

TRAFFIC CONTROL / INTERCONNECT / DATA LINE

HE30 SERIES



DESCRIPTION

The HE30 Series is a two-stage, hybrid surge suppressor designed for use on data or communication circuits where surges of 10KA (8 x 20uS) or less are anticipated. This device will provide continuous and reliable protection for all of your sensitive electronics.

The #10 stud is used for mounting HE30 and serves as the grounding mechanism to ensure proper grounding of the internal protection scheme. Care should be taken to provide a clean, conductive surface that is bonded to earth ground and mounted as close as possible to the lines to be protected.

The HE30A is a polarized unit designed to be used on low voltage DC signal lines. This unit has a black and black/red color-coded input pair, with a white and white/red output pair.

The HE30C is a non-polarized unit designed for use on low voltage DC signal lines. This unit has a black and black/red color-coded input pair, with a white and white/red output pair.

The standard HE30 second stage clamp is from each line to ground (A) except in cases where the ground potential may vary. In this case, a line-to-line second stage clamp would be preferred.

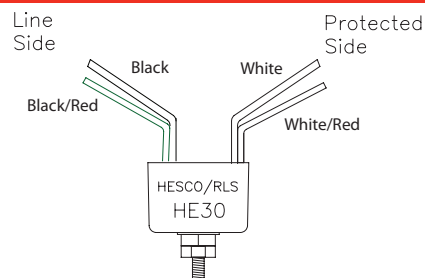
SPECIFICATIONS

Peak Surge Current	
8 x 20us.....	10KA
Occurrences.....	100 typical @ 2KA
Response Time.....	<1nS
Voltage Clamp.....	8, 12, 20, 30 or special
Series Impedance.....	1.29 Ohms
Energy.....	250 Joules
Continuous Current.....	100mA max.
Operating Temperature.....	-40°C to +85°C
Weight.....	1.7 Oz.
Dimensions (In.).....	1" x 1" x .75"
Mounting.....	Stud #10-32 x 3/8"

FEATURES

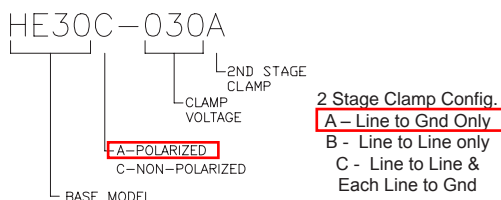
- Lightning Protection for Balanced Low Voltage Signal Lines
- Common and Differential Mode
- Two-Stage Protection
- Installs Easily
- Self Restores
- Fast Response Time
- Flame Retardant Epoxy Encapsulated
- Selectable Clamp Voltages
- Compact In Size

INSTALLATION



ORDERING INFORMATION

The HE30 Series suppressor part numbers consist of four major parts. These are the model, polarity, voltage and second stage clamp configuration. Be sure to specify all four requirements when placing orders.



HESCO/RLS
220 Springview Commerce Drive
Unit 190
DeBary, FL 32713
Fax 386.668.2793

For more information and product support call us at...

1-800-547-4868

SSM-LE Series

SSM-6LE AND SSM-12LE SERIES

ENHANCED NEMA SIGNAL MONITOR



SSM-6LE

SSM-12LE

EDI continues to set the industry standard and provide traffic signal professionals with reliable, high quality mission critical component products that improve the performance and lifecycle of traffic control systems.

Providing the signal technician with powerful monitoring and trouble-shooting tools helps ensure that cabinet malfunctions are detected, diagnosed, and repaired with confidence. The Full Intersection LCD display and event log recording capabilities present the signal technician with detailed and accurate information regarding cabinet operation. True RMS voltage sensing makes the SSM-LE series the most reliable signal monitor available at any cost.

Model Options:

SSM-6LE	6 channel capability with EIA-232 Port
SSM-6LEip	6 channel capability with Ethernet Port
SSM-12LE	12 channel capability with EIA-232 Port
SSM-12LEip	12 channel capability with Ethernet Port

SSM-LE ENHANCED FEATURES

NEMA TS1 Standard: The SSM-LE series meets all specifications of NEMA Standard TS-1 1989 R2000, Part 6. Basic fault coverage includes Conflict, Red Fail, CVM, 24V-I and 24V-II.

- Dual Indication Monitoring detects simultaneous active signals on a channel.
- Clearance Monitoring assures proper sequencing of signals and a minimum yellow clearance interval.
- AC Line Monitoring responds to low AC Line voltages as well as interruptions.

Full Intersection & Status Display: High contrast, large area Liquid Crystal Displays (LCD) show full intersection status with an active Red, Yellow, Green, and Walk indicator for each channel. Separate indicators identify channels involved in the fault.

Event Logging: The SSM-LE series maintains a nonvolatile event log recording the complete intersection status as well as previous fault events, AC Line events, configuration changes, monitor resets, cabinet temperature and true RMS voltages for all AC inputs. A real time clock time stamps each log event with time and date.

Signal Sequence: The five Signal Sequence History Logs stored in nonvolatile memory graphically display up to 30 seconds of signal status prior to each fault trigger event with 50ms resolution to ease diagnosing of intermittent and transient faults.

EDI RMS-ENGINE: A DSP coprocessor converts ac input measurements to True RMS voltages, virtually eliminating false sensing due to changes in frequency, phase, or sine wave distortion.

Configuration Options: Front panel options include GY Dual Indication, LEDguard, +24V and CVM Latching, Red Fail Walk Disable, External Watchdog input, CVM Log Disable, and FYA Mode.

Communications to PC or Remote Traffic Management Center: An EIA-232 or optional Ethernet port provides access by a local PC or remote TMC running ECom Windows based software for status, event log review, and archival.

Flashing Yellow Arrow PPLT: The SSM-LE series supports MUTCD Flashing Yellow Arrow PPLT operation with two different modes for TS-1 cabinet configurations.

LEDguard®: This EDI innovative signal thresholding technique can be used to increase the level of monitoring protection when using LED based signal heads.

EBERLE DESIGN INC.

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Complies With The New
NEMA MMU2 Standard and
MUTCD Requirements



SmartMonitor

MMU2-16LE SERIES

NEMA LCD MALFUNCTION MANAGEMENT UNIT

- MMU2-16LEip with Ethernet Port
- MMU2-16LE with EIA-232 Port

Whether you're a **NOVICE** or **EXPERT** Signal Technician, wouldn't it be great if you could:

- ☐ Use a built-in SETUP WIZARD to **quickly and accurately configure** the Signal Monitor to the exact requirements of the cabinet and intersection?
- ☐ Use a MENU DRIVEN LCD interface to **view** vital cabinet operational details such as field signal voltages, historical event logs, and monitor configuration data?
- ☐ Use a built-in DIAGNOSTIC WIZARD to **automatically diagnose** cabinet malfunctions and **pinpoint** faulty signals?

If your answer is Yes, the **MMU2-16LE SmartMonitor®** is for YOU!

