Miami-Dade Transit
Metromover Fleet Management Plan

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Director

June 2003

Revision III

Mission Statement

"To meet the needs
of the public
for the highest quality
transit service:
safe, reliable, efficient
and courteous."

MIAMI-DADE TRANSIT METROMOVER FLEET MANAGEMENT PLAN

June 2003

This document is a statement of the processes and practices by which Miami-Dade Transit (MDT) establishes current and projected Metromover revenue-vehicle fleet size requirements and operating spare ratio. It serves as an update of the October 2000 Fleet Management Plan and includes a description of the system, planned revenue service, projected growth of the system, and an assessment of vehicle maintenance current and future needs.

Revisions of the October 2000 Fleet Management Plan contained in the current plan include:

- Use of 2-car trains as a service improvement to address overcrowding during peak periods
- Implementation of a rotation program to normalize vehicle mileage within the fleet
- Plans to complete a mid-life modernization of the vehicle fleet

Metromover's processes and practices, as outlined in this plan, comply not only with Federal Transit Administration (FTA) Circular 9030.1B, Chapter V, Section 15 entitled, "Fixed Guideway Rolling Stock," but also with supplemental information received from FTA.

This plan is a living document based on current realities and assumptions and is, therefore, subject to future revision. The plan is updated on a regular basis to assist in the planning and operation of Metromover.

The Fleet Management Plan is structured to present the demand for service and methodology for analysis of that demand in Section Two. Section Three of the plan addresses the supply of vehicles, explains the balance between the demand for and supply of vehicles, and summarizes the maintenance plan.

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List of Acronyms

ALS	Automatic Line Supervision
ATC	Automatic Train Control
ATO	Automatic Train Operation
ATP	Automatic Train Protection
CRT	Cathode Ray Tube
DTS	Data Transmission System
ETS	Emergency Trip System
FSR	Fleet Spare Ratio
FTA	Federal Transit Administration
FY	Fiscal Year
HVAC	Heating, Ventilation, and Air Conditioning
LRTP	Long Range Transportation Plan
M3	Materials Management & Maintenance Project
MCBD	Miami Central Business District
MDT	Miami Dade Transit
MMBSF	Mean Miles Between Service Failures
MOS	Minimum Operable Segment
MPH	Miles Per Hour
MPO	Metropolitan Planning Organization
OEM	Original Equipment Manufacturer
OSR	Operating Spare Ratio
PDS	Power Distribution System
PM	Preventive Maintenance
PSS	Program Station Stop
PVR	Peak Vehicle Requirement
RMC	Rail Maintenance Control
SOP	Standard Operating Procedure
TDM	Time Division Multiplex
TDP	Transit Development Program
TEA	Transit Equipment Administration System
TIP	Transit Improvement Program
TRI	Transit Rail Inventory

SECTION I: INTRODUCTION

Brief History

Metromover originally began service to the Miami Central Business District (MCBD) in April 1986. It was an elevated, electrically powered, fully automated people mover system connecting with Metrorail at Government Center and with Metrobus at various locations throughout downtown Miami.

In May 1994, the Omni and Brickell Extensions were constructed and added 2.5 miles to the original 1.9-mile guideway, 12 new stations to increase the number of stations to 21, and 17 additional vehicles for a fleet total of 29. The new system provided a connection with Metrorail at Brickell Station in addition to the existing Metrorail connection at Government Center.

Metromover offers convenient access to a variety of government businesses, entertainment and cultural centers in the central downtown, Omni, and Brickell areas. Major destinations include Bayside Marketplace, Miami Arena, Miami-Dade Community College, James L. Knight Center, Dade County School Board, Miami Herald, Stephen P. Clark Center, Brickell, Financial District, American Airlines Arena, and the Performing Arts Center. Illustrations of the Metromover System from 5:15 a.m. until 7:00 p.m. and from 7:00 p.m. until 12:30 a.m. are presented in Figures 1-1 and 1-2.

Presently, on weekdays, the system operates from 5:15 a.m. to 12:30 a.m. on the Inner Loop and until 10:30 p.m. on the Brickell and Omni Outer Loops. The schedule is coordinated to coincide with the Metrorail service plan and permits Metromover trains to meet Metrorail “last trains” at Government Center and Brickell. Metromover service on weekends and holidays provides minimum passenger service operation on specified loop or extensions; although, some holidays require normal weekday service.

While Metromover has a design capability of 30 mph maximum speed, it currently operates at an average speed of 10.2 mph. The Metromover system is capable of providing five basic service routes. Travel times for the service routes are outlined in Table 1-1.

Table 1-1 - Metromover Routes and Travel Times

Route	*Distance*	*Approximate Travel Time*
Inner Loop	2.1 miles	10 minutes, 48 seconds
Outer Loop	2.2 miles	10 minutes, 52 seconds
Brickell Loop	4.1 miles	25 minutes
Omni Loop	4.7 miles	28 minutes, 17 seconds
Brickell/Omni Loop	6.8 miles	42 minutes, 19 seconds

During Fiscal Year (FY) 2001, Metromover's unlinked passenger trips totaled 4.9 million with an average weekday ridership of 16,243 passengers. Both unlinked passenger trips and average weekday ridership exceeded FY 2000 trips and ridership by 14.4% and 13.6%, respectively. FY 2001 ridership represents the highest level of annual ridership reported to date.

In FY 2001, the nearly 1.1 million Metrorail transfers to Metromover accounted for approximately 22.6% of total Metromover boardings. Metromover transfers of 1.6 million to Metrorail resulted in 12% of total Metrorail boardings. Transfers to and from Metrobus are currently not collected.

Heavy, preventive, and running maintenance, detail cleaning, and storage of vehicles are accomplished at a single facility, located in the MCBD. On the Omni Extension, the School Board Maintenance Area is used for daily inspections and light cleaning.

Figure 1-1 - Metromover System Map – 5:15 am - 7 pm

Figure 1-2 - Metromover System Map – 7 pm – 12:30 am

Overview of Current Metromover Fleet and Operating Practices

Current Metromover Vehicle Fleet

- The fleet consists of 29 cars with a normal capacity of 100 customers per car. The seated passenger load is 8, and the standing passenger load is 92. Vehicles are usually operated as single cars, commonly referred to as trains, but can be coupled as two-car trains, also referred to as deuces, to meet special ridership demands.

- The current peak vehicle requirement is 18.

- Primary propulsion for the vehicles is supplied by a 600-Volt AC source.

- Vehicles are controlled in either automatic mode or manually. During automatic control, train speed, stations stopping, door control, and dwell time are performed without any assistance from an operator. For manual operation, a control panel, which contains all the controls necessary for an operator to operate the vehicle, is provided on each end of the Mover vehicle.

- In order to attain correct route sequencing and synchronization on the outer MCBD loop (shared by both Brickell and Omni routes), the routing method for the Metromover is first come/first serve. By making adjustments to the dwell times on inbound trains, a reasonable synchronization is attainable.

- Under normal operating conditions, each train operating in revenue service will stop at each station on its route. The normal dwell time is 15 seconds at the Brickell and Omni Extensions and 20 seconds on the Inner and Outer Loops.

- Trains operate under full Automatic Train Control (ATC) with Automatic Train Operation (ATO), Automatic Train Protection (ATP) and Automatic Line Supervision (ALS) at all times while in passenger service. The maximum vehicle speed permitted by safe train separation and civil speed constraints does not exceed 30 MPH at any time.

- Non-revenue operating periods are used for vehicle maintenance testing, facilities maintenance, system maintenance, and other non-revenue activities.

A description of the current fleet is presented in Table 1-2.

Table 1-2 - Current Metromover Vehicle Fleet

Number of Cars	**29**
Car Length	**39 Feet**
Car Width	**9 feet, 4 inches**
Maximum Speed	**30 mph**
Normal Acceleration	**2.0 mph/s**
Normal Deceleration	**2.0 mph/s**
Manufacturer	**AEG Transportation Systems**
Propulsion Type	**600V ac source**
Service Entry Dates	**April 1, 1985** **12 Phase 1: MC001-MC012** **June 25, 1994 – September 30, 1994** **17 Phase 2: MC013-MC029**

The date that each vehicle entered service is listed in Table 1-3. All Phase 1 vehicles entered service on the same day, April 1, 1985. Phase 2 vehicles entered service from June 25, 1993 through September 30, 1994, a period of fourteen months. Thirteen of the seventeen new Phase 2 vehicles entered service on June 26, 1994.

Table 1-3 - Vehicle Service Entry Dates

Phase	***Vehicle***	***Date Entered Service***
Phase 1	MC001-MC012	04/01/85
Phase 2	MC026	06/25/93
	MC027	07/30/93
	MC015	09/23/93
	MC013-MC014	06/26/94
	MC016-MC019	06/26/94
	MC021-MC025	06/26/94
	MC028-MC029	06/26/94
	MC020	09/30/94

A graphic illustration of the flow of the vehicles entering service is presented in Figure 1-3.

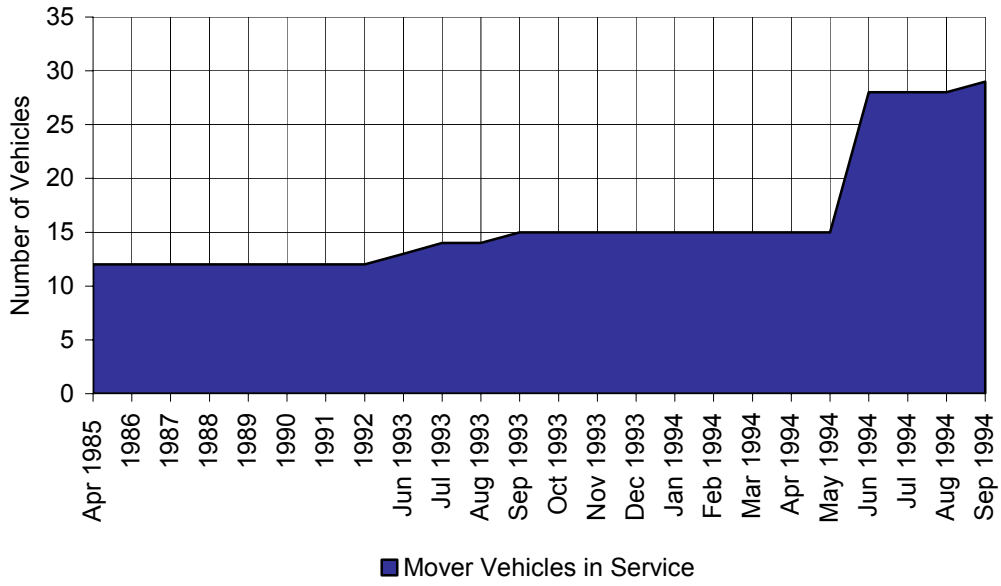


Figure1-3 - Vehicles in Service

Layouts of the vehicle exterior, coupler, guidance system, and underframe equipment are illustrated in Figures 1-4 through Figure 1-7.

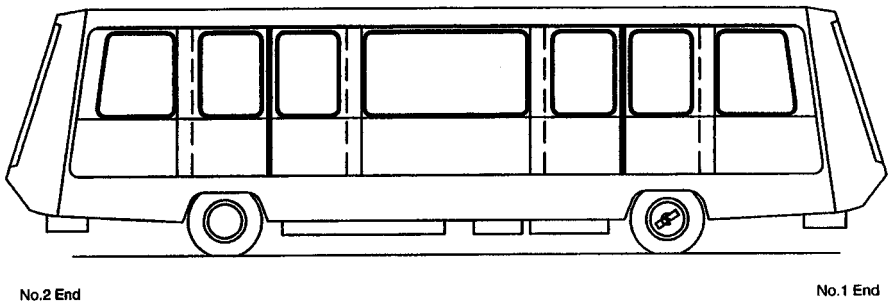


Figure 1-4 - Metromover Vehicle Exterior

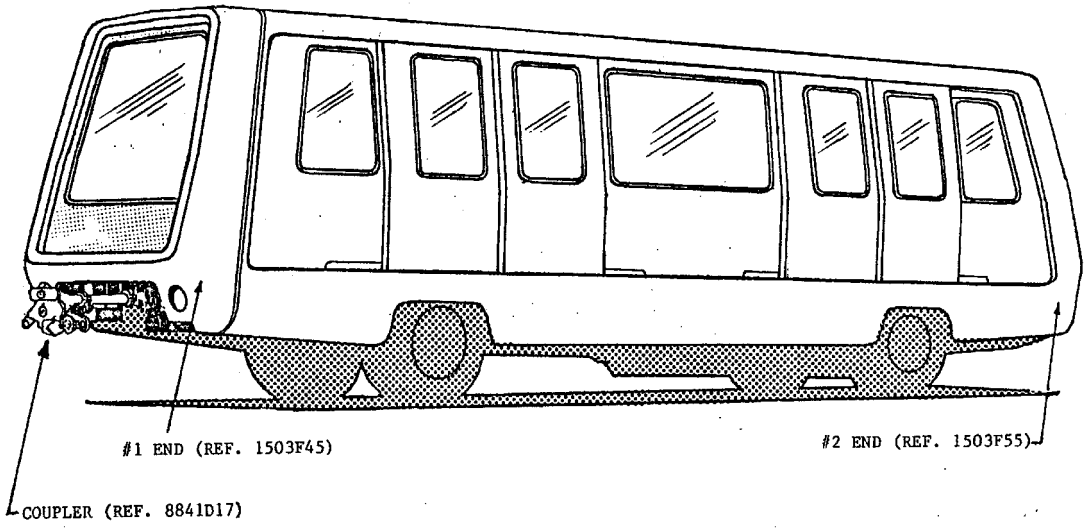


Figure 1-5 - Metromover Vehicle Exterior with Coupler

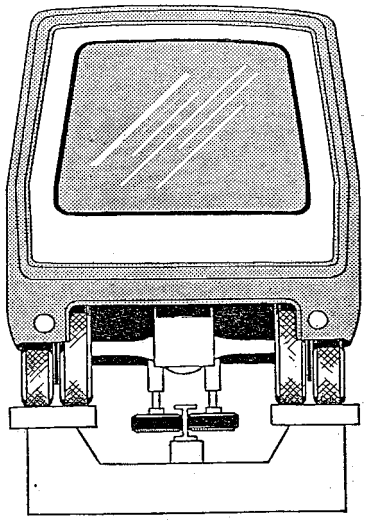
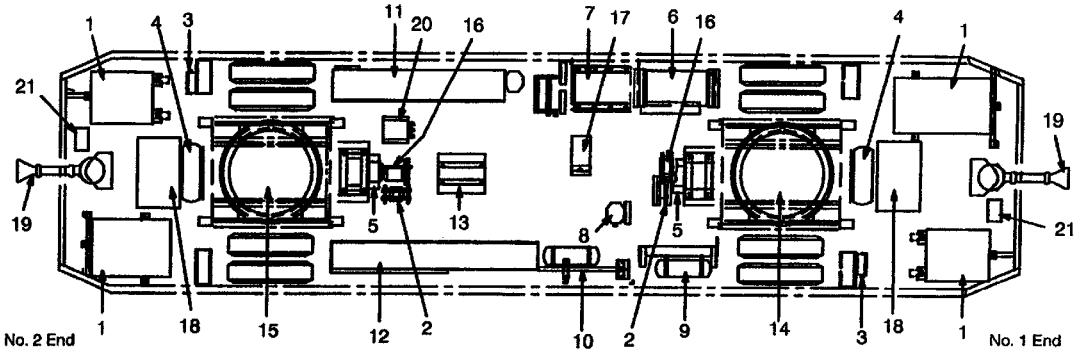


Figure 1-6 - Metromover Vehicle Guidance Feature



Item	Description	Item	Description
1	Air Conditioning	11	Auxiliary Control Box
2	Grounding Inductor Box	12	Motor Control Box
3	Pre-amplifier Box	13	Brake Resistors
4	Brake Control Package	14	Bogie Assembly No. 1
5	Traction Motor	15	Bogie Assembly No. 2
6	Air Compressor	16	Tach Junction Box
7	Battery Box	17	Interposing Brake Relay Box
8	Brake Transformer	18	Trainline Junction Box
9	Air Control Package	19	Coupler
10	Auxiliary Release Package	20	Door Transducer Box
		21	Trainline Cap Storage Box

Figure 1-7 - Metromover Vehicle Underframe Equipment

Current Metromover Operating Practices

- On weekdays, the system operates from 5:15 a.m. to 12:30 a.m. on the Inner Loop and until 10:30 p.m. on the Brickell and Omni Outer Loops. The schedule is coordinated to coincide with the Metrorail service plan to enable Metromover trains to meet Metrorail "last trains" at Government Center and Brickell. Metromover service on weekends and holidays provides minimum passenger service operation on specified loop or extensions. Some holidays require normal weekday service. Typical train headways are indicated in Table 1-4, and stations served are presented in Table 1-5. Loop configurations with corresponding hours of operation are illustrated in Figures 1-8 through 1-11.

- Metromover utilizes a Test Track for the troubleshooting and testing of out-of-service vehicles. The test track, located at the Maintenance Facility on M-1, is equipped with two (2) pseudo stations that can duplicate Program Station stopping and vehicle performance.

- Non-revenue operating periods are used for vehicle maintenance testing, facilities and system maintenance, and other non-revenue activities.

- All vehicles, stations, and guideway system elements are checked daily to ensure operational safety and reliability. Maintenance personnel assigned to these activities report the findings to Central Control. Any item affecting operational safety is corrected before the system element is released by maintenance for passenger service.

- Each vehicle to be utilized in passenger service receives a daily inspection within a 24-hour period. The inspection is specified in the MDT Metrorail/Metromover Maintenance Program Policy, Appendix A. This inspection includes critical under car requirements, headlights, taillights, trip wires, doors, voice communications equipment, lighting, graphics, and emergency equipment. The vehicle ATC equipment is tested for normal operation on a weekly basis or as specified in the policy.

- Central Control, which is located on the 5th floor of the Stephen P. Clarke Center, is staffed on a 24-hour basis to ensure supervision, control, communications and coordination of Metromover operations. Central Control is responsible for all revenue and non-revenue train movements.

- A complete sweep of the guideway is made prior to passenger service each morning to ensure that the guideway is clear of foreign objects, that interlocking switches are functioning properly, as well as to provide verification that there is proper train detection in all track circuits. Sweep trains, while under manual control, are driven at restricted speed. The operator is not to exceed the speed at which a buzzer is sounded. In the

manual mode, the operator can control the vehicle train speed from 0 to 30 mph. Upon reaching 17 mph, a buzzer alarms the operator that the speed reached exceeds the manual mode recommended speed limit. Sweep trains do not carry customers.

Table 1-4 Metromover Service

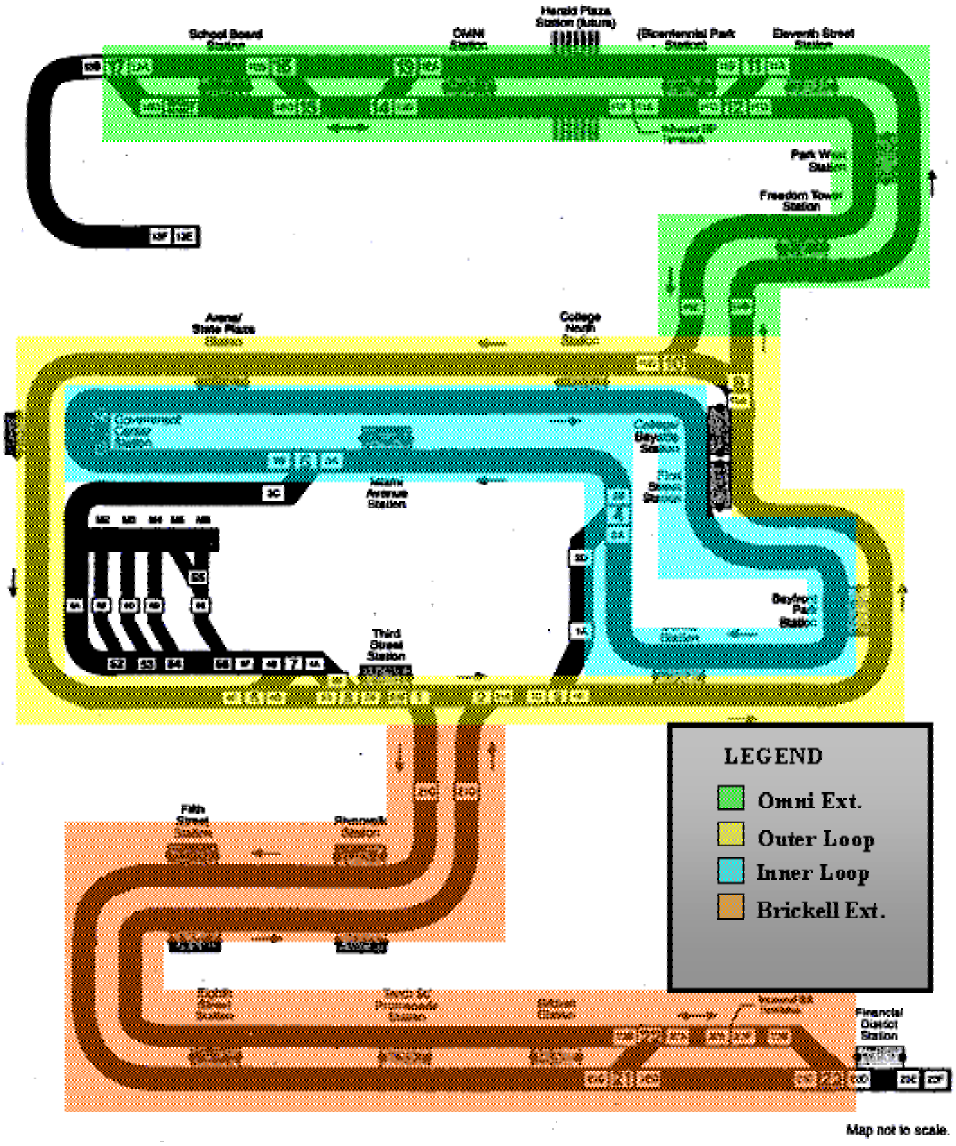
Weekday Trains/Headway					
Service Hours	***PVR***	***Inner Loop (1)***	***Omni Loop (2)***	***Brickell Loop***	***Full Loop Omni/Brickell***
5:15 a.m. – 7:00 p.m.	18	5 / 2:12 min	5 / 5:24 min	5 / 5:24 min	---
7:00 p.m. – 10:30 p.m.	17	5 / 2:12 min	---	---	10 / 4:14 min
10:30 p.m. – 12:30 a.m. (3)	7	5 / 2:12 min	Omni/Brickell Closed		
Weekend and Holiday Trains/Headway					
Service Hours	***PVR***	***Inner Loop (1)***	***Omni Loop (2)***	***Brickell Loop***	***Full Loop Omni/Brickell***
5:15 a.m. – 7:00 p.m.	13	3 / 3:40 min	5 / 5:24 min	5 / 5:24 min	---
7:00 p.m. – 10:30 p.m.	13	3 / 3:40 min	---	---	10 / 4:14 min
10:30 p.m. – 12:30 a.m. (3)	3	3 / 3:40 min	Omni/Brickell Closed		

Notes: 1) Inner Loop weekday service includes two 'Deuces' (Two-Car Train) for a total of seven (7) trains; 2) Omni Loop weekday service includes one 'deuce' for a total of six (6) trains; 3) Inner Loop end of service (12:30 a.m.) may be adjusted to ensure passengers transferring from the last Metrorail trains to the Metromover System at Government Center are transported. Potential service changes resulting from the People's Transportation Plan are addressed on page 31.

Table 1-5 - Stations Serviced

Inner Loop	***Omni Loop (1)***	***Brickell Loop***	***Full Loop (2)***
Government Center	Government Center	Government Center	Government Center
Arena/State Plaza	Third Street Station	Third Street	Eighth Street Station
College North	Knight Center	Riverwalk Station	Brickell Station
College/Bayside	Bayfront Park	Fifth Street Station	Financial
First Street	First Street Station	Eighth Street Station	Knight Center
Bayfront Park	College/Bayside	Tenth Street Station	Bayfront Park
Knight Center	Freedom Tower Station	Brickell Station	First Street Station
Miami Avenue	Park West Station	Financial District	College/Bayside
	Eleventh Street Station	Knight Center	Eleventh Street Station
	Omni Station	Bayfront Park	Omni Station
	School Board Station	First Street Station	School Board
	College North	College/Bayside	College North
	Arena/State Plaza	College North	Arena/State Plaza
		Arena/State Plaza	

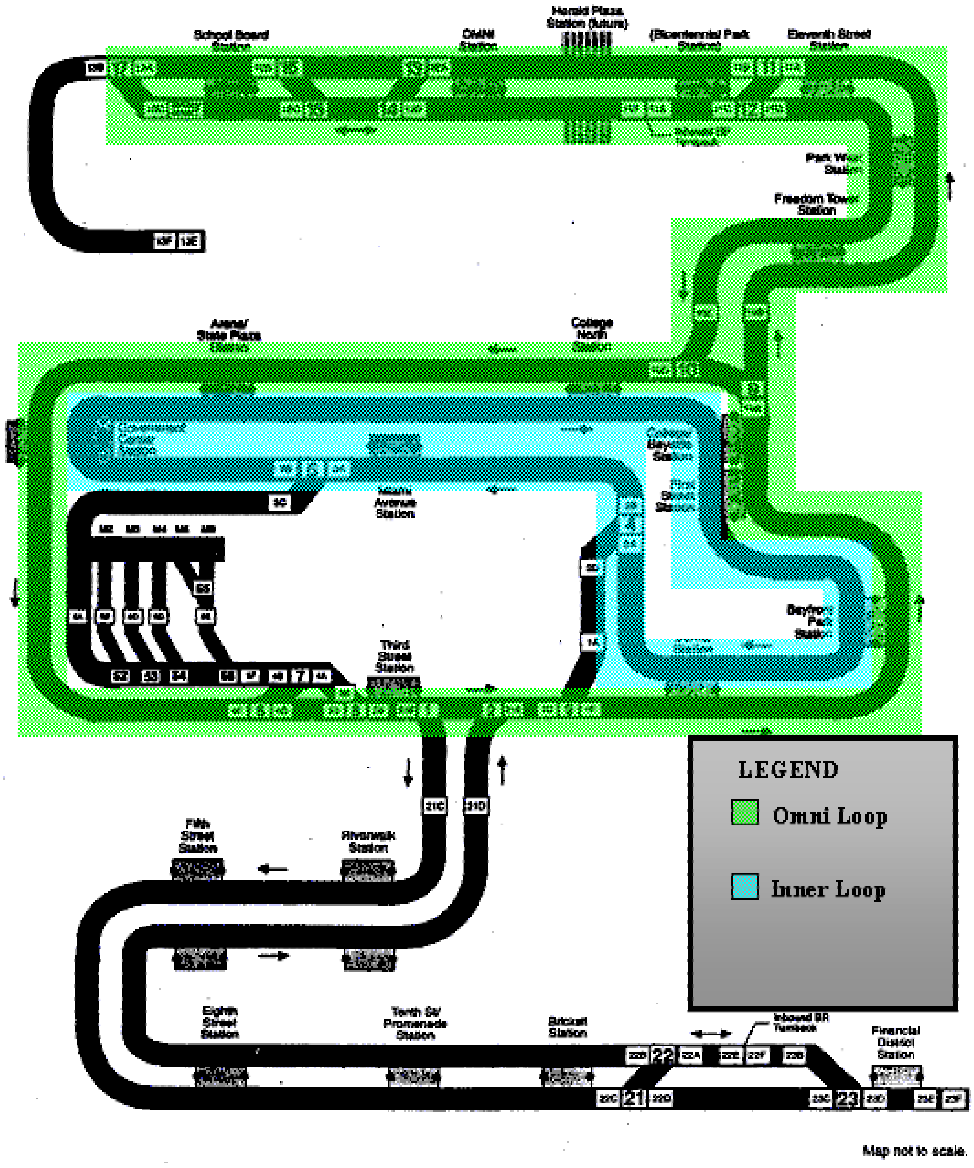
Notes: 1) Omni Loop Bicentennial Park Station is closed; 2) Full Loop implemented daily incorporates an early station closing operation additional to the combination of Omni and Brickell Loops. Freedom Tower, Park West, Third Street, Riverwalk, Fifth Street, and Tenth Street Stations close at 7:00 p.m. Trains are routed to by-pass these stations until the end of service.



Loop/Extension	*Weekdays*	*Weekends*
Omni Extension	5:15 am – 7:00 pm	5:30 am – 7:00 pm
Outer Loop	5:15 am – 7:00 pm	5:30 am – 7:00 pm
Inner Loop	5:15 am – 12:30 am	5:30 am – 12:30 am
Brickell Extension	5:15 am – 7:00 pm	5:30 am – 7:00 pm

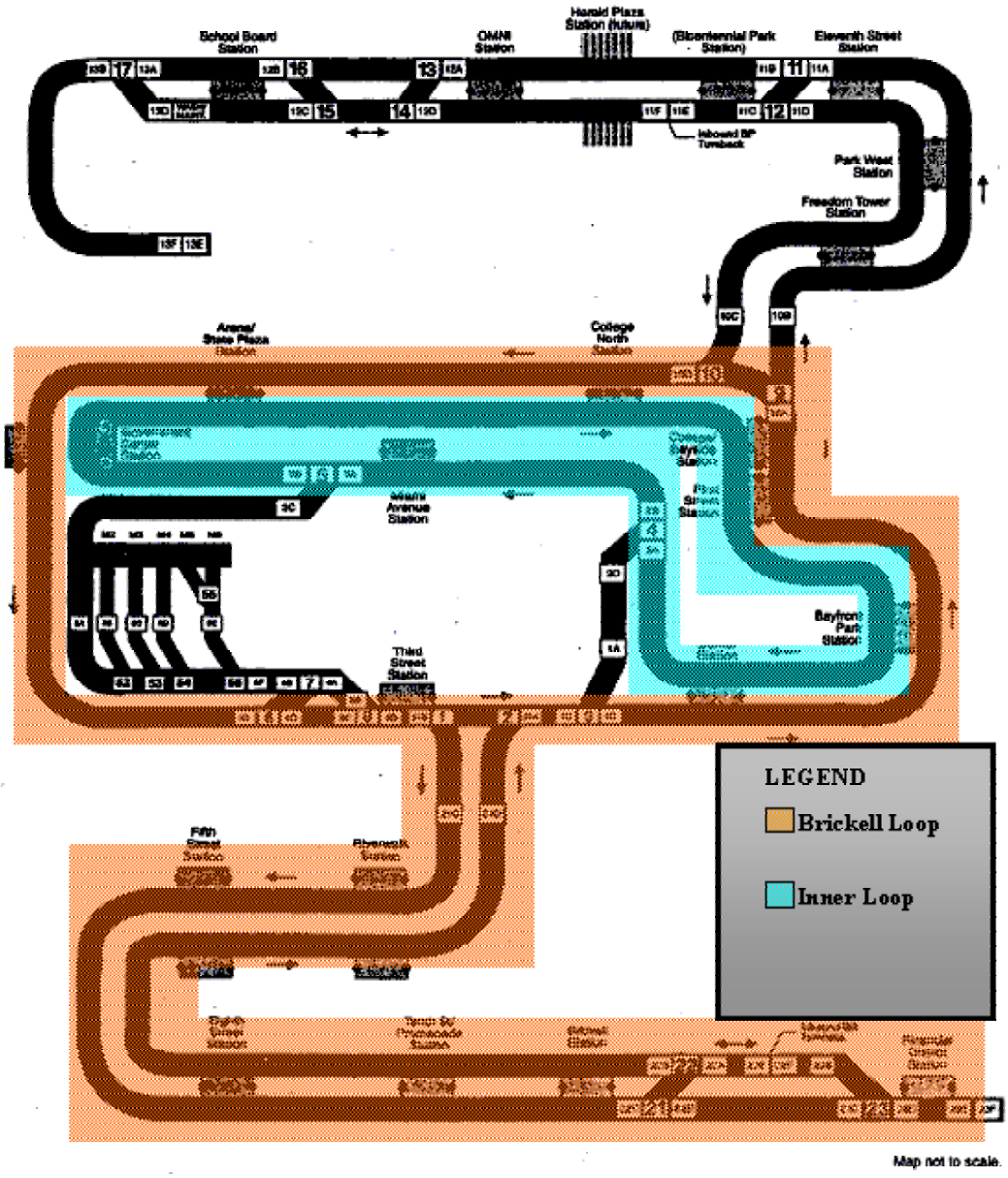
Note: Omni and Brickell Extensions are integrated with the Outer Loop to form a “Full Loop” operation from 7 pm until 10:30 pm.

