INSTALLATION MANUAL

CELS

Coordinated Emergency Lighting System™

CONTROL BOX

CODE 3 INC.
A PUBLIC SAFETY EQUIPMENT COMPANY

CONTENTS:

For future reference record your product's serial no. here _____

IMPORTANT: **Read all instructions and warnings before installing and using.**
INSTALLER: **This manual must be delivered to the end user of this equipment.**

Introduction

The CELS™ Coordinated Emergency Lighting System (hereafter called "the system") is designed to be mounted in the interior of the vehicle and can control all of the emergency vehicle lighting on your slick top vehicle to flash synchronously with the programmability of a CC lightbar! The system can also dim the entire emergency lighting system.
CELS provides greater control of your lights to match your situational needs. CELS is available in 5 undercover lighting packages.

Product Features

Packages

- Packages 1-4 include 4 types of lighting equipment and a control box.
- Package 5 includes 3 types of lighting equipment and a control box.
- Package 6 includes 1 type of lighting equipment and a control box.
- Control box can be wired to any switching type system.
- NarrowStik™ functionality with exterior rear window light (Citadel).
- Dimming capability for all lighting equipment.
- Synchronous capability for all lighting equipment.
- For use on Ford PI Utility and Chevy Tahoe vehicles.
- CELS Flash Patterns work independently of a light bar, if one is installed on your vehicle.

CELS Package LED Lighting Components

- SuperVisor U® with Torus LEDs mounts inside windshield with no drilling.
- Citadel™ LED Exterior Lighting Systems fits under the Rear Spoiler with no drilling.
- PAR36 Fog Light with 7 LEDs per Head (4.25" diameter).
- XT4S LED Light heads (4.52” wide).

Specifications

- Control Box Dimensions: 4 ¾” W x 8 ½” L x 1 7/8” H
- Control Box Weight: 1 lb.
- 12 Volts
- 5 Year LED Warranty

WARNING!

The use of this or any warning device does not ensure that all drivers can or will observe or react to an emergency warning signal. Never take the right-of-way for granted. It is your responsibility to be sure you can proceed safely before entering an intersection, driving against traffic, responding at a high rate of speed, or walking on or around traffic lanes. The effectiveness of this warning device is highly dependent upon correct mounting and wiring. Read and follow the manufacturer’s instructions before installing or using this device. The vehicle operator should insure daily that all features of the device operate correctly. In use, the vehicle operator should insure the projection of the warning signal is not blocked by vehicle components (i.e.: open trunks or compartment doors), people, vehicles, or other obstructions. This equipment is intended for use by authorized personnel only. It is the user’s responsibility to understand and obey all laws regarding emergency warning devices. The user should check all applicable city, state and federal laws and regulations. Code 3, Inc., assumes no liability for any loss resulting from the use of this warning device. Proper installation is vital to the performance of this warning device and the safe operation of the emergency vehicle. It is important to recognize that the operator of the emergency vehicle is under psychological and physiological stress caused by the emergency situation. The warning device should be installed in such a manner as to: A) Not reduce the output performance of the system, B) Place the controls within convenient reach of the operator so that he can operate the system without losing eye contact with the roadway. Emergency warning devices often require high electrical voltages and/or currents. Properly protect and use caution around live electrical connections. Grounding or shorting of electrical connections can cause high current arcing, which can cause personal injury and/or severe vehicle damage, including fire. Driver and/or passenger air bags (SRS) will affect the way equipment should be mounted. This device should be mounted by permanent installation and within the zones specified by the vehicle manufacturer, if any. Any device mounted in the deployment area of an air bag will damage or reduce the effectiveness of the air bag and may damage or dislodge the device. Installer must be sure that this device, its mounting hardware and electrical supply wiring does not interfere with the air bag or the SRS wiring or sensors. Mounting the unit inside the vehicle by a method other than permanent installation is not recommended as unit may become dislodged during swerving, sudden braking or collision. Failure to follow instructions can result in personal injury. PROPER INSTALLATION COMBINED WITH OPERATOR TRAINING IN THE PROPER USE OF EMERGENCY WARNING DEVICES IS ESSENTIAL TO INSURE THE SAFETY OF EMERGENCY PERSONNEL AND THE PUBLIC.

WARNING!

Any electronic device may create or be affected by electromagnetic interference. After installation of any electronic device operate all equipment simultaneously to insure that operation is free of interference. Never power emergency warning equipment from the same circuit or share the same grounding circuit with radio communication equipment. All devices should be mounted in accordance with the manufacturer's instructions and securely fastened to vehicle elements of sufficient strength to withstand the forces applied to the device.

Installation Instructions

Mount the System Box using customer supplied screws in the (4) slots provided in the housing's base. **Note: This box <u>SHOULD NOT</u> be mounted on the exterior of the vehicle!**

WARNING!

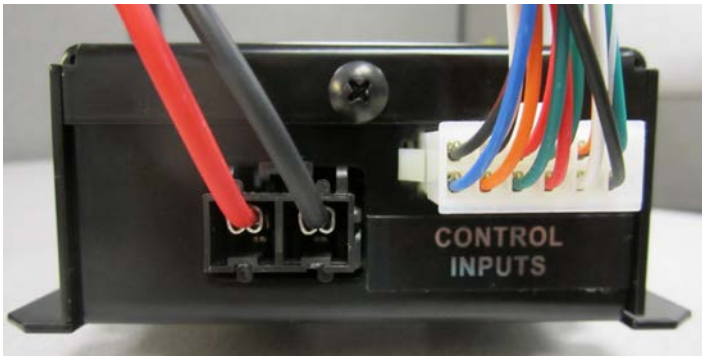
This unit must be mounted within the interior passenger compartment of the vehicle only. It is not intended for use in exterior applications. All devices should be mounted in accordance with the manufacturer's instructions and securely fastened to vehicle elements of sufficient strength to withstand the forces applied to the device. Driver and/or passenger air bags (SRS) will affect the way equipment should be mounted. This device should be mounted by permanent installation and within the zones specified by the vehicle manufacturer, if any. Any device mounted in the deployment area of an air bag will damage or reduce the effectiveness of the air bag and may damage or dislodge the device. Installer must be sure that this device, its mounting hardware and electrical supply wiring does not interfere with the air bag or the SRS wiring or sensors. Mounting the unit inside the vehicle by a method other than permanent installation is not recommended as unit may become dislodged during swerving, sudden braking or collision. Failure to follow instructions can result in personal injury.