NEW MMU2-16LE SmartMonitor® ENHANCED FEATURES

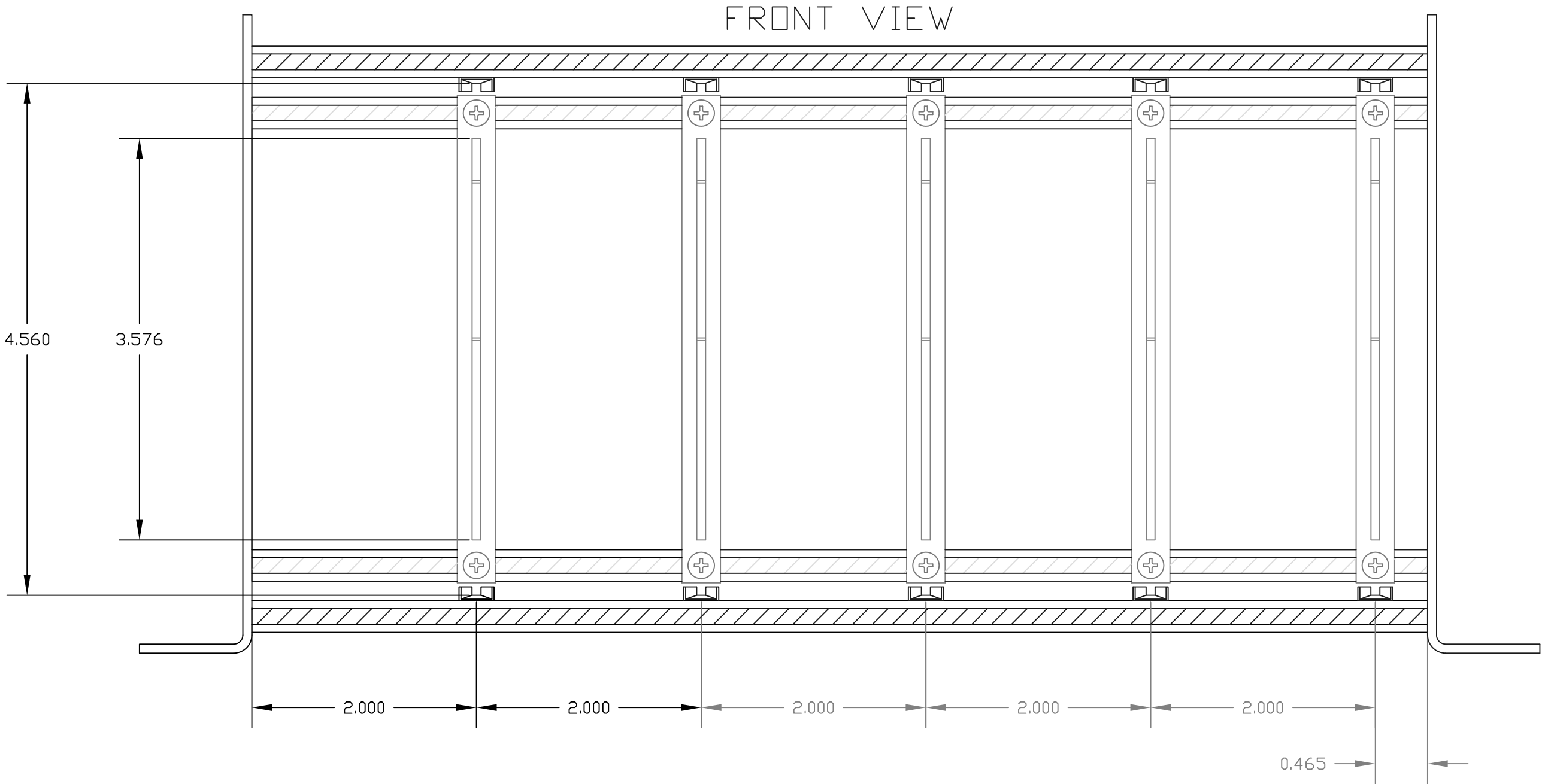
NEMA TS2-2016 Standard:	The MMU2-16LE <i>SmartMonitor®</i> meets all specifications of the NEMA Standard TS2-2003 (R2008) for the MMU2 configuration while maintaining compatibility with NEMA TS1-1989 Assemblies.
NEMA Standard Flashing Yellow Arrow PPLT:	The MMU2-16LE <i>SmartMonitor®</i> supports MUTCD Flashing Yellow Arrow PPLT operation and meets / exceeds the NEMA Standard MMU2 requirements of TS2-2016 FYA, providing modes for both TS-2 or TS-1 cabinet configurations.
Standardized Communications:	Real-time SDLC communications with the Controller Unit exchanges field input status, Controller Unit output status, fault status, MMU programming, and time and date.
Full Intersection & Status Display:	Two high contrast, large area Liquid Crystal Displays (LCD) continuously show full RYG(W) intersection status. A separate graphic LCD provides a menu driven user interface to status, signal voltages, configuration, event logs, and the Help system.
Event Logging:	A time-stamped nonvolatile event log records the complete intersection status as well as AC Line events, configuration changes, monitor resets, temperature and true RMS voltages.
Setup Wizard:	Use the built-in Setup Wizard to configure the Nema Enhanced settings of the <i>SmartMonitor®</i> by answering a short series of questions regarding intersection design and operation.
Diagnostic Wizard and Help System	The Diagnostic Wizard <i>automatically pinpoints</i> faulty signals and offers trouble-shooting guidance. The integrated Help System provides context sensitive operational assistance.
TS-1 Type 12 with SDLC Mode:	The MMU2-16LE <i>SmartMonitor®</i> can be configured to operate with the Port 1 SDLC function and Diagnostic Wizard enabled in a TS-1 twelve channel cabinet with no cabinet wiring changes.
Program Card Memory:	Enhanced settings of the MMU2-16LE <i>SmartMonitor®</i> are stored in nonvolatile memory on the EDI Program Card. Moving the Program Card to another MMU2-16LE automatically transfers all settings.
Signal Sequence History Log:	The five Signal Sequence History logs stored in nonvolatile memory graphically display up to 30 seconds of signal status prior to each fault event.
LEDguard®:	This EDI innovative signal threshold technique can be used to increase the level of monitoring protection when using LED based signal heads.
EDI RMS-Engine:	A DSP coprocessor converts AC input measurements to True RMS voltages, virtually eliminating false sensing due to changes in frequency, phase, or sine wave distortion.
ECcom PC Software:	Access to the MMU2-16LE data is provided by the industry standard EDI ECcom Windows based software for status, event log retrieval, configuration, and data archival.

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REVISION	INITIAL RELEASE		TOLERANCES:		DECIMALS:		TEMPLE INC. 5 POS CARD RACK			
			ANGLES: 1/2°		. X +/- 0.030					
			FRACTIONS: 1/16		. XX +/- 0.010					
					. XXX +/- 0.005					
			DRAWN	JLW	DATE	5-13-02				
ISSUE	A		CHECKED		DATE	TITLE 5 POS CARD RACK				
			ENG		DATE					
			PROD		DATE					
			00000							
			MODEL		NEXT ASSY					
				SCALE= 1/1		SHEET 1 OF 1				



PS-175B

Heavy Duty Rack Power Supply

The ideal power source when using high current devices such as video detection cards.

The PS-175B Rack Power Supply is a rack mounted high efficiency switching power supply that provides regulated 24 VDC power for a Nema TS-1 Detector Rack. The PS-175B meets or exceeds all requirements of the NEMA Standard TS-1 1989 R2005.

Each EDI PS-175B Cabinet Power Supply is put through a rigorous three part Total Quality Assurance program and tested under the extreme environmental conditions experienced on the street. It is this commitment to quality and performance that EDI products are known for, providing years of trouble free operation.

- **PS175B:** 24Vdc @ 3 Amps

PS-175B OPERATIONAL FEATURES

Basic Functions: The PS-175B provides a regulated output rated at 3 Amps over the full -30°F to 165°F (-34°C to +74°C) Nema operating temperature range.

- ☒ 3 Amp Maximum Load Current
- ☒ Full Output Regulation: 24 Vdc +/- 2 Vdc
- ☒ Four DC Output pins are common
- ☒ Input and Output Fused

Display Indicators: Separate green LED indicators are provided to display input and output status and fuse integrity.

Output Protection: The output is fused for over-current protection and protected against voltage transients by a 1500 Watt suppressor.

Input Voltage Operating Range: 89 Vac to 270 Vac at 50 / 60 Hz

Input / Output Pins:

Pin	Pin	Function
A	1	DC Ground
B	2	DC Output
C	3	DC Output
L	10	Chassis Ground
M	11	AC Neutral
N	12	AC Line
U	17	DC Output
V	18	DC Output

Power Switch: Switches AC power input

Connector: Double sided 44-pin with gold contact fingers

Dimensions: 4.5 inches High x 2 inches Wide x 6.875 inches Deep excluding handle

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**2-Channel
Rack Mount Type**



4-Channel Rack Mount Type

ORACLE ENHANCED SERIES

INTELLIGENT LCD INDUCTIVE LOOP MONITORS

- **ORACLE 2E SERIES – DUAL CHANNEL**
- **ORACLE 4E SERIES – QUAD CHANNEL**
- **ORACLE 4H SERIES – QUAD CHANNEL ½ WIDTH**

The ORACLE 2E, 2EC, 4E, 4H & 4EC "ENHANCED" Series Loop Monitors from Eberle Design takes vehicle detection well into the 21st century. The ORACLE "ENHANCED" detectors not only indicate vehicle presence with great accuracy and reliability, but also incorporate a complete built-in loop analyzer for optimum detector set-up and loop diagnostic purposes.

