VNC LOGIC CONTROLLER
PART NO. 023-2000-2XX
VIKING® VX LTR® REPEATER
INSTALLATION INSTRUCTIONS

VNC LOGIC CONTROLLER
PART NO. 023-2000-2XX
VIKING® VX LTR® REPEATER
INSTALLATION INSTRUCTIONS

The E.F. Johnson Company designs and manufactures two-way radio equipment to serve a wide variety of communications needs. Johnson produces equipment for the mobile telephone and land mobile radio services which include business, industrial, government, public safety, and personal users.

LAND MOBILE PRODUCT WARRANTY

The manufacturer's warranty statement for this product is available from your product supplier or from the E.F. Johnson Company, 299 Johnson Avenue, Box 1249, Waseca, MN 56093-0514. Phone (507) 835-6222.

WARNING

This device complies with Part 15 of the FCC rules. Operation is subject to the condition that this device does not cause harmful interference. In addition, changes or modification to this equipment not expressly approved by E. F. Johnson could void the user's authority to operate this equipment (FCC rules, 47CFR Part 15.19).

DO NOT allow the antenna to come close to or touch, the eyes, face, or any exposed body parts while the radio is transmitting.

DO NOT operate the radio near electrical blasting caps or in an explosive atmosphere.

DO NOT operate the radio unless all the radio frequency connectors are secure and any open connectors are properly terminated.

DO NOT allow children to operate transmitter equipped radio equipment.

SAFETY INFORMATION

Proper operation of this radio will result in user exposure below the Occupational Safety and Health Act and Federal Communication Commission limits.
The information in this document is subject to change without notice.

The contents of this manual are subject to change without notice.

®LTR is a registered trademark of E.F. Johnson Company.
®Call Guard is a registered trademark of E.F. Johnson Company.
®VIKING is a registered trademark of E.F. Johnson Company.
®TOUCH TONE is a registered trademark of AT&T.
®IBM is a registered trademark of International Business Machines.
®AmeriCom is a registered trademark of AmeriCom Corporation.
®ProComm Plus is a registered trademark of DataStrom Technology Inc.

TABLE OF CONTENTS

TABLE OF CONTENTS

TABLE OF CONTENTS

TABLE OF CONTENTS

8   CIRCUIT DESCRIPTION

9   ALIGNMENT AND TEST PROCEDURES

10   COMPONENT LAYOUT AND SCHEMATIC DIAGRAM

A   DISPATCH NETWORKING FORM

LIST OF FIGURES

TABLE OF CONTENTS

TABLE OF CONTENTS

SECTION 1   INTRODUCTION

1.1 SCOPE OF MANUAL

This service manual provides installation, operation, programming, service, and alignment information for the Viking Network Controller (VNC). These cards are installed in the VIKING VX LTR Repeater, Part No. 242-2008-232/234 or 242-2009-232/234.

1.2 PART NUMBER BREAKDOWN

The VNC-125 is bi-lingual with English as standard and a second language selected by the last digit of the Part Number. Included with each VNC is a modular telephone cable (PN 023-2000-376).

```
023    -2000-   2   X   X

                        0 = ENGLISH
                        1 = SPANISH
                        2 = MANDARIN
                        3 = PORTUGUESE
                        4 = RUSSIAN

                        6 = VNC-95 (TONES)
                        7 = VNC-105 (SINGLE LANGUAGE)
                        8 = VNC-125 (BI-LINGUAL)
```
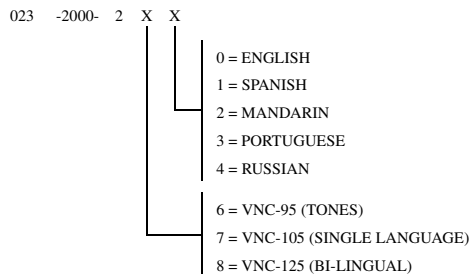
1.3 DESCRIPTION

The Viking Network Controller (VNC) provides an interface between the repeater and a phone line to permit telephone calls to be placed to and from mobile transceivers. The VNC provides telephone line supervision, audio processing, supervisory tones, and repeater and mobile control functions. It operates with either simplex or duplex mobiles if they are equipped with a DTMF encoder and the proper software. One VNC is installed in each repeater which is to have interconnect capability and one phone line is installed to each VNC. Many interconnect parameters such as ID code service levels, mobile ring time, etc. are programmable using the VNC programming software.

The VNC also allows for Dispatch Networking. This allows a customer to communicate with other units located at distant sites. The base can communicate to the mobiles on the local system using the same ID code if desired (see Table 1-1).

The Repeater is programmed with a laptop or personal computer using the repeater software, Part No. 023-9998-297 (Version 6.64 or later). The VNC is programmed with a laptop or personal computer and Terminal Emulation software for a TVI920 terminal (e.g. ProComm Plus®).

1.4 FACTORY CUSTOMER SERVICE

The Customer Service Department of the E.F. Johnson Company provides customer assistance on technical problems and the availability of local and factory repair facilities. Customer Service hours are 7:30 a.m. - 5:30 p.m. Central Time, Monday - Friday. There is also a 24-hour emergency technical support telephone number. From within the continental United States, the Customer Service Department can be reached at this toll-free number:

1-800-328-3911

When your call is answered at the E.F. Johnson Company, you will hear a brief message informing you of numbers that can be entered to reach various departments. This number may be entered during or after the message using a tone-type telephone. If you have a pulse-type telephone, wait until the message is finished and an operator will come on the line to assist you. When you enter a first number of "1" or "2", another number is requested to further categorize the type of information you need. You may also enter the 4-digit extension number of the person that you want to reach if you know what it is.

FAX Machine - Sales   (507) 835-6485
FAX Machine - Cust Serv   (507) 835-6969

NOTE: *Calls from outside the continental United States to the Customer Service Department use the following numbers:*

Customer Service Department - (507) 835-6911
Customer Service FAX Machine - (507) 835-6969

You may also contact the Customer Service Department by mail. Please include all information that may be helpful in solving your problem. The mailing address is as follows:

> E.F. Johnson Company
> Customer Service Department
> 299 Johnson Avenue
> P.O. Box 1249
> Waseca, MN 56093-0514

1.5 PRODUCT WARRANTY

The warranty statement for this transceiver is available from your product supplier or from the Warranty Department, E.F. Johnson Company, 299 Johnson Avenue, Box 1249, Waseca, MN 56093-0514. This information may also be requested by phone from the Warranty Department. The Warranty Department may also be contacted for Warranty Service Reports, claim forms, or any questions concerning warranties or warranty service by dialing (507) 835-6970.

1.6 FACTORY RETURNS

Repair service is normally available through local authorized E.F. Johnson Land Mobile Radio Service Centers. If local service is not available, the equipment can be returned to the factory for repair. However, it is recommended that you contact the Customer Service Department before returning equipment. A service representative may be able to suggest a solution to the problem so that return of the equipment would not be necessary. If using the toll-free number in the preceding section, enter "2".

Be sure to fill out a Factory Repair Request Form #271 for each unit to be repaired, whether it is in or out of warranty. These forms are available free of charge by calling the repair lab (see Section 1.4) or by requesting them when you send a unit in for repair. Clearly describe the difficulty experienced in the

space provided and also note any prior physical damage to the equipment. Then include a form in the shipping container with each unit. Your phone number and contact name are very important because there are times when the technicians have specific questions that need to be answered in order to completely identify and repair a problem.

When returning equipment for repair, it is also a good idea to use a PO number or some other reference number on your paperwork in case you need to call the repair lab about your unit. These numbers are referenced on the repair order and it makes it easier and faster to locate your unit in the lab.

Return Authorization (RA) numbers are not necessary unless you have been given one by the Customer Service Department. They require RA numbers for exchange units or if they want to be aware of a specific problem. If you have been given an RA number, reference this number on the Factory Repair Request Form sent with the unit. The repair lab will then contact the Field Service Department when the unit arrives.

1.7 REPLACEMENT PARTS

E.F. Johnson replacement parts can be ordered directly from the Service Parts Department. To order parts by phone, dial the toll-free number and then enter "1" as described in Section 1.4. When ordering, please supply the part number and quantity of each part ordered. E.F. Johnson dealers also need to give their account number.

If there is uncertainty about the part number, include the designator (C112, for example) and the model number of the equipment the part is from.

You may also send your order by mail or FAX. The mailing address is as follows and the FAX number is shown in Section 1.4.

> E.F. Johnson Company
> Service Parts Department
> 299 Johnson Avenue
> P.O. Box 1249
> Waseca, MN 56093-0514

1.8 SOFTWARE UPDATES/REVISIONS

All inquiries concerning updated software, its installation and revisions should be directed to the Customer Service Department (see Section 1.4).

Table 1-1   VNC FEATURES

VNC			FEATURES
		95	**Basic Telephone Interconnect**
			- Six period airtime logging capacity for 5000 user identities (User IDs) and 65,535 seconds (approx. 18.2 hrs.) per period per ID. Downloadable via modem.
			- Real Time Display, via modem, of repeater usage.
			- Remote programmability, via modem, of all interconnect system parameters.
			- Two-Wire telephone interconnect:
			DTMF Overdial Inward
			DTMF or Pulse Outward Dialing
			- Supervisory signals similar to the Johnson RIC.
			- CW Station ID.
	105		**Telephone Interconnect Networking**
			- Dial-Click Decoding.
			- Storage of up to 5000 interconnect call records per repeater.
			- Selectable voice prompts, English language.
			- On-line system statistics over the last 24 hours, accessible via modem, including:
			Individual repeater usage.
			Entire system repeater loading statistics.
			All Trunks Busy.
			- Companding, selectable by User ID.
			- ID Validation for entire system, programmable by modem.
			- Remote control, via modem, of individual user parameters including:
			Allowable Interconnect Levels.
			Conversation Timer.
			Extended Horn Honk.
			Full or Half Duplex.
			- Modem share.
			- Dispatch Networking.
125			**Enhanced Telephone Interconnect Networking**
			- Four-Wire Direct Inward Dialing.
			- Bi-Lingual Voice Prompts, language selectable by User ID.
			- Scrambler Interface, selectable by User ID.
			- Roamer Check-In.

This page intentionally left blank.

SECTION 2   INSTALLATION

CAUTION

The power must be turned off on the IAC (S508) whenever cards are installed or removed from the card rack (see Figure 2-9).

2.1 VNC INSTALLATION

The Viking Network Controller is designed to be installed in the repeater card rack. The cards are equipped with inject/extract pull tabs that also lock the cards into the card rack. The cards slide into the card rack and plug into the backplane connectors (see Figure 2-9). The VNC should be plugged into one of the four backplane connectors on the right side of the backplane. These four connectors are farther apart than the first four connectors and allow the necessary room between cards. (The right most connection is reserved for the IAC.)

2.2 TELEPHONE LINE CONNECTIONS

The VNC has been designed to allow either 2-Wire or 4-Wire E&M connections for the interconnect built-in (see Section 7.4). Without changing any PC boards, jumpers can be changed to make the conversion between 2- and 4-Wire. Move W2, W3, W4, W5, W6, W7 and W11 to the 4-position to be 4-Wire compatible (see Figure 10-2).

2.2.1 2-WIRE CONNECTIONS

The modular telephone cable, Part No. 023-2000-376 (see Figure 2-1), connects to J2, terminals 5 and 6 (see Figure 2-2) on the rear of the repeater (see Figure 2-10). The modular cable is routed through a strain relief (mounting screw and strain relief are included in the cable kit, see Table 2-1) and attached to the rear of the cabinet, then plugged into the modular phone line jack. 2-Wire connections use Loop Start (LS) only.
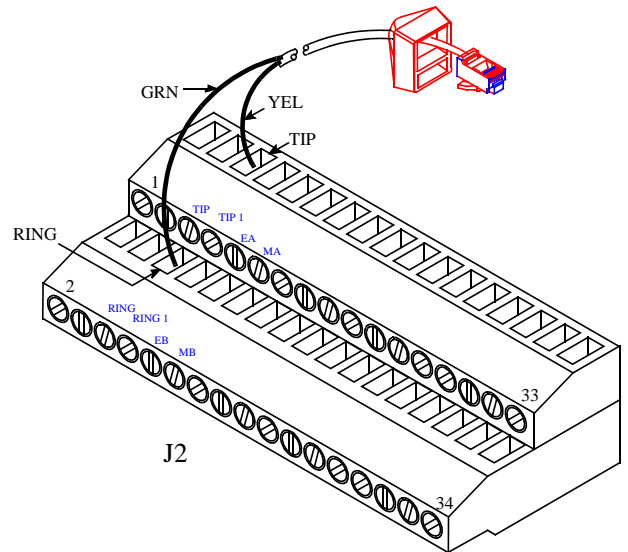
Figure 2-2   2-WIRE TELEPHONE LINE CONNECTIONS

Table 2-1   ACCESSORIES

Accessory	Part No.
Extender Card*	023-2000-231
Modular Telephone Cable	023-2000-376
50-ohm termination	023-4406-504
Programming Cable Kit*	023-2000-195
VNC Extender Cable*	023-2000-170
*Included in 250-2000-230 Repeater Service Kit	

Figure 2-1   TELEPHONE MODULAR CABLE

TIP (YEL)-5
RING (GRN)-4
TIP1 (BLU)-6
RING1 (RED)-3
EA (GRY)-7
EB (BRN)-8
MA (ORN)-1
MB (BLK)-2

2.2.2 4-WIRE CONNECTIONS

The modular telephone cable, Part No. 023-2000-376 (see Figure 2-1), connects to J2, terminals 5, 6, 7 and 8 (see Figure 2-3) on the rear of the repeater. The modular cable is routed through a strain relief (mounting screw and strain relief are included in the cable kit, see Table 2-1) and attached to the rear of the cabinet, then plugged into the modular phone jack to the phone lines (see Figure 2-10). 4-Wire connection default is Immediate start and Wink start is optional.

Balanced 600 ohm Tx and Rx is provided to connect to a Type II 4-Wire circuit. On the Rx side, make sure the output of this circuit is padded so the Dial Tone level is between -0 and -2 dBm0. The receive side on the VNC has been calibrated for this level of Dial Tone so that the companding works properly. Jumper W10 may be installed in lieu of padding the circuit, and the Telco gain can be adjusted with R67.

The Tx side may have to be padded if -16 dBm is desired. The "To Telco" pot may not have the desired control over Tx level without a pad installed. Jumper W1 may be installed in lieu of padding. Adjust the "To Telco" pot R23 for a comfortable listening level to the called party.
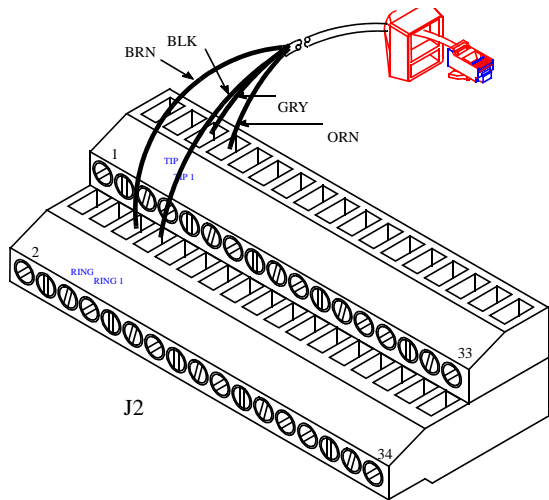
Figure 2-3   4-WIRE TELEPHONE LINE CON-NECTIONS

The M-Leads (mouth) coming from the VNC tells the circuit that an off-hook condition exists. The output is a dry relay contact. Different 4-Wire cir-cuits, either Type 1 or 2, may require a different M-Lead configuration. This lead can be used to signal the M-Lead circuit in the 4-Wire equipment that an off-hook condition occurs. Use the MA and MB leads for closure.

The E-Leads (ear) on the VNC are used to signal the VNC that an incoming call is in progress. This signal is the same as the Ring signal on a 2-Wire circuit. The EB lead is connected to ground and can be used to turn on the E-Lead detector when connected to the E-Lead. The E-Lead has a polarity switch, by using W8 in either + or - configuration, which allows the VNC to operate properly. See Figure 2-3 for a diagram of these connections.

NOTE: VNC-105 and VNC-125 use +9V on the E-Lead.

2.2.3 NETWORK CONNECTIONS

In some cases the VNC will be connected either directly or via a microwave channel back-to-back with another VNC. This configuration allows intersite or interband networking. If this configuration is desired, connect the units as shown in Figure 2-4 for best results. Due to the close proximity of these units, a resistor pad must be soldered into each unit so the DTMF decoder can work properly. Connect a 1k ohm resistor "across" R70 to pad the signal.
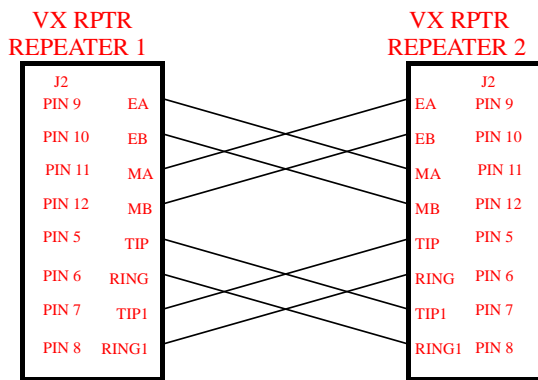
Figure 2-4   BACK-TO-BACK NETWORKING

2.3 LIGHTNING SUPPRESSION

The VNC provides secondary lightning suppression only. If the site is located in an area where lightning is a problem, make sure that a good Primary lightning suppressor is installed where the phone lines enter the building. Either Gas tube or Carbon type primary suppression is suggested.
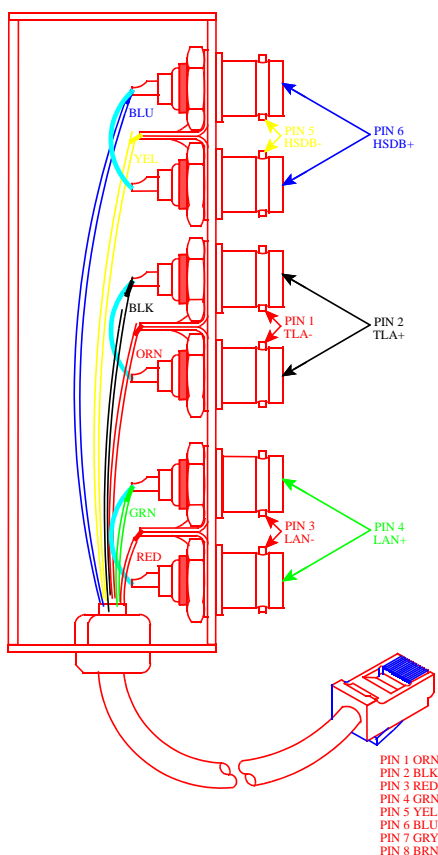
Figure 2-5 RJ-11 TO BNC ADAPTER MODULE

2.4 TRUNK LINE ACCOUNTING (TLA) INSTALLATION

The TLA cabling to the VIKING repeaters only is shown in Figure 2-7 and with CR8000s is shown in Figure 2-6. The VIKING repeaters are connected using coaxial cables in daisy chain fashion using adapter modules (see Figure 2-5). Connect the TLA data bus of one of the RIC units to the adapter module on one of the repeaters.

The RIC units are then connected in series using the TLA connectors. The open connection on the first and last repeater requires a 50 ohm termination (see Table 2-1).

NOTE: If the TLA system is not used, one of the TLA connectors on each repeater's adapter module requires a 50 ohm termination and no TLA coaxial connections between repeaters are required.

NOTE: Only the TLA cable is shown in Figures 2-6 and 2-7. The HSDB cable and LAN cable connections are shown in Figure 2-8.

2.5 LOCAL AREA NETWORK (LAN)

The LAN data bus is used by the sync master to communicate programming information and retrieve interconnect call records from multiple VNCs. The jumpers on the Digital Card should be in the 'B' position on W2 and W3. This configures the data bus for open emitter bus drivers. The VIKING repeaters are connected using coaxial cables in daisy chain fashion using adapter modules (see Figure 2-5). At each end of this cable there should be a 50 ohm termination. A VIKING repeater only is shown in Figure 2-7 and with CR8000s is shown in Figure 2-6.

The LAN data bus has two indicators on the front panel (see Figure 9-4) that show activity on the bus. These are important to the operation of the trunking system in that they show normal operation. The "Talk" light flashes at a steady rate on the Master (the VNC generating the Sync on the data bus) unit. The "Listen" on all Slave VNCs flashes when the Master is sending. Each Slave's Talk light flashes once every 40 Listen flashes.

NOTE: A steady Talk or Listen light indicates a jumper or termination problem.

NOTE: Only the HSDB and LAN cables are shown in Figure 2-8. The TLA cable connections are shown in Figures 2-6 and 2-7.
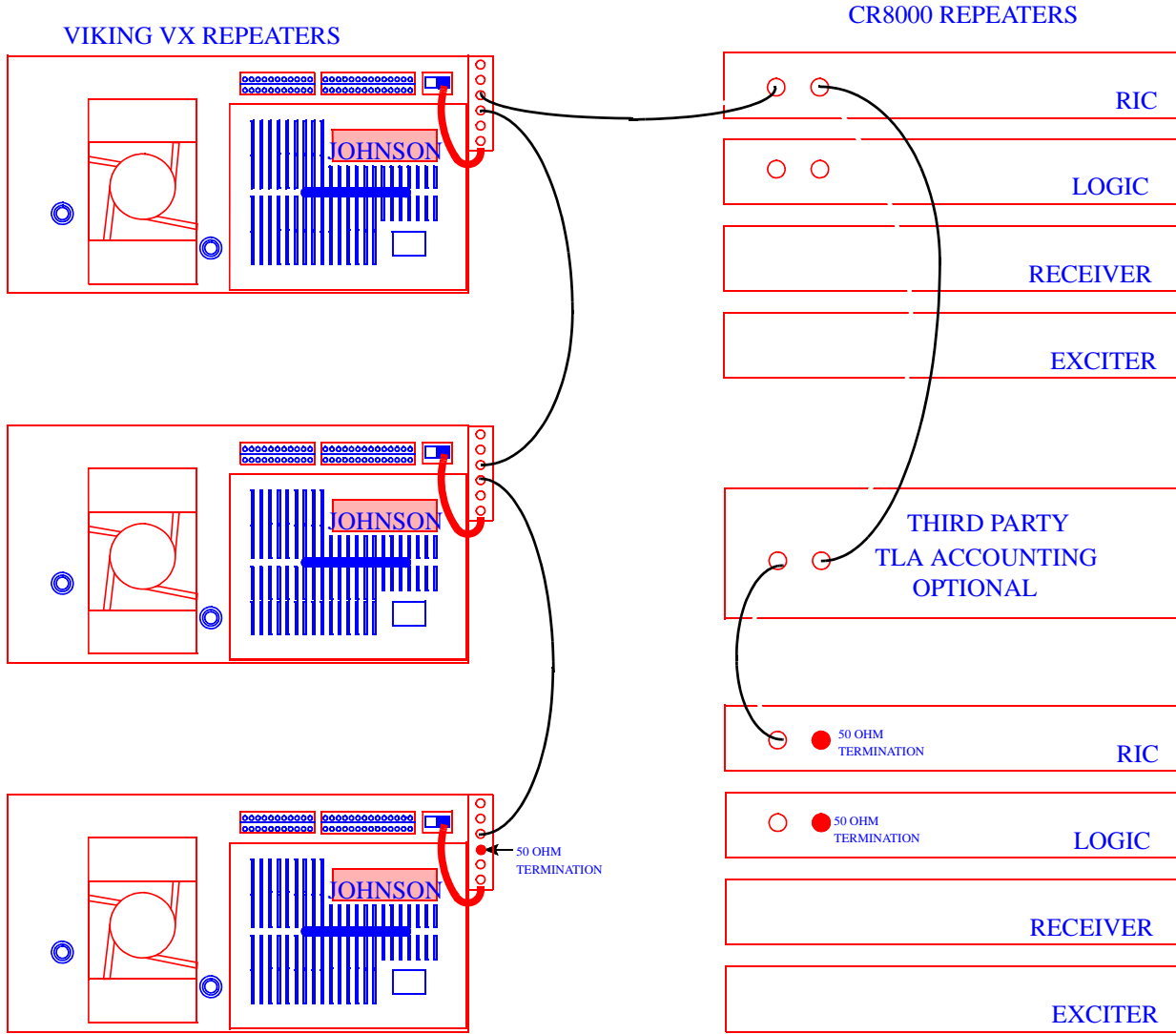
Figure 2-6   VIKING AND CR8000 TLA CABLE INSTALLATION

THIRD PARTY TLA
OPTIONAL

50 OHM
TERMINATION

50 OHM
TERMINATION

JOHNSON

HSDB

TLA BUS

JOHNSON

HSDB

TLA BUS

50 OHM
TERMINATION

JOHNSON
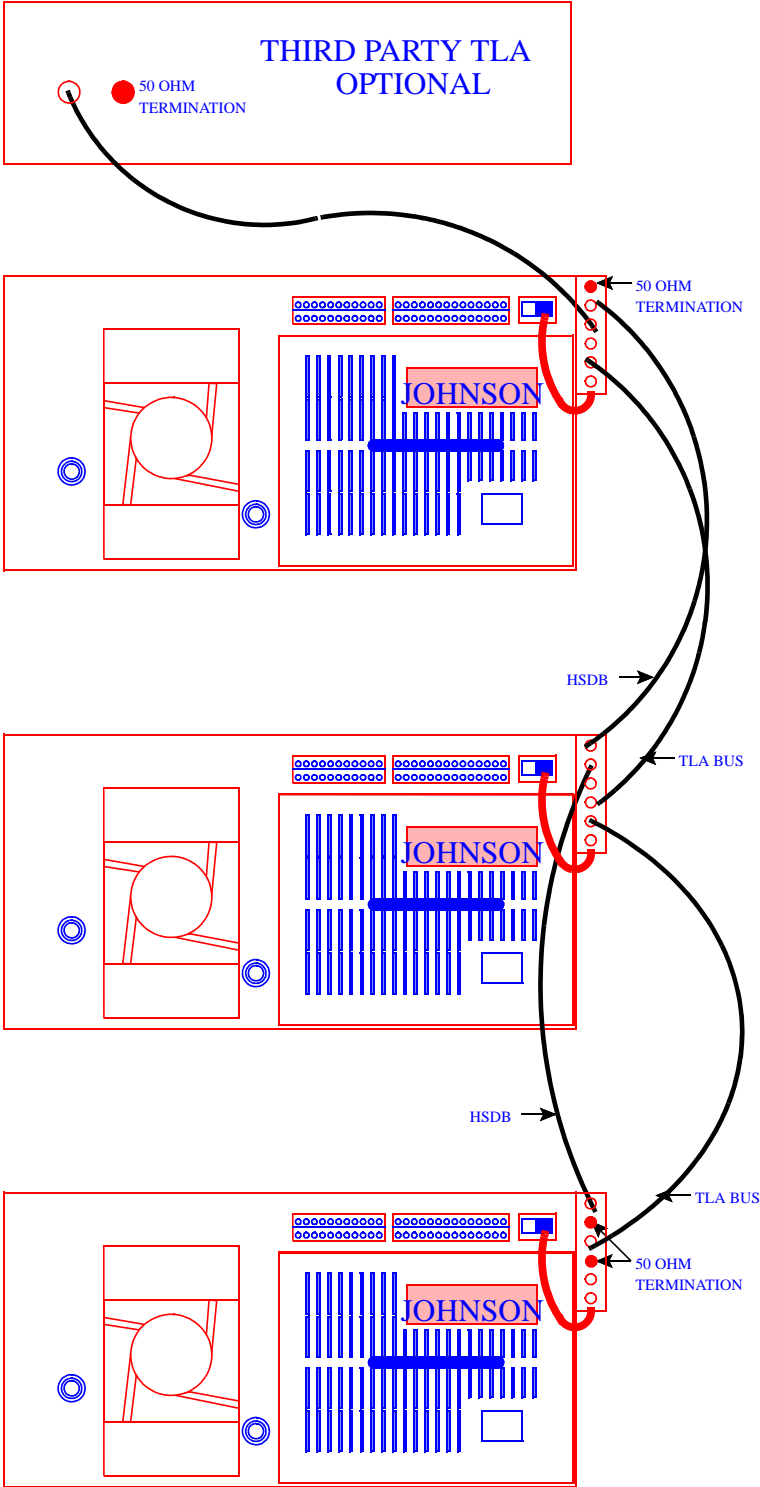
Figure 2-7   VIKING TLA CABLE INSTALLATION

2.6 HIGH SPEED DATA BUS INSTALLATION

NOTE: Only the High Speed Data Bus cables and LAN cables are shown here. The TLA cable connections are shown in Figure 2-6.

