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U.S. Department
of Transportation

**Urban Mass
Transportation
Administration**

Rail Transit System Maintenance Practices for Automatic Fare Collection Equipment

Transportation Systems Center
Cambridge MA 02142

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UMTA Technical Assistance Program

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of Transportation

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Rail Transit System Maintenance Practices for Automatic Fare Collection Equipment

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Office of Systems Assessment
Cambridge MA 02142

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Washington DC 20590

PREFACE

A review of rail transit system maintenance practices for automatic fare collection (AFC) equipment was performed. This study supports an UMTA sponsored program to improve the reliability of AFC equipment. The maintenance practices of the transit systems are generally similar, however, several exceptions were found which have potential for improving AFC equipment reliability if more widely adopted. Those practices worthy of consideration include: dedicated crews for performing preventive maintenance, automated scheduling and monitoring of preventive maintenance actions, incentives for additional training of maintenance technicians, and automated systems for management and analysis of information on maintenance problems and actions. Results of the study suggest that the many advantages of AFC equipment, particularly those capable of performing complex functions, are achieved at the expense of more intensive maintenance requirements. Further analyses may support development of more effective maintenance programs by determining if relationships can be established between specific maintenance practices and the reliability of AFC equipment on different transit systems.

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1. INTRODUCTION

This report describes the maintenance practices of rail transit systems for automatic fare collection (AFC) equipment. The report was prepared in support of an UMTA sponsored project to improve the reliability and effectiveness of AFC equipment at rail transit systems.

Automatic fare collection equipment has the potential for reducing labor costs and fraud, providing flexible and equitable fares, increasing patron mobility, documenting origin/destination patterns, and producing demand and revenue statistics. These benefits of AFC equipment are not being achieved without certain costs, however. A problem generally encountered with AFC equipment, particularly those with more complex functions, has been low reliability with resulting intensive maintenance requirements. The quality of maintenance provided by transit systems in response to this need may, in turn, influence AFC equipment reliability. By documenting their individual maintenance practices, this report will allow rail transit systems to share this information in an effort to promote improved AFC equipment reliability.

Information for this report was obtained from sources listed in the reference section and from telephone conversations and correspondence with rail transit systems using AFC equipment. A total of 14 systems are currently participating with UMTA in evaluating AFC equipment performance; however, these systems are not uniformly treated in this report. More information was obtained from some systems than others. If the information in this report proves useful to rail transit systems, it can form the basis for a more comprehensive analysis of maintenance practices.

2. DESCRIPTION OF AFC EQUIPMENT BY TRANSIT SYSTEM

The different types of fare collection equipment operated by the various agencies is summarized in Table 2-1. The total number of fare collection units of all types per agency range from 2846 for NYCTA to 14 for LIRR. All of the transit systems (RTA excluded) employ at least gates or turnstiles. The number of daily passengers per gate/turnstile shows considerably less variation from one system to another than the absolute number of units as shown in Table 2-2. However, the variation in this statistic still ranges from a low of 349 for ICG to a high of 2471 for CTA. This variation can partly be explained by the relative complexity of the AFC equipment used by the different agencies. Those agencies with the greatest number of passengers per gate/turnstile (CTA, SEPTA, NYCTA) have simple turnstile systems that perform only one function as shown in Table 2-3. Agencies in the next highest group (PATH, MBTA) have only turnstiles but they perform several functions. Those agencies with the fewest passengers per gate/turnstile (WMATA, MARTA, PATCO, BART and ICG) all have either multiple types of AFC equipment and or multiple functions involving magnetic fare cards performed by the gates/turnstiles. As demonstrated in Section 3.2, there is some evidence to suggest that those agencies with greater AFC equipment complexity require a larger AFC maintenance staff per passenger.

TABLE 2-1. SUMMARY OF AFC EQUIPMENT BY TRANSIT SYSTEM

TRANSIT SYSTEMS	TYPES OF AFC EQUIPMENT								TOTAL AFC UNITS
	GATES	TURNSTILE	FARECARD VENDOR	ADD-FARE	CHANGE MAKER	BILL CHANGER	TRANSFER/PASS DISPENSER		
MARTA	164	-	-	-	-	-	-	-	164
MBTA	-	350	-	-	-	-	-	-	350
CTA	-	2252	-	-	-	-	-	-	225
ICG	169	-	112	-	-	-	-	-	281
RTA	-	-	-	-	-	26	-	-	26
PATH	-	190 ³	-	-	-	-	-	-	190
PATCO	85	-	72	-	42	-	17	-	216
NYCTA	-	2846	-	-	-	-	-	-	2846
LIRR	-	10	2	-	-	-	2	-	14
SEPTA	-	138	-	-	-	-	-	-	138
BART	320	-	180	110	140	-	80	-	830
WMATA	462	-	301	119	-	-	-	-	882

1 - Gates accept coins and tickets and dispense transfers.
 2 - Transfer dispenser incorporated into turnstile.
 3 - Bill changer tied to turnstile.

TABLE 2-2. GATE-TURNSTILE USE RATES BY TRANSIT SYSTEM

Transit System	Route Miles	Stations	Daily Passenger (1000's)	Total Gates/Turnstiles	Daily Passengers Per Gate/Turnstile
CTA	89	142	556	225	2471
ICG	41	49	59	169	349
MBTA	74	72	250	350	714
NYCTA	230	458	3320	2846	1167
PATH	14	12	170	190	895
PATCO	15	13	42	85	494
SEPTA	29	55	280	138	2028
BART	71	34	143	320	447
WMATA		43	290	462	627
MARTA	14	14	68	128	531

TABLE 2-3. GATE/TURNSTILE FUNCTIONS BY TRANSIT SYSTEM

GATE/ TURNSTILE FUNCTION	BART	MARTA	WMATA	PATCO	PATH	MBTA	NYCTA	SEPTA	CTA	LIRR	MDCTA	MTA	ICG	RTA
Graduated Fare	*			*										
Stored Value	*			*										
Magnetic Fare card	*			*				*					*	
Bill Verifier				*										
Bill Changer				*										
Transfer Dispenser				*						*	*	*	*	
Ticket Transport				*										*
Coin/Token Acceptor				*			*	*	*	*	*	*	*	*
Pass Reader				*										
Change Dispenser				*						*	*	*	*	*

3. MAINTENANCE PRACTICES FOR AFC EQUIPMENT

3.1 MAINTENANCE ORGANIZATION

Organizational charts for transit systems with organizational units responsible for maintaining AFC equipment are exhibited in Appendix A. The charts are simplified from those originally obtained from the properties to highlight those organizational elements involved in maintenance of AFC equipment. All transit systems have units fully dedicated to performing maintenance of AFC equipment in station areas. Shop repair of AFC equipment is sometimes performed by a general shop support group which has responsibility for repair of other equipment in addition to AFC equipment (PATCO, BART).

3.2 STAFFING AND ASSIGNMENT OF MAINTENANCE FUNCTIONS

Table 3-1 shows the number of employees directly associated with performing or supervising AFC equipment maintenance functions on various transit systems. All the transit systems have maintenance technicians fully dedicated to repair of AFC equipment. On some transit systems the maintenance technicians split their time between field repairs and shop repairs (ICG, MARTA, PATH). Taking into consideration the amount of time spent in shops by their line technicians, the number of AFC units (gates, fare card vendors, add fares, etc.) per line technician ranges from an approximate high of 39 to a low of 13. These numbers cannot be directly compared, since machine complexity, level of use, and equipment age have not been taken into consideration.

Normalizing these results by passenger volumes (Ref. 1) shows that the number of daily passengers per line maintenance technician (adjusted for shop time) is remarkably similar for MARTA, BART, WMATA, PATCO and ICG at 6800, 5958, 5714, 4333 and 4214, respectively. These properties each have at least 2 different

Table 3-1. STAFFING OF AFC MAINTENANCE

Transit System	Number of Line Maintenance Technicians	Number of Shop Repair Technicians	Number of Supervisory Personnel	Other Maintenance Personnel
ICG	18-Line Repairs/Shop	4	5-Senior Technicians	
BART	24	20 6-Assemblers	3-Line Foreman 2-Shop Foreman	
WMATA	8-Preventive Maint.(PM) 8-PM/Line Repairs 33-Line Repairs	6	6-Shift Supervisors 1-Line Supervisor	3-Dispatchers 2-Logistics 1-Locksmith 2-Engineers 4-Line runners (contract)
MARTA	13-Line Repairs/Shop	Covered by line technicians.	1-AFC Foreman	
PATCO	8-Technicians 1-Repairman		1-Equip. Foreman	
PATH	7-Line Repairs/Shop	1-Full time technician. Also covered by line technicians.		
CTA				

types of AFC equipment which perform a number of functions. PATH has a significantly larger number of daily passengers per line maintenance technician at 28600. The greater maintenance productivity at PATH may be attributable to the property having essentially only one type of AFC equipment (see Table 2-1) which performs relatively few functions (see Tables 2-1, 2-2, and 2-3).

All properties have provisions for supervision of maintenance technicians. In some cases, the first level of supervision is a senior technician or working foreman.

The shop staffs responsible for repair of AFC equipment on some properties are supplemented with maintenance technicians that split their time between stations and shops during off peak hours. On other properties (BART, PATCO) the shop staffs perform repair on other electronic and communication equipment in addition to AFC equipment.

The assignment of AFC maintenance personnel on properties is summarized in Table 3-2. All the properties have at least 2 maintenance shifts which span at least 12 hours of operation (most properties provide maintenance coverage from about 6 am to 10 pm). Technicians are assigned to cover a transit line or group of stations. This arrangement is permanent in BART's case. These technicians are also frequently assigned to specific high density stations during peak hours, especially if the stations are otherwise unattended, to provide quick response to maintenance needs (ICG, MARTA, PATH, CTA).

