

# **VR-CM50 CRT CONSOLE MULTI-NET<sup>®</sup> SYSTEM PLANNER**

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# VR-CM 50 CRT CONSOLE MULTI-NET<sup>®</sup> SYSTEM PLANNER

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## **INTRODUCTION**

The E.F. Johnson VRCM-50 Distributed Microprocessor Console System represents the state of the art in modern control center technology. True digital audio, full on-line programming, advanced diagnostics and the widest range of features available today make the E.F. Johnson VRCM-50 the system of choice for the most advanced applications. Our completely modular approach to both hardware and software makes the system affordable for even the most modest systems.

This System Planner describes the VRCM-50 and its features to help you design a console system. It assumes that you are familiar with the technology and conventions used in industry-standard land mobile radio systems and that you have defined the basic system requirements such as the number of radio channels and console positions needed.

## **HOW THIS PLANNER IS ORGANIZED**

The Planner is organized into four sections.

Section 1 includes an overview of the VRCM-50 and outlines a procedure to determine your console equipment requirements. A series of detailed questionnaires and data sheets is provided to help you take an inventory of your system requirements.

Section 2 lists the common Central Processor Package equipment and options. Central Processors are offered in a number of sizes to meet varying requirements. Most VRCM-50 Central Processors can be field upgraded to accommodate system expansion.

Section 3 covers CRT consoles using Mouse/Trackball and Touchscreen control. CRT consoles are more cost effective for larger systems and are preferred where workstation space is at a premium. Most CRT systems use multiple pages or windows to access various control functions such as paging or auxiliary switch controls. The VRCM-50 allows screens to be easily customized to meet individual operator preferences and can be changed on-line with the console in full operation. Samples of CRT modules and screens have been captured for illustration.

Section 4 lists installation and maintenance options such as cables, accessories and spares. The options in this section apply to both Module and CRT-based console systems.

## **HOW TO USE THIS PLANNER**

In planning a system, it is generally advisable to first size the Central Processor Package and choose the appropriate system-wide options. Then determine the options needed for each radio channel in the system. Once the Central Processor is defined, choose the type of consoles desired and pick the options for each console. It should be noted that Module and CRT based consoles can be intermixed in systems. Lastly, select the installation and maintenance options needed for your operation.

## **WHERE TO FIND HELP**

E.F. Johnson's Application Engineers will gladly assist you in planning your console system. Once you have formulated your requirements, we suggest that you allow us to review your design with you to be sure there are no accidental oversights and to suggest alternate solutions that may optimize the system and reduce costs.

If your system has special requirements that are not addressed in this Planner, please contact the E. F. Johnson Marketing Department.



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SECTION 1 PLANNING THE SYSTEM

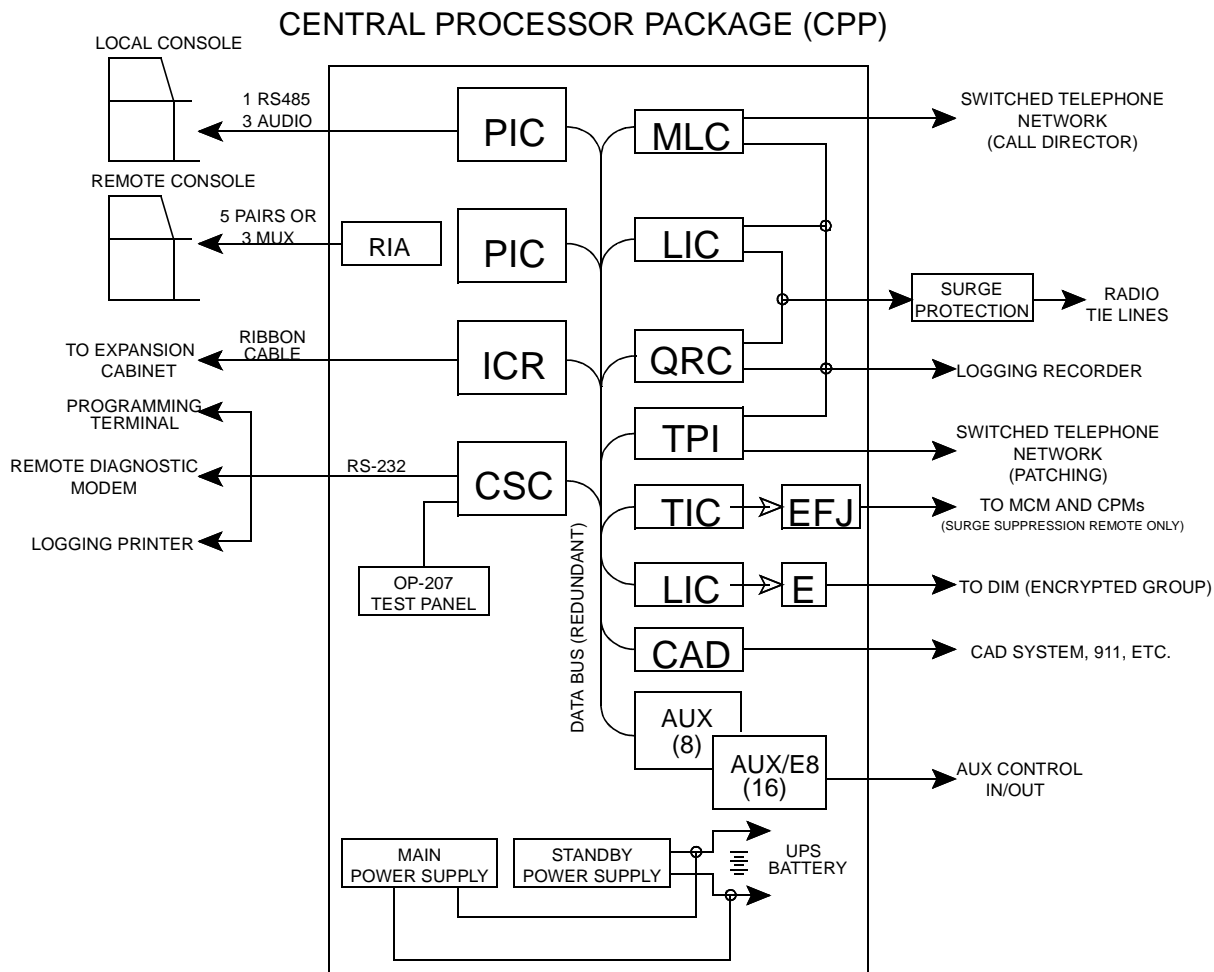


Figure 1-1 CENTRAL PROCESSOR PACKAGE

1.1 SYSTEM OVERVIEW

The VR-CM50 System uses a Central Processor Package (CPP) (see Figure 1-1), which provides the distributed microprocessor framework for the system and controls all data and audio processing. The CPP contains common channel interface and control electronics shared by all the Console Positions in the system. Common audio is processed in digital rather than analog form to provide the highest speech quality with freedom from noise and RF interference.

1.1.1 CIRCUIT TECHNOLOGY

All circuit boards in the system have no more than two circuit layers and use through-hole technology. This allows field repairs to be made without specialized service equipment. Readily available, off-the-shelf components are used throughout the system wherever practical. A complete listing is included in the VR-CM50 Console Service Manual to facilitate local parts sourcing. Circuit boards, modules and power supplies may be removed and replaced with power on and the system in full operation.

### 1.1.2 CONSOLE POSITIONS

The Console Positions consist of switches, display indicators, speakers, and a microphone and/or headset interface. Microprocessors in each Console encode and decode the control and display information to and from the Central Processor Package (CPP). Console Positions may use conventional switch/indicator controls/displays or may be graphic based. Graphic-Based console positions use a color CRT video display and can be controlled by using a mouse, trackball or infrared Touchscreen.

### 1.1.3 CONSOLE POSITION LINKS

A single 6-pair telephone cable is the only link required between a Console Position and the CPP, for most systems. Three pairs are 600 ohm balanced audio lines for Selected Receive, Unselected Receive and Transmit Audio. The fourth pair is an RS-485 digital link operating at 38.4k baud. The two remaining pairs are used for dedicated monitor speakers or as spares, if needed. Individual consoles may be located up to 4000 feet from the CPP using this hardware link. Console Positions may also be remotored to an unlimited distance using the Remote Interface Adapter and modem. All Console Positions provide full parallel cross-indication, regardless of their distance from the CPP.

### 1.1.4 RELIABILITY

Multiple redundant microprocessors and circuitry assure the highest overall system reliability. The system continuously runs data and audio diagnostic routines to isolate potential problems before they create a critical situation. Distributed microprocessors perform all System Diagnostics, Self-Healing Procedures and Report Error conditions to the System Printer and Maintenance Memory Storage Buffer. These capabilities often restore near normal system performance should problems occur. All systems include a minimum one hour Uninterruptable Power Supply (UPS) to provide full system operation during short term power outages and maximum protection from line surges. The CPP and each console have individual UPS systems to eliminate the possibility of a single point failure.

### 1.1.5 FLEXIBILITY

The VR-CM50 System provides the highest degree of flexibility in providing options that will meet a customer's specific requirements. Most VR-CM50 options are implemented in software rather than hardware. This allows for a custom designed system and makes future field changes easy to accomplish. This design philosophy also allows the local service provider to easily maintain a full service spares inventory.

### 1.1.6 CHANNEL CAPABILITY

The VR-CM50 System can handle up to 118 audio channels divided between Radio Circuits and Console Positions. For example, an 18-position console system can support up to 100 Radio Channels plus additional Auxiliary Switch and CAD based functions. Even larger systems can be implemented using multiple VR-CM50 CPPs interconnected with Systems Arbiter cards.

### 1.1.7 DESIGN CONCEPT

Audio signals are processed in the VR-CM50 system using Time Division Multiplexing (TDM). With this technique, an instantaneous sample or "snapshot" of each audio path in the CPP is taken every 125 microseconds. The "snapshot" is converted into an 8-bit computer digital "word" at that instant. The digital word is then placed onto the TDM digital data bus structure.

The data bus structure concept can be envisioned as a train towing hopper cars, (see Figure 1-2), with each hopper car representing a time slot on the data bus. The data bus structure capacity is 128 time slots for signal processing, 10 are for switch/indicator status and diagnostic routines, the remaining 118 are audio channels.

Once digitized audio is placed on the TDM bus, it is routed to any card or group of cards in the CPP where it can be converted back into analog form if required. Digital audio is immune to interference from outside sources (i.e. Radio Frequency (RF), Telephone PABX's or Electric Motors). Digital audio levels remain constant regardless of changes in channel loading caused by routine operations (i.e. simulcasting or multi-party channel patches).

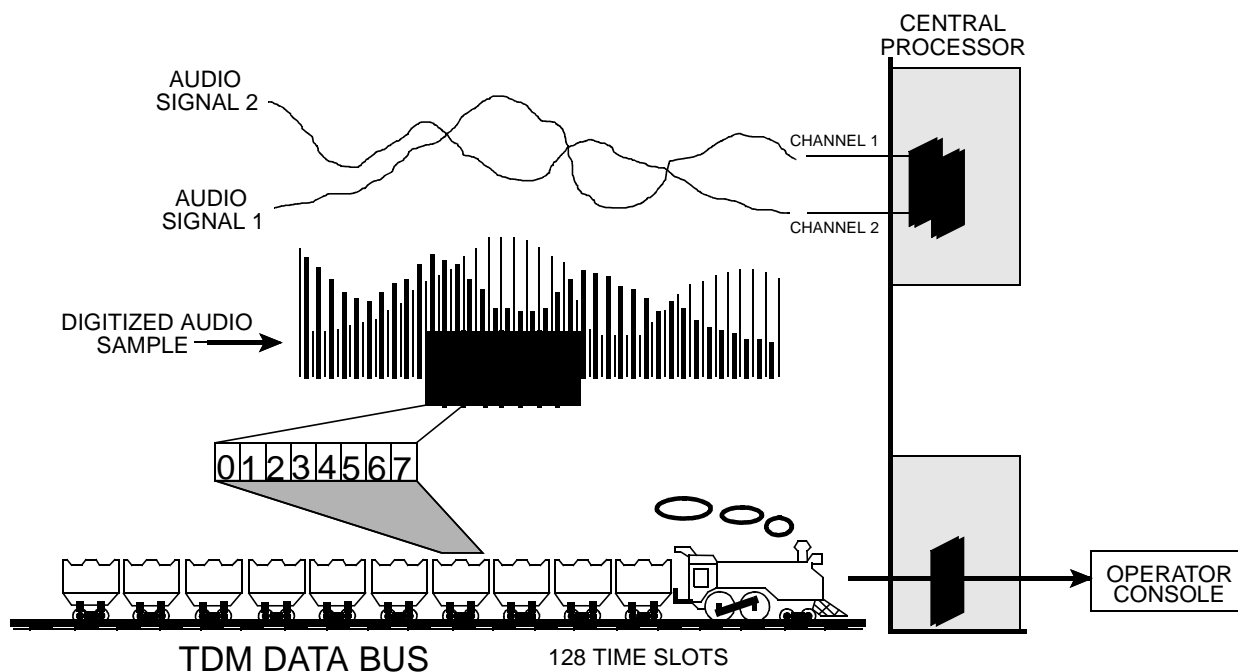


Figure 1-2 TDM DATA BUS

### 1.1.8 DATA BUS RELIABILITY

Two fully redundant data bus structures are used in each VR-CM50 system. Failure of data communications on any one of the primary data bus data lines causes automatic switch over to the second data bus system. Because the time slot assignments are under processor control, these assignments can be rerouted to a properly functioning bus without operator-intervention (see Figure 1-2).

## 1.2 PLANNING THE SYSTEM

This section is designed to help you determine the equipage requirements for your system. The following sections are organized as a series of questions that will address your needs and give insight into your requirements. Proceed through each section in the given order as listed.

### 1.2.1 STEPS IN PLANNING THE SYSTEM

1. Size the Central Package.
2. Calculate the Card Count.
3. Choose System-Wide Options.
4. Choose Transmit/Receive Channel Options.
5. Choose Channel Control Options.
6. Choose CRT Console Options.
7. Choose Installation and Maintenance Options.

### 1.2.2 CENTRAL PACKAGE CONSIDERATIONS

Size the Central Package by filling out sheets shown in pages 1-5 and 6. Central Packages are available in a variety of standard sizes ranging from 14 card to 120 card capability. For systems of 30 cards

and larger, Central Package cabinets are offered in 60 inches high Standard profile, and 88 inches high High profile. Standard profile models hold a maximum of 30 cards, High profile models hold a maximum of 60 cards per cabinet.

Standard profile systems are somewhat easier to service than those in High profile cabinets because power supplies are accessible from the top and all card cages are at or below eye level. Large systems in Standard profile cabinets require more floor space than the same systems in High profile cabinets. High profile systems are more space efficient and are better suited to large equipment rooms with cables that feed from the top. Be sure to check ceiling clearance when

specifying High profile cabinets. Remember to allow for ceiling protrusions such as fire detectors or sprinkler heads.

There is little, if any cost difference between similar size systems in either cabinet style. Standard profile systems are designated by model numbers beginning with VR-CM50 92xxx. High profile systems are designated by numbers beginning with VR-CM50 93xxx.

Once the card count has been determined, continue populating the Central Package by selecting the SYSTEM-WIDE options. The System-Wide options are explained in detail in Section 2.7 of this Planner.



## SIZE THE CENTRAL PACKAGE

1. PIC/MLC count:
  - How many consoles are in the system? 1a. \_\_\_\_\_
  - How many are module based? 1b. \_\_\_\_\_
  - How many have more than 4 speakers? 1c. \_\_\_\_\_
  - How many have more than 8 speakers? 1d. \_\_\_\_\_
  - How many have more than 12 speakers? 1e. \_\_\_\_\_
  - How many are CRT based? 1f. \_\_\_\_\_
  - Are these consoles equipped with an integrated telephone screen? 1g. Y/N \_\_\_\_\_
  - If Yes, how many phone lines are in the system? 1h. \_\_\_\_\_
  
2. RIA count:
  - How many of these consoles are installed at remote locations? 2. \_\_\_\_\_
  
3. LIC count:
  - How many base stations are in the system? 3a. \_\_\_\_\_
  - How many of these stations are critical and require hot-standby redundant controllers? 3b. \_\_\_\_\_
  - How many base stations have vehicle ID in use? 3c. \_\_\_\_\_
  - How many of these stations use MOTOROLA MDC-1200 signaling? 3d. \_\_\_\_\_
  - How many of these stations use anything other than MOTOROLA MDC-1200 signaling? 3e. \_\_\_\_\_
  
4. QRC count:
  - How many monitor-only receivers are in the system? 4a. \_\_\_\_\_
  - How many of the base stations are T2-2R stations? 4b. \_\_\_\_\_
  - How many of these stations are critical and require hot-standby redundant controllers? 4c. \_\_\_\_\_
  - How many of the base stations are T4-4R stations? 4d. \_\_\_\_\_
  - How many of these stations are critical and require hot-standby redundant controllers? 4e. \_\_\_\_\_
  - How many of the base stations are T8-8R stations? 4f. \_\_\_\_\_
  - How many of these stations are critical and require hot-standby redundant controllers? 4g. \_\_\_\_\_
  
5. TPI count:
  - How many separate phone patch lines are in the system? 5. \_\_\_\_\_
  
6. AUX count:
  - How many auxiliary control functions are in the system? 6a. \_\_\_\_\_  
(Includes electric doors, lights, pumps, sirens, etc.)
  - How many of the base stations are T8-R8 or T8-8R stations? 6b. \_\_\_\_\_
  
7. AUX/A count:
  - How many alarm functions are in the system? 7. \_\_\_\_\_  
(Includes panic, intrusion, doors, etc)
  
8. AUX/V count:
  - How many base stations have voters controlled from the console(s)? 8a. \_\_\_\_\_
  - How many of these voters have more than 6 receiver sites? 8b. \_\_\_\_\_
  - How many of these voters have more than 12 receiver sites? 8c. \_\_\_\_\_
  
9. CAD count:
  - How many channels have vehicle ID display? 9a. \_\_\_\_\_
  - Must the console time be synchronized to another system  
(logging recorder, CAD, WWV)? 9b. Y/N \_\_\_\_\_
  - Is statistics management reporting required? 9c. Y/N \_\_\_\_\_
  - Do any consoles have customer-special, standard operating procedures screens? 9d. Y/N \_\_\_\_\_
  - Is Morse code ID for the base stations in the system required? 9e. Y/N \_\_\_\_\_

## CALCULATE THE CARD COUNT

PIC count:           Line 1a. \_\_\_\_\_  
                       +Line 1c. \_\_\_\_\_  
                       +Line 1d. \_\_\_\_\_  
                       +Line 1e. \_\_\_\_\_  
                                   = \_\_\_\_\_

MLC count:           Line 1h. \_\_\_\_\_ + 4 = \_\_\_\_\_                           Round to next highest whole number: + \_\_\_\_\_

RIA count:           Line 2. \_\_\_\_\_ + \_\_\_\_\_

LIC count:           Line 3a. \_\_\_\_\_ + \_\_\_\_\_  
                       Line 3b. \_\_\_\_\_ + \_\_\_\_\_

QRC count:           Line 4a. \_\_\_\_\_ + 4 = \_\_\_\_\_  
                       + Line 4b. \_\_\_\_\_ + 2 = \_\_\_\_\_  
                                   = \_\_\_\_\_                           Round to next highest whole number: + \_\_\_\_\_  
                       Line 4c. \_\_\_\_\_ + \_\_\_\_\_  
                       Line 4d. \_\_\_\_\_ + \_\_\_\_\_  
                       Line 4e. \_\_\_\_\_ + \_\_\_\_\_  
                       Line 4f. \_\_\_\_\_ X2 = \_\_\_\_\_ + \_\_\_\_\_  
                       Line 4g. \_\_\_\_\_ X2 = \_\_\_\_\_ + \_\_\_\_\_

TPI count:           Line 5. \_\_\_\_\_ + \_\_\_\_\_

AUX count:           Line 6a. \_\_\_\_\_ + 16 = \_\_\_\_\_                           Round to next highest whole number: + \_\_\_\_\_  
                       + Line 6b. \_\_\_\_\_ + 2 = \_\_\_\_\_                           Round to next highest whole number: + \_\_\_\_\_

AUX/A count:        Line 7. \_\_\_\_\_ + \_\_\_\_\_

AUX/V count:        Line 8a. \_\_\_\_\_  
                       + Line 8b. \_\_\_\_\_  
                       + Line 8c. \_\_\_\_\_  
                                   = \_\_\_\_\_ + \_\_\_\_\_

CAD count:           Line 3d. \_\_\_\_\_                           If Line 3d ≥ 1, enter 1. If Line 9a = 0, enter 0. + \_\_\_\_\_  
                       Line 3e. \_\_\_\_\_ + 2 = \_\_\_\_\_                           Round to next highest whole number: + \_\_\_\_\_  
                       Line 9b. \_\_\_\_\_                           If Line 9b is Y, enter 1. If Line 9b is N, enter 0. + \_\_\_\_\_  
                       Line 9c. \_\_\_\_\_                           If Line 9c is Y, enter 2. If Line 9c is N, enter 0. + \_\_\_\_\_  
                       Line 9d. \_\_\_\_\_                           If Line 9d is Y, enter 1. If Line 9d is N, enter 0. + \_\_\_\_\_  
                       Line 9e. \_\_\_\_\_                           If Line 9e is Y, enter 1. If Line 9e is N, enter 0. + \_\_\_\_\_  
                       Line 9f. \_\_\_\_\_                           If Line 9f is Y, enter 1. If Line 9f is N, enter 0. + \_\_\_\_\_  
   If Line 9g is Y, enter 2. If Line 9g is N, enter 0. + \_\_\_\_\_

TOTAL OF ALL LINES \_\_\_\_\_ X 0.1 = \_\_\_\_\_                           TOTAL OF ALL LINES = \_\_\_\_\_  
 (Allowance for expansion)                           TOTAL                           Round to next highest whole number: + \_\_\_\_\_

USABLE CARD COUNT REQUIRED FOR CENTRAL PACKAGE: \_\_\_\_\_  
 (Refer to the "Standard Central Processor Packages", Table 2-1.)

## 1.3 SYSTEM WIDE OPTIONS

### 1.3.1 POWER SUPPLY AND REDUNDANCY OPTIONS TDM-OP200/A->TDM-OP203/4

Choose the country in which the system will be used. Options TDM-OP200/A - /NZ. Refer to Section 2.7.1.

Does the CPP require a reserve power supply? A reserve Power Supply is provided automatically for all Central Packages except VR-CM50 9214X and VR-CM50 9220X. If a reserve power supply is required for these models, it must be ordered separately.

Does the system require a hot-standby system controller? A reserve Central System Controller (CSC) card is provided automatically for all Central Packages except VR-CM50 9214X and -509220X. If a reserve CSC is required for these models, it must be ordered separately.

On-line Programming and Programmable Paging are provided automatically for all Central Packages except VR-CM50 9214X and VR-CM50 9220X. If these options are required for these models, they must be ordered separately.

### 1.3.2 ON-LINE PROGRAMMING OPTIONS TDM-OP204 THROUGH TDM-OP404/4

Does the system require On-Line Programming? If YES, choose the TDM-OP204 option for the CPP size derived from the calculation sheet, Pages 1- and 1-6. Refer to Section 2.8. (This option also requires TDM-OP253, Programmable Paging, to be installed in the system.)

### 1.3.3 SYSTEM DIAGNOSTICS OPTIONS TDM-OP205 THROUGH TDM-OP209

Does the system require a Diagnostic Logging Printer? If YES, refer to Section 2.9. (The CPP is not readily compatible with most off-the-shelf computer printers.)

Does the system require a Technician Test Panel? If YES, refer to Section 2.9.

Does the system require a Maintenance Terminal? If YES, refer to Section 2.9. (Maintenance terminals are convenient for self-servicing customers, but are not required if servicing is performed by an E.F. Johnson dealer under contract.)

Does the system require Remote Diagnostics capability? Remote diagnostics capability is provided automatically for all Central Packages except VR-CM50 9214X and -509220X. If this is required for these models, it must be ordered separately.

### 1.3.4 MISCELLANEOUS SYSTEM OPTIONS TDM-OP210 THROUGH TDM-OP242

Does the system require expanded I/O panel capacity? Refer to Section 2.10. (Most systems do not require this option). Systems with an unusual mix of consoles versus channels are the most likely candidates. For example, a 30-card CPP with more than 8-consoles requires an additional panel as will a 30-card system with 20- or more channels. (This option can be difficult to define until the exact system configuration with all required options is determined.)

Does the system require an additional CPP cabinet bay? If YES, refer to Section 2.10. (Additional bays are required only for customer or vendor furnished equipment or for specially engineered systems with a large quantity of auxiliary control relays or greatly extended UPS holdup time.)

Will the system have integrated telephone capability using TDM-MLC cards (CRT consoles only)? If YES, refer to Section 2.10.

Does the system require extended UPS holdup time? If YES, choose the TDM-OP214 option for the CPP size derived from the calculation sheet, Pages 1-5 and 1-6. Refer to Section 2.10. (It is not practical to further extend the UPS time by merely cascading several TDM-OP214 options because the power supply could not readily recharge a heavier battery load and run the system should a deep discharge occur. If a two hour minimum is not adequate, contact E.F. Johnson engineering for applications assistance.)

Is a 12-hour not a 24-hour clock display format required? If YES, refer to Section 2.10.

Is a guard tone other than the industry standard 2175 Hz required? If YES, refer to Section 2.10. (Some aircraft and railroad systems use other guard tone frequencies. Caution must be used in mixing guard tones in a system, contact E.F. Johnson for applications assistance.)

## **1.4 CAD OPTIONS**

### **1.4.1 VEHICLE ID INTERFACE OPTIONS TDM-OP251/A THROUGH TDM-OP251/P**

Does the system utilize Vehicle ID? If YES, refer to Section 2.13. (Different ID formats can be mixed in the same system but cannot be ported to the same channel. For example, a console could support a G-STAR system for the Police channels and MDC-1200 for the Public Works Channels but could not support both G-STAR and MDC-1200 on the same Police channel.)

### **1.4.2 EXTERNAL TIME SYNC OPTIONS TDM-OP252D THROUGH TDM-OP252S**

Does the system require the real-time clock to be synchronized to an external source? If YES, refer to Section 2.14. (It is good practice that all time clocks in the system record and display the same time. These options allow the console clocks to be driven by the master clock in a CAD system, logging recorder or by the Bureau of Weights and Measures WWV.)

### **1.4.3 MISCELLANEOUS CAD OPTIONS TDM-OP253 THROUGH TDM-OP263H**

Does the system require programmable paging capability? If YES, refer to Section 2.15. (This is a required option for all on-line programmable systems.)

Does the system require statistics management reporting? If YES, refer to Section 2.16. (This option is convenient for larger system users who wish to statistically track system activity on a console and channel basis.)

Does the system require Customer special SOP (Standard Operating Procedure) screens? If YES, refer to Section 2.16. (This option is typically used for "alarm clock" reminders or special console related

operating procedures. It is generally not suitable for phone listings or as a replacement for a procedures manual.)

Does the system require CW (Morse code) ID of the stations? If YES, refer to Section 2.16. (In medium to large systems, this option is often more cost effective than individual station identifiers because all stations in the system can be covered using one card.)

