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User Guide,
Motion 3000ES Escalator Control

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Important Precautions and Useful Information

This preface contains information that will help you understand and safely maintain MCE equipment. We strongly recommend you review this preface and read this manual before installing, adjusting, or maintaining Motion Control Engineering equipment. This preface discusses:

- Safety and Other Symbol Meanings
- Environmental Considerations
- In This Guide

Safety and Other Symbol Meanings

Danger

This manual symbol is used to alert you to procedures, instructions, or situations which, if not done properly, might result in personal injury or substantial equipment damage.

Caution

This manual symbol is used to alert you to procedures, instructions, or situations which, if not done properly, might result in equipment damage.

This manual symbol is used to alert you to instructions or other immediately helpful information.

Environmental Considerations

- Keep ambient temperature between 32 and 104 degrees F (0 to 40 degrees C).
- Prevent condensation on the equipment.
- Make certain that power line fluctuations are within plus or minus 5% of proper value.

In This Guide:

This guide is the installation, adjustment, and troubleshooting guide for the Motion 3000ES escalator control. When viewed online as a pdf file, hyperlinks link to related topics and informational websites. The manual includes:

- Contents: Table of Contents. When viewed online as a pdf file, hyperlinks in the Contents link to the associated topic in the body of the manual.
- *Motion 3000ES*: Product Description, installation, and troubleshooting instructions.

Motion 3000ES Contents

Motion 3000ES Escalator Control

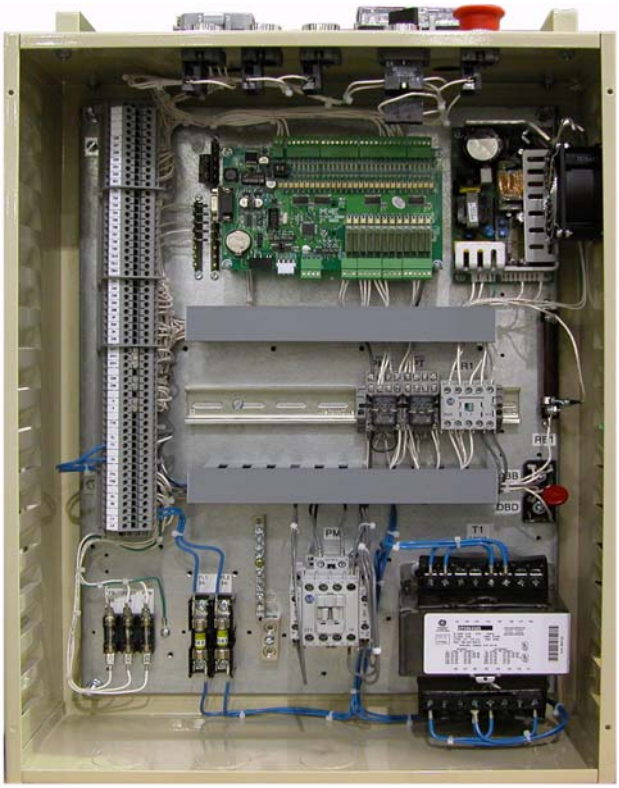
About Motion 3000ES

Motion 3000ES is a field programmable escalator control from Motion Control Engineering. Motion 3000ES controls provide hardware flexibility, allowing enclosure size and motor drive, control keypad, and processor board locations (in cabinet or remote) to vary depending on the needs of the installation. Escalator controls are available in VVVF Variable Speed, Across-the-Line, or Wye/Delta Direct Line Control versions.

Motion 3000ES is fully ASME A17.1-2010, CSA B44.10, BS EN 115, and AS 1735.5 compliant, with independent, redundant safety string inputs, signal path, and processing to ensure safe operation. Motion 3000ES controls feature:

- Prominent, externally accessible machine controls
- VVVF drive or Wye/Delta compatibility
- High speed CAN serial bus communication
- High visibility LED message and parameter displays
- Internal event storage with time stamp
- Multiple remote display support
- Direct parameter entry (no external devices required)
- Cabinet or remote mount inspection control sockets
- Field programmable

The standard Motion 3000 shipment contains two enclosures for non-VVVF drive units or three enclosures for VVVF drive units. This configuration allows simpler installation and reduces wire runs.



Main Upper entry cabinet
24” x 18” x 8” (61 x 46 x 20 cm)

Drive cabinet (if used)
24” x 12” x 12” (61 x 31 x 31 cm)

Main cabinet (top view) controls, standard programmer, and inspection control plug

Lower entry cabinet
12” x 12” x 4” (31 x 31 x 10 cm)

Installation

This section contains:

- Equipment grounding
- AC connections
- Initial power up
- Field connections

Equipment Grounding

For good grounding, quality wiring materials and methods must be used. Grounding must conform to all applicable codes. Proper grounding is essential for system safety and helps to reduce noise-induced problems. General grounding guidelines include:

- The grounding wire to the equipment cabinet should be the same gauge (diameter) or larger than the primary AC power feeders for the controller and should be as short as possible.
- The grounding wire between equipment cabinets may follow a branching or daisy-chain configuration, but the wire must terminate at the last controller and NOT loop back.
- You must provide a direct, solid ground to the controller and motor. An indirect ground, such as the building structure or a water pipe, may not provide proper grounding and could act as an antenna — radiating RFI noise and interfering with electronic equipment in the building.
- The conduit containing the AC power feeders must not be used for grounding.

Check for Shorts to Ground

Check for shorts to ground before powering up the system. **Power must be OFF at the main disconnect.** If any shorts to ground are discovered, they must be corrected before proceeding. A short to ground is defined as having a resistance of less than 20 ohms between ground and the terminal being tested.

Danger

Be certain that power is OFF at the main disconnect before proceeding.

1. Disengage all fuses at the bottom of the cabinet.
2. Measure the resistance between the cabinet ground and all field connection terminals (connectors J1 through J4 and J6 through J9 on the EC-MCB board and J1 through J4 on the EC-SCB board).
3. Check for shorts to ground on motor power terminals L1, L2, and L3.
4. Check for shorts to ground on brake terminals B1 and B2, (EB1 and EB2 where applicable).
5. If no shorts to ground are discovered, re-engage the fuses. Refer to the job prints for fuse location if necessary.

AC Voltage Verification and Wiring

The AC wiring instructions in this section describe wiring from commercial power. The majority of technical information is contained in the MCE job prints package and referenced here as necessary. As shown in the job prints (if specified), an isolation transformer may be used to clean up “dirty” commercial power or shift voltage levels, and also prevent noise from electrical equipment from being introduced back into the building power system. Isolation transformers are specified in some, but not all, installations.

AC Voltage Verification and Wiring instructions include:

- Verifying main line power and wiring the controller
- Initial power up

All conductors entering or leaving the controller cabinet must be in conduit. High voltage, high current conductors, such as power conductors from the fused disconnect or isolation transformer, must be separated from control wires. It is essential that control wires be routed through a separate conduit away from high current conductors.

Incoming power to the controller and outgoing power wires to the motor must be in their respective grounded conduit.

Verifying Main Line Power and Wiring the Controller

1. Consult the job prints. Verify that AC supply is as specified.

Proper motor branch circuit protection in the form of a fused disconnect switch or circuit breaker must be provided for each escalator according to applicable electrical code. Each disconnect or breaker must be clearly labeled with the escalator number. The electrical contractor must determine the wire size for the main AC power supply and for the wiring from the disconnect or breaker to the escalator controller.

2. If an isolation transformer is used, connect AC supply wiring to the transformer, and transformer outputs to the controller, as shown in the job prints.
3. If no isolation transformer is used, connect AC supply wiring to the controller as shown in the job prints.

Check Before Applying Power

Escalator control enclosures are light weight. During shipping, they can be roughly handled, sometimes jarring connections and even socketed board components loose. To avoid damage, ensure reliable performance, and avoid troubleshooting expense:

1. Verify that no factory wiring connections have become loosened.
2. Make sure all relays are properly seated with retainer clips in place.
3. Make sure all ribbon cables are properly seated.
4. Verify all factory wired screw terminals are torqued to MCE recommendations.

Initial Power Up

After AC power is connected, you are ready to temporarily power up the controller and check initial controller and drive parameters.

Caution

This procedure assumes that no field wiring has been connected to the controller. If field wiring has been connected, disconnect it before beginning this procedure. Before applying power, physically check all components. Components loosened during shipment may cause damage.

1. On the controller, verify:
   - Inspection/Auto switch in Inspection position
2. Power up the controller. If the controller fails to power up, refer to the job prints and check supply connections and fuses.

Controller Parameters

A simple keypad and display allow access to controller parameters.

Your controller may have the optional LCD display. The LCD display is capable of displaying full text status and error messages.

- ESC button: Press to exit parameter settings without saving changes.
- UP button: Move up in parameter settings list. Change the value of a selected digit. (Digit will be flashing when its value can be changed.)
- DOWN button: Move down in parameter settings list. Move between digits of a selected value.
- OK: Select/Save.
- At the highest level, parameters are grouped under seven functions, FUN1 through FUN7.
- Within each function, parameters are listed numerically by function and parameter order (i.e., F1-01 is the first parameter of function FUN1, F1-02 is the second, etc.).
- Consult the complete parameter table for an ordered list of all parameters. Please refer to “Controller Parameters” on page 32.
- To reset any latched fault, press both UP and DOWN buttons and hold them down for two seconds.

Parameter setting example — Setting automatic oiling duration:

- Check the table to see that oiling duration is parameter F2-02.
- Press OK to access parameters.
- Press UP until FUN2 is displayed.
- Press OK to select FUN2 parameters.
- Press UP until F2-02 is displayed.
- Press OK to display the current setting. (For example: 0030 indicates 30 seconds.)
- Press DOWN to move to the digit you want to change (selected digit flashes).
- Press UP to change the digit value. (For example, changing the 3 to a 4.)
- Press OK to save the new value.
- Press ESC to exit the set up menu. (The display will show “STOP.”)

The programming display is also used to display error codes if the controller discovers a problem. Please refer to “Fault Conditions” on page 50.

If an error is displayed, first correct the condition, then press and hold the UP and DOWN buttons simultaneously — the error will clear after three seconds.

Check the following parameters to verify they match the physical configuration of your system. Set if needed.

- F1-01, Brake contact: N/C or N/O (or disable if the brake is not equipped with a contact)
- F1-02, Auxiliary brake contact: N/C, N/O, Cancel, or Disable.
  Cancel means that the system does not have an auxiliary brake. The T4 output is always OFF by default, is not connected to anything, and never changes state.

  Disable means that the system does have an auxiliary brake but does not have a contact to feedback the brake position to the controller. The system ignores the status of input P22 (Auxiliary Brake Contact) and drops the auxiliary brake (T4 output) in the following instances:
  - Overspeed; Reversal; Broken Drive Chain; Loss of Power.
- F4-01, Drive mode:
  - 0: VVVF or ATL
  - 1: Wye/Delta
- F4-03, EC-SCB presence: Yes

Construction Mode: Parameter F5-07, when set to a value of 1 (one), places the escalator in a mode where all faults are automatically reset (no fault is latched). This mode is useful during installation. While in this mode, the escalator control WILL NOT enter automatic operation. Before automatic operation may be entered, F5-07 must be set to 0 (zero). When set to 0, fault latching will return to normal.

Drive Parameters

If you have a VVVF Control, selected drive parameters should be checked at this time. One of two drives may be used.

Controllers equipped with CT Emerson drives use dynamic braking resistors installed in a separate resistor cabinet. The dynamic braking resistors dissipate energy produced by the motor under certain loading conditions. Controllers with KEB/TorqMax drives do not use the dynamic braking resistors.

Operation Description when Equipped with a Drive

Normal Mode (Single Speed): Up Going: Drive is always in control. Energy savings are realized when the escalator has a light load because the drive can provide less voltage and current while maintaining contract speed. When the load increases, the drive automatically increases voltage and current (only 2 modes—rated current and less current, not variable).

Down Going: At start, drive (KEB drive only) accelerates escalator to contract speed (soft start to 60Hz). Once contract speed is reached, the drive drops PM and picks PML. This switches power to the line. In this configuration, power can be put back on the line if the load of the down going escalator causes the motor to act like a generator. CT drives use dynamic braking resistors to dissipate energy as heat.

Inspection speed is adjustable.

Energy Saving Modes (when code allows speed change during operation)
Sensors are mounted at the top and bottom entries to the escalator in order to detect someone approaching or exiting the escalator.

Energy Saving Mode (Two Speeds, Starting Direction Only) After there has been no activity for a user-defined period, the escalator will change from high speed to low speed. When an entry detector senses someone approaching the escalator, the speed is increased from low to high. An additional timer can be set to stop the escalator completely after there has been no activity for a user-defined period at slow speed. In this case, when an entry detector senses someone approaching the escalator, the escalator changes from a stopped condition to high speed in the starting direction only.

Intelligent Mode (Two Speeds, Two Directions Based on Entry Detection)
After there has been no activity for a user-defined period, the escalator will change from high speed to low speed. When an entry detector senses someone approaching the escalator, the speed is increased from low to high. An additional timer can be set to stop the escalator completely after there has been no activity for a user-defined period at slow speed. In this case, when an entry detector senses someone approaching the escalator, the escalator changes from a stopped condition to high speed **AND** goes in the direction determined by the entry detector.

CT Emerson The drive uses a direct entry, LED display and keypad. The display is a two-row display with the upper row showing drive status or the current menu and parameter number being viewed. The lower row shows the value of the displayed parameter number or, if the drive has tripped, the specific fault indication. Read the manual shipped with the drive for details not provided here. (Please refer to "CT Drive Fault Displays" on page 54 for a listing of drive faults.)

CT Menu Access CT drive parameters beyond menu 0 may be protected by User Security and Parameter Access Level settings. Parameter Access Level determines whether the user can access menus beyond menu 0. User Security determines whether the user can change parameters or just read them.

To set User Security:

1. At parameter 0.34, enter the desired security code (from 1 to 999), then press the M button.
2. Set parameter 0.49, Access Level, to "2" (Local).
3. Press the drive reset button to activate the security code and reset the drive. The drive will return to access Level 1 (Menu 0 only) and the security code entry will be hidden (0.34).

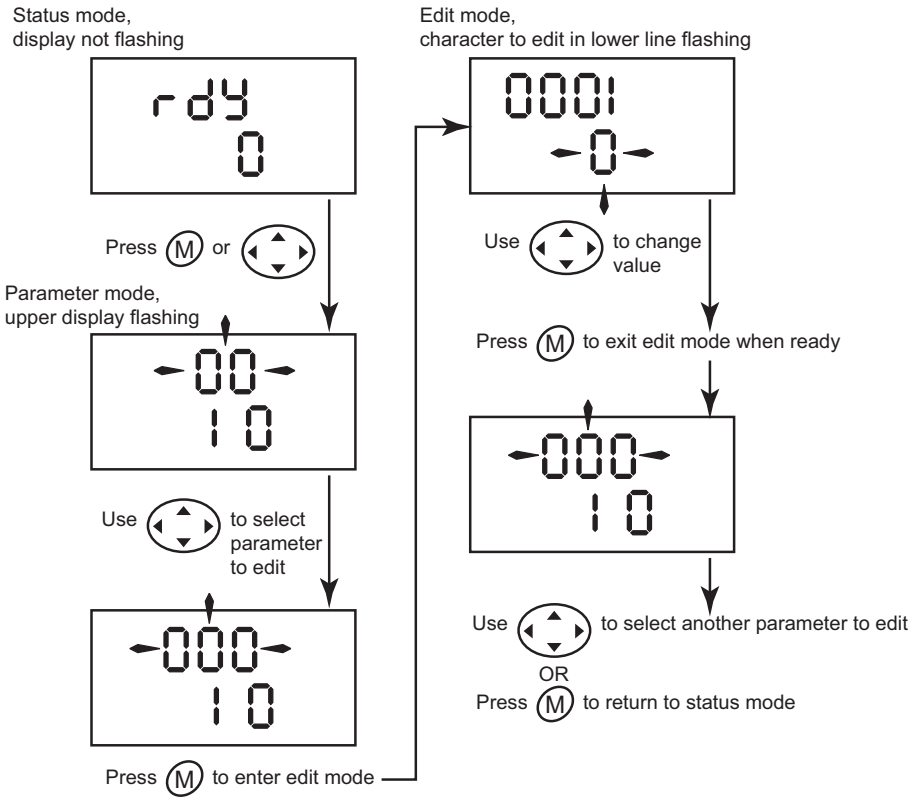
To set Access Level so advanced menus can be accessed:

1. Set parameter 0.49, Access Level, to "1" (Level 2).
2. Select a parameter to edit and press the M button. The drive will display CodE.
3. Use the arrow buttons to set the security code, then press the M button. The drive will display the parameter to be set in edit mode.
4. To lock User Security again, set parameter 0.49 to "2" (Local) and press the reset button.

To disable User Security (so it does not have to be used each time):

1. At parameter 0.34, enter the security code, then press the M button.
2. Set parameter 0.49, Access Level, to "2" (Local).
3. Press the drive reset button to unlock the security code and reset the drive.
4. Set parameter 0.34 to "0" then press the M button. User Security is now disabled.

CT Parameter Entry The graphic below provides the parameter editing sequence.