The VIKING repeaters are interconnected by a high speed data bus through an adapter module in a daisy chain fashion (see Figure 2-8). A 50 ohm termination is required on the last repeater of both types. Switch settings for S2 and S3 on the MPC are also shown.
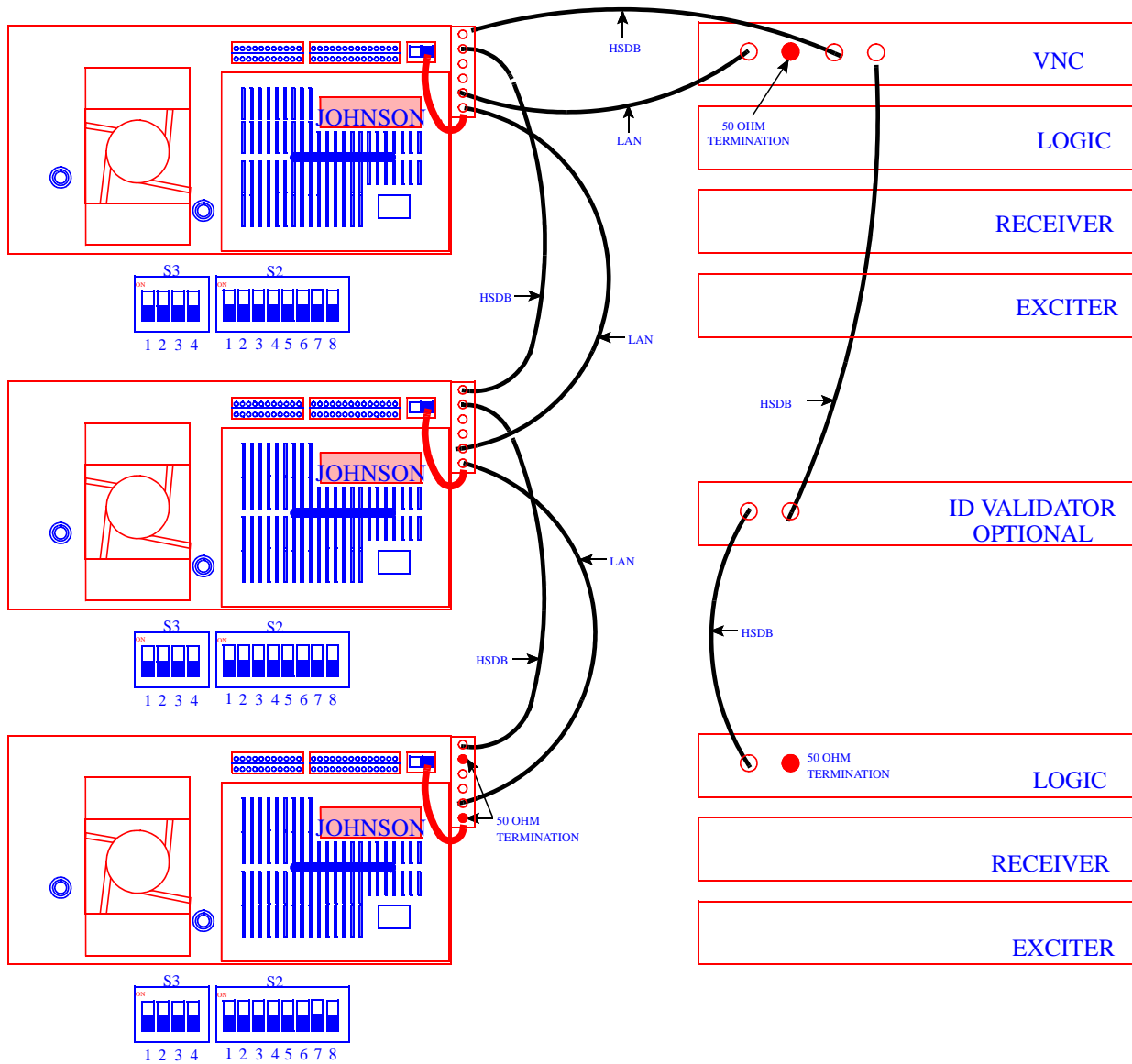
Figure 2-8   VIKING AND CR8000 HSDB AND LAN CABLE CONNECTIONS
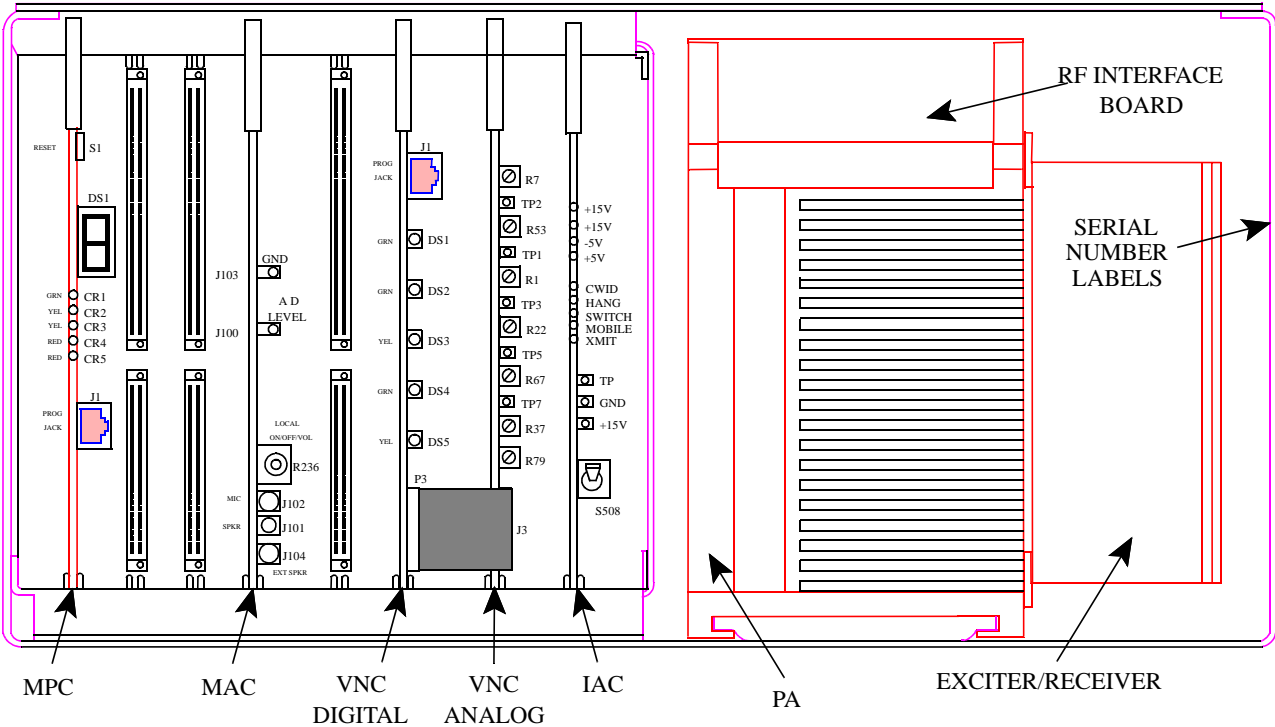
Figure 2-9   REPEATER CARDS
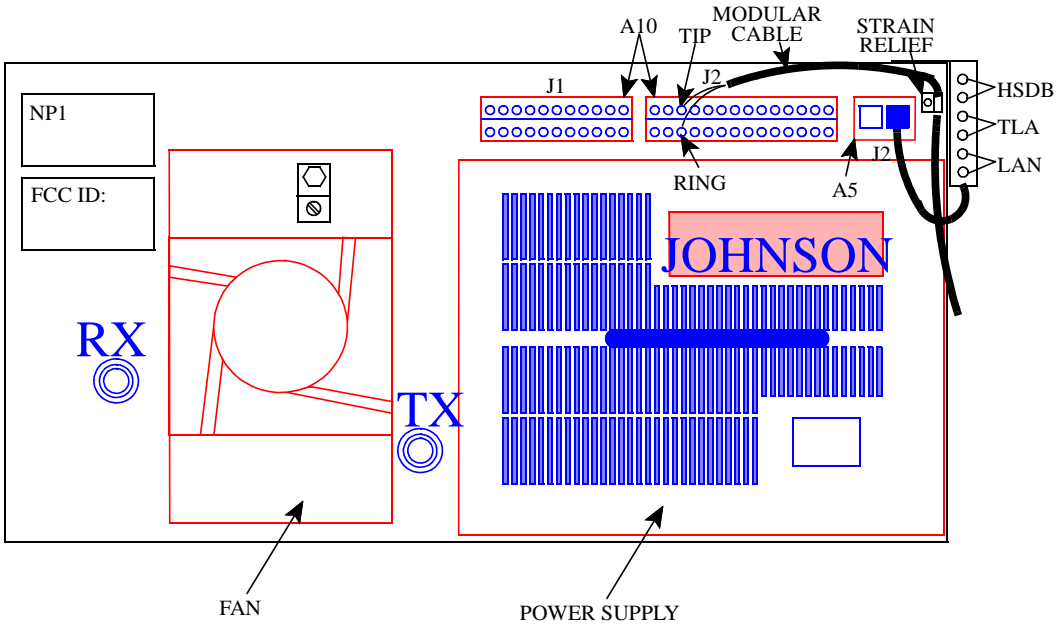
Figure 2-10   REPEATER BACK VIEW

This page intentionally left blank.

SECTION 3   SOFTWARE

3.1 INTRODUCTION

The Johnson Repeater Program on 3.5 inch disk, Part No. 023-9998-297, uses an IBM® personal computer to program the EEPROM (Electrically Erasable Programmable Read-Only Memory) in the Main Processor Card (MPC). To lessen the chance of programming errors and simplify operation, the program uses yes/no questions or toggles through the available responses when applicable.

The computer is connected directly from the PC serial port to the MPC using cable Part No. 023-3000-195. The interconnect cables used are shown in Figure 4-10. The DB-9 to 8-pin modular adapter is connected to the serial port of the computer and an interconnect cable connects the adapter to the MPC.

NOTE: These connections are for the IBM computer and may differ from an IBM compatible. In which case, consult the manuals for your computer for serial port outputs and connections.

3.1.1 HOW TO USE THIS MANUAL

This manual introduces the program and illustrates how to use the features. This manual is organized to easily find programming information with the Table of Contents, Index and Parameter Tables for the responses required for programming.

Graphic reproductions of the screens are shown for reference. Adjacent to the screens are tables to provide the parameters, available responses and a brief description of the parameter. It is not the intent of this manual to teach computer operation, but to allow the user to become familiar with the available screens and the responses without having to be at the computer.

3.1.2 GETTING STARTED

NOTE: Before starting you should already know how to start MS-DOS®, format and make backup copies of disks, copy and delete files, and run programs. If you are unfamiliar with any of these actions, refer to the MS-DOS manual for your computer for more information (see Section 5).

Follow the computer instructions for loading the disk. The MS-DOS Version 3.2 or later operating system is needed to run the programs. The computer needs to have RS-232C capability and must be either 'COM1' or 'COM2'.

3.1.3 COMPUTER DESCRIPTION

The programming software is designed to run on an IBM PC or compatible computer that meets the following minimum requirements.

1. A PC with an 80286 or better processor.

2. One 3.5" high density disk drive

3. 2M of memory

4. MS-DOS version 3.2 or higher

5. One serial port

6. Monochrome or color monitor and video card

Although the program uses color to highlight certain areas on the screen, a monochrome (black and white) monitor or LCD laptop also provide satisfactory operation. Most video formats such as EGA and VGA are supported. A serial port is required to connect the Repeater to the computer. This port is standard with most computers.

3.1.4 EEPROM DATA STORAGE

The data programmed into the MPC is stored by an EEPROM. Since this type of device is nonvolatile, data is stored indefinitely without the need for a constant power supply. A repeater can be removed from the site or even stored indefinitely without affecting programming. Since EEPROM is also reprogrammable, a new device is not needed if programming is changed.

3.1.5 COMMAND LINE OPTIONS

HELP

To show all options available from the command line type: /h or /?. Either '/' or '-' can be used. For example: 2000pgmr /h

The options can be entered in any order. For example: 2000pgmr /d /b /c

COM PORT

The Johnson programming software defaults to serial port COM1. However, if this port is already in use, the software can be reconfigured to use serial port COM2. To do this, use one of the following methods:

1. When running the compiled (.EXE) version, type / c2 on the command line after the program name. For example: 2000pgmr /c2 or -c2

2. Select COM port from Utilities heading.

BAUD RATE

The software defaults to 9600 baud, however this rate can be changed. To do this from the command line, type /bxxxx (xxxx = baud rate). For example: 2000pgmr /b or -b

NOTE: When the baud rate is changed on the command line the baud rate jumpers on J3 in the MPC must also be changed to the same baud rate.

DEMO MODE

This option is used to view the screens for Read Setup Parms and Write Setup Parms from the Transfer menu when a repeater is not connected to the computer. Normally these screens are not available without a repeater connected. To do this from the command line, type: /d or -d. For example: 2000pgmr /d

3.1.6 COLOR OR MONOCHROME OPERATION

The programming software utilizes color for a color monitor and video card. However, with LCD-type displays, this may make some information hard to read because the contrast is poor. To improve contrast, a monochrome mode can be selected in the display mode from Utilities heading.

3.2 REPEATER PROGRAM SOFTWAR

3.2.1 INSTALLING THE SOFTWARE

When you receive the programming software, make a backup copy and store the master in a safe place. Copy the distribution disks using DOS COPY command. For example, type:

COPY A: A: (single floppy drive)

or

COPY A: B: or C: (multi-drive systems).

If you have a hard disk drive, you may want to create one or more separate directories for transceiver programming and then transfer the program disk files to those directories. To create a new directory, use the MKDIR command. For example, to create directory RADIOPRG, type:

MKDIR \RADIOPRG.

Then to make the new directory the current directory, use the CHDIR command. For example, to change to the \RADIOPRG directory, type

CHDIR \RADIOPRG.

To copy all files from a floppy disk in drive A: to this directory, type:

COPY A:*.*

If you have a single floppy drive and no hard disk drive, you need to create programming disks. The reason for this is that there is not adequate space on the backup disk(s) for storing radio files. If your computer has dual floppy disk drives, the backup disk can be placed in one drive and then the radio files stored on a disk in the second drive.

To make a programming disk, format a blank disk using FORMAT B: or FORMAT B: /S (use "/S" if it must be a bootable disk). Then copy the required

program file or files to the programming disk. To do this, type COPY A:(filename.ext) B:(filename.ext). For example, to copy the file 2000pgmr.exe from drive A to drive B, type

COPY A:2000pgmr.exe B:2000pgmr.exe

This procedure works for either single or dual drive computers. Refer to your computer reference manual for more information on these DOS commands.

3.3 REPEATER PROGRAMMER

When the program is loaded into the computer and executed, the menu shows the files available from the directory. The program is used to create, edit, transfer and receive the repeater and channel parameters described in Section 5.

IMPORTANT

The commands and displays referred to in this manual are for the IBM PC and may differ from IBM compatible. Refer to the computer's operating system manual for command explanations.

3.3.1 PROGRAM FILES

The files that appear in the program directory are needed for program operation.

3.4 ALIGNMENT SOFTWARE

The software for the repeater programs the MPC for VNC operation. Under the menu heading Test are the alignment procedures for the VNC Interface (see Figure 3-1).

File Edit Transfer Hardware **Test** Utilities

PA
Receiver
Exciter
Full Rptr/Station
RNT Interface
Telephone Interface
VNC Interface
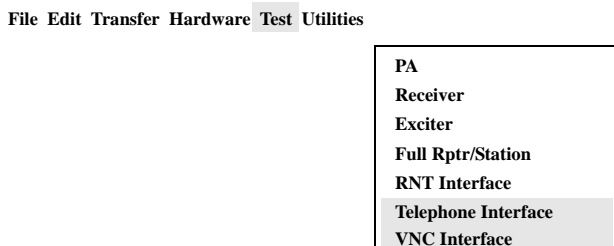
Figure 3-1   REPEATER TEST MENU

Refer to Section 9 for Alignment Procedures as shown in the program, alignment points diagrams and test setup diagrams.

3.5 HELP F1

Help screens are available for most parameters and options in this program. Whenever a parameter or options clarification is needed, press F1 and if a help screen is available it will pop-up on the screen. Press Escape <ESC> to exit the pop-up screen.

HELP - F1

FILE
- Load
- Save
- Save As
- DOS Shell
- Quit   ALT X

EDIT
- Setup Parameters F4
  - Repeater Number
  - Channel Number
  - Telco Network Type
  - Area
  - Sync Repeater
  - Standalone
  - ID Validator
  - CWID Time
  - CWID Message
  - Local Mic ID
  - Test Mode ID
  - RF Power Level
  - Power Source
- Select Repeater
  - Default
  - Repeater Number
- Alarm Configuration
  - Input Alarms — Input Type Selection
  - Output Alarms — Output Type Selection
  - Cross Reference — Alarm Cross Reference Selection
- Repeater Type
  - Multi-Net
  - LTR
  - Universal Station
  - Frequency Band
    - 800 MHz
    - 800 MHz (-12.5 kHz)
  - Power Level
    - 75W
    - 175W
- Delete Repeater
- Telephone Access Parms
- Telephone Interface
- TIC Calibration Data

TRANSFER
- Read Setup Parms F5
- Write Setup Parms F6
- Read TIC Calibration Data
- Write TIC Calibration Data

HARDWARE
- HSDB Monitor
  - Repeater (1-20)
  - Home
  - UID
  - GoTo
  - GID
- RX/TX Data
  - Data Received From Radio
  - Data Transmitted to Radio
    - UID
    - Home
    - GID
    - Pri
    - Stat
    - Time
- RF Data
  - RF Line Monitor
- Revisions
- Mode Select
  - Normal
  - Test

TEST
- PA
- Receiver
- Exciter
- Full Repeater/Station
- RNT Interface
- Telephone Interface
- VNC Interface
  - All Tests
  - Repeater Setup
  - Transmitter Tests
    - Test Mode - Transmit Test Word
    - Frequency Adjust
    - Power Output Adjust
  - Receiver Tests
    - All Receive Tests
    - TCXO Frequency Adjust
    - Audio Distortion
    - Hum & Noise Measurement
    - SINAD Measurement
    - Squelch Adjust
    - Data Level Adjust
    - Local Speaker/Mic
    - Desense Check
    - Miscellaneous Tests
  - Transmit Audio/Data
    - All Transmit Tests
    - Audio Deviation Limit
    - Repeat Audio Level
    - Data Level Adjust
    - Audio/Data Deviation
    - CWID Level Check
    - Local Speaker/Mic
    - Tx Hum & Noise Ratio
  - Voter Audio Adjust
  - Audio/Data Adjust
    - All Audio/Data Tests
    - Voice Audio From Repeater
    - Voice Audio To Repeater
    - FSK DATA Level To Repeater
    - FSK DATA Level From Repeater
    - RS-232
  - Repeater Operation
    - New HSDB Test
    - Old HSDB Test
    - Handshake Test
    - Alarm Test

UTILITIES
- COM Port
  - COM 1
  - COM 2
  - Baud Rate
- Display Mode
  - Color
  - Monochrome
- Alarm Display
- User Level
  - Novice
  - Advanced

Figure 3-2   REPEATER PROGRAMMING FLOWCHART

SECTION 4   PULL DOWN MENUS

4.1 MENU DISPLAYS

The menus available are listed at the top of the screen. Move the cursor with the arrow keys to high-light the menu name. Press Enter to view the menu and the arrow keys to scroll through the menu. Call up the highlighted selection by pressing Enter. Only the menus that relate directly to the VNC Logic Controller are discussed here, for more information on the Repeater Program refer to Figure 3-2 and the Repeater Service Manual.

4.2 FILE MENU

This menu manipulates new or existing files into directories and saves files to be called up at another time.

File Edit Transfer Hardware Test Utilities

```
Load
Save
Save As
─────────────
Print Config
DOS Shell
About...
Quit   ALT X
```
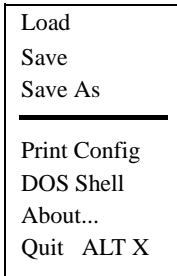
Figure 4-1   FILE MENU

4.2.1 LOAD

Load reads information from a stored file. The program requests the filename to be loaded into the buffer. The filename from a disk can be entered in the highlighted area. Then move the cursor down with the arrow key and highlight "Ok" and press Enter. To select an existing file, use the arrow keys to move down the menu list and press Enter when the high-lighted filename is the file to load.

NOTE: The default extension is ".qx". Any extension can be entered and used, but ".qx" will be displayed first.

```
┌──────── Load File ────────────┐
│ Dir c:\example\file\load       │
│ File *.qx                      │
│  ┌─────────────┐ ┌──────────┐ │
│  │ file1.qx    │ │ ..\      │ │
│  │             │ │ tmp\     │ │
│  │             │ │          │ │
│  │             │ │          │ │
│  └─────────────┘ └──────────┘ │
│  Ok                   Cancel   │
└────────────────────────────────┘
```
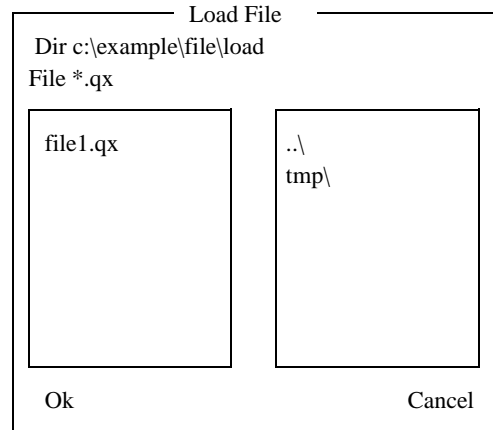
Figure 4-2   LOAD FILE

4.2.2 SAVE

This saves the edited version of an existing file loaded in the buffer under the same filename in the directory and deletes the old file. Loads a new file created in the Edit menu into the directory.

4.2.3 SAVE AS

Saves the edited version of an existing file loaded in the buffer under a new filename or gives a new file created in the Edit menu a filename.

```
┌──────── Save File ────────────┐
│ Dir c:\example\file\load       │
│ File *.qx                      │
│  ┌─────────────┐ ┌──────────┐ │
│  │ test.qx     │ │ ..\      │ │
│  │             │ │ tmp\     │ │
│  │             │ │          │ │
│  │             │ │          │ │
│  └─────────────┘ └──────────┘ │
│  Ok                   Cancel   │
└────────────────────────────────┘
```
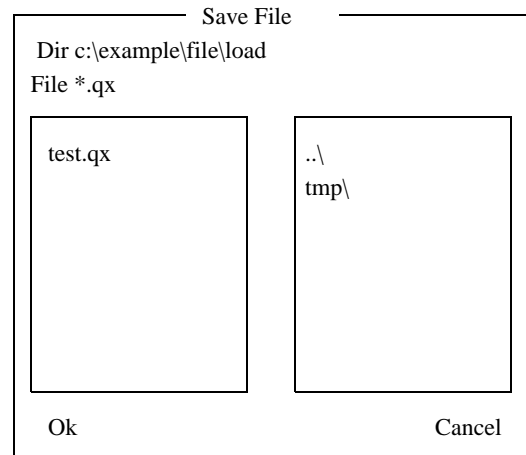
Figure 4-3   SAVE FILE

4.2.4 DOS SHELL

Temporarily suspends the program and returns to DOS. Directories and other DOS commands can be performed. To return to the program from DOS, type EXIT and press Enter.

4.2.5 QUIT (ALT X)

Exits the repeater program and returns to DOS. Be sure all files are saved before exiting the program.

4.3 EDIT

File Edit Transfer Hardware Test Utilities

```
Setup Parameters  F4
Select Rptr
Alarm Config
Repeater Type
Delete Rptr
Telephone Access Parms
Telephone Interface
TIC Calibration Data
```
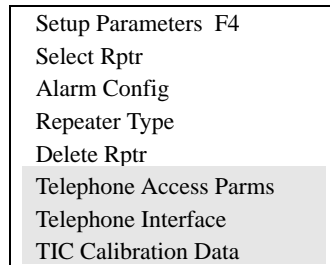
Figure 4-4   EDIT MENU

This menu is used to create new files and set or change the repeater operating parameters. The file-name for the repeaters in this file is shown in the lower left corner of the screen.

4.3.1 SETUP PARAMETERS

Programs the repeater parameters and options of each repeater at a site. Table 5-1 lists the parameters that are set by this screen (see Figure 5-2) and gives a brief description of each. See Section 4.3.2 to select repeater type to setup.

NOTE: The parameters are shown in the lower left of the pop-up screen for reference.

REPEATER NUMBER

Each repeater is programmed with a repeater number from 1-20. Make sure that this number agrees with the Home repeater number programmed in the mobiles assigned to this repeater.

CHANNEL NUMBER

Each repeater is programmed with a number of the channel that it is operating on (1-920). See Appendix A in the Repeater Service Manual.

TELCO NETWORK TYPE

Select which type of Telephone Network option will be used. Select VNC; the other options listed are for reference only.

FSK - AFSK on secondary lines.

RS232 - Digital communication on secondary lines.

FSK Blank and Burst - Audio Frequency Shift Keying on primary lines.

None - Dispatch use only (No RNT)

TIC - Internal basic telephone interconnect (No RNT).

VNC - Internal networking Viking Network Controller interconnect (No RNT).

