ITS Firmware for the Advanced Transportation Controller

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Background

- Over the years, ODOT's ITS Unit has been tasked with developing custom systems to support a variety of roadside applications.
- These systems were developed with a variety of hardware and software making them difficult to support over time as vendors changed their products and when the agency's IT environment changed.

Background

- With ODOT's adoption of the ATC for ramp metering and traffic signals, it made sense to standardize on this platform for ITS custom applications.

Past Custom ITS Systems

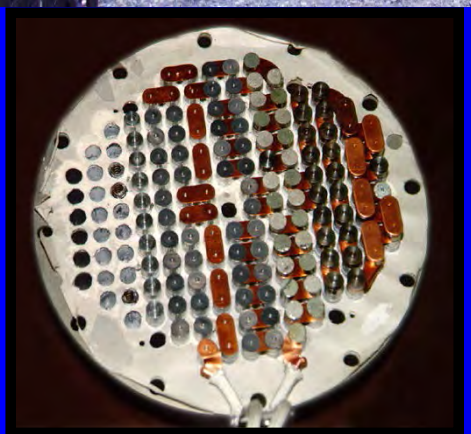
- Road and Weather Information Station
- High Wind Warning Systems
- Flood Warning Systems
- Ice Warning Systems
- Overlength Warning Systems
- Remotely Controlled Interstate Gates
- Speed/Curve Warning Systems
- Queue Warning Systems
- DMS NTCIP Translators for Drum Signs

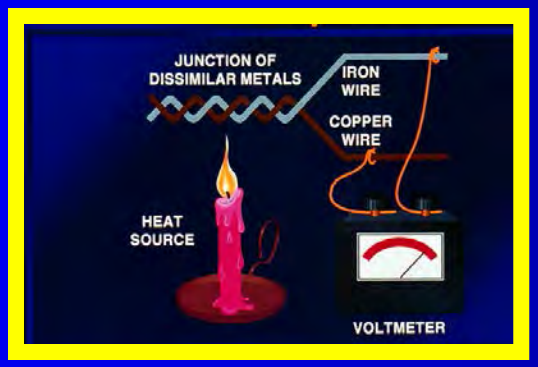
Past Presentations at Western States ITS Forum

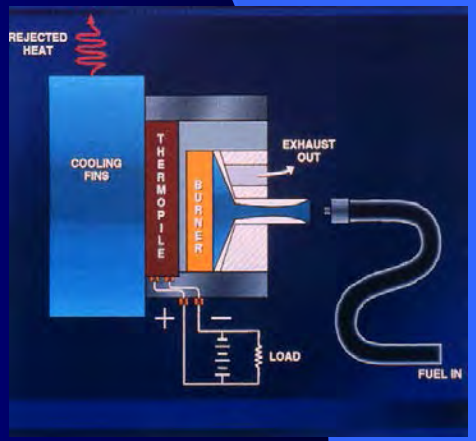
Part of the Story

- Weather Warning Systems and Gates – 2007
- ATC for Oregon DOT – 2013
- Multnomah Falls Parking Management System-2015
- Lincoln City Adaptive Signal Timing - 2016

Road and Weather Information Station







Yaquina Bay Bridge High Wind Warning System

SCAN Web ssi®

Region 2
Yaquina Bridge Wind Alert (US 101 MP 141.5) (110000)
Site Status

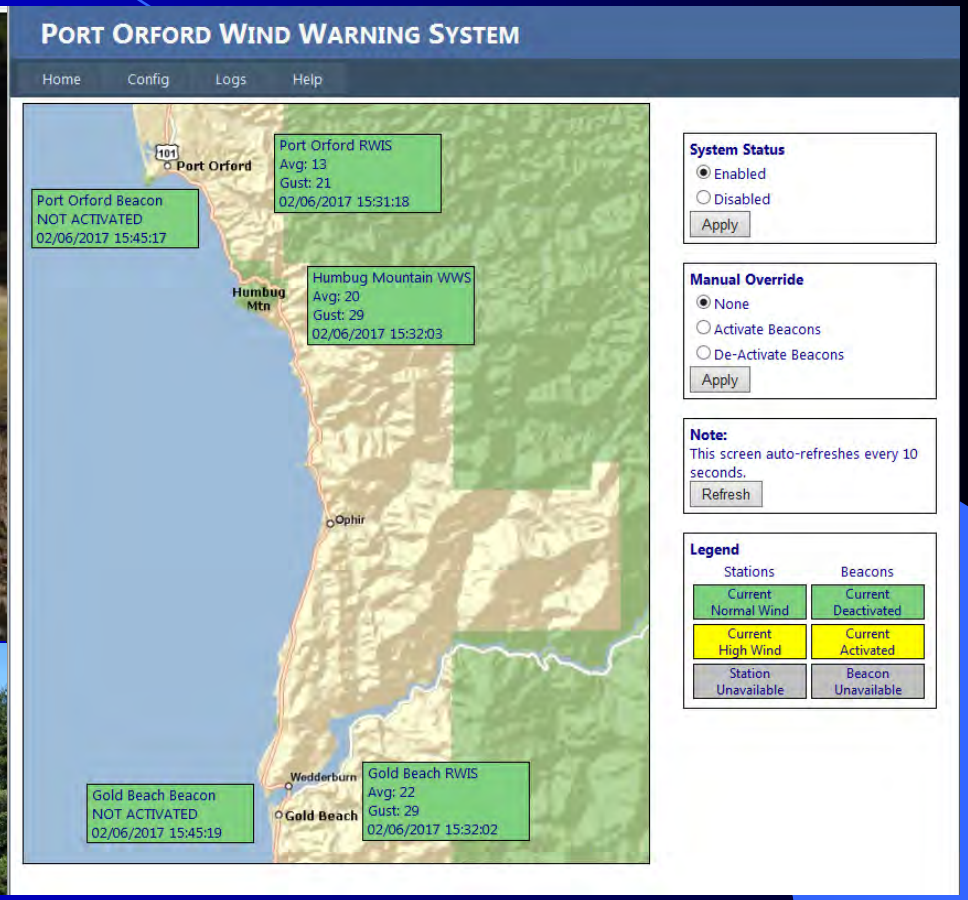
Current Time: 02/27/2017 10:37 PST
Data Time: 02/27/2017 10:37 PST

Air Data						Wind Data			
Temp	RH	Dew	WtBlb	Min	Max	SpdAvg	SpdGst	DirAvg	DirGst
42F	-	-	-	-	-	15 mph	25 mph	SW	-

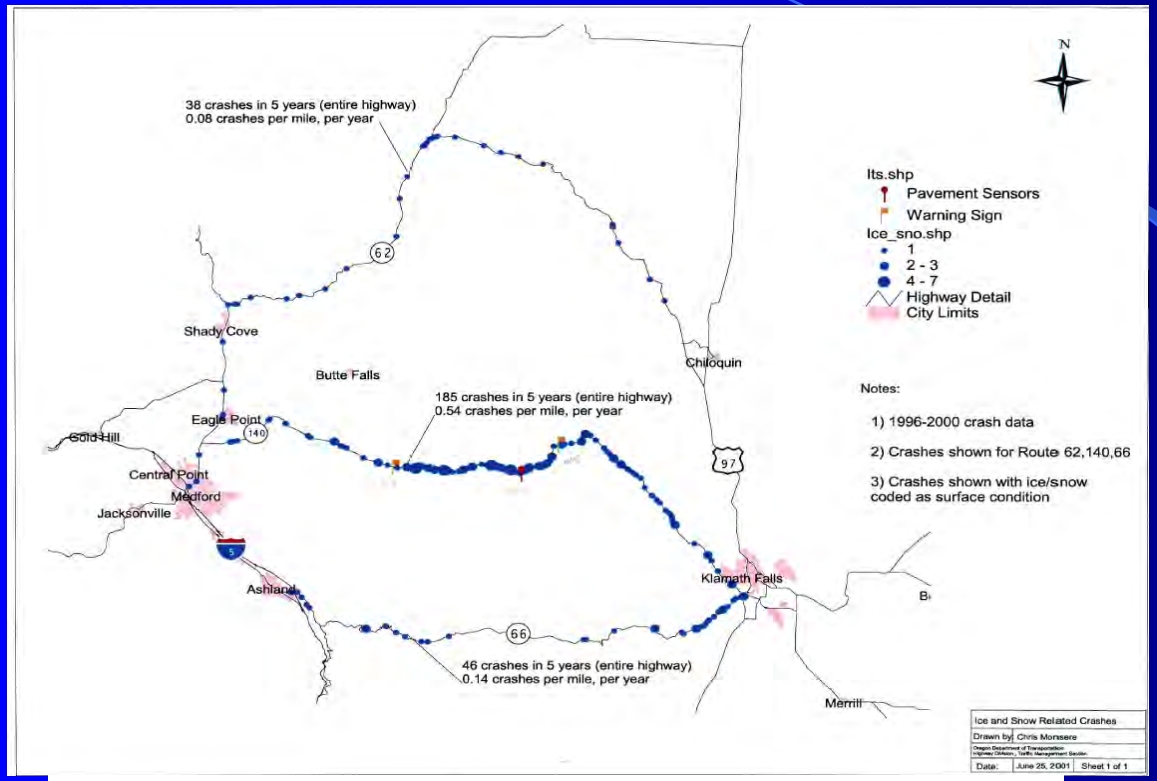
Device Status (basic relay control)

Device	Status	Set By	
Yaquina Wind Sign (0)	Off	Opto22	History Interface
Yaquina Wind Alarm (1)	Off	Opto22	History Interface

Port Orford High Wind Warning System



Butte Creek Ice Warning System



Generic Device Status

Device	Mode	Control State	Last State Change	Set By	Device Status	Last Status Change	
Ice Sign (0)	Manual	Sign ON	02/25/2017 16:14	User Request	-	02/25/2017 16:14	History Interface

Air Data

Temp	RH	Dew	WtBlb	Min	Max
26F	69%	18F	24F	21F	27F

Wind Data

SpdAvg	SpdGst	DirAvg	DirGst
Calm	4 mph	NW	N

Precipitation

Type	Intensity	Rate
Yes	-	-

Last Precipitation Period

Start Time	End Time
02/27/2017 10:14	-

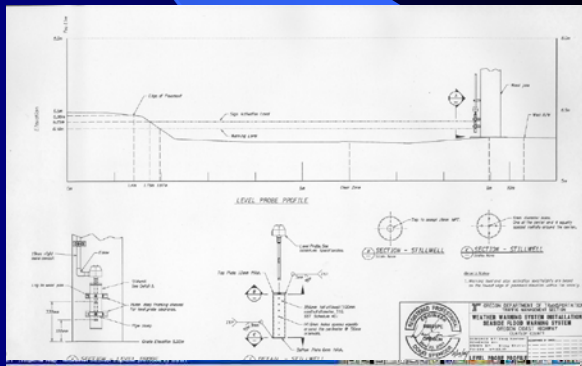
Accumulation

10 min.	1 hr.	3 hr.	6 hr.	12 hr.	24 hr.
-	-	-	-	-	-

Surface Data

Sensor	Status	Sfc	Pvt	Sub	Frz	CF	Chem	Dpth	DpthThk	Ice	Fl	Cond	Salin	
OR 140 Westbound (0)	Error	27.9F	-	-	-	-	-	-	-	-	-	0 mhos	21	History
(1)	No Report	-	-	-	-	-	-	-	-	-	-	-	-	History

Seaside Flood Warning System



McKenzie Pass Overlength Warning System

Cushman Flood Warning System

Interstate Gates

File Edit View Favorites Tools Help

Gate Controls

I-84 WB | I-84 EB

Ramp Gate: Traffic Gate at Union Interchange On-Ramp I-84 MP 265.26 WB View Log

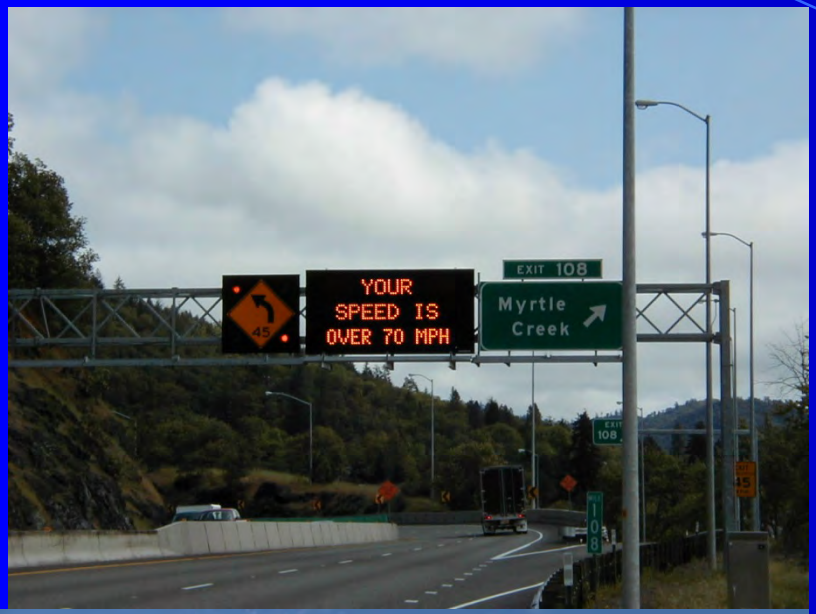
Last Poll: 2/6/2017 3:39:15 PM
Gate Status: OPEN
Last Change: 1/19/2017 10:48:25 AM

Poll Site | Open Gate | Close Gate

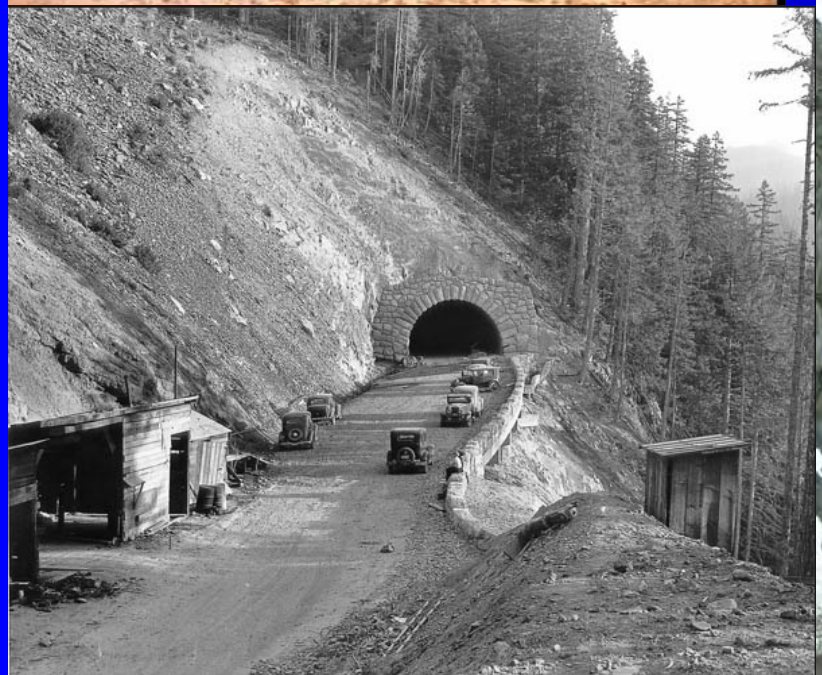
Last image taken from site:

2/6/2017 3:39:53 PM

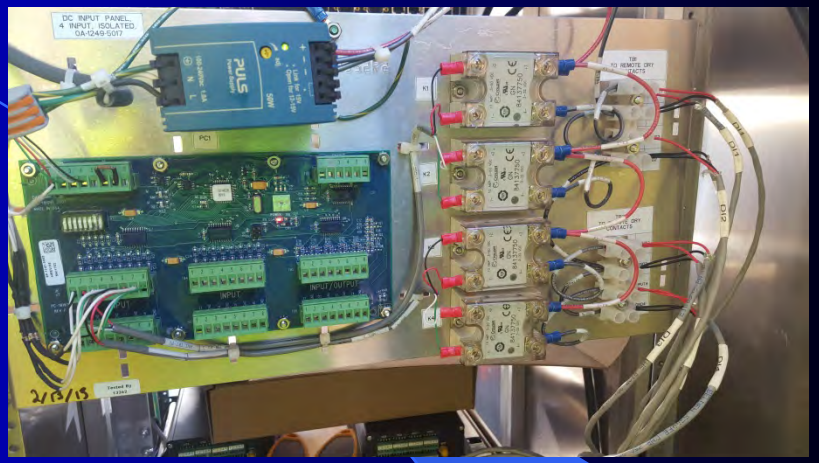
Curve/Speed Warning Systems



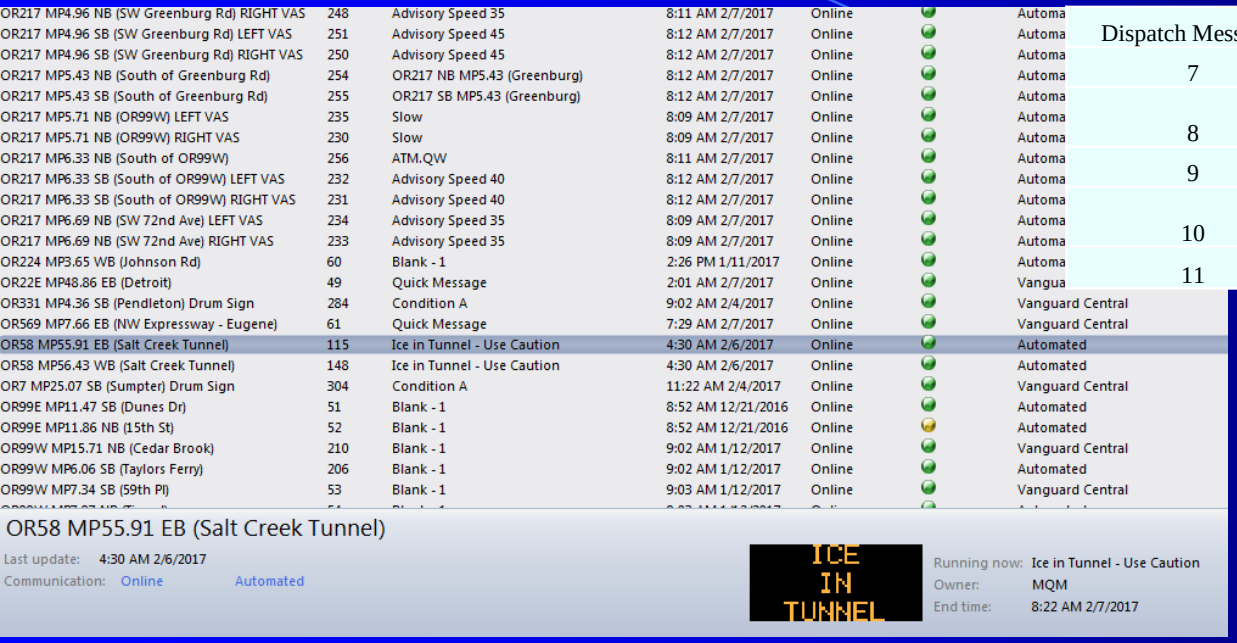
Salt Creek Tunnel



Salt Creek Tunnel – Ice Warning System



Salt Creek Tunnel (Continued)



OR217 MP4.96 NB (SW Greenburg Rd) RIGHT VAS	248	Advisory Speed 35	8:11 AM 2/7/2017	Online	Automa
OR217 MP4.96 SB (SW Greenburg Rd) LEFT VAS	251	Advisory Speed 45	8:12 AM 2/7/2017	Online	Automa
OR217 MP4.96 SB (SW Greenburg Rd) RIGHT VAS	250	Advisory Speed 45	8:12 AM 2/7/2017	Online	Automa
OR217 MP5.43 NB (South of Greenburg Rd)	254	OR217 NB MP5.43 (Greenburg)	8:12 AM 2/7/2017	Online	Automa
OR217 MP5.43 SB (South of Greenburg Rd)	255	OR217 SB MP5.43 (Greenburg)	8:12 AM 2/7/2017	Online	Automa
OR217 MP5.71 NB (OR99W) LEFT VAS	235	Slow	8:09 AM 2/7/2017	Online	Automa
OR217 MP5.71 NB (OR99W) RIGHT VAS	230	Slow	8:09 AM 2/7/2017	Online	Automa
OR217 MP6.33 NB (South of OR99W)	256	ATM.QW	8:11 AM 2/7/2017	Online	Automa
OR217 MP6.33 SB (South of OR99W) LEFT VAS	232	Advisory Speed 40	8:12 AM 2/7/2017	Online	Automa
OR217 MP6.33 SB (South of OR99W) RIGHT VAS	231	Advisory Speed 40	8:12 AM 2/7/2017	Online	Automa
OR217 MP6.69 NB (SW 72nd Ave) LEFT VAS	234	Advisory Speed 35	8:09 AM 2/7/2017	Online	Automa
OR217 MP6.69 NB (SW 72nd Ave) RIGHT VAS	233	Advisory Speed 35	8:09 AM 2/7/2017	Online	Automa
OR224 MP3.65 WB (Johnson Rd)	60	Blank - 1	2:26 PM 1/11/2017	Online	Automa
OR22E MP48.86 EB (Detroit)	49	Quick Message	2:01 AM 2/7/2017	Online	Vangua
OR331 MP4.36 SB (Pendleton) Drum Sign	284	Condition A	9:02 AM 2/4/2017	Online	Vanguard Central
OR569 MP7.66 EB (NW Expressway - Eugene)	61	Quick Message	7:29 AM 2/7/2017	Online	Vanguard Central
OR58 MP55.91 EB (Salt Creek Tunnel)	115	Ice in Tunnel - Use Caution	4:30 AM 2/6/2017	Online	Automated
OR58 MP56.43 WB (Salt Creek Tunnel)	148	Ice in Tunnel - Use Caution	4:30 AM 2/6/2017	Online	Automated
OR7 MP25.07 SB (Sumpter) Drum Sign	304	Condition A	11:22 AM 2/4/2017	Online	Vanguard Central
OR99E MP11.47 SB (Dunes Dr)	51	Blank - 1	8:52 AM 12/21/2016	Online	Automated
OR99E MP11.86 NB (15th St)	52	Blank - 1	8:52 AM 12/21/2016	Online	Automated
OR99W MP15.71 NB (Cedar Brook)	210	Blank - 1	9:02 AM 1/12/2017	Online	Vanguard Central
OR99W MP6.06 SB (Taylors Ferry)	206	Blank - 1	9:02 AM 1/12/2017	Online	Automated
OR99W MP7.34 SB (59th Pl)	53	Blank - 1	9:03 AM 1/12/2017	Online	Vanguard Central

