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SCRTD METRO RAIL PROJECT

SPECIAL STUDY OF THE INTEGRATION OF BUS AND RAIL OPERATIONS CONTROL CENTERS

INTERIM REPORT ON TASK 3: DOCUMENTATION OF CONTROL FACILITIES AND OPERATIONS AT SELECTED NORTH AMERICAN TRANSIT SYSTEMS

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TABLE OF CONTENTS

Page Number

I N D E X O F E X H I B I T S

Page Number

INTRODUCTION

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During the course of the design process for its Metro Rail Central Control Facility, the Southern California Rapid Transit District (SCRTD) decided to investigate the potential for expanding the facility into a multi-modal one handling light rail and bus as well as Metro Rail control functions. A study was undertaken to assess the advantages and disadvantages of separate control facilities as compared with an integrated control center.

The evaluation of Metro Rail/light rail control facilities was completed in March 1984.[1] The assessment of bus/rail control functions began in March 1984 and was structured as a six-task assignment, as follows:

Task 1: Review the present SCRTD Bus Central Control Facility's space, staffing, equipment, and functions, and evaluate future requirements.

Task 2: Review the facility space, staffing, equipment, and functions planned for the Metro Rail Central Control Facility.

Task 3: Evaluate the Central Control Facility space, staffing, equipment, and functions at other selected North American transit systems.

Task 4: Evaluate the space, staffing, and equipment required by a combined bus/rail Central Control Facility.

Task 5: Evaluate existing plans for both bus and rail Central Control Facilities on the basis of data gathered at other transit properties.

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1 Special Study of Metro Rail/Light Rail Central Control Facility Integration, WBS 10, SCRTD Metro Rail Project Interim Report, prepared by Booz, Allen & Hamilton, March 1984.

Task 6: Evaluate the Central Control Facility options open to SCRTD and make recommendations.

This current report documents the Task 3 effort. It reviews the control facility layouts, staffing, equipment, and functions of five selected North American transit systems:

- Metropolitan Atlanta Rapid Transit Authority (MARTA)
- Washington Metropolitan Area Transit Authority (WMATA)
- Chicago Transit Authority (CTA)
- Greater Cleveland Regional Transit Authority (GCRTA)
- Toronto Transit Commission (TTC).

Visits were made to each of these systems, during which control center facilities were toured and structured interviews were conducted with supervisory-level personnel. The information gathered during these visits is summarized in the body of this report, following a brief description of the study background.

1.0 STUDY BACKGROUND

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To enable the SCRTD to benefit from the experience of other transit systems, an evaluation was conducted of the facility layouts, staffing, equipment, and functions of the control centers at five North American transit properties. The five properties selected for evaluation are all multi-modal systems that demonstrate varying degrees of integration in bus/rail control. The selected properties, and their degree of control integration, are as follows:

- Metropolitan Atlanta Rapid Transit Authority (MARTA)--Heavy rail and bus operations with a complete separation in control locations and functions

- Washington Metropolitan Area Transit Authority (WMATA)--Bus and heavy rail operations with co-location of facilities but separate supervisory structures

- Chicago Transit Authority (CTA)--Bus and heavy rail operations with co-location of facilities and joint supervision of functions

- Greater Cleveland Regional Transit Authority (GCRTA)--Bus, heavy rail, and light rail operations with integrated rail control but separate bus control location and functions

- Toronto Transit Commission (TTC)--Bus, heavy rail, and light rail operations with co-location and complete integration of control.

Visits were made to these systems in April 1984, during which control facilities were toured and interviews were conducted with supervisory-level personnel knowledgeable of both bus and rail control operations. (See Appendix A for a list of personnel interviewed.) A questionnaire was used to structure these interviews. The questionnaire, developed by SCRTD and included as Appendix B, sought the following information:

Facility

- Floor plan

- Utilization of particular areas (e.g., computer room, equipment room) by bus/rail operations staff

- Availability and use of training room

- Type of access control

Personnel

- Organizational structure and responsibilities

- Types of staff training

- Maximum/minimum staffing levels

- Utilization of field personnel

Functions/Equipment

- Availability and use of various tools/equipment

- Weaknesses of current equipment

- Assignment of control functions

- Method/responsibilities/equipment for responding to:

  - Security incidents
  - Maintenance needs
  - Passenger assistance requirements
  - Traction power problems
  - Rail system failures

- Assignment of communications responsibilities, means of communication, distribution of calls, monitoring and recording of communications

- Troubleshooting methods

- Advantages/disadvantages of present control arrangements.

Chapter 2 presents a brief description of each of the five transit systems. The information gathered during the course of the site visits is presented in Chapter 3.

2.0 OVERVIEW OF SELECTED TRANSIT SYSTEMS

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This chapter briefly summarizes the operating characteristics and approach to control functions at each of the five transit properties visited during the course of this study.

All of the transit properties conduct multimodal bus/heavy rail operations. Two of the properties, GCRTA and TTC, also operate light rail lines and TTC also operates trolley buses. The operating characteristics and relative size of the five properties are summarized in Exhibit 2-1.

The degree of integration in bus/rail control functions, and the equipment used for vehicle control, varied from property to property. At MARTA, the control centers for bus and rail operations are geographically separate, and coordination between the two is achieved through radio and telephone communications. Station CCTV monitoring and passenger assistance functions are conducted from three facilities that are separate from the bus and the rail control centers.

MARTA rail facilities and operations are monitored by mimic boards and CRT displays. Bus dispatch operations are performed by radio, with no capability for automatic vehicle monitoring or locating.

At WMATA, bus and rail operations are co-located, but the co-location occurred because of the availability of space rather than because of any anticipated benefits. Nevertheless, WMATA management perceives that operational advantages have been derived from the co-location, particularly in the ability to coordinate responses to emergency situations.

Train control at WMATA is achieved entirely through the use of CRTs; no mimic boards are provided. Bus operations are controlled by radio; no automatic vehicle monitoring or locating equipment is used.

EXHIBIT 2-1
General Characteristics of Five Selected Transit Properties

Characteristic	MARTA	WMATA	CTA	GCRTA	TTC
Number of buses	778	2,028	2,307	1,088	1,407
Annual bus miles (millions)	28.9	51.5	77.0	20.9	56.3
Number of heavy rail vehicles	120	298	1,895	100	630
Number of light rail vehicles	-	-	-	79	306
Number of route miles (rail)	16	39	175	51	79
Number of stations	20	44	140	18	49
Total annual passengers (millions)	105	170	561	74	406

At CTA, the bus and rail control centers are co-located, and this co-location occurred specifically to achieve operational advantages. Train control is accomplished by monitoring chart recordings of vehicle locations. The equipment is antique but effective. A new rail line to O'Hare Airport will employ a modern automatic train control system, and CRTs will be used to monitor operations on the line. A mimic board is also being installed within the rail control center, but it will be used in a public relations capacity rather than for operations control.

At GCRTA, heavy rail and light rail control functions are completely integrated, while bus control is completely separate, both in location and operations. GCRTA currently uses zone control towers for its rail operations. However, a new centralized rail control facility, which will employ CRTs, will soon be opened. Bus operations at GCRTA are controlled by a radio communication system equipped with automatic vehicle locating capabilities.

At TTC, the most complex of the properties surveyed, all surface vehicles (buses, trolley buses, and light rail vehicles) are controlled by a single pool of dispatchers. Heavy rail control operations are also performed at this facility by two dedicated train controllers.

For its bus operations, TTC is currently experimenting with automatic vehicle monitoring (AVM) equipment and has plans to use AVM on a systemwide basis. The equipment will be installed at each bus division, but a central point of coordination will be maintained within the present control center.

Details on the functional characteristics of the five surveyed systems are given in the following chapter.

3.0 FUNCTIONAL COMPARISON

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The examination of control functions at the five selected transit properties revealed significant differences as well as similarities. To compare and contrast transit control technology and procedures at the surveyed systems, this chapter presents data on their:

- Facilities
- Organization
- Operations and technology.

3.1 FACILITIES

The investigation of space allocation at surveyed properties considered total floor space provided for control functions, as well as the space allocated to:

- Bus Control: Bus dispatching, computer, and equipment rooms
- Rail Control: Train/power control, computer, and equipment rooms
- Security Dispatching Rooms
- Passenger Assistance
- CCTV Monitoring Rooms.

The findings of this investigation are summarized in Exhibit 3-1. As that exhibit indicates, total floor space allocated to central control functions varies significantly among the properties, ranging from about 5,700 square feet at CTA to approximately 12,000 square feet at TTC. The total floor space correlates to some degree with property size, but facility size is also a function of such other variables as the control technologies employed by a system, space availability constraints, etc.

EXHIBIT 3-1
Control Facility Space Allocation
(in square feet)

Functions	MARTA	WMATA	CTA	GCRTA(a)	TTC
Bus Control(b)					
Dispatch	600	500	1,350	1,500	2,200(c)
Computer	(d)	350	250	150	2,500(c)
Equipment	(d)	(e)	165	(d)	(d)
Total	600	850	1,765	1,650	4,700
Rail Control					
Train Control/ Power Control	2,700	1,000	1,930	2,900	3,200
Computer	1,200	2,680(f)	325	1,280	1,250
Equipment	900	2,310	1,650	1,800	3,025
Total	4,800	5,990	3,905	5,980	7,475
Security Dispatching	(g)	350	0	0	0
Passenger Assistance/ CCTV Monitoring	3,000(g)	0	0	0	0
Total	8,400	7,190	5,670	7,630	12,175

a. Rail information represents new facility.
b. Peak vehicles: MARTA--580; WMATA--1,600; CTA--1,900; GCRTA--750; TTC--1,500.
c. Represents planned AVM/communication system; space distribution between 10 separate divisions (e.g., each division will have approximately 220 square feet for dispatch and 250 square feet for computers).
d. Included in bus dispatch room allocation.
e. Included in rail equipment room.
f. Includes 1,000 square feet of computer support facility space.
g. Divided among 3 zone centers; includes 900 square feet for security dispatching.

The total floor space allocated to bus control functions also exhibits marked variations. TTC will have the greatest allocation when their AVM system is implemented on a systemwide basis. The 4,700 square feet which is shown in Exhibit 3-1 reflects the estimated space requirements for the AVM system at TTC. It should also be noted that the 7,475 square foot space allocation for rail control at TTC includes the present bus dispatch function. The TTC central control operation does not differentiate between the surface transit modes, and the amount of space required for each could not be ascertained. In addition, it is important to recognize that the TTC's AVM system is distributed among 10 separate bus divisions, each of which requires two computers and AVM equipped work stations. A centralized bus control center would significantly reduce total bus control space requirements (particularly through computer sharing), and total floor space would be more comparable with that of other systems.

The total floor space allocated to bus control at CTA and GCRTA is similar, at 1,765 and 1,650 square feet, respectively. This is surprising, in that the extent of their bus operations is not comparable. GCRTA operates approximately 750 peak vehicles, while CTA's operations are more than double that size, at 1,900 peak vehicles. The explanation of this is twofold. The work station layout of the GCRTA is such that considerable circulation space is provided. Also, the CTA utilizes a conveyor belt to divert action calls from dispatchers to supervisors; therefore, work stations must be grouped accordingly.

Bus control space at WMATA is considerably smaller than at CTA and GCRTA, because their control room is physically constrained. An expansion study is currently being undertaken.

Within the rail control area, train control/power control space allocations are relatively consistent, ranging from about 2,000 to 3,000 square feet at all properties but WMATA. WMATA has only 1,000 square feet allocated to train/power control, but again the facility is physically constrained, and expansion is being considered.

The space allocated to rail control equipment and computer rooms exhibits wide variations among the surveyed properties, ranging from approximately 2,000 square feet at MARTA and CTA to about 4,300 square feet at TTC and to almost 5,000 square feet at WMATA. The latter figure, however, includes bus as well as rail control equipment, and also includes approximately 1,000 square feet of computer support facility space. The variations occur primarily because of vast differences in computer technology that exist among the systems, as well as because of the sizes of the systems themselves.

Of the five surveyed properties, MARTA and GCRTA have completely separate bus and rail control facilities. At the three remaining systems--WMATA, CTA, and TTC--common space is provided for certain control functions. Exhibit 3-2 summarizes those areas that are shared by bus/rail control at these three systems, and floor plans are attached at the end of this report.

Access to control facilities--whether separate or co-located--is controlled at all surveyed systems except TTC, where this feature is currently being added (see Exhibit 3-3). At the four properties with access control systems, personnel questioned the advantages of and cost justification for restricting access to the control center. It was also indicated that the access control systems have not proved extremely reliable, highlighting the need for careful system and equipment selection.

3.2 ORGANIZATION

This section summarizes findings concerning the organizational structure and staffing levels for bus and rail control at surveyed properties, and the training provided for control staff members.

3.2.1 Organizational Structure

Exhibits 3-4 through 3-8 illustrate the organizational structure for bus/rail control functions at each of the five properties considered in this study. As can be seen, each structure is unique:

- MARTA has separate departments for all bus and rail functions, and the administration of transit operations is not combined below the level of Director of Transportation.
- WMATA also separates its bus and rail ("service") departments, but this structure is unique because the Assistant General Manager of Transit Operations also is responsible for maintenance functions.
- CTA combines the administration of rail and bus operations control at its control center. A manager, the Supervisor of Control, manages both bus and rail control functions so that, organizationally, bus and rail operations are separated only at the dispatch level.

EXHIBIT 3-2
Space Shared by Bus and Rail Control

Facility Common to Bus/Rail Control	WMATA	CTA	TTC(a)
Computer Room		X	X
Equipment Room	X	X	X
Maintenance Room		X	X
Relief/Lunch Room	X	X	X
Training/Conference Room		X	N.A.
Visitors' Gallery	X	X	(b)

Note: "X" indicates that the room is shared.
"N.A." indicates that the room does not exist.

