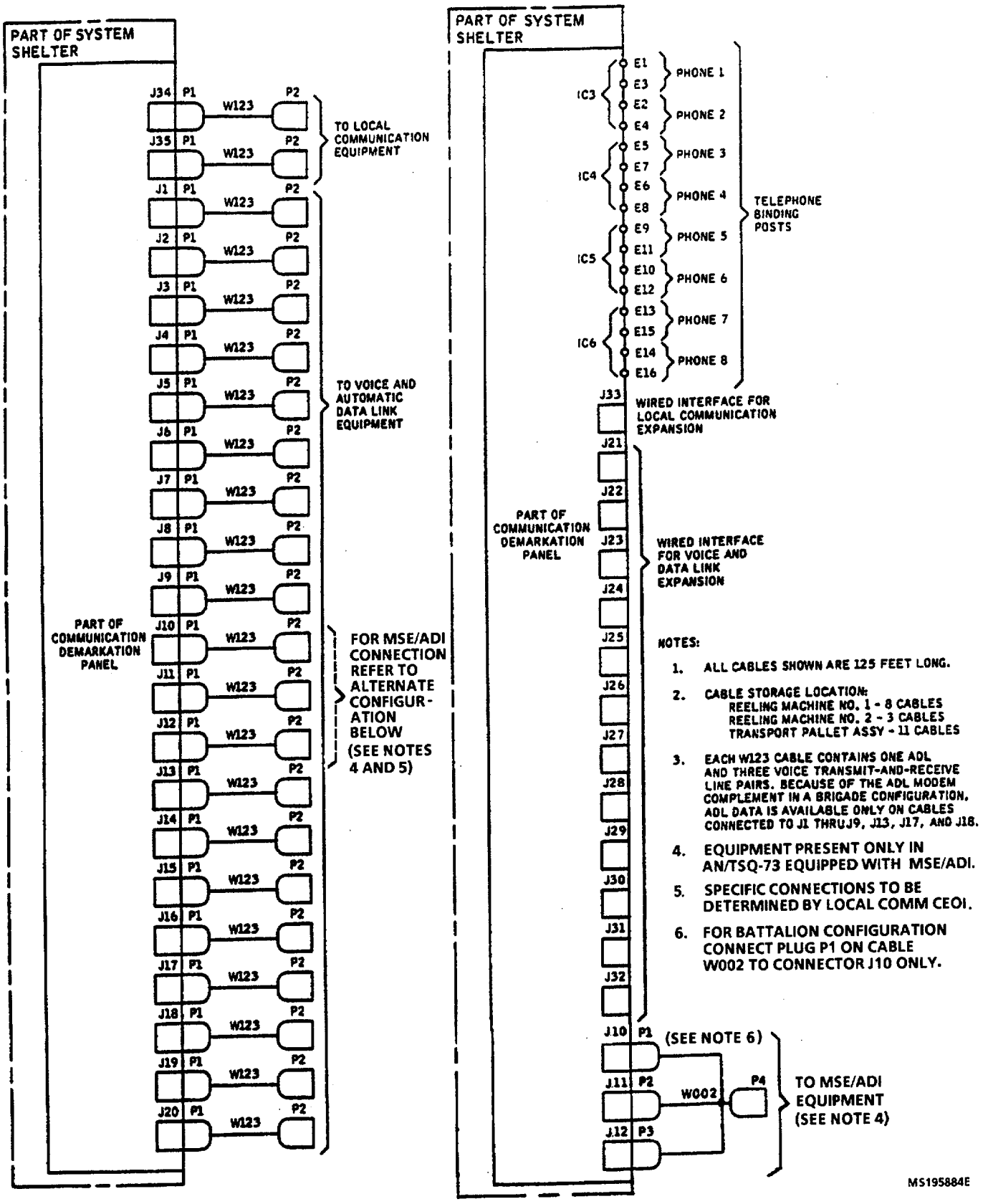


Figure 10-5. Communications Equipment Interconnection Diagram.

(8) The ADL function uses the following system parameter data:

(a) Data link filter criteria, including height (over, under), circular area or sector (inside or outside), and identity (equal, not equal).

NOTE

All data sent to HAWK ATDL-1 FUs must be within a 120-kilometer range filter that is a nonvariable program parameter.

(b) Open/noisy line and parity error threshold criteria.

(c) Local site geographic position.

(d) Data Link Reference Point (DLRP) geographic position.

(e) Time-of-day.

(9) The ADL function uses data from the track file, jam strobe file, fire unit file, and site file as required for processing, formatting, and controlling message content and transmission.

(10) The ADL function performs the generation processing, and I/O control of digital data link messages for the AN/TSQ-73 system. The data content of received messages is processed, stored, and integrated with the data base.

(11) The ADL function interfaces with other DP functions when required as determined by the message content being processed. The DP function may be requested to perform display data updates. The ADL function interfaces with the Tracking function for performing track update on non-auto-tracked remote sources tracks. The ADL function interfaces with the Miscellaneous function for coordinate transformation or conversion and with the Executive function for bookkeeping operations and interval timing requests. The Threat Evaluation function requests the ADL function to transmit hold fire and cease fire messages. The ADL function has unique requirements for remote sources data links.

(12) Input message processing guards against a loss of data. All received messages are processed. ATDL-1 message checksums and TADIL B message parity is verified on received messages. ATDL-1 message checksums and TADIL B message parity is generated for transmitted messages. The ADL function performs open/noisy line and parity error communication status checks. A link is declared open/noisy when "N" or more of the last 32 messages received had an invalid checksum or parity. A link is declared in parity error status when 'N" or more of the last 512 messages had an invalid checksum or parity. Since test messages are used in ATDL-1 and TADIL B, the ADL function interfaces with the On-Line Fault Detection function, via the Equipment Status Table, for performing missed message status checks. A link will be considered in a missed message status if a valid test message was not received within the last 60 seconds. A valid test message is one that has a valid checksum, parity, R counter, and T counter, and whose validity indicator is zero.

(13) Remote sources data link processing (ATDL-1 and TADIL B) consists of processing and generating all remote source messages. All air surveillance messages are subject to data link transmission zone tests. Messages not meeting any one of the operator-established transmission zone parameters (except SPI and Intelligence) are inhibited from further processing (unless preceded by a track alert message). Transmission zone parameters (except SPI and Intelligence) apply to both transmission and receipt of messages on both link types. SPI and intelligence parameters apply only to transmission/forwarding; receipt and display of these messages always occurs. The system allows for data base retransmission of received messages on remote sources data links. Command messages may also be retransmitted over selected remote links (brigade or master battalion only). Selection is on a per link basis as specified in the address portion of the message. Terminate commands received from a remote source are retransmitted automatically to all ATDL-1 interfaces except the source. An alert is displayed for the operator to inform him that the command has been retransmitted. When the AUTO ADL ENGAGE command processing is enabled, the ADL function responds automatically to a remote source command to engage a specified track. The ADL function requests the TEWAITEBA function to determine the recommended subordinate unit (local fire unit or Battalion) to conduct the engagement of the track. Transmission of messages occurs on a priority (as soon as possible) basis or on a normal (once per transmission cycle) basis as required. Test messages are sent as the highest priority message. All priority messages for a given link are transmitted before any normal messages are transmitted on that link. Remote sources data link processing interfaces with the DP function for generation of the following operator alerts:

(a) Track engagement order received.

(b) State of alert or weapon control condition received.

(c) Track engagement order receipt/compliance received.

(d) A terminate command has been automatically retransmitted.

(e) No response made to track engagement order or engagement order receipt/compliance message.

(f) Track information management message requiring operator action received.

(g) Differing track identification information received.

(14) The ADL function outputs requests to the DP function to update display data affected by ADL processing. The data includes FU status; special points position data; track position, velocity, and other amplifying data; jam strobe data; alert status; weapon control order; missile count; Intelligence/EW data; and operator alerts. The ADL function requests track update processing to be performed by the Tracking function and interfaces with the Miscellaneous function to request stereographic-to-stereographic coordinate transformations, as well as conversion operations. The ADL function interfaces with the Executive function for requesting bookkeeping and interval timing operations and with the On-Line Fault Detection function in performing missed message status checks.

(15) When the AUTO ADL ENGAGE command processing is enabled, the ADL function responds automatically to a remote source command to engage a specified track. The ADL function requests the TEWA/TEBA function to determine the recommended subordinate unit (local fire unit or Battalion) to conduct the engagement of the track. When the Intelligence/EW data, TEVAL and ID modes are enabled, the ADL function automatically uses such information to determine the target identity. The ADL/TEWA functions determine the threat priority.

(16) When a main power failure occurs, the IBDL supplies backup power to the CMOS memories in the ADP (permitting data retention for up to 30 minutes). The IBDL draws power from the emergency power battery equipment which is actuated automatically during power failure.

c. *MSE/ADI.* For AN/TSQ-73 system equipped with MSE/ADI, the MSE/ADI requirements for the voice and data communications systems is similar to those described in previous paragraphs a and b, with the following exceptions:

(1) Based on the local COMM communications electronic operating instructions (CEOI), any three connectors on the communications demarkation panel (e.g., J10 thru J12) can be assigned to the MSE/ADI function. Signal cables (W001 thru W003) link the three connectors to remotely located ADI and SLTU interface equipment (fig. 10-4).

(2) Two of the three connectors (J10 and J11) each contain two voice lines and one data line (4-wire circuits) and connector J10 also carries 4-wire control/status signals between the shelter OI and the remote MSE/ADI. Connector J12 contains three additional data lines. The OI is connected to J10 through the maintenance-test jacks on the communications patching panel.

(3) In a Brigade configuration the MSE/ADI provides five data circuits (one to Control and Reporting Center (CRC) and one to each of four battalions) and four voice circuits (two to CRC and two to all battalions). If all five data channels are not needed, some may be reconfigured to voice channels.

(4) In a Battalion configuration the MSE/ADI provides one data circuit and two voice circuits (all to brigade).

Section III. GENERAL COMMUNICATIONS REFERENCE DATA

10-9. General. This section provides general operating reference data for use with both data and voice communications equipment. Figures 10-6 thru 10-9 are used when determining links to be used or that are in use. For AN/TSQ-73 system equipped with MSE/ADI, figure 10-6.1 is used when determining MSE/ADI links to be used (specific connections to be determined by local comm CEOI) or that are in use. These illustrations supplement the operating procedures (Sections IV and V). Figures 10-10 thru 10-12.2 aid the operator in connecting various links and define signals for a variety of situations. For AN/TSQ-73 system equipped with MSE/ADI, figures 10-10.1 and 10-10.2 aid the operator in connecting various links and defines signals for a variety of MSE/ADI configurations.

10-9.1. Typical ADA Brigade-Battalion-Battery Communications System. Figure 10-12.1 is provided as a guide to be used in establishing AN/TSQ-73 communications. The communications equipment shown is necessary to configure the communications network as depicted. Each network will be structured according to the necessary confinements of the particular situation but should, as far as possible, be similar to that shown. For AN/TSQ-73 system equipped with MSE/ADI, four voice lines and five data lines are transferred via local comm CEOI selected connectors (e.g., J10 thru J12) to the external MSE/ADI for digital conversion and transfer to battalion FDCs 1 thru 4 and to the CRC.

10-9.2. Displacement of Brigade AN/TSQ-73 and Redistribution of Battalions. In the event that it becomes necessary to move (displace) the brigade AN/TSQ-73 system, the battalions assigned to that brigade must be redistributed to adjacent brigade AN/TSQ-73s during the time that the original brigade system is unable to perform command and control. This procedure is illustrated in figure 10-12.2. Provided that the adjacent brigades have preinstalled J-2317 boxes, this procedure may be accomplished quickly and efficiently.

10-10. Voice Communications Directory. A voice communications directory (fig. 10-13) is provided for each VCS and is located in the shelter near each unit. The voice communications directory is divided into four sections:

a. *Net Communications Directory*. The net communications directory lists the subscriber's name and the communication nets that the subscriber is connected to: operational (OPNL), maintenance (MAINT), and command administration (CMD-AD). A subscriber can be connected to any combination of these nets, and a checkmark in the appropriate column of the directory indicates that the subscriber is connected to that particular net. The address (ADRS) column of the directory contains sequential numbers corresponding to the physical address of each modem.

b. *Local Communications Directory*. The local communications directory lists the names of the five possible local communication sources selected via the VCS LOCAL COMM 1 thru 5 switches.

c. *Intercommunications Directory*. The intercommunications directory lists the name of the external subscriber(s) selected via the VCS INTERCOMM 1 thru 6 switches. Two subscribers may be on a comm line and both subscriber's names are listed (on the same line) in the directory corresponding to the particular comm line. Comm lines 1 and 2, however, are restricted for VCS use only and are not available to external subscribers.

d. *VCS Address Assignments*. The VCS address assignments directory lists the 10 possible VCS address assignments. Once the VCS address number is assigned, the physical location of the VCS is noted in the directory next to the number corresponding to the VCS address assignment.

10-11. Voice Net Circuit Terminations. The telephone equipment within the HAWK BCP or PCP van is a 4-wire, 1600-Hz system terminating two netted voice circuits. Normally, the Operational Control (OC) circuits from the Command Administration (CA) circuits from the Battalion AN/TSQ-73 are terminated in these vans. The Maintenance-Test Voice net does not have a terminating system. This circuit can either be terminated in a telephone TA-312, or switchboards SB-22 or SB-86.

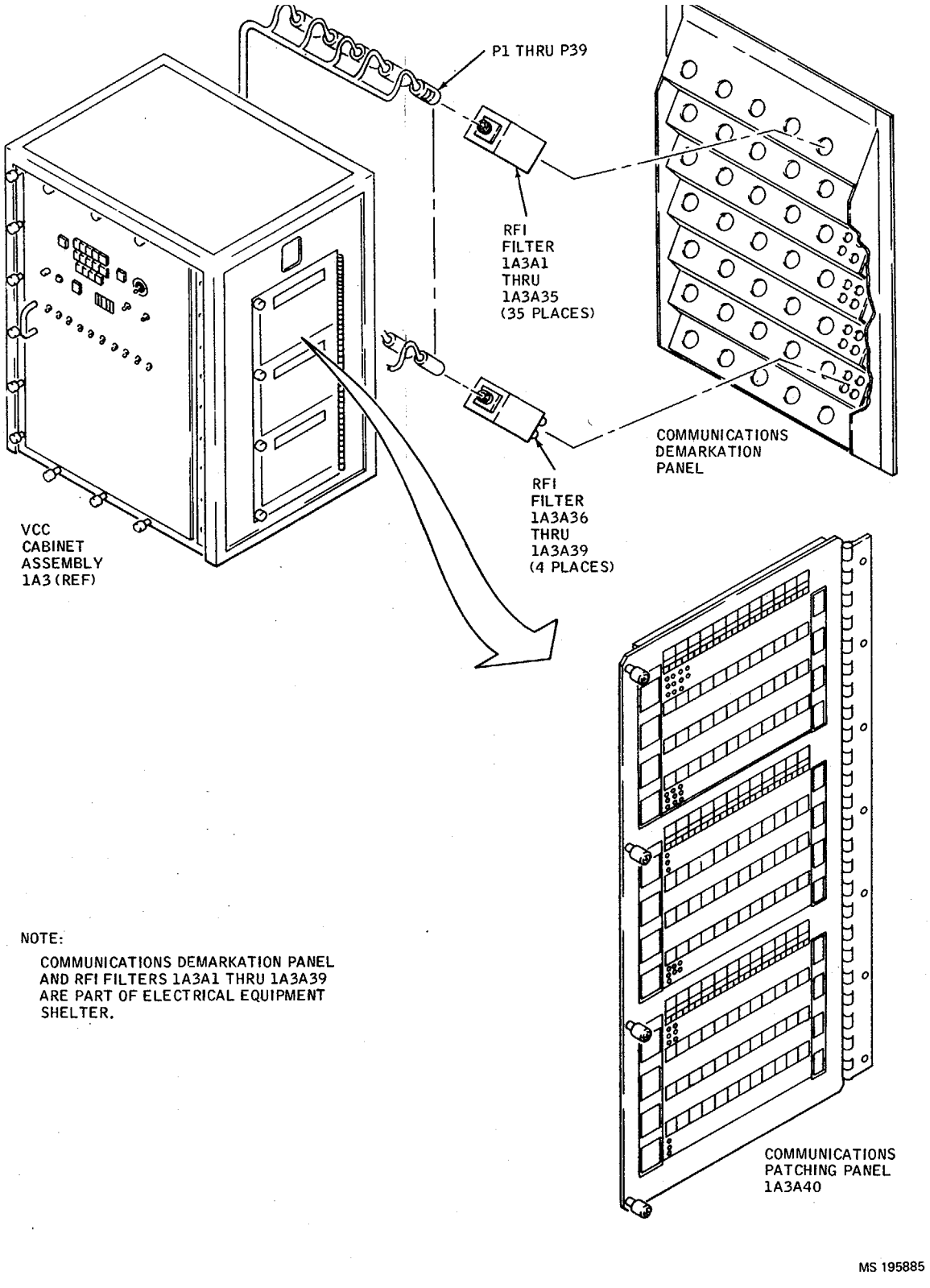


Figure 10-6. Patch Panel Connections (Sheet 1 of 2)

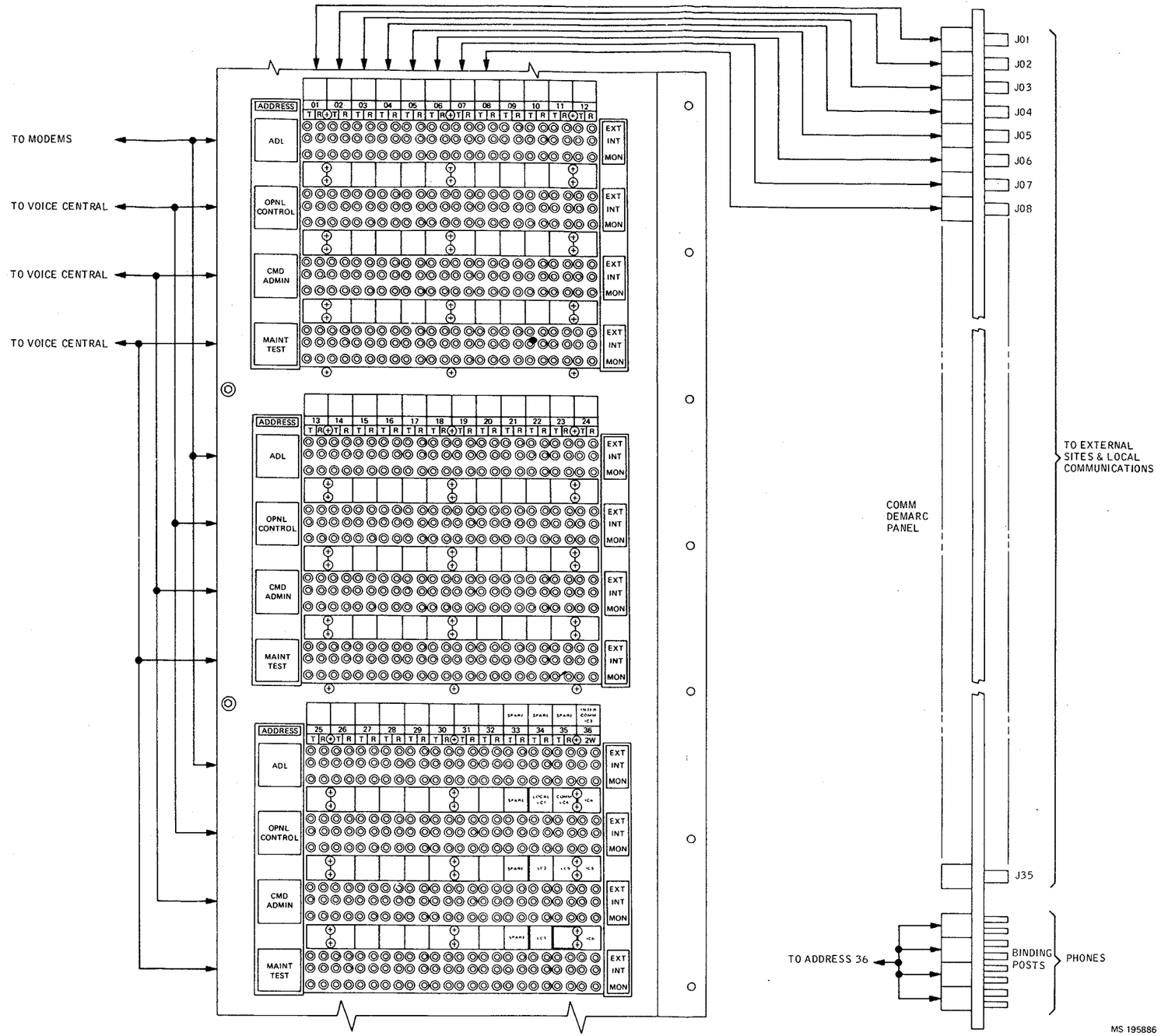


Figure 10-6. Patch Panel Connections (Sheet 2 of 2)

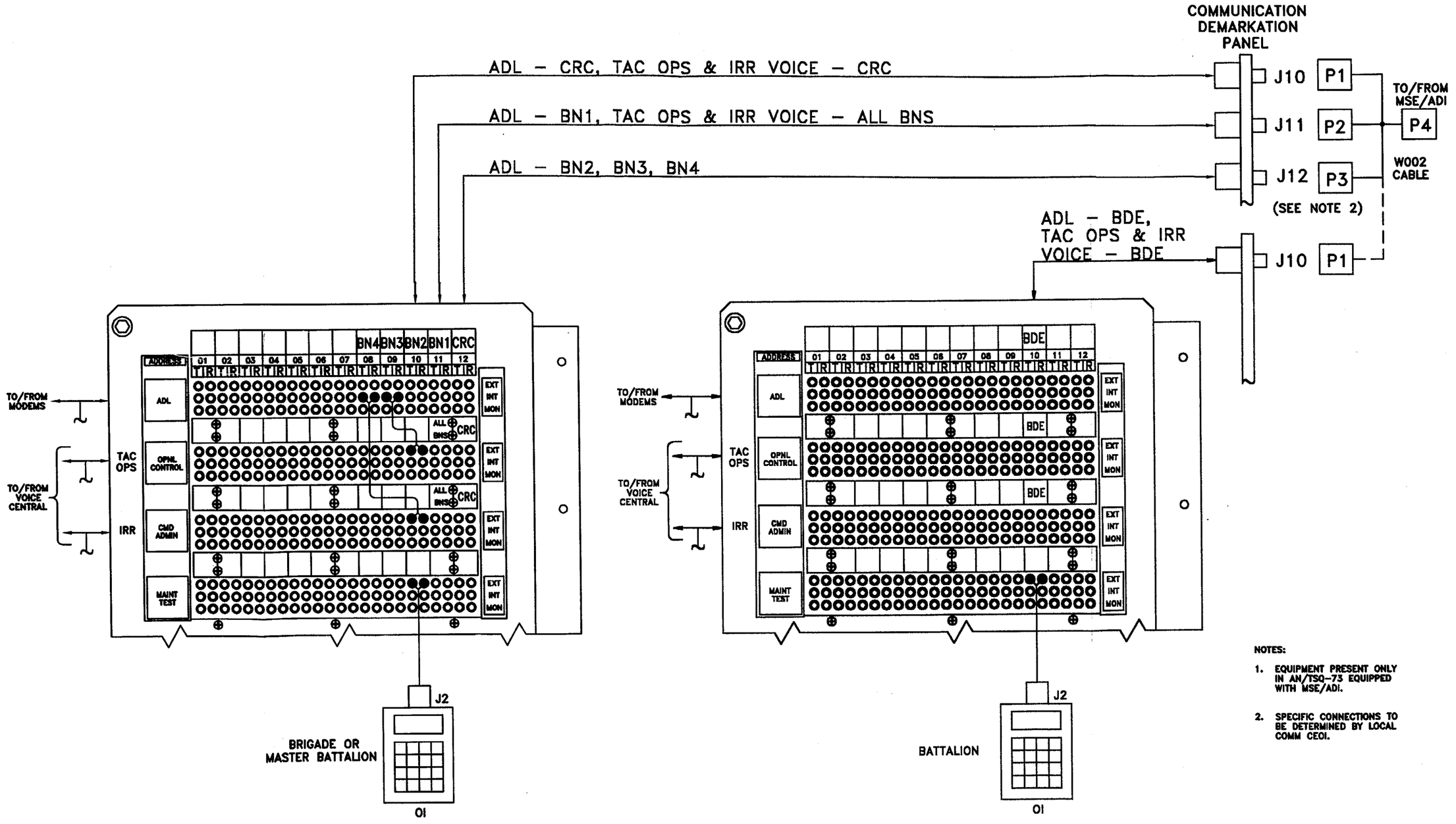


Figure 10-6.1 MSE/ADI Patch Panel Connections

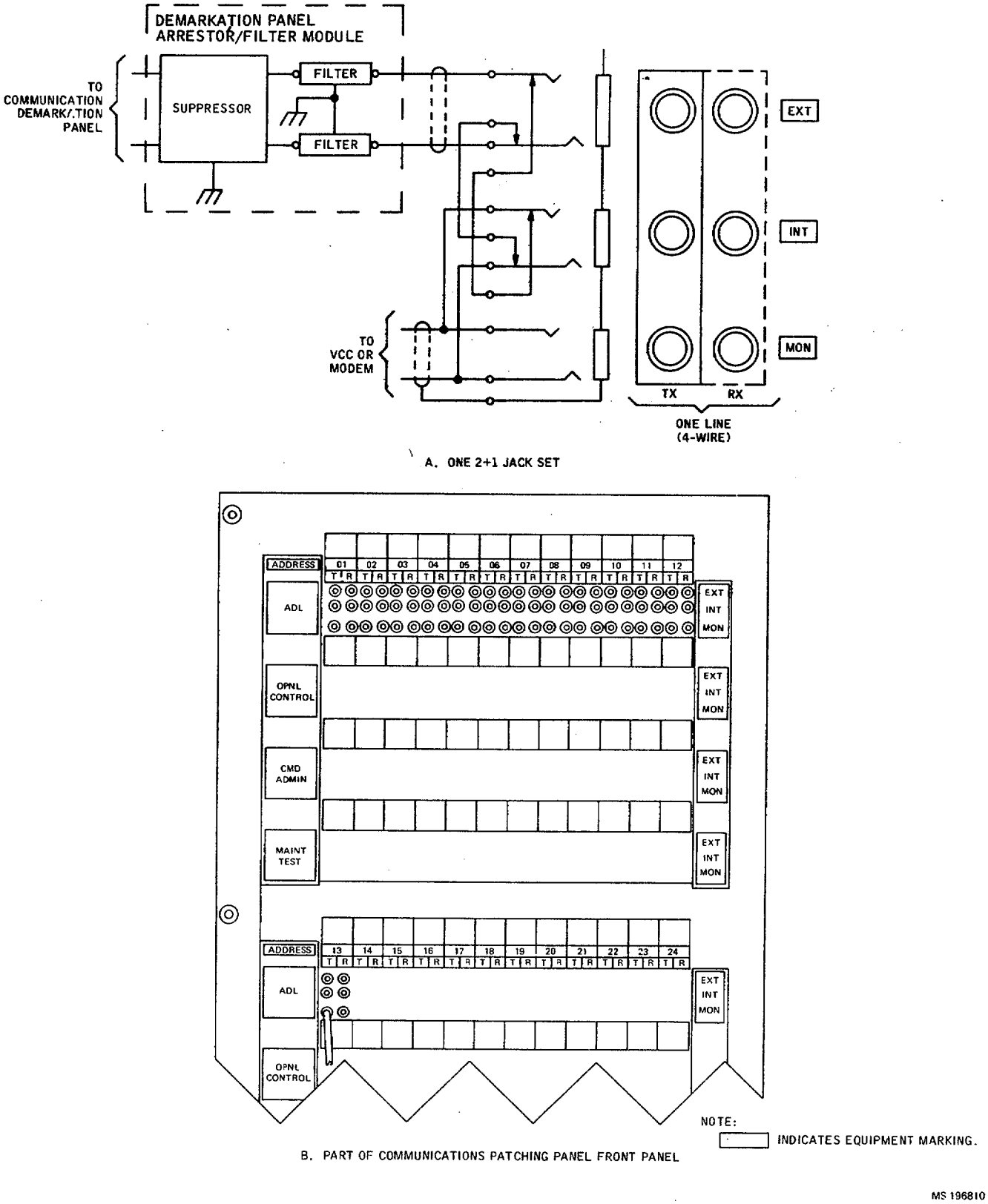
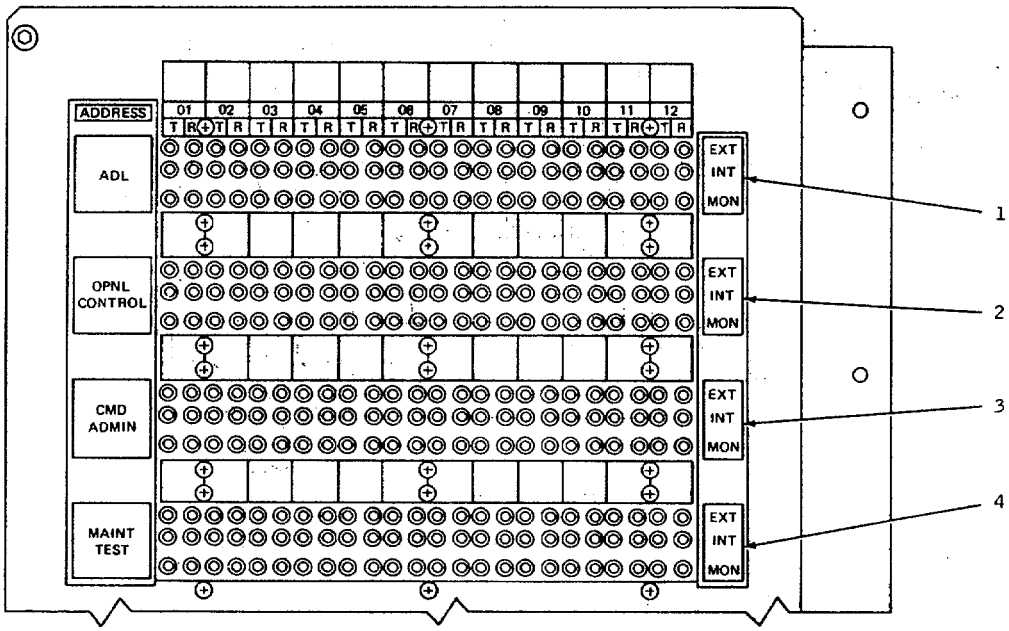


