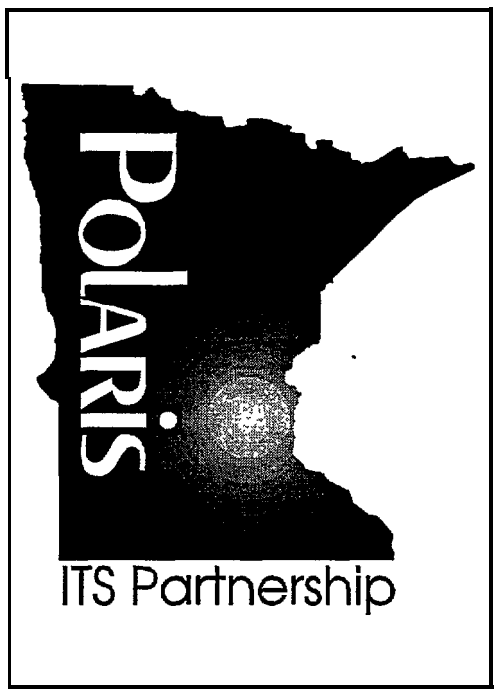
Minnesota Department of Transportation Agreement Number: 73807P

Minnesota Intelligent Transportation Systems

Statewide Intelligent Transportation Systems As-Is Agency Reports for Minnesota



Volume 3 Operational Tests

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Statewide ITS As-Is Agency Report for Minnesota
Volume 3
Operational Tests

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Appendices

1. INTRODUCTION

The purpose of the Polaris Project is to define an Intelligent Transportation Systems (ITS) architecture for the state of Minnesota. An architecture is a framework that defines a complex system, in terms of a set of smaller, more manageable systems which are fully defined in terms of their individual boundaries, functions, physical components, and interfaces. They illustrate how each of the systems interrelate and contribute to the overall ITS objectives and requirements.

A well defined architecture provides many benefits for a complex system. It defines and optimizes the location of system functions. It identifies critical interfaces, and illustrates how associated systems can be integrated to share resources and information. It establishes standards for communications and physical components so that inter-operability can be maintained as the system evolves to incorporate new capabilities and technologies.

The Minnesota Statewide ITS Architecture is a tailored version of the National ITS Architecture. Tailoring incorporates the prioritized wants and needs of the state's transportation users and stakeholders, as well as its existing ITS infrastructure. The functional architecture, physical architecture, system requirements and implementation plan are fully documented in the following project deliverables:

ITS Traveler Wants/ Needs - Information obtained from Minnesota residents in ten end user sessions held across the state. Used to establish and prioritize end-user requirements.

ITS Transportation Wants/ Needs - Information obtained from ITS stakeholder institutions. Used to establish and prioritize ITS service provider requirements.

ITS Wants/Needs Analysis - Final results and recommendations of the wants and needs research.

Statewide ITS As-Is Agency Reports for Minnesota - Information about existing transportation systems that establish the starting point for the Architecture Implementation Plan.

ITS System Specification - Incorporates the results of the functional and physical architectures into specification format. The specification will clearly identify ITS system level requirements for the identified Minnesota ITS services.

ITS Component Specification - Incorporates the results of the functional to physical allocation in specification format. The specification will clearly identify the Minnesota ITS component systems requirements.

ITS Architecture Implementation Plan - A recommended ITS deployment strategy for future state initiatives.

2. SCOPE

This document, *Statewide ITS As-Is Agency Reports for Minnesota,* consists of a collection of individual system survey reports related to transportation systems. The Polaris Project will use the survey information collected to derive the existing architectural framework. After the existing architectural framework is derived, this information will be used as the baseline for developing the Minnesota Statewide ITS Architecture.

Agencies identified and contributed to this document were:

- Minnesota Department of Transportation Office of Advanced Transportation Systems
- Minnesota Department of Transportation Traffic Management Center
- Minnesota Department of Transportation Metropolitan Division
- Minnesota Department of Transportation Electrical Services Section
- St. Paul Department of Public Works
- Minneapolis Department of Public Works
- Hennepin County Department of Public Works
- Ramsey County Department of Public Works
- Minnesota State Patrol
- Hennepin County Medical Center
- Metropolitan Council Transit Operations
- Metropolitan Airports Commission
- Gopher State One Call
- Minnesota Office of Tourism

2.1 Document Overview

This document presents the methods, assumptions and procedures used to collect the baseline information. The documentation of systems that were inventoried is presented in Section 3.

2.2 Methods, Assumptions, and Procedures

2.2.1 System Identification

Agency and system candidates were based upon several factors prior to survey. Through market research, the highest wants and needs priorities for traveler and transportation related agencies identified the functional areas to be improved (i.e. Travel Conditions). The Polaris Project took the functional wants and needs and associated the wants and needs functions to current Minnesota Agencies. Another factor that contributed to identifying the candidate agencies was the presence of existing Intelligent Transportation Systems infrastructure that has been deployed to support integrating open systems for travelers, inter-agency and intra-agency needs.

One hundred twenty one pre-survey candidate systems identified by the process described previously, are listed in Appendix A. The pre-survey candidate list represents systems that were known by members of the Polaris Architecture working team, Mn/DOT Guidestar, and SRF

Consulting Group, Inc. Of the 121 candidate systems, 38 system surveys were performed and included in this document. The 38 systems were selected as "best representatives" of the 121 pre-survey candidates and provided a diverse base of information to use for developing the Minnesota Statewide ITS Architecture.

2.2.2 Data Collection Guide

The survey of systems required that a standard data collection approach be applied for the *Statewide ITS As-Is Agency Reports for Minnesota*. A data collection guide was prepared to help this effort.

The data collection guide was developed to provide interviewers with an overview of relevant information that needed to be collected during the survey for each system. The data collection effort focused on the following:

- A block diagram of the system and interfaces to external users and systems.
- All hardware elements that are interconnected to form the bounds of the system.
- All software components used by the hardware elements.
- All system interfaces that connect hardware components together and external systems to the system.
- All personnel using the system.

The Data Collection Guide is presented in Appendix B.

2.2.3 Field Data Collection

The survey collection activities were completed by two teams of interviewers. Prior to an on-site interview, an agency or system contact person was briefed as to the nature of the survey. In some cases, generally where agencies knew little of the Polaris project, a follow-up letter was sent to further outline the desired level of information.

The on-site interview was generally a free format discussion of the specific system elements. The data collection guide was only used to ensure all components where discussed. The interviewers recorded the audio portion of the interview in order to help with the documentation of the system. Where possible, the actual system components were also recorded on videotape, again, to help with the system documentation. In some cases, written documentation from the agency was reviewed to help describe the system.

A report of the surveyed system followed a standard format and consisted of two basic parts: 1) a system block diagram and 2) a data collection template. The block diagram is intended to depict the system components and interfaces while the template thoroughly describes the system configuration. The template is organized to step through the system related personnel, hardware, software and interfaces. All systems documented for the project used this standardized approach. The system documentation was separated by agencies into eight volumes.

The system reports contained in this volume follow in Section 3.

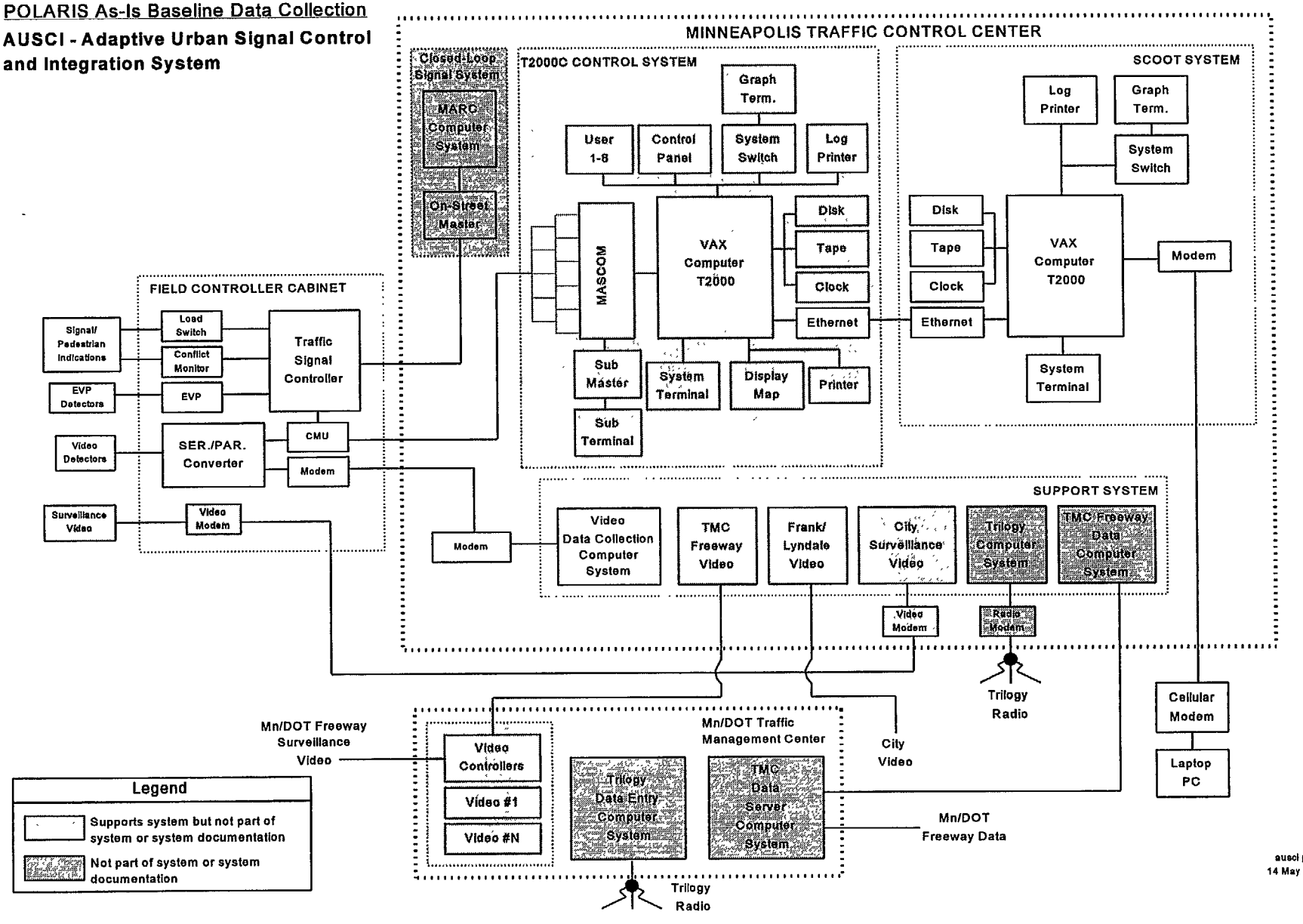
3. As-Is BASELINE SYSTEM DOCUMENTATION

3.3 OPERATIONAL TESTS

3.3.1 AUSCI - ADAPTIVE URBAN SIGNAL CONTROL AND INTEGRATION SYSTEM

POLARIS As-Is Baseline Data Collection

AUSCI - Adaptive Urban Signal Control and Integration System



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AS-IS DATA COLLECTION TEMPLATE

1.0 AGENCY "CITY OF MINNEAPOLIS"

- Agency Type	Department of Public Works/Transportation Division
- Agency Functions	Manage Traffic Operations and Data
- Agency Location(s)	Border Avenue Facility 300 Border Avenue North Minneapolis, MN 55405-1528
- Contacts	Michael J. Monahan Director of Transportation and Special Projects City of Minneapolis 233 City Hall Minneapolis, MN 55415-1318 (612) 673-5750 (voice) - (612) 348-7383 (fax)

2.0 SYSTEM "ADAPTIVE URBAN SIGNAL CONTROL AND INTEGRATION"

- Date of As-Is Data Collection	2/21/96 System documentation based on information provided by Westwood Professional Services, Inc.
- Purpose	Test the effectiveness and suitability of using Split Cycle Offset Optimization Technique (SCOOT) adaptive operation in an urban Central Business District (CBD) setting.
- Hours of Operation	7 days a week, 24 hours per day
- Geographic Coverage	City of Minneapolis CBD including 56 intersections in the area bounded by: Hennepin Ave on the south, Lyndale Avenue on west, 3rd Avenue North on the north and 1st Street South on the east.

- Contacts	Marilyn Remer Minnesota Guidestar Mail Stop 320 117 University Avenue Room 320 St. Paul, MN 55155 (612) 282-2469 (voice) - (612) 215-0409(fax) Mike Belrose Westwood Professional Services, Inc. 14180 West Trunk Highway 5 Eden Prairie, MN 55344 (612) 937-5150 (voice) - (612) 937-5822 (fax) Dallas W. Hildebrand. P.E. Planning, Programming & Design Engineer City of Minneapolis Department of Public Works-Traffic Division 300 Border Avenue North Minneapolis, MN 55405-l 528 (612) 673-5750 (voice) - (612) 348-7383 (fax)
- Status	Phase 1 concept development completed and submitted for approval, Phase 2 implementation to begin April 1, 1996. System installation to be completed in December 1997.
- Policies	Developed using Minnesota Guidestar and FHWA design policies. Implementation guided by City of Minneapolis operation philosophies.
- Constraints	Implementation involves a new application effort, concept development with limited system information and implementation using Canadian and British contractors.
- Block Diagram	See attached

- Typical Operational Scenario	The test area intersections will be able to be controlled by both the existing city of Minneapolis Fortran system and the SCOOT system. Once the SCOOT system is operational, it will measure real time traffic flows (using video detection devices), model the operation of the network and traffic flows, attempt to minimize the total system delay under the given conditions and generate traffic signal timing plan(s) representing the minimum delay solution. The new traffic signal timing plan(s) will then be implemented in real time by the Fortran computer system. The process is repeated continuously with small but regular timing changes. (1) The Fortran traffic control system will perform all necessary functions for traffic control. See System 1.2 - City of Minneapolis Fortran traffic signal control system documentation. (2) The SCOOT system will supply optimized adaptive timing information to the Fortran system test.
- Other	(1) 140 video detection devices will be installed to support SCOOT operation and to aid in evaluation of the system test. Approximately 4-6 of the video detection devices will be used to test the ability of the device to provide full motion video. (2) Eight video cameras will be installed in the test area for surveillance purposes. The video surveillance system will use twisted pair wire for communication to the traffic control office (This video surveillance system has similar hardware and software components as the St. Paul DIVERT System Operational Test - see System 3.4.2 documentation)

NOTE: There was no indication that the city of Minneapolis traffic signal system staff would change when the SCOOT system is operational. This description of personnel is the same as the system personnel that is operating and maintaining System 1.2 - Fortran Traffic Signal Control System.

2.1 PERSONNEL "PLANNING, PROGRAMMING AND DESIGN ENGINEER"

- Personnel Function	Oversee traffic operations, planning, design and operational tests.
- Quantity	1
- Location	City of Minneapolis, Department of Public Works - Transportation Division
- Workload	40 hours/week - Does not work directly with day to day operation of the Fortran system.
- Working hours	Normal business hours
- Status	Existing
- Contact	Dallas W. Hildebrand, P.E.

