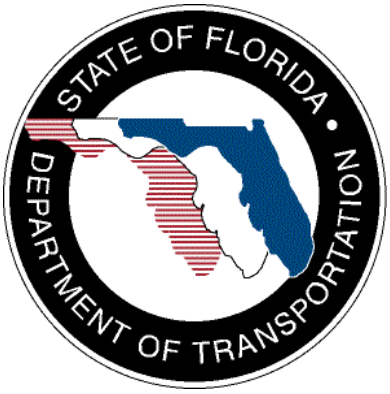
SunGuide™:

Implementation Plan for District 1 Ft. Myers

SunGuide-IP-D1FM-1.0.2



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November 21, 2008

Document Control Panel			
File Name:	SunGuide-IP-D1FM-1.0.2		
File Location:	SunGuide CM Repository		
CDRL:	7-8		
Name		**Initial**	**Date**
Created By:	Steve Dellenback, SwRI	SWD	11/05/08
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Appendicies:
A – Current device Listing

List of Acronyms

C2C.....Center-to-Center
CCTV .....Closed Circuit Television
ConOps.....Concept of Operations
CSE.....Computer Sizing Estimates
DMS .....Dynamic Message Sign
EH.....Executive Handler
EM .....Event Management
FDOT.....Florida Department of Transportation
GUI.....Graphical User Interface
IDS.....Incident Detection Systen
IIS .....Internet Information Server
IP .....Implementation Plan
ITS .....Intelligent Transportation Systems
IV&V.....Independent Verification and Validation
MCP.....Manual Control Panel
NTCIP .....National Transportation Communications for ITS Protocol
RMS.....Ramp Metering Subsystem
RPG .....Response Plan Generator
RS .....Reporting Subsystem
RTMC.....Regional Traffic Management Center
RWIS .....Roadway Weather Information System
SB .....Safety Barrier
SDD .....Software Design Document
SICP.....Software Integration Case Procedures
SIP .....Software Integration Plan
SRS .....Software Requirements Specification
SUM .....Software User's Manual
SwRI.....Southwest Research Institute
TCP/IP .....Transmission Control Protocol/Internet Protocol
TMC .....Transportation Management Center
TS .....Terminal Server
TSS .....Transportation Sensor Subsystem
TvT .....Travel Time
VDD .....Version Description Document
VPN .....Virtual Private Network

REVISION HISTORY

Revision	Date	Changes
1.0.0-Draft	November 7, 2008	Initial Release
1.0.0	November 12, 2008	Updated based on District 1 comments.
1.0.1	November 20, 2008	Updated based on TransCore comments.
1.0.2	November 21, 2008	Updated with graphics provided by TransCore.

1. Scope

1.1 Document Identification

This document serves as the Implementation Plan (IP) for the SunGuide™ software specific to the District 1, Ft. Myers implementation (D1FM).

1.2 Project Overview

The Florida Department of Transportation (FDOT) is conducting a program that is developing SunGuide software. The SunGuide software is a set of Intelligent Transportation System (ITS) software that allows the control of roadway devices as well as information exchange across a variety of transportation agencies. The goal of the SunGuide software is to have a common software base that can be deployed throughout the state of Florida. The SunGuide software development effort was based on ITS software available from the state of Texas. In addition to the reuse of software (along with customization of this software), a number of new software modules are being developed. The following figure provides a graphical view of the software.

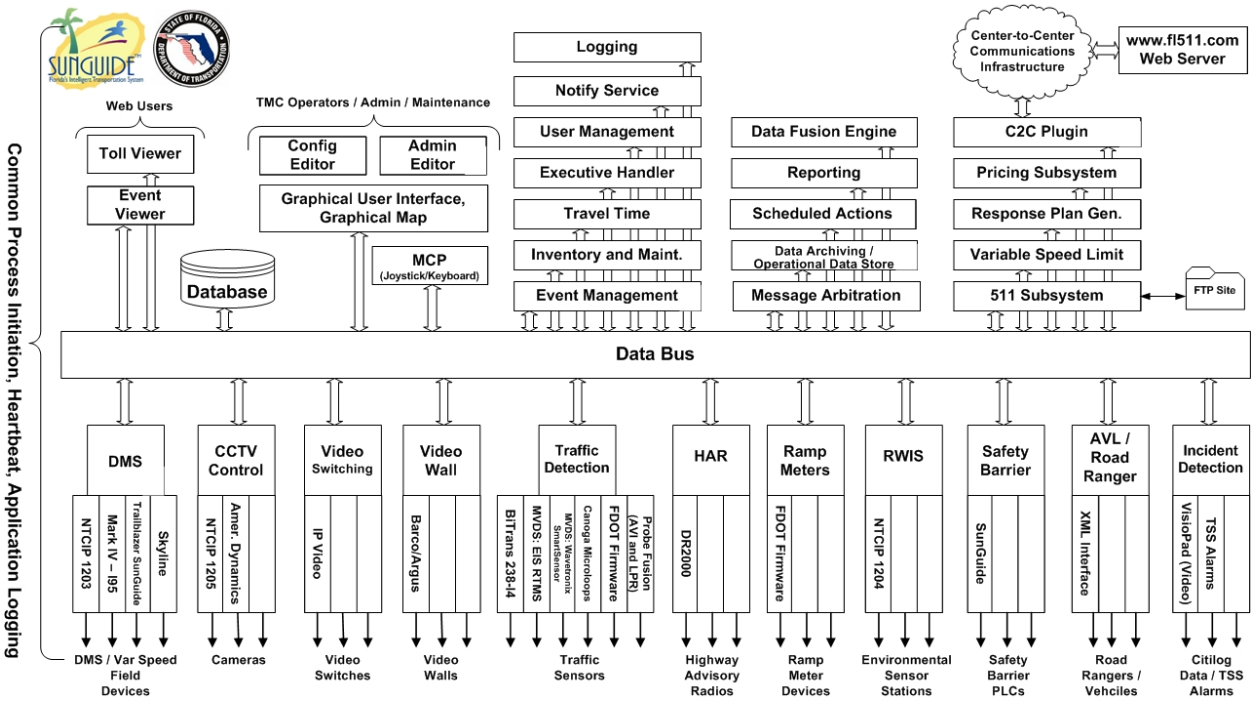

Figure 1.1 - High-Level Architectural Concept

The SunGuide development effort began in October 2003, two major releases have been developed and this document is addressing the third major release of the software. After the development, the software will be deployed to a number of Districts and Expressway Authorities throughout Florida and support activities will be performed.

1.3 Related Documents

A number of documents are available on the project web site that describe the SunGuide software. Many of these documents were used to produce this document. The "Reading Room" of the project web site should be reviewed:

http://sunguide.datasys.swri.edu

1.4 Contacts

The following are contact persons for the SunGuide software project:

- Elizabeth Birriel, ITS Central Office, elizabeth.birriel@dot.state.fl.us, 850-410-5606
- Trey Tillander, FDOT SunGuide Project Manager, trey.tillander@dot.state.fl.us, 850-410-5617
- David Chang, ITS Specialist, David.Chang@dot.state.fl.us, 850-410-5622
- Steve Dellenback, SwRI Project Manager, sdellenback@swri.org, 210-522-3914
- Robert Heller, SwRI Software Project Manager, rheller@swri.org, 210-522-3824

The following are contacts for other organizations that are expected to be involved with this deployment:

- Florida Department of Transportation, District 1 ITS
  - Carlos Bonilla, Operations Manager, CarlosF.Bonilla@dot.state.fl.us, (239) 461-4338
  - Chris R. Birosak, ITS Program Manager, Chris.Birosak@dot.state.fl.us, (863) 519-2507
  - Katherine Duvall, ITS Project Manager, katherine.duvall@dot.state.fl.us, (863) 519-2726
- Consultants:
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  - Roger Marrero, roger.marrero@transcore.com
  - Julio Natareno, julio.natareno@transcore.com

2. Deployment Details

The following documents should be available to District 1 staff as they prepare for a SunGuide deployment (the most recent versions are available on the project web site):

- Computer Sizing Estimates (CSE)
- Software Requirements Specification (SRS)
- Software Design Document (SDD)
- Version Description Document (VDD)
- Software User's Manual (SUM)
- Software Integration Plan (SIP)
- Software Integration Case Procedures (SICP)
- Administrator Training Slides
- Operator Training Slides
- Installation Notes

2.1 Subsystems To Be Installed

The following Release 4.1 SunGuide subsystems will be installed for the initial deployment at District 1:

- Administrative Editor (AE)
- Center-to-Center (C2C) - note: access to FLATIS Floodgate capability and sending events to FLATIS is implemented as part of the C2C plug-ins
- Closed Circuit Television (CCTV)
- Data Bus (DB)
- Data Archive (DA)
- Dynamic Message Sign (DMS)
- Event Management (EM)
- Executive Handler (EH)
- Graphical User Interface/Map (GUI)
- Incident Detection (IDS)
- Reporting Subsystem (RS)
- Response Plan Generator (RPG)
- Roadway Weather Information System (RWIS)
- Safety Barrier (SB)
- Status Logger (SL)
- Transportation Sensor Subsystem (TSS)
- Travel Time (TvT)
- Video Wall (VW)

As additional hardware is installed at D1, additional subsystems will be added to the base deployment.

