



HS400 Series Tandem Full Height Turnstile

Service & Installation Manual



Note: Successful turnstile installation depends on reading this manual.

Important Note: 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, and repairs.

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The High-Security Series

Full-Height Turnstile (Tandem) | Interior & Exterior Application

HS427-T | HS430-T

The High-Security Series units can be engineered to meet all your security and control requirements, and can be created as stand-alone units, or as part of an integrated system. Available in stainless steel (304 or 316), carbon steel with powder coating, or hot-dipped galvanized finish. These units can be fitted for any application with leading edge technology and features.

Controls and Interfaces

- Biometric Integration
- Fail-Open or Fail-Secure Locking
- Card Readers
- Push-Button and Wireless Remotes
- Electronic/LCD Counters
- Manual Key Override – both directions
- Metal Detection
- Indicator Lights



Hot-dipped Galvanized finish
Also available in stainless steel or power coated finishes.



Size Options

(pedestrian clearance):
HS427-T: 27" (686mm)
HS430-T: 30" (782mm)

Optional black or safety orange end caps available for galvanized units.



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

For two decades, TurnstilesUS 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, TurnstilesUS is the secure choice. And, we're experienced in access control systems, from card readers to biometric scanning, to give you the power to control access.

| | Depth | Width | Passage Width | Passage Height | Overall Height |
|----------------|-----------------|----------------|---------------|----------------|----------------|
| | A* | B* | C* | D* | E* |
| HS427-T | 57" 1448mm | 94" 2388mm | 27" 686mm | 84" 2134mm | 91" 2311mm |
| HS430-T | 59.1" 1501mm | 102" 2591mm | 30" 762mm | 84" 2134mm | 91" 2311mm |

* See CAD drawings on reverse side.

The High-Security Series

Full-Height Turnstile (Tandem) | Interior & Exterior Application

HS427-T | HS430-T

Applications:

Ideal for controlling orderly flow of foot traffic in both indoor and outdoor settings

Design & Construction:

- Designed for secure operation with aesthetics in mind
- Featuring fully welded exterior components
- Minimal exposed stainless steel hardware
- Heavy gauge materials meeting ASTM standards

Measures:

HS427-T

Size of opening (pedestrian clearance)

HS427-T 27" (686mm)

Arm and Barrier Tubing Sizes

1 1/2" diameter 14 gauge (38mm) - Standard

1 3/4" diameter 14 gauge (44mm) - Optional

Width Depth

94" (2388mm) 57" (1448mm)

HS430-T

Size of opening (pedestrian clearance)

HS430-T 30" (762mm)

Arm and Barrier Tubing Sizes

1 1/2" diameter 14 gauge (38mm) - Standard

1 3/4" diameter 14 gauge (44mm) - Optional

Width Depth

102" (2591mm) 59.1" (1501mm)

All models:

- Overall exterior height 91" (2311mm)
- Pedestrian walk through height 84" (2134mm)

Matching Swing Gate available

(see model HS336 Manual Passage Gate information)

HS336 - Back
(stainless steel
with optional
mesh push bar)



Available Finishes:

- Hot dipped galvanized carbon steel
- Carbon steel with powder coating (standard color is black/other colors available upon request)
- Our signature 304 stainless steel, No. 4 satin finish, or 316 stainless

Operation:

6500 Series Control Head, featuring:

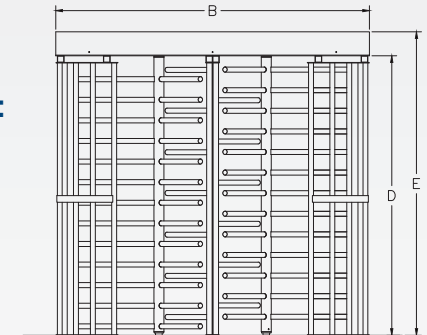
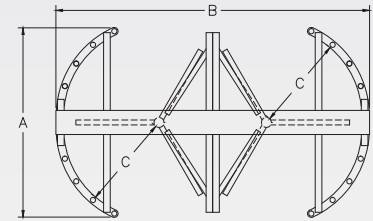
- Auto-indexing (self-centering) with adjustable hydraulic shock suppression
- Hardened tool steel locking bars, cam and roller assemblies
- Permanently lubricated bearings
- Your choice of manual or electronic control on both directions
- Nearly universal integration to any number of access control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

Options:

- Card reader mounting plates
- Daylight visible indicator lights
- Bi-directional key overrides
- Lockout bar (padlock not included)
- Decorative arm caps (for galvanized unit)
- Stainless steel overhead full canopy
- Half canopy (covers passageway)
- 8 digit key resettable LCD counter with seven year lithium battery
- Cold weather package, including thermostat controlled heater and insulated mainframe
- Metal detection
- Push button and wireless remotes
- Heel guard arm covers
- Hinged or split covers (for tight clearance installations)
- 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.



Dimensions are approximate.

Electrical Specifications:

(per rotor)

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
(Cold weather package available)

Operating Voltage: 24VDC

Operating Current: 1.2 A (typical)

Standards and Codes:

Austenitic stainless steel:

ASTM A240, A249, A276

Hot rolled steel:

AISI C-1020, AISI C-1018

Hot dipped galvanizing:

ASTM A-143, ASTM A-153-80

Stainless steel fasteners:

ASTM A-320

American Welding Society (AWS)

Standard D 1.1



The 6500 series control head is certified to conform to UL Standard 325 & UL Subject 2593



Tandem Fastener List

- QTY 8 - 3/8 X 1 ½ CARRIAGE BOLTS W/ NUTS, WASHERS & LOCK WASHERS: CONTROL HEAD TO MAIN FRAME
- QTY 8 - 3/8 X 1 ½ CARRIAGE BOLTS W/ NUTS: YOKE TO BOX TUBING
- QTY 4 - 3/8 X 1 ½ CARRIAGE BOLTS W/ NUTS, WASHERS & LOCK WASHERS: BARRIER TO BOX TUBING
- QTY 4 - 3/8 X 3 CARRIAGE BOLTS W/ NUTS, WASHERS & LOCK WASHERS: BARRIER TO BOX TUBING
- QTY 12 - 3/8 X 3 CARRIAGE BOLTS W/ NUTS, WASHERS & LOCK WASHERS: BOX TUBING TO MAIN FRAME
- QTY 16 - 3/8 X 4 WEDGE TYPE ANCHORS W/ NUTS & WASHERS: YOKES TO CONCRETE
- QTY 2 - 5/8 X 4 WEDGE TYPE ANCHOR W/ NUTS, BEARING BLOCK & BEARING: CENTER COLUMN MOUNTING
MAKE SURE BEARING IS GREASED

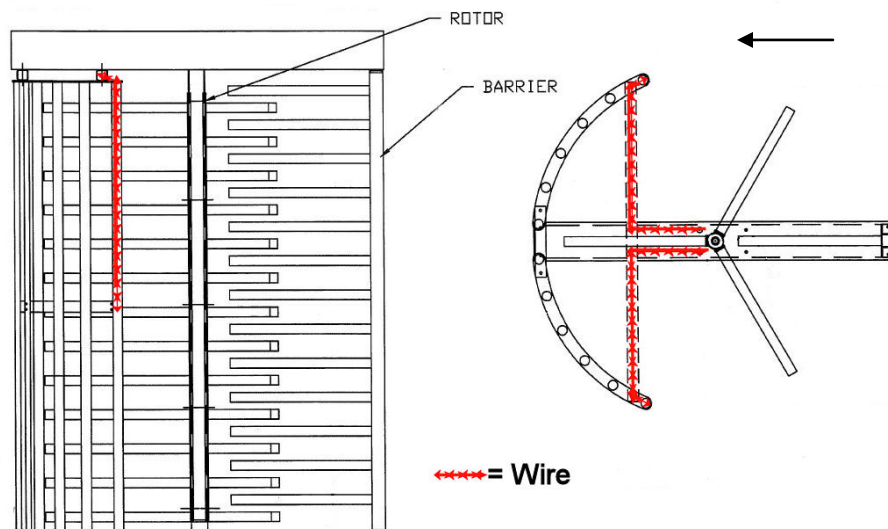
Pre-installation Tips

When installing a new turnstile, there are several helpful hints that can be used in order to make the installation go smoothly. It is highly recommended that these are reviewed before installation.

- If pouring a new concrete pad, make certain it is level. If the turnstile is not level, it may not operate correctly. If installing on an existing concrete pad, shim the turnstile so it is level.
- If the turnstile is electronic, pre-plan how it will be wired. We provide several options for running conduit into each turnstile.
 - The end plates on the main frame have punch outs for conduit.

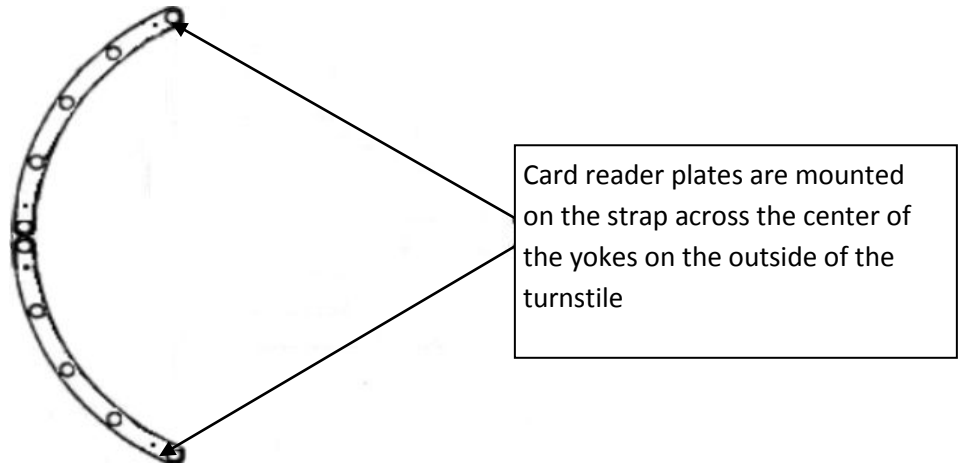


- If purchased with an optional card reader plate, the suggested method for running the wire is through the yokes, into the cross arms and into the main channel. Use a shielded 2 conductor 22 gauge cable per direction.

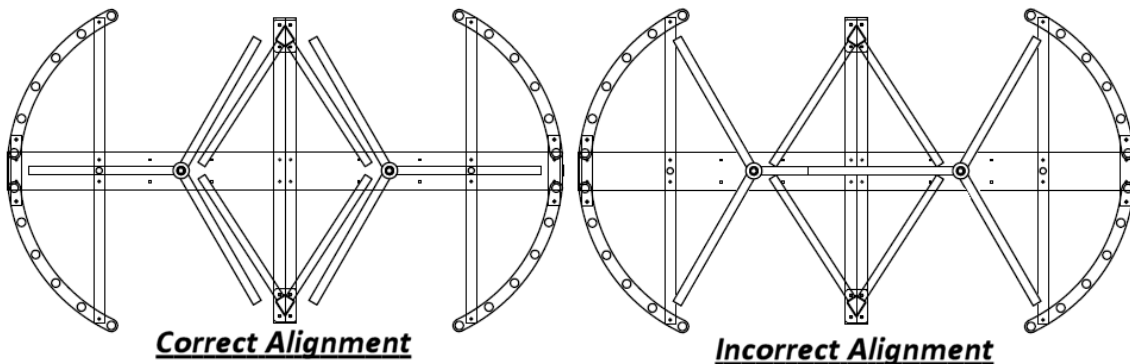


- Electronic turnstiles are operated from a provided 24VDC 2.1 amp power supply. Installing outlet receptacles inside of the main channel through provided conduit access is required.
- Access control devices, such as card readers, push buttons, biometric devices, etc. need to operate on a **normally open dry momentary contact of one second or less**. If your access control device is unable to provide a contact of one second or less, you can enable an on-board one shot timer (see later in guide).

When installing a turnstile purchased with card reader plates, pay special attention when working with the curved yoke pieces. One side of the yoke will be drilled specially for card reader plate mounting.



- Proper rotor alignment (left) is important for turnstile operation. Improper rotor alignment (right) can lead to users becoming trapped inside of the turnstile.



