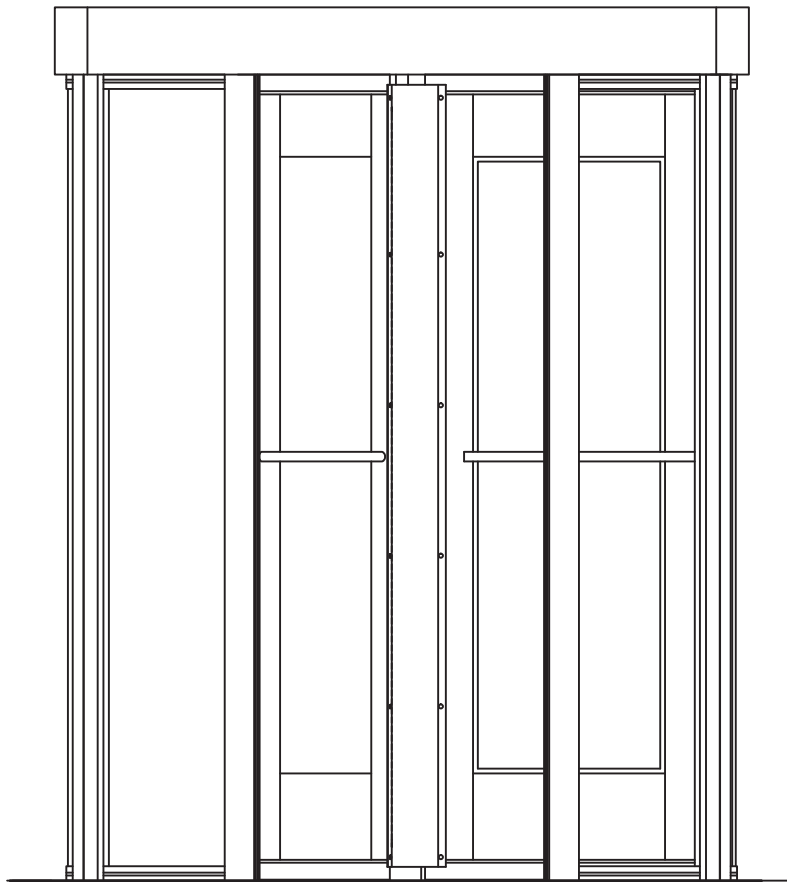


# Monitor RD70

## Service & Installation Manual



**Note: Successful turnstile installation depends on reading this manual.**

*Please keep this service manual after installation. If an installation is done by a construction company or outside installer, please pass this book along to the end user. This book is required for maintenance, troubleshooting & repairs.*

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# The Monitor™ RD70 Series

Full-Height Turnstile | Interior Application

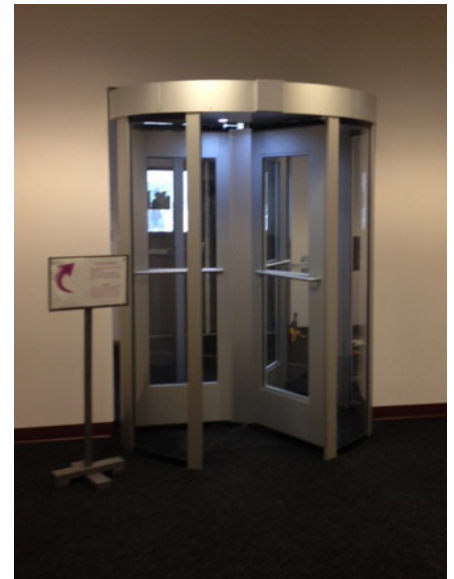
RD70



The Monitor™ RD70 Series is a stylish 3-vane high security portal. It is designed for locations requiring improved visitor security or as the barrier between production and office areas. Instead of a traditional physical barrier to prevent passage in the wrong direction, the RD70 comes equipped with a high tech ultrasonic sensor. This sensor allows for a full door panel appearance while still enforcing standard turnstile passage flow.



RD70 shown with optical anti-tailgating (entry side)



RD70 (exit side)

## We're the #1 Choice of Top Architects, Security Pros and Engineers

For more than 30 years, Controlled Access has been the globally trusted name in pedestrian control equipment. Made in Ohio and shipped worldwide, we are the first choice of leading architects, facility managers, security consultants, and engineers. Whether your project requires high security full-height turnstiles, waist high units, or matching ADA accessible gates, Controlled Access is the secure choice. We're experienced in access control systems, from card readers to biometric scanning, to give you the power to control access.



# The Monitor™ RD70 Series

RD70

## Full-Height Turnstile | Interior Application

### Applications:

The Monitor™ RD70 Series is a full security card access, tamper-resistant revolving door that's designed for locations requiring improved visitor security or as the barrier between production and office areas.

### Product Features:

#### Materials & Finishes:

- Various 6061 & 6063 extruded aluminum
- 3/16" scratch-resistant polycarbonate
- 1/4" clear tempered glass
- 7 & 11 gauge steel (mainframe/canopy)
- Anodized aluminum sheet, canopy wrap
- Finish: Standard anodizing finish is clear. Also available in dark bronze. Other colors can be quoted upon request.

#### Assembly & Hardware:

- Major lower components pre-assembled with concealed spring pins and solid rods
- All exposed fasteners are stainless steel
- Canopy & outer cage panels secured to concrete with 3/4" thread rods, epoxied into concrete
- Rotor pivots on a sealed load runner bearing, secured with high strength plastic coupling anchored into concrete
- Door panels and cosmetic covers secured with flat head screws
- Minimum of 6" needed above canopy in order for canopy to be removed

### Dimensions:

- **Exterior Height:** 91" (2311.4mm)
- **Interior Height:** 84" (2133.6mm)
- **Diameter:** 72.284" (1836mm)
- **Pedestrian Clearance:** 29.750" (755.6mm)

\* Dimensions are subject to change without notice

### Operation Features

#### 6500 Series Control Head:

- Auto-indexing (self-centering) with adjustable hydraulic shock suppression
- Hardened tool steel locking bars, cam and roller assemblies
- Permanently lubricated bearings
- Nearly universal integration to any number of access control systems
- Your choice on each electronic direction of locking or unlocking on power failure

#### RD70 Specific Features:

- Ultrasonic barrier detects if a presence enters the wrong area of the portal - and in that event, the turnstile will not allow the person to advance and will reverse allowing them only to exit thru the defined "unsecure" side.
- Audible message via loop recorder when ultrasonic sensor detects a presence
- Low voltage canopy lighting

### Options:

- Card reader mounting plates
- Daylight visible indicator lights
- 8 digit key resettable LCD counter with seven year lithium battery
- Metal detection portal
- Custom height decorative aluminum top
- Optical anti-tailgating
- Additional options available upon request

### Warranty:

Units are warranted against defects in materials and workmanship for a period of one year from date of delivery. See warranty information for specific details.

### Electrical Specifications:

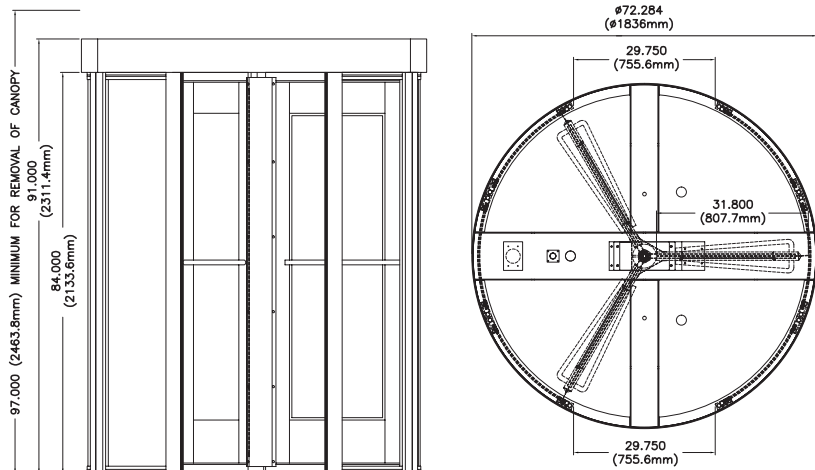
Input Voltage: 100-240 VAC  
Input Current: 1.3 - .55 A  
Frequency: 50/60 Hz

Storage Temperature: -4 to 158°F  
Operating Temperature: 32 to 122°F

Operating Voltage: 24VDC  
Operating Current: 1.2 A (typical)



Controlled Access, Inc. is certified by Advantage International Registrar to be an ISO 9001:2015 company



\* Dimensions are approximate

## RD70 Theory of Operation

The RD70 security revolving door allows for an aesthetically pleasing solution to facility security. Unlike a traditional revolving door, the RD70 remains locked until access control is presented. After one user passes through, the RD70 will re-lock until another request to pass is presented. Traffic passes through on one side of the RD70 from both directions much like a traditional turnstile. However, an ultrasonic sensor exists within the canopy to act as a digital barrier to allow a full revolving door feel.

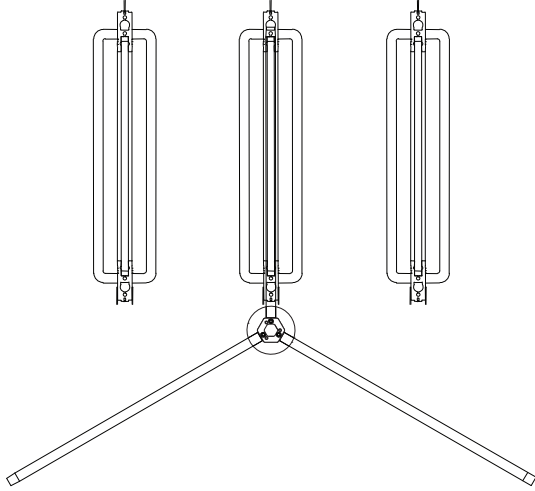
The RD70 can be configured for a multitude of functions. Upon loss of power, the door can be pre-configured in our factory to lock or unlock. One shot timers (which can be disabled if desired) come programmed directly into the control board. These one shot timers act as a buffer to prevent long signal lengths from card readers from allowing more than one person through on a single card swipe. An adjustable number of card swipes can be processed at a time, allowing for a quick flow of traffic through the unit. There is also an integrated fire alarm input which will unlock the RD70 in both directions until the alarm condition is finished. The previously mentioned digital barrier can be configured to back the turnstile up in either direction upon sensing, forcing the person in the wrong area of the turnstile back out into the unsecure side of the RD70. This sensor also has an adjustable sensing height as well as a time delay filter to ensure minimal false alarms.

Recent advances in technology have allowed the addition of user friendly convenient functions for portal use indication. One of these features is an audible annunciator which instructs users to pass through the unit and also what occurs in the event the ultrasonic sensor detects somebody in the wrong area of the portal. There are also three indicator lights built into the canopy which change colors and animates based on the status of the unit.

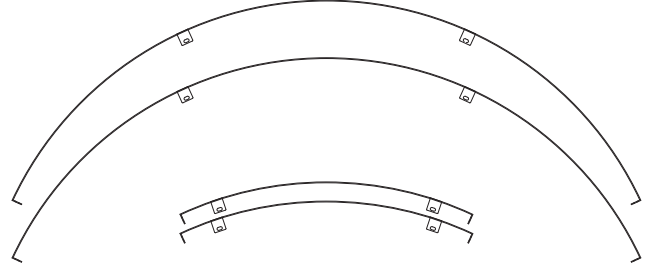
The control system also has provisions for optional free exit sensor arrays and anti-piggyback modules. These features have some adjustable settings within the PLC for configuring as needed per the requirements of the specific facility.

## RD70 Components

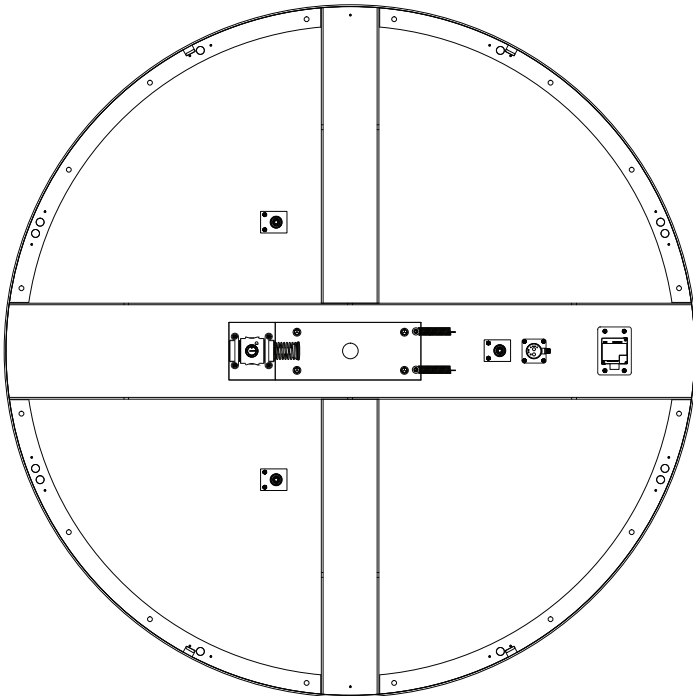
Partially Assembled Rotor Tree  
w/ 2x Door Assemblies



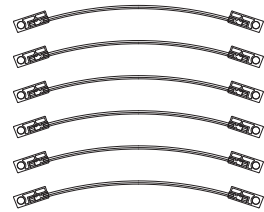
Decorative Canopy Wrap



Canopy (As Delivered)



6x Yoke Assemblies  
(Various Types)



Control Head Assembly

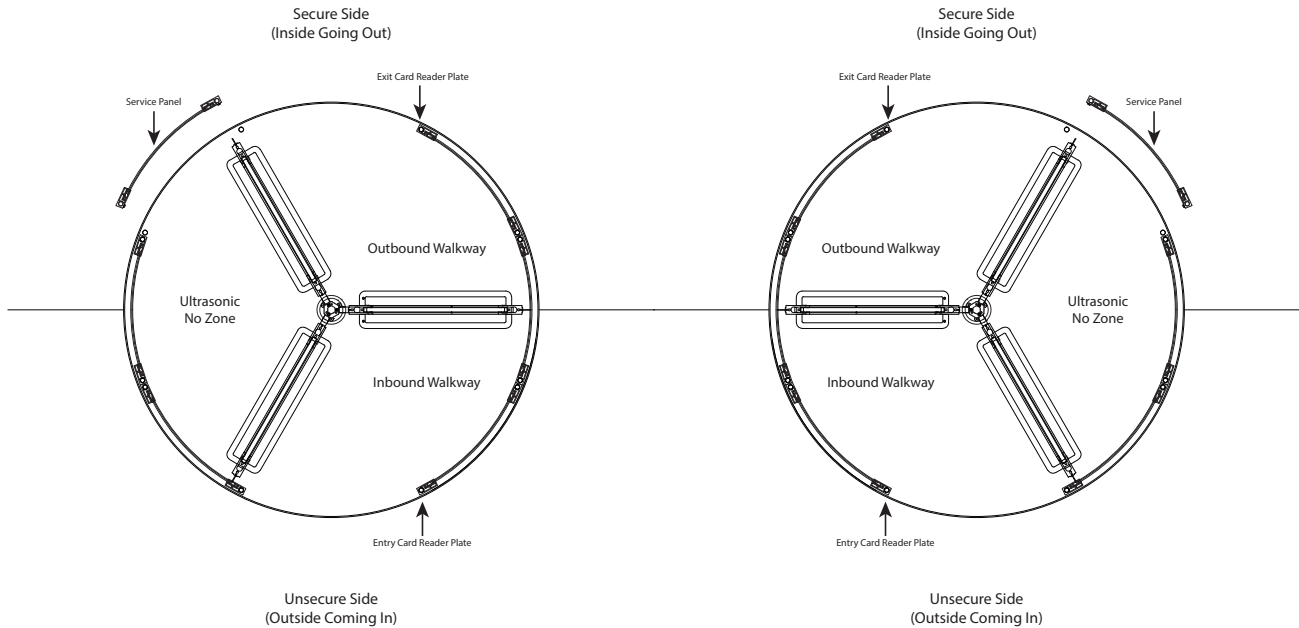


Not Shown: Fasteners, Threaded Rods, Electronics, Brushes, Optional Components

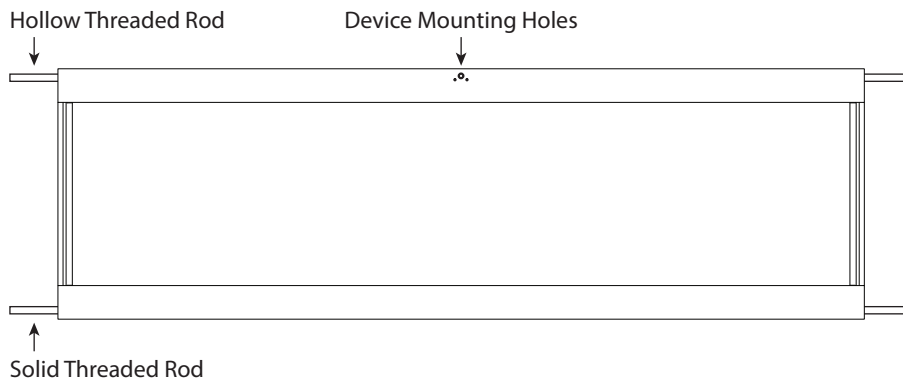
## RD70 Pre Installation Notes

It is important to note that each RD-70 installation may be different. Layout of yoke panels and rotor alignment varies from project to project. This installation manual illustrates one generic possible layout / view. Review the information provided on the control head box to understand how the unit has been configured and refer to the canopy itself for labels to see where various posts and panels belong.

For example: the curved yoke sections may be laid out in a mirror image of what is shown or possibly even completely different. Two potential final layouts could include:

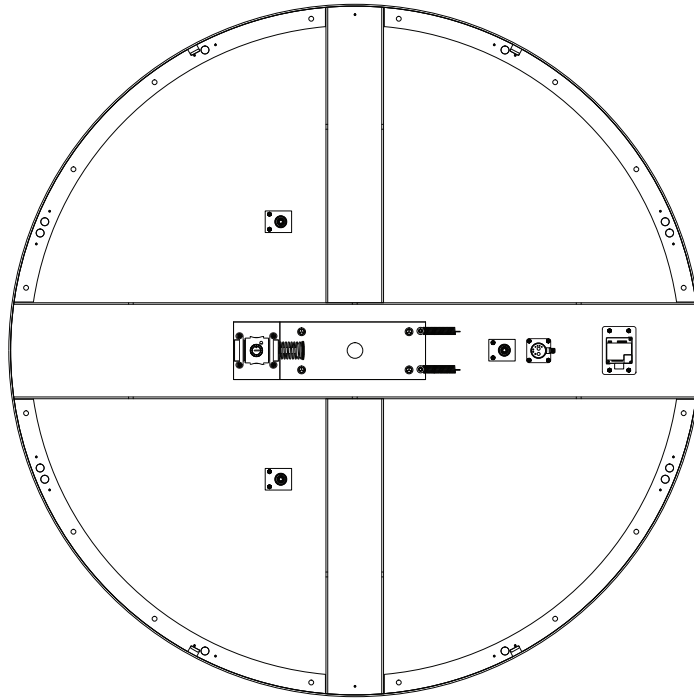


It is also important to note that where card readers or optional anti-piggybacking devices may be mounted, the curved yoke sections include additional mounting holes and are intended to be supported with hollow rods (to run cable through) as opposed to other sections being secured with solid rods. Depending on the options purchased, the hole patterns may vary.