2.2 PERSONNEL "TRAFFIC SIGNAL SYSTEMS ENGINEER'

- Personnel Function	Oversee day to day Fortran system operation.
- Quantity	1
- Location	City of Minneapolis, Department of Public Works - Transportation Division
- Workload	40 hours/week
- Working hours	Normal business hours
- Status	Existing
- Contact	Roger Plum

2.3 PERSONNEL "TRAFFIC SYSTEMS OPERATORS"

- Personnel Function	Monitor system operation in addition to other administrative duties.
- Quantity	2
- Location	City of Minneapolis, Department of Public Works - Transportation Division
- Workload	75 percent of time on Fortran system
- Working hours	6:00 am - 7:00 pm, Monday - Friday The operator shifts overlap from 10:00 am to 2:00 pm. The city does staff the control center during some special events that do occur during their normal working hours.
- Status	Existing

2.4 PERSONNEL "TRAFFIC SYSTEMS ANALYST"

- Personnel Function	Works on Fortran system database and computer system.
- Quantity	1
- Location	City of Minneapolis, Department of Public Works - Transportation Division
- Workload	25 to 50 percent of time on Fortran/SCOOT system
- Working hours	Normal business hours
- Status	Existing

2.5 PERSONNEL "ELECTRICIAN"

- Personnel Function	Maintain traffic control signal systems and lighting systems.
- Quantity	23 Total 5 Foreman 2 Signal service personnel 1 Technician 15 Electricians
- Location	City of Minneapolis, Department of Public Works - Transportation Division
- Workload	Normal work week
- Working hours	Normal business hours
- status	Existing

3.1 HARDWARE "DEC VAX COMPUTER"

- Hardware Type	Computer
- Functions	Runs SCOOT traffic signal control optimization software application.
- Location	Minneapolis traffic control center
- Data Type	Data
- Status	New
- Other	Digital Equipment Corporation VAX computer

3.1.1 SOFTWARE "SCOOT Version 3.1"

- Software Type	Transportation software application
- Functions	Traffic control application and control, receives vehicle detection inputs and generates optimized timing plans for real time implementation to traffic signal controllers
- Application Language	Assembly code and other languages.
- Status	New
- Constraints	The SCOOT system has an implementation capacity of 300 intersections.
- Issues	Proprietary software. Owned and licensed to Mn/DOT by Siemens, no rights to observe or modify programs under limits of license, no distribution rights.
- Contacts	Supplier - Fortran Traffic Systems Limited 470 Midwest Road Scarborough, Ont. MlP 4Y5, Canada (416) 288-1320 (voice) (416) 288-9914 (fax) l-800-265-1197 (toll free USA) Developer - Siemens Plessey Controls Limited Sopers Lane;Poole, Dorset, United Kingdom, BH17 7ER 44-202-782000 (voice) 44-202-782331 (fax)

3.1.2 SOFTWARE "VMS OPERATING SYSTEM"

- Software Type	Operating system
- Functions	Control VAX CPU 1) Run software application, manages disk space and memory. 2) Perform data backups. 3) Control hardware resources, printers, displays and controllers.
- Status	New
- Policies	None

3.2 HARDWARE "CLOCK"

- Hardware Type	Clock
- Functions	Send time data to CPU.
- Location	Minneapolis traffic control center
- Data Name/Contents	Time
- Data Type	Data
- status	New

3.3 HARDWARE "GRAPHICAL TERMINAL"

- Hardware Type: Terminal/Workstation
- Functions: 1) Displays system inforrnation.
  2) Reports system events including coordination errors and controller failures.
- Location: Minneapolis traffic control center
- Data Name/Contents: System information
- Data Type: Data
- Status: New

3.4 HARDWARE "SYSTEM SWITCH"

- Hardware Type: Switch
- Functions: Enable system
- Location: Minneapolis traffic control center
- Data Type: Data
- status: New

3.5 HARDWARE "SYSTEM TERMINAL"

- Hardware Type: Terminal/Workstation
- Functions: 1) Displays traffic count and timing plan data.
  2) Displays current timing plans.
  3) Receives parameters for creating timing plans.
  4) Used to control SCOOT and VAX operating system.
- Location: Minneapolis traflic control center
- Data Name/Contents: System and computer information
- Data Type: Data
- status: New

3.6 HARDWARE "LOG PRINTER'

- Hardware Type: Printer
- Functions: Prints data
- Location: Minneapolis traffic control center
- Data Name/Contents: System information and timing plan data
- Data Type: Data
- Status: New

3.7 HARDWARE "LAPTOP PC COMPUTER'

- Hardware Type	Laptop PC computer
- Functions	Allows access to SCOOT computer from remote locations.
- Location	Remote locations
- Data Name/Contents	System operation and status data
- Data Type	Data
- Status	New

3.8 HARDWARE "COMMUNICATION MODIFICATION UNIT (CMU)"

- Hardware Type	Communication unit
- Functions	Special communication device used to interface the Fortran system and the traffic signal controller.
- Location	Field controller cabinet
- Data Name/Contents	Timing coordination information, traffic counts and controller status.
- Data Type	Data
- Status	Existing

3.9 HARDWARE "TRAFFIC SIGNAL CONTROLLER'

- Hardware Type	NEMA traffic signal controller
- Functions	Operates traffic control signal system
- Location	Field controller cabinet
- Data Name/Contents	Timing information, traffic counts and controller status.
- Data Type	Data
- Status	Existing
- Other	Eagle EPAC NEMA

3.10 HARDWARE "VIDEO DETECTOR"

- Hardware Type	Video detector system
- Functions	Vehicle detection device, supplies count and occupancy information to SCOOT computer system.
- Location	In field
- Data Name/Contents	Traffic count and occupancy data
- Data Type	Data
- Status	New
- Other	This video detection system is still under development but is very similar in operation to the Autoscope package.

3.11 HARDWARE "SERIAL/PARALLEL CONVERTER"

- Hardware Type: Converter
- Functions: Converts serial communication to contact closure output.
- Location: Field controller cabinet
- Data Name/Contents: Traffic count detector information
- Data Type: Data
- Status: New

3.12 HARDWARE "VIDEO DATA COLLECTION COMPUTER SYSTEM"

- Hardware Type: PC
- Functions: This computer will poll video detection devices at regular intervals to download detector data. The polling interval depends on the storage capability of video detection devices and what type of detector data is being collected. All image recognition and conversion to detector output is completed in the hardware that is located in the field.
- Location: Minneapolis traffic control center
- Data Name/Contents: Traffic count detector information
- Data Type: Data
- Status: New

3.12.1 SOFTWARE "VIDEO DATA COLLECTION SOFTWARE?'

- Software Type: Traffic count data
- Functions: Store, analyze and report traffic count data
- Status: New

3.1.2 SOFTWARE "OPERATING SYSTEM'

- Software Type: Operating system
- Functions: Control PC
  1) Run software application, manages disk space and memory.
  2) Perform data backups.
  3) Control hardware resources, printers, displays, and controllers.
- Status: New
- Other: Most likely DOS or Windows

3.13 HARDWARE "ETHERNET CARD - SCOOT COMPUTER"

- Hardware Type	Communications
- Functions	Sends and receives information from the Fortran computer system.
- Location	Minneapolis traffic control center
- Data Name/Contents	Receives controller status and detector data from the Fortran computer. Sends table of timing parameters to the Fortran computer.
- Data Type	Data
- Status	New

3.14 HARDWARE "ETHERNET CARD - FORTRAN COMPUTER"

- Hardware Type	Communications
- Functions	Sends and receives information from the SCOOT computer system.
- Location	Minneapolis traffic control center
- Data Name/Contents	Sends controller status and detector data to the SCOOT computer. Receives table of timing parameters from the SCOOT computer.
- Data Type	Data
- Status	New

4.1 INTERFACE	VAX computer (SCOOT system)
- Connects to . . .	VAX computer (Fortran system)
- Interface location	Minneapolis traffic control center
- Interface Type	Data
- Interface Direction	Both
- Interface Component	High speed ethernet data channel
- Protocol/Standard	Custom drivers form computer to computer communication
- Information Direction	Both
- Information Standards	Proprietary

4.2 INTERFACE	VAX computer
- Connects to . . .	Clock
- Interface location	Minneapolis traffic control center
- Interface Type	Data
- Interface Direction	Both
- Interface Component	RS-232
- Information Type/Content	Time
- Information Direction	Input

4.3 INTERFACE	VAX computer
- Connects to . . .	Graphical terminal
- Interface location	Minneapolis traffic control center
- Interface Type	Data
- Interface Direction	Both
- Interface Component	RS-232
- Information Type/Content	System data
- Information Direction	output
- Information Frequency	Continuous
- Information Standards	Proprietary

4.4 INTERFACE	VAX computer
- Connects to . . .	System switch
- Interface location	Minneapolis traffic control center
- Interface Type	Data
- Interface Direction	Both
- Interface Component	RS-232
- Information Type/Content	None
- Information Direction	Input
- Information Frequency	As needed
- Information Standards	Proprietary

4.5 INTERFACE	VAX computer
- Connects to . . .	Log printer
- Interface location	Minneapolis traffic control center
- Interface Type	Data
- Interface Direction	Both
- Interface Component	RS-232
- Information Type/Content	System errors
- Information Direction	output
- Information Frequency	Continuous

4.6 INTERFACE	VAX computer
- Connects to . . .	System terminal
- Interface location	Minneapolis traffic control center
- Interface Type	Data
- Interface Direction	Both
- Interface Component	RS-232
- Information Type/Content	System information
- Information Direction	Both
- Information Frequency	As needed
- Information Standards	Proprietary

4.7 INTERFACE	Master communication unit (MASCOM)
- Connects to . . .	Communication management unit (CMU)
- Interface location	Minneapolis traffic control center and field controller cabinet
- Interface Type	Data
- Interface Direction	Both
- Interface Component	Twisted pair wire
- Protocol/Standard	Proprietary
- Information Type/Content	Signal coordination parameters, traffic count data and system status information.
- Information Direction	Both
- Information Frequency	Once per second
- Other	The city has six 50-pair trunk lines (300 pair total) running into the traffic control center. The city is currently using 70 pair for this system.

4.8 INTERFACE	Communication management unit (CMU)
- Connects to . . .	Traffic signal controller
- Interface location	Field controller cabinet
- Interface Type	Data
- Interface Direction	Both
- Interface Component	Wire
- Information Type/Content	Signal coordination parameters, traffic count data and system status information.
- Information Direction	Both
- Information Frequency	Once per second

4.9 INTERFACE	Communication management unit (CMU)
- Connects to . . .	Serial/parallel converter
- Interface location	Field controller cabinet
- Interface Type	Data
- Interface Direction	Both
- Interface Component	Twisted pair wire
- Information Type/Content	Video detector count data
- Information Direction	Both
- Information Frequency	Once per second

4.10 INTERFACE	Serial/parallel converter
- Connects to . . .	Video detector device
- Interface location	Field controller cabinet and video detector camera device
- Interface Type	Data
- Interface Direction	Both
- Interface Component	Twisted pair wire
- Information Type/Content	Video detector count data
- Information Direction	Both
- Information Frequency	Once per second

4.11 INTERFACE	Serial/parallel converter
- Connects to . . .	Field controller cabinet modem
- Interface location	Field controller cabinet
- Interface Type	Data
- Interface Direction	Both
- Interface Component	Twisted pair wire
- Information Type/Content	Video detector count data
- Information Direction	Both
- Information Frequency	Frequency of information is a function of storage capacity of video detection system and amount/type of data being stored.

4.12 INTERFACE	Field controller cabinet modem
- Connects to . . .	Traffic control center modem
- Interface location	Field controller cabinet and traffic control center
- Interface Type	Data
- Interface Direction	Both
- Interface Component	Twisted pair wire
- Information Type/Content	Video detector count data
- Information Direction	Both
- Information Frequency	Frequency of information is a function of storage capacity of video detection system and amount/type of data being stored.

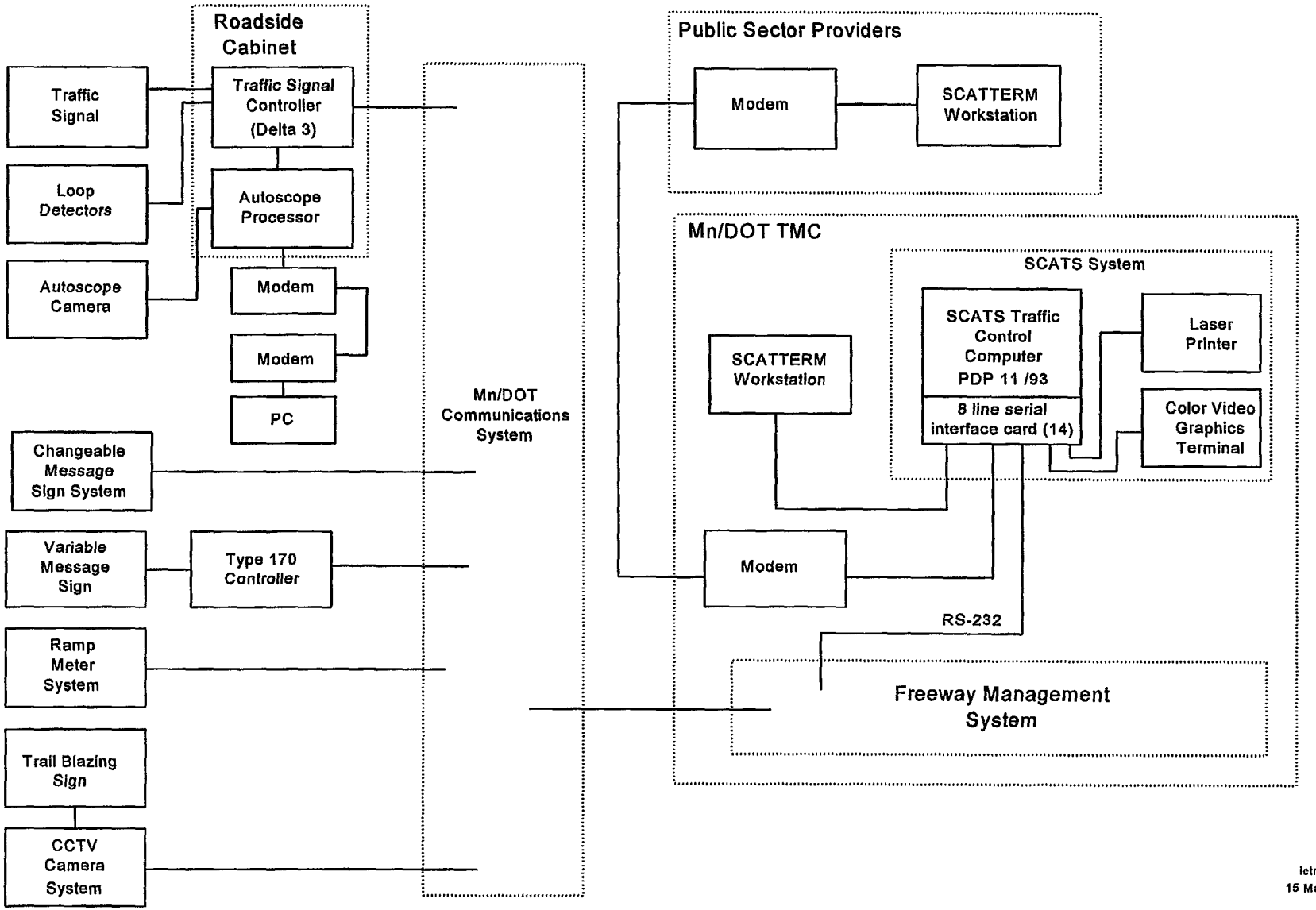
4.13 INTERFACE	Traffic control center modem
- Connects to . . .	Video data collection computer system
- Interface location	Traffic control center
- Interface Type	Data
- Interface Direction	Both
- Interface Component	RS-232
- Information Type/Content	Video detector count data
- Information Direction	Both
- Information Frequency	Frequency of information is a function of storage capacity of video detection system and amount/type of data being stored.