3.3 MAINTENANCE PROCESS

The usual processes for initiating maintenance actions on properties is summarized in Table 3-3. If a property normally has attendants on duty at their stations, the attendants are the primary means by which AFC maintenance needs are made known (BART, WMATA, CTA). If the stations are typically unattended, passengers

Table 3-2. ASSIGNMENT OF MAINTENANCE TECHNICIANS

Transit System	Shift Size	Shift Schedule	Shift Assignment
ICG		<p>1 shift: 6:00am-2:30pm 1 shift: 8:00am-4:30pm 1 shift: 10:00am-6:30pm</p>	<p>Technicians assigned to cover one of 4 areas. Also perform shop repairs in one of 3 satellite shops. Randolph & Van Buren Stations - peak hours.</p>
BART		<p>2 10-hour shifts/day (four-day work week)</p>	<p>Technicians permanently assigned to one of 4 lines</p>
WMATA	8 techs/shift	<p>2 shifts: 6:30am-3:00pm 2 shifts: 2:00pm-10:00pm</p>	<p>Each technician assigned to cover about 4 stations.</p>
MARTA	<p>5 techs/shift (weekdays) 3 techs/shift (Saturday) 1 tech/AM shift Sunday 4 techs/PM shift Sunday</p>	<p>2 10-hour shifts/day</p>	<p>High density stations - peak hours Line maint (3 techs) - off peak hours Shop maint (2 techs) - off peak hours</p>
PATCO		<p>1 shift: 6:30am-2:30pm 1 shift: 2:30pm-11:00pm 1 shift: 10:00am-6:30pm(Sun.)</p>	<p>Assigned to New Jersey & Philadelphia sections.</p>
PATH	7 techs/shift		<p>High density stations - peak hours. Split between line maint & shop repairs - off peak hours.</p>
CTA			<p>High density stations - peak hours.</p>

Table 3-3. MAINTENANCE PROCESS

Transit System	Process for Initiating Maintenance Actions
ICG	<ol style="list-style-type: none"> 1. Central control monitors equipment by CCTV and remote monitoring devices and initiates maintenance requests. 2. Passengers call in problems on PAL* phones.
BART	<ol style="list-style-type: none"> 1. Attendant updates computer status of equipment and initiates maintenance requests.
WMATA	<ol style="list-style-type: none"> 1. Attendant monitors equipment and submits maintenance request to central control. 2. Central control dispatches technician and maintains records.
MARTA	<ol style="list-style-type: none"> 1. Initiated by passengers using passenger aid phones. 2. Stations also monitored by CCTV at 3 zone centers. Maintenance requests made from centers. 3. Employees may initiate maintenance requests.
PATCO	<ol style="list-style-type: none"> 1. Initiated by passengers using passenger aid phones.
PATH	<ol style="list-style-type: none"> 1. Initiated by passengers using passenger aid phones to central control. 2. Stations also monitored by CCTV. 3. Attendants call in requests if present during peak hours.
CTA	<ol style="list-style-type: none"> 1. Attendants request maintenance through their supervisors, to the CTA power supervisor, to maintenance foreman, to individual line technicians.

*Passenger Assistance Line.

frequently initiate maintenance actions by phoning in AFC equipment problems on special passenger aid phones (PATCO). These stations are also monitored by closed circuit television (MARTA, PATH) and other status devices (ICG) which assist the property in determining if AFC maintenance actions are required. Property employees (maintenance technicians, security guards, etc) may also make note of equipment problems during the course of their normal duties and initiate maintenance actions.

3.4 PERFORMANCE OF MAINTENANCE TASKS

The performance of maintenance tasks by various types of employees is summarized in Table 3-4. Minor "finger tip" maintenance requirements (soft maintenance), typically involving clearing of money/card jams, are generally performed by station attendants if the stations are staffed. PATH has a unique situation which requires both a coin box operator and a security guard to be present before AFC equipment can be opened. Because of this, attendants and maintenance technicians will initially attempt to clear jams using special probes that do not require opening the equipment. Properties which have unstaffed stations must rely on maintenance technicians to clear money jams. MARTA also permits security personnel to clear money jams.

Other maintenance actions performed on AFC equipment within the station area (hard maintenance) is universally limited to replacement of malfunctioning components/assemblies or worn parts and performing minor functions such as adjustments, lubrication and cleaning. Repair of components/assemblies and rebuilding of AFC equipment is generally performed by the properties in their shops. Most properties have shop staffs dedicated to working on AFC equipment. These staff, however, are often supplemented by line maintenance technicians (ICG, MARTA, PATH). The BART shop staff repairs all electronic equipment in addition to AFC equipment.

Table 3-4. PERFORMANCE OF MAINTENANCE TASKS

Transit System	Who performs soft/finger tip maintenance (clearing of money/card jams)?	Do line technicians perform hard repairs consisting of lubrication, adjustments and replacement of components/assemblies/worn parts?	Who performs shop repairs (repair of components/assemblies).
ICG	Line technicians	Yes	Shop technicians temporarily being supplemented by line technicians.
BART	Attendants	Yes	Shop technicians repair all BART electronic equipment including AFC equipment.
WMATA	Attendants	Yes	Shop technicians
MARTA	Line technicians & security personnel	Yes	Technicians split time between line & shop.
PATCO			Shop Technicians
PATH	Attendants & line technicians (special probes are used). Coin box operator & PATH Police required to open equipment.	Yes	1-full time shop technician 7-technicians splitting time between line & shop
CTA		Yes	

3.5 PREVENTIVE MAINTENANCE PRACTICES

All properties have programs for preventive maintenance (PM) as summarized in Table 3-5. On most properties, PM is performed by line maintenance technicians as part of their normal duties. MARTA supplements its PM efforts with overtime if necessary. WMATA is the only property with a fully dedicated crew for performing PM only. Originally two shifts were established to perform PM. One of the shifts is currently supporting regular maintenance activities.

Preventive maintenance is performed at different levels and frequencies among the properties. The properties generally have daily inspections of AFC equipment to check for proper operation. Primary PM is performed on a weekly basis at ICG. The other properties have monthly programs of PM. BART and MARTA have automated scheduling of AFC equipment for PM. ICG relies on senior technicians to ensure that PM is performed on a weekly basis. A program is underway on ICG to supplement their weekly PM with complete overhauls on their AFC equipment (6 months for bill validators and coin acceptors, 12 months for gates). All properties have prescribed procedures for PM, however, they vary in specifics. Samples of prescribed preventive maintenance procedures are exhibited in Appendix B.

Manual records of PM actions performed are kept by WMATA, BART and MARTA. ICG does not keep a log of PM actions. BART and MARTA also place their PM information in a computer automated data base for providing PM status updates on all AFC equipment for management review. BART also keeps a copy of the manually completed PM trouble ticket with the AFC equipment.

3.6 MAINTENANCE MANUALS AND TRAINING

All properties investigated have manuals or standard procedures for maintaining AFC equipment as summarized in Table 3-6. The ICG uses an

Table 3-5. PREVENTIVE MAINTENANCE PRACTICES

Transit System	Who performs PM?	How is PM Scheduled?	Are Prescribed Procedures used for PM?	How are PM Actions Documented?
ICG	Line technicians as part of normal duties.	Senior technician ensures that PM is performed weekly. Overhaul program being implemented: 6 & 12 month intervals.	Yes, developed on basis of experience.	No records of PM actions.
BART	Line technicians as part of normal duties.	Computer-based PM scheduling system	Yes	Trouble ticket for PM. Copy stays with equipment. Also entered into computer data base.
WMATA	Two shifts originally dedicated to perform only PM.	Primary PM is performed on a monthly basis.	Yes	PM card completed. Consolidated monthly reports produced.
MARTA	Line technicians as part of normal duties. Overtime used if necessary.	Primary monthly PM automatically scheduled. Daily & weekly inspections also performed.	Yes	Manual log and computer-based records
PATCO	Shop technicians and shop repairman.	No PM for ticket vendors. Gates maintained on a fixed schedule by subsystem.		
PATH	Line technicians as part of normal duties.	Monthly & quarterly PM required. Daily inspections.	Yes	
CTA	Line technicians as part of normal duties.	PM performed at technician's discretion; turnstiles are inspected periodically depending on station traffic and technician availability.	No	

Table 3-6. MAINTENANCE MANUALS AND TRAINING

Transit System	Maintenance Manuals		Training Program?	Are technicians fully cross-trained on all equipment?
	Are they used?	Developed by Transit System or manufacturer?		
ICG	No, only a training manual	Transit System	yes	Vendor & turnstile technicians interchange roles. PAL * tech.perm.assigned.
BART	yes	Developed by Transit System based on manufacturer material.	Yes, for new hires. Refresher courses being considered.	yes
WMATA	yes	Transit System modified manufacturer manuals. New manuals from manufacturer now available.	Yes, minimum level required. Additional training optional.	yes
MARTA	yes	Transit System modified Manufacturer manuals.	yes	yes
PATCO				
PATH				
CTA				

*Passenger Assistance Line.

extensive training manual for this purpose. All properties have developed their own manuals usually based on documents originally provided by the AFC equipment manufacturer. WMATA is presently obtaining a revised set of maintenance manuals from the equipment manufacturer.

All properties provide maintenance training for their employees when they are hired and when new equipment is purchased. BART is currently considering refresher courses for its maintenance technicians. WMATA has a unique program of requiring a minimum level of training for all maintenance technicians and offering additional training as an employee option if higher certification is desired. Maintenance technicians are generally cross-trained on all AFC equipment. The only exception found to this is on the ICG where technicians responsible for maintaining passenger assistance phones are permanently assigned to that equipment.

3.7 MAINTENANCE SUPPORT ACTIVITIES

Various maintenance support activities and practices of properties are summarized in Table 3-7. Documentation of maintenance actions, excluding preventive maintenance, are at least manually performed on all properties. Samples of maintenance action reports are exhibited in Appendix C. BART and MARTA also transfer their maintenance information into a computer automated data base for generation of consolidated activity reports and maintenance statistics. Samples of computer generated maintenance statistics are exhibited in Appendix D. WMATA is planning to implement an automated system for managing its maintenance information.

Repair parts and other items required by technicians in the field are usually transported from inventory points via the rail transit line. The ICG uses highway vehicles to transport parts and equipment as well as the

TABLE 3-7. MAINTENANCE SUPPORT ACTIVITIES

Transit System	Maintenance Documentation & Periodic Maintenance Reports	Logistics	Communication With Technicians
ICG	"Trouble Tickets" completed for maintenance actions. All records are manual. No reports.	Parts transported by rail or auto from central inventory. Technicians travel by auto.	Two-way radios.
BART	"Trouble Tickets" completed for maintenance actions. Central computer based records maintained ("ODDS"). Maintenance statistics reports.	Parts transported by rail from central and satellite inventories.	Telephone (supervisors have pagers) and PA system.
WMATA	Manual records of maintenance actions maintained. Computer-based system being implemented.	Parts transported by line runners operating under contract.	Pagers and telephone.
MARTA	Report completed on each maintenance action. Central computer-based records maintained. Biweekly reports.	Parts transported by rail from central storage.	Passenger aid phones and PA system.
PATCO			
PATH	"Coin Box Repair Report" completed for field repair actions. Monthly consolidation of reports.		
CTA			

Table 3-7 MAINTENANCE SUPPORT ACTIVITIES (Continued)

Transit System	Retrofits & New Installations Performed?	Diagnostic Equipment?	Supervision?	Warranty Administration?	Engineering & Analytical staff?
ICG	Yes, when required	Ticket vendors have limited self-diagnostic aids.	5-Senior technicians	All equipment out of warranty.	Yes
BART	Supervised only.	Trouble shooting guide. Special test box for IBM gates.	4-Lead technicians 3-Foremen	Most equipment is out of warranty.	Yes
WMATA	Yes, just completed new mezzanine.	AFC equipment has self-diagnostic aids.	1-Supervisor/shift rooms between stations.	Yes, warranty manager.	Yes
MARTA	Yes, extensive retrofit currently underway.	Gates have self-diagnostic aids. Portable ticket readers & time generators.	1-AFC foreman, 1st shift. 1-General foreman, other shifts.	No	Yes
PATCO			1-Foreman		
PATH		Special probe used for clearing money jams.			
CTA					

technicians between stations. WMATA uses contract employees to serve as line runners for logistical support. BART has satellite storage of parts as well as a central inventory similar to the other transit systems.