WARNING!

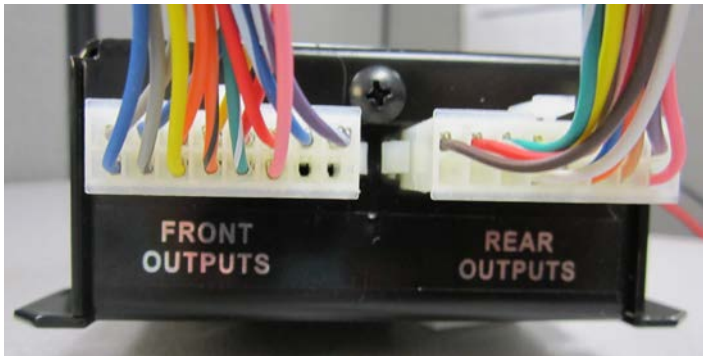
Utilizing non-factory supplied screws and/or mounting brackets and/or the improper number of screws may result in loss of warranty coverage on the equipment.

Wiring Instructions

See Figure-1 for the wiring harness connection locations of the Control Input Wires and the main power and ground wires. See Figure-2 for the Front Output Wires, and the Rear Output Wires. Wire the system based on the wiring diagrams for the individual package ordered as shown on pages 6, 7, 8, 9 & 10. The power and ground should be wired using 12 gage wire and 12 gage butt splices with a 20 amp fuse on the power wire. All of the Input and the Front and Rear Output wires are 22 gage and should be connected with 22 gage butt splices.



<u>Figure-1</u>



<u>Figure-2</u>

Wiring the Individual Dual Color XT4 & PAR36 Light Heads

The CELS Dual Color XT4 & PAR36 Light Heads are **"<u>STEADY BURN ONLY"</u>** light heads and rely on the CELS Controller for controlling flash patterns. The CELS Dual Color XT4 & PAR36 Light Heads have (3) control wires, (2) Power wires and (1) Ground Wire. The power wire colors match the colors of the LEDs in the light heads. The Ground wire is always black. **NOTE: See wire color chart on page 5 for individual wire colors.**

Wiring the Individual Single Color XT4 & PAR36 Light Heads

The CELS Single Color XT4 & PAR36 Light Heads are also **"<u>STEADY BURN ONLY"</u>** light heads and rely on the CELS Controller for controlling flash patterns. The CELS Single Color XT4 & PAR36 Light Heads have only (2) control wires, (1) Power wire which is Red and (1) Ground Wire which is Black.

WARNING!

DO NOT APPLY 12 VOLTS DIRECTLY TO THE CELS BOX OUTPUT WIRES! THE CELS CC BOARD OR LIGHT HEADS COULD BE DAMAGED BY APPLYING 12 VOLTS TO THE CC OUTPUTS!

General Wiring

CELS Wiring

• Read through the wiring diagram for the purchased system prior to the installation and become fully familiar with it to be sure all of the connections will be made as needed for correct system operation. If there are any questions or problems call our Technical Assistance HOTLINE (314) 996-2800.
• Verify before final connections are made that Front Output wires are connected to front outputs and Rear Output wires are connected to rear outputs before crimping the connections.
• Verify that the Front and Rear CELS Output Harness Plugs are in their correct locations See Figure 2 on page 3 (The plugs are labeled as to their function). If they have been unplugged they can be switched by accident!
• The majority of the wire colors from the CELS Box Front and Rear Output wires to the Front Device Outputs (Full or Half SuperVisor) and Rear Device Outputs (Dual Color and Single Color Citadel) match up color to color. Some wire color shades may vary slightly. The Package 5 System individual device output wires are all customer supplied and dependent on the customer provided wire colors.
• For the XT4 and PAR36 front light head wire colors see wire color chart on page 5 for individual wire colors.
• The main power and ground wires should be connected directly to the vehicle's battery and not to an auxiliary vehicle connection and must be fused properly. See wiring diagram for the purchased package. Packages 1 - 4 will have an average current draw of 12 - 15A and a maximum of 20A.
• After all programming is complete attach the Black/Red wire to ground to avoid accidental flash pattern/program changes.
• If you require a CA Title 13 Steady Red Light Head feature, the Brown/White wire may be substituted in place of any of the CELS Output Wires to provide the desired steady burn light head. **Note: DO NOT COMBINE THE BROWN/WHITE WIRE WITH ANY OF THE OUTPUT WIRES.**

General Wiring Best Practices

• Larger wires and tight connections will provide longer service life for components. Follow the AWG Table on page 5 for proper wiring gauges based on length of wire run.
• For high current wires it is highly recommended that terminal blocks or soldered connections be used with heat shrink tubing to protect the connections.
• Do not use insulation displacement (e.g. 3M® Scotchlock type) connectors.
• Route wiring using grommets and sealant when passing through compartment walls.
• High ambient temperatures (e.g. under hood) will significantly reduce the current carrying capacity of wires, fuses, and circuit breakers. Use "SXL" type wire in engine compartment.
• All wiring should conform to the minimum wire size and other recommendations of the wire manufacturer and be protected from moving parts and hot surfaces.
• Looms, grommets, cable ties, and similar installation hardware should be used to anchor and protect all wiring.
• Fuses or circuit breakers should be located as close to the power takeoff points as possible and properly sized to protect the wiring and devices
• The installer should install a fuse sized to approximately 125% of the maximum Amp capacity in the supply line to protect against short circuits. For example, a 30 Amp fuse should carry a maximum of 24 Amps.
• DO NOT USE 1/4" DIAMETER GLASS FUSES AS THEY ARE NOT SUITABLE FOR CONTINUOUS DUTY IN SIZES ABOVE 15 AMPS!
• Circuit breakers are very sensitive to high temperatures and can "false trip" when mounted in hot environments or operated close to their capacity.

Ground Connections

• Ground terminations should be made to substantial chassis components, preferably directly to the vehicle battery. Some OEM provided ground points are not sufficient to provide a proper ground. If in doubt, check to verify the ground with a Multi Meter.
• If Chassis Ground must be used, connection points should be clean and have paint or coatings removed to insure a good tight ground connection. The gage of the grounding wire must match or exceed the AWG Table shown on page 5.
• Avoid stacking multiple ground connections to one ground source.
• Verify that hardware, screws, bolts, washers, etc. will provide a sufficient ground connection.

