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SECTION I
INTRODUCTION

The Model 458.XX MicroConsole (shown in figure 1-1) provides readout and station control functions. The MicroConsole also provides the chassis connections for the 458 series of functional plug-in modules. Input/output connectors supplied on the rear panel are provided for devices such as transducers, servovalves, hydraulic service manifolds, an oscilloscope, x-y recorder, or a computer. Operating controls and indicators for station control are located on the MicroConsole front panel.

The Model 458 MicroConsole comes in two models: the Model 458.10 MicroConsole is primarily designed for vibration, structural and component testing; the Model 458.20 MicroConsole is primarily designed for materials testing. System operating functions performed by both configurations are the same except that the peak memory function is optional on the Model 458.10 MicroConsole. Both the 458.10 and 458.20 can be used (with the appropriate compliment of plug-in modules) as stand alone system controllers or rack mounted with additional accessories (such as an oscilloscope, analog x-y recorder, external function generator, etc).

Figure 1-1. Model 458 MicroConsole (458.10 Shown)
NOTE
Unless noted otherwise, references in this manual to the dc controllers refer to both the Model 458.11 DC Controller (typically used in the Model 458.20 MicroConsole) and the Model 458.12 DC Controller (typically used in the Model 458.10 MicroConsole). Unless otherwise noted, references in this manual to the ac controllers refer to both the Model 458.13 AC Controller (typically used in the Model 458.20 MicroConsole) and the Model 458.14 AC Controller (typically used in the Model 458.10 MicroConsole).

NOTE
Unless noted otherwise, information in this manual applies to both the Model 458.10 and Model 458.20 MicroConsole.

1.1 FUNCTIONAL DESCRIPTION

The Model 458 MicroConsole provides a multifunction digital display, cycle counter, program and record control, hydraulic pressure control, interlocks and an internal power supply for the plug-in modules. These functions are described in the following subsections.

1.1.1 DISPLAY AND CYCLE COUNTER

The display section of the MicroConsole includes a multifunction digital display for signal readout and cycle count display, a nine-digit cycle counter, readout signal selection of key operating signals and a keypad for entering various test parameters and scaling factors. The MicroConsole also contains battery backup to retain counter parameters and scaling factors when power is removed.

The MicroConsole cycle counter counts up to 999,999,999 cycles at rates up to 1000 Hz. The current count can be monitored on the multifunction digital display. The counter can stop the test by using the keypad to enter a preset cycle count. A switch is provided to reset the counter to zero when starting a test. The input to the counter is obtained either from an internal device (e.g., 458.90 Function Generator or 458.91 MicroProfiler™) or ac external device input through a rear panel connector. The counter can be adjusted to trigger at any positive-going level between plus and minus 10 volts.

The multifunction digital display is switch selectable to read various operating signals as a percent of full scale or in engineering units. (Full scale engineering units are entered by the operator via the keypad.) The digital display can be used to monitor system signals during test setup and operation. Indicators are provided to indicate which signal is currently routed to the digital display. Available signals include the analog operating signals such as transducer output, command, dc error, simultaneous peak/valley, peak memory, etc.
Additional signals include the preset and current cycle count and other signal levels that can be displayed for adjustment (such as transducer full scale, upper and lower limit detect levels, error detect levels, etc.). An external signal can be input for readout via a front panel BNC type connector. Any signal selected for digital display readout (except current and preset count) is routed to a rear panel connector that can be connected to an auxiliary device such as an oscilloscope or recording device.

1.1.2 PROGRAM/RECORD AND PROG SOURCE CONTROL

The program/record section of the MicroConsole provide Run and Stop switches that enable and disable the program command applied to the servo control loop. The Run/Stop switches can also be used to simultaneously start/stop an external analog x-y recorder. The Prog Source section of the MicroConsole provides switches to select the program signal on the signal bus or select a program from an auxiliary device input to a rear panel connector. Indicators are provided to indicate the program source (Internal or External) and program/record status (Run or Stop).

1.1.3 HYDRAULIC PRESSURE CONTROL

The hydraulic pressure section of the MicroConsole provides switches that control system hydraulic pressure. Depending on the MicroConsole configuration, these controls will operate either a hydraulic power supply (HPS) and/or a hydraulic service manifold (HSM). Configuring the MicroConsole for a specific hydraulic configuration is accomplished by positioning internal jumpers. The switches can turn the HPS/HSM on and off and also control the high/low pressure output of the HPS/HSM (provided the HPS/HSM has high/low pressure capability). The Emergency Stop section of the MicroConsole contains a large, conspicuous switch that is used to stop the program and remove hydraulic pressure in case of emergency.

1.1.4 INTERLOCKS

The interlock section of the MicroConsole provides controls and indicators that terminate the test under predetermined conditions (program interlocks) or stop the test and shut down hydraulic pressure if undesirable conditions occur (hydraulic interlocks). Input signals to the interlock circuits internal to the MicroConsole include end of count, underpeak detect, error detect and upper and lower limit detect. Error, upper limit and lower limit levels are adjusted on the ac and dc controllers and generate a controller interlock. Maximum and minimum underpeak levels are adjusted on the MicroConsole. The error, limit, and underpeak detect circuits can be set to indicate an interlock condition or generate an active interlock to shut down the system. The controller interlock is active if any plug-in module (including the range cartridge of the active controller) is removed from the MicroConsole.

External signals applied to the interlock circuits include hydraulic interlocks (typically from the hydraulic power supply such as low fluid level, over temperature, etc.), program interlocks (typically from the load unit crosshead locks circuit), and mechanical interlocks (typically from the load unit test area guard or actuator rod position limit switches).
1.1.5 POWER SUPPLY

The MicroConsole accepts all standard ac line voltages and includes a power supply which provides the necessary dc voltage levels to power internal circuitry and all plug-in modules. The power supply provides a master ±10 volt reference to establish transducer conditioning and program command full scale. The power supply also provides the master 10 kHz oscillator for ac transducer excitation.

Line loss (power failure) detection is included. If more than 1 cycle of the ac input power is missed or if the ac input power falls below 80% of full power for more than 200 ms, a power failure is detected.

1.2 SPECIFICATIONS

Specifications for the Model 458 MicroConsole are listed in table 1-1.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental:</td>
<td></td>
</tr>
<tr>
<td>Temperature</td>
<td>10°C (50°F) to 50°C (122°F)</td>
</tr>
<tr>
<td>Relative humidity</td>
<td>0 to 85%, noncondensing</td>
</tr>
<tr>
<td>Hydraulic interlock input</td>
<td>three external contact closures</td>
</tr>
<tr>
<td>Remote HYD interlock</td>
<td>selectable, external contact closure or 5 volt</td>
</tr>
<tr>
<td>Program Aux interlock input</td>
<td>logic input</td>
</tr>
<tr>
<td>Remote run/stop input</td>
<td>one external contact closure</td>
</tr>
<tr>
<td>Hydraulic Output Signals:</td>
<td>opto-coupled, selectable for external contact</td>
</tr>
<tr>
<td>HPS pump start</td>
<td>closure or 5 volt logic input</td>
</tr>
<tr>
<td>pump run</td>
<td></td>
</tr>
<tr>
<td>pump high</td>
<td>10 A @ 250 Vac (max)</td>
</tr>
<tr>
<td></td>
<td>0.5 A @ 125 Vac; 2 A @ 30 Vdc (max)</td>
</tr>
<tr>
<td>HSM</td>
<td>24 Vdc or 115 Vac (determined by HPS input) 0.4 A</td>
</tr>
<tr>
<td></td>
<td>@ 125 Vac; 2 A @ 30 Vdc (max)</td>
</tr>
</tbody>
</table>