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a. When TTC implements its planned AVM equipment, the control functions and facilities for this mode will be distributed among the divisions, and the sharing of space as indicated will no longer apply. A central bus command station will remain in the current rail facility, however, so some sharing will occur, but the bulk of bus control space will be separate.

b. A visitor's gallery is currently being added between the train/power control rooms and within the space allocated to these functions.

EXHIBIT 3-3
Facility Access Control

Access Control Method	MARTA	WMATA	CTA	GCRTA	TTC(a)
Code Entry			X(b)		
CCTV	X		X(b)		
ID Card Reader		X		X(c)	
Log Book		X			

a. Under consideration
b. Equipment does not function.
c. Planned for new facility.

TRANSPORTATION DIVISION ORGANIZATIONAL CHART

EXHIBIT 3-4
Metropolitan Atlanta Rapid Transit Authority
Organization Chart

EXHIBIT 3-5
Washington Metropolitan Area Transit Authority
Organization Chart

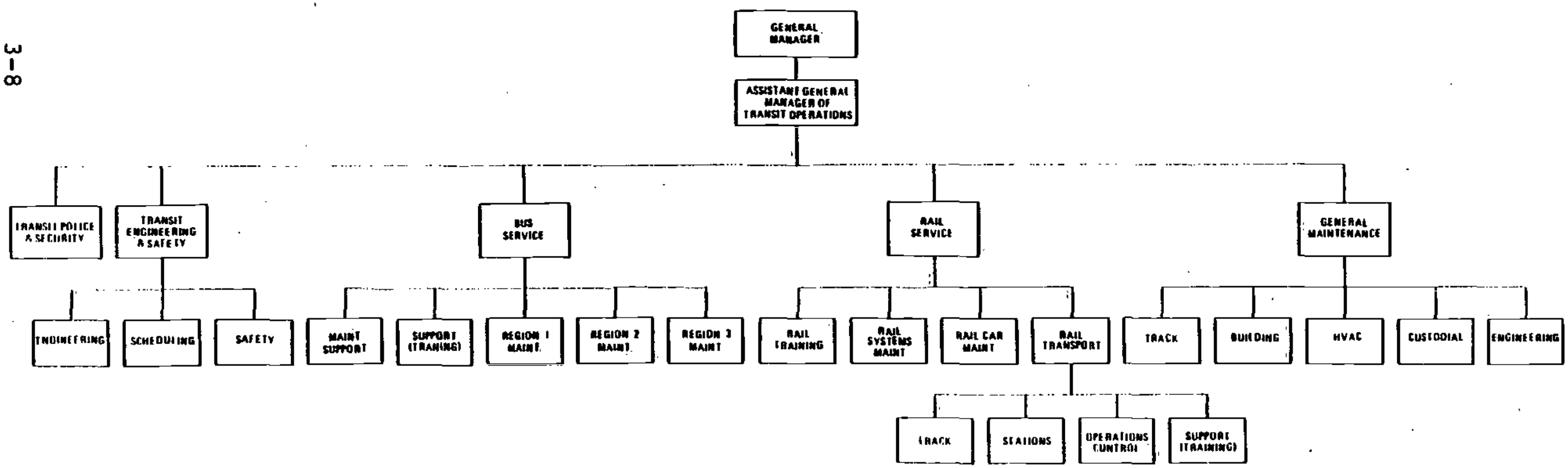


EXHIBIT 3-6

CHICAGO TRANSIT AUTHORITY
CENTRAL CONTROL ORGANIZATION CHART

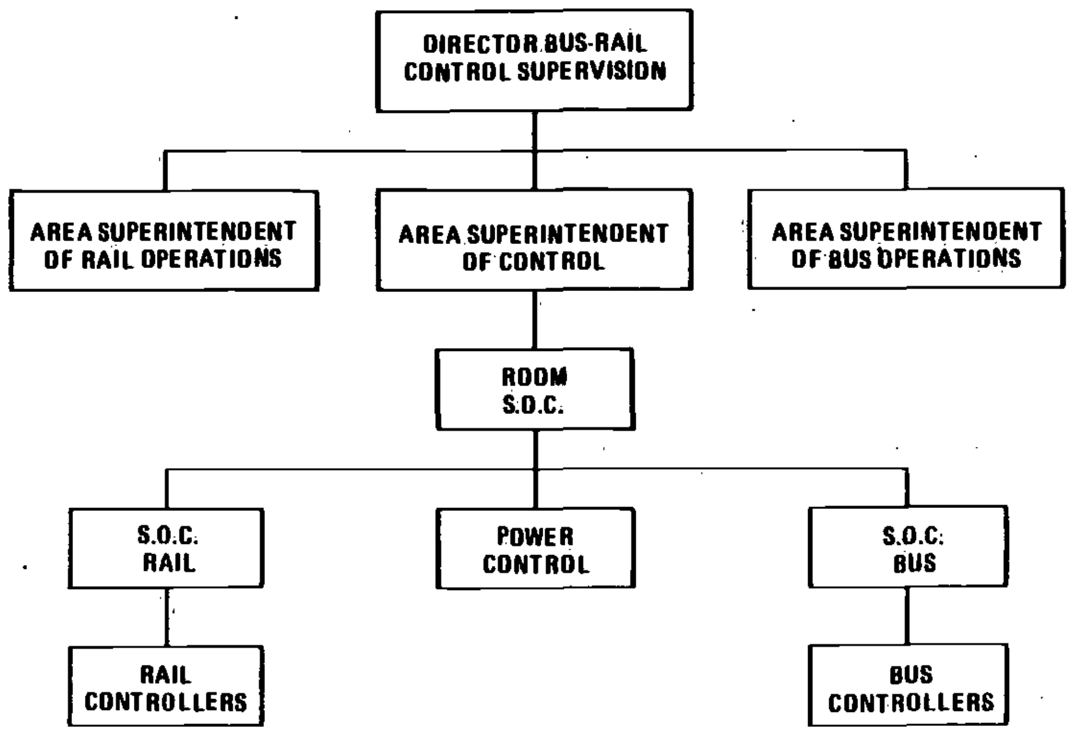


EXHIBIT 3-7

GREATER CLEVELAND RAPID TRANSIT AUTHORITY
FUTURE RAIL CONTROL ORGANIZATION CHART

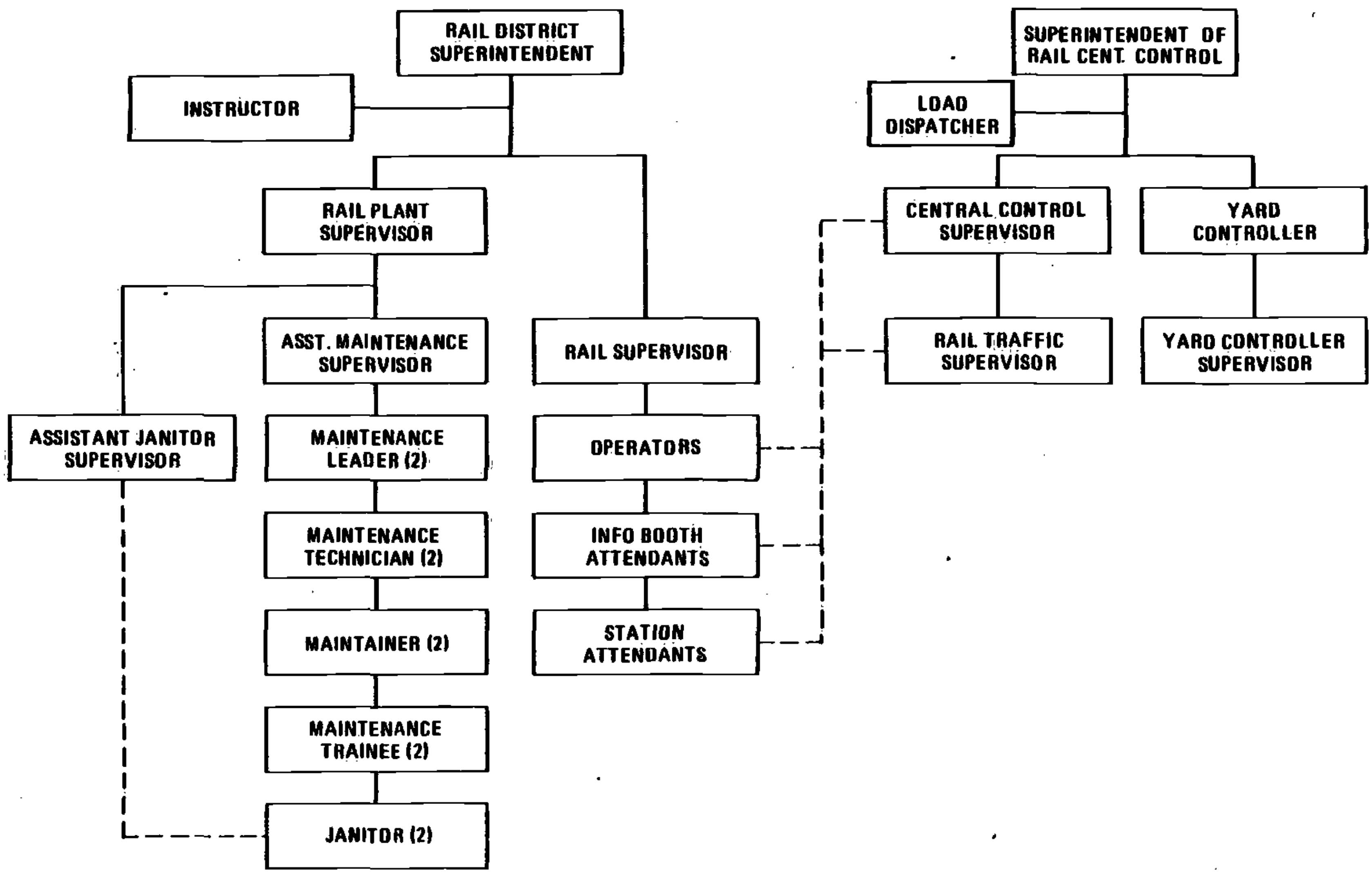
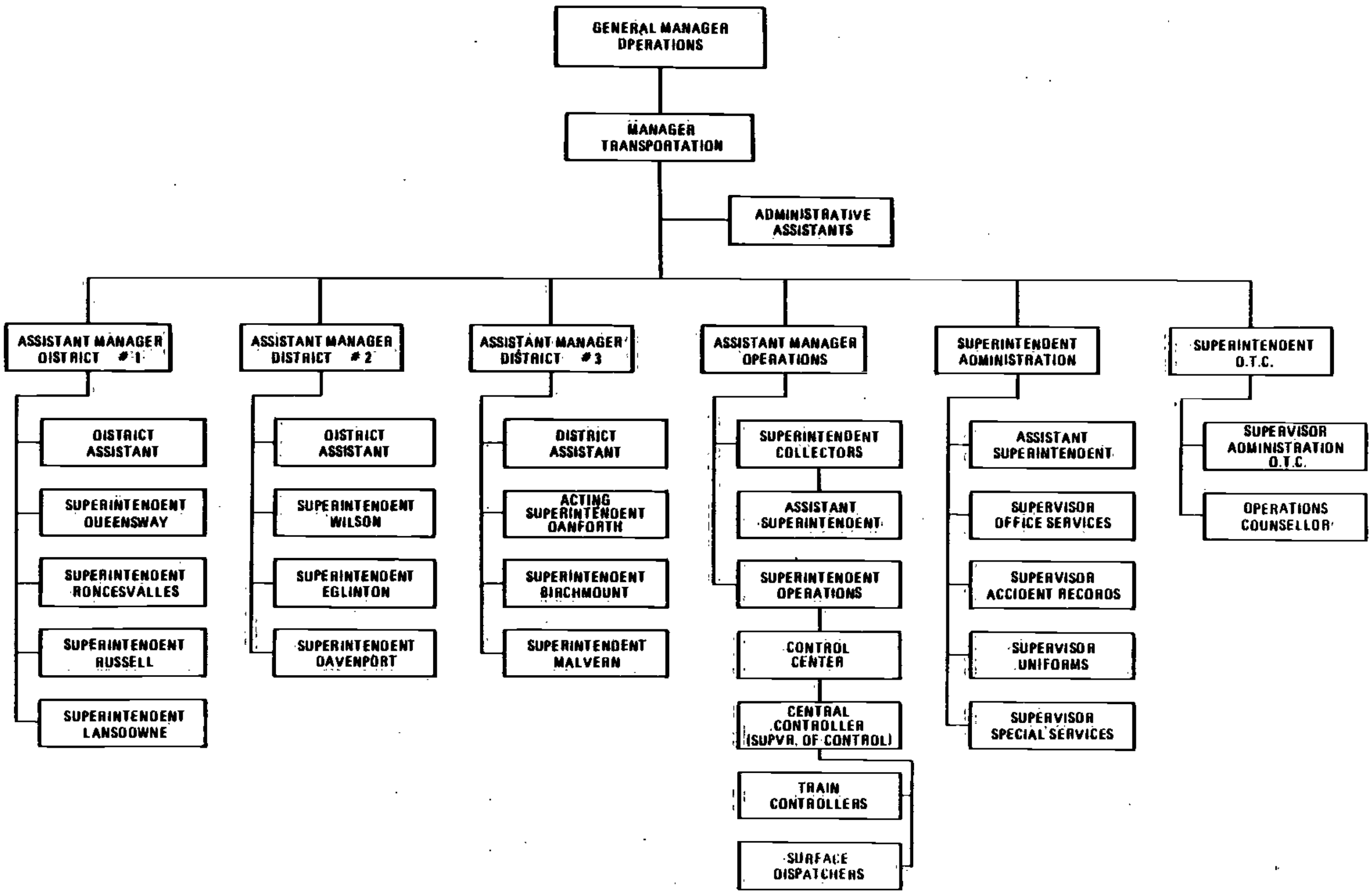


EXHIBIT 3-8
Toronto Transit Commission
Organization Chart



- GCRTA has separate departments for all bus and rail functions and the administration of transit operations is not combined below upper level management (bus organizational chart unavailable).

