1.0 INTRODUCTION

The primary purpose of troubleshooting is to return plant equipment to operational status as fast as possible by finding the cause of a problem and correcting it. A cause is what makes a problem happen and the reason why it occurred. A symptom is an indication that a problem exists. Recognizing the symptom of a problem can help you find the cause and once the cause is known, it can be corrected. Troubleshooting combines the knowledge of the materials, machinery, and procedure with the analytical process of identifying the limited number of variables that can cause the problem. This module covers the most common faults found in the OP40 process, the causes, and the steps taken to return a station back to an operational status.

2.0 TROUBLESHOOTING ROUTINES

One of the first steps in locating a malfunction or fault that may occur during the OP40 process, is access the Master Control Machine Layout Screen as shown in Figure 701. This screen will have the “Fault” block on the status bar highlighted in red. The long information block located under the status bar should identify the type of fault if it applies to the overall operation. Also, the station fault block will be highlighted in red, indicating which of the six stations has the fault.

For an example, Figure 701 indicates that Station 5 has a fault.

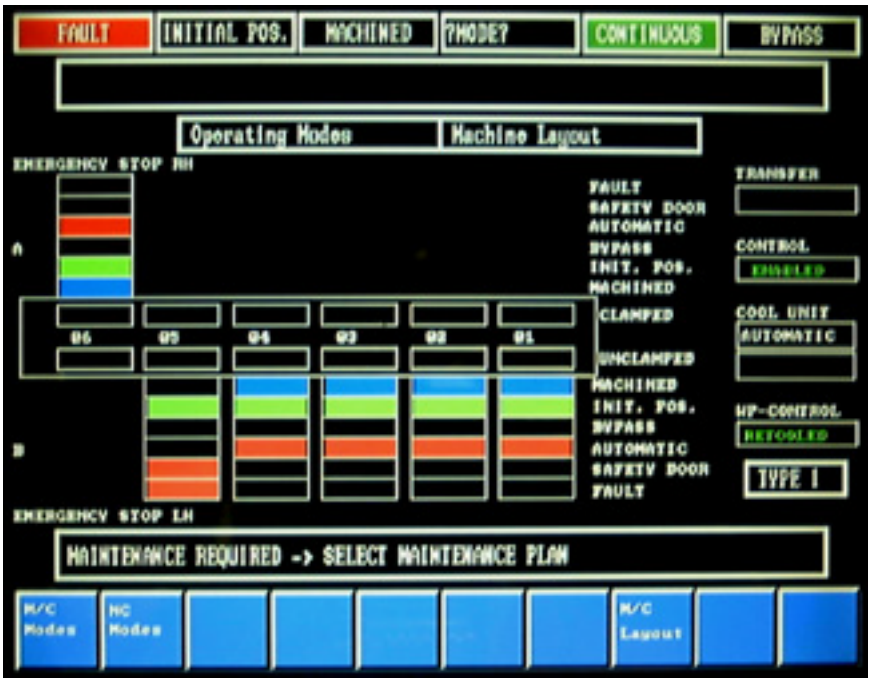


Figure 701: Master Control Machine Layout Screen

The second step is to access the Main Panel Operating Modes screen, shown in Figure 702, where additional information is provided. This screen would be accessed if the fault affects the entire operation. The information provided on the display will include operating mode and allow the technician to operate the transfer bar, cycle the units, and stop/start the operation.

