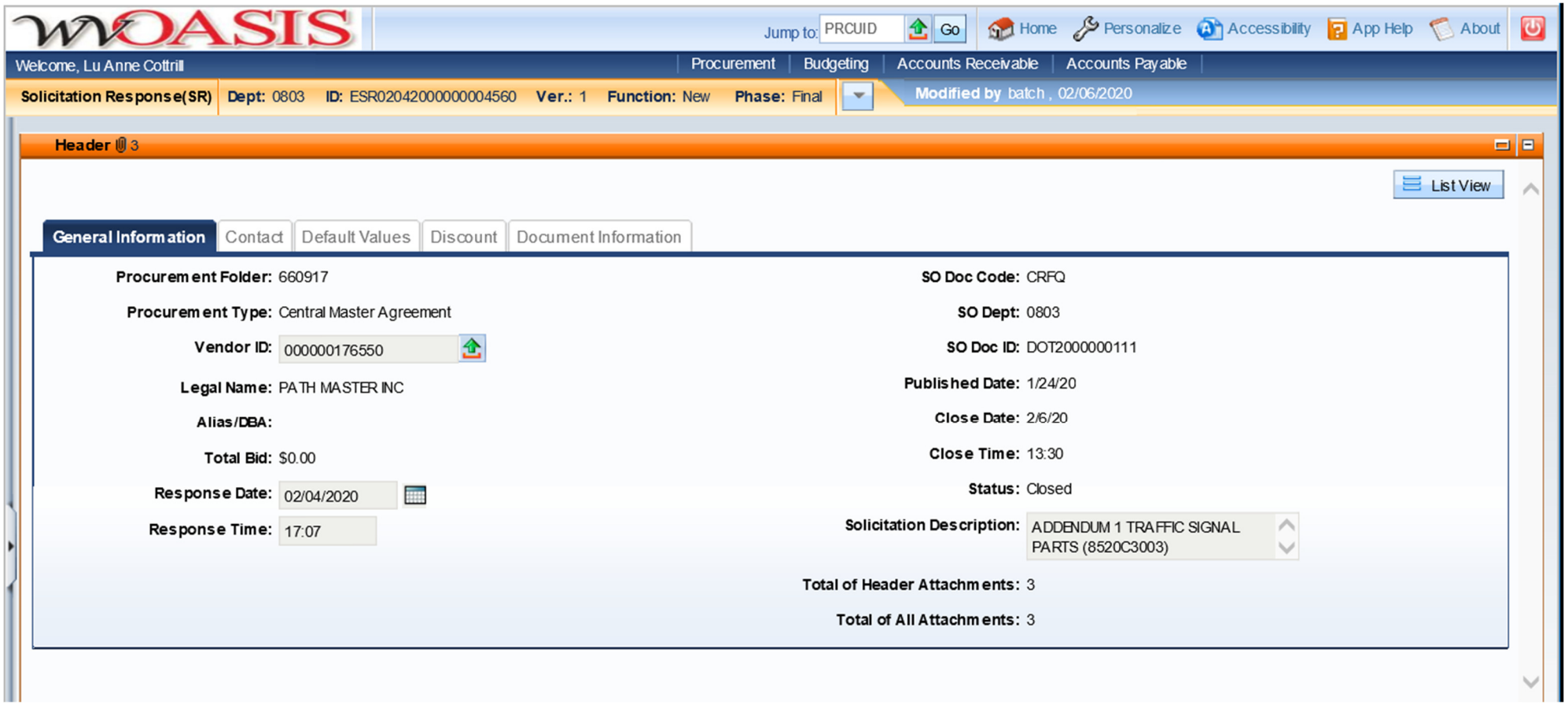
The following documentation is an electronically-submitted vendor response to an advertised solicitation from the *West Virginia Purchasing Bulletin* within the Vendor Self-Service portal at ***wvOASIS.gov***. As part of the State of West Virginia's procurement process, and to maintain the transparency of the bid-opening process, this documentation submitted online is publicly posted by the West Virginia Purchasing Division at ***WVPurchasing.gov*** with any other vendor responses to this solicitation submitted to the Purchasing Division in hard copy format.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Jump to: PRCUID Go
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Accessibility
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About
Welcome, Lu Anne Cottrill
Procurement
Budgeting
Accounts Receivable
Accounts Payable
Solicitation Response(SR) Dept: 0803 ID: ESR02042000000004560 Ver.: 1 Function: New Phase: Final
Modified by batch , 02/06/2020
Header 3
List View
General Information
Contact
Default Values
Discount
Document Information
Procurement Folder: 660917
Procurement Type: Central Master Agreement
Vendor ID: 000000176550
Legal Name: PATH MASTER INC
Alias/DBA:
Total Bid: $0.00
Response Date: 02/04/2020
Response Time: 17:07
SO Doc Code: CRFQ
SO Dept: 0803
SO Doc ID: DOT2000000111
Published Date: 1/24/20
Close Date: 2/6/20
Close Time: 13:30
Status: Closed
Solicitation Description: ADDENDUM 1 TRAFFIC SIGNAL PARTS (8520C3003)
Total of Header Attachments: 3
Total of All Attachments: 3

Purchasing Division
2019 Washington Street East
Post Office Box 50130
Charleston, WV 25305-0130

State of West Virginia
Solicitation Response

Proc Folder : 660917

Solicitation Description : ADDENDUM 1 TRAFFIC SIGNAL PARTS (8520C3003)

Proc Type : Central Master Agreement

Date issued	Solicitation Closes	Solicitation Response	Version
	2020-02-06 13:30:00	SR 0803 ESR02042000000004560	1

VENDOR

000000176550

PATH MASTER INC

Solicitation Number: CRFQ 0803 DOT2000000111

Total Bid : $0.00 **Response Date:** 2020-02-04 **Response Time:** 17:07:58

Comments:

FOR INFORMATION CONTACT THE BUYER

Crystal G Hustead

(304) 558-2402
crystal.g.hustead@wv.gov

Signature on File **FEIN #** **DATE**

All offers subject to all terms and conditions contained in this solicitation

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Ln Total Or Contract Amount
1	TRAFFIC SIGNAL PARTS FOR MAINTENANCE	0.00000	EA	$299,215.000000	$0.00

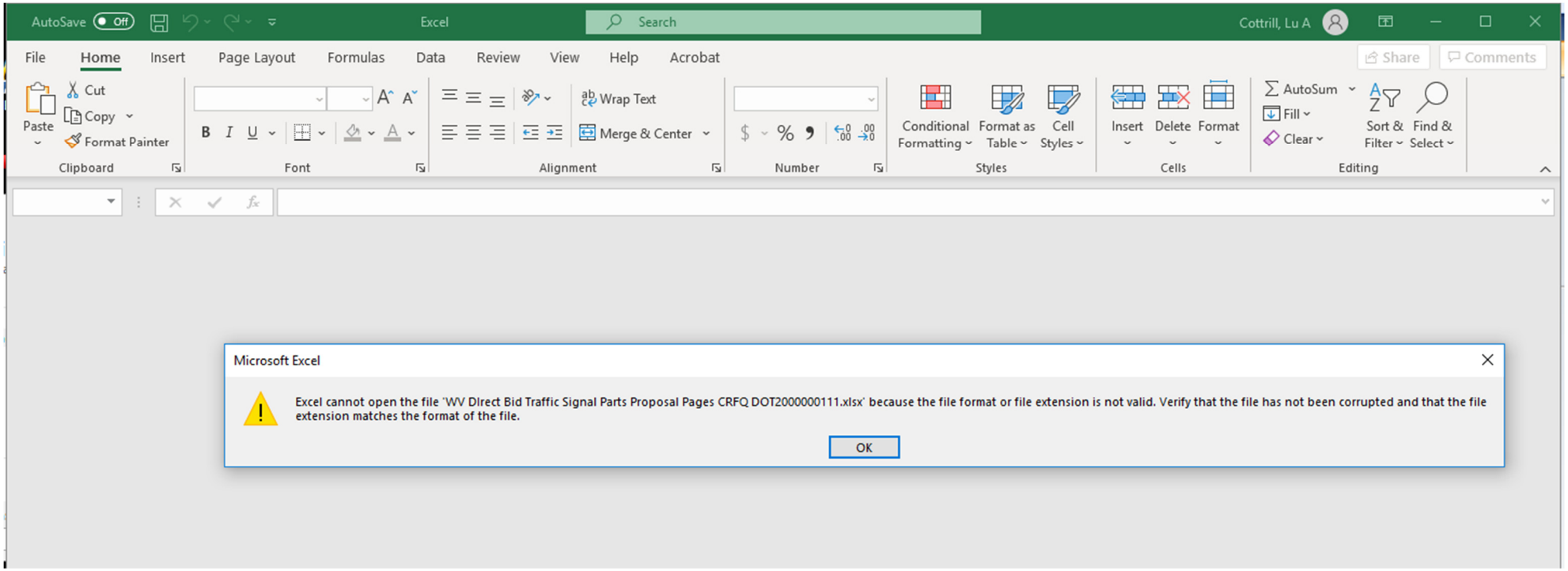
Comm Code	Manufacturer	Specification	Model #
46161504			

Extended Description : PRICING TO BE INCLUDED ON THE ATTACHED EXHIBIT A PRICING PAGE

Comments: Alternate Specs Submitted and Shown on Submittal Pages

Exhibit A Pricing Page

CRFQ DOT2000000111						
Item Number	**Estimated Quantities**	**Unit of Measure**	**Description**	**UNSPC CODE**	**Unit Price**	**Total Cost**
			SECTION 1			
1	20	ea	Siemens Eagle Traffic Controller M60 Series or equivalent	46161504	No Bid	No Bid
2	10	ea	Siemens Eagle Master Traffic Controller M60 Series or equivalent	46161504	No Bid	No Bid
3	30	ea	Repairs of Siemens Eagle Traffic Controllers	46161504	No Bid	No Bid
4	1	ea	Eagle Traffic Signal TS2 Pole Mounted Signal Cabinet or equivalent	46161504	No Bid	No Bid
5	1	ea	Eagle TS2 Ground Mounted Traffic Signal Cabinets or equivalent	46161504	No Bid	No Bid
			SECTION 2			
6	20	ea	Econolite Cobalt ATC Traffic Signal Controller or euqivalent	46161504	2700	54000
7	20	ea	Repair of Econolite Traffic Controller	46161504	750	15000
8	1	ea	Econolite TS2 Pole Mounted Signal Cabinet or equivalent	46161504	9060	9060
9	1	ea	Econolite TS Ground Mounted Signal Cabinet or equivalent	46161504	9480	9480
			SECTION 3			
10	10	ea	Iteris RZ4 Vehicle Detection Camera or equivalent	46161504	No Bid	No Bid
11	5	ea	Repair of Iteris RZ4 Video Detection Camera or equivalent	46161504	No Bid	No Bid
12	10	ea	Iteris Vehicle Detection Card or equivalent	46161504	No Bid	No Bid
13	10	ea	Repair of Iteris Video Detection Card	46161504	No Bid	No Bid
			SECTION 4			
14	10	ea	Autoscope Vehicle Detection Video Camera or equivalent	46161504	1675	16750
15	10	ea	Repair of Autoscope Vehicle Detection Camera or equivalent	46161504	625	6250
16	10	ea	Autoscope Vehicle Detection Cards or equivalent	46161504	2100	21000
17	10	ea	Repair of Autoscope Vehicle Detection Cards	46161504	300	3000
			SECTION 5			
18	1	ea	Wavetronix Smart Sensor Matrix Vehicle Detection Radar or euqivalent	46161504	No Bid	No Bid
19	1	ea	Wavetronix Smart Sensor"Advance" Matrix Vehicle Detection Radar or equivalent	46161504	No Bid	No Bid
20	10	ea	Wavetronix Smart 2-Channel Detection Card or equivalent	46161504	No Bid	No Bid
21	5	ea	Wavetronix 4-Channel Vehicle DetectionCard or equivalent	46161504	No Bid	No Bid
			SECTION 6			
22	1	ea	Econolite Accuscan "Stop Bar"+Advance Model 500 or Equal Vehicle Detection Radar	46161504	3125	3125
23	1	ea	Econolite Accuscan "Stop Bar"+ Advnace Model 600c or equal Vehicle Detection Radar	46161504	3725	3725
24	10	ea	Econolite Accuscan model TMIB2 or equal Detection Radar Controller Interface Card	46161504	4050	40500
			SECTION 7			
25	30	ea	TOMAR Preemption Control Systems Detectors or euqivalent	46161504	No Bid	No Bid
26	20	ea	TOMAR Preemption Control Systems Detection Cards or equivalent	46161504	No Bid	No Bid
27	15	ea	Repair of TOMAR Preemption Control Systems Detection Cards or euqivalent	46161504	No Bid	No Bid
			SECTION 8			
28	30	ea	Traffic Signal Conflict Monitor	46161504	690	20700
29	15	ea	Traffic Signal Malfunction Management Unit	46161504	750	11250
30	30	ea	Trafffic Signal Bus Interface Unit	46161504	240	7200
31	150	ea	Green LED Signal Lamp	46161504	25	3750
32	150	ea	Yellow LED Signal Lamp	46161504	25	3750
33	150	ea	Red LED Signal Lamp	46161504	25	3750
34	30	ea	LED Pedestrain Signal Head with Housing and Mounting Hardware	46161504	245	7350
35	30	ea	Audible Pedestrian Push Button	46161504	585	17550
36	50	ea	TS1 Cabinet Power Supply	46161504	No Bid	No Bid
37	15	ea	TS2 Cabinet Power Supply	46161504	470	7050
38	5	ea	Time Clocks	46161504	350	1750
39	50	ea	56K Wired Modems	46161504	280	14000
40	20	ea	Flash Transfer Relays	46161504	30	600
41	5	ea	Solar Flasher Controller	46161504	165	825
42	5	ea	Solar Flasher Motor Unit	46161504	No Bid	No Bid
			SECTION 10			
43	20	ea	ENCOM Radio Transceivers or equivalent	46161504	No Bid	No Bid
			SECTION 11			
44	10	ea	Intuicom Radio Transceivers or equivalent	46161504	1780	17800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Conditional Formatting
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Microsoft Excel
Excel cannot open the file 'WV DIrect Bid Traffic Signal Parts Proposal Pages CRFQ DOT2000000111.xlsx' because the file format or file extension is not valid. Verify that the file has not been corrupted and that the file extension matches the format of the file.
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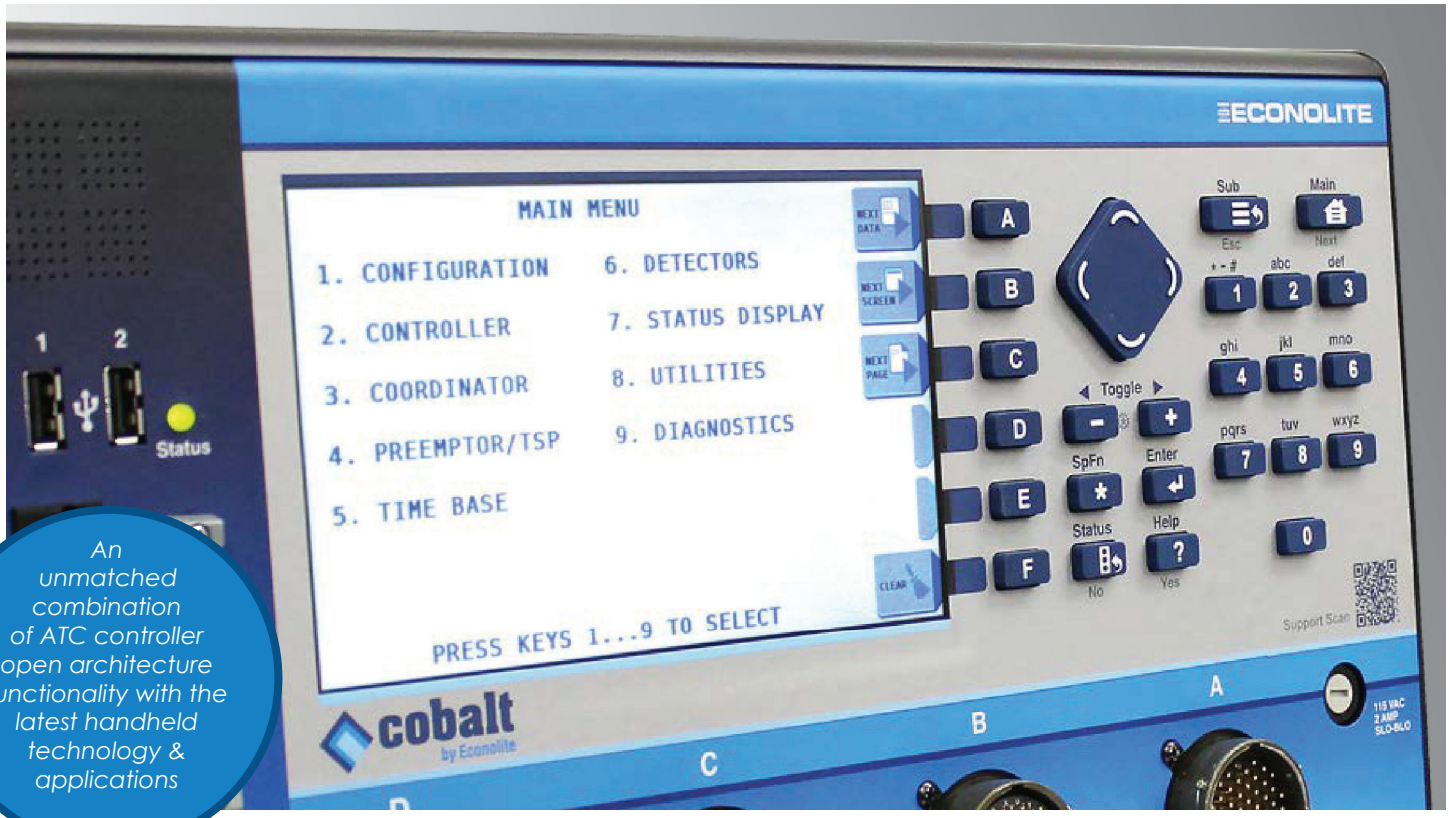
CRFQ 0803 DOT2000000111
B/R# 6
Qty. 20
With FSK/RS232 Telemetry Module

cobalt
by Econolite



An unmatched combination of ATC controller open architecture functionality with the latest handheld technology & applications

About Cobalt-C Series

The traffic signal controller represents one of the most important intelligent technology and communication components of a signalized intersection. As such, today's advanced traffic signal controller must integrate leading edge electronics, while supporting industry standards and specifications. Econolite continues its tradition of offering the most advanced and innovative technologies with the Cobalt™ family of Advanced Transportation Controllers (ATC).

Fully meeting the industry's ATC standard 5.2b and proposed standard 6.10, Cobalt-C is designed to provide an unmatched combination of ATC controller open architecture functionality with powerful, field-proven Cobalt ASC/3-LX software. Cobalt-C also features a breakthrough hardened seven-inch screen and user interface matched with a Linux-based operating system, making programming and access to functions the easiest in the industry.

At A Glance

- Revolutionary, large seven-inch TFT LCD display
- High brightness and contrast display for better outdoor readability than any other controller on the market
- Linux, open architecture real-time multi-tasking operating system
- Alternative Web browser-based user interface allows remote programming and status observation (with appropriate network connection)

ECONOLITE®

Cobalt-C ATC Hardware

Cobalt ATC controllers may be configured with Econolite's robust Cobalt Cobalt ASC/3-LX application software package, or other pre-qualified ATC/Linux software application software meeting current ATC standards. OS and software upgrades can be made easily by USB memory stick, SD card, or Ethernet via Econolite's Windows software installation application.

Cobalt -C includes a high-power, Linux-based Engine Board that is compliant with the ATC 5.2b and proposed 6.10 standard for a NEMA standard TS2 Type-1 or Type-2 I/O connectors,: four Ethernet ports, two USB ports, and an SD Card slot. Additionally, the Cobalt -C seven-inch, high brightness TFT LCD module with is readable in direct sunlight, and is not affected by condensation or water drops.

Hardware Details

- Supports Econolite Linux-based software or other pre-qualified ATC/Linux software
- ATC Engine Board
  - Fully compliant with the ATC Standard version 5.2b and proposed ATC Standard 6.10
  - 233MHz PowerQUICC II Pro-processor that provides 10 times more processing power than previous generation controller processor
  - 128Mbytes of DDR2 DRAM memory for application and OS program execution
  - 64 Mbytes of FLASH for storage of OS Software and user applications
  - 2MB of SRAM memory for non-volatile parameter storage
- Two integral Ethernet switches for two networks, ENET1 and ENET2
- Two USB 2.0 ports used to:
  - Update application software
  - Upload or download configuration
  - Upload logged data
- Datakey socket for an optional 3.3V Datakey, 8MB
- SD Memory Card socket
  - The SD Card stores configuration and logs and provides automatic backup of configuration
- CPU Active LED
- Three communications ports standard:
  - NEMA-ATC SDLC serial port 1
  - 25 pin serial port 2
  - 9 pin console serial port
- Built in speaker for enhanced audio controller feedback
- Integral carrying handle in back of controller
- Power Supply
  - Meets all requirements of ATC standard v6.10.
  - External 24VDC protected by a self-resetting electronic fuse
- Operating system
  - Linux 2.6.3x or later kernel and Board Support Package (BSP)
  - Compliant to ATC Standard V. 5.2.b Annex B specifications

Hardware Options

- Two models:
  - TS2 type 2 connectors
  - TS2 type 1 connector
- Communications module options:
  - FSK Module that can be configured for RS232 operation
  - 2070 TEES 2009 standard 6A, 6B, and 7A plug-in modules
- Datakey 3.3V, 8MB

Capabilities

Control Features

- 16 phases, 8 configurable concurrent groups in 4 timing rings
- 16 vehicle overlaps that can be configured as normal, -green/ yellow, PPLT/FYA or Econolite
- 16 pedestrian phases that can be configured as pedestrian overlaps
- Exclusive pedestrian operation
- Dynamic max operation
- Extendable walk and pedestrian clearance
- Advanced Walk
- Bike input and green timing
- Adaptive red clearance
- Transit Signal Priority

Coordination Features

- 120 coordination event plans, each with its own cycle, offsets, split timing, coordinated phases, vehicle and pedestrian recall and phase omits
- Offset and split entries displayed in percent or seconds
- Automatic permissive periods
- Fixed or floating force-off
- Crossing arterial coordination
- Quick-sync feature

Preemption Features

- Ten preemption sequences. Each may be configured as priority, first-come-first-serve, or bus preemption operation
- ECPI interlock to provide added monitoring
- Railroad gate-down input and timing.
- Conditional delay when entering preemption
- Multiple exit preemption options
  - Exit to selected exit phase
  - Exit to coordination (no transition)
  - Exit to interrupted pedestrian phase
  - Exit to interrupted vehicle phase
  - Use timing from an exit timing plan once, then the normal timing plan
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  - Exit to the phases where the most drivers have waited the longest

Time Base Features

- 200 schedule programs, configurable for any combination of months, days of the week, and days of the month
- Fixed or floating exception day programs that override the day plan event on a specific day
- 50 day plan events that can use any of the 100 action plans
- 100 action plans that can be used by any of the 50 day plans

Status Display Features

- Keyboard selection of detailed dynamic status displays for each of the main controller unit functions including: controller, coordinator, preemptor, time base, detectors, and MMU

Detector Features

- 64 vehicle detectors
- 16 system or speed detectors
- Unique detector types and operation
- Individually assignable to phase and functions
- Lock/non-lock function by detector
- 4 detector plans
- 4 detector diagnostics plans
- Logging of volume and/or occupancy assignable by detector
- 4 pedestrian diagnostic plans

Logging Features

- Separate buffers for detector activity, detector failures, controller events, and MMU events
- Logged data can be:
  - Viewed on front panel
  - Retrieved via a RS-232 terminal port, USB flash drive, or SD Card
  - Transferred via telemetry to a traffic management center

Systems

- NTCIP level 2 compliance
- Supports Centracs®, Aries® and TS2 NTCIP Level 2-compliant pre-qualified central applications

Cobalt Software

Cobalt ASC/3 Linux Software

- Provides menu selection
- Field-proven for over 9 years
- Allows for an agency-specific default database
- Automatic backup of controller database to optional Datakey, SD card, or manual back up to USB flash drive
- Context sensitive help
- 100-statement logic processor to test inputs, outputs or timers and take actions based on the results
- Peer-to-Peer operation is a feature that allows controllers to share information with other controllers, independent of the central system. One controller can communicate with up to 15 other controllers through Ethernet.

Optional Software

- Centracs Adaptive
- Intersection Monitor

User Interface

At its foundation, Cobalt-C has an intuitive navigation system that can be used with a laptop. Mobile device connectivity includes four Ethernet ports and two Universal Serial Bus (USB) ports that include support for an external Wi-Fi device. Cobalt-C also includes a Secure Digital (SD) port to provide almost unlimited file storage capability.

Basic Specifications

- Temperature
  - -34.6°F to +165°F (-37°C to +74°C)
- Power
  - 110VAC @ 50/60 HZ or optional 220/240 VAC @ 50/60 HZ
  - Fuse protection for either 110 or 220/240V
  - Protection for the 24VDC supply is provided by a resettable electronic fuse
- Dimensions
  - 14.84"W x 8.50"H x 6.13"D

ECONOLITE®

3360 E La Palma Avenue, Anaheim, CA 92806 · 714-630-3700 · sales@econolite.com · www.econolite.com

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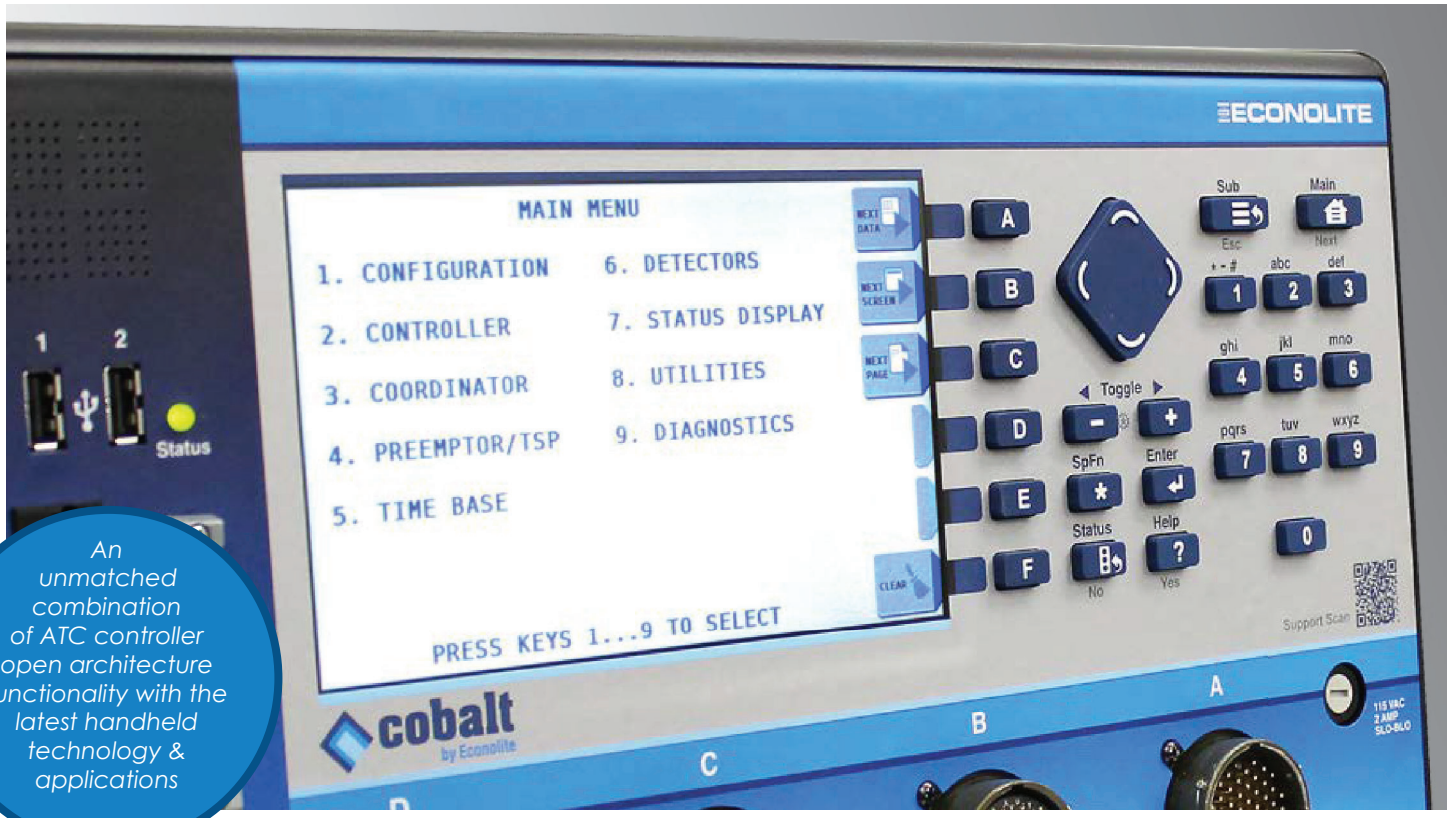
B/R# 8
Qty. 1

cobalt
by Econolite



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B/R# 8
Qty. 1

HESCO/RLS INCORPORATED

Your source for quality, reliable surge protection.

TRAFFIC CONTROL / AC SERVICE

HE1750

DESCRIPTION

The HE1750 has been specifically designed for use on both type 170 and on NEMA controllers. Because of the high quality of this protector, it may be used as a standalone device without the use of an external line filter. If an external line filter is required, it is recommended that a HESCO/RLS line filter be used.

The HE1750 (like the popular HE1800) is a multi-stage, high energy suppressor that incorporates a sophisticated, inline EMI/RFI filter. The inline filter has been designed to effectively reject random noise and spikes from 10KHz to 25MHz. The primary and secondary clamp stages are separated by an inductive network; yet work together to give clamp voltages of under 395 volts at 20KA (8 x 20us).

The HE1750 also incorporates the use of warning/failure indicators in addition to remote sensing for monitoring by a central computer. If random data base memory loss or any other transient interference is effecting the safe operation of one or more of your intersections, the HE1750 surge protector will quickly and effectively eliminate the problem.

SPECIFICATIONS

Peak Surge Current
8 x 20us.....48KA
Max Clamp Voltage.....395VAC
Response Time.....<5nS
Continuous Service Current.....15 Amps Max
Operating Temperature.....-40 to 85c
Dimensions (in.).....4.6W x 3.1L x 1.9H
Mounting.....Aluminum Base Plate

FEATURES

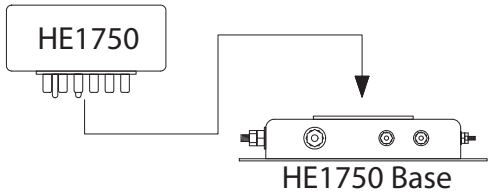
- Modular Design
- Multi-Stage Surge Arrestor
- Effectively Protects Against Lightning and Other Power Surges
- Dry Relay Contact Remote Sensing Circuit
- Immediately Self-Restores After Each Surge
- LED Warning / Failure Indicators

PIN ASSIGNMENTS

Line In.....1,2
Neutral In.....11,12
Ground.....3,4,9,10
Line Out.....5
Neutral Out.....7
Relay NC.....8
Relay Com.....6

MIL-STD-220A INSERTION LOSS DATA

Frequency	Insertion Loss (dB)
60Hz	0
10Khz	35
50Khz	71
100Khz	72
500Khz	75
2MHz	67
5MHz	57
10MHz	52
20MHz	38



CAUTION: Disconnect Power Prior to Installing or Removing Unit

HESCO/RLS Incorporated
1470 Kastner Place, Suite 112
Sanford , FL 32771
Fax (407) 321-2344

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

1-800-547-4868

www.hescorls.com

CRFQ 0803 DOT2000000111
B/R# 8
Qty. 1
Qty. 3 BIU's

Traffic Cabinet Components and Accesories

BIU

What, exactly, is a BIU?

The Bus Interface Unite (BIU) is a rack module that interfaces 24V logic I/O signals to the Synchronous Data Link Control (SDLC) serial bus of TS2 Type-1 traffic cabinets. The BIU is required in all TS2 Type-1 cabinets and in TS2 Type-2 cabinets when controller I/O interface is through the SDLC bus.

About BIU

It is required in all TS2 Type-1 cabinets and in TS2 Type-2 cabinets when controller I/O interface is through the SDLC bus, not via TS1 MS-A, B, and C connectors.

Physically, the BIU-64 consists of a circuit board and a front panel. A male 64-pin DIN 41612 Type-B series connector provides the connection to the backplane of the rack. A female 15-pin metal shell D subminiature connector with latching blocks provides the connection to the SDLC cable. The front panel provides separate indicator lights for Power, Transmit, and Valid Data. It also provides a handle for easy removal of the unit from the rack. A separate TS2 cabinet power supply provides the required 24 VDC power plus a 60 Hz line-timing reference.

Hardware

The BIU measures 2.34 in. W x 4.50 in. H x 6.60 in. D. Low-profile components are used in order to facilitate an optional half-width front plate unit which measures 1.17 in. x 4.5 in. x 6.60 in. The BIU will slide freely into two rack card-guides having a nominal slot width of 0.075 in. and a maximum slot width of 0.125 in.

An aluminum handle is provided on the front panel to allow easy removal of the BIU from the rack. Nominal outer dimensions of the handle shall be 1 in. x 2½ in.

The card rack connector on back of the BIU is a male 64-pin DIN 41612 type-B series. The connector is centered at the edge of the circuit board and oriented with Pin 1 located on top. The circuit board edges align with the connector per DIN 41612.

The Port-1 SDLC bus connector on the front panel of the BIU is a 15-pin metal shell sub-miniature type with female gold plated contacts. The connector is equipped with latching blocks and mates with a male 15-pin D-type cable connector that is equipped with spring latches (Amp part number 745012-1 or equivalent).

The front panel made of 0.090 in. sheet aluminum and is finished with a durable protective coating. Two indicator lamps are provided on the front panel, as specified by the TS2 Standard, for Power and Transmit. In addition, the front panel provides a Valid Data indicator, which lights whenever a Valid Data frame is received. The Power light flashes during absence of Line Frequency Reference (LFR) from the cabinet power supply. The BIU operates with internally generated 60 Hz reference in the absence of the LFR signal.

Pin Assignments

- Port-1 (SDLC bus) pin assignments shall be as specified in Section 8.6.2.1 of the TS2 Standard:
  - *1 - Rx Data*
  - *2 - Logic Ground*
  - *3 - Rx Clock +*
  - *4 - Logic Ground*
  - *5 - Tx Data*
  - *6 - Logic Ground*
  - *7 - Tx Clock +*
  - *8 - Logic Ground*
  - *9 - Rx Data -*
  - *10 - Not Used*
  - *11 - Rx Clock -*
  - *12 - Earth Ground*
  - *13 - Tx Data -*
  - *14 - Reserved*
  - *15 - Tx Clock -*

CRFQ 0803 DOT2000000111
B/R# 8
Qty. 1

Traffic Cabinet Components and Accessories

PS 200

What, exactly, is a PS 200?

Econolite's PS Series of power supply units supplies regulated DC power, and unregulated AC power, and a line frequency reference for the detector rack, BIUs, load switches, and other auxiliary equipment. The PS Series meets all requirements and NEMA standards. All TS-2 Type 1 cabinets and TS-2 Type 2 cabinets that utilize a BIU require a PS unit.

About the PS-200

The PS-200 cabinet power supply is a shelfmounted unit, which supplies regulated DC power, unregulated AC power, and a line frequency reference for the detector rack, BIUs, load switches, and other auxiliary equipment. The PS-200 meets all requirements of the NEMA TS2-2003 standard. All TS-2 Type 1 cabinet assemblies require the use of this unit, as well as any TS-2 Type 2 cabinet assemblies that utilize Bus Interface Units (BIU). Each PS-200 cabinet power supply is put through a rigorous quality program and tested under the extreme environmental conditions experienced on the street.

Display Indicators

A separate LED indicator is provided to display output status and fuse integrity for the three supply outputs. The Line Frequency Reference LED indicator pulses to show 60 Hz activity.

Input / Output Pins

A	AC Neutral
B	Line Frequency Reference Output
C	AC Line Input
D	+12 VDC Output
E	+24 VDC Output
F	Reserved
G	Logic Ground
H	Earth Ground
I	12 VAC Output
J	Reserved

Output Protection

The +12 VDC, +24VDC, and 12 VAC outputs are fused for over-current protection. Each output is protected against voltage transients by a 1500 Watt suppressor.

Test Points

Individual test jacks are provided for the +12 VDC output, +24 VDC output, and Logic Ground reference.

Basic Specifications

- Dimensions
  - *6" H x 5.8" W x 8.3" D*

1250 N. Tustin Avenue, Anaheim, CA 92806 · 714-630-3700 · sales@econolite.com · www.econolite.com

CRFQ 0803 DOT2000000111
B/R# 8
Qty. 1

Model FL-200

SOLID STATE FLASHER

Engineering Excellence!

