

28615041

METRO RAIL PROJECT
RAIL CONTROL CENTER
FUNCTIONAL PLAN

Prepared by
Southern California Rapid Transit District
Systems Design and Analysis Department
and
Metro Rail Transit Consultants

July 1985

LACMTA LIBRARY

The preparation of this document has been financed in part through a grant from the U.S. Department of Transportation, Urban Mass Transportation Administration, under the Urban Mass Transportation Act of 1964, as amended, the State of California, and the Los Angeles County Transportation Commission.

TABLE OF CONTENTS

| <u>Chapter</u> | | <u>Page</u> |
|----------------|--|-------------|
| | LIST OF TABLES | ii |
| | LIST OF FIGURES | ii |
| | LIST OF ABBREVIATIONS | iii |
| 1. | INTRODUCTION | 1 |
| 2. | SYSTEM DESCRIPTION | 3 |
| 3. | ELEMENTS OF THE RAIL CONTROL CENTER | 7 |
| 3.1 | Rail Operations Control Room | 7 |
| 3.2 | Metro Rail CCTV Room | 8 |
| 3.3 | Transit Police Command Center | 8 |
| 3.4 | Equipment and Data Processing Rooms | 9 |
| 3.5 | Rail Operations Administration and Support Facilities | 9 |
| 4. | RAIL CONTROL CENTER STAFF | 10 |
| 4.1 | Operations Supervisor | 10 |
| 4.2 | Train Dispatcher | 11 |
| 4.3 | Communications Controller | 12 |
| 4.4 | Closed Circuit Television Operators | 14 |
| 4.5 | Police Watch Commander | 15 |
| 4.6 | Police Radio Dispatcher | 15 |
| 4.7 | Police Auxiliary Dispatcher | 16 |
| 4.8 | Future Dispatch Position | 16 |
| 5. | RAIL CONTROL CENTER EQUIPMENT | 17 |
| 5.1 | Operating Consoles | 17 |
| 5.2 | System Status Board | 28 |
| 5.3 | Support Equipment | 30 |
| 6. | FUNCTIONAL LAYOUT AND ROOM SIZES | 33 |
| 6.1 | RCC Location | 33 |
| 6.2 | RCC Layout | 33 |
| 6.3 | RCC Room Dimensions | 34 |
| 6.4 | RCC Changes with System Expansion from MOS-1 | 34 |
| | APPENDICES | 42 |
| Appendix A | Plans of RCCs for Selected U.S. Transit Properties | 43 |
| Appendix B | Rail Control Center Staff/Function Development | 49 |
| Appendix C | References | 63 |

LIST OF TABLES

| <u>Table</u> | | <u>Page</u> |
|--------------|--|-------------|
| 5-1 | Train Dispatcher Display and Command Screens | 20 |
| 6-1 | Rail Control Center Conceptual Space Requirement | 42 |
| A-1 | Functional Responsibilities Comparison | 49 |
| B-1 | RCC Staff/Function Development | 52 |

LIST OF FIGURES

| <u>Figure</u> | | <u>Page</u> |
|---------------|--|-------------|
| 2-1 | Metro Rail System Map | 4 |
| 5-1 | Metro Rail System Status Board | 32 |
| 5-2 | Metro Rail System Status Board - Detail Views | 33 |
| 6-1 | Rail Control Center | 37 |
| 6-2 | Control Room | 38 |
| 6-3 | Transit Police Command Center | 39 |
| 6-4 | CCTV Room | 40 |
| 6-5 | Transportation Facility - Second Floor - Main Shop Building | 41 |
| A-1 | Floor Plan - PATH | 45 |
| A-2 | Floor Plan - MARTA | 46 |
| A-3 | Floor Plan - MDCTA | 47 |
| A-4 | Floor Plan - WMATA | 48 |

LIST OF ABBREVIATIONS

| | |
|-------|---|
| ATEL | Administrative Telephone |
| CCTV | Closed Circuit Television |
| CC | Communications Controller |
| ETEL | Emergency Telephone |
| HVAC | Heating, Ventilation and Air Conditioning |
| I-COM | Intercom |
| LRT | Light Rail Transit |
| LS | Line Supervisor |
| MTEL | Maintenance Telephone |
| MRTC | Metro Rail Transit Consultants |
| MDCTA | Metro Dade County Transportation Administration |
| MARTA | Metropolitan Atlanta Rapid Transit Authority |
| MOS | Minimum Operable Segment |
| OS | Operations Supervisor |
| PAI | Passenger Assistance Intercom |
| PATH | Port Authority Trans - Hudson |
| PA | Public Address |
| RF | Radio Frequency |
| RCC | Rail Control Center |
| SCRTD | Southern California Rapid Transit District |
| SCADA | Supervisory Control and Data Acquisition |
| TD | Train Dispatcher |
| TO | Train Operator |
| TP | Transit Police |
| TPCC | Transit Police Command Center |
| TVO | (Closed Circuit) Television Operator |
| VDU | Video Display Unit |
| WMATA | Washington Metropolitan Area Transit Authority |

CHAPTER 1

INTRODUCTION

This document describes the functional plan for the Rail Control Center (RCC) of the SCRTD Metro Rail System. This facility will be located on the second floor of the Metro Rail Main Shop Building adjacent to the Transportation Facility. It will serve as the nerve center for the daily operations of Metro Rail.

The purpose of the plan is to provide a basis for facility and equipment design by identifying the organizational elements to be located there, the functions of each, and the personnel, equipment, and spatial requirements needed to perform these functions. The functional and spatial relationships among elements are also defined as a basis for facility layout.

The need for a RCC functional plan was identified in January, 1984, when it was determined that existing documentation had focused primarily on hardware and layout, with no overall basis provided as to how the facility elements were to function. Some of the documentation was also out-of-date.

In addition, it was noted that there were still many open issues concerning what organizational elements should be housed at the facility. There was initial agreement that the RCC would need to house the Metro Rail Control Center, Metro Rail CCTV Center, and Transit Police Command Center. Other elements considered for inclusion were: Transit Police Headquarters, Rail Operations Administrative Offices, Central Ticket Encoding and Distribution Facilities, Bus Dispatch Center, and the Light Rail System Control Center.

A working group was established to undertake the preparation of a functional plan for the RCC. Parallel efforts were also initiated to evaluate the necessity of locating the elements in question within the facility.

A summary presentation of the functional plan was given on April 24, 1984. The presentation showed functional relationships and the estimated space required for a facility housing all candidate elements. Subsequent analyses of facility construction costs led to decisions not to house the Police Headquarters, Ticket Encoding, Bus Dispatch Center and the Light Rail System Control Center elements in the RCC, and to compress the space estimates of the elements that are to be housed there.

It was also decided that the second floor Main Shop location should be used, rather than construct a new, stand-alone facility. Incorporating the RCC into the Main Shop Building allowed the required administrative offices to be located in the adjacent transportation facility.

The functional plan is presented in six chapters and three appendices. Following this introductory chapter, Chapter 2 provides a brief description of the SCRTD Metro Rail system for which the RCC will serve as operations center. Chapter 3 outlines the operations elements of the facility, while Chapter 4 describes the personnel and their responsibilities. Chapter 5 provides a description of the work stations and equipment. Chapter 6 summarizes the spatial requirements for the RCC and briefly discusses it as an element of the transportation facility. Appendix A presents layouts of existing rail operations control centers and a table comparing functional responsibilities with 6 existing control facilities. Appendix B defines staff/function relationships for various incidents and activities, and Appendix C provides a list of references.

CHAPTER 2

SYSTEM DESCRIPTION

The SCRTD transit system will consist of Metro Rail, light rail, and bus service. Each of these modes will be controlled from separate facilities: Metro Rail from the RCC located in the Main Shop Building; light rail from a new facility to be built near the junction of the Los Angeles-Long Beach and Century lines; and the bus lines from the existing Bus Dispatch Center. Located within the Metro Rail RCC is the Transit Police Command Center. This will direct the forces of the Transit Police in ensuring the security of all modes of SCRTD transit.

To ensure the maximum coordination of activity, direct voice and data communications will be provided among all control centers, and the Transit Police Command Center will be provided with the capability of receiving CCTV images from Metro Rail and LRT locations.

Metro Rail will be a high-speed, steel-wheel, steel-rail, rapid transit system serving the high-ridership corridors of Los Angeles County. The initial line, currently in final design, will have 18 miles of underground trainway. As Figure 2-1 shows, it will serve the central business district, Wilshire Boulevard, Fairfax Avenue, and the Hollywood and North Hollywood areas. Eighteen stations are planned with the distance between stations ranging from 0.4 miles in the downtown area to 2.5 miles through the Santa Monica Mountains.

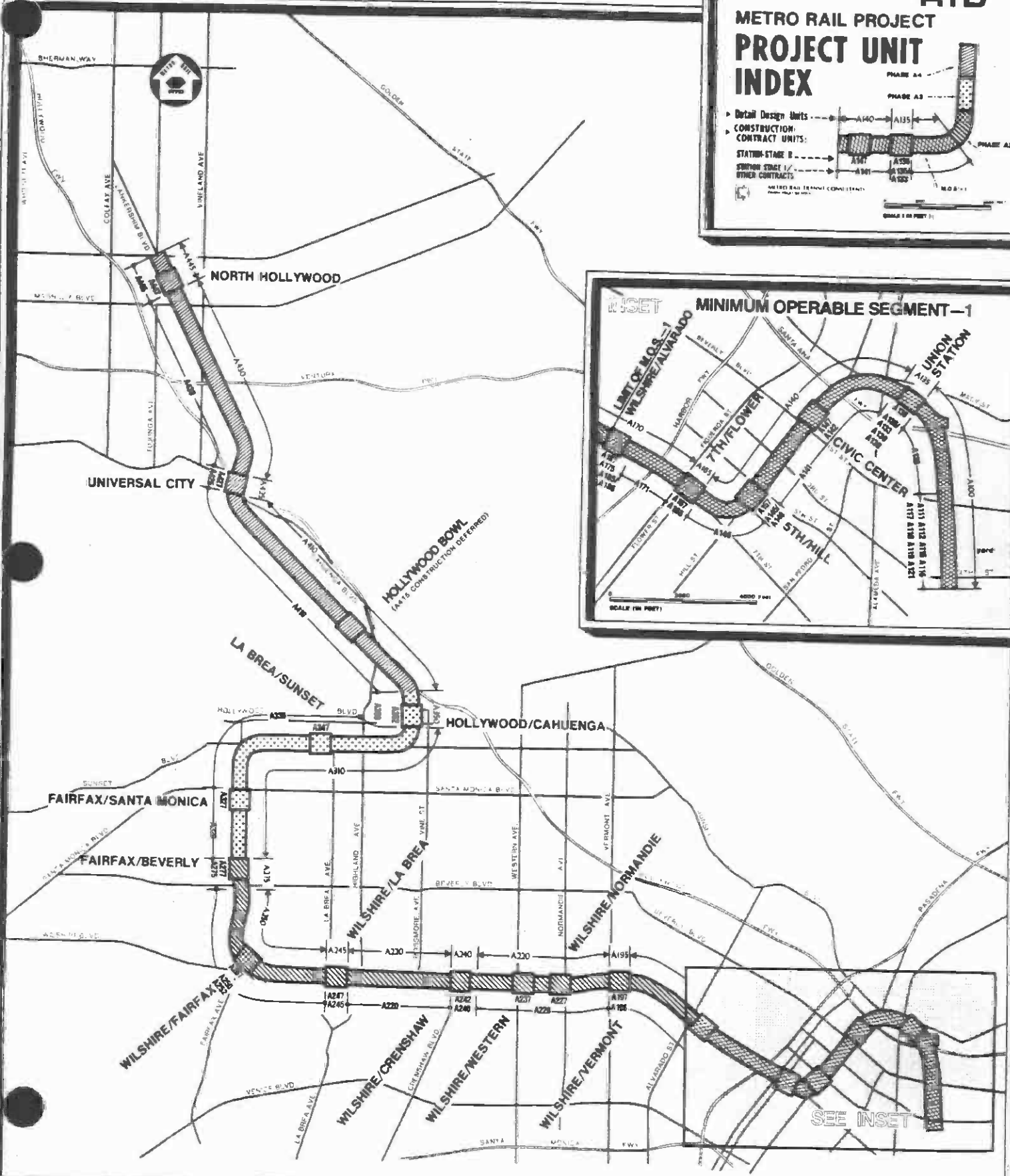
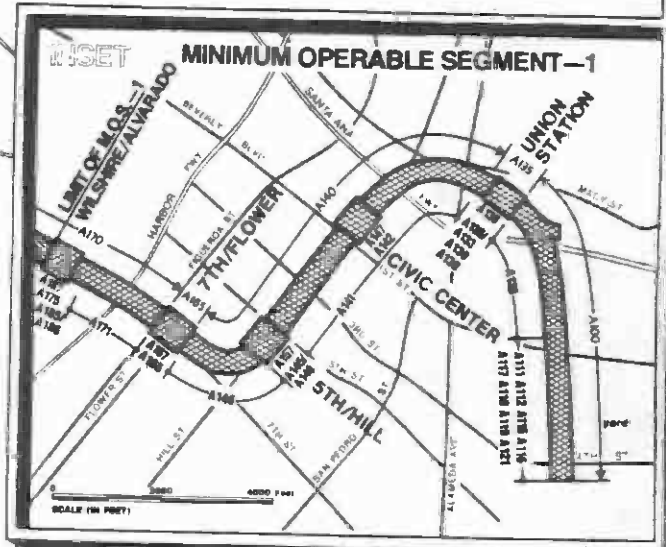
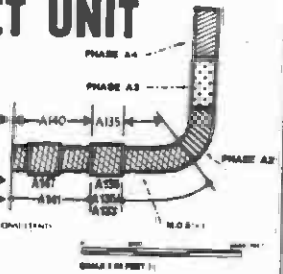
SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT

MAY 1985



METRO RAIL PROJECT PROJECT UNIT INDEX

- Detail Design Units
- CONSTRUCTION CONTRACT UNITS:
- STATION STAGE B
- STATION STAGE A
- OTHER CONTRACTS



Stations are being designed to permit both attended or unattended operation. Station attendants will be assigned to monitor station activity and to assist patrons when and where it is determined they are justified. All stations will be equipped with CCTV cameras for monitoring by RCC personnel.

