TURNSTILES.us™
SECURING THE U.S. and the GLOBE

HS400 Series Single 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.

Table of Contents

The High-Security Series www.TURNSTILES.us HS427-S • HS430-S

Full-Height Turnstile (Single) • Interior & Exterior Application HS439-S • HS448-S

The most reliable full-height turnstiles available, 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, powder coat or a hot-dipped galvanized finish, these units can be fitted for any application with leading edge technology and features.

Controls and Interfaces

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

Size Options
(pedestrian clearance):

HS427-S: 27" (686mm)
HS430-S: 30" (782mm)
HS439-S: 39" (991mm)
HS448-S: 48" (1219mm)

304 Stainless, No. 4 Satin finish (shown)

Also available in hot-dipped galvanized or powder coat finishes.

	Depth A*	Width B*	Passage Width C*	Passage Height D*	Overall Height E*
HS427-S	54" 1372mm	62" 1575mm	27" 686mm	84" 2134mm	91" 2311mm
HS430-S	56" 1422mm	66" 1676mm	30" 762mm	84" 2134mm	91" 2311mm
HS439-S	68" 1727mm	84" 2134mm	39" 990mm	84" 2134mm	91" 2311mm
HS448-S	93" 2362mm	106" 2692mm	48" 1219mm	84" 2134mm	91" 2311mm

* See CAD drawings on reverse side.

The High-Security Series www.TURNSTILES.us HS427-S • HS430-S

Full-Height Turnstile (Single) • Interior & Exterior Application HS439-S • HS448-S

Applications:

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

Product Features:

Materials and Finishes available in your choice of:

- Hot dipped galvanized carbon steel
- Polyester enamel on carbon steel (standard color is black/ other colors available upon request)
- Our signature 304 Stainless steel/ No. 4 satin finish

Design & Construction:

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

Controller & Access Control Operation:

- Self-centering control head with adjustable hydraulic shock suppression
- Hardened tool steel locking bars, cam and roller assemblies
- Permanently lubricated bearings
- All units are available in clockwise, counter-clockwise or bi-directional passage

Measures:

HS427-S

Size of opening (pedestrian clearance)
HS427-S 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
62" (1575mm)	54" (1372mm)

HS430-S

Size of opening (pedestrian clearance)
HS430-S 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
66" (1676mm)	56" (1422mm)

Measures: (continued)

HS439-S

Size of opening (pedestrian clearance)
HS439-S 39" (991mm)

Arm and Barrier Tubing Sizes
1 3/4" diameter 14 gauge (44mm)

Width	Depth
84" (2134mm)	68" (1727mm)

HS448-S

Size of opening (pedestrian clearance)
HS448-S 48" (1219mm)

Arm and Barrier Tubing Sizes
1 3/4" diameter 14 gauge (44mm)

Width	Depth
106" (2692mm)	93" (2362mm)

All models:

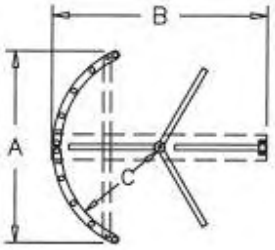
- Overall exterior height 91" (2311mm)
- Pedestrian walk through height 84" (2134mm

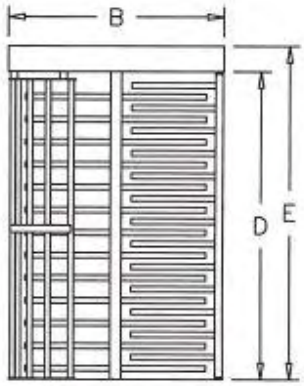
Options:

- Electronic locking module featuring heavy-duty 24 vdc pull-type industrial solenoids and card reader interface
- Available in Fail-Safe (open on power failure) or Fail-Lock (lock on power failure modes)
- Can interface with card readers, computer attendance systems, coin and token acceptors, push buttons, wireless remote controls and metal detectors
- Electronic 6 digit resetable counter with LCD display and ten-year lithium battery
- Vertical Graphic Array (VGA) red x / green arrow
- Additional options available on request

Matching Swing Gate available

(see model HS336 Manual Passage Gate information)





Electrical Specifications:

Command module input 110-240 VAC (2 amp-1 amp) 50-60 Hz; control voltage 24 VDC.
All electrical components are UL recognized and CSA certified.

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

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.

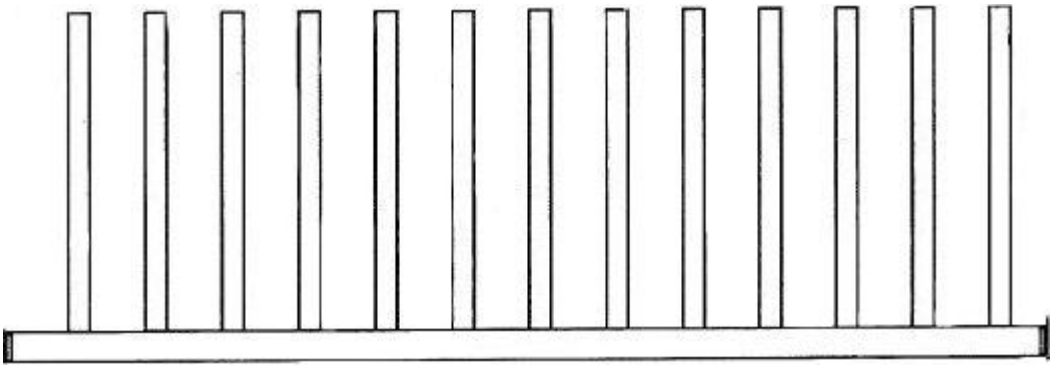
Parts Checklist

Each turnstile should have the following components on the skid (per turnstile).

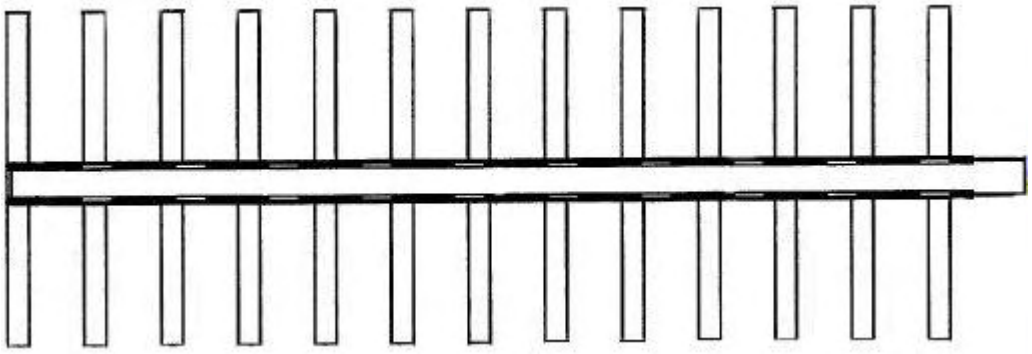
- Mainframe (Main channel with 2 cross arms inside):

- 2x Yokes:

- Barrier:



- Rotor:



- 6500 series control head
- Fastener kit / bearing block/ bearing (fastener list on next page)
- Optional components such as card reader mounting plates, light arrays, counters
- Custom / special components

FASTENER LIST

QTY 10- ½ x 1" SOCKET CAP BOLTS W/ LOCK WASHERS (HS439-GV/PC & HS448-GV/PC ONLY): ARM ASSEMBLIES TO ROTOR

QTY 4 - 3/8 x 1 ½" CARRIAGE BOLTS W/ NUTS, WASHERS & LOCK WASHERS: CONTROL HEAD TO MAIN FRAME

QTY 4 - 3/8 X 1 ½ CARRIAGE BOLTS W/ NUTS: YOKE TO BOX TUBING

QTY 2 - 3/8 X 1 ½ CARRIAGE BOTS W/ NUTS, WASHERS & LOCK WASHERS: BARRIER TO MAIN FRAME

QTY 4 - 3/8 X 3 CARRIAGE BOLTS W/ NUTS, WASHERS & LOCK WASHERS: BOX TUBING TO MAIN FRAME

QTY 6 - 3/8 X 4 WEDGE TYPE ANCHORS W/ NUTS & WASHERS: 4 FOR YOKES TO CONCRETE
2 FOR BARRIER TO CONCRETE

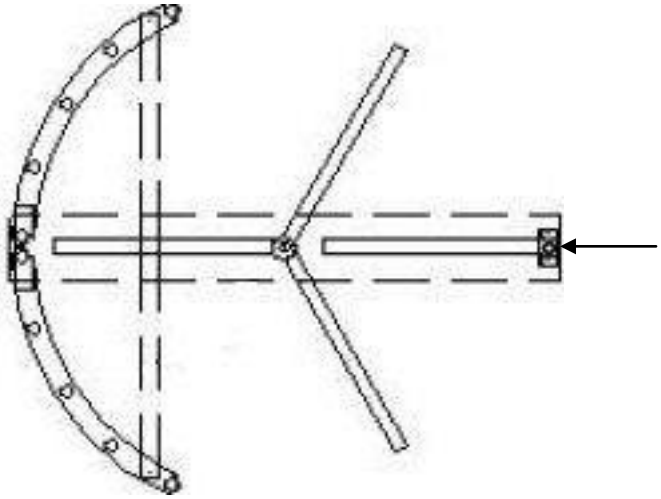
QTY 1 - 5/8 X 4 WEDGE TYPE ANCHOR W/ NUT, BEARING BLOCK & BEARING: CENTER COLUMN MOUNTING
MAKE SURE BEARING IS GREASED

Pre-installation Tips

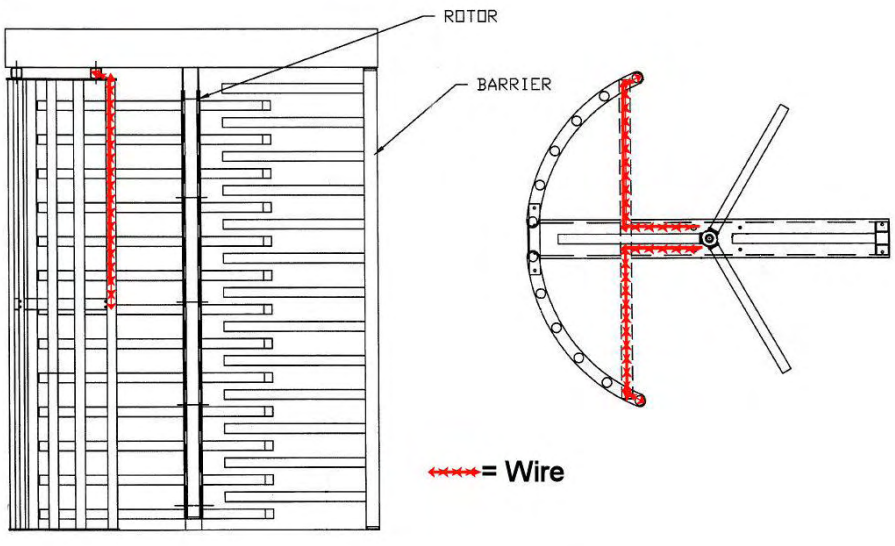
When installing a new turnstile, there are several helpful hints that can be used in order to make the installation go smoothly. It is highly recommended that these are reviewed before installation.

- 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.

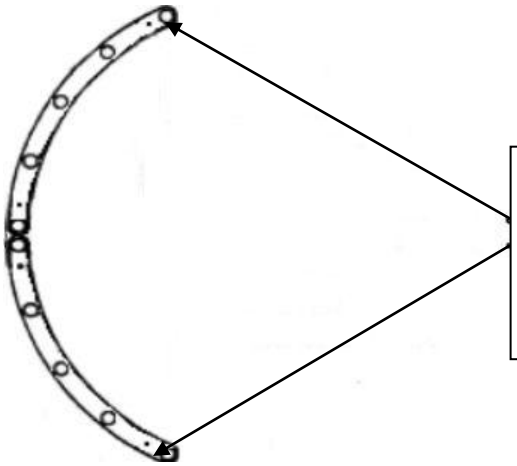
  - The stationary barrier is hollow and has a hole in the top that goes through the mainframe.