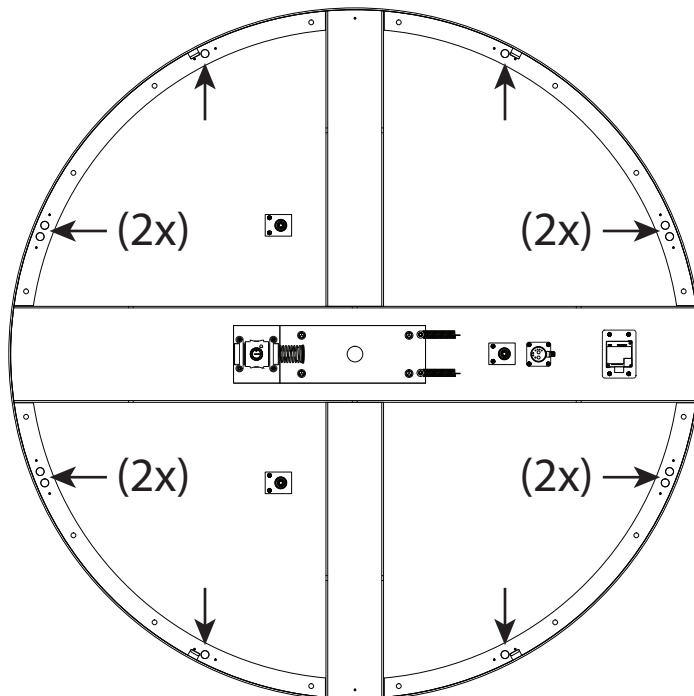


## Installation Instructions

- 1.) If needed, pour a level concrete pad at least 4" thick and 4" greater than the unit's length and width in each direction. Model specific diagrams are available if needed.
- 2.) Unpack turnstile(s) and verify all parts are included. Use the parts checklist in the beginning of this book.
- 3.) Place canopy assembly on the ground in the location the turnstile will be installed.



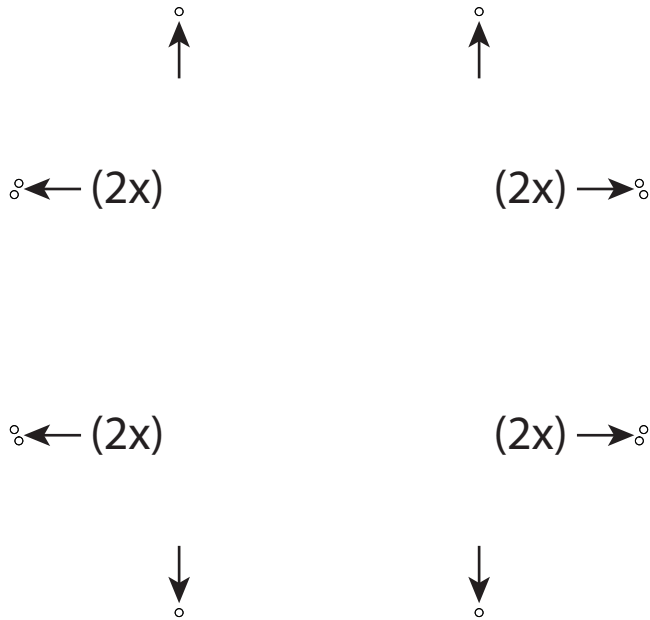
- 4.) Mark the 12x holes shown below with arrows for locations to be drilled for support rods.



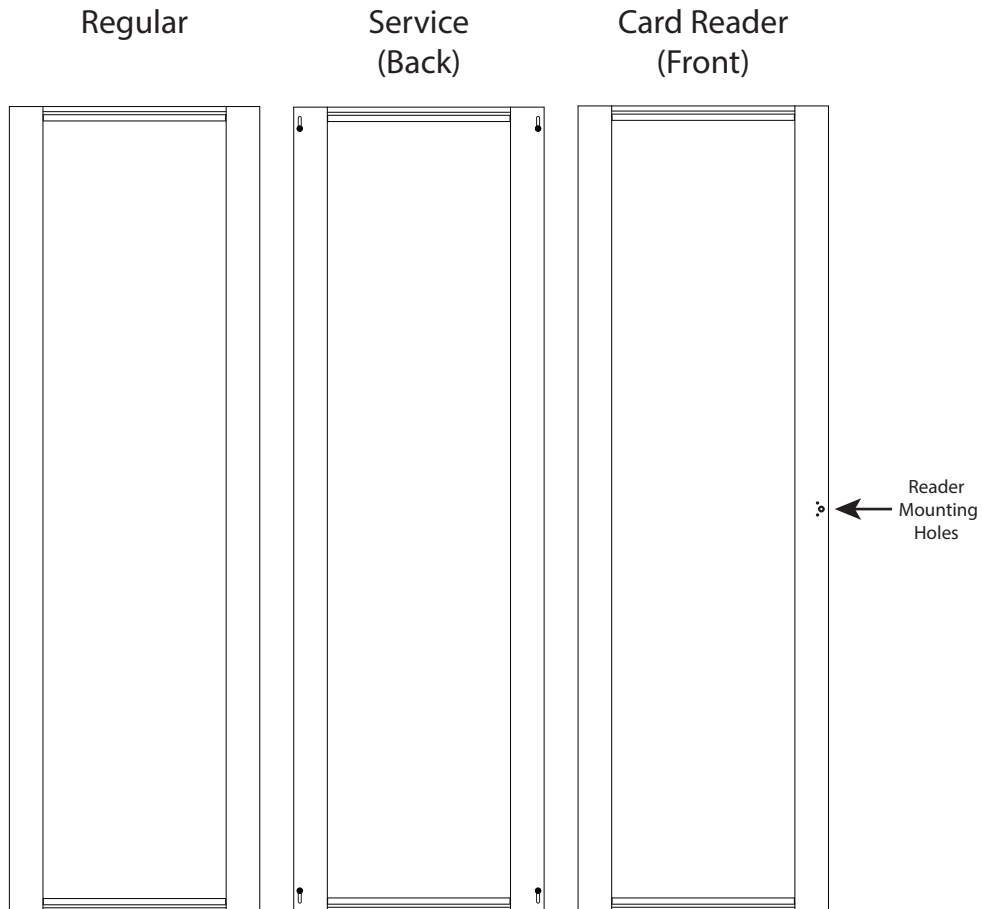


## Installation Instructions (continued)

5.) Remove canopy from installation location and drill 12x 7/8" holes 4" deep in each marked location. Remove dust and debris from these holes.

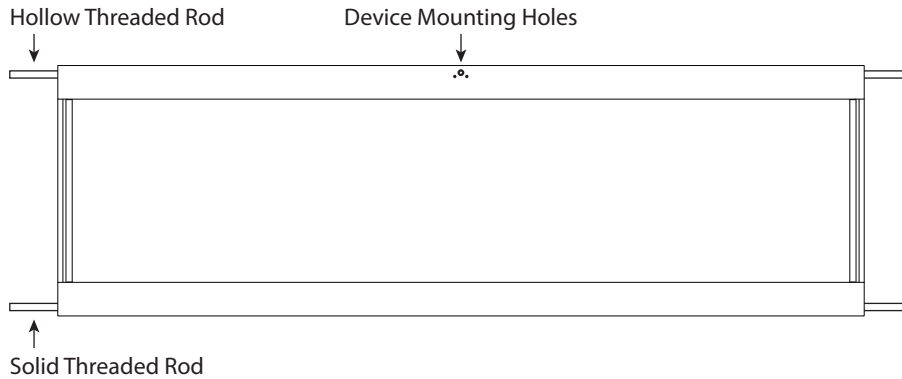


6.) Identify the various different types of yoke panels used in the production of the project uses. These yokes will go in different locations depending on the job specific layout.



## Installation Instructions (continued)

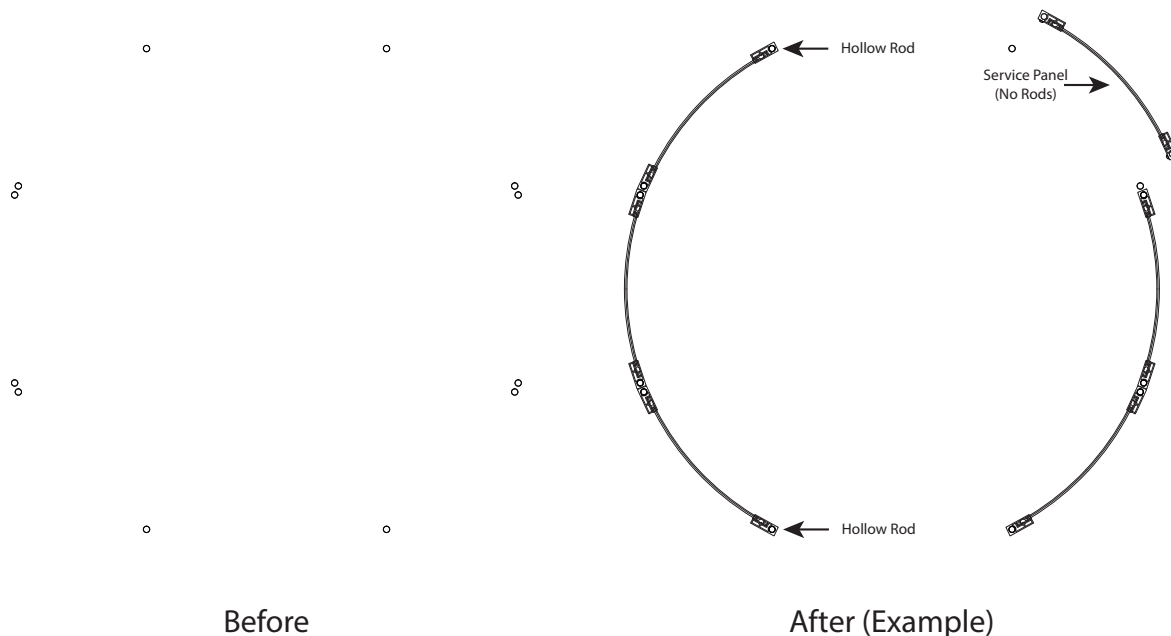
7.) In preparation of installation, slide the appropriate rods through the ends of the yokes (except for the service panel). Solid rods are to be used in most yokes, except where card reader (or possibly anti-piggybacking equipment) is to be installed.



8.) Prepare epoxy by following directions on package and pour into the holes drilled for the rods. **Do NOT pour epoxy into the two holes for the service panel!** Fill the holes approximately 3/4 of the way from the top.

9.) Stand the yoke panels up right and slide into drilled holes. **The installation layout may differ than illustrated, refer to canopy and control head box for specific placement of panels.**

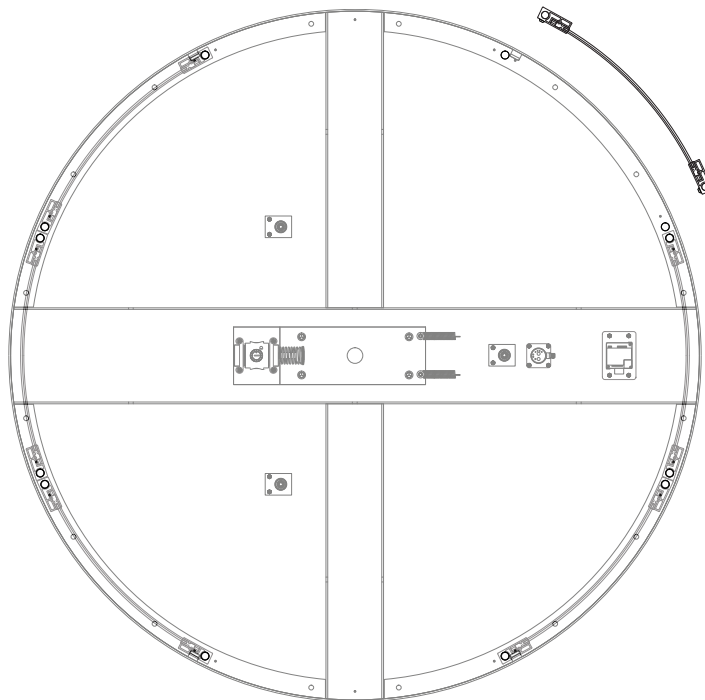
After all panels are in place, allow epoxy to cure per instructions epoxy package. Be sure to clean up any over spill or use blocks to space the panels off of the floor until the epoxy dries to prevent the panels from being glued to the floor.



## Installation Instructions (continued)

10.) Once the epoxy has cured, remove blocks from under yokes (if necessary) and prepare to lift the canopy. Pay attention to the alignment of where the main channel section, the ultrasonic sensor, etc. in relation to the final installation.

11.) Lift the canopy and place it on top of the assembled yoke panels. Feed the rods in the yokes through the holes in the canopy. Again, be sure to refer to the job specific info provided on the control head box and labels in canopy to determine which way that the canopy should be mounted.

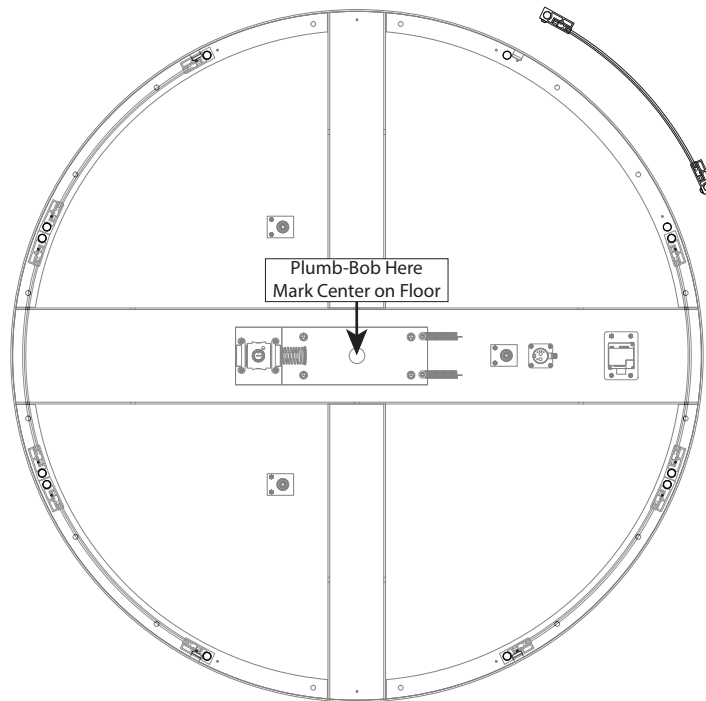


12.) Use a spirit level to level the canopy, shimming from the underside of the yokes where needed.

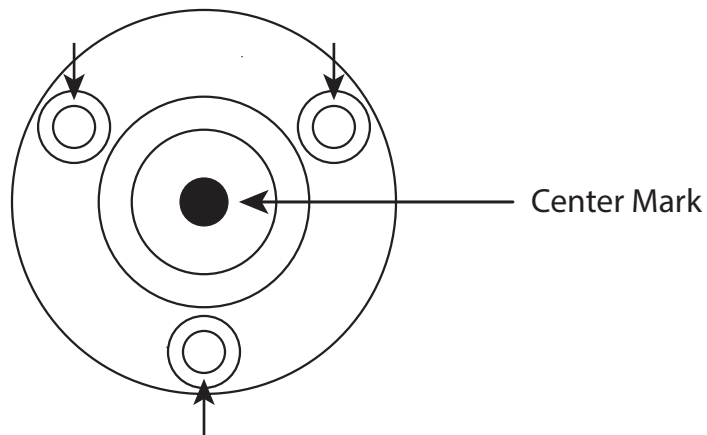
13.) Once the canopy is level, install 10x 3/4-16 stainless steel hex nuts onto each of the threaded rods and tighten to secure the entire assembly to the concrete.

## Installation Instructions (continued)

14.) Using a plumb bob, mark the center of the canopy onto the concrete by feeding it through the center hole.

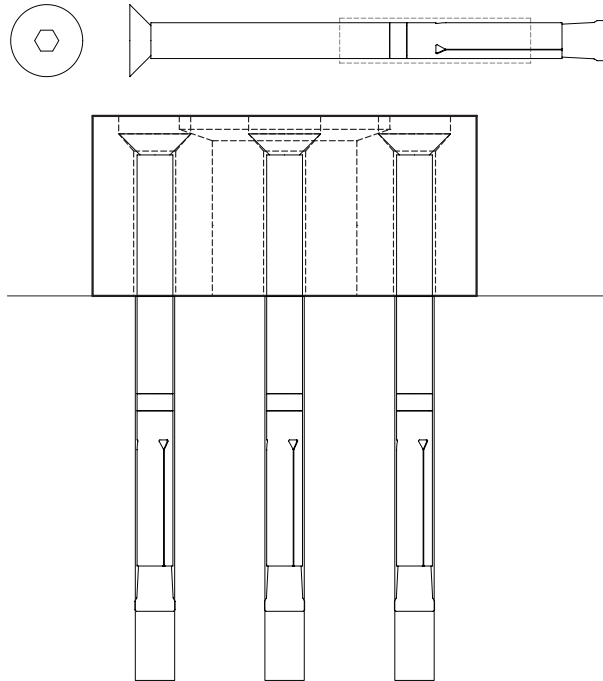


15.) Using the center mark, position the bearing mount block on the floor. Use it as a template to drill the 3x 3/8 diameter holes about 4" deep. Remove the dust from the holes once drilled.

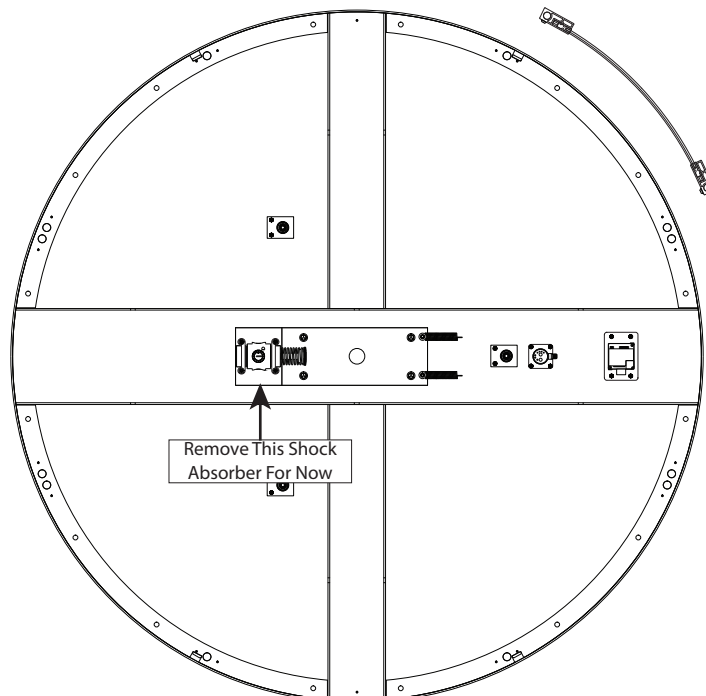


## Installation Instructions (continued)

16.) Hammer in the 3x 3/8 flat head concrete anchors into the holes and tighten them with an allen wrench to secure the bearing block to the concrete. This is the where the center pivot point of the rotor will balance from.

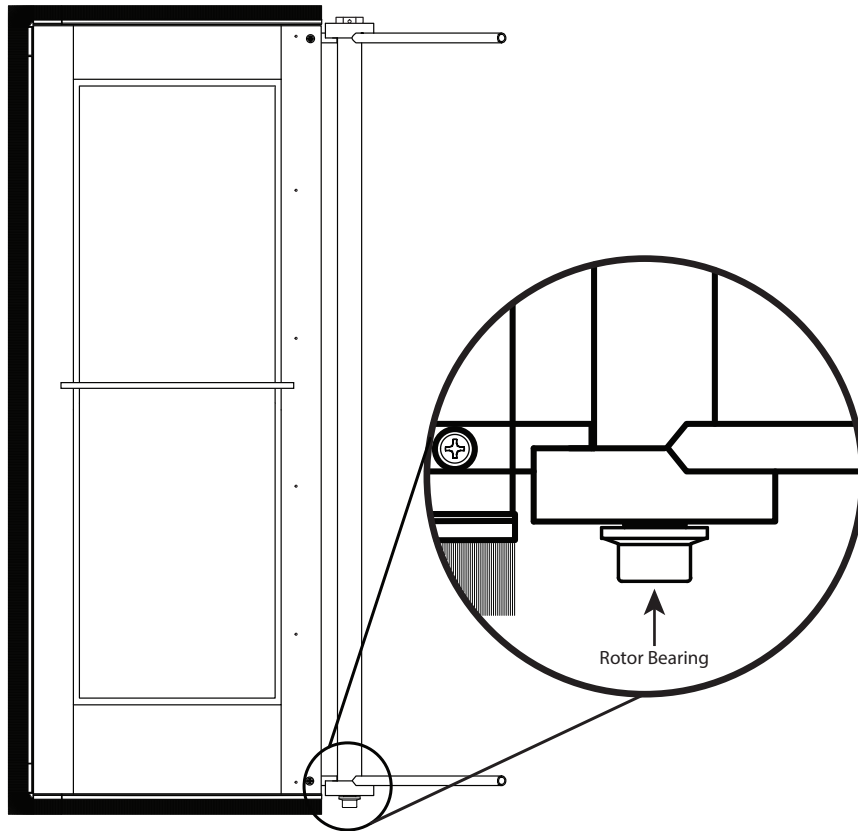


17.) Remove the hydraulic shock assembly from the canopy by unscrewing the 4x 5/16-18 button head cap screws holding it in place.