Knowing More . . . Telling More . . .

For over 30 years Eberle Design Inc (EDI), has provided technicians and engineers with reliable, high quality mission critical component products that improve the performance and lifecycle of traffic control systems. The ORACLE "ENHANCED" series meet or exceed all applicable requirements in NEMA TS 1-1989 and NEMA TS2-2003.

ORACLE ENHANCED FEATURES

LCD View Screens:

The Loop Frequency, $\Delta L/L\%$, Loop Inductance, DEFLECTOMETER® Pie Graph, DEFLECTOMETER® Numeric Optimizer, DEFLECTOMETER® Streaming Graph, Frequency Stability Graph, Sensitivity Level, Mode of Operation, and Vehicle Counting Accumulator can be viewed on the front panel LCD for each channel simultaneously.

DEFLECTOMETER® Pie Graph & Numeric Value Indicator:

The LCD screen displays a pie graph which assists in determining the optimum sensitivity setting by showing the change in inductance caused by traffic moving over the loop. Changes to the sensitivity setting are reflected on the graph in real time during a Call state. Optimum sensitivity setting is reached when the DEFLECTOMETER® value reaches the value of 10 or 50% of the graph, based on typical size vehicles.

DEFLECTOMETER® Streaming Graph:

While the DEFLECTOMETER® pie graph displays an instantaneous indication of the current Call strength, the Streaming Graph display graphically shows the Call strength over time. The horizontal axis represents a six second interval. The vertical axis represents Call strength. The graph streams when there is a Call present.

Frequency Stability Graph:

The frequency stability graph provides the capability to analyze each frequency level to ensure proper selection of the nominal loop tuning frequency. The XY graph displays detector frequency samples with respect to the reference. A variation from the center of the graph depicts frequency instability on the channel. Basically a thin smooth graph offers a more optimum frequency selection over a thick uneven line.

Paired Channel Functions Directional Logic and 3rd Car Logic:

When both of the paired channels have detection in Directional Logic mode, the last channel to have detection will output a CALL until the detection for the last channel ends, even if the detection ends for the first channel. This feature is intended to be used in freeway ramps for wrong way detection and left turn lanes where other movements in the intersection tend to clip the detection zone of the left turn lane.

3rd Car Logic provides a Call output when both channels are in the Call state. 3rd Car Logic is typically used in left turn queues to provide logic for Protected-Permissive movements.

AccurateCount Mode: Model ORACLE 2EC & 4EC Only

AccurateCount mode produces a secondary output in addition to the primary CALL output for each vehicle entering the loop zone. Loop configurations ranges from a single loop to eight loops connected together in series. The LCD screen will report counts from the secondary "Count" outputs and is capable of accumulating 999,999 vehicle counts per channel before rolling over to zero. Note: The ORACLE 4EC (4-ch. model) does not provide secondary count outputs to the edge card connector. The Count Accumulator screen can be used to view the AccurateCount totals.

Programmable Navigation:

The ORACLE "ENHANCED" Series provides a flexible and simple programming process via the front panel bidirectional toggle switches. Moving through the menu choices has never been easier. The new QuikSet mode navigates to commonly used menu items quickly.

Loop Fault History Log:

For each channel, the LCD screen can display the last 25 loop fault conditions and power events.

Loop Inductance Display Indicator:

In the "Induct" display mode the LCD screen displays the equivalent system loop inductance (loop and lead-in inductance) within the range of 20 to 2500 microHenries.

$\Delta L/L$ Percentage Indicator:

The "Induct" display mode shows the percentage of inductance change during the CALL state.

LCD Display Back Lighting and Heater:

The Liquid Crystal Display (LCD) incorporates a white LED backlight. The backlight improves visibility in poor lighting conditions. A built-in heater improves operation in very cold temperatures.

Variable Character Channel ID:

Up to five characters or numbers can be selected to identify each channel of detection.

Point Probe Micro Sensor Support: Model ORACLE 2EC & 4EC Only

The ORACLE 2EC and ORACLE 4EC models support the use of point probe type micro sensors. Consult the factory for compatibility details.

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ORACLE "ENHANCED" Series - Intelligent LCD Two & Four Channel Inductive Loop Monitors

Front Panel Controls: Two high-reliability sealed front panel toggle switches for each channel are used to select operational and display settings. One switch is designated "MENU (Back/Select)" and is used to accept the setting displayed and to move to the next menu item or go back to the previously displayed screen. The second switch is designated "SCROLL (Up/Down)" and allows you to move through each selected menu.

Sensitivity: There are twenty (20) selectable sensitivity levels per channel. The DEFLECTOMETER Pie Graph, DEFLECTOMETER Numeric Value and a DEFLECTOMETER Streaming Graph, make it easy to set-up and optimize sensitivity for each channel. Sensitivity can be selected from the "Set up" or "QuickSet" menus, to optimize vehicle detection on varying loop and lead-in configurations. Sensitivity is stated in terms of $\Delta L/L$ [i.e. as the minimum percentage change in the total inductance (loop plus lead-in) to which the unit will respond at the given level.]

Sens.	$\Delta L/L$	Sens.	$\Delta L/L$	Sens.	$\Delta L/L$	Sens.	$\Delta L/L$
20	0.0035%	15	0.020 %	10	0.113 %	5	0.640 %
19	0.0050%	14	0.028 %	9	0.160 %	4	0.905 %
18	0.0071%	13	0.040 %	8	0.226 %	3	1.280 %
17	0.010 %	12	0.057 %	7	0.320 %	2	1.810 %
16	0.0141 %	11	0.080 %	6	0.453 %	1	2.560 %

Loop Frequency: The LCD screen displays the actual loop frequency to help avoid interference which may occur when loops connected to different detectors are located adjacent to one another. One of eight (8) settings (normally in the range of 20 to 60 kilohertz) may be selected for each channel via the "Setup" or the "QuickSet" menu options. It is recommended that adjacent loops have a frequency separation of at least 5 KHz.

Frequency Stability Graph: In the Frequency display mode the LCD screen also displays a frequency stability graph that allows you to analyze each channels frequency level to ensure proper selection of frequency levels. The XY graph displays detector frequency samples with respect to the reference. The channel reference is in the center of the graph. A variation from the center of the graph depicts frequency instability on the channel. Basically a thin smooth graph offers a more optimum frequency selection over a thick or uneven line.

Presence / Pulse Modes: For each channel, a Presence or Pulse output mode may be selected via the "SET UP" menu. If presence mode is selected then a choice of short, long, or user defined presence can be selected. Short Presence is defined as 30 minutes and Long Presence is defined as 120 minutes. In User Defined mode, a setting between 1 and 120 minutes can be entered. On the expiration of short or long presence time a detect CALL will be reset. In user defined mode, the detect CALL can be selected to reset on timer expiration or at the next End-Of-Green (EOG) signal after the expiration of the timer. The green signal is applied to the Timer Control input via the edge card connector. In Pulse mode, a 125 ms \pm 25ms width pulse will be output for each vehicle entering the loop.

Loop Inductance Display: For each channel, when in the "Induct" display mode, the LCD screen displays the equivalent system loop inductance (loop and lead-in inductance) within the range of 20 to 2500 microHenries.

Loop Inductance $\Delta L/L$ Display: For each channel, when in the "Induct" display mode, the LCD screen displays the percentage of inductance change during the CALL state.

DEFLECTOMETER Pie Graph: For each channel, the LCD screen displays a pie graph which assists in determining the optimum sensitivity setting by showing the change in inductance caused by traffic moving over the loop. Optimum sensitivity setting is reached when the DEFLECTOMETER is at 50% and the numeral to the right of the pie graph reaches the value of 10, based on typical size vehicles. *Changes are reflected during the Call, so sensitivity can be (re)adjusted while a vehicle is stopped over the loop.* Selecting the optimum sensitivity level insures detection of all vehicles, including motorcycles and hi-bed trucks. This helps to eliminate any further service calls to adjust detector sensitivities.