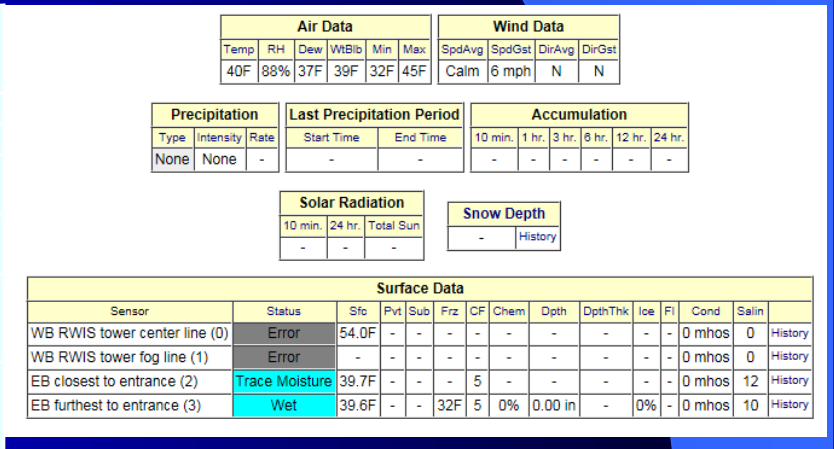
OR58 MP55.91 EB (Salt Creek Tunnel)

Last update: 4:30 AM 2/6/2017
Communication: Online Automated

Running now: Ice in Tunnel - Use Caution
Owner: MQM
End time: 8:22 AM 2/7/2017

Dispatch Messages	Page 1	Page 2	Priority
7	DEBRIS IN TUNNEL	USE CAUTION	200
8	TUNNEL CLOSED AHEAD	PREPARE TO STOP	200
9	ROAD WORK AHEAD	EXPECT DELAYS	200
10	STALLED VEHICLE AHEAD	PREPARE TO STOP	200
11	WRECK AHEAD	EXPECT DELAYS	200

Permanent Message No.	Message	Page Time	Priority	Message Duration	Activation	Controller Input
1	Reserved for Daktronics					
2	Reserved for Daktronics					
3	BICYCLE IN TUNNEL/USE CAUTION	1.5 s	100	8 minutes	Pushbutton, monentary contact	1
4	ICE IN TUNNEL/USE CAUTION	1.5s	150	continuous	Handswitch, ON/OFF maintained	2
5	WORK IN TUNNEL/PREPARE TO STOP	1.5s	100	continuous	Handswitch, ON/OFF maintained	3
6	WRECK IN TUNNEL/PREPARE TO STOP	1.5s	200	continuous	Handswitch, ON/OFF maintained	4



Air Data

Temp	RH	Dew	WtBlb	Min	Max
40F	88%	37F	39F	32F	45F

Wind Data

SpdAvg	SpdGst	DirAvg	DirGst
Calm	6 mph	N	N

Precipitation

Type	Intensity	Rate
None	None	-

Last Precipitation Period

Start Time	End Time
-	-

Accumulation

10 min.	1 hr.	3 hr.	6 hr.	12 hr.	24 hr.
-	-	-	-	-	-

Solar Radiation

10 min.	24 hr.	Total Sun
-	-	-

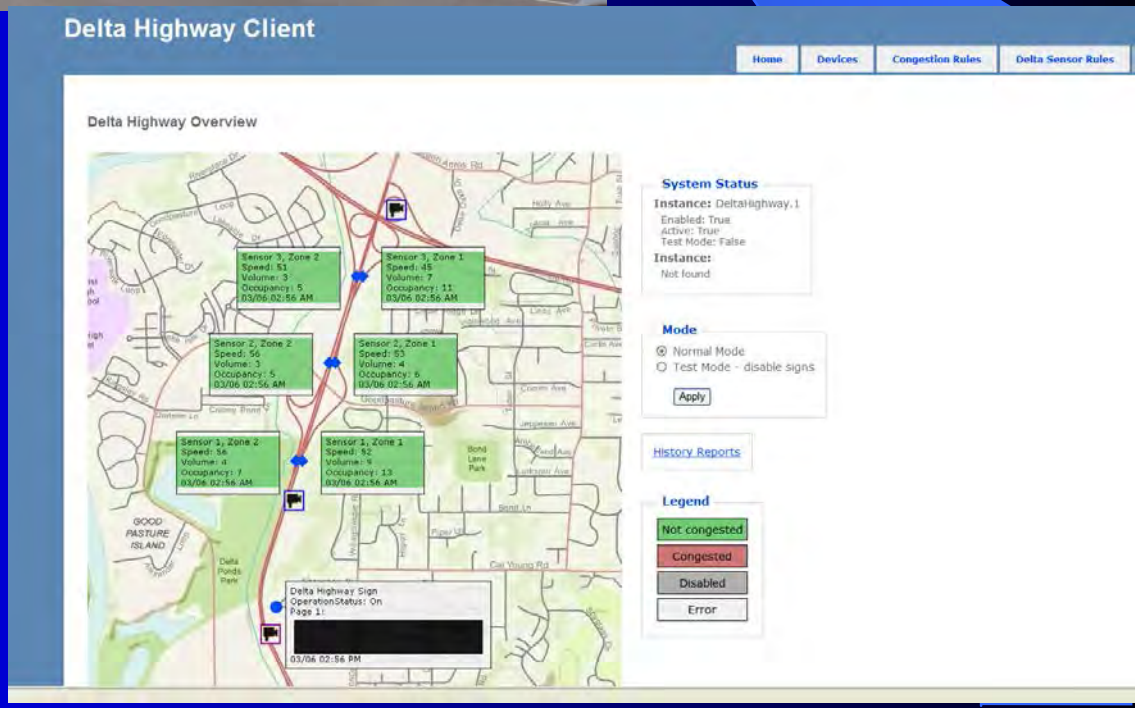
Snow Depth

-	History

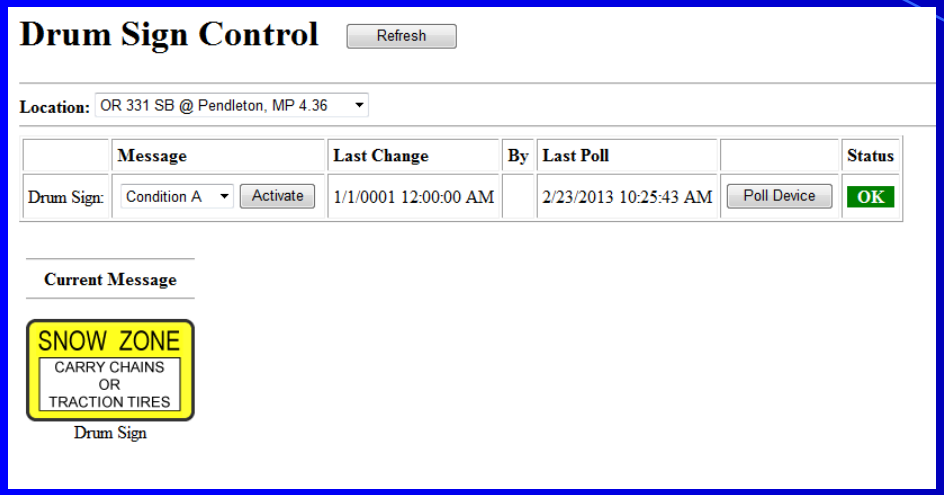
Surface Data

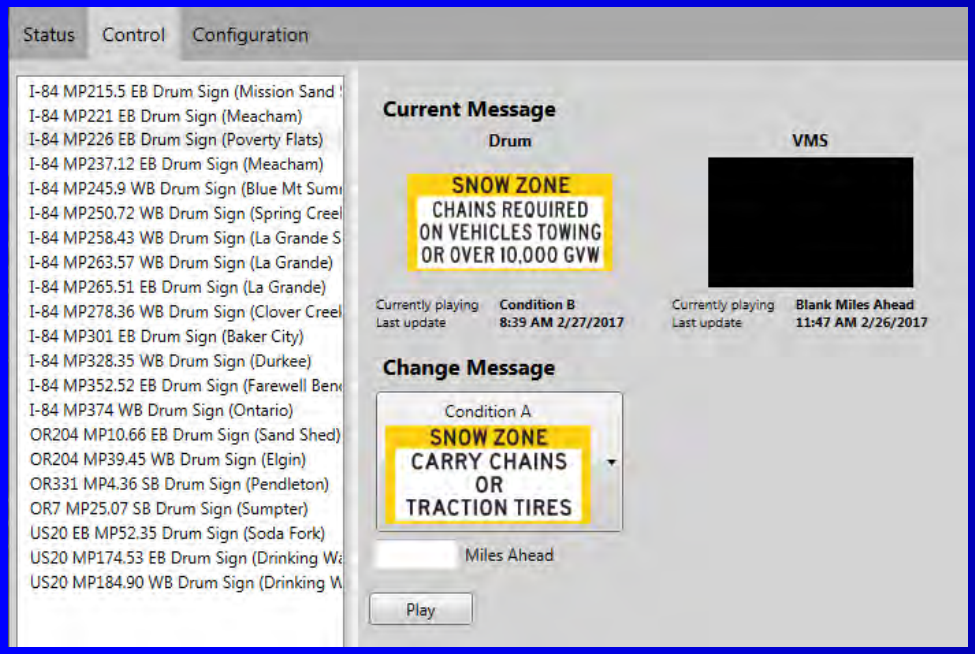
Sensor	Status	Sfc	Pvt	Sub	Frz	CF	Chem	Dpth	DpthThk	Ice	Fl	Cond	Salin	
WB RWIS tower center line (0)	Error	54.0F	-	-	-	-	-	-	-	-	-	0 mhos	0	History
WB RWIS tower fog line (1)	Error	-	-	-	-	-	-	-	-	-	-	0 mhos	0	History
EB closest to entrance (2)	Trace Moisture	39.7F	-	-	-	5	-	-	-	-	-	0 mhos	12	History
EB furthest to entrance (3)	Wet	39.6F	-	-	32F	5	0%	0.00 in	-	0%	-	0 mhos	10	History

Delta Hwy Queue Warning System

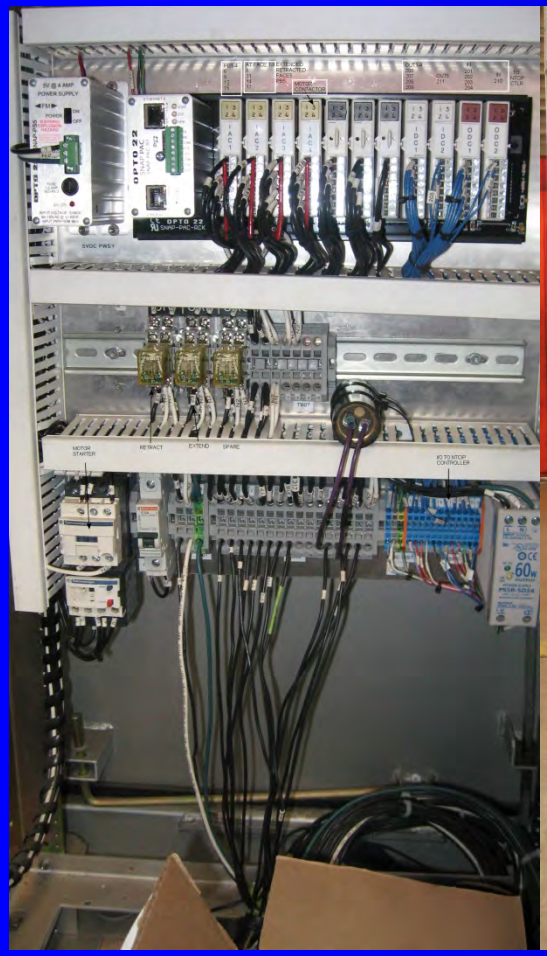


Drum Signs – NTCIP Upgrade



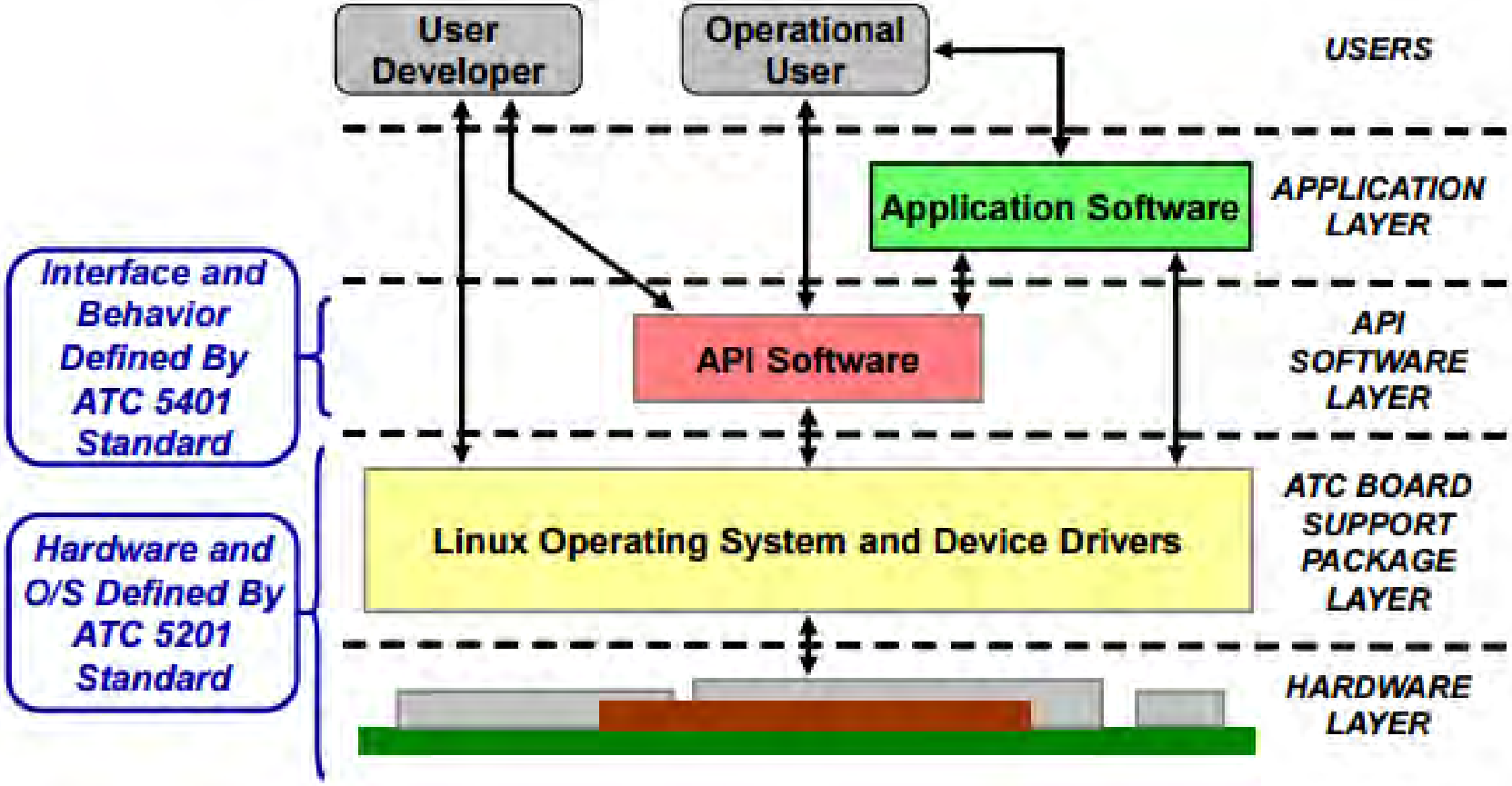


Drum Signs (Continued)



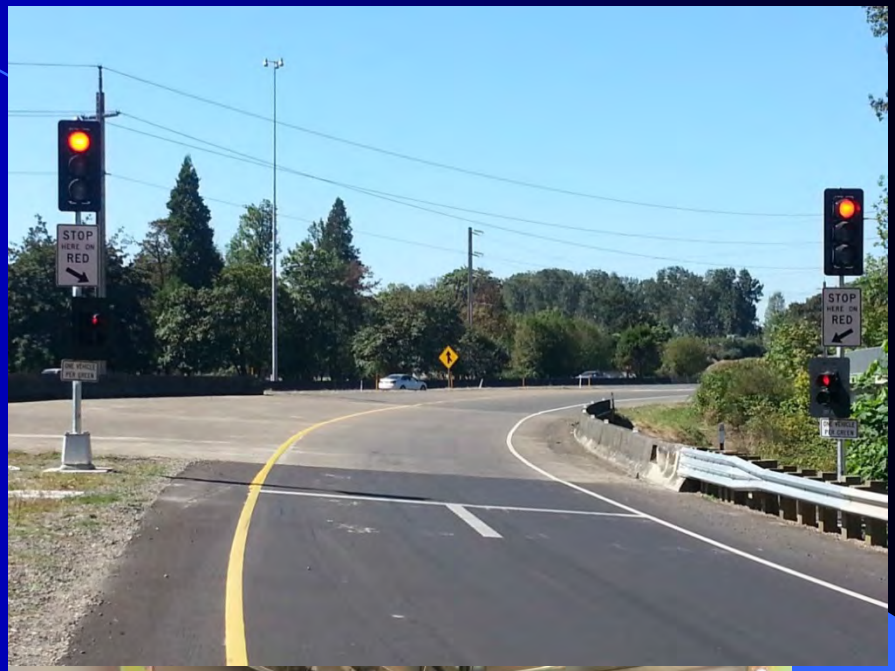
Advanced Transportation Controller

ATC API

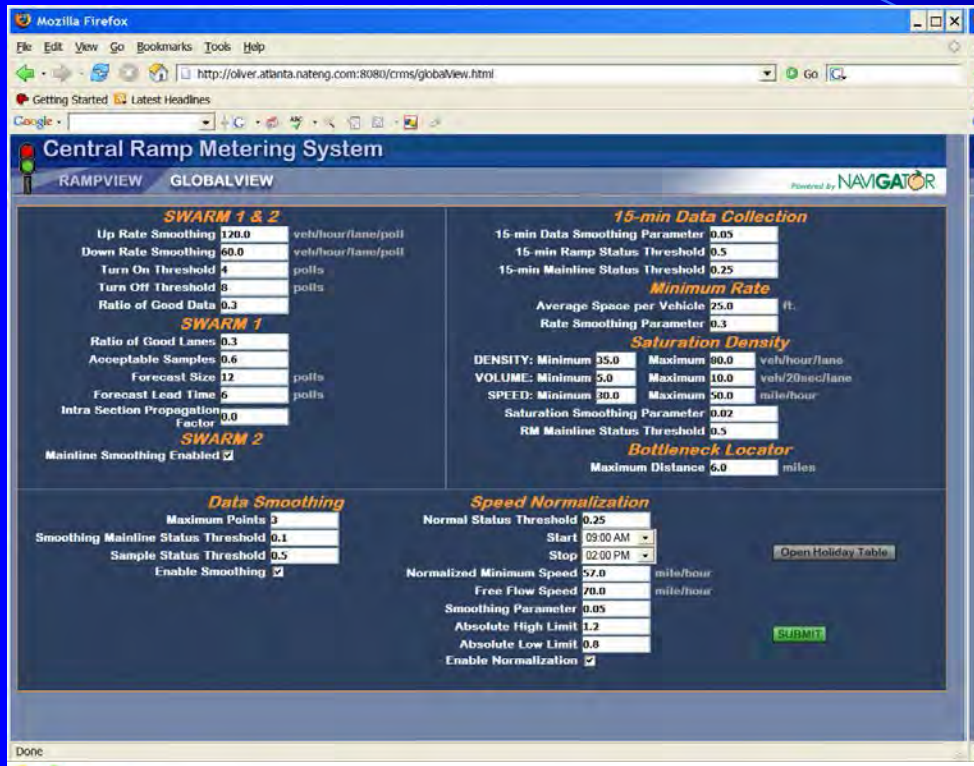

User Developer
Operational User
USERS
Application Software
APPLICATION LAYER
Interface and Behavior Defined By ATC 5401 Standard
API Software
API SOFTWARE LAYER
Linux Operating System and Device Drivers
ATC BOARD SUPPORT PACKAGE LAYER
Hardware and O/S Defined By ATC 5201 Standard
HARDWARE LAYER