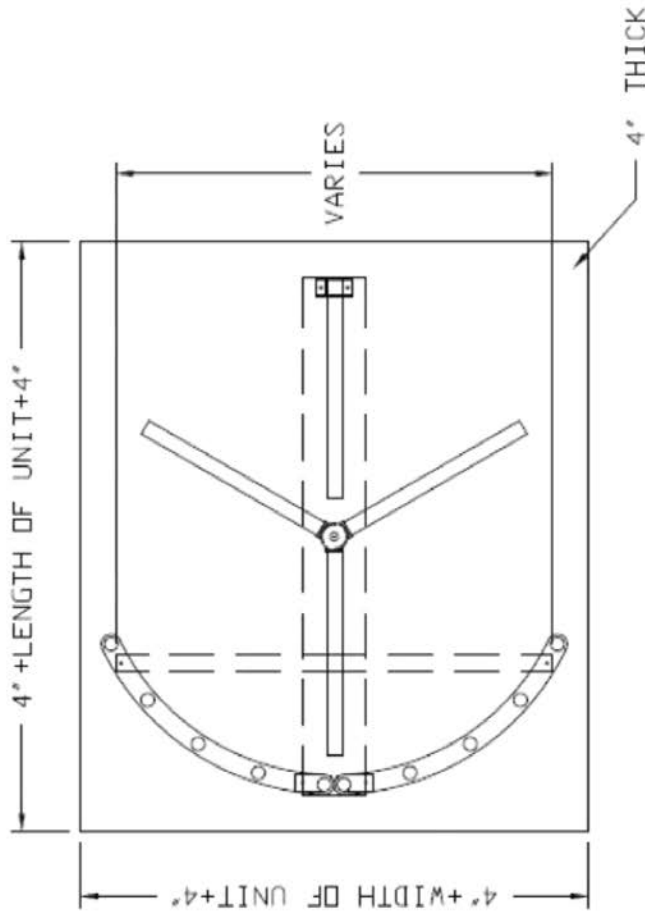
- Tools required for installation:
 - Hammer drill
 - 3/8 concrete bit
 - 5/8 concrete bit
 - Hammer
 - Punch
 - Marker
 - Plumb-bob
 - 9/16 wrench
 - 15/16 wrench
 - 1/8 allen wrench
 - Level
 - Grease gun
 - Safety gloves
 - Safety glasses

Concrete Pad Sizes

P.N. CA-FHCNCR

CONCRETE PAD SIZES

- HS427-S
LENGTH: 70" WIDTH: 62"
- HS430-S
LENGTH: 74" WIDTH: 64"
- HS439-S
LENGTH: 92" WIDTH: 76"
- HS448-S
LENGTH: 114" WIDTH: 105"
- HS427-T
LENGTH: 102" WIDTH: 62"
- HS430-T
LENGTH: 114" WIDTH: 64"



WE SUGGEST 4" OF CONCRETE ON EACH SIDE OF THE UNIT
 SEE FORMULAS ABOVE TO CALCULATE SIZES.

| | | | |
|----------------|--------------|------------------|--|
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| DATE: 08/10/05 | | REVISED: | |

Concrete Anchor Installation

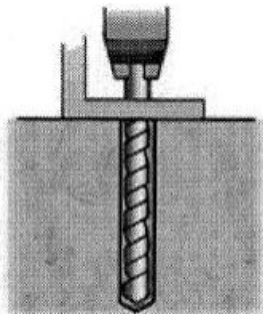
Instructions for Using Wedge Anchors

Determine the appropriate wedge anchor length for your project.

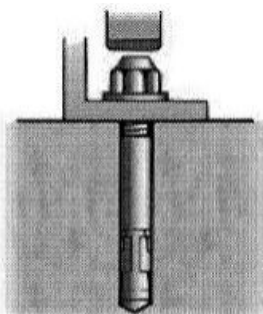
1. Add:
 The thickness of material to be fastened
 -to-
 The minimum embedment required
 -to-
 The thickness of the nut and washer (about one anchor diameter).
2. Once you have determined the appropriate wedge-type-anchor length, drill your hole using a bit with the same diameter, 1/2" deeper than the anticipated anchor embedment.
3. Clean the drilled hole of any debris.
4. Thread the nut and washer until the nut is flush with the top of the anchor.
5. Hammer it into position (nut and washer flush with the surface of the material).
6. Tighten finger completely and then take an additional 3-5 turns with the wrench.
7. If the anchor spins in the hole, force it up using a screwdriver until the clip binds into the concrete.

Thunderstud® Wedge Anchor Technical Information

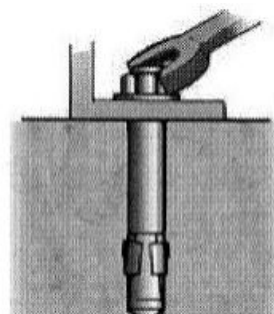
| Diam. & Length | Min. Embedment | Thread Length |
|----------------|----------------|---------------|
| 1/4" | 1-1/8" | 3/4" |
| 3/8" | 1-1/2" | 7/8" |
| 3/8" | 1-1/2" | 1-1/8" |
| 1/2" | 2-1/4" | 1-1/4" |
| 1/2" | 2-1/4" | 1-1/4" |
| 5/8" | 2-3/4" | 2" |
| 5/8" | 2-3/4" | 2" |
| 5/8" | 2-3/4" | 2" |
| 3/4" | 3-1/4" | 2" |
| 3/4" | 3-1/4" | 2" |
| 3/4" | 3-1/4" | 2" |
| 7/8" | 3-7/8" | 2-1/4" |
| 1" | 4-1/2" | 2-1/4" |
| 1-1/4" | 5-1/2" | 3-1/4" |



1. Drill hole 1/2" to 1" deeper than anchor embedment. Clean hole of debris.



2. With nut threaded past the end of stud, hammer into position.



3. Tighten finger tight plus an additional 3-5 turns with wrench.

Turnstile Installation

Step 1) If needed, pour a level concrete pad at least 4" thick at the schematic on page 9.



Note: A level surface is required for proper turnstile operation.

Step 2) Unpack turnstile(s) and verify all parts are included. Use the parts checklist in the beginning of this book.

Step 3) Unwrap the main channel (Figure A) from cardboard and foam packaging. Remove (6) 10/24 button head screws and take the lid off.



Figure A: Main channel

Step 4) Remove cross arms from the main channel. Using a square, assemble cross arms to the underside of the main channel by using the provided 3" carriage bolts as shown below (Figure B).

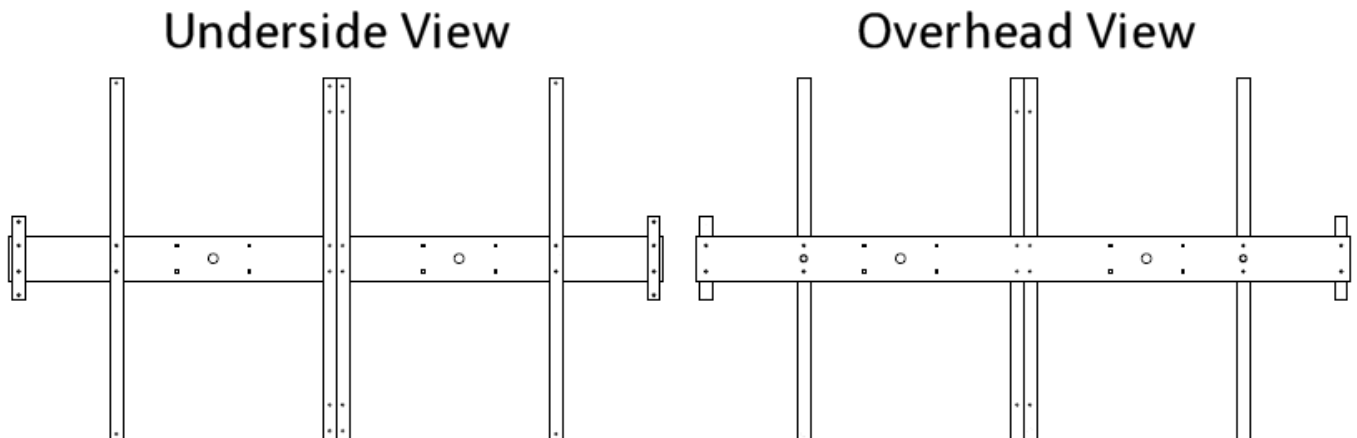


Figure B: Assembled mainframe



Note: Carriage bolts are designed to be hammered into place, so on locations where the hole is round, simply tap the head of the bolt into the hole.

Step 5) Utilizing the assembled mainframe, mark holes for the 3/8" concrete anchors to circled holes pointed out below (Figure C)

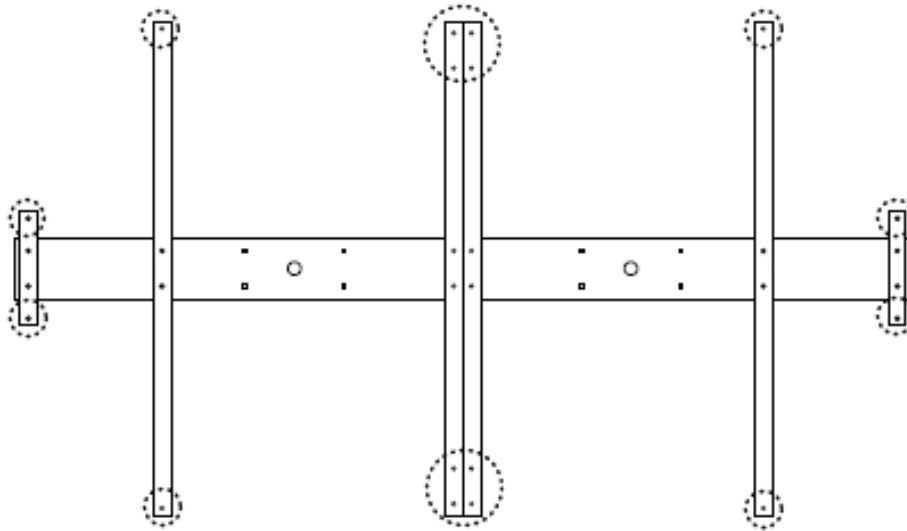


Figure C: Using mainframe as a template to mark holes for concrete anchors (circled dots)

Step 6) Before drilling, verify the cross arms were square to the mainframe by temporarily setting a yoke and a barrier over each set of holes to ensure that the hole patterns match. (Figure D).

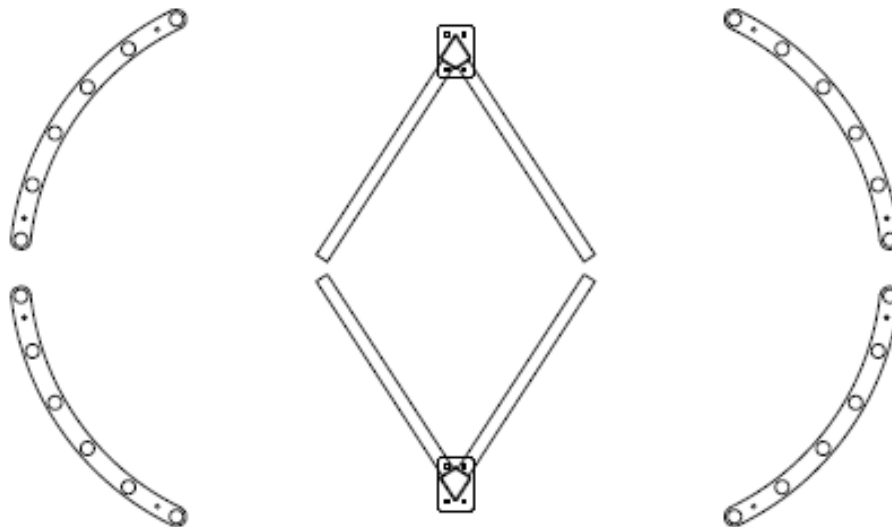


Figure D: Location of the barriers and yokes.

Step 7) Once satisfied with alignment, begin drilling the holes marked with a 3/8 concrete bit. Install anchors according to concrete anchor installation guide on page 10.

Step 8) Bolt curved yokes into the concrete (Figure E)



Figure E: Mounting the curved yoke pieces to the concrete.



Note: Depending on how the turnstile was ordered, yokes may have two tapped holes with button head screws on one end of the support strap (in the middle of the yoke) for mounting card reader plates. These holes should be oriented to the outside of the turnstile.

Step 9) Before continuing, identify the different rotors and barriers based on the component identification section of this manual (page 5). Once identified, mount the stationary barriers to the concrete (Figure F)

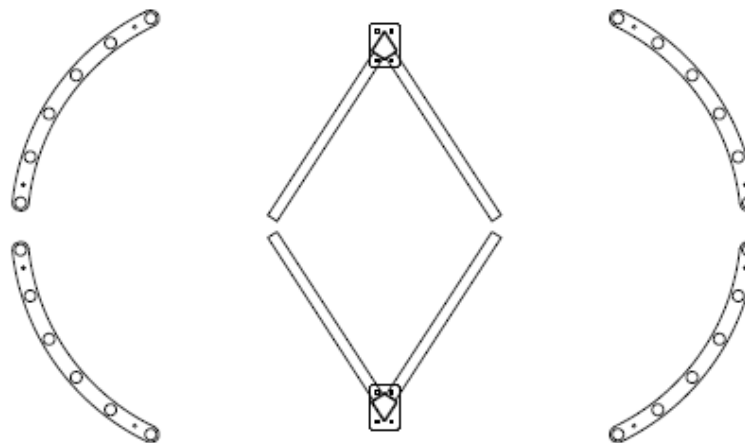


Figure F: Mounting the stationary barriers to concrete.

Step 11) Mount the mainframe on top of yokes and stationary barriers using 1 1/2" carriage bolts (Figure G).

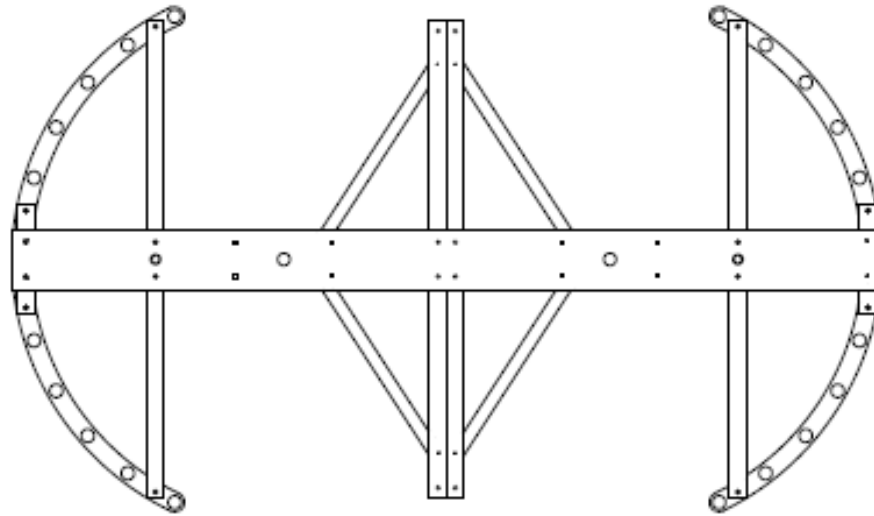


Figure G: Mounting the mainframe on top of the yokes and barrier.