The fare collection system will be of the barrier type with ticket-checking fare gates controlling entry and exit at each station, supported with ticket-issuing vending machines. With all stations being in subway, escalators, stairs, and elevators will provide vertical circulation between the surface, fare collection mezzanine, and platform levels.

Service will be provided by trains of four or six cars. The trains will be capable of automatic operation; the lone employee on the train - the train operator - will open and close the doors at each station. In emergencies or unusual situations, the operators can assume manual control of the train. Central control personnel will be able to monitor and direct changes to train schedules and train performance. CCTV will enable operational activities at all stations to be visually monitored.

Current plans call for service to be operated 20 hours per day, 7 days per week by Year 2000. The minimum headway in week-day peak periods will be 3-1/2 minutes. Year 2000 service levels will require a fleet of 130 vehicles. Ridership that year is expected to reach 364,000 patrons per day.

Initially, a 4-mile portion of the line (shown as "Minimum Operable Segment-1" on Figure 2.1) will be constructed. It is currently anticipated that the line will be incrementally extended until it reaches the 18-mile locally preferred alternative system.

Extensions to the initial 18-mile Metro Rail line are under consideration, with proposals for branch lines to Santa Monica or Westwood and to Norwalk. These extensions would roughly double the route miles and number of stations of Metro Rail.

CHAPTER 3

ELEMENTS OF THE RCC

As described in Chapter 1, the Rail Control Center will serve as the nerve center for daily operations of Metro Rail. The elements necessary to perform this function are:

- o Rail Operations Control Room
- o Metro Rail CCTV Room
- o Transit Police Command Center
- o Equipment Room
- o Data Processing Room

3.1 Rail Operations Control Room

The Rail Operations Control Room will be the location from which operations personnel will supervise and control the movement of trains on Metro Rail. The dispatchers will have control of the route setting and train control equipment on the main line and will have direct radio communication with the Train Operators. The traction power supply will also be under the control of RCC personnel in the Operations Control Room. The SCADA (Supervisory Control and Data Acquisition) subsystem will supply operations information (on-line occurrences) to the RCC. All equipment such as HVAC, train control, fire protection, gas sensing, and fare collection equipment will be monitored, and arrangements for the dispatch of maintenance staff will be made from this room. RCC personnel will be responsible for decisions on schedule alteration to provide the best service to patrons and for informing patrons of schedule alterations, delays, and alternative travel routes when necessary because of Metro Rail service disruptions. Rail Operations Control Room staff will liaise with staff at other locations: Station Agents for patron

assistance; Line Supervisors at terminal stations for service adjustments; maintenance personnel for facility repair; Yard Dispatcher and vehicle maintenance staff for provision or replacement of trains; Crew Dispatcher for alterations to staff assignments; Police Dispatcher for security matters; and other transit mode control centers for coordination of services during disruptions or special activities. The Communications Controller will also coordinate activities and act on instruction from the adjacent Fire Incident Command Post, when that post is staffed.

3.2 Metro Rail CCTV Room

The CCTV Room will be the location for monitoring fare gates, platform edges, and ticket vending equipment at Metro Rail stations via CCTV cameras. The CCTV operators will also assist patrons at the stations via intercom and public address, and will monitor and control the status of station fare collection equipment. Remote-controlled ticket readers will enable CCTV operators to read the encoding on an inserted ticket, in order to further assist patrons.

3.3 Transit Police Command Center

The Transit Police Command Center is to serve as the central location for monitoring and directing the daily activities of Transit Police units on patrol of the SCRTD bus/rail system (including mobile, foot patrol, and undercover units). When a security incident is observed or called in to the Metro Rail CCTV Center, the Light Rail CCTV Center, or Bus Dispatch Center, the Transit Police Command Center will be notified and respond with appropriate action that will generally include the dispatching of Transit Police units in the field to the scene.

The location of the Command Center adjacent to the Rail Control and CCTV Rooms will promote the coordination of operations and security activities and help to provide a quick, effective response to incidents requiring police attention. Viewing windows between each of these rooms will also assist in coordination of efforts.

CCTV image transfer between Metro Rail and Light Rail Control Centers will be provided for Transit Police security requirements.

3.4 Equipment and Data Processing Rooms

The Rail Operations Control, CCTV, and Transit Police personnel will rely very heavily on computer and communications equipment to perform their respective functions. Each work station in these rooms will have computer and communications controls suited to its specific requirements. Central hardware and computer equipment will be located in the Equipment and Data Processing Rooms.

3.5 Rail Operations Administration and Support Facilities

The RCC personnel will require support facilities. These include a lunch room/kitchenette, restrooms, and lockers (for work shift personnel only). An elevator will be required to move equipment to the second floor and for access by handicapped employees. The location of the RCC, Transportation Facility, and Administrative offices within the Main Shop Building allows for common support facilities to be constructed for use by all staff members and avoids expensive duplication of facilities (see Figure 6-5).

CHAPTER 4

RAIL CONTROL CENTER STAFF

The Rail Control Center will be staffed by operations and security personnel who will be responsible for overseeing the safe and efficient movement of patrons on the Metro Rail System. This chapter identifies the RCC personnel and their functional responsibilities.

4.1 Operations Supervisor (OS)

The OS will have primary responsibility for ensuring the safe and efficient transportation of passengers on the Metro Rail System. He will have ultimate responsibility for all operations decisions made during his shift assignment.

The OS will be in charge of all activity within the Control Room and the CCTV Room. He will monitor, guide and direct the Train Dispatcher, Communications Controller and the CCTV Operators. He will coordinate the activities of these personnel to avoid conflicts of responsibilities in handling disruptions or other control center functions. Line Supervisors, who will work closely with the Train Dispatchers, will act under OS direction.

Under normal circumstances, system operation will not require direction from the OS. The RCC staff and SCADA computer will operate the system. During disruptions to service, the OS will be kept informed of events and will ensure that proper action is taken to adjust the service. The OS will coordinate with the Light Rail Control and/or Bus Dispatch Centers when warranted during serious disruptions. The OS will oversee implementation of emergency procedures and will ensure that police, fire, ambulance

and other agencies are notified when necessary via the Communications Controller. The OS will also oversee the establishment and maintenance of liaison with a command post at the scene of an emergency and at the RCC.

The OS will be responsible for supervising RCC operations personnel and Line Supervisors. The OS will rely upon the transportation Crew Dispatcher to ensure that all operations positions will be covered during the shift and will contact the Crew Dispatcher when a position is or becomes vacant.

The OS will work with the Rail Operations Instructors and the Rail Operations Manager to evaluate and critique all methods and procedures used. The OS will assist the Instructors with the initial and on-going training of RCC operations personnel.

4.2 Train Dispatcher (TD)

The TD will oversee train operations by monitoring all main line train movements. Normally, these train movements will be automatically controlled by a computer under TD supervision. When necessitated by service disruptions or unscheduled train moves, the TD will be able to re-direct and control the routing and performance of trains on the main line by inputting appropriate commands to the computer.

All radio communication (on the Operations and Emergency channels) with Train Operators on the main line will be through the TD. When a train encounters functional trouble, the TD may assist the Train Operator in troubleshooting the problem in order to move the train. The TD will be responsible for all communication with the Yard Dispatcher regarding main line/yard train handoffs.

The TD will also monitor and control all electrical substations (excluding the Main Shop) for traction and auxiliary power supplies. In the event of the loss of power from a substation, the TD will be responsible for taking action to reconnect to the supply.

The TD will also control traction power and auxiliary power systems to permit scheduled and corrective maintenance to power system components or to other station or right-of-way equipment. Cutting off power may also be required during emergencies.

The TD will ensure that the Communications Controller (described in the following section) is informed of all in-service failures to rail vehicles, train control equipment, and power distribution equipment so that a record of the failure is entered into the computer and transmitted to the responsible maintenance group.

The TD will also ensure that the OS is aware of all unusual or potentially disruptive events.

4.3 Communications Controller (CC)

The CC will monitor all status displays, alarms, and indications of the environmental control system and station equipment. The communications system will include methane gas, fire, smoke (in selected station ancillary rooms) and seismic detectors. Station equipment to be monitored by the CC will include fare collection equipment, station lighting and HVAC. Intrusion alarms will be routed to the CCTV Operators (described in the following section).

The CC will have equipment for answering ETEL calls, though these will normally be handled by the CCTV Operators. The CC will have access to all Metro Rail Opera-

tions radio channels, and the radio channels provided in the subway for the Transit Police, the Los Angeles City Fire Department and the Los Angeles County Fire Department.

The CC will be responsible for communications to outside agencies and to the maintenance department. When the CC is made aware of an emergency via an alarm or from the TD or a CCTV Operator, the CC will inform the OS and, under the OS's direction, will contact appropriate external emergency services, including police, fire and ambulance. The CC will have access to the public address system and may, under the OS's direction, inform patrons in affected stations of train delays or other service information. The CC will also, when instructed by the OS, provide patron direction if the need arises for train and/or station evacuation.

When a Fire Department Representative is occupying the adjacent Fire Incident Command Post, the CC will assist him with communications and equipment control. This may involve control of HVAC, fare gates, ventilation fans, public address system and emergency telephones. When the Fire Incident Command Post is staffed, the Fire Department Representative will handle all radio communications on the City Fire and County Fire radio channels.

The CC will be responsible for ensuring that all operating equipment failures are recorded into the TRANSMIS computer. Most failures of fixed equipment will be equipment-detected and automatically recorded. Some failures will be related to the CC by the TD or CCTV Operators and will require manual input into the computer. In most cases, the CC will contact the appropriate maintenance group when an equipment failure arises.

4.4. Closed Circuit Television Operators

The CCTV Operators will be responsible for continuous visual monitoring of station activity, security, passenger flow, and the operation of fare collection equipment. Each CCTV Operator's workstation will include 12 CCTV monitors. These monitors will be capable of displaying video images from any of the up to 24 cameras in the two passenger stations the CCTV Operator is monitoring. Each workstation will be capable of adding 4 monitors, should the need arise. By means of the passenger assistance intercom, verbal assistance will be rendered to passengers experiencing difficulties with fare collection equipment. Ticket readout capability will also be provided to the CCTV Operators.

The CCTV Operator will receive all calls from passenger assistance intercoms. If the call is from a patron encountering difficulty with the fare collection system, the CCTV Operator will be able to interpret the encoding on the patron's ticket via a station ticket reader and, if warranted, control the fare collection equipment (e.g. remove equipment from service, lock or release one or more fare gates, reset/override certain fare gate control logic). The CCTV Operator will regularly control the directionality of fare gates at unattended stations to accommodate patron flows.

If a patron calls the CCTV Operator to report a security incident, the CCTV Operator will immediately switch the call to the Police Radio Dispatcher responsible for rail system security. If the patron has called to request bus or rail service information, the CCTV Operator may switch the call to SCRTD's Telephone Information Service in the Customer Relations Department.

The CCTV Operator will be responsible for answering ETEL calls from the station(s) being monitored. The CCTV Operator may either handle or forward these calls, as appropriate. Station intrusion alarms will also be routed to the CCTV Operator's workstation for response.

The CCTV Operator will have equipment for making PA announcements to the stations being observed. This will also include the capability to record a message for continued re-broadcast to the appropriate station(s).

4.5 Police Watch Commander

The Watch Commander will be responsible for the Transit Police Command Center. The Watch Commander will liaise with the OS, the supervisors at the Light Rail Control Center and Bus Dispatch Center, and municipal law enforcement agencies to ensure that security needs throughout the SCRTD System are being met. He will oversee and direct the Transit Police Command Center staff to ensure that appropriate action is taken in responding to security and safety incidents. The Watch Commander will have an office within the Transit Police Command Center.

4.6 Police Radio Dispatcher

The rail Police Radio Dispatcher will direct and coordinate all SCRTD security forces on the Metro Rail and light rail systems, including foot patrol, mobile patrol, and undercover officers. The rail Police Radio Dispatcher will receive calls from the CCTV Operators or others regarding security incidents on the rail system and will take appropriate action, including dispatching forces to the scene. The rail Police Radio Dispatcher will also monitor the two Transit Police radio channels provided

below-ground. The Police Radio Dispatcher will input incident information into the computer as a record of each incident.

The bus Police Radio Dispatcher will direct and coordinate bus system security forces. This post will require direct line communications with the Bus Dispatch Center for receiving and processing incident data.