4.14 INTERFACE	VAX computer
- Connects to . . .	VAX computer modem
- Interface location	Traffic control center
- Interface Type	Data
- Interface Direction	Both
- Interface Component	RS-232
- Information Type/Content	SCOOT system information
- Information Direction	Both
- Information Frequency	As needed

3.3.2 ICTM - INTEGRATED CORRIDOR TRAFFIC MANAGEMENT SYSTEM

POLARIS As-Is Baseline Data Collection

ICTM - Integrated Corridor Traffic Management System



AS-IS DATA COLLECTION TEMPLATE

1.0 AGENCY "MINNESOTA DEPARTMENT OF TRANSPORTATION"

2.0 SYSTEM "ICTM - INTEGRATED CORRIDOR TRAFFIC MANAGEMENT"

- Date of As-Is Data Collection	3/l/96
- Purpose	1) Alleviate congestion in the I-494 corridor 2) Reduce ramp queue/cross street conflicts due to queue backup into intersections 3) Reduce short (less than 2-mile) trip usage of I-494 4) Coordinate traffic management across jurisdictional boundaries
- Hours of Operation	Continuous
- Geographic Coverage	I-494 from 34th Avenue in Richfield to East Bush Lake Road in Edina
- Contacts	Linda Taylor, ICTM Project Manager Mn/DOT, Waters Edge Offices
- Status	Currently in deployment phase. Final deployment in 1997
- Block Diagram	See attached
- Typical operational scenario	There are a wide variety of possible scenarios due to the complexity of the system. A typical scenario involves congestion detection through loop detectors or Autoscope video detection systems. The location and severity of the congestion is fed to the SCATS system computer which has built-in algorithms for ramp meter timing and intersection signal timing based on congestion levels. The intersection controllers are instructed to alter timing plans based on SCATS input and the Mn/DOT Freeway Management System (FMS) alters ramp metering rates based on SCATS data. Additionally, traffic can be diverted using changeable message signs and "trailblazer" signs along alternate routes. This typically would be done as an incident management scenario and not as a congestion management mechanism

2.1 PERSONNEL "ICTM PROJECT MANAGER'

3.1 HARDWARE "TRAFFIC SIGNAL HEAD"

- Hardware Type	Intersection signal device (red./ yellow/ green)
- Functions	Displays stop /caution /go lights to motorists
- Location	At 21 intersections in the I-494 ICTM corridor
- Data Name/Contents	N/A
- Data Type	Indicator light
- Status	Existing
- Recommended Improvements	The number of intersections will be increased to 46 during the summer of 1996

3.2 HARDWARE "LOOP DETECTOR"

- Hardware Type	Inductive vehicle detection device
- Functions	Detects the presence of vehicles
- Location	The ICTM System has loops in pavement on I-494 and receives loop detector data from the Freeway Management System (FMS) for the 27 ramps in the test corridor
- Data Name/Contents	Vehicle present / not present. This can be used to compute lane or ramp volume and occupancy.
- Data Type	On/off pulse
- Status	Existing

3.3 HARDWARE "AUTOSCOPE CAMERA"

- Hardware Type	Vehicle detection video camera
- Functions	This unit is aimed and focused at a specific area of roadway. The video signal is sent to an Autoscope processor which analyzes the incoming video for vehicle detection. The processor sends a signal to a traffic signal controller interprets it as though it were a loop detector input.
- Location	Penn Ave., 24th Ave., and 34th Ave. near their I-494 crossings
- Data Name/Contents	Real-time video of detection zones
- Data Type	Video
- Status	Existing
- Policies	It is a general policy of Mn/DOT not to use video surveillance systems for law enforcement purposes

3.4 HARDWARE "AUTOSCOPE CONTROL UNIT"

- Hardware Type	Modular Intel 486SX based video signal processor
- Functions	Receives incoming signal from video cameras and emulates a loop detector signal to the Delta 3 Controller
- Location	At intersections (see HARDWARE 3.3)
- Data Name/Contents	1) Incoming video of pre-defined segment of road. 2) Outgoing video of pre-defined segment of road to supervisor computer (when connected) 3) Loop detector signal to Delta 3 Controller
- Data Type	Data
- status	Existing
- Other	The Autoscope system requires a "Supervisor Computer" to be set up and monitored. This computer must be a 386 or faster processor, which can be permanently attached via RS-232 connection or connected by dial up modem. The computer may also be a portable computer which is carried to the Autoscope Controller and manually connected through its serial port. It is not clear which method Mn/DOT uses in this system.

3.5 HARDWARE "MODEM"

- Hardware Type	Serial communications device
- Functions	Sends video and other calibration data to a supervisor computer
- Location	At intersections (see HARDWARE 3.3)
- Data Name/Contents	Video of road, detection zone definitions
- Data Type	Data
- status	Existing

3.6 HARDWARE "MODEM'

- Hardware Type	Serial communications device
- Functions	Receives video and other calibration data to a supervisor computer
- Location	At Mn/DOT TMC
- Data Name/Contents	Video of road, detection zone definitions
- Data Type	Data
- Status	Existing

3.7 HARDWARE "SUPERVISOR PC"

- Hardware Type	Computer with 80386 or faster processor
- Functions	This computer is used to set up and monitor the operation of the Autoscope system. Functions include: Defining detection zones on a video overlay Defining vehicle types for detection Visually verifying detections
- Location	At Mn/DOT TMC
- Data Name/Contents	Video of road, detection zone definitions
- Data Type	Data
- status	Existing

3.8 HARDWARE "DELTA 3 TRAFFIC SIGNAL CONTROLLER"

- Hardware Type	Multifunction, multidrop intersection controller. These are designed to replace standard NEMA control units. They fit into standard NEMA cabinets and interface with NEMA load switches and conflict monitors.
- Functions	1) Turns appropriate bulb in signal controller head on/off (using internally stored timing plans) 2) Receives data from loop detector 3) Receives data from Autoscope processor (as loop detector input) 4) Communicates with FMS to report detector input and signal status. Can also receive revised/new timing plans.
- Location	At intersections (see HARDWARE 3.3)
- Data Type	Data
- Status	Existing
- Constraints	If operating in fixed, actuated, or time-of-day mode, the phase, red time, and maximum timings are held in a "Personality PROM Module" which is programmed off-site and installed into the unit. If the unit is operating in adaptive mode, phase timing may be altered by the SCATS computer.

3.8.1 SOFTWARE "DELTA 3 CONTROLLER SOFTWARE'

- Software Type	AWA proprietary operating system
- Software Standards	Proprietary
- Functions	1) Monitoring and data collection for vehicle detection 2) Minimum cycle length and clearance times 3) Pedestrian phase interval control 4) Traffic light interval control 5) Emergency vehicle signal pre-emption 6) Communications 7) Fall back modes 8) Fault monitoring and flash Fall back
- Other	This software receives operating parameters from the "Personality PROM Module" which is programmed with a utility called CGEN.

3.9 HARDWARE "CHANGEABLE MESSAGE SIGN SYSTEM"

- Hardware Type	See documentation of system 2.3 "Mn/DOT TMC CMS Control System"
- Recommended Improvements	The two changeable message signs will be upgraded to variable message (matrix) signs during the summer of 1996.

3.10 HARDWARE "VARIABLE MESSAGE SIGN"

- Hardware Type	Outdoor message sign
- Functions	Display information to motorists
- Data Name/Contents	Pre-defined messages for motorists
- Data Type	Text
- Status	Existing

3.11 HARDWARE "RAMP METERING SYSTEM"

Hardware Type	See documentation of system 2.1 "Mn/DOT TMC Ramp Meter System"

3.12 HARDWARE "TRAIL BLAZING SIGNS"

- Hardware Type	On/Off blank out matrix signs
- Functions	Displays an arrow indicating the proper direction for motorists following a detour to follow
- Location	At intersections along the arterial routes parallel to I-494
- status	To be installed January 1997

3.13 HARDWARE "CCTV CAMERA SYSTEM"

- Hardware Type	See documentation of system 2.2 "Mn/DOT TMC Video Surveillance System"

3.14 HARDWARE "TYPE 170 INTERSECTION CONTROLLER"

- Hardware Type	Intersection signal controller
- Functions	1) Operate signal lights 2) Monitor traffic using in-pavement loop detectors. 3) Communicate intersection component status to a central management system.
- Location	at each intersection near I-494 in the test corridor
- Data Type	Data
- Status	Existing

3.15 HARDWARE "Mn/DOT COMMUNICATIONS SYSTEM"

- Hardware Type	See documentation of the Mn/DOT TMC Communications System

3.16 HARDWARE "SCATTERM WORKSTATION"

- Hardware Type	Intel-based IBM PC (80486) 4 MB RAM Color VGA Display 30 MB available disk space
- Functions	Allows user to access the SCATS system through either a dial-up or dedicated connection to the serial interface on the PDP-11 Once connected, the user can view status of the system (i.e. receive system fault alarms, monitor operation, and access system log data). Based on security level, may be able to manually set ramp metering rates, activate the detour system, and change system parameters.
- Location	Hennepin County Edina Richfield MnDOT ESS (Direct Connect) Bloomington Mn DOT TMC (Direct Connect) Mn/Dot Metro District Oakdale Office
- Data Name/Contents	There are two types of displays available on the workstations: Zone Display Zone volume data 1. Balancing multiplier **2.** Ramp target/ set/ actual volumes 3. Ramp occupancy/ threshold parameters/ weighting factor 4. Ramp red time and rate Ramp Display Similar to above but including: 1. Downstream mainline detector volume and occupancy 2. Degree of saturation for ramp volumes
- Data Type	Data
- Status	Existing
- Constraints	For permanent connections, communication speeds should be at least 9600 bps. For dial-up connections, 4800 bps is the minimum with 9600 or faster recommended.

3.16.1 SOFTWARE "DOS"

- Software Type	Operating system

3.16.2 SOFTWARE "SCATTERM"

- Software Type	Communications/ control software to permit interface with SCATS Regional Computer (PDP-11)
- Functions	The Operator can view the following: 1) Intersection status 2) Current faults/subsystem operation 3) Ramp metering status 4) Adaptive control parameters 5) System and controller settings 6) Traffic data 7) Graphics of intersections, subsystems, and regional operation The Operator can control/change the following: 1) Intersection operation 2) Ramp metering rates 3) Adaptive control parameters 4) System and controller settings

3.17 HARDWARE "FREEWAY MANAGEMENT SYSTEM"

- Hardware Type	See documentation for systems under 2.1-2.4
- Other	The software in this system will be modified to interface with the SCATS systems and local ramp meter controllers will have their communications hardware upgraded to the Type 170E specification.

3.18 HARDWARE "EIGHT LINE SERIAL COMMUNICATIONS CARD"

- Hardware Type	I/O interface hardware (8 ports/card)
- Functions	Allow communication between the PDP-11 and: 1) Remote dial-up SCATTERM PC's 2) TMC and ESS direct connect SCATTERM PC's 3) Freeway Management System 4) Video graphics terminal 5) Laser printer
- Location	TMC
- Data Name/Contents	These units send: 1) System status information to SCATTERM PC's 2) Display graphics to color graphics terminal 3) Control commands to the FMS to sent through the Mn/dot communication system to ramp meters, intersection signals, changeable and variable message signs, and trailblazer signs 4) System activity/error logs to Laser Printer These units receive: 1) System commands from SCATTERM PC's 2) System commands from color graphics terminal 3) Volume/Occupancy data from detector loops and Autoscope system through the intersection signal controller.
- Data Type	Data
- Status	Existing

3.19 HARDWARE "SCATS TRAFFIC CONTROL COMPUTER"

- Hardware Type	Digital Equipment Corporation Minicomputer (PDP 1l/93)
- Functions	This unit: 1) Provides information to the SCATTERM Workstations 2) Uses pre-defined algorithms to determine appropriate ramp metering rates, or, in the case of an incident detour, appropriate signal timings on parallel arterial routes. 3) Activates Changeable/Variable message signs and selects appropriate message. 4) Activate Trailblazer signs in the event of a detour 5) Provides coordinated, adaptive control of intersection traffic signals.
- Location	TMC Computer Room
- Data Name/Contents	See HARDWARE 3.15. Computer also has some management capabilities including the capability to college traffic volume data, system operation data, and system fault reporting for maintenance.
- Data Type	Data
- status	Existing
- Issues	ICTM Project Implementation Plan specifies that a second PDP-11 could be added to the system if the number of ramps/ intersections exceeds the capacity of the unit.

3.19.1 SOFTWARE 'MICRO RSX-11, V4.4"

- Software Type	Operating system

3.19.2 SOFTWARE "SCATS REGIONAL MASTER SOFTWARE V5.0"

- Software Type	Traffic management and control software
- Functions	Can be operated to minimize overall stops and delays or maximize throughput based on volume. System software adapts each signal cycle, thus allowing adaptation to non-recurring demand peaks.
- Constraints	Software will support 128 intersection or ramp metering controller devices. Since ICTM supplies ramp metering connections through the FMS, 128 intersections plus ramp meters can be supported.
- Issues	The software has several modifications in this application: 1. SCATS will communicate with the FMS using an Roads and Traffic Authority of New South Wales (RTA)-supplied protocol 2. SCATS display will include ramp metering information 3. SCATS ramp metering algorithms will be modified to match TMC algorithms and then upgraded to allow differential rates within zones.
- Contact	Neal Gross AWA Traffic Systems, Inc. Detroit, MI (517) 349-6300
- Other	Software was developed by the Roads and Traffic Authority (RTA) of New South Wales, Australia

3.20 HARDWARE "LASER PRINTER"

- Hardware Type	Plain paper laser printer (8ppm simplex)
- Functions	Produce hard copy system logs and reports
- Location	TMC
- Data Type	Data

3.21 HARDWARE "COLOR VIDEO GRAPHICS TERMINAL"

- Hardware Type	Digital Equip. Corp. VT340-GA
- Functions	Allow operator to controVprogram system.
- Location	TMC computer room
- Data Type	Data

3.22 HARDWARE "MODEM"

- Hardware Type	Dial-up Serial Communications Device
- Functions	Allow communication between remote SCATTERM Workstations and the SCATS PDP-11 across voice grade telephone lines.
- Location	Modem pool at TMC computer room and at each of 6 remote locations
- Data Name/Contents	See SOFTWARE 3.13.2.
- Data Type	Data
- Status	Existing
- Other	The modems are configured in a roll-over pool of six total ports. ICTM project staff have exclusive access to port 1, public sector partners will use ports 2 through 6, and a miscellaneous group (U of M, evaluation team members, and others as necessary) will have access to port 6 when not in use by a public sector partner.

