Strong. Smart. Beautiful.

1000320 Rev 2 4/18/06

T5x Error Codes

DGC5X Console Board W/ ACD3X LCB

Table of Contents **Page #**

Error Code Description **2**

Service Information **2-3**
- **Serial Number Information** **2**
- **Manager Mode & Engineering Mode** **2**
- **Service 5 Mode Details** **2-3**

Elevation Movement Related Errors **4-12**
- **E1 Reverse Elevation Pot** **5-6**
- **E1 Corrective Action Parts Needed** **7**
- **E2 Elevation Out of Range** **8-9**
- **E2 Corrective Action Parts Needed** **10**
- **E3 Elevation Stall** **11**
- **E3 Corrective Action Parts Needed** **12**

Speed Movement Related Errors **13-23**
- **E5 Over Speed** **14**
- **E5 Corrective Action Parts Needed** **15**
- **E6 Runaway Belt** **16**
- **E6 Corrective Action Parts Needed** **17**
- **E7 Speed Sensor Feedback Missing** **18**
- **E7 Corrective Action Parts Needed** **19**
- **E9 Speed Range** **20**
- **E9 Corrective Action Parts Needed** **21**
- **Speed Feedback Issue Corrective Action** **22**
- **Speed Feedback Issue Corrective Action Parts Needed** **23**

Operational Errors **24-28**
- **E16 Stuck Key Pad** **25**
- **E16 Corrective Action Parts Needed** **25**
- **E18 Safety Switch Test Failure** **26**
- **E18 Corrective Action Parts Needed** **27**
- **E19 NOVRAM Failure** **28**
- **E19 Corrective Action Parts Needed** **28**

LCB DFR Error Log **29-31**
- **E40 Registered error code sent from the motor control board** **29-30**
- **ACD3X LCB Blink LED Error Codes** **30-31**

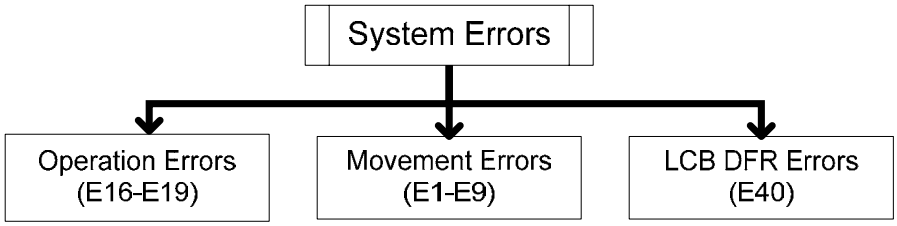
Notes:

If there are any safety concernes please call the Matrix Fitness Systems Service Department at 866-693-4863 before performing any service.

Please make sure to take any saftey percautions before performing any service.
Unplug any electrical power cords before touching any electrical components.
Use common sense before performing any electrical service.
Do not touch any component that is "hot" or looks to be "hot".

ERROR CODES

Errors are divided in elevation related errors (E1 – E3) ,speed related errors (E5 – E9) or Operation Errors (E16-E19), LCB DFR Errors (E40)
System should be properly calibrated (if possible) before attempting to troubleshoot error codes.



The following table contains standard error codes. Other error codes are enabled for development purposes but cannot be remedied via engineering variables. Error codes above 9 require toggle of system power to reset. Error codes 9 and below can be remedied in some conditions by system calibration.

CODE	DESCRIPTION
1	Reverse Elevation Pot
2	Elevation Out Of Range
3	Elevation Movement Stall
5	Over-Speed
6	Runaway Belt
7	Speed Sensor Feedback Missing
9	Speed Range (usually caused by calibration)
16	Stuck Key Error
18	Safety Switch Test Failure
19	NOVRAM Failure
40	Drive Fault Error

Service Information

For faster service please have the following information ready.

Serial Number
Production Date:
This information is located on the front of the elevation rack.

Recording Information Needed from Manager Mode, Engineering Mode, & Service Mode

- To enter Manager Mode hold down the Rolling & Manual Keys for 3 seconds.
- To enter ENG Mode hold down the Rolling & Manual Keys for 10 seconds.
  You will need to press Enter to select the specific function you are looking for.

- Enter the Service 5 Display and Record the Last 5 Error Codes. This is needed for future diagnostic use.
  1. Enter Manager Mode by hold down the Rolling & Manual Keys for 3 seconds MANAGER is displayed.
  2. Use the Speed Up Arrow to move to SERVICE. Press Enter.
  3. Use the Speed Up Arrows to move to SERVICE 5 and press Enter.
  4. Use the Speed Down Arrow Key to cycle through the list of Errors.
  5. Please record the last 5 Errors that occurred, you will also need to record the error detail. To do this you need to use the Elevation Up Arrow to cycle through the details of each selected error.

  Please record the Errors as they are displayed on the console.

E 5 – ERROR LOG DETAILS

DOT MATRIX
Blank

ALPHA NUMERIC
Displays text describing the value displayed in the time window. Current displayed values:
1. "ERROR CODE" – flagged error code
2. "TARGET SPD" – target speed at the time of the error (1/10 MPH)
3. "ACTUAL SPD" – actual speed at the time of the error (1/100 MPH)
4. "TARGET PWM" – target belt PWM at the time of the error (ticks)
5. "ACTUAL PWM" – actual belt PWM at the time of the error (ticks)
6. "TARGET ELV" – target elevation at the time of the error (1/10 percent grade)
7. "ACTUAL ELV" – actual elevation at the time of the error (a/d ticks)
8. "TIME TOTAL" – target program run time (in minutes)
9. "TIME EXP" – expired program time (in seconds, only accumulated while belt is running)
10. "SCREEN" – screen program was on when error occurred.

SEVEN SEGMENTS
- Elevation – Displays current number of errors
- Speed – Displays current error index (higher number more recent, flashes on and off)
- Distance – Displays the logged error code
- Time – Displays the value of the logged error parameter (see ALPHANUMERIC description above for details on the unit value).

DISCRETE
Start, elevation and speed LED's flash on and off

KEYS
- Elevation Up/Down - Scrolls through the error parameters for the currently displayed error
- Speed Up/Down Keys – Scrolls through the error codes and resets the error parameter to the first value
- Stop Key (pressed) – Jumps back one level
- Start Key – Resets error counter (clears out errors and error count)