4.7 Police Auxiliary Dispatcher

The Auxiliary Dispatcher will be responsible for answering all telephone calls made to the Transit Police from outside the Metro Rail System. The Auxiliary Dispatcher will assist the Police Radio Dispatchers and will provide relief for them as required.

4.8 Future Dispatch Position

Room sizing will allow for this post to be added should the amount of activity warrant it.

CHAPTER 5

RAIL CONTROL CENTER EQUIPMENT

The RCC will contain displays, controls, communications equipment, and computer systems to enable the RCC staff to perform their duties of monitoring and controlling the system, as defined in Chapter 4 and further developed in Appendix B.

5.1 Operating Consoles

The Operations Control Room will contain three main consoles (see Figure 6-2) each corresponding to the appropriate primary function. The CCTV Observation Room will contain nine main consoles, the Transit Police Command Center will include three operating consoles, and a training console will be provided in the data processing room.

5.1.1 Train Dispatcher Console

The Train Dispatcher's console will be located in the Operations Control Room immediately in front of the System Status Board. The console will be positioned so as to provide a full view of the System Status Board from either of the two positions provided. Each position will have the following equipment:

1. Two SCADA video display units (VDUs) with data and graphics capability to provide detailed line or power section schematics and to display systems status messages and (visually) acknowledge TD commands of switches, signals, train performance, power distribution system components, etc. (May also display warning or rejection messages, as appropriate).

2. Full SCADA keyboard to facilitate control of switches and signals, train performance, and power distribution system equipment.
3. Electronic telephone set with alphanumeric display. This equipment will also function as the communications keyboard providing TD control over radio, telephone and RCC intercom.
4. Radio channel(s) speaker to give selected radio channel audio while the TD is using another communications medium.
5. Footswitch:

Footswitch for monitoring of and transmitting on radio channels
6. Headset jacks/headset:

Headset jacks and headset for transmitting and receiving on radio channels, telephone, and intercom.

Table 5-1 lists the display and command screens required by the TD. The technology chosen to control the display and command screens - preferably touch-screen technology - should provide for the rapid access of information and the prompt initiation of action required to deal with a real-time situation.

While two workstations are to be provided at this console, it is envisioned that only one TD will normally be required to control train and power operations on the 18-mile system.

Table 5-1

TRAIN DISPATCHER DISPLAY AND COMMAND SCREENS

TRAIN CONTROL

- Main Menu
- System status display
- Display of track layout and occupancy around a specified station, or between any stations
- Display of track layout and occupancy within or between interlockings
- Display of track layout and occupancy at the yard/mainline transfer point
- Alarm and failure status
- Resident schedules
- Reports and log entries
- Vehicle location report
- Route initiation for each interlocking (touchscreen entry/exit operation)
- Switch control
- Transfer of control to/from local panels
- Train performance selection
- Station dwell time modification
- Written communication with the Yard Dispatcher

Table 5-1
(cont.)

TRACTION POWER

- ° Main menu
- ° System status display
- ° For any substation - equipment status, power, voltage and current level, energy consumption
- ° Auxiliary power system at any location - equipment status, voltage and current levels, energy consumption
- ° Alarm and failure status
- ° Alarm acknowledgement
- ° Reports and log entries
- ° Opening and closing of all breakers, switches and controls
- ° Track-to-earth current alarms and readout

System Communications Console

The System Communications Console will be a two-workstation console. The Communications Controller's (CC) position will be staffed at all times. The adjacent Fire Incident Command Post will be staffed by a Fire Department Representative during emergencies to provide RCC liaison to on-site fire-fighting forces. The System Communications Console will be centrally located in the control room, providing a full view of the System Status Board (described in Section 5.2). The CC position will have the following equipment:

1. Two SCADA VDUs with data and graphics capability to: provide detailed system schematics and/or diagrams; display system status messages and acknowledge CC commands; and to enter incident data.
2. Full SCADA keyboard to provide system and subsystem control for station facilities and equipment and to control image display on the CCTV call-up monitor (described below).
3. Electronic telephone set with alphanumeric display. This equipment will also function as the communications keyboard providing CC control over radio, RF paging, public address, RCC intercom, and telephone. As a telephone, it will provide access to ATEL, MTEL and PAI lines and direct line communications to area emergency service agencies. A separate telephone instrument will be provided to handle ETEL calls. This instrument will include an integral display to indicate where the ETEL calls originate.

4. Two speakers: One for selected radio channel(s) audio and the other for the audio on those radio channel(s) not selected at the console.

5. Footswitch:

Footswitch for monitoring of and transmission on radio channels

6. Headset/headset jack:

Headset and headset jacks for transmitting and receiving audio on radio channels, telephone and intercom.

7. Audio recording equipment - the RCC will have a dual transport, multiple-track audio recorder to record all radio channels and all active ETEL lines. This will operate automatically, though manual change-over of recording tapes will be required on a daily basis. Playback equipment and tape maintenance and repair accessories will also be available.

8. Public address system announcement recording and broadcast equipment will allow the CC to create a message and broadcast it to designated station(s).

9. CCTV call-up monitor to permit viewing of selected station activity.

The Fire Incident Command Post shall be equipped with the following:

1. Electronic telephone set with alphanumeric display. This equipment will also function as the communications keyboard providing control over the Los Ange-

les City Fire Department and Los Angeles County Fire Department radio frequencies provided on the Metro Rail System. It will also access ATEL and direct lines to area emergency service agencies. A separate instrument for ETEL calls will be provided. This instrument will include an integral display to indicate where the ETEL calls originate.

2. Two speakers in accordance with item 4 above.
3. Footswitch/headset jack/headset in accordance with 5 and 6 above.

The Fire Incident Command Post will be able to view the SCADA VDU's provided at the CC's workstation.

5.1.3 Closed Circuit Television Operation Console

A total of nine CCTV consoles will be provided in the CCTV room. The CCTV Console will contain 6 CCTV monitors (each Metro Rail station will have a maximum of 12 cameras). There will be provisions for switching station video to any one of the 6 monitors for that station. A larger call-up monitor will be provided at each CCTV Console Workstation. On weekdays during the period from the AM peak through the PM peak, each CCTV Operator will be responsible for monitoring the activity at a pair of stations. At other times the monitoring load for the 18-station starter line will be consolidated to permit monitoring by five CCTV Operators. Each CCTV Console will also have the following equipment:

1. A single SCADA VDU to display CCTV call-up monitor instructions, monitor fare collection equipment status and to receive ticket encoding data from a station ticket reader.

2. SCADA keyboard to control the call-up monitor, and fare collection equipment status.
3. Electronic telephone set with alphanumeric display. This equipment will function as the communications keyboard providing CCTV Operator control of the public address system RCC intercom and telephone. It will provide displays of incoming PAI calls and allow the CCTV Operator to handle the call and re-direct it as necessary.
4. Headset jacks/headset for transmitting and receiving audio in any communications mode.
5. Video recording equipment to permit the recording of the CCTV image on the call-up monitor.
6. Public address system announcement recording and broadcast equipment will allow the CCTV Operator to record the required message and broadcast it to the designated station(s).

5.1.4 Operations Supervisor's Console

The Supervisor's Console will be located in the control room, providing a full view of all workstations within the control room and of the System Status Board. The Supervisor's Console will be functionally similar to the TD console, but will have priority access to the central processing unit.

The Supervisor's Console will have the following equipment:

1. Two SCADA VDU's with data and graphics capability.

2. Full SCADA keyboard to provide system control and to control CCTV call-up monitor displays.
3. Electronic telephone set with alphanumeric display. This equipment will also function as the communications keyboard providing OS control of radio, RF paging, RCC intercom, and telephone. As a telephone, it will provide access to ATEL, MTEL and ETEL lines, provide direct line communications to other transit control centers (bus and LRT), and to area emergency service agencies.
4. Two speakers, one for selected radio channel(s) audio and the other for the audio on those radio channel(s) not selected at the console.
5. Footswitch:

Footswitch for monitoring of and transmission on radio channels
6. Headset jacks/headset:

Headset jacks and headset for transmitting and receiving audio in any communications mode.
7. CCTV call-up monitor to permit viewing of selected station activity.

5.1.5 Police Dispatch Console

There will be two Police Dispatch Consoles in the Transit Police Command Center - one for handling all rail system incidents and the other for bus system incidents (though both consoles will be capable of performing

either function). In order to handle rail system incidents, both consoles will have the following equipment:

1. Transit Police Incident Processing VDU to display incident data.
2. Keyboard to control the VDU and to enter incident data.
3. A controlled access system VDU to display system status messages.
4. A controlled access system keyboard for system control.
5. Electronic telephone set with alphanumeric display. This equipment will function as the communications keyboard providing Police Radio Dispatcher control of radio, RCC intercom, and telephone. It will provide access to ATEL, ETEL and PAI lines, and direct line access to area emergency service agencies.
6. Selected radio channel(s) speaker to provide radio channel audio when the Police Radio Dispatcher is using another communications medium.

7. Footswitch:

Footswitch for monitoring of and transmitting on radio channels

8. Headset jacks/headset:

Headset jacks and headset for transmitting and receiving audio in any communications medium.

9. CCTV call-up monitor to permit viewing of selected station activity (the arrangement of this equipment should provide for access from both consoles).
10. Video recording equipment to permit the recording of the CCTV image on the call-up monitor.

The bus Police Dispatch Console is not described in detail in this report, as it will be provided by others. This console will require wire-line links to the Bus Dispatch Center for radio and telephone audio transmitting and receiving and for the transfer of incident data. Both Police Dispatch Consoles will require access to the criminal investigation data terminal.

5.1.6 Police Telephone Answering (Auxiliary Dispatcher) Console

This console will handle all calls to Transit Police for both bus and rail incidents made from the District's field locations. The Telephone Answering Console will include:

1. Electronic telephone set with alphanumeric display, providing direct line access to area emergency service agencies.
2. Headset jack/headset for transmitting and receiving audio.

5.1.7 Training Console

This will be located in the Data Processing Room of the RCC. The console will allow Dispatcher/Controller candidates to obtain hands-on experience at a console without being immediately involved in real-time operations.

This console will be identical to the Supervisor's Console described above, excepting the priority access to the computer.

5.2 System Status Board

The RCC will incorporate a display board showing the status of train operations, train control equipment and traction power equipment. Operations Room design will provide for an unobstructed view of the status board from the Train Dispatcher's console, the Communications Controller's console, and the Operations Supervisor's console.

The System Status Board will provide a schematic representation of the rail system beyond the Yard/Main Line Transfer Point and will use appropriate indications to reflect the status of specific train control equipment and the location of trains on the main line.

In addition, the System Status Board will provide a schematic representation of the power system, from substation rectifier to contact rail. It will also use indications to reflect the status of all circuit breakers and switches to enable decisions to be made and

action taken to maintain traction power by alternative feeding arrangements.¹

Figure 5-1 shows top and front views of the System Status Board for the starter line. The dimensions of the board and the location of the Train Dispatcher's console are taken from the MRTC-Systems Design Division RCC design concept sketches of April 1984.

Figure 5-2 is a sample section of the System Status Board, detailing the suggested types of board indications.

If operation of the Status Board must be suspended (either due to a malfunction or on account of load shedding in a power emergency, for example) the RCC staff can call up a VDU representation of the overall system for both train control and traction power.

¹ The traction power display described deviates from the requirements of Section 3.17.6 of Volume V of the Design Criteria. In particular, the display does not represent the entire traction power system. It includes the status of third rail sections and all dc feeder breakers and alarm summaries for the rest of the system. This deviation is felt to be justified since:

- ° It provides the information needed to run the system and respond to operational problems.
- ° Detailed information required for the control or problem response for the traction power system is felt to be best displayed on a console VDU.

Upon project acceptance of this functional plan, a Change Request will be issued to revise the referenced section of the Design Criteria accordingly.