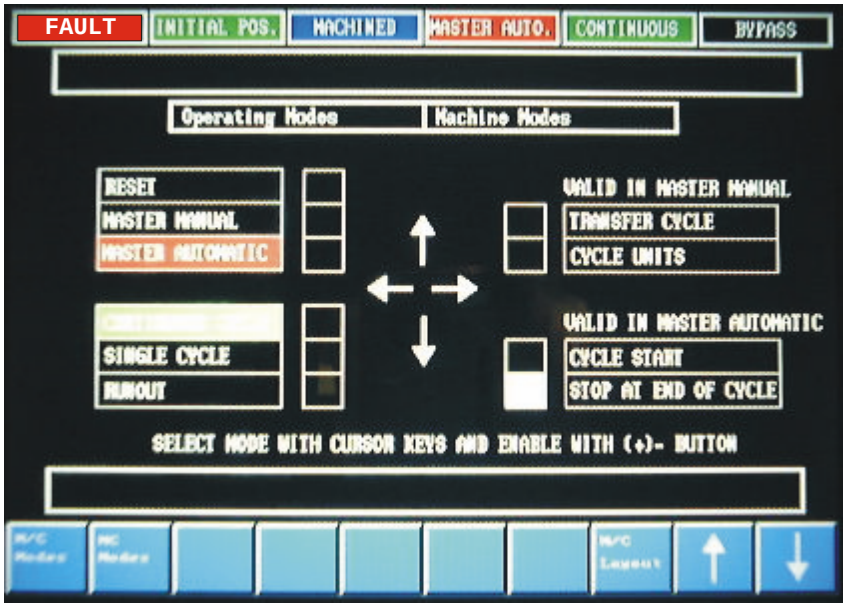


Figure 702: Operating Modes, Main Panel

The Operating Modes panel shown in Figure 703 is found on Stations 1 through 6. This screen is used to operate the individual stations when changing tools or troubleshooting. This screen will have the “Fault” block on the status bar highlighted in white. The long information block located under the status bar should identify the type of fault applicable to the individual station. For an example, Figure 703 indicates that a “Spindle Motor Overload B” fault has occurred at this station.

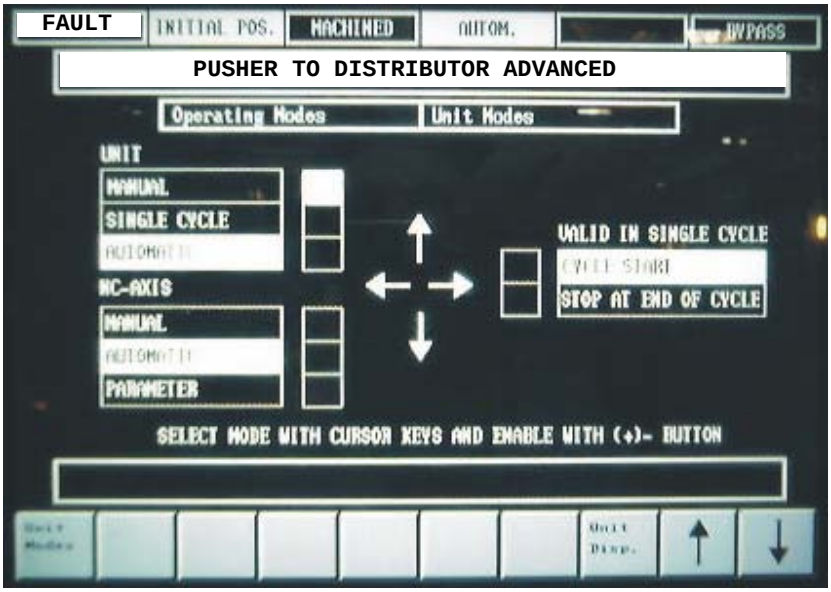


Figure 703: Operating Modes, Stations 1-6 Control Panels

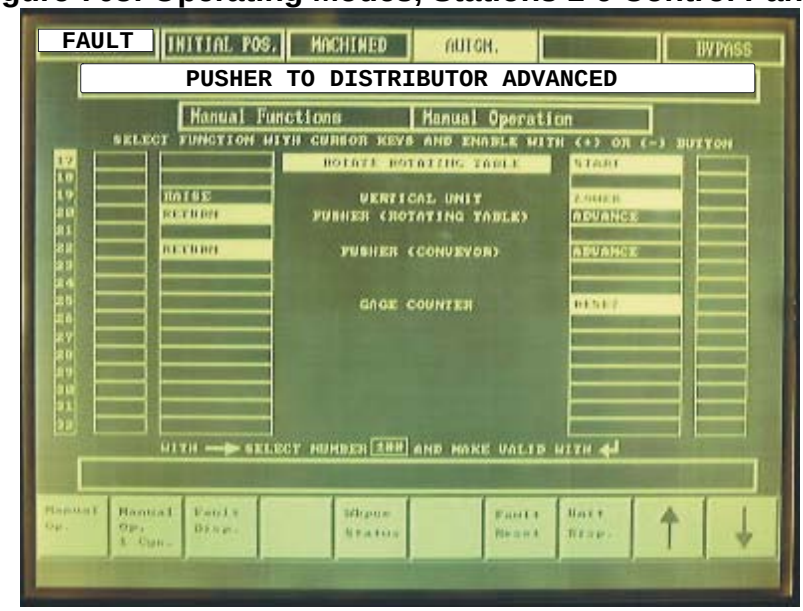


Figure 704: Manual Functions Screen, Main Control and Stations 1-6 Control Panels

