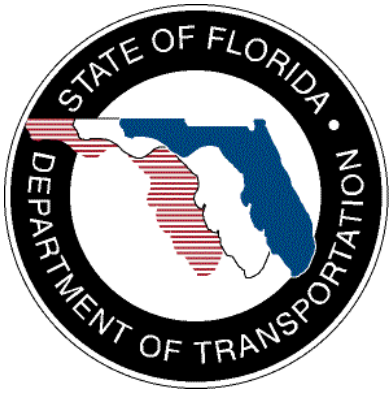
SunGuide™:

Safety Barrier Device Protocol Document

SunGuide-SBDEV-Protocol-1.0.1



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List of Acronyms

FDOT .....Florida Department of Transportation

ITN.....Invitation to Negotiate

PLC .....Programmable Logic Controller

Revision History

Revision	Date	Changes
1.0.0	January 24, 2005	Initial Release
1.0.1	February 5, 2008	Updated document name, graphics and changed terminology form “Interface Control Document” to “protocol document”

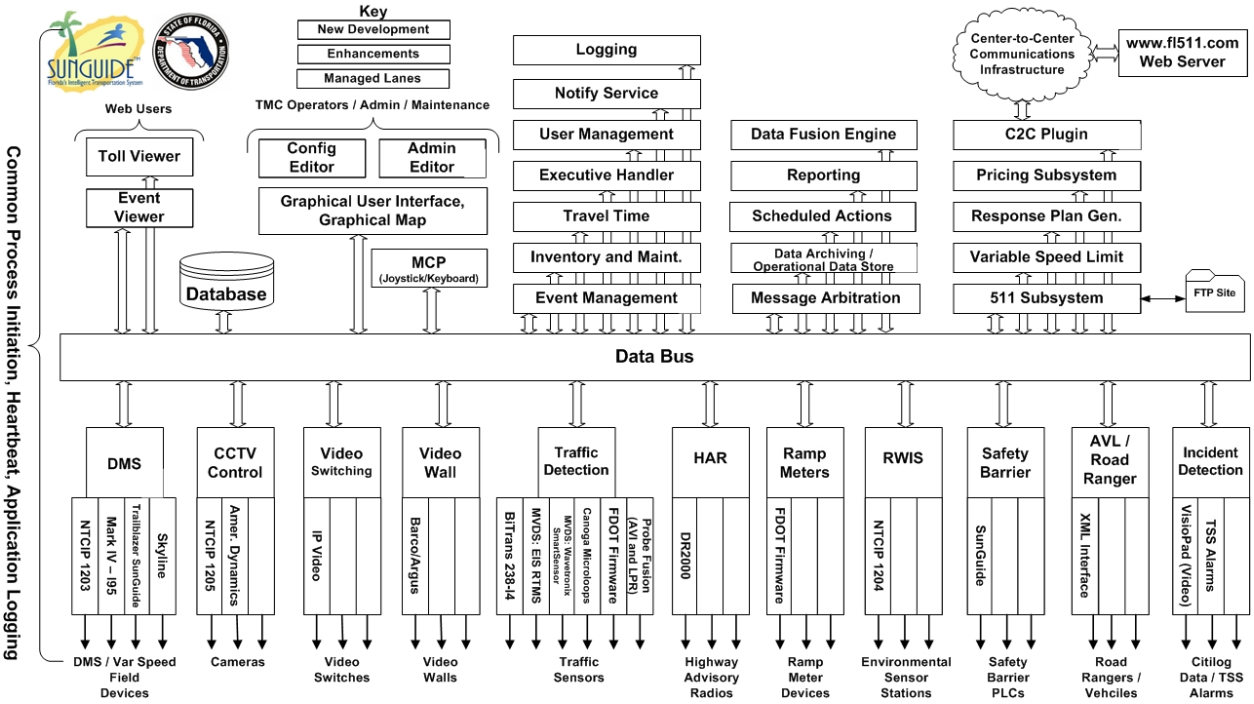
1. Scope

1.1 Document Identification

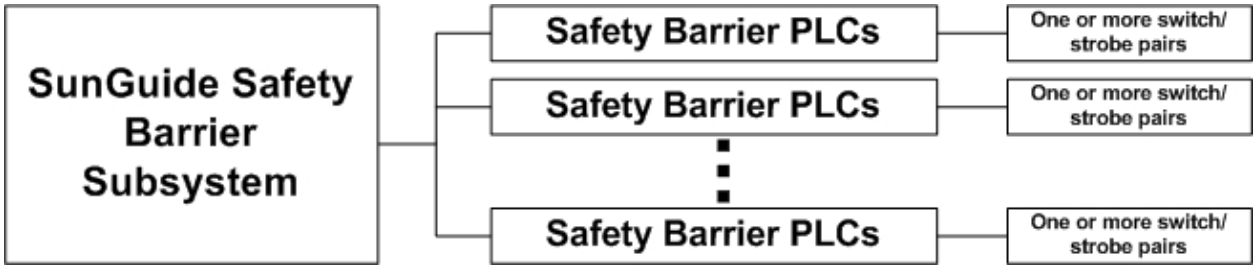
This protocol document describes the interface between individual SunGuide™ Safety Barrier subsystems and the Florida Department of Transportation (FDOT) safety barrier PLCs (Programmable Logic Controllers), the document describes the byte stream between the safety barrier PLCs and the SunGuide software.

1.2 Project Overview

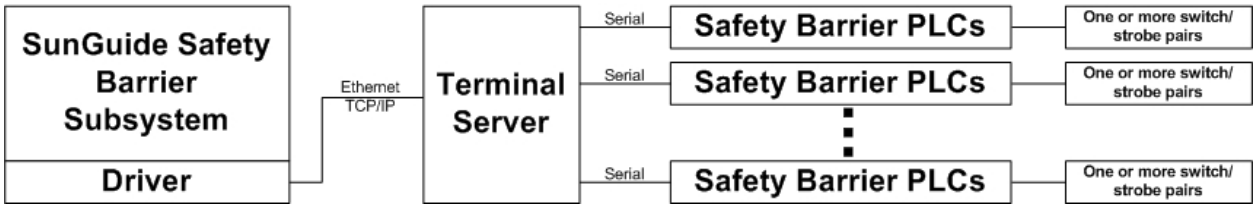
The Florida Department of Transportation (FDOT) is conducting a program that is developing SunGuide software. The SunGuide software is a set of Intelligent Transportation System (ITS) software that allows the control of roadway devices as well as information exchange across a variety of transportation 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 is based on ITS software available from the state of Texas; significant customization of the software is being performed as well as the development of new software modules. The following figure provides a graphical view of the SunGuide software:



The Safety Barrier subsystem provides the capability to receive barrier events from Programmable Logic Controllers (PLCs) when cars breach the cable. The following figure provides a high level concept view of how the Safety Barrier field hardware interfaces with the SunGuide software:



The SunGuide Safety Barrier software subsystem expects to communicate with the field controllers using TCP/IP. The PLC in the safety barrier field site is expecting to use serial communications. Therefore the hardware required to interface the SunGuide Safety Barrier subsystem to the field hardware is depicted in the following figure:



The terminal server depicted in the above figure is one of several hardware configurations that could be used. The SunGuide requirement is to have TCP/IP access to the device with the ability to exchange serial data streams.

2. Data

The following sections detail the transactions that can be exchanged between the SunGuide Safety Barrier subsystem and the safety barrier field hardware. A "safety barrier station" is considered to a strobe lamp and switch (a single PLC may communicate to multiple safety barrier stations).