## **1.5 TRANSMIT/RECEIVE CHANNEL OPTIONS**

The process of going through all the questions in this Section must be repeated for each Base Station in the system. Select the Control Options for each Base Station - TDM-OP300 Series.

### **1.5.1 TONE/DC CONTROL OPTIONS TDM-OP301 THROUGH TDM-OP315**

Choose the method of control for the station. Refer to Section 2.14:

#### **Tone Control**

##### **TDM-OP301**

Configures the channel for tone control.

##### **TDM-OP302**

Extended guard tone timing, is only used in systems with RF links where keying delays are inherent.

##### **TDM-OP303**

Sequential function tones, are used in MOTOROLA stations for DVP/DES control.

##### **TDM-OP305**

LOBL (Line Operated Busy Light) appliques, are required only if the channel has parallel channel controllers or parallel non-E.F. Johnson consoles.

#### **DC Control**

##### **TDM-OP311**

Configures the channel for DC control.

##### **TDM-OP312**

Simultaneous Tone/DC keying, is rarely used but finds application in some mixed function systems.

##### **TDM-OP315**

LOBL (Line Operated Busy Light) function, is required only if the channel has parallel channel controllers or non-E.F. Johnson consoles.

## E&M Control

### TDM-OP321

E&M Control is often used for microwave links or for local-control base stations. E&M control can be combined with either tone or DC control if required.

### 1.5.2 MISCELLANEOUS TRANSMIT/RECEIVE CHANNEL OPTIONS TDM-OP318 THROUGH TDM-OP351

Choose the Patch Options required for the station. Refer to Section 2.20. Patch is VOX controlled in most systems. Non-VOX patch, TDM-OP318 allows another control parameter to force the patch direction. The control may be a contact closure from the base station (COR output) or guard tone detection using an external tone decoder.

Choose the miscellaneous control options for the station. Refer to Section 2.20.

## 1.6 CRT CONSOLE CONSIDERATIONS

### 1.6.1 WHAT SIZE CONSOLE?

CRT consoles can be integrated into full-size or desktop systems. Refer to information given above for Module-Based systems.

If additional speakers are needed, they can be mounted on module trays. In this case, additional PIC and Applique cards need to be considered.

The CRT system can also use dedicated modules which can be used for paging and control functions. Contact the factory for assistance.

While the system has a standard UPS holdup time of 1 hour, a CRT console with a 14" or 17" monitor and Touchscreen has a standard UPS holdup time of 20 minutes. Systems with mouse/trackball control only (no Touchscreen) will have slightly longer holdup times. Systems with 21" monitors will have shorter holdup times, typically 15 minutes. Option TDV-OP475 will double the holdup time - 40 minutes for a 14" monitor with Touchscreen.

## 1.7 CRT CONSOLE POSITION ELECTRONICS

Sections 1.7, 1.8 and 1.9 will define the console options you may need to configure a CRT system. CRT options are explained in detail in Section 3 of this Planner.

### THE PROCESS OF GOING THROUGH ALL THE QUESTIONS IN SECTIONS 1.7, 1.8 AND 1.9 MUST BE REPEATED FOR EACH CONSOLE IN THE SYSTEM.

### 1.7.1 CRT CONSOLE PROCESSORS

Options Include 14", 17" or 21" Dispatch Position Processors in Console, Desktop, Electronics Only and Work Station versions.

Choose the size of the CRT based on the sizes available. Refer to Section 3.1. Electronics Only and Workstation versions.

Specify TDV-15094xxC for a slide-out PC/UPS mounted in E.F. Johnson or other cabinetry.

Specify TDV-15094xxD for desktop enclosure where the PC is provided in a free-standing tower case.

Specify TDV-15094xxE for electronics-only to be housed in furniture provided by others.

Specify TDV-15094xxW for workstation environments where no control panel turret is desired.

*Note: "xx" equals 00 for a 14" monitor, 17 for a 17" monitor and 21 for a 21" monitor.*

Since the operation of the CRT Console Processor may be configured for Mouse/Trackball and/or Touchscreen control, specify TDV-OP490 through TDV-OP492 for each console.

Choose either a Blank Module Panel (BMP5252125) or an 8 Station Master/Slave Intercom Module (TDV-M9008) to be installed in the accessory module slot on the Control Tray. If no module is chosen, a blank module must be specified.

## **1.8 CRT CONSOLE OPTIONS**

### **1.8.1 POWER SUPPLY OPTIONS TDV-OP400/A THROUGH TDV-OP400/NZ**

Choose the country in which the system will be used. Options TDV-OP400/A through /NZ. Refer to Section 3.4.

### **1.8.2 FOOT SWITCH OPTIONS TDV-OP401D THROUGH TDV-OP401W**

Refer to Section 3.5. (If non is specified, the connector-only will be provided. Option TDV-OP401W is a custom-made foot switch with an extended delivery period.)

### **1.8.3 MICROPHONE OPTIONS TDV-OP402/HR THROUGH TDV-OP405**

Refer to Section 3.6. (If a second microphone location (TDV-OP405) is specified, be sure to identify the placement of the additional microphone connector. The additional microphone must be ordered separately.)

### **1.8.4 HEADSET/TELCO INTERFACE OPTIONS TDV-OP406 THROUGH TDV-OP410**

Will the console be operated with a headset? If YES, will the headset be used for both radio and telephone communications? Refer to Section 3.7.

### **1.8.5 PAGING/SIGNALING ENCODER OPTIONS TDV-OP411 THROUGH TDV-OP420**

Will the console be used for Paging? If YES, refer to Section 3.8 (While the consoles can be used with an external paging encoder, the use of this type places some strict limitations on channel and frequency steering. In addition, all other console operations are pre-empted when the encoder is in use. The internal encoder provides a smoother and more flexible operation than an external encoder and allows paging to occur while the console is engaged in other dispatch operations.)

### **1.8.6 ALERT TONE OPTIONS TDV-OP421 THROUGH TDV-OP427**

Refer to Section 3.12.

### **1.8.7 MISCELLANEOUS CRT CONSOLE OPTIONS TDV-OP430 THROUGH TDV-OP475**

Miscellaneous options that need additional information are detailed here. The remaining can be found in Section 3.13.

Integrated Recall Recorder (TDV-OP445C1 and C2) - 1 or 2 channels. Refer to Section 3.13. (If you are recording selected channel audio, you cannot playback to the selected channel speaker. The recorder will record itself on playback.)

Does the console require EKG Telemetry filters? If YES, refer to Section 3.13. (If the console is routinely used for EMS telemetry and the dispatchers do not wish to hear the telemetry carrier tone, the console can be equipped with filters to suppress the carrier tone. While this option is offered, in general, it is not recommended. Many EMS dispatchers prefer to listen to carrier tone patterns and can frequently determine the status of the telemetry. That is, if the system is idle, waiting or in use. In addition, when the EKG carrier is suppressed, it also takes out a significant segment from the voice spectrum.)

Is the system set up for On-Line Programming? If YES, then the consoles also have to be setup for on-line programming. Refer to Section 3.13.

### **1.8.8 ADDITIONAL MISCELLANEOUS CRT CONSOLE OPTIONS TDV-OP490 THROUGH TDV-OP492/21**

Is the console to be equipped for Mouse or Trackball control? Refer to Section 3.13.

What size Touchscreen is required? The size is dependent on the size of the CRT that was specified in Section 1.7. Refer to Section 3.13 for details on this option.

## **1.9 CRT-BASED CHANNEL CONTROL OPTIONS**

### **1.9.1 CRT CHANNEL CONTROL OPTIONS TDV-OP501 THROUGH TDV-OP552**

Options TDV-OP501 through TDV-OP535 are to be assigned only on specific module keys. Refer to Section 1.9.

## 1.10 INSTALLATION AND MAINTENANCE OPTIONS

Refer to Section 4 , Installation and Maintenance Options, for explanation of the following items:  
(*Note: the use of "/XX" following an option number indicates other choices available under that option.*)

### 1.10.1 CPP CARD EXTENDER TDM-CRDEX

Central Processor Card Extender.

### 1.10.2 CABLES

What is the distance from the console to the CPP? Is Plenum cable required? (Check local fire code.)

### 1.10.3 6-PAIR CONSOLE/ CPP CABLES TDM-OP702/XX THROUGH TDM-OP703/XX

Each dispatch position requires a 6 pair cable to connect the console to the CPP (or RIA). If the console has more than four speakers, an additional 6 pair cable will be required for every four additional speakers. These cables are furnished in several standard lengths from 50 feet to 1000 feet in both conventional (TDM-OP702) and plenum rated (TDM-OP703) versions. All cables are furnished with 14 pin ribbon connectors attached. Contact the factory if non-standard lengths are required.

### 1.10.4 CONSOLE/ CPP - GROUND BOND TDM-OP702/XX THROUGH TDM-OP703/XX

Each dispatch position must be individually bonded to a common ground point at the CPP (or RIA) using a #6 or larger copper wire. This wire is furnished with the TDM-OP702 or OP703 cables. Where practical, the ground wire will be provided uncut in a length equal to the total of all OP702 or OP703 cables ordered. This will allow the installer to optimize each cable run with minimal waste.

### 1.10.5 CONSOLE/ CPP - NO GROUND BOND TDM-OP704/XX THROUGH TDM-OP705/XX

When secondary links from each console to the associated PIC card in the CPP are used, no ground wire is required. Option TDM-OP704/XX is the standard (non plenum) wire and TDM-OP705/XX is the plenum rated wire.

### 1.10.6 25-PAIR CONSOLE/ CPP CABLES TDM-OP711 THROUGH TDM-OP714/XX

Each Central Processor Package uses a number of 25 pair cables to connect the CPP electronics to the RTL surge protector boxes. The standard length is 35 feet. Order additional cables or extended lengths as required.

### 1.10.7 POWER DISTRIBUTION RAIL T400960/ T40096E

Power Distribution Rail (E.F. Johnson Cabinet/ Non-E.F. Johnson Cabinet).

### 1.10.8 SPARE CARDS

Spare cards can only be used for replacement of existing cards. They generally cannot be used for system expansion without additional line terminators, cables and firmware not included in spares pricing. Each card includes an anti-static "Pizza Box" for card storage or shipment to a board repair depot.

### 1.10.9 DOCUMENTATION

A minimum of one (1) VR-CM50 Console Service Manual **must** be ordered with each system. Without this manual, there is no way to provide the "Customer Data" for the system.

Installation Manual - VR-CM50 System  
004-3039-274

Service Manual - VR-CM50 System  
001-3039-273 Volume 1  
001-3039-274 Volume 2

CRT Console Operating Manual  
002-3039-273





## SECTION 2 CENTRAL PROCESSOR PACKAGE EQUIPMENT

### 2.1 SUMMARY OF CENTRAL PROCESSOR PACKAGE CARDS

#### **TDM-ARB**

(Multiple System Arbiter)

Allows interconnection of Multiple CPPs in systems that exceed 120 card or time slots.

#### **TDM-AUX, TDM-AUX/M, TDM-AUX/E8**

(Auxiliary Interface Controller)

The link between the CPP and any external control inputs or outputs related to the System. Outputs are 4PDT relay contacts.

#### **TDM-AUX/A /TDM-AUX/V**

(Alarm or Voter Interface Controller)

The link between the CPP and an alarm interface, voting comparator or other I/O system which requires logic level output rather than relay contact closures.

#### **TDM-CAD**

(CAD Interface Controller)

The link between the CPP and an external computer aided dispatch or data processing system, vehicle ID systems, external time references, etc.

#### **TDM-CSC**

(Central System Controller)

The master controller for the entire VR-CM50 System.

#### **TDM-ICR**

(Inter-Cabinet Repeater)

The link between two or more CPP cabinets operating within the same 120 card system.

#### **TDM-LIC**

(Line Interface Transmit/Receive Controller)

The link between the CPP and the individual radio base stations in the system.

#### **TDM-MLC**

(Multi-Line Telephone Interface Controller)

Provides four individual Tip/Ring interfaces to the Public Switched Telephone Network (PSTN) for integrated radio/telephone applications (CRT Consoles only)

#### **TDM-PIC**

(Position Interface Controller)

The link between the CPP and an individual dispatch position.

#### **TDM-QRC**

(Quad Receive-Only Controller)

The link between the CPP and receiver sections of multi-receiver base stations or individual monitor receivers.

#### **TDM-RIA**

(Remote Interface Adapter)

Allows a full function console to be operated at virtually an unlimited distance from the CPP.

#### **TDM-TPI**

(Telephone Patch Interface Controller)

The link between the CPP and the Public Switched Telephone Network (PSTN) for radio to telephone patching.

#### **TDM-EFJ**

(EFJ Multi-Net RNT Trunked Radio Interface)

The link between the CPP and an E.F. Johnson Multi-Net II trunked radio system.

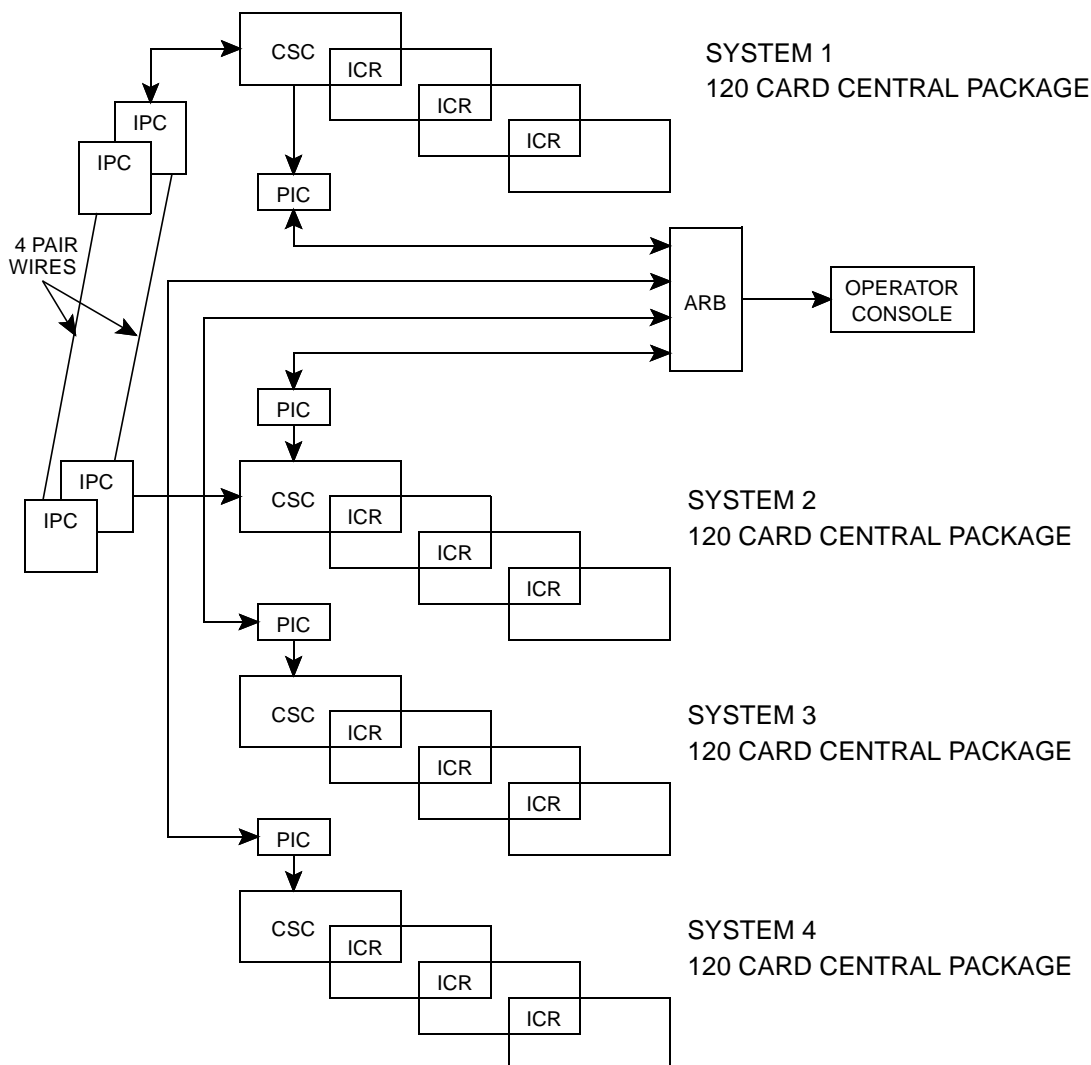


Figure 2-1 EXPANDED SYSTEM

## 2.2 CENTRAL PROCESSOR PACKAGE CARDS

The symbol (+) next to the card name indicates that the system will support a "Hot-standby" card for that function. The standby card must be specified separately. The color listed next to the card description is that of the ejectors on the circuit card. Typically, a "card" also includes the backplane line terminator cable, line terminator circuit board, firmware and I/O cable, where applicable.

*NOTE: When expanding an existing system, the system configuration should be carefully reviewed to make certain the needed card slots are available for the intended use. In some cases, additional Central Package card capacity and/or the rearrangement of existing card locations may be necessary. In most cases, expansion can be accomplished without taking the system off-line. Contact the factory for assistance in planning the expansion of an existing system.*

### 2.2.1 TDM-ARB (MULTIPLE SYSTEMS ARBITER) [GRAY]

One (1) TDM-ARB card is required to access the functions and to transmit and receive on all channels in up to four (4) Central Processor Packages (CPPs).

The VR-CM50 has an architectural limitation of 120 card slots in a system central package. While this is adequate for the majority of applications, some very large systems may exceed this limitation. The TDM-ARB card allows an associated console to access the control functions and to transmit and receive on all channels in up to four (4) separate, collocated Central Processor Packages (CPPs). One TDM-ARB is required for each console that must access multiple CPPs. One TDM-PIC for each console must be present in each of the central packages the console must access. If cross-patching is required between channels in multiple central packages, an IPC card must also be present for that console in each package. Figure 2-1 shows the role of the ARB card in expanded systems.

Quick reference for Expanded Systems:

1. One ARB is required for each console that must access multiple systems.
2. One PIC for each console must be present in each of the Central Packages the console will access.
3. One IPC provides four (4) full duplex patch busses between two arbitrated VR-CM50 systems.
4. One ICR card is required for each additional 30 cards in the system.

### 2.2.2 TDM-AUX (+) AND TDM-AUX/M (+) (AUXILIARY INTERFACE CONTROLLER) [BLACK]

One (1) TDM-AUX or AUX/M card is required for every eight (8) relays. The TDM-AUX/M card is used in 14-card Central Packages only.

The TDM-AUX is the link between the Central Processor Package and any external control inputs or outputs related to the System. These can include electrically operated doors, lamps, pumps, fire sirens,

alarms, etc. The AUX is used in all standard VR-CM50 Central Packages, the AUX/M in the 14-card package. The relay mechanical mounting is the only difference between the two cards. One card can address up to 16 Auxiliary Switch functions in any combination of 4-switch or 8-switch modules. The card includes 16-buffered relay outputs, 32-optoisolated logic inputs and 3-optoisolated logic inputs and timers for On/Off and Sequencing control for fire siren applications. The associated control relays are mounted on DIN plug-in sockets and provide 4PDT contacts at up to 5A (non-inductive) per contact. The AUX or AUX/M includes 8-control relays. Option TDM-AUX/E8 (see Section 2.2.3) is required to expand to 16 control relays.

The relay mounting panel associated with each AUX card requires 7 inches of vertical cabinet mounting space within the Central Processor Package housing. The use of multiple AUX cards may require additional cabinet space. Refer to System Wide Option TDM-OP211, Section 2.10 that describes the Cabinet Bay sizes.

### 2.2.3 TDM-AUX/E8 (HARDWARE OPTION)

TDM-AUX/E8 is a hardware option which provides 8 additional DIN track mounted, 4PDT relays to expand the AUX or AUX/M control capability to 16 relay outputs.

### 2.2.4 TDM-AUX/A (ALARM INTERFACE CONTROLLER) [BROWN]

One (1) TDM-AUX/A card is required for every 16 alarm I/O lines.

The TDM-AUX/A is a link between the Central Processor Package and alarm inputs. The AUX/A provides logic level outputs rather than relay contact closures. The card is compatible with both supervised and non-supervised local circuits using either normally closed or normally open protection loops. The card is not directly compatible with reversing relay systems. (Contact the Factory for assistance if reversing relay inputs are needed.)

### 2.2.5 TDM-AUX/V (VOTER INTERFACE CONTROLLER) [BROWN]

One (1) TDM-AUX/V card is required for one 6-site GE shelf, or one 8-site Motorola shelf.

The TDM-AUX/V is compatible with GE, Motorola TAC and SPECTRA-TAC, Hall and other industry standard voting comparators. One card is required for one 6-site GE shelf, or one 8-site Motorola (or Hall) shelf. The card includes a line driver interface board which is installed at the voter shelf.

### 2.2.6 TDM-CAD (+) (CAD INTERFACE CONTROLLER) [YELLOW]

One (1) TDM-CAD card is required for each option offered. Refer to System Wide Options TDM-OP251/A through TDM-OP263/H for CAD applications.

The TDM-CAD card is the link between the Central Processor Package (CPP) and an external Computer Aided Dispatch (CAD) or data processing system such as 'Vehicle ID' where interaction between the systems is required. The card is also used for internal functions which are data intensive such as programmable paging, statistics processing and special user control functions which require a custom interface.

The TDM-CAD card includes two (2) bi-directional RS-232C and RS-422 interfaces which can be configured for standard data communication rates from 300 baud to 19.2k baud. There is an additional RS-232C output port intended for a printer interface. Sockets provide for up to 2M bytes of RAM, EPROM or E<sup>2</sup>PROM on-card memory, depending on the application.

Refer to System Wide Options TDM-OP251/A through TDM-OP263/H, Section 2.13 through 2.16, for typical CAD applications.

### 2.2.7 TDM-CSC (+) (CENTRAL SYSTEM CONTROLLER) [RED]

One (1) TDM-CSC card is furnished as part of the CPP. An additional card should be specified as a "hot standby" for any system with two or more console positions.

The TDM-CSC is the master controller for the entire system. The card includes a non-microprocessor based system timer, the system real-time clock and I/O interfaces to the maintenance terminal, modem and logging printer. The system configuration is stored on this card.

Two CSC cards are recommended for most system. One card serves as the Designated System Controller and the other as its "hot standby" reserve. The "standby" CSC is continuously tested to detect a possible shelf failure while it is in reserve status and is automatically updated when programming changes are made to the active controller. Switch-over of system control occurs automatically in the event of a CSC malfunction. The "standby" controller is continuously tested to detect a shelf failure of the card while it is not on-line.

The primary CSC is furnished as part of the basic Central processor Package. The reserve CSC is added where required by specifying System Wide Option TDM-OP203 or TDM-OP203/x, (where x=2,3,4) Reserve CSC for 20/30 (etc.) Card CPPs. A reserve CSC is furnished as standard equipment on all systems quoted after September 1, 1993.

*NOTE: A card slot is always reserved for TDM-OP203 even if it is not required. This slot cannot be reassigned to another function.*

### 2.2.8 TDM-ICR (+) (INTER-CABINET REPEATER) [ORANGE]

The primary TDM-ICR card (1) is provided with each 30 plus card system. The Reserve card (1) is added with System Wide Options TDM-OP203/2, /3 or /4.

The TDM-ICR is the link between two or more Central Package cabinets operating within the same 120-card system. Each Central Processor Package, whether it resides in a 30-card or 60-card cabinet, has a data bus limitation of thirty (30) cards. This limit was imposed to preserve the entirety of the TDM bus waveforms and prevent degradation of the TDM data bus timing. The primary ICR cards are furnished as part of the basic Central Processor in systems of forty (40) or more card capacity. The reserve card for each ICR is automatically added when System Wide Option TDM-OP203/2, /3, /4 is specified. This option is included as standard equipment on all systems quoted after September 1, 1993.

*NOTE: The appropriate number of card slots are reserved for "hot standby" ICR cards even if they are not specified. These slots cannot be reassigned to other functions.*

2.2.9 TDM-LIC (+) (LINE INTERFACE TRANSMIT/RECEIVE CONTROLLER) [WHITE]

One (1) TDM-LIC card is required for each radio base station in the system.

The TDM-LIC is the link between the Central Processor Package and the individual radio base stations in the system. The card includes:

1. Receive audio amplifier with both 2 and 4-Wire ports.
2. Automatic level setting circuitry
3. Transmit audio amplifier/line driver
4. 3 frequency synthesizers for control tone and paging tone generation
5. I/O control lines for channel control options.

This card is equipped to run full audio path diagnostics including the line driver transformer and will support a variety of tone, DC, and E&M signaling options.

The LIC line terminator board includes three (3) control relays; one 4PDT relay for alternate line selection, one DPDT relay for remote takeover and one SPST relay for M-Lead PTT.

Multi-receiver channel configurations may also require a TDM-QRC for receive audio paths. (See Section 2.18 to 2.20 for Transmit/Receive options, TDM-OP3xx.)

*NOTE: Slots can be pre-wired with line terminators only for "Plug and Play" expansion. Refer to Section 2.3.*

2.2.10 TDM-MLC - CRT CONSOLES ONLY (MULTI-LINE TELEPHONE INTERFACE CONTROLLER) [MAUVE]

One (1) TDM-MLC card is required for every four (4) telephone lines interfaced.

The TDM-MLC allows the console to be used as an integrated radio/telephone system. Each MLC provides four (4) telephone line interfaces which can be used with CO lines or 1A2 key systems. Each line includes an FCC approved coupler with ring detection. Individual lines can be conferenced and can be patched to other telephone lines and/or radio channels. The MLC is used with the Integrated Telephone Screen which allows up to 48 lines per console and includes: Hold, Flash, Conference, Patch and Speed Dial capability; a dedicated keypad dialer, and ringer. Two different ring tones can be assigned with priority levels to differentiate Emergency and Non-Emergency calls. Telephone line conferencing and patching is full duplex. Radio to telephone patching is half-duplex.

TDM-OP212 is also required to mouse the MLC line terminators. Each OP212 I/O panel will mount up to five (5) MLC line terminators.

For additional information, refer to Console Options TDV-OP453 and TDV-OP468.

2.2.11 TDM-PIC (POSITION INTERFACE CONTROLLER) [BLUE]

One (1) TDM-PIC card is required for each Dispatch Position in the system.

The TDM-PIC is the link between the Central Processor Package and each individual dispatch position. The card includes the console audio interfaces plus RS-485 and RS-232C console data ports. The audio ports are for Transmit Audio, Unselected Receive Audio and Selected Receive Audio. An optional applique board provides drivers for two additional monitor speakers is required. The RS-485 console link is used for local, wire line operation. The RS-232C data port is a modem driver for long distance remote operation of the console. The diagnostic software and individual console personality is stored on this card.

TDM-OP453 is also required if the console has more than two speakers. Consoles having more than four speakers will require multiple PIC cards.

*NOTE: Slots can be pre-wired with line terminators only for "Plug and Play" expansion. Refer to Section 2.3.*

### 2.2.12 TDM-ORC (+) (QUAD RECEIVE-ONLY CONTROLLER) [GREEN]

One (1) TDM-ORC card is required for every four (4) radio receivers not included as part of a TDM-LIC card.