Splicing Connections

• Use the correct wire stripper to be sure all strands of the wires remain intact and will provide sufficient electrical current capacity.
• Do not under strip or over strip the wire as it could prevent proper connections or leave bare wiring exposed for potential short circuits.
• Use appropriate crimping pliers to insure good connections.
• Always use properly sized connectors/terminals appropriate to the wire gage being used (Butt Splices, Fork Terminals, Ring Terminals, & etc.).
• Use wire of sufficient gage to provide sufficient electrical current capacity.
• Minimize the number of splices where ever possible to reduce voltage drop.
• Particular attention should be paid to the location and method of making electrical connections and splices to protect these points from corrosion and loss of conductivity (Wire Loom, Heat Shrink Tubing, or Sealed Connectors may be necessary in wet or hot environments).

RF Considerations

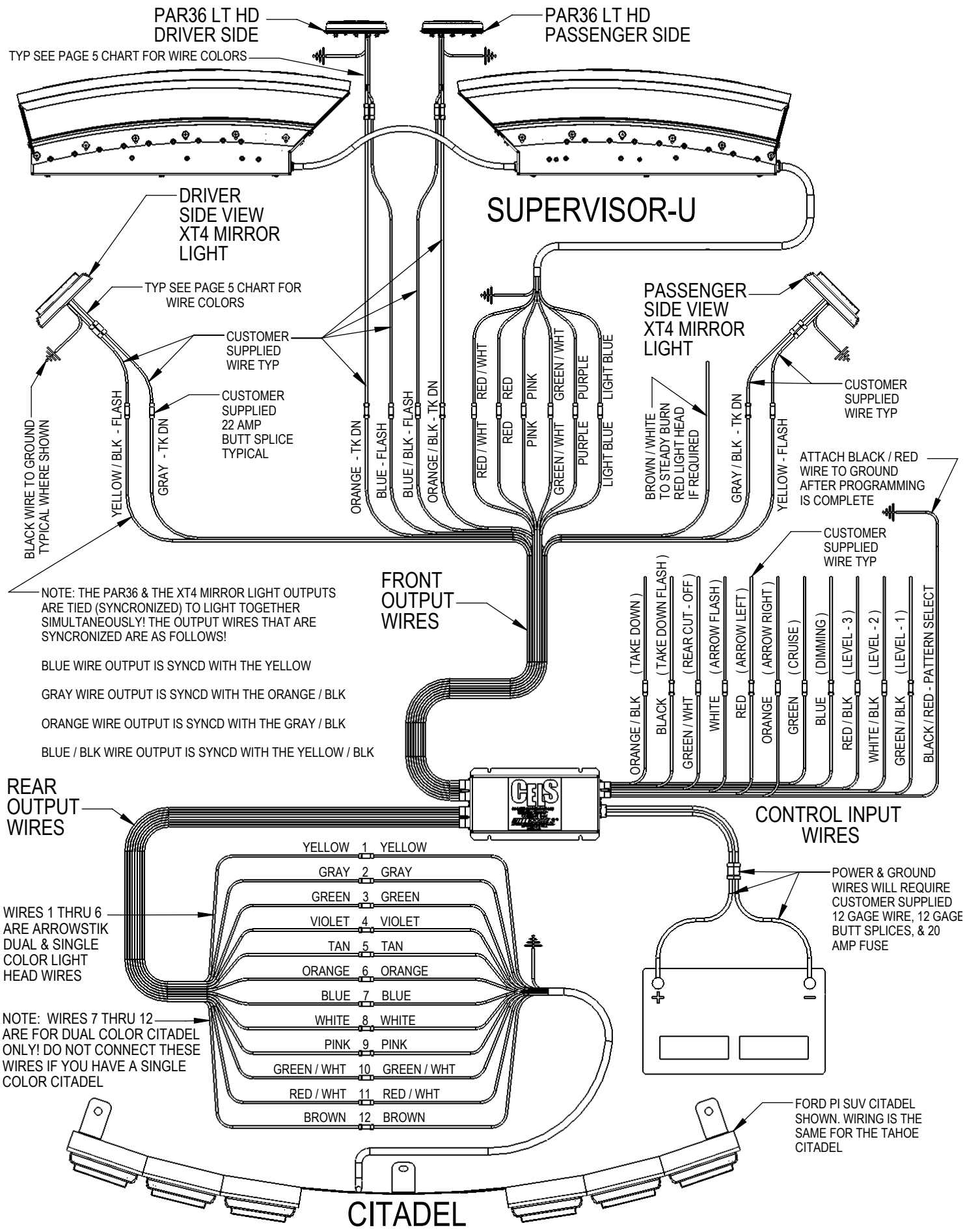
• Do not locate the CELS Box close to an antenna or other RF/EM emitting device.
• Do not route cables or wires from a CELS SuperVisor, CELS Citadel, or other CELS controlled light heads within 18 inches of an antenna, antenna cable, radar unit, radio amplifier, or other RF/EM emitting device.

XT4 LIGHT HEAD WIRE COLOR TABLE THE BLACK WIRE IS ALWAYS THE GROUND WIRE			PAR36 LIGHT HEAD WIRE COLOR TABLE THE BLACK WIRE IS ALWAYS THE GROUND WIRE		
LED COLOR	DUAL / SINGLE	POWER WIRE COLORS	LED COLOR	DUAL / SINGLE	POWER WIRE COLORS
RED / AMBER	DUAL	RED / YELLOW	BLUE / WHITE	DUAL	BLUE / WHITE
BLUE / AMBER	DUAL	BLUE / YELLOW	RED / WHITE	DUAL	RED / WHITE
RED / BLUE	DUAL	RED / BLUE	RED / BLUE	DUAL	RED / BLUE
BLUE / WHITE	DUAL	BLUE / WHITE	BLUE / AMBER	DUAL	BLUE / YELLOW
RED / WHITE	DUAL	RED / WHITE	RED / AMBER	DUAL	RED / YELLOW
AMBER / WHITE	DUAL	YELLOW / WHITE	RED	SINGLE	RED
BLUE	SINGLE	RED	BLUE	SINGLE	RED
RED	SINGLE	RED	WHITE	SINGLE	RED
AMBER	SINGLE	RED	AMBER	SINGLE	RED
WHITE	SINGLE	RED			