Figure 1-8 - Omni/Brickell Extensions and Inner/Outer Loops



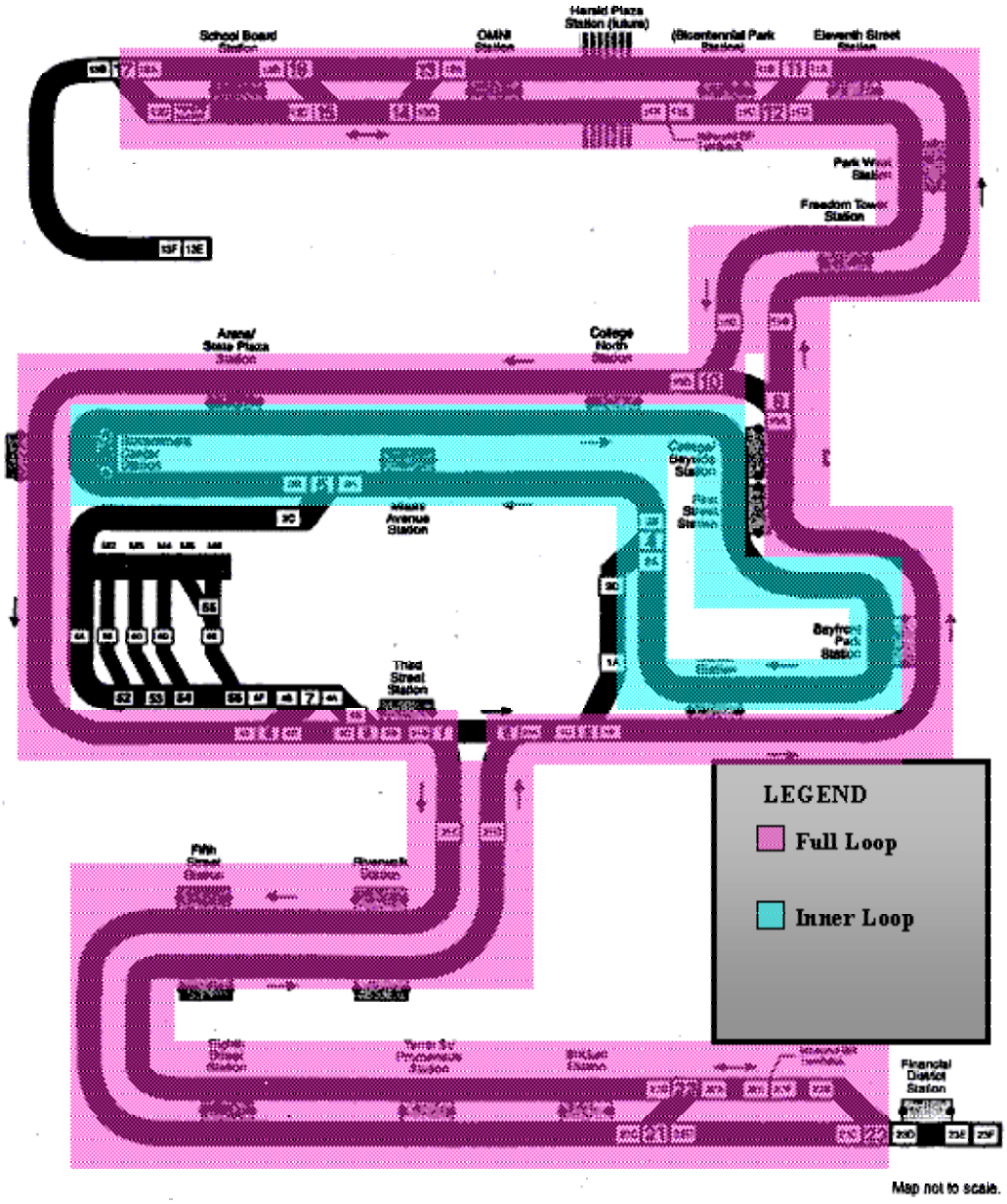
Loop/Extension	*Weekdays*	*Weekends*
Omni Loop	5:15 am – 7:00 pm	5:30 am – 7:00 pm
Inner Loop	5:15 am – 12:30 am	5:30 am – 12:30 am

Figure 1-9 - Omni Loop and Inner Loop



Loop/Extension	*Weekdays*	*Weekends*
Brickell Loop	5:15 am – 7:00 pm	5:30 am – 7:00 pm
Inner Loop	5:15 am – 12:30 am	5:30 am – 12:30 am

Figure 1-10 - Brickell Loop and Inner Loop



Loop/Extension	*Weekdays*	*Weekends*
Full Loop	7:00 pm – 10:30 pm	7:00 pm – 10:30 pm
Inner Loop	5:15 am – 12:30 am	5:30 am – 12:30 am

Figure 1-11 - Full Loop and Inner Loop

SECTION II: REVENUE VEHICLE DEMAND

Quality of Service

MDT is committed to providing a safe and reliable transportation system. The safety of the public and MDT employees is of primary concern to all Metromover personnel. When service is interrupted, every attempt is made to restore that service with minimal disruption to the customer. Recovery Technicians from Metromover Maintenance are assigned and rove the system, readily available in case of any malfunction. Any vehicle that fails is moved to the nearest tail track or maintenance facility to maintain service on the guideway.

Customer surveys are frequently used to obtain customer input and perceptions of Metromover service. The survey results provide valuable information concerning the quality of Metromover service from the customer's perspective and present suggestions for potential improvements in service. In November 1999, Petra Brock prepared "An Assessment of the Attitudes and Concerns of Existing and Potential Metromover Riders Working in the Downtown, Brickell and Omni Areas," for Miami-Dade Transit. Data contained in the report were based on responses to an on-board survey of 1,746 Metromover riders in addition to a telephone survey of 360 respondents. An area of focus within the assessment, specifically related to quality of service, included two questions for on-board survey respondents concerning Metromover reliability and wait time. Responses were assigned by frequency of respondents' use of Metromover and included designations of first timers, less than once a week riders, once a week riders, 2-6 times a week riders, and daily riders. A sampling of the responses is presented in Tables 2-1 and 2-2. Metromover received high marks in providing reliable service from all on-board respondents. Well over 90% of respondents in each category found Metromover service to be reliable/very reliable. Once a week riders were the most critical with 4.8% indicating that service was very unreliable and also the most favorable with 42.1% indicating that service was very reliable. In terms of favorable reliability, first time users were the most positive with over 98% reliable/very reliable responses.

Table 2-1 - On-Board Survey: Metromover Reliability

On-Board Respondents HOW RELIABLE IS METROMOVER?						
Options	***First Timers***	***<Once a Week Riders***	***Once a Week Riders***	***2-6 Times a Week Riders***	***Daily Riders***	***Total Riders***
Very Unreliable	0.0%	0.0%	4.8%	0.3%	0.9%	0.6%
Unreliable	1.7%	2.9%	0.0%	6.3%	6.4%	5.4%
Reliable	67.7%	70.6%	53.0%	70.3%	67.7%	68.5%
Very Reliable	30.5%	26.5%	42.1%	23.0%	24.9%	25.5%

Metromover also scored high marks concerning the wait time between cars. Once a week riders who were satisfied/very satisfied totaled 100%. Daily riders

were the most critical of the wait time; nonetheless, over 90% of on-board respondents were satisfied/very satisfied with the wait time.

Table 2-2 - On-Board Survey: Metromover Wait Time

On-Board Respondents HOW SATISFIED ARE YOU WITH THE WAIT TIME BETWEEN CARS?						
Options	***First Timers***	***<Once a Week Riders***	***Once a Week Riders***	***2-6 Times a Week Riders***	***Daily Riders***	***Total Riders***
Very Unreliable	1.2%	0.0%	0.2%	0.0%	1.7%	1.6%
Unreliable	5.9%	2.4%	1.8%	0.0%	6.7%	7.4%
Reliable	72.6%	73.0%	76.6%	46.9%	73.4%	71.8%
Very Reliable	20.3%	26.4%	21.4%	53.1%	18.3%	19.1%

Questions presented to telephone survey respondents were slightly different than the two questions asked of on-board respondents. In the absence of in-transit time constraints, telephone survey respondents not only were asked more detailed questions but also were asked to evaluate potential system improvements and indicate how the improvements would affect their future use of the Metromover system. While almost half of the on-board respondents were daily riders, over half of those respondents surveyed by telephone rode the system less than once a week. In terms of quality of service, 14% of telephone respondents felt that Metromover reliability was a major problem, 33% indicated they would definitely use Metromover more if there were less breakdowns/delays, and 29% would increase their use if waiting time were reduced.

Section 2A: Estimation of Passenger Demand and Resulting Peak Vehicle Requirements

Passenger Demand

Metromover is a unique form of transit service. It serves as a collector/distributor for customers moving throughout the MCBD. Passengers use Metromover not only to travel from one downtown location to another but also to access Metrorail and Metrobus. With Bicentennial Park Station closed, Metromover services 20 stations along its routes. The following Metromover Stations provide weekday service from 5:15 a.m. until 12:30 a.m. and weekend/holiday service from 5:30 a.m. until 12:30 a.m.:

Arena/State Plaza Station	Financial District Station
Bayfront Park Station	First Street Station
Brickell Station	Government Center Station
College North Station	Knight Center Station
College/Bayside Station	Miami Avenue Station
Eighth Street Station	Omni Station
Eleventh Street Station	Schoolboard Station

Fifth Street Station, Riverwalk Station, Tenth Street/Promenade Station, and Third Street Station close at 7:00 p.m. daily. Freedom Tower and Park West Stations also close at 7:00 p.m. daily; however, these stations do remain open after 7:00 p.m. when there are scheduled events at the American Airlines Arena.

Metromover stations are served by 24 different bus routes. The Omni Station offers connection with 15 separate Metrobus routes, and the Bayfront Park Station connects with 10 separate Metrobus routes. Metromover links with Metrorail at Brickell and Government Center Stations and operates on a programmed schedule driven by accessibility to MCBD, Metrorail, and Metrobus.

A November 1999 assessment of the attitudes and concerns of Metromover riders found that over 60% of the on-board riders surveyed were connecting with other forms of public transportation. Over 33% indicated that Metrorail was part of their trip, while 12% indicated that they would be using Metrobus, and 20% planned to use both Metrorail and Metrobus.

FY 2001 transfer data show there were nearly 1.1 million Metrorail transfers to Metromover, which accounted for approximately 22.6% of total Metromover boardings, and Metromover transfers of 1.6 million to Metrorail resulted in 12% of total Metrorail boardings. The flow of passengers to and from Metromover and Metrorail as well as the flow to and from Metrorail and Metrobus is displayed in Figure 2-1.

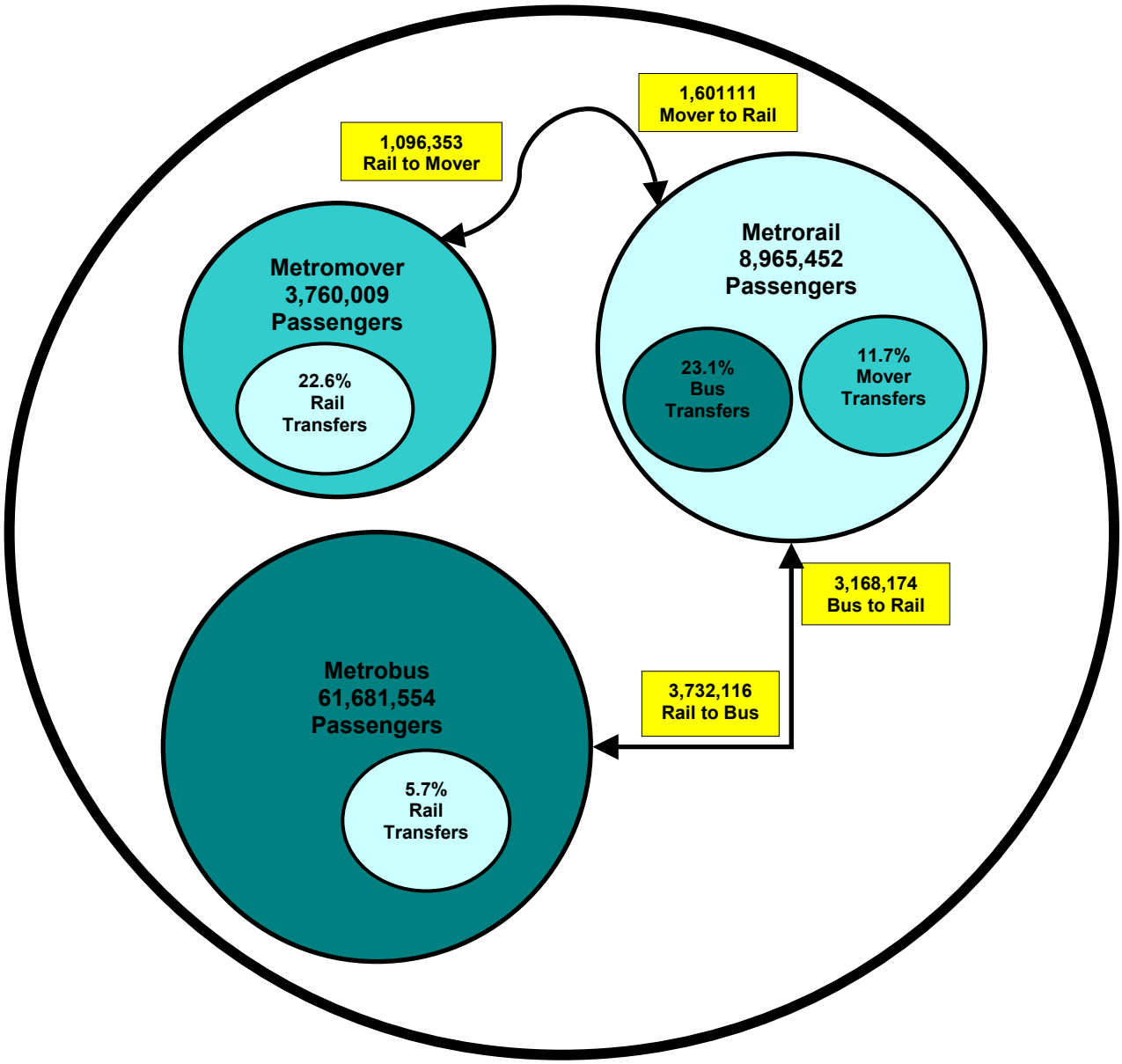


Figure 2-1 - FY 2001 Passenger Transfer Flow
Metromover, Metrorail, Metrobus

In the November 1999 assessment, when on-board respondents were asked to indicate where they were coming from or going to at the time of their trip, the majority identified work or school as their destination. Trip purpose among on-board respondents is presented in Table 2-3. On-board survey respondents

Table 2-3 - On-Board Survey: Trip Purpose

On-Board Respondents WHERE ARE YOU COMING FROM OR GOING TO ON YOUR TRIP TODAY?				
	Respondent's Travel Time			
Destination	*Weekday Rush Hour*	*Other Weekday Times*	*Weekends*	*Total*
Work/School	69.3%	61.7%	28.2%	58.4%
Business Meetings	5.4%	10.2%	2.1%	7.3%
Events-KnightCenter/Arena	0.7%	0.7%	4.8%	1.4%
Shopping	6.9%	14.3%	28.4%	14.4%
Restaurants	1.4%	8.8%	10.3%	6.7%
Entertainment	10.0%	7.3%	21.8%	10.6%
Other	8.9%	9.2%	21.5%	11.2%

traveling on weekdays were three times as likely to be heading to or from work/school as respondents traveling on weekends, while weekend respondents were twice as likely as weekday respondents to be heading for recreational activities. Nonetheless, travel to work, school, and business meetings on weekends remained relatively high. Passenger demand for Metromover service includes business and entertainment destinations on a daily basis.

General Ridership Growth

Average weekday ridership in FY 2001, as presented in Table 2-4, represents a significant increase for Metromover and exceeds the previous weekday high of 14,295 by almost 2,000 riders.

Table 2-4 - Metromover Average Daily Ridership

Fiscal Year	*Average Weekday*	*Average Saturday*	*Average Sunday*
1995	13,225	9,381	8,144
1996	12,712	6,760	6,258
1997	13,558	7,449	4,730
1998	13,735	5,987	4,463
1999	13,689	5,954	4,418
2000	14,295	5,943	4,614
2001	16,243	7,111	6,114

While Saturday and Sunday average ridership also increased, FY 2001 average weekend ridership remains well below levels recorded in FY 1995. Figure 2-2 represents annual ridership growth for average weekday, Saturday, and Sunday boardings from FY 1986 through FY 2001.

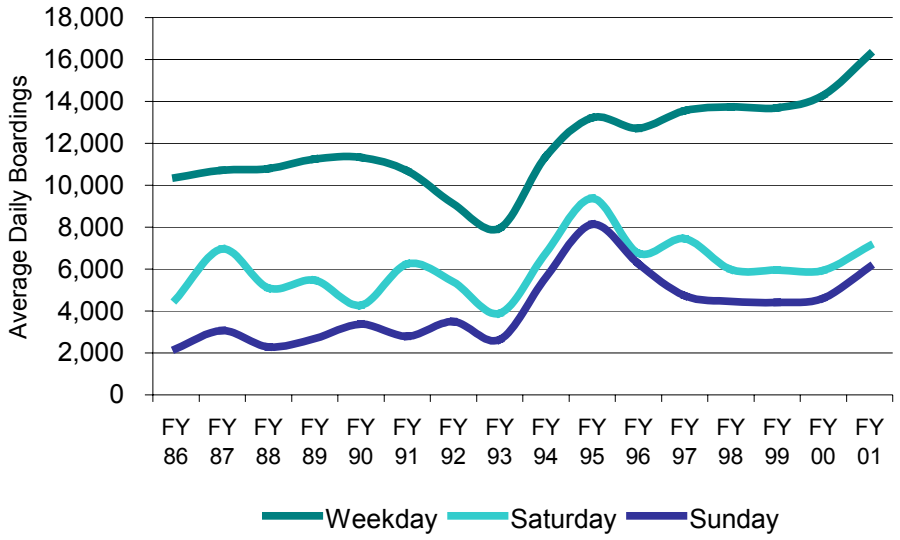


Figure 2-2 - Average Daily Boardings, FY 1986 – FY 2001
Weekday, Saturday & Sunday

Metromover total annual boardings are represented in Figure 2-3.

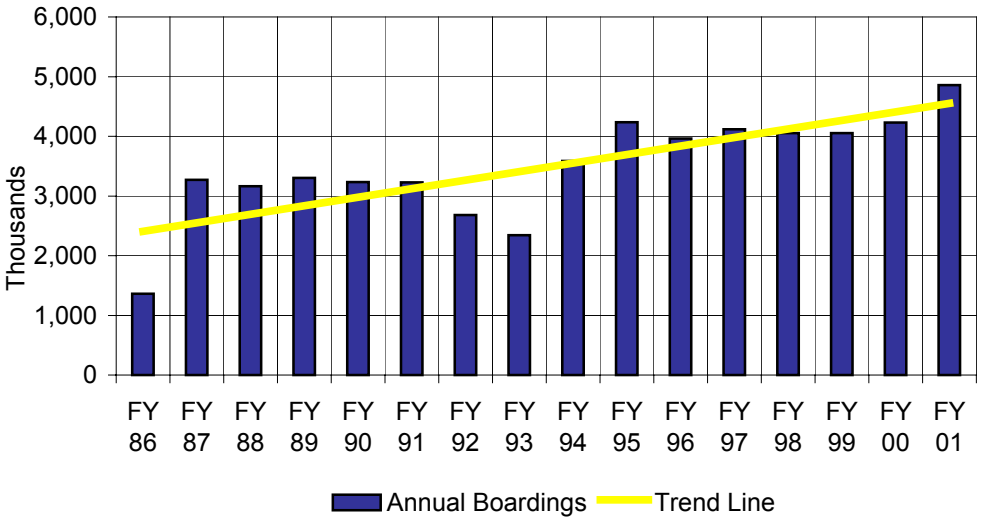


Figure 2-3 - Metromover Total Annual Boardings
FY 1985 – FY 2001

Metromover's total boardings by station for FY 2001 are identified in Table 2-5.

Table 2-5 - Metromover Station Boardings

	Boardings					
Stations	Weekday	Saturday	Sunday	Holiday	Total	% of Total
Government Center	1,706,608	174,954	136,768	57,479	2,075,810	42.7%
Bayfront Park	486,135	26,893	20,981	8,381	542,390	11.2%
Brickell	405,795	31,510	27,380	16,385	481,070	9.9%
College/Bayside	221,768	25,638	23,094	6,545	277,046	5.7%
Omni	219,900	26,073	24,380	6,633	276,986	5.7%
Miami Avenue	142,224	9,854	4,903	2,632	159,613	3.3%
Knight Center	133,554	9,309	6,519	2,430	151,811	3.1%
First Street	116,564	13,911	11,981	2,783	145,239	3.0%
College North	130,121	6,728	4,420	1,544	142,813	2.9%
Eighth Street	107,945	4,989	4,344	1,315	118,593	2.4%
Financial District	102,204	7,095	5,103	1,745	116,148	2.4%
School Board	59,015	9,328	7,653	1,750	77,746	1.6%
Tenth Street	55,292	2,429	1,743	671	60,135	1.2%
Arena/State Plaza	48,707	5,300	3,488	1,113	58,609	1.2%
Third Street	32,315	3,140	2,087	584	41,126	0.8%
Fifth Street	37,141	1,873	1,149	390	40,553	0.8%
Riverwalk	22,726	2,767	2,131	711	28,335	0.6%
Freedom Tower	16,803	2,555	1,885	576	21,819	0.4%
Eleventh Street	15,629	2,992	2,418	448	21,487	0.4%
Park West	14,395	2,442	1,789	406	19,033	0.4%

Over 40 percent of total boardings in FY 2001 occurred at Government Center, a key station on the Downtown Inner/Outer Loop. Government Center was followed by Bayfront Park Station, also on the Downtown Inner/Outer Loop, with 11 percent of total boardings. Brickell, a significant station on the Brickell extension, ranked third with 10 percent of the total boardings, followed by College/Bayside and Omni, each with 6 percent of total boardings. Omni Station is the most significant station on the Omni extension. Boardings by each station's percentage of the total are illustrated in Figure 2-4.

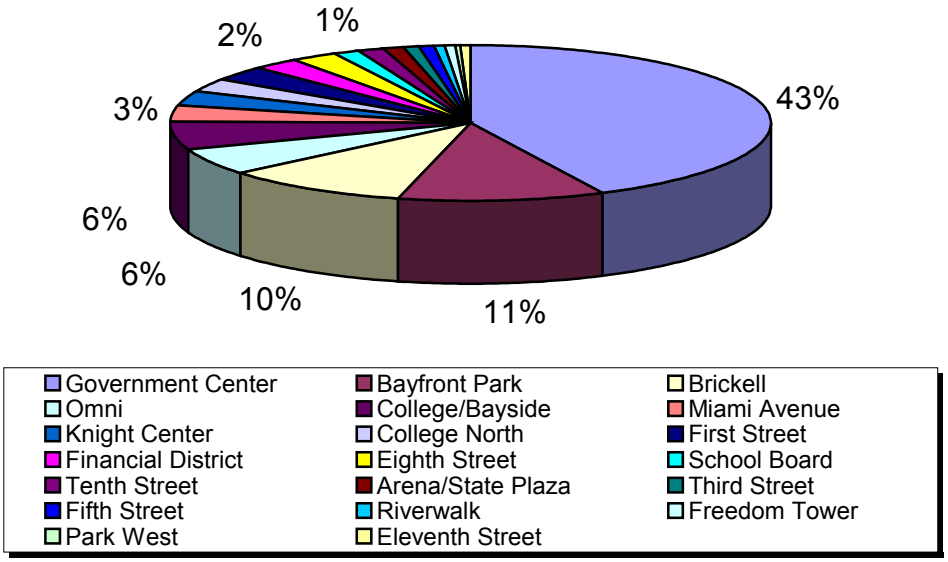


Figure 2-4 - Station Boardings % of Total

The significance of boardings at stations other than Government Center is difficult to determine because of the scope of the service provided at Government Center. The Center for Urban Transportation Research at the University of South Florida, (CUTR), examined boardings by station as part of the Phase II, Metromover and Operational Review Final Report dated April 10, 2002. CUTR awarded each station between 1 and 20 points based on where boardings at each station fell in relationship to all other stations. Government Center received 20 points in each of the types of days, since it recorded the highest station boardings on weekdays, Saturdays, Sundays, and Holidays.

Figure 2-5 is a graphic presentation of the ranking of the stations based on weekday, Saturday, Sunday, and holiday boardings. The stations on the Omni extension, Downtown Inner/Outer Loop, and Brickell extension are identified. Stations on all three loops fall into the highest boardings categories, indicating that high volume stations occur throughout the entire system.

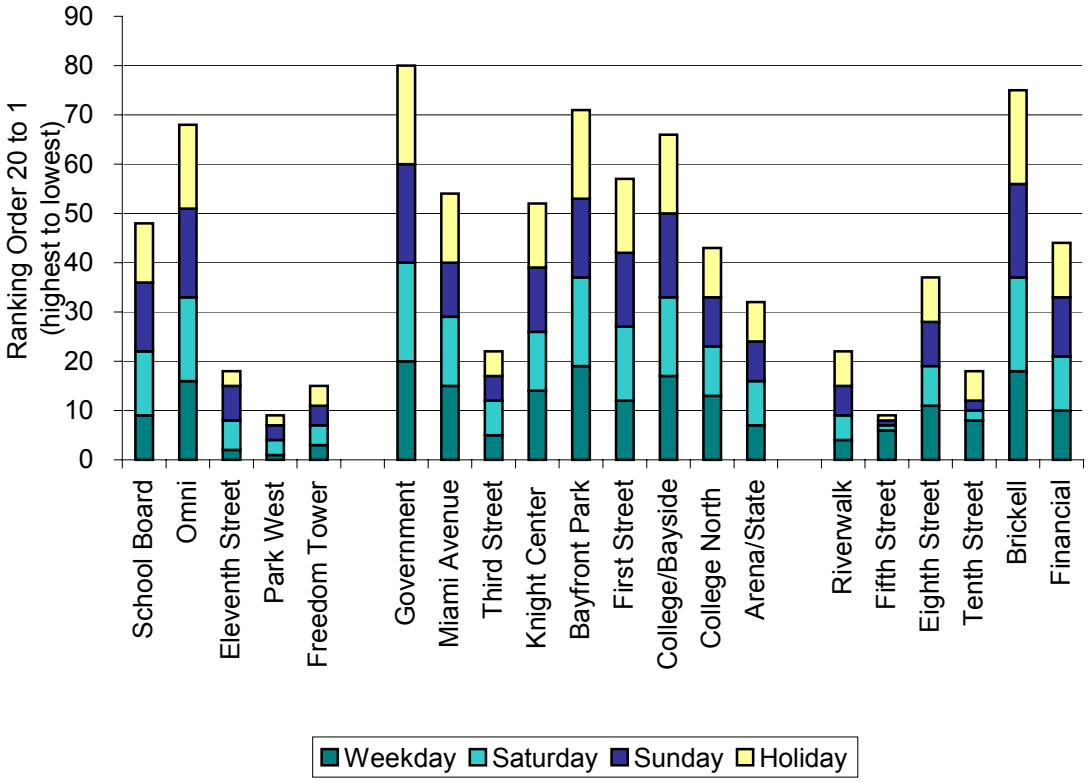


Figure 2-5 - Stations Ranked by Number of Boardings, FY 2001

Seasonal Variation in Passenger Demand

In comparison to previous years, FY 2001 boardings appeared to be disproportionately higher from March through August as illustrated in Figure 2-6.

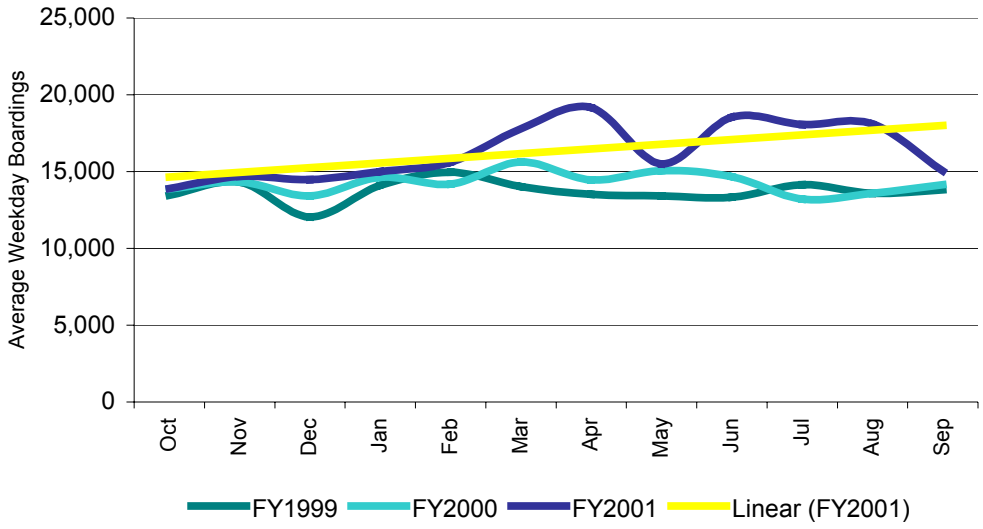


Figure 2-6 - Seasonal Variation in Passenger Demand
October 1999 – September 2001

Estimates of Future Demand

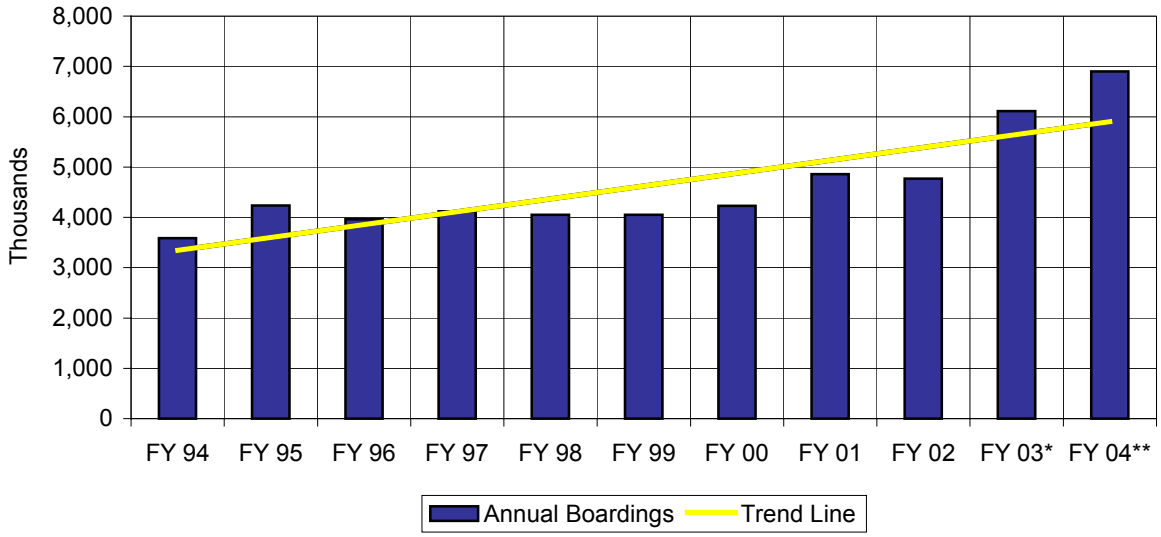
Rail Transportation supports the Service Plan developed by Service and Mobility Planning Division of Miami-Dade Transit for Metromover. The service plan defines system peak vehicle requirements to meet the operations schedule.

Service and Mobility Planning specifies vehicle configuration, i.e., single vehicles or two vehicles (coupled), and the number of vehicles required by time of day. Upon receipt of the service plan, Rail Transportation prepares a Metromover Operational Plan. The Operational Plan includes among other characteristics, distribution of total vehicle fleet to the categories of passenger service vehicles, recovery vehicles, maintenance assigned vehicles and inactive/stored vehicles.

Demand estimates for premium transit services are developed through the periodic updating of the Miami Urbanized Area Long Range Transportation Plan (LRTP) and the use of transportation models to ascertain daily trips taken by the population at large. Statistics taken into account include the area's population projections as well as the mix of various residential, commercial, and industrial land uses in the region, including other socio-economic factors, such as household income, education levels, auto ownership and/or availability, the location of major attractions or destinations, and employment centers.

Passenger demand is influenced not only by socio-economic factors, e.g., income levels and private automobile availability, but also by other factors such as weather, pricing of fares, retail price of fuel, parking fees, and transit system reliability.

On November 6, 2002, Metromover eliminated all passenger fares and initiated free service for all passengers. Boardings in FY 2003 and FY 2004 are projected to increase to over 6 million annually. Projected annual boardings of 6,900,380 for FY 2004 represent a ridership increase of 48.3 percent. Projected boardings are illustrated in Figure 2-7.



Notes: May 1994 – Brickell and Omni Loops opened for service; November 2002 – Metromover free for all passengers; *FY 2003 represents 8 months actual data plus 4 months projected data; **FY 2004 represents 12 months projected data.

Figure 2-7 - Projected Total Annual Boardings

Projected annual ridership by day of the week for FY 2003 and FY 2004 is presented in Figure 2-8.