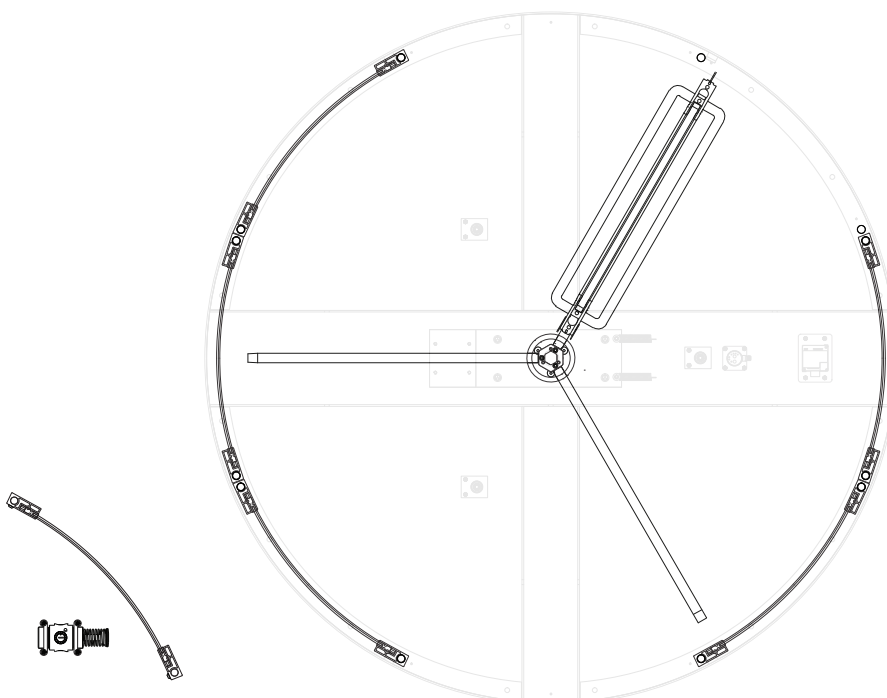


## Installation Instructions (continued)

18.) Remove packaging from partially assembled rotor and stand it up right. On the bottom of this assembly is the actual bearing that the rotor rides on.

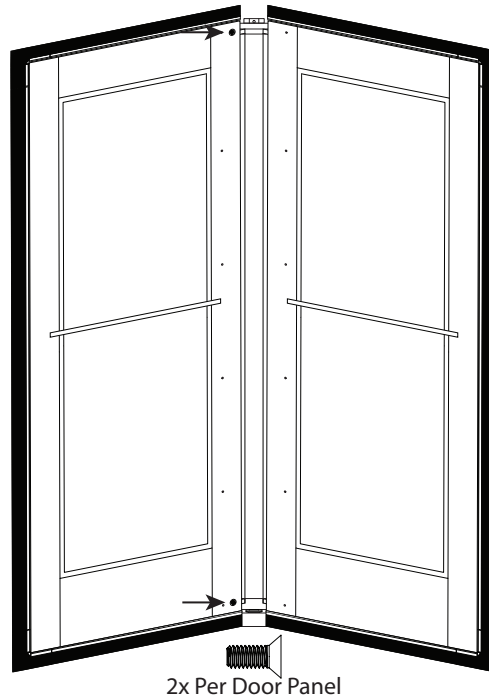


19.) Pivot the rotor into the portal through the opening left by the service panel and set the rotor onto the bearing block (the bearing will fit into the top of the block).

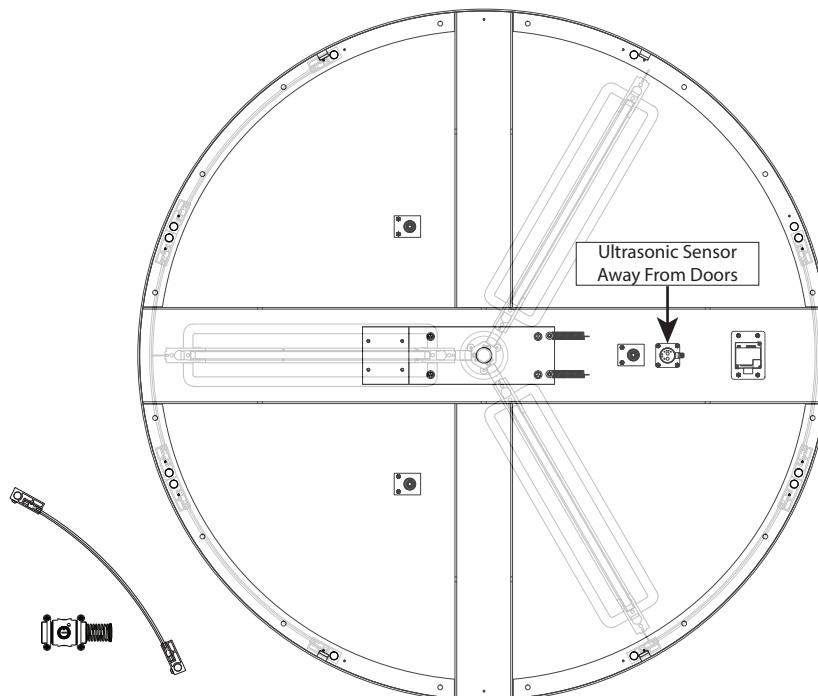


## Installation Instructions (continued)

20.) Slide the remaining two door panels onto the arms of the rotor tree. Push them close to the center. At the top and bottom of each door panel (on one side only) fasten the door panel to the rotor try by utilizing the 5/16 flat head screws in the holes located near the center on the rotor arms.

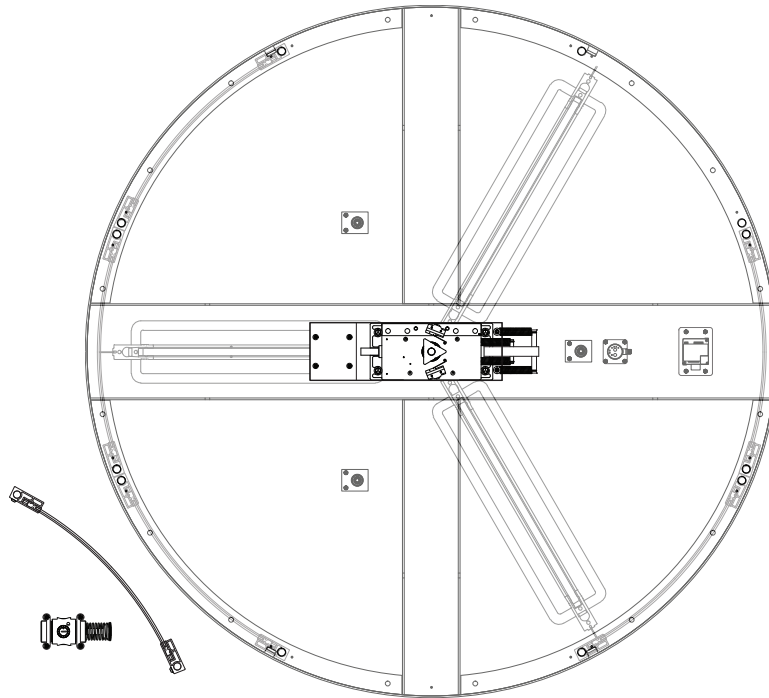


21.) **CRITICAL STEP** - Position rotor assembly so that one arm is located in the center of the passage, which is directly across from where the ultrasonic sensor is. The rotor must be aligned away from the ultrasonic sensor or there will be operational problems with the unit.

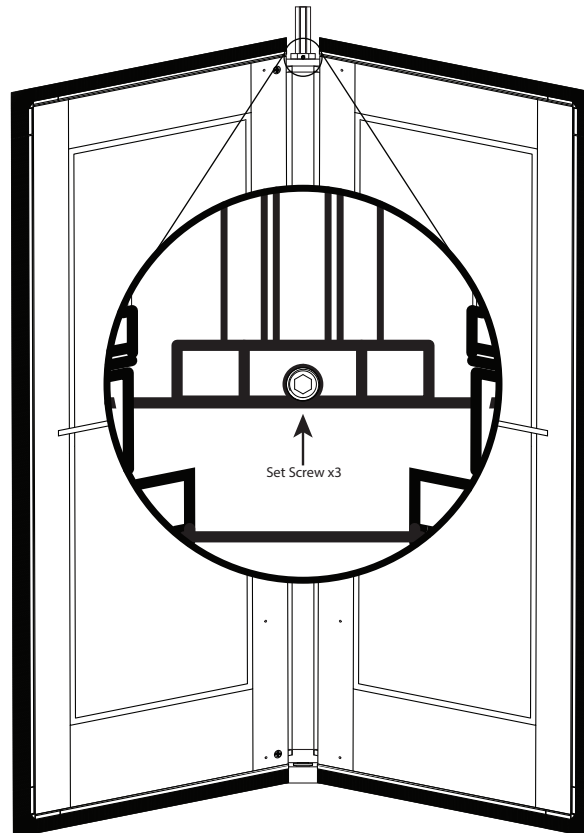


## Installation Instructions (continued)

22.) With the rotor in the correct position, insert the control head assembly into the top of the rotor through the canopy. This will probably require one person to hold the rotor while another feeds the shaft of the head into it. Connect the springs to the index pin.



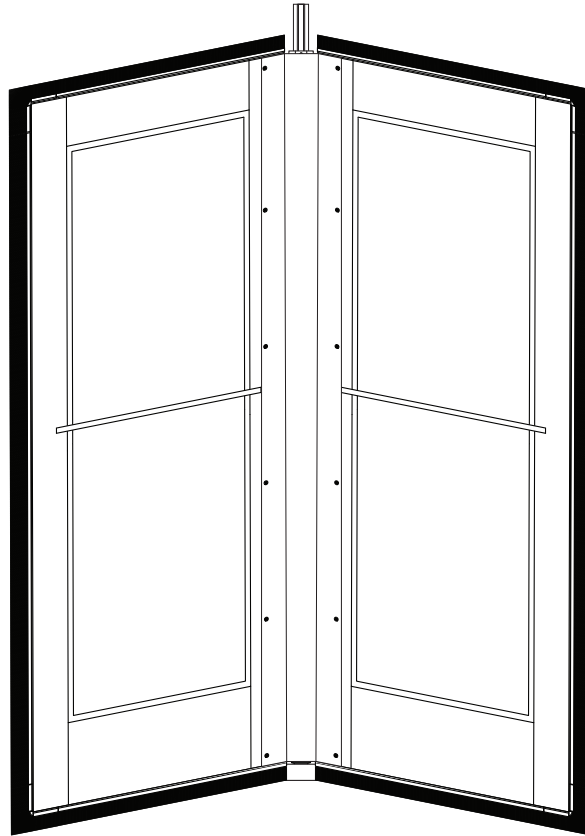
23.) Where the hex insert slides into the top of the rotor, tighten the 3x 3/8-16 set screws. This step can be easy to miss. It reduces rattling during rotation.



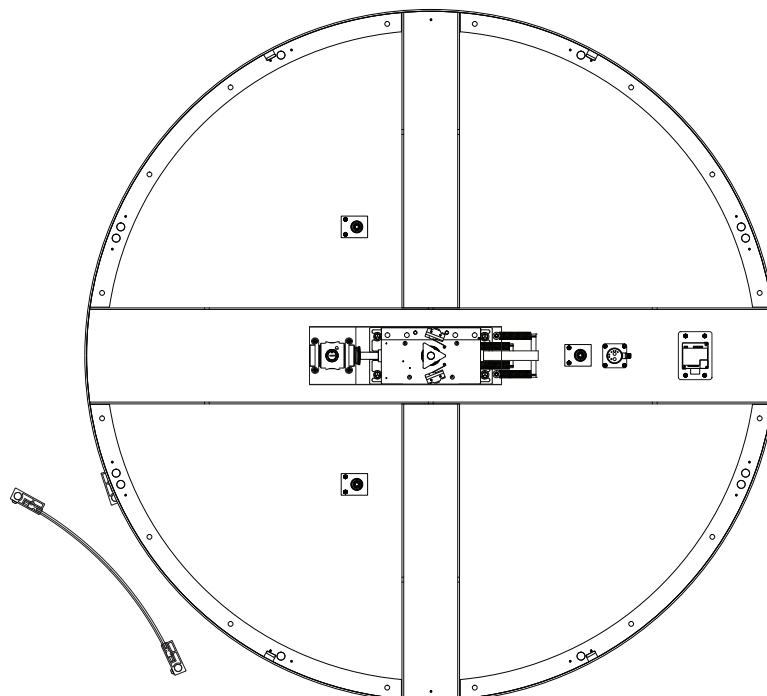


## Installation Instructions (continued)

24.) Install the 3x decorative rotor covers by attaching them to the door panels with the 10/32 flat head screws (12 per cover panel).

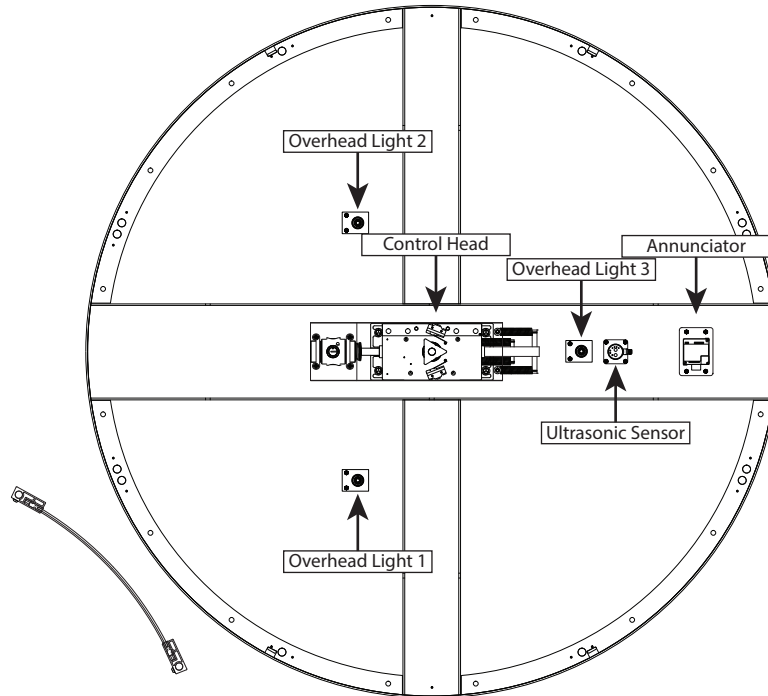


25.) Reinstall the hydraulic shock absorber by compressing the piston into the shock roller on the control head and fastening into place with the 5/16-18 button head screws.

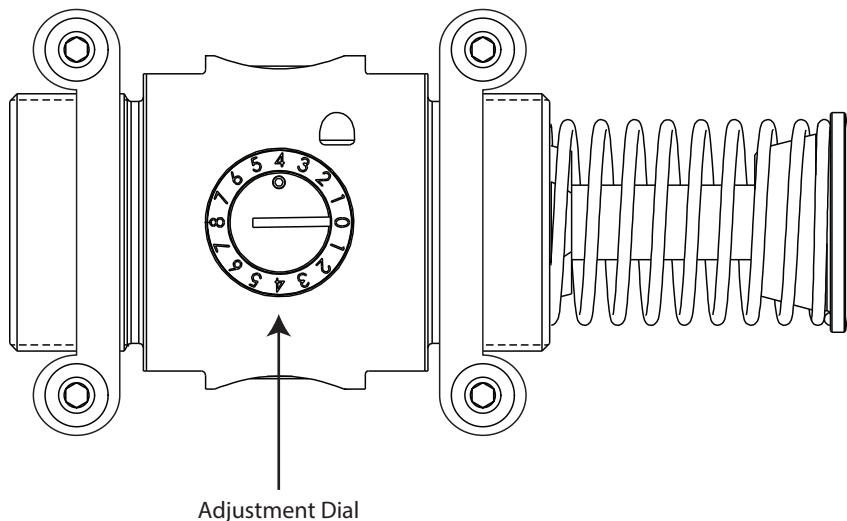


## Installation Instructions (continued)

26.) Mount the electronics rail to one of the main channel wings using provided side screws. Connect each of the electronic components to the various labeled cables on the electronics rail.

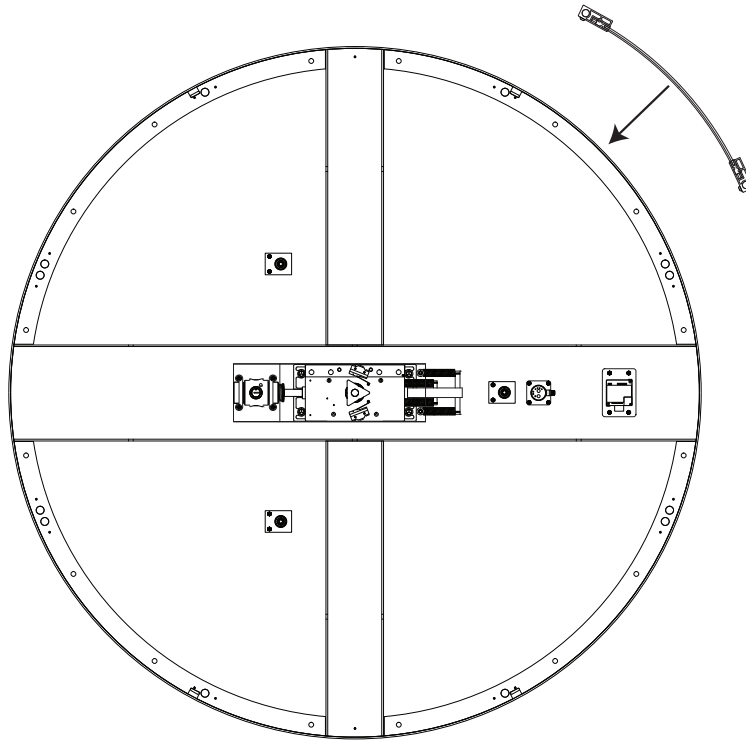


27.) Set hydraulic shock absorber by loosening small set screw on dial and turning dial with a screw driver or coin. Tighten the set screw back up before testing rotation. The higher the number, the more the shock power. Most installations will be around a 7, but even a slight nudge in either direction makes a tremendous difference. The rotor should self center but slow down before reaching home.