DEFLECTOMETER Streaming Graph: For each channel, while the DEFLECTOMETER displays an instantaneous indication of the current Call strength, the Streaming Graph display graphically shows the Call strength over time. The horizontal axis represents a six second interval. The vertical axis represents Call strength. The graph only streams when there is a Call present and displays approximately six seconds of data.

Event Log: For each channel, the LCD screen can display the last 25 loop fault conditions and power events via the "Event Log" menu. A channel reset will not clear the Event Log from memory. To clear the Event Log memory, select either "Clear Log" or "Clear All" from the "Event Log" menu.

Channel ID: Up to five (5) characters can be selected to identify each channel of detection.

Call Delay Timer: For each channel, a delay time of 0.1 seconds to 5 minutes can be set via the "SET UP" menu. Call Delay time starts counting down when a vehicle enters the loop detection area. Delay time can be overridden by a green signal at the Timer Control input.

Call Extension Timer: For each channel, an extension time of 0.1 seconds to 1 minute can be set via the "SET UP" menu. Call Extension time starts counting down when the last vehicle clears the loop detection zone. Any vehicle entering the loop detection zone during the Extension time period causes the channel to return to the CALL state. The Extension timer can be enabled upon the following options: Extend Always Mode, Extend On-Green Mode, Extend Disconnect, and Extension Plus Disconnect

Timer Control Inputs: Timer Control inputs are provided for each channel to modify the operation of the Delay and Extension functions. The application of a True (low) state voltage will inhibit the Delay timing function and/or enable the Extend timing function. Timer Control inputs are primarily provided for downward compatibility.

3rd Car Model: A "3rd Car" mode setting can be enabled by selecting the "3rd Car" option in the "Paired Channels" menu. The "3rd Car" mode is intended to be used in Protected / Permissive left turn situations. "3rd Car" mode links ch. 1 and 2 together, and links ch. 3 and 4 together.

Directional Logic: A Directional Logic setting can be enabled by selecting the "Direction" option in the "Paired Channels" menu. This feature is intended to be used in freeway ramps for wrong way detection and left turn lanes where other movements in the intersection tend to clip the detection zone of the left turn lane. Directional logic mode links ch. 1 and 2 together, and links ch. 3 and 4 together.

Channel Output Control: Each channel has one of three output options to choose from in the Setup menu: OFF, ON, or CALL.

Display: The Liquid Crystal Display (LCD) incorporates a white LED backlight. The backlight is energized when any switch is actuated and remains on for 1 hour after the last switch actuation.

Loop Fault Monitor: The detector continuously checks the integrity of the loop. The system is able to detect open circuit loops, shorted loops, or sudden changes in inductance exceeding 25% of the nominal inductance. If a fault is detected, both the DETECT (Red) and FAULT (Yellow) LEDs continuously emit a sequence of flashes. Each type of fault is identified by a different flash sequence. In addition to the LED flash sequence, the LCD will display the type of fault condition during the fault state. If the fault condition is removed, the LCD "Fault" indication and the DETECT (Red) LED will return to normal operation. The FAULT (Yellow) LED will continue to flash with the sequence signifying the type of fault that was last detected. In the case of the 25% Change in Inductance fault (possible loss of a loop within a parallel of loops), the unit will log the fault and return to the new inductance after a period of two seconds. The logged fault will be stored in the Event Log memory. The backlight improves visibility in poor lighting conditions.

High Intensity Color-Coded LED Indicators:

Red DETECT Indicator:

- Vehicle Detection = Solid ON
- Delay Timing = 2 Hz flash rate.
- Extension Timing = 4 Hz flash rate.
- 3rd Car Mode = 10 flashes per second.
- Directional Logic Mode = 10 flashes per second.
- Open Circuit = 1 single flash followed by a pause.
- Shorted Circuit = 2 flashes followed by a pause.
- 25% Change in Inductance = 3 flashes followed by a pause.

Yellow FAULT Indicator:

- Open Circuit = 1 single flash followed by a pause.
- Shorted Circuit = 2 flashes followed by a pause.
- 25% Change in Inductance = 3 flashes followed by a pause.

Vehicle Counting (AccurateCount) Display (ORACLE 2EC & 4EC models): If *AccurateCount* (Enable Vehicle Counting) mode is enabled, the LCD will report vehicle accumulated counts. For each channel, when a vehicle occupies the loop zone, the LCD counter accumulates one vehicle count per output. The counter is capable of accumulating 999,999 vehicle counts per channel before rolling over to zero.

For each channel of the Oracle 2EC model, the *AccurateCount* (Enable Vehicle Counting) output feature can be enabled via the "Set up" menu to produce a secondary output in addition to the primary CALL output for every vehicle entering the loop zone. Each vehicle entering the loop will cause an output pulse of 125ms \pm 25ms from the secondary "Count" output on pin S [(Channel 1) and pin Y (Channel 2) Model ORACLE 2EC only] irrespective of the size of the loop.

For each channel, when the *AccurateCount* (Enable Vehicle Counting) feature is enabled, a loop configuration must be selected, via the "Set up Counting Type" menu for either a single loop or up to eight loops connected together in series.

Mechanical:

Height = 4.5 inches (114.3 mm)

Depth = 6.875 inches (174.6 mm)

Width = 1.14"W (29.6mm) 2E, 2EC, & 4H, and 2.34 inches (59.44 mm) 4E & 4EC

Environmental:

Operating Temperature: -30 to +165° F (-34 to +74° C)

LCD Operating Temperature: -4 to 165° F (-20 to +70° C)

Humidity Range (non-condensing): 0 to 95% Relative

Electrical:

DC Supply Voltage = 10.8 Vdc to 28.8 Vdc

DC Supply Current = 100 mA maximum (2E, 2EC), 175 mA maximum (4E, 4EC, 4H)

DC Supply Heater Current = 250 mA maximum (2E, 2EC, 4H), 500 mA maximum (4E, 4EC)

DC Inputs:

True (low) = Less than 8 Vdc

False (high) = Greater than 16 Vdc

Optically Isolated Outputs:

True (low, 50 mA) = Less than 1.5 Vdc

False (high) = Greater than 16 Vdc

Maximum Current = 100 mA

Relay Outputs:

AC Contact Rating = 5A @ 120 Vac

DC Contact Rating = 5A @ 30 Vdc

Loop Inductance (Tuning) Range: The detector will automatically tune to a loop and lead-in combination within the tuning range of 20 to 2500 microHenry with a Q factor greater than 5.

Environmental Tracking: The detector automatically and continuously compensates for component drift and environmental effects throughout the tuning range and across the entire temperature range.

Grounded Loop Operation: Each detector channel will operate when connected to poor quality loops including those that have a short to ground at a single point.

Lead-in Length: The unit will operate with lead-in (feeder) lengths up to 5,000 feet (1,524 m.) with appropriate loops and proper lead-in cable.

Loop Input Transient Protection: The loop input incorporates transient protection devices and the loop oscillator circuitry is transformer-isolated for each channel. The transient protection will withstand the discharge of a 10 uF capacitor charged to 2,000V across the loop inputs or between a loop input and Earth Ground for each channel. The transformer isolation allows operation with a loop which is grounded at a single point.