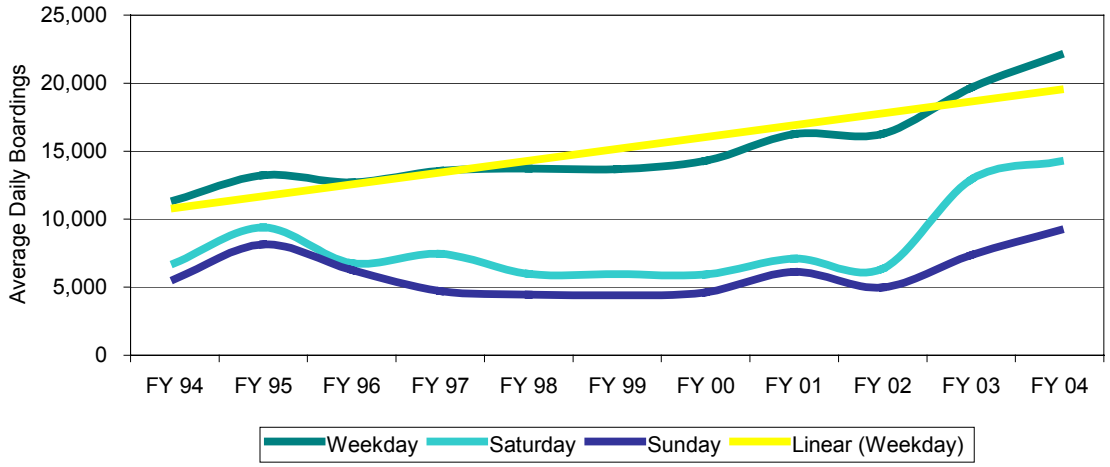


Figure 2-8 - Projected Daily Boardings, FY 2003 – FY 2004

Service Planning Model

The Metromover system serves as a major collector/distributor for the Metrorail system in the MCBD. While ridership is certainly a factor in determining service needs, other factors, such as connections with Metrorail and Metrobus and downtown activities including employment, shopping, and tourism, are significant in dictating system needs. Current weekday service requires a minimum of five (5) trains assigned to each of the three (3) loops - Inner Loop, Omni Loop, and Brickell Loop to achieve connections with Metrorail and Metrobus as well as to maintain established service headways. In FY 2002, two additional trains, configured as deuces (two-car trains) were added to the Inner Loop to meet passenger demands, and in FY 2003, one (1) additional train was added to the Omni Loop in response to passenger complaints of delays and overcrowding. The current weekday constant Peak Vehicle Requirement (PVR) is eighteen (18) vehicles configured as fifteen (15) trains, three of which are deuces in revenue service.

Span of Service and Peak Periods

Metromover service operates frequently and does not require timetables. By operating a consistent and reliable service, along with the high frequencies and service coverage, Metromover provides the incentive for people to travel throughout the MCBD to destinations that are within easy reach.

The Metromover span of service matches that of Metrorail. The peak period is designated from 5:15 a.m. to 7:00 p.m. and base service is operated in the evening between 7:00 p.m. and 12:30 a.m. Because of low ridership, the Brickell and Omni Extensions terminate service at 10:30 p.m. while the Inner Loop operates until 12:30 a.m.

Frequency of Service

Metromover vehicles are unmanned and do not have the associated operating costs of Metrorail. Therefore, the incremental costs of providing the highest level of service are significantly less than other modes. Headways vary from just over 2 minutes on the Inner Loop to slightly over 5 minutes on the Brickell and Omni legs of the Outer Loop.

Metromover headway is defined as the interval of time between two trains traveling in the same direction on the same track. Using this as a guideline, the following headways are observed with 15 trains in revenue service:

- Inner Loop 2:12 minutes
- Omni Loop 5:24 minutes
- Brickell Loop 5:24 minutes

From 7:00 pm until 10:30 pm, when the "full loop" configuration is used, the headway with 10 trains in operation is as follows:

- Full Loop 4:14 minutes

Factors considered when adjusting Metromover frequencies include:

- Number of cars available
- Load factors
- Passenger demand
- Route length
- Running time
- Downtown activities
- Attraction of new riders

Passenger Service Vehicle Requirements

Metromover provides passenger service over an 8.8-mile guideway consisting of three loops. All twenty-one stations are elevated. The guideway switch guides a vehicle from a single fixed guideway onto one of the two alternate fixed diverging guideways. The guideway automatic switches for Phase 1 of the system include six right hand switches and five left hand switches. In addition to these eleven automatic switches, Phase 2 uses five right hand and eight left hand switches, for a total of 24 automatic switches and one (1) manual switch. Metromover guideway tail tracks and turnbacks are used essentially for failure management strategies in terms of mitigating service interruptions, which may be a result of a vehicle or wayside failure, system disruptions or passenger emergencies. Figure 2-9 illustrates Metromover tracks, switches, signals and Emergency Trip System (ETS) buttons. The emergency trip system removes power from the guideway during maintenance or passenger egress onto the guideway by quickly de-energizing a powered section of the guideway that may endanger someone. The typical use of this system is carefully planned to isolate guideway switches or a section of the guideway for maintenance, while the remainder of the guideway remains operational.

Service level drives Metromover operating requirements just as it drives Metrorail's operating requirements; however, while Metrorail relies on service headways and passenger volumes to determine frequency of service and train configuration, Metromover relies solely on passengers volumes. Metromover operates based on a fixed rather than a variable headway. Therefore, service adjustments are driven by the ebb and flow of passenger volumes and are accomplished through the addition or reduction of cars in the train configuration rather than through changes in the frequency of service.

Each car has a normal capacity of 100 customers per car. The seated passenger load is 8, and the standing passenger load is 92. Vehicles are generally operated as single cars, normally referred to as trains but can be coupled as a “two-car” train to meet ridership demands. Based on 100 passengers per car, adding cars to trains would increase passenger capacity as outlined in Table 2-6.

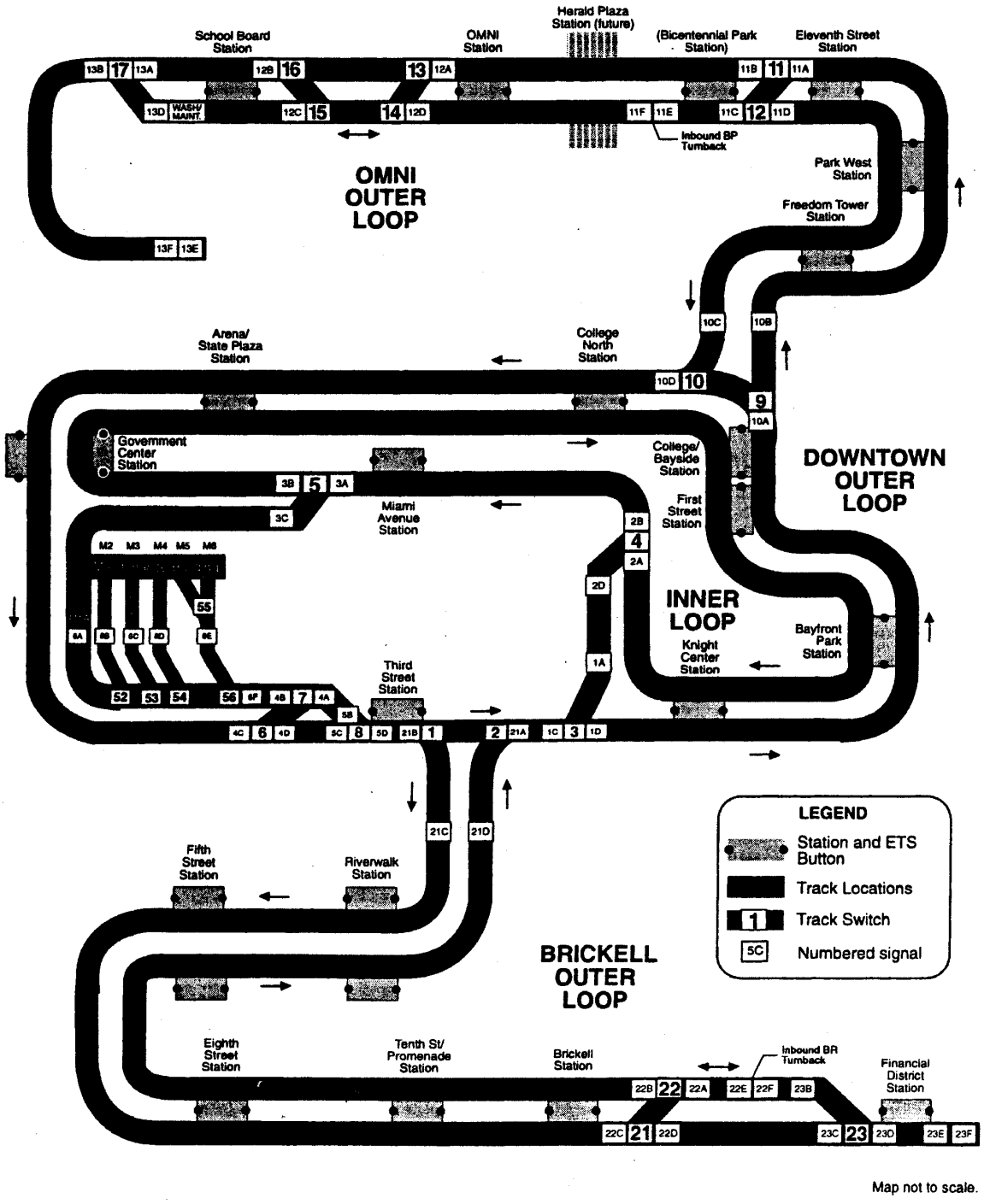


Figure 2-9 - Guideway Diagram of Metromover Tracks, Switches, Signals, and Emergency Trip Station (ETS) Buttons

Table 2-6 - Passenger Volumes Based on Two-Car Trains (Deuces)

Trains	*One-Car Trains*	*Two-Car Trains*	*Total Cars*	*Total Passengers*
Inner Loop, Omni Loop or Brickell Loop - Weekdays				
5	5	0	5	500
5	4	1	6	600
5	3	2	7	700
5	2	3	8	800
5	1	4	9	900
5	0	5	10	1,000
Inner Loop Weekends				
3	3	0	3	300
3	2	1	4	400
3	1	2	5	500
3	0	3	6	600
Full Loop Weekdays & Weekends				
10	10	0	10	1,000
10	9	1	11	1,100
10	8	2	12	1,200
10	7	3	13	1,300
10	6	4	14	1,400
10	5	5	15	1,500
10	4	6	16	1,600
10	3	7	17	1,700
10	2	8	18	1,800
10	1	9	19	1,900
10	0	10	20	2,000

Twice as many passengers can be served by doubling the number of cars. The limiting factor actually becomes the size of the available 29-vehicle fleet. Theoretically, in the absence of any vehicles assigned for maintenance and given the existing headways, at a maximum Metromover could operate 14 two-car trains and 1 one-car train, totaling 29 cars serving a total of 2,900 passengers.

Peak Vehicle Requirement (PVR)

The Peak Vehicle Requirement (PVR) is the total number of cars needed simultaneously in the peak period to satisfy passenger demand and failure management while keeping per-car passenger loads at or below a pre-determined level. Table 2-7 illustrates the car requirements based on peak and off-peak service requirements. The current weekday requirement for service demands (operating trains only) is 15 trains (12 single-car trains and three deuces, totaling 18 cars) during peak service. Weekend requirements are 13 trains (12 single-car trains and 1 deuce, totaling 14 cars).

Table 2-7 - Peak Vehicle Requirements

Location	*Trains*	*One-Car Trains*	*Two-Car Trains*	*Total Cars*
Weekdays				
Inner Loop	5	3	2	7
Omni Loop	5	4	1	6
Brickell Loop	5	5	0	5
Total	15	12	3	18
Weekends				
Inner Loop	3	3	0	3
Omni Loop	5	5	0	5
Brickell Loop	5	5	0	5
Total	13	13	0	13

Failure Management Strategies

Failure management vehicles (spares) can be used to supplement passenger service when incidents or vehicle malfunctions occur that require replacement vehicles. The Central Control Rail Traffic Controller determines when a replacement is required and advises the Metromover Maintenance Supervisor. Replacement vehicles are dispatched to revenue service as required. Due to infrequent use, zero failure management vehicles are allocated in the PVR.

Immediate failure management strategies are required to reduce passenger delay and eliminate crush loads. The following types of failure management are implemented upon initiation of vehicle replacement:

- Recovery Technicians stationed throughout the system are dispatched to troubleshoot failure or to collect data.
- A rescue train is routed to a disabled vehicle, which is unable to move, for coupling and manual removal from the system.
- Selected turn backs are utilized to expedite vehicle removal from Metromover guideway. The failure mode routes are Brickell turn back, Bicentennial Park turn back, and School Board inbound.
- Additional Metromover vehicles may be dispatched from maintenance to accommodate revenue service or special events.

System Failure

During operation of the Metromover System, it may be necessary to implement procedures that address system disruptions. During such disruptions, the general rules and guidelines of the Metromover Operating Plan are followed.

The primary concern of all Metromover personnel must be for the safety of the public on a stalled vehicle that is not in a station. Immediate voice communication by Central Control to the stalled vehicle and dispatch of maintenance personnel to the affected vehicle are critical. Special attention must be given to restricting use of door emergency pull handles.

Maintenance personnel, upon arrival at the scene, must advise Central Control of conditions and communicate with the passengers to inform them of their presence and provide assistance.

Following are the three primary reasons for failure management strategies to be deployed:

- Loss of Track Power
- Track Switch Failure
- Wayside Failures

Loss of Track Power

Loss of track power is indicated at Central Control when the power rail lights on the Power Distribution System (PDS) display panel change status from red to green and by a corresponding train control Cathode Ray Tube (CRT) message. This condition is associated with either a breaker trip or open operation. The breaker lights change status from red to either green/yellow or green, and the train control CRT shows the corresponding breaker trip or breaker open message.

Track Switch Failure

A track switch failure is due either to loss of locked indication or to loss of control to the switch. If a switch fails for the Inner Loop, Brickell Extension, or Omni Extension, the Rail Traffic Controller contacts the Metromover Supervisor and or Metromover Recovery Technician to investigate the problem, and in conjunction with the Rail Traffic Controller, to determine the best and safest course of action that will allow for service to continue on an appropriate default route.

Wayside Failures

False Occupancy
A false occupancy failure occurs when Central Control's Train Control display panel and CRT indicate track occupancy when no vehicle is in a specific track circuit. This false occupancy will not allow any movement in the specified Track circuit. If False Occupancy occurs in the Inner Loop, Brickell or Omni Extension, the Rail Traffic Controller contacts the Maintenance Supervisor and/or the designated Recovery Technician to investigate the occupancy. With the aid of

the Rail Traffic Controller, they determine the best and safest course of action to resume passenger service.

Occupancy Detection
An occupancy is posted for a given track circuit, if any one of these situations occurs:

- Track actually occupied
- Time Division Multiplex (TDM) failure, resulting either in disruption of the distribution of Data Down or the recovery of Data Back
- Failure in associated transmission circuitry
- Failure in associated reception circuitry
- Vital relay failure
- Broken or shorted track circuit cable
- Power loss to interlocking, a Tx/Rx cabinet or a MUX cabinet

Data Transmission System (DTS) - Phase II only
DTS provides discreet control of the PDS, the station chimes, and the Support Facility Alarms. The Central DTS also contains two serial data links to the Train Control Computer, which are used for event data logging and alarm discrimination. The remote drops contain a serial link to send graphic information to the station dynamic signs and a serial link to send and receive information from the station Automatic Train Operation (ATO) cabinet.

Automatic Train Operation (ATO)
The ATO cabinet has a dedicated serial link connection to the central computers through a station DTS drop for Phase II equipment, and Phase I is hardwired to interlocking. This link enables the central control computers and the individual ATO cabinets to exchange data on a continuous basis without the need for numerous signal relays. The central computers use this link to transmit the following information to the ATO cabinets:

- Central on-line signal
- Graphics codes for each platform
- Open door request for each platform
- Run through request for each platform

Each ATO cabinet uses its serial link connection to transmit the following status information to the central computers:

- Doors open berth 1 (for each platform)
- Doors open berth 2 (for each platform)
- Door edge active

Events and Influencing Factors Accounted for in Fleet Management Plan

Present System

Expansion of the present Metromover system is included in the 2025 Long Range Transportation Plan (LRTP) Update later years (Priority IV), and it consists of "closing" the Omni and Brickell Loops. However, these projects appear in the unfunded category at this time. The revitalization of Miami's CBD and development of larger scale office and residential projects is anticipated in the near future. The development of these projects may accelerate increased ridership trends creating the need to increase PVR and, eventually, the Metromover car fleet.

Metromover

Metromover, which began service in 1986, operates over a guideway that consists of a two-track 1.9-mile (3.1 km) loop through the core of the Miami Central Business District, a two-track 1.1-mile (1.8 km) extension south from the loop through the Brickell Business District, and a two-track 1.4-mile (2.3 km) extension north from the loop to the Omni area. There are 21 stations located on the existing system. Major destinations include: Bayside Marketplace, Miami Arena, Miami-Dade Community College, James L. Knight Center, Omni Mall, Dade County School Board, Miami Herald, American Airlines Arena, and the Stephen P. Clark Center.

Future System Development

The *Miami-Dade Long Range Transportation Plan for the Year 2025* projects a 39% increase in population within Miami-Dade County with a 34% increase in person trips as compared to current levels. The 20-year transportation "Needs Plan" identifies more than a hundred capacity improvement projects at a projected cost of $16.1 billion. After identifying a potential funding gap of almost $5 billion, Miami-Dade County developed a "Minimum Revenue Plan" that contains new low-technology transit corridor projects, postpones important highway improvements, and costs approximately two thirds of the cost of the Needs Plan. Improvement of the public transportation system is one of the primary emphases of the Minimum Revenue Plan. Priority projects include Bus Rapid Transit, Light Rail Transit, and additional Heavy Rail Connections. The Year 2025 Transportation Plan includes extension or expansion of the current Metromover system as *Unfunded Priority IV* projects consisting of "closing" the Omni and Brickell Loops. Funded improvements to the Metromover are focused on capital improvements identified in the 2001 Transportation Improvement Program (TIP) and on continued improvement of service reliability during the Transit Development Program (TDP) 2001-2006 time period.

People's Transportation Plan

The People's Transportation Plan calls for Metromover Inner Loop service to be improved to a 24-hour operation effective with the implementation of Metrorail 24-hour service in June 2003. Outer Loop service will continue with the current service pattern, since 24-hour bus service is planned. These Metrobus routes will serve the Omni and Brickell Metromover corridors.

Scheduling and Operating Strategies Used to Reduce In-Service Metromover Vehicle Requirements

Recovery Technicians

When service is interrupted, restoration of service with minimal disruption is of primary concern to MDT. Metromover utilizes four (4) recovery technicians and one (1) recovery supervisor throughout the system, Tuesday through Thursday during revenue service hours. One (1) technician is assigned to the Omni Extension, one (1) to the Brickell Extension and two (2) to the Inner/Outer Loop between the hours of 6:00 a.m. and 10:00 p.m. Between the hours of 10:00 p.m., and 6:00 a.m. one (1) recovery technician is assigned to monitor the system. Additionally, during special events and weekends, three (3) recovery technicians are also responsible for the Data Transmission System (DTS), PDS, vehicle and wayside systems.

To expedite the recovery process, if a problem is encountered on the system, and the vehicle cannot be returned to ATO mode or manually operated, the vehicle closest to the malfunctioning vehicle becomes the recovery vehicle to either tow or push the disabled train to the next station to remove passengers. When the vehicle has been cleared, the disabled vehicle is moved to the maintenance shop.

Section 2B: Estimation of Fleet Demand Resulting from Metromover Vehicle Maintenance Requirements

Two types of maintenance are performed on the Metromover vehicles:

Operating Maintenance: Scheduled (preventive) maintenance to include scheduled replacement of specific components and/or systems to improve the reliability of the Metromover car and Unscheduled (corrective) maintenance

8-10 Year Inspection: Corresponds to approximately 260,000 miles, and represents the most comprehensive and detailed evaluation of all components as well as replacement of major components of the guidance structure

Maintenance Assigned Vehicles

Maintenance assigned vehicles are those vehicles out of service for "scheduled" preventive maintenance and "unscheduled" corrective maintenance.

The number of vehicles in this category is determined by historic experience as reflected in records and in the Preventive Maintenance (PM) Program specifications. Based on FY 2002 records, the daily average of maintenance assigned vehicles declined from 8 to 6 due to a significant decline in "unscheduled" corrective maintenance.

Vehicle availability from October 2000 to September 2001 is reflected in Table 2-8. Active vehicles are those vehicles not currently stored; available vehicles are those vehicles ready for revenue service; and, unavailable vehicles are those vehicles assigned to vehicle maintenance for scheduled and unscheduled maintenance.

Table 2-8 - Active and Available Metromover Vehicles
October 2000 – September 2001

	2000			2001								
Status	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**
Cars	29	29	29	29	29	29	29	29	29	29	29	29
Active	29	29	29	29	27	25	25	26	25	25	26	27
Available	18	18	20	22	20	19	17	20	17	19	19	19
Unavailable	11	11	9	7	7	6	8	6	8	6	7	8

The relationship between "active" and "available" Metromover vehicles is illustrated in Figure 2-10.

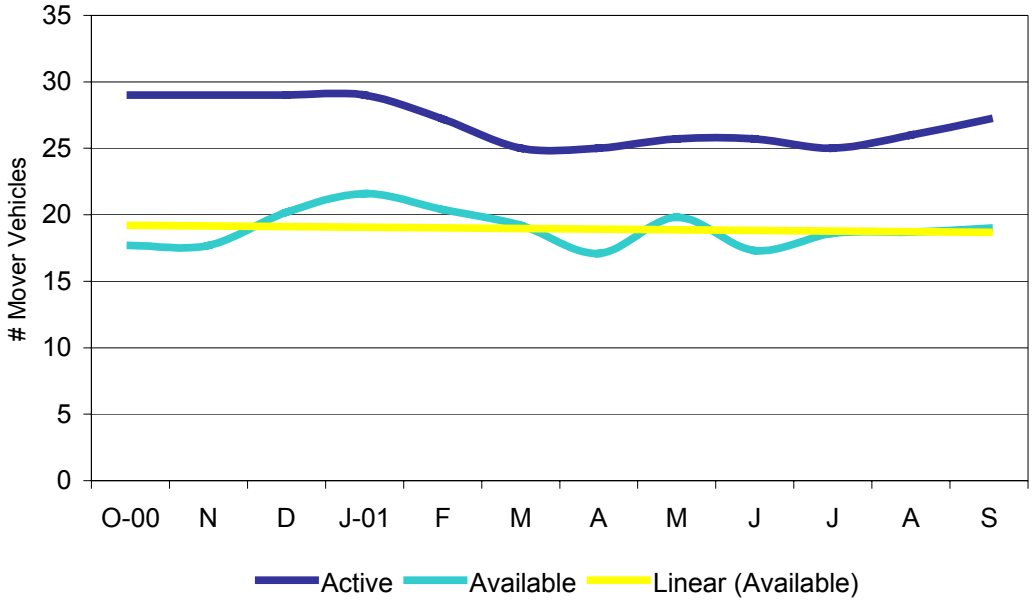


Figure 2-10 - Metromover "Vehicle" Availability
October 2000 – September 2001

Scheduled Preventive Maintenance (PM)

The Metromover transit vehicle scheduled maintenance program is designed to maintain vehicle reliability by detecting potential defects and allowing them to be corrected before they fail. It also permits servicing of equipment requiring lubrication, measurement, and adjustment. Vehicles are withdrawn from service at regular calendar and mileage-based intervals to permit scheduled preventive maintenance actions.

With assistance from Rail Maintenance Control and Field Engineering & Systems Maintenance, Metromover Maintenance incorporates "trend analysis" into the PM Program. Actual failures are tracked to establish failure rates for specific equipment types. Trends within those failure rates are established, and PM replacement schedules are adjusted for component replacement accordingly. Timely replacement of components based on actual failure rates minimizes in-service failures and improves the overall quality of Metromover service.

Rail Maintenance Control prepares the PM schedule using an on-time adherence window of five days before through five days after the target inspection date. To achieve on-time adherence, Metromover Maintenance Technicians are required to perform the PM on the day scheduled by Rail Maintenance Control as indicated on the PM calendar. The following is a summary of the types of inspection activities that make up the scheduled maintenance program.

Daily Inspection

- Safety test of the car-born automatic train control equipment
- Visual inspection of the interior and exterior of the car
- Functional test of safety-critical and passenger convenience components
- Defects are corrected prior to releasing the car for service

Schedule for Types of Inspections

- Scheduled inspections are classified as Type A, B, C, D, E, F, G, S and Brake PM/56 Day
- Inspections take place inside the maintenance facility
- Frequency of the inspections is listed in Table 2-2
- Sample "PM Packages" for these inspections are included in Appendices B-F

Vehicle Maintenance staff not only routinely complete 100% of the A-G inspections that are scheduled but also complete 100% of those inspections on time.

Metromover Vehicle Preventive Maintenance Schedule

The current PM scheduled is outlined in Table 2-9.

Table 2-9 - Metromover Vehicle PM Schedule

Inspection	*Inspection Interval*	*Interval Mileage*	*Labor Time (Hours)*
Daily	24 hours	71	0.3
A	37 days	2,627	17.6
B	75 days	5,325	23.2
C	225 days	15,975	33.3
D	450 days	31,950	129.8
E	900 days	63,900	107.8
F	4-5 years	130,000	101.0
G	8-10 years	260,000	
S	Removed from storage and returned to service		
Brake PM	56 days		

Type A
- Base level PM scheduled at a 37-day interval
- Aimed at preventing most common problems
- Includes: Couplers, HVAC, Brakes, Assemblies, Drive Wheels, Motors, Control Boxes, Reverser, Switches, Interior, Interior Subsystems, Doors and Door Operations, Exterior, Air Compressor, Underframe, and Battery

Type B
- Scheduled at a 75-day interval
- Includes all the requirements of the Type A Inspection
- Includes additional tasks aimed at more in-depth checks of the components

Type C
- Scheduled at a 225-day interval
- Encompasses all the requirements of the previous inspections
- Adds more detailed checks of the friction brakes and electrical systems

Type D
- Scheduled at a 450-day interval
- Includes all of the tasks of the previous level

Type E
- Scheduled at a 900-day interval
- Includes all of the tasks of the previous level

Type F
- Scheduled at a 4-5 year interval
- Includes all of the tasks of the previous levels
- Evaluates all major components with replacement as required

Type G
- Scheduled at an 8-10 year interval
- Most comprehensive with detailed evaluation of all components
- Replace major components of guidance structure

Type S
- Performed when vehicles are removed from storage and returned to active service

Brake PM/56 Day
- Scheduled at a 56-day interval
- Ensures integrity of the vehicle emergency braking system
- Completed on all vehicles when removed from storage

Scheduled Component Overhaul

F-Inspection
- Represents the 4-5 year component overhaul corresponding to approximately 130,000 miles

G-Inspection
- Represents an 8-10 year overhaul interval, corresponding to approximately 260,000 miles

To date, 26 vehicles have undergone an F-inspection while 4 vehicles have received a G-Inspection. The overhaul includes the braking system, Heating, Ventilation and Air Conditioning (HVAC) equipment, guide wheels, doors, motor controls, and air system. Personnel at the Metromover Maintenance Shop perform equipment overhaul with assistance from outside vendors. Cumulative mileage of vehicles is included in Appendix G.

Cleaning Program

The cleaning program consists of two levels of interior and exterior cleaning accomplished during off-peak and non-revenue hours. Cleaning of the guideway station tracks is completed on a semi-annual schedule throughout the year.

- Level One
  - Performed daily by two specifically assigned Cleaners
  - Includes: vacuuming floors, inspecting scratched side panels and end cap seats, cleaning of interior windows, panels, and seats
  - Cars with graffiti or vandalism are removed from service immediately
  - Exterior washing is performed three times per week by Metromover Technicians who manually drive the trains through an automatic car wash as the trains are daily inspected at the School Board inspection facility

- Level Two
  - Performed six times per year
  - Includes interior detail cleaning (hand washing) of vehicle ceilings, light fixtures, seats, polishing interior stainless steel with steel bright, and the shampooing and vacuuming of carpet
  - Exterior detail cleaning consists of buffing and waxing (hand polishing the vehicle body, tire dressing and hub cleaning, and undercarriage touch-up

- Cleaning is performed at the Metromover Maintenance building and the School Board inspection shop

Preventive Maintenance Program Monitoring and Support

Responsibility for development of and revisions to the scheduled maintenance program lies with Field Engineering and Systems Maintenance Division, Metromover Maintenance, and Rail Maintenance Control (RMC).

Maintenance Management Information System

Throughout MDT, a variety of both manual and automated systems are used for managing inventory, purchasing, creating and tracking work orders, labor allocation and other maintenance and materials management functions. Most systems are not interfaced and do not communicate with one another, which causes data to be duplicated and results in the production of inconsistent reporting throughout MDT. The two largest systems, Transit Rail Inventory (TRI) and Transit Equipment Administration (TEA) are 20-year old mainframe applications that are costly to maintain and difficult for personnel to use.

On October 3, 2000, the Materials Management & Maintenance (M3) Project was officially started to address these problems. A committee comprised of members of all functional areas was created. Committee members were responsible for submitting user requirements and attending vendor demonstrations. Information Technology Services completed the "Feasibility Study" on August 9, 2001. The M3 Project is presently in the procurement phase. MDT plans to replace the TEA by November 2005.

Since 1986, serialized components have been tracked to facilitate scheduled overhauls/repairs and reliability analysis. All materials have been tracked and reported.

Reliability Improvement Program

Several programs are in place to improve the reliability of equipment through upgrade of existing components and/or replacement of units. These include:

- HVAC
- Differential Replacement for Phase 1 Vehicles
  Replacement of the differential has been accomplished on all of the 12 Phase 1 vehicles.
- Digi-Trip System – Power Distribution System (PDS) – Replace obsolete Amp-tector
- Grounding Switch – Addition of a grounding switch at School Board Maintenance to expedite repairs found on Daily PM inspections

The following improvements are being implemented as a result of the Metromover Healthcheck:

1) Pressure Cleaning Metromover guideway – Cleaning scheduled and Standard Operating Procedure for cleaning has been developed
2) Power Feed and Power Cable – Re-route or re-enforce cable insulation between the "I" Beam and support brackets; Investigate the possibility of contractor evaluation of cable (high pot testing)
3) Guideway Switches – Include yearly replacement of speed ramps as part of the Preventive Maintenance Program
4) Vehicle Couplers – Add detailed inspection to 5K inspections
5) Component Shop – Two Metromover Maintenance Technicians are currently assigned to the Metromover Component Shop established in September 2001; primary responsibilities support rebuilding of worn or defective parts resulting from vehicle inspections, running maintenance, and the rebuilding of wayside track and switch components; positive results to date include significant cost savings, greater control over repairs, and improved turnaround time for components rebuilt in-house
6) Differential Pinion Seals – Re-chroming yokes and replacing seals
7) Vehicle A/C Units – Change out metal fresh air intake filters to disposable paper type; Ensure the re-heat switches are in the "on" position
8) Motor Control Box – Change all hardware to stainless steel
9) Vehicle Joy Plugs – Five (5) year replacement
10) Equipment Racks – Add cleaning and inspecting terminal boards and solder joints to the "D" PM Inspection package
11) Vehicle Doors – Replace existing nutcracker with new type LS6 switch
12) Program Station Stop Tape – Change out PSS tape on entire system, starting with Phase I equipment
13) Vehicle Drive Shafts – Change out drive shafts on the Metromover Fleet with balanced shafts
14) Battery and Auxiliary Control Boxes – Change out the capacitor in both the battery charger and auxiliary control circuits on the "D" PM inspection package
15) Vehicle Collector Assemblies – Complete overhaul of the assemblies on the "D" PM inspection

The philosophy and goals of the Metrorail/Metromover Maintenance Program Policy are to maximize cost effectiveness of maintenance efforts consistent with safe operations through a proper balance of preventive maintenance, corrective maintenance, and systems improvements, where necessary. Appendix A provides an outline of the MDT Metrorail/Metromover Maintenance Program Policy. The mission of the maintenance program is accomplished through the following objectives:

- Eliminate increases in component failure rates due to equipment age
- Increase reliability of components and subsystems through identification and modification of existing design
- Improve efficiency of maintenance operations through:
  - Productivity-enhancing capital investments
  - Re-design of shop processes
  - Enhancement of the skills of the workforce, and
  - Application of state-of-the-art repair techniques and test equipment

Safety

- Of primary concern, and above all other concerns is ensuring that the entire system, including passenger vehicles, operates safely at all times

Reliability

- System reputation and ridership depend on overall performance
- Excessive disruptions in service are unacceptable and must be kept to a minimum
- To maintain a high standard of reliability, all required maintenance must be performed at proper intervals
- Scheduled overhaul is in place to extend the life and dependability of the vehicles
- To assist in lowering component failures, the maintenance engineering process of identification of problems and equipment modification in the event of ongoing equipment malfunctions through MDT's Change Review Board must be supported

Quality

- Safe and reliable performance can only be achieved if quality work is performed
- Quality increases reliability and safety
- Safety, reliability, and quality are inseparable, dependent concepts essential to the provision of first class transit service

Cleaning

- Clean, comfortable vehicles are essential to providing quality service to MDT customers and are a tangible reflection of MDT's commitment to customer service.