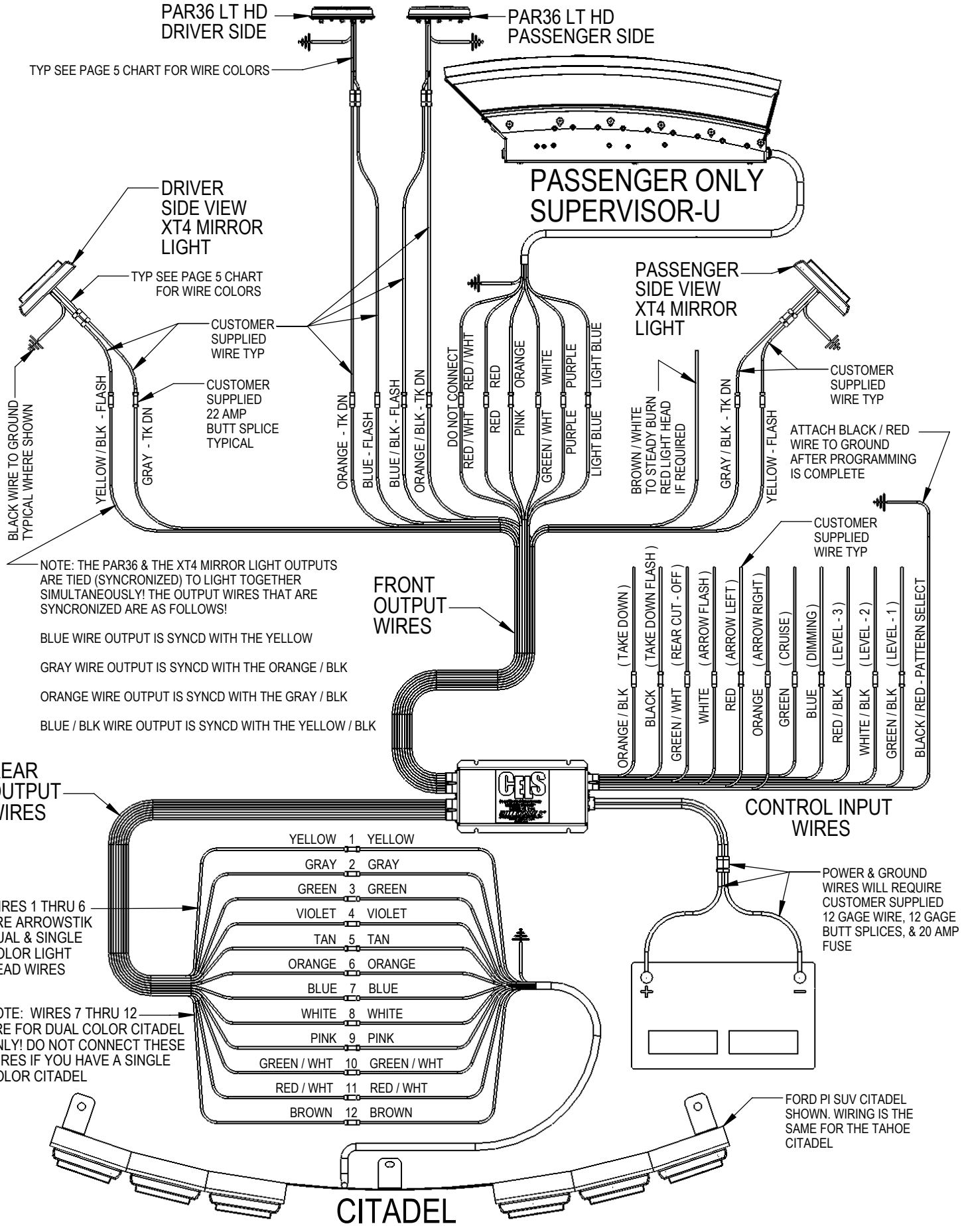
Wire Gauge Selection Table 12 Volt Circuit

AMPS	3'	5'	7'	10'	15'	20'	25'
0 to 5	18	18	18	18	18	18	18
6	18	18	18	18	18	18	18
7	18	18	18	18	18	18	18
8	18	18	18	18	18	16	16
10	18	18	18	18	16	16	16
11	18	18	18	18	16	16	14
12	18	18	18	18	16	16	14
15	18	18	18	18	14	14	12
18	18	18	16	16	14	14	12
20	18	18	16	16	14	12	10
22	18	18	16	16	12	12	10
24	18	18	16	16	12	12	10
30	18	16	16	14	10	10	10
40	18	16	14	12	10	10	8
50	16	14	12	12	10	10	8
100	12	12	10	10	6	6	4
150	10	10	8	8	4	4	2
200	10	8	8	6	4	4	2

