



# ***DGF1J***

## ***ENGINEERING GUIDE***

STANDARD CONSOLE FOR:  
T9800S (CVTM0033) & T9800HRT (CVTM0031)

# DGF1J Upper Board: Engineering Guide

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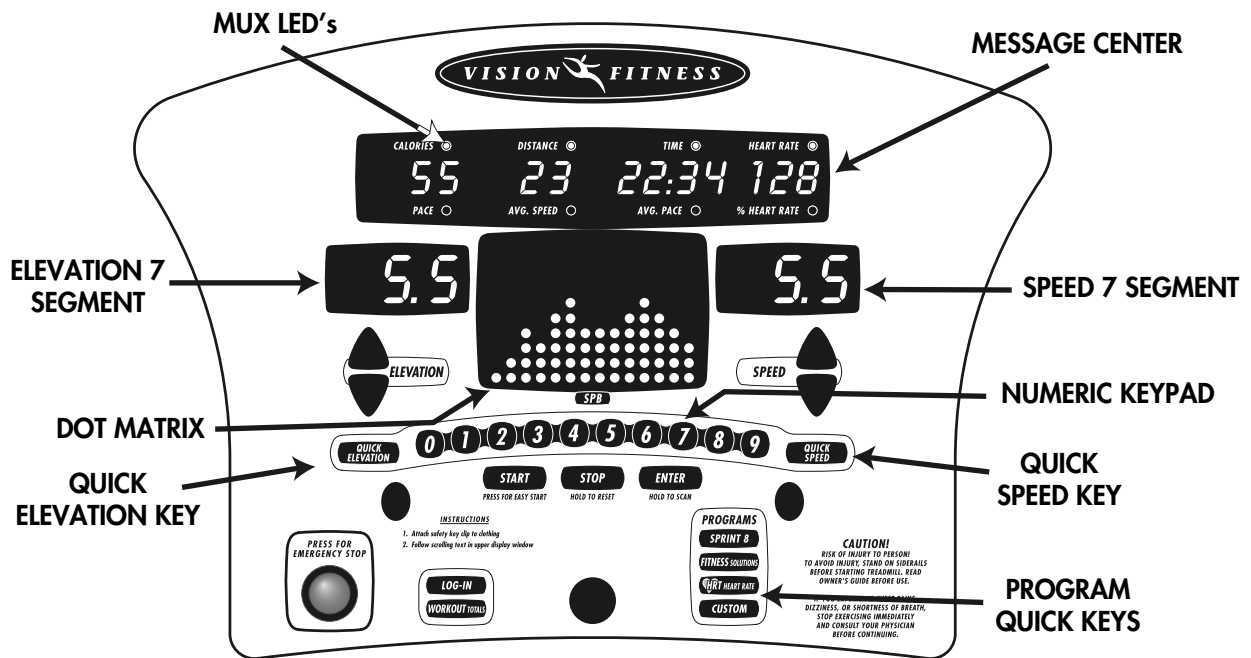
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## OVERVIEW

### 1.1 T9800 SERIES CONSOLE DISPLAY FIELDS & KEYS

FIGURE 1.1-1.1.1

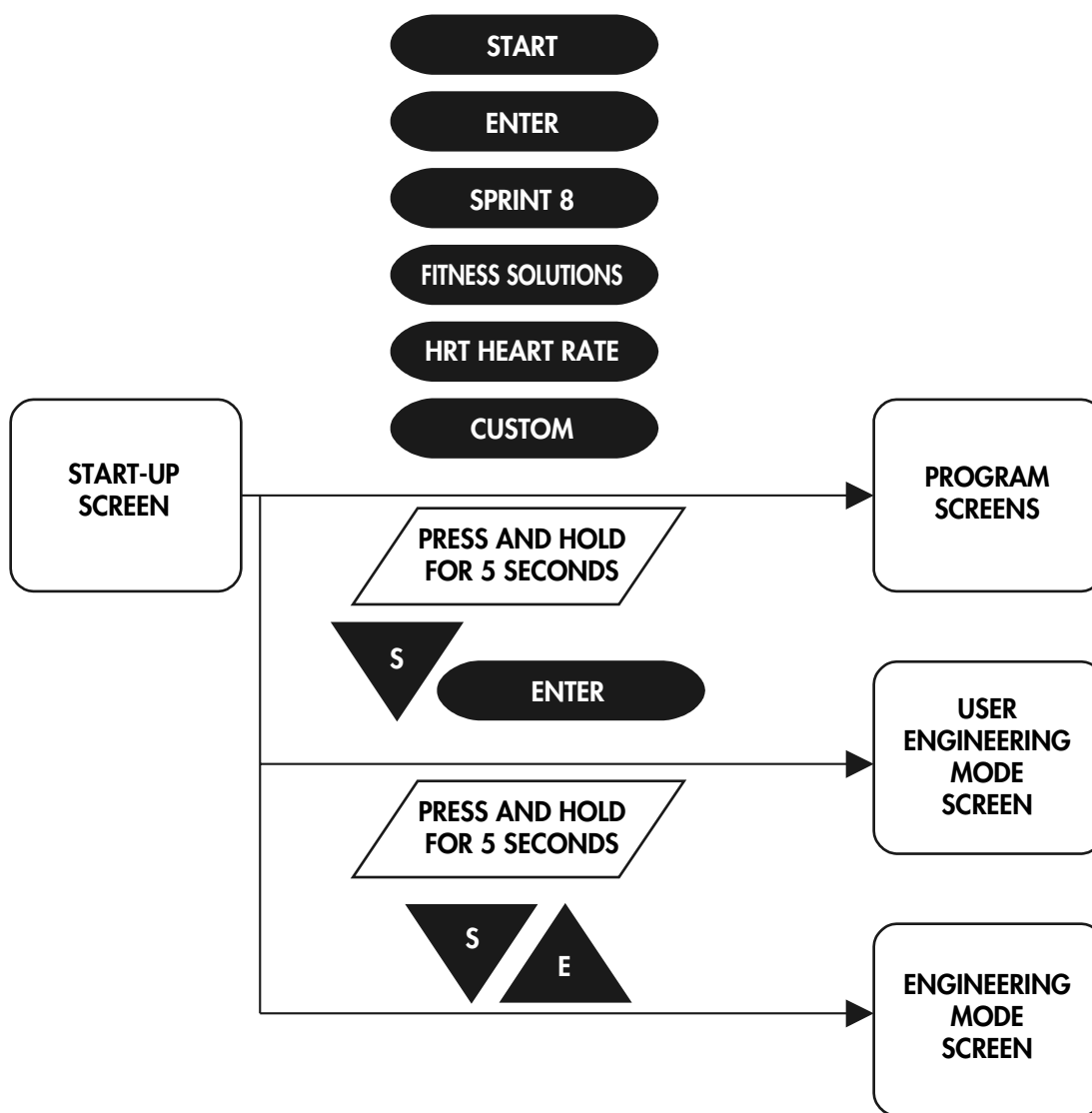


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## 1.2 OPERATION MODES

At power-up the console software performs self-tests and initialization, then displays the Start-Up screen. From the Start-Up screen the software can enter one of three modes, based on which keys are pressed. Simultaneously pressing and holding the **"SPEED DOWN"** and **"ENTER"** or **"SPEED DOWN"** AND **"ELEVATION UP"** keys for 5 seconds will cause the software to enter, respectively, User Engineering Mode or Engineering Mode. Pressing any of the Program Select keys or the **"START"** key will cause the software to enter the normal User Mode of operation.

FIGURE 1.1-1.2.1



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## 1.3 GENERAL NOTES

- Outputs to motor controller disabled in hardware while in the safety startup screen. All control outputs and speed inputs must go inactive before advancement to the next screen
- Failure of program checksum, ram check and register check will cause rapid beeping with no display/function (initial startup check).
- Initial failure of critical non-volatile parameter load/verify will cause re-initialization to default values. Message **"RSTNOVRAM"** will appear briefly in the alphanumeric display.
- Repeat failure of critical non-volatile load/verify will cause system to jump to error screen (hard failure).
- Failure of non-critical non-volatile load/verify will briefly display **"NOVRAM FAILURE"** in the alphanumeric display and will re-initialize non-critical parameters to default values (allowing the treadmill to operate).

## 2. USER ENGINEERING MODE

The user must hold down **"ENTER"** and **"SPEED DOWN"** keys for 5 seconds while at the Startup Screen. The console will beep twice and **"USERENG MODE"** will appear in the Message Center. After another five seconds the console will beep twice and **"UNITS ENG/METRIC"** will appear in the Message Center.

### USER ENGINEERING MODE MENU NAVIGATION

- Use the **"ELEVATION UP/DOWN"** keys to step through menu items. Menu will wrap from last item to first item and vice-versa.
- Use **"ENTER"** key to select Menu item.
- Use the **"SPEED UP/DOWN"** keys to change the item value.
- Press the **"STOP"** key to return from a menu item to menu without saving any changes.
- Press the **"ENTER"** key to save a change or initiate action.
- When the **"EXIT"** menu item is displayed, pressing **"ENTER"** will exit User Engineering.