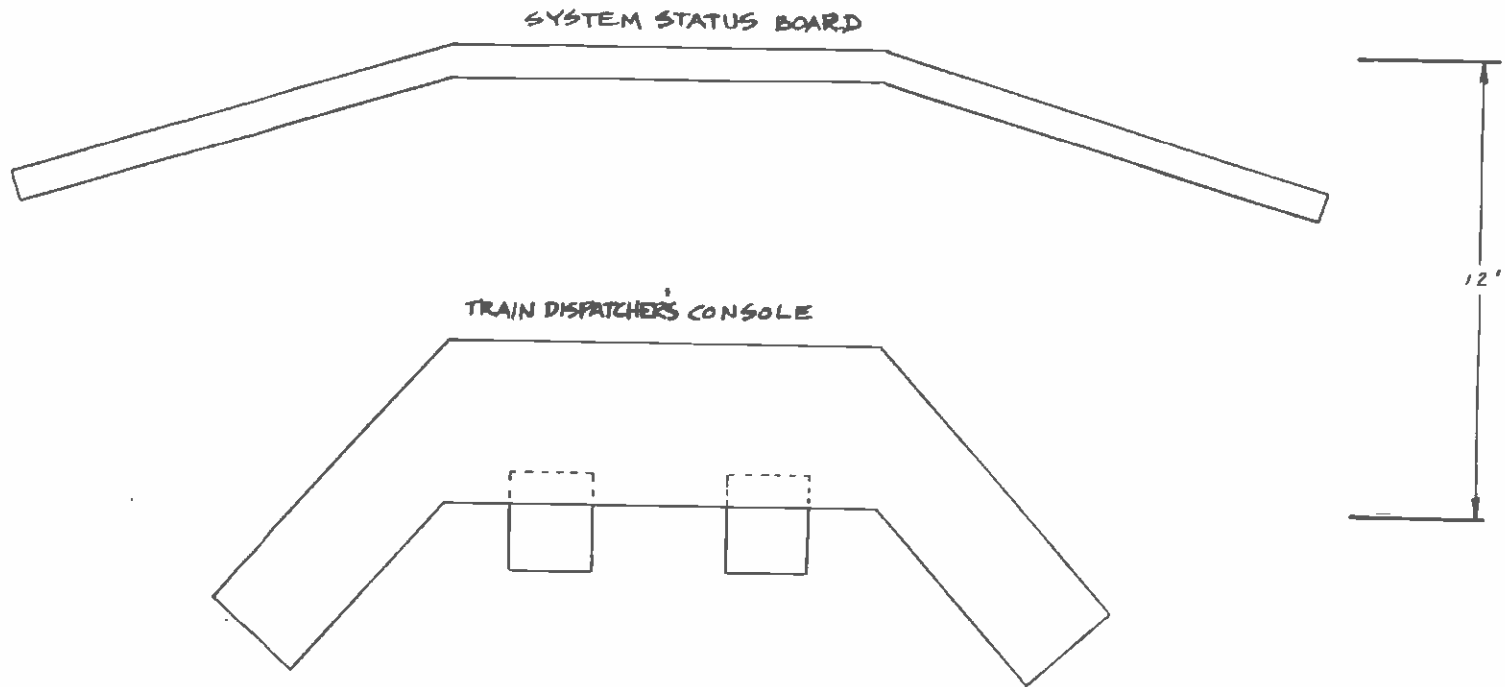
Support Equipment

Communications management equipment such as switches, relays, and multiplexing equipment will be required to enable the workstations to be supplied with the indications, alarms, and control functions described above. The digital telephone switch provided for the RCC will allow for re-programming of the routing of telephone lines to any instrument in the RCC. This will allow the system to adapt to changes in traffic patterns, shift assignments, etc.

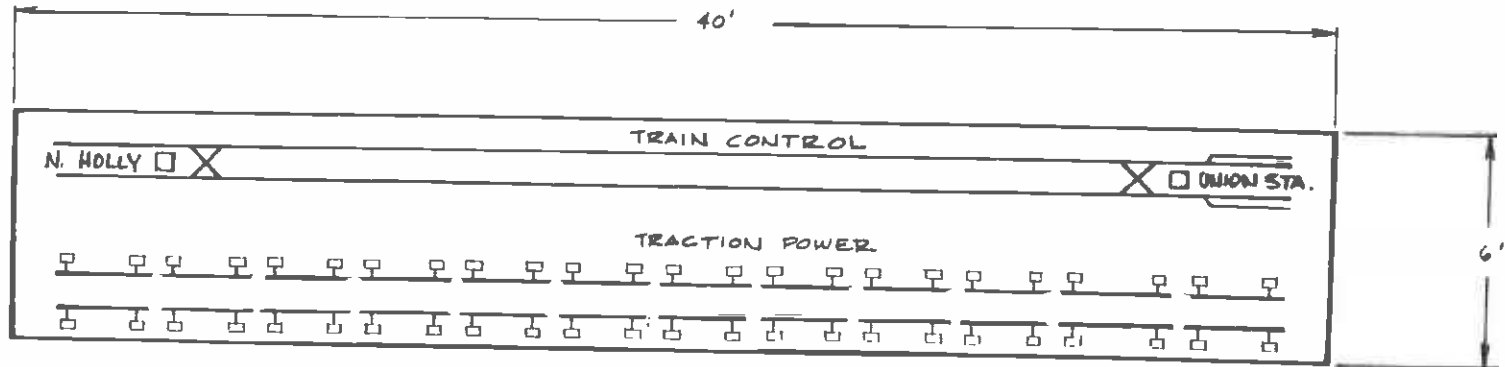
In addition, computer equipment will be necessary for the SCADA subsystem. This equipment will be housed in an environmentally-controlled room in close proximity to the Control, Police Command Center, and CCTV rooms.

The RCC/Main Shop complex will also include standby power support systems to handle power outages from a few cycles to up to several hours. A standby generator and an uninterruptable power supply have been provided to support RCC operation.

TOP VIEW



FRONT VIEW



**FIGURE 5-1
METRO RAIL SYSTEM STATUS BOARD**

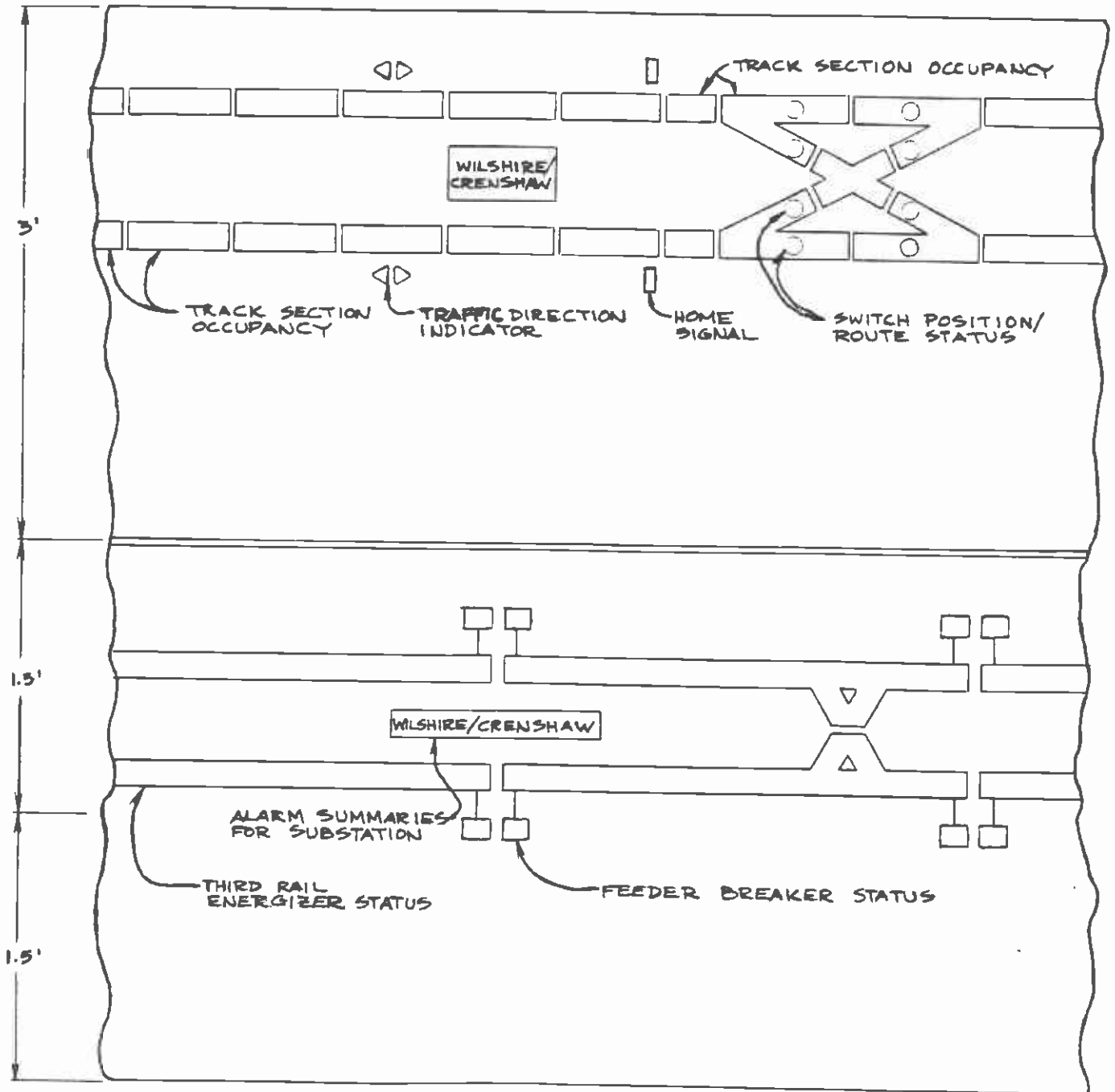


FIGURE 5-2
 METRO RAIL
 SYSTEM STATUS BOARD
 DETAIL VIEWS

CHAPTER 6

FUNCTIONAL LAYOUT AND ROOM SIZES

The proper dimensions and location of each room within the RCC are important to its effectiveness. The personnel assigned there must also be provided appropriate employee support facilities (wash-rooms, lunchrooms, etc.) for their daily needs. This chapter describes the functional requirements of the RCC with respect to location, layout, and dimension. Changes to the facility from MOS-1 through the 18-mile system are also considered.

6.1 RCC Location

As described in Chapter 1, the RCC will be located on the 2nd floor of the Main Shop Building. This will place it adjacent to the Transportation Facility. The location of transportation and operations control functions together will have the significant advantage of consolidating all sections of the Metro Rail Operations Division under one roof. As the Transportation Facility is to house Metro Rail Operations administrative offices, top Metro Rail management will have convenient access to the RCC, as the need arises. There will be office space for RCC supervisory personnel. The RCC staff will also have access to the employee support facilities provided in the Transportation Facility. Figure 6-5 is a plan of the Transportation Facility.

6.2 RCC Layout

To operate as a coherent unit, the Control Room, CCTV Room, and Transit Police Command Center must be adjacent to one another. Each room will therefore be directly accessible by connecting doors with the other two rooms.

Viewing windows will also be provided to permit the observation of activities in the other rooms. This arrangement will provide for quick, effective coordination of activities among the rooms. It will also permit the supervision of CCTV Room activities by either the OS or the Watch Commander, depending upon the eventual organization of personnel. Viewing windows from the Transit Police Command Center and the Control Room to the access corridor will also be provided.

Figure 6-1 is a floor plan of the complete RCC installation, while Figures 6-2 through 6-4 detail the Control Room, CCTV Room, and Transit Police Command Center.

6.3 RCC Room Dimensions

The dimensions of each room must provide sufficient space for the proper placement of all workstations and other equipment to be located within. Table 6-1 shows the area that will be provided for each room. These room sizes are based on the RCC conceptual layout contained on a sketch made by MRTC-Facilities Design as accepted by SCRTD on November 12, 1984. The availability of space on the second floor of the Main Shop enables the rooms to be of sufficient size to handle the Metro Rail system including projected extensions to Santa Monica and Norwalk. This layout is also affected by fixed circulation element (stairs, etc.) location. The console sizes shown in Figures 6-2 through 6-4 have been maximized to ensure the adequacy of room dimensions.

6.4 RCC Changes with System Expansion from MOS-1

6.4.1 Operations Control Room

All console positions will be included as part of the MOS-1 installation. The System Status Board will ini-

tially display only the MOS-1 system, but sufficient space will be provided to allow for its expansion through the 18-mile system.

6.4.2 Transit Police Commander Center

As noted in Section 4.8, this room will include sufficient space for installation of additional control equipment. In MOS-1 the bus and rail radio dispatcher consoles, the telephone answering console, and the Watch Commander's office will be placed in service.

6.4.3 CCTV Room

Figure 6-4 reflects the MOS-1 requirements for CCTV Consoles. The room has been sized to allow for installation of up to 19 CCTV Consoles providing monitoring capabilities for 38 passenger stations (in excess of the requirements for the 18-mile system).

6.4.4 Equipment and Data Processing Rooms

Floor space in each of these rooms has been laid out to allow for equipment installation requirements for the 18-mile system.