Step 12) Check the levelness of turnstile. If necessary, shim from the floor to make turnstile level.

Step 13) Using a plumb-bob, mark the holes for the bearings and rotors (Figure H).



Note: This step requires as much precision as possible, or the turnstile may not operate correctly. Do NOT rely on the mainframe as a template for this hole.

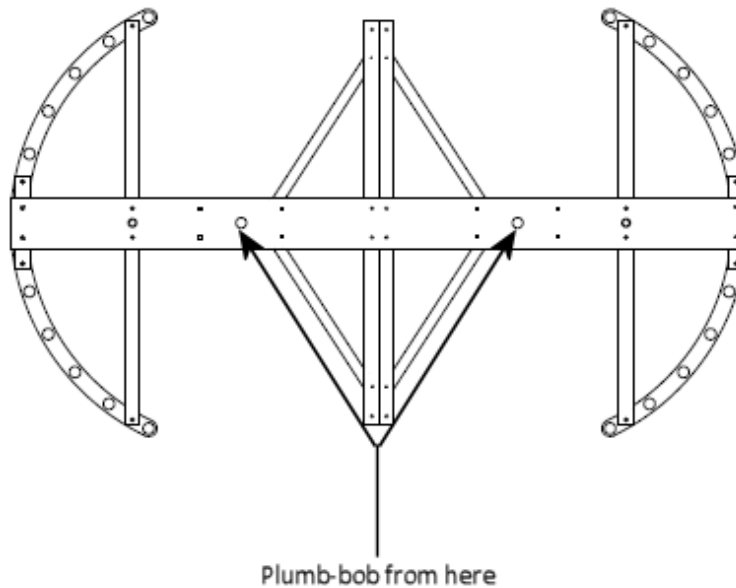


Figure H: Using a plumb-bob to mark holes for rotor placement.

Step 14) Drill holes for the 5/8" concrete anchors that hold the bearing blocks (Figure I) and bearings in place. Install the anchors in the concrete. Install bearing blocks to concrete and add bearings.

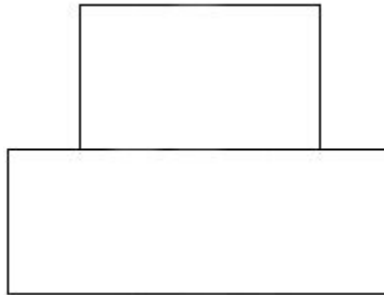


Figure I: The bearing blocks used to support the bearings and rotors.

Step 15) Place the rotors on top of the bearing blocks. Make sure that one set of arms on the rotor points in between the two yoke assemblies (Figure J).



Note: Improper rotor alignment will cause users to become trapped inside of the turnstile.

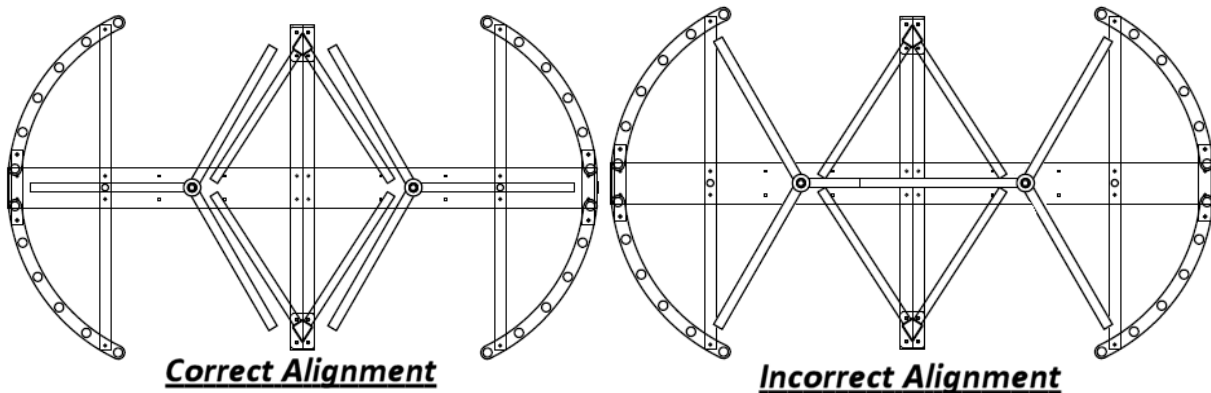


Figure J: Proper rotor alignment (left) vs. improper rotor alignment (right).

Step 17) Slide the control heads into the tops of the rotors. The control heads have 7/8" hex shafts that insert into adaptors on the rotors. If the turnstile is electronic, mount the control heads with the power supplies towards the side of the turnstile that power is ran to. The control heads will function the same whichever way it is installed into the rotor, but each head might be configured differently.

Step 18) Bolt the control heads to the mainframe using the 1 1/2" carriage bolts.

Important Electrical Information

Installation of the control head mechanism into the turnstile requires a grounding-type outlet receptacle installed inside of the frame or cabinet through the provided conduit access points.

To reduce the risk of electric shock, this equipment has a grounding type plug that has a third (grounding) pin. This plug will only fit into a grounding type outlet. If the plug does not fit into the outlet, contact a qualified electrician to install the proper outlet. Do not change this plug in any way.

Additionally, the P24-60W power supply from this appliance must be grounded to the frame of the turnstile. Utilize the green colored grounding screw threaded into the grounding tab located near the power supply along with the provided grounding wire from the power supply to ensure the equipment is properly grounded.

Do not connect to a receptacle controlled by a switch.

UL 294 Classification Declarations:

| Feature | Level |
|-------------------------|--------------|
| Destructive Attack Test | I |
| Line Security | I |
| Endurance | IV |
| Standby Power | I |

ULC S319, Class 1

Wiring methods shall be in accordance with:

National Electrical Code, ANSI/NFPA 70

Canadian Electrical Code, CSA C22.1, Part I, Safety Standard for Electrical Installations

The 6500 Series Control Head is suitable for indoor & outdoor use, within in an appropriate turnstile or gate model.

6500 Series Control Head Installation

To reduce the risk of electrical shock, do NOT hard wire the power supply directly into input voltage. Only power this turnstile from a grounding-type receptacle. Should the turnstile be installed without a grounding-type receptacle, contact a qualified electrician to install one for you.

Waist High Installation:

New waist high turnstile already have the 6500 Series Control Head mounted in place.

However, should the need to replace the control head arise, follow these steps:

- Remove the arm assembly from the turnstile by unbolting the 3x 5/16-18 button head cap screws.
- Remove the lid from the cabinet. Some models have a lock and key system while others are secured with 10/24 button head cap screws located on the sides.
- Unplug the control head from the grounded receptacle located inside of the cabinet.
- Unbolt the 4x 5/16-18 carriage bolts holding the control head assembly in place.
- Pull the control head out of the cabinet and disconnect any access control inputs from the control board.
- Place the new control head on top of the cabinet and connect the access control inputs to the new control board (see wiring diagram).
- Insert the control head into the cabinet with the locking bars facing upwards towards you and bolt it into place with the 4x 5/16-18 carriage bolts.
- Ground the new power supply to the cabinet.
- Plug in the control head to the grounded outlet receptacle.
- Install arm assembly onto arm adapter with the 3x 5/16-18 button head cap screws.
- Test functionality of turnstile. Adjust hydraulic shock as needed.
- Reinstall lid.

Full Height Installation:

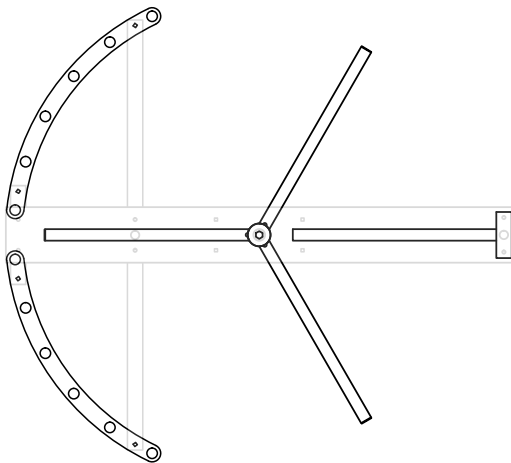
- Remove the cover from the mainframe by removing the 10/24 truss head screws.
- If applicable, remove the existing control head from the mainframe:
 - Unplug the existing control head from the grounded outlet receptacle.
 - Unbolt the 4x 3/8-16 carriage bolts holding the head in the main channel.
 - Disconnect access control inputs from the existing control board.
 - Pull the control head assembly straight up. The shaft will also come out after about 4".
- Install the control head into the hex insert on the rotor so that the rotor is properly aligned with one set of arms in between the two yokes (see rotor alignment information).
- Bolt the control head into the main channel with the 4x 3/8-16 carriage bolts.
- Connect access control inputs to new control board (see wiring diagram).
- Ground the power supply to the frame utilizing the provided grounding tab located near the control head.
- Plug the control head into a grounded outlet receptacle.
- Test functionality of turnstile. Adjust hydraulic shock as needed.
- Replace the cover of the mainframe using the 10/24 truss head screws.

Single Full Height Turnstile Rotor Alignment

Mounting a new 6500 Series Control Head is very simple. Unbolt the existing control head from whatever turnstile it is installed in and mount the new one in its place. The 6500 Series Control Head is backwards compatible with nearly every turnstile we have ever made on it's own. In units that the hole pattern does not match, an adapter plate is provided to make installation just as simple.

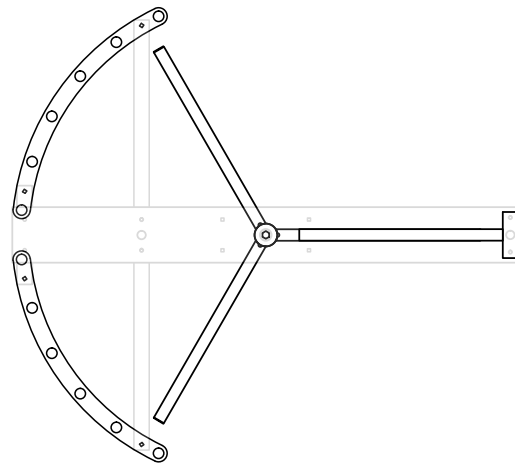
Installing a 6500 Series Control Head into a full height turnstile requires a little extra attention to detail when installing. The rotor itself needs to be properly aligned within the passage way before installing the control head or it will not function as intended. One set of arms on the rotor of the unit needs to be pointing in the center of the two half-moon yoke assemblies, not meshed together with the stationary barrier's arms. See diagram below.

Correct Alignment



Rotor has one set of arms in between two half-moon yokes in home position. Arms are not meshed with stationary arms on the barrier.

Incorrect Alignment



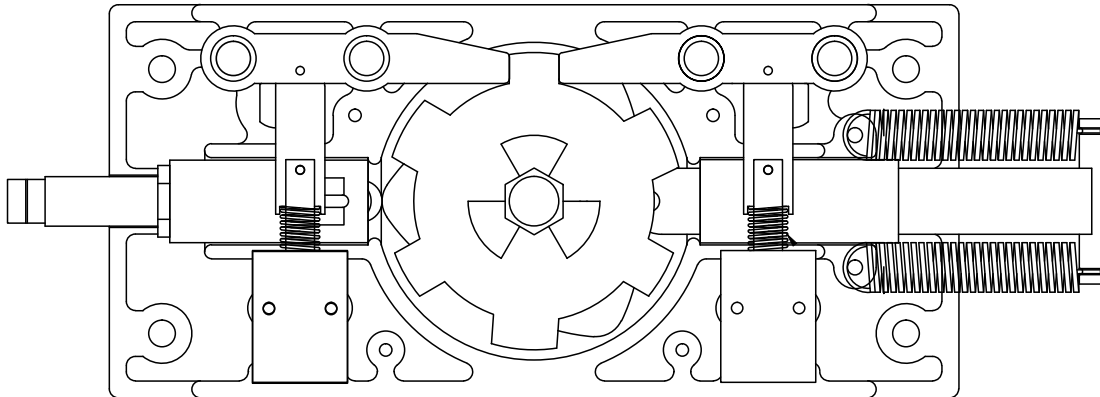
Rotor should **NOT** have one set of arms meshed with stationary arms on barrier with the other two sets of arms pointing to the outsides of the half-moon yokes.

Note: Failure to properly align the rotor can cause inconsistent operation and the **possibility to become trapped within the turnstile** in some scenarios. If the rotor was installed incorrectly, the solution is to fix the rotor alignment. Do not adjust access control or logic controller settings to accommodate the improper alignment.

Simply remove the four carriage bolts holding the 6500 Series Control Head to the mainframe, pull up on the control head to remove it as one assembly, spin the rotor to the correct position, then reinstall the control head into the mainframe.

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 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.