Table 1-1. Model 458 MicroConsole Specifications
<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>MicroConsole status</td>
<td>selectable, 19 - 24 V level or 5 V logic</td>
</tr>
<tr>
<td>to remote device:</td>
<td></td>
</tr>
<tr>
<td>Emergency stop</td>
<td>active (high); inactive (low)</td>
</tr>
<tr>
<td>Hydraulic interlock</td>
<td>active (high); inactive (low)</td>
</tr>
<tr>
<td>Mechanical interlock</td>
<td>active (high); inactive (low)</td>
</tr>
<tr>
<td>Controller interlock</td>
<td>active (high); inactive (low)</td>
</tr>
<tr>
<td>Program aux interlock</td>
<td>active (high); inactive (low)</td>
</tr>
<tr>
<td>Hydraulics, on/off</td>
<td>on (high); off (low)</td>
</tr>
<tr>
<td>Hydraulics, pressure</td>
<td>high (high); low (low)</td>
</tr>
<tr>
<td>Program, run/stop</td>
<td>run (high); stop (low)</td>
</tr>
<tr>
<td>End-of-count interlock</td>
<td>active (high); inactive (low), 5 volt logic only</td>
</tr>
<tr>
<td>End-of-count rollover</td>
<td>1 ms high pulse, 5 volt logic only</td>
</tr>
<tr>
<td>Counter:</td>
<td>jumper selectable: system shutdown or 1</td>
</tr>
<tr>
<td>End-of-count indication</td>
<td>jumper selectable: internal program bus, rear panel BNC, or rear panel remote connector</td>
</tr>
<tr>
<td>ms high pulse</td>
<td>100 kHz ±1 V @ 10mA (max)</td>
</tr>
<tr>
<td>Input</td>
<td></td>
</tr>
<tr>
<td>Impedance</td>
<td></td>
</tr>
<tr>
<td>Readout Display:</td>
<td>DC mode: ±0.05% FS; Peak mode: ±0.5% FS</td>
</tr>
<tr>
<td>Accuracy</td>
<td>0.1 % 300 Hz</td>
</tr>
<tr>
<td>Peak Range</td>
<td>1000 MΩ, ±10 Vdc</td>
</tr>
<tr>
<td>Input Impedance</td>
<td></td>
</tr>
<tr>
<td>Power supply:</td>
<td>100 Vac ±10% @ 48 to 63 Hz</td>
</tr>
<tr>
<td>Input (selectable)</td>
<td>115 Vac ±10% @ 48 to 63 Hz</td>
</tr>
<tr>
<td>Voltage for internal use:</td>
<td>215 Vac ±10% @ 48 to 63 Hz</td>
</tr>
<tr>
<td>Module power</td>
<td>230 Vac ±10% @ 48 to 63 Hz</td>
</tr>
<tr>
<td>Module power</td>
<td>+15, ±0.5 Vdc @ 2.25 A</td>
</tr>
<tr>
<td>Module power</td>
<td>-15, ±0.5 Vdc @ 2.25 A</td>
</tr>
<tr>
<td>Module power, relay</td>
<td>+5, ±0.1 Vdc @ 2 A</td>
</tr>
<tr>
<td>Front panel</td>
<td>+24, ±5 Vdc unregulated @ 1.5 A</td>
</tr>
<tr>
<td>Front panel</td>
<td>-26.5, 20.5 Vdc @ 50 mA</td>
</tr>
<tr>
<td></td>
<td>5.8 Vac ±2% @ 40 mA</td>
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Specifications are subject to change without notice.
SECTION II
OPERATION

This section provides a functional description of the Model 458 MicroConsole front panel controls and indicators (shown in Figure 2-1). The controls and indicators are described in the following subsections based on functional areas. Operational procedures are explained along with the control descriptions.

Figure 2-1. Model 458 MicroConsole Controls and Indicators
2.1 DISPLAY CONTROLS AND INDICATORS

The Display section of the MicroConsole provides digital readout of signals and parameters associated with Model 458 MicroConsole operation. Signals and parameters which can be displayed on the multifunction digital display (except Preset Count, Current Count and External Input) are associated with the plug-in modules whose signals are applied to the readout bus via the Display switch on the module front panel. (Refer to the appropriate product manual for additional information on the controller Display switch.)

Table 2-1 describes the Display controls and indicators shown in Figure 2-2.

![Figure 2-2. Display Controls and Indicators](image-url)
<table>
<thead>
<tr>
<th>Item</th>
<th>Control/Indicator</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Readout display</td>
<td>Front panel readout for the MicroConsole is provided by a multifunction display. The display provides a nine-digit readout (leading zeros suppressed with a maximum count of 999,999,999). Signals are displayed in percent of full scale (maximum reading: 110.000%, with 100.000% scaled to 10 Vdc) and engineering units readout (with a maximum value of 99999).</td>
</tr>
<tr>
<td>2</td>
<td>Display Select</td>
<td>The Display Select switches are used to select a signal or parameter for readout on the digital display. The available signals and parameters are described in item 3 of this table. Two switches are provided: one to scroll the selection up and one to scroll the selection down. Momentarily pressing the appropriate switch scrolls the selection up or down one position. Pressing and holding the switch causes continuous scrolling. When the upper or lower-most signal is selected, the next selection will wrap around to the other end of the display selections.</td>
</tr>
<tr>
<td>3</td>
<td>Readout signals</td>
<td>The following are descriptions of the available signals and parameters which can be routed to the digital display via the Display Select switches. Green indicators to the right of each signal/parameter show current signal selection. Refer to the appropriate product manual for specific signal descriptions.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Transducer Output: displays the conditioned and amplified transducer output signal from the selected controller. The signal represents the mechanical input to the associated transducer.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Transducer Peak Max (memory): simultaneously displays the transducer output’s peak (most positive or least negative value) and valley (most negative or least positive value) in the format: PM +XXX.XX V -XXX.XX. Peak memory is updated when this or Transducer Output is selected. The peak memory is reset when a different controller is selected for display. The Peak switch (item 6) is used to select the peak display mode or when Memory Reset (item 4) is pressed.</td>
</tr>
<tr>
<td>Item</td>
<td>Control/Indicator</td>
<td>Description</td>
</tr>
<tr>
<td>------</td>
<td>------------------</td>
<td>-------------</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Set Point: displays the value of the static command (mean level offset) produced by an ac or dc controller Set Point control.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Command: displays the composite command signal to the servo control loop. This signal is the input program command after Span and Set Point program scaling.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• DC Error: displays the signal representing the difference between the composite command (desired condition) and selected feedback (actual condition) for example, the conditioned transducer output selected for servo loop control.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Error Detect: displays the level the dc error must exceed to activate the error interlock. This level is adjusted by the Error control on the selected controller front panel.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Upper Limit Detect: displays the most positive (least negative) level the transducer output must exceed in order to activate the upper limit interlock. This level is adjusted by the U Lim (upper limit) control on the selected controller front panel.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Lower Limit Detect: displays the most negative (least positive) level the transducer output must exceed in order to activate the upper limit interlock. This level is adjusted by the L Lim (lower limit) control on the selected controller front panel.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Zero: displays the amount of offset introduced into the transducer output by the selected controller front panel Zero control.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Transducer Full Scale: displays the associated transducer full scale output in engineering units. Transducer Full Scale would also be selected when entering or changing the engineering units full scale value.</td>
</tr>
<tr>
<td>Item</td>
<td>Control/Indicator</td>
<td>Description</td>
</tr>
<tr>
<td>------</td>
<td>-------------------</td>
<td>-------------</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Underpeak Max (maximum): the most positive (least negative) level the transducer output must exceed to prevent activating the underpeak interlock. This level is adjusted by the MicroConsole front panel Underpeak Max control.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Underpeak Min (minimum): the most negative (least positive) level the transducer output must exceed to prevent activating the underpeak interlock. This level is adjusted by the MicroConsole front panel Underpeak Min control.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Preset Count: this selection is used to check, enter or change the preset count. The preset count is entered via the keypad. The preset count determines the number of cycles before a test ends or generates a rollover EOC (end-of-count) signal.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Current count: displays the present value of the cycle counter.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• External Input: displays the signal input to the MicroConsole through the External Input connector on the front panel or the the Ext Meter Input (J44) on the backplane assembly (refer to subsections 4.3.1 and 4.6.10 for additional information).</td>
</tr>
<tr>
<td></td>
<td>Memory Reset</td>
<td>• Auxiliary Input: the signal associated with this selection depends on the particular module selected for display. Refer to the appropriate module product manual for auxiliary input information.</td>
</tr>
</tbody>
</table>

Pressing this switch resets the peak memory to zero. This switch only functions when Transducer Peak Mem is selected for readout on the digital display.

