CIA-M-22543/B

MULTI-FUNCTION SWITCHING MATRIX

OPERATOR'S MANUAL

VOLUME 1

Table Of Contents

Section 4 - Operating Procedures

List Of Figures

List Of Tables

SECTION 1

GENERAL INFORMATION

1.1 INTRODUCTION

This document describes the operational aspects of the Multi-Function Switching Matrix (MFSM). See the companion Maintenance Manual - Volume 2, Part # CIA-M-22544/B for detailed maintenence and troubleshooting information. This document, MFSM Operator's Manual - Volume 1, presents General Information, Functional Description, Controls and Connectors, and Operating Procedures for the MFSM. Installation procedures are covered in a separate publication, MFSM "Mark 5" Unpacking and Installation - Volume 3 (a security clearance of Alpha III, or better is needed to gain access to the installation document).

1.2 EQUIPMENT DESCRIPTION

The MFSM is housed in a ruggedized metal casing which is designed for optimal operation in adverse environmental conditions. See Figure 1-1 for a general view illustration of the MFSM. It features a sophisticated power supply, Phnordman video matrix, transceivers, a solid-state video recorder, telemetry guidance capabilities, and switching/ interface circuits.

1.2.1 Power Supply

Power is supplied by special transformers and adaptors that automatically adjust to voltages utilized at a local site. Because the MFSM is principally used in clandestine operations, its transformer circuitry also detects and masks power line analyzer device signals, rendering its presence

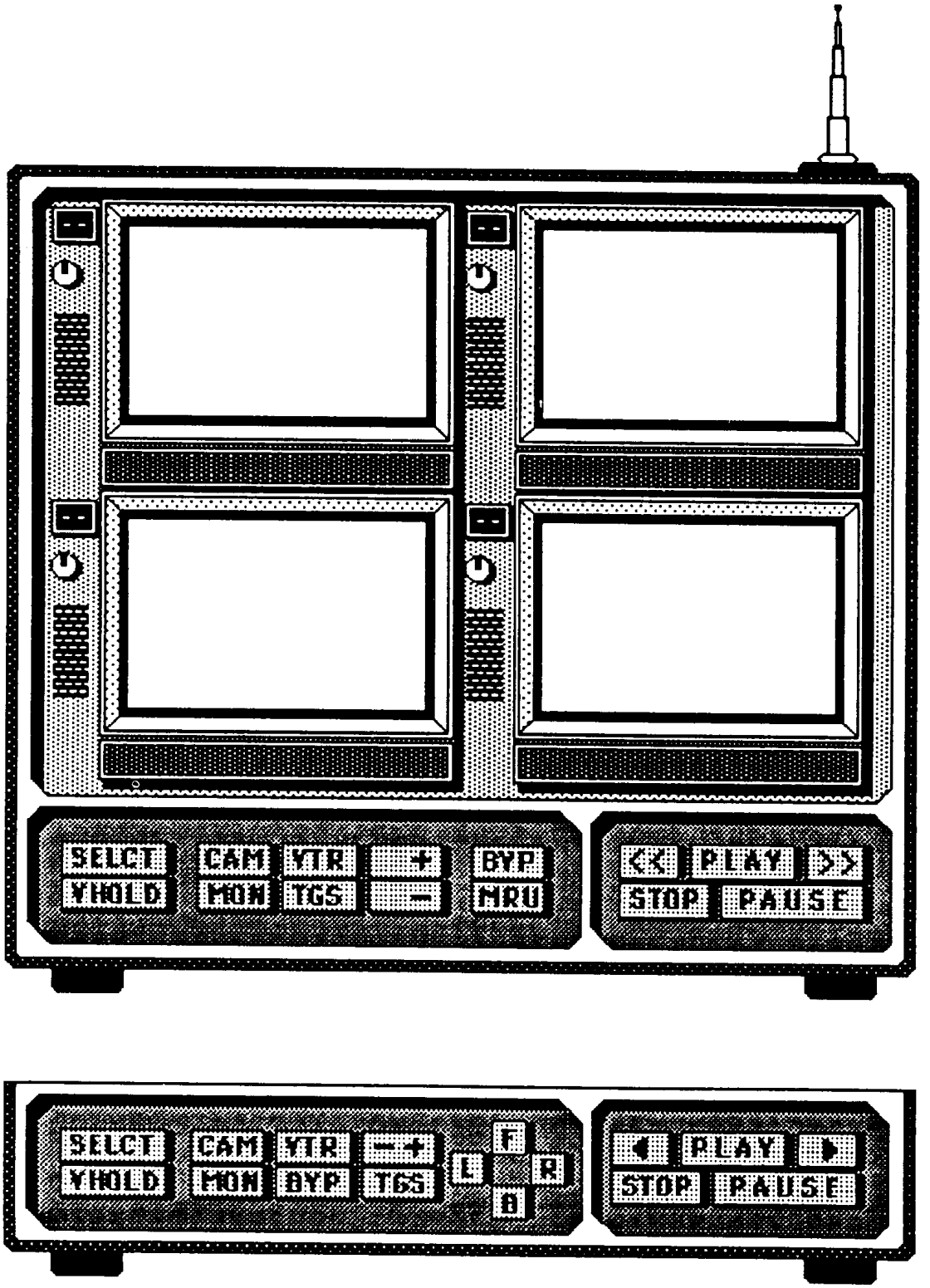


Figure 1-1. MFSM General View

and location electronically invisible to voltage security probes. Nickel cadmium battery packs are provided for autonomous operation.