AREA

This is the same as the area bit used when programming the mobiles. This bit is usually "0".

SYNC REPEATER

Select this option if the repeater will be the Sync repeater for the HSDB.

LOCAL MIC ID

The local microphone connected to the MAC jack is assigned a Group ID for transmitting when the local microphone PTT is active. This Group ID can be set from 1-250, 0 = disabled, the default for Local Microphone is 253. This allows the Repeater to operate as a base station.

TEST MODE ID

The Group ID that is transmitted when the Repeater is in the Test Mode. The Group IDs are from 1-250, 0 = disabled, the default for Test Mode is 254.

RF POWER LEVEL

This is the default power level. Enter the power level (25-75 Watts) that the repeater will use for transmit power.

NOTE: Not the actual power out level. Other factors must be considered for a true power out.

POWER SOURCE

Indicates the primary type of power source the Repeater is powered from. AC or DC.

4.3.2 REPEATER TYPE

This menu selection is used to choose the type of repeater for Setup Parameters (F4) menu (see Section 4.3.1). After the repeater type is selected, the Setup Parameters screen will contain the parameters for that type of repeater only. This will then become the default repeater type unless changed in the repeater type menu.

```
┌─────────────────────────────────────┐
│                                      │
│        Repeater Type Selection       │
│                                      │
│                                      │
│        Select the Repeater Type      │
│                                      │
│                 LTR                  │
│                                      │
│      Freq Band: 900 MHz              │
│                                      │
│      Power Level: 160W               │
│                                      │
│      IAC Type:   4 I/O IAC           │
│                                      │
│              Press F2 to Accept      │
│  ┘                                 └ │
│  Select Signaling Method (Spacebar)  │
```
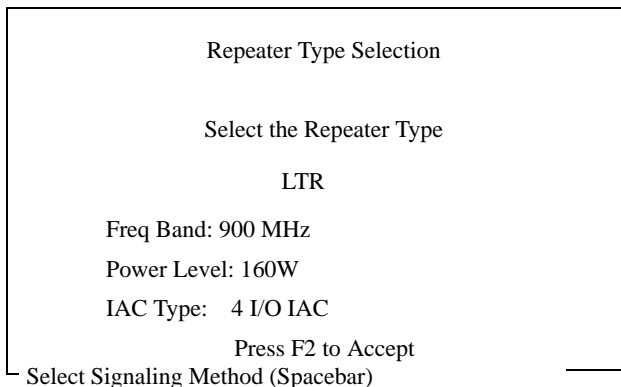
Figure 4-5   REPEATER TYPE

Select the type of repeater that is being configured. This repeater requires LTR signaling protocol and features at 800 MHz and 75W.

4.4 TRANSFER

File Edit Transfer Hardware Test Utilities

```
┌──────────────────────────────┐
│  Read Setup Parms   F5        │
│  Write Setup Parms  F6        │
│  Read TIC Calibration Data    │
│  Write TIC Calibration Data   │
│  Edit Option Keys             │
└──────────────────────────────┘
```
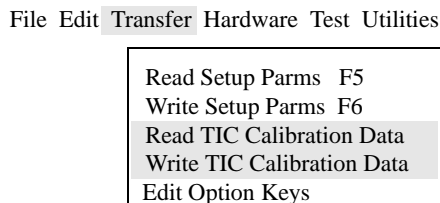
Figure 4-6   TRANSFER MENU

4.4.1 READ SETUP PARAMETERS (F5)

Read parameters from the Repeater.

4.4.2 WRITE SETUP PARAMETERS

Write the current repeater's parameters to the Repeater.

4.5 TEST

File Edit Transfer Hardware Test Utilities

```
┌──────────────────────┐
│  PA                   │
│  Receiver             │
│  Exciter              │
│  Full Rptr/Station    │
│  RNT Interface        │
│  Telephone Interface  │
│  VNC Interface        │
└──────────────────────┘
```
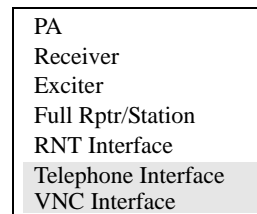
Figure 4-7   TEST MENU

4.5.1 VNC INTERFACE

This is the only selection used for alignment of the VNC Logic Controller.

Refer to Section 7 for the System Description and Section 9 for Alignment Procedures, equipment list, component layout, and circuit connections.

4.6 UTILITIES

File Edit Transfer Hardware Test Utilities

```
                              COM Port
                              Display Mode
                              Alarm Display
                              User Level
```

TO MPC
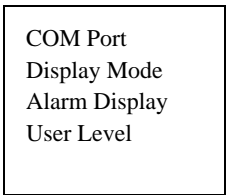
Figure 4-8   UTILITIES MENU

4.6.1 COM PORT

This is the COM port used to send and receive data from the MPC. An interface cable connects the Repeater to the computer (see Figure 4-10). This menu also sets the baud rate for the data from the computer to the MPC.

```
      Select COM Port Desired




     (r) COM 1    ( ) COM 2

          Baud rate:  9600

  Spacebar to Select
```
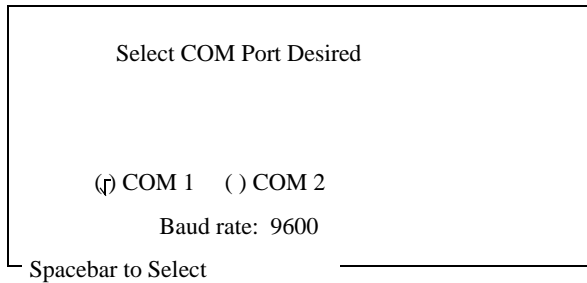
Figure 4-9   COM PORT SELECTION
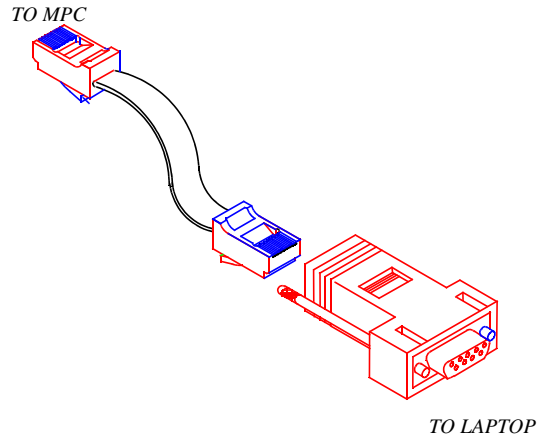
TO LAPTOP

**Figure 4-10   PROGRAMMING CABLE KIT
(023-2000-195)**

4.6.2 DISPLAY MODE

This screen allows the color mode to be selected for color monitors. When using a laptop computer, monochrome is recommended for better resolution.

```
      Select Color Mode Desired




     (r) Color    ( ) Monochrome

  Spacebar to Select
```
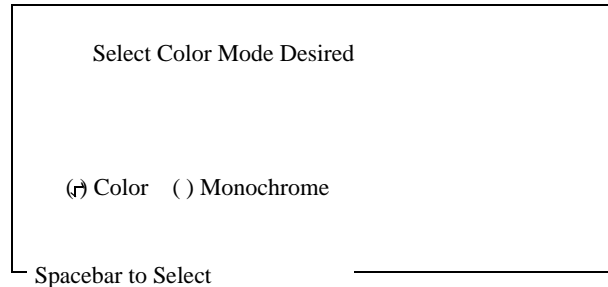
Figure 4-11   COLOR MODE SELECTION

SECTION 5   REPEATER PROGRAMMING

HELP - F1

FILE
- Load
- Save
- Save As
- DOS Shell
- Quit   ALT X

EDIT
- Setup Parameters F4
  - Repeater Number
  - Channel Number
  - Telco Network Type
  - Area
  - Sync Repeater
  - Local Mic ID
  - Test Mode ID
  - RF Power Level
  - Power Source
- Select Repeater
- Alarm Configuration
- Repeater Type
- Delete Repeater

TRANSFER
- Read Setup Parms F5
- Write Setup Parms F6

HARDWARE
- RX/TX Data
- RF Data
- Revisions
- Mode Select

TEST
- PA
- Receiver
- Exciter
- Full Repeater/Station
- VNC Interface ———— Adjust Viking Network Controller

UTILITIES
- COM Port
- Display Mode
- Alarm Display

Figure 5-1   VIKING VX VNC REPEATER PROGRAMMING FLOWCHART

5.1 CREATING A NEW FILE

An example will be used to show the programming for a new file created including a VNC.

NOTE: At any point in the programming sequence, if F1 is selected, a help screen appears to explain the menu selection highlighted at that point.

5.1.1 SELECT REPEATER TO EDIT

A repeater is selected to program. When no file exists with programmed repeaters, the default is selected and edited.

1. Highlight EDIT, press Enter.

2. Highlight REPEATER TYPE, press Enter.

3. Select LTR, Press F2.

4. Highlight SELECT RPTR, press Enter.

5. If Default is the only repeater in this list, press Enter, otherwise highlight the repeater number and press Enter.

6. Highlight SETUP PARAMETERS, press Enter.

7. The Setup Parameters screen appears (see Figure 5-2). Fill in the parameters for this repeater. A brief description of the parameters is in Table 5-1. Full descriptions are in the Viking VX Repeater Service Manual.

8. Select parameters, press F2 to accept.

9. Highlight ALARM CONFIGURATION and press Enter, if alarms are to be configured.

10. Program the Alarms to configure, press F2.

11. Highlight FILES, press Enter.

12. Highlight SAVE, press Enter.

13. Type in a valid DOS filename. For this example site1.qx is used.

14. The file consists of repeater one under the filename of site1.qx.

15. See Section 6 to program the VNC Logic Controller.

5.2 ADDING A REPEATER TO A FILE

The example used for Site 1 will again be used to add repeaters to the filename site1.qx.

1. Highlight EDIT, press Enter.

2. Highlight SELECT REPEATER, press Enter.

3. The repeater list shown for this file includes repeater one. These contain the same parameters with the exception that when selected for edit the programmed repeater can be overwritten and the data lost.

4. Highlight DEFAULT, press Enter.

5. Highlight SETUP PARAMETERS, press Enter.

6. Change the Repeater number and other parameters as required for this repeater, press F2.

7. Highlight EDIT, press Enter.

8. Highlight ALARM CONFIGURATION and press Enter, if alarms are to be configured.

9. Program the Alarms to be configured, press F2.

10. Highlight FILES, press Enter.

11. Highlight SAVE, press Enter.

12. Repeater 2 is added to the Repeater List in file site1.qx.

13. See Section 6 to program the VNC Logic Controller.

Table 5-1 LTR REPEATER SETUP PARAMETERS

Parameter	Response	Description
Repeater Number	1-20	Each repeater is assigned a Home Repeater number from 1-20.
Channel Number	1-920	Each repeater is programmed with a number of the channel that it is operating on.
Telco Network Type	None VNC	Data signaling type, None=LTR dispatch only. VNC=network telephone interconnect.
Area	0, 1	Same as value of the Area bit in the mobiles.
Sync Repeater	Yes, No	Sync repeater for HSDB. Determines Master or Slave VNC.
Local MIC ID	0 = disabled 1-225, 253 = default	Group ID transmitted when the local microphone PTT is active.
Test Mode ID	0 = disabled (default) 1-225, 254	Group ID transmitted when the Repeater is in the Test Mode.
RF Power Level	25-85	Power level in watts for transmit power.
Power Source	AC or DC	The type of primary power source for the Repeater.

```
 File  Edit  Transfer  Hardware  Test  Utilities              <F1> - Help           09:17:09

                          LTR Repeater Setup Parameters Edit

        Repeater Number:  1                Telco Network Type: VNC
        Channel Number:  100               Area:        0


        Sync Repeater:   No                CWID Time:      30
        Stand Alone:    Y                  CWID Message:    EXAMPLE
        ID Validator:    N/A


        Local MIC ID:   253                RF Power Level:  75
        Test Mode ID:   254                Power Source:   AC




                               Press F2 to Accept
      Repeater Home (1-20)


 <Filename>                                         Rptr 15          75W
    Rptr: 1  Norm  Sftw: Disabled   HSDB: Self    MAC: LTR
```

Figure 5-2 LTR SETUP PARAMETERS EDIT SCREEN

MAIN MENU

    [A]irtime Logging
- [V]iew Airtime
- [D]ownload Airtime Data
- [C]lear Airtime Data
- [S]ystem Statistics
  - Individual Repeater
  - System Loading
  - All Trunks Busy Display

    [R]eal Time Status
- Validation Channel
- LAN Display

    [C]Download Configuration

    [I]nterconnect
- [D]ownload Call Records
- [C]lear Call Records

    [E]dit
- [S]ystem Parameters
  - Zero Length Call
  - Validation Enable
  - CTCSS Base Number
  - CTCSS Fade Time
  - LTR Fade Time
  - Inter Digit Time
  - Mobile Activity
  - Network Mobile Activity
  - Idle Message Time
  - Phone Hangup Delay
  - Incoming Call Retries
  - Speech Detect
  - Speech Detect Time
  - Dial Tone Seek Time
  - Delay Star/Pound
  - Land Line Pound
  - Voice & Tone Prompts
  - VCR Connected
  - Conversation Timers A, B & C
  - Lower & Upper Limit Timers ("S" Timer)
  - Variable Time Priority
  - Two-Way Pager Timer Limit
  - Two-Way Pager Activity Timer
  - Number of Rings to Mobile
  - Extended Rings to Mobile
  - Set Weekday Time Periods
  - Set Weekend Time Period
  - CWID Time
  - Repeater to Use CWID Numbers 1, 2, 3 & 4
  - CWID Numbers 1, 2, 3 & 4
  - Pulse Dial Enable
  - Auto Logoff
  - Network Connect Try Time
  - Repeater Phone Lockout
  - Prompt Repeater Lockout
  - Dial Tone Feed
  - Modem Shared
  - Dial Click Enable (VNC105, VNC125)
  - This VNC's Phone Number VNC125
  - Default Language VNC125
  - DID Digits (VNC Only)VNC125
  - Wink Start VNC125
  - 4-Wire Disconnect (1=ENABLE) VNC125
- [U]ser Parameters
  - Interconnect Levels
  - Conversation Time
  - Extended Horn Honk
  - Audio Companding
  - Full Duplex
  - User is Valid
  - Scrambling VNC125
  - Second Language VNC125
  - Roamer - Remote Update Message (Optional) VNC125
- [X]Phone Number Prefix Table
- [P]Network Phone Numbers
- [N]etwork Parameters
  - Local ID
  - System
  - Remote ID
- [D]ID Table VNC125

    [S]et-Up
- [T]Set Current Time
- [S]Change Sign-On Message
- [P]Change Passwords
- [I]nitialize and Reset

    [U]pload Configuration

Figure 5-3   VNC PROGRAMMING FLOWCHART

SECTION 6   VNC PROGRAMMING

6.1 COMPUTER CONFIGURATION

Set up the computer for TVI920, FDX, 1200 or 2400 and N81 on the bottom of the ProComm Plus screen. VBase is preset to TVI920, FDX, N81, select baud rate by pressing F2.

6.2 COMMUNICATING WITH THE VNC

Using a cable directly connected to the computer, or terminal and modem to call the remote site where the VNC is located. Once the modems are communicating, the screen displays a Sign-On message similar to the one in Figure .

```
E.F. Johnson, Copyright © 1993

VNC Logic Controller    S/W Version 4.23

Password:
```

Figure 6-1   SIGN-ON SCREEN

Either a "Control" or "Monitor" password can be entered to gain access to the unit. The Monitor password only allows viewing of menu items while the Control password allows full access. The control password default is "CONTROL" and the default for the monitor password is "MONITOR".

If for some reason the passwords are changed, lost, or forgotten, removing the battery temporarily restores the passwords, but also destroys any stored or logged data. This procedure should be avoided if at all possible. Contact the technical service department to assist in recovering without going to the site (see Section 1.4).

6.3 MAIN MENU

Once a correct password is entered, the sign-on message and Main menu are displayed (see Figures and Figure 6-2).

```
E.F. Johnson

Main Menu:


        A = Airtime Logging

        R = Real Time Status

        C = Download Config.

        I = Interconnect

        E = Edit Parameters

        S = Setup

        U = Upload Config.
```

Figure 6-2   MAIN MENU

6.4 AIRTIME LOGGING MENU

This menu is displayed when an "A" is entered from the Main menu.

```
E.F. Johnson

Airtime Logging Menu:


        V = View Airtime

        D = Download Airtime Data

        C = Clear Airtime Data

        S = System Statistics

        =>
```

Figure 6-3   AIRTIME LOGGING MENU

6.4.1 VIEWING LOGGED AIRTIME

```
E.F. Johnson

View Logged Airtime:

User ID? 01101



 Total seconds is:
               01015  01129  00634  01516  00487  0
                         Press ENTER to continue...
```

Figure 6-4   VIEW LOGGED AIRTIME

Any of the 5000 ID codes using the trunking system connected to the VNC are logged. The accrued airtime has a capacity of 6 x 65535 seconds. Each time period can be set using the System Parameters menu (see Section 6.8.1). If the maximum count is reached for any time period, it will not overflow. An example of how the airtime menu and how the time periods are displayed is shown in Figure 6-4.

Enter the user ID to view the airtime and press ENTER. The accumulated airtime for that ID appears in real time. Press ENTER again to view another user ID code.

6.4.2 DOWNLOAD AIRTIME DATA

The airtime that has accrued for each ID can be downloaded to the office computer for further processing (see Figure 6-5). "All" accumulated airtime can be downloaded to a computer using XMODEM (checksum). The XMODEM protocol is a universal method of transferring data between two computers. The sending station (VNC) sends a block of 128 bytes of data to the receiving station. The data includes a block number, control characters, data and checksum. The receiving station checks for the proper order and the checksum. If the data was showing an error, the data is rejected and a NACK (Not Acknowledge) is sent to the sending station where it resends the data. The sending station will only retry up to 10 times and revert back to the prompt. If the data was correct, the receiving station sends an ACK (Acknowledge) to the sending station, then the next block of data is sent. In the case where there is not enough data to fill the 128 byte block, spaces (20H) are used for fill characters, with a Carriage Return (0DH) and Line Feed (0AH) at the end.

```
E.F. Johnson

Download Logged Data

 Downloading is ready,
 To abort the download, press ESC then press X.
```

Figure 6-5 DOWNLOAD LOGGED DATA

6.4.3 CLEAR AIRTIME DATA

Logged airtime can be cleared after a successful download has taken place. After all the data has been transferred correctly, use the Clear Logged Airtime Data command (see Figure).

NOTE: Remember to always check all downloaded data to make sure that it is intact and that all of the data has been properly downloaded into the computer's memory.

```
E.F. Johnson

Clear Logged Airtime Data:


     Caution!!!  Caution!!!  Caution!!!
     All logged data will be lost.
Are you sure? [Y/N]
```

Figure 6-6 CLEAR LOGGED AIRTIME DATA

6.4.4 SYSTEM STATISTICS

The VNC displays system statistics for the entire trunking system, even if all of the channel logic units are not VNCs. There are three types of statistics that can be displayed: Individual Repeater, Entire System Repeater Loading, and All Trunks Busy. All of the statistics can be displayed with just a terminal or computer using a terminal program such as ProComm. The statistics are updated every hour and configured to repeat every 24 hours. The statistics will be lost if power is cycled.

Figure 6-7 shows the screen that appears when "S" is selected. Enter the appropriate prompt for the type of statistics desired.

```
E.F. Johnson

Repeater number (21 for All Trunks Busy, 22 for Entire System):
```

Figure 6-7 DISPLAY STATISTICS

6.4.5 INDIVIDUAL REPEATER

Each repeater can be displayed by entering the individual repeater number. The display shows each hour (HR) over the last 24 hours of usage (see Figure 6-8). The line going through the display indicates the current hour. Complete data is not calculated for the current hour so nothing is displayed. Once the data has been displayed, a screen print can transfer data to a printer if a computer is being used.

```
HR=00*                                     000% RPT=01
HR=01*                                     000%
HR=02*                                     000%
HR=03*                                     000%
HR=04*                                     000%
HR=05*                                     000%
HR=06**                                    003%
HR=07*****                                 009%
HR=08**********                            018%
HR=09****************                      068%
HR=10*********************************     089%
HR=11********************************      092%
HR=12*****************************         070%
HR=13*******************************       082%
HR=14***************************           080%
HR=15*****************************         081%
HR=16***************************           068%
HR=17**********************                048%
HR=18****************                      035%
HR=19*********                             022%
HR=20***                                   013%
HR=21**                                    004%
HR=22--------------------------------      000%
HR=23*                                     000%
```

Figure 6-8   REPEATER USAGE

6.4.6 SYSTEM LOADING

An average of all active channels on the trunking system can be displayed by entering "22". Every channel is averaged and shown as typical loading for the system.

6.4.7 ALL TRUNKS BUSY DISPLAY

When "21" is entered the following display shows in percent by hour (HR) how long the system was in an All Trunks Busy (ATB) condition (see Figure 6-9). The ATB indicates that all of the available channels were in use and the customers would get a "system busy" if during that time they tried to access the system. Depending on individual system requirements, this ATB figure should warn the system owner that the customers are getting busy signals when attempting to use the system and additional channels should be installed. If additional channels are not available an alternative method of limiting usage such as higher rates should be employed to decrease the ATBs.

```
HR=00*                                     000% ATB
HR=01*                                     000%
HR=02*                                     000%
HR=03*                                     000%
HR=04*                                     000%
HR=05*                                     000%
HR=06**                                    002%
HR=07****                                  004%
HR=08*****                                 010%
HR=09***                                   004%
HR=10********                              016%
HR=11***********                           018%
HR=12*****************                     027%
HR=13************                          019%
HR=14*******************                   028%
HR=15***********                           019%
HR=16*********                             011%
HR=17****                                  005%
HR=18***                                   002%
HR=19*                                     001%
HR=20*                                     000%
HR=21**                                    000%
HR=22------------------------------        000%
HR=23*                                     000%
```

Figure 6-9   ALL TRUNKS BUSY DISPLAY

6.5 REAL TIME STATUS

The Real Time Status command "R" uses the customer's ID codes to view each channel for usage (see Figure 6-10). The display is updated each time a mobile keys or unkeys the microphone. On busy systems, the display might slow down slightly. If a repeater does not exist, "No Rptr" will be displayed in the status field. If the channel is not being used, "Idle" will be placed in the status field.

The "Interconnect Usage" shows the percentage of interconnect channels in use. This display is constantly updated. The system variable conversation timer uses this data to determine when to reduce the conversation time for interconnect. The display moves faster or slower, depending on if the system has been configured for dispatch or interconnect priority.

```
                   REAL TIME DISPLAY

                Interconnect Usage=000%

               LAN Status Interconnect Storage %
     01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20
 100-- -- -- 24 -- -- -- -- 000 -- -- -- 000 -- -- --
     01    -    Idle     08          No Rptr 15        No Rptr
     02          No Rptr 09          No Rptr 16        No Rptr
     03          No Rptr 10   -      Idle    17   -    No Rptr
     04          No Rptr 11          No Rptr 18        No Rptr
     05 05-101 Valid     12          No Rptr 19        No Rptr
     06          No Rptr 13          No Rptr 20        No Rptr
     07          No Rptr 14  17-034 Valid    21   -    Idle
```

Figure 6-10   REAL TIME DISPLAY

6.5.1 VALIDATION CHANNEL

Channel "21" is also shown on the display. This channel is not really available to the customers, it is the time slot that the validator on the system uses to validate customers using the system. If an invalid ID code starts to use the system the VNC checks if the ID code is valid. If the ID code is invalid, the ID code is placed in time slot 21. The channel logic that is being used by this invalid ID code sees that it is invalid and signals the VNC doing the validation, that validation is complete.

6.5.2 LAN DISPLAY

The Local Area Network (LAN) interconnect status shows the amount of interconnect record storage available to the system. Each VNC can store up to 5000 interconnect calls based on the number dialed. Each VNC is connected to the LAN data bus. The LAN master tells the slave VNC units when to start collecting the interconnect call records. The lowest channel number starts collecting call records first and then on up to the highest channel number VNC. Each VNC shows in percent how much storage is used in 12 percent steps.

This display also shows that each VNC is properly connected to the LAN data bus. If a known VNC is not displayed, this indicates that a bad connection on the data bus may exist.

6.6 DOWNLOAD CONFIGURATION

The VNC allows the system manager to backup the VNC programming by downloading the configuration data already in place. Should lightning hit the site and scramble the data inside of the VNC, the system manager can upload the latest copy of the parameters back into the VNC to get it back on line fast.

NOTE: Download the system configuration into a file and save it in a safe place.

Do the download procedure on a regular basis to ensure that customer programming information can be restored easily, should something go wrong at the site.

```
Download Configuration Data:


To abort the download, press ESC then press X.
```
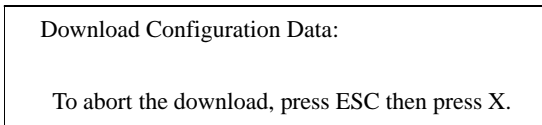
Figure 6-11   DOWNLOAD CONFIGURATION DATA

6.7 INTERCONNECT

The Interconnect menu (see Figure 6-12) is displayed when "I" is selected from the Main Menu (see Figure 6-2). Each VNC is capable of storing up to 5000 interconnect call records per unit. Each unit is connected via a LAN. The LAN is used to move stored records between the VNC units. If more than one VNC is installed, the lowest repeater number starts to store the interconnect call records received over the Trunk Line Accounting (TLA) data bus.

```
Interconnect Menu

  D = Download Call Records
  C = Clear Call Records
  =>
```

Figure 6-12   INTERCONNECT MENU

6.7.1 DOWNLOADING INTERCONNECT

During downloading the LAN is used to move the call records from each slave VNC to the master where the data is formatted and sent down to the computer file.

As the download proceeds, each record that is transferred is shown as a block. Each block is 128 characters of information. Make sure that the terminal program successfully downloads the information, and to be sure, the VNC displays if the download was successful or not.

The Download Interconnect Call Data menu (see Figure 6-13) is displayed when "D" is selected from the Interconnect menu (see Figure 6-12). If the message "No call records to download" appears, it indi-

cates that no records have been stored since the last time the memory was cleared. If for some reason there should be stored data and this message is displayed, check the LAN and TLA connections on the equipment. It takes approximately 15 seconds for the Master VNC to recognize that a call has been stored.

```
Interconnect Menu

  D = Download Call Records
  C = Clear Call Records
  =>
```

Figure 6-13   DOWNLOAD INTERCONNECT CALL DATA

6.7.2 CLEARING INTERCONNECT

The Clear Call Records menu (see Figure 6-14) is displayed when "C" is selected from the Interconnect menu (see Figure 6-12). After a successful download has taken place the call records should be cleared making room for additional call records. Make sure the downloaded call records are "correct" and "intact" before clearing the memory.