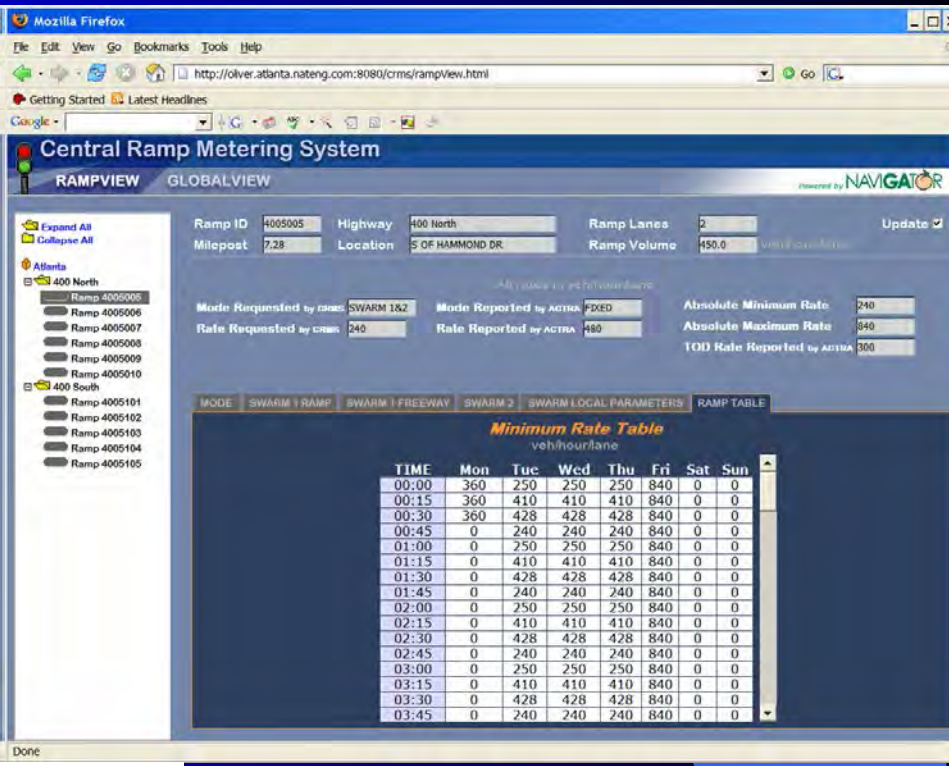
ATC Uses in ODOT

Ramp Metering



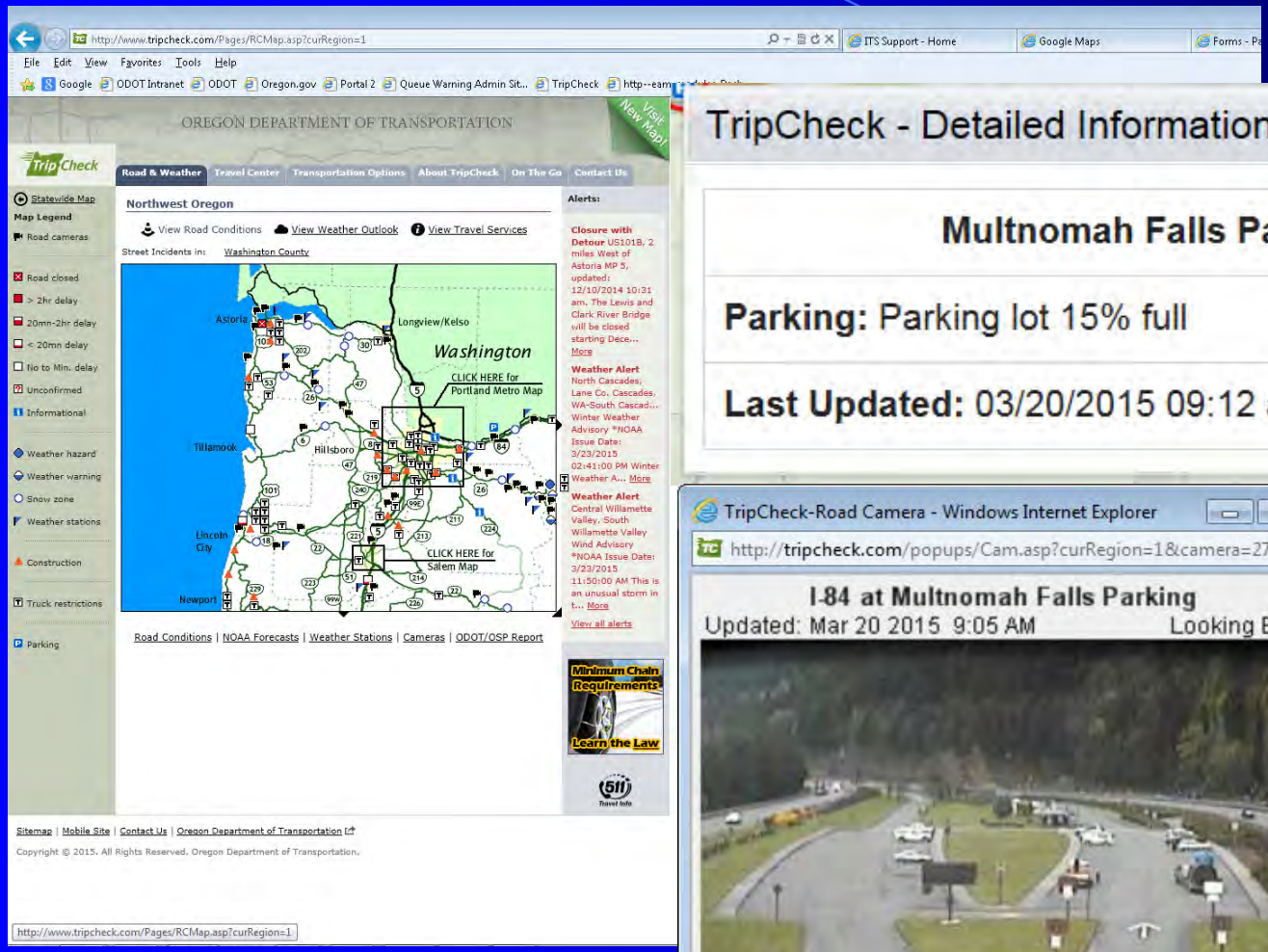
Ramp Metering (Continued)



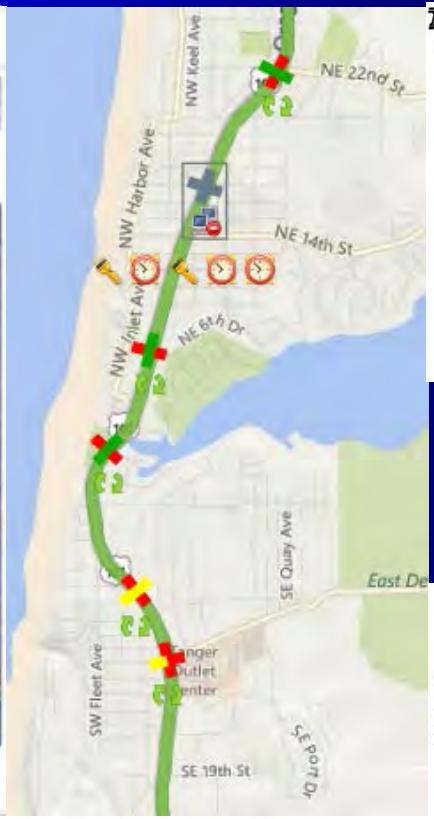


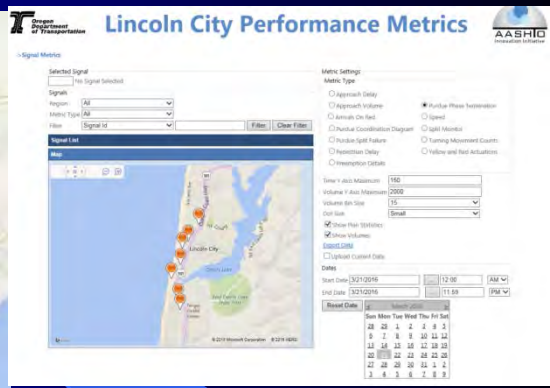
Multnomah Falls Parking Management System

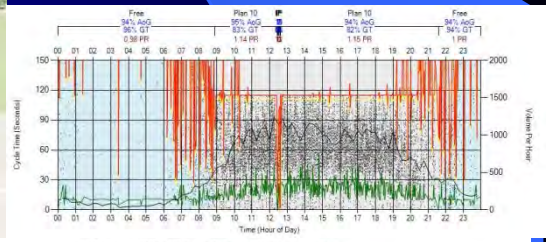
Multnomah Falls (Continued)

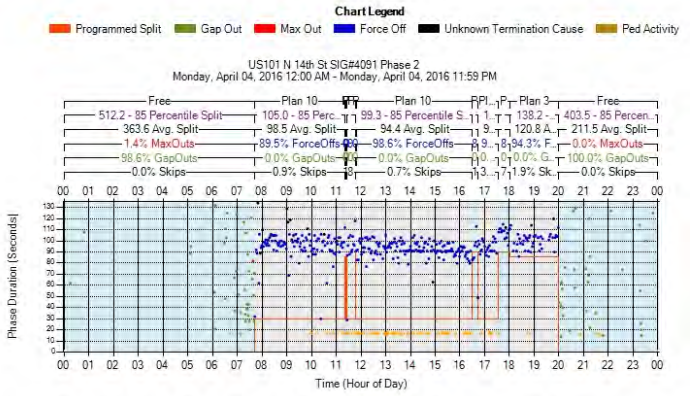


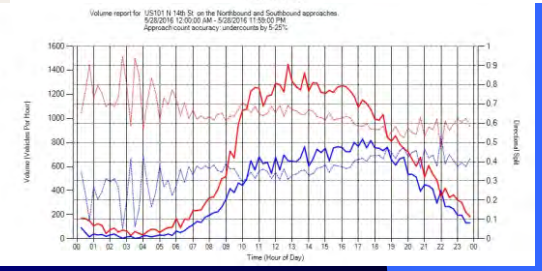
Traffic Signals











ITS Firmware for the ATC

- Road and Weather Information Station
- Weather Warning System
- Queue Warning System
- Overlength Warning System
- Remote ATC Control (On/Off) from Central
- Curve/Speed Warning System
- Remote Controlled Gate System
- Overheight Warning System
- Data Logging

ITS Firmware

- Issued as a work order contract under the programming services portion of the ramp metering price agreement contract.
- Development contract. ODOT is issued an Enterprise license. ODOT does not own the source code. Contractor sees it as a new product.
- ATC is a discrete On/Off control device built primarily for traffic signal operation. ODOT needed a means for analog/digital conversion of RWIS atmospheric sensors.
- Needed to standardize the electrical signals from sensors.

ITS Firmware

- Customize output to drive On/Off beacons, open/close gates, etc.
- Ability to activate messages on VMS.
- ATC capable of talking to 255 other ATC's on the network from vendor's signal software.
- Data logging to local USB is configurable.

Use of the ATC

- Common equipment and support
- Peer to Peer communications, up to 255 on the network
- NTCIP
- XML
- Custom Boolean Logic feature from traffic signals
- ATC API

ATC Inputs/Outputs

- Ethernet ports
- USB ports
- Serial ports
- C11S connector
- C1S connector

Sensors Used

- Anemometer – Wind Speed/Direction
- Temperature
- Relative Humidity
- Precipitation
- Water Level
- Visibility
- Side fire microwave radar
- Forward facing radar
- Pavement sensors
- Inductive loops

Anemometer (Wind Speed/Direction)

Specifications

Range:
Wind speed: 0-100 m/s (224 mph)
Azimuth: 360° mechanical, 355° electrical (5° open)

Accuracy:
Wind speed: ± 0.3 m/s (0.6 mph) or 1% of reading
Wind direction: ± 3 degrees

Threshold:* Propeller: 1.0 m/s (2.4 mph) Vane: 1.0 m/s (2.4 mph)

Signal Output:
Wind speed: magnetically induced AC voltage, 3 pulses per revolution. 1800 rpm (90 Hz) = 8.8 m/s (19.7 mph)
Azimuth: analog DC voltage from conductive plastic potentiometer – resistance 10K Ω , linearity 0.25%, life expectancy – 50 million revolutions

Power Requirement:
Potentiometer excitation: 15 VDC maximum

Sensor Cable:
A 3 meter (9.8 ft) pigtail cable is supplied for electrical connections.
For longer cable lengths a user supplied junction box or connector may be used.

Dimensions:
Overall height: 37 cm (14.6 in)
Overall length: 55 cm (21.7 in)
Propeller: 18 cm (7 in) diameter
Mounting: 34 mm (1.34 in) diameter (standard 1 inch pipe)

Weight:
Sensor weight: 1.0 kg (2.2 lbs)
Shipping weight: 2.3 kg (5 lbs)

MODEL 05603C, Wind Sensor Interface (0-5 VDC outputs)
Power Requirement: 8-24 VDC (5 mA @ 12 VDC)
Operating Temperature: -50 to 60°C
Output Signals: 0-5.00 VDC full scale

MODEL 05631C, Wind Line Driver (4-20 mA outputs)
Power Requirement: 12-30 VDC (40 mA max.)
Operating Temperature: -50 to 60°C
Output Signals: 4-20 mA full scale

Temperature/Relative Humidity

Model 41342 Temperature Probe offers accurate temperature-only measurement. Three output options are available: 0-1 VDC, 4-20 mA, and 4 wire RTD. Probes are easily installed in YOUNG naturally ventilated (multi-plate) and aspirated radiation shields. A junction box is provided for cable terminations.

41342 Manual | 41342L Manual | 41342V Manual

Specifications

Power Required:	**41382**	**41342**
V Option: 10-28 VDC	8 mA	5 mA
L Option: 10-28 VDC	40 mA	20 mA

RELATIVE HUMIDITY: (41382)
Measuring Range: 0-100 %RH
Accuracy at 23°C: ±1%RH,
Stability: Better than ±1%RH per year
Response Time: 10 seconds (without filter)
Sensor Type: Rotronic Hygromer™
Output Signal: V option: 0-1 VDC, L option: 4-20 mA

TEMPERATURE: (41382, 41342)
Calibrated Measuring Range: -50 to 50°C (suffix C) -50 to 150°F (suffix F)
Response Time: 10 seconds (without filter)
Accuracy at 23°C: ±0.3°C /optional ±0.1°C NIST calibration - 41342 only
Sensor Type: Platinum RTD
Output Signal: V Option: 0-1 VDC, L Option: 4-20 mA, 4 wire RTD (41342 only)
Recommended Radiation Shields:
Model 41003P Multi-Plate Radiation Shield
Model 43502 Aspirated Radiation Shield

Precipitation

- Convert 0-5VDC to 0-20 mA using 250 ohm resistor.

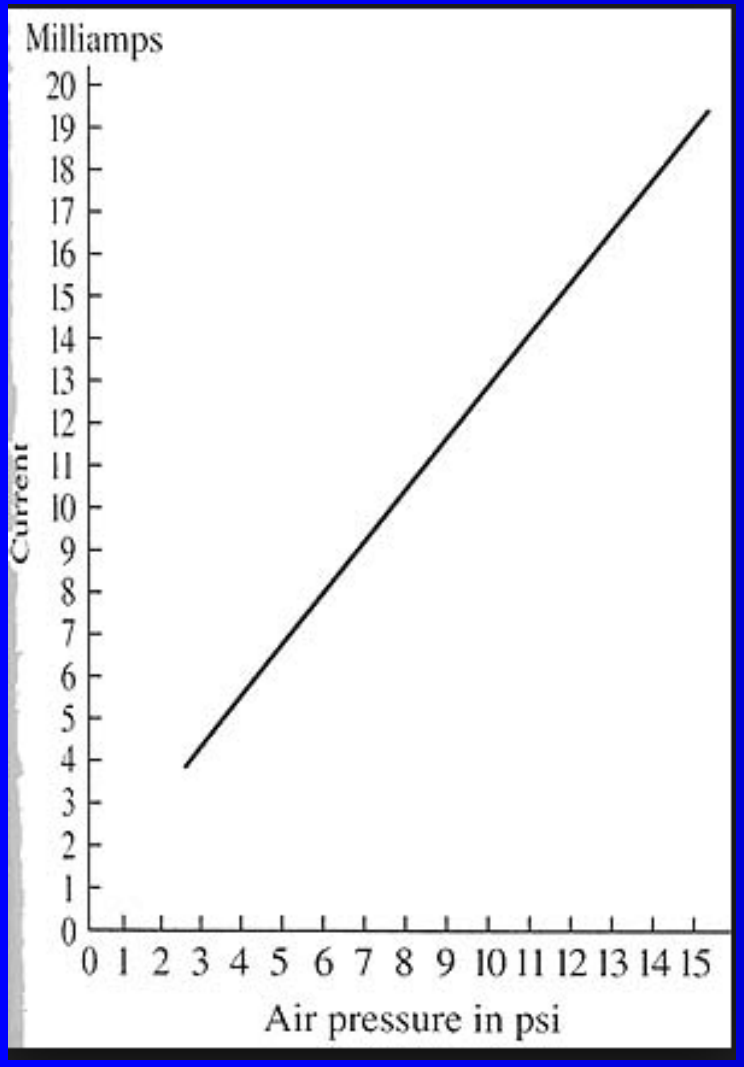
Specifications
Threshold: 1 mm (.04 in)
Accuracy: ±1 mm (±.04 in)
Signal: 0 to 5.00 VDC = 0 to 50 mm precipitation
Chamber Drain Time: 30 seconds approx.
Power Requirement: Measuring Circuit: 8 to 30 VDC, Heater: 48 Watts @ 28 VAC, Operating Temperature: -20ËšC to +50ËšC (-4ËšF to 122ËšF)
Dimensions:
Height: 65 cm (25.6 in)
Diameter: 14 cm (5.5 in)
Catchment Dia: 133 mm (4.4 in)
Catchment Area: 100 cm^2 (60.8 in^2)
Mounting: U-bolts fit vertical pipe 25-50 mm (1-2 in) diameter.
Weight: 2.5 Kg (5.5 lb)
Shipping Weight: 4 Kg (9 lb)

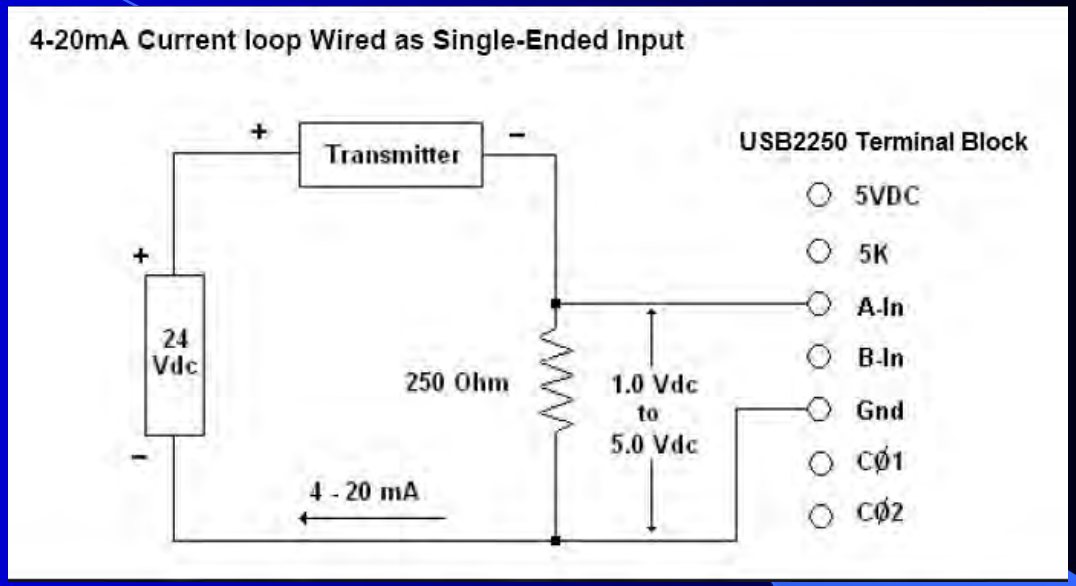
Visibility

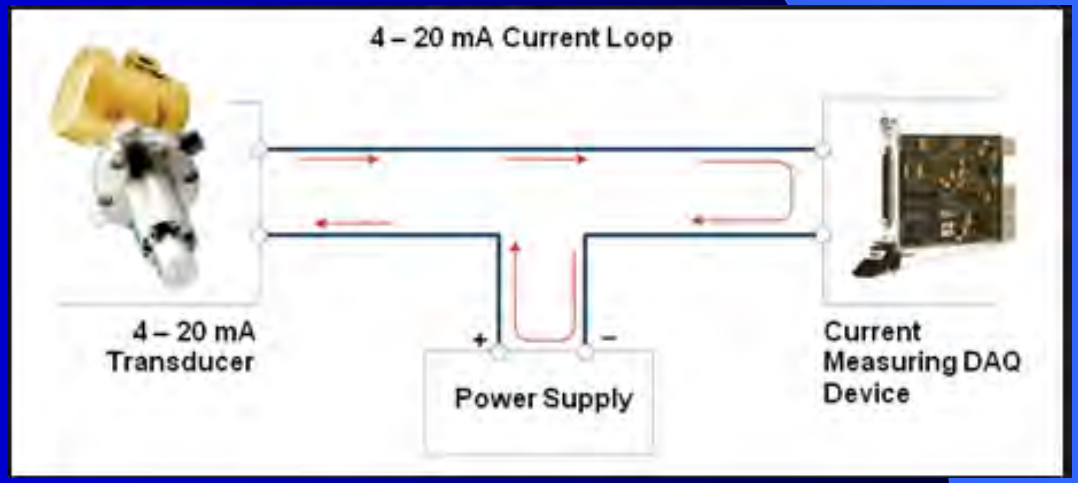
VS2k-UMB	Measuring range 10…2000m	
Technical data	Output signal	4…20mA/20…4mA
	Interface	RS485 semi-duplex wire, UMB protocol, SDI12
	Protection	IP66
	Weight	Approx. 4kg
	Dimensions	500 x 230 x 80 mm
	Op. temperature range	–40…60 °C
	Power supply	Typ. 24VDC (22…28 VDC) 3W; Peak 10W
	Included in delivery	Connection cable
	Value update	1 minute
	Cable length	10m
Visibility	Principle	Forward scattered light procedure
	Unit	m
	Accuracy	±10m or ±10%, highest value applies
Accessories	UMB Interface converter ISOCON-UMB	
	Connecting cable	
	Power supply 24 V/4 A	
	Surge protection	

- Use 4-20 mA instead of RS-485. Did not want to standardize on a visibility sensor from one manufacturer by developing a device driver.

Why 4-20 mA?


Milliamps
Current
20
19
18
17
16
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
Air pressure in psi


4-20mA Current loop Wired as Single-Ended Input
Transmitter
+
–
+
–
24
Vdc
250 Ohm
1.0 Vdc
to
5.0 Vdc
4 - 20 mA
USB2250 Terminal Block
5VDC
5K
A-In
B-In
Gnd
CØ1
CØ2

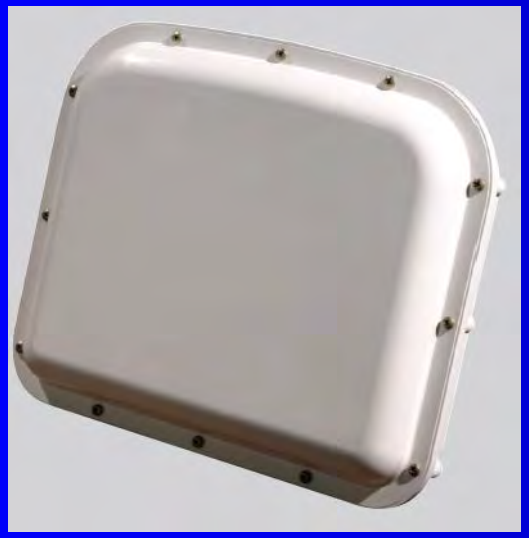

4 – 20 mA Current Loop
4 – 20 mA
Transducer
+
–
Power Supply
Current
Measuring DAQ
Device

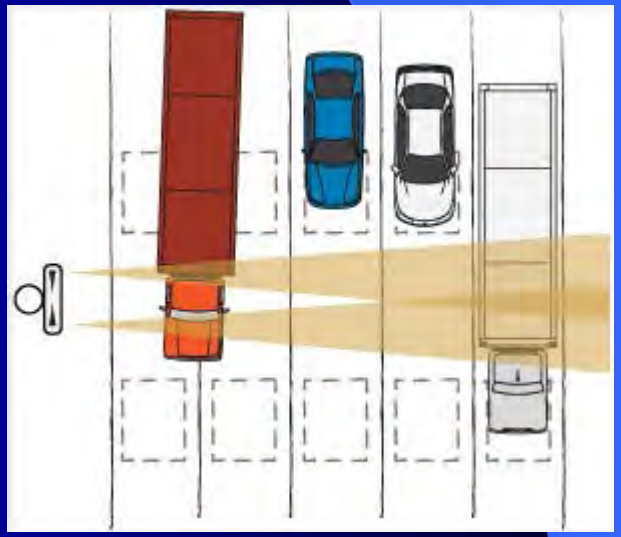
Water Level

- Contact closure thru ATC C1 connector
- Ultrasonic gap switch, float, other
- No calibration, not affected by fluid type, viscosity, density, pressure, temperature, or electrical properties.

Side Fire Microwave Radar

- Currently have a price agreement contract for the Wavetronix HD-126. Connects to the serial port of the ATC or via TCP/IP. Device driver developed as part of the ramp metering effort.