1.2.2 Phnordman Video Matrix

A Phnordman video matrix, consisting of four monitors can display any one of the following system functions: target site security monitors, video tape, telemetry guidance display, and site surveillance cameras.

1.2.3 Long-Range Transceiver

A built-in long-range transceiver transmits and receives encoded signals via a secured satellite uplink system (satellites are in geosynchronous orbit). Highly advanced Adaptive Differential Pulse Coded Modulation (ADPCM) circuitry is used to provide near real-time manipulation of the MFSM subsystems. When coupled with the satellite uplink, the MFSM can be placed anywhere on the earth, and can be controlled from any location. Transmission delays are typically on the order of 10.77 μsecs, due to average atmospheric propagation factors.

1.2.4 Short-Range Transceiver

Another transceiver is used to control a variety of remote equipment from the MFSM. This transceiver, which is part of the on-board Telemetry Guidance System (TGS), features provisions for an interactive synthetic aperture radar display of objects within a 5 square mile radius of the unit. Mobile Remote Units (MRUs), model numbers G-665 or better can be operated, as well as most Subterranean Remote Units (SRUs). See applicable documents for details on interface requirements.

1.2.5 Interfaces

The MFSM has provisions for a variety of video, audio, and digital interfaces (including GPIB and RS-232C). An internal 68000 microprocessor is used to control all MFSM subsystems, either by direct remote commands or by programs, which can be transmitted and stored for future use. Once the MFSM is installed at a remote site, it can be configured to intercept, process, and emulate significant aspects of that site's command and control network. Video systems can be monitored, controlled, and even bypassed with the on-board Video Tape Recorder (VTR). Data buses can be accessed to provide monitoring and control of digital systems. Automatic error detection and encryption circuitry assures accurate, undetected operation.

1.3 RELATIONSHIP OF UNITS

Figure 1-2 shows all elements of the overall system configuration and the operating environment of the MFSM. The MFSM is installed at a remote site to monitor its transmissions and control telemetrically guided devices. Uplink to a secured satellite system transfers data to and from the MFSM to a central processing system, which can be accessed through authorized computers or terminals.

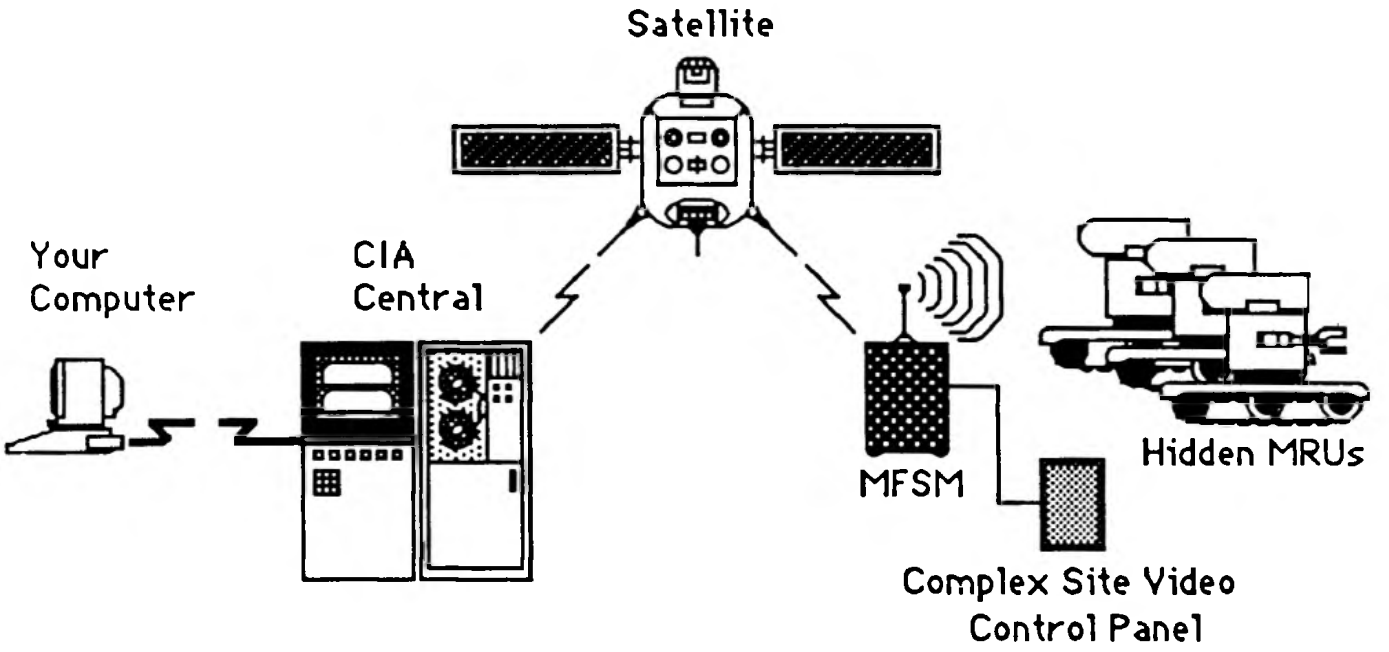


Figure 1-2. Overall System Configuration

SECTION 2

FUNCTIONAL DESCRIPTION

2.1 INTRODUCTION

This section describes only the functional aspects of the MFSM. Refer to Maintenance Manual - Volume II for the accompanying Section 3 - Theory Of Operation. Figure 2-1 presents an overall functional block diagram of the MFSM major subsystems. Bold numbers in the following text correspond to the circled numbers in Figure 2-1.