2.2 District 1: Before Software Installation

The following sections describe the activities that District 1 staff (or their consultants) need to perform prior to the SunGuide software deployment. To assist in installation planning, the

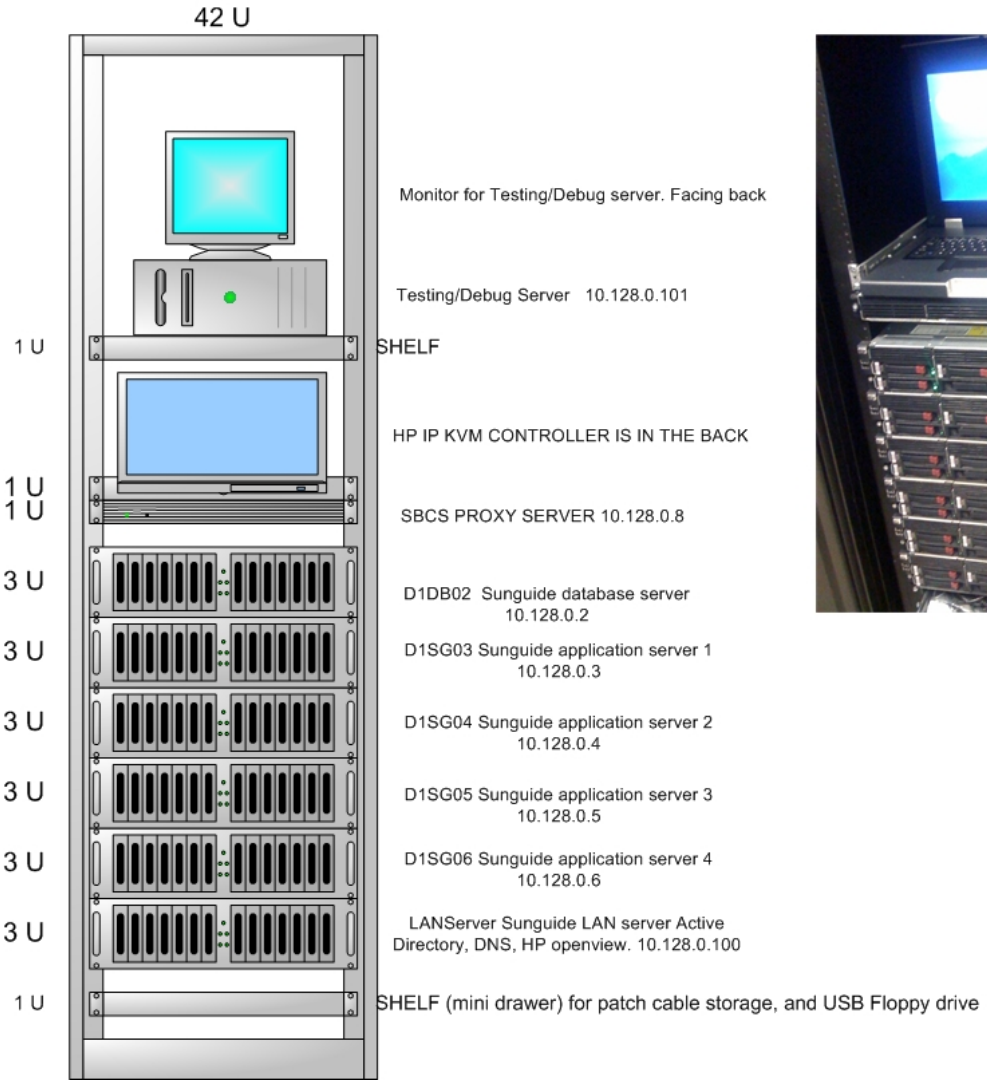
SunGuide *Computer Sizing Estimate (CSE)* document should be referenced. This document can be found at the project web site: http://sunguide.datasys.swri.edu. The document is loaded in the "Various Documents" section of the "Reading Room". Note that if funding allows workstation performance can be enhanced if the fastest possible workstations can be procured.

2.2.1 Servers

The following servers will be provided to operate the SunGuide software (note: the servers will not be operated in a clustered environment):

- Four SunGuide application Servers
- One Oracle servers
- One server for network applications (e.g. Active Directory, network management software, etc.); note: the applications on this server will not be configured as part of the SunGuide deployment activities

The remainder of this section discusses the SwRI recommended installation of the SunGuide software on those servers. All servers will be running Windows 2003, Standard Edition. The following diagram depicts how the servers will be installed in the racks in the computer room:



The contents of the following table are based on information furnished to SwRI by representatives of District 1 and provide current and projected device counts in the Ft. Myers area (note: detailed listing of current devices is included in Appendix A).

SunGuide Device Types	Current Count	Future Count (3 yrs)
Maximum simultaneous users	12	12
DMS TCP/IP connected signs	26	36
DMS Dialup Connected Signs	0	0
CCTV Users Simultaneously Controlling Cameras	10	10
American Dynamics MCPs	0	0
CCTV Users Simultaneously Switching Video	0	0
Video Wall Barco/Argus Controllers	1	1
TSS EIS Detectors Note: SunGuide was developed against the EIS X2 model, District 6 uses EIS X3 configured in "X2 compatibility mode", D1 has EIS X4 devices that have not been tested with SunGuide	55	155
TSS Wavetronix Detectors	56	
TSS 3M Microloop Detectors	0	0
TSS Bitrans Detectors	0	0
TSS License Plate Reader Devices	0	0
Simultaneous Active Events	20	20
Ramps Metered	0	0
RWIS TCP/IP Stations	2	3
Highway Advisory Radio (one controller for multiple HARs)	0	52
Data Archive Deployment	1	1
Safety Barrier Safety Barrier Stations	267 (all via 1 interface. Proxy server)	267 (all via 1 interface)

The following table is extracted from the SunGuide *Computer Sizing Estimates* document and is used to quantify the number of SunGuide application servers required based on the subsystems to be installed.

SunGuide Subsystem	Number of Servers Required	D1FM Deployment
Status Logger	0.1	**0.1**
Data Bus		

SunGuide Subsystem	Number of Servers Required	D1FM Deployment
Base system up to 500 ITS devices	0.5	**0.5**
Over 500 devices	0.5	**0**
User Interface		
For every 10 users simultaneously logged in (note that for sever estimation this was left at 0.5 even though 12 users were specified)	0.5	**0.5**
DMS (includes MAS)		
Base subsystem	0.5	**1**
For every 100 TCP/IP connected signs	0.5	**0.5**
For every 50 dialup signs (assumes 5 modems)	0.5	**0**
CCTV Control (includes Manual Control Panel [MCP])		
Base subsystem	0.25	**0.25**
For every 10 users simultaneously controlling cameras	0.25	**0.25**
Video Switching		
Base subsystem	0.5	**0**
For every 10 users simultaneously switching video	0.1	**0**
Video Wall		
Base subsystem	0.25	**0.25**
For each Barco/Argus Controller	0.1	**0.1**
TSS		
Base subsystem	0.25	**0.25**
For every 300 detectors	0.5	**0.5**
Event Management		
Base subsystem for up to 20 concurrent events	0.25	**0.25**
For each 20 concurrent events over the base amount	0.25	**0**
Ramp Metering		
Base subsystem	0.5	**0**
For every 20 ramps	0.25	**0**
Roadway Weather Information System (RWIS)		
Base subsystem	0.25	**0.25**
For every 50 TCP/IP connected sensors	0.25	**0.25**
Highway Advisory Radio (HAR)		
Base subsystem	0.25	**0**
For every 50 HARs	0.1	**0**
Archive		
Base subsystem	0.5	**0.5**
Safety Barrier		
Base Subsystem	0.1	**0.1**
For every 50 Barriers	0.1	**0.1**
Travel Time (TvT)		

SunGuide Subsystem	Number of Servers Required	D1FM Deployment
Base Subsystem	0.5	**0.5**
Web Servers (should be protected with a firewall)		
General Web server	1	**0**
Center-to-Center interface server	0.5	**0**
Emergency Evacuation	0.5	**0**
Maintenance Management Systems	0.5	**0**
Total SunGuide Application Servers Needed		**6.15**

The above analysis suggests that 6.15 servers would be needed to support the SunGuide installation as has been discussed with FDOT. The sizing estimates in the *Computer Sizing Estimates* were based on best engineering judgment. After several installations it is clear that the estimates were conservative; Southwest Research Institute® (SwRI®) believes that given the number of devices and based on the number of subsystems being initially deployed in District 1 that four servers be dedicated to running SunGuide software with one being dedicated to the database is more than sufficient.