Metromover Vehicle Maintenance continues to strive to meet all preventive maintenance schedules at a 100% on-time completion rate and corrective maintenance requirements achievable with allocated resources.

Unscheduled Corrective Maintenance

When maintenance repairs are required as a result of in-service failures, it is difficult to compensate for the absence of the equipment. Service quality suffers, and the cost of repairing failed equipment can be more expensive than planned repairs. The approved MDT Metrorail/Metromover Maintenance Program Policy strives to minimize unscheduled corrective maintenance to avoid the accompanying service quality degradation.

From the first day of revenue operation, Metromover Maintenance has had an excellent preventive maintenance program for routinely inspecting, cleaning, adjusting, testing, and repairing components to prevent revenue failures. Because of this excellent program, with a nearly 100% completion rate, service failures have been minimized, and the division has consistently been able to provide the required number of cars for revenue service throughout the year.

Figure 2-11 illustrates the mean miles between service failures during FY 2001, which are calculated by dividing the number of vehicle miles operated to the number of vehicle guideway hardware failures that resulted in a service interruption. Given that this method of calculating mean miles between service failures includes all failures regardless of the length of the disruption caused by those failures, little can be concluded concerning Metromover's performance from a passenger impact perspective. In October 2001, Metromover redefined "failure" for performance reporting. The methodology for measuring Mean Miles Between Service Failures (MMBSF) performance for Metromover in the future will be based on service disruptions equal to or greater than 2 minutes per Rail Operations Standard Operating Procedures 81.09. Establishing a range of time for service interruptions provides a better indication of disruptions that actually impact passengers and brings Metromover more in line with the reporting methodologies common within other transit agencies.

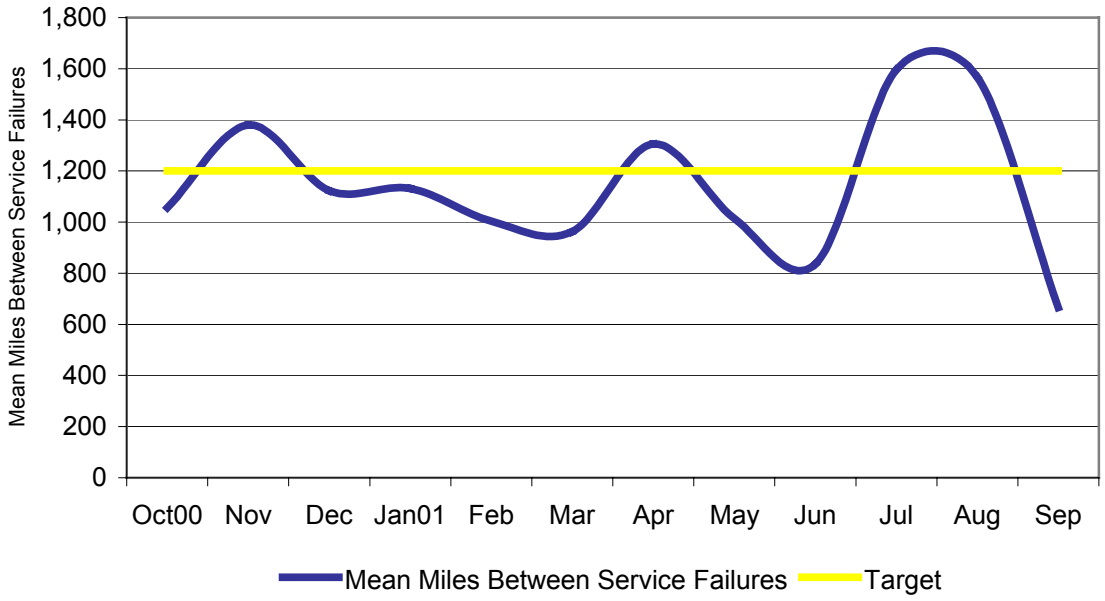


Figure 2-11 - Mean Miles Between Failures
October 2000 – September 2001

Metromover Vehicle Malfunctions

Safety-Related Failures

Safety is a primary concern that affects all levels of MDT activities, including operations and maintenance. MDT personnel are charged with the responsibility of insuring the safety of passengers, employees, property, and the general public. Whenever a Metromover vehicle is reported for a problem with safety-related car-born equipment, the car is immediately removed from service. This is consistent with MDT's System Safety Operating Plan.

Metromover vehicles are equipped with several fail-safe system interlocks. They include:

- Automatic Train Protection
- Automatic Train Operation
- Propulsion System
- Braking System
- Door Systems

Any failure to one of the vehicles' fail-safe systems will not allow the vehicle to move until the fault is cleared or the failed system is bypassed. Vehicles are immediately removed from service when they experience a failure to a critical

fail-safe system. Passengers are off-loaded at the first available station when a train is moved with a fail-safe system bypassed.

NOTE: *Any condition that exhibits a safety hazard to passengers or employees requires corrective action and the vehicle will be removed from service. Any vehicle that exhibits a carborne system failure impacting the safety of passengers or employees is removed from service. This action is consistent with MDT's operating philosophy as well as MDT's System Safety Operating Plan.*

FY 2001 system repairs are provided in Table 2-10.

Table 2-10 - Metromover Fleet Repairs

Tier	System	FY2001	% of Total
I	Electrical	441	19.4%
	Doors	393	17.3%
II	Automatic Train Control	213	9.4%
	HVAC	206	9.1%
III	Lighting	177	7.8%
	Pneumatic	155	6.8%
	Drive	139	6.1%
	Body	130	5.7%
	Guidance	121	5.3%
	Prop & Dynamic Braking	98	4.3%
	Suspension	77	3.4%
	Friction Brakes	53	2.3%
	Spring Brake	31	1.4%
	Communications	28	1.2%
	Miscellaneous	14	0.6%
	Total	2,276	

Repairs with the greatest frequency were electrical in nature followed by door repairs. Electrical and door repairs accounted for over 36% of total repairs, and each of those repairs almost doubled the next highest types of repairs, Automatic Train Control and HVAC, which each represented approximately 9% of total repairs.

Repairs generally occurred in three tiers with the first tier showing a range of 17 to 19% of total repairs. The second tier ranged from 9.1 to 9.4% of total repairs. Repairs in the third tier fell below 7% of the total. Fleet repairs identified by each system's percentage of the total are illustrated in Figure 2-12.

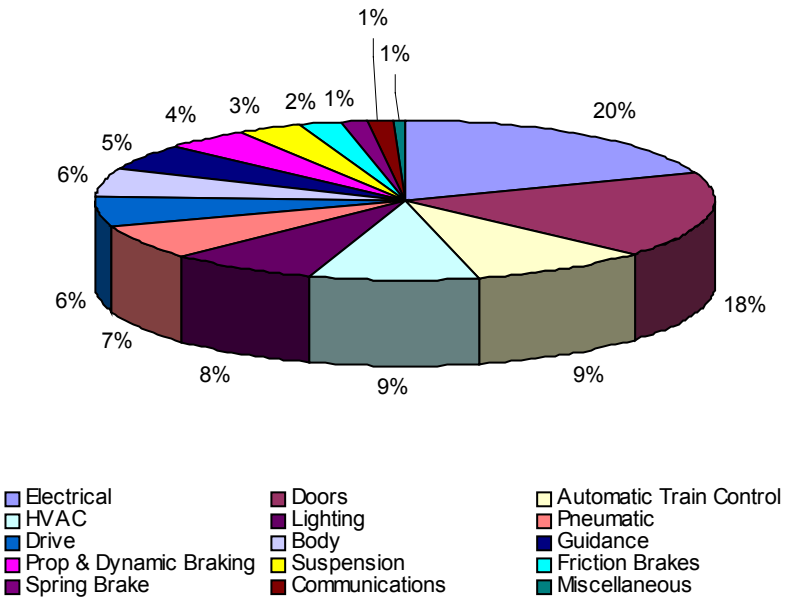


Figure 2-12 - Metromover System Repairs
% Total Repairs

Removal of Vehicles from Passenger Service

In addition to equipment-related malfunctions, which result in removal of vehicles from service, vehicles must be removed from passenger service under a number of safety-related failure conditions. Rail Transportation assures strict adherence to the Metromover Rules and Procedures Manual. Table 2-11 specifies the conditions of operating rules for Metromover Maintenance excerpted from the Metromover Operation Rules and Procedures Manual.

Other Types of Failures

In addition to safety-related conditions, MDT removes vehicles from service that have an adverse affect on passengers. Examples include the following:

- Battery Charger Failure
- Doors Fail to Open
- No Service Brake Release
- Low Air Pressure
- No Dynamic Brakes
- Motor Overload
- No Spring Brakes
- HVAC Failure
- Guidewheels

- ATO Status Alarm
- Overspeed Alarm
- CAD/AVL Communications Failure
- Collector Shoe Assemblies
- Loss of Speed Code
- Stop with Code Alarms
- Flat Tire
- Service Brake Alarms
- General Class I
- General Class II
- Graffiti

Table 2-11 - Metromover Operations Rules and Procedure Manual Operating Rules

Rule #	*Requirements*
4037	Vehicle operators must use care when coupling and uncoupling vehicles to avoid injury or damage.
4063	Do not move a vehicle with a damaged collector shoe assembly until it is secured from contact with the power rail.
4066	Power must be removed underneath the Service Truck, prior to any movement.
4067	Operator of the maintenance service truck shall be governed by all vehicle movement Rules and Procedures, except in specified work areas (referencing Rule #4057, which governs movement inside a work area).
4068	Operator of the maintenance service truck shall test the brakes and check with Central Control for occupancy detection prior to use.
4069	Operator of the service maintenance truck shall operate not exceeding restricted speed.

Environmental Conditions Affecting the Spare Factor

A variety of environmental impacts criteria were analyzed, and it was determined they have no significant impact in the Operating Spare Ratio (OSR). The OSR, therefore, is not adjusted to account for exceptional environmental hazards.

The main issues regarding environmental conditions that do affect the OSR in Miami include the following:

- Metromover system line is elevated (grade-separated)
- Metromover cars are stored on open air guideway

- Metromover system traverses parts of Miami-Dade County that are, for the most part, within the 100 – and/or 500-year flood plain
- Possible environmental hazards include:
  - On a regular, seasonal basis: wind-driven rain, sun exposure (ultraviolet rays) impact on car appearance, and direct lightning strikes on cars and equipment
  - On an irregular, seasonal basis: area is subject to direct and/or indirect effects of tropical storms, including category 1-5 hurricanes (during the wet season from June 1 until November 30), and very infrequently, tornadoes can occur

Based on recent history, it appears the only significant danger is that the area where a major portion of the fleet is located sustains a direct hit by a tornado or a major hurricane. Hurricane Andrew in August 1992 was the last and only (major) hurricane experienced in the area since the opening of Metromover. This was a Category 4 storm whose center passed through the South Florida area, some 30 miles south of the southern terminus of the Metromover system (southern most station). Should a similar storm pass closer to (or over) the yard and shop area, some damage may be expected to the vehicles.

Since these are unpredictable natural occurrences, a "hurricane preparedness" plan has been developed to help mitigate the possible damage done by a storm's direct hit. This preparedness plan is revised and re-issued annually prior to the hurricane season.

Covered and protected areas for storage of cars can accommodate up to 22 vehicles. Areas for use during adverse weather include: Stephen P. Clark Center, Metromover Maintenance Facility, School Board Maintenance, and Knight Center.

Vehicles Out of Service: The Operating Spare Ratio

FTA defines the Operating Spare Ratio (OSR) as follows:

$$\text{Operating Spare Ratio} = \frac{\text{Total Fleet} - \text{Peak Vehicles Required}}{\text{Peak Vehicles Required}}$$

MDT chooses to use the Operating Spare Ratio (OSR) as an indicator of proper available fleet utilization. For FY 2003, the MDT operating spare ratio, as defined by FTA, equals 61.1% as indicated by the following calculation:

FY 2003:

Total Fleet	=	29
PVR	=	18
Operating Spare Ratio	=	(29 – 18) / 18 = 61.1%

MDT's OSR has declined since FY 2001. The total active fleet has remained constant at 29, while the PVR rose from 15 to 17 in FY 2002 and to 18 in FY 2003. This 20% increase in the PVR reduced the MDT OSR from 93% to 61% in FY 2003.

Revenue vehicle supply and demand for FY 1999 through FY 2009 are reflected in Table 2-12 and looking forward are based on a PVR ranging from 18-22, maintenance requirements of 6, and allocation of 1 vehicle for modernization during FY 2005 followed by 5 vehicles in FY 2006 and 6 vehicles in FY 2007[1]. It is also assumed that vehicles will not be assigned to short-term storage/rotation during the modernization program.

Table 2-12 - Revenue Vehicle Demand and Supply FY 1999 – FY 2009

Vehicle Demand and Supply of Revenue Vehicles											
	FY 99	*FY 00*	*FY 01*	*FY 02*	*FY 03*	*FY 04*	*FY 05*	*FY 06*	*FY 07*	*FY 08*	*FY09*
VEHICLE DEMAND											
Operating Requirements											
Scheduled on Line	15	15	15	17	18	18-22[2]	18-22	18-22	18-22	18-22	18-22
Peak Vehicle Requirements	15	15	15	17	18	18-22	18-22	18-22	18-22	18-22	18-22
Maintenance Requirements											
Scheduled Maintenance	2	2	2	3	3	3	3	3	3	3	3
Unscheduled Maintenance	6	6	6	3	3	3	3	3	3	3	3
Maintenance Total	8	8	8	6	6	6	6	6	6	6	6
VEHICLE SUPPLY											
Vehicles Owned											
Vehicles Owned/Purchased	29	29	29	29	29	29	29	29	29	29	29
Total Stored/Rotation Vehicles	6	3	3	3	0	0	0	0	0	0	0
Planned Procurement	0	0	0	0	0	0	0	0	0	0	0
Adjustment to Vehicle Supply											
Accident Damaged Vehicles	0	0	0	0							
Car Modernization	0	0	0	0			1	5	6	0	0
Total Fleet	29	29	29	29	29	29	28	24	23	29	29
FTA Operating Spare Ratio	93%	93%	93%	71%	61%	61-32%	56-27%	33-9%	28-5%	61-32%	61-32%

Note: FY 2003 – FY 2009 figures are projections based on preliminary planning to date

[1] This schedule is based on the assumption that Phase I vehicles will be rehabilitated rather than replaced, and that the rehabilitation will occur within a 3-year cycle. The consultant will complete a cost-benefit analysis during the modernization process to determine the best course of action (replacement versus rehabilitation of Metromover Phase 1 vehicles) for Miami-Dade Transit.

[2] Growth is based on a 20% increase in PVR and current ridership figures which rose from an FY 2001 average weekday of 16,243 to 17,597 in August 2002, an 8% increase.

Special Events

MDT provides extra service to support increased ridership to special events (i.e., sporting events, concerts, etc.). Specific service needs are based on historical trends and Metrorail transfer requirements. Extra service includes not only expanded hours of service but also reconfiguration of trains from single-cars to two-cars. As noted earlier, Freedom Tower and Park West Stations normally close at 7:00 p.m. daily; however, the stations remain open after 7:00 p.m. for scheduled events at American Airlines Arena.

The Effect of Maintenance Policy on the Spares Ratio

Spare Vehicles

Spare vehicles are revenue vehicles that are required by MDT to accommodate the following activities while, at the same time, maintaining planned schedules:

- Routine requirements
- Heavy maintenance requirements
- Unexpected vehicle breakdowns
- Accidents
- Other

Passenger Service Vehicles

Passenger service vehicles are those vehicles scheduled on the guideway during peak periods to provide revenue service in addition to the failure management vehicles required to insure the provision of a minimum number of revenue vehicles. This Peak Vehicle Requirement varies and is based on the level of service being provided at a given time including:

- MDT's Service Planning Guidelines
- Ridership
- Demand patterns

Past Experience

Over the past three years, MDT has determined that an adequate spare ratio is necessary to ensure PVR is met daily. If not for the fact that MDT had an adequate fleet spare ratio, service quality would have deteriorated.

Current Spares Requirements

Based on a daily average of vehicles out of service from October 2000 through March 2002, to maintain the current level of performance in the maintenance shop, approximately 6 vehicles must be held out of service for scheduled and unscheduled repairs. Based on maintenance data, calculation of the maintenance demand is presented in Table 2-13:

Table 2-13 - Calculation of Maintenance Vehicle Demand

Need	*Vehicles Per Day*
Preventive Maintenance (PM)	3
Repair	3
Scheduled Overhaul	0
Total	6

Metromover Maintenance Facilities

There is currently one Metromover maintenance repair facility in operation. Daily inspections and light cleaning are performed at the School Board Maintenance area. Maintenance and inspection facilities are identified in Table 2-14.

Table 2-14 - Metromover Maintenance Facilities

Shop	*Line*	*Year Opened*	*Function*
Downtown	Phases I and II	1986	Heavy Repair Overhaul Inspection and Heavy Repair
School Board	Phase II	1994	Daily Inspection Light Cleaning

SECTION III: THE SUPPLY OF REVENUE VEHICLES

This section of the Metromover Fleet Management Plan addresses the supply of Metromover revenue vehicles, explains the balance between the demand for vehicles and the supply of vehicles, and summarizes the maintenance plan.

Planned Metromover Vehicle Procurements

There are no plans in place at this time to procure additional vehicles.

Procurement Schedule Table

When a need for additional vehicles is recognized, an appropriate schedule will be developed.

Adjustment to Vehicle Supply

Accident Damaged Vehicles

There are presently no vehicles out of service due to accidents.

Stored/Rotation Vehicles

In an effort to minimize mileage within the Phase 2 fleet to ensure a fleet of sufficient size in the future and to maximize the use of the Phase 1 vehicles until their midlife overhaul, Metromover uses a short-term storage program where the two (2) highest-mileage Phase 2 vehicles spend a maximum of 90 days in storage. The vehicles receive regularly scheduled inspections prior to storage and are capable of returning to service immediately at the end of the 90-day storage period after receiving a storage inspection. The vehicles spend 90 days in storage and then 90 days in revenue service prior to being returned to storage if their mileage continues to rate in the top two (2) of the Phase 2 vehicles. The mandatory return to revenue service after a 90-day period in storage eliminates a vehicle remaining in storage indefinitely.

The procedure for storing and rotating Metromover vehicles is as follows:

- Maximum of three (3) vehicles stored at any given time
- Vehicles are removed from service for storage and rotation on a staggered schedule not less than one (1) week apart
- Vehicles are placed in storage after the regularly scheduled vehicle preventive maintenance inspection has been completed

- Vehicles selected for storage will be those active Phase 2 vehicles that have accumulated the highest mileage
- Only vehicles that are ready for revenue service are stored
- Once committed to storage, vehicles are not removed from storage until the 90-day period has ended
- When vehicles are removed from storage and returned to active service, they receive an “S” inspection
- The 56-day Brake Test PM will be performed prior to the vehicle being placed in passenger (revenue) service
- Maintenance Control is responsible for scheduling vehicles into and out of storage, maintaining and monitoring the necessary records so as to ensure compliance with the approved PM program

A summary of vehicle storage/rotation is presented in Table 3-1.

In the event of the implementation of 24-hour revenue service outlined in the People’s Transportation Plan, all Mover vehicles will be removed from storage, and the storage rotation program will become inactive.

Table 3-1 - Metromover Stored Vehicle Rotation

Car	Date Stored	Date Removed	Days Stored	Date Stored	Date Removed	Days Stored	Date Stored	Date Removed	Days Stored	Cumulative Miles 09/30/01
MC001	06/13/96	06/17/99	(1,099)							356,677
MC002	04/14/99	07/12/99	(89)							482,914
MC003	01/15/00	04/17/00	(93)							445,278
MC004	09/09/96	12/03/98	(907)							386,800
MC005	04/19/00	07/18/00	(90)							474,077
MC006	04/27/96	01/27/97	(275)							422,982
MC007	07/19/00	08/21/00	(33)	09/03/99	12/02/99	(90)				552,823
MC008	04/13/00	07/06/00	(84)							509,353
MC009	01/11/00	04/12/00	(92)							412,622
MC010	02/11/00	04/26/00	(75)							489,345
MC011	01/13/98	12/02/99	(688)							374,299
MC012	01/01/95	01/01/96	(365)							335,892
MC013	01/13/97	11/28/99	(1,049)							212,418
MC014	01/18/02	04/19/02	(91)	10/24/01	12/07/01	(44)				305,808
MC015*	04/02/02			08/28/01	11/09/01	(73)	02/28/01	05/31/01	(92)	319,257
MC016*	04/23/02			08/09/00	08/21/00	(12)				229,724
MC017	04/27/00	08/08/00	(103)							288,120
MC018	07/23/96	07/02/97	(344)							269,965
MC019	05/19/01	08/16/01	(89)							320,497
MC020	12/22/97	03/02/99	(435)							234,543
MC021	06/08/01	08/27/01	(80)							293,500
MC022	08/07/96	06/28/97	(325)							263,038
MC023	01/18/02	04/20/02	(92)	03/01/01	06/05/01	(96)	07/22/00	08/21/00	(30)	335,900
MC024*	04/17/02			02/07/01	05/11/01	(93)				324,303
MC025	10/19/01	11/18/01	(30)	09/05/01	09/14/01	(9)				307,278
MC026	01/05/02	04/05/02	(90)	05/04/01	08/10/01	(98)				335,152
MC027	10/01/01	11/08/01	(38)	02/01/01	04/30/01	(88)				303,907
MC028	06/19/01	09/07/01	(80)							284,103
MC029	11/15/97	08/04/00	(993)							182,324

*Indicates a vehicle currently in storage.

Metromover Vehicle – Mid-life Modernization

Metromover Phase 1 vehicle mid-life modernization is planned when a vehicle reaches 734,000 service miles. Assuming similar service schedules in the future, based on cumulative mileage through June 2002 in addition to FY 2001 daily mileage, the average mileage per vehicle within the fleet will reach that point in FY 2011, as illustrated in Table 3-2.

Table 3-2 -Metromover 734,000-Mile Projection

Car	Cumulative Miles June 2002	734,000 Miles vs Current	Daily Mileage	Projected Car Days	Projected Dates
MC001	381,307	352,693	103	3,437	11/26/2011
MC002	518,307	215,693	129	1,676	1/31/2007
MC003	461,675	272,325	77	3,516	2/14/2012
MC004	387,612	346,388	44	7,807	11/14/2023
MC005	498,719	235,281	116	2,020	1/10/2008
MC006	454,944	279,056	120	2,316	11/1/2008
MC007	580,118	153,882	106	1,445	6/14/2006
MC008	534,009	199,991	98	2,035	1/24/2008
MC009	430,260	303,740	71	4,265	3/4/2014
MC010	518,951	215,049	100	2,161	5/29/2008
MC011	405,998	328,002	103	3,187	3/21/2011
MC012	361,783	372,217	114	3,256	5/29/2011
MC013	243,914	490,086	123	3,974	5/16/2013
MC014	318,768	415,232	93	4,480	10/4/2014
MC015	338,630	395,370	100	3,957	4/29/2013
MC016	260,463	473,537	154	3,080	12/4/2010
MC017	317,706	416,294	117	3,562	3/31/2012
MC018	301,442	432,558	142	3,044	10/29/2010
MC019	353,642	380,358	120	3,158	2/21/2011
MC020	262,921	471,079	120	3,924	3/28/2013
MC021	315,788	418,212	95	4,410	7/27/2014
MC022	294,337	439,663	130	3,388	10/9/2011
MC023	351,805	382,195	105	3,649	6/26/2012
MC024	358,175	375,825	156	2,417	2/9/2009
MC025	330,176	403,824	109	3,690	8/5/2012
MC026	346,894	387,106	96	4,031	7/12/2013
MC027	331,340	402,660	133	3,017	10/3/2010
MC028	309,540	424,460	105	4,059	8/10/2013
MC029	217,187	516,813	142	3,652	6/29/2012
Total Fleet	10,786,411	10,499,589	3,221	98,613	
Average	371,945	362,055	111	3,400	10/21/2011

It is possible that the mileage projections are somewhat understated given that the Peak Vehicle Requirement consistently remained at 15 until FY 2002, when it rose to 17 and, subsequently, to 18 (an increase of 20% in the PVR) at the beginning of FY 2003. Recalculating mileage using a 20% increase in daily mileage prorated over the entire fleet yields slightly different projections. Furthermore, vehicle demands outlined in Table 2-11 anticipate a need for as many as 22 vehicles to satisfy the PVR in the out-years of the plan (over a 40% increase in the previous PVR). Projections based on growth in the PVR for vehicles by Phase as well as the entire fleet are presented in Table 3-3. Metromover's Inner Loop service will be improved to a 24-hour operation by June 2003. Service improvements as well as any additional PVR requirements will escalate mileage projections.

Table 3-3 - Mileage Projections Based on Varying PVR

Phase	*Daily Mileage*	*Projected Car Days*	*Projected Dates*	*Mileage PVR 15+3 +20%*	*Projected Car Days*	*+20% Projected Dates*	*Mileage PVR 15+7 +40%*	*Projected Car Days*	*+40% Projected Dates*
Phase I Total	1,181	37,121		1,417	31,025		1,653	26,593	
Phase II Total	2,040	61,492		2,448	51,215		2,856	43,898	
Fleet Total	3,319	101,706		3,983	84,825		4,647	72,707	
Phase I Average	98	3,093	12/18/2010	118	2,585	7/29/2009	138	2,216	7/25/2008
Phase II Average	120	3,617	5/24/2012	144	3,013	9/29/2010	168	2,582	7/26/2009
Fleet Average	111	3,400	10/21/2011	133	2,836	4/3/2010	155	2,431	2/24/2009

As the PVR increases, fleet mileage more rapidly approaches the 734,000-mile rehabilitation target. Total mileage for Phase 2 vehicles should be higher than Phase 1 vehicles due to the larger inventory of vehicles. Average vehicle mileage, on the other hand, should accumulate at similar rates; however, average mileage figures in Table 3-3 indicate that Phase 2 mileage is growing at a faster rate than Phase 1 average mileage. Removal of the Phase 1 vehicles from service for rehabilitation along with increased Peak Vehicle Requirements will cause more growth in Phase 2 vehicle miles, which translates into the movement of the Phase 2 rehabilitation requirement from 2011 to 2009, as indicated in Table 3-3.

The F-inspection (4-5-year interval) and G-inspection (8-10-year interval) are basic overhauls and are insufficient to maintain the expected performance of the vehicle. Vehicles are scheduled to receive two F-inspections and two G-inspections prior to a mid-life modernization.

The Office of Management and Budget committed to pledging a portion of the local option gas tax to issue $140 million in bonds to fund the Metrorail and Metromover vehicle modernization programs. The 2002 – 2007 capital program

includes over $15 million for the Metromover Phase 1 vehicle mid-life modernization beginning with planning and engineering funds in FY 2002.

The Department of Procurement Management on January 14, 2002 advertised an RFP for a consultant to develop overhaul specifications for “Metrorail and Phase One Metromover Mid-Life Vehicle Fleet Overhaul and Modernization Project,” and the Consultant Selection Process has been completed.

Metromover, unlike Metrorail, has the option of replacing rather than rehabilitating vehicles due to the cost-structure of the Metromover vehicle. As part of the modernization project, the consultant will examine rehabilitation versus replacement of the Phase 1 vehicles. Rehabilitation/replacement of Metromover Phase 1 vehicles (12 cars) will coincide with the Rail Mid-Life Modernization Process, which is outlined in Figures 3-1 and 3-2. A specific schedule for the Phase One Metromover Mid-Life Vehicle Fleet Overhaul and Modernization Project has not been outlined at this time.

Field Engineering is planning for the complete rail fleet mid-life modernization to begin in October 2003. Mid-life modernization of the Metromover Phase 1 vehicles is intended to:

- Upgrade and modernize systems for improved performance
- Eliminate increased levels of obsolescence currently being experienced because replacement parts are no longer produced
- Bring the cars to a “like new” condition in preparation for the second half of fleet life

Work will be contracted out due to the scope of the work to be performed and the nature of the facilities required to support the project. Field Engineering will develop specifications and schedules in conjunction with the Consulting Services Contractor. Schedules and time frames for completion will be contingent upon the decision to rehabilitate or replace.

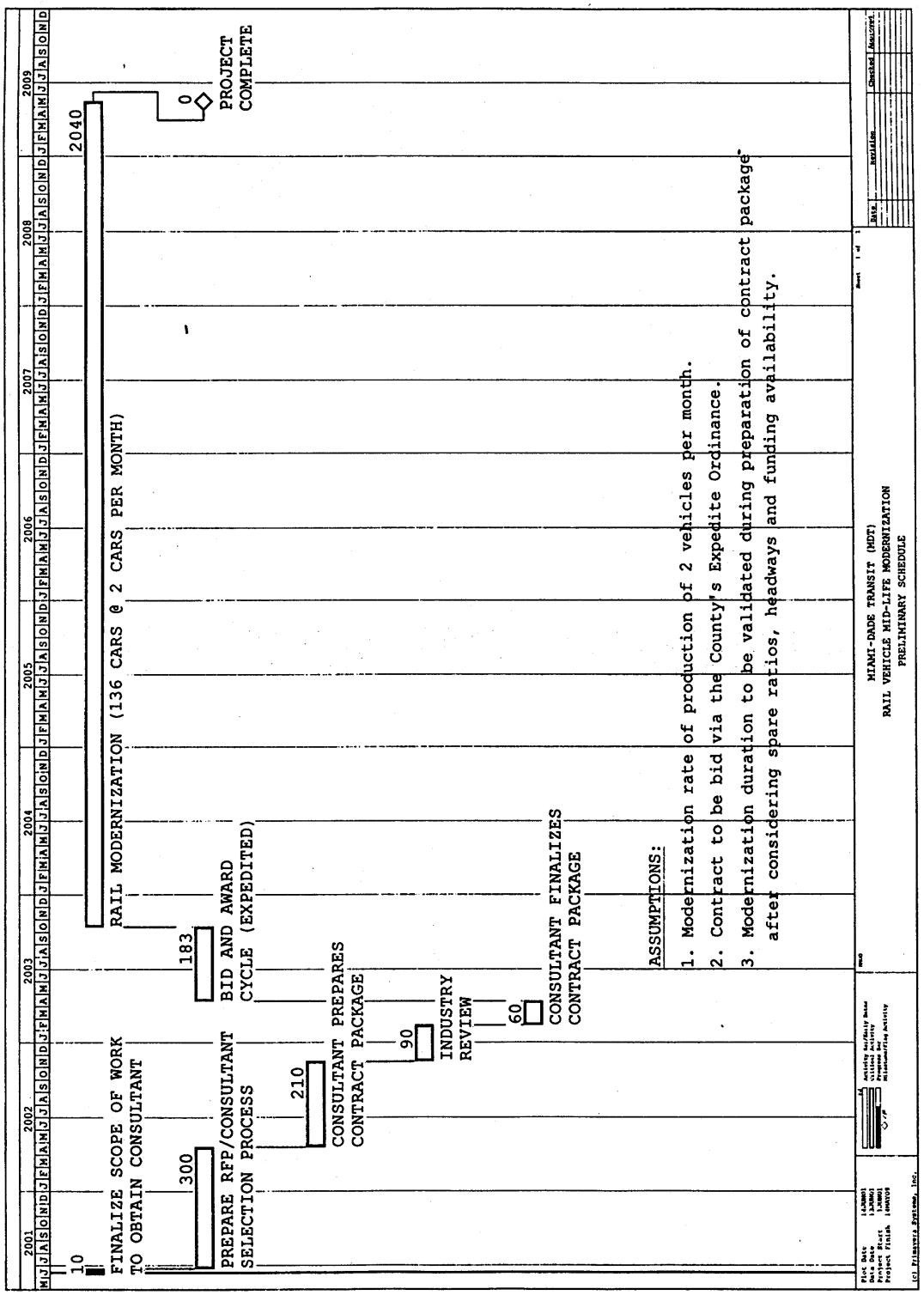


Figure 3-1 - Metrorail Mid-Life Modernization Preliminary Schedule

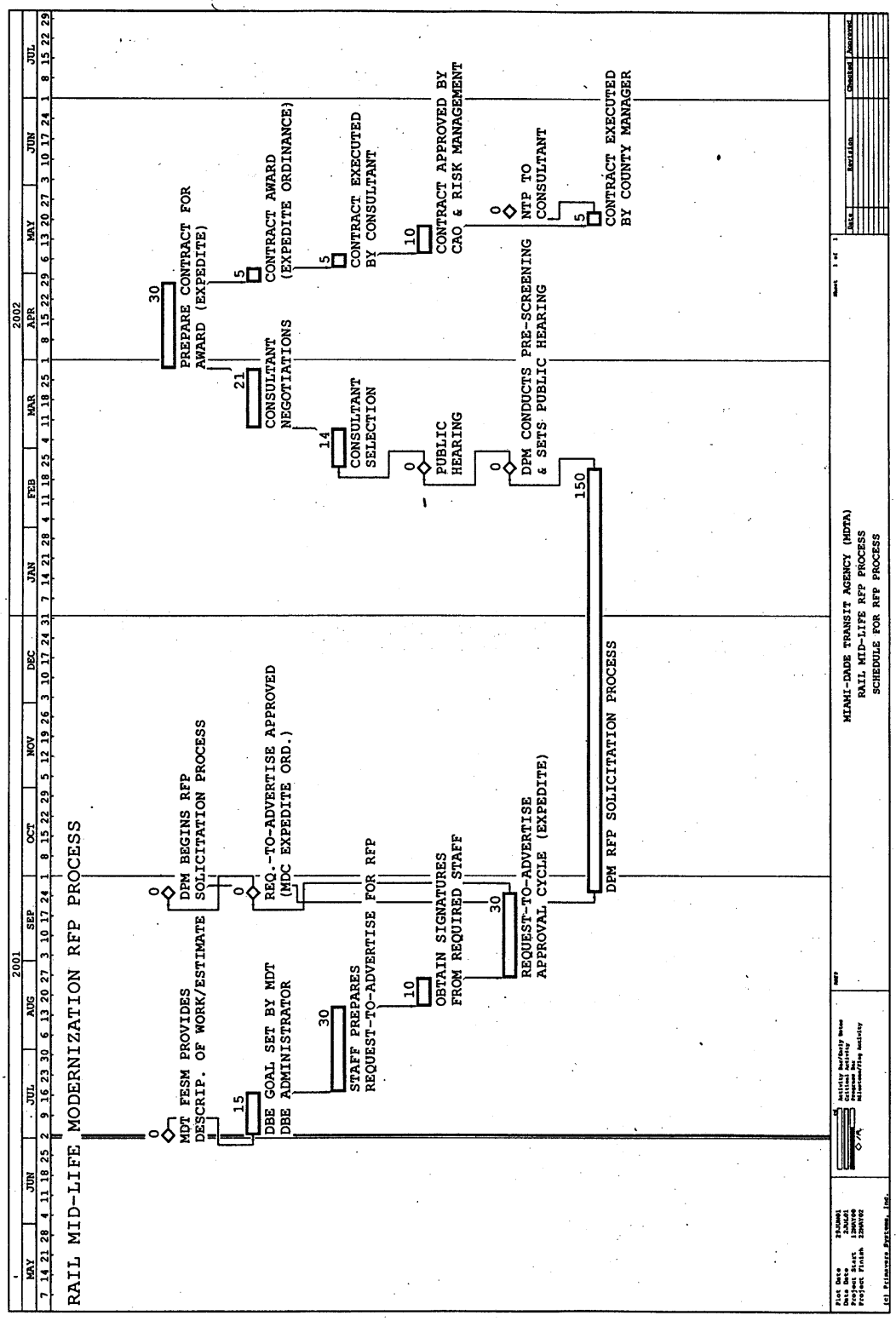


Figure 3-2 - Metrorail/Metromover Mid-Life Modernization RFP Process

Vehicle Supply and Demand During Modernization

MDT must insure an adequate supply of revenue vehicles to maintain service during the Metromover Phase I modernization. A decision to replace the Metromover Phase I vehicles would insure continuous operation of service with minimal impact on vehicle supply or demand, since replacement vehicles could be added to the fleet prior to removal of existing vehicles. Should MDT decide to modernize the Phase I vehicles, revenue vehicle supply needs must be addressed. Factors included in the allocation of vehicles are revenue vehicle requirements, FTA's OSR, and the use of a 20% spare ratio to meet scheduled and unscheduled maintenance needs. Table 3-4 presents a variety of scenarios that include the impact of varying Peak Vehicle Requirements on the OSR and the availability of vehicles for modernization.