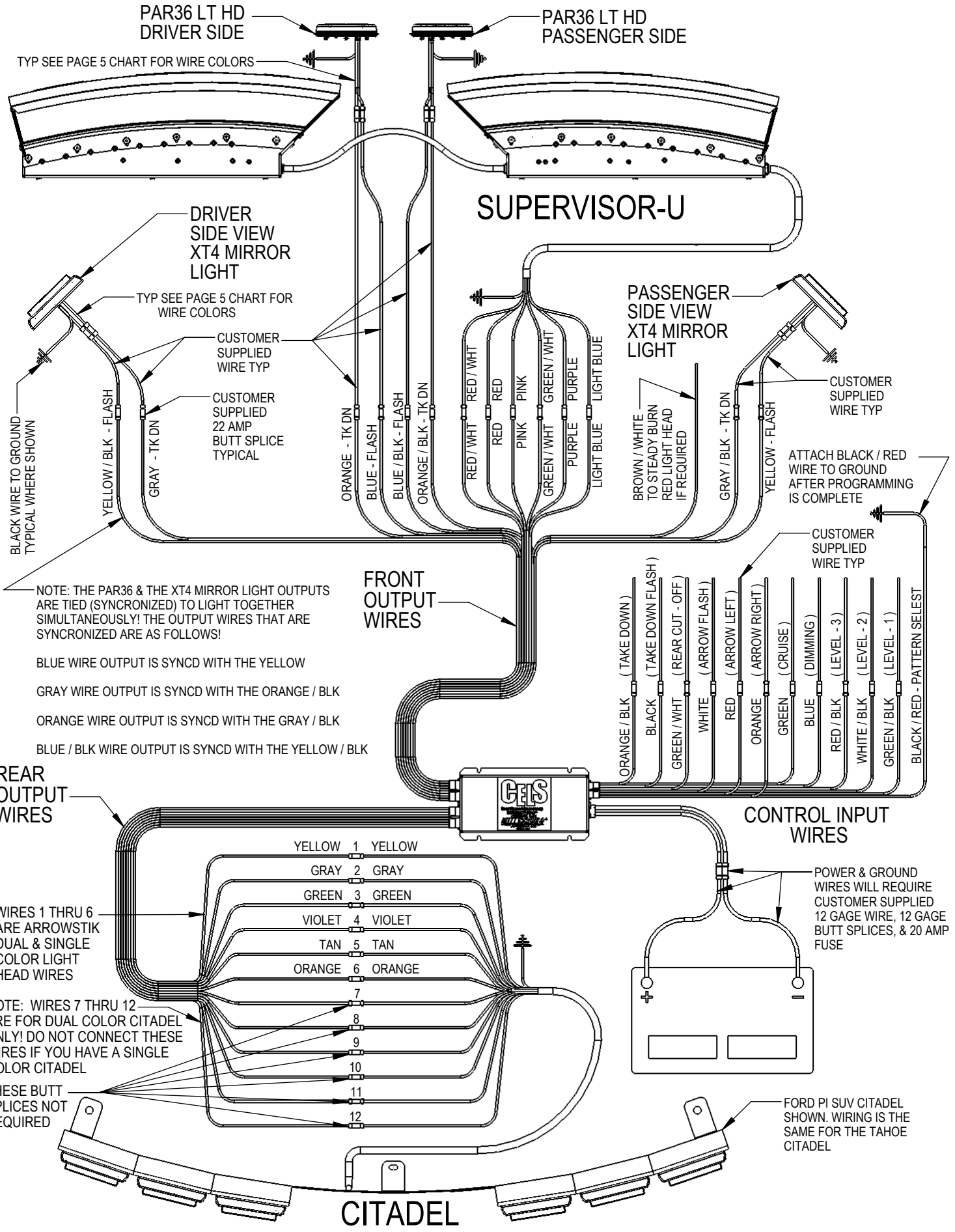
CELS WIRING DIAGRAM - PACKAGE - 1



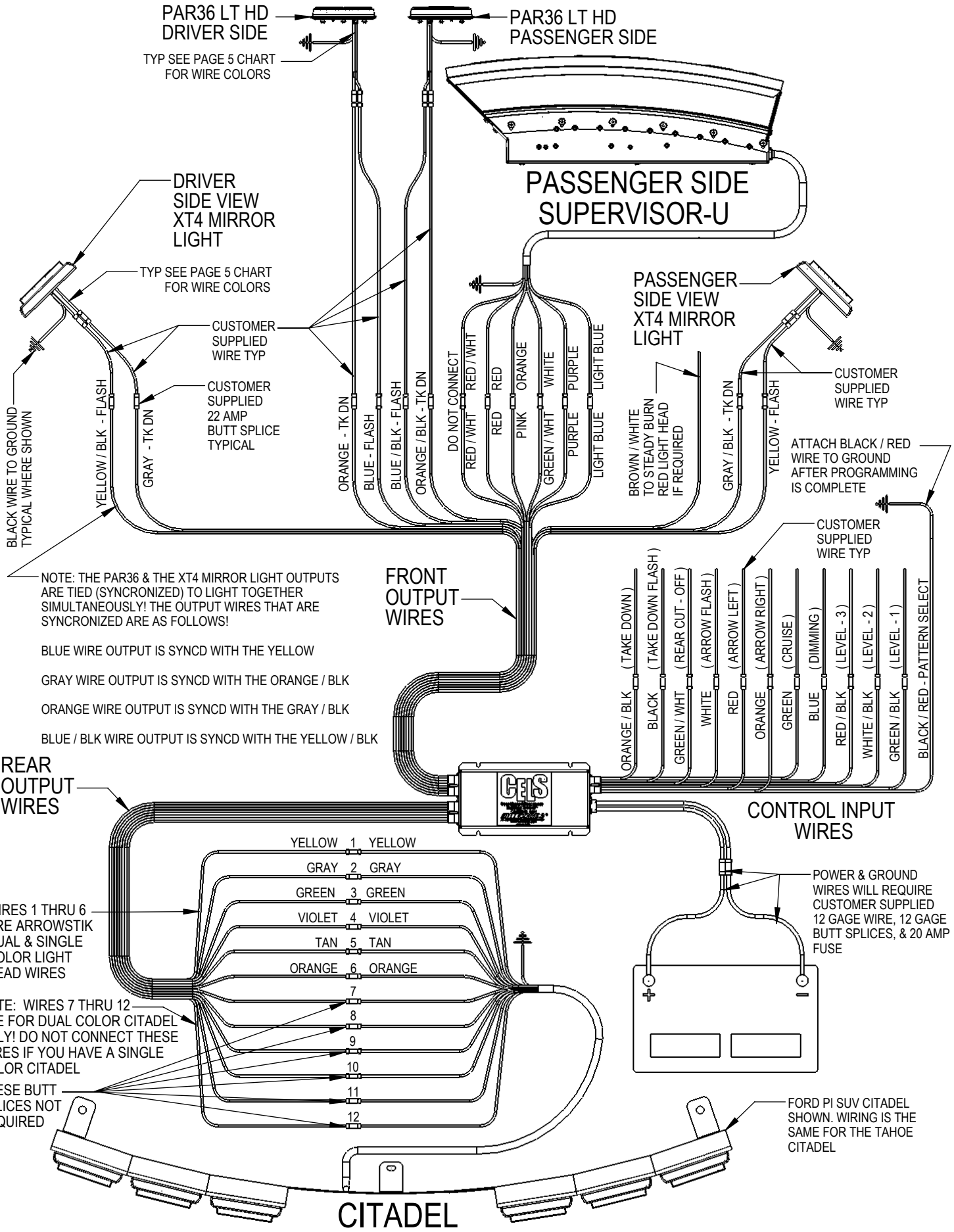
CELS WIRING DIAGRAM - PACKAGE - 2



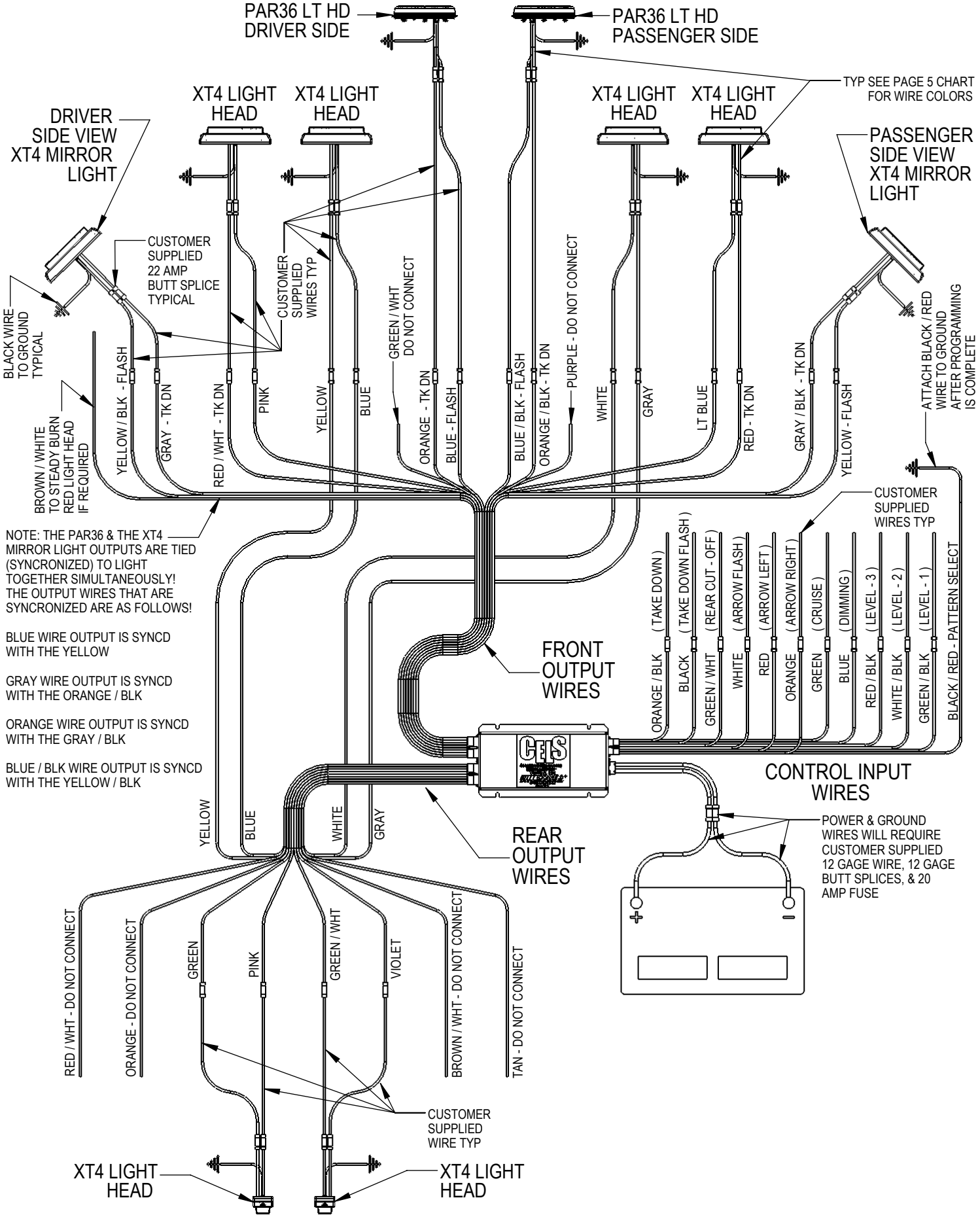
CELS WIRING DIAGRAM - PACKAGE - 3



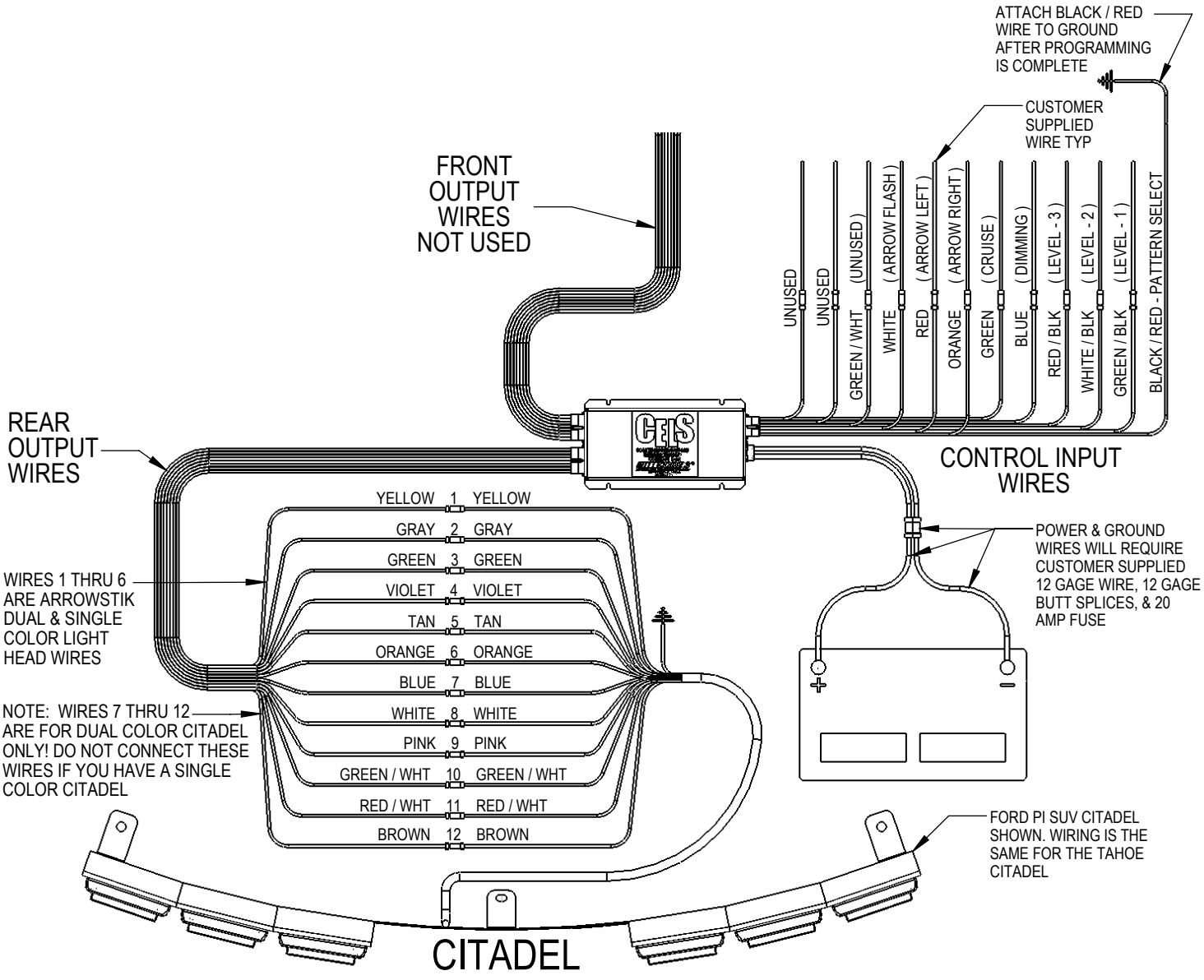
CELS WIRING DIAGRAM - PACKAGE - 4



CELS WIRING DIAGRAM - PACKAGE - 5



CELS WIRING DIAGRAM - PACKAGE - 6



3-Level Flashing Feature

Flash patterns are based on the 600-series lightbar software (where a single set of the 7 combinations of 3-level inputs configures the entire bar, instead of configuring/flashing in pairs). This feature will flash Supervisor and Citadel heads, as well as XT4 and PAR36 heads (primaries only if secondaries are configured as Takedowns). Patterns available are:

Packages 1 Thru 4

1	NULL FLASH	All off
2	NFPA QF 75fpm	Supervisor, Citadel, Additional
3	SLOW QF 60fpm	Supervisor, Citadel, Additional
4	FAST SGL 375fpm	Supervisor, Citadel, Additional
5	SLOW SGL 60fpm	Supervisor, Citadel, Additional
6	FAST DBL 115fpm	Supervisor, Citadel, Additional
7	SLOW DBL 60fpm	Supervisor, Citadel, Additional
8	VAR RATE SGL	Supervisor, Citadel, Additional
9	CYCLE	Supervisor, Citadel, Additional
10	NFPA QF 75fpm	Front: Supervisor, Additional
11	FAST SGL 375fpm	Front: Supervisor, Additional