2-5
<table>
<thead>
<tr>
<th>Item</th>
<th>Control/Indicator</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>Scale Select</td>
<td>This switch is used to select the digital display readout value in either percent full scale or engineering units. Each time this switch is pressed, the selection alternates between Percent Full Scale and Engr (engineering) Scale. The indicators show which value is selected. The percent of full scale and engineering units values do not apply to the Zero, Preset Count, and Current Count readout selections. These selections distinguish both the Percent Full Scale and Engr Scale indicators.</td>
</tr>
</tbody>
</table>
| 6    | Peak             | Pressing this switch selects the peak mode of digital display readout for the following signals:  
- Transducer Output  
- Transducer Peak Memory  
- Command  
- DC Error  
- External Input  
- Auxiliary Input  
Other signals are not affected by the peak mode. The peak mode displays between the peak and valley values of the readout signal selection. Pressing the switch again deselects the peak mode of display and the display reverts back to the selected percent full scale or engineering units. The indicator above the Peak switch lights when the peak display mode is active. |
| 7    | Keypad           | The keypad is used when Preset Count or Engr Scale is selected. The Clear switch removes data from the display and memory. The numeric switches load data into the display. The Enter switch stores the data into the MicroConsole memory. |

2.1.1 ENGINEERING SCALE SELECTION

Engr (engineering) Scale displays a numeric value of the engineering units of a range cartridge. When Engr Scale is selected, the display must be set up to correspond to a range cartridge (the cartridge doesn't need to be installed). Engineering Scales may be entered and maintained for each module location (including Expansion MicroConsoles). To set up the display to engineering units perform the following procedure:
1. Press Scale Select to select Engr Scale.
2. Press the display switch of the ac or dc controller selected for scaling.
3. Select Transducer Full Scale on the readout display.
4. Use the front panel keypad to load the number recorded on the front of the range cartridge (the range of the cartridge) of the ac or dc controller being monitored.
5. Press enter.

Only the numeric value of the engineering unit is displayed. The engineering scale is maintained in memory even when percent full scale is selected or when power is removed.

2.2 COUNTER CONTROLS AND INDICATORS

The Counter controls and indicators are shown in figure 2-3. The Counter controls consist of the Enable, Counter On, Counter Reset and keypad switches. The counter indicators consist of the Counter On indicator and the Preset Count and Current Count Displays (described in table 2-1). The keypad is used to input a preset count to stop a test after a specific number of cycles. The Enable switch must be pressed simultaneously with the Counter On switch or the Counter Reset switch to function (this prevents the switch status from accidentally being changed). Each time the Counter On switch is pressed, the counter alternates between on and off. The Counter Reset switch is used to set the counter to zero. The Counter On indicator lights when the counter is enabled.

![Counter Controls and Indicators Diagram](image)

Figure 2-1. Program Operation Controls and Indicators
2.2.1 COUNTER OPERATION

Operation of the counter involves selecting the end-of-count mode, setting the preset count and enabling the counter before the test starts. The end-of-count modes are determined by a switch and jumper configurations on the Readout/Counter circuit card (refer to subsections 4.3.2, 4.3.4, 4.3.5) and the Hydraulic Control/Power Supply circuit card (refer to subsection 4.4.7). The following describe the end-of-count modes and their applications:

- The rollover pulse end-of-count mode generates a signal to an external device. The rollover pulse is generated at every multiple of the preset count. The rollover signal can allow an external device to automatically record data or stop the program without generating an interlock.

- The hydraulic interlock end-of-count mode generates an active End of Count (hydraulic) interlock after the preset number of cycles. A hydraulic interlock stops the test program and shuts down the hydraulic pressure.

- The program interlock end-of-count mode generates an active End of Count (program) interlock to stop the test program after the preset number of cycles. This mode is useful for stopping the test program to record data at regular intervals then resume the test. To resume the test, press the Interlocks Reset switch to clear the End of Count (program) interlock. Select Current Count for readout on the MicroConsole display. Reset the current count and restart the test program.

The following procedure provides information to familiarize the operator with the operation of the counter:

1. Use the Display Select switch(es) to light the Current Count indicator and display the value in the current count register.

2. Press and hold the Enable switch, then press the Counter Reset switch to reset the counter to 0 CYCLES. (If Enable is not pressed first, the Counter Reset switch will not function.)

3. Press the Display Select switch to light the Preset Count indicator. The existing preset count will be displayed.

4. Press the keypad Clear switch to blank the display and reset the preset count to 0 CYCLES.

   NOTE

   If a preset count of 0 CYCLES is entered, the program cannot be started.

5. Use the keypad switches to load in the desired preset count on the display.

   NOTE

   The Current Count function can be used as a cycle counter by entering a number larger than the expected number of test cycles.
6. With the correct preset count number displayed, press the keypad Enter switch to store the preset count. If this is not done, the previous preset count will be maintained.

7. Press and hold the Enable switch and press the Counter On switch to enable cycle counting. If the Enable switch is not pressed first, the Counter On switch will not function and cycles will not be counted.

8. To monitor the cycle count on the display during the test, select Current Count on the MicroConsole display.

9. Set up the program generation device (e.g., 458.90 Function Generator, remote computer, etc.) for the desired program command.

10. Apply system hydraulic pressure and start the test.

11. The current count will increment with each program cycle until it equals the preset count generating an end-of-count signal.

2.3 PROGRAM SOURCE CONTROLS AND INDICATORS

The Prog (program) Source controls and indicators are shown in figure 2-3. The controls consist of the Enable switch, Prog Source Ext (external) and Int (internal) switches. To select the program source, the Enable switch must be pressed simultaneously with the Prog Source Ext switch or Int switch (this prevents accidental changes of the program). Pressing the Int switch connects the program source from the program device installed in the MicroConsole or a device connected to J50 on the backplane. The internal program source is bussed to all modules in the MicroConsole. Pressing the Ext switch selects an external program command source(s) input at the backplane connectors JX04. The external program source is not bussed to any other module locations.

2.4 CONTROL TRANSFER ENABLE SWITCH

The Control Transfer Enable switch (shown in figure 2-3) is used in conjunction with the Control switches on the front panel of each ac or dc controller to transfer servo loop control from one module to another. Refer to the appropriate ac or dc controller manual for operating procedures.

2.5 EMERGENCY STOP SWITCH

The Emergency Stop control (shown in figure 2-4) will generate an emergency stop interlock which stops the program and shuts down hydraulic pressure. A connector on the MicroConsole rear panel provides contact connections to daisy-chain the Emergency Stop switch with the remote emergency stop controls from other devices.

2-9
NOTE

During normal operation, it is not recommended to routinely use the Emergency Stop switch to turn off hydraulic pressure. Instead, use the Hydraulic Pressure controls described in subsection 2.6.

Figure 2-4. Hydraulic/Program Control Switches and Indicators

2.4 HYDRAULIC PRESSURE CONTROLS AND INDICATORS

The Hydraulic Pressure controls (shown in figure 2-4) are used to control the pressure of the system hydraulic power supply (HPS) and/or hydraulic service manifold (HSM). Indicators show the status of each Hydraulic Pressure control. Internal jumpers configure the functions of the controls to match the hydraulic pressure capabilities of the HPS and HSM (i.e. low/high capability vs high only). Refer to subsections 4.4.1, 4.4.4 and 4.4.5 for configuration information.

2.7 PROGRAM/RECORD CONTROLS AND INDICATORS

The Program/Record controls (shown in figure 2-4) are used to start and stop the program command applied to the servo control loop. The controls can also simultaneously start and stop an external readout device (typically an analog x-y recorder). The Program/Record indicators provide a run/stop status indication of the program and external recorder.

2.8 INTERLOCK CONTROLS AND INDICATORS

The Interlocks controls and indicators (shown in figure 2-5) are used to terminate the test under predetermined conditions, or stop the test and shut down hydraulic pressure if undesirable conditions occur.

2-10
When an interlock is active, the interlock indicators identify the type of interlock. The following paragraphs describe the MicroConsole interlocks:

- **Emergency Stop**: an active emergency stop interlock lights the Emergency Stop indicator (red), disables the program command from the servo control loop and shuts down hydraulic pressure. An active emergency stop interlock is generated by pressing the Emergency Stop switch on the MicroConsole front panel or by a remote emergency stop switch.

- **End-of-Count**: an active end-of-count interlock lights the End of Count indicator (yellow) and, depending on an internal jumper setting (refer to subsections 4.3.2 and 4.4.7), generates a program interlock (which stops the test) or generates an active hydraulic interlock (which stops the test and shuts down the hydraulic pressure). An active end-of-count interlock is generated when the MicroConsole current count equals the preset count.