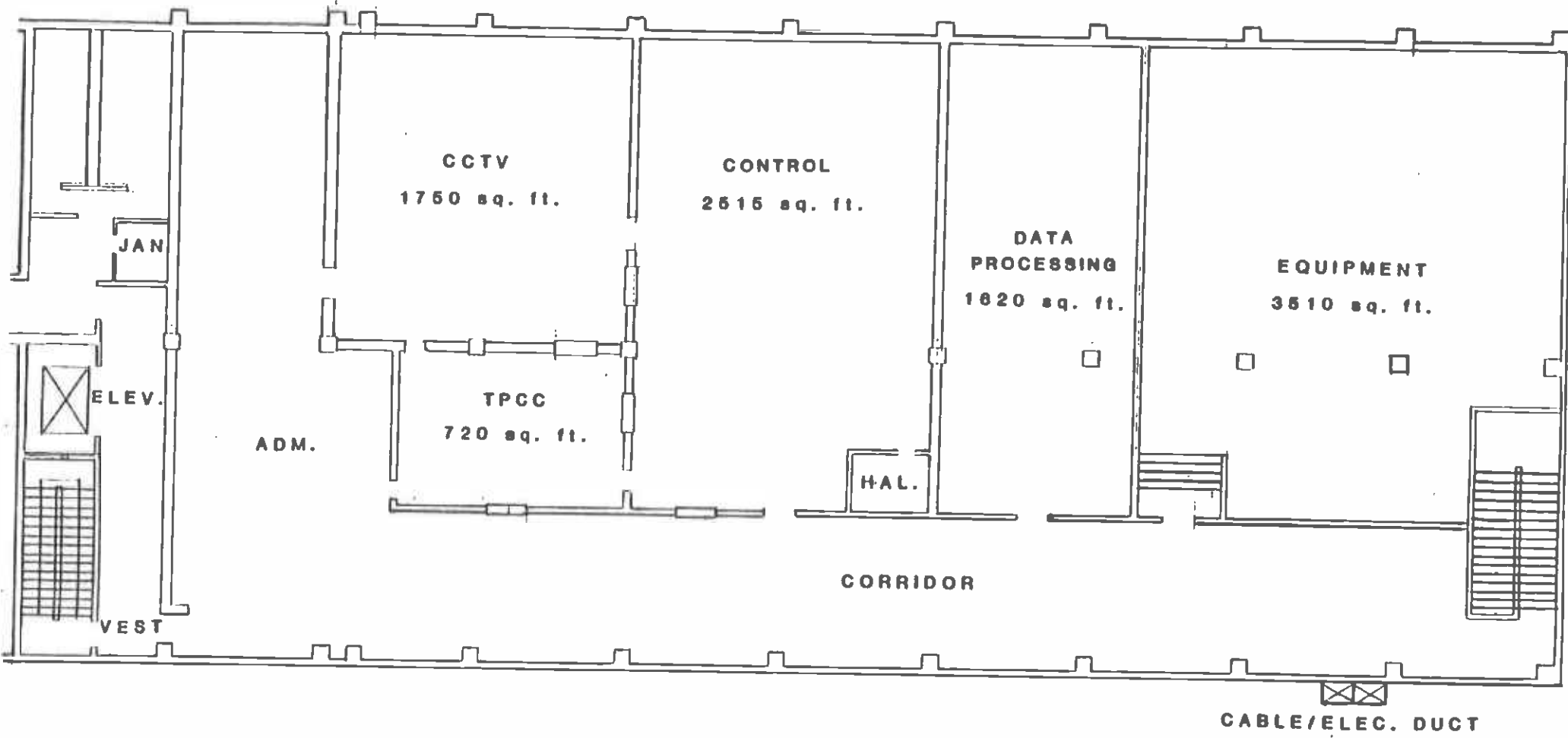


FIGURE 6-1
RAIL CONTROL CENTER



SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL PROJECT

DESIGNED BY
CHECKED BY
DATE

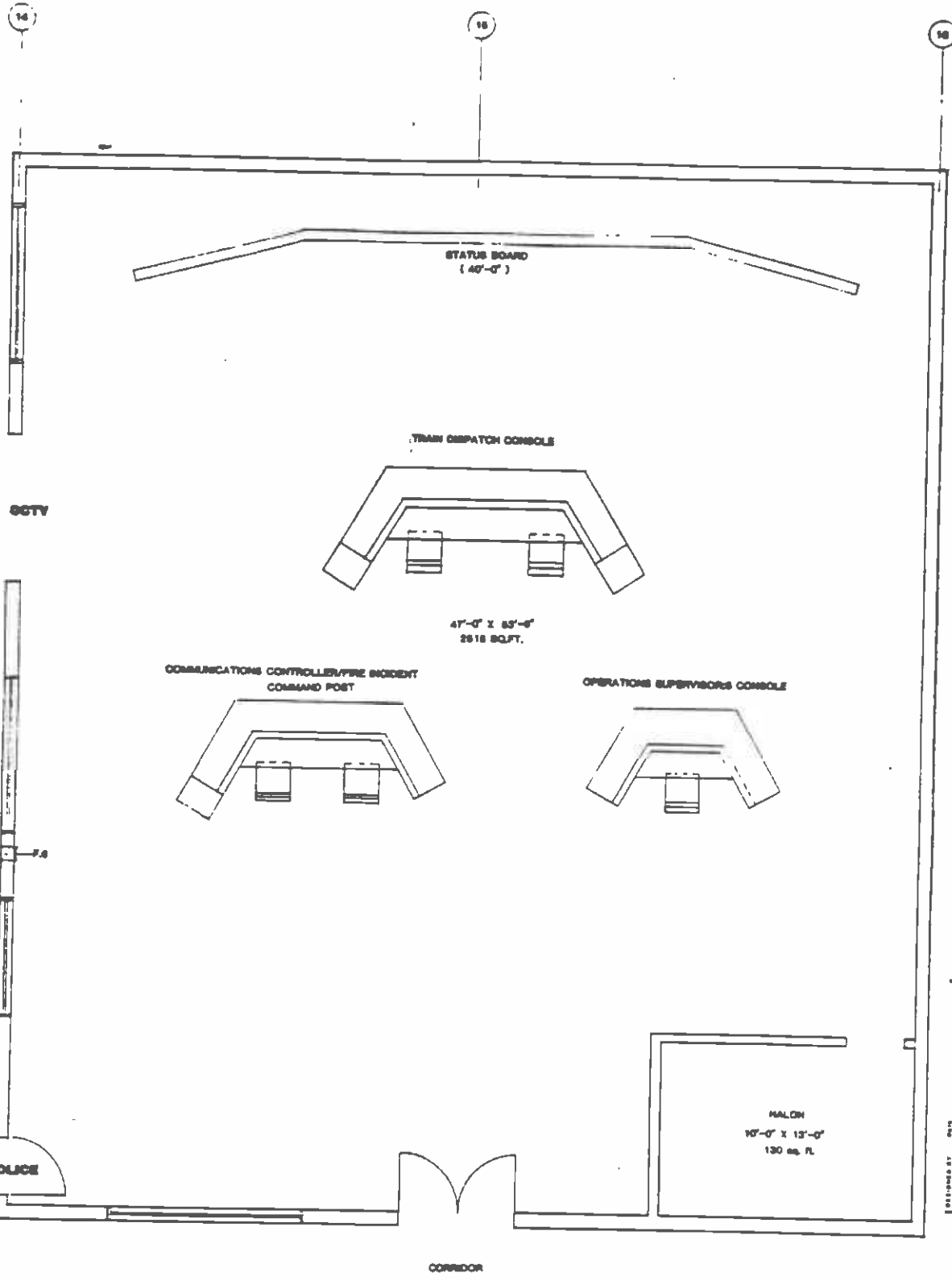
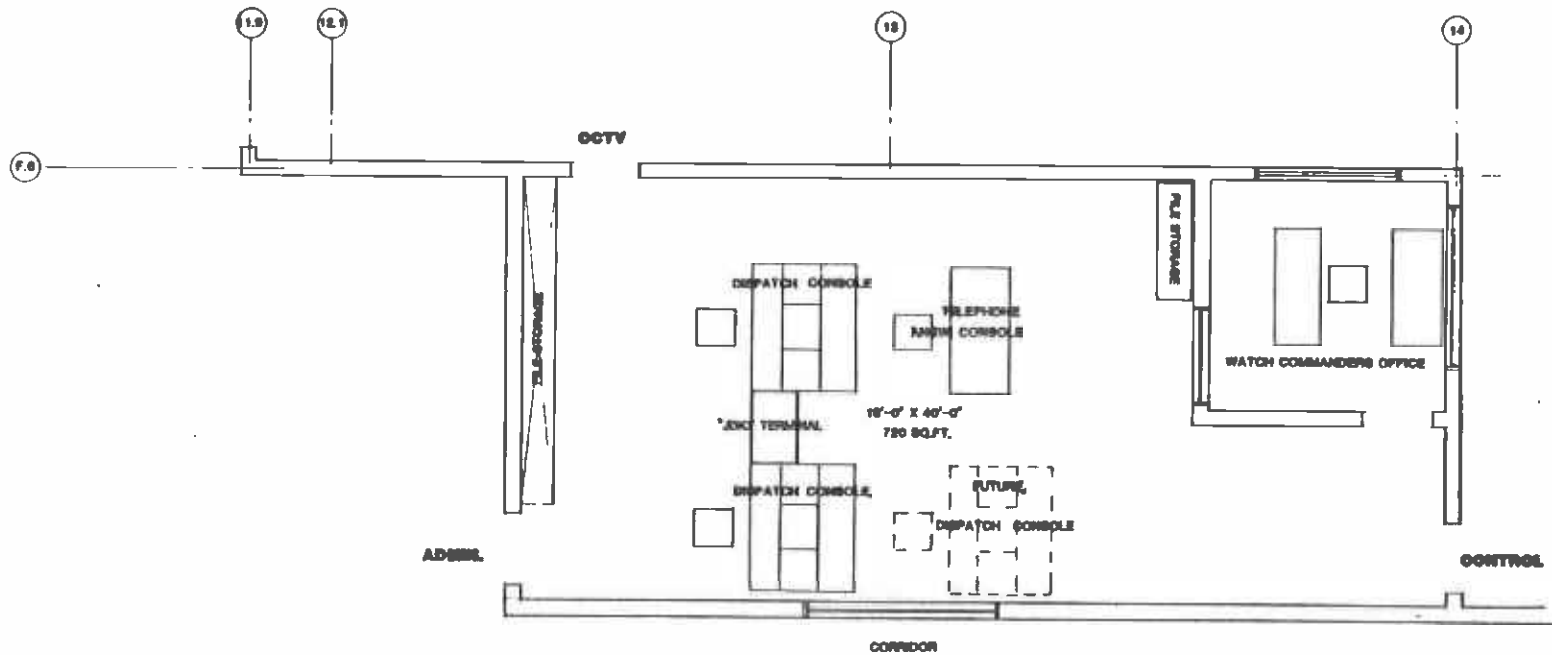


FIGURE 6-2
CONTROL ROOM



TRANSIT POLICE COMMAND CENTER

 J. Lane

 J. Lane

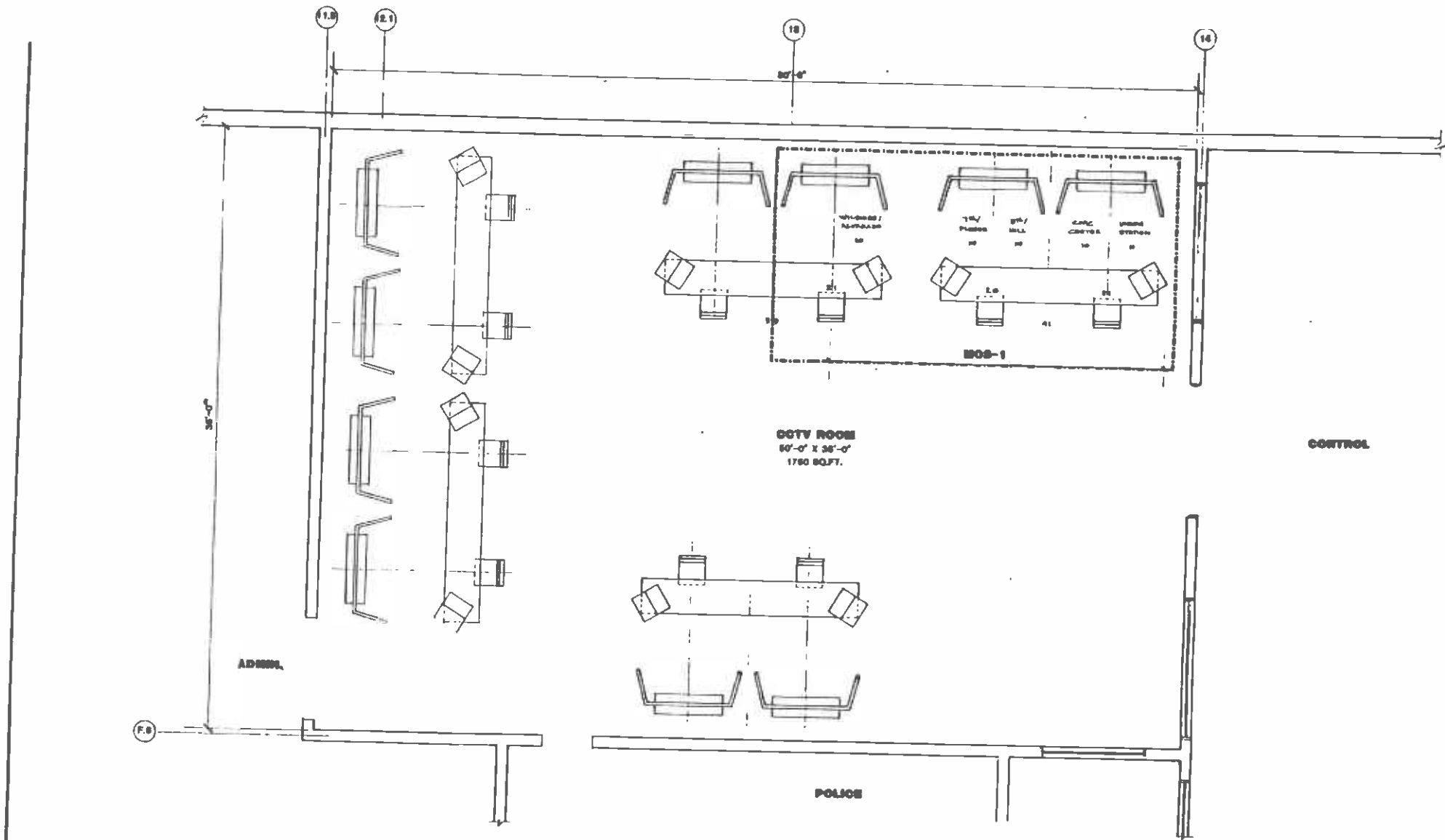
SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
 METRO RAIL PROJECT