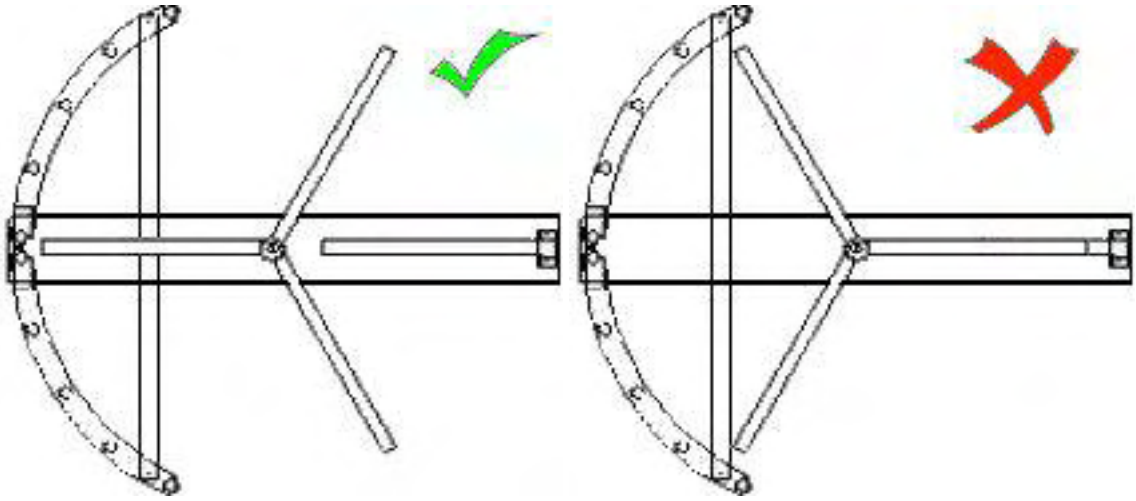
  - If purchased with an optional card reader plate, the suggested method for running the wire is through the yokes, into the cross arms and into the main channel. Use a shielded 2 conductor 22 gauge cable per direction.



- Electronic turnstiles are operated from a provided 24VDC 3 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, contact TURNSTILES. and ask about an additional one shot timer system to accommodate your existing system.
- 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.



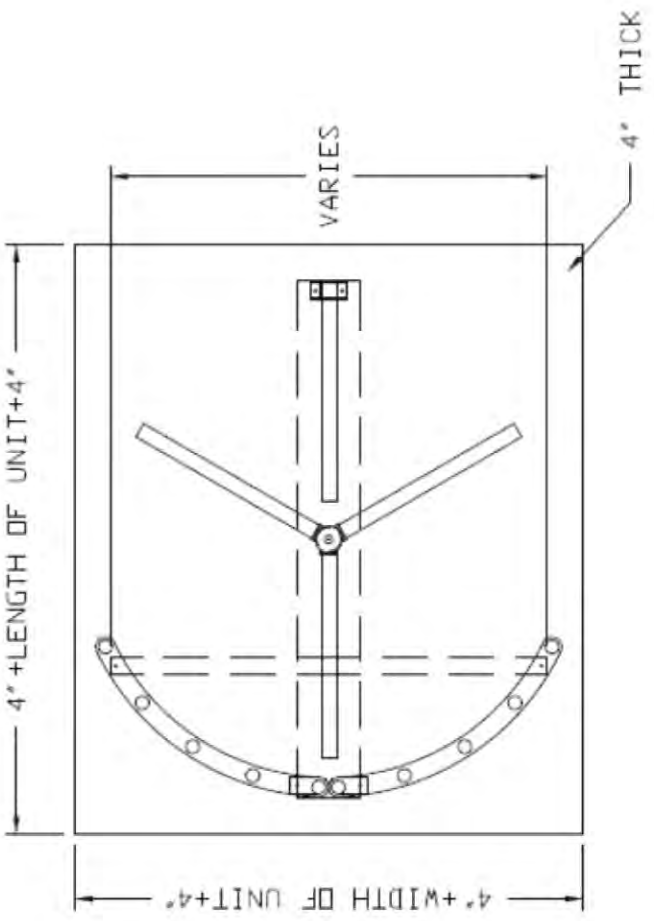
- Proper rotor alignment (left) is important for turnstile operation. Improper rotor alignment (right) can lead to users becoming trapped inside of the turnstile.



- 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-FHCONCR



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

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"

SCALE: 20=1	APPROVED BY:	DRAWN BY: LC III
DATE: 08/10/05		REVISED:

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(303) 670-1099 (303) 679-8949 fax

www.TURNSTILES.us

CONCRETE PAD FORMULAS

Concrete Anchor Installation

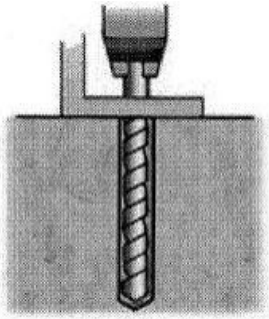
Instructions for Using Wedge Anchors

Determine the appropriate wedge anchor length for your project.

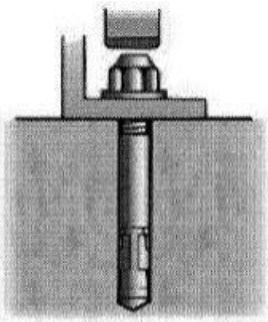
1. 1. Add:
   The thickness of material to be fastened
   -to-
   The minimum embedment required
   -to-
   The thickness of the nut and washer (about one anchor diameter).
2. Once you have determined the appropriate wedge-type-anchor length, drill your hole using a bit with the same diameter, ½" deeper 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

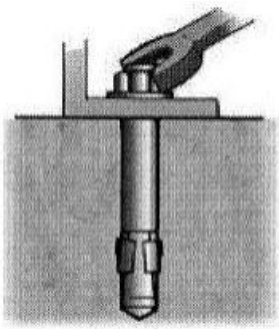
Diam. & Length	Min. Embedment	Thread Length
1/4"	1-1/8"	3/4"
3/8"	1-1/2"	7/8"
3/8"	1-1/2"	1-1/8"
1/2"	2-1/4"	1-1/4"
1/2"	2-1/4"	1-1/4"
5/8"	2-3/4"	2"
5/8"	2-3/4"	2"
5/8"	2-3/4"	2"
3/4"	3-1/4"	2"
3/4"	3-1/4"	2"
3/4"	3-1/4"	2"
7/8"	3-7/8"	2-1/4"
1"	4-1/2"	2-1/4"
1-1/4"	5-1/2"	3-1/4"



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 (4) 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).

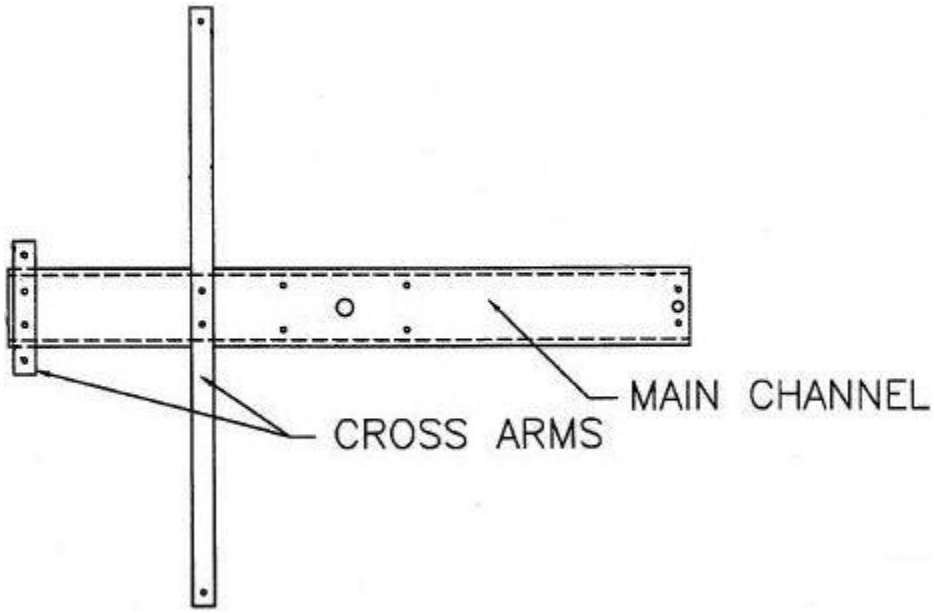


Figure B: Assembled mainframe

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

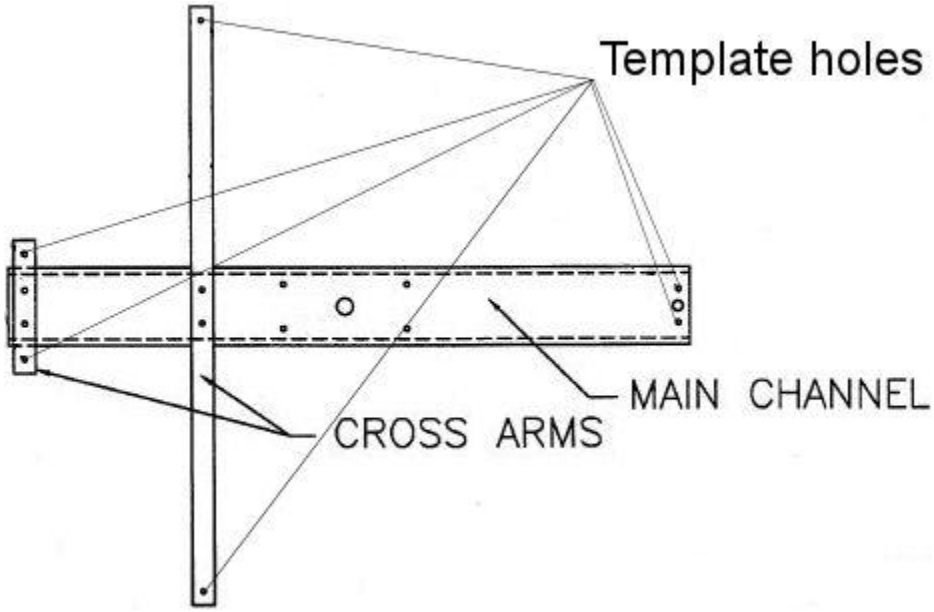


Figure C: Using mainframe as a template to mark holes

Step 6) Drill the two holes for the 3/8” concrete anchors marked from the shorter cross arm (Figure D).