Forward Facing Radar

General Specifications	
Type	Special Application Radar
Accuracy	100% accurate with a resolution of ±0.10 unit of measure (±0.10 mph, ±0.10 km/h)
Ambient Operating Tempurature	-22° F to +158° F (-30° C to +70° C)
Available Frequencies	K-Band
Communications	RS232, DB-9 serial connector
Controls	Adjustable through software.
Cosign - Horizontal	0 - 45° (Default = 0)
Cosign - Vertical	0 - 45° (Default = 0)
Data Format (Default)	<D> [SSS] <cr> D = Direction, S = Speed, cr = Carriage Return (Note: Various other protocols can be selected)
Data Hold Time	100 to 9999 ms (Default is 2000 ms)

General Specifications - continued	
Speed Measurements	mph, km/h, feet-per-second, & meters-per-second (Default is mph)
Speed Range	5 - 150 mph (8 - 241 km/h) (Min/Max user selectable)
Standard Warranty	One-year parts & labor
Target Acquistion Time	20 ms
Water Resistance	Meets International Robustness Standard IEC 529:1989 and European Community Standard EN60529 Classification IP67

- Connects to serial port of the ATC.
- Developed a driver for the protocol. This unit is common in the industry and used in a variety of ODOT installations.

Pavement Sensor

Parameter Number	Parameter Name	Sid	Range, Resolution and Unit
01	Air temperature [1,2]	T1	-40.0 ... +60.0 °C
02	Relative humidity [1]	RH1	000.0 ... 100.0 %
03	Dew point [1]	TD1	-40.0 - +60.0 °C
11	Visibility	VI	0 ... 2000 m
14	Input Voltage	BT1	9.0 ... 30.0 V
30	Surface temperature [1]	TS1	-40.0 ... +60.0 °C
36	Surface status	ST1	WRS
42	Coverage thickness	WT1	00.00 ... 99.00 mm
61	DST111 hardware status [1]	HTS	00 ... 99
66	Surface status (same as 36)	ST3	WRS
68	Level of grip	GR3	0.00 ... 1.00
71	DSC111 hardware status	HCS	00 ... 99
72	Amount of water	WL3	00.00 ... 99.00 mm
73	Amount of ice	IL3	00.00 ... 99.00 mm
74	Amount of snow	SL3	00.00 ... 99.00 mm

- Use RS-485 to connect to serial port of the ATC.
- Developed a driver for the ATC. Vaisala approval.
- ODOT is using grip factor and visibility for changing the posted speeds in Oregon.

Analog to Ethernet

8-Channel Differential Analog Current Input Module

- 0-11mA, 0-20mA, 4-20mA, ±20mA, or 0-20 amps AC Input
- 8 analog differential current input channels
- 12 to 32V DC Power (2.8W)

XT1211: Modbus/TCP and i2o protocol
XT1212: Ethernet/IP protocol
XT1213: Profinet protocol

The XT1210 offers an isolated Ethernet network interface for up to eight differential current input channels. Isolated differential inputs deliver better measurements, superior noise rejection, and eliminate the need for current loop isolators.

Rugged construction, high density design, and easy USB-to-PC/Windows setup combine for a very effective and reliable module. These units are ideal for remote monitoring, distributed control, or SCADA applications.

Input Ranges
0 to 11mA, 0 to 20mA, 4 to 20mA, ±20mA.
0 to 20 amps AC (with optional AC sensor)

Ethernet Communication
Modbus TCP/IP, Ethernet/IP, Profinet,
i2o® peer-to-peer, 10/100Base-T(X)
PriorityChannel™ device determinism

Power Requirement
12 to 32V DC (2.8W)

- Provides a means for analog signals to get into the ATC.

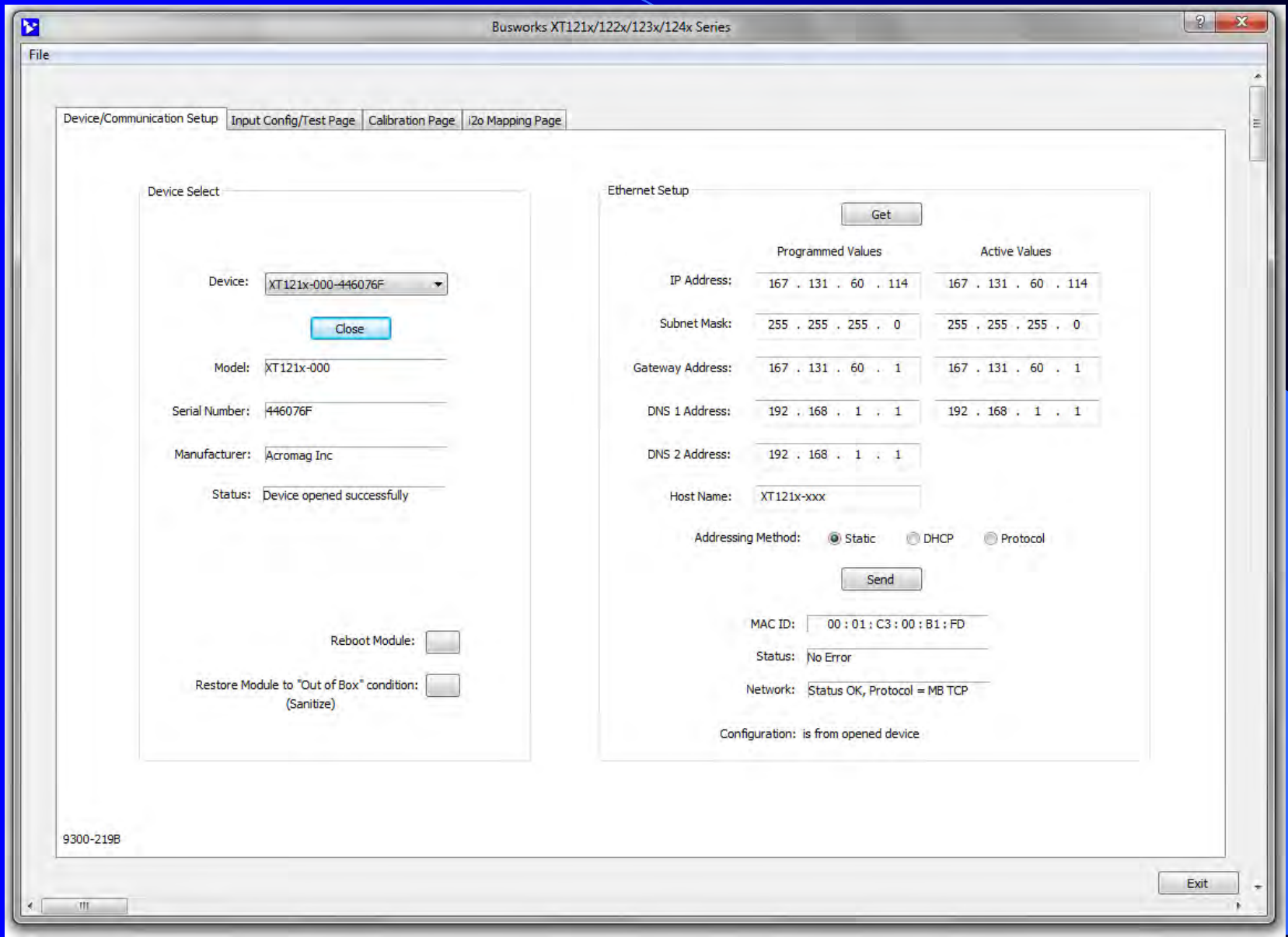
Modbus

- Modbus was first developed as a serial communications protocol, originally published by Modicon ,in 1979 for Programmable Logic Controllers (PLC).
- Developed for industrial applications
- Openly published and royalty free
- Easy to deploy and maintain
- Several versions of Modbus now
- Non-vendor specific.

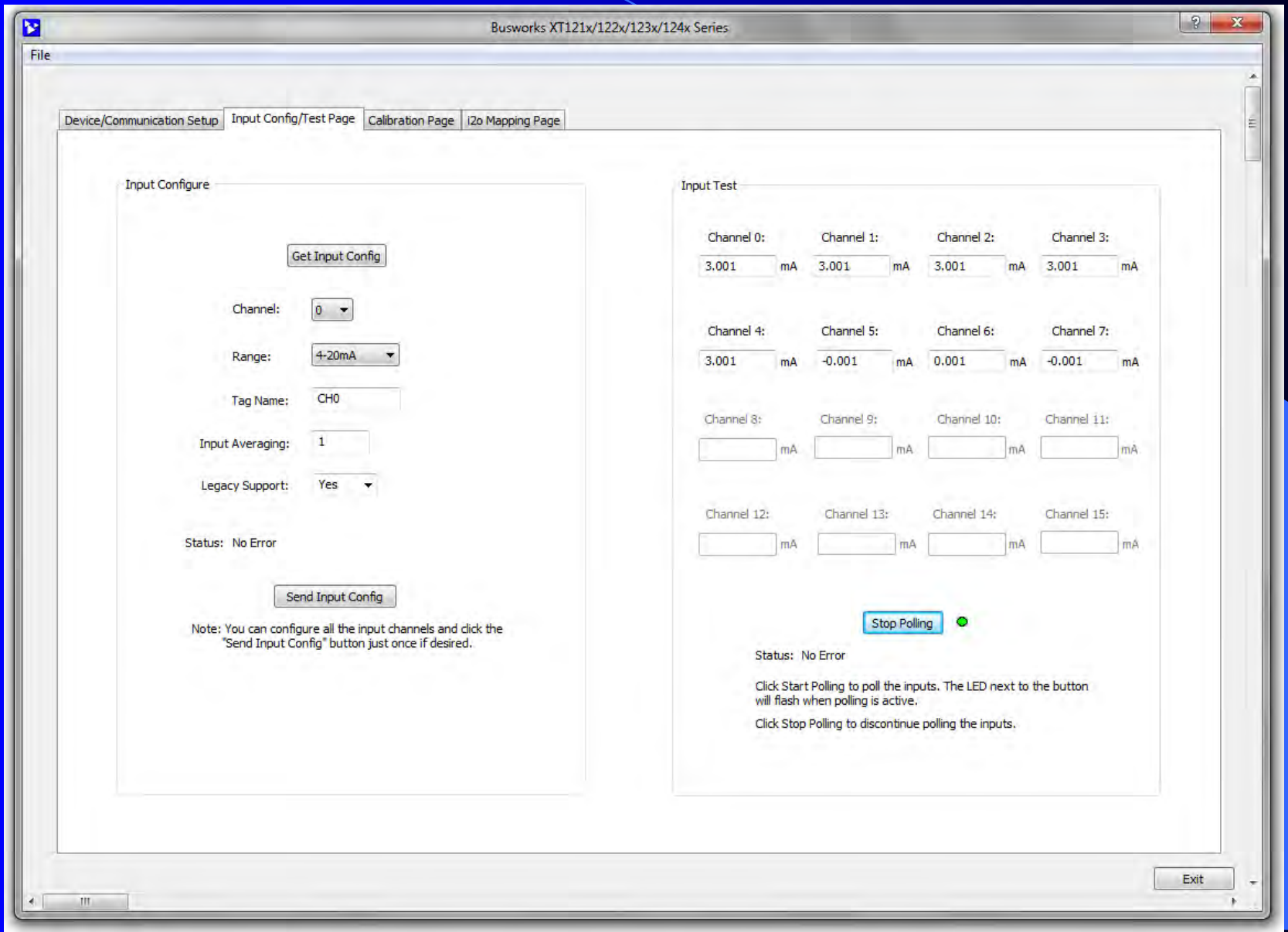
Analog to Ethernet Module

- 8 inputs per module
- Accuracy: +/- 0.05% of span
- 16 bit analog to digital converter
- -40 to 158 degrees F
- MTBF: 478,858 hours at 77 degrees F
- Power: 12 to 32 VDC
- Shock: 25g per IEC
- Vibration: 4g per IEC
- DIN rail mount

Analog to Ethernet – Device Setup



Analog to Ethernet – Input Configuration

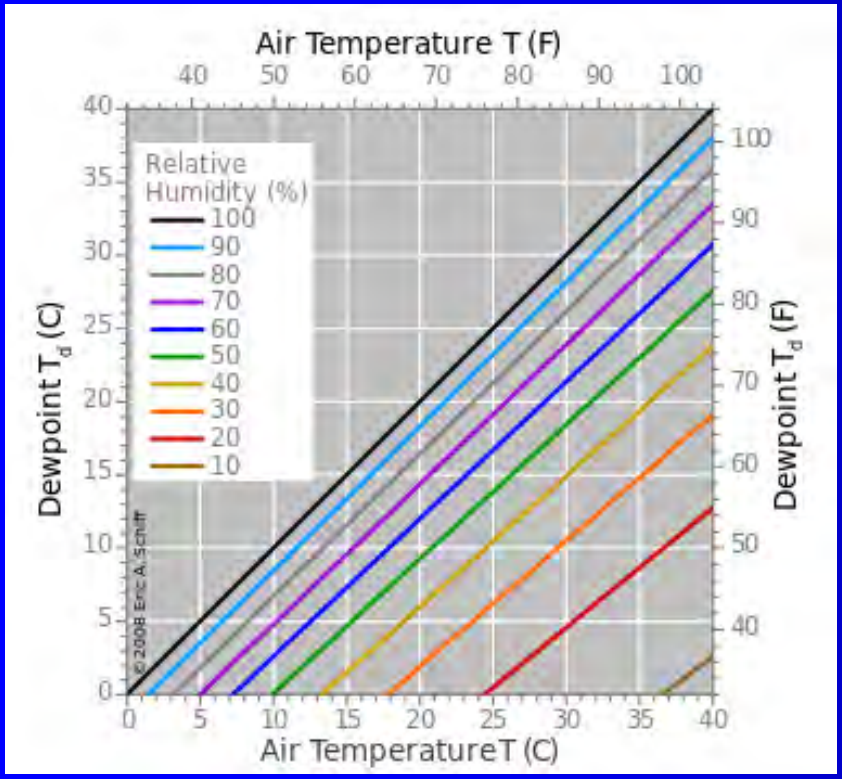


ITS Firmware - RWIS

- Wind Speed and Direction
- Temperature and Humidity
- Precipitation
- Water Level
- Visibility
- Pavement Sensor

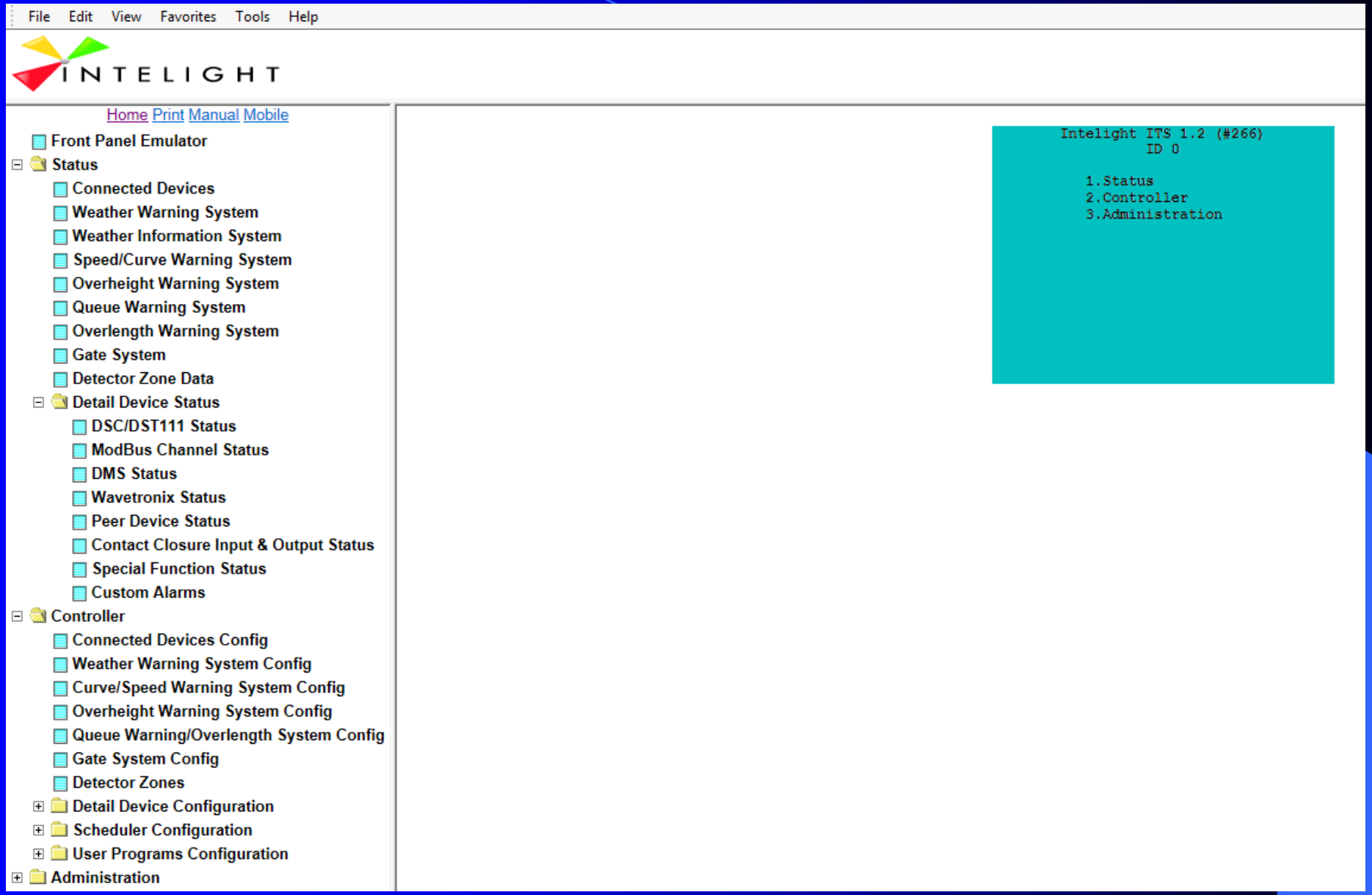
- Dew Point – maybe in the future

Dew Point

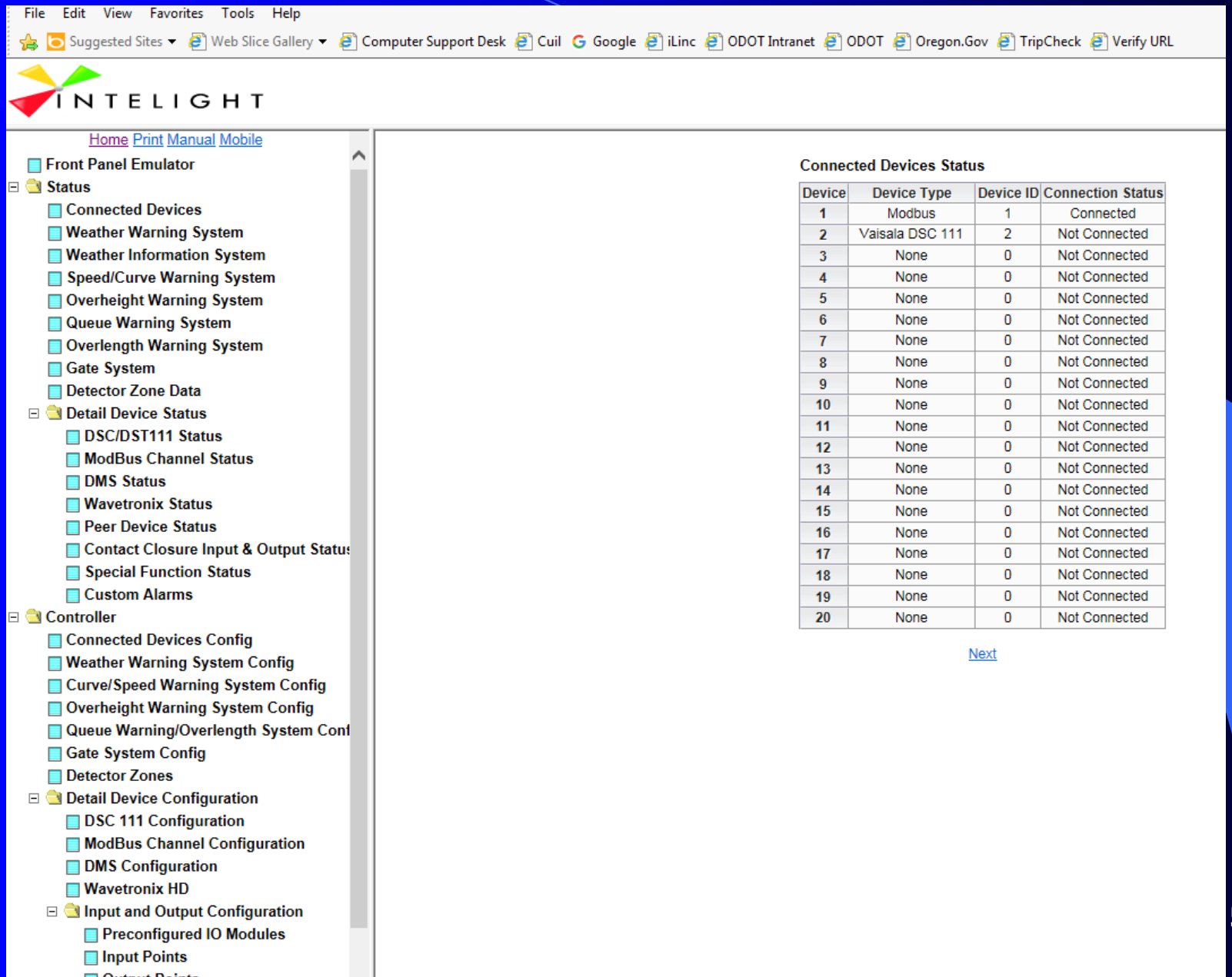


- Several formulas.
- ODOT maintenance doesn't use.