The Manual Functions screen shown in Figure 704 is used to manually operate the components of the individual stations. An example would be locking/unlocking the safety doors, returning/advancing the pusher, or resetting the gage counter.

The following is a list of the stations and what the control screen would identify as the most common faults found during the OP40 process.

- Main Panel - Transfer Clutch Overload
- Station 1 or 6 - Rotating Table Out of Position
- Station 1- Pusher to Distributor Advanced
- Station 6 - Pusher to Rotating Table Advanced
- Station 4 - Work Piece Too Small/Large A, B, or C
- Station 5 - Spindle Motor Overload A, B, C, or D
- Station 6 - Gage Counter Alarm

2.1 MAIN PANEL - TRANSFER CLUTCH OVERLOAD

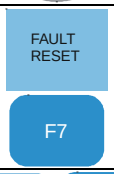
When the Main Control "*Mimic Display*" Screen indicates a system fault, the Main Panel display may identify a "*TRANSFER CLUTCH OVERLOAD*" fault. The reason for this type of fault could include one of the following problems:

- Stuck Valve
- Jammed Part
- Electrical
- Lubrication

To correct the "Transfer Clutch Overload" fault the following steps must be performed in sequence.

Step:	Action:	Awareness:
1.	Open all Safety doors on line side by performing steps 2 through 5	
2.	Select "*Manual*" on station display and press [**FUNCTION PLUS]** pushbutton. Results: Places station into manual mode.	
3.	Press [**MANUAL FUNCTIONS**] key. Results: Displays Manual Function screen	
4.	Press [**F1**] key. Results: Returns to Manual Function screen.	
5.	Select "*Safety Door*" on display and press [**FUNCTION PLUS]** pushbutton. Results: Unlocks Safety Door	

<table>
<tr><td>6.</td><td colspan="2">At each station, visually inspect for cause of fault.</td></tr>
<tr><td>7.</td><td colspan="2"><table>
<tr><th>IF:</th><th>THEN:</th></tr>
<tr><td>Jammed part</td><td>Clear jammed part.

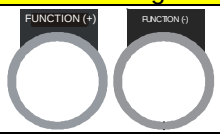
<table>
<tr><th>IF:</th><th>THEN:</th></tr>
<tr><td>Jammed due to chips or shavings</td><td>Clean out with an air hose.</td></tr>
<tr><td>Unable to clear</td><td>Call Machine Repair</td></tr>
</table></td></tr>
<tr><td>Broken Locator</td><td>Reposition the transfer bar and call Machine Repair.</td></tr>
</table></td></tr>
<tr><td>8.</td><td colspan="2">Open station 6 access doors with the key.</td></tr>
<tr><td>9.</td><td colspan="2">Referencing the transfer clutch prox. switch, adjust the reset clutch at station 6 with a 44mm. wrench until green light appears on prox. switch.</td></tr>
<tr><td>10.</td><td colspan="2">Close station 6 access doors and lock with key.</td></tr>
<tr><td>11.</td><td colspan="2">Close all safety doors and perform steps 12 through 15 for each station</td></tr>
<tr><td>12.</td><td>Select “Safety Door” on display and press [FUNCTION MINUS] pushbutton.
Results: Locks Safety Doors</td><td>Safety Door
  </td></tr>
<tr><td>13.</td><td>Press [F7] key.
Results: Clears Safety Door Fault</td><td>  </td></tr>
<tr><td>14.</td><td>Press [Oper Modes] key and then [F1] key.
Results: Displays the Operating Mode screen</td><td>  </td></tr>
<tr><td>15.</td><td>Select “Automatic” and press [FUNCTION PLUS] pushbutton.
Results: Engages “Automatic” mode</td><td>Automatic
  </td></tr>
<tr><td>16.</td><td>Return to Main Panel and reset fault by pressing either the [Manual Function] or [Fault Display] key.
Results: Displays [F7] Fault reset key</td><td>  </td></tr>
<tr><td>17.</td><td>Press the [F7] key.
Results: Clears fault
IF the fault does NOT reset,
THEN the clutch is not properly adjusted.</td><td>  </td></tr>
<tr><td>18.</td><td>Press the [OP MODES] key and then the[F1] key.</td><td>  </td></tr>
<tr><td>19.</td><td>Select “Cycle Start” and press [FUNCTION PLUS] pushbutton until the horn stops.
Results: Machine starts</td><td>Cycle Start
  </td></tr>
</table>