Table 3-4 - Varying Revenue Vehicle Requirements

Fleet	*PVR*	*Fleet Minus PVR*	*FTA Operating Spare Ratio*	*20% Spare Ratio*	*Total Vehicle Requirement*	*Available For Modernization*
29	29	0	0.0%	6	35	-6
29	28	1	3.6%	6	34	-5
29	27	2	7.4%	6	33	-4
29	26	3	11.5%	6	32	-3
29	25	4	16.0%	5	30	-1
29	24	5	20.8%	5	29	0
29	23	6	26.1%	5	28	1
29	22	7	31.8%	5	27	2
29	21	8	38.1%	5	26	3
29	20	9	45.0%	4	24	5
29	19	10	52.6%	4	23	6
29	18	11	61.1%	4	22	7
29	17	12	70.6%	4	21	8
29	16	13	81.2%	4	20	9
29	15	14	93.3%	3	18	11

Using FTA's formula to calculate the Operating Spare Ratio, Table 3-4 shows the OSRs generated by varying PVRs based on the 29-car fleet. OSRs that fall within the range of 20% are bordered by a bold outline. As indicated above, all PVRs below 23 generate a relatively high OSR.

It was assumed that approximately 20% of the PVRs will need to be used as spares to meet scheduled and unscheduled maintenance needs. That 20% spare ratio, when combined with the corresponding PVR, equals the total vehicle requirement. Based on a 29-car fleet with a 20% spare ratio, the maximum PVR

available to MDT is 24 with an allowance of zero cars available for modernization.

In Table 3-5, the vehicles available for modernization were subtracted from the total fleet, and the FTA OSR was recalculated based on the actual fleet that would be available during modernization. MDT's current PVR of 18, bordered by a bold outline, provides 7 cars for modernization, assuming a 20% spare ratio for maintenance needs. Based on these figures, the PVR could increase to 22 vehicles and 2 cars would still be available for modernization based on a 20% OSR. It should be noted that the use of a 20% spare ratio for scheduled and unscheduled maintenance needs is significant due to the fact that MDT's OSR has ranged from 93% to 61% since FY 1999, while maintenance requirements ranged from 8-6 vehicles. The allocation of vehicles to the modernization program will reduce fleet size, thereby reducing the need for some percentage of scheduled and unscheduled maintenance vehicles.

Table 3-5 - Vehicles Available for Modernization

Fleet	*PVR*	*Fleet Minus PVR*	*FTA Operating Spare Ratio*	*20% Spare Ratio*	*Total Vehicle Requirement*	*Available For Modernization*
29	24	5	20.8%	5	29	0
28	23	5	21.7%	5	28	1
27	22	5	22.7%	5	27	2
26	21	5	23.8%	5	26	3
24	20	4	20.0%	4	24	5
23	19	4	20.5%	4	23	6
22	18	4	22.2%	4	22	7
21	17	4	23.5%	4	21	8
20	16	4	25.0%	4	20	9
18	15	3	20.0%	3	18	11

Metromover staff in conjunction with Field Engineering, the Consulting Services Contractor, and the Service and Mobility Planning Division must consider all relevant factors, such as train configuration and vehicle capacity, in the provision of service when establishing the optimal formula to maintain service delivery and facilitate the mid-life modernization with minimal disruption to Metromover customers.

Appendices

APPENDIX A	MDT Metromover/Metrorail Operations Maintenance Program Policy
APPENDIX B	Sample Metromover PM Package: A-E Inspections
APPENDIX C	Sample Metromover PM Package: F Inspection
APPENDIX D	Sample Metromover PM Package: G Inspection
APPENDIX E	Sample Metromover Pre-Operational “S” Inspection of Stored Vehicles
APPENDIX F	Sample Metromover Vehicle Emergency Brake Test (56-Day)
APPENDIX G	Cumulative Mileage by Vehicle (September 2001)

APPENDIX A

MDT Metrorail/Metromover

Operations Maintenance Program Policy

MIAMI-DADE TRANSIT
METRORAIL AND METROMOVER
MAINTENANCE PROGRAM POLICY

Effective Date: March 27, 1996

Revision Date: June 1, 2000
Revision Number: B

I. CONTENT:

II. POLICY

1.0 Maintenance Program Philosophy/Goal:

- Maximize cost effectiveness of maintenance efforts consistent with safe operations through a proper balance of preventive maintenance, corrective maintenance and hardware/software improvement.

2.0 Purpose of Maintenance Program:

- To maintain the designed safety and reliability levels of the equipment.

- The Maintenance Program recognizes that maintenance cannot correct deficiencies in the designed safety and reliability levels of equipment. At best, the maintenance program can only prevent deterioration from the design levels. If those inherent levels are found to be unsatisfactory in service, design modification is necessary to obtain improvement.

3.0 Maintenance Program Objectives:

- To ensure realization of design safety and reliability levels of equipment.

- To restore safety and reliability to their inherent levels when deterioration has occurred.

- To obtain the information needed to improve design of item whose inherent reliability proves inadequate.

- To accomplish these objectives at minimum total cost, including maintenance costs and the costs of residual failures.

4.0 Types of Maintenance:

- Planned/Scheduled Maintenance:
  - PMs and Modifications

- Nonscheduled Maintenance:
  - Correction of discrepancies found during PMs, modifications, other unscheduled maintenance, normal operations or data analysis.

- Planned, Non Scheduled Maintenance:
  - At times, discrepancies found during PMs, modifications, or other unscheduled maintenance, normal operations or data analysis, can be deferred and a shop visit planned and scheduled for a later time to correct the discrepancy.

Discrepancies affecting safety or operational reliability cannot be deferred.

5.0 Maintenance Program Accomplishment:

- Scheduled Tasks-Modifications:
  - Accomplished in accordance with plan.
  - Objective: to improve safety, reliability or maintainability.
- Scheduled Tasks – PM inspections:
  - Accomplished at specified intervals.
  - Objective: to prevent deterioration of equipment from designed safety and reliability levels.
  - Types of Tasks:
    - Lube/Servicing
    - Operations/Visual Check
    - Inspection/Functional Check
    - Condition Testing and Recording
    - Restoration
    - Discard
- Nonscheduled Tasks:
  - Accomplished as required.
  - Generated from:
    - Scheduled Tasks
    - Malfunction Reports
    - Data Analysis
  - Objective: restore equipment to acceptable safety and reliability levels.

6.0 Maintenance Program Efficiency:

- Schedules only those tasks necessary to meet stated objectives.
- Does not schedule tasks that will increase maintenance costs without a corresponding increase in reliability or safety.

7.0 Scheduled Maintenance Application:

- Track System scheduled maintenance program will be such that the trackwork system meets or exceeds standards specified in the MIAMI-DADE TRANSIT RAIL OPERATIONS (DIVISION) STANDARD OPERATING PROCEDURES, P.M. GP-03 (Safety Standards for Inspection and Maintenance of Track).

- All fixed, mobile and transportable equipment used in the delivery and maintenance of MDTA Rail and People Mover (Automated Guideway) transit service will have periodic preventive maintenance inspections and servicing.

- PM Inspections and servicing will consist of routine tasks as described above under Program Content, Scheduled Tasks.

- Campaign Inspections are short term inspections of specific hardware items for the purpose of assessing status or condition. Such inspections can be initiated by the maintenance engineer, maintenance supervision of management or Rail Maintenance Control. Such inspections are temporary in nature and are not considered as part of the approved PM program. Campaign inspections, while independent of the PM program, may be ordered and scheduled in conjunction with routine approved PM inspections as a matter of expediency.

8.0 Scheduled Inspection/Tasks Specifications:

- Specifications for PM performance will be derived from manufacturer's recommendations as modified by experience and engineering analyses of the hardware and its use.

- PM performance specifications will include specific tasks, procedures, methods, tools and test equipment where appropriate, frequency of performance, dimensions/tolerances, rates, distances, clearances, quantities, viscosities, and other such standards as appropriate.

9.0 Deviation from Maintenance Program Specifications:

- No deviations from any approved PM task, procedure, method, frequency or other specification that exists to insure public/employee safety are permitted.

- Deviations from approved PM tasks, procedures, method, frequency or other specifications that exist solely for reliability, maintainability or other economic reasons, may be authorized by written approval of the Assistant Director, Transit Services or higher authority. Such deviations from the approved PM program will be authorized only under extreme circumstances.

10.0 Maintenance Program Records:

- Records required by Federal, State and local agencies and other as necessary to verify scheduling and accomplishment of the approved PM program inspections shall be maintained in good order and accessibility.

- Such records as necessary to support warranty and other claims and analyses for economic reliability, maintainability, performance, quality control and PM program revision purposes shall also be maintained in good order and accessibility.

11.0 Maintenance Program Revisions:

- Program Continuously Examined.

  In addition to revisions resulting from hardware systems changes, the maintenance program is continuously examined for potential improvements based on reliability/maintainability historical experience.

- Initiation of Revision.

  Program changes can be identified and recommended by numerous sources; for example, the County's Employee Suggestion Program, Supervisory Staff, Rail Maintenance Control and others.

  The actual change is initiated by a memo of recommendation with supporting justification from the maintenance engineer in whose area of responsibility the program procedures fall. In general the changes add or delete tasks from a routine inspection bill of work or

increase/decrease an inspection frequency. Specification changes and methods changes are also included.

- Approval of Revision.

  A copy of the affected procedure is modified by Maintenance Control per the engineer's recommendation and circulated, along with the justification and supporting documentation, for review and approval/disapproval by all affected Division Chiefs, Office of Safety and Security and the Assistant Director.

  If the change is approved by consensus, it becomes effective as soon as all appropriate paperwork is revised and issued. If disapproved, the recommended change is returned to the initiating engineer with reasons for disapproval. The engineer then may take appropriate action to allay objections or drop the case, depending on the situation.

- Increases to Maintenance.

  Additions to the program and changes that increase the intensity of maintenance may not go through the entire approval process; recommended additions to the maintenance program, if approved by the maintenance section that must accomplish the additional maintenance, are then reviewed by Maintenance Control. If there will be no scheduling problems, no further approvals are necessary. Otherwise, the recommended change enters the normal approval process. Changes of this type usually originate with the maintenance department involved who notify the appropriate engineer of their need. The engineer then prepares the recommended change and initiates the process illustrated in the attached flow chart.

- Additions in the form of newly created preventive maintenance procedures will be treated the same as revisions resulting in a decrease in intensity of maintenance (see Section 11.0, paragraphs 2 and 3).

12.0 Maintenance Program Revisions Justification:

- Approval Process.

A good preventive maintenance program is constantly under scrutiny for its cost-effectiveness, and as a result, there will be frequent revisions to improve procedures.

Revisions that delete tasks, increase inspection intervals or otherwise reduce the intensity of maintenance are subject to an approval process that requires sign off by Rail Maintenance Control, the division head responsible for accomplishment of the PM, Office of Safety and Security, and any division head whose area of responsibility may be affected, as well as the Assistant Director.

- Maintenance Engineering Required.

  The procedure improvement can be proposed by anyone; however, the written PM procedure revision must be recommended in writing by the appropriate maintenance engineer. The engineer must describe in a memo that will accompany the revised procedure through the approval/sign off process, the reasoning and justification for the proposed revision.

- Justification.

  The Maintenance Engineer's memo must address, as a minimum, the following concerns of those who must provide their approval or disapproval of the revision:

  - The purpose of the revision, why it is proposed.

  - What are the changes being recommended? Are tasks being added, deleted, modified, simplified, etc., are specs being changed, methods changed, test equipment changed; etc.

  - What effect will the change have on the following:

    - Safety?
    - Reliability?
    - Maintainability?
    - Operations/System Performance?
    - Costs?

  - A description of the analysis that supports the recommendation to revise the procedure. The analysis may be a detailed study

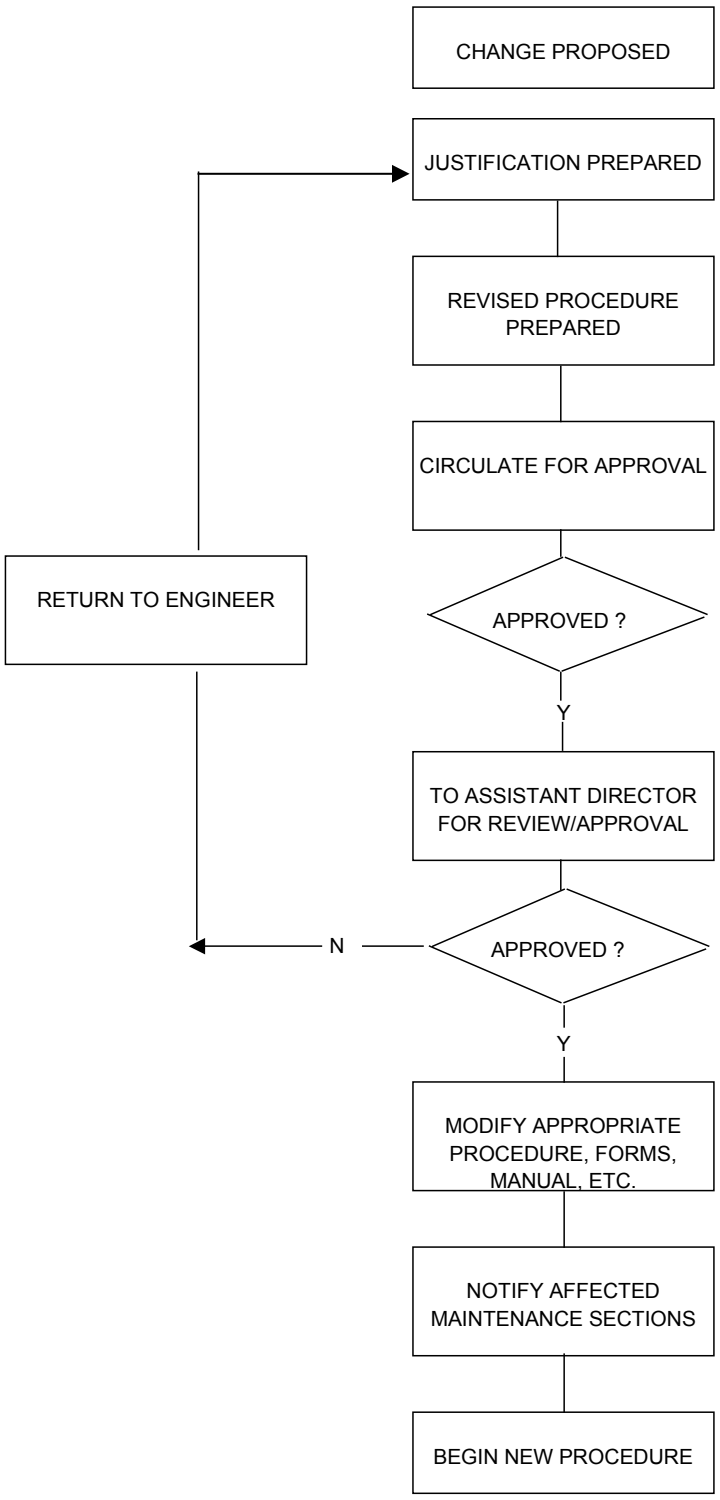
of the results of previous accomplishments of the procedure, an analysis of failure data, or it may be an industry survey, or a vendor's recommendation, or even a logical rationale, in the absence of all other hard data.

The engineer's memo is to be complete enough that the revision will pass through the approval route without generating questions or objections from those who must sign their approval.

13.0 Conditional Maintenance Program Revisions:

- The approval process for revisions to the program may impose conditions on the revision.
  - There may be occasions when a test period with appropriate data collection and analysis to establish the efficacy of the change may be required by one or more of those individuals who must approve the change.
- Maintenance Engineering specifies criteria for a successful test.
  - The engineer specifies length of test, data collection and analysis requirements and defines a successful outcome of the test and resubmits the recommendation for approval.
- Conclusion of test.
  - If successful, a report summarizing the results will be prepared and circulated with the revised PM procedure for final approval.
  - If unsuccessful, the original procedure is restored and the concerned parties are notified of the action.

MAINTENANCE PROGRAM
REVISIONS FLOW CHART



MINIMUM: 3 APPROVALS REQUIRED FOR NEW OR REDUCED MAINTENANCE PROCEDURES
2 APPROVALS FOR ADDITIONS TO MAINTENANCE

APPENDIX B

Sample Metromover PM Package: A-E Inspections

MIAMI-DADE TRANSIT AGENCY
DOWNTOWN COMPONENT OF METRORAIL

MR510R 0__________

PM NO. A-VEH | **SYSTEM VEHICLE** | **TYPE __37 DAY__**

MILEAGE READING ______ **DATE** ______

* *

List below all the discrepancies found during this PM. List corrective action for the discrepancy. If follow-up action is required, state responsibility for corrective action. Use as many data sheets as required. **Be detailed.**

* *

CAR NUMBER	DUE DATE	LATE DATE	DATE COMPLETED
________	______	______	__________

VMR #	ITEM #	DISCREPANCY/ACTION	SIGNATURE WHEN CORRECTED

REVISION 2 (02-22-99)

MPLOYEE SIGNATURE/ BADGE#	EMP. CLASS. ABBREV.	START TIME OF PM	COMPLETION DATE & TIME	HOURS WORKED

Supervisor's Signature **Date**

MIAMI-DADE TRANSIT
METROMOVER
MOVER VEHICLE INSPECTION

REVISION: B **PM No. 410**
REVISED 12/01/01 **PAGE 1 OF 25**

SPECIAL INSTRUCTIONS: 1) RECORD THE HUB MILEAGE ON THE COVER SHEET 2) IF ANY COMPONENT FAILS INSPECTION CHECK DEFECT COLUMN. DOCUMENT ALL DISCREPANCIES ON COVER SHEET WITH "VMR" NUMBER AS APPLICABLE. 3) FILL -OUT COMPLETELY ANY ATTACHED DATAT SHEET. 4) ALL REFERENCES ARE TO THE DPM VEHICLE EQUIPMENT MANUAL (REV. 11/95), UNLESS OTHERWISE NOTED.	**A** **37**	**B** **75**	**C** **225**	**D** **450**	**E** **900**	**OK**	**DEFECT**	**INIT**
UNDER VEHICLE:								
1 COUPLER								
1.1 Lubricate the coupler locking pin with EP-2 lubricant (TG9150LU0039).		*	*	*	*			
1.2 Lubricate the coupler through the grease fitting with EP-2 lubricant (TG9150LU0039).		*	*	*	*			
1.3 Check for ease of movement of the coupler automatic re-centering deice through a sideward swing on either side of center. If the coupler does not re-center properly, repair as necessary.			*	*	*			
1.4 Check the air coupler and connections, and the self-sealing check valve for leaks by use of a solution of soap and water. If a leak is detected, tighten connection or remove and re-seal using Teflon tape (TG8040TA0005) or equivalent.					*			
1.5 Inspect coupler, stops, bushings, mounting plate, bolts, draw bar and draft gear for damage and cracks.	*	*	*	*	*			
2.0 VENTILATION BLOWER FILTERS								
2.1 Replace air filter for ventilation blower, in the #1 end.	*	*	*	*	*			
2.2 Replace air filter for ventilatin blower, in the #2 end.	*	*	*	*	*			
3.0 FIRE EXTINGUISHER								
3.1 Check fire extinguisher indicator dial for proper charge (needle should be in the green area). Replace fire extinguisher if proper charge is not indicated on dial.		*	*	*	*			

				A 37	B 75	C 225	D 450	E 900	OK	DEFECT	INIT
3.2	Check yellow tag for proper expiration date on each fire extinguisher. Replace fire extinguisher if date is expired.				*	*	*	*			
4	**SERVICE HVAC EQUIPMENT: (UNDER VEHICLE)**										
4.1	Check Condenser fan for tightness on shaft.				*	*	*	*			
4.2	Clean the surface of the condenser coil with approved condenser cleaner.			*	*	*	*	*			
4.3	Inspect compressor and condenser assemblies for loose hardware and check plumbing for signs of leaks. Repair as needed.			*	*	*	*	*			
4.4	Inspect liquid line filter drier indicator element ot ascertain system dryness. If other than a safe or dry condition is note, replace the filter - drier cartridge.					*	*	*			
5	**PNEUMATIC BRAKE SYSTEM**										
5.1	Verify pressure setting and visually inspect the following subsystem components for cracks, dry rot, or other signs of fatigue; replace as necessary.										
	<u>Phase I Vehicle only</u>										
5.2	Inspect the brake application release valves (4); replace as necessary.				*	*					
5.3	Inspect pressure switch setting for the specifications listed:					*	*	*			
MRP	normally open	TB1-1 to TB1-2	closes @ 95 psi decreasing			*	*	*			
SBR	normally closed	TB1-5 to TB1-6	opens @ 65 psi decreasing			*	*	*			
CSO	normally closed	TB1-13 to TB1-14	opens @ 155 psi increasing			*	*	*			
			closes @ 120 psi decreasing			*	*	*			
FB	normally open	TB1-3 to TB1-4	closes @ 80 psi increasing			*	*	*			
DB	normally open	TB1-5 to TB1-6	closes @ 7 psi increasing			*	*	*			

				A 37	B 75	C 225	D 450	E 900	OK	DEFECT	INIT
	Phase II Vehicles Only										
5.4	Inspect pressure switch setting for the specification listed below. Pressure switches are screw adjustable. If unable to adjust a pressure switch, replace it. (Ref. Sectin 3.3.3.7 and Table 3-10)						*	*			
MRP	normally open	TB1-1 to TB1-2	closes @ 95 psi decreasing			*	*	*			
SBR	normally closed	TB1-5 to TB1-6	opens @ 65 psi decreasing			*	*	*			
CSO	normally closed	TB1-13 to TB1-14	opens @ 155 psi increasing			*	*	*			
			closes @120 psi decreasing			*	*	*			
	Phase I and Phase II Vehicles										
5.5	Drain air tanks of moisture. Indicate if moisture is present.			*	*	*	*	*			
5.6	Rebuild brake Chambers. Check for leaks.						*	*			
	AIR CONTROL PACKAGE										
5.7	Test for leaks. Apply 155 psi through air dryer, then shut off supply line, verify there are no air leaks from the subsystem components. Limit of 5 psi per 10 minutes. Repair/replace as necessary.			*	*	*	*	*			
5.8	Check all air regulators for proper pressure settings. Adjust as necessary.										
	A. Left regulator 105 psi +0 -5.				*	*	*	*			
	B. Right regulator 80 psi +0 -5.				*	*	*	*			
5.9	Check emergency brake by-pass valve for proper position (up position) and ensure safety wiring is in place. Repair as required.			*	*	*	*	*			
6	**BOGIE ASSEMBLIES**										
6.1	Verify that connections are tight on leveling valve linkage. Repair or replace damaged leveling valve and tighten loose connections.			*	*	*	*	*			

		A 37	B 75	C 225	D 450	E 900	OK	DEFECT	INIT
6.2	Inspect the following for leakage, damage, cracks, dry rot or other signs of fatigue. Replace if necessary.		*	*	*	*			
	1. Shock absorbers.			*	*	*			
	2. Radius absorbers.			*	*	*			
	3. Leaf springs.			*	*	*			
	4. Leveling valves (3).			*	*	*			
6.3	Ensure the vehicle has proper alignment and is level using a measuring rod 18.5 inches + .5 "or" measuring from the door plate to the running surface is 42 inches + 1.	*	*	*	*	*			
6.4	Inspect air springs (air bags) for indications of leaks, deterioration, chafing or cracks. Replace as necessary. Inspect hardware connections for tightness.	*	*	*	*	*			
6.5	Lubricate the following with EP2 lubricant (TG9150LU0039).								
	1. Radus arm rods (3/bogie)		*	*	*	*			
	2. Drive shaft universals		*	*	*	*			
	3. Bogie ring pivot bearing.			*	*	*			
6.6	Verify that the differential is filled to one inch below fill plug. Refill as needed . Use ultra gear lubricant (TG9050LU0083).		*	*	*	*			
6.7	Check for any leaks from the inner wheel hubs and pinion seals. Notify supervisor if any leaks are found.	*	*	*	*	*			
6.8	Check that brakes are not caged.	*	*	*	*	*			
6.9	Inspect the following items for any damage, bogie structure, guide axles, suspension and spring bushings, (visual). If damage unusual condition(s) are detected inform supervisor.		*	*	*	*			
6.10	Check each vehicle bogie to ensure it is level. Lay 4 foot level across guide tire safety discs. If vehicle bogies are not level (See Section 5.4.26, page 5-200) for adjustment procedure.					*			

		A 37	B 75	C 225	D 450	E 900	OK	DEFECT	INIT
6.11	Inspect al bogie air lines for chaffing and wear. Replace any defective parts.		*	*	*	*			
6.12	Inspect the bogie attachment bolts (large bolts) for cracks or other signs of fatigue, looseness and safety wire. Replace as necessary.	*	*	*	*	*			
7.0	**GUIDE WHEEL ASSEMBLIES (Section 3.15)**								
NOTE:	Symptoms of a worn guide wheel bearing can include but are not limited to: 1. Intermittent tight spots that are felt when the guide wheel is slowly rotated by hand. 2. A grinding or scraping sound that is heard when the guide wheel is rotated. 3. Grease throw-off around the joint where the grease cup presses into the guide wheel hub.								
	<u>LUBRICATION (TG9150GR0004)</u>								
7.1	Remove guide wheel bearing cover and inspect guide wheel bearing for lubrication. If lubricant is not visible, dark, showing signs of moisture, call supervisor for bearing inspection.	*	*	*					
7.2	Remove & replace the bearings in all eight (8) guide wheel assemblies, use new bearings. Generate VMR and write "perform task 7.4 after 8 hour of revenue service. (Ref. Section 5.4.27, pages 5-201 thru 5-211). Fill out "Guidewheel Data Sheet" as needed.				*	*			
7.3	Inspect guide tires for damage (broken or deformed) and for wear with go/no-go gauge. Replace the guide tires if damaged or if they fail go/no-go test.	*	*	*	*	*			
7.4	Check guide wheel play as follows: (See drawing 4677c31)								
	A. Mount the dial indicator on the bottom of the safety disc.	*	*	*	*	*			
	B. Carefully position the indicator arm on the very bottom of spindle shaft.	*	*	*	*	*			

		A 37	B 75	C 225	D 450	E 900	OK	DEFECT	INIT
NOTE:	Place dial indicator 1/2 inch from dust seal on safety disk for deflection indication. (Ref. Figure 5-98, page 5-210								
	C. Grasp the tire and pull down on tire while rotating it back and forth (couple of inches). Note indicator reading, establish zero point.	*	*	*	*	*			
	D. Push up on tire in a rocking motion while rotating the tire back and forth and observe dial indicator reading. the difference should be .001" - .005" tolerance is obtained. From one castle nut opening to the next is .006".	*	*	*	*	*			
	E. If there is no play or less than .001" the castle nut must be loosened one or more openings until the .001" - .005" tolerance is obtained. From one castle nut opening to the next is .006".	*	*	*	*	*			
NOTE:	The wheel should spin freely and not bind. You should be able to turn it with little to moderate force.								
	F. If too much play is noted, the nut must be tightened.	*	*	*	*	*			
	G. Install cotter pin when proper play is achieved.	*	*	*	*	*			
	H. Record all data below, including the tolerance dimension arrived a for each wheel.	*	*	*	*	*			
7.4.1	GUIDELWHEELS POSITION DIAGRAM:								

#1 END

#8	**#1**
#7	**#2**
#6	**#3**
#5	**#4**

#2 END

Actual wheel bearing clearance readings after adjustments (.001" - .005").

				A 37	B 75	C 225	D 450	E 900	OK	DEFECT	INIT
wheel no.	reading	reading	wheel no.								
#8	_____	_____	#1	*	*	*	*	*			
#7	_____	_____	#2	*	*	*	*	*			
#6	_____	_____	#3	*	*	*	*	*			
#5	_____	_____	#4	*	*	*	*	*			

Comments: _____

_____

NOTE: If 7.4 steps fail to obtain correct tolerance, notify supervisor to measure bearing seats on spindle. Measure each journal at two locations 90 degrees apart. One measurement is made parallel with the guide axle mounting flange (upper bearing seat) should measure 1.9990" to 1.9995", a second measurement is made perpendicular to the guide axle mounting flange (lower bearing seat) should measure 1.2493" to 1.2498". Record measurements. If out of tolerance remove spindle for chrome plating.