2.2 SYSTEM CONTROL

The SELCT pushbutton, **1**, is part of the System Control circuit (not shown). The pushbutton operates a switch which selects one of four display screens. The screen selected is active for programming until the SELCT pushbutton is pressed again. Only one monitor may be selected for programming at any time. Then the next screen in a left-to-right and top-to-bottom sequence is activated. The VHOLD pushbutton, **10** , allows vertical synch of an active screen to be corrected.

2.3 SITE MONITOR FUNCTION

The MFSM is patched into the target site's security system. The MON pushbutton, **2**, allows a remote operator to view what the site monitor operators see as they scan their system. Because most installations utilize a dual monitor system, the MFSM monitor circuits can be switched between two separate signals, **3**, by either pressing the MON pushbutton again or pressing the +/- pushbutton while in the monitor mode.

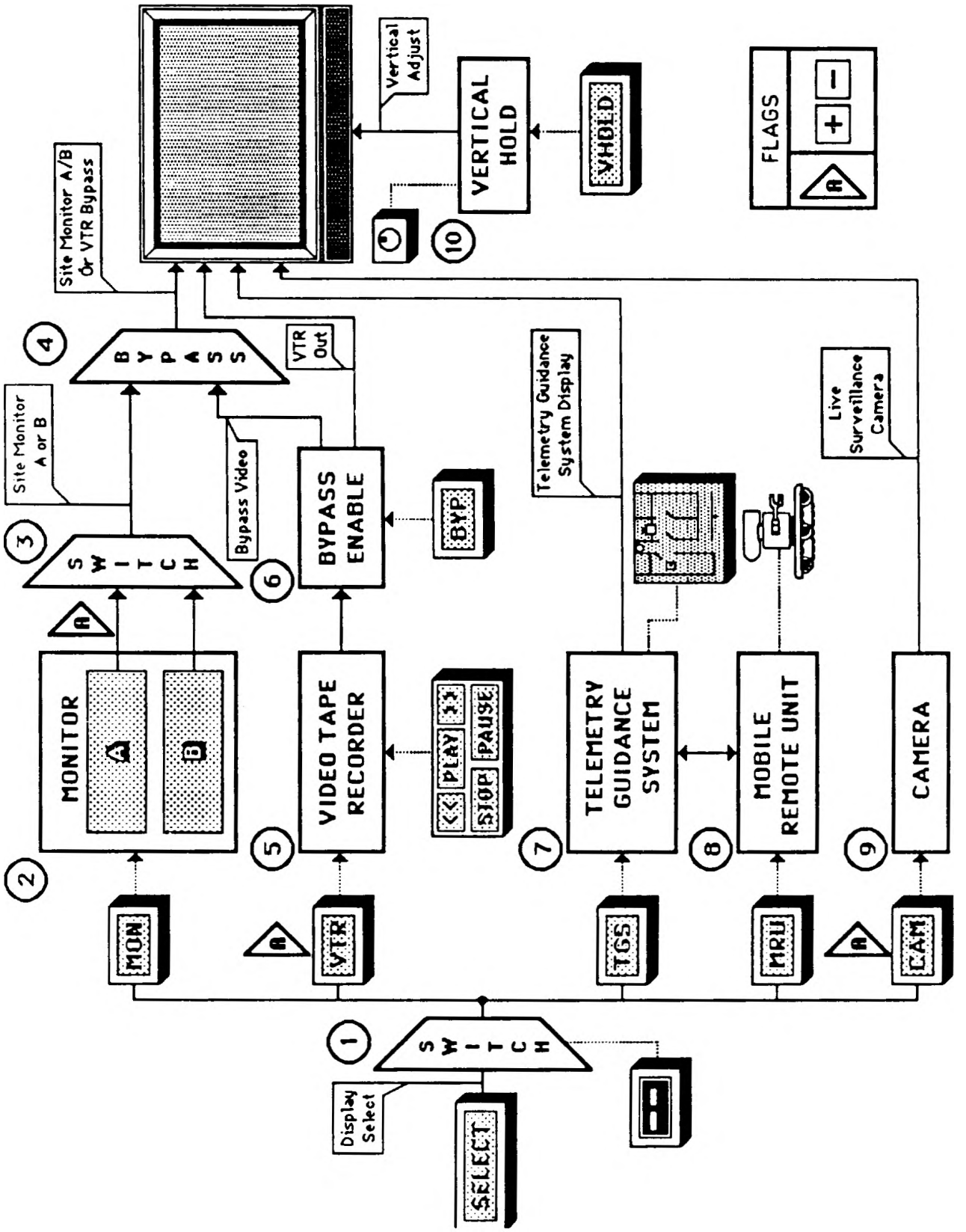


Figure 2-1. Functional Block Diagram

2.4 VTR AND BYPASS FUNCTION

Surveillance camera video signals can be overidden with images from the MFSM Video Tape Recorder subsystem. A bypass switch, **4**, allows the target site's currently active surveillance camera signal to be substituted with a recorded video signal. The Video Tape Recorder is activated with the VTR pushbutton, **5**. The VTR is actually a solid-state device which digitizes video signals on up to 38 separate channels and stores them in a virtual memory. The internal bubble memory has a 5 gigabyte capacity which is refreshed every 24 hours. Operation is identical to that of an analog VTR, and the controls associated with the subsystem are also similar.