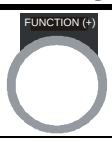
2.2 STATION 1 or 6 - ROTATING TABLE OUT OF POSITION

When the Main Control "*Mimic Display*" Screen indicates a fault at Station 1 or 6, the "*Operating Modes*" station display may identify a "*Rotating Table Out of Position*" fault. The reason for this type of fault could include one of the following problems:

- Brake Malfunction
- Jammed part
- Loose or faulty electrical switch
- Distributor off-location

To correct the "Rotating Table Out of Position" fault the following steps must be performed in sequence.

Step:	Action:	Awareness:
1.	Select "*Manual*" on station display and press [**FUNCTION PLUS]** pushbutton. Results: Places station into manual mode.	Manual 
2.	Press [**MANUAL FUNCTIONS**] key. Results: Displays Manual Function screen	
3.	Press [**F1**] key. Results: Returns to Manual Function screen.	
4.	Scroll to line 17 - "Rotate Rotating Table"	Rotate Rotating Table
5.	Push the [**FUCTION PLUS**] and [**FUNCTION MINUS**] pushbuttons at the same time. Results: Allows operator to select individual components on the turntable.	
6.	Verify that Station 1 components are on the minus side of the display.	
7.	Verify that line 17 – "Rotate Rotating Table" is selected.	Rotate Rotating Table
8.	Push and release the [**FUNCTION PLUS**] pushbutton. Results: Table rotates	
9.	Repeat step 8 until the components are in their original positions. IF NOT sure of original position, THEN remove all the rods from the table.	
10.	Verify that rotating table is in position and "Start" is highlighted on the display.	Start
11.	Select "Automatic" and press [**FUNCTION PLUS]** pushbutton until the horn stops. Results: Machine starts	Automatic

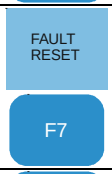
	IF fault is redisplayed, THEN notify an electrician.	

2.3 STATION 1 - PUSHER TO DISTRIBUTOR ADVANCED

When the Main Control "*Mimic Display*" Screen indicates a fault at Station 1, the "*Operating Modes*" station display may identify a "*Pusher to Distributor Advanced*" fault. The reason for this type of fault could include one of the following problems:

- Part off-location
- Jammed part
- Loose or faulty electrical switch
- Distributor off-location
- Double parts in rotating table
- Rotating table off-location

To correct the "Pusher to Distributor Advanced" fault the following steps must be performed in sequence.

Step:	Action:	Awareness:
1.	Select "*Manual*" on station display and press [**FUNCTION PLUS]** pushbutton. Results: Places station into manual mode.	Manual 
2.	Press [**MANUAL FUNCTIONS**] key. Results: Displays Manual Function screen	
3.	Press **[F7]** key. Results: Clears the fault.	
4.	Press [**F1**] key. Results: Returns to Manual Function screen.	
5.	Select "*Pusher to Swivel Flap*" on display and press [**FUNCTION MINUS**] pushbutton. Results: Returns pusher.	Pusher to Swivel Flap 
6.	Select "*Safety Door*" on display and press [**FUNCTION PLUS]** pushbutton. Results: Unlocks Safety Door	Safety Door 
7.	Open Station 1 Safety door on line side and visually inspect for cause of fault.	

8.

