



Silent Messenger NTCIP Integration Guide

Release 2.3.0

Solar Technology Inc.

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INTRODUCTION

This guide describes how to operate a Silent Messenger message board in NTCIP mode. It includes information on how to configure the message board to use NTCIP and information about the Solar Technology implementation of the NTCIP standards. It is intended to assist one in integrating a message board into a larger NTCIP environment.

This guide is not intended as a replacement for the relevant NTCIP standards. Instead, it will refer to portions of these standards as necessary. NTCIP standards documents can be downloaded from <http://www.ntcip.org>.

1.1 Overview

Solar Technology NTCIP compliant signs provide the following capabilities:

- Connectivity through SNMP over UDP over IP over Ethernet or Cellular Modem.
- The ability to define and activate 32 changable messages, and 32 volatile messages. (This can be increased to 1024 of each at customer request.)
- The ability to ship with up to 512 customer-defined permanent messages.
- The ability to display messages with up to 16 pages.
- The ability to define up to 32 fonts.
- The ability to define 16 schedules, 16 day plans, and 96 day plan entries.
- The ability to define 16 graphics.
- The ability to read information about the sign, including battery status, temperature, active message, currently defined fonts, and stored messages & graphics.

1.2 Standards Compliance

The Silent Messenger message board complies with the following NTCIP standards. (Version numbers are in parenthesis.)

- NTCIP 1201 (v3.15r) - Global Object Definitions
- NTCIP 1203 (v3.04) - Object Definitions for Dynamic Message Signs

1.3 Connectivity

Solar Technology NTCIP compliant signs support the following means of connecting the management station to the sign:

- SNMP (2301/1101) over UDP/IP (2202) via Ethernet (2104) - Touch screen controller has a 10/100BASET auto-sensing Ethernet port. - Works with various IP-based data networks using external routers and cell modems.

ENABLING AND DISABLING NTCIP

This chapter describes how to enable and disable NTCIP, and how to set the administrator community string.

2.1 NTCIP Control Modes

The Solar Technology NTCIP implementation supports three NTCIP control modes:

Central

The message board responds to NTCIP requests, and NTCIP controls what the display panel is displaying. This corresponds to a `dmsControlMode` of `central`.

Local

The message board responds to NTCIP requests, but those requests are not allowed to activate a message. Instead of NTCIP, the built-in TRAFIX and remote Control Center 3000 software are used to manage messages. This corresponds to a `dmsControlMode` of `local`.

Disabled

The message board will not respond to NTCIP requests.

When the control mode is local a request to set the `dmsControlMode` to `centralOverride` will place the sign in central mode, but will not change the position of the NTCIP control mode switch. To reset the sign to local mode, switch it from local to central mode, then back to local mode.

The message board must be rebooted when the NTCIP mode is transitioned from Central or Local to Disabled.

2.2 Enabling NTCIP from the Message Board

To enable NTCIP from the local touchscreen using TRAFIX, one must first access the NTCIP settings screen.

1. Touch the blank screen to wake the controller up.
2. Touch “Main Menu”.
3. If necessary, enter a password to log in.
4. Touch “Supervisor”.
5. Touch “Manage NTCIP Settings”.

At the NTCIP settings screen, one can select the NTCIP administrator password. Please note that the onscreen keyboard does not support the input of lower-case letters, and so the password will consist entirely of upper-case letters, numbers, and punctuation.

Warning: NTCIP allows a user to remotely control the message being displayed on the message board. Therefore, it is important to choose strong community strings, and to maintain control of those community strings.

Once the password has been set, NTCIP can be enabled by touching the radio button to the left of “Central”, and then touching “OK”.

Upon enabling NTCIP for the first time, the message board should display “NTCIP ENABLED”. Within a few seconds, the message board will begin to respond to SNMP requests on the IP address assigned to its Ethernet port, and PMPP requests on its modem port (if configured).

2.3 Local Control / Disabling NTCIP from the Message Board

NTCIP can be disabled from TRAFIX by accessing the NTCIP settings screen, touching the radio button to the left of Local or Disabled, as appropriate, and touching “OK”.

2.4 Web Interface

The web interface allows NTCIP control to be turned off and on. Choosing “Disable NTCIP” from the web interface will turn it off (note that this is local mode, not disabled mode). Choosing “NTCIP Enabled” from the web interface will turn it back on.

GLOBAL OBJECTS

This section describes how the Solar Technology NTCIP implementation implements objects described in version 3.03 of the NTCIP 1201 standard.

3.1 Global Set ID

Supported.

3.2 Module Table

Supported. This contains two rows. Row 1 contains information about the version of TRAFIX running on the message board, while Row 2 contains information about the Solar Technology NTCIP implementation.