RAIL CONTROL CENTER

1/2" = 1'-0"
 1-201-28

FIGURE 6-3
 TPCC



| | | | | | | | | | | |
|---|---------------------------------|--|--|--|--|--|--|----------------------------|--|---|
| THE OPERATION OF THE SERVICE HAS BEEN SUBJECT TO FIRST PRIORITY AS PART OF THE U. S. DEPARTMENT OF TRANSPORTATION URBAN TRANSIT PROGRAM UNDER AUTHORITY UNDER THE URBAN MASS TRANSPORTATION ACT OF 1964 AS AMENDED AND IN PART BY THE LAWS OF THE CITY AND OF LOS ANGELES COUNTY AND OF THE STATE OF CALIFORNIA | | | | DESIGNED BY <i>J. L. LEVINE</i> CHECKED BY <i>J. L. LEVINE</i> IN CHARGE DATE | | SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT METRO RAIL PROJECT | | RAIL CONTROL CENTER | | CONTRACT NO. SHEET NO. SCALE SHEET NO. |
| NO. DATE BY DES. APP. REVISIONS | NO. DATE BY DES. APP. REVISIONS | | | DATE | | APPROVED | | SHEET NO. | | |

FIGURE 6-4
CCTV ROOM

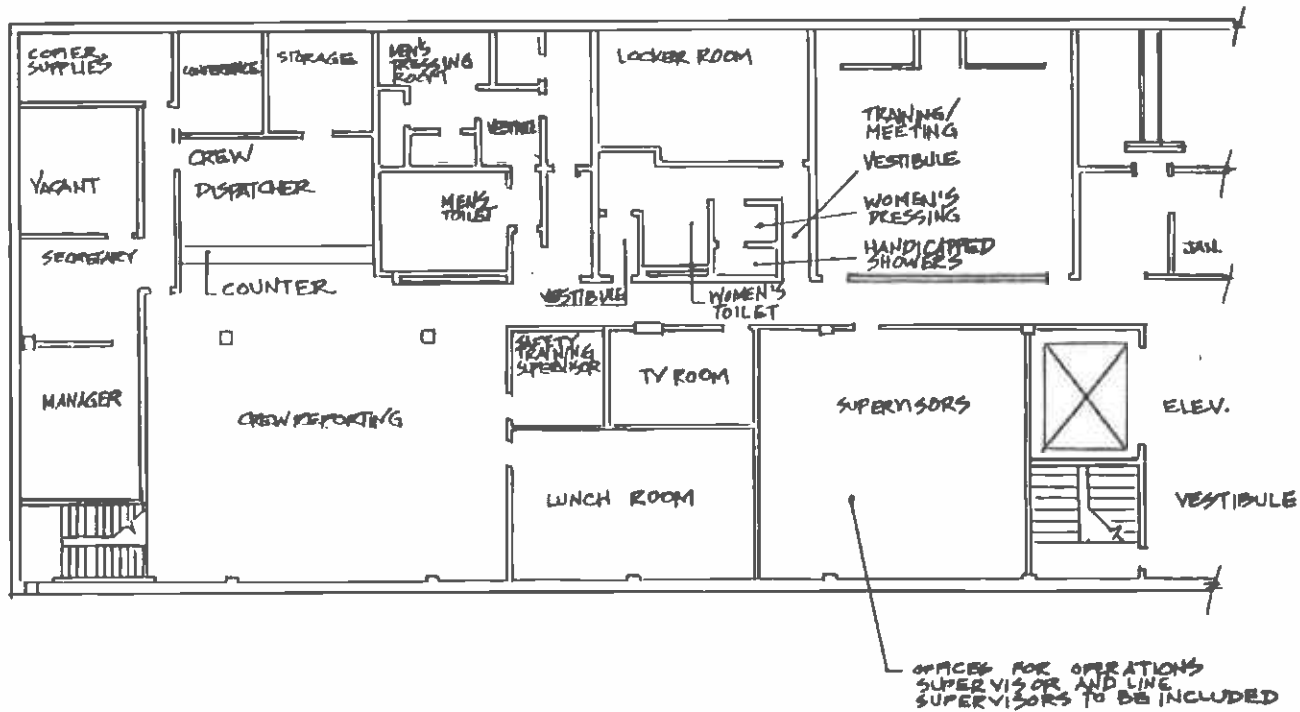


FIGURE 6-5
TRANSPORTATION FACILITY—SECOND FLOOR—MAIN SHOP BUILDING

Table 6-1

RAIL CONTROL CENTER
CONCEPTUAL SPACE REQUIREMENT

| | |
|-----------------------|----------------------|
| Control Room | 2,515 sq. ft |
| CCTV Room | 1,750 sq. ft |
| Police Command Center | 720 sq. ft |
| Data Processing | 1,620 sq. ft |
| Equipment | <u>3,510 sq. ft</u> |
| TOTAL | <u>10,115 sq. ft</u> |

APPENDICES

APPENDIX A

PLANS OF RCCs FOR SELECTED U.S. TRANSIT PROPERTIES

As part of the planning process for the Metro Rail Control Center, a detailed study was made of selected Control Centers for operating and planned U.S. transit properties. The properties selected for detailed study included:

- o PATH in Newark
- o MARTA in Atlanta
- o MDCTA in Miami
- o WMATA in Washington, D.C.
- o MTA in Baltimore (Drawings not available)
- o METRO, Proposed for Houston (Drawings not available)
- o PATCO in Camden (Drawings not available)

Summary information and example plans for the central control facilities of these systems are attached.

Table A-1 then compares functional responsibilities at the RCC with those of 6 other control facilities.