CT Saving Parameters Once you have set parameters as desired, you must do the following to save them:

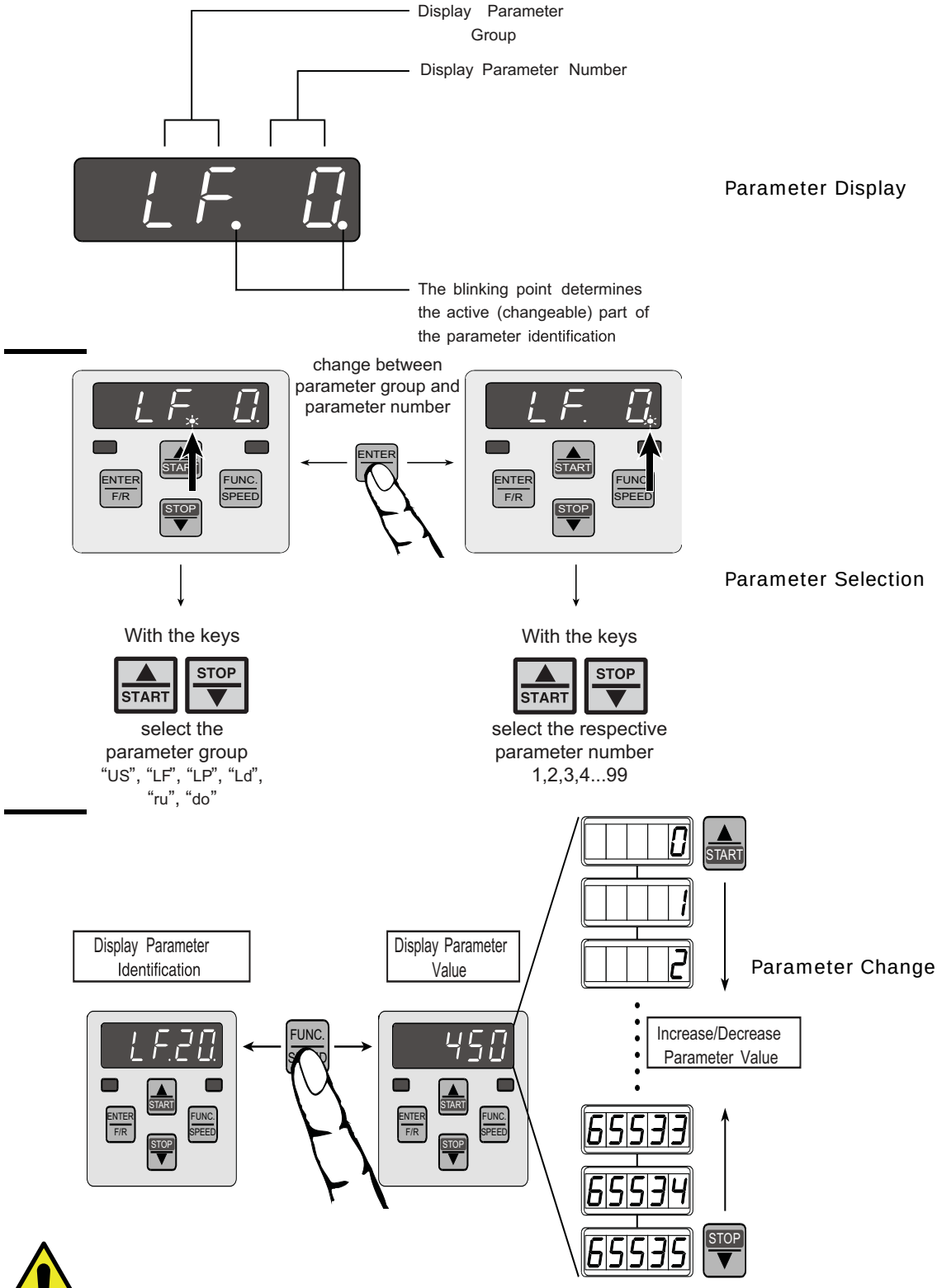
1. Enter 1000 in parameter 0.00. (If the drive is in under voltage trip state or being supplied from a 48V backup source, 1001 must be entered instead.)
2. Press the drive reset button.

CT Parameter Check Check the following parameters now. Please refer to “CT Drive Parameters” on page 41. Set if needed.

- Motor rated frequency, Hz (0.47)
- Motor rated current, A (0.46)
- Motor rated speed, RPM (0.45)
- Motor rated voltage, V (0.44)
- Maximum frequency, Hz (0.02)
- Acceleration rate, s/100Hz (0.03)
- Deceleration rate, s/100Hz (0.04)
- Ramp Mode Select = FAST (0.15)

At this point, shut down the controller before making field connections.

KEB F5 The KEB F5 drive uses an LED display and a membrane keypad. Parameters are displayed and changed as shown below.



Changes are accepted and saved only after ENTER is pressed.
Some parameters (i.e., motor data) cannot be changed while the escalator is operating.

User Mode Parameters – Overview

The 00.F5.060-2034 is a custom operator which stores several drive set up programs. The following operator-specific parameters have been created to facilitate downloading the set up program to the drive:

OS Parameters

OS. 1	**Password**

dn Parameters

dn. 0	**Program Selection and Download**
dn. 1	**Password After Download**

CP. 0 "Password" - Switching Between CP Mode and Program Mode

A) Press FUNC key to display	CP.01	***(or other CP parameter)***
B) Press DOWN key until	CP. 0	
C) Press FUNC key to display	CP_ro	***or***
	CP_on	
D) Press UP/DOWN keys until	660.	
E) Press ENTER key to display	Pr90P	

OS. 1 "Password" - Switching Between Program Mode to CP Mode

A) Press FUNC key to display	dn 1	***(or other user parameter)***
B) Press ENTER key to move flashing decimal next to letters	dn. 1	
C) Press DOWN key until	OS. 1	
D) Press FUNC key to display	Pr90P	***or***
	FULOP	
E) Press UP/DOWN keys until	100.	
F) Press ENTER key to display	CP_ro	

* = flashing decimal point.

dn. 0 "Program Download"

This parameter chooses which program file is sent to the drive. Pressing enter starts the download. After the download is complete, the password selected in dn.01 is entered and the operator reboots.

A) Press FUNC key to display 05.1 *(or other user parameter)*

B) Press ENTER key to move flashing decimal next to letters 05.1

C) Press UP key until dn.0 ✸= flashing decimal point.

D) Press FUNC key to display current setting.

E) Use UP/DOWN keys to choose program:

50 H2	=	*50 Hz program 230/400V current rating/overload*
60 H2	=	*60 Hz program 230/480V current rating/overload*
FSdEF	=	*clear inverter memory (KEB factory values)*
n3000	=	*Escalator program*

F) Press ENTER to start download process

dn. 1 "Password After Download"

This parameter defines what password level is set after the programming is complete.

A) Press FUNC key to display 05.1 *(or other user parameter)*

B) Press ENTER key to move flashing decimal next to letters 05.1

C) Press UP key until dn.0 ✸= flashing decimal point.

D) Press ENTER key to move flashing decimal next to number dn.0

E) Press UP key until dn.1

F) Press FUNC key to display current setting.

G) Use UP/DOWN keys to choose password after download:

CP_ro	=	*CP read only (DEFAULT)*
CP_on	=	*CP read write*
CP_SE	=	*CP Service (only use if advised by KEB personnel)*
APPL	=	*Application mode*
drIvE	=	*Drive mode*
Pr90P	=	*Programmable Operator / User Mode*
FULOP	=	*Full Operator / User Mode with Debug*

At this point, shut down the controller before making field connections.

Field Connections

This section contains:

- Motor connections
- Brake connections
- Safety and I/O connections

Checking the Motor

If this job reuses existing rotating equipment, the equipment must be checked for insulation breakdown before proceeding.

1. Disconnect all motor and brake wiring.
2. Perform an insulation test between these wires and the frame of the related equipment using a Megohm meter to subject the insulation to the same high voltages that would be present during escalator operation.
3. A minimum insulation resistance of 100k Ohms is required.
4. Correct any insulation problems before proceeding with installation. Insulation problems may indicate a serious problem in the equipment.

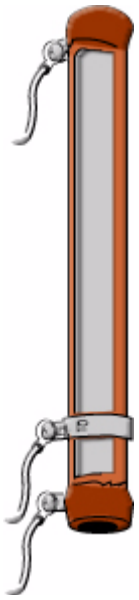
Wiring the Motor to the Controller

Incoming power to the controller and outgoing power wires to the motor must be in their respective grounded conduit.

It is very important that AC motor wires be kept separate from control wires both inside and outside the controller cabinet. Use a shielded power cable between the motor drive and the AC Motor stator connections to reduce RFI/EMI noise (Siemens Protoflex - EMV or equivalent). The shield must be terminated to earth ground at both ends. Keep the AC power wiring separate from the control wires.

1. Refer to the job print showing the AC drive and connections to rotating equipment.
2. Make connections as shown in the job prints. Be certain to follow any schematic notes regarding wire sizes and any specific motor wiring connections.

Brake Resistance; DC Brake Only



Large resistors with slip-ring adjusters are used to adjust brake drop time. Resistor RB1 adjusts primary brake output. Resistor RB2 adjusts the auxiliary brake output. Check sheet -1 of your job prints for detailed information.)

1. Check the resistance across RB1 and RB2. As an initial working value, RB resistance should be about three times (3 X) the resistance measured across the brake coil.
2. Adjust RB1 and RB2 as required.

Wiring the Brake

1. Refer to the job prints. Connect brake wires to controller terminals B1 and B2.
2. Connect aux brake wires to controller terminals EB1 and EB2 (if available).
3. Brake wires must not be routed in the same conduit with AC motor wires or velocity encoder wires.

Safety String

Safety string devices are wired in series between a 24VDC source and the #4 bus in the controller. The #4 bus is connected to the safety inputs of the main and secondary processor boards (P6 on the EC-MCB and P26 on the EC-SCB).

1. Refer to the drawings package for the job.
2. Connect the safety string as shown.

Figure 1. Typical Controller Terminal Block

Auxiliary Brake Information

If your job uses an auxiliary brake (usually mounted with the step drive equipment and not provided by MCE), it will stay picked until one of four conditions occur:

- Loss of power
- Step overspeed faults occur (E-02, E-03, E-40, E-41)
- Step reversal faults occur (E-01, E-39)
- Drive chain broken detection device input activated (error E-19, input P19)

Proximity Sensors / Rail and Step Speed

The proximity sensors used to check rail speed and step speed/presence are listed below. Connect sensors as shown in the job prints. Each sensor has three or four wires (system dependent):

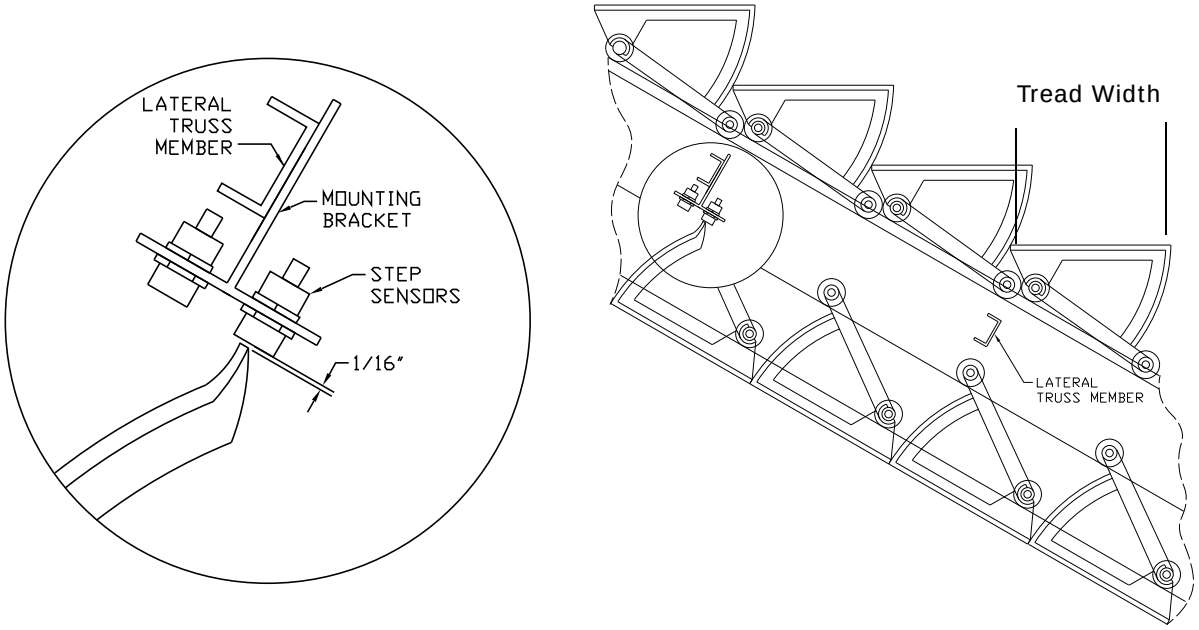
- Brown: 24 VDC
- Blue: Common
- Black: Data
- White (if present): Not Used

Table 1. Step and Rail Proximity Sensors

Location	Output Type	Operation Range	Recommended Output Level	Sensor/Target Clearance
Hand Rail	Open Collector, PNP	10 - 40 VDC	18 VDC	4mm (0.15 inches)
Step	Open Collector, PNP	10 - 40 VDC	18 VDC	15mm (0.5 inches)

Step Sensors Each processor board (MCB, SCB) has inputs for two step sensors (S1, S2). MCB sensors are located at the top of the escalator. SCB sensors are located at the bottom of the escalator. Refer to Tables 2 and 6 for input terminal connections.

Figure 2. Step Sensor Mounting

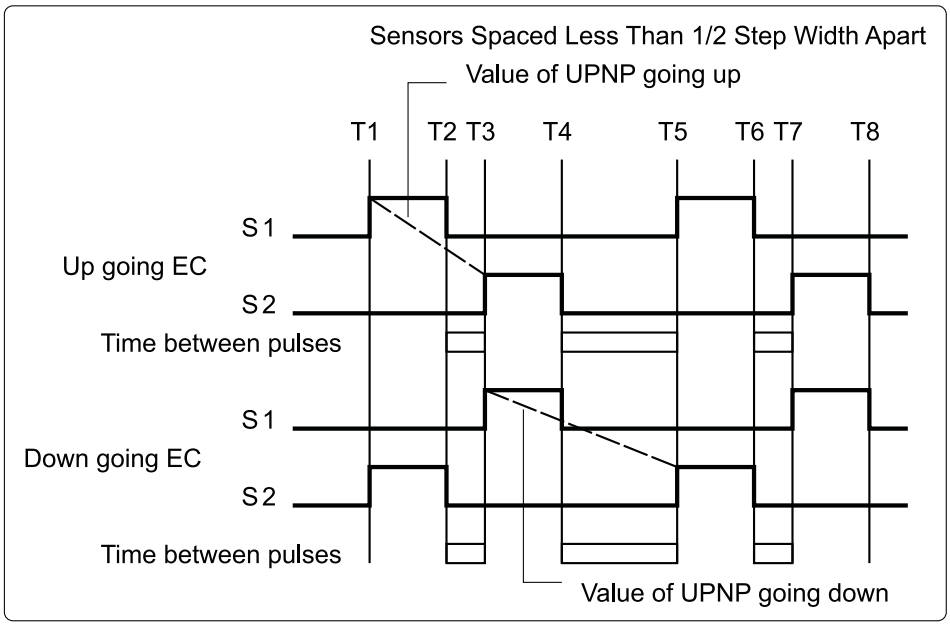


1. Measure the escalator step tread width (see Figure 2). Step sensors must be spaced less than a half step width apart.

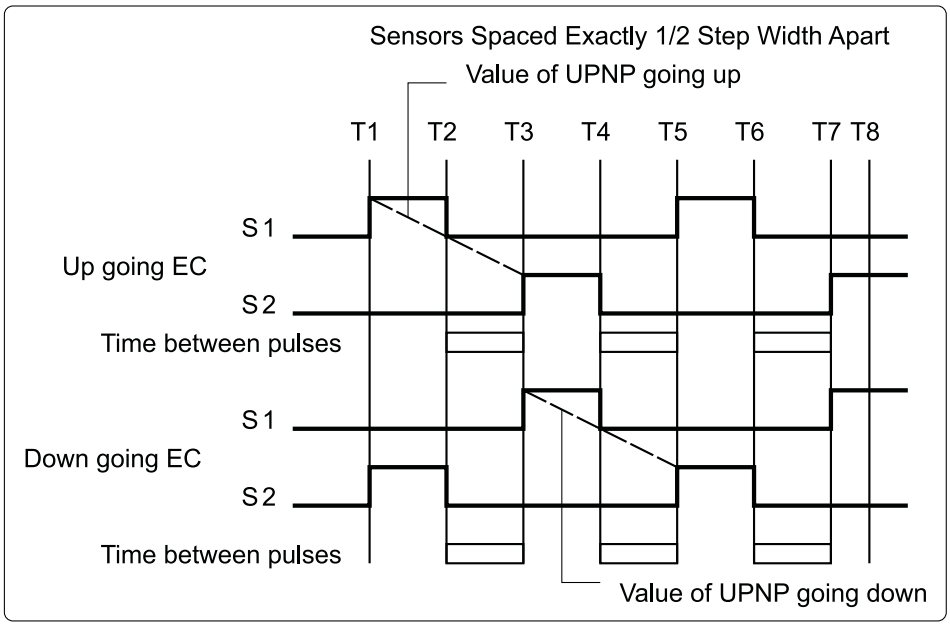
Note

DO NOT place sensors EXACTLY 1/2 tread width apart because this will prevent the controller from being able to sense motion reversal or slippage. Please refer to “Sensor Spacing Timing Diagram” on page 17.

Figure 3. Sensor Spacing Timing Diagram



When sensors S1 and S2 are spaced less than 1/2 step width apart, the time from leading edge of S1 to leading edge of S2 is shorter going up and longer going down (dotted lines). Time between sensors is shorter than time between steps (blocks).



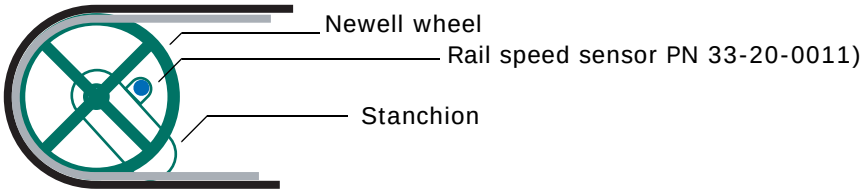
When sensors S1 and S2 are spaced exactly 1/2 tread width apart, the time from leading edge of S1 to leading edge of S2 (dotted lines) is the same going either up or down. In this case, the controller will not be able to sense motion reversal. Time between sensors (blocks) is the same as time between steps.

2. Remove one step.
3. Move the opening to the top of the incline. Position the opening near a lateral truss member at the top of the incline, just downhill from the curved transition tracks.
4. Assemble the step sensors (PN 33-20-0010) with jam nuts and lock washers to mounting brackets as shown in Figure 2. Hand-tighten the nuts so that the sensors are centered (equal amount of adjustment thread above and below the bracket flange).
5. Position the sensor bracket against the lateral truss member so that the sensors are approximately 1/8” from the riser of a return side step (see Figure 2). It may be necessary to jog the escalator so that the return side riser is positioned correctly near the lateral truss member. Mark the lateral cross member at locations where two mounting holes will be drilled.

6. Drill mounting holes in the lateral truss member.
7. Install the upper step sensors. Set the running clearance to 1/16” (1.59 mm) max. Tighten the hardware.
8. Connect cables (PN 33-20-0012) to the sensors. Extend the cables from the sensors to the top escalator pit. Secure the cables with wire ties, being careful to route the cables away from moving steps, handrails, chains, etc. Route cables away from high voltage power and motor leads. Label the ends of the wires “TOP STEP SENSORS”.
9. Slowly jog the escalator to confirm that the steps clear the sensors without interference.
10. Move the opening to the bottom of the incline. Step opening should be positioned near a lateral truss member at the bottom of the incline, just uphill from the curved transition tracks.
11. Repeat steps 5 through 7 for the bottom sensors.
12. Connect cables (PN 33-20-0012) to the bottom sensors. Extend the cables from the sensors to the bottom escalator pit. Secure the cables with wire ties, being careful to route the cables away from moving steps, handrails, chains, etc. Label the ends of the wires “BOTTOM STEP SENSORS”.
13. Slowly jog the escalator to conform that the steps clear the sensors without interference.

Rail Speed Sensors Each processor board (MCB, SCB) has inputs for two (left and right) handrail speed sensors. Sensors are mounted on the upper stanchions so that they detect the passage of the newell wheel spokes. One set of sensors (left and right) are connected in parallel to both processor boards. Refer to the job prints. Refer to Tables 2 and 6 for input terminal connections.