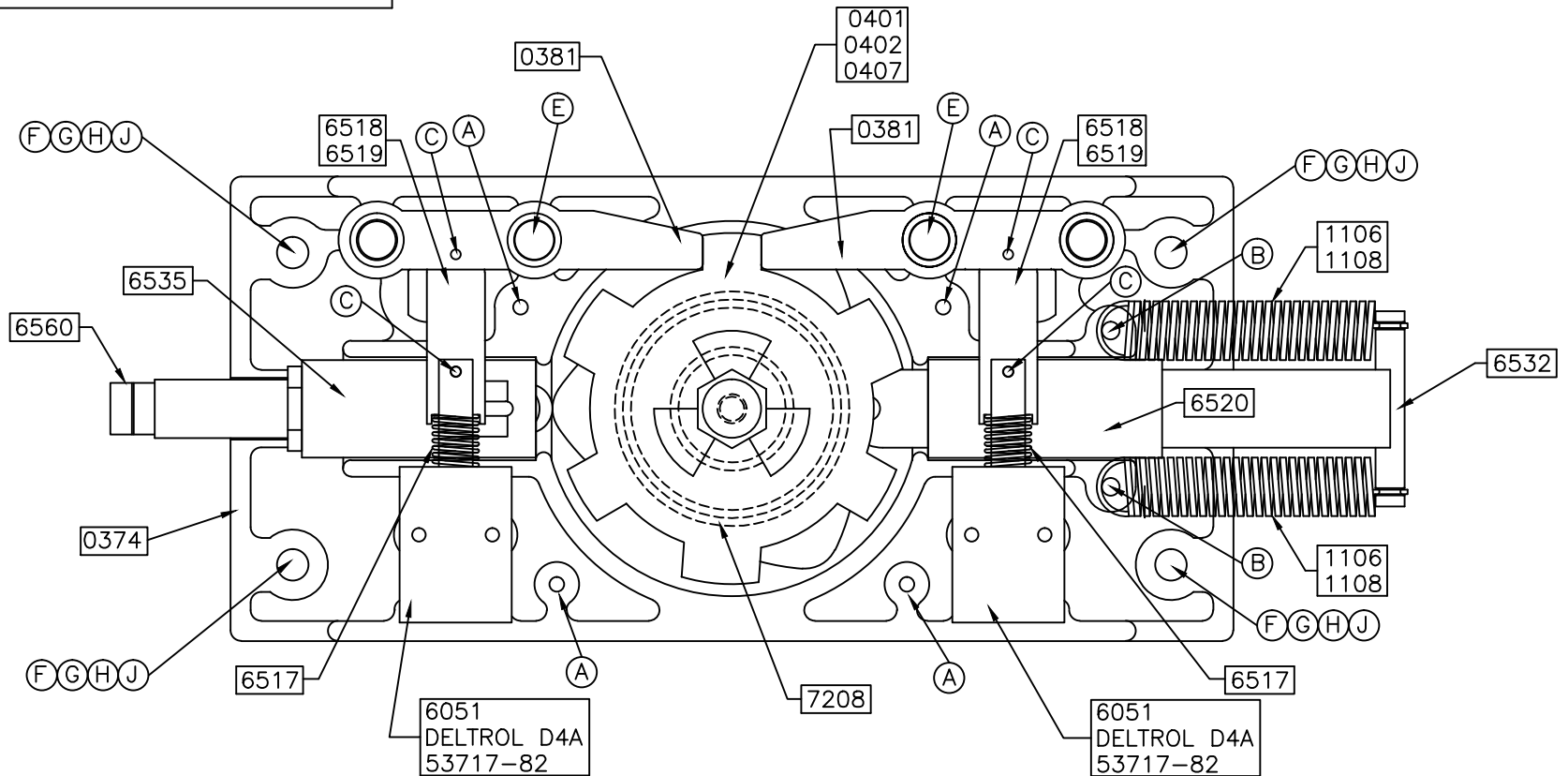


An internal view of an electronically controlled two way 6500 series control head.

While the head can be configured for mechanical (no electronics) operation, the 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, this control head will allow for one rotation per valid entry request. Our anti-backup cams are designed so that it is 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.

TOP CASTING REMOVED



ALL ELECTRICAL COMPONENTS UL CERTIFIED

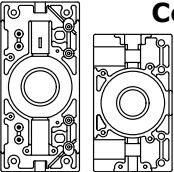
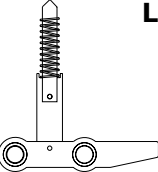
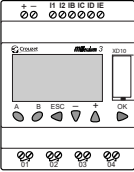
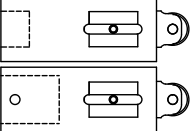
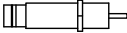
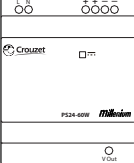

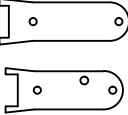

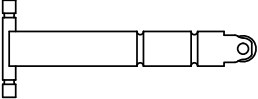
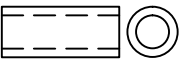

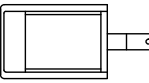
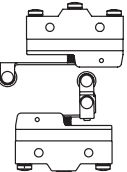


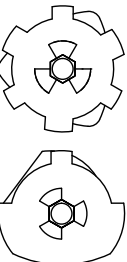
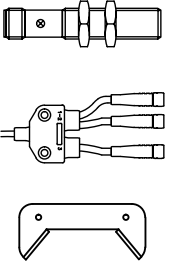
6500 SERIES CONTROL HEAD BOTTOM ASSEMBLY

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 |

| | | |
|--|--|---|
|  <p>Control Head Castings 0373 - Bottom Casting 0372 - Top Casting</p> |  <p>Locking Bar Assemblies 0382 - Fail Open Assembly 0383 - Fail Lock Assembly</p> |  <p>0740 - Logic Controller (XD10)</p> |
|  <p>Shock Housing Assemblies 6535 - WH/427/430/T80/ADA 6541 - 439/448/P60/HD</p> |  <p>Hydraulic Shock Absorbers 6560 - WH/427/430/T80/ADA 6561 - 439/448/P60/HD</p> |  <p>0750 - 24VDC Power Supply (60 W) w/ NEMA 5-15 Drop Cord</p> |
|  <p>0381 - Locking Bar Casting w/ Oil Impregnated Bushings</p> |  <p>Locking Bar Linkages 6519 - Fail Open 6518 - Fail Lock</p> |  <p>Solenoid Springs 6510 - Fail Open Spring 6016 - Fail Lock Spring</p> |
|  <p>6532 - Index Pin</p> |  <p>6520 - Index Pin Tubing</p> |  <p>Indexing Springs 1106 - Waist High (Light) 1108 - Full Height (Heavy) 07 - ADA (Extra Heavy)</p> |
|  <p>6051 - Solenoid Deltrol D4A53717-82</p> |  <p>Limit Switches 2180 - Standard (Z-15GW2-B7-K) 1700 - One Way (BZ2RW825-A2)</p> |  <p>Limit Switch Cams 2267 - Standard 2268 - ADA 2269 - One-Way</p> |
|  <p>Control Head Bearings 7208 - Bottom Casting (6007RSNR) 1641 - 1" ID for HD Top Castings & All Pre-2018 Tops (1641-2RSNR) \$ 1640 - 7/8" ID for Standard Duty Top Castings (1640-2RSNR)</p> |  <p>Cam Assemblies 0401 - 427/430/T80/WH (7/8 Hex) 0407 - 439/448/P60/HD (1.25" Hex) 0402 - ADA (Must specify model)</p> |  <p>Proximity Sensor & Accessories 7211 - 24VDC PNP Prox. Sensor w/ M12 Connector (Sick 1040763) 0766 - 3 Branch M12 Splitter 6589 - Turnstile Prox. Bracket w/ 3x Mounts - LH, RH & Home</p> |

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 unsecured 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 is 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.

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.

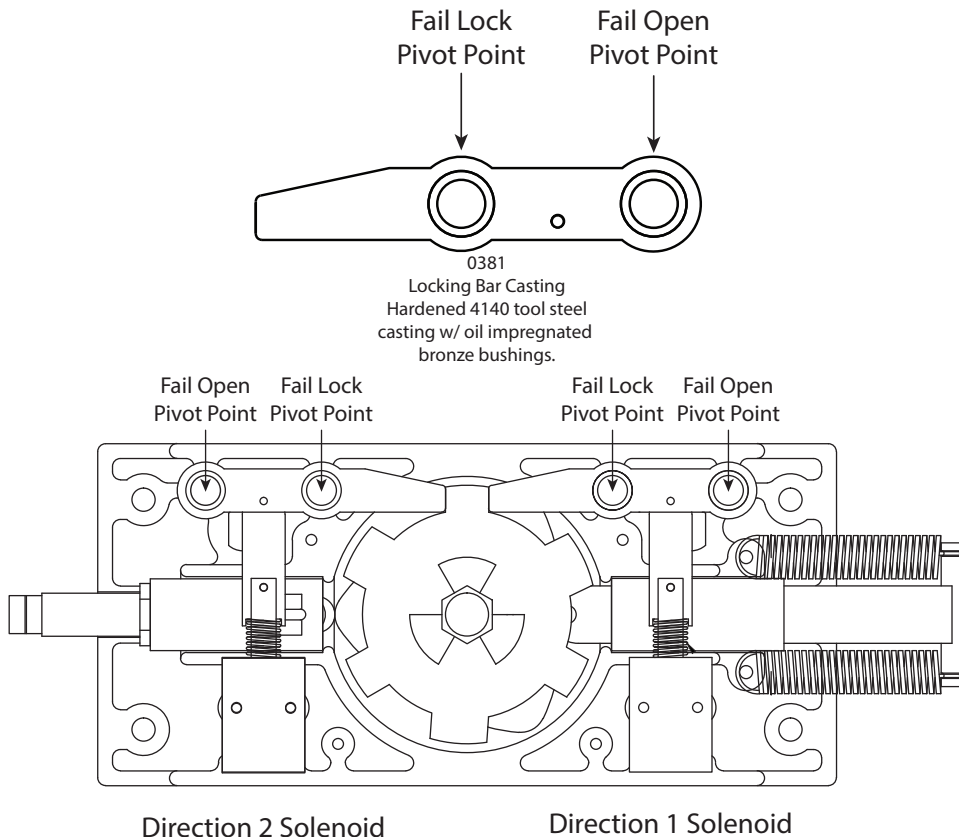
“No passage” directions include a fail lock locking bar assembly as well as an unwired solenoid. This adds the appropriate parts to the control head to prevent it from rotating in that direction.

“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)

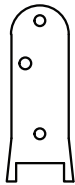
The 6500 Series Control Head can be reconfigured from fail lock to fail open and vice versa. Extra components are required to do so.

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.

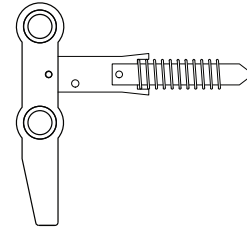
If changing from fail lock to fail open or vice versa, install dowel pin in alternate hole.



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 much lighter in force
Wire diameter is .032"
This spring was also used on the 6100 Series Control Head.



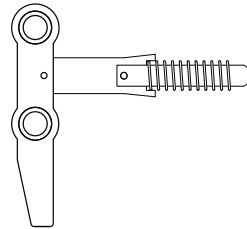
0383
Fail Lock Locking Bar Assembly
Includes locking bar casting w/ oil impregnated bushings, solenoid spring, locking bar linkage, and solenoid plunger.



6519
Fail Open Linkage
These have an approximate length of 2.5" and do not have the extra hole for the key override option.

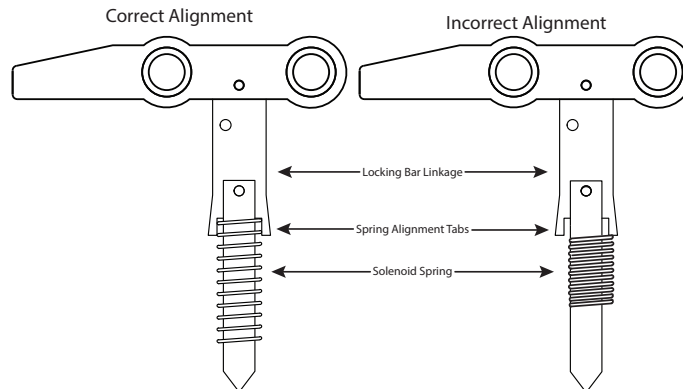


6510
Fail Open Solenoid Spring
These look similar to fail lock, but are actually stronger in force.
Wire diameter is .041".



0382
Fail Open Locking Bar Assembly
Includes locking bar casting w/ oil impregnated bushings, solenoid spring, locking bar linkage, and solenoid plunger.

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

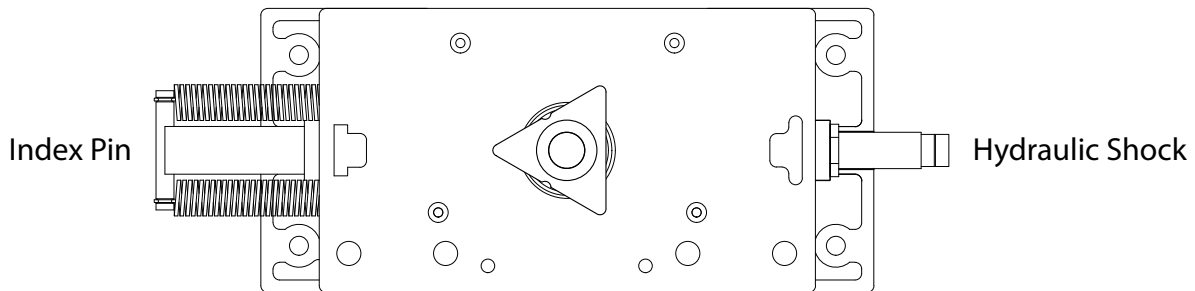


6500 Series Control Head Hydraulic Shock Information

The 6500 Series Control Head utilizes a spring loaded index pin for auto-centering the cam while a hydraulic shock offers counter resistance to slow the rotation down.