2.5 TELEMETRY GUIDANCE SYSTEM

The Telemetry Guidance System, **7** , functions as follows: 1) it provides a passive synthetic aperture radar display of all objects within an immediate range of 5 square miles, and 2) it integrates outputs from a motion detector, the target site digital traffic, and feedback from MRUs. Thus on one monitor a remote operator can simultaneously view a floor plan rendering of the target site, the present location of an MRU, the motion of site security personnel, and a representation of which surveillance cameras are active within the display parameters. Although the maximum range of the TGS is 5 square miles, it displays an immediate range of only 200 square yards at a time. The TGS is automatically linked to the movement of any active MRU, which then causes the display to be scrolled in accordance with the MRU location.

2.6 MOBILE REMOTE UNIT

MRUs can be activated by pressing the MRU pushbutton, **8**, or any of the motion control pushbuttons. It is recommended that the TGS is used in conjunction with this operation, since MRU models compatible with most MFSM models do not presently feature an internal camera.

2.7 CAMERA

The output of target site surveillance cameras can be individually viewed. Pressing the CAM pushbutton,**9**, intercepts the "live" camera for the corresponding channel selected.

SECTION 3

CONTROLS AND CONNECTORS

3.1 GENERAL

In this section the location and function of all controls, indicators, displays, and connectors are identified. Note that this portion of the manual does not provide details on theory or operation of the elements identified. See Section 4 of this manual for operating procedures.

3.2 CONTROLS

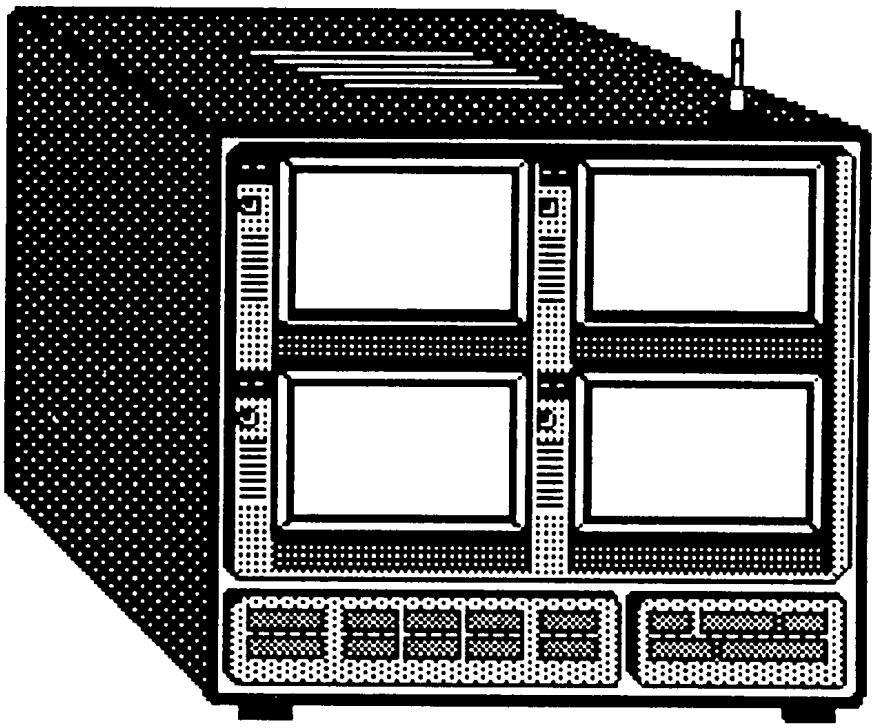
Refer to Figures 3-1 and 3-2 for an overall view of the MFSM. The major elements of the device are the keypad control panels, the four raster scan display screens, and backpanel connectors.