- **Program Aux (auxiliary)**: an active program auxiliary interlock lights the Program Aux indicator (yellow) and removes the program command from the servo control loop. The cause of an active program auxiliary interlock is typically an unlocked crosshead; however, the actual cause is dependent on the system configuration. Refer to the system Reference Manual or Instruction Manual, typically supplied with the system documentation package, for specific causes of an active program auxiliary interlock.
• Hydraulic: an active hydraulic interlock lights the Hydraulics indicator (red), removes the program command from the servo control loop and shuts down hydraulic pressure. Refer to section IV, Installation, for hydraulic interlock input connections. Refer to the system Reference Manual or Instruction Manual, typically supplied with the system documentation package, for specific causes of an active hydraulic interlock.

• Controller: an active controller interlock lights the Controller indicator (red), removes the program command from the servo control loop and shuts down hydraulic pressure. An active controller interlock is generated when the MicroConsole underpeak detector generates an active interlock. A controller error detector or limit detector generates an active interlock or when a plug-in module (including range cartridge) is removed from the Model 458 MicroConsole.

• Mechanical: an active mechanical interlock lights the Mechanical indicator (red), removes the program command from the servo control loop, and shuts down hydraulic pressure. The mechanical interlock is provided as a general purpose interlock and the actual cause of an active mechanical interlock is dependent on the system configuration. Refer to subsection 4.6.2 for information on mechanical interlock input connections. Refer to the system Reference Manual or Instruction Manual, typically supplied with the system documentation package, for specific causes of an active mechanical interlock.

The following interlocks are associated with the servo control loop and are typically used to stop the test under predetermined conditions:

• The underpeak interlock monitors the underpeak detector from one of the ac or dc controllers. The input to the underpeak detector is transducer output signal. The underpeak input is determined by an internal switch on the ac or dc controllers (only one may be selected). Refer to the appropriate ac or dc controller product manual. The underpeak Max and Min adjustments set levels the transducer feedback must reach to continue the test. If the input signal fails to reach the most positive (least negative) or most negative (least positive) level (as determined by the Max and Min adjustments respectively), the underpeak interlock is activated and lights the red underpeak indicator. Underpeak detection is typically used to stop the test at the onset of failure in a low cycle fatigue test. The underpeak interlock is enabled or disabled.

• The error interlock monitors the error detector of the ac or dc controller selected for active control. The error detector is adjusted to detect an excessive dc error. If the dc error exceeds the adjusted level, an error interlock is active and lights the error indicator on the active ac or dc controller. The dc error detection level is adjusted on each ac or dc controller. Only the active ac or dc controller detection level can activate an error interlock. A switch on the ac or dc controller determines if an excessive dc error will cause an indication only or generate an active interlock to stop the test and shut down hydraulic pressure. Refer to the appropriate ac or dc controller product manual for information on the error detector, error detection adjustment procedure and error interlock configurations.
The upper and lower limit interlocks monitor the upper and lower limit detectors of all ac or dc controllers related to the testing station. The upper and lower limits are adjusted to detect the maximum and minimum levels the transducer output should achieve during a test. If any one of the upper or lower limits is exceeded, the appropriate indicator on the appropriate ac or dc controller lights. The upper and lower limits are adjusted on each ac and dc controller. A switch on each ac or dc controller determines if an exceeded limit will cause an indication only or generate an active interlock to stop the test and shut down the hydraulic pressure. Refer to the appropriate ac or dc product manual for information on the upper and lower limit detectors, limit adjustment procedures and limit interlock configurations.

2.9 UNDERPEAK DETECTOR OPERATION

Underpeak detection is typically used to stop the test at the onset of failure in a low cycle fatigue test. For example, the underpeak detector will monitor force in a strain-controlled test and be set for 5 to 10% (depending on test requirements) below the peak load after strain hardening (or softening, depending on the specimen material). Refer to figure 2.6.

There are two conditions under which the underpeak detector is adjusted: one is when the operator knows the required underpeak detection reference levels before starting the test and the other is when the reference levels are not known and the underpeak detection reference levels must be adjusted after the test has started. The following two subsections provide operating adjustment instructions for setting the maximum and minimum underpeak reference levels.

Only one module may be selected as the input to the underpeak detector. Refer to an ac or dc controller product manual for information to select the controller output to the underpeak detector (switch S10-6).

![Diagram of Underpeak Detection](image)

Figure 2-6. Underpeak Detection

2-13
NOTE

The input to the underpeak detector is the transducer output from one of the controllers. Only one controller may be selected for underpeak detection. Refer to the installation section in the appropriate controller product manual for jumper information.

2.9.1 UNDERPEAK ADJUSTMENT WITH KNOWN REFERENCE LEVELS

Perform the following procedure to adjust the Underpeak Max and Min controls when the underpeak reference levels can be determined before the test starts. All controls and indicators are on the MicroConsole.

1. Select Underpeak Max and Percent Full Scale on the MicroConsole display.

NOTE

To ensure proper operation of the underpeak detector, the maximum underpeak detector level must be at least 1% less positive (more negative) than the expected input to the underpeak detector. Also, the minimum underpeak detector level must be at least 1% less negative (more positive) than the expected input to the underpeak detector.

2. Run the program.

3. Monitor the display and adjust the Underpeak Max control to the desired reference level.

4. Select Underpeak Min on the MicroConsole display.

5. Monitor the display and adjust the Underpeak Min control to the desired reference level.

6. Press the associated Disable/Enable switch to enable the underpeak detector interlock.

For example, a strain-controlled, constant-amplitude, cyclic fatigue test with the strain program produces 80% tensile and compressive forces. To prevent equipment damage due to specimen fracture, it is desired to shut down the system when onset of failure (typically a 10% drop in force) is detected. In this case the Max control would be adjusted to -70% and Underpeak Disable/Enable switch would be pressed to light the Underpeak Enab indicator.

2-14
2.9.2 UNDERPEAK ADJUSTMENT DURING TEST

Perform the following procedure to adjust the underpeak detector when the underpeak reference levels cannot be determined or calculated before the test starts. This is typical for a strain controlled test using the underpeak detector to stop the test at a specific drop in load because the strain limits are generally specified by the test and the resultant forces vary depending on the specimen material. The following procedure is written for this application and can be used as a guideline for other applications. All controls and indicators are on the MicroConsole unless otherwise noted.

1. Ensure the Interlocks Underpeak Disab indicator is lit (i.e., the underpeak detector interlock is disabled). If necessary, press the Underpeak Disable/Enable switch.

2. Select the dc controller associated with the force (load) control mode to route the dc controller signals to the display.

3. Select Transducer Output and Percent Full Scale on the MicroConsole display. This displays the conditioned force transducer (load cell) output.

4. Apply system hydraulic pressure and start the test.

NOTE

If the Model 458.10 MicroConsole is not equipped with the peak display option, external equipment (e.g., oscilloscope) will be necessary to monitor the input to the underpeak detector.

5. Press the Peak switch to select the peak mode of display.

6. Allow the test to run to the point of specimen strain hardening (or strain softening). This can be the point the peak display stabilizes.

7. Note the peak/valley levels on the display.

8. Select Underpeak Max on the MicroConsole display.

NOTE

To ensure proper operation of the underpeak detector, the maximum underpeak detector level must be at least 1% less positive (more negative) than the input to the underpeak detector. Also, the minimum underpeak detector level must be at least 1% less negative (more positive) than the input to the underpeak detector.

9. Adjust the Underpeak Max control for a display reading 5 to 10% (depending on the test and specimen type) less positive (more negative) than the transducer output peak level noted in step 7. In other applications, adjust the Underpeak Max control to the desired maximum underpeak detection level.

2-15
10. Select Underpeak Min on the MicroConsole display.

11. Adjust the Underpeak Min control for a display reading 5 to 10% (depending on the test and specimen type) less negative (more positive) than the transducer output valley level noted in step 7. In other applications, adjust the Underpeak Min control to the desired minimum underpeak detection level.

12. Press the Underpeak Disable/Enable switch to light the Interlocks Underpeak Enable indicator and enable the underpeak detector interlock.

13. The test will stop and hydraulic pressure will be removed when the input to the underpeak detector crosses the near level after failing to reach either the underpeak maximum or minimum detection level.