	(a) Upper bearing seat _____ inches						*	*			
	(b) Lower bearing seat _____ inches						*	*			
7.5	Check hubs for cracks. Check front two guidewheel spindle for cracks near the lower two bolt holes. If cracks are found see shift supervisor for scheduling repair.				*	*	*	*			
7.6	Ensure that all hardware connections are safety wired correctly. (Ref. Section 5.1.2.2, pages 5-3 thru 5-5)				*	*	*	*			
8.0	**COLLECTOR ASSEMBLIES**										
8.1	Rebuild Collector Assemblies.						*				
8.2	Inspect for proper operation and lubricate with light weight spray oil the following:										
	1. Collector assembly pivot bearings.				*	*		*			
	2. Spring hook points.				*	*		*			
	3. Power shoe holders.				*	*		*			
					*	*		*			

		A 37	B 75	C 225	D 450	E 900	OK	DEFECT	INIT
8.3	Check all springs for 15 lbs. Of pressure using a spring gauge. Repair as necessary.		*	*		*			
8.4	Check for broken/cracked collector shoes. If any area replaced, enter on "vehicle collector replacement record" on back page.	*	*	*		*			
8.5	Check for broken/bent collector assemble arms.	*	*	*		*			
8.6	Check that all collector cables are securely clamped and in place.	*	*	*	*	*			
8.7	Check for nicks on collector shoe cables and for broken terminals.	*	*	*	*	*			
8.8	Check insulation blocks for cracks.	*	*	*	*	*			
8.9	Check collector shoe alignment. The shoe holder should be aligned with power rai to achieve proper mating. (Ref. Figure 3-1, page 3-17/18).	*	*	*	*	*			
8.10	Perform the vehicle choke check per the following procedure:								
	A. Position vehicle or train in maintenance building on track M2 or M3 or M4		*	*	*	*			
	B. Turn off all vehicle breakers and then track power.		*	*	*	*			
	C. Connect an ohmeter to the ATO shoe (either side) and the underframe ground pad. Verify that the resistance is less than 1 Ohm.		*	*	*	*			
	D. Repeat step "C" until all ATO/ground ground shoe pairs on the train the within specification.		*	*	*	*			
	E. If a high resistance is found, the choke must be replaced (Repair must be performed before vehicle can be cleared for service).		*	*	*	*			
	F. When finished, restore power.	*	*	*	*	*			

		A 37	B 75	C 225	D 450	E 900	OK	DEFECT	INIT
9.0	**INSPECT DRIVE WHEELS:**								
9.1	Inspect for wear and inflation, 3/32" min. tread and 110 +5 psi cold.	*	*	*	*	*			
9.2	Inspect for loose dog ears. Using a torque wrench check torque of main tire lug nuts (160 Ft-Lbs) and check rims for cracks. If cracks are found fasteners for tightness.	*	*	*	*	*			
9.3	Check hubodometer fasteners for tightness.	*	*	*	*	*			
10.0	**propulsion motor (Section 3.3.4.1 and Fig. 2-5)**								
10.1	Remove commutator covers and perform the following steps:	*	*	*	*	*			
CAUTION:	Use a safety mask due to the carbon.								
10.1.1	Inspect internal/external motor cables for any damages, signs of chaffing, overheating, broken or cracked insulation, proper shrink sleeving and broken or loose cable ties. Replace all defective cable(s).	*	*	*	*	*			
10.1.2	Clean motor filter media and assure that there are no gaps upon re-installation.	*	*	*	*	*			
10.1.3	Blow out motor, use dry air (max 30 psi air pressure).	*	*	*	*	*			
10.2	Inspect commutator for the following:		*	*	*	*			
	A. Signs of brush grooving or threading.		*	*	*	*			
	B. Overheating (purple color) or flash-over damage.		*	*	*	*			
	C. Inspect mica slots for foreign material; copper beads on ends of commutator bars.		*	*	*	*			
	D. Inspect commutator surface for discoloration. If any of the above are found, notify supervisor.		*	*	*	*			
10.3	Inspect carbon brushes for the following conditions:	*	*	*	*	*			
	A. Worn - replace any brush that is less than 1 inch long.	*	*	*	*	*			

		A 37	B 75	C 225	D 450	E 900	OK	DEFECT	INIT
	B. Damaged - replace any brush that is broken, chipped, burnt, or shows uneven wear.	*	*	*	*	*			
	C. Shunts - ensure there are no loose or frayed brush shunts.	*	*	*	*	*			
NOTE:	Frayed brushes are signs of weak/broken springs.								
10.4	Inspect brush holders as follows:			*	*	*			
	A. Check brushholder cap bolts for 15-30 Ft-Lbs torque.			*	*	*			
	B. Check brushholder cable connector bolt for 11 Ft-Lbs. Torque.			*	*	*			
	C. Clean brushholder and insulators by wiping with a solvent dampened rag such as electronic cleaner (avoid solvent on brush cover and commutator). If insulator is burned through and/or flash-overs have burned craters into insulators equal to one-half of the thickness of the insulator, replace the brushholder.			*	*	*			
	D. Check spring action to see if brushes move freely.			*	*	*			
	E. The clearance between the brush and brushholder must not exceed 0.010". The clearance width-wise must not exceed 0.0625".			*	*	*			
	F. Check brushholder alignment, it must be within 1/2 mica bar thickness.			*	*	*			
	G. Ensure brushholder clearance to commutator is 0.07" - 0.11".			*	*	*			
	H. Ensure spring pressure is 5.5 to 7.5 lbs.			*	*	*			
	I. Replace any damaged or broken springs.			*	*	*			
10.5	Check creepage band for signs of cracking, burning, nicks, and overheating. Clean with a solvent dampened rag. If creepage band is damaged see shift supervisor.		*	*	*	*			

		A 37	B 75	C 225	D 450	E 900	OK	DEFECT	INIT
10.6	Inspect arc horns for metal beads or build up from flash-over, clean as necessary.	*	*	*	*	*			
NOTE:	Assure that arc horns are free of paint, grease, etc.	*	*	*	*	*			
10.7	Inspect the field coil visible end for any signs of charred insulation. Also check visible connections for tightness. Replace as necessary.	*	*	*	*	*			
10.8	Lubricate pinion end roller bearing. Apply 1.0 oz. Of EP-2 (TG9150LU0039) using the grease fitting on th coupling end housing.			*	*	*			
10.9	Lubricate commutator end bearing, using EP-2 lubricant. (Ref. 3.3.4.1, I1, page 3-32).				*	*			
11	**MOTOR CONTROL BOX (Section 3.3.4.2)**								
11.1	Remove covers and ensure that the seals and locking bolts are intact.				*	*			
CAUTION:	Be aware of capacitor bank in Relay Panel Assembly, it can be a potential shock hazard.				*	*			
11.2	Clean MCB interior with damp rag and/or vacuum. Remove any flash marks.				*	*			
11.3	Adjust potentiometer in Motor Overload (MOS) circuitry to read 100 +1 ohm.				*	*			
11.4	Check all hardware and wire connections for tightness (each screw, nut, and bolt with proper tool).				*	*			
11.5	Check all wiring and reverser hoses for impact, excessive bend, or heat damage. Replace items as necessary.				*	*			
11.6	Use mirror and flashlight to check MOL contacts for burning and pitting. Replace contacts as necessary				*	*			
11.7	Manually operate the MOL relay and check to ensure proper latching.				*	*			

		A 37	B 75	C 225	D 450	E 900	OK	DEFECT	INIT
12	**REVERSER (Section 4.3.5.4)**								
CAUTION:	Do not file heel of contact. Do not oil contact.								
12.1	Check the reverser for proper operation by manually energizing the air valves. Check for good electrical contact pressure.				*	*			
12.2	Test for sluggish operation of reverser. Depress each magnet valve armature all the way, one at a time. If reverser operates sluggishly, check magnet valves for air leaks or check for rough durm fingers and contacts.				*	*			
12.3	Inspect main contacts for burning and pitting. Replace as necessary.				*	*			
12.4	Check main contact wear. If it exceeds 1/8", replace contact.				*	*			
12.5	Ensure interlocks latch, repair as necessary.				*	*			
12.6	Inspect shunts and check for loose, burnt, or broken shunts. Replace as necessary.				*	*			
12.7	Lubricate as follows:								
NOTE:	Note not over lubricate.								
	A. Lubricate internal cylinder walls with M#55271-AA (TG9150GR0001).				*	*			
	B. Lubricate surface between shaft operating lever and piston operating rod with M#53701GC (TG9150GR0001).				*	*			
13	**BRAKE SWITCH (4.3.5.3)**								
13.1	Clean brake switch with electric parts cleaner.		*	*	*	*			
13.2	Inspect braided cable and replace when fraying. Refer to drawing #565F315 for disassembly/reassembly.				*	*			

		A 37	B 75	C 225	D 450	E 900	OK	DEFECT	INIT
13.3	Inspect brake switch as follows:		*	*	*	*			
	A. Disassemble, clean and lubricate al hinge points. Use EP-2 lube (TG9150LU0039).				*	*			
	B. Inspect interlocks, contacts and operation. Clean contacts if pitted and/or burned. Check electrical contact pressure and inspect for broken jumper.			*	*	*			
	C. Inspect for damage. Replace when burned halfway through.				*	*			
	D. Check contacts for binding, repair as repair.		*	*	*	*			
	E. Operates switch manually and ensure contacts align properly. Adjust as necessary.		*	*	*	*			
14	**LINE SWITCH (4.3.5.3)**								
14.1	Clean line switch with electric parts cleaner.	*	*	*	*	*			
14.2	Inspect braided cable and replace when fraying. Refer to drawing #565F315 for disassembly/reassembly.				*	*			
14.3	Inspect line switch arc box as follows:								
	A. Disassemble, clean and lubricate al hinge points. Use EP-2 lube (TG9150LU0039).				*	*			
	B. Inspect interlocks, contacts and operation. Clean contacts if pitted and/or burned. Check electrical contact pressure and inspect for broken jumper.			*	*	*			
	C. Inspect for damage. Replace when burned halfway through.				*	*			
	D. Check contacts for binding, repair as required.		*	*	*	*			
	E. Operate switch manually and ensure contacts align properly. Adjust as necessary.		*	*	*	*			

		A 37	B 75	C 225	D 450	E 900	OK	DEFECT	INIT
15	**AUXILIARY CONTROL BOX (Section 3.3.4.3)**								
15.1	Remove covers and ensure that the seals and locking bolts are intact.				*	*			
15.2	Clean ACB interior with a damp rag and/or vacuum. Remove any flash marks.				*	*			
15.3	Check all hardware and wire connections to ensure they are secure. Thighten each screw, nut and bolt as required.				*	*			
15.4	Check all wiring for chaffing, impact, bend, or heat damage. Replace wiring as necessary.				*	*			
15.5	Power plug: inspect power plug for signs fo arcing and/or damage.					*			
16	**AUXILIARY RELEASE PACKAGE**								
16.1	Check and adjust pressure regulator with a calibrated gauge, should be 80 psi +0, -5.				*	*			
16.2	Inspect for leaks and replace defective parts.				*	*			
17	**BATTERY SERVICE (Section 3.3.1.2)**								
NOTE:	Remember to follow applicable safety precautions when working with batteries.								
17.1	Check electrical connections (tight and clean).			*	*	*			
17.2	Check for any battery case damage (leaks). Replace battery if case is damaged.			*	*	*			
17.3	Check battery charger located in Auxiliary Control Box as follows: A. Check output voltage of battery charger with a meter. Take readings at: Phase I BCB and BCG terminals Phase I TB2 - 1 and TB2 - 3 terminals on Auxiliary Control Panel.								
17.4	Test Caps for leakage with approved tester. Remove & replace if necessary.					*			

		A 37	B 75	C 225	D 450	E 900	OK	DEFECT	INIT
	Output voltage reading should be 26.0 to 28.0 Vdc. Value_____ Repair/replace as necessary.			*	*	*			
	B. Check resistors and capacitors for signs of burning or damage. Replace resistors or capacitors if damaged.	*	*	*	*	*			
	C. Ensure fuses are tight in their holders.	*	*	*	*	*			
18	**BRAKE INTERPOSING RELAY ASSEMBLY**								
18.1	Check all connections at terminal block for tightness. Tighten as necessary.				*	*			
18.2	Visibly inspect the relay contacts for burning or pitting. If any abnormal condition is found, replace the relay.				*	*			
19	**AIR COMPRESSOR: (Section 3.3.3.1)**								
19.1	Clean air intake filter with shop air.	*	*	*					
19.2	Replace air intake filter.				*	*			
19.3	Clean interconnecting cooling fins with shop air.				*	*			
19.4	Inspect drive belts and pulley alignment. Replace and adjust as necessary.		*	*	*	*			
19.5	Check oil level. Use 404P791HO1 oil only. (SAE 30W, Nondetergent TG91150LU0012).	*	*						
19.6	Change compressor oil. Use 404P791HO1 oil.			*	*	*			
20	**GENERAL - UNDERFRAME**								
20.1	Inspect underframe area for loose items, corrosion and chaffing. Tighten and/or repair all loose items or problem found.	*	*	*	*	*			
20.2	Inspect the underframe equipment and clean as needed of any dirt and oil build-up.			*	*	*			

		A 37	B 75	C 225	D 450	E 900	OK	DEFECT	INIT
	EXTERIOR:								
21	**LIGHTS AND BODY**								
21.1	Inspect vehicle head lights on the Number #1 and Number #2 end when each end is selected. If head lights are not "ON" when selected, repair/replaced lights as required.	*	*	*	*	*			
21.2	Inspect vehicle marker lights. Repair and/or replace as needed.	*	*	*	*	*			
21.3	Inspect the vehicle exterior for body damage, corrosion and areas needing paint.	*	*	*	*	*			
	INTERIOR (Subsystems):								
22	**SERVICE HVAC EQUIPMENT**								
22.1	Inspect Evaporator blower fan for tightness on shaft.			*	*	*			
22.2	Check flexible air duct for damage. Repair or replace as needed.				*	*			
22.3	Clean the surface of the evaporator coil.			*	*	*			
22.4	Clean the evaporator coils.			*	*	*			
22.5	Clean the evaporator drain pan.			*	*	*			
22.6	Clean the drain lines.			*	*	*			
22.7	Clean the return air sensor probe.		*	*	*	*			
22.8	Rinse and reinstall evaporator filter in #1 and #2 end. Replace if necessary.		*	*	*	*			
22.9	Check interior of vehicle of proper operation of F-end and R-end HVAC units.	*	*	*	*	*			

		A 37	B 75	C 225	D 450	E 900	OK	DEFECT	INIT
	NOTE: HVAC should be in operation when checking level in sight glass. **Prior to adding freon, check high side (275 psi) and low side (60 psi) pressure readings.**								
22.1	Check A/C condenser sight glass for porper charge (veh. exterior). Freon full level is equal to 1/2 sight glass. If a more accurate check is required, use a gauge to verify psi (Low side suction line compressor crankcase 60 psi and the High side hot gas line compressor crankcase 275 psi).	*	*	*	*	*			
22.11	Inspect HVAC system for leaks.			*	*	*			
22.12	Ensure that re-heat switches are in the "ON" position	*	*	*	*	*			
23	**<u>Vehicle General Interior Inspection</u>**								
23.1	Ensure vehicle interior has information decals. "Door Release" and "Door Number" decals on all doors. "No Smoking" decals, "No Eating" decals above all seats. Install missing decals as necessary.	*	*	*	*	*			
23.2	Ensure vehicle overhead light are operational. Repair/replaced as required.	*	*	*	*	*			
23.3	Check for defective carpet, paint, finish, and trim.	*	*	*	*	*			
23.4	Ensure graphic LED's are illuminating and verify VASSA unit for message operation.	*	*	*	*	*			
	A. On CPU1, flip switch 7 down and the other switches up: Verify that the VASSA plays messages 22 given in Appendix A of Manual. B. On CPU1, flip all switches up: Verify that the graphics signs read "Test1". Verify that the VASSA plays message 2A given in Appendix A of Manual.								

		A 37	B 75	C 225	D 450	E 900	OK	DEFECT	INIT
	Phase II Vehicle								
	ATC1 must be set to Mode 5. There are two sub modes of operations that are selected by SW3. SW12 must be put in the ON position and SW11 - SW5 must be in the OFF position.								
	A. Mode 5.0 - Audio Announcements: In this mode, the voice message number dialed on SW2 & SW1 will be sent to the announcement system. DS7A&B will display the test message number being sent to the audio unit. Fr a listing of the keying data (See Appendix B, Miami DCMC Vehicle ATC Diagnostic Monitor User's Guide).								
	B. Mode 5.1 Graphic Signs Displays: In this mode, the graphic message number dialed on SW2 & SW1 will be sent to the graphic signs. DS7A& B will display the upper ASCII character and DS6A&B will display the lower ASCII character of the message number being sent to the graphic signs. Appendix B, Miami DCMC Vehicle ATC Diagnostic Monitor User's Guide).								
23.5	Remove fire extinguisher from holder. Verify from inside vehicle that the voice enunciator is playing.		*	*	*	*			
	"We are aware that the fire extinguisher has been removed. Assistance is on the way".								
	Replace fire extinguisher back on holder. Make repairs as necessary.								
23.6	Inspect fire extinguisher mounting bracket area for loose hardware. Thighten and/or repair al loose hardware, correct any problems found.		*	*	*	*			
23.7	Ensur interior has no loose or unlocked, hardware, equipment, or covers.	*	*	*	*	*			

		A 37	B 75	C 225	D 450	E 900	OK	DEFECT	INIT
23.8	Inspect the vehicle stanchions for tightness and ensure all screws are present (top and bottom connection point). Reinstall any missing screws and use adhesive thread locking (#53836HRA00A, lock-tite TG8030SE08) to ensure all screws are secured properly.	*	*	*	*	*			
23.9	Ensure emergency overhead lighting is operating properly.	*	*	*	*	*			
23.1	Ensure LED's and gauges on propulsion monitor panel, lamps on summary monitor pane., and lamps on manual controller panel (both ends), are operating correctly. Ensure the manual controller station is properly secured.	*	*	*	*	*			
23.11	Check PA and RTT by talking to Central Control to ensure communications are operational.	*	*	*	*	*			
23.12	Ensure Motor Overload alarm and reset circuitry is operational. Push the emergency push button (Mushroom) on the Train's A-Rack to prevent the ATO reset of a Motor Overload condition. Ensure stinger power down, at Motor Control Box, manually latch the Motor Overload Relay in the Motor Control Box.				*	*			
23.13	Restore Stinger power and verify MOL Alarm Lights ast both Summary Monitor Panels as well as the MOL Alarm received at Central Control are lit.				*	*			
23.14	Reset MOL condition by depressing the MOL reset push botton at the #2 end. Verify MOL alarm at Central Control as well as the MOL Panel Lights in the train clear. Repair as necessary.				*	*			
24	**DOORS AND DOOR OPERATORS**								
24.1	Visually inspect door operators for any damage and motor brushes for wear. Replace any defective parts.				*	*			
24.2	Lubricate operators with Syn-Tech Specialty lubricant (TG9150Gr-2).				*	*			
24.3	Inspect door operator alignment. (Ref. Fig. 5-10, page 5-26).				*	*			

		A 37	B 75	C 225	D 450	E 900	OK	DEFECT	INIT
24.4	Check all electrical and mechanical connections for tightness. Tighten all loose connections.				*	*			
24.5	Check all wiring for broken or worn insulation, replacing any wire that is defective.				*	*			
24.6	Clean the lower door guide track of any debris. Use a brush or vacuum and clean rag. Lubricate with greaseless lubricant.	*	*	*	*	*			
24.7	Inspect the lower strip bearing and replace if necessary.	*	*	*	*	*			
24.8	Inspect each door panel for damage (dents), proper alignment and operation. Replace or repair as necessary.			*	*	*			
24.9	Ensure that the emergency pull cables are operational. Replace any defective cables.	*	*	*	*	*			
24.1	Check that the sensitive edge protrudes less than 1.5" when the doors are open.	*	*	*	*	*			
24.11	Check door sensitive edges for tears, cuts, etc., and replace as necessary. Ensure that the sensitive edge is operational at top, middle, and bottom. Repair as required.	*	*	*	*	*			
24.12	Visually inspect the following door subsystem components for cracks, breaks, unusual noises, mis-alignment, uneven wear, and dirt. Replace all defective components found. Clean as required.								
	1. Door cap.			*	*	*			
	2. Nutcracker.			*	*	*			
	3. Mylar strip.			*	*	*			
	4. Upper door bearing roller.			*	*	*			
	5. Lower door guide plate.			*	*	*			
24.13	Ensure the nutcracker is operating correctly, perform the following steps on vehicle doors:			*	*	*			
	A. Using a 3/4" wood doweling rod, insert it while the doors are closing.			*	*	*			

		A 37	B 75	C 225	D 450	E 900	OK	DEFECT	INIT
	B. The door closed light for that set of doors should not go out (on manual controller and summary monitor panel), and the "all doors closed" light should not come "on".			*	*	*			
	C. Insert the rod in three places on each door; approximately 18 inches from top, center of door set, and 18 inches from bottom.			*	*	*			
	D. If the "door closed" lights go out, or you have an "all doors closed", adjust the door's (nutcracker switch) so that they are working correctly.			*	*	*			
24.14	Ensure door opening and closing times are 4.0 seconds + .5 seconds. Adjust as necessary.		*	*	*	*			
24.15	Verify with a spring gage that the door closing force is 15 to 30 pounds. Make adjustments as necessary.			*	*	*			
24.16	Verify each door recycle push-button is functional. Make repairs as necessary.			*	*	*			
24.17	Remove and clean tips of sensitive edge contacts with scotchbrite, also clean sliding track. (**Cars 13-29 only)**			*	*	*			
24.18	Inspect and adjust sensitive edge spring and cable assembly. Replace if necessary. **(Cars 1-12 only).**		*	*	*	*			
24.19	Level the doors (door edge is to be parallel to the mating door edge).					*			
25	**NUMBER 2 END EQUIPMENT ASSEMBLY**								
25.1	Vacuum and clean out the No. 2 end equipment bay.				*	*			
25.2	Check hardware for tightness and chaffing.				*	*			
25.3	Verify emergency air blower is operational. Replace as necessary.				*	*			

		A 37	B 75	C 225	D 450	E 900	OK	DEFECT	INIT
26	**NUMBER 1 END EQUIPMENT ASSEMBLY**								
26.1	Do the following for the "A", "B", and "C", racks (phase-I), and ATC-1, 2, & 3 (phase-II)								
	A. Vacuum clean the area (remove the racks)				*	*			
	B. Check for loose hardware.				*	*			
	C. Check wiring for chaffing and proper				*	*			
	D. Check connector pins and connector hardware.				*	*			
	E. Inspect terminal boards and solder joints.				*	*			
27	**INTERIOR AIR CONTROL PACKAGE FUNCTION VERIFICATION**								
27.1	Ensure operation of all fail-safe emergency (FSE) and quick release valves.	*	*	*					
NOTE:	Be thorough. This is an important check. Both F.S.E. valves must operate. One person operates the manual controller (drop handle to emergency position) and another person verifies that the quick release valves at each end of the vehicle exhausts all air in a sharp, short audible pause (no lingering drain down audible).								
27.2	Observe that the pressure is being asserted on the Service Brake Chamber by observing the gauges o the Number 2 end when the Number 2 end Manual Controller is Moved for the ATO Mode. Observe that eh compressor cycles on at 120 psi and off at 155 psi. If compressor do not cycles "On and "Off" adjust/replace CSO pressure switch.	*	*	*	*	*			
27.3	Check the air pressure regulator settings. Make sure air pressure is built up on car. Verify that both brake chamber gauges read approximately 105 psi with pressure applied, and approximately "0" psi with brakes off (located in no. 2 end of car).		*	*	*	*			

		A 37	B 75	C 225	D 450	E 900	OK	DEFECT	INIT
27.4	Verify spring brake application by each of the following methods and repair as needed.		*	*	*	*			
	A. Disconnecting the frangible flag plug.		*	*	*	*			
	B. Depressing the emergency push-button on the "A" rack.		*	*	*	*			
	C. Depressing the emergency push-button on each of the manual control.		*	*	*	*			
27.5	Visually check interrupter assembly, make sure wire is installed securely. Repair as necessary.	*	*	*	*	*			
28	**AIR COMPRESSOR INSPECTION INSIDE VEHICLE**								
28.1	Inspect/test air pressure alarm as follows and repair as necessary.					*			
	A. Turn off air compressor at LCB at No. 2 end of car.					*			
	B. Drain air from the car.					*			
	C. "Air light" on summary monitor panel should light between 95-100 psi.					*			
	D. Verify air pressure alarm at Central.					*			
28.2	Use shp air pressure to build up pressure in vehicle, turn off all breakers except "BCB1". Place vehicle in manual, release brakes, check for air leaks under vehicle, brake chambers and application release valve no. 1 and no. 2 vehicle ends. Repair as necessary.			*	*	*			
28.3	Use shop air pressure to build up pressure in vehicle, turn off all breakers except "BCB1". Place vehicle in manual, apply brakes, check for air leaks under vehicle, brake chambers and application release valve no. 1 and no. 2 vehicle ends. Repair as necessary.			*	*	*			
29	**EMERGENCY STOP & TRACK SIGNALING AMPLIFIER RELAY (OVERSPEED VITAL RELAY)**								
29. 1	Remove the relay and check visible contacts for burning or pitting. If burnt or pitted, replace the relay.				*	*			

		A 37	B 75	C 225	D 450	E 900	OK	DEFECT	INIT
29.2	If contacts are not pitted or burned, inspect for pick-up voltage and drop-away voltage. Remove and replace the relay (for calibration) if out-of-spec.				*	*			
	Minimum D/A voltage= _____volts (1.94)				*	*			
	Maximum P/U voltage= _____volts (6.34)				*	*			
29.3	Check contact resistance.								
	A. Front contacts: 0.09 Ohms.				*	*			
	B. Back contacts:								
	Silver to Silver - 0.03 Ohms				*	*			
	Silver to Silver/Carbon - 0.18 Ohms				*	*			
	Replace the relay if out-of-spec.				*	*			
29.4	Check all external terminals for tightness and re-tighten as necessary.			*	*	*			
30	**INTERIOR BATTERY CHARGER VERIFICATION**								
30.1	Check battery voltage (with calibrated meter) at terminal BBS and BBG. Readings should be between 22.0 - 28.0 Vdc.	*	*	*	*	*			
30.2	Battery load test and phase loss alarms verification.			*	*	*			
	A. Turn "off" 600 Vac power (all car breakers "on").			*	*	*			
	B. Verify phase loss alarms at Central control.			*	*	*			
	C. Ensure all car breakers are "on" and intitiate radio vehicle polling with Central Control.			*	*	*			
	D. Ensure 600 Vac stinger power is "off".			*	*	*			
	E. Monitor vehicle polling with Centra for 30 minutes. If polling is lost, inspect battery charger and batteries replace vehicle batteries as needed.			*	*	*			

MIAMI-DADE TRANSIT METROMOVER MOVER VEHICLE INSPECTION PM No. 410 REVISION: B REVISED 12/01/01 PAGE 25 OF 25	A 37	B 75	C 225	D 450	E 900	OK	DEFECT	INIT

Quantity of VMR's originated by this inspection… _____

Additional comments/discrepancies: _____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____ _____

Chief Supervisor's Signature **Date**

QUALITY VERIFICATION OF PM TASKS		
Tasks Inspected		**Inspected By: _____ Date: _____** **Supervisor's Signature** **Inspected By: _____ Date: _____** **Chief Supervisor**

APPENDIX C

Sample Metromover PM Package: F Inspection

MIAMI-DADE TRANSIT AGENCY
DOWNTOWN COMPONENT OF METRORAIL

MR510R 0 __ __ __ __ __

PM NO. F-VEH SYSTEM VEHICLE TYPE 1800 DAY

MILEAGE READING _____ DATE _____

List below all the discrepancies found during this P.M. List corrective action for the discrepancy. If follow-up action is required, state responsibility for corrective action. Use as many data sheets as required. **Be detailed.**

CAR NUMBER	DUE DATE	LATE DATE	DATE COMPLETED
MC			

VMR #	ITEM #	DISCREPANCY/ACTION	SIGNATURE WHEN CORRECTED

EMPLOYEE SIGNATURE/ BADGE #	EMP. CLASS. ABBRV.	START TIME OF PM	COMPLETION DATE & TIME	HOURS WORKED

Supervisor's Signature **Date**

SPECIAL INSTRUCTIONS: 1) RECORD THE HUB MILEAGE ON THE COVER SHEET. 2) IF COMPONENT FAILS INSPECTION AND A “VMR” IS ORIGINATED (30 MINS. OR MORE FOR REPAIR), CHECK “VMR” COLUMN AND DOCUMENT “VMR NUMBER” ON COVER SHEET OF PM.	OK	VMR	INIT
1.0 SERVICE HVAC EQUIPMENT (Section 5)			
1.1 Rinse and reinstall evaporator filter in #1 and #2 end. Replace if necessary.			
1.2 Clean the evaporator drain pan.			
1.3 Clean condenser coils.			
1.4 Check A/C condenser sight glass for proper charge (veh. Exterior). Freon full level is equal to ½ sight glass. If a more accurate check is required, use a gauge. High-side 275 psi and low-side 60 psi.			
1.5 Check interior of vehicle for proper operation of F-end and R-end HVAC units.			
1.6 Inspect HVAC system for leaks. (See engineer for inspection procedure.)			
2.0 BOGIE ASSEMBLIES (Section 3.13)			
2.1 Verify that the vehicle leveling system is operating correctly. Leveling valve failure requires immediate repair.			
2.2 Inspect the following for leakage, damage, cracks, dry rot, or other signs of fatigue. Replace if necessary. 1. Shock absorbers. 2. Radius absorbers. 3. Leaf springs. 4. Leveling valves (3).			
2.3 Ensure the vehicle has proper alignment and is level (height for platform) using a measuring rod.			
2.4 Inspect air springs (air bags) for indications of leaks, deterioration, chafing or cracks. Replace as necessary. Inspect hardware connections for tightness.			
2.5 Drain main air tank and bogie of any moisture, presence of condensation is an indication that the air dryer is not functioning properly. Replace desiccant filter as required.			
2.6 Visually inspect main reservoir (mrp) and associated piping for cracks, dry rot, or signs of fatigue, and replace as necessary.			
2.7 Lubricate the following with EP2 lubricant (TG9150LU0039). 1. Radius arm rods (3/bogie) 2. Drive shaft universals. 3. Bogie ring pivot bearing.			

	OK	VMR	INIT
2.8 Fill differential hub 1" below service level, use 140W oil.			
2.9 Clean any oil spills around differential, antennas or wheel hubs with wire brush and soap solution.			
2.10 Check for any leaks from the wheel hubs. Notify supervisor if any leaks are found.			
Note: Heavy repairs (bogies) require supervisor approval/sched.			
2.11 Inspect the following items for any damage: bogie structure, guide axles, suspension, spring bushings, etc. (visual). If damage or unusual condition(s) are detected, inform supervisor.			
2.12 Check motor cables for any damages, wear, and proper shrink sleeving, etc.			
2.13 Check each vehicle bogie to ensure it is level. Lay 6 ft. level across guide tire safety discs. If vehicle bogies are not level, see vehicle equipment manual 5.4.26 (pages 5-200) for adjustment procedure.			
2.14 Inspect all bogie air lines for chaffing and wear. Replace any defective parts.			
2.15 Ensure that all hardware connections are safety wired correctly.			
2.16 Measure resistance 3-phase power to car body ground. Must be less than 1 ohm, use low ohmmeter.			
2.17 Inspect the 4 bogie attachment bolts (large bolts) on each corner of the frame for cracks or other signs of fatigue. Replace as necessary.			
3.0 GUIDEWHEEL ASSEMBLIES (Section 3.15)			
3.1 Remove guidewheel bearing cover and inspect guidewheel bearing for lubrication. If lubrication is not visible, dark, and/or liquid from overheating, call supervisor for bearing inspection.			
3.2 Remove and replace the bearings in all eight (8) guidewheel assemblies, use new bearings. Perform task 3.5 approximately 24 hours after replacement of bearings (seating-in).			
Note: Notify supervisor to measure bearing seats on spindle. Upper bearing seat should measure 1.9985" to 1.9950" in a transverse direction to the car's length. The lower seat should measure 1.2490" to 1.2498" in transverse direction. Record measurements. If our of tolerance, remove spindle for chrome plating. (a) Upper bearing seat _____ inches (b) Lower bearing seat _____ inches			
3.3 Inspect guide tires for wear with go/no-go gauge. If tires fail go/no-go test, replace the guide tires.			
3.4 Inspect guide tires for damage (broken or deformed). Replace guide tires if necessary.			

OK	VMR	INIT

3.5 Check guidewheel play as follows:

A. Mount the dial indicator on the bottom of the safety disc.
B. Carefully position the indicator arm on the very bottom of spindle shaft.
C. Grasp the tire (preferably 2 people) and pull down on tire while rotating it back and forth (couple of inches). Note indicator reading, establish zero point.
D. Push up on tire in a rocking motion while rotating the tire back and forth and observe dial indicator reading. The difference should be .001" to .007", optimum range is .001" to .005".
E. If there is no play or less than .001", the castle nut must be loosened one or more openings until the .001"-.005" tolerance is obtained. From one castle nut opening to the next is .006".
F. If too much play is noted, the nut must be tightened.
G. Install cotter pin when proper play is achieved.
H. Record all data below, including the tolerance dimension arrived at for each wheel.

3.5.1 GUIDEWHEELS:

#1 end:
#8 0 0 #1
#7 0 0 #2
#6 0 0 #3
#5 0 0 #4

#2 end: Actual wheel bearing clearance readings after adjustments (.001"-.005")

Wheel No.	Reading	Reading	Wheel No.
#8			#1
#7			#2
#6			#3
#5			#4

Comments: _____

_____

3.6 Check hubs for cracks. Check front two guidewheel spindles for cracks near the lower two bolt holes. If cracks are found, see shift supervisor to schedule repair.

4.0 INSPECT DRIVE WHEELS:

4.1 Inspect for wear and inflation, 3/32" min. tread and 110 ± 5 psi cold.

4.2 Using a torque wrench check torque of main tire lug nuts (160 Ft-Lbs) and check rims for cracks. If cracks are found, notify supervisor.

5.0 BATTERY SERVICE (Section 3.6)

5.1 Check electrical connections, make sure they are tight and clean. See vehicle equipment manual page 3-35 thru 3-37 for cleaning instructions.