### USER ENGINEERING MODE MENU

- Units-English/Metric
- Maximum Work-Out Time
- Pause Time
- Default Age
- Default Weight
- Scroll Speed
- Maximum Speed
- Disable Elevation Errors
- Auto-Calibration
- Total Hours
- Total Distance
- Belt/Motor Hours
- Lift Motor Hours
- Lubricate Deck Message
- Clean Treadmill Message
- Software Version
- Exit

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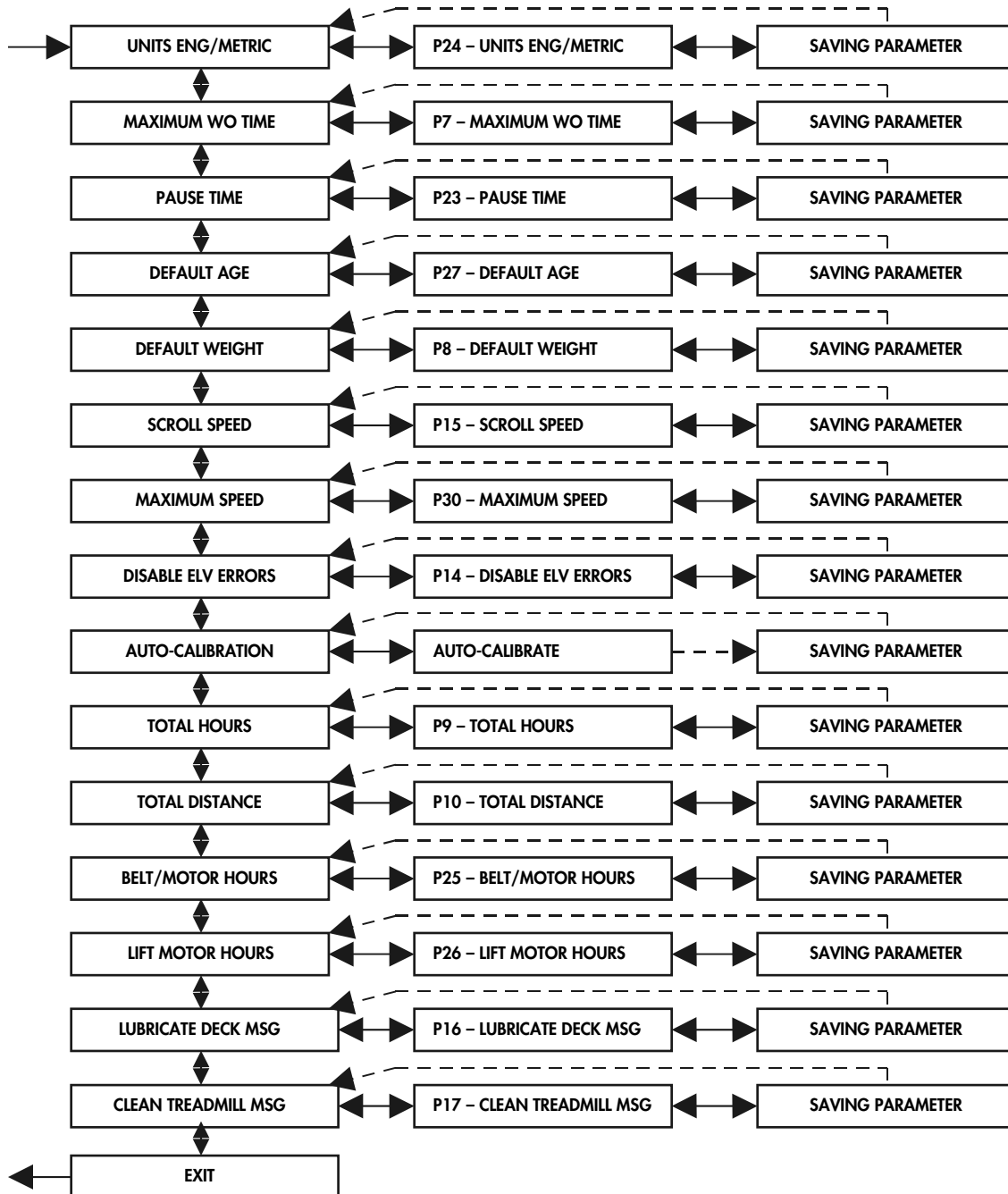
## USER ENGINEERING MODE MENU

#	Menu Item	Description	Default Value	Min.Value	MaxValue
P24	UNITS	Measurement units	English	English	Metric
P7	MAX WO TIME	Maximum program time - minutes	99	5	99
P23	PAUSE TIME	Pause time - min:sec	10:00	0:05	10:00
P27	DEFAULT AGE	Default age - years	40	15	99
P8	DEFAULT WEIGHT	Default weight - lbs	150	80	400
P15	SCROLL SPEED	Sets speed of text scrolling	3	1	5
P30	MAX SPEED	Maximum treadmill speed - MPH	12.0	2.0	12.0
P14	DISABLE ELV ERRS	Toggles Elevation Errors off/on	no	yes	yes
P9	TOTAL HOURS	Accumulated hours	0	0	6553.5
P10	TOTAL DISTANCE	Accumulated distance	0	0	65535
P25	BELT/MOTOR HOURS	Accumulated belt/treadmill motor hours	0	0	6553.5
P26	LIFT MOTOR HRS	Accumulated lift motor hours	0	0	6553.5
P17	LUBRICATE DECK MSG	Prompt when due for lube <sup>1</sup>	OFF	On	OFF
P18	CLEAN TREADMILL MSG	Prompt when due for cleaning <sup>1</sup>	OFF	On	OFF

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## USER ENGINEERING MODE SCREENS

FIGURE 1.3-2.1



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## 3. ENGINEERING MODE

The user must hold down **"ELEVATION UP"** and **"SPEED DOWN"** keys for 5 seconds while at the Startup Screen. The console will beep twice and **"ENGINEERING MODE"** will appear in the Message Center. After another five seconds the console will beep twice and **"CONFIGURATION"** will appear in the Message Center.

### ENGINEERING MODE MENU NAVIGATION

- Use **"UP/DOWN"** keys to step through menu items. Menu will wrap from last item to first item and vice-versa.
- Use **"ENTER"** key to select menu item.
- Some menu items lead to sub-menus, other to action or information screens.
- Press the **"STOP"** key to return from a menu item to main menu without saving any changes.
- Press the **"ENTER"** key to save a change or initiate action.
- When the EXIT menu item is displayed, pressing **"ENTER"** will return to the menu or exit Engineering mode if at top level.

### ENGINEERING MODE MAIN MENU

- Configuration
- System Tests
- Auto-Calibration
- Manual Calibration
- Maintenance
- Software Version
- Exit

### ENGINEERING MODE SUB-MENUS

- Configuration
  - Treadmill Model
  - Units-English/Metric
  - Maximum Work-Out Time
  - Default Work-Out Time
  - Pause Time
  - Default Age
  - Default Weight
  - Scroll Speed
  - Maximum Speed
  - Disable Elevation Errors
  - Reset NOVRAM
  - Exit
- System Tests
  - Hardware Test
  - Display Test
  - Keyboard Test
  - Safety Switch Test
  - IO Test
  - Burn-In Test
  - Elevation Burn-In
  - Exit



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## **ENGINEERING MODE SUB-MENUS (CONTINUED)**

- Auto-Calibration
- Manual Calibration
  - P0 PWM Minimum Speed
  - P1 PWM 1/2 Maximum Speed
  - P2 Maximum Speed
  - P4 Elevation Minimum
  - P5 Elevation Maximum
  - P13 Elevation Direction
  - P19 Magnet Count
  - P20 Effective Diameter
  - P21 PWM Start Speed
  - P29 Ramp Time
  - P30 Max Speed
  - Exit
- Maintenance
  - Total Hours
  - Total Distance
  - Belt/Motor Hours
  - Lift Motor Hours
  - Lubricate Deck Message
  - Clean Treadmill Message
  - Error Log
  - Exit
- Software Version
- Exit

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## USER ENGINEERING MODE MENU

Address	Description	Min. Value	Default Value	Max Value	Units
P0 PWM MIN SPEED	PWM value at min speed (0.5 mph)	1	34	110	ticks
P1 PWM 1/2 MAX	PWM value at 1/2 max speed (6.4 mph/10.0 kph)	111	167/173	250	ticks
P2 PWM MAX SPD	PWM value at max speed (12.0 mph/20.0 kph)	250	333/346	485	ticks
P3 (unused)					
P4 ELV MIN	Value at zero or minimum elevation (0%)	10	50	149	A/D ticks
P5 ELV MAX	Value at maximum elevation (15%)	150	205	255	A/D ticks
P6 TREADMILL MODEL	0 – T9800 HRT 1 – T9800 HRT INT 2 – T9800 S	0	0	2	
P7 MAX WO TIME	Maximum program time	15	99	99	minutes
P8 WEIGHT	Weight used for calories	80/36	150/68	400/182	lbs/kg
P9 OP HOURS	Accumulated hours	0	0	6553.5	hours
P10 OP DIST	Accumulated distance	0	0	65535	miles/km
P11 (unused)					
P12 (unused)					
P13 ELV DIR	Elevation pot inverter	yes	yes	no	
P14 DISABLE ELV ERRS	Toggles Elevation Errors off and on	no	no	Yes	
P15 SCROLL SPEED	Sets speed of text scrolling	1	3	5	
P16 LUBRICATE DECK MSG	Number of hours since last lube/Message enable	0/OFF	0/OFF	0xffff/on	hours
P17 CLEAN TREADMILL MSG	Distance since last cleaning/Message enable	0/OFF	0/OFF	0xffff/on	miles/km
P18 (unused)					
P19 MAGNET COUNT	Magnet Count- number of speed sensor pulses per belt roller revolution.	1	26	48	
P20 EFF DIAMETER	Effective Diameter	57.1 (2)	67.8 (331)	127.0 (511)	mm
P21 PWM START SPEED	PWM value at start speed	2	31 *	75	ticks

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## USER ENGINEERING MODE MENU

Address	Description	Min. Value	Default Value	MaxValue	Units
P22 DFLT WO TIME	Default program time	5	30	99	minutes
P23 PAUSE TIME	Default program pause time	0:05	10:00	10:00	min:sec
P24 MEAS. UNITS	Measurement units	English	English	Metric	
P25 BELT/MOTOR HRS	Accumulated belt/motor hours	0	0	6553.5	hours
P26 LIFT MOTOR HRS	Accumulated lift motor hours	0	0	6553.5	hours
P27 DFLT AGE	Default Age	15	40	99	years
P28 (unused)					
P29 RAMP TIME	Speed ramp-up time	12	30	40	seconds
P30 MAX SPEED	Maximum speed	2.0	12.0/20.0	12.0/20.0	MPH/KPH
EXIT	Returns user to Main Engineering Menu				