THE JOHN F. HOBAN
OPERATIONS CONTROL CENTER

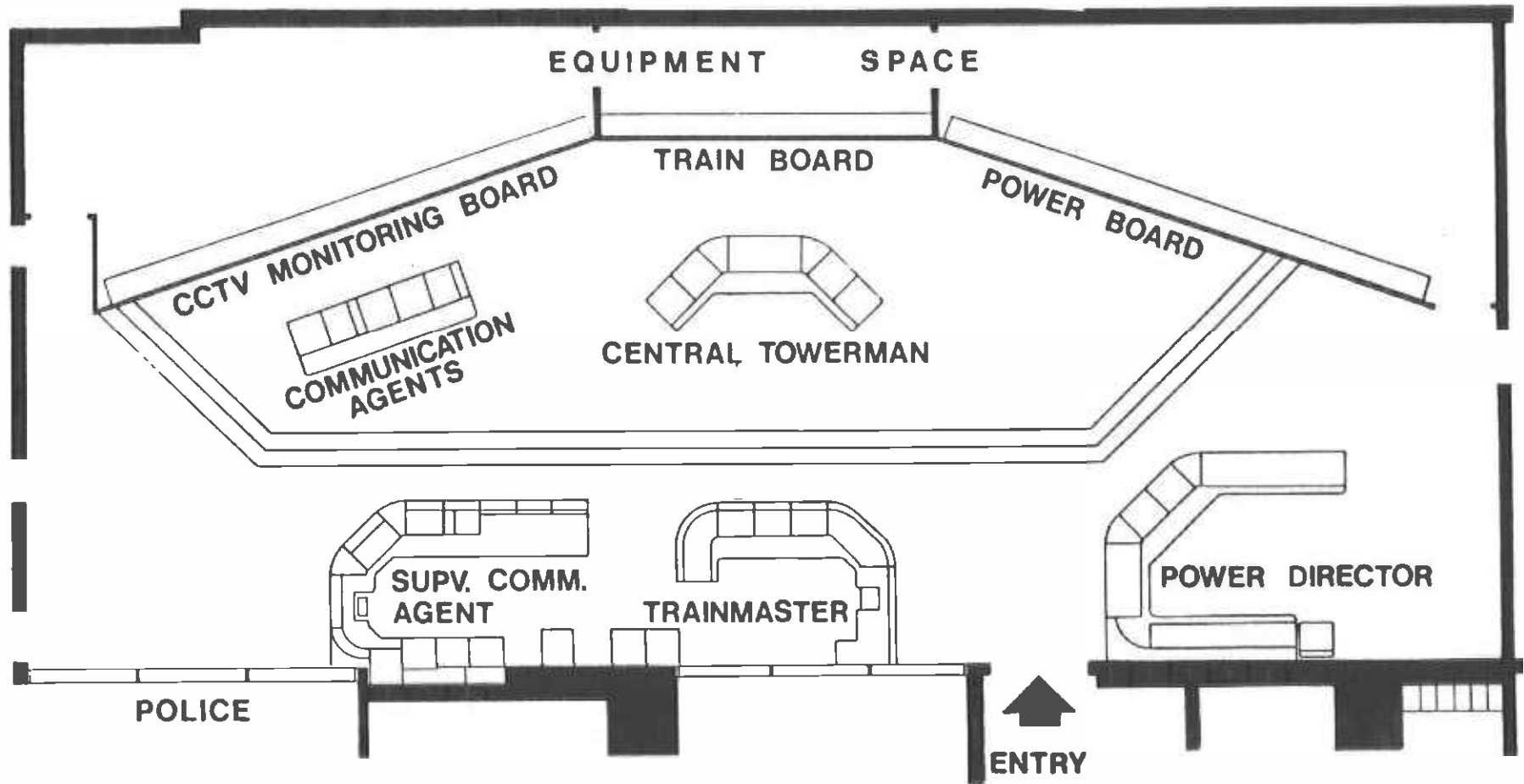


FIGURE A-1
FLOOR PLAN - PATH

RAIL CENTRAL CONTROL LAYOUT: MARTA

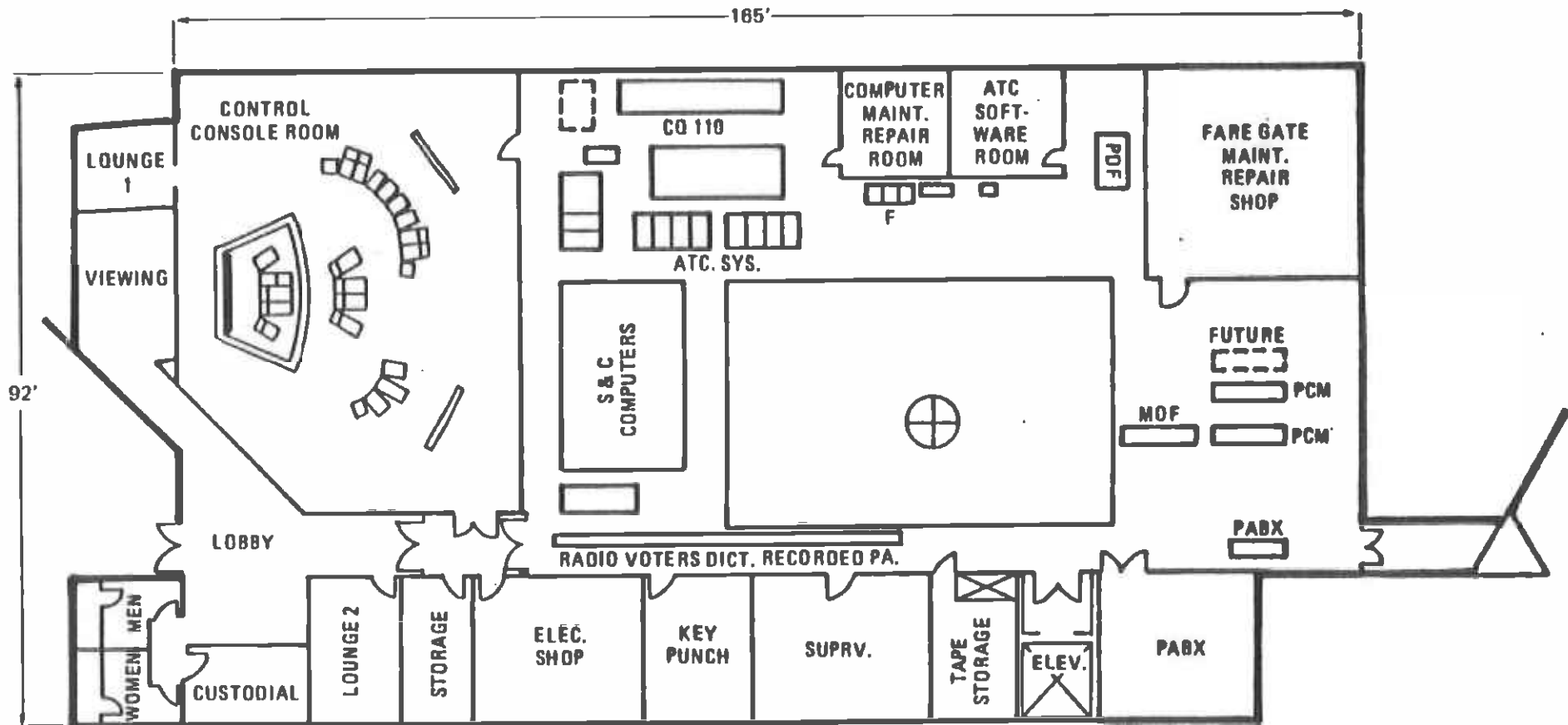


FIGURE A-2
FLOOR PLAN - MARTA

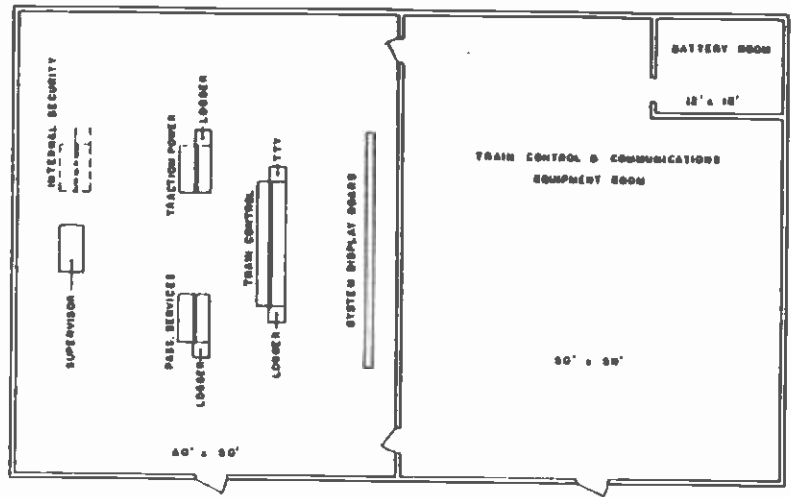
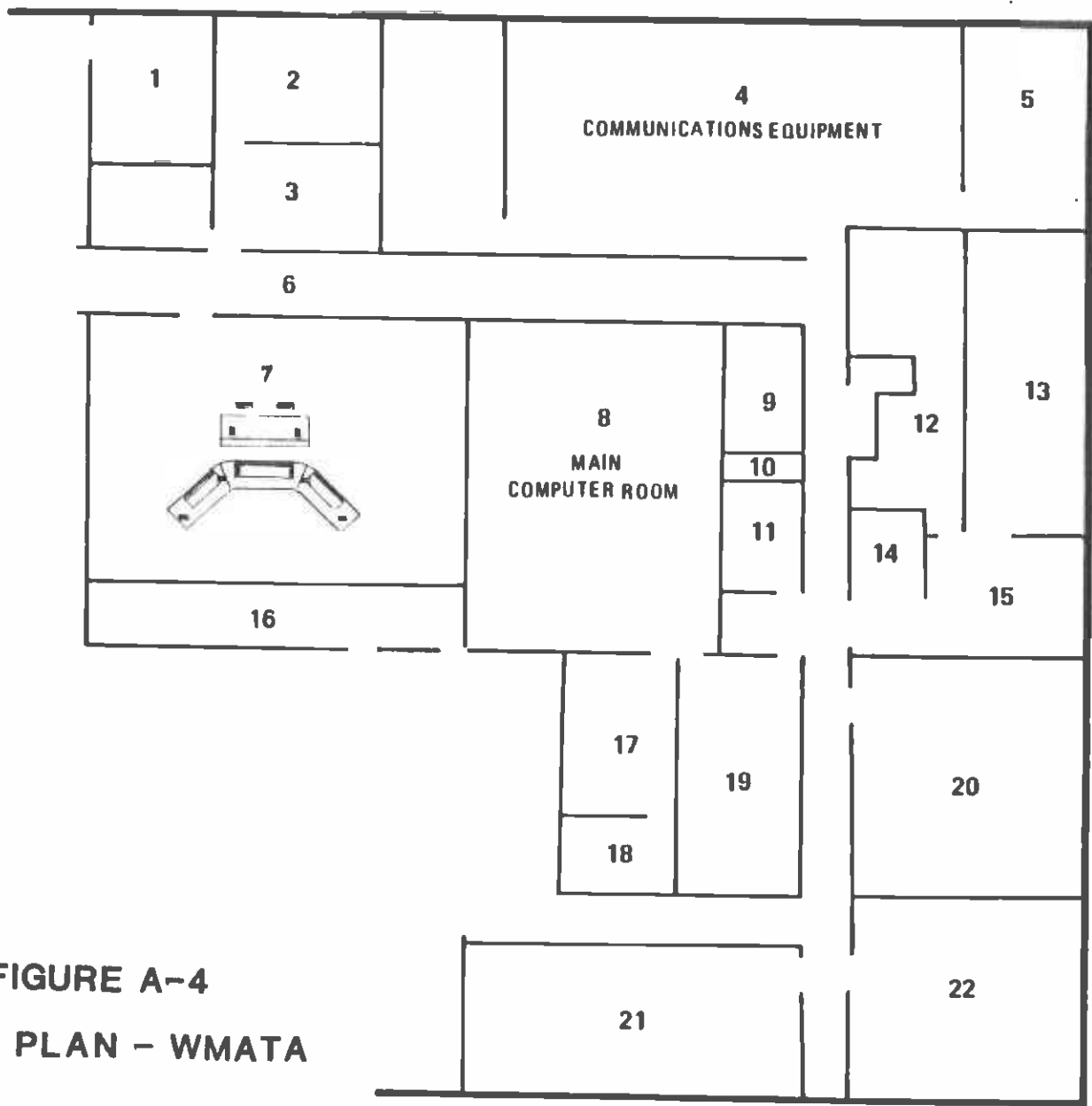


FIGURE A-3
FLOOR PLAN - MDCTA



- 1 CONFERENCE
- 2 TELE.-MAINTENANCE
- 3 PABX
- 4 COMMUNICATIONS EQUIPMENT
- 5 AUXIL. POWER
- 6 CORRIDOR
- 7 OPERATIONS ROOM
- 8 MAIN COMPUTER ROOM
- 9 DISPLAY
- 10 ELEC. CLO.
- 11 SUPPORT SUPERVISOR
- 12 FILE MAINTENANCE
- 13 REMOTE JOB
- 14 DATA CONTROL
- 15 DATA PREP.
- 16 VISITORS GALLERY
- 17 PROGRAMMERS
- 18 LIBRARY
- 19 MACH. ROOM
- 20 DATA RECORDS
- 21 ELECTRONIC MAINTENANCE
- 22 ELECTRONIC MAINTENANCE

FIGURE A-4
FLOOR PLAN - WMATA

Table A-1

CENTRAL CONTROL FUNCTIONAL RESPONSIBILITIES
COMPARISON TO OTHER PROPERTIES

| FUNCTION | PROPERTY | | | | | | |
|---------------------------------------|------------|----------|----------|-----------|-----------|------------|-------|
| | SCRTD | BART | MARTA | MDCTA | BALTIMORE | PATCO | WMATA |
| TRAIN OPNS. | TD | TD | TD | TD | TD | TD | TD |
| POWER OPNS. | TD | TPO | FC | TPO | TPO | TD | TD |
| MTC. DISPATCH | CC | MD | TD CC | CC | TD TPO | TD | CC |
| PA ANNOUNCEMENTS | CCTV CC | SA CC | CCTV | CC | TD TPO | CCTV | CC |
| POLICE DISPATCH | PD | PD | CCTV | PD | PD | TD | PD |
| CCTV MONITORING | CCTV | SA | CCTV | CCTV | SA | CCTV | SA |
| ALARM MONITORING | CC | TPO | FC | TPO CC | TPO | TD CCTV | ANY |
| ANSWERING PATRON ASSIST. TELEPHONE | CCTV | SA | CCTV | CCTV | SA | CCTV | N/A |
| ANSWERING EMERG. TELEPHONE | CC CCTV | N/A | CC | TD TPO | ANY | TD | SA |

KEY

ANY - ANY CCF POSITION

CC - COMMUNICATIONS CONTROLLER

CCTV - CCTV OPERATOR

FC - FACILITIES CONTROLLER

MD - MAINTENANCE DISPATCHER

N/A - NOT APPLICABLE

PD - POLICE DISPATCHER

SA - STATION ATTENDANT

TD - TRAIN DISPATCHER

TPO - TRACTION POWER OPERATOR

APPENDIX B

RCC STAFF/FUNCTION DEVELOPMENT

The RCC functional plan report details the positions, staffing levels and equipment required in the RCC. In order to determine these aspects, it was necessary to identify the functions to be performed in the RCC, which position should logically perform these functions and what equipment would be required at the workstation(s) involved.

RCC staff were identified as being involved in the following major functions:

- o Train operations supervision
- o Traction power supervision
- o Equipment/Facilities maintenance dispatch
- o Emergency management
- o Passenger assistance
- o Safety/Security
- o Management information system/report generation

For each of these functions, events likely to occur (both routine and unusual) were considered. Scenarios for detecting and responding to the specific event were developed and tested for adequacy and appropriateness of the processing of the incident. From these scenarios, equipment and layout requirements for the assigned workstation were prepared. The workload per workstation was estimated (based on experience with similar equipment/systems

at other rail transit properties) in order to determine if additional staff would be required. From this, room sizing and layout was developed considering man/machine interface and inter-workstation coordination requirements.

Table B.1 provides a general description of how the RCC staff will detect and respond to a particular incident. The list is not intended to be all-inclusive, but rather to give an indication of the level of attention that was put into the development of the functional plan.

Table B.1

RCC Staff/Function Development

| <u>Functional Area</u> | <u>RCC Detection</u> | | <u>Response/Activity</u> | | | <u>Remarks</u> |
|---|----------------------|--|--------------------------|---|---|---------------------------|
| | <u>Who</u> | <u>How</u> | <u>Who</u> | <u>What</u> | <u>How</u> | |
| I. <u>Train Operations Supervision</u> | | | | | | |
| ° Train Dispatching (scheduled) | | Automatic function - SCADA handles according to timetable | | | | |
| ° Train Dispatching (unscheduled) | TD | ° SCADA | TD | ° Lineup entered | SCADA | Entering mainline |
| | | | | ° Lineup entered | SCADA | Terminal Dispatch |
| ° Train will not move | TD | ° Radio from TO ° Radio from LS ° Display Board ° SCADA alert | TD | ° Instructs TO ° Informs LS ° Adjusts Service ° Informs OS ° Informs CC | Radio Radio SCADA I-com. I-com. | |
| | | | CC | ° Enters incident data ° Makes PA Announcements | TRANSMIS PA | To maintenance for action |
| ° Train operates only in extraordinary mode | TD | ° Radio from TO ° Radio from LS ° SCADA alert | TD | ° Instructs TO ° Informs LS ° Adjusts service ° Informs OS ° Informs CC | Radio Radio SCADA I-com. I-com. | |
| | | | CC | ° Enters incident data | TRANSMIS | To maintenance for action |

Table B.1

RCC Staff/Function Development

| <u>Functional Area</u> | <u>RCC Detection</u> | | <u>Response/Activity</u> | | | <u>Remarks</u> |
|---|----------------------|--|--------------------------|---|---|----------------|
| | <u>Who</u> | <u>How</u> | <u>Who</u> | <u>What</u> | <u>How</u> | |
| ° Train fails to stop at station or stops out of position | TD | ° Radio from TO ° Radio from LS ° SCADA alert | TD | ° Instructs TO ° Informs LS ° Adjusts service ° Informs OS ° Informs CC | Radio Radio SCADA I-com. I-com. | |
| | | | | | | |
| ° Wayside ATC Failure | TD | ° Radio from TO ° Radio from LS ° Display board ° SCADA alert | TD | ° Instructs TO ° Informs LS ° Informs OS ° Informs CC | Radio Radio I-com. I-com. | |
| | | | | | | |
| II. Traction Power Supervision | | | | | | |
| ° Monitor System Status | TD | ° Display board ° SCADA VDU | | | | |
| ° Scheduled Energization/ De-energization | | | TD | ° Initiates Commands ° Informs OS/CC | SCADA I-com. | |
| | TD | ° SCADA acknow. ° Display Board | TD | ° Enters Incident Data | SCADA | |

Table B.1

RCC Staff/Function Development

| <u>Functional Area</u> | <u>RCC Detection</u> | | <u>Response/Activity</u> | | | <u>Remarks</u> |
|---|----------------------|--|--------------------------|--|--|----------------------------|
| | <u>Who</u> | <u>How</u> | <u>Who</u> | <u>What</u> | <u>How</u> | |
| ° Unscheduled De-energization | TD | ° Radio from TO ° Radio from LS ° Display board ° SCADA alert | TD | ° Initiates corrective action ° Instructs TO ° Informs LS ° Informs OS/CC ° Enters Incident Data | SCADA Radio Radio I-com. SCADA | |
| III. Equipment/Facilities Maintenance Dispatch | | | | | | |
| a. ° Wayside Equipment Maintenance Dispatch | TD | ° Display Board ° SCADA alert ° I-com. from TD ° Radio from TO ° Radio from LS | TD | ° Initiate corrective action ° Inform TD/OS | SCADA I-com. | To maintenance for action. |
| | | | CC | ° Enters Incident Data | TRANSMIS | |
| b. ° Vehicle Equipment Maintenance Dispatch | TD | ° Radio from TO ° Radio from LS ° Display board ° SCADA alert | TD | ° Instructs TO ° Informs LS ° Adjusts Service | Radio Radio SCADA | To maintenance for action. |
| | | | CC | ° Informs OS/CC ° Enters Incident Data | I-com. TRANSMIS | |