3.3 Base Standards

Supported.

3.4 Global Database Management

Database management has not been implemented.

3.5 Time Management

Supported.

The daylightSavingsTimeTable has 1 row.

Changing the time in NTCIP does not change the time in TRAFIX. Changing the time in TRAFIX may change the NTCIP time in unpredictable ways.

3.6 Time Base Schedules and Day Plans

Supported. The Solar Technology NTCIP implementation supports 16 time base schedules, and 16 day plans each containing 96 events.

3.7 Report Parameters

The report parameters node is implemented as described in NTCIP 1201 v2.32.

3.8 PMPP

The HDLC Group nodes are not supported, as all currently-supported communications methods are unicast-only.

3.9 Security

The security node is implemented as described in NTCIP 1201 v2.32. The message board supports 127 community names in addition to the administrator community. The defined values for `communityNameAccessMask` are:

Value	Meaning
0x00000000	Read-only access
0xffffffff	Read-write access to non-security nodes.

3.10 Auxiliary I/O

The message board implements 0 analog and 0 digital auxiliary I/Os.

DYNAMIC MESSAGE SIGN OBJECTS

This section describes how the Solar Technology NTCIP implementation implements objects described in version 2.39b of the NTCIP 1203 standard.

4.1 Sign Configuration and Capability

Supported. These values may be incorrect if the sign panel type is set incorrectly in TRAFIX. The sign panel type may be set from the TRAFIX main menu by touching “Supervisor”, “Describe Sign Panel Type”.

4.2 VMS Configuration

Supported. The character height and width are fixed to 0, as this sign supports variable width fonts.

4.3 Font Definition

Supported.

The message board supports 32 fonts, all of which can be redefined to the user. The number of supported fonts can be increased to 32 at customer request.

4.4 Multi Configuration

Supported.

The message board supports a black (0) background color, and an amber (9) foreground color. Attempts to change these colors to unsupported values will cause an error.

The color scheme is monochrome 1 bit.

The following MULTI tags are supported:

- flashing [fltxoy] / [floytx]
- font [fox] / [fox,cccc]
- graphic [gn] / [gn,x,y] / [gn,x,y,cccc]
- hexadecimal character [hcx]

- justification line [jlx]
- justification page [jpx]
- new line [nlx]
- new page [np]
- page time [ptxoy]
- spacing character [scx]
- field local time 12 hour [f1]
- field local time 24 hour [f2]
- ambient temperature Celsius [f3]
- ambient temperature Fahrenheit [f4]
- speed km/h [f5]
- speed m/h [f6]
- day of week [f7]
- date of month [f8]
- year 2 digits [f9]
- year 4 digits [f10]
- local time 12 hour AM/PM [f11]
- local time 12 hour am/pm [f12]
- user-defined fields [f50-f99]
- text rectangle [trx,y,w,h]

The radar fields [f5] and [f6] will display the current speed in the units emitted by the radar, rather than the current speed.

A message may contain up to 16 pages. The total length of a message is limited to 32768 characters.

The default font is 1, which defaults to the 7px Road Safety (normal) font.

4.5 Messages

Supported.

The message board supports up to 512 permanent messages, but only one is defined by default. More permanent messages can be added by customer request at the time of message board manufacture.

Memory Type	Number	MULTI String	Priority
permanent	1	CAUTION	1

By default, the message board supports 32 changeable and 32 volatile messages. These can be increased to up to 1024 changeable and 1024 volatile at the time of message board manufacture.

4.6 Sign Control

Supported.

Setting the control mode to local allows the sign panel to be controlled through TRAFIX and Control Center 3000. The control mode must be central for the panel to be controlled via NTCIP.

For efficiency reasons, the end duration, power loss, and communication loss conditions are evaluated once a minute, on the minute. As a result, it can take up to 60 seconds for messages triggered by these conditions to be activated.

For example, if a message is displayed at 13:00:45 with a duration of 2 minutes, the end duration message will be activated at 13:03:00.

A power loss occurs when the message board's battery voltage fails below 11 volts. A power loss recovery occurs when the voltage rises above 11 volts. If the battery voltage decreases to the point where the controller no longer functions, upon regaining power this will be treated as a reset, and the reset message will be displayed.

A communications loss occurs when no message with a valid SNMP community string is received within dm-sTimeCommLoss seconds.

The pixel service settings are ignored, as Silent Messenger message boards do not require pixel service.

4.7 Illumination/Brightness

The message board supports the following dmsIllumControl modes:

- photocell
- manualDirect
- manual (alternate name for manualDirect)

Brightness levels are supported.

4.8 Scheduling

Supported.