## 3.1 CONFIGURATION MENU

### CONFIGURATION MENU

- Treadmill Model
- Units-English/Metric
- Maximum Work-Out Time
- Default Work-Out Time
- Pause Time
- Default Age
- Default Weight
- Scroll Speed
- Maximum Speed
- Disable Elevation Errors
- Reset NOVRAM
- Exit

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## CONFIGURATION MENU

	<i>Menu Item</i>	<i>Description</i>	<i>Default Value</i>	<i>Min.Value</i>	<i>MaxValue</i>
P6	T9800 HRT T9800 HRT INT T9800 S	Heart Rate Heart Rate, International Standard	T9800 HRT	T9800 HRT	T9800 S
P24	UNITS	Measurement units	English	English	Metric
P7	MAX WO TIME	Maximum program time – min.	99	5	99
P22	DEFAULT WO TIME	Default program time – min.	30	5	99
P23	PAUSE TIME	Pause time - min:sec	10:00	0:05	10:00
P27	DEFAULT AGE	Default age - years	40	15	99
P8	DEFAULT WEIGHT	Default weight - lbs	150	80	400
P15	SCROLL SPEED	Sets speed of text scrolling	3	1	5
P30	MAX SPEED	Maximum treadmill speed - MPH	12.0	2.0	12.0
P14	DISABLE ELV ERRS	Toggles Elevation Errors off/on	no	yes	yes

## 3.2 SYSTEM TESTS

### SYSTEM TESTS MENU

- Hardware Test
- Display Test
- Keyboard Test
- Safety Switch Test
- IO Test
- Burn-In Test
- Elevation Burn-In
- Exit

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## 3.2.1 HARDWARE TEST

This screen allows the direct operation of treadmill elevation and belt.

<i>Key</i>	<i>Function</i>
ENTER	Starts test
ELEVATION UP	Increases incline
ELEVATION DOWN	Decreases incline
SPEED UP	Directly increases the PWM value and outputs it to the motor controller without ramping
SPEED DOWN	Directly decreases the PWM value and outputs it to the motor controller without ramping
STOP	Stops test, turns off motors, returns to menu
START	N/A

<i>Display</i>	<i>Function</i>
Dot Matrix	PWM output value
Alphanumeric	Displays "HARDWARE TEST" flashing on and off. If Heart Rate detected displays actual heart rate in BPM
Elevation	Elevation a/d ticks.
Speed	Speed in native units (MPH or KPH).

## 3.2.2 DISPLAY TEST

This screen allows testing of all screen display elements.

<i>Key</i>	<i>Function</i>
ENTER	Starts test
ELEVATION UP	
ELEVATION DOWN	
SPEED UP	
SPEED DOWN	
STOP	Stops test, returns to menu
START	N/A

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## 3.2.2 DISPLAY TEST

Test Order	1	2	3
Dot Matrix			
Alphanumeric	"DISPLAY TEST"		
7-Segments			

Display test initially comes up with all displays on and the message **"DISPLAY TEST"** toggling in the alpha numeric with the last line being fully illuminated. An auto-increment feature can be used to sequence through the display test or the auto-increment feature can be used.

Each display will be tested during display test in the following order (when auto increment is used):

- Dot Matrix Display's
- Alpha Numeric Display and Discrete LED's
- Seven Segment Display's

### 3.2.2.1 DOT MATRIX

The dot matrix display test will proceed in the following manner:

- Row from bottom to top, single color (green then red).
- Columns from left to right, single color (green then red).
- Full display, single colors (green, red and then amber). Each color takes 14 key presses to clear.

Dot matrix display left in all on, amber color mode.

### 3.2.2.2 ALPHANUMERIC

The alpha numeric display test will proceed in the following manner:

- Count from 0 to 9, all displays.
- Segments clockwise from top segment, all displays (including decimal point).
- All segments in a single character illuminate, left to right.
- All characters on

Alphanumeric returns to the toggling message **"DISPLAY TEST"** and then all segments on.

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## 3.2.2.3 SEVEN SEGMENT

The seven-segment display test will proceed in the following manner:

- Count from 0 to 9, all displays.
- Segments clockwise from top segment, all displays (including decimal point).
- All segments in a single character illuminate, left to right, in the following order: elevation window and speed window.
- All characters on

Seven-segment display test leaves all displays on.

## KEYS

- START Key – Starts display test auto increment or resumes auto increment at current location.
- ENTER Key – Stop display test auto increment at current location.
- STOP Key – Jumps out of display test.
- UP/DOWN Keys - Stop auto increment and steps through display test in forward or reverse direction.

## 3.2.3 KEYBOARD TEST

Display indicates the pressed key in the alphanumeric display. The stop key jumps out of the key test and as such verifies its operation.

## 3.2.4 SAFETY SWITCH TEST

This screen allows testing of the push-button and magnetic safety switches.

<i>Key</i>	<i>Function</i>
ENTER	Starts test
ELEVATION UP	N/A
ELEVATION DOWN	N/A
SPEED UP	N/A
SPEED DOWN	N/A
STOP	Stops Test, returns to test menu
START	N/A

<i>Display</i>	<i>Function</i>
Dot Matrix	blank
Alphanumeric	Displays "SAFETY SWITCH TEST"
Elevation	OFF/ON status of pushbutton safety switch
Speed	OFF/ON status of magnetic safety switch

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## 3.2.5 IO TEST

Wrap back fixture must be present for this test.

<i>Key</i>	<i>Function</i>
ENTER	Starts test
ELEVATION UP	N/A
ELEVATION DOWN	N/A
SPEED UP	N/A
SPEED DOWN	N/A
STOP	Stops Test, returns to test menu
START	N/A

<i>Display</i>	<i>Function</i>
Dot Matrix	blank
Alphanumeric	Displays "WRAP BACK"
Elevation	Received characters
Speed	blank

## 3.2.6 BURN-IN TEST

The burn in mode can be used to run tests that require the treadmill to continually run. The program is based on the 5K Run. Segment changes occur every 0.1 mi. or 0.1 km, depending on the treadmill configuration. When the system reaches the last segment, it loops to the first segment. Speed at program start is at 1/2 maximum speed. The user can adjust speed and incline. The program returns to the preset incline upon segment completion. Keyboard functions are the same as in normal operating mode.



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## 3.2.7 ELEVATION BURN-IN TEST

The elevation burn-in test continually runs from minimum elevation to maximum elevation.

<i>Key</i>	<i>Function</i>
ENTER	Starts test
ELEVATION UP	N/A
ELEVATION DOWN	N/A
SPEED UP	N/A
SPEED DOWN	N/A
STOP	Stops Test, returns to test menu
START	N/A

<i>Display</i>	<i>Function</i>
Dot Matrix	# up/down cycles
Alphanumeric	Displays "ELEVATION BURN-IN TEST"
Elevation	Elevation a/d ticks
Speed	Target Elevation in % Grade

## 3.2.8 EXIT

Press the **"ENTER"** key to return to the main Engineering Mode menu.

## 3.3 AUTO-CALIBRATION

The Auto-Calibration routine automatically finds and sets the start, minimum, half-maximum and maximum PWM values and the maximum and minimum elevation values. Success or failure of the auto calibration routine will be temporarily indicated in the alphanumeric display upon completion of the auto calibration routine. Exits Engineering Mode at completion. See Section 4.7 for details.

**CAUTION!!! BELT WILL START TO MOVE UNDER SOFTWARE CONTROL WITH NO RAMPING!!!**

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## 3.3 AUTO-CALIBRATION

The Auto-Calibration routine automatically finds and sets the start, minimum, half-maximum and maximum PWM values and the maximum and minimum elevation values. Success or failure of the auto calibration routine will be temporarily indicated in the alphanumeric display upon completion of the auto calibration routine. Exits Engineering Mode at completion. See Section 4.7 for details.

**CAUTION!!! BELT WILL START TO MOVE UNDER SOFTWARE CONTROL WITH NO RAMPING!!!**

<i>Key</i>	<i>Function</i>
ENTER	Starts test
ELEVATION UP	N/A
ELEVATION DOWN	N/A
SPEED UP	N/A
SPEED DOWN	N/A
STOP	Stops Test, turns off motors, returns to test menu
START	N/A

<i>Display</i>	<i>Function</i>
Dot Matrix	PWM output value
Alphanumeric	Displays "AUTO-CALIBRATING", then "START PWM", "MIN PWM", "HALF PWM", "MAX PWM" and "DC"
Elevation	Elevation a/d ticks
Speed	Speed in native units (MPH or KPH)

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## 3.4 MANUAL CALIBRATION

### MANUAL CALIBRATION MENU

- P0 PWM Minimum Speed
- P1 PWM 1/2 Maximum Speed
- P2 Maximum Speed
- P4 Elevation Minimum
- P5 Elevation Maximum
- P13 Elevation Direction
- P19 Magnet Count
- P20 Effective Diameter
- P21 PWM Start Speed
- P29 Ramp Time
- Exit

Key	Function
ENTER	Selects Menu Item or saves value
ELEVATION UP	Next Menu Item
ELEVATION DOWN	Previous Menu Item
SPEED UP	Increments Value
SPEED DOWN	Decrements Value
STOP	Returns to menu
START	N/A

#### 3.4.1 P0 PWM MIN SPEED

PWM minimum speed is the PWM when the belt is the minimum speed (0.5 MPH/0.4 KPH). This setting is used to calibrate the PWM output to the motor controller.