Figure 10-7. Communications Patching Panel



CONTROL/INDICATOR	DESCRIPTION	FUNCTION
1 ADDRESS ADL	AUTOMATIC DATA LINK (ADL) PATCHING FACILITIES CONSISTING OF 32 BANTAM 2 + 1 JACKS	ALLOWS LINE-SIDE, EQUIPMENT-SIDE, AND NONINTERRUPTING MONITOR CAPABILITIES, AS WELL AS NORMAL PATCHING
2 ADDRESS OPNL CONTROL	OPERATIONAL CONTROL PATCHING FACILITIES CONSISTING OF 32 BANTAM 2 + 1 JACKS	SAME AS ADL (ITEM 1)
3 ADDRESS CMD ADMIN	COMMAND AND ADMINISTRATION PATCHING FACILITIES CONSISTING OF 32 BANTAM 2 + 1 JACKS	SAME AS ADL (ITEM 1)
4 ADDRESS MAINT TEST	MAINTENANCE TEST PATCHING FACILITIES CONSISTING OF 32 BANTAM 2 + 1 JACKS	SAME AS ADL (ITEM 1)

MS 195888

Figure 10-8. Patching Functions

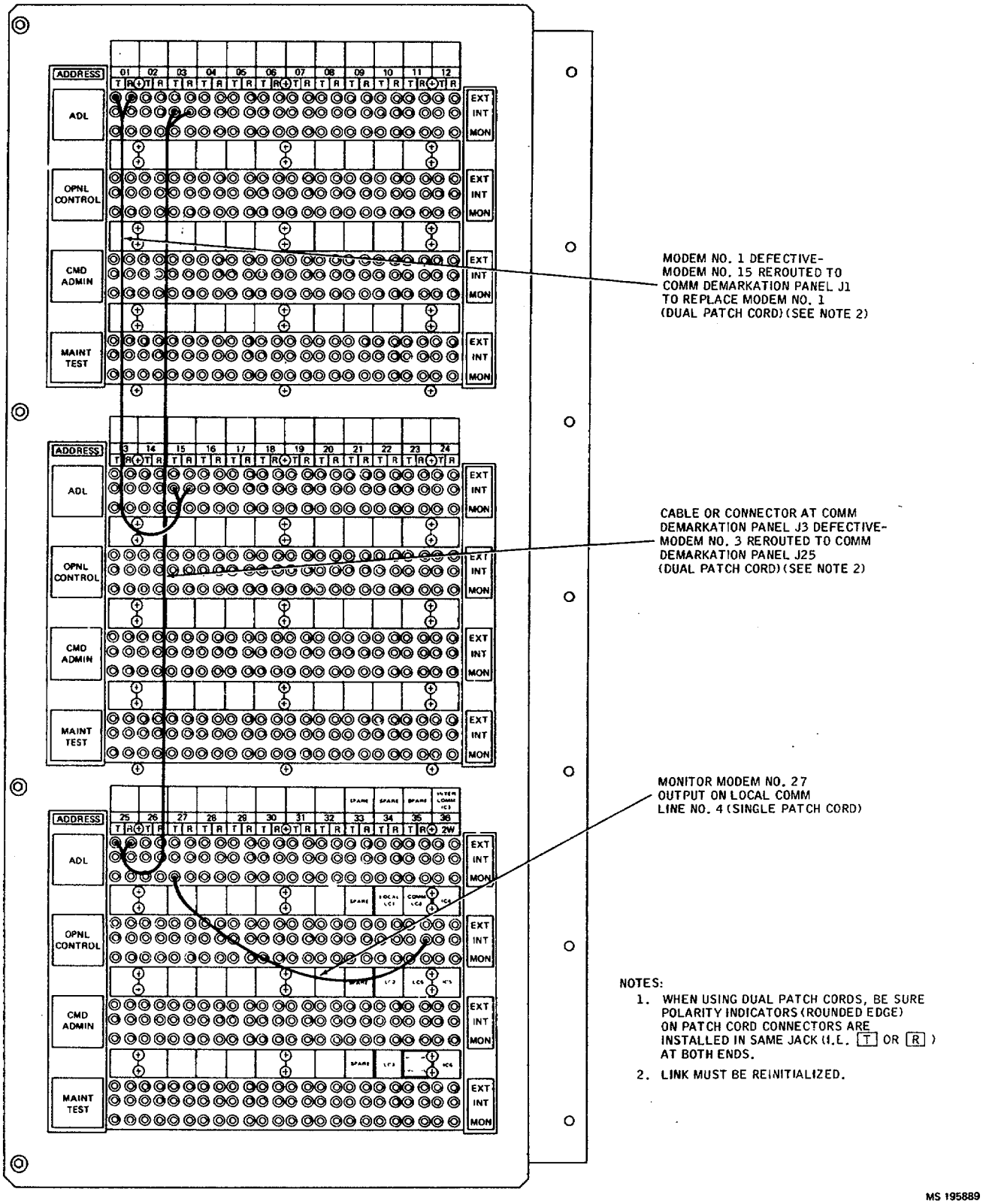
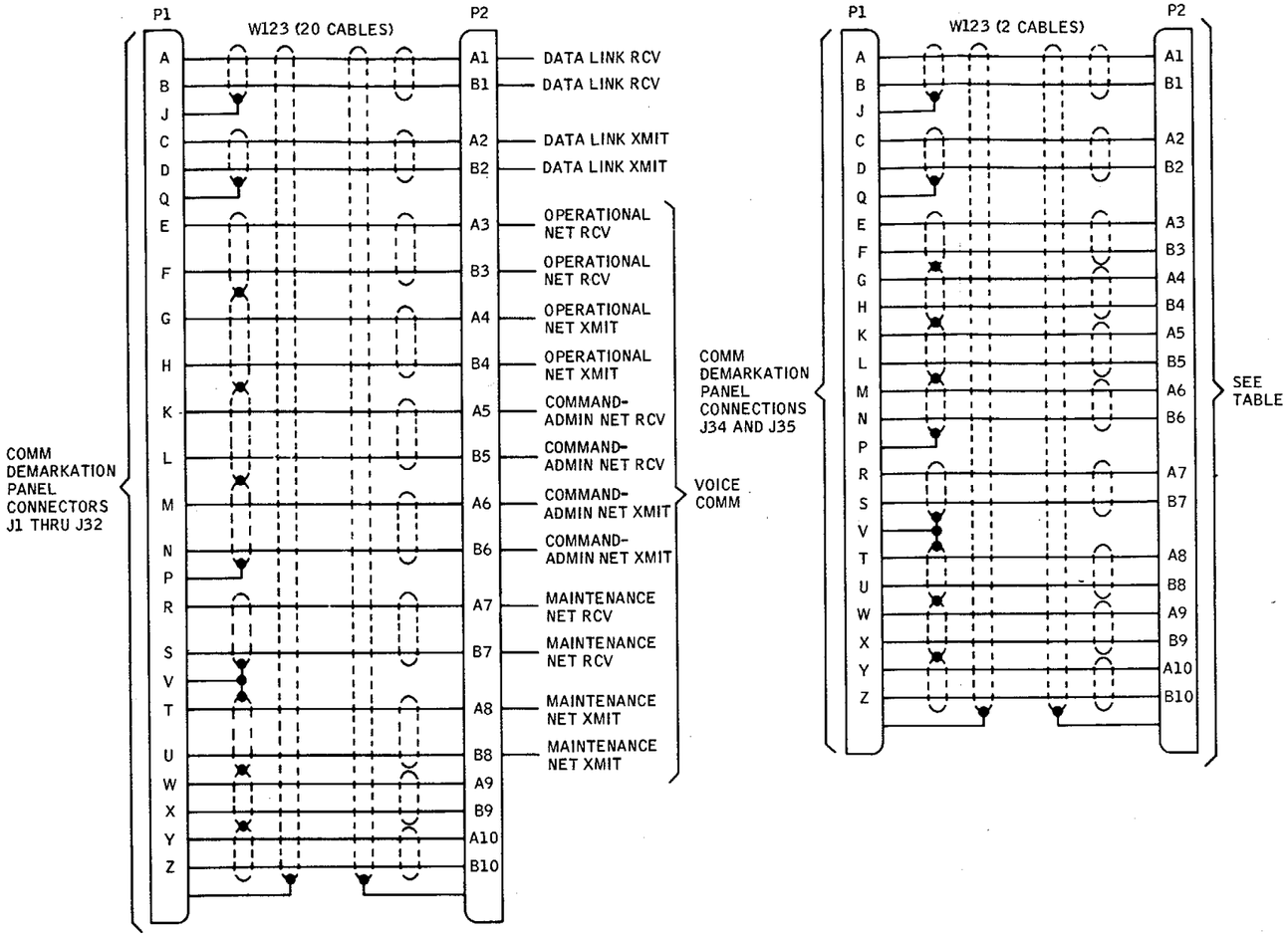


Figure 10-9. Patch Panel Operation (Sample)

10-19/10-20 blank)

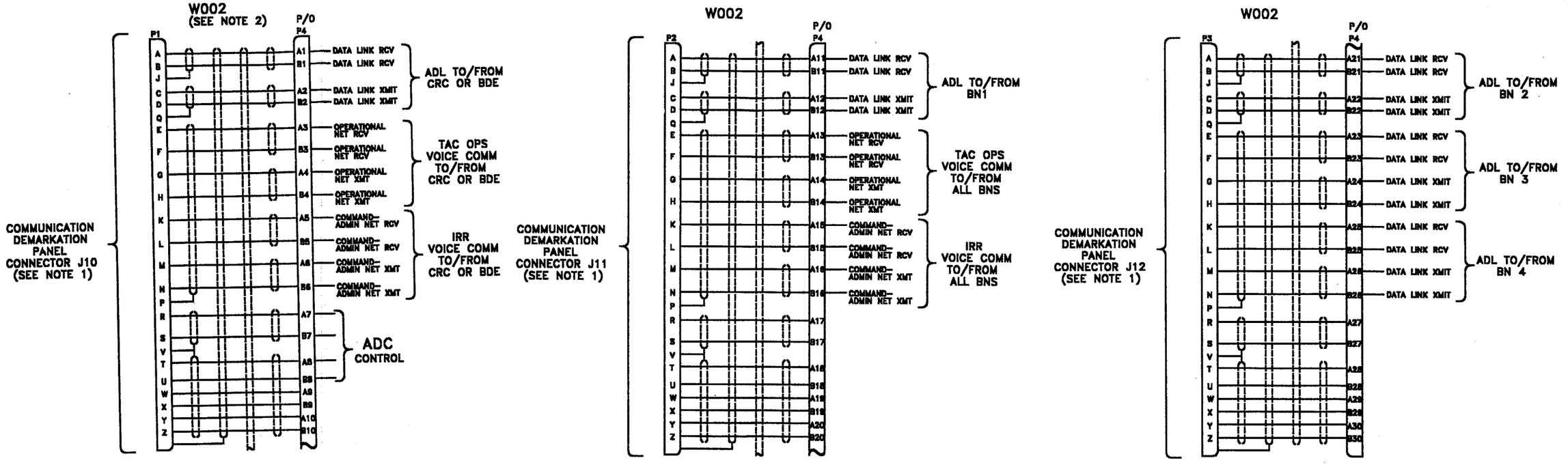


P2	LOCAL COMM J34	LOCAL COMM J35
A1	SPARE	SPARE
B1	SPARE	SPARE
A2	SPARE	SPARE
B2	SPARE	SPARE
A3	1-RCV	4-RCV
B3	1-RCV	4-RCV
A4	1-XMIT	4-XMIT
B4	1-XMIT	4-XMIT
A5	2-RCV	5-RCV
B5	2-RCV	5-RCV
A6	2-XMIT	5-XMIT
B6	2-XMIT	5-XMIT
A7	3-RCV	MONITOR MIC
B7	3-RCV	MONITOR MIC
A8	3-XMIT	MONITOR HS
B8	3-XMIT	MONITOR HS
SPARES TERMINATED ON PATCH PANEL		

NOTE:
J-33: 8 PAIR SPARE TERMINATED ON PATCH PANEL.

MS 428119

Figure 10-10. External Signal Configuration for Connectors J1 thru J35



NOTES:

1. SPECIFIC CONNECTIONS TO BE DETERMINED BY LOCAL COMM CEOI.
2. EQUIPMENT PRESENT ONLY IN AN/TSQ-73 EQUIPPED WITH MSE/ADI.

MS559134

Figure 10-10.1 MSE/ADI Brigade/Master Battalion

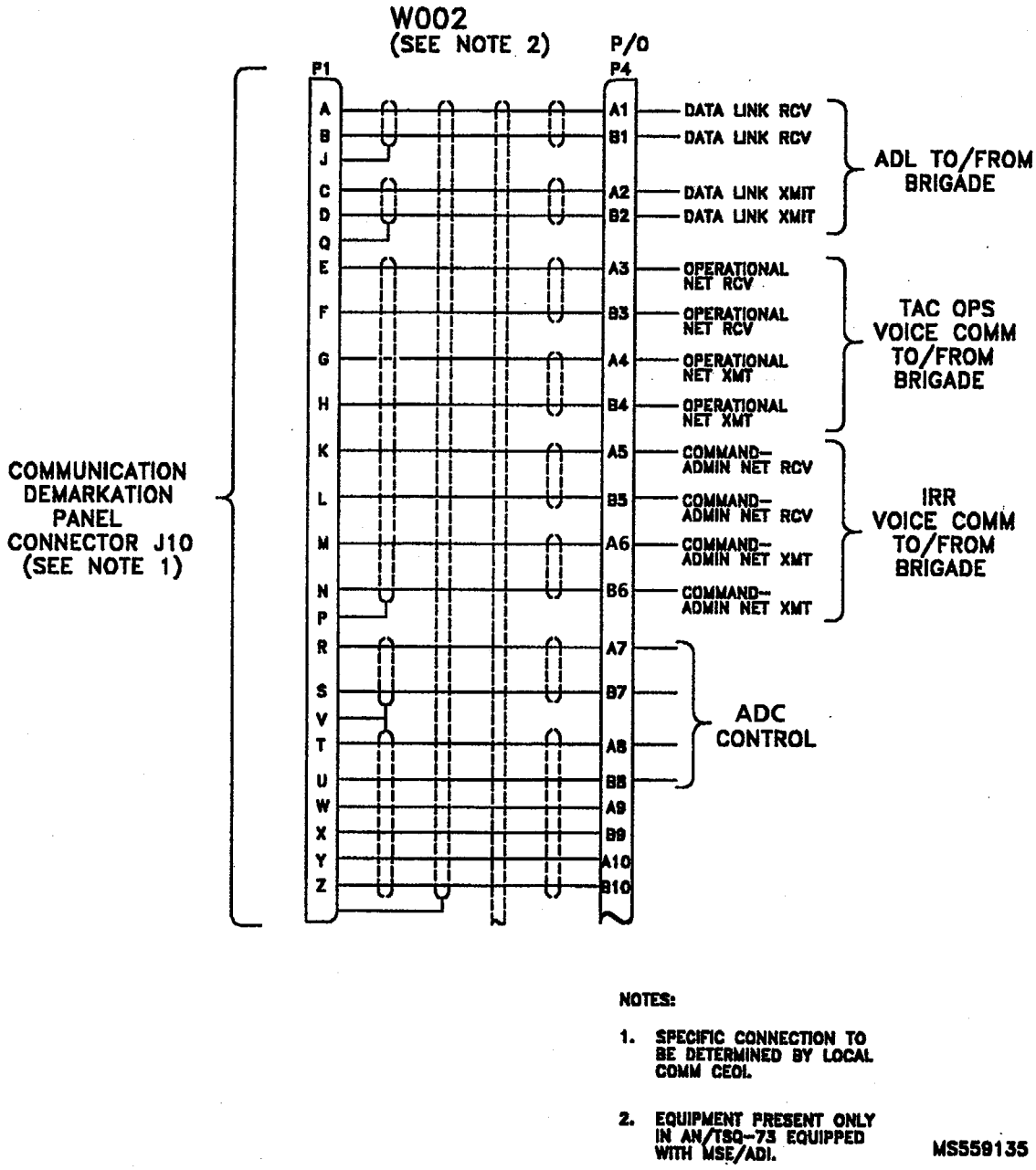


Figure 10-10.2 MSE/ADI Battalion Signal Cable Configuration

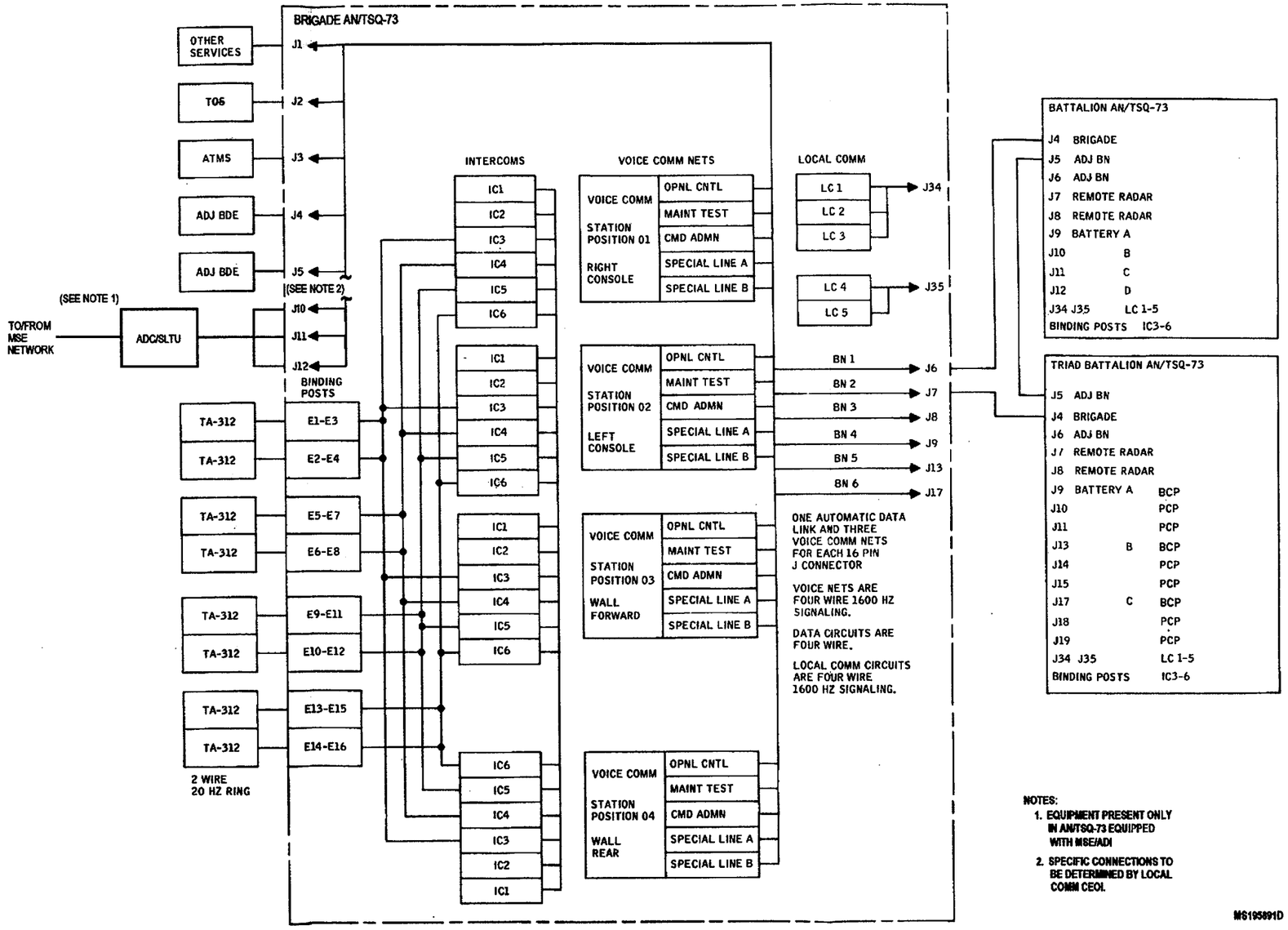


Figure 10-11. AN/TSQ-73 Communications

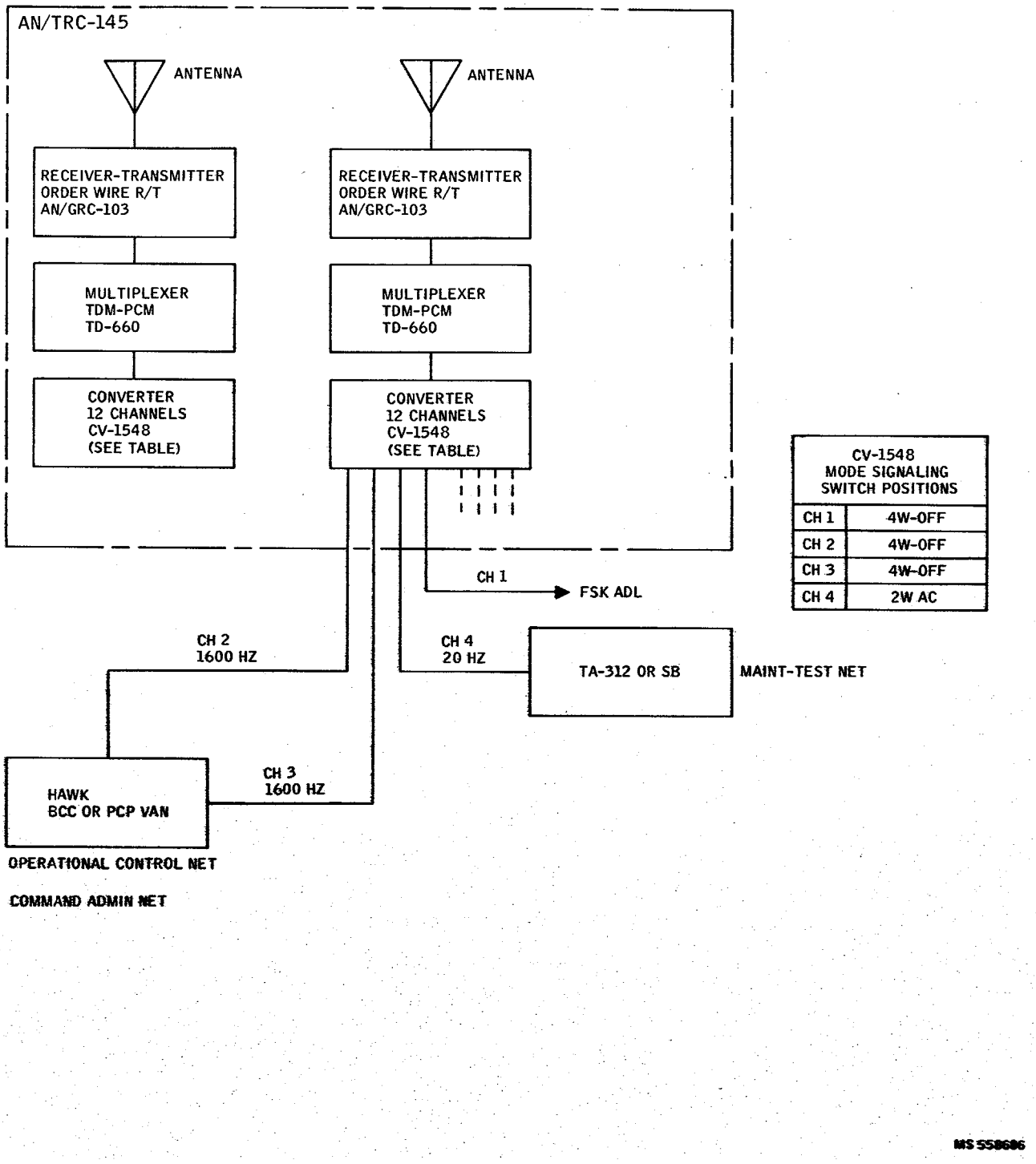
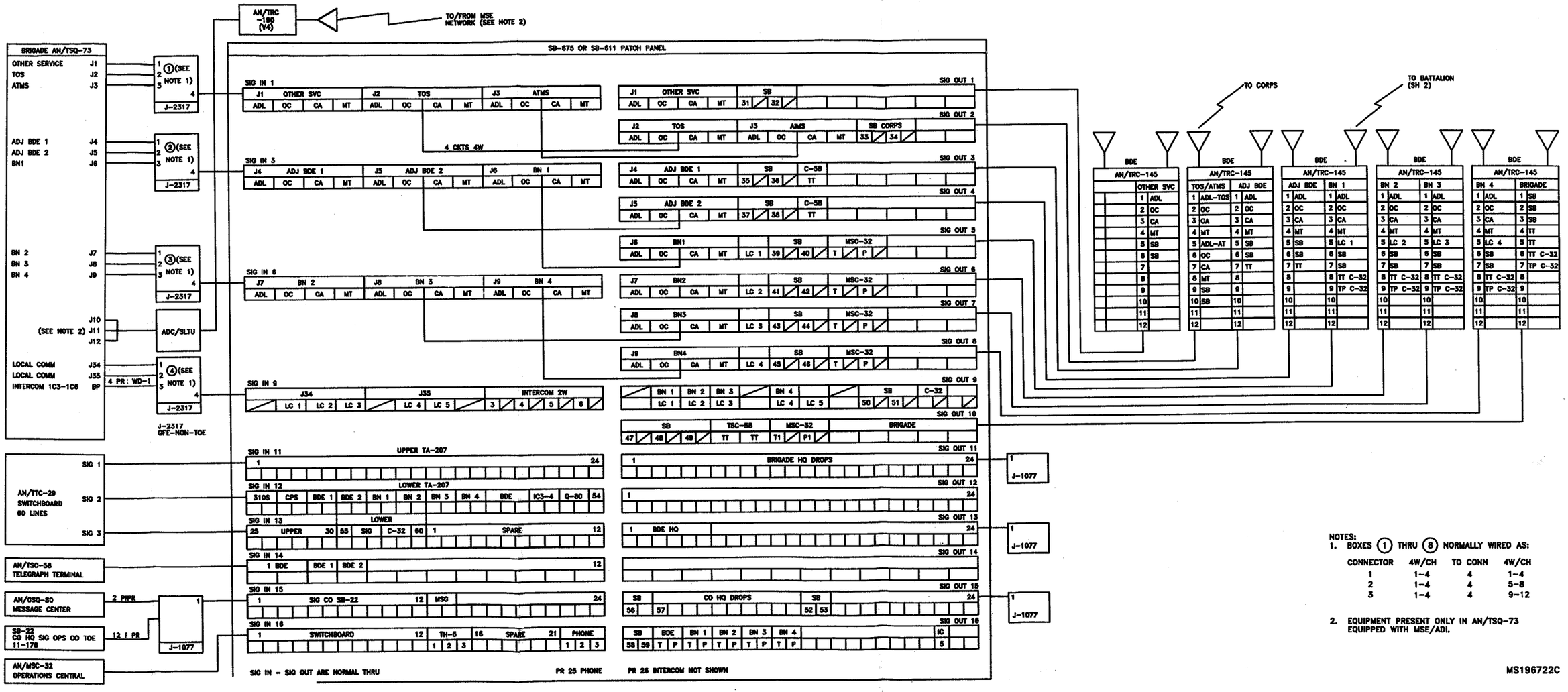


Figure 10-12. AN/TSQ-73 Net Terminations



NOTES:
1. BOXES (1) THRU (8) NORMALLY WIRED AS:

CONNECTOR	4W/CH	TO CONN	4W/CH
1	1–4	4	1–4
2	1–4	4	5–8
3	1–4	4	9–12

2. EQUIPMENT PRESENT ONLY IN AN/TSQ-73 EQUIPPED WITH MSE/ADI.

Figure 10-12.1 Typical ADA Brigade-Battalion -Battery Communication (Sheet 1 of 2)