2.10 SELF TEST FEATURE

The Model 458 MicroConsole runs a self test any time electrical power is applied or Reset is pushed (located on the Readout/Counter circuit card). The self test consists of a RAM and EPROM check sum, turning on the Interlock LEDs for 5 seconds performing an A/D conversion and checking that the battery voltage is above 2.5 volts. The self test displays "SELF TEST" on the readout display during the tests. Table 2-2 lists the error messages of each test. An error will cause the error message to flash briefly then continue the remaining tests. When the self test is completed, the readout will prompt the operator with the message "REV XX HIT ENTER", which represents the revision level of the EPROM and directs the operator to press the Enter switch on the keypad. The next message, "SEL. DISP. MODULE" is displayed if a module is not selected for display.

<table>
<thead>
<tr>
<th>TEST</th>
<th>ERROR MESSAGE</th>
<th>REMEDY</th>
</tr>
</thead>
<tbody>
<tr>
<td>RAM</td>
<td>MEMORY FAIL</td>
<td>CONTACT MTS</td>
</tr>
<tr>
<td>EPROM</td>
<td>REV XX MEMORY FAIL</td>
<td>CONTACT MTS</td>
</tr>
<tr>
<td>LEDs</td>
<td>failed LED NOT ON</td>
<td>CONTACT MTS</td>
</tr>
<tr>
<td>A/D TEST</td>
<td>A/D S-TEST FAIL</td>
<td>REFER TO SUBSECTION 3.4</td>
</tr>
<tr>
<td>BATTERY TEST</td>
<td>BATTERY LOW</td>
<td>REFER TO SUBSECTION 3.5</td>
</tr>
</tbody>
</table>

2-16
This section provides service information for the Model 458 MicroConsole. Servicing the MicroConsole involves the following adjustments:

- The various power supply voltages.
- The oscillator amplitude on the Hydraulic Control/Power Supply circuit card.
- The counter trigger level adjustment.
- The analog-to-digital (A/D) circuit calibration.
- The battery replacement on the Readout/Counter circuit card.

The procedures in the following subsections assume the person performing calibration is familiar with all operating aspects of the Model 458 MicroConsole, associated plug-in modules and other system components. All calibration adjustments should be performed with hydraulics off. Equipment required includes a peak reading digital voltmeter (DVM) with input impedance above 10 MΩ, a precision voltage source and an extender card (p/n 399977-01).

![Figure 3-1. HYD Control/Power Supply Circuit Card Adjustment Locations](image-url)
NOTE

The MicroConsole contains static sensitive components which require handling precautions to prevent component damage. When handling the circuit cards, avoid touching any components or circuitry. Circuit card repairs should be made at a static-free station by personnel familiar with such devices.

NOTE

The adjustment values specified in the following procedures provide for optimum calibration accuracy. The adjustment tolerances of these procedures during field calibration are dependent on system requirements and available test equipment.

Turn the MicroConsole on for 5 minutes prior to making any electrical adjustments.

3.1 POWER SUPPLY ADJUSTMENTS

Table 3-1 lists the monitoring point, adjustment and tolerance for the power supply voltages. Use a DVM to monitor the voltages in the order shown in Table 3-1 and, based on the associated tolerance, adjust if necessary (TP-1 is common). Refer to figure 3-1 for the location of the monitoring points and adjustments on the HVD Control/Power Supply card. The Model 458 MicroConsole top cover must be removed to make the power supply adjustments.

<table>
<thead>
<tr>
<th>Voltage</th>
<th>Monitor Point</th>
<th>Adjustment</th>
<th>Tolerance</th>
</tr>
</thead>
<tbody>
<tr>
<td>+15.0 Vdc'</td>
<td>J26A-1 TP-1</td>
<td>R101</td>
<td>±0.5 V</td>
</tr>
<tr>
<td>-15.0 Vdc</td>
<td>J26B-16 TP-1</td>
<td>R121</td>
<td>±0.5 V</td>
</tr>
<tr>
<td>+5.0 Vdc'</td>
<td>J26A-13 TP-1</td>
<td>R80</td>
<td>±0.1 V</td>
</tr>
<tr>
<td>-26.5 Vdc</td>
<td>J26B-4 TP-1</td>
<td>R130</td>
<td>±0.5 V</td>
</tr>
<tr>
<td>+10.000 Vdc</td>
<td>J26B-9 TP-1</td>
<td>R32</td>
<td>±0.001 V</td>
</tr>
<tr>
<td>-10.000 Vdc</td>
<td>J26B-1 TP-1</td>
<td>R30</td>
<td>±0.001 V</td>
</tr>
<tr>
<td>+24 Vdc'</td>
<td>J26B-3 TP-1</td>
<td>none</td>
<td>±5 V</td>
</tr>
<tr>
<td>5.8 Vac</td>
<td>J26B-6 J26B-7</td>
<td>none</td>
<td>4.9 to 6.2 Vac</td>
</tr>
</tbody>
</table>

1 these monitor points require the use of extender board p/n 399977-01

unregulated
3.2 10 KHz OSCILLATOR ADJUSTMENT

The 10 kHz oscillator has a fixed frequency. The amplitude of the oscillator is adjustable. Refer to figure 3-1 for the location of the monitoring points and adjustment potentiometer on the HYD Control/Power Supply card.

1. If mounted in a equipment rack, slide the MicroConsole out to remove the top cover.
2. Connect a peak reading DVM between J2a8-11 and TP-1 (common) of the Hydraulic Control/Power Supply circuit card to monitor the 10 kHz signal.
3. Adjust R45 for a DVM reading of 10.0 Vp-p ±0.1 V.
4. Disconnect the DVM, replace the top cover and if mounted in a equipment rack, slide the MicroConsole in.

3.3 COUNTER REFERENCE LEVEL ADJUSTMENT

The counter can be adjusted to trigger at any level between -10 V and +10 V (triggering on the positive-going cycle). Refer to figure 3-2 for the location of the monitoring point and adjustment potentiometer on the Readout/Counter card. To adjust the input counter trigger level perform the following procedure:

---

*Figure 3-2. Readout/Counter Adjustment Location*
1. If mounted in a equipment rack, slide the MicroConsole out to remove the top cover.

2. Connect a DVM to J12-14 (+) and TP-1 (common) on the Readout/Counter circuit card to monitor the COUNTER TRIP LEVEL.

3. Adjust R85 for a DVM reading equal to the desired level.

4. Disconnect the DVM, replace the top cover and if mounted in a equipment rack, slide the MicroConsole in.

3.4 A/D CALIBRATION

Perform the following procedure to calibrate the A/D circuit for the front panel readout display. Refer to figure 3-2 for the location of the monitoring points and adjustment potentiometers on the Readout/Counter card.

1. If mounted in a equipment rack, slide the MicroConsole out to remove the top cover.

2. Verify the +10 V and -10 V reference levels on the HYD Control/Power Supply circuit card (refer to table 3-1). Adjust if necessary.

3. Connect a DVM to J12-7 and TP-1 (common) and adjust R206 (Ref Adjust) such that the DVM reading toggles between +1.099 and -2.000 Vdc.

4. Select External Input and Percent Full Scale on the MicroConsole display and input a +10.000 V, ±0.001 V signal at the front panel External Input BNC connector. (The EXT INPUT SELECT switch, Si, must be set to FRONT).

5. Connect the DVM to J12-1 and verify the presence of +10.000 V, ±0.005 V.

6. Adjust R105 (A/D Adjust) such that the front panel digital meter reading toggles between +99.999 and +100.000.

7. Disconnect the DVM, replace the top cover and, if mounted in a equipment rack, slide the MicroConsole in.

3.5 BATTERY REPLACEMENT

The battery may need replacement if the self test results in a battery low error message. The low battery indication occurs if the battery voltage is below 2.5 Vdc. The following procedure is used to replace the battery. Refer to figure 3-1 for the location of the battery on the Readout/Counter circuit card.

3-4
*** WARNING ***

Excessive heat could cause the battery to explode. The use of heat sinks on the battery leads is recommended during the following procedure.

1. If mounted in a equipment rack, slide the MicroConsole out to remove the top cover. Remove power from the MicroConsole and disconnect J25, J27 and J29.

2. Remove the thumb screw securing the Readout/Counter circuit card, disconnect J11 and J13 and remove the circuit card from J10 of the MicroConsole.

3. Position jumper X6 across pins 2 and 3 to disconnect the battery from the circuitry.

4. Connect a DVM across the battery. Check the battery voltage, if it is below 2.5 Vdc replace the battery. A new battery should read approximately 3.6 Vdc. Disconnect the DVM.