Figure 4. Rail Speed Sensor Locations



Note

Adjust rail sensors so that the face of the sensor is 1/8” (3mm) from the spoke.

Caution

All sensors, settings, and learn operations related to step and rail speed must be carefully completed. Speed related settings and sensors are critical to safe operation of the escalator. Accurate installation and operating safety are the responsibility of installation and maintenance personnel.

Table 2. EC-MCB Input Connector Descriptions: J1, J2, J3, J4, J5, J6, J11

Terminal	No.	Function	Remark
J1	S1	Spare speed sensor input	Not used
	S2	Step Sensor #1	S2 and S3 monitor direction, step speed, and missing steps for Sensors #1 and #2 respectively.
	S3	Step Sensor #2	
	S4	Left handrail speed monitoring	Pulse input. Frequency between 0.5-25HZ
	S5	Right handrail speed monitoring	
J2	P1	Normal/inspection mode select	High = Normal. Low = Inspection.
	P2	Normal operation run	High = Normal operation, Run selected
	P3	Run up	High = Run up
	P4	Run down	High = Run down
	P5	Contactor proving input	Open/Low = run disabled Closed/High = run enabled
	P6	Safety circuit	Low = Open safety, run disabled High = Safety OK, run enabled, LED ON
	P7	Manual lubrication	Oil pump operation button, High = on
	P8	Brake contact input	N/O, N/C can be selected through the menu
	P9	Programmable: See Note 1.	Active high inputs. Any active input will open the safety string, stopping the escalator. Under fault conditions, there will be +24V at these terminals. Note 1: Some LCD software versions allow programmable error messages when this input is activated: Reverse Phase, Speed Governor, Reverse Phase or Motor Efficiency Controller fault, Motor Efficiency Controller Fault. Parameter F4-16 is used to define the error message.
	P10	Motor overheat sensor	
J3	P11	Upper left skirt obstruction	
	P12	Upper right skirt obstruction	
	P13	Upper left comb-step impact detection	
	P14	Upper right comb-step impact detection	
	P15	Upper left handrail entry detection	
	P16	Upper right handrail entry detection	
	P17	Upper step level detection	
	P18	Upper step upthrust detection	
J4	P19	Broken drive chain detection	Activation of this input will also cause the aux. brake to drop.
	P20	Upper stop switch	Controlled stop.
	P21	Smoke detector	High = smoke detector active. Stop delay time adjustable through controller parameter F2-10.
	P22	Auxiliary brake contact	High = brake lifted, run enabled.
	P23	Upper entry detector	Active with VVVF drive when energy saving mode is selected.
	P24	Programmable: See Note 2.	Emergency stop when activated. Note 2: Some LCD software versions allow programmable error messages when this input is activated: Seismic Fault, Tandem Fault, Broken Belt, Brake Wear, Broken Step Chain, Brake Overheat, Speed Governor. Parameter F4-17 is used to define the error message.
	CM7	COM	Common for S1-P23.
J11	24V+	DC24V power supply	Note polarity. Wire correctly.
	24V-		

Table 3. EC-MCB Output Connector Descriptions: J7, J8, J9, J10

Terminal	No.	Wye / Delta drive mode	ATL and VVVF drive mode
J7	T1	Wye contactor	Power contactor
	T2	Delta contactor	Running contactor
	T3	Brake contactor	Brake contactor
	CM1	T1 - T3 common	T1 - T3 common
	T4	Auxiliary brake contactor	Auxiliary brake contactor
	CM2	T4 common	T4 common
J6	T5	Lubrication contactor	Lubrication contactor
	CM3	T5 common	T5 common
	T6	Alarm bell	Alarm bell
	CM4	T6 common	T6 common
J8	T7	Up contactor	Up contactor/Run up
	T8	Down contactor	Down contactor/Run down
	T9		High speed
	T10		Low speed
	CM5	T7-T10 common	T7-T10 common
J9	T11	Normal running signal output	Normal running signal output.
	T12	Fault contact, LED ON = No fault	Fault contact, LED ON = No fault
	CM6	T11-T12 common	T11-T12 common

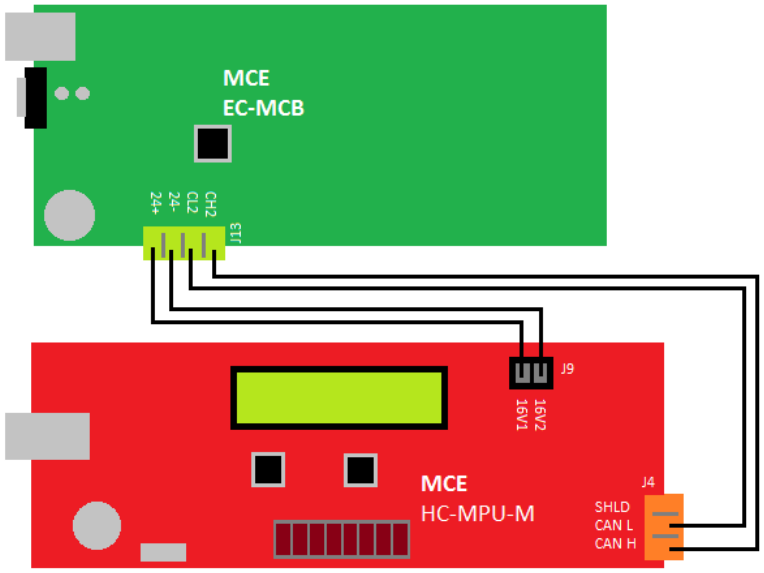
Table 4. EC-MCB J12 Connector Description

Terminal	No.	Component	Remark
J12	TB	RS485 interface for remote monitoring	
	TA		
	CL1	Connect with CL1 terminal on EC-SCB	Communication between EC-MCB and EC-SCB; upper entry display board (if equipped); upper LCD panel (if equipped)
	CH1	Connect with CH1 terminal on EC-SCB	

Table 5. EC-MCB J13 Connector Description

Connect from EC-MCB			Connect to MC-MPU		
Terminal	No.	Component	Terminal	No.	Remark
EC-MCB J13	CH 2	CAN BUS H	HC-MPU J4	CAN H	Remote monitoring
	CL 2	CAN BUS L	HC-MPU J4	CAN L	
	24V-	-24VDC	HC-MPU J9	16V2	
	24V+	+24VDC	HC-MPU J9	16V1	

Figure 5. EC-MCB Wiring Diagram



Configuration

After connecting power, “INITIALIZING BOARD COMM” will appear on the USN-BASE assembly LCD display.

Device Type

Note

It is important that all communication wires are disconnected from the USN board before changing the **device type**. Make sure all ethernet, CAN, and serial cables are disconnected.

When making changes to settings:

- Press N to cycle through menu
- Press S to select
- Use S to move cursor
- Use +/- to change selection
- Press N to go to save menu
- Press S to save

To begin configuration:

1. Set only the F7 switch UP.
2. Press N until Device Type is displayed.
3. Press S to select.
4. Verify/set the Device Type to Motion 3000ES Escalator Controller.
5. If the Device Type was changed, reset the USN board by pressing the RSTA button.
6. After the device reboots, confirm new device type is selected.

An escalator connection has additional parameters that need to be configured. Please note: *each escalator must have its own unique lift number*.

For an escalator to work with USN, it must be an LCD (not LED) model. Verify that the escalator versions are the following, or higher:

- MCB = LCD32
- SCB = SCB20
- LCD = LCD2

1. Place switch F7 in the up position. Using the keypad as described earlier, set and save:
   - Job Name: Defines the job name displayed on the iMonitor Summary screen.
   - Job Number: Defines the job number displayed on iMonitor Summary screen.
   - Number of Escalators: Defines the number of escalators the USN will be monitoring on the CAN bus.
     - If only one escalator is to be connected to the USN, choose the 1 (AUTO) setting. This setting assumes that only one escalator will be connected to the USN board and it will automatically detect the lift number on the bus.
     - If more than one escalator is on the bus the USN will connect to the first one it sees. Since detection is automatic the Escalator Connection menu is not shown.
   - Escalator Connection: The USN has the ability to group up to 4 escalators in a group. This parameter maps the lift number that will be the first escalator in the group, second escalator, and so on. This parameter must match escalator FUN 4:15
   - Escalator Label: This two-character value will be displayed in iMonitor under the escalator grouping. For example, you could set lift 2 to display as “E2”.
2. Proceed to IP Setup.

IP Setup

You may need to consult an IT person to find out the appropriate IP settings for your network. With the F7 switch in the up position, set:

- IP Address
- Subnet Mask
- Gateway Address
- Other options (MCE use only)

Important

- **After defining network settings, you must reset the USN board by disconnecting and reconnecting the IDC power connector.**

The processor boards, EC-MCB and EC-SCB can each use up to four (optional) display boards. The last display board in each chain must have an impedance matching resistor to properly terminate the CAN bus. Jumper J1 on the display board (EC-DISP) is used to enable or disable the impedance matching resistor. The PI boards also have a jumper that determines their position (top or bottom of escalator).

Figure 6. Display Board CAN Termination

This jumper, J1, must be in place on the final display board if multiple display boards are connected to one of the processor boards (EC-MCB or EC-SCB). Remove the jumper on intervening boards.

If only one display board is connected, the jumper must be in place.

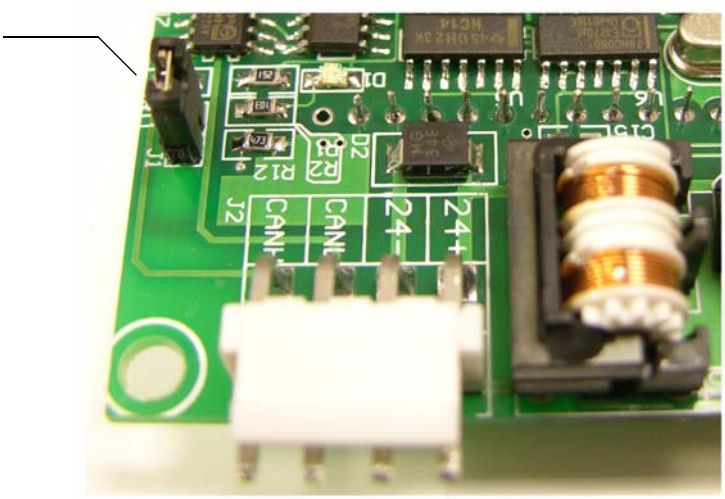


Figure 7. Display Board Position Jumper

The position of the jumper on J3 determines whether the PI board is set for use at the TOP or at the BOTTOM of the escalator.

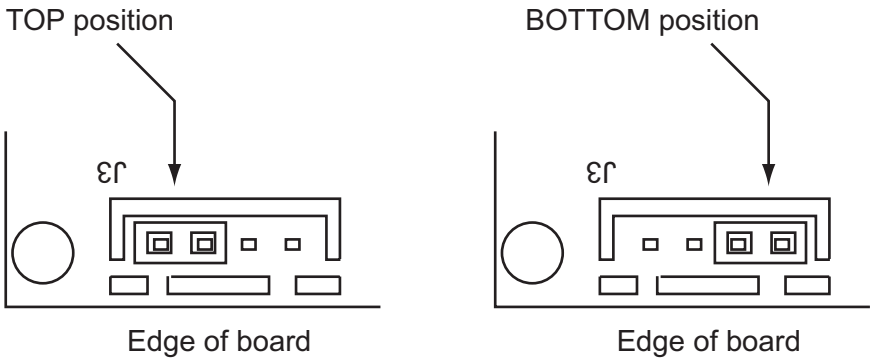


Table 6. EC-SCB Input Connector Descriptions: J1, J2, J3, J4

Terminal	No.	Function	Remark
J1	S6	Step Sensor #1	S6 and S7 monitor direction, step speed, and missing steps for Sensors #1 and #2 respectively.
	S7	Step Sensor #2	
	S8	Left handrail speed monitoring	Impulse input. Frequency between 0.5-25HZ
	S9	Right handrail speed monitoring	
J2	P26	Safety circuit	Low = Open safety, run disabled High = Safety OK, run enabled
	P27	Lower left skirt obstruction detection	Active high inputs. Any active input will open the safety string, stopping the escalator. Under fault conditions, there will be +24V at these terminals.
	P28	Lower right skirt obstruction detection	
	P29	Lower left comb-step impact detection	
	P30	Lower right comb-step impact detection	
	P31	Lower left handrail entry detection	
	P32	Lower right handrail entry detection	
	P33	Lower step level detection	
J3	P34	Lower step upthrust detection	
	P35	Lower stop switch	
	P36	Spare input	Some LCD software versions allow an error message to be programmed for display when P36 is activated: Broken step chain, Tandem fault, Broken belt, Brake wear, Pit flooded, Brake overheat. Program using parameter F4-18.
	P37	Spare input	Some LCD software versions allow an error message to be programmed for display when P37 is activated: Pit flooded, Tandem fault, Broken belt, Brake wear, Broken step chain, Brake overheat. Program using parameter F4-19.
	P38	Lower entry detector	Active with VVVF drive when energy saving mode is selected.
	CM10	COM	Common for S6 through P38

Table 7. EC-SCB Output Connector J9

Terminal	No.	Wye/Delta drive mode	ATL and VVVF drive mode
J9	T13	Active when Up or Down contactors are active	Active when UP or DOWN contactors are active or when inverter output is active.
	COM	common	common
	T14	Spare output	Not used
	COM	common	common
	T15	Spare output	Not used
	COM	common	common

Table 8. EC-SCB Connector J6

Terminal	No.	Component	Remark
J6	CL1	Connect with the CANL terminal on the EC-MCB	Communication between EC-MCB and EC-SCB; lower entry display board (if equipped); lower LCD panel (if equipped).
	CH1	Connect with the CANH terminal on the EC-MCB	
	24V+	DC24V power supply	Note polarity. Connect correctly.
	24V-		

Table 9. EC-SCB Connector J7

Terminal	No.	Component	Remark
J7	CH2	CAN BUS +	Remote monitoring
	CL2	CAN BUS -	
	24V-	-24VDC (not used)	
	24V+	+24VDC (not used)	

Please refer to “EC-MCB Wiring Diagram” on page 21 for information about properly terminating the CAN bus connection to display boards.

Initial System Startup

This section describes initial startup and adjustment.

- Prestart check
- Initial startup

Prestart Check

Before system startup:

- Check and correct any hazardous conditions
- Check/adjust installed components for:
  - Smooth operation
  - Proper adjustment to required tolerances
- Lubricate as required:
  - Bearings
  - Tracks
  - Chains
  - Guides
  - Other hardware
- Ensure that:
  - Step bands, skirts, and comb segments are in order
  - No debris or equipment is in or on escalator
  - All steps are fitted
  - Safety devices and protective switches are properly installed

Construction Mode

Construction mode operation allows the escalator to be run on inspection only with a bare minimum of field wiring installed. For construction mode operation, only the following are needed to run the escalator:

- Motor, brake, and drive (if used)
- Safety String (may be jumpered out initially if necessary)

1. To enter construction mode, set escalator parameter F5-07 to 1 (one). This setting causes all faults to reset automatically while you are making initial adjustments.
   - In construction mode, the escalator parameter display will show “-CH-” and the entry displays will show “X”.
2. After completing adjustment, you must set F5-07 back to 0 (zero) before the escalator will enter automatic operation.
   - When F5-07 is set back to 0 (zero), the parameter display will show “STOP” and the entry displays will show “SP”.

Caution

If safety devices are bypassed, take extreme caution to avoid personnel injury or equipment damage. As safety equipment is installed, it must be wired into the safety string.

Initial Startup

The initial startup procedure requires:

- Power up
- Drive (if used) parameter check/set
- Inspection operation

Power Up

1. Press the controller Stop button so power is removed from the machine.
2. Set the Norm/Insp switch to the Inspection position.
3. Close the main disconnect.
4. Check that controller is powered and drive, if equipped, is on and displaying “inh” (CT) or “noP” (KEB). (Please refer to “CT Drive Fault Displays” on page 54 or page 61 for KEB if the drive trips and displays an error code.)
5. If you have not already done so, check and set if needed, CT drive:
   - Motor rated frequency, Hz (0.47)
   - Motor rated current, A (0.46)
   - Motor rated speed, RPM (0.45)
   - Motor rated voltage, V (0.44)
   - Maximum frequency, Hz (0.02)
   - Acceleration rate, s/100Hz (0.03)
   - Deceleration rate, 2/100Hz (0.04)
   - Ramp Mode Select = FAST (0.15)

For KEB drives, See “KEB Drive Parameters (VVVF Drive Only)” on page 43 .

6. After checking CT or KEB settings, if equipped, release stop button.
7. Check EC-MCB board indicators to see that:
   - P8 is lighted (brake contact) if available
   - P5 is lighted (motor/brake contactor proving)
   - P6 is lighted (safety string complete)
   - P22 is lighted (aux brake contact) if available
8. Check that the escalator control display is showing “X.” Please refer to “Controller Fault Displays” on page 50 if an error code is displayed.
9. Check that all personnel are clear of moving equipment.

Inspection Operation

You are now ready to run the escalator on Inspection to determine that basic operating parameters are adequate, acquire self-learned speed limitation parameters, and check that safety string devices are functioning properly.

1. If you are using a remote inspection device, check that it is the only unit plugged in and that the escalator control is set to Norm. If you are running from the buttons on top of the main cabinet, check that the escalator control is set to Insp.
2. Press and hold the Safety button.
3. Press and hold the run up or run down button.

Remote Inspection Control Connection Special sockets for connecting remote inspection controls are provided. The sockets are covered and, as soon as a socket cover is opened, the escalator is placed in Inspection mode and stopped. Depending on job requirements, these sockets may be mounted on the control enclosure and/or remotely in locations specified by the customer.

For any inspection socket to be active, the escalator control must be in Normal mode. If two or more inspection control devices are inadvertently connected at any one time, all inspection sockets are immediately disabled.

Figure 8. Remote Inspection Socket and Control

In order for the remote socket to be active, the controller Inspection/Normal switch must be set to NORM.

Brake Pick and Drop Check that the brakes are picking to running clearance. If available, check brake labeling or documentation for recommended pick voltage and verify that the controller is supplying the correct voltage. During initial setup, we recommend setting brake resistance (RB1 and RB2) to three times the resistance across the brake coils for primary and auxiliary brakes. If necessary, adjust brake resistance to achieve the desired drop time.

For PM disk brake control, please refer to the job drawings for brake adjustment instructions and to the mBrake section in this manual for a detailed description.

Escalator Braking Distance Feature This feature (not available in all versions of software) measures the stopping distance of the escalator by monitoring the output of the handrail proximity sensors at S4 and S5 of the MCB. Immediately upon receiving a stop signal, the MCB counts the number of pulses received at S4 and S5 and determines whether or not the escalator has stopped within a user-defined tolerance.