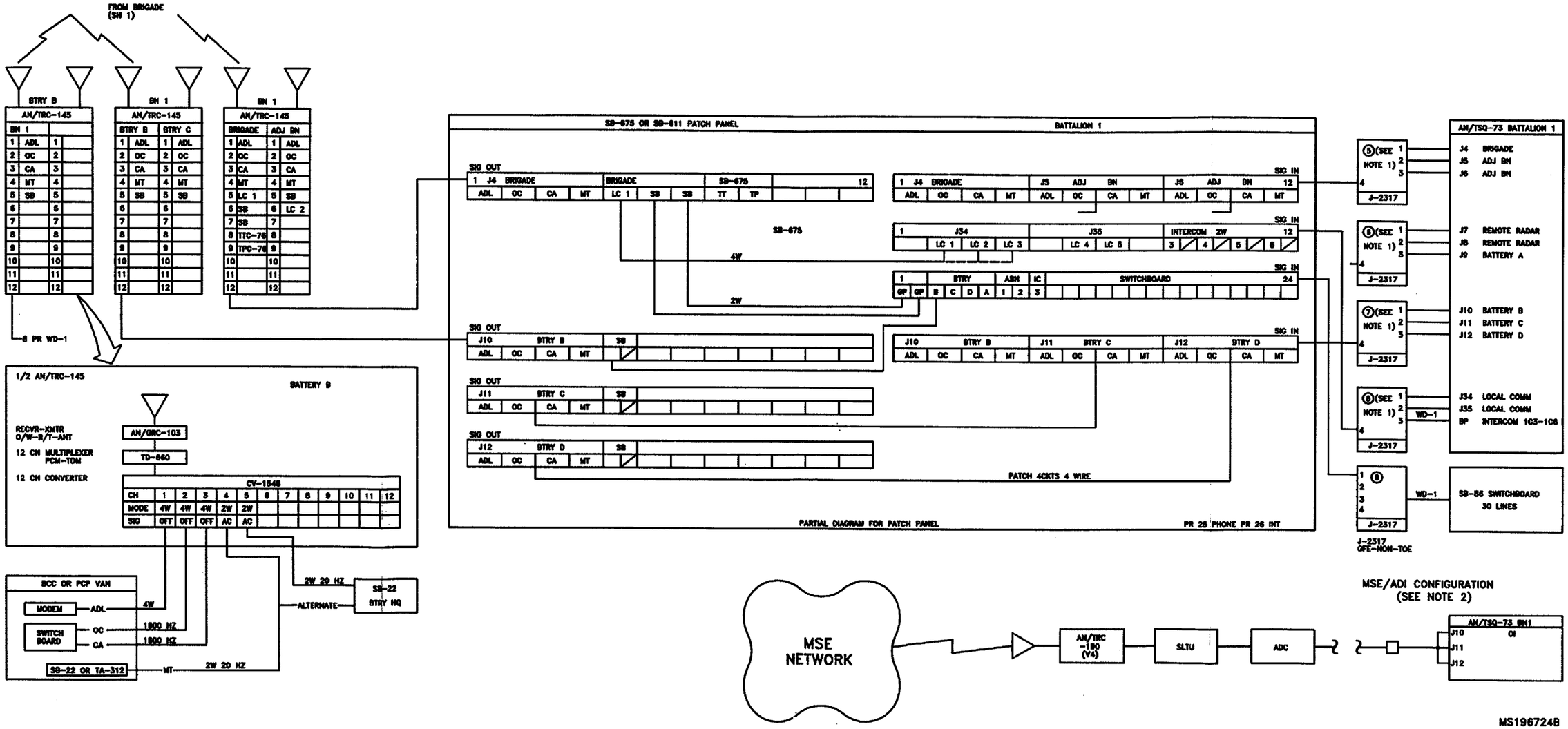
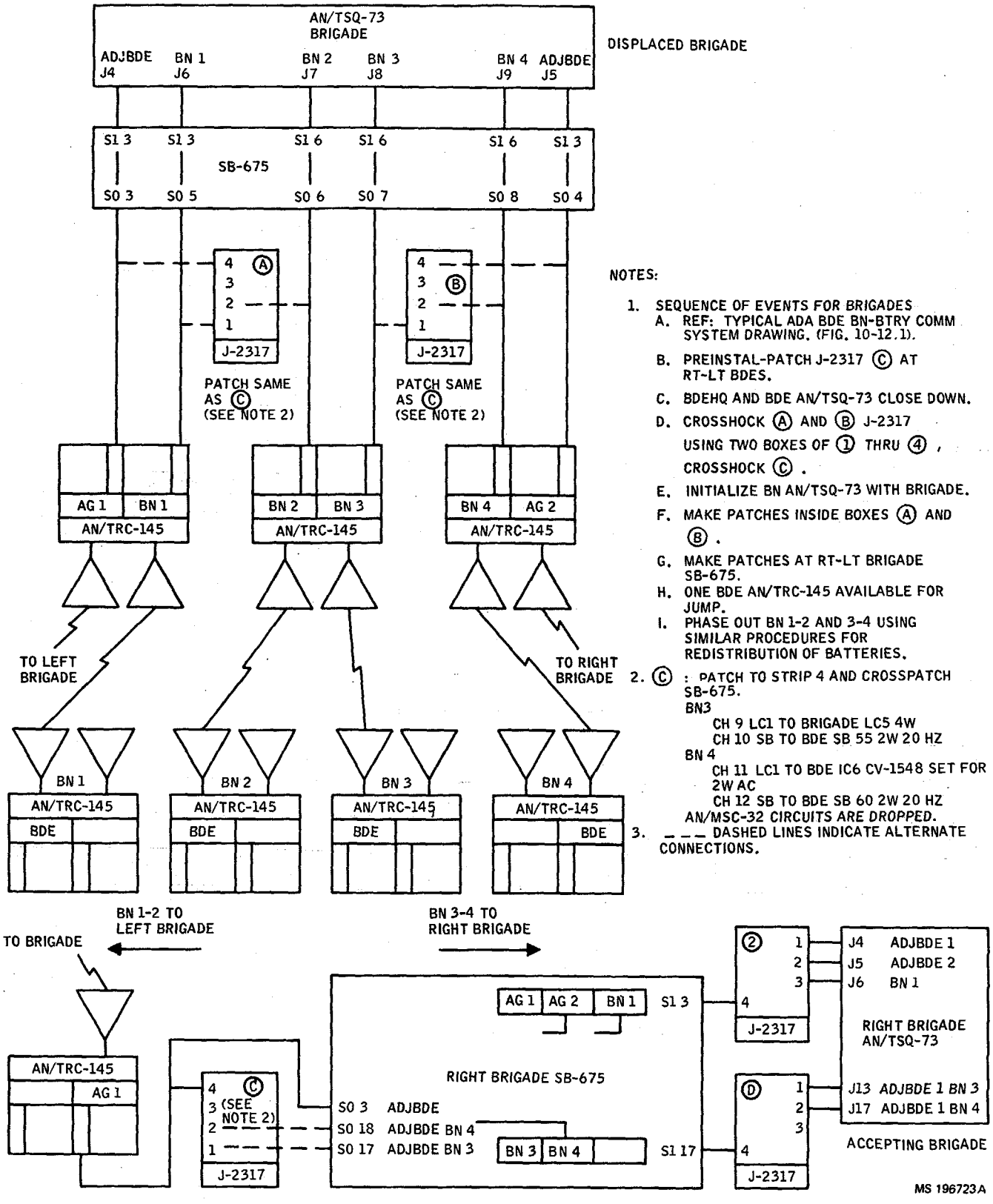


Figure 10-12.1 Typical ADA Brigade-Battalion -Battery Communication Sheet (2 of 2)



NOTES:

1. SEQUENCE OF EVENTS FOR BRIGADES
   A. REF: TYPICAL ADA BDE BN-BTRY COMM SYSTEM DRAWING. (FIG. 10-12.1).
   B. PREINSTAL-PATCH J-2317 (C) AT RT-LT BDES.
   C. BDEHQ AND BDE AN/TSQ-73 CLOSE DOWN.
   D. CROSSHOCK (A) AND (B) J-2317 USING TWO BOXES OF (1) THRU (4), CROSSHOCK (C).
   E. INITIALIZE BN AN/TSQ-73 WITH BRIGADE.
   F. MAKE PATCHES INSIDE BOXES (A) AND (B).
   G. MAKE PATCHES AT RT-LT BRIGADE SB-675.
   H. ONE BDE AN/TRC-145 AVAILABLE FOR JUMP.
   I. PHASE OUT BN 1-2 AND 3-4 USING SIMILAR PROCEDURES FOR REDISTRIBUTION OF BATTERIES.
2. (C): PATCH TO STRIP 4 AND CROSSPATCH SB-675.
   BN3
   CH 9 LC1 TO BRIGADE LC5 4W
   CH 10 SB TO BDE SB 55 2W 20 HZ
   BN 4
   CH 11 LC1 TO BDE IC6 CV-1548 SET FOR 2W AC
   CH 12 SB TO BDE SB 60 2W 20 HZ
   AN/MSC-32 CIRCUITS ARE DROPPED.
3. _ _ _ DASHED LINES INDICATE ALTERNATE CONNECTIONS.

Figure 10-12.2 Displacement of Brigade AN/TSQ-73 and Redistribution of Battalions

AN/TSQ-73 VOICE COMMUNICATIONS DIRECTORY

NET COMMUNICATIONS DIRECTORY

ADRS	SUBSCRIBER	OPNL	MAINT	CMD-AD	ADRS	SUBSCRIBER	OPNL	MAINT	CMD-AD
01					17				
02					18				
03					19				
04					20				
05					21				
06					22				
07					23				
08					24				
09					25				
10					26				
11					27				
12					28				
13					29				
14					30				
15					31				
16					32				

LOCAL COMM DIRECTORY

1	
2	
3	
4	
5	

INTERCOMM DIRECTORY

LINE	ALL VCS ADRS	EXT ADRS	EXT SUBSCRIBER(S)
1-2		—	NONE
3		32	
4		32	
5		32	
6		32	

VCS ADRS ASSIGNMENTS

1		6	
2		7	
3		8	
4		9	
5		10	

MS 196803

Figure 10-13. Voice Communications Directory

Section IV. Voice COMMUNICATIONS OPERATING PROCEDURES

10-12. General. This section provides the AN/TSQ-73 operator procedures required for both normal voice communications equipment operation and for operation of the equipment configuration modified for the MSE/ADI (for AN/TSQ-73 system equipped with MSE/ADI). Figures 10-14 thru 10-29 provide typical situations for the standard configuration and the procedures needed to perform the normal operations. Figure 10-29.1 provides the situations and procedures for the MSE/ADI configuration. All procedures assume that the requirements outlined in TM 9-1430-651-12 (Emplacement and Preparation for Travel) and TM 9-1430-652-10-3 (Initialization and Operating Procedures) have been complied with, i.e., the system is installed, initialized, and is operational.

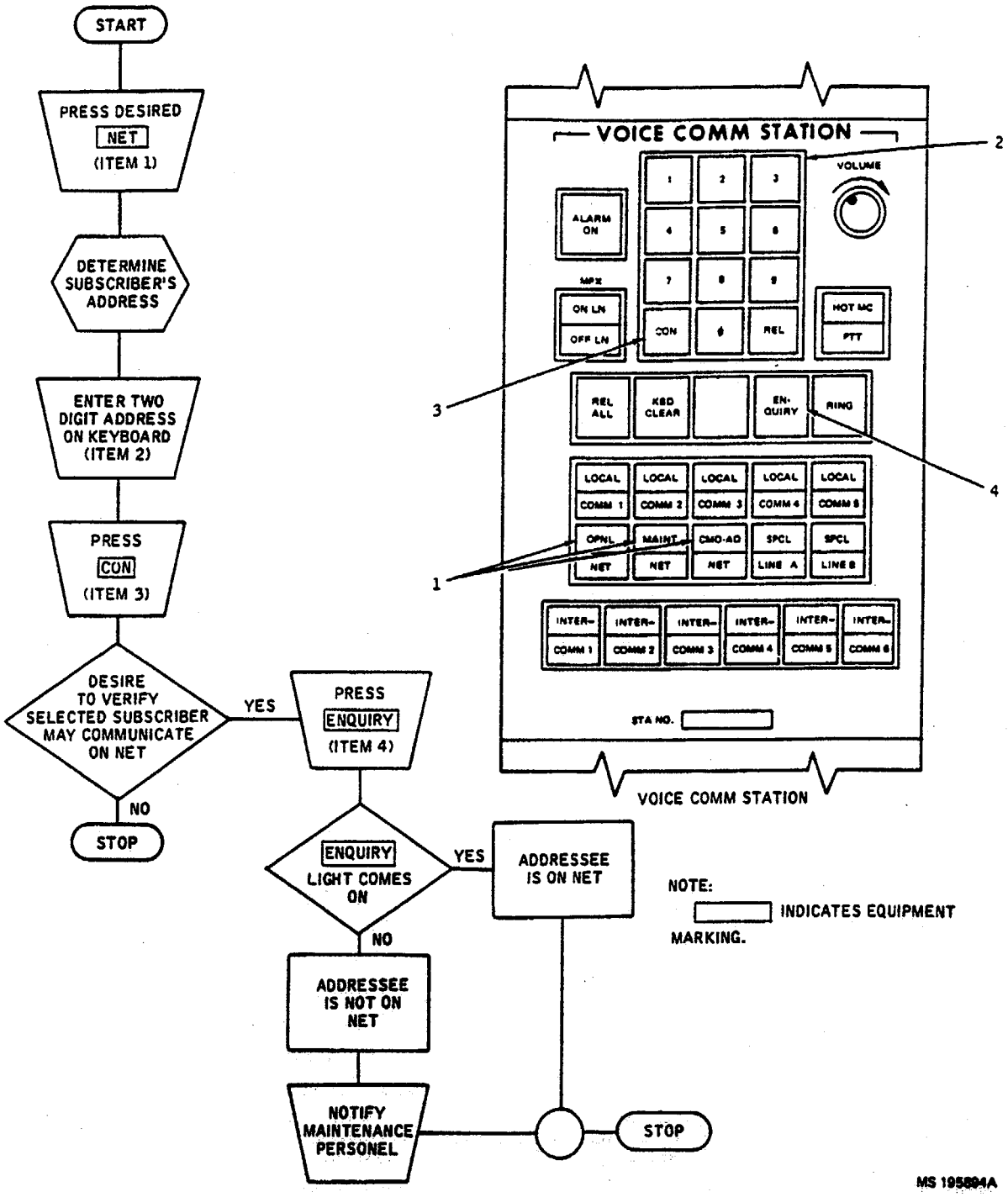


Figure 10-14. Connect Subscriber to Operational Control Net

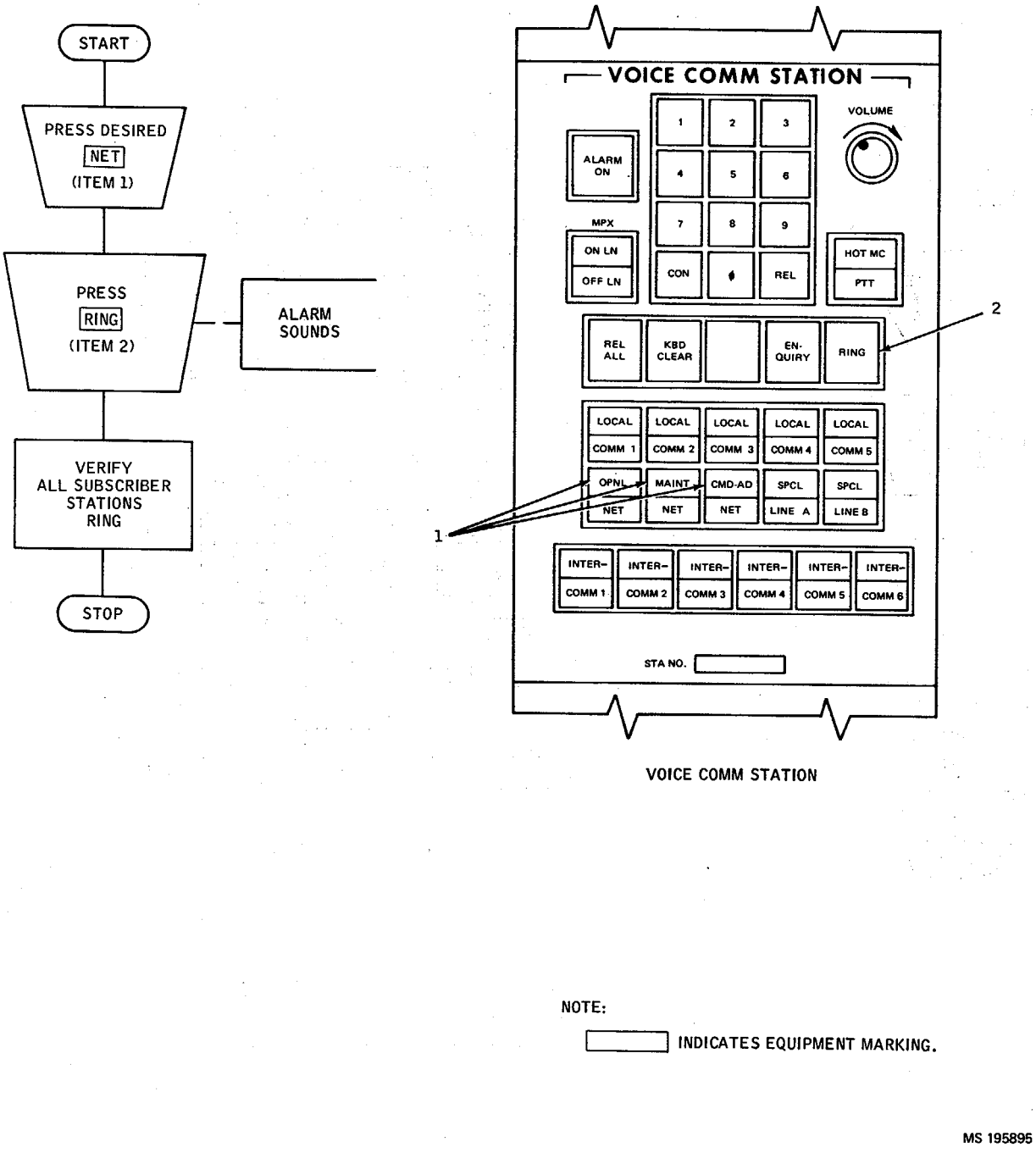
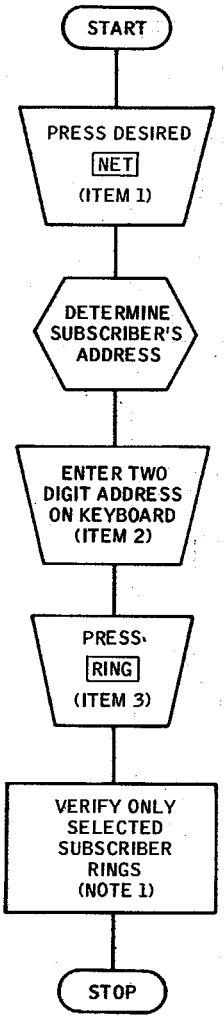
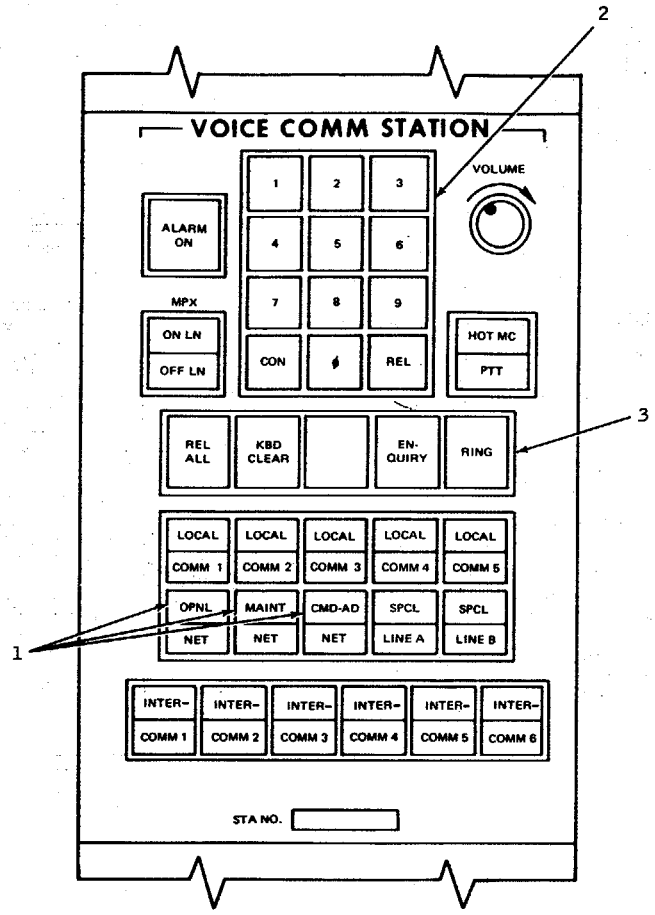


Figure 10-15. Ring All Connected Net Subscribers to Establish Communications





VOICE COMM STATION

NOTES:

1. ONLY SUBSCRIBER RINGS; HOWEVER ALL UNITS ARE ON SAME LINE AND ACTIVE (PARTY-LINE)
2. [ ] INDICATES EQUIPMENT MARKING.

MS 195896

Figure 10-16. Ring Selected Subscriber on Net

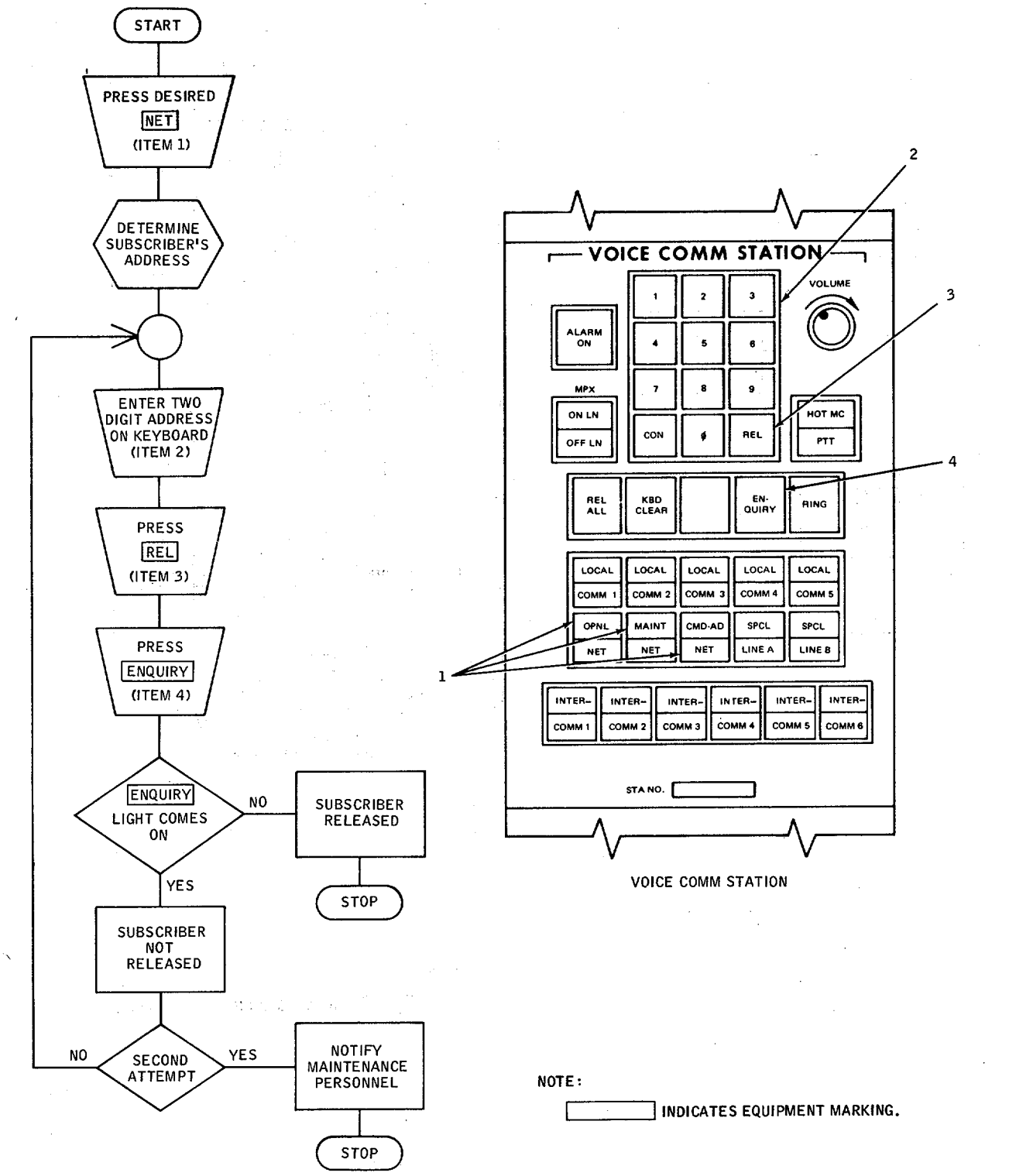


Figure 10-17. Release Selected Subscriber from Net

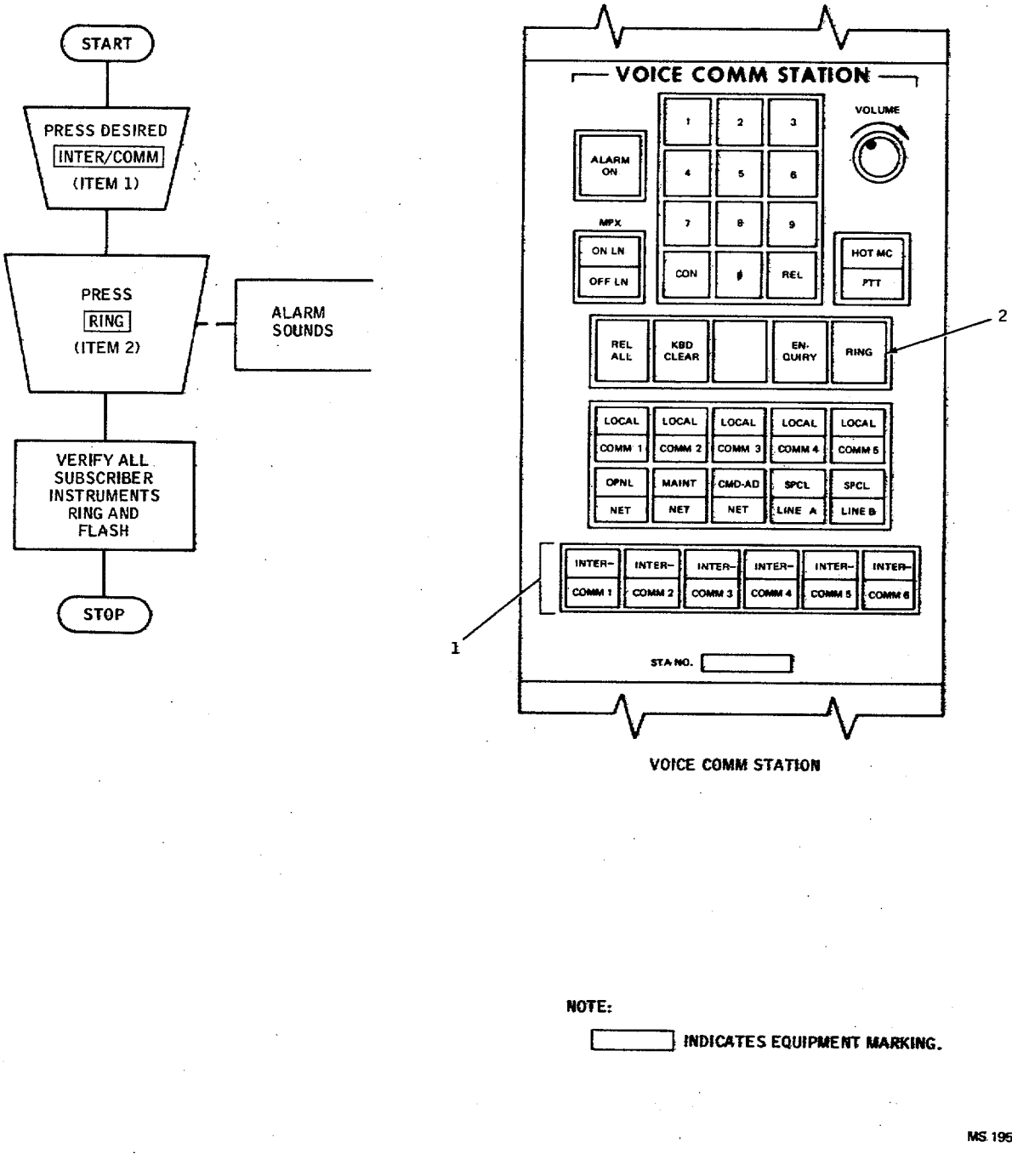
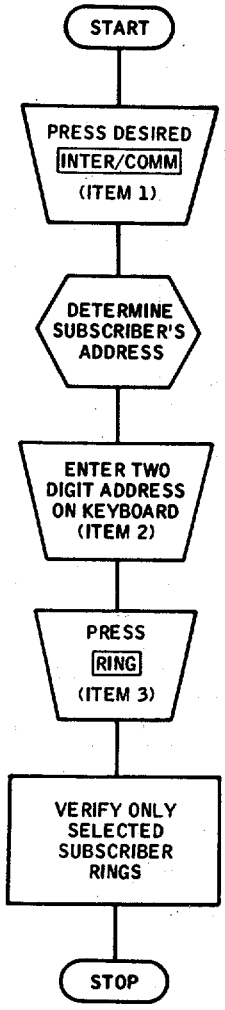
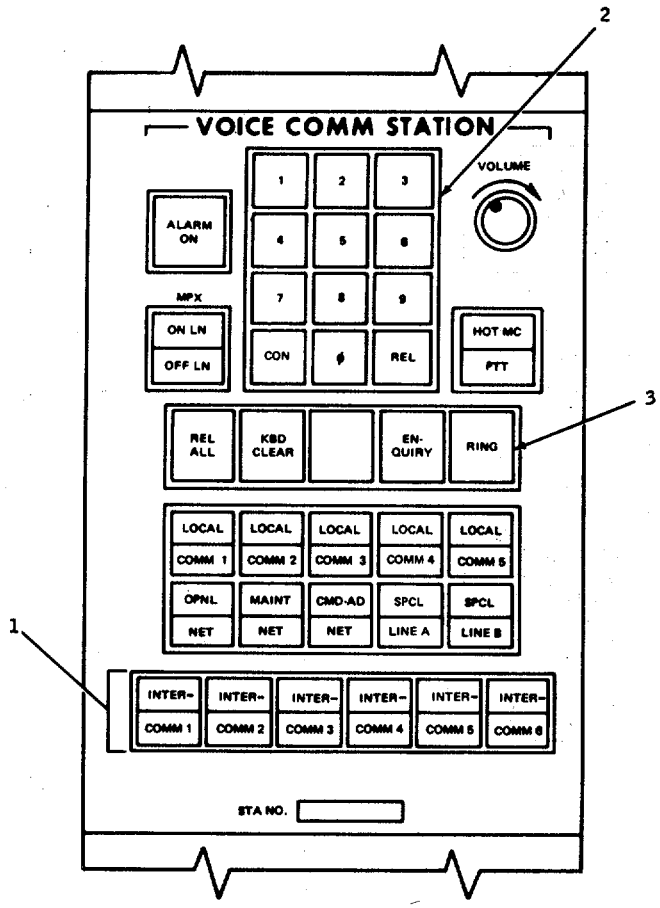


Figure 10-18. Ring All Intercomm Subscribers





VOICE COMM STATION

NOTE:

[ ] INDICATES EQUIPMENT MARKING.