ITS Firmware

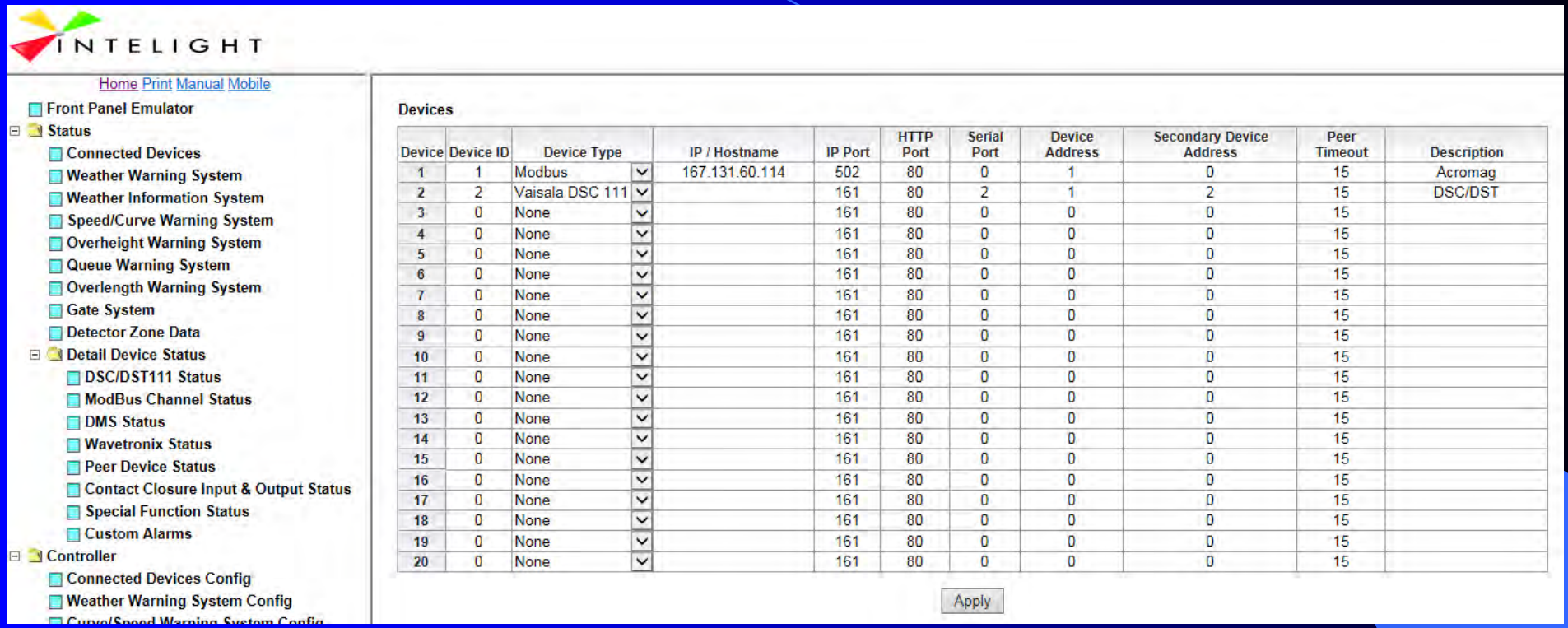


Connected Devices - Status



Device	Device Type	Device ID	Connection Status
1	Modbus	1	Connected
2	Vaisala DSC 111	2	Not Connected
3	None	0	Not Connected
4	None	0	Not Connected
5	None	0	Not Connected
6	None	0	Not Connected
7	None	0	Not Connected
8	None	0	Not Connected
9	None	0	Not Connected
10	None	0	Not Connected
11	None	0	Not Connected
12	None	0	Not Connected
13	None	0	Not Connected
14	None	0	Not Connected
15	None	0	Not Connected
16	None	0	Not Connected
17	None	0	Not Connected
18	None	0	Not Connected
19	None	0	Not Connected
20	None	0	Not Connected

Connected Devices - Configuration



Device	Device ID	Device Type	IP / Hostname	IP Port	HTTP Port	Serial Port	Device Address	Secondary Device Address	Peer Timeout	Description
1	1	Modbus	167.131.60.114	502	80	0	1	0	15	Acromag
2	2	Vaisala DSC 111		161	80	2	1	2	15	DSC/DST
3	0	None		161	80	0	0	0	15	
4	0	None		161	80	0	0	0	15	
5	0	None		161	80	0	0	0	15	
6	0	None		161	80	0	0	0	15	
7	0	None		161	80	0	0	0	15	
8	0	None		161	80	0	0	0	15	
9	0	None		161	80	0	0	0	15	
10	0	None		161	80	0	0	0	15	
11	0	None		161	80	0	0	0	15	
12	0	None		161	80	0	0	0	15	
13	0	None		161	80	0	0	0	15	
14	0	None		161	80	0	0	0	15	
15	0	None		161	80	0	0	0	15	
16	0	None		161	80	0	0	0	15	
17	0	None		161	80	0	0	0	15	
18	0	None		161	80	0	0	0	15	
19	0	None		161	80	0	0	0	15	
20	0	None		161	80	0	0	0	15	

Serial Port Settings

Serial Port Settings

Port	Description	Function	Drop Address	Speed	Data Bits	Stop Bits	Parity	Flow Control	CTS Delay	RTS Extension
1	PORT 2/C21S	None	1	9600	8	1	None	None	0	0
2	AUX_P3/C22S	None	1	9600	8	1	None	None	0	0
3	PORT 1	None	1	9600	8	1	None	None	0	0
4	COMA/C50S	None	1	9600	8	1	None	None	0	0
5	FIELD_IO	None	1	9600	8	1	None	None	0	0
6	DISPLAY/C60M	None	1	9600	8	1	None	None	0	0
7	SP7	None	1	9600	8	1	None	None	0	0
8	SP8	None	1	9600	8	1	None	None	0	0
9	COM9	None	1	9600	8	1	None	None	0	0
10	COM10	None	1	9600	8	1	None	None	0	0

Apply

Modbus Channels Mapping

INTELIGHT

Home Print Manual Mobile

- Front Panel Emulator
- Status
  - Connected Devices
  - Weather Warning System
  - Weather Information System
  - Speed/Curve Warning System
  - Overheight Warning System
  - Queue Warning System
  - Overlength Warning System
  - Gate System
  - Detector Zone Data
  - Detail Device Status
    - DSC/DST111 Status
    - ModBus Channel Status
    - DMS Status
    - Wavetronix Status
    - Peer Device Status
    - Contact Closure Input & Output Status
    - Special Function Status
    - Custom Alarms
- Controller
  - Connected Devices Config
  - Weather Warning System Config

ModBus Channels Mapping

Channel	ModBus Device Global ID	Channel Type	ModBus Address	Sensor Type	Sensor Index	Scaling Multiplier	Scaling Divisor	Scaling Add	Min Valid Value	Max Valid Value
1	1	Analog	4	Anemometer	1	1	20	0	-100	20100
2	1	Analog	4	Wind Vane	1	355	20000	0	-100	20100
3	1	Analog	4	Humidity	1	1	20	0	-100	20100
4	1	Analog	4	Air Temperature	1	1	20	-500	-100	20100
5	0	None	0	None	0	1	1	0	-3276	32767
6	0	None	0	None	0	1	1	0	-3276	32767
7	0	None	0	None	0	1	1	0	-3276	32767
8	0	None	0	None	0	1	1	0	-3276	32767
9	0	None	0	None	0	1	1	0	-3276	32767
10	0	None	0	None	0	1	1	0	-3276	32767
11	0	None	0	None	0	1	1	0	-32768	32767
12	0	None	0	None	0	1	1	0	-32768	32767
13	0	None	0	None	0	1	1	0	-32768	32767
14	0	None	0	None	0	1	1	0	-32768	32767
15	0	None	0	None	0	1	1	0	-32768	32767
16	0	None	0	None	0	1	1	0	-32768	32767
17	0	None	0	None	0	1	1	0	-32768	32767
18	0	None	0	None	0	1	1	0	-32768	32767
19	0	None	0	None	0	1	1	0	-32768	32767
20	0	None	0	None	0	1	1	0	-32768	32767

Apply

Weather Information System

Atmospheric Sensors

Weather Station	1
Current Wind Speed	50.0
Avg Wind Speed	49.9
Max Gust Speed	50.0
Current Wind Direction	180
Avg Wind Direction	180
Avg Wind Direction Compass	South
Air Temp	0.0
Relative Humidity	50.0
Precipitation	N/A
Visibility	N/A
Water Level	N/A
Level Of Grip	N/A

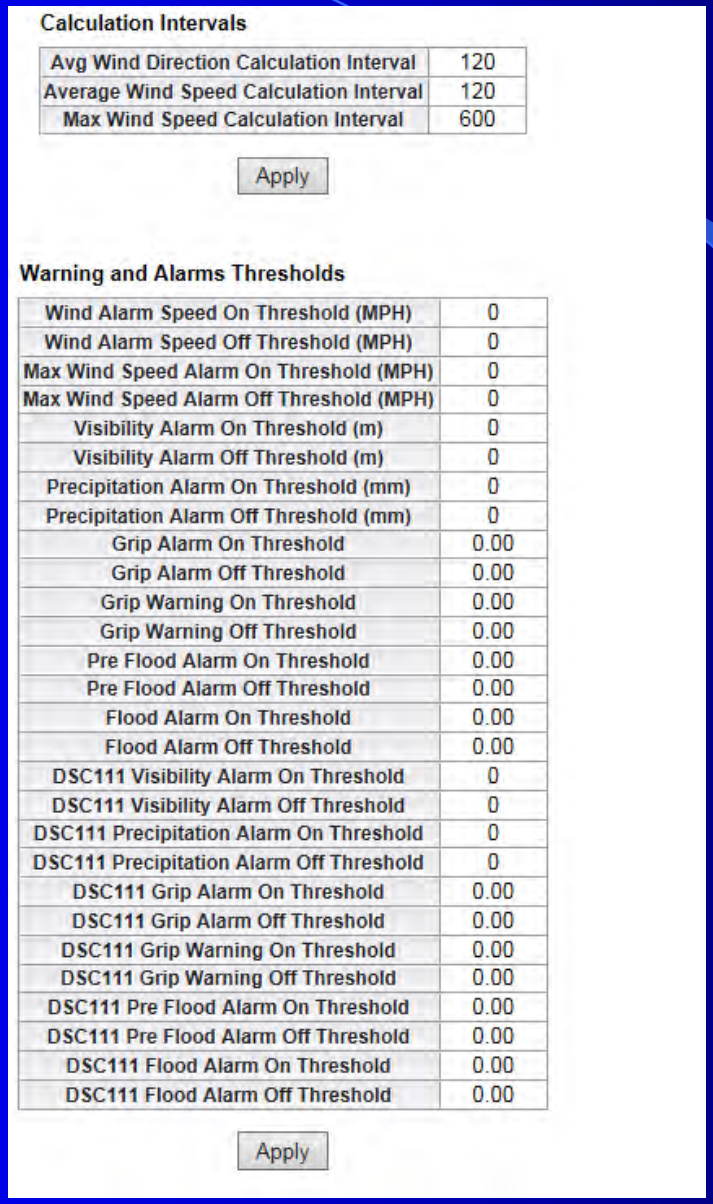
Next

Pavement DSC/DST 111 Sensor

Weather Station	1
Air Temperature	23.5
Relative Humidity	41.2
Dew Point	9.6
Visibility	N/A
Input Voltage	27.1
Surface Temperature	22.7
DST111 Hardware Status	Hardware OK
Surface Status	2
Surface Warning	No Warning
Surface State	Moist
Level Of Grip	0.81
DSC111 Hardware Status	0
Main Hardware Status	Hardware Ok
Receiver Window Status	Clear
Amount Of Water	0.00
Amount Of Snow	0.00
Amount Of Ice	0.00

Next

Weather Warning System - Configuration



Calculation Intervals

Avg Wind Direction Calculation Interval	120
Average Wind Speed Calculation Interval	120
Max Wind Speed Calculation Interval	600

Apply

Warning and Alarms Thresholds

Wind Alarm Speed On Threshold (MPH)	0
Wind Alarm Speed Off Threshold (MPH)	0
Max Wind Speed Alarm On Threshold (MPH)	0
Max Wind Speed Alarm Off Threshold (MPH)	0
Visibility Alarm On Threshold (m)	0
Visibility Alarm Off Threshold (m)	0
Precipitation Alarm On Threshold (mm)	0
Precipitation Alarm Off Threshold (mm)	0
Grip Alarm On Threshold	0.00
Grip Alarm Off Threshold	0.00
Grip Warning On Threshold	0.00
Grip Warning Off Threshold	0.00
Pre Flood Alarm On Threshold	0.00
Pre Flood Alarm Off Threshold	0.00
Flood Alarm On Threshold	0.00
Flood Alarm Off Threshold	0.00
DSC111 Visibility Alarm On Threshold	0
DSC111 Visibility Alarm Off Threshold	0
DSC111 Precipitation Alarm On Threshold	0
DSC111 Precipitation Alarm Off Threshold	0
DSC111 Grip Alarm On Threshold	0.00
DSC111 Grip Alarm Off Threshold	0.00
DSC111 Grip Warning On Threshold	0.00
DSC111 Grip Warning Off Threshold	0.00
DSC111 Pre Flood Alarm On Threshold	0.00
DSC111 Pre Flood Alarm Off Threshold	0.00
DSC111 Flood Alarm On Threshold	0.00
DSC111 Flood Alarm Off Threshold	0.00

Apply

Outputs

Output Points

IO Module: 1

Output Point	Description	Output Control Type	Index
1	C1-2	Not Active	0
2	C1-3	Not Active	0
3	C1-4	Not Active	0
4	C1-5	Not Active	0
5	C1-6	Not Active	0
6	C1-7	Not Active	0
7	C1-8	Not Active	0
8	C1-9	Not Active	0
9	C1-10	Not Active	0
10	C1-11	Not Active	0
11	C1-12	Not Active	0
12	C1-13	Not Active	0
13	C1-15	Not Active	0
14	C1-16	Not Active	0
15	C1-17	Not Active	0
16	C1-18	Not Active	0
17	C1-19	Not Active	0
18	C1-20	Not Active	0
19	C1-21	Not Active	0
20	C1-22	Not Active	0
21	C1-23	Not Active	0
22	C1-24	Not Active	0
23	C1-25	Not Active	0
24	C1-26	Not Active	0
25	C1-27	Not Active	0
26	C1-28	Not Active	0
27	C1-29	Not Active	0
28	C1-30	Not Active	0
29	C1-31	Not Active	0
30	C1-32	Not Active	0
31	C1-33	Not Active	0
32	C1-34	Not Active	0

Not Active
Aux Function On
Global Variable
Special Function On
Watchdog
Wind Alarm Status
Water Level Warning
Water Level Alarm
Visibility Alarm
Precipitation Alarm
Grip Warning
Grip Alarm
DSC111 Visibility Alarm
DSC111 Precipitation Alarm
DSC111 Grip Warning
DSC111 Grip Alarm
DSC111 Pre Flood Alarm
DSC111 Flood Alarm
Speed Alarm
Gate Close Output
Gate Open Output
Gate Closed Sign Output
Overheight Alarm
Overheight Warning
Queue Alarm Per Lane
Global Queue Alarm
Overlength Alarm Per Lane
Global Overlength Alarm

Apply

Queue Warning - Configuration

Global Queue Alarm DMS Actions

Apply

Global Overlength Alarm DMSActions

Apply

Queue Warning Lanes Configuration

Lane	1	2	3	4	5
Mode	Disabled	Disabled	Disabled	Disabled	Disabled
Sample Period	0	0	0	0	0
Lead Detector Number	0	0	0	0	0
Lead Zone Length (ft)	0.0	0.0	0.0	0.0	0.0
Trail Detector Number	0	0	0	0	0
Trail Zone Length (ft)	0.0	0.0	0.0	0.0	0.0
Speed Trap Spacing (ft)	0.0	0.0	0.0	0.0	0.0
Vehicle Length (ft)	0.0	0.0	0.0	0.0	0.0
Wavetronix Number	0	0	0	0	0
Wavetronix Lane Number	0	0	0	0	0
Erratic Count	0	0	0	0	0
Max Presence	0	0	0	0	0
No Activity	0	0	0	0	0

Apply

Next

Alarm Configuration

Lane	1	2	3	4	5
Volume Alarm On	0	0	0	0	0
Volume Alarm Off	0	0	0	0	0
Occ Alarm On	0	0	0	0	0
Occ Alarm Off	0	0	0	0	0
Speed Alarm On (mph)	0	0	0	0	0
Speed Alarm Off (mph)	0	0	0	0	0
Length Alarm On (ft)	0.0	0.0	0.0	0.0	0.0
Min Alarm Time (sec)	0	0	0	0	0
Queue Alarm DMS Actions					
Overlength Alam DMS Actions					

Apply

Next

Queue Warning - Status

Queue Warning Lanes Status

Lane	End Time	Volume Data	Percent Occupancy	Speed Data (mph)	Lane Status	Lead Status	Trail Status
1	Unknown	N/A	N/A	N/A	Disabled	Disabled	Disabled
2	Unknown	N/A	N/A	N/A	Disabled	Disabled	Disabled
3	Unknown	N/A	N/A	N/A	Disabled	Disabled	Disabled
4	Unknown	N/A	N/A	N/A	Disabled	Disabled	Disabled
5	Unknown	N/A	N/A	N/A	Disabled	Disabled	Disabled
6	Unknown	N/A	N/A	N/A	Disabled	Disabled	Disabled
7	Unknown	N/A	N/A	N/A	Disabled	Disabled	Disabled
8	Unknown	N/A	N/A	N/A	Disabled	Disabled	Disabled
9	Unknown	N/A	N/A	N/A	Disabled	Disabled	Disabled
10	Unknown	N/A	N/A	N/A	Disabled	Disabled	Disabled

Queue Warning Alarms Status

Lane	Queue Alarm	Speed Alarm	Occupancy Alarm	Volume Alarm
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				

Global Alarm

Queue Alarm

Queue Warning - Detector Zone Data

Detector Zone Data

Zone	End Time	Volume	Occupancy	Speed (mph)	85 Percent Speed (mph)	Status
1	Unknown	N/A	N/A	N/A	N/A	Disabled
2	Unknown	N/A	N/A	N/A	N/A	Disabled
3	Unknown	N/A	N/A	N/A	N/A	Disabled
4	Unknown	N/A	N/A	N/A	N/A	Disabled
5	Unknown	N/A	N/A	N/A	N/A	Disabled
6	Unknown	N/A	N/A	N/A	N/A	Disabled
7	Unknown	N/A	N/A	N/A	N/A	Disabled
8	Unknown	N/A	N/A	N/A	N/A	Disabled
9	Unknown	N/A	N/A	N/A	N/A	Disabled
10	Unknown	N/A	N/A	N/A	N/A	Disabled
11	Unknown	N/A	N/A	N/A	N/A	Disabled
12	Unknown	N/A	N/A	N/A	N/A	Disabled
13	Unknown	N/A	N/A	N/A	N/A	Disabled
14	Unknown	N/A	N/A	N/A	N/A	Disabled
15	Unknown	N/A	N/A	N/A	N/A	Disabled
16	Unknown	N/A	N/A	N/A	N/A	Disabled
17	Unknown	N/A	N/A	N/A	N/A	Disabled
18	Unknown	N/A	N/A	N/A	N/A	Disabled
19	Unknown	N/A	N/A	N/A	N/A	Disabled
20	Unknown	N/A	N/A	N/A	N/A	Disabled
21	Unknown	N/A	N/A	N/A	N/A	Disabled
22	Unknown	N/A	N/A	N/A	N/A	Disabled
23	Unknown	N/A	N/A	N/A	N/A	Disabled
24	Unknown	N/A	N/A	N/A	N/A	Disabled
25	Unknown	N/A	N/A	N/A	N/A	Disabled
26	Unknown	N/A	N/A	N/A	N/A	Disabled
27	Unknown	N/A	N/A	N/A	N/A	Disabled
28	Unknown	N/A	N/A	N/A	N/A	Disabled
29	Unknown	N/A	N/A	N/A	N/A	Disabled
30	Unknown	N/A	N/A	N/A	N/A	Disabled
31	Unknown	N/A	N/A	N/A	N/A	Disabled
32	Unknown	N/A	N/A	N/A	N/A	Disabled

Next

Gate - Status

Gate

Gate	1	2	3	4
Status	Opened	Unknown	Unknown	Unknown
Sign Delay Remaining	0	0	0	0
Closed Limit Input Status				
Open Limit Input Status	X			
Open Request Input Status				
Close Request Input Status				
Open Control Output				
Close Control Output				

Gate System Control

Gate	Manual Gate Control
1	None
2	None
3	None
4	None

Apply

Gate – Inputs/Outputs

Input Points

IO Module: 1

Input Point	Description	Input Control Type	Index
1	C1-39	Not Active	0
2	C1-40	Not Active	0
3	C1-41	Not Active	0
4	C1-42	Not Active	0
5	C1-43	Not Active	0
6	C1-44	Not Active	0
7	C1-45	Not Active	0
8	C1-46	Not Active	0
9	C1-47	Not Active	0
10	C1-48	Not Active	0
11	C1-49	Not Active	0
12	C1-50	Not Active	0
13	C1-51	Not Active	0
14	C1-52	Not Active	0
15	C1-53	Gate Status Open Input	1
16	C1-54	Gate Status Close Input	1
17	C1-55	Gate Request Open Input	1
18	C1-56	Gate Request Close Input	1
19	C1-57	Gate Request Open Input	1
20	C1-58	Gate Request Close Input	1
21	C1-59	Not Active	0
22	C1-60	Not Active	0
23	C1-61	Not Active	0
24	C1-62	Not Active	0
25	C11-10	Not Active	0
26	C11-11	Not Active	0
27	C11-12	Not Active	0
28	C11-13	Not Active	0
29	C1-63	Not Active	0
30	C1-64	Not Active	0
31	C1-65	Not Active	0
32	C1-66	Not Active	0

Apply

Output Points

IO Module: 1

Output Point	Description	Output Control Type	Index
1	C1-2	Gate Open Output	1
2	C1-3	Gate Close Output	1
3	C1-4	Gate Closed Sign Output	1
4	C1-5	Not Active	0
5	C1-6	Not Active	0
6	C1-7	Not Active	0
7	C1-8	Not Active	0
8	C1-9	Not Active	0
9	C1-10	Not Active	0
10	C1-11	Not Active	0
11	C1-12	Not Active	0
12	C1-13	Not Active	0
13	C1-15	Not Active	0
14	C1-16	Not Active	0
15	C1-17	Not Active	0
16	C1-18	Not Active	0
17	C1-19	Not Active	0
18	C1-20	Not Active	0
19	C1-21	Not Active	0
20	C1-22	Not Active	0
21	C1-23	Not Active	0
22	C1-24	Not Active	0
23	C1-25	Not Active	0
24	C1-26	Not Active	0
25	C1-27	Not Active	0
26	C1-28	Not Active	0
27	C1-29	Not Active	0
28	C1-30	Not Active	0
29	C1-31	Not Active	0
30	C1-32	Not Active	0
31	C1-33	Not Active	0
32	C1-34	Not Active	0