Communication with technicians in the field is accomplished by radio (ICG), telephones and pagers (BART, WMATA), PA systems (BART, MARTA) and use of passenger aid phones (MARTA).

Among their duties, maintenance technicians are frequently used by the transit systems to retrofit AFC equipment and install new equipment (ICG, WMATA, MARTA). BART performs only supervision of contractor retrofits and installations.

Special diagnostic aids and tools are generally employed by the transit systems to assist in maintaining AFC equipment. Frequently, AFC equipment has built in self diagnostic capabilities to indicate which part of the operation cycle or subsystem has malfunctioned (ICG, WMATA, MARTA). BART also has a special test box for diagnosing problems on its IBM gates. MARTA uses portable ticket readers and time generators. Since PATH personnel can't open AFC equipment without a coin box operator and security officer present, attempts are initially made to clear jams by using special metal and plastic probes.

Each transit system provides supervision of its maintenance technicians, although the means differ. Several systems (ICG, BART) have senior or lead technicians who serve as working foreman to provide direct supervision of maintenance technicians. On BART the lead technicians are supervised, in turn, by one foreman per shift. WMATA has one line supervisor per shift (6 shifts) who roams between stations to oversee work and provide technical guidance. MARTA and PATCO have one foreman responsible for overall supervision of maintenance technicians.

Most transit systems at one time had a program of warranty administration for their AFC equipment. These programs are now generally inactive since their AFC

equipment is beyond the warranty period. WMATA is the only exception found with an active warranty program and a manager of warranty administration. The warranty period is one year for new AFC equipment on WMATA.

All the transit systems have additional staff to provide engineering and analytical support to their maintenance programs. The various support activities encountered on different transit systems include the following:

- maintainability, reliability and availability engineering.
- configuration control.
- system design and specification.
- preparation of maintenance manuals and procedures.
- design of corrective actions.
- supervision of installations and retrofits.
- selection of alternative systems/subsystems.

4. CONCLUSIONS/RECOMMENDATIONS

AFC equipment maintenance practices of the rail transit systems investigated exhibited many general similarities. Several notable exceptions were observed, however, which might prove useful in improving equipment reliability if they were more widely implemented.

While all transit systems have programs for preventive maintenance, only one had a maintenance crew fully dedicated to this function. Such a practice could enhance the quality of preventive maintenance efforts. The scheduling of preventive maintenance by several transit systems is automatically performed by computer based systems and is also monitored by an automated updating procedure. These systems may provide better assurance that required maintenance is performed.

One transit system has requirements for additional training if maintenance technicians desire higher levels of certification. Such a program provides an incentive for technicians to improve their level of expertise.

Several transit systems have automated systems for managing records of maintenance problems and subsequent maintenance actions. These systems greatly enhance the ability of transit systems to develop information and perform analyses that will lead to more effective maintenance practices.

Analysis of the maintenance practices information suggests that more complex AFC systems permit greater operational flexibility and reduce the need for station attendants. However, these systems also require more intensive maintenance programs. In addition, the passenger processing time is generally higher for the more complex AFC systems.

It is recommended that further analyses of maintenance practices be conducted and include consideration of reliability statistics for AFC equipment on the different transit systems. If relationships between certain maintenance practices and AFC equipment reliability can be established, this information would prove useful in developing more effective maintenance programs.

APPENDIX A

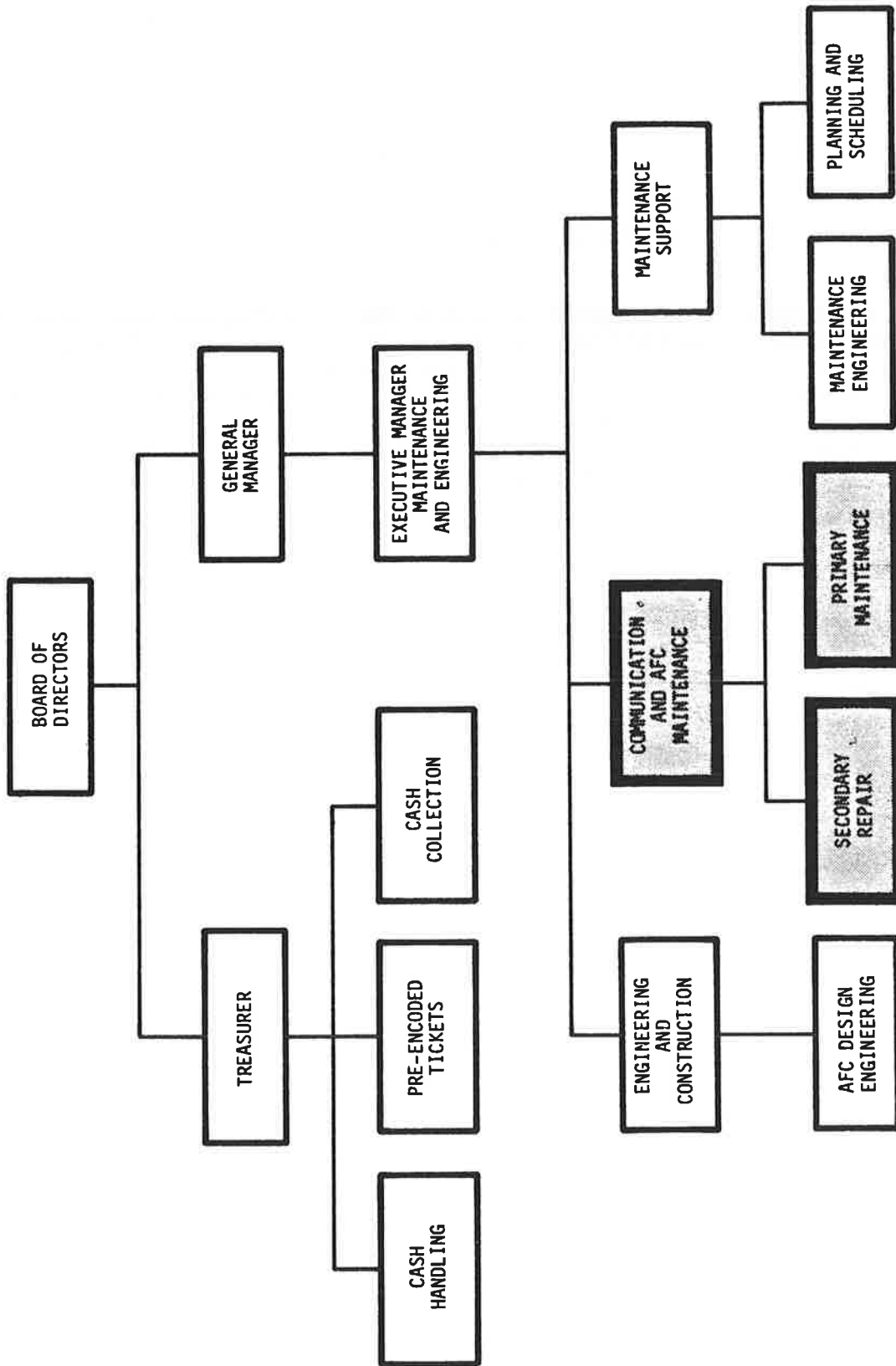
TRANSIT AGENCY

ORGANIZATIONAL CHARTS

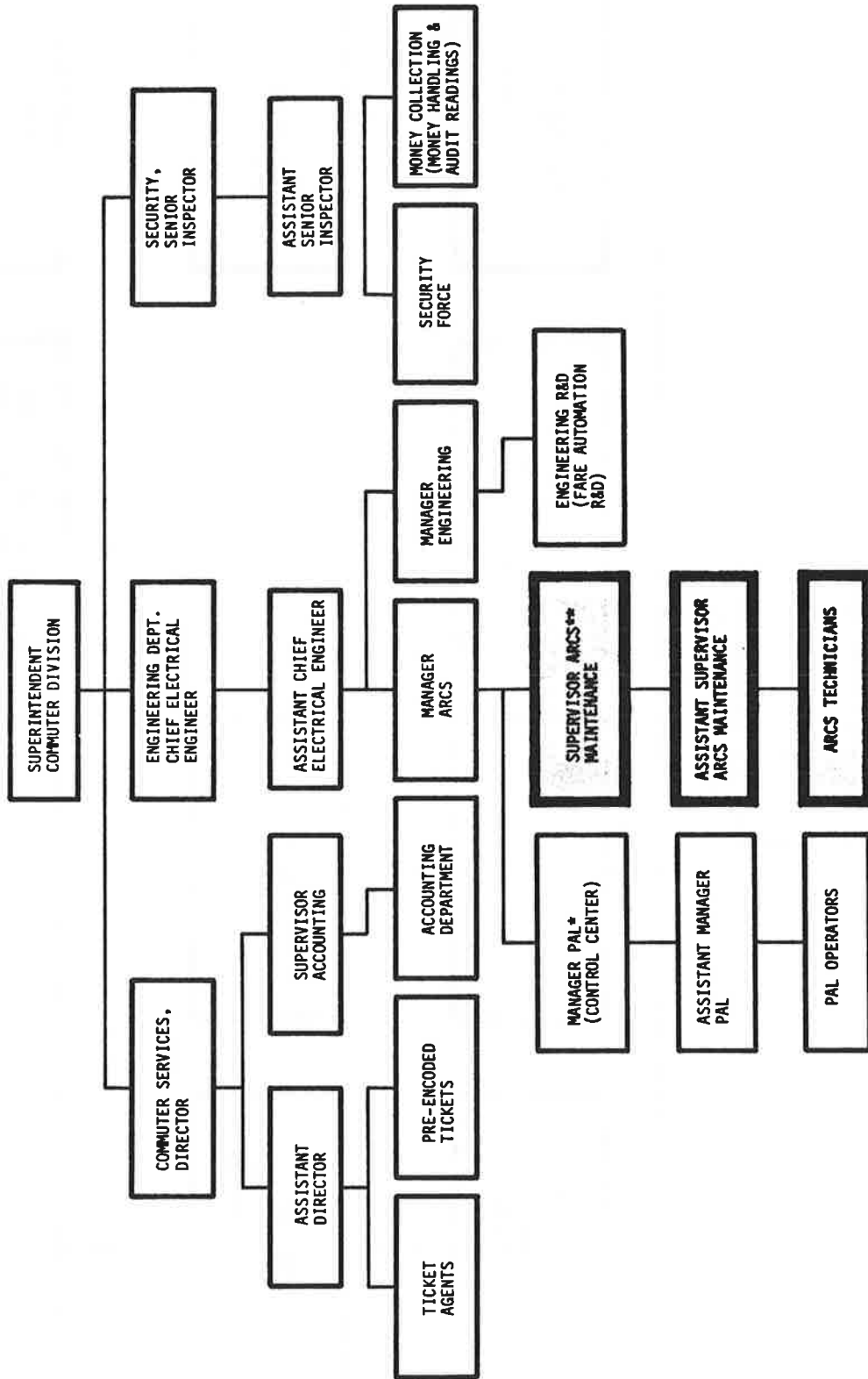
The purpose of this Appendix is to show the fare collection maintenance and revenue handling responsibilities, including staffing support and functions, within the overall organization of the rail transit systems. Although incomplete, the organizational charts at several systems (listed below) are included with the fare collection maintenance responsibilities highlighted. Further planned maintenance study efforts by the Department of Transportation will build upon this format to make the charts as complete as possible.