- **Maximum rated load current of 15 Amps RMS per circuit over the entire operational temperature and voltage ranges.**
- **Operating voltage range: 89 to 135 VAC RMS at 60 ±3 Hz.**
- **Operating temperature range: -40° to 165° F (-40° to 74° C).**
- **Operating humidity range: 5 to 95% (non-condensing).**
- **Off state leakage current less than 10 mA peak at 135 VAC RMS.**
- **Flash rate: 57 ±3 flashes per minute with an ON period of 50 ±5%.**
- **Maximum one second surge current: 40 Amps RMS at 120 VAC, 60 Hz.**
- **Maximum one cycle surge current: 175 Amps RMS at 120 VAC, 60 Hz.**
- **Dual circuit operation.**
- **Dimensions: 8.00" (20.32 cm) long x 4.17" (10.59 cm) high x 1.55" (3.94 cm) wide.**

Overview:

The Model FL-200 Flasher is designed to meet or exceed NEMA Standards TS 1-1994 and TS 2-1998 and is compatible with Type 170 installations. Model FL-200 Flashers are dual circuit, solid state devices that are constructed with extruded aluminum exterior components which promote rapid heat dissipation to ensure lower operating temperatures and dependable long term operation. All internal components are readily accessible to facilitate replacement.

Reno A & E
4655 Aircenter Circle • Reno, Nevada • 89502 • USA
Tel: (775) 826-2020 • Fax: (775) 826-9191 • E-mail: sales@renoae.com • Internet: www.renoae.com

ISO 9001 REGISTERED

CRFQ 0803 DOT2000000111
B/R# 8
Qty. 1
Qty. 16 Loadswitches

Model LS-200

SOLID STATE LOAD SWITCH

Engineering Excellence!

- Two LED indicators per circuit provide independent confirmation of input and output states.
- Output LED is illuminated when the current flowing in the load exceeds 50 mA.
- Maximum rated continuous load current of 10 Amps RMS over the entire operational temperature and voltage ranges. Triacs are rated for 25 Amps RMS.
- Operating voltage range: 89 to 135 VAC RMS at 60 ±3 Hz.
- Operating temperature range: -40° to 165° F (-40° to 74° C).
- Operating humidity range: 5 to 95% (non-condensing).
- Off state leakage current less than 10 mA peak at 135 VAC RMS.
- Isolation greater than 2000 volts RMS.
- Maximum input current: less than 20 mA per input.
- Maximum one cycle surge current: 175 Amps RMS at 120 VAC, 60 Hz.
- Three electrically independent circuits.
- Dimensions: 8.00" (20.32 cm) long x 4.17" (10.59 cm) high x 1.55" (3.94 cm) wide.

Overview:

The Model LS-200 Load Switch exceeds industry standards by featuring two LED indicators per individual circuit (one for the input, one for the output). This feature provides a means of quickly and accurately conveying information regarding the input and output states of each circuit to assist technicians trouble shooting potential cabinet problems. The Model LS-200 Load Switch is designed to meet or exceed NEMA Standards TS 1-1994 and TS 2-1998 and is compatible with Type 170 installations. Model LS-200 Load Switches are three circuit, solid state devices that are constructed with extruded aluminum exterior components which promote rapid heat dissipation to ensure lower operating temperatures and dependable, long term operation. All internal components are readily accessible to facilitate replacement.

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4655 Aircenter Circle • Reno, Nevada • 89502 • USA
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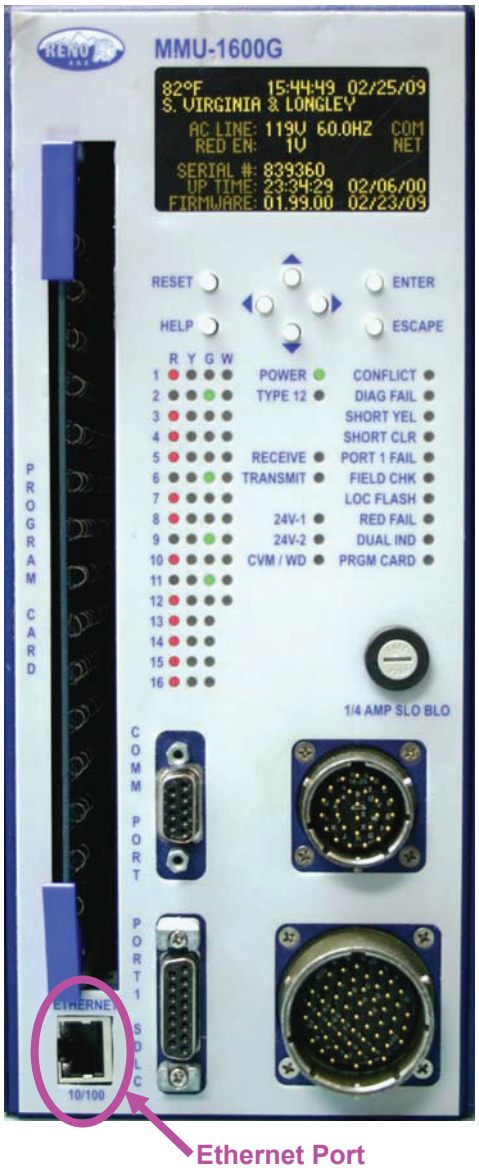
ISO 9001 REGISTERED

MMU-1600GE

Malfunction Management Unit

CRFQ 0803 DOT2000000111
B/R# 8
Qty. 1



- **Meets and/or exceeds all NEMA TS 2 specifications (NEMA TS 1 compatible – Type 12 operation)**
- **Organic Light Emitting Diode (OLED) display provides outstanding readability in any light condition and functions reliably over a temperature range of -22º F to +176º F (-30º C to +80º C)**
- **All AC field voltages can be displayed on a single screen, making viewing of leakage voltages on all load switch output a simple task**
- **Context sensitive Help system to assist with configuration and troubleshooting tasks**
- **77 front panel LEDs provide a clear, concise, real-time indication of the status of all channel inputs and fault conditions**
- **Event logging provides a detailed, time-stamped record of time changes, monitor resets, configuration changes, prior faults, AC line voltages, and signal sequence data**
- **The most advance Flashing Yellow Arrow Left Turn monitoring available in the industry**
- **LED signal head thresholds provide enhanced monitoring for LED indications**
- **Front panel mounted RS-232 Communications Port facilitates in-field firmware upgrades and access to stored logs**
- **Ethernet Port allows communications with the monitor through a settable Ethernet network IP address. Both the Ethernet port and the RS-232 Port can be used at the same time**
- **Configuration Wizard easily configures the monitor for most applications in just a few minutes**
- **All configuration data can be stored on a Reno A&E Program Card and can be copied from monitor to monitor**
- **Canadian Flashing Green Monitoring version available**

Overview:

The Model MMU-1600GE Malfunction Management Unit is a full featured unit that monitors up to 16 traffic signal channels for conflicting inputs, improper sequencing, incorrect timing, and invalid voltage levels. The MMU-1600GE is fully compliant with NEMA Standard TS 2-2003. The MMU-1600GE can operate in either Type 16 mode (sixteen channels) or Type 12 mode (twelve channels). When configured to operate in Type 12 mode, the unit is downward compatible with NEMA Standard TS 1-1989. The MMU-1600GE features an Organic light Emitting Diode (OLED) display that sets a new standard for user-friendly monitor configuration.

Reno A&E

Transportation Control Products
4655 Aircenter Circle • Reno, Nevada • 89502 • USA
Tel: (775) 826-2020 • Fax (775) 826-9191
E-mail: sales@renoae.com • Website: www.renoae.com

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Since 2000

MMU-1600GE ENHANCED FEATURES

The following is a list of features included in Reno A&E's Model MMU-1600GE Malfunction Management Unit which enhance the safety and operation of the unit. These features extend the operational capabilities of the MMU-1600GE beyond the requirements set forth in NEMA Standards Publication TS 2-2003.

Hardware Features: The MMU-1600GE unit incorporates a 16-bit microprocessor as the main processing unit, a digital signal processor (DSP), and two microcontrollers. The main microprocessor can be upgraded via the front panel RS-232 port. The DSP and the microcontrollers are flash based and can be programmed in circuit.

One of the microcontrollers is dedicated to monitoring diagnostic signals from the DSP and the main microprocessor. This microcontroller holds the main processor in the reset state until the AC Line voltage and all supply voltages have been verified as being within operational ranges.

The MMU is entirely connectorized internally with the exception of the two wires to the front panel fuse and an earth ground wire. This makes the MMU very easy to assemble and maintain. The possibility of wiring errors within the unit has been eliminated.

The MMU has an internal buzzer that indicates when the main processor is not running. This will only occur very briefly during power up, 1.5 seconds after loss of AC power, and during major diagnostic failures.

Graphics Display: The MMU-1600GE uses an Organic Light Emitting Diode (OLED) display. This display provides outstanding readability form -22º F to +176º F (-30º C to +80º C). The display is graphics based with a resolution of 128 x 64 and supports 16 shades of gray. The display has a contrast ratio of 2000:1.

Ethernet Port: The monitor supports a 10/100 Ethernet port. This port can be used simultaneously with the front panel RS-232 port. The Ethernet port is read-only when the monitor powers up. In order to write data through the Ethernet port, the reset button must be pressed and released. This action will cause the Ethernet port to be read-write for the next 15 minutes. This read-only function ensures that data in the monitor cannot be changed without someone physically being at the location of the monitor. This ensures that the IP address is correct and that changes cannot be implemented without physical access to the monitor.

Voltage Display Screens: The monitor has a special display mode that can show all of the AC field inputs in real-time or the values at the time of the last fault. It can also show all of the DC voltages in real-time or at the time of the last fault. The user can navigate between the four possible screens using the four arrow buttons. The real-time AC field voltage screen is very helpful in seeing the leakage voltage of load switches.

Configuration Wizard: The Configuration Wizard in the monitor can quickly configure the monitor for most intersections with 8 phases or less and running dual ring. The wizard can configure the following settings: Dual Indication / Field Check, Green-Yellow Monitoring Enable, Red Enables, Pedestrian Monitoring, Flashing Yellow Arrow Left Turns, Co-Channels, LED Thresholds, and External Watchdog Enable.

The wizard will also provide warnings about program card settings that do not agree with the configuration information entered in to the wizard.

Context Sensitive Help System: The monitor implements an advanced help system that will provide additional information based on what the user is currently doing or the fault currently being displayed. If the graphics display is showing a fault, pressing the HELP button will display information about this type of fault, common causes of this fault, and how to troubleshoot this type of fault.

Program Card Memory: Reno A&E MMU program cards have always contained a serial EEPROM memory device. The program card will work in any manufacturers MMU as a standard program card. But, when installed in a Reno A&E MMU, the monitor will copy all configuration data to the memory device. As of the 01.07.07 version of firmware, the storage of data was standardized across all Reno A&E MMU models. This allows the user to remove the program card from any model Reno A&E MMU and insert it into the MMU-1600G. Once powered up, the monitor will prompt the user whether the configuration stored on the program card or the configuration stored in the monitor should be used. If program card is selected, all configuration data stored on the program card will be copied into the monitor and used. If the monitor configuration is selected, the monitor configuration data will be copied to the program card.

Dual Indication Monitoring: This monitoring feature detects simultaneously active inputs of Green (Walk), Yellow, or Red (Don't Walk) on the same channel. The DUAL INDICATION / FIELD CHECK settings allow Dual Indication monitoring to be enabled on a per channel basis.

Type 12 – When the MMU is operating in this mode; Dual Indication monitoring detects simultaneously active inputs of Green and Yellow, Green and Red, Yellow and Red, Walk and Yellow, or Walk and Red on the same channel. When any two inputs of a channel are sensed as active for more than 1000 milliseconds, the MMU transfers the Output relay contacts to the fault condition and illuminates the DUAL IND indicator.

Type 16 – When the MMU is operating in this mode; Dual Indication monitoring detects simultaneously active inputs of Green and Yellow, Green and Red, or Yellow and Red on the same channel. When any two inputs of a channel are sensed as active for more than 1000 milliseconds, the MMU transfers the Output relay contacts to the fault condition, illuminates the DUAL IND indicator, and sets the Spare Bit #2 bit (bit 68) of the Type 129 Frame to 1.

Dual Indication monitoring is disabled when the Red Enable input is not active or if the Load Switch Flash bit (bit 112) of the Type 0 Frame is set to 1.

The MMU remains in this fault condition until the unit is reset by the activation of the front panel reset switch or the activation of the Reset input. An MMU Power Failure does not reset the MMU when it has been triggered by detection of Dual Indications on a channel prior to the MMU Power Failure.

GY-Dual Indication Monitoring: This monitoring function detects simultaneously active inputs of Green and Yellow field signal inputs on the same channel. When the Green and Yellow inputs of a channel are sensed as active for more than 1000 msec the MMU transfers the Output relay contacts to the fault condition, illuminates the DUAL IND indicator, and sets the Spare Bit #2 bit (bit 68) of the Type 129 Frame to 1.

The MMU remains in this fault condition until the unit is reset by the activation of the front panel reset switch or the activation of the Reset input. An MMU Power Failure does not reset the MMU when it has been triggered by detection of GY-Dual Indications on a channel prior to the MMU Power Failure. GY-Dual Indication Monitoring may be enabled concurrently with Dual Indication Monitoring.

GY-Dual Indication Monitoring is enabled by the use of the GRN-YEL MON ENABLED setting. When the GY-Dual Indication Monitoring option is enabled, all channels which have DUAL INDICATION / FIELD CHECK set to OFF will be individually monitored for simultaneously active Green and Yellow inputs. All channels that have DUAL INDICATION / FIELD CHECK set to ON will function as described above in Dual Indication Monitoring.

GY-Dual Indication monitoring is disabled when the Red Enable input is not active or if the Load Switch Flash bit (bit 112) of the Type 0 Frame is set to 1.

Field Check Monitoring: This monitoring function combines information about active field inputs with information received through the Port 1 communications between the Controller Unit and the MMU in a TS2 Cabinet Assembly. The MMU will receive a Type 0 Frame from the Controller Unit (Type 1 or Type 2 CU) that contains an image of the controller output commands to the load switches.

When the field signal input states detected as active or inactive by the MMU do not correspond with the information received from the Controller Unit in the Type 0 Frame for 10 consecutive 100 millisecond periods, the MMU will enter the fault mode, transfer the Output relay contacts to the Fault position, illuminate the FIELD CHK indicator, and set the Spare Bit #1 bit (bit 67) of the Type 129 Frame to 1.The MMU remains in this fault condition until the unit is reset by the activation of the front panel reset switch or the activation of the Reset input. An MMU Power Failure does not reset the MMU when it has been triggered by detection of Field Check fault prior to the MMU Power Failure. Field Check Monitoring is enabled concurrently with Dual Indication Monitoring.

Field Check Monitoring is enabled for each channel, individually, through the use of DUAL INDICATION / FIELD CHECK per channel settings. Field Check Monitoring is disabled when the RED ENABLE input is not active.

LED Thresholds: The monitor can use the standard incandescent field display thresholds or enhanced LED field display thresholds. The monitor normally uses 15 VAC as off and 25 VAC as on for Green, Yellow, and Walk displays and uses 50 VAC as off and 70 VAC as on for Red displays. With the LED thresholds active, the monitor uses the same voltage thresholds for all displays but will use different voltage thresholds based on the test being performed. For Conflict, Dual Indication, and Field Check the monitor uses 15 VAC as off and 25 VAC as on. For Red Fail, Short Yellow, and Short Clearance the monitor uses 50 VAC as off and 70 VAC as on.

Flashing Yellow Arrow Left Turn Monitoring: The monitor supports four section Flashing Yellow Arrow (FYA) left turn displays. Faults monitored for include: Dual Indication, Red Fail, Flashing Yellow Arrow must flash, and a solid Yellow Arrow terminating a Green Arrow must conflict with the opposing through Green and Yellow. Reno A&E monitors provide the most flexible and advanced Flashing Yellow Arrow Left Turn monitoring capabilities available in the industry.

Modified CVM Latch: This feature is useful in cabinets where the CVM input may not always be valid within the programmed Minimum Flash time and where latched CVM failures is desired. In the modified mode of operation, the MMU will not latch a CVM failure until the CVM input has been valid for more than 175 milliseconds.

This function is enabled by the setting MODIFIED CVM LATCH. This feature only has an effect if the CVM Latch jumper is installed on the programming card.

Type 16 Only Mode: This feature is useful in cabinets where the user is retrofitting a TS 2 monitor into a TS 1 cabinet and wants to use the Type 16 mode, but the existing Connector A harness does not have a wire for pin "HH" (Type Select). Activating this feature forces the MMU to operate in the Type 16 mode regardless of the logic level on the Type Select input. While this feature is on, the TYPE 12 LED will show the Function Disabled indication (50 milliseconds on, once every two seconds).

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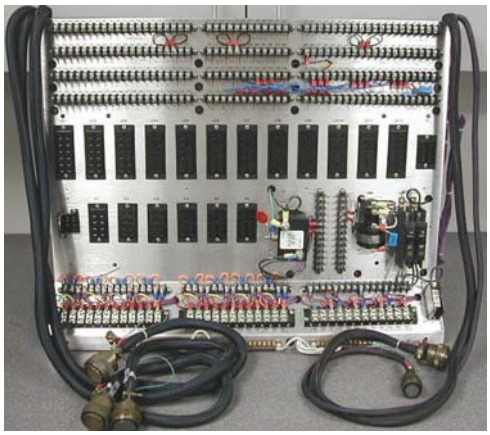
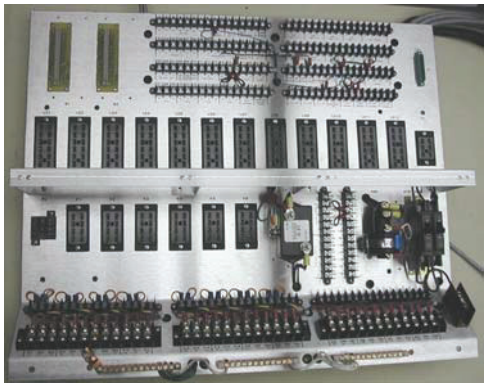
B/R# 8
Qty. 1

PATH MASTER
Where Traffic Meets Technology

NEMA TS2 Type 2
12 Position Cabinet Assembly



NEMA TS2 Type 2
12 Position Wired Panel



NEMA TS2 Type 1
12 Position Wired Panel

NEMA Wired Cabinet Assemblies

NEMA TS1/NEMA TS2-1/NEMA TS2-2

Path Master, Inc. wired cabinet assemblies are designed and built to meet all current NEMA requirements, both in TS1 and TS2 configurations. All panels are constructed from 3.18mm (.125") aluminum and include the following list of features:

- Field terminals for signal hook-up are mounted at 45° for ease of maintenance and installation.
- All electrical connections to the backside of the panel are soldered in place. All electrical connections to the front side of the panel use crimp terminals with threaded fasteners.
- All main power panel devices are fastened to the lower right portion of the main panel including all circuit breakers, line filters and load relays. An option side mounted power panel is available.
- The wiring harnesses to the controller and monitor are protected with a nylon mesh or "Snake Skin".
- The front side of the backpanel is permanently silk-screened with both functional descriptions and terminal reference numbers. The backside is silk-screened with terminal reference numbers.
- All plug-in and panel mounted devices are identified with silk-screened designations.
- Flash programming is made from the front of the panel with the use of a screwdriver.
- All NEMA defined controller functions are terminated and accessible from the front of the backpanel.
- Available in 4, 8, 12, and 16 load switch positions in both NEMA TS1 and NEMA TS2 configurations.
- Mounting for load switches and flashers are in a single horizontal row and include an adjustable support bracket.

Specifications

NEMA TS2 Type 1

8 Position	558mmH x 508mmW	(22"H x 20"W)
12 Position	558mmH x 686mmW	(22"H x 27"W)
16 Position	558mmH x 864mmW	(22"H x 34"W)

NEMA TS1/TS2 Type 2

4 Position	380mmH x 406mmW	(15"H x 16"W)
8 Position	508mmH x 508mmW	(20"H x 20"W)
12 Position	558mmH x 686mmW	(22"H x 27"W)
16 Position	521mmH x 864mmW	(20.5"H x 34"W)

Path Master, Inc., 1960 Midway Drive, Twinsburg, Ohio 44087
330-425-4994, Fax: 330-425-9338, www.pathmasterinc.com

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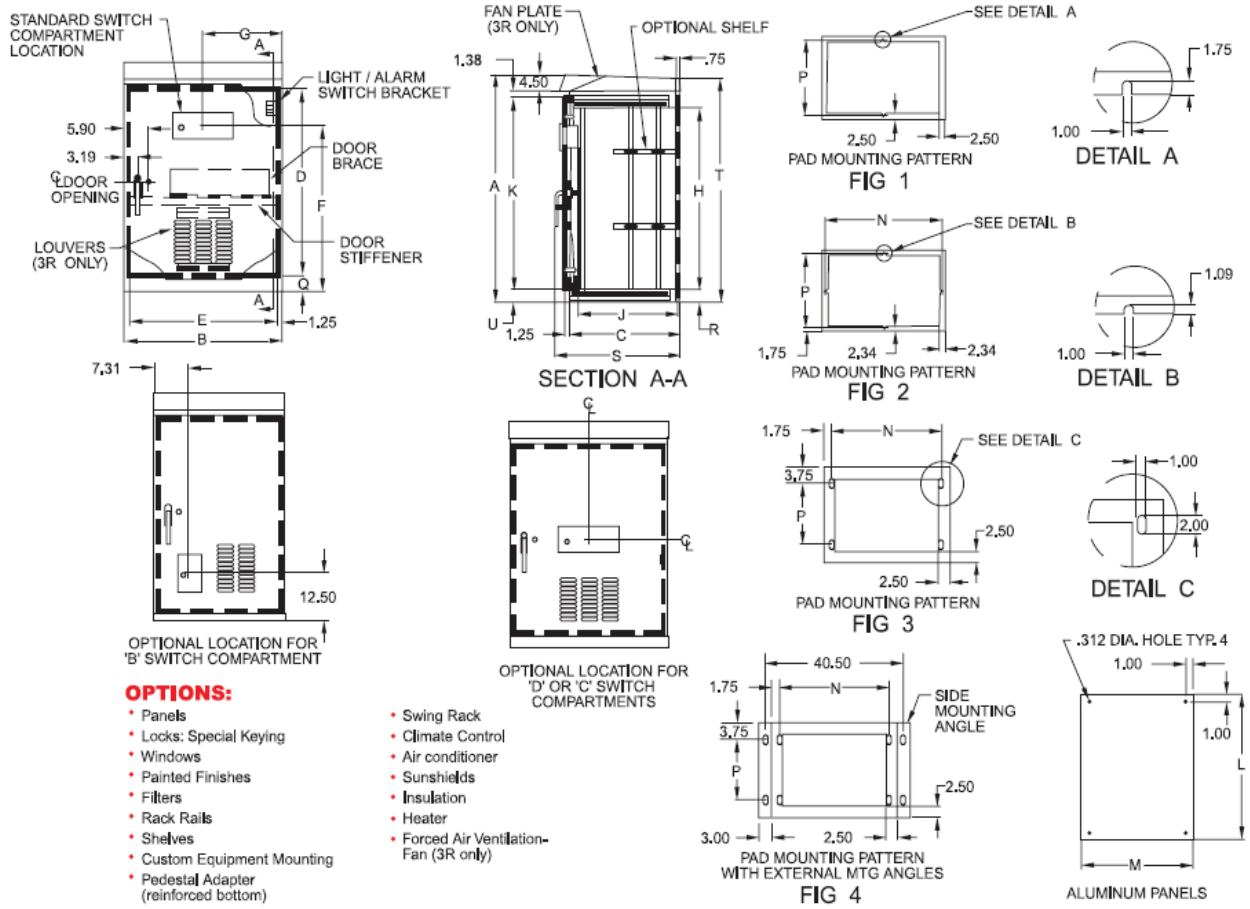
PATH MASTER
Where Traffic Meets Technology

NEMA 3R Traffic Enclosures



OPTIONS:

- Panels
- Locks: Special Keying
- Windows
- Painted Finishes
- Filters
- Rack Rails
- Shelves
- Custom Equipment Mounting
- Pedestal Adapter (reinforced bottom)
- Swing Rack
- Climate Control
- Air conditioner
- Sunshields
- Insulation
- Heater
- Forced Air Ventilation- Fan (3R only)

Type	Catalog Number	Mtg	Overall Size			Door Opening		Cubic Feet	PAD MTG Pattern	
			A (H)	B(W)	C(D)	D (H)	E(W)		N	P
G	TC412516	PM	41	25	16	32	22.5	9.5	N/A	N/A
K2	TC512516	PM	51	25	16	42	22.5	11.8	N/A	N/A
KB	TC512516	BM	51	25	16	42	22.5	11.8	0	12.5
M2	TC503017	PM	50	30	17	39	27.5	14.8	N/A	N/A
M	TC503017	BM	50	30	17	39	27.5	14.8	26.5	13.5
SM2	TC583017	PM	58	30	17	47	27.5	17.1	N/A	N/A
SM	TC583017	BM	58	30	17	47	27.5	17.1	26.5	13.5
M36/2WV	TC513617	PM	51	36	17	40	33.5	18.0	N/A	N/A
SM36/2	TC583617	PM	58	36	17	47	33.5	20.5	N/A	N/A
SM36	TC583617	BM	58	36	17	47	33.5	20.5	33.5	13.5
XM	TC763017	BM	76	30	17	65	27.5	22.4	26.5	13.5
XM36	TC763617	BM	76	36	17	65	33.5	22.4	33.5	13.5
SXM36/2	TC663617	PM	66	36	17	55	33.5	23.4	N/A	N/A
P38	TC553826	BM	55	38	26	44	35.5	31.5	34.5	18.5
P44	TC554426	BM	55	44	26	44	41.5	36.4	40.5	18.5
R38	TC773826	BM	77	38	26	66	35.5	31.5	34.5	18.5
R44	TC774426	BM	77	44	26	66	41.5	36.4	40.5	18.5

Path Master, Inc., 1960 Midway Drive, Twinsburg, Ohio 44087
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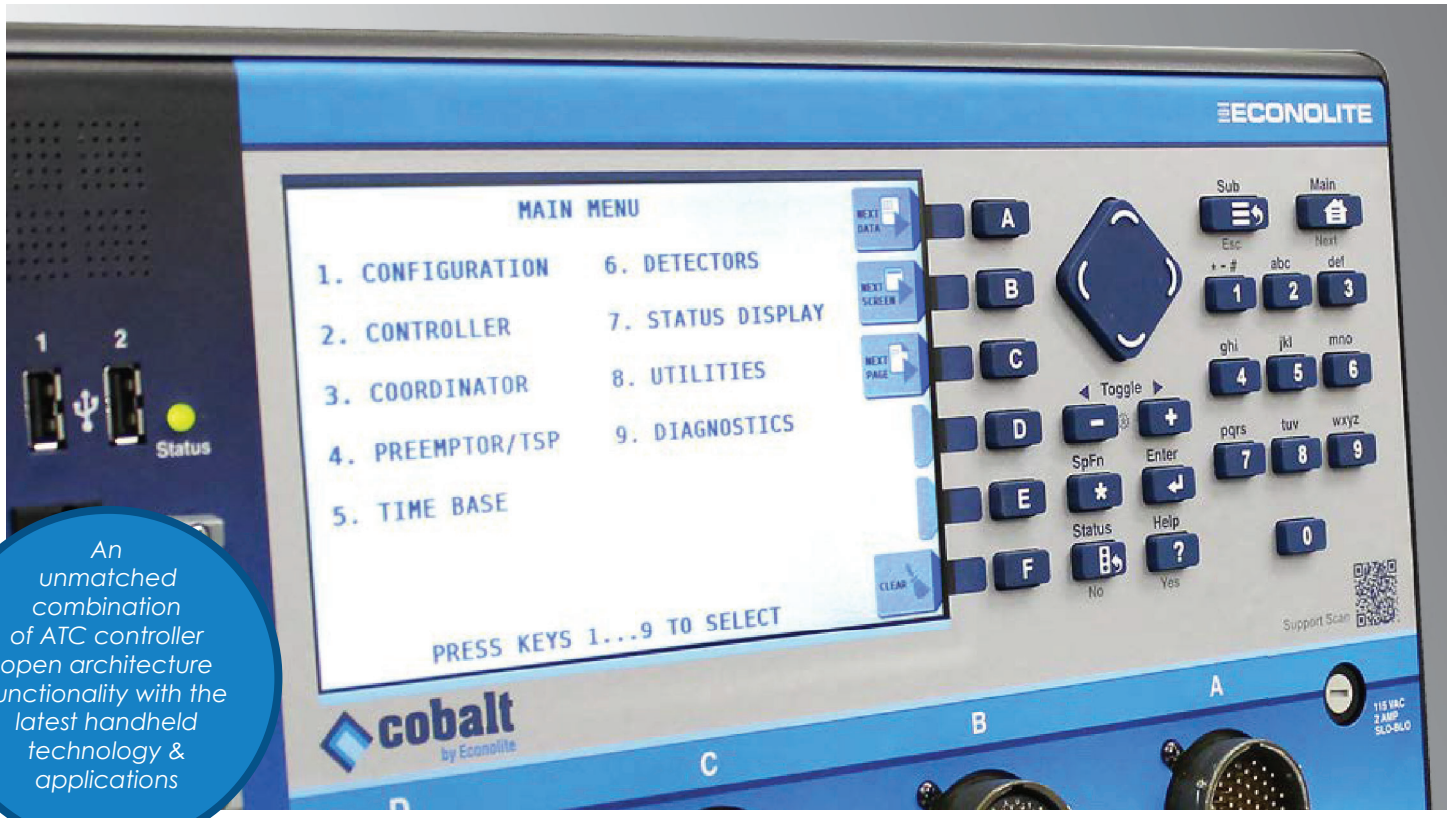
B/R# 9
Qty. 1

cobalt
by Econolite



An unmatched combination of ATC controller open architecture functionality with the latest handheld technology & applications

About Cobalt-C Series

The traffic signal controller represents one of the most important intelligent technology and communication components of a signalized intersection. As such, today's advanced traffic signal controller must integrate leading edge electronics, while supporting industry standards and specifications. Econolite continues its tradition of offering the most advanced and innovative technologies with the Cobalt™ family of Advanced Transportation Controllers (ATC).

Fully meeting the industry's ATC standard 5.2b and proposed standard 6.10, Cobalt-C is designed to provide an unmatched combination of ATC controller open architecture functionality with powerful, field-proven Cobalt ASC/3-LX software. Cobalt-C also features a breakthrough hardened seven-inch screen and user interface matched with a Linux-based operating system, making programming and access to functions the easiest in the industry.

At A Glance

- Revolutionary, large seven-inch TFT LCD display
- High brightness and contrast display for better outdoor readability than any other controller on the market
- Linux, open architecture real-time multi-tasking operating system
- Alternative Web browser-based user interface allows remote programming and status observation (with appropriate network connection)

ECONOLITE®

Cobalt-C ATC Hardware

Cobalt ATC controllers may be configured with Econolite's robust Cobalt Cobalt ASC/3-LX application software package, or other pre-qualified ATC/Linux software application software meeting current ATC standards. OS and software upgrades can be made easily by USB memory stick, SD card, or Ethernet via Econolite's Windows software installation application.

Cobalt -C includes a high-power, Linux-based Engine Board that is compliant with the ATC 5.2b and proposed 6.10 standard for a NEMA standard TS2 Type-1 or Type-2 I/O connectors,: four Ethernet ports, two USB ports, and an SD Card slot. Additionally, the Cobalt -C seven-inch, high brightness TFT LCD module with is readable in direct sunlight, and is not affected by condensation or water drops.

Hardware Details

- Supports Econolite Linux-based software or other pre-qualified ATC/Linux software
- ATC Engine Board
  - Fully compliant with the ATC Standard version 5.2b and proposed ATC Standard 6.10
  - 233MHz PowerQUICC II Pro-processor that provides 10 times more processing power than previous generation controller processor
  - 128Mbytes of DDR2 DRAM memory for application and OS program execution
  - 64 Mbytes of FLASH for storage of OS Software and user applications
  - 2MB of SRAM memory for non-volatile parameter storage
- Two integral Ethernet switches for two networks, ENET1 and ENET2
- Two USB 2.0 ports used to:
  - Update application software
  - Upload or download configuration
  - Upload logged data
- Datakey socket for an optional 3.3V Datakey, 8MB
- SD Memory Card socket
  - The SD Card stores configuration and logs and provides automatic backup of configuration
- CPU Active LED
- Three communications ports standard:
  - NEMA-ATC SDLC serial port 1
  - 25 pin serial port 2
  - 9 pin console serial port
- Built in speaker for enhanced audio controller feedback
- Integral carrying handle in back of controller
- Power Supply
  - Meets all requirements of ATC standard v6.10.
  - External 24VDC protected by a self-resetting electronic fuse
- Operating system
  - Linux 2.6.3x or later kernel and Board Support Package (BSP)
  - Compliant to ATC Standard V. 5.2.b Annex B specifications

Hardware Options

- Two models:
  - TS2 type 2 connectors
  - TS2 type 1 connector
- Communications module options:
  - FSK Module that can be configured for RS232 operation
  - 2070 TEES 2009 standard 6A, 6B, and 7A plug-in modules
- Datakey 3.3V, 8MB

Capabilities

Control Features

- 16 phases, 8 configurable concurrent groups in 4 timing rings
- 16 vehicle overlaps that can be configured as normal, -green/ yellow, PPLT/FYA or Econolite
- 16 pedestrian phases that can be configured as pedestrian overlaps
- Exclusive pedestrian operation
- Dynamic max operation
- Extendable walk and pedestrian clearance
- Advanced Walk
- Bike input and green timing
- Adaptive red clearance
- Transit Signal Priority

Coordination Features

- 120 coordination event plans, each with its own cycle, offsets, split timing, coordinated phases, vehicle and pedestrian recall and phase omits
- Offset and split entries displayed in percent or seconds
- Automatic permissive periods
- Fixed or floating force-off
- Crossing arterial coordination
- Quick-sync feature

Preemption Features

- Ten preemption sequences. Each may be configured as priority, first-come-first-serve, or bus preemption operation
- ECPI interlock to provide added monitoring
- Railroad gate-down input and timing.
- Conditional delay when entering preemption
- Multiple exit preemption options
  - Exit to selected exit phase
  - Exit to coordination (no transition)
  - Exit to interrupted pedestrian phase
  - Exit to interrupted vehicle phase
  - Use timing from an exit timing plan once, then the normal timing plan
  - Exit to a selected phase first then to free or coordination (selectable)
  - Exit free for one complete cycle then resume coordination (no transition)
  - Exit to the phases where the most drivers have waited the longest

Time Base Features

- 200 schedule programs, configurable for any combination of months, days of the week, and days of the month
- Fixed or floating exception day programs that override the day plan event on a specific day
- 50 day plan events that can use any of the 100 action plans
- 100 action plans that can be used by any of the 50 day plans

Status Display Features

- Keyboard selection of detailed dynamic status displays for each of the main controller unit functions including: controller, coordinator, preemptor, time base, detectors, and MMU

Detector Features

- 64 vehicle detectors
- 16 system or speed detectors
- Unique detector types and operation
- Individually assignable to phase and functions
- Lock/non-lock function by detector
- 4 detector plans
- 4 detector diagnostics plans
- Logging of volume and/or occupancy assignable by detector
- 4 pedestrian diagnostic plans

Logging Features

- Separate buffers for detector activity, detector failures, controller events, and MMU events
- Logged data can be:
  - Viewed on front panel
  - Retrieved via a RS-232 terminal port, USB flash drive, or SD Card
  - Transferred via telemetry to a traffic management center

Systems

- NTCIP level 2 compliance
- Supports Centracs®, Aries® and TS2 NTCIP Level 2-compliant pre-qualified central applications

Cobalt Software

Cobalt ASC/3 Linux Software

- Provides menu selection
- Field-proven for over 9 years
- Allows for an agency-specific default database
- Automatic backup of controller database to optional Datakey, SD card, or manual back up to USB flash drive
- Context sensitive help
- 100-statement logic processor to test inputs, outputs or timers and take actions based on the results
- Peer-to-Peer operation is a feature that allows controllers to share information with other controllers, independent of the central system. One controller can communicate with up to 15 other controllers through Ethernet.

Optional Software

- Centracs Adaptive
- Intersection Monitor

User Interface

At its foundation, Cobalt-C has an intuitive navigation system that can be used with a laptop. Mobile device connectivity includes four Ethernet ports and two Universal Serial Bus (USB) ports that include support for an external Wi-Fi device. Cobalt-C also includes a Secure Digital (SD) port to provide almost unlimited file storage capability.