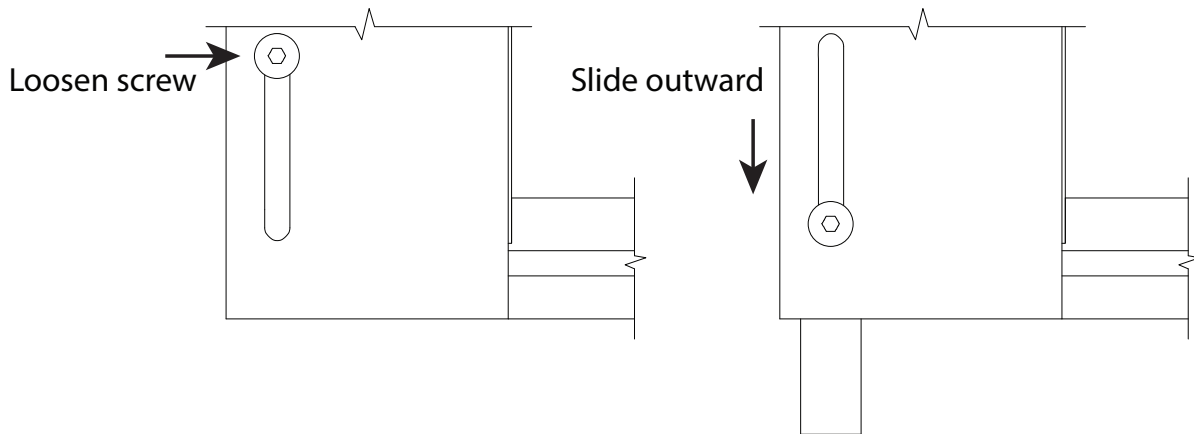


## Installation Instructions (continued)

28.) Install service panel by loosening the screws securing the service pins in the yoke and sliding them inside. Place yoke in open position, extend service pins and tighten screws. Add 3/4-10 nuts to the top pins once in place to prevent the panel from rattling.



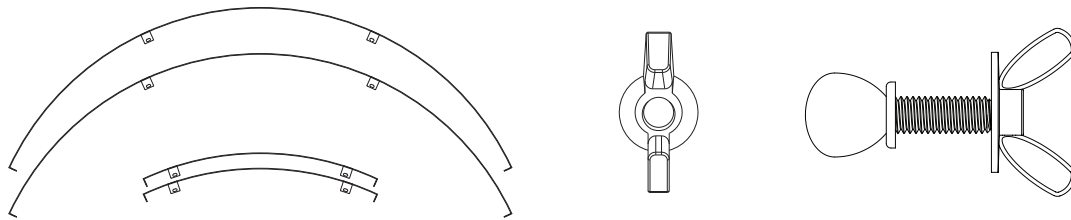
In all 4 corners of service panel...



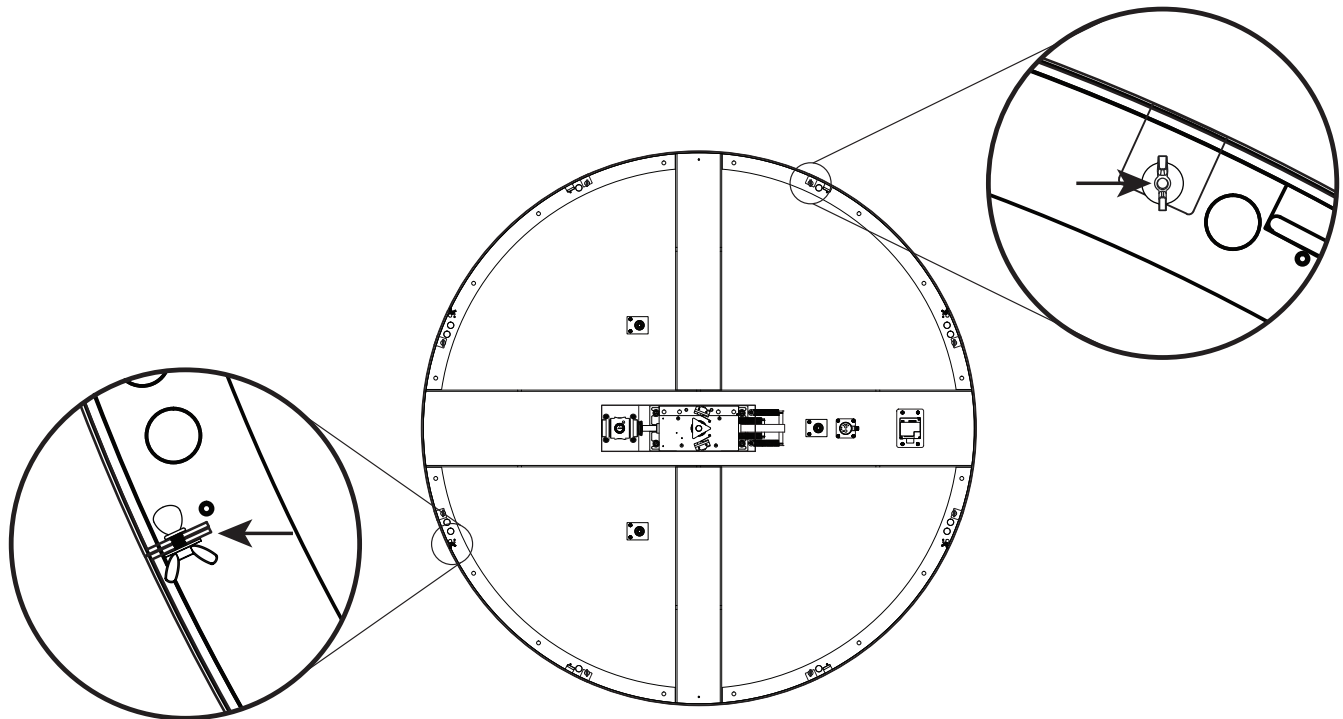
## Installation Instructions (continued)

29.) Following the wiring diagrams located a bit later in this manual, connect access control devices and options to the electronics. Test unit for operation, adjusting settings and hydraulic shock as needed until satisfied.

30.) Install decorative shroud wrap onto canopy. Each of the four parts of the wrap are designed to be fastened together with thumb screws while the entire wrap is designed to be secured to the canopy with wing nuts onto 10/32 studs coming out from the top of the canopy.



Secure wrap to canopy utilizing wing nuts on 10/32 studs coming out from the top (8 places)

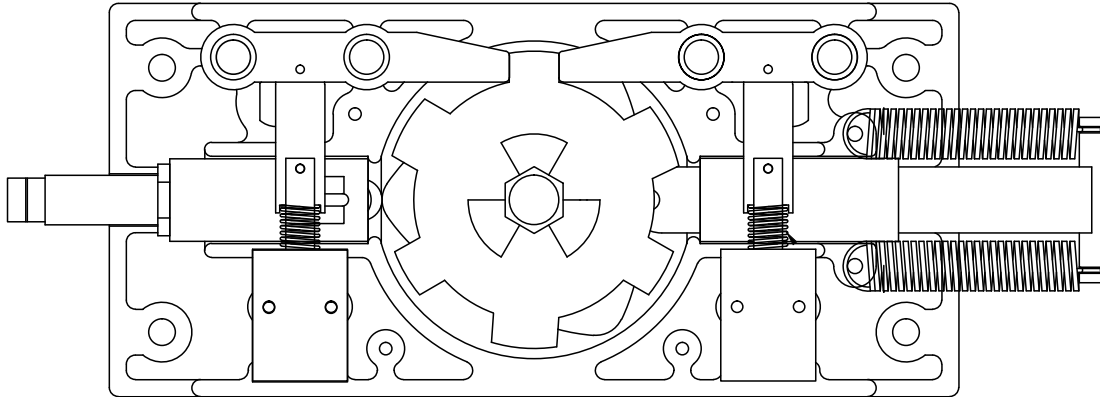


Secure wrap segments using 2x wing nuts and thumb screws per seam (4 places)

Please save this manual for future reference. If installed by a third party, please pass along to end user.

## 6500 Series Control Head Mechanical Information

All of our turnstiles and ADA gates operate with a mechanism called the 6500 Series Control Head. This sturdy and easy to maintain drive for the turnstile has replaced all previous model control heads. It is adaptable to nearly any existing turnstile and comes with each new turnstile purchase. This control head can be configured in multiple ways to accommodate the security requirements of each individual job site.



*An internal view of an electronically controlled two way 6500 series control head.*

While the head can be configured for mechanical (no electronics) operation, a turnstile's security potential is reached in the case of an electronic two way control head. In this instance, each rotational direction is independently unlocked. Configured properly, a control head will allow for one rotation per valid entry request. Our anti-backup cams are designed so that it is mechanically impossible to become trapped within the turnstile when properly installed.

Each control head comes preconfigured to your specific needs based off of a directional sheet that is filled out before shipment. The heads are delivered pre-wired, tested and adjusted to our factory recommendations. Installation is simple: connect inputs from access control devices into the logic controller and plug the unit's power supply into a 100-240 VAC (single phase) receptacle. The power supply will automatically set itself to function on your local voltage and convert it to 24VDC.

## 6500 Series Control Head Configurations

The 6500 Series Control Head can be configured in a number of different ways. All units operating with the 6500 Series Control Head self-center with a spring driven indexing pin and hydraulically shock to the home position to prevent damage or injury.

Various configurations are available to suit the needs of any environment. These include:

**Manual both ways:** Unit rotates freely in both directions. This unsecure configuration is used as a means to direct traffic through one area. Full height turnstiles can be also be purchased with an out of service lockout bar which would allow the end user to lock the turnstile with a standard pad lock.

**Manual one way:** Turnstile rotates in one direction but not the other. This is often used for egress only areas.

**Electronic one way with free exit:** Unit rotates freely in one direction but requires some form of access control in the other. This is a typical installation in many facilities that want to control who is entering but want egress to be free flowing.

**Electronic one way with no exit:** Turnstile is locked in both directions at all times, but in one direction can be unlocked with access control. Typically, this would be installed in scenarios where there is an alternate means of exiting the facility.

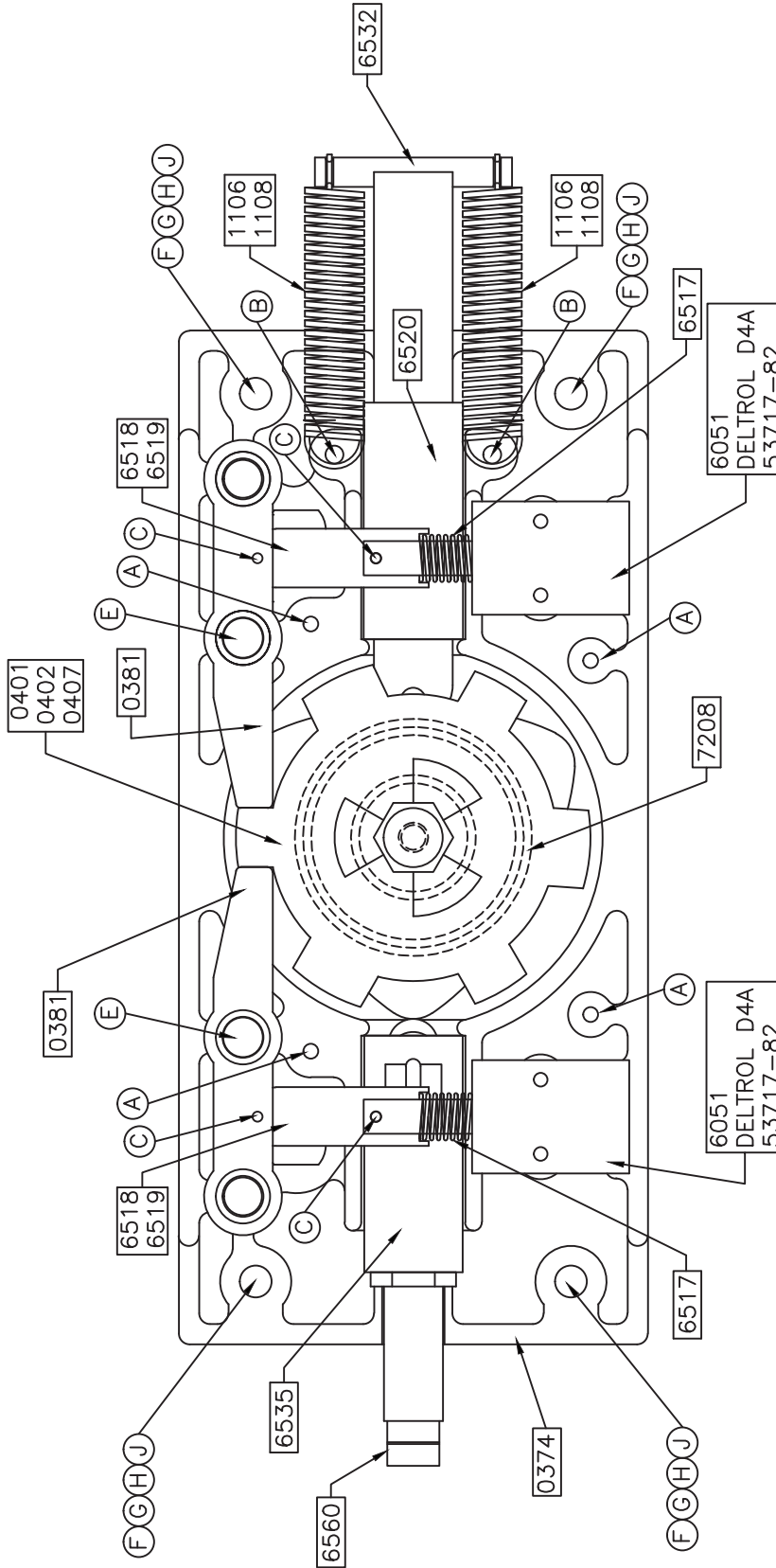
**Electronic two way:** Turnstile requires access control for both entering and exiting a facility. This configuration offers the highest level of security and also flexibility for installations.

**Fail lock:** Upon power failure, an electronically controlled direction would remain locked. This offers a high level of security but typically is not a good idea for egress unless alternate methods of exiting are available. Unless equipped with key overrides, this can be easily converted to fail open by ordering alternate parts. This is also known as fail secure.

**Fail open:** Upon power failure, an electronically controlled direction would remain open. This is the most common configuration as it allows for secure access controlled passage in normal situations but in power outages it free wheels. Unless equipped with key overrides, this can be easily converted to fail lock by ordering alternate parts. This is also known as fail safe.

**Key overrides:** This option is available on either electronic or manual two way models. It can allow for a quick reconfiguration of free flowing passage or locking in either direction. The key override option is not intended for constant every day use. Should you require an additional lock-down feature on your turnstile, a better option (on a full height turnstile) is an out of service lockout with a standard pad lock. Note that the key override option makes conversion between fail lock and fail open very difficult to accomplish and also may not be available for some turnstile or gate models.

TOP CASTING REMOVED



ALL ELECTRICAL COMPONENTS UL CERTIFIED

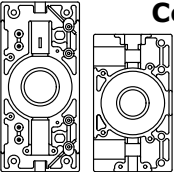
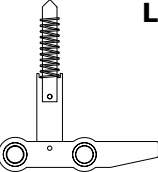
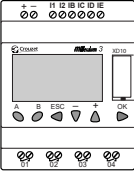
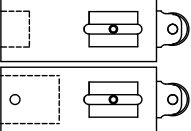
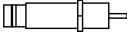


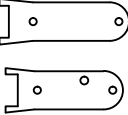

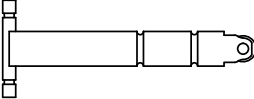
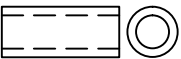
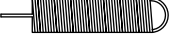
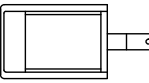
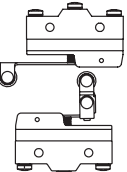


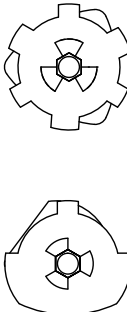
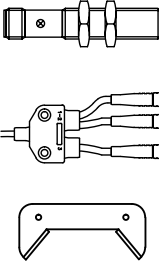
NOTE:  
ALL WIRE AWG 18 GAUGE 300 VAC  
UL 1007/1569

SYM	QTY	DESCRIPTION
(A)	4	1/4-20 x 1" SOCKET HEAD
(B)	2	1/4"φ x 1 1/4" SPRING PIN
(C)	4	1/8"φ x 5/8" SPRING PIN
(E)	2	1/2"φ X 2 1/4" DOWEL PIN

WAIST HIGH UNITS		
(F)	4	5/16 x 1-1/2" SS CARRIAGE BOLT
(G)	4	5/16 SS FLAT WASHER
(H)	4	5/16 SS LOCK WASHER
(J)	4	5/16 SS HEX NUT

FULL HEIGHT UNITS		
(F)	4	3/8" x 1-1/2" SS CARRIAGE BOLT
(G)	4	3/8 SS FLAT WASHER
(H)	4	3/8 SS LOCK WASHER
(J)	4	3/8 SS HEX NUT

6500 SERIES CONTROL HEAD BOTTOM ASSEMBLY

 <p><b>Control Head Castings</b> 0373 - Bottom Casting 0372 - Top Casting</p>	 <p><b>Locking Bar Assemblies</b> 0382 - Fail Open Assembly 0383 - Fail Lock Assembly</p>	 <p>0740 - Logic Controller (XD10)</p>
 <p><b>Shock Housing Assemblies</b> 6535 - WH/427/430/T80/ADA 6541 - 439/448/P60/HD</p>	 <p><b>Hydraulic Shock Absorbers</b> 6560 - WH/427/430/T80/ADA 6561 - 439/448/P60/HD</p>	 <p>0751 - 24VDC Power Supply (60 W) w/ NEMA 5-15 Drop Cord</p>
 <p>0381 - Locking Bar Casting w/ Oil Impregnated Bushings</p>	 <p><b>Locking Bar Linkages</b> 6519 - Fail Open 6518 - Fail Lock</p>	 <p><b>Solenoid Springs</b> 6510 - Fail Open Spring 6016 - Fail Lock Spring</p>
 <p>6532 - Index Pin</p>	 <p>6520 - Index Pin Tubing</p>	 <p><b>Indexing Springs</b> 1106 - Waist High (Light) 1108 - Full Height (Heavy) 1107 - ADA (Extra Heavy)</p>
 <p>6051 - Solenoid Deltrol D4A53717-82</p>	 <p><b>Limit Switches</b> 2180 - Standard (Z-15GW2-B7-K) 1700 - One Way (BZ2RW825-A2)</p>	 <p><b>Limit Switch Cams</b> 2267 - Standard 2268 - ADA 2269 - One-Way</p>
 <p><b>Control Head Bearings</b> 7208 - Bottom casting on all models (6007RSNR) 1641 - 1" ID for HS-22/439/448/P60/RD70/Pre 2018 Top Castings (1641-2RSNR) 1640 - 7/8" ID for WH/ADA/T80 and 7/8" hex cams sold after 2018 (1640-2RSNR)</p>	 <p><b>Cam Assemblies</b> 0415 - All HS-22 Models/439/448/HD (1.25" Hex, Short) 0407 - P60 &amp; RD70 Models (1.25" Hex, Long) 0401 - T80/WH/Legacy 427/430 (7/8 Hex Shaft) 0402 - ADA w/ Arm Adaptor 0416 - ADA w/ Chain Drive</p>	 <p><b>Proximity Sensor &amp; Accessories</b> 7211 - 24VDC PNP Prox. Sensor w/ M12 Connector (Sick 1040763) 0766 - 3 Branch M12 Splitter 6589 - Turnstile Prox. Bracket w/ 3x Mounts - LH, RH &amp; Home</p>



## 6500 Series Control Head Locking Bar Information

The 6500 Series Control Head is built to order based on a direction set up sheet sent with each quote. This sheet defines how each direction of passage functions.

Direction 1 is defined as clockwise rotation on a full height or with the cabinet on the right for waist high. Direction 2 is defined as counter-clockwise rotation on a full height or with the cabinet on the left for waist high.

Possible configurations include: no passage, free passage (manual), fail lock and fail open. Fail lock and fail open are not field reversible without additional components.