- If the number of pulses matches the learned value within the programmable stopping distance error, then no error is generated.
- If the number of pulses exceeds the learned value by more than the programmable stopping distance error, then E57 “Stop is too long” is generated.
- If the number of pulses is less than the learned value by more than the programmable stopping distance error, then E58 “Stop is too short” is generated.

Associated Parameters

- F3-19 Self-learned Stopping Distance: (0-9999; 0 means feature is disabled)
- F3-20 Stopping Distance Error: (0-99%; default = 50)

1. Be sure that the brake is adjusted correctly so that the escalator is stopping within the desired distance.
2. Enter 1 for parameter F3-19. This enables the feature and allows the MCB to establish a baseline stopping distance the next time a learn function is performed.
3. Perform a learn function. Please refer to “Escalator Learn Operation” on page 30. In order for the stopping distance to be learned, the escalator must be stopped during the learn function. After completing the learn function by stopping the escalator, note that the value of F3-19 has been updated to reflect the baseline stopping distance for the escalator.

To reliably calculate the braking distance, the learned value of F3-19 must be at least 6. If the learned value is less than 6, the handrail wheels will need to be modified such that pulses are generated at a higher frequency. This can be achieved by either making the diameter of the wheels smaller or by adding more surfaces to the wheels that trigger the sensor. If more surfaces that trigger the sensors are added, all of the surfaces must be equidistant from each other.

Adjust F3-20 to define the stopping distance error. For example, assume F3-19 is determined to be 10 after performing the learn function. If F3-20 is set to 30, this means that the allowable stopping distance is between 7 and 13 counts (10 +/- 30%). If the escalator stops outside of this range, an error message will be generated.

Escalator Learn Operation Before performing the learn operation, you should be comfortable with the operation of the escalator. You must use a hand held tachometer to check the escalator step and handrail speeds and verify that all adjustments are correctly made.

The controller requires a self-learn operation to acquire speed limitation values for parameters F3-01 through F3-08 and pulse phase difference parameters F4-08 and F4-09.

1. To run a self learn on the EC-MCB processor, set FUN4, F4-10 to 1. For the EC-SCB processor, set FUN4, F4-11 to 1. These can be set to 1 for the same run so that both processors learn simultaneously. (After changing parameters, press ESC to return to STOP.)
2. With the escalator on normal operation, provide a **run up** signal.

The display will flash “Fusy” twice very briefly. After Fusy flashes twice, the learn operation is complete and the escalator should be stopped using the STOP switch. When the self learn is complete, F4-10 (or-11) will reset to zero (0). If an error is encountered during the learn operation, the escalator will stop but F4-10 (and -11) will remain set to one (1).

3. Check the values of F3-01 through F3-08, F4-08, and F4-09 to see that they have been set.

If you need to repeat the learn process, simply reset parameter F4-10 (and F4-11) to 1.

Safety String Check With the escalator running properly, you can test each safety string contact/switch to see that the escalator stops when the device is opened and that the controller display shows the proper fault code.

Operating Adjustments

Both the controller and the VVVF drive (if used) allow adjustment of many operating characteristics. You will need to adjust each for optimal performance of the escalator installation. This section contains complete controller and drive parameter tables.

Keypad Refresher

- ESC button: Press to exit parameter settings without saving changes.
- DOWN button: Move down in parameter settings list. Move between digits of a selected value.
- UP button: Move up in parameter settings list. Change the value of a selected digit. (Digit will be flashing when its value can be changed.)
- OK: Select/Save.

- At the highest level, parameters are grouped under seven functions, FUN1 through FUN7.
- Within each function, parameters are listed numerically by function and parameter order (i.e., F1-01 is the first parameter of function FUN1, F1-02 is the second, etc.).
- Consult the complete parameter table for an ordered list of all parameters.

Controller Parameters

See “Controller Parameters” on page 32 for specific information. To display and change controller parameters:

1. Press OK to access the function menu.
2. Press the Up or Down button to scroll through the main menus (FUN3-FUN7).
3. Press OK to enter the displayed menu.
4. Use Up or Down to scroll to the desired parameter.
5. Press OK to display the parameter value.
6. Use the Down button to move between digits of a displayed value.
7. Use the Up button to change the value of a selected (flashing) digit.
8. Press OK to save the new value.
9. “Yes” will flash briefly indicating that the new value has been saved.
10. Press ESC at any time to exit the menu without making changes (before pressing OK).

Faults If a fault number is displayed:

1. Please refer to “Controller Fault Displays” on page 50 for a fault description.
2. Correct the fault.
3. Press and hold the Up and Down buttons simultaneously for three seconds to clear the fault display.

Table 10. Controller Parameters

Param	Name	Description	Value	Default	MCE
		FUN1-Logic Input Settings			
F1-01	Contact on Brake	Set the correct polarity of Brake Contact or to disable this feature	0=NC 1=NO 2=Disable	1	
F1-02	Contact on Auxiliary brake	Set the correct polarity of Auxiliary brake contact or to disable or to cancel this feature	0=NC 1=NO 2=Cancel 3=Disable	2	
F1-03	Upper entry detection switch	With VVVF drive & energy-saving control, upper entry detecting switch input setting	0=NC 1=NO	1	
F1-04	Lower entry detection switch	With VVVF drive & energy-saving control, lower entry detecting switch input setting	0=NC 1=NO	1	
		FUN2- Timer Menu			
F2-01	Oil timer interval	Oil ---- time interval setting	0-9999 min	120	
F2-02	Oil Timer duration setting	Oil ---- duration setting	0-9999 sec	6	
F2-03	Speed Pick Delay	In VVVF drive mode, delay from brake picked to motor run mode. Program to 1000 for VVVF application. In ATL mode, this feature is not used. Program to default setting 1000 In Wye/Delta mode, delay from brake picked to Wye contactor Closed. Program to 500 for Wye/Delta application	0-9999 millisec	1000	
F2-04	Up/Dn to Delta delay	Wye/Delta only. Delay from Wye contactor enable to Delta contactor enable	0-9999 millisec	1000	1000
F2-05	Month /Date Setting	System time setting: Month /Date	MM/DD	0000	Month/Date
F2-06	Hour/Minute Setting	System time setting: Hour/Minute (24-hour clock)	HH/MM	0000	Hour/Minute
F2-07	Reduced Speed Timer	Duration setting from high speed to low speed operation	1-9999 sec 0=disabled	60	
F2-08	Auto-Stop Timer	Duration setting from low speed operation to stop/standby. If set to “0”, F4-05 automatic direction switching is disabled.	1-9999 sec 0=disabled	0	
F2-09	Handrail Overspeed Delay	Delay time of the speed fault checking for left and right handrail	0-9 sec	4	4
F2-10	Smoke Detector Delay	Delay time setting for fire alarm fault inspection	0-30 sec	15	15
F2-11	Alarm Timer at start	Alarm bell output time setting before the Escalator start	0-9 sec	1	1

Table 10. Controller Parameters

Param	Name	Description	Value	Default	MCE
F2-12	Stop Delay	PM Contactor and Brake drop delay setting. Program to 900msec for VVVF drive/ ATL and 0 sec for Wye/Delta. If system is equipped with Motor Efficiency Controller, set to 200.	0-5000Msec	500	
F2-13	Y/D Open Transition Timer	Wye-Delta Open Transition Timer	0-5000Msec	0	100
F2-14	Alarm Shutoff Timer	Alarm Bell output Shutoff Timer	0-60 min	0	10
		FUN3- Speed Monitoring			
F3-01	Step speed S2	Terminal S2 on EC-MCB: Speed checking 1 for step wheels/direction	0-9999 units	1	Learned Speed checking 1 for step speeds
F3-02	Step speed S3	Terminal S3 on EC-MCB: Speed checking 2 for step wheels/direction	0-9999 units	1	Learned Speed checking 2 for step speeds
F3-03	Left handrail speed S4	Terminal S4 on EC-MCB: Speed checking for left handrail	0-9999 units	1	Learned speed checking for Left handrail
F3-04	Right handrail speed S5	Terminal S5 on EC-MCB: Speed checking for right handrail	0-9999 units	1	Learned speed checking for Right handrail
F3-05	Step speed S6	Terminal S6 on EC-SCB: Speed checking 1 for step wheels	0-9999 units	1	Learned Speed checking 1 for step speeds
F3-06	Step speed S7	Terminal S7 on EC-SCB: Speed checking 2 for step wheels	0-9999 units	1	Learned Speed checking 2 for step speeds
F3-07	Left handrail speed S8	Terminal S8 on EC-SCB: Speed checking for left handrail	0-9999 units	1	Learned speed checking for Left handrail
F3-08	Right handrail speed S9	Terminal S9 on EC-SCB: Speed checking for right handrail	0-9999 units	1	Learned speed checking for Right handrail
F3-09	Speed error on S2	Set Upper and Lower speed limit for S2 using the percentage of value of F3-01.	0-99%	15	15
F3-10	Speed error on S3	Set Upper and Lower speed limit for S3 using the percentage of value of F3-02.	0-99%	15	15
F3-11	Speed error on S4	Set Upper and Lower speed limit for S4 using the percentage of value of F3-03.	0-99%	15	15
F3-12	Speed error on S5	Set Upper and Lower speed limit for S5 using the percentage of value of F3-04.	0-99%	15	15

Table 10. Controller Parameters

Param	Name	Description	Value	Default	MCE
F3-13	Speed error on S6	Set Upper and Lower speed limit for S6 using the percentage of value of F3-05.	0-99%	15	15
F3-14	Speed error on S7	Set Upper and Lower speed limit for S7 using the percentage of value of F3-06.	0-99%	15	15
F3-15	Speed error on S8	Set Upper and Lower speed limit for S8 using the percentage of value of F3-07.	0-99%	15	15
F3-16	Speed error on S9	Set Upper and Lower speed limit for S9 using the percentage of value of F3-08.	0-99%	15	15
F3-17	Missing step on EC-MCB	Top missing steps detecting by S2, S3 on EC-MCB	0-9999	0	Enter same as learned value of parameter F3-01
F3-18	Missing step on EC-SCB	Bottom missing steps detecting by S6, S7 on EC-SCB	0-9999	0	Enter same as learned value of parameter F3-05
F3-19	Self-learned stopping distance	Learned stopping distance. Not available on all software versions.	0-9999	0	Set automatically
F3-20	Stopping distance error	Sets upper and lower stopping distance limit using the percentage of value of F3-19. Not available on all software versions.	0-99%	0	
F3-21	Missing step at low speed	VVVF systems only. Scales learned step speed so that missing step can be detected at low speed during energy saving mode. Not available on all software versions.	0-99%	0	
		FUN4- Advanced Configuration			
F4-01	Motor control	Selects VVVF/ATL or Wye/Delta drive mode	0=VVVF or ATL 1= Wye/Del	0	
F4-02	Arrow display mode	Display mode of the EC-DISP Board	0=big arrow 1=small arrow	0	0
F4-03	EC-SCB enable	Determines if the EC-SCB board is used for control redundancy (read) or not.	0=No 1=Yes	1	1
F4-04	Oil device type	Type of the oil device	0=motor 1=electromagnetic Valve	1	1
F4-05	Energy saving mode	Determines escalator automatic speed mode selection (VVVF drive only).	0= Normal (Single speed) 1= Energy Saving (2 spd, starting direction only) 2= Intelligent (2 spd, 2 directions based on entry detect)	0	
F4-06	Rev insp enable on EC-MCB	Applied reversal inspection on EC-MCB or not	0=No 1= Yes	0	1

Table 10. Controller Parameters

Param	Name	Description	Value	Default	MCE
F4-07	Rev detect enable on EC-SCB	Applied reversal detection on EC-SCB or not	0=No 1= Yes	0	1
F4-08	Pulse phase difference on EC-MCB	Pulse phase difference on EC-MCB. Automatically set when a self-learn operation is run for this processor. See F4-10.	0 – 99	0	Set automatically
F4-09	Pulse phase difference on EC-SCB	Pulse phase difference on EC-SCB Automatically set when a self-learn operation is run for this processor. See F4-11.	0 - 99	0	Set automatically
F4-10	Self-learn on EC-MCB	Used to enable a self-learn operation for the EC-MCB board.	0=disabled 1=enabled	1	0
F4-11	Self-learn on EC-SCB	Used to enable a self-learn operation for the EC-SCB board.	0=disabled 1=enabled	1	0
F4-12	P2(Run) enable on EC-MCB	P2 (“RUN”) on EC-MCB is used or not	0=No 1=Yes	1	
F4-13	Fault latch setting P9-P27	Faults Latch or Unlatch A=P9, P10, P11 B=P12, P13, P14, C=P15, P16, P17 D=P18, P24, P27	0=Latch 1-7 = Unlatch	0000 D C B A	5017 (See note following table)
F4-14	Fault latch setting P28-P37	Faults Latch or Unlatch A=P28, P29, P30 B=P31, P32, P33, C=P34, P36, P37 D= N/A, N/A, N/A	0=Latch 1-7 = Unlatch	0000 D C B A	0101 (See note following table)
F4-15	Escalator number	Escalator ID for remote monitoring. Not available on all software versions.	0-9999	0	0
F4-16	P9 Enable	Programmable error message: 1. Reverse Phase 2. Speed Governor 3. Reverse Phase or MEC Fault 4. MEC fault Not available on all software versions.	1-4	1	1
F4-17	P24 Enable	Programmable error message: 1. Seismic Fault 2. Tandem Fault 3. Broken Belt 4. Brake Wear 5. Broken Step Chain 6. Brake Overheat 7. Speed Governor Not available on all software versions.	1-6	1	1
F4-18	P36 Enable	Programmable error message: 1. Broken Step Chain 2. Tandem Fault 3. Broken Belt 4. Brake Wear 5. Pit Flooded 6. Brake Overheat Not available on all software versions.	1-6	1	1

Table 10. Controller Parameters

Param	Name	Description	Value	Default	MCE
F4-19	P37 Enable	Programmable error message: 1. Pit Flooded 2. Tandem Fault 3. Broken Belt 4. Brake Wear 5. Broken Step Chain 6. Brake Overheat Not available on all software versions.	1-6	1	1
		FUN5-Counters & Fault History			
F5-01	Password setting	Set passcode: default is 00000000.			
F5-02	Usage time limit	Limitation of the use time	0-9999hr	0	
F5-03	Usage time balance	The rest of the use time	0-9999hr	0	
F5-04	Clear fault log	Clears the F6-01 fault history.			
F5-05	Parameter Default	Resets all controller parameters to their default values.			
F5-06	Start counter	Operational Counter	0-9999		
F5-07	Construction Mode	Construction Mode	0=OFF 1=ON	0	
		FUN6-Fault Display			
F6-01	Fault display	Fault display			
		FUN7- Software Ver. for EC-MCB			
F7-01	Software version.	Software version.			
		FUN8- Software Ver. for EC-SCB			
F8-01	Software version	Software version			

Parameters in the preceding table that reference this note are set by entering a number (1 - 7) in the displayed digit that corresponds to the group of switches you want to set. For example, entries shown in the tables below would result in the settings shown in the shaded area below the entry.

Table 11. F4-13 Default Setting

Entry: 5			Entry: 0			Entry: 1			Entry: 7		
Switch Group D			Switch Group C			Switch Group B			Switch Group A		
P27	P24	P18	P17	P16	P15	P14	P13	P12	P11	P10	P9
0	0	0	0	0	0	0	0	0	0	0	0
0	0	1	0	0	1	0	0	1	0	0	1
0	1	0	0	1	0	0	1	0	0	1	0
0	1	1	0	1	1	0	1	1	0	1	1
1	0	0	1	0	0	1	0	0	1	0	0
1	0	1	1	0	1	1	0	1	1	0	1
1	1	0	1	1	0	1	1	0	1	1	0
1	1	1	1	1	1	1	1	1	1	1	1

- When set to 0, input latches
- When set to 1, input does not latch
- In this example, P24, 17, 16, 15, 14, and 13 are 0 (latching inputs) while P27, 18, 12, 11, 10, and 9 are 1 (non-latching inputs)

Table 12. F4-14 Default Setting

Entry: 0			Entry: 1			Entry: 0			Entry: 1		
Switch Group D			Switch Group C			Switch Group B			Switch Group A		
N/A	N/A	N/A	P37	P36	P34	P33	P32	P31	P30	P29	P28
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	1	0	0	1	0	0	1
0	0	0	0	1	0	0	1	0	0	1	0
0	0	0	0	1	1	0	1	1	0	1	1
0	0	0	1	0	0	1	0	0	1	0	0
0	0	0	1	0	1	1	0	1	1	0	1
0	0	0	1	1	0	1	1	0	1	1	0
0	0	0	1	1	1	1	1	1	1	1	1

- In this example, P37, 36, 33, 32, 31, 30, and 29 are 0 (latching inputs) while P34 and P28 are 1 (non-latching inputs).

Displaying Parameters in Real Time

When the escalator is running, you can cycle through parameters to check their settings by pressing the UP or DOWN buttons on the display/keypad. The system must be running in Normal mode for the parameters to be viewed in real time.

- RUNT: Running time.
- USP1: Speed from S2 on EC-MCB.
- USP2: Speed from S3 on EC-MCB.
- USP3: Speed from S4 on EC-MCB.
- USP4: Speed from S5 on EC-MCB.
- DSP1: Speed from S6 on EC-SCB.
- DSP2: Speed from S7 on EC-SCB.
- DSP3: Speed from S8 on EC-SCB.
- DSP4: Speed from S9 on EC-SCB.
- RSTU: Operating status.
- CLOC: Current time.
- UPNP: Pulse phase differences on EC-MCB.
- DPNP: Pulse phase differences on EC-SCB.
- Cn-H: CAN high.
- Cn-L: CAN low.

CT Drive Parameters (VVVF Drive Only)

Status

In status mode, the drive display shows the operating status of the drive:

- Auto tune: Auto tune in progress.
- inh: Inhibited; enable input is inactive.
- rdY: Ready; enable closed but inverter not active.
- StoP: Stopped; inverter active but holding zero speed/frequency.
- run: Running; inverter active and motor running.
- SCAN: Drive is trying to synchronize in regen mode.
- ACUU: Power mains lost; decelerating to zero in mains loss ride-through or stop modes.
- dEC: Decelerating; speed/frequency ramping to zero after a stop.
- dc: DC injection; DC injection stop active.
- POS: Position; position control active during orientation stop.
- triP: Tripped; drive has tripped.
- act: Active; regen unit is synchronized and inverter is active.

Displaying Drive Parameters

In parameter view mode, the first display row shows the menu parameter number and the second the value of that parameter. To display drive parameters and check their current settings:

1. Use the (M) mode button to select parameter view mode (upper line flashing in drive display).
2. Use left and right arrows on rocker switch to select a menu.
3. Use up and down arrows on the rocker switch to select a parameter.

- Press up and down arrows simultaneously to return to the first parameter in a menu.
- Press left and right arrows simultaneously to return to Menu 0 (zero).
- The drive remembers the last parameter being viewed so when you leave, then return to parameter view mode, that parameter will be displayed.