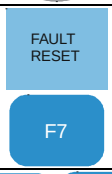
IF:	THEN:
Part off-location	Reposition part
Jammed part	Clear jammed part. IF unable to clear, THEN call Machine Repair.
Loose or faulty electrical switch	Notify an Electrician
Distributor off-location	Try to reposition manually. IF unable to reposition, THEN notify an Electrician or Machine Repair
Double parts in rotating table	Remove parts from table
Rotating table off-position	Try to reposition manually. IF unable to reposition, THEN notify an Electrician

9. Close Station 1 safety door.

10. Select "*Safety Door*" on display and press [**FUNCTION MINUS**] pushbutton.
Results: Locks Safety Doors

Safety Door

11. Press [**F7**] key.
Results: Clears Safety Door Fault



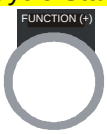
12. Press **[Oper Modes]** key and then **[F1]** key.
Results: Displays the Operating Mode screen

13. Select "*Single Cycle*" and press [**FUNCTION PLUS**] pushbutton.
Results: Engages Single Cycle mode

Single Cycle

14. Select "*Cycle Start*" and press [**FUNCTION PLUS**] pushbutton.
Results: "*Initial Pos*" and "*Machined*" will highlight on status bar.

Cycle Start



IF:	THEN:
"*Initial Pos*" and "*Machined*" are NOT highlighted	Repeat steps 1 through 13
Repeating steps 1 through 16 does NOT clear the fault	Notify Machine Repair or an Electrician

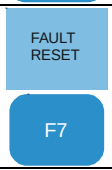
15.	Select "*Automatic*" and press [**FUNCTION PLUS**] pushbutton. Results: Engages "*Automatic*" mode	Automatic 
16.	Select "*Cycle Start*" and press [**FUNCTION PLUS**] pushbutton until the horn stops. Results: Machine starts	Cycle Start 

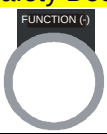
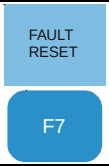
2.4 STATION 6 - PUSHER TO ROTATING TABLE ADVANCED

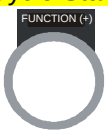
When the Main Control "*Mimic Display*" Screen indicates a fault at Station 6, the "*Operating Modes*" station display may identify a "*Pusher to Rotating Table Advanced*" fault. The reason for this type of fault could include one of the following problems:

- Part off-location
- Jammed part
- Loose or faulty electrical switch
- Distributor off-location
- Double parts in rotating table
- Rotating table off-location

To correct the "Pusher to Rotating Table Advanced" fault the following steps must be performed in sequence.

Step:	Action:	Awareness:
1.	Select "*Manual*" on station display and press [**FUNCTION PLUS**] pushbutton. Results: Places station into manual mode.	Manual 
2.	Press [**MANUAL FUNCTIONS**] pushbutton. Results: Displays Manual Function screen	
3.	Press [**F7**] key. Results: Clears the fault.	
4.	Press [**F1**] key. Results: Returns to Manual Function screen.	

<table>
<tr><td>5.</td><td>Select “Pusher (rotating table)” on display and press [FUNCTION MINUS] pushbutton.
Results: Return pusher.</td><td>Pusher (Rotating Table)
  </td></tr>
<tr><td>6.</td><td>IF station 8
THEN select “Vertical Unit” and press [FUNCTION MINUS] pushbutton.
Result: Vertical unit will rise.</td><td>Vertical Unit
  </td></tr>
<tr><td>7.</td><td>Select “Safety Doors” on display and press FUNCTION PLUS] pushbutton.
Results: Unlocks Safety Doors.</td><td>Safety Door
  </td></tr>
<tr><td>8.</td><td>Open applicable station safety door on control panel side and visually inspect for cause of fault.</td><td></td></tr>
<tr><td>9.</td><td><table><tr><th>IF:</th><th>THEN:</th></tr><tr><td>Part off location</td><td>Reposition part</td></tr><tr><td>Jammed part</td><td>Clear jammed part.
IF unable to clear,
THEN call Machine Repair.</td></tr><tr><td>Loose or faulty electrical switch</td><td>Notify an Electrician</td></tr><tr><td>Distributor off location</td><td>Try to reposition manually.
IF unable to reposition,
THEN notify an Electrician or Machine Repair</td></tr><tr><td>Double parts in rotating table</td><td>Remove parts from table</td></tr><tr><td>Rotating table off position</td><td>Try to reposition manually.
IF unable to reposition,
THEN notify an Electrician</td></tr></table></td><td></td></tr>
<tr><td>10.</td><td>Close applicable station safety door.</td><td></td></tr>
<tr><td>11.</td><td>Select “Safety Door” on display and press [FUNCTION MINUS] pushbutton.
Results: Locks Safety Doors</td><td>Safety Door
  </td></tr>
<tr><td>12.</td><td>Press [F7] key.
Results: Clears Safety Door Fault</td><td>  </td></tr>
<tr><td>13.</td><td>Press [Oper Modes] pushbutton and Press [F1] key.
Results: Returns to “Operating Modes” screen.</td><td>  </td></tr>
</table>