The TDM-QRC is the link between the Central Processor Package (CPP) and receiver sections of multi-receiver base stations or individual monitor receivers. The card includes:

1. Four receive audio amplifiers
2. Automatic level setting circuitry
3. I/O control lines for various control options

The card is equipped to run full audio path diagnostics for each section. The receivers may be assigned in groups to Ts-2R, T4-4R, T8-8R and dual or octal receive-only control modules.

*NOTE: Slots can be pre-wired with line terminators only for "Plug and Play" expansion (see Section 2.3).*

### 2.2.13 TDM-RIA (REMOTE INTERFACE ADAPTER) [VIOLET]

One (1) TDM-RIA card is required to allow a console to be operated at an unlimited distance from the Central Package.

The TDM-RIA allows a full function console position to be operated at virtually unlimited distance from the Central Package. The link requires either five (5) type 3002 unconditioned telephone pairs or three (3) duplex microwave channels. The RIA includes:

1. Central Package and remote interface modules
2. AGC line drivers/receivers with auto diagnostics
3. RTL surge protection
4. Fast-Train 9600 baud modems
5. Applications software

The REMOTE end is housed in a wall-hung cabinet and includes a one hour UPS power supply.

### 2.2.14 TDM-TPI (+) (TELEPHONE PATCH INTERFACE CONTROLLER) [WHITE]

One (1) TDM-TPI card is required for each telephone patch interface in the system.

The TDM-TPI card is the single channel link between the Central Processor Package and the subscriber telephone network for radio/telephone patching. The card includes:

1. Receive Audio Amplifier
2. Line Driver Transformer
3. Frequency Synthesizers for DTMF Generation

The card is equipped to run full audio path diagnostics including the line driver transformer. Each VR-CM50 system will support any number of telephone patch interfaces. Each dispatch position console will support the full system complement of patch interfaces with up to eight (8) available at any one time.

The TPI and LIC are identical cards. The TPI line terminator includes an FCC registered protective coupler and eliminates the control relays used for base station alternate line and take-over control.

### 2.2.15 TDM-EFJ (EFJ MULTI-NET RNT TRUNKED RADIO INTERFACE)

One (1) TDM-EFJ is required for each console that is connected to a Multi-Net RNT (Radio Network Terminal). If the console is to control talkgroups from two or more RNTs, one (1) TDM-EFJ is required for each RNT.

The TDM-EFJ is the link between the Central Processor Package and the E.F. Johnson Multi-Net II trunked radio system. The TDM-EFJ is actually a TDM-TIC universal Trunking Interface Controller card configured for the Multi-Net II system. The TDM-TIC includes an RS232C serial data link and four (4) bi-directional auto ports to the Multi-Net RNT. The ports are defined as Selected Audio, Unselected Audio and two (2) trunked-to-conventional patch groups or dedicated talkgroup monitor speakers. A 25 pair console I/O connector is furnished as part of this option. Additional I/O connector capacity (TDM-OP210) may be required for some systems.

Each TDM-EFJ requires a corresponding MCM (Multi-Net Console Module) card in the Multi-Net RNT. The MCM supports Selected and Unselected Audio only. If the trunked-to-conventional patch ports are to be supported, two (2) CPM (Console Patch Module) cards are required in the Multi-Net RNT in addition to the MCM. The interface allows only four ports; additional cards for additional ports are not supported.

Multi-Net systems can be configured with either single or multiple RNTs. If any console must access talkgroups from two or more RNTs, a TDM-EFJ must be provided for each RNT accessed by that console. Each RNT must have a corresponding MCM and (if required) CPM modules.

## 2.3 "PLUG AND PLAY " SYSTEM PRE-WIRING OPTIONS

When cards are purchased for addition to an existing VR-CM50 Central Processor Package (CPP), the expansion kit typically consists of three major items; The CPP card, a line terminator assembly for the card and a ribbon cable assembly to connect the line terminator to the card cage backplane.

With few exceptions, new cards can be installed at any convenient slot in the card cage - VR-CM50 systems do not limit cards to specific slot locations. Because of this inherent flexibility in placing CPP cards, the backplane and I/O connector wiring cannot be preassigned and must be performed as part of the installation. As a general rule, this is easily accomplished by a qualified radio technician.

If at the time of system purchase, it is known that specific channels and/or positions are likely to be added in the future, the card cages can be pre-wired so that the expansion requires only plugging-in the appropriate PC card. Each of the following options provides the card line terminator, backplane ribbon cables and assigns RTL I/O pairs and card cage PC Board guide colors as required. An option ending in "+" designates a card slot with planned "hot standby" capability. Be sure the CPP has sufficient I/O capacity for planned expansion - order TDM-OP210 and/or TDM-OP711 as required.

When ordering the cards to be installed in the pre-wired slots, use the prefix TSP rather than TDM. TSP designates a spare card with no line terminator or backplane cable - refer to Section 4 of this planner.

### 2.3.1 TDM-LIC.LT AND TDM-LIC.LT+ (SLOT PRE-WIRED FOR TDM-LIC)

TDM-LIC.LT+ designates slots wired for a TDM-LIC with an adjacent TDM-OP340 "hot standby" card. Assigns 'White card' guides to slots, When populating the slots order TSP-LIC.

### 2.3.2 TDM-PIC.LT (SLOT PRE-WIRED FOR TDM-PIC)

Assigns 'Blue card' guides to slot and includes the position connector on the RTL I/O panel. When populating the slot, order TSP-PIC.

### 2.3.3 TDM-QRC.LT AND TDM-QRC.LT+ (SLOT PRE-WIRED FOR TDM-QRC)

TDM-QRC.LT+ designates slots wired for a TDM-QRC with an adjacent TDM-OP341 "hot standby" card. Assigns 'Green card' guides to slots. When populating the slots, order TSP-QRC.

## 2.4 CENTRAL PROCESSOR PACKAGES

All audio and data processing for the system is performed at the Central Processor Package (CPP) which is shared by all Dispatch Position Consoles in the system. The electronics is comprised of a number of microprocessor based card assemblies which can be combined as needed to form a complete system. Typically, one card controls a single function such as one

console position or one radio base station. Where applicable, some cards control multiple functions such as auxiliary switches or Receive-Only channels. Critical functions can be backed up with "hot standby" controllers which will be switched on-line automatically in the event of a failure of the primary controller.

The smallest and most compact Central Processor Unit (see Figure 2-3) houses a maximum of 14-cards, 16 Auxiliary Relays and includes a power supply and internal UPS battery. (27H x 21W x 26D)

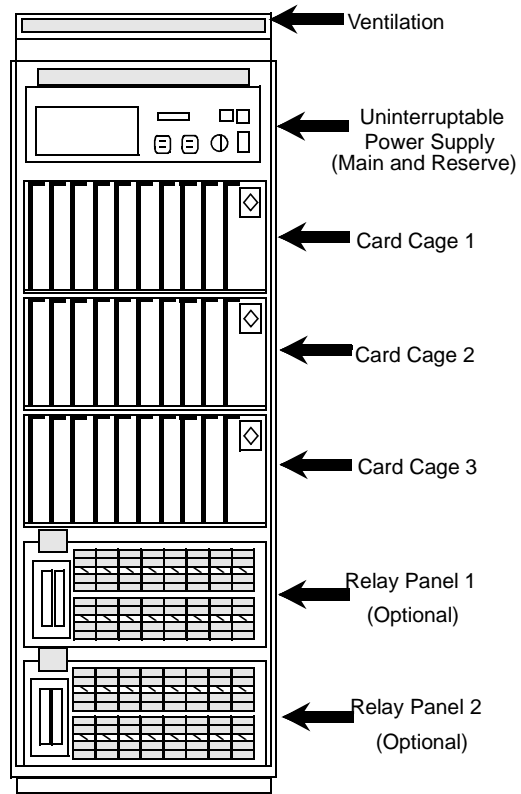
The Standard size Central Processor Unit (see Figure 2-2) houses a maximum of 30-cards, 32 Auxiliary Relays and includes a power supply and internal UPS backup battery. (60H x 21W x 26D)

The High Profile Central Processor Unit (see Figure 2-4), contains a maximum of 60-cards, 64 auxiliary Relays and includes a power supply and dual internal UPS batteries. (88H x 22W x 26D)

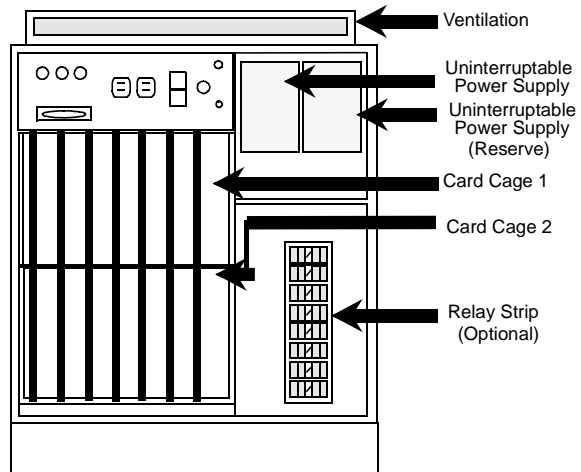
**2.5 STANDARD CENTRAL PROCESSOR PACKAGES**

The following Central Processor Packages include an enclosed rack cabinet (except in-console models), Main and "hot standby" CSC/ICR cards (TDM-OP203), main reserve Power Supplies (TDM-OP202), with 1 hour minimum UPS support, main and "hot standby" programmable paging controllers (TDM-OP253 and OP253/H), a diagnostic modem (TDM-OP209), connectors for E.F. Johnson Diagnostic Printer and Maintenance Terminal and Gas-Tube Surge Protection for all AC lines and RTL I/O lines.

*NOTE: Many variations of these standard Central Packages are available to meet special systems requirements. Please contact the factory for engineering assistance.*

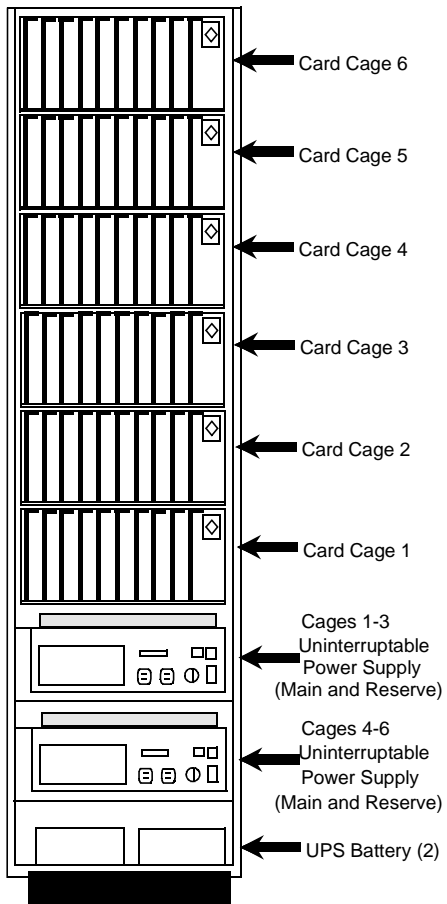


**Figure 2-2 CENTRAL PROCESSOR UNIT - 30 CARDS**



**Figure 2-3 CENTRAL PROCESSOR UNIT - 14 CARDS**





**Figure 2-4 CENTRAL PROCESSOR UNIT - 60 CARDS**

**Table 2-1 STANDARD CENTRAL PROCESSOR PACKAGES**

The following Central Processor Packages include an enclosed rack cabinet (except in-console models), Main and hot-standby CSC/ICR cards (TDM-OP203), main and reserve Power Supplies (TDM-OP202), with 1 hour minimum UPS support, main and hot-standby programmable paging controllers (TDM-OP253 and OP253/H), a diagnostic modem (TDM-OP209), connectors for E.F. Johnson Diagnostic Printer and Maintenance Terminal and Gas-tube Surge Protection for all AC lines and TRL I/O lines.

- (1) \*Total Card Slots
- (2) \*Usable Card Slots
- (3) Cabinet Dimensions
- (4) Maximum number of Console Positions
- (5) Number of 25-Pair TRL I/O Kits Included
- (6) Maximum Number of Auxiliary Control Relays
- (7) Reserve Power Supply Option
- (8) Reserve Central Processor Option
- (9) On-Line Programming Option
- (10) 2X Extended UPS Hold-Up Time Option
- (11) Model Number

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
14	10	IN-CONSOLE	3	1	16	OP202/M	OP203	OP204	N/A	TDM-1509114
14	10	27 x 21 x 26	3	1	16	OP202/M	OP203	OP204	N/A	TDM-1509214
14	10	27 x 21 x 26	3	1	16	OP202/M	OP203	OP204	N/A	TDM-1509214X**
20	16	60 x 21 x 26	8	2	48	OP202	OP203	OP204	OP214	TDM-1509220
20	16	60 x 21 x 26	8	2	48	OP202	OP203	OP204	OP214	TDM-1509220X**
30	26	60 x 21 x 26	8	3	32	OP202	OP203	OP204	OP214	TDM-1509230
30	26	88 x 22 x 26	8	3	64	OP202	OP203	OP204	OP214	TDM-1509330
50	44	60 x 39 x 26	32	5	80	OP202/2	OP203/2	OP204/2	OP214/2	TDM-1509250
50	44	88 x 22 x 26	32	5	64	OP202/2	OP203/2	OP204/2	OP214/2	TDM-1509350
60	54	60 x 39 x 26	32	6	64	OP202/2	OP203/2	OP204/2	OP214/2	TDM-1509260
60	54	88 x 22 x 26	32	6	64	OP202/2	OP203/2	OP204/2	OP214/2	TDM-1509360
80	72	60 x 58 x 26	48	8	112	OP202/3	OP203/3	OP204/3	OP214/3	TDM-1509280
90	82	60 x 58 x 26	48	9	96	OP202/3	OP203/3	OP204/3	OP214/3	TDM-1509290
90	82	88 x 44 x 26	48	9	128	OP202/3	OP203/3	OP204/3	OP214/3	TDM-1509390
110	100	60 x 77 x 26	64	11	128	OP202/4	OP203/4	OP204/4	OP214/4	TDM-15092110
110	100	88 x 44 x 26	64	11	128	OP202/4	OP203/4	OP204/4	OP214/4	TDM-15093110
120	110	60 x 77 x 26	64	12	128	OP202/4	OP203/4	OP204/4	OP214/4	TDM-15092120
120	110	88 x 44 x 26	64	12	128	OP202/4	OP203/4	OP204/4	OP214/4	TDM-15093120

\* The difference between Total and Usable card slots reflects the CSC, ICR, and Programmable Paging cards used in the basic system.  
 \*\* TDM-1509214X and TDM-1509220X Central Packages do not include TDM-OP202, TDM-OP203, TDM-OP204, TDM-OP209, TDM-OP253 or TDM-OP253/H as standard equipment. Add these options selectively as required for specific applications.

## 2.6 SUMMARY OF SYSTEM WIDE OPTIONS

POWER SUPPLY	TDM-OP200/A	Equip with N. America Power Connector
	\$ TDM-OP200/GB	Equip with British Power Connector
	\$ TDM-OP200/E	Equip with Continental Europe Power Connector
	\$ TDM-OP200/I	Equip with India/S. Africa Power Connector
	\$ TDM-OP200/NZ	Equip with Australia/New Zealand Power Connector
	\$ TDM-OP202	Reserve Power Supply for 20/30 Card CPPs
	\$ TDM-OP202/2	Reserve Power Supply for 50/60 Card CPPs
	\$ TDM-OP202/3	Reserve Power Supply for 80/90 Card CPPs
	\$ TDM-OP202/4	Reserve Power Supply for 110/120 Card CPPs
	\$ TDM-OP202/M	Reserve Power Supply for 14 Card CPPs
	\$ TDM-OP203	Reserve CSC for 14/20/30 Card CPPs
	\$ TDM-OP203/2	Reserve CSC/ICR for 50/60 Card CPPs
	\$ TDM-OP203/3	Reserve CSC/ICR for 80/90 Card CPPs
	\$ TDM-OP203/4	Reserve CSC/ICR for 110/120 Card CPPs
ON-LINE PROGRAMMING	\$ TDM-OP204	On-Line Programming for 14/20/30 Card CPPs
	\$ TDM-OP204/2	On-Line Programming for 50/60 Card CPPs
	\$ TDM-OP204/3	On-Line Programming for 80/90 Card CPPs
	\$ TDM-OP204/4	On-Line Programming for 110/120 Card CPPs
SYSTEM DIAGNOSTICS	\$ TDM-OP205	Diagnostic/Logging Printer - RS-232C Serial
	\$ TDM-OP207	Technician Audio Test Panel
	\$ TDM-OP208	Dedicated Local Maintenance Terminal
	\$ TDM-OP208PC	Maintenance Terminal Emulation Software for IBM PC
	\$ TDM-OP209	Remote Diagnostics/Programming Package
MISCELLANEOUS	\$ TDM-OP210	Expanded I/O Connector Panel Capacity
	\$ TDM-OP211/60	Additional CPP Cabinet Bay - 60" High (for VR-CM50 9200 Series CPP)
	\$ TDM-OP211/88	Additional CPP Cabinet Bay - 84" High (for VR-CM50 9300 Series CPP)
	\$ TDM-OP212	Mounting of 5 Additional MLC Cards
	\$ TDM-OP214	2X UPS Holdup Time for 20/30 Card CPPs
	\$ TDM-OP214/2	2X UPS Holdup Time for 50/60 Card CPPs
	\$ TDM-OP214/3	2X UPS Holdup Time for 80/90 Card CPPs
	\$ TDM-OP214/4	2X UPS Holdup Time for 110/120 Card CPPs
	TDM-OP241	12 Hour Clock Display Format
	\$ TDM-OP242	Alternate System Guard Tone (2100/2300/2325 Hz)

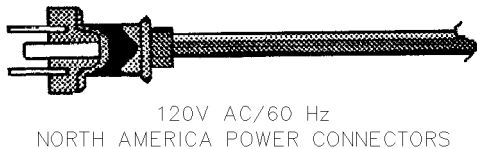
The "\$" Symbol preceding an option indicates an associated charge for that option.

**2.7 SYSTEM WIDE OPTIONS**

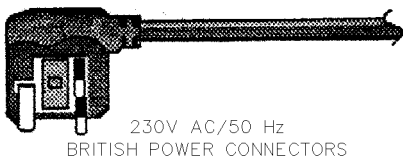
The following options describe choices for SYSTEM CONFIGURATION. Hardware options generally have an associated cost impact. Software Options are offered at NO CHARGE if specified at the time of original system order. Hardware modifications may be required when adding software options to existing VR-CM50 systems.

**2.7.1 POWER CONNECTORS**

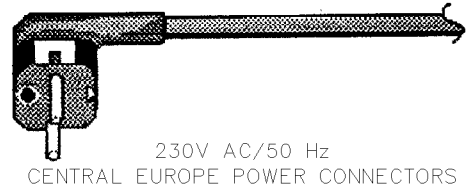
The Central Processor Package must be equipped with a power connector from the TDM-OP200 options which will provide 120V (85-130V, 47-66 Hz AC single phase power) or 230V (170-260V, 47-66 Hz AC single phase power) system operation. Power supply outlets will be NEMA 5-15 for all 120V NA systems and SCHUKO for all 230V systems. Options TDM-OP400/A, TDM-OP400/GB, TDM-OP400/E, TDM-OP400/I and TDM-OP400/NZ are the corresponding power connector options for the dispatch consoles. (Refer to Section 3.4). All 230V options include a 230/120 volt transformer to power the ventilation fans, TDM-OP205 printer(s) and TDM-OP209 modem.



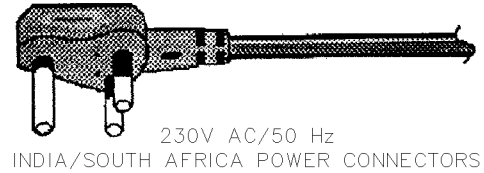
**Figure 2-5 TDM-OP200/A**



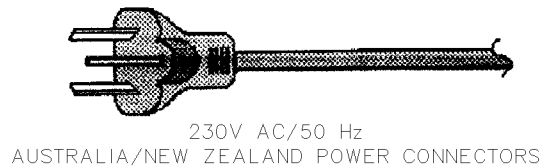
**Figure 2-6 TDM-OP200/GB**



**Figure 2-7 TDM-OP200/E**



**Figure 2-8 TDM-OP200/I**



**Figure 2-9 TDM-OP200/NZ**

**2.7.2 RESERVE POWER SUPPLIES FOR CPPS**

- TDM-OP202 - for 20/30 Card CPPs.
- TDM-OP202/2 - for 50/60 Card CPPs.
- TDM-OP202/3 - for 80/90 Card CPPs.
- TDM-OP202/4 - for 110/120 Card CPPs.
- TDM-OP202/M - for 14 Card CPPs.

TDM-OP202 (or TDM-OP202/?, where "?" = 2,3,4 or M) is a hardware option which adds a reserve power supply that will be automatically brought on line in the event of a failure of the primary power supply module. When not in use, the reserve supply is off-line to prevent unnecessary wear or susceptibility to power line surges that can affect a "hot standby" power supply. This option is included as standard equipment on all systems quoted after September 1, 1993.

## 2.7.3 RESERVE CSC/ICR FOR CPPS

TDM-OP203 - for 14/20/30 Card CPPs.  
 TDM-OP203/2 - for 50/60 Card CPPs.  
 TDM-OP203/3 - for 80/90 Card CPPs.  
 TDM-OP203/4 - for 110/120 Card CPPs.

Reserve CSC/ICR for 50/60 Card CPPs TDM-OP203 (or TDM-OP203/?, where "?" = 2,3, or 4) is a hardware option which adds a second CSC card which will automatically assume fully systems operation in the event of a failure of the primary controller. Reserve ICR card(s) are also added for systems larger than 30 cards. The reserve cards are continuously tested to detect possible shelf failures while in reserve status and are automatically updated when programming changes are made to the system. The option includes continuous auto-diagnostic software to detect a potential failure of a standby controller, even when it is not in service. This option is included as standard equipment on all systems quoted after September 1, 1993.

## 2.8 ON-LINE PROGRAMMING

### 2.8.1 ON-LINE PROGRAMMING FOR CPPS

TDM-OP204 - for 14/20/30 Card CPPs.  
 TDM-OP204/2 - for 50/60 Card CPPs.  
 TDM-OP204/3 - for 80/90 Card CPPs.  
 TDM-OP204/4 - for 110/120 Card CPPs.

TDM-OP204 (or TDM-OP204/?, where "?" = 2,3 or 4) is a hardware option which eliminates the need for EPROM replacement by providing personality resident in E2PROM which can be reprogrammed with the system on-line using an IBM or compatible PC with E.F. Johnson menu-driven software. A system equipped with TDM-OP204 can also be reprogrammed by modem from a remote location by a qualified technician or by the E.F. Johnson factory if the Central Processor is equipped with telephone dial-in capability and TDM-OP209 REMOTE DIAGNOSTICS AND PROGRAMMING. This option is included as standard equipment on all systems quoted after September 1, 1993.

*NOTE: Any system equipped with TDM-OP204 (or TDM-OP204/?) must also be equipped with TDM-OP253 PROGRAMMABLE PAGING if paging formats require in-field modification. Each console must also be equipped with TDM-OP454 or TDV-OP454.*

## 2.9 SYSTEM DIAGNOSTICS

### 2.9.1 TDM-OP205 DIAGNOSTIC/LOGGING PRINTER - RS-232 SERIAL

TDM-OP205 is a hardware option which provides an 80-column, 9-pin dot matrix printer with a serial interface, 8k message buffer, a 20' interconnect cable and a table-top printer stand. The printer is compatible with all VR-CM50 logging ports including those used for diagnostic messages, status management reports, programmable paging and vehicle ID logging.

*NOTE: The use of a printer for hard copies of diagnostic messages is extremely important and strongly recommended. Serial printers other than the one offered by E.F. Johnson as TDM-OP205 can be used, but drivers are not available from the factory and compatibility cannot be assured. The OKI Microline 172/182 series of commercial printers are also compatible with the VR-CM50.*

### 2.9.2 TDM-OP207 TECHNICIAN AUDIO TEST PANEL

TDM-OP207 is a hardware option which adds a local speaker and microphone with a PTT switch to the Central Package power supply. Used in conjunction with a maintenance terminal. TDM-OP207 allows service personnel to access any radio channel from the Central Package, to intercom with any console position in the system and to run all diagnostic programs from the Central Package.

### 2.9.3 TDM-OP208 DEDICATED LOCAL MAINTENANCE TERMINAL

TDM-OP208 is a hardware option which provides a local maintenance terminal with a 20' interconnect cable at the Central Package for technician access to the system. The terminal is hardware and software key locked to prevent unauthorized access to the system software.

### 2.9.4 TDM-OP208PC MAINTENANCE TERMINAL SOFTWARE FOR IBM PC

TDM-OP208PC is a hardware option which equips a customer owned, IBM compatible PC to access the system. The program requires a minimum 286 PC with 640K RAM, 10M bytes of available hard

disk space, one 3.5" or 5.25" floppy drive, a monochrome or color monitor and at least one serial I/O port. The option includes all software needed to access the maintenance/diagnostic screens and to program a system equipped with TDM-OP204/?, (where "?" = 2, 3, or 4).

### **2.9.5 TDM-OP209 REMOTE DIAGNOSTICS/ PROGRAMMING PACKAGE**

TDM-OP209 is a hardware option which equips the Central Processor Package with a data port and a 2400 baud dial-up modem to permit remote diagnostics read-out. Local key-switch activation is required to permit system access. No software is required to implement this option - however a compatible terminal is required at the receiving end to access the system screens. TDM-OP209 can be used to remotely reprogram the system if the Central Processor is equipped with TDM-OP204/? (where "?" = 2, 3, or 4) and the consoles are equipped with TDM-OP454 ON-LINE REPROGRAMMING. This option is included as standard equipment on all systems quoted after September 1, 1993.

## **2.10 MISCELLANEOUS SYSTEM WIDE OPTIONS**

### **2.10.1 TDM-OP210 EXPANDED I/O PANEL CONNECTOR CAPACITY**

Unless otherwise specified, the Central package includes a single I/O connector panel which provides mounting for the following:

1. Up to (6) 25-pair ribbon connectors for RTL I/O (150 lines)
2. Up to (8) 6-pair ribbon connectors for console I/O (8 consoles)
3. Up to (7) DB-25 connectors for RS-232C I/O (1 printer, 6 other)

TDM-OP210 is a hardware option which provides an additional I/O panel for applications where extra connector slots are required (e.g. for more than 8 Dispatch Positions or more than 6 RTL I/O cables). Each panel requires 5-1/4" of vertical mounting space -- be sure adequate rack space is available.

### **2.10.2 TDM-OP211/60 ADDITIONAL CPP CABINET BAY - 60 " HIGH**

(For VR-CM50 9200 Series CPP)

### **2.10.3 TDM-OP211/88 ADDITIONAL CPP CABINET BAY - 88 " HIGH**

(For VR-CM50 9300 Series CPP)

TDM-OP211/60 and TDM-OP211/88 are hardware options which provide an additional Central Package cabinet bay that may be used for extra I/O connector panels, auxiliary control relays or specialized peripheral equipment. The option does not include an additional power supply or additional card slot capacity. Each cabinet adds 22" to the width of the Central Package.