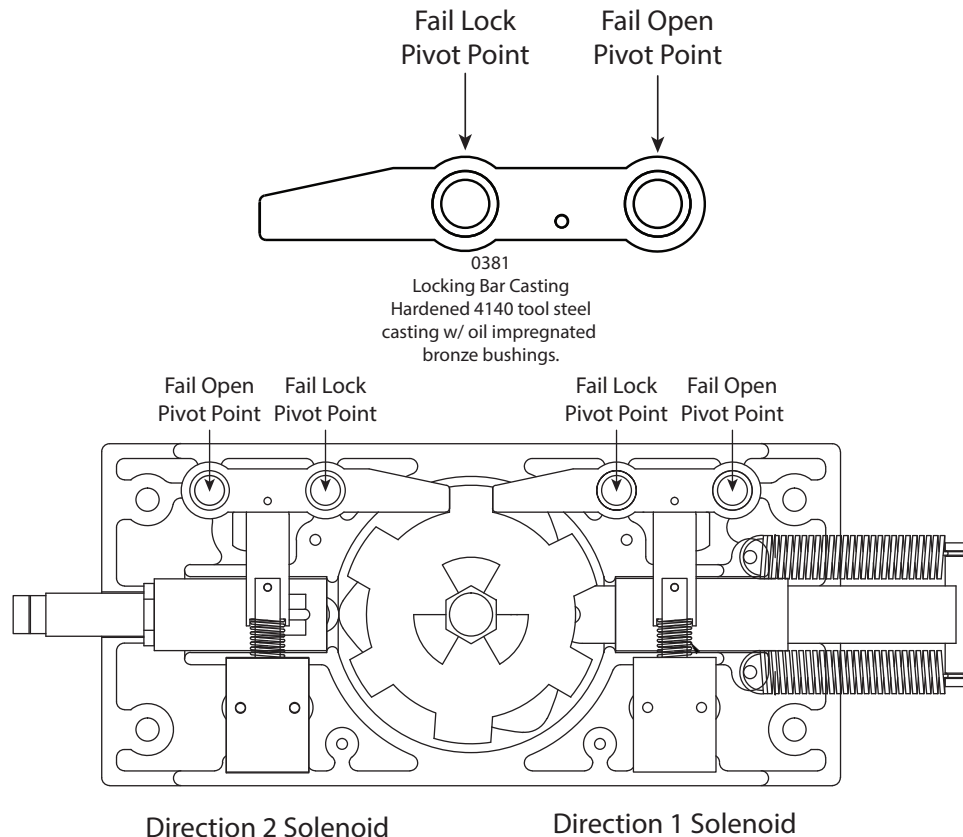
“No passage” directions include a fail lock locking bar assembly as well as an unwired solenoid. This adds the appropriate parts to the control head to prevent it from rotating in that direction.

“Free passage” (or manual) directions remove the solenoid and locking bar assembly, allowing the cam to spin freely.

Each direction has a pair of holes on the locking bar and control head casting. These holes act as pivot points for the locking bar casting. The inner holes are fail lock and outer holes are fail open. A .5” dowel pin slides through the entire assembly to hold everything in place.

Alternate linkages and springs are needed to convert a direction’s power failure status.

If optional key overrides are included, it becomes much more difficult to re-arrange the configuration. Typically it is best to send the control head into the factory to reconfigure any key override equipped head to ensure everything is done correctly.



## 6500 Series Control Head Locking Bar Information (Continued)

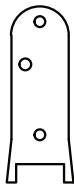
The 6500 Series Control Head can be reconfigured from fail lock to fail open and vice versa. Extra components are required to do so.

If a control head has key overrides, we suggest sending it in for factory reconfiguration.

Locking bar assemblies are held together with 1/8" spring pins. Extracting these pins and reinstalling them can be tricky, so for convenience we also offer entire locking bar assemblies.

Replacing an entire locking bar assembly is simple; punch the .5" dowel pin from the pivot point through the head casting (via a small hole in the bottom casting for this purpose), pull out the old locking bar assembly and replace it with the new one.

If changing from fail lock to fail open or vice versa, install the dowel pin in the alternate hole.



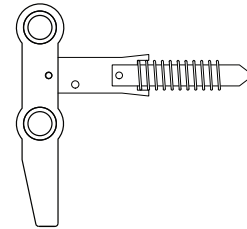
6518

**Fail Lock Linkage**  
These have an approximate length of 2.25" and also include an extra hole the key override option.



6010

**Fail Lock Solenoid Spring**  
These look the same as the fail open, but are actually lighter in force. Wire diameter is .032". This spring was also used on the 6100 Series Control Head.



0383

**Fail Lock Locking Bar Assembly**  
Includes locking bar casting w/ oil impregnated bushings, solenoid spring, locking bar linkage, and solenoid plunger.



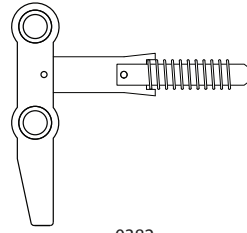
6519

**Fail Open Linkage**  
These have an approximate length of 2.5" and do not have the extra hole for the key override option.



6510

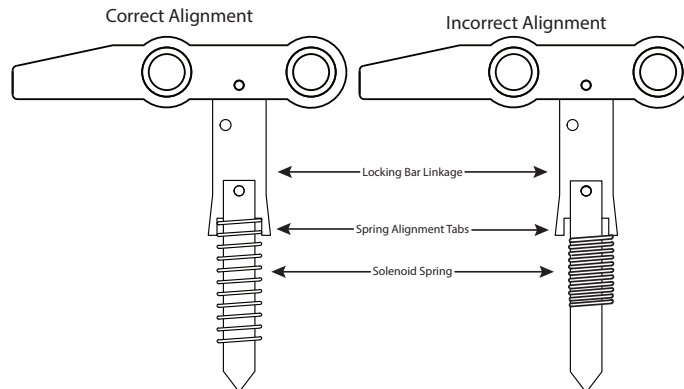
**Fail Open Solenoid Spring**  
These look similar to fail lock, but are actually stronger in force. Wire diameter is .041".



0382

**Fail Open Locking Bar Assembly**  
Includes locking bar casting w/ oil impregnated bushings, solenoid spring, locking bar linkage, and solenoid plunger.

Make sure the solenoid spring is between the alignment tabs on the linkage or the assembly may bind when pivoting.

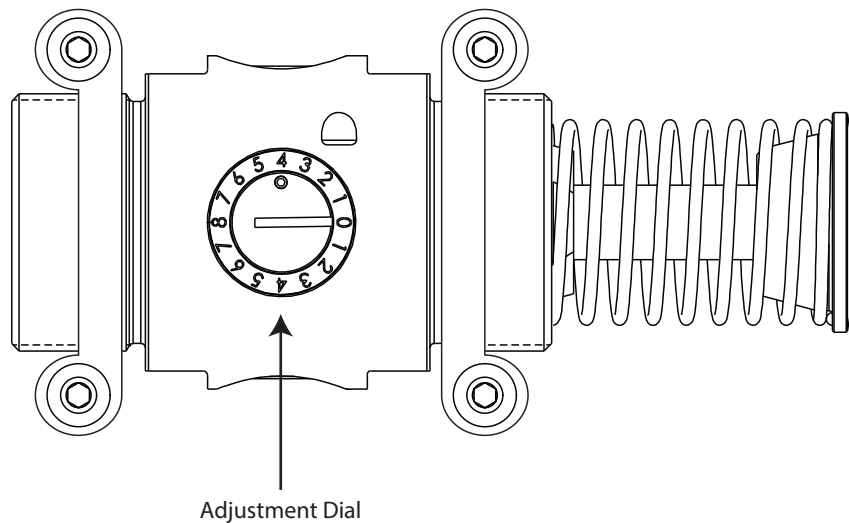


## RD70 Shock and Indexing Information

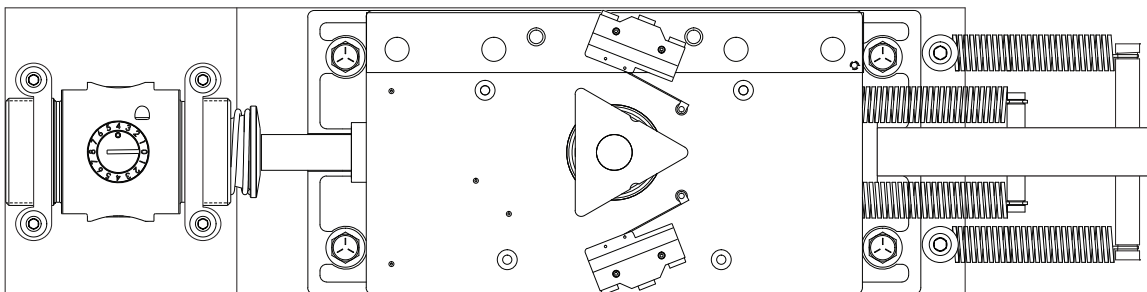
Each RD70 is equipped with a large foot mount hydraulic shock. This shock should never need to be replaced, but in the event it needs to, contact Controlled Access, Inc. and ask for part number 6547.

This shock is adjusted by loosening the small set screw on the dial face and turning the dial with a screw driver or coin. The higher the number, the more shocking power.

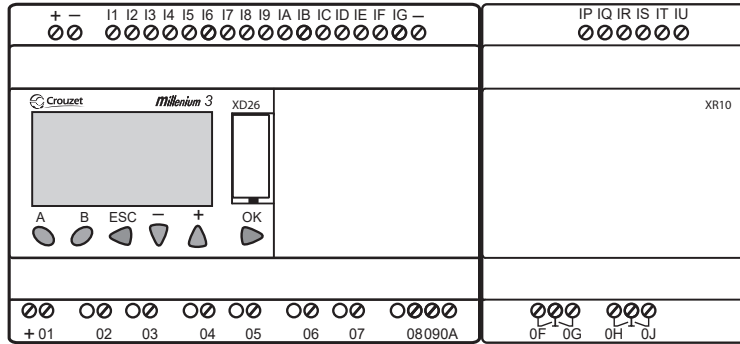
This shock can be very sensitive and even the smallest adjustment can make a major difference, so it is recommended that the set screw is tightened down between each adjustment until the rotation is just right - with the rotor still self-centering but without slamming in the home position.



Due to the mass of the rotor, the control head also has a special index pin that is equipped to accommodate four springs instead of two. Please contact us if there is ever any need to replace either the springs or the special index pin.



## RD70 Wiring Legend (Gen 3.)



Each unit is built to order, pre-configured to function as specified at the time the order is placed. Some or all of the information listed may not be relevant to the installation.

Inputs are triggered with local 24VDC + (also known as PNP or sourcing). Connect relay output from access control device to turnstile by terminating 24VDC + to relay common and the desired input to the relay's normally open terminal.

Be sure to disconnect power before wiring the board for safety.

### Input Descriptions:

+: 24VDC + Input from Power Supply

-: 24VDC - Input from Power Supply

11: Direction 1 Input - Unlocks the rotor clockwise for one rotation or until the timer expires.

12: Direction 2 Input - Unlocks the rotor counter clockwise for one rotation or until the timer expires.

13: Fire Alarm Input - Unlocks the rotor in both directions for the duration of contact closure.

14: Ultrasonic Input - Output from ultrasonic sensor terminates here, sets unit in alarm mode upon activation.

15: Limit 1 Input - Detects clockwise rotation to lock unit after access control activation.

16: Limit 2 Input - Detects counter clockwise rotation to lock unit after access control activation.

17: Free Passage Input - Optional free passage sensor output terminates here, free passage setting must be defined.

18: Piggyback Input - Optional piggyback alarm output terminates here, piggyback setting must be defined.

All other inputs unused.

### Output Descriptions:

+: Must be connected to 24VDC+

O1: Direction 1 Go Light Output - Activates CW overhead light to be green. Optional side light green wire also is terminated here unless the direction free passage.

O2: Direction 1 Yield Light Output - Activates CW overhead light to be yellow. Optional side light yellow wire also is terminated here if the direction is free passage.

O3: Direction 1 Side Light Output - Depending on if the unit is equipped with a free exit sensor, this will output is for the (optional) side yellow LED (if controlled passage) or the (optional) side green LED (if free passage).

O4: Direction 2 Go Light Output - Activates CCW overhead light to be green. Optional side light green wire also is terminated here unless the direction free passage.

O5: Direction 2 Yield Light Output - Activates CCW overhead light to be yellow. Optional side light yellow wire also is terminated here if the direction is free passage.

O6: Direction 2 Side Light Output - Depending on if the unit is equipped with a free exit sensor, this will output is for the (optional) side yellow LED (if controlled passage) or the (optional) side green LED (if free passage).

O7: Wrong Area Red Light Output - Turns the overhead light in the wrong area red while active in either direction.

O8: Alarm Lights - Turns all over head lights to alarm output mode to indicate the ultrasonic sensor detected that someone is in the wrong area of the portal or if the (optional) piggyback sensor detected piggybacking.

O9: Annunciator Pin 1 - Alone, this output sounds the annunciator to indicate the rotor should rotate clockwise. Together with OA, the message about the ultrasonic alarm is played.

OA: Annunciator Pin 2 - Alone, this output sounds the annunciator to indicate the rotor should rotate counter clockwise. Together with O9, the message about the ultrasonic alarm is played.

OF: Direction 1 Solenoid Output - Engages or disengages the direction 1 solenoid. Shared common to 24VDC+.

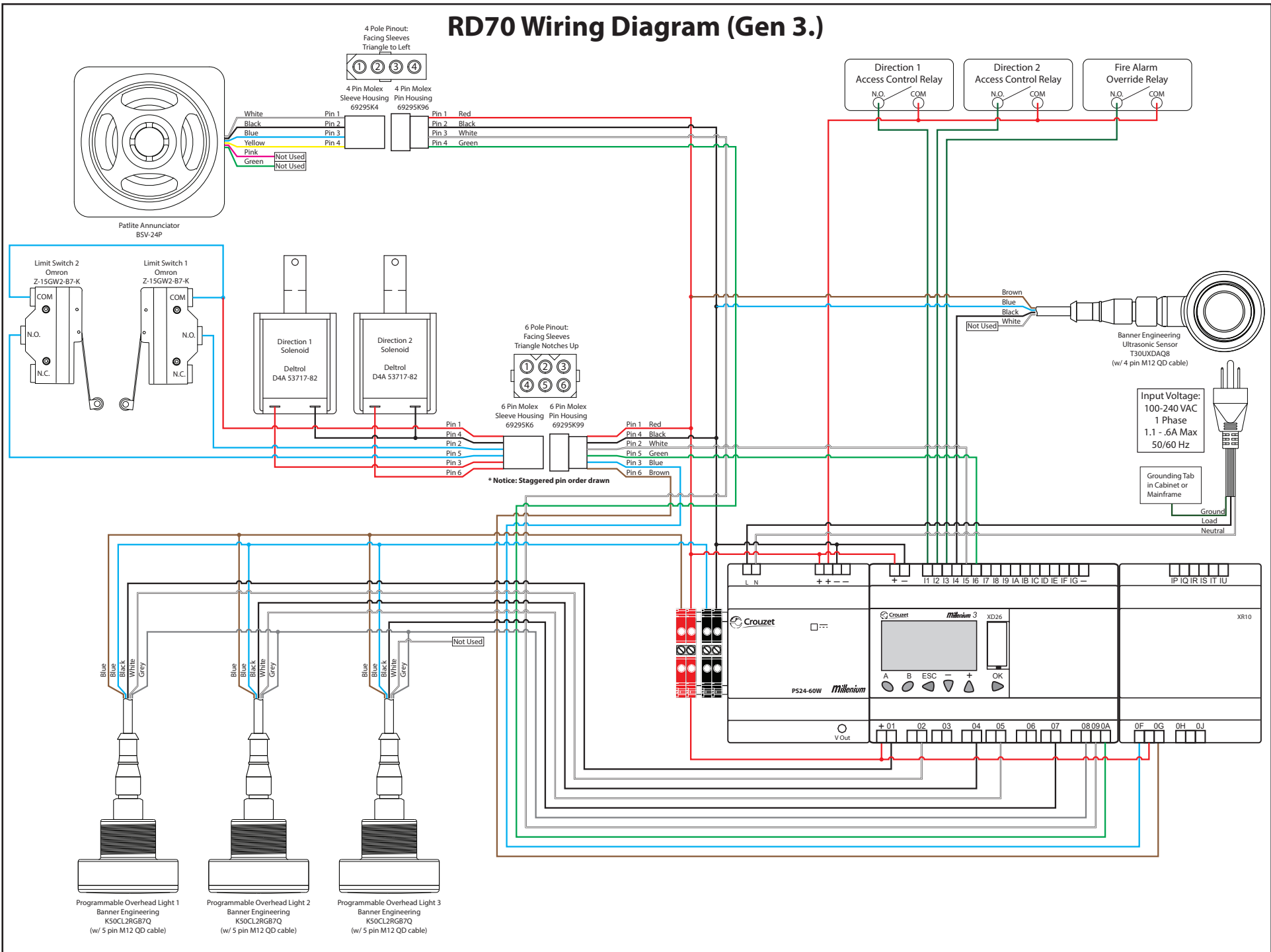
OG: Direction 2 Solenoid Output - Engages or disengages the direction 2 solenoid. Shared common to 24VDC+.

OH: Piggyback Sensor Trigger - This output is used to activate the (optional) piggyback sensor along with the common.

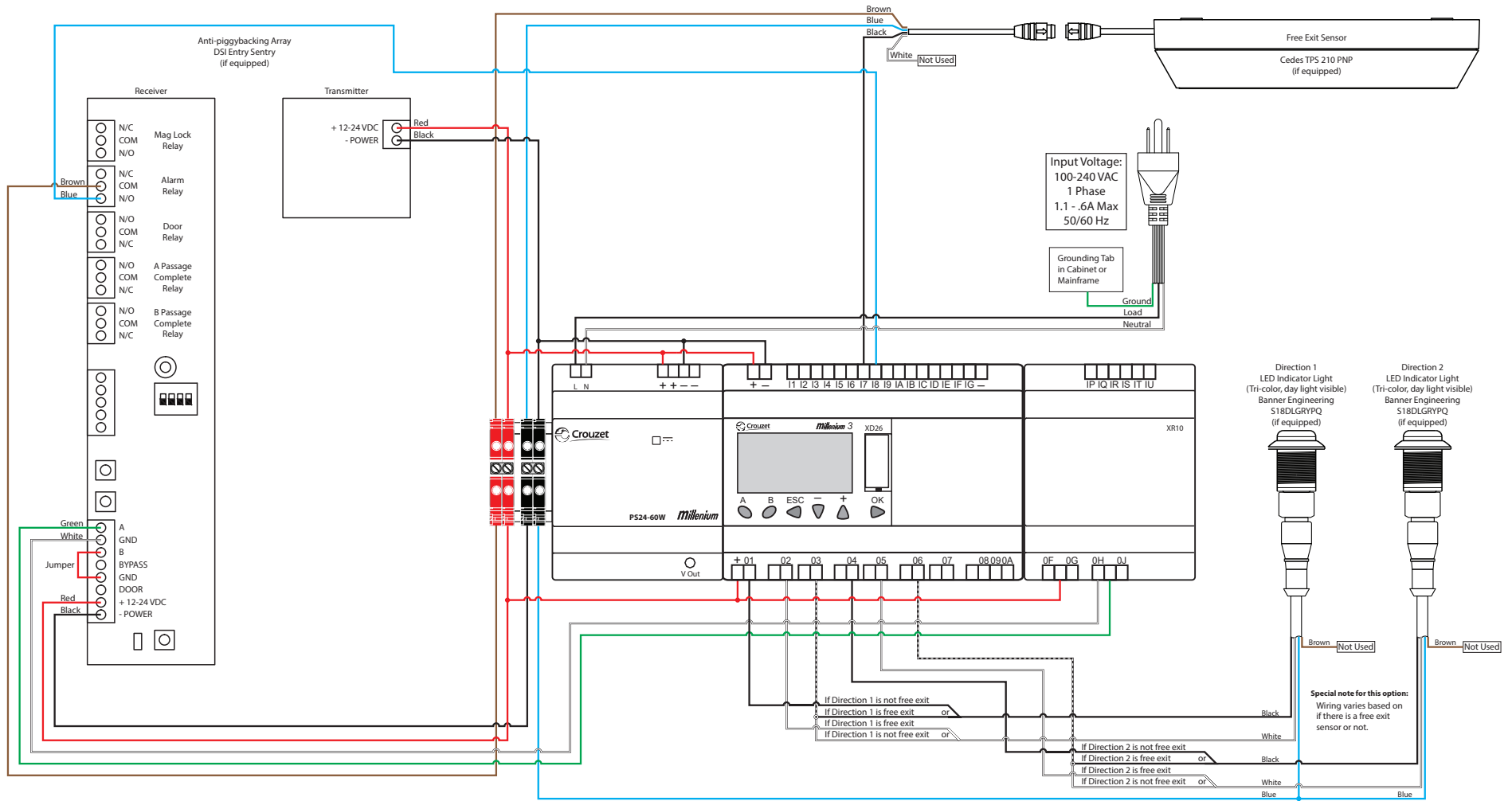
OJ: Not Used

Outputs on the XD26 are transistor PNP outputs. Outputs on the XR10 are relay outputs in which the first common is connected to 24VDC+. Voltage for other devices can be taken from this common terminal if needed.