- TTC has a completely integrated organizational structure for bus, trolley bus, LRT, and rail operations.

Those transit properties which have integrated organizational structures indicated that, in their opinion, significant advantages are derived from that approach:

- Prompt decision-making is facilitated

- A single command point is established that minimizes the potential for inaccurate information and that facilitates communications (with staff, management, and the media) during an incident and consistent documentation afterward

- There is accountability for decisions made during an incident.

The principal disadvantage of an integrated organizational structure is the broad responsibility invested in the control center supervisor. He/she must be cognizant of both bus and rail operations control and schedules and must possess substantial leadership skills.

3.2.2 Staffing Levels

The maximum and minimum number of staff members involved in bus and rail control operations at each of the five surveyed properties is summarized in Exhibit 3-9. As that exhibit indicates, staffing levels vary widely from property to property, ranging from 10 at GCRTA to 22 at WMATA. This wide variation is explained by the operational and technological differences that exist among the properties, including the following:

- Divisional or zonal segmentation of control within a single mode increases control staff requirements.

EXHIBIT 3-9
Staffing Levels

Staffing Area	MARTA	WMATA	CTA	GCRTA	TTC
Train Control					
Maximum	2	7(a)	4	3	2
Minimum	1	4	1	1	1
Power Control					
Maximum	1	(b)	2	1	2
Minimum	1		1	1	1
Bus Control					
Maximum	4	6	6	3	7
Minimum	1	1	2	1	3
Maintenance					
Maximum		4	1(c)	1(c)	1(c)
Minimum		2		1	1
Security					
Maximum	9(d)	4		1	
Minimum					
Passenger Assistance					
Maximum	2	(b)	1		
Minimum	1				
Room Supervisor					
Maximum	1	(b)	2	1	1
Minimum	1		1		1
TOTAL					
(Maximum)	21	22	16	10	13

a. Includes 1 supervisor, 1 power control operator, 1 vehicle maintenance technician, and 1 P.A. operator.
b. Included in Train Control.
c. On-site communication equipment maintainer.
d. Includes three supervisors.

- TTC currently controls all surface vehicles (bus, trolley bus, and light rail) from a central location employing a peak staff of 7 dispatchers. However, following systemwide implementation of AVM and distribution of control among the individual bus divisions, peak staff requirements will rise to approximately 20.

- MARTA's passenger assistance and CCTV monitoring functions are conducted from three separate zone centers, imposing a need for a separate supervisor at each center, rather than a single supervisor at a central location.

• Staff levels at central control facilities for bus operations depend not only on fleet size but also on the ratio of street supervisory staff to fleet size.

  - CTA has a peak fleet of 1,900 vehicles, but only 4 dispatchers receive calls from vehicle operators (2 supervisors complete all action calls). This comparatively large load on the bus dispatchers (475 buses per dispatcher) is alleviated, however, by the large street supervisory staff (70) employed by CTA. The street supervisors assume some of the control responsibilities that would otherwise devolve upon the dispatchers.

  - MARTA also has 4 peak dispatchers, but a fleet of only 580 buses. This relatively small load on bus dispatchers (145 buses per dispatcher) negates the need for a large street supervisory staff. Therefore, MARTA's control is efficiently maintained with only 8 street supervisors.

A summary of bus dispatch/street supervisory staffing levels and workloads is given in Exhibit 3-10.

EXHIBIT 3-10
Distribution of Bus Control

	Peak Vehicles	Number of Dispatchers	Peak Vehicles Per Dispatcher	Number of Street Supervisors	Peak Vehicles Per Supervisor
MARTA	580	4	145	8	73
WMATA	1,600	5	320	34	47
CTA	1,900	4(a)	475	70	27
GCRTA	750	3	250	15	50
TTC(b)	1,500	7	214	40	38
TTC(c)	1,500	15	100	40	38

a. 4 dispatchers receive calls; 2 additional supervising dispatchers follow-up on action calls.
b. Current levels.
c. Adjusted levels for systemwide AVM.

3.2.3 Staff Utilization

All of the systems surveyed provide a street supervisory staff to support operations. In general, street supervisors are dedicated to a single mode. The exception to this is WMATA, where a common pool of supervisors is used for bus and rail.

The number of peak supervisors deployed by each system is shown on Exhibit 3-11. As illustrated, assignments are distributed between fixed and roving locations.

Street supervisory forces are dispatched by the control center at all of the systems. Vehicle operators notify central control of assistance requirements and dispatchers inform the street supervisor. While direct radio communication between bus operators and street supervisors is possible at all of the properties, this is not routine. Even emergency situations are handled through central control.

Maintenance forces are also dispatched directly through the control center at all systems. The TTC has a dedicated telephone "hot line" to the maintenance supervisor. WMATA provides a maintenance dispatching unit, with a peak staff of four, co-located with bus and rail control. They also have a vehicle maintenance technician on-site in the rail control room to provide trouble shooting assistance.

Maintenance personnel are not normally shared between modes. However, the maintenance of all radio communication, telecommunications, and computer equipment is normally conducted by a common pool of maintenance personnel regardless of the transit mode. (The exception to this rule occurs at MARTA, where telecommunication maintenance personnel are dedicated to a specific mode.) The CTA and TTC each provide a technician who is resident at the central control facility.

Bus and rail system security is maintained by a common pool of transit police/security personnel at all of the systems except the CTA, which relies upon the city police. WMATA has a co-located dispatch center where police dispatchers communicate with rail or bus control personnel to dispatch officers to the scene of an incident. The GCRTA also has a dedicated police officer dispatching security personnel, although this is disjoint from control. MARTA and the TTC both dispatch security forces directly from their control centers.

EXHIBIT 3-11
Field Supervisor Staffing Summary

	Bus		Rail		Common Pool	
	Fixed	Roving	Fixed	Roving	Fixed	Roving
MARTA	-	8	-	6	-	-
WMATA	-	-	-	-	13	21
CTA	20	50	24	-	-	-
GCRTA	7	8	8	1	-	-
TTC	-	40	-	8	-	-

The approaches used for intermodal security coordination vary considerably. WMATA, with co-location of bus control, rail control, and security dispatching can readily coordinate the response to an incident. At the TTC, police forces are dispatched directly by personnel in their intermodal control center via a dedicated radio channel. Even after the AVM for bus control is implemented systemwide a central bus control command station will be maintained at the TTC's current rail/power/surface control center to coordinate both security and operational emergencies.

The GCRTA achieves intermodal coordination by maintaining a dedicated supervisory radio channel. Security incident information is transmitted over this channel and security police and supervisors communicate directly. Coordination is removed from central control responsibility and is managed by the street supervisors.

At MARTA, police are dispatched directly from the bus control center or the rail zone centers. Coordination is acheived by control personnel through communication between the control centers.

3.3 TRAINING

This section discusses training programs for control staff at each of the five selected properties. Entry-level qualifications are first considered, followed by a description of training and retraining programs. Finally, a discussion of qualification requirements across modes (bus and rail) is given.

3.3.1 Entry-Level Qualifications

Extensive field supervisory experience is a prerequisite for employment as a train controller at all of the properties, and as a bus controller at four of the properties. The exception is TTC, where surface (bus, trolley, light rail) dispatchers are not hired necessarily from supervisory ranks; however, heavy rail train controllers at TTC must have a minimum of 2 years experience as field supervisors. CTA differs slightly from the other four properties by drawing its train controllers not only from rail supervisory personnel, but also from bus supervisory personnel and bus senior dispatchers.

3.3.2 Training Programs

Training programs for bus control staff are 10-12 weeks long at CTA and 3-4 weeks long at the remaining four properties. All properties viewed the duration of their training programs as adequate except TTC, where a longer period is desired. Their situation is unique, however, as dispatchers are not hired necessarily from supervisory ranks. They must learn trolley bus and light rail, as well as bus routes and operations in four weeks.

Training programs for rail control staff are in all cases more extensive than for bus dispatchers. MARTA precedes a 3-4 month on-the-job (OTJ) training period with 3 weeks of classroom experience. The TTC, WMATA, and GCRTA also provide on-the-job training programs for rail controllers; GCRTA supplements its OJT with the use of simulation equipment.

At CTA, a 10-day management course must be taken by all rail control candidates prior to the start of actual training. A 6-9 month field training program is then given to familiarize the future controller with all routes and all rail- and tunnel-related jobs. This is followed by 3 months of OJT, for a total training duration of one year. Following an additional year as a train controller, personnel can then qualify for power control through an OJT period of about 9 months.

The stated rationale for CTA's extensive training for both bus and rail control personnel is that:

- Thoroughly qualified controllers increase the efficiency with which service is provided and maintained.
- Emergencies are handled more readily if control personnel are thoroughly qualified.
- Control staff are better prepared for eventual promotion to supervisor of the control room (bus and rail).

These contentions are supported by the efficiency with which emergencies are handled.

3.3.3 Retraining/Requalification

Only TTC has a formal retraining program for its surface (bus, trolley bus, light rail) dispatchers, administering an annual requalifying test to these personnel. TTC also has made provisions for retraining dispatchers once AVM is implemented systemwide. Dispatchers will be continually rotated with street supervisors to maintain their knowledge of street operations.

At all other properties, retraining of bus dispatchers is an ad hoc process. It typically coincides with equipment or service changes, or as needed to refamiliarize personnel with a particular procedure.

Requalification of rail controllers occurs at all systems except GCRTA--formally at MARTA, WMATA, and TTC and informally at CTA. MARTA, WMATA, and TTC administer written tests, with a high minimum acceptable grade required to pass. Failure can result in retesting, retraining, or dismissal. The test, which is given every 6 months at MARTA and annually at WMATA and TTC, includes questions on emergency procedures, operator and supervisory procedures, safety, security, maintenance (troubleshooting), and equipment.

At CTA, on-going refamiliarization occurs to keep rail controllers abreast of service or equipment changes, or to investigate observed procedural or performance inadequacies.

3.3.4 Multiple Bus/Rail Qualification

Qualification of control staff in bus and rail operations occurs routinely only at CTA, where the integration of operations and joint supervision of control functions requires the Supervisor of Control to be proficient in all areas. To prepare staff for eventual promotion to this position, selected staff members receive training in bus, train, and power control functions. To insure retention of knowledge and to provide appropriate experience, the multi-qualified controllers rotate between the three control functions.

MARTA and GCRTA also allow certain individuals to qualify in both modes, but only on an exceptional basis.

3.4 OPERATIONS AND TECHNOLOGY

This section focuses on the operations, equipment, and technology adopted by the five surveyed transit properties in fulfilling their central control functions, both for bus and rail systems. The section examines communication interfaces and procedures, control and support technologies, and passenger assistance, security dispatching, and emergency response equipment and procedures.

3.4.1 Communications Interface

Bus dispatchers and rail controllers generally serve as the communication link between vehicle operators and other required personnel, such as security forces, maintenance personnel, supervisory personnel, and emergency services. The central control communication interfaces at the five properties surveyed during the course of this study are illustrated in Exhibits 3-12 through 3-16.

As the exhibits illustrate, in most cases the communication interface within a mode is straightforward and similar from property to property. A bus operator will, for instance, report a need for maintenance to the bus central control facility. The dispatcher will provide advice if appropriate or will relay the information to maintenance, where a course-of-action is decided. The dispatcher then reports back to the bus.

For problems requiring coordination between modes, the communication interface becomes more complex. At TTC and CTA the necessary intermodal coordination is facilitated by the integration of bus/rail control, with responsibility for both being invested in one person, a Supervisor of Control. Coordination is thus enhanced, for one person is in charge of the coordination effort and communications between bus and rail control personnel is direct. At WMATA, the bus/rail control functions have separate supervisory structures, but the communications interface is facilitated by the co-location of facilities, enabling face-to-face communications between bus dispatchers, rail controllers, and security personnel.