MATRIX
SERVICE 1

MATRIX
SERVICE 5

MATRIX
ERROR CODE

MATRIX
TARGET SPD

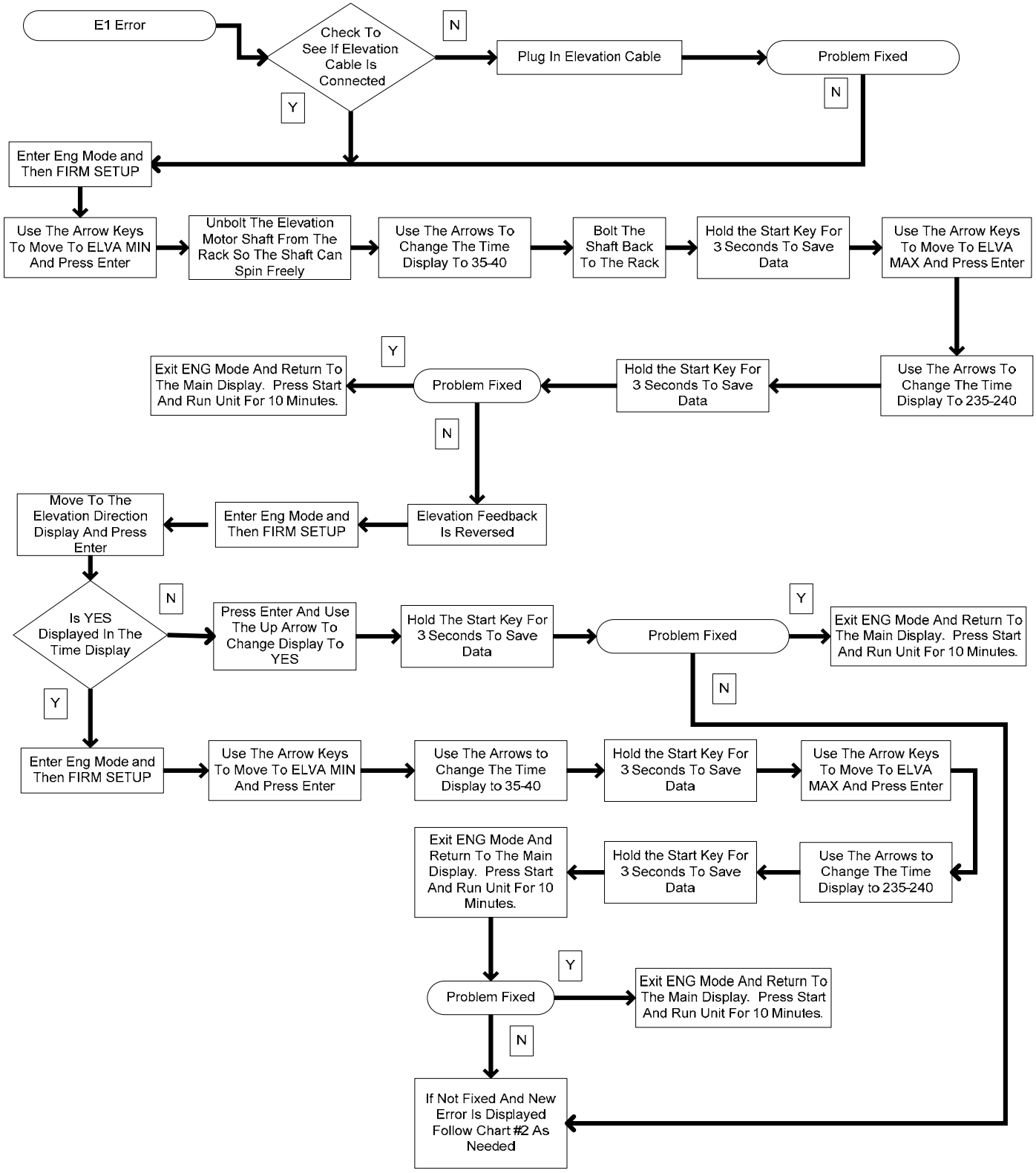
ELEVATION MOVEMENT RELATED ERRORS

E1 - Reverse Elevation Pot

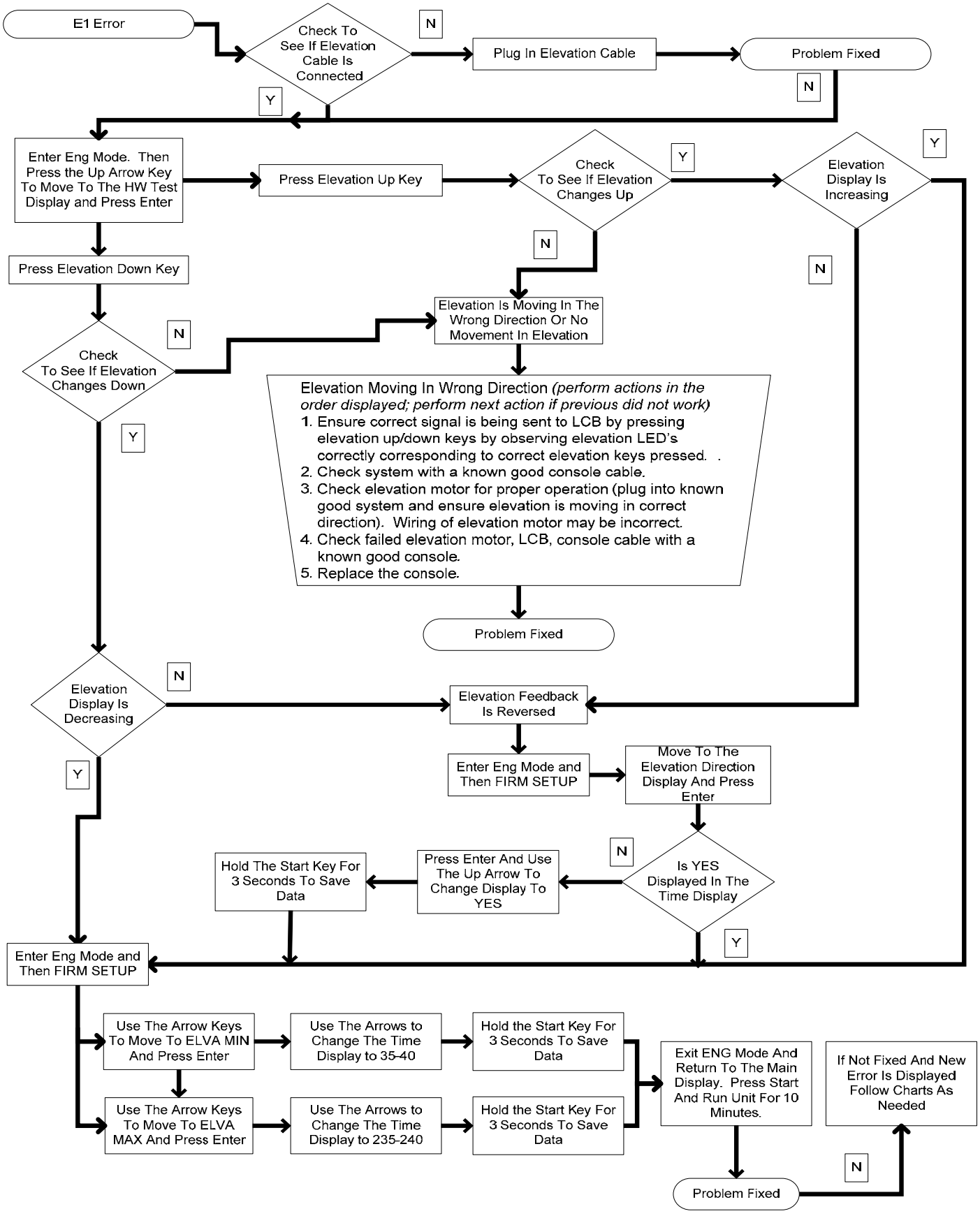
OVERVIEW

When elevation movement is commanded (e.g. elevation up) the elevation position feedback is expected to change in the correct direction (e.g. increase in pot value for an elevation up command). If the elevation position feedback changes in the opposite of the expected direction (e.g. elevation command up and elevation feedback decreases) a reverse elevation error (E1) is flagged.

Solution Flow Chart # 1



Solution Flow Chart # 2

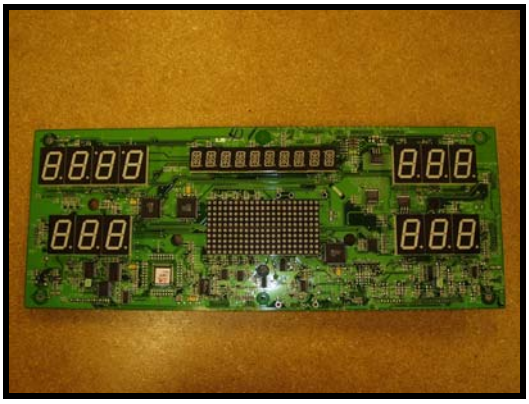


E1 CORRECTIVE ACTION PARTS NEEDED

Part Number: SCD301017A
Description: J-Star Incline Motor 110v (T4, T5, T5x)
Drawing Number: M02

Part Number: MC0522005N
Description: Console Cable (T4, T5, T5x)
Drawing Number: P03

Part Number: SJFD06003A
Description: Motor Controller ACD3X, 110v (T5x)
Drawing Number: M08



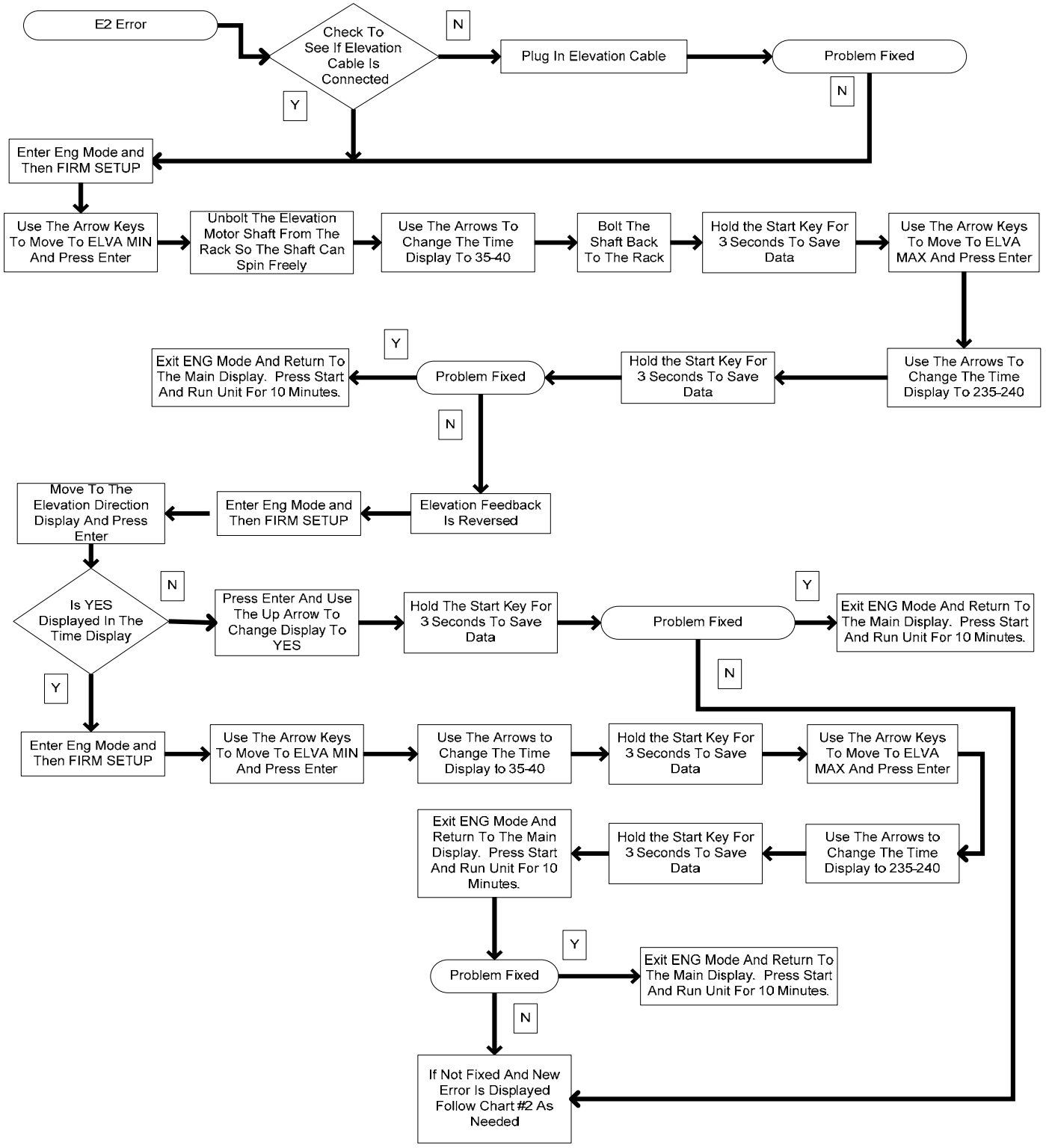
Part Number: DGC5X
Description: Console Control Board (T4, T5, T5x)
Drawing Number: N02