NOTE: Once the call records are cleared, the information cannot be recovered!

```
E.F. Johnson

Clear Interconnect Call Records:

  Caution!!!  Caution!!!   Caution!!!

  All logged data will be lost.

 => Are you sure? [Y/N]
```
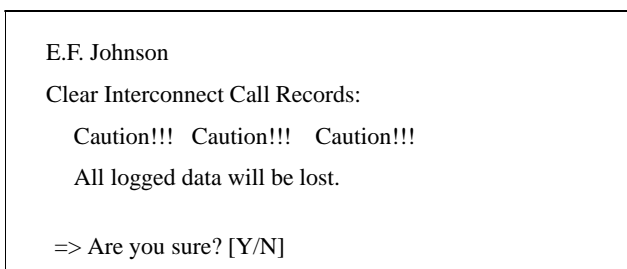
Figure 6-14   CLEAR CALL RECORDS

6.8 EDIT PARAMETERS MENU

The Edit menu (see Figure 6-15) is displayed when "E" is selected from the Main Menu (see Figure 6-2). The seven sub-menus contain the functions and operation parameters of the VNC which enable individual IDs and the entire system to be customized.

```
E.F. Johnson

Edit Menu:

  S=System Parameters
  P=Network Phone Numbers
  N=Network Parameters
  U=User Parameters
  X=Phone Number Prefix Table
  D=DID Table


  =>
```
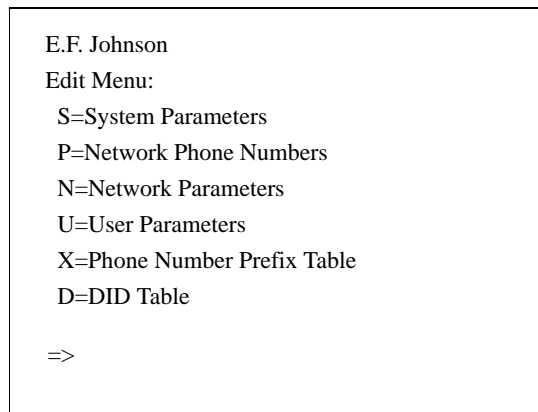
Figure 6-15   EDIT PARAMETERS MENU

6.8.1 SYSTEM PARAMETERS (SCREEN 1)

The majority of the programming of the VNC is done within the System Parameters menu. This menu has six screens which can be accessed by entering a "+" and the number of screens to advance and press "Return". For example, entering a "+2 Return" advances two screens. Continue with these commands until you reach the desired screen and parameter to edit. To go back to previous screens, enter a "-" and the number of screens and press "Return". Just entering a "+" or "-" will move one page.

Use the "Return" key to scroll to the parameters to change or add in the "New Value" column (see Figure 6-35). Enter the new value then press "Return", and the new value appears under the "Current Value" column. The following are descriptions of each parameter, functions and suggested settings for optimal performance. Timer values are entered in hundredths (0.1) of a second. For example: If a limit of 1 minute is required, enter a value of "600" (0.1 x 600 = 60 seconds).

Zero Length Call

The zero length call parameter filters Interconnect calls to generate zero duration under two conditions.

1. If an incoming land line originated call is unanswered by the intended mobile.

2. The mobile makes an outgoing call and does not trip the mobile activity detector before sending the pound key.

Also all calls that are below the set time limit (0-59 sec) are not logged. The call filter should be set to an appropriate time limit to eliminate the unusable calls that would normally be stored in memory using up valuable storage space.

Validation Enable

This parameter can enable or disable the validation signal in time slot 21 on the high speed data bus. The validation should be disabled if a logging device is currently being used on the system. Make sure only one device on the LTR data bus is generating the validation. If two or more devices are trying to validate ID codes simultaneously, intermittent operation occurs.

NOTE: The Validation parameter "must be enabled" in order for the VNC to validate IDs.

NOTE: The CTCSS parameters must be set to zero for Disable.

LTR Fade Time (Not used on VX style of VNC)

When an LTR user is on the channel, this parameter controls the amount of time the transmitter remains on-the-air after carrier-to-repeater is removed and no turn-off message (31) is received from the mobile (default is 1.2 sec). This prevents the repeater from staying on-the-air with that transmission if the signal is too weak to receive.

Inter-Digit Time

The amount of time allowed between the entering (dialing) of DTMF digits. If digits are entered slowly the VNC responds with a "Dial Time Expired" prompt. This minimizes the waste of channel time when someone is taking an unusually long amount of time to dial a number.

NOTE: When "dial pulse" is enabled, the inter-digit time is increased by the software, because dial pulses are sent significantly slower than DTMF tones. If the

inter-digit time limit is set too short it may expire in the amount of time it takes for one number to be rotary dialed (dial pulse).

Mobile Activity

This sets the maximum amount of time permitted between key-ups on interconnect calls. If for example the value is set for 20 seconds and the mobile does not key-up within that time, the VNC warns the mobile with two "beeps", if it is not keyed-up within the next 5 seconds the call is dropped (terminated).

Network Mobile Activity

This sets maximum amount of time permitted between key-ups on Networked calls. If for example the value is set for 20 seconds and the mobile does not key-up within that time, the VNC warns the mobile with two "beeps". If the mobile does not key-up within the next 5 seconds the call is dropped and the Network connection is terminated.

Idle Message Time

This controls the time span between idle message broadcasts.

Phone Hangup Delay

Phone Hangup Delay is the amount of time the VNC holds the repeater for the Central Office (CO) to confirm that the phone line has gone idle and the call is terminated.

Incoming Call Retries

This is the number of attempts (retries) a landside caller can make at overdialing a mobile's ID code. The VNC responds with the "Dialed number invalid, Please try again" prompt after each failed attempt until the set number of retries is reached. The VNC then responds with the prompt "Sorry, goodbye" and terminates the call.

Speech Detect

When an interconnect call is made the VNC has the ability to detect if speech is present from the mobile side. If the Speech Detect is Enabled, and a

mobile makes an interconnect call, the VNC starts logging "Airtime only". The VNC starts logging "Interconnect" (RIC) time after the Speech Detect is tripped by the mobile. If Speech Detect is <u>Disabled</u>, the VNC starts accumulating interconnect time as soon as the mobile initiates the call.

NOTE: If Speech Detect is enabled no audio passes until it has been tripped.

Speech Detect Time

The Speech Detect "Time" is utilized "only" on interconnect calls and when the Speech Detect parameter above is "Enable". If speech has not been detected from the mobile side and the Speech Detect Time expires, the VNC terminates the call. For example, the timer is set for 30 seconds and the mobile makes an interconnect call. If 30 seconds pass and speech has not yet been detected from the mobile, the call is terminated.

Dial Tone Seek Time

This parameter controls the amount of time the VNC tries to detect dial tone before it sends an All Trunks Busy signal. "The telephone line is busy", prompt.

Quick Star/Pound Detect

The VNC has a programmable Star "*" and Pound "#" detect time. The normal length of the interconnect pound duration is 300 ms. The Star length for networking access is 300 ms. The VNC can be configured for short (50 ms) duration tones if desired. Enter the exact star/pound duration time required, from 50 ms on up to several seconds.

Land Line Pound Detect

Enables or disables land line pound (#) turn off during non-networking interconnect calls. Enable by entering "1" or disable by entering "0" in the New Value column.

6.8.2 SYSTEM PARAMETERS (SCREEN 2)

The VNC series can be programmed to generate any prompt for the majority of the functions by entering the "Number" of the desired prompt under the "New Value" column. For Example: To change voice prompt Number 15 for "Mobile Busy" to a "Trunk Line Busy" tone Number 9, change the value for "Mobile Busy" by entering 9 in the "New Value" column. See Table 6-2 for Voice and Tone Prompts and Figure 6-36 for a sample screen.

6.8.3 SYSTEM PARAMETERS (SCREEN 3)

See Table 6-3 for a list of Timer Parameters and Figure 6-37 for a sample screen.

Conversation Timers A, B & C

The VNC has three fixed conversation timers (A, B and C) that can be applied to any ID code on an individual basis. A value must first be entered for each timer. The values that are entered are in tenths (0.1) of a second, so if a limit of "1 minute" is required, enter a value of "600" (0.1 x 600 = 60 seconds). The range is from 1 to 99 minutes. Thirty seconds before these timers expire, a warning "tick" is heard only by the mobile party. This tick indicates that there is 30 seconds of conversation time and the call should be completed. Setup the timers by entering the amount of seconds desired for each.

NOTE: Timer "C" sends warning "ticks" when the programmable time limit is reached and allows the call to continue for 99 minutes. This extended time may be used as "premium" talk time and the customer could be billed accordingly.

Lower and Upper Limit Timers

The VNC has a system variable timer "S" that when programmed, automatically adjusts the conversation time based on the amount of system traffic. This timer has a Lower and Upper limit. The lower limit is the minimum time the customer can talk when the system is at its peak capacity. The upper limit is the maximum time the customer can talk when the system traffic is at a minimum.

Variable Timer Priority

This parameter configures the system variable timer for either dispatch or interconnect priority. This priority scheme can give interconnect priority when the system is comprised of mostly dispatch channels. When configured for interconnect priority the average is based on active interconnect channels only (this includes any channel that has a valid interconnect customer enabled). To select interconnect priority enter "0" and for dispatch enter "1".

Two-Way Pager Timer Limit

This controls the maximum amount of talk time available during a two-way pager conversation. Exceeding the set time limit terminates the call.

Two-Way Pager Activity Timer

During a two-way pager conversation, if neither speech from mobile, land line or transmitter activity has been detected within the set time limit, the VNC terminates the call. This keeps the channel free if a user fails to terminate a call.

Number of Rings to Mobile

This controls the number of times the VNC rings the mobile before prompting the land line caller with "Mobile did not respond."

Extended Rings to Mobile

This parameter increases an individual ID the number of rings to the mobile, over and above the limit set in the parameter above.

Set Weekday Time Periods

The "Set Weekday" command places accrued air-time in the proper time period 24 hours a day. Starting at 12:00 AM on Monday to 11:59 PM on Friday. All airtime used between these points is placed into one of the six time periods. The starting time for each time period is adjustable.

6.8.4 SYSTEM PARAMETERS (SCREEN 4)

See Table 6-4 for a list of Time and CWID Parameters and Figure 6-38 for a sample screen.

Set Weekend Time Period

The set weekend command puts all accrued air-time into any of the six time periods. Just like the set weekdays command, the airtime is put into a time period depending on the time of day. A weekend is 12:00 AM Saturday to 11:59 PM Sunday. It is that period until the next period starting time.

CWID Time

The VNC sends a CWID message to identify the repeater in Morse code. This parameter sets the time interval between each CWID transmission.

Repeater to Use CWID Numbers 1, 2, 3 and 4

Designates which repeaters broadcast each CWID message. For example, CWID #1 on repeater 01, CWID #2 on repeater 05 and so on.

CWID Numbers 1, 2, 3 and 4

Designates each of the four CWID messages. Example, message #1 WNPP413, #2 WTRE674 and so on (CWID 14-characters maximum, A-Z, 0-9).

Pulse Dial Enable

The VNC series can dial out to a land line in pulse (clicks) or DTMF (tones). The Pulse Dial should be enabled in areas where there is rotary (pulse) phone service in use. Enable dial pulse with "1" or disable with "0" in the New Value column.

6.8.5 SYSTEM PARAMETERS (SCREEN 5)

See Table 6-5 for a list of Log-Off, Network and Phone Lockout Parameters and Figure 6-39 for a sample screen.

Auto Log-off

The VNC automatically logs off from the programming menu if no keyboard activity is detected within a 10 minute period. The password must be re-entered after this point, thus preventing unauthorized access of the system if someone forgot to log off. Enter "0" to cancel this function.

Network Connect Try Time

When a mobile makes a dispatch networked call, the local VNC attempts to call and connect (handshake) with a VNC channel at the distant site until it gains access, or the time limit set for the "Network Connect Try Time" has expired. If the time limit expires before a network connection is made, the mobile hears the voice prompt, "All circuits are busy, please try again".

Repeater Phone Lockout

The VNC has the capability to "Lockout" (disable) interconnect service on the entire system or on individual repeaters (VNC controlled repeaters only). One of the reasons for locking out interconnect, is to free up repeaters for dispatch customers. If interconnect traffic becomes too heavy on a system, a dispatch customer might have a hard time finding a free repeater. With the lockout feature repeaters can be selected to limit interconnect and the time period for the lockout function. The VNC monitors the traffic on the system and when the set limit for a certain repeater is reached, the VNC locks out any further interconnect service for that repeater.

NOTE: In order to obtain optimal results with this feature, it is suggested that the system be set up by the following guidelines and examples.

The main purpose of interconnect lockout is to have more repeater time available for dispatch IDs. When using the repeater phone lockout feature it is recommended that Home Interconnect IDs are not on channels that will be "locked out". It is also recommended that Home Dispatch IDs are not on interconnect channels. When a Home Interconnect ID is on a channel with lockout, that ID tries to access its Home channel first. If successful and the channel is "locked" a busy signal is received every time it is accessed. If

the Home channel is locked out, and is being used by a Dispatch ID, the call could be trunked to a free interconnect channel. If a Dispatch ID is Homed on a busy Interconnect channel, it cannot trunk it to a repeater that has interconnect lockout.

The interconnect VNCs do not send a free repeater message for those channels that have interconnect locked out. Therefore the other interconnect channels can not trunk any IDs to those locked out channels. Dispatch IDs can use a locked out channel only if they are "Homed" on a locked out channel or on a dispatch channel.

For Example: On the 6-channel system shown in Figure 6-16, 4-channels have interconnect and 2-channels are dispatch only. All Dispatch IDs are Homed on channels 1, 2, 3 and 4. All Interconnect IDs are Homed on Channels 5 and 6. Repeaters 3 and 4 would then be designated as the channels to have interconnect lockout. If an "Interconnect" ID that is Homed on Channel 5 keys up, it tries to access Channel 5 first. If Repeater 5 is open the call is made, if Repeater 5 is busy, the call is then trunked to one of the other interconnect channels (3, 4 or 6). If Channel 6 was busy and Channels 3 and 4 were "locked out", that ID would get a busy signal. If a Dispatch ID that is Homed on Channel 1 keys up, and that channel is busy, it now can be trunked to Channels 2, 3, 4, 5 or 6.

Assigning IDs properly assures that the system is working in the most efficient and profitable way.

The point at which interconnect lock out "occurs" is programmable by the system owner, and is determined by "2" factors. The percentage of "System Loading" and which "Time Periods" are selected to have the lockout enabled.

The percentage of "System Loading" is determined by the "amount of traffic" the system has at any given time. With a 10-channel system and when 5-channels are in use, the system loading percentage is "50%". This data is being calculated constantly by the VNC and changes as the system traffic increases or decreases. The VNC bases the system loading percentage on either interconnect or dispatch traffic. Use the "Variable Timer Priority" parameter in Screen 3 (see Section 6.8.3) to establish the priority for interconnect, or dispatch traffic.
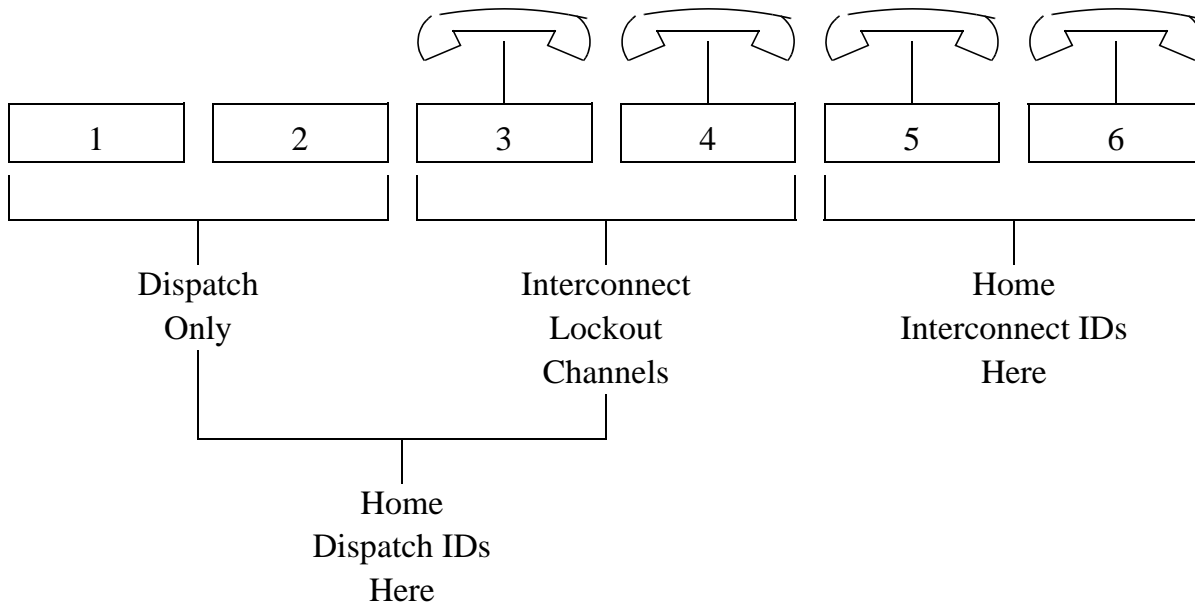
Figure 6-16 6-CHANNEL SYSTEM

The "Time Periods" determine what time of the day lock out is in effect, and if on a weekday or a weekend. The Time Periods are set under System Parameters Screens 3 and 4 (see Sections 6.8.3 and 6.8.4).

To simplify the process, each of the Time Periods and System Loading percentages have been assigned a numerical value, that is used in the programming of each repeater's lockout time. An equation and a list of the parameters and their corresponding values are shown in Figure 6-17.

6.8.6 PROGRAMMING PHONE LOCKOUT PARAMETERS

Follow the example and the steps listed below to program each repeater with the interconnect lockout parameters.

1. Select from Table A the Time Periods the interconnect lockout is active. Numbers 7 & 8 designate the Time Periods as "weekdays" or "weekends" (see Figure 6-17).

2. Add together the "Time Period values" selected. Example: 256 + 1024 + 16384 = 17664

3. Select the "percentage of System Loading" from Table B. (This is the percentage of loading the system reaches before the interconnect is disabled) Example: 40% = 102.

4. Add the "total" of the "Time Period values" to the "System Loading percentage value" selected. Example: 17664 + 102 = 17766

5. Enter this "total" (17766) into the "New Value" column next to the repeater numbers selected in Screen 6 (see Figure 6-17).

6.8.7 SYSTEM PARAMETERS (SCREEN 6)

See Table 6-6 for a list of Phone Parameters and Figure 6-40 for a sample screen.

<u>Repeater Phone Lockout</u>

Continued from Screen 5 (see Sections 6.8.5 and 6.8.6).

Tone (Repeater Lockout)

When the Repeater Lockout turns off intercon-
nect service to a repeater, the incoming calls to that
repeater receive a busy signal. This busy signal is the
default prompt Number 15 (Busy Tone). To change
the prompt, enter any one of the prompts that are listed
in Table 6-2.

Dial Tone Feed (VNC-125 Only)

The Dial Tone Feed should "only" be enabled
when "4-Wire DID/DOD" lines are being used with
the VNC.

*NOTE: Do Not enable Dial Tone Feed if the Viking
Call Router is used on the system.*

Modem Shared (VNC-105 and VNC-125 Only)

This parameter allows the sharing of a Telco line
between an interconnect and a Modem. This saves the
cost of having a separate line dedicated for data com-
munication to the VNC. Enable the Modem shared
function by entering a "1" in the New Value column.
When the VNC is called up, a prompt requests that the
mobile number be entered. At this point enter a 5-
digit code (78123) which prompts the VNC to release
the interconnect and connects to the Modem. The first
2-digits of the code (78) are factory set. The last 3-
digits can be any number desired. 78123 is used here
as an example.

The entire process can be programmed into a
communication program (e.g. ProComm). To set up
the communication program to call the VNC, enter the
auto dial as "8985705,,,,78123". The first 7-digits
(8985705) are the phone number of the VNC. The
commas that follow (,,,,) act as a time spacer; each one
is two seconds. This "space" gives the VNC enough
time to give the voice prompt "Enter mobile number"
before it is sent the 5-digit code number (78123).
Once the VNC receives the code, it releases the inter-
connect and connects to the Modem.

The 5-digit code number can also be assigned to
a DID number (VNC-125 only DID function), just as
assigning a mobile's ID to a DID number. Go to the
DID Table, found in the Edit Parameters menu (see
Figure 6-15). Select a DID number and assign it the
5-digit code (78123). When that DID number is
called, the VNC-125 connects to the Modem. The
same 7-digit DID number could be used as the auto
dial number for the PC's communication program (i.e.
ProComm).

*NOTE: When using a "smart" Modem, make sure it is
set up as follows:*

Auto Answer = OFF
Set DTR (Data Terminal Ready) to follow the line.
Set Echo = OFF
Command Recognition = ON
Command Reply = OFF
DCD does not apply.

This VNC's Phone Number (VNC-125 Only)

This parameter is used only in VNC-125 models
that have the Remote Check-in option. This is the
phone number that is sent to a mobile's Home site
Viking Call Router when roaming into this VNC-125
site and checks in. The Home site VCR then re-routes
the mobile's incoming calls to that number. For a
description of the VNC-125 Remote Check-in option
see Section 6.12.

Default Language

This parameter designates which language the
VNC-125 uses for the voice prompts to land line call-
ers. Enter a "0" for "English" or a "1" for the "2nd
language" prompts.

Click Decoder

This parameter enables or disables the VNCs
ability to decode "incoming" dial click. When the
Central Office (CO) processes a call that is made
using a rotary or dial pulse phone, the digits are sent in
"pulses". The CO then sends the call out in "clicks" to
its destination. The VNC can decode and encode
these clicks when this parameter is enabled. Enable =
"1" and Disable = "0".

*NOTE: VNC-125 and VNC-105 can decode/encode
dial clicks. VNC-95 can only encode dial clicks.*

TABLE A

Time Periods / Numerical Values

1 = 256
2 = 512
3 = 1024
4 = 2048
5 = 4096
6 = 8192
7 = 16384 (Weekday)
8 = 32768 (Weekend)

①

Time Periods

1 = 256
3 = 1024
② + 7 = 16384   System Loading

Total 17664 + 102 (40%) = 17766

④

TABLE B

System Loading Percentages / Numerical Values

0% = 00
10% = 26
20% = 51
30% = 76
③ 40% = 102
50% = 128
60% = 153
70% = 179
80% = 204
90% = 230
100% = 255

Enter this number in the NEW VALUE column by the appropriate repeaters.

⑤

E.F. Johnson

NAME	LOWER LIMIT	UPPER LIMIT	CURRENT VALUE	NEW VALUE
RPTR 15 phone lockout	00000	65535	05478	17766
RPTR 16 phone lockout	00000	65535	00000	
RPTR 17 phone lockout	00000	65535	00000	

Figure 6-17   PHONE LOCKOUT EQUATION AND PARAMETERS

DID Digits (VNC-125 Only)

Enter the amount of digits the CO sends to the VNC-125 for DID overdial (usually 2 to 4 digits).

Wink Start (Option 4-Wire Only)

Some COs need to receive a "wink" signal from the VNC-125. This signal lets the CO know that the VNC-125 is ready to receive any DTMF digits that are sent. If the CO requires a wink start signal, enter a "1" to Enable this parameter.

6.9 PROGRAMMING DISPATCH NETWORK-ING

First, plan a Network on the form provided in Appendix A.

1. Include all systems that are currently, and soon to be involved in the network by geographical location.

2. Assign each trunking system a site number from 01 to 64. Usually the first system to employ networking should be system 01.

3. Assuming that all of the systems in this example are connected to a standard dial-up telephone line, include each systems telephone number. This number should be the first number in rotary if more than one channel is going to be networked. This list of telephone numbers is to be entered into each VNC Master at each site. Each additional system number added to the network should be updated in every system.

4. This list should be entered into the "Edit Network Phone Number" table (see Section 6.10). Make sure the telephone number is exactly how it would be dialed from the trunking site including the "1" before the area code. The telephone numbers can be deleted and changed if required.

5. Include the ID codes that are to be networked. Make one column for Network Manual and one for Automatic. It is not necessary to retain the same ID code at each site. Any ID code can be used.

6. When setting the ID codes three pieces of information must be known:

   ID code at the remote site
   Site number
   ID code at the originating site (this site)

EXAMPLE:

● Go to the "Edit Network Parameters" (see Section 6.11) and enter the ID code for the local system. Enter 5-digits including the Home repeater and ID code. The VNC searches the memory for this ID code and displays any network programming if already set up. This is a good way to check a single ID code's network parameters.

● The VNC asks for the Site Number to be networked. Enter a 2-digit number for the desired site. Use the form provided in Appendix A to determine what the Site Number is going to be and enter that number.

● Enter the ID code for the distant system. This ID code does not have to be the same, any ID code compatible with the distant system is acceptable.

● The programming is complete for this ID code.

   Make sure that the distant site has its programming setup. Use a radio and activate the Dispatch Networking. The call should go through and the message "Please Proceed" should be heard.

IMPORTANT

Make sure that the networked mobiles are programmed as if they were going to be an interconnect. The mobile must be able to key the radio with the ID code being sent by the repeater.

6.10 NETWORK PHONE NUMBERS MENU

The Network Phone Numbers menu is displayed when "P" is selected from the Edit menu (see Figure 6-15).

When entering the telephone numbers for the sites, make sure that the number is set up "exactly" how it would be dialed when placing the call from the site (see Figure). This also includes the "1" before the prefix. Up to 64 sites can be accessed from any one system. Enter the phone number for each site next to that site's designated network number (01 through 64).

```
EDIT NETWORK PHONE NUMBERS
(Enter "-" to back up one, "C" to clear parameter,"+" to display a page)
(Enter "L" and a number to go to a line)

  01    17145551212
  02    12138985705
```

Figure 6-18   NETWORK PHONE NUMBERS

6.11 NETWORK PARAMETERS MENU

The Network Parameters menu (see Figure 6-19) is displayed when "N" is selected from the Edit menu (see Figure 6-15).

The ID codes must be assigned to a system number (site telephone number) before networking can take place. In the Manual mode, each system that the customer can access must be entered separately. If the Local ID code 10110 is to network with Site-2 and the ID code at Site-2 is 03010, the data should look like the entries in Figure 6-19.

To assign interconnect service to a Manual networking ID, enter a "98" by the selected ID in the "system" column. Then enter the "interconnect level" (2-6) that ID is to have in the "Remote ID" column. In the example below, ID 10110 would have local only (2) interconnect level service. To make a call, key up and enter "*98" to receive dial tone, then dial a number.

```
EDIT NETWORK PARAMETERS
(Enter "-" to back up one, "C" to clear parameter,

LOCAL        REMOTE
   ID    SYS    ID

 10110    02   03010
 10500    10   01031
 10110    98   00002
```

Figure 6-19   EDIT NETWORK PARAMETERS

The same Local ID code can access up to 64 sites if necessary. If the ID code is set up for Automatic Networking, only one system can be accessed per ID code, otherwise the site cannot be selected in Automatic. Make one Automatic ID for each system that is to be networked. The Manual ID code can be used as the primary Dispatch ID code saving ID codes if desired.