Basic Specifications

- Temperature
  - -34.6°F to +165°F (-37°C to +74°C)
- Power
  - 110VAC @ 50/60 HZ or optional 220/240 VAC @ 50/60 HZ
  - Fuse protection for either 110 or 220/240V
  - Protection for the 24VDC supply is provided by a resettable electronic fuse
- Dimensions
  - 14.84"W x 8.50"H x 6.13"D

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B/R# 9
Qty. 1

HESCO/RLS INCORPORATED

Your source for quality, reliable surge protection.

TRAFFIC CONTROL / AC SERVICE

HE1750

DESCRIPTION

The HE1750 has been specifically designed for use on both type 170 and on NEMA controllers. Because of the high quality of this protector, it may be used as a standalone device without the use of an external line filter. If an external line filter is required, it is recommended that a HESCO/RLS line filter be used.

The HE1750 (like the popular HE1800) is a multi-stage, high energy suppressor that incorporates a sophisticated, inline EMI/RFI filter. The inline filter has been designed to effectively reject random noise and spikes from 10KHz to 25MHz. The primary and secondary clamp stages are separated by an inductive network; yet work together to give clamp voltages of under 395 volts at 20KA (8 x 20us).

The HE1750 also incorporates the use of warning/failure indicators in addition to remote sensing for monitoring by a central computer. If random data base memory loss or any other transient interference is effecting the safe operation of one or more of your intersections, the HE1750 surge protector will quickly and effectively eliminate the problem.

SPECIFICATIONS

Peak Surge Current
8 x 20us.....48KA
Max Clamp Voltage.....395VAC
Response Time.....<5nS
Continuous Service Current.....15 Amps Max
Operating Temperature.....-40 to 85c
Dimensions (in.).....4.6W x 3.1L x 1.9H
Mounting.....Aluminum Base Plate

FEATURES

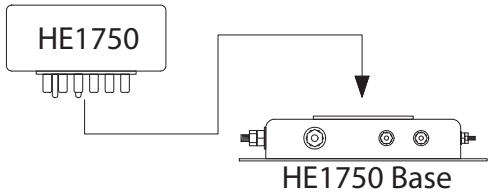
- Modular Design
- Multi-Stage Surge Arrestor
- Effectively Protects Against Lightning and Other Power Surges
- Dry Relay Contact Remote Sensing Circuit
- Immediately Self-Restores After Each Surge
- LED Warning / Failure Indicators

PIN ASSIGNMENTS

Line In.....1,2
Neutral In.....11,12
Ground.....3,4,9,10
Line Out.....5
Neutral Out.....7
Relay NC.....8
Relay Com.....6

MIL-STD-220A INSERTION LOSS DATA

Frequency	Insertion Loss (dB)
60Hz	0
10Khz	35
50Khz	71
100Khz	72
500Khz	75
2MHz	67
5MHz	57
10MHz	52
20MHz	38



CAUTION: Disconnect Power Prior to Installing or Removing Unit

HESCO/RLS Incorporated
1470 Kastner Place, Suite 112
Sanford , FL 32771
Fax (407) 321-2344

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

1-800-547-4868

www.hescorls.com

CRFQ 0803 DOT2000000111
B/R# 9
Qty. 1
Qty. 3 BIU's

Traffic Cabinet Components and Accesories

BIU

What, exactly, is a BIU?

The Bus Interface Unite (BIU) is a rack module that interfaces 24V logic I/O signals to the Synchronous Data Link Control (SDLC) serial bus of TS2 Type-1 traffic cabinets. The BIU is required in all TS2 Type-1 cabinets and in TS2 Type-2 cabinets when controller I/O interface is through the SDLC bus.

About BIU

It is required in all TS2 Type-1 cabinets and in TS2 Type-2 cabinets when controller I/O interface is through the SDLC bus, not via TS1 MS-A, B, and C connectors.

Physically, the BIU-64 consists of a circuit board and a front panel. A male 64-pin DIN 41612 Type-B series connector provides the connection to the backplane of the rack. A female 15-pin metal shell D subminiature connector with latching blocks provides the connection to the SDLC cable. The front panel provides separate indicator lights for Power, Transmit, and Valid Data. It also provides a handle for easy removal of the unit from the rack. A separate TS2 cabinet power supply provides the required 24 VDC power plus a 60 Hz line-timing reference.

Hardware

The BIU measures 2.34 in. W x 4.50 in. H x 6.60 in. D. Low-profile components are used in order to facilitate an optional half-width front plate unit which measures 1.17 in. x 4.5 in. x 6.60 in. The BIU will slide freely into two rack card-guides having a nominal slot width of 0.075 in. and a maximum slot width of 0.125 in.

An aluminum handle is provided on the front panel to allow easy removal of the BIU from the rack. Nominal outer dimensions of the handle shall be 1 in. x 2½ in.

The card rack connector on back of the BIU is a male 64-pin DIN 41612 type-B series. The connector is centered at the edge of the circuit board and oriented with Pin 1 located on top. The circuit board edges align with the connector per DIN 41612.

The Port-1 SDLC bus connector on the front panel of the BIU is a 15-pin metal shell sub-miniature type with female gold plated contacts. The connector is equipped with latching blocks and mates with a male 15-pin D-type cable connector that is equipped with spring latches (Amp part number 745012-1 or equivalent).

The front panel made of 0.090 in. sheet aluminum and is finished with a durable protective coating. Two indicator lamps are provided on the front panel, as specified by the TS2 Standard, for Power and Transmit. In addition, the front panel provides a Valid Data indicator, which lights whenever a Valid Data frame is received. The Power light flashes during absence of Line Frequency Reference (LFR) from the cabinet power supply. The BIU operates with internally generated 60 Hz reference in the absence of the LFR signal.

Pin Assignments

- Port-1 (SDLC bus) pin assignments shall be as specified in Section 8.6.2.1 of the TS2 Standard:
  - *1 - Rx Data*
  - *2 - Logic Ground*
  - *3 - Rx Clock +*
  - *4 - Logic Ground*
  - *5 - Tx Data*
  - *6 - Logic Ground*
  - *7 - Tx Clock +*
  - *8 - Logic Ground*
  - *9 - Rx Data -*
  - *10 - Not Used*
  - *11 - Rx Clock -*
  - *12 - Earth Ground*
  - *13 - Tx Data -*
  - *14 - Reserved*
  - *15 - Tx Clock -*

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Qty. 1

Traffic Cabinet Components and Accessories

PS 200

What, exactly, is a PS 200?

Econolite's PS Series of power supply units supplies regulated DC power, and unregulated AC power, and a line frequency reference for the detector rack, BIUs, load switches, and other auxiliary equipment. The PS Series meets all requirements and NEMA standards. All TS-2 Type 1 cabinets and TS-2 Type 2 cabinets that utilize a BIU require a PS unit.

About the PS-200

The PS-200 cabinet power supply is a shelfmounted unit, which supplies regulated DC power, unregulated AC power, and a line frequency reference for the detector rack, BIUs, load switches, and other auxiliary equipment. The PS-200 meets all requirements of the NEMA TS2-2003 standard. All TS-2 Type 1 cabinet assemblies require the use of this unit, as well as any TS-2 Type 2 cabinet assemblies that utilize Bus Interface Units (BIU). Each PS-200 cabinet power supply is put through a rigorous quality program and tested under the extreme environmental conditions experienced on the street.

Display Indicators

A separate LED indicator is provided to display output status and fuse integrity for the three supply outputs. The Line Frequency Reference LED indicator pulses to show 60 Hz activity.

Input / Output Pins

A	AC Neutral
B	Line Frequency Reference Output
C	AC Line Input
D	+12 VDC Output
E	+24 VDC Output
F	Reserved
G	Logic Ground
H	Earth Ground
I	12 VAC Output
J	Reserved

Output Protection

The +12 VDC, +24VDC, and 12 VAC outputs are fused for over-current protection. Each output is protected against voltage transients by a 1500 Watt suppressor.

Test Points

Individual test jacks are provided for the +12 VDC output, +24 VDC output, and Logic Ground reference.

Basic Specifications

- Dimensions
  - *6" H x 5.8" W x 8.3" D*

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Qty. 1

Model FL-200

SOLID STATE FLASHER

Engineering Excellence!

- **Maximum rated load current of 15 Amps RMS per circuit over the entire operational temperature and voltage ranges.**
- **Operating voltage range: 89 to 135 VAC RMS at 60 ±3 Hz.**
- **Operating temperature range: -40° to 165° F (-40° to 74° C).**
- **Operating humidity range: 5 to 95% (non-condensing).**
- **Off state leakage current less than 10 mA peak at 135 VAC RMS.**
- **Flash rate: 57 ±3 flashes per minute with an ON period of 50 ±5%.**
- **Maximum one second surge current: 40 Amps RMS at 120 VAC, 60 Hz.**
- **Maximum one cycle surge current: 175 Amps RMS at 120 VAC, 60 Hz.**
- **Dual circuit operation.**
- **Dimensions: 8.00" (20.32 cm) long x 4.17" (10.59 cm) high x 1.55" (3.94 cm) wide.**

Overview:

The Model FL-200 Flasher is designed to meet or exceed NEMA Standards TS 1-1994 and TS 2-1998 and is compatible with Type 170 installations. Model FL-200 Flashers are dual circuit, solid state devices that are constructed with extruded aluminum exterior components which promote rapid heat dissipation to ensure lower operating temperatures and dependable long term operation. All internal components are readily accessible to facilitate replacement.

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CRFQ 0803 DOT2000000111
B/R# 9
Qty. 1
Qty. 16 Loadswitches

Model LS-200

SOLID STATE LOAD SWITCH

Engineering Excellence!

- Two LED indicators per circuit provide independent confirmation of input and output states.
- Output LED is illuminated when the current flowing in the load exceeds 50 mA.
- Maximum rated continuous load current of 10 Amps RMS over the entire operational temperature and voltage ranges. Triacs are rated for 25 Amps RMS.
- Operating voltage range: 89 to 135 VAC RMS at 60 ±3 Hz.
- Operating temperature range: -40° to 165° F (-40° to 74° C).
- Operating humidity range: 5 to 95% (non-condensing).
- Off state leakage current less than 10 mA peak at 135 VAC RMS.
- Isolation greater than 2000 volts RMS.
- Maximum input current: less than 20 mA per input.
- Maximum one cycle surge current: 175 Amps RMS at 120 VAC, 60 Hz.
- Three electrically independent circuits.
- Dimensions: 8.00" (20.32 cm) long x 4.17" (10.59 cm) high x 1.55" (3.94 cm) wide.

Overview:

The Model LS-200 Load Switch exceeds industry standards by featuring two LED indicators per individual circuit (one for the input, one for the output). This feature provides a means of quickly and accurately conveying information regarding the input and output states of each circuit to assist technicians trouble shooting potential cabinet problems. The Model LS-200 Load Switch is designed to meet or exceed NEMA Standards TS 1-1994 and TS 2-1998 and is compatible with Type 170 installations. Model LS-200 Load Switches are three circuit, solid state devices that are constructed with extruded aluminum exterior components which promote rapid heat dissipation to ensure lower operating temperatures and dependable, long term operation. All internal components are readily accessible to facilitate replacement.

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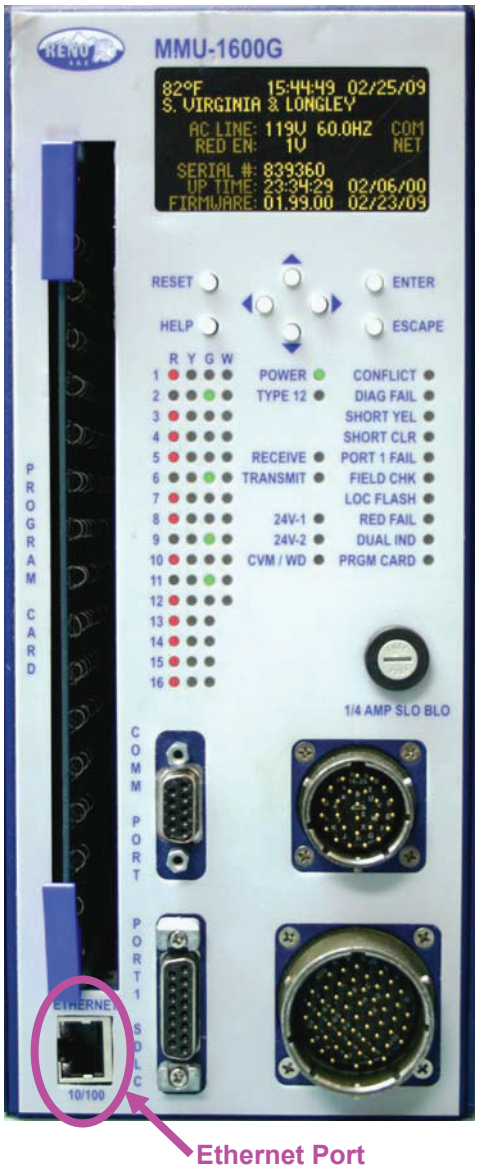
B/R# 9
Qty. 1

MMU-1600GE

Malfunction Management Unit



- **Meets and/or exceeds all NEMA TS 2 specifications (NEMA TS 1 compatible – Type 12 operation)**
- **Organic Light Emitting Diode (OLED) display provides outstanding readability in any light condition and functions reliably over a temperature range of -22º F to +176º F (-30º C to +80º C)**
- **All AC field voltages can be displayed on a single screen, making viewing of leakage voltages on all load switch output a simple task**
- **Context sensitive Help system to assist with configuration and troubleshooting tasks**
- **77 front panel LEDs provide a clear, concise, real-time indication of the status of all channel inputs and fault conditions**
- **Event logging provides a detailed, time-stamped record of time changes, monitor resets, configuration changes, prior faults, AC line voltages, and signal sequence data**
- **The most advance Flashing Yellow Arrow Left Turn monitoring available in the industry**
- **LED signal head thresholds provide enhanced monitoring for LED indications**
- **Front panel mounted RS-232 Communications Port facilitates in-field firmware upgrades and access to stored logs**
- **Ethernet Port allows communications with the monitor through a settable Ethernet network IP address. Both the Ethernet port and the RS-232 Port can be used at the same time**
- **Configuration Wizard easily configures the monitor for most applications in just a few minutes**
- **All configuration data can be stored on a Reno A&E Program Card and can be copied from monitor to monitor**
- **Canadian Flashing Green Monitoring version available**

Overview:

The Model MMU-1600GE Malfunction Management Unit is a full featured unit that monitors up to 16 traffic signal channels for conflicting inputs, improper sequencing, incorrect timing, and invalid voltage levels. The MMU-1600GE is fully compliant with NEMA Standard TS 2-2003. The MMU-1600GE can operate in either Type 16 mode (sixteen channels) or Type 12 mode (twelve channels). When configured to operate in Type 12 mode, the unit is downward compatible with NEMA Standard TS 1-1989. The MMU-1600GE features an Organic light Emitting Diode (OLED) display that sets a new standard for user-friendly monitor configuration.

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Transportation Control Products

4655 Aircenter Circle • Reno, Nevada • 89502 • USA

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Since 2000

MMU-1600GE ENHANCED FEATURES

The following is a list of features included in Reno A&E's Model MMU-1600GE Malfunction Management Unit which enhance the safety and operation of the unit. These features extend the operational capabilities of the MMU-1600GE beyond the requirements set forth in NEMA Standards Publication TS 2-2003.

Hardware Features: The MMU-1600GE unit incorporates a 16-bit microprocessor as the main processing unit, a digital signal processor (DSP), and two microcontrollers. The main microprocessor can be upgraded via the front panel RS-232 port. The DSP and the microcontrollers are flash based and can be programmed in circuit.

One of the microcontrollers is dedicated to monitoring diagnostic signals from the DSP and the main microprocessor. This microcontroller holds the main processor in the reset state until the AC Line voltage and all supply voltages have been verified as being within operational ranges.

The MMU is entirely connectorized internally with the exception of the two wires to the front panel fuse and an earth ground wire. This makes the MMU very easy to assemble and maintain. The possibility of wiring errors within the unit has been eliminated.

The MMU has an internal buzzer that indicates when the main processor is not running. This will only occur very briefly during power up, 1.5 seconds after loss of AC power, and during major diagnostic failures.

Graphics Display: The MMU-1600GE uses an Organic Light Emitting Diode (OLED) display. This display provides outstanding readability form -22º F to +176º F (-30º C to +80º C). The display is graphics based with a resolution of 128 x 64 and supports 16 shades of gray. The display has a contrast ratio of 2000:1.

Ethernet Port: The monitor supports a 10/100 Ethernet port. This port can be used simultaneously with the front panel RS-232 port. The Ethernet port is read-only when the monitor powers up. In order to write data through the Ethernet port, the reset button must be pressed and released. This action will cause the Ethernet port to be read-write for the next 15 minutes. This read-only function ensures that data in the monitor cannot be changed without someone physically being at the location of the monitor. This ensures that the IP address is correct and that changes cannot be implemented without physical access to the monitor.

Voltage Display Screens: The monitor has a special display mode that can show all of the AC field inputs in real-time or the values at the time of the last fault. It can also show all of the DC voltages in real-time or at the time of the last fault. The user can navigate between the four possible screens using the four arrow buttons. The real-time AC field voltage screen is very helpful in seeing the leakage voltage of load switches.

Configuration Wizard: The Configuration Wizard in the monitor can quickly configure the monitor for most intersections with 8 phases or less and running dual ring. The wizard can configure the following settings: Dual Indication / Field Check, Green-Yellow Monitoring Enable, Red Enables, Pedestrian Monitoring, Flashing Yellow Arrow Left Turns, Co-Channels, LED Thresholds, and External Watchdog Enable.

The wizard will also provide warnings about program card settings that do not agree with the configuration information entered in to the wizard.

Context Sensitive Help System: The monitor implements an advanced help system that will provide additional information based on what the user is currently doing or the fault currently being displayed. If the graphics display is showing a fault, pressing the HELP button will display information about this type of fault, common causes of this fault, and how to troubleshoot this type of fault.

Program Card Memory: Reno A&E MMU program cards have always contained a serial EEPROM memory device. The program card will work in any manufacturers MMU as a standard program card. But, when installed in a Reno A&E MMU, the monitor will copy all configuration data to the memory device. As of the 01.07.07 version of firmware, the storage of data was standardized across all Reno A&E MMU models. This allows the user to remove the program card from any model Reno A&E MMU and insert it into the MMU-1600G. Once powered up, the monitor will prompt the user whether the configuration stored on the program card or the configuration stored in the monitor should be used. If program card is selected, all configuration data stored on the program card will be copied into the monitor and used. If the monitor configuration is selected, the monitor configuration data will be copied to the program card.

Dual Indication Monitoring: This monitoring feature detects simultaneously active inputs of Green (Walk), Yellow, or Red (Don't Walk) on the same channel. The DUAL INDICATION / FIELD CHECK settings allow Dual Indication monitoring to be enabled on a per channel basis.

Type 12 – When the MMU is operating in this mode; Dual Indication monitoring detects simultaneously active inputs of Green and Yellow, Green and Red, Yellow and Red, Walk and Yellow, or Walk and Red on the same channel. When any two inputs of a channel are sensed as active for more than 1000 milliseconds, the MMU transfers the Output relay contacts to the fault condition and illuminates the DUAL IND indicator.

Type 16 – When the MMU is operating in this mode; Dual Indication monitoring detects simultaneously active inputs of Green and Yellow, Green and Red, or Yellow and Red on the same channel. When any two inputs of a channel are sensed as active for more than 1000 milliseconds, the MMU transfers the Output relay contacts to the fault condition, illuminates the DUAL IND indicator, and sets the Spare Bit #2 bit (bit 68) of the Type 129 Frame to 1.

Dual Indication monitoring is disabled when the Red Enable input is not active or if the Load Switch Flash bit (bit 112) of the Type 0 Frame is set to 1.

The MMU remains in this fault condition until the unit is reset by the activation of the front panel reset switch or the activation of the Reset input. An MMU Power Failure does not reset the MMU when it has been triggered by detection of Dual Indications on a channel prior to the MMU Power Failure.

GY-Dual Indication Monitoring: This monitoring function detects simultaneously active inputs of Green and Yellow field signal inputs on the same channel. When the Green and Yellow inputs of a channel are sensed as active for more than 1000 msec the MMU transfers the Output relay contacts to the fault condition, illuminates the DUAL IND indicator, and sets the Spare Bit #2 bit (bit 68) of the Type 129 Frame to 1.

The MMU remains in this fault condition until the unit is reset by the activation of the front panel reset switch or the activation of the Reset input. An MMU Power Failure does not reset the MMU when it has been triggered by detection of GY-Dual Indications on a channel prior to the MMU Power Failure. GY-Dual Indication Monitoring may be enabled concurrently with Dual Indication Monitoring.

GY-Dual Indication Monitoring is enabled by the use of the GRN-YEL MON ENABLED setting. When the GY-Dual Indication Monitoring option is enabled, all channels which have DUAL INDICATION / FIELD CHECK set to OFF will be individually monitored for simultaneously active Green and Yellow inputs. All channels that have DUAL INDICATION / FIELD CHECK set to ON will function as described above in Dual Indication Monitoring.

GY-Dual Indication monitoring is disabled when the Red Enable input is not active or if the Load Switch Flash bit (bit 112) of the Type 0 Frame is set to 1.

Field Check Monitoring: This monitoring function combines information about active field inputs with information received through the Port 1 communications between the Controller Unit and the MMU in a TS2 Cabinet Assembly. The MMU will receive a Type 0 Frame from the Controller Unit (Type 1 or Type 2 CU) that contains an image of the controller output commands to the load switches.

When the field signal input states detected as active or inactive by the MMU do not correspond with the information received from the Controller Unit in the Type 0 Frame for 10 consecutive 100 millisecond periods, the MMU will enter the fault mode, transfer the Output relay contacts to the Fault position, illuminate the FIELD CHK indicator, and set the Spare Bit #1 bit (bit 67) of the Type 129 Frame to 1.The MMU remains in this fault condition until the unit is reset by the activation of the front panel reset switch or the activation of the Reset input. An MMU Power Failure does not reset the MMU when it has been triggered by detection of Field Check fault prior to the MMU Power Failure. Field Check Monitoring is enabled concurrently with Dual Indication Monitoring.

Field Check Monitoring is enabled for each channel, individually, through the use of DUAL INDICATION / FIELD CHECK per channel settings. Field Check Monitoring is disabled when the RED ENABLE input is not active.

LED Thresholds: The monitor can use the standard incandescent field display thresholds or enhanced LED field display thresholds. The monitor normally uses 15 VAC as off and 25 VAC as on for Green, Yellow, and Walk displays and uses 50 VAC as off and 70 VAC as on for Red displays. With the LED thresholds active, the monitor uses the same voltage thresholds for all displays but will use different voltage thresholds based on the test being performed. For Conflict, Dual Indication, and Field Check the monitor uses 15 VAC as off and 25 VAC as on. For Red Fail, Short Yellow, and Short Clearance the monitor uses 50 VAC as off and 70 VAC as on.

Flashing Yellow Arrow Left Turn Monitoring: The monitor supports four section Flashing Yellow Arrow (FYA) left turn displays. Faults monitored for include: Dual Indication, Red Fail, Flashing Yellow Arrow must flash, and a solid Yellow Arrow terminating a Green Arrow must conflict with the opposing through Green and Yellow. Reno A&E monitors provide the most flexible and advanced Flashing Yellow Arrow Left Turn monitoring capabilities available in the industry.

Modified CVM Latch: This feature is useful in cabinets where the CVM input may not always be valid within the programmed Minimum Flash time and where latched CVM failures is desired. In the modified mode of operation, the MMU will not latch a CVM failure until the CVM input has been valid for more than 175 milliseconds.

This function is enabled by the setting MODIFIED CVM LATCH. This feature only has an effect if the CVM Latch jumper is installed on the programming card.

Type 16 Only Mode: This feature is useful in cabinets where the user is retrofitting a TS 2 monitor into a TS 1 cabinet and wants to use the Type 16 mode, but the existing Connector A harness does not have a wire for pin "HH" (Type Select). Activating this feature forces the MMU to operate in the Type 16 mode regardless of the logic level on the Type Select input. While this feature is on, the TYPE 12 LED will show the Function Disabled indication (50 milliseconds on, once every two seconds).

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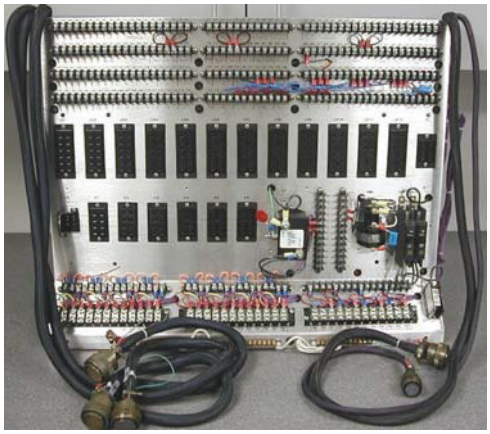
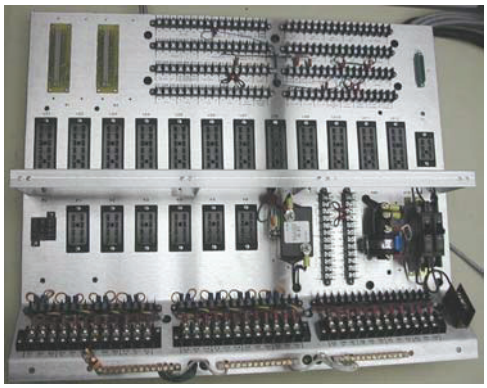
B/R# 9
Qty. 1

PATH MASTER
Where Traffic Meets Technology

NEMA TS2 Type 2
12 Position Cabinet Assembly



NEMA TS2 Type 2
12 Position Wired Panel



NEMA TS2 Type 1
12 Position Wired Panel

NEMA Wired Cabinet Assemblies

NEMA TS1/NEMA TS2-1/NEMA TS2-2

Path Master, Inc. wired cabinet assemblies are designed and built to meet all current NEMA requirements, both in TS1 and TS2 configurations. All panels are constructed from 3.18mm (.125") aluminum and include the following list of features:

- Field terminals for signal hook-up are mounted at 45° for ease of maintenance and installation.
- All electrical connections to the backside of the panel are soldered in place. All electrical connections to the front side of the panel use crimp terminals with threaded fasteners.
- All main power panel devices are fastened to the lower right portion of the main panel including all circuit breakers, line filters and load relays. An option side mounted power panel is available.
- The wiring harnesses to the controller and monitor are protected with a nylon mesh or "Snake Skin".
- The front side of the backpanel is permanently silk-screened with both functional descriptions and terminal reference numbers. The backside is silk-screened with terminal reference numbers.
- All plug-in and panel mounted devices are identified with silk-screened designations.
- Flash programming is made from the front of the panel with the use of a screwdriver.
- All NEMA defined controller functions are terminated and accessible from the front of the backpanel.
- Available in 4, 8, 12, and 16 load switch positions in both NEMA TS1 and NEMA TS2 configurations.
- All load switches and flashers are mounted in a single horizontal row and include an adjustable support bracket.

Specifications

NEMA TS2 Type 1

8 Position	558mmH x 508mmW	(22"H x 20"W)
12 Position	558mmH x 686mmW	(22"H x 27"W)
16 Position	558mmH x 864mmW	(22"H x 34"W)

NEMA TS1/TS2 Type 2

4 Position	380mmH x 406mmW	(15"H x 16"W)
8 Position	508mmH x 508mmW	(20"H x 20"W)
12 Position	558mmH x 686mmW	(22"H x 27"W)
16 Position	521mmH x 864mmW	(20.5"H x 34"W)

Path Master, Inc., 1960 Midway Drive, Twinsburg, Ohio 44087
330-425-4994, Fax: 330-425-9338, www.pathmasterinc.com

CRFQ 0803 DOT2000000111
B/R# 9
Qty. 1

Large Single Door

APX Enclosures, Inc.
200 Oregon Street Mercersburg, PA 17236
Phone: (717) 328-9399 Fax: (717) 328-2447 www.apx-enclosures.com

LARGE SINGLE DOOR

APPLICATION - NEMA 3R
APX Enclosures, Inc. 3R large single door enclosures are designed to house electronic controls, terminals, and instruments, and to **provide protection from rain, sleet, snow, dripping water and corrosion, while providing ventilation.**

INDUSTRY STANDARD:
U.L. Type 3R, 4X

STANDARD CONSTRUCTION:
(For details see specification sheets.)

A. ENCLOSURE:
1. The complete enclosure is made from .125" thick aluminum alloy type 5052-H32 to provide a strong and rigid construction. ~~Alternative material is 14 gauge type 304 stainless steel. (Specifier must choose the material to be used.)~~
2. Each enclosure is equipped with two adjustable "C" mounting channels on both side walls, and back wall, providing versatile positioning of shelves, or optional panels or rack mounting angles.
3. The door frame opening is double flanged on all four sides. These flanges increase the strength of door opening and help prevent dust and liquids from dropping into the enclosure when the door is opened.
4. All exterior seams are ground smooth or sealed weathertight with silicone sealant.
5. Pole or wall mounted enclosures have welded stiffener plates to reinforce the top and bottom of rear wall. Welded bottom plates are standard on pole mounted enclosures. A removable bolt-on bottom plate is available as an option.
6. (3R only) Enclosures have provisions for mounting a forced-air fan system that can be thermostatically controlled, and air is exhausted through a slotted vent system in the roof overhang.

B. DOOR:
1. All doors are equipped with a three-point latching mechanism with nylon rollers at the top and bottom.
2. Each door handle is .75" stainless steel round bar and has provisions for a padlock.
3. (3R only) The standard main door lock is Corbin #1548-1 or equal.
4. (3R only) A louvered air vent with filter-retaining brackets and a disposable paper filter element is provided.
5. The main door is sealed with closed-cell neoprene gasket.
6. The continuous door hinge is .075" thick stainless steel with a .25" stainless steel hinge pin.
7. The switch compartment with removable back panel is standard and also made from .125" thick aluminum alloy type 5052-H32. This back can optionally be replaced with a clear lexan window to provide for limited access inspection of operating components or instrumentation.
8. The switch compartment door hinge is 14 gauge stainless steel with a .120 stainless steel hinge pin.

APPLICATION - NEMA 4X
APX Enclosures, Inc. 4X large single door enclosures are designed to house electronic controls, terminals, and instruments, and to **provide protection from rain, sleet, snow, dripping water and corrosion, as well as hosedown, splashing water, oil or coolant seepage.**

NEMA 3R SHOWN

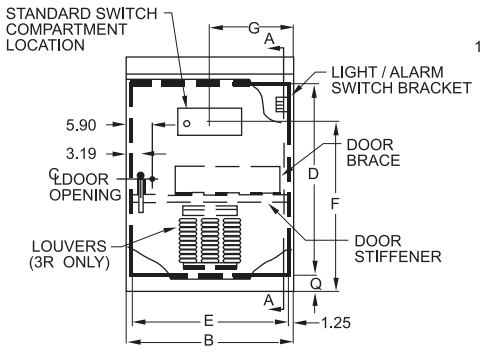
C. FINISH:
1. Natural aluminum enclosures are mill finish per federal specification QQA-250/8.
2. Painted enclosures are treated with an iron phosphate coating and dried by radiant heat.

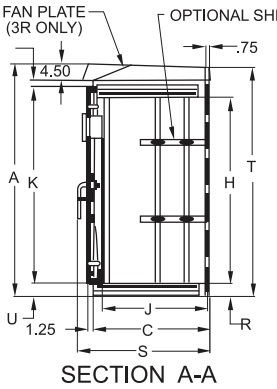
FOR NEMA TYPE 4X RATING:
DELETE *all vents and main door lock (Corbin #1548-1), and Corbin R357SGS switch compartment lock.*
ADD *Chicago #1703-100-G switch compartment lock. All through holes are sealed.*

APX Enclosures, Inc.

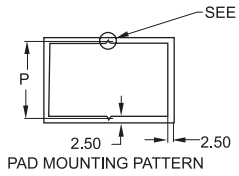
APX Enclosures, Inc.

LARGE SINGLE DOOR



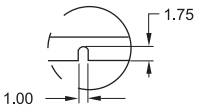


SECTION A-A

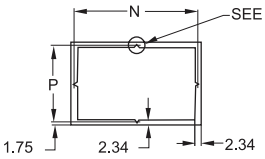


PAD MOUNTING PATTERN

FIG 1

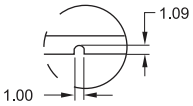


DETAIL A

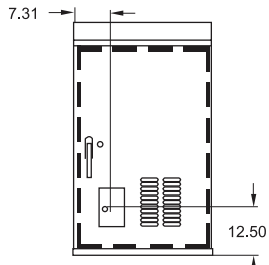


PAD MOUNTING PATTERN

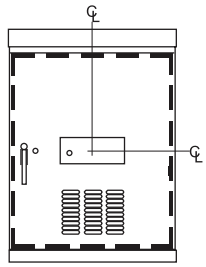
FIG 2



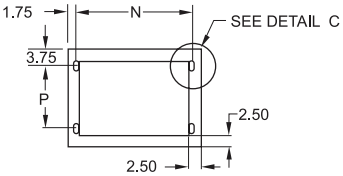
DETAIL B



OPTIONAL LOCATION FOR 'B' SWITCH COMPARTMENT

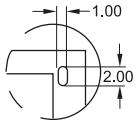


OPTIONAL LOCATION FOR 'D' OR 'C' SWITCH COMPARTMENTS



PAD MOUNTING PATTERN

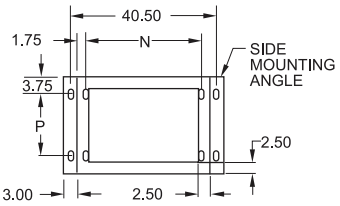
FIG 3



DETAIL C

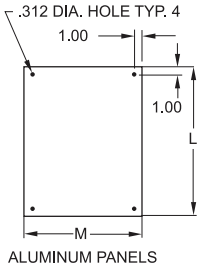
OPTIONS:

- Panels
- Locks: Special Keying
- Windows
- Painted Finishes
- Filters
- Rack Rails
- Shelves
- Custom Equipment Mounting
- Pedestal Adapter (reinforced bottom)
- Swing Rack
- Climate Control
- Air conditioner
- Sunshields
- Insulation
- Heater
- Forced Air Ventilation-Fan (3R only)



PAD MOUNTING PATTERN WITH EXTERNAL MTG ANGLES

FIG 4



ALUMINUM PANELS

DIMENSIONS (inches)

CATALOG NUMBER	MOUNTING OPTIONS			OVERALL ENCLOSURE			DOOR OPENING		SWITCH COMPARTMENT LOCATION		AVAILABLE EQUIPMENT SPACE		DOOR HEIGHT	PANEL SIZE		PAD MTG. PATTERN		MISCELLANEOUS DIMENSIONS				
	PED	POLE	PAD	A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q	R	S	T	U
FIG.1																						
TC301815	YES	YES	YES	30.00	18.00	15.00	21.00	15.50	16.81	8.00	19.00	11.31	23.25	22.63	15.00	N/A	12.50	2.00	3.00	18.62	28.50	.88
TC362015	YES	YES	YES	36.00	20.00	15.00	27.00	17.50	23.25	10.00	25.00	11.31	29.25	28.63	17.00	N/A	12.50	2.00	3.00	18.62	34.50	.88
TC412516	YES	YES	YES	41.00	25.00	16.00	32.00	22.50	28.25	12.50	30.00	12.31	34.25	33.63	22.00	N/A	13.50	2.00	3.00	19.62	39.50	.88
TC512516	YES	YES	YES	51.00	25.00	16.00	42.00	22.50	34.25	12.50	40.00	12.31	44.25	43.63	22.00	N/A	13.50	2.00	3.00	19.62	49.50	.88
FIG.2																						
TC503017	NO	YES	YES	50.00	30.00	17.00	39.00	27.50	37.25	15.00	39.00	13.31	41.25	42.63	27.00	26.50	13.50	4.00	3.00	20.62	48.50	2.88
TC503617	NO	NO	YES	50.00	36.00	17.00	39.00	33.50	37.25	18.00	39.00	13.31	41.25	42.63	33.00	32.50	13.50	4.00	3.00	20.62	48.50	2.88
TC583617	NO	NO	YES	58.00	36.00	17.00	47.00	33.50	45.25	18.00	47.00	13.31	49.25	50.63	33.00	32.50	13.50	4.00	3.00	20.62	56.50	2.88
TC583017	NO	NO	YES	58.00	30.00	17.00	47.00	27.50	45.25	15.00	47.00	13.31	49.25	50.63	27.00	26.50	13.50	4.00	3.00	20.62	56.50	2.88
TC763017	NO	NO	YES	76.00	30.00	17.00	65.00	27.50	63.25	15.00	65.00	13.31	67.25	68.63	27.00	26.50	13.50	4.00	3.00	20.62	74.50	2.88
FIG.3																						
TC363624	NO	NO	YES	36.00	36.00	24.00	25.00	33.50	23.25	18.00	25.00	20.31	27.25	28.63	33.00	32.50	18.50	4.00	3.00	27.62	34.50	2.88
TC443624	NO	NO	YES	44.00	36.00	24.00	33.00	33.50	31.25	18.00	33.00	20.31	35.25	36.63	33.00	32.50	18.50	4.00	3.00	27.62	42.50	2.88
TC553826	NO	NO	YES	55.00	38.00	26.00	44.00	35.50	39.37	19.00	44.00	22.31	46.25	48.25	35.00	34.50	18.50	4.00	3.00	29.62	53.50	2.88
TC554426	NO	NO	YES	55.00	44.00	26.00	44.00	41.50	39.37	22.00	44.00	22.31	46.25	48.25	41.00	40.50	18.50	4.00	3.00	29.62	53.50	2.88
TC594426	NO	NO	YES	59.00	44.00	26.00	48.00	41.50	43.37	22.00	48.00	22.31	50.25	52.25	41.00	40.50	18.50	4.00	3.00	29.62	57.50	2.88
TC723618	NO	NO	YES	72.00	36.00	18.00	61.00	33.50	45.00	18.00	61.00	14.31	63.25	65.25	45.00	32.50	13.50	4.00	3.00	21.62	70.50	2.88
TC773826	NO	NO	YES	77.00	38.00	26.00	66.00	35.50	50.00	19.00	66.00	22.31	68.25	70.25	35.00	34.50	18.50	4.00	3.00	29.62	75.50	2.88
TC774426	NO	NO	YES	77.00	44.00	26.00	66.00	41.50	50.00	22.00	66.00	22.31	68.25	70.25	41.00	40.50	18.50	4.00	3.00	29.62	75.50	2.88

LARGE SINGLE DOOR

Autoscope AIS-IV

CRFQ 0803 DOT2000000111
B/R# 14
Qty. 10

▹ ▹ The Autoscope Image Sensor (AIS) Series is a lightweight color zoom camera system, designed for the rigors and performance requirements of vehicle detection at virtually all traffic intersection and highway environments.