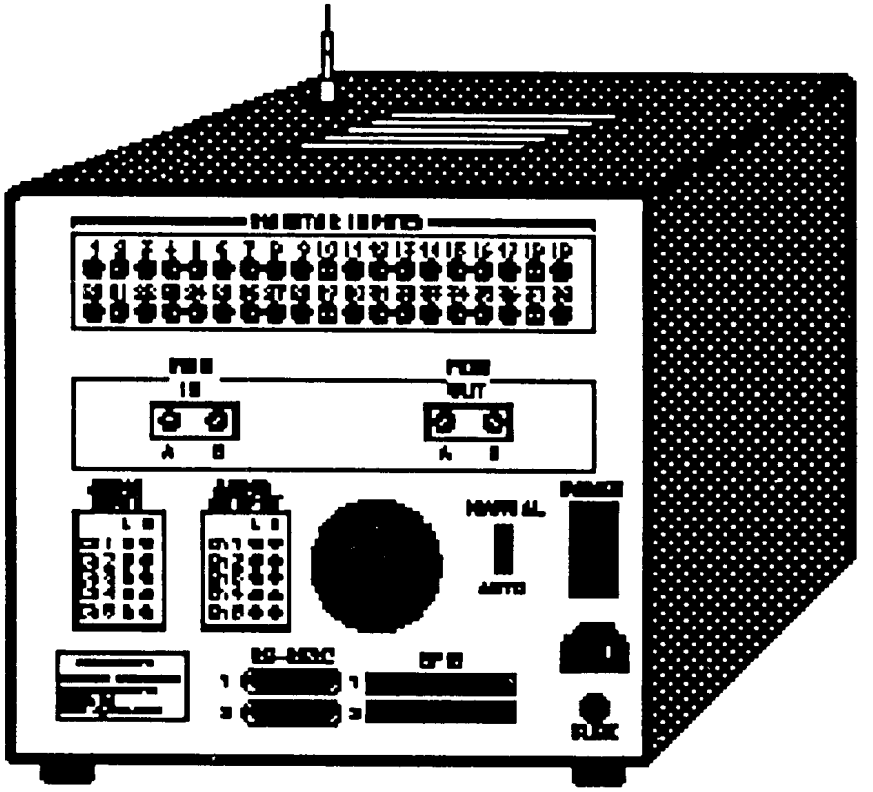
3.2.1 Keypad Control Panels

Figure 3-3 provides an illustration of two configurations of the keypad control panel. Different keypad arrangements are used, depending on the MFSM model number and the operator's interfacing computer. They are divided into two major groups: system control and VTR control. Table 3-1 describes the elements shown in Figure 3-3.

3.2.2 Display Controls

Display controls are shown in Figure 3-4. Operating procedures and interpretation of these displays are detailed in Section 4.





Figures 3-1 and 3-2. Overall MFSM Views

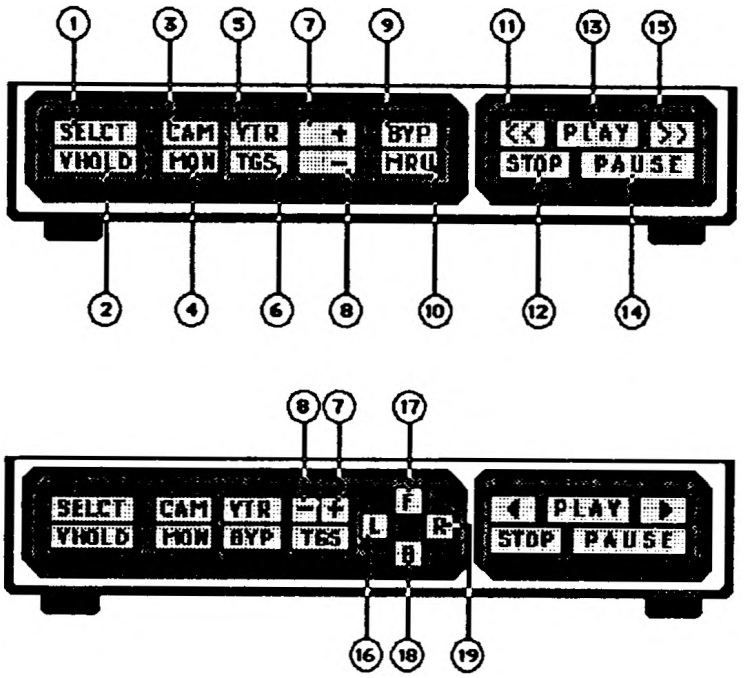


Figure 3-3. Keypad Control Panels

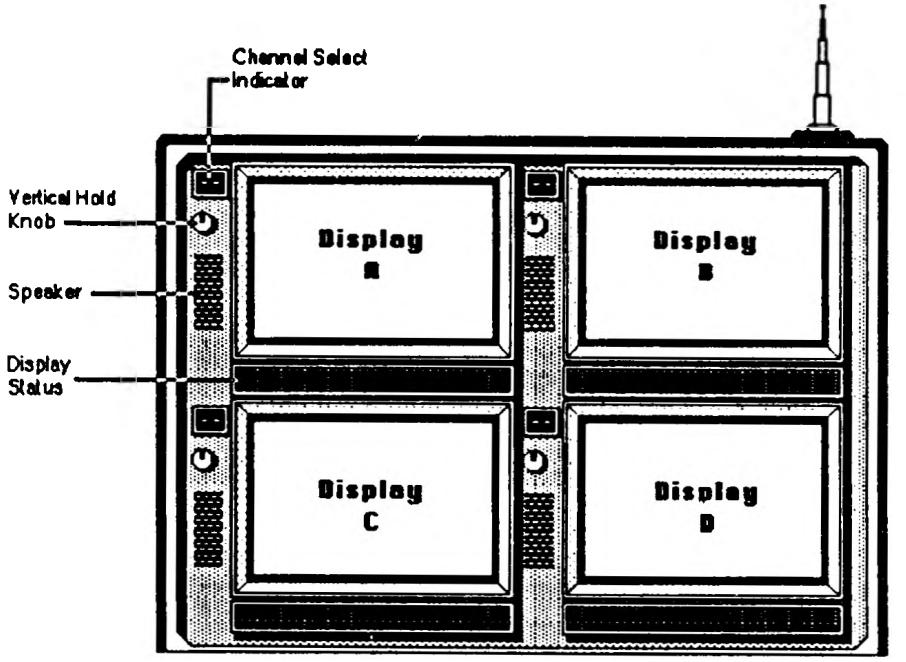


Figure 3-4. Phnordman Video Matrix

TABLE 3-1. Keypad Control Panel Elements

Item No.	Nomen-clature	Description
1	SELCT	Used to select screens for activation. Selection occurs in a left-to-right, top-to-bottom, sequence.
2	VHOLD	Vertical hold adjust mode switch.
3	CAM	Selects "live" camera for viewing.
4	MON	Gains access to target site internal closed-circuit security monitors. Two circuits are available for viewing: MON A and MON B.
5	VTR	Activates the Video Tape Recorder.
6	TGS	Activates the Telemetry Guidance System display on the screen selected.
7	+	Increments channels when in CAM and VTR modes. Toggles between site security monitor circuits when in MON mode. Adjusts vertical hold on some models.
8	-	Decrements channels when in CAM and VTR modes. Toggles between site security monitor circuits when in MON mode. Adjusts vertical hold on some models.
9	BYP	Toggles VTR bypass of site monitor channel.