Set properly, the shock will allow a turnstile or gate to self-center while rotating smoothly without slamming.

Some turnstile models use a different shock than others. Waist highs and smaller full heights use a .75" diameter shock (Enidine brand) while larger full heights use a 1" diameter shock (ACE Controls brand).



Enidine Brand Shocks:

Setting:

Loosen the set screw on the head of the dial and turn the knob. The dial can be set between 0 and 8. The higher the number, the stronger the shock is. Tightening the set screw can alter the shock strength so a good habit is to loosen the set screw, turn the dial, tighten the set screw then test your setting. Repeat until satisfied.

Replacement:

Thread the new shock into the shock housing as far as it will turn while the cam is in the home position. Once it bottoms out, thread the shock back out 1.5 - 2 turns until the numbers on the dial are facing upright. Some models may require an additional turn or two outward if the arm does not self center on even the lowest setting.

ACE Controls Brand Shocks:

Setting:

Loosen the set screw located on the end of the shock itself before the dial. The dial can be set between 0-8 and the set screw acts as indicator for the dial. The lower the number, the stronger the shock is.

Replacement:

Thread the new shock into the housing as far as it will turn while the cam is in the home position. Once it bottoms out, thread the shock back out 1.5-2 turns until the set screw pointer is facing upright. Fasten the shock into the housing by snugging the 1/4-28 set screw into the bronze housing (snugly, but do not over tighten or the brass might start to tare).

Failure to turn the shock back out after threading it in all of the way will likely cause the part to wear out very quickly.

6500 Series Control Head Electrical Information

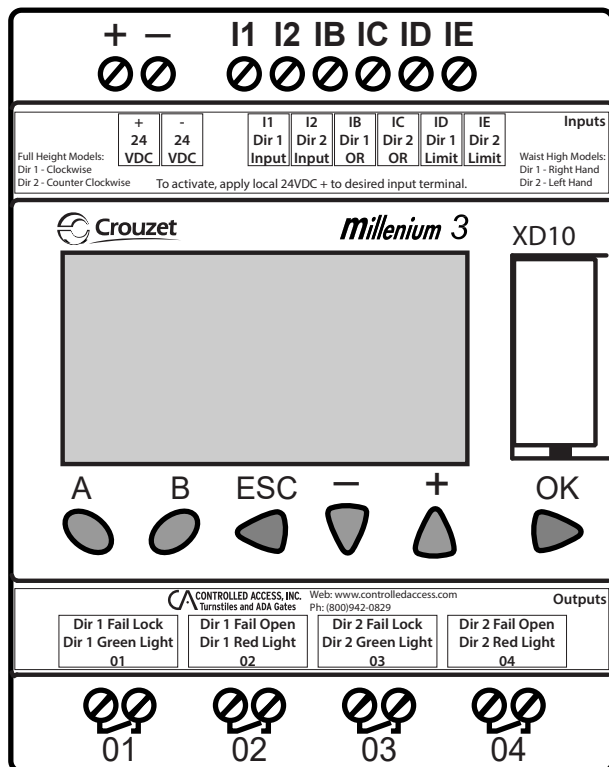
Each electronic control head comes with a power supply, a programmable logic controller (PLC), limit switches (or optionally, proximity sensors) and solenoids. For safety purposes, it is recommended that you read all literature on the electrical components before attempting to install the control head into a turnstile.

The 6500 Series Control Head is on the third generation of electronic components. The new XD10 logic controller is a direct replacement of both the 0789 control board and 6789 (Keyence KV-16DR) logic controller.

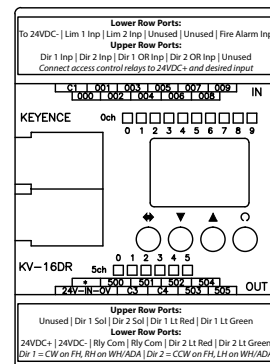
The latest enhancements provide a broader temperature range for outdoor installations (-4 to 131F) as well as a user friendly text based interface with a daylight visible display. With this also comes some new features such as on board testing buttons, turnstile statistics / information, etc.

While the wiring may be different, there are very few exceptions to when this board is compatible with installed products. If an installation has the old 0789 circuit board (PCB) and has the optional proximity sensor upgrade, new proximity sensors will need to be purchased. This is because the 0789 board had NPN inputs while the XD10 (and the KV-16DR) have PNP inputs.

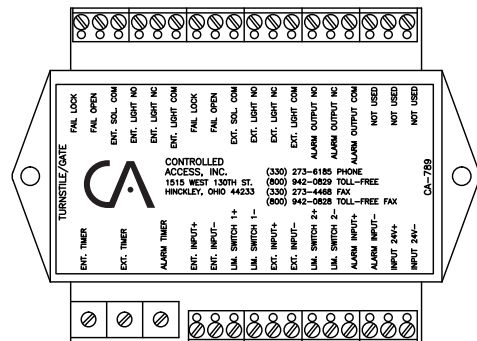
The new PLC still requires relay contact closures for inputs just like all previous generations, so any installation is compatible in one way or another. If assistance is needed with understanding how to convert the wiring from access control to the new logic controller, please view this manual or call our technical support department for assistance.



XD10 Logic Controller
0740

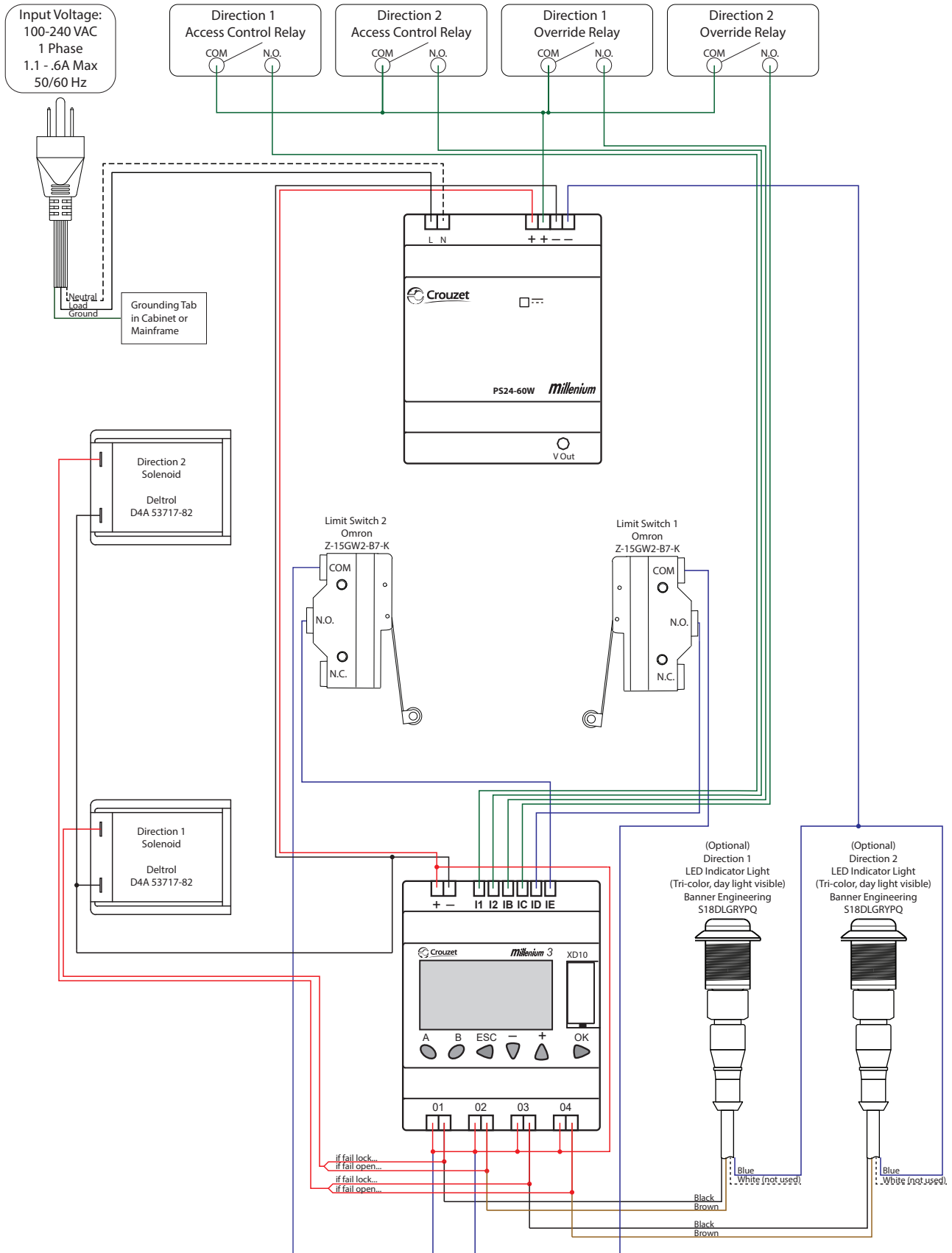


KV-16DR Logic Controller
6789

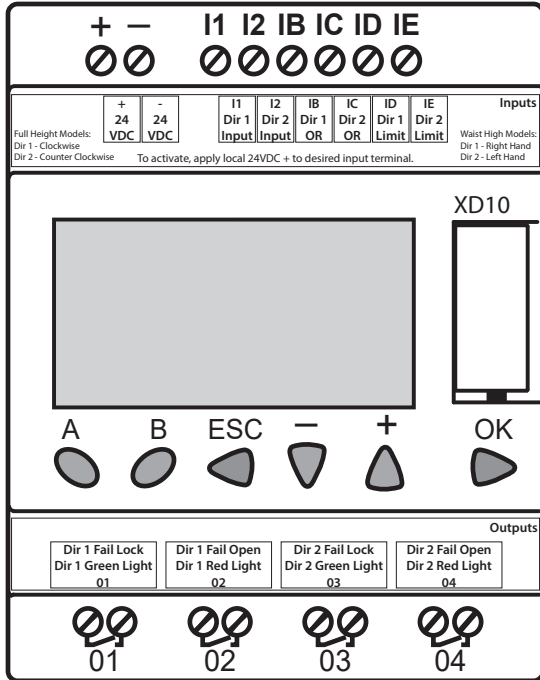


Control Board
0789

6500 Series Control Head w/ XD10 Controller Standard Wiring Diagram



6500 Series Control Head w/ XD10 Controller Standard Wiring Legend



General definitions:

- Direction 1** - Clockwise on full height turnstiles or cabinet on right for waist high turnstiles & ADA gates.
- Direction 2** - Counter clockwise on full height turnstiles or cabinet on left for waist high turnstiles & ADA gates.
- Limit** - A switch or sensor designed to detect rotation and lock the unit after a rotation.
- Fail Lock** - Upon power failure, the direction is designed to remain locked. Also known as Fail Secure.
- Fail Open** - Upon power failure, the direction is designed to remain opened. Also known as Fail Safe.

Each unit is built to order, preconfigured 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.

Note: directional status outputs (lights) are unaffected by optional key overrides as the override occurs outside of the logic controller.

Input descriptions:

- 24VDC +** Positive output from the 24VDC power supply connects here.
- 24VDC -** Negative output from the 24VDC power supply connects here.

- I1 - Direction 1 Input** - Unlocks direction 1 for either one rotation or until the timer expires. Standard access control should terminate here.
- I2 - Direction 2 Input** - Unlocks direction 2 for either one rotation or until the timer expires. Standard access control should terminate here.
- IB - Direction 1 Override** - Holds direction 1 unlocked for duration of contact closure. Mainly for fire alarms and other temporary overrides.
- IC - Direction 2 Override** - Holds direction 2 unlocked for duration of contact closure. Mainly for fire alarms and other temporary overrides.
- ID - Limit 1 Input** - Cancels Direction 1 activation if triggered before timer expires, re-locking the unit after one rotation.
- IE - Limit 2 Input** - Cancels Direction 2 activation if triggered before timer expires, re-locking the unit after one rotation.

Output descriptions:

All 4 relay outputs have individual commons. 24VDC+ is distributed to each relay common to operate the turnstile. It is OK to add extra wires to these relay commons to distribute voltage to other devices.

- 01 - Output 1** - Dual purpose output for Direction 1. If the direction is fail lock, it's solenoid would connect here. If equipped with an indicator light, the green leg would connect here. Output switches from OFF to ON when directional input is triggered.
- 02 - Output 2** - Dual purpose output for Direction 1. If the direction is fail open, it's solenoid would connect here. If equipped with an indicator light, the red leg would connect here. Output switches from ON to OFF when directional input is triggered.
- 03 - Output 3** - Dual purpose output for Direction 2. If the direction is fail lock, it's solenoid would connect here. If equipped with an indicator light, the green leg would connect here. Output switches from OFF to ON when directional input is triggered.
- 04 - Output 4** - Dual purpose output for Direction 2. If the direction is fail open, it's solenoid would connect here. If equipped with an indicator light, the red leg would connect here. Output switches from ON to OFF when directional input is triggered.