The following software needs to be installed on the servers before the software installation team arrives on-site:

- Microsoft Standard Server 2003 with all current updates from Microsoft

The software installation team assumes that FDOT will have licenses and installation media available for the following products:

- Microsoft Standard Server 2003
- Oracle 10g, version 10.1.0.2.0

The SunGuide software will be installed and configured on the following machines (the recommendations are based on the current number of devices and the number of devices expected in the future):

- Database Servers:
  - Oracle
- Application Server #1 (this will be the server Operators access in order to log into SunGuide):
  - Executive Handler
  - Status Logger
  - Admin Editor
  - Notify Manager
  - User Interface (Internet Information Server [IIS] Web Server)
  - Data Bus
  - Video Wall
  - Center-to-Center plug-ins (this will need access to the FL-ATIS network once it is deployed)
- Application Server #2:
  - Executive Handler

    - MAS
    - DMS (and drivers)
    - Travel Time
    - CCTV (and drivers)
    - RWIS (and drivers)
- Application Server #3:
    - Executive Handler
    - TSS (and drivers)
    - IDS
    - Safety Barrier
- Application Server #4:
    - Executive Handler
    - Event Management
    - Reporting Subsystem
    - Response Plan Generator
    - Data Archive

During the installation activities, a VPN (Virtual Private Network) connection should be configured that will allow SwRI staff to access the D1 Ft., Myers computers from remote locations. This will facilitate any troubleshooting (the VPN can only be provided with District 1 approval).

2.2.2 Workstations

The following software must be installed on each workstation that will access the SunGuide software:

- Microsoft Windows XP, Service Pack 3
- Microsoft Internet Explorer 7.0
- Adobe SVG Viewer 3.03 (can be downloaded at no charge from the Adobe website)

2.2.3 Device Protocol Compliance

For the devices being deployed, District 1 needs to verify that the protocol used by the devices to be controlled by the SunGuide software is compliant to the following protocols:

Subsystem	Protocol Reference
CCTV Control	NTCIP 1205 v01.08 Amendment 1 v01.08 (August 2004)
DMS	NTCIP 1203, FDOT MIB (Sep 2001)
RWIS	NTCIP 1204 v02.18 (April 2004)
Safety Barrier	SunGuide protocol
Traffic Detection	EIS RTMS, Issue 2 (April 2003)
Traffic Detection	Wavetronix RTMS: SS105 SmartSensor Data Protocol V2.02
Video Wall	Barco/Argus Apollo, version 1.8 of the API

In addition to verifying the protocols are compliant, the District 1 staff needs to verify the TCP/IP connectivity to the field devices prior to the on-site installation activities being performed. This can most simply be accomplished by using "ping" to verify that the device is accessible from the server room using the network that the SunGuide servers will be utilizing.

Past history from previous new SunGuide installations indicates that approximately 80% of deployment efforts are spent on device connectivity (future upgrades do not take this level of effort). In new deployments wiring issues, device configuration issues and network issues have been shown to take a lot of time to resolve. Any effort prior to the deployment using "test software" (often provided by the vendors) to communicate to the devices from computers in the control center can reduce the installation efforts.

2.2.4 Network Infrastructure

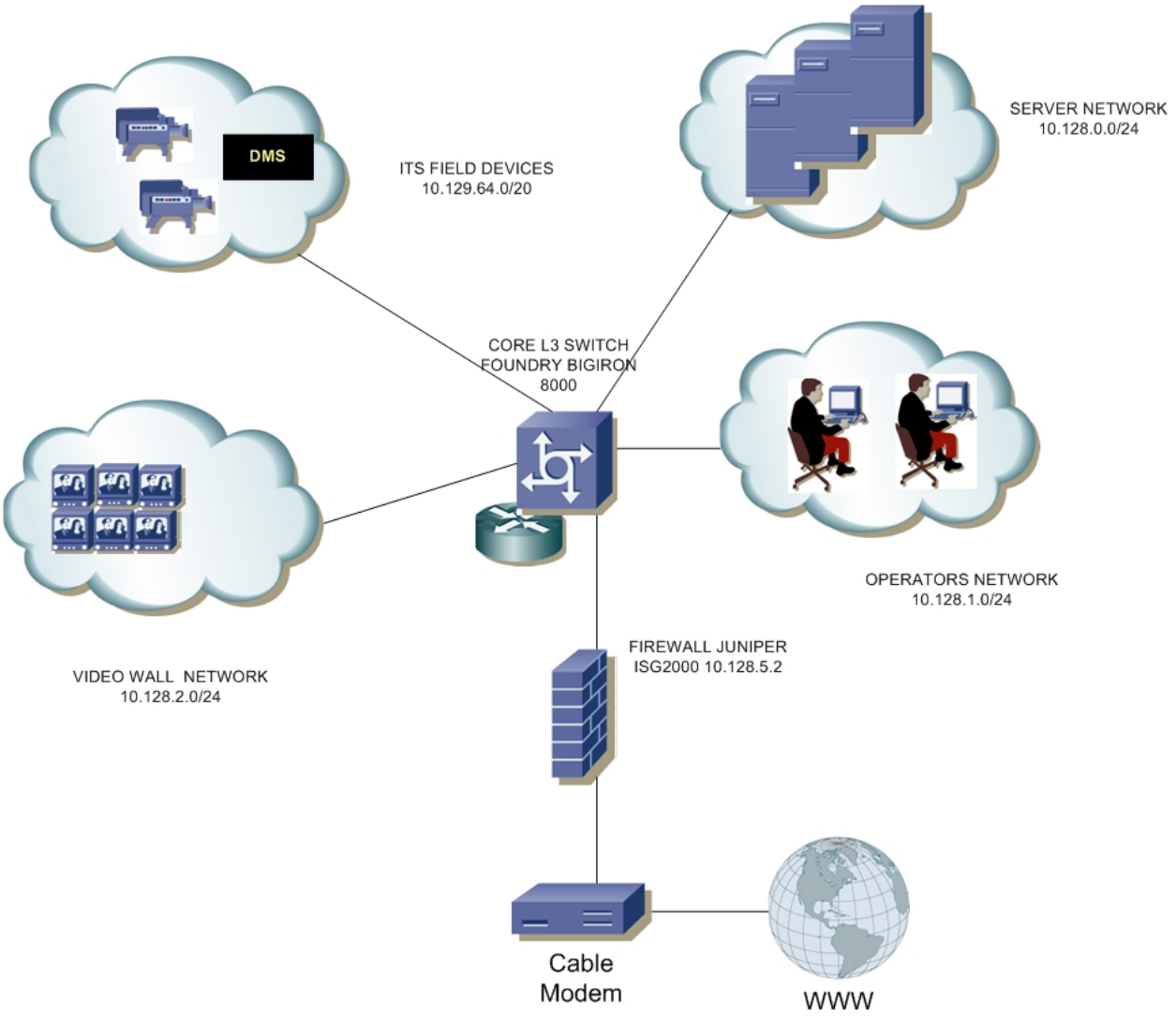
The following sections described the network infrastructure that must be in place prior to installation of the SunGuide software.

2.2.4.1 Hardware

Due to the client/server nature of the SunGuide software, TCP/IP is used to exchange data between application servers. Due to the web based implementation of the SunGuide user interface, each SunGuide workstation requires TCP/IP access to the SunGuide application servers. District 1 needs to verify that TCP/IP connectivity exists between all SunGuide application servers and SunGuide workstations.

Early in the development of requirements for SunGuide, FDOT made the decision that the devices should be connected via TCP/IP to the SunGuide application servers. There are a number of techniques to connect traditional serial ITS devices so that they can be accessed via TCP/IP, these techniques include the use of a terminal server (a box that has a TCP/IP connection and has multiple serial ports) or a port server (a box that has a TCP/IP connection and a single serial port). The only exception to the use of TCP/IP access is that DMS devices can be accessed via a modem or directly through a serial port if the connection is made through a Windows "COM" port on the SunGuide application server running the DMS device driver.

It is District 1's responsibility to provide all necessary network hardware and cables to provide the required connectivity. The following high level network diagram depicts District 1's network layout:



2.2.4.2 Software

As the SunGuide software is configured, it will need access to various "standard" servers (e.g. a time server) that may be installed as part of the SunGuide installation or may be available as part of the greater FDOT network. The following network services need to be available and the details (e.g., host names, addresses) need to be available during the SunGuide software configuration:

- SMTP Mail Server (optional): The SunGuide notify manager needs to be able to send emails on major system events so SMTP mail server access is required.
- DNS Server (optional): The SunGuide applications utilize TCP/IP to exchange data and the applications can use either IP addresses or host names in their configuration files. Note that the use of DNS is preferred because using explicit IP addresses is less flexible than using hostnames.

- Time Server (optional): It is recommended that all SunGuide computers (workstations and servers) be synchronized to a common time source as it is desirable during diagnostics to have the same time on all SunGuide systems.

2.2.5 Device Worksheets

The following sections describe the information that must be collected about each device that is to be utilized by the SunGuide software.