Editing Drive Parameters

To change drive parameters:

1. Display the parameter.
2. Use the Ⓜ mode button to select parameter edit mode (lower line flashing in drive display).
3. Use up and down arrows on rocker switch to change value.
4. Press the mode button to exit edit mode.

- Optionally, choose a particular digit to edit using the left or right arrows.
- Press and hold up or down arrows to change value continuously.
- Press and hold up and down arrows simultaneously to set a value to 0 (zero).
- Value entry above maximum or below minimum for parameter is not allowed.

Once you have set parameters as desired, you must do the following to save them:

1. Enter 1000 in parameter 0.00. (If the drive is in under voltage trip state or being supplied from a 48V backup source, 1001 must be entered instead.)
2. Press the drive reset button.

Running the Motor from the Keypad

You are able to run the motor manually from the drive keypad:

1. Set parameter Pr 1.14 to 4 to enable Stop and Run buttons.
2. If desired, the Reverse button may be enabled through Pr 6.13.
3. Adjust frequency/speed using Pr 1.17 (see note below).

Note

Pr 1.17 is a read only parameter than can only be adjusted in status mode using the Up or Down buttons. With keypad control active, pressing Up or Down in status mode causes the drive to automatically display the keypad reference and adjust it in the relevant direction. This can be done whether the drive is disabled or running. Reference units for different modes are:
- Open loop: Hz
- Closed loop: RPM
- Servo: RPM

Refer to the drive manual for detailed information.

CT Drive Reset/Parameters Table

If the drive has tripped or a reset is necessary for other reasons (refer to the drive manual), the drive may be reset in one of two ways:

1. Stop button: If the drive has been set up such that the stop button is not operative, then the key has a drive reset function only. Conversely, if the Stop button is operative, initiate a reset by:
   - Drive running: Hold the Run button and then press the Stop button.
   - Drive stopped: Press the Stop button.
2. Reset the drive by setting Drive Reset parameter Pr 10.33 from 0 to 1. (A digital input may be programmed to toggle this parameter.)

Please see the drive manual for additional reset information.

Table 13. CT Drive Parameters

Para	Description	Units	Default	MCE
0.00	Saving parameters Enter pr. 0.00=1000 and press the red Reset button. Restoring default Parameters Enter pr. 0.00=1244 and press the red Reset button.	----	0	0
0.01	Minimum Reference Clamp	Hz	0	0
0.02	Maximum Reference Clamp	Hz	60	60
0.03	Acceleration rate 1	s/100Hz	5	7
0.04	Deceleration rate 1	s/100Hz	10	4
0.05	Reference Selector	----	A1.A2	Pr
0.06	Symmetrical Current Limit	%	165	165
0.07	Voltage mode select	----	Ur I	Fd
0.08	Low Frequency Voltage Boost	%	3.0	3.0
0.09	Dynamic V/F/Flux optimize Select	----	Off	ON
0.10	Motor RPM (Read only)	RPM	0	0
0.11	Output Frequency (Read only)	Hz	0	0
0.12	Current Magnitude (Read only)	Amps	0.00	0.00
0.13	T28 digital input 5 destination	----	1.41	1.45
0.14	T29 digital input 6 destination	----	6.31	1.46
0.15	T8 analog input 3 mode	----	th	Volt
0.16	Preset Reference 1	Hz	0.00	1.3
0.17	Preset Reference 2	Hz	0.00	60.0
0.18	Preset Reference 3	Hz	0.00	30.0
0.19	Preset Reference 4	Hz	0.00	10.0
0.20	Relay source (Brake Release indicator)	----	10.01	12.40
0.21	Ramp Mode Select	----	Fast	Fast
0.22	S ramp enable	----	Off	Off
0.23	Full power braking time	Seconds	0.02	0.90
0.24	Full power braking period	Seconds	2.0	2.0
0.25	Brake controller enable	----	diS	USEr
0.26	Pre Brake release delay	Seconds	1.0	1.0
0.27	Post brake release delay	Seconds	1	0
0.28	Enable Forward/Reverse key	----	Off	Off
0.29	Smart Card parameter data previously loaded	----	0	1

Table 13. CT Drive Parameters

0.30	Parameter Cloning	----	None	None
0.31	Drive Voltage Rating	Voltage	400/200	
0.32	Maximum Heavy Duty Rating (Read Only)	Amps	0	
0.33	Catch a Spinning Motor	----	0	0
0.34	User Security Code	----	0	0
0.35	Serial Comms Mode	----	rtu	rtu
0.36	Baud Rate	----	19200	19200
0.37	Serial Address	----	1	1
0.38	Current Loop Kp Gain	----	20	20
0.39	Current Loop Ki Gain	----	40	40
0.40	Auto Tuning	----	0	0
0.41	Maximum Switching Frequency	KHz	3 (8Khz)	3 (8Khz)
0.42	Number of motor poles	Poles	Auto	
0.43	Rated Motor Power Factor	----	0.85	0.85
0.44	Rated Motor Voltage	Volts	460/230	
0.45	Rated load rpm / rated speed	RPM	1800	
0.46	Motor Rated Current	Amps	0	
0.47	Motor Rated Frequency	Hz	60	
0.48	User Drive Mode of Operation	----	Open Loop	Open Loop
0.49	Security Status	----	L1	L2
0.50	Drive Software Version		1.11 or >	
Menu 2: Ramps				
02.08	Standard Ramp Voltage	Volts	775	775
Menu 8: Digital I/O				
8.23	T26 Digital I/O 3 destination	----	6.30	6.30
8.24	T29 Digital I/O 4 destination	----	6.32	6.32
Menu 11: General Drive Setup				
11.22	Parameter displayed at power-up	----	0.10	0.10
Menu 12: Slot 3 Setup				
17.13	Enable auto run	----	ON, 0FF	OFF

* in the table above means that the value is set as required by customer job requirements.

KEB Drive Parameters (VVVF Drive Only)

Normal Mode (Single Speed):

Up Going: Drive is always in control. Energy savings are realized when the escalator has a light load because the drive can provide less voltage and current while maintaining contract speed. When the load increases, the drive automatically increases voltage and current (only 2 modes—rated current and less current, not variable).

Down Going: At start, drive accelerates escalator to contract speed (soft start to 60Hz). Once contract speed is reached, the drive drops PM and picks PML. This switches power to the line. In this configuration, power can be put back on the line if the load of the down going escalator causes the motor to act like a generator.

Inspection speed is adjustable.

Energy Saving Modes (when code allows speed change during operation)

Sensors are mounted at the top and bottom entries to the escalator in order to detect someone approaching or exiting the escalator.

Energy Saving Mode (Two Speeds, Starting Direction Only)

After there has been no activity for a user-defined period, the escalator will change from high speed to low speed. When an entry detector senses someone approaching the escalator, the speed is increased from low to high. An additional timer can be set to stop the escalator completely after there has been no activity for a user-defined period at slow speed. In this case, when an entry detector senses someone approaching the escalator, the escalator changes from a stopped condition to high speed in the starting direction only.

Intelligent Mode (Two Speeds, Two Directions Based on Entry Detection)

After there has been no activity for a user-defined period, the escalator will change from high speed to low speed. When an entry detector senses someone approaching the escalator, the speed is increased from low to high. An additional timer can be set to stop the escalator completely after there has been no activity for a user-defined period at slow speed. In this case, when an entry detector senses someone approaching the escalator, the escalator changes from a stopped condition to high speed **AND** goes in the direction determined by the entry detector.

User Mode Parameters – Overview

The 00.F5.060-2034 is a custom operator which stores several drive set up programs. The following operator-specific parameters have been created to facilitate downloading the set up program to the drive:

OS Parameters

OS.01 **Password**

dn Parameters

dn.00 **Program Selection and Download**

dn.01 **Password After Download**

CP. 0 "Password" - Switching Between CP Mode and Program Mode

A) Press FUNC key to display CP.01 ***(or other CP parameter)***

B) Press DOWN key until CP.00

C) Press FUNC key to display CP_rO ***or*** CP_On

D) Press UP/DOWN keys until 660.

E) Press ENTER key to display P-90P

OS. 1 "Password" - Switching Between Program Mode to CP Mode

A) Press FUNC key to display dn.01* ***(or other user parameter)***

B) Press ENTER key to move flashing decimal next to letters dn.01

C) Press DOWN key until OS.01*

D) Press FUNC key to display P-90P ***or*** FULOP

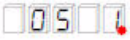
E) Press UP/DOWN keys until 100.

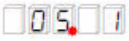
F) Press ENTER key to display CP_rO

* = flashing decimal point.

dn. 0 "Program Download"

This parameter chooses which program file is sent to the drive. Pressing enter starts the download. After the download is complete, the password selected in dn.01 is entered and the operator reboots.

A) Press FUNC key to display  *(or other user parameter)*

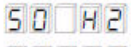
B) Press ENTER key to move flashing decimal next to letters 

C) Press UP key until 

✸= flashing decimal point.

D) Press FUNC key to display current setting.

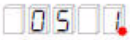
E) Use UP/DOWN keys to choose program:

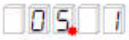
	=	*50 Hz program 230/400V current rating/overload*
	=	*60 Hz program 230/480V current rating/overload*
	=	*clear inverter memory (KEB factory values)*
	=	*Escalator program*

F) Press ENTER to start download process

dn. 1 "Password After Download"

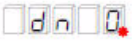
This parameter defines what password level is set after the programming is complete.

A) Press FUNC key to display  *(or other user parameter)*

B) Press ENTER key to move flashing decimal next to letters 

C) Press UP key until 

✸= flashing decimal point.

D) Press ENTER key to move flashing decimal next to number 

E) Press UP key until 

F) Press FUNC key to display current setting.

G) Use UP/DOWN keys to choose password after download:

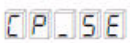
	=	*CP read only (DEFAULT)*
	=	*CP read write*
	=	*CP Service (only use if advised by KEB personnel)*
	=	*Application mode*

Table 14. KEB F5 Parameters for Escalator Applications

WARNING: Do not change drive parameters while escalator is running. Incorrect drive parameters can cause erratic operation.				
WARNING: Parameters with an asterisk (*) must be set correctly for your specific motor/machine/job.				
Param	**Description**	**Unit**	**Default**	**MCE**
CP.00	Password	-	-	-
CP.01	Motor Rated Power (KW = HP x 0.75)	KW	7.5	
CP.02	Motor Rated Current	A		
CP.03	Motor Electronic Overload Current	A		
CP.04	Motor Rated Voltage	V	460	*
CP.05	Motor Rated Frequency	Hz	60	*
CP.06	Motor Rated Power Factor	-	0.85	0.85
CP.07	Motor Rated Frequency	Hz	60	*
CP.08	Low Speed Torque Boost	%	5.0	5.0
CP.09	Voltage Regulation (Set equal to motor voltage)	V	460	*
CP.10	Energy Saving Factor	%	50	** 50
CP.11	Low Speed (recommend 50% of High Speed CP.13)	Hz	10.0000	**
CP.12	Inspection Speed	Hz	35.0000	** 10.0000
CP.13	High Speed	Hz	60.0000	**
CP.14	Line Frequency (Set 1Hz lower than line frequency)	Hz	59.0000	
CP.15	Acc Time	sec	5.00	**5.00
CP.16	Dec Time	sec	5.00	**5.00
CP.17	Drive Contactor Turn OFF Timer	mSec	100.00	100.00
CP.18	Drive Contactor Turn ON Timer	mSec	1000.00	1000.00
CP.19	Line Contactor Turn ON Timer	mSec	1000.00	1000.00
CP.20	Energy Saving Trigger Level. (Set 2A higher than idle current running full speed up. Monitor CP.21 to see actual current.)	A	-	CP.21 + 2A
CP.21	Phase Current	A	-	Read Only
CP.22	Peak Phase Current (Press Down key to reset)	A	-	Read Only
CP.23	Actual Frequency Display	Hz	-	Read Only
CP.24	Output Voltage	V	-	Read Only
CP.25	Actual DC Voltage	V	-	Read Only
CP.26	Peak DC Voltage (Press Down key to reset)	V	-	Read Only
CP.27	Input terminal state. (Display active inputs. See Table 17 for decoding values)	-	0: no input	Read Only
CP.28	Inverter State	-	-	Read Only
CP.29	Function select (Selects which functions are active. See Table 16 for available setting.)	-		4
CP.30	Escalator status mode (Display current mode of operation. See Table 15 to decode number.)	-	-	Read Only

Table 14. KEB F5 Parameters for Escalator Applications

WARNING: Do not change drive parameters while escalator is running. Incorrect drive parameters can cause erratic operation.				
WARNING: Parameters with an asterisk (*) must be set correctly for your specific motor/machine/job.				
Param	**Description**	**Unit**	**Default**	**MCE**
CP Mode to User Mode: To access user mode parameters (OS and dF), set CP.00 to 660. User Mode to CP Mode: Set OS.01 to 100 to go back to CP Mode. Note: Do not change these parameters unless directed by MCE engineer or tech support.				
OS.00	Operator Type	-	-	80131
OS.01	Password	-	-	-
OS.02	Software Date	-	-	-
OS.04	Diag Response Delay Time	-	-	1
OS.05	Diag baud Rate	-	-	38400
OS.06	Auto Reset Fault	-	-	5
dF.00	Machine Download (n3000 = Escalator Program)	-	n3000	n3000
* Parameters are motor/machine/job dependent. ** Recommended but field adjustable.				

Table 15. KEB CP.30 Escalator Mode Status Table

Value	State	Value	State	Value	State
0	Idle	15	Up Inspection	30	Down Brake Off
1	No Enable Error	16	Up Low Speed	31	Down Start
2	No Enable Wait for Direc-tion Drop	17	Up Low to High Speed Accel.	32	Down Inspection
3	Kill Contacts	18	Up High Speed	33	Down Low Speed
4	Stopped	19	Up High to Low Speed	34	Down High Speed
5	Wait for Enable	20	Up Low Time Delay Energy Saving	35	Down Decel
6	Up Wait for Enable	21	Up Low Energy Saving Active	36	Down Low Time Delay Energy Saving
7	Up Enabled	22	Up High Time Delay Energy Saving	37	Down Low Energy Saving Active
8	Up Brake Off	23	Up High Energy Saving Active	38	Down High Line Operation
9	Brake On	24	Up High Line Operation	39	Down Drive and Line Con-tactor Off
10	Modulation Off	25	Up Drive and Line Contactor Off	40	Down High Speed Search Active
11	Turn Off Time Delay Drive Contactor	26	Up High Speed Search Active	41	Down Speed Search Timer
12	Up Start	27	Up Speed Search Timer		
13	Fast Stop	28	Down Wait for Enable		
14	Up Decel	29	Down Enabled		

Table 16. KEB Function Selection

Value	State	Value	State	Value	State
0	No Function Active	2	Energy Saving Up all Speeds Active	8	Line Contactor Enabled for High Speed Up Operation.
1	Energy Saving Down Low Speed Active	4	Line Contactor Enabled for High Speed Down Operation		
To select more than one function, add the respective numbers together and enter the total value.					

Table 17. KEB Input Status

Value	State	Value	State	Value	State
0	No Inputs Active.	68	Low Speed and Up Active	137	High Speed, Enable, and Down Active
1	Enable Active	69	Low Speed, Enable, and Up Active	192	Inspection Speed Active
2	Reset Active	72	Low Speed and Down Active	193	Inspection Speed and Enable Active
4	Up Active	73	Low Speed, Enable, and Down Active	196	Inspection Speed and Up Active
5	Up and Enable Active	128	High Speed Active	197	Inspection Speed, Enable, and Up Active
8	Down Active	129	High Speed and Enable Active	200	Inspection Speed and Down Active
9	Down and Enable Active	132	High Speed and Up Active	201	Inspection Speed, Enable, and Down Active
64	Low Speed Active	133	High Speed, Enable, and Up Active		
65	Low Speed and Enable Active	136	High Speed and Down Active		

Commissioning Tests

Overspeed and reversal errors may need to be demonstrated during commissioning tests.

Step Overspeed Error

1. After completing a learn run at contract speed, record the values for parameters F3-01, F3-02, F3-05, and F3-06. They should all be very close to the same number. (They are learned speeds from the four step sensors.)
2. Manually change one of the step sensors parameters to a value 20% more than the learned value.
3. Record the handrail learned values (F3-03, F3-04, F3-07, and F3-08). Set all of them to 0 (zero) to temporarily disable handrail speed checking.
4. Start the escalator and observe that an overspeed error is generated.
5. Set the changed step sensor value and the four handrail values back to the recorded settings.

Regarding the preceding test, the error was generated because the controller was expecting the time between pulses to be 1200 mS when it was actually 1000 mS. This is greater than the allowed error (default is 15% as defined by parameter F3-09) so the overspeed error was generated. Note that the learned values represent time between sensor pulses so, the lower the number, the higher the frequency of the pulse (or, the faster the steps are travelling).

Reversal

For this test, parameters F4-06 and F4-07 must be set to 1 to enable reversal detection.

1. After completing a learn run, switch the inputs at S2 and S3 on the J1 connector of the EC-MCB board.
2. Start the escalator. Observe that a reversal fault, E-01, is generated.
3. Return the S2 and S3 connections to the correct positions.

Fault Conditions

Both the controller and the VVVF drive (if used) will display fault condition codes. This section contains complete controller and drive fault condition tables and descriptions.

Controller Faults

To reset a latched fault, press both UP and DOWN buttons and hold them down for two seconds.

Terminals P10 through P18, P20, and P21 on the EC-MCB and terminals P27 through P34 on the EC-SCB are assignable to different functions. The following table lists faults for these terminals as they are normally assigned by MCE. There is a generic table following this one with spaces to write the devices monitored by your system if changes have been made or your system does not conform to the standard.