BART
ICG
LIRR
MARTA
MBTA
PATCO
PATH
WMATA

BART

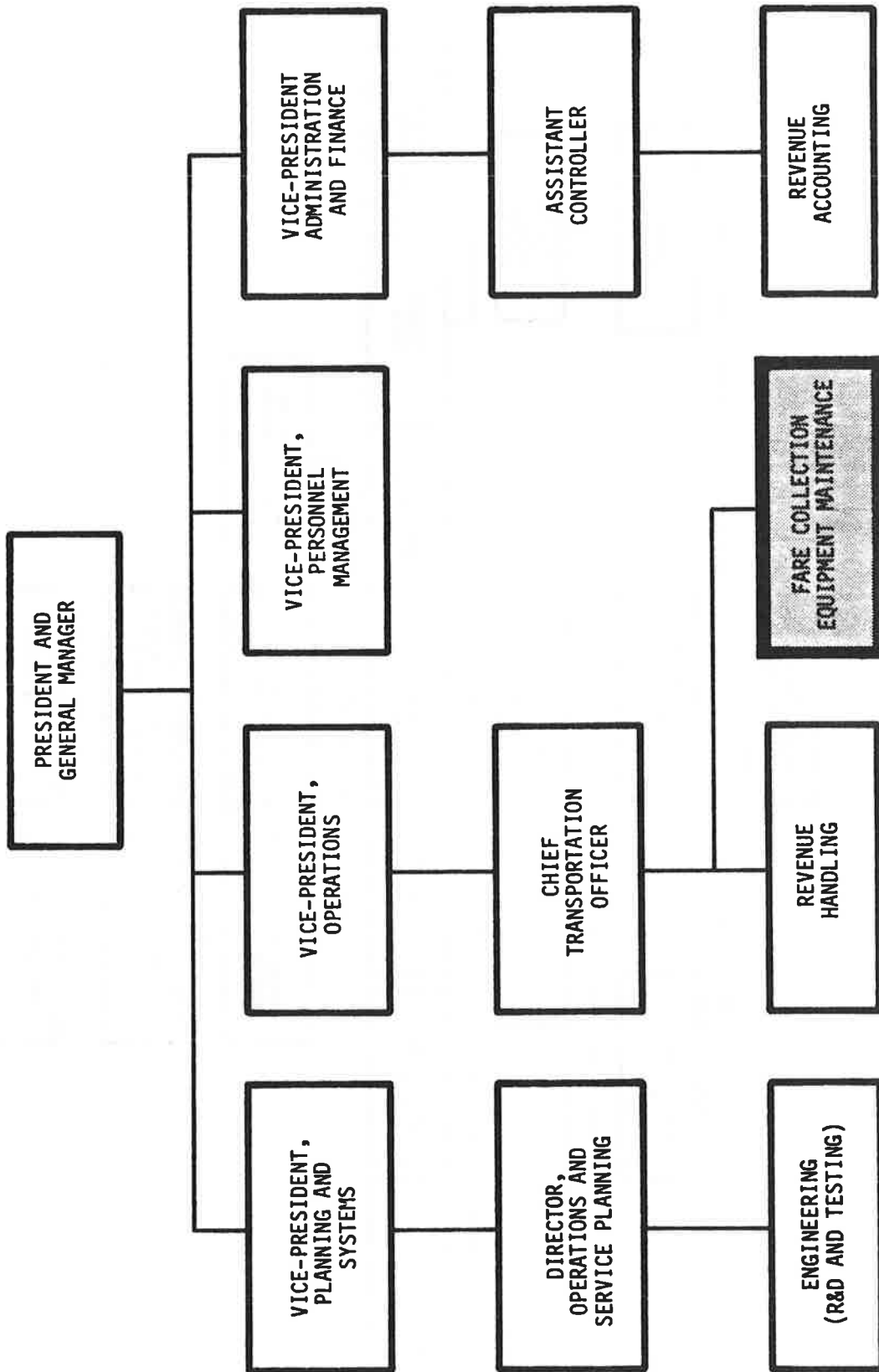


ICG

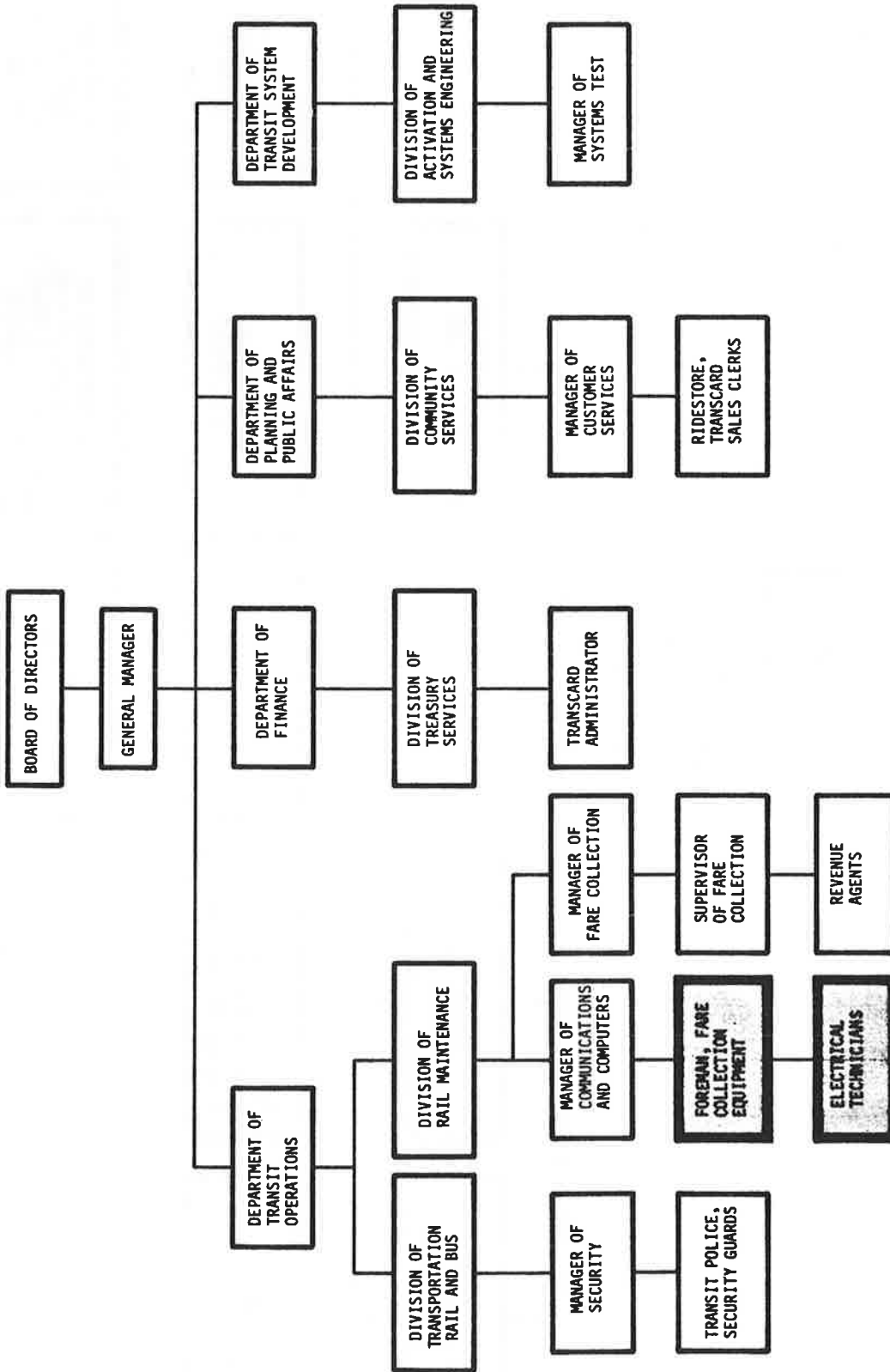


*PASSENGER ASSISTANCE LINE
 **AUTOMATIC REVENUE COLLECTION SYSTEM

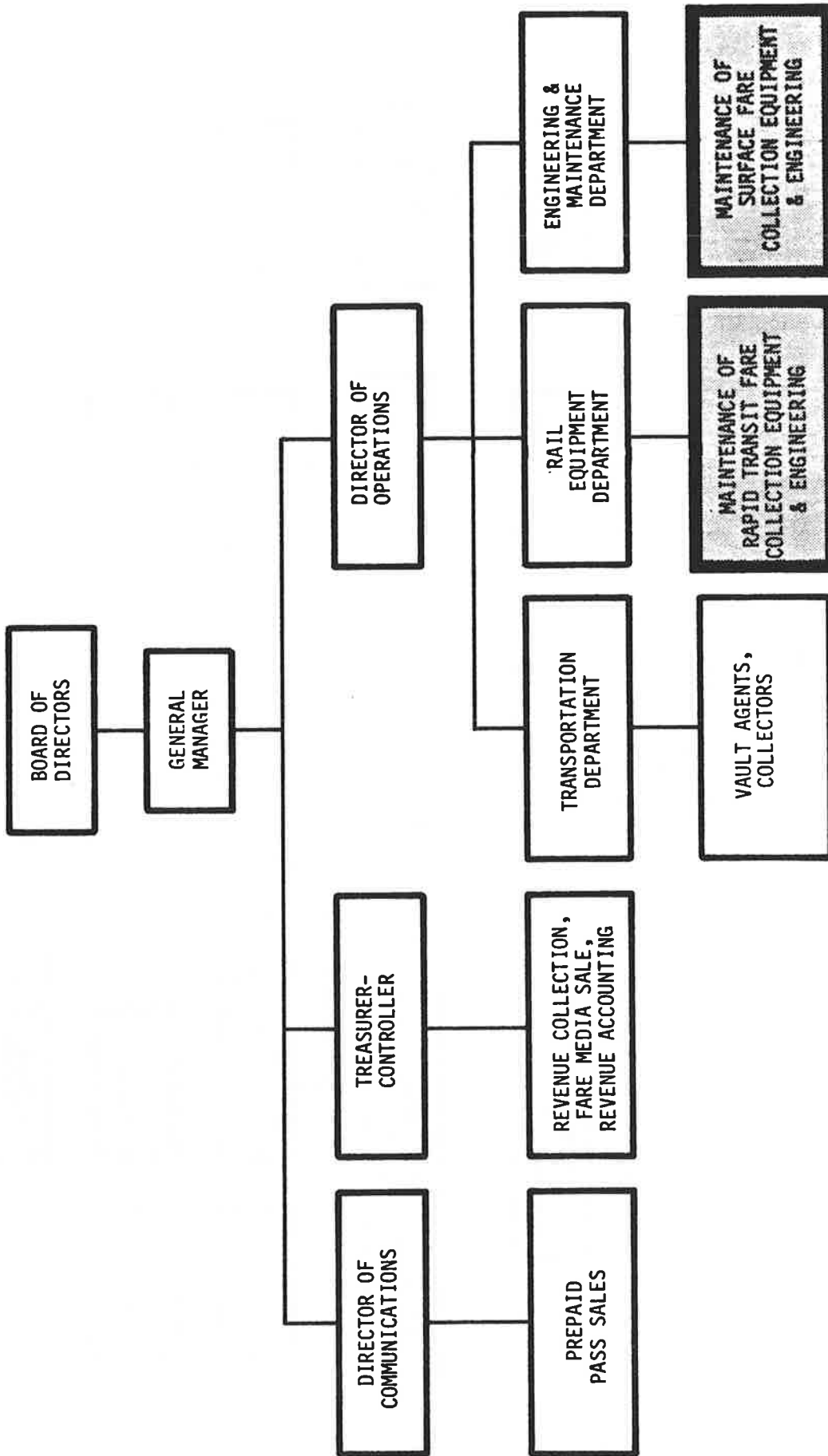
LIRR



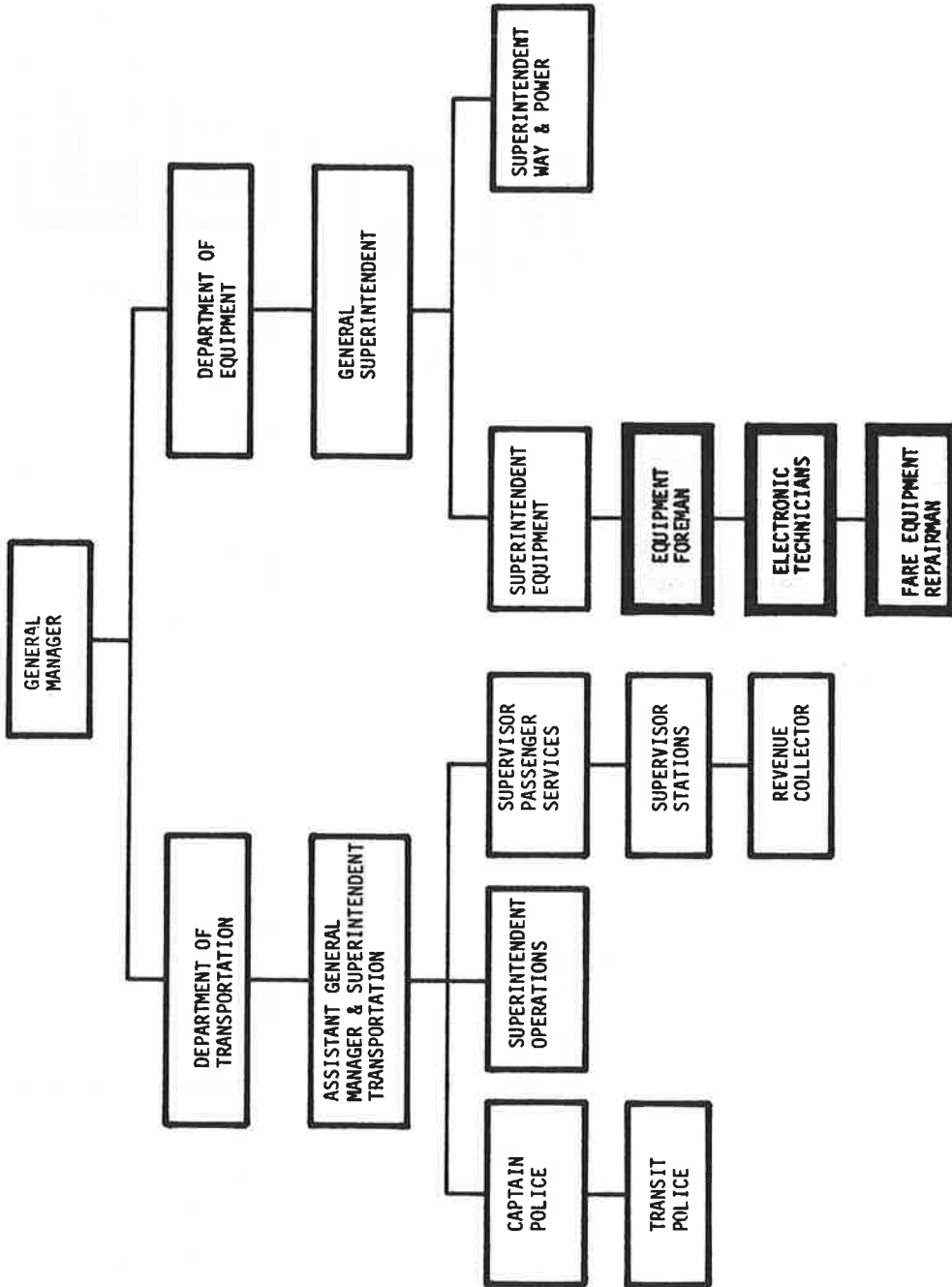