Notes:

- When entering latitude/longitude values a full 8 digits of precision must be entered as coordinates are stored in micro degrees which require 8 digits. SunGuide has a 30 character limit for device short names and descriptions are limited to 256 characters.
- Appendix A of this document has preliminary device information, the information requested in the following tables is best presented in an Excel worksheet format. Note that the data already provided is not all the information required to perform the SunGuide installation.

2.2.5.1 CCTV Worksheet

The following data needs to be collected for each CCTV to be configured:

Camera Name	Unique name of camera
Center Id	Unique name of center where camera resides
Protocol	Specifies the protocol (values: SNMP, SNMP(PMPP)) for camera
Poll Process	Name of driver for camera
Manufacturer	Manufacturer of camera
Location Description	Description of where camera resides
Roadway	Roadway of where camera resides
Direction	Direction of roadway where camera is installed
Latitude	Latitude of where camera resides
Longitude	Longitude of where camera resides
Op Status	Operational status (values: Active, Error, Failed, OutOfService) of camera
Address Type1	Address type (values: pmppAddress, commAddress) for camera, if pmppAddress then camera uses SNMP (PMPP); if commAddress then camera uses SNMP
Address Type2	Specific address type (values: portServerAddress) of Address Type 1
Address	Device address of camera
Port Server IP	IP address for the port server where camera resides
Port Server Port Number	Port number for the port server where camera resides
Community Name	Community name for camera (SNMP)
Attach to Video Device	If selected, additional IP video parameters must be supplied.

The following data need to be provided for IP video:

Video Device IP Address	IP address for encoder
Blackout	Determines if camera restricted
Video Device Type	Type (IP video device) of video device for encoder
IP Streaming Driver ID	Unique IP video switch driver name
Card Number	Card number for VBrick encoder
Manufacturer	Manufacturer (values: Coretec, iMpath, Teleste, VBrick) of encoder
Model	Model of encoder
Streaming Type	Streaming type (values: elementary, transport, program) for encoder
Secondary Interface	Secondary interface for VBrick encoder which enables users to maximize number of inputs for encoder
Snapshot Requested	Determines if snapshots are generated for encoder

2.2.5.2 DMS Worksheet

The following data needs to be collected for each DMS to be configured:

Sign Name	Unique name of DMS
Center Id	Unique name of center where DMS resides
Protocol	Specifies the protocol (values: SNMP, SNMP(PMPP), MarkIV, SunGuide (for Trailblazers)) for DMS
Connection Type	Specifies how the DMS is connected to the network (values: Direct, Modem, Long Distance Modem)
Poll Process	Name of driver for DMS
Packet Timeout	Amount of time the driver will wait on a response from a DMS before timing out (recommended time is 5 seconds)
Packet Retry Limit	How many times a packet is attempted before it errors out, for most signs the recommended number is 2, for signs prone to errors, this can be increased
Command Retry Limit	How many times a command is attempted before it errors out, a command consists of multiple packets. Recommended number is 1
Op Status	Operational status (values: Active, OutOfService) of DMS
Type	Values: Fiber Optic, LED, Flip-Disk, Shutter
Manufacturer	Values: FDS, IDI, MarkIV, Telespot, Skyline
Number of Lines	Number of displayable lines
Beacons	Whether the sign has beacons, if so, specify the beacon address
Day Brightness Level	The numeric value for brightness setting in the daytime
Night Brightness Level	The numeric value for brightness setting in the nighttime
Location Description	A text field describing the location of the DMS
Roadway	Roadway on which this DMS resides
Direction	The direction of the roadway on which this DMS resides
Latitude	Latitude of where this DMS resides
Longitude	Longitude of where this DMS resides
Number of Columns	Number of characters that can be displayed using a normal font
Beacon Address	The address on which the sign receives activate/deactivate beacon requests
Address Type 1	Address type (values: PMPP, SunGuide, MarkIV) for DMS, if PMPP then DMS protocol should be SNMP (PMPP); if SunGuide or MarkIV, then DMS uses same protocol name

Address Type 2	Specific address type (values: Direct, PortServer, Dialup) of Address Type 1
Address	Device address of DMS
Community Name	Community name for DMS (SNMP)

The following data need to be provided for DMSs connected via a TCP/IP connection:

IP Address	IP address for the port server where DMS resides
Port Number	Port number for the port server where DMS resides

The following data need to be provided for DMSs connected directly via a serial port:

Communications port	Communications port to which the DMS is connected
Baud Rate	This should match the baud rate of the DMS
Data Bits	This should match the data bits the DMS is expecting
Stop Bits	This should match the stop bits the DMS is expecting
Parity	This should match the parity the DMS is expecting

The following data need to be provided for DMSs connected via a modem:

Phone Number	Phone number for the DMS, should include any prefix needed for dialing
Baud Rate	This should match the baud rate of the DMS

2.2.5.3 RWIS Worksheet

The following data needs to be collected for each RIWS to be configured:

Sign Name	Unique name of RWIS
Protocol	Should be NTCIP (only version supported)
Connection Type	Specifies how the device is connected to the network (values: Direct, Modem, Long Distance Modem)
Op Status	Operational status (values: Active, OutOfService) of device
Manufacturer	Name of manufacturer
Location Description	A text field describing the location of the device
Roadway	Roadway on which this device resides
Direction	The direction of the roadway on which this device resides
Latitude	Latitude of where this device resides
Longitude	Longitude of where this DEVICE resides
Address Type 1	Address type (values: PMPP) for device, if PMPP then device protocol should be SNMP (PMPP)
Address Type 2	Specific address type (values: Direct, PortServer, Dialup) of Address Type 1
Address	Device address of device
Port Server IP	IP address for the port server where device resides
Port Server Port Number	Port number for the port server where device resides
Community Name	Community name for device (SNMP)

2.2.5.4 Safety Barrier Worksheet

The following data needs to be collected for each SB to be configured (note that in District 1 all communications will to a single IP address for all PLCs):

Station Name	Unique name of device
Roadway	Roadway on which this device resides
Location Description	A text field describing the location of the device
Latitude	Latitude of where this device resides
Longitude	Longitude of where this device resides
Op Status	Operational status (values: Active, OutOfService) of device
PLC ID	The identifier of the PLC that is used to identify the device
Unit ID	The unit identifier of the device within the PLC
Address	Device address of device
IP Address	IP address of the proxy server
Port Number	Port number

2.2.5.5 TSS Worksheet

The following data need to be provided for each Highway (Route) to be in the deployment:

Roadway Description	Textual description of the roadway (route)
Short Name	Short text name that will be seen by the operators
Directions	The directions that the roadway runs (can be multiple directions)
Cross Streets (multiple entries)	Textual descriptions of cross streets (that intersect the roadway); typically a roadway will have multiple cross streets
Lat Lon	Latitude and longitude of the intersection between the roadway and the cross street

The following data needs to be collected for each TSS detector to be configured:

Detector Name	Unique name of detector
Center Id	Unique name of center where detector resides
Driver Name	Name of driver for the detector (e.g., BiTrans, RTMS)
Poll Cycle	Time in seconds between device polls
Type	Type of detector (e.g., Loop, Radar, AVI or LPR)
Protocol	Specifies the protocol (see the protocols supported on the projecyt web site)
Op Status	Operational status (values: Available or Offline)
Location Description	Description of where detector resides
Roadway	Roadway of where detector resides
Direction	Direction of roadway where detector is installed
Latitude	Latitude of where detector resides
Longitude	Longitude of where detector resides
Address	Device address of detector
Port Server IP	IP address for the port server where detector resides
Port Server Port Number	Port number for the port server where detector resides

The following data needs to be collected for each lane that is to be configured:

TSS Link	The name of the links that will be defined in the system; links will have an association to detectors.
TSS Lanes	For each link, the name of each lane associated with the link; for each lane the zone number and description needs to be identified (e.g., which detection zone is

	associated with a lane).

The following data needs to be collected for each link that will have an alarm threshold to be configured:

TSS Link	The name of the links that will be defined in the system.
Threshold Value(s)	What the speed and occupancy values should be for each threshold (this includes a start and end time) value to be defined.

2.3 SwRI: Software Installation

The following sections describe the activities that SwRI staff will perform to install the SunGuide software. District 1 staff should be available to monitor and observe the software installation process.

2.3.1 Server Preparation

The following software needs to be installed on the servers before the software installation team arrives on-site:

- One server be configured as the Oracle server:
  - Oracle 10g server, version 10.1.0.2.0
- Four servers will be configured as application servers:
  - Oracle 10g Client, version 10.1.0.2.0
  - IIS (Microsoft installation disk)
  - ASP.NET (this installed as part of Microsoft IIS)

2.3.2 Workstation Preparation

The following software needs to be installed on the workstations before the software installation team arrives on-site:

- Adobe SVG Viewer (must be acquired from Adobe.com)
- Roadgeek font (this is provided on the SunGuide install CD)

2.3.3 Software Installation

In order to install the SunGuide application software, the following steps will be performed by the software installation team:

- In a common directory with a share point accessible to the SunGuide application servers the following files will be installed:
  - Install master configuration file which is named config.xml and edit the contents to match the District 1 network configuration.
  - Install XML schemas used by the SunGuide applications.