Indicator light information:

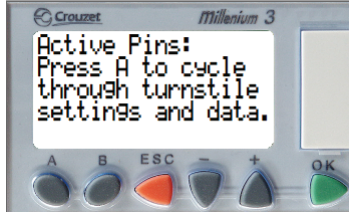
- Green Light** - An indicator to inform pedestrians that they are allowed to pass through the unit. Uses black output wire from light's cable.
- Red Light** - An indicator to inform pedestrians that the unit is locked or that pedestrians require credentials to enter. Uses brown output wire from light's cable.

As a side note, indicator lights purchased from Controlled Access, Inc. can also be wired to glow **yellow**. If desired, this can be used instead of red with the unused white wire on the light's cable to indicate to pedestrians they require credentials to enter. This is especially handy for multi-lane installations in which some directions are "no passage" instead of "controlled passage". Likewise, green lights can also be wired to a red light output to constantly glow green to indicate "free passage".

6500 Series Control Head w/ XD10 Controller Standard Turnstile Settings

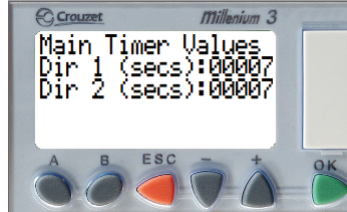
The XD10 logic controller on the 6500 Series Control Head has a text based menu screen to adjust settings and view statistics of the turnstile. Pressing the A button will cycle to each of the screens available on the device. Pressing B from any screen listed will return to the Home Screen.

Home Screen



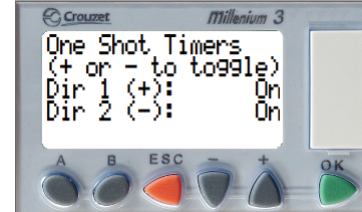
This screen is at the start of the menu cycle. The top section will give a read out of inputs that are currently receiving voltage. The display will return to this screen after cycling through all windows, 5 minutes of inactivity or pressing the B button.

Timer Values Screen



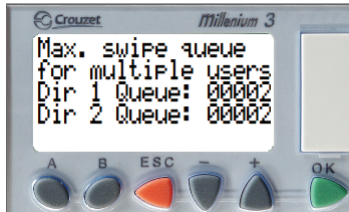
This screen allows for the each directional timer to be modified. Select which value you wish to edit by pressing the + & - key. Press OK to select the value then press + or - to modify. Save by pressing the OK button again. Each timer can have a value of 1 - 60 seconds. The timer will be canceled upon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

One-Shot Timers Screen



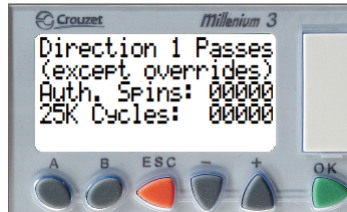
This screen allows for the two one-shot timer settings to be enabled or disabled. This setting prevents access control from holding open a direction on the standard direction inputs. Toggle Direction 1 by pressing + and Direction 2 by pressing -. This should be set to "On" in almost every installation.

Swipe Queue Screen



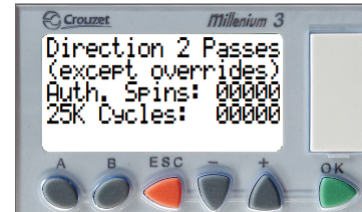
This screen defines the maximum number of access control requests the unit will allow in queue. Each value can be set from between 1 (for maximum security) to 3 (for fast paced passage). The default is 2. The method to change these settings is the same as the Timer Values Screen.

Direction 1 Counts Screen



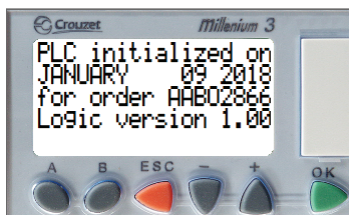
This screen gives statistics about how many times direction 1 was activated and cycled. Since there is a limit to how many counts can be displayed, after 25000 cycles the first counter resets and adds to the second counter.

Direction 2 Counts Screen



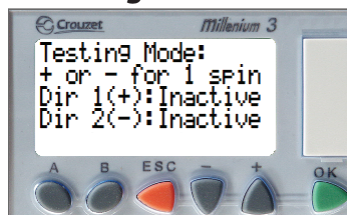
This screen gives statistics about how many times direction 2 was activated and cycled. Since there is a limit to how many counts can be displayed, after 25000 cycles the first counter resets and adds to the second counter.

General Info Screen



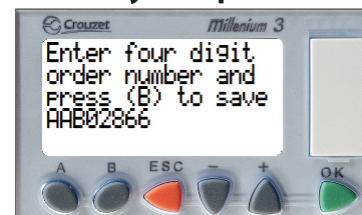
This screen displays when the PLC was initiated, the order number it was activated for (except for any revision suffixes which are not needed for order lookup), and the PLC software version.

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.

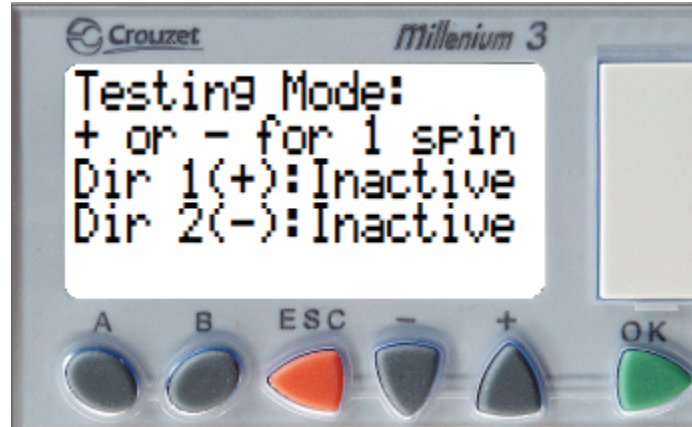
Factory Setup Screen



This screen should only appear when first set up in the factory or if something occurs to totally reset the logic controller. If this manages to occur and the order number (if known), enter it as a value then press B to save.

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 successful 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.

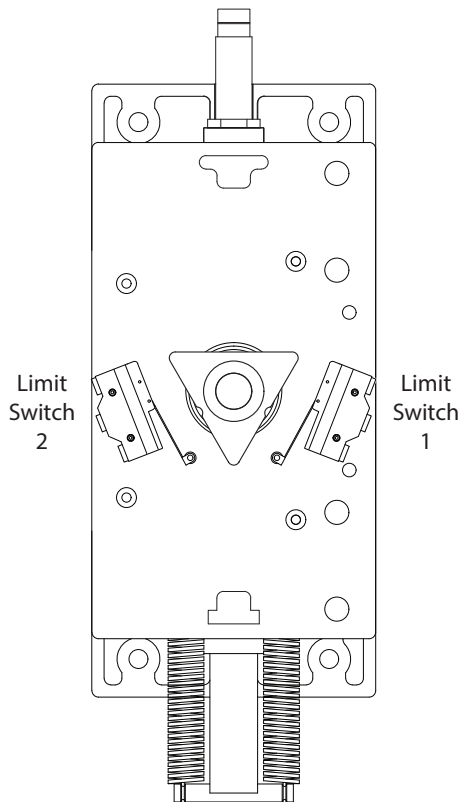
If the unit does not successfully re-lock after manually triggering the limit switch, ensure that it is wired properly. Return to the home screen and press / hold the limit switch. If the switch is being held but the "Active Pins" display does not include the switch being held, it may be necessary to 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 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.

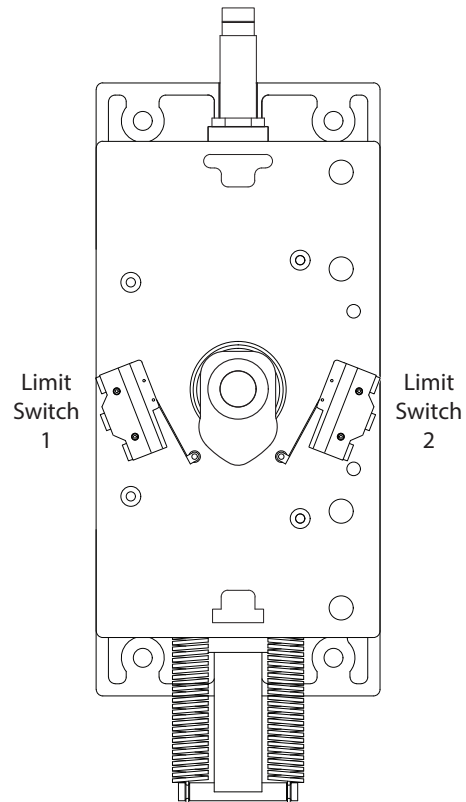
Turnstile Control Head



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 jigging 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.

Bi-annual 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.

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 13-15 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 16. 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 13-15 for wiring information. |
| | Limit switches are broken. | Inspect limit switches for breakage, replace as needed. |
| | Control head requires maintenance. | Refer to page 18 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 17 for more information. |
| People are becoming trapped inside of the turnstile (Full Height models) | Rotor was installed backwards. | Refer to page 4 installation for visual diagram on how to install rotor properly. |
| Turnstile only rotates 30 degrees. | Limit switches wired incorrectly. | Refer to pages 13-15 for wiring information and page 17 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 17 for top cam information. |
| Unit remains unlocked until access control is presented. | Fail open / fail lock configuration is wired incorrectly. | Refer to pages 13-15 for wiring information. |
| Turnstile is slamming into the closed position. | Shock either needs adjusted or replaced. | Refer to page 12 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 9-11 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 15 for direction port explanations. |
| Turnstile fails lock when needed to fail open or vice versa. | Improperly filled out direction sheet. | Refer to page 11 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 18-19. |
| Other problems. | | Please contact us for any other issues. |

Proper Turnstile Usage

The 6500 Series Control head is easy to use. There are a few things that users should be trained on and informed of.

- In the case of an electronic turnstile, approach the unit and present access control credentials. Do not push on the arms of the rotor until after the access control device successfully unlocks the turnstile. A sturdy click sound will be heard from the main channel when the solenoid pulls the locking bar open.
- Note that the turnstile will not unlock if the rotor or arm is being pushed on before access control activates the solenoid. The unit should unlock once pressure is released but it is a better practice to wait until the unit is unlocked before pushing on the rotor.
- Once access has been granted, proceed through the turnstile immediately. Waiting too long could cause the rotor to time out mid-rotation, forcing the user to back out of the turnstile. There are timer settings for adjusting how long it takes for this to occur. The default time provided is 7 seconds. The reason for this is in case somebody swipes and walks away without passing through.
- Walk at a reasonable pace through the turnstile. Do not slam the rotor through the rotation. This can be unsafe and may cause unnecessary wear and tear to the control head.
- Try to be respectful of users wanting to pass through the opposite direction. Allow people who are waiting an opportunity to pass through the turnstile.
- Avoid rotation the rotor of a full height without being in the passage. This will cause the rotor to re-lock before you have a chance to pass through the turnstile.
- Piggybacking : More than one user trying to squeeze through the turnstile on one rotation should be avoided. Large bags and carts should be brought through an alternate means of entrance.

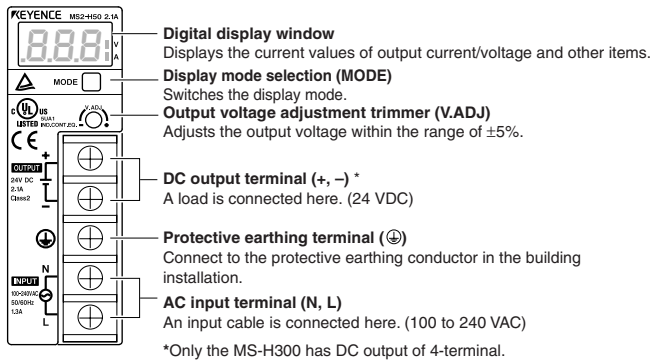
Warranty Information

Seller warrants the goods against defective workmanship and materials provided that Buyer notify Seller within one (1) year after receipt by Buyer of the goods of any claim under this Warranty. The liability of Seller shall be limited to replacing or repairing defective goods returned by Buyer and delivered to the factory of the Seller, transportation charges prepaid.

Replaced or repaired goods will be redelivered freight repaid to the address of Buyer shown hereon. Except for the Warranty contained herein, there shall be no other warranties, such as warranties of fitness and merchantability or otherwise express or implied, written or verbal, and Seller shall not be liable for consequential damages in any event.

Compact Switching Power Supply MS2 Series Instruction Manual

Part Names and Functions



Safety Precautions

Danger

- Do not perform any electrical wiring while electric current is applied. Failure to follow this may result in an electric shock or fire.
- Be sure to connect the grounding cable. Failure to follow this may result in an electric shock or fire.
- Do not touch this unit within 1 minute after AC input is turned off. Failure to follow this may result in an electric shock.
- Do not modify or repair this unit. Failure to follow this may result in an electric shock, accident, or product failure.
- Do not touch any terminal of this unit while electric current is applied. Use the unit with the terminal cover installed to avoid an electric shock.

Warning

- When this unit is used in a system that may cause a serious accident or damage if the unit fails, be sure to install a safety device.
- Pay attention to prevent foreign matter such as metal particles, dust, paper or wood chips from entering the inside of this unit. Failure to follow this may result in a fire or product failure.
- Do not touch any metallic part while electric current is applied or immediately after input is shut off. Failure to follow this may result in a burn due to a high temperature.
- If a failure or abnormality occurs while this unit is in use, immediately such off AC input and stop operation of this unit. Failure to follow this may result in a fire or accident.