5.2 Check for any battery case damage (leaks). Replace battery if case is damaged.

	OK	VMR	INIT
5.3 Check battery charger as follows: A. Verify that the battery charger overvoltage setting is correct at +30.81. B. Connect a digital voltmeter across the battery charger output. Verify output is 26.68 volts. Repair/replace as necessary. 5.4 Check the battery voltage on the number 2 end meter or at terminal BBS and BBG. Readings should be between 22.0-28.0 Vdc. 5.5 Battery load test and phase loss alarms verification. A. Turn "off" 600 Vac power (all car breakers "on"). B. Verify phase loss alarms at Central Control. C. Ensure all car breakers are "on" and initiate radio vehicle polling with Central Control. D. Ensure 600 Vac stinger power is "off." E. Monitor vehicle polling with Central for 30 minutes. If polling is lost, replace vehicle batteries.			
6.0 COUPLER 6.1 Lubricate the coupler locking pin with EP-2 lubricant. 6.2 Lubricate the coupler through the grease fitting with EP-2 lubricant. 6.3 Check for ease of movement of the coupler automatic recentering device through a sideward swing of 11 degrees on either side of center. If the coupler does not re-center properly, repair as necessary. 6.4 Check the air coupler and connections and the self-sealing check valve for leaks by use of a solution of soap and water. If a leak is detected, tighten connection or remove and reseal using Teflon tape.			
7.0 GENERAL – UNDERFRAME 7.1 Inspect underframe area for loose items, chaffing, etc. Tighten and/or repair all loose items or problems found. 7.2 Inspect the underframe equipment and clean as needed of any dirt and oil build-up.			
8.0 VENTILATION BLOWER FILTERS 8.1 Replace air filter for ventilation blower, in the #1 end. 8.2 Replace air filter for ventilation blower, in the #2 end.			
9.0 POWER SUPPLIES 9.1 Check power supply inputs and outputs for a tolerance of $\pm$.01, +24v, -24v, +12, +6, +15, -15. A. Open breakers BCB1 and BCB2. B. Put the power supply rectifier modules on the extender modules ("B" and "C" racks A8). C. Close breakers BCB1 and BCB2.			

	OK	VMR	INIT
D. Read the filtered voltage output of each of the six circuits on each board. E. Reference sheet 90 of schematic 5574C70 for output pins. F. Reference sheet 98 of schematic 5574C70 for approximate voltage levels. These are unregulated power supplies and actual readings will be substantially higher (5v = 10Vdc, 15v = 20Vdc).			
10.0 DOORS AND DOOR OPERATORS			
10.1 Visually inspect door operators for any damage and motor brushes for wear. Replace any defective parts.			
10.2 Lubricate operators with EP-2 lubricant.			
10.3 Inspect door operator alignment (Ref: Vehicle Equipment Manual 4.3.5.1).			
10.4 Check all electrical and mechanical connections for tightness. Tighten all loose connections.			
10.5 Check all wiring for broken or worn insulation, replacing any wire that is defective.			
10.6 Clean door roller track and the lower door guide track of any debris. Use a brush or vacuum, and clean with a lint-free cloth.			
10.7 Ensure that the emergency pull cables are operational. Replace any defective cables.			
10.8 Check that the sensitive edge protrudes less than 1.5" when the doors are open.			
10.9 Check door sensitive edge s for tears, cuts, etc., and replace as necessary. Ensure that the sensitive edge is operational at top, middle, and bottom. Repair as required.			
10.10 Visually inspect the following door subsystem components for cracks, breaks, unusual noises, misalignment, uneven wear, and dirt. Replace all defective components found. 1. Door cap. 2. Nutcracker. 3. Mylar strip. 4. Upper door bearing roller. 5. Lower door guide plate.			
10.11 Ensure the nutcracker is operating correctly, perform the following steps on vehicle doors: A. Using a ¾" wood dowling rod, insert it while the doors are closing. B. The "door closed" light for that set of doors should not go out (on manual controller and summary monitor panel), and the "all doors closed" light should not come "on." C. Insert the rod in three places on each door; approximately 18 inches from top, center of door set, and 18 inches from bottom. D. If the "door closed" lights go out, or you have an "all doors closed", adjust the door's (nutcracker switch) so that they are working correctly.			

	OK	VMR	INIT

10.12 Ensure door opening and closing times are 4.0 seconds ± .5 seconds. Adjust as necessary.

10.13 Verify with a spring gage that the door closing force is 15 to 30 pounds. Make adjustments as necessary.

10.14 Verify each door recycle pushbutton is functional. Make repairs as necessary.

10.15 Remove and clean tips of sensitive edge contacts with Scotchbrite, also clean sliding track. (Cars 13-29 only)

10.16 Inspect and adjust sensitive edge spring and cable assembly. Replace if necessary. (Cars 1-12 only)

10.17 Level the doors (door edge is to be parallel to the mating door edge).

10.18 Inspect the lower strip bearing and replace if necessary.

11.0 BRAKE CONTROL PACKAGE (Section 3.4.3.1)

11.1 Replace the application/release valves AR1 and AR2.

11.2 Inspect pressure switch setting for the specifications listed:

MRP	normally open	tbl-1 to tbl-2	95 psi incr.
PB	normally closed	tbl-3 to tbl-4	5 psi incr.
PBR	normally closed	tbl-5 to tbl-6	65 psi decr.
CSO	normally closed	tbl-13 to tbl-14	open 155 psi - close 120 psi
FB	normally open	tbl-3 to tbl-4	80 psi incr.
DB	normally open	tbl-5 to tbl-6	7 psi incr.

11.3 Drain air tanks of moisture.

11.4 Rebuild the friction brake system as follows:

Note: The vehicle friction brakes are self adjusting, automotive drum type and air controlled wedge brake with fail-safe spring chambers. The following parts are to be used in rebuilding the vehicle friction brake system.

1. 16 degree wedge assembly kit.
2. Service brake air chamber kit.
3. Adjusting bolt assembly.
4. Anchor plunger.
5. Brake shoe lining (non-asbestos) assy.
6. Shoe return spring.
7. Adjuster assembly.
8. Diaphram SBC 9".
9. Diaphram SCB 16".
10. Seal hub.

Repair Code: BRKOH Last brake overhaul _____

11.5 Inspect the brake control package on each drive end to determine if components operate correctly. Replace all defective components.

	OK	VMR	INIT
12.0 AUXILIARY RELEASE PACKAGE (Section 3.4.4) 12.1 Check and adjust pressure regulator, should be 85 psi +0, -5. 12.2 Inspect operation of solenoid and replace all defective components. 12.3 Inspect valves for internal leaks and replace all defective parts. 12.4 Inspect the auxiliary release package components for leaks and correct pressure setting. Replace defective components as necessary.			
13.0 PNEUMATIC SYSTEMS 13.1 Remove and replace the pneumatic compressors (verify CSO cut-on and cut-off setting are correct) and related subsystems including the air control package, two brake control packages, and the auxiliary release package. 13.2 Verify pressure setting and visually inspect the following subsystem components for cracks, dry rot, or other signs of fatigue; replace as necessary. 1. Parking brake release (PBR) 60 psi decr. 2. Full brakes 1& 2 (FB-1, FB-2) 80 psi increase. 3. Air bag failure sensor 1, 2, and 3 (ABF-1)			
14.0 PROPULSION MOTOR (Section 3.5) 14.1 Remove commutator covers and perform the following steps: **CAUTION:** Use a safety mask due to the carbon. 14.1.1 Clean motor filter media and assure that there are no gaps upon re-installation. 14.1.2 Blow out motor, use dry air (max 30 psi air pressure) 14.2 Inspect commutator for the following: A. Signs of brush grooving or threading. B. Overheating (purple color) or flashover damage. C. Inspect mica slots for foreign material; copper beads on ends of commutator bars. D. Inspect commutator surface for burn. If burned, verify spring tension on brushes for smooth sliding, adjust as necessary. If any of the above are found, notify supervisor.			
14.3 Inspect carbon brushes for the following conditions: A. Worn – replace any brush that is less than 1 inch long. B. Damaged – replace any brush that is broken, chipped, burnt, or shows uneven wear. C. Shunts – ensure there are no loose or frayed brush shunts. 14.4 Inspect brusholders as follows: A. Check brusholder cap bolts for 15-30 Ft-Lbs torque. B. Check bursholder cable connector bolt for 11 Ft-Lbs torque. C. Clean brusholder and insulators by wiping with a solvent dampened rag such as electronic cleaner (avoid solvent on brush cover and commutator). If			

	OK	VMR	INIT
it is burned through and/or flashovers have burned craters into insulators equal to one-half of the thickness of the insulator, replace the brusholder. D. Check spring action to see if brushes move freely. E. The clearance between the brush and brusholder must not exceed 0.010". The clearance width-wise must not exceed 0.0625". F. Check brusholder alignment, it must be within ½ mica bar thickness. G. Ensure brusholder clearance to commutator is 0.07" – 0.11". H. Ensure spring pressure is 5.5 to 7.5 lbs. I. Replace any damaged or broken springs.			
14.5 Check creepage band for signs of cracking, burning, nicks, and overheating. Clean with a solvent dampened rag. If creepage band is damaged, see shift supervisor.			
14.6 Inspect arc horns for metal beads or build up from flashover, clean as necessary. A. Assure that arc horns are free of paint, grease, etc.			
14.7 Inspect internal/external cables for signs of chaffing, overhearing, broken or cracked insulation, and broken or loose cable ties. Replace all defective cable(s).			
14.8 Inspect the field coil visible end for any signs of charred insulation. Also check visible connections for tightness. Replace as necessary.			
14.9 Lubricate pinion end roller bearing. Apply 0.5 oz. of Exxon Lidok EP #2 using the grease fitting on the coupling end housing.			
14.10 Lubricate commutator end bearing, using EP2 lubricant.			
14.11 Inspect tach sensor and gear tooth area. Clean the area.			
15.0 MOTOR CONTROL BOX (Section 3.8)			
15.1 Remove covers and ensure that the seals and locking bolts are intact.			
CAUTION: Discharge capacitors before proceeding.			
15.2 Clean MCB interior with damp rag and/or vacuum. Remove any flash marks.			
15.3 Ensure potentiometer reads 100 ± 1 ohm. Adjust as needed.			
15.4 Check all hardware and wire connections for tightness (each screw, nut, and bolt with proper tool, see torque chart).			
15.5 Check all wiring and reverser hoses for impact, excessive bend, or heat damage. Replace items as necessary.			
15.6 Check relays for clean contact. Use mirror and flashlight to check for burning and pitting. Replace relay as necessary.			
15.7 Manually operate the M.O.L. relay and check to ensure proper latching.			

	OK	VMR	INIT
15.8 Ensure motor overload reset in motor control box is operational. Put emergency pushbutton on auxiliary brake panel #2 end down so ATO will not automatically reset overload. Repair as necessary.			
15.9 Restore stinger power and verify M.O.L. lights are lit on both monitor panels.			
15.10 Verify MOL alarm at Central clears. Repair as necessary.			
16.0 REVERSER (Section 3.8)			
16.1 Check the reverser for proper operation by manually energizing the air valves. Check for good electrical contact pressure.			
16.2 Test for sluggish operation of reverser. Depress each magnet valve armature all the way, one at a time. If reverser operates sluggishly, check magnet valves for air leaks or check for rough drum fingers and contacts.			
16.3 Inspect main contacts for burning and pitting. Replace as necessary.			
16.4 Ensure interlocks latch, repair as necessary.			
16.5 Inspect shunts and check for loose, burnt, or broken shunts. Replace as necessary.			
16.6 Lubricate as follows: A. Lubricate internal cylinder walls with M#55271-AA. B. Lubricate surface between shaft operating lever and piston operating rod with M#53701GC			
17.0 BRAKE SWITCH			
17.1 Inspect braided cable and replace when fraying. Refer to drawing #565F315 for disassembly/reassembly.			
17.2 Inspect brake switch arc box as follows: A. Inspect for damage. Replace or repair with arc box cement when burned halfway through. B. Check contacts for binding, repair as required. C. Disassemble, clean and lubricate all hinge points. Use EP-2 lube. D. Inspect interlocks, contacts, and operation. Clean contacts if pitted and/or burned. Check electrical contact pressure. E. Operate switch manually and ensure contacts align properly. Adjust as necessary. F. Inspect for broken jumper.			
18.0 LINE SWITCH			
18.1 Inspect braided cable and replace when fraying. Refer to drawing #565F315 for disassembly/reassembly.			
18.2 Inspect line switch arc box as follows: A. Inspect for damage. Replace or repair with arc box cement when burned halfway through.			

	OK	VMR	INIT
B. Check contacts for binding, repair as required. C. Disassemble, clean and lubricate all hinge points. Use EP-2 lube. D. Inspect interlocks, contacts, and operation. Clean contacts if pitted and/or burned. Check electrical contact pressure. E. Operate switch manually and ensure contacts align properly. F. Inspect for broken jumper.			
19.0 AUXILIARY CONTROL BOX (Section 3.7)			
19.1 Remove covers and ensure that the seals and locking bolts are intact.			
19.2 Clean ACB interior with a damp rag and/or vacuum. Remove any flash marks.			
19.3 Check all hardware and wire connections to ensure they are secure. Tighten each screw, nut, and bolt as required.			
19.4 Check all wiring for chaffing, impact, bend, or heat damage. Replace wiring as necessary.			
19.5 Check all relays for clean contact. Use a mirror and flashlight to check for burning and pitting. Replace relay as necessary.			
19.6 Switch "off" and "on" all molded case circuit breakers. Also operate the thermal breakers and "PRC" switch. Note any binding or sluggish operation.			
19.7 **Power plug:** ensure power plug pins are secure.			
20.0 BRAKE INTERPOSING RELAY ASSEMBLY			
20.1 Check all external terminals for tightness. Tighten as necessary.			
20.2 Remove and replace brake interposing relay.			
21.0 COLLECTOR ASSEMBLIES (Section 3.10)			
21.1 Check all springs for 15 lbs. of pressure using a spring gauge. Repair as necessary.			
21.2 Inspect for proper operation and lubricate with light weight spray oil the following: 1. Collector assembly pivot bearings. 2. Spring hook points. 3. Power shoe holders.			
21.3 Check for broken/cracked collector shoes. If any are replaced, enter on "vehicle collector replacement record" on back page.			
21.4 Check for broken/bent collector shoe pins.			
21.5 Check that all collector cables are securely clamped and in place.			
21.6 Check for nicks on collector shoe cables and for broken terminals.			

	OK	VMR	INIT
21.7 Check insulation blocks for cracks.			
21.8 Check collector shoe alignment per procedure.			
21.9 Perform the vehicle choke check per the following procedure: A. Run vehicle or train into maintenance building on track M3 or M4. B. Turn off all vehicle breakers and then track power. C. Connect an ohmmeter to the ATO shoe (either side) and the car body. Verify that the resistance is less than 1 Ohm. D. Repeat step "C" until all ATO/ground ground shoe pairs on the train are within specification. E. If a high resistance is found, the choke must be replaced. F. When finished, restore power.			
22.0 INTERIOR			
22.1 Ensure vehicle interior has information decals.			
22.2 Check for defective carpet, paint, finish, and trim.			
22.3 Ensure graphic LEDs are illuminating and verify VASSA unit for message operation.			
22.4 Ensure interior has no loose or unlocked hardware, equipment or covers.			
22.5 Inspect the vehicle stanchions for tightness and ensure all screws are present (top and bottom connection point).			
22.5.1 Reinstall any missing screws and use adhesive thread locking (#53836HRA00A, locktite) to ensure all screws are secured properly.			
22.6 Ensure emergency overhead lighting is operating properly.			
22.7 Ensure overhead lighting is operating.			
22.8 Ensure fire extinguishers are charged by checking indicator dial.			
22.9 Ensure LEDs and gauges on propulsion monitor panel, lamps on summary monitor panel, and lamps on manual controller panel (both ends), are operating correctly. Ensure the manual controller station is properly secured.			
22.10 Check PA and RTT by talking to Central Control to ensure communications are operational.			
23.0 EXTERIOR			
23.1 Ensure headlights, running lights, and overhead lights are operational.			
23.2 Visually check interrupter assembly, make sure wire is installed securely. Repair as necessary.			
24.0 NUMBER 1 END EQUIPMENT ASSEMBLY (Section 3.1)			

	OK	VMR	INIT
24.1 Perform the vehicle track signal level setting per the procedure. (Page 3-54, 3.18.1 Preamp Test Proc.) (Page 3-56, 3.18.2 Test Area Set Up Proc.)			
24.2 Do the following for the "A", "B", and "C", racks (phase-I), and ATC-1, 2, and 3 (phase-II) A. Vacuum clean the area (remove the racks). B. Check for loose hardware. C. Check wiring for chaffing, proper routing, etc. D. Check connector pins and connector hardware.			
24.3 Check and clear the diagnostic alarms on the ATC2 (phase-II vehicles) and the B-rack (phase-I vehicles).			
25.0 EMERGENCY STOP & TRACK SIGNALLING AMPLIFIER RELAY			
25.1 Check all external terminals for tightness and re-tighten as necessary.			
25.2 Remove the relay and check visible contacts for burning or pitting. If burnt or pitted, replace the relay.			
26.0 VITAL RELAY			
26.1 Inspect for pickup voltage and dropaway voltage. Remove and replace the relay (for calibration) if out-of-spec. Minimum D/A voltage = _____ volts (1.94) Maximum P/U voltage = _____ volts (6.34)			
26.2 Check contact resistance. A. Front contacts: 0.09 Ohms. B. Back contacts: Silver to Silver – 0.03 Ohms. Silver to Silver/Carbon - 0.18 Ohms. Replace the realy if out-of-spec.			
27.0 NUMBER 2 END EQUIPMENT ASSEMBLY (Section 3.19)			
27.1 Vacuum and clean out the No. 2 end equipment bay.			
27.2 Check hardware for tightness and chaffing.			
27.3 Verify emergency air blower is operational. Replace as necessary.			
28.0 AIR CONTROL PACKAGE			
28.1 Test for leaks. Limit of 5 psi per 30 minutes. Repair as necessary.			
28.2 Check all air requlators for proper pressure settings. Adjust as necessary. A. Left regulator 105 psi +0 –5. B. Right regulator 80 psi +0 –5.			
28.3 Apply 155 psi through air dryer, then shut off supply line, verify there are no air leaks from the subsystem components. Replace components as necessary.			

	OK	VMR	INIT
28.4 Observe that the service brakes are operating in their normal pressure range of 10-20 psi when service braking is initiated. Observe that the compressor cycles on at 120 psi and off at 155 psi.			
28.5 Verify that dynamic braking is operational, use the current meter for this check.			
28.6 Check that brakes are not caged.			
28.7 Check for oil leaks around brake wheel seals. If leaks are found, notify supervisor.			
28.8 Check emergency brake by-pass valve for proper position and safety wiring. Repair as required.			
28.9 Remove and replace quick release valves (2) and fail-safe emergency (FSE) valves (2) for overhaul. Ensure proper operation of all fail-safe emergency (FSE) and quick release valves.			
NOTE: Be thorough. This is an important check. Both F.S.E. valves must operate. One person operates the manual controller (drop handle to emergency position) and another person verifies that the quick release valves at each end of the vehicle exhausts all air in a sharp, short audible pause (no lingering drain down audible).			
28.10 Check the air pressure regulator settings. Make sure air pressure is built up on car. After air pressure regulators are set, verify that both brake chamber gauges read 105 $\pm$ 5 psi with pressure applied, and "0" psi with brakes off (located in No. 2 end of car).			
28.11 Verify spring brake application by each of the following methods and repair as needed. A. Disconnecting the frangible flag plug. B. Depressing the emergency pushbutton on the "A" rack. C. Depressing the emergency pushbutton on each of the manual controls.			
28.12 Inspect/test air pressure alarm as follows and repair as necessary. A. Turn off air compressor at LCB at No. 2 end of car. B. Drain air from the car. C. "Air light" on summary monitor panel should light between 95-100 psi. D. Verify air pressure alarm at Central.			
28.13 Make sure air pressure on vehicle is built-up and turn off all breakers except "BCB1". Place vehicle in manual, release brakes, check for air leaks under vehicle, brake chambers, and application release valve No. 1 and No. 2 vehicle ends. (Brake rate) Repair as necessary.			

Quantity of VMRs originated by this inspection: _____

Additional comments/discrepancies: _____
_____
_____
_____
_____

_____ _____
Chief Supervisor’s Signature Date

QUALITY VERIFICATION OF PM TASKS		
TASKS INSPECTED		**Inspected by: _____ Date: _____** **Supervisor Signature**
		Inspected by: _____ Date: _____ **Chief Supervisor**

APPENDIX D

Sample Metromover PM Package: G Inspection

MIAMI-DADE TRANSIT AGENCY
DOWNTOWN COMPONENT OF METRORAIL

MR510R 0 __ __ __ __ __

PM NO. G-VEH SYSTEM VEHICLE TYPE 3600 DAY

MILEAGE READING _____ DATE _____

List below all the discrepancies found during this P.M. List corrective action for the discrepancy. If follow-up action is required, state responsibility for corrective action. Use as many data sheets as required. **Be detailed.**

CAR NUMBER	DUE DATE	LATE DATE	DATE COMPLETED
MC			

VMR #	ITEM #	DISCREPANCY/ACTION	SIGNATURE WHEN CORRECTED

EMPLOYEE SIGNATURE/ BADGE #	EMP. CLASS. ABBRV.	START TIME OF PM	COMPLETION DATE & TIME	HOURS WORKED

Supervisor's Signature **Date**

SPECIAL INSTRUCTIONS:	OK	VMR	INIT
1) RECORD THE HUB MILEAGE ON THE COVER SHEET.			
2) IF COMPONENT FAILS INSPECTION AND A “VMR” IS ORIGINATED (30 MINS. OR MORE FOR REPAIR), CHECK “VMR” COLUMN AND DOCUMENT “VMR NUMBER” ON COVER SHEET OF PM.			

1.0	**SERVICE HVAC EQUIPMENT** (Section 5)			
1.1	Rinse and reinstall evaporator filter in #1 and #2 end. Replace if necessary.			
1.2	Clean the evaporator drain pan.			
1.3	Clean condenser coils.			
1.4	Check A/C condenser sight glass for proper charge (veh. Exterior). Freon full level is equal to ½ sight glass. If a more accurate check is required, use a gauge. High-side 275 psi and low-side 60 psi.			
1.5	Check interior of vehicle for proper operation of F-end and R-end HVAC units.			
1.6	Inspect HVAC system for leaks. (See engineer for inspection procedure.)			
1.7	Overhaul HVAC system. (See engineer for procedure.)			
2.0	**BOGIE ASSEMBLIES** (Section 3.13)			
2.1	Verify that the vehicle leveling system is operating correctly. Leveling valve failure requires immediate repair.			
2.2	Inspect the following for leakage, damage, cracks, dry rot, or other signs of fatigue. Replace if necessary. 1. Shock absorbers. 2. Radius absorbers. 3. Leaf springs. 4. Leveling valves (3).			
2.3	Ensure the vehicle has proper alignment and is level (height for platform) using a measuring rod.			
2.4	Inspect air springs (air bags) for indications of leaks, deterioration, chafing or cracks. Replace as necessary. Inspect hardware connections for tightness.			
2.5	Drain main air tank and bogie of any moisture, presence of condensation is an indication that the air dryer is not functioning properly. Replace desiccant filter as required.			
2.6	Visually inspect main reservoir (mrp) and associated piping for cracks, dry rot, or signs of fatigue, and replace as necessary.			
2.7	Lubricate the following with EP2 lubricant (TG9150LU0039). 1. Radius arm rods (3/bogie) 2. Drive shaft universals. 3. Bogie ring pivot bearing.			

	OK	VMR	INIT
2.8 Fill differential hub 1" below service level, use 140W oil.			
2.9 Clean any oil spills around differential, antennas or wheel hubs with wire brush and soap solution.			
2.10 Check for any leaks from the wheel hubs. Notify supervisor if any leaks are found.			
Note: Heavy repairs (bogies) require supervisor approval/sched.			
2.11 Inspect the following items for any damage: bogie structure, guide axles, suspension, spring bushings, etc. (visual). If damage or unusual condition(s) are detected, inform supervisor.			
2.12 Check motor cables for any damages, wear, and proper shrink sleeving, etc.			
2.13 Check each vehicle bogie to ensure it is level. Lay 6 ft. level across guide tire safety discs. If vehicle bogies are not level, see vehicle equipment manual 5.4.26 (pages 5-200) for adjustment procedure.			
2.14 Inspect all bogie air lines for chaffing and wear. Replace any defective parts.			
2.15 Ensure that all hardware connections are safety wired correctly.			
2.16 Measure resistance 3-phase power to car body ground. Must be less than 1 ohm, use low ohmmeter.			
2.17 Inspect the 4 bogie attachment bolts (large bolts) on each corner of the frame for cracks or other signs of fatigue. Replace as necessary.			
3.0 GUIDEWHEEL ASSEMBLIES (Section 3.15)			
3.1 Remove guidewheel bearing cover and inspect guidewheel bearing for lubrication. If lubrication is not visible, dark, and/or liquid from overheating, call supervisor for bearing inspection.			
3.2 Remove and replace the bearings in all eight (8) guidewheel assemblies, use new bearings. Perform task 3.5 approximately 24 hours after replacement of bearings (seating-in).			
Note: Notify supervisor to measure bearing seats on spindle. Upper bearing seat should measure 1.9985" to 1.9950" in a transverse direction to the car's length. The lower seat should measure 1.2490" to 1.2498" in transverse direction. Record measurements. If out of tolerance, remove spindle for chrome plating. (a) Upper bearing seat _____ inches (b) Lower bearing seat _____ inches			
3.3 Inspect guide tires for wear with go/no-go gauge. If tires fail go/no-go test, replace the guide tires.			
3.4 Inspect guide tires for damage (broken or deformed). Replace guide tires if necessary.			

OK	VMR	INIT

3.5 Check guidewheel play as follows:
- A. Mount the dial indicator on the bottom of the safety disc.
- B. Carefully position the indicator arm on the very bottom of spindle shaft.
- C. Grasp the tire (preferably 2 people) and pull down on tire while rotating it back and forth (couple of inches). Note indicator reading, establish zero point.
- D. Push up on tire in a rocking motion while rotating the tire back and forth and observe dial indicator reading. The difference should be .001" to .007", optimum range is .001" to .005".
- E. If there is no play or less than .001", the castle nut must be loosened one or more openings until the .001"-.005" tolerance is obtained. From one castle nut opening to the next is .006".
- F. If too much play is noted, the nut must be tightened.
- G. Install cotter pin when proper play is achieved.
- H. Record all data below, including the tolerance dimension arrived at for each wheel.

3.5.1 GUIDEWHEELS:

#1 end:
#8 0 0 #1
#7 0 0 #2
#6 0 0 #3
#5 0 0 #4

#2 end: Actual wheel bearing clearance readings after adjustments (.001"-.005")

Wheel No.	Reading	Reading	Wheel No.
#8			#1
#7			#2
#6			#3
#5			#4

Comments: _____

_____

3.6 Check hubs for cracks. Check front two guidewheel spindles for cracks near the lower two bolt holes. If cracks are found, see shift supervisor to schedule repair.

3.7 Remove and replace guidewheel spindle for non-destructive testing. This test will be conducted to see if the spindles exhibit cracks around the bolted connection point, etc. See the engineer for coordinating testing. Install a float spindle using new bolts and correct preload torque as follows:
Upper guidance structure: 260 Ft-Lbs
Guidewheel rim bolts: 55 Ft-Lbs
Guidewheel rim to hub bolts: 75-80 Ft-Lbs

4.0 INSPECT DRIVE WHEELS:

4.1 Inspect for wear and inflation, 3/32" min. tread and 110 $\pm$ 5 psi cold.

4.2 Using a torque wrench check torque of main tire lug nuts (160 Ft-Lbs) and check rims for cracks. If cracks are found, notify supervisor.

		OK	VMR	INIT
5.0	**BATTERY SERVICE** (Section 3.6)			
5.1	Check electrical connections, make sure they are tight and clean. See vehicle equipment manual page 3-35 thru 3-37 for cleaning instructions.			
5.2	Check for any battery case damage (leaks). Replace battery if case is damaged.			
5.3	Check battery charger as follows: A. Verify that the battery charger overvoltage setting is correct at +30.81. B. Connect a digital voltmeter across the battery charger output. Verify output is 26.68 volts. Repair/replace as necessary.			
5.4	Check the battery voltage on the number 2 end meter or at terminal BBS and BBG. Readings should be between 22.0-28.0 Vdc.			
5.5	Battery load test and phase loss alarms verification. A. Turn "off" 600 Vac power (all car breakers "on"). B. Verify phase loss alarms at Central Control. C. Ensure all car breakers are "on" and initiate radio vehicle polling with Central Control. D. Ensure 600 Vac stinger power is "off." E. Monitor vehicle polling with Central for 30 minutes. If polling is lost, replace vehicle batteries.			
6.0	**COUPLER**			
6.1	Lubricate the coupler locking pin with EP-2 lubricant.			
6.2	Lubricate the coupler through the grease fitting with EP-2 lubricant.			
6.3	Check for ease of movement of the coupler automatic recentering device through a sideward swing of 11 degrees on either side of center. If the coupler does not re-center properly, repair as necessary.			
6.4	Check the air coupler and connections and the self-sealing check valve for leaks by use of a solution of soap and water. If a leak is detected, tighten connection or remove and reseal using Teflon tape.			
7.0	**GENERAL – UNDERFRAME**			
7.1	Inspect underframe area for loose items, chaffing, etc. Tighten and/or repair all loose items or problems found.			
7.2	Inspect the underframe equipment and clean as needed of any dirt and oil build-up.			
8.0	**VENTILATION BLOWER FILTERS**			
8.1	Replace air filter for ventilation blower, in the #1 end.			
8.2	Replace air filter for ventilation blower, in the #2 end.			
9.0	**POWER SUPPLIES**			

	OK	VMR	INIT
9.1 Check power supply inputs and outputs for a tolerance of ±.01, +24v, -24v, +12, +6, +15, -15. A. Open breakers BCB1 and BCB2. B. Put the power supply rectifier modules on the extender modules ("B" and "C" racks A8). C. Close breakers BCB1 and BCB2. D. Read the filtered voltage output of each of the six circuits on each board. E. Reference sheet 90 of schematic 5574C70 for output pins. F. Reference sheet 98 of schematic 5574C70 for approximate voltage levels. These are unregulated power supplies and actual readings will be substantially higher (5v = 10Vdc, 15v = 20Vdc).			
10.0 DOORS AND DOOR OPERATORS 10.1 Visually inspect door operators for any damage and motor brushes for wear. Replace any defective parts. 10.2 Lubricate operators with EP-2 lubricant. 10.3 Inspect door operator alignment (Ref: Vehicle Equipment Manual 4.3.5.1). 10.4 Check all electrical and mechanical connections for tightness. Tighten all loose connections. 10.5 Check all wiring for broken or worn insulation, replacing any wire that is defective. 10.6 Clean door roller track and the lower door guide track of any debris. Use a brush or vacuum, and clean with a lint-free cloth. 10.7 Inspect each door panel for damage (dents), proper alignment and operation. Replace or repair as necessary. 10.8 Ensure that the emergency pull cables are operational. Replace any defective cables. 10.9 Check that the sensitive edge protrudes less than 1.5" when the doors are open. 10.10 Check door sensitive edges for tears, cuts, etc., and replace as necessary. Ensure that the sensitive edge is operational at top, middle, and bottom. Repair as required. 10.11 Visually inspect the following door subsystem components for cracks, breaks, unusual noises, misalignment, uneven wear, and dirt. Replace all defective components found. 1. Door cap. 2. Nutcracker. 3. Mylar strip. 4. Upper door bearing roller. 5. Lower door guide plate. 10.12 Ensure the nutcracker is operating correctly, perform the following steps on			

	OK	VMR	INIT

vehicle doors:
A. Using a ¾" wood dowling rod, insert it while the doors are closing.
B. The "door closed" light for that set of doors should not go out (on manual controller and summary monitor panel), and the "all doors closed" light should not come on.
C. Insert the rod in three places on each door; approximately 18 inches from top, center of door set, and 18 inches from bottom.
D. If the "door closed" lights go out, or you have an "all doors closed", adjust the door's (nutcracker switch) so that they are working correctly.

10.13 Ensure door opening and closing times are 4.0 seconds ± .5 seconds. Adjust as necessary.

10.14 Verify with a spring gage that the door closing force is 15 to 30 pounds. Make adjustments as necessary.

10.15 Verify each door recycle pushbutton is functional. Make repairs as necessary.

10.16 Remove and clean tips of sensitive edge contacts with Scotchbrite, also clean sliding track. (Cars 13-29 only)

10.17 Inspect and adjust sensitive edge spring and cable assembly. Replace if necessary. (Cars 1-12 only)

10.18 Level the doors (door edge is to be parallel to the mating door edge).

10.19 Inspect the lower strip bearing and replace if necessary.

11.0 BRAKE CONTROL PACKAGE (Section 3.4.3.1)

11.1 Replace the application/release valves AR1 and AR2.

11.2 Inspect pressure switch setting for the specifications listed:

MRP	normally open	tbl-1 to tbl-2	95 psi incr.
PB	normally closed	tbl-3 to tbl-4	5 psi incr.
PBR	normally closed	tbl-5 to tbl-6	65 psi decr.
CSO	normally closed	tbl-13 to tbl-14	open 155 psi - close 120 psi
FB	normally open	tbl-3 to tbl-4	80 psi incr.
DB	normally open	tbl-5 to tbl-6	7 psi incr.