### **2.10.4 TDM-OP212 MOUNTING OF 5 ADDITIONAL MLC CARDS**

TDM-OP212 is a hardware option which equips the Central Package for mounting of up to five TDM-MLC cards, to allow control of up to twenty (20) telephone lines. Order an additional TDM-OP212 for every five (5) TDM-MLC cards to be installed. TDM-MLC cards are not included - order separately.

### **2.10.5 TDM-OP214 2X UPS HOLDUP TIME FOR 20/30 CARD CPPS**

### **2.10.6 TDM-OP214/2 2X UPS HOLDUP TIME FOR 50/60 CARD CPPS**

### **2.10.7 TDM-OP214/3 2X UPS HOLDUP TIME FOR 80/90 CARD CPPS**

### **2.10.8 TDM-OP214/4 2X UPS HOLDUP TIME FOR 110/120 CARD CPPS**

The VR-CM50 Central Processor includes an internal UPS battery which provides continued operation in the event of an AC power failure. The UPS holdup time varies with system equipage, but is rated at a minimum of one (1) hour for a fully loaded system with a fully charged battery. In most cases, the typical VR-CM50 system will have about three hours of UPS reserve using the standard battery package. Systems with T/R channels using DC remote control will have shorter holdup times.

TDM-OP214 (or TDM-OP214/?, where "?" = 2, 3, or 4) is a hardware option which provides an additional Central Processor UPS battery to double the holdup time to a minimum of two (2) hours. This option requires that each console be equipped with TDM-OP475 - 2X UPS HOLDUP TIME.

*NOTE: It is not practical to use multiple TDM-OP204/? (where "?" = 2, 3, or 4) options to achieve further extended holdup times because of charging circuit limitations. Consult the factory for engineering assistance if UPS reserve time guaranteed in excess of two (2) hours minimum is required.*

#### 2.10.9 TDM-OP241 12 HOUR CLOCK DISPLAY FORMAT

Unless otherwise specified, the standard system clock display will be in military format (0000 to 2359) hours). TDM-OP241 is a software option which changes the time display at all consoles to the 12 hours AM/PM format. Clock programming is still performed in 24 hour format.

The time display in either format is synchronized at all Dispatch Positions.

#### 2.10.10 TDM-OP242 ALTERNATE SYSTEM GUARD TONE (2100/2300/2325 HZ)

TDM-OP242 is a hardware option which changes the VR-CM50 standard system guard tone of 2175 Hz to an alternate frequency and automatically reconfigures all Tx and Tx notch filters, diagnostic pilot tone filters and tone LOBL detectors (if applicable).

Available alternate tone selections are 2100 Hz, 2300 Hz, and 2325 Hz. The tone frequency must be specified at the time of order.

**2.11 SUMMARY OF CAD INTERFACE OPTIONS**

VEHICLE ID	\$ TDM-OP251/A	ID "Alias" Table for up to 999 Consecutive Units
INTERFACES	\$ TDM-OP251/AE	Expanded ID "Alias" Table for up to 9,999 Consecutive Units
	\$ TDM-OP251/C	Coded Communications Model 1207 Interface
	\$ TDM-OP251/M	Motorola MDC-1200 Single Port Interface
	\$ TDM-OP251/P	ID Printer Capability (TDM-Op205 Printer Only)
EXTERNAL TIME	\$ TDM-OP252/D	Dictaphone 5000/7000 Logging Recorder Interface
SYNC INTERFACES	\$ TDM-OP252/H	Heath/Zenith Systems WWVB Interface
	\$ TDM-OP252/K	Kinematrics WWVB Interface
	\$ TDM-OP252/M	Magnasync Logging Recorder Interface
	\$ TDM-OP252/S	Spectracom Netclock WWVB Interface
CAD	\$ TDM-OP253	CAD Programmable Paging
PROGRAMMABLE	\$ TDM-OP253/C	Paging CAD System Interface
PAGING INTERFACE	\$ TDM-OP253/H	"Hot Standby" Paging Controller
	\$ TDM-OP253/P	Paging Printer Capability
MISCELLANEOUS	\$ TDM-OP255	Statistics and Management Package
CAD OPTIONS	\$ TDM-OP257	Customer Package
	\$ TDM-OP258	System Wide CW Station Identification
	\$ TDM-OP259	Automatic ANI/ALI Signaling Control
MULTI-NET	\$ TDM-OP262	EFJ Multi-Net RNT Trunked Radio Interface
INTERFACE	\$ TDM-OP262/H	"Hot Standby" Trunked Radio Interface

The "\$" Symbol preceding an option indicates an associated charge for that option.



## 2.12 CAD INTERFACE OPTIONS

The following options describe predefined CAD Card Programs. Options include CAD card with RAM/ROM as required, I/O connector and applications software. Console position accessories must be ordered separately. Unless otherwise noted, each option requires one (1) card slot in the system Central Processor Package (CPP).

*NOTE: On-Line Programming (TDM-OP204/x) may be required when adding CAD Options to existing systems. Contract the factory for applications assistance.*

## 2.13 VEHICLE ID INTERFACES

The following interfaces are used to display Vehicle ANI information. Display may be via a digital display on a TDM-M460?G channel module equipped with TDM-OP551 or via the VR-CM50 9122/1 5" CRT Vehicle ID Display unit.

*NOTE: ID decoders are not included with the option and must be ordered separately.*

2.13.1 TDM-OP251/A ( "ALIAS " TABLE FOR 3-DIGIT INPUT) [1-999 UNITS]

2.13.2 TDM-OP251/AE ( "ALIAS " TABLE FOR 4-DIGIT INPUT) [1-999 UNITS]

TDM-OP251/A and /AE are hardware options which translate the output of individual ANI encoders into familiar unit numbers. May be interfaced to a CRT terminal or CAD system if frequent unit alias updating is required.

These two options do not require a CAD card or separate card slot in the CPP. The program resides on the CAD card for the Vehicle ID option itself, i.e. TDM-OP251/C, G or M.

If multiple Vehicle ID options are installed in a system such as TDM-OP251/G and TDM-OP251/M, separate alias tables must be provided for each system.

*NOTE: Option TDM-OP251/A or TDM-OP251/AE may be ordered, NOT BOTH.*

2.13.3 TDM-OP251/C (CODED COMMUNICATIONS MODEL 1207 INTERFACE)

TDM-OP251/C interfaces with either one (1) or two (2) Coded Communications Model 1207 multi-channel encoder/decoder units. Each Model 1207 is capable of up to seven (7) channels of ID/Emergency encode/decode or fourteen (14) channels of decode only.

2.13.4 TDM-OP251/M (MOTOROLA MDC-1200 SINGLE PORT INTERFACE)

TDM-OP251/M interfaces with either one (1) or two (2) Motorola B1666A or B1667A decoders. Each decoder is capable of one (1) T/R channel with ID/Emergency display.

The Motorola data format requires that the decoder be tied to the CAD card itself rather than the LIC data port. For this reason, one TDM-OP251/M must be specified for every two (2) channels with MDC-1200 data.

2.13.5 TDM-OP251/P (ID PRINTER CAPABILITY) [TDM-OP205 PRINTER ONLY]

TDM-OP251/P is a hardware option which provides an RS-232C output port for a Vehicle ID logging printer. The printed log includes a time and date stamp and channel-used for each data entry logged.

*NOTE: TDM-OP251/P requires a dedicated TDM-OP205 printer which must be ordered separately.*

## 2.14 EXTERNAL TIME SYNC INTERFACES

The following interfaces are used to synchronize the master real time clock with an external time clock such as WWV, a CAD system or logging recorder clock.

TDM-OP252/D  
Dictaphone 5000/7000 Logging Recorder Interface

TDM-OP252/H  
Heath/Zenith Systems WWVB Interface

TDM-OP252/K  
Kinematics WWVB Interface

## TDM-OP252/M

Magnasync Logging Recorder Interface

## TDM-OP252/S

Spectracom Netclock WWVB Interface

*NOTE: WWV receivers and/or logging recorder time sync generator/readers are not included with the option and must be ordered separately. Logging recorder interfaces must be RS-232C only. TDM-OP251 is not compatible with IRIG time sync generators or readers.*

## 2.15 CAD PROGRAMMABLE PAGING INTERFACES

### 2.15.1 TDM-OP253 PROGRAMMABLE PAGING

TDM-OP253 is a hardware option which allows all keypad and single button paging formats including complex sequences with stacked and chained pages to be programmed in the field using an IBM or compatible PC without the need for EPROM replacement. This option allows wide latitude in defining paging plans. Access codes, tone frequencies, tone timing, channel/frequency/site steering, alert tones and call chaining are all individually definable for each page

TDM-OP253 includes a RS-232C port for programming. Programming is compatible with options TDM-OP208 or OP208PC which should be specified separately. This option is furnished as standard equipment on all systems quoted after September 1, 1993.

*NOTE: TDM-OP253 requires two (2) slots in the Central Processor Package. One slot is required for the paging controller. The second is reserved for a "hot standby" controller.*

### 2.15.2 TDM-OP253/C PAGING CAD SYSTEM INTERFACE

TDM-OP253 provides a second RS-232C port for interfacing to a CAD system for automated dispatching. Contact the factory for details on the communications protocol.

### 2.15.3 TDM-OP253/H "HOT STANDBY" PAGING CONTROLLER

TDM-OP253/H is a hardware option which specifies a second TDM-CAD controller which functions as a "hot standby" for TDM-OP253. In Public Safety applications such as Fire/EMS Alerting where paging is a critical functions, this option is strongly recommended for system with two or more dispatch positions. Programming is automatically exchanged between the main and standby controllers when the option is present. This option is furnished as standard equipment on all systems quoted after September 1, 1993.

This option does not require a separate card slot in the CPP. Its slot is assigned and reserved as part of TDM-OP253.

### 2.15.4 TDM-OP253/P PAGING PRINTER CAPABILITY

TDM-OP253/P is a hardware option which provides a third RS-232C output port for a paging printer. The printed log includes a time and date stamp and channel-used for each data entry logged. this option requires a dedicated TDM-OP205 printer - order separately. Printer drivers are not available for any printer other than TDM-OP205.

This option does not require a CAD card or a separate card slot in the CPP.

## 2.16 MISCELLANEOUS CAD OPTIONS

### 2.16.1 TDM-OP255 STATISTICS AND MANAGEMENT PACKAGE

TDM-OP255 is a hardware option which continuously gathers statistical data regarding operation of the system, collates and presents it in report form on a periodic basis. The data presented includes:

1. Number and accumulated time of all inbound messages by channel and console
2. Number and accumulated time of all tone and voice transmissions by channel and console.
3. Number of patch transmissions by channel and console

4. Number of pages by channel and console
5. Integrated telephone system activity by console.

Reports can be generated automatically on an hourly, shift or daily basis, and at any time on demand. The supervisory console can obtain an instant "snapshot" of the data for any channel on demand along with a comparison of the previous reporting period activity.

This option includes a dedicated TDM-OP205 printer.

#### 2.16.2 TDM-OP257 CUSTOMER PACKAGE

TDM-OP257 is a hardware option which provides customer specific HELP screen messages displayed on the control panel CRT. The messages may be specific directives called on demand from the console HELP menu or "alarm clock" messages such as reminders to conduct daily or weekly alert tests at pre-determined intervals.

*NOTE: This option is not suitable for information that us be periodically reprogrammed such as telephone listings. Each screen presentation is limited to a single line of 37 characters.*

#### 2.16.3 TDM-OP258 SYSTEM-WIDE CW STATION IDENTIFICATION

TDM-OP258 is a hardware option which provides Morse code station identification for any or all radio stations in the system. Code parameters and call signs for each station are user programmable. Identification intervals are selectable from a menu of several options.

*NOTE: Requires option TDM-OP208 or TDM-OP208PC for programming.*

#### 2.16.4 TDM-OP259 (APPLIES TO CRT CONSOLES ONLY) AUTOMATIC ANI/ALI SIGNALING CONTROL

TDM-OP259 is a hardware option which signals an associated E-911 controller to route the ANI/ALI information to a console that has answered or joined an incoming emergency call. This option is used in conjunction with a TDV-OP468 Multi-Line Telephone Screen in E-911 applications. Contract the factory for applications assistance and specific telephone switch compatibility.

#### 2.16.5 TDM-OP262 MULTI-NET INTERFACE

TDM-OP262 is a hardware option which equips the Central Processor to interface with an EFJ Multi-Net II Trunked Radio System. The Multi-Net system may be a single or multiple RNT design. The option includes a System Manager TDM-CAD board and all required interface software. Two adjacent slots are required in the Central Processor Package; one for the primary System manager card and one for the hot standby card which is always supplied.

One TDM-EFJ Multi-Net II Interface Controller card must be provided per Dispatch Position per RNT. Refer to Section 2.2.15 for further details.

#### 2.16.6 TDM-OP262/H MUTLI-NET INTERFACE

TDM-OP262/H is a hardware option which specifies a second TDM-OP262 which functions as a "Hot Standby" for the primary.

**2.17 SUMMARY OF TRANSMIT/RECEIVE CHANNEL OPTIONS**

TONE CONTROL OPTIONS	TDM-OP301	Configures a channel for tone remote control
	TDM-OP302	Extended Guard Tone Timing
	TDM-OP303	Sequential Function Control Tones
	\$ TDM-OP305	Tone Line Operated Busy LED (LOBL)
DC CONTROL OPTIONS	\$ TDM-OP311	DC Remote Keying
	TDM-OP315 DC	Line Operated Busy LED (LOBL)
MISCELLANEOUS OPTIONS	TDM-OP318	Non-Vox Operated Patch
	\$ TDM-OP319	Full Duplex, Full Conferencing, EMS Patch
	TDM-OP321	E&M Remote Keying
	\$ TDM-OP324	Tone Detector TDM-OP325 Alert/Monitor RX Control
	\$ TDM-OP327	Tone Notch Filter
	\$ TDM-OP329	Subtractive Echo Cancellation
	TDM-OP331	4 Wire Receive Audio
	TDM-OP332	Logic Driven CALL Indicator
	TDM-OP333	Through Console Repeat Operation (Non-Vox)
	\$ TDM-OP335	4-Site Selection Relays
	\$ TDM-OP336	8-Site Selection Control
	\$ TDM-OP338	Multiple Source Cross Mute
	\$ TDM-OP340	"Hot Standby" LIC Card
	\$ TDM-OP341	"Hot Standby" QRC Card
	TDM-OP345	4-Code CTCSS Selection
	TDM-OP346	8-Code CTCSS Selection
TDM-OP347	Repeater-Down Traffic Marker	
\$ TDM-OP348	LIC Auxiliary Relay Controls (4 Function)	
\$ TDM-OP351	Activate LIC Digital Data Port (Vehicle ID)	
TDM-OP362	Individual Talkgroup Encryption-EFJ Multi-Net	

The "\$" Symbol preceding an option indicates an associated charge for that option.

## 2.18 TRANSMIT/RECEIVE CHANNEL OPTIONS

The following options describe choices for CHANNEL CONFIGURATION. Hardware options generally have an associated cost impact. Software options are offered at NO CHARGE if specified at the time of original system order. Hardware modifications may be required when adding software options to existing VR-CM50 systems.

### 2.18.1 TDM-OP301 TONE REMOTE KEYING

TDM-OP301 is a software option which configures a particular channel for tone remote control. All industry standard control tones from 650 to 2325 Hz are supported. The control tones for each function must be specified at the time of order.

### 2.18.2 TDM-OP302 EXTENDED GUARD TONE TIMING

Certain radio systems, such as those using RF links for base station control, may require extended high-guard tone timing to assure reliable transmitter keying. TDM-OP302 is a software option which extends the high-guard timing beyond 125 ms in 25 ms programmable increments to allow for keying delays introduced by the RF link. The high-guard tone duration must be specified at the time of order.

### 2.18.3 TDM-OP303 SEQUENTIAL FUNCTION CONTROL TONES

The standard tone keying sequence requires a high level guard tone for 125 ms followed by a single function tone burst for 35 ms, followed by continuous low level guard tone for the duration of PTT.

TDM-OP303 is a software option which reconfigures the channel to transmit two (2) sequential 35 msec function tone bursts, following the high level guard tone burst. This scheme is used by MOTOROLA and others for multi-frequency switching, voice encryption activation, CTCSS control and other similar functions. The tone frequencies for each function must be specified at the time of order.

### 2.18.4 TDM-OP305 TONE LINE OPERATED BUSY LED (LOBL)

TDM-OP305 is a hardware option which configures a particular channel to derive channel busy indication from the guard tone produced by a parallel-connected, tone remote control unit. The option specifies an applique circuit board which attaches to the Line Interface Controller (TDM-LIC). The applique uses a digital 2175 Hz filter which does not require periodic retuning.

*NOTE: This option cannot be used in combination with TDM-OP311.*

## 2.19 DC CONTROL OPTIONS

### 2.19.1 TDM-OP311 DC REMOTE KEYING

TDM-OP311 is a hardware option which configures a particular channel for DC remote control. All industry standard control currents from  $\pm 2.5$  mA to  $\pm 16$  mA including pulsed and sustained currents are supported. The option specifies an applique circuit board which attaches to the Line Interface Controller (TDM-LIC) and contains a high voltage DC/DC converter power supply with two (2) programmable control current regulators.

### 2.19.2 TDM-OP315 DC LINE OPERATED BUSY LED (LOBL) [REQUIRES TDM-OP311]

The TDM-OP315 is a software option which configures a particular channel to derive channel busy indication from the loop keying current produced by a paralleled connected DC remote control unit. A "sensitivity" control is provided to allow the LOBL to be optimized for the specific control parameters of each channel.

## 2.20 MISCELLANEOUS OPTIONS

### 2.20.1 TDM-OP318 NON-VOX OPERATED PATCH

As a general rule, cross-patch is a VOX activated function that operates on a first-come, first-served basis. TDM-OP318 is a software option which configures the channel for non-vox patch priority such that

an incoming external control signal forces the patch direction outward from the channel. This option requires that the base station receiver be equipped with a COR (Carrier Operated Relay) output. Typical applications are in simplex or half duplex EMS systems where hospital-based radios or controllers must have patch priority.

### 2.20.2 TDM-OP319 FULL DUPLEX, FULL CONFERENCING, EMS PATCH

Typical digital audio systems cannot provide full conferencing patch capability for more than two participants because the CODEC used for audio processing can only read data from a single time slot. TDM-OP319 is a hardware option which configures the channel to read up to 120 time slots and allows the channel to function as part of an EMS type matrix patch network with full duplex, full conferencing patch capability. The option specifies an applique' circuit board which contains proprietary digital audio circuitry and attaches to the Line Interface Controller (LIC).

### 2.20.3 TDM-OP321 E&M REMOTE KEYING

TDM-OP321 is a software option which configures a particular channel for E&M (6-Wire) keying. The option provides an optoisolated receiver unmuting input (E-Lead) plus an isolated relay contact closure to key the base station or a microwave mux path (M-Lead). This option may also be used to interface with local or extended-local control base stations.

### 2.20.4 TDM-OP324 TONE DETECTOR

TDM-OP324 is a hardware option which equips the channel to detect and respond to a specific in-band tone or tone combination. The tone detector is a Digital Signal Processor with outputs that may be directed to any of the normal channel control logic inputs. Typical applications are burst tone detection, voter pilot tone detection, non-vox controlled patch and channel alarms.

### 2.20.5 TDM-OP325 ALERT/MONITOR RX CONTROL

TDM-OP325 is a software option which holds the receiver audio fully muted until an external ALERT command is received. Upon receipt of the logic transi-

tion, the receiver audio is passed at full volume until the mute condition is manually restored. The receiver audio can be manually unmuted at any time via either a MONITOR/RESET key on the channel control module or the volume control knob cap.

*Note: Option does not include alert decoder.*

### 2.20.6 TDM-OP327 TONE NOTCH FILTER

TDM-OP327 is a hardware option which equips the channel with a digital notch filter to reject a specific in-band tone. A typical application is pilot tone rejection when monitoring the output of a receiver which is encoded for use with a voting comparator system. TDM-OP324 is a prerequisite for this option.

### 2.20.7 TDM-OP329 SUBTRACTIVE ECHO CANCELLATION

TDM-OP329 is a hardware option which equips the channel with a Digital Signal Processor programmed for subtractive echo cancellation. A typical application is in full duplex, cross band repeater, EMS hospital matrix systems in which the output of a mobile repeater must be suppressed at the console to avoid acoustic feedback through the repeater. The technical issues involved in subtractive echo cancellation are highly complex and application-specific. Contact the factory for Engineering assistance before specifying this option.

### 2.20.8 TDM-OP331 4-WIRE RECEIVE AUDIO

TDM-OP331 is a software option which configures a particular channel for 4-Wire audio and assigns the necessary I/O pairs to the connector wire list. Unless otherwise specified at the time of order, the 4-Wire receive audio port will be disabled.

### 2.20.9 TDM-OP333 THROUGH CONSOLE REPEAT OPERATION (NON-VOX)

TDM-OP333 is a software option which configures the channel such that receive audio (e.g. from a voting comparator) is automatically retransmitted through the Line Interface Controller (LIC). Receive audio is pre-empted during console originated transmissions. Operator control of the self-repeat function is provided via a key on the channel control module.

The repeater dropout time is programmable from 1 to 4 seconds. This option requires that the base station receiver be equipped with a COR output.

#### 2.20.10 TDM-OP335 4-SITE SELECTION RELAYS

TDM-OP335 is a hardware option which equips the channel with four (4) alternate line selection relays and assigns the necessary I/O pairs to the connector wire list. Site selection control can be accomplished either of two ways:

1. Requires one M3604G or M4604G T/R module at each console position. The top keys on the channel module are used to step from site to site. The right key increments from S1 >> S4 -- the left key decrements from S4 << S1. This method offers the advantage of requiring only a single module width of tray space but is less user friendly if sites are frequently switched. This method cannot be used if the channel has other control options that requires keys to be designated for site selection.
2. Requires one M3601G or M4601G T/R module plus one M2904Y Auxiliary Switch module for site selection. The site keys are programmed as a 1-of-4 interlocked group. This method is more user friendly since each site is clearly identified but requires two module widths of tray space and has the added cost burden of the switch module. This method is compatible with all other channel control options.

#### 2.20.11 TDM-OP336 8-SITE SELECTION CONTROL

TDM-OP336 is a hardware option which equips the system with 8-site selection control. This requires: 1/2 TDM-AUX card with relays for each T8 base station, and TDM-M3601G or TDM-M4601G T/R module plus TDM-M2908Y module with option TDM-OP604B at each position.

#### 2.20.12 TDM-OP338 MULTIPLE SOURCE CROSS MUTE

TDM-OP338 is a hardware option which must be specified for any channel that must be cross muted by two or more transmit sources. This option can be used with T1-R1, T2-R2, T4-R4, T2-2R and T4-4R chan-

nels and Receive-only channels. Individual frequencies may be specified as the mute source from T2 and T4 channels. This option is not required for single-point cross muting.

#### 2.20.13 TDM-OP340 "HOT STANDBY " LIC CARD

Unless otherwise specified, a single Line Interface Controller (LIC) is provided for each channel in the system. TDM-OP340 is a hardware option which provides an additional controller which operates in a "hot standby" mode. Should a failure of the primary control card be detected, the "hot standby" controller will be automatically brought on-line and the "failed" controller will be isolated from the system.

*NOTE: If the channel is equipped with a tone LOBL applique (OP305), a DC keying applique (OP311) or a full conferencing patch applique (OP319), these options must be specified and priced separately for both the main and standby LIC card.*

*If the channel is T2-2R, T4-4R or T8-8R and uses a QRC for a receive audio path, OP341 must also be specified to assure proper failure protection.*

#### 2.20.14 TDM-OP341 "HOT STANDBY " QRC CARD

TDM-OP341 is a hardware option which provides an additional Quad Receiver Controller (QRC) which operates in a "hot standby" mode. Should a failure of the primary control card be detected, the "hot standby" controller will be automatically brought on-line and the "failed" controller will be isolated from the system. The option includes the standby QRC card and backplane interconnect cable. While OP341 can be used to back-up any QRC in the system, its primary intended use is to back-up QRC cards which are part of multi-receiver T/R channels equipped with option OP340.

#### 2.20.15 TDM-OP345 4-CODE CTCSS SELECTION

TDM-OP345 is a software option which configures a particular channel to generate control functions to select any of four (4) CTCSS tone codes. The control functions switch the CTCSS generator at the base

station -- the console dispatch position cannot generate the actual CTCSS tone code. DC or tone remote control may be used to implement this option.

CTCSS code selection requires one M2904Y Auxiliary Switch module in addition to the T/R module. The selection keys are programmed as a 1-of-4 interlocked group. This option is compatible with all other channel control options.

*NOTE: In tone keying systems, the function tones will be 1350 Hz, 1250 Hz, 1150 Hz and 1050 Hz for CTCSS codes 1 - 4 respectively, unless otherwise specified.*

### 2.20.16 TDM-OP346 8-CODE CTCSS SELECTION

TDM-OP346 is a software option which configures a particular channel to generate control functions to select any of eight (8) CTCSS tone codes. The control functions switch the CTCSS generator at the base station - the console dispatch position cannot generate the actual CTCSS tone code. Tone remote control must be used to implement this option.

CTCSS code selection requires one M2908Y Auxiliary Switch module in addition to the T/R module. The selection keys are programmed as a 1-of-8 interlocked group. This option is compatible with all other channel control options. dispatch position cannot generate the actual CTCSS tone code. Tone remote control must be used to implement this option.

*NOTE: In tone keying systems, the function tones will be 1350 Hz, 1250 Hz, 1150 Hz, 1050 Hz, 1750 Hz, 1650 Hz, 1550 Hz and 1450 Hz for CTCSS codes 1 - 8 respectively, unless otherwise specified.*

### 2.20.17 TDM-OP347 REPEATER-DOWN TRAFFIC MARKER

In mobile relay systems, if the repeater is disabled, mobiles using the channel cannot hear other mobile units using the channel. TDM-OP347 is a software option which causes a 700 Hz tone to be transmitted on the talk-out frequency for second every 2 seconds during mobile talk-in, when the repeater is disabled. The marker is automatically activated upon repeater knockdown (refer to TDM-OP501).

### 2.20.18 TDM-OP348 LIC AUXILIARY RELAY CONTROLS (4-FUNCTION)

TDM-OP348 is a hardware option which equips the channel with four (4) auxiliary relays controlled by the four option keys on a "G" or "S" series T/R channel control module. Each relay provides two (2) isolated Form C contacts. The option specifies the line terminator auxiliary relay applique board, backplane interconnect cable and assigns the appropriate I/O pairs to the connector wire list.

### 2.20.19 TDM-OP351 ACTIVATE LIC DIGITAL DATA PORT (VEHICLE ID)

TDM-OP351 is a hardware option which equips the channel with an RS232C digital data link in addition to the usual 2 wire/4 wire audio links. This option is intended for use with vehicle tracking systems, trunking interface controllers, digital voice encryption systems and vehicle identification systems. The data rate is programmable from 1200 baud to 19.2K baud. The message length is limited to 31 characters.