EXHIBIT 3-12

CONTROL COMMUNICATION INTERFACE: MARTA

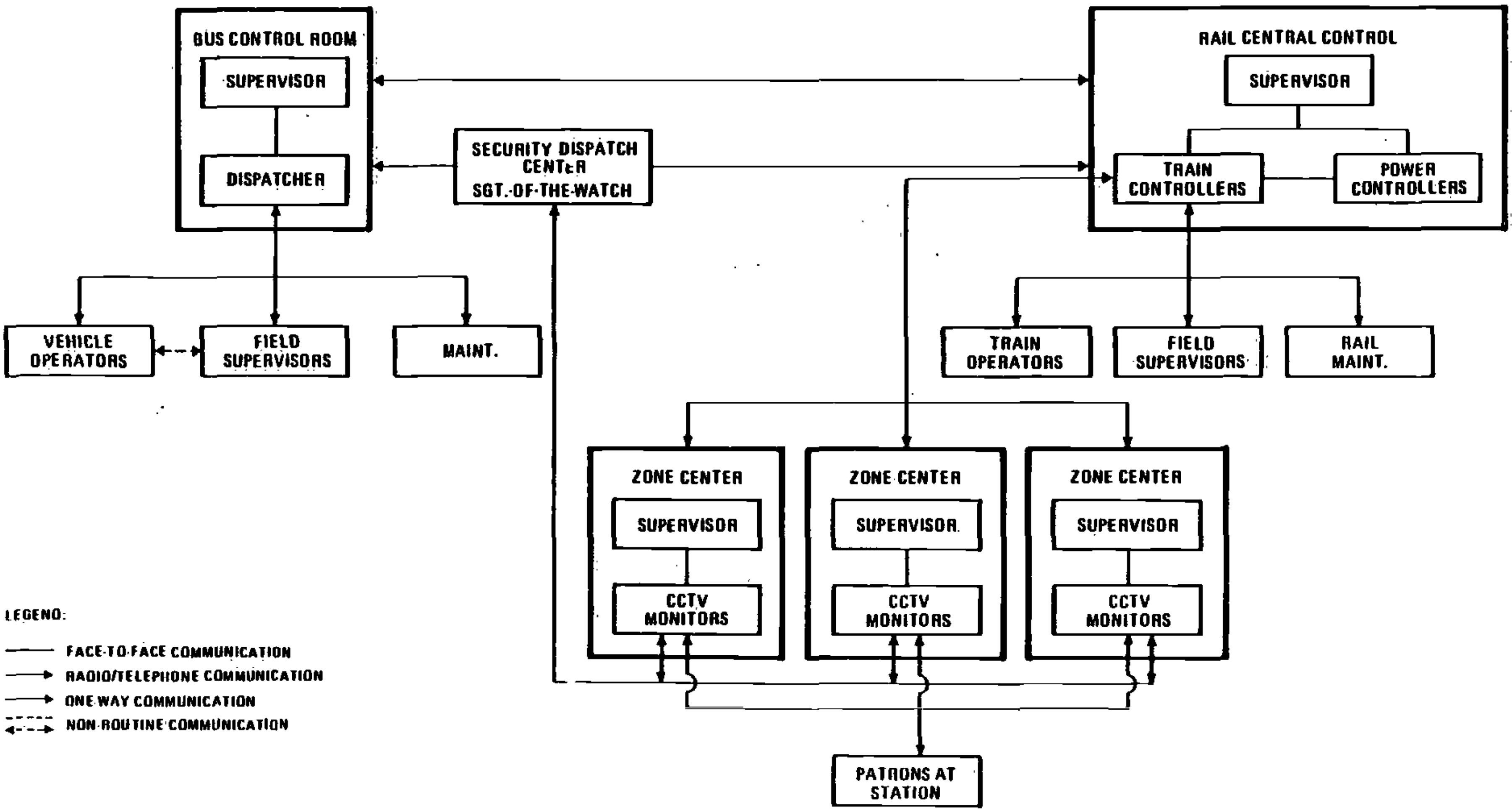


EXHIBIT 3-13

CONTROL COMMUNICATION INTERFACE: WMATA

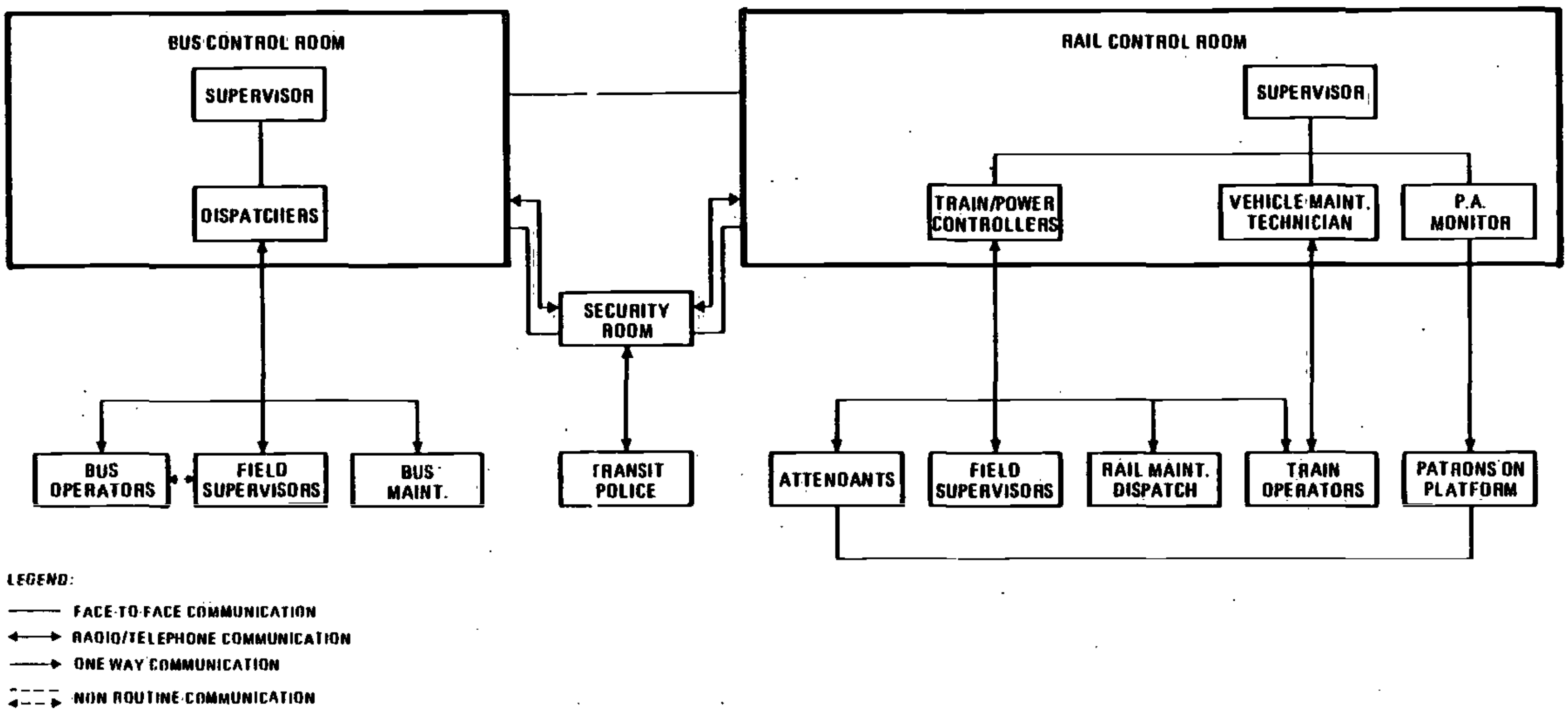
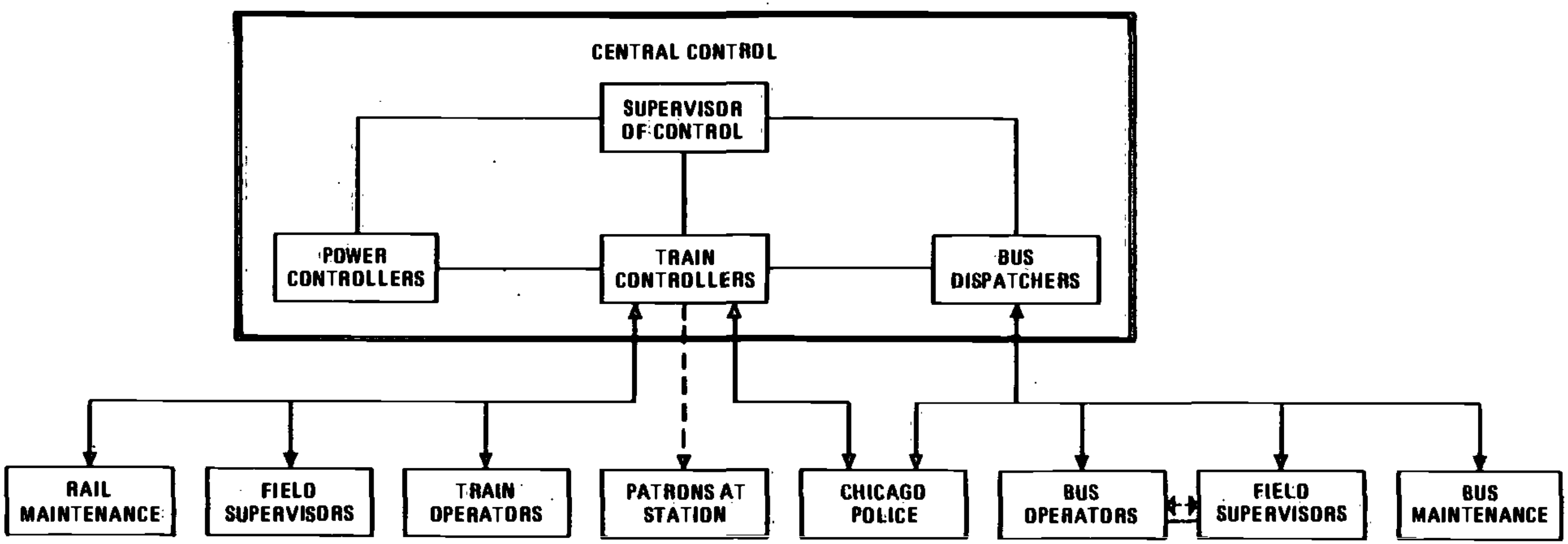


EXHIBIT 3-14
CONTROL COMMUNICATION INTERFACE: CTA



LEGEND:

- FACE-TO-FACE COMMUNICATION
- RADIO/TELEPHONE COMMUNICATION
- ONE WAY COMMUNICATION
- NON-ROUTINE COMMUNICATION

EXHIBIT 3-15

CONTROL COMMUNICATION INTERFACE: GCRTA

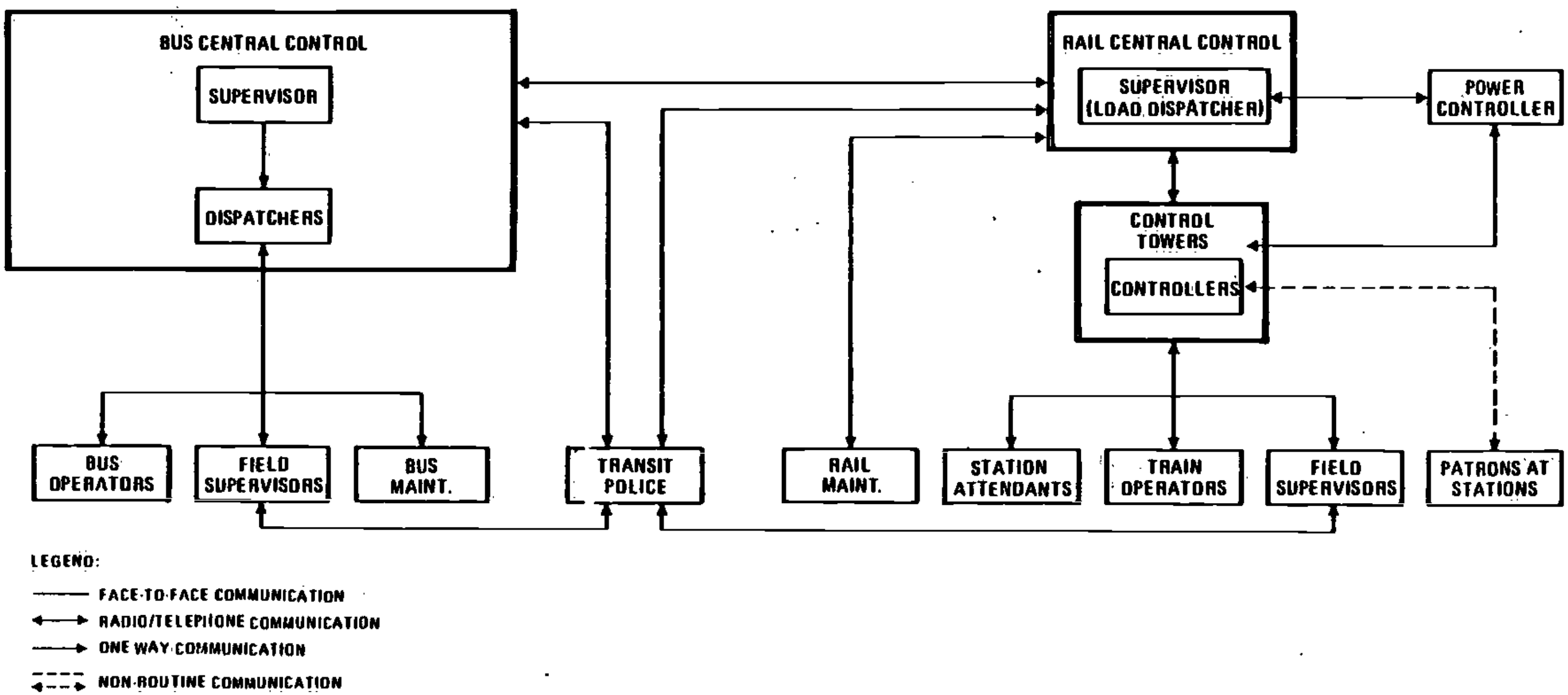
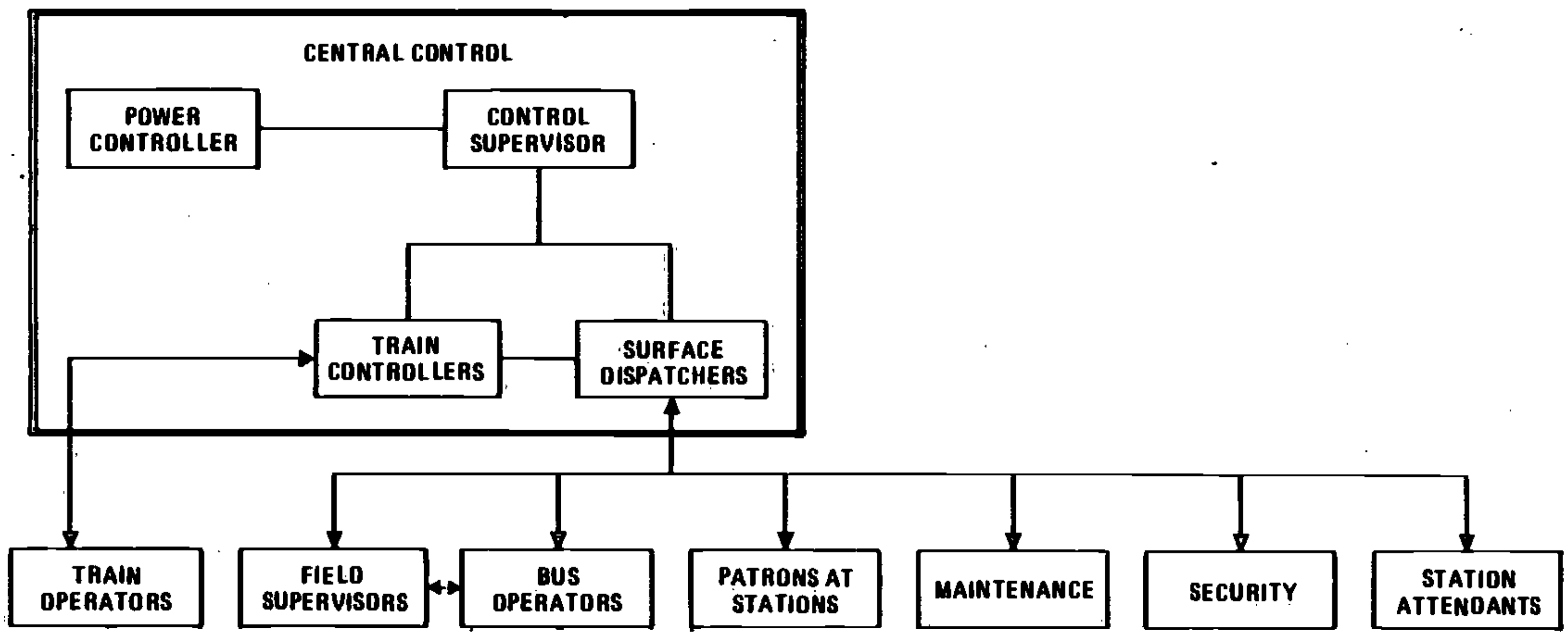