Response Timing: (Two channel operation with both channels at same sensitivity, Filter Off)

Sens.	Response	Sens.	Response	Sens.	Response	Sens.	Response.
20	59-104 ms	15	12-21 ms	10	4-7 ms	5	4-7 ms
19	43-76 ms	14	12-21 ms	9	4-7 ms	4	4-7 ms
18	32-55 ms	13	8-14 ms	8	4-7 ms	3	4-7 ms
17	24-41 ms	12	8-14 ms	7	4-7 ms	2	4-7 ms
16	16-28 ms	11	8-14 ms	6	4-7 ms	1	4-7 ms

Connector Pin Assignment:

Pin	ORACLE 2E, 2EC	Pin	ORACLE 2E, 2EC
A	Logic Ground	1	Ch 1 Timer Control Input
B	DC Supply	2	Ch 2 Timer Control Input
C	Ext. Reset	3	Det. Address Bit #3
D	Ch 1 Loop Input	4	Ch 1 Redundant Loop Input
E	Ch 1 Loop Input	5	Ch 1 Redundant Loop Input
F	Ch 1 Output (+)	6	Det. Address Bit #0
H	Ch 1 Output (-)	7	Ch 1 Status Output
J	Ch 2 Loop Input	8	Ch 2 Redundant Loop Input
K	Ch 2 Loop Input	9	Ch 2 Redundant Loop Input
L	Chassis Ground	10	Det. Address Bit #1
P	Reserved	13	Reserved
R	Reserved	14	Reserved
S	Ch 1 Cnt Output (+)	15	Det. Address Bit #2
T	Ch 1 Cnt Output (-)	16	Reserved
U	Reserved	17	Reserved
V	Reserved	18	Reserved
W	Ch 2 Output (+)	19	Data Trans. Output (TX)
X	Ch 2 Output (-)	20	Ch 2 Status Output
Y	Ch 2 Cnt Output (+)	21	Data Receive Input (RX)
Z	Ch 2 Cnt Output (-)	22	Reserved

Note: Pins M & N and 11 & 12 are RESERVED

Pin	ORACLE 4E,4EC,4H	Pin	ORACLE 4E,4EC,4H
A	Logic Ground	1	Ch 1 Timer Control Input
B	DC Supply	2	Ch 2 Timer Control Input
C	Ext. Reset	3	Det. Address Bit #3
D	Ch 1 Loop Input	4	Ch 1 Redundant Loop Input
E	Ch 1 Loop Input	5	Ch 1 Redundant Loop Input
F	Ch 1 Output (+)	6	Det. Address Bit #0
H	Ch 1 Output (-)	7	Ch 1 Status Output
J	Ch 2 Loop Input	8	Ch 2 Redundant Loop Input
K	Ch 2 Loop Input	9	Ch 2 Redundant Loop Input
L	Chassis Ground	10	Det. Address Bit #1
P	Ch 3 Loop Input	13	Ch 3 Redundant Loop Input
R	Ch 3 Loop Input	14	Ch 3 Redundant Loop Input
S	Ch 3 Cnt Output (+)	15	Det. Address Bit #2
T	Ch 3 Output (-)	16	Ch 3 Status Output
U	Ch 4 Loop Input	17	Ch 4 Redundant Loop Input
V	Ch 4 Loop Input	18	Ch 4 Redundant Loop Input
W	Ch 2 Output (+)	19	Data Trans. Output (TX)
X	Ch 2 Output (-)	20	Ch 2 Status Output
Y	Ch 4 Output (+)	21	Data Receive Input (RX)
Z	Ch 4 Output (-)	22	Ch 4 Status Output

Power

AOES6 Outdoor Enclosure



Shown with Alpha UPS module, transfer switches, and AlphaCell batteries.

- Designed for outdoor or secure indoor applications
- Traffic grade aluminum enclosure protects battery backup power systems from outdoor elements
- Various mounting options (including pole-mount) provide a flexible solution
- Large sun shield reduces solar heat load inside the cabinet
- Thermostat controlled fan and louvered vents ensure reliable operation in high temperatures
- 180° stainless steel piano hinged door with two locking open positions makes internal component installation and maintenance easy and convenient
- Three-point latching mechanism with Corbin Type 2 lock (or optional Best lock) for maximum security

The Alpha Outdoor Enclosure Side Mount 6 (AOES6) is designed to protect traffic industry battery backup power system components from harsh outdoor elements. The rugged enclosure is made of 0.125" aluminum and designed to easily accommodate an Alpha uninterruptible power supply (UPS) module, Alpha transfer switches, and up to four AlphaCell™ 195 GXL, 220 GXL, 3.5HP or 4.0HP batteries with room for additional components that may be required for your application. The Side Mount 6 is an outdoor rated (NEMA 3R) enclosure. Features include: stainless steel door handle, integrated lock and latch, integrated document holder and an angled generator plug with water tight generator door (generator plug option). Additional options and accessories are available (see listing on reverse).

AOES6

Consult your Alpha representative for P/N configurations

Mechanical

Dimensions:

mm: 1220H x 419W x 419D

inches: 48H x 16.5W x 16.5D

Weight: 34kg (75lbs)

Construction: High strength corrosion resistant 0.125" thick aluminum

Finish: Natural aluminum

Equipment space: EIA standard 483mm (19"), 8RU space (without generator inlet) with two (2) battery shelf

Cable entrance:

Bottom of enclosure: 1 x 76mm (3") diameter knock-out

Hardware

Hinge type: Stainless steel piano hinge

Door prop: Aluminum rod, 2 locking open positions

Handle: Stainless steel handle with padlock fitting for extended life and improved look

Door latch: 3 point latch with integrated Corbin Type 2 lock (or optional Best lock) for maximum security

HVAC

Cooling: Thermostat controlled 48Vdc fan, 100 cfm or better, ON at 49°C (120°F) Off at 32°C (89°F)

Ventilation: Door installed louvers

Environmental

Temperature:

Operating: -40 to 46°C

Storage: -40 to 85°C

Installation

Access: Removable bottom shelf for easy wiring access

Maintenance

Door installed louver: Equipped with washable filter

Other: Bug screen protected top vent

Enclosure Options

Mounting: Side mount (standard) - designed to mount to the side of most traffic enclosure cabinets
 Ground mount kit (optional)
 Pole mount kit (optional)

System Specifications (as shown)

- 2 Battery shelf with 4x AlphaCell 220GXL batteries
- FXM1100 UPS
- Universal automatic transfer switch
- Universal generator transfer switch

System Options

- Generator support: locking generator access door and L5-30 F1 plug
- AlphaGuard™ battery balancer
- Battery heater mats
- "On Battery" indicator light
- Door activated interior light
- Tilt switch
- Tamper switch

Agency Compliance

CSA/UL, CE: UL50E/C22.2 No.94

NEMA rating: 3R

FXM 1100

RUGGED UPS MODULE



- 1100W/VA UPS module designed to operate in extreme environments and provide maximum flexibility while ensuring critical loads remain protected and running during outages and other power disturbances
- Wide range Automatic Voltage Regulation (AVR) lengthens battery life by providing protection without transferring to backup mode during voltage surge or sag
- Independently programmable control and report dry contacts allow monitoring and controlling of key functions
- Temperature compensated battery charging protects batteries from overcharging or undercharging at extreme temperatures, extending the life of the battery
- Local and remote monitoring and control via RS232 port and Ethernet SNMP interface
- UPS panels can be rotated, improving usability and viewing convenience

Consult your Alpha representative for P/N

ELECTRICAL

Model	120Vac	230Vac
Battery String Voltage	48Vdc	48Vdc
Nominal Voltage	120Vac	230Vac
Frequency	60/50Hz $\pm 5\%$ (auto-detection)	
Input	Voltage range	85 to 175Vac
	Current (@ nominal voltage and max battery charging current)	15.5A
		8A
Output	Waveform	Pure sinewave
	Nominal voltage	120Vac
		230Vac
	Voltage regulation at nominal input	$\pm 10\%$ on line mode, $\pm 2\%$ on inverter mode
	Power at 55°C	1100W/VA
Frequency	Output frequency = Input frequency	

MECHANICAL

Dimensions:

mm: 133H x 394W x 222D
inches: 5.22H x 15.5W x 8.75D

Weight: 16kg (35lbs)

ENVIRONMENTAL

Operating Temp Range*: -40 to 74°C (-40 to 165°F)

Humidity: Up to 95% (non condensing)

Altitude(m/ft): Up to 3700 (12,000)**

Audible Noise @ 25°C: 45dBa @ 1 meter (39in)

MTBF (hours): 150K + as per Telcordia SR-332,
100% duty cycle, full load

BTU/Hr: Normal mode: 22W/75 BTU/hr
Backup mode: 242W/825.75 BTU/hr

PERFORMANCE

Typical Output Voltage THD: ... <3% (resistive load)

Typical Efficiency: >98% (resistive load)

Typical Transfer Time: <5ms

Load Crest Factor: 3:1 (load dependent)

POWER CONNECTOR OPTIONS

120Vac Model

Input		Output	
Standard	Terminal Block	Terminal Block	
Optional	Terminal Block	Terminal Block + Dual 5-15R	
	IEC**	IEC**	

230Vac Model

Standard	Terminal Block	Terminal Block
----------	----------------	----------------

**FXM models with IEC connectors come with 4 lines LCD display instead of the traditional 2 lines display. Only available in Kit 0380009-003