5. Unsolder the battery leads from the noncomponent side of the circuit card and remove the old battery (note the polarity of the leads). Install the new battery (noting the polarity of the leads) and solder the leads of the new battery to the circuit card.

6. Position jumper X6 across pins 1 and 2 to connect the battery to the circuitry. The BATTERY LOW message will result if jumper X6 is not installed across pins 1 and 2.

7. Install the Readout/Counter card, secure it with the thumb screw, replace the top cover and, if mounted in a equipment rack, slide the MicroConsole in. Reconnect the cables removed in steps 1 and 2.

3.6 FRONT PANEL REMOVAL

To replace the front panel circuit card, the front panel assembly must be removed to gain access to the circuit card. Perform the following procedure to remove (and install) the front panel assembly. Refer to figure 3-3 during the following procedure.

1. If mounted in a equipment rack, slide the MicroConsole out to remove the top cover. Remove power from the MicroConsole and disconnect J25, J27 and J29.

2. Disconnect the cables J11 and J21 from the front panel circuit card and disconnect J28 from the HYD Control/Power Supply circuit card.

3. Remove the modules and blank panels from the MicroConsole and slide the front panel assembly to the right (note the position of the modules).

4. Remove the 2 thumb screws securing the front of the HYD Control/Power Supply and Readout/Counter circuit cards.
5. Remove the 4 bracket screws securing the left bracket and remove the bracket.

6. Remove the 2 screws securing the left side of the top bracket.

7. Raise the left side of the top bracket slightly and remove the front panel assembly.

8. Remove the 5 screws securing the front panel circuit card to the front panel assembly.

9. To install the front panel circuit card, perform steps 2 through 8 in reverse order.

3.7 **REAR PANEL REMOVAL**

The rear panel of the MicroConsole must be removed to gain access to the backplane jumpers.

*** WARNING ***

Remove Power to the MicroConsole before removing the rear panel. Remove the power cord to ensure line voltage is not present at the rear panel to provide possible electrical shock.
Remove the four screws identified with the screwdriver symbol to remove the rear panel. Access to the backplane jumpers can be achieved without removing any cables. Do not strain the cables. Remove any cable prone to strain while accessing the backplane.

### 3.8 TEST POINT SIGNALS

The Readout/Counter and HYD Control/Power Supply cards have test connectors that may be used as test points for relevant signals. The following is a list of signals (and associated pin numbers) for the test connectors.

**Table 3-2. HYD Control/Power Supply Test Point Signals**

<table>
<thead>
<tr>
<th>J26A</th>
<th>J26B</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 +15 V</td>
<td>1 -10 V</td>
</tr>
<tr>
<td>2 LOW LINE</td>
<td>2 +15 V LOSS</td>
</tr>
<tr>
<td>3 PWR LINE FAIL</td>
<td>3 +24 V</td>
</tr>
<tr>
<td>4 115 VAC INTLK</td>
<td>4 -26 VDC</td>
</tr>
<tr>
<td>5 PUMP INTLK #3</td>
<td>5 5.8 HI</td>
</tr>
<tr>
<td>6 E-STOP INTLK</td>
<td>6 5.8 CT</td>
</tr>
<tr>
<td>7 MECH INTLK</td>
<td>7 5.8 LO</td>
</tr>
<tr>
<td>8 STOP</td>
<td>8</td>
</tr>
<tr>
<td>9 INTERNAL CONTROLLER INTLK</td>
<td>9 +10 V</td>
</tr>
<tr>
<td>10 REMOTE CONT INTLK</td>
<td>10</td>
</tr>
<tr>
<td>11 PROG INTLK</td>
<td>11 10 KHZ</td>
</tr>
<tr>
<td>12 RUN</td>
<td>12</td>
</tr>
<tr>
<td>13 +5 V</td>
<td>13</td>
</tr>
<tr>
<td>14 XHEAD PROG INTLK</td>
<td>14</td>
</tr>
<tr>
<td>15 PWR LOSS</td>
<td>15</td>
</tr>
<tr>
<td>16 PUMP ON</td>
<td>16  GND (ANALOG)</td>
</tr>
<tr>
<td>17 PUMP INTLK #1</td>
<td>17  POWER FAIL</td>
</tr>
<tr>
<td>18 PUMP INTLK #2</td>
<td>18 -15 V</td>
</tr>
</tbody>
</table>

**Table 3-3. Readout/Counter Test Point Signals**

<table>
<thead>
<tr>
<th>J12</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 MAX PEAK OUT</td>
</tr>
<tr>
<td>2 MIN PEAK OUT</td>
</tr>
<tr>
<td>3 A/D INPUT</td>
</tr>
<tr>
<td>4 DC INPUT UNFILTERED</td>
</tr>
<tr>
<td>5 A/D CLOCK</td>
</tr>
<tr>
<td>6 A/D INPUT</td>
</tr>
<tr>
<td>7 V REF (2V)</td>
</tr>
<tr>
<td>8 -5 V</td>
</tr>
<tr>
<td>9 COUNT</td>
</tr>
<tr>
<td>10 MIN UNDERPEAK EXCEEDED</td>
</tr>
<tr>
<td>11 UNDERPEAK MEAN LVL</td>
</tr>
<tr>
<td>12 MAX UNDERPEAK EXCEEDED</td>
</tr>
<tr>
<td>13 COUNTER INPUT</td>
</tr>
<tr>
<td>14 COUNTER TRIP LVL</td>
</tr>
<tr>
<td>15 GND (ANALOG)</td>
</tr>
<tr>
<td>16 GND (DIGITAL)</td>
</tr>
<tr>
<td>17 GND (ANALOG)</td>
</tr>
<tr>
<td>18</td>
</tr>
</tbody>
</table>
SECTION IV
INSTALLATION

This section provides general information for installing the Model 458 MicroConsole in regards to connecting it to typical system components (e.g., hydraulic power supply, load unit, transducers, etc) and positioning the printed wiring board (PWB) in the input power connector for the available line voltage. This section also provides information for positioning the jumpers and setting the switches on the Readout/Counter circuit card, the Hydraulic Control/Power Supply circuit card and the backplane. Read and observe the following caution before installing the conditioner.

CAUTION

Because the Model 458 MicroConsole contains components and modules which are sensitive to static, care should be taken when handling these modules to prevent damage to the circuit card or its components. The following precautions are suggested.

1. Do not remove or install a module or circuit card while power is applied to the MicroConsole.

2. Touch the console or other ground point before removing or installing a module.

3. When handling circuit cards, avoid making physical contact with any components, circuitry and the contacts of the card. Rather, grasp the card by its noncontact sides.

4. Maintain the same potential between the printed circuit card and the equipment by touching the console or surfaces it will contact by touching the surfaces first.

5. Handle the integrated circuits by the edges. Avoid touching the pins themselves.

6. Any circuit card repairs should be made at a static-free work station by personnel familiar with repairing such devices.
4.1 SLIDE RAIL MOUNTING

Perform the following procedure to rack-mount the Expansion MicroConsole with slide rails into a console.

1. Determine the mounting position for the MicroConsole. Note which two holes on each of the equipment rack front hole strips will be used to mount the slide rails (refer to figure 4-1). Ensure the slide rails are positioned at the same level.

![Diagram of slide rail mounting](image)

Figure 4-1. Rack Mounting the Female Slide Assembly (Top View)

2. Separate the female slide assembly (outer slide) from the male slide assembly (attached to the chassis) by pulling the female slide to the rear of the chassis and unlocking the spring lock.

3. Install the female slide assembly to the console as shown in figure 4-1 using the hex head screws and nut bars from the slide hardware mounting kit.

4. Repeat steps 2 and 3 to mount the other female slide assembly on the opposite side of the console.

5. Fully extend the female slides from the console. Insert male sides mounted on the chassis into the female slides until the spring latch locks.

6. Press the spring latch releases and slide the chassis into the console.

4-2
4.2 LINE VOLTAGE SELECTION

The MicroConsole receives power from a detachable, three-wire power cord. The power cord plugs into an input power connector block located on the MicroConsole rear panel. Located in the input power connector block are the input power fuse and a PWB to adapt the MicroConsole to various input line voltages. The power switch is adjacent to the power cord input ('O' represents off, and 'I' represents on.)