4.9 Sign Status

The following types of status are supported:

- MULTI field table
- Current Speed and Current Speed limit (when a supported radar is attached to the message board.)
- Watchdog Failure Count
- Short Error Status
- Power Status
- Temperature Status
- Light Sensor Status
- Watchdog Timer Status

The following types of status do not correspond to types of hardware present on the system.

- Climate-Control Status
- Lamp Test Status
- Drum Status
- Humidity Status
- Fuel Status

4.10 Graphics

Supported.

The message board supports graphics that are defined with a `dmsGraphicType` of `monochrome1bit`.

Up to 255 graphics may be defined.

MISCELLANEOUS OBJECTS

We support the following objects from other standards.

5.1 GPS Coordinates and Compass

If a message board is equipped with a GPS Receiver, it will provide information to the `essLatitude` and `essLongitude` MIB nodes, defined in NTCIP 1204.

If a message board is equipped with a magnetic compass, it will provide information to the `essVehicleBearing` MIB node, defined in NTCIP 1204. The value provided will be relative to Magnetic North, rather than True North.

FONTS

By default, Silent Messenger message boards have the following fonts accessible through NTCIP:

Number	Alias	Description
1	250	7px Road Safety (normal)
2	253	7px Road Safety (bold)
3	252	7px Road Safety (condensed)
4	251	7px Road Safety (narrow)
5	248	Canadian French MTO
6	249	5px Road Safety
7	254	11px Road Safety
8	255	20px Road Safety

By default, there are 32 redefinable fonts, with default fonts taking up slots 1-8. The number of redefinable fonts can be increased to 127 at customer request. Each font in the range 1-255 can be accessed by an alias, but these aliases can not be accessed or changed.

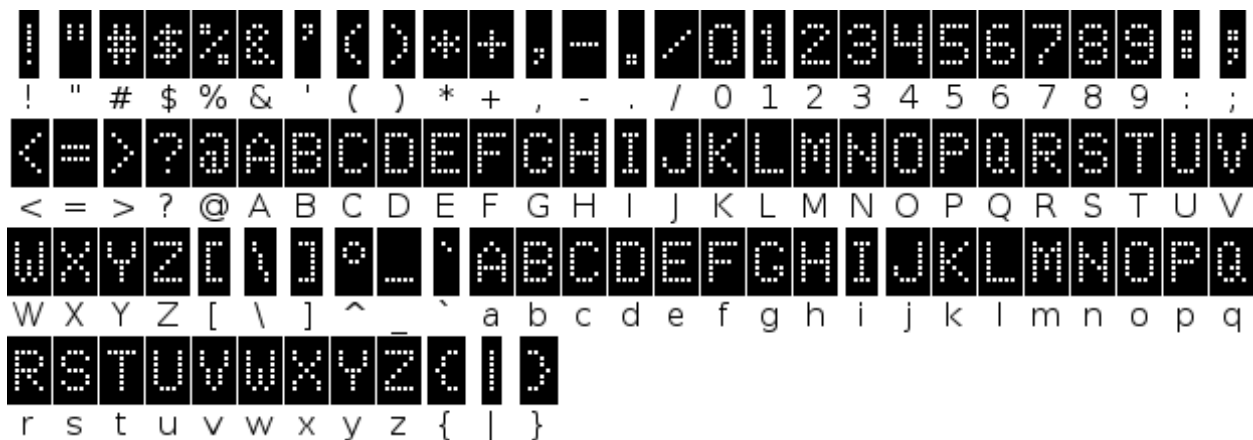


Figure 6.1: Font 1 - 7px Road Safety (normal)

!	"	#	\$	%	&	'	(	)	*	+	,	-	.	/	0	1	2	3	4	5	6
!	"	#	\$	%	&	'	(	)	*	+	,	-	.	/	0	1	2	3	4	5	6
7	8	9	:	;	<	=	>	?	@	A	B	C	D	E	F	G	H	I	J	K	L	
7	8	9	:	;	<	=	>	?	@	A	B	C	D	E	F	G	H	I	J	K	L	
M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	[\]	^	_	`	'	A	B
M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	[\]	^	_	`	'	a	b
C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	
c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	
Y	Z	{	|	}																		
y	z	{	|	}																		

Figure 6.2: Font 2 - 7px Road Safety (bold)

!	"	#	\$	%	&	'	(	)	*	+	,	-	.	/	0	1	2	3	4	5	6	7	8	9	:	;
!	"	#	\$	%	&	'	(	)	*	+	,	-	.	/	0	1	2	3	4	5	6	7	8	9	:	;
<	=	>	?	@	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	
<	=	>	?	@	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	
W	X	Y	Z	[	\	\]	^	_	`	'	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
W	X	Y	Z	[\]	^	_	`	'	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q
R	S	T	U	V	W	X	Y	Z	{	|	}																
r	s	t	u	v	w	x	y	z	{	|	}																