EXHIBIT 3 - 16
CONTROL COMMUNICATION INTERFACE: TTC



LEGEND:

- FACE-TO-FACE COMMUNICATION
- RADIO/TELEPHONE COMMUNICATION
- ONE WAY COMMUNICATION

Conversely, the bus/rail modes at MARTA and the GCRTA not only have separate supervisory structures but are also housed in completely separate facilities. Coordination among the central control personnel for bus and rail systems thus depends on radio and telephone communications. No single centralized point of coordination exists.

The advantages of co-located control facilities are apparent:

- Intermodal coordination becomes easier
- The impact of communication equipment failure is reduced
- Incident processing time decreases
- Information accuracy/reliability may increase.

These observations were supported during study interviews, particularly with regard to emergency situations. As an example, the CTA boasts a response time of 10 to 15 minutes to provide a 20-vehicle bus shuttle. They cite their integrated control system as facilitating this performance.

3.4.2 Operations Control Assignments

Operations control assignments are made by geographic zone or by route for rail, and either zone or garage for bus, at all of the transit systems. An assignment summary is shown on exhibit 3-17.

For bus operations, automatic call distributing to the next available controller and transferring capabilities are available only at WMATA, although TTC surface dispatchers can select calls on any channel. At the other properties, each dispatcher is assigned the responsibility for vehicles on a unique radio channel.

EXHIBIT 3-17
Control Assignments

	MARTA	WMATA	CTA	GCRTA	TTC
Bus	Zone	Garage	Garage	Garage	Zone
Rail	Route	Zone	Route	Zone	Zone

3.4.3 Control Technology

In fulfilling their central control functions, the five surveyed transit properties use similar primary equipment for bus operations control, but vary somewhat in their equipment choice for rail control. Exhibit 3-18 summarizes the central control equipment at each of the five properties.

For bus operations control, all properties use a data-enhanced radio communication system as their primary equipment. GCRTA and CTA also have automatic vehicle locating (AVL) systems, although CTA uses this feature only in emergency or exceptional situations. Automatic vehicle monitoring (AVM) is not used at any system at present, although TTC is currently testing this feature on 100 buses at one division and plans to implement AVM systemwide in the short term.

Rail control is accomplished with CRTs at WMATA and will be at the GCRTA when its new rail control facility becomes fully operational. TTC uses a mimic board and MARTA uses a mimic board and CRTs. The CTA is installing a mimic board for the new airport line. The mimic board will be used for public relations and CRT displays will be employed for actual train control.

During interviews with transit property personnel concerning train control equipment, benefits of both CRTs and mimic boards were identified:

- CRTs provide more information and in greater detail
- CRTs require less space
- Mimic boards allow the controller to see the entire line displayed, simplifying monitoring duties.

As both CRTs and mimic boards have operational advantages and have been proven effective at many transit properties, equipment selection appears to be a matter of preference. Neither system is inferior to the other, and each provides unique benefits.

EXHIBIT 3-18
Control Equipment

Equipment	MARTA	WMATA	CTA	GCRTA	TTC
Rail Control Equipment					
Mimic Boards	X		X(a)	X(b)	X
CRTs	X	X	X(a)		
Pen Graph			X		
Power Control Equipment					
Remote Control Substations	X	X	(c)	X(d)	X
Bus Control Equipment					
Data enhanced radio	X	X	X	X	X
AVL			X	X(e)	
AVM					X(f)

a. Airport extension only.
b. CRTs for train control are planned for new facility.
c. Remote control is being added.
d. Remote control for heavy rail only; this feature is being added for light rail.
e. Also have automatic mechanical monitoring capability.
f. Presently being tested; expect to use systemwide.

3.4.4 Support Technology

The supporting technological equipment/tools of the central control systems at each of the five surveyed properties are strikingly similar (see Exhibit 3-19):

- All five properties have visual display and control capabilities for train location and power supply monitoring.
- All properties but GCRTA maintain hard-copy files on bus location and status.
- No property but CTA has on-line vehicle maintenance hard-copy information.
- All five properties have a data-enhanced radio communication system.
- All properties (except GCRTA) have intrafacility (e.g., console to console) intercom capabilities.
- All properties but WMATA have emergency hotlines.
- All properties but GCRTA have direct communication links to field maintenance personnel.
- All five properties record all radio calls, and four record telephone calls (see Exhibit 3-20).

3.4.5 Passenger Assistance Equipment/Methods

All five of the surveyed properties have provisions for passenger assistance, although the types of assistance provided vary among the properties. The CTA control center communicates with rail patrons in emergency situations only. Conversely, TTC controllers provide routine customer information. A summary of rail passenger assistance methods and equipment are provided as Exhibit 3-21.

EXHIBIT 3-19
Equipment/Tools Available in Control Centers

Equipment/Tool	MARTA	WMATA	CTA	GCRTA	TTC
Train Location:					
Hard-Copy Reporting	X		X		X
Visual Display & Control	X	X	X	X	X
Power--Visual Display & Control	X	X	X	X	X
Bus Location & Status--Hard Copy	X	X	X(a)		X
On-Line Maintenance--Hard Copy			X		
Radio Communications	X	X	X	X	X
Data-Enhanced Radio Communications	X	X	X	X	X
Intercom--Intrafacility	X(b)	X(c)	X		X
Emergency Hotlines	X		X	X	X
Incident Processing--CRT/Keybrd./Prt.			X	X	
Telephone/Radio Cross-Patch	X(d)	X		X	
Direct Commication Link to Field Maintenance/Transportation Facilities	X	X	X		X
CCTV Monitoring	X	(e)			X(e)
Radio/Telephone Recording & Playback	X	X(f)	X	X	X

a. Emergency location only.
b. Rail only - highly recommended having bus/rail intercom capabilities.
c. Intermodal.
d. Rail control only.
e. Available in stations; monitored by attendants.
f. Telephone, radio, and environment recording for rail center; radio recording only for bus.

EXHIBIT 3-20
Communication Recording

	Radio	Telephone	Other	Tape Storage Duration(a)
MARTA	X	X		60 Days
WMATA	X	X	X(b)	30 Days(c)
CTA	X	X(d)		30 Days
GCRTA	X			2 Years
TTC	X	X		30 Days

a. How long tapes are held prior to re-recording.
b. Environment microphone in rail control center.
c. Security dispatching tapes held for one year.
d. Emergency lines only.

EXHIBIT 3-21
Rail Passenger Assistance Summary

	MARTA	WMATA	CTA	GCRTA	TTC
Communication					
Direct with Passengers	X				X
Through Station Attendants	X	X	X	X	X
Type of Assistance					
Routine		X			X
Emergency	X	X	X	X	X
Method					
Public Telephone	X				X
Emergency Telephone	X			X	X
CCTV	X	X		X	X
Radio	X	X	X		X
Intercom		X	X		X
Visual Display Board		X			X

An interesting feature for passenger assistance utilized by WMATA and TTC is display boards within the rail stations. WMATA's provides a vehicle location display, while the TTC controllers transmit messages directly to patrons in stations. The latter application is particularly beneficial in directing patrons during emergencies. Both transit systems recommend visual display during emergencies, also citing the revenue attained through commercial advertising on those displays.

CCTV equipment is utilized by all of the systems for passenger security, and in some cases for revenue security. Station attendants generally monitor the screens, except at the CTA where local police monitor the four CCTV-equipped stations.

At the GCRTA, only one station--the airport terminal--has CCTV capabilities. The TTC, WMATA and MARTA monitor all stations. MARTA is unique in that this function is accomplished by security personnel in three distinct zone centers.

The TTC also uses CCTV for crowd control at major interchange or transfer points. A public address system enables station attendants to convey routine or particular messages to patrons in the stations. Central control can also transmit patron messages directly.

4.0 CONCLUSIONS

4.0 CONCLUSIONS

The final section of this report will highlight information presented in the preceding text. The information should be interpreted only as a summary of site visit data. Actual recommendations based on this information will be made within a final report containing all recommendations.

Facility

- The total floor space allocated to central control functions ranged from 5,670 square feet at the CTA to 12,175 at the TTC. Included in the latter is an estimated 4,700 square feet required for the new systemwide AVM system.
- The space provided for train control/power control was consistent within a range of approximately 2,000 to 3,000 square feet. (WMATA provides only 1,000 square feet but are admittedly crowded and considering expansion.)
- Bus control provisions showed marked variations and are not directly related to property size. The range was 500 to 1,500 square feet.
- Computer space allocation varied by mode, with bus requirements ranging from 150 to 350 square feet, and rail computer space ranging from 1,200 to 2,680 square feet.
- The systems with co-located bus and rail control centers realize significant space sharing.
- The value of a viewing gallery is not apparent.
- The advantages of control access was questioned by many properties because of equipment reliability.

Organization

- The properties with integrated organizational structures cite the following benefits:

  - A single focal point of command can be established, promoting:

    - Prompt decision making

    - Reliable information

    - Consistent communications with staff, management and the media

  - Accountability for decisions during emergency situations.

- Decentralization of control, either within or across modes, increases staff requirements.

- Bus control dispatcher requirements are affected by street supervisory staffing levels.

- AVM technology is expected to significantly increase bus dispatcher requirements at the TTC (from 7 to at least 20).

- A common (intermodal) pool of field supervisory forces is used only at WMATA.

- Security dispatching procedures vary considerably (e.g., dedicated police dispatch; bus/train controller dispatch; field supervisory coordination/communication).

- Intermodal security incident response is facilitated by co-location of security and bus/train control personnel.

Training

- Candidates for bus or rail control positions are generally required to have field supervisory experience.

- A four week program is sufficient for training bus dispatchers (assuming prior field experience).

- Rail controllers generally receive 3 to 4 months of on-the-job training, often supported by classroom instruction.

- Formal retraining for bus dispatchers is generally not done, although familiarization instruction is used and coincides with service or procedural changes.

- Formal retraining of rail controllers is practiced at all systems in the form of written or oral tests, with minimum standards required for passing.

- Multiqualification of control personnel is done only at the CTA.

Operations and Technology

- Decentralization of control results in:

  - Decreased efficiency at intermodal or security coordination

  - Increased dependence on communication equipment

  - Increased incident processing time

  - Decreased information reliability.

- A data enhanced radio communication system is utilized by all systems for bus control

- Automatic vehicle locating technology is deployed by the GCRTA and CTA; the TTC is testing and planning systemwide automatic vehicle monitoring

- CRTs and mimic boards are the primary technologies for train control; each offers certain advantages:

  - CRTs provide more information and in greater detail

  - CRTs require less space

  - Mimic boards are easier to monitor, allowing controllers to see the entire line simultaneously.

- The support technology for control is very similar at the five properties:
  - Interfacility intercom
  - Emergency hotlines
  - Phone/radio recording equipment
  - Visual train location and power supply monitoring capabilities.
- All of the systems provide direct passenger assistance, but the equipment and procedures vary significantly.
- CCTV is used to some extent at all of the systems for both passenger and revenue security.
- With the exception of MARTA, station attendants monitor the CCTV screens. A general concensus, however, is that they are unqualified and usually too busy for this, and dedicated security can best perform CCTV monitoring.

APPENDIX A

REFERENCES

REFERENCES

Metropolitan Atlanta Rapid Transit Authority

- Thomas O. Duvall, Director of Transportation
- William E. Callier, Assistant Director of Rail Transportation
- Edward J. Manning, Manager of Transportation Services

Washington Metropolitan Area Transit Authority

- S. Neil Dove, Supervisor, Central Communications, Office of Bus Service
- C. R. Hayes, Rail Operations Officer, Rail Transportation
- Martin J. Lukes, Train Control Engineer, Office of Engineering
- John Sutton, Captain, Transit Police

Chicago Transit Authority

- James R. Blaa, Special Assistant to Executive Director
- Michael V. LaVelle, Director, Service
- R. O. Swindell, Director, Power, Signal and Communications Engineering

Greater Cleveland Regional Transit Authority

- Charles F. Hunt, Assistant Director of Rail Transportation
- James E. Ferguson, Traffic Supervisor
- Hank Kwaak, Chief Traffic Supervisor

Toronto Transit Commission

- Don L. Swenor, Supervisor, Electrical Design, Plant Department
- V. F. Farrell, Supervisor, Special Events, Transportation Department

APPENDIX B

STUDY QUESTIONNAIRE

STUDY QUESTIONNAIRE

LAYOUT

1. If available, please provide a floor plan of the operations control facility(ies).

2. Which of the following facilities are "shared" between bus and rail operations control staff and functions?

   - Computer room
   - Equipment room
   - Maintenance room
   - Relief/lunch room
   - Training/conference room
   - Visitor's gallery/viewing area
   - Other (please specify)

3. Is a training room provided for operations control staff?

4. If so, which of the following functions and with what simulator equipment (if any) is this facility equipped to provide instruction?