#### 3.4.2 P1 PWM 1/2 MAX SPEED

PWM at half the maximum speed (12.0 MPH). This setting is used to calibrate the PWM output to the motor controller.

#### 3.4.3 P2 PWM MAX SPEED

PWM at maximum speed (12.0 MPH), used to calibrate the PWM output to the motor controller.

#### 3.4.4 P4 ELEVATION MIN

Current elevation minimum value is displayed in the Speed window.

**CAUTION!!! THERE IS NO MECHANICAL STOP OR LIMIT SWITCH TO LIMIT ELEVATION UPWARD TRAVEL. CARE MUST BE TAKEN TO PREVENT RUNNING THE ELEVATION MOTOR OFF THE “TOP”.**

#### 3.4.5 P5 ELEVATION MAX

Current elevation maximum value is displayed in the Speed window.

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## **3.4.6 P13 ELEVATION DIRECTION**

When set to YES the elevation direction is reversed to allow different configuration elevation motors/motor controllers to be used. When set to NO the elevation direction reading is used as is.

## **3.4.7 P19 MAGNET COUNT**

The magnet count adjustment allows use of different number of speed sensor pulses per belt roller revolution allowing for use with different configured motor controllers.

Current magnet count displayed in the Speed window..

## **3.4.8 P20 EFFECTIVE DIAMETER**

The effective diameter value is used to set the distance per magnet count used in the speed calculations. Adjust this value to compensate for different roller diameters/belt thickness and, in the case of motor mounted speed sensors, adjust for pulley ratios.

Current value is displayed in the Speed window.

## **3.4.9 P21 PWM START SPEED**

PWM start speed is the PWM at which the belt begins to move. This setting is used to calibrate the PWM output to the motor controller.

## **3.4.10 P29 RAMP TIME**

Ramp time is used to set the ramp up/down rate (acceleration) for the belt speed. Ramp time is limited by the ramp time of the motor controller in use.

Current ramp time (in seconds) is displayed in the time window.

Ramp time message will flash during edit mode.

## **3.4.11 EXIT**

Press the **"ENTER"** key to return to the main Engineering Mode menu.

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## 3.5 MAINTENANCE

### MAINTENANCE MENU

- Total Hours
- Total Distance
- Belt/Motor Hours
- Lift Motor Hours
- Lubricate Deck Message
- Clean Treadmill Message
- Error Log
- Exit

#### 3.5.1 TOTAL HOURS

The total accumulated treadmill operating hours is displayed in the speed window. Press and hold the **"START"** key for 3 seconds to reset accumulated hours to zero.

#### 3.5.2 TOTAL DISTANCE

The total accumulated treadmill operating distance is displayed in the speed window. Press and hold the **"START"** key for 3 seconds to reset accumulated distance to zero.

#### 3.5.3 BELT/MOTOR HOURS

The total accumulated treadmill belt/belt motor operating hours is displayed in the speed window. Press and hold the **"START"** key for 3 seconds to reset accumulated hours to zero.

#### 3.5.4 LIFT MOTOR HOURS

The total accumulated treadmill elevation motor operating hours is displayed in the speed window. Press and hold the **"START"** key for 3 seconds to reset accumulated hours to zero.

#### 3.5.5 LUBRICATE DECK MESSAGE

The enable lubricate treadmill deck message status is displayed in the speed window. Use the **"SPEED"** keys to toggle enable status: OFF/ON.

Total accumulated hours since last lube is displayed in the elevation window. Press and hold the **"START"** key for 3 seconds to reset accumulated hours to zero.

#### 3.5.6 CLEAN TREADMILL MESSAGE

The enable clean treadmill deck message status is displayed in the speed window. Use the **"SPEED"** keys to toggle enable status: OFF/ON.

Total accumulated hours since last cleaning is displayed in the elevation window. Press and hold the **"START"** key for 3 seconds to reset accumulated hours to zero.

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## 3.5.7 ERROR LOG

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).

## 3.5.8 EXIT

Press the **"ENTER"** key to return to the main Engineering Mode menu.

## 3.6 SOFTWARE VERSION

Press the **"ENTER"** key to display the product code, software version and checksum in the alphanumeric display.

For example:



DGF1J V1.02 38C3

## 3.7 EXIT

Press the **"ENTER"** key to exit Engineering mode.

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## 4. SYSTEM CALIBRATION PROCEDURE

Before initial use or after a NOVRAM reset, the system will need to be calibrated. The following procedures outline the calibration procedures.

**CAUTION! MANY CALIBRATION PROCEDURES CAUSE BELT MOVEMENT WITHOUT RAMPING. DO NOT STAND ON THE BELT OR IN ANY POSITION THAT COULD BE COMPROMISED BY BELT OR ELEVATION MOVEMENT!**

### 4.1 ENTER ENGINEERING MODE

1. Hold down the **"ELEVATION UP"** and **"SPEED DOWN"** keys until **"ENGINEERING MODE"** is displayed in the alphanumeric.
2. Press the **"ELEVATION UP"** key until **"MANUAL CALIBRATION"** is displayed in the alphanumeric.
3. Press the **"ENTER"** key. **"P0PWN MINSPEED"** will be displayed in the alphanumeric.

### 4.2 SET ELEVATION DIRECTION

*Elevation direction adjustment allows the same console software to be used with a reversed configured elevation motor and the AC Motor Controller.*

1. Press **"ELEVATION UP"** key 5 times until, **"P13ELV DIRECTION"** is displayed.
2. Press **"ENTER"**, the value (**"YES"** or **"NO"**) in the speed window will blink.
3. Using the **"SPEED UP/DOWN"** keys select either **"YES"** for the AC Motor Controller or **"NO"** for the DC Motor Controller.
4. Press the **"ENTER"** key to save or the **"STOP"** key to retain the previous value.

### 4.3 SET ELEVATION MINIMUM

*Adjusts elevation minimum setting.*

1. Press the **"ELEVATION UP/DOWN"** keys until **"P4ELEVATION MIN"** is displayed in the alphanumeric display.
2. Press the **"ENTER"** key.
3. Adjust the treadmill to the lowest position using the **"SPEED UP/DOWN"** keys. (Elevation A/D reading displayed in the elevation window)
4. Press the **"ENTER"** key to save or the **"STOP"** key to retain the previous value.

### 4.4 SET ELEVATION MAXIMUM

*Adjusts elevation maximum setting.*

1. Press the **"ELEVATION UP/DOWN"** keys until **"P5ELEVATION MAX"** is displayed in the alpha-numeric display.
2. Press the **"ENTER"** key.
3. Adjust the treadmill to the highest position using the **"SPEED UP/DOWN"** keys **CAUTION! DO NOT RUN THE ELEVATION DRIVE OFF THE UPPER END OF TRAVEL!** (Elevation A/D reading displayed in the elevation window)
4. Press the **"ENTER"** key to save or the **"STOP"** key to retain the previous value.

# DGF1J Upper Board: Engineering Guide

## 4.5 SET MAGNET COUNT

Magnet count adjustment allows the same console software to be used with different magnet counts at different locations (2 pulses per revolution of the belt roller – Reliance Drive Configuration, 44 pulses per roller revolution – AC motor controller)

1. Press the **"ELEVATION UP/DOWN"** keys until **"P19MAGNETCOUNT"** is displayed in the alphanumeric display.
2. Press the **"ENTER"** key, the magnet count displayed in the time window will flash.
3. Select the correct magnet count for the current motor (44 for the AC Motor Controller).
4. Press the **"ENTER"** key to save or the **"STOP"** key to retain the previous value.

## 4.6 SET EFFECTIVE DIAMETER

Allows for adjustment for belt/roller diameter variations and compensates for pulley ratio's when using the AC motor controller (AC motor controller measures pulses at the motor shaft).

1. Press the **"ELEVATION UP/DOWN"** keys until **"P20EFFDIAMETER"** is displayed in the alphanumeric display.
2. Press the **"ENTER"** key.
3. **CAUTION!!! THE BELT WILL START AND RAMP UP APPROXIMATELY 12 MPH IN THIS STEP!!!**  
Allow the motor speed to stabilize and then measure the belt speed. Using the **"SPEED UP/DOWN"** keys, adjust the effective diameter value (displayed in the elevation window) until the displayed speed (speed window) matches the measured speed +/- .05 MPH. **THE MAGNET COUNT PARAMETER MUST BE PROPERLY SET BEFORE ADJUSTING THIS VALUE!!!**
4. Press the **"ENTER"** key to save or the **"STOP"** key to retain the previous value.

## 4.7 RUN AUTO-CALIBRATION

Automatically detects and stores the correct values for PWM START, MINIMUM, HALF AND MAXIMUM variables and the maximum and minimum elevation values. Failure of the auto-calibration routine is indicated with a triple beep and the failure cause will be temporarily displayed in the alphanumeric display.

1. Press the **"ELEVATION UP/DOWN"** keys until **"AUTO-CALIBRATION"** is displayed in the alphanumeric display.
2. Press the **"ENTER"** key. **CAUTION!!! BELT MOTOR WILL BE ENABLED AND MOVEMENT WILL OCCUR UNDER SOFTWARE CONTROL!!!**
3. Allow the auto-calibration routine to function. Current operations are indicated in the alphanumeric display.
4. Auto-calibration routines will indicate successful completion with a double beep or failure with a triple beep.

## PWM START

Is the PWM minimum threshold in which belt movement occurs. This parameter is used to ensure belt movement occurs within 2 seconds from the end of the "3" count but not before.

1. Press the **"ELEVATION UP/DOWN"** keys until **"P21PWMSTARTSPD"** is displayed in the alphanumeric display.
2. Press the **"ENTER"** key. **CAUTION!!! BELT MOTOR WILL BE ENABLED AND MOVEMENT WILL OCCUR WHEN THE PWM OUTPUT VALUE EXCEEDS THE MOTOR STARTING THRESHOLD!!!**
3. SLOWLY increase the PWM value using the **"SPEED UP/DOWN"** keys until the belt begins moving (approximately 0.3 MPH should be displayed in the speed window).
4. Press the **"ENTER"** key to save or the **"STOP"** key to retain the previous value.