About Autoscope

As more Intelligent Transportation System (ITS) programs come online, transportation agencies and metropolitan planning organizations (MPO) are realizing the enhanced traffic management capabilities that are accessible through ITS. A solution that offers one of the largest gains in capability and lower cost of ownership to any ITS program is a video detection system. A video system provides access to new levels of strategic traffic information, supporting comprehensive reporting for funding opportunities, regular signal timing updates, traveler and shared traffic information, etc. Optimized as a video source for the Autoscope standalone Machine Vision Processor (MVP) product suite, the AIS Suite of cameras produce consistently high quality video in all weather, lighting, and traffic conditions common in today's demanding traffic management and ITS environments.

At A Glance

- ▹ Designed for most wide-area machine vision vehicle detection applications
- ▹ Low maintenance
- ▹ Low power consumption
- ▹ Rugged, environmentally sealed enclosure
- ▹ Auto-gain circuitry for improved detection in varying light conditions
- ▹ Hydrophilic faceplate coating
- ▹ No streaking or blooming from bright light sources (headlights)

ECONOLITE

Description

The image sensor has high sensitivity for accurate vehicle detection at night and during other low light conditions. The solid-state design provides maximum hardware reliability for 24/7 operations. The color image sensor minimizes streaking and blooming from bright light sources, such as headlights and wet pavement that could adversely affect detection performance.

A variety of available mounting brackets enable easy installation of the AIS camera systems on existing poles, mast arms, or other structures. The unique bracket design speeds installation by minimizing adjustment hardware and eliminating steps in the set-up process

Faceplate Heater

New technology has greatly reduced the power consumption of the AIS. By applying heat directly to the faceplate, the AIS can keep the faceplate clear in extreme conditions with less power.

Zoom Control

"Control-over-Coax" technology is used to adjust the zoom lens, eliminate adapter cables, or extra control wires in the pole, simplifying installation. Zoom and camera controls travel to the AIS along the coax cable. Adjustments are made via a hand-held zoom controller or a coax modem that plugs into the coax cable, allowing the user to adjust the lens via a laptop computer.

Color or Black & White

The AIS-IV can be ordered with output video pre-set to color or black & white. For RackVision™ and 2020™ MVP products, order with color video output. For use with Autoscope 2004 MVP, black & white video must be used. The video output can be switched by the user via the zoom control setup software.

EasyLock Connection Option

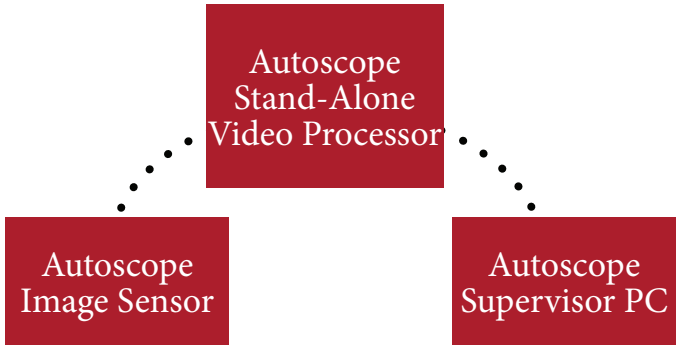
This connector is an excellent choice for easy field installation. It eliminates "pig tail" camera cables and splicing by allowing the installer to pull power and coax cable directly to the camera. Connectors are easily installed for reliable, waterproof connections.

Hydrophilic Faceplate Coating

This new faceplate coating fills the porous surface of the face plate, preventing airborne contaminants and water from striking and sticking to the surface of the lens. The coating maintains image quality and reduces the need for maintenance.

Basic Specifications

- Temperature
  - -40°F to +140°F (-40°C to +60°C)
- Power
  - Input power options: 85-265VAC-40-440Hz/24VAC, 47-440Hz/12-14VDC
  - 10W max
  - 5W nominal
- Dimensions
  - Housing Enclosure: 3.5 in. D x 10.3 in. L (8.89 cm D x 26.2 cm L)
  - Weather sunshield: 14.5 in. L (36.8 cm L)



1250 N. Tustin Avenue, Anaheim, CA 92806 · 714-630-3700 · sales@econolite.com · www.econolite.com

PELCO PRODUCTS, INC.
www.pelcoinc.com
EDMOND, OK 73013
405-340-3434
FAX: 405-340-3435

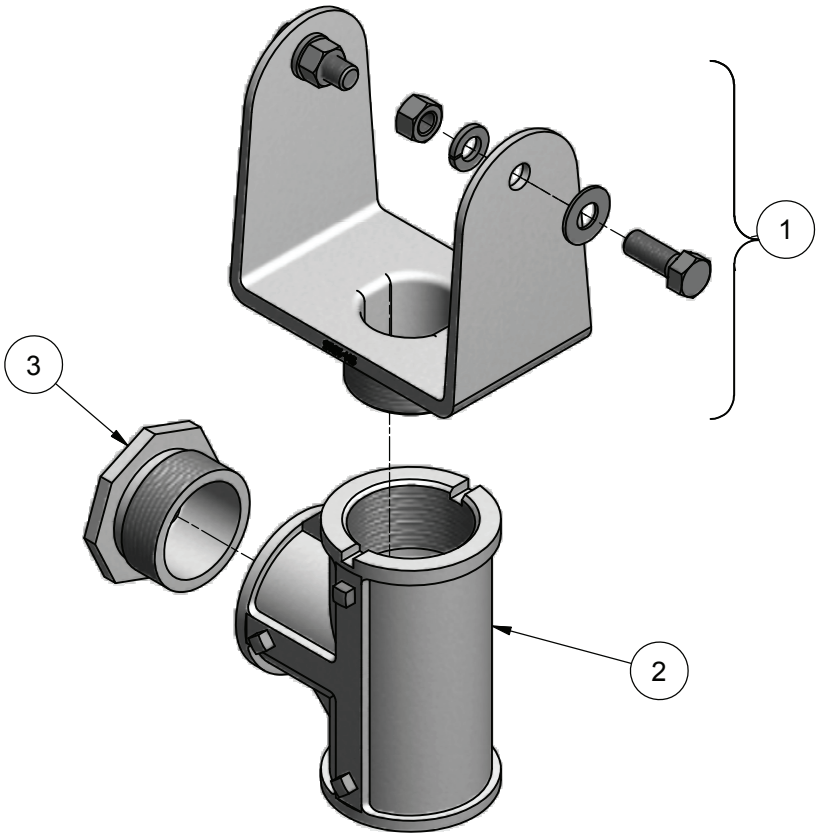
ASS

CRFQ 0803 DOT2000000111
B/R# 14
Qty. 10

REF:	TITLE:	PART NO.:
Pathmaster	Camera Bracket, 1-PC w/ Tee & Octagonal Cap, Alum	SP-5861

PART NO
SP-5861-PXX

Process No Color=PNC
Paint=PXX



Notes:
1. 1-Piece For Mounting Iteris, Odetics or Econlite Solo Pro Type Camera.

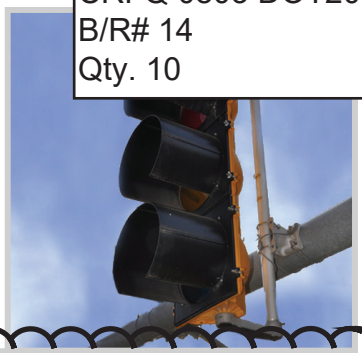
OPTIONS
Paint

ITEM	PART NUMBER	DESCRIPTION	QTY
1	SH-0535-PXX	Bracket, Camera Mount, 1-Piece Tilt & Pan, 1-1/2" Ext Threads, Alum	1
2	SE-0458-PXX	Tee, Serrated, 1-1/2" NPS w/ Set Screws, Alum	1
3	SE-0361-M1	Closure Cap, Octagonal, 1-1/2" NPS x 7/8", Alum	1

DRAWN: WAC DATE: 9/27/2011	CHK'D: KAK DATE: 9/29/2011	REV: A-10/5/11 WAC	REV CHK'D: KAK DATE: 10/6/2011	SHEET 1 OF 1

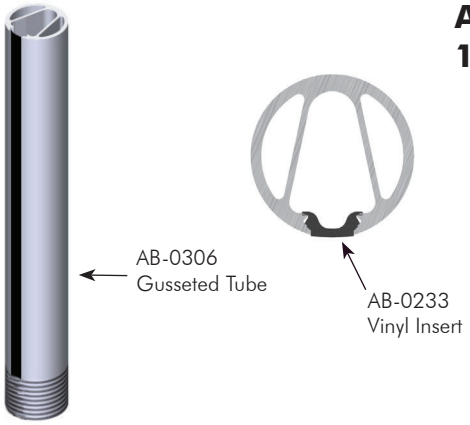
Aluminum Tubes

CRFQ 0803 DOT2000000111
B/R# 14
Qty. 10



Supplied in lengths shown below, Pelco's vertical support tubing is made from high strength aluminum alloy. A unique shape and vinyl insert insures a complete weather proof wiring installation anywhere along the entire length of the tube.

The standard 46" tube will accommodate all signal combinations up to 3-Section 12". Tubes are also available in 58" and 74" lengths for 4 and 5-Section combinations.

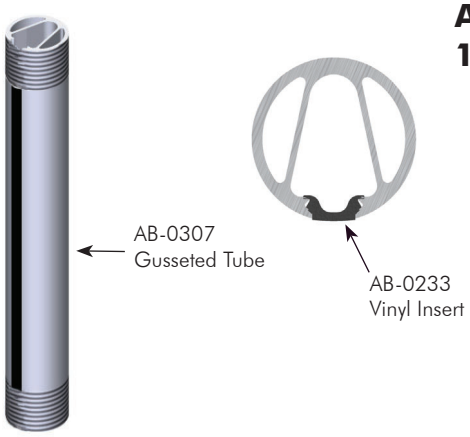


Astro-Brac Gusseted Tube w/ Vinyl Insert, 1-1/2" x Length, Threaded One End

AB-2003 - [Length] - [Coating]

Length:
23=23"
37=37"
46=46"
58=58"
74=74"

Coating:
PNC=Process No Color
P_ _=Paint



Astro-Brac Gusseted Tube w/ Vinyl Insert, 1-1/2" x Length, Threaded Both Ends

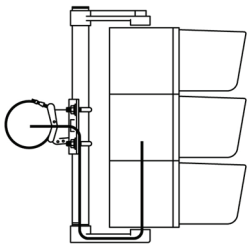
AB-2007 - [Length] - [Coating]

Length:
23=23"
37=37"
46=46"
58=58"
74=74"

Coating:
PNC=Process No Color
P_ _=Paint

Concealed Wiring Installation

Pelco's aluminum gusseted tubes allow wire entry at any point. Vinyl insert conceals wiring from mast arm to signal head. Simply run wire throughout field-drilled hole in mast arm, through Astro-Brac, and into support tube. Hollow lower arm provides a channel for wire to be fed into signal head.



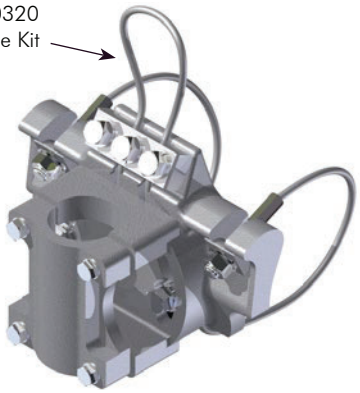
Note: 1. Lengths up to 120" maximum are available upon request. Specify by including Length in the part number, i.e., AB-2003-120-PNC.
2. See Reference Section for available paint colors.

CRFQ 0803 DOT2000000111
B/R# 14
Qty. 10

Galaxy Series Clamp Kits

The Galaxy is designed using a single cable plate, which allows for easier installation, as well as the multi-directional adjustable tube saddle for strength. These high tensile aluminum alloy clamp kits provide strength with maximum adjustability and complete clamping versatility. Comes complete with all necessary attaching hardware.

AB-0280/
AB-0320
Cable Kit



Astro-Brac, Galaxy Series Clamp Kit, Cable Mount

	Cable Length		Coating
AB-3055	- [ ]	-	[ ]

Cable Length:
62=62″ Cable
84=84″ Cable
96=96″ Cable

Coating:
PNC=Process No Color
P_ _=Paint

Note:
Stainless steel upgrade available: includes stainless cable.
Specify by including -SS in the part number, i.e., AB-3055-62-SS-PNC.

CRFQ 0803 DOT2000000111
B/R# 14
Qty. 10
Qty. 2500' of Cable

ADVANCED DIGITAL CABLE INC.
94 Eagle Fork Rd Hayesville,NC 28904
Phone (800)343-2579 Fax (828)389-3922

Part Number: **2062PE**

Description: 75 Ohm Precision Video Coax Cable with Dual 96% Tinned Copper Braids and a Black Polyethylene jacket.

Physical Characteristics:

Awg	20
Stranding	Solid
Conductor Material	Bare Copper .032" nom
Dielectric Material	Low density foamed polyethylene
Nominal Diameter	.200"
First Braid Awg	34
First Braid Material	Tinned Copper
First Braid Coverage	96%
First Nominal Diameter	.226"
Second Braid Awg	34
Second Braid Material	Tinned Copper
Second Braid Coverage	96%
Second Nominal Diameter	.252"
Final Jacket Material	Black Polyethylene
Nominal Thickness	.026"
Nominal Operation Diameter	.304"

INKJET PRINT:

ADVANCED DIGITAL CABLE INC. 75 Ohm PRECISION VIDEO COAX CABLE RATED FOR OUTDOOR USE

Nominal Attenuation:

Impedance:	75 Ohms
Capacitance	20.5 pF/foot
Velocity of Prop	66%
Temperature Rating	-55°C to +80°C

Applicable Standards:

UL Type	NA
ROHS Compliant	Yes

Attenuation

Frequency	Nom db/100
3.6	.54
10	.78
71	2.10
135	3.00
270	4.30
360	5.10
720	7.40
1000	9.20

Customer Name:_____Date Signed:_____

Customer Approval:_____

Specification Issue Date: 05/20/09

CRFQ 0803 DOT2000000111
B/R# 14
Qty. 10
Qty. 250' of Cable

Advanced Digital Cable, Inc.	Specification Sheet for 16 awg 3 conductor PVC/ Nylon	Date:	05/18/07
		Part Number:	AST-6603TC
Drawn by:	Customer Approval:	UL Type:	TC

Construction Details:

This cable is constructed with a core composed of three polyvinyl chloride insulated and Nylon jacketed 16 awg stranded tinned copper conductors cabled together and a black sunlight resistant polyvinyl chloride jacket completes the package.

Physical Specifications

Conductors: 3 – 16 awg (26/30") tinned copper .059" nom.

Dielectric: 15 mil wall of 105C polyvinyl chloride to a nominal diameter of .088". See color code.

Skin: 5 mil wall of Nylon jacket to a nominal diameter of .098"

Cable: 3 –16 awg conductors in a 3" left hand lay to a nominal diameter of .215"

Jacket: 45 mils of black 90 deg. C sunlight, moisture, and flame resistant polyvinyl chloride to a nominal diameter of .305".

Print: White Ink:
ADVANCED DIGITAL CABLE 16/3 CAMERA (UL) TYPE TC 90C 600V E195597 SUN RES DIR BUR

Put-up: Reels per customer requirements.

Color Code

Quantity	Color
1	Black
1	White
1	Green

Electrical and Mechanical Testing

Conductor: Conforms to ASTM B-3 and B-8

Insulation: Conforms to UL 62 type TFN requirements.
Min. average thickness: .015"
Min. thickness any pt.: .013"

Nylon: Conforms to UL 62 type TFN requirements.
Min. thickness any pt.: .004"

Spark Testing: 6,000 volts AC at 1,000 to 3,500 Hertz.

Jacket: Conforms to UL 1277 requirements.
Min. average thickness: .045"
Min. thickness any pt.: .036"

Dielectric test: 2,000 volts AC at 60 Hertz for 1 minute per UL 1277.

Additional Testing: Physical and visual Continuity and cross testing on each shipping length of finished cable.

CRFQ 0803 DOT2000000111
B/R# 16
Qty. 10

Autoscope RackVision 1 and 2

▹ ▹ Quality sources of video signal include the Autoscope Image Sensor or existing CCTV cameras that meet minimum performance standards.

About RVP1 & RVP2

The need for a simple, reliable and cost-effective dynamic video-based detection solution at vulnerable intersections and along congested roadways is becoming more important in maintaining mobility and safety. As a result, agencies are leveraging the benefits of the video processing and broadband communications capabilities of video detection, including Autoscope – a critical first step in implementing an Intelligent Transportation System (ITS) program.

The Autoscope RackVision Pro Series solutions, including RVP1 and 2 are Machine Vision Processors (MVP) designed to meet intersection detection objectives of vehicle detection and signal actuation in a typical traffic cabinet. This cost-effective detection solution utilizes the same algorithms that have established Autoscope video detection as the global leader for wide-area video vehicle detection.

At A Glance

- ▹ Provides basic video vehicle detection for intersection stop-line and advance extension applications
- ▹ Bicycle detection
- ▹ Installs in a standard detector rack or self-contained shelf-mount unit
- ▹ Software installation by USB flash drive
- ▹ Comprehensive traffic data collection
- ▹ Self-test on power-up

ECONOLITE

Benefits

- No laptop required
- Reliable performance
- Interchangeability with existing solutions
- Compatibility with standard loop detector racks
- Low power consumption
- Minimal maintenance
- Cost-effective solution for traffic detection
- Easy to install and configure
- Field-proven ***Autoscope*** accuracy and reliability
- Built on proven ***Autoscope Terra***™ Technology
- Connects to existing ***Autoscope AIS*** or other CCTV cameras
- Compatible with color or monochrome cameras
- Native language graphical user interface support

Applications

- Fully actuated intersection detection
- Semi-actuated intersection detection
- Temporary construction and work zone safety
- Traffic studies
- Bicycle detection

Set-Up & Operation

The RVP1 and RVP2 detector cards are easy to install/configure and adaptable to meet an agency's detection requirements. Autoscope Mouse & Monitor functionality quickly sets up intersection detection applications without the use of a laptop.

Simple Mouse & Monitor setup enables stop lines and advance extension detection zones to be drawn as needed. Users can also easily assign detector outputs to interface with NEMA TS1/TS2, Type 170/179 and 2070 ATC controllers.

Basic Specifications

- **Temperature**
  - -29°F to +165°F/-34°C to +74°C
- **Power**
  - 12 or 24-VDC 11 Watts maximum
- **Dimensions**
  - 4.5 in. (H) x 2.3 in. (W) x 7 in. (D) (11.4cm x 5.7 cm x 17.8 cm) plus handle
  - 0.5 lb (0.2 kg)

1250 N. Tustin Avenue, Anaheim, CA 92806 · 714-630-3700 · sales@econolite.com · www.econolite.com

381200916-5

CRFQ 0803 DOT2000000111
B/R# 22
Qty. 1
Type 45 Radar Detector With
1 JBox and 1 Sensor

smartmicro
SMART MICROWAVE SENSORS

HIGH DEFINITION TRAFFIC RADAR

UMRR-11

- 4D/HD
- Multi-lane
- Replaces Loops, outperforms video detectors
- Detects moving and stopped traffic
- Works under all conditions
- Maintenance free

Intersections

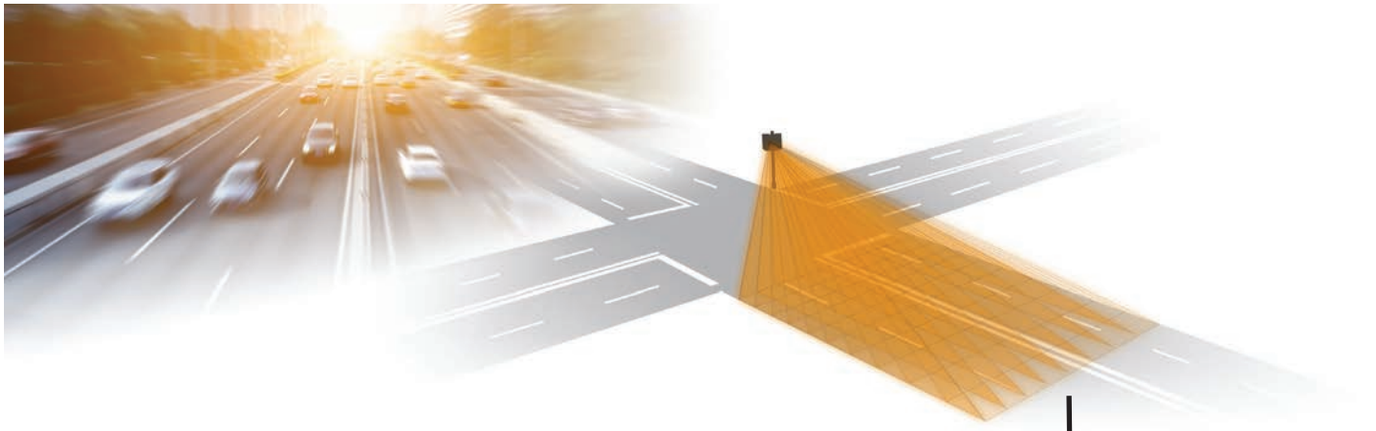
- Stop Bar+
- Stop + Advance
  Stop Bar and Advance Detection with one Single Sensor

Arterials

- Forward+
  Traffic Counting and Classification

Enforcement

- Red Light Enforcement
- Speed Enforcement
  Certified



UMRR-11

	Type 44	Type 45
APPLICATIONS	Stop Bar+ 4D/HD Forward+ 4D/HD	Stop+Advance 4D/HD Forward+ 4D/HD
TECHNOLOGY	4D Object Tracking with HD Resolution	4D Object Tracking with HD Resolution
PERFORMANCE		
Detection Range (Passenger Car)	120m (393ft) / China 85m	150m (492ft) / China 100m
Detection Range (Truck)	180m (590ft) / China 120m	180m (590ft) / China 120m
Maximum Detection Range	180m (590ft)	180m (590ft)
Azimuth Field of View	-40° to +40°	-20° to +20°
Elevation Field of View	-12° to +12°	-10° to +10°
Number of Lanes	Up to 6	Up to 4
Minimum Detection Range	3m (10ft)	
Range Accuracy	typ. <±2.5% or <±0.25m (bigger of)	
Speed Accuracy	typ. <±0.28m/s or ±1% (bigger of)	
Speed Interval	-88.8 to +88.8m/s (-320 to +320km/h)	
Refresh Time	<75ms	
Simultaneously Tracked Objects	Up to 126	
MECHANICAL		
Weight	340g (12oz)	
Dimensions	110 x 99 x 30.38mm	
Enclosure	Rugged, watertight casing (IP67)	
ENVIRONMENTAL		
Operation Temperature	-40 to +85°C (-40 to +185°F)	
Shock; Vibration	100g rms; 14g rms	
GENERAL		
Frequency Band; EIRP	24.0 to 24.25GHz (K Band); 20dBm or 12.7dBm in certain regions*	
Mounting Height	1.5 to 10m (5 to 32.5ft)	
Power Supply	8 to 32 VDC, <5W	
Connector	12 Pin plug Hirose LF10WBRB 12PD (Bayonet)	
Communication Interface	Ethernet, RS485, CAN Bus, Relays (Option)	
Compatible Interface Modules	NEMA Cabinet Cards (Relays, SDLC), HSDPA/UMTS/GPRS WiFi Modems	

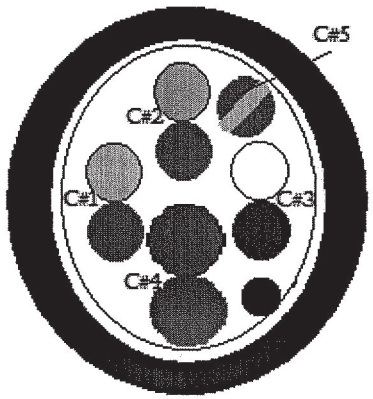
*Can be selected

CRFQ 0803 DOT2000000111
B/R# 22
Qty. 1
Qty. 250' of Cable

OLYMPIC PART No 61530C

DATE:	10/3/2013							REVISION:	1

DESCRIPTION: 3/PR AND 1C #22, 1PR 20 AWG, POLYETHYLENE INNERS, DRAIN, FOIL SHIELD, BLACK PVC JACKET



COMPONENT #1:	#22 7/30 TC INSULATED WITH .015" POLYETHYLENE TWISTED TOGETHER TO FORM A PAIR CC: YELLOW PAIRED WITH GREEN
COMPONENT #2:	#22 7/30 TC INSULATED WITH .015" POLYETHYLENE TWISTED TOGETHER TO FORM A PAIR CC: PINK PAIRED WITH GRAY
COMPONENT #3:	#22 7/30 TC INSULATED WITH .015" POLYETHYLENE TWISTED TOGETHER TO FORM A PAIR CC: BROWN PAIRED WITH WHITE
COMPONENT #4:	#20 7/28 TC INSULATED WITH .015" POLYETHYLENE TWISTED TOGETHER TO FORM A PAIR CC: RED PAIRED WITH BLUE
COMPONENT #5:	ONE SINGLE CONDUCTOR #20 7/28 TC INSULATED WITH .015" POLYETHYLENE CC: GREEN W/ YELLOW STRIPE
CABLING:	FIVE COMPONENTS CABLED TOGETHER FILLERS IF REQURED
DRAIN:	#22 7/30 TINNED COPPER DRAIN WIRE
OVERALL TAPE SHIELD:	WRAP WITH AN ALUMINUM/POLYESRTER TAPE SHIELD, FOIL FACING IN, IN CONTACT WITH DRAIN WIRE
JACKET:	.053" BLACK PVC
APPROXIMATE NOM OD:	.395"
PRINT IN WHITE:	DIGITAL RADAR CABLE...E151405 3PR22 - 1PR20 – 1C20 AWG TYPE CM 75C (UL)...C(UL) TYPE CMH...80C 300V FT-1..ROHS...CE...UV RESISTANT

I HAVE REVIEWED ABOVE SPECIFICATION AND IT CONFORMS TO ITEM ORDERED UNDER
PO#
NOTE ANY EXCEPTIONS HERE ➔
SIGNED: _____ DATED: 10/3/2013

CRFQ 0803 DOT2000000111
B/R# 23
Qty. 1
Type 42 Radar Detector With
1 JBox and 1 Sensor

smartmicro
SMART MICROWAVE SENSORS GMBH

UMRR |

Universal Traffic Management Radar

INTERSECTIONS

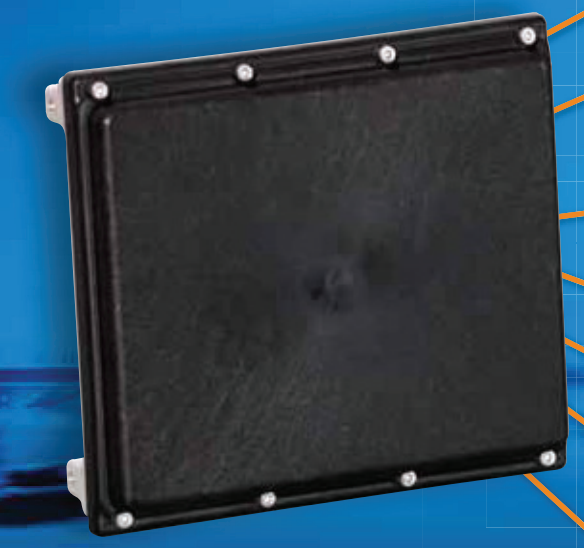
- Stop Bar +
- Advance +
- Stop + Advance
  Stop Bar and Advance Detection with one Single Sensor

ARTERIALS

- Forward +
  Traffic Counting and Classification

ENFORCEMENT

- Red Light Enforcement
- Speed Enforcement
  Certified



MULTI-LANE
Lane Specific, Up To 8 Lanes, Up To 450m

REPLACES LOOPS,
OUTPERFORMS VIDEO DETECTORS

DETECTS MOVING AND
STOPPED TRAFFIC

RELAYS, SDLC, RS485, ETHERNET

WORKS UNDER ALL CONDITIONS

FIELD PROVEN
In Service Since 2009, Many Thousands Deployed Worldwide

MAINTENANCE FREE

Smartmicro GmbH | In den Waashainen 1 | 38108 Braunschweig | Germany | www.smartmicrogroup.com | info@smartmicro.de

UMRR-0A |

· Multi-Lane, Multi-Object 3D Tracking Radar.
· For Intersection Control, Traffic Counting and Enforcement Applications.

	TYPE 29	TYPE 30	TYPE 32
APPLICATIONS			
	Stop + Advance Forward + Enforcement	Stop Bar + Forward + Enforcement	Advance +
TECHNOLOGY			
	3D Object Tracking		
PERFORMANCE			
Passenger Car Detection Range	160m (525ft) / China: 105m	105m (344ft) / China: 75m	240m (787ft) / China: 170m
Bicycle Detection Range	50m (164ft) / China: 35m	46m (151ft) / China: 32m	90m (295ft) / China: 65m
Optional Vehicle Detection Range	180m (591ft)	-	305m (1000ft)
Azimuth Field of View	-18...+18deg	-35...+35deg	-12...+12deg
Minimum Detection Range	1.5m (5ft)		
Range Accuracy	typ. < +/- 2.5% or < +/- 0.25m (bigger of)		
Speed Accuracy	typ. < +/- 0.28m/sec or +/- 1% (bigger of)		
Speed Interval	-68.3m/sec to -0.1m/sec and 0.1m/sec to 68.3m/sec (opt. +/-88.8m/sec)		
Refresh Time	50 msec		
Simultaneously Tracked Objects	Up to 64		
MECHANICAL			
Weight	330g (0.73lbs)	295g (0.65lbs)	1276g (2.81lbs)
Dimensions	110 x 99 x 31mm	95 x 85 x 31mm	213 x 155 x 31mm
Enclosure	Rugged, Watertight Casing Conforming to IP67		
ENVIRONMENTAL			
Operation Temperature	-40 to +85deg C (-40 to +185deg F)		
Shock; Vibration	100g rms; 14g rms		
GENERAL			
Frequency Band; EIRP	24.0 to 24.25GHz (K Band); 20dBm		
Mounting Height	1.5 to 10m (4.5 to 18ft)		
Power Supply	7 to 32 VDC; 3.7 Watts		
Connector	8 Pin plug Binder Series 712		
Communication Interface	RS485, CAN Bus, Relay Contacts		
Compatible Interface Modules	Ethernet, NEMA Cabinet Cards (Relays, SDLC), HSDPA/UMTS/GPRS WiFi Modems		

UMRR-0C |

NEW!

· Wide Beam, Long Range, Multi-Lane, Multi-Object 3D Tracking Radar with High Resolution.
· For Intersection Control, Traffic Counting and Enforcement Applications with Dense Traffic.
· Vehicle Length Measurement and Classification.
· Ethernet Interface, Real Time Clock, Flash Memory for Data Storage.

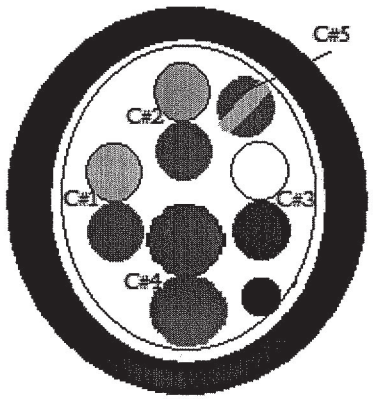
	TYPE 40	TYPE 42 replaces Type 39
APPLICATIONS		
	Stop + Advance 2DHD Forward + 2DHD Enforcement 2DHD	Stop + Advance 3DHD Forward + 3DHD Enforcement 3DHD
TECHNOLOGY		
	3D Object Tracking with 2DHD Resolution	3D Object Tracking with 3DHD Resolution
PERFORMANCE		
Passenger Car Detection Range	350m (1148ft) / China: 230m	170m (558ft) / On request: 250m (820ft)
Truck Detection Range	450m (1476ft) / China: 350m	280m (919ft) / On request: 300m (984ft)
Maximum Range	450m (1476ft)	330m (1082ft)
Azimuth Field of View	-18…+18deg	-50…+50deg
Minimum Detection Range	1.5m (5ft)	
Range Accuracy	typ. < +/- 1.5% or < +/- 0.25m (bigger of)	
Speed Accuracy	typ. < +/- 0.28m/sec or +/- 1% (bigger of)	
Speed Interval	-68.3m/sec to -0.1m/sec and 0.1m/sec to 68.3m/sec (opt. +/-88.8m/sec)	
Refresh Time	79msec	≤79 / ≤40msec
Simultaneously Tracked Objects	Up to 256 (126 Reported)	
MECHANICAL		
Weight	1230g (7.71lbs)	
Dimensions	212.6 x 154.6 x 38.15mm	
Enclosure	Rugged, Watertight Casing Conforming to IP67	
ENVIRONMENTAL		
Operation Temperature	-40 to +74deg C (-40 to +165deg F)	
Shock; Vibration	100g rms; 14g rms	
GENERAL		
Frequency Band; EIRP	24.0 to 24.25GHz (K Band); 20dBm (12.7dBm in certain regions)	
Mounting Height	1.5 to 10m (4.5 to 33ft)	
Power Supply	13 to 32 VDC; 14 Watts	13 to 32 VDC; 12 Watts
Connector	12 Pin plug Hirose LF10WBRB 12PD (Bayonet)	
Communication Interface	Ethernet, RS485, CAN Bus	
Compatible Interface Modules	NEMA Cabinet Cards (Relays, SDLC), HSDPA/UMTS/GPRS WiFi Modems	
Other Features	Real Time Clock, Flash Memory for >2 Months Storage	

CRFQ 0803 DOT2000000111
B/R# 23
Qty. 1
Qty. 250' of Cable

OLYMPIC PART No 61530C

DATE:	10/3/2013							REVISION:	1

DESCRIPTION: 3/PR AND 1C #22, 1PR 20 AWG, POLYETHYLENE INNERS, DRAIN, FOIL SHIELD, BLACK PVC JACKET



COMPONENT #1:	#22 7/30 TC INSULATED WITH .015" POLYETHYLENE TWISTED TOGETHER TO FORM A PAIR CC: YELLOW PAIRED WITH GREEN
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CABLING:	FIVE COMPONENTS CABLED TOGETHER FILLERS IF REQURED
DRAIN:	#22 7/30 TINNED COPPER DRAIN WIRE
OVERALL TAPE SHIELD:	WRAP WITH AN ALUMINUM/POLYESRTER TAPE SHIELD, FOIL FACING IN, IN CONTACT WITH DRAIN WIRE
JACKET:	.053" BLACK PVC
APPROXIMATE NOM OD:	.395"
PRINT IN WHITE:	DIGITAL RADAR CABLE...E151405 3PR22 - 1PR20 – 1C20 AWG TYPE CM 75C (UL)...C(UL) TYPE CMH...80C 300V FT-1..ROHS...CE...UV RESISTANT

I HAVE REVIEWED ABOVE SPECIFICATION AND IT CONFORMS TO ITEM ORDERED UNDER
PO#
NOTE ANY EXCEPTIONS HERE ➔
SIGNED: _____ DATED: 10/3/2013

CRFQ 0803 DOT2000000111
B/R# 24
Qty. 10
Model TMIB_AB-02000

SMART MICROWAVE SENSORS GMBH

Project Documentation | TMIB V2 Data Sheet

Project Number:

SMS Project Number:

Project Title:
Traffic Management Interface Board V2

Keyword(s):
TMIB2 Traffic Management Interface Board NEMA TS1 Loop Detector Output TS2 SDLC

Date:
July 13, 2017

Document:
TMIB V2 Data Sheet.doc

1 Traffic Management Interface Board Data Sheet

1.1 General Information

The Smartmicro TMIB (Traffic Management Interface Board) connects up to four UMRR Radar sensors (traffic detectors) to NEMA TS1 or TS2 cabinets (TMIB rack mount version); or to other traffic controllers (TMIB shelf mount version).