MARTA



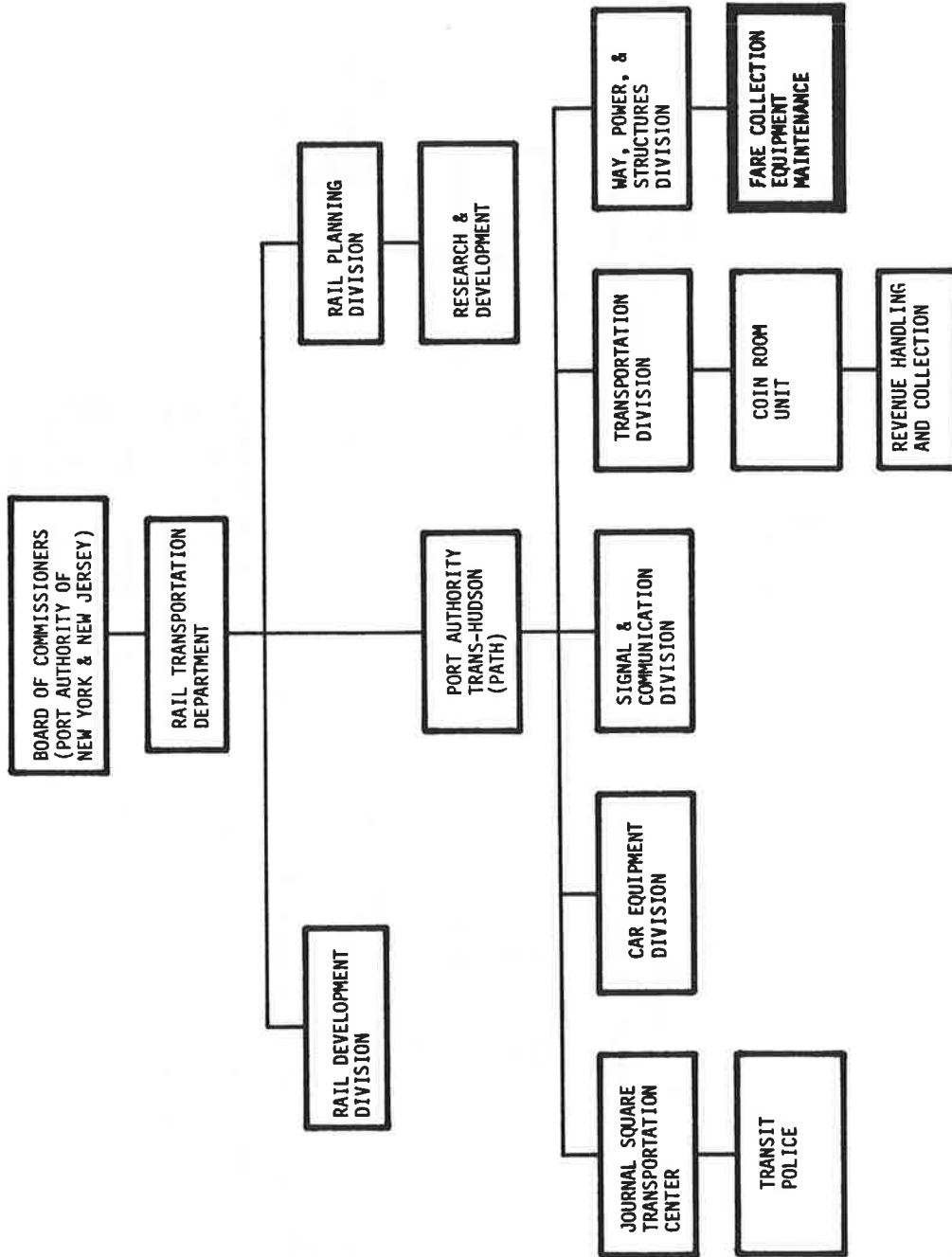
MBTA



PATCO



PATH



APPENDIX B

**SAMPLE PREVENTIVE
MAINTENANCE PROCEDURES**

**MARTA GATES - PM PROCEDURES
IGG GATE WEEKLY MAINTENANCE
ICG VENDOR WEEKLY MAINTENANCE
BART ADDFARE LUBRICATION SCHEDULE**