Table 18. Controller Fault Displays

Fault	Description	Troubleshooting
E-01	Reversal detection fault on EC-MCB. S2 and S3 input on J1 of EC-MCB.	Confirm that F4-08 is set to the same value as UPNP when escalator is going UP. If not, refer to the Escalator Learn Operation to re-learn
		Verify that sensors are spaced < 1/2 tread width apart.
E-02	Overspeed fault. Step Speed/ Missing Step monitoring using upper sensor 1. S2 input on J1 of EC-MCB.	Check connection and function of input device.
		Confirm that F3-01 is set to the same value as USP1. If not, refer to the Escalator Learn Operation to re-learn parameter F3-01.
		Check escalator mechanical integrity.
E-03	Overspeed fault. Step Speed/ Missing Step monitoring using upper sensor 2. S3 input on J1 of EC-MCB.	Check connection and function of input device.
		Confirm that F3-02 is set to the same value as USP2. If not, refer to the Escalator Learn Operation to re-learn parameter F3-02.
		Check escalator mechanical integrity.
E-04	Overspeed fault. Left handrail speed monitoring. S4 input on J1 of EC-MCB.	Check connection and function of input device.
		Confirm that F3-03 is set to the same value as USP3. If not, refer to the Escalator Learn Operation to re-learn parameter F3-03.
		Check escalator mechanical integrity.
E-05	Overspeed fault. Right handrail speed monitoring. S5 input on J1 of EC-MCB.	Check connection and function of input device.
		Confirm that F3-04 is set to the same value as USP4. If not, refer to the Escalator Learn Operation to re-learn parameter F3-04.
		Check escalator mechanical integrity.
E-06	Underspeed fault. Step Speed/Missing Step monitoring using upper sensor 1. S2 input on J1 of EC-MCB.	Check connection and function of input device.
		Confirm that F3-01 is set to the same value as USP1. If not, refer to the Escalator Learn Operation to re-learn parameter F3-01.
		Check escalator mechanical integrity.
E-07	Underspeed fault. Step Speed/Missing Step monitoring using upper sensor 2. S3 input on J1 of EC-MCB.	Check connection and function of input device.
		Confirm that F3-02 is set to the same value as USP2. If not, refer to the Escalator Learn Operation to re-learn parameter F3-02.
		Check escalator mechanical integrity.
E-08	Underspeed fault. Left handrail speed monitoring. S4 input on J1 of EC-MCB.	Check connection and function of input device.
		Confirm that F3-03 is set to the same value as USP3. If not, refer to the Escalator Learn Operation to re-learn parameter F3-03.
		Check escalator mechanical integrity.
E-09	Reverse phase fault. P9 input on J2 of EC-MCB.	Check input device to P9 terminal. May be used for Speed Governor or Motor Efficiency Controller depending on configuration.

Table 18. Controller Fault Displays

Fault	Description	Troubleshooting
E-10	Motor overheat fault. P10 input on J2 of EC-MCB.	Check input device to P10 terminal.
E-11	Upper left missing skirt fault. P11 input on J3 of EC-MCB.	Check input device to P11 terminal.
E-12	Upper right missing skirt fault. P12 input on J3 of EC-MCB.	Check input device to P12 terminal.
E-13	Upper left comb-step impact fault. P13 input on J3 of EC-MCB.	Check input device to P13 terminal.
E-14	Upper right comb-step impact fault. P14 input on J3 of EC-MCB.	Check input device to P14 terminal.
E-15	Upper left handrail entry fault. P15 input on J3 of EC-MCB.	Check input device to P15 terminal.
E-16	Upper right handrail entry fault. P16 input on J3 of EC-MCB.	Check input device to P16 terminal.
E-17	Upper step sag fault. P17 input on J3 of EC-MCB.	Check input device to P17 terminal.
E-18	Upper step upthrust fault. P18 input on J3 of EC-MCB.	Check input device to P18 terminal.
E-19	Drive chain broken fault. P19 input on J4 of EC-MCB.	Check input device to P19 terminal.
E-20	Missing step fault. S2 and S3 input on J1 of EC-MCB or S6 and S7 input on J1 of EC-SCB.	Check input device to S2 and S3 terminals.
E-21	Smoke detector fault. P21 input on J4 of EC-MCB.	Check input device to P21 terminal.
E-24	Run direction input fault. P3 and P4 inputs on J2 of EC-MCB.	Check mechanics of both upper and lower escalator starting switches. Check for proper operation of Up and Down inputs to P3 and P4 terminals.
E-25	Run direction input fault at power up. P3 and P4 inputs on J2 of EC-MCB.	Check mechanics of both upper and lower escalator starting switches. Check for proper operation of Up and Down inputs to P3 and P4 terminals.
E-27	Lower left missing skirt fault. P27 input on J2 of EC-SCB.	Check input device to P27 terminal.
E-28	Lower right missing skirt fault. P28 input on J2 of EC-SCB.	Check input device to P28 terminal.
E-29	Lower left comb-step impact fault. P29 input on J2 of EC-SCB.	Check input device to P29 terminal.
E-30	Lower right comb-step impact fault. P30 input on J2 of EC-SCB.	Check input device to P30 terminal.
E-31	Lower left handrail entry fault. P31 input on J2 of EC-SCB.	Check input device to P31 terminal.
E-32	Lower right handrail entry fault. P32 input on J2 of EC-SCB.	Check input device to P32 terminal.
E-33	Lower step sag fault. P33 input on J2 of EC-SCB.	Check input device to P33 terminal.

Table 18. Controller Fault Displays

Fault	Description	Troubleshooting
E-34	Lower step upthrust fault. P34 input on J3 of EC-SCB.	Check input device to P34 terminal.
E-35	Underspeed fault. Right handrail speed monitoring. S5 input on J1 of EC-MCB.	Check connection and function of input device. Confirm that F3-04 is set to the same value as USP4. If not, refer to the Escalator Learn Operation to re-learn parameter F3-04. Check escalator mechanical integrity.
E-36	CAN communication fault, EC-MCB	Check connections at CL1 and CH1 between EC-MCB and EC-SCB. Use a shielded, twisted pair cable for CAN communication. Check CAN termination.
E-37	Brake fault. P8 input on J2 of EC-MCB.	Check brake contact. If brake contact is not present, set parameter F1-01 = 2.
E-38	Auxiliary brake fault. P22 input on J4 of EC-MCB	Check auxiliary brake contact. If brake contact is not present, set parameter F1-02 = 3.
E-39	Reversal detection fault on EC-SCB. S6 and S7 input on J1 of EC-SCB.	Confirm that F4-09 is set to the same value as DPNP when escalator is going UP. If not, refer to the Escalator Learn Operation to re-learn Verify that sensors are spaced < 1/2 tread width apart.
E-40	Overspeed fault. Step Speed/ Missing Step monitoring using lower sensor 1. S6 input on J1 of EC-SCB.	Check connection and function of input device. Confirm that F3-05 is set to the same value as DSP1. If not, refer to the Escalator Learn Operation to re-learn parameter F3-05. Check escalator mechanical integrity.
E-41	Overspeed fault. Step Speed/ Missing Step monitoring using lower sensor 2. S7 input on J1 of EC-SCB.	Check connection and function of input device. Confirm that F3-06 is set to the same value as DSP2. If not, refer to the Escalator Learn Operation to re-learn parameter F3-06. Check escalator mechanical integrity.
E-42	Overspeed fault. Left handrail speed monitoring. S8 input on J1 of EC-SCB.	Check connection and function of input device Confirm that F3-07 is set to the same value as DSP3. If not, refer to the Escalator Learn Operation to re-learn parameter F3-07. Check escalator mechanical integrity.
E-43	Overspeed fault. Right hand-rail speed monitoring. S9 input on J1 of EC-SCB.	Check connection and function of input device. Confirm that F3-08 is set to the same value as DSP4. If not, refer to the Escalator Learn Operation to re-learn parameter F3-08. Check escalator mechanical integrity.
E-44	Underspeed fault. Step Speed/Missing Step monitor-ing using lower sensor 1. S6 input on J1 of EC-SCB.	Check connection and function of input device. Confirm that F3-05 is set to the same value as DSP1. If not, refer to the Escalator Learn Operation to re-learn parameter F3-05. Check escalator mechanical integrity.
E-45	Underspeed fault. Step Speed/Missing Step monitor-ing using lower sensor 2. S7 input on J1 of EC-SCB.	Check connection and function of input device. Confirm that F3-06 is set to the same value as DSP2. If not, refer to the Escalator Learn Operation to re-learn parameter F3-06. Check escalator mechanical integrity.
E-46	Underspeed fault. Left hand-rail speed monitoring. S8 input on J1 of EC-SCB.	Check connection and function of input device. Confirm that F3-07 is set to the same value as DSP3. If not, refer to the Escalator Learn Operation to re-learn parameter F3-07. Check escalator mechanical integrity.
E-47	Underspeed fault. Right handrail speed monitoring. S9 input on J1 of EC-SCB.	Check connection and function of input device. Confirm that F3-08 is set to the same value as DSP4. If not, refer to the Escalator Learn Operation to re-learn parameter F3-08. Check escalator mechanical integrity.
E-48	CAN communication fault, EC-SCB	Check connections at CL1 and CH1 between EC-MCB and EC-SCB. Use a shielded, twisted pair cable for CAN communication.
E-49	P36 Input on J3 of EC-SCB	Check input device to terminal P36. User defined error message will be generated for some software versions if programmed by user.
E-50	Contactor proving fault. P5 input on J2 of EC-MCB.	Check P5 input to verify that it is activated when the escalator is stopped.

Table 18. Controller Fault Displays

Fault	Description	Troubleshooting
E-51	Brake contactor fault. P8 input on J2 of EC-MCB.	Check input device.
		Check setting of parameter F1-01. Verify that setting matches physical characteristic of break contact.
E-52	Seismic fault. P24 input on J4 of EC-MCB.	Check input device to terminal P24. User defined error message will be generated for some software versions if programmed by user.
E-53	Smoke detection fault. P21 input on J4 of EC-MCB.	Check input device to terminal P21.
E-55	Safety circuit fault. P6 input on J2 of EC-MCB.	Check stop switch on top of control cabinet.
		Check remaining safety devices.
E-56	Safety circuit fault. P26 input on J2 of EC-SCB.	Check stop switch on top of control cabinet.
		Check remaining safety devices.
E57	Stopping distance error.	Number of pulses exceeds the learned value by more than the programmable stopping distance error, See “Escalator Braking Distance Feature” on page 29 .
E58	Stopping distance error.	Number of pulses is less than the learned value by more than the programmable stopping distance error, See “Escalator Braking Distance Feature” on page 29 .
E-59	P37 input on J3 of EC-SCB	Check input device to terminal P37. User defined error message will be generated for some software versions if programmed by user.

Table 19. Customer Specific Fault Display Assignment Entry

Fault	Terminal	Your System Assignment
E-10	P10 on EC-MCB	
E-11	P11 on EC-MCB	
E-12	P12 on EC-MCB	
E-13	P13 on EC-MCB	
E-14	P14 on EC-MCB	
E-15	P15 on EC-MCB	
E-16	P16 on EC-MCB	
E-17	P17 on EC-MCB	
E-18	P18 on EC-MCB	
E-27	P27 on EC-SCB	
E-28	P28 on EC-SCB	
E-29	P29 on EC-SCB	
E-30	P30 on EC-SCB	
E-31	P31 on EC-SCB	
E-32	P32 on EC-SCB	
E-33	P33 on EC-SCB	
E-34	P34 on EC-SCB	

CT Drive Faults

Note

The drive faults listed here are current as of publication of these tables. If you believe that a description is not accurate, please consult the manufacturer manual shipped with the drive. The numeric codes listed below each alphabetic fault code in the table may be input to drive Pr10.38 if you wish to force the associated trip.

Table 20. CT Drive Fault Displays

Trip	Diagnosis
C.Acc	SMARTCARD trip: SMARTCARD Read / Write fail
185	Check SMARTCARD is fitted / located correctly Replace SMARTCARD
C.Chg	SMARTCARD trip: Data location already contains data
179	Erase data in data location Write data to an alternative data location
C.Cpr	SMARTCARD trip: The values stored in the drive and the values in the data block on the SMART-CARD are different
188	Press the red reset button
C.dat	SMARTCARD trip: Data location specified does not contain any data
183	Ensure data block number is correct
C.Err	SMARTCARD trip: SMARTCARD data is corrupted
182	Ensure the card is located correctly Erase data and retry Replace SMARTCARD
C.Full	SMARTCARD trip: SMARTCARD full
184	Delete a data block or use different SMARTCARD
CL2	Analog input 2 current loss (current mode)
28	Check analog input 2 (terminal 7) current signal is present (0-20mA, 4-20mA etc.)
CL3	Analog input 3 current loss (current mode)
29	Check analog input 3 (terminal 8) current signal is present (0-20mA, 4-20mA etc.)
CL.bit	Trip initiated from the control word (Pr 6.42)
35	Disable the control word by setting Pr 6.43 to 0 or check setting of Pr 6.42
C.Optn	SMARTCARD trip: Solutions Modules fitted are different between source drive and destination drive
180	Ensure correct Solutions Modules are fitted Ensure Solutions Modules are in the same Solutions Module slot Press the red reset button
C.rdo	SMARTCARD trip: SMARTCARD has the Read Only bit set
181	Enter 9777 in Pr xx.00 to allow SMARTCARD Read / Write access Ensure card is not writing to data locations 500 to 999
C.rtg	SMARTCARD trip: SMARTCARD attempting to change the destination drive ratings No drive rating parameters have been transferred
186	Press the red reset button. Drive rating parameters are: The above parameters will be set to their default values. Parameter Function 2.08 Standard ramp voltage 4.05/6/7, 21.27/8/9 Current lim-its 5.07, 21.07 Motor rated current 5.09, 21.09 Motor rated voltage 5.17, 21.12 Stator resistance 5.18 Switching frequency 5.23, 21.13 Voltage offset 5.24, 21.14 Transient inductance 5.25, 21.24 Stator inductance 6.06 DC injection braking current
C.Typ	SMARTCARD trip: SMARTCARD parameter set not compatible with drive
187	Press the reset button Ensure destination drive type is the same as the source parameter file drive type
dESt	Two or more parameters are writing to the same destination parameter
199	Set Pr xx.00 = 12001 check all visible parameters in the menus for duplication

Table 20. CT Drive Fault Displays

EEF	EEPROM data corrupted - Drive mode becomes open loop and serial comms will time out with remote keypad on the drive RS485 comms port.
31	This trip can only be cleared by loading default parameters and saving parameters
EnC1	Drive encoder trip: Encoder power supply overload
189	Check encoder power supply wiring and encoder current requirement. Maximum current = 200mA @ 15V, or 300mA @ 8V and 5V
EnC2	Drive encoder trip: Wire break
190	Check cable continuity Check wiring of feedback signals is correct Check encoder power is set correctly Replace feedback device If wire break detection on the main drive encoder input is not required, set Pr 3.40 = 0 to disable the EnC2 trip
EnC3	Drive encoder trip: UVW phase offset incorrect whilst running
191	Check the encoder signal for noise Check encoder shielding Check the integrity of the encoder mechanical mounting Repeat the offset measurement test
EnC4	Drive encoder trip: Feedback device comms failure
192	Ensure encoder power supply is correct Ensure baud rate is correct Check encoder wiring Replace feedback device
EnC5	Drive encoder trip: Checksum or CRC error
193	Check the encoder signal for noise Check the encoder cable shielding With EnDat encoders, check the comms resolution and/or carry out the auto-configuration Pr 3.41
EnC6	Drive encoder trip: Encoder has indicated an error
194	Replace feedback device With SSI encoders, check the wiring and encoder supply setting
EnC7	Drive encoder trip: Initialization failed
195	Re-set the drive Check the correct encoder type is entered into Pr 3.38 Check encoder wiring Check encoder power supply is set correctly Carry out the auto-configuration Pr 3.4**1** Replace feedback device
EnC8	Drive encoder trip: Auto configuration on power up has been requested and failed
196	Change the setting of Pr 3.41 to 0 and manually enter the drive encoder turns (Pr 3.33) and the equivalent number of lines per revolution (Pr 3.34) Check the comms resolution
EnC9	Drive encoder trip: Position feedback selected is selected from a Solutions Module slot which does not have a speed / position feedback Solutions Module fitted
197	Check setting of Pr 3.26 (or Pr 21.21 if the second motor parameters have been enabled)
EnC10	Drive encoder trip: Servo mode phasing failure because encoder phase angle (Pr 3.25 or Pr 21.20) is incorrect
198	Check the encoder wiring. Perform an autotune to measure the encoder phase angle or manually enter the correct phase angle into Pr **3.25** (or Pr **21.20**). Spurious EnC10 trips can be seen in very dynamic applications. This trip can be disabled by setting the speed threshold in Pr **3.08** to a value greater than zero. Caution should be used in setting the over speed threshold level as a value which is too large may mean that an encoder fault will not be detected.
ENP.Er	Data error from electronic nameplate stored in selected position feedback device
176	Replace feedback device
Et	External trip from input on terminal 31
6	Check terminal 31 signal Check value of Pr 10.32 Enter 12001 in Pr xx.00 and check for parameter controlling Pr 10.32 Ensure Pr 10.32 or Pr 10.38 (=6) are not being controlled by serial comms
HF01	Data processing error: CPU address error
	Hardware fault - return drive to supplier
HF02	Data processing error: DMAC address error
	Hardware fault - return drive to supplier
HF03	Data processing error: Illegal instruction
	Hardware fault - return drive to supplier
HF04	Data processing error: Illegal slot instruction

Table 20. CT Drive Fault Displays

	Hardware fault - return drive to supplier
HF05	Data processing error: Undefined exception
	Hardware fault - return drive to supplier
HF06	Data processing error: Reserved exception
	Hardware fault - return drive to supplier
HF07	Data processing error: Watchdog failure
	Hardware fault - return drive to supplier
HF08	Data processing error: Level 4 crash
	Hardware fault - return drive to supplier
HF09	Data processing error: Heap overflow
	Hardware fault - return drive to supplier
HF10	Data processing error: Router error
	Hardware fault - return drive to supplier
HF11	Data processing error: Access to EEPROM failed
	Hardware fault - return drive to supplier
HF20	Power stage recognition: serial code error
220	Hardware fault - return drive to supplier
HF21	Power stage recognition: unrecognized frame size
221	Hardware fault - return drive to supplier
HF22	Power stage recognition: multi module frame size mismatch
222	Hardware fault - return drive to supplier
HF23	Power stage recognition: multi module voltage rating mismatch
223	Hardware fault - return drive to supplier
HF24	Power stage recognition: unrecognized drive size
224	Hardware fault - return drive to supplier
HF25	Current feedback offset error
225	Hardware fault - return drive to supplier
HF26	Soft start relay failed to close, soft start monitor failed or braking IGBT short circuit at power up
226	Hardware fault - return drive to supplier
HF27	Power stage thermistor 1 fault
227	Hardware fault - return drive to supplier
HF28	Power stage thermistor 2 fault or internal fan fault (size 3 only)
228	Hardware fault - return drive to supplier
HF29	Control board thermistor fault
229	Hardware fault - return drive to supplier
It.AC	Output current overload timed out (I^2t) - accumulator value can be seen in Pr 4.19
20	Ensure the load is not jammed / sticking Check the load on the motor has not changed Tune the rated speed parameter (closed loop vector only) Check feedback device signal for noise Check the feedback device mechanical coupling
It.br	Braking resistor overload timed out (I^2t) – accumulator value can be seen in Pr 10.39
19	Ensure the values entered in Pr 10.30 and Pr 10.31 are correct Increase the power rating of the braking resistor and change Pr 10.30 and Pr 10.31 If an external thermal protection device is being used and the braking resistor software overload is not required, set Pr 10.30 or Pr 10.31 to 0 to disable the trip
O.CtL	Drive control board over temperature
23	Check cubicle / drive fans are still functioning correctly Check cubicle ventilation paths Check cubicle door filters Check ambient temperature Reduce drive switching frequency
O.ht1	Power device over temperature based on thermal model