# RD70 Wiring Diagram (Gen 3.)



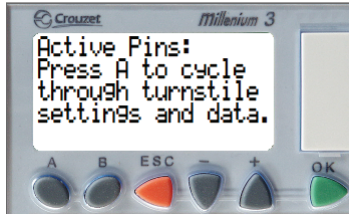
# RD70 Optional Components Wiring (Gen 3.)



## RD70 Gen 3. Settings & Statistics

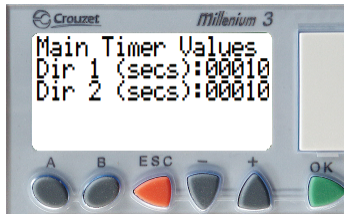
The logic controller on the RD70 has a text based menu screen to adjust settings and view statistics of the turnstile. Pressing the A button will cycle to each of the screens available on the device. Pressing B from any screen listed will return to the Home Screen.

### Home Screen



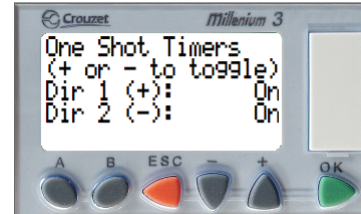
This screen is at the start of the menu cycle. The top section will give a read out of inputs that are currently receiving voltage. The display will return to this screen after cycling through all windows, 5 minutes of inactivity or pressing the B button.

### Timer Values Screen



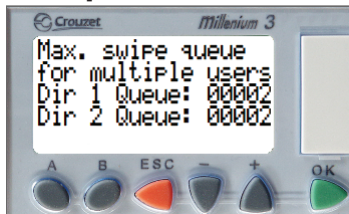
This screen allows for the each directional timer to be modified. Select which value you wish to edit by pressing the + & - key. Press OK to select the value then press + or - to modify. Save by pressing the OK button again. Each timer can have a value of 1 - 60 seconds. The timer will be canceled upon rotation of unit.

### One-Shot Timers Screen



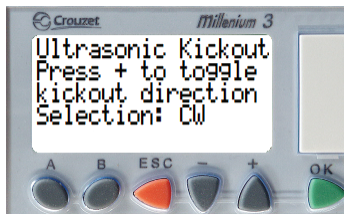
This screen allows for the two one-shot timer settings to be enabled or disabled. This setting prevents access control from holding open a direction on the standard direction inputs. Toggle Direction 1 by pressing + and Direction 2 by pressing -. This should be set to "On" in almost every installation.

### Swipe Queue Screen



This screen defines the maximum number of access control requests the unit will allow in queue. Each value can be set from between 1 (for maximum security) to 3 (for fast paced passage). The default is 2. The method to change these settings is the same as the Timer Values Screen.

### Ultrasonic Kickout Screen



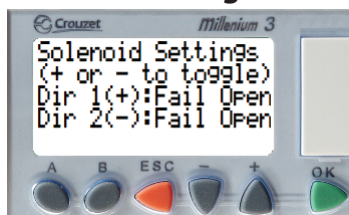
This screen designates which direction the unit will rotate in the event the ultrasonic sensor detects someone in the wrong area of the passage. Pressing + will toggle between CW and CCW.

### Ultrasonic Kickout Delay



This screen defines how long the ultrasonic sensor must output before engaging the ultrasonic sensor's alarm scenario.

### Solenoid Settings Screen



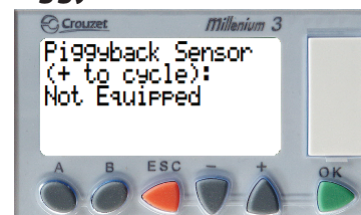
This screen defines whether each solenoid is fail lock or fail open. Most installations are going to be fail open in both directions. Pressing + and - toggles each direction.

### Free Exit Sensor Screen



This screen defines whether a free exit sensor is equipped on the unit and which direction it is equipped for. Pressing + cycles between not equipped, CW or CCW.

### Piggyback Sensor Screen

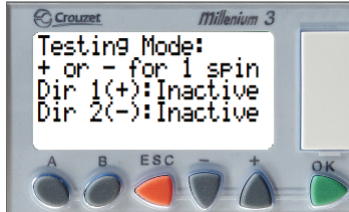


This screen defines whether a piggyback detection sensor is equipped on the unit and which direction it is equipped for. Pressing + cycles between not equipped, CW or CCW>

## RD70 Gen 3. Settings & Statistics, continued.

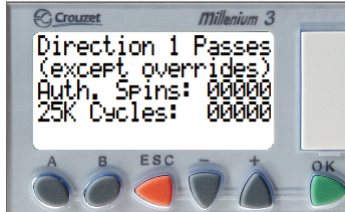
The logic controller on the RD70 has a text based menu screen to adjust settings and view statistics of the turnstile. Pressing the A button will cycle to each of the screens available on the device. Pressing B from any screen listed will return to the Home Screen.

### Testing Mode Screen



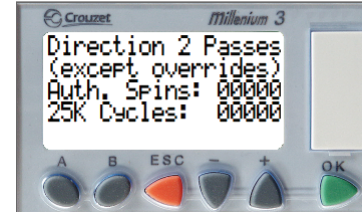
While this screen is active, the unit can be tested with push buttons to simulate access control inputs. See the page dedicated to testing for more information.

### Direction 1 Counts Screen



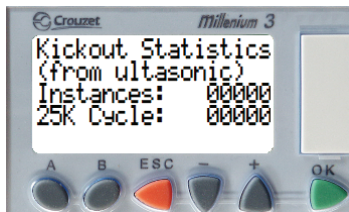
This screen gives statistics about how many times direction 1 was activated and cycled. Since there is a limit to how many counts can be displayed, after 25000 cycles the first counter resets and adds to the second counter.

### Direction 2 Counts Screen



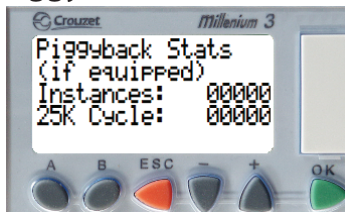
This screen gives statistics about how many times direction 2 was activated and cycled. Since there is a limit to how many counts can be displayed, after 25000 cycles the first counter resets and adds to the second counter.

### Kickout Counts Screen



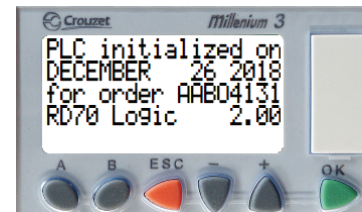
This screen gives statistics about how many times the ultrasonic alarm scenario activated and cycled. Since there is a limit to how many counts can be displayed, after 25000 cycles the first counter resets and adds to the second counter.

### Piggyback Counts Screen



This screen gives statistics about how many times the anti piggy-backing scenario activated and cycled (if unit is equipped). Since there is a limit to how many counts can be displayed, after 25000 cycles the first counter resets and adds to the second counter.

### General Info Screen



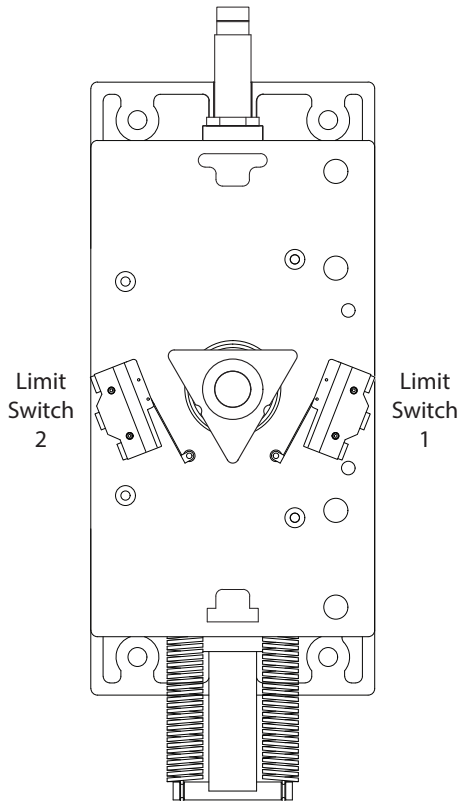
This screen displays when the PLC was initiated, the order number it was activated for (except for any revision suffixes which are not needed for order lookup), and the PLC software version.



## 6500 Series Control Head Limit Switch Information

Electronically controlled 6500 Series Control Heads utilize limit switches (or optionally, proximity sensors) in order to detect rotation. Depending on the type of unit (turnstile or ADA gate), the limit switch for a direction may be on the left or the right hand side of the control head.

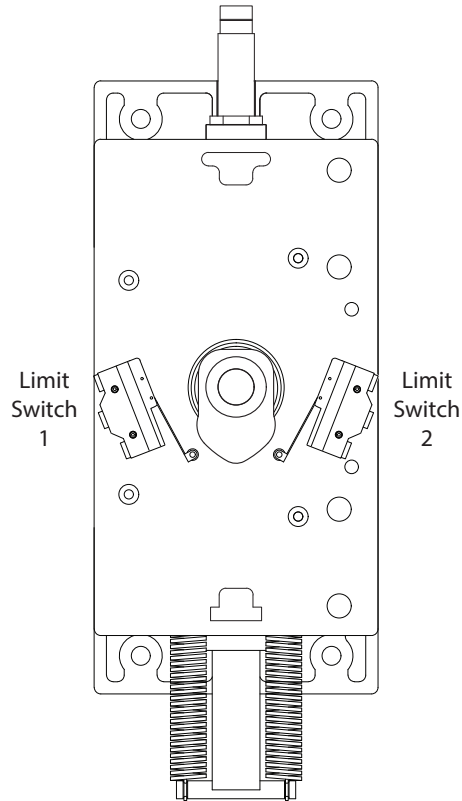
### Turnstile Control Head



Turnstile control heads use a triangular shaped limit switch cam. One point of the triangle needs to be facing the index pin (bar with two springs) when the cam is in the home position. The two indents in the sides of the triangle are for jiggling purposes. It does not matter which point is facing to the springs.

The limit switch for direction 1 is on the right and the limit switch for direction 2 is on the left. In this configuration, the first limit switch triggered does not affect the unit. The second switch triggers after the half-way point of the rotation, which draws in the solenoid. This allows the rotation to go to home but prevents the rotor from backing in the other direction.

### ADA Gate Control Head



ADA Gate control heads use an oblong lobe shaped limit switch cam. The point of the lobe needs to be facing the index pin (bar with two springs) when the cam is in the home position.

The limit switch for direction 1 is on the left and the limit switch for direction 2 is on the right. In this configuration, the limit switch relevant to the swing is triggered after the cam leaves home position, which re-engages the locking bar. The cam is still free to move until it swings back to the home position.

Options and configurations may alter the quantity or layout of the limit switches. Some examples of this would be electronically controlled one direction turnstiles, turnstiles with counters and turnstiles equipped with home position switches.

## Maintenance & Cleaning

To ensure long life on any turnstile, the following maintenance is recommended. Note: these figures are assuming a maximum 75000 passages per year. Turnstiles with heavier traffic should be maintained more frequently.

### Annual Servicing

- Secure all nuts & bolts throughout each model. This includes concrete anchors, carriage bolts holding together mainframes, and the bolts holding the control head assembly together.
- Remove the index pin assembly from the control head by disconnecting the two extension springs & apply white lithium grease. Use 3-in-1 oil on the index pin roller.
- If the unit is a High Security series full height turnstile, add grease to the rotor's roller bearing by utilizing the grease fitting fastened into the bottom of the rotor.

### Biennial Servicing

- Disassemble the control head by removing the 4x socket head cap screws holding the top casting to the bottom casting (and the triangular limit switch cam if equipped).
- Clean any loose debris / grease from the inside of the casting.
- Inspect internal components for wear and replace as needed.
- Apply 3-in-1 oil to the bronze bushings on the locking bar assemblies and shock piston.
- Apply white lithium grease to the shock piston where it enters the bronze housing.
- Reassemble the control head assembly, using removable strength (typically blue) thread sealer (such as Loctite 243) on the head bolts to ensure the assembly stays together.

### Cleaning

- Galvanized surfaces can be cleaned with soap and water. The finish may dull over time, but this is normal.
- Powder coated surfaces should be cleaned with a non-abrasive cleaner such as Formula 409. Inspect finish for chips and touch up as needed or the exposed steel may rust.
- Stainless steel surfaces should be polished with a stainless steel wax or polish. Contrary to common belief, stainless steel is not rust proof. Exposure to certain chemicals and harsh environments such as ocean air or chemical plants may cause surface corrosion. Minor discoloration can be removed with a rust penetrating product (such as PB Blaster) along with non-scratching scouring pads. Severe cases of contamination may require the use of specialty products. We have had great success with products such as Stellar Solutions' Citrisurf 2310 Rust Remover and Passivation Solution.
- The decorative solid surface tops on our Executive models, Beacon models and some PassThru models should be polished with furniture polish (such as Scott's Liquid Gold Wood Cleaner). Allowing the product to soak into the material for a few minutes easily restores the surface's luster.
- Polycarbonate plastic should only be cleaned following the plastic manufacturer's recommendations. **DO NOT USE ANY PRODUCTS THAT INCLUDE AMMONIA OR OTHER HIGH PH PRODUCTS.** If the model purchased includes polycarbonate plastic, see the section of the manual dedicated to cleaning it (starting on the next page). Failure to use appropriate cleaning methods will cause aesthetic and structural damage to the plastic which will not be covered under the warranty.

Control heads can be removed from the turnstile and shipped to the factory at any time for repairs and maintenance. Please include contact information so we can call to discuss any issues your control head may have. Please note that any repairs that cost under \$500.00 will require a credit card payment before being returned.



## Makrolon® Cleaning Instructions

Periodic cleaning of Makrolon® polycarbonate, using correct procedures with compatible household cleaners, is recommended to prolong the service life of your material.

Makrolon® GP polycarbonate has a relatively soft surface that mars easily with wiping action. Makrolon 15, Makrolon AR, and Hygard sheets are hard coated, abrasion/mar resistant polycarbonate products that offer a higher degree of scratch resistance and surface hardness. These products provide superior protection against unintentional chemical attack. However, the use of abrasive, gritty cleaners and/or hard cleaning implements (e.g. hard brushes, scrapers, squeegees) should be avoided to eliminate the possibility of scratching the surface coating.

The following cleaning techniques are based on standard industry practices.

### General Cleaning:

- 1) Thoroughly pre-rinse with warm water to loosen and wash away surface material, grit and grime.
- 2) Using a soft microfiber cloth or moist non-abrasive sponge, gently wash with a mild diluted soap or detergent.
- 3) Rinse thoroughly with lukewarm clean water. To prevent water spots, thoroughly dry the glazing with a dry soft cloth.

### Removing Heavy Oils and Tars:

- 1) Thoroughly pre-rinse with warm water to loosen and wash away surface material, grit and grime.
- 2) With a 50/50 isopropyl alcohol-water mixture, gently rub the area with a soft non-abrasive cloth.
- 3) Immediately rinse thoroughly with lukewarm clean water. To prevent water spots, thoroughly dry the glazing with a dry soft cloth.

### Removing Graffiti, Paint, Marker, Inks and Glazing Compounds:

- 1) Thoroughly pre-rinse with warm water to loosen and wash away surface material, grit and grime.
- 2) Using Naphtha VM&P grade, Isopropyl Alcohol or Butyl Cellosolve, gently rub the area with a soft non-abrasive cloth. Do not apply solvent cleaners under direct sunlight or during high temperatures.
- 3) Immediately rinse thoroughly with lukewarm clean water. To prevent water spots, thoroughly dry the glazing with a dry soft cloth.

### Removing Adhesive backed Labels:

- 1) Isopropyl Alcohol, Naphtha VM&P grade or Kerosene will help lift stickers and adhesives.
- 2) Immediately rinse thoroughly with lukewarm clean water. To prevent water spots, thoroughly dry the glazing with a dry soft cloth.

### Compatible Cleaners

The following cleaning agents are compatible with Makrolon Polycarbonate Sheet products when used according to the manufacturer's recommendations:

- Top Job, Joy®
- Palmolive Liquid®
- Windex® Ammonia free

[Top Job and Joy are registered trademarks of Proctor & Gamble, Palmolive is a registered trademark of Colgate Palmolive, Windex is a registered trademark of Drackett Products Company]

### Points to Remember

Do not use abrasive cleaners.

Do not use high alkaline cleaners (high pH or ammoniated).

Do not leave cleaners sitting on polycarbonate for periods of time; wash off immediately.

Do not apply cleaners under direct sunlight or at elevated temperatures.

Do not clean your polycarbonate with any unapproved cleaners. When in doubt, seek guidance.

Using scrapers, squeegees, razors or other sharp instruments may permanently scratch your polycarbonate.

Always avoid dry rubbing/cleaning your polycarbonate, as sand and dust particles clinging to the exterior of the glazing may scratch its surface.

An Anti-Static Canned-Air Ionizer can reduce electrostatic charge buildup on polycarbonate, consequently reducing dirt and dust buildup that would hinder cleaning.

### Special Note:

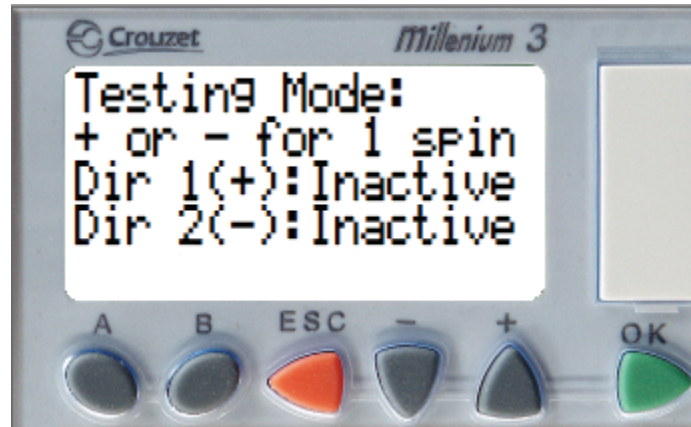
The edges of your polycarbonate sheet are not protected with an abrasion and chemical resistance hard coating. Do not allow cleaning solutions and solvents to pool along the edges for any length of time. Always rinse edges thoroughly with generous amounts of lukewarm clean water.

### ***Removing scratches from Makrolon polycarbonate sheet/window***

Deep scratches and gouges made by sharp objects such as keys, screwdrivers, and knives cannot be repaired. Fine scratches may be reduced in severity or cosmetically hidden by using a buffing compound such as NOVUS 2 Plastic Fine Scratch Remover, followed by a cleaning and polishing agent like NOVUS 1. However, for abrasion resistant coated products such as Makrolon AR, Makrolon 15 and Makrolon FC, buffing their abrasion resistant coated surface is not recommended because doing so further damages the coating and these scratched sites worsen the condition. Once removed, the coating cannot be repaired and buffing sites may optically distort the window.

## 6500 Series Control Head w/ XD10 Controller Standard Turnstile Testing

The XD10 logic controller on the 6500 Series Control Head can be activated by contact closures between 24VDC+ and the relevant input. New technology allows for simpler on-board testing as well. To diagnose issues with the unit, press A on the keypad to cycle between screens until the testing mode screen appears.



Testing mode simulates valid access control inputs based on the settings defined on the other menu screens. The unit should unlock for the duration of the directional timer or until the unit is rotated. If the button is pressed twice, it should allow two rotations or time out based on the multi-swipe setting. If the button is held and the one shot timers are disabled, the unit will continue to remain open until the button is released and another rotation or timeout occurs.