MS 195899

Figure 10-19. Ring Selected Subscriber on Intercomm Line

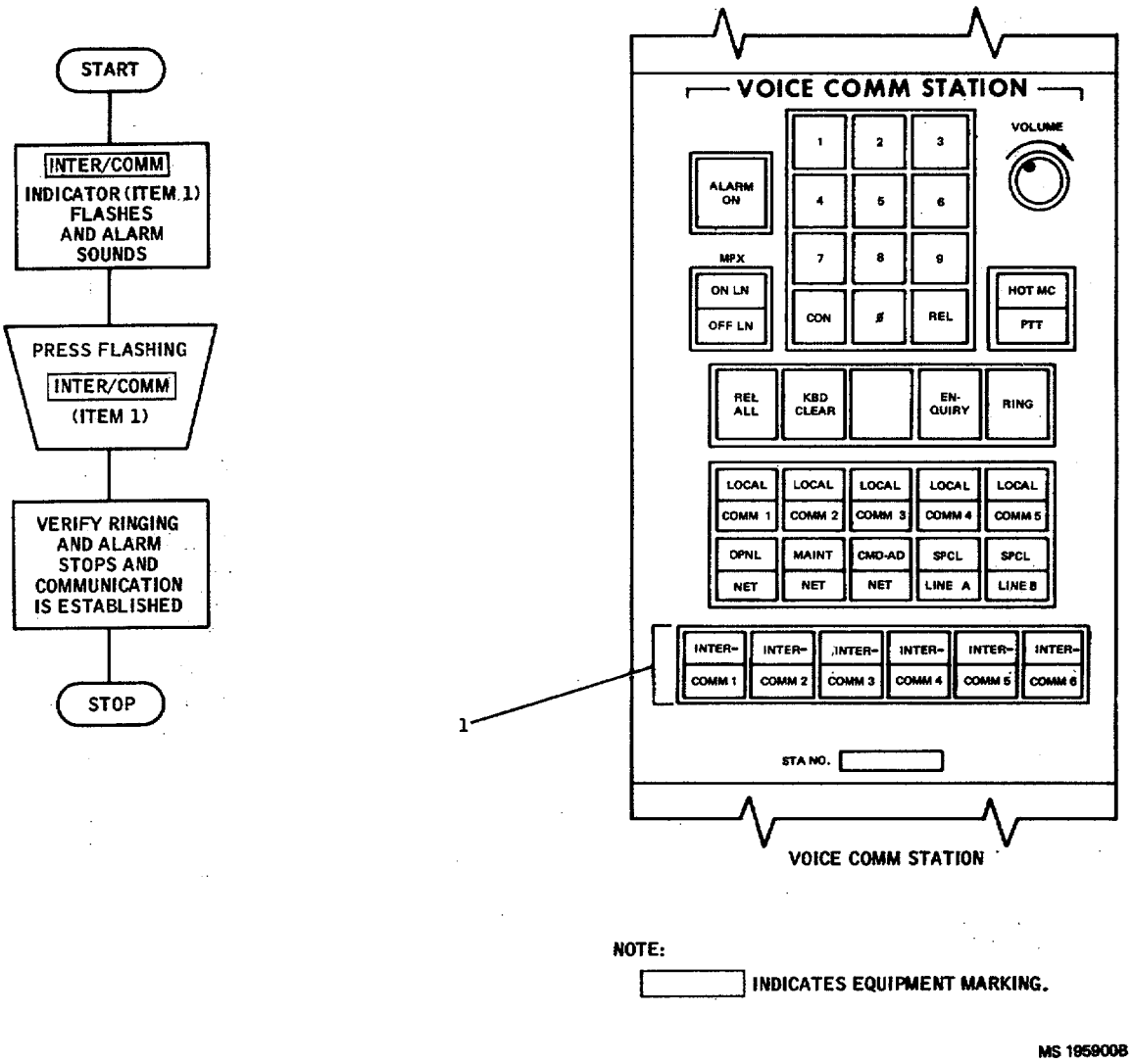


Figure 10-20. Answer Call on Intercomm Lines

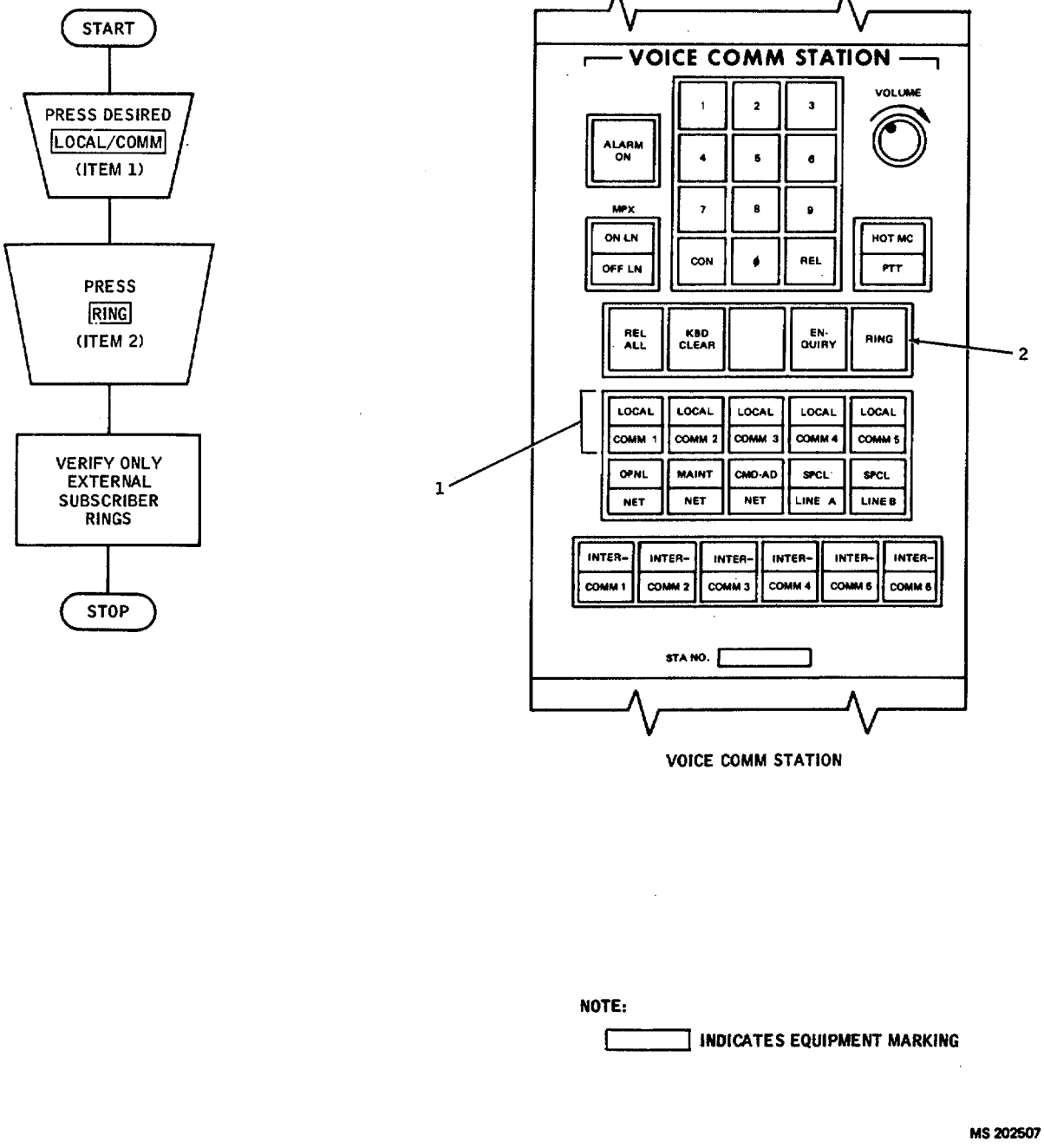


Figure 10-21. Ring External Subscriber on Local Comm Line.

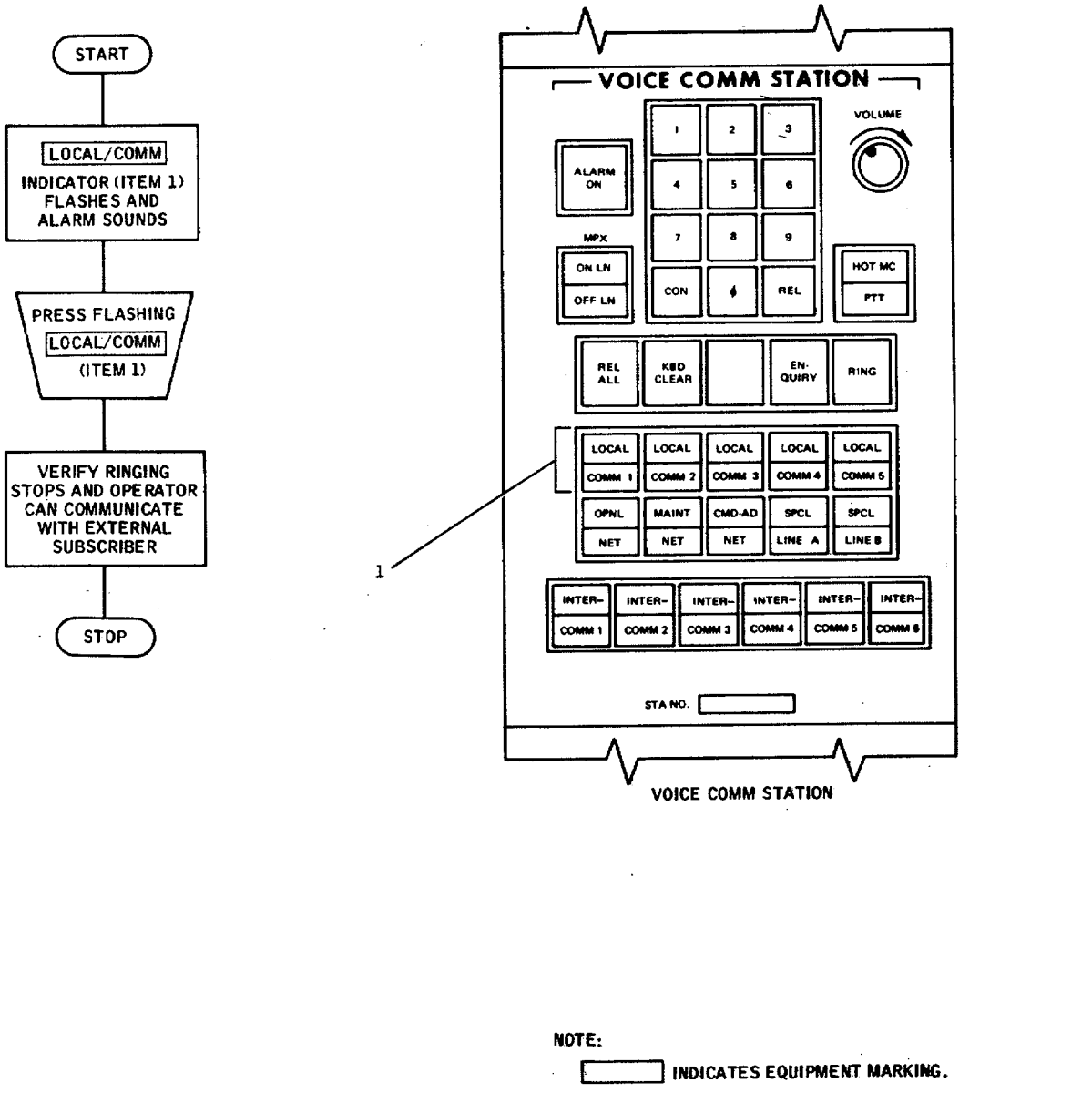
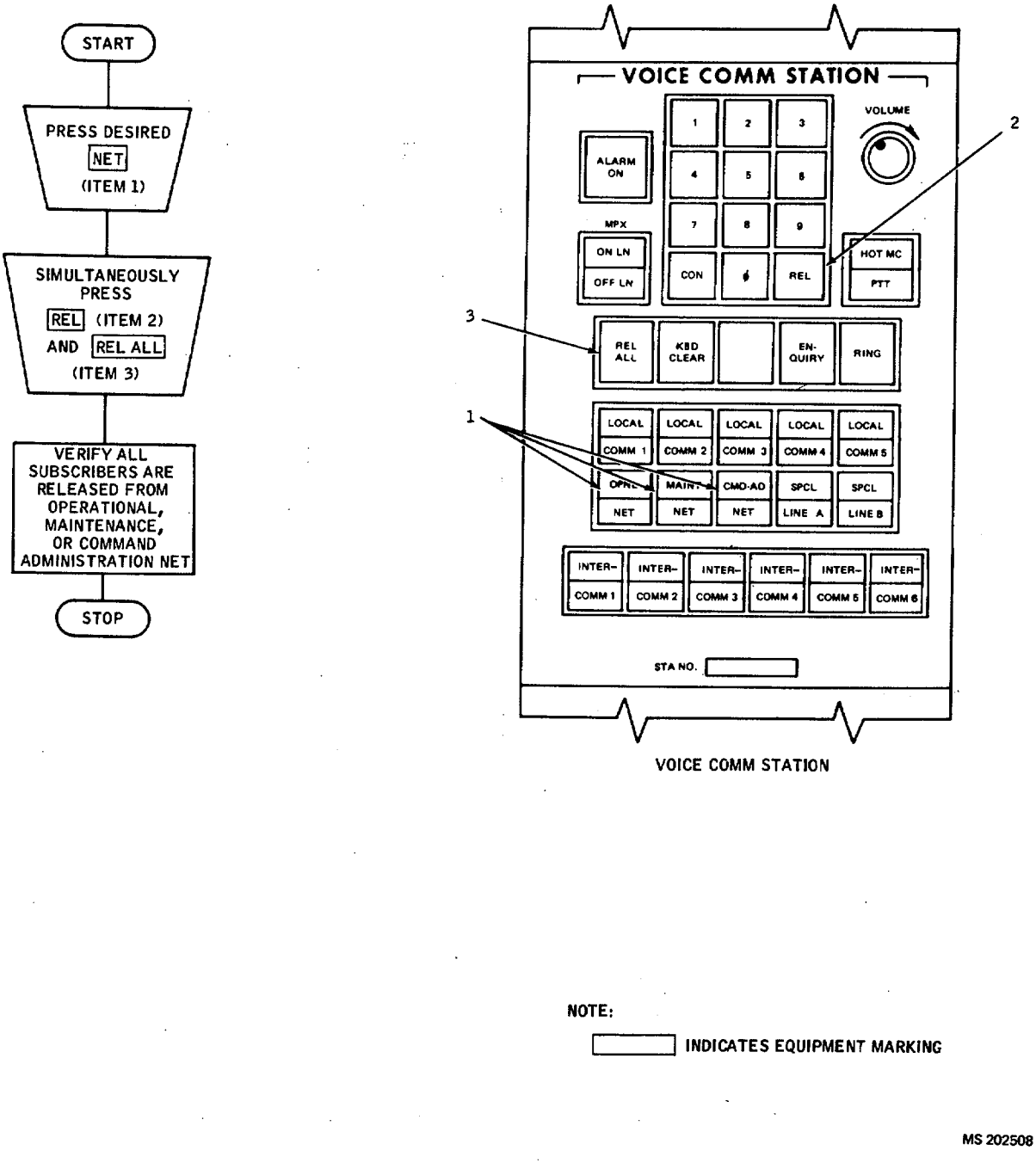
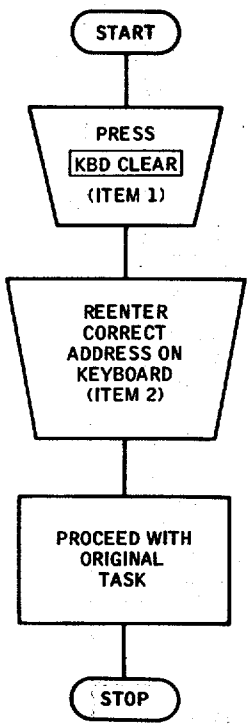


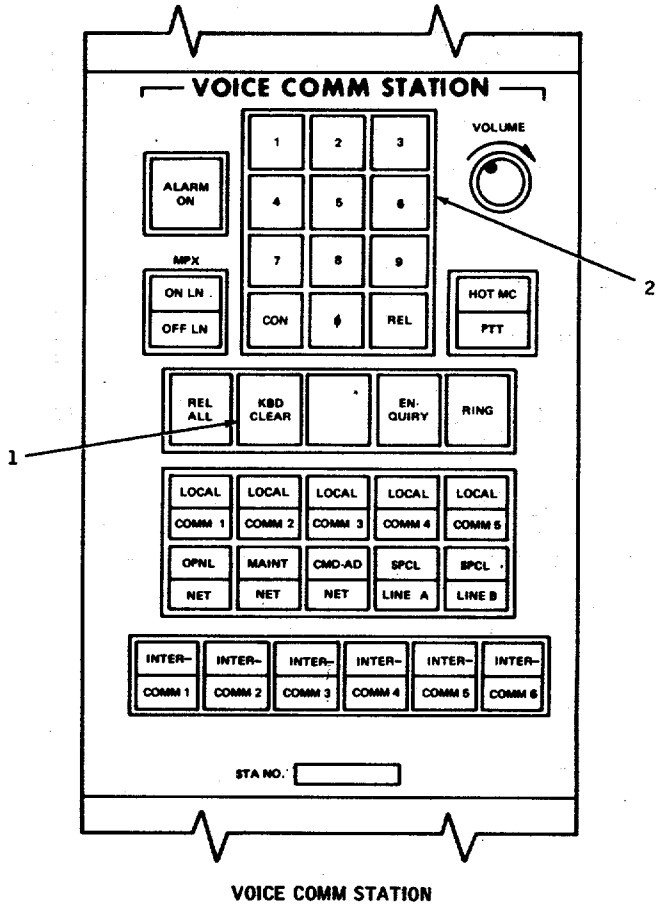
Figure 10-22. Answer Call on Local Comm Line



VOICE COMM STATION

Figure 10-23. Disconnect All Subscribers from Net





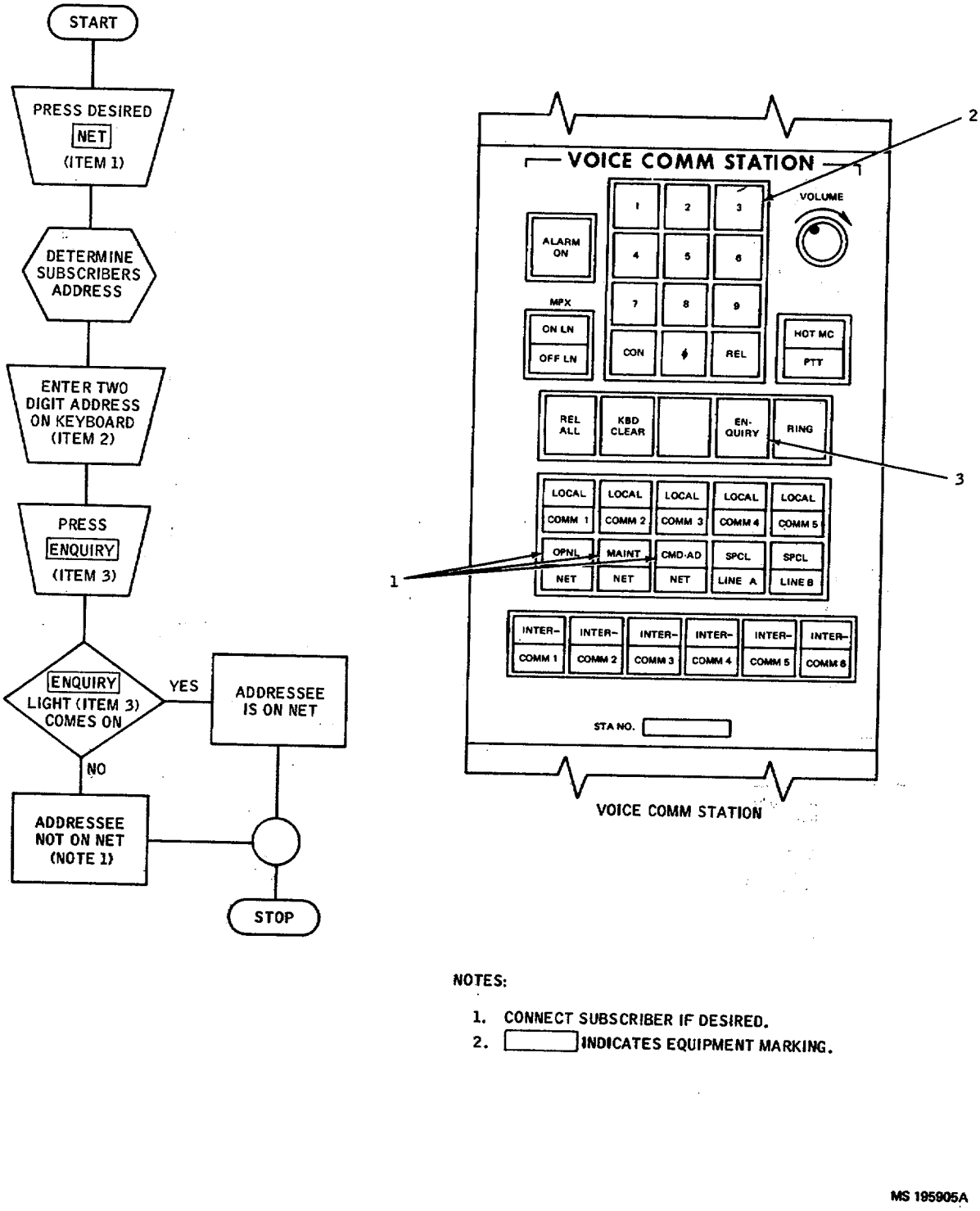
VOICE COMM STATION

NOTE:

[ ] INDICATES EQUIPMENT MARKING.

MS 195904

Figure 10-24. Correct Keyboard Entry Error



NOTES:

1. CONNECT SUBSCRIBER IF DESIRED.
2. [ ] INDICATES EQUIPMENT MARKING.

MS 195905A

Figure 10-25. Determine if Addressee is Connected to Net

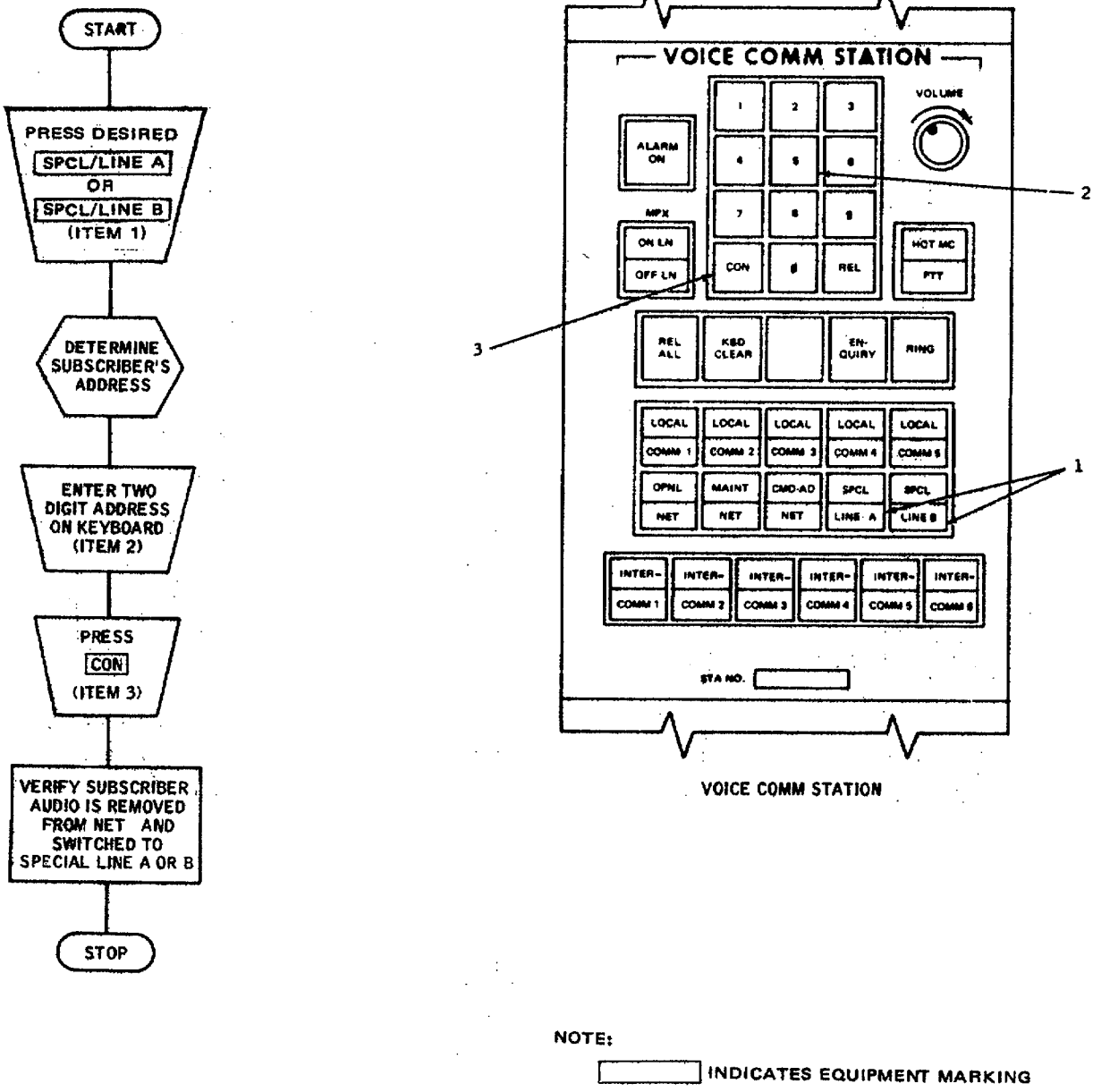
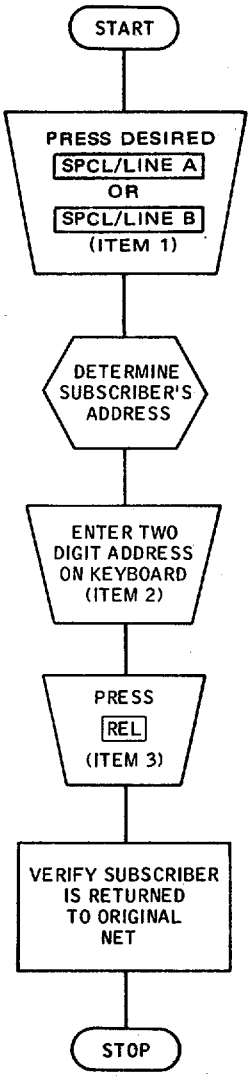
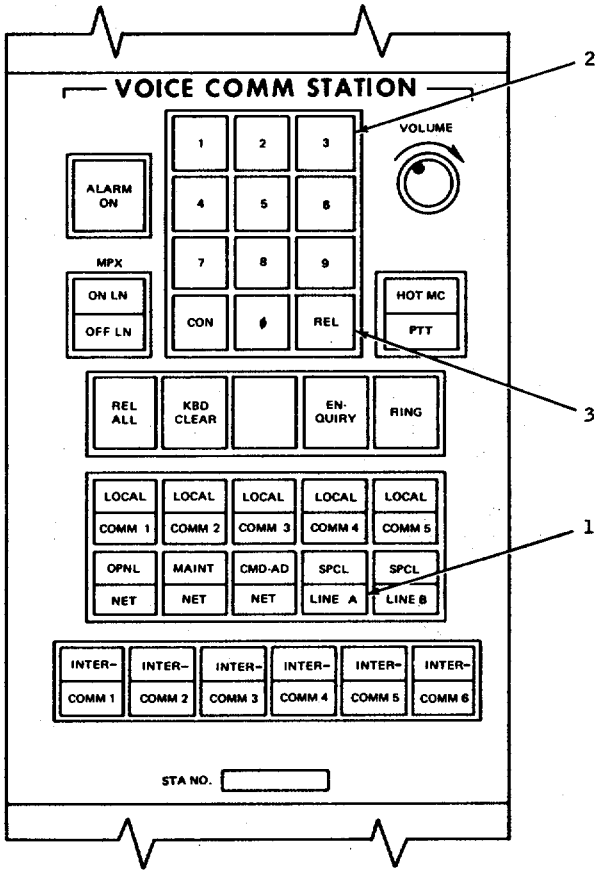


Figure 10-26. Transfer Subscriber from CMD-AD Net to Special Line A or B





VOICE COMM STATION

NOTE:

[ ] INDICATES EQUIPMENT MARKING.