4.1 INTERFACE	Traffic signal head
- Connects to . . .	Delta 3 controller
- Interface location	At intersections
- Interface Type	Power lead
- Interface Direction	Input
- Interface Component	Wire
- Information Direction	Input
- Information Frequency	As required by timing plan

4.2 INTERFACE	Loop Detector
- Connects to . . .	Delta 3 controller
- Interface location	At intersections
- Interface Direction	output
- Interface Component	Wire lead
- Information Type/Content	Vehicle present/not present
- Information Direction	output

4.3 INTERFACE	Autoscope Camera
- Connects to . . .	Autoscope Controller
- Interface location	At intersections
- Interface Type	Data (video signal)
- Interface Direction	output
- Interface Component	RS-170
- Protocol/Standard	Composite video
- Information Type/Content	Live video of a predefined segment of road for vehicle detection
- Information Direction	output
- Information Frequency	Continuous

4.4 INTERFACE	Autoscope Controller
- Connects to . . .	Delta 3 Controller
- Interface location	At intersection (in roadside cabinet)
- Interface Type	Data
- Interface Direction	output
- Interface Component	Detector I/O port on Autoscope unit to Detector I/O port on Delta 3, Cable configuration not collected.
- Protocol/Standard	Emulates in-pavement inductive loop detector
- Information Type/Content	Vehicle present/not present.
- Information Direction	output
- Information Frequency	Continuous

4.5 INTERFACE	Autoscope Controller
- Connects to . . .	Autoscope modem
- Interface location	At intersection (in roadside cabinet)
- Interface Type	Data
- Interface Direction	Both
- Interface Component	Serial connection, exact configuration not collected.
- Information Type/Content	Autoscope calibration/vehicle detection zone setup data.
- Information Direction	output
- Information Frequency	Continuous
- Other	This interface is primarily used as a maintenance facility and to verify autoscope operation

4.6 INTERFACE	Autoscope modem
- Connects to . . .	Supervisor modem
- Interface Type	Data
- Interface Direction	Both
- Interface Component	Cable configuration not collected
- Information Type/Content	Autoscope calibration/vehicle detection zone setup data
- Information Direction	Both
- Information Frequency	Continuous
- Other	This interface is primarily used as a maintenance facility and to verify autoscope operation

4.7 INTERFACE	Supervisor modem
- Connects to . . .	Supervisor PC
- Interface Type	Data
- Interface Direction	Both
- Interface Component	Cable configuration not collected
- Information Type/Content	Autoscope calibration/vehicle detection zone setup data
- Information Direction	Both
- Information Frequency	Continuous
- Other	This interface is primarily used as a maintenance facility and to verify autoscope operation

4.8 INTERFACE	
- Connects to . . .	Mn/DOT Communication System
- Interface Type	Data
- Interface Direction	Both
- Interface Component	Twisted pair in multidrop configuration
- Information Type/Content	1) Reports: Intersection signal status and volume/occupancy data. 2) Receives: Commands to change signal timing
- Information Direction	Both
- Information Frequency	Continuous

4.9 INTERFACE	Changeable Message Sign System
- Connects to . . .	Mn/DOT Communications System
- Other	See documentation of system 2.3 "MnDOT TMC CMS Control System"

4.10 INTERFACE	Variable Message Sign
- Connects to . . .	MnDOT Communications System or Type 170 Controller
- Interface location	It is not clear at this point whether the Type 170 controller will be integrated into the sign or will be located remotely in a free standing cabinet. If communication hardware is integrated, the sign unit will connect directly via twisted pair to the I-494 communications trunk. The precise configuration of this interface if the controller is external is not known.
- Interface Type	Data
- Interface Direction	Input
- Interface Component	Twisted pair
- Information Type/Content	Command to display one of several predefmed messages
- Information Direction	Input
- Information Frequency	As Needed
4.11 INTERFACE	Ramp Metering System
- Connects to . . .	Mn/DOT Communications System
- Other	See documentation of system 2.1 "MnDOT TMC Ramp Meter System"
4.12 INTERFACE	Trail Blazing Sign
- Connects to . . .	Type 170 Controller in CCTV Camera System
- Interface Type	On/Off signal
- Interface Direction	Input
- Interface Component	Twisted pair
- Information Direction	Input
4.13 INTERFACE	CCTV Camera System
- Connects to . . .	Mn/DOT Communications System
- Interface Direction	Both
- Information Direction	Both
- Information Frequency	Continuous
- Other	See documentation of system 2.2 "MnDOT Video Surveillance System"

4.14 INTERFACE	Mn/DOT Communications System
- Connects to . . .	Freeway Management System
- Interface Direction	Both
- Information Direction	Both
- Information Frequency	Continuous
- Other	See documentation of the Mn/DOT TMC Communications system

4.15 INTERFACE	Freeway Management System
- Connects to . . .	8 Line Serial Interface Card
- Interface location	TMC Computer Room
- Interface Type	Data
- Interface Direction	Both
- Interface Component	RS-232 serial cable
- Information Type/Content	From FMS to SCATS: 1) Volume and Occupancy data, with a faulty detector flag, every 30 seconds +/-10 seconds. 1) "All data for interval sent" message 3) Startup red times for each ramp for use in the SCATS algorithm 4) Details of any manual override to a ramp metering rate From SCATS to FMS: 1) Red time for each ramp. l/10 second increments from .l to 99.9. This is sent within l/10 second of receipt of detector data. 2) Calculated metering rate number(0 to 7) for use in TMC terminal 3) Flags to indicate if downstream or ramp occupancy are active in the determination of the rate for the ramp. 4) Message indicating SCATS wants ramp metering control to be transferred between the two systems.
- Information Direction	Both
- Information Frequency	Continuous

4.16 INTERFACE	SCATTERM Workstation
- Connects to . . .	8 Line Serial Interface Card
- Interface location	TMC Computer Room
- Interface Type	Data
- Interface Direction	Both
- Interface Component	RS-232 Serial Cable
- Information Type/Content	See SOFTWARE 3.13.2 Functions
- Information Direction	Both
- Information Frequency	Continuous
- Other	This Interface uses port 8 on the serial interface card

4.17 INTERFACE	SCATTERM Workstations (6)
- Connects to . . .	Modem
- Interface location	TMC Computer Room
- Interface Type	Data
- Interface Direction	Both
- Interface Component	Serial dial-up connection (US West)
- Information Type/Content	See SOFTWARE 3.13.2 Functions
- Information Direction	Both
- Information Frequency	As Needed
- Other	This interface comes into a modem bank in roll-over configuration at the TMC. There are a number of modems equal to the number of workstations, so all workstations could be connected simultaneously.

4.18 INTERFACE	Modem
- Connects to . . .	8 Line Serial Interface Card
- Interface location	TMC Computer Room
- Interface Type	Data
- Interface Direction	Both
- Interface Component	RS-232 Serial Cable
- Information Type/Content	See SOFTWARE 3.13.2 Functions
- Information Direction	Both
- Information Frequency	As Needed
- Other	The SCATS system has enough ports (numbers 1 through 6) to support all authorized dial-in user connections simultaneously.

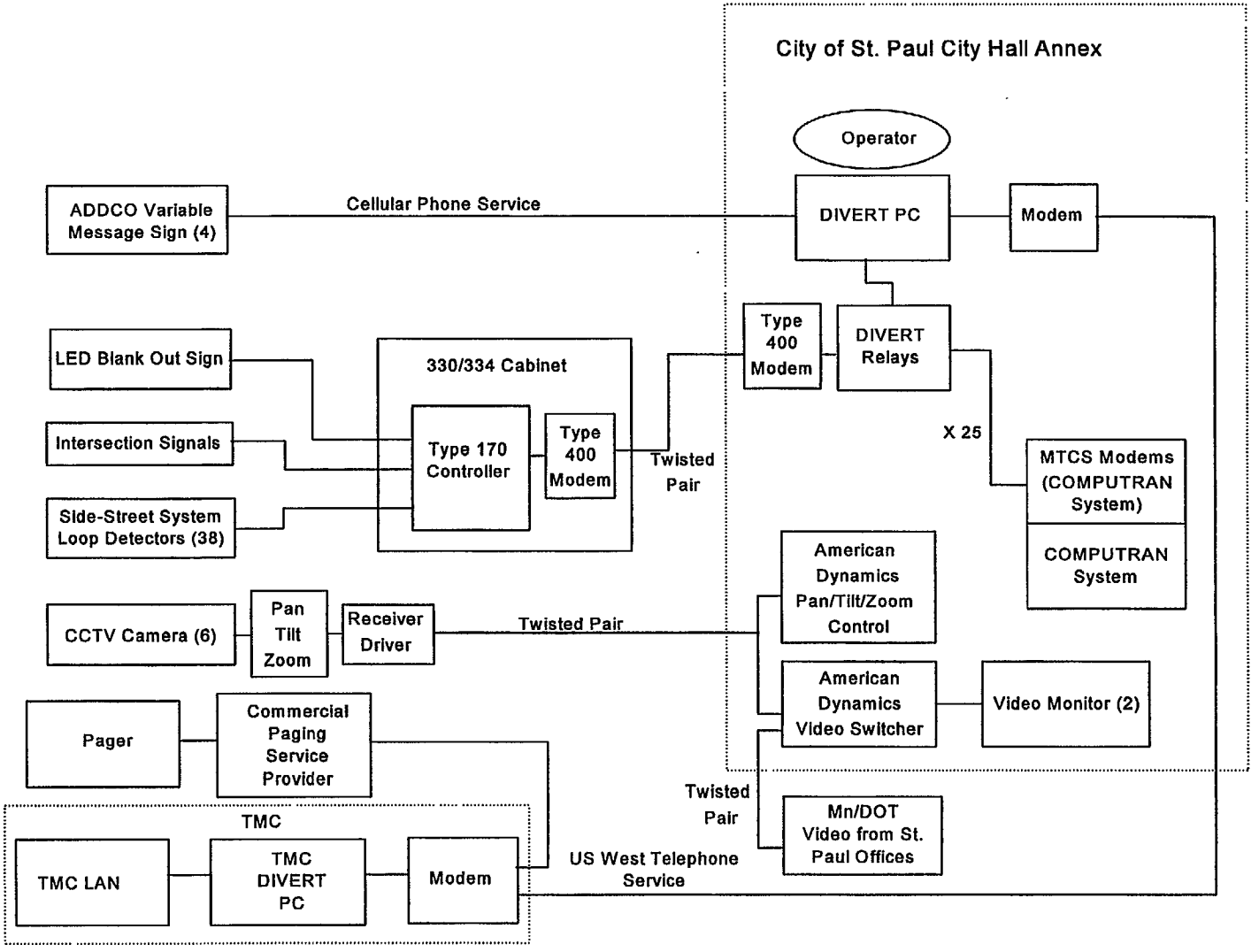
4.19 INTERFACE	Laser Printer
- Connects to . . .	8 Line Serial Interface Card
- Interface location	TMC Computer Room
- Interface Type	Data
- Interface Direction	Input
- Interface Component	RS-232 Serial Cable
- Information Type/Content	System operation and status reports, as well as error/fault logs.
- Information Direction	Input
- Information Frequency	As Needed
- Other	The laser printer and color video terminal share port 0 on the eight line serial interface card

4.20 INTERFACE	Color Video Graphic Terminal
- Connects to . . .	Eight Line Serial Interface Card
- Interface location	TMC Computer Room
- Interface Type	Data
- Interface Direction	Both
- Interface Component	RS-232 Serial Cable
- Information Type/Content	System operation and status for graphical display, also displays error /fault messages. An Operator can also manually control the system and change algorithms from this terminal.
- Information Direction	Both
- Information Frequency	As Needed
- Other	The laser Printer and color video terminal share port 0 on the eight line serial interface card

3.3.3 DIVERT INCIDENT MANAGEMENT SYSTEM

POLARIS As-Is Baseline Data Gathering Effort

DIVERT Incident Management System



divert.pre
22 May 1996

AS-IS DATA COLLECTION TEMPLATE

1.0 AGENCY "CITY OF ST. PAUL"

- Agency Type	Public Works, Traffic Division
- Agency Functions	Manage traffic operations within the city of St. Paul. This includes signal and incident management
- Agency Location(s)	City Hall Annex
- Contacts	Sammuel Boyd Mn/DOTt Guidestar (612) 282-5317 Paul T. Kurtz 800 City Hall Annex St. Paul, MN 55102-1660 (612) 266-6203 Bob Sands/Gary Rylander Edwards & Kelcey, Inc. (612) 835-6411

2.0 SYSTEM "DIVERT INCIDENT MANAGEMENT SYSTEM"

- Date of As-Is Data Collection	l/25/96
- Purpose	This system is designed to decrease the congestion impacts of incidents in the I-35E/ I-94 commons area (capital interchange) near downtown St. Paul by redirecting traffic to designated city streets acting as alternate routes. This system is a FHWA sponsored one year operational test and will be evaluated after test period to determine the effectiveness and potential future use.
- Hours of Operation	6:00am to 6:30pm to coincide with Traffic Management Center (TMC) hours of operation. The system will automatically page an operator during non-work hours (24 hours/day).
- Geographic Coverage	City of St. Paul, Central Business District (CBD)
- Contacts	See above
- Status	To be activated 2/96
- Block Diagram	See attached
- Policies	The magnitude of incident which will warrant activation of the DIVERT system will be defined in an operations plan which is not yet complete

- Typical Operational Scenario	When an incident is detected in the pre-determined St. Paul freeway segment by the Mn/DOT Traffic Management Center (TMC) a telephone communication will go to the DIVERT operator at the St. Paul City Hall Annex. The operator will the assess the incident using a video feed from the TMC camera system. If the incident is significant, the DIVERT System will be activated and variable message signs will be used to direct motorists off the freeways to local streets. Once on local streets, blank out signs along the alternate route guide diverted traffic to an entry point where they may get back on the freeway. Traffic signals along alternate routes will implement an alternate timing plan which provides longer green times for the diverted traffic. Any of four predetermined alternate routes may be activated by the DIVERT operator depending on the incident location and the associated traffic impacts.

2.1 PERSONNEL "DIVERT OPERATOR"

- Personnel Function	Assess incidents in the DIVERT corridor and activate/deactivate the DIVERT message signs and timing plans.
- Quantity	One
- Location	St. Paul City Hall Annex
- Working hours	7:00 am to 4:00 pm
- Status	Existing personnel

2.2 PERSONNEL "TMC PERSONNEL"

- Personnel Function	Monitors TMC video system for incidents; will notify St. Paul DIVERT personnel if an incident is detected in the DIVERT corridor
- Quantity	N/A
- Working hours	TMC operation hours, 6:00am to 6:30pm

3.1 HARDWARE "VARIABLE MESSAGE SIGN"

- Hardware Type	Outdoor changeable message sign, currently mounted on trailers,
- Functions	Display messages telling motorists where to exit I-35E or I-94 during an incident
- Location	Signs are located "upstream" of the last exit a motorist reaches before each of the following ans they travel along I-35E or I-94: I-35E NB I-35E SB I-94 EB I-94 WB
- Quantity	Four
- Data Name/Contents	Instructions to motorists to exit the freeway and use alternate route
- Data Type	Text
- Status	Existing
- Recommended Improvements	City is examining the possibility of using bridge/overpass mounted signs
- Other	Manufactured by ADDCO and operated by proprietary ADDCO software

3.2 HARDWARE "LED BLANK-OUT SIGN"

- Hardware Type	LED sign; on/off control lead connected to Type 170 signal controller
- Functions	Display the alternate route to diverted motorists
- Location	At intersections along pre-determined alternate routes
- Data Name/Contents	"Trailblazer" info (i.e. indicates correct route)
- Data Type	Text
- Status	Existing
- Other	Supplied by Warning Lights, Inc.