Apply

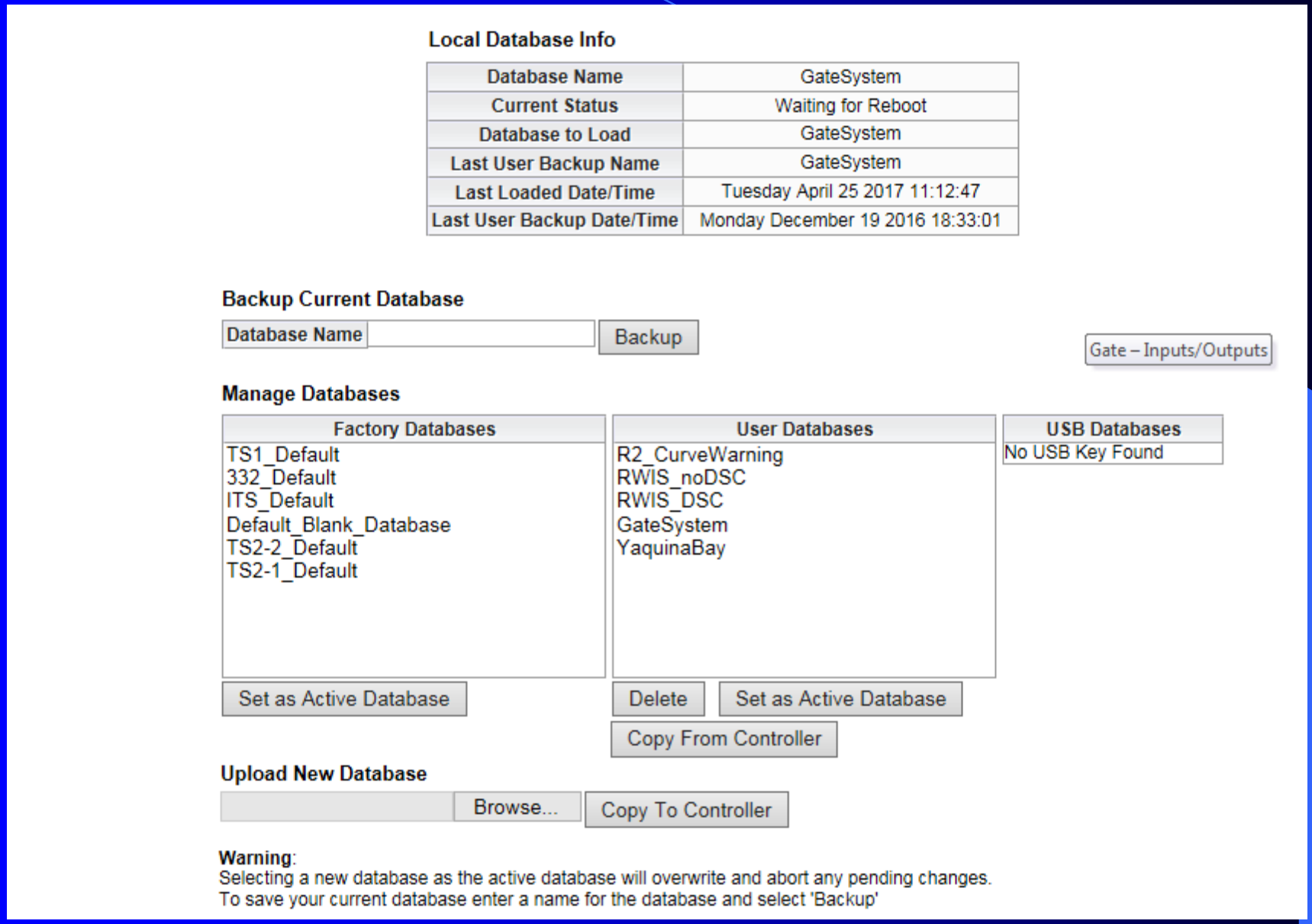
Gate - User Program

Program 1: Main, Other Programs: Sub Routines

Program: 1

Statement	Result Value	Result	Index	Operation	Parameter A	Index	Parameter B	Index	Delay	Extension	Description
1	0	Global Variable	1	Result=A	Gate Closed Sign Status	1	None	0	0.0	0.0	
2	0	Sign Status	2	Result=A Peer B	Global Variable	1	Number	1	0.0	0.0	
3	0	Sign Status	1	Result=A	Gate Closed Sign Status	1	None	0	0.0	0.0	
4	0	None	0	None	None	0	None	0	0.0	0.0	
5	0	None	0	None	None	0	None	0	0.0	0.0	
6	0	None	0	None	None	0	None	0	0.0	0.0	
7	0	None	0	None	None	0	None	0	0.0	0.0	
8	0	None	0	None	None	0	None	0	0.0	0.0	
9	0	None	0	None	None	0	None	0	0.0	0.0	
10	0	None	0	None	None	0	None	0	0.0	0.0	
11	0	None	0	None	None	0	None	0	0.0	0.0	
12	0	None	0	None	None	0	None	0	0.0	0.0	
13	0	None	0	None	None	0	None	0	0.0	0.0	
14	0	None	0	None	None	0	None	0	0.0	0.0	
15	0	None	0	None	None	0	None	0	0.0	0.0	
16	0	None	0	None	None	0	None	0	0.0	0.0	

ITS Firmware - Database



Local Database Info

Database Name	GateSystem
Current Status	Waiting for Reboot
Database to Load	GateSystem
Last User Backup Name	GateSystem
Last Loaded Date/Time	Tuesday April 25 2017 11:12:47
Last User Backup Date/Time	Monday December 19 2016 18:33:01

Backup Current Database

Database Name [ ] Backup

Gate – Inputs/Outputs

Manage Databases

Factory Databases	User Databases	USB Databases
TS1_Default 332_Default ITS_Default Default_Blank_Database TS2-2_Default TS2-1_Default	R2_CurveWarning RWIS_noDSC RWIS_DSC GateSystem YaquinaBay	No USB Key Found

Set as Active Database | Delete | Set as Active Database

Copy From Controller

Upload New Database

[ ] Browse... Copy To Controller

Warning:
Selecting a new database as the active database will overwrite and abort any pending changes.
To save your current database enter a name for the database and select 'Backup'

Event Logs and Sensor and Systems Recoding

Log Number	Description
1	04/28/17 10:01:30 Wind Alarm Sign 1 Off
2	04/28/17 10:01:30 Weather Alarm Sign 1 off
3	04/28/17 10:01:30 Gate Close Status 1 off
4	04/28/17 09:59:45 Gate Close Status 1 on
5	04/28/17 09:59:44 Gate Open Status 1 off
6	04/28/17 09:59:17 Gate Open Request 1 off
7	04/28/17 09:59:15 Gate Open Request 1 on
8	04/28/17 09:59:13 Gate Close Request 1 off
9	04/28/17 09:59:13 Wind Alarm Sign 1 On
10	04/28/17 09:59:13 Weather Alarm Sign 1 on
11	04/28/17 09:59:12 Gate Close Request 1 on
12	04/28/17 09:58:42 Wind Alarm Sign 1 Off
13	04/28/17 09:58:42 Weather Alarm Sign 1 off
14	04/28/17 09:58:42 Gate Open Status 1 on
15	04/28/17 09:58:41 Gate Close Status 1 off
16	04/28/17 09:58:36 Gate Close Status 1 on
17	04/28/17 09:58:35 Gate Open Status 1 off
18	04/28/17 09:57:53 Wind Alarm Sign 1 On
19	04/28/17 09:57:53 Weather Alarm Sign 1 on
20	04/28/17 09:56:08 Gate Open Status 1 on
21	04/28/17 09:55:42 Wind Alarm Sign 1 Off
22	04/28/17 09:55:41 Weather Alarm Sign 1 off
23	04/28/17 09:54:43 Gate Open Status 1 off
24	04/28/17 09:54:12 Gate Close Request 1 off
25	04/28/17 09:54:12 Wind Alarm Sign 1 On
26	04/28/17 09:54:11 Weather Alarm Sign 1 on

Status	Running
Log Size (Kb)	0

Log Enabled	Enabled
Log File Storage	USB
Log History (hours)	1000
Delete Log File	No Action

Apply

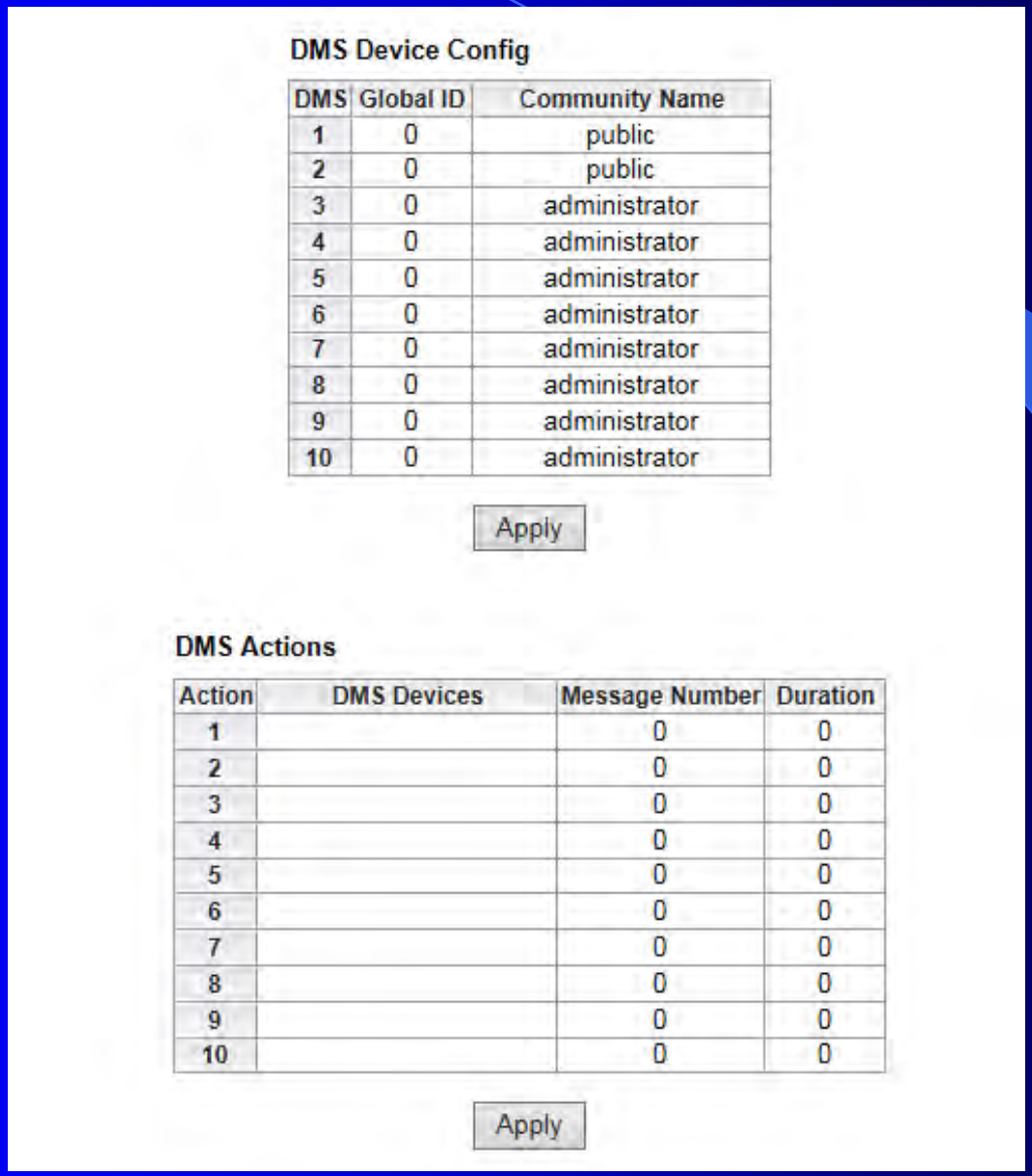
CSV log format

- current hourly log

XML log format

- current hourly log

DMS Message Configuration



DMS Device Config

DMS	Global ID	Community Name
1	0	public
2	0	public
3	0	administrator
4	0	administrator
5	0	administrator
6	0	administrator
7	0	administrator
8	0	administrator
9	0	administrator
10	0	administrator

Apply

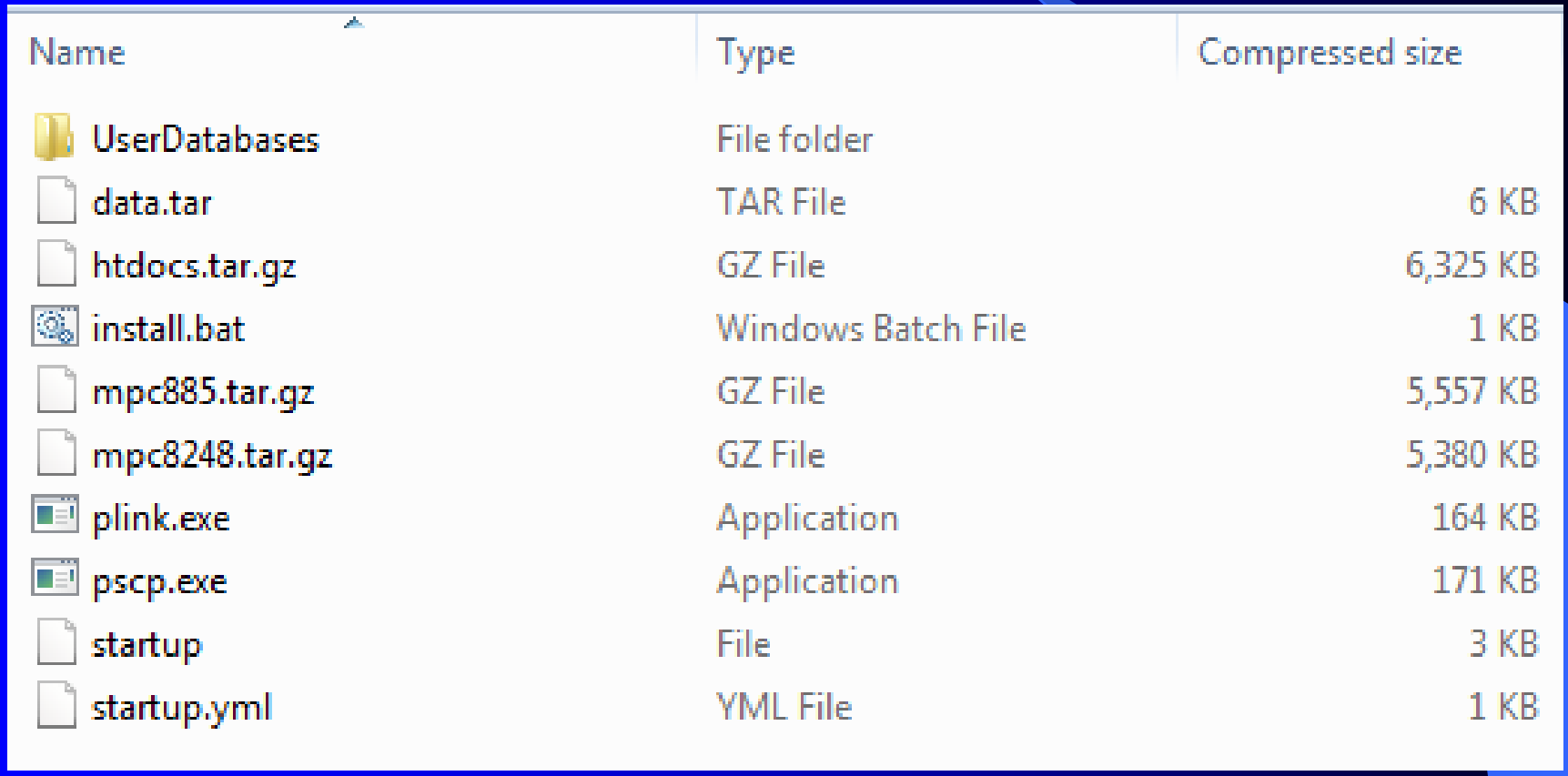
DMS Actions

Action	DMS Devices	Message Number	Duration
1		0	0
2		0	0
3		0	0
4		0	0
5		0	0
6		0	0
7		0	0
8		0	0
9		0	0
10		0	0

Apply

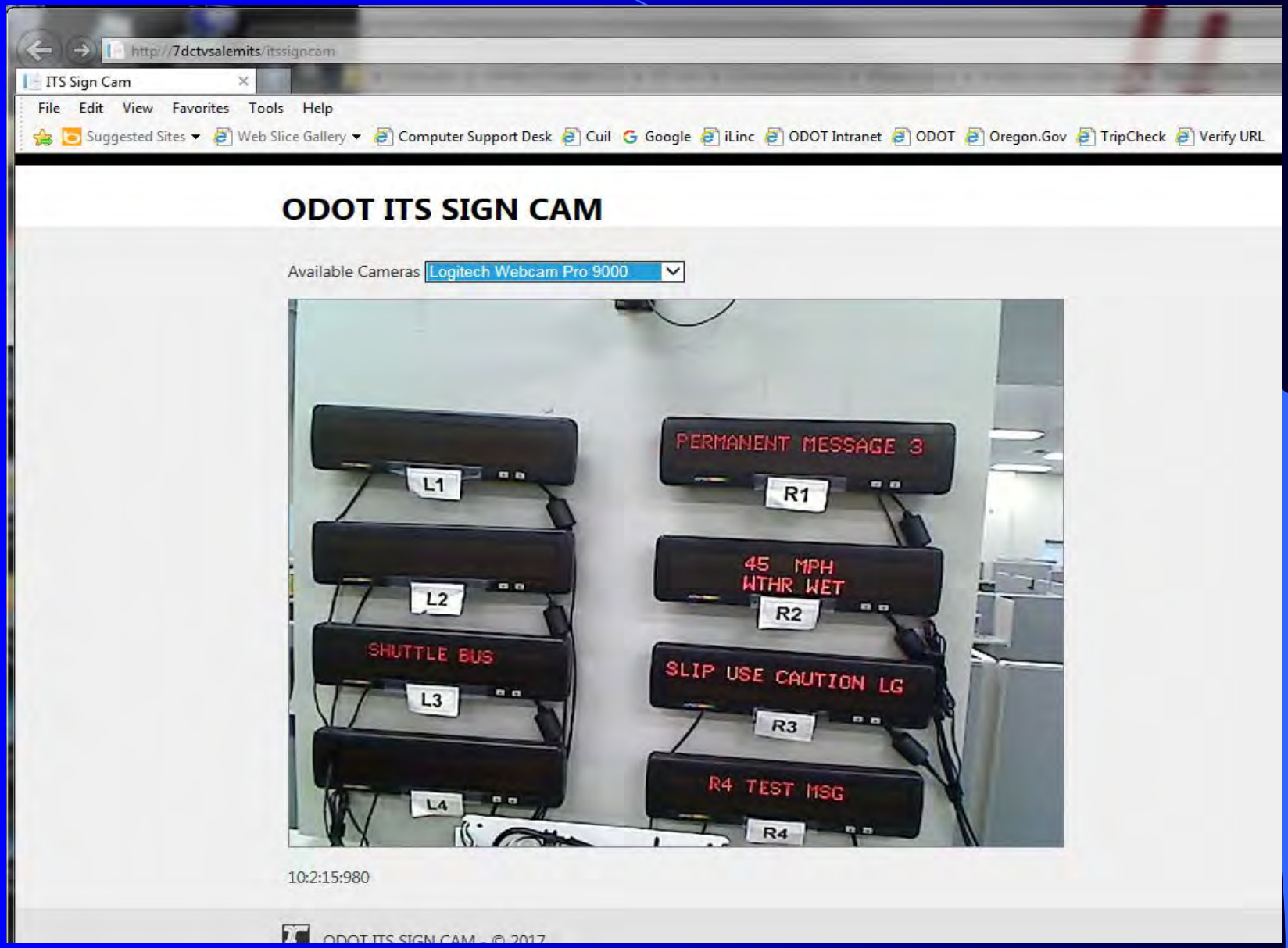
Bench Testing

Files – For Sean Campbell



Name	Type	Compressed size
UserDatabases	File folder	
data.tar	TAR File	6 KB
htdocs.tar.gz	GZ File	6,325 KB
install.bat	Windows Batch File	1 KB
mpc885.tar.gz	GZ File	5,557 KB
mpc8248.tar.gz	GZ File	5,380 KB
plink.exe	Application	164 KB
pscp.exe	Application	171 KB
startup	File	3 KB
startup.yml	YML File	1 KB

VMS Testing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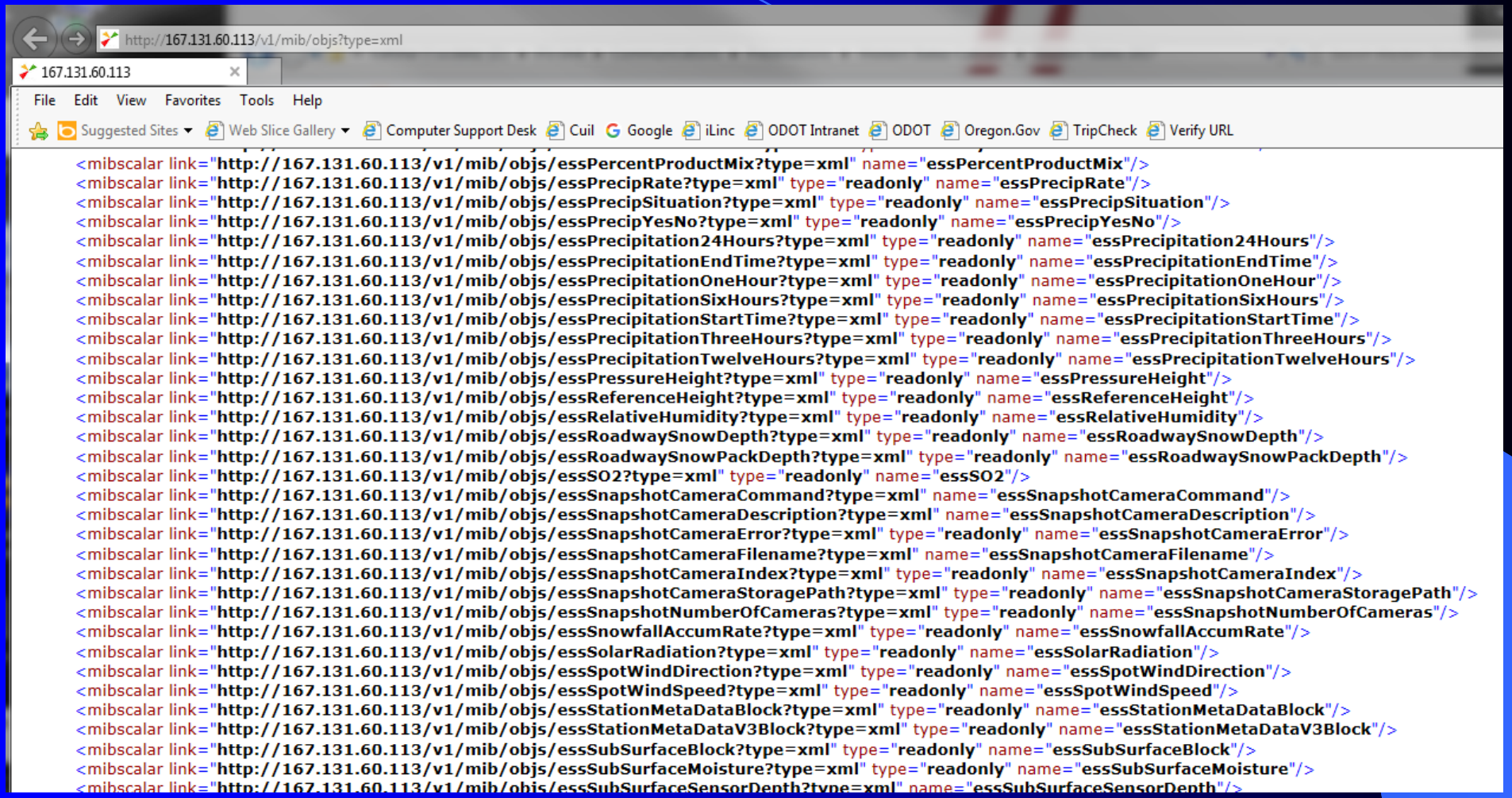
File Edit View Favorites Tools Help
Suggested Sites
Web Slice Gallery
Computer Support Desk
Cuil
Google
iLinc
ODOT Intranet
ODOT
Oregon.Gov
TripCheck
Verify URL
ODOT ITS SIGN CAM
Available Cameras
Logitech Webcam Pro 9000
L1
L2
SHUTTLE BUS
L3
L4
PERMANENT MESSAGE 3
R1
45 MPH
WTHR WET
R2
SLIP USE CAUTION LG
R3
R4 TEST MSG
R4
10:2:15:980
ODOT ITS SIGN CAM - © 2017