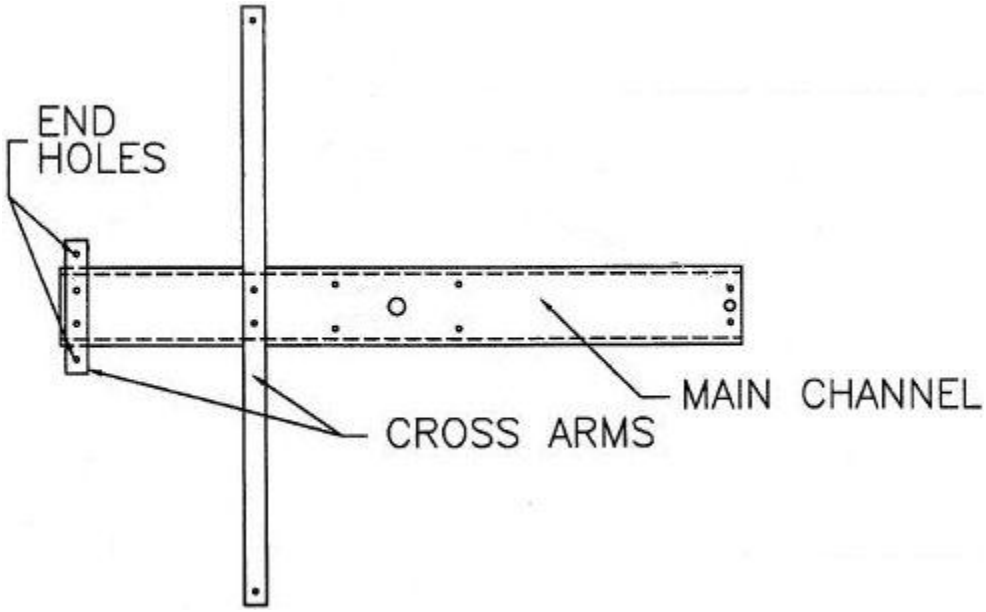


Figure D: Location of the end holes to drill first.

Step 7) Verify squareness of the cross arms to the mainframe and that the holes line up on the concrete to the holes on the cross arms. After certainty of correctness, drill the remaining holes called out on Figure C. Install anchors into holes. Refer to page 10 for concrete anchor installation help.

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

Note: Depending on how the turnstile was ordered, yokes may have holes for mounting card reader plates. These holes should be pointing to the outside of the turnstile.

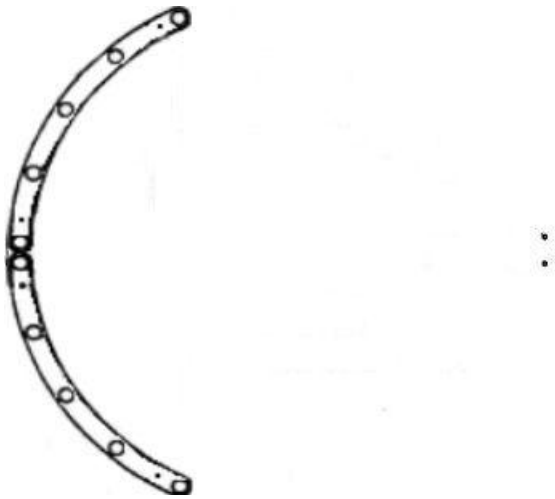


Figure E: Mounting the curved yoke pieces to the concrete.

Step 9) Mount the stationary barrier to the concrete (Figure F)

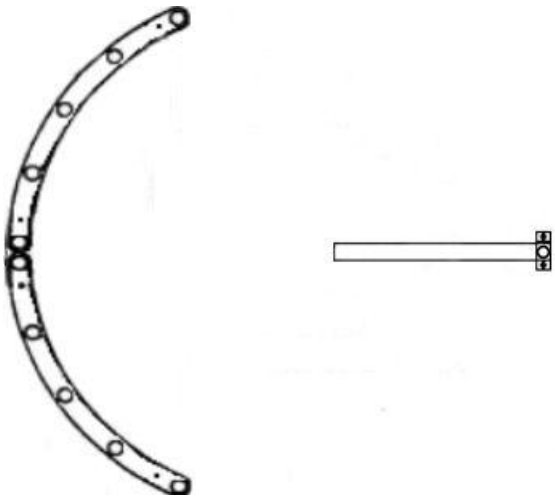


Figure F: Mounting the stationary barrier to concrete.

Step 10) Mount the mainframe on top of yokes and stationary barrier using 1 1/2” carriage bolts (Figure G).

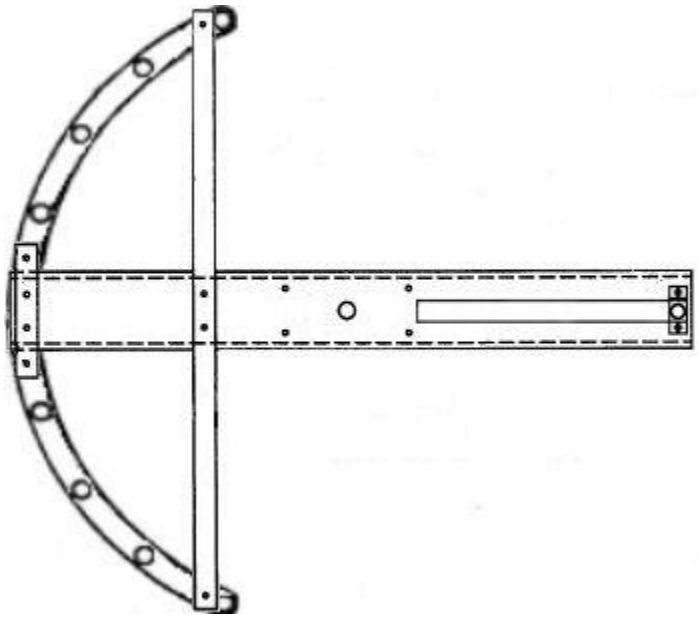


Figure G: Mounting the mainframe on top of the yokes and barrier.

Step 11) Check the levelness of turnstile. If necessary, shim from the floor to make turnstile level.

Step 12) Using a plumb-bob, mark the hole for the bearing and rotor (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.

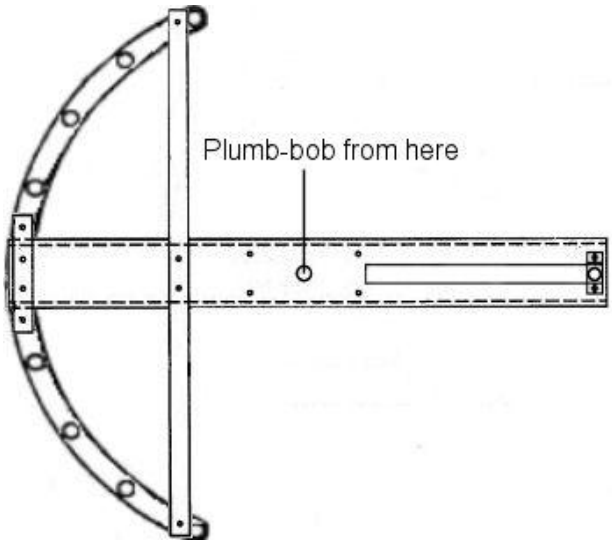


Figure H: Using a plumb-bob to mark hole for rotor placement.

Step 13) In the case of a HS439/448, bolt arm assemblies to the center column using the ½" x 1" socket cap bolts. Make sure they are bolted on the same way as the one already bolted on.

Step 14) Drill a hole for the 5/8" concrete anchor that holds the bearing block (Figure I) and bearing in place. Install the anchor in the concrete. Install bearing block to concrete and add bearing.

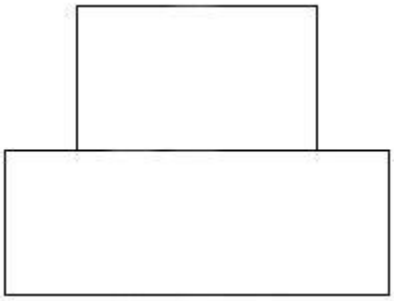


Figure I: The bearing block used to support the bearing and rotor.

Step 15) Place the rotor on top of the bearing block. 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.

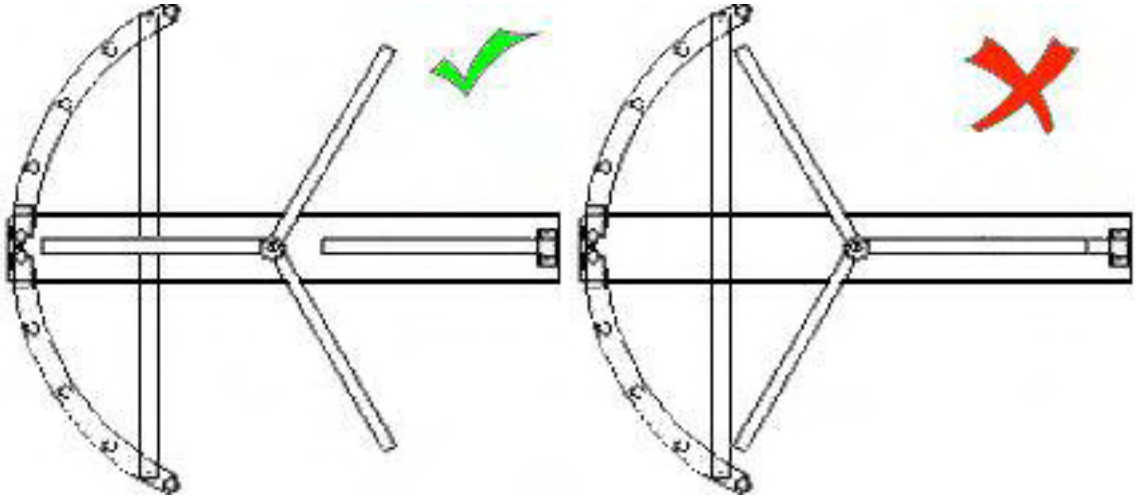


Figure J: Proper rotor alignment (left) vs. improper rotor alignment (right).

Step 16) Slide the control head into the top of the rotor. The control head has a 7/8" (or 1 ¼" for HS439 & HS448 models) hex shaft that inserts into an adaptor on the rotor itself. If turnstile is electronic, point the gold colored power supply towards the side of the turnstile that power is ran to. The control head will function the same whichever way it is installed into the rotor.

Step 17) Bolt the control head to the mainframe using the 1 ½" carriage bolts.

6500 Series Control Head Information

All of our full height turnstiles operate with a mechanism called the 6500 series control head (Figure K). 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.