E2 – Elevation Out Of Range

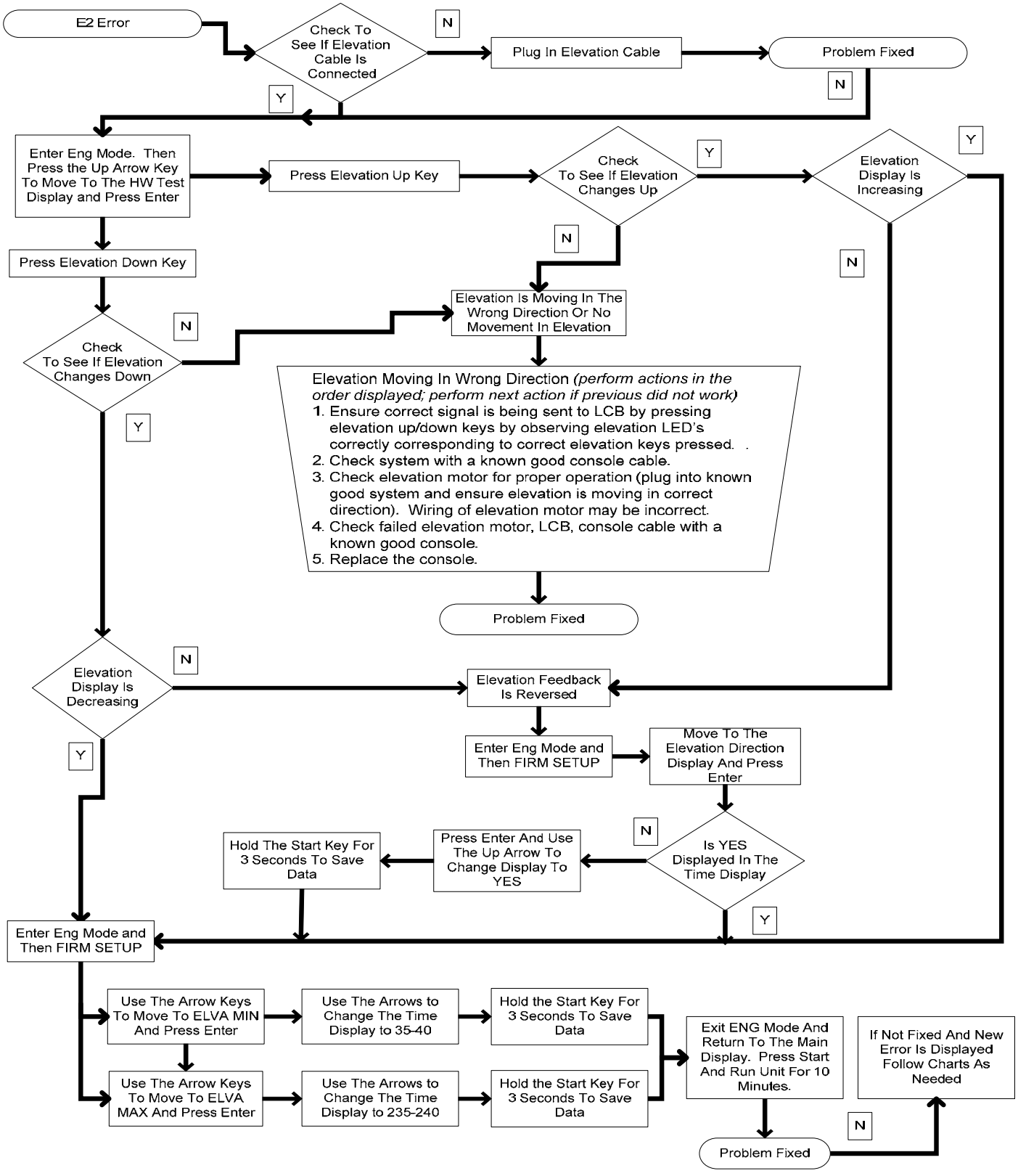
OVERVIEW

To prevent the elevation from stalling at the lower travel end or running off on the top end of travel the elevation position feedback is monitored. If the elevation position feedback is lower than expected (e.g. < 10) or higher than expected (e.g. > 250) then an E2 is called.

Solution Flow Chart # 1



Solution Flow Chart # 2

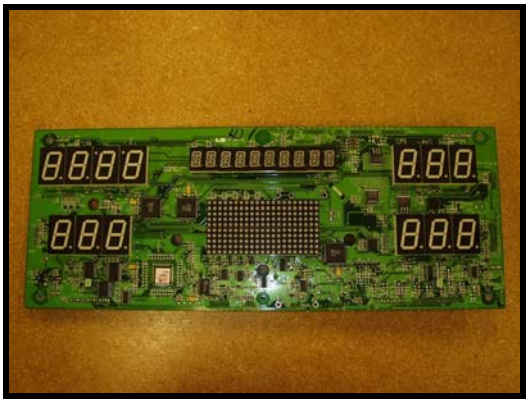


E2 CORRECTIVE ACTION PARTS NEEDED

Part Number: SCD301017A
Description: J-Star Incline Motor 110v (T4, T5, T5x)
Drawing Number: M02

Part Number: MC0522005N
Description: Console Cable (T4, T5, T5x)
Drawing Number: P03

Part Number: SJFD06003A
Description: Motor Controller ACD3X, 110v (T5x)
Drawing Number: M08



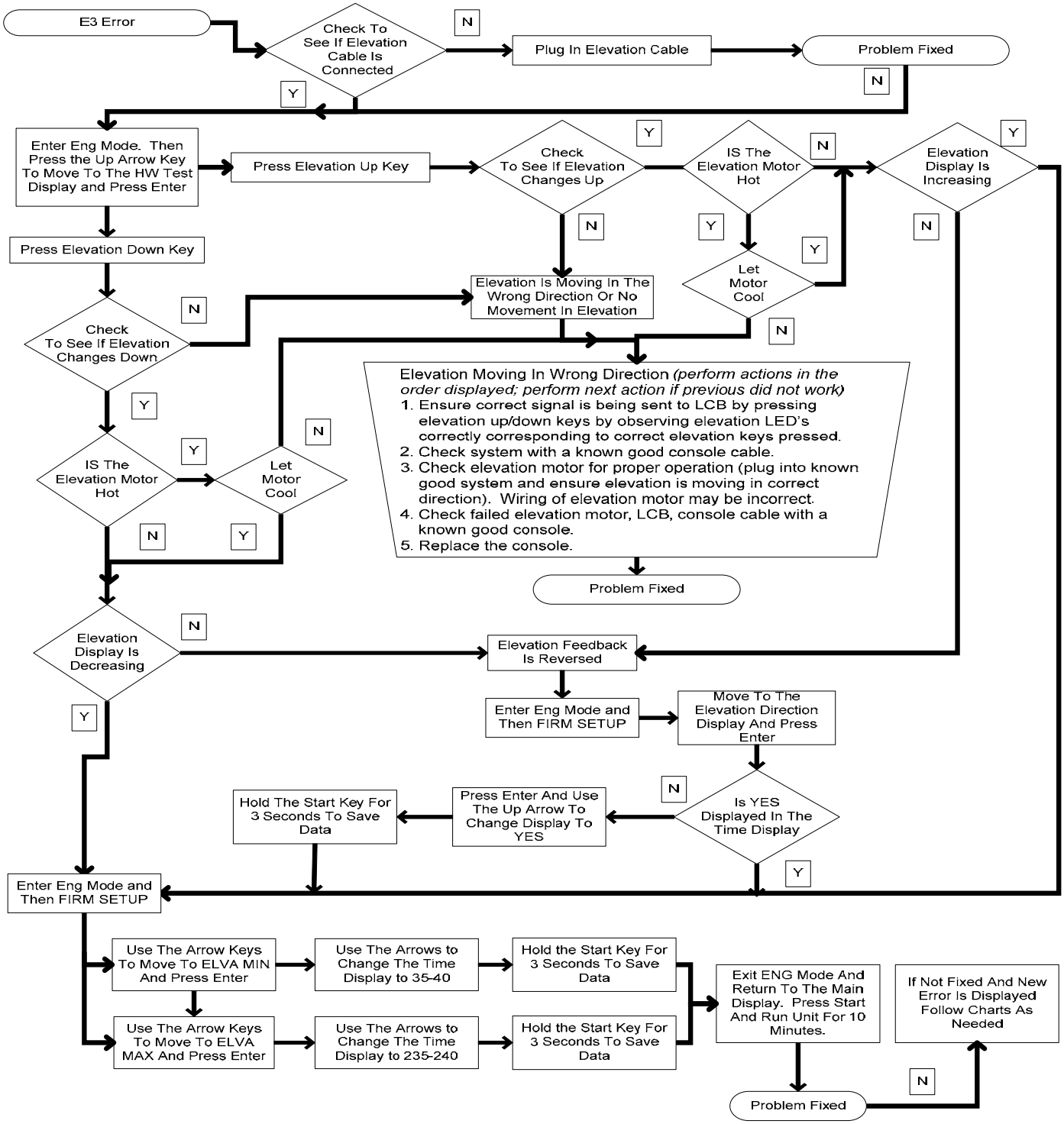
Part Number: DGC5X
Description: Console Control Board (T4, T5, T5x)
Drawing Number: N02