Figure 6.3: Font 3 - 7px Road Safety (condensed)

!	"	#	\$	%	&	'	(	)	*	+	,	-	.	/	0	1	2	3	4	5	6	7	8	9	:	;
!	"	#	\$	%	&	'	(	)	*	+	,	-	.	/	0	1	2	3	4	5	6	7	8	9	:	;
<	=	>	?	@	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	
<	=	>	?	@	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	
W	X	Y	Z	[	\	\]	^	_	`	'	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
W	X	Y	Z	[\]	^	_	`	'	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q
R	S	T	U	V	W	X	Y	Z	{	|	}																
r	s	t	u	v	w	x	y	z	{	|	}																

Figure 6.4: Font 4 - 7px Road Safety (narrow)

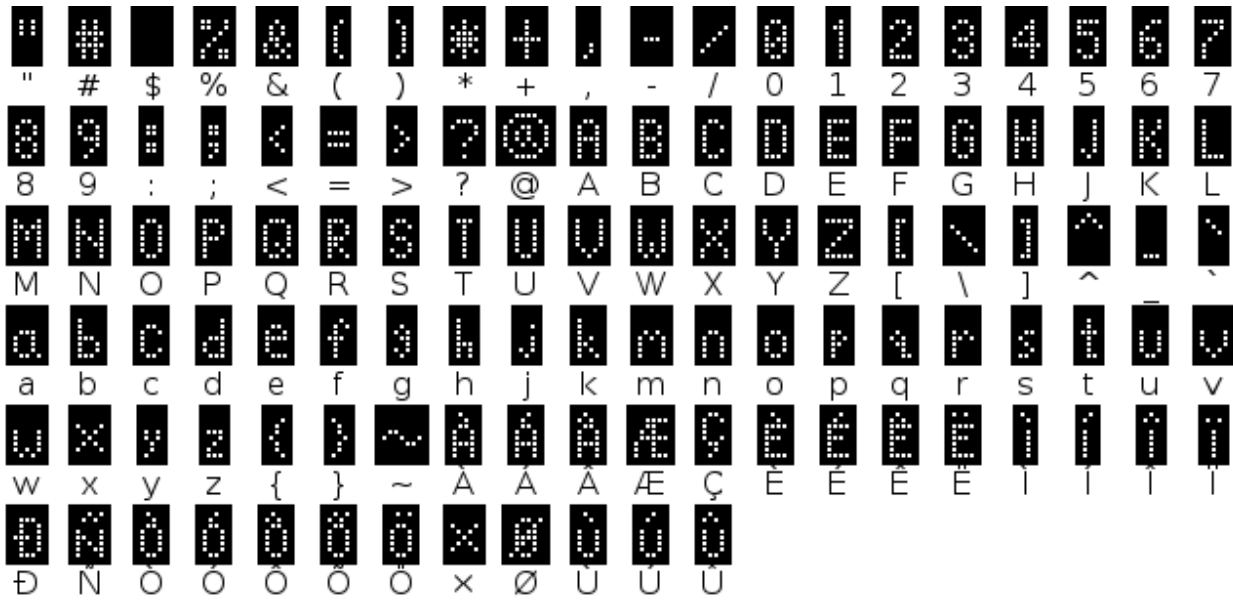


Figure 6.5: Font 5 - Canadian French MTO

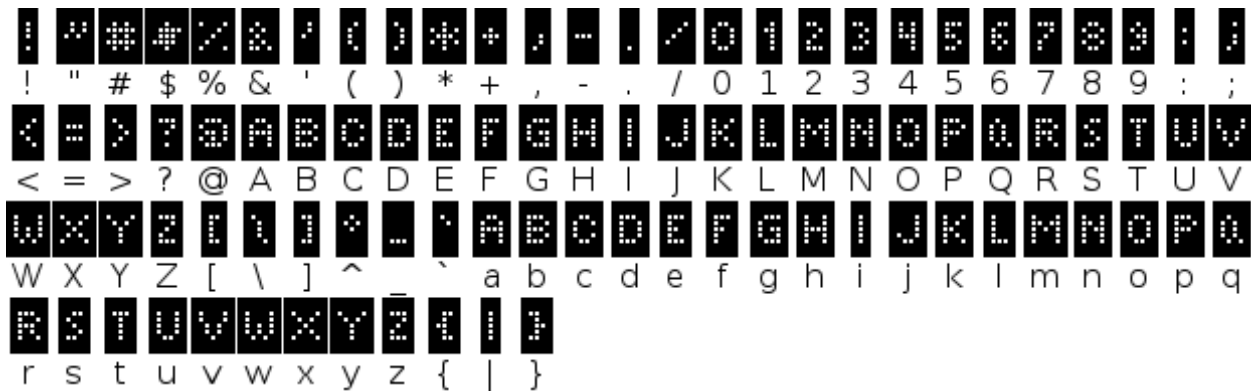