12	SLOW DBL 60fpm	Front: Supervisor, Additional
13	VAR RATE SGL	Front: Supervisor, Additional
14	CYCLE	Front: Supervisor, Additional

Package 5

1	NULL FLASH	All off
2	NFPA QF 75fpm	Front, Rear
3	SLOW QF 60fpm	Front, Rear
4	FAST SGL 375fpm	Front, Rear
5	SLOW SGL 60fpm	Front, Rear
6	FAST DBL 115fpm	Front, Rear
7	SLOW DBL 60fpm	Front, Rear
8	VAR RATE SGL	Front, Rear
9	CYCLE	Front, Rear
10	NFPA QF 75fpm	Front
11	FAST SGL 375fpm	Front
12	SLOW DBL 60fpm	Front
13	VAR RATE SGL	Front
14	CYCLE	Front

Package 6

1	NULL FLASH	All off
2	NFPA QF 75fpm	Front, Rear
3	SLOW QF 60fpm	Front, Rear
4	FAST SGL 375fpm	Front, Rear
5	SLOW SGL 60fpm	Front, Rear
6	FAST DBL 115fpm	Front, Rear
7	SLOW DBL 60 fpm	Front, Rear
8	VAR RATE SGL	Front, Rear
9	CYCLE	Null Flash
10	NFPA QF 75fpm	Null Flash
11	FAST SGL 375fpm	Null Flash
12	SLOW DBL 60fpm	Null Flash
13	VAR RATE SGL	Null Flash
14	CYCLE	Null Flash

Defaults: L1 default is pattern 10, L2 default is pattern 2, L3 default is pattern 9.

All patterns above are alternating except VAR RATE SNGL, which is picket fence. Cycle flash patterns will consist of NFPA Quad, Var Rate SGL, Fast SGL, Slow Double patterns from the same column.