A TMIB set consists of two cards. The TMIB_AB assembly is the control board plus the interface board. This second board contains all surge and overvoltage protection circuitry for four long cables to four sensors, as it is the typical case on an intersection. One TMIB set can replace up to 16 inductive loops (TS1 usage) / up to 64 inductive loops (TS2 SDLC usage, up to four TS2 BIUs replaced).

The data of all four Radar sensors can be accessed conveniently through one single 100Base-TX Ethernet interface.

Rack-mount use:

In a typical (rack mount) installation, the TMIB consists of two NEMA form factor cards: The TMIB_AB assembly consisting of TMIB_A featuring TS1 loop contacts and status LEDs as well as the TMIB_B, which contains the sensor interface connections and the RS485/SDLC bus connectivity for TS2 cabinets. One TMIB can be connected to up to four "Inductive Loop Detector Unit" slots, replacing 16 inductive loops. In addition, up to three TMIB_C expansion cards may be installed. Each TMIB_C card offers four loop detector outputs. In NEMA TS1 installations they can be used to connect additional relay contacts to the traffic cabinet, because each TS1 card is limited to a maximum of four loop detector outputs.

Shelf-mount use:

In a typical (shelf mount) installation, the TMIB_AB assembly resides within an enclosure, offering all interfaces to the user.

The TMIB is well integrated in smartmicro's Easy Mode and TMConfigurator (Traffic Management Configurator) PC software to give the installer a powerful and easy-to-use tool for setup and maintenance.

Please note: TMIB_A/B/C are not fully fail-safe devices. While a number of steps have been taken to make sure the devices show a fail-safe behavior, this cannot be assured under all conditions. The connected sensors (detectors) do not have 100% detection rate or zero false alarm rate (see data sheet). In case of communication problems, sensor failure, TMIB_A/B/C failure in part or in whole, under certain condition a non-fail-safe behavior may occur.

1.2 General Performance Data

Parameter	Value
Connectivity	
Supported traffic detectors	UMRR-0Fxxxx or UMRR-0Cxxxx connected by Ethernet, CAN or 4-wire RS485
Supported outputs / interfaces	NEMA TS1 loop detector outputs NEMA TS2 SDLC bus 100Base-TX Ethernet
Number of detectors per TMIB	Up to 4
Number of virtual loops for NEMA TS2	Up to 16 per attached UMRR sensor Up to 64 total
Number of loops replaced for NEMA TS1 (4 detector slots used)	Up to 16[1]
NEMA TS2 Detector BIUs	Up to 4 (Detector BIU 8 thru 11)
Environmental	
Ambient Temperature	NEMA TS2 compliant[2]
Humidity	NEMA TS2 compliant
Shock	NEMA TS2 compliant
Vibration	NEMA TS2 compliant
Mechanical	
Weight TMIB_AB Weight TMIB_C	410g / 14.5oz
Dimensions	See section 4
Model No.	**TMIB_AB-02xxyy** **TMIB_C-02xxyy**
General	
Power Supply	10 ... 30 V DC 3.6W typical (TMIB unit excl. detectors)
Form factor	NEMA TS1 / TS2 Inductive Loop Detector Unit

[1] TMIB_C Extension cards required for more than 4 loop detector outputs.

[2] Batteries may have a reduced temperature range from -30°C to +85°C, the buzzer has a reduced temperature range of -30°C to +70°C, RJ50 expansion ports have reduced temperature range from -25°C to +90°C. These constraints do not limit normal operation of the TMIB.

1.3 Device Photographs

Figure 1: TMIB_AB assembly.

Figure 1 shows a typical TMIB_AB set installation, which consists of two cards: TMIB_A featuring TS1 loop contacts and status LEDs as well as the TMIB_B, which contains the sensor interface connections and the RS485/SDLC bus connectivity for TS2 cabinets.

In addition, up to three TMIB_C daughter cards can be connected to a TMIB rack mount installation, each offering four additional TS1 loop contacts. For shelf mount installations, the TMIB_C daughter cards would not be required.

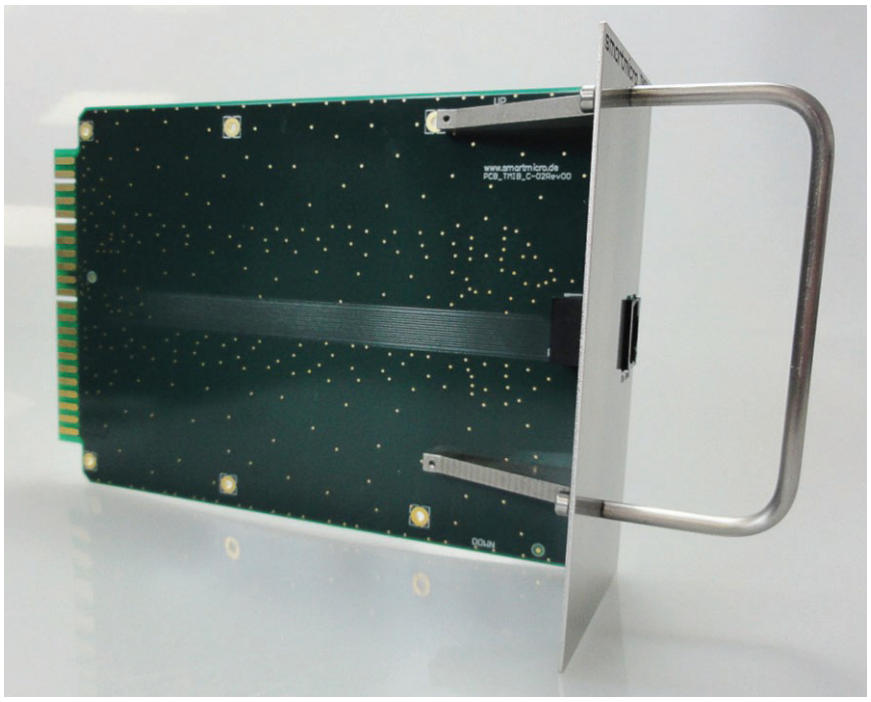


Figure 2: TMIB_C

2 Features and Applications

2.1 Intersection Applications

NEMA cabinets are typically used to control actuated intersections. They observe the current traffic flow through a set of loop detectors and adopt the red and green phases of the traffic lights accordingly. While loop detectors are dependable and robust, they are also cost and service intensive. UMRR traffic detectors offer cost effective and seamless loop replacement through non-invasive radar technology. In order to connect them to NEMA TS1 or TS2 cabinets, the TMIB is used, which is installed into the detector rack.

2.1.1 NEMA TS1 Installations

For NEMA TS1 installations, loop detector outputs are emulated through opto-isolators. The TMIB_AB cards provide four loop detector outputs. Up to 16 loops total can be replaced using TMIB_AB and additional TMIB_C daughter cards - if multiple UMRR-0A sensors shall be connected to one TMIB.

2.1.2 NEMA TS2 Installations

For NEMA TS2 installations, all vehicle detections are transmitted over the SDLC serial link. Therefore, only the TMIB itself (TMIB_AB assembly) is needed. Up to four Detector BIUs are supported with a total of 64 virtual loops.

2.1.3 Interfaces to Traffic Management Control systems

The TMIB offers on board 100Base-TX Ethernet interface for data retrieval and integration into Traffic Management Control systems.

2.2 General purpose applications

A shelf mount version offers the loop detector outputs and digital data interfaces in a boxed design – to support a variety of applications.

2.3 On-board diagnostics (BIT)

The TMIB has extensive means of onboard diagnostics through watchdog elements and LEDs on the front panel. General function can be instantly overlooked by Power Good, Heartbeat and Failure LEDs. Detailed diagnostics can be retrieved through data interfaces. The sensor communication link health can be checked by LEDs.

Signaling of error conditions can be adapted to customer requirements.

2.4 User interfaces

The TMIB provides the user interfaces displayed in Figure and Figure .

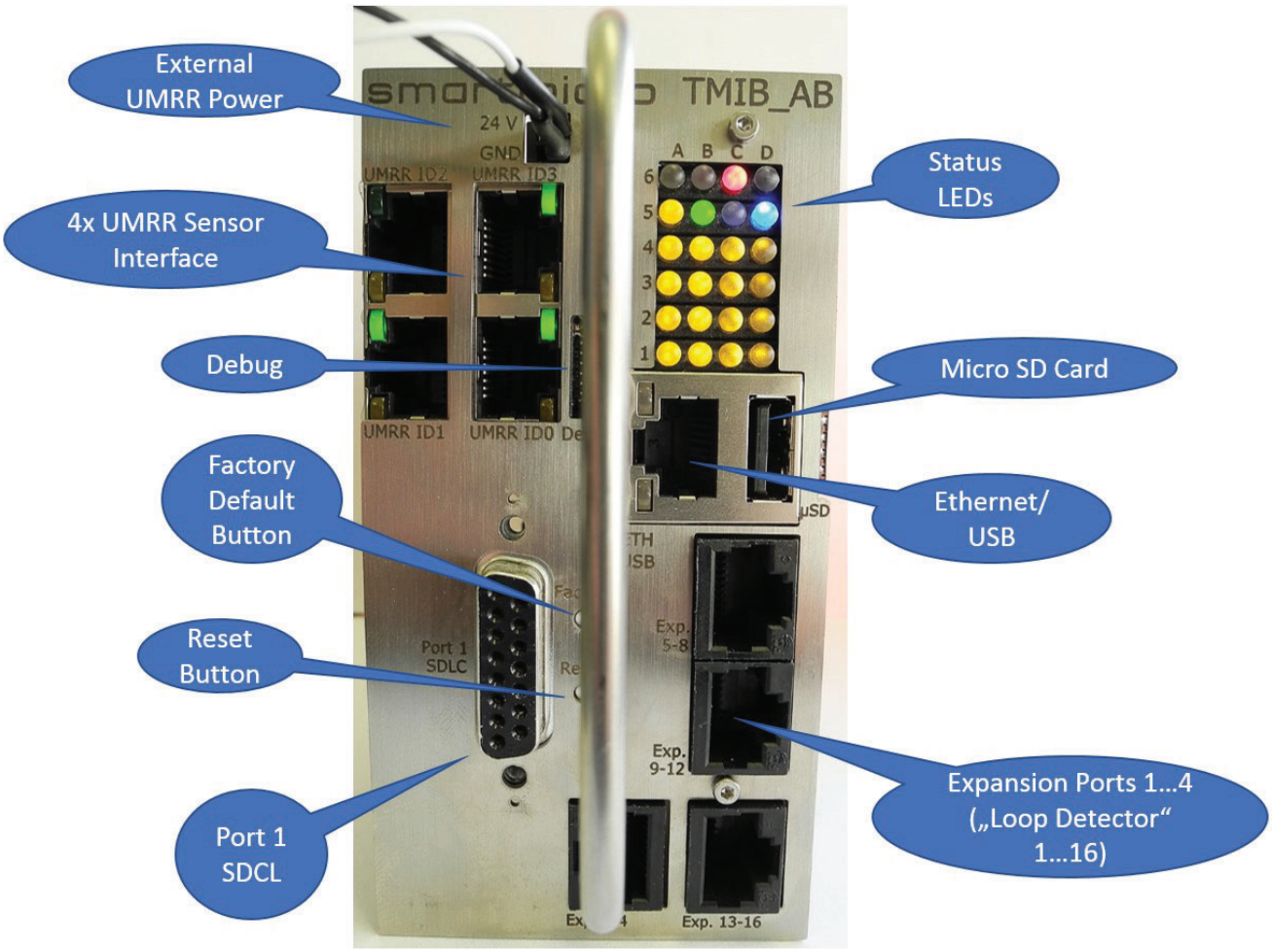


Figure 3: TMIB User interfaces (front panel)

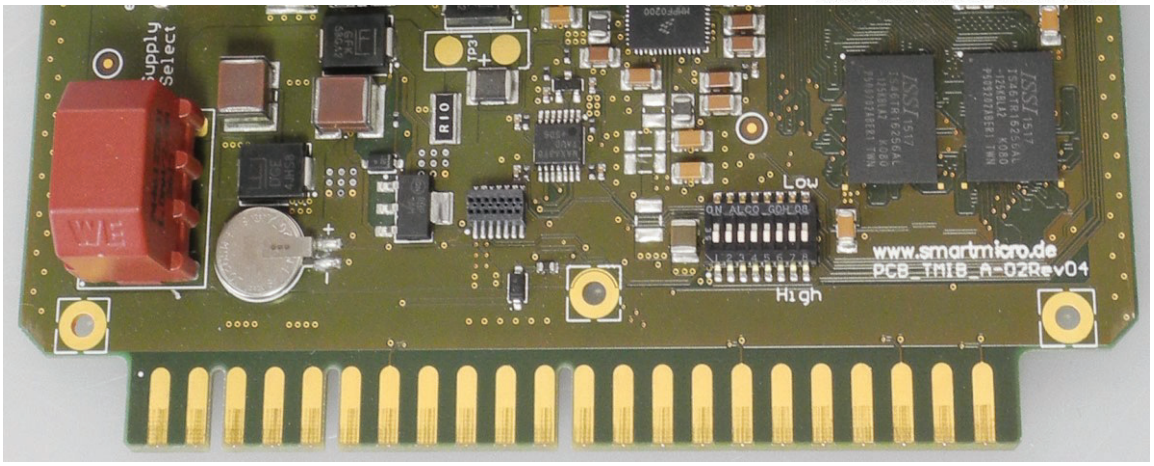


Figure 4: TMIB User interfaces (rear panel)

The user interfaces are:

- **Reset Switch** to allow the user to reset the TMIB device
- **Factory Default Button** to set the TMIB back to factory settings.
- **Status LEDs** to display the TS1 and TS2 virtual loops states; also to provide diagnostics information such as Power Good, Heartbeat, Error states, SDLC Activity and others.
- **Relay Expansion** to connect to TMIB_C Relay Expansion cards (NEMA TS1 form factor) or Terminal Block Expansion cards (loop detector output channels 1 .. 16).
- **UMRR Sensor Interface** to connect to UMRR sensors via RS485 (see section 3.1), including communication link health indicator.
- **Debug** for Debugging purposes by smartmicro trained personnel.
- **Micro SD Card** for maintenance and logging.
- **SDLC Port 1** connector.
- **Ethernet** (100Base-TX) interface.
- **USB** connector.
- NEMA TS1 / TS2 style **backplane multipoint pin header** (rack mount version) or Access to Power Supply / 4x loop detector outputs / SDLC (shelf mount version).

Please refer to the TMIB User Manual for detailed functional description.

3 Connection Scheme

The TMIB connects to up to four UMRR traffic detectors. It provides them with adequate supply voltage (sourced by the power supply terminal block at the TMIB front panel) and reads the data transmitted from or to all four sensors via CAN bus, Ethernet or 4-wire RS485 data stream. To communicate with NEMA TS1 traffic controllers, the TMIB activates all loop detector outputs corresponding to triggered detection zones defined in the UMRR. In order to support NEMA TS2 systems, the TMIB also sends all assigned loop calls over a SDLC serial link.

The data from the four connected UMRR sensors can be retrieved through 100Base-TX Ethernet interface. Also the setup (alignment, placing of virtual loops etc.) of all four sensors can be conveniently accomplished through the one single Ethernet port.

3.1 Connecting four UMRR sensors to a controller through the TMIB

The connection scheme is displayed Figure in below.

Figure 5: Connecting four UMRR sensors to a controller through the TMIB

3.1 Connecting UMRRs

The homerun cable of each UMRR traffic sensor is fed to a patch panel inside the traffic cabinet, where it is wired to a short Cat5 cable with RJ-45 connector, which plugs in directly into the sensor interface block of the TMIB_AB assembly.

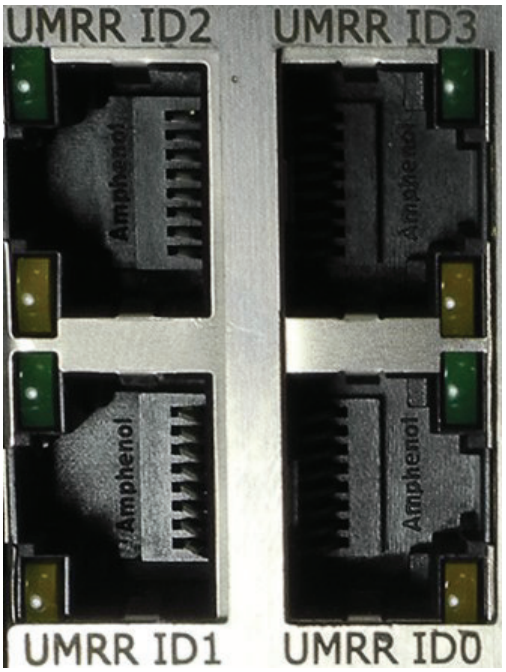


Figure 6: UMRR sensor interface

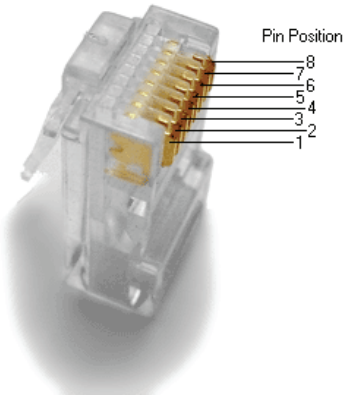


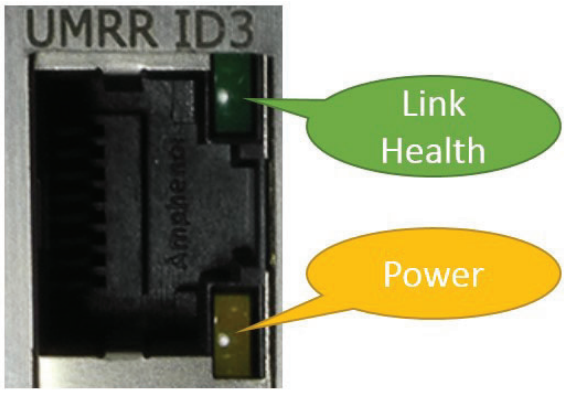
Figure 3-1: UMRR sensor connector

The pin-out for 4-wire RS485 communication is given by Table 1 shown below. Where standard Cat.6 cables are used at long distance, it is suggested to double up the power pair.

RJ-45 pin	Signal description		JBOX pin	Wire color EIA/TIA 568B (World)	Wire color EIA/TIA 568A (Europe)
1	**RS485**	**TX_N**	**5**	**White/orange**	**White-green**
2	**RS485**	**TX_P**	**6**	**Orange**	**green**
3	**CAN**	**HIGH**	**11**	**White/green**	**White-orange**
4	**VCC**	**(+)**	**8**	**Blue**	**Blue**
5	**GND**	**GND**	**7**	**White/blue**	**White-blue**
6	**CAN**	**LOW**	**12**	**Green**	**Orange**
7	**RS485**	**RX_P**	**4**	**White-brown**	**White-brown**
8	**RS485**	**RX_N**	**3**	**Brown**	**Brown**

Table 1: TMIB Full duplex version pin-out (UMRR-0C or UMRR-0F full-duplex RS485)

3.1.1 Communication Link Health indicator, power health indicator.



If there is no Sensor connected, the green Activity LED will be "on" after booting the TMIB. This helps to connect the sensor.
After connecting a sensor, the green LED will start blinking if data is transferred and stay dark if there's no data transmission.

If the sensor is powered from the TMIB, the yellow LED will be "on" continuously.
If this yellow LED begins to blink, or go "off", please seek further advice from the logfile accessible through the TMIB WEB-GUI. If the yellow power indicator stays "off", the sensor is not powered from the TMIB.

3.2 Connecting to the Backplane Connector (shelf mount version)

The Backplane Connector is located at the rear end of the shelf mount TMIB. The pin assignments (Table 1) are a 1:1 copy of the NEMA TS1 / TS2 backplane multipoint socket.

Pin	Signal description	Signal description	Pin
1	N.C.	Logic Ground	A
2	N.C.	Detector Unit DC Supply	B
3	N.C.	External Reset	C
4	N.C.	N.C.	D
5	N.C.	N.C.	E
6	N.C.	Channel 1 Output (+)	F
7	Channel 1 Status Output	Channel 1 Output (-)	H
8	N.C.	N.C.	J
9	N.C.	N.C.	K
10	N.C.	Chassis Ground	L
11	N.C.	N.C.	M
12	N.C.	N.C.	N
13	N.C.	N.C.	P
14	N.C.	N.C.	R
15	N.C.	Channel 3 Output (+)	S
16	Channel 3 Status Output	Channel 3 Output (-)	T
17	N.C.	N.C.	U
18	N.C.	N.C.	V
19	N.C.	Channel 2 Output (+)	W
20	Channel 2 Status Output	Channel 2 Output (-)	X
21	N.C.	Channel 4 Output (+)	Y
22	Channel 4 Status Output	Channel 4 Output (-)	Z

Table 1: Backplane Connector Pin Assignments

4 Mechanical Data

4.1 Dimensions of TMIB Assembly (TMIB_AB)

Width:	59,5 mm
Length:	176 mm (PCB)
	213 mm (incl. handle)
Height:	114,3 mm

Figure 7: TMIB_AB assembly mechanical data

4.2 TMIB_C Dimensions

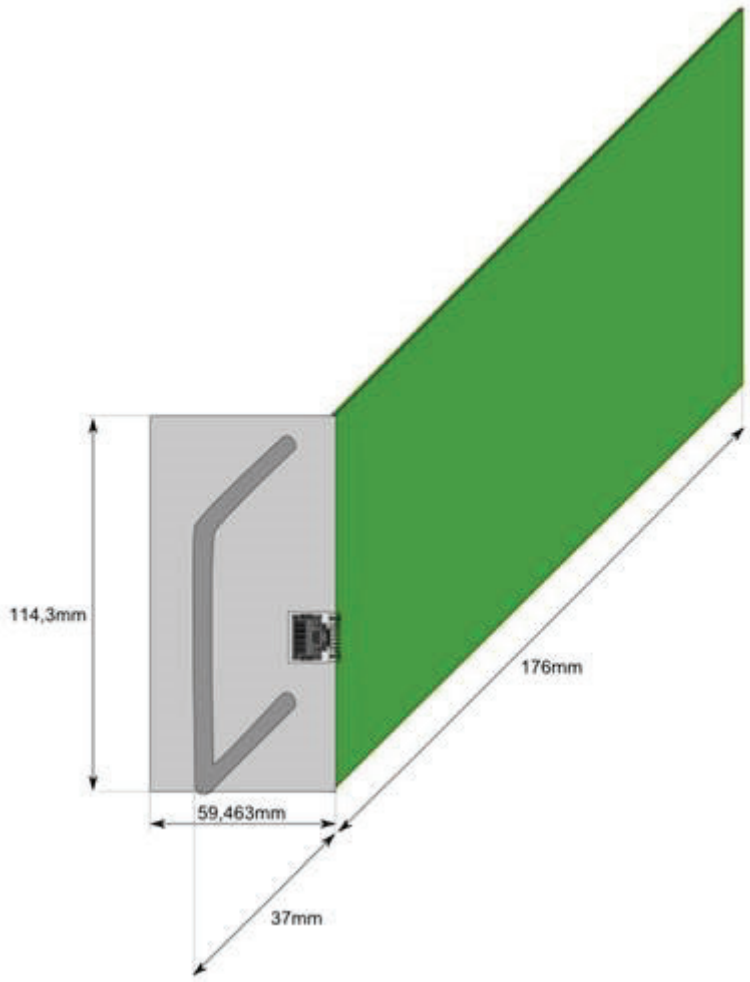


Figure 8: TMIB_C circuit board

Width:	59,5 mm
Length:	176 mm (PCB)
	213 mm (incl. handle)
Height:	114,3 mm

4.3 Shelf Mount Housing Dimensions

Width:	119.5 mm
Length:	200 mm
Height:	64 mm

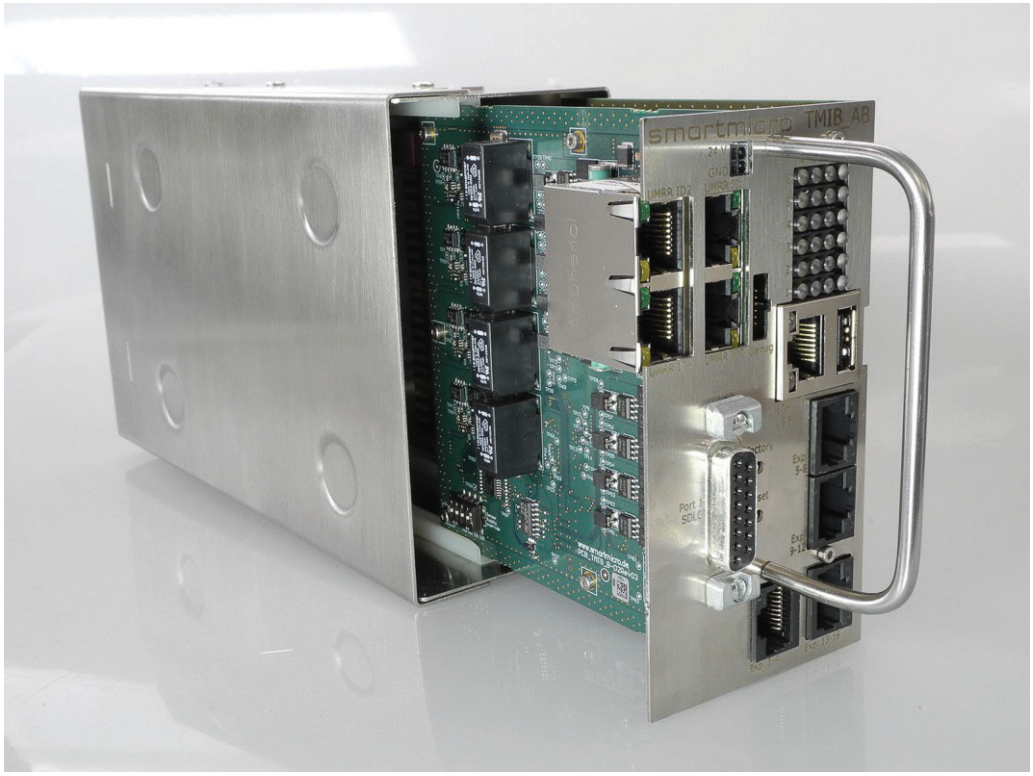


Figure 9: TMIB_AB in Shelf Mount Housing

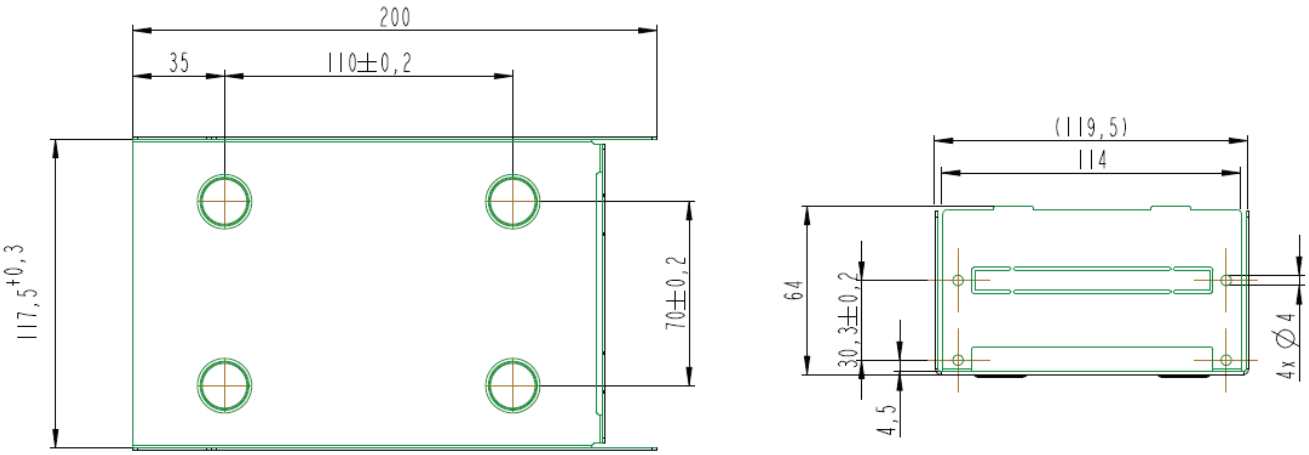


Figure 10: Dimensions of Shelf Mount Housing

5 Important Legal Disclaimer Notice

All Product, Product specifications and data in this project documentation are subject to change without notice to improve reliability, function, design or otherwise.

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Statements regarding the suitability of Products for certain types of applications are based on Smartmicro' knowledge of typical requirements that are often placed on Smartmicro' Products in generic/general applications. Such statements are, however, not binding statements about the suitability of Products for a particular/specific application. It is the customer/user's own responsibility to validate that the Product with the specifications described herein is suitable for use in its particular/specific application. Parameters and performance of the Products may due to particular/specific applications and due to particular/specific surroundings deviate from the statements made herein. Therefore, it is important that customer/user has thoroughly tested the Products and has understood the performance and the limitations of the Products before installing the Products for the final applications or before commercialization. Although Products are well optimized to be used for the intended applications stated herein, it must also be understood by the customer/user that the detection probability may not be 100 % and the false alarm rate may not be zero.

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6 Contact

Address:

smart microwave sensors GmbH
In den Waashainen 1
38108 Braunschweig
Germany

Phone / Fax numbers:

Phone: +49-531-39023-0
Fax: +49-531-39023-599

Web / Email address:

Web: www.smartmicro.de
www.smartmicrogroup.com
Email: info@smartmicro.de

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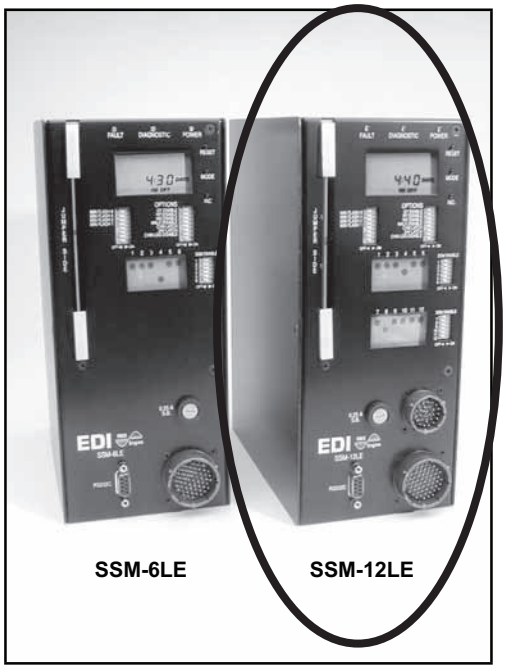

SSM-LE SERIES

Enhanced NEMA Signal Monitor Unit

A NEW STANDARD OF SAFETY AND DIAGNOSTIC CAPABILITIES

Providing the signal technician with powerful monitoring and trouble-shooting tools helps assure 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. New True RMS voltage sensing capabilities make the SSM-LE series the most reliable signal monitor available at any cost.

The SSM-LE series signal monitor includes both ~~six channel (SSM-6LE)~~ and twelve channel (SSM-12LE) configurations.

SSM-LE OPERATIONAL FEATURES

Enhanced Monitoring Functions: The SSM-LE series meets all specifications of NEMA Standard TS1-1994, 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 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 Signal Sequence History Log stored in nonvolatile memory graphically displays up to 30 seconds of signal status prior to the 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, +24V and CVM Latching, Red Fail Walk Disable, External Watchdog input, and CVM Log Disable.

ECcom PC Software: Access by a computer is provided by EDI ECcom Windows based software for status, event log review and archival, using the standard EIA-232 front panel port.

CU Communication: The SSM-LEC model will upload to a Controller Unit for remote interrogation. Consult the factory for availability.

EBERLE DESIGN INC.
3819 E. La Salle Street Phoenix, AZ 85040 USA
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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 TS2-2003 (R2008) Standard Including Amendment #4:	The MMU2-16LE *SmartMonitor*® 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 *SmartMonitor*® supports MUTCD Flashing Yellow Arrow PPLT operation and meets / exceeds the NEMA Standard MMU2 requirements of TS-2 Amendment #4-2012, 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 *SmartMonitor*® by answering a short series of questions regarding intersection design and operation.
Diagnostic Wizard: and Help System	The Diagnostic Wizard *automatically pinpoints* 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 *SmartMonitor*® 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 *SmartMonitor*® 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.

EBERLE DESIGN INC.
3510 East Atlanta Avenue
Phoenix, AZ 85040 USA
www.EDItraffic.com
Tel (480) 968-6407
Fax (602) 437-1996

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BIU-700

NEMA TS-2 Bus Interface Unit

The BIU-700 Bus Interface Unit (BIU) performs the interface between Port 1 of the Controller Unit and the Loop Detector Racks, Terminals and Facilities, and other devices in a NEMA TS-2 Cabinet Assembly. Its functions include controlling load switch outputs, detector resets, communicating with Inductive Loop Detectors and other devices, and the conditioning and conversion of Terminals and Facilities and Loop Detector call inputs for the Controller Unit.

Each EDI BIU-700 is put through a vigorous 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.

BIU-700 OPERATIONAL FEATURES

Basic Functions: The BIU-700 Bus Interface Unit meets or exceeds all requirements of the NEMA Standard TS2-1998 for the BIU configuration.

Display Indicators: Separate Power, Receive, and Transmit LED indicators display DC power status and SDLC Port 1 status.

Input / Output Pins: Signal I/O Configuration:

- ✓ 15 DC Output pins
- ✓ 24 Programmable Input / Output pins
- ✓ 8 DC Input pins
- ✓ 4 Optically isolated input pins
- ✓ 1 Line Frequency Reference input pin
- ✓ 4 Address Select input pins

Output Drivers: All outputs are rated at 150mA continuous sink current. Each output provides a 500mA typical current limit. Outputs are rated to 50 volts and utilize a voltage clamp for inductive transient protection.

Isolated Inputs: Four optically isolated inputs provide isolation for Pedestrian Detector and Remote Interconnect inputs. These inputs are intended for direct connection to 12 Vac from the cabinet power supply for Pedestrian Detector applications. They may also be connected for 'Low True' DC applications when the Opto Common pin is connected to a 24Vdc supply.