6.12 USER PARAMETERS MENU

The User Parameters menu (see Figure 6-20) is displayed when "U" is selected from the Edit menu (see Figure 6-15).

Enter the ID number of the user parameters to view or alter. In this example, the ID 20101 was entered. After the ID has been entered, the "User Status" menu appears (see Figure 6-20).

```
E.F. Johnson

  User Status:

ID = 20101
Interconnect Level = 5: International (01+)
Conversation Time  =  Timer A
Extended Horn Honk = No
Audio Companding   = Yes
Full Duplex  =  No
User is VALID
Scrambling  =  No
Second Language  =  No
Roamer = Yes  Number = 7146661212-10101

Press Space to change value, Press Enter for next value.
```

Figure 6-20   USER STATUS MENU

Press the "Enter" key to go to the parameter to change. Press the "Space" bar until the appropriate value is shown. The following are parameters shown in the User Status menu, along with a brief description and the values that can be selected for each.

6.12.1 INTERCONNECT LEVELS

This designates the level of interconnect service wanted for the selected ID. The following is a list of available types of interconnect services.

1 = Dispatch - ID has dispatch service only.

2 = Local Calls Only - ID can only call to the local area code.

3 = Long Distance (0+) - ID can make local and 0+ long distance calls only.

4 = Long Distance (1+) - ID can make local, 0+ and 1+ long distance calls only.

5 = International (01+) - ID can make local, 0+, 1+ long distance and 01+ international calls only.

6 = International (011+) - ID can make local, 0+, 1+ long distance and 01+, 011+ international calls.

7 = Network Manual - designates the ID as having manual dispatch networking and local calls only (DTMF microphone or keypad required).

8 = Network Automatic - designates the ID as having automatic dispatch networking capability only. (If mobile has no DTMF, keying the microphone automatically activates networking.)

9 = Two-Way Paging (single beep) - ID can only receive incoming calls, a single "beep" notifies the mobile receiving a call. Mobile has dispatch operation normally and must also be programmed as an interconnect ID.

10 = Two-Way Paging (phone type ring) - ID can only receive incoming calls, a phone type ring notifies mobile receiving a call. Mobile has dispatch operation normally and must also be programmed as an interconnect.

11 = Auto Call (single beep auto call) - VNC-125 only. ID has two-way paging capability with single "beep" notification of page and "one"

pre-stored auto-dial number. When the mobile keys up, this number is then "automatically" dialed.

To "program" the auto-dial number for the selected ID, press the space bar until Interconnect level "11" is reached. Then press "Enter", which moves the cursor to the Number entry slot on the right. Now enter the phone number desired for that ID. This number can be changed at any time by repeating the same procedure.

12 = Auto Call (Phone Ring) - VNC-125 only. ID has two-way paging capability with phone type "ring" notification of page and "one" pre-stored auto-dial number. When the mobile keys up, the number is "automatically" dialed.

To "program" the auto-dial number for the selected ID, press the space bar until Interconnect level "12" is reached. Then press "Enter", which moves the cursor to the Number entry slot on the right. Now enter the phone number desired for that ID. This number can be changed at any time by repeating the same procedure.

6.12.2 CONVERSATION TIME

Assigns one of the four conversation timers A, B, C and S to the selected ID. The parameters of the timers are set in the System Parameters menu. The timers are as follows:

A, B and C - These are "fixed" conversation timers, each with a pre-set time limit.

S - This is the system "variable" timer which has an upper and lower time limit which automatically adjusts the conversation time according to system traffic priority.

6.12.3 EXTENDED HORN HON

Extends the number of rings to the mobile. Select Yes to enable, or No to disable this function.

6.12.4 AUDIO COMPANDING (VNC-105 and VNC-125 Only)

The VNC has built in audio companding which increases the audio quality of interconnect calls dramatically. Enable the companding feature by selecting Yes, disable by selecting No. For the companding to work, the mobiles "must" also have companding capability.

6.12.5 FULL DUPLEX

If this ID is assigned to a full duplex mobile select Yes, if it is not select No.

6.12.6 USER IS VALID

Validates users on a per ID basis. Select "Valid" and the ID is able to access the system. Select "Invalid" and that ID is not able to communicate on the system. This comes in handy when dealing with customers who are either late with, or refuse to pay their bills. Invalidate the ID and it no longer can get service from the system. Then validate the ID when the bill is paid.

6.12.7 SCRAMBLING

(VNC-125 Only)

Disable this function, select "No". Not available.

6.12.8 SECOND LANGUAGE

(VNC-125 Only)

The VNC-125 is capable of both English and foreign language voice prompts. Assign either the foreign or English prompts to any individual ID. For example: ID 20101 could have Spanish voice prompts and ID20105 could have English voice prompts. Select Yes to assign an ID the "foreign" language prompts and No to assign "English" prompts.

6.12.9 ROAMER CHECK-IN - REMOTE UPDATE MESSAGE (VNC-125 Option

One of the unique options available for the VNC-125 is the Remote Update Message feature. The VNC-125 interfaces with the Viking Call Router to

enable customers to travel from their Home site to a remote VNC-125 site, and have their incoming telephone calls re-routed to the remote site. If the selected ID is to have this feature, press the "Space" bar to change from No to Yes.

If Yes is selected, the word "Number" appears next to it on the menu. Enter the complete "Phone Number" of the Viking Call Router that this ID is Homed on, then a dash (-) and the mobiles 5-digit ID at the Home site Viking Call Router. The entry should look like this "7145551212-10101". This is the number that the VNC-125 calls to update the Home site Viking Call Router that this ID checked into a new service area and where to reroute calls. If the call is being placed within the "same" area code, Do Not enter the area code in front of the number (5551212-10101). The following examples illustrate step by step, how the Remote Update Message procedure is accomplished.

1. The customer (Mobile-1) "checks in" when arriving into the new service area (Site-B). To check into the VNC-125, the customer simply accesses the system and enters a DTMF "*" (star). At the completion of the call, the message "Welcome, check-in accepted" is spoken, informing the customer that he has checked into the new calling area (see Figure 6-21).

2. The VNC-125 at remote Site-B places a short call (Remote Update Message) to the VCR at the customers Home Site-A.

3. The VCR-125 at Site-A receives the check-in message via a DID line and updates its memory with the customers new site location.

4. A landline caller dials the 7-digit phone number for Mobile-1. The Site-A Viking Call Router decodes the number and recognizes it as the ID for Mobile-1 and the Mobile-1 has checked in at Site-B (see Figure 6-22).

5. The Site-A Viking Call Router prompts the landline caller with "Please wait while your call is being re-routed" and then selects a DOD line and re-routes the call to the VNC-125 at Site-B.

6. The VNC-125 at Site-B translates the number and rings the mobile.

7. Mobile-1 receives the call re-routed from Site-A (Home system).

NOTE: The Remote Update Message option was only designed to allow mobiles to travel into remote service areas and have calls forwarded to that Site. If the mobile does not answer a call, the VNC is not equipped to forward the call to another number or voice mail unit. An additional Viking Call Router is required at the Remote Site to transfer unanswered calls to another number or to a voice mailbox.
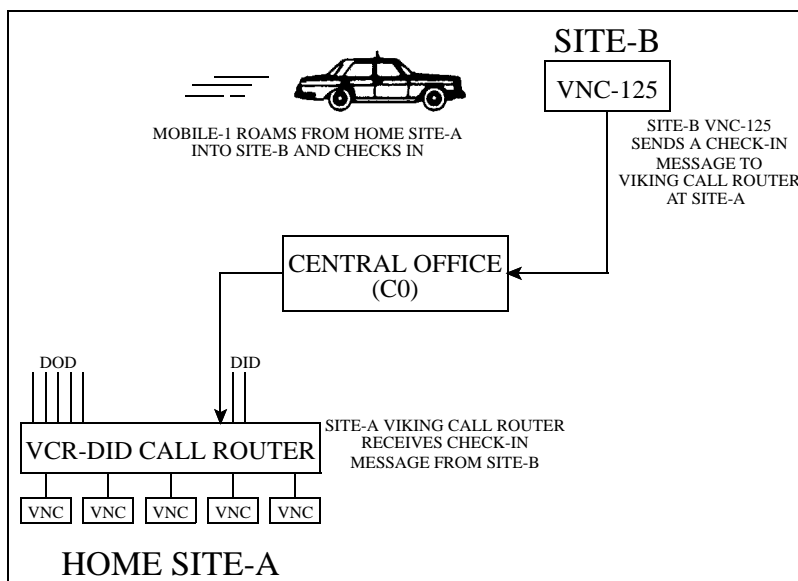
Figure 6-21   ROAMER CHECK-IN TO SITE-B
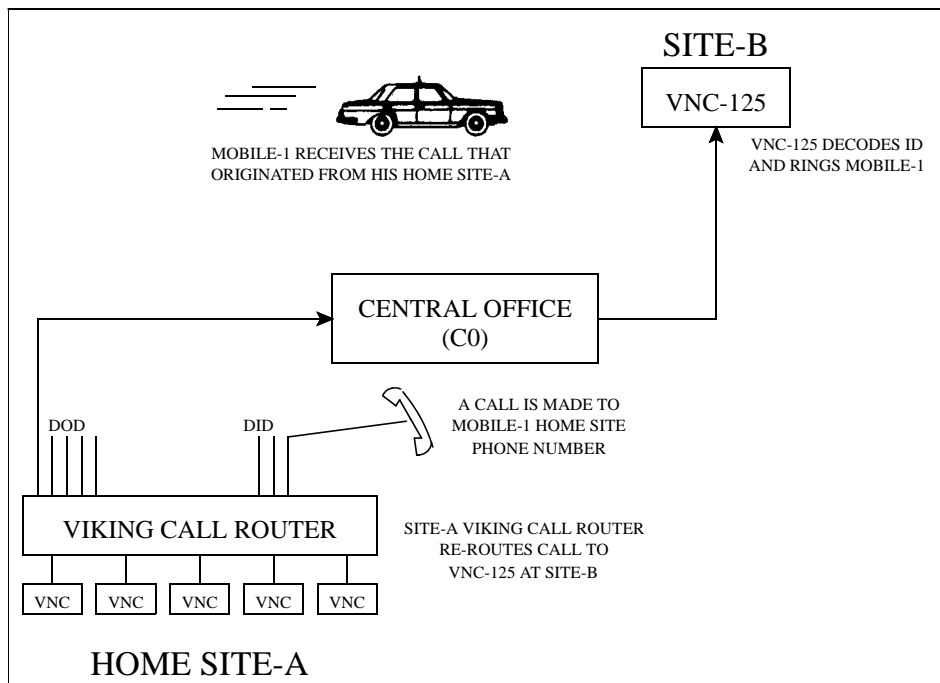
Figure 6-22   ROAMER LANDSIDE CALL TO MOBILE

6.13 PHONE NUMBER PREFIX TABLE

The normal class of service limits the customer to a specific kind of calling. If the trunking system is on an area code or other calling boundary, this type of call restriction may not be adequate. Additional calling privileges can be added by class of service or global (everyone).

The "Prefix Editor" allows the adding and deleting of prefixes. Several examples are shown to demonstrate this versatile feature. Up to 64 prefixes can be entered. The Wild Card character is signified with a star (*) key. Enter an "X" to bring up the Prefix Editor menu from the Edit Menu (see Figure 4-4).

EXAMPLE-1

If a customer is set for local only calls and a time and weather service is toll free, but in the next area code, set up the Prefix Editor as follows:

1. Enter "A" to (add) the number to the table. Then enter a "+" (plus) to enable customers to call the number (see Figure 6-23).

2. Enter the appropriate "interconnect level".

3. Type in the phone number to add to the service level and press "Enter".

4. The "Number Added to Table" appears under the new number. This is the "only" long distance prefix that Local ID codes can now dial.

(A=Add, D=Delete, ENTER=Next Page, ESC=Exit)?
Plus or Minus? +
Interconnect Level? 2
Enter phone number (*=any digit)
17148531212
Number Added to Table

Figure 6-23   EXAMPLE-1

EXAMPLE-2

The city where the system is located has a dial-a-joke number (492-7711). The customers are tying up the system by calling this number all day long. To block this number, set up the Prefix Editor as follows (see Figure 6-23):

1. Select "A" (add) to add the number.

2. Enter "-" (minus) to "block" out the number.

3. Specify the interconnect level of service.

4. Type in the new number, enter a "-" (minus) after it and press Enter.

5. The Number Added to Table appears below the new number.

The minus "after" the number signals the VNC to ignore any digits the mobile may dial after the programmed numbers have been dialed. Any specific number can be blocked for the entire system (class of service 5 and below) by using the Prefix Editor.

```
(A=Add, D=Delete, ENTER=Next Page, ESC=Exit)?
Plus or Minus? -
Interconnect Level? 5
Enter phone number? (*=any digit)
4927711-
Number Added to Table
```

Figure 6-24   EXAMPLE-2

To "Delete" a number from the table enter "D". Then enter the prefix location number (00, 01, 02, etc.) of the number to delete and press Enter (see Figure 6-25). The "Next Page" command allows viewing the next page or pages.

```
(A=Add, D=Delete, ENTER=Next Page, ESC=Exit)?
Which number to Delete? 01
01 + 2 8985705
      **DELETED**
```

Figure 6-25   DELETE A NUMBER

6.14 DID TABLE (VNC-125 Only)

The DID Table menu is displayed when "D" is selected from the Main menu (see Figure 6-2).

1. Enter the digits of the new DID number and press Enter (see Figure 6-26).

```
E.F. Johnson
DID Editor
 DID        ID    NEW ID
 ---        ---   ------
Enter DID Number:1234
```

Figure 6-26   DID EDITOR

2. The number entered appears under the DID column (see Figure 6-27).

```
E.F. Johnson
DID Editor
 DID       ID      NEW ID
 ---       ---     ------       DID Pass Through Number
 1234  =  20101    20101
 1235  =  77123    (77123)
```

Figure 6-27   NEW DID NUMBER

3. Enter the ID to assign the new number to, under the "New ID" column.

4. Press Enter and the ID appears in the ID column.

Once the first DID number has been entered, the next number in sequence is displayed. To enter a New DID number out of sequence from those displayed, press the "Escape" key. To scroll through the existing numbers press "Enter" to advance 1-line or press "+" and "Enter" to advance 10-lines. To go back one line press "-" and "Enter". Press the "Escape" key twice to exit the menu.

6.14.1 DID PASS THROUGH NUMBER

The VNC is capable of both DID and normal overdial service. In some cases customers may not want DID service. These customers can be given a special DID phone number called the "DID Pass

Through Number". This DID number has the code "77123" assigned as the mobile ID number. When the VNC receives the DID Pass Through Number, the normal DID operation is bypassed and the "Enter mobile number" prompt is given. The calling party may then overdial the ID of the mobile to contact.

Bypassing the DID is also necessary for dispatch networking purposes. During dispatch networking, a VNC at one site connects to another VNC site by calling the assigned phone number. Assigning the DID Pass Through Number as the VNC's site phone number enables calling VNCs to receive the necessary prompt to connect dispatch networking calls.

6.15 SET-UP MENU

The Set-up menu (see Figure 6-28) is displayed when "S" is selected from the Edit menu (see Figure 6-15).

```
E.F. Johnson

Set-up Menu:

    T = Set Current Time
    S = Change Sign on Message
    P = Change Passwords
    I = Initialize and Reset

  =>
```

Figure 6-28   SET-UP MENU

6.15.1 SET CURRENT TIME

The VNC has a real time clock that must be set to the correct time of day. Follow the prompts and remember, this clock is in 24 hour time (Military time) (see Figure 6-29).

```
E.F. Johnson
Set Time And Data:
The current time and date is:  08:47   05/23/94
Change the time and date? =>
```

Figure 6-29   SET TIME AND DATE

6.15.2 CHANGE SIGN-ON MESSAGE

The VNC can display a message when a successful password has been entered. This message can be up to 64 characters in length. E.F. Johnson has been used for the sign on message for all menu examples (see Figure 6-30).

```
E.F. Johnson, Copyright © 1993

VNC Logic Controller    S/W Version 4.23

Password:
```

Figure 6-30   CHANGE SIGN-ON MESSAGE

6.15.3 CHANGE PASSWORD

The change password menu allows either the Control or Monitor password to be changed to any ASCII string up to 8 characters in length (see Figure 6-31). The password must be entered "Exactly" the same, twice. The password is never retransmit- ted. Record the new password for future reference.

```
E.F. Johnson
Change Password Menu:
      M = Change Monitor Password
      C = Change Control Password
```

Figure 6-31   CHANGE PASSWORD MENU

If the passwords is lost, remove the battery and then replaced it after 5-minutes. The passwords are then restored to Control and Monitor.

WARNING

All programming and logged data will also be lost.

6.15.4 INITIALIZE VNC

The memory can be initialized by using the "Initialize" command. Doing this "Clears All" memory and "All" stored data is lost. The passwords are returned to "Control" and "Monitor" and a hardware reset also takes place (see Figure 6-32).
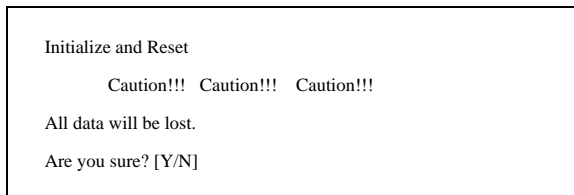
```
Initialize and Reset

        Caution!!!   Caution!!!   Caution!!!

All data will be lost.

Are you sure? [Y/N]
```

Figure 6-32   INITIALIZE AND RESET

6.16 UPLOAD CONFIGURATION

If the system has lost it's programming, go through the initialization procedure and clear out all memory locations. Go back to this menu and start an upload.

Using XMODEM, send the latest downloaded configuration file "back" to the VNC. Once the VNC has received this entire file, all programming is restored back to its latest condition (see Figure 6-33).

```
Upload Configuration Data:

Uploading is ready.  Begin UPLOADING now.

Please wait 90 seconds to abort the download.
```
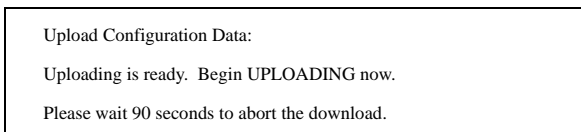
Figure 6-33   UPLOAD CONFIGURATION DATA

The screen in Figure 6-34 is displayed if the data has failed to upload or the 90 seconds abort time has expired.

```
Upload Configuration Data:


The upload has failed.  Press ENTER to continue.
```
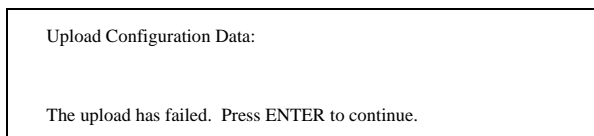
Figure 6-34   UPLOAD CONFIGURATION DATA - FAILED

6.17 PROGRAMMING TROUBLESHOOTING

This section is to help troubleshoot some of the commonly asked programming questions.

1. VNC toggles the relay continuously.

   a. The MPC is not present or operating properly.

2. VNC Off-hook continuously.

   a. SW1 on Analog card Switch 6 turned on.

3. Call light cycles every 18 seconds.

   a. High AC voltage from Tip to Ground or Ring to Ground.

4. VNC slaves not being updated with programming after 1 hour to 1.5 hours.

   a. Broken, disconnected or shorted cable, termination.

5. Radio cannot Handshake.

   a. Repeater number, area, radio programming incorrect.

6. On mobile to land line calls, audio does not cut through for several seconds or not at all.

   a. Mobile Activity detector level R7 on Analog card set incorrectly.

7. Validation does not work.

   a. Validation not enabled or other device on LTR bus also doing validation.

   b. Data bus termination incorrect.

6.18 DOWNLOAD FORMATS

The dispatch download from the VNC is in ASCII and can be used directly by all computer programs. The data is stored with each ID code on one line. Up to 6-periods at 65535 seconds per ID code can be stored. The dispatch format is shown in Section 6.18.2.

6.18.1 INTERCONNECT RECORD

The interconnect record contains all of the necessary information to accurately bill the customer for the call placed.

In the case where there is not enough data to fill the 128 byte block, spaces (20H) are used for fill characters, with a Carriage Return (0DH) and Line Feed (0AH) at the end. The format of the download RIC call data is as follows.

Byte	Definition
0-1	Repeater used **(16)**
2-3	Home Repeater (ID) **(12)**
4-6	User number (ID) **(246)**
7	55 Hex **(U)**
8-22	Phone number [1] **(15078355518)**
23-24	Duration of call minutes **(03)**
25-26	Duration of call seconds **(24)**
27	Space (20 Hex)
28-29	Hour call placed **(19)**
30-31	Minute call placed **(50)**
32-33	Month call placed **(02)**
34-35	Day call placed **(01)**
36-37	Year call placed **(95)**
38	Carriage Return (0D Hex)
39	Line Feed (0A Hex)

EXAMPLE: 1612246U 150783555180324 1950020195

6.18.2 DISPATCH RECORD

```
                        Time Periods
ID Code    1      2       3       4       5       6
 I I I I I _DDDDD_DDDDD_DDDDD_DDDDD_DDDDD_DDDDD,CR,LF
```

I = ID Code EX 03012
_ = ASCII Space (20H)
D = Up to 65535 seconds of dispatch airtime Period 1.
_ = ASCII Space (20H)
D = Up to 65535 seconds of dispatch airtime Period 2.
_ = ASCII Space (20H)
D = Up to 65535 seconds of dispatch airtime Period 3.
_ = ASCII Space (20H)
D = Up to 65535 seconds of dispatch airtime Period 4.
_ = ASCII Space (20H)
D = Up to 65535 seconds of dispatch airtime Period 5.
_ = ASCII Space (20H)
D = Up to 65535 seconds of dispatch airtime Period 6.
CR = ASCII carriage return.
LF = ASCII line feed.

Table 6-1   SYSTEM PARAMETERS (SCREEN 1)

Parameter	Response	Description
Zero Length Call	0-59 sec	Filters Interconnect calls to generate zero duration.
Validation Enable	0 = Off 1 = On	Enables/Disables the validation signal in time slot 21 on the high speed data bus.
CTCSS Base Number	NA	Must be set to zero.
CTCSS Fade Time	NA	
LTR Fade Time	NA	
Inter Digit Time	10-300 (0.1 sec steps)	Time allowed between the entering (dialing) of DTMF digits.
Mobile Activity	80-3000 (0.1 sec steps)	Maximum time permitted between key-ups on Interconnect calls.
Network Mobile Activity	80-3000 (0.1 sec steps)	Maximum time permitted between key-ups on Networked calls.
Idle Message Time	66-65535 (0.1 sec steps)	Time between idle message broadcasts.
Phone Hangup Delay	0-254 (0.1 sec steps)	Time the VNC holds the repeater to allow the CO to identify that the phone line has gone idle.
Incoming Call Retries	0-10	Number of attempts (retries) a landside caller can make at overdialing a mobile's ID code.
Speech Detect	0 = Off 1 = On	On (Enabled) start logging time when Speech Detect is tripped. Off (Disabled) start logging time when mobile initiates the call.
Speech Detect Time	256-3000 (0.1 sec steps)	Utilized only on interconnect calls and when the Speech Detect parameter is Enabled.
Dial Tone Seek Time	20-200 (0.01 sec steps)	Amount of time the VNC tries to detect dial tone.
Quick Star*/Pound#	1-255 (0.01 sec steps)	Normal length is 300 ms.
Land Line Pound#	0 = Off 1 = On	Enables or disables land line pound turn off during non-networking interconnect calls.

E.F. Johnson

NAME		LOWER LIMIT	UPPER LIMIT	CURRENT VALUE	NEW VALUE
Zero Length Call	(sec)	000	059	000	
Validation Enable	(0=OFF)	000	001	001	
CTCSS Base Number	(0=OFF)	000	218	002	
CTCSS Fade Time	(0.03 sec)	010	254	024	
LTR Fade Time	(0.03 sec)	040	254	040	
Inter Digit Time	(0.1 sec)	040	00300	00020	
Mobile Activity	(0.1 sec)	00080	03000	00900	
Network Mobile Activity	(0.1)	00080	03000	00200	
Idle Message Time	(0.03)	00033	65535	00333	
Phone Hangup Delay	(0.1)	00000	00254	00020	
Incomming Call Retries		000	010	001	
Speech Detect	(0=OFF)	000	001	001	
Speech Detect Time	(0.1 sec)	00256	03000	00600	
Dial Tone Seek Time	(.01)	020	200	040	
Quick STAR/POUND	(.01)	001	255	030	
Land Line POUND	(0=OFF)	000	001	001	

Figure 6-35   SYSTEM PARAMETERS (SCREEN 1)

Table 6-2 SYSTEM PARAMETERS (SCREEN 2)

No.	Prompt	Description
0	Call Complete	Tone - "dee-doo..." answer tone for phone line.
1	Call Complete	Tone - "beep...beep...beep" notifies mobile call is complete.
3	Activity Warning	Tone - "beep..beep" warns that the mobile has reached the Mobile Activity time-out limit and has 10 seconds before cutoff.
4	Mobile Ring	Tone - "b-ring..." outgoing ring to mobile.
5	Ring-Ring	
6	Dial Tone	Tone - Used for DID call routers that require dial tone feed.
7	Phone Ring	Tone - Normal telephone ring back tone to the land line caller.
9	"Trunk Line Busy"	Voice - The telephone line is busy.
10	"Call Complete"	Voice - Signals the mobile or landside caller that the number dialed is invalid or incorrect due to signal noise.
11	"Dial Time Expired"	Voice - Signals the mobile or landside caller that the dial-tone time-out limit is exceeded and no DTMF digits were entered.
12	"Dialed Number Invalid"	Voice - Notifies the mobile or landside caller that the number dialed is invalid or incorrect due to signal noise.
13	"Call Time Expired"	Voice - Notifies mobile that the conversation time limit has expired and the call has been terminated.
14	"Enter Mobile Number"	Voice - Requests a land line caller to overdial the mobile's ID.
15	Mobile Busy	Tone - Notifies the landside caller that the mobile called is busy.
16	"Sorry, Goodbye"	Voice - The response to the land line caller if an incorrect or invalid ID code is entered.
17	"Please Try Again"	Voice - Request for land line caller to retry if ID code was incorrect.
18	Warning Tick	Tone - "tick" provided to mobile signifying 30 seconds until conversation time expires.
26	"Connecting, Please Wait"	Voice - Informs mobile that a dispatch networked call is being connected.
28	"Please Proceed"	Voice - Informs mobile that a networked call has been successfully connected and to proceed.
29	"All Circuits Are Busy, Please Try Again"	Voice - Informs mobile that the VNC site being networked to has no available VNC channels, try again.
30	"Invalid Site Number"	Voice - Informs mobile it has entered an invalid site number when attempting to network to another site.
31	"Mobile Does Not Respond"	Voice - Informs the landside caller that the mobile called is not responding, or answering the page.
32	"Welcome, Check In Accepted"	Voice - Informs mobile of a successful check in to a new site.
33	DTMF*	Tone - Star key DTMF tone.
34	DTMF4	Tone - Number-4 key DTMF tone.
35	"Mobile Busy"	Voice - Notifies the landside caller that the mobile requested is busy.
36	No Prompt	Dead Silence
	VCR Connected 0 = No, 1 = Yes	This parameter determines if a VCR Interconnect Call Router is being interfaced with the VNC.