- Execute the database creation scripts to prepare the database for installation of the SunGuide applications.
- Using the installation instructions in the SunGuide *Version Description Document* (VDD) and installation notes install the SunGuide applications. Any patches released subsequent to the release of the full installation CD need to be installed (in order) after the installation CD is executed.

Two SunGuide system administration applications do not execute in a browser environment. These applications should be installed on workstations that may be used to diagnose the health and status of the system; details of the application are contained in the SUM. SwRI will install the following applications on the two end workstations on the right side of the control room when looking at the video wall (per District 1 direction):

- Executive Handler viewer: provides an overview of currently operating SunGuide applications.
- Status Logger viewer: provides the ability to review the SunGuide application log files.

2.3.4 Software Configuration

After the SunGuide software is installed, various configuration activities need to occur; the software installation team will perform the following configurations:

- Install and configure Status Logger on a single SunGuide application server (the SunGuide applications will log to this one instance of Status Logger).
- Install and configure Executive Handler server on all SunGuide application servers
- Modify the IIS to restrict access to the SunGuide Admin utility to users specified by District 1.

The SunGuide GUI is designed to load GUI components for the SunGuide applications. The loading (and overall performance) of the GUI can be improved if the GUI components associated with subsystems not installed is removed. The software installation team will remove the GUI components for the subsystems that were not installed; this is done because when the GUI is installed it includes the components for ALL SunGuide subsystems, this removal is done so that users do not see menu options for subsystems which are not installed and configured.

2.3.5 C2C Configuration

During the SunGuide software configuration, the Center-to-Center (C2C) interfaces need to be configured so that the District 1 deployment can exchange information and command requests (assuming operators have the appropriate permissions) with other control centers and FL-ATIS. To achieve this exchange of data a TCP/IP path must be established between the cooperating centers, this requires agencies to make appropriate modifications to firewall and other network appliances that may restrict this type of data flow. The following SunGuide C2C components need to be installed on the District 1 servers:

- C2C Plug-in Publisher
- C2C Plug-in Subscriber
- C2C Extractor
- C2C Provider
- C2C Command Receiver

The C2C interface should then be tested to assure that the software is properly configured; this testing will be performed using the C2C Test Suite.

2.4 SwRI / D1FM: Post Software Installation (Configuration)

The following sections describe the activities that the District 1 staff need to perform after the SunGuide software deployment. SwRI and PBS&J (ITS GC) staff will be available to assist and work with the District 1 staff to accomplish these activities. SwRI recommends that both the District 1 SunGuide administrator and at least one SunGuide operator be available during this process.

2.4.1 Populate Tables

The following tables need to be populated using the SunGuide Administration tool:

- User Management:
  - Users
  - Groups
  - Workstations
- CCTV:
  - Device Tables
- DMS:
  - Device Tables
  - Approved Words
- RWIS:
  - Device Tables
- Safety Barrier:
  - Device Tables
- TSS:
  - Alarm Thresholds
  - Device Tables
  - Detector Maps
  - Poll Cycles
- Event Management:
  - Activity Types
  - Agencies
  - Agencies Contacts
  - Comment Types
  - Event Status Types
  - Event Types
  - Injury Types
  - Organizations
  - Location Configuration
  - Mailing Lists
  - Mailing Lists Contacts
  - Procedural Errors
  - Response Plans
  - Vehicle Tracking

    - Weather Conditions
- Reporting Subsystem:
    - Reports
    - Reporting Groups
- Data Archive: Properties
- Miscellaneous: Centers

The SunGuide *Software User's Manual* (SUM) and Administrator Training slides should be consulted on use of these editors. To aid in future configuration, for any device that does not have an entry at least one entry for every possible device will be added; this will help illustrate how future entries should be structured (naming, option selection, etc.) and also verify that the Admin editor can read and write information to the appropriate tables.

2.4.2 Create Map Links

Each implementation of SunGuide must have a Map Link layer created; this layer is used by the operator map to display instrumented sections of roadway as well as highway shields. This layer is displayed in conjunction with the DynaMap shape file data to provide a complete looking map on the operator workstation. The SUM has a section titled "Map Administration with Link Editor" that explains the use of this software. Additionally, the Map Link Editor should be used to create the shields that should be displayed.

2.4.3 DMS Linking File

A device linking file needs to be created so that DMS devices can be selected for recommended Event response plans. The Software User's Manual describes how to create this file.

2.5 SwRI / D1FM: Testing

Once the configuration is complete and equipment is made available, a series of ad hoc tests will be performed to verify software operation. If District 1 wishes, the formal test cases from the SunGuide *Software Integration Case Procedures (SICP)* can be executed but this activity has not been performed in recent SunGuide deployments. Areas that will be tested / exercised include:

- CCTV:
    - Control of CCTV devices
- DMS:
    - Devices being polled
    - Control of DMS devices
    - DMS devices showing on map with status information
- RWIS Devices:
    - Devices being polled
    - RIWS data showing up on map
- Safety Barrier Devices:
    - Devices being polled
    - SB data showing up on map

- TSS Devices:
  - Devices being polled
  - TSS data showing up on map
- Video Wall Devices:
  - Switching videos to different viewers on the wal
  - Creating and changing video wall layouts
- Event Management:
  - Event Creation
  - Event Management
  - Response Plan Generation
- Reporting Subsystem:
  - Generate reports
- Various:
  - Test C2C plugin using XML tester to receive data
  - Verify Data Archive is configured to store TSS data (note that this subsystem will not be used in the short term but will be configured for future use)

2.6 Training

Training will be conducted in the District 1 control center as the installation is performed; the training will be both a hands-on that occurs during the installation and configuration activities as well as formal class. The following training will be provided to the District 1 personnel during the installation and configuration:

- Administrator Training - the intent of the System Administration/Deployment training is to prepare personnel to install/configure the SunGuide software and administer the SunGuide system on a daily basis. The following topics will be addressed during the hands-on training:
  - Installation procedures
  - Backup procedures
  - Recovery procedures
  - Modifying hardware configurations
  - Tailoring of the system environment
  - Starting/stopping/restarting the system
  - Troubleshooting:
    - Executive Handler
    - Status Logger
  - Workstation installation

<<< Note that the Operator training will be provided by >>>
<<< PBS&J – the scope of the class is their responsibility >>>

- Operator Training - the intent of the Operator/User Interface course is to prepare personnel to use the SunGuide™ system on a daily basis in a typical operational mode. The course will include the following topics:
    - SunGuide System Administration fundamentals
    - Executive Handler fundamentals
    - Status Logger fundamentals
    - Graphical User Interface (GUI)/Map fundamentals
    - Closed Circuit Television (CCTV) operations
    - Dynamic Message Sign (DMS) operations
    - Traffic Sensor Subsystem (TSS) fundamentals; including License Plate Reader fundamentals
    - Video Switching fundamentals;
    - Travel Time fundamentals; including the enhanced Travel Time functionality using LPR and AVI.
    - Center-to-Center (C2C) fundamentals

  The training format consists of:

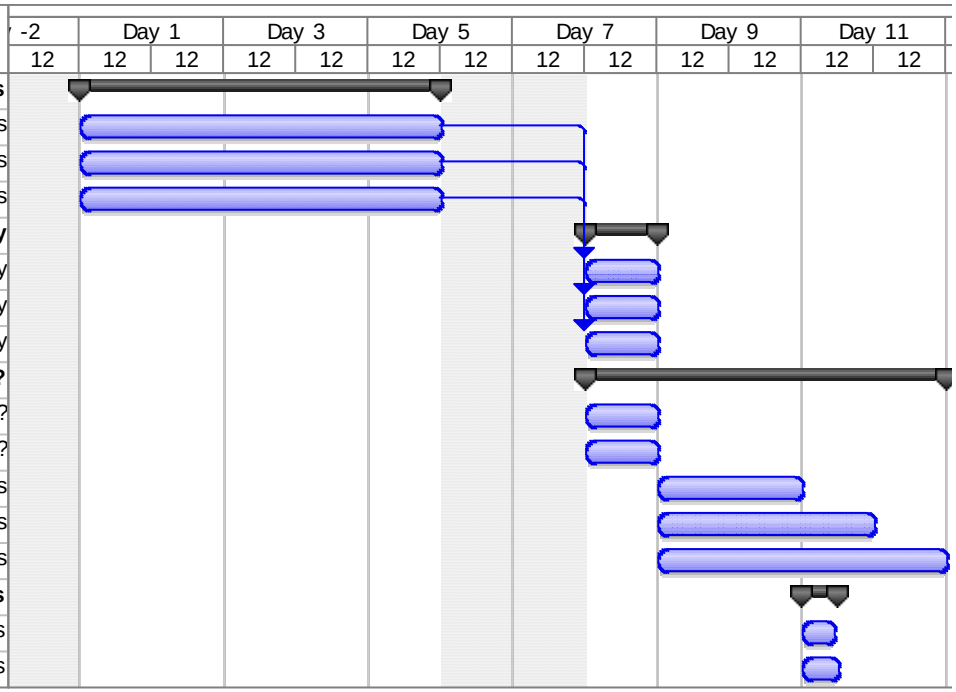
    - Classroom instruction using PowerPoint presentation (8 hours)
    - Hands-on instruction using City's SunGuide System (4 hours)

  The operator training will be conducted at the District 1 Ft. Myers TMC during non-operational hours.