### 2.20.20 TDM-OP362 INDIVIDUAL TALKGROUP ENCRYPTION-EFJ MULTI-NET

TDM-OP362 is a hardware option which allows individual EFJ Multi-Net II talkgroups to be encrypted. Each encrypted talkgroup will require one (1) TDM-LIC equipped with TDM-OP362. The TDM-LIC must be ordered separately. Each TDM-OP362 must have a corresponding DIM (Dispatch Interface Module) card in the RNT.

Each encrypted talkgroup will require one full RTL I/O group (5-pairs) from the Central Processor. Each 25-pair connector can support five (5) encrypted talkgroups. Additional TRL I/O kits (TDM-OP711) and assitional I/O connector capacity (TDM-OP210) may be required for some Multi-Net systems.



## SECTION 3 CRT CONSOLE POSITION EQUIPMENT

### 3.1 CRT CONSOLE PROCESSOR

The VR-CM50 Console Processor includes the following: (see Figure 3-1)

1. SVGA 0.28 DP Monitor available in a 14", 17" or 21" flat screen (see Table 3-1).

CONTROL TRAY WHICH CONSISTS OF:

1. Programmable Keypad
2. Selected/Unselected Audio Speakers
3. Accessory module slot (Optional). (Refer to Section 1.7.1 for possible modules to be installed in this slot.)

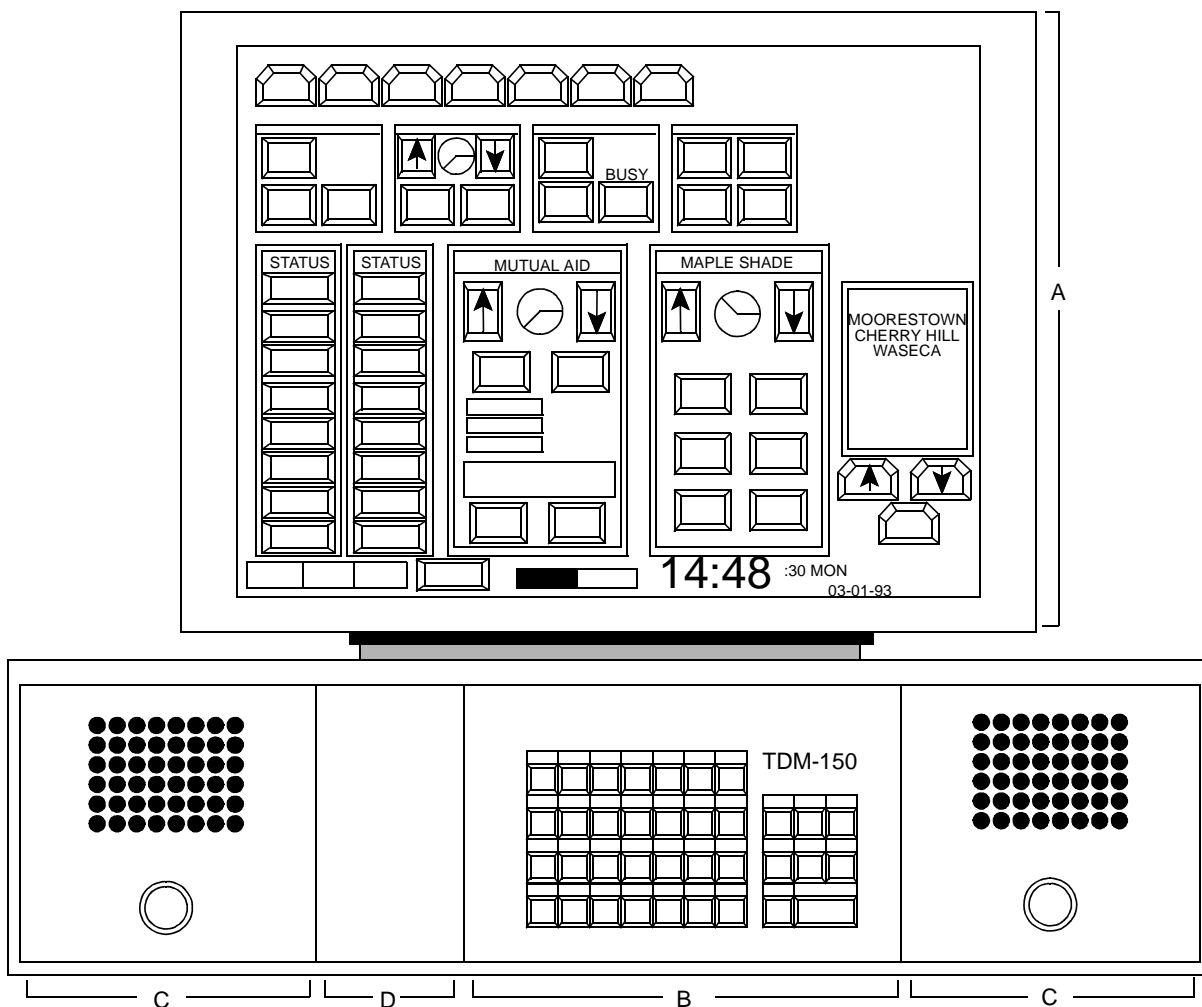


Figure 3-1 TDM-150 CRT CONSOLE PROCESSOR

**Table 3-1 AVAILABLE MONITORS**

Monitor Size	Console Mount	Desk Top	Electronics Only	Work Station
14"	TDV-1509400C	TDV-1509400D	TDV-1509400E	TDV-1509400W
17"	TDB-1509417C	TDV-1509417D	TDV-1509412E	TDV-1509417W
21"	TDV-1509421C	TDV-1509421D	TDV-1509421E	TDV-1509421W

All models may be controlled by a Mouse/Trackball and/or a Touchscreen.

*NOTE: Each position must be equipped with a TDV-OP400/xx Power Connector option.  
Each position must be equipped with at least one Control Option, TDV-OP490 - TDV-OP492.*

**3.1.1 CONSOLE MODELS (C-SUFFIX)**

Console Models (C-Suffix) are for installation in E.F. Johnson (or other) console cabinetry. The control electronics is housed in a 5 1/4" rack mounted tray which includes Selected and Unselected Audio speakers, a control panel with keypad and space for an accessory special function module. A slide-out drawer is included to mount the console PC and UPS in the base of the console.

**3.1.2 DESK-TOP MODELS (D-SUFFIX)**

Desk-Top Models (D-Suffix) are similar to "C" models above but include a desktop enclosure for the control electronics tray. The console PC and UPS are furnished in free standing cases for placement under or next to the console desk.

**3.1.3 ELECTRONICS-ONLY MODELS (E-SUFFIX)**

Electronics-Only Models (E-Suffix) are similar to "C" models above but are furnished as individual components for mounting in customer provided, rack-mounted furniture. The console PC and UPS are furnished in free standing cases. Interface cables are furnished in extended lengths to allow for extra deep console furniture.

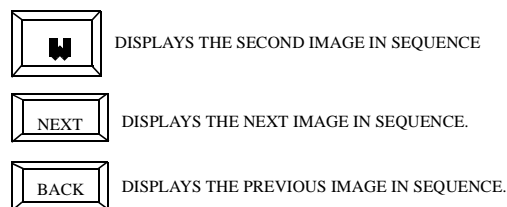
**3.1.4 WORK STATION MODELS (W-SUFFIX)**

Work Station Models (W-Suffix) have no control electronics tray - all console operations are performed via the CRT screen. The console electronics, PC and

UPS are all furnished in free-standing cases for placement under or next to the work station desk. Selected and Unselected Audio speakers are furnished in satellite cases for placement on the work station desk top at the convenience of the operator.

**3.2 CRT RADIO CONTROL MODULES**

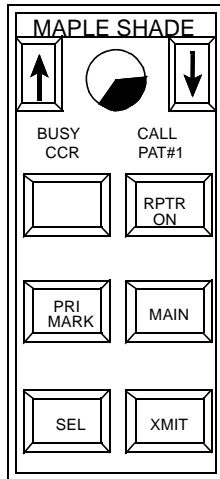
In a CRT console system, radio control modules appear on the Main Screen. Modules can be displayed in a variety of different sizes ranging from Large to Micro (see Figures 3-4 and 3-5). The Large module is the most convenient to use because all control functions are continuously displayed. However, due to space limitations, it is often necessary to depict the radio control modules in smaller image sizes in order to fit the desired number on the Main Screen. when a smaller module image is displayed, in most cases, there will be other representations of the module hidden from view which control the lesser used functions of the channel.



**Figure 3-2 IMAGE DISPLAY KEYS**

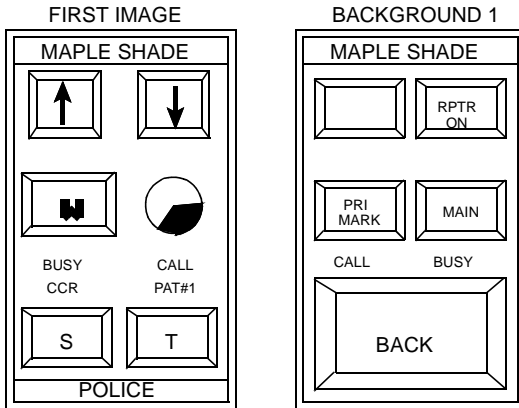
The various images of the smaller modules can be accessed in sequence; that is, the first image allows access to the second, etc. with the last image accessing the first. The operation is as follows:

All the buttons appear at one on the Full Size Radio Module (see Figure 3-3) and are accessed from the Main Screen.

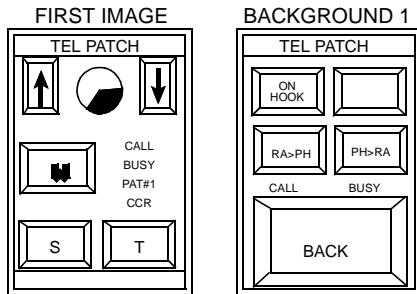


**Figure 3-3 FULL SIZE RADIO MODULE**

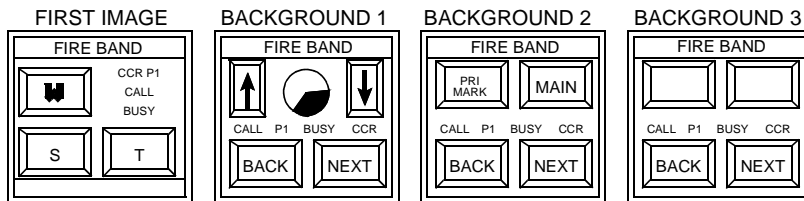
MEDIUM T/R MODULE:



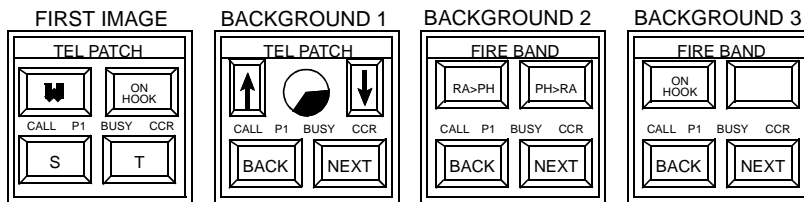
SMALL T/R MODULE:



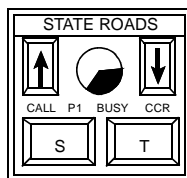
TINY T/R MODULE (Regular):



TINY T/R MODULE (With Front Screen Option Button):



TINY T/R MODULE (With No Option Buttons):



MICRO MODULE (With No Option Buttons):

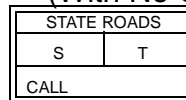
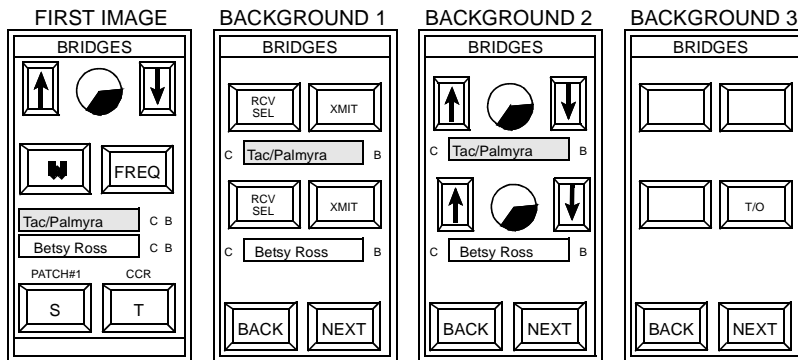
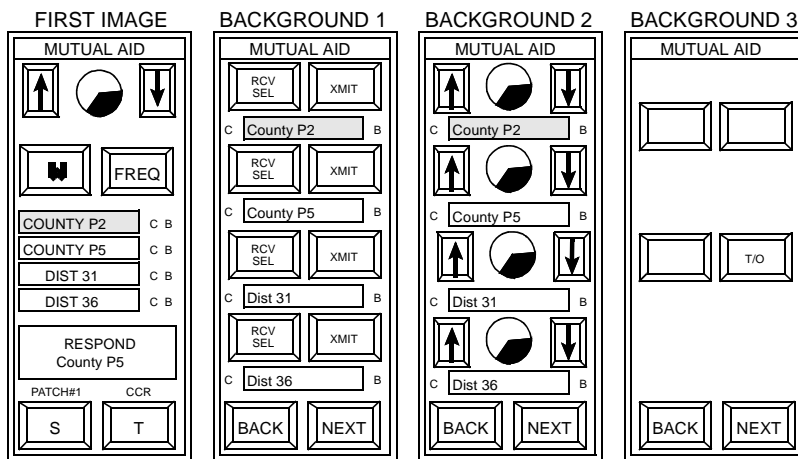


Figure 3-4 RADIO MODULE SIZES

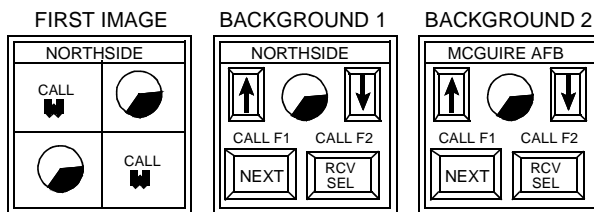
T2/2R MODULE:



T4/4R MODULE:



DUAL RECEIVE MODULE:



TRUNKING/VEHICLE ID MODULE:

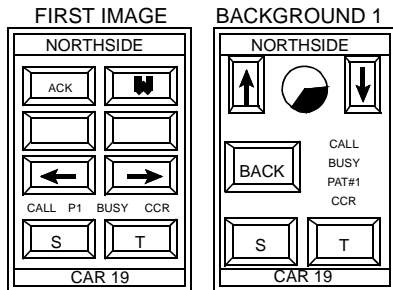


Figure 3-5 MULTI-FREQUENCY RADIO MODULES

**3.3 SUMMARY OF CRT CONSOLE POSITION OPTIONS**

<b>AC POWER</b>	TDV-OP400/A	Equip Position for 120V AC w/N. America Power Connectors
	\$ TDV-OP400/GB	Equip Position for 240V AC w/British Power Connectors
	\$ TDV-OP400/E	Equip Position for 240V AC w/European Power Connectors
	\$ TDV-OP400/I	Equip Position for 240V AC w/India-S. Africa Power Connectors
	\$ TDV-OP400/NZ	Equip Position for 240V AC w/Australia-New Zealand Power Connectors
<b>FOOT SWITCH</b>	\$ TDV-OP401D	Dual Foot Switch-Monitor/PTT
	\$ TDV-OP401DD	Dual Foot Switch-Monitor/PTT (Desktop Console)
	\$ TDV-OP401S	Single Foot Switch-PTT Only
	\$ TDV-OP401SD	Single Foot Switch-PTT Only (Desktop Console)
	\$ TDV-OP401W	Single 24" Foot Switch-PTT Only
<b>MICROPHONE</b>	\$ TDV-OP402/HR	Panel Microphone-Hum Reducing
	\$ TDV-OP404	Portable Desk Microphone w/Monitor/PTT Switches
	\$ TDV-OP405	Auxiliary Microphone Location
<b>HEADSET/TELCO INTERFACE</b>	\$ TDV-OP406	Headset Jack Interface
	\$ TDV-OP406/D	Headset Jack Interface for Desktop Cabinet
	\$ TDV-OP407	Second Headset Jack
	\$ TDV-OP409	Electronic 1A2 Telco Interface
	\$ TDV-OP410	Two-Line Telco (911+Admin Lines)
<b>PAGING/SIGNALING ENCODER</b>	TDV-OP411	1+1 Keypad Paging Format
	TDV-OP412	2+2 Keypad Paging Format
	TDV-OP413	Single Tone Keypad Signaling Format
	TDV-OP414	DTMF Keypad Signaling Format
	TDV-OP415	1500 Hz Rotary Dial Keypad Signaling Format
	TDV-OP416	2805 Hz Rotary Dial Keypad Signaling Format
	TDV-OP417	5/6 Tone Keypad Signaling Format
<b>QUEUE PAGING</b>	TDV-OP418	Stack-Then-Send Paging Control
<b>PAGING ASSIGNMENT</b>	TDV-OP419	Single Button Paging Assignment
<b>CROSS PATCH</b>	TDV-OP420	Eight Level Channel Cross Patch
<b>ALERT TONES</b>	TDV-OP421	1004 Hz Steady Alert Tone
	TDV-OP422	600 Hz Steady Alert Tone
	TDV-OP423	1004 Hz Pulsing Alert Tone - 2 PPS
	TDV-OP424	600 Hz Pulsing Alert Tone - 2 PPS
	TDV-OP425	1500/900 Hz Warble Alert Tone
	TDV-OP426	1200 Hz Steady Alert Tone
	TDV-OP427	1004 Hz 3-Pulse Alert Tone

The "\$" Symbol preceding an option indicates an associated charge for that option.

**CRT CONSOLE POSITION OPTIONS (Continued)**

MISCELLANEOUS	TDV-OP430	Simulcast Instant PTT
	TDV-OP431	PA System Feed
	TDV-OP433	Two-Key Safety Interlock
	TDV-OP434	Global Selected Channel Priority Marker
	TDV-OP435	Select Key Interlock Defeat
	TDV-OP438	Local PTT Relay Contact Output
	TDV-OP439	Global "Call" Operation
	TDV-OP441	First Level Supervisor
	TDV-OP442	Second Level Supervisor
		\$ TDV-OP445/C1ATIS Recall Recorder Interface - Single Channel
		\$ TDV-OP445/C2ATIS Recall Recorder Interface - Dual Channel
	\$ TDV-OP448	EKG Telemetry Notch Filters
	\$ TDV-OP450	Additional Console PIC Card for Monitor Speakers
	\$ TDV-OP451	Assign Channels to Dedicated Monitor Speaker
	TDV-OP452	Assign All Channels to Individual Speakers
	\$ TDV-OP453	PIC Monitor Speakers
	\$ TDV-OP454	PIC On-Line Programming
	TDV-OP460	Console Equipped for Remote Operation
	TDV-OP462	Equip Console for EFJ Multi-Net II
	\$ TDV-OP465	Console Equipped with CRT EMS Patch Matrix
	\$ TDV-OP468	Console Equipped with Multi-Line Telephone
	\$ TDV-OP470	Console Equipped with Assignable Channel Modules
	\$ TDV-OP475	2X Console UPS Hold-Up Time
	\$ TDM-OP490	Equip Console for Trackball Control
	\$ TDV-OP491	Equip Console for Mouse Control
	\$ TDV-OP492	Equip Console for 14" Touchscreen Control
	\$ TDV-OP492/17	Equip Console for 17" Touchscreen Control
	\$ TDV-OP492/21	Equip Console for 21" Touchscreen Control

The "\$" Symbol preceding an option indicates an associated charge for that option.

### 3.4 CRT CONSOLE POSITION OPTIONS

The following options describe choices for CONSOLE CONFIGURATION. Hardware options generally have an associated cost impact. Software Options are offered at NO CHARGE if specified at the time of original system order. Hardware modifications may be required when adding software options to existing VR-CM50 systems.

#### 3.4.1 POWER CONNECTORS

The Console position **must** be equipped with a power connector from the **TDM-OP400** options which will provide 120V (85-130V, 47-66 Hz AC single phase power) or 230V (170-260V, 47-66 Hz AC single phase power) system operation. Power supply outlets will be NEMA 5-15 for all 120V NA systems and SCHUKO for all 230V systems. Options TDM-OP200/A, TDM-OP200/GB, TDM-OP200/E, TDM-OP200/I and TDM-OP200/NZ are the corresponding power connector options for the Central Processing Package (CPP). (Refer to Section 2.7.1.)

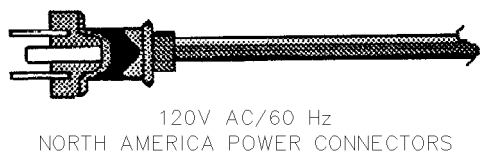


Figure 3-6 TDM-OP200/A

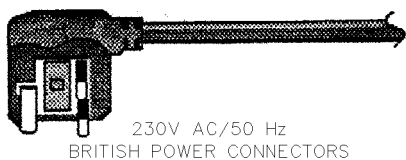


Figure 3-7 TDM-OP200/GB



Figure 3-8 TDM-OP200/E

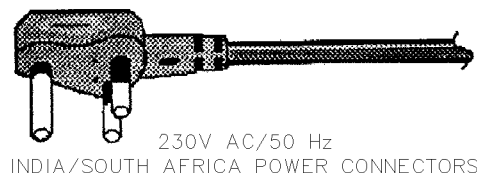


Figure 3-9 TDM-OP200/I

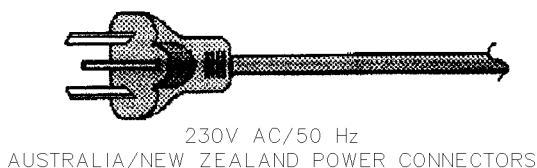


Figure 3-10 TDM-OP200/NZ

### 3.5 FOOT SWITCH

#### 3.5.1 TDV-OP401D DUAL FOOT SWITCH - MONITOR/PTT

Unless otherwise specified, radio control panels are equipped only for manual operation of the MONITOR and TRANSMIT functions. TDV-OP401D is a **hardware option** which provides a heavy-duty dual foot switch with an anti-skid base to allow hands-free activation of MONITOR and TRANSMIT for the selected channel(s). This foot switch has a cord length of one (1) foot.

The Desktop Console version of this foot switch (**TDV-OP401DD**) is identical to the above but includes a cord length of eight (8) feet.



### 3.5.2 TDV-OP401S SINGLE FOOT SWITCH - PTT ONLY

TDV-OP401S is a **hardware option** which provides a heavy-duty single foot switch with an anti-skid base to allow hands-free activation of 'Transmit' for the selected channel(s). The 'Monitor' function is operated manually from the control panel. This foot switch has a cord length of one (1) foot.

The Desktop Console version of this foot switch is **TDV-OP401SD** which is identical to the above but has a cord length of eight (8) feet.

### 3.5.3 TDV-OP401W SINGLE FOOT SWITCH

TDV-OP401W is a **hardware option** which provides a heavy-duty single foot switch, 24 inches wide with an anti-skid base to allow hands-free activation of 'Transmit' for the selected channels. The 'Monitor' function is operated manually from the control panel.

*Note: This is a non-stock option available on special order only.*

## 3.6 MICROPHONE

### 3.6.1 TDV-OP402/HR PANEL MICROPHONE (HUM REDUCING)

TDV-OP402/HR is a **hardware option** which provides a cardioid pattern pencil microphone designed to reduce the hum induced from nearby CRT terminals. It has a uniform frequency response from 70 to 8000 Hz and a front/back sensitivity ratio of 20 dB. The microphone is mounted on a 13" flexible gooseneck which is attached to the radio control panel adjacent to the selected audio speaker. The microphone cable is concealed within the flexible gooseneck.

### 3.6.2 TDV-OP404 PORTABLE DESK MICROPHONE WITH MONITOR/PTT SWITCHES

TDV-OP404 is a **hardware option** which provides an omni-directional microphone having a uniform frequency response from 70 to 8000 Hz and a front/back sensitivity ratio of 20 dB. The microphone

is mounted on a portable desk stand and is equipped with a 5 foot cable which attaches to the console via a cowl connector.

### 3.6.3 TDV-OP405 AUXILIARY MICROPHONE LOCATION

Operator convenience frequently requires the placement of an auxiliary microphone away from the radio control panel; for example, at a computer terminal. TDV-OP405 is a **software option** which specifies a second microphone port. The additional microphone (TDV-OP402/HR or OP404) must be ordered separately.

## 3.7 HEADSET/TELCO INTERFACE

### 3.7.1 TDV-OP406 AND TDV-OP406D HEADSET JACK INTERFACE

TDV-OP406 is a **hardware option** which provides an audio interface and one dual headset jack to allow the use of an amplified headset/lip microphone such as those offered by PLANTRONICS, ACS and others for hands-free radio operation. On a free-standing console, the headset jack mounts under the writing surface at any convenient location. On desktop consoles, the headset jack mounts in the cabinet base. The headset jack is compatible with both 4- and 6-Wire headsets and includes a volume control and a switch to disable a trainee's microphone. Headsets must be ordered separately.

### 3.7.2 TDV-OP407 SECOND HEADSET JACK

Refer to TDV-OP406 for description of the headset jack. TDV-OP407 is a **hardware option** which provides a second, parallel connected headset jack which can be used by a trainee or supervisor. Both jacks have individual volume controls.

### 3.7.3 TDV-OP409 ENHANCED 1A2 TELCO HEADSET OPERATION

TDV-OP409 is a **hardware option** which allows a headset to function both with the radio and an associated telephone instrument. The features include:

1. Separate radio and telephone jack-box volume controls.
2. Amplified Telephone Rx.

TDV-OP406 and TDV-OP407 (if required) must be specified separately. The telephone instrument must be headset compatible.

Operation is as follows:

With the telephone on-hook, selected audio is routed to the headset earpiece, the selected panel speaker is muted and the headset microphone is routed to the radio channels. With the telephone **off-hook**, selected audio reverts to the panel speaker and the headset is routed to the telephone instrument to allow normal, full duplex telephone operation. Should it be necessary to use the radio while the telephone is off-hook, pressing any PTT switch will place the telephone on "1/2 hold" during the radio transmission. Telephone audio will continue to appear at the headset earpiece but the caller will not hear the radio transmission.

*NOTE: For a TELCO interface to function effectively, the telephone instrument must generate an off-hook output when a line pickup key is activated. Most 1A2 key systems provide this function, however many of the newer digital key-sets cannot. A "wild key" on the console control tray can be assigned to provide the off-hook transfer.*

### 3.7.4 TDV-OP410 TWO-LINE TELCO OPERATION (911 + ADMINISTRATIVE LINES)

Systems which are part of 911 PSAPs often have the need for the console operator to access two telephone instruments through the headset; the 911 lines and the administrative (non emergency) lines. TDV-OP410 is a **hardware option** which allows the headset to switch between the radio and either of two telephones with a minimum of manual operator control required.

Both telephone instruments must be headset compatible. To function properly, at least one (and preferably both) of the two telephone instruments must generate an off-hook output when a line pickup key is enabled. The majority of 911 and E911 instruments do

offer this feature - check with the telephone supplier to be sure. As discussed under TDV-OP408, most of the newer feature-intensive, digital phone systems do not provide off-hook outputs, manual switching is required.