E3 – Elevation Stall

OVERVIEW

To reduce the risk of elevation motor/system damage or overheating in the event of a stall elevation stall conditions are monitored. If movement is commanded and the position feedback indicates no movement-taking place an elevation stall error is called. This problem has been caused most frequently by overheated elevation motor.

Solution Flow Chart

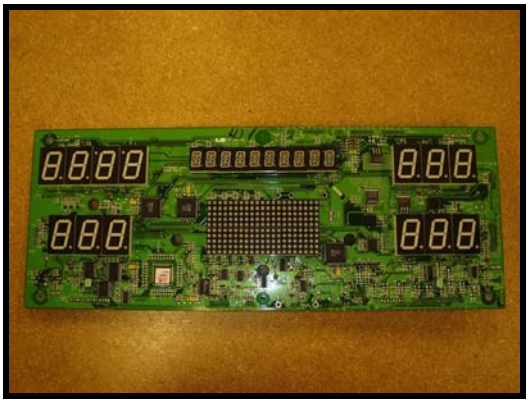


E3 CORRECTIVE ACTION PARTS NEEDED

Part Number: SCD301017A
Description: J-Star Incline Motor 110v (T4, T5, T5x)
Drawing Number: M02

Part Number: MC0522005N
Description: Console Cable (T4, T5, T5x)
Drawing Number: P03

Part Number: SJFD06003A
Description: Motor Controller ACD3X, 110v (T5x)
Drawing Number: M08



Part Number: DGC5X
Description: Console Control Board (T4, T5, T5x)
Drawing Number: N02

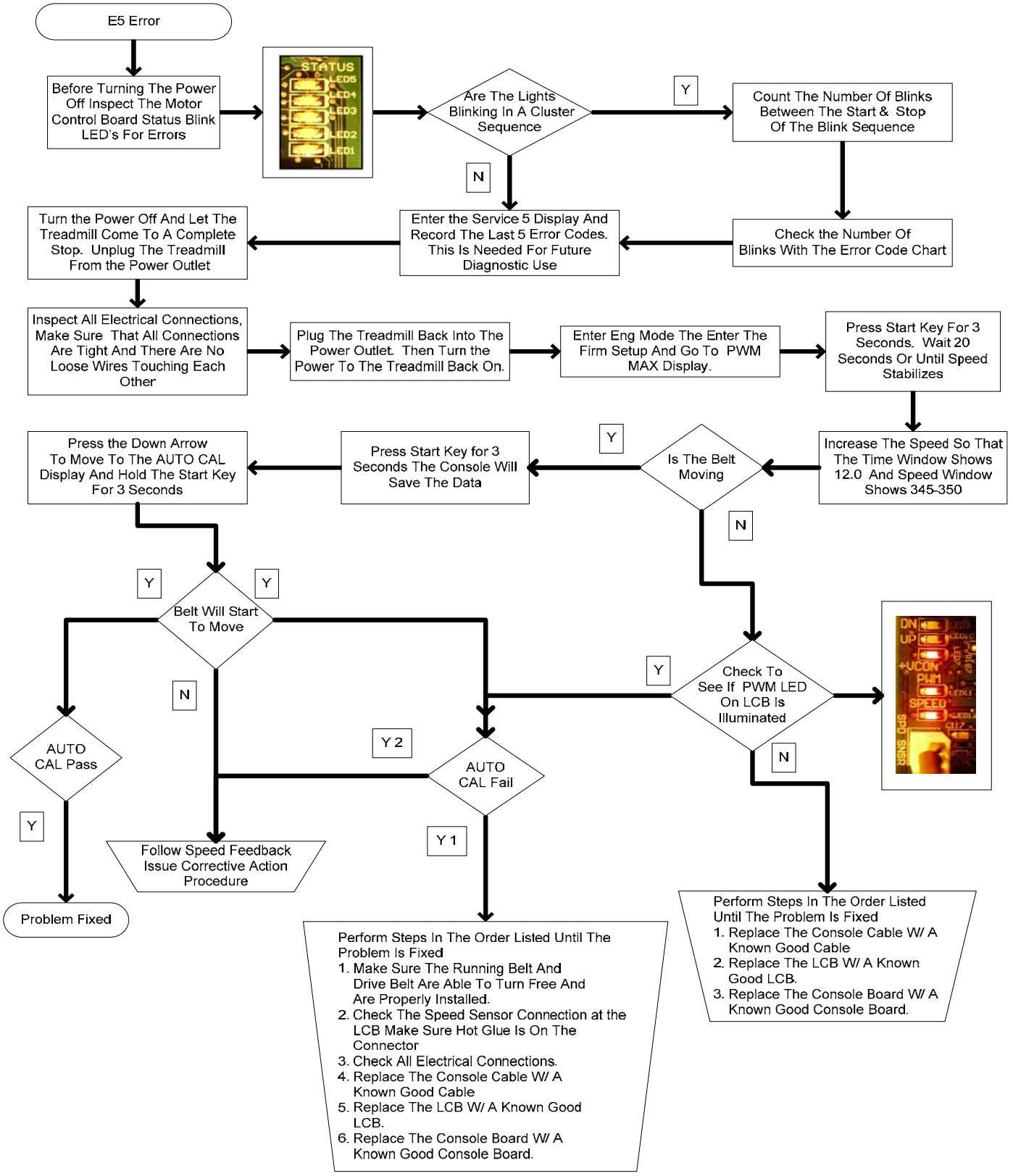
SPEED MOVEMENT RELATED ERRORS

E5 – Over-speed Error

OVERVIEW

If the actual speed from the speed sensor exceeds the system maximum speed by a limit (currently 2 MPH) an over-speed error occurs (E5).

Solution Flow Chart



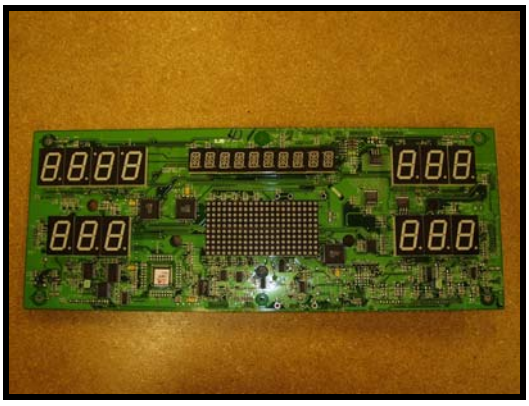
E5 CORRECTIVE ACTION PARTS NEEDED

Record parameter information recorded with this error for future analysis.
Speed Feedback Issues – See speed feedback issue trouble shooting guide in *the CORRECTIVE ACTION PROCEDURES – Speed Issues* section of this document.