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## 4.7 RUN AUTO-CALIBRATION (CONTINUED)

### PWM MINIMUM

Used to calibrate the PWM output per MPH.

1. Press the **"ELEVATION UP/DOWN"** keys until **"P0PWMINSPEED"** is displayed in the alphanumeric display.
2. Press the **"ENTER"** key. **CAUTION!!! THE BELT WILL START AND SPEED WILL RAMP UP APPROXIMATELY TO THE TARGET SPEED VALUE DISPLAYED IN THE ELEVATION WINDOW!!!**
3. Once the motor speed has stabilized measure the belt speed and adjust the PWM value (displayed in the speed window) until the measured speed matches the target speed +/- .05 MPH.
4. Press the **"ENTER"** key to save or the **"STOP"** key to retain the previous value.

### PWM HALF – USED TO CALIBRATE THE PWM OUTPUT PER MPH.

1. Press the **"ELEVATION UP/DOWN"** keys until **"P1PWM1/2MAXSPD"** is displayed in the alphanumeric display.
2. Press the **"ENTER"** key. **CAUTION!!! THE BELT WILL START AND SPEED WILL RAMP UP APPROXIMATELY TO THE TARGET SPEED VALUE DISPLAYED IN THE ELEVATION WINDOW!!!**
3. Once the motor speed has stabilized measure the belt speed and adjust the PWM value (displayed in the speed window) until the measured speed matches the target speed (elevation window) +/- .05 MPH.
4. Press the **"ENTER"** key to save or the **"STOP"** key to retain the previous value.

### PWM MAX

Used to calibrate the PWM output per MPH.

1. Press the **"ELEVATION UP/DOWN"** keys until **"P2PWMMAXSPEED"** is displayed in the alphanumeric display,
2. **CAUTION!!! THE BELT WILL START AND SPEED WILL RAMP UP APPROXIMATELY TO THE TARGET SPEED VALUE DISPLAYED IN THE ELEVATION WINDOW!!!**
3. Once the motor speed has stabilized measure the belt speed and adjust the PWM value (displayed in the speed window) until the measured speed matches the target speed (elevation window) +/- .05 MPH.
4. Press the **"ENTER"** key to save or the **"STOP"** key to retain the previous value.

**CALIBRATION IS NOW COMPLETE**  
**RESET SYSTEM BY TOGGING POWER OR BY PRESSING THE EMERGENCY STOP BUTTON**

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## 5. TROUBLESHOOTING GUIDE

**CAUTION!!! FOLLOW ALL SAFETY PROCEDURES AND USE COMMON SENSE FOR WORKING WITH ELECTRICAL/MECHANICAL SYSTEMS.**

### 5.1 ERROR CODES

Code	Description
1	Elevation Reversed
2	Elevation Range
3	Elevation Stall
4	Acceleration Past Limit
5	Speed Past Limit
6	Speed Input
7	Speed Stall
8	Speed Sensor
9	Speed Range
10	Array Bound
11	Pointer Bound
12	Nv Wrong Location
13	Variable Bound
14	Divide By Zero
15	Screen Bound
16	Stuck Key
17	Speed Ramp
18	Safety Switch
19	Novram Failure

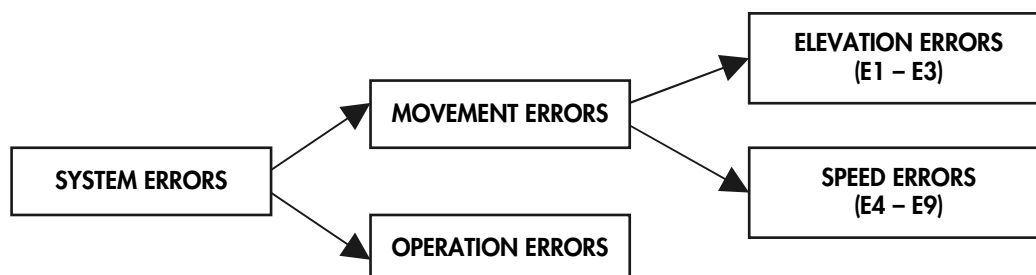
Error codes can be divided into two major groups; movement related errors and system operation errors.

Movement related errors (errors below E10) can be remedied in some cases by correctly calibrating the system (please see SYSTEM CALIBRATION PROCEDURE in this document) so access to engineering screens are allowed.

System operation errors indicate the system or software is malfunctioning in an unexpected way. These errors require a power down reset (unplugging) in order to clear. Some of these errors may reoccur once power is applied (e.g. stuck key error) until error source is resolved (e.g. replace keypad).

Movement related errors can be divided in elevation related errors (E1 – E3) or speed related errors (E5 – E9).

System should be properly calibrated (if possible) before attempting to troubleshoot error codes.



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## 5.2 ELEVATION MOVEMENT RELATED ERRORS

### 5.2.1 E1 – ELEVATION REVERSED ERROR

#### 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.

#### PROBLEM IDENTIFICATION

The movement can be directly controlled and the elevation position feedback can be directly read in the hardware test. To observe the elevation error, enter the hardware screen (see HARDWARE TEST SCREEN section in this document). Use the elevation up/down keys to directly control the elevation movement (within the travel limits of the elevation mechanism). Observe the elevation position feedback displayed in the elevation window. Use the below guide to identify the problem.

#### CORRECTIVE ACTION

*Elevation Moving In Wrong Direction (perform actions in the order displayed, perform next action if previous did not work)*

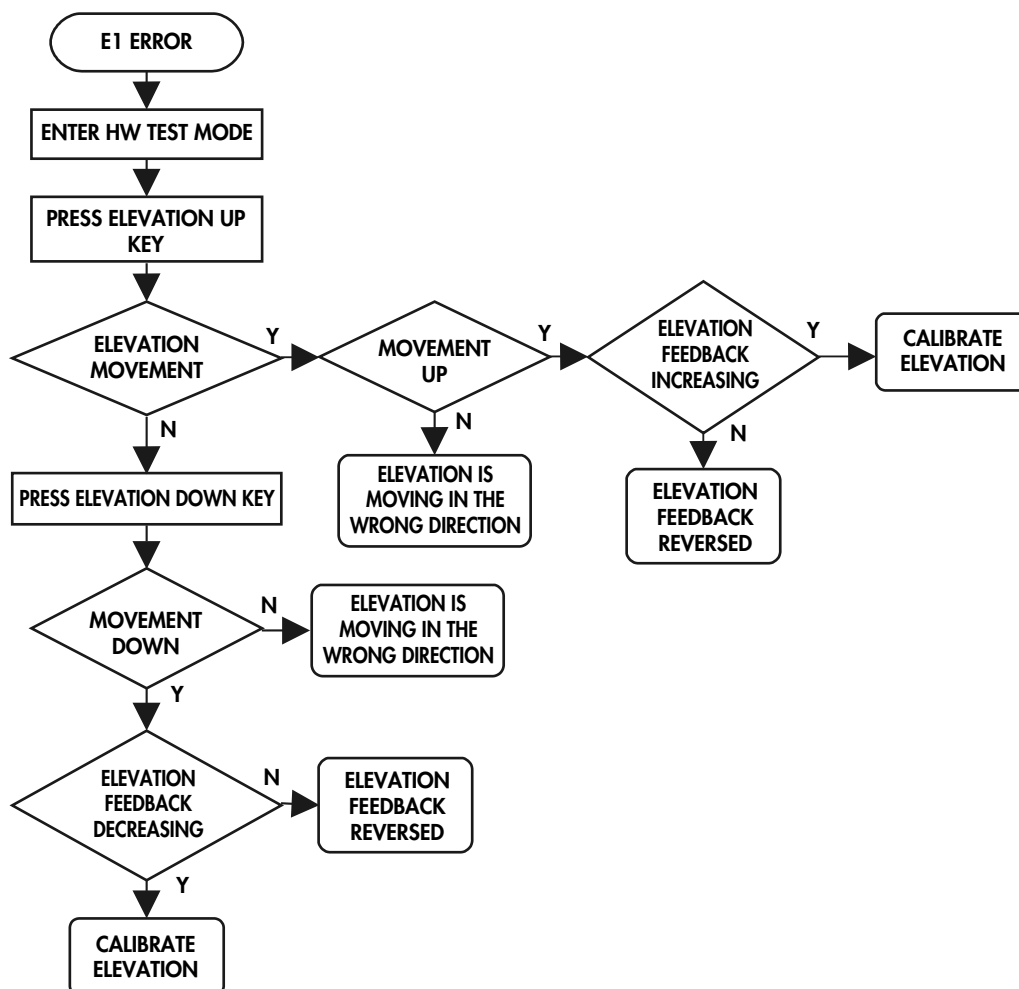
- Ensure correct signal is being sent to Motor Controller board by pressing **“ELEVATION UP/DOWN”** keys by observing elevation LED's correctly corresponding to correct elevation keys pressed. If failure occurs for this step check ribbon cable and then the Motor Controller board.
- Check system with a known good ribbon cable.
- Check elevation motor for proper operation (plug into known good system and ensure elevation is moving in correct direction). Wiring of elevation motor may be incorrect.
- Check failed elevation motor, Motor Controller board, ribbon cable with a known good console.

*Elevation Feedback Reversed*

- Reverse the elevation direction in the firmware setup screens (see Manual Calibration screen in this document).
- Calibrate Elevation
- Calibrate the elevation as outlined in the System Calibration Procedure in this document.