Caution

- Check that the AC input rated voltage of this unit is equal to the voltage of the AC power supply.
- Do not connect the AC power supply to the DC output terminals.
- Do not disturb the convection of air near the vent of the casing.

Precautions for CE Markings

KEYENCE has evaluated the conformity of the MS2 Series with the requirements of the EMC Directives and Low-voltage Directives under the following condition, and confirmed that the MS2 Series meets these requirements. For the Low-voltage Directives, the MS2 Series has obtained certification from TUV Rheinland for the following standards.

<Precautions>

● EMC Directives (89/336/EEC)

- Applicable standard (EMI) EN55011, Group 1, Class A
- Applicable standard (EMS) EN61000-6-2

● Low-voltage Directives (73/23/EEC)

- Applicable standard EN60950-1
- EN50178
- Overvoltage category II
- Pollution degree 2

- The MS2 Series is designed as a Class I Equipment. Be sure to connect the protective earthing terminal on the terminal block to the protective earthing conductor in the building installation.
- The MS2 Series is an open-type device. Be sure to install it in an appropriate enclosure rated as IP54 or better.
- Use the MS2 Series according to the derating conditions and the installation conditions described in this manual.
- The MS2 Series does not include a disconnecting device. Be sure to install a disconnecting device such as a circuit breaker in the building installation wiring.

Precautions for UL Standards

The MS2 Series meets the following UL standards and has obtained UL and C-UL certification.

- Applicable standard UL508 Industrial Control Equipment
 UL60950-1 Information Technology Equipment - Safety
 CAN/CSA C22.2 No. 14-M95 Industrial Control Equipment
 CAN/CSA C22.2 No. 60950-1-03 Information Technology Equipment - Safety
- UL File No. E195940, E242533
- UL category NMTR, NMTR7 / QQQQ2, QQQQ8

<Precautions>

- Use wires that meet the following conditions for the terminal block. (tightening torque : 1.2 N•m)

| | |
|--------------------|--------------------|
| Wire range | AWG#14-22 |
| Wire Material | Copper wire only |
| Wire type | Stranded wire only |
| Temperature rating | 60°C/75°C |
- The MS2 Series is designed as a Class I Equipment. Be sure to connect the protective earthing terminal on the terminal block to the protective earthing conductor in the building installation.
- The MS2 Series is an open-type device. Be sure to install it in an appropriate enclosure rated as IP54 or better.
- Use the MS2 Series according to the derating conditions and the installation conditions described in this manual.
- The MS2 Series does not include a disconnecting device. Be sure to install a disconnecting device such as a circuit breaker in the building installation wiring.
- The output of the MS2-H50 is regarded as Class 2 output specified in NEPA70 (NEC: National Electrical Code) in the U.S.A. (UL Category: EPBU2/EPBU8)

Installation Conditions

Installation environment

- Installation this unit indoors.
- Do not install this unit in locations exposed to direct sunlight.
- Do not install this unit in locations in which there is corrosive gas or flammable gas.
- Do not install this unit in locations exposed to a lot of dust, soot, or stem.
- Do not install this unit in locations in which water, oil, or chemicals may splash onto the unit.
- When installing this unit in a location subject to vibration or impact, consider the vibration proof mounting.

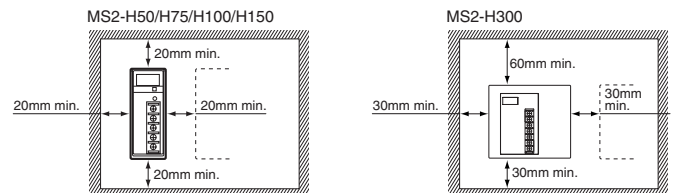
When installing this unit in a control console

- The ambient temperature for this unit should not exceed the upper temperature limit (refer to the derating characteristic). When the upper temperature limit may be exceeded, install a cooling fan or cooler so that the ambient temperature is below the upper temperature limit.
- Leave a sufficient ventilation space around this unit for head dissipation.
- Do not install this unit just above a device with high head generation (transformer, inverter, servo amplifier, etc.).

Installation

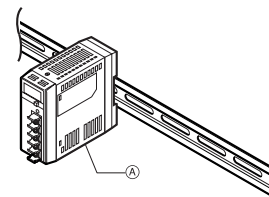
Space around the unit

The MS2 Series uses natural air-cooling. To ensure sufficient convection of air to dissipate heat, provide enough space between the MS2 Series and the control panel or other nearby devices as shown below.



Installation orientation

Install this unit with the base (A) down as shown below. Do not install the unit in any other orientation.



Mounting bracket (optional)

Make sure that the tightening torque for the mounting screw holes of this unit is 0.5 N•m or less.

Wiring

Terminals

| Screw size | Tightening torque |
|------------|-------------------|
| M4 | 1.2 N•m |

Crimp terminals

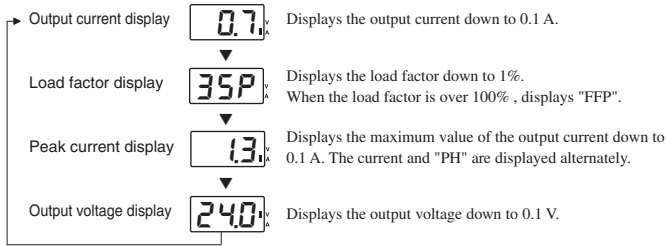


Cables

Select cables with a wire diameter suited to the output rated current.

Method of Operation

The display mode changes each time when the MODE switch is pressed.



• The MS2 Series is set to the output current display mode before shipment. It retains the display mode that was used before the power was turned off.

• When the switch is held down for 3 seconds or more, the current mode is locked and cannot be changed. To unlock the mode, hold down the switch again for 3 seconds or more.

Dimensions

| Model | MS2-H50 | MS2-H75 | MS2-H100 | MS2-H150 | MS2-H300 |
|---|--|------------------|-----------------|------------------|------------------|
| Rated input voltage = 1 | 100 to 240 VAC (85 to 264 VAC, 110 to 370 VDC) | | | | |
| Rated Frequency = 1 | 50/60 Hz (47 to 63 Hz, DC) | | | | |
| Input current (100/200 VAC) | 1.3 A/0.7 A max. | 1.9 A/0.9 A max. | 2.1 A/1.3A max. | 2.2 A/1.1 A max. | 3.9 A/1.8 A max. |
| Efficiency (100/200 VAC) | 92%/35% typ. (with 100% load) | | | | |
| Leakage current (100/200 VAC) | 0.4 mA/0.75 mA max. (with 100% load) | | | | |
| Rush current (100/200 VAC) | 25 A/50 A max. (with 100% load, at 25°C cold start) | | | | 18 A/36 A max. |
| Rated output voltage | 24 VDC | | | | |
| Adjustable voltage range | ±5% (with V ADJ.) | | | | |
| Rated output current | 2.1 A (Class2) | 3.2 A | 4.5 A | 6.5 A | 12.5 A |
| Ripple/noise voltage | 180mVp-p max. | | | | |
| Input fluctuation | 0.4 % max. | | | | |
| Load fluctuation | 1.5 % max. | | | | |
| Temperature fluctuation | 0.02 %/°C max. | | | | |
| Starting time | 500 ms max. (at Surrounding Air Temperature of 0 to 55°C under ated I/O conditions) | | | | |
| Output holding time | 20 ms min. (at Surrounding Air Temperature of 25°C under ated I/O conditions) | | | | |
| Overcurrent protection | Activates when the current reaches 125% or more of the rated output current. Constant current voltage limiting. Automatic reset. | | | | |
| Overvoltage protection +2 | Activates when the voltage reaches 26.4 V or more. Voltage turn-off. Operation resumes when the input power is turned on again. | | | | |
| Display method | 3-digit, 7-segment LED (Character height: 10 mm) | | | | |
| Memory backup time | Approx. 10 years (at 20°C) | | | | |
| Display resolution | 0.1 A/0.1 V/1% | | | | |
| Surrounding Air Temperature (for operation) | -10 to 55°C, No condensation (See "Output Derating Characteristics".) | | | | |
| Relative humidity | 25 to 85%, No condensation | | | | |
| Surrounding Air Temperature (for storage) | -20 to 70°C, N condensation | | | | |
| Withstand voltage | 3.0 kVAC 50/60 Hz 1 min (across input and output terminals), 2.0 kVAC 50/60 Hz 1min (across input terminals and PE terminal), 500 VAC 50/60 Hz 1 min (across output terminals and PE terminal) | | | | |
| Shock | Peak acceleration: 300 m/s ² in X, Y, and Z directions, 2 times respectively | | | | |
| Vibration | In X, Y, and Z directions, 2 hours respectively under the following conditions 10 to 57 Hz, 0.3 mm double-amplitude, 57 to 500 Hz, 19.6 m/s ² (2G), 5.5-minute cycle | | | | |
| Insulation resistance | 100 MΩ min. (with 500 VDC megohmmeter) (across input and output terminals) (across input terminals and PE terminal) (across output terminals and PE terminal) | | | | |
| Safety standard | UL : UL508, UL60950-1 C-UL : CSA C22.2 No.14-M95, CSA C22.2 No.60950-1-03 EN : EN60950-1, EN50178 IEC : IEC60950-1 | | | | |
| EMC standard | FCC Part15B ClassA, EN55011 ClassA, EN61000-6-2 | | | | |
| Limits for harmonic current emissions | EN61000-3-2 +3 | | | | |
| Parallel operation | Possible (OP-4207 is required.) +4 | | | | |
| Serial operation | Possible (External diode is required.) +4 | | | | |

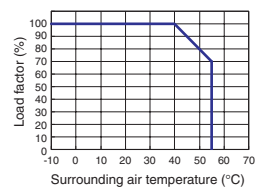
*2 To reset the unit, turn off the input power once, wait for 1 minute or more, and then turn on the input power again.

*3 For MS2-H100, it is applied only when the load ratio is 70% or lower.

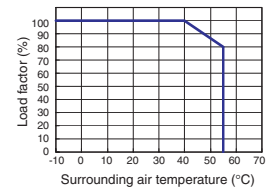
*4 The Applicable standards do not apply for parallel and serial operations.

Output Derating Characteristics

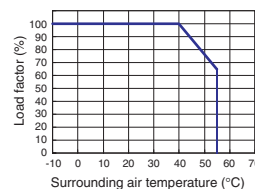
MS2-H50/H150



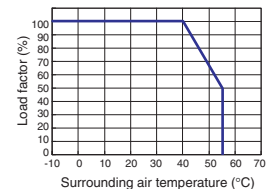
MS2-H75



MS2-H100

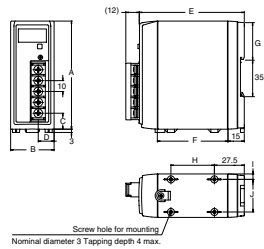


MS2-H300



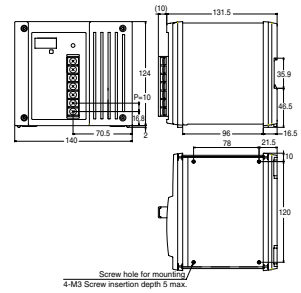
Dimensions

MS2-H50/H150/H100

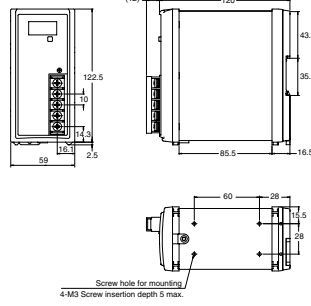


| Model | A | B | C | D | E | F | G | H | I | J |
|--------------|-------|----|------|------|-----|----|------|----|-------|------|
| MS2-H50 | 95.5 | 40 | 14.7 | 14.6 | 67 | 60 | 33.4 | 40 | 6 | 30 |
| MS2-H75/H100 | 114.5 | 52 | 15.1 | 17.1 | 110 | 78 | 41 | 32 | 14.75 | 42.5 |

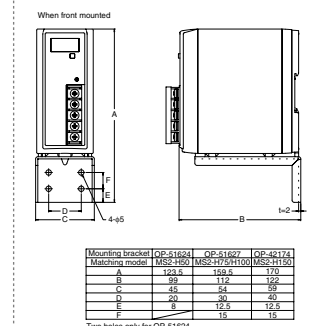
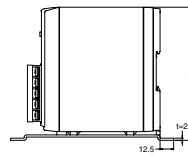
MS2-H300



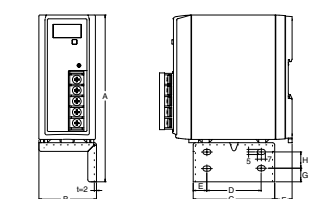
MS2-H150



When bottom mounted



When side mounted



| Mounting bracket | OP-51624 | OP-51627 | OP-51174 |
|------------------|----------|--------------|----------|
| Matching model | MS2-H50 | MS2-H75/H100 | MS2-H150 |
| A | 124.5 | 153.5 | 170 |
| B | 89 | 117 | 122 |
| C | 45 | 54 | 59 |
| D | 20 | 30 | 45 |
| E | 6 | 15 | 15 |

| Mounting bracket | OP-51624 | OP-51627 | OP-51174 |
|------------------|----------|--------------|----------|
| Matching model | MS2-H50 | MS2-H75/H100 | MS2-H150 |
| A | 124.5 | 153.5 | 170 |
| B | 89 | 117 | 122 |
| C | 45 | 54 | 59 |
| D | 20 | 30 | 45 |
| E | 6 | 15 | 15 |

Two holes only for OP-51624.

| Mounting bracket | OP-51626 | OP-51628 | OP-42175 |
|------------------|----------|--------------|----------|
| Matching model | MS2-H50 | MS2-H75/H100 | MS2-H150 |
| A | 107.5 | 122.5 | 132.8 |
| B | 158 | 150 | 160 |
| C | 45 | 54 | 55 |
| D | 20 | 30 | 45 |
| E | 125 | 140 | 150 |

| Mounting bracket | OP-51626 | OP-51623 |
|------------------|----------|--------------|
| Matching model | MS2-H50 | MS2-H75/H100 |
| A | 120.5 | 131.8 |
| B | 85 | 95 |
| C | 45 | 55 |
| D | 20 | 30 |
| E | 12.5 | 12.5 |
| F | 14.5 | 16 |
| G | 15 | 15 |

Two holes only for OP-51626.
The side mounting bracket can be attached to either sides.