3.3 HARDWARE "INTERSECTION TRAFFIC SIGNAL"

- Hardware Type	Red-Yellow-Green Traffic control signal
- Functions	Control traffic flow through intersections. During DIVERT System operation, the signal will have longer green times along the alternate route and longer red times on the cross streets.
- Location	At intersections along the alternate routes
- Data Name/Contents	N/A
- Data Type	N/A
- Status	Existing

3.4 HARDWARE "SYSTEM LOOP DETECTORS"

- Hardware Type	Wire-coil magnetic induction vehicle detection device
- Functions	Send a signal indicating that a vehicle has passed over the loop
- Location	At intersections along alternate routes
- Data Name/Contents	Vehicle present/not present
- Data Type	Data
- Status	Existing
- Other	A total of 38 loop detectors have been added to the system to facilitate detecton of congestion in the downtown St. Paul area. These detectors are located on city streets which intersect the DIVERT alternate routes. If a queue is building on one of these cross-streets the DIVERT system can be suspended to avoid congestion on local streets.

3.5 HARDWARE "CLOSED CIRCUIT VIDEO (CCTV) CAMERA"

- Hardware Type	Panasonic Color Video Camera
- Functions	Provides real-time visual monitoring of locations within the St. Paul CBD
- Location	Selected intersections
- Quantity	6
- Data Name/Contents	Images of intersections along the designated alternate routes
- Data Type	Analog video

3.6 HARDWARE "PAN/TILT/ZOOM (PTZ) ACTUATOR"

- Hardware Type	Electromechanical PTZ Device
- Functions	Provides remote control pan, tilt, and zoom functions for the camera
- Location	Attached to each camera.
- Quantity	Six
- Data Name/Contents	N/A
- Data Type	N/A
- Status	Existing

3.7 HARDWARE "330/332 INTERSECTION CONTROLLER CABINET"

- Hardware Type	Environmental housing for Type 170 Intersection controller
- Functions	Provides power and environmental protection for controllers and other at-intersection hardware components
- Location	At intersections
- Data Name/Contents	N/A
- Data Type	N/A
- status	Existing

3.8 HARDWARE "TYPE 170 INTERSECTION CONTROLLER"

- Hardware Type	Traffic signal controller
- Functions	Process, control, and log signal events. Also activates LED blank-out signs and receives data from loop detectors
- Location	At each intersection. This hardware is part of field signal system
- Data Type	Data
- status	Existing

3.9 HARDWARE "TYPE 400 MODEM"

- Hardware Type	Serial communication device
- Functions	Communicates intersection component status to the DIVERT PC and receives commands to change signal timing and turn blank out signs on/off
- Location	At each intersection-this HW is part of field signal system and at St. Paul City Hall Annex
- Data Name/Contents	Blank out sign on/off, loop detector presence, signal light status, and system commands to change sign status and change timing plan.
- Data Type	Data
- Status	Existing

3.10 HARDWARE "DIVERT PC"

- Hardware Type	Desktop PC
- Functions	1) Monitors and displays incoming loop detector data 2) Activates and controls variable message signs(VMS). 3) Communicates DIVERT system status to TMC DIVERT PC
- Location	St. Paul City Hall Annex
- Quantity	1
- Data Name/Contents	Communicating with: 1) Loop detector: volume and lane occupancy 2) VMS: Sign status and commands to display messages 3) TMC: System active/inactive message
- Data Type	Data
- Status	Existing
- Other	ZEOS Pantera with Intel Pentium CPU

3.10.1 SOFTWARE "MS-DOS OPERATING SYSTEM"

- Software Type	MS DOS/ Windows
- Software Standards	Winl6Win32s
- Status	Existing

3.10.2 SOFTWARE "ADDCO SIGN MANAGEMENT SOFTWARE"

- Software Type	Sign control and management
- Software Standards	Propriety ADDCO standard
- Functions	Activates sign and selects message to display
- Status	Being installed

3.10.3 SOFTWARE "EXCALIBUR DIVERT SOFTWARE"

- Software Type	Multifunction system management software.
- Functions	Communicates instructions to Type 170 controllers for timing plans and blank out signs and receives loop detector data
- Status	Being installed

3.11 HARDWARE "CITY HALL ANNEX DIVERT MODEM"

- Hardware Type	Dial-up serial communications device
- Functions	Provide data communication between St. Paul City Hall Annex and TMC. Will Be used to notify TMC DIVERT PC of incidents, receive confirmation that the DIVERT System has been activated, and notify an off-hours DIVERT Operator through an automated dial-out to a paging service provider.
- Location	St. Paul City Hall Annex
- Quantity	1
- Data Name/Contents	Messages indicating DIVERT system activity
- Data Type	Voice or data
- Status	Existing

3.12 HARDWARE "DIVERT RELAYS"

- Hardware Type	Electromechanical relay
- Functions	Switches signal timing plan control from COMPUTRAN system to DIVERT system by switching control twisted pairs from Modified Traffic Control System (MTCS) modems to DIVERT PC
- Location	St. Paul City Hall Annex
- Quantity	25
- Data Name/Contents	N/A
- Data Type	N/A
- Status	Existing

3.13 HARDWARE "MODIFIED TRAFFIC CONTROL SYSTEM (MTCS) MODEMS"

- Hardware Type	Serial Communications Modem
- Functions	Communicates with Type 170 intersection controllers over dedicated twisted pair connections
- Location	St. Paul City Hall Annex
- Quantity	25
- Data Name/Contents	Timing plan selections, blank-out sign on/off, and loop detector data
- Data Type	Data
- Status	Existing

3.14 HARDWARE "AMERICAN DYNAMICS PAN/TILT/ZOOM CONTROL"

- Hardware Type: American Dynamics PTZ Control Panel
- Functions: Allows operator at City Hall Annex to interactively control the pan, tilt and zoom functions of the camera in real time
- Location: St. Paul City Hall Annex
- Quantity: 1
- Data Name/Contents: N/A
- Data Type: N/A
- Status: Existing

3.15 HARDWARE "AMERICAN DYNAMICS VIDEO SWITCHER"

- Hardware Type: American Dynamics Video Switcher and control panel
- Functions: Allows operator at City Hall Annex to select any of six St. Paul cameras or any of the Mn/DOT-TMC cameras for display on the City Hall Annex video monitors
- Location: St. Paul City Hall Annex
- Quantity: 1
- Data Name/Contents: N/A
- Data Type: N/A
- Status: Existing

3.16 HARDWARE "COLOR VIDEO MONITOR"

- Hardware Type: Video Monitor
- Functions: Displays incoming video signals from various outdoor cameras
- Location: St. Paul City Hall Annex
- Quantity: 2
- Data Name/Contents: N/A
- Data Type: N/A
- Status: Existing
- Other: Phillips color monitor

3.17 HARDWARE "TMC MODEM'

- Hardware Type	Dial-up serial communications device
- Functions	Provide data communication between St. Paul City Hall Annex and TMC. Will be used to notify TMC DIVERT PC of incidents, receive confirmation that the DIVERT System has been activated and notify an off-hours DIVERT Operator through an automated dial-out to a paging service provider.
- Location	Mn/DOT Traffic Management Center
- Data Name/Contents	Messages indicating DIVERT system activity
- Data Type	Voice or Data
- Status	Existing

3.18 HARDWARE "TMC DIVERT PC"

- Hardware Type	Desktop Computer
- Functions	Receives data from the DIVERT PC at the St. Paul City Hall Annex indicating system status Automatically dials into the Commercial Paging Service Provider and sends an alert message/code to DIVERT personnel,
- Location	Mn/DOT TMC
- Quantity	1
- Data Name/Contents	DIVERT system active/inactive information Message to page DIVERT personnel
- Data Type	N/A
- Status	Existing

3.19 HARD WARE "COMMERCIAL PAGING SERVICE PROVIDER"

- Hardware Type	Service provider
- Functions	Sends messages to pagers carried by DIVERT personnel
- Data Name/Contents	Messages and/or codes which indicate the presence of an incident in the DIVERT corridor
- Data Type	Data

3.20 HARDWARE "PAGER"

- Hardware Type	Alphanumeric pager
- Functions	Receives messages from paging service and displays them on an LCD screen
- Location	Portable
- Data Name/Contents	Messages an/or codes relating to incidents in the DIVERT Corridor
- Data Type	Data

3.21 HARDWARE "TMC LAN"

- Hardware Type	Local area computer network
- Functions	Supplies loop detector data to the DIVERT system
- Location	Mn/DOT TMC
- Data Name/Contents	Lane volume/ occupancy data from loop detectors in the DIVERT corridor.
- Data Type	Data

4.1 INTERFACE	VARIABLE MESSAGE SIGN
- Connects to . . .	DIVERT PC
- Interface location	N/A
- Interface Type	Data
- Interface Direction	Both
- Interface Component	Commercial cellular telephone service
- Information Type/Content	Instructions to signs to display a given message, confirmation signal back to DIVERT PC
- Information Direction	Both
- Information Frequency	As Needed

4.2 INTERFACE	LED BLANK OUT SIGN
- Connects to . . .	Type 170 intersection controller
- Interface location	At intersections
- Interface Type	On/Off
- Interface Direction	Input
- Interface Component	On/Off lead wire
- Protocol/Standard	N/A
- Information Type/Content	N/A
- Information Direction	Input
- Information Frequency	N/A
- Information Standards	N/A

4.3 INTERFACE	INTERSECTION SIGNAL
- Connects to . . .	Type 170 intersection controller
- Interface location	At intersections
- Interface Type	Power 110 VAC
- Interface Direction	Input
- Interface Component	On/Off lead wire
- Protocol/Standard	N/A
- Information Type/Content	N/A
- Information Direction	Input
- Information Frequency	As Needed
- Information Standards	N/A
- Other	Controls the Red-Yellow-Green signal head

4.4 INTERFACE	LOOP DETECTOR
- Connects to . . .	Type 170 intersection controller (via detector card amplifier)
- Interface location	At intersections
- Interface Type	Data
- Interface Direction	output
- Interface Component	Lead wire
- Protocol/Standard	N/A
- Information Type/Content	N/A
- Information Direction	output
- Information Frequency	As Needed
- Information Standards	N/A

4.5 INTERFACE	TYPE 170 INTERSECTION CONTROLLER
- Connects to . . .	DIVERT relay bank
- Interface location	City Hall Annex
- Interface Type	Data
- Interface Direction	Both
- Interface Component	Twisted pair cable
- Protocol/Standard	RS-232 to a Type 400 Modem
- Information Type/Content	This interface carries the following information: 1) Lane volume/ occupancy (via loop detection) 2) Intersection light status 3) Blank out sign on/off command and status (DIVERT route intersection only)
- Information Direction	Both
- Information Frequency	Continuous
- Information Standards	N/A
- Other	This interface uses a Type 400 modem at each end. The modems are integrated into the intersection controllers and into the DIVERT/COMPUTRAN systems.

4.6.1 INTERFACE	CCTV CAMERA/PTZ
- Connects to . . .	American Dynamics Pan/Tilt/Zoom Controller
- Interface location	City Hall Annex
- Interface Type	Data
- Interface Direction	Input
- Interface Component	Twisted Pair (shared with video signal)
- Protocol/Standard	N/A
- Information Type/Content	N/A
- Information Direction	Input
- Information Frequency	As Needed
- Information Standards	N/A

4.6.2 INTERFACE	CCTV CAMERA/RTZ
- Connects to . . .	American Dynamics Video Switcher
- Interface location	City Hall Annex
- Interface Type	Video
- Interface Direction	output
- Interface Component	Twisted Pair (shared with PTZ signal)
- Protocol/Standard	N/A
- Information Type/Content	Real time color video signal from St. Paul CBD cameras
- Information Direction	output
- Information Frequency	Continuous
- Information Standards	N/A

4.7 INTERFACE	DIVERT RELAYS
- Connects to . . .	DIVERT PC
- Interface location	City Hall Annex
- Interface Type	Data
- Interface Direction	Both
- Information Type/Content	Signal status and loop detector information from 170 Controllers at intersections; also LED blank out sign on/off signals and timing plan select commands
- Information Direction	Both
- Information Frequency	As Needed

4.8 INTERFACE	DIVERT RELAYS
- Connects to . . .	MTCS Modems
- Interface location	City Hall Annex
- Interface Type	Data
- Interface Direction	Both
- Interface Component	Twisted Pair cables
- Information Type/Content	Signal status and loop detector information from 170 Controllers at intersections; also LED blank out sign on/off signals and timing plan select commands
- Information Direction	Both
- Information Frequency	As Needed
- Other	This is the default control information path connecting to the COMPUTRAN system

4.9 INTERFACE	AMERICAN DYNAMICS VIDEO SWITCHER
- Connects to . . .	Color Video Monitors
- Interface location	City Hall Annex
- Interface Type	Composite video
- Interface Direction	output
- Interface Component	RCA cable
- Protocol/Standard	RGB Composite Video
- Information Type/Content	Video signal from video switcher, which selects the camera whose output is to be viewed
- Information Direction	output
- Information Frequency	Continuous

4.10 INTERFACE	AMERICAN DYNAMICS VIDEO SWITCHER
- Connects to . . .	Mn/DOT Central Office Video Feed
- Interface location	City Hall Annex
- Interface Type	Data
- Interface Direction	Input
- Interface Component	Twisted pair cable
- Information Type/Content	Video from any of the TMC system cameras
- Information Direction	Input
- Information Frequency	Continuous

4.11 INTERFACE	ST. PAUL CITY HALL ANNEX DIVERT MODEM
- Connects to . . .	DIVERT PC
- Interface location	City Hall Annex
- Interface Type	Data
- Interface Direction	Both
- Interface Component	RS-232 Serial
- Information Type/Content	Communication about incident detection and DIVERT System status Also sends Mn/DOT loop detector data to St. Paul City Hall Annex for loops in the DIVERT corridor
- Information Direction	Both
- Information Frequency	As needed

4.12 INTERFACE	ST. PAUL CITY HALL ANNEX DIVERT MODEM
- Connects to . . .	Mn/DOT TMC DIVERT MODEM (via US West)
- Interface location	City Hall Annex
- Interface Type	Voice/Data
- Interface Direction	Both
- Interface Component	Voice grade telephone service (US West)
- Information Type/Content	Communication about incident detection and DIVERT System status Also sends Mn/DOT loop detector data to St. Paul City Hall Annex for loops in the DIVERT corridor
- Information Direction	Both
- Information Frequency	As needed

4.13 INTERFACE	TMC DIVERT MODEM
- Connects to . . .	TMC DIVERT PC
- Interface location	Mn/DOT TMC
- Interface Type	Data
- Interface Direction	Both
- Interface Component	RS-232 Serial connection
- Information Type/Content	Communication about incident detection and DIVERT system status (active/inactive)
- Information Direction	Both
- Information Frequency	As needed