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3819 E. La Salle Street Phoenix, AZ 85040 USA
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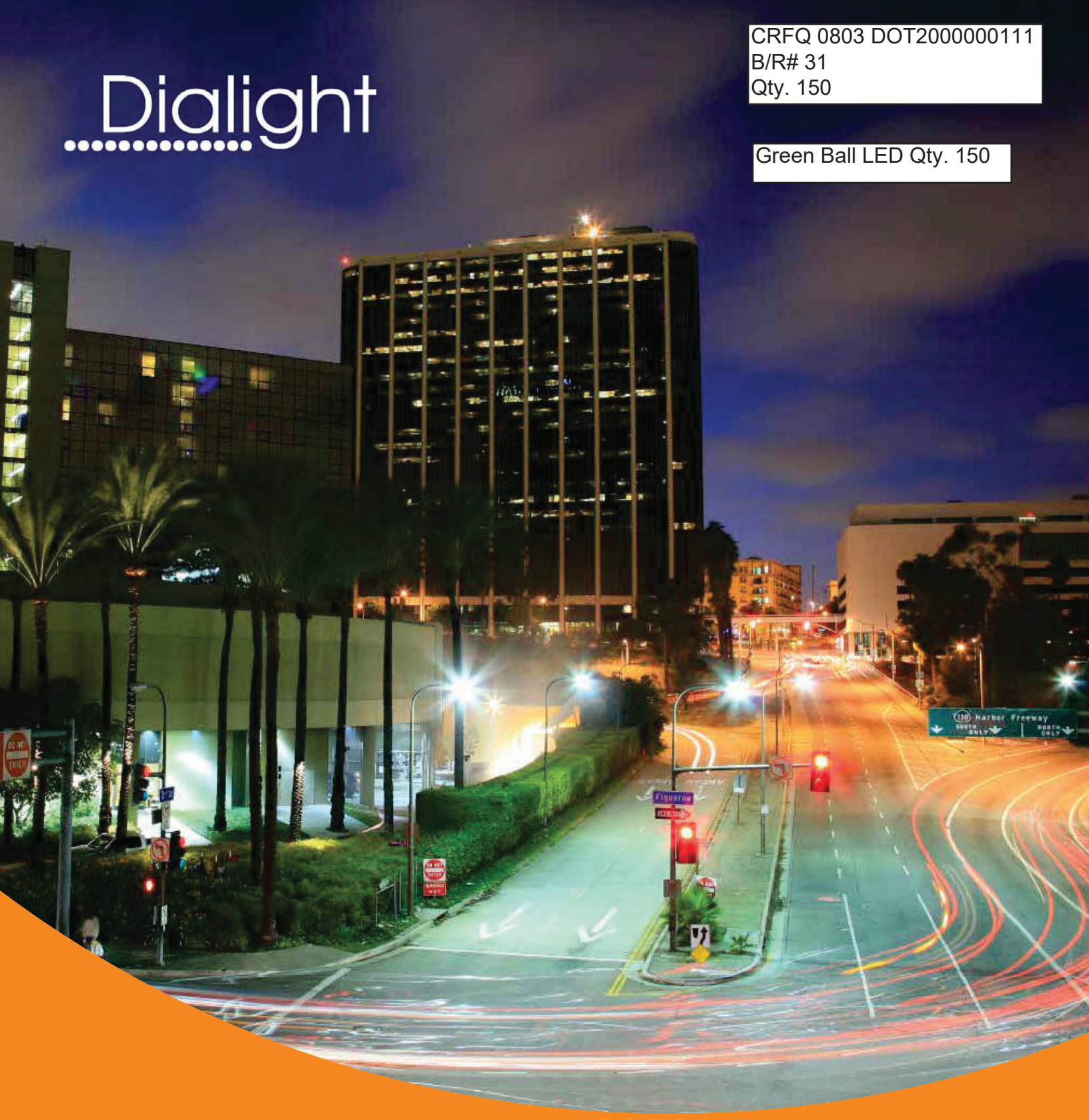
Green Ball LED Qty. 150

Dialight



ITE Compliant LED Signal Modules

ITE Compliant LED Traffic Signal

Module Performance Specifications

All LED Ball Signal Modules - 8 inch (200mm) and 12 inch (300mm)

All shall be fully compliant to the ITE VTCSH LED Circular Supplement specifications dated and adopted June 27, 2005. Compliance to the ITE VTCSH-2 Interim Purchase Specification is not sufficient, and will not substitute for compliance to the ITE VTCSH LED Circular Supplement specifications. Additionally, prior to bid award, the manufacturer shall submit to purchaser, reports from ETL/Intertek, that certify full compliance of all LED ball signal modules to the entire ITE specification. These tests should include but not be limited to the luminous intensity measurements and requirements outlined in the ITE specification sections 6.4.4 through 6.4.4.4.2 (25°C and 74°C / 49°C). Evidence of full compliance to all required testing methods, procedures and sections as outlined in the above ITE document Figure 2, Design Qualification Testing Flow Chart must be included without any exceptions, changes or omissions. The manufacturer must also submit a datasheet showing the catalog number of the items submitted on the bid and the Independent Lab report must show full qualification of this catalog number.

All LED 12 inch (300mm) Arrow Signal Modules

All shall be fully compliant to the **"Omni-directional"** specifications of the ITE VTCSH - LED Vehicle Arrow Traffic Signal Supplement adopted July 1, 2007. Additionally, prior to bid award, the manufacturer shall submit to purchaser, reports from ETL/Intertek that certify full compliance of all LED Arrow signal modules. These tests should include but not be limited to the luminous intensity measurements and requirements outlined in the ITE specification sections 6.4.4 through 6.4.4.4.2 (25°C and 74°C / 49°C). Evidence of full compliance to all required testing methods, procedures and sections as outlined in the above ITE document Attachment 1, "Design Qualification Testing Flow Chart" must be included without any exceptions, changes or omissions The manufacturer must also submit a data sheet showing the catalog number of the items submitted on the bid and the Independent Lab report must show full qualification of this catalog number.

All LED 16x18 Countdown Pedestrian Signal Modules

All shall be fully compliant to the ITE PTCSI Part-2: LED Pedestrian Traffic Sig nal Modules specifications adopted August 4, 2010 or the latest adopted version as listed on the ITE website at time of bid. Additionally, prior to bid award, the manufacturer shall submit to purchaser, reports from ETL/Intertek that certify full compliance of LED signal modules, to these specifications. Evidence of full compliance to all required testing methods, procedures and sections as outlined in the above ITE document Attachment 2, "Design Qualification Testing Flow Chart" must be included without any exceptions, changes or omissions. The manufacturer must also submit a data sheet showing the exact catalog number of the items submitted on the bid and the Independent Lab report must show full qualification of this catalog number. Combination hand/person pedestrian signal modules shall incorporate separate power supplies for the hand and the person icons.

In addition to, and in excess of the above applicable ITE specification compliance, the on-board circuitry of all LED traffic signal modules shall include voltage surge protection, to withstand high-repetition noise transients and low-repetition high-energy transients as stated in Section 2.1.8, NEMA Standard TS 2-2003. In addition, the module shall comply with the following standards: IEC 1000-4-5 at 3kV with a 2 ohm source impedance, ANSI/IEEE C62, 41-2002; IEC 61000-4-12 (6kV, 200A, 100kHz ring wave).

Warranty

Manufacturer shall provide at time of bid, a written warranty which provides for repair or replacement of modules that fail to function as intended due to workmanship or material defects within the first 60 months from date of delivery. Modules which exhibit luminous intensities less than the minimum as specified in the ITE specifications as indicated above, within the first 60 months from date of delivery shall be replaced or repaired.

Notes

CSA approved to the following applicable requirements:

- CSA Standard C22.2 No. 9.0-96 General Requirements for Luminaires
- CSA Std. No. C22.2 No. 250.0-04 Luminaires
- UL Std. No. 1598-2004 (May 2006) Luminaires

Uniform Appearance LED Traffic Signal Modules

Features & Benefits

- *Fully compliant to ITE VTCSH-LED Circular Signal Supplement dated 6/27/2005
- Industry's lowest power for all colors
- Meets or exceeds ITE intensity, color & uniformity spec, including 49ºC / 74ºC requirements
- Temperature compensated power supplies for longer LED life
- Uniform appearance
- Expanded view radiation pattern suitable for span wire and steep grade applications
- Transient suppression exceeds ITE and NEMA specifications (Up to 6KV ring wave)
- Manufactured with anti-capillary wires
- Conformal coated power supply
- Secondary lens treatment for abrasion resistance
- Patent No. 7,281,818 and other patents pending
- Intertek/ETL certified and listed on ETL certification program
- All units operate at 80-135VAC RMS, 60+/-3Hz

Part Number	Color	Lens Type	Dominant Wavelength (nm)	Typical Wattage at 25ºC	Peak Minimum Maintained Luminous Intensity (cd)	Size (in)	*Meets ITE Spec	CSA Approved
433-1110-003XL	Red	Tinted	625	7	165	8	•	•
433-1170-003XL	Red	Clear	625	7	165	8	•	•
433-3130-901XL	Yellow	Tinted	590	8	410	8	•	•
433-3170-901XL	Yellow	Clear	590	8	410	8	•	•
433-2120-001XL	Green	Tinted	500	7	215	8	•	•
433-2170-001XL	Green	Clear	500	7	215	8	•	•
433-1210-003XL	Red	Tinted	625	7	365	12	•	•
433-1270-003XL	Red	Clear	625	7	365	12	•	•
433-3230-901XL	Yellow	Tinted	590	9	910	12	•	•
433-3270-901XL	Yellow	Clear	590	9	910	12	•	•
433-2220-001XL	Green	Tinted	500	8	475	12	•	•
4332270-001XL	Green	Clear	500	8	475	12	•	•

Omni-Directional Uniform Appearance LED Arrow

Features & Benefits

- *Fully compliant to ITE VTCSH-LED Vehicle Arrow Supplement dated 7/01/2007
- Allows for mounting in any orientation in the signal head
- Industry's lowest power for all colors
- Meets or exceeds ITE intensity, color & uniformity spec, including 49ºC / 74ºC requirements
- Temperature compensated power supplies for longer LED life
- Uniform appearance
- Transient suppression exceeds ITE and NEMA specifications (Up to 6KV ring wave)
- Manufactured with anti-capillary wires
- Conformal coated power supply
- Secondary lens treatment for abrasion resistance
- Intertek/ETL certified and listed on ETL certification program
- All units operate at 80-135VAC RMS, 60+/-3Hz

Part Number	Color	Lens Type	Dominant Wavelength (nm)	Typical Wattage at 25ºC	Peak Minimum Maintained Luminous Intensity (cd)	*Meets ITE Spec	CSA Approved
432-1314-001XOD	Red	Tinted	628	6	56.8	•	•
432-1374-001XOD	Red	Clear	628	6	56.8	•	•
431-3334-901XOD	Yellow	Tinted	590	7	141.6	•	•
431-3374-901XOD	Yellow	Clear	590	7	141.6	•	•
432-2324-001XOD	Green	Tinted	500	6	73.9	•	•
432-2374-001XOD	Green	Clear	500	6	73.9	•	•

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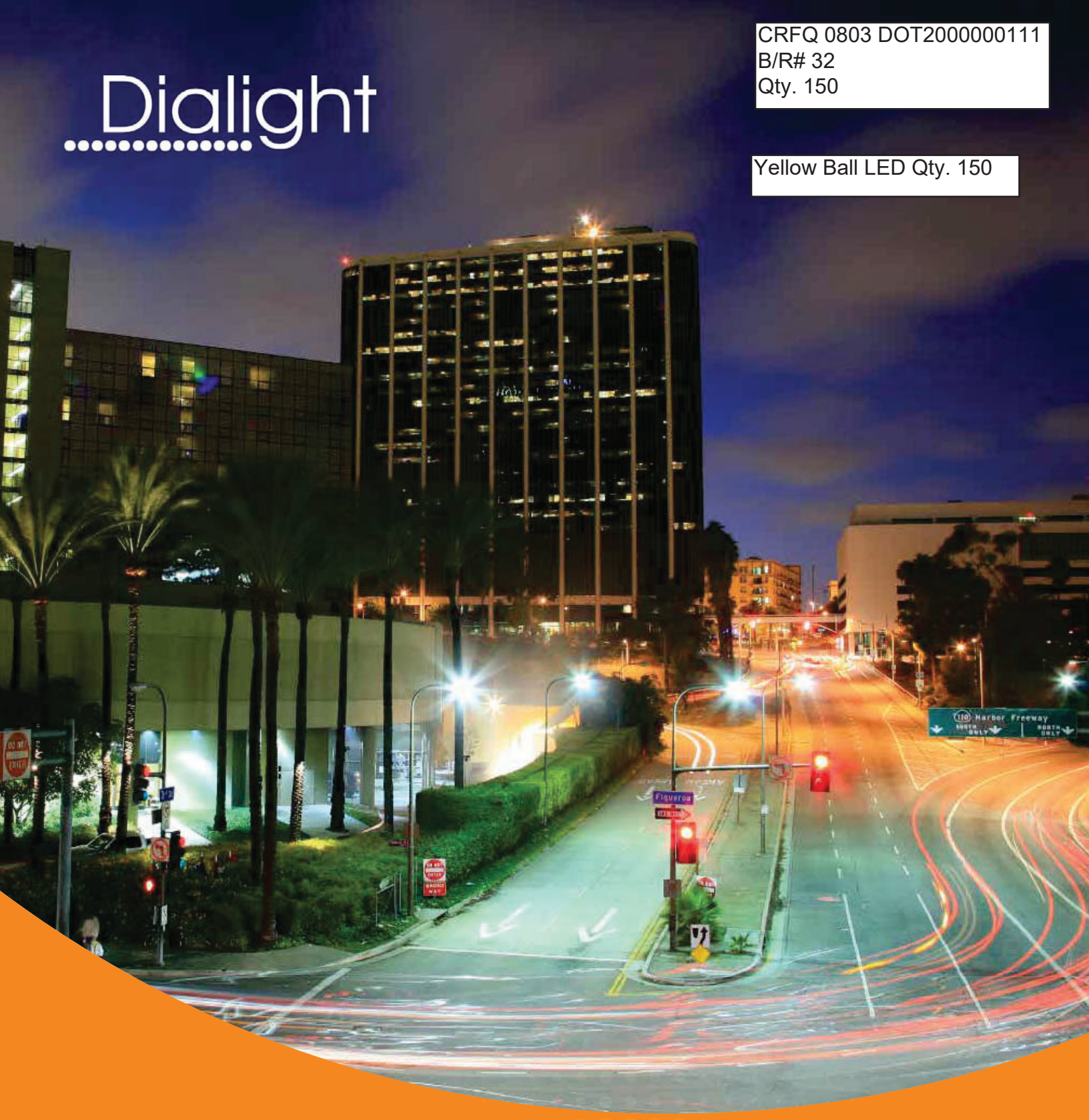
Yellow Ball LED Qty. 150



ITE Compliant LED Signal Modules

ITE Compliant LED Traffic Signal

Module Performance Specifications

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All LED 12 inch (300mm) Arrow Signal Modules

All shall be fully compliant to the **"Omni-directional"** specifications of the ITE VTCSH - LED Vehicle Arrow Traffic Signal Supplement adopted July 1, 2007. Additionally, prior to bid award, the manufacturer shall submit to purchaser, reports from ETL/Intertek that certify full compliance of all LED Arrow signal modules. These tests should include but not be limited to the luminous intensity measurements and requirements outlined in the ITE specification sections 6.4.4 through 6.4.4.4.2 (25°C and 74°C / 49°C). Evidence of full compliance to all required testing methods, procedures and sections as outlined in the above ITE document Attachment 1, "Design Qualification Testing Flow Chart" must be included without any exceptions, changes or omissions The manufacturer must also submit a data sheet showing the catalog number of the items submitted on the bid and the Independent Lab report must show full qualification of this catalog number.

All LED 16x18 Countdown Pedestrian Signal Modules

All shall be fully compliant to the ITE PTCSI Part-2: LED Pedestrian Traffic Sig nal Modules specifications adopted August 4, 2010 or the latest adopted version as listed on the ITE website at time of bid. Additionally, prior to bid award, the manufacturer shall submit to purchaser, reports from ETL/Intertek that certify full compliance of LED signal modules, to these specifications. Evidence of full compliance to all required testing methods, procedures and sections as outlined in the above ITE document Attachment 2, "Design Qualification Testing Flow Chart" must be included without any exceptions, changes or omissions. The manufacturer must also submit a data sheet showing the exact catalog number of the items submitted on the bid and the Independent Lab report must show full qualification of this catalog number. Combination hand/person pedestrian signal modules shall incorporate separate power supplies for the hand and the person icons.

In addition to, and in excess of the above applicable ITE specification compliance, the on-board circuitry of all LED traffic signal modules shall include voltage surge protection, to withstand high-repetition noise transients and low-repetition high-energy transients as stated in Section 2.1.8, NEMA Standard TS 2-2003. In addition, the module shall comply with the following standards: IEC 1000-4-5 at 3kV with a 2 ohm source impedance, ANSI/IEEE C62, 41-2002; IEC 61000-4-12 (6kV, 200A, 100kHz ring wave).

Warranty

Manufacturer shall provide at time of bid, a written warranty which provides for repair or replacement of modules that fail to function as intended due to workmanship or material defects within the first 60 months from date of delivery. Modules which exhibit luminous intensities less than the minimum as specified in the ITE specifications as indicated above, within the first 60 months from date of delivery shall be replaced or repaired.

Notes

CSA approved to the following applicable requirements:

- CSA Standard C22.2 No. 9.0-96 General Requirements for Luminaires
- CSA Std. No. C22.2 No. 250.0-04 Luminaires
- UL Std. No. 1598-2004 (May 2006) Luminaires

Uniform Appearance LED Traffic Signal Modules

Features & Benefits

- *Fully compliant to ITE VTCSH-LED Circular Signal Supplement dated 6/27/2005
- Industry's lowest power for all colors
- Meets or exceeds ITE intensity, color & uniformity spec, including 49ºC / 74ºC requirements
- Temperature compensated power supplies for longer LED life
- Uniform appearance
- Expanded view radiation pattern suitable for span wire and steep grade applications
- Transient suppression exceeds ITE and NEMA specifications (Up to 6KV ring wave)
- Manufactured with anti-capillary wires
- Conformal coated power supply
- Secondary lens treatment for abrasion resistance
- Patent No. 7,281,818 and other patents pending
- Intertek/ETL certified and listed on ETL certification program
- All units operate at 80-135VAC RMS, 60+/-3Hz

Part Number	Color	Lens Type	Dominant Wavelength (nm)	Typical Wattage at 25ºC	Peak Minimum Maintained Luminous Intensity (cd)	Size (in)	*Meets ITE Spec	CSA Approved
433-1110-003XL	Red	Tinted	625	7	165	8	•	•
433-1170-003XL	Red	Clear	625	7	165	8	•	•
433-3130-901XL	Yellow	Tinted	590	8	410	8	•	•
433-3170-901XL	Yellow	Clear	590	8	410	8	•	•
433-2120-001XL	Green	Tinted	500	7	215	8	•	•
433-2170-001XL	Green	Clear	500	7	215	8	•	•
433-1210-003XL	Red	Tinted	625	7	365	12	•	•
433-1270-003XL	Red	Clear	625	7	365	12	•	•
433-3230-901XL	Yellow	Tinted	590	9	910	12	•	•
433-3270-901XL	Yellow	Clear	590	9	910	12	•	•
433-2220-001XL	Green	Tinted	500	8	475	12	•	•
4332270-001XL	Green	Clear	500	8	475	12	•	•

Omni-Directional Uniform Appearance LED Arrow

Features & Benefits

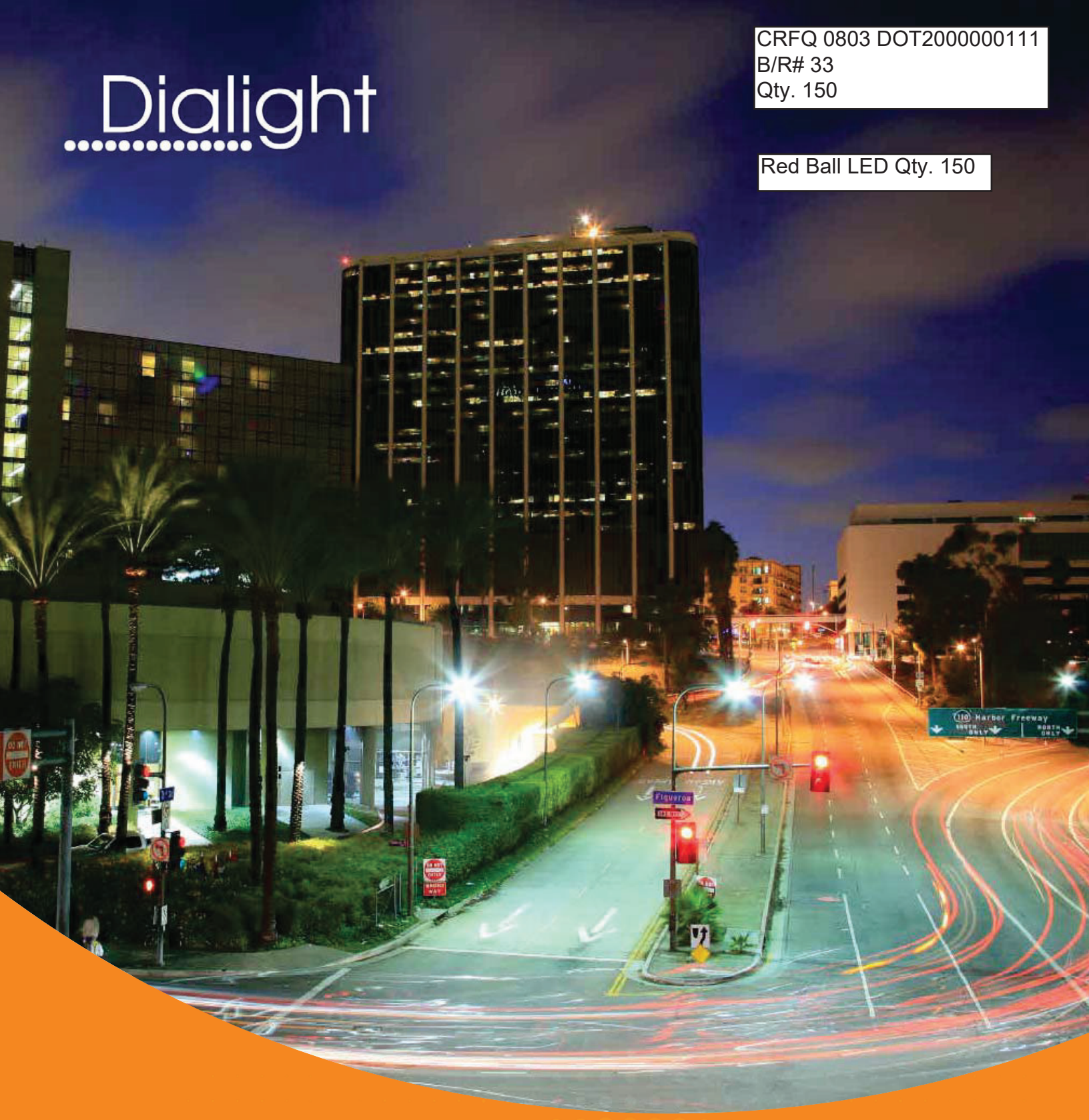
- *Fully compliant to ITE VTCSH-LED Vehicle Arrow Supplement dated 7/01/2007
- Allows for mounting in any orientation in the signal head
- Industry's lowest power for all colors
- Meets or exceeds ITE intensity, color & uniformity spec, including 49ºC / 74ºC requirements
- Temperature compensated power supplies for longer LED life
- Uniform appearance
- Transient suppression exceeds ITE and NEMA specifications (Up to 6KV ring wave)
- Manufactured with anti-capillary wires
- Conformal coated power supply
- Secondary lens treatment for abrasion resistance
- Intertek/ETL certified and listed on ETL certification program
- All units operate at 80-135VAC RMS, 60+/-3Hz

Part Number	Color	Lens Type	Dominant Wavelength (nm)	Typical Wattage at 25ºC	Peak Minimum Maintained Luminous Intensity (cd)	*Meets ITE Spec	CSA Approved
432-1314-001XOD	Red	Tinted	628	6	56.8	•	•
432-1374-001XOD	Red	Clear	628	6	56.8	•	•
431-3334-901XOD	Yellow	Tinted	590	7	141.6	•	•
431-3374-901XOD	Yellow	Clear	590	7	141.6	•	•
432-2324-001XOD	Green	Tinted	500	6	73.9	•	•
432-2374-001XOD	Green	Clear	500	6	73.9	•	•

Dialight

CRFQ 0803 DOT2000000111
B/R# 33
Qty. 150

Red Ball LED Qty. 150



ITE Compliant LED Signal Modules

ITE Compliant LED Traffic Signal

Module Performance Specifications

All LED Ball Signal Modules - 8 inch (200mm) and 12 inch (300mm)

All shall be fully compliant to the ITE VTCSH LED Circular Supplement specifications dated and adopted June 27, 2005. Compliance to the ITE VTCSH-2 Interim Purchase Specification is not sufficient, and will not substitute for compliance to the ITE VTCSH LED Circular Supplement specifications. Additionally, prior to bid award, the manufacturer shall submit to purchaser, reports from ETL/Intertek, that certify full compliance of all LED ball signal modules to the entire ITE specification. These tests should include but not be limited to the luminous intensity measurements and requirements outlined in the ITE specification sections 6.4.4 through 6.4.4.4.2 (25°C and 74°C / 49°C). Evidence of full compliance to all required testing methods, procedures and sections as outlined in the above ITE document Figure 2, Design Qualification Testing Flow Chart must be included without any exceptions, changes or omissions. The manufacturer must also submit a datasheet showing the catalog number of the items submitted on the bid and the Independent Lab report must show full qualification of this catalog number.

All LED 12 inch (300mm) Arrow Signal Modules

All shall be fully compliant to the **"Omni-directional"** specifications of the ITE VTCSH - LED Vehicle Arrow Traffic Signal Supplement adopted July 1, 2007. Additionally, prior to bid award, the manufacturer shall submit to purchaser, reports from ETL/Intertek that certify full compliance of all LED Arrow signal modules. These tests should include but not be limited to the luminous intensity measurements and requirements outlined in the ITE specification sections 6.4.4 through 6.4.4.4.2 (25°C and 74°C / 49°C). Evidence of full compliance to all required testing methods, procedures and sections as outlined in the above ITE document Attachment 1, "Design Qualification Testing Flow Chart" must be included without any exceptions, changes or omissions The manufacturer must also submit a data sheet showing the catalog number of the items submitted on the bid and the Independent Lab report must show full qualification of this catalog number.

All LED 16x18 Countdown Pedestrian Signal Modules

All shall be fully compliant to the ITE PTCSI Part-2: LED Pedestrian Traffic Sig nal Modules specifications adopted August 4, 2010 or the latest adopted version as listed on the ITE website at time of bid. Additionally, prior to bid award, the manufacturer shall submit to purchaser, reports from ETL/Intertek that certify full compliance of LED signal modules, to these specifications. Evidence of full compliance to all required testing methods, procedures and sections as outlined in the above ITE document Attachment 2, "Design Qualification Testing Flow Chart" must be included without any exceptions, changes or omissions. The manufacturer must also submit a data sheet showing the exact catalog number of the items submitted on the bid and the Independent Lab report must show full qualification of this catalog number. Combination hand/person pedestrian signal modules shall incorporate separate power supplies for the hand and the person icons.

In addition to, and in excess of the above applicable ITE specification compliance, the on-board circuitry of all LED traffic signal modules shall include voltage surge protection, to withstand high-repetition noise transients and low-repetition high-energy transients as stated in Section 2.1.8, NEMA Standard TS 2-2003. In addition, the module shall comply with the following standards: IEC 1000-4-5 at 3kV with a 2 ohm source impedance, ANSI/IEEE C62, 41-2002; IEC 61000-4-12 (6kV, 200A, 100kHz ring wave).

Warranty

Manufacturer shall provide at time of bid, a written warranty which provides for repair or replacement of modules that fail to function as intended due to workmanship or material defects within the first 60 months from date of delivery. Modules which exhibit luminous intensities less than the minimum as specified in the ITE specifications as indicated above, within the first 60 months from date of delivery shall be replaced or repaired.

Notes

CSA approved to the following applicable requirements:

- CSA Standard C22.2 No. 9.0-96 General Requirements for Luminaires
- CSA Std. No. C22.2 No. 250.0-04 Luminaires
- UL Std. No. 1598-2004 (May 2006) Luminaires

Uniform Appearance LED Traffic Signal Modules

Features & Benefits

- *Fully compliant to ITE VTCSH-LED Circular Signal Supplement dated 6/27/2005
- Industry's lowest power for all colors
- Meets or exceeds ITE intensity, color & uniformity spec, including 49ºC / 74ºC requirements
- Temperature compensated power supplies for longer LED life
- Uniform appearance
- Expanded view radiation pattern suitable for span wire and steep grade applications
- Transient suppression exceeds ITE and NEMA specifications (Up to 6KV ring wave)
- Manufactured with anti-capillary wires
- Conformal coated power supply
- Secondary lens treatment for abrasion resistance
- Patent No. 7,281,818 and other patents pending
- Intertek/ETL certified and listed on ETL certification program
- All units operate at 80-135VAC RMS, 60+/-3Hz

Part Number	Color	Lens Type	Dominant Wavelength (nm)	Typical Wattage at 25ºC	Peak Minimum Maintained Luminous Intensity (cd)	Size (in)	*Meets ITE Spec	CSA Approved
433-1110-003XL	Red	Tinted	625	7	165	8	•	•
433-1170-003XL	Red	Clear	625	7	165	8	•	•
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433-2120-001XL	Green	Tinted	500	7	215	8	•	•
433-2170-001XL	Green	Clear	500	7	215	8	•	•
433-1210-003XL	Red	Tinted	625	7	365	12	•	•
433-1270-003XL	Red	Clear	625	7	365	12	•	•
433-3230-901XL	Yellow	Tinted	590	9	910	12	•	•
433-3270-901XL	Yellow	Clear	590	9	910	12	•	•
433-2220-001XL	Green	Tinted	500	8	475	12	•	•
4332270-001XL	Green	Clear	500	8	475	12	•	•

Omni-Directional Uniform Appearance LED Arrow

Features & Benefits

- *Fully compliant to ITE VTCSH-LED Vehicle Arrow Supplement dated 7/01/2007
- Allows for mounting in any orientation in the signal head
- Industry's lowest power for all colors
- Meets or exceeds ITE intensity, color & uniformity spec, including 49ºC / 74ºC requirements
- Temperature compensated power supplies for longer LED life
- Uniform appearance
- Transient suppression exceeds ITE and NEMA specifications (Up to 6KV ring wave)
- Manufactured with anti-capillary wires
- Conformal coated power supply
- Secondary lens treatment for abrasion resistance
- Intertek/ETL certified and listed on ETL certification program
- All units operate at 80-135VAC RMS, 60+/-3Hz

Part Number	Color	Lens Type	Dominant Wavelength (nm)	Typical Wattage at 25ºC	Peak Minimum Maintained Luminous Intensity (cd)	*Meets ITE Spec	CSA Approved
432-1314-001XOD	Red	Tinted	628	6	56.8	•	•
432-1374-001XOD	Red	Clear	628	6	56.8	•	•
431-3334-901XOD	Yellow	Tinted	590	7	141.6	•	•
431-3374-901XOD	Yellow	Clear	590	7	141.6	•	•
432-2324-001XOD	Green	Tinted	500	6	73.9	•	•
432-2374-001XOD	Green	Clear	500	6	73.9	•	•

CRFQ 0803 DOT2000000111
B/R# 34
Qty. 30
With Clamshell Mount
Black Housing

Pedestrian Signal Housing

12" Housing
16" Housing
Aluminum
Polycarbonate

16 inch housing
shown in Federal yellow

12 inch housing
shown in black

Signals
Signs
Software
Specialty

Overview

McCain's Pedestrian Signal Housings are designed to be used in conjunction with standard or LED pedestrian signal modules to promote pedestrian safety at intersections. McCain housings exceed the Institute of Transportation Engineers (ITE) standards, offering a low maintenance and durable housing in either die cast aluminum or injection molded polycarbonate resin. They are available in 12" or 16" styles, and the 12" housings are available in 1-section or 2-section varieties. The 12" polycarbonate housings are reinforced with a 10 percent fiberglass fill for superior strength and durability unmatched by standard polycarbonate resins. The fiberglass fill is optional on the 16" polycarbonate housings.

Benefits

- 12" or 16" styles
- Rugged aluminum or polycarbonate construction
- Designed for standard symbol or word pedestrian signal modules including LED
- Door-hinge hardware can be removable and reversible or permanently attached
- Highly customizable including a variety of fabrication, mounting, and visor options
- 16" available with *Vantage Visor*™ for increased visibility and impact protection

Product Description

The McCain Pedestrian Signal Housing is available in 12" and 16" styles and a variety of configurations including aluminum or polycarbonate construction, with a number of options (see Options for details).

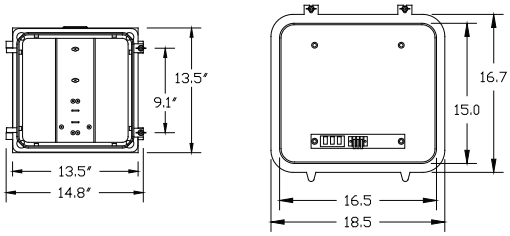
The door is attached with stainless steel detent-type clevis or roll pins and eye bolt/wing nut assemblies. Two equally spaced mounting lugs, integrally cast into the top and bottom of the 16" and the sides of the 12", allow the doors to hinge from either direction. When clevis pins are used, the door and eye bolt assemblies can be removed and rotated without the use of any tools, facilitating maintenance.

All interior mounting locations on the 16" housing are symmetrically positioned, allowing the rotation of components when using the bi-directional McCain Clamshell Mount to mount to the right or left side.

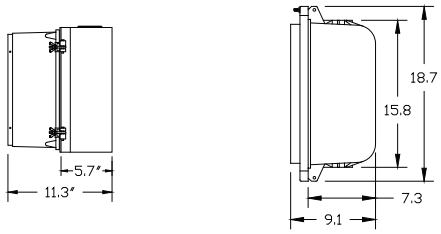
Pedestrian Signal Housing

12" housing *16" housing*

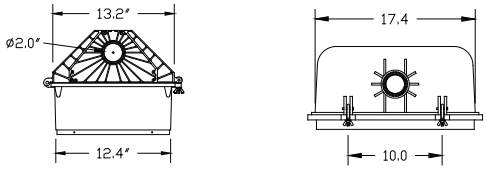
Front



Side



Top



Dimensions rounded to the nearest 0.1"

12" 2-section with tunnel visors

16" with Vantage Visor

Standard Features

- Stainless steel hardware includes hinge pins (detent-type clevis or roll) and eye bolt/wing nuts (latch)
- Terminal block with quick-disconnect fittings on one side of each terminal position and screw clamps on the other side

General Specifications

Dimensions*:	12" Housing	16" Housing
Housing:	13.2" H x 13.2" W x 5.7" D	15.8" H x 17.4" W x 7.3" D
Door (incl. tabs):	13.5" H x 15.0" W x 5.6" D	18.7" H x 18.5" W x 1.8" D
Overall:	14.0" H x 15.0" W x 11.3" D	18.7" H x 18.5" W x 9.1" D

Material:	Polycarbonate: Ultraviolet and heat stabilized, flame retardant, permanently colored, 10% fiberglass reinforcement (12" standard, 16" optional) Aluminum: Type 360, reduced corrosion, increased powder coat adhesion
Finish(es):	Polycarbonate: Colored resins integral to housing Aluminum: Powder coated
Color(s):	Federal yellow, signal green, black, or custom colors
Access:	Front door (1), 16": hinged top or bottom 12": hinged left or right
Latching System:	Eye bolt assemblies
Mounting:	Standard signal hardware
Environmental:	Operating temperature: -37° C to +74° C Humidity: 0 to 95% (non-condensing)
Shipping Weight:	12": Poly 5 lbs, Al 9 lbs 16": Poly 9 lbs, Al 10 lbs

Options

- Polycarbonate 10% fiberglass fill for added durability (optional on 16", standard on 12")
- Modules: LED or incandescent; international Hand/Man symbol, "WALK"/"DON'T WALK" words
- Visors: *Vantage Visor* (16" only), tunnel, or cap (12" only)
- Clamshell mount (16" only - housing available pre-drilled for mount)
- Custom terminal blocks
- Door hardware permanent (roll pins) or removable (clevis pins)

** Dimensions are approximate and vary based on material used*

Hand/Man modules
(sold separately)

16" Vantage Visor
(sold separately)

16" Tunnel visor
(sold separately)

16" Clamshell mount
(sold separately)

To learn more about McCain's Integrated Traffic Solutions, please contact ***info@mccain-inc.com*** *or call* ***(760) 727-8100***

McCain®

2365 OAK RIDGE WAY // VISTA, CALIFORNIA 92081 // USA // WWW.MCCAIN-INC.COM

CRFQ 0803 DOT2000000111
B/R# 34
Qty. 30

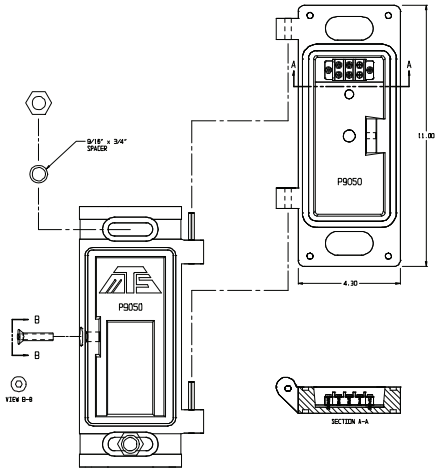
McCain

The Power of Ingenuity

2365 Oak Ridge Way •
Vista, CA 92081, USA •
Phone 760-727-8100 •
Fax 760-727-8264 •
www.mccaintraffic.com

Clamshell Mounting Hardware

- Simplified installation (half mounted on pole and half mounted on signal)
- Multiple mounting methods
  - Through-bolt
  - Banding
  - Lag screw (wood pole)
- Vandal proof lock
- Dual wiring
  - Screw terminal
  - Quick disconnect
- Optional conduit entrance (wood pole mount)



Material Cast Aluminum Alloy

Paint Finishes ~~Federal Yellow, Dark Olive Green,~~ Black

Dimensions 11-1/4" H Max x 5-1/2" W Max x 2-3/4 D Max

Weight Total weight does not exceed 7-1/2 lbs.

Construction The clamshell consists of a two part mounting assembly. The hinge pins on the pole mounted half are stainless steel and fit into the ears on the signal mounted half. The pole half of the assembly shall be designed to fit the curvature of poles 4" in diameter and larger.