2.1 General Data Format

The safety barrier protocol uses the following message structure:

Header	PLC Id	Unit	Qualifier	Length	Data 1	Data 2	…	Data N	Checksum

The fields have the following interpretations:

- Header (one byte) is always hex FF
- PLC Id (two bytes) is the identifying number of the PLC (value between 0 and 65025)
- Unit (two bytes) is the identifying number of the safety barrier station (value between 0 and 65025)
- Qualifier (one byte) defines the nature of the message
- Length (one byte) defines the number of bytes of data
- Checksum (one byte) represents the sum of all data bytes to a maximum of hex FF (overflow beyond the value of 255 overwrites the checksum)

2.2 SunGuide Software to Safety Barrier PLC

The following messages can be sent from SunGuide to the safety barrier PLC:

Name	Qualifier	Length	Content of data bytes	Description
Status request	Hex 81	0	None	Issued so that the PLC will generate a status response request for the specified safety barrier station.
Enhanced status request	Hex 82	0	None	Issued so that the PLC will generate an enhanced status response request for the specified safety barrier station.
Reset command	Hex 83	0	None	Issued so the PLC will reset the lamp and switch to "normal" positions (i.e. non-barrier event) for the specified safety barrier station.
Clock sync	Hex 84	14	ASCII text string: YYYYMMDDHHMMSS	Issued so that the PLC will synchronize its clock, time is based on a 24 hour clock.
Power on reset	Hex 85	0	None	Issued so the PLC does a complete power reset to itself.
Set switch status	Hex 86	1	Switch status: • Hex 0 - normal position • Hex 1 - barrier event in progress	Issued for testing/diagnostics purposes to explicitly set the status of the specified switch.

Name	Qualifier	Length	Content of data bytes	Description
Set lamp status	Hex 87	1	Lamp status: • Hex 0 - normal position • Hex 1 - barrier event in progress	Issued for testing/diagnostics purposes to explicitly set the status of the specified lamp.
Schedule barrier event test at time	Hex 88	14	ASCII text string: YYYYMMDDHHMMSS	Issued for testing/diagnostic purposes – PLC will generate a barrier event at the specified time for the specified safety barrier station.

2.3 Safety Barrier PLC to SunGuide Software

The following messages can be sent from the safety barrier PLC to the SunGuide software (note that the PLC id and the unit of the safety barrier station generating the response will be provided in the response message):

Name	Qualifier	Length	Content of data bytes	Description
Status response	Hex 91	2	Data byte 1: Lamp status: • Hex 0 - normal position • Hex 1 - barrier event in progress • 2 -Failed Data byte 2: Switch status: • Hex 0 - normal position • Hex 1 - barrier event in progress • Hex 2 –Failed	Issued by the PLC in response to a status request being received.
Enhanced status response	Hex 92	66	Data byte 1: Lamp status: • Hex 0 - normal position • Hex 1 - barrier event in progress • 2 -Failed Data byte 2: Switch status: • Hex 0 - normal position • Hex 1 - barrier event in progress • Hex 2 –Failed Data bytes 3-66: • ASCII text string	Issued by the PLC in response to a status request being received; the 64 character ASCII text string is a free format diagnostic string generated by the PLC.
Barrier event	Hex 93	16	Data byte 1: Lamp status: • Hex 0 - normal position • Hex 1 - barrier event in progress • 2 -Failed Data byte 2: Switch status: • Hex 0 - normal position • Hex 1 - barrier event in progress • Hex 2 –Failed Data bytes 3-16: • ASCII text string: YYYYMMDDHHMMSS	Issued asynchronously by the PLC to indicate a barrier event has occurred. Time is based on a 24 hour clock.

Name	Qualifier	Length	Content of data bytes	Description
Barrier test event	Hex 94	16	Data byte 1: Lamp status: • Hex 0 - normal position • Hex 1 - barrier event in progress • 2 -Failed Data byte 2: Switch status: • Hex 0 - normal position • Hex 1 - barrier event in progress • Hex 2 –Failed Data bytes 3-16: • ASCII text string: YYYYMMDDHHMMSS	Issued asynchronously for testing/diagnostic purposes by the PLC to indicate a test barrier event has occurred. Time is based on a 24 hour clock.

3. Notes

None.