Figure 10-27. Release Subscriber from Special Line A or B

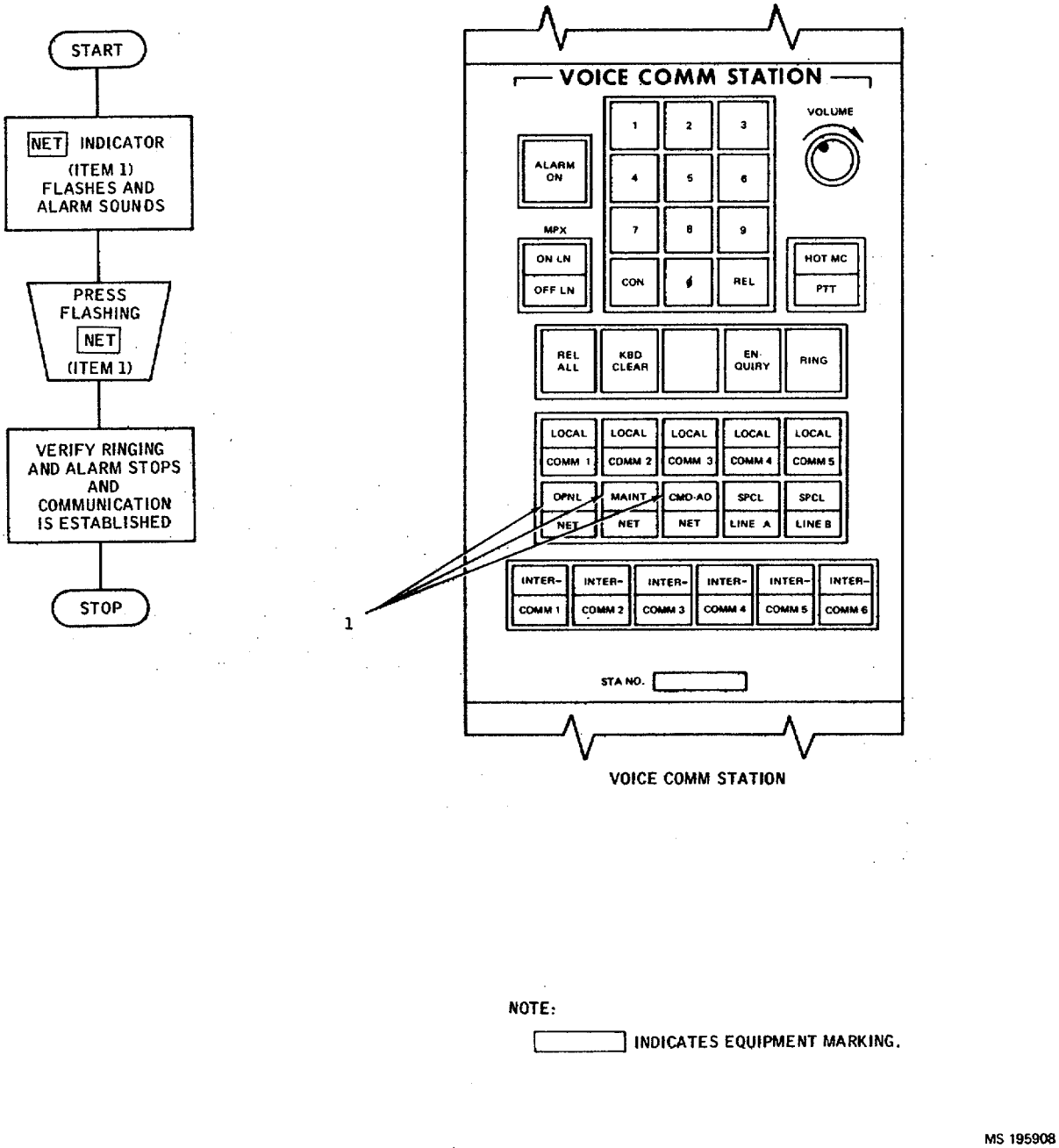
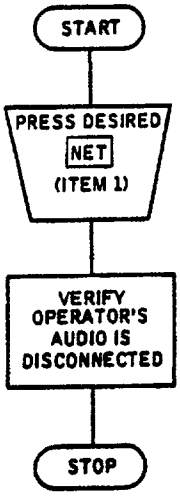
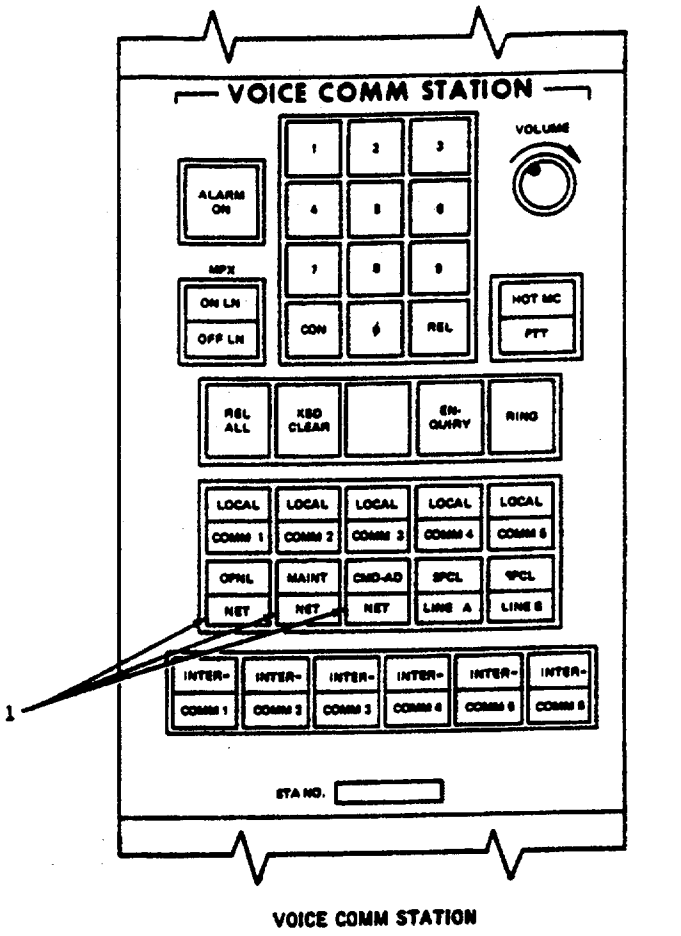


Figure 10-28. Answer Call on Net





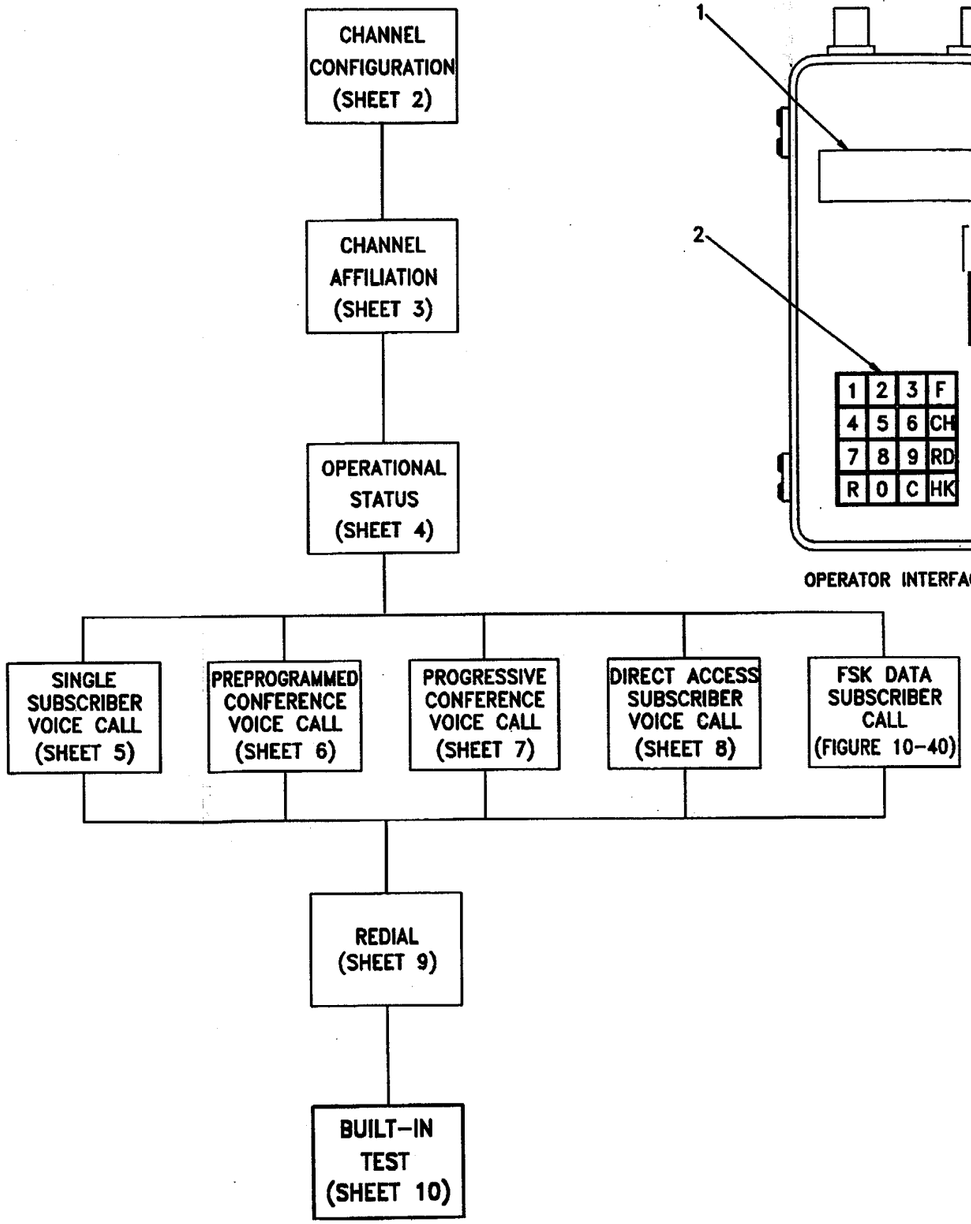
VOICE COMM STATION

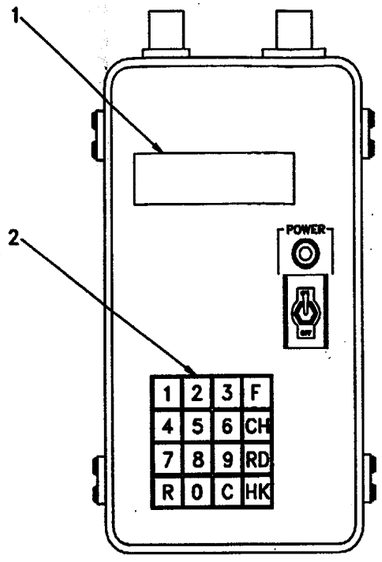
NOTE:

INDICATES EQUIPMENT MARKING.

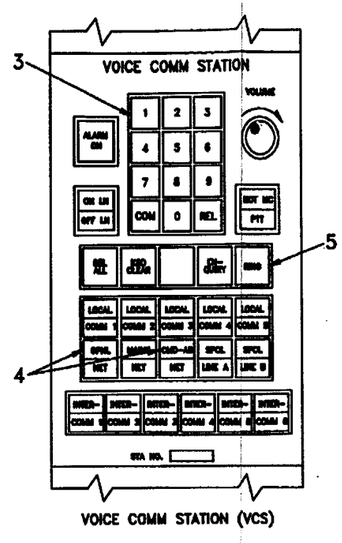
MS 186909

Figure 10-29. Hang-Up on Net





OPERATOR INTERFACE (OI)



VOICE COMM STATION (VCS)

NOTES:

1. CHANNEL CONFIGURATION DISPLAY (DEFAULT SHOWN)

```
C : 1D 2D 3D 4D 5D
    6V 7V 8V 9V
```

1 THRU 9 = CHANNEL NUMBER
D = DATA CHANNEL
V = VOICE CHANNEL
F = FAILED CHANNEL

2. A CHANNEL MUST BE ON HOOK IN ORDER TO BE RECONFIGURED. AN ATTEMPT TO RECONFIGURE AN OFF HOOK CHANNEL WILL RESULT IN THE RECONFIGURATION NOT ALLOWED MESSAGE. TO PLACE AN OFF HOOK CHANNEL ON HOOK, SELECT THE OFF HOOK CHANNEL (CH X) AND DEPRESS THE HK KEY ON THE OI KEYPAD (ITEM 2).

3. DURING AFFILIATION DIALING, THE DIALED NUMBER APPEARS ON THE SECOND LINE OF THE OI DISPLAY (ITEM 1). THIS NUMBER WILL REMAIN ON THE DISPLAY AS THE REDIAL NUMBER FOR THE REDIAL FEATURE. IF SOME OPERATION ON THE KEYPAD CAUSES DISPLAY OF THIS CHANNEL TO CHANGE TO ANOTHER DISPLAY, AND THEN RETURN TO THIS CHANNEL FOR DIALING, THE SECOND LINE OF THE DISPLAY WILL SHOW THE REDIAL NUMBER PRECEDED BY THE PRECEDENCE AT WHICH THE PREVIOUS CALL OF THAT NUMBER WAS MADE, AND AT WHICH THE REDIAL WILL BE MADE. FOR VOICE CHANNELS, THE PRECEDENCE WILL BE IMMEDIATE (I) WHILE FOR DATA CHANNELS, THE PRECEDENCE WILL BE FLASH (F).

4. DIALING DISPLAY

```
CHX:V  MODE
LNXXXXX
```

CHX = CHANNEL NUMBER 1 THRU 9
V = VOICE CHANNEL, OR
D = DATA CHANNEL
MODE = ON HOOK
OFF HOOK
ERROR TONE
DIAL TONE
TRAFFIC
LNXXXXX = LAST NUMBER DIALED (THIS CHANNEL)
I = IMMEDIATE PRECEDENCE
F = FLASH PRECEDENCE
6C = PREPROGRAMMED CONFERENCE CALL
8R = AFFILIATION
8C = DISAFFILIATION

5. ERROR TONE IS DISPLAYED WHEN: A MESSAGE IS NOT ACKNOWLEDGED, THE BAD PARITY MESSAGE IS RECEIVED, OR THE INVALID COMMAND MESSAGE IS RECEIVED.

6. IF A PREPROGRAMMED CONFERENCE LIST SUBSCRIBER DOES NOT ANSWER THE INITIAL CALL, THE CALL MAY BE REDIALED BY PRESSING THE C KEY ON THE OI KEYPAD (ITEM 2).

7. CHANNEL MODE DISPLAY

```
CHO: 1X 2X 3X 4X
     5X 6X 7X 8X 9X
```

1 THRU 9 = CHANNEL NUMBER
X = OPERATIONAL MODE
T = TRAFFIC
H = ON HOOK
B = BUSY
E = ERROR TONE
D = DIAL TONE
F = FAILED

8. [ ] INDICATES EQUIPMENT MARKINGS OR DISPLAYED MESSAGE.

9. EQUIPMENT PRESENT ONLY IN AN/TSQ-73 EQUIPPED WITH MSE/ADI.

MS559136

Figure 10-29.1. MSE/ADI Operation (Sheet 1 of 11)

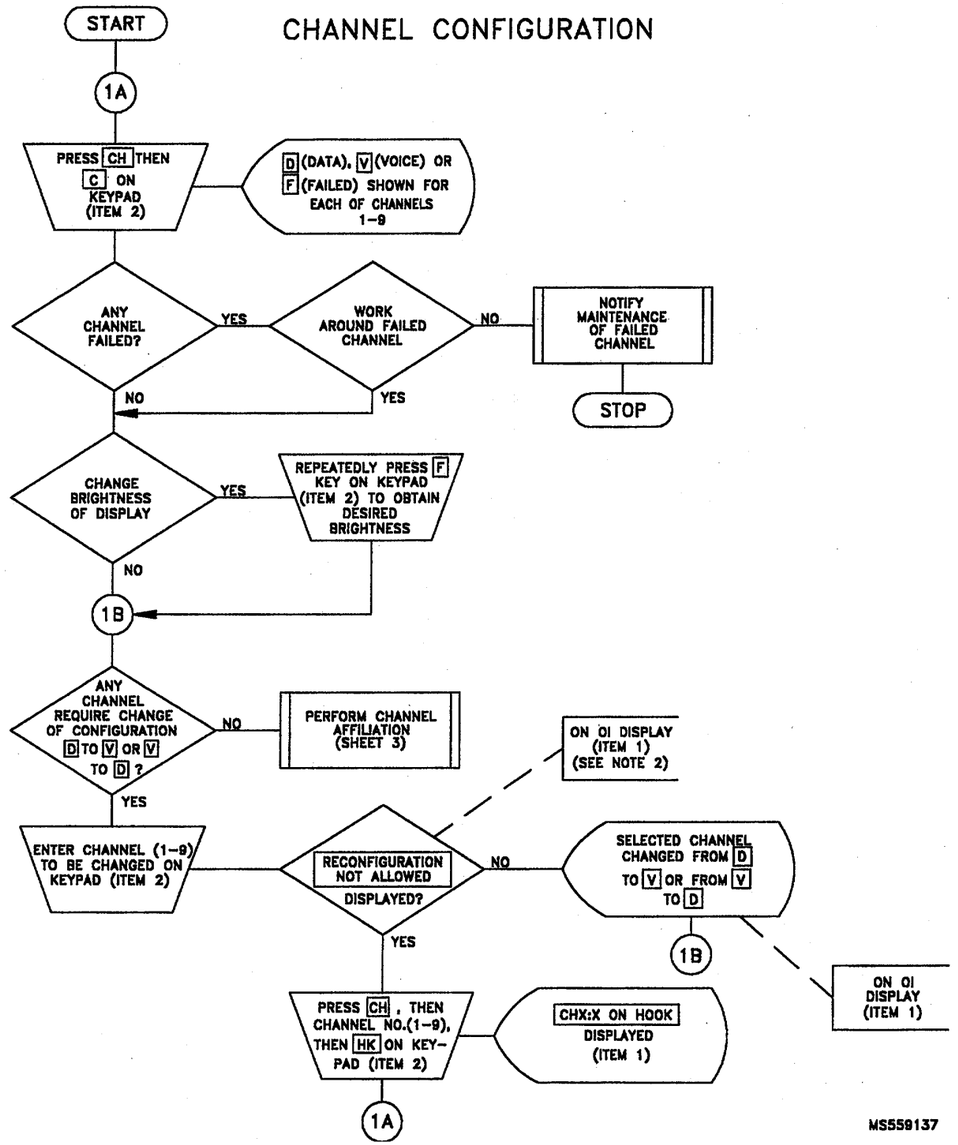


Figure 10-29.1. MSE/ADI operation (Sheet 2 of 11)

CHANNEL AFFILIATION

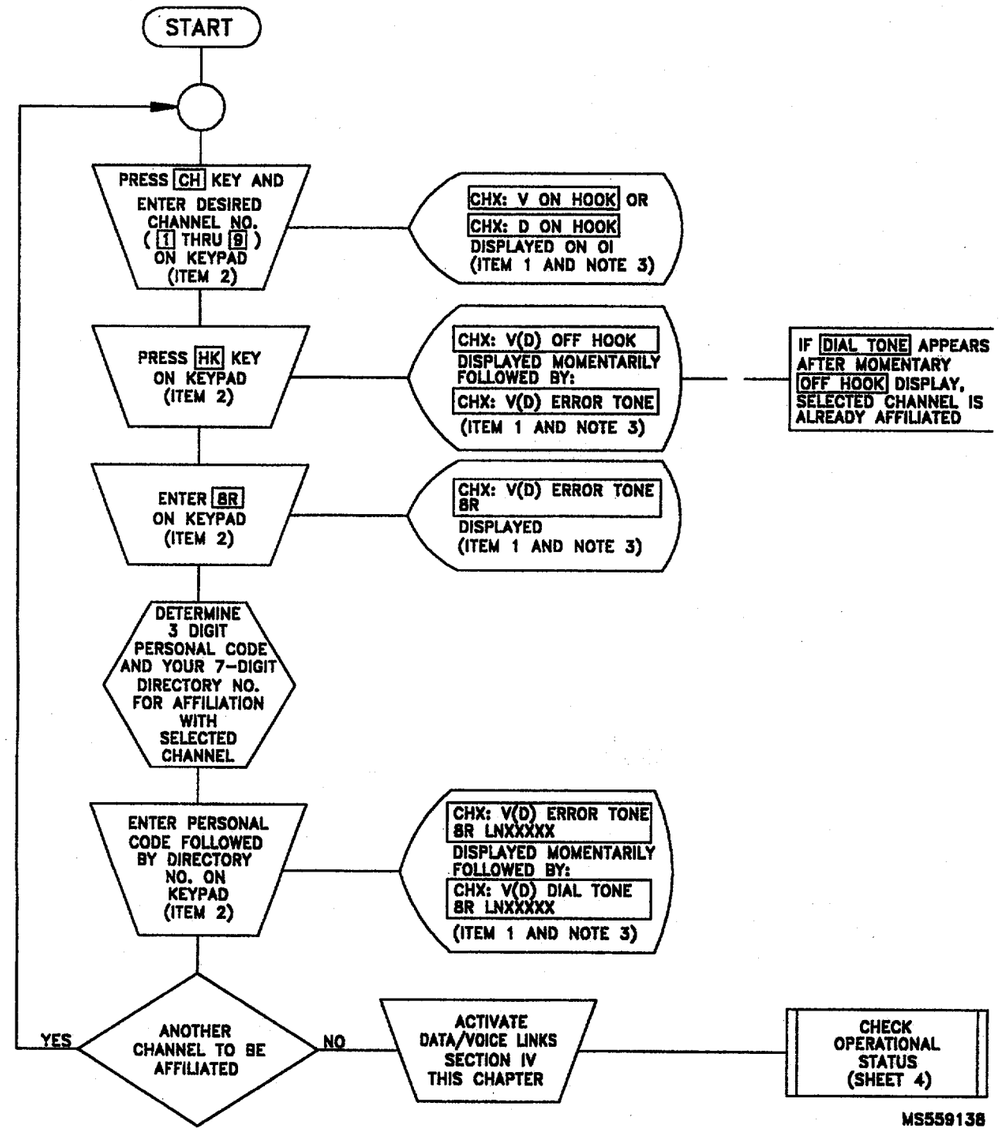


Figure 10-29.1. MSE/ADI operation (Sheet 3 of 11)

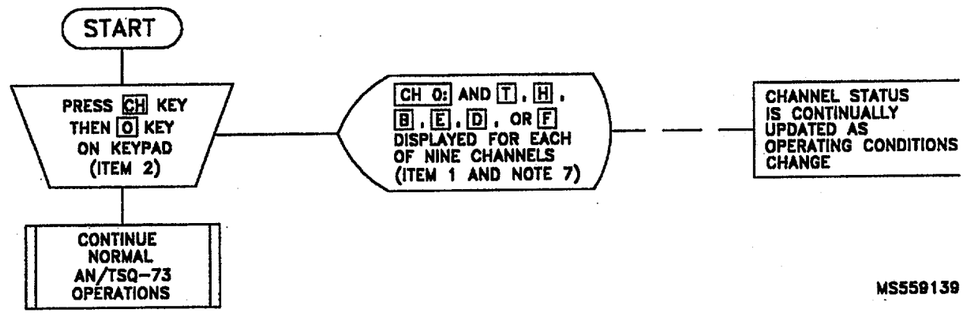


Figure 10-29.1. MSE/ADI operation (Sheet 4 of 11)

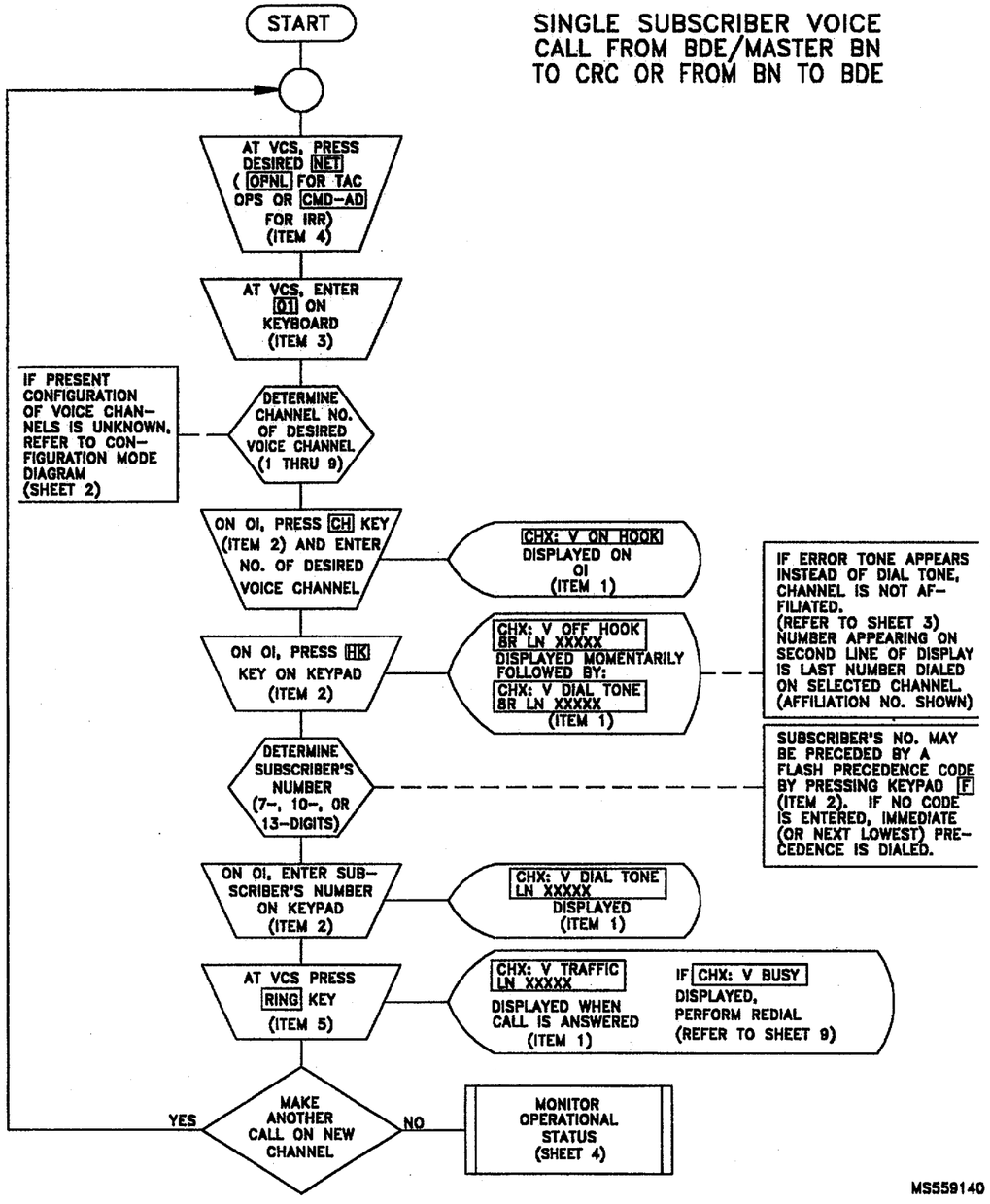


Figure 10-29.1. MSE/ADI operation (Sheet 5 of 11)

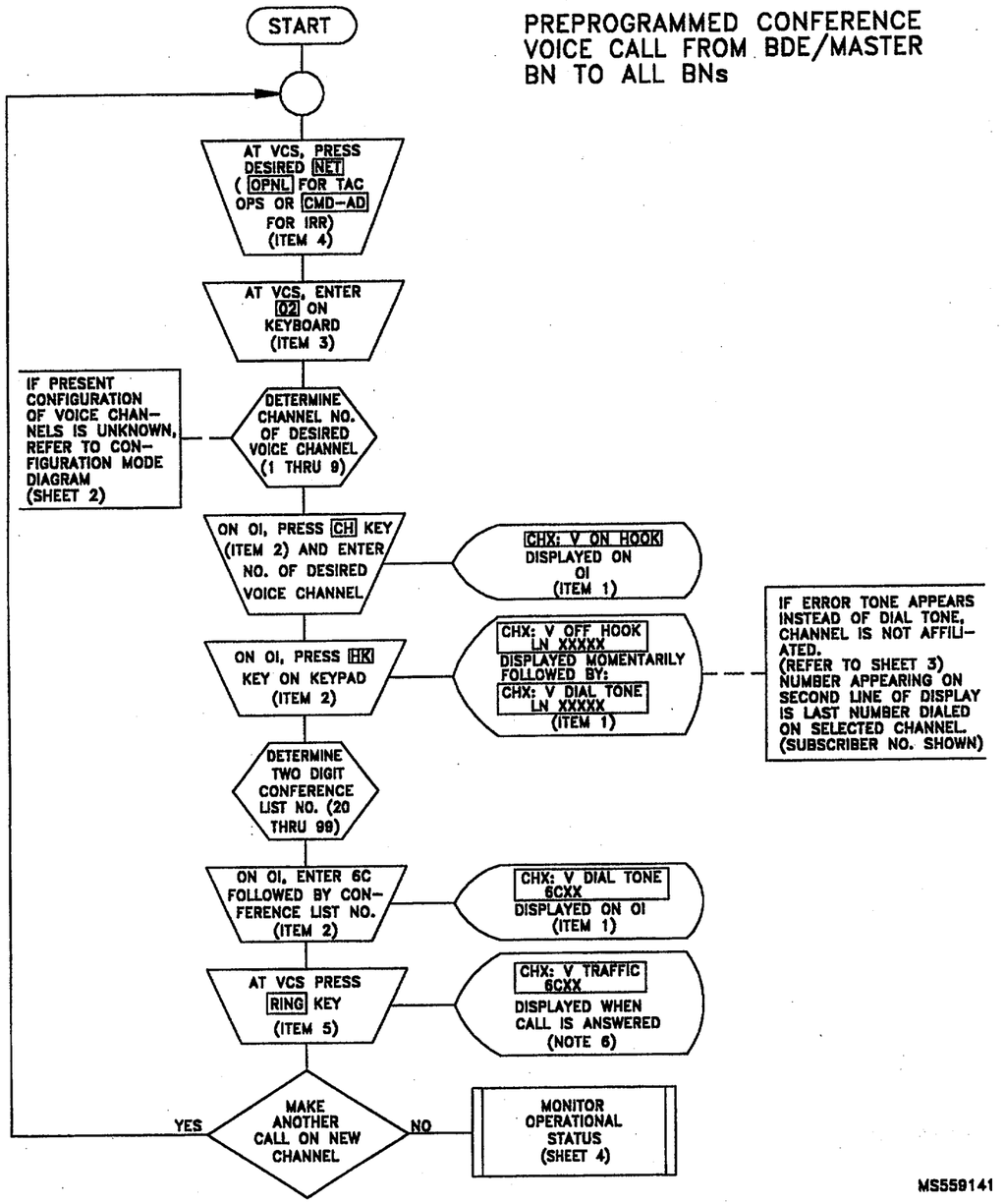


Figure 10-29.1. MSE/ADI operation (Sheet 6 of 11)