AGENCY COMPLIANCE***

Electrical Safety: UL1778, CSA 22.2 No 107.3; EN62040-1

Marks: *****

EMC: CFR47, Part 15 Subpart B, Class A; CES-003 Class A; EN62040-2

*Derates after 55°C

**Derates 2°C per 300m (1000ft) above 1400m (4500ft)

***Compliance only applies to units with standard input and output connectors.

Contact us for compliance information on models with optional power connectors

****CE applies to 230Vac version only

AlphaCell™ XTV

AGM Top-Terminal Batteries



Your Power Solutions Partner

- Extreme temperature Absorbed Glass Mat (AGM) technology
- Superior cold temperature performance for outdoor applications
- Longer runtimes help increase network reliability
- Multiple models provide options for all network architectures
- Power density gains allow more runtime from smaller sized battery
- Extended service life for non-temperature controlled outdoor enclosures
- Full 5-year replacement warranty*



The AlphaCell XTV Battery line is specifically designed for extreme outdoor temperature applications. It's virgin lead-alloy grids minimize corrosion and maximize life expectancy. Patented Computerized Charge/Discharge System (CCDS) provides 100% out-of-box runtime capacity. Strategic global manufacturing and distribution locations available with non-spillable transportation ratings. Optimized for remote advanced status monitoring.

*When used with Alpha approved power supplies and enclosures in USA and Canada. For other regions see manual for details



AlphaCell XTV Extreme Temperature Batteries

NOMINAL SPECIFICATIONS					
Battery Models		100XTV	150XTV	195XTV	240XTV
P/N		1810226	1810227	1810228	1810229
Operating Temperature Range (w/ Temperature Compensation)		-40 to 60°C / -40 to 140°F (charger temperature compensation @ ±3.3mVpc per °C)			
Storage Temperature		-10 to 40°C (14 to 104°F)	-10 to 40°C (4 to 104°F)	-10 to 40°C (14 to 104°F)	-10 to 40°C (14 to 104°F)
Self Discharge		Battery can be stored up to 12 months at 25°C (77°F). Higher temperatures during storage will require more frequent recharge.			
Voltage Per Unit		12V	12V	12V	12V
Float Charge Voltage		13.5 to 13.8 Vdc average per 12V unit at 25°C (77°F)			
Refresh/Boost Charging Voltage		14.4 to 15.0 Vdc average 12V unit at 25°C (77°F)			
Maximum AC Ripple (Charger)		0.5% RMS or 1.5% of float recommended for best results. Maximum voltage allowed = 4% P/P			
Terminal Type		Threaded alloy insert terminal to accept M6 x 12mm bolt	Threaded alloy insert terminal to accept M6 x 20mm bolt		
Terminal Hardware Torque		13.6NM / 120in-lbs	13.6NM / 120in-lbs	13.6NM / 120in-lbs	13.6NM / 120in-lbs
Case Sizes		22NF	24	27	31
Dimensions	mm	207H x 228L x 138W	214H x 275L x 168W	214H x 322L x 169W	217H x 343L x 170W
	inches	8.17H x 9.01L x 5.46W	8.44H x 10.85L x 6.65W	8.43H x 12.71L x 6.67W	8.57H x 13.50L x 6.71W
Weight Approximate		17.7kg (39lbs)	25.4kg (56lbs)	30.5kg (67lbs)	32kg (75lbs)
Runtime Rating 25A (@ 25°C/77°F to 1.75Vpc)		100 minutes	150 minutes	195 minutes	240 minutes
Amp Hour Capacity 20Hr Rate (@ 25°C/77°F to 1.75Vpc)		56Ah	80Ah	100Ah	112Ah
Maximum Discharge Current		300A	800A	800A	850A
Short Circuit Current		1450A	1900A	2250A	2650A
Impedance 60Hz (approximate)		0.005Ω	0.0045Ω	0.0039Ω	0.0034Ω
Conductance Range Fully Charged New Battery (@ 25°C/77°F)		700 - 800	900 - 1100	1050 - 1250	1250 - 1550

Terminal hardware included with every battery

CONSTANT CURRENT NOMINAL RATINGS IN AMPS (@ 25°C / 77°F TO 1.75V PER CELL)										
Discharge Time (Hours)	1	2	3	4	5	6	8	10	12	20
100XTV	39.4	22.1	15.8	12.4	10.3	8.7	6.7	5.4	4.6	2.8
150XTV	53.0	30.6	21.6	16.8	13.9	11.9	9.3	7.7	6.5	4.0
195XTV	65.5	37.6	26.9	21.0	17.3	14.7	11.3	9.4	7.9	5.0
240XTV	81.7	45.5	32.1	25	19.8	16.6	13	10.5	9	5.6

ESTIMATED RUNTIME MINUTES USING XM3-918HP (DEDUCT 4-6% FOR LEGACY XM POWER SUPPLIES)																
90VAC @	4A				8A				12A				18A			
XTV Models	100	150	195	240	100	150	195	240	100	150	195	240	100	150	195	240
3 Batteries	280	401	506	581	133	190	245	289	81	117	153	188	47	69	92	118
6 Batteries	597	869	1083	1240	298	427	538	617	188	269	344	399	113	163	211	251
9 Batteries	914	1349	1673	1927	465	672	841	961	300	430	542	621	185	264	337	391

ESTIMATED RUNTIME MINUTES USING XM3-624HP (DEDUCT 4-6% FOR LEGACY XM, VMX, AND GMX POWER SUPPLIES)																
60VAC @	4A				8A				12A				18A			
XTV Models	100	150	195	240	100	150	195	240	100	150	195	240	100	150	195	240
3 Batteries	416	599	751	858	203	290	369	427	126	181	234	276	74	108	142	175
6 Batteries	869	1280	1588	1828	441	637	797	912	284	407	513	589	174	249	319	371
9 Batteries	1321	1941	2441	2832	681	995	1237	1419	444	661	803	918	278	398	503	577

Based on .92 cable plant factor @ 25°C / 77°F


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Power

AlphaGuard™

Battery Charge Management System



- Extends battery life
- Replace single batteries, not the entire string
- Spreads charge voltage equally across batteries
- Compensates for battery differences as they age
- Optional status-monitoring communications-interface modules
- Safe unattended operation designed to CSA C22.2 No. 107.1 and UL 1778 Standards

AlphaGuard monitors and protects your batteries by spreading the charge voltage equally across all the batteries in the string, ensuring that every battery, whether old or new, is properly charged. With an ideal voltage always across each battery, life and runtime are optimized. Individual batteries in a string can be replaced as they fail, allowing batteries to be left in service longer. This stops the wasteful and costly practice of replacing batteries based on a scheduled maintenance programs or disposing of batteries that may have years of useful life left because one battery has failed.



AlphaGuard

The AlphaGuard employs a patented Charge Management Technology (CMT) to shuttle excess charge current to batteries requiring a greater charge, and is contained in a small plastic enclosure that installs directly on top of one the batteries in the string. A short service cable connects the AlphaGuard to each of the batteries in the string. Both 36VDC (3 battery) and 48VDC (4 battery) versions are available. One AlphaGuard is required per string.

An AlphaGuard configured with the optional voltage sense cabling and interface module (DSM, ESM, EDSM or External DOCSIS[®]) allows the AlphaGuard to interface with a status-monitoring module. Two AlphaGuard modules can be connected to an interface module. Refer to individual interface module documentation for additional information.