Mounting The clamshell is mechanically designed to allow for various types of mounting such as banding, thru-bolt or lag screw mounting. The bolt holes are elongated horizon tally to allow for rotation on the pole.

The closed signal half of the assembly is secured to the pole half through use of a flathead socket bolt and tightened using a 3/16" Allen wrench.

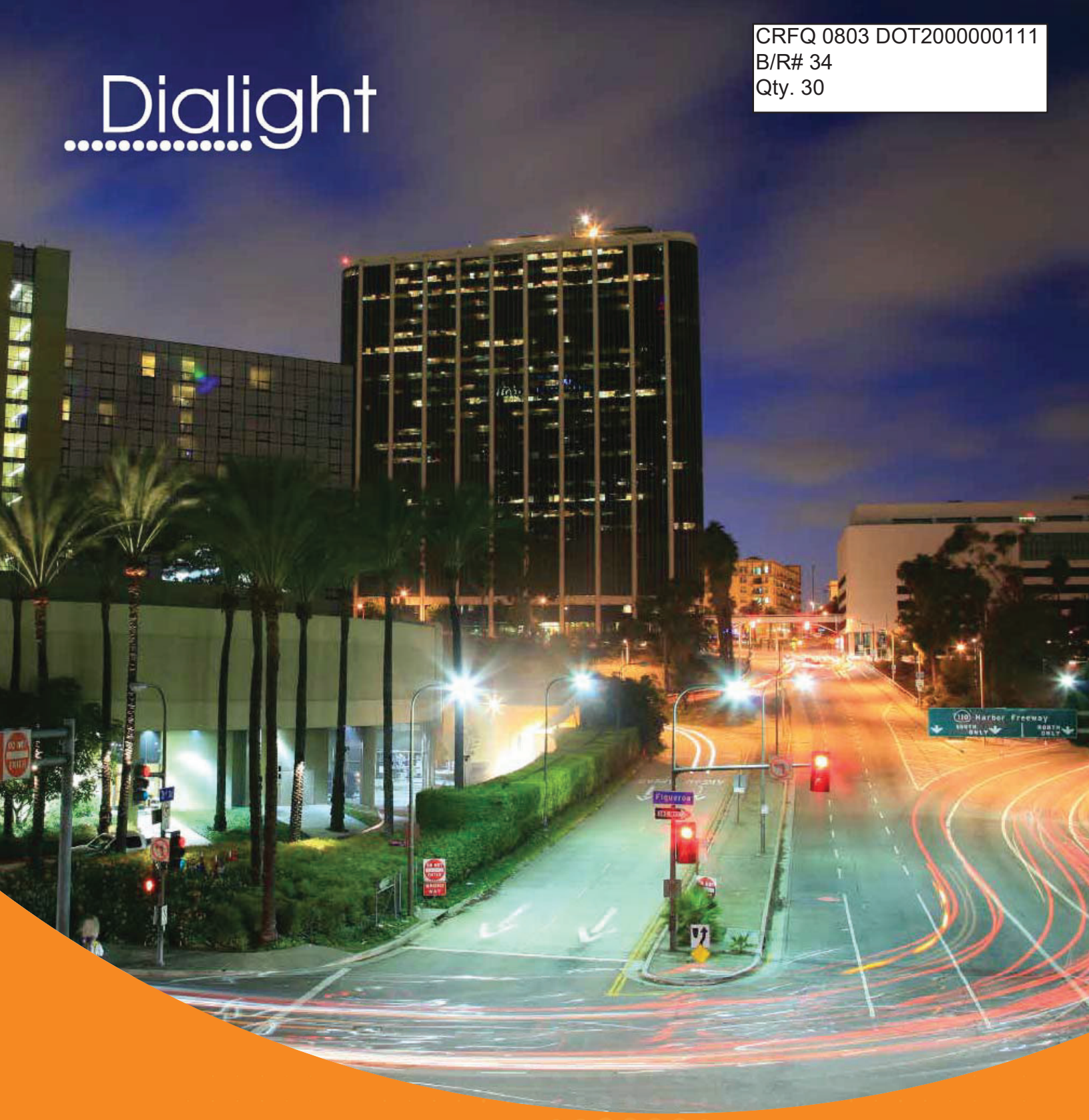
Wiring The field wiring is terminated on a horizontally mounted 3 position terminal block located in the upper half of the signal mounted half.

Miscellaneous A neoprene gasket provides for a rain-tight seal.

Warranty The clamshell and its associated hardware is warranted for two (2) years from the date of shipment and covers material and workmanship.

CRFQ 0803 DOT2000000111
B/R# 34
Qty. 30

Dialight



ITE Compliant LED Signal Modules

ITE Compliant LED Traffic Signal

Module Performance Specifications

All LED Ball Signal Modules - 8 inch (200mm) and 12 inch (300mm)

All shall be fully compliant to the ITE VTCSH LED Circular Supplement specifications dated and adopted June 27, 2005. Compliance to the ITE VTCSH-2 Interim Purchase Specification is not sufficient, and will not substitute for compliance to the ITE VTCSH LED Circular Supplement specifications. Additionally, prior to bid award, the manufacturer shall submit to purchaser, reports from ETL/Intertek, that certify full compliance of all LED ball signal modules to the entire ITE specification. These tests should include but not be limited to the luminous intensity measurements and requirements outlined in the ITE specification sections 6.4.4 through 6.4.4.4.2 (25°C and 74°C / 49°C). Evidence of full compliance to all required testing methods, procedures and sections as outlined in the above ITE document Figure 2, Design Qualification Testing Flow Chart must be included without any exceptions, changes or omissions. The manufacturer must also submit a datasheet showing the catalog number of the items submitted on the bid and the Independent Lab report must show full qualification of this catalog number.

All LED 12 inch (300mm) Arrow Signal Modules

All shall be fully compliant to the **"Omni-directional"** specifications of the ITE VTCSH - LED Vehicle Arrow Traffic Signal Supplement adopted July 1, 2007. Additionally, prior to bid award, the manufacturer shall submit to purchaser, reports from ETL/Intertek that certify full compliance of all LED Arrow signal modules. These tests should include but not be limited to the luminous intensity measurements and requirements outlined in the ITE specification sections 6.4.4 through 6.4.4.4.2 (25°C and 74°C / 49°C). Evidence of full compliance to all required testing methods, procedures and sections as outlined in the above ITE document Attachment 1, "Design Qualification Testing Flow Chart" must be included without any exceptions, changes or omissions The manufacturer must also submit a data sheet showing the catalog number of the items submitted on the bid and the Independent Lab report must show full qualification of this catalog number.

All LED 16x18 Countdown Pedestrian Signal Modules

All shall be fully compliant to the ITE PTCSI Part-2: LED Pedestrian Traffic Sig nal Modules specifications adopted August 4, 2010 or the latest adopted version as listed on the ITE website at time of bid. Additionally, prior to bid award, the manufacturer shall submit to purchaser, reports from ETL/Intertek that certify full compliance of LED signal modules, to these specifications. Evidence of full compliance to all required testing methods, procedures and sections as outlined in the above ITE document Attachment 2, "Design Qualification Testing Flow Chart" must be included without any exceptions, changes or omissions. The manufacturer must also submit a data sheet showing the exact catalog number of the items submitted on the bid and the Independent Lab report must show full qualification of this catalog number. Combination hand/person pedestrian signal modules shall incorporate separate power supplies for the hand and the person icons.

In addition to, and in excess of the above applicable ITE specification compliance, the on-board circuitry of all LED traffic signal modules shall include voltage surge protection, to withstand high-repetition noise transients and low-repetition high-energy transients as stated in Section 2.1.8, NEMA Standard TS 2-2003. In addition, the module shall comply with the following standards: IEC 1000-4-5 at 3kV with a 2 ohm source impedance, ANSI/IEEE C62, 41-2002; IEC 61000-4-12 (6kV, 200A, 100kHz ring wave).

Warranty

Manufacturer shall provide at time of bid, a written warranty which provides for repair or replacement of modules that fail to function as intended due to workmanship or material defects within the first 60 months from date of delivery. Modules which exhibit luminous intensities less than the minimum as specified in the ITE specifications as indicated above, within the first 60 months from date of delivery shall be replaced or repaired.

Notes

CSA approved to the following applicable requirements:

- CSA Standard C22.2 No. 9.0-96 General Requirements for Luminaires
- CSA Std. No. C22.2 No. 250.0-04 Luminaires
- UL Std. No. 1598-2004 (May 2006) Luminaires

Uniform Appearance Hand & Person Pedestrian Signals

Features & Benefits

- *Fully compliant to ITE PTCSI Part 2 LED Pedestrial Traffic Signal Module Specification dated 3/09/2004
- Meets or exceeds ITE uniformity ration of not more than 1 to 5 between the max and the min luminance values as measured in (.5") dia spots
- Manufactured with anti-capillary wires
- Conformal coated power supply
- Fuse and transient suppressor incorporated for superior line and load protection
- Independent dedicated power supplies for added safety and reliability
- Intertek/ETL certified and listed on ETL certification program
- Transient suppression exceeds ITE and NEMA specifications (Up to 6KV ring wave)
- All units operate at 80-135VAC RMS, 60+/-3Hz

Part Number	Size	Description	Typical Wattage at 25°C		Min. Luminance (cd/m2)		*Meets ITE Spec	CSA Approved
			Hand	Person	Hand	Person		
430-6450-001X	16 x 18	Side-by-side Hand and Person	9	7	1,400	2,200	•	•
430-6472-001X	16 x 18	Overlay Hand and Person	11	7	1,400	2,200	•	•
430-5770-001X	12 x 12	Hand Only	8	N/A	1,400	N/A	•	•
430-7771-001X	12 x 12	Person Only	N/A	6	N/A	2,200	•	•
430-6772-001X	12 x 12	Overlay Hand and Person	8	10	1,400	2,200	•	•

Uniform Appearance Countdown Pedestrian Signals

Features & Benefits

- *Fully compliant to ITE PTCSI Part 2 LED Pedestrial Traffic Signal Module Specification dated 8/04/2010
- MUTCD compliant for countdown applications
- Full preemption compatibility
- Up to 8 units can be connected in parrallel without affecting the monitoring of the Hand/Person
- Manufactured with anti-capillary wires
- Three (3) independent dedicated power supplies for added safety and reliability
- Intertek/ETL certified and listed on ETL certification program
- Reduced off state icon visibility results in increased pedestrian safety by eliminating the potential to misinterpret the signal
- Conformal coated power supply
- New imporved one piece housing design
- Improved optical design to provide superior uniform appearance of the icons
- Transient suppression exceeds ITE and NEMA specifications (Up to 6KV ring wave)
- All units operate at 80-135V AC RMS, 60+/-3Hz

Part Number	Housing Size	Symbol Color			Typical Wattage at 25°C			Min. Luminance (cd/m2)			*Meets ITE Spec	CSA Approved
		Countdown	Hand	Person	Countdown	Hand	Person	Countdown	Hand	Person		
430-6479-001X	16 x 18	Portland Orange	Portland Orange	Lunar White	8	11	10	1,400	1,400	2,200	•	•
430-7773-001X	12 x 12	Portland Orange	N/A	N/A	5	N/A	N/A	1,400	N/A	N/A	•	•

Campbell Company

CRFQ 0803 DOT2000000111
B/R# 35
Qty. 30
Qty. 15 Left Arrow
Qty. 15 Right Arrow
Black

Advisor Guide Accessible Pedes (AGPS)

FEATURES

- Data Collection
- Night Mode Volume
- Sound Directionality
- Adjustable Station Angle

KEY BENEFITS

- Independent Locations
- 4-wire Interface
- Configuration Templates
- Event Tracking Log
- Ped Count / Call Data
- USB Interface
- Simple Menu Utility
- NEMA TS 2 Certified
- Meets MUTCD Guidelines

Verisys Registrars® ISO 9001:2008 Certified

Made in the USA

Overview

Pedestrians are finding it more challenging to cross safely at signalized intersections. The Advisor AGPS provides important cues to assist all pedestrians to cross the intersection safely by providing audible, tactile, and visual indications at the crosswalk.

A locator tone tells a pedestrian that the crossing is equipped with APS and where it can be found. The acknowledgement tone and visual LED indication accompany a pedestrian call. An extended press provides specific intersection information and access to additional functions. The walk tone or message is accompanied by a vibro-tactile indication during the visual walk display. Optional clearance phase indications may provide additional information to the pedestrian where appropriate. All volumes are controlled by AGC.

Independent Station

AGPS is independent, one pedestrian display requires one AGPS. There are no additional devices in the cabinet. Simple, easy to install, robust in operation.

Agency Benefits

The Advisor Guide (AGPS) is designed around flexibility and ease of use. Each station is configured at the factory, although customization and data extraction are simple.
Software with GUI interfaces guide technicians through programming and configurations with roll over help menus.
Night mode volume controls, along with forward facing speakers, incorporate Quiet Signals Technology to accommodate residential and evening business considerations.
Our “mounting buttons” adjust the angle of the arrow on the actuator to point at the crossing destination point.
Agencies can identify specific parameters for residential, retail, and industrial areas and save them as a configuration templates.
Campbell’s SFP hand held programmer allows one button press configuration.
AGPS is designed to also work properly with:

- RRFBs,
- Solar Mid-Block crossings
- Passive pedestrian detectors
- Non- pedestrian actuated downtown core areas

Campbell Company

APS

AGPS 915

Installation

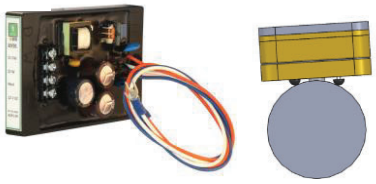
AGPS is ready to mount, out of the box, a four conductor cable connects to the Signal Power Interface (SPI) in the pedestrian signal head.

Aesthetically pleasing extension brackets and mounting hardware are available allowing stations to be mounted within accessibility guidelines.

Technical Specification

Configuration	Type
Interface	Windows Utility
Audio File update	USB
Data Format	CSV
Firmware Upgrade	USB

SPI



Adjustment Buttons

Parameter (SPI)	Rating
Input voltage	85 -135 VAC 220 VAC
Output voltage	12V DC
Connection	4 wire
Dimension	2 ¾ x 3 1/2 x 1 7/8”

AGPS 400

Parameter	
BS Size	5 x 12 x 1 ¾ “
BS Weight	7.0 lbs
AGPS 400	5 X 9” Rectangle Insert
Power (rest)	2.2W @ 120 VAC
Current (rest)	18 mA @ 120 VAC
Max Power	8.4 W
Switch life	100 x 10^6
Operational force	< 3lbf
Operating Temp Range	-40C to +85C
Max Volume	100dB @ 1m
AGC Range	Adjustable 0 – 5dB over ambient
Audio Output Options	Default plus 4 options
LED	3000 mcd , 160 degree viewing angle
Volume control	Fully adjustable, independent channels
Reporting	Pedestrian Usage, Event Logging, System Evaluation
Synchronicity	Beaconing, Group Walk
Night Mode	Volume, Recall, or complete configuration.
Selectable Options (options selected via lap top USB connection via a menu drive utility)	EP APS, Vib Pulse Call, Recall, Beaconing, Group Walk, Walk time out, Locator Tempo, EP Time, Vib Intensity
Sign Sizes	5 X 7 ¾, 5 X 9”, 9 X 12 “, 9 X 15”
Warranty	3 year
Test Type	**Compliance**
Functionality	MUTCD 4E, TAC
Transient Voltage Protection Mechanical Shock and Vibration	NEMA TS2

CRFQ 0803 DOT2000000111
B/R# 37
Qty. 15

PS-250

Heavy Duty Cabinet Power Supply

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

The PS-250 Cabinet Power Supply is a shelf mounted unit which supplies regulated DC power, unregulated AC power, and a line frequency reference for the Detector Rack, BIUs, load switches, and other auxiliary equipment. The PS-250 meets and/or exceeds all requirements of the NEMA TS2-2003 (R2008) Standard.

All TS-2 Type 1 cabinet assemblies require the use of this unit as well as any TS-2 Type 2 cabinet assemblies that utilize Bus Interface Units (BIU).

Each EDI PS-250 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.

PS-250 OPERATIONAL FEATURES

Basic Functions: The PS-250 provides four outputs rated over the full -30ºF to 165ºF (-34ºC to +74ºC) Nema operating temperature range:

- ☑ **+12 VDC rated at 5 Amps**
- ☑ +24 VDC rated at 3 Amps
- ☑ 12 VAC rated at 0.25 Amps
- ☑ 60 Hz Line Frequency Reference rated at 50 mAmps
- ☑ Input Voltage Operating Range is 89 Vac to 135 Vac at 50/60 Hz
- ☑ Power Factor Corrected

Display Indicators: A separate LED indicator is provided to display output status and fuse integrity for the four supply outputs. The Line Frequency Reference LED indicator pulses to show 60 Hz activity.

Input / Output Pins:

Pin	Function
A	AC Neutral
B	Line Frequency Reference Output
C	AC Line Input
D	+12 VDC Output
E	+24 VDC Output
F	Reserved
G	Logic Ground
H	Earth Ground
I	12 VAC Output
J	Reserved

Test Points: Individual test jacks are provided for the +12 VDC output, +24 VDC output, and Logic Ground reference.

Output Protection: The +12 VDC, +24VDC, and 12 VAC outputs are fused for over-current protection. Each output is protected against voltage transients by a 1500 Watt suppressor.

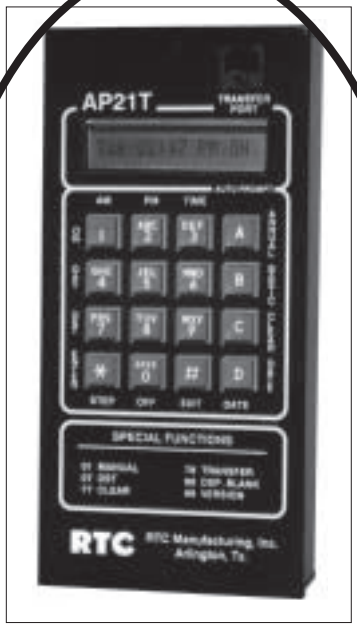
Dimensions: **Compact Size**: 6.0 inches High x 4.0 inches Wide x 8.4 inches Deep

EBERLE DESIGN INC.
3510 East Atlanta Avenue
Phoenix, AZ 85040 USA
www.EDItraffic.com
Tel (480) 968-6407
Fax (602) 437-1996

CRFQ 0803 DOT2000000111
B/R# 38
Qty. 5

AP21 SERIES TIME SWITCH

AP21
AC/DC Powered



AP21T
AC/DC Powered
with Program Transfer

AP21TR
AP21TRDC
Compact Size: 2" x 2 1/2" x 4"

- 16-character, alpha-numeric, Liquid Crystal Display (LCD)
- Daylight Savings Time entered from the keyboard
- 48-hour capacitive back-up, no batteries
- Auto Prompt for user friendly programming
- 16 Powerful Program Steps
- 10 Skip Plans for Holidays
- 15 Amp relay output
- Program Transfer from unit to unit (AP21T & AP21TR)
- Laptop Computer Programmable using the 21PC Software
- AP21's are AC/DC,
  AP21T's are AC/DC, ←
  AP21TR's are AC only
  AP21TRDC's are DC only
- Smallest Time Switch ever built for Traffic Applications (AP21TR)

RTC

RTC Manufacturing, Inc.

"Serving the traffic signal industry since 1987."

www.rtc-traffic.com

AP21 SERIES TIME SWITCH

The family of AP21's are single circuit, calendar programmable solid state time switches. They are used for switching electric circuits according to a pre-set time and date program. The AP21's AUTO PROMPTING alpha-numeric display makes programming fast and simple. Program transfer can be accomplished by using a Laptop Computer or an AP21T. The AP21TR is only 2" x 2 1/2" x 4" making it the smallest time switch ever designed specifically for traffic applications. The AP21 and AP21T draw their power from any 120VAC or 12VDC supply. The AP21TR is 120VAC powered and the AP21TRDC is 12VDC powered.

STANDARD FEATURES

- 16 character, alpha-numeric, easy to read ***Liquid Crystal Display*** (LCD). Optional back-lit display available.
- ***Automatic Daylight Savings Time*** (DST) compensation.
- DST data entered from keyboard - ***makes future DST changes quick and easy.***
- Time of Day entered in ***12-hour format.***
- Automatic Leap Year compensation.
- 48-hour capacitive memory back-up - ***no batteries to replace.***
- The display "Auto Prompts" the operator through the programming process - ***very user friendly.***
- ***16*** powerful ***program steps.***
- Single Day, Week End, Week Day, or Every Day programming capability for each program step.
- ***10 Skip Plans*** - Each skip plan prevents the time switch output from activating on a specific day or consecutive days.
- ***Program Transfer*** from one AP21T to another, or from an AP21T to an AP21TR (AC or DC).
- ***Laptop Computer Programmable*** - using the 21PC Software.
- SPDT ***Relay Output rated at 15 Amps*** at 115 VAC resistive load.
- AP21 and AP21T's work on ***120VAC and 12VDC*** power sources.

SPECIFICATIONS

Display . . . . . .16 character, Apha-Numeric, Liquid Crystal Display (LCD), Back-lit Display Optional

Keyboard . . . . . .16 Key, Positive Action Push Button

Back-up Power . . . . . 48 Hour Capacitive

Electrical Connection . . .Terminal Block (#12 to #20 AWG) or CPC Connector with Harness (optional)

Output. . . . . SPDT Relay Rated at 15 Amps 115 VAC Resistive Load

Line Voltage . . . . . 95 to 135VAC, 60 HZ and 12VDC

Time Base . . . . . AC Powered (power line) Back-up and DC Powered +/-.005% Crystal

Size . . . . . .7.6"h x 3.7"w x 1.55"d (AP21) 8.0"h x 3.7"w x 1.55"d (AP21T) 2.0" x 2.5" x 4.0" (AP21TR)

Temperature Range. . . . . -30 to +74 Degrees C

ORDERING INFORMATION

Part Number	Description
AP21	Single Circuit Time Switch
→ AP21T	Single Circuit Time Switch with Transfer
AP21TR	Single Circuit Time Switch (2" x 2.5" x 4")
AP21TRDC	12VDC Version of AP21TR
21PC	Laptop Programming Software & Cables
EL	Electro-Luminescent (back-lit) Display
21048	CPC Connector with 48" Wiring Harness
21072	CPC Connector with 72" Wiring Harness
91107	Program Transfer Cable

NOTE: All AP21 and AP21T's are AC and DC powered, AP21TR is AC and AP21TRDC is DC powered.

RTC Manufacturing, Inc.

RTC

P. O. Box 150189 * Arlington, TX 76015
(800) 782-8721 (817) 860-1217
(800) 448-8850 fax (817) 274-3610 fax

"Serving the traffic signal industry since 1987."

www.rtc-traffic.com

ECONOLITE
Solutions that Move the World®

CRFQ 0803 DOT2000000111
B/R# 39
Qty. 50

Industrial 56K Dial-Up Modem

A reliable and economical 56K modem for masters, controllers, and Autoscope® dial-up datacomm applications

Description

The Industrial 56K Dial-Up Modem provides fully-integrated data communications over wide-area networks using dial-up phone lines and the Internet.

The Industrial 56K Modem fully complies with Part 68 of the Federal Communications Commission (FCC) rules.

The Industrial 56K Dial-Up Modem is enclosed in a rugged metal housing. A terminal block connector provides power connection from a 24 VDC or 24 VAC source. Power can come from the supplied power puck or cabinet 24 VDC. A 9-pin serial connector and standard RJ11 phone jack provide the connections to the phone network from the controlling equipment.

Four red LED indicators show the status of communications (RD, TD, DCD, and DTR) and the power status of the modem.

Benefits

- Complete modem solution
- 56Kbps performance
- Full-featured datacom operation
- Serial interface
- Low power consumption
- Small footprint
- Micro-controller technology for reliable long-life performance
- Shelf-mountable

Features

- Modem downloads at V.90/K56flex speeds from a digital V.90 or K56flex server
- Modem uploads at 33.6 Kbps (enhanced V.34)
- Standard RS-232 serial interface supporting DTE transfer speeds to 230.4 Kbps
- Supports V.42 error correction with V.42bis or MNP Class 5 data compression
- Supports industry-standard AT-style commands
- Remote configuration, diagnostic tests, distinctive ring, 3-number storage for automatic dialing, and flash memory for firmware updates

Data Rates: Client-to-Server

- Data communications support V.90 or K56flex for download speeds to 56 Kbps when connected to a fully digital V.90 or 56Kflex server, and upload speeds up to 33.6 Kbps via enhanced V.34. Negotiates an enhanced V.34 (33.6 K), V.32bis (14.4 K), V.32 (9600), V.22bis (2400), or slower speed connection with non-V.90 modems

Data Rates: Client-to-Client

- 33,600, 31,200, 28,800, 26,400, 24,000, 21,600, 19,200, 16,800, 14,400, 12,000, 9600, 7200, 4800, 2400, 1200, 0-300 bps

Data Format

- Serial, binary, asynchronous

Error Correction

- ITU-T V.42 (LAP-M or MNP3-4)

Data Compression

- ITU-T V.42bis (4:1 throughput), MNP 5 (2:1 throughput)

Speed Conversion

- Serial port data rates adjustable to 300, 1200, 2400, 4800, 9600, 19,200, 38,400, 57,600, 115,200, and 230,400 bps

Command Buffer

- 40 characters

Intelligent Features

- Fully AT command compatible; auto-dial, redial, repeat dial; pulse or tone dial; dial pauses; auto answer; adaptive line probing; automatic symbol and carrier frequency during startup, retrain, and rate renegotiation; DTMF detection; call status display, auto-parity and data rate selections; keyboard-controlled modem options; non-volatile memory; on-screen displays for modem option parameters; command lines of up to 40 characters each; help menus; remote configuration; DTR dialing

Data Modulation

- FSK at 300 bps, PSK at 1200 bps, QAM at 2400, 4800, and 9600 bps (non-trellis), QAM with trellis-coded modulation (TCM) at 9,600, 12,000, 14,400, 16,800, 19,200, 21,600, 24,000, 26,400, 28,800, 31,200, 33,600, and 56,000 bps

Flow Control

XON/XOFF (software), RTS/CTS (hardware)

Transmit Level

- -11 dBm (dial-up)

Receiver Sensitivity

- -43 dBm under worst-case conditions

AGC Dynamic Range

- 43 dB

Diagnostics

- Local analog loop, local digital loop, remote digital loop

Interface

- Serial interface for EIA RS-232C/ITU-T V.24/V.28
- Female 9-pin metal shell D subminiature connector with female jack screws

Power

- 20 to 28 VAC/DC, not exceeding 5 W (power puck provided)

Dimensions

- 1.6 in. H x 4.2 in. W x 6 in. D (41 mm H x 107 mm W x 152.4 mm D)

Weight

- 1.0 lb (0.45 kg)

Environmental

- -29.2°F to 165.2°F (-34°C to 74°C)
- 0 to 95% relative humidity (non-condensing over the entire temperature range)

Approvals

- FCC Part 68 approved
- Industry Canada CSOs
- Approvals provided in controlled configurations and must be reevaluated in end user configurations

Warranty

- Two-year warranty

Product Support

- Product support and training available by a team of factory-trained technical support specialists

3360 E. La Palma, Anaheim, CA 92806-2856
Tel: (714) 630-3700 • Fax: (714) 630-6349
E-mail: sales@econolite.com
www.econolite.com
38409E0307-4

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Solutions that Move the World®

CRFQ 0803 DOT2000000111
B/R# 40
Qty. 20

Model TR-200

Flash transfer relay

- **Operating voltage range: 89 to 135 VAC RMS 47 to 63 Hz**
- **Operating temperature range: -40° to +180° F (-40° to 82° C)**
- **Operating humidity range: 5% to 95% (non-condensing)**
- **Coil specifications:**
  - **Maximum pull-in voltage: 85 VAC**
  - **Minimum dropout voltage: 25 VAC**
  - **Nominal power: 4 VA at 120 VAC**
- **Contact material: Silver alloy**
- **Contact ratings:**
  - **30 Amps resistive at 120 / 240 VAC**
  - **20 Amps resistive at 28 VDC**
  - **10 Amps tungsten at 120 VAC**
  - **175 Amps one cycle surge RMS at 120 VAC**
  - **100,000 operations at rated load**
- **Dielectric strength:**
  - **Across open contacts: 600V RMS**
  - **Contact to coil: 1500 V RMS**
  - **Contact to frame: 1500 V RMS**
  - **Leakage current: ≤ 1 mA**
- **LED provides visual indication of coil voltage**
- **Solid polarizing pin**
- **Dimensions: 2.47 inches (6.27 cm) high x 1.85 inches (4.70 cm) wide x 3.90 (9.91 cm) deep (including connector)**

Overview:

The Model TR-200 Flash Transfer Relay is designed to meet or exceed NEMA Standard TS 2-2003. Model TR-200 Flash Transfer Relays are constructed with a transient suppressed full wave rectified coil to provide chatter free operation in brownout conditions down to 89 VAC. The rectified coil provides lower power consumption than conventional AC coils. A rear mounted eight pin polarized connector mates with a Cinch-Jones 2408SB socket.

Reno A & E
4655 Aircenter Circle • Reno, Nevada • 89502 • USA
Tel: (775) 826-2020 • Fax: (775) 826-9191 • E-mail: sales@renoae.com
Visit our Website at www.renoae.com for the most current product information.

ISO 9001 REGISTERED

P/N 551-4002-00 5/12/05

CRFQ 0803 DOT2000000111
B/R# 41
Qty. Model PS-30

MORNINGSTAR corporation

Product shown with optional meter.

Morningstar's ***ProStar*** is the world's leading mid-range solar controller for both professional and consumer applications. This second generation ProStar:

- Adds new features and protections using highly advanced technology
- Provides longer battery life and improved system performance
- Sets new standards for reliability and self-diagnostics

Standard Features:

- Versions available: 15 or 30 amp
  12 / 24 or 48 volt
  negative or positive ground
- Estimated 15 year life
- PWM series battery charging (not shunt)
- 3-position battery select: gel, sealed or flooded
- Very accurate control and measurement
- Jumper to eliminate telecom noise
- Parallel for up to 300 amps
- Temperature compensation
- Tropicalization: conformal coating, stainless-steel fasteners & anodized aluminum heat sink
- No switching or measurement in the grounded leg
- 100% solid state
- Very low voltage drops
- Current compensated low voltage disconnect (LVD)
- LED's indicate battery status and faults
- Capable of 25% overloads
- Remote battery voltage sense terminals

Electronic Protections:

- Short-circuit — solar and load
- Overload — solar and load
- Reverse polarity
- Reverse current at night
- High voltage disconnect
- High temperature disconnect
- Lightning and transient surge protection
- Loads protected from voltage spikes
- Automatic recovery with all protections

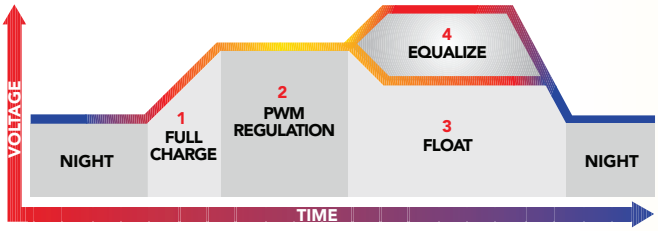
ProStar™ TECHNICAL SPECIFICATIONS

ProStar Options:

- Digital meter
  - – Highly accurate voltage and current display
  - – Low self-consumption (1 mA)
  - – Includes manual disconnect button
  - – Displays 5 different protection functions and disconnect conditions
  - – Self-diagnostics (self-test) provides a comprehensive test of the ProStar —
    - Displays 9 different controller status parameters, including temperature
    - Displays detected faults
- Positive ground
- Remote temperature probe

Optimized Battery Charging:

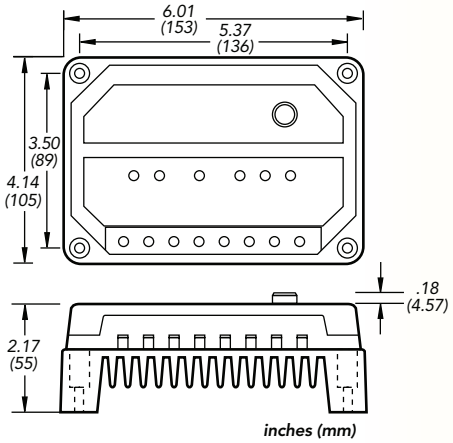
The ProStar has 4 stages of charging to provide increased battery capacity and life.



Mechanical Specifications:

Weight:
12 oz
(0.34 kg)

Wire Size:
#6 AWG
(16 mm²)



ProStar Versions:

	PS-15	PS-30	PS15M-48V
Rated Solar Current	15A	30A	15A
Rated Load Current	15A	30A	15A
System Voltage	12/24V	12/24V	48V
Options:			
Digital Meter	yes	yes	standard
Positive Ground	no	yes	yes
Remote Temp. Probe	yes	yes	yes

Battery Voltage Setpoints*

	Gel	Sealed	Flooded
Regulation Voltage	14.0	14.15	14.4
Float	13.7	13.7	13.7
Equalization	n/a	14.35	14.9/15.1
Load Disconnect	11.4	11.4	11.4
Load Reconnect	12.6	12.6	12.6

Note: values are for 12V. Use 2X for 24V and 4X for 48V.

Electrical Specifications:

	12V	24V	48V
Temp. Comp. (mV/°C)*	– 30mV	– 60mV	– 120mV
Accuracy	40mV	60mV	80mV
Min. voltage to operate	8V	8V	15V
Self-consumption	22mA	25mA	28mA
LVD current coefficient**	– 20mV	– 40mV	– 80mV
Charge algorithm	PWM, constant voltage		
Operating temperature	– 40°C to + 60°C		
Digital Display:			
Operating temperature	– 30°C to + 85°C		
Voltage accuracy	0.5%		
Current accuracy	2.0%		
Self-consumption	1 mA		

* 25°C reference
** per amp of load

WARRANTY: ***Five year warranty period. Contact Morningstar or your authorized distributor for complete terms.***

AUTHORIZED MORNINGSTAR DISTRIBUTOR:

MORNINGSTAR corporation

8 Pheasant Run
Newtown, PA 18940 USA
Tel: +1 215-321-4457 Fax: +1 215-321-4458
E-mail: info@morningstarcorp.com
Website: www.morningstarcorp.com

CE

PRINTED IN USA 211E-R3-2/11

EB-X

CRFQ 0803 DOT2000000111
B/R# 44
Qty. 10

900MHz HIGH-SPEED SERIAL/ETHERNET TRANSCEIVER

Intuicom's EB-X is a long-range, high-speed industrial wireless radio enabling both IP and serial connectivity. The EB-X provides remote serial and IP data connectivity to IP based networks, enabling high performance data transport and mobile wireless access for vehicle based operations.

FUNCTIONALITY & FLEXIBILITY

Providing Ethernet and dual serial port connectivity simultaneously, the EB-X offers a single solution to a broad range of applications. With up to 4 Mbps of available bandwidth, the EB-X is flexible enough to support legacy serials as well as the most current IP devices. The EB-X is multi-functional and may be operated as the access point or end-point in point-to-point, point to multipoint, and peer to peer communications.

Employing Intuicom's robust and secure frequency hopping spread spectrum technology, the EB-X PLUS is inherently resistant to interference from other RF equipment including other spread spectrum radios. Empowered with an ultra-sensitive and highly-selective RF receiver, the EB-X provides real-time, robust data transport. With top performance and security that includes 128-bit or 256 AES encryption; the EB-X provides superior "real world" throughput and performance over other wireless products.

KEY FEATURES

- Best-in-Class 900 MHz Performance
- Ethernet and Dual Serial Port interfaces
- High-Speed Performance up to 4 Mbps
- 60 mile range (LOS)
- Secure: 128-bit & 256-bit AES Encryption

EASE OF USE

EB-X's embedded web-based set-up makes getting up and running a straight-forward and simple process. Our robust design and ruggedized enclosure makes certain your applications keep running in the most difficult environments.

Like all our radios, the EB-X is designed and built in Colorado, USA.