TABLE 3-1. Keypad Control Panel Elements

10	MRU	Activates Mobile Remote Unit (MRU). Only one MRU can be active at any time.
11	<<	Rewinds VTR tape.
12	STOP	Stops VTR tape. Causes screen to show blank until the tape is played. Indicated by highlight on pushbutton.
13	PLAY	Starts VTR tape. Function activation is indicated by highlight on pushbutton.
14	PAUSE	Pauses VTR tape. Function activation is indicated by flashing highlight on pushbutton. PLAY must be pressed again to restart tape.
15	>>	Advances the VTR tape.
16	L	Used in conjunction with MRU mode. Causes MRU to turn left.
17	F	Used in conjunction with MRU mode. Causes MRU to move forward.
18	B	Used in conjunction with MRU mode. Causes MRU to move backwards.
19	R	Used in conjunction with MRU mode. Causes MRU to turn right.

3.3 BACKPANEL CONNECTORS

Backpanel connectors are hardwired on site. All cables and connectors terminate in special adaptors that interface with the target site terminals. Figure 3-5 shows connectors on the backpanel of the MFSM.

3.3.1 Video Inputs/Outputs

Camera inputs are taken directly from taps of a remote site's video control center. Up to 38 channels are provided. The MFSM solid-state recorder bypass output connectors (labelled MON OUTPUTS) are patched back into the remote site switching unit. Bias and phasing mismatches are automatically compensated for. A synch signal from the MFSM control microprocessor is included with every VTR output to allow for precise synchronization with the target system's timing devices.

3.3.2 Audio Inputs/Outputs

Although the BNC connectors for monitor inputs also carry audio signals, the MFSM is equipped with 10 RCA-type stereo input and output jacks. These are used for ancillary bugging purposes. These jacks can also be interfaced with the Digital Audio Synthesizing Unit (DAS[TT]), Part # CIA-UYA-007/9, for special highly sophisticated jamming and audio alteration purposes.

3.3.3 Data Acquisition Connectors

GPIB and RS-232C connectors form the lower part of the backplane panel. The target site's digital traffic is routed through these connectors. In addition, serial-to-parallel probes, signature analyzers, serial interface probes, trace modules, remote control devices, etc. can be connected to these ports. See the companion MFSM Maintenance Manual - Volume 2 for details on connectors.

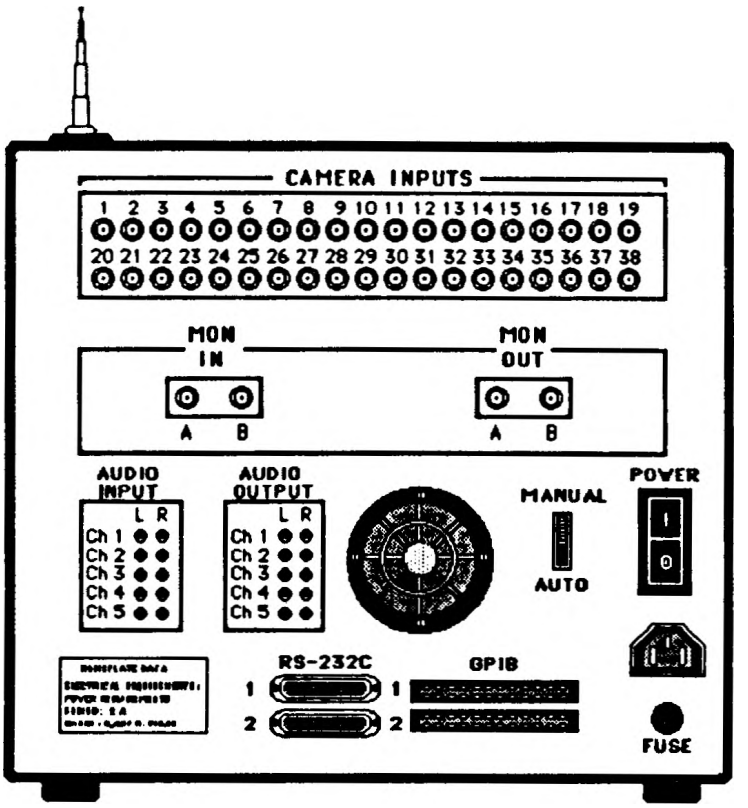


Figure 3-5. Backpanel Connectors

SECTION 4

OPERATING PROCEDURES

4.1 GENERAL

This section describes detailed operating procedures for the following modes of MFSM operation:

- Monitoring
- VTR
- Bypass
- TGS and MRU

Operating procedures for menus and displays used to control parameters are presented in this section. Initial turn-on procedures, basic programming rules, and operating modes are discussed, respectively.

4.2 TURN-ON PROCEDURES

Gaining access to the MFSM from an unauthorized microcomputer terminal is virtually impossible. Uplinks are possible only when originated from central computer control to offsite terminals.

4.3 BASIC PROGRAMMING RULES

A hand shaped cursor is used to "press" the appropriate pushbuttons on the MFSM front panel. On microcomputers configured with a standard joystick the cursor is positioned with the control column, and the desired pushbutton is activated by pressing the joystick switch (typically #1). On microcomputers configured with a mouse the cursor is positioned by moving the mouse, and the desired

pushbutton is activated by pressing the switch on top of the mouse once.