The MicroConsole is set up for 115 Vac operation at the factory. If the available line voltage is not 115 Vac, perform the following procedure.

1. Obtain access to the MicroConsole rear panel and disconnect the input power cord from the input power connector block.

2. Slide the plastic cover over to access the fuse and PWB.

3. Lift the FUSE FULL lever outward and toward the input power connections and remove the fuse.

4. Remove the PWB by inserting a hook in the hole provided and pulling it out.

5. Refer to table 4-1. Position the PWB such that the appropriate input voltage selection legend will be visible and push the PWB back into the input power connector block.

Table 4-1. Input Voltage and Corresponding PWB Legend

<table>
<thead>
<tr>
<th>Input Voltage</th>
<th>PWB Legend</th>
</tr>
</thead>
<tbody>
<tr>
<td>90 - 105 Vac</td>
<td>100</td>
</tr>
<tr>
<td>105 - 126 Vac</td>
<td>120</td>
</tr>
<tr>
<td>194 - 220 Vac</td>
<td>220</td>
</tr>
<tr>
<td>220 - 253 Vac</td>
<td>240</td>
</tr>
</tbody>
</table>

NOTE

These specifications are maintained providing the input voltage is within ±10% at 43 to 63 Hz. Table 4-1 shows the recommended PWB selections for optimum operation.

6. Install a 3 amp, slo-blo fuse for 100 and 115 Vac operation; or install a 1.5 amp, slo-blo fuse for 215 or 230 Vac operation.

7. If necessary, replace the main power cord to obtain the appropriate wall receptacle connector. Refer to table 4-2.
<table>
<thead>
<tr>
<th>Ac Voltage</th>
<th>Wall Connector Description</th>
<th>MTS Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>100-120</td>
<td><img src="SM-F182A" alt="Diagram" /></td>
<td>114088-01</td>
</tr>
<tr>
<td>230</td>
<td><img src="SM-F182B" alt="Diagram" /></td>
<td>114099-02</td>
</tr>
<tr>
<td>230</td>
<td><img src="SM-F182C" alt="Diagram" /></td>
<td>114099-03</td>
</tr>
<tr>
<td>230</td>
<td><img src="SM-F182E" alt="Diagram" /></td>
<td>114099-06 (13 A fuse for above 114099-07)</td>
</tr>
</tbody>
</table>

4.2.1. **SYSTEM COMMON AND GROUND CONNECTIONS**

The external connections for circuit common (black terminal) and chassis common (metallic terminal) are located on the rear panel of the MicroConsole. The wire from the chassis common terminal is connected to the vertical strut of the console with a braided wire. The chassis common wire is disconnected prior to pulling the unit out of the console; therefore, this braided wire should be as short as possible. The system ground is connected to the bottom of the vertical strut with a braided wire. The black terminal is connected to a single power ground or earth ground point. The braided wire for this connection should be long enough to allow the unit to be pulled out for testing.
4.3 READOUT/COUNTER CARD SWITCH AND JUMPER DESCRIPTIONS

The following subsections provide information on the effect of the Readout/Counter circuit card jumpers and switches on the MicroConsole operation. The jumper figures show the jumper pins as black dots, jumper blocks as shaded rectangles and jumper wires as curved lines. The Set-up Configuration chart in section VI shows the jumper and switch configurations when the MicroConsole is manufactured. The chart may be copied to record a specific MicroConsole configuration. The location of the jumpers and switches are shown in figure 4-2.

![Diagram of Readout/Counter Card Switch and Jumper Locations](image)

Figure 4-2. Readout/Counter Card Switch and Jumper Locations

4.3.1 EXTERNAL METER INPUT (SWITCH S1)

Switch S1 selects the source of the Auxiliary input to the MicroConsole. Set S1 in the Front position to select the BNC input on the front of the MicroConsole. Set S1 in the Rear position to select BNC input J46 on the backplane.

4.3.2 END OF COUNT INTERLOCK/ROLLOVER (SWITCH S2)

Switch S2 selects the mode of the end-of-count signal. The Interlock position will shut down the program and/or the hydraulics when the end of count signal occurs. The Rollover position sends the end of count signal out the backplane connector J48 to an external device.

4.3.3 RESET (SWITCH S3)

Switch S3 is a momentary switch to reset the MicroConsole electronics. When the MicroConsole is reset the self test program is restarted.

4-5
4.3.4 EXTERNAL COUNTER INPUT (JUMPER X1)

Jumper X1 configures the MicroConsole electronics to accept the type of external counter signal input at connector J51. The external counter input may be a cyclic analog signal requiring a differential input or a 5 volt logic signal. Subsection 4.3.6 provides information to select the external counter signal as the input to the counter. Refer to figure 4-3 and configure jumper X1 per system requirements.

![Diagram of Jumper X1](image)

Figure 4-3. External Counter Input Jumper

4.3.5 AUXILIARY COUNTER Input (JUMPER X2)

Jumper X2 configures the MicroConsole electronics to accept the type of auxiliary counter signal input at connector J48. The auxiliary counter input may be a cyclic analog signal requiring a differential input or a 5 volt logic signal. Subsection 4.3.6 provides information to select the auxiliary counter signal as the input to the counter. Refer to figure 4-3 and configure jumper X2 per system requirements.

![Diagram of Jumper X2](image)

Figure 4-4. Auxiliary Counter Input Jumper

4-6
4.3.6 COUNTER INPUT SELECTION (JUMPERS X3 AND X4)

Jumper X3 and X4 select the input to the counter. The counter input may be selected from
the external counter input at connector F51, the auxiliary counter input at connector J48 or
from the internal program bus. If the external or auxiliary input is selected, ensure jumper X1
or X2 is configured to comply with the input signal (refer to subsections 4.3.4 or 4.3.5).
Figure 4-5 shows the configurations of jumpers X3 and X4 to provide the counter input.

![Diagram of counter input selection jumpers]

Figure 4-5. Counter Input Selection Jumpers

4.3.7 CRYSTAL OSCILLATOR CONNECTION (JUMPER X5)

The quartz crystal oscillator generates the frequency required to run microprocessor. Ensure
jumper X5 connects the oscillator as shown in figure 4-6.

![Diagram of crystal oscillator connection jumper]

Figure 4-6. Crystal Oscillator Connection Jumper
4.3.8 BATTERY CONNECT (JUMPER X6)

Jumper X6 connects the battery to the Readout/Counter circuitry to backup the MicroConsole operational parameters. The battery is disconnected when the MicroConsole is manufactured. The battery should be connected when the MicroConsole is installed. Refer to figure 4-7 to connect the battery.

Figure 4-7. Battery Connection Jumper

4.1.9 SAMPLE AND HOLD MODES (JUMPERS X7 AND X8)

Jumpers X7 and X8 configure the sample and hold mode of operation. Remove jumpers X7 and X8 to enable the sample and hold function of the maximum and minimum peak values. Install jumpers X7 and X8 to lock the circuit in the sample mode and disable the hold function. Figure 4-8 shows the sample and hold jumper configurations.

Figure 4-8. Sample and Hold Jumpers
The following subsections provide information on the effect of the Hydraulic Control/Power Supply circuit card jumpers and switches on the MicroConsole operation. The jumper figures show the jumper pins as black dots, jumper blocks as shaded rectangles and jumper wires as curved lines. The Set-up Configuration chart in section VI shows the jumper and switch configurations when the MicroConsole is manufactured. The chart may be copied to record a specific MicroConsole configuration. The location of the jumpers and switches are shown in figure 4-9.

Figure 4-9. Hydraulic Control/Power Supply Card Switch and Jumper Locations

4.4.1 HYDRAULIC PRESSURE (SWITCH S1)

Switch S1 selects the configuration of the front panel Hydraulic Pressure switches. The HIGH ONLY selection provides high hydraulic pressure to the HPGB and HSM when the front panel hydraulic Low switch is pressed. The HIGH/LOW selection provides high or low hydraulic pressure to the HPS and HSM as selected by the front panel Hydraulic Pressure switches (as configured by jumpers X20 and X21, as described in subsections 4.4.4 and 4.4.5).
4.4.2 10 KHZ OSCILLATOR SELECT (JUMPERS X1 AND X2)

Jumpers X1 and X2 select the source of the 10 kHz oscillator signal. The 10 kHz signal may be selected from the internal oscillator or an external oscillator input at connector J43. Refer to figure 4-10 and configure jumpers X1 and X2 per system configuration.