With the testing mode screen open, press and release + to activate in direction 1. The unit should unlock and allow one rotation. If the unit successfully functions this way, repeat the same for direction 2 by pressing the - button.

If everything is functioning properly from the menu test but not with access control, either access control is not connected properly, is normally closed instead of normally open, or is not properly configured. Contact a security integrator for assistance with help with the access control system.

If the unit successfully unlocks but does not re-lock upon rotation, try to manually trigger the appropriate limit switch for the direction that is not working correctly. If this helps, it is likely that the limit switch is not properly being triggered by the limit switch cam. Either adjust the height of the limit switch cam or tweak the lever on the limit switch a bit closer to the limit switch cam's tip.

If the unit does not successfully re-lock after manually triggering the limit switch, ensure that it is wired properly. Return to the home screen and press / hold the limit switch. If the switch is being held but the "Active Pins" display does not include the switch being held, it may be necessary to replace the switch. Note that there is a short delay from when the switch is triggered to when the display will register it as active, however this is normal.

If there are other issues with operation, check out the troubleshooting guide for additional diagnostic procedures or call Controlled Access, Inc. for assistance.

## 6500 Series Control Head w/ XD10 Controller Troubleshooting

Symptoms	Causes	Solutions
Turnstile does not power up or logic controller's display cycles on and off.	Power supply is not receiving input voltage.	Verify outlet receptacle installed in mainframe / cabinet is operating correctly and that the power supply is plugged in.
	Power supply is not producing 24VDC voltage, but is receiving AC.	Remove + lead from power supply output. If output voltage resumes, there is a short circuit in the wiring. If not, the power supply is faulty. Replace power supply.
	Short circuit in the wiring as determined in previous step.	Refer to pages 28-30 for wiring information.
	Loose wiring from power supply to logic controller.	
	Short circuit in the wiring.	
	Solenoid(s) burnt out (will occur if main AC voltage is connected directly to solenoid).	If wiring is correct, try to disconnect the solenoids from outputs 01 - 04. If system stops cycling, replace faulty solenoid.
Solenoid tabs grounded out against control head casting after being reassembled from maintenance or reconfiguration.	Disassemble control head casting and flip solenoids so that the tabs with wires are facing away from the center of the control head casting.	
Turnstile powers up but does not respond.	Solenoid (-) wire(s) not properly terminated.	Ensure solenoid negative wires are properly terminated to 24VDC- input and that the 3 wire splice (if equipped) is properly crimped.
	Improper wiring from access control to logic controller.	Ensure one leg of access control output relay is connected to 24VDC + and the other to the desired input.
	Access control device malfunction.	Disconnect access control from logic controller. Perform testing procedures on page 37. If the turnstile works properly, contact manufacturer of access control device.

## 6500 Series Control Head w/ XD10 Controller Troubleshooting

Symptoms	Causes	Solutions
More than one person can get through turnstile.	Access control device output connected to override inputs.	Wire access control to I1 or I2 with one-shot timer enabled.
	Access control device output set too long.	This can be avoided by enabling the one-shot timers built into the logic controller program. If this is undesirable, ensure the output from the access control system is one second or less.
	Loose wiring to the logic controller from limit switches.	Refer to pages 28-30 for wiring information.
	Limit switches are broken.	Inspect limit switches for breakage, replace as needed.
	Control head requires maintenance.	Refer to page 34 for more information.
	Limit switches are missing the triangular top cam.	Adjust the top cam to the proper height and/or tweak the triggers on the limit switch. Refer to page 33 for more information.
People are becoming trapped inside of the turnstile (Full Height models)	Rotor was installed backwards.	Refer to page 15 installation for visual diagram on how to install rotor properly.
Turnstile only rotates 30 degrees.	Limit switches wired incorrectly.	Refer to pages 28-30 for wiring information and page 33 for limit switch placement.
	Limit switch cam is misaligned.	The top cam should have one point facing the control board. If this is not the case, readjust the top cam. Refer to page 33 for top cam information.
Unit remains unlocked until access control is presented.	Fail open / fail lock configuration is wired incorrectly.	Refer to pages 28-30 for wiring information.
Turnstile is slamming into the closed position.	Shock either needs adjusted or replaced.	Refer to page 27 for more information.
Turnstile is not centering properly.	Shock needs adjusted.	
		Binding in control head.
Turnstile seems to be binding mechanically.	Rotor is not plumb / turnstile body is not level.	

## 6500 Series Control Head w/ XD10 Controller Troubleshooting

Symptoms	Causes	Solutions
Unit remains locked after access control is presented until arm is pulled in.	Mechanical bind between locking bar and cam assembly (typically from unit being out of plumb or not level)	Remove locking bar assembly from control head (easiest way on non-key lock models is to punch out dowel pin pivot point from bottom side of head casting) and file down tip of locking bar to give clearance.
Turnstile rotating the wrong direction.	Improperly filled out direction sheet.	In some cases, the control head can be reconfigured in the field to operate as needed. Refer to pages 21-26 for information about how the control head operates. If needed, control heads can be returned to the factory for reconfiguration for a fee of labor plus parts (if required). Please contact us before returning a control head in this instance.
	Directional inputs wired incorrectly.	Refer to wiring legend on page 28 for direction port explanations.
Turnstile fails lock when needed to fail open or vice versa.	Improperly filled out direction sheet.	Refer to page 25 for more information. Additional parts will be required to convert operation. The control head can be returned for reconfiguration for a fee of labor plus parts (if required). Please contact us before returning a control head in this instance.
Unable to hold direction open to allow multiple people to pass through the turnstile.	Override wired to incorrect inputs.	Ensure the access control device dedicated to overriding passage is wired to the override input instead of the standard input for that direction.
	One-shot timers are enabled (on regular access control input).	Disable the one-shot timer settings on the logic controller. Be sure that your access control output is one second or less during regular secure operation or extra people may be able to pass through. Refer to pages 31-32.
Other problems.		Please contact us for any other issues.

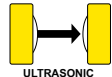


## U-GAGE® T30UX Series with Discrete Output

Ultrasonic Sensor with TEACH-Mode Configuration



- 1, 2 and 3 m (3.28, 6.56, and 9.84 ft) versions with short dead zones (10% of max range)
- Built-in temperature compensation
- Fast, easy-to-use TEACH-Mode programming; no potentiometer adjustments
- Remote TEACH for security and convenience
- Wide operating temperature range of  $-40^{\circ}$  to  $+70^{\circ}$  C ( $-40^{\circ}$  to  $+158^{\circ}$  F)
- Outputs can be set for either NPN (sinking) or PNP (sourcing), Normally Open (N.O.) or Normally Closed (N.C.)
- Compact, self-contained, right-angle sensor package with fully encapsulated electronics



### Models

Models	Range and Frequency	Cable <sup>1</sup>		Discrete Output	Response Time
T30UXDA	100 mm to 1 m (3.9 in to 39 in) 224 kHz	Standard 2 m (6.5 ft) cable	10 to 30V dc	NPN, PNP, NO, NC, Selectable	45 ms
T30UXDB	200 mm to 2 m (7.8 in to 78 in) 174 kHz				92 ms
T30UXDC	300 mm to 3 m (11.8 in to 118 in) 114 kHz				135 ms



#### WARNING: Not To Be Used for Personnel Protection

Never use this product as a sensing device for personnel protection. Doing so could lead to serious injury or death. This product does NOT include the self-checking redundant circuitry necessary to allow its use in personnel safety applications. A sensor failure or malfunction can cause either an energized or de-energized sensor output condition.

<sup>1</sup> Only standard 2 m (6.5 ft) cable models are listed. For 4-Pin Euro-Style integral QD, add suffix "Q8" to the model number (for example, T30UXDAQ8). For 150 mm (6 in) PUR pigtail cable with 4-Pin threaded Euro-Style QD, add suffix "QPMA" to the model number (for example, T30UXDAQPMA). For 9 m (30 ft) cable, add suffix "W/30" to the model number (for example, T30UXDA W/30). A model with a QD connector requires a mating cable; see [Quick-Disconnect Cables](#) on page 11.

## Overview

The U-GAGE® T30UX is an easy-to-use ultrasonic sensor with extended range and built-in temperature compensation. Simple push button configuration provides flexibility for a variety of applications.

Easy-to-see indicator LEDs communicate the status of the sensor. The Green “Power” LED ON indicates that the sensor is in Run Mode (the sensor’s normal operating condition). The Red “Signal” LED indicates the target signal strength. The Amber “Output” LED indicates that the output is enabled and the sensor is receiving a signal within the window limits (depending on NO or NC). The Amber “Mode” LED indicates the currently selected mode.



Figure 1. Features

## Principles of Operation

Ultrasonic sensors emit one or multiple pulses of ultrasonic energy, which travel through the air at the speed of sound. A portion of this energy reflects off the target and travels back to the sensor. The sensor measures the total time required for the energy to reach the target and return to the sensor. The distance to the object is then calculated using the following formula:

$$D = \frac{ct}{2}$$

**D** = distance from the sensor to the target

**c** = speed of sound in air

**t** = transit time for the ultrasonic pulse

To improve accuracy, an ultrasonic sensor may average the results of several pulses before outputting a new value.

### Temperature Effects

The speed of sound is dependent upon the composition, pressure and temperature of the gas in which it is traveling. For most ultrasonic applications, the composition and pressure of the gas are relatively fixed, while the temperature may fluctuate.

In air, the speed of sound varies with temperature according to the following approximation:

In metric units:  $C_{m/s} = 20 \sqrt{273 + T_C}$

In English units:  $C_{ft/s} = 49 \sqrt{460 + T_F}$

$C_{m/s}$  = speed of sound in meters per second

$C_{ft/s}$  = speed of sound in feet per second

$T_C$  = temperature in °C

$T_F$  = temperature in °F

### Temperature Compensation

Changes in air temperature affect the speed of sound, which in turn affects the total time for the echo measured by the sensor. An increase in air temperature shifts both sensing window limits closer to the sensor. Conversely, a decrease in air temperature shifts both limits farther away from the sensor. This shift is approximately 3.5% of the limit distance for a 20° C change in temperature.

The T30UX series ultrasonic sensors are temperature compensated. This reduces the error due to temperature by about 90%. The sensor will maintain its window limits to within 2.2% over the -40° to +70° C (-40° to +158° F) operating range of the sensor.



#### NOTE:

- Exposure to direct sunlight can affect the sensor’s ability to accurately compensate for changes in temperature.
- If the sensor is measuring across a temperature gradient, the compensation will be less effective.

## Sensor Configuration

Two TEACH methods may be used to configure the sensor:

- Teach individual minimum and maximum limits, or
- Use Auto-Window feature to center a sensing window around the taught position.


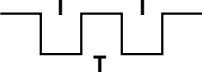


The sensor may be configured either via its push button, or via a remote switch. Remote configuration also may be used to disable the push button, preventing unauthorized personnel from adjusting the configuration settings. To access this feature, connect the white wire of the sensor to 0V dc, with a remote configuration switch between the sensor and the voltage.

Configuration is accomplished by following the sequence of input pulses. The duration of each pulse (corresponding to a push button “click”), and the period between multiple pulses, are as “T”: **0.04 seconds < T < 0.8 seconds**

Remote line configuration requires a greater than 1 second pause between pulse sequences.

## Mode Setup - Output Configuration

Sensors can be set up for either NPN (sinking) or PNP (sourcing). In addition, the user can select between Normally Open (N.O.) and Normally Closed (N.C.) operation. Normally Open is defined as the output energizing when the target is present. Normally Closed is defined as the output energizing when the target is absent (see [Figure 2. Teaching independent minimum and maximum limits](#) on page 4).

	Push Button 0.04 sec. < “click” < 0.8 sec.		Remote Line 0.04 sec. < T < 0.8 sec.	
	Procedure	Result	Procedure	Result
<b>Output Configuration Mode</b>	Push and hold MODE push button for > 2 seconds 	<b>Power LED:</b> OFF <b>Mode LED:</b> Flashing Amber shows previously selected mode	Double-pulse the remote line 	<b>Power LED:</b> OFF <b>Mode LED:</b> Flashing Amber shows previously selected mode
<b>Select Output</b>	“Click” the MODE push button to cycle to correct selection: <ul style="list-style-type: none"> <li>• NPN - Normally Open</li> <li>• NPN - Normally Closed</li> <li>• PNP - Normally Open</li> <li>• PNP - Normally Closed</li> </ul> 	<b>Power LED:</b> OFF <b>Mode LED:</b> Flashes to indicate currently selected mode (120 second time out <sup>2</sup> )	<ul style="list-style-type: none"> <li>• Single-pulse for NPN - Normally Open</li> <li>• Double-pulse for NPN - Normally Closed</li> <li>• Triple-pulse for PNP - Normally Open</li> <li>• Quad-pulse for PNP - Normally Closed</li> </ul>	<b>Power LED:</b> ON Green <b>Mode LED:</b> ON to indicate currently selected mode (Sensor returns to RUN mode)
<b>Save and Activate Mode</b>	Push and hold MODE push button for > 2 seconds 	<b>Power LED:</b> ON Green <b>Mode LED:</b> ON Amber for selected mode	No action required; sensor will return to Run Mode	None

## Teaching Minimum and Maximum Limits

### General Notes on Teaching

- The sensor will return to RUN mode if the first TEACH condition is not registered within 120 seconds after the initial 2 second hold on the Discrete push button.
- To exit TEACH mode without saving any changes, press and hold the Discrete push button or remote line longer than 2 seconds (before teaching the second limit). The sensor will revert to the last saved limits.

<sup>2</sup> The sensor will revert to previously saved configuration and return to RUN mode if TEACH is inactive for 120 seconds after the initial 2 second hold on push button

- After the first limit is taught, the sensor will remain in TEACH mode until the TEACH sequence is finished or exited by a 2 second hold on the Discrete push button or remote line.

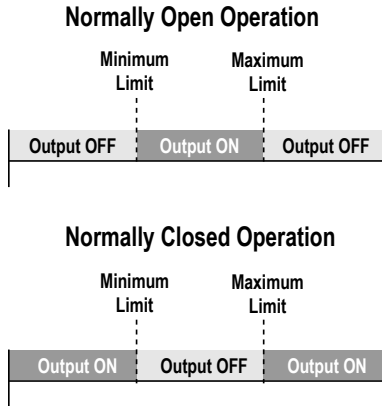


Figure 2. Teaching independent minimum and maximum limits

	Push Button 0.04 sec. < “click” < 0.8 sec.		Remote Line 0.04 sec. < T < 0.8 sec.	
	Procedure	Result	Procedure	Result
<b>TEACH Mode</b>	Push and hold the Discrete push button longer than 2 seconds 	<b>Power LED: OFF</b> <b>Output LED: ON</b>	No action required; sensor is ready for first limit teach	None
<b>Teach First Limit</b>	Position the target for the first limit (120 second time out)	<b>Signal LED: Must be ON Red or Flashing Red<sup>3</sup></b>	Position the target for the first limit	<b>Signal LED: Must be ON Red or Flashing Red<sup>3</sup></b>
	“Click” the Discrete push button 	<b>Teach Accepted</b> <b>Power LED: OFF</b> <b>Output LED: Flashing</b> <b>Teach Not Accepted</b> <b>Output LED: ON</b>	Single-pulse the remote line 	<b>Teach Accepted</b> <b>Power LED: OFF</b> <b>Output LED: Flashing</b> <b>Teach Not Accepted</b> <b>Power LED: ON</b>
<b>Teach Second Limit</b>	Position the target for the second limit (no time out)	<b>Signal LED: Must be ON Red or Flashing Red</b>	Position the target for the second limit (no time out)	<b>Signal LED: Must be ON Red or Flashing Red</b>
	“Click” the Discrete push button 	<b>Teach Accepted</b> <b>Output LED: ON or OFF, depending on NO or NC Mode</b> <b>Power LED: ON</b> <b>Teach Not Accepted</b> <b>Output LED: Flashing</b> <b>Power LED: OFF</b>	Single-pulse the remote line 	<b>Teach Accepted</b> <b>Output LED: ON or OFF, depending on NO or NC Mode</b> <b>Power LED: ON</b> <b>Teach Not Accepted</b> <b>Output LED: Flashing</b> <b>Power LED: OFF</b>

## Teaching Limits Using the Auto-Window Feature

Teaching the same limit twice automatically centers a window on the taught position (see *Figure 4. Window Size* on page 5 for window sizes).

### General Notes on Teaching

- The sensor will return to RUN mode if the TEACH condition is not registered within 120 seconds after the initial 2 second hold on the Discrete push button.
- To exit TEACH mode without saving any changes, press and hold the Discrete push button or remote line longer than 2 seconds (before teaching the second limit). The sensor will revert to the last saved limits.
- After the first limit is taught, the sensor will remain in TEACH mode until the TEACH sequence is finished or exited by a 2 second hold on the Discrete push button or remote line.

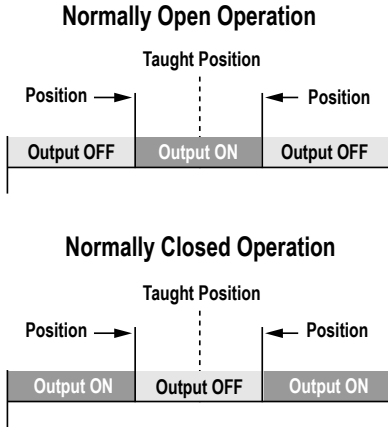

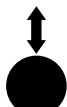
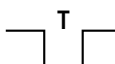



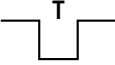
Figure 3. Using the Auto-Window feature for teaching each output

Models	Window
"A" suffix	± 10 mm (0.4 in)
"B" suffix	± 20 mm (0.8 in)
"A" suffix	± 30 mm (1.2 in)

Figure 4. Window Size

	Push Button 0.04 sec. < "click" < 0.8 sec.		Remote Line 0.04 sec. < T < 0.8 sec.	
	Procedure	Result	Procedure	Result
<b>TEACH Mode</b>	Push and hold the Discrete push button longer than 2 seconds 	<b>Power LED:</b> OFF <b>Output LED:</b> ON	No action required; sensor is ready for first limit teach	None
<b>Teach First Limit</b>	Position the target for the center of window (120 second time out)	<b>Signal LED:</b> Must be ON Red or Flashing Red <sup>4</sup>	Position the target for the center of window	<b>Signal LED:</b> Must be ON Red or Flashing Red <sup>4</sup>
	"Click" the Discrete push button 	<b>Teach Accepted</b> <b>Power LED:</b> OFF <b>Output LED:</b> Flashing <b>Teach Not Accepted</b> <b>Output LED:</b> ON	Single-pulse the remote line 	<b>Teach Accepted</b> <b>Power LED:</b> OFF <b>Output LED:</b> Flashing <b>Teach Not Accepted</b> <b>Output LED:</b> ON
<b>Re-Teach Limit</b>	Without moving the target, "click" the Discrete push button again 	<b>Teach Accepted</b> <b>Output LED:</b> ON or OFF, depending on NO or NC Mode	Without moving the target, single-pulse the remote line again	<b>Teach Accepted</b> <b>Output LED:</b> ON or OFF, depending on NO or NC Mode

<sup>4</sup> Sensor will not Teach or indicate "Teach Not Accepted" when there is no signal present (Signal LED Red or Flashing Red)

	Push Button 0.04 sec. < “click” < 0.8 sec.		Remote Line 0.04 sec. < T < 0.8 sec.	
	Procedure	Result	Procedure	Result
		<b>Power LED: ON</b> <b>Teach Not Accepted</b> <b>Output LED: Flashing</b> <b>Power LED: OFF</b>		<b>Power LED: ON</b> <b>Teach Not Accepted</b> <b>Output LED: Flashing</b> <b>Power LED: OFF</b>