MARTA GATES - PM PROCEDURES RECOMMENDED BY
MANUFACTURER

Location	Frequency	Item	Action
Gate array	Each shift	External appearance	<p>Visually check for surface damage and cleanliness of each cabinet.</p> <p>Ensure that all latent display covers are clean and undamaged and that when lighted, information is legible.</p> <p>Verify that gates in use are properly lighted ENTER or EXIT, and gates not in use are lighted CLOSED.</p>
	Each day	Coin acceptance	<p>(1) Insert a coin and actuate PUSH FOR TRANSFER.</p> <p>(2) Insert a token and actuate PUSH FOR TRANSFER.</p> <p>(3) Check transfers to see that printing is centered and dark.</p>
		Turnstile	<p>(1) Verify that the turnstile rotates in both directions and that damper functions properly. (Adjust damper only when necessary.)</p> <p>(2) Verify that turnstile head bolts and arms are tight.</p>
		Displays	<p>Verify that all LED indicators and latent displays light during lamp test.</p>

MARTA GATES - PM PROCEDURES RECOMMENDED BY
MANUFACTURER (Continued)

Location	Frequency	Item	Action
Gate array (cont)	Each time cabinet is opened	Access doors and panels Interior area of gate cabinet Cabinet locks	Check door and panel move- ment for binding and align- ment. Check for chafing or binding of electrical wiring. Correct any sharp edge contacts with lines. Check for evidence of overheating. Check all locks to ensure proper operation and security.
Handicap gate	Each day Every 30 days	Alarm Barrier	Verify that the handicap gate alarm circuit is functioning by exiting the gate in the correct direction to check that the alarm does not sound and then by attempting to gain illegal entry to check that the alarm does sound. (1) Check barrier for proper closing and latching. (2) Check mounting hard- ware for tightness.
Ticket transport	Each day	Magnetic heads Pinch rollers LED lenses and phototransistors	Check magnetic heads for cleanliness. Check drive and pressure rollers for signs of exces- sive wear. Check for cleanliness.

MARTA GATES - PM PROCEDURES RECOMMENDED BY
MANUFACTURER (Continued)

Location	Frequency	Item	Action
Ticket transport (cont)	Each day (cont)	Transport belts	Check transport belts for excessive wear and cleanliness.
Coin acceptor	Each day	Housing	Verify that the acceptor housing is correctly mounted.
		Coin return	Check coin-return mechanism for correct adjustment and operation.
		Coin vault	Check to see if the vault is approaching capacity. (View through coin channel.)
	Every 30 days	LED lenses and phototransistors	Verify that all LED and phototransistor lenses are in place.
		Housing door	Verify that the door of the acceptor housing closes freely and completely triggering both micro-switches.
Transfer dispenser	Each day	Printer	Check for acceptable print quality.
		Paper roll	Check supply of stock remaining on the roll.
	Every 30 days	Assembly	Check all bolts for tightness. (Do not overlook allen screws on timing shaft.)

ICG
GATE WEEKLY MAINTENANCE

1. Check clock and calendar.
2. Clean handler transport belt and all rollers.
3. Check all PAL functions
 - A. Entry credit
 - B. Exit credit
 - C. Gate release
 - D. Error inhibit
 - E. Gate interim
 - F. Out of service indication from each handler.
 - G. Entry-Exit credit when gate is out of service.
4. Check for proper operation of all gates.
 - A. Anti shutdown
 - B. Anit pass back
 - C. Run 2 paper and plastic tickets with 69 rides down in each handler.
 - D. Check expiration date with tickets encoded for minimum and maximum date.
 - E. Check station code with tickets encoded good in other than the zone the gates are located.
 - F. Check with a zero ride ticket with a time other than the four hours which is good.
 - G. Check error inhibit for station code error and 3 hour entry-exit.
5. Handler
 - A. Check handlers for proper operation.
 - B. Check for noisy handlers - replace and rebuild when found.
 - C. Clean belts, rollers, sensors and magnetic heads.
 - D. Check idler rollers for flat spots.
 - E. Check to make sure that the allen screws on the belt driver roller is tight, to avoid slippage of belt and possible short tracks.
 - F. Check return and capture roller set screws, make sure they are tight.
 - G. Check for proper travel of ticket through handler and gate top cover.
 - H. Observe and make sure there are no loose screws on handlers, especially the handler latch screws.
6. Check turnstile and adjust if necessary, for proper operation of the damper, latching and credit subtracting mechanisms.

OVERALL

1. Clean gates.
2. Remove tickets from captures.

ICG
VENDOR WEEKLY MAINTENANCE

1. Clean handler and all ticket transport rollers.
2. Check handler belts and print ribbon.
3. Check all zone push buttons, observe pay this amount display for proper fare. Select a ticket for one dollar or more and use one dime, half dollar, quarter and one nickel. Observe pay this amount display for proper subtraction. Check all zone push buttons, lights and other bulbs and replace burned out bulbs.
4. Test dispense two tickets (Check one for)
 1. Expiration date
 2. Number of rides (one-way, round-trip or weekly) and (ticket type)
 3. Length of clock track (2.6") and for skew
 4. Printer (proper date and clarity) and (handler number)
 5. Encoding should start about .4" from leading edge
 6. Return the other ticket to Supervisor's office
5. Bill Validator
 - A. Accepting ones and fives (proper credit)
6. Coin Acceptor
 - A. Accepting nickels, dimes, quarters and halves (proper credit)
7. Check the following items
 - A. Card 13 for proper expiration date and clock setting
 - B. Ticket stacker for refilling of tickets
 - C. Check capture bin for captured tickets
 - D. Check the last day of the month for proper setting
 - E. When OSS should reject all coins and bill validator should not start
 - F. Coin hoppers for change
 - G. Check batt with meter should read 4.2 V.D.C., replace if necessary
8. When the logic switch is turned off and on, the trip and audit counters should be checked to make sure they don't advance. Also, check for proper expiration date and printer date.
9. Clean exterior/interior when temperature is above freezing.

BAY AREA RAPID TRANSIT DISTRICT AUTOMATIC FARE COLLECTION PREVENTIVE MAINTENANCE AND INSPECTION MANUAL

BOOK NO. 45 ENGINEERING APPROVAL Al Qida

PROCEDURE
AF-3

1 PAGE
OF 4

DATE ISSUED
10/12/81

REVISION DATE

ORIGINATOR
J. Whitely

IBM ADDFARE LUBRICATION SCHEDULE

I. PURPOSE

Lubrication is applied to various moving parts to reduce friction or prevent rust.

II. MATERIALS REQUIRED

- A. Lubricant IBM #12, Stock #91-50-51904
- B. Lubricant IBM #23, Stock #91-50-51908
- C. Lubricant, WD 40, Stock #91-50-51810
- D. Texpad Texwipe, Stock #79-20-60005

III. GENERAL

- A. Do not apply lubricant to any surface unless specifically called out in the procedure.
- B. Clean lubricant from hands prior to working on adjustment procedure.
- C. Should a lubricant be smudged onto an unwanted clean surface, remove with a texwipe alcohol pad.
- D. Remove any excess lubrication.
- E. Any lubricant that appears dried out or hard, should be removed prior to the addition of new lubricant.
- F. Use IBM manuals for parts and assembly reference.

IV. SAFETY

- A. Turn power off to prevent the starting of moving machinery while lubricant is being applied.

BOOK NO 45	PREVENTIVE MAINTENANCE AND INSPECTION	PROCEDURE NO. AF-3
DATE ISSUED: 10/12/81		APPROVAL <i>acs</i>
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V. PROCEDURE

- A. Transport (See Figures 1 thru 6)
 1. Inject and Drive pressure roll two-leaf spring and pin contact points
 2. Inject and Drive pressure roll two-pivot points.
 3. Main drive belt idler spring and pivot points.
 4. Read, write, and verify casting pivot points.
 5. Magnetic selected pressure roll leaf spring and pin contacts.
 6. Magnetic selected pressure roll retainer spring contact with shaft end
 7. Lockout gate return extension spring.
 8. THM slides.
 9. Magnetic selected pressure roll detent pin and armature contact.
(See Figure 7).
- B. Coin Acceptor (See Figures 1 thru 6)
 1. Transfer cradle pins and bushings.
- C. Escrow (See Figures 1 thru 6)
 1. Escrow Cup Shaft.
- D. Pushbutton Assembly (See Figures 1 thru 6)
 1. Shafts behind the pushbuttons where they pass through the sheet metal pushbutton housing.
 2. Bent coin release assembly at all points where metal surfaces slide or rotate against each other.
- E. Door Assembly (See Figures 1 thru 6)
 1. Latch cam grooves and pins..
 2. Latch rod guides and clamps.
 3. Latch rod strike surfaces.
 4. Latch strikers - where rods engage.
 5. Slot and Top of door mounted staybrace stop.
 6. Spring plunger and stop pin on cabinet mounted staybrace.

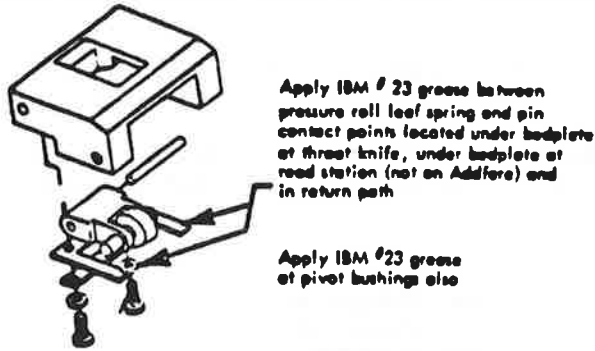


FIGURE 1 LUBRICATION-PRESSURE ROLL

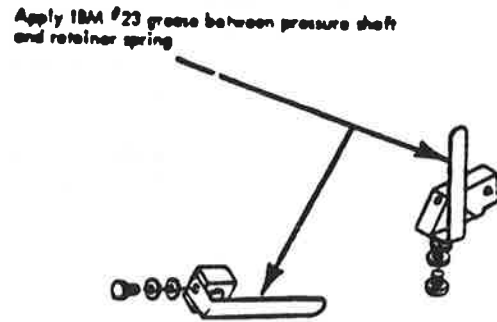


FIGURE 4 LUBRICATION-RETAINER SPRING

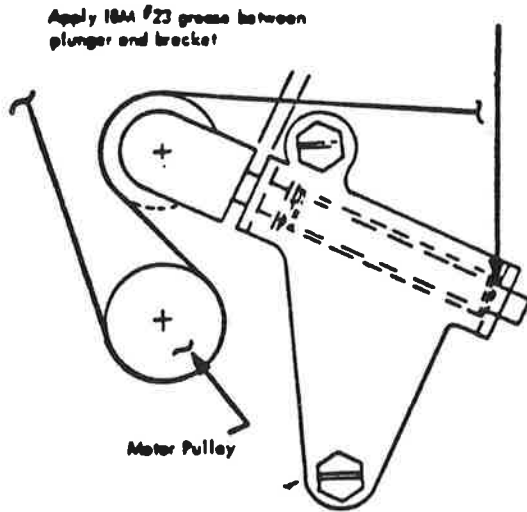


FIGURE 2 LUBRICATION IDLER ASSY.