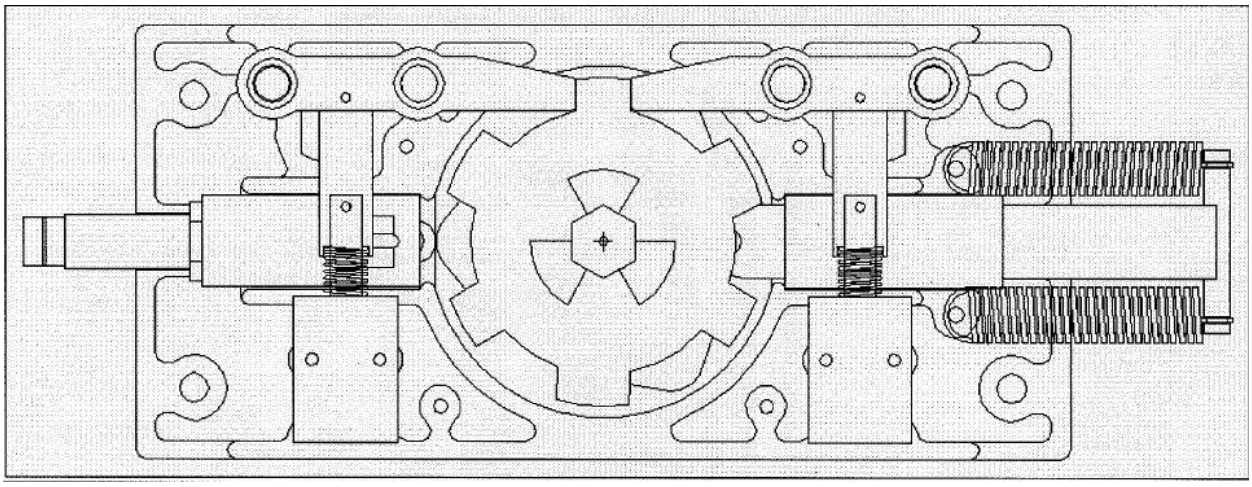


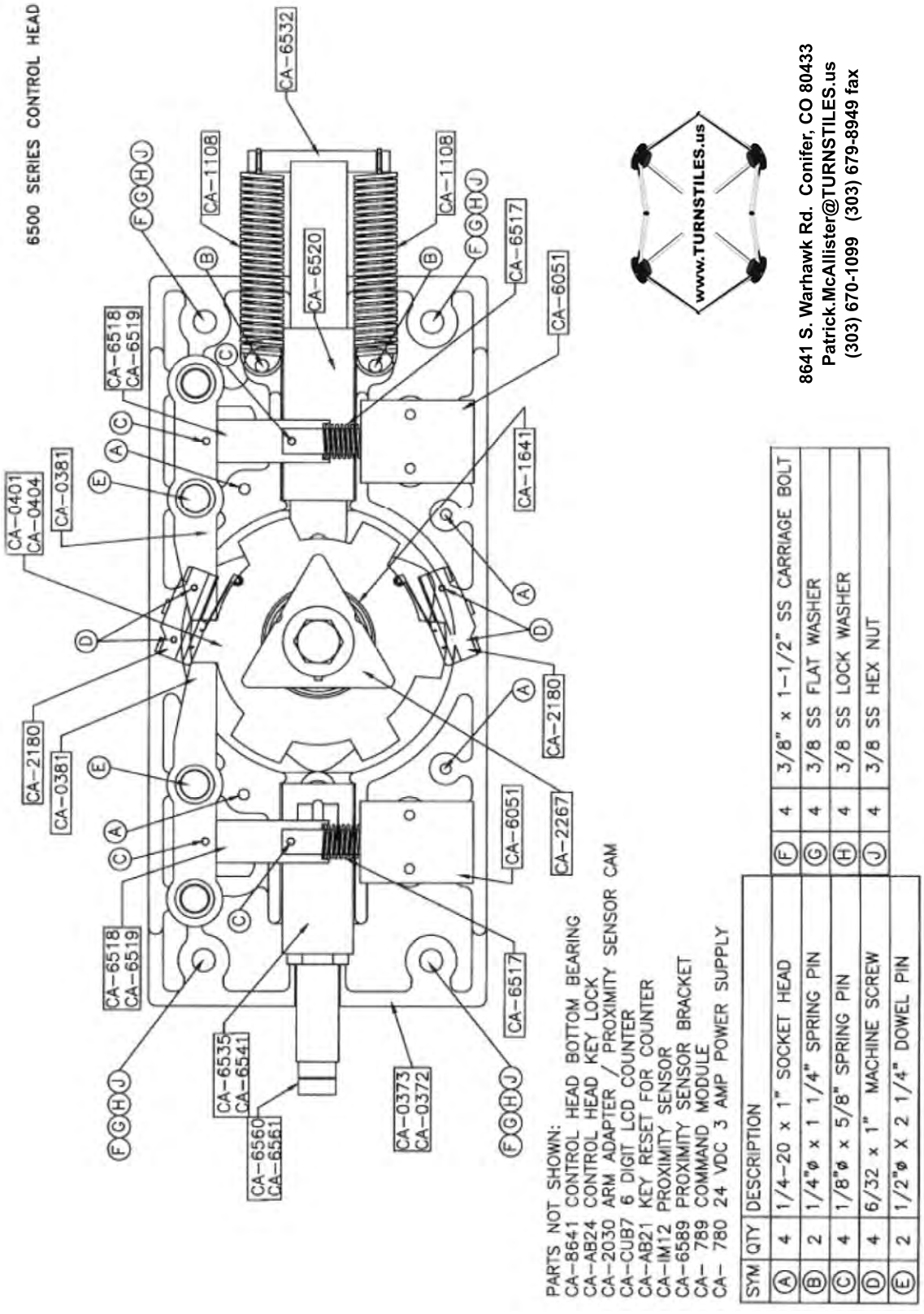
Figure K: An internal view of an electronically controlled two-way 6500 series control head.

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 cam is designed so that it is impossible to become trapped within the turnstile.

Each control head comes pre-configured 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: land inputs from access control devices into the control board and plug the unit's power supply into a standard 110VAC receptacle.

Note: Proper turnstile operation requires a dry, normally open momentary contact (of one second or less). If current access control devices cannot produce a signal length short enough, we can provide one-shot timers for accommodation.

6500 Series Full Height Control Head Parts Breakdown



SYM	QTY	DESCRIPTION
A	4	1/4-20 x 1" SOCKET HEAD
B	2	1/4"ø x 1 1/4" SPRING PIN
C	4	1/8"ø x 5/8" SPRING PIN
D	4	6/32 x 1" MACHINE SCREW
E	2	1/2"ø X 2 1/4" DOWEL PIN
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

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(303) 670-1099 (303) 679-8949 fax

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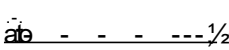


Index Pin Assembly
All Models
6532 $108.19

Index Pin Tubing
All Models
6520 $26.90

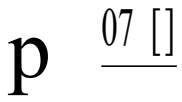
Index Spring
WH Models: 11 06 $5.31
FH Models: 1108 $5.31
ADA Gates: 11 07 $5.31

Control Head Casting
Top Casting: 0372 $179.10
Bottom Casting: 0373 $179.1 O

Top Casting Bearing
All Models
1641 (1641-2RSNR) $24.81

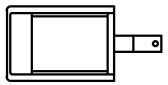
Bottom Casting Bearing
All Models
7208 (6007RSNR) $23.22

Hydraulic Shock Absorber
427/430/T80/WH/ADA
6560 (ACE MA225) $149.72
439/448/P60
6561 (ACE MA600) $224.90

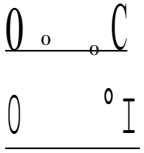


Shock Housing
427/430/T80/WH/ADA
6535 $154.26
439/448
6541 $162.00

WH Arm Adapter
Proximity Sensor Cam
2030 $57.74



Solenoid
All Models
6051 $59.59
(Deltrol D4A53717-83)

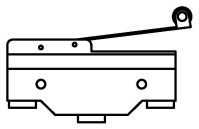


Locking Bar Linkage
Fail Lock: 6518 $10.00
Fail Open: 6519 $10.00

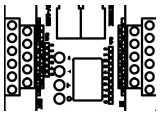
Locking Bar
All Models
0381 $34.23

Solenoid Springs
Fail Open: 6510 $7.35
Fail Lock: 6016 $7.35

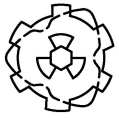
Limit Switch Cam
Standard: 2267 $25.00
ADA Gate: 2268 $27.87
One-Way: 2269 $58.92



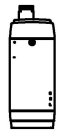
Limit Switch
Standard: 2180 $24.72
OMRON Z-15GW2-B7-K
One-Way: 1700 $58.92
OMRON BZ2RW825-A2



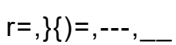
Logic Controller
6789 $210.00
(KEYENCE KV1 6DR)



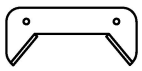
Cam Assembly (specify limit/prox)
427/430/TBO/WH: 0401 7/8" Hex $215.77
439/448/P60: 0407 1-1/4" Hex $238.05
ADA Gate (specify model): $190.75
0402 7/8" Hex



Power Supply100-240VAC
24VDC 2.1 AMP
0781 (KEYENCE M52-H50) $150.00



Proximity Sensor(PNP)
7211 (SICK 1040765) $150.83



Proximity Sensor Bracket
6589 $10.00

All pricing subject to change without notice. All parts orders are shipped via UPS. Expedited shipping available upon request.
The above prices do not include shipping. All parts orders under $500.00 require credit card payment before shipment.

6500 Series Control Head Configuration Information

The 6500 series can be configured in a number of different ways. All turnstiles self-center unless otherwise specified.

Free wheel: Turnstile rotates freely in both directions and does not self center.

Manual both ways: Turnstile rotates freely in both directions. This unsecure configuration is used as a means to direct traffic through one area. A lockout bar would allow end user to lock the turnstile with a standard pad lock.

Manual one way: Turnstile rotates in one direction but not the other. This configuration is great for an exit way.

Electronic one way with free exit: Turnstile rotates freely in one direction and requires access credentials for the other. This configuration is suitable for secure entry and unsecure exit.

Electronic one way with no exit: Turnstile requires access credentials for one direction and allows no passage in the other. This configuration is suitable for a secured entryway with an alternate means of exit.

Electronic two way: Turnstile requires access credentials for both directions. This configuration is perfect for locations requiring secured entry and exit passage.

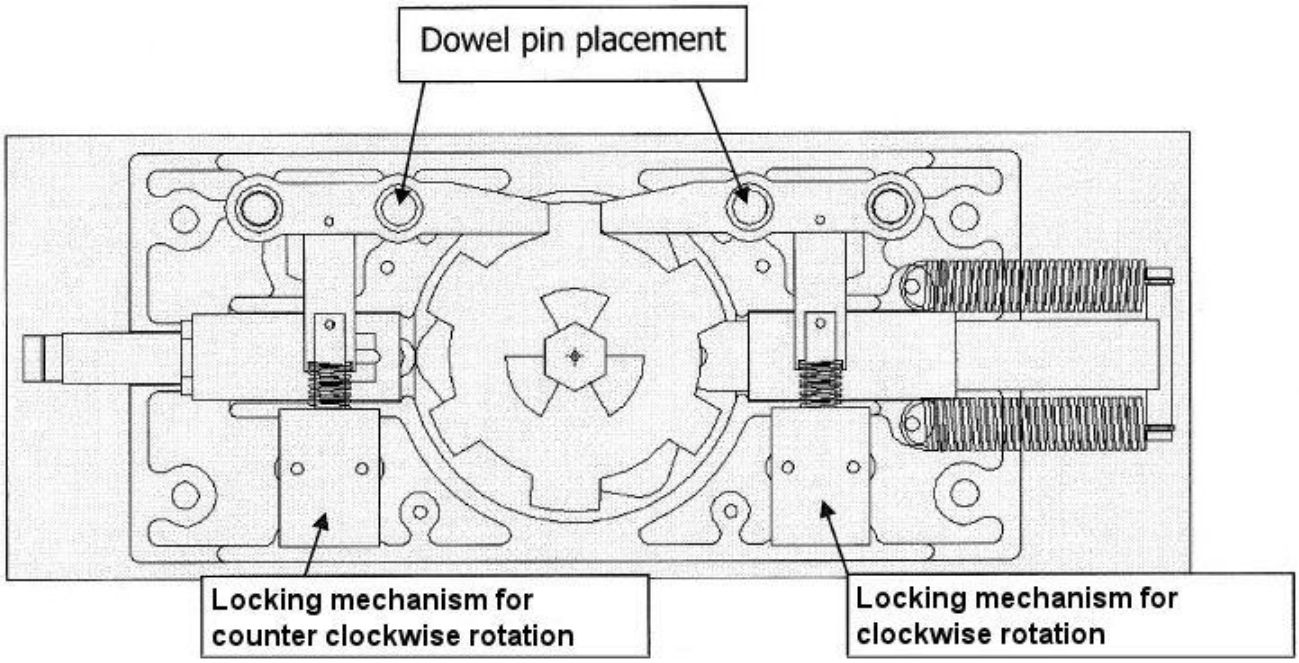
Fail lock: Upon power failure, turnstile will remain locked in one or both directions. This is convertible to fail open by ordering an alternate linkage.

Fail open: Upon power failure, turnstile will remain unlocked in one or both directions. This is convertible to fail lock by ordering an alternate linkage.

Key override: This option is for a location that the security requirements may change. The key override option is not intended for everyday use. Should you require an additional lockdown feature on your turnstile, a better option is a lockout bar (Figure L) with a pad lock.