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PLC Specifications

General specifications

| | | |
|---|---|---|
| Model | AC type KV-10AT(P)/AR KV-16AT(P)/AR KV-24AT(P)/AR KV-40AT(P)/AR | DC type KV-10DT(P)/DR KV-16DT(P)/DR KV-24DT(P)/DR KV-40DT(P)/DR |
| Rated voltage | 100 to 240 VAC (±10%) | 24 VDC (+10%, -20%) |
| AC current consumption | KV-10AT(P)/AR: 0.4 A KV-16AT(P)/AR: 0.5 A KV-24AT(P)/AR: 0.6 A KV-40AT(P)/AR: 0.7 A | — |
| AC power factor | 60% | — |
| Output voltage | 24 VDC (±10%) | — |
| Output capacity <small>(Including the internal current consumption and current consumption of expansion units.)</small> | KV-10AT(P)/AR: 0.4 A KV-16AT(P)/AR: 0.6 A KV-24AT(P)/AR: 0.6 A KV-40AT(P)/AR: 0.7 A | — |
| Allowable instantaneous interruption time | 40 ms max. | 2 ms max. |
| Internal current consumption (converted into 24 VDC value) | KV-10AR/DR: 100 mA max. KV-10AT(P)/DT(P): 80(85) mA max. KV-16AR/DR: 120 mA max. KV-16AT(P)/DT(P): 90(100) mA max. KV-24AR/DR: 140 mA max. KV-24AT(P)/DT(P): 100(105) mA max. KV-40AR/DR: 180 mA max. KV-40AT(P)/DT(P): 120(130) mA max. | |
| Expansion units | KV-E8X: 25 mA max. KV-E16X: 35 mA max. KV-E8T(P): 40 mA max. KV-E16T(P): 60(70) mA max. KV-E8R: 70 mA max. KV-E16R: 110 mA max. KV-E4XR: 45 mA max. KV-E4XT(P): 30 mA max. | |
| | KV-D30 Operator interface panel: 60 mA max. KV-P3E Handheld programmer: 65 mA max. | |
| Ambient temperature | 0 to 50°C, 0 to 45°C (KV-P3E) | |
| Relative humidity | 35 to 85% | |
| Ambient storage temperature | -20 to +70°C | |
| Withstand voltage | 1,500 VAC for 1 minute (Between power terminal and I/O terminals, and between external terminals and housing) | |
| Noise immunity | 1,500 Vp-p min., pulse width: 1 μs, 50 ns (by noise simulator) Conforming to EN standard (EN61000-4-2/-3/-4/-6) | |
| Shock | 150 m/s ² (15 G), working time: 11 ms, in X, Y and Z directions, 2 times respectively | |
| Vibration | 10 to 55 Hz, 1.5 mm max. double amplitude in X, Y and Z directions, 2 hours respectively (1 G max. when attached to DIN rail) | |
| Insulation resistance | 50 MΩ min. (Between power terminal and I/O terminals, and between external terminals and housing, measured with 500 VDC megohmmeter) | |
| Environmental restrictions | No excessive dust or corrosive gases | |
| Weight | KV-10AR: Approx. 250 g, KV-10AT(P): Approx. 240 g, KV-16AR: Approx. 300 g, KV-16AT(P): Approx. 280 g, KV-24AR: Approx. 350 g, KV-24AT(P): Approx. 330 g, KV-40AR: Approx. 450 g, KV-40AT(P): Approx. 410 g, KV-10DR: Approx. 150 g, KV-10DT(P): Approx. 140 g, KV-16DR: Approx. 190 g, KV-16DT(P): Approx. 180 g, KV-24DR: Approx. 240 g, KV-24DT(P): Approx. 210 g, KV-40DR: Approx. 330 g, KV-40DT(P): Approx. 280 g | |

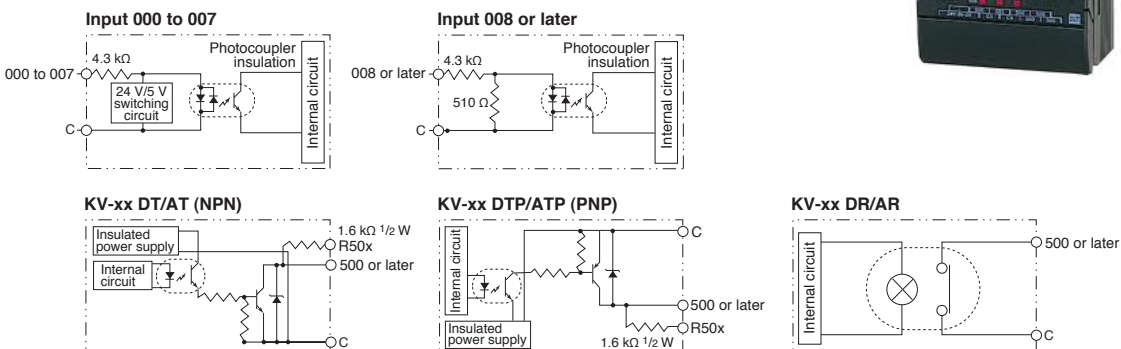
Performance specifications

| | |
|---|--|
| Arithmetic operation control method | Stored program method |
| I/O control method | Refresh method |
| Programming language | Ladder diagram and expanded ladder diagram |
| Instruction types | Basic instruction: 28, Application instruction: 22, Arithmetic instruction: 26, Interrupt instruction: 4 |
| Minimum scan time | 140 μs min. |
| Instruction processing time | Basic instruction: 0.7 μs min., Application instruction: 6.4 μs. min. |
| Program capacity | 2,000 steps (KV-10xx, KV-16xx) 4,000 steps (KV-24xx, KV-40xx) |
| Maximum number of expansion units | 8 (7 for KV-40xx) |
| Number of I/O points (including 10 to 40 I/O points of basic unit) | 10 to 152 points (when expansion units are connected) |
| Internal utility relay | 2,560 points: 1000 to 1915 and 3000 to 17915 |
| Special utility relay | 160 points: 2000 to 2915 |
| Data memory (16 bits) | 2,000 words: DM 0000 to DM1999 |
| Temporary data memory (16 bits) | 32 words: TM00 to TM31 |
| Timer/counter | 250 in all: 0.1-s timer: TMR (0 to 6553.5 s), 0.01-s timer: TMH (0 to 655.35 s), 0.001-s timer: TMS (0 to 65.535 s), UP counter: C, Up/down counter: UDC |
| Digital trimmer | 2 trimmers (set in access window) |
| High-speed counter | 2 counters of 30 kHz, 2-phase high-speed counter (0 to 65535 count) *1 |
| High-speed counter comparator | 4 comparators (2 for each high-speed counter) Direct output allowed |
| Positioning control function | Independent 1 axis, 50 kHz max. |
| Memory switch | 16 |
| Memory backup | Program memory Flash ROM, rewritable 100,000 times or more Data memory, counter, internal utility relay Data retained for 2 months min. with electrical double-layer capacitor (at 25°C), Data can be backed up with Flash ROM in all models. <small>(Retention devices are set by MEMSW instruction.)</small> |
| Self-diagnosis | CPU and RAM errors |
| Number of contact comments | 1,000 max. contact comments can be saved. |

*1. 24-bit setting is available.



Input/output circuit of base unit



Input specifications of base unit

| Model | KV-10xx | KV-16xx | KV-24xx | KV-40xx |
|-----------------------------------|---|---------|---------|---------|
| No. of inputs | 6 | 10 | 16 | 24 |
| Input common | COM is connected internally. | | | |
| Maximum input rating | 26.4 VDC | | | |
| Input voltage *1 | 24 VDC, 5.3 mA/5 VDC, 1.0 mA | | | |
| Input time constant | 10 ms (Typical) 10 μs when HSP instruction is used Variable in 7 steps from 10 μs to 10 ms while special utility relay 2813 is ON (Set by DM1940) | | | |
| Interrupt input response | 10 μs (Typical) | | | |
| High-speed counter input response | 30 kHz (24V±10%) | | | |

*1. Inputs 000 to 007 can be changed to 5 V input.

Output specifications of basic unit

| Model | KV-10xT(P) | KV-16xT(P) | KV-24xT(P) | KV-40xT(P) | KV-10xR | KV-16xR | KV-24xR | KV-40xR |
|----------------------------|---|------------|------------|------------|--|---------|---------|---------|
| No. of outputs | 4 | 6 | 8 | 16 | 4 | 6 | 8 | 16 |
| Output common | 1 common | | | | Each common terminal is independent. | | | |
| Output type | Transistor output (NPN or PNP) | | | | Relay output | | | |
| Rated load | 30 VDC 0.3 A (503 and other) 0.1 A (500 to 502) | | | | 250 VAC/30 VDC 2 A (Inductive load) 4 A (Resistive load) | | | |
| Peak load current | 0.2 A (500 to 502) 1 A (Other) | | | | 5 A | | | |
| Relay service life | — | | | | Electrical service life: 100,000 times or more (20 times/min) Mechanical service life: 20-million times or more | | | |
| Relay replacement | — | | | | Not allowed | | | |
| Output frequency | 50 kHz (500 to 502) | | | | — | | | |
| Built-in serial resistance | 1.6 kΩ 1/2W (R500 to R502) | | | | — | | | |

Input/output specifications of expansion unit

| Input/output | Input | | Output | | | | Input/output |
|---|--|---------------|------------------------------|---------------|--|---------------|--|
| External connection method | Terminal block | | | | | | |
| Model | KV-E8X | KV-E16X | KV-E8T(P) | KV-E16T(P) | KV-E8R | KV-E16R | KV-E4XT(P)/R |
| Number of inputs | 8 | 16 | — | | — | | 4 |
| Input common | 4 points/common | | — | | — | | 4 points/common |
| Maximum input rating | 26.4 VDC | | — | | — | | 26.4 VDC |
| Input voltage | 24 VDC, 5.3 mA | | — | | — | | 24 VDC, 5.3 mA |
| Minimum ON voltage | 19 V | | — | | — | | 19 V |
| Maximum OFF current | 2 mA | | — | | — | | 2 mA |
| Input impedance | 4.3 kΩ | | — | | — | | 4.3 kΩ |
| Input time constant <small>(Changed in two steps by special utility relays 2809 to 2812)</small> | For both rising (OFF → ON) and falling (ON → OFF) operations, 10 ms: 10 ms±20%, 10 μs: 10 μs±20% | | — | | — | | For both rising (OFF → ON) and falling (ON → OFF) operations, 10 ms: 10 ms±20%, 10 μs: 10 μs±20% |
| Number of outputs | — | | 8 | 16 | 8 | 16 | 4 |
| Output type | — | | NPN (PNP) Transistor | | Relay | | NPN (PNP) Transistor/Relay |
| Output common | — | | COM is connected internally. | | 4 points/common | | 4 points/common |
| Rated load voltage | — | | 30 VDC | | 250 VAC/30 VDC, 2 A (Inductive load), 4 A (Resistive load) | | 30 VDC/, 250 VAC/30 VDC, 2 A (Inductive load), 4 A (Resistive load) |
| Rated output current | — | | 0.5 (0.3) A/point | | 2 A/point (Inductive load), 4 A/point (Resistive load), 4 A/common | | 0.5 A/point/, 2 A/point (Inductive load), 4 A (Resistive load), 4 A/common |
| ON resistance | — | | — | | 50 mΩ or less | | — / 50 mΩ or less |
| Leakage current at OFF | — | | 100 μA max. | | — | | 100 μA max./ — |
| Residual voltage at ON | — | | 0.8 V max. | | — | | 0.8 V max./ — |
| Rising operation time (OFF → ON) | — | | 50 μs max. | | 10 ms max. | | 50 μs max./10 ms max. |
| Falling operation time (ON → OFF) | — | | 250 μs max. | | 10 ms max. | | 250 μs max./10 ms max. |
| Relay service life | — | | — | | Electrical: 100,000 times or more (20 times/min), Mechanical: 20-million times or more | | Electrical: 100,000 times or more (20 times/min), Mechanical: 20-million times or more |
| Relay replacement | — | | — | | Not allowed | | — /Not allowed |
| Weight | Approx. 100 g | Approx. 130 g | Approx. 100 g | Approx. 130 g | Approx. 130 g | Approx. 190 g | Approx. 100 g/Approx. 120 g |

Input/output circuit of expansion unit