ArrowStik activation will override all other Citadel outputs. Rear Cutoff activation will override Citadel flashing outputs. If XT4 and PAR36 secondaries are configured as Takedowns, then Takedown Steady activation will override both XT4 and PAR36 primaries.

Dim Feature

Dim will dim all outputs that are currently being activated by another function, to 25%, except Supervisor Takedowns. Dim will not affect Cruise function.

Cruise Feature

Packages 1, 2, & 6: Cruise lights will turn on the Citadel secondary-color end outputs (heads 1 and 6) and additional (PAR36 and XT4) secondary outputs.
Packages 3 & 4: Cruise lights will turn on the Citadel primary-color end outputs (heads 1 and 6) and additional (PAR36 and XT4) secondary outputs.

The heads will be turned on at 12.5% duty cycle. This function is not programmable. Cruise functionality will be overridden by any other feature/input being active, except Dim and Rear Cutoff, which have no effect on Cruise.

ArrowStik Feature

This feature will be enabled for Packages 1-4 & 6.
The Citadel primary-color (i.e. ArrowStik) outputs will behave as a normal lightbar 6-head ArrowStik.
ArrowStik activation will override the Citadel ArrowStik as well as dual-color (i.e. flashing rear) outputs.
Flash patterns will be the standard 800-series and 950-series patterns. Default will be Mode 1, Medium speed for all four flash pattern types.