<table>
<tr><td>14.</td><td>Select “Single Cycle” and press [FUNCTION PLUS] pushbutton.
Results: Engages Single Cycle mode</td><td>Single Cycle
  </td></tr>
<tr><td>15.</td><td>Select “Cycle Start” and press [FUNCTION PLUS] pushbutton.
Result: “Initial Pos” and “Machined” will highlight on status bar.
<table>
<tr><th>IF:</th><th>THEN:</th></tr>
<tr><td>“Initial Pos” and “Machined” are <u>NOT</u> highlighted</td><td>Repeat steps 1 through 14</td></tr>
<tr><td>Repeating steps 1 through 14 does <u>NOT</u> clear the fault</td><td>Notify Machine Repair or an Electrician</td></tr>
</table></td><td>Cycle Start
  </td></tr>
<tr><td>16.</td><td>Select “Automatic” and press [FUNCTION PLUS] pushbutton”
Results: Engages “Automatic” mode</td><td>Automatic
  </td></tr>
<tr><td>17.</td><td>Select “Cycle Start: and press [FUNCTION PLUS] pushbutton until the horn stops.
Results: Machine starts.</td><td>Cycle Start
  </td></tr>
</table>

2.5 STATION 4 - WORK PIECE TOO SMALL OR LARGE A, B, C, OR D

When the Main Control “*Mimic Display*” Screen indicates a fault at Station 4, the “*Operating Modes*” station display may identify a “*Work Piece Too Small or Large A, B, C, or D*” fault. The reason for this type of fault could include one of the following problems:

- Worn or chipped tool
- Chip or shavings in the gage fixtures

To correct the “Work Piece Too Small or Large A, B, C, or D” fault the following steps must be performed in sequence.

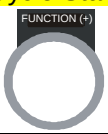
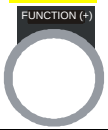
<table>
<tr><th>Step:</th><th>Action:</th><th>Awareness:</th></tr>
<tr><td>1.</td><td>Press [MANUAL FUNCTIONS] key.
Results: Displays Manual Function screen</td><td> 
</td></tr>
<tr><td>2.</td><td>Press [F7] key.
Results: Clears the fault</td><td> 
</td></tr>
<tr><td>3.</td><td><table>
<tr><th>IF BORE SIZE TOO:</th><th>THEN:</th></tr>
<tr><td>Small</td><td>1. Toggle bypass switch
2. Highlight “Cycle Start”
3. Press [FUNCTION PLUS] pushbutton until horn stops.</td></tr>
<tr><td>Large</td><td>1. Highlight “Cycle Start”
2. Press [FUNCTION PLUS] pushbutton until horn stops.</td></tr>
</table></td><td>Cycle Start
 
</td></tr>
<tr><td>4.</td><td><table>
<tr><th>IF FAULT IS REDISPLAYED TOO:</th><th>THEN:</th></tr>
<tr><td>Small</td><td>Check gage fixtures for any chips/shavings.<table>
<tr><th>IF:</th><th>THEN:</th></tr>
<tr><td>Chips/shavings are present</td><td>Remove</td></tr>
<tr><td>No chip/shavings are present</td><td>Check part on quality gage.</td></tr>
</table></td></tr>
<tr><td>Large</td><td>Check part on quality gage. IF too large, THEN replace tool.</td></tr>
</table></td><td></td></tr>
</table>

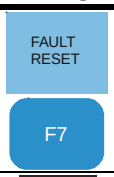
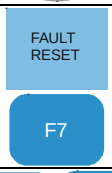
2.6 STATION 5 – SPINDLE MOTOR OVERLOAD A, B, C, OR D

When the Main Control “*Mimic Display*” Screen indicates a fault at Station 5, the “*Operating Modes*” station display may identify a “*Spindle Motor Overload A, B, C, or D*” fault. The reason for this type of fault could include one of the following problems:

- New tool run-in
- Cold start before motor warm-up

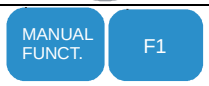
To correct the “Spindle Motor Overload A, B, C, or D” fault the following steps must be performed in sequence.