# DGF1J Upper Board: Engineering Guide

## 5.2.1 E1 – ELEVATION REVERSED ERROR



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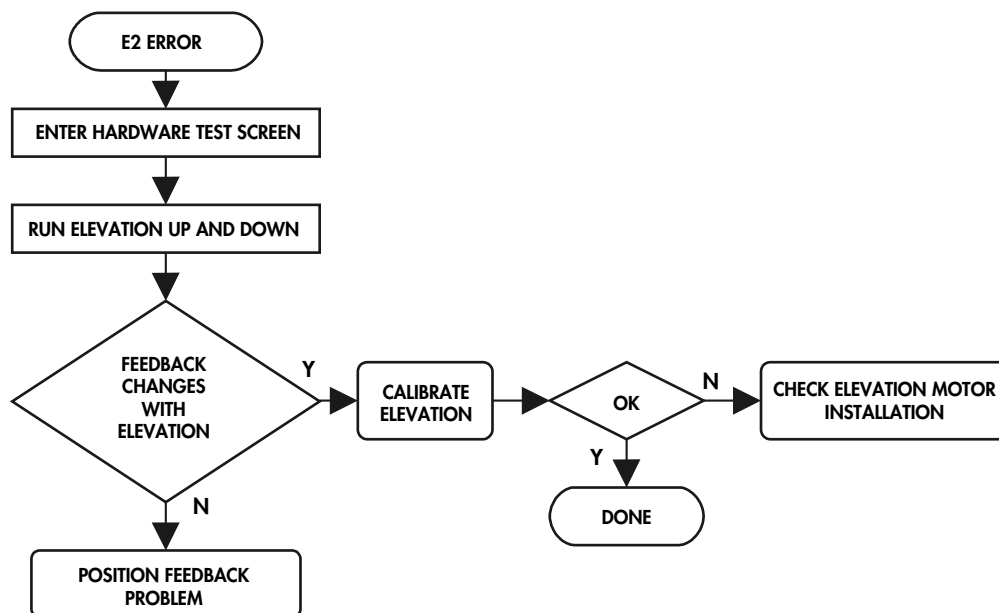
## 5.2.2 E2 – ELEVATION RANGE ERROR

### 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.

### PROBLEM IDENTIFICATION

The movement can be directly controlled and the elevation position feedback can be directly read in the hardware test. To observe the elevation error, enter the hardware screen (see HARDWARE TEST SCREEN section in this document). Use the **“ELEVATION UP/DOWN”** keys to directly control the elevation movement (within the travel limits of the elevation mechanism). Observe the elevation position feedback displayed in the elevation window. Use the below guide to identify the problem.



### CORRECTIVE ACTION

*Elevation Moving In Wrong Direction (perform actions in the order displayed, perform next action if previous did not work)*

- Ensure correct signal is being sent to Motor Controller board by pressing **“ELEVATION UP/DOWN”** keys and observing elevation LED's correctly corresponding to correct elevation keys pressed. If failure occurs for this step check ribbon cable and then the Motor Controller board.
- Check system with a known good ribbon cable.
- Check elevation motor for proper operation (plug into known good system and ensure elevation is moving in correct direction). Wiring of elevation motor may be incorrect.
- Check failed elevation motor, Motor Controller board, ribbon cable with a known good console.

### ELEVATION FEEDBACK REVERSED

- Reverse the elevation direction in the Configuration screen (see Manual Calibration screen in this document).
- Calibrate Elevation
- Calibrate the elevation as outlined in the System Calibration Procedure in this document.

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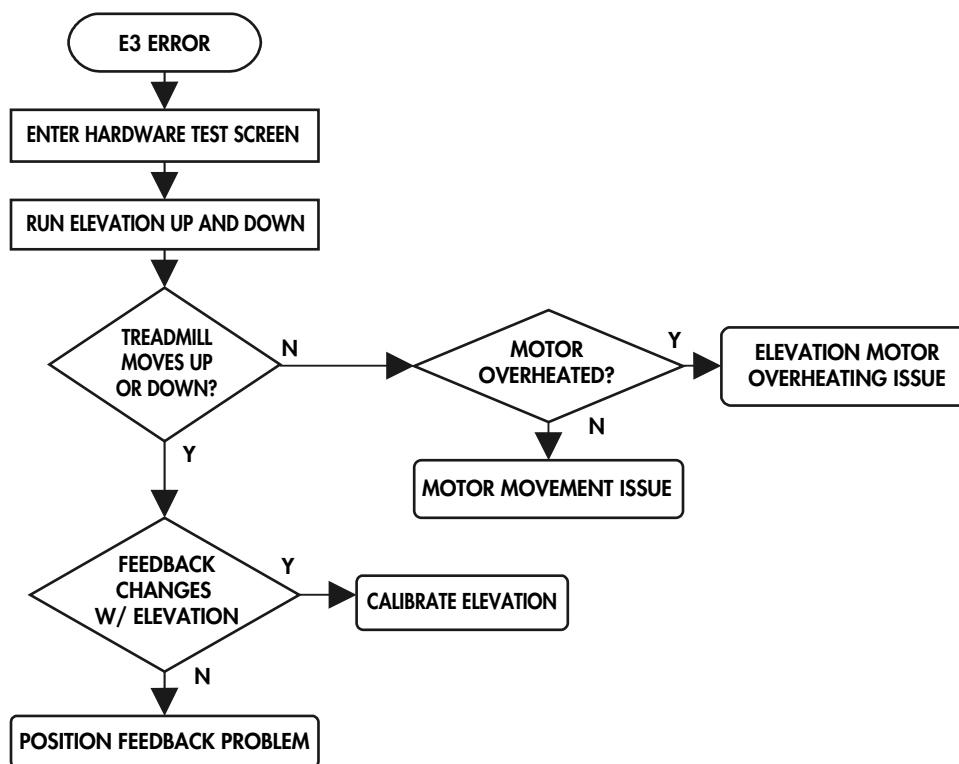
## 5.2.3 E3 – ELEVATION STALL ERROR

### 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.

### PROBLEM IDENTIFICATION

The movement can be directly controlled and the elevation position feedback can be directly read in the hardware test. To observe the elevation error, enter the hardware screen (see HARDWARE TEST SCREEN section in this document). Use the **“ELEVATION UP/DOWN”** keys to directly control the elevation movement (within the travel limits of the elevation mechanism). Observe the elevation position feedback displayed in the elevation window. Use the below guide to identify the problem. **ENSURE NO OBSTRUCTIONS (FURNITURE, OBJECTS, PEOPLE ETC.) IS PREVENTING PROPER TREADMILL MOVEMENT BEFORE CHECKING FOR ERROR CAUSE.**



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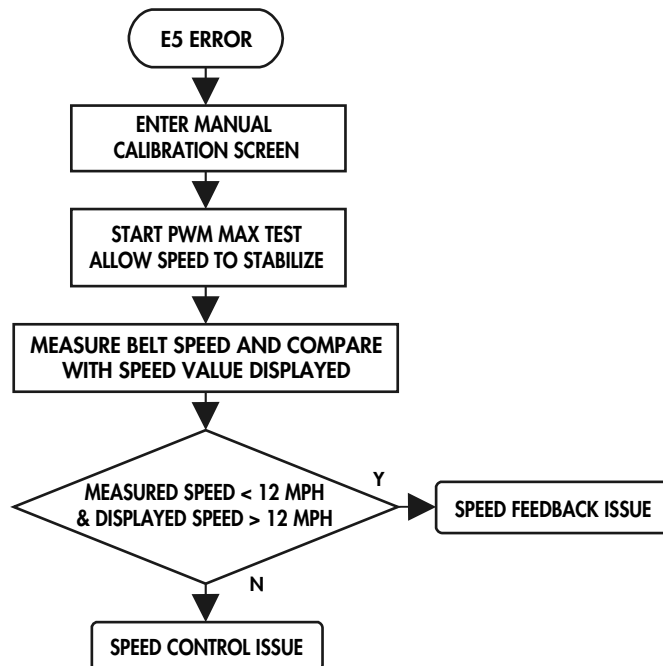
## 5.3 SPEED MOVEMENT RELATED ERRORS

### 5.3.1 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).

#### PROBLEM IDENTIFICATION



#### CORRECTIVE ACTION

**CAUTION!!! FOLLOW ALL SAFETY PROCEDURES AND USE COMMON SENSE FOR WORKING WITH ELECTRICAL/MECHANICAL SYSTEMS.**

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.

**Speed Control Issues** – See speed control issue trouble shooting guide in the *CORRECTIVE ACTION PROCEDURES – Speed Issues* section of this document

Record parameter information logged with error. **REMOVE POWER!!!** Carefully check all connections. Check Motor Controller board and the Motor controller settings to ensure all settings are correct. Run the system at maximum speed to ensure no additional over speed failures occur. If repeat over speed errors occur remove the treadmill from service.