E.F. Johnson

NAME		LOWER LIMIT	UPPER LIMIT	CURRENT VALUE	NEW VALUE
Prmpt (Trunk line busy)	9	000	255	009	
Prmpt (Call complete)	10	000	255	010	
Prmpt (Dial time expired)	11	000	255	011	
Prmpt (Dialed # invalid)	12	000	255	012	
Prmpt (Call time expired)	13	000	255	013	
Prmpt (Ent. mobile number)	14	000	255	014	
Prmpt (Mobile busy)	15	000	255	015	
Prmpt (Sorry, goodbye)	16	000	255	016	
Prmpt (Please try again)	17	000	255	017	
Prmpt (Phone ring)	7	000	255	007	
Prmpt (Activity warning)	3	000	255	003	
Prmpt (Mobile ring)	5	000	255	005	
Paging Single beep	1	000	255	001	
Paging (Call time exp.)	13	000	255	013	
Paging (Call complete)	10	000	255	010	
VCR Connected (0 = NO)		000	001	000	

Figure 6-36   SYSTEM PARAMETERS (SCREEN 2)

Table 6-3   SYSTEM PARAMETERS (SCREEN 3)

Parameter	Response	Description
Conversation Timers A, B and C	600-54000 (0.1 sec steps)	Range is 1-99 minutes. 30 seconds before time expires, a warning "tick" is heard by the mobile.
Lower & Upper Limit Timers	600-54000 (0.1 sec steps)	Automatically adjusts the conversation time based on system traffic load.
Variable Timer Priority	0 = Interconnect 1 = Dispatch	Configures the system variable timer for dispatch or interconnect priority.
Two-Way Pager Timer Limit	80-47115 (0.1 sec steps)	Controls the maximum amount of talk time available during a two-way pager conversation.
Two-Way Pager Activity Timer	80-47115 (0.1 sec steps)	With no speech or transmitter activity within the set time limit, the VNC terminates the call.
Number of Rings to Mobile	1-20	Number of times the VNC rings the mobile before prompting the caller "Mobile did not respond".
Extended Rings to Mobile	1-20	Can increase individual ID the number of rings to mobile over and above the limit set.
Set Weekday Time Periods	00:00 AM - 23:59 PM	Start time for each 24 hour time period.

E.F. Johnson

NAME	LOWER LIMIT	UPPER LIMIT	CURRENT VALUE	NEW VALUE
Conversation Timer A	00600	54000	01800	
Conversation Timer B	00600	54000	01800	
Conversation Timer C	00600	54000	01800	
Lower Limit for Timer S	00600	54000	01800	
Upper Limit for Timer S	00600	54000	54000	
Var Tmr Priority (0 = Inter)	000	001	000	
Two Way Pager Time Limit	00080	47115	00300	
Two Way Pager Activity Timer	00080	47115	00100	
Number of Rings to Mobile	001	020	006	
Extended Rings to Mobile	001	020	012	
Weekday Period 1			00:00	
Weekday Period 2			--:--	
Weekday Period 3			--:--	
Weekday Period 4			--:--	
Weekday Period 5			--:--	
Weekday Period 6			--:--	

Figure 6-37   SYSTEM PARAMETERS (SCREEN 3)

Table 6-4   SYSTEM PARAMETERS (SCREEN 4)

Parameter	Response	Description
Set Weekend Time Period	00:00 AM - 23:59 PM	Start/stop time for weekend time period. Default is 12:00 AM Saturday night to 11:59 PM Sunday.
CWID Time	256-65535 (0.03 sec steps)	Time between CWID broadcasts.
Repeater to Use CWID Nos. 1, 2, 3 and 4	1-20	Designates which repeaters broadcast each CWID message.
CWID Nos. 1, 2, 3 & 4	7-characters A-Z, 0-9	Designates each of the four CWID messages.
Pulse Dial Enable	0 = OFF 1 = ON	Dial out to land line in pulse (clicks) or DTMF (tones).

E.F. Johnson

NAME	LOWER LIMIT	UPPER LIMIT	CURRENT VALUE	NEW VALUE
Weekend Period 1			00:00	
Weekend Period 2			--:--	
Weekend Period 3			--:--	
Weekend Period 4			--:--	
Weekend Period 5			--:--	
Weekend Period 6			--:--	
CWID Time (0.03 sec)	00256	65535	36352	
Repeater to use CWID #1	001	020	000	
CWID #1 -------------->	WNPP413			
Repeater to use CWID #2	005	020	000	
CWID #2 -------------->	WTRE674			
Repeater to use CWID #3	000	020	000	
CWID #3 -------------->				
Repeater to use CWID #4	000	020	000	
CWID #4 -------------->				
Pulse Dial Enable (0 = OFF)	000	001	000	

Figure 6-38   SYSTEM PARAMETERS (SCREEN 4)

Table 6-5 SYSTEM PARAMETERS (SCREEN 5)

Parameter	Response	Description
Auto Log-off	0 = Disabled 1 = Enabled	If no keyboard activity within 10 minutes.
Network Connect Try Time	100-3000 (0.1 sec steps)	Time limit for attempts from local VNC to connect with a distant site VNC.
Repeater Phone Lockout	0-65535 (see formula in Section 6.8)	Locks out (disable) interconnect service on the entire system or a single VNC controlled repeater.

E.F. Johnson

NAME	LOWER LIMIT	UPPER LIMIT	CURRENT VALUE	NEW VALUE
Auto Logoff (1 = Enabled)	000	001	001	
Network connect try time	00100	03000	01200	
RPTR 1 phone lockout	00000	65535	00000	
RPTR 2 phone lockout	00000	65535	00000	
RPTR 3 phone lockout	00000	65535	00000	
RPTR 4 phone lockout	00000	65535	00000	
RPTR 5 phone lockout	00000	65535	00000	
RPTR 6 phone lockout	00000	65535	00000	
RPTR 7 phone lockout	00000	65535	00000	
RPTR 8 phone lockout	00000	65535	00000	
RPTR 9 phone lockout	00000	65535	00000	
RPTR 10 phone lockout	00000	65535	00000	
RPTR 11 phone lockout	00000	65535	00000	
RPTR 12 phone lockout	00000	65535	00000	
RPTR 13 phone lockout	00000	65535	00000	
RPTR 14 phone lockout	00000	65535	00000	

Figure 6-39 SYSTEM PARAMETERS (SCREEN 5)

Table 6-6   SYSTEM PARAMETERS (SCREEN 6)

Parameter	Response	Description
Repeater Phone Lockout	0-65535 (see formula in Section 6.8)	Lockout (disable) interconnect service on the entire system or a single VNC repeater. Continued from Screen 5.
Prompt (Repeater Lockout)	0-255	When the Repeater Lockout turns off interconnect service to a repeater, the incoming calls to that repeater receive a busy signal.
Dial Tone Feed	0 = Off 1 = On	Should only be used with 4-wire DID/DOD lines. Do Not use with Viking Call Router.
Modem Shared	0 = Disabled, 1 = Shared	Shared Telco line between an interconnect and a modem.
This VNC's Phone Number (VNC-125 Only)	10-digits (0-9)	Used only on VNC models with Remote Check-in option. Phone number sent to mobile's Home site VCR when in roam.
Default Language (VNC-125 Only)	0 = English 1 = 2nd Language	Language used by VNC for voice prompts to land line callers.
Dial Click Enable	0 = Disable, 1 = Enable	VNC's ability to decode incoming dial clicks.
DID Digits (VNC-125 Only)	0 = Off, 1 = Enabled	2 to 4 digits the CO sends to the VNC for DID overdial.
Wink Start (Option)	0 = Disabled, 1 = Enabled	If a wink signal from the VNC is required by CO.
4-Wire Disconnect (VNC-125 Only)	0 = Disabled, 1 = Enabled	When enabled, this monitors the VNC E-Lead to determine if the CO is trying to disconnect the call (E-Lead termination).

```
E.F. Johnson

        NAME                          LOWER      UPPER     CURRENT      NEW
                                      LIMIT      LIMIT      VALUE      VALUE

  RPTR 15 phone lockout               00000      65535      00000
  RPTR 16 phone lockout               00000      65535      00000
  RPTR 17 phone lockout               00000      65535      00000
  RPTR 18 phone lockout               00000      65535      00000
  RPTR 19 phone lockout               00000      65535      00000
  RPTR 20 phone lockout               00000      65535      00000
  Tone (Repeater Lockout)              000        255        008
  Dial Tone Feed (1 = ON)              000        001        001
  MODEM Shared (1 = shared)            000        001        000
  This VNC's Phone Number =         7145551212
  Default Language (0 = 1st)           000        001        000
  Click Decoder (1 = Enabled)          000        001        000
  DID Digits (0 = Off)                 000        001        000
  Wink Start (1 = Enabled)             000        001        000
   4-Wire Disconnect (1 = Enabled)     000        001        000
```

Figure 6-40   SYSTEM PARAMETERS (SCREEN 6)

Table 6-7   USER STATUS PARAMETERS

Parameter	Response	Description
ID	XXYYY XX = 01-20 YYY = 001-250	User ID number to View or Alter parameters. XX = Home Channel number. YYY = Group ID number.
Interconnect Levels	1-12	See Section 6.11.1. Level of interconnect service for the selected ID.
Conversation Time	Timer A, B, C, S.	Conversation timer to the selected ID.
Extended Horn Honk	Yes, No	Extends the number of rings to the mobile.
Audio Companding	Yes, No	Increases the audio quality of interconnect calls. The mobiles must also have companding.
Full Duplex	Yes, No	If this ID is assigned to a full duplex mobile.
User is VALID	Valid, Invalid	Validates users on a per ID basis.
Scrambling	Yes, No	Optional output that drives a voice scrambler.
Second Language	Yes, No	Select Yes to assign an ID foreign language prompts, No to assign English prompts.

```
E.F. Johnson

   User Status:

ID = 20101

Interconnect Level = 5: International (01+)

Conversation Time  =  Timer A

Extended Horn Honk = No

Audio Companding   = Yes

Full Duplex  =  No

User is VALID

Scrambling  =  No

Second Language  =  No

Roamer = Yes  Number = 7146661212-10101


Press Space to change value, Press Enter for next value.
```

Figure 6-41   USER STATUS MENU

SECTION 7   SYSTEM DESCRIPTION

7.1 FCC USER INSTRUCTIONS AND CUSTOMER INFORMATION

In order to connect this system to the network, (see Table 7-1) provide the telephone company with:

1. The sequence for trunk connections.

2. The facility interface codes by position.

3. The ringer equivalence number or service order code, as applicable, by the position.

This equipment complies with Part 68 of the FCC rules. A label with the FCC registration number and Ringer Equivalence Number (REN) (as applicable) for this equipment is on the rear panel of the repeater cabinet (see Figure 2-10). If requested this information must be given to the Telephone Company (Telco).

The REN (as applicable to the service provided by the Telco) is used to determine the number of devices you may connect to the telephone line and still have assurance that all devices ring properly when called. In most, but not all areas, the sum of the RENs of all devices should not exceed 5.0. To be certain of the number of devices you may connect to each line, call the local Telco and request the maximum allowable REN for the calling area.

If any of your telephone equipment causes harm to the Network, the Telco may discontinue your service. If possible, you will be notified in advance, otherwise you will be notified as soon as possible. You will also be advised of your rights to file a complaint with the FCC.

The Telco may make changes in its facilities, equipment operations, or procedures, that could affect the proper operation of your equipment. Advance notice will be given to provide an opportunity to maintain uninterrupted service.

In the event repairs are needed on this equipment, please contact: E.F. Johnson Company Customer Service Department (see Section 1.4). The Telco may ask that you disconnect this equipment from the network until the problem has been corrected or until you are sure that the equipment is not malfunctioning.

The VNC Logic Controller (VNC) can be disconnected by pulling the card out of the backplane connectors.

FCC rules prohibit the connection of customer provided equipment to Central Office (CO) implemented coin telephone service. Connection to party lines is subject to state tariffs. (Contact your state public service commission for information.)

Table 7-1   SYSTEM INFORMATION

TYPE OF INTERFACE	REN	Jack Type
Viking Network Controller J3BUSA-21076-OT-T	1.4B	RJ11C

7.2 VNC SYSTEM FEATURES

7.2.1 DISPATCH AND INTERCONNECT ON SAME REPEATER

Normal dispatch communications are not degraded with a VNC installed in a repeater. The VNC does not affect repeater operation unless an Interconnect ID code is detected, then the repeater is held for the duration of the call. Normal data signaling occurs on the channel while a phone call is in progress.

7.2.2 EXPANDABLE CAPACITY

The interconnect capacity of an LTR system can be expanded as the demand for the service increases. One repeater in an LTR system may be initially equipped with interconnect and then other repeaters can be equipped as need for service grows. Excessive initial capacity is not required.

7.2.3 CALL TRUNKING

The benefits of trunking are also realized when using interconnect. If the Home repeater of a mobile making a call is busy and the mobile is trunked to another repeater with interconnect, the call is completed on that channel. A mobile can also be trunked to another channel to receive a phone call. The benefits of trunking (such as less channel blocking) are greatest for interconnect operation when all the repeaters in a system are equipped with interconnect.

7.2.4 SELECTABLE INTERCONNECT AND DISPATCH OPERATION

If the mobile is equipped with a Group or System select switch, telephone interconnect operation can be selected in one switch position and dispatch operation in other switch positions (with proper code PROM programming).

7.2.5 CALL PRIVACY

When making a call, no other users in the system can hear the conversation, not even the system dispatcher, unless the same Home repeater and Interconnect ID codes are assigned to more than one mobile.

7.2.6 COMPLETE CALL CONTROL

A call can be terminated at any time by the mobile or landside party by sending a DTMF '#'. A DTMF '#' is sent automatically by the LTR interconnect control unit when the handset is hung up.

7.2.7 CONVERSATION TIMERS

Calls are automatically limited to 1-99 minutes by the programming of the VNC. When this time expires, a 'tick' sounds every second for 30 seconds. The call is then automatically terminated.

7.2.8 INTERCONNECT LEVELS

The VNC can be programmed to limit overseas, long-distance, and local calls to certain ID codes. Overseas and long-distance calls can also be disallowed entirely. Direct-dialing or operator-assist privileges on these calls can also be limited to certain ID codes. Single digit '0' calls and/or '1411' or '411' directory assistance calls can be disallowed. Directory assistance using 555-1212 is disallowed unless specifically allowed in the prefix list. Emergency '911' calls are always allowed.

7.2.9 HALF-DUPLEX/FULL-DUPLEX OPERATION

Installing the VNC in a repeater, which is a full-duplex transceiver, results in half-duplex telephone calls if the mobile transceiver is half-duplex, or full-duplex telephone calls if it is full-duplex. The difference between a half- and full-duplex transceiver is that a half-duplex transceiver cannot transmit and receive at the same time, while a full-duplex transceiver can.

Since the VNC interfaces with a full-duplex transceiver, the landside party can always talk and listen at the same time. If the mobile user is also using a full-duplex transceiver, true telephone- type communications results for both parties because each can talk and listen at the same time. The mobile user does not have to press and release a PTT switch because the transmitter is on continuously during the call.

If the mobile transceiver is a half-duplex type, the mobile user must press the PTT switch to talk and release it to listen. The landside party then cannot be

heard while talking or talked to while listening. To make this type of call less confusing for the landside party, a special tone can be enabled in the VNC unit. This tone sounds when the mobile user releases the PTT switch to signal when the landside party can respond.

7.3 DISPATCH NETWORKING

The VNC's Dispatch Networking feature allows a dispatch customer to communicate with other units located at distant sites. The base can communicate to the mobiles on the local system using the same ID code if desired. There are two types of network ID codes available.

The first is a Network Manual ID. This kind of ID code allows the ID code to be used for local communication and be used to network to distant sites if desired. A DTMF microphone is required to function the VNC to make an inter-site network call. There are up to 64 possible sites for networking a trunking system. An additional 63 sites can be directly accessed using a DTMF microphone. By keying the radio and entering a "*" and the 2-digit site code the connection can be initiated. The mobile can also be given local interconnect privilege. To make a local call, the mobile keys up, enter "*98" and gets dial tone.

NOTE: Manual Networking only. ID code 98 access level must be entered in the Network Parameters menu (see Section 6.11).

Network "Automatic" is the second method. This kind of networking does not require a DTMF microphone. By pressing the microphones push- to-talk button the call is automatically started. An unanswered call to a distant site times-out if the called party does not answer (time is programmable). Once a conversation has been started, and a delay of 30-seconds elapses between key-ups, the connection is terminated.

Call progress messages are spoken to help the customer operate the system more efficiently. In the Network Manual mode if an invalid site number is accidentally entered, the prompting says "Invalid site number!". Once a valid site number or network automatic call has been successfully started, the message "Connecting, Please wait" is heard. If the distant

VNC answers and handshaking is successful, the message "Please Proceed!" is heard. Just like an interconnect call, a mobile activity warning time-out "beep-beep" is heard 5-seconds before disconnection. If the lines are busy, a message "All circuits are busy, please try again" is heard.

The VNC sends a prompt when called by a land line that asks for a mobile number to be entered. This same message prompts the calling dispatch network VNC to overdial the ID code that is to be networked. The direct number should be used by the VNC so access can be direct. If a VCR DID Call Router is being used, then use a dispatch networking DID number.

7.3.1 LAND LINE TO DISPATCH NETWORK CALL

Network calls can also be placed by normal telephone. Just like an Interconnect ID, a Dispatch Network ID can be overdialed after the prompt. A DID number may also be used.

7.4 PHONE LINES

7.4.1 GENERAL

Each VNC Logic Controller (VNC) requires a phone line to connect it to the telephone company's Central Office (CO). The number of lines that are required is determined by the number of repeaters equipped with interconnect (only one VNC is installed per repeater).

There must be at least one phone number which a landside party can dial to access the interconnect system. A rotary switch can be used at the CO so that all phone lines serving the interconnect have the same phone number. Then when a landside party makes a call, the rotary switch automatically connects the caller to the first phone line that is not busy. Alternatively, each VNC could have its own phone number and a landside caller should always call a specific repeater. This situation may be desirable in certain applications but may result in decreased efficiency since the probability would be higher that a landside caller would get a busy signal. If queuing or other

features are required, a PABX (Private Automatic Branch Exchange) may be required. Contact the E.F. Johnson Marketing Department for further details on special system configurations that may be required.

7.4.2 GRADE OF PHONE LINE REQUIRED

The telephone company classifies phone lines by a series number. The grade of phone line required is determined by the type of equipment to which it is connected. The various classifications along with the intended use for each is listed in Table 7-2. For interconnect, Series 2000 lines are adequate.

Table 7-2   PRIVATE LINE CLASSIFICATIONS

Series	Usage
1000	Low-Speed Signaling and Teletype
2000	Voice-Grade
3000	Voice-Grade Data Transmission
4000	Telephoto
5000	Multi-Channel Carrier Systems
6000	High-Grade Audio
7000	Video
8000	Wide-Band Data
11000	Wide-Band Data

7.4.3 BATTERY AND RINGING VOLTAGES

With a 2-wire phone line (see Section 2.2), one wire is typically referred to as the "tip" and the other wire as the "ring". However, this terminology is not universal since some phone companies may use "+" and "-" designations. The tip and ring terms are derived from the plug used to make connections on a manual switchboard. The tip side of the phone line usually goes to ground through the Central Office (CO) equipment and the ring side goes to the negative terminal of a -48V battery also at the CO. The positive terminal of this battery is connected to ground.

When the CO signals ringing on a phone line, a 20 Hz, 86V RMS signal is usually used. This signal is superimposed on the -48V DC battery supply and the duty cycle of the ringing signal is 2-seconds on and 4-seconds off.

7.4.4 SUPERVISION

The VNC can be seized from either landside or mobile seizure. Landside seizure occurs by Direct Inward Dial (DID) or Two-Way Start (2WY). Mobile seizure is a request for outgoing service on the telephone line.

Once seizure has occurred, connection supervision takes place. Incoming calls are connected by Immediate Start or Wink Start (option 4-Wire Only). Immediate Start requires the ability to accept digits in less than 70 milliseconds before digits are sent. Wink Start sends digits after a short battery reversal and back to normal battery before digits are received. 2-Way Incoming indicates readiness to accept end-to-end DTMF digits by outputting a "proceed" tone.

Outgoing calls have three ways to determine when to send digits:

1. Immediate Start (4-Wire)

   Waits 70 milliseconds before digits are sent.

2. Dial Tone Delay (2-Wire)

   Waits until 100 milliseconds of dial tone is received before digits are sent.

3. Wink Delay (4-Wire)

   Waits for battery reversal and back to normal battery before digits are sent.

7.4.5 SIGNALING

Once connection supervision has occurred, the digit signaling is done. There are two ways to send and receive digits:

1. Dial Pulse

   Counts the "breaks and makes" of loop current.

2. DTMF

   Determines the tone pair of a set of frequencies.

The VNC sends or receives the appropriate signaling depending on the direction of the call. The VNC is capable of sending and receiving "end-to-end" signaling where the call is completed and normal voice communication takes place, or numeric information can be sent or received via DTMF. Dial pulse information cannot pass through the telephone company's Central Office (CO) to make it back and forth to the units.

7.4.6 CALL SUPERVISION

Once the signaling of the digits has occurred, call status is determined for answer and disconnect.

Answer supervision is an indication of when the called party answers the telephone. The method used is mobile speech activity that detects the presence of mobile speech for a certain length of time.

Disconnect supervision detects when the called party hangs-up (disconnects) and a message is sent to the VNC to disconnect from the telephone line. The method used is to wait for the mobile disconnect message. If the mobile does not hang up properly, the message is not sent and the call continues. Fail-safe alternatives watch for loss of mobile speech or detect the return of dial tone. This ensures call disconnect allowing another call to be placed. The VNC then informs the Main Processor Card (MPC) that it has disconnected from the telephone line.

7.4.7 TELEPHONE LINE STYLES

There are several different styles of telephone lines the VNC controls. The following styles of lines and their basic connection are supported.

1. Direct Inward Dialing (DID)

   The DID offers direct inward dialing of the telephone number and supplies the -48V DC battery to the incoming lines. The Central Office (CO) contacts the DID by closing the loop and sends the number to the DID by dial pulse or DTMF. The DID can handle 2, 3 or 4 digits being spilled forward by the CO.

2. Direct Outward Dial (DOD)

   The DOD offers access to the CO lines for outward going calls, interfaces to lines of different supervision (i.e. Loop Start or Type II E&M) and dials the desired telephone number by dial pulse or DTMF.

3. Four-Wire Type II E&M (E&M)

   E&M is primarily used with electronic switches, public leased lines or microwave equipment to provide complete separation of transmit and receive audio lines. There are DID and DOD types of E&M units. The signaling unit provides the -48V DC battery to the M-lead, while the trunk unit provides ground to the M-lead. The signaling is reversed for the E-lead.

4. Dial Pulse

   Dial pulsing is the "break and make" of the loop path to cause no flow and flow of loop current. The number of breaks, when no current flows, is the number of the desired digit, with 10 pulses equaling 0.

5. Dual Tone Multi-Frequency (DTMF)

   DTMF tone signaling is used on almost all push button telephones. DTMF is where the desired digit is composed of a combination of two tones. A tone pair consists of one tone from the low band group (697, 770, 852 or 941 Hz), and the high band group (1209, 1336, 1447 or 1633 Hz).

7.4.8 PULSE AND DTMF DIALING

Introduction

The two methods commonly used to encode a telephone number are DTMF and dial pulsing. The landside party must use a Touchtone®-type phone which generates DTMF tones used to overdial the Home and Group ID. In addition, the mobile must have some type of DTMF encoder.

DTMF Dialing

DTMF (Dual-Tone Multi-Frequency) dialing is a method of number encoding using two multiplexed tones. A different tone combination is produced for

each number dialed. The low tone group consisting of 697, 770, 852, and 941 Hz, and the high tone group 1290, 1336, 1477, and 1633 Hz. Although these 8-tones can provide 16-tone combinations, only twelve are used on most keypads. A tone is assigned to each row and column of keys as shown in Figure 7-1. When a key is pressed, the row and column frequencies are selected. For example; '4' is encoded by combining 770 and 1209 Hz tones. The tone frequencies are chosen to reduce harmonic relationships. The frequency tolerance is ±2% and the tone level is -6 dBm. DTMF dialing is fast and DC continuity is not required.

HIGH-BAND FREQUENCIES

	1209 Hz	1336 Hz	1477 Hz	1633 Hz
697 Hz	1	ABC 2	DEF 3	A
770 Hz	GHI 4	JKL 5	MNO 6	B
852 Hz	PRS 7	TUV 8	WXY 9	C
941 Hz	✳	OPERATOR 0	#	D

LOW-BAND FREQUENCIES

USED ON TELEPHONE SETS   SPARE
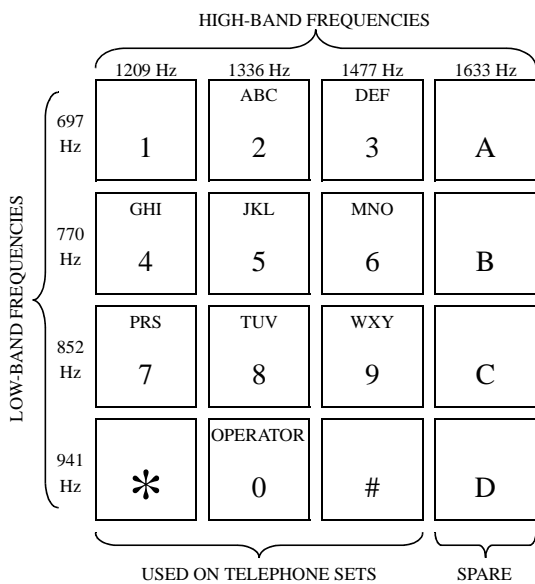
Figure 7-1   DTMF KEYPAD

Pulse Dialing

The number dialed is encoded into a series of pulses. The number of pulses produced is the same as the number dialed except for "0" which is 10-pulses. A pulse is produced by opening the loop between the tip and ring lines. Pulses are produced at a rate of 10 or 20 per second.

The type of phone (DTMF or Pulse) can be determined by listening in the earpiece when a key is pressed. If the phone is DTMF, each key produces a different tone and if it is pulse, a series of rapid clicks is heard. (A phone with a rotary dial is always a pulse type.)

7.5 CONFIGURING AN LTR SYSTEM FOR IN-TERCONNECT

7.5.1 INTRODUCTION

There are, of course, many different ways to configure an LTR system with telephone interconnect. The software for the Repeater and the EEPROM in the mobiles can be programmed in a variety of ways to customize operation for a particular application. Programming is described in Section 6. There are also several methods of connecting the phone lines. A method of connecting WATS and FX lines is described in Section 7.5.3.

Another consideration is how many of the repeaters in the system should be equipped with a VNC Logic Controller.