Table 20. CT Drive Fault Displays

21	Reduce drive switching frequency Reduce duty cycle Decrease acceleration / deceleration rates Reduce motor load
O.ht2	Heatsink over temperature
22	Check cooling fans, ventilation path, and filters. Increase ventilation. Decrease acceleration / deceleration rates. Reduce drive switching frequency. Reduce duty cycle. Reduce motor load.
Oht2.P	Power module heatsink over temperature.
105	Check fans, ventilation paths, and filters. Increase ventilation. Decrease acceleration / deceleration rates. Reduce drive switching frequency. Reduce duty cycle. Reduce motor load.
O.ht3	Drive over temperature based on thermal model.
27	Drive will attempt to stop the motor before tripping. If the motor does not stop in 10s, the drive will trip. Check fans, ventilation paths, and filters. Increase ventilation. Decrease acceleration / deceleration rates. Reduce duty cycle. Reduce motor load.
Oht4.P	Power module rectifier over temperature.
102	Check for supply imbalance. Check fans, ventilation paths, and filters. Increase ventilation. Decrease acceleration / deceleration rates. Reduce drive switching frequency. Reduce duty cycle. Reduce motor load.
OI.AC	Instantaneous output over current detected: peak output current greater than 225%.
3	Acceleration / deceleration rate is too short. If seen during autotune, reduce voltage boost Pr 5.15. Check for short circuit on output cabling. Check integrity of motor insulation. Check feedback device wiring. Check feedback device mechanical coupling. Check feedback signals are free from noise. Is motor cable length within limits for that frame size? Reduce the values in speed loop gain parameters - Pr 3.10, Pr 3.11, and Pr 3.12 (closed loop vector)

Table 20. CT Drive Fault Displays

OIAC.P	Power module over current detected from the module output currents
104	Acceleration / deceleration rate is too short. If seen during autotune, reduce voltage boost Pr 5.15 Check for short circuit on output cabling Check integrity of motor insulation Check feedback device wiring Check feedback device mechanical coupling Check feedback signals are free from noise Is motor cable length within limits for frame size? Reduce the values in speed loop gain parameters - Pr 3.10, Pr 3.11, and Pr 3.12 (closed loop vector)
OI.br	Braking transistor over current detected: short circuit protection for the braking transistor activated
4	Check braking resistor wiring Check braking resistor value is greater than or equal to the minimum resistance value Check braking resistor insulation
OIbr.P	Power module braking IGBT over current
103	Check braking resistor wiring Check braking resistor value is greater than or equal to the minimum resistance value Check braking resistor insulation
OldC.P	Power module over current detected from IGBT on state voltage monitoring
109	Vce IGBT protection activated Check motor and cable insulation
O.Ld1	Digital output overload: total current drawn from 24V supply and digital outputs exceeds 200mA
26	Check total load on digital outputs (terminals 24, 25, 26) and +24V rail (terminal 22)
OV	DC bus voltage has exceeded the peak level or the maximum continuous level for 30 seconds
2	Increase deceleration ramp (Pr0.04) Decrease braking resistor value (staying above the minimum) Check nominal AC supply level Check for supply disturbances which could cause the DC bus to rise - voltage overshoot after supply recovery from a notch induced by DC drives Check motor insulation See drive manual for additional
OV.P	Power module over voltage
106	Increase deceleration ramp (Pr 0.04) Decrease braking resistor value (staying above minimum) Check nominal AC supply level Check for supply disturbances Check motor insulation See drive manual for additional
O.SPd	Motor speed has exceeded the over speed threshold
7	Increase the over speed trip threshold in Pr 3.08 (closed loop only) Speed has exceeded 1.2 x P4r 106 or Pr 1.07 (open loop mode) Reduce the speed loop P gain (Pr 3.10) to reduce the speed overshoot (closed loop only)
PAd	Keypad has been removed when the drive is receiving the speed reference from the keypad
34	Fit keypad and reset Change speed reference selector to select speed reference from another source
Ph	AC voltage input phase loss or large supply imbalance detected
32	Ensure all three phases are present and balanced Check input voltage levels are correct (at full load) Note: Load level must be between 50 and 100% for the drive to trip under phase loss conditions. The drive will attempt to stop the motor before this trip is initiated.

Table 20. CT Drive Fault Displays

Ph.P	Power module phase loss detection
107	Ensure all three phases are present and balanced Check input voltage levels are correct (at full load)
PS	Internal power supply fault
5	Remove any Solutions Modules and reset Check integrity of interface ribbon cables and connections (size 4,5,6 only) Hardware fault - return drive to supplier
PS.10V	10V user power supply current greater than 10mA
8	Check wiring to terminal 4 Reduce load on terminal 4
PS.24V	24V internal power supply overload
9	The total user load of the drive and Solutions Modules has exceeded the internal 24V power supply limit. The user load consists of the drive digital outputs plus the SM-I/O Plus digital outputs, or the drive main encoder supply plus the SM-Universal Encoder Plus and SM-Encoder Plus encoder supply. • Reduce load and reset • Provide an external 24V >50W power supply • Remove any Solutions Modules and reset
rS	Failure to measure resistance during autotune or when starting in open loop vector mode 0 or 3
33	Check motor power connection continuity
SCL	Drive RS485 serial comms loss to remote keypad
30	Refit the cable between the drive and keypad Check cable for damage Replace cable Replace keypad
th	Motor thermistor trip
24	Check motor temperature Check thermistor continuity Set Pr **7.15** = VOLt and reset the drive to disable this function
thS	Motor thermistor short circuit
25	Check motor thermistor wiring Replace motor thermistor Set Pr **7.15** = VOLt and reset the drive to disable this function
tunE	Autotune stopped before completion
18	The drive has tripped out during the autotune The red stop key has been pressed during the autotune The secure disable signal (terminal 31) was active during the autotune procedure
tunE1	The position feedback did not change or required speed could not be reached during the inertia test (see Pr 5.12)
11	Ensure the motor is free to turn i.e. brake was released Check encoder coupling to motor
tunE2	Position feedback direction incorrect or motor could not be stopped during the inertia test (see Pr 5.12)
12	Check motor cable wiring is correct Check feedback device wiring is correct Swap any two motor phases (closed loop vector only)
tunE3	Drive encoder commutation signals connected incorrectly or measured inertia out of range (see Pr 5.12)
13	Check motor cable wiring is correct Check feedback device U,V and W commutation signal wiring is correct
tunE4	Drive encoder U commutation signal fail during an autotune
14	Check feedback device U phase commutation wires continuity Replace encoder
tunE5	Drive encoder V commutation signal fail during an autotune
15	Check feedback device V phase commutation wires continuity Replace encoder
tunE6	Drive encoder W commutation signal fail during an autotune
16	Check feedback device W phase commutation wires continuity Replace encoder
tunE7	Motor number of poles set incorrectly
17	Check lines per revolution for feedback device Check the number of poles in Pr **5.11** is set correctly

Table 20. CT Drive Fault Displays

Uflt	Multi module drive: Unidentified fault
171	Check all interconnecting cables between power modules Ensure cables are routed away from electrical noise sources
UP div0	Onboard PLC program attempted divide by zero
90	Check program
UP OFL	Onboard PLC program variables and function block calls using more than the allowed RAM space (stack overflow)
95	Check program
UP ovr	Onboard PLC program attempted out of range parameter write
94	Check program
UP PAr	Onboard PLC program attempted access to a non-existent parameter
91	Check program
UP ro	Onboard PLC program attempted write to a read-only parameter
92	Check program
UP So	Onboard PLC program attempted read of a write-only parameter
93	Check program
UP udf	Onboard PLC program un-defined trip
97	Check program
UP uSEr	Onboard PLC program requested a trip
96	Check program
UV	DC bus under voltage threshold reached
1	Check AC supply voltage level Drive voltage rating (Vac) Under voltage threshold (Vdc)

KEB Drive Faults

The drive faults listed here are current as of publication of these tables. If you believe that a description is not accurate, please consult the manufacturer manual shipped with the drive.

Table 21. KEB Drive Error Displays

Display	Description	Cause
E. UP	Under voltage. DC bus voltage below permissible value; input single-phasing; phase imbalance greater than 2%.	• Input voltage low or unstable. • Input wiring incorrect. • Isolation transformer too small. • Isolation transformer connected wrong. • One phase of input missing. • Phase imbalance over 2%.
E. OP	Over voltage. DC bus voltage above permissible value during motor regenerative operation or because of line side voltage spikes.	• Input voltage too high; install step down tx. • Voltage spikes on line; install line choke. • Brake resistor connection incorrect. • Brake resistor resistance too large. • Inverter poorly grounded.
E. OC	Peak output current exceeded or ground fault.	• Short circuit on motor leads. • Ground fault on motor leads. • Motor contactor damaged or burned. • Inverter poorly grounded. • Incorrect motor data (LF10-LF19). • Shorted output transistor.
E. OL	Time dependent overload. See KEB manual.	• Motor wired incorrectly. • Motor data wrong (check motor current). • Inverter too small. • High mechanical load.
E.OL2	Time dependent overload at low speed. See KEB manual.	• Motor stand still current too high. • Incorrect motor data. • Inverter too small. • High mechanical load. • Motor wired incorrectly.
E.nOL	Cool down phase completed (after an E.OL or E.OL2 error).	• E.OL or E. OL2 errors can now be reset.
E. OH	Inverter overheat. Heat sink temperature above permissible limit.	• Insufficient cooling. • Ambient temperature too high. • Cooling fan clogged.
E.dOH	Motor over temp. External motor temp switch tripped.	• Terminals T1/T2 resistance over 1650 ohms. • Motor temp sensor overheat. • Factory T1/T2 jumper missing.
E.nOH	Overtemp cooled down. Over temp error may now be reset.	• Temperature now at safe level.
E. 0S	Over speed.	• Speed over 110% of LF.20. • Verify LF.10 - LF.19, LF.27. • Encoder cable noise.

Table 21. KEB Drive Error Displays

Display	Description	Cause
E.LSF	DC Bus charging error. Occurs for a short time during drive power up but clears automatically if no real error exists.	• Input voltage wrong or too low. • High supply line resistance. • Incorrect brake resistor connection. • Braking transistor not functioning. • Inverter failure.
E.EnC	Encoder failure.	• Encoder connection problem. • Encoder channels reversed.
E.EnC 1	Encoder signal loss; wrong rotation direction or too much drag.	• Encoder signal missing. • Check encoder connections and signals.
E.EnCC	Encoder communication error. Serial communication problem with encoder.	• See parameters 2.LF.26. • Clear through 0.LF.26 when ready.
E.PuC 1	Power unit code. Power stage not identified during initialization.	• Replace drive.
E.PuCH	Power unit code changed. Typically experienced when changing control cards.	• Unit will automatically configure for new power stage and clear error. • Drive maintains history for reference. • Clear through parameter US.27.
E.br	Error current check. Before each run, drive sends current to each motor phase to verify. Then applies magnetizing current and monitors.	• One or more motor leads disconnected. • Motor contactor timing incorrect. • Motor contactor damaged or burnt. • Motor windings damaged. • Drive unable to generate acceptable current levels. • May be bypassed through US.25 = 1.
E.hybC	Encoder card changed.	• Error will clear automatically. • New feedback card will be recognized. • Unit maintains history.
E.hyb	Encoder card invalid.	• Damaged encoder card.
E.OH2	Electronic motor overload.	• Motor current exceeds LF.9 or LF.12. • Mechanical load excessive. • Check motor data LF.10 - LF.19.
E.buS	Serial communication between keypad and drive lost. (Bypass through US.29.)	• Error will clear when communication is restored. • If not, remove keypad, cycle drive power, verify red pilot LED on steady, reinstall keypad. • Check KEB manual.
bbL	Precedes most faults. Also occurs if the drive enable is turned off while the car is running.	• Indicates output transistors have been safely shut off and are being blocked from further operation.

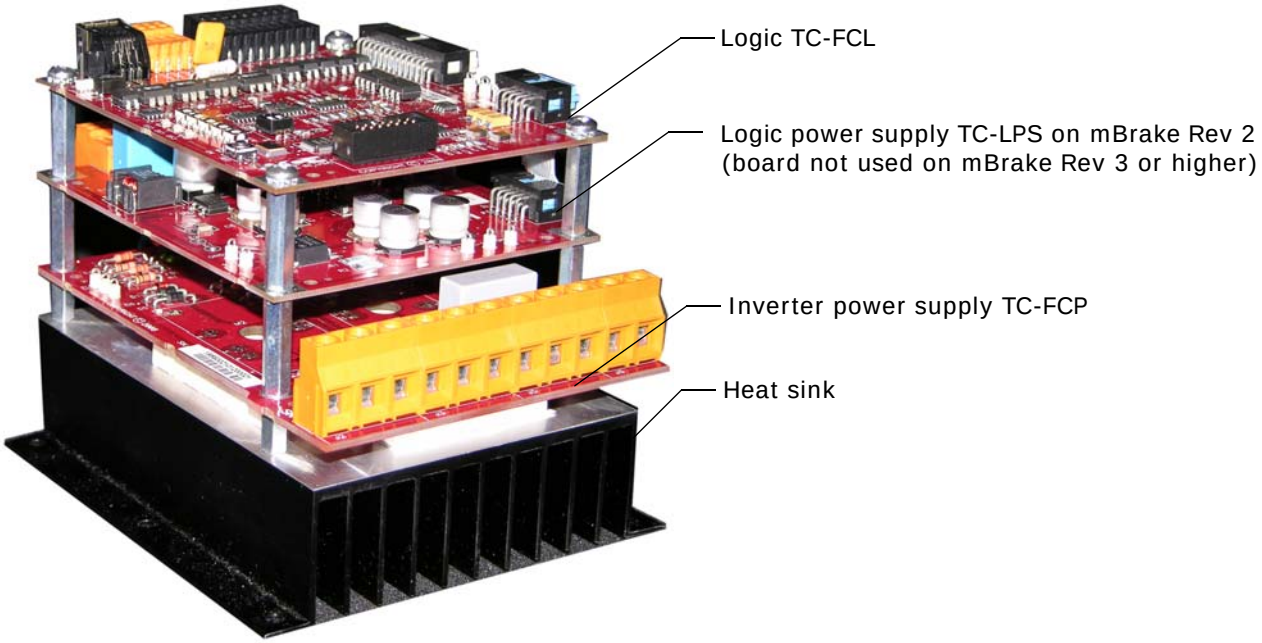
Brake Module

In a typical escalator machine brake control circuit, a fixed voltage is abruptly applied or removed to control the position of the brake. There is no control of the rate at which the brake moves — the command is simply on, or off. Control voltages are provided to pick, hold, and drop the brake.

A brake control module, used for permanent magnet, disk brake applications, allows the level of the control voltage to be adjusted. Modulated voltages provide control over the entire range of brake movement. The module provides the ability to control the rate at which the brake descends onto the braking surface. With this ability, brake control can be more subtle resulting in a smoother ride under all motion conditions in which the brake plays a part, saving energy, and reducing brake coil temperatures.

The MCE brake module can be controlled by discrete inputs or through a CAN interface. Discrete control provides compatibility with MCE legacy controls. If a machine has dual independent brakes with one being used as an unintended motion emergency brake and the other as the standard machine brake, two modules are required.

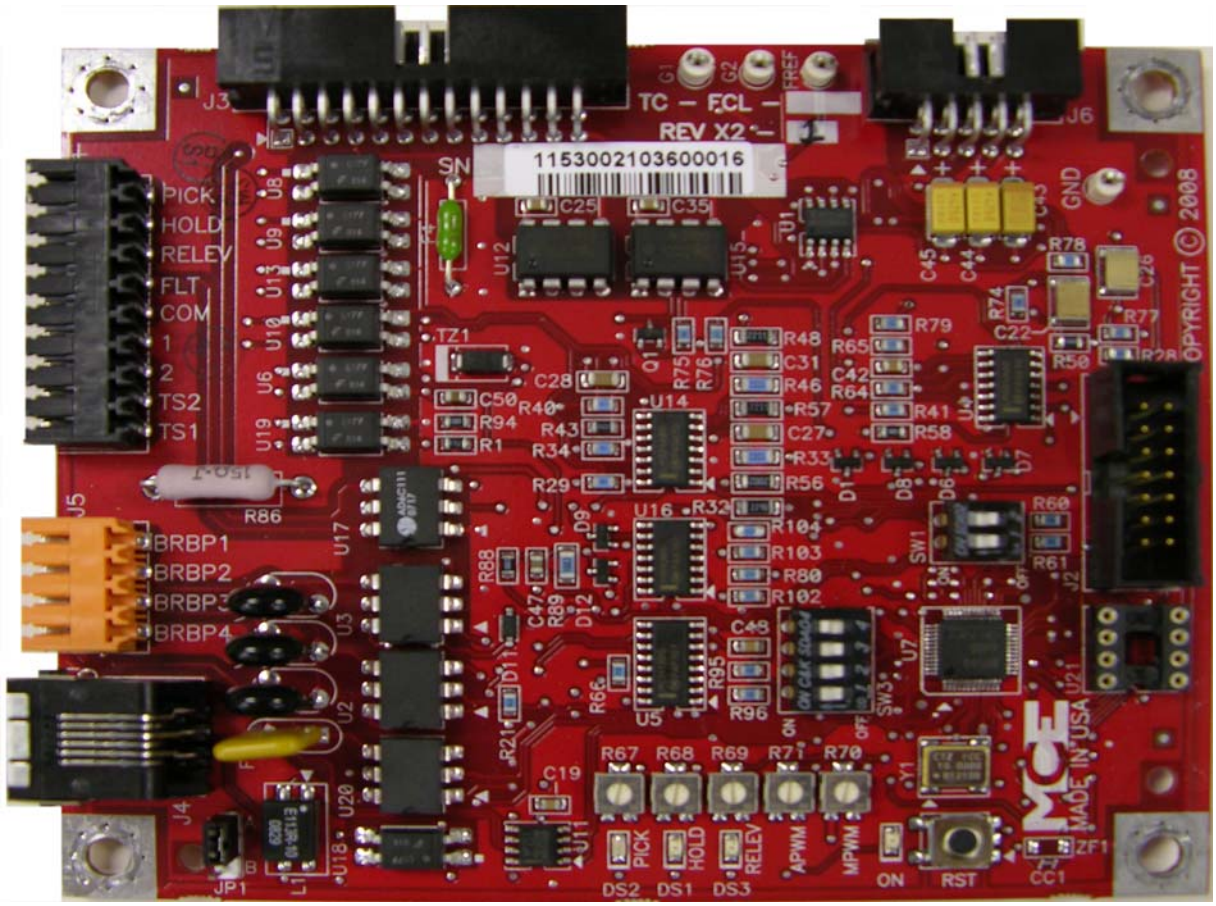
Figure 9. Motion Brake Module



Configuration

The top board, TC-FCL, provides the controls to configure the module for job requirements. Such configuration is completed at the factory when the module is shipped installed in a controller. If the module is a modification to an existing control, check this instruction for proper settings. If you are replacing an existing module, set up the new module to match.