When a pushbutton has been pressed, the finger of the cursor changes to a down position, and the lettering on the button is highlighted with color to indicate the active status. Depending on the pushbutton pressed (and the function in operation) the highlight may be momentary, it may continue as long as the button is held down, or it may stay on until the pushbutton is pressed a second time.

4.3.1 Selecting Display

To select a display, press the **SELCT** pushbutton. The channel indicator for the next display in a left-to-right, top-to-bottom order will immediately flash. The channel number is changed by pressing the + or - pushbuttons.

4.3.2 Adjusting Vertical Hold

Sometimes the vertical hold must be adjusted on a display. To do this, perform the following procedure:

1. Press the **SELCT** pushbutton to select the desired display.

2. On systems equipped with a joystick:

   - Move the hand cursor to the **VHOLD** pushbutton.
   - Press and hold the joystick control button.
   - The **VHOLD** is highlighted.
   - While still pressing the joystick control button, move the column forward to control the rate of bottom-to-top vertical roll, and back to control the rate of top-to-bottom roll.

3. On systems equipped with a mouse:

   - Press and hold the **VHOLD** pushbutton.
   - The **VHOLD** is highlighted.
   - Press the + or - button to control the rate of vertical roll.
   - Press the **VHOLD** pushbutton again.

4.4 OPERATING MODES

The MFSM Monitoring, VTR, Bypass, and TGS/MRU functions provide extremely powerful and flexible capabilities for sophisticated real-time remote covert activities. In the **MON** mode, an operator may view a site's internal monitoring system. In **CAM** mode, the operator may also view individual cameras independent of it's monitoring system. The **VTR** mode allows for playback and analysis of all the site's recorded activities. The **BYP** mode enables an operator to intercept an internal monitoring system and substitute its current channel with a taped image corresponding to the same channel. Finally, the **TGS** and **MRU** modes provide information concerning the relative displacement and disposition of hostile counterintelligence forces, and allows command and control over friendly intelligence elements. Successfui use of the MFSM, therefore, depends on the ability of the operator to manipulate all the resources available to carry out the desired mission.

4.4.1 Monitoring

Monitoring takes place in two modes: viewing of a remote site internal video security monitoring circuits, and viewing elements of those circuits independent of the site central control.

4.4.1.1 Viewing Security Monitors. To gain access to internal security monitors, perform the following procedure:

1. Select the desired display monitor on the MFSM.
2. Press the **MON** pushbutton.
3. The default monitor circuit is "A". Verify that the monitor status display indicates "SECURITY MON A (or B)".
4. To change the current monitor, press the **MON** pushbutton.
5. Verify that the monitor status display indicates the alternate monitor circuit.

4.4.1.2 Viewing Independent Cameras. Individual surveillance cameras at the site can be isolated for viewing. To view a separate camera, the appropriate channel for that camera must be activated. Perform the following procedure:

1. Select the desired display monitor on the MFSM.
2. Press the **CAM** pushbutton.
3. Verify that the monitor status display indicates "LIVE".
4. Press the + pushbutton to increment channels and the - pushbutton to decrement channels.

4.4.2 Video Tape Recorder Operation

The Video Tape Recorder mode of operation is useful for display and analysis of pre-recorded activity. Recording is continuously automatic, so there are no provisions for "recording" an independent event, as with a standard VTR. When a channel is set for display, the taped material is transferred from a special buffer.

When a display on the MFSM has been selected and the **VTR** pushbutton has been pressed, the VTR will then function in a manner similar to normal analog devices. See Section 3 for an explanation of pushbutton functions associated with the VTR. The display status indicates "TAPE" when the VTR is active. To change the current tape channel number, press either the + or - pushbutton.

The synch signal that is recorded with the original image is automatically shown during playback. That signal is present on the bottom part of the screen as numbers that correspond to the minute and second of a one hour period. Shuttle search is possible by pressing the **PLAY** pushbutton and then pressing the >> or << buttons. A speeded image of the recorded material will be shown, along with synch numbers at the bottom.

4.4.3 Bypass

The bypass mode allows the recorded image from a VTR channel to replace its corresponding surveillance camera. To perform a monitor bypass, do the following:

1. Use one of the MFSM displays to show the VTR screen.
2. Select the VTR channel to be bypassed (using + or - pushbutton).
3. If necessary, advance or rewind the VTR until the time synch values match those shown on a real-time display.
4. Press the **PLAY** button on the VTR.
5. Press **BYP** to bypass the surveillance camera signal with tape.
6. Verify that the monitor status display indicates "BYPASS CAMERA".

To disable the bypass, do the following:

1. Select MFSM display showing the bypassed camera.
2. Press the **BYP** pushbutton to return to normal VTR function.

WARNING

SOME SECURITY SYSTEMS CAN DETECT WHEN A SYNCHRONIZATION ERROR HAS OCCURRED. BE ABSOLUTELY CERTAIN THAT THE CORRECT TIME SYNCH SIGNAL IS PRESENT ON THE BYPASS CHANNEL.

4.4.4 TGS and MRU Modes

When the Telemetry Guidance System screen is present on any of the MFSM displays, all pertinent information regarding active cameras, site personnel placement, navigational information, and MRU location is provided. To display the TGS screen:

1. Select the desired display monitor on the MFSM.
2. Press the **TGS** pushbutton.
3. Verify that the monitor status display indicates "TGS - _____". The current direction of the MRU is shown in the space after the dash.