Figure L: Optional lockout bar

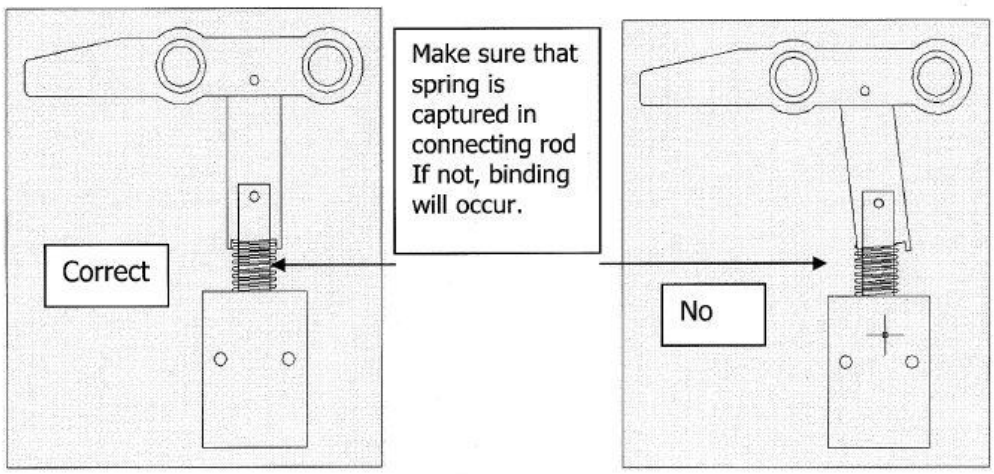
6500 Series Control Head Locking Bar Information



Any number of configurations is possible on the 6500 series control head. In the case of an electronic two way head, two independent locking mechanisms are in place. The diagram above shows that the locking bar to the left locks the turnstile in the counter clockwise direction and the locking bar on the right locks the turnstile in the clockwise position. A circuit board or key override is needed to lock or unlock each direction.

If removing the locking bar becomes necessary for any reason, two methods can be used. The easiest method is to punch the dowel pin out from the bottom side of the control head. This releases the locking bar from the casting. An alternate approach would be to remove the (4) ¼-20 socket head cap screws from the casting and remove the lid.

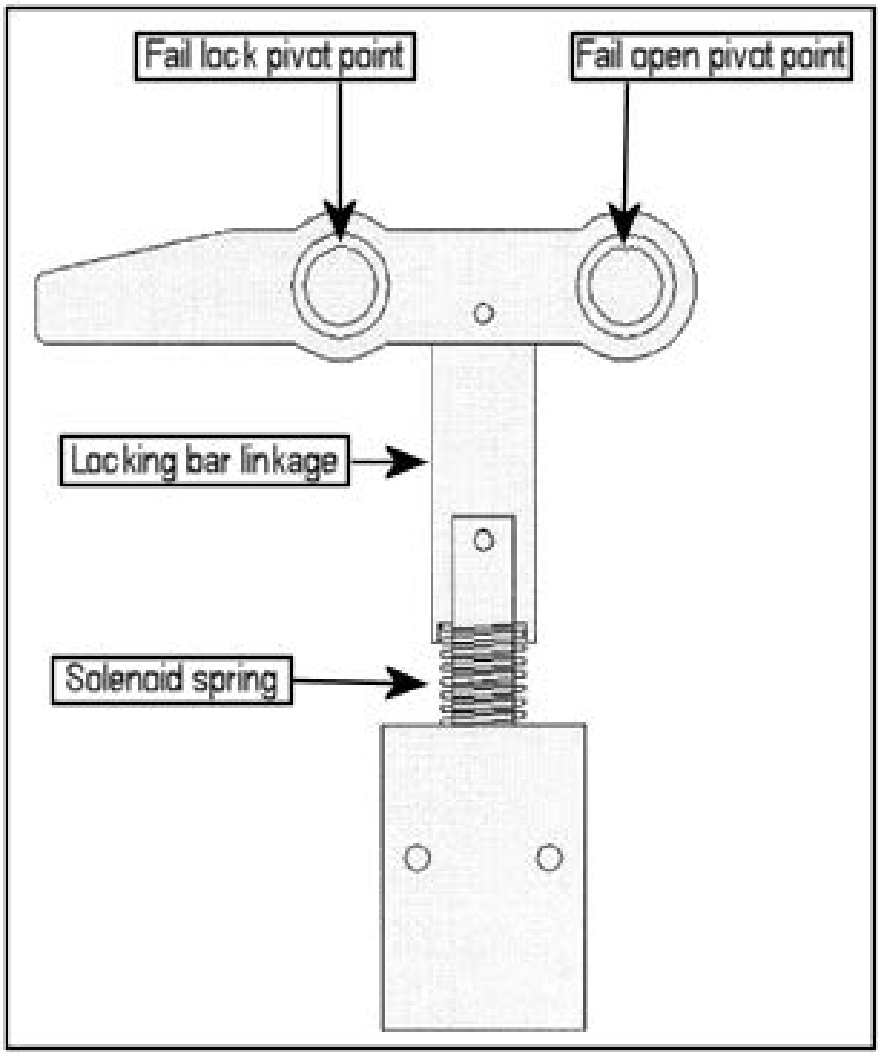
When installing or replacing the locking bars into the control head, be sure to take special care to align the solenoid spring (shown below).



Dowel Pin Placement

Each solenoid can independently be set for fail open or fail lock operation (refer to page 19 for more information). Control heads are preconfigured before shipment. To change fail open to fail lock or vice versa, the alternate locking bar linkage is required. A new locking bar assembly, which includes the locking bar itself with a linkage, may be purchased instead for simpler installation.

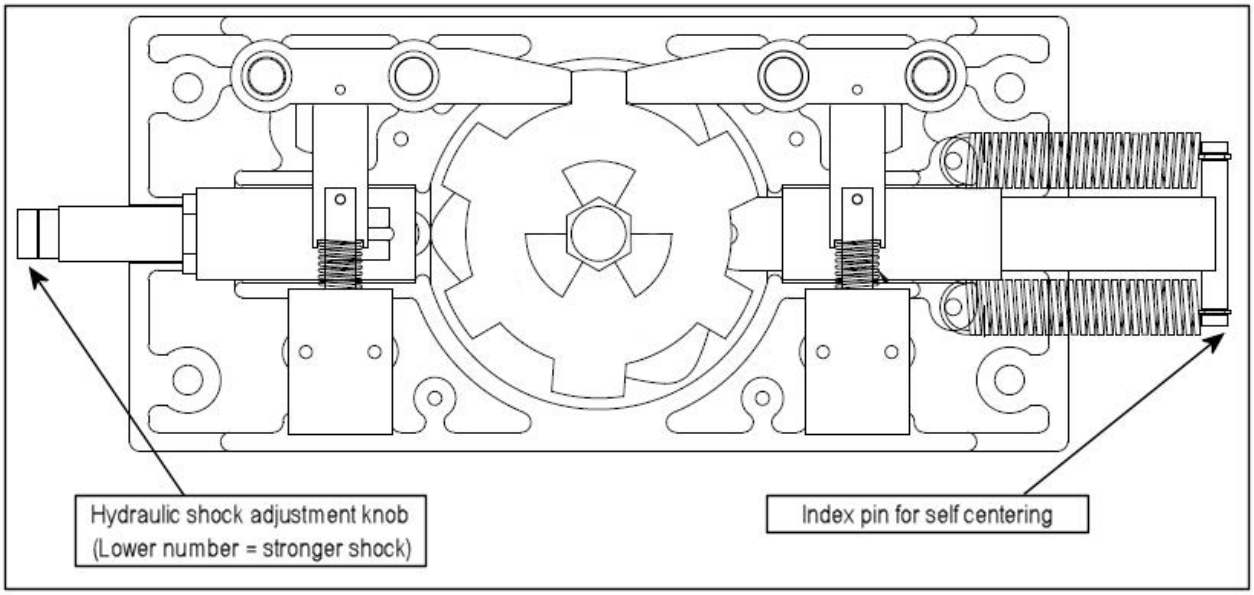
Description	Part Number
Fail open linkage	6518
Fail lock linkage	6519
Fail open locking bar assembly	0382
Fail lock locking bar assembly	0383



6500 Series Control Head Shock Adjustment and Replacement

Our turnstiles come with hydraulic shocks in order to alleviate wear on the control head. These shocks allow the turnstile to return to the center position without slamming into place. Although we adjust these in the factory, different environments may require additional field adjustment.

The shock is located adjacent to the index pin. To adjust the shock, loosen the set screw pointed upwards and adjust the dial. A lower number yields more shock, whereas a higher number yields less shock. The factory setting for a standard full height turnstile ranges between 0 and 1.



Should the shock need replaced, be sure not to fully thread the shock into the shock housing. Instead, thread the shock until it no longer spins, and then back the shock out approximately 1 ½ - 2 turns until the set screw is facing up. Lock down the shock with the provided nut, and then make field adjustments to the shock strength.

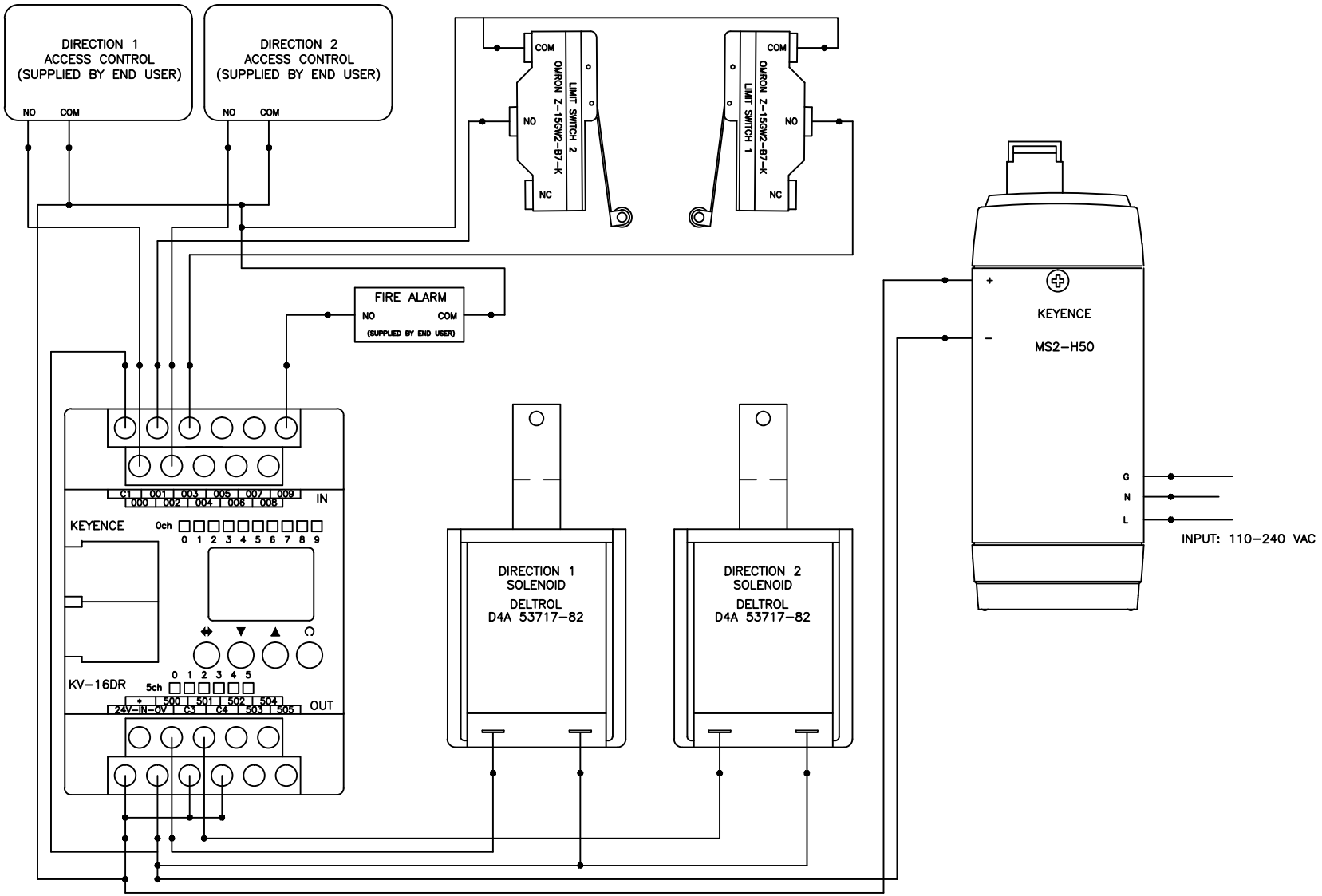
6500 Series Full Height Control Head Electrical Information

Each electronically controlled turnstile comes with a power supply, a circuit board, limit switches (or proximity sensors) and solenoids. The standard power supply, part number 0780, operates on 110 VAC and has an output of 24 VDC at 3 amps. The standard power supply has a regular outlet plug, so running conduit into the mainframe with an outlet receptacle is required. Alternate power supplies are available for 220 VAC applications.