   - Rail control
   - Power supervision
   - Bus control
   - Security
   - Passenger assistance
   - Radio/telephone/intercom tape playback
   - System operational test facilities
   - Other (please specify)

5. Is access to the operations control facility controlled?

6. If so, which of the following equipment is used to control access?

   - Code-entry
   - CCTV
   - I.D. card reader (computer-controlled)
   - Other (please specify)

PERSONNEL

7. Please provide an organization chart which includes all operations control personnel.

8. What personnel are "shared" between bus and rail operations control (e.g., managerial and/or secretarial)?

9. Are any maintenance responsibilities "shared" between bus and rail systems?

10. Are operations control personnel multi-qualified (i.e., for rail <u>and</u> bus control)?

11. If so, what percentage have been so trained and for what functions have they been qualified?

12. Are operations control personnel subject to requalification?

13. If so, how often and by what procedures(s) are they requalified?

14. Why was multi-qualification of personnel employed (i.e., existing labor agreement, to effect personnel savings, etc.)?

15. Will this policy be continued?

16. What are the maximum and minimum numbers of personnel on duty at any one time devoted to the following functions? (Please note where persons are shared between functions.)

	MAXIMUM	MINIMUM
• Rail control		
• Power control		
• Bus control		
• Maintenance control		
• Security		
• Passenger assistance		
• Room supervision		
• Clerical		
• Other (please specify)		

17. How are field operations supervision forces utilized by the operations control staff (i.e., assigned by operations control or independent of operations control, etc.)?

18. Is a common pool of field supervisors used on the bus and rail systems?

19. How many of these field supervisors are assigned to a fixed location?

20. How many of the field supervisors are assigned to mobile (or roving) assignments?

21. If a common pool is used, how are responsibilities assigned (i.e., as required by incident or strictly bus, etc.)?

FUNCTIONS/EQUIPMENT

22. Which of the following tools/equipment are available to operations control personnel?

- Hard-copy train location reporting
- Visual train location display and control
- Visual traction power status display/control
- Hard-copy logging of bus location/status
- Hard-copy logging of on-line maintenance
- Radio communications
- Data-enhanced radio communications
- Intra-facility intercom (i.e., console-to-console, etc.)
- Emergency services' hotlines
- CRT/keyboard/printer for incident processing/reporting
- Telephone/radio cross-patch
- Direct communications links to field maintenance and/or transportation facilities
- CCTV monitoring of stations/facilities
- Radio/telephone recording/playback equipment

23. Which of the above are available to any one work station?

24. When would an employee be authorized to use multiple functions? Further, what functions can be combined and over what geographic area?

25. Beyond the information noted above, are there weaknesses in the current equipment's or system's capabilities (please explain)?

26. What changes/enhancements are planned for this equipment?

27. Is security dispatching done from the operations control center?

28. Is a common pool of security officers used to handle bus and rail incidents?

29. Are operations control staff (as opposed to transit police) responsible for security dispatching?

30. How are responsibilities for assigning and handling multi-modal transit police incidents coordinated?

31. Are operations control personnel responsible for providing on-line passenger assistance (also, describe the nature of the assistance provided [i.e., schedule information, instruction])?

32. If so, by what means is passenger contract established?

- Public telephone
- Emergency telephone
- Intercom

33. Which of the following tools/equipment are available to the employees providing passenger assistance?

- CCTV
- Emergency services' hotlines (include to which agencies these have been provided)
- Radio communications
- CRT/keyboard for incident processing/reporting

34. Are rail system traction power substations remote control?

35. If so, what displays and controls are available at operations control?

36. How are operations coordinated in the event there is an unusual occurrence on the rail system which may require any one of the following service changes?

- Bus shuttle

- Bus substitution (short duration, i.e., 1 day or less)

- Bus substitution (long duration)

37. For connecting feeder bus routes which offer only limited hours of service or operate on a wide headway, how are services coordinated in the event of a protracted rail system delay?

38. How are rail control assignments divided (i.e., by zone, by route, etc.)?

39. How are bus control assignments divided?

40. How are maintenance forces dispatched, when additional support is required, such as for the following events?

- Road call
- Major rail delay
- Major bus/rail accident
- Unscheduled facilities maintenance
- Signal system interruption/failure
- Traction power system interruption/failure
- Communications system interruption/failure

41. Are operations control personnel responsible for handling direct communications with the following?

- Vehicle operators

- Field supervision forces

- Maintenance forces (specify, i.e., vehicle, facilities)

- Security forces

- Station attendants

42. Are radio communications between vehicle operators and field supervision forces possible?

43. If so, is this a normal means of communication?

44. Do operations control personnel provide field trouble-shooting instructions (to the vehicle operator)?

45. How are radio channel monitoring duties assigned (i.e., by lines, zones, quantity of vehicles, etc.)?

46. How are radio assignments for field supervision forces assigned (i.e., by the control person handling vehicle operator communications, etc.)?

47. How are field maintenance forces dispatched (as above)?

48. Are all radio channels recorded?

49. Are all incoming//outgoing telephone lines (including hotlines) recorded?

50. How are incoming calls distributed? Transferred?

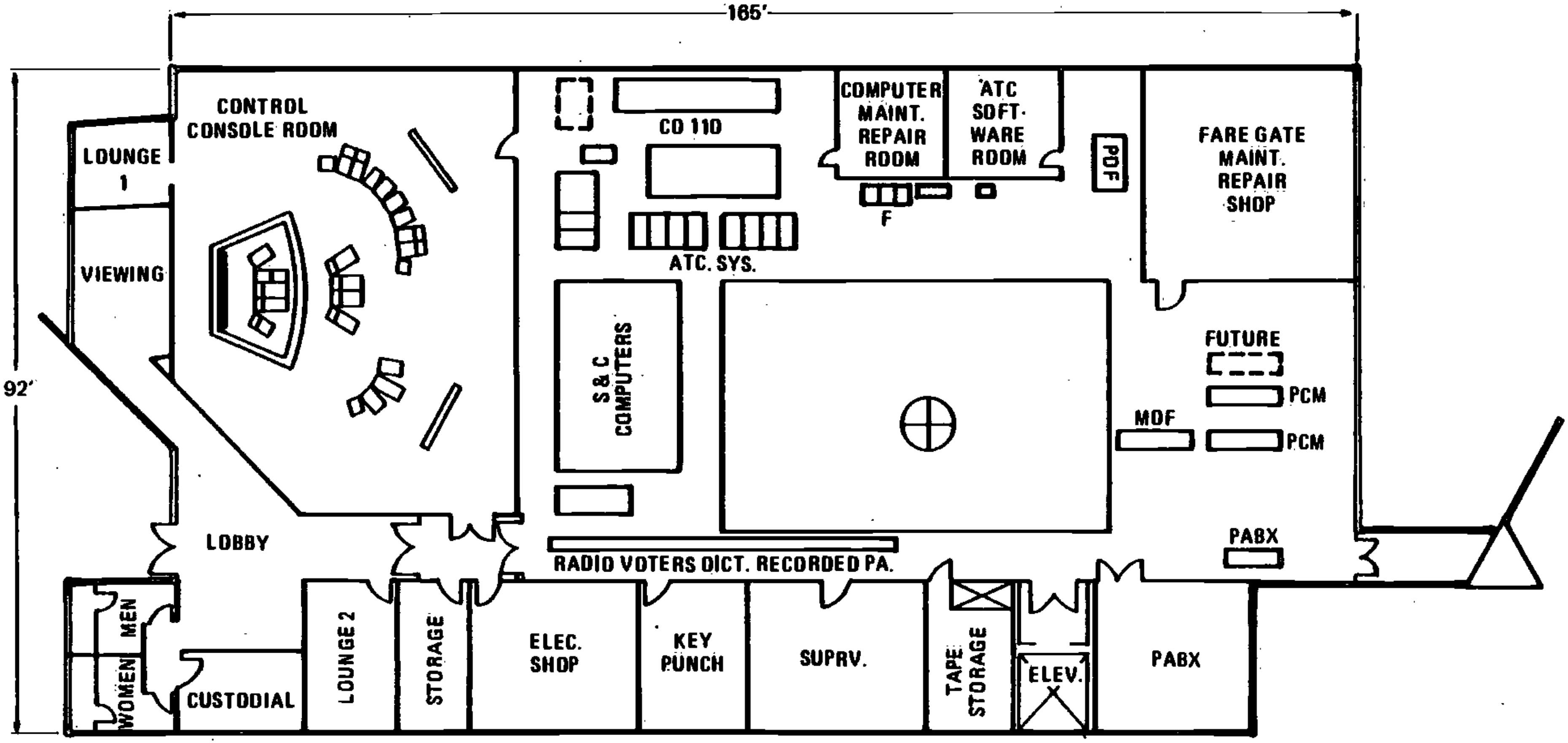
51. For what time period are tapes held prior to re-recording?