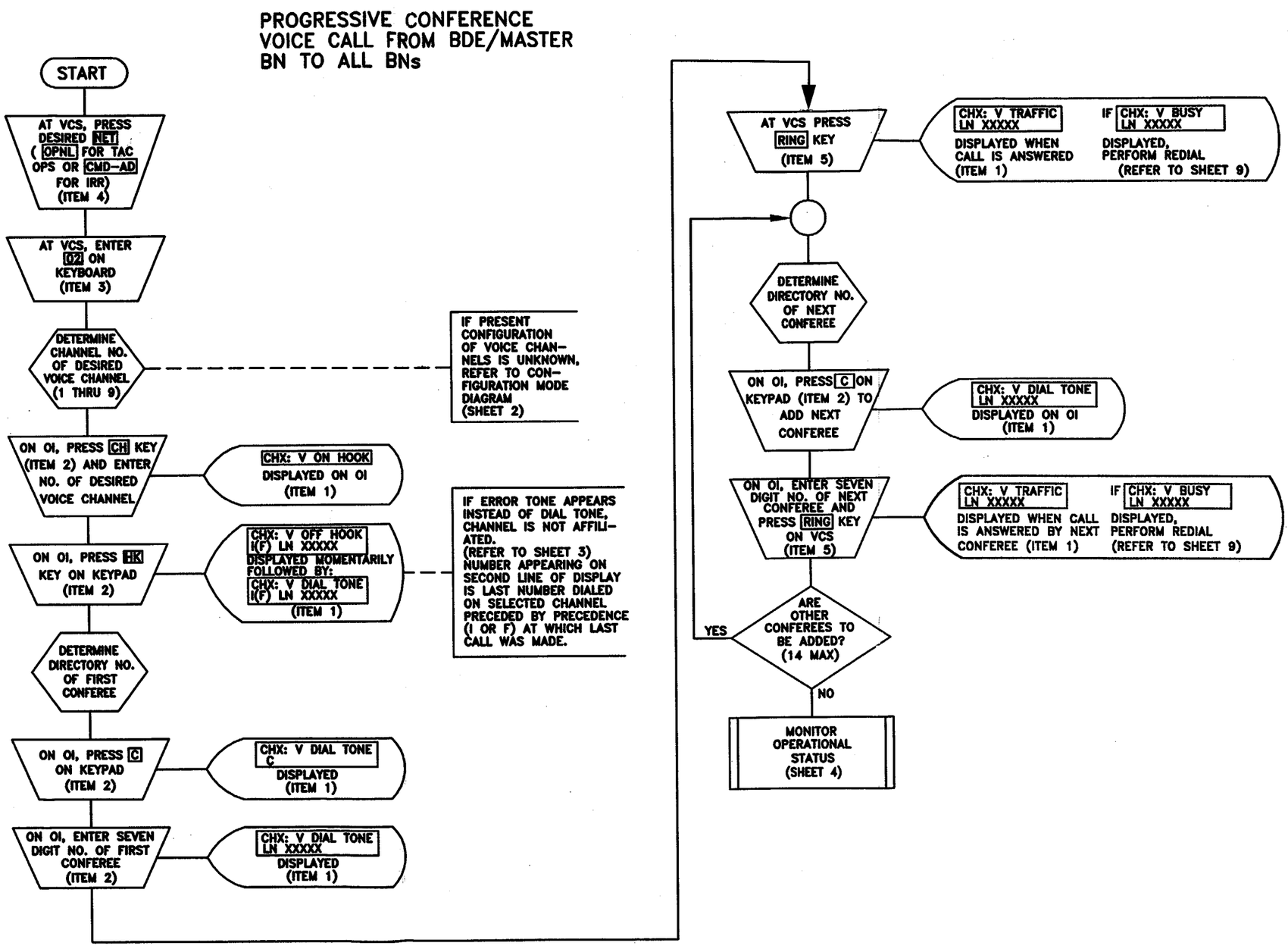


Figure 10-29.1. MSE/ADI operation (Sheet 7 of 11)

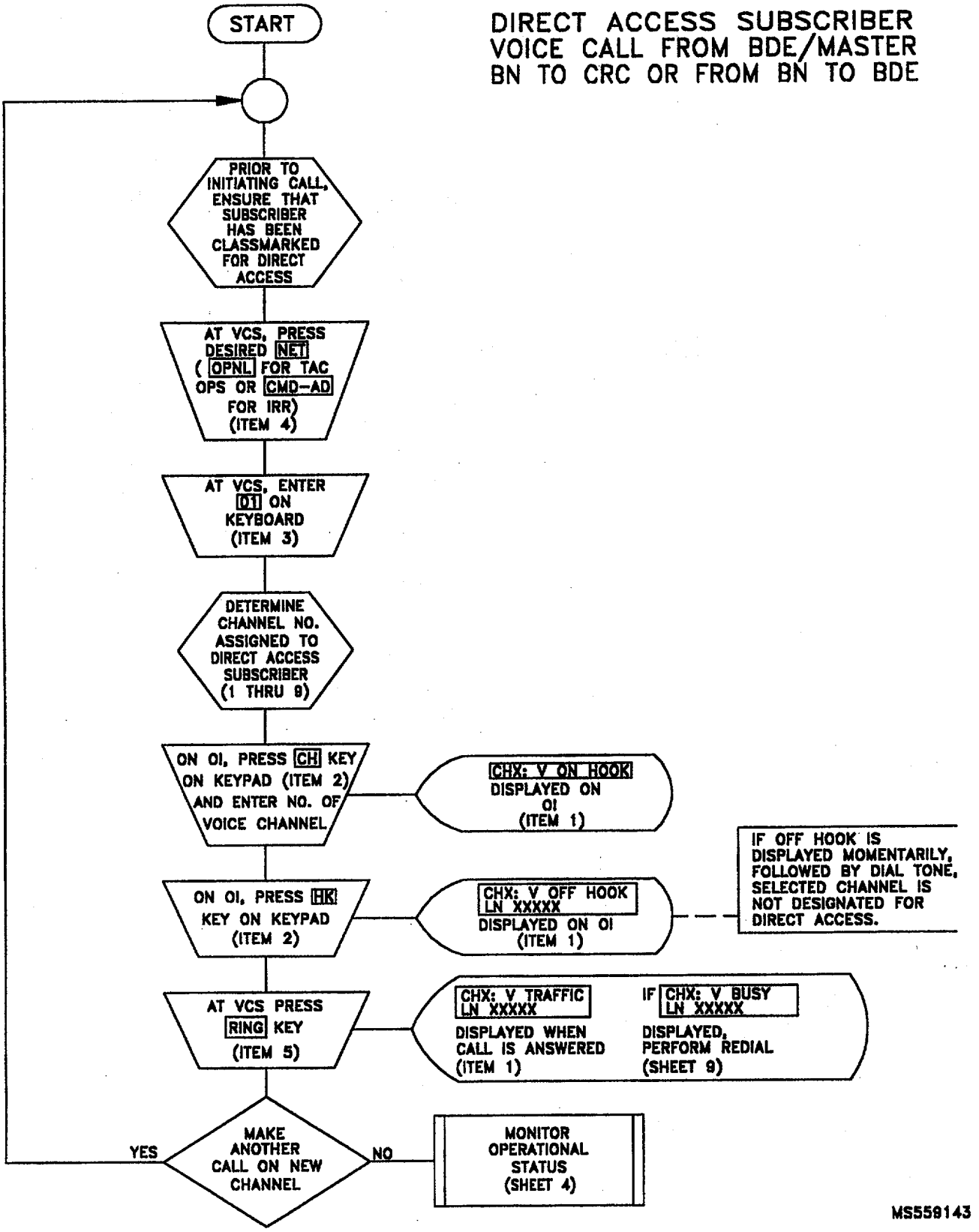


Figure 10-29.1. MSE/ADI operation (Sheet 8 of 11)

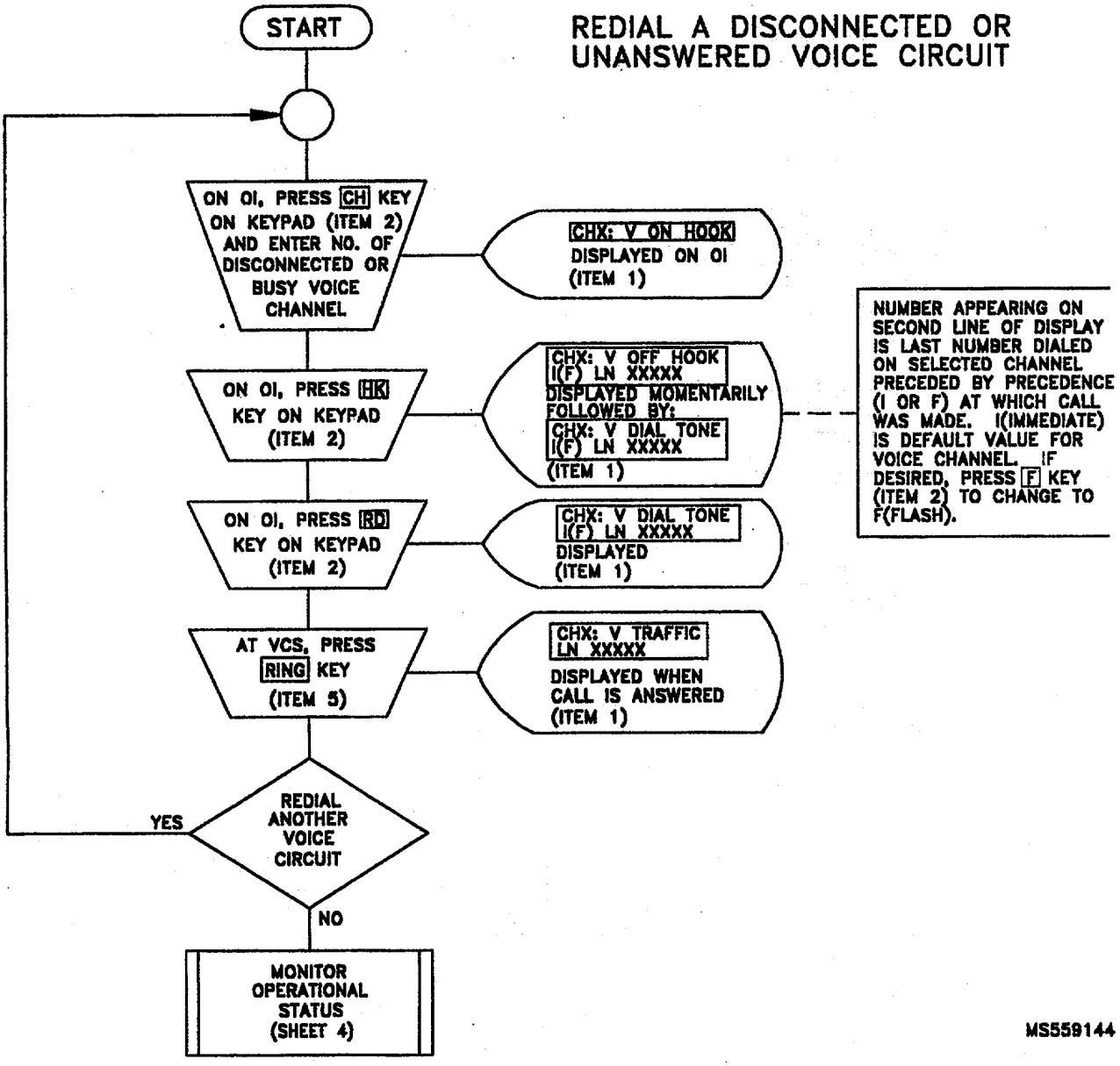


Figure 10-29.1. MSE/ADI operation (Sheet 9 of 11)

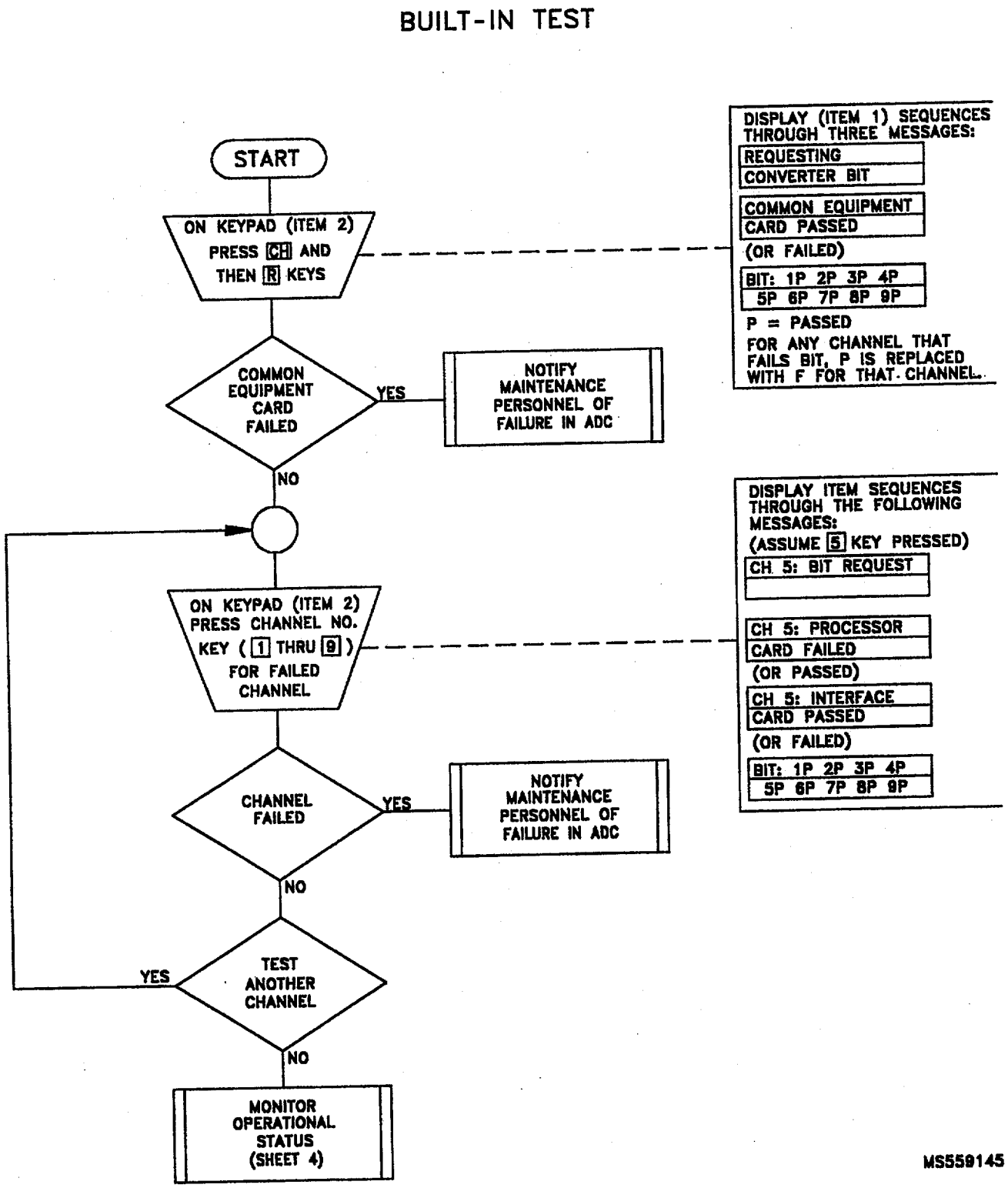


Figure 10-29.1. MSE/ADI operation (Sheet 10 of 11)

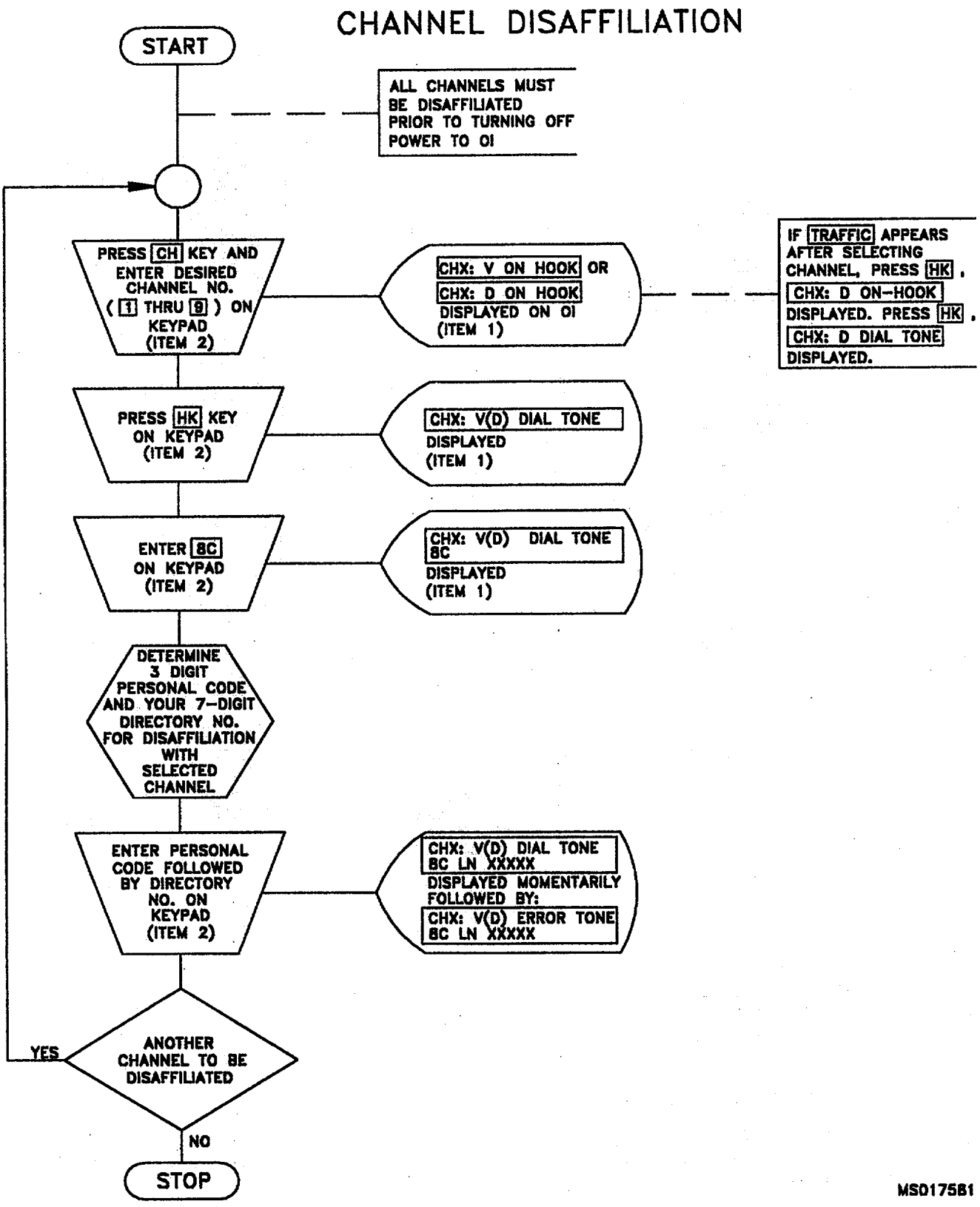


Figure 10-29.1. MSE/ADI operation (Sheet 11 of 11)

Section V. DATA COMMUNICATIONS OPERATING PROCEDURES

10-13. General. This section provides the AN/TSQ-73 operator procedures required for normal data link operation and for operation of the equipment configuration modified for the MSE/ADI (for AN/TSQ-73 system equipped with MSE/ADI). Figure 10-30 and tables 10-1. 1, 10-1.2 and 10-2 are used to determine data link addresses and modem switch settings used in standard configuration operating procedures, figures 10-32 thru 10-39. Figure 10-40 covers data operations applicable only to systems that have MSE/ADI in place. Table 10-3 lists Modem/Device/Connector assignments. All procedures assume that the requirements outlined in TM 9-1430-651-12 (Emplacement and Preparation for Travel) and TM 9-1430-652-10-3 (Initialization and Operating Procedures) have been complied with, i.e., the system is installed, initialized, and is operational.

NOTE

When configuring system remote links, avoid the type of situation illustrated in figure 10-29.2 where a closed loop has been created. This type of ADL loop can result in dual designation, duplicate track numbers and other correlation problems.

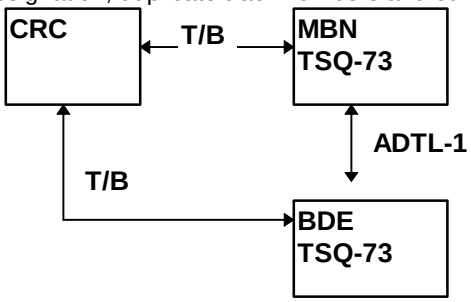


Figure 10-29.2. Possible ADL Loop

Table 10-1.1. Data Link *Switch Settings* - Battalion

Link number[2]	Description
0-7	TADIL B/ATDL-1 sites[1]
10-37	ATDL-1 Fire unit[1]

[1]Set modem FORMAT switch to IAB, BIT RATE BPS switch to 1200, and ATTEN (DB) to 00.
[2]Link to Modem assignment is optional and achieved with CC102 (TM 9-1430-652-10-6). However, to prevent false off-line modem failure typeouts, the following procedures are recommended when making Link to Modem assignments: a. Perform data link switch settings as required on selected active modems and set individual power switches to ON.

b. Select the required number of spare modems to beverifled operational by internal loop test. Selection must be such that at least one active modem or one spare modem is associated with each modem power supply installed in the modem card cages per TM 9-1430-655-20-7, figure 3-16 and table 3-9. Perform data link switch settings as required and set individual power switches to ON.

c. At the system patch panel, patch internal transmit to internal receive for all spare modems selected in b. above.

d. Set individual power switches to OFF on remaining unused modems. Provided unused modems are powered off prior to boot loading the system, TMON errors will not be generated.

Table 10-1.2. Data Link Switch Settings - Master Battalion

Link number[2]	Description
0-7	TADIL B/ATDL-1 sites[1]
10-37	ATDL-1 Fire unit[1]

[1]Set modem FORMAT switch to IA/TB, BIT RATE BPS switch to 1200, and ATTEN (DB) to 00.
[2]Link to Modem assignment is optional and achieved with CC102 (TM 9-1430-652-10-6). However, to prevent false off-line modem failure typeouts, the following procedures are recommended when making Link to Modem assignments:

a. Perform data link switch settings as required on selected active modems and set individual power switches to ON.

b. Select the required number of spare modems to be verified operational by internal loop test. Selection must be such that at least one active modem or one spare modem is associated with each modem power supply installed in the modem card cages per TM 9-1430-655-20-7, figure 3-16 and table 3-9. Perform data link switch settings as required and set individual power switches to ON.

c. At the system patch panel, patch internal transmit to internal receive for all spare modems selected in b. above.

d. Set individual power switches to OFF on remaining unused modems. Provided unused modems are powered off prior to boot loading the system, TMON errors will not be generated.

Table 10-2. Data Link Switch Settings - Brigade

Link number[2]	Description
0-7	TADIL B/ATDL-1 sites[1]
10-37	ATDL-1 Fire unit[1]

[1]Set modem FORMAT switch to IA/TB, BIT RATE BPS switch to 1200, and ATTEN (DB) to 00.

[2]Link to Modem assignment is optional and achieved with CC102 (TM 9-1430-652-10-6). However, to prevent false off-line modem failure typeouts, the following procedures are recommended when making Link to Modem assignments:

a. Perform data link switch settings as required on selected active modems and set individual power switches to ON.

b. Select the required number of spare modems to be verified operational by internal loop test. Selection must be such that at least one active modem or one spare modem is associated with each modem power supply installed in the modem card cages per TM 9-1430-655-20-7, figure 3-16 and table 3-9. Perform data link switch settings as required and set individual power switches to ON.

c. At the system patch panel, patch internal transmit to internal receive for all spare modems selected in b. above.

d. Set individual power switches to OFF on remaining unused modems. Provided unused modems are powered off prior to boot loading the system, TMON errors will not be generated.

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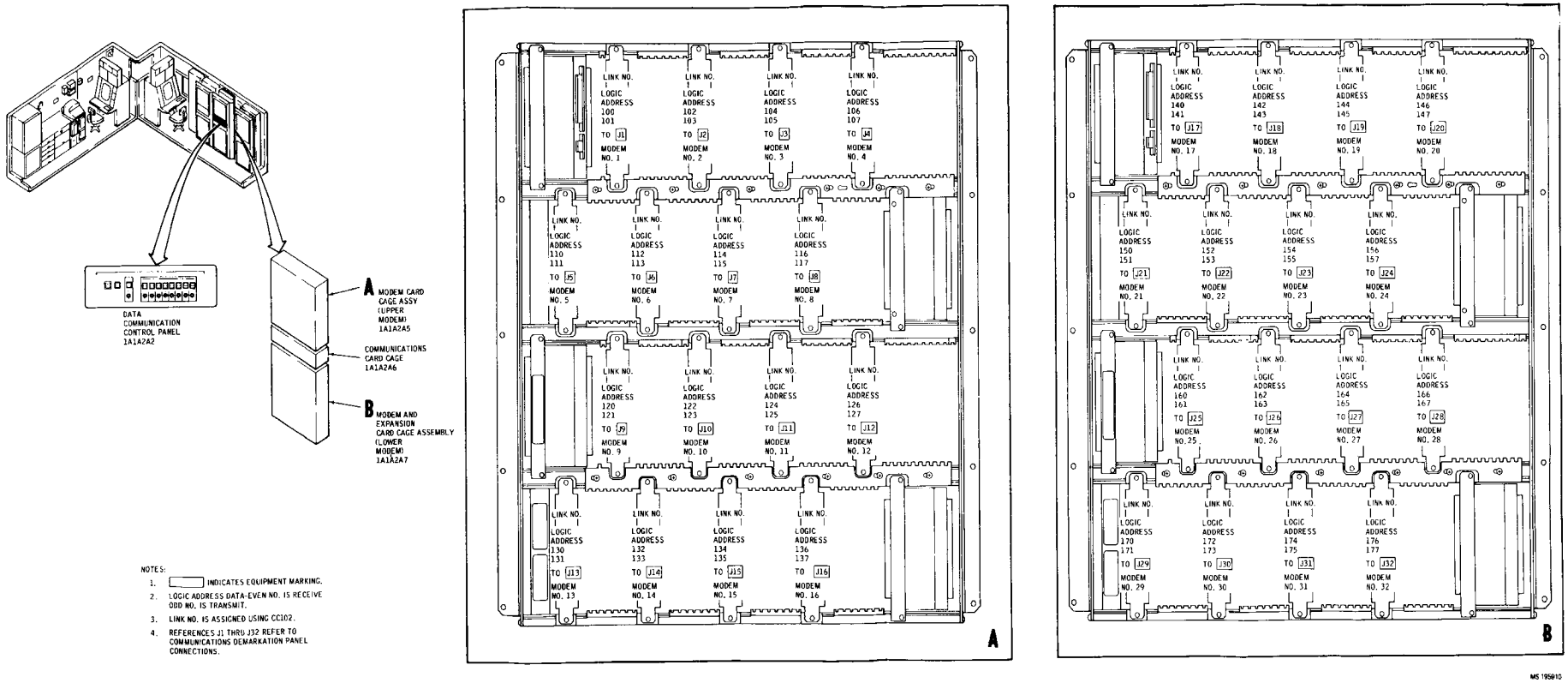


Figure 10-30. Data Link Selection

10-45/(10-46 blank)