The control board (port label shown below) offers two independent directional inputs. On a full height turnstile, clockwise rotation is controlled by the ENT. INPUT ports. Counter clockwise rotation is controlled by the EXT. INPUT ports. A momentary, normally open dry contact (of one second or less) is required to trigger each direction. If existing equipment does not have the capability to produce this type of signal, a one-shot timer can be purchased.

A diagram showing the port layout of the 789 Control Board.

Note: Access control devices need to provide a momentary, normally open dry contact of one second or less. A longer signal can cause more than one person to be able to pass through the turnstile. If you are unable to provide a contact of one second or less, ask us about a one-shot timer.



11/1/12

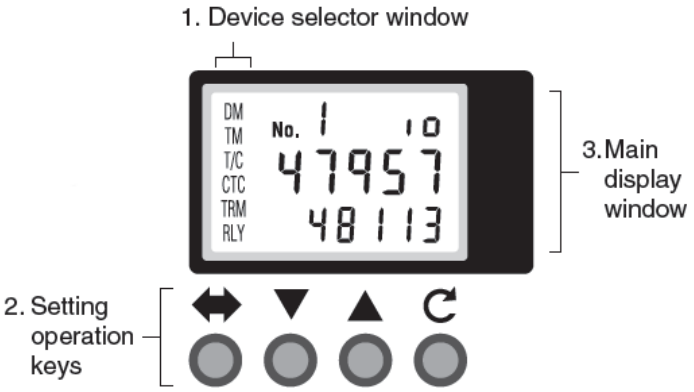
6500 Series Full Height Control Head Wiring Legend

Note: This is a multipurpose control board. Not all functions are used. All outputs on the right side of this legend are 24 VDC+. Use the INPUT 24V- port on the left side to provide negative polarity to light arrays and solenoids. Removing the jumpers above the light contacts will provide a dry contact for integration into existing systems.

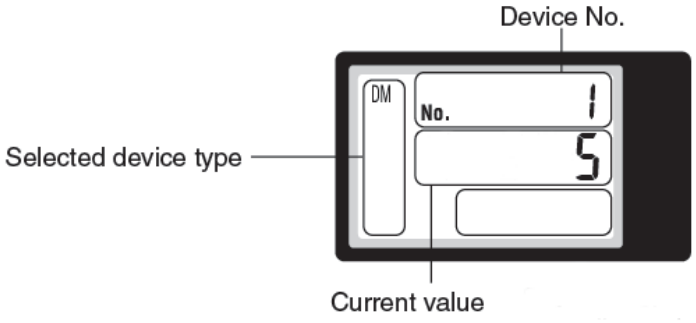
Timer controls length of time for person to enter	**ENT TIMER**	**FAIL LOCK**	Enter fail lock Solenoid 24 vdc+
		FAIL OPEN	Enter fail open Solenoid 24 vdc+
Timer controls length of time for person to exit	**EXT TIMER**	**ENT SOL COM**	Not Used
Timer controls length of alarm to sound	**ALARM TIMER**	**ENT LIGHT NO**	Status light 24 vdc+
		ENT LIGHT NC	Status light 24 vdc+
Contact closer of these two terminals by push button or card reader unlocks turnstile clockwise	**ENT INPUT +** **ENT INPUT -**	**ENT LIGHT COM**	Not Used
		FAIL LOCK	Exit fail lock Solenoid 24 vdc+
Contact closer of these two terminals by limit switch on control head relocks after one person enters	**LIM SWITCH 1+** **LIM SWITCH 1-**	**FAIL OPEN**	Exit fail open Solenoid 24 vdc+
		EXT SOL COM	Not Used
Contact closer of these two terminals by push button or card reader unlocks turnstile counter clockwise	**EXT INPUT +** **EXT INPUT -**	**EXT LIGHT NO**	Status light 24 vdc+
		EXT LIGHT NC	Status light 24 vdc+
Contact closer of these two terminals by limit switch on control head relocks after one person exits	**LIM SWITCH 2+** **LIM SWITCH 2-**	**EXT LIGHT COM**	Not Used
		ALARM OUTPUT NO	Cover alarm 24 vdc+
NOTE- If only one limit switch exits install jumper wire to LIM SWITCH 1+ and LIM SWITCH 2+		**ALARM OUTPUT NC**	Not Used
		ALARM OUTPUT COM	Not Used
Contact closer of these two terminals by cover tamper switch turns alarm on	**ALARM INPUT +** **ALARM INPUT -**		
		ANTI SOL NO	Anti-backup solenoid Fail open 24 vdc+
18 to 30 vdc power supply input and one leg from all solenoids attached to vdc -	**INPUT 24 V +** **INPUT 24 V -**	**ANTI SOL NC**	Anti-backup solenoid Fail lock 24 vdc+
		ANTI SOL COM	Not Used

Overview of the Access Window

On the logic controller, an access window is available to change and adjust many different values. Each value is referred to as a “device”. The window comprises of 3 primary areas: The device selector window, operation keys, and the main display window.



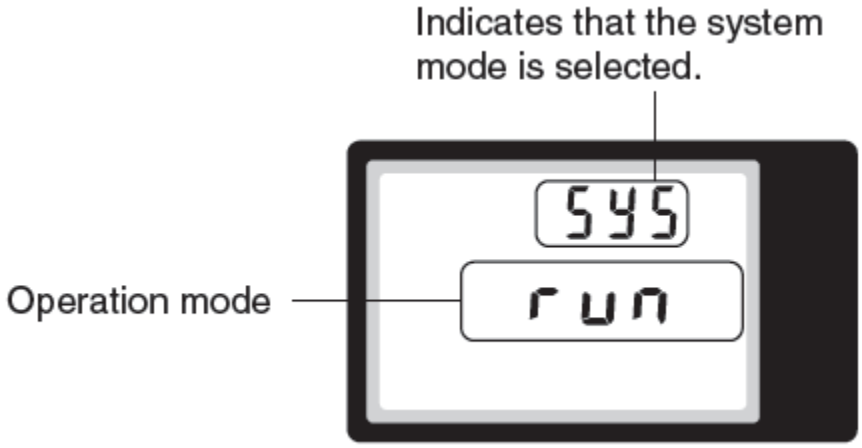
Although the logic controller is capable of many functions, all of the devices that the control head operates from are accessed in “Device Mode”. When device mode is active, the display screen will show DM in the top left corner.



That being said, it is possible to stray from the device mode settings. In the selected device type section of the access window, DM, TM, T/C, CTC, TRM, and RLY are all possible selections to load. Again, we are only using DM (device mode) with the 6500 series control head.

Should you find that you accidently have loaded any other selected device type, simply press ⬌to scroll until you have once again loaded the DM type.

In addition to the device mode window, system mode can be accessed as well.



Although under normal circumstances you should never encounter this window, if by accident you should happen to come across it, simply press the up or down arrow until the window reads “run”. Press and hold the ↻ button for 3 seconds, and the display will return to device mode.

Additionally, should for any reason the display lettering become red instead of green, you will need to access system mode to run the program in this fashion. Holding the ⇔ key while pressing up and down allows you to change between system mode and device mode. A third mode, which will display TRM on the left side of the screen, can also be accessed. Cycle through until the appropriate mode is displayed.

Finally, it is possible to lock the keypad. Should you inadvertently do so, press and hold the ⇔ button and an arrow key together for 3 seconds to unlock the keypad again.

Device Settings of the 6500 Series Control Head

While working within device mode, two primary values should be considered. On the top of the display, the selected device is shown. The 6500 series control head settings can be adjusted with devices 0 – 7.

Pressing the up or down arrows allow you to select which device you wish to modify. Pressing and holding the ↻ key for 3 seconds loads the modification window. While modifying, the digits on the window begin to flash. Pressing ↔ will move the cursor in a digit. Select the correct digit to modify, then use the arrows to change the value. Once finished, hold the ↻ button for 3 seconds and your adjustment will save.

Should a value inputted not fall within the specified range of the device being modified, the value will automatically adjust to the highest possible value. A description of each device setting is:

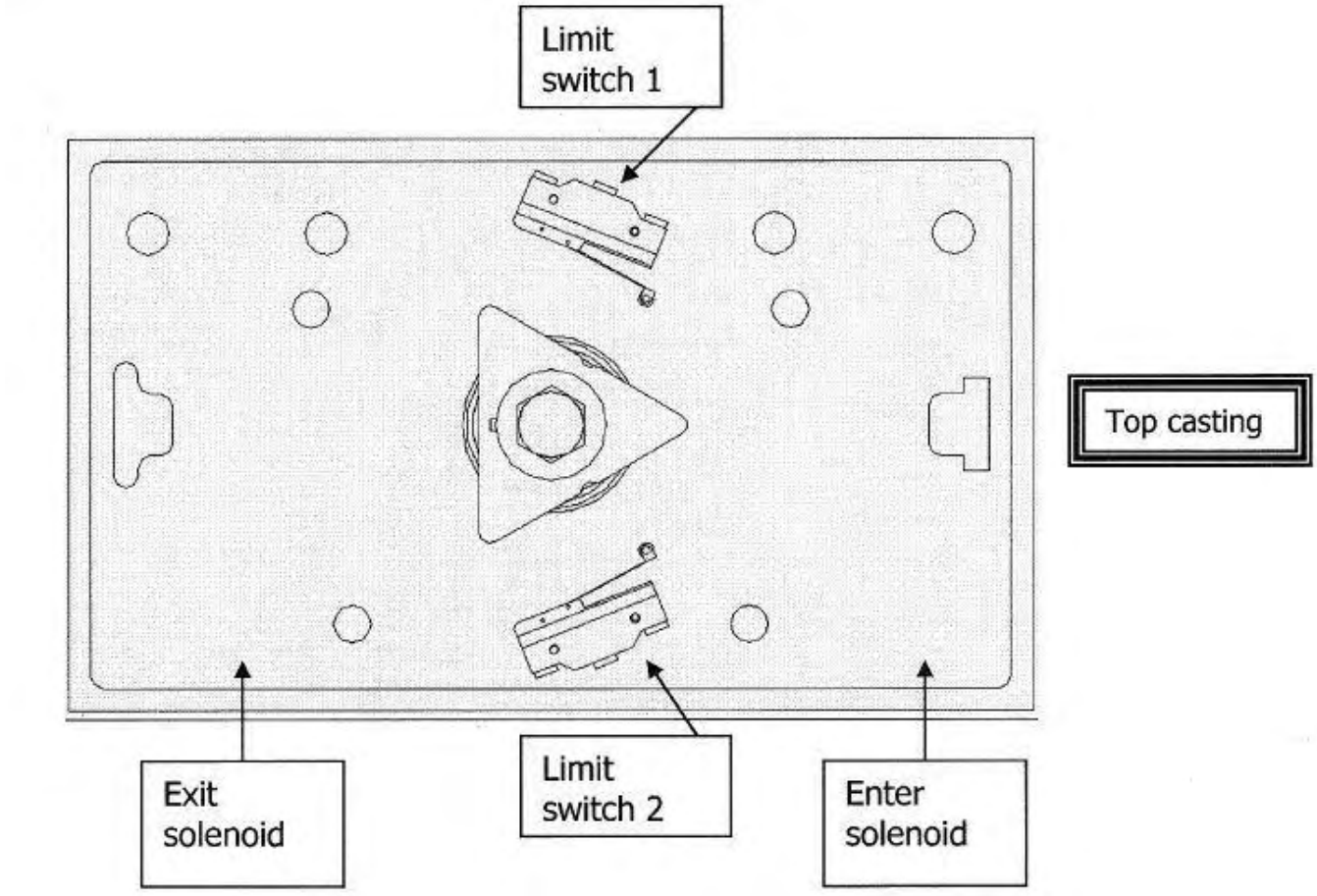
- **DM0:** Timer value for Direction 1. The range of this setting is 1 – 60 seconds. This is how long the direction will remain open for if a user does not pass through the direction. The default setting is 7 seconds.
- **DM1:** Timer value for Direction 2. The range of this setting is 1 – 60 seconds. This is how long the direction will remain open for if a user does not pass through the direction. The default setting is 7 seconds.
- **DM2:** Direction 1 fail status. This determines when the solenoid receives power and is preconfigured based on each individual order. 0 means the direction is fail lock & 1 means the direction is fail open. This setting is not affected by factory reset.
- **DM3:** Direction 2 fail status. This determines when the solenoid receives power and is preconfigured based on each individual order. 0 means the direction is fail lock & 1 means the direction is fail open. This setting is not affected by factory reset.
- **DM4:** Direction 1 one-shot timer: This setting determines whether or not the access control input length is ignored and converted to a .1 second pulse internally. Enabling this allows the turnstile to ignore access control from allowing too many users pass through the turnstile. Disabling it allows access control to hold the direction open. 0 means the one-shot timer is inactive & 1 means the one-shot timer is active.
- **DM5:** Direction 2 one-shot timer: This setting determines whether or not the access control input length is ignored and converted to a .1 second pulse internally. Enabling this allows the turnstile to ignore access control from allowing too many users pass through the turnstile. Disabling it allows access control to hold the direction open. 0 means the one-shot timer is inactive & 1 means the one-shot timer is active.
- **DM6:** Direction 1 multi-swipe: This setting allows more than one access control request to be processed at a time to allow a faster flow of traffic. The range is 1-3. As each access control request is processed, each rotation subtracts from the total, allowing a constant flow of traffic. Most installations would benefit from a value of 2, which is the default setting.
- **DM7:** Direction 2 multi-swipe: This setting allows more than one access control request to be processed at a time to allow a faster flow of traffic. The range is 1-3. As each access control request is processed, each rotation subtracts from the total, allowing a constant flow of traffic. Most installations would benefit from a value of 2, which is the default setting.

- **DM9:** Direction 1 Count: Displays how many valid rotations were made in direction 1. This has a max value of 60,000 and will reset to 0 once that number is reached. This will not count fire alarm, hold open or key override rotations. This count is for maintenance and repair logging purposes.
- **DM10:** Direction 2 Count: Displays how many valid rotations were made in direction 2. This has a max value of 60,000 and will reset to 0 once that number is reached. This will not count fire alarm, hold open or key override rotations. This count is for maintenance and repair logging purposes.

Additionally, scrolling downward past DM0 will allow you access to **DM1999**, which resets all settings to factory defaults (except for solenoid fail status settings). Choose any value greater than 0 to perform the factory reset.

6500 Series Full Height Control Head Limit Switch Information

An HS400 series full height turnstile is designed to lock after one rotation (or after a timer has determined that nobody has passed through the turnstile). In order to accomplish this, a limit switch is triggered and sends a signal to the control board.



The enter solenoid is deactivated by limit switch 1, and the exit solenoid is deactivated by limit switch two. On a full height turnstile, limit switch one is located near the locking bars, and limit switch two is near the solenoids. It is also important to notice that the top cam has one point facing the front side of the control head, towards the circuit board and index pin.

Note: The control head will not operate properly if the limit switches and top cam are not adjusted properly or altered from factory shipment.

HS400 Series Maintenance & Cleaning

To ensure long life on any turnstile, the following maintenance is recommended.

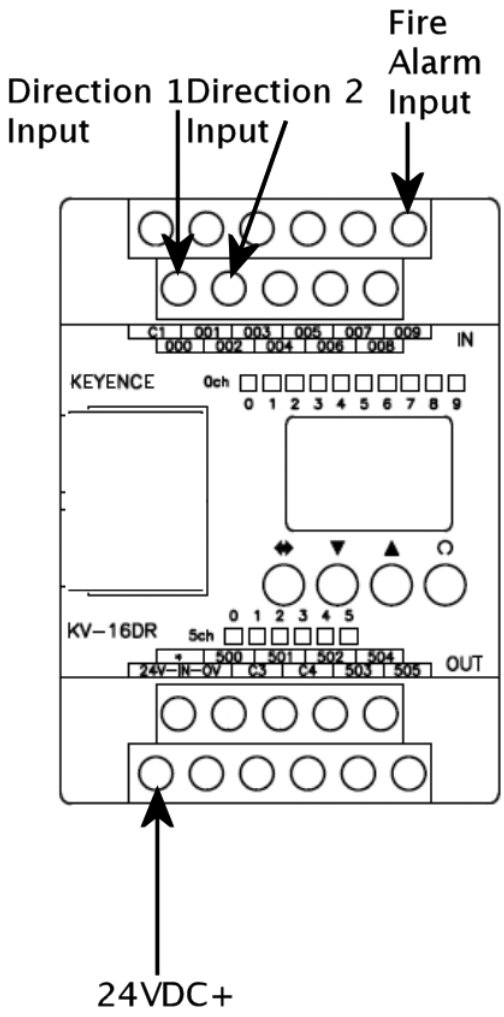
- Annual
  - On the bottom of each rotor, you should find a grease fitting. Utilize this fitting to re-grease the bearing that the rotor rests on.
  - Make sure all nuts are securely fastened on all parts of the turnstile.
  - On the control head, remove the index pin and apply white lithium grease. Use 3 in 1 oil on the index pin roller. The index pin is easily removed from the control head by disconnecting the springs from it.
- Bi-annual
  - Remove the lid from the control head. Clean any debris and apply grease to the shock roller assembly. Use 3 in 1 oil on the shock piston roller.
  - Apply 3 in 1 oil to the bronze bushing on the locking bars.
  - Inspect control head parts for wear and tear, replace parts as needed.
  - Reassemble control head. Using a removable strength (blue) thread sealer (such as Loctite) on the head bolts will help the control head remain sturdy.
- Cleaning
  - Galvanized turnstiles can be cleaned with soap and water. Galvanized finish may fade in color over time, but this is normal.
  - Powder coated turnstiles should be cleaned with a non-abrasive cleanser such as Formula 409. Be sure to inspect for chips on the powder coating and touch them up, or the exposed steel may rust.
  - Stainless steel turnstiles should be polished with a stainless steel wax or polish. **In harsh environments, such as facilities near the ocean or within a chemical plant, stainless steel turnstiles should be waxed with a simple car wax to prevent surface discoloration on an annual basis.** Discoloration and surface rust can be easily removed with a rust penetrating product, such as P.B. Blaster, along with non-scratching scouring pads.

Control heads can be removed from the mainframe 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.

Note: The recommended time frames are assuming a maximum of 75000 passages per year. Turnstiles with heavier traffic should be maintained more frequently.

6500 Series Control Head Testing

6500 Series Testing Procedures



To test whether or not your control head is functioning properly...

- -Unplug power supply from outlet
- -Disconnect access control and fire alarm system from inputs 000, 002, and 009 (if applicable)
- -Plug the power supply back into the outlet
- -Using a length of 18 gauge wire, momentarily touch the the 24VDC+ screw terminal with one end, and input 000 with the other. The solenoid should engage
- - Trigger limit switch 1 and the unit should relock. It will also relock when the timer expires
- - Repeat this step with 24VDC+ and input 002. The alternate solenoid should engage
- - Trigger limit switch 2 and the unit should relock
- - If desired, test the fire alarm by jumping and holding input 009 to 24VDC+ and both directions should unlock

HS400 Series Single Full Height Troubleshooting

Symptom	Cause	Solution
Turnstile does not unlock.	Turnstile not receiving 110VAC.	Verify outlet receptacle installed in mainframe is operating correctly and that the power supply is plugged in.
	Loose wiring from power supply to circuit board.	Refer to pages 23-25 for wiring information.
	Power supply is not producing voltage.	Verify by checking the voltage on the INPUT 24V ports on the control board. If there is no voltage, replace power supply.
	Circuit board malfunction.	Check the circuit board for and LEDs. One LED should be lit above the INPUT 24V ports. No other LED's should be lit, unless a direction is triggered. Contact us for additional support or replace circuit board.
	Access control device malfunction.	Disconnect access control from circuit board. Momentarily jump directional inputs. If the turnstile works properly, contact manufacturer of access control device.
	Control head requiring maintenance.	Refer to page 27.
More than one person can get through turnstile.	Access control device output set too long and the circuit board's intelligence cannot take over.	This can be verified by disconnecting the access control device from the circuit board and momentarily jumping the directional input. If the unit operates correctly, contact the manufacturer of the access control device for information on how to reduce output signal length to one second or less. If device is unable to be set that low, a one-shot timer can be purchased to change signal length.
	Loose wiring to the control board from limit switches.	Refer to pages 23-25 for wiring information.
	Limit switches are broken.	Inspect limit switches for breakage, replace as needed.
	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 pages 17-18 for parts locations.

People are becoming trapped inside of the turnstile.	Rotor was installed backwards.	Refer to step 15 on page 15.
Turnstile only rotates 30 degrees.	Limit switches wired incorrectly.	Refer to pages 23-25 for wiring information and page 26 for limit switch placement.
	Top 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 26 for top cam information.
Turnstile is slamming into the closed position.	Shock either needs adjusted or replaced.	Refer to page 22 for more information.
Turnstile is not centering properly.	Shock needs adjusted.	Refer to page 22 for more information.
	Binding in control head.	See next troubleshooting hint.
Turnstile seems to be binding mechanically.	Rotor is not plumb / turnstile body is not level.	Refer to the installation instructions for more information.
	Control head requires maintenance.	Refer to page 27 for more information.
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 16-19 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.	In the case of an electronic control head, two separate directional inputs exist. The ENT INPUT ports on the circuit board operate the rotor clockwise; the EXT INPUT ports operate the rotor counter clockwise.
Turnstile fails lock when needed to fail open or vice versa.	Improperly filled out direction sheet.	Refer to page 21 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.
Other problems.		Please contact us for any other issues.

Proper Turnstile Usage

The HS400 series turnstile 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 swipe the card. Do not push on the arms of the rotor until after access control device is engaged and a click sound from the mainframe is heard. This sound is the locking mechanism engaging.