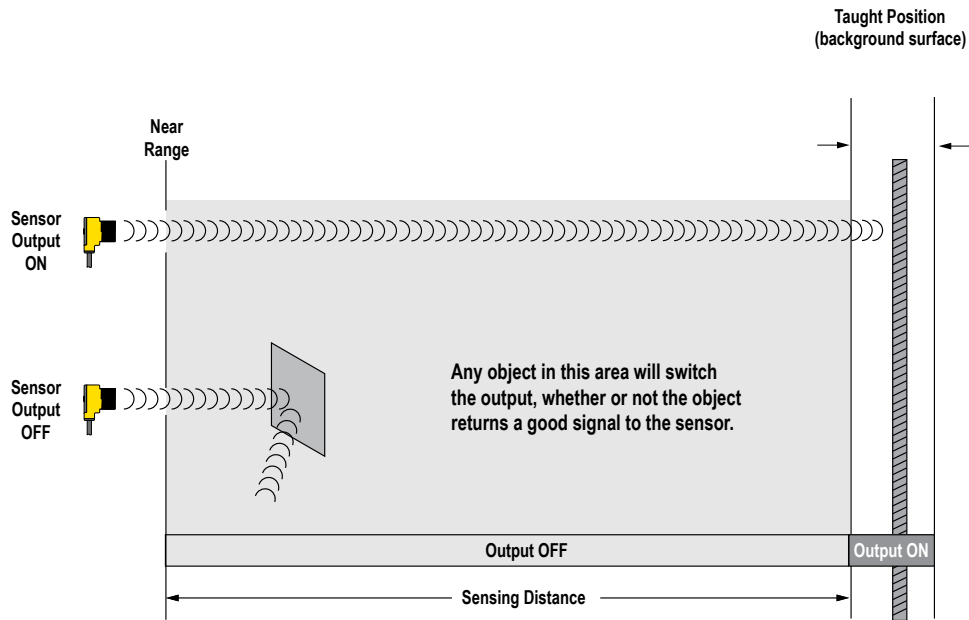


Figure 5. An application for the Auto-Window feature (retroreflective mode)

## Remote Line TEACH

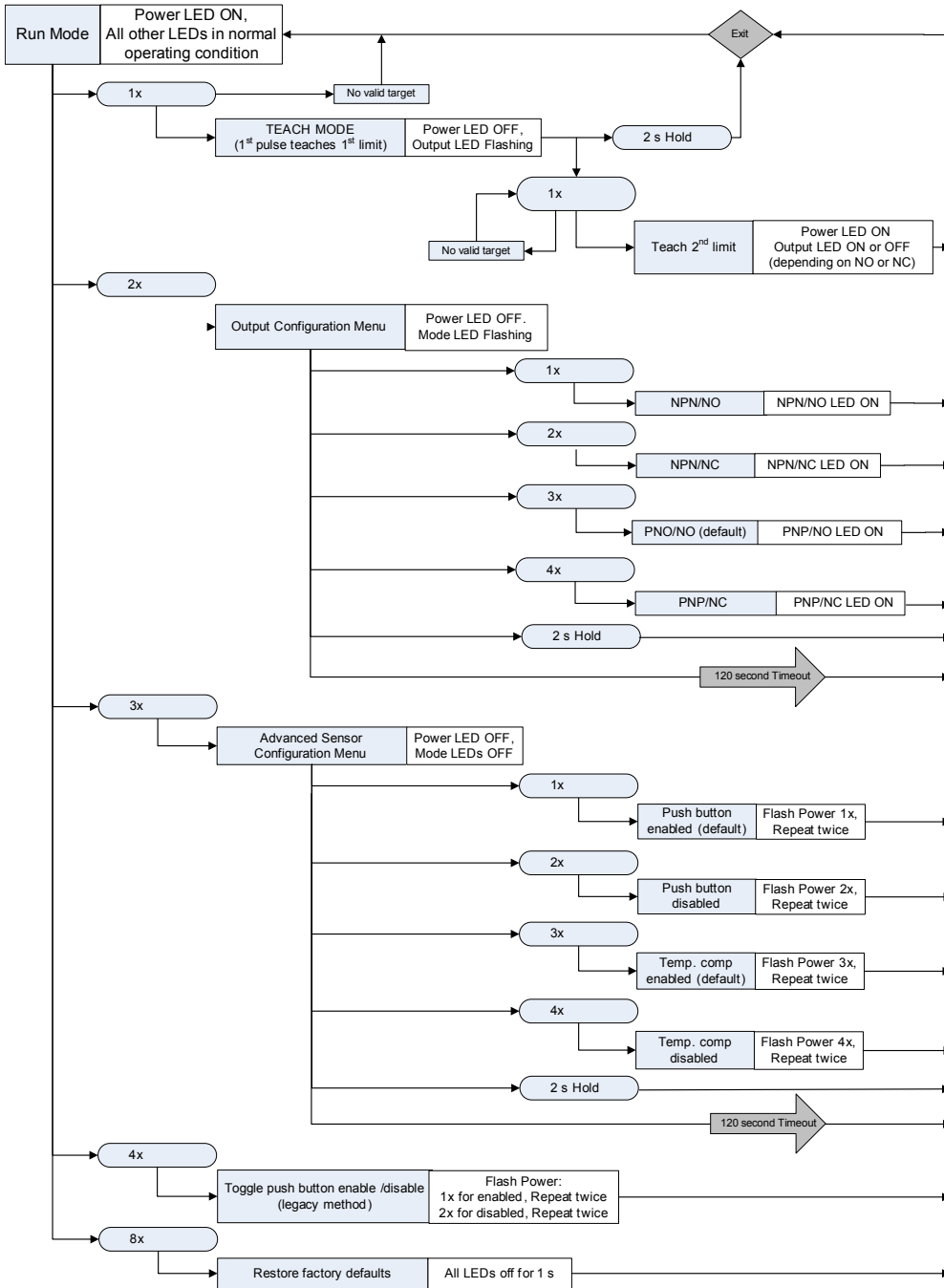
### General Notes

- Run Mode is the sensor’s normal operating condition
- The duration of each Pulse is defined as “T”: **0.04 < T < 0.8 s**



- A Hold will exit TEACH MODE and return to Run Mode with previously saved changes. The duration of a Hold is: **T > 2 s**
- A Timeout will occur if a condition is not registered within 120 seconds, causing the sensor to return to Run Mode (during sensor configuration only)
- Sensor configuration user feedback shown on Green LED. See flowchart.
- The Red Signal LED will be ON whenever the target is in view.

U-GAGE® T30UX Series with Discrete Output



## Specifications

### Sensing Range

- “A” suffix models: 100 mm to 1 m (3.9 in to 39 in)
- “B” suffix models: 200 mm to 2 m (7.8 in to 78 in)
- “C” suffix models: 300 mm to 3 m (11.8 in to 118 in)

### Ultrasonic Frequency

- “A” suffix models: 224 kHz
- “B” suffix models: 174 kHz
- “C” suffix models: 114 kHz

### Supply Voltage

10 to 30V dc (10% max. ripple) at 40 mA, exclusive of load

### Supply Protection Circuitry

Protected against reverse polarity and transient voltages

### Output Configuration

**Discrete (switched) output models:** SPST solid-state switch. Configurable as NPN (sinking) or PNP (sourcing) via Mode push button. Normally Open (NO) or Normally Closed (NC) operation is also selectable via Mode push button (see [Mode Setup - Output Configuration](#) on page 3).

The default setting is PNP/NO

### Output Rating

- Discrete output models:** 100 mA max.
- OFF-state leakage current:** NPN: < 200  $\mu$ A at 30V dc (see NOTE 1); PNP: < 10  $\mu$ A at 30V dc
- ON-state saturation voltage:** NPN: < 1.6V at 100 mA; PNP: < 3V at 100 mA

### Output Protection Circuitry

Protected against short circuit conditions

### Output Response Time

- “A” suffix models: 45 ms
- “B” suffix models: 92 ms
- “C” suffix models: 135 ms

### Delay at Power-up

500 ms

### Temperature Effect

0.02% of distance/ $^{\circ}$ C

### Repeatability

- “A” suffix models: 0.1% of distance (0.5 mm min.)
- “B” suffix models: 0.1% of distance (1.0 mm min.)
- “C” suffix models: 0.1% of distance (1.5 mm min.)

### Sensing Hysteresis

- “A” suffix models: 2 mm
- “B” suffix models: 3 mm
- “C” suffix models: 4 mm

### Minimum Window Size

10 mm (0.4 in)

### Adjustments

**Sensing window limits:** TEACH-Mode of near and far window limits may be set using the push button or remotely via TEACH input.

**Output Configuration:** NPN, PNP, Normally Open (NO), Normally Closed (NC) select (see [Mode Setup - Output Configuration](#) on page 3 or [Remote Line TEACH](#) on page 6).

**Advanced configuration options:** Push button enabled/disabled, temperature compensation enabled/disabled (see [Remote Line TEACH](#) on page 6)

### Indicators

See [Figure 1. Features](#) on page 2

### Construction

- Housing:** PBT polyester
- Push buttons:** polyester
- Transducer:** epoxy /ceramic composite

### Environmental Rating

Leakproof design, rated IP67 (NEMA 6)

### Connections

2 m (6.5 ft) or 9 m (30 ft) shielded 4-conductor (with drain) PVC cable, 150 mm (6 in) PUR Euro-style pigtail (QPMA), or 4-pin integral Euro-style connector (Q8)

### Operating Conditions

- Temperature:**  $-40^{\circ}$  to  $+70^{\circ}$  C ( $-40^{\circ}$  to  $+158^{\circ}$  F)
- Humidity:** 95% at  $+50^{\circ}$  C (non-condensing)

### Vibration and Mechanical Shock

All models meet Mil. Std. 202F requirements method 201A (vibration: 10 to 60 Hz max., double amplitude 0.06 in, max acceleration 10G). Also meets IEC 947-5-2; 30G 11 ms duration, half sine wave

### Application Note

The temperature warmup drift upon power-up is less than 1% of the sensing distance.

### Certifications

CE Pending

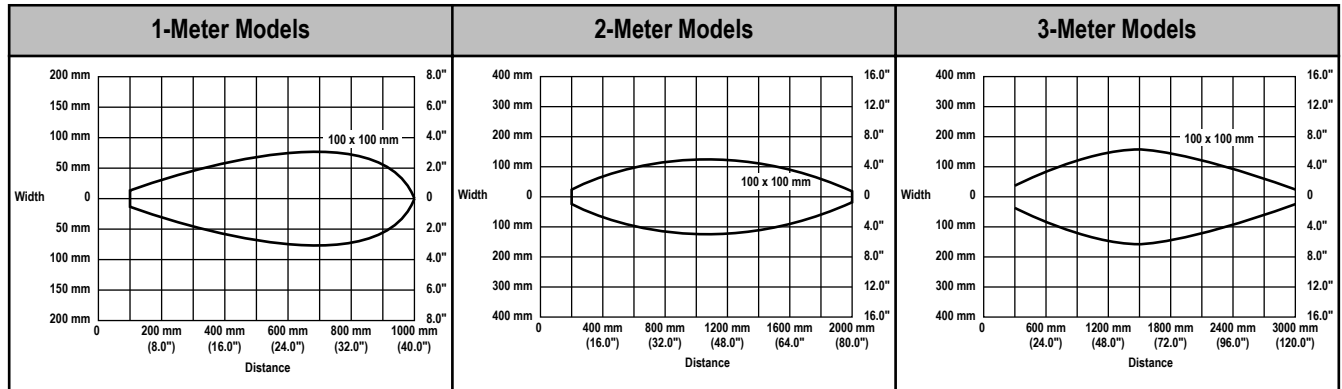


**NOTE 1:** NPN < 200  $\mu$ A for load impedance > 3 k $\Omega$ ; for load current of 100 mA, leakage < 1% of load current

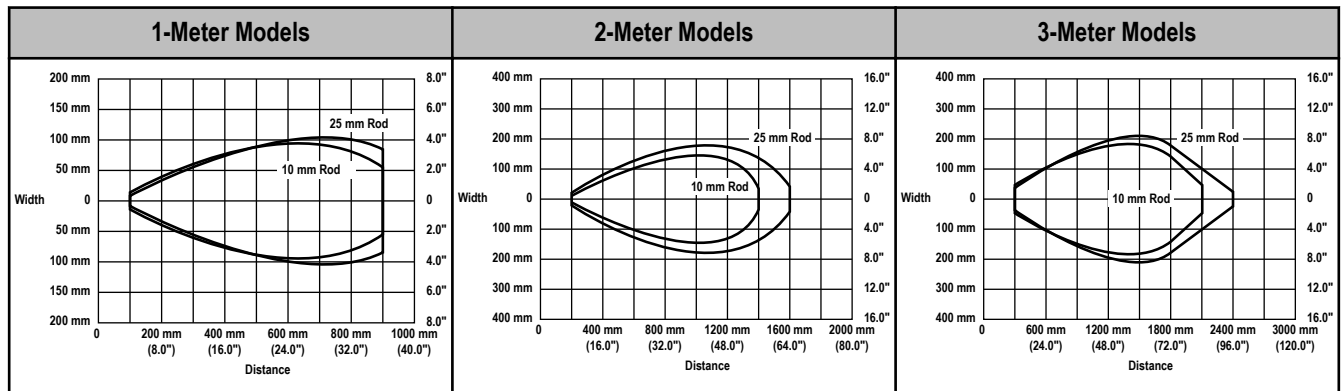


## Performance Curves

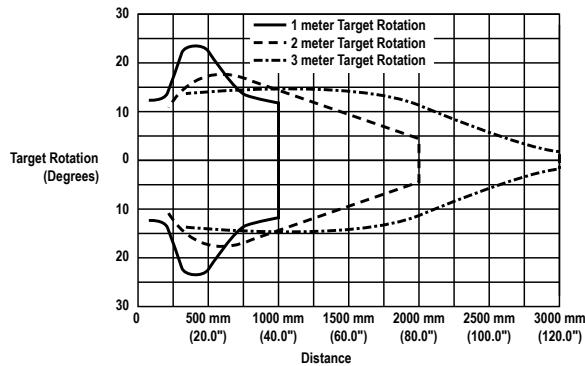
### With Plate Target (Typical)



### With Rod Target (Typical)

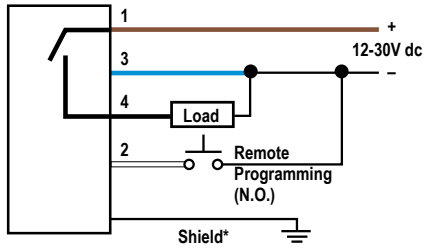


## Maximum Target Rotation Angle



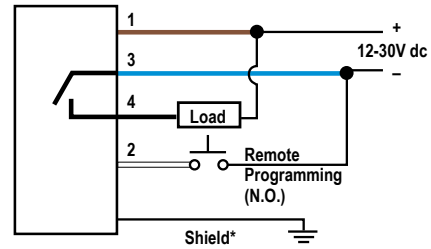
## Hookups

### NPN (Sinking) Output Selected



\* It is recommended that the shield wire be connected to either earth ground or DC common.

### PNP (Sourcing) Output Selected

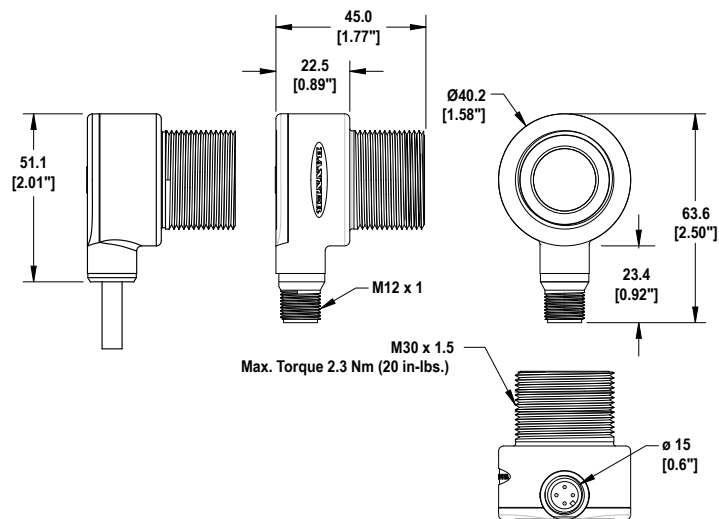


\* It is recommended that the shield wire be connected to either earth ground or DC common.

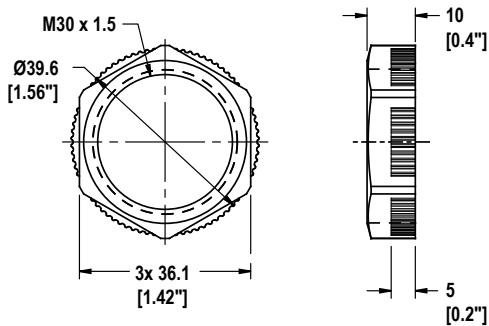
Cable and QD hookups are functionally identical.

It is recommended that the shield wire be connected to earth ground. Shielded cordsets are recommended for all QD models.

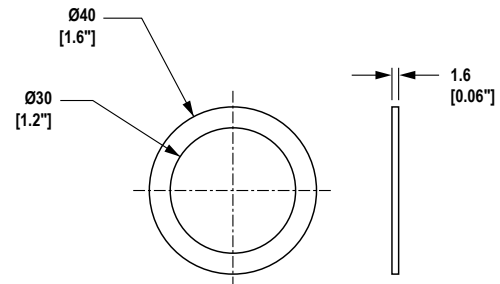
## Dimensions



### Locknut (included with all models)



### Washer (included with all models)



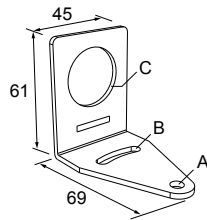
## Quick-Disconnect Cables

4-Pin Threaded M12/Euro-Style Cordsets with Shield				
Model	Length	Style	Dimensions	Pinout
MQDEC2-406	1.83 m (6 ft)	Straight		<p>1 = Brown 2 = White 3 = Blue 4 = Black</p>
MQDEC2-415	4.57 m (15 ft)			
MQDEC2-430	9.14 m (30 ft)			
MQDEC2-406RA	1.83 m (6 ft)	Right-Angle		
MQDEC2-415RA	4.57 m (15 ft)			
MQDEC2-430RA	9.14 m (30 ft)			

## Brackets

### SMB30A

- Right-angle bracket with curved slot for versatile orientation
- Clearance for M6 (1/4 in) hardware
- Mounting hole for 30 mm sensor
- 12-ga. stainless steel

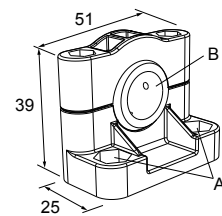


**Hole center spacing:** A to B=40

**Hole size:** A=ø 6.3, B= 27.1 x 6.3, C=ø 30.5

### SMB1815SF

- Swivel with set screws for mounting sensors by the cable hub
- Black reinforced thermo-plastic polyester
- Stainless steel swivel locking hardware and hex wrench included

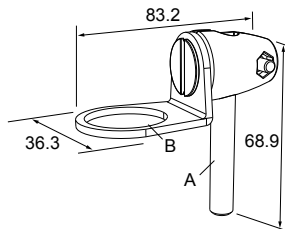


**Hole center spacing:** A = 36.0

**Hole size:** A = ø 5.0, B = ø 15.0

### SMB30FA

- Swivel bracket with tilt and pan movement for precise adjustment
- Mounting hole for 30 mm sensor
- 12-ga. 304 stainless steel
- Easy sensor mounting to extrude rail T-slot
- Metric and inch size bolt available

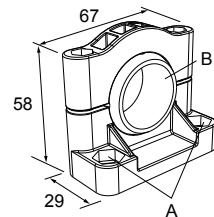


**Bolt thread:** SMB30FA, A= 3/8 - 16 x 2 in; SMB30FAM10, A=M10 - 1.5 x 50

**Hole size:** B= ø 30.1

### SMB30SC

- Swivel bracket with 30 mm mounting hole for sensor
- Black reinforced thermo-plastic polyester
- Stainless steel mounting and swivel locking hardware included



**Hole center spacing:** A=ø 50.8

**Hole size:** A=ø 7.0, B=ø 30.0

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