Figure 6.6: Font 6 - 5px Road Safety

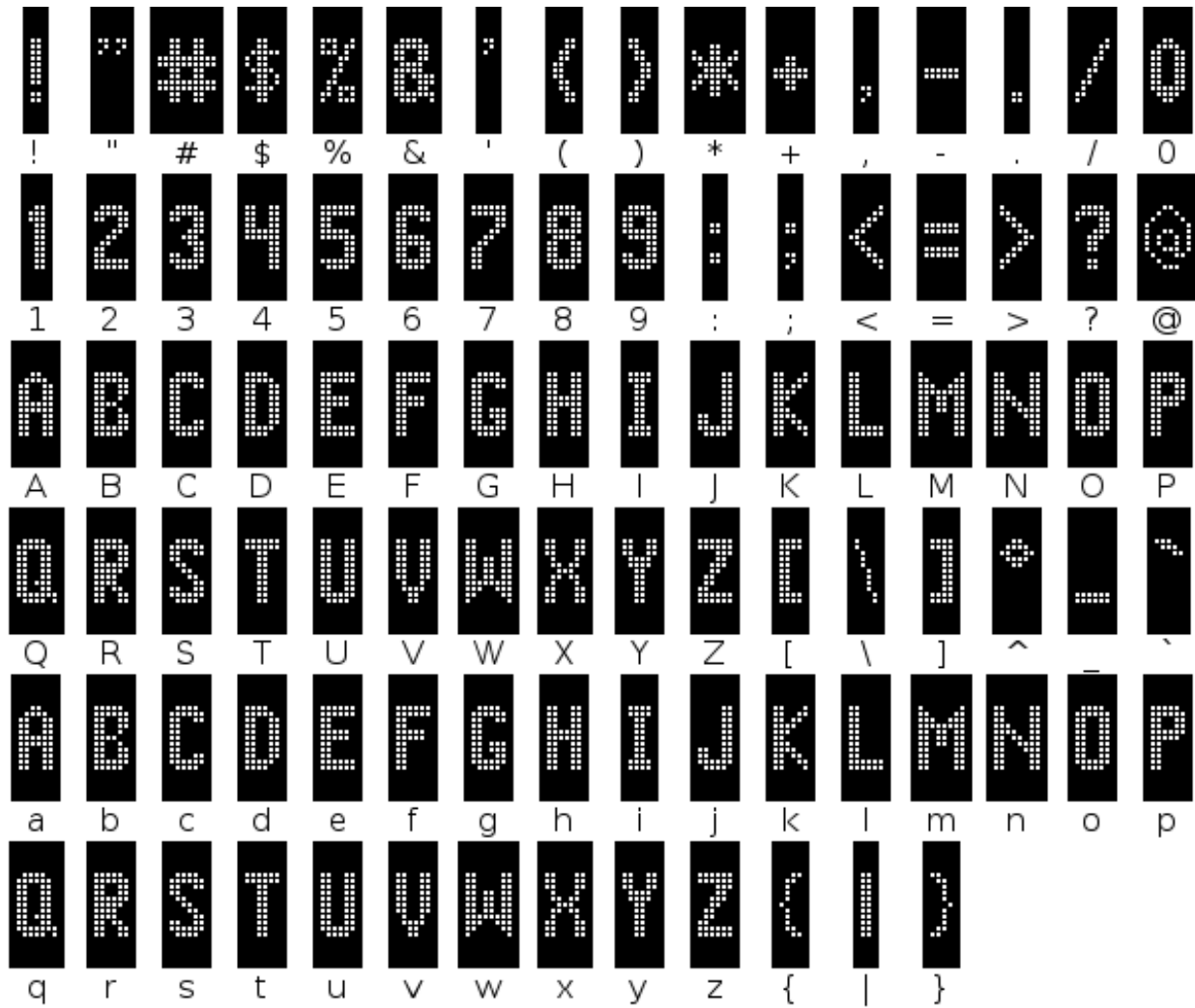


Figure 6.7: Font 7 - 11px Road Safety

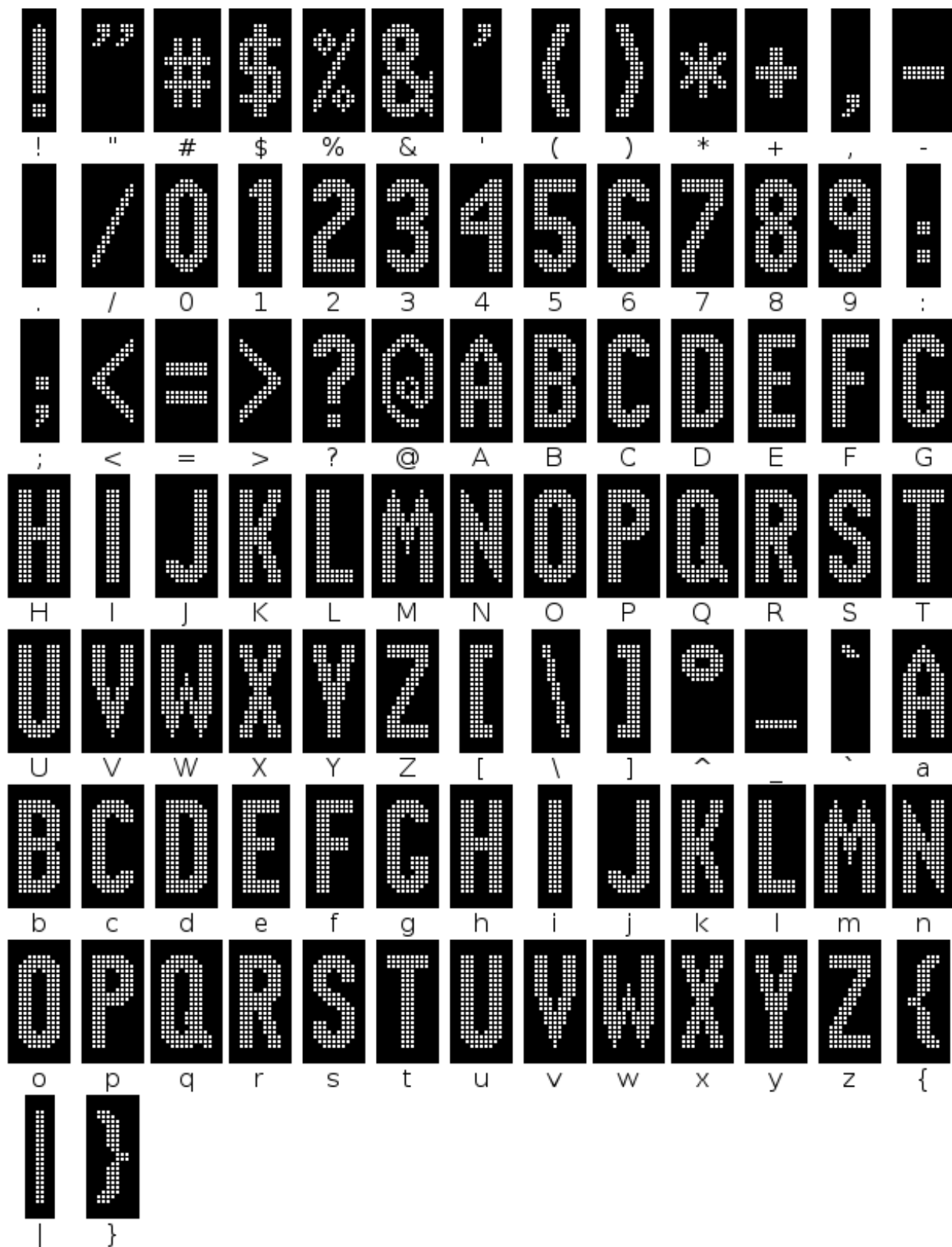


Figure 6.8: Font 8 - 20px Road Safety

ERROR INTERPRETATION

The Silent Messenger message board can produce SNMP and NTCIP errors in response to malformed or syntactically incorrect input. This section describes these errors, and provides advice on how to fix them.

7.1 SNMP Error Status

The Silent Messenger message board can produce the following values of the error status field in an SNMP PDU:

(no response) When the IP address is incorrect, the community string is incorrect, the message board is firewalled off, or the message board is not in NTCIP mode, no response will be received.

Mitigation: See *troubleshooting*.

tooBig (1) Either the request was too large to be processed, or the response was too large to send in a single packet.

Mitigation: Reduce the size of the request being sent, by requesting less OIDs at once.

noSuchName (2) A request was made for an object that is not supported by the message board, such as a vendor-specific object from another vendor.

Mitigation: Ensure control software is NTCIP-compliant.

badValue (3) A request was made to set an object to a value of an incorrect type for that object. For example, this is generated when setting an integer-valued object to a string value.