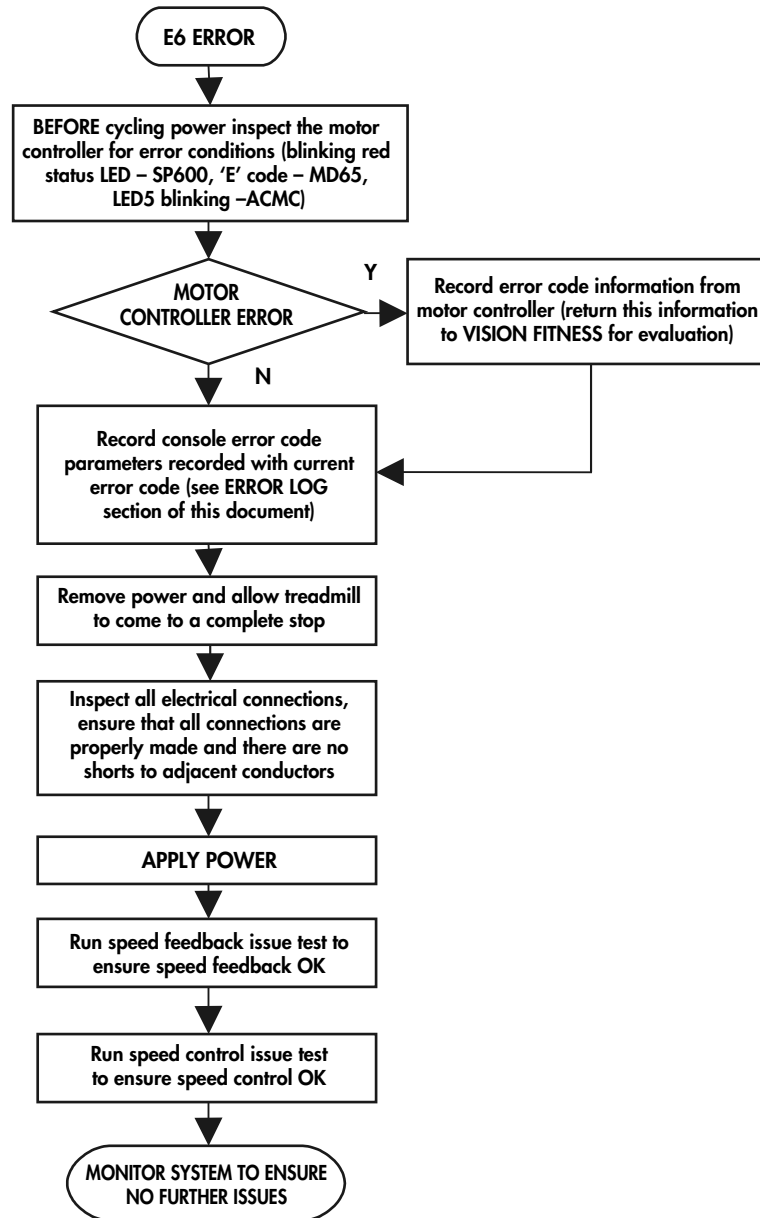
# DGF1J Upper Board: Engineering Guide

## 5.3.2 E6 – INPUT BELT SPEED 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 not responding to input.

### PROBLEM IDENTIFICATION





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## 5.3.2 E6 – INPUT BELT SPEED ERROR (CONTINUED)

### CORRECTIVE ACTION

**CAUTION!!! FOLLOW ALL SAFETY PROCEDURES AND USE COMMON SENSE FOR WORKING WITH ELECTRICAL/MECHANICAL SYSTEMS.**

Record parameter information recorded with this error for future problem analysis.

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

*Speed Control Issues* – See speed control issue trouble shooting guide in the *CORRECTIVE ACTION PROCEDURES – Speed Issues* section of this document

**REMOVE POWER!!! CAREFULLY CHECK ALL CONNECTIONS, MOTOR CONTROLLER BOARD AND THE SETTING TO ENSURE ALL SETTINGS ARE CORRECT. RUN THE SYSTEM AT MAXIMUM SPEED TO ENSURE NO ADDITIONAL FAILURES OCCUR.**

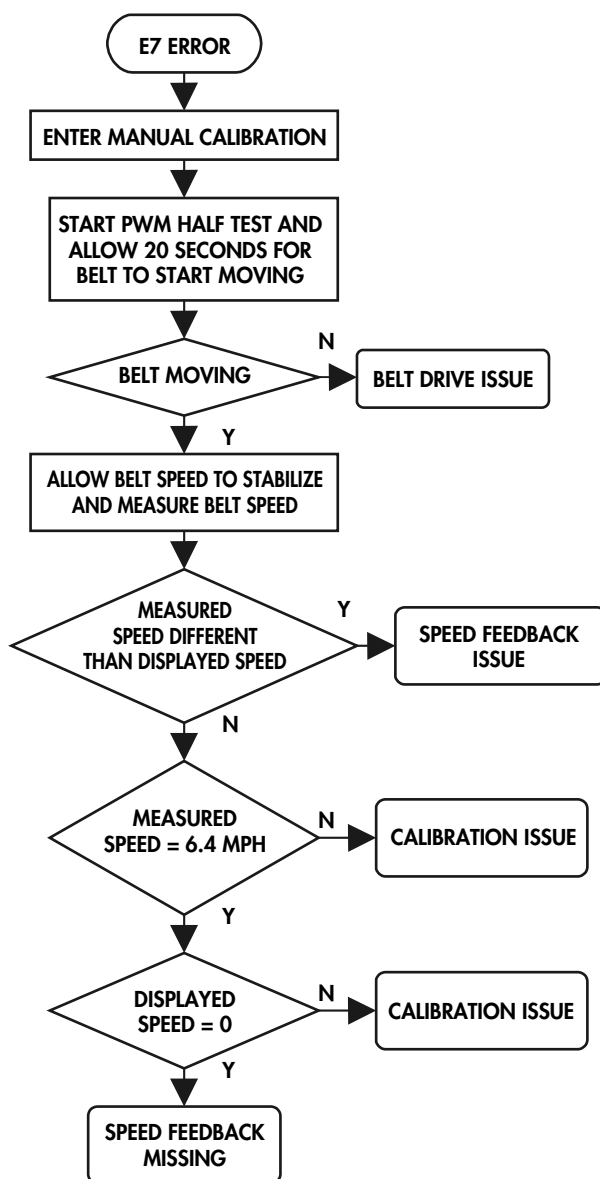
# DGF1J Upper Board: Engineering Guide

## 5.3.3 E7 – SPEED STALL ERROR

### OVERVIEW

If no belt movement is detected several seconds after commanding belt movement a speed stall error (E7) is called.

### PROBLEM IDENTIFICATION



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## 5.3.3 E7 – SPEED STALL ERROR (CONTINUED)

### CORRECTIVE ACTION

**CAUTION!!! FOLLOW ALL SAFETY PROCEDURES AND USE COMMON SENSE FOR WORKING WITH ELECTRICAL/MECHANICAL SYSTEMS.**

Record parameter information recorded with this error for future problem analysis (see *SERVICE 5 – ERROR LOG* section of this document).

Ensure the belt is freely moving and is not binding, rubbing or otherwise held back.

**Belt Drive Issues** – See belt drive issue trouble shooting section in the *CORRECTIVE ACTION PROCEDURES – Speed Issues* section of this document.

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

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

**Calibration Issues** – See speed calibration issue trouble shooting section in the *CORRECTIVE ACTION PROCEDURES – Speed Issues* section of this document

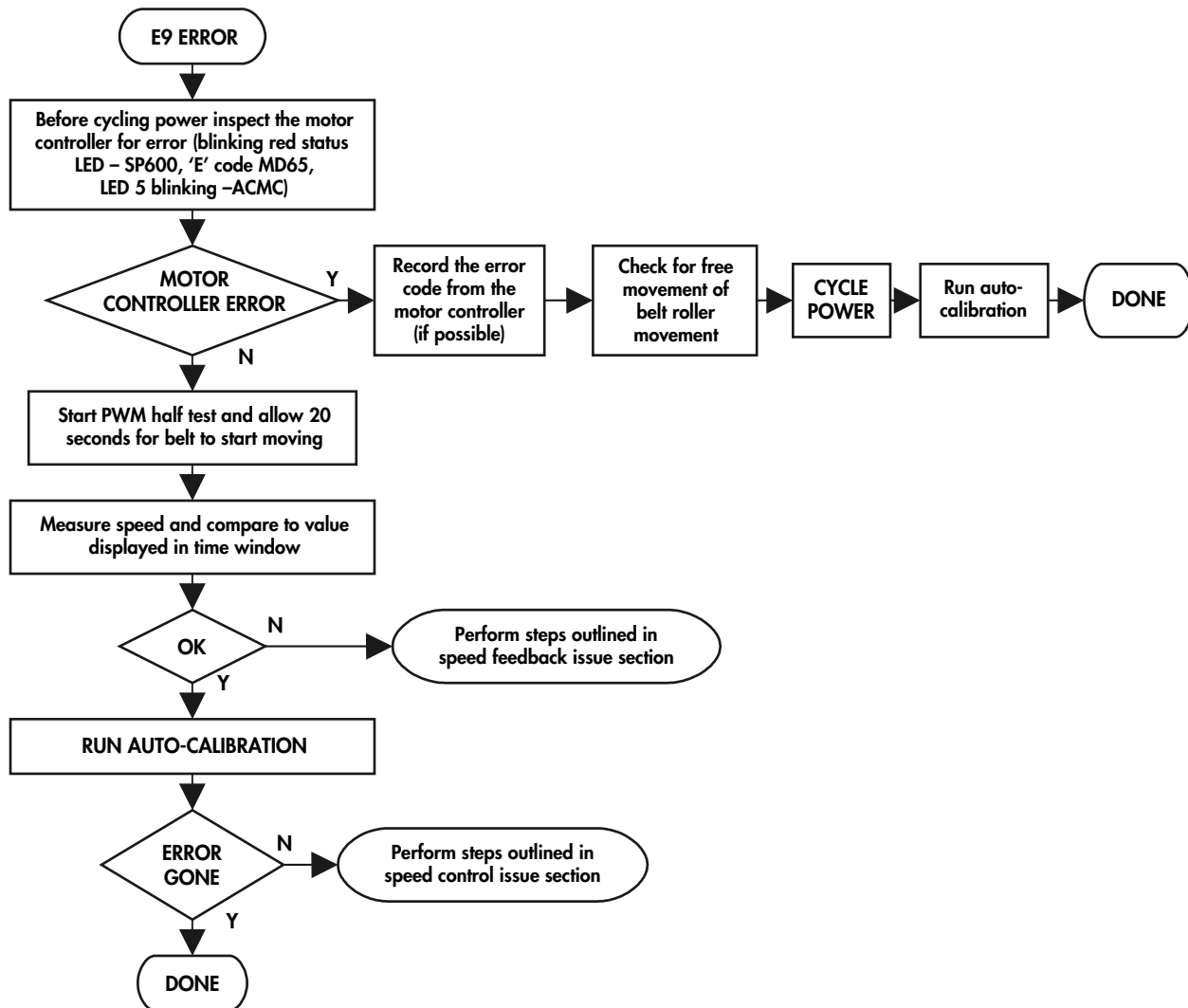
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## 5.3.4 E9 – SPEED RANGE ERROR

### 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 .8 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.

### PROBLEM IDENTIFICATION



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## 5.3.4 E9 – SPEED RANGE ERROR (CONTINUED)

### CORRECTIVE ACTION

**CAUTION!!! FOLLOW ALL SAFETY PROCEDURES AND USE COMMON SENSE FOR WORKING WITH ELECTRICAL/MECHANICAL SYSTEMS.**

Record parameter information recorded with this error for future problem analysis (see ERROR LOG section of this document).