2.7 Deployment Schedule

The following schedule is proposed for the deployment. The SunGuide installation is scheduled to occur the week of November 17, 2008. The installation team will need access to hardware devices throughout the implementation process. Note that if activities complete early then if District 1 and SwRI agree the timing for the following events may be modified to shorten the overall deployment schedule.

ID	Task Name	Duration
1	**Preinstallation Activities (City of TLH Activities)**	**5 days**
2	Install Operating Systems	5 days
3	Install / Configure Oracle	5 days
4	Install / Configure Workstations	5 days
5	**Server Configuration / Verification**	**1 day**
6	Verify server software	1 day
7	Verify configuration	1 day
8	Verify workstations	1 day
9	**Site Installation and Checkout**	**5 days?**
10	Insall SunGuide softw are	1 day?
11	Configure SunGuide	1 day?
12	Configure Devices	2 days
13	Test Field Connectivity	3 days
14	Softw are Testing	4 days
15	**Training**	**0.5 days**
16	Administrator Class (TBD - likely OJT)	3 hrs
17	Operator Training (PBS&J)	4 hrs



3. Notes

None.

Appendix A

Current Device Listings

The following table contains the protocol and TCP configuration information for the CCTV devices:

CCTV name	Vendor	Protocol	IP address	Multicast Address	Multicast UDP port	TCP PTZ port	Mpeg 2 Encoder	RS422 port connected?
1	Vicon SVFT	NTCIP	10.129.64.2	232.192.10.1	4444	4439	Vbrick Mpeg 2	Yes
2	Vicon SVFT	NTCIP	10.129.64.14	232.192.10.2	4444	4439	Vbrick Mpeg 2	Yes
3	Vicon SVFT	NTCIP	10.129.64.26	232.192.10.3	4444	4439	Vbrick Mpeg 2	Yes
4	Vicon SVFT	NTCIP	10.129.64.38	232.192.10.4	4444	4439	Vbrick Mpeg 2	Yes
5	Vicon SVFT	NTCIP	10.129.64.50	232.192.10.5	4444	4439	Vbrick Mpeg 2	Yes
6	Vicon SVFT	NTCIP	10.129.64.62	232.192.10.6	4444	4439	Vbrick Mpeg 2	Yes
7	Vicon SVFT	NTCIP	10.129.64.130	232.192.10.7	4444	4439	Vbrick Mpeg 2	Yes
8	Vicon SVFT	NTCIP	10.129.64.142	232.192.10.8	4444	4439	Vbrick Mpeg 2	Yes
9	Vicon SVFT	NTCIP	10.129.64.166	232.192.10.9	4444	4439	Vbrick Mpeg 2	Yes
10	Vicon SVFT	NTCIP	10.129.64.178	232.192.10.10	4444	4439	Vbrick Mpeg 2	Yes
11	Vicon SVFT	NTCIP	10.129.64.190	232.192.10.11	4444	4439	Vbrick Mpeg 2	Yes
12	Vicon SVFT	NTCIP	10.129.64.202	232.192.10.12	4444	4439	Vbrick Mpeg 2	Yes
13	Vicon SVFT	NTCIP	10.129.65.2	232.192.10.13	4444	4439	Vbrick Mpeg 2	Yes
14	Vicon SVFT	NTCIP	10.129.65.14	232.192.10.14	4444	4439	Vbrick Mpeg 2	Yes
15	Vicon SVFT	NTCIP	10.129.65.38	232.192.10.15	4444	4439	Vbrick Mpeg 2	Yes
16	Vicon SVFT	NTCIP	10.129.65.50	232.192.10.16	4444	4439	Vbrick Mpeg 2	Yes
17	Vicon SVFT	NTCIP	10.129.65.62	232.192.10.17	4444	4439	Vbrick Mpeg 2	Yes
18	Vicon SVFT	NTCIP	10.129.65.86	232.192.10.18	4444	4439	Vbrick Mpeg 2	Yes
19	Vicon SVFT	NTCIP	10.129.65.130	232.192.10.19	4444	4439	Vbrick Mpeg 2	Yes
20	Vicon SVFT	NTCIP	10.129.65.142	232.192.10.20	4444	4439	Vbrick Mpeg 2	Yes
21	Vicon SVFT	NTCIP	10.129.65.154	232.192.10.21	4444	4439	Vbrick Mpeg 2	Yes
22	Vicon SVFT	NTCIP	10.129.65.166	232.192.10.22	4444	4439	Vbrick Mpeg 2	Yes
23	Vicon SVFT	NTCIP	10.129.65.178	232.192.10.23	4444	4439	Vbrick Mpeg 2	Yes
24	Vicon SVFT	NTCIP	10.129.65.190	232.192.10.24	4444	4439	Vbrick Mpeg 2	Yes
25	Vicon SVFT	NTCIP	10.129.66.2	232.192.10.25	4444	4439	Vbrick Mpeg 2	Yes
26	Vicon SVFT	NTCIP	10.129.66.26	232.192.10.26	4444	4439	Vbrick Mpeg 2	Yes
27	Vicon SVFT	NTCIP	10.129.66.38	232.192.10.27	4444	4439	Vbrick Mpeg 2	Yes
28	Vicon SVFT	NTCIP	10.129.66.50	232.192.10.28	4444	4439	Vbrick Mpeg 2	Yes
29	Vicon SVFT	NTCIP	10.129.66.62	232.192.10.29	4444	4439	Vbrick Mpeg 2	Yes
30	Vicon SVFT	NTCIP	10.129.66.63	232.192.10.30	4444	4439	Vbrick Mpeg 2	Yes
31	Vicon SVFT	NTCIP	10.129.66.142	232.192.10.31	4444	4439	Vbrick Mpeg 2	Yes
32	Vicon SVFT	NTCIP	10.129.66.143	232.192.10.32	4444	4439	Vbrick Mpeg 2	Yes
33	Vicon SVFT	NTCIP	10.129.66.154	232.192.10.33	4444	4439	Vbrick Mpeg 2	Yes
34	Vicon SVFT	NTCIP	10.129.66.155	232.192.10.34	4444	4439	Vbrick Mpeg 2	Yes
35	Vicon SVFT	NTCIP	10.129.66.166	232.192.10.35	4444	4439	Vbrick Mpeg 2	Yes
36	Vicon SVFT	NTCIP	10.129.66.190	232.192.10.36	4444	4439	Vbrick Mpeg 2	Yes
37	Vicon SVFT	NTCIP	10.129.67.2	232.192.10.37	4444	4439	Vbrick Mpeg 2	Yes
38	Vicon SVFT	NTCIP	10.129.67.3	232.192.10.38	4444	4439	Vbrick Mpeg 2	Yes
39	Vicon SVFT	NTCIP	10.129.67.50	232.192.10.39	4444	4439	Vbrick Mpeg 2	Yes
40	Vicon SVFT	NTCIP	10.129.67.62	232.192.10.40	4444	4439	Vbrick Mpeg 2	Yes
41	Vicon SVFT	NTCIP	10.129.67.67	232.192.10.41	4444	4439	Vbrick Mpeg 2	Yes
42	Vicon SVFT	NTCIP	10.129.67.86	232.192.10.42	4444	4439	Vbrick Mpeg 2	Yes
43	Vicon SVFT	NTCIP	10.129.67.87	232.192.10.43	4444	4439	Vbrick Mpeg 2	Yes