TABLE 6: TRAFFIC DIRECTING/TRAFFIC WARNING FLASH PATTERNS

Mode	LEFT	CENTER	RIGHT	FLASH
1	Building	Building	Building	Standard Flash*
2	Building, 3 Flash	Building, 3 Flash	Building, 3 Flash	Quad Flash Standard
3	Traveling Ball, 3 Flash	Traveling Ball, 3 Flash	Traveling Ball, 3 Flash	Simultaneous Flash*
4	Build/Collapse	Build/Collapse	Build/Collapse	Quad Flash Simultaneous
5				Even/Odd Flash*
6				Quad Flash Even/Odd
7				Left/Right Flash*
8				Quad Flash Left/Right
9				Traveling Ball Flash*
	All Patterns have a fast, medium, or slow speed.	All Patterns have a fast, medium, or slow speed.	All Patterns have a fast, medium, or slow speed.	All Patterns have a fast, medium, or slow speed.

Rear Cutoff Feature

The Rear Cutoff feature uses the RCUT input to cut off the rear (Citadel) flashing (primary) outputs. This feature (by definition of cutoff) overrides the 3-Level functionality to the rear. This function is not programmable. This feature will be unaffected by ArrowStik functionality. Rear Cutoff will not affect Cruise function.

Takedown Feature

The Takedown feature has two inputs: Takedown Flash and Takedown Steady. (Packages 1-5 only)

Takedown Flash will flash the Supervisor Takedowns. The patterns for flashing are as follows (default is pattern 1):

1 NFPA QUAD 75fpm
2 SLOW QUAD 60fpm
3 FAST SGL 375fpm
4 MED SGL 115fpm
5 FAST DOUBLE 115fpm
6 SLOW DOUBLE 60fpm
7 VAR RATE SGL
8 CYCLE

Takedown Steady will activate the Supervisor Takedowns, as well as XT4 and PAR36 secondaries if they are configured as Takedowns.

In Takedown Steady mode, Supervisor Takedown heads will be run at 100% duty cycle, and PAR36 and XT4 secondary heads (if activated) will be run at 50% duty cycle.

Takedown Steady configuration options (default is pattern 2):
1 Takedown activates Supervisor TD only

2 Takedown activates Supervisor TD and PAR36, XT4 secondaries (“Flood” mode)

Steady Burn Feature

The steady burn feature functions like in the 600 series software, where the jumpers on the CC board will select whether L1, L1 and L2, or L1 and L2 and L3 will activate the SB output. This can be used, for example, for a customer CA Steady Red feature. **See Figure-3 below for jumper locations!**

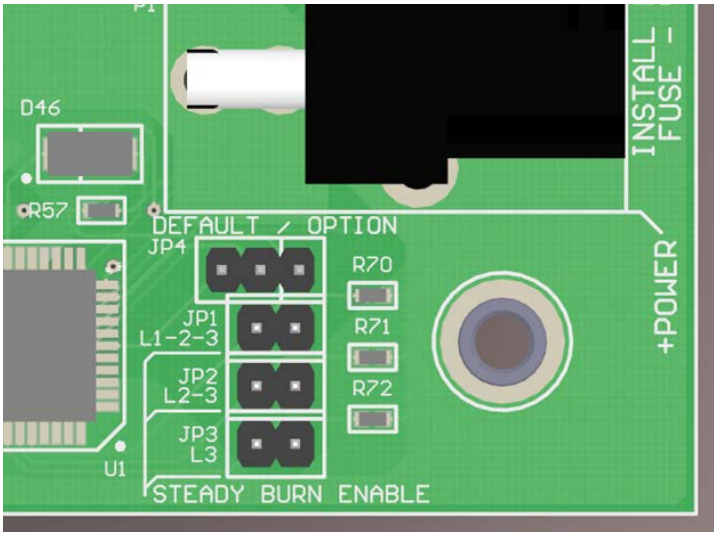


Figure-3

Flash Pattern Selection Feature

Flash pattern selection works like the 600 series software. Touching the PGM wire to +12V for at least 50ms will change to the next pattern, and holding it for approx. 4 seconds will reset to the factory default pattern. This will work if one of the other modes is active, via the following inputs:
L1 – changes L1 flash pattern
L2 – changes L2 flash pattern
L3 – changes L3 flash pattern
L1+L2 – changes L1+L2 flash pattern
L2+L3 – changes L2+L3 flash pattern
L1+L2+L3 – changes L1+L2+L3 flash pattern
TDFL – changes Takedown flash pattern
TDSB – changes whether PAR36 and XT4 secondaries are included in takedown steady burn

Notes:

Notes:

Notes:

WARRANTY

Code 3, Inc.'s emergency devices are tested and found to be operational at the time of manufacture. Provided they are installed and operated in accordance with manufacturer's recommendations, Code 3, Inc. guarantees all parts and components except the lamps to a period of 1 year, LED Lighthead modules to a period of 5 years (unless otherwise expressed) from the date of purchase or delivery, whichever is later. Units demonstrated to be defective within the warranty period will be repaired or replaced at the factory service center at no cost.

Use of lamp or other electrical load of a wattage higher than installed or recommended by the factory, or use of inappropriate or inadequate wiring or circuit protection causes this warranty to become void. Failure or destruction of the product resulting from abuse or unusual use and/or accidents is not covered by this warranty. Code 3, Inc. shall in no way be liable for other damages including consequential, indirect or special damages whether loss is due to negligence or breach of warranty.

CODE 3, INC. MAKES NO OTHER EXPRESS OR IMPLIED WARRANTY INCLUDING, WITHOUT LIMITATION, WARRANTIES OF FITNESS OR MERCHANTABILITY, WITH RESPECT TO THIS PRODUCT.

NEED HELP? Call our Technical Assistance HOTLINE - (314) 996-2800

PRODUCT RETURNS

If a product must be returned for repair or replacement*, please contact our factory to obtain a Return Goods Authorization Number (RGA number) before you ship the product to Code 3, Inc. Write the RGA number clearly on the package near the mailing label. Be sure you use sufficient packing materials to avoid damage to the product being returned while in transit.

*Code 3, Inc. reserves the right to repair or replace at its discretion. Code 3, Inc. assumes no responsibility or liability for expenses incurred for the removal and /or reinstallation of products requiring service and/or repair.; nor for the packaging, handling, and shipping: nor for the handling of products returned to sender after the service has been rendered.

CODE 3®
A PUBLIC SAFETY EQUIPMENT COMPANY

CODE 3®
10986 North Warson Road
St. Louis, MO 63114
Technical Service
(314) 996-2800
cs-c3@code3esg.com
www.code3esg.com

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Revision 2, 03/31/2015 - Instruction Book Part No. T15624
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