*NOTE: At minimum, TDV-OP406 and TDV-OP409 must also be specified if TDV-OP410 is desired.*

## 3.8 PAGING/SIGNALING ENCODER OPTIONS

Each Dispatch Position may be equipped with up to four of the following paging or signaling encoder options

### 3.8.1 TDV-OP411 1+1 KEYPAD PAGING FORMAT

TDM-OP411 is a **software option** which adds a two-tone-sequential matrix encoder to the radio control panel keypad in any of several code plan formats (e.g. MOTOROLA QC II, GE TYPE 99, REACH, PLECTRON, etc). The Code Plan (e.g. MOTOROLA "N" plan), Group Format (Diagonal tone or Long Tone B), and Timing Protocol (e.g. Tone A time, Inter-tone gap time, Tone B time, Warble time and Waiting time between consecutive pages) must be specified in detail.

The output can be directed to the Selected Channel or a dedicated channel, site and/or frequency under program control. Operator feedback is displayed via the control panel CRT.

### 3.8.2 TDV-OP412 2+2 KEYPAD PAGING FORMAT

TDV-OP412 is a **software option** which adds a 2+2 matrix tone encoder to the radio control panel keypad in any of several code plan formats such as Motorola QC I or Bramco. The code plan [e.g. Motorola "A, B or Z" plan] and timing protocol must be specified in detail.

The output can be directed to the selected channel or a dedicated channel under program control. Operator feedback is displayed on the CRT.

*NOTE: TDV-OP412 uses a 4-digit access code.*

### 3.8.3 TDV-OP413 SINGLE-TONE KEYPAD SIGNALING FORMAT

TDV-OP413 is a **software option** which adds a 16-function, EIA single-tone encoder to the radio control panel keypad. Timing protocol must be specified.

The output can be directed to the selected channel or a dedicated channel under program control. Operator feedback is displayed on the CRT.

### 3.8.4 TDV-OP414 DTMF KEYPAD SIGNALING FORMAT

TDV-OP414 is a **software option** which adds a 16 key DTMF encoder to the radio control panel keypad. The encoder operates in the "store and send" mode for up to 12 digits per sequence. The tone mark and space times must be specified.

The output can be directed to the selected channel or a dedicated channel under program control. Operator feedback is displayed on the CRT.

### 3.8.5 TDV-OP415 1500 HZ ROTARY DIAL KEYPAD SIGNALING FORMAT

TDV-OP415 is a **software option** which adds a 12 key Dial Pulse (Interrupter) encoder to the radio control panel keypad. The encoder operates in the "store and send" mode for up to 12 digits per sequence. The pulse rate and mark/space ratio must be specified.

The output can be directed to the selected channel or a dedicated channel under program control. Operator feedback is displayed on the CRT.

### 3.8.6 TDV-OP416 2805 HZ ROTARY DIAL KEYPAD SIGNALING FORMAT

TDV-OP416 is a **software option** which adds a 12 key Dial Pulse (Interrupter) encoder to the radio control panel keypad. The encoder operates in the "store and send" mode for up to 12 digits per sequence. The pulse rate and mark/space ratio must be specified.

The output can be directed to the selected channel or a dedicated channel under program control. Operator feedback is displayed on the CRT.

### 3.8.7 TDV-417 5/6 TONE KEYPAD SIGNALING FORMAT

TDV-OP417 is a **software option** which adds a 10 key 5/6 tone digital encoder to the radio control panel keypad. The encoder operates in the "store and send" mode for up to 12 digits per sequence. 5/6 tone signaling is offered in four (4) common formats: U.S.A./EIA, CCIR, EEA and ZVEI.

The formats differ in tone assignments, tone and gap timing and in the method of group alerting. The exact format desired must be specified at the time of order.

The output can be directed to the selected channel or a dedicated channel under program control. Operator feedback is displayed on the CRT.

## 3.9 QUEUE PAGING

### 3.9.1 TDV-OP418 STACK-THEN-SEND PAGING

Refer to option TDV-OP419 below. In normal operation, Single Button Pages are transmitted instantly upon pressing a paging key. TDV-OP418 is a **hardware option** which causes all pages to be placed in a stack queue rather than instantly transmitted. Pressing a SEND key will transmit the stack. Pressing a CLEAR key will erase the stack. Pressing an ABORT key will terminate the stack transmission. Priority pages can be instantly transmitted without having to stack by pressing the UNLOCK key on the Master Control panel simultaneously with a paging key, even if there is a stack of pages in queue. TDV-OP418 is a position-wide option - i.e. if programmed, it must apply to all single button page keys on the console.

## 3.10 PAGING ASSIGNMENT

### 3.10.1 TDV-OP419 SINGLE BUTTON PAGING ASSIGNMENT

This **software option** provides up to 256 single button activated pages per console position. Each button may be assigned any paging code from any of the

installed paging options, TDV-OP411 through TDV-OP418. Paging codes assigned to single button activation may be stacked and chained for multiple pager access from a single key depression. Each page may be automatically steered to any channel, frequency or site in the system. Any of a series of distinctive alert tones may be appended to any single button page or sequence.

Paging buttons may be placed on the Main Screen or on dedicated Paging Screens. Buttons may be color coded to suit operator preferences. The number of single button pages per console must be specified.

### 3.11 CROSS PATCH

#### 3.11.1 TDV-OP420 EIGHT LEVEL CHANNEL CROSS PATCH

TDV-OP420 is a **software option** which allows the console to cross patch between two or more radio and/or dedicated telephone channels. Each console can support up to eight (8), simultaneous on-going patches. The TDV-150 system can support an unlimited number of patch combinations. There is no limit to the number of installed channels that can participate in any patch combination.

*NOTE: If phone patch operation is required, the Central Processor must be equipped with one TDM-TPI card for each separate phone patch line.*

### 3.12 ALERT TONE OPTIONS

Each console is equipped to generate any three of the listed alert tone options. Specify three for each console position.

TDV-OP421 - 1004 Hz Steady Alert Tone  
(Most commonly Specified)

TDV-OP422 - 600 Hz Steady Alert Tone

TDV-OP423 - 1004 Hz Pulsing Alert Tone  
(2 PPS Pulse Rate)

TDV-OP424 - 600 Hz Pulsing Alert Tone  
(2 PPS Pulse Rate)

TDV-OP425 - 1500/900 Hz Warble Alert Tone  
(Most commonly Specified)

TDV-OP426 - 1200 Hz Steady Alert Tone

TDV-OP427 - 1004 Hz 3-Pulse Only Alert Tone

### 3.13 MISCELLANEOUS OPTIONS

#### 3.13.1 TDV-OP430 SIMULCAST INSTANT PTT

Unless otherwise specified, the radio control panel is equipped with two simulcast enable switches which recall simulcast combinations from memory for activation via the transmit bar. TDV-OP430 is a **software option** which reconfigures these switches to function as Simulcast Instant Transmit keys rather than simulcast enable keys.

#### 3.13.2 TDV-OP431 PA SYSTEM FEED

TDV-OP431 is a **software option** which assigns a key on the control tray to access a customer-furnished PA system. The PA interface provides a Form C relay contact for PA amplifier keying and a 600 ohm balanced audio output from the CPP at 0 dBm level when the PA key is pressed at any console.

#### 3.13.3 TDV-OP433 TWO-KEY SAFETY INTERLOCK

This **software option** assigns the UNLOCK key on the Master Control Panel to act as a safety interlock to prevent accidental activation of single button page sequences or auxiliary control functions such as sirens or overhead doors. The UNLOCK key switch must be pressed and held before and while the page or auxiliary switch is pressed to start the desired function.

#### 3.13.4 TDV-OP434 GLOBAL SELECTED CHANNEL PRIORITY MARKER

Sometimes there is a need to continuously alert the users of a channel that radio traffic is limited to priority messages only. TDV-OP434 is a **software option** which encodes a 700 Hz tone that is transmitted for 0.6 seconds and repeats every 6 seconds in the absence of voice traffic on the channel. Tx or Rx voice traffic on the channel will cause the marker tone to be inhibited for the duration of the message. Any channel(s) may be placed in a "marked" state while normal console operations are conducted on another selected channel.

### 3.13.5 TDV-OP435 ALTERNATE ACTION CHANNEL SELECT

In normal operation, pressing the SELECT key of any channel will automatically DESELECT any previously selected channel(s). TDV-OP435 is a **software option** which changes all SELECT keys to alternate action; press to select - press again to deselect, with no interlock among channels.

### 3.13.6 TDV-OP438 LOCAL PTT RELAY CONTACT OUTPUT

TDV-OP438 is a **hardware option** which adds a relay to the Control Tray Processor to provide a dry contact closure for any manual console PTT command from the Transmit Bar, Foot Switch or a module Instant PTT key. This feature is typically used to control an "ON-THE-AIR" lamp or mute a dispatch room TV set or intercom.

### 3.13.7 TDV-OP439 GLOBAL "CALL " OPERATION (MASS TRANSIT APPLICATION)

This **software option** changes the key normally assigned to MONITOR on the Master Control Panel to a second Transmit key labeled CALL. The TRANSMIT bar and right side foot switch, causes PTT with the station CTCSS tone stripped. The CALL key and left side foot switch, causes PTT with the station CTCSS tone encoded. The key on the Master Control Panel normally assigned to PRIORITY MARKER or PA FEED is reassigned as the MONITOR key. This option finds frequent application in consoles used in Mass-Transit systems.

### 3.13.8 TDV-OP441 FIRST LEVEL SUPERVISOR (1 REQUIRED PER SYSTEM)

This **software option** designates a specific console Dispatch Position as the first level (highest priority) system supervisor. This Dispatch Position will have time setting capability, receive diagnostic messages and have transmit priority over all other consoles in the system. The option also allows the supervisor to disable certain channel modules at designated positions or to disable/enable one or more entire console position(s). The color of the disabled channel module will change from gray to cyan and the word "DISABLED" will be displayed on the module.

### 3.13.9 TDV-OP442 SECOND LEVEL SUPERVISOR

This **software option** designates one or more specific Dispatch Positions as a second level system supervisor. These Dispatch Positions will have Channel/Position Disable/Enable capability and transmit priority over non-supervisory positions, but are subordinate to the first level supervisor. TDV-OP442 applies only to systems having three or more positions.

### 3.13.10 TDV-OP445 C1 AND C2 ATIS RECALL RECORDER INTERFACE - SINGLE/DUAL CHANNEL

TDV-OP445 is a **hardware option** which allows a single or dual channel ATIS IR-30U recorder to be controlled through the Master Control Panel. The C1 option provides a single channel recorder control. The C2 option provides dual channel recorder control. The recorder(s) are not included and must be purchased separately.

The ATIS IR-30U features simultaneous record and playback and has a 5 minute solid state digital memory which can be field expanded up to 60 minutes.

The recorder is controlled by a dedicated ATIS control Module which appears on the Main Screen and displays time and message block information. The recorder(s) can be connected to any audio source - typically the Telephone and/or Selected Audio and can be programmed to playback through the Selected Audio speaker (Telephone only), Unselected Audio speaker or a dedicated Monitor speaker. A take-off jack for downloading to a cassette tape recorder is included.

### 3.13.11 TDV-OP448 EKG TELEMETRY NOTCH FILTERS

TDV-OP448 is a **hardware option** which provides a notch filter for the Selected and Unselected audio speakers to remove the 1400 Hz carrier tone used for cardiac telemetry in EMS systems. The option uses a "wild key" on the Master Control Panel to switch the filter on and off as needed. The filter should not be permanently activated because its broad bandwidth will cause degradation in voice quality.

This option is mutually exclusive with certain other option TDV-OP409 if the phone does not provide automatic off-hook output.

### 3.13.12 TDV-OP450 ADDITIONAL CONSOLE PIC CARD FOR MONITOR SPEAKERS

In most cases, the Central Package will be equipped with one (1) Position Interface Controller (PIC) for each console in the system. One Position Interface Controller allows each Dispatch Position to have:

1. Full data communications with the Central Package and all other console positions in the system.
2. Selected and Unselected audio speakers.
3. Two (2) additional audio channels for dedicated monitor speakers (requires TDV-OP453 described below).

If a Dispatch Position requires more than four (4) speaker/amplifier modules, one or more additional PIC card(s) will be required to provide the extra audio channel capability. TDV-OP450 is a **hardware option** which equips the Central Package with an additional PIC card which allows up to four (4) additional audio channels. Any one console may have up to three (3) TDV-OP450s to provide a maximum of 16 speakers; Selected Audio and up to fifteen (15) Unselected Audio or sixteen (16) Dedicated Channel speakers.

*NOTE: This option provides expanded speaker capability only - not redundant data processing capability for the console position.*

#### **IMPORTANT:**

*When adding extra speakers to a CRT Console, mounting and power requirements must be considered. One or more TDM-1509102 Module Tray Processors must be used to mount the speaker modules. Each tray requires 5 1/4 x 19 inches of panel mounting space.*

*The TDV-OP1509400 power supply can support two additional speaker modules (not trays of speakers), if more than two additional speakers (Selected/Unselected plus 2 monitor) are required, additional power supply capacity will be required - contact E.F. Johnson Engineering.*

### 3.13.13 TDV-OP451 DEDICATED UNSELECTED AUDIO MONITOR SPEAKER

Unless otherwise specified, each Dispatch Position is equipped with two (2) speaker/amplifier modules: one (1) for Selected Channel Audio and the other for mixed audio from the unselected channels. TDV-OP451 is a **software option** which provides an additional speaker port which may be dedicated to a particular transmit/receive or receive-only channel or group of channels. Each speaker/amplifier module requires two (2) module slot spaces on a Module Tray Processor.

In order to be acoustically effective, there must be physical separation between monitor speakers and/or the select/unselect audio speakers. Allowance for this separation must be made in configuring the Module tray panels.

*NOTE: Option specifies programming only. Order TDM-1509102 module trays and TDM-M2301 Speaker Modules for each console as required. OP450 and/or OP453 may also be required.*

### 3.13.14 TDV-OP452 INDIVIDUAL CHANNEL SPEAKERS

TDV-OP452 is a **software option** which permanently assigns each channel to a dedicated speaker regardless of whether the channel is selected or unselected. This option is not compatible with headset operation. Each speaker/amplifier module requires two (2) module slot spaces on a Module Tray Processor.

In order to be acoustically effective, there must be physical separation between monitor speakers and/or the select/unselect audio speakers. Allowance for this separation must be made in configuring the Module tray panels.

*NOTE: Option specifies programming only. Order TDM-1509102 module trays and TDM-M2301 Speaker Modules for each console as required. OP450 and/or OP453 may also be required.*

### 3.13.15 TDV-OP453 PIC AUDIO CHANNEL 3 AND 4

The basic TDM-PIC or TDV-OP450 supports two (2) speaker ports only. TDV-OP453 is a **hardware option** which specifies an applique board for the PIC card which must be ordered for any PIC supporting three (3) or four (4) speaker ports.

The TDM-PIC assigned to each console position will support only Selected Audio and Unselected Audio speakers. TDV-OP453 allows the use of two (2) TDV-OP451 speakers or TDV-OP452 dedicated channel speakers in addition to or in lieu of the Selected and Unselected Audio speakers.

### 3.13.16 TDV-OP454 PIC ON-LINE PERSONALITY REPROGRAMMING

The console personality programming is normally resident in one or sometimes two EPROM chips on the TDM-PIC. Any change in the console programming requires that a new personality EPROM be programmed and installed on the PIC. Replacement EPROMs can be obtained from the E.F. Johnson factory or, with proper equipment and software, programmed in the field by a qualified technician. The console must be taken off-line for EPROM replacement - a process which generally can be completed in less than 60 seconds.

TDV-OP454 is a **hardware option** which eliminates the need for EPROM replacement by providing personality resident in E<sup>2</sup>PROM which can be reprogrammed with the console on-line using an IBM or compatible PC with E.F. Johnson menu-driven software. A console equipped with TDM-OP454 can also be reprogrammed by modem from a remote location by a qualified technician or by the E.F. Johnson factory if the Central Processor is equipped with TDM-OP209 REMOTE DIAGNOSTICS AND PROGRAMMING. This option is furnished as standard equipment on all consoles sold after September 1, 1993.

### 3.13.17 TDV-OP460 CONSOLE EQUIPPED FOR REMOTE OPERATION

TDV-OP460 is a **software option** which permits the Dispatch Position console to be placed at virtually unlimited distances from the Central Processor Pack-

age using dedicated telephone lines or microwave mux channels. Typically, five (5) telephone pairs (type 3002 unconditioned lines) or three (3) full duplex microwave channels are needed for full console operation. Extra monitor or dedicated channel speakers may require additional link pairs or mux channels.

TDV-OP460 operates at 9600 baud using a special algorithm which provides control response times virtually indistinguishable from those of a console operating via a direct wire line link.

*NOTE: Option specifies programming only. Order TDM-RIA and channel modules separately for each console as required.*

### 3.13.18 TDV-OP462 EQUIP CONSOLE FOR EFJ MULTI-NET II

TDV-OP462 is a **software option** which equips the console to access and control Multi-Net II talkgroups. One (1) TDV-OP462 is required for each console that will be connected to a single or multiple RNT Multi-Net system. The option includes a replacement overlay for the Radio Control Panel which features the E.F. Johnson Multi-Net II logo instead of Orbacom TDM-150 logo.

TDV-OP462 requires that the Central Processor Package be equipped with option TDM-OP262 and TDM-EFJ cards for each Dispatch Position/RNT in the system. It should be noted that each Dispatch Position has a limit of 128 equivalent control modules or talkgroups. A typical Multi-Net system will require five (5) module equivalents for the talkgroup overhead; Individual Call In, Individual Call Out, Unmonitored Group Emergency, Unmodulated Group Assignable and Telephone Interconnect. Conventional channels, paging keys, auxiliary switch keys and telephone screens all use some number of module equivalents. Contact the factory for applications assistance in determining the talkgroup capacity for each specific systems.

*NOTE: Options TDM-EFJ, TDM-OP262, TDM-OP362 are available only through E.F. Johnson and may not be ordered directly from Orbacom.*

### 3.13.19 TDV-OP465 CRT EMS PATCH MATRIX

TDV-OP465 is a **hardware option** which equips the console to display an X-Y patch matrix typically used in EMS base/hospital systems. A TDM-LIC must be present in the CPP for each base station and hospital interconnect. The matrix allows up to 40 simultaneous patch combinations (in addition to the 8 standard under option TDV-OP420) to be active at each console with full cross indication among consoles. Each base may be conferenced to multiple hospitals.

### 3.13.20 TDV-OP468 CONSOLE EQUIPPED WITH MULTI-LINE TELEPHONE

TDV-OP469 is a **hardware option** which equips the console to display a 48 line, integrated telephone screen. One TDM-MLC must be present in the CPP for every four (4) active telephone lines system wide. The telephone allows call-in and call-out on all active lines, conferencing of multiple lines, and patching of telephone lines to radio channels. Provision is included for automatic hook flash, call holding and call transfer, speed dialing and last number redial. Two ringer tones are provided to allow differentiation between emergency and non-emergency lines.

When the phone screen is not displayed, incoming calls may be answered via a pop-up window. When the phone screen is displayed, all radio channels are readily accessible via the status list display.

Telephone audio can only be directed to the PIC Audio Channel 3 port. Each position equipped with TDV-OP468 must therefore also be equipped with TDV-OP453 PIC Audio Channels 3 and 4. If additional speakers are required, remember that the first PIC will be able to support only one speaker via audio channel 4. A console with two monitor speakers and TDV-OP468 will require a TDV-OP450 Additional Console PIC Card, to support the fourth speaker.

### 3.13.21 TDV-OP475 EXTENDED CONSOLE UPS HOLD-UP TIME (REQUIRES CPP OPTION TDM-OP214)

The VR-CM50 console includes an internal UPS battery which provides continued operation in the event of an AC power failure. While the system has a

UPS hold-up time of one (1) hour, a CRT console with a 14" or 17" monitor and Touchscreen has a UPS hold-up time of 20 minutes. Systems with mouse/trackball control only (no Touchscreen) will have slightly longer hold-up times. Systems with 21" monitors will have shorter hold-up times. TDV-OP475 is a **hardware option** which provides an increased capacity UPS that allows a minimum of 40 minutes of operation without AC power.

*NOTE: Contact the factory if UPS hold-up time in excess of 40 minutes is required.*

### 3.13.22 TDV-OP490 EQUIP CONSOLE FOR TRACKBALL CONTROL

TDV-OP490 is a **hardware option** which equips the console for control using a Trackball. The Trackball includes three buttons for Option Select, Channel Select and Instant Transmit. The Trackball typically requires less disk space than a mouse and is somewhat more tolerant of operator abuse.

### 3.13.23 TDV-OP491 EQUIP CONSOLE FOR MOUSE CONTROL

TDV-OP491 is a **hardware option** which equips the console for control using a mouse. The mouse includes three buttons for Option Select, Channel Select and Instant Transmit. The mouse requires more desk space than a Trackball but is a familiar control method for many PC users. The mouse can be used comfortably by both left and right handed dispatchers.

### 3.13.24 TDV-OP492, -OP492/17, -OP492/21 EQUIP 14", 17" OR 21" CRT CONSOLE WITH TOUCHSCREEN CONTROL

TDV-OP492 is a **hardware option** which equips the console CRT with an infrared matrix Touchscreen. All console functions can be controlled by touching the appropriate key on the displayed module graphics, thereby emulating a traditional dispatch console. The infrared system does not use a screen overlay which can distort or blur the image display. Since there are no mechanical contact points, the system does not exhibit wear over time, even with the abnormally heavy use of a dispatcher environment.



TDV-OP492 can be combined with either Trackball (TDV-OP490) or mouse (TDV-OP491) control to provide fail-safe operation that suits the preferences of individual dispatchers.

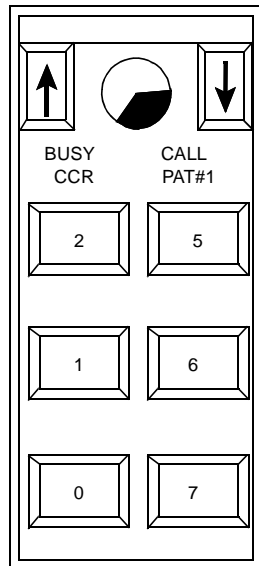
*NOTE: At least one control option, TDV-OP490, TDV-OP491 or TDV-OP492 must be specified for each console.*

**3.14 SUMMARY OF CRT CHANNEL CONTROL OPTIONS**

<b>CHANNEL OPTIONS</b>	TDV-OP501	Repeater Enable/Disable (Tone/DC)
	TDV-OP503	Dedicated CTCSS Enable/Disable (Tone/DC)
	TDV-OP504	Dedicated Channel Priority Marker
	TDV-OP505	Alternate Line Select (Main-Stby)
	TDV-OP507	Supervisory Hard Takeover
	TDV-OP508	Remote Control function (Requires TDM-OP348)
	TDV-OP509	Dedicated Signaling Function
	TDV-OP510	Clear/Encrypted Select (Motorola DVP Stations)
	TDV-OP512	Mute RX-2 (Tone/DC)
	TDV-OP525	Alert/Monitor Operation
	TDV-OP533	Through Console Repeat Enable/Disable
	TDV-OP535	Assign Frequency Keys for Site Selection (Requires TDM-OP335)
	TDV-OP551	Vehicle ANI Display

**3.15 CRT CONTROL OPTIONS**

The CRT Channel Control Options are sensitive to channel module button placement. Refer to Table 3-2 and Figure 3-11.



**Figure 3-11 MODULE BUTTON POSITIONS**

**Table 3-2 MODULE BUTTONS AND OPTIONS**

CRT Radio Module Button Positions vs. CRT-Based Module Options		
<b>[Button 2]</b>  TDV-OP501 TDV-OP503 TDV-OP508 TDV-OP509 TDV-OP510  TDV-OP533* TDV-OP535	Or Or And/Or And/Or Fixed Fixed Fixed And	<b>[Button 5]</b>  TDV-OP501 TDV-OP503 TDV-OP508 TDV-OP509 TDV-OP512 (or) TDV-OP525  TDV-OP535
<b>[Button 1]</b>  TDV-OP501 TDV-OP503 TDV-OP504 TDV-OP507 TDV-OP508 TDV-OP509 TDV-OP533*	Or Or Fixed Fixed And/Or And/Or Fixed	<b>[Button 6]</b>  TDV-OP501 TDV-OP503 TDV-OP505  TDV-OP508 TDV-OP509
<b>[Button 0]</b>  SELECT	Fixed	<b>[Button 7]</b>  TRANSMIT
* TDV-OP533 can be placed either on button 1 or 2.		

### 3.15.1 TDV-OP501 REPEATER ENABLE/DISABLE (TONE/DC)

TDV-OP501 is a **software option** which assigns button #1, 2, 5 or 6 to enable and disable a mobile relay repeater. The option may be specified for Tone remote control, DC remote control or dry contact control systems. Tone control provides non-transmitted standard EIA function tone sequence, usually 1450 Hz and 1550 Hz. DC control is a sustained current, usually -6 ma, which keeps the repeater disabled. Dry contact control is usually specified for voter systems and requires that the LIC be equipped with Auxiliary Relays - option TDM-OP348. TDV-OP501 is an alternate action function and provides full cross indication among parallel connected consoles.

### 3.15.2 TDV-OP503 DEDICATED CTCSS ENABLE/DISABLE (TONE/DC)

TDV-OP503 is a **software option** which assigns button #1, 2, 5 or 6 to enable and disable the receiver CTCSS. The option may be specified for Tone remote control, DC remote control or dry contact control systems. Tone control provides non-transmitted standard EIA function tone sequence, usually 1450 Hz and 1550 Hz. DC control is a sustained current, usually -6 ma, which keeps the receiver open. Dry contact control is usually specified for local control stations and requires that the LIC be equipped with Auxiliary Relays - option TDM-OP348. TDV-OP503 is an alternate action function and provides full cross indication among parallel connected consoles.

*NOTE: This option should not be confused with the standard MONITOR-before-PTT feature present on all CTCSS equipped base stations.*

### 3.15.3 TDV-OP504 DEDICATED CHANNEL PRIORITY MARKER

Certain operational situations may require that a channel be temporarily designated for priority or emergency-only usage. TDV-OP504 is a **software option** which assigns button #1 to transmit a 700 Hz priority tone marker for 0.6 seconds every 6 seconds to alert users that channel access is restricted. The marker is automatically disabled during voice trans-

mission. This option cannot be provided on modules equipped with Hard Takeover, TDV-OP507. The console can, however, be equipped with option TDV-OP434, global priority marker, to provide a like function.

### 3.15.4 TDV-OP505 ALTERNATE LINE SELECT (MAIN/STANDBY)

TDV-OP505 is a **software option** which assigns button #6 to control a 4PDT relay on the LIC line terminator to allow the channel to be switched between either of two radio control lines. The option functions in both 2 wire and 4 wire modes. This is an Alternate-action function which provides full cross indication among parallel connected consoles. This option automatically assigns RTL pairs for 4-Wire Main and Standby I/O.