CCTV name	Vendor	Protocol	IP address	Multicast Address	Multicast UDP port	TCP PTZ port	Mpeg 2 Encoder	RS422 port connected?
44	Vicon SVFT	NTCIP	10.129.67.154	232.192.10.44	4444	4439	Vbrick Mpeg 2	Yes
45	Vicon SVFT	NTCIP	10.129.67.178	232.192.10.45	4444	4439	Vbrick Mpeg 2	Yes
46	Vicon SVFT	NTCIP	10.129.67.190	232.192.10.46	4444	4439	Vbrick Mpeg 2	Yes
47	Vicon SVFT	NTCIP	10.129.67.191	232.192.10.47	4444	4439	Vbrick Mpeg 2	Yes
48	Vicon SVFT	NTCIP	10.129.67.202	232.192.10.48	4444	4439	Vbrick Mpeg 2	Yes
49	Vicon SVFT	NTCIP	10.129.67.238	232.192.10.49	4444	4439	Vbrick Mpeg 2	Yes
50	Vicon SVFT	NTCIP	10.129.68.2	232.192.10.50	4444	4439	Vbrick Mpeg 2	Yes
51	Vicon SVFT	NTCIP	10.129.68.38	232.192.10.51	4444	4439	Vbrick Mpeg 2	Yes
52	Vicon SVFT	NTCIP	10.129.68.50	232.192.10.52	4444	4439	Vbrick Mpeg 2	Yes
53	Vicon SVFT	NTCIP	10.129.68.51	232.192.10.53	4444	4439	Vbrick Mpeg 2	Yes
54	Vicon SVFT	NTCIP	10.129.68.62	232.192.10.54	4444	4439	Vbrick Mpeg 2	Yes
55	Vicon SVFT	NTCIP	10.129.68.98	232.192.10.55	4444	4439	Vbrick Mpeg 2	Yes
56	Vicon SVFT	NTCIP	10.129.68.130	232.192.10.56	4444	4439	Vbrick Mpeg 2	Yes
57	Vicon SVFT	NTCIP	10.129.68.142	232.192.10.57	4444	4439	Vbrick Mpeg 2	Yes
58	Vicon SVFT	NTCIP	10.129.68.178	232.192.10.58	4444	4439	Vbrick Mpeg 2	Yes
59	Vicon SVFT	NTCIP	10.129.68.190	232.192.10.59	4444	4439	Vbrick Mpeg 2	Yes
60	Vicon SVFT	NTCIP	10.129.68.191	232.192.10.60	4444	4439	Vbrick Mpeg 2	Yes
61	Vicon SVFT	NTCIP	10.129.68.202	232.192.10.61	4444	4439	Vbrick Mpeg 2	Yes
62	Vicon SVFT	NTCIP	10.129.68.203	232.192.10.62	4444	4439	Vbrick Mpeg 2	Yes
63	Vicon SVFT	NTCIP	10.129.69.2	232.192.10.63	4444	4439	Vbrick Mpeg 2	Yes
64	Vicon SVFT	NTCIP	10.129.69.38	232.192.10.64	4444	4439	Vbrick Mpeg 2	Yes
65	Vicon SVFT	NTCIP	10.129.69.50	232.192.10.65	4444	4439	Vbrick Mpeg 2	Yes
66	Vicon SVFT	NTCIP	10.129.59.51	232.192.10.66	4444	4439	Vbrick Mpeg 2	Yes
67	Vicon SVFT	NTCIP	10.129.69.74	232.192.10.67	4444	4439	Vbrick Mpeg 2	Yes
68	Vicon SVFT	NTCIP	10.129.69.98	232.192.10.68	4444	4439	Vbrick Mpeg 2	Yes
69	Vicon SVFT	NTCIP	10.129.69.130	232.192.10.69	4444	4439	Vbrick Mpeg 2	Yes
70	Vicon SVFT	NTCIP	10.129.69.154	232.192.10.70	4444	4439	Vbrick Mpeg 2	Yes
71	Vicon SVFT	NTCIP	10.129.69.155	232.192.10.71	4444	4439	Vbrick Mpeg 2	Yes
72	Vicon SVFT	NTCIP	10.129.69.178	232.192.10.72	4444	4439	Vbrick Mpeg 2	Yes
73	Vicon SVFT	NTCIP	10.129.69.190	232.192.10.73	4444	4439	Vbrick Mpeg 2	Yes
74	Vicon SVFT	NTCIP	10.129.69.202	232.192.10.74	4444	4439	Vbrick Mpeg 2	Yes
75	Vicon SVFT	NTCIP	10.129.70.26	232.192.10.75	4444	4439	Vbrick Mpeg 2	Yes
76	Vicon SVFT	NTCIP	10.129.70.38	232.192.10.76	4444	4439	Vbrick Mpeg 2	Yes
77	Vicon SVFT	NTCIP	10.129.70.62	232.192.10.77	4444	4439	Vbrick Mpeg 2	Yes
78	Vicon SVFT	NTCIP	10.129.70.86	232.192.10.78	4444	4439	Vbrick Mpeg 2	Yes
79	Vicon SVFT	NTCIP	10.129.70.98	232.192.10.79	4444	4439	Vbrick Mpeg 2	Yes

The following table contains the protocol and TCP configuration information for the DMS devices:

DMS name	Vendor	Protocol	IP address	UDP Control port	Read/Write Community name	Lines by Columns	Sign Type
1	Adaptive Micro Displays	NTCIP(SNMP)	10.129.64.64	300	public	3 by18	Char
2	Adaptive Micro Displays	NTCIP(SNMP)	10.129.64.154	300	public	4 by18	Char

DMS name	Vendor	Protocol	IP address	UDP Control port	Read/Write Community name	Lines by Columns	Sign Type
3	Adaptive Micro Displays	NTCIP(SNMP)	10.129.65.26	300	public	5 by18	Char
4	Adaptive Micro Displays	NTCIP(SNMP)	10.129.65.74	300	public	6 by18	Char
5	Adaptive Micro Displays	NTCIP(SNMP)	10.129.66.14	300	public	7 by18	Char
6	Adaptive Micro Displays	NTCIP(SNMP)	10.129.66.130	300	public	8 by18	Char
7	Adaptive Micro Displays	NTCIP(SNMP)	10.129.66.178	300	public	9 by18	Char
8	Adaptive Micro Displays	NTCIP(SNMP)	10.129.67.26	300	public	10 by18	Char
9	Adaptive Micro Displays	NTCIP(SNMP)	10.129.67.38	300	public	11 by18	Char
10	Adaptive Micro Displays	NTCIP(SNMP)	10.129.67.142	300	public	12 by18	Char
11	Adaptive Micro Displays	NTCIP(SNMP)	10.129.67.166	300	public	13 by18	Char
12	Adaptive Micro Displays	NTCIP(SNMP)	10.129.67.214	300	public	14 by18	Char
13	Adaptive Micro Displays	NTCIP(SNMP)	10.129.68.26	300	public	15 by18	Char
14	Adaptive Micro Displays	NTCIP(SNMP)	10.129.68.74	300	public	16 by18	Char
15	Adaptive Micro Displays	NTCIP(SNMP)	10.129.68.86	300	public	17 by18	Char
16	Adaptive Micro Displays	NTCIP(SNMP)	10.129.68.154	300	public	18 by18	Char
17	Adaptive Micro Displays	NTCIP(SNMP)	10.129.68.166	300	public	19 by18	Char
18	Adaptive Micro Displays	NTCIP(SNMP)	10.129.69.14	300	public	20 by18	Char
19	Adaptive Micro Displays	NTCIP(SNMP)	10.129.69.26	300	public	21 by18	Char
20	Adaptive Micro Displays	NTCIP(SNMP)	10.129.69.62	300	public	22 by18	Char
21	Adaptive Micro Displays	NTCIP(SNMP)	10.129.69.86	300	public	23 by18	Char
22	Adaptive Micro Displays	NTCIP(SNMP)	10.129.69.142	300	public	24 by18	Char
23	Adaptive Micro Displays	NTCIP(SNMP)	10.129.69.166	300	public	25 by18	Char
24	Adaptive Micro Displays	NTCIP(SNMP)	10.129.70.2	300	public	26 by18	Char
25	Adaptive Micro Displays	NTCIP(SNMP)	10.129.70.14	300	public	27 by18	Char
26	Adaptive Micro Displays	NTCIP(SNMP)	10.129.70.50	300	public	28 by18	Char

The following table contains the protocol and TCP configuration information for the RWIS devices:

RWIS name	Vendor	RPU	Protocol	IP address
1	Quixote SSI	linux	NTCIP 1204 v02.18	**10.129.65.202**
2	Quixote SSI	linux	NTCIP 1204 v02.18	**10.129.69.203**

The following table contains the protocol and TCP configuration information for the Safety Barrier devices (note: SunGuide will talk to a Proxy Server that is at IP 10.128.0.8, this IP corresponds to a Windows XP64 server that will be hosting SIMREX's Proxy server):

Master radio name	Vendor	Protocol	IP address
1	Simrex	Sunguide	10.129.64.3
2	Simrex	Sunguide	10.129.64.15
3	Simrex	Sunguide	10.129.64.27
4	Simrex	Sunguide	10.129.64.39
5	Simrex	Sunguide	10.129.64.51
6	Simrex	Sunguide	10.129.64.63
7	Simrex	Sunguide	10.129.64.131
8	Simrex	Sunguide	10.129.64.143

Master radio name	Vendor	Protocol	IP address
9	Simrex	Sunguide	10.129.64.167
10	Simrex	Sunguide	10.129.64.179
11	Simrex	Sunguide	10.129.64.191
12	Simrex	Sunguide	10.129.64.203
13	Simrex	Sunguide	10.129.65.3
14	Simrex	Sunguide	10.129.65.15
15	Simrex	Sunguide	10.129.65.39
16	Simrex	Sunguide	10.129.65.51
17	Simrex	Sunguide	10.129.65.87
18	Simrex	Sunguide	10.129.65.143
19	Simrex	Sunguide	10.129.65.155
20	Simrex	Sunguide	10.129.65.167
21	Simrex	Sunguide	10.129.65.179
22	Simrex	Sunguide	10.129.65.191
23	Simrex	Sunguide	10.129.66.3
24	Simrex	Sunguide	10.129.66.27