4.14 INTERFACE	TMC DIVERT MODEM
- Connects to . . .	Commercial Paging Service Provider
- Interface location	Mn/DOT TMC
- Interface Type	Data
- Interface Direction	Both
- Interface Component	US West voice grade telephone line
- Information Type/Content	Message or code sent to commercial paging service provider to be relayed to the pager devices
- Information Direction	Both
- Information Frequency	As needed

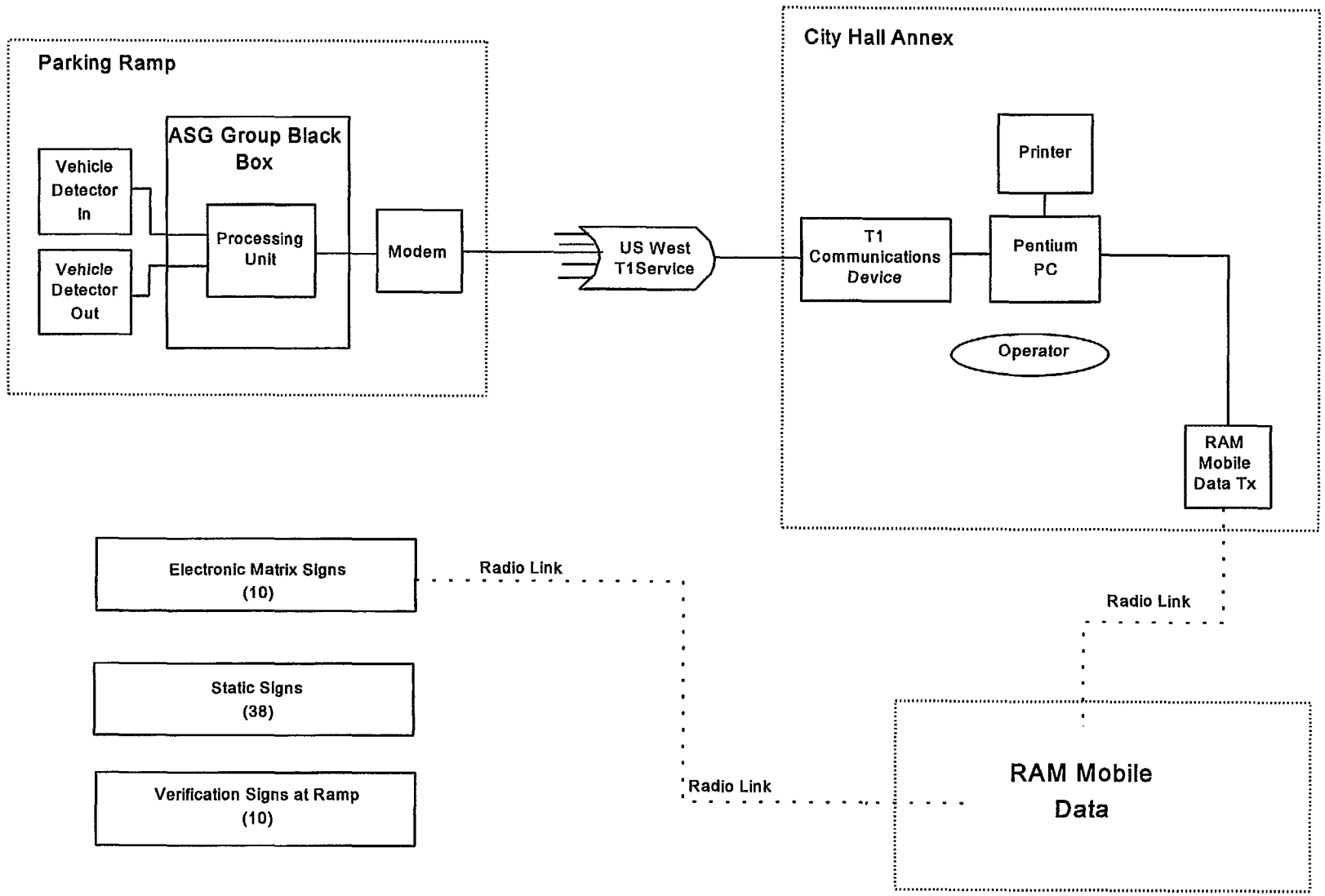
4.15 INTERFACE	COMMERCIAL PAGING SERVICE PROVIDER
- Connects to . . .	DIVERT Pagers
- Interface Type	Data
- Interface Direction	Both
- Interface Component	Radio Pager transmission
- Information Type/Content	Messages/codes indicating incident detection status
- Information Direction	Both
- Information Frequency	As needed

4.16 INTERFACE	TMC LAN
- Connects to . . .	DIVERT PC
- Interface Type	Data
- Interface Direction	Both
- Interface Component	Ethernet
- Information Type/Content	Mn/DOT loop detector data for loops in the DIVERT corridor
- Information Direction	Both
- Information Frequency	Continuous

3.3.4 ADVANCED PARKING INFORMATION SYSTEM

POLARIS As-Is Baseline Data Collection

Advanced Parking Information System



AS-IS DATA COLLECTION TEMPLATE

1.0 AGENCY "CITY OF ST. PAUL - DEPARTMENT OF PUBLIC WORKS"	
- Agency Type	City of St. Paul, Department of Public Works
- Agency Functions	Manage traffic operations and data, including: 1 .Collect data through vehicle detection devices (i.e. loop detectors) 2. Operate signal systems (installation, maintenance, Programming) 3 Traffic management planning
- Agency Location(s)	St. Paul City Hall Annex
2.0 SYSTEM "ADVANCED PARKING INFORMATION SYSTEM'	
- Date of As-Is Data Collection	l/25/96
- Purpose	Provide real-time parking availability information to motorists. This system uses dedicated hardware at each participating ramp to detect vehicle entries/exits and to contact a central PC with the number of spaces available at a given ramp. The PC then relays the information to RAM MobileData, which broadcasts the information to electronic matrix signs with special receivers. There are dedicated electronic matrix signs for each ramp and the signs will display the number of remaining spaces at the ramp.
- Hours of Operation	During special events.
- Geographic Coverage	Downtown St. Paul
- Contacts	Paul Kurtz, City of St. Paul, Department of Public Works.
- status	To be implemented 2/96 at ten (10) participating ramps.
- Issues	This is an FHWA operational test; duration is one year
- Block Diagram	See attached
- Typical Operational Scenario	Will be activated and provide information to motorists during special events.
2.1 PERSONNEL "SYSTEM ADMINISTRATOR"	
- Personnel Function	As an operational test, details about staff responsibilities and workload were not available. However, the contact person for this system indicated that an administrative position and a staff position would be necessary for this system

2.2 PERSONNEL "STAFF"

- Personnel Function	See personnel 2.1

3.1 HARDWARE "AGS GROUP BLACK BOX"

- Hardware Type	Vehicle detection and space availability black box (AGS Group)
- Functions	Monitors entries/exits from parking ramp and communicates data to computer at City Hall Annex
- Location	At participating parking ramps
- Data Name/Contents	Content is number of spaces available at ramp
- Data Type	Data
- Status	Being installed
- Contact	AGS Group (European manufacturer)
- Other	One unit with detectors at each of ten ramps

3.2 HARDWARE "VEHICLE LOOP DETECTOR"

- Hardware Type	Magnetic induction-type vehicle detector
- Functions	Indicates presence of vehicle
- Location	At entrances and exits of parking structures
- Data Type	Data (on/off pulse)
- status	Existing

3.3 HARDWARE "AGS GROUP MODEM"

- Hardware Type	Dial-up modem
- Functions	Sends information from AGS Group black box to US West Tl service
- Location	At each ramp
- Data Name/Contents	Number of spaces available at ramp
- Data Type	Data
- Status	Existing
- Other	This hardware is a physical component of the AGS Group blackbox.

3.4 HARDWARE "US WEST Tl SERVICE"

- Hardware Type	Tl Service
- Functions	Receives data from AGS Group Black Box modems at each ramp, sends data to City Hall Annex on a single Tl line.
- Data Name/Contents	Number of spaces available at ramp
- Data Type	Data
- Status	Being installed

3.5 HARDWARE "Tl COMMUNICATIONS DEVICE"

- Functions: Receives data from US West Tl service
- Location: St. Paul City Hall Annex
- Data Name/Contents: Number of spaces available at ramp
- Data Type: Data
- status: Being installed

3.6 HARDWARE "PENTIUM PC"

- Hardware Type: Intel-based Personal Computer
- Functions: Processes incoming space availability data and sends appropriate data to RAM Mobile Data for transmission to signs.
- Location: St. Paul City Hall Annex
- Data Name/Contents: Incoming data is ramp space availability; outgoing data is message sign display information
- Data Type: Data
- Status: Being installed

3.6.1 SOFTWARE "DOS'

- Software Type: Operating System
- Software Standards: MS-DOS

3.6.2 SOFTWARE "MICROSOFT WINDOWS"

- Software Type: Operating System/GUI
- Software Standards: Win16/Win32

3.6.3 SOFTWARE "ASG GROUP SYSTEM SOFTWARE"

- Software Type: Integrated communications/sign management package
- Functions: Communicate with ramp black boxes for space data, process data, communicate with electronic matrix signs
- status: To be deployed 2/96

3.7 HARDWARE "PRINTER"

- Hardware Type: Dot-Matrix printer
- Functions: Print hard copies of log messages
- Location: City Hall Annex
- Data Name/Contents: System operations data, error messages
- Data Type: Data

3.8 HARDWARE "RAM MOBILE DATA TRANSMITTER"

- Hardware Type	Proprietary RF transmitter
- Functions	Sends data to RAM Mobile Data transmitter facility in Woodbury.
- Location	City Hall Annex
- Data Name/Contents	Number of spaces at ramps for display on the electronic matrix signs.
- Data Type	Data

3.9 HARDWARE "ELECTRONIC MATRIX SIGNS"

- Hardware Type	Outdoor electronic changeable message sign
- Functions	Display messages regarding parking space information to motorists
- Location	Curbside in downtown St. Paul
- Data Name/Contents	Number of available spaces at appropriate ramps/lots
- Data Type	RAM MobilData Radio information
- Status	Existing but inactive

3.10 HARDWARE "STATIC SIGNS"

- Hardware Type	Steel outdoor signs
- Functions	Direct motorists to ramps
- Location	City of St. Paul CBD, various sites
- Data Name/Contents	Ramp name, arrow showing direction
- Data Type	Text

3.11 HARDWARE "VERIFICATION SIGNS AT RAMP"

- Hardware Type	Steel outdoor signs
- Functions	Confirm ramp location to motorists
- Location	At participating ramps
- Data Name/Contents	Ramp Name
- Data Type	Text

4.1 INTERFACE	AGS GROUP BLACK BOX MODEM
- Connects to . . .	US West Tl Service
- Interface Type	Data
- Interface Direction	Both
- Interface Component	US West Voice Grade Telephone Line
- Protocol/Standard	Unknown/proprietary
- Information Type/Content	Parking space availability data for ramp
- Information Direction	output

4.2 INTERFACE	VEHICLE LOOP DETECTOR
- Connects to . . .	AGS Group black box
- Interface location	At parking ramps
- Interface Type	Data (on/off pulse)
- Interface Direction	output
- Interface Component	Wire lead
- Information Type/Content	Presence of vehicle
- Information Direction	output

4.3 INTERFACE	US WEST Tl SERVICE
- Connects to . . .	T1 Communications device
- Interface Type	Data
- Interface Direction	Both
- Information Type/Content	Parking space availability data for each of the ten ramps
- Information Direction	output

4.3 INTERFACE	PENTIUM PC
- Connects to . . .	Printer
- Interface location	City Hall Annex
- Interface Type	Data
- Interface Direction	Both
- Interface Component	Parallel Cable
- Information Type/Content	Information to be printed
- Information Direction	output

4.4 INTERFACE	UNKNOWN CONNECTION FROM PC TO RAM MOBILE DATA TRANSMITTER
- Connects to . . .	RAM Mobile Data transmitter on rooftop
- Interface location	City Hall Annex
- Interface Type	Data
- Interface Direction	Both
- Information Type/Content	Parking space availability data for each ramp
- Information Direction	output

4.4 INTERFACE	RAM MOBILE DATA TRANSMITTER
- Connects to . . .	RAM Mobile Data service in Woodbury, MN
- Interface Type	Data
- Interface Direction	Both
- Information Type/Content	Parking space availability data for each ramp
- Information Direction	output

4.5 INTERFACE	RAM MOBILE DATA RADIO TRANSMITTER
- Connects to . . .	Electronic Matrix Signs
- Interface location	RAM Transmitter: Woodbury, MN
- Interface Type	Data
- Information Type/Content	Parking space availability data for ramp
- Information Direction	Both

APPENDIX A

As-Is Agency Reports
Pre-Survey Candidate Systems List

PRE-SURVEY CANDIDATE SYSTEMS

Traffic Signal Control Systems
- City of St. Paul Computran traffic signal control system
- City of St. Paul traffic signal intersection hardware (field equipment)
- City of Minneapolis Fortran traffic signal control system
- Mn/DOT Metro Division/District traffic office closed loop traffic signal system(s)
- County closed loop traffic signal systems (Hennepin, Ramsey, etc.)
- City closed loop traffic signal systems
- Video detection/control of signal system (T.H. 65 & 53rd, Lyndale and Frankhn Ave)
- Pre-emption of traffic signals for emergency vehicles (EVP)
- Pre-emption of traffic signal at fire stations
- Pre-emption of traffic signals at railroad crossings (20 locations in Metro area)
- Minneapolis AUSCI operational test

Freeway Management System
- MnDOT TMC ramp meter system
- Mn/DOT TMC video surveillance system
- Mn/DOT TMC CMS control system
- KBEM radio broadcast system
- Mn/DOT TMC cable TV information system - (Triple Vision system)
- Mn/DOT Metro Division/District portable changeable message signs
- TMC traffic history database (volume and occupancy data)
- TMC incident log database
- U of M Autoscope incident detection system
- Genesis operational test
- Trilogy operational test
- Mn/DOT workzone traffic management system operational test

Transit Management Systems
- MCTO "Trapeze" scheduling/planning system (creates bus/driver schedules)
- MCTO "radio" system (computer assisted radio system, 7 channels)
- MCTO automatic passenger counters (on some buses)
- MCTO electronic fare collection boxes (on all buses)
- MCTO TIC BusLine system (voice responses system, customer service system)
- MCTO customer service system for route/schedule planning (live telephone operators)
- MCTO transportation section (provides construction information to MCTO)
- MCTO bus stop database (contains the attributes of each bus stop)
- MCTO Police crime/incident tracking system
- MCTO Opticom emitters (EVP on 80 buses)
- MCTO speed light system (ramp meter pre-emption on selected ramps)
- MCTO Route-0-Matic system - vectors around incidents and congestion
- Metropolitan Council Rideshare system (Mn dial-a-ride)
- MCTO funded paratransit systems
- Metropolitan Council Metro Mobility passenger registration system
- Metropolitan Council Metro Mobility passenger reservation system
- U of M transit management
- Southwest Transit
- Minnesota Valley Transit
- Plymouth Metrolink
- School bus dispatch systems