11.3 Drain air tanks of moisture.

11.4 Rebuild the friction brake system as follows:

Note: The vehicle friction brakes are self adjusting, automotive drum type and air controlled wedge brake with fail-safe spring chambers. The following parts are to be used in rebuilding the vehicle friction brake system.
1. 16 degree wedge assembly kit.
2. Service brake air chamber kit.
3. Adjusting bolt assembly.
4. Anchor plunger.
5. Brake shoe lining (non-asbestos) assy.
6. Shoe return spring.

	OK	VMR	INIT
7. Adjuster assembly. 8. Diaphram SBC 9". 9. Diaphram SCB 16". 10. Seal hub. Repair Code: BRKOH Last brake overhaul _____ 11.5 Inspect the brake control package on each drive end to determine if components operate correctly. Replace all defective components.			
12.0 AUXILIARY RELEASE PACKAGE (Section 3.4.4) 12.1 Check and adjust pressure regulator, should be 85 psi +0, -5. 12.2 Inspect operation of solenoid and replace all defective components. 12.3 Inspect valves for internal leaks and replace all defective parts. 12.4 Inspect the auxiliary release package components for leaks and correct pressure setting. Replace defective components as necessary.			
13.0 PNEUMATIC SYSTEMS 13.1 Remove and replace the pneumatic compressors (verify CSO cut-on and cut-off setting are correct) and related subsystems including the air control package, two brake control packages, and the auxiliary release package. 13.2 Remove and replace the air compressor electric motor. 13.3 Verify pressure setting and visually inspect the following subsystem components for cracks, dry rot, or other signs of fatigue; replace as necessary. 1. Parking brake release (PBR) 60 psi decr. 2. Full brakes 1& 2 (FB-1, FB-2) 80 psi increase. 3. Air bag failure sensor 1, 2, and 3 (ABF-1)			
14.0 PROPULSION MOTOR (Section 3.5) 14.1 Remove commutator covers and perform the following steps: **CAUTION:** Use a safety mask due to the carbon. 14.1.1 Clean motor filter media and assure that there are no gaps upon re-installation. 14.1.2 Blow out motor, use dry air (max 30 psi air pressure) 14.2 Inspect commutator for the following: A. Signs of brush grooving or threading. B. Overheating (purple color) or flashover damage. C. Inspect mica slots for foreign material; copper beads on ends of commutator bars. D. Inspect commutator surface for burn. If burned, verify spring tension on brushes for smooth sliding, adjust as necessary. If any of the above are found, notify supervisor.			

	OK	VMR	INIT
14.3 Inspect carbon brushes for the following conditions: A. Worn – replace any brush that is less than 1 inch long. B. Damaged – replace any brush that is broken, chipped, burnt, or shows uneven wear. C. Shunts – ensure there are no loose or frayed brush shunts.			
14.4 Inspect brusholders as follows: A. Check brusholder cap bolts for 15-30 Ft-Lbs torque. B. Check bursholder cable connector bolt for 11 Ft-Lbs torque. C. Clean brusholder and insulators by wiping with a solvent dampened rag such as electronic cleaner (avoid solvent on brush cover and commutator). If it is burned through and/or flashovers have burned craters into insulators equal to one-half of the thickness of the insulator, replace the brusholder. D. Check spring action to see if brushes move freely. E. The clearance between the brush and brusholder must not exceed 0.010". The clearance width-wise must not exceed 0.0625". F. Check brusholder alignment, it must be within ½ mica bar thickness. G. Ensure brusholder clearance to commutator is 0.07" – 0.11". H. Ensure spring pressure is 5.5 to 7.5 lbs. I. Replace any damaged or broken springs.			
14.5 Check creepage band for signs of cracking, burning, nicks, and overheating. Clean with a solvent dampened rag. If creepage band is damaged, see shift supervisor.			
14.6 Inspect arc horns for metal beads or build up from flashover, clean as necessary. A. Assure that arc horns are free of paint, grease, etc.			
14.7 Inspect internal/external cables for signs of chaffing, overhearing, broken or cracked insulation, and broken or loose cable ties. Replace all defective cable(s).			
14.8 Inspect the field coil visible end for any signs of charred insulation. Also check visible connections for tightness. Replace as necessary.			
14.9 Lubricate pinion end roller bearing. Apply 0.5 oz. of Exxon Lidok EP #2 using the grease fitting on the coupling end housing.			
14.10 Lubricate commutator end bearing, using EP2 lubricant.			
14.11 Inspect tach sensor and gear tooth area. Clean the area.			
14.12 Remove and replace the propulsion motors (2) with new or reconditioned motors. Return the removed motors to stores for minor overhaul.			
15.0 MOTOR CONTROL BOX (Section 3.8)			
15.1 Remove covers and ensure that the seals and locking bolts are intact.			
CAUTION: Discharge capacitors before proceeding.			

	OK	VMR	INIT
15.2 Clean MCB interior with damp rag and/or vacuum. Remove any flash marks.			
15.3 Ensure potentiometer reads 100 ± 1 ohm. Adjust as needed.			
15.4 Check all hardware and wire connections for tightness (each screw, nut, and bolt with proper tool, see torque chart).			
15.5 Check all wiring and reverser hoses for impact, excessive bend, or heat damage. Replace items as necessary.			
15.6 Check relays for clean contact. Use mirror and flashlight to check for burning and pitting. Replace relay as necessary.			
15.7 Manually operate the M.O.L. relay and check to ensure proper latching.			
15.8 Ensure motor overload reset in motor control box is operational. Put emergency pushbutton on auxiliary brake panel #2 end down so ATO will not automatically reset overload. Repair as necessary.			
15.9 Restore stinger power and verify M.O.L. lights are lit on both monitor panels.			
15.10 Verify MOL alarm at Central clears. Repair as necessary.			
16.0 REVERSER (Section 3.8)			
16.1 Check the reverser for proper operation by manually energizing the air valves. Check for good electrical contact pressure.			
16.2 Test for sluggish operation of reverser. Depress each magnet valve armature all the way, one at a time. If reverser operates sluggishly, check magnet valves for air leaks or check for rough drum fingers and contacts.			
16.3 Inspect main contacts for burning and pitting. Replace as necessary.			
16.4 Ensure interlocks latch, repair as necessary.			
16.5 Inspect shunts and check for loose, burnt, or broken shunts. Replace as necessary.			
16.6 Lubricate as follows: A. Lubricate internal cylinder walls with M#55271-AA. B. Lubricate surface between shaft operating lever and piston operating rod with M#53701GC			
16.7 Remove and replace the reverser for overhaul.			
17.0 BRAKE SWITCH			
17.1 Inspect braided cable and replace when fraying. Refer to drawing #565F315 for disassembly/reassembly.			
17.2 Inspect brake switch arc box as follows: A. Inspect for damage. Replace or repair with arc box cement when burned			

	OK	VMR	INIT
halfway through. B. Check contacts for binding, repair as required. C. Disassemble, clean and lubricate all hinge points. Use EP-2 lube. D. Inspect interlocks, contacts, and operation. Clean contacts if pitted and/or burned. Check electrical contact pressure. E. Operate switch manually and ensure contacts align properly. Adjust as necessary. F. Inspect for broken jumper. 17.3 Remove the brake switch from the motor control box and replace with a new/rebuilt unit, return removed unit to stores for repair/overhaul.			
18.0 LINE SWITCH 18.1 Inspect braided cable and replace when fraying. Refer to drawing #565F315 for disassembly/reassembly. 18.2 Inspect line switch arc box as follows: A. Inspect for damage. Replace or repair with arc box cement when burned halfway through. B. Check contacts for binding, repair as required. C. Disassemble, clean and lubricate all hinge points. Use EP-2 lube. D. Inspect interlocks, contacts, and operation. Clean contacts if pitted and/or burned. Check electrical contact pressure. E. Operate switch manually and ensure contacts align properly. F. Inspect for broken jumper. 18.3 Remove and replace the line switch from the motor control box. Return removed unit to stores for repair/rebuild.			
19.0 AUXILIARY CONTROL BOX (Section 3.7) 19.1 Remove covers and ensure that the seals and locking bolts are intact. 19.2 Clean ACB interior with a damp rag and/or vacuum. Remove any flash marks. 19.3 Check all hardware and wire connections to ensure they are secure. Tighten each screw, nut, and bolt as required. 19.4 Check all wiring for chaffing, impact, bend, or heat damage. Replace wiring as necessary. 19.5 Check all relays for clean contact. Use a mirror and flashlight to check for burning and pitting. Replace relay as necessary. 19.6 Switch "off" and "on" all molded case circuit breakers. Also operate the thermal breakers and "PRC" switch. Note any binding or sluggish operation. 19.7 **Power plug:** ensure power plug pins are secure.			
20.0 BRAKE INTERPOSING RELAY ASSEMBLY 20.1 Check all external terminals for tightness. Tighten as necessary.			

	OK	VMR	INIT
20.2 Remove and replace brake interposing relay.			
21.0 COLLECTOR ASSEMBLIES (Section 3.10)			
21.1 Check all springs for 15 lbs. of pressure using a spring gauge. Repair as necessary.			
21.2 Inspect for proper operation and lubricate with light weight spray oil the following: 1. Collector assembly pivot bearings. 2. Spring hook points. 3. Power shoe holders.			
21.3 Check for broken/cracked collector shoes. If any are replaced, enter on "vehicle collector replacement record" on back page.			
21.4 Check for broken/bent collector shoe pins.			
21.5 Check that all collector cables are securely clamped and in place.			
21.6 Check for nicks on collector shoe cables and for broken terminals.			
21.7 Check insulation blocks for cracks.			
21.8 Check collector shoe alignment per procedure.			
21.9 Perform the vehicle choke check per the following procedure: A. Run vehicle or train into maintenance building on track M3 or M4. B. Turn off all vehicle breakers and then track power. C. Connect an ohmmeter to the ATO shoe (either side) and the car body. Verify that the resistance is less than 1 ohm. D. Repeat step "C" until all ATO/ground ground shoe pairs on the train are within specification. E. If a high resistance is found, the choke must be replaced. F. When finished, restore power.			
22.0 INTERIOR			
22.1 Ensure vehicle interior has information decals.			
22.2 Check for defective carpet, paint, finish, and trim.			
22.3 Ensure graphic LEDs are illuminating and verify VASSA unit for message operation.			
22.4 Ensure interior has no loose or unlocked hardware, equipment or covers.			
22.5 Inspect the vehicle stanchions for tightness and ensure all screws are present (top and bottom connection point).			
22.5.1 Reinstall any missing screws and use adhesive thread locking (#53836HRA00A, locktite) to ensure all screws are secured properly.			

	OK	VMR	INIT
22.6 Ensure emergency overhead lighting is operating properly. 22.7 Ensure overhead lighting is operating. 22.8 Ensure fire extinguishers are charged by checking indicator dial. 22.9 Ensure LEDs and gauges on propulsion monitor panel, lamps on summary monitor panel, and lamps on manual controller panel (both ends), are operating correctly. Ensure the manual controller station is properly secured. 22.10 Check PA and RTT by talking to Central Control to ensure communications are operational.			
23.0 EXTERIOR 23.1 Ensure headlights, running lights, and overhead lights are operational. 23.2 Visually check interrupter assembly, make sure wire is installed securely. Repair as necessary.			
24.0 NUMBER 1 END EQUIPMENT ASSEMBLY (Section 3.1) 24.1 Perform the vehicle track signal level setting per the procedure. (Page 3-54, 3.18.1 Preamp Test Proc.) (Page 3-56, 3.18.2 Test Area Set Up Proc.) 24.2 Do the following for the "A", "B", and "C", racks (phase-I), and ATC-1, 2, and 3 (phase-II) A. Vacuum clean the area (remove the racks). B. Check for loose hardware. C. Check wiring for chaffing, proper routing, etc. D. Check connector pins and connector hardware. 24.3 Check and clear the diagnostic alarms on the ATC2 (phase-II vehicles) and the B-rack (phase-I vehicles).			
25.0 EMERGENCY STOP & TRACK SIGNALLING AMPLIFIER RELAY 25.1 Check all external terminals for tightness and re-tighten as necessary. 25.2 Remove the relay and check visible contacts for burning or pitting. If burnt or pitted, replace the relay.			
26.0 VITAL RELAY 26.1 Inspect for pickup voltage and dropaway voltage. Remove and replace the relay (for calibration) if out-of-spec. Minimum D/A voltage = _____ volts (1.94) Maximum P/U voltage = _____ volts (6.34) 26.2 Check contact resistance. A. Front contacts: 0.09 Ohms. B. Back contacts:			

	OK	VMR	INIT
Silver to Silver – 0.03 Ohms. Silver to Silver/Carbon - 0.18 Ohms. Replace the relay if out-of-spec.			
27.0 NUMBER 2 END EQUIPMENT ASSEMBLY (Section 3.19)			
27.1 Vacuum and clean out the No. 2 end equipment bay.			
27.2 Check hardware for tightness and chaffing.			
27.3 Verify emergency air blower is operational. Replace as necessary.			
28.0 AIR CONTROL PACKAGE			
28.1 Test for leaks. Limit of 5 psi per 30 minutes. Repair as necessary.			
28.2 Check all air requlators for proper pressure settings. Adjust as necessary. A. Left regulator 105 psi +0 –5. B. Right regulator 80 psi +0 –5.			
28.3 Apply 155 psi through air dryer, then shut off supply line, verify there are no air leaks from the subsystem components. Replace components as necessary.			
28.4 Observe that the service brakes are operating in their normal pressure range of 10-20 psi when service braking is initiated. Observe that the compressor cycles on at 120 psi and off at 155 psi.			
28.5 Verify that dynamic braking is operational, use the current meter for this check.			
28.6 Check that brakes are not caged.			
28.7 Check for oil leaks around brake wheel seals. If leaks are found, notify supervisor.			
28.8 Check emergency brake by-pass valve for proper position and safety wiring. Repair as required.			
28.9 Remove and replace quick release valves (2) and fail-safe emergency (FSE) valves (2) for overhaul. Ensure proper operation of all fail-safe emergency (FSE) and quick release valves.			
NOTE: Be thorough. This is an important check. Both F.S.E. valves must operate. One person operates the manual controller (drop handle to emergency position) and another person verifies that the quick release valves at each end of the vehicle exhausts all air in a sharp, short audible pause (no lingering drain down audible).			
28.10 Check the air pressure regulator settings. Make sure air pressure is built up on car. After air pressure regulators are set, verify that both brake chamber gauges read 105 $\pm$ 5 psi with pressure applied, and "0" psi with brakes off (located in No. 2 end of car).			
28.11 Verify spring brake application by each of the following methods and repair as			

	OK	VMR	INIT
needed. A. Disconnecting the frangible flag plug. B. Depressing the emergency pushbutton on the "A" rack. C. Depressing the emergency pushbutton on each of the manual controls. 28.12 Inspect/test air pressure alarm as follows and repair as necessary. A. Turn off air compressor at LCB at No. 2 end of car. B. Drain air from the car. C. "Air light" on summary monitor panel should light between 95-100 psi. D. Verify air pressure alarm at Central. 28.13 Make sure air pressure on vehicle is built-up and turn off all breakers except "BCB1". Place vehicle in manual, release brakes, check for air leaks under vehicle, brake chambers, and application release valve No. 1 and No. 2 vehicle ends. (Brake rate) Repair as necessary.			

Quantity of VMRs originated by this inspection: _____

Additional comments/discrepancies: _____

_____

_____

_____

_____

_____ _____
Chief Supervisor's Signature Date

QUALITY VERIFICATION OF PM TASKS		
TASKS INSPECTED		**Inspected by: _____ Date: _____** **Supervisor Signature**
		Inspected by: _____ Date: _____ **Chief Supervisor**

APPENDIX E

Sample Metromover Pre-Operational "S"

Inspection of Stored Vehicles

MIAMI-DADE TRANSIT AGENCY
METROMOVER
Pre-Operation "S" Inspection of Stored Cars

S-VEH_____ DUE DATE_____ RO #__ __ __ __ __ __

Job Time

Employee Name	Classification	Employee #	Date	Hours

_____
Supervisor's Signature

EMPLOYEE SIGNATURE/ BADGE #	EMP. CLASS. ABBRV.	START TIME OF PM	COMPLETION DATE & TIME	HOURS WORKED

Supervisor's Signature **Date**

M E T R O M O V E R
PRE-OPERATION "S" INSPECTION
OF STORED VEHICLES

1) BATTERY INSPECTION FOR PHASE I VEHICLE 1 THROUGH 12, AND SEVERAL PAHASE II VEHICLES.

   A. CHECK ELECTRICAL CONNECTIONS (TIGHTEN AND CLEAN).
   B. CHECK FOR ANY BATTERY CASE DAMAGE.
   C. VERIFY THAT THE BATTERY CHARGER OVER-VOLTAGE SETTING IS CORRECT.

2) PERFORM BATTERY INSPECTION FOR THE REMAINING PHASE II VEHICLES WITH WET CELLS.

   A. CHECK ELECTRICAL CONNECTIONS (TIGHT AND CLEAN).
   B. CHECK FOR ANY BATTERY CASE DAMAGE (LEAKS).
   C. VERIFY THAT THE BATTERY CHARGER OVER-VOLTAGE SETTING IS CORRECT.
   D. CHECK SPECIFIC GRAVITY; RECORD READINGS. HOSE BATTERIES WITH WATER AFTER DOING SPECIFIC GRAVITY CHECK. RECORD DATA BELOW.

      NOTE: COUNT THE BATTERIES FROM LEFT TO RIGHT, 1, 2, OR 3. COUNT THE CELLS PER BATTERY AT THE LEFT FRONT AS NUMBER ONE, THEN IN SEQUENCE, FROM FRONT TO BACK, FOR THE FOLLOWING CELLS.

      CAUTION: USE ONLY DISTILLED WATER WHEN FILLING CELLS. INSPECT BATTERY WATER LEVEL AND ADD WATER IF NEEDED.

      NOTE: RECORD IF WATER WAS ADDED.

CELL	PER TEM.	HYD. READING	TEMPERATURE CELL/AMBIENT	ACID LEVEL	CHARGER VOLTS
1.					
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9.					
10.					
11.					
12.					

3) PHASE I VEHICLES ONLY:

MEASURE THE ATO VOLTAGE BETWEEN BBST AND BCG (LOCATED ON THE AUX PANEL) AND RECORD HERE. Actual voltage = _____ Vdc (SHOULD BE 22.0 TO 29.5 Vdc, DEPENDANT ON TEMPERATURE). CHECK THE DC METER AT THE #2 END.

3a) PHASE II VEHICLES ONLY:

MEASURE AND RECORD THE VOLTAGE AT AXP TB2-1 WITH RESPECT TO AXP TB2-3. THE VOLTAVGE MUST BE BETWEEN 24.0 AND 29.5 Vdc.

ACTUAL VOLTAGE = _____ Vdc.

4) PHASE I VEHICLES ONLY:

DIAL IN LOCATION F9 ON BOTH CPU1 AND CPU2. MAKE SURE SWITCHES 6 AND 7 ARE IN THE 'UP' POSITION AND ALL OTHER SWITCHES ARE DOWN.

a) PERFORM A LAMP TEST BY TURNING SWITCH 2 ON BOTH CPUs TO THE 'UP' POSITION AND VERIFY THAT ALL THE LEDS ARE LIT.

4a) PHASE II VEHICLES ONLY:

POSITION SWITCH SW4 ON THE POWER SUPPLY/MONITOR MODULE FOR BOTH ATC1 AND ATC2 TO THE '2' POSITION. NOTE THAT WHATEVER IS DIALED INTO SW1 AND SW2 IS THE OUTPUT TO DISPLAYS DS7A&B, DS6A&B, DS4A&B, DS3A&B, DS2A&B, LED 19-12, AND LED 11-4. POSITION SW1 AND SW2 TO VERIFY THAT ALL SEGMENTS ON ALL OF THE LED HEX DISPLAYS ARE FUNCTIONAL.

5) VERIFY TELEPHONE HAND-SET CAN COMMUNICATE WITH CENTRAL.

6) PHASE I VEHICLES ONLY:

ON THE CPU-2 I/O MODULE:

A. PLACE ALL SWITCHES BUT SWITCH 7 IN THE 'UP' POSITION.
B. PLACE THE MSB HEX SWITCH IN THE '0' POSITION. A '01' WILL LIGHT IN THE HEX DISPLAY INDICATING THAT THE TOP RIGHT LED IS ALARM 1.
C. DIAL THE LSB HEX SWITCH THROUGH ALL 16 POSITIONS. (ALL LEDs ON BOTH CPU-2 I/O'S WILL BE LIT.)

D. DIAL THE LSB HEX SWITCH TO ‘0’, AND THE MSB SWITCH TO ‘1’. A ‘17’ WILL LIGHT IN THE HEX DISPLAY INDICATING THAT THE TOP RIGHT LED IS ALARM 17.
E. DIAL THE LSB HEX SWITCH THROUGH THE NEXT 9 POSITIONS. (ALL THE LEDS IN THE UPPER I/O MODULE WILL LIGHT ALONG WITH BIT 0 IN THE LOWER.)
F. PLACE SWITCH 7 IN THE ‘UP’ POSITION (ALL LEDS WILL GO OFF).
G. VERIFY THAT CENTRAL RECEIVES ALL 25 ALARMS.

6a) PHASE II VEHICLES ONLY:

A. PRESS THE **ALARM ACKNOWLEDGE BUTTON** ON THE TEST BOX TO CLEAR THE ALARM SENDING BUFFER. REPEAT AS NECESSARY TO CLEAR ALL ALARMS.
B. SET ATC2 IN MODE E (SW4 TO POSITION E) AND RESET THE ALARMS DISPLAYED ON THE LEDS BY TOGGLING SW5.
C. SET ATC2 IN MODE F (SW4 TO POSITION F) AND RESET THE ALARMS DISPLAYED ON THE LEDS BY TOGGLING SW5.

NOTE: ALL ALARMS ARE SELF ACKNOWLEDGED BY THE ATC AFTER 30 SECONDS UNLESS ACKNOWLEDGED SOONER WITH THE ALARM ACKNOWLEDGE BOX. UPON RESETTING THE VEHICLE BACK TO INITIAL CONDITIONS, THE VEHICLE DOORS CAN BE OPENED TO RESET THE PROGRAM SOTP VELOCITY VARIABLE IF NEEDED.

NOTE: IF THE LEDS IN EITHER MODE E OR F DO NOT CLEAR, DETERMINE THE FAULT AND CORRECT THE CONDITION SO THE FLAG CAN BE CLEARED. REFERENCE THE CHART BELOW FOR ALARM LISTINGS. IF THE VEHICLE IS SUPPORTED ON JACK STANDS, THE LOW AIR ALARM WILL NOT BE CLEARED AS A RESULT OF LOW AIR SPRING PRESSURE.

ALARMS 1-16 ARE DISPLAYED ON LEDS 4-19 BY SETTING SW 45 TO E.

D. VERIFY THAT CENTRAL RECEIVED ALL 25 ALARMS.

7) DOORS:

_____ 1. CLEAN DOOR ROLLER TRACK AND LOWER DOOR GUIDE TRACK.
_____ 2. OPEN AND CLOSE EACH DOOR PANEL AND CHECK THAT THE FORCE REQUIRED TO MOVE THE DOOR IS UNIFORM THROUGHOUT. ACCEPTABLE IS: -MIN/MAX (15 LB MIN–20 LB MAX).
_____ 3. CHECK THAT THE EMERGENCY PULL CABLES ARE OPERATIONAL
_____ 4. CHECK DOOR OPENING TIME TO BE 3± .5 SEC.

_____ 5. CHECK DOOR CLOSING TIME TO BE 4± .5 SEC.
_____ 6. CHECK THE FORCE REQUIRED TO STALL THE DOOR IS NOT MORE THAN 30 LBS. ACCEPTABLE IS (15 LB MIN-30 LB MAX).
_____ 7. CHECK THAT THE SENSITIVE EDGE IS OPERATIONAL AT TOP, MIDDLE, AND BOTTOM.
_____ 8. CHECK THAT SENSITIVE EDGE PROTRUDES LESS THAN 1.5" FROM DOOR OPENING WHEN DOORS ARE OPEN.
_____ 9. CHECK WHEN DOORS ARE CYCLED TO CLOSE, ALL OUTSIDE ARMS AT OR BELOW HORIZONTAL.

_____ _____
SIGNATURE DATE

_____ _____
INSPECTING SUPERVISOR SIGNATURE DATE

QUALITY VERIFICATION OF PM TASKS		
TASKS INSPECTED		**Inspected by: _____ Date: _____** **Supervisor Signature**
		Inspected by: _____ Date: _____ **Chief Supervisor**

APPENDIX F

Sample Metromover Vehicle Emergency Brake Test

(56-Day)

MIAMI-DADE TRANSIT AGENCY
DOWNTOWN COMPONENT OF METRORAIL

MR510R 0 __ __ __ __ __

PM NO. 451 SYSTEM VEHICLE TYPE BRAKE/56 DAY

MILEAGE READING _____ DATE _____

List below all the discrepancies found during this P.M. List corrective action for the discrepancy. If follow-up action is required, state responsibility for corrective action. Use as many data sheets as required. **Be detailed.**

CAR NUMBER	DUE DATE	LATE DATE	DATE COMPLETED
MC			

VMR #	ITEM #	DISCREPANCY/ACTION	SIGNATURE WHEN CORRECTED

REVISION 2 (02-22-99)

EMPLOYEE SIGNATURE/ BADGE #	EMP. CLASS. ABBRV.	START TIME OF PM	COMPLETION DATE & TIME	HOURS WORKED

Supervisor's Signature **Date**

SPECIAL INSTRUCTIONS:	FAIL	OK	VMR	INIT
1) RECORD THE HUB MILEAGE ON THE COVER SHEET.				
2) IF COMPONENT FAILS INSPECTION AND A "VMR" IS ORIGINATED (30 MINS. OR MORE FOR REPAIR), CHECK "VMR" COLUMN AND DOCUMENT "VMR NUMBER" ON COVER SHEET OF PM.				

1.0 PROCEDURE

1.1 Place portable trip stop assembly on the guideway at the "0" marker at the appropriate location as specified by the test boundary.

1.2 **PHASE II VEHICLES ONLY**

NOTE: Mode 6.4 is used for chart recording purposes. Selected variables are scaled then outputted to the chart recorder analog output on the J1 (DB-25S cable) connector os the power supply board monitor panel. The output ports have a range of "0" to "10" volts.

For maximum scale calibration, switch 12 must be on.
For minimum scale calibration, switch 5 must be on.

1.2.1 Go to ATC-2, and dial mode 6, then dial the sub-mode number into SW3 (it should be 4).

1.2.2 Connect the chart recorder to the J1 connector of the Power Supply Board using the correct wire harness.

NOTE: Be sure the ground output is also connected to the chart recorder.

1.2.3 Select chart recorder speed of 25 mm/sec and 50 mv/div.

1.2.4 Toggle SW5 to ON to send the minimum scaled value to the chart recorder. Set the zero adjust on the chart recorder to 0% for each channel. Toggle SW5 OFF (down position).

1.2.5 Toggle SW12 to ON to send the maximum scaled value to the chart recorder. Set the gain adjust on the chart recorder to 100% for each channel. Toggle SW12 OFF (down position).

1.3 **PHASE I VEHICLES ONLY**

1.3.1 Set up chart recorder speed for 25 mm/sec and channel 1 for 100 mv/mm, connect it to the I/O output jack.

1.3.2 On CPU 2 or CPU 1 dial up F5 to display vehicle speed.

1.3.3 Connect channel 2 across frangible flag wire and adjust it for 500 mv/mm.

ALL VEHICLES

1.4 Request permission from Central Control to move vehicle to test site's starting boundary.

	FAIL	OK	VMR	INIT
1.5 Request Central Control to initiate a run through at any station in the test boundary.				
1.6 Request permission from Central Control to release test vehicle in ATO.				
1.7 Measure the distance the vehicle traveled after the interrupter flag wire is broken by the portable trip stop assembly placed on the guideway.				
1.8 Record the measurement on sheet from the chart recorded paper, compute the following and record on attached data sheet. A. Vehicle Mileage B. Vehicle speed C. Stopping Distance D. Deceleration rate E. Time delay emergency/relay drop to full brake rate F. Fill in any other information which is required				
1.9 Verify that the spring brakes are applied by the indication on manual controller station. (Phase I and Phase II vehicles)				
1.10 Verify that the trip stop alarm is lit. Phase I vehicles; Module 6, check bit 9. Phase II vehicles: Mode 14, SW4=E, check LED 12.				
1.11 Repair frangible flag (interrupt wire).				
1.12 Request Central Control to remove the run through command at stations within the test boundary.				
1.13 If the test vehicle stopping distance is not within the minimum and maximum distance allowed, and within the acceptable brake rate criteria, the vehicle must be removed from service until malfunction is corrected and the vehicle passes this test successfully.				

COMMENTS:

TECHNICIAN SIGNATURE DATE

SUPERVISOR SIGNATURE DATE

ATTACHMENT(S):

EMERGENCY BRAKE RATE 56 DAY DATA SHEET

Emergency Brake Rate 56 Day Data Sheet.

System: Miami DCM Vehicle: _____ End: _____

Date: _____ Weather: _____ Temperature: _____

Equipment Calibrated and expiration Date: From _____ To _____

Enter Vehicle speed (Vo) from chart recorder paper:

(_____) x .64 = _____ MPHPS (Phase I vehicle only)

(_____) x .60 = _____ MPHPS (Phase II vehicle only)

Vehicle measure stopping distance: _____ Ft.

Minimum: _____ Ft. and Maximum: _____ Ft. allowed from pass/fail table.

Enter Dv and Dt from chart recorder paper into deceleration formula below:

Phase I:
Dv/Dt: (((_____) x .64) / ((_____) /25)) = _____ MPHPS; _____ G's

Phase II:
Dv/Dt: (((_____) x .60) / ((_____) /25) = _____ MPHPS; _____ G's

Minimum 4.07 MPHPS and Maximum 6.70 MPHPS

Enter Dt from chart recorder paper (time delay emergency/relay drop to full brake applied).

Dt: ((_____) / 25) = _____ seconds

Minimum .80 seconds and Maximum 1.40 seconds

Chart recorder number _____.

Vehicle passed _____ or Vehicle failed _____

Has vehicle had any brake work done since last test? ☐ Yes ☐ No Date: _____

Failure correction report: _____

_____

Description of corrected works performed: _____

_____

Revised 3/25/1999

After Retrofit
(Vehicles #2, 8, 9, and 10)
(New Vehicles #15, 20, 26, and 27)

MIAMI DCM
(Old Cars After Retrofit and Phase II Vehicles)

ENTRY SPEED (MPH)	STOPPING DISTANCE (FEET)	
	MAXIMUM	MINIMUM
0	0.0	0.0
1	2.2	1.3
2	4.8	2.8
3	7.8	4.5
4	11.1	6.4
5	14.8	8.6
6	18.8	11.0
7	23.2	13.6
8	28.0	16.4
9	33.1	19.4
10	38.6	22.7
11	44.4	26.1
12	50.6	29.8
13	57.2	33.7
14	64.1	37.9
15	71.4	42.2
16	79.0	46.8
17	87.0	51.6
18	95.4	56.6
19	104.1	61.8
20	113.2	67.2
21	122.7	72.9
22	132.5	78.8
23	142.7	84.9
24	153.2	91.2
25	164.1	97.7
26	175.3	104.5
27	186.9	111.5
28	198.9	118.7
29	211.3	126.1
30	223.9	133.7
31	237.0	141.6
32	250.4	149.6

APPENDIX G

Metromover Cumulative Mileage by Vehicle

June 2002

Mover Vehicle Mileage

June 2002

Mover Vehicle	Cumulative Miles	June 2002 Miles
MC001	381,307	959
MC002	518,307	4,222
MC003	461,675	2,175
MC004	387,612	0
MC005	498,719	3,990
MC006	454,944	4,467
MC007	580,118	3,210
MC008	534,009	4,215
MC009	430,260	1,358
MC010	518,951	6,070
MC011	405,998	3,162
MC012	361,783	4,020
MC013	243,914	1,073
MC014	318,768	4,678
MC015	338,630	0
MC016	260,463	0
MC017	317,706	2,475
MC018	301,442	3,660
MC019	353,642	5,681
MC020	262,921	4,092
MC021	315,788	2,473
MC022	294,337	4,319
MC023	351,805	2,960
MC024	358,175	0
MC025	330,176	3,878
MC026	346,894	2,537
MC027	331,340	4,697
MC028	309,540	3,111
MC029	217,187	2,319
Total	10,786,411	85,801