Part Number: SCB001301
Description: Speed Sensor (T5x)
Drawing Number: JAM03

Part Number: MC0522005N
Description: Console Cable (T4, T5, T5x)
Drawing Number: P03

Part Number: SJFD06003A
Description: Motor Controller ACD3X, 110V T5X (T5x)
Drawing Number: M08



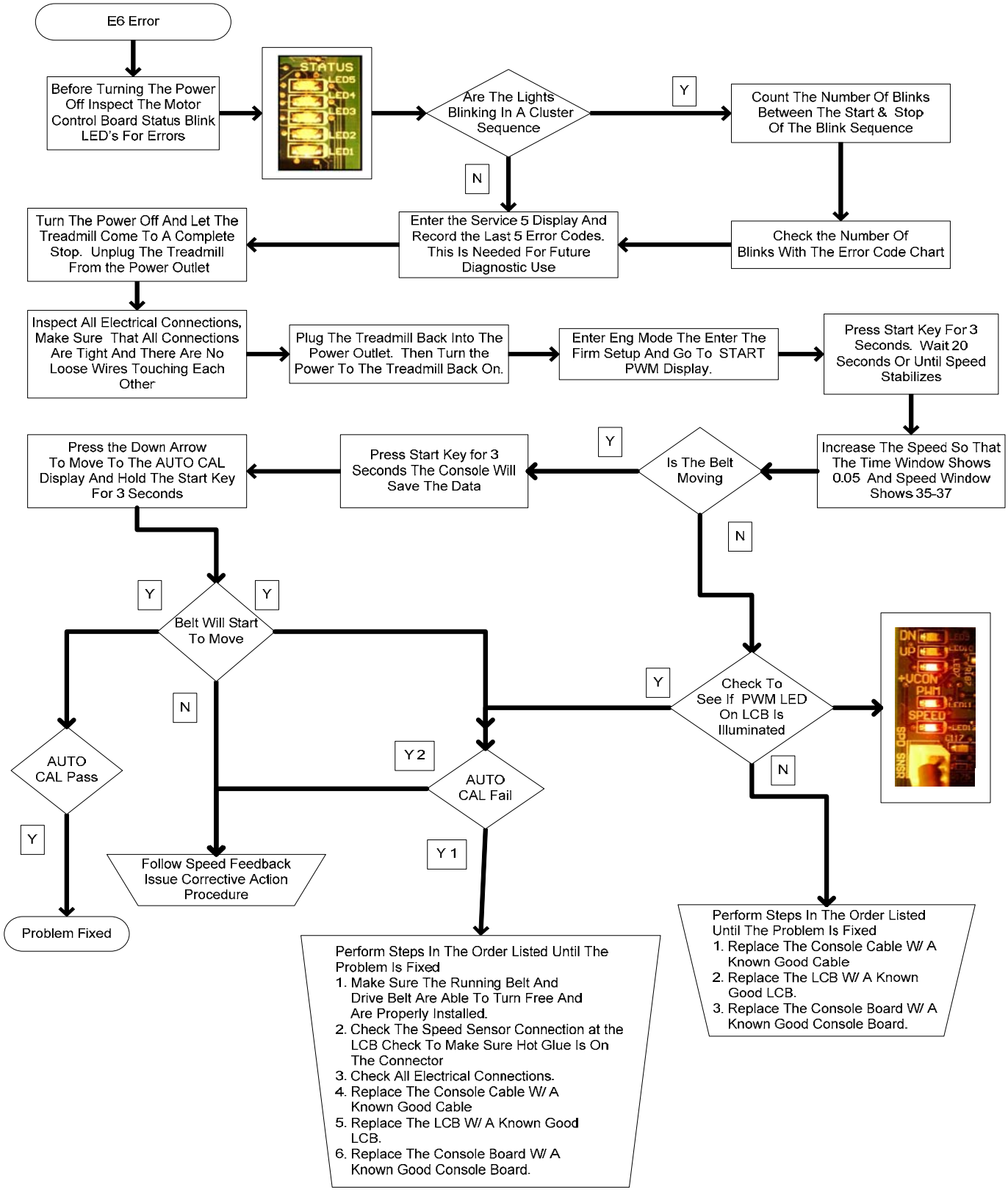
Part Number: DGC5X
Description: Console Control Board (T4, T5, T5x)
Drawing Number: N02

E6 – Runaway Belt Error

OVERVIEW

If the actual belt speed is greater than the target speed by a limit and increasing then an E6 error is called. E6 errors flag errors that will result in the belt "running away" or not responding to input.

Solution Flow Chart



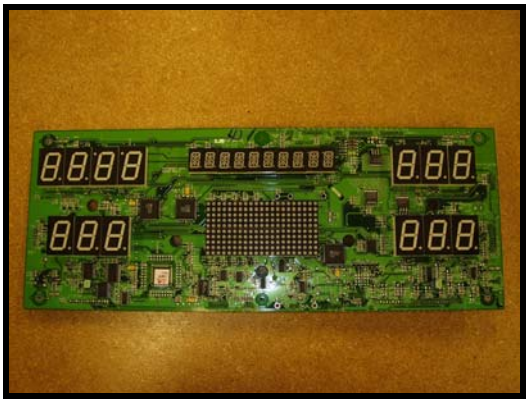
E6 CORRECTIVE ACTION PARTS NEEDED

Speed Feedback Issues – See speed feedback issue trouble shooting guide in *the CORRECTIVE ACTION PROCEDURES – Speed Issues* section of this document.

Part Number: SCB001301
Description: Speed Sensor (T5x)
Drawing Number: JAM03

Part Number: MC0522005N
Description: Console Cable (T4, T5, T5x)
Drawing Number: P03

Part Number: SJFD06003A
Description: Motor Controller ACD3X, 110V T5X (T5x)
Drawing Number: M08



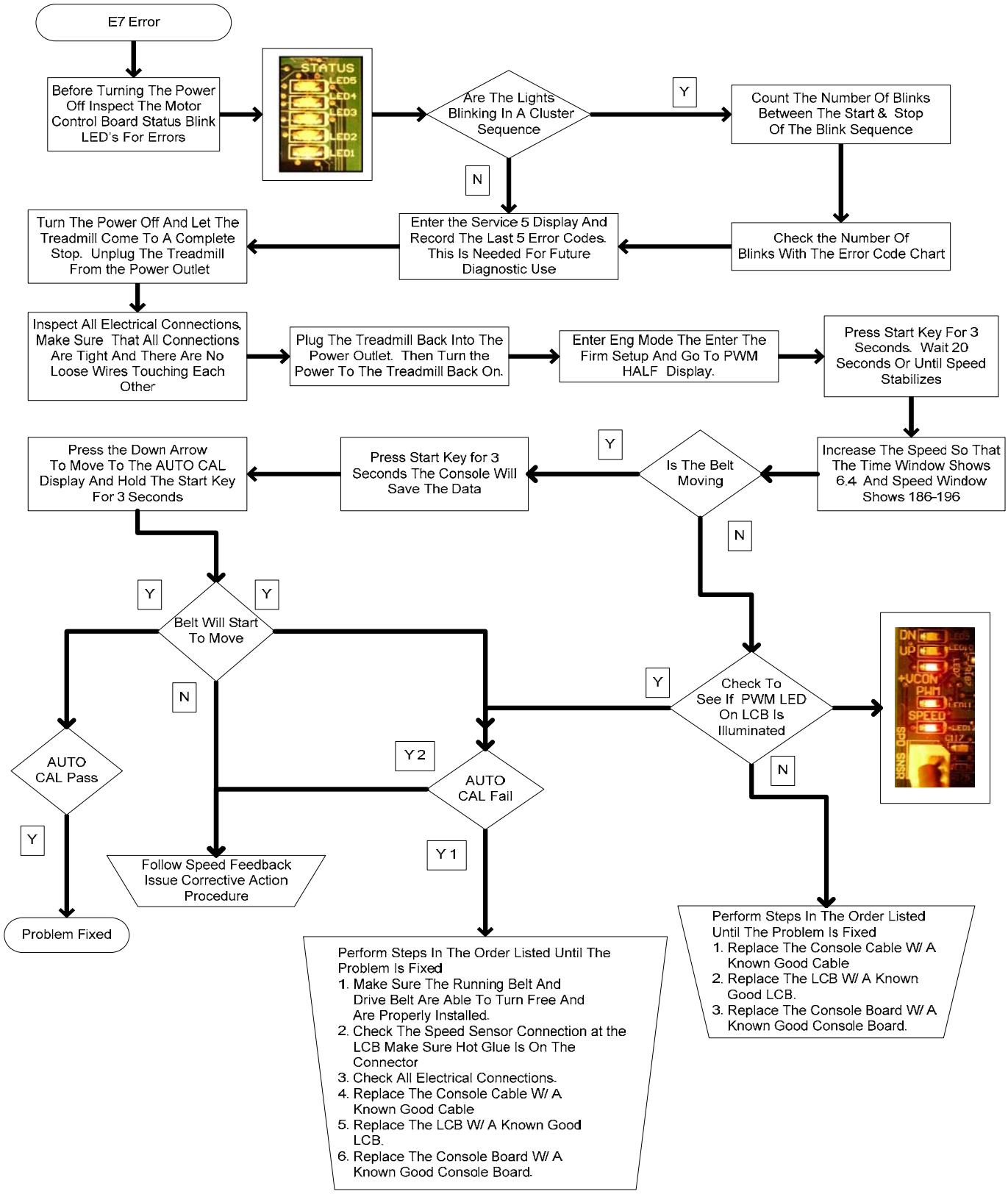
Part Number: DGC5X
Description: Console Control Board (T4, T5, T5x)
Drawing Number: N02

E7 – Speed Sensor Missing Error

OVERVIEW

If no belt movement is detected several seconds after commanding belt movement a speed stall error (E7) is called. First turn the power off and then back on and the error will be removed. Next check the SOFTWARE VERSION. If software is below 2.6 then upgrade console to 3.8. This will be a new console preprogrammed to new version and then sent out.