Mitigation: Ensure control software is NTCIP-compliant.

genError (5) A different kind of error occurred. This can be set when the sign is in local control mode, when a value is sent that is the correct type but is otherwise semantically invalid, or when the request is corrupt.

Mitigation: See *troubleshooting*.

7.2 NTCIP Errors

The following errors can be produced in response to NTCIP commands:

- NTCIP operations can produce a SNMP genError when they are semantically invalid.
- When a messageStatus of error (5) is reported, the dmsValidateMessageError object will report either other (1) or syntaxMULTI(5). In the latter case, the dmsMultiSyntaxError, dmsMultiSyntaxErrorPosition, and dmsMultiOtherErrorDescription objects describe the MULTI error.
- dmsActivateMessageError is set when activating a message fails.
- dmsIllumBrightnessValuesError is set when setting the illumination brightness fails.

The message board can report the following error conditions using bits of shortErrorStatus:

- Bit 1 - communications error
- Bit 2 - power error
- Bit 5 - pixel error
- Bit 6 - photocell error
- Bit 7 - message error
- Bit 8 - controller error
- Bit 9 - temperature warning
- Bit 11 - critical temperature error

CONFIGURING CONTROL SOFTWARE

8.1 Vanguard Standard

8.1.1 Message Board Configuration

The following steps must be performed for each message board before Vanguard can control that message board. Perform these steps using Control Center 3000:

1. If necessary, upgrade the message board to TRAFIX-2.2.2 or later.
 - “CMS Unit”,
 - “Check for Updates”
2. Install the Vanguard (V) provision file on the message board.
 - “CMS Unit”
 - “Provision Unit”
 - “Provision Unit and Erase all data”,
 - “Vanguard”
 - “Download”
3. Set the message boards’s NTCIP community string.
 - “CMS Unit”
 - “Set the Unit’s NTCIP/UTMC password...”
 - Choose a community string of between 8 and 16 characters in length. This should be the same for all message boards. Enter it in the “New Password” and “Confirm Password” fields.
 - “Ok”
4. Enable NTCIP central mode.
 - “CMS Unit”
 - “NTCIP Control Mode”
 - “Enabled”
 - “Central”

8.1.2 Installation of Solartech Fonts

This makes the two most common Solartech fonts available in Vanguard. You will need the “Solartech 7px Normal” and “Solartech 7px Bold” font files.

Perform the following steps once per Vanguard installation, from a workstation logged in as the administrator:

- Starting at the home screen, choose “System options”
- Choose “System Configuration”
- Choose “Manage Server Fonts”
- Choose “Add a new font”
- Open “Solartech 7px Normal”
- Choose “Add a new font”
- Open “Solartech 7px Bold”
- Choose “Synchronize fonts with server”
- Exit out of Vanguard, then restart it.

The above steps must be done before proceeding.

On all other workstations, the following steps must be performed before that workstation can be used to control a Solartech message board.

- Starting at the home screen, choose “System options”
- Choose “System Configuration”
- Choose “Manage Server Fonts”
- Choose “Synchronize fonts with server”
- Exit out of Vanguard, then restart it.

A restart of Vanguard is necessary to ensure that the fonts are properly loaded. If Vanguard is not restarted, the fonts may not show up when creating a message.

8.1.3 Configuration of a Message Board/Display

These steps must be performed for each message board, but note that some steps will be changed or skipped if the message board is not the first Solar Technology message board, or the first of its type.

1. Get to the Manage Displays screen.
 - Starting at the home screen, choose “System options”
 - Choose “System Configuration”
 - Choose “Manage displays”
2. Choose “Add a new display”
3. Create a new network. (We create one network per message board.)
 - Choose “Create new network”
 - Choose “Internet”
 - At the “Set the options for communications screen”,
 - DNS/IP address: The IP address of the message board.

- Port Number: 161
 - Transport: UDP/TCP
 - Enable display callback response: leave unchecked
 - Do not pick Test - it doesn't work.
 - Choose "Next"
 - Choose "No back-up network"
 - Choose "Manual Configuration"
4. If this is the first time a Solartech message board has been added to this server, proceed to step 5. Otherwise, proceed to step 6.
5. Create a new NTCIP profile.
- Choose "Create new profile"
 - Choose "Version 2.0"
 - At the "Enter the community names and select a blank type property" screen:
 - Read-only community name: (enter the community string)
 - Read-write community name: (enter the community string)
 - Blank Type: Blank
 - Blank Number: 1
 - Choose "Next"
 - Choose "Advanced Options"
 - At the "Select the custom objects and options..." screen,
 - Uncheck "Daktronics"
 - Uncheck "Florida"
 - Uncheck "Port Authority NY/NJ"
 - All other choices should be checked.
 - Choose "Next"
 - At the "Select the options to be included" screen,
 - Uncheck "Climate"
 - Uncheck "Humidity"
 - All other choices should be checked.
 - Choose "Next"
 - At the "Specify the Management Information Base..." screen, choose "Next".
 - For the name of the profile, enter "Solar Technology v2", then choose "Next".
 - Proceed to step 7.
6. Select the NTCIP profile.
- Choose "Select existing profile"
 - Choose "Solar Technology v2"