![Diagram of internal and external jumpers X1 and X2]

Figure 4-10. 10 kHz Oscillator Input Jumpers

4.4.3 POWER BACKUP (JUMPERS X5 AND X6)

Jumpers X5 and X6 select the type of voltage to charge an external backup power supply. An unregulated ±15 Vdc is available for a capacitive backup. A regulated ±15 Vdc is available for a battery backup. Refer to figure 4-11 and configure jumpers X5 and X6 per system requirements.

![Diagram of unregulated and regulated voltages X5 and X6]

Figure 4-11. Power Backup Jumpers
4.4.4 HPS PRESSURE (JUMPER X20)

Jumper X20 configures the front panel Hydraulic Pressure switches for high/low or high only operation of the HPS when switch S1 is set for HIGH/LOW operation (refer to subsection 4.4.1). Refer to figure 4-12 and configure jumper X20 to match the capabilities of the HPS.

High/Low

[Diagram of High/Low setting]

High Only

[Diagram of High Only setting]

Figure 4-12. HPS Pressure Jumper

4.4.5 HSM PRESSURE (JUMPER X21)

Jumper X21 configures the front panel Hydraulic Pressure switches for high/low or high only operation of the HSM when switch S1 is set for HIGH/LOW operation (refer to subsection 4.4.1). Refer to figure 4-13 and configure jumper X21 to match the capabilities of the HSM.

High/Low

[Diagram of High/Low setting]

High Only

[Diagram of High Only setting]

Figure 4-13. HSM Pressure Jumper

4-11
4.4.6 CMPTR 2 STATUS VOLTAGE (JUMPER X22)

Jumper X22 selects the voltage of the status signals output through connector J48. The signals may be 5 volt logic or 24 volt logic. Refer to figure 4-14 and configure jumper X22 per system requirements.

![Diagram of 5 Volt Logic and 24 Volt Logic](image)

Figure 4-14. CMPTR 2 Status Voltage Jumper

4.4.7 EOC INTERLOCK (JUMPER X23)

Jumper X23 selects the type of interlock generated when the end-of-count interlock is activated. A program interlock may be selected to stop the test program or a hydraulic interlock may be selected to stop the test program and shut down the hydraulics. Refer to figure 4-15 and configure jumper X23 per system requirements.

![Diagram of Hydraulic Interlock and Program Interlock](image)

Figure 4-15. EOC Interlock Jumper

4-12
4.4.8 REMOTE RUN INPUT (JUMPERS X24 AND X25)

Jumpers X24 and X25 configure the remote run input electronics to accept a 5 volt logic signal or switch contacts. The remote run signal is input through connector J48. Refer to figure 4-16 and configure jumper X24 and X25 per system requirements.

5 Volt Logic          Switch Contacts
X24  X25
   •    •

Figure 4-16. Remote Run Input Jumpers

4.4.9 REMOTE STOP INPUT (JUMPERS X26 AND X27)

Jumpers X26 and X27 configure the remote stop input electronics to accept a 5 volt logic signal or switch contacts. The remote stop signal is input through connector J48. Refer to figure 4-17 and configure jumper X26 and X27 per system requirements.

5 Volt Logic          Switch Contacts
X26  X27
   •    •

Figure 4-17. Remote Stop Input Jumpers

4.4.10 LOAD UNIT INTERLOCK (JUMPERS X28 AND X29)

Jumpers X28 and X29 configure the load unit interlock input electronics to accept a 5 volt logic signal or switch contacts. The load unit interlock signal is input through connector J29. Refer to figure 4-18 and configure jumper X28 and X29 per system requirements.

5 Volt Logic          Switch Contacts
X28  X29
   •    •

Figure 4-18. Load Unit Interlock Jumpers
4.4.11 REMOTE HYDRAULIC INTERLOCK (JUMPERS X30 AND X31)

Jumpers X30 and X31 configure the remote hydraulic interlock input electronics to accept a 5 volt logic signal or switch contacts. The remote hydraulic interlock signal is input through connector J48. Refer to figure 4-19 and configure jumper X30 and X31 per system requirements.

![5 Volt Logic and Switch Contacts Diagram](image)

Figure 4-19. Remote Hydraulic Interlock Jumpers

4.4.12 PUMP INTERLOCK (JUMPERS X35, X36, AND X37)

Jumpers X35, X36 and X37 correspond with pump interlocks 1, 2 and 3 respectively. The jumpers configure the input electronics for an active high or active low signal to generate a hydraulic interlock. Refer to figure 4-20 and configure each jumper to comply with the type of interlock input signal.

![Active High and Active Low Diagram](image)

Figure 4-20. Pump Interlock Jumpers

4.5 BACKPLANE JUMPER DESCRIPTIONS

The following subsections provide information on the effect of the Backplane circuit card jumpers on the MicroConsole operation. The jumper figures show the jumper pins as black dots, jumper blocks as shaded rectangles and jumper wires as curved lines. The Set-up Configuration chart in section VI shows the jumper configurations when the MicroConsole is manufactured. The chart may be copied to record a specific MicroConsole configuration. Access to the backplane jumpers requires the rear panel to be removed (refer to subsection 3.7). The location of the jumpers are shown in figure 4-21.

4-14
4.5.1 INTERLOCK CHAIN (JUMPER X11)

Jumper X1 (along with jumpers across pins 10 and 60 of each unoccupied module connector) ensure continuity of the interlock daisy chain loop. When multiple 458 chassis are interconnected, the interlock chain is routed serially through each 458 chassis. Jumper X1 determines if the interlock chain is extended through connector J900 or completed on the MicroConsole backplane. Refer to figure 4-22 and configure jumper X1 per system requirements.

![Figure 4-21. Backplane Jumper Locations]

Figure 4-21. Backplane Jumper Locations

![Figure 4-22. Interlock Chain Jumper]

Figure 4-22. Interlock Chain Jumper
4.5.2 10 KHz CHASSIS OUTPUT (JUMPERS X10 AND X11)

Jumpers X10 and X11 determine if the 10 kHz oscillator signal is output to another 458 chassis through connector J900. Refer to figure 4-23 and configure jumpers X10 and X11 per system requirements.

![Figure 4-23. 10 kHz Chassis Output Jumper](image)

4.5.3 MULTIPLE CHANNEL/STATION (JUMPERS X12 THROUGH X27)

These jumpers are normally installed to maintain continuity of the signal bus between module connectors J300 and J400. The jumpers can be removed for multiple channel or multiple station applications.

4.5.4 READOUT CONNECTOR SELECTION (JUMPERS X106 THROUGH X600)

The module output selections for J103, J203, J303, J403, J503 and J603 (JX03) are determined by the configuration of jumpers X106 through X600, respectively XX00. The backplane jumpers route one or two outputs from a module to backplane connectors JX03 and/or J40 and J41. One signal may be selected for all output connectors or separate signals may be routed to different connectors. Jumpers X106 through X600 use 2 jumpers. One jumper is used to select an output for JX03 while the other jumper is used to select an output for J40 and J41. Refer to the appropriate product manual for signal selection and jumper configurations. Figure 4-24 shows the jumper locations.

![Figure 4-24. Module Output Selections](image)

4-16
All input/output signals that interface between the MicroConsole and other system components are connected to, or available at, the MicroConsole rear panel and backplane connectors (shown in figure 4-25). This section provides information on all input/output signals at the rear panel and backplane connectors. The information in this section is based on a standard system using the MicroConsole. Custom or unique applications are not covered. For additional or specific information refer to drawing 399715-01 section VII. Also, refer to the system assembly drawing, console configuration drawings and cable drawings located in the system Reference Manual (typically supplied with the system documentation package). At the end of this section, table 4-4 provides MTS Systems Corporation part numbers for the recommended mating connectors. The sequence of the following subsections in the numerical order of the rear panel and backplane connectors.

NOTE

J23A, J23B, J25, J29, J43, and J48 are used to maintain the integrity of the interlock system. Refer to the appropriate subsection if any of these connections are not used for information to maintain the interlock integrity.

Figure 4-25. Rear Panel Connectors
4.6.1 J22 HYD STATUS

Connector J22 Hyd (Hydraulic Status) provides output signals to an external device to monitor on/off, low pressure and high pressure hydraulic status. The output is through an opto isolator. When active, the maximum current rating