Models

AG-CMT-3:	AlphaGuard Charge Management SC, 36V String—including 36VDC battery interface cable
AG-CMT-4:	AlphaGuard Charge Management SC, 48V String—including 48VDC battery interface cable

Specifications

Configuration

Quantity:	One (1) AlphaGuard is required per battery string
Service Location:	With the battery string

Cabling

AG-S9-Cable:	AG-CMT-36/48SC Voltage Sense Cable, Single String, 9'
AG-D9-Cable:	AG-CMT-36/48SC Voltage Sense Cable, Two String, 9'
AG-S35-Cable:	AG-CMT-36/48SC Voltage Sense Cable, Single String, 35'
AG-D35-Cable:	AG-CMT-36/48SC Voltage Sense Cable, Two String, 35'



AlphaGuard Enclosure



AG-DSM-S9-Cable



AG-DSM-D9-Cable



AG-DSM-D35-Cable



AG-DSM-S35-Cable

Mechanical

Housing Material:	High impact plastic
Dimensions (in):	1.44H x 4.82W x 4.25D
(mm):	36H x 122W x 108D
Weight (lb):	0.8
(kg):	.36

Electrical

Batteries:	Individual 12VDC nominal batteries configured into 36 or 48VDC strings
Circuit Protection:	Single blow fuse, reverse polarity protected
Environmental:	-40 to 55°C (-40 to 131°F), 5 to 95% humidity
Quiescent Current Draw:	1mA max. (Current consumed by AlphaGuard after low voltage total shutdown)
Charge Management:	Most effective during float period of charge
Max. Current:	2A @ 25°C
Quality of Final Balance:	±100mV max. between any two (2) batteries
Charging Efficiency:	80 to 90%
Charge Balance:	±100mV typical
Low Voltage Cutoff:	34.5VDC/46VDC ±5%
Communication to XM2:	AlphaGuard configured DSM status monitoring card
Voltage Sense Regulation:	±100mV



Battery Ring Lug



Battery Cable
36V 6ft

Battery Cable
48V 6ft

Warranty

5 years

For more information visit www.alpha.com

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049-225-10-007 (11/06)

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Remote Battery Monitoring System Plus

Real-Time Measurement and Control



Your Power Solutions Partner

- Compact, intelligent and cost effective system for determining battery condition remotely
- Monitors each individual 12V battery via a user programmable schedule, from hourly to monthly
- Intelligent battery balancing extends the life of the battery string and reduces maintenance costs
- Automatic data logging function records individual battery voltage, temperature and admittance
- Enables the scheduling and budgeting of battery replacements
- Built-in web server allows for convenient read-only monitoring from any internet-connected computer



The Remote Battery Monitoring System (RBMS) from Alpha provides detailed, real time information on batteries, reducing unnecessary costly truck rolls, and ensuring actual outage backup times are not unknowingly compromised by degraded batteries. Scalable up to 2 strings of 4 batteries each, the system provides detailed information on every battery, from admittance to individual battery temperatures and string voltages. This, and a wealth of other information (including alarms) can be monitored directly via SNMP. Unit has a built-in SNMP proxy, a built-in web server and a built-in SMTP mail client.

Power

Remote Battery Monitoring System Plus

48Vdc 1 String: 0370260-002

48Vdc 2 Strings: 0370260-003

ELECTRICAL

Site controller unit:

Voltage:21 – 59Vdc

Power consumption:7W

NOTE: Power is supplied from the battery bank

Sensors:

Voltage:12V: 8.0 – 16Vdc

Power consumption:12V: <10mA nominal, 0.5/6A during admittance test

MECHANICAL

Site controller unit:

Dimensions:

mm:32H x 104.15W x 120.15D

inches:1.26H x 4.1W x 4.73D

Weight:0.242kg (0.53lbs)

Sensors (12V)

- Two-wire connection with max bolt size for terminals of 5/16 inch
- Mounted to the top of the battery with self-adhesive industrial Velcro strip
- CAT5 cable used to daisy chain from sensor to sensor
- Last sensor in the daisy chain connects to String 1 for the first battery string
- Last sensor in the daisy chain connects to String 2 for the second battery string

Power harness cable connection

- Connects to the 48Vdc battery string + (Red) and – (Black) terminals

OPTIONAL ACCESSORIES

Equipment	P/N
AC Output Current Sensor	7400583
Moisture Sensor	7400162
120V AC wall transformer, for monitoring utility power voltage	0180059
Two wire sensor, High Current*	0180055
Battery cable to power RBMS Controller*	8701040
*included with 0370260-002/003 kit	

ENVIRONMENTAL

Operating temperature: ...-40 to 80°C (-40 to 176°F)

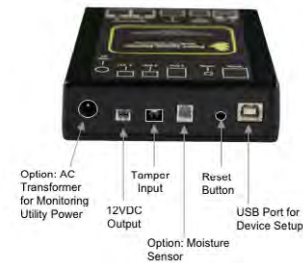
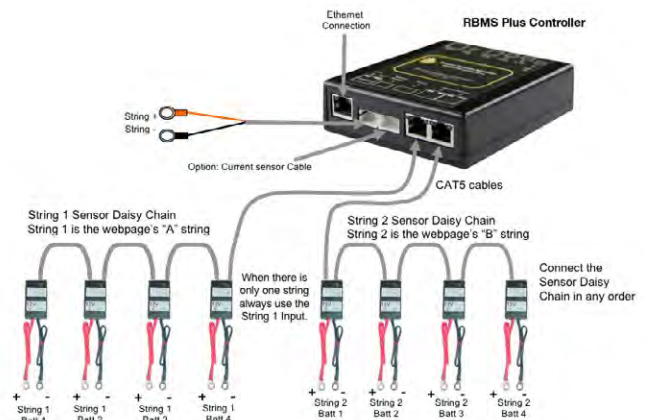
COMMUNICATIONS

Site controller unit

- SNMP via TCP/IP & built-in web server and SMTP mail client

Site controller software

- Optional Lookout software provides a convenient way to monitor multiple site controllers on the network



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LMD301 Series

DEFLECTOMETER™ SERIES

SINGLE CHANNEL NEMA TS-1 LOOP MONITOR™

Built-in DEFLECTOMETER™ Technology Provides Users With:

- ☑ Call Strength Indicator for Optimum Sensitivity Programming
- ☑ One step / One vehicle dynamic Sensitivity programming
- ☑ Frequency Meter for immediate analysis of loop frequency, avoiding loop cross-talk problems
- ☑ Push Button Programming

Why guess when you can know your detector is optimally programmed and performing for all vehicle classes!

Model Options:

- LMD301S Single Channel with Solid State outputs
- **LMD301T Single Channel with Delay & Extend timing**
- LMD301TS Single Channel with Delay & Extend timing & Solid State outputs

ENHANCED FEATURES

DEFLECTOMETER Call Strength Indicator:

The *Call Strength Indicator* provides the technician with a simple one-step method for accurately setting the optimum level of sensitivity that ensures accurate vehicle detection of all vehicles, including motorcycles and high-bed trucks. **NO MORE GUESSING!**

When a medium size vehicle is over the roadway loop, a DEFLECTOMETER™ Call Strength value of "5" assures that the optimum sensitivity has been achieved. You can adjust the DEFLECTOMETER™ reading *DYNAMICALLY* without moving the vehicle by using the front panel UP or DOWN sensitivity buttons. **IT DOES NOT GET ANY EASIER THAN THIS!**

Frequency Meter:

The built-in *Frequency Meter* reports the operating frequency of the loop network. Ensuring that adjacent loops are separated by at least 5 KHz will avoid crosstalk problems and future service calls.

Output CALL Test Mode:

The Output Call Test Mode provides a straight forward way to test that the Controller Unit is receiving an active output from the detector. This eliminates the need for cabinet test switches and associated wiring. A huge time saving feature during system set-up and trouble-shooting.

Advanced Loop Diagnostics:

The Fault (FLT) indicator displays the type of fault: Short, Open or 25% change of inductance. The Fault Monitor will report and store three types of loop faults; Open Loops, Shorted Loops, and 25% sudden changes in inductance. Each type of fault is indicated by a unique sequence of flashes allowing the user to diagnose loop failures at a glance.

Delay & Extension Timing:

The LMD301t model provides a programmable Delay time of 1 to 63 seconds, and an Extend time of 0.25 to 15.75 seconds. These parameters are set via the front panel DIP switches.

STANDARD FEATURES

- ☑ Delay & Extension Timing on LMD301t model
- ☑ Automatic Tuning
- ☑ Lightning & Surge Protection
- ☑ Four Frequency Levels
- ☑ Separate Color-Coded LED indicators
- ☑ Wide Loop Inductance Range: 20 to 2500 microHenries.

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LMD301 DEFLECTOMETER™ SERIES SINGLE CHANNEL INDUCTIVE LOOP VEHICLE DETECTOR

SPECIFICATIONS

General Characteristics

Controls: Front panel push buttons allow the user to set the Sensitivity Level, Operational mode, and nominal Frequency independently on each channel. DIP switches allow the user to set the Delay and Extension timers on the LMD301t model.