GENERAL SPECIFICATIONS

Enclosure	cast aluminum
Size	165mm x 107mm x 53mm
Weight	680g
Operating Temperature	-40ºC to +75ºC
Humidity	0 to 95%, non-condensing
Reliability	62,000 hours MTBF
RoHS	Directive 2011/65/EU

INTERFACES

Ethernet	RJ45
Serial	DB-9 (two)
USB	Micro USB
RF Connector	TNC (f)

POWER REQUIREMENTS

Operating Voltage	9-36 VDC
Transmit Current	350 mA @12 VDC
Receive/Idle Current	100 mA @ 12VDC

DATA TRANSMISSION

Error Detection	CRC, FEC, and ARQ
Link Throughput	Up to 1.6 Mbps; 4 Mbps with Compression
User Interface Rates	Ethernet Rate: 10/100 Mbps
	Serial: up to 115 kbps
Data Encryption	128-bit and 256-bit AES CCM
Advanced Features	Packet Compression and Packet Aggregation

TRANSMITTER

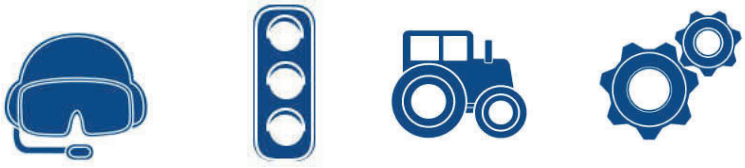
Frequency Range	902-928 MHz
Output Power	Up to 1 Watt, user selectable
Range	60+ Miles (LOS)
Data Rates	115.2 kbps to 4 Mbps
Channel Size	230.4 to 32225.6 kHz
Modulation	.
Hopping Rates	25ms to 400ms
Hopping Channels	Up to 112

RECEIVER

System Gain	136 dB
IF Selectivity	>40 dB

Sensitivity

RF Data Rate	Without FEC	With FEC
115 kbps	-105 dBm	-108dBm
250 kbps	-102 dBm	-105 dBm
500 kbps	-99 dBm	-102 dBm
1 Mbps	-95 dBm	-98 dBm
4 Mbps	-83 dBm	-86 dBm



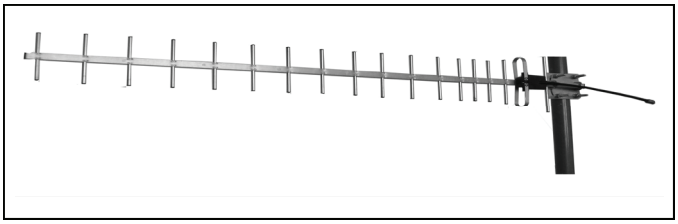
Note: Specifications subject to change without notice.

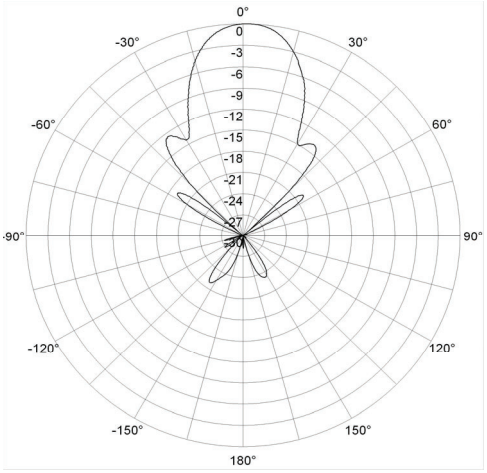
CRFQ 0803 DOT2000000111
B/R# 44
Qty. 10
13dBi Antenna

TerraWave Solutions® 824-960 MHz 15 dBi Yagi Antenna with N-Style Jack Connector

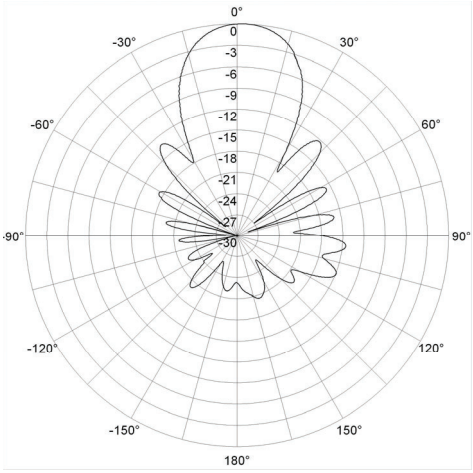
TerraWave's 15 dBi directional yagi antenna is designed for applications in the 900 MHz frequency, including, radio frequency identification (RFID) applications, cellular systems, global system for mobile (GSM) communications, code-division multiple access systems (CDMA) applications, multipoint applications and wireless video links. It features a high gain and can be mounted in a horizontal or vertical polarization. Includes heavy-duty steel mounting brackets and an N-style jack connector. All TerraWave antennas are covered by the Company's two-year TerraNet warranty program. For questions and to purchase product, contact a wireless networking solutions sales engineer at 210-375-8482, 800-851-4965 or sales@terrawave.com. Visit www.terrawave.com for additional information.

Specifications	
Model	T09150Y11206T
Frequency Range	824 ~ 960 MHz
Bandwidth	136 MHz
Gain	15 dBi
Horizontal Beamwidth	28°
Vertical Beamwidth	28°
Front-to-Back Ratio	≥ 18 dB
VSWR	≤ 1.5
Nominal Impedance	50 Ohms
Maximum Power Rating	50 Watts
Polarization	Vertical or Horizontal
Connector	N-Style Jack
Antenna Length	50.4"
Weight	1.45 lbs
Wind Load	120 mph
Element Material	Aluminum
Mast Mount Diameter	Ø1.57" ~ Ø2.76"
Operating Temperature Range	-40°F to +158°F





E-Plane Pattern



H-Plane Pattern

www.terrawave.com | Email: sales@terrawave.com | Phone: 210-375-8482 | Fax: 210-375-8482 | 10521 Gulfdale, San Antonio, TX 78216

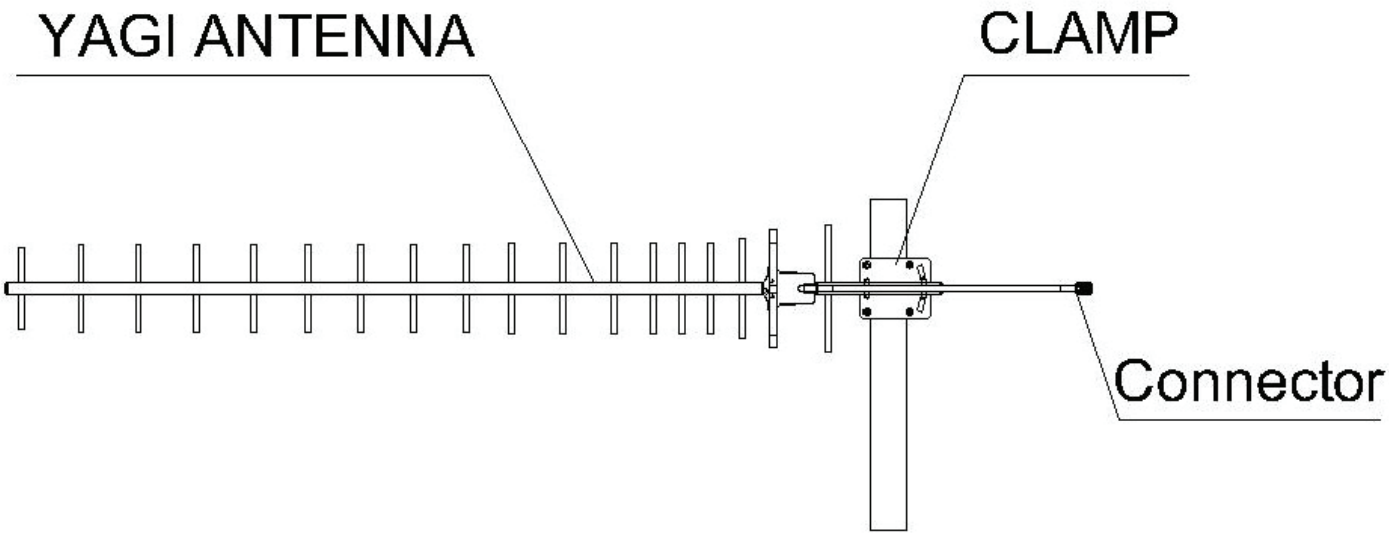
TerraWave Solutions® 824-960 MHz 15 dBi Yagi Antenna with N-Style Jack Connector

Mounting Bracket Information for T09150Y11206T

Polarization Information

Vertical Polarization
As shown in the picture below, all antenna grids are vertically pointing to ground.

Horizontal Polarization
1. Loosen the clamp and pull out the antenna
2. Rotate the clamp by 90 degree and push back onto the antenna. Tighten the clamp firmly.
3. Install the antenna such that all grids are pointing parallel (horizontally) to the ground.



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CRFQ 0803 DOT2000000111
B/R# 44
Qty. 10

Telecom/Datacom Products

CX-HFN
High-Frequency Coax Protector—Type N

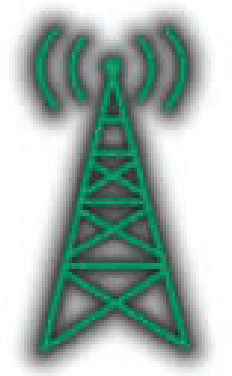
The **CX-HFN** surge protector is designed to protect sensitive electronic equipment from damage due to excessive voltage or currents generated by lightning or static build-up.

The **CX-HFN** offers low signal loss at frequencies up to 3 gigahertz. The unit also has a replaceable protection cartridge.

The **CX-HFN** accommodates both bulkhead mount and stud mount. The input and output connections are interchangeable.

SPECIFICATIONS	
Frequency	0 to 4 GHz
Max Insertion Loss	<0.5 db2 to 3 GHz
Max VSWR	<1.3 :1 1 to 2 GHz
Characteristic Impedance	50 Ohms
DC Blocking	None
Connectors	Female N-Type
Breakdown Voltage	350V
Surge Current	5000 Amps
Cartridge Life	›600 Times @ 500 Amp pulse
Size (W x H x L)	1 in. x 1.25 in. x .875 in.
Mounting Stud	1/4 x 20

Keeping You Connected!



NEED HELP?
Call 1-800-648-4076
1805 N.E. 19th Avenue
P.O. Box 1778
Ocala, Florida 34478
(352) 732-3029
FAX (352) 867-1237
Sales: 1-800-648-4076
E-mail us at:
edco@edcosurge.com
Internet:
http://www.edcosurge.com

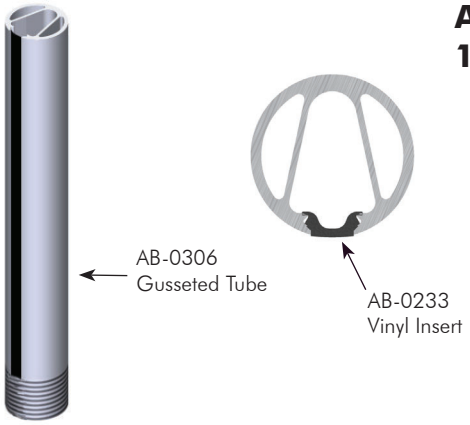
EMERSON
Network Power

CRFQ 0803 DOT2000000111
B/R# 44
Qty. 10

Aluminum Tubes

Supplied in lengths shown below, Pelco's vertical support tubing is made from high strength aluminum alloy. A unique shape and vinyl insert insures a complete weather proof wiring installation anywhere along the entire length of the tube.

The standard 46" tube will accommodate all signal combinations up to 3-Section 12". Tubes are also available in 58" and 74" lengths for 4 and 5-Section combinations.

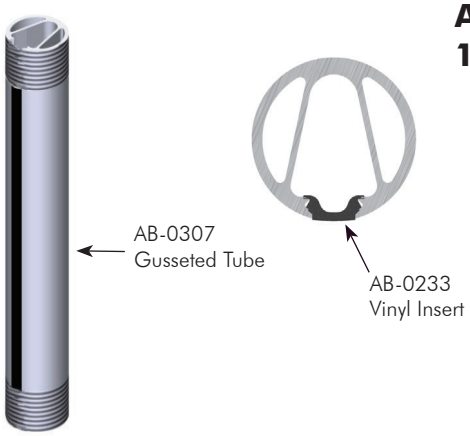


Astro-Brac Gusseted Tube w/ Vinyl Insert, 1-1/2" x Length, Threaded One End

AB-2003 - [Length] - [Coating]

Length:
23=23"
37=37"
46=46"
58=58"
74=74"

Coating:
PNC=Process No Color
P_ _=Paint



Astro-Brac Gusseted Tube w/ Vinyl Insert, 1-1/2" x Length, Threaded Both Ends

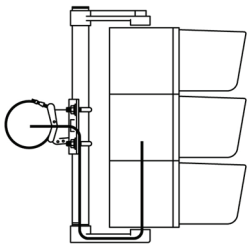
AB-2007 - [Length] - [Coating]

Length:
23=23"
37=37"
46=46"
58=58"
74=74"

Coating:
PNC=Process No Color
P_ _=Paint

Concealed Wiring Installation

Pelco's aluminum gusseted tubes allow wire entry at any point. Vinyl insert conceals wiring from mast arm to signal head. Simply run wire throughout field-drilled hole in mast arm, through Astro-Brac, and into support tube. Hollow lower arm provides a channel for wire to be fed into signal head.

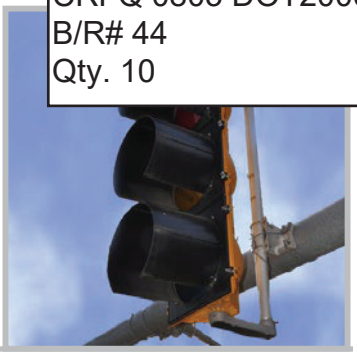


Note: 1. Lengths up to 120" maximum are available upon request. Specify by including Length in the part number, i.e., AB-2003-120-PNC.
2. See Reference Section for available paint colors.

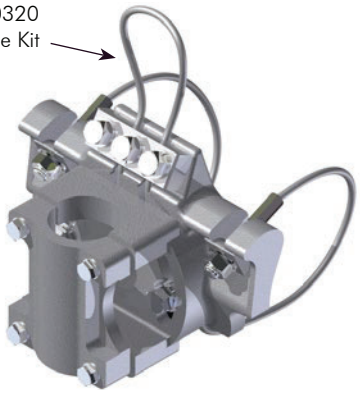
Galaxy Series Clamp Kits

The Galaxy is designed using a single cable plate, which allows for easier installation, as well as the multi-directional adjustable tube saddle for strength. These high tensile aluminum alloy clamp kits provide strength with maximum adjustability and complete clamping versatility. Comes complete with all necessary attaching hardware.

CRFQ 0803 DOT2000000111
B/R# 44
Qty. 10



AB-0280/
AB-0320
Cable Kit



Astro-Brac, Galaxy Series Clamp Kit, Cable Mount

	Cable Length		Coating
AB-3055	- [ ]	-	[ ]

Cable Length:
62=62" Cable
84=84" Cable
96=96" Cable

Coating:
PNC=Process No Color
P_ _=Paint

Note:
Stainless steel upgrade available: includes stainless cable.
Specify by including -SS in the part number, i.e., AB-3055-62-SS-PNC.

CRFQ 0803 DOT2000000111
B/R# 44
Qty. 10

TIMES MICROWAVE SYSTEMS

LMR®-400
Flexible Low Loss Communications Coax

Ideal for...

- Drop-in replacement for RG-8/9913 Air-Dielectric type Cable
- Jumper Assemblies in Wireless Communications Systems
- Short Antenna Feeder runs
- Any application (e.g. WLL, GPS, LMR, WLAN, WISP, WiMax, SCADA, Mobile Antennas) requiring an easily routed, low loss RF cable

• **LMR®** standard is a UV Resistant Polyethylene jacketed cable designed for 20-year service outdoor use. The bending and handling characteristics are significantly better than air-dielectric and corrugated hard-line cables.

• **LMR®- DB** is identical to standard LMR plus has the advantage of being watertight. The addition of waterproofing compound in and around the foil/braid insures continuous reliable service should the jacket be inadvertently damaged during installation or in the future.

• **LMR®- FR** is a non-halogen (non-toxic), low smoke, fire retardant cable designed for in-building runs that can be routed anywhere except air handling plenums. LMR-FR has a UL/NEC & CSA rating of 'CMR' and 'FT4' respectively. In addition, the LMR-FR series is MSHA-P rated for mining operations.

• **LMR®- FR-PVC** is a general-purpose indoor cable and has a UL/NEC & CSA rating of 'CMR' and 'FT4' respectively. It is less expensive than LMR-FR, however it emits toxic fumes (HCL) and greater smoke density when burned.

• **LMR®- PVC** is designed for low loss general-purpose indoor/outdoor applications and is somewhat more flexible than the standard polyethylene jacketed LMR.

• **LMR®- PVC-W** is a white-jacketed version of LMR-PVC for marine and other indoor/outdoor applications where color compatibility is desired.

• **Flexibility** and bendability are hallmarks of the LMR-400 cable design. The flexible outer conductor enables the tightest bend radius available for any cable of similar size and performance.

• **Low Loss** is another hallmark feature of LMR-400. Size for size LMR has the lowest loss of any flexible cable and comparable loss to semirigid hard-line cables.

• **RF Shielding** is 50 dB greater than typical single shielded coax (40 dB). The multi-ply bonded foil outer conductor is rated conservatively at > 90 dB (i.e. >180 dB between two adjacent cables).

• **Weatherability**: LMR-400 cables designed for outdoor exposure incorporate the best materials for UV resistance and have life expectancy in excess of 20 years.

• **Connectors**: A wide variety of connectors are available for LMR-400 cable, including all common interface types, reverse polarity, and a choice of solder or non-solder center pins. Most LMR connectors employ crimp outer attachment using standard hex crimp sizes.

• **Cable Assemblies**: All LMR-400 cable types are available as pre-terminated cable assemblies. Refer to the section on FlexTech for further details.

Part Description				Stock
Part Number	Application	Jacket	Color	Code
LMR-400	Outdoor	PE	Black	54001
LMR-400-DB	Outdoor/Watertight	PE	Black	54091
LMR-400-FR	Indoor -Riser CMR	FRPE	Black	54030
LMR-400-FR-PVC	Indoor -Riser CMR	FRPVC	Black	54073
LMR-400-PVC	Indoor/Outdoor	PVC	Black	54218
LMR-400-PVC-W	Indoor/Outdoor	PVC	White	54204

Construction Specifications			
Description	Material	In.	(mm)
Inner Conductor	Solid BCCAl	0.108	(2.74)
Dielectric	Foam PE	0.285	(7.24)
Outer Conductor	Aluminum Tape	0.291	(7.39)
Overall Braid	Tinned Copper	0.320	(8.13)
Jacket	(see table above)	0.405	(10.29)

Mechanical Specifications

Performance Property	Units	US	(metric)
Bend Radius: installation	in. (mm)	1.00	(25.4)
Bend Radius: repeated	in. (mm)	4.0	(101.6)
Bending Moment	ft-lb (N-m)	0.5	(0.68)
Weight	lb/ft (kg/m)	0.068	(0.10)
Tensile Strength	lb (kg)	160	(72.6)
Flat Plate Crush	lb/in. (kg/mm)	40	(0.71)

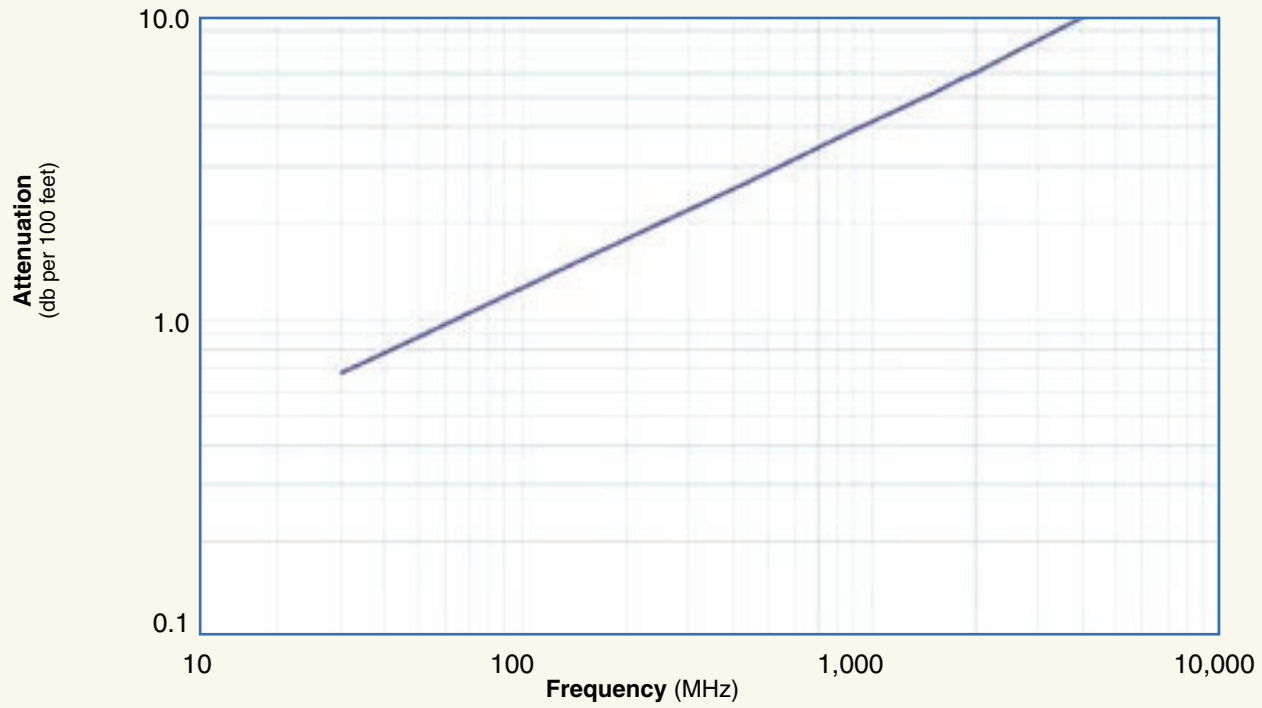
Environmental Specifications

Performance Property	°F	°C
Installation Temperature Range	-40/+185	-40/+85
Storage Temperature Range	-94/+185	-70/+85
Operating Temperature Range	-40/+185	-40/+85

Electrical Specifications

Performance Property	Units	US	(metric)
Cutoff Frequency	GHz	16.2	
Velocity of Propagation	%	85	
Dielectric Constant	NA	1.38	
Time Delay	nS/ft (nS/m)	1.20	(3.92)
Impedance	ohms	50	
Capacitance	pF/ft (pF/m)	23.9	(78.4)
Inductance	uH/ft (uH/m)	0.060	(0.20)
Shielding Effectiveness	dB	>90	
DC Resistance			
Inner Conductor	ohms/1000ft (/km)	1.39	(4.6)
Outer Conductor	ohms/1000ft (/km)	1.65	(5.4)
Voltage Withstand	Volts DC	2500	
Jacket Spark	Volts RMS	8000	
Peak Power	kW	16	

Attenuation vs. Frequency (typical)



Frequency (MHz)	30	50	150	220	450	900	1500	1800	2000	2500	5800
Attenuation dB/100 ft	0.7	0.9	1.5	1.9	2.7	3.9	5.1	5.7	6.0	6.8	10.8
Attenuation dB/100 m	2.2	2.9	5.0	6.1	8.9	12.8	16.8	18.6	19.6	22.2	35.5
Avg. Power kW	3.33	2.57	1.47	1.20	0.83	0.58	0.44	0.40	0.37	0.33	0.21

Calculate Attenuation =
$(0.122290) \bullet \sqrt{FMHz} + (0.000260) \bullet FMHz$ (interactive calculator available at http://www.timesmicrowave.com/cable_calculators)

Attenuation:
VSWR=1.0 ; Ambient = +25°C (77°F)

Power:
VSWR=1.0; Ambient = +40°C; Inner Conductor = 100°C (212°F); Sea Level; dry air; atmospheric pressure; no solar loading

CRFQ 0803 DOT2000000111
B/R# 44
Qty. 10

TIMES MICROWAVE SYSTEMS

LMR®-195
Flexible Low Loss Communications Coax

Ideal for...

- Jumper Assemblies in Wireless Communications Systems
- Short Antenna Feeder runs
- Any application (e.g. WLL, GPS, LMR, WLAN, WISP, WiMax, SCADA, Mobile Antennas) requiring an easily routed, low loss RF cable
- Drop-in replacement for RG-58 and RG-142

• **LMR®** standard is a UV Resistant Polyethylene jacketed cable designed for 20-year service outdoor use. The bending and handling characteristics are significantly better than air-dielectric and corrugated hard-line cables.

• **LMR®- DB** is identical to standard LMR plus has the advantage of being watertight. The addition of waterproofing compound in and around the foil/braid insures continuous reliable service should the jacket be inadvertently damaged during installation or in the future.

• **LMR®- FR** is a non-halogen (non-toxic), low smoke, fire retardant cable designed for in-building runs that can be routed anywhere except air handling plenums. LMR-FR is UL/NEC & CSA rated'CMR' and 'FT4' respectively, meets FAA FAR25 requirements and is MSHA-P for mining operations.

• **LMR®- FR-PVC** is a general-purpose indoor cable and has a UL/NEC & CSA rating of 'CMR' and 'FT4' respectively. It is less expensive than LMR-FR, however it emits toxic fumes (HCL) and greater smoke density when burned.

• **LMR®- PVC** is designed for low loss general-purpose applications and is somewhat more flexible than the standard polyethylene jacketed LMR.

• **LMR®- PVC-W** is a white-jacketed version of LMR-PVC for marine and other applications where color compatibility is desired.

• **LMR®- MA** is a flexible cable designed specifically for mobile antenna applications. It has a PVC jacket and un-bonded aluminum tape to facilitate end stripping with automated equipment.

• **Flexibility** and bendability are hallmarks of the LMR-195 cable design. The flexible outer conductor enables the tightest bend radius available for any cable of similar size and performance.

• **Low Loss** is another hallmark feature of LMR-195. Size for size LMR has the lowest loss of any flexible cable and comparable loss to semirigid hard-line cables.

• **RF Shielding** is 50 dB greater than typical single shielded coax (40 dB). The multi-ply bonded foil outer conductor is rated conservatively at > 90 dB (i.e. >180 dB between two adjacent cables).

• **Weatherability**: LMR-195 cables designed for outdoor exposure incorporate the best materials for UV resistance and have life expectancy in excess of 20 years.

• **Connectors**: A wide variety of connectors are available for LMR-195 cable, including all common interface types, reverse polarity, and a choice of solder or non-solder center pins. Most LMR connectors employ crimp outer attachment using standard hex crimp sizes.

• **Cable Assemblies**: All LMR-195 cable types are available as pre-terminated cable assemblies. Refer to the section on FlexTech for further details.

Part Description				Stock
Part Number	Application	Jacket	Color	Code
LMR-195	Outdoor	PE	Black	54110
LMR-195-DB	Outdoor/Watertight	PE	Black	54113
LMR-195-FR	Indoor-Riser CMR	FRPE	Black	54111
LMR-195-FR-W	Indoor-Riser CMR	FRPE	White	54158
LMR-195-FR-PVC	Indoor-Riser CMR	FRPVC	Black	54105
LMR-195-MA	Mobile Antennas	PVC	Black	54210
LMR-195-PVC	General Purpose	PVC	Black	54215
LMR-195-PVC-W	General Purpose	PVC	White	54199

Construction Specifications			
Description	Material	In.	(mm)
Inner Conductor	Solid BC	0.037	(0.94)
Dielectric	Foam PE	0.110	(2.79)
Outer Conductor	Aluminum Tape	0.116	(2.95)
Overall Braid	Tinned Copper	0.139	(3.53)
Jacket	(see table above)	0.195	(4.95)

Mechanical Specifications

Performance Property	Units	US	(metric)
Bend Radius: installation	in. (mm)	0.5	(12.7)
Bend Radius: repeated	in. (mm)	2.0	(50.8)
Bending Moment	ft-lb (N-m)	0.2	(0.27)
Weight	lb/ft (kg/m)	0.021	(0.03)
Tensile Strength	lb (kg)	40	(18.2)
Flat Plate Crush	lb/in. (kg/mm)	15	(0.27)

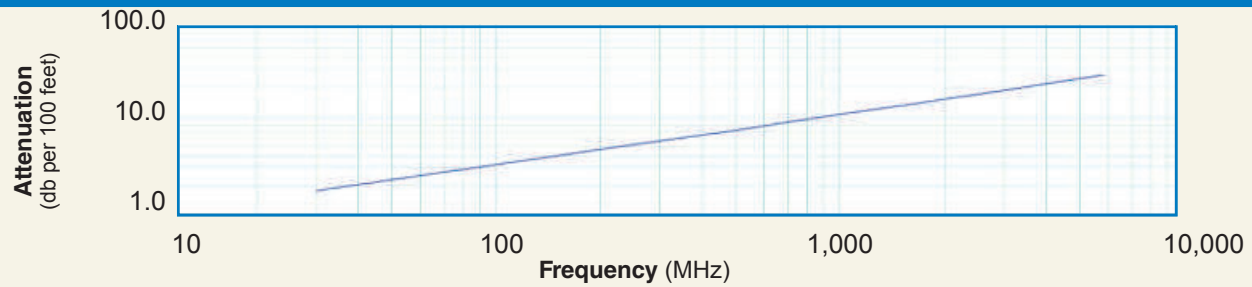
Electrical Specifications

Performance Property	Units	US	(metric)
Velocity of Propagation	%	76	
Dielectric Constant	NA	1.56	
Time Delay	nS/ft (nS/m)	1.27	(4.17)
Impedance	ohms	50	
Capacitance	pF/ft (pF/m)	25.4	(83.3)
Inductance	uH/ft (uH/m)	0.064	(0.21)
Shielding Effectiveness	dB	>90	
DC Resistance			
Inner Conductor	ohms/1000ft (/km)	7.6	(24.9)
Outer Conductor	ohms/1000ft (/km)	4.9	(16.1)
Voltage Withstand	Volts DC	1000	
Jacket Spark	Volts RMS	3000	
Peak Power	kW	2.5	

Environmental Specifications

Performance Property	°F	°C
Installation Temperature Range	-40/+185	-40/+85
Storage Temperature Range	-94/+185	-70/+85
Operating Temperature Range	-40/+185	-40/+85

Attenuation vs. Frequency (typical)



Frequency (MHz)	30	50	150	220	450	900	1500	1800	2000	2500	5800
Attenuation dB/100 ft	2.0	2.5	4.4	5.4	7.8	11.1	14.5	16.0	16.9	19.0	29.9
Attenuation dB/100 m	6.5	8.4	14.6	17.7	25.5	36.5	47.7	52.5	55.4	62.4	98.1
Avg. Power kW	0.89	0.68	0.39	0.32	0.22	0.16	0.12	0.11	0.10	0.09	0.06

Calculate Attenuation = (0.356859) • $\sqrt{FMHz}$ + (0.000470) • FMHz (interactive calculator available at http://www.timesmicrowave.com/cable_calculators)
Attenuation: VSWR=1.0 ; Ambient = +25°C (77°F) **Power:** VSWR=1.0; Ambient = +40°C; Inner Conductor = 100°C (212°F); Sea Level; dry air; atmospheric pressure; no solar loading

Connectors

Interface	Description	Part Number	Stock Code	VSWR** Freq. (GHz)	Coupling Nut	Inner Contact Attach	Outer Contact Attach	Finish* Body /Pin	Length in (mm)	Width in (mm)	Weight lb (g)
N male	Straight Plug	TC-195-NM	3190-1555	<1.25:1 (2.5)	Knurl	Solder	Crimp	S/G	1.5 (38.1)	0.75 (19.1)	0.073 (33.1)
N male	Right Angle	TC-195-NMH-RA-D	3190-2425	<1.35:1 (6)	Hex/Knurl	Solder	Crimp	A/G	1.3 (32.1)	1.19 (30.1)	0.083 (37.5)
SMA male	Straight Plug	TC-195-SM	3190-1553	<1.25:1 (2.5)	Hex	Solder	Crimp	SS/G	1.0 (25.4)	0.32 (8.1)	0.015 (6.8)
TNC male	Straight Plug	TC-195-TM	3190-1554	<1.25:1 (2.5)	Knurl	Solder	Crimp	S/G	1.4 (35.6)	0.59 (15.0)	0.045 (20.4)

* Finish metals: N=Nickel, S=Silver, G=Gold, SS=Stainless Steel, A=Alballoy **VSWR spec based on 3 foot cable with a connector pair

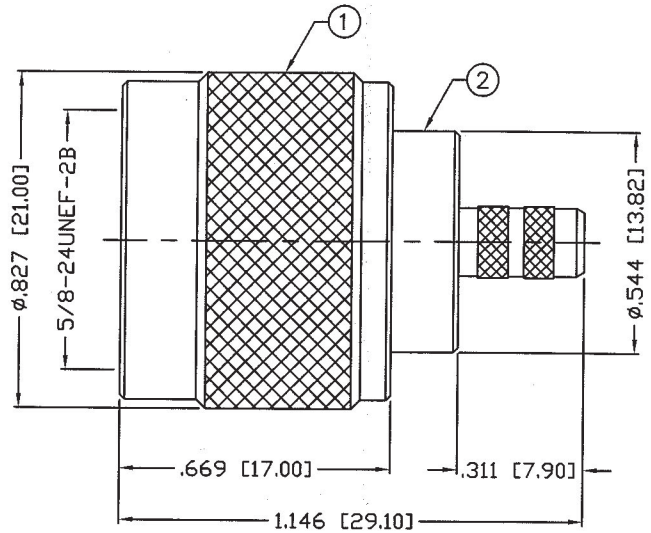
Install Tools

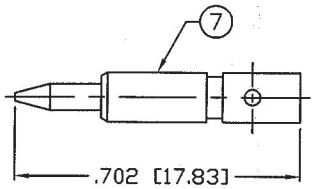
Type	Part Number	Stock Code	Description
Crimp Tool	CT-240/200/195/100	3190-667	Crimp tool for LMR-100,195, 200 and 240 connectors
Cutting Tool	CCT-01	3190-1544	Cable end flush cut tool
Deburr Tool	DBT-U	3192-001	Removes center conductor rough edges
Replacement Blade	RB-01	3190-1609	Replacement blade for cutting tool

ALL DIMENSIONS ARE REFERENCE ONLY

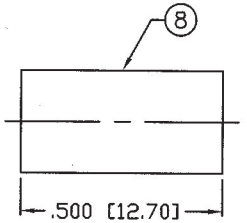
PART NO. **RFN-1005-3C**

REV	DESCRIPTION	DWN	DATE	APPROVED
A	ENGINEERING RELEASE	CZS	10/29/99	R. RICE
B	CHANGE FERRULE STUD, FORMAT, SPECS & DWG # (9253A)	CZS	5/17/01	JDMc





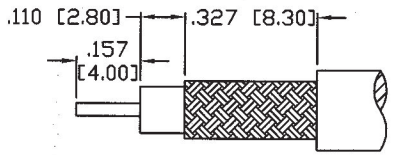
RECOMMENDED CRIMP DIE: .100



RECOMMENDED CRIMP DIE: .213

SPECIFICATIONS:

IMPEDANCE: 50 Ohms
FREQUENCY RANGE: 0–11 GHz
VSWR: 1.3 Max. @ 9 GHz
INSERTION LOSS: .06 dB Max. x $\sqrt{f(GHz)}$
WORKING VOLTAGE: 1k V rms @ sea level
TEMPERATURE RANGE: –65°C TO 165°C
INSULATION RESISTANCE: 5k M Ohms min.
(C) FOR RG–58, 58A, 58C, 141, 141A, BELDEN 8240,
8259, 8262, 9201, 9203, 9310, 9311 & COMM/SCOPE 0268



RECOMMENDED STRIPPING DIM'S

#	DESCRIPTION	QTY	MATERIAL	FINISH
1	SHELL	1	BRASS	SILVER, 80µ"
2	BODY	1	BRASS	SILVER, 80µ"
3	INSULATOR	1	PTFE	---
4	GROUND RING	1	BRASS	SILVER, 80µ"
5	GASKET	1	SILICONE	---
6	RETAINING RING	1	SUS 304	---
7	PIN	1	BRASS	GOLD, 3µ"
8	FERRULE	1	BRASS	SILVER, 80µ"
9				
10				
11				
12				
13				
14				

008974

APPROVALS	DATE
DRAWN C. ZUNIGA	7/26/01
CHECKED JDMc	9-11-01
ORJ DRAWN C. ZUNIGA	10/29/99

UNLESS OTHERWISE SPECIFIED:
1. REMOVE ALL BURRS
2. BREAK ALL CORNERS & EDGES .005 R. MAX.
3. CHAMFER 1ST & LAST THREADS 45°
4. SURFACE ROUGHNESS 63 FINISH MIL-STD-10
5. DIAMETERS ON COMMON CENTERS TO BE CONCENTRIC WITHIN .002 T.I.R.
6. ALL DIMENSIONS ARE AFTER PLATING.

DIMENSIONS ARE IN INCHES AND [MILLIMETERS]
UNLESS OTHERWISE NOTED TOLERANCES ARE:

DECIMALS	DIAMETER
.XXX±.003 [.08]	.XXX±.001 [.03]
.XX±.005 [.13]	.XX±.003 [.08]

RF connectors
DIVISION OF RF INDUSTRIES, LTD.
7610 MIRAMAR RD
SAN DIEGO,CA 92126
(858) 549–6340
(858) 549–6345 FAX

N PLUG, CRIMP

SIZE	CABLE GROUP	DWG NO.	REV
A	C	RFN–1005–3C	B

SCALE: NTS | CAD FILE OUTLINE | SHEET 1 OF 1