XML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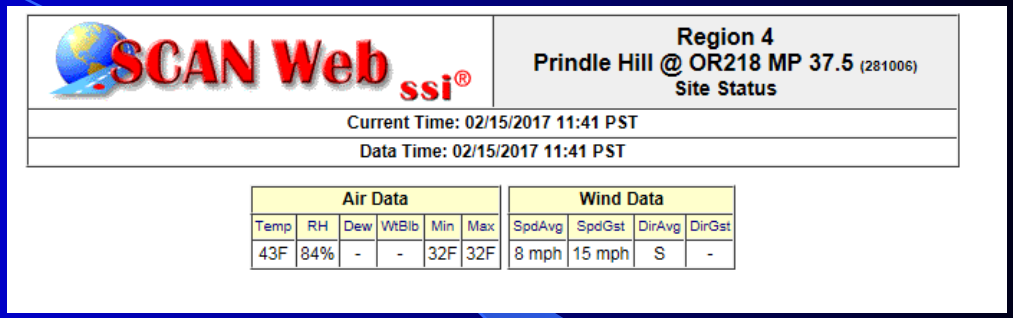
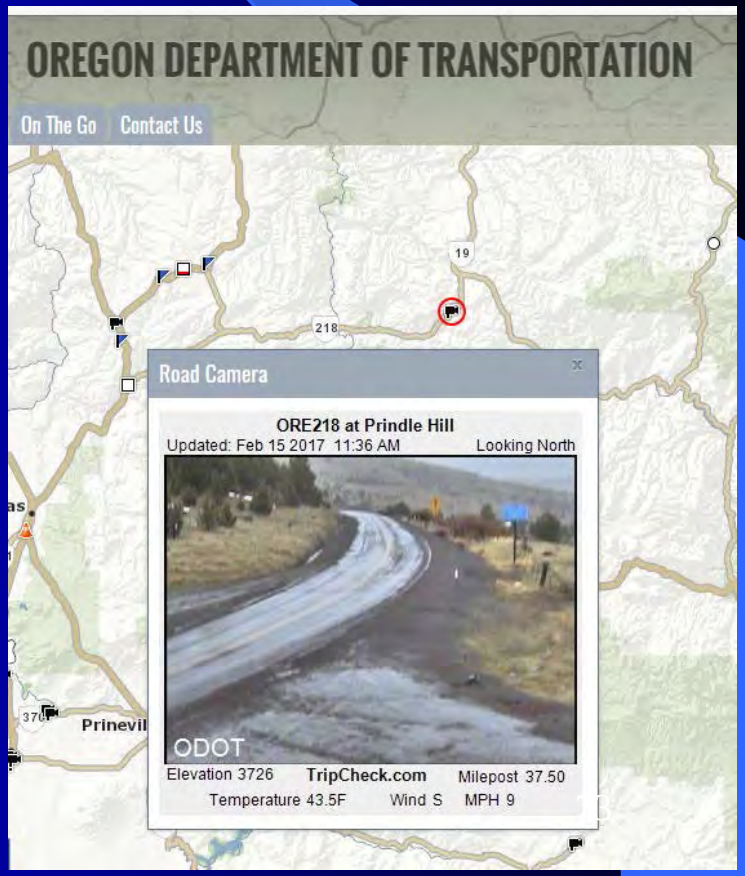
New Deployments Using ITS Firmware

Road and Weather Information Station



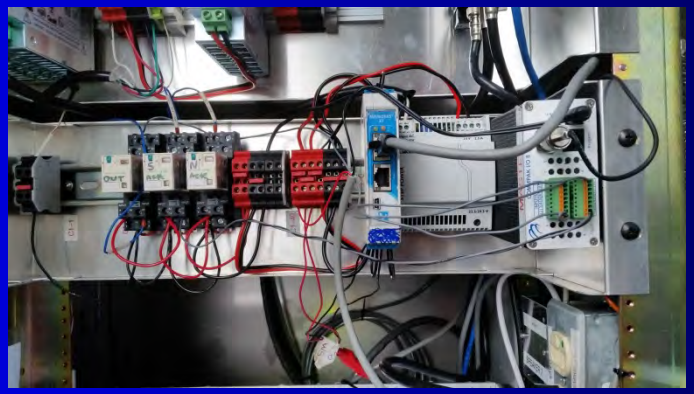
- Around 20 ATC's being configured for RWIS deployment at this time.



High Wind Warning – Yaquina Bay Upgrade 2016

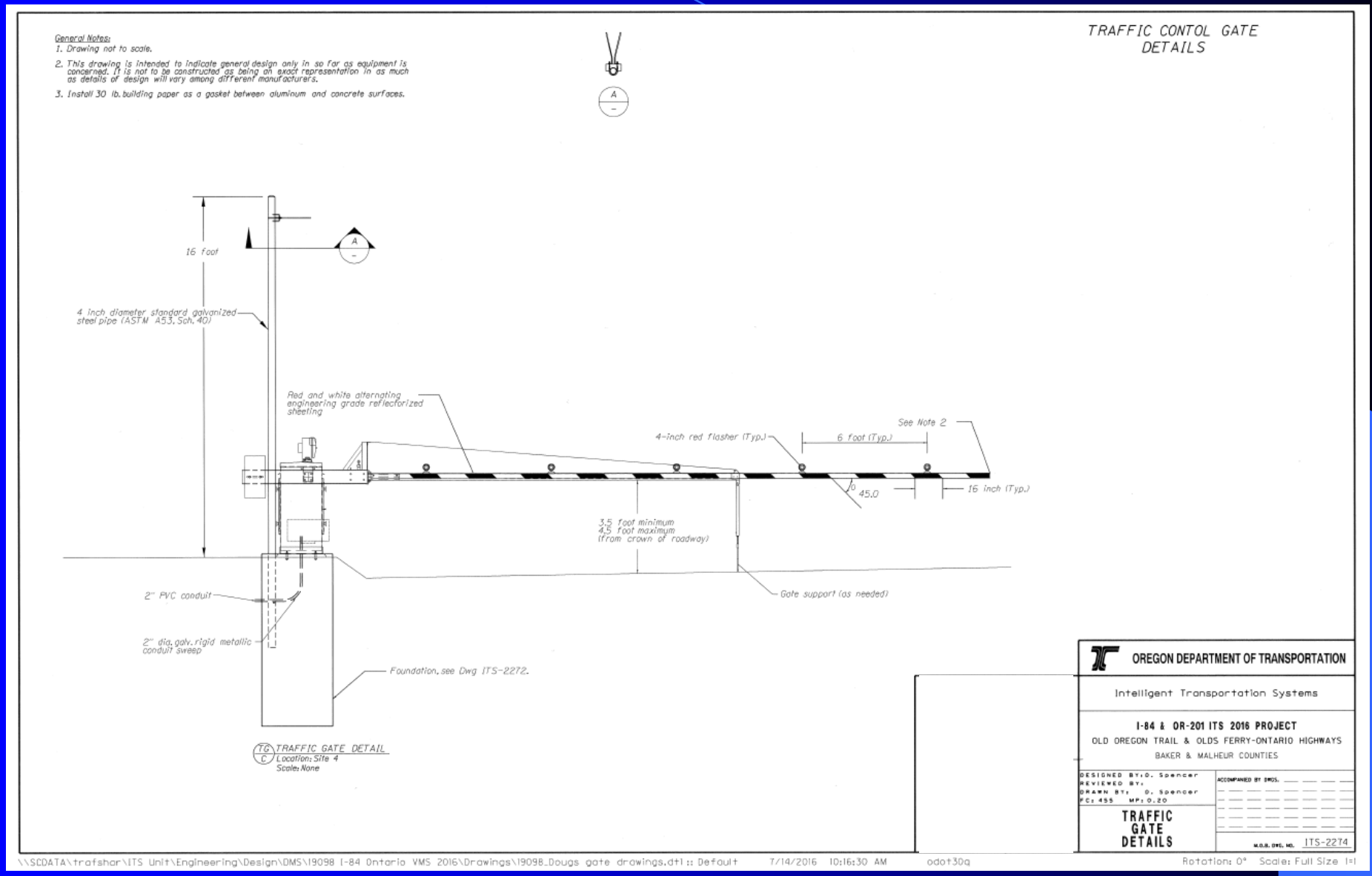
Air Data						Wind Data			
Temp	RH	Dew	WtBlb	Min	Max	SpdAvg	SpdGst	DirAvg	DirGst
54F	-	-	-	-	-	8 mph	12 mph	W	-

Device Status (basic relay control)			
Device	Status	Set By	
Yaquina Wind Sign (0)	Off	Opto22	History Interface
Yaquina Wind Alarm (1)	Off	Opto22	History Interface



- Installed ATC and Analog to Ethernet module
- Changed radios

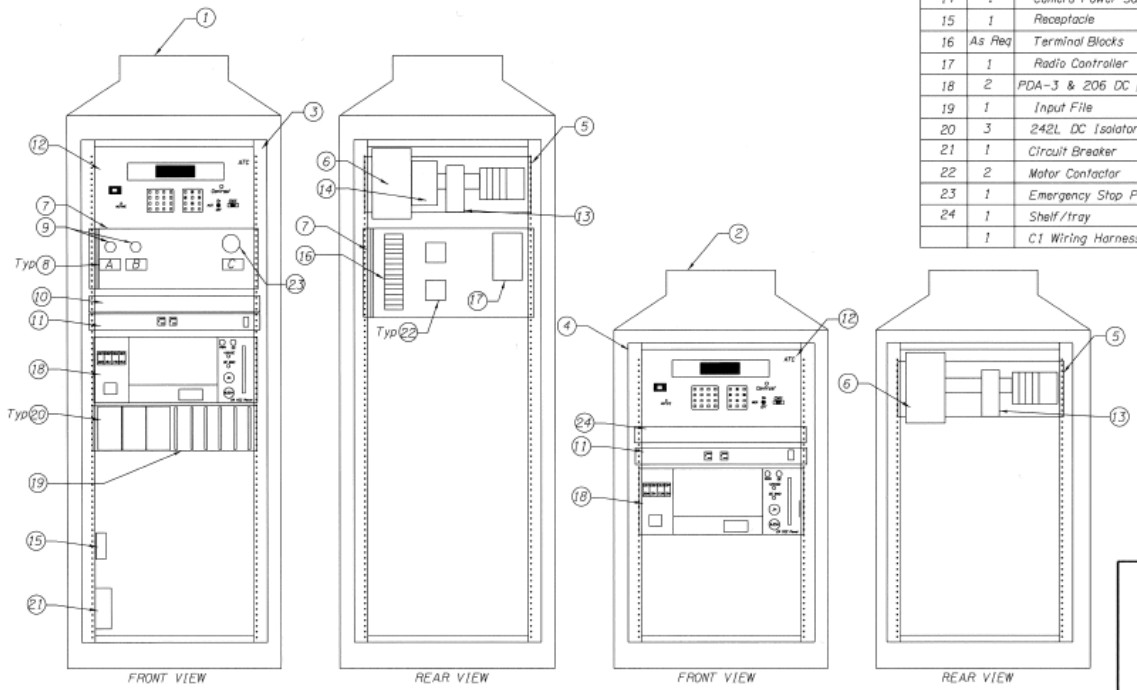
Region 5 ITS 2016 Project –VMS, Interstate Gate and RWIS Currently in Construction



Interstate Gate and RWIS – Cabinet Layouts

NAMEPLATE SCHEDULE	
LETTER	ENGRAVING
A	OPEN
B	CLOSE
C	E-STOP

MATERIAL/PARTS LIST			
ITEM	QTY	NOMENCLATURE	MATERIAL DESCRIPTION
1	1	332 Cabinet	See Special Provisions.
2	1	336S Cabinet	State furnished.
3	1	332 Cabinet-EIA Rack	w/ cabinet
4	1	336S Cabinet-EIA Rack	w/cabinet
5	2	Communication Bracket	Per ODOT's Greensheets. Fiber Optic bracket.
6	2	Network Router	State furnished and installed. Leave 2" of rack height available.
7	1	Backplane	Aluminum. Continuous piano hinge left side. Swings forward.
8	3	Nameplate	1/16" thick laminated plastic stock with white surface and black lettering.
9	2	Pushbutton	30mm, oil tight, spring return, with legend plate, 120V
10	2	Shelf/Tray	19" rack slide out tray.
11	2	Power Strip	19" rack mountable, 12 NEMA 5-20R outlets, 120VAC, 1U height.
12	2	ATC Controller	State furnished. Contractor to mount in cabinet.
13	1	Video Encoder	State furnished. Contractor to mount in cabinet.
14	1	Camera Power Supply	State furnished. Contractor to mount in cabinet.
15	1	Receptacle	General purpose, 5-20R, duplex, ivory, 120V, UL 498, 3 wire
16	As Req	Terminal Blocks	600V, block, barrier, rail, end clamp, UL 1059.
17	1	Radio Controller	See Special Provisions.
18	2	PDA-3 & 206 DC power supply	Per Caltran's TEES and Qualified Products List.
19	1	Input File	Per Caltran's TEES and Qualified Products List
20	3	242L DC Isolator	Per Caltran's TEES and Qualified Products List.
21	1	Circuit Breaker	UL 489 listed.
22	2	Motor Contactor	NEMA AC Contactor with overload relay, UL 508 listed. Size "0".
23	1	Emergency Stop Pushbutton	Red, mushroom head, push-pull style, UL 508 listed.
24	1	Shelf/tray	W/cabinet
	1	C1 Wiring Harness	Per Caltran's TEES. Tape back all unused conductors (spare).



GATE CABINET ASSEMBLY
Location: Site 4
PANEL LAYOUT
(Cabinet door omitted for clarity purposes)

PTR CABINET ASSEMBLY
Location: Site 5
PANEL LAYOUT
(Cabinet door omitted for clarity purposes)

General Notes:

1. Nameplate text height shall be 1/4" minimum on plastic engraving.
2. Mount ATC to rack with stainless steel hardware.
3. Cabinet assemblies shall be UL 508A or NRTL listed. Submit to the Engineer product cutsheets, panel layout drawings, and wiring diagrams for approval prior to fabrication.
4. Cabinet layout may change due to dimensions of the parts supplied by the Contractor.
5. All conductors shall be clearly marked with heat shrink type tags. Label on the conductors shall match the wiring diagram provided by the panel shop.
6. Label all terminal blocks, relays, and motor contactors with permanent means. Labeling shall match the construction drawings and the drawings submitted by the panel shop.
7. Wire emergency stop pushbutton as a Category 0 stop function per NFPA 79.

OREGON DEPARTMENT OF TRANSPORTATION

Intelligent Transportation Systems

I-84 & OR-201 ITS 2016 PROJECT
OLD OREGON TRAIL & OLDS FERRY-ONTARIO HIGHWAYS
BAKER & MALHEUR COUNTIES

DESIGNED BY: D. Spencer
REVIEWED BY:
DRAWN BY: D. Spencer
FC: var MP: var

ACCOMPANIED BY DWGS.

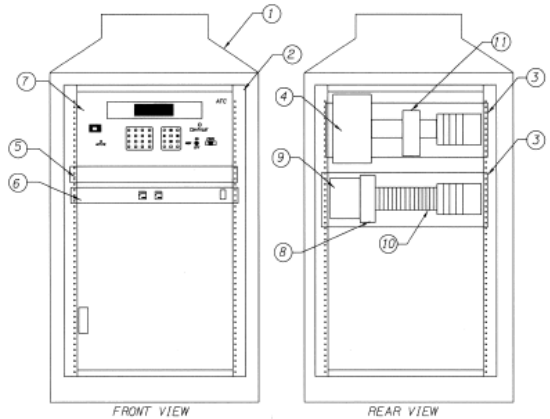
GATE & PTR CABINET LAYOUTS

M.O.D. DWG. NO. ITS-2273

\\SCDATA\trafshor\ITS Unit\Engineering\Design\DMS\19098 I-84 Ontario VMS 2016\Drawings\19098_Dougs gate drawings.dtl :: Default 7/14/2016 10:16:29 AM odot30q

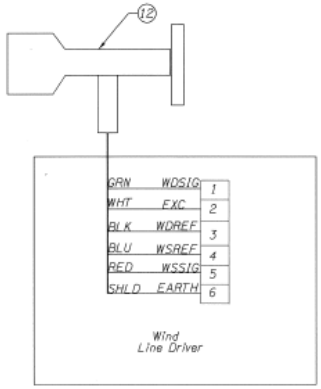
Rotation: 0° Scale: Full Size 1=1

RWIS Wiring Diagram



RWIS CABINET ASSEMBLY
Location: Sites 3 & 8

PANEL LAYOUT
(Cabinet door omitted for clarity purposes)

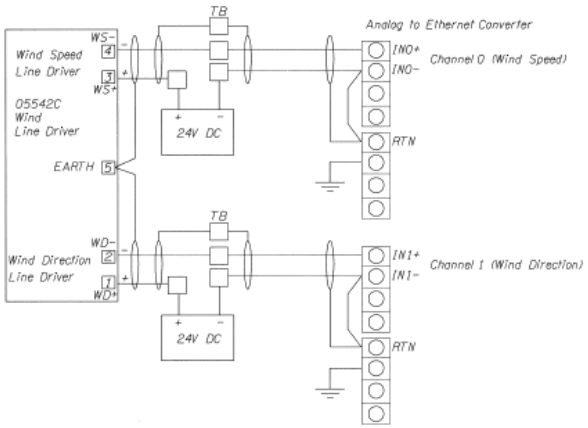


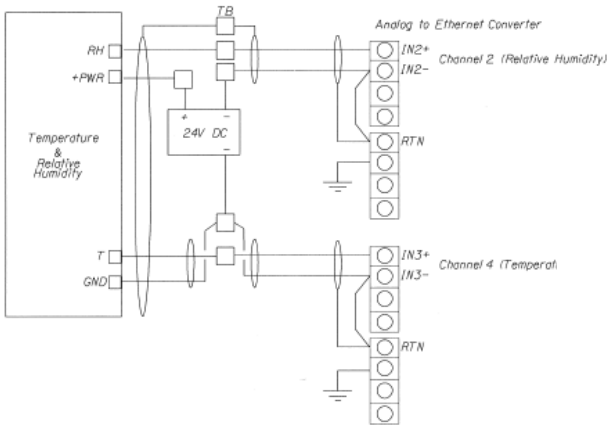
Anemometer Wiring Diagram

MATERIAL/PARTS LIST			
ITEM	QTY	NOMENCLATURE	MATERIAL DESCRIPTION
1	1	336S Cabinet	State furnished.
2	1	336S Cabinet-EIA Rack	W/cabinet
3	2	Communication Bracket	See ODOT's Greensheets. Fiber Optic bracket.
4	1	Network Router	State furnished and installed. Leave 2" of rack height available.
5	1	Shelf/Tray	W/cabinet
6	1	Power Strip	19" rack mountable, 12 NEMA 5-20R outlets, 120VAC, 1U height.
7	1	ATC Controller	State furnished. Contractor to mount in cabinet.
8	1	Analog to Ethernet Converter	Acromag XT1211, 4-20 mA input to Modbus TCP/IP.
9	1	DC Power Supply	24V DC, UL508 listed.
10	As Req	Terminal Blocks	Sectional, double terminal, barrier-type, 300V rated. UL 1059 listed.
11	1	Video Encoder	State furnished. Contractor to mount in cabinet.
12	1	Anemometer	RM Young Model No. 05106, Marine Wind Monitor.
	1	Wind Line Driver	RM Young Model 05631C (4-20 mA)
	1	Relative Humidity/Temperature	RM Young Model No. 41382LC2 (4-20 mA)

General Notes:

1. Mount ATC to rack with stainless steel hardware.
2. Cabinet assemblies shall be UL 508A or NRTL listed. Submit to the Engineer product cutsheets, panel layout drawings, and wiring diagrams for approval prior to fabrication.
3. Cabinet layout may change due to dimensions of the parts supplied by the Contractor.
4. All conductors shall be clearly marked with heat shrink type tags. Label on the conductors shall match the wiring diagram provided by the panel shop.
5. Panel layout and material parts list shown for one cabinet assembly. See Site Plans for the quantity of cabinets and sensors required.





OREGON DEPARTMENT OF TRANSPORTATION

Intelligent Transportation Systems

I-84 & OR-201 ITS 2016 PROJECT

OLD OREGON TRAIL & OLDS FERRY-ONTARIO HIGHWAYS

BAKER & MALHEUR COUNTIES

DESIGNED BY: D. Spencer
REVIEWED BY:
DRAWN BY: D. Spencer
FC: vor MP: vor

ACCOMPANIES BY DWGS.