7.5.2 SYSTEM SETUP

The best interconnect service is produced when all repeaters in a system are equipped with interconnect. All available channels can then be used for interconnect and a mobile is always trunked to a repeater equipped with interconnect. If not all repeaters in a system are equipped with interconnect, the chance of a mobile getting trunked to a repeater without interconnect increases as the number of interconnect-equipped repeaters decreases, especially during busy periods.

The disadvantage of equipping all repeaters in a system with interconnect is that the entire system can be tied up with phone calls. This may cause dispatch service to deteriorate. Therefore, the best tradeoff in performance level can usually be obtained if only a portion of the repeaters are equipped with interconnect.

Call Attempts on Non-Interconnect Repeaters

If the Home repeater is busy when an access is made, the mobile may be trunked to any repeater in the system that is not busy (free repeater selection is random). If a mobile is trunked to a repeater without interconnect, the call cannot be completed on that access. No dial tone or other supervision is then

returned when the PTT switch is released because the repeater reacts as it would with a dispatch call. This may be confusing to the user.

To prevent access attempts on repeaters not equipped with interconnect, repeaters with interconnect are specified when programming the mobile. If trunking to a non-interconnect repeater then occurs, the transmitter does not key and the busy tone sounds.

If an access attempt on a non-VNC repeater occurs, a timer is set in the mobile which prevents another attempt for 10 seconds. If an access is attempted during this delay period, the intercept tone sounds and the transmitter does not key. It is not possible to make another attempt to holding the PTT switch down because this timer does not count down with the PTT switch pressed. This delay ensures that the mobile is updated with new data before another call attempt is made.

Interconnect-equipped repeaters can be specified when programming all current transceivers. However, with early LTR transceivers that are programmed using the PROM Programmer II (e.g. 8700 and 88xx), Interconnect repeaters cannot be specified. One alternative with these transceivers is to program "phone call only" systems, which have only VNC equipped repeaters .

7.5.3 USING THE MOBILE SYSTEM SELECT SWITCH TO ACCESS SPECIAL PHONE LINES

If special phone lines such as WATS[1] or FX[2] are required, the mobile system select switch can be used to select local lines, WATS/FX lines, or dispatch operation. As shown in Figure 7-2, two VNC units in a 5-repeater system could be connected to local phone lines and two could be connected to WATS/FX lines. System 1 could be programmed for local calls (Repeaters 1 and 5), System 2 for long distance calls (Repeaters 9 and 13), and System 3 for dispatch calls (all repeaters).
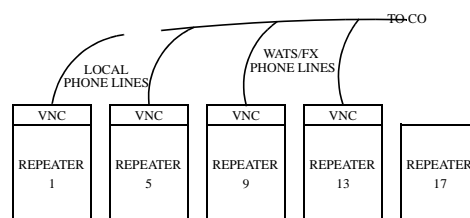

Figure 7-2   CONFIGURING PHONE LINES

7.6 SYSTEM OPERATION

7.6.1 INTRODUCTION

With a VNC installed, the repeater looks for valid interconnect ID codes. If found, the repeater composes new receive data to "busy up" the repeater until the call is finished (the repeater is held for the duration of a call). System trunking occurs in the normal manner.

In the idle mode, the repeater monitors the phone line for ringing voltage. In addition, it also monitors the repeater receive data for a valid interconnect ID code. If a ringing signal is detected on the phone line, the mobile terminate sequence described in Section 7.6.2 is initiated. If a valid interconnect ID code is detected, the mobile originate sequence described in Section 7.6.3 is initiated.

7.6.2 MOBILE TERMINATE CALL SEQUENCE

<u>Accessing the System</u>

When the landside party calls an LTR mobile, the telephone number of the repeater interconnect system is dialed. The telephone company Central Office (CO) then typically applies an 86V RMS, 20 Hz ringing voltage to the phone line. When a ringing signal of at least 17V RMS is detected, the number of cycles of ringing are counted. When the appropriate number of cycles have been counted, the receive data is

---

[1] WATS is an abbreviation for Wide Area Telecommunication Service and a WATS line is a special dedicated phone line used for long distance dialing only.

[2] FX (Foreign Exchange) is a phone line that goes to an exchange outside the one serving the area. Calls to that exchange can then be made at local instead of long distance rates.

checked to see if there are any mobile requests to use the repeater (either interconnect or dispatch). If there are none, it closes the phone line relay to answer the call and generates data to "busy up" the repeater.

If the repeater is being used by a dispatch ID code, the VNC waits for that transmission to end before closing the relay. If an interconnect ID (indicating a mobile attempt to make a call) is detected, that request is picked up instead of the landside call attempt. The line relay is closed and if the landside caller is still ringing and a dial tone is not detected within three seconds, the line relay is opened and both calls are dropped. A dropped call is indicated to the landside party by a dial tone and the mobile user hears a voice prompt. If the landside party hangs up in time for the dial tone to be detected, a mobile originate sequence is initiated (refer to Section 7.6.3).

If there were no mobile requests detected, a proceed prompt is set to landside caller after the line relay is closed. The landside caller then enters the home repeater number followed by the ID code of the mobile being called. For example, to call a mobile assigned to Repeater 4 with an ID code of 38, "04038" is entered (5-digits must always be entered and a DTMF-type keypad used). There is a selectable interdigit time limit to enter each digit after the proceed prompt. If more than 5-seconds is between each digit, the call is terminated.

Mobile Ringing

The VNC decodes the repeater and ID number and checks the information to make sure that ID code is authorized interconnect service. If it is, the mobile being called is signaled on that channel. If it is not the mobile's Home repeater, data placed on the repeater high-speed data bus causes signaling on the mobile's Home repeater the same as with a standard dispatch call. A fast ringing tone is then sent to both the mobile and landside caller. Ringing continues until the mobile answers or the mobile ring count is exceeded. This count is the maximum rings permitted and it is programmed into the VNC for 1-20 rings. If the mobile does not answer, the "Mobile did not respond" voice prompt is sent to the mobile and the call is terminated.

Mobile Answer

The answer is detected when a carrier appears on that channel. The data sent by the mobile is then checked to make sure it is the correct mobile. If it is, it halts ringback and goes into the conversation mode. If it is not the correct mobile, the call is terminated. When the conversation mode is entered, telephone audio is opened to the mobile, billing begins, and the conversation time-out timer begins timing. If the turn-around tone is enabled when programming, this tone is produced whenever the mobile push-to-talk switch is released. This tone may be partially heard by the mobile when it goes into the receive mode.

With duplex mobiles, this tone is not produced since the mobile transmitter remains keyed. There is also a mobile activity timer which measures the time between transmissions if the mobile is half-duplex. If the time between transmissions exceeds the mobile activity time programmed, the call is terminated. This time can be set from 8-300 seconds, in 0.1 second intervals (60 seconds typical). Five seconds before the call is terminated, a warning tone is sounded to alert the mobile. The purpose of this timer is to automatically terminate a call if the mobile does not send the "#" digit (refer to the next Section).

Call Termination

1. Either party can send a "#" DTMF tone.

2. The mobile activity timer can time out.

With half-duplex mobiles, if the call is ended without the "#" code being sent or the phone line battery reversing, the call is automatically terminated when the time-out time expires. A "#" code is usually automatically sent by telephone-style control units when the handset is hung up. However, if the transceiver is full-duplex and the handset is not hung up when the call is completed, the call (and billing) may not terminate until the total call length expires.

When the end of the call is detected, the phone relay is opened, the repeater is released, and the repeater returns to the idle mode.

7.6.3 MOBILE ORIGINATE SEQUENCE

Accessing the System

When a mobile originate call is to be initiated, the mobile transmitter is keyed briefly to send a data message containing the interconnect ID code to the repeater. The receive data is monitored, the ID codes are checked for one that is allowed interconnect privileges. When an interconnect ID code is detected, data is generated to "busy up" the repeater for the duration of the call and dial tone is sent to the mobile.

Dialing the Telephone Number

If more than the inter-digit time period occurs between digits, the "Dialed number invalid" voice prompt is sent and the call is terminated. Continual checks are made to see if the mobile transmitter unkeys. When it does the last digits have been sent. Continual checks are also made for a "#" digit which would indicate the mobile has terminated the call.

Dialed Number Verification

After the telephone number has been dialed, the mobile is checked to see if it is authorized for the service level requested. The service level authorized to each interconnect ID code and the operator assistance allowed on the system is determined by the programming. If a service level is requested that is not authorized to that ID code or on the system, the call is terminated.

Checks are first made to see if an emergency 911 has been dialed. If it has, the call is allowed to proceed. Then checks are made to see if it is either a 411, 1411 or 555-1212 directory assistance or single digit "0" call. If it is and these calls are allowed by the programming, it is allowed to proceed. Next, checks are made to see if seven digits have been dialed. If less than seven digits have been dialed or there is a "0" or "1" in the first two digits of a 7-digit call, the call is terminated. A 7-digit number without the first two digits a "0" or "1", is allowed to proceed.

If the dialed number is more than seven digits long, it checks to see if the mobile is allowed to make toll calls (overseas or long distance). If toll calls are permitted, it then checks for overseas calls ("01" in first two digits). If it is not an overseas call, it is a standard long distance call and is allowed to proceed

if the first digit is a "0". If it is not a "0", that mobile is checked to see if it is permitted direct-dial long distance calls.

If the first two digits were "01" indicating an overseas call, checks are made to see if overseas calls are permitted. If they are, it then checks to see if the third digit is a "1" indicating a direct-dial overseas call. If it is not a "1", the call is allowed to proceed. If it is a "1", checks are made to see if direct-dial overseas calls are authorized.

If the number is valid, the phone line relay is closed. If dial tone is detected, the validated # is dialed.

PBX Calls

Telephone interfaces connected to PBX's have to have the prefix programmed. See Section 6.13 for information on the Prefix Editor.

Landside Answer

If the dialed number was valid, the telephone audio to the mobile is turned on, mobile voice is activated and ringback is heard by the mobile. When landside answer is detected, billing starts in one of two ways:

1. Mobile speech detect.

2. A call is intiated.

Once the call is answered, it is timed in minutes and seconds for the length of the conversation. As with a mobile terminate call, the length between transmissions is timed if the mobile is half-duplex. If the time between transmissions exceeds the turn-around time programmed, the mobile is assumed to have gone away and the call is automatically terminated. Five seconds before the call is terminated, a warning tone is sounded to alert the mobile. The turn-around tone is also heard if it was enabled when programming. In addition, if the length of the call exceeds the time programmed in the conversation time-out timer, a "tick" sounds every second and the call is automatically terminated in 30 seconds.

Call Termination

If the call has been completed it is detected by detecting a "#" DTMF digit from either the landside or mobile party. With half-duplex mobiles, if a "#" digit is not sensed, the call terminates when the turn-around time expires or a second dial tone is detected. A "#" code is also automatically sent by most telephone style control units when the handset is hung up. However, if the transceiver is full-duplex and the handset is not hung up when the call is completed, the call (and billing) may not terminate until the conversation time expires.

When the call is terminated, the call accounting data is dumped to the call accounting equipment (if used). This data includes the mobile Home repeater number and ID code, the length of the call in minutes and seconds, and the phone number called. When the data dump is complete, the repeater goes back to the idle mode.

7.6.4 VNC SUPERVISORY TONES

Several supervisory tones are generated which are heard by the landside and mobile users (also see Table 6-2). The following is a brief description of these tones.

Proceed Tone

The proceed tone tells a landside caller to enter the home repeater number and ID code of the mobile being called. The landside caller must use a DTMF phone and enter each digit within five seconds. If there are more than five seconds between digits, the call is terminated. The proceed tone is a 620 Hz tone of 405 milliseconds duration followed immediately by a 440 Hz tone of the same duration.

Reorder Tone

The reorder tone tells a caller that the call has been terminated. The reorder tone consists of three 620 Hz tone pulses that are 270 milliseconds in length separated by 270 millisecond pauses.

Fast Ringing Tone

The fast ringing tone is the ring back heard by the landside party and the ringing heard by the mobile during a mobile terminate call. The fast ringing tone is a 1209/941 Hz mixed tone with a repetition rate of 25 ms On and 25 ms Off for two seconds. This sequence continues until ringing is terminated.

Turn-Around Tone

The turn-around tone can be enabled or disabled when programming the VNC. This tone is heard by the landside party (and partially by the mobile user) when a simplex mobile goes into the receive mode. This tone is a signal to the landside party to begin speaking. The turn-around tone is a 620 Hz tone of 270 milliseconds duration.

Mobile Return Time Warning Tone

This tone sounds five seconds before the turn-around time programmed expires. If the mobile is not keyed within five seconds, the call is automatically terminated. This tone consists of two 620 Hz tones that are 150 milliseconds long separated by a 150 millisecond pause.

Dial Tone

The dial tone is a combined 440 Hz and 350 Hz tone heard by a mobile, initiating a mobile originate sequence. This tone is produced by the VNC independent of the CO or PBX.

Conversation Timer-Out Timer Tone

This tone is heard by the landside and/or mobile user when the length of the conversation has reached the conversation time programmed in the VNC. This tone resembles a "tick" and is heard once per second for 30 seconds. The call is then automatically terminated. Each "tick" is a 620 Hz tone of a 10 milliseconds duration. The conversation time can be programmed for 1-90 minutes.

7.7 DIALING TELEPHONE NUMBER

7.7.1 INTRODUCTION

To place calls on a VNC LTR system, the transceiver must be equipped with some type of telephone keypad that generates DTMF tones. With a mobile transceiver, this is usually a microphone with a keypad or a telephone-style handset such as the 500/600 XT. With LTR 856x/857x handheld transceivers, models with front panel keypads are available.

7.7.2 DTMF MICROPHONE

To make a telephone call with a DTMF microphone, the PTT switch is momentarily pressed to acquire a dial tone. If a VNC-equipped repeater was accessed, the dial tone is heard and the telephone number is then dialed. The first digit must be dialed within 5 seconds after hearing the dial tone and then each succeeding digit must be dialed within the time set by the "Interdigit Timer" or the call will be terminated. If the microphone has an automatic PTT feature, pressing a key automatically keys the transmitter. After the number is dialed, the PTT switch is released to listen and pressed to talk.

7.7.3 500/600 XT HANDSET, 856x/867x HAND-
HELD

The 500 XT handset is currently used with the LTR 8602, and the 600 XT handset is currently used with the AmeriCom®/LTR 8625 and LTR 8630. The 8602, 8625 and 8630 are full duplex which allows both parties to talk and listen at the same time just like with standard landside telephone calls. After the number is sent with these transceivers, the transmitter automatically unkeys briefly to tell the VNC that all digits have been sent.

The 500/600 XT handsets and the 856x/857x handheld transceivers have a memory which allows frequently dialed numbers to be recalled and then sent in a timed format. Numbers can also be dialed manually and overdialed during a conversation if desired.

The 600 XT handset and the 856x/857x LTR handheld transceivers automatically obtain the dial tone and send the phone number in the display when the Send key is pressed. With the 500 XT handset, the dial tone must be obtained manually and then the number in the display is sent automatically. Refer to the appropriate operating manual for more information on placing calls with this equipment.

This page intentionally left blank.

SECTION 8 CIRCUIT DESCRIPTION

R1 on the Trunk Control Processor (TCP) adjusts the audio to a calibrated level through U41D. The audio passes through U2B onto the Expander/ALC circuit made up of parts of U2, U6B, U1A and U4. The processed audio drives U1B to drive the tele-phone Hybrid. R22 controls the mobile to Telco audio. The voice, and DTMF audio is also mixed at U1B and sent to the Telco. The Expander/ALC circuit is controlled by U3C. Repeat audio is processed by U5C/D that forms a speech detector. R7 controls the level of detection. The TCP microprocessor monitors this detect output for voice activity.

DTMF audio is processed through a 2-pole filter U1C for the DTMF decoder U15. U15 is a DTMF transceiver which also generates DTMF signals that can be directed towards the mobile or Telco by U4. A single pole RC filter R3, C25 removes switching noise from the DTMF generator.

The Hybrids consist of T1 and T2 with a balance circuit C31-C35 and R37. A reverse polarity current detector U32/U33 detects any change in Telco line state. K1 is the off-hook relay controlled by U26E. Lightning protection is D16/D17/D18/R83. The Ring detector U11 acts as two circuits. As ring detectors,

the diodes sense ring voltage of 51V. As a 4-wire E-Lead the detector using W10/W15, the ring polarity is controlled by U16F/W13.

Receive audio from the Telco goes through T4 on U9D. Gain controls R67 and W10 allow precise con-trol of the audio level into the compressor/ALC cir-cuit. Audio is processed through the Compressor/ALC circuit U6A/U9A/U10 and is summed in U9A. The voice synthesizer output is processed through a lowpass filter U5A/U5B to U10 and can be directed to the mobile or Telco. U9A sums the Telco audio, repeat audio, voice synthesizer and DTMF generator for transfer to the Main Audio Card (MAC). Repeat audio passes through U10 controlled by U3F. U9B provides an analog ground called Vref.

The microprocessor accesses up to 1M byte of memory. U4 is the program EPROM that controls the operation of the Digital PC board. U5/U6 are the RAM chips that store all of the information and billing data. U7 controls the memory battery backup, watch-dog, and low voltage alarm. U12/U13/U14 are the speech synthesizer that speaks the voice prompts. U37/U10 control address decoding for the peripherals. U9 is the real time clock that keeps track of when to change time periods.

This page intentionally left blank.

SECTION 9   ALIGNMENT AND TEST PROCEDURES

9.1 INTRODUCTION

Refer to Figure 9-2 for connections to the Test Circuit and Test Equipment. Refer to the Viking VX Service Manual, Part No. 001-2008-201, for connections to the Test Circuit, Test Equipment and component layouts and repeater alignment points diagrams.

All ground connections refer to P700, pin 64. TIP and RING phone connections are found on the green connector J2, pin 5 and 6 on the back of the repeater (see Figure 2-2).

Assume all audio voltmeters are **"unbalanced"** unless specifically stated otherwise. Set all DIP switches on MPC and MAC to **OFF**. Verify U24 on the MPC is **removed**.

Power down the repeater (disengage the locking lever of the IAC or turn off the toggle switch S508) and place the VNC (analog) card on the extender card. Power up the repeater by engaging the IAC card or turning on the toggle switch S508.

SET ALL POTS TO MID-RANGE

NOTE: A fully tested repeater is necessary for this test.

9.2 INPUT GAIN AND TO TELCO AUDIO

1. Set up a service monitor to generate a signal on the repeaters frequency with a 1 kHz tone at ±2 kHz deviation (100 µV).

2. Connect an AC voltmeter to TP1 on the VNC (analog) card (see Figure 9-5) and adjust the Input Gain pot R1 for 150 mV RMS.

3. Connect an AC voltmeter to TP3 and adjust the To Telco pot R22 for 425 mV RMS.

9.3 MOBILE ACTIVITY (Speech Detect)

1. Set up a service monitor to generate a signal on the repeater frequency with a 1 kHz tone at ±1.2 kHz deviation (100 µV).

2. Connect a DC voltmeter to TP2 on the VNC (analog) card and adjust the Mobile Activity pot R7 so that the voltage just snaps above 3.5V. This voltage level indicates that mobile speech is present.

9.4 DIAL TONE LEVEL ADJUST

1. Ensure a phone line is connected properly to J2 on the back of the repeater (see Figure 2-2) and a radio is properly programmed.

2. Select the Interconnect ID and key the radio.

3. Dial tone should be heard.

4. With the modulation analyzer on the repeater's transmit frequency, adjust the From Telco pot R79 on the VNC (analog) card (see Figure 9-5) for ±2.8 kHz deviation. Be sure the Modulation Analyzer LPF switch is set to 3 kHz.

5. Have a person on the other end do a number count with a normal voice. Adjust R67 so the audio from the mobile sounds clear and the Telco line noise is not present or added to the normal audio.

6. Repeat Step 4.

9.5 HYBRID ADJUST

With a phone line connected properly to J2 on the back of the repeater (see Figure 2-2) and a radio programmed properly, proceed as follows:

1. Select the Interconnect ID and key the radio. Dial tone should be heard.

2. Dial a test telephone line or a silent line from the Central Office (CO).

3. Turn on SW1, switch 6 ON (Analolg Card).

4. Key the radio and speak loudly enough to trip the speech detect circuitry.

5. Connect an AC voltmeter to TP5 (see Figure 9-4) and generate a 1 kHz tone at ±2 kHz deviation (use SED box or DTMF-5 on radio microphone).

    NOTE: Data must be present for the audio to pass on to the telephone.

6. Starting at SW1, switch 5, turn each switch (1-5) On and record the reading; then turn the switch Off and go to the next switch (see Figure 9-1).
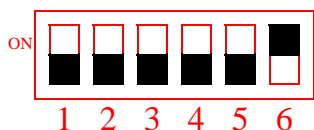
ON 1 2 3 4 5 6

Figure 9-1   SW1 SWITCH SETTINGS

SW1   **Reading**

Switch 5   _____
Switch 4   _____
Switch 3   _____
Switch 2   _____
Switch 1   _____

7. When the lowest reading is found, leave that switch ON.

8. Switch only the lower number switches from the switch left on to find a lower reading. If a lower reading is found, leave that switch turned ON.

Example:

If switch 4 was the lowest reading, then switch 3, 2 and 1 would be turned On then Off to find a lower reading, if one existed. If switch 2 provided a lower reading, leave it On. Then turn switch 1 On and if the reading is lower leave it on, if not turn it off.

9. Adjust the Hybrid Balance pot R37 for a NULL reading.

10. Turn SW1, switch 6 Off. SW1, switch 6 is used to keep the off-hook relay activated.
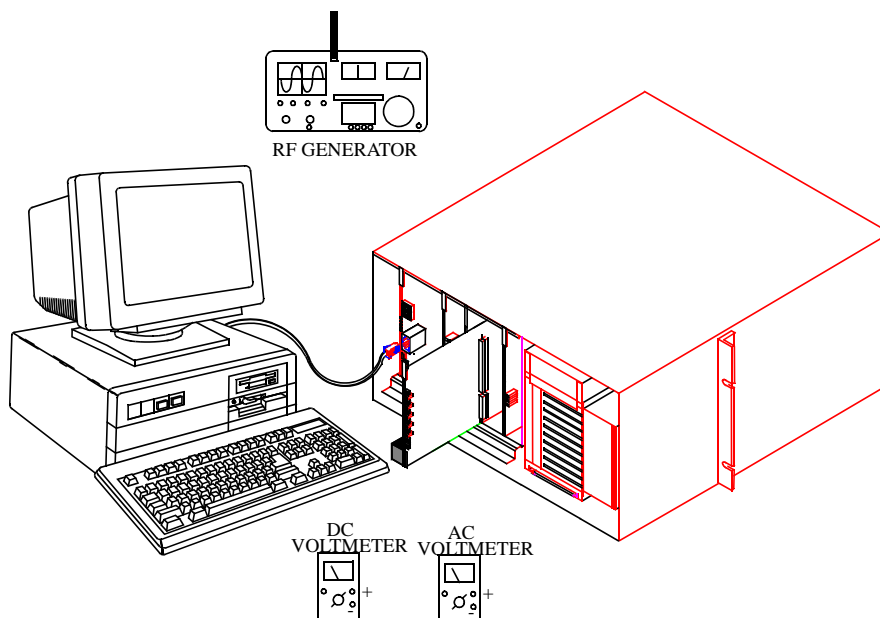
RF GENERATOR

DC VOLTMETER   AC VOLTMETER

Figure 9-2   TEST SETUP

9.6 WIRE CONNECTIONS FOR VCR AND VNC INTERFACE

9.6.1 VCR (DID OR OVERDIAL) TO VIKING VX REPEATER

VCR "Logic Port" to Viking VX Interface Jack J2 on the rear of the Viking VX Repeater

While looking at the rear of the VCR, pin 1 is on the right side of the Logic port, and pin 8 is on the left.

VCR Logic Port Pin No.	J2 Pin No.
1	21
2	9
4	5
5	6
7	12
8	11

W6 and W11 must be in the 4-Wire position. W9 must be in the E-Gnd position.

To configure the VCR and VNC to allow "Daisy Chain" capabilities for programming purposes, configure as follows:

VCR Logic Port DB-9 Pin No.	J2 Pin No.
1	16
2	15
3	13
5	21

9.6.2 MODEM CONNECTIONS TO VIKING VX VNCs

There are two different ways to interface the Modem to the VNC and two different ways to configure the Modem connections to the telephone lines.

Connections to the VNC Master when using a dedicated Modem telephone line.

1. Connections to the programming jack J1, located on the front of the VNC Digital board (see Figure 10-4).

J1	UDS Line Powered Modem
1 (gnd)	pin 7
2 (RxD)	pin 3
3 (TxD)	pin 2
4	NC
5	NC
6 (DTR)	pin 20

2. Connections to the VNC Master via J2 located on the rear of the repeater (green terminal block).

J2	UDS Line Powered Modem
21 (gnd)	pin 7
13 (RxD)	pin 3
15 (TxD)	pin 2
16 (DTR)	pin 20

3. Set the baud rate switch on the rear of the UDS Modem to "1200".

4. Set the Mode switch on the rear of the UDS Modem to "ANS" (Answer).

5. Set the switch on the front of the Modem to "DATA".

6. Connect the telephone line to the "TELCO" port on the rear of the Modem.

NOTE: Make sure the baud rate switch on the VNC card is set to "1200 baud" (SW1, segment 8), see Figure 9-4).

A "Smart" Modem can also be used, but there are special parameters in the Modem that need to be programmed. Refer to the Smart Modem installation instruction sheet.

Using The Modem Share Option Of The VNC-105 or VNC-125

1. Make all connections to J1 or J2, in Steps 1 and 2 above, to the Modem DB-25 connector.

2. Enter the programming menu of the VNC and select "Edit Parameters" from the Main Menu, then "System Parameters".

3. Step to the last page of programming parameters and step to the "Modem Shared" parameter (see Figure 6-40).

4. Enable the Modem Shared option by entering a "1".

With the Modem Shared option enabled, connect the telephone line at the site to both the VNC telephone connection points and to the "Telco" port on the rear of the Modem.

When the telephone number of the VNC is called, the VNC answers and gives the normal voice prompt to "Enter Mobile Number". When this prompt is heard, enter the number **"78123"**. This triggers the DTR line of the VNC and the Modem is put on line. At this time the VNC releases the telephone line and Modem communication begins.

NOTE: It is important to "log in" and "log off" (ESC [escape] out of the Main Menu) of the VNC when in this configuration.

If not "logged off", the VNC DTR line stays high which causes the Modem to be connected to the telephone line upon an incomming call to the VNC. This condition times out after 10 minutes of none activity to the VNC programming configuration. This is also a programmable parameter, make sure the "Auto Logoff" remains "Enabled" in the VNC System Parameters (see Figure 6-39).

While communication with the VNC is taking place in the "Modem Shared" configuration, the repeater is still available for dispatch communication by the radio users. This has presented a problem and a slight modification on the VNC card is necessary. On the VNC Master/Analog card, clip one lead of R39 to remove it from the circuit (see Figure 10-2). This prevents the dispatch audio from passing onto the telephone lines and causing problems with the Modem communication.