The following table contains the protocol and TCP configuration information for the TSS devices (note that the SunGuide TSS driver does not support the some of the most recent RTMS protocols available, devices will need to be set in the proper configuration to utilize the older protocols until SunGuide is upgraded – see the protocol section of this document as to the versions supported):

MVDS Name	Vendor/model	Protocol	IP address	TCP port number	Comm via TS?
1	RTMS X4	RTMS	10.129.64.4	2000	no
2	RTMS X4	RTMS	10.129.64.16	2000	no
3	RTMS X4	RTMS	10.129.64.28	2000	no
4	RTMS X4	RTMS	10.129.64.40	2000	no
5	RTMS X4	RTMS	10.129.64.52	2000	no
6	RTMS X4	RTMS	10.129.64.65	2000	no
7	RTMS X4	RTMS	10.129.64.132	2000	no
8	RTMS X4	RTMS	10.129.64.144	2000	no
9	RTMS X4	RTMS	10.129.64.168	2000	no
10	RTMS X4	RTMS	10.129.64.180	2000	no
11	RTMS X4	RTMS	10.129.64.192	2000	no
12	RTMS X4	RTMS	10.129.64.204	2000	no
13	RTMS X4	RTMS	10.129.65.4	2000	no
14	RTMS X4	RTMS	10.129.65.16	2000	no
15	RTMS X4	RTMS	10.129.65.40	2000	no
16	RTMS X4	RTMS	10.129.65.52	2000	no
17	RTMS X4	RTMS	10.129.65.53	2000	no
18	RTMS X4	RTMS	10.129.65.54	2000	no
19	RTMS X4	RTMS	10.129.65.55	2000	no
20	RTMS X4	RTMS	10.129.65.63	2000	no
21	RTMS X4	RTMS	10.129.65.88	2000	no
22	RTMS X4	RTMS	10.129.65.131	2000	no

MVDS Name	Vendor/model	Protocol	IP address	TCP port number	Comm via TS?
23	RTMS X4	RTMS	10.129.65.144	2000	no
24	RTMS X4	RTMS	10.129.65.156	2000	no
25	RTMS X4	RTMS	10.129.65.168	2000	no
26	RTMS X4	RTMS	10.129.65.180	2000	no
27	RTMS X4	RTMS	10.129.65.192	2000	no
28	RTMS X4	RTMS	10.129.66.4	2000	no
29	RTMS X4	RTMS	10.129.66.28	2000	no
30	RTMS X4	RTMS	10.129.66.51	2000	no
31	Wavetronix SS105	Wavetronix	10.129.66.52	4001	yes
32	Wavetronix SS105	Wavetronix	10.129.66.53	4001	yes
33	RTMS X4	RTMS	10.129.66.54	2000	no
34	Wavetronix SS105	Wavetronix	10.129.66.64	4001	yes
35	Wavetronix SS105	Wavetronix	10.129.66.65	4001	yes
36	Wavetronix SS105	Wavetronix	10.129.66.143	4001	yes
37	Wavetronix SS105	Wavetronix	10.129.66.144	4001	yes
38	RTMS X4	RTMS	10.129.66.167	2000	no
39	Wavetronix SS105	Wavetronix	10.129.66.168	4001	yes
40	Wavetronix SS105	Wavetronix	10.129.66.169	4001	yes
41	RTMS X4	RTMS	10.129.66.170		no
42	Wavetronix SS105	Wavetronix	10.129.66.179	4001	yes
43	Wavetronix SS105	Wavetronix	10.129.66.191	4001	yes
44	RTMS X4	RTMS	10.129.67.4	2000	no
45	RTMS X4	RTMS	10.129.67.5	2000	no
46	Wavetronix SS105	Wavetronix	10.129.67.14	4001	yes
47	Wavetronix SS105	Wavetronix	10.129.67.51	4001	yes
48	Wavetronix SS105	Wavetronix	10.129.67.52	4001	yes
49	Wavetronix SS105	Wavetronix	10.129.67.63	4001	yes
50	RTMS X4	RTMS	10.129.67.68	2000	no
51	Wavetronix SS105	Wavetronix	10.129.67.88	4001	yes
52	Wavetronix SS105	Wavetronix	10.129.67.89	4001	yes
53	Wavetronix SS105	Wavetronix	10.129.67.90	4001	yes
54	RTMS X4	RTMS	10.129.67.91	2000	no
55	Wavetronix SS105	Wavetronix	10.129.67.130	4001	yes
56	Wavetronix SS105	Wavetronix	10.129.67.155	4001	yes
57	Wavetronix SS105	Wavetronix	10.129.67.179	4001	yes
58	RTMS X4	RTMS	10.129.67.192	2000	no
59	RTMS X4	RTMS	10.129.67.193	2000	no
60	Wavetronix SS105	Wavetronix	10.129.67.203	4001	yes
61	Wavetronix SS105	Wavetronix	10.129.67.226	4001	yes
62	Wavetronix SS105	Wavetronix	10.129.67.227	4001	yes
63	Wavetronix SS105	Wavetronix	10.129.67.239	4001	yes
64	Wavetronix SS105	Wavetronix	10.129.67.240	4001	yes
65	Wavetronix SS105	Wavetronix	10.129.68.3	4001	yes
66	Wavetronix SS105	Wavetronix	10.129.68.4	4001	yes
67	Wavetronix SS105	Wavetronix	10.129.68.14	4001	yes
68	Wavetronix SS105	Wavetronix	10.129.68.15	4001	yes
69	Wavetronix SS105	Wavetronix	10.129.68.39	4001	yes

MVDS Name	Vendor/model	Protocol	IP address	TCP port number	Comm via TS?
70	Wavetronix SS105	Wavetronix	10.129.68.40	4001	yes
71	RTMS X4	RTMS	10.129.68.52	2000	no
72	RTMS X4	RTMS	10.129.68.53	2000	no
73	Wavetronix SS105	Wavetronix	10.129.68.63	4001	yes
74	Wavetronix SS105	Wavetronix	10.129.68.87	4001	yes
75	Wavetronix SS105	Wavetronix	10.129.68.99	4001	yes
76	RTMS X4	RTMS	10.129.68.131	2000	no
77	Wavetronix SS105	Wavetronix	10.129.68.132	4001	yes
78	RTMS X4	RTMS	10.129.68.133	2000	no
79	Wavetronix SS105	Wavetronix	10.129.68.143	4001	yes
80	Wavetronix SS105	Wavetronix	10.129.68.167	4001	yes
81	Wavetronix SS105	Wavetronix	10.129.68.179	4001	yes
82	RTMS X4	RTMS	10.129.68.192	2000	no
83	RTMS X4	RTMS	10.129.68.193	2000	no
84	Wavetronix SS105	Wavetronix	10.129.68.204	4001	yes
85	Wavetronix SS105	Wavetronix	10.129.68.205	4001	yes
86	Wavetronix SS105	Wavetronix	10.129.69.3	4001	yes
87	Wavetronix SS105	Wavetronix	10.129.69.4	4001	yes
88	Wavetronix SS105	Wavetronix	10.129.69.39	4001	yes
89	RTMS X4	RTMS	10.129.69.52	2000	no
90	RTMS X4	RTMS	10.129.69.53	2000	no
91	Wavetronix SS105	Wavetronix	10.129.69.75	4001	yes
92	RTMS X4	RTMS	10.129.69.99	2000	no
93	RTMS X4	RTMS	10.129.69.100	2000	no
94	Wavetronix SS105	Wavetronix	10.129.69.131	4001	yes
95	RTMS X4	RTMS	10.129.69.156	2000	no
96	RTMS X4	RTMS	10.129.69.157	2000	no
97	Wavetronix SS105	Wavetronix	10.129.69.179	4001	yes
98	RTMS X4	RTMS	10.129.69.191	2000	no
99	Wavetronix SS105	Wavetronix	10.129.69.192	4001	yes
100	Wavetronix SS105	Wavetronix	10.129..69.193	4001	yes
101	RTMS X4	RTMS	10.129.69.194	2000	no
102	Wavetronix SS105	Wavetronix	10.129.69.204	4001	yes
103	RTMS X4	RTMS	10.129.70.27	2000	no
104	RTMS X4	RTMS	10.129.70.28	2000	no
105	Wavetronix SS105	Wavetronix	10.129.70.39	4001	yes
106	Wavetronix SS105	Wavetronix	10.129.70.40	4001	yes
107	Wavetronix SS105	Wavetronix	10.129.70.63	4001	yes
108	Wavetronix SS105	Wavetronix	10.129.70.74	4001	yes
109	Wavetronix SS105	Wavetronix	10.129.70.87	4001	yes
110	Wavetronix SS105	Wavetronix	10.129.70.99	4001	yes
111	Wavetronix SS105	Wavetronix	10.129.70.100	4001	yes