### 3.15.5 TDV-OP507 SUPERVISORY HARD TAKEOVER

TDV-OP507 is a **software option** which assigns button #1 to control a 2PDT relay on the LIC line terminator which breaks the 2 wire RTL pair to render all remote Dispatch Positions inoperative in accordance with FCC regulations. This is an Alternate action function which provides full cross indication among parallel connected consoles. This option automatically assigns an RTL pair for connection to the Remote Dispatch Points.

### 3.15.6 TDV-OP508 REMOTE CONTROL FUNCTION (REQUIRES OP348)

TDV-OP508 is a **software option** which assigns buttons #1, 2, 5 and/or 6 to control unspecified Wild Card functions using dry contact closures. Button 1 is normally assigned for Hard Takeover, TDV-OP507. Button 6 is normally assigned for Alternate Line Select, TDV-OP505. These options, if specified, will pre-empt the use of buttons 1 and 6 for auxiliary function tone or DC remote control commands. The switch legend and control parameters must be specified. Specify 1 - TDV-OP508 for each function required. This option automatically assigns one RTL pair for connection to each function.

### 3.15.7 TDV-OP509 DEDICATED SIGNALING FUNCTION

TDV-OP509 is a **software option** which assigns buttons #1, 2, 5 and/or 6 to control unspecified Wild Card functions either at or through the base station using tone signaling. Typical applications include a single button paging, DTMF codes, single tone or Dial Pulse codes for base station site selection or repeater control. The switch legend and detailed signaling parameters must be specified.

### 3.15.8 TDV-OP510 CLEAR/ENCRYPTED SELECT (MOTOROLA "DVP" STATIONS)

TDV-OP510 is a **software option** which modifies the PTT tone control sequence to include two (2) sequential function tones - refer to TDM-OP303. Unless otherwise specified, the Clear command will add a 1050 Hz tone to the standard PTT sequence. The Encrypted command will add a 1150 Hz tone to the PTT sequence.

Button #2 is assigned and designated as the fixed location for this option.

*NOTE: Some Encryption schemes - e.g. GE VOICE-GUARD - use the standard F1 PTT sequence for CLEAR voice and the standard F2 PTT sequence for ENCRYPTED voice. In this case, specify a standard T2-R2 module and request the F1/F2 button legend to read "CLEAR/ENCRYPT".*

*Some Encryption schemes - e.g. TRANSCRIPT - require a contact closure to enable the encryption function. In this case, specify TDV-OP508 and assign button #2 or #5 to the CLEAR/ENCRYPT function.*

### 3.15.9 TDV-OP512 MUTE RX-2 (TONE/DC)

TDV-OP512 is a **software option** which is used to control T2-2R stations in which the audio from both receivers appears on the 2-Wire RTL pair. Button #5 is assigned to send a control tone sequence or sustained DC current to mute the station's second receiver. Specify the required control parameters.

*NOTE: This option is not required for T2-2R stations which use 4-Wire RTL I/O where the station's second receiver audio appears on a separate RTL pair. Remember, two QRC sections must be assigned for T2-2R modules using 4- or 6-Wire RTL I/O.*

### 3.15.10 TDV-OP525 ALERT/MONITOR OPERATION

TDV-OP525 is a **software option** which configures the channel such that the receive audio is normally fully muted. When terminal WI2 on the LIC line terminator is pulled low by an external contract closure, the receive audio is enabled at full volume until manually reset by button #5. The button can also be used to manually open the receive audio to allow the channel to be monitored at will.

### 3.15.11 TDV-OP533 THROUGH CONSOLE REPEAT ENABLE/DISABLE

TDV-OP533 is a **software option** which configures the channel such that audio received via the 4-Wire input is retransmitted along with a PTT command via the 2-Wire control pair. This allows the console to perform the function of the remote keying panel normally used in Repeater stations. The function is particularly useful in Main/Standby applications where multiple Remote Keying Panels could cause keying conflicts. The audio input from the receiver must be accompanied by a COR (Carrier Operated Relay) input which keys the transmitter as soon as the receiver detects a signal. The option can be used with Tone, DC or E&M signaling.

Button #1 or #2 are assigned and designated as the fixed locations for this option.

### 3.15.12 TDV-OP535 ASSIGN FREQUENCY KEYS FOR SITE SELECTION (REQUIRES OP335)

TDV-OP535 is a **software option** which converts the "FREQ" buttons on a T4-R4 module to 1-of-4 Site Selection. The channel must be equipped with four auxiliary relays for actual site control.

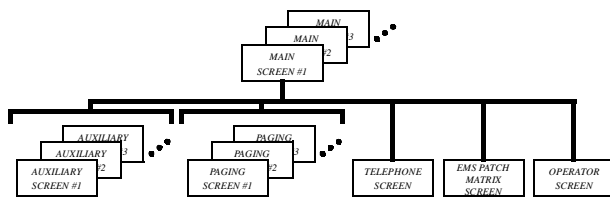
### 3.15.13 TDV-OP551 VEHICLE ANI DISPLAY

TDV-OP551 is a **software option** which programs the alphanumeric display on the T/R module to display the vehicle ID code transmitted by the radio on each PTT plus any status or emergency message codes. The display is capable of all 256 ASCII characters. The ANI code transmitted by the radio can be translated to a familiar unit number using an alias table.

*NOTE: TDV-OP251/? must be ordered separately. (The /? refers to any of several Vehicle ID formats from various manufacturers -- see Section 2.13).*

**3.16 CRT SCREEN DISPLAY**

Figure 3-13 represents how screens are arranged and displayed in a CRT Console System. The top-level screen is the Main Screen of which there can be several. These screens display radio channels and other often used features, such as Auxiliary and Paging functions. Auxiliary and Paging functions can be performed either directly from the Main Screens by activating the "PAGE" or "AUX" button (refer to the Main Screen diagram - #2 cluster Figure 3-12) or via full 8-button modules that are placed directly on the Main Screens. In addition, Telephone, EMS Patch Matrix and Operator Screen can be accessed from the Main Screens.



**Figure 3-12 MAIN SCREENS**

Refer to Figure 3-13 for locations of the numbered areas that follow.

**3.16.1 #1 MODULE AREA**

This large area of the screen contains mostly radio modules. Other control buttons can appear here also. Door latches, camera controls, alarm alert lights, and page keys are typical control buttons.

**3.16.2 #2 MENU AREA**

These seven buttons allow access to features such as simulcasts, patches, and buttons that appear on other screens. The menu displayed in this picture is called the "Main Menu". The first six buttons perform various screen switching functions. The last button switches to the "Function Menu". Simulcasts, patches, and other operations are performed from the Function Menu.

**3.16.3 #3 ACTIVE POINTER**

The pointer moves around the screen to highlight the active mouse or Touchscreen object. For mouse users, it indicates which screen button will be activated when a mouse button is pressed. For Touchscreen users, it shows the precise location of the last finger press.

**3.16.4 #4 STATUS LIST**

This list contains lesser-used radio modules. Each "Module" is shown as a line of text. It is called a "Status List" because the text changes color depending on the status of the radio module. For instance, the line of text flashes red if an incoming call is present. The arrow buttons below the Status List allow for scrolling, since only 13 modules are shown at one time.

When a different screen is accessed during operation, each of the graphical radio modules depicted on the Main Screen is compressed down to a single line and placed on the Status List. This allows the operator to have access to ALL of the radio modules in the system even though the Main Screen is not displayed.

**3.16.5 #5 TIME/DATE**

This area displays the date (month/day/year) and time (hours/minutes/seconds). This information is synchronized with all other consoles in the system.

**3.16.6 #6 VU METER**

This meter shows the incoming audio level of the selected module. In transmit mode, it shows the outgoing audio level to the selected base stations.

**3.16.7 #7 MAIN TRANSMIT KEY**

This button is one of several ways to transmit on the selected module. The following are other methods:

- Physical "Transmit" key on the Radio Control Panel
- Foot Switch (if available)
- Headset (if available)
- XMIT or T button on the selected module itself

3.16.8 #8 CONTROL BUTTONS

This area contains control buttons frequently used during radio operations. The following is a list of buttons provided in this area:

UNLOCK - Turns off safety lock on certain Auxiliary and Paging buttons.

HELP - Request console help menu.

A1, A2, A3 - Alert tones on the selected module.

MON - Monitors all traffic on radio channel.

S1, S2 - Single-button activation of simulcasts.

ALL MUTE - Temporarily mutes unselected channel audio.

ICOM SEL - Establishes intercom contact with another console.

PA - Activates public address system (if available).

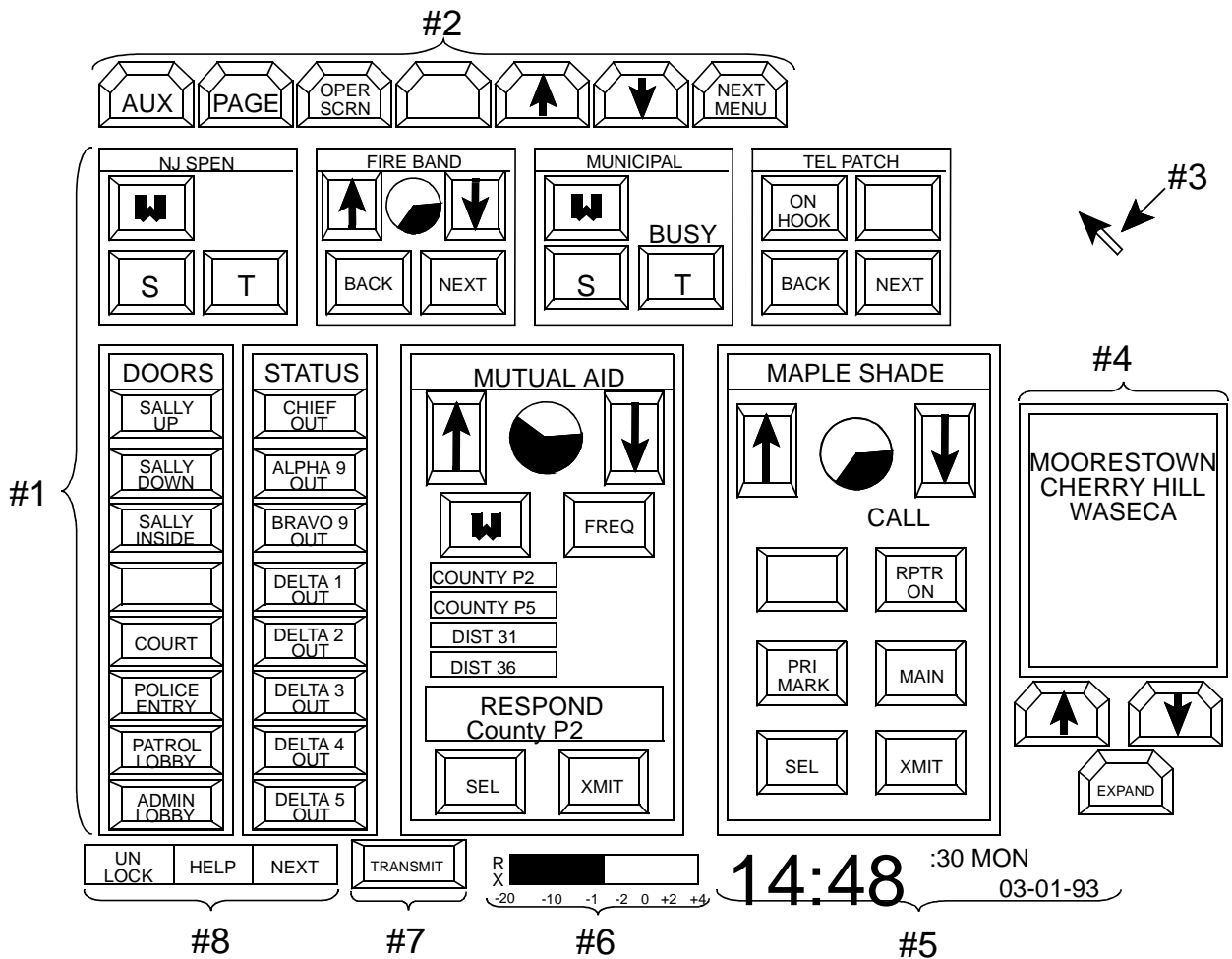


Figure 3-13 CRT-BASED CONSOLE SYSTEM DISPLAY

### 3.17 AUXILIARY SCREENS

Auxiliary Screens are used for non-radio control buttons such as door latches, camera control and alarms. Each Auxiliary Screen can contain seven columns of eight buttons for a total of 56 buttons per screen. The columns are also called "modules", and each one usually contains only one type of buttons, such as door latch buttons. A console could have up to 20 such Auxiliary Screens (see Figure 3-15).

Individual columns or modules can be placed on the top level or main screens if desired (see Figure 3-14).

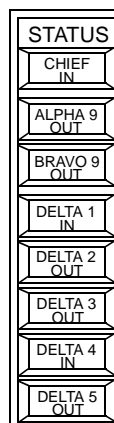


Figure 3-14 STATUS COLUMN

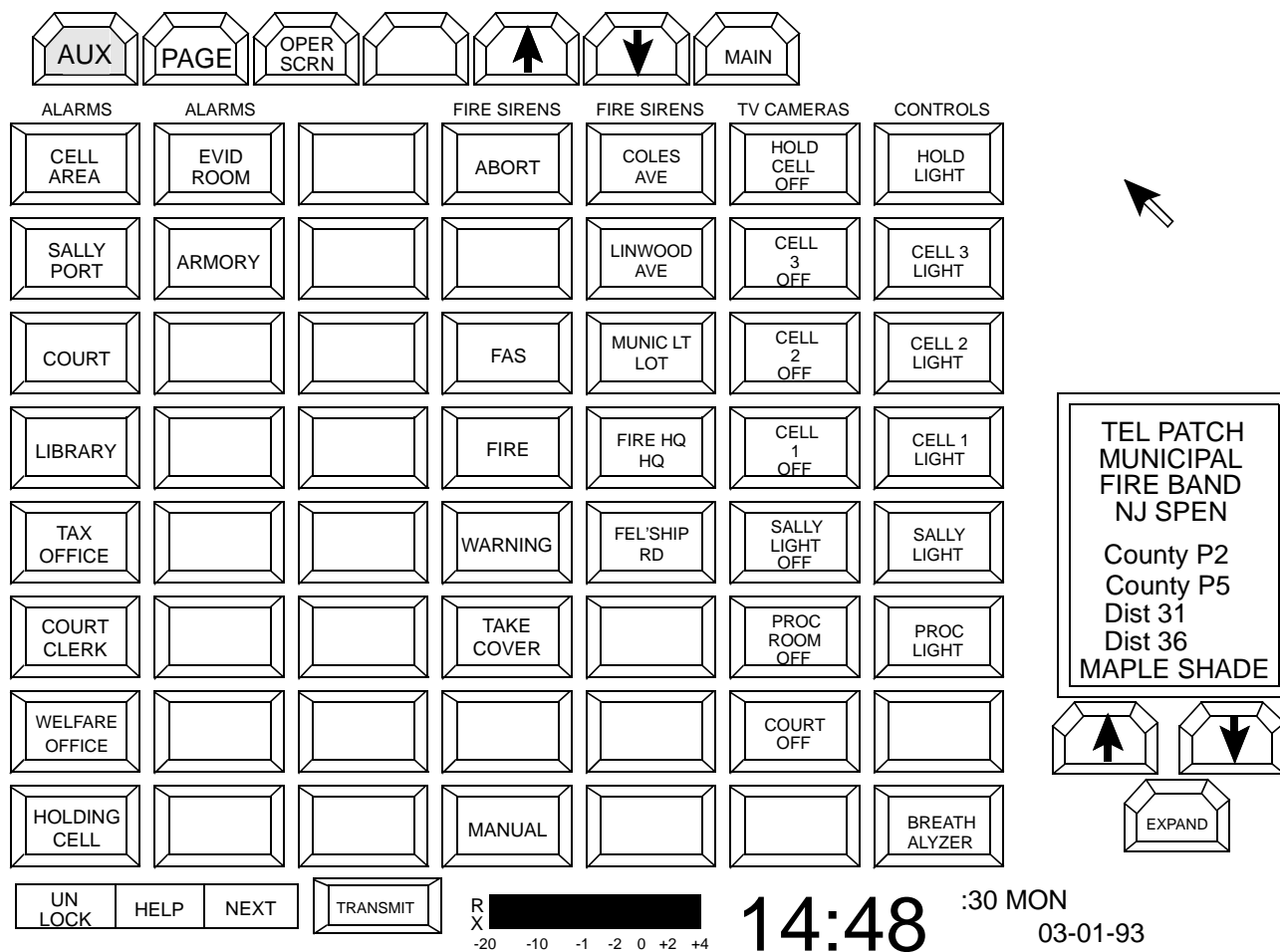


Figure 3-15 AUXILIARY SCREEN

### 3.18 PAGING SCREEN

Paging Screens contain buttons which send out radio or telephone paging tones. Paging Screens look almost identical to Auxiliary Screens, except that paging buttons usually will be colored for easy reference. For instance, Police paging buttons might be colored blue, and Fire paging buttons might be colored red. Each console can have up to 255 active paging buttons (see Figure 3-17).

Individual columns or modules can be placed on the top level or Main Screens if desired (see Figure 3-16).

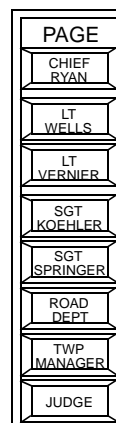


Figure 3-16 PAGING COLUMN

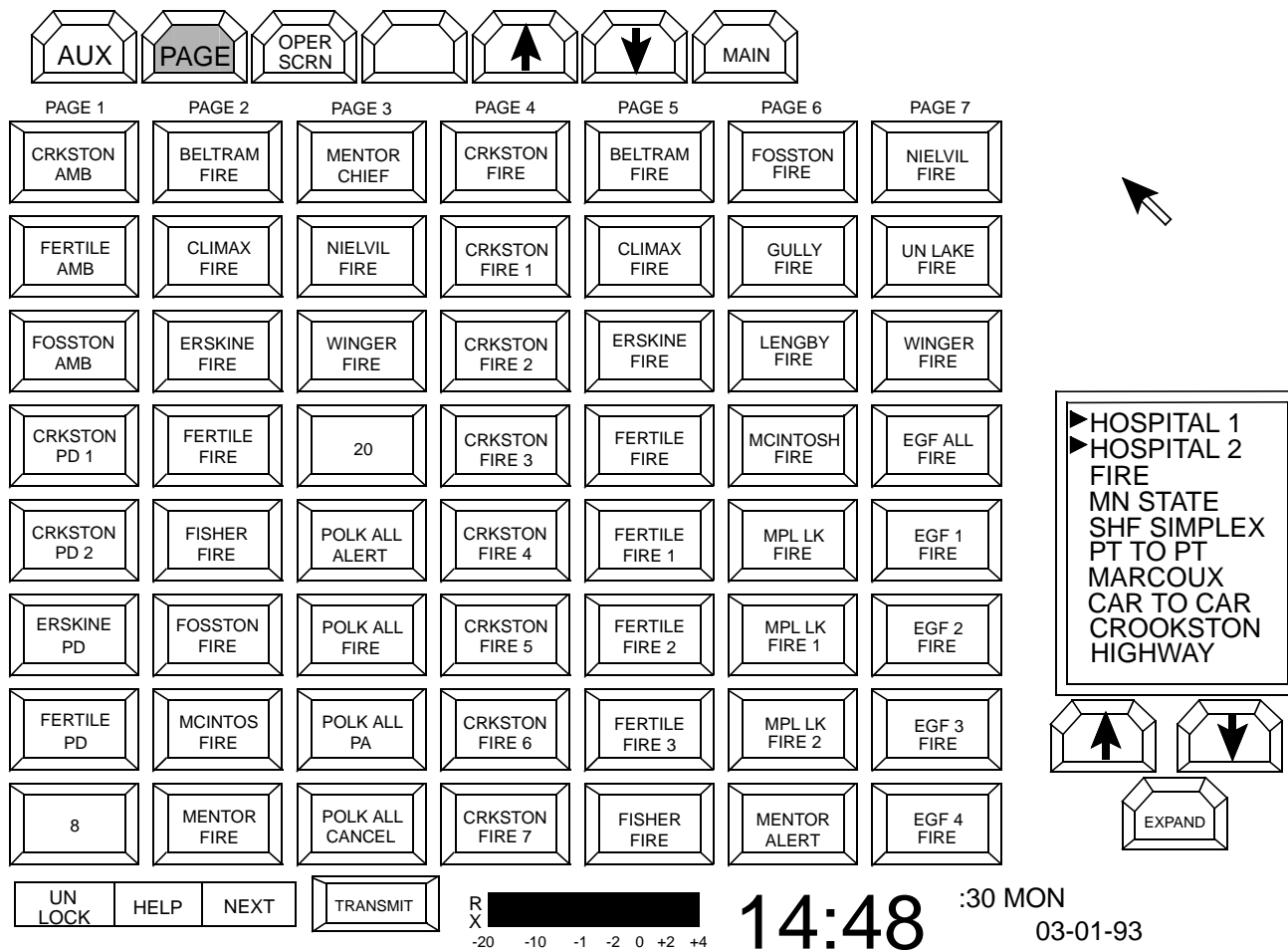


Figure 3-17 PAGING SCREEN

3.19 TELEPHONE SCREEN

The Telephone Screen can support forty-eight (48) individual telephone lines. Each phone line button can have either 1 or 2 lines of identifying text. The buttons themselves can be any color, but gray is recommended. When a telephone line rings, the button will turn red and start blinking.

To answer the call, the button is either touched or clicked-on (with Trackball or mouse) and will appear as depressed or pushed in. In addition, a column of 8-buttons programmed to hold frequently used numbers, is available as a "Speed Dial" resource.

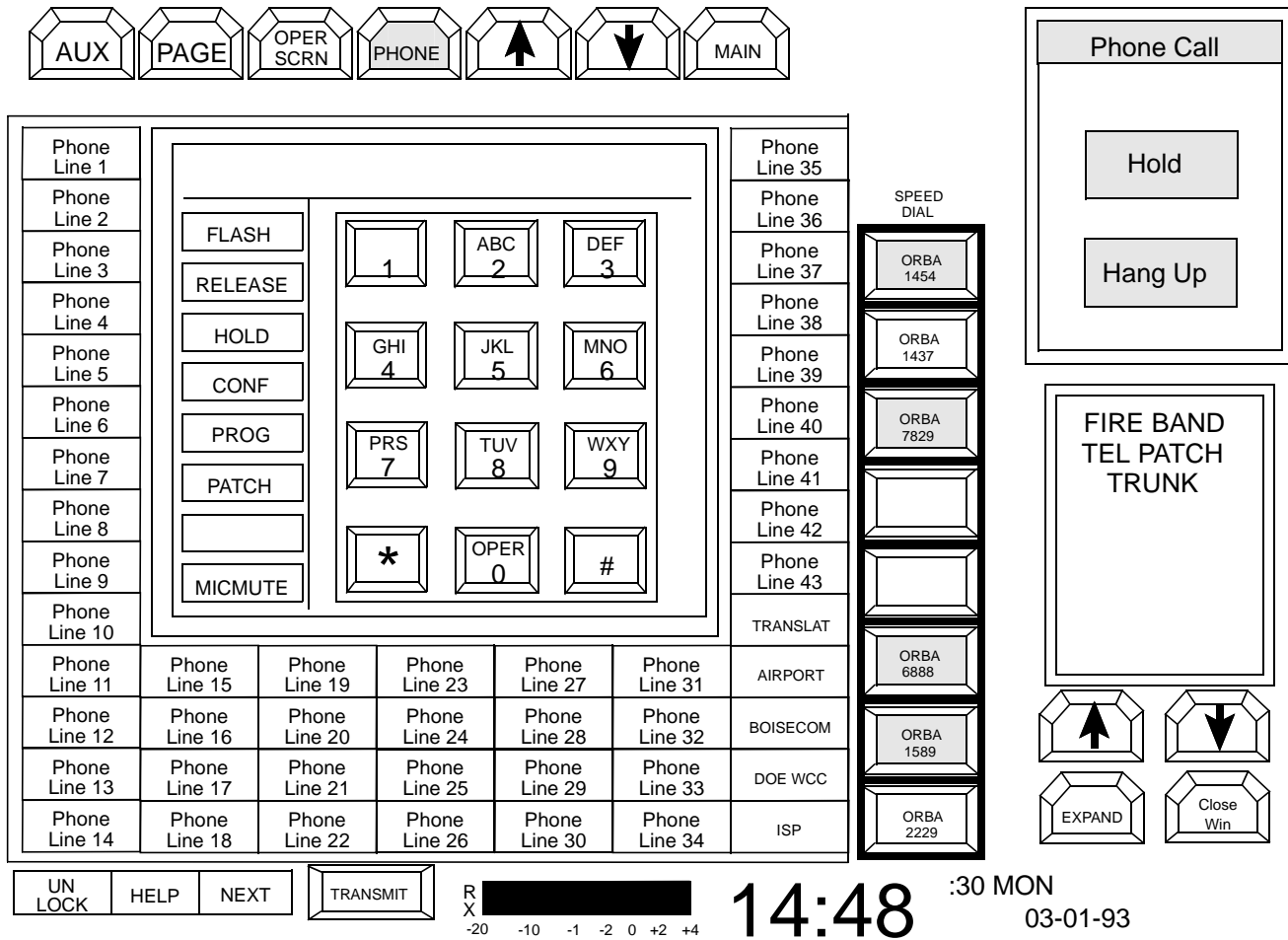


Figure 3-18 TELEPHONE SCREEN



### 3.20 EMS PATCH MATRIX SCREEN

The CRT Patch Matrix is designed to provide a user-friendly control panel for EMS radio patches. Radio channels are placed on the X-axis and hospitals are placed on the Y-axis. Touching or clicking on the bottom at an X-Y intersection will activate a patch between the radio and hospital chosen.

X and Y scroll keys are used to re-center the matrix for large system. Up to 40-patch combinations may be active simultaneously at each console position, in addition to the eight (8) patches provided under TDV-OP420. A TDM-LIC must be present in the CPP for each base station and hospital interconnect.

The screenshot displays the EMS Patch Matrix interface. At the top, there are navigation buttons for 'BASE' (left and right arrows), 'MAIN', and a mouse cursor. The main area is a grid with 8 columns representing radio channels and 8 rows representing hospitals. The columns are labeled: F1 BERRY 1, F1 BERRY 2, F4 ELLEN DALE, F1 BLUE MTN 1, F2 BLUE MTN 2, F1 FAIRVIEW, RICE COUNTY, and FUTURE BASE. The rows are labeled: HBG BLS, HBG ALS 1, HBG ALS 2, POLY BLS, POLY ALS, OSTEOPATHIC, UNIV BLS, and UNIV ALS. Each cell in the grid contains a 'PATCH' button, with some showing 'OFF' and others 'ON'. For example, 'PATCH ON' is visible for F2 BLUE MTN 2 in the HBG ALS 1 and HBG ALS 2 rows, and for F1 BERRY 2 in the UNIV BLS row. To the right of the grid is a 'Matrix Status' window showing active patches: ELLEN<F4>->UNIV B and BLUE 2<F2>-><MULT>. Below this is a 'CLEAR MATRIX' button. Further down is a list of standby UHF channels: CITY PUB WK, RIVER, CITY FD 3, CITY FD 4, CITY FD 3, CITY FD 1, FD 1 SOUTH, FIRE 1 LOWR, FIRE 1 CNTR, and FIRE 1 UPPR. At the bottom of the screen are control buttons: UN LOCK, HELP, NEXT, TRANSMIT, and a frequency display showing '14:48' and '30 MON' with a date '03-01-93'. A frequency scale from -20 to +4 is also visible.