52. What are your views of the (dis)advantages of the bus/rail control arrangement currently used?

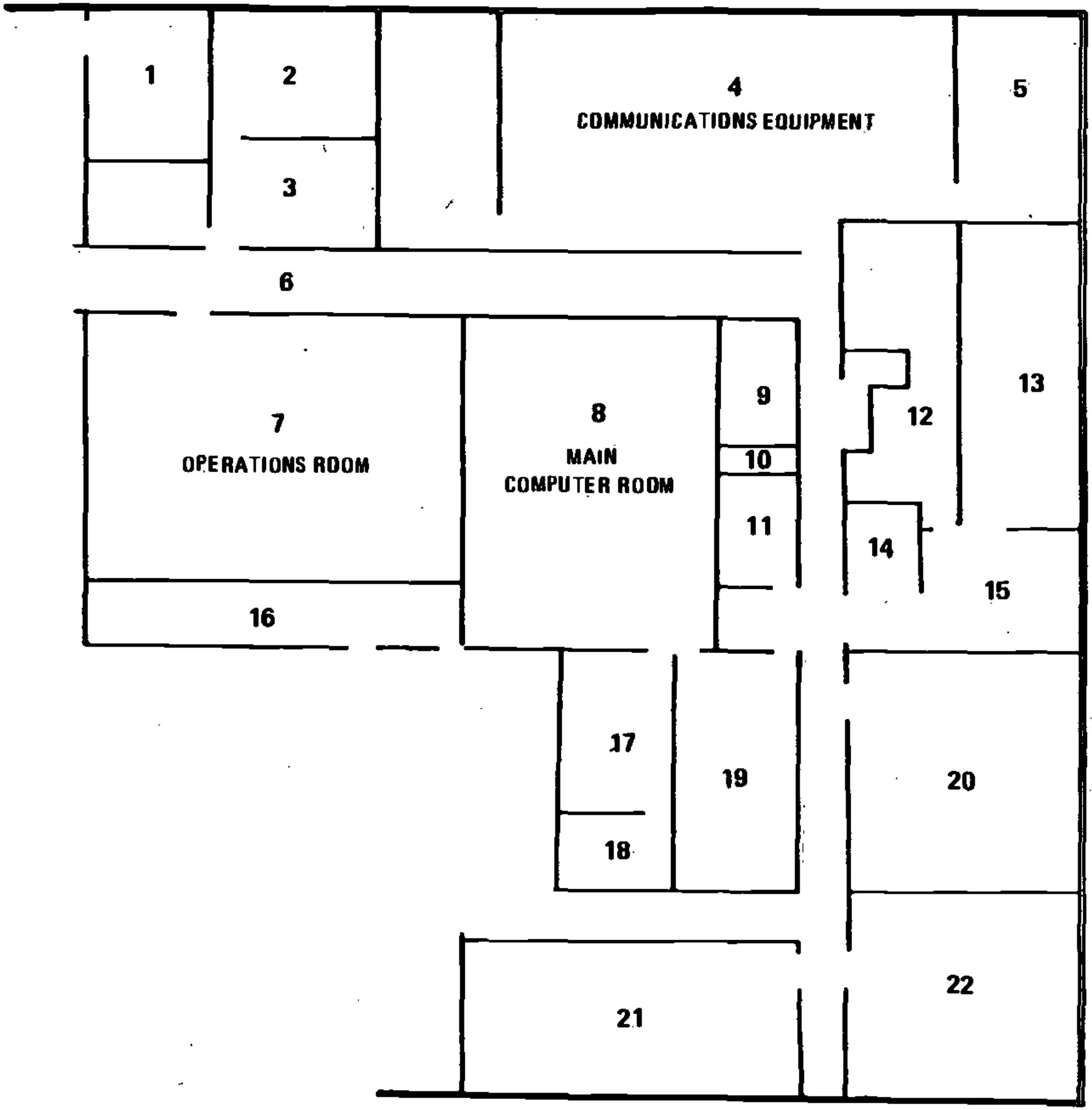
APPENDIX C

CENTRAL CONTROL FACILITY LAYOUTS

RAIL CENTRAL CONTROL LAYOUT: MARTA

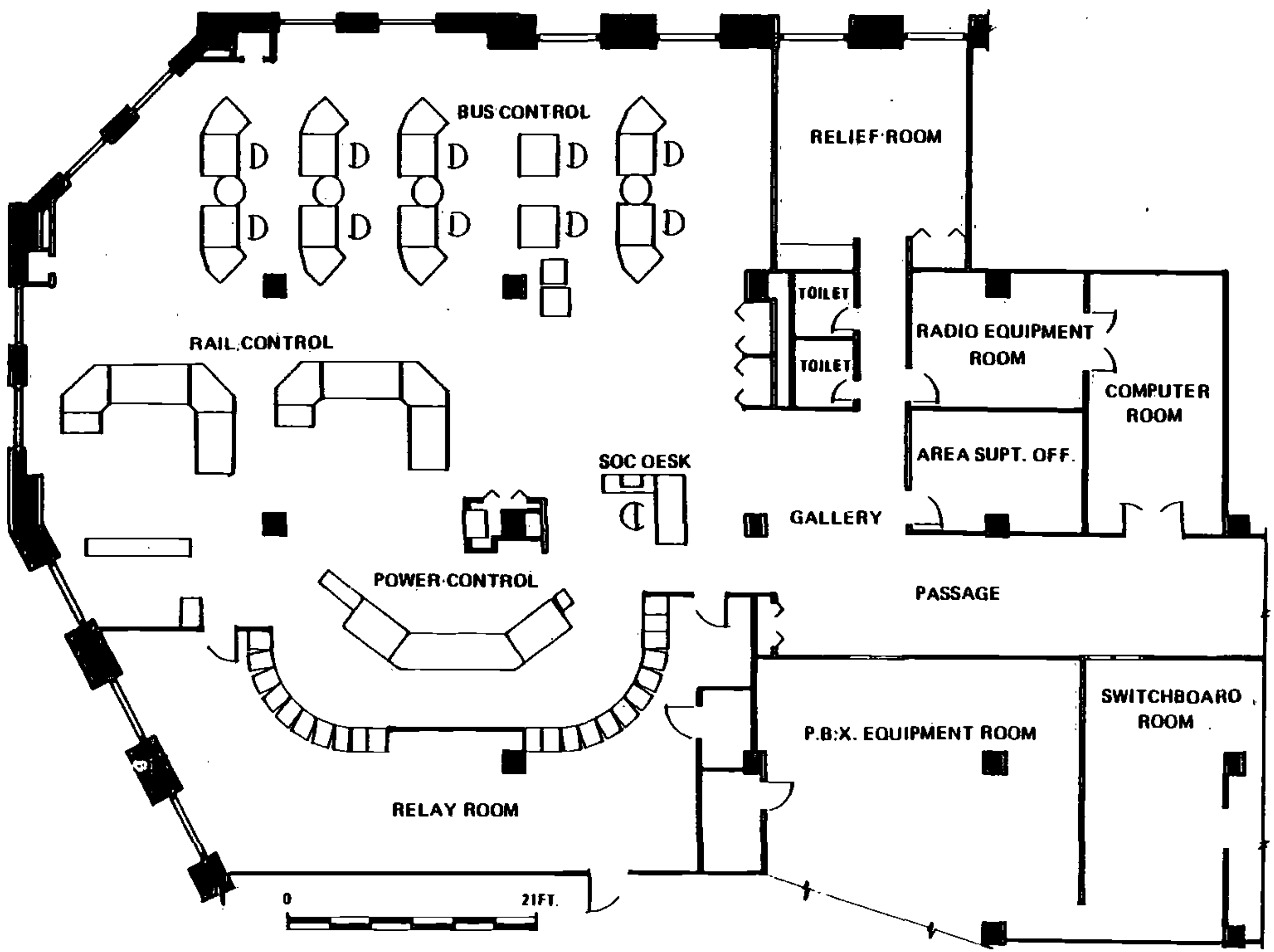


CENTRAL CONTROL LAYOUT: WMATA

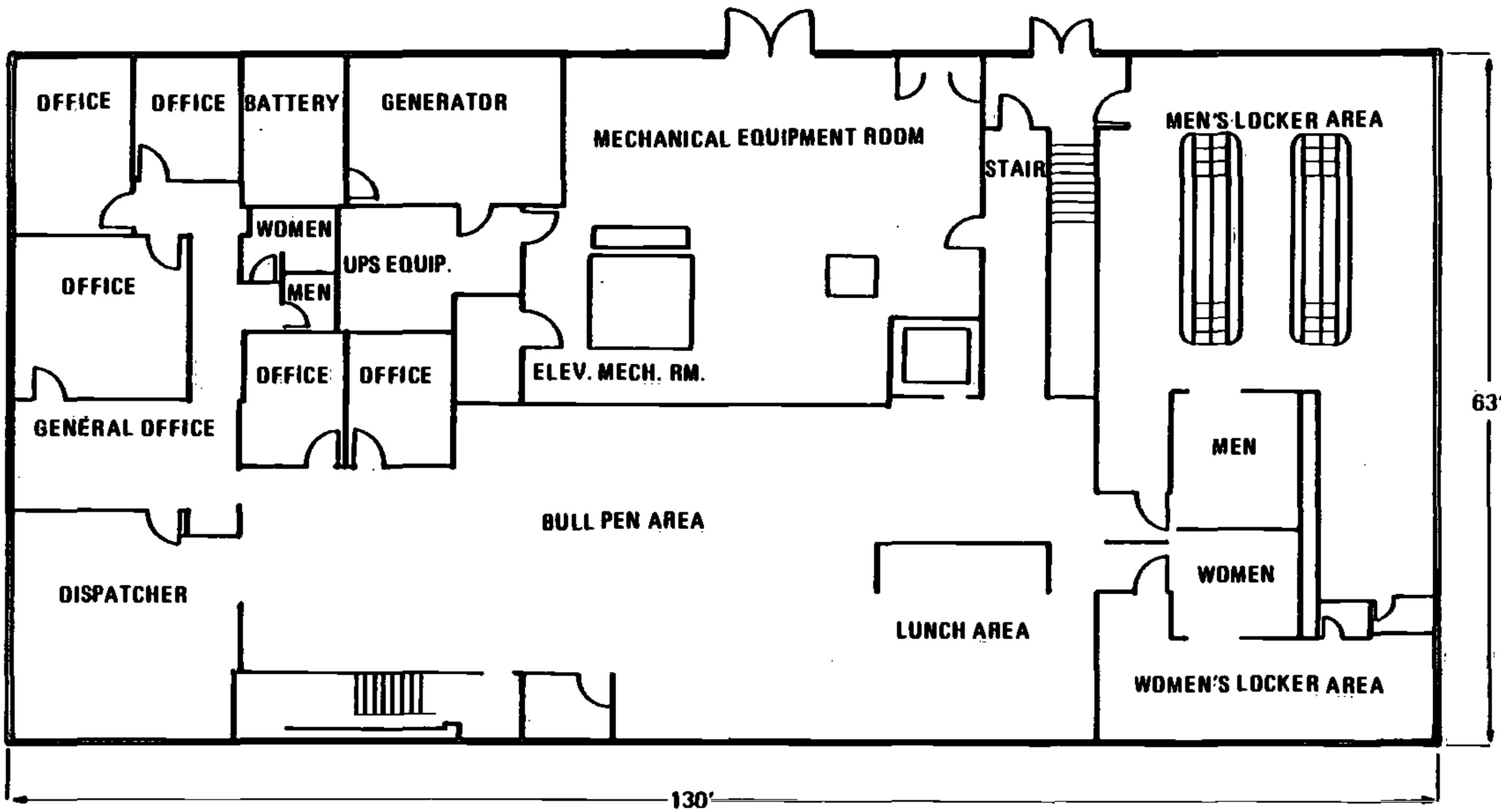


1 CONFERENCE
2 TELE.–MAINTENANCE
3 PABX
4 COMMUNICATIONS EQUIPMENT
5 AUXIL. POWER
6 CORRIDOR
7 OPERATIONS ROOM
8 MAIN COMPUTER ROOM
9 DISPLAY
10 ELEC. CLO.
11 SUPPORT SUPERVISOR
12 FILE MAINTENANCE
13 REMOTE JOB
14 DATA CONTROL
15 DATA PREP.
16 VISITORS GALLERY
17 PROGRAMMERS
18 LIBRARY
19 MACH. ROOM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