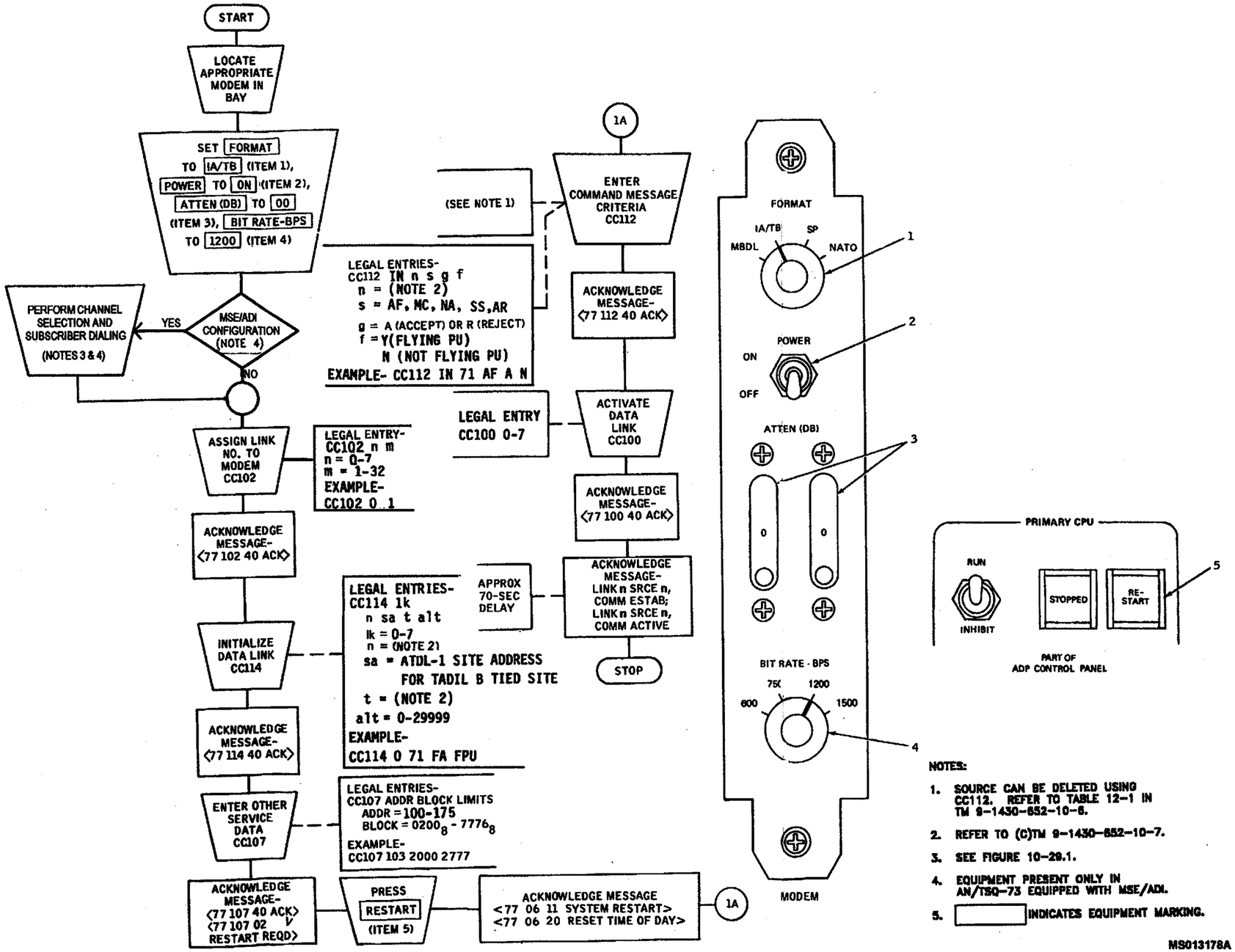


Figure 10-32. Activate TADIL B Link

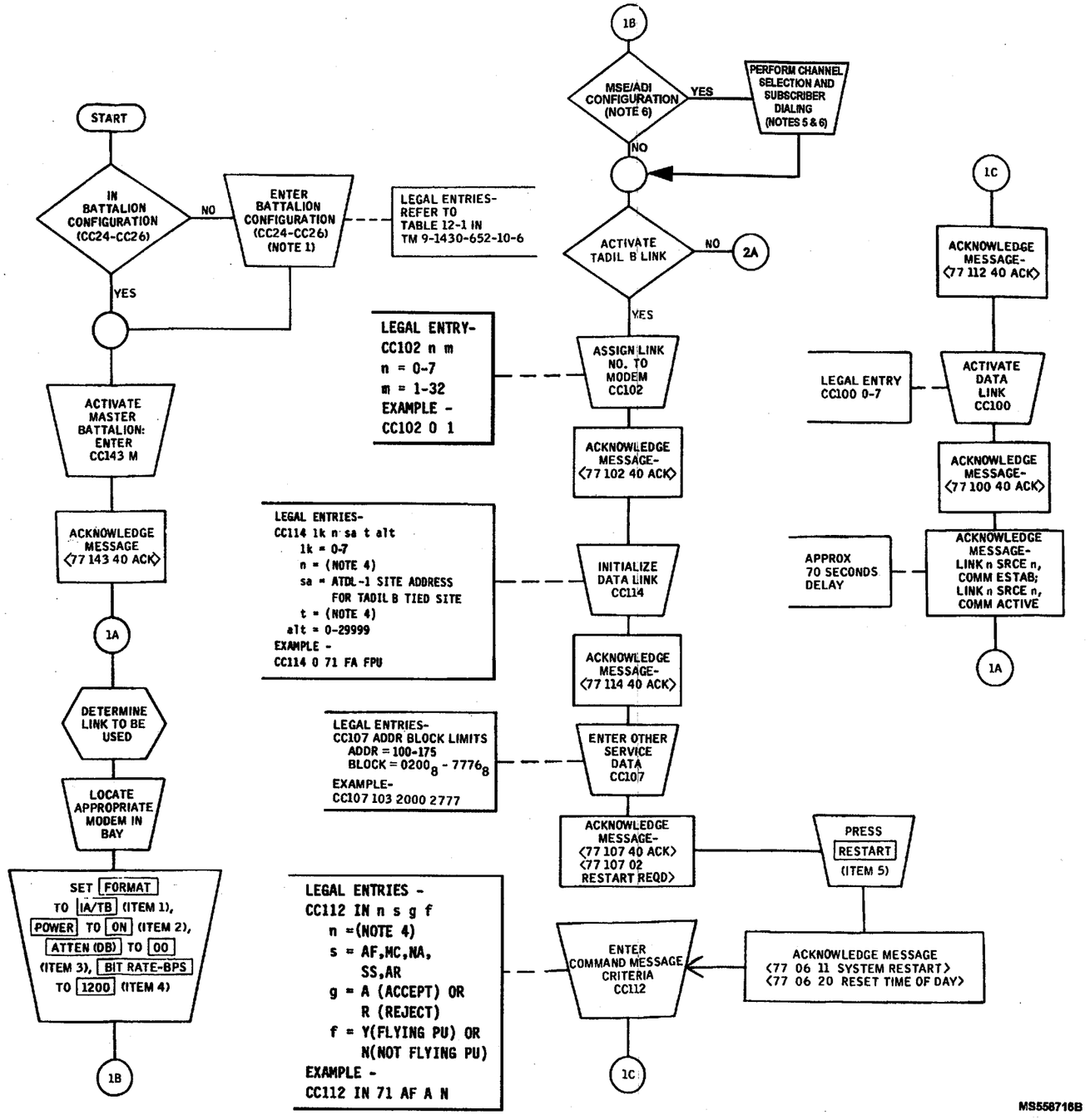
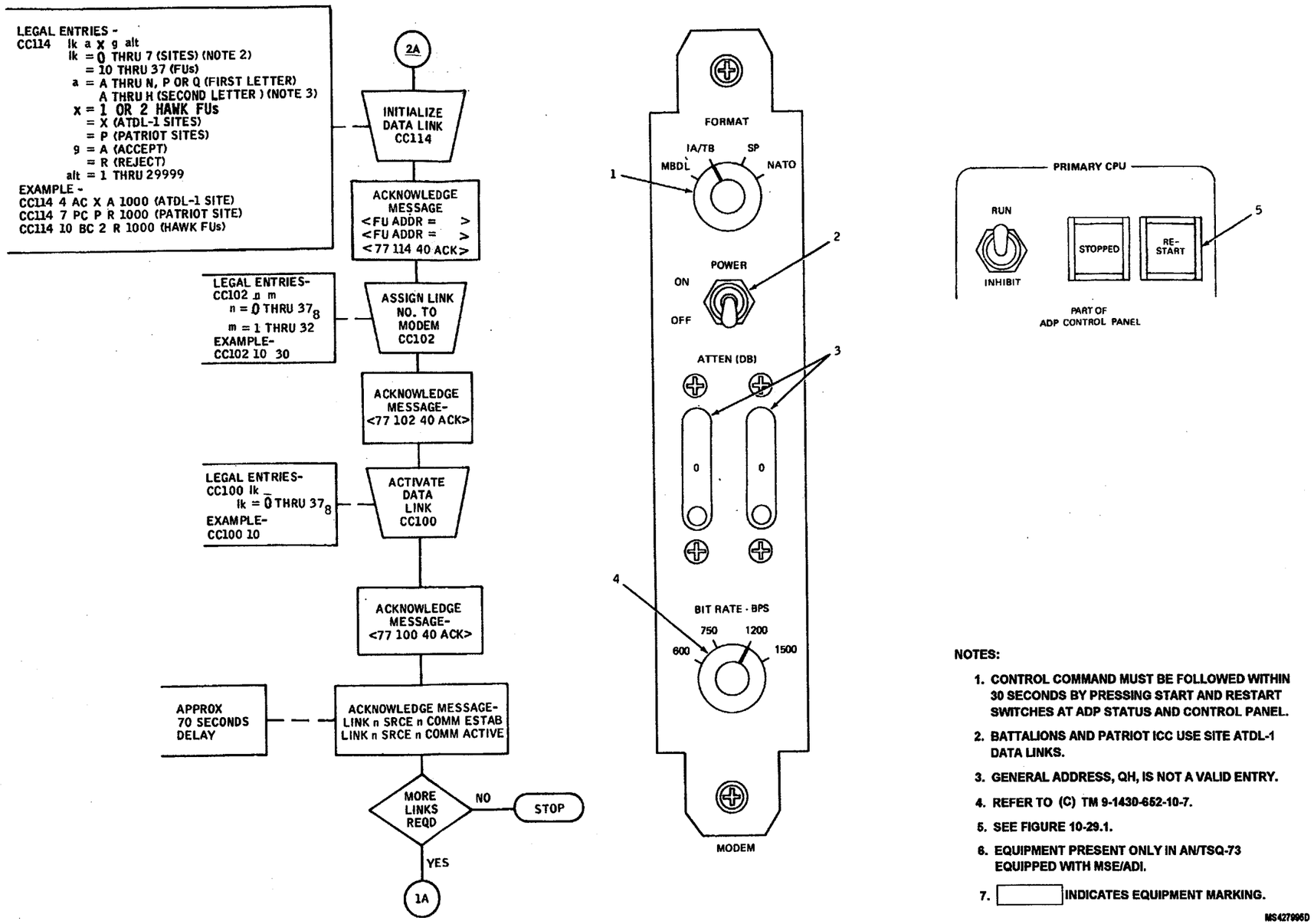


Figure 10-32.1. Activate Master Battalion Data Link
(Sheet 1 of 2)



NOTES:

1. **CONTROL COMMAND MUST BE FOLLOWED WITHIN 30 SECONDS BY PRESSING START AND RESTART SWITCHES AT ADP STATUS AND CONTROL PANEL.**
2. **BATTALIONS AND PATRIOT ICC USE SITE ATDL-1 DATA LINKS.**
3. **GENERAL ADDRESS, QH, IS NOT A VALID ENTRY.**
4. **REFER TO (C) TM 9-1430-652-10-7.**
5. **SEE FIGURE 10-29.1.**
6. **EQUIPMENT PRESENT ONLY IN AN/TSQ-73 EQUIPPED WITH MSE/ADI.**
7. **[ ] INDICATES EQUIPMENT MARKING.**

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Figure 10-32.1. Activate Master Battalion Data Link (Sheet 2 of 2)

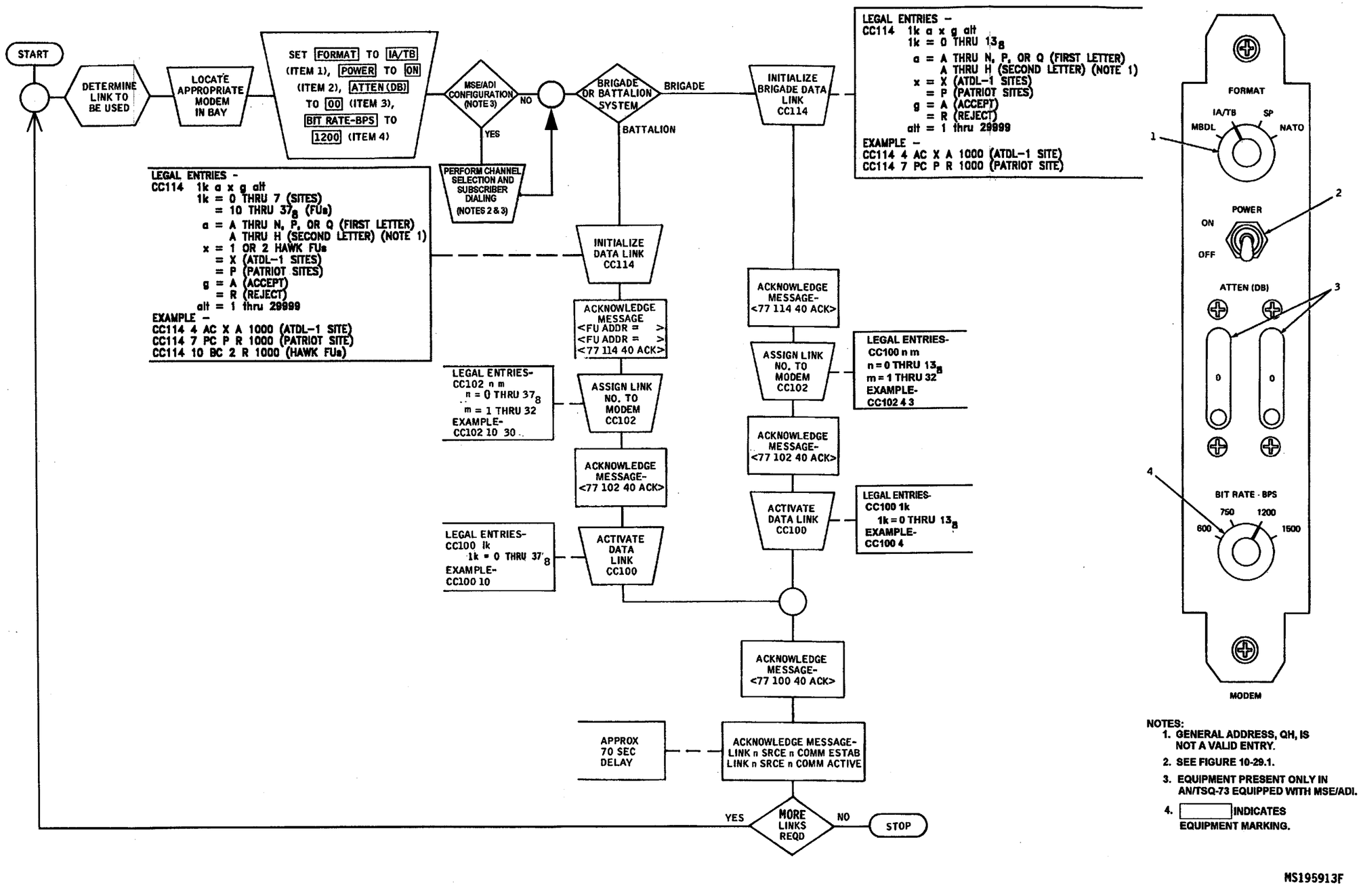
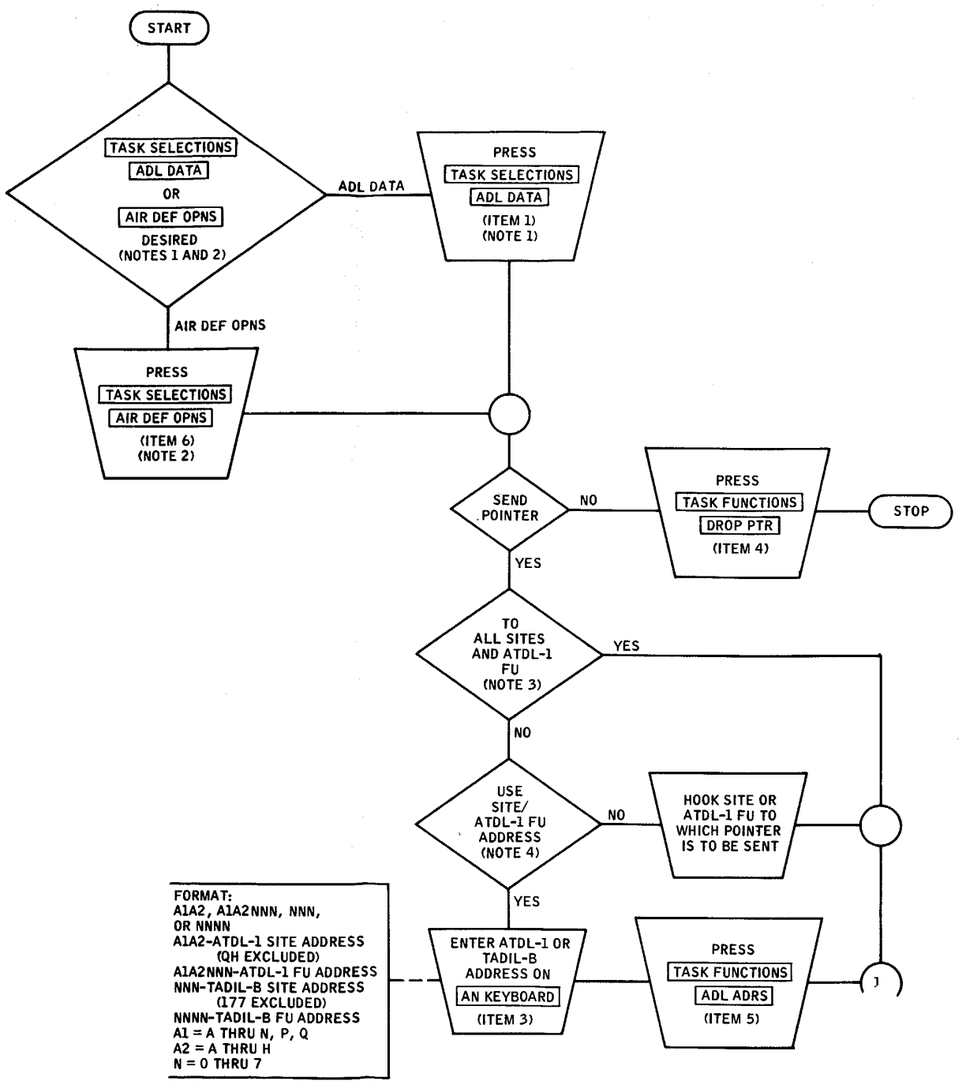


Figure 10-33. Activate ATDL-1 Link

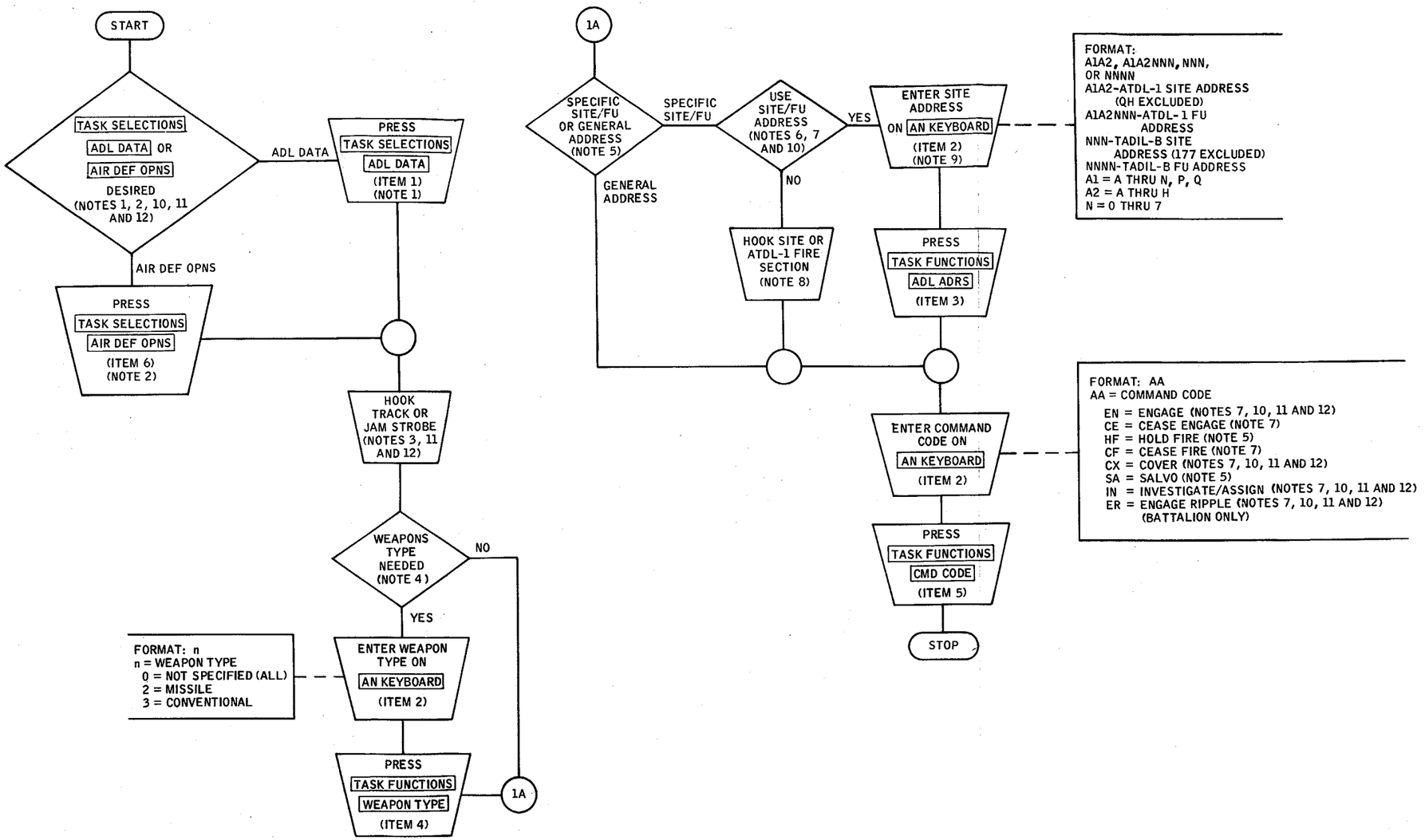


NOTES:

1. ADL DATA IS VALID IN ALL MODES EXCEPT MONITOR OR TEST.
2. AIR DEF OPNS IS VALID ONLY IN TRACKING/ TACTICAL MODE.
3. MAY ALSO BE SENT TO ALL ATDL-1 SITES/FUs BY PRESSING ADL DATA , ENTERING QH, AND PRESSING ADL ADRS .
4. USE OF SITE/ATDL-1 FU ADDRESS REQUIRES THE USE OF ADL DATA .
5. ONLY ONE POINTER MAY BE DISPLAYED AT A TIME. ANOTHER MAY BE RECEIVED AND STORED; IT WILL BE DISPLAYED WHEN THE FIRST POINTER IS DROPPED.
6. SENT TO DESIGNATED TIED SITE OR ATDL-1 FU (OR TADIL-B NON-TIED SITE). POINTER WILL BE SENT TO REPORTING SITE OF ATDL-1 NON-TIED SITE/FU.
7. ☐ INDICATES EQUIPMENT MARKING.

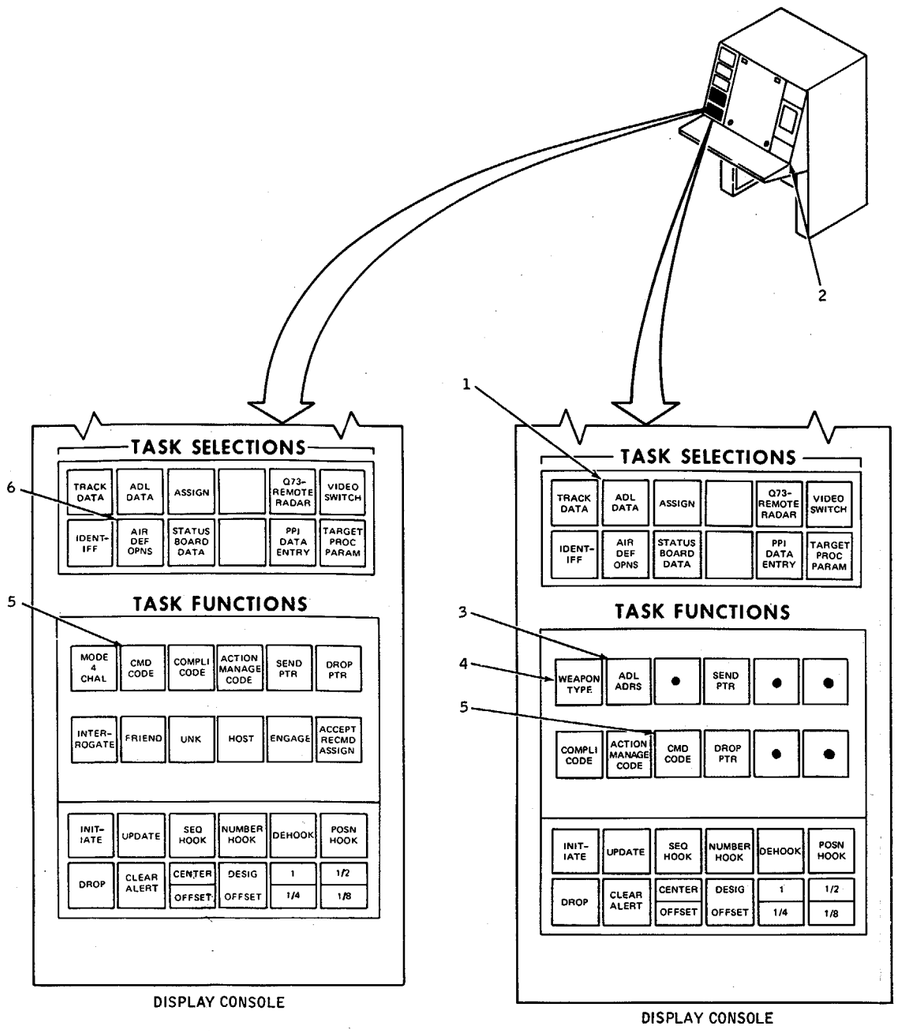
MS 202083 E

Figure 10-35. Send or Drop Pointer



MS 558715

Figure 10-35.1. Send Command Message
(Sheet 1 of 2)



NOTES:

1. [ADL DATA] IS VALID IN ALL MODES EXCEPT MONITOR OR TEST.
2. [AIR DEF OPNS] IS VALID ONLY IN TRACKING/TACTICAL MODE.
3. JAM STROBE ENGAGEMENT IS ONLY POSSIBLE WITH ATDL-1 FUs.
4. USE OF [WEAPON TYPE] REQUIRES THE USE OF [ADL DATA] . IF NO ENTRY IS MADE, 0 IS ASSUMED.
5. GENERAL ADDRESS IS VALID ONLY FOR COMMANDS HOLD FIRE OR SALVO. GENERAL ADDRESS MAY ALSO BE SENT BY PRESSING [ADL DATA], ENTERING QH OR 177, AND PRESSING [ADL ADRS]
6. USE OF SITE/FU ADDRESS REQUIRES THE USE OF [ADL DATA]
7. SPECIFIC ADDRESS IS VALID FOR COMMANDS ENGAGE, ENGAGE RIPPLE, COVER, INVESTIGATE/ASSIGN, CEASE FIRE, AND CEASE ENGAGE. MESSAGE IS SENT TO DESIGNATED TIED SITE, FU, OR TADIL-B NON-TIED SITE. MESSAGE WILL BE SENT TO REPORTING SITE OF ATDL-1 NON-TIED SITE OR FU.
8. ILLEGAL IF [ADL ADRS] PREVIOUSLY ENTERED.
9. ILLEGAL IF SITE/FU IS CURRENTLY HOOKED.
10. ATTEMPTING TO SEND ENGAGE, ENGAGE RIPPLE, INVESTIGATE/ASSIGN, OR COVER COMMAND TO A LASHE FU WILL RESULT IN FU LASHE ILLEGAL ACTION.
11. ATTEMPTING TO SEND ENGAGE OR ENGAGE RIPPLE COMMANDS ON A HOSTILE OR UNKNOWN TRACK IN A HOLD ZONE WILL RESULT IN TK IN HZ ILLEGAL ACTION. IF THE TRACK IS HOSTILE AND THE COMMAND WAS ORIGINALLY RECEIVED VIA ADL, A MANUAL ASSIGN WILL SEND THE COMMAND. IF THE TRACK IS UNKNOWN, THE COMMAND CANNOT BE SENT. IF THE TRACK IS HOSTILE, AND THE COMMAND DID NOT ORIGINATE FROM ADL, THE COMMAND CANNOT BE SENT. ATTEMPTING TO ASSIGN AN UNKNOWN TRACK IN A TIGHT ZONE IF THE COMMAND WAS ORIGINALLY RECEIVED VIA ADL WILL RESULT IN TK N/HST ILLEGAL ACTION.
12. FOR TRACKS IN HOLD OR TIGHT ZONE, RETRANSMISSION OF COMMANDS MAY BE NECESSARY, REFER TO LOCAL SOP.
13. [ ] INDICATES EQUIPMENT MARKING.