Solution Flow Chart



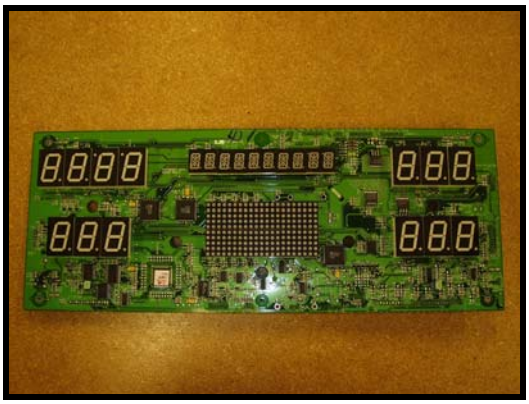
E7 CORRECTIVE ACTION PARTS NEEDED

Speed Feedback Issues – See speed feedback issue trouble shooting section in *the CORRECTIVE ACTION PROCEDURES – Speed issues* section of this document.

Part Number: SCB001301
Description: Speed Sensor (T5x)
Drawing Number: JAM03

Part Number: MC0522005N
Description: Console Cable (T4, T5, T5x)
Drawing Number: P03

Part Number: SJFD06003A
Description: Motor Controller ACD3X, 110V T5X (T5x)
Drawing Number: M08



Part Number: DGC5X
Description: Console Control Board (T4, T5, T5x)
Drawing Number: N02

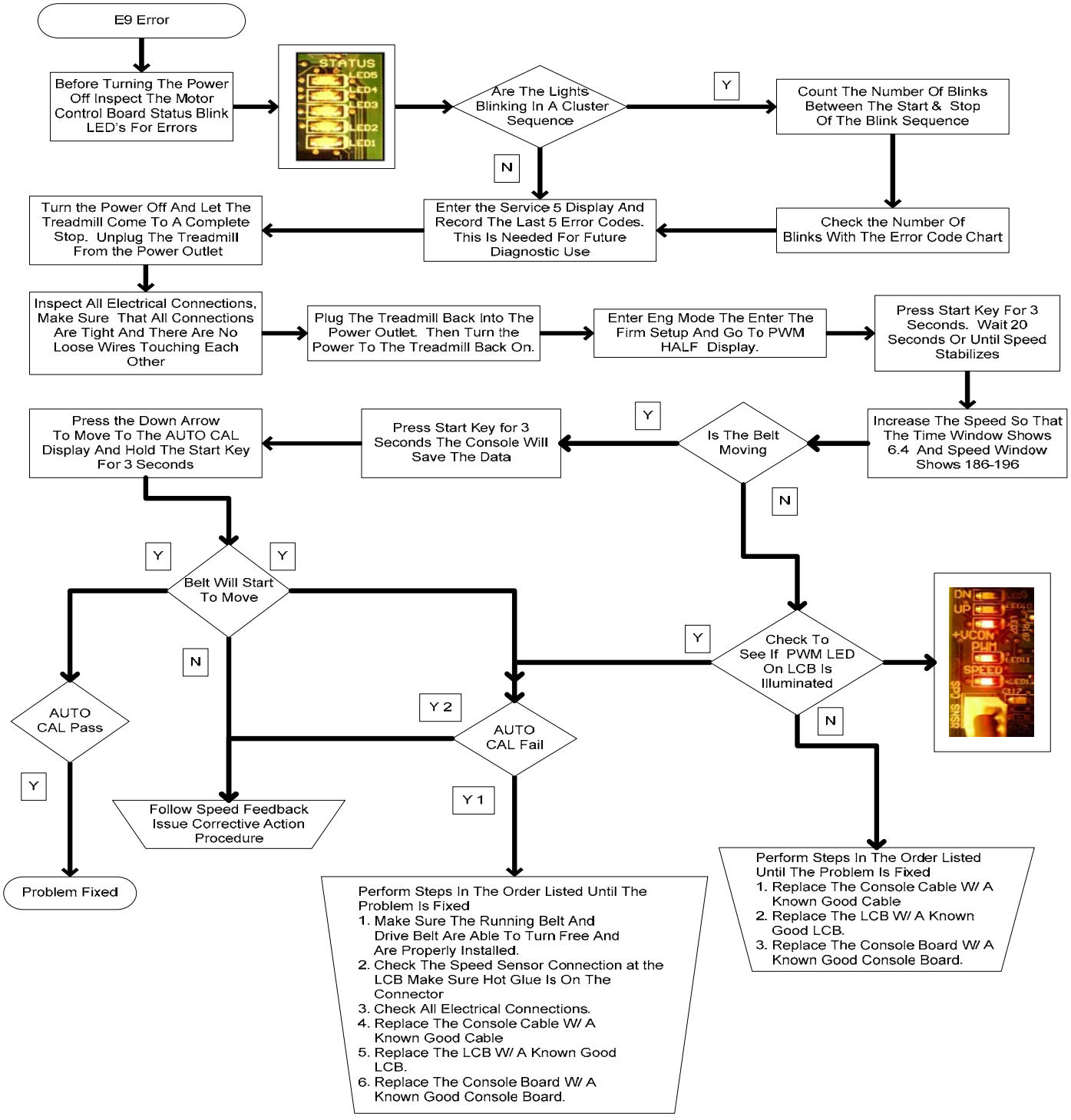
E9 – Speed Range Error

OVERVIEW

During normal run time operation the value stored during auto calibration is used to initially set the speed (e.g. target speed = 12 MPH, PWM ticks = Maximum PWM = 363). Once the speed stabilized the actual speed is monitored and if different than the target speed the PWM value is adjusted until the actual speed matches the target speed. If the PWM value is changed by more than the amount of ticks required to change 1.7 MPH and the actual speed does not match the target speed then an E9 error is flagged. This error indicates the motor controller system is unable to maintain the target speed.

First Check the SOFTWARE VERSION. If software is below 2.6 then upgrade console to 2.6 or higher. This will be a new console preprogrammed to new version and then sent out.

Solution Flow Chart



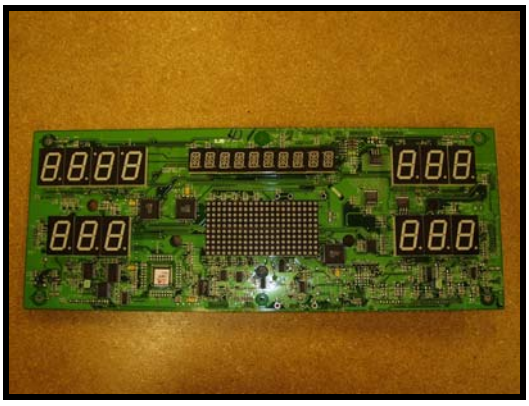
E9 CORRECTIVE ACTION

Ensure the belt is freely moving and is not binding, rubbing or otherwise held back.
Speed Feedback Issues – See speed feedback issue trouble shooting section in *the CORRECTIVE ACTION PROCEDURES – Speed Issues* section of this document.

Part Number: SCB001301
Description: Speed Sensor (T5x)
Drawing Number: JAM03

Part Number: MC0522005N
Description: Console Cable (T4, T5, T5x)
Drawing Number: P03

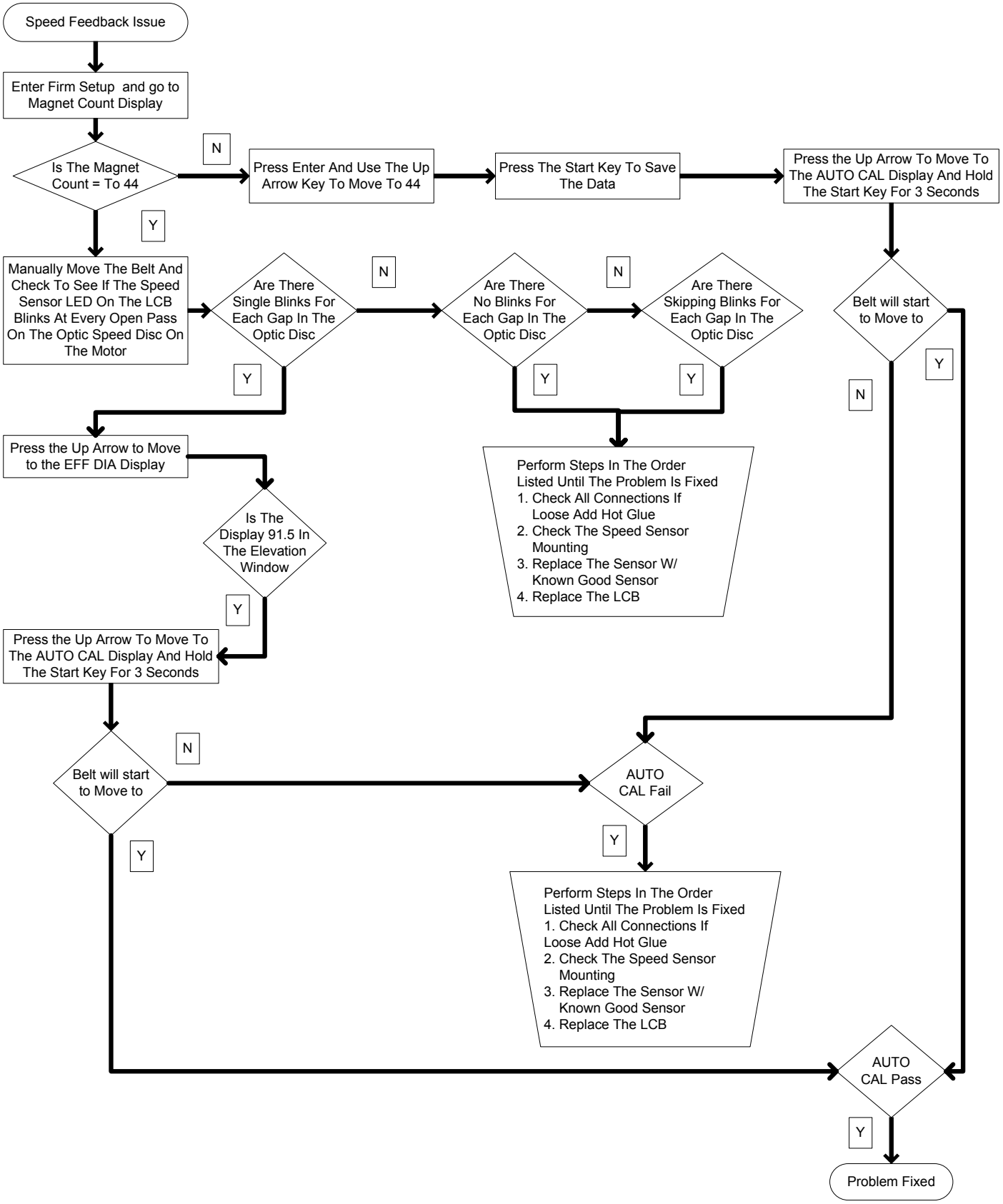
Part Number: SJFD06003A
Description: Motor Controller ACD3X, 110V T5X (T5x)
Drawing Number: M08