Incident Management Program
- Mn/DOT TMC Highway Helper program (including AVL system)
- Private tow contracts
- U of M police incident management
- St. Paul DIVERT operational test

Electronic Fare Payment Systems
- City of Minneapolis Parking fare collection (smart card)
- City of Minneapolis electronic parking meter maid system
- Smart Darts operational test

PRE-SURVEY CANDIDATE SYSTEMS (CONTINUED)

Electronic Toll Collection Systems
- Toll road proposals (5 proposals in MN)
- Congestion Pricing Study
- Mileage based tax study

Multi modal Traveler Information Systems
- Travlink operational test

Administrative Systems
- Mn/DOT Electrical Services maintenance management system
- Mn/DOT Electrical Service gopher state one-Cal l access system
- Mn/DOT TIS
- Mn/DOT automatic traffic recorder system
- Mn/DOT ISTEA management systems
- Mn/DOT CVO administrative systems
- DPS CVO administrative systems
- Cityof Minneapolis sign database

Other Information Systems
- Airline flight arrival/departure information - NW
- Airport rental car kiosk - Hertz
- MNOffice of Tourism travel information center kiosks
- Mn/DOT TMC road weather information system access
- Mn/DOT Metro Division weather information access
- Mn/DOT Aeronautics weather information system
- Mn/DOT statewide road weather information telephone information
- Mn/DOT Pavement Condition and Weather ReportingSystem - future
- Internal distribution system Distribution of TMC loop data via the Internet
- RWIS - Mn/DOT future Road/Weather Information System

Emergency Res onse Systems
- Motorist call box system
- Mobile Data Termmals (MDT) in all State Patrol cars
- Laptop PC's in State Patrol cars to replace MDT's - pilot project in 1996
- Emergency 911 log system at State Patrol
- State patrol information desk State Patrol South St. Paul information desk
- State Patrol access to drivers license information. via 911 center
- Mn/DOT Mayday operational test
- Demand response dispatch systems - numerous standalone systems

Parking Management Systems
- Metropolitan airports commission parking management
- City of Minneapolis parking management systems
- U of M parking management
- St. Paul Advanced Parking Information System operational test

Miscellaneous
- Mn/DOT portable traffic management system
- City of Minneapolis police special event management
- City of St. Paul special event management
- U of M special event management
- Mn/DOT pilot differential PS broadcast base station
- Mn/DOT maintenance vehicle AVL
- Mn/DOT Metro Division/District maintenance dispatch
- Hennepin County Medical Center emergency vehicle dispatch
- MN Pollution Control Agency air quality monitoring sites
- Met. Council Forecasting models - uses data from Mn/DOT TIS database
- U of M traffic management system proposal

Interagency Systems
- ICTM - Integrated Corridor Traffic Management System operational test (includes Autoscope)
- ARCTIC - operational test in Virginia, MN

PRE-SURVEY CANDIDATE SYSTEMS (CONTINUED)

CVO Systems
- List of s_ stems from MN Guidestar
- CVO call-in number
- State Patrol toll free Inforrnation number

Construction InformationNotification Systems
- Gopher State One Call system for utility locations
- Mn/DOT construction information dissemmauon
- Counties' systems (Hennepin County)
- Counties' systems (Ramsey County)
- City system (Minneapolis)
- City system (St. Paul)
- Utilities' systems

Communications Systems
- Mn/DOT TMC Fiber optic data communications system
- Mn/DOT Microwave Communication System
- Mn/DOT Tl system
- M.n/DOT Wide Area Network
- MNET (STARS)
- Voice radio - State Patrol, Mn/DOT Maintenance, DNR
- 800 MHZ Trunked Radio system (Metro area)
- Internet Cornnmnications
- Traffic Signal Interconnect systems
- RBDS - Radio Broadcast Data Systems
- Mn/DOT Video Conferencing

APPENDIX B

As-Is Agency Reports
Data Collection. Guide

Minnesota Guidestar

As-Is Transportation Systems Inventory Data Collection Guide

LORAL
Federal Systems-Owego

POLARIS As-Is Transportation Systems Inventory
Data Collection Guide

PURPOSE

The purpose of this document is to provide information about the Polaris As-Is Transportation Systems Inventory Template, information provided by this guide is representative but not inclusive as to the amount or all the types of information that may be found during a Polaris survey.

ORGANIZATION

Organization of this document is based on the Polaris As-Is Transportation Systems Inventory Template. For each template page in the Polaris As-Is Transportation Systems Inventory Template, a section in this document, will list the types of information to be collected, a description of how the data will be collected, recommended answers for known entities, and miscellaneous note area for unstructured items. The following list contains this documents sections:

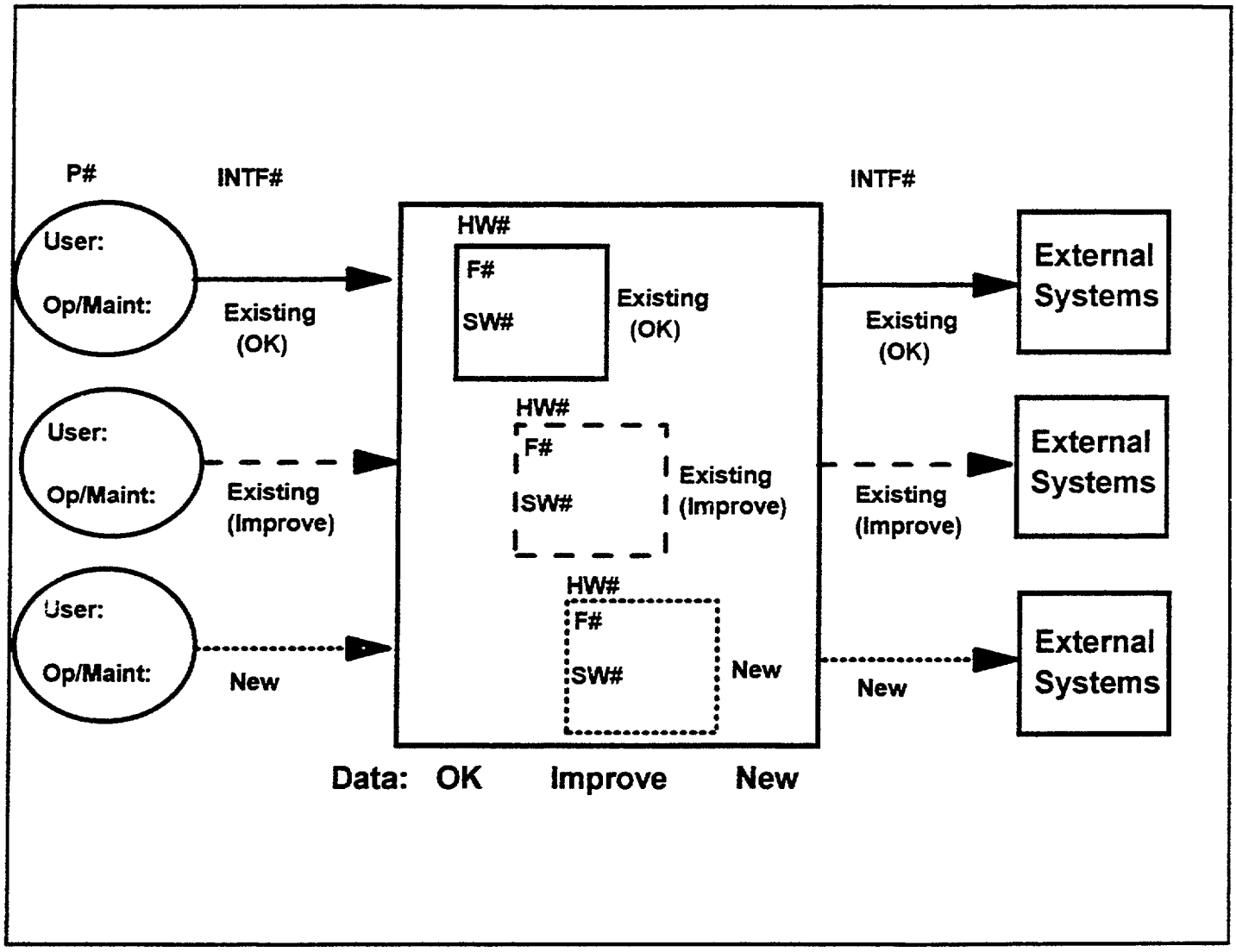
1.0 Systems
1.1 Hardware Components
1.2 Software Components
1.3 Software Interfaces
1.4 System Personnel
2.0 Agency
2.1 Agency Interfaces
2.2 Agency Systems

About the Template Document

The Polaris As-Is Transportation Systems Inventory Template is a document intended to assist the data collector in the field perform their task more expediently. The document is a collection of 8 sections that are identical to the sections in this document. Seven of sections are on one sheet of paper. One section expanded to two sheets of paper. The theory of the document structure was to duplicate each document section numerous until the entire system, or what ever thing you are collecting data on is captured on the templates.

1.0 Systems

In order to understand the system being surveyed, the surveyor shall draw the system in block diagram format. The block format shall conform to the following example. Template Page #1 is where the system block diagram shall be drawn.



1 .1 Hardware Components

The purpose of Hardware Components, Template Page #1 , is to list all the various hardware elements that are interconnected to form the bounds of the system to be described. For each hardware element, an identifier, HW#, shall be created and associated with hardware element graphic drawn in the System Block Diagram, Template Page #1.

Template Page #1 contains the following columns to be completed during the survey process. Definitions for each column is provided to assist in providing consistency in collecting data. Where possible, suggested recommendations for collecting data is provided.

HW# — Identifier for each component on the System Block Diagram (drawing). Each identifier used with the System Block drawing shall be unique for each System Block Diagram.

Hardware Name — A generic name for identification purposes within the user community. If no name is provided, then the Manufacturer and Model number is acceptable.

Hardware Type — Classifies the identifier, HW#, into a generic group.

If the type of component is not known, then Make and Model will be required.

Recommended choices for this column may be selected from the following list:

1. Computer Processors
2. Workstations
3. Telecommunication Devices
   a. Hubs
   b. Routers
   c. Transmitters
   d. Receivers
   e. Modems
   f. Decoders/Encoders
4. Peripherals
   a. Printers
   b. Displays

c. Barcode Readers
d. Magnetic Stripe Readers
e. Punch Cards
f. Magnetic Tape
g. Diskette
h. CD ROM
i. Cartridge Tape

5. Telephones
   a. Wire Based
   b. Wireless
6. Two way Radio Transmitters/ Receivers
7. Radio Receivers
8. Traffic Signals
9. Video Cameras
10. Loop Detectors
11. Message Signs
12. Temperature Sensors
13. Optical Transmitters / Receivers
14. Microwave

Functions - (F#)

Describes the major functions of the system. For each major function, a new entry lines shall be used for writing the description. For each function, the F# is associated to the respective HW# on the System Block Diagram, Template Page #1 The following list contains some recommended functions that may be used to describe a component.

1. Process
2. Control
3. Store
4. Communicate
5. Signal
6. Log
7. Record
8. Speak
9. Write
10. Print
11. Messaging
12. Locate
13. Search

Location

States where geographically the HW# is located.

Considerations should be given for : Multiple buildings within one community, multiple cities, multiple states, countries and other Agencies or private sector. Try to limit the information to Building Name and relevant geographic location versus room number or address. Detailed information is not required unless there is multi-jurisdictional or multi-organizations within one building.

Data Name / Content

A brief description of the data or information is processed and stored by the HW#. Some examples are:

1. Database of System Users
2. Database of construction projects
3. Collect incident information and reformat the data

Data Type

Classifies the data into a generic group. Choices for this group are:

1. Voice
2. Data
3. Video
4. Paper
5. Other (specify) _____

Status

An indicator about the existence, transition, or non-existence of the HW#:

E=Existing (Currently in place, No modifications planned)
D=Deleted (An agency has plans to delete this element in the future, but at the time of survey the element existed.)
I=Improve (Currently in place, but requires modification due to element not meeting user needs, or system needs)
N=NEW (New system planned for future deployment, but at the time of survey is not currently deployed.)

Policies

List agency policies that are practiced with respect to the Hardware components. Listed below are a couple of examples of what would belong in this topic.

1. Maintenance of the radio equipment
2. Agency X requires all PC's to be hardware locked and anchored to a non-removable building structure.

Constraints / Restrictions

List agency constrained and/or restrictions with respect to

Hardware Components

1. The hardware is outdated and can no longer be upgraded.

2. Hardware maintenance is not available for the equipment because it is too old.

Issues — List any issues that are related to this specific componenet. If the issue is global to the system, then is only needs to be stated once.

Recommended Improvements / Planned Changes

List any system or component recommended improvement that the contact person discusses. State whether the improvement is planned or a "wish" and explain why they system and component is being improved. If the improvement is global to the system, then is only needs to be stated once.

Contacts / Phone Numbers

List the contact person from which you recieved this information and their phone number.

Other — List anything else that may be relevant about the system, but does not fit in the above columns.

1.2 Software Components

SW# — [Same description as HW# in Section 1 .1]

Software Name — [Same description as Hardware Name # in Section 1 .1]

Software Type — Classifies the identifier, SW#, into generic groups

1. Transportation Software Applications

2.3 Operating Communication Systems Protocols
4. Database

6.5 Data User Interchange Interface
7. System Management

8.9 Office Controller Applications Programs
10. Firmware

Software Standards — Specify for each software type the associated product or standard. The following list is organized with the standards listed within software type.

1. Transportation System Applications
   - a. Urban Traffic Control Sofware (UTCS)
   - b. Sindney Control Adaptive Device Software (SCADS)
   - c. SCOOTS
   - d. 170 Software -WAPITI
   - e. National Electrical Materials Association (NEMA) Software
   - f. TRAPEZE
   - g. AVL

2. Operating System
   - a. DOS
   - b. WINDOWS
   - c. WINDOWS FOR WORKGROUPS
   - d. WINDOWS95
   - e. UNIX

f. OS/2
g. WINDOWS NT
h. Macintosh / System 7
i. OS/400
j. MVS
k. VM
l. VSE
m. VMS/VSE
n. Other

3. Communication Protocols
   a. TCP/IP (UNIX, IBM, Microsoft, Beamon Whiteside, Exceed, FTP)
   b. SNA (IBM)
   c. IPX/SPX (Novell)
   d. OSI
   e. DECnet (Digital Equipment)
   f. BISYNC
   g. Frame Relay
   h. x.25
   i. FDDI
   j. ATM
   k. NetBios (IBM, Microsoft)
   l. Other
4. Database
   a. Oracle
   b. Sybase
   c. Informix
   d. Database 2
   e. FoxPro
   f. Microsoft Access
   g. Other
5. Data Interchange
   a. GIS
   b. Image
   c. Vector
   d. Vector Graphics
   e. Images
   f. Printing (PostScript, PCL, AFP)
   g. Computer Aided Logistics (CALS)
   h. Electronic Data Interchange (EDI)
   i. Electronic Mail (Email)
   j. Electronic Documents

k. Traffic Messaging
l. Weather Messaging
m. Location Messaging
n. Construction Messaging
o. Other

6. User Interface
   a. Windows (Microsoft)
   b. Windows for WorkGroups (Microsoft)
   c. X-windows (UNIX)
   d. Presentation Manager (IBM OS/2)
   e. Character Based
   f. Other
7. System Management
   a. Network
   b. Computer Devices
   c. Data
   d. Other
8. Office Applications
   a. Word Processors (WordPerfect, MS Word, DisplayWrite)
   b. Spreadsheets (123, Excel, Quattro Pro)
   c. Graphics (Corel Draw, MS PowerPoint, Freelance)
   d. Multimedia (Video Conferencing)
   e. Project Scheduling (Microsoft Project, Primivera)
   f. Other

Function

[Same description as Function in Section 1.1]

Application Language

This field is only applicable for Software Types of Transportation Software Applications when there is a software application that has been custom designed and coded for a specific need or requirements. (ie. There is only one or few software applications in existence) Then the programming language of the software application should be determined. The following list provides some of programming languages that may have been used:

1. c++
2. Visual C++
3. c
4. Visual C
5. Basic
6. Visual Basic

7. Pascal
8. COBOL
9. FORTRAN
10. Assembler
11. Ada
12. Other

Status — [Same description as Status in Section 1.1]

Policies — List agency policies that are practiced with respect to Software Components. Listed below are a couple of examples of what would belong in this topic.