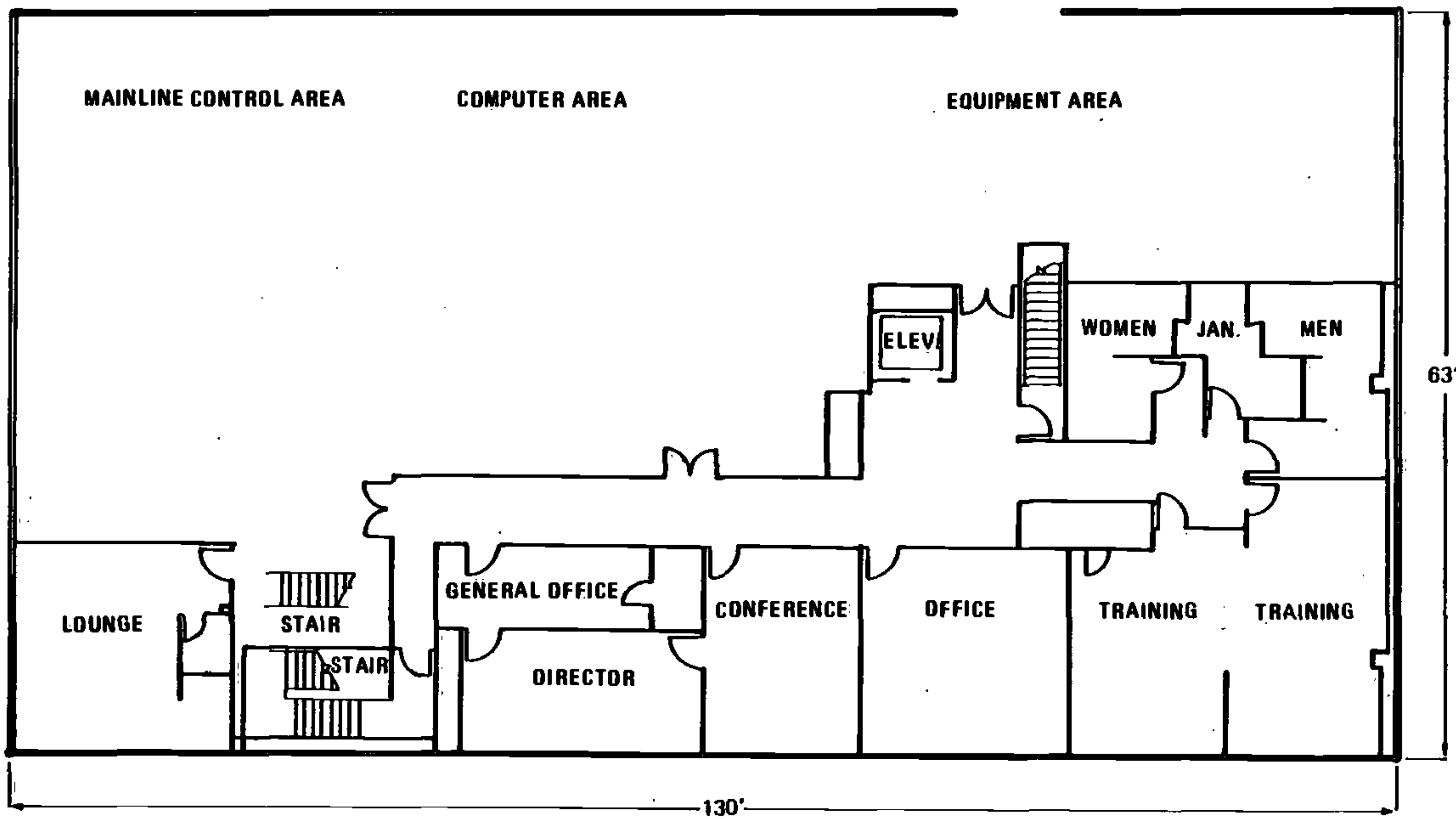
CENTRAL CONTROL LAYOUT: CTA



RAIL CENTRAL CONTROL LAYOUT: GCRTA
1ST FLOOR



RAIL CENTRAL CONTROL LAYOUT: GCRTA
2ND FLOOR



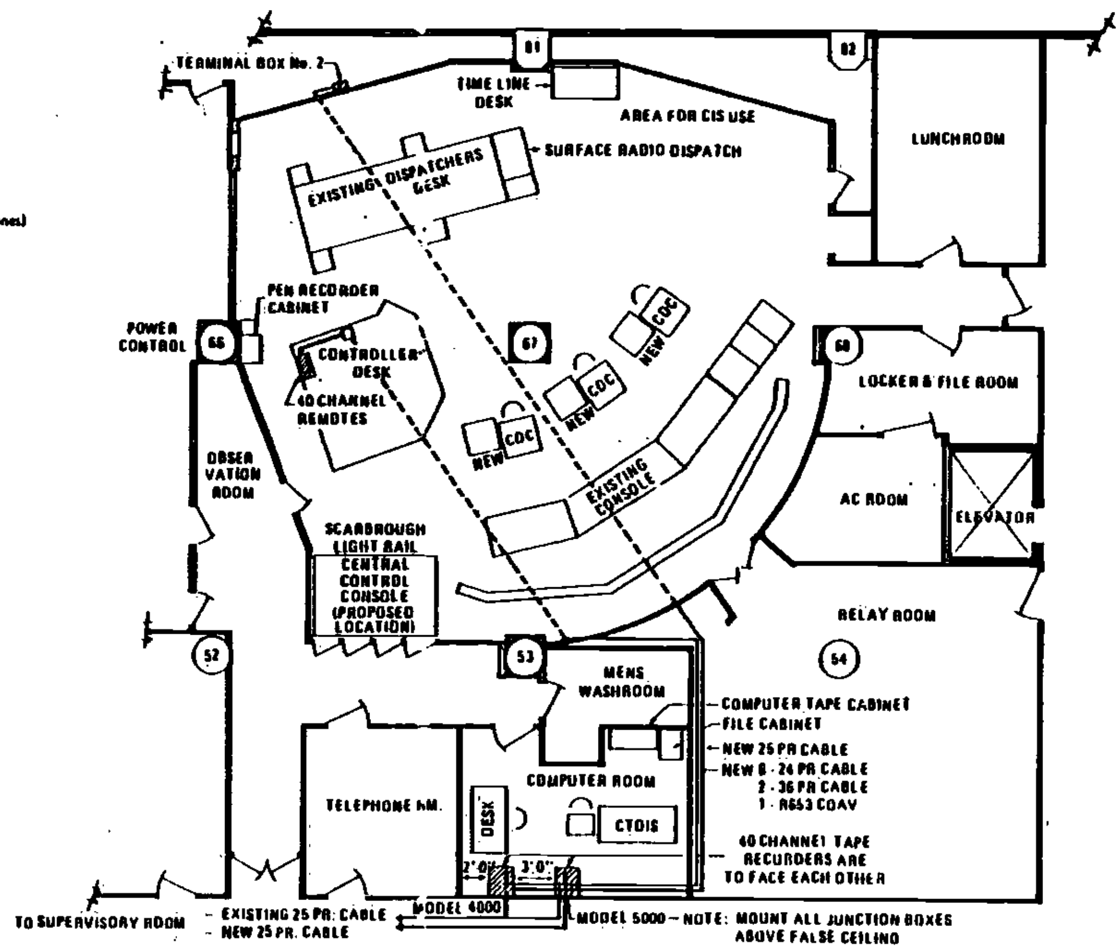
CENTRAL CONTROL LAYOUT: TTC

MODEL 4000 CHANNEL ALLOTMENT

Channel No.	Assignment
1	Time
2	VHF · Plant Radio
3	P.A.X. 444
4	P.A.X. 445
5	P.A.X. 448
6	P.A.X. 555
7	P.A.X. 556
8	P.A.X. 557
9	P.A.X. 558
10	P.A.X. 559
11	Tower No. 1 Left Position
12	Tower No. 2 Right Position
13	P.M.C. Position "K"
14	P.M.C. Position "AJ"
15	534 9511 (Pax 351)
16	534 9512 (Pax 350)
17	P.A. Announcements (All Zones)
18	Car to Wayside (zone 1) Islington to Ossington
19	Car to Wayside (zone 2) Ossington to Broadview
20	Car to Wayside (zone 3) Broadview to Warden
21	Car to Wayside (zone 4) St. George to Bloor
22	Car to Wayside (zone 5) Bloor to Lawrence
23	Car to Wayside (zone 6) Lawrence to Finch
24	Car to Wayside (zone 7) St. George to Lawrence
25	Car to Wayside (zone 8) Lawrence West to Wilson
26	534 5223
27	534 8032
28	Controller's Console · A
29	Dispatcher's Console · B
30	Dispatcher's Console · C
31	Dispatcher's Console · D
32	Dispatcher's Console · E
33	Dispatcher's Console · F
34	Dispatcher's Console · G
35	Fire Department
36	Police Department
37	TTC Security 503
38	Department of Ambulance Services
39	Bell Telephone 534 8221
40	Bell Telephone 534 8222

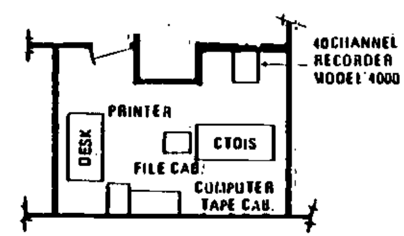
MODEL 5000 CHANNEL ALLOMENT

Channel No.	Assignment
1	Radio – Channel 1
2	Radio – Channel 2
3	Radio – Channel 3
4	Radio – Channel 4
5	Radio – Channel 5
6	Dispatch Console "H"
7	Dispatch Console "I"
8	Dispatch Console "J"
9	Dispatch Console "K"
10	B/D Conference
11	YUS Conference



APPROX. LOCATION OF TERMINAL BOX No. 1 (LOCATED IN SUPERVISORY ROOM)

PARTIAL FLOOR PLAN LAYOUT



EXISTING COMPUTER ROOM LAYOUT

APPENDIX D

SAMPLE INCIDENT REPORTING FORMS

MARTA INCIDENT REPORT

RADIO DISPATCHER'S
REPORT SHEET

BUS ______________________________

ROUTE ______________________________

BLOCK ______________________________

LOCATION ______________________________

____

TIME ______________________________

TROUBLE ______________________________

____

____

____

55-0208

RAIL TRANSPORTATION DEPARTMENT
COMMAND CENTER SUPERVISOR'S REPORT

DATE ______________________ LINE ______________________

TIME OF INCIDENT ______________________ LOCATION ______________________

INITIAL DELAY ______________________ REPORTED BY ______________________

INTERVAL ______________________ TRAIN OPERATOR ______________________

CARS ____

BRIEF DESCRIPTION OF INCIDENT ____

CHRONOLOGICAL SEQUENCE OF EVENTS ____

TRAINS ABANDONED ____

REROUTES ____

COMMAND CENTER SUPERVISOR ______________________

10.98 (12/81)

metro

Washington Metropolitan Area Transit Authority

TROUBLE REPORT	☐ INJURIES ☐ FATALITY	DIVISION	DATE
		EMPLOYEE INJURED ☐ YES ☐ NO	

Route No.	Bus No.	Block No.	Employee No.	Run No.	Location	Destination	Time Stopped	Time OK

OPERATOR	SENIORITY DATE	BIRTH DATE

REPORTED BY	TO	☐ RADIO ☐ PHONE ☐ EMERGENCY	TIME	POLICE PRECINCT NO.

WHOM NOTIFIED	POLICE REPORT NO.

TIME NOTIFIED

PERPETRATORS NO. PERSONS: ☐ MALE ☐ FEMALE RACE	WEAPONS ☐ GUN ☐ KNIFE ☐ OTHER ☐ NONE

AUTHORITY LOSS	CASH VALUE	PROPERTY	PERSONAL LOSS	FUNDS	PROPERTY

REMARKS

COPIES TO: Messrs:

CENTRAL COMMUNICATIONS

LOG NUMBERED ____________ SPECIAL ☐ DETENTION ☐ CHANGE OFF ☐ OTHER ☐

DATE TIME DISP. NO. RADIO ☐ TELEPHONE ☐

BUS	BLK	GAR	OPER NO.	RUN	BREV	LOCATION	TIME	TRIPS LOST RT	TRIPS LOST NO

DESTINATION	TROUBLE	MECH	TIME

WHOM NOTIFIED

TIME

REMARKS

SERVICE TRUCK NOTIFIED NO. TIME DO-CONSOLE INITIAL EI

SUPERVISOR NOTIFIED NO. TIME

13.198 (2/82) Orig. - Dispatcher Yellow - OO Console

CHICAGO TRANSIT AUTHORITY

BUS CONTROL RECORD

CONTROL CENTER

Gar Run	Bus	Location	Dir

Time	Per M R T	Nature

Rendzys Loc	Dir	Time	Cont #

ASSIGNMENTS

Time	Cont #	10-51	10-53, 54	Trucks	PM

PD Call Time	Star	Beat	TOA	FD Call Time	Equip	TOA

Bus Order ☐ VMS ☐ Phone	Gar	Time	Cont #	922 Leave	Delay

Gar Supt	Dist Supt	Remarks	Date
			APR 4 1984

T 3147 REV. 1/79

If two CTA vehicles are involved, use this side for vehicle struck.

Run ________ Route ________________ # ________ Run ________ Route ________________ # ________

Operator ________________ Badge ________ Operator ________________ Badge ________

Address ________________ Address ________________

Details ________________________________

____

____

____

Damage ________________________________

____

Additional Notifications ________________________________

____

T 3147 REV. 1/79 Back

CRIMINAL COMPLAINT REPORT

File # ____________

Name of Employee ____________ Badge # ____________

Address ____________ Home Telephone # ____________

Garage Terminal ____________ Route ____________ # ______ Run # ______ Car/Bus # ______

Date of Occurrence ____________ Time ______ Location ____________ Direction ______

Police Officer ____________ Star No. ______ District ______ Beat ______

DEFENDANTS NAME 1. ____________ Address ____________ Age ______

DEFENDANTS NAME 2. ____________ Address ____________ Age ______

Names and Addresses of Witnesses ____________

____

CRIMINAL COMPLAINT SIGNED ____________ By Whom ____________

Description of Incident ____________

____

____

____

CROSS COMPLAINT SIGNED ____________ By Whom ____________

COURT Br. ______ Loc. ____________ Date ____________ Time ______

HOLIDAY COURT Br. ______ Loc. ____________ Date ____________ Time ______

Initial Call From ____________ Time ______

Notifications 1 ____________ Time ______ 2 ____________ Time ______

3 ____________ Time ______ 4 ____________ Time ______

5 ____________ Time ______ 6 ____________ Time ______

CONTROLLER ____________ # ______

	YES	NO		YES	NO	
Monitor Phone Used?	☐	☐	Defendant #1 Bonded	☐	☐	Police Arrival Time ______
Booth/Vehicle Alarm Equipped?	☐	☐	Defendant #2 Bonded	☐	☐	Fire Arrival Time ______
Activated?	☐	☐	Reset Time ______			Delay ______

CLAIM DEPARTMENT

Received By ____________ Time ______

Notification ____________

By ____________ Time ______

Verifications ____________

By ____________ Time ______

Attorney Notified ____________ Time ______

BUS CONTROL CRIMINAL COMPLAINT REPORT

Crime	☐ 10-83	☐ 10-84	☐ 10-86	☐ 10-88	☐ 10-90	☐ 10-91

Location

On ______________________ Signpost ______________ Direction

Street

Between ______________ & ______________

Mon	Rad	Tel

Time	Cont. #	Garage & Run	Vehicle	Badge	Interrogation by Monitor Signpost & Time	Signpost & Time

PD Call Time	PD #	Star	Beat	Arrival	Cancel	Security	FD Call Time	Equip. #	Arrival	Cancel

Time	Cont. #	Sent	Told

Interception By	Time	Location	G/F	G/S	D/S

Description of Incident	Date
	SOC

RAIL CONTROL CRIMINAL COMPLAINT REPORT

Time	Per	Route	Location	Direction	Nature

Run	Terminal	Time	Spread	Delay	Cars 1	2	3	4	5	6	7	8

Fr. T S PL	To	+	Fr. T S PL	To	P.D. Time	Star	Beat	To A	F.D. Time	Veh.	To A

Run	Term.	Time	Delay	Fr. T S PL	To	Run	Term.	Time	Delay	Fr. T S PL	To

Security	Mass Tran.	Description of Incident

Personnel Sent & Time	Personnel Told & Time		
Ann. Time	10.77's Time	Date	
Ann. Loc.	Response	SOC	Cont. #

Form P [illegible] Feb 8? (67U)
Toronto Transit Commission
Transportation Department

Transit Control Centre — Daily Report

__________ DAY __________ 19 ____ PAGE NO 1

TIME OF ORIGINAL CALL DESP. INITIALS	REPORTED BY	RECORDED BY	TIME OF OCCURRENCE	LOCATION OF OCCURRENCE	MESSAGE	PERSONNEL ADVISED
					POWER CUTS	
					REQUESTED BY / LOCATION & DIRECTION / DURATION	

TORONTO TRANSIT COMMISION
TRANSPORTATION DEPARTMENT
TRANSIT CONTROL CENTRE--SUMMARY OF SUBWAY SERVICE

DATE ______________________________

Sat/Sun/Holiday

Time Period	Make Up of Service		Cancellationa		Delays					
					Number			Length		
			Run	Reason	B/D	Y/U/S	Total	B/D	Y/U/S	Total
.00am to 2.00pm	Bloor/Danforth	Trains				-	-		-	
	Yonge/Uni/Spd.	Trains			-		-	-		
	Total	Trains								Min
2.00pm to 10.00pm	Bloor/Danforth	Trains				-	-		-	
	Yonge/Uni/Spd.	Trains			-		-	-		
	Total	Trains								Min
10.00pm to 2.00am	Bloor/Danforth	Trains				-	-		-	
	Yonge/Uni/Spd.	Trains			-		-	-		
	Total	Trains								Min
Total Service	Total-Bloor/Danforth					-	-		-	
	Total-Yonge/Uni/Spd				-		-	-		
	Grand Total									Min

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TORONTO TRANSIT COMMISSION

TRANSPORTATION DEPARTMENT

DATE ______________________

TRANSIT CONTROL CENTRE....DAILY REPORT....SURFACE

TIME		
2.00am to 6.00am	TRANSIT CONTROL WEATHER SUMMARY WEATHER TEMPERATURE degrees Fahrenheit BAROMETER RAIL ROADWAY	TRANSIT CONTROL SERVICE SUMMARY 6.00am-10.00am Cancellations Extras BUSES T/COACHES S/CARS TOTALS
6.00am to 10.00am	TRANSIT CONTROL WEATHER SUMMARY WEATHER TEMPERATURE degrees Fahrenheit BAROMETER RAIL ROADWAY	
10.00am to 2.00pm	TRANSIT CONTROL WEATHER SUMMARY WEATHER TEMPERATURE degrees Fahrenheit BAROMETER RAIL ROADWAY	TRANSIT CONTROL SERVICE SUMMARY 2.00pm-6.00pm Cancellations Extras BUSES T/COACHES S/CARS TOTALS
2.00pm to 6.00pm	TRANSIT CONTROL WEATHER SUMMARY WEATHER TEMPERATURE degrees Fahrenheit BAROMETER RAIL ROADWAY	
6.00pm to 2.00am	TRANSIT CONTROL WEATHER SUMMARY WEATHER TEMPERATURE degrees Fahrenheit BAROMETER RAIL ROADWAY	COMMENTS:

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