Part Number: DGC5X
Description: Console Control Board (T4, T5, T5x)
Drawing Number: N02

SPEED FEEDBACK ISSUE CORRECTIVE ACTION PROCEDURES

Solution Flow Chart



SPEED FEEDBACK ISSUE CORRECTIVE ACTION PROCEDURES PARTS NEEDED

Part Number: SCB001301
Description: Speed Sensor (T5x)
Drawing Number: JAM03

Part Number: SJFD06003A
Description: Motor Controller ACD3X (T5x)
Drawing Number: M08

OPERATIONAL ERRORS

E16 – Stuck key error

OVERVIEW

If a key press is detected for more than 45 seconds a stuck key error is flagged. This error is primarily caused by a faulty keypad but could be caused by other issues (object on the keypad).

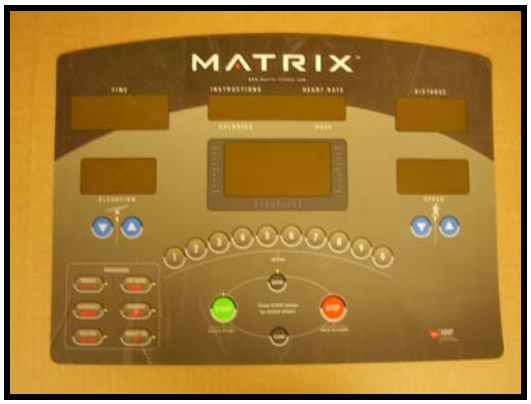
CORRECTIVE ACTION

1. First check all of the screws in the back of the console cover to see if they are too tight. If the screws are too tight this will pull the front face of the console back and cause the key pad to sick and flag an E16 Error.
2. Remove the back cover screws and check to see if the screws on the internal T brace are too tight. If the screws are too tight this will pull the front face of the console back and cause the key pad to sick and flag an E16 Error.

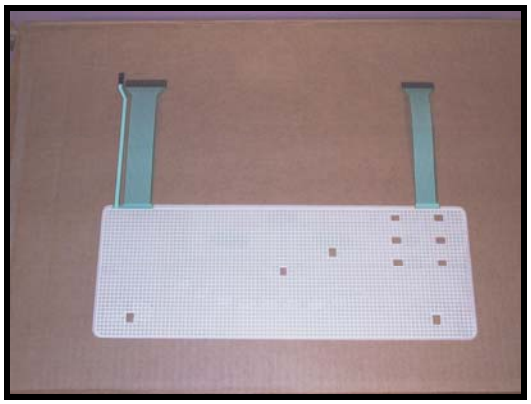
If loosening the screws does not fix this problem then you will need the replace the Key Membrane(s).

CORRECTIVE ACTION PARTS NEEDED

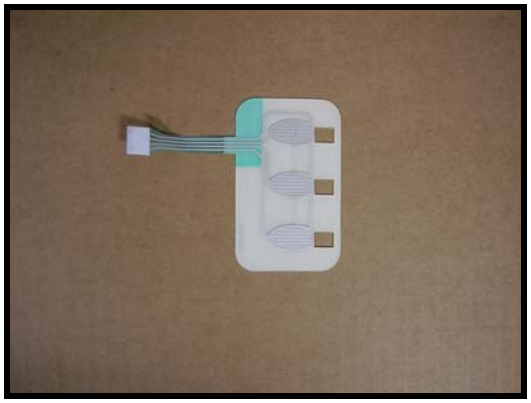
Reset system power. If error re-occurs replace the keypad with a known good keypad. If error still occurs replace console board with known good console.



Part Number: MC060320C
Description: Overlay Main (T5x)
Drawing Number: N01



Part Number: MC0602216A
Description: Key Membrane Large (T4, T5, T5x)
Drawing Number: N04



Part Number: MC0602187A
Description: Key Membrane Small (T5, T5x)
Drawing Number: N05

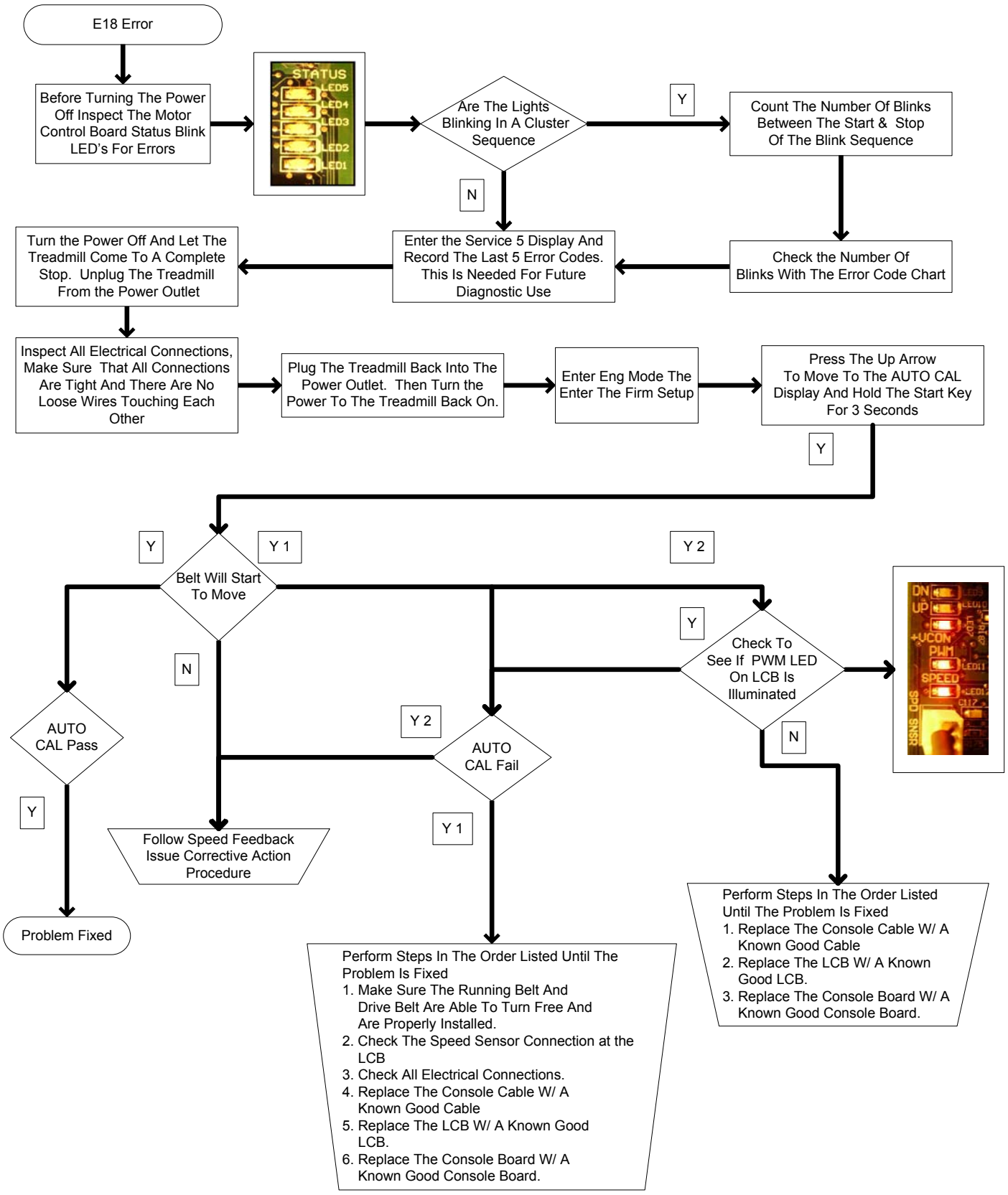
Part Number: MC0601321C
Description: Right Overlay (T5x)
Drawing Number: N47

E18 – Safety switch test failure

OVERVIEW

If the actual speed exceeds limit set for safety switch test a safety switch test failure error occurs.