Setting Sensitivity - Front Panel Push Buttons

The DEFLECTOMETER™ (front panel 7-segment LED) aids in setting the DETECTOR quickly and easily to the most optimum sensitivity level to ensure the trouble-free detection of all vehicles, including motorcycles and high bed vehicles. For typical vehicles (mid-size vehicle / small pick up) utilizing properly installed roadway loops, a Call Strength of 5 displayed on the DEFLECTOMETER™ during the DETECT output period indicates an optimum sensitivity setting. For high profile vehicles (commercial trucks, 4x4's, etc...), a Call Strength value of 4 will be optimum. For low profile vehicles (sports cars, etc...), a Call Strength value of 6 will be optimum.

Adjusting sensitivity using the DEFLECTOMETER™ (recommended):

The DEFLECTOMETER™ should read zero (0) with no vehicle over the roadway loop. When a typical mid-sized vehicle is completely in the detection zone (DET indicator On), the Call Strength value should be adjusted up or down until the DEFLECTOMETER™ displays the desired optimum value of 5 (or 4 or 6 as described above).

If a typical vehicle located over the roadway loop causes the Call Strength "7" to be displayed on the DEFLECTOMETER™, the sensitivity should be decreased two levels. This can be done by pressing the front panel SENS ⬇ button two times to achieve the Call Strength value of 5.

If a typical vehicle located over the roadway loop causes the number "2" to be displayed on the DEFLECTOMETER™, the sensitivity should be increased three levels. This can be done by pressing the front panel SENS ⬆ button three times to achieve the Call Strength value of 5.

NOTE: THE DEFLECTOMETER™ CALL STRENGTH DYNAMICALLY UPDATES AFTER EACH SENSITIVITY LEVEL CHANGE, ALLOWING YOU TO CHANGE SENSITIVITY SETTINGS WHILE A VEHICLE REMAINS IN THE LOOP DETECTION ZONE.

Adjusting sensitivity without using the DEFLECTOMETER™ (manually setting sensitivity):

The DETECTOR offers 9 levels of sensitivity (1 to 9). Level 9 is the highest sensitivity. Sensitivity Level can be manually set to any desired value by pressing the front panel SENS buttons (⬆ or ⬇) when a vehicle is NOT over the roadway loop (DET indicator Off). The first time a SENS button (⬆ or ⬇) is pressed, the current Sensitivity Level is displayed on the DEFLECTOMETER™ for 3 seconds. If either SENS button (⬆ or ⬇) is pressed again before the 3 second period ends, the Sensitivity Level will increase (SENS ⬆) or decrease (SENS ⬇). The new Sensitivity Level value will be displayed on the DEFLECTOMETER™ display for 3 seconds. The factory default Sensitivity setting is level 6.

Sensitivity	ΔL / L	Sensitivity	ΔL / L
9	0.01%	4	0.32%
8	0.02%	3	0.64%
7	0.04%	2	1.28%
6	0.08%	1	2.56%
5	0.16%	-	-

Loop Frequency / Loop Frequency Display: One of four frequency settings may be selected via the front panel FREQ push button to alleviate interference which may occur when loops connected to different detectors are located adjacent to one another. To help prevent or diagnose crosstalk problems, the loop frequency is displayed on the front panel DEFLECTOMETER™. The current loop frequency is displayed after pressing the FREQ button to display the current Frequency Level. The frequency is shown in KHz with a "-" symbol displayed both before and after the numeric digits shown on the DEFLECTOMETER™.

For example, after pressing the FREQ button once the display sequence might show:

"3" ⇒ "-" ⇒ "2" ⇒ "7" ⇒ "-"

This sequence would indicate Frequency Level "3" and a loop reference frequency of 27 KHz. Detectors on adjacent loops should all be separated by at least 5 KHz.

Loop Fault Monitoring: The Detector continuously checks the integrity of the loop. The system is able to detect shorted or open circuit loops, or sudden changes in inductance exceeding 25% of the nominal inductance. If a fault is detected, the OUT and FLT indicators continuously emit a sequence of flashes. Additionally, the DEFLECTOMETER™ displays the letter "F" indicating a current loop fault. Each type of fault is identified by a unique flash sequence:

Flash Sequence	Fault
1 flash	Open Circuit Loop.
2 flashes	Shorted Circuit Loop.
3 flashes	25% excessive change in inductance.

If the Open or Shorted fault condition self heals, the DET indicator and DEFLECTOMETER™ will return to normal operation. The FLT indicator will continue to flash with the sequence signifying the type of fault that was last detected. In the case of the excessive inductance change fault, the unit will return to the new inductance after a period of two seconds and continue operation. The fault condition will be indicated by the flash sequence of the FLT indicator.

Operational Modes

Presence: A Presence output mode may be selected from the front panel MODE push button. If presence mode is selected then a choice of short (S) or long (L) can be selected. Short Presence is defined as 30 minutes and Long Presence is defined as 120 minutes.

Pulse: A Pulse output mode (P) may be selected from the front panel MODE push button. In Pulse mode, a 125 ms ± 25ms width pulse will be output for each vehicle entering the loop.

Call: A continuous CALL output (C) may be selected from the front panel MODE push button which will signal the presence of a vehicle. This mode is used for testing the CALL output of a channel.

Channel Off: The Channel Off (-) may be selected from the front panel Mode push button. This option turns OFF the channel and disables the oscillator.

LMD301t Selectable Options:

Call Delay Timer for Presence & Pulse Modes: A delay time of 1 to 63 seconds can be set via the DELAY DIP switches. The numeric sum of the switches in the On position is equal to the Delay time. Call Delay time starts counting down when a vehicle enters the loop detection area. During the Delay time the DET indicator will flash two times per second and the DEFLECTOMETER™ will display the letter "d". Delay time can be overridden by a True (low) signal at the Timer Control input.

Call Extension Timer for Presence Mode: An extend time of 0.25 to 15.75 seconds can be set via the EXTEND DIP switches. The numeric sum of the switches in the On position is equal to the Extend time. Two modes are provided:

Extend Always (default): Call Extend time starts counting down when the last vehicle clears the loop detection zone. During the Extend time the DET indicator will flash four times per second and the DEFLECTOMETER™ will display the letter "E". Any vehicle entering the loop detection zone during the Extend time period causes the Extend timer to be reset and the output maintained. The Timer Control input has no effect on this mode.

Extend on Green (EOG)

Call Extend time starts counting down when the last vehicle clears the loop detection zone if the Timer Control input is True (low). During the Extend time the DET indicator will flash four times per second and the DEFLECTOMETER™ will display the letter "E". Any vehicle entering the loop detection zone during the Extend time period causes the Extend timer to be reset and the output maintained.

The Extend on Green mode is enabled by a factory installed diode on the pcb. Consult the factory for details.

Timer Control Inputs: Timer Control inputs are provided for each channel to modify the operation of the Delay and Extension functions. The application of a True (low) state voltage will inhibit the Delay timing function and/or enable the Extend timing function. Timer Control inputs are primarily provided for downward compatibility.

Pin Assignment:

Pin	Function
A	Neutral (AC-)
B	Ch 1 Output Relay Common (Emitter)
C	Power (AC+)
D	Channel 1 Loop Input
E	Channel 1 Loop Input
F	Ch 1 Output Relay N.O. (Collector)
G	Ch 1 Output Relay N.C.
H	Earth Ground
I	No Connect
J	Ch 1 Timer Control (LMD301t)

N.O. is Normally Open, N.C. is Normally Closed.

Relay Contacts are shown with power applied, loops connected and no vehicle present.

AC Supply Voltage:	Minimum 89 Vac Maximum 270 Vcc Frequency 47 to 63 Hz
AC Timer Control Inputs:	True (active) Greater than 70 Vac False (not active) Less than 15 Vac
Optically Isolated Outputs:	True (low, 50 mA) Less than 1.5 Vdc Maximum Current 100 mA
Relay Outputs:	AC Contact Rating 5A @ 120 Vac DC Contact Rating 5A @ 30 Vdc
Environmental:	Operating Temperature Range: -30°F to 165°F (-34°C to 74°C)
Mechanical:	Height 5.5 inches Width 2 inches Depth 5.412 inches