*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.

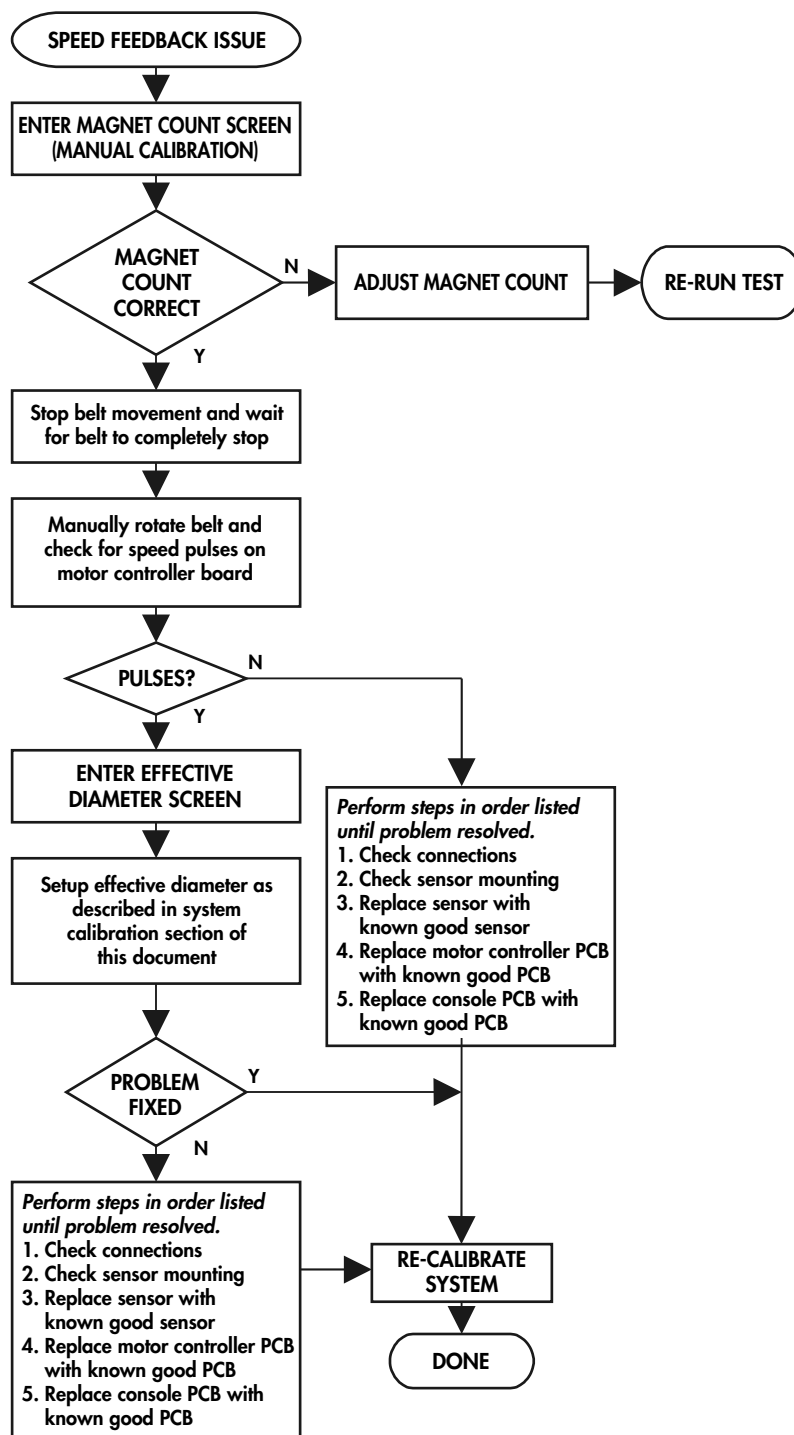
*Speed Control Issues* – See speed control issue trouble shooting guide in the *CORRECTIVE ACTION PROCEDURES – Speed Issues* section of this document

*Calibration Issues* – See speed calibration issue trouble shooting section in the *CORRECTIVE ACTION PROCEDURES – Speed Issues* section of this document

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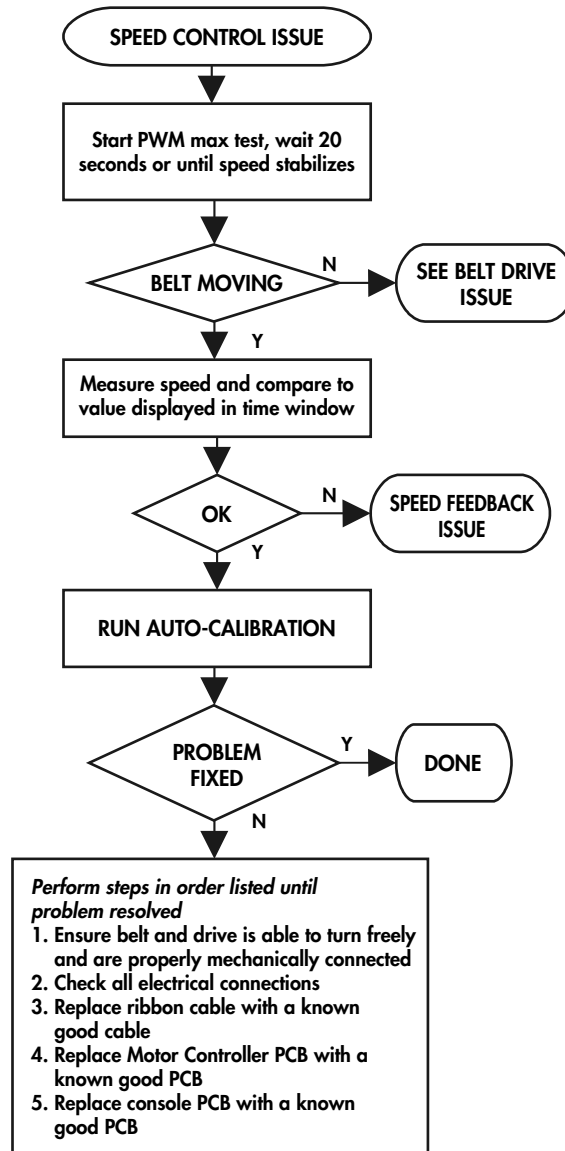
## 5.3.5 CORRECTIVE ACTION PROCEDURES – SPEED ISSUES

### 5.3.5.1 SPEED FEEDBACK ISSUES



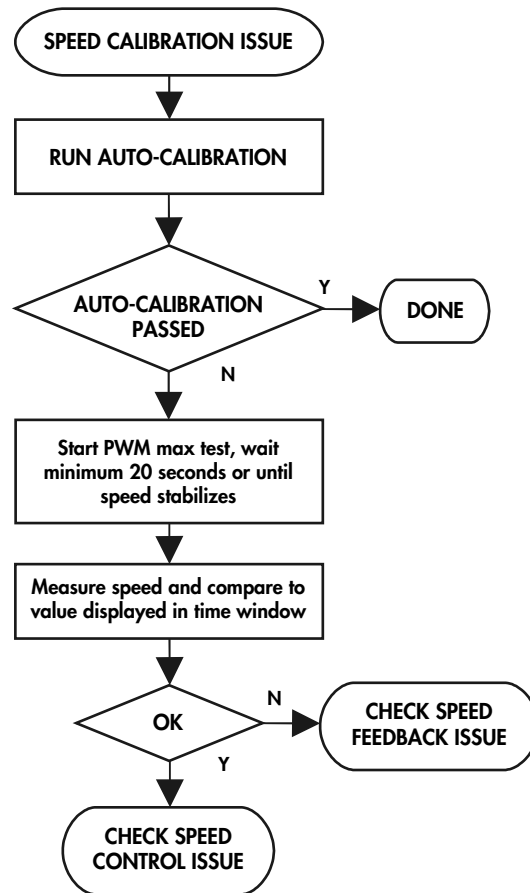
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## 5.3.5.2 SPEED CONTROL ISSUE



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## 5.3.5.3 SPEED CALIBRATION ISSUE





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## **5.4 SYSTEM OPERATION ERRORS**

System operation errors indicate the system or software is malfunctioning in an unexpected way. These errors require a power down reset (unplugging) in order to clear. Some of these errors may reoccur once power is applied (e.g. stuck key error) until error source is resolved (e.g. replace keypad).

### **5.4.1 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**

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

### **5.4.2 E18 – SAFETY SWITCH TEST FAILURE**

#### **OVERVIEW**

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

#### **CORRECTIVE ACTION**

Re-calibrate system as listed in system calibration section of this document and re-run safety switch test. If system still fails safety switch test run speed feedback issue and speed control issue tests in the corrective action procedures section of this document.

### **5.4.3 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 PCB will need to be returned to Vision Fitness for repair.