Solution Flow Chart

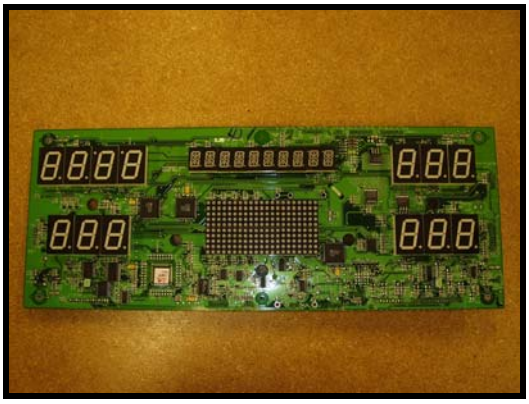


E18 CORRECTIVE ACTION PARTS NEEDED

Part Number: SCB001301
Description: Speed Sensor (T5x)
Drawing Number: JAM03

Part Number: MC0522005N
Description: Console Cable (T4, T5, T5x)
Drawing Number: P03

Part Number: SJFD06003A
Description: Motor Controller ACD3X, 110V T5X (T5x)
Drawing Number: M08



Part Number: DGC5X
Description: Console Control Board (T4, T5, T5x)
Drawing Number: N02

E19 – NOVRAM Failure

OVERVIEW

If the values stored in non-volatile memory are out of limits or do not match the safety check value stored in non-volatile memory a NOVRAM failure occurs. The system attempts to re-initialize the non-volatile memory three times and if the NOVRAM check fails all three attempts a NOVRAM failure error (E19) is called.

CORRECTIVE ACTION

An E-19 error indicates the NOVRAM has critically failed and needs to be replaced. If an E19 error occurs the console should be reprogrammed with the current software version and the power should be toggled. If this does not clear the E-19 error the console board will need to be returned to Matrix for repair.

E40 – Registered error code sent from the motor control board

OVERVIEW

E40 indicates that it is logged when the console board has received the error code sent from the motor control board while the console board has not detected/issued its own error yet. The E40 type of error has same error parameters stored in non-volatile memory as other types of error. As the motor error code has thirty-two types of fault, the environment (parameters) stored is snapshot at the moment when faults are decoded at the first time.

For the detail of this type of error, please refer to the related motor-control document.

CORRECTIVE ACTION

An E-40 error indicates something wrong happened on the motor control board. The information collected is solely used to assist for engineering analysis of other types of error. If there ares no other types of error occurring right after E40, there is no need to make corrections.

ERROR PARAMETERS

The following table outlines the error parameters stored in non-volatile memory for each occurred error.

NO. OF PARAMETERS	VARIABLE NAME	DISCRIPTION OF VARIABLE
1	Error Code	The registered error's type
2	Target Speed	The goal speed the console tries to achieve
3	Actual Speed	The speed when the error is detected
4	Target PWM	The goal PWM the console tries to demand
5	Actual Signal	The PWM when the error is detected
6	Target Elevation	The goal grade the console tries to achieve
7	Actual Elevation	The grade when the error is detected, displayed as A/D ticks
8	Program Time	The intended workout time when the error is detected
9	Total Program Time	The accumulated workout time when the error is detected
10	Elevation Direction	The set direction that decides the elevation to go up or down
11	Elevation "Zero" Position	The set elevation position which is regarded as a base grade
12	Maximum Elevation	The set maximum grade the elevation is allowed to go
13	Magnet Counts	The set number of magnet used for the related calculation
14	Effective Diameter	The set motor diameter used for the related calculation
15	Start PWM	The set PWM to start running the belt
16	Minimum PWM	The set minimum PWM to the lowest speed
17	Half Maximum PWM	The set half maximum PWM to the middle speed
18	Maximum PWM	The set maximum PWM to the highest speed
19	Ramp Time	The set argument to decide the belt speed's acceleration
20	Speed Unit	The speed unit used when the error is detected
21	Operation Time - hr	The console total workout operation time in "hr" part
22	Operation Time - sec	The console total workout operation time in "sec" part
23	Distance – mi./km	The console total workout distance in "mi./km" part
24	Distance – 100^{th} mi./km	The Console total workout distance in "100^{th} mi./km" part
25	Current Screen	The screen when the error is detected
26	Motor Board Status	The motor control board's status when the error is detected*
27	Motor Drive Fault Code 1	The lower 16 bits of fault code sent from the motor control board**
28	Motor Drive Fault Code 2	The upper 16 bits of fault code sent from the motor control board**

* The parameter of Motor Board Status is displayed as a combined 16-bit hexadecimal number. The value of the lower 8 bits represents which status the motor control board stands; the value of the upper 8 bits represents the console system time/clock counts of the pulse width when the status is an “Invalid Signal” or “Noise”. For more information of the parameter, please refer to the related motor-control document.

** The two parameters of Motor Drive Fault Code 1 and Motor Drive Fault Code 2 are displayed as 16-bit hexadecimal numbers. There are total 31 types (0-30) of fault sent from the motor control board. Each bit of the two parameters of Motor Drive Fault Code 1 and Motor Drive Fault Code 2 represents one respective type of fault save the Motor Drive Fault Code 2 parameter’s left significant bit 31, which is specially used as an indicator of the fault code being sent. For the detail of the parameters, please refer to the related motor-control document.

MOTOR BOARD STATUS DFR on console

The following table is the list of the motor board status.

Value of Lower 8 Bits	Value of Upper 8 BITS	Description of the value
0	0	Indicates there is no signal received
1	0	Indicates the motor relay is off, no errors (logic high)
2	0	Indicates the motor relay is on, no speed commanded (10Hz signal)
3	0	Indicates the motor relay is on, speed commanded, all normal (logic low)
4	0	Indicates the error pulse is detected
5	0	Indicates the console is waiting for a period of time after it issues a reset-command to the motor control board
6	NN	When the value of the lower 8 bits equals to the value, the upper bits 8 to 15 indicates the pulse width of an invalid signal. The period is the number NN times the system interrupt time.
7	NN	When the value of the lower 8 bits equals to the value, the upper bits 8 to 15 indicates the pulse width of a very narrow noise. The period is the number NN times the system interrupt time.

ACD3X LCB Status LED Blink Code

With the motor cover off you can count the STATUS LED’s. These LED are marked LED1-LED5 on the LCB.

Normal Operation

LED’s 1,2,and 3 will blink back and forth to indicate the processor is on-line and operational.
LED 4 is used as a discrete / analog signal to the upper console.
LED 5 indicates the system status / mode. Curently the 3 modes are defined as Safe Mode, Stand-By Mode and Run Mode.

Mode Definitions
Safe Mode: When the controllers safety relay is not energized and no error is present LED 5 will be off
Stand-By Mode: When the safety relay is engaged but the system is not outputting and active PWM signal to the Motor and no error is present. LED 5 blinks off and on at a fast rate.
Run Mode: When the system outputs and active PWM Control signal to the motor and no error is present. LED 5 remain on.

Please see the blink code chart and the next page

ACD3X LCB Blink LED Error Codes

Number Of Blinks	Description Of Error
1	2.5 Vdc Ref Status- Indicates the 2.5 Vdc reference is operating outside the acceptable operational parameters
2	1.65Vdc Ref Status- Indicates the 1.65 Vdc reference is operating outside the acceptable operational parameters
3	Phase B Current Sensor- Indicates the current sensor is operating outside the acceptable operational parameters
4	Phase A Current Sensor- Indicates the current sensor is operating outside the acceptable operational parameters
5	Phase C Circuit Open
6	Phase B Circuit Open
7	Phase A Circuit Open
8	DC Link Bus Overvoltage- The DC Link voltage has exceeded 415 Vdc
9	Critical DC Link Bus Overvoltage- The DC Link voltage exceeds 425 Vdc
10	DC Link Bus Undervoltage- The DC Link voltage has dropped below 120 Vdc
11	Illigal Speed Command- The Console has commanded speed prior to closing the safety relay
12	Phase Over Current (RMS)
13	Faulty Speed Sensor- The speeds sensor has not transmitted pulses for at least 7 periods
14	Heat Sink Over Temperature- The heatsink temperature is too hot
15	Over Temperature on Motor Or Drive- Either the heat sink or the motor is too hot (Hard Fault
16	Open
17	Brake Gate Driver Fault (Hard Fault)
18	Phase A Low Gate Driver Fault (Hard Fault)
19	Phase B Low Gate Driver Fault (Hard Fault)
20	Phase C Low Gate Driver Fault (Hard Fault)
21	Output Peak Over Current- The peak current has exceeded 25 Amps (Hard Fault)
22	Phase A High Gate Driver Fault (Hard Fault)
23	Phase B High Gate Driver Fault (Hard Fault)
24	Phase C High Gate Driver Fault (Hard Fault)
25	DC Link Bus Overvoltage- The DC Link voltage has exceeded 425 Vdc