MS 195916H

Figure 10-35.1. Send Command Message (Sheet 2 of 2)

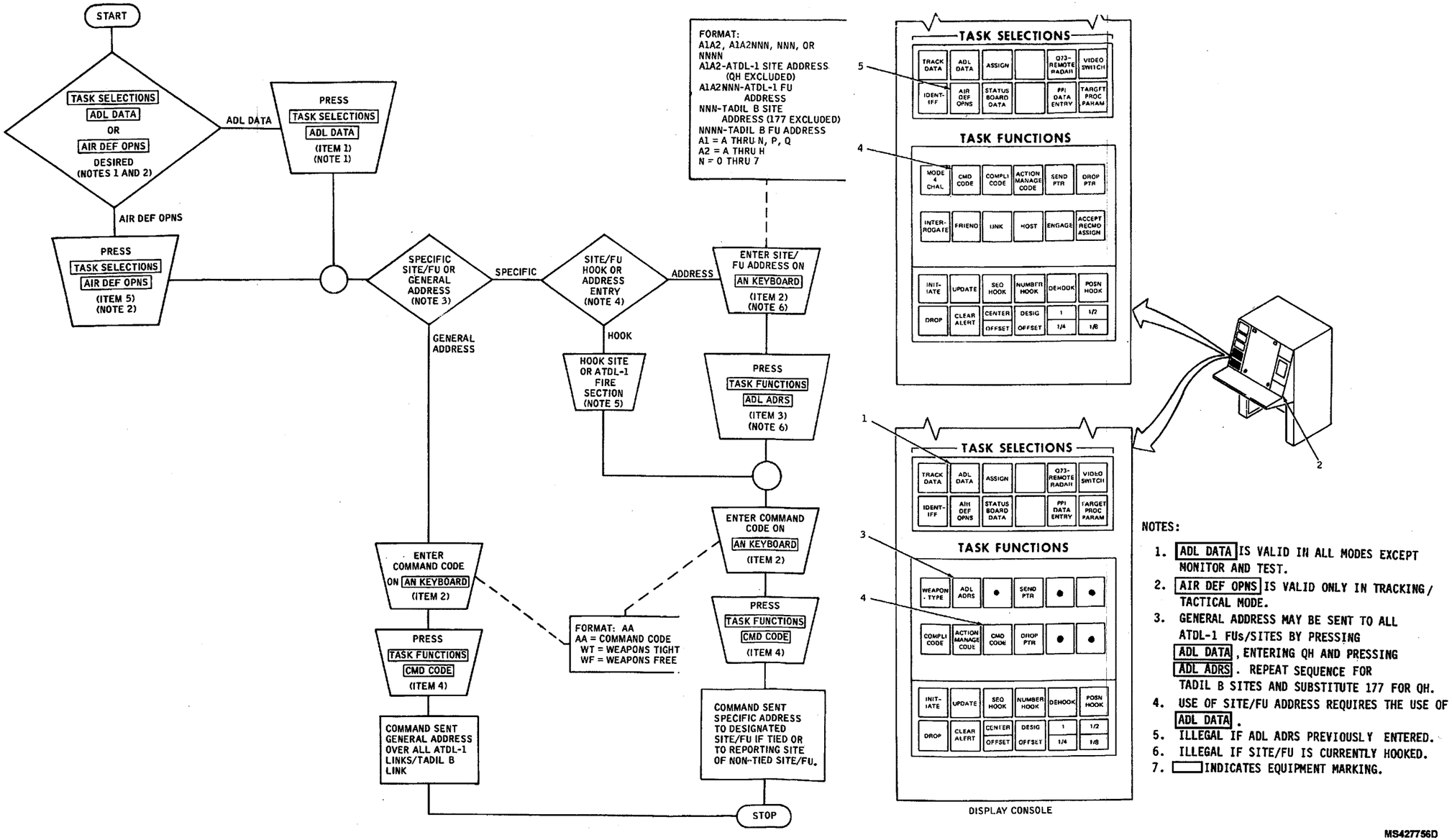
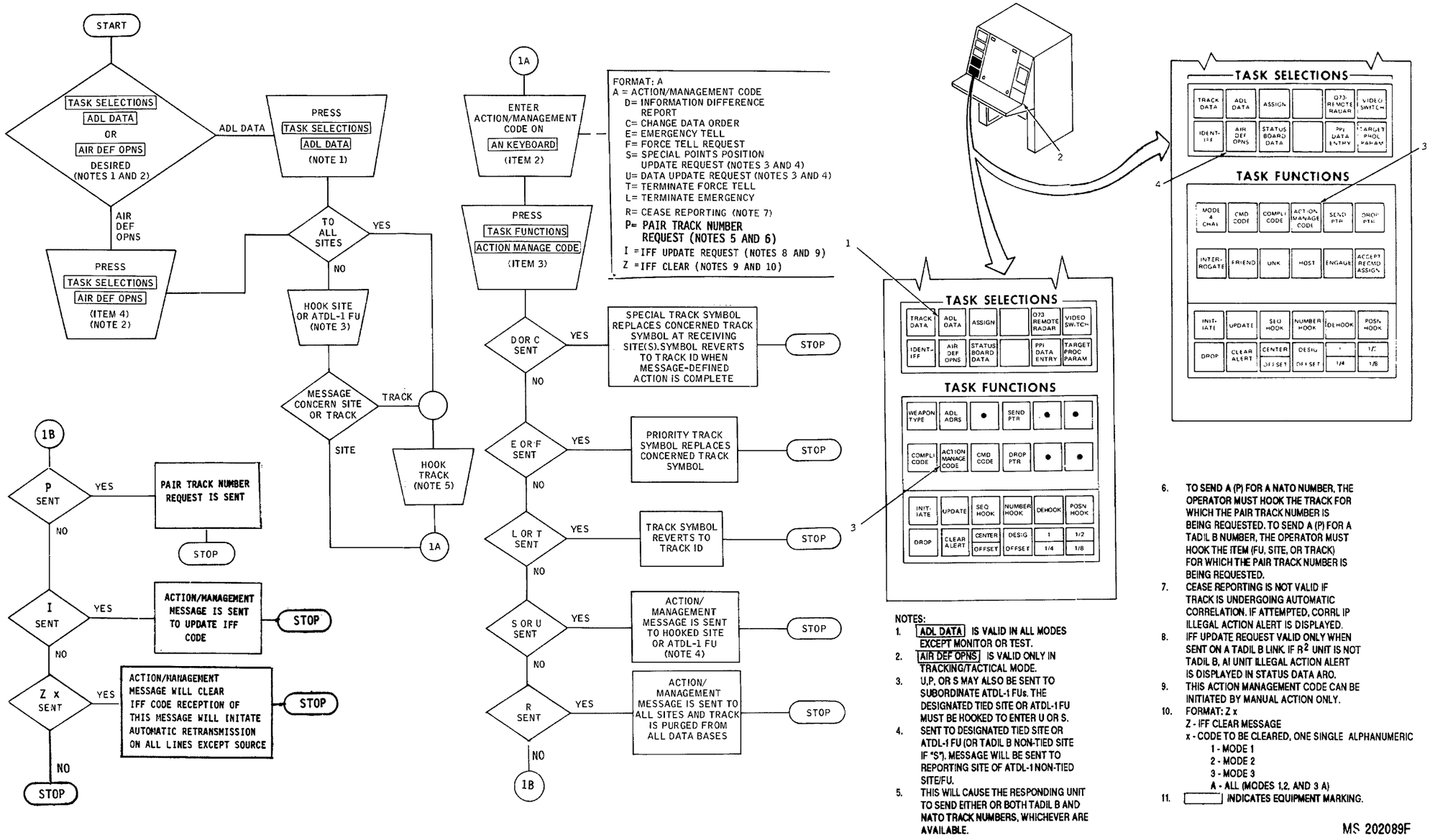


Figure 10-36. Send Operational Status Command Message



NOTES:

1. ADL DATA IS VALID IN ALL MODES EXCEPT MONITOR OR TEST.
2. AIR DEF OPNS IS VALID ONLY IN TRACKING/TACTICAL MODE.
3. U,P, OR S MAY ALSO BE SENT TO SUBORDINATE ATDL-1 FUs. THE DESIGNATED TIED SITE OR ATDL-1 FU MUST BE HOOKED TO ENTER U OR S.
4. SENT TO DESIGNATED TIED SITE OR ATDL-1 FU (OR TADIL B NON-TIED SITE IF "S"). MESSAGE WILL BE SENT TO REPORTING SITE OF ATDL-1 NON-TIED SITE/FU.
5. THIS WILL CAUSE THE RESPONDING UNIT TO SEND EITHER OR BOTH TADIL B AND NATO TRACK NUMBERS, WHICHEVER ARE AVAILABLE.
6. TO SEND A (P) FOR A NATO NUMBER, THE OPERATOR MUST HOOK THE TRACK FOR WHICH THE PAIR TRACK NUMBER IS BEING REQUESTED. TO SEND A (P) FOR A TADIL B NUMBER, THE OPERATOR MUST HOOK THE ITEM (FU, SITE, OR TRACK) FOR WHICH THE PAIR TRACK NUMBER IS BEING REQUESTED.
7. CEASE REPORTING IS NOT VALID IF TRACK IS UNDERGOING AUTOMATIC CORRELATION. IF ATTEMPTED, CORRL IP ILLEGAL ACTION ALERT IS DISPLAYED.
8. IFF UPDATE REQUEST VALID ONLY WHEN SENT ON A TADIL B LINK. IF R^2 UNIT IS NOT TADIL B, AI UNIT ILLEGAL ACTION ALERT IS DISPLAYED IN STATUS DATA ARO.
9. THIS ACTION MANAGEMENT CODE CAN BE INITIATED BY MANUAL ACTION ONLY.
10. FORMAT: Z x
    Z - IFF CLEAR MESSAGE
    x - CODE TO BE CLEARED, ONE SINGLE ALPHANUMERIC
    1 - MODE 1
    2 - MODE 2
    3 - MODE 3
    A - ALL (MODES 1,2, AND 3 A)
11. [ ] INDICATES EQUIPMENT MARKING.

MS 202089F

Figure 10-37. Send Action/Management Message

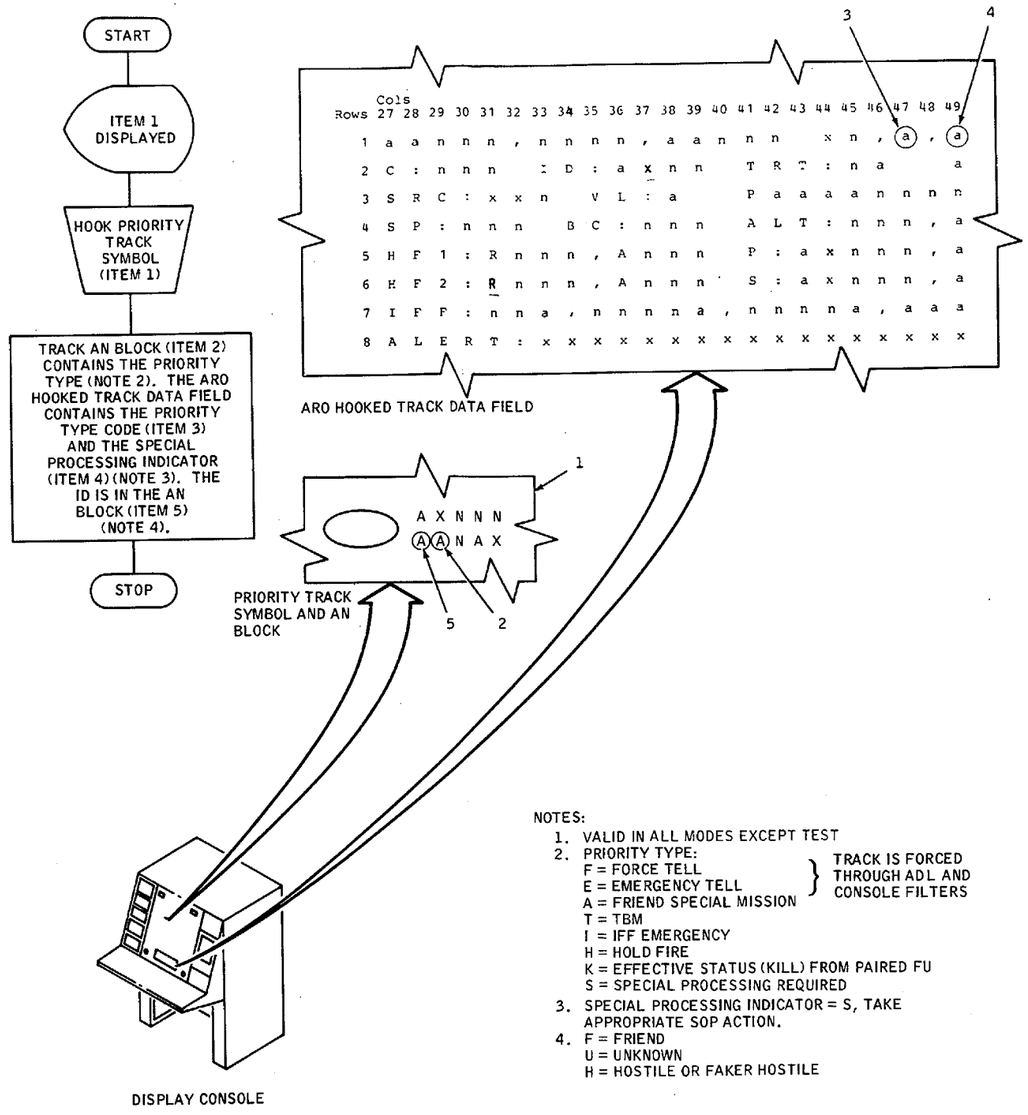
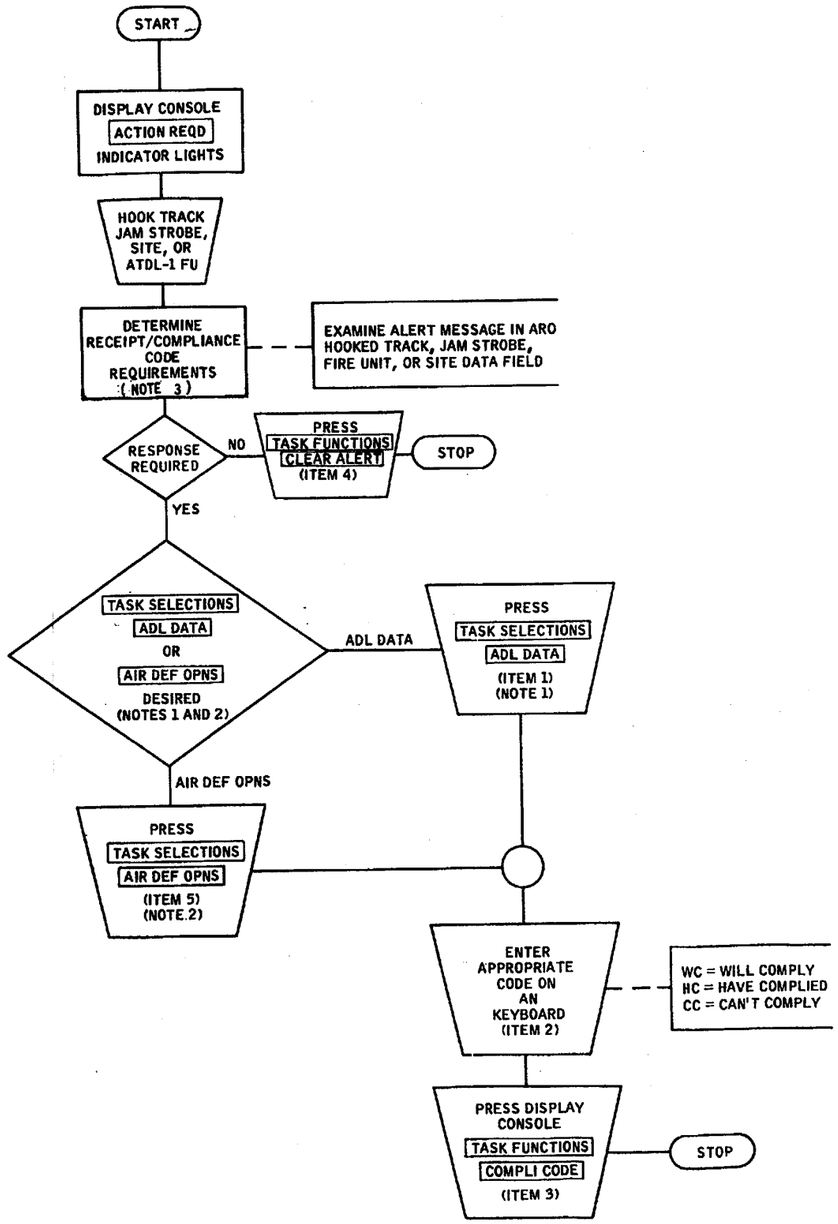
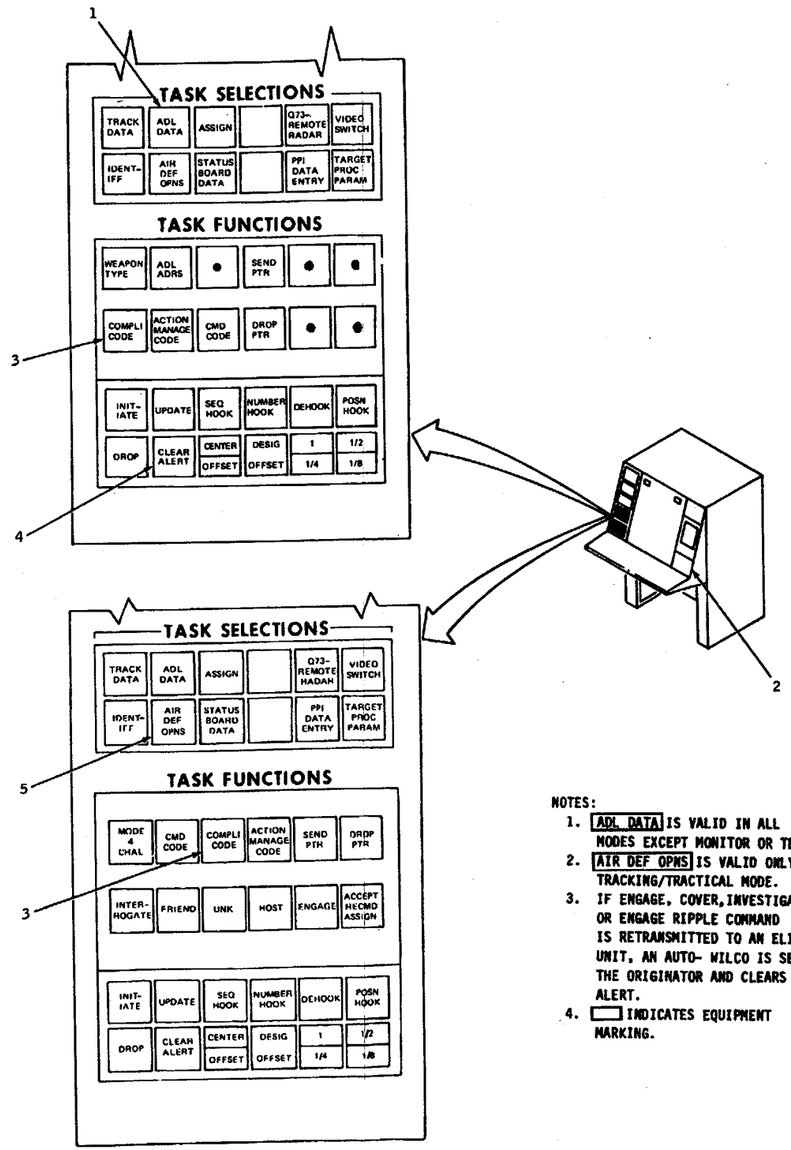


Figure 10-38. Receive Force Tell, Emergency Tell, and Special Processing Messages



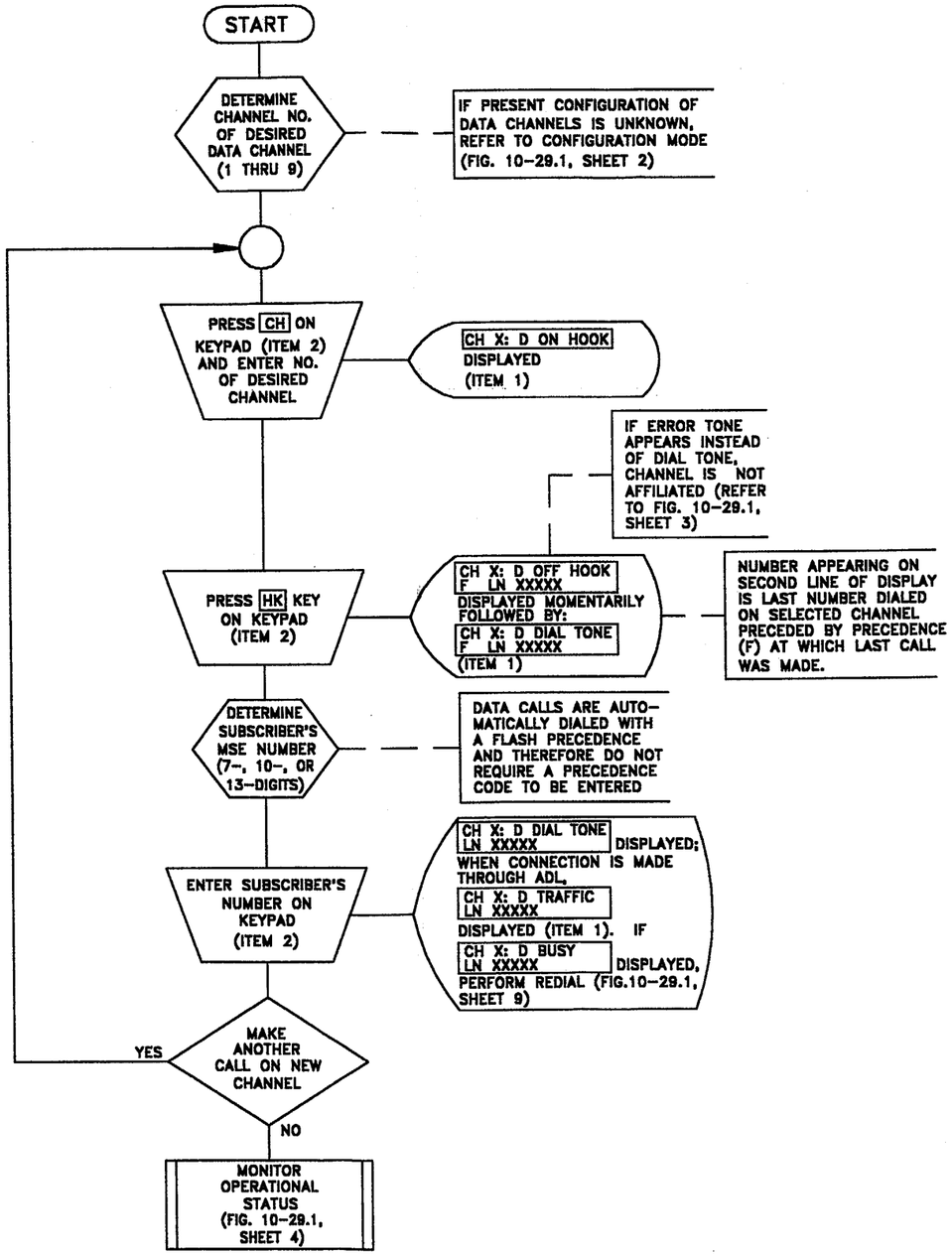


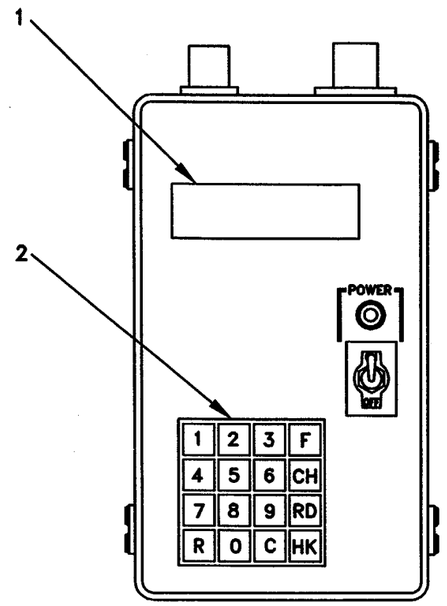
NOTES:

1. ADL DATA IS VALID IN ALL MODES EXCEPT MONITOR OR TEST.
2. AIR DEF OPNS IS VALID ONLY IN TRACKING/TRACTICAL MODE.
3. IF ENGAGE, COVER, INVESTIGATE/ASSIGN OR ENGAGE RIPPLE COMMAND IS RETRANSMITTED TO AN ELIGIBLE UNIT, AN AUTO- WILCO IS SENT TO THE ORIGINATOR AND CLEARS THE ALERT.
4. ☐ INDICATES EQUIPMENT MARKING.

MS 428009A

Figure 10-39. Receive Commands.





OPERATOR INTERFACE

NOTES:
1. CHANNEL CONFIGURATION DISPLAY (DEFAULT SHOWN)

C : 1 D 2 D 3 D 4 D 5 D
6 V 7 V 8 V 9 V

1 THRU 9 = CHANNEL NUMBER
D = DATA CHANNEL
V = VOICE CHANNEL
F = FAILED CHANNEL

2. [ ] INDICATES EQUIPMENT MARKINGS OR DISPLAYED MESSAGE.

3. EQUIPMENT PRESENT ONLY IN AN/TSQ-73 EQUIPPED WITH MSE/ADI.

MS559146

Figure 10-40. MSE/ADI FSK Data Subscriber Call (From /to All Locations)

Table 10-3. Modem/Device/Connector Assignments

Modem number	Receiver demodulator physical device address	Transmitter modulator physical device address	Demarkation panel connection	Modem number	Receiver demodulator physical device address	Transmitter modulator physical device address	Demarkation panel connection
1	100	101	J1	17	140	141	J17
2	102	103	J2	18	142	143	J18
3	104	105	J3	19	144	145	J19
4	106	107	J4	20	146	147	J20
5	110	111	J5	21	150	151	J21
6	112	113	J6	22	152	153	J22
7	114	115	J7	23	154	155	J23
8	116	117	J8	24	156	157	J24
9	120	121	J9	25	160	161	J25
10	122	123	J10	26	162	163	J26
11	124	125	J11	27	164	165	J27
12	126	127	J12	28	166	167	J28
13	130	131	J13	29	170	171	J29
14	132	133	J14	30	172	173	J30
15	134	135	J15	31	174	175	J31
16	136	137	J16	32	176	177	J32

NOTE: Link to Modem assignment is optional and achieved with CC102 (TM 9-1430-652-10-6).

BERNARD W. ROGERS
General, United States Army
Chief of *Staff*

Official:

J. C. PENNINGTON
Major General, United States Army
The Adjutant General

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THE METRIC SYSTEM AND EQUIVALENTS

'NEAR MEASURE

. Centimeter = 10 Millimeters = 0.01 Meters = 0.3937 Inches
1 Meter = 100 Centimeters = 1000 Millimeters = 39.37 Inches
1 Kilometer = 1000 Meters = 0.621 Miles

'VEIGHTS

Gram = 0.001 Kilograms = 1000 Milligrams = 0.035 Ounces
1 Kilogram = 1000 Grams = 2.2 lb.
1 Metric Ton = 1000 Kilograms = 1 Megagram = 1.1 Short Tons

LIQUID MEASURE

1 Milliliter = 0.001 Liters = 0.0338 Fluid Ounces
1 Liter = 1000 Milliliters = 33.82 Fluid Ounces

SQUARE MEASURE

1 Sq. Centimeter = 100 Sq. Millimeters = 0.155 Sq. Inches
1 Sq. Meter = 10,000 Sq. Centimeters = 10.76 Sq. Feet
1 Sq. Kilometer = 1,000,000 Sq. Meters = 0.386 Sq. Miles

CUBIC MEASURE

1 Cu. Centimeter = 1000 Cu. Millimeters = 0.06 Cu. Inches
1 Cu. Meter = 1,000,000 Cu. Centimeters = 35.31 Cu. Feet

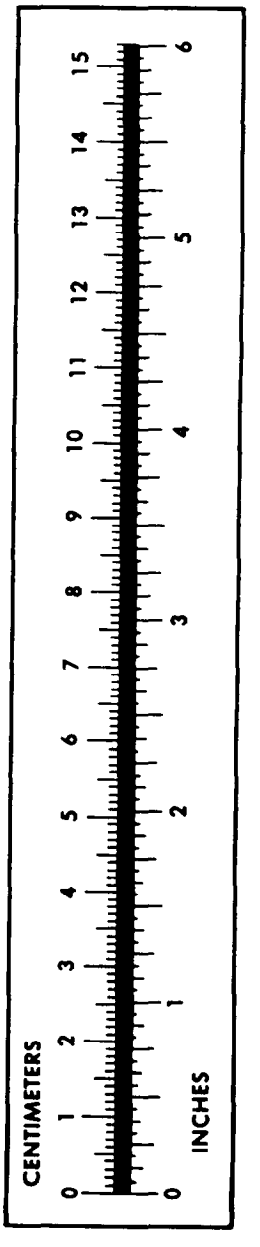
TEMPERATURE

5/9(°F - 32) = °C
212° Fahrenheit is evuivalent to 100° Celsius
90° Fahrenheit is equivalent to 32.2° Celsius
32° Fahrenheit is equivalent to 0° Celsius
9/5C° + 32 =°F

APPROXIMATE CONVERSION FACTORS

TO CHANGE	TO	MULTIPLY BY
Inches	Centimeters	2.540
Feet	Meters	0.305
Yards	Meters	0.914
Miles	Kilometers	1.609
Square Inches	Square Centimeters	6.451
Square Feet	Square Meters	0.093
Square Yards	Square Meters	0.836
Square Miles	Square Kilometers	2.590
Acres	Square Hectometers	0.405
Cubic Feet	Cubic Meters	0.028
Cubic Yards	Cubic Meters	0.765
Fluid Ounces	Milliliters	29.573
ıts	Liters	0.473
arts	Liters	0.946
allons	Liters	3.785
Ounces	Grams	28.349
Pounds	Kilograms	0.454
Short Tons	Metric Tons	0.907
Pound-Feet	Newton-Meters	1.356
Pounds per Square Inch	Kilopascals	6.895
Miles per Gallon	Kilometers per Liter	0.425
Miles per Hour	Kilometers per Hour	1.609

TO CHANGE	TO	MULTIPLY BY
Centimeters	Inches	0.394
Meters	Feet	3.280
Meters	Yards	1.094
Kilometers	Miles	0.621
Square Centimeters	Square Inches	0.155
Square Meters	Square Feet	10.764
Square Meters	Square Yards	1.196
Square Kilometers	Square Miles	0.386
Square Hectometers	Acres	2.471
Cubic Meters	Cubic Feet	35.315
Cubic Meters	Cubic Yards	1.308
Milliliters	Fluid Ounces	0.034
Liters	Pints	2.113
Liters	Quarts	1.057
ers	Gallons	0.264
ms	Ounces	0.035
ograms	Pounds	2.205
Metric Tons	Short Tons	1.102
Newton-Meters	Pounds-Feet	0.738
Kilopascals	Pounds per Square Inch	0.145
lometers per Liter	Miles per Gallon	2.354
meters per Hour	Miles per Hour	0.621



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