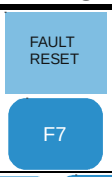
Step:	Action:	Awareness:
1.	Select “*Manual*” on station display and press [**FUNCTION PLUS]** pushbutton. Results: Places station into manual mode.	Manual 
2.	Press [**MANUAL FUNCTIONS**] key. Results: Displays Manual Function screen	
3.	Press [**EMERG. RETURN**] pushbutton. Results: Returns to Manual Function screen.	
4.	Press [**FUNCTION PLUS]** pushbutton.	
5.	Select “*Cycle Start*: and press [**FUNCTION PLUS]** pushbutton until the horn stops. Results: Machine starts. IF fault is redisplayed, THEN perform steps **TBS**	Cycle Start 
6.	Select “*Manual*” on station display and press [**FUNCTION PLUS]** pushbutton. Results: Places station into manual mode.	Manual 
7.	Press [**MANUAL FUNCTIONS**] pushbutton. Results: Displays Manual Function screen	
8.	Press [**F1**] key. Results: Displays Manual Function screen	
9.	Select “*Slide to tool change position*” on display and press [**FUNCTION MINUS**] pushbutton. Result: Head will return.	Slide to Tool Change Position 
10.	Select “*Safety Door*” on display and press [**FUNCTION PLUS**] pushbutton. Results: Unlocks Safety Doors.	Safety Door 
11.	Turn overloaded spindle by hand until no binding is felt.	
12.	Close applicable Station Safety door.	
13.	Select “*Safety Door*” on display and press [**FUNCTION MINUS**] pushbutton. Results: Locks Safety Doors	Safety Door 

14.	Press [**F7**] key. Results: Clears Safety Door Fault	
15.	Press [**EMERGENCY RETURN**] pushbutton. Result: "*Initial Pos*." will highlight on the status bar.	
16.	Press [**F7**] pushbutton. Results: Clears Emergency Return fault	
17.	Press **[OPER MODES]** key and then press **[F1]** key. Results: Displays Oper Mode screen	
18.	Select "*Automatic*" and press [**FUNCTION PLUS]** pushbutton. Results: Engages "*Automatic*" mode	
19.	Select "*Cycle Start*" and press [**FUNCTION PLUS]** pushbutton until the horn stops. Results: Machine starts IF machine does not start, THEN notify an electrician	

2.7 STATION 6 - GAGE COUNTER ALARM

When the Main Control "*Mimic Display*" Screen indicates a fault at Station 6, the "*Operating Modes*" station display may identify a "*Gage Counter Alarm*" fault. The reason for this type of fault is most likely a gage counter not reset by the operator. To correct the "Gage Counter Alarm" fault the following steps must be performed in sequence.

Step:	Action:	Awareness:
1.	Select "*Manual*" on station display and press [**FUNCTION PLUS]** pushbutton. Results: Places station into manual mode.	
2.	Press [**MANUAL FUNCTIONS**] key and then **[F1]** key. Results: Displays Manual Function screen	
3.	Select "*Gage Counter*" on display and press [**FUNCTION PLUS]** pushbutton. Results: Gage Counter Alarm fault will clear	

4.	Press [**F7**] key. Results: Reset Gage Counter Alarm fault	
5.	Press **[OPER MODES]** key and then press **[F1]** key. Results: Displays "*Operating Modes*" screen.	
6.	Select "*Automatic*" on display and press [**FUNCTION PLUS]** pushbutton. Results: Engages "*Automatic*" mode.	

7.	Select "*Cycle Start*" on display and press [**FUNCTION PLUS]** pushbutton until the horn stops Results: Machine will start.