Figure 3-19 EMS PATCH MATRIX SCREEN

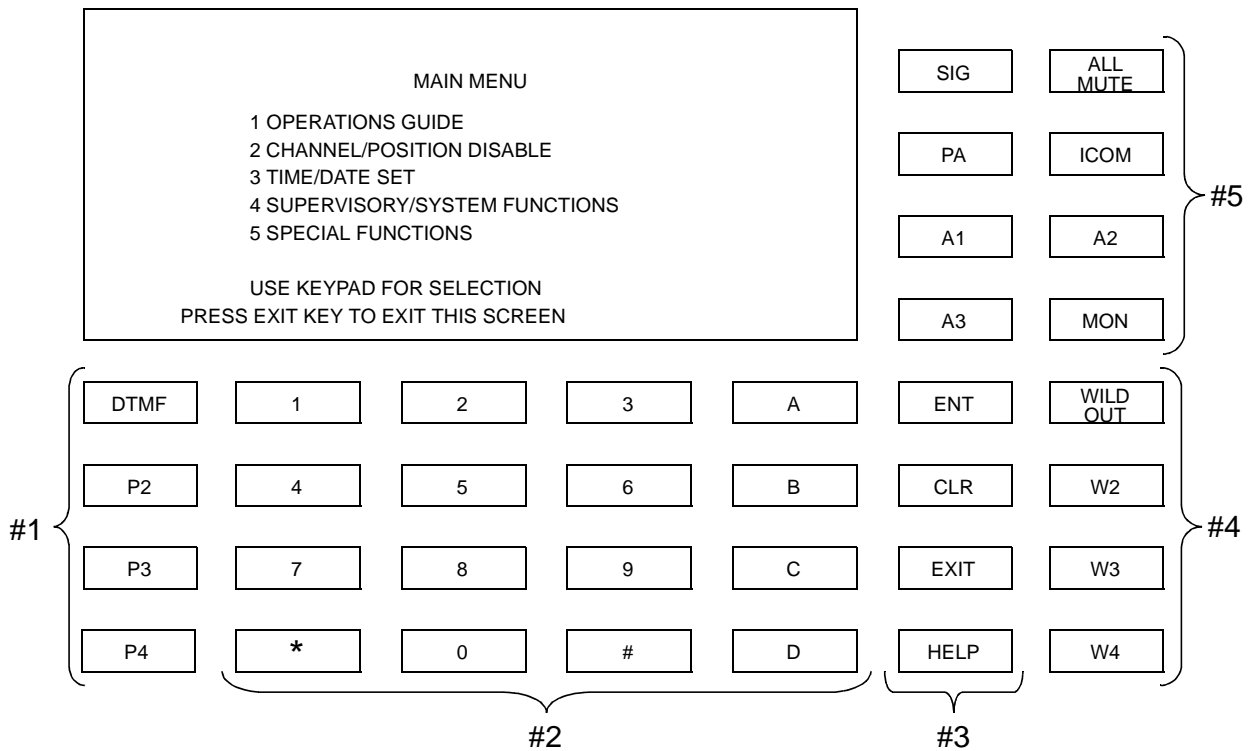
**3.21 OPERATOR SCREEN**

The Operator Screen (see Figure 3-20) is mainly used for operations requiring number entry or a large data display. These may include:

- Paging
- Setting the system time and date
- Changing system parameters
- Help

Console-to-console intercom  
Patch review  
Channel enable/disable  
and other functions.

The large rectangle in the center of the screen emulates the 5" video screen used in modular VR-CM50 consoles. This screen is activated by Main Menu "Oper Scrn" button, as well as by certain other screen buttons and RCP keys.



**Figure 3-20 OPERATOR SCREEN**

Refer to Figure 3-20 for locations of the numbered areas that follow.

### 3.21.1 #1 MANUAL PAGING BUTTONS

These buttons are used to send manually entered pages. Each button represents a different paging method, up to four buttons are available. After a button is pressed, the screen will prompt for the numeric paging information. Then, the "SIG" button can be used to transmit the page immediately. Or, the "ENT" button can be used to stack the page. Stacking allows you to enter several manual pages, and then transmit them all at one time (by pressing SIG).

The various paging plans are as follows:

#### 1 + 1

Specifies any of several commonly used 2-tone sequential paging plans including those offered by Motorola (QCII), GE, Reach, Plectron, Federal and others. Codes are accessed using the standard 2- or 3-digit entry in accordance with the pager manufacturer's standard code plans.

#### 2 + 2

Specifies a standard chord paging plan including Motorola (QC), Bramco, and others. Codes are accessed using a 4-digit entry in accordance with the page manufacturer's standard code plan.

#### DTMF

Specifies standard DTMF (Dual Tone Multi-Function: generic term for Touch Tone) signaling. Up to 12-digits may be entered in sequence and transmitted as a group using the "SIG" key. The Help Screen provides a guide through this process. All 16-numeric/data buttons are supported in DTMF phone dialing and paging.

#### DP

Specifies standard rotary dial signaling including Secode and others. Up to 12-digits may be entered in sequence and transmitted as a group using the "SIG" button (store and forward operation). Only the 10-numeric buttons are supported in DP paging. The DP encoder may be programmed for 1500 Hz or 2805 Hz operation.

#### Mnemonic

Specifies a fully customized paging plan for the customer's unique requirements. In mnemonic paging, code plans may be intermixed, stacked, chained and accessed using unique address codes. Mnemonic plans may also be identified by generic button names such as FIRE, POLICE, etc.

### 3.21.2 #2 16-KEY DATA ENTRY KEYPAD

This keypad is the means of numeric input. It is used to enter menu selection numbers, manual page numbers and dialing, console-to-console intercom numbers, etc.

### 3.21.3 #3 MENU CONTROL BUTTONS

These 4-buttons control the menus that are displayed on the screen:

1. [ENT] Usually used as a confirmation key (Enter).
2. [CLR] Used to clear the line when entering numeric information (Clear).
3. [EXIT] Select this button to return to the previous menu level or escape out of the present operation.
4. [HELP] This button, at the lowest level, brings up the Operator Screen's Main Menu.

*NOTE: This is not related to the Main Menu shown at the top of the CRT Console screen.*

The user may access a CRT Operations Guide and get help on such topics as simulcasting, patching, system paging, console intercom, and other possible help screens.

Other supervisory functions, such as time/date set, are accessed using other Main Menu selections.

### 3.21.4 #4 OPTION BUTTONS

The function of these buttons will be different from system to system.

3.21.5 #5 CONTROL TRAY BUTTONS

This section of buttons is mainly a duplicate of the Control Tray. The exception is the "SIG" key, which is only available on the Operator Screen.

3.21.6 OPERATOR SCREEN MENUS

The Operator Screen has many different levels of menus which may vary from system to system. Figure 3-21 is a flowchart of the common menus.

The most common use of the Operator Screen will be for Paging and Help.

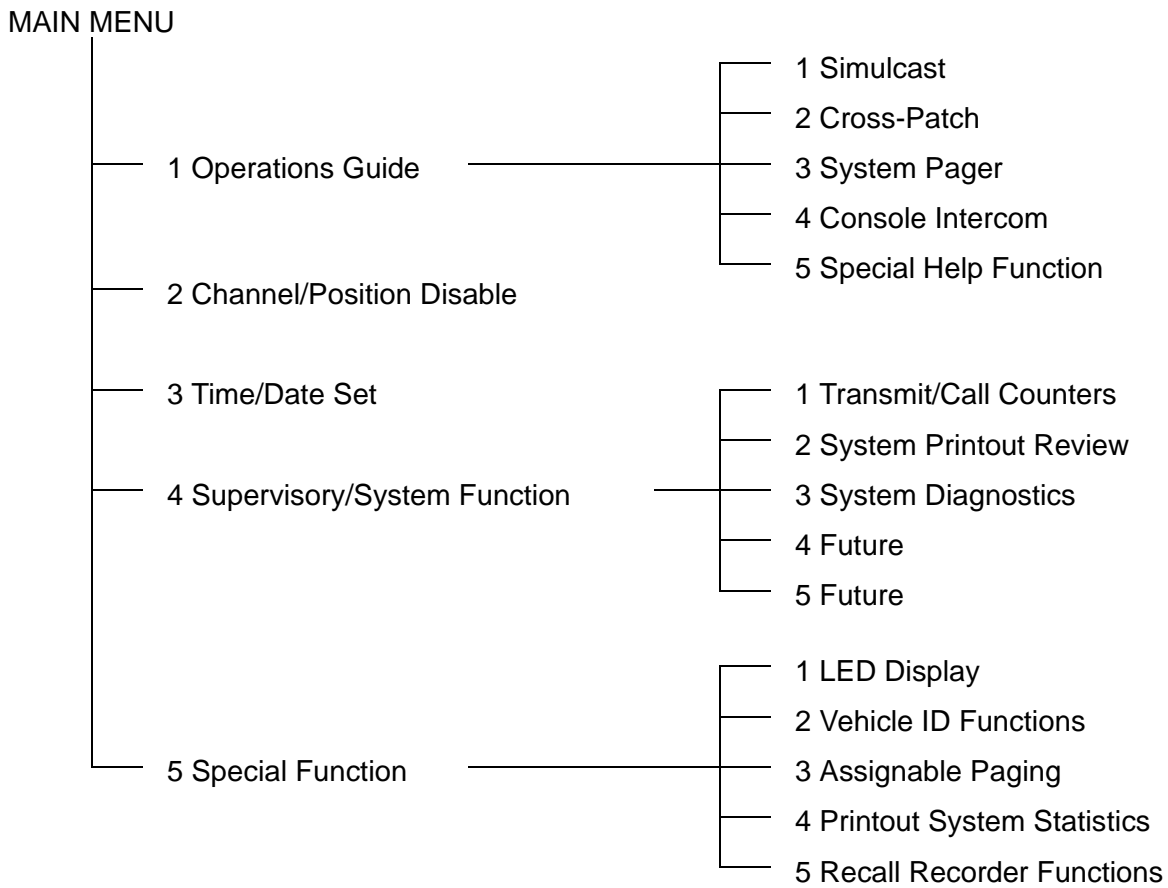


Figure 3-21 OPERATOR SCREEN MENUS FLOWCHART

## SUMMARY OF CRT AUXILIARY SWITCH OPTIONS

TDV-OP601	1-of-4 Interlocked Switches/Internal Function
TDV-OP602B	1-of-4 Interlocked Switches/External Function
TDV-OP603	1-of-8 Interlocked Switches/Internal Function
TDV-OP604B	1-of-8 Interlocked Switches/External Function
TDV-OP605	Two-Key Safety Lock for Auxiliary Switch Function
TDV-OP610B	Individual Key/Momentary Action
TDV-OP611B	Individual Key/Alternate Action
TDV-OP640	Alarm Monitor Function/Non-Supervised (N.O. Trigger)
TDV-OP641	Alarm Monitor Function/Supervised (N.C. Trigger)
TDV-OP642	Alarm Audible Alert Link
TDV-OP643	Alarm Manual Bypass (Daytime-defeat)
TDV-OP650	Three Level Status Indicator (Off-Green-Red)
TDV-OP660	Fire Siren Timing Program
TDV-OP661	Fire Siren Timing Program Abort

All options are "NC" - No Charge if specified at time or order.

### 3.22 CRT AUXILIARY SWITCH HARDWARE/ SOFTWARE OPTIONS

The following options describe choices for Auxiliary Switch controls. The options shown describe functions only. TDV-AUX or TDV-AUX/V cards must be ordered separately.

Software Options are offered at No Charge if specified at the time of original system order. Hardware modifications may be required when adding software options to existing VR-CM50 systems.

#### 3.22.1 TDV-OP601 THROUGH TDV-OP605

Unless otherwise specified, each switch on an Auxiliary Switch Module will function independently of all others. Options TDV-OP601 through TDV-OP605 assign switches to function as interactive groups rather than individual stand-alones.

Internal Function indicates that the switches control a function internal to the system - no contact closures are available. Internal functions generally are not linked to an AUX card in the Central Package.

External functions provide contact closures for connection to the outside world. External function options ending in "B" must be linked to a TDM-AUX card in the Central Package.

#### 3.22.2 TDV-OP601 1-OF-4 INTERLOCKED SWITCHES/INTERNAL FUNCTION

TDV-OP601 is a **software option** which configures a vertical column of 4-switches to operate as a 1-of-4 interlocked group. Pressing any switch in the group will release the previously activated function. Typical applications include Frequency, CTCSS code or Burst tone selection for a base station.

#### 3.22.3 TDV-OP602B 1-OF-4 INTERLOCKED SWITCHES/EXTERNAL FUNCTION

TDV-OP602B is a **software option** which configures a vertical column of 4-switches to operate as a 1-of-4 interlocked group. Pressing any switch in the group will release the previously activated function in the column. Two TDV-OP602B options may be combined on one switch group. Typical applications include UP-STOP-DOWN control of overhead doors.

### 3.22.4 TDV-OP603 1-OF-8 INTERLOCKED SWITCHES/INTERNAL FUNCTION

TDV-OP603 is a **software option** which configures a column of switches to operate as a 1-of-8 interlocked group. Pressing any switch in the group will release the previously activated function. Typical applications include Frequency, CTCSS code or Burst Tone selection for a base station.

### 3.22.5 TDV-OP604B 1-OF-8 INTERLOCKED SWITCHES/EXTERNAL FUNCTION

TDV-OP604B is a **software option** which configures a column of switches to operate as a 1-of-8 interlocked group. Pressing any switch in the group will release the previously activated function.

### 3.22.6 TDV-OP605 TWO-KEY SAFETY INTERLOCK

Some control functions may offer such consequence that it is not prudent to allow them to be initiated by a single keystroke that could occur accidentally. TDV-OP605 is a **software option** which requires that the UNLOCK key on the Control Tray keypad be held before a particular control function can be activated. The option can be assigned to any auxiliary switch function on a key- by-key basis. Typical applications include single button paging and siren controls. Order one for each key to which the function is assigned - i.e., if there are a total of 10-keys on the console which require a 2-key interlock, order 10, TDV-OP605.

### 3.22.7 TDV-OP610B SINGLE SWITCH/MOMENTARY ACTION

TDV-OP610B is a **software option** which programs the relay assigned to a key to be pulled whenever and for as long as the key is depressed. Specify whether the indicator associated with the key is to be illuminated by the switch action itself or by external input. Typical applications are for electric door release activation. Order one for each key function required.

### 3.22.8 TDV-OP611B SINGLE SWITCH/ALTER-NATE ACTION

TDV-OP611B is a **software option** which programs the relay assigned to the key to be pulled and held when the key is depressed once and released when the key is depressed a second time (push ON/push OFF). Specify whether the indicator associated with the key is to be illuminated by the switch action itself or by an external input. Typical applications are for light or gas pump control. Order one for each key function required.

### 3.22.9 TDV-OP640 ALARM MONITOR FUNCTION/NON-SUPERVISED

TDV-OP640 is a **software option** which programs the assigned key to function as an alarm indicator which will respond to an externally applied contact **closure**. Upon momentary application of an external ground, the normal indication will change to a flashing red. This indication will remain until the alarm is manually acknowledged regardless of further changes of the input state. Pressing the key serves to acknowledge the alarm and change the indication to a steady red until the external ground is removed which resets the indication to normal. Typical applications include panic and door alarms. Order one for each key function required. When the alarm function appears at multiple console positions, the alarm when activated will sound at all positions but can be acknowledged for all by any position. If the alarm screen is not displayed, a pop up window will appear to display the alarm condition.

### 3.22.10 TDV-OP641 ALARM MONITOR FUNCTION/SUPERVISED

TDV-OP641 is a **software option** which programs the assigned key to function as an alarm indicator which will respond to an externally applied contact **opening**. The function is similar to TDV-OP640 except that the alarm responds to the removal of the external ground. This mode will cause an indication if the contact loop wiring is broken. Typical applications include intrusion and fire alarms. Order one for each function required. When the alarm function appears at multiple consoles, the alarm when activated will sound at all consoles but can be acknowledged for all by any console. If the alarm screen is not displayed, a pop up window will appear to display the alarm condition.

### 3.22.11 TDV-OP642 ALARM MONITOR AUDIBLE ALERT LINK

TDV-OP642 is a **software option** which causes the Control Tray Alarm Horn to sound each time an alarm activation is detected. This option can be assigned to individual alarms on a key-by-key basis. Specify whether the alarm should be a steady horn or a short pulse.

### 3.22.12 TDV-OP643 MANUAL ALARM BYPASS (DAYTIME DEFEAT)

Some alarms need to be activated during certain time periods but readily deactivated at other times. TDV-OP643 is a **software option** which allows the operator to easily enable and disable the alarm function of a particular key while retaining the indicator function of the key. Typical applications are entrance doors which are used routinely during the day but must be alarmed during off-hours. Order one for each function required. When the bypass function appears at multiple consoles, the alarm can be enabled and disabled for all consoles by any console.

### 3.22.13 TDV-OP650 THREE LEVEL STATUS INDICATOR

TDV-OP650 is a **software option** which programs a key to provide an OFF/GREEN/RED status display. The indication sequences one step for each key depression. Parallel indication is provided when the display appears at multiple consoles. Typical application is "OUT OF SERVICE / AVAILABLE / ON-CALL" indication. Order one for each key required to provide the function. This option does not require linkage to an AUX card in the Central Processor Package.

### 3.22.14 TDV-OP660 FIRE SIREN TIMER

TDV-OP660 is a **software option** which programs a key to provide a timed siren or horn control function. The timing sequence parameters must be specified for ON time, OFF time and NUMBER OF ROUNDS for each key. A 2 second First Round Tim-

ing Extension may be programmed to overcome siren motor start-up inertia. The presence of the option in the system requires use of one key and its associated relay for a MANUAL siren control function. Order one for each timing function required.

### 3.22.15 TDV-OP661 FIRE SIREN TIMER ABORT

TDV-OP661 is a **software option** which adds a PROGRAM CANCEL function to a module equipped with TDV-OP660 Siren Controls. The option uses one key and its associated relay. Order one per console where required.

## 3.23 ADDING MODULE TRAYS TO CRT CONSOLE SYSTEMS

1. Module trays can be added to CRT systems for the following functions:
  - a. Dedicated Monitor Speakers
  - b. Single Button Paging Modules
  - c. Auxiliary Switch Modules

Module trays cannot be used for Transmit/Receive or Receive-Only modules in CRT systems.

2. When used for Dedicated Monitor Speakers, the following rules apply:
  - a. Use Module Tray Processor **TDV-1509102**
  - b. TDV-OP450 and TDV-OP453 must be added as required for the additional speakers.
  - c. Additional CPP/Console Interface Cables may be required - TDM-OP704/xx or TDM-OP705/xx.

The CIP Tray can supply power for a maximum of two (2) additional speakers.

*NOTE: If more than two additional speakers are required, a separate power supply must be added.*

- d. Order T400960 or T400960E Power Distribution Rails as required (see Section 4).

Mounting furniture must also be provided.

3. When used for Single Button Paging or Auxiliary Switch Modules, the following rules apply:

- a. TDM-PIC must be provided for the module trays.
- b. A second CPP/Console Interface Cables may be required - TDM-OP704/xx or TDM-OP705/xx.

The CIP Tray can supply power for a maximum of two (2) module trays.

*NOTE: If more than two additional trays are required, or if control modules plus additional speakers are required, a separate power supply must be added.*

- c. Order T400960 or T400960E Power Distribution Rails as required (see Section 4).

Mounting furniture must also be provided.



## SECTION 4 INSTALLATION AND MAINTENANCE OPTIONS

### 4.1 CONSOLE/ CPP CABLES

A six (6) pair telephone cable, plus an equal length of #6 THHN copper wire, is used as the primary link of each console to its associated PIC card in the Central Package. Consoles with two or more PIC cards will require one I/O cable per PIC. Cables are furnished in standard lengths with AMP ribbon connectors on each end. Minimum cable length is 50 feet.

Plenum cable is required for runs in HVAC ducts or under pressurized computer floors. Check local fire codes before ordering.

Options TDM-OP702/xx designate Standard rated cables while options TDM-OP703/xx designate Plenum rated cables.

**TDM-OP702/05** or **TDM-OP703/05** - 50' length.

**TDM-OP702/75** or **TDM-OP703/75** - 75' length.

**TDM-OP702/10** or **TDM-OP703/10** - 100' length.

**TDM-OP702/15** or **TDM-OP703/15** - 150' length.

**TDM-OP702/20** or **TDM-OP703/20** - 200' length.

**TDM-OP702/50** or **TDM-OP703/50** - 500' length.

**TDM-OP702/1M** or **TDM-OP703/1M** - 1000'.

#### 4.1.1 TDM-OP704/XX OR TDM-OP705/XX NO GROUND WIRE (STANDARD AND PLENUM)

Options TDM-OP704/xx and TDM-OP705/xx provide a six (6) pair telephone cable used for secondary links from TDM/TDV-OP450 or PICs controlling module trays added to CRT consoles. No ground wire is provided. Refer to options TDM-OP702/xx for cable length.

Options TDM-OP704/xx designate Standard (non-plenum) rated cables while options TDM-OP705/xx designate Plenum rated cables.

#### 4.1.2 TDM-OP711 ADDITIONAL RTL I/O KIT (25-PAIR WITH SURGE PROTECTION)

Each Central Processor Package is furnished with a complement of RTL I/O kits consistent with the requirements for a typical system of that size. Each TDM-OP711 equips the Central Processor with an additional 25-pair, surge protected I/O block which may be needed for I/O intensive systems, i.e. those with large numbers of T/R channels, monitor receivers or multi-site radio channels.

A 25-pair telephone cable is used to link each Central Processor RTL I/O cable to its associated surge protected termination block. Unless otherwise specified, RTL I/O cables are furnished non-plenum rated in a standard length of 35 feet with AMP ribbon connectors applied at each end.

To extend the interconnect cable beyond 35 feet, specify TDM-OP712/xx. (xx=numbers following options below.)

**TDM-OP712/10** - 100' length.

**TDM-OP712/15** - 150' length.

If the interconnect cables must be Plenum rated to route through air handling ducts or under pressurized floors, specify TDM-OP713 or TDM-OP714/xx.

**TDM-OP713** - Substitute 25-Pair I/O Cable Plenum Rated - 35' length.

**TDM-OP714/10** - Extend 25-Pair Plenum I/O Cable to 100' length.

**TDM-OP714/15** - Extend 25-Pair Plenum I/O Cable to 150' length.

*NOTE: Contact the factory if alternate lengths are required. VR-CM50 consoles may be operated on standard, 24-gauge telephone twisted-pair house cable if convenient for installation. Other types of cable such as multi-conductor electrical cable categorically cannot be used.*

### 4.2 POWER DISTRIBUTION RAIL

#### 4.2.1 T400960 POWER DISTRIBUTION RAIL (E.F. JOHNSON CABINET)

#### 4.2.2 T400960E POWER DISTRIBUTION RAIL (NON-E.F. JOHNSON CABINET)

Power Distribution Rails are used to distribute power to TDM-1509102 module trays in module consoles. One rail must be installed in each cabinet bay in which a module tray is mounted. Individually, one rail can support from 1 to 4 module trays.

### 4.3 CENTRAL PACKAGE CARD SPARES

The following include a replacement Central Package Card in a static-safe storage container which can be used to return an exchanged card to a board depot for repair, if the spare is used.

*NOTE: Spare cards can only be used for replacement of existing cards. They generally cannot be used for system expansion without additional line terminators, cables and firmware not included in spares pricing.*

**TSP-ARB** - Systems Arbiter Board (Spare)

**TSP-AUX** - Auxiliary Interface Controller (Spare)

**TSP-AUX/A** - Alarm Interface Controller (Spare)

**TSP-AUX/V** - Voter Interface Controller (Spare<sup>1</sup>)

**TSP-CAD** - CAD Interface Controller (Spare)

**TSP-CSC** - Central System Controller (Spare)

**TSP-ICR** - Inter-cabinet Repeater (Spare)

**TSP-LIC** - Line/Telephone Patch Interface  
Controller (Spare<sup>2</sup>)

**TSP-MLC** - Multi-Line Telephone Interface  
Controller (Spare<sup>3</sup>)

**TSP-PIC** - Position Interface Controller (Spare)

**TSP-QRC** - Quad Receive-Only Controller (Spare)

**TSP-RIA** - Remote Interface Adapter (Spare<sup>4</sup>)

<sup>1</sup> Includes Central Processor Card and Voter shelf Terminator for Motorola voters.

<sup>2</sup> The TDM-LIC and TDM-TPI are identical cards. The TSP-LIC serves as a spare for either card.

<sup>3</sup> Includes Central Processor Card and Line Terminator with power supply and FCC approved line couplers.

<sup>4</sup> Includes Central Processor and Console RIA cards with FT9600 modem appliques installed.

### 4.4 DISPATCH POSITION SPARES

The following include the Control Interface Processor Tray, CIP Power Supply, Selected and Unselected Audio Speakers, Radio Control Panel with Keypad, '486 PC in tower case and SVGA monitor. Interconnect cables are not included.

**TDV-OP400/xx power option must be specified and ordered separately.**

**TSP-1509400** - CRT Dispatch Position -  
14" Monitor - CIP Tray (Spare)

**TSP-1509417** - CRT Dispatch Position -  
17" Monitor - CIP Tray (Spare)

**TSP-1509421** - CRT Dispatch Position -  
21" Monitor - CIP Tray (Spare)

The following include the Control Interface Processor and Power Supply in a tower case, Selected and Unselected Audio Speakers in satellite cases, '486 PC in tower case and SVGA monitor. Interconnect cables are not included.

**TDV-OP400/xx power option must be specified and ordered separately.**

**TSP-1509400W** - CRT Dispatch Position -  
14" monitor - CIP Tower (Spare)

**TSP-1509417W** - CRT Dispatch Position -  
17" monitor - CIP Tower (Spare)

**TSP-1509421W** - CRT Dispatch Position -  
21" monitor - CIP Tower (Spare)

**TSP-1509401** - CIP Tray (Spare<sup>1</sup>)

**TSP-1509401W** - CIP Tray (Spare<sup>2</sup>)

**TSP-CIP** - CIP PC Board Assembly (Spare<sup>3</sup>)

**TSP-4862501** - Dispatch Position 486 based PC in  
Tower Case (Spare<sup>4</sup>)

**TSP-ZCM1495** - 14" SVGA Flat-Screen Monitor  
(IDEK) (Spare) Touchscreen Compatible

**TSP-VMF8317** - 17" SVGA Flat-Screen Monitor  
(IDEK) (Spare) Touchscreen Compatible

**TSP-VMF8621** - 21" SVGA Flat-Screen Monitor  
(IDEK) (Spare) Touchscreen Compatible