Figure 10. Configuration



Switches and Jumpers

Table 22. SW1, Manual Bypass

2	1	Description
Off	Off	Manual brake pick enabled (will cause Main IGBT stuck open fault to be indicated until the brake contactor is picked to allow power to the brake module). In this mode, a manual brake pick switch connected between BRBP1 and BRBP3 will energize the brake coil connected between BRBP2 and BRBP4 and immediately lift the brake regardless of the status of the escalator controller.
Off	On	Unused
On	Off	Unused
On	On	Unused

The four switches of DIP switch SW3 function as two independent pairs. Switches 4 and 3 enable various software features. Switches 2 and 1 set the ID for the module. The ID identifies the module to the controller allowing it to be addressed and controlled independently of any other modules used (up to three).

Table 23. SW3 Module ID and Software Features

4	3	2	1	Description
		Off	Off	Brake module, ID=1 Primary brake module address
		Off	On	Brake module, ID=2 Secondary brake module address where module 1 controls the first brake coil and module 2 controls a second brake coil on the same machine.
		On	Off	Brake module, ID=3 Emergency brake module address
		On	On	Module, ID=4 Future
Off	Off			Standard mode
Off	On			Escalator mode.
On	Off			Enables software update from EEPROM chip inserted in socket U21
On	On			unused

Reset Switch The reset switch, RST, resets the logic board processor.

Jumper JP1 JP1 enables/disables the CAN termination resistor.

- A position: Terminates the CAN connection on the board.
- B position: Leaves the CAN termination open on the board (Normal position for this board).

ON LED

The ON LED next to the Reset switch is on solidly when the module is powered and functioning properly. The ON LED will blink if a fault condition is detected. Under fault conditions, the LED will blink a number of times, go dark for a period of time, and then repeat. The number of blinks indicates the fault detected.

Table 24. LED Fault Indication

Blinks	Fault	Description	Reset
1	Load over current	If load current goes above 20A during the first 5 seconds of operation or above 15A for 5 seconds during operation, over current will be reported and current will be limited to 15A.	Current reduction
2	Load over voltage	If load voltage goes above 310VDC for more than 5 seconds, over voltage condition will be reported through FLT output and voltage will be limited to 310V.	Voltage reduction
3	Aux IGBT stuck open	If the brake is in pick, hold, or relevel mode and the Aux IGBT monitoring circuit returns a high signal for 100mS or more, the Aux IGBT stuck closed fault will occur.	Discrete: Processor reset. CAN: Auto reset after 8 seconds.

Table 24. LED Fault Indication

Blinks	Fault	Description	Reset
4	Aux IGBT stuck closed	If the voltage across the Aux IGBT does not go high enough to trigger the Aux IGBT monitoring circuit during the dissipate mode, the Aux IGBT Stuck closed fault will occur. This fault is scanned for after the module switches from dissipate to inactive mode.	Discrete: Processor reset. CAN: Auto reset after 8 seconds.
5	Main IGBT stuck open	If the brake is in pick, hold, or relevel mode and there is less than 5 volts or 100mA across the coil for 200 mS or more, the IGBT stuck open fault will occur.	Discrete: Processor reset. CAN: Auto reset after 8 seconds.
6	Main IGBT stuck closed	If the brake is not in pick, hold, relevel, or dissipate mode and there is more than 10 volts or 2 Amps across the brake coil for 200 mS or more, the IGBT stuck closed fault will occur.	Discrete: Processor reset. CAN: Auto reset after 8 seconds.
7	Module overheat	The IGBT units on the bottom of the TC-FCP board generate heat when operating. A thermal sensor on the heat sink is connected to the module logic board through the TS1 and TS2 inputs. If the temperature becomes excessive, the logic module will generate a fault, pulling the FLT output to the Common connection level and alerting the controller.	Temperature reduction.
8	Trying to run in manual release mode	Manual brake pick is enabled.	Remove from manual brake pick mode.
9	Bypass button stuck closed	Brake bypass button stuck closed in manual pick mode.	Check button.
10	Not used		
CAN MODE ONLY			
11	Discrete input during CAN operation	Verify discrete pick, hold, and relevel inputs to J1 are not used when CAN control is active.	Auto reset after 8 seconds.
12	Module address error.	Verify SW1 positions for each module. SW3 Module ID and Software Features on page 1-65.	Auto reset after 8 seconds.
13	Not calibrated	Module has not been calibrated	Calibrate module
14	Load undercurrent	Current <80% of learned	Auto reset after 8 seconds.
15	Load undervoltage	Voltage <80% of intended	Auto reset after seconds.
Continuously	CAN disconnected	CAN to module disconnected	Troubleshoot connection

Module Connectors Per Board

Top Board, TC-FCL

This section provides information about user-accessible module connections.

Table 25. J1 Pin Assignment

Pin	Function
PICK	Discrete Pick control input from controller (V AC/DC)
HOLD	Discrete Hold control input from controller (V AC/DC)
RELEV	Discrete Relevel control input from controller (V AC/DC)
FLT	Overload fault output
COM	Common connection for PICK, HOLD, RELEV, FLT
1	1 Bus (common) from escalator controller
2	2 Bus (120VAC) from escalator controller
TS2	Thermal switch input from sensor on module heat sink
TS1	Thermal switch input from sensor on module heat sink

J4, J5 J4 is a modular, CAN connector for serial module control. (See preceding information about termination enabling jumper JP1.) J5 provides auxiliary connections that can be used to directly lift the machine brake, regardless of controller status.

Table 26. J5 Auxiliary Brake Connections

Pin	Function
BRBP1	With BRBP3, connects to auxiliary brake pick switch
BRBP2	With BRBP4, energizes brake coil when active
BRBP3	With BRBP1, connects to auxiliary brake pick switch
BRBP4	With BRBP2, energizes brake coil when active

The level of the pick voltage is adjusted using potentiometer R67. The maximum pick voltage range is determined by input voltage to the module and whether the input connection is single phase, FCL1/FCL2, or three phase, FCL1/FCL2/FCL3.

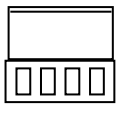
J3 J3 provides control signals to the TC-FCP board and accepts feedback voltages from the TC-FCP board.

J6 On mBrake Rev 2 or lower, J6 accepts DC power voltages from the logic power supply board (TC-LPS).

J6 On mBrake Rev 3 or higher, J6 accepts 24v external power only when the CAN bus is not used.

Middle Board, TC-LPS (used only on mBrake Rev 2 or lower)

1 and 2 bus power connections from the controller are connected to TC-LPS connector J1. As viewed from the front of the connector, pinout is:



This board provides DC power to the logic board through connector J2.

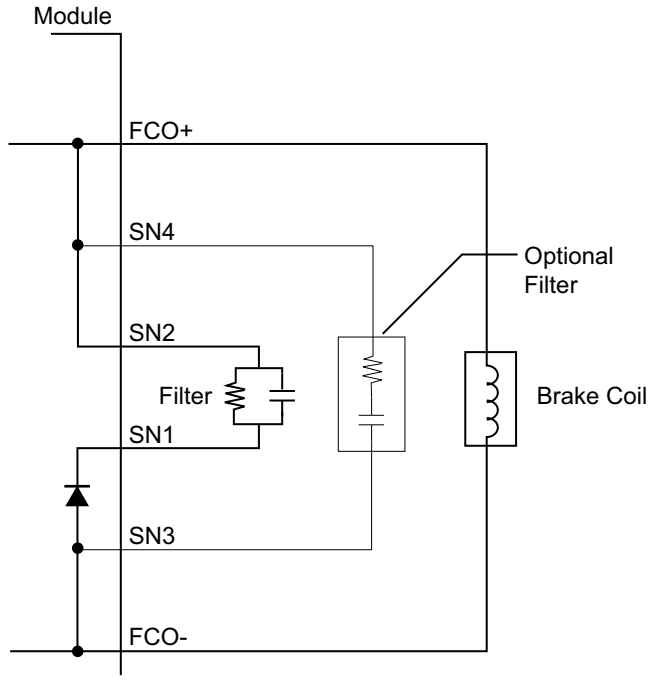
Bottom Board, TC-FCP

The FCP board transforms AC input power (single or three phase) into the DC output voltage required to control the brake. The in-line connectors on the board are sized to handle higher voltage and current.

Table 27. In-Line Connectors Pin Assignment

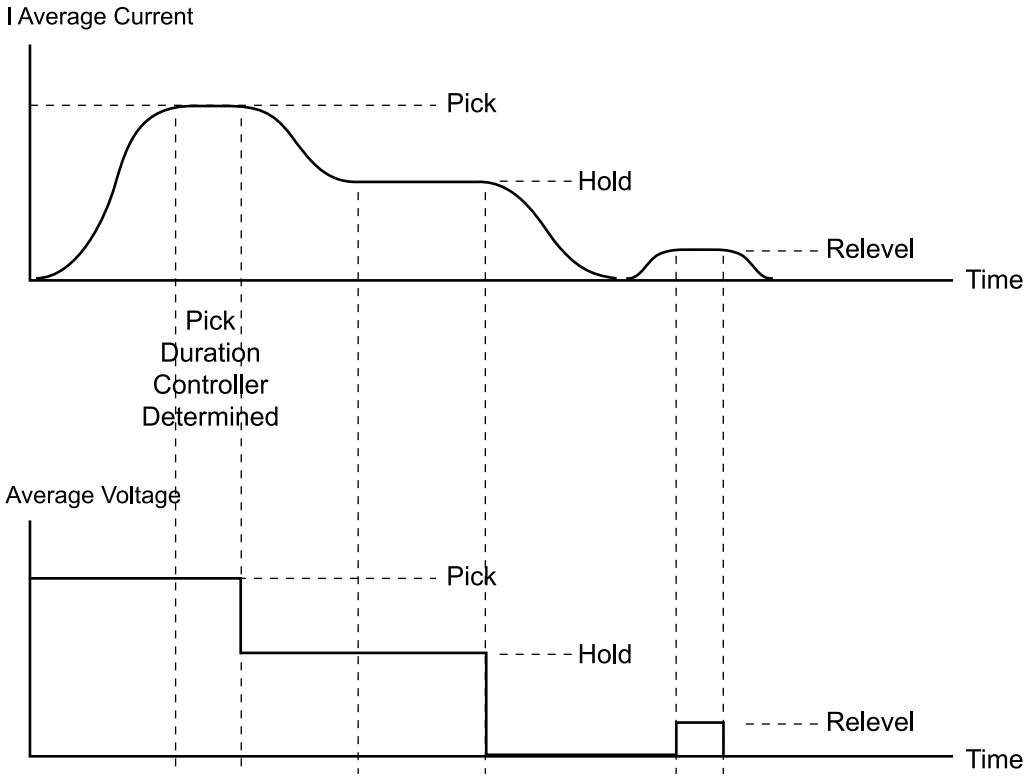
Pin	Function
J2, SN1	With SN2, connection point for external filter provided with unit
J2, SN2	With SN1, connection point for external filter provided with unit
J2, SN3	With J3, SN4, connection point for user-provided external filter
J3, SN4	With J2, SN3, connection point for user-provided external filter
J3, FCO-	With FCO+, provides power to energize brake coil under normal logic conditions
J3, FCO+	With FCO-, provides power to energize brake coil under normal logic conditions
J5, DT1	Factory Only. Production testing.
J5, DT2	Factory Only. Production testing.
J5, FCL1	AC input, with J6, FCL2 for single-phase use or J6, FCL2/FCL3 for three-phase use
J6, FCL2	AC input, with J5, FCL1 for single-phase use or J5, FCL1/J6 FCL3 for three-phase use
J6, FCL3	AC input, with J5, FCL1 and J6, FCL2 for three-phase use.

Figure 11. External Filtering



Timing

Figure 12. Brake Timing Diagram



Adjustment

Typically, the module will have been pre-installed and connected at the factory. If you are replacing an existing module, mount this module in the same location and follow the controller job prints to make electrical connections.

This module may be used with TC-FCL board DIP switch 3, rockers 3 and 4 set to standard or escalator mode. See “SW3 Module ID and Software Features” on page 65 . If in standard mode, adjust as below. If in escalator mode, see “Escalator Mode” on page 71.

Trim pots and Function (Discrete Control Only)

Potentiometer settings are used primarily when the module is being controlled through the discrete connections.

- R67, Brake Pick Voltage (maximum output to lift brake), LED lights
- R68, Brake Hold Voltage (percentage of Pick Voltage), LED lights
- R69, Brake Relevel Voltage (percentage of Pick Voltage), LED lights
- R70, Brake Drop Rate (clockwise = faster)
- R71, Brake Pick Rate (clockwise = faster)

Setup for Adjustment

1. Disconnect power to the controller.
2. Discrete control only. Rotate trim pots R67, 68, and 69 counter-clockwise to locate the begin stop, then clockwise to locate the end stop. Then set to the approximate center position.
3. Connect Brake outputs FCO+/FCO- and BRBP2/BRBP4 (if used) as shown in your job drawings. These connections are probably made from the module to a panel-mount connector and from the panel-mount connector to the brake.
4. Connect the brake filter across SN1/SN2 as shown on the job prints. Connect the input 3- or single-phase power as shown in the job prints.
5. Connect control inputs from escalator controller as shown in your job prints (CAN or Discrete control).
6. Connect a volt meter across the brake coil.

Discrete Control Adjustment

Check that there is no CAN connection to the brake module. This procedure is for discrete voltages control.

1. Apply power to the controller. Place the escalator on Inspection operation and pick a direction.
2. With the brake picked, adjust R67 to attain the brake manufacturer pick voltage. Verify that the brake picks cleanly.
3. After the brake settles to hold position, adjust R68 to attain manufacturer hold voltage. Verify that the brake is not dragging.
4. Disconnect power from the controller.

CAN Control Adjustment

1. Apply power to the controller. Place the escalator on Inspection.
2. Pick a run direction. Verify that the brake picks cleanly. If not, readjust pick voltage and retry.
3. After the brake settles to hold position, verify that the brake is not dragging. If necessary, readjust hold voltage and retry.

Only if a Manual Brake Pick Button is Used with CAN Control If a manual brake pick button is used on this job, pick voltage applied when the button is active is determined by FCL potentiometer R67. To adjust:

1. On Inspection, move to mid-point position of travel to allow the steps to safely drift up or down when the brake is picked.
2. Set SW1 to enable manual pick.
3. Press the manual pick button, observe brake pick while adjusting R67 to minimum required voltage for clean pick action.
4. Release the manual pick button. Take SW1 off manual pick mode.

Escalator Mode

When the module is set up for escalator applications:

- Relevel LED will light when brake is dropping.
- R70 adjusts drop time.
- R67 adjusts pick voltage.

After one second, the main IGBT is forced open. The brake will be fully dropped after one second.

Software Level Verification

To verify software level when the module is in escalator mode:

1. Power up the controller (or press the RESET button on the module).
2. LEDs Pick, Hold, and Relevel will flash the software level in binary format.

PICK LED is the MSB; RELEVEL LED is the LSB. For example, if the software level were 3.7.0, the LEDs would flash:

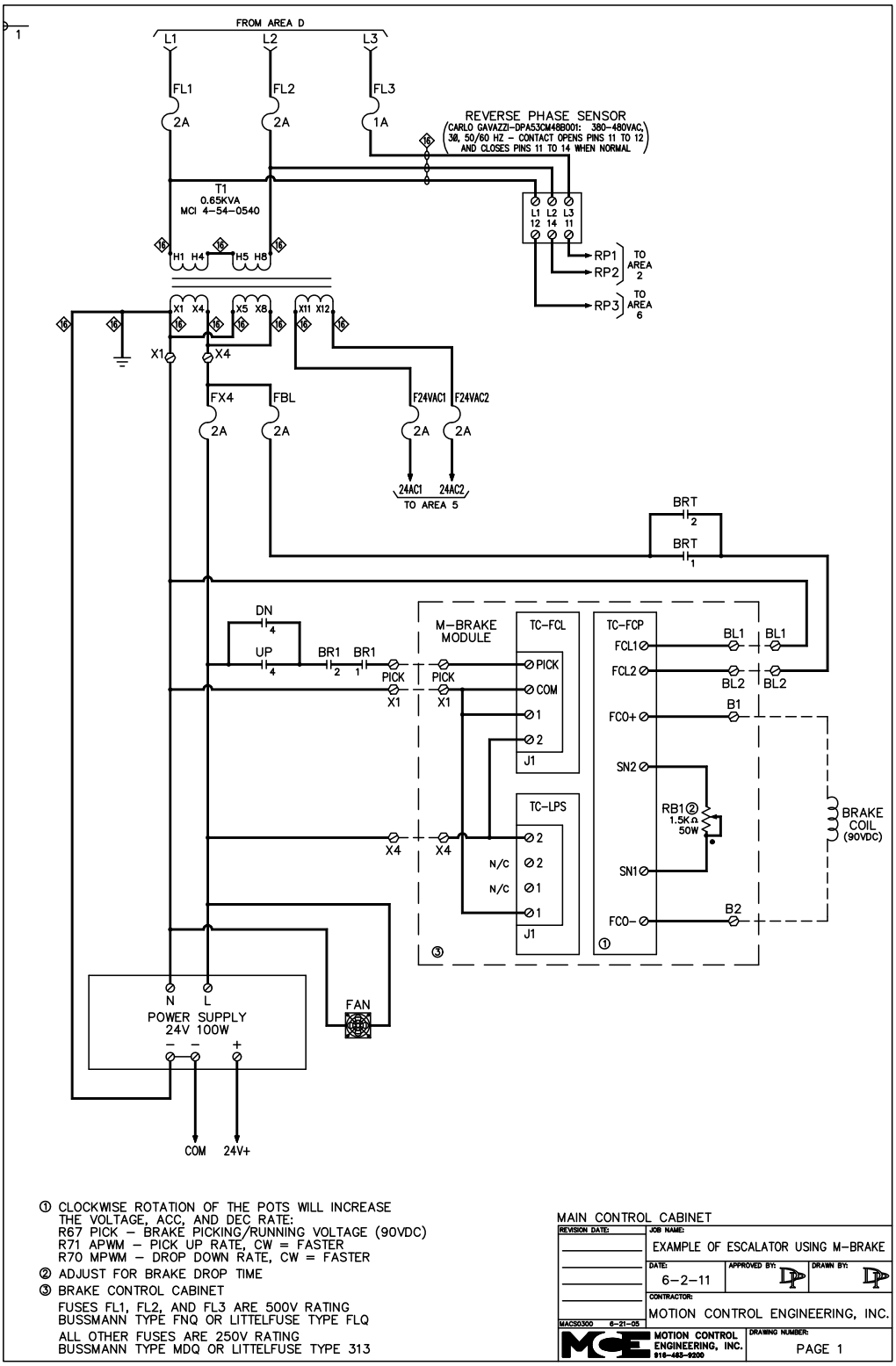
Table 28. Escalator Software Level

PICK	HOLD	RELEVEL	Flash Sets	Value
OFF	ON	ON	First	3
ON	ON	ON	Second	7
OFF	OFF	OFF	OFF	0

Typical mBrake Installation

Typical mBrake connection is illustrated below.

Figure 13. mBrake Connection



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