Table B.1

RCC Staff/Function Development

| <u>Functional Area</u> | <u>RCC Detection</u> | | <u>Response/Activity</u> | | | <u>Remarks</u> |
|---|----------------------|----------------------------|--------------------------|-------------------------------------|------------|----------------------------------|
| | <u>Who</u> | <u>How</u> | <u>Who</u> | <u>What</u> | <u>How</u> | |
| ° Fare Collection Equipment Failure | CC | ° SCADA alert | CC | ° Remove unit from service | SCADA | If not done so automatically. |
| | | ° I-com. from TVO | | | Radio | |
| | TVO | ° SCADA alert | | ° Dispatch field Technicians | TRANSMIS | To maintenance for action. |
| | | ° PAI call | | ° Enter Incident Data | I-com. | |
| <hr/> | | | | | | |
| d. ° Communications System Maintenance Dispatch | | | | | | |
| ° Radio System Failure | CC | ° SCADA Alert | CC | ° Implement corrective action | SCADA | To maintenance for action. |
| | TD | ° SCADA Alert | | | TRANSMIS | |
| | | ° Loss of Radio Traffic | | ° Enter Incident Data | I-com. | Other than affected area. |
| | | ° TO/LS via Telephone | TD | ° Inform OS/TD | Radio | |
| | | | | ° Inform TO/LS | | |
| <hr/> | | | | | | |
| ° District Telephone System Failure | CC | ° SCADA Alert | CC | ° Implement corrective action | SCADA | To maintenance for action. |
| | | ° Radio report | | | TRANSMIS | |
| | | | | ° Enter Incident Data | I-com. | |
| | | | | ° Inform OS | | |

Table B.1

RCC Staff/Function Development

| <u>Functional Area</u> | <u>RCC Detection</u> | | <u>Response/Activity</u> | | | <u>Remarks</u> |
|--|----------------------|--|--------------------------|--|--------------------|----------------------------|
| | <u>Who</u> | <u>How</u> | <u>Who</u> | <u>What</u> | <u>How</u> | |
| ° CCTV System Failure | TVO | ° SCADA Alert ° CCTV (non) Observation | CC | ° Implements Corrective Action | SCADA | To maintenance for action. |
| | CC | ° SCADA Alert ° I-com. report | | ° Enter Incident Data ° Informs TVO | TRANSMIS I-com. | |
| e. ° Environmental Control System Maintenance Dispatch | | | | | | |
| ° Fan/Damper/etc. Activation | | SCADA automatically monitors on-line conditions and when warranted, proposes a course of action to be implemented, modified or rejected by the CC. | | | | |
| ° Fan/Damper/etc. Failure | CC | ° SCADA Alert | CC | ° Implements Corrective Action | SCADA | To maintenance for action. |
| | | | CC | ° Enters Incident Data ° Informs OS | TRANSMIS I-com. | |
| f. ° Fire Detection/Protection System Maintenance Dispatch | | | | | | |
| ° Fire Detection/Protection System Equipment Activation | | Automatic function - SCADA implements according to Dispatcher input of on-site conditions. | | | | |

Table B.1

RCC Staff/Function Development

| <u>Functional Area</u> | <u>RCC Detection</u> | | <u>Response/Activity</u> | | | <u>Remarks</u> |
|--|----------------------|---|--------------------------|---|---|---|
| | <u>Who</u> | <u>How</u> | <u>Who</u> | <u>What</u> | <u>How</u> | |
| <ul style="list-style-type: none"> ° Fire Detection/ Protection System Equipment Failure | CC | <ul style="list-style-type: none"> ° SCADA Alert ° Radio/telephone report | CC | <ul style="list-style-type: none"> ° Implements Corrective Action ° Enters Incident Data ° Informs OS/TD | <ul style="list-style-type: none"> SCADA TRANSMIS I-com. | <ul style="list-style-type: none"> To maintenance for action. Information distribution as appropriate. |
| <ul style="list-style-type: none"> g. ° Gas/Seismic Detection System Maintenance Dispatch | | | | | | |
| <ul style="list-style-type: none"> Equipment Failure | CC | <ul style="list-style-type: none"> ° SCADA Alert ° Radio/telephone report | CC | <ul style="list-style-type: none"> ° Implements Corrective Action ° Enters Incident Data ° Informs OS/TD | <ul style="list-style-type: none"> SCADA TRANSMIS I-com. | <ul style="list-style-type: none"> To maintenance for action. Information distribution as appropriate. |
| IV. Emergency Management | | | | | | |
| <ul style="list-style-type: none"> ° Train Derailment/ Collision | TD | <ul style="list-style-type: none"> ° Radio from TO ° Radio from LS ° SCADA Alert | TD | <ul style="list-style-type: none"> ° Adjusts Service ° Instructs TO ° Informs LS ° Informs OS/CC/ | <ul style="list-style-type: none"> SCADA Radio Radio I-com. | |

Table B.1

RCC Staff/Function Development

| <u>Functional Area</u> | <u>RCC Detection</u> | | <u>Response/Activity</u> | | | <u>Remarks</u> |
|------------------------|----------------------|------------------------------------|--------------------------|---|-----------------------|---|
| | <u>Who</u> | <u>How</u> | <u>Who</u> | <u>What</u> | <u>How</u> | |
| | CC | ° ETEL Report | | | | |
| | | | CC | ° TVO ° Enters Incident Data | TRANSMIS | To maintenance for action. |
| | | | OS | ° Arranges for alternate services | Direct Line Telephone | |
| | | | TVO | ° Makes PA Announcements | PA | |
| | | | CC | ° Coordinates with emergency service agencies | Direct Line Telephone | Fire, paramedics, etc. as required. |
| | | | CC | ° Coordinates with TP for evacuation, etc. | I-com. | |
| | | | CC/ TVO | ° Advises Customer Relations | Direct Line Telephone | For travel information service. |
| <hr/> | | | | | | |
| ° Falling Debris | | | | | | |
| | TD | ° Radio from TO ° Radio from LS | TD | ° Instructs TO ° Instructs LS | Radio Radio | |
| | | ° SCADA Alert | | ° Advises OS/CC | I-com. | |
| | CC | ° Telephone Report | CC | ° Adjusts service ° Enters Incident Data | SCADA TRANSMIS | For maintenance action. Fire, paramedics, etc. |
| | | | | ° Coordinates with emergency service agencies | Direct Line Telephone | |

Table B.1

RCC Staff/Function Development

| <u>Functional Area</u> | <u>RCC Detection</u> | | <u>Response/Activity</u> | | | <u>Remarks</u> |
|------------------------|----------------------|---------------|--------------------------|---|-----------------------|---------------------------------|
| | <u>Who</u> | <u>How</u> | <u>Who</u> | <u>What</u> | <u>How</u> | |
| | | | | ° Coordinates with TP for evacuation, etc. | Direct Line Telephone | |
| | | | OS | ° Arranges for alternate services | Direct Line Telephone | |
| | | | TVO | ° Makes PA Announcements | PA | |
| | | | CC/ TVO | ° Advises Customer Relations | Direct Line Telephone | For travel information service. |
| ° Fire/Explosion | CC | ° SCADA Alert | CC | ° Advises OS/TD/TVO | I-com. | |
| | | | | ° Enters Incident Data | TRANSMIS | For maintenance action. |
| | | | | ° Coordinates with emergency service agencies | Direct Line Telephone | Fire, paramedics, etc. |
| | | | | ° Coordinates with TP for evacuation, etc. | I-com. | |
| | | | | ° Operates Environmental Control system, as required. | SCADA | |
| | | | TD | ° Adjusts service | SCADA | |
| | | | | ° Instructs TO | Radio | |
| | | | | ° Instructs LS | Radio | |

Table B.1

RCC Staff/Function Development

| <u>Functional Area</u> | <u>RCC Detection</u> | | <u>Response/Activity</u> | | | <u>Remarks</u> |
|------------------------|----------------------|----------------|--------------------------|---|-----------------------|---------------------------------|
| | <u>Who</u> | <u>How</u> | <u>Who</u> | <u>What</u> | <u>How</u> | |
| | | | OS | ◦ Arranges for alternate services | Direct Line Telephone | |
| | | | TVO | ◦ Makes PA Announcements | PA | |
| | | | CC/ TVO | ◦ Advises Customer Relations | Direct Line Telephone | For travel information service. |
| ◦ Water/Flood | CC | ◦ SCADA Alert | CC | ◦ Advises TD/OS/TVO | I-com. | |
| | | ◦ ETEL Report | | ◦ Operates pumps | SCADA | |
| | TD | ◦ TO via Radio | | ◦ Enters Incident Data | TRANSMIS | For maintenance action. |
| | | ◦ LS via Radio | | ◦ Coordinates with emergency service agencies | Direct Line Telephone | |
| | | | | ◦ Coordinates with TP for evacuation, etc. | I-com. | |
| | | | TD | ◦ Adjusts service | SCADA | |
| | | | | ◦ Instructs TO | Radio | |
| | | | | ◦ Instructs LS | Radio | |
| | | | OS | ◦ Arranges for alternate services | Direct Line Telephone | |
| | | | TVO | ◦ Makes PA Announcements | PA | |
| | | | CC/ TVO | ◦ Advises Customer Relations | Direct Line Telephone | For travel information service. |

Table B.1

RCC Staff/Function Development

| <u>Functional Area</u> | <u>RCC Detection</u> | | <u>Response/Activity</u> | | | <u>Remarks</u> |
|------------------------------------|----------------------|-----------------------------------|---------------------------|---|---|--|
| | <u>Who</u> | <u>How</u> | <u>Who</u> | <u>What</u> | <u>How</u> | |
| V. Passenger Assistance | | | | | | |
| ° Service Info. | TVO | ° PAI | TVO | ° Attempts to Answer ° Transfers to Travel Info. | PAI Direct Line Telephone | |
| ° Fare Collection System Operation | TVO | ° PAI | TVO | ° Attempts to Answer ° Uses on-site ticket reader ° Reads ticket encoding ° Releases fare gate to allow entry/exit ° Removes equipment from service | PAI SCADA SCADA SCADA | To instruct patron. VDU If on-site equipment is suspected to be defective. |
| | | | TVO CC | ° Advises CC ° Enters Incident Data | I-com. TRANSMIS | For maintenance action. |
| ° Patron Injury/Illness | TVO CC | ° PAI ° ETEL ° Radio report | TVO or CC TD | ° Contacts Emergency Services ° Advises TD ° Instructs TO ° Informs LS | Direct Line Telephone I-com. Radio Radio | If necessary (such as patron on tracks) |

Table B.1

RCC Staff/Function Development

| <u>Functional Area</u> | <u>RCC Detection</u> | | <u>Response/Activity</u> | | | <u>Remarks</u> |
|---------------------------------------|--|---|--|---|---|---|
| | <u>Who</u> | <u>How</u> | <u>Who</u> | <u>What</u> | <u>How</u> | |
| VI. Safety/Security | CC | ◦ SCADA Alert | CC or TVO | ◦ Coordinate with TP ◦ Contact Emergency Services | I-com. Direct Line Telephone | |
| ◦ Fare Collection Revenue Collection | This is a scheduled occurrence and as such requires no RCC intervention. | | | | | |
| ◦ Fare Collection Equipment Intrusion | CC TVO | ◦ SCADA alert ◦ I-com. from TVO ◦ SCADA alert ◦ CCTV observation ◦ PAI call | CC TP | ◦ Informs TP ◦ Enter Incident Data ◦ Dispatch Units | I-com. TRANSMIS Radio | To maintenance for action. |
| ◦ Equipment Vandalism | TVO TD | ◦ SCADA Alert ◦ CCTV observation ◦ PAI ◦ Radio Report | TD CC | ◦ Dispatches Units ◦ Enters Incident Data | Radio TRANSMIS | For on-site assistance. For maintenance action. |
| ◦ Robbery/Physical Violence | TVO CC TD TP | ◦ CCTV Observation ◦ PAI ◦ ETEL ◦ TO via radio ◦ Radio report | TVO, CC, TD or TP TVO, CC, or TD TD | ◦ Contacts Emergency Services ◦ Coordinates with TP for on-site response ◦ Instructs TO ◦ Informs LS | Direct Line Telephone I-com. Radio Radio | If incident requires train to be delayed. |

Table B.1

RCC Staff/Function Development

| <u>Functional Area</u> | <u>RCC Detection</u> | | <u>Response/Activity</u> | | | <u>Remarks</u> |
|----------------------------|---|------------|--------------------------|--------------------|------------|----------------|
| | <u>Who</u> | <u>How</u> | <u>Who</u> | <u>What</u> | <u>How</u> | |
| | | | TP | ° Dispatches Units | Radio | |
| VII. MIS/Report Generation | Each of the above incidents require generation of a log or report entry. Train operations incidents are handled by the TD, with the exception of maintenance reports which are handled by the CC. This allows the CC to handle all maintenance reporting. | | | | | |
| | Safety/Security incidents are handled by the TP. | | | | | |
| | Certain equipment status reports (fare collection revenue data for example) is completely automatic, being accumulated and reported by SCADA. | | | | | |

APPENDIX C

REFERENCES

PRIMARY

1. System Design Criteria and Standards
 - a. Vol. I Fire/Life Safety, Sections 2.7 and 2.8
 - b. Vol. III Station Control, Section 18.4
 - c. Vol. V Communications, Section 3.17
2. Communications In-Progress Specification,
February 1985

SECONDARY

1. System Specification - Communications Section
2. Memo, Central Control Configuration, W.J. Rhine,
March 1982
3. Memo, Communications - Transit Police Requirements,
J. Burgess, November 1982
4. Memo, Space Allocation - Central Control,
M.C. Becher/D.R. Paige, January 1983
5. Project Program, Operations Control Center, MRTC
Facilities Design, October 1983

6. Minutes of Meetings on Central Control Facility, MRTC System Integration, October 1983; January 1984; April 1984
7. Special Study of the Integration of Bus and Rail Operations Control Centers, Booz-Allen & Hamilton, 1984
8. Letter, Central Control Facility Alternative A-Main Shop, J. Crawley, November 1984
9. Letter, Rail Control Center Redesign Main Shop Building, D. Hammond, February 1985