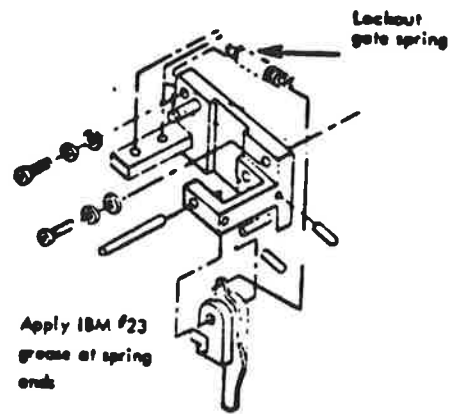


FIGURE 5 LUBRICATION-LOCKOUT GATE

Apply IBM #23 grease between pressure roll leaf spring and pin contact--two locations on machines

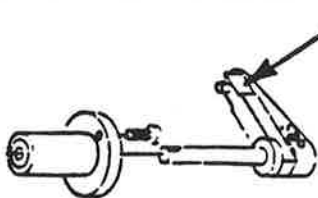
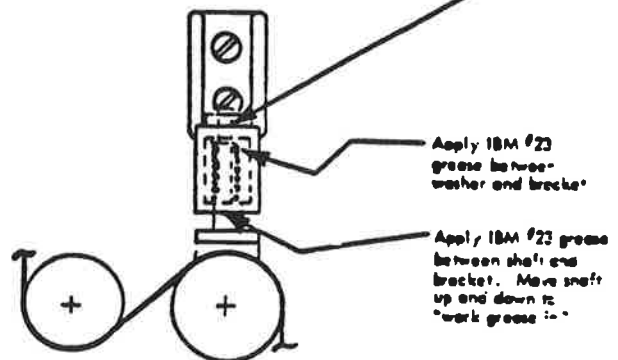


FIGURE 3 LUBRICATION-PRESSURE ROLL SPRING

Apply IBM #23 grease between shaft and bracket

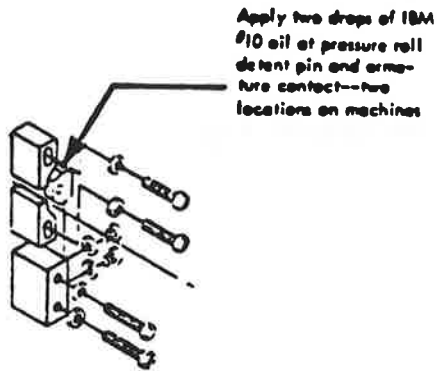


(Note: These lubrication instructions apply also to the belt tighteners (2) on the Return Path Assembly)

FIGURE 6 LUBRICATION-RETURN PATH ASSY.

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- F. Lubricate with lubriplate: Return money, bent coin release, etc., shafts for operational ease. Adjust travel of shafts if required.
- G. Lubricate with lubriplate all lock cylinders, hinges for doors, or panels, "T" handles, closing bolts and bearing surfaces. Exercise for operational smoothness.



Apply two drops of IBM
#10 oil at pressure roll
detent pin and arma-
ture contact--two
locations on machines

FIGURE 7 LUBRICATION-PRESSURE
ROLL DETENT

APPENDIX C

SAMPLE MAINTENANCE ACTION REPORTS

ICG
GATE TROUBLE SHEET

DATE	AREA			Tech.	Station	Gate #	Handler	Closed	NAR	Ticket	Jam	Throat	Sensor	Read	Sensor	Write	Sensor	Return	Cap Sensor	Cap. Flag	Turnstile	Logic	Heater	Vandalism	Other than Listed	OTHER REMARKS			
		Time	Hand. #																										

TIME	LOCATION	GATE	DISCREPANCY	TECH
	ARTS	P/m's		WD ✓
	MIDTOWN	P/m's		WD 9:30
	Dec	3	NO xfers	JJ 9:59
		4	" "	JJ -
	NAVE	P/m's		WO 10:10
1020	WE	7	COIN JAM	WO
1022	DEC	4	\$ NO →	JJ
		5	" "	JJ
	ASHBY	H/c	Jammed	WR
	WE	8	TRUSTLE TOO TIGHT	WO
	WE	4	NO xfers	WO
	5 Point	4	OOS	JJ
	Art Center	3	lock with coins	B.G.
	Civic Center	^{Noch} Handl	NO Xfers NO Xfers	JJ
	Vine	8	TAPES xfers	JJ
	SPS	40	CARD JAM	WO
1420	NAVE	20	WONT ACCEPT XCARDS	B.G.
	CC	2	WONT accept xfer	B.G.
	N AVE	4	NO xfers	B.G.
	Pichtree	8	Squirrel Guard	RG
	Ashby	4	xfer stuck in gate	RG
	Dec	5	NO xfers	B.G.
1610	CAND	5	NO Xfers	RB
1645	No AVE	22	WONT ACCEPT CARDS	RG
1645	No AVE	20	WONT Reser	RG
1645	CAND	6	NO Xfers	RB

LEASE DO NOT TEAR SIDES OFF SHEET-WE KEEP THESE PERMANENTLY IN A NOTEBOOK.
 1645 ART CIR ? Already Done RB

MARTA

AY DATE 4, 11, 83

PAGE 2

TIME	LOCATION	GATE	DISCREPANCY	TECH
-	CC	9	Problem w/ Evac Panel ^{Filled}	BG
1945	West End	4	WONT STAY ON	BG
2115	CHNI	20	TEARING CARPS	WH

PLEASE DO NOT TEAR SIDES OFF SHEET-WE KEEP THESE PERMANENTLY IN A NOTEBOOK.

STATION: _____ CONSOLE: _____ SERIAL # _____ TIME: _____ DATE: _____
 Central Control Reprinted: _____

[] Out of Service	[] Not Issuing Xfers	[] Not Accepting Tickets
[] Coin Jam	[] Wrong Date/Time Xfers	[] Not Accepting B/R's
[] Accepts Fare No Entry	[] Short Transfers	[] Not Accepting Weekly's
[] Rejecting Coins	[] Not Printing Xfers	[] Not Accepting Monthly's
[] OUT OF SERVICE	[] XFER DISPENSER PROBS	[] Replaced Broken Hub
[] Ram Error	[] Paper Jam At Bezel	[] Other Turnstile Mech.
[] Rom Error	[] Paper Jam At Blade	[] Turnstile Electrical
[] Ticket/Xfer Jam Sensor	[] Mechanical Problem	[] MASTER CLOCK PROBS
[] Transfer Power Loss	[] Electrical Problem	[] Set Clock
[] Transfer Paper Low	[] Replaced Ribbon	[] Correct Elect. Prob.
[] Money Bag 2 Full/ Write Fail	[] Correct Ribbon Reverse	[] Replaced Battery
[] Reload Variable Data	[] Set Clock	[] Check/Adjusted Charger
[] Money Bag Full	[] Correct Clock Mechanical	[] Replaced Master Clock
[] Replaced I.C.'s	[] Replaced Dispenser	[] REPLACED LAMPS
[] Money Jam	[] TICKET TRANSPORT PROBS	[] CABINET & LOCK PROBS
[] Reseated Chips	[] Cleared Ticket	[] Lock Misaligned
[] No Leds Lit	[] Diverter Adjusted	[] POWER SUPPLY PROBS
[] No Jam Found	[] Correct Transport Mech.	[] Power Supply Replaced
[] Intrusion Indicated	[] Correct Transport Elec.	[] LOOSE CONNECTION
[] Reset Logic	[] Correct Blocker	[] Adjusted Passenger Sen.
[] COIN ACCEPTOR PROBS	[] Replaced Transport	[] Corrected A15 Board
[] Cleared Coin Jam	[] TURNSTILE PROBS	[] REPLACED OPTICAL SENSOR
[] Cleaned Coin Acceptor	[] Cleaned/Adjust Solenoid	[] REPLACED DISPLAY PCB
[] Loose Plug On Acceptor	[] Adjusted Damper	[] NO PROBLEM FOUND
[] Replaced C Acceptor	[] Tightened Arm/Hub	[] PATRON MISUSE

CORRECTIVE MAINTENANCE: _____ TIME: _____ TECHNICIAN: _____

APPENDIX D

SAMPLE COMPUTER GENERATED
MAINTENANCE STATISTICS REPORTS

MARTA

MAINTENANCE REPORTS PER STATION

FOR PERIOD BEGINNING 02/18/83 AND ENDING 03/03/83

STATION	MR TTL	MR N/C
AVONDALE	8	2
DECATUR	8	5
EAST LAKE	6	0
CANDLER PARK	1	0
INMAN PARK	1	0
KING MEMORIAL	1	0
GEORGIA STATE	18	4
 EAST LINE TOTAL	 43	 11
 FIVE POINTS	 22	 4
OMNI	8	1
VINE CITY	5	3
ASHBY	3	0
WEST LAKE	10	3
HIGHTOWER	7	1
 WEST LINE TOTAL	 55	 12
 LAKEWOOD	 0	 0
OAKLAND	0	0
WEST END	14	5
GARNETT	1	0
PEACHTREE CENTER	10	0
CIVIC CENTER	2	0
NORTH AVENUE	17	1
MIDTOWN	8	0
ARTS CENTER	8	0
LINDBERGH	0	0
LENOX	0	0
 NORTH/SOUTH LINE TOTAL	 60	 6
 COMBINED TOTALS	 158	 29

MARTA

MAINTENANCE REPORTS PER PROBLEM TYPE

FOR PERIOD BEGINNING 02/18/83 AND ENDING 03/03/83

PROBLEM DESCRIPTION	EAST	WEST	N/S	TOTAL
---------------------	------	------	-----	-------

TRANSFER DISPENSER PROBLEMS:

PAPER JAM	5	3	3	11
MECHANICAL	3	4	4	11
ELECTRICAL	0	0	0	0
RIBBON REPLACEMENT	0	5	2	7
RIBBON MECHANICAL	0	0	0	0
CLOCK SET	2	0	3	5
CLOCK MECHANICAL REPLACED	0	0	0	0
TOTALS	10	12	12	34

COIN ACCEPTOR PROBLEMS:

COIN JAM	1	2	5	8
MECHANICAL	0	0	3	3
ELECTRICAL	0	0	1	1
RETURN MECHANISM REPLACED	0	0	0	0
TOTALS	1	2	11	14

CARD TRANSPORT PROBLEMS:

TICKET JAM	5	8	5	18
MECHANICAL	2	3	5	10
ELECTRICAL	0	0	0	0
DIVERTER	1	0	2	3
BLOCKER	0	0	0	0
HEATER/THERMOSTAT REPLACED	0	0	0	0
TOTALS	8	11	12	31

CENTRAL ELECTRONICS PCB PROBLEMS:

RAM/ROM	0	0	0	0
TICKET/XFER JAM/SENSOR FAIL	2	1	1	4
COIN IN RETENTION	0	0	1	1
MONEY BAG TWO FULL/WRITE FAIL REPLACED IC	0	6	1	7
INTRUSION	1	0	0	1
NO INDICATION - RESET LOGIC	2	0	1	3
RESEATED CHIPS	0	2	2	4
RELOADED VARIABLE DATA REPLACED	2	1	0	3
	4	6	7	17
	0	0	0	0
TOTALS	11	16	13	40

MARTA

MAINTENANCE REPORTS PER PROBLEM TYPE

FOR PERIOD BEGINNING 02/18/83 AND ENDING 03/03/83

PROBLEM DESCRIPTION	EAST	WEST	N/S	TOTAL
TURNSTILE PROBLEMS:				
SOLENOID	0	0	0	0
ADJUST DAMPER	0	2	0	2
ADJUST HUB/ARM	0	0	1	1
BROKEN HUB	0	0	0	0
MECHANICAL	1	2	1	4
ELECTRICAL	0	0	0	0
TOTALS	1	4	2	7
MASTER CLOCK PROBLEMS:				
SET TIME/DATE	0	0	1	1
ELECTRICAL	0	0	0	0
BATTERY	0	0	0	0
REPLACED	0	0	0	0
TOTALS	0	0	1	1
LAMP REPLACEMENTS:	1	2	0	3
CABINET AND LOCK PROBLEMS:	0	0	4	4
HANDICAP BARRIER PROBLEMS:	0	0	0	0
POWER SUPPLY PROBLEMS:	0	0	1	1
MISCELLANEOUS HARDWARE PROBLEMS:				
LOOSE CONNECTION	0	0	0	0
PASSENGER SENSOR	0	0	0	0
A15 BOARD	0	0	0	0
OPTICAL SENSOR PCB	1	1	0	2
READ/WRITE PCB	0	0	0	0
SIGNAL CONDITION PCB	0	0	0	0
SOLENOID DRIVER PCB	0	0	0	0
JUNCTION BOX PCB	0	0	0	0
DISPLAY PCB	0	2	0	2
PUSH FOR TRANSFER SWITCH	0	0	0	0
CIRCUIT BREAKER REPLACED	0	0	0	0
VAULT/COIN BAG	0	0	0	0
OTHER MECHANICAL	0	0	0	0
OTHER ELECTRICAL	0	0	0	0
TOTALS	1	3	0	4

MARTA

MAINTENANCE REPORTS PER PROBLEM TYPE

FOR PERIOD BEGINNING 02/18/83 AND ENDING 03/03/83

PROBLEM DESCRIPTION	EAST	WEST	N/S	TOTAL
OPERATIONS PROBLEMS:				
MONEY BAG FULL	0	1	0	1
INCORRECT BUS-RAIL TRANSFER	0	0	0	0
TRANSFER PAPER LOW	0	0	0	0
DOOR OPEN	2	1	0	3
REROUTED TRANSFER PAPER	0	0	0	0
PATRON MISUSE	0	0	1	1
OTHER	4	1	0	5
TOTALS	6	3	1	10
NO PROBLEM FOUND:	4	2	3	9
COMBINED TOTALS	43	55	60	158

BART

MRSPCDOA MAINTENANCE AND RELIABILITY INFORMATION SYSTEM
 FUNCTION: HISTORY EQUIPMENT

11/16/82
 11.32.26

AUTOMATIC FARE COLLECTION WAYSIDE TRACKING
 -INCIDENT HISTORY-

EQUIP NO	LOC	OPEN	INCD	STATUS
1001	M16	04		SERVICEABLE

EQUIP NO	LOC	OPEN	INCD	STATUS
1002	M90	01		SERVICEABLE

INCIDENT	SYMP	ILOC	OCCURRED DATE/TIME	REPAIRED DATE/TIME	DOC NO
N329527D	4000	M90	08/06/82 14:10	08/06/82 00:00	01

DEDUCTS FARE BUT DOES NOT PRINT VALUE ON TICKET OR OPEN BARRIERS.
 REPAIRED

INCIDENT	SYMP	ILOC	OCCURRED DATE/TIME	REPAIRED DATE/TIME	DOC NO
N329535L	4000	M90	08/10/82 16:02	08/11/82 00:00	01

ACCEPTS RVTS WILL NOT OPEN GATE
 REPRD LATCH ON VERFD STATN

COMMAND:
 MESSAGE: USE PFB TO PAGE FORWARD

MRSPCDOA MAINTENANCE AND RELIABILITY INFORMATION SYSTEM
 FUNCTION: HISTORY EQUIPMENT

11/16/82
 11.32.40

AUTOMATIC FARE COLLECTION WAYSIDE TRACKING
 -INCIDENT HISTORY-

EQUIP NO	LOC	OPEN	INCD	STATUS
1002	M90	01		SERVICEABLE

INCIDENT	SYMP	ILOC	OCCURRED DATE/TIME	REPAIRED DATE/TIME	DOC NO
N338074J	4000	M90	08/25/82 17:30	08/26/82 00:00	01

BARRIER STAYS OPEN.
 RESET CP-9.

INCIDENT	SYMP	ILOC	OCCURRED DATE/TIME	REPAIRED DATE/TIME	DOC NO
N338078A	4000	M90	08/27/82 19:23	08/28/82 00:00	01

VALUE DEDUCTED, BARRIERS DONT OPEN.

INCIDENT	SYMP	ILOC	OCCURRED DATE/TIME	REPAIRED DATE/TIME	DOC NO
N338115L	4000	M90	09/22/82 20:45	09/22/82 00:00	01

BARRIERS REMAIN OPEN
 RESET CP-9

COMMAND:
 MESSAGE: USE PF7 TO PAGE BACKWARD OR PFB TO PAGE FORWARD

BART

HRSPCDOA MAINTENANCE AND RELIABILITY INFORMATION SYSTEM
FUNCTION: STATUS EQUIPMENT

11/16/8
11.35.5

AUTOMATIC FARE COLLECTION WAYSIDE TRACKING
 -OPEN INCIDENTS-
EQUIP NO LOC OPEN INCD STATUS
1001 M16 04 SERVICEABLE

EQUIP NO LOC OPEN INCD STATUS
1002 M90 01 SERVICEABLE

INCIDENT SYMP ILOC OCCURRED DATE/TIME INCD STATUS
N324546B 4000 M90 02/23/82 20:25 REPAIRED
TICKET JAM IN READ STATION

EQUIP NO LOC OPEN INCD STATUS
1003 A60 01 SERVICEABLE

EQUIP NO LOC OPEN INCD STATUS
1004 M16 03 SERVICEABLE

COMMAND:
MESSAGE: USE PF8 TO PAGE FORWARD

BART

MRSFC00H MAINTENANCE AND RELIABILITY INFORMATION SYSTEM 11/16/82
 FUNCTION: EQUIP STATUS/STATION 11.51.25

WAYSIDE TRACKING

LINE NO: A10
 PRINT (Y/N): N

AFC STATUS REPORT
 LAKE MERRIT

EX-G STA	EN-G STA	RE-G STA	CHAN STA	VEND STA	ADD STA	READ STA	TRAN STA
1020 SER	2020 SER		4408 SER	5025 SER	6011 SER	7008 SER	8021 SER
1520 SER	2520 SER		4417 SER	5038 SER	6019 SER	7018 SER	8023 SER
1602 SER	2602 OUT		4710 SER	5653 OUT	6643 SER		
1702 SER	2702 SER		4719 OUT	5654 SER			

STATION SUMMARY

EX-GATE	EN-GATE	RE-GATE	CHANGER	VENDOR	ADDFARE	READER	TRANS
SER 04	SER 03	SER 00	SER 03	SER 03	SER 03	SER 02	SER 02
OUT 00	OUT 01	OUT 00	OUT 01	OUT 01	OUT 00	OUT 00	OUT 00

COMMAND:
 MESSAGE: ENTER STATION NO/PRINT OPTION

MRSFC00H MAINTENANCE AND RELIABILITY INFORMATION SYSTEM 11/16/82
 FUNCTION: EQUIP STATUS/STATION 11.53.26

WAYSIDE TRACKING

LINE NO: M40
 PRINT (Y/N): N

AFC STATUS REPORT
 CIVIC CENTER

EX-G STA	EN-G STA	RE-G STA	CHAN STA	VEND STA	ADD STA	READ STA	TRAN STA
1058 SER	2058 SER		4016 SER	5065 SER	6039 OUT	7041 SER	8120 SER
1059 SER	2059 SER		4438 SER	5066 SER	6040 SER	7042 SER	8121 SER
1060 SER	2060 SER		4439 SER	5067 SER	6041 SER	7043 SER	8122 SER
1067 SER	2066 SER		4440 SER	5068 OUT	6057 SER		8124 SER
1556 SER	2544 SER		4702 SER	5112 SER	6608 SER		8125 SER
1557 SER	2545 SER		4739 SER	5619 SER	6613 SER		
1558 SER	2546 SER		4740 SER	5623 SER			
1565 SER	2565 SER						

STATION SUMMARY

EX-GATE	EN-GATE	RE-GATE	CHANGER	VENDOR	ADDFARE	READER	TRANS
SER 08	SER 08	SER 00	SER 07	SER 06	SER 05	SER 03	SER 05
OUT 00	OUT 00	OUT 00	OUT 00	OUT 01	OUT 01	OUT 00	OUT 00

COMMAND:
 MESSAGE: ENTER STATION NO/PRINT OPTION

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