Since location of an active MRU can also be shown relative to its surroundings, it is best to control the MRU in conjunction with the TGS display. Figure 4-1 explains the symbols used on the TGS screen.

4.4.4.1 Controlling MRU Movement. To control an MRU displayed on the TGS, perform the following procedure:

1. On systems equipped with a joystick:

   a) Move the hand cursor to the **MRU** pushbutton.
   b) Press and release the joystick control button.
   c) The **MRU** button is highlighted.
   d) Move the column forward to move the MRU forward, and back to move the MRU backwards.
   e) Move the column to the left to turn the MRU to the left, and to the right to turn the MRU to the right.
   f) Note that the TGS status display indicates the direction (EAST, WEST, NORTH, or SOUTH) the MRU is facing.
   g) Centering the control column stops the MRU in its current position.
   h) Press the **MRU** button again to release the MRU function.
   i) Verify that the **MRU** button is no longer highlighted.

   On systems equipped with a mouse:

   a) Press and hold the **F** button to move the MRU forward, and the **B** button to move the MRU backwards.
   b) Press and hold the **L** button to turn the MRU to the left,
      and the **R** button to turn the MRU to the right.
   c) Note that the monitor status display indicates the direction (EAST, WEST, NORTH, or SOUTH) the MRU is facing.

4.5 SECRECY WARNING

The content of this manual is of the highest "**TOP SECRET**" classification. Do not remove this document from its locked files. Operatives with proper security clearance will receive sealed copies. It is unlawful to copy this MFSM document onto magnetic tape or disk, or by any optical, chemical, or mechanical means.

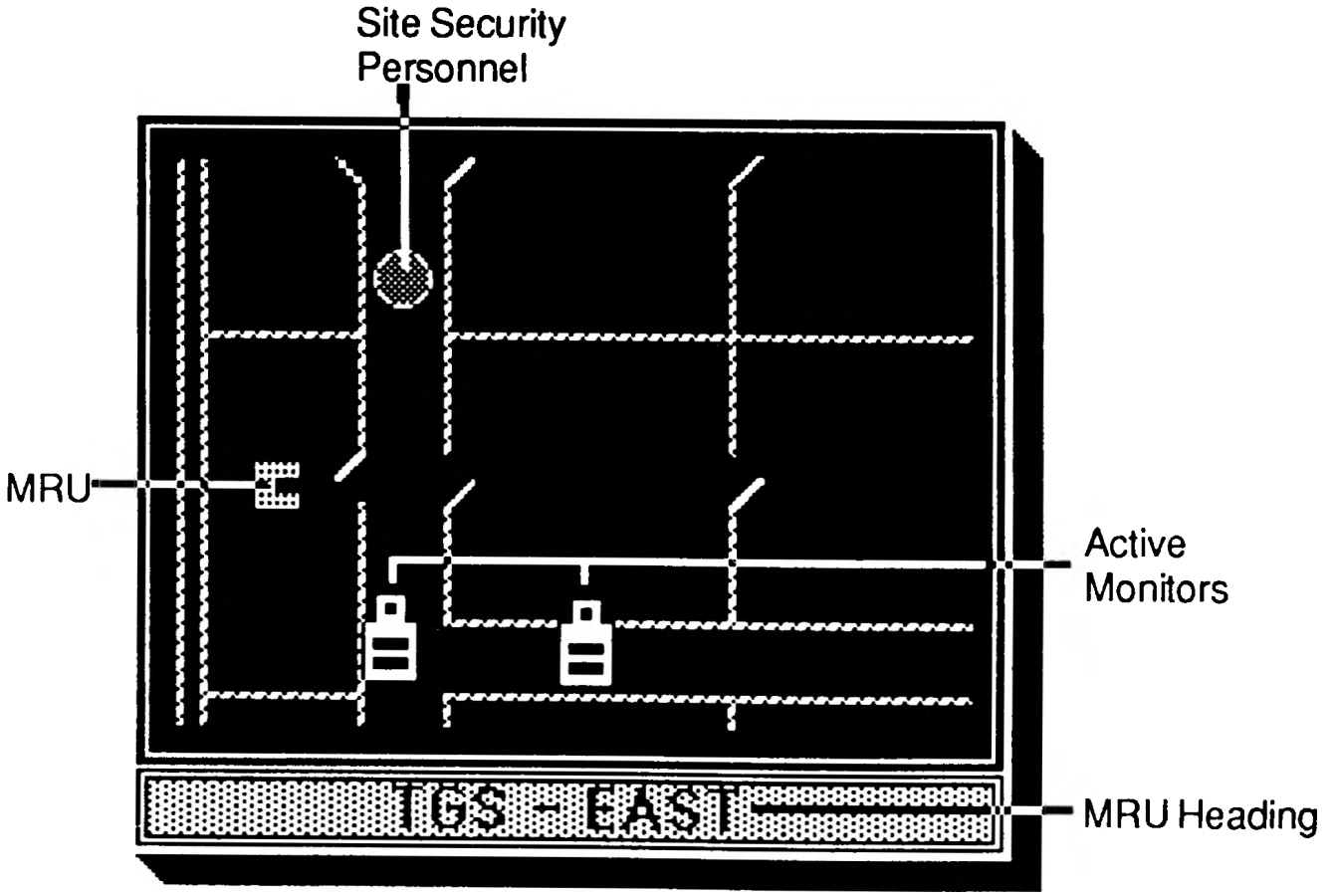


Figure 4-1. TGS Screen