NOTE: On the UDS 212ALP Dumb Modem, the DTR line <u>must</u> be high (10V DC) in order for the Modem to function at all.

9.7 MODEMS

NOTE: This information may differ from Modem to Modem. Consult the Modem manual for details.

9.7.1 SMART MODEM SHARED CONFIGURATION

The following is a summary of the Modem configuration changes needed when using a Smart Modem in the "Modem Shared" configuration.

1. Auto Answer = **OFF**
2. Set DTR (Data Terminal Read) to follow the line.
3. Set DCD (Data Carrier Detect) to follow the line.
4. Echo = **OFF**
5. Command Recognition = **ON**
6. Command Reply = **OFF**

The following is an example of the method used to change these parameters in several brands of Modems:

AT&V<Enter>
Displays the present stored profile and other settings.

ATS0=0<Enter>
Turns off the auto answer.

ATS0=1<Enter>
Turns on the auto answer

AT&D1<Enter>
Detects an ON or OFF transition of DTR (Enables the DTR lead to activate the Modem).

AT&D3<Enter>
This also enables the DTR lead but also resets the Modem after the call is terminated. (Many times Smart Modems go into an unknown state when the call is terminated. By resetting the MOdem, this can usually prevent the need for a manual power reset.)

AT&C1<Enter>
Allows DCD follow DTR.

ATE0<Enter>
Sets echo to be disabled.

ATQ1<Enter>
Disables the result code transmission.

AT&W0<Enter>
Causes Modem to store its current parameters and values in its non-volatile RAM (the parameters that were just changed).

AT&W1<Enter>Stores active profile to stored profile list.

AT&V<Enter>
Displays the present stored profile and other settings.

9.7.2 DUMB MODEM SHARED CONFIGURA-
        TION

    When using a UDS 212ALP Dumb Modem in the "Modem Shared" configuration, make the following connections.

1. Set the Auto Answer switch to the answer position.
2. Set the baud rate switch to 1200.
3. Set the front panel switch to DATA.
4. Use a one to one Modem cable to connect to a VNC-120.

    For use on a VX VNC the Modem connections can be made on J2 the green terminal block in the rear of the VX Repeater.
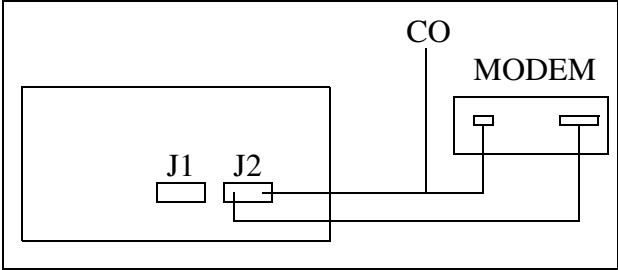
Modem DB-25 Pin No.	J2 Pin No.
2 (TxD)	15
3 (RxD)	13
20 (DTR)	16
7 (Gnd)	21

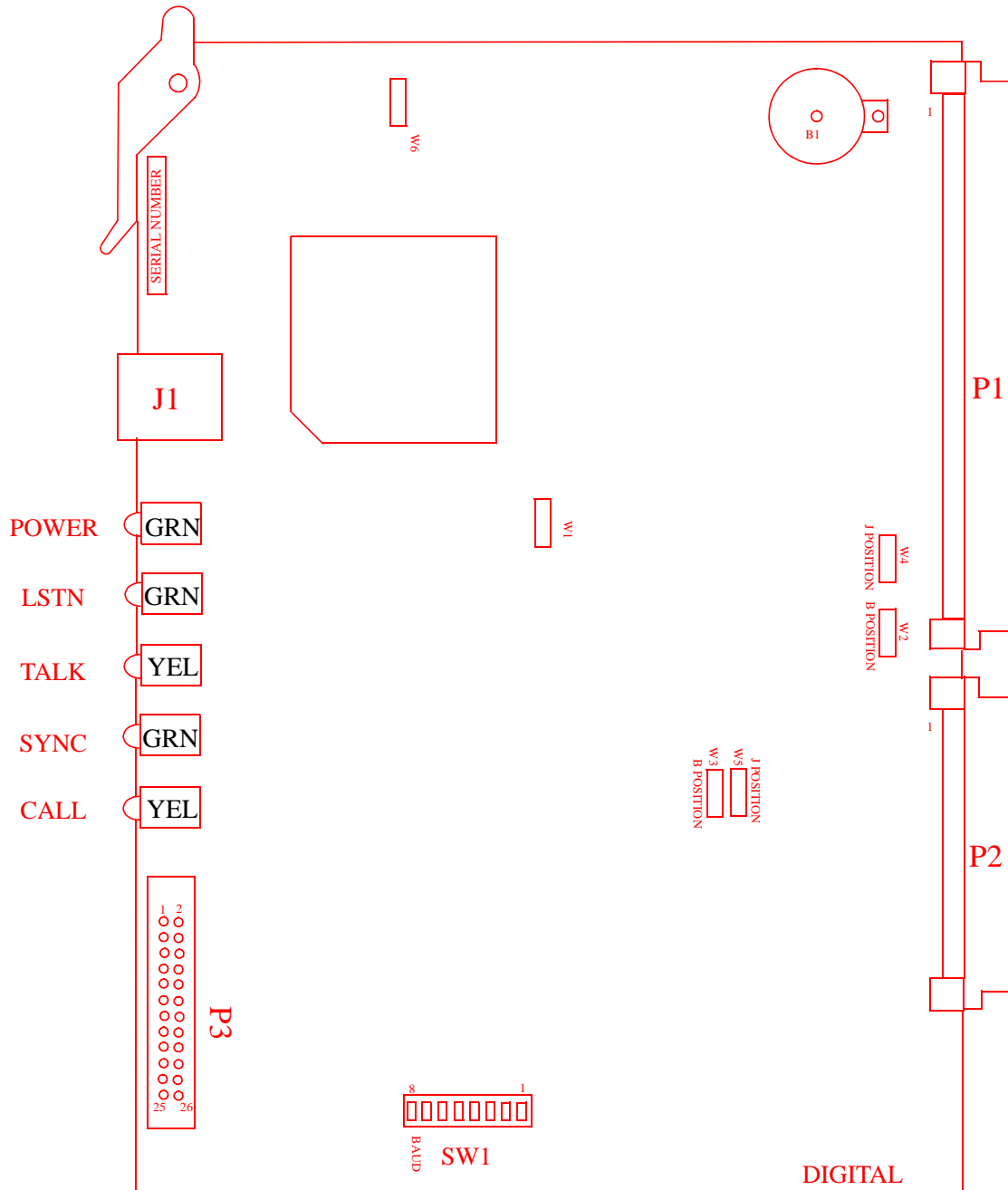
Figure 9-3   VX VNC TO MODEM

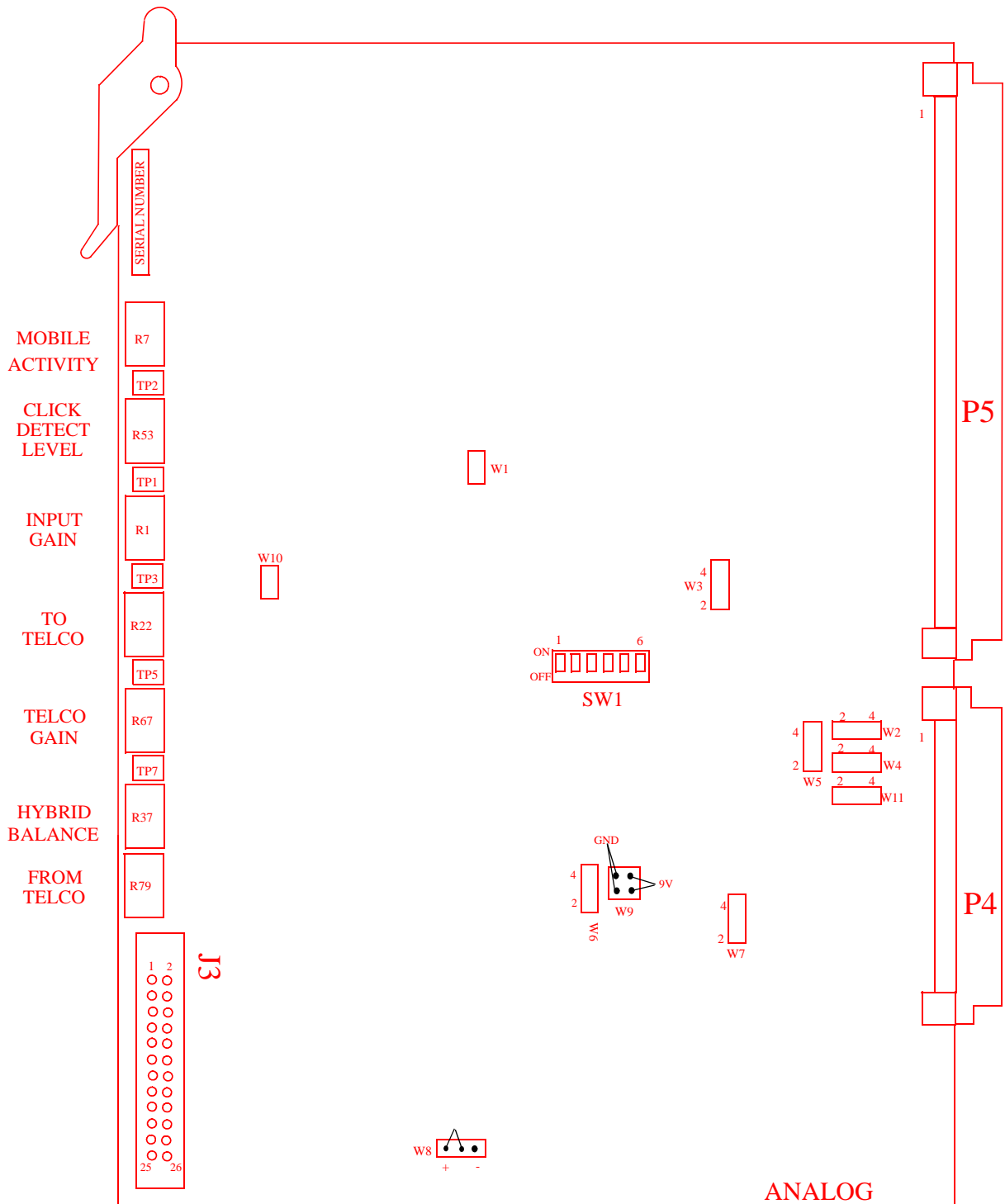**Figure 9-4   VNC (DIGITAL) CARD ALIGNMENT POINTS**

Figure 9-5   VNC (ANALOG) CARD ALIGNMENT POINTS

This page intentionally left blank.

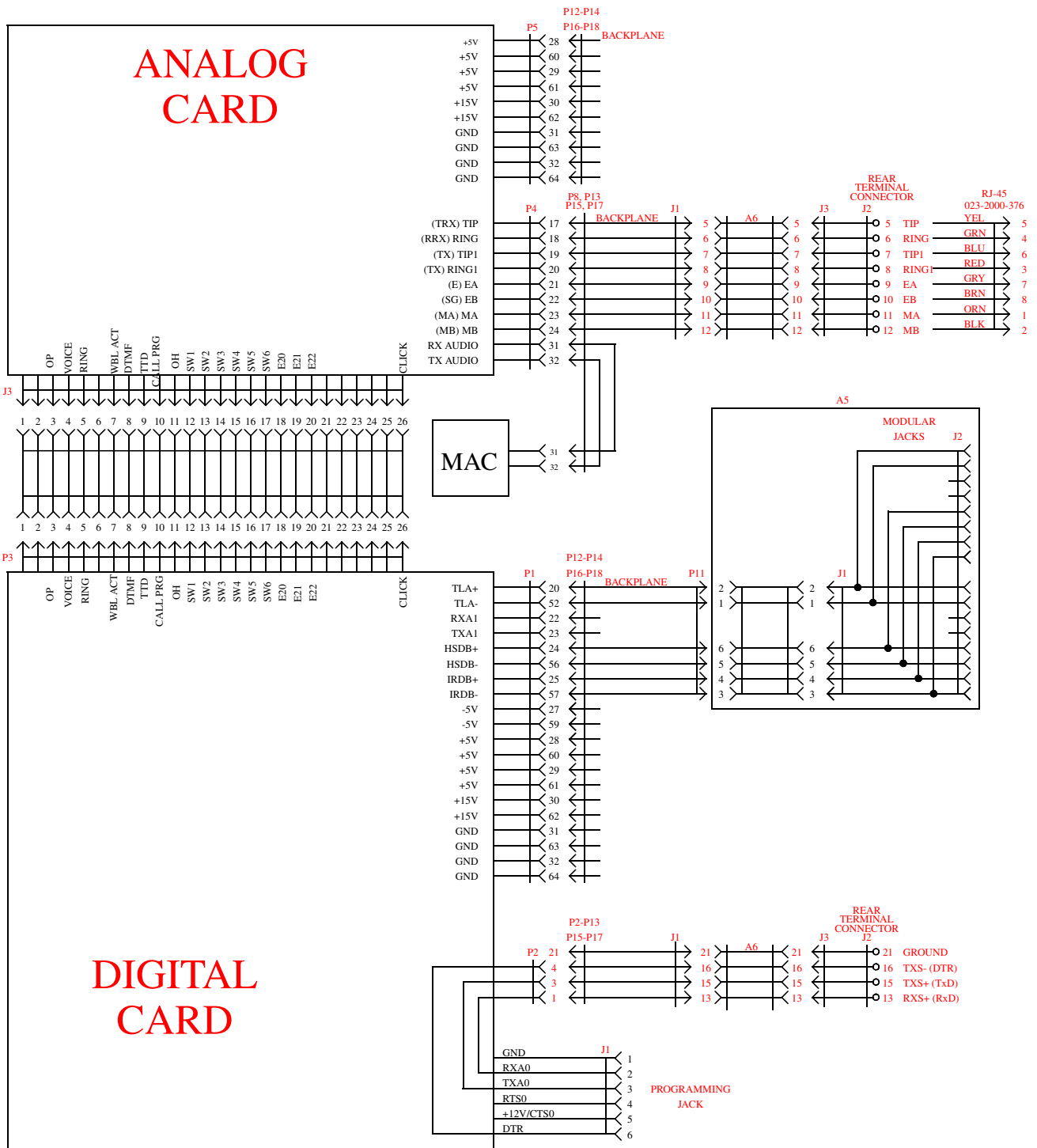# SECTION 10   COMPONENT LAYOUT AND SCHEMATIC DIAGRAM

Figure 10-1   INTERCONNECT SCHEMATIC
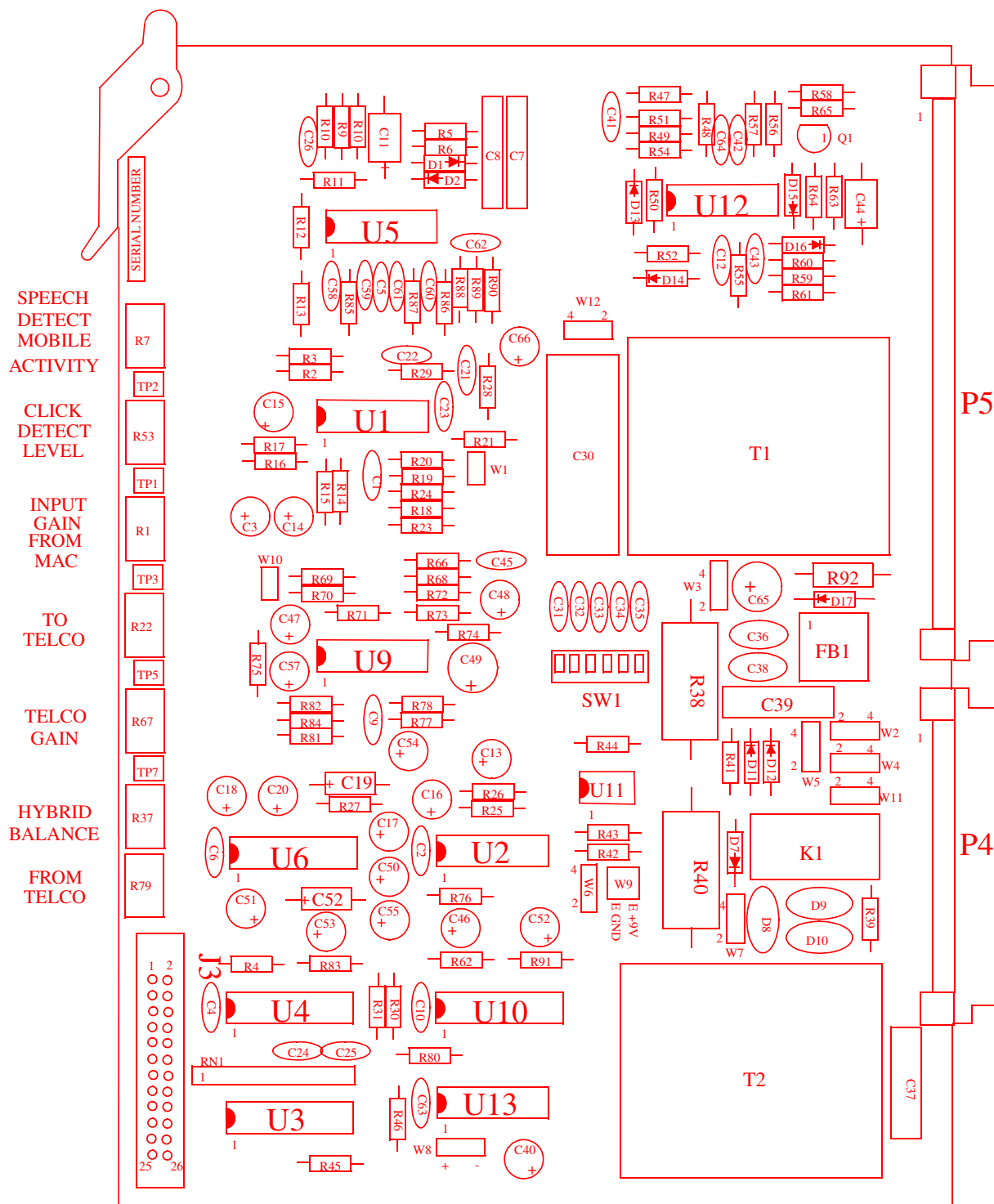
COMPONENT LAYOUT AND SCHEMATIC DIAGRAM

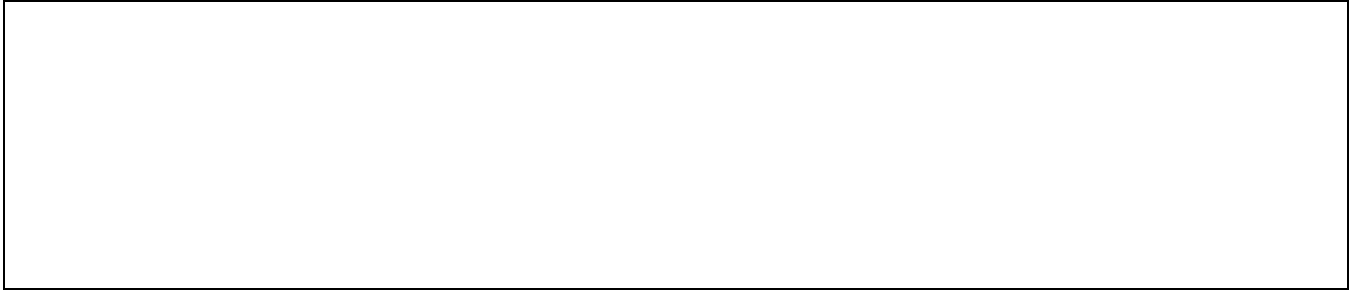**Figure 10-2   VNC (ANALOG) CARD COMPONENT LAYOUT**

Figure 10-3   VNC (ANALOG) CARD SCHEMATIC

COMPONENT LAYOUT AND SCHEMATIC DIAGRAM
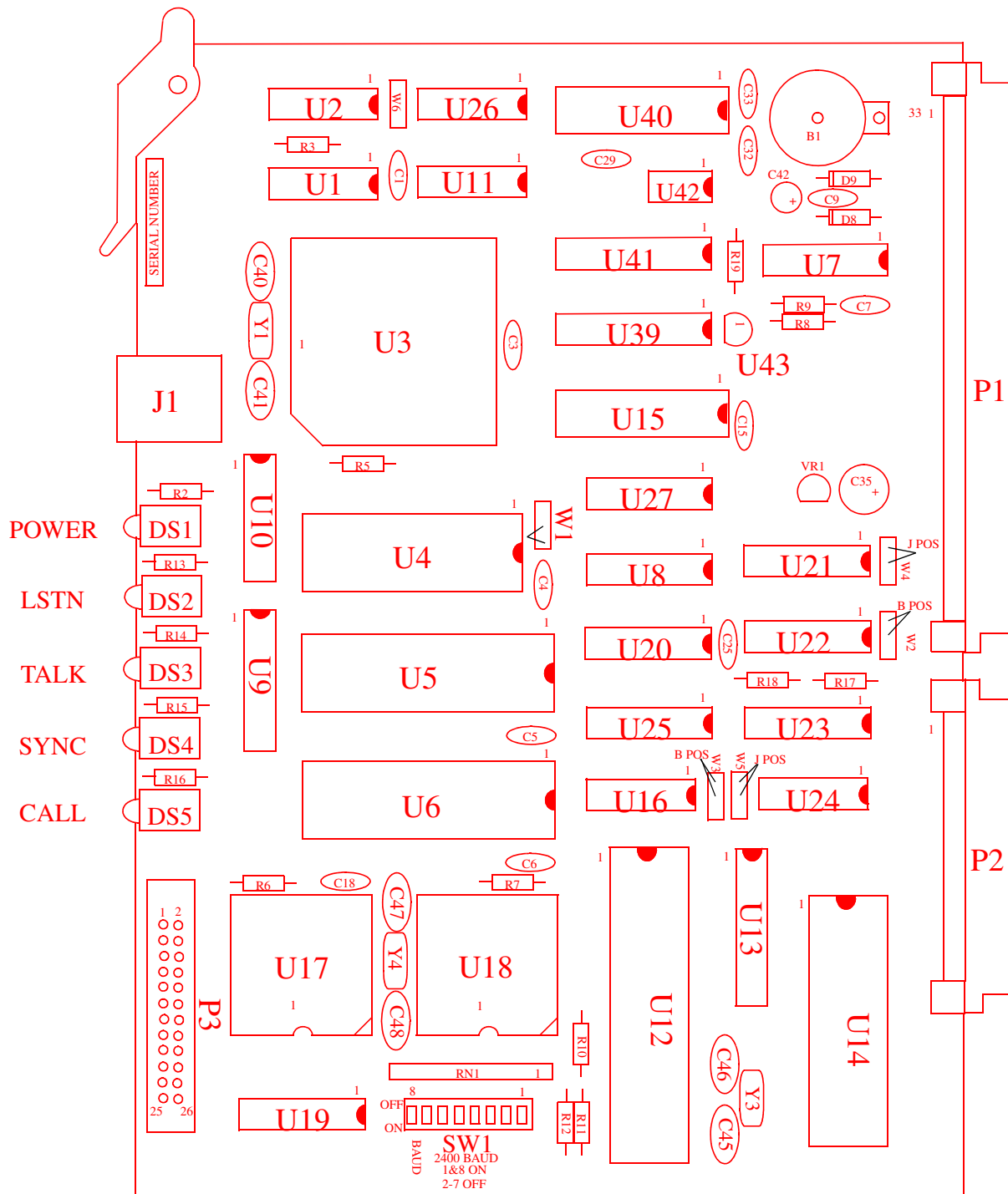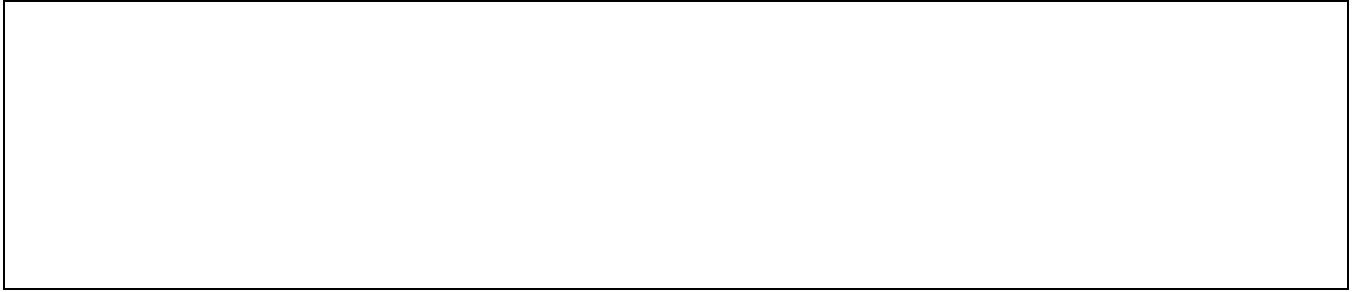

Figure 10-4   VNC (DIGITAL) CARD COMPONENT LAYOUT
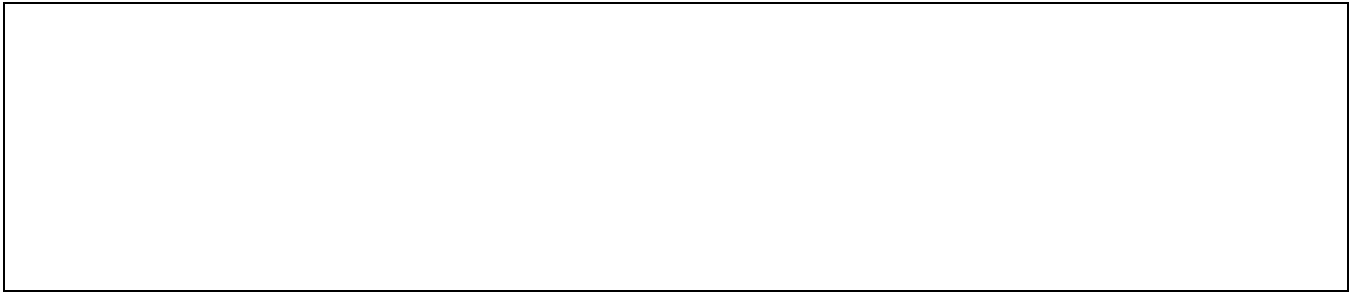
Figure 10-5   VNC (DIGITAL) CARD SCHEMATIC (1 OF 2)

Figure 10-6   VNC (DIGITAL) CARD SCHEMATIC (2 OF 2)

APPENDIX A   DISPATCH NETWORKING FORM

Site Location:
Network site number:
Network site telephone number:
Site Modem number:
Trunking Channels

01   02   03   04   05   06   07   08   09   10   11   12   13   14   15   16   17   18   19   20

(Circle the VNC Channels)

Local ID	Networked To (Site Number)	Distant ID	Local ID	Networked To (Site Number)	Distant ID

This page intentionally left blank.