  Note: Turnstile will not unlock if pressure is being applied to the rotor. The unit will unlock after pressure is released; however, it is a better practice to wait until the click sound is heard before pushing the rotor.
- After requesting access with access control devices, proceed through turnstile immediately. Waiting too long could cause the turnstile to time-out mid rotation, forcing the user to back out of the turnstile. Factory timer settings are at 7-10 seconds. While these timers are adjustable for up to 60 seconds, we recommend 7-10 seconds because if someone chooses to swipe and walk away from the turnstile, another person would not be able to pass through without credentials. The limit switches on the control head override the directional timers.
- 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.
- Wait until the unit has self-centered before the next user passes through. This is more about safety than anything.
- Try to be respectful of users wanting to pass through the other direction. Allow people who are waiting an opportunity to pass through the turnstile.
- Avoid rotating the rotor before walking through on a valid entry request. This will cause the rotor to 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.

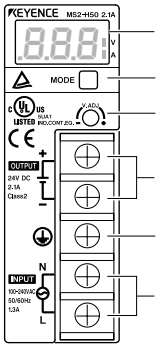
Warranty Information

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



Digital display window
Displays the current values of output current/voltage and other items.

Display mode selection (MODE)
Switches the display mode.

Output voltage adjustment trimmer (V.ADJ)
Adjusts the output voltage within the range of ±5%.

DC output terminal (+, –) *
A load is connected here. (24 VDC)

Protective earthing terminal (⏚)
Connect to the protective earthing conductor in the building installation.

AC input terminal (N, L)
An input cable is connected here. (100 to 240 VAC)

*Only the MS-H300 has DC output of 4-terminal.

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 / QQGQ2, QQGQ8

<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 60ºC/75ºC
- 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

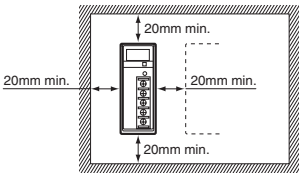
- The ambient temperature for this unit should not exceed the upper temperature limit (refer to the derating characteristic). When the upper temperature limit may be exceeded, install a cooling fan or cooler so that the ambient temperature is below the upper temperature limit.
- Leave a sufficient ventilation 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

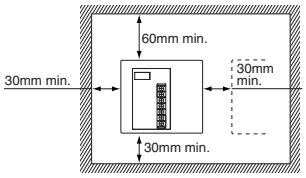
■ Space around the unit

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.

MS2-H50/H75/H100/H150

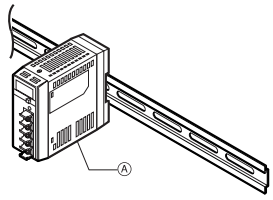


MS2-H300



■ Installation orientation

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



■ Mounting bracket (optional)

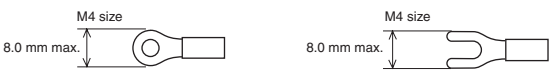
Make sure that the tightening torque for the mounting screw holes of this unit is 0.5 N•m or less.

Wiring

Terminals

Screw size	Tightening torque
M4	1.2 N•m

Crimp termianls



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.

Output current display — Displays the output current down to 0.1 A.

Load factor display — Displays the load factor down to 1%. When the load factor is over 100% , displays "FFP".

Peak current display — Displays the maximum value of the output current down to 0.1 A. The current and "PH" are displayed alternately.

Output voltage display — Displays the output voltage down to 0.1 V.

- 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.

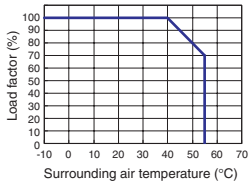
Dimensions

	Model	MS2-H50	MS2-H75	MS2-H100	MS2-H150	MS2-H300
Input conditions	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)	82%/85% 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.
Output conditions	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)				
Protection	Overcurrent protection	Activates when the current reaches 125% or more of the rated output current. Constant current voltage limiting. Automatic reset				
		2.7 A min.	4.0 A min.	5.3 A min.	7.9 A min.	15.6 A min
	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	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%				
Environment	Surrounding Air Temperature (for operation)	–10 to 55ºC, No condensation (See "Output Derating Characteristics".)				
	Relative humidity	25 to 85%, No condensation				
	Surrounding Air Temperature (for storage)	–20 to 70°C, N ccondensation				
	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/s², 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/s2 (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)				
Applicable standard	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				
Other	Parallel operation	Possible (OP-42207 is required.) ∗4				
	Serial operation	Possible (External diode is required.) ∗4				
	Cooling method	Natural air cooling				

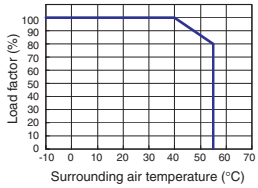
∗2 To reset the unit, turn off the input power once, wait for 1 minute or more, and then turn on the input power again.
∗3 For MS2-H100, it is applied only when the load ratio is 70% or lower.
∗4 The Applicable standards do not apply for parallel and serial operations.

Output Derating Characteristics

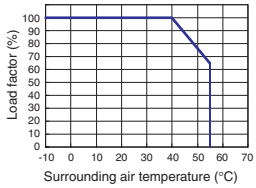
MS2-H50/H150



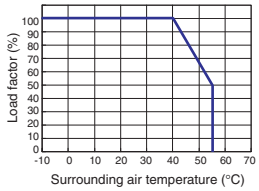
MS2-H75



MS2-H100

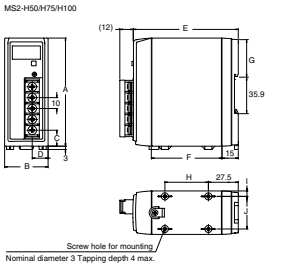


MS2-H300



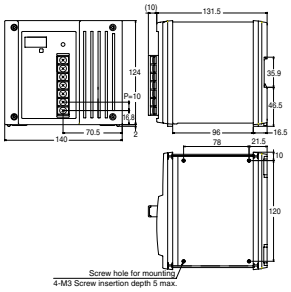
Dimensions

MS2-H50/H75/H100

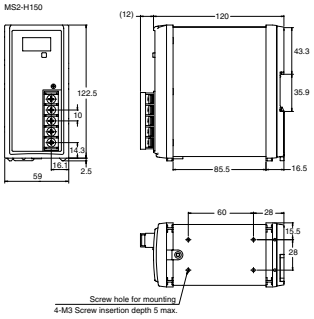


Model	A	B	C	D	E	F	G	H	I	J
MS2-H50	99.5	40	14.7	14.6	97	65	33.4	40	5	30
MS2-H75/H100	114.5	52	15.1	17.1	110	78	41	52	4.75	42.5

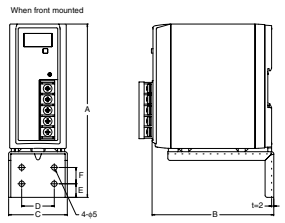
MS2-H300



MS2-H150



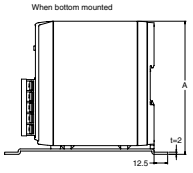
When front mounted



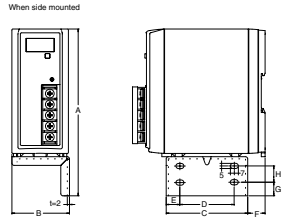
Mounting bracket	OP-51624	OP-51627	OP-42174
Matching model	MS2-H50	MS2-H75/H100	MS2-H150
A	123.5	159.5	170
B	99	112	122
C	45	54	59
D	20	30	40
E	8	12.5	12.5
F		15	15

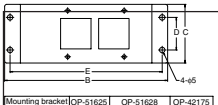
Two holes only for OP-51624.

When bottom mounted



When side mounted





Mounting bracket	OP-51625	OP-51628	OP-42175
Matching model	MS2-H50	MS2-H75/H100	MS2-H150
A	107.5	122.5	132.5
B	135	150	160
C	45	54	55
D	20	30	40
E	125	140	150

Mounting bracket	OP-51626	OP-51623	
Matching model	MS2-H50	MS2-H75/H100	MS2-H150
A	120.5	153.5	157
B	45	54	60
C	65	75	75
D	40	50	50
E	12.5	12.5	12.5
F	14.5	16	20.5
G	8	12.5	12.5
H		15	15

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

PLC Specifications

General specifications

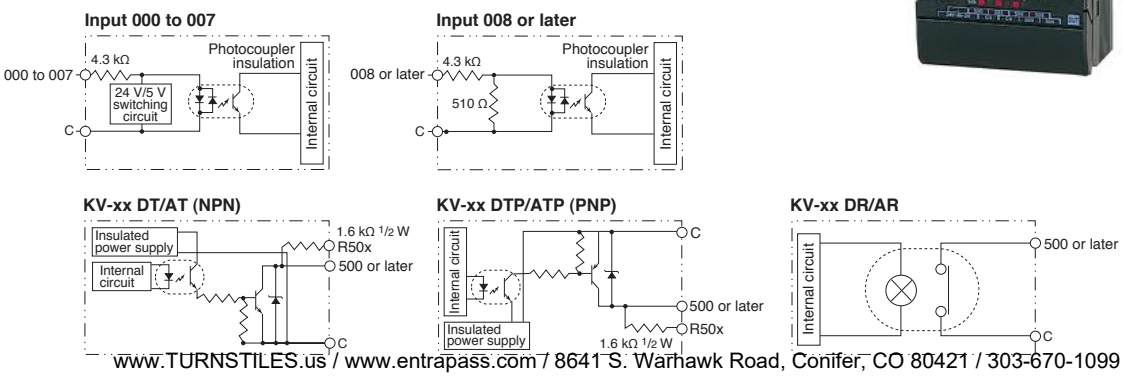
Model	Base unit	AC type KV-10AT(P)/AR KV-16AT(P)/AR KV-24AT(P)/AR KV-40AT(P)/AR	DC type KV-10DT(P)/DR KV-16DT(P)/DR KV-24DT(P)/DR KV-40DT(P)/DR
Rated voltage	Base unit	100 to 240 VAC (±10%)	24 VDC (+10%, -20%)
AC current consumption	Base unit	KV-10AT(P)/AR: 0.4 A KV-16AT(P)/AR: 0.5 A KV-24AT(P)/AR: 0.6 A KV-40AT(P)/AR: 0.7 A	—
AC power factor	Base unit	60%	—
Output voltage	Base unit	24 VDC (±10%)	—
Output capacity (Including the internal current consumption and current consumption of expansion units.)	Base unit	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	Base unit	40 ms max.	2 ms max.
Internal current consumption (converted into 24 VDC value)	Base unit	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.	
	Others	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/s² (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 (Retention devices are set by MEMSW instruction.)	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.
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

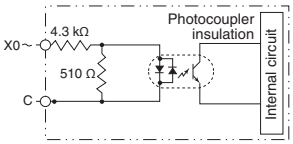
Model	KV-10xT(P)	KV-16xT(P)	KV-24xT(P)	KV-40xT(P)	KV-10xR	KV-16xR	KV-24xR	KV-40xR
No. of outputs	4	6	8	16	4	6	8	16
Output common	1 common				Each common terminal is independent.			
Output type	Transistor output (NPN or PNP)				Relay output			
Rated load	30 VDC 0.3 A (503 and other) 0.1 A (500 to 502)				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

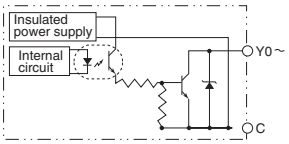
Input/output	Input		Output				Input/output
External connection method	Terminal block						
Model	KV-E8X	KV-E16X	KV-E8T(P)	KV-E16T(P)	KV-E8R	KV-E16R	KV-E4XT(P)/R
Number of inputs	8	16	—				4
Input common	4 points/common		—				4 points/common
Maximum input rating	26.4 VDC		—				26.4 VDC
Input voltage	24 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 (Changed in two steps by special utility relays 2609 to 2612)	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

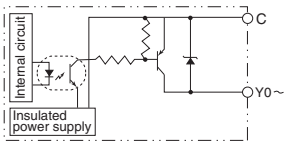
Input



Output (NPN Transistor)



Output (PNP Transistor)



Output (Relay)