RWIS CABINET LAYOUT & WIRING

M.O.B. DWG. NO. ITS-2275

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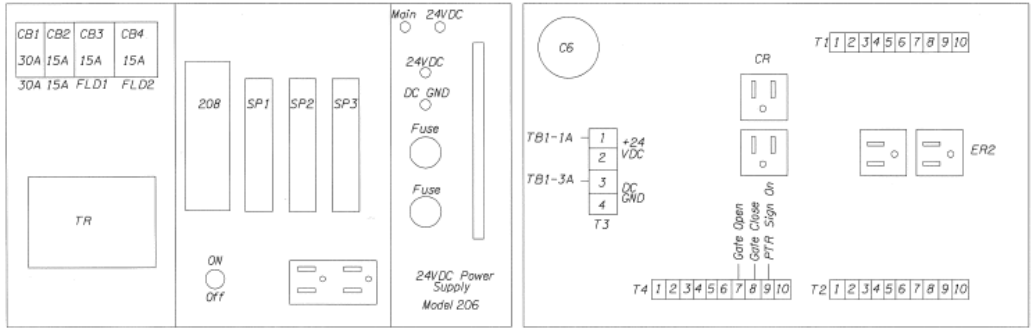
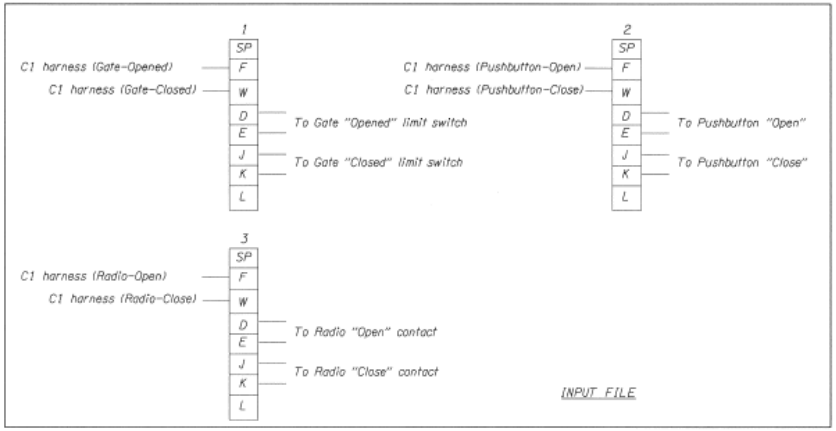
Gate Control Wiring



PDA #3 Front View

PDA #3 Rear View

ATC Controller C1 Assignment				
Pin No.	Source	Connection To	I/O	Function
1	DC GND	DC GND BUS		DC GND
2	01-1	C6-1	Output	SP 1-3/Gate Open
3	01-2	C6-2	Output	SP 1-5/Gate Close
4	01-3	C6-3	Output	SP 1-7/PTR Sign On
53	I2-7	IFI-11F	Input	Gate Open Position
54	I2-8	IFI-11W	Input	Gate Closed Position
55	I3-1	IFI-4F	Input	Pushbutton Open
56	I3-2	IFI-4W	Input	Pushbutton Close
57	I3-3	IFI-6F	Input	Radio Open
58	I3-4	IFI-6W	Input	Radio Close



OREGON DEPARTMENT OF TRANSPORTATION

Intelligent Transportation Systems

I-84 & OR-201 ITS 2016 PROJECT

OLD OREGON TRAIL & OLDS FERRY-ONTARIO HIGHWAYS

BAKER & MALHEUR COUNTIES

DESIGNED BY: D. Spencer
REVIEWED BY:
DRAWN BY: D. Spencer
PE: var MP: var

ACCOMPANIED BY DWGS.

GATE CONTROL INPUTS/OUTPUTS

M.O.B. DWG. NO. ITS-2276

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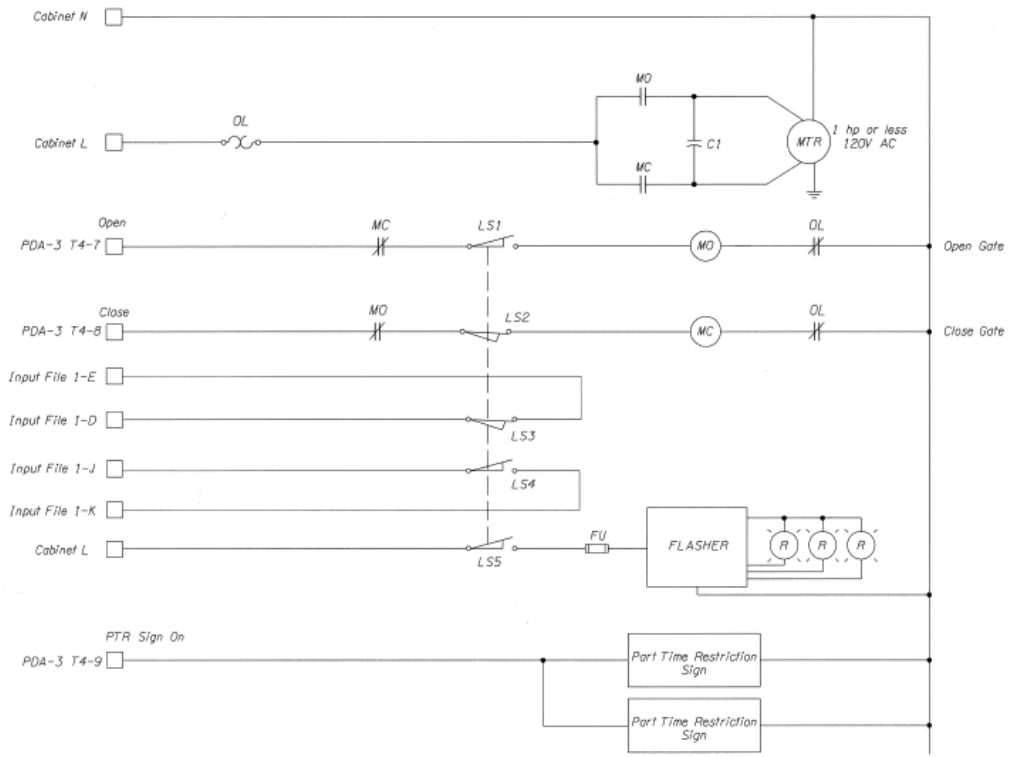
Rotation: 0° Scale: Full Size 1=1

Gate Control Wiring Diagram



Symbols and Legend

- Fuse
- Capacitor
- Limit switch, normally open
- Limit switch, normally closed
- (R) Indicating light, lens color shown in center of device
- Thermal overload
- Relay contact, normally open
- Relay contact, normally closed
- Coil, relay or contactor

LIMIT SWITCH SCHEDULE

LS1	Breaks when gate arm reaches full upright "open" position.
LS2	Breaks when gate arm reaches full down "closed" position.
LS3	Made when gate is full upright "open" position.
LS4	Made when gate is full down "closed" position.
LS5	Breaks when gate arm reaches full upright open position.

General Notes:

1. Shown with the gate in the Open position.
2. Limit switches are individually adjustable.
3. Drawing shown is for conceptual purposes. Actual wiring diagram may vary depending on gate manufacturer's equipment. See Special Provisions for submittal requirements.

OREGON DEPARTMENT OF TRANSPORTATION

Intelligent Transportation Systems

I-84 & OR-201 ITS 2016 PROJECT

OLD OREGON TRAIL & OLDS FERRY-ONTARIO HIGHWAYS

BAKER & MALHEUR COUNTIES

DESIGNED BY: D. Spencer
REVIEWED BY:
DRAWN BY: D. Spencer
FCs: var MPs: var

ACCOMPANIED BY DWGS.

GATE & PTR WIRING DIAGRAM

M.O.B. DWG. NO. ITS-2277

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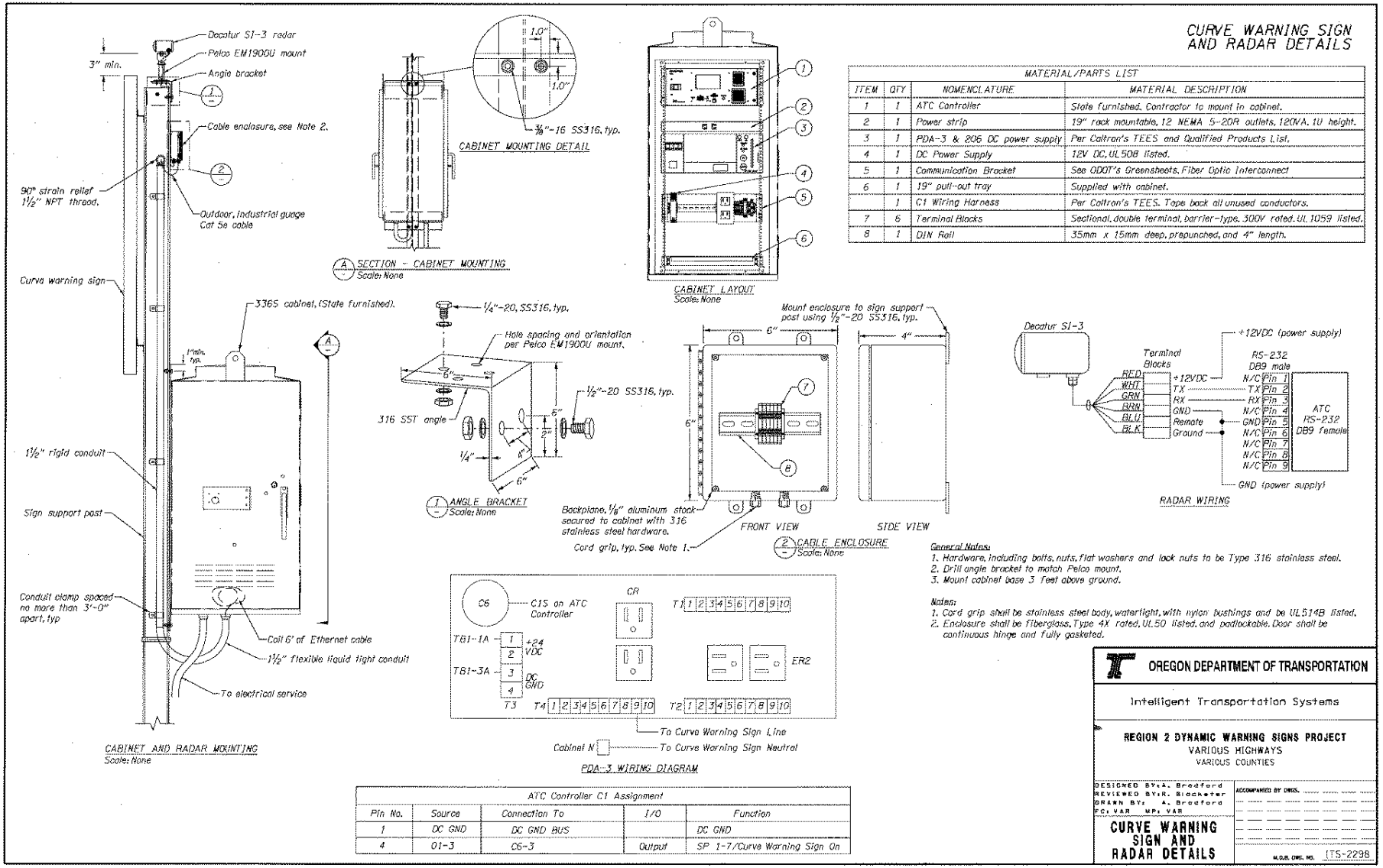
Rotation: 0° Scale: Full Size 1=1

Region 2 - Speed/Curve Warning System Currently in Construction



MATERIAL/PARTS LIST			
ITEM	QTY	NOMENCLATURE	MATERIAL DESCRIPTION
1	1	ATC Controller	State furnished. Contractor to mount in cabinet.
2	1	Power strip	19" rack mountable, 12 NEMA 5-20R outlets, 120VA. 1U height.
3	1	PDA-3 & 206 DC power supply	Per Caltron's TEES and Qualified Products List.
4	1	DC Power Supply	12V DC, UL508 listed.
5	1	Communication Bracket	See ODOT's Greensheets, Fiber Optic Interconnect
6	1	19" pull-out tray	Supplied with cabinet.
	1	C1 Wiring Harness	Per Caltron's TEES. Tape back all unused conductors.
7	6	Terminal Blocks	Sectional, double terminal, barrier-type, 300V rated. UL 1059 listed.
8	1	DIN Rail	35mm x 15mm deep, prepunched, and 4" length.

ATC Controller C1 Assignment				
Pin No.	Source	Connection To	I/O	Function
1	DC GND	DC GND BUS		DC GND
4	01-3	C6-3	Output	SP 1-7/Curve Warning Sign On

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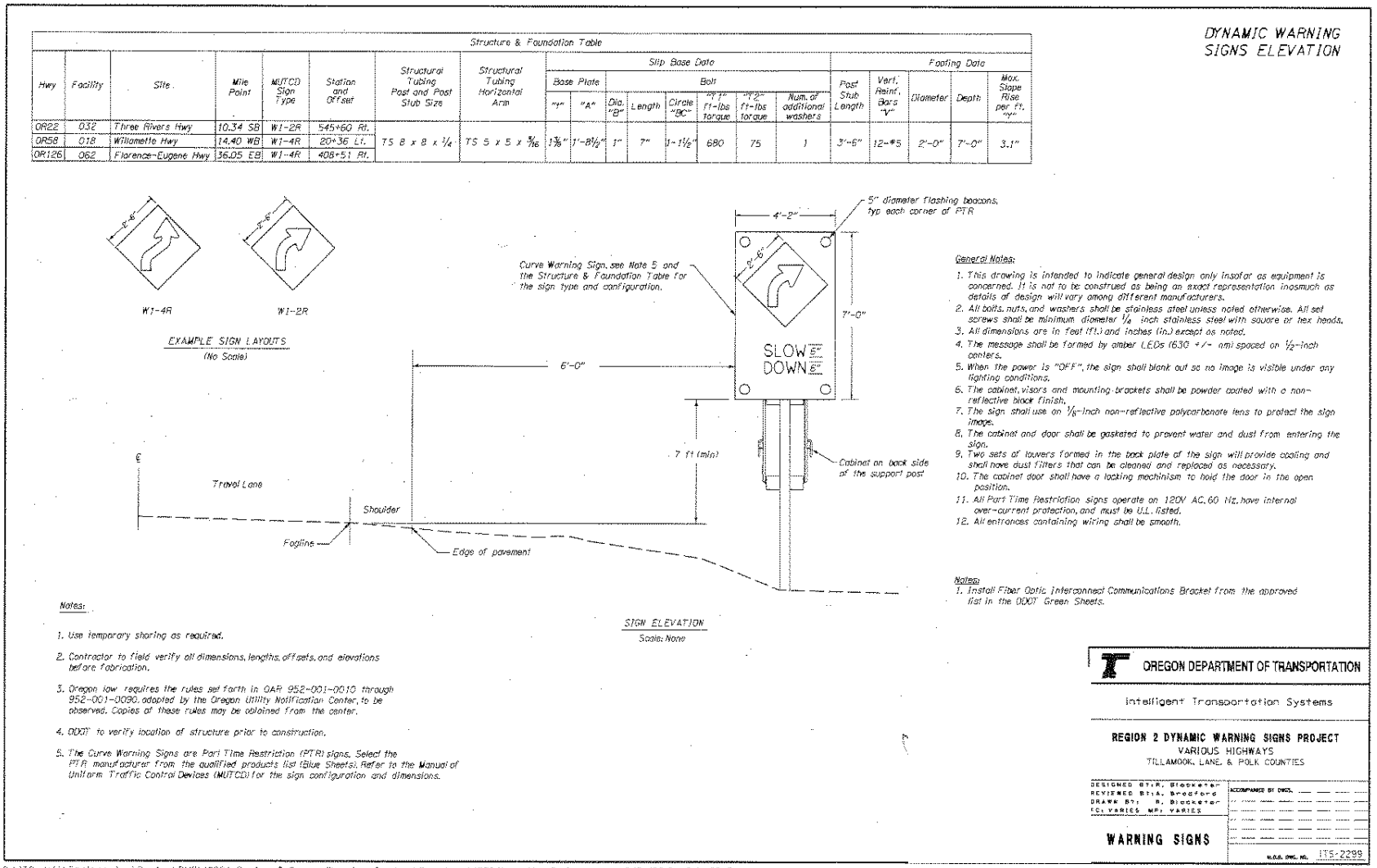
Region 2 - Speed/Curve Warning System



DYNAMIC WARNING SIGNS ELEVATION

Structure & Foundation Table

Hwy	Facility	Site	Mile Point	MUTCD Sign Type	Station and Offset	Structural Tubing Post and Post Stub Size	Structural Tubing Horizontal Arm	Slip Base Data								Footing Data				
								Base Plate		Bolt										
								"H"	"A"	Dia. "B"	Length	Circle "BC"	"H" ft-lbs torque	"A" ft-lbs torque	Num. of additional washers	Post Stub Length	Vert. Reinf. Bars "V"	Diameter	Depth	Max. Slope Rise per Ft. "H"
OR22	032	Three Rivers Hwy	10.34 SB	W1-2R	545+60 Rt.	TS 8 x 8 x ¼	TS 5 x 5 x 5/16	1⅜"	1'-8½"	1"	7"	1-1½"	680	75	1	3'-6"	12-#5	2'-0"	7'-0"	3.1"
OR58	018	Willamette Hwy	14.40 WB	W1-4R	20+36 Lt.															
OR126	062	Florence-Eugene Hwy	36.05 EB	W1-4R	408+51 Rt.															

W1-4R W1-2R

EXAMPLE SIGN LAYOUTS
(No Scale)

SIGN ELEVATION
Scale: None

General Notes:

1. This drawing is intended to indicate general design only insofar as equipment is concerned. It is not to be construed as being an exact representation inasmuch as details of design will vary among different manufacturers.
2. All bolts, nuts, and washers shall be stainless steel unless noted otherwise. All set screws shall be minimum diameter ¼ inch stainless steel with square or hex heads.
3. All dimensions are in feet (ft.) and inches (in.) except as noted.
4. The message shall be formed by amber LEDs (630 +/- nm) spaced on ½-inch centers.
5. When the power is "OFF", the sign shall blank out so no image is visible under any lighting conditions.
6. The cabinet, visors and mounting brackets shall be powder coated with a non-reflective black finish.
7. The sign shall use an ⅛-inch non-reflective polycarbonate lens to protect the sign image.
8. The cabinet and door shall be gasketed to prevent water and dust from entering the sign.
9. Two sets of louvers formed in the back plate of the sign will provide cooling and shall have dust filters that can be cleaned and replaced as necessary.
10. The cabinet door shall have a locking mechanism to hold the door in the open position.
11. All Part Time Restriction signs operate on 120V AC, 60 Hz, have internal over-current protection, and must be U.L. listed.
12. All entrances containing wiring shall be smooth.

Notes:

1. Use temporary shoring as required.
2. Contractor to field verify all dimensions, lengths, offsets, and elevations before fabrication.
3. Oregon law requires the rules set forth in OAR 952-001-0010 through 952-001-0090, adopted by the Oregon Utility Notification Center, to be observed. Copies of these rules may be obtained from the center.
4. ODOT to verify location of structure prior to construction.
5. The Curve Warning Signs are Part Time Restriction (PTR) signs. Select the PTR manufacturer from the qualified products list (Blue Sheets). Refer to the Manual of Uniform Traffic Control Devices (MUTCD) for the sign configuration and dimensions.

Notes:

1. Install Fiber Optic Interconnect Communications Bracket from the approved list in the ODOT Green Sheets.

OREGON DEPARTMENT OF TRANSPORTATION

Intelligent Transportation Systems

REGION 2 DYNAMIC WARNING SIGNS PROJECT
VARIOUS HIGHWAYS
TILLAMOOK, LANE, & POLK COUNTIES

DESIGNED BY: R. Blackstar
REVIEWED BY: A. Bradford
DRAWN BY: R. Blackstar
FOLIOS: VARIES MP: VARIES

ACCOMPANIED BY DWGS.

WARNING SIGNS

W.O.U. DWG. NO. ITS-2299

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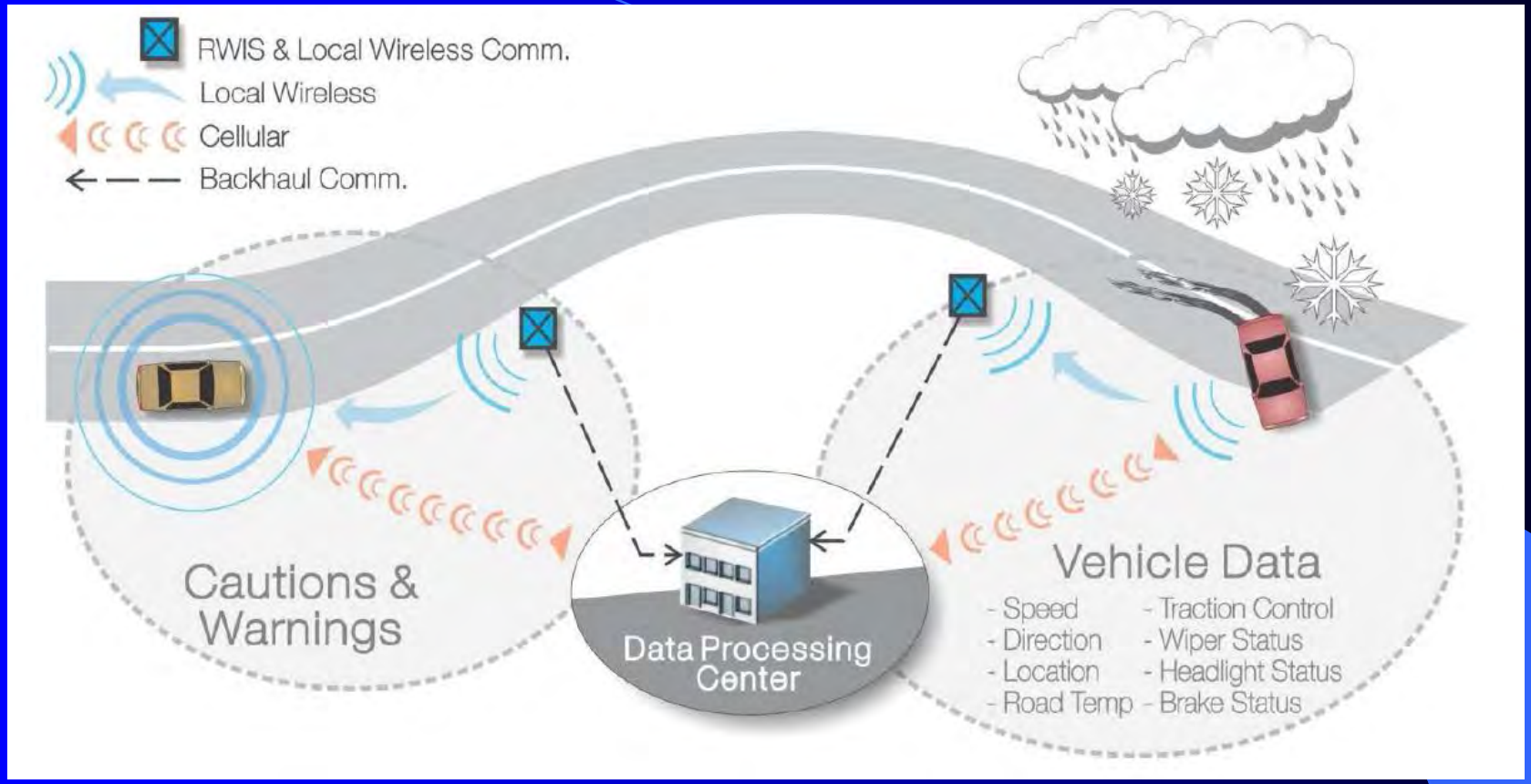
McKenzie Pass Over Length Warning System – 2017/2018 Upgrade

ATM - Variable Speed Limit Systems

ATM - Variable Advisory Speed Systems

Connected Vehicle



- Connected Vehicle Firmware does the SAE J2735 to NTCIP translation.
- Uses the ATC API
- Connected Vehicle Firmware-Summer 2017

Thank You

- Doug Spencer, P.E.
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