7. If this is the first time a display of this type (width and height) is being configured, proceed to step 8. Otherwise, proceed to step 9.
8. Create a new display type.
 - Choose “Create new display type”
 - Choose “Full matrix”
 - At the “Set options for the display type” screen: * Set “Display height” to the display height, in pixels. * Set “Display width” to the display width, in pixels. * Set “Color depth” to “Monochrome” * Set “Color” to “Amber”. * Choose “Next”
 - Choose “Use a custom font list”
 - At the “Select fonts” screen:
 - Select each font on the right side, in turn. Then choose “Remove”
 - In the left column, select “Solartech 7px Normal”. In the right column, select slot 1. Choose “Add”.
 - In the left column, select “Solartech 7px Bold”. In the right column, select slot 2. Choose “Add”.
 - Choose “Next”.
 - At the “Specify a name for the the new display type” screen:
 - Uncheck “Enable automatic naming”
 - Enter an appropriate name. For example, “<width> x <height> Solartech”.
 - Choose “Next”
 - Proceed to step 10.
9. Select an existing display type.
 - Choose “Select existing display type”
 - Choose the appropriate display type.
10. Set the display options:
 - Hardware address: 1
 - Time zone: As appropriate.
 - Enable Daylight Savings Time: As appropriate.
 - Choose “Next”
11. Enter a name for the display.
 - Name: As appropriate.
 - Notes: As appropriate.
 - Choose “Finish”.

To add another message board, return to step 2.

Once the message board has been added, it should be able to be controlled normally.

8.1.4 Troubleshooting

- The message board will not allow a font to be modified when that font is in use. Please blank the message board before uploading a font.

- An error 10061 may be caused by an invalid IP address, network transport, or community string.
- If a “Device is in local mode” error occurs, Control Center 3000 must be used to switch the device back to central mode.
- Vanguard uses a non-standard interface to display test patterns. We do not support this interface, and so will not display test patterns.

TROUBLESHOOTING

The most common problem we encounter is that a message board is in local mode when a command is sent. This will cause genErr responses to all set requests, except for setting dmsControlMode to centralOverride.

To resolve this, ensure NTCIP is in central mode, using the procedure described in *Enabling NTCIP from the Message Board*.

If the message board does not respond to communications, please check:

- That NTCIP is in Central mode.
- That the IP address of the message board is correct.
- That the SNMP port (UDP port 161) is not firewalled.
- That an appropriate community string is being provided. Note that community strings are case-sensitive, and that TRAFIX forces them to upper-case.

Additional diagnostic information can be viewed by enabling the web interface on the message board, logging in to the web interface, and then visiting:

```
http://1.2.3.4/output
```

where 1.2.3.4 is the IP address of the message board.

This diagnostic information displays the contents of SNMP requests, and can prove valuable when debugging problems with NTCIP communications.

For more support, please email ntcipsupport@solartechnology.com.

SECURITY IMPLICATIONS

NTCIP allows a party that does not have physical access to a message board to control what the message board is displaying. As a result, it's important to control access to NTCIP. We can provide the following security advice:

- It is important to choose a good community strings, and maintain control of these community strings. When a person no longer has need to access a system, his community string should be revoked.
- To prevent “sniffing” and “man-in-the-middle” attacks, all traffic should be routed over networks that are difficult for untrusted parties to access. Examples of these networks include:
 - A wired network which unauthorized users are not allowed to connect to, connected to a reliable ISP.
 - A wireless network protected by WPA or WPA2 encryption.
 - A mobile network to which both the client and the message board are directly connected.

By observing these security precautions, one can prevent unauthorized users from accessing your message board.

ABOUT THIS DOCUMENT

This document has unlimited distribution.

For comments, question, or clarifications, please email ntcipsupport@solartechnology.com.

The latest version of this document can be download from <http://www.solartechnology.com/>. From the menu bar, at the top of the site, choose:

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11.1 Changes

December 30, 2011 - Version 2.3.0

- Change the number of messages we support by default, and clarify that we can increase those messages on request.
- Indicate the fonts loaded in slots 1-8.
- Add support for retrieving the watchdog timer status.
- Add support for querying the light sensor status.

January 12, 2011 - Version 2.0.5

- Added Miscellaneous Objects section.
- Added Error Interpretation section.