1. Agency X does not permit any non-business related software to be installed on PC's .

2. Agency X requires all PC's Operating Systems to have password protection to prevent unauthorized system access to the networks.

Constraints / Restrictions — List agency constrained and/or restrictions with respect to Software Components

1. The software is outdated and can no longer be upgraded.

2. Software maintenance is not available for the equipment because it is too old.

Issues — List any issues that are related to this specific componenet If the issue is global to the system, then is only needs to be stated once.

Recommended Improvements / Planned Changes

List any system or component recommended improvement that the contact person discusses. State whether the improvement is planned or a "wish" and explain why they system and component is being improved. If the improvement is global to the system, then is only needs to be stated once.

Contacts / Phone Numbers

List the contact person from which you recieved this information

	and their phone number.
Other	List anything else that may be relevant about the system, but does not fit in the above columns.

1.3 System Interfaces

The purpose of System Interfaces, Template Pages #5-7, is to list all the various interfaces that connect the Hardware Components together and External Systems to the system being surveyed. For each Hardware Component, HW# listed, the interface, INTF#, between the two components shall be listed individually until all the interfaces between Hardware Components are covered. For Systems outside the boundary of the system being surveyed, their respective interfaces shall be listed.

INTF#	[Same description as HW# in Section 1.1]
External System Name	[Same description as Hardware Name in Section 1.1]
Interface Locations	States which locations the interfaces are located. If the interface is co-located in the same location, then only one location is required.
Interface Type	Classifies the interface into a generic group. Choices for this group are: 1. Audio 2. Data 3. Video 4. Paper 5. Other (specify) _____
Interface Direction	Three choices are available for this item. Circle the applicable item. Input — Flow of information is coming in to the surveyed system or component being described output — Flow of information is going towards another component or external system. Both — Flow of information is going both directions.
Interface Component	A name of the physical entity in which the interface is established. The following list contains some more popular types of Interface Components:

1. Wire Based
   a. Token Ring
   b. Ethernet
   c. FDDI
   d. SONET
   e. Arcnet
   f. Applenet
   g. ATM
   h. ISDN
   i. RS-232
   j. RS-422
   k. SDLC
   l. Modems (Bell 202, 212, 213, V.24, V.32 V.34)
   m. Other _____
2. Wire Based Media (cabling), if there is'an external network geographically located.

   For wire based media (cabling), the wire/fiber count should be captured to
   a. Level 3 Unshielded Twisted Pair (UTP), (Telephone Voice / Data 2 MB)
   b. Level 4 Unshielded Twisted Pair,(UTP) [Data 10 MB]
   c. Level 5 Unshielded Twisted Pair,(UTP) [Data 100 MB]
   d. Shielded Twisted Pair (STP) [Data rate at 10 MB]
   Shielded Twisted Pair (STP) [Data rate at 100 MB]
   f. Multimode Fiber
   g. Single Mode Fiber
   h. Service Provider (ie. US West)
   i. Other _____
3. Wireless Based
   a. FM (ie. Two way / Broadcast)
   b. AM (ie. Broadcast)
   c. CDPD (ie. Digital Cellular Data Network)
   d. Ardis (ie. Digital Cellular, Two way paging)
   e. AMP (ie. Cellular Telephone)
   f. Microwave
   g. Other

Protocol / Standard — The interface should have a protocol or other standard

associated with how it operates. In some instances there will be multiple protocols and standards associated with the interface. All protocols and standards shall be listed. The following list identifies some of the protocols / standards that may be found.

a. TCP/IP (UNIX, IBM, Microsoft, Beamon Whiteside, Exceed)
b. SNA (IBM)
c. IPX/SPX (Novell)
d. OSI
e. DECnet (Digital Equipment)
f. BISYNC
g. Frame Relay
h. X.25
i. FDDI
j. ATM
k. NetBios (IBM, Microsoft)
l. Video (ie. Manchester Code Based)
m. Other

Information Type / Content

A description of the information that is being passed through the interface. (ie. road conditions, Traffic congestion, road construction information)

Information Direction

Three choices are available for this item. Circle the applicable item.

Input	Flow of information is coming in to the surveyed system or component being described
output	Flow of information is going towards another component or external system.
Both	Flow of information is going both directions.

Information Frequency

Specify what rate the data is exchanged between components

Information Standards

List any standards that are identified with the information being processed. Some areas where standards may be present presented listed in the following list:

1. If location information is provided, what is the units or other location attributes provided?
   a. Street Names of the nearest intersections
   b. Mile Markers
   c. Latitude / Longitude
   d. Addresses
   e. Internal Travel Interchange Standard
   f. State / Plane Coordinate
   g. Links / Nodes
   h. Other
2. Traffic Messaging
3. Weather Messaging
4. Location Messaging
5. Construction Messaging
6. Mapping Standards (GIS)
   a. Image
   b. Vector
7. Electronic Mail (Email)
8. Electronic Data Interchange (EDI)
9. Computer Aided Logistics (CALS)

Policies

List agency policies that are practiced with respect to System Interfaces. Listed below are a couple of examples of what would belong in this topic.

1. Agency X only operates the interface with System A Monday - Friday, 8AM - 5PM.
2. Agency Y requires authorization to use Agency X interfaces to their systems.

Constraints / Restrictions

List agency constraints and/or restrictions with respect to System Interfaces:

1. The interface hardware is outdated and can no longer be upgraded.
2. The maintenance of the interface is only supported by a vendor specializing in RF transmitters.

Issues

List any issues that are related to this specific componenet If

the issue is global to the system, then is only needs to be stated once.

Recommended Improvements / Planned Changes

List any system or component recommended improvement that the contact person discusses. State whether the improvement is planned or a “wish” and explain why they system and component is being improved. If the improvement is global to the system, then is only needs to be stated once.

Contacts / Phone Numbers

List the contact person from which you recieved this information and their phone number.

Other

List anything else that may be relevant about the system, but does not fit in the above columns.

1.4 System Personnel

The purpose of System Personnel, Template Page #9, is to capture the interaction a human being with the system being surveyed. For each type of personnel using the system, a P# shall be created on the System Block Diagram to identify the personnel and where they interface with the system.

P#	[Same description as HW# in Section 1.1]
Personnel Role	A description of the personnel interfacing with the system. Some examples of a role are: 1. System Maintainer 2. Data Input 3. Data Analysis 4. Data Collector 5. User 6. Other
Quantity	Approximate quantity of personnel who perform this particular role. A individual may have more that one personnel role in working with the system, therefore may be counted more that once.
Location	[Same description as HW# in Section 1.1]
Workload	Approximate amount of time per week the personnel spends interfacing with the system. The amount should be estimated on the total quantity of personnel for each role. Circle the appropriate designator on the template. Each designator is described in the following list. E Extensive Use = 90-100% Utilization H High - average hours are >70 - 120 per week M Medium - average hours are 30 -60 per week L Low - average hours are <20 per week
Status	[Same description as Status in Section 1.1]
Policies	List agency policies that are practiced with respect to System

Personnel. Listed below are a couple of examples that may be found in this topic.

1. Agency X only operates the System A with the System Administrator, Monday - Friday, 8AM - 5PM.
2. Educational requirements to operate System B is experience with UNIX.

Constraints / Restrictions — List agency constraints and/or restrictions with respect to Systems Personnel.

1. The personnel do not have the skills to maintain the system.

Issues — List any issues that are related to this specific componenet. If the issue is global to the system, then is only needs to be stated once.

Recommended Improvements / Planned Changes

List any system or component recommended improvement that the contact person discusses. State whether the improvement is planned or a "wish" and explain why they system and component is being improved. If the improvement is global to the system, then is only needs to be stated once.

Contacts / Phone Numbers

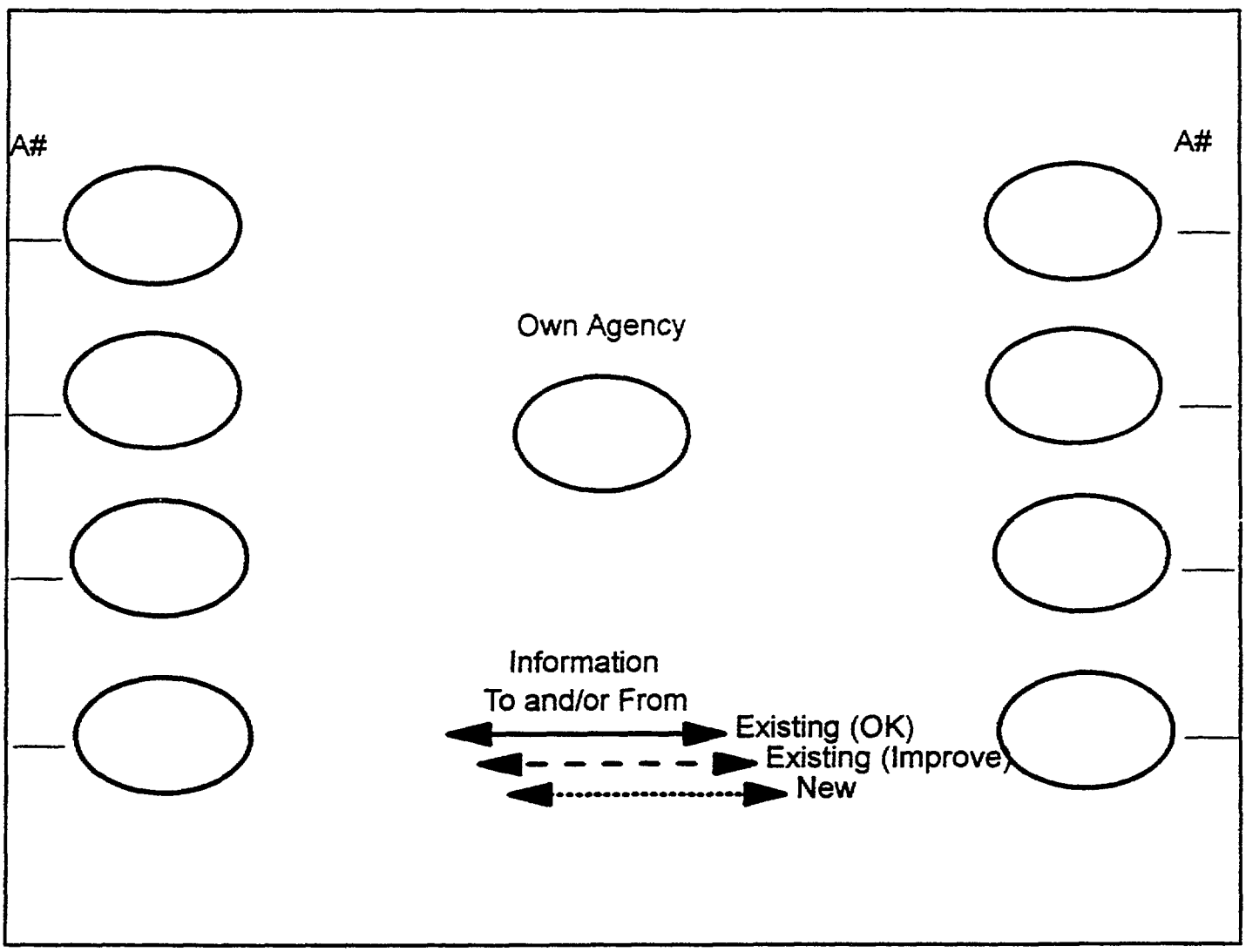
List the contact person from which you recieved this information and their phone number.

Other — List anything else that may be relevant about the system, but does not fit in the above columns.

2.0 Agency

Information about the organization which contains the system being surveyed is collected in this section. The purpose of this section is to identify any other systems or interfaces that an a agency has an established method for communicating.

Template Page #9 is a graphical view of who agencies have relationships with other agencies. For each agency surveyed, identify the external agencies by assigning an A# identifier, and placing the name of the external agency inside the oval. Indicate the type of interface between the agencies, by the legend in Template Page #7.



2.1 Agency Interfaces (Internal / External)

The purpose of Agency Interface, Template Page #I I, is to further understand the type of relationship that is established with an external organization.

A# — [Same description as HW# in Section 1 .1]

Location — [Same description as Location in Section 1 .1]

Information Content — This column is a summary of the information exchanged between the agencies. An few examples of the how to complete this item would be: Road Weather Information, Road Construction, and Incident Reporting

Interface Method — How is the information being exchanged today? Some recommended methods are presented in the following list:

1. Telephone
2. Fax
3. Mail
4. Computer Information Network
   a. Internet
   b. America Online
   c. CompuServe
   d. Prodigy
   e. Bulletin Board Service
   f. Other
   g. Two Way Radio
   h. Television
5. Radio Broadcast
6. Visual
7. Newspaper
8. Hardcopy Handouts (ie. Flyers, pamphlets)

Frequency — The frequency of information exchange shall be expressed in some type of units over a time period.

1. One time / minute
2. One time / hour
3. One time / day

4. One time /week
5. One time / month
6. One time / year
7. As needed
8. Post unplanned event (ie. traffic accident)
9. Other

Status — [Same description as Status in Section 1.1]

Policies — List agency policies that are practiced with respect to the environment. Listed below are a couple of examples that may be found in this topic.

1. Agency X only operates the System A with the System Administrator, Monday - Friday, 8AM - 5PM.

2. Educational requirements to operate System B is experience with UNIX.

Constraints / Restrictions — List agency constraints and/or restrictions with respect to Systems Personnel.

1. The personnel do not have the skills to maintain the system.

issues — List any issues that are related to this specific componenet. If the issue is global to the system, then is only needs to be stated once.

Recommended Improvements / Planned Changes

List any system or component recommended improvement that the contact person discusses. State whether the improvement is planned or a “wish” and explain why they system and component is being improved. If the improvement is global to the system, then is only needs to be stated once.

Contacts / Phone Numbers

List the contact person from which you recieved this information and their phone number.

Other — List anything else that may be relevant about the system, but does not fit in the above columns.

2.2 Agency Systems and Programs

Template Page #13 is collecting all the systems that an agency being surveyed is using. It is intended that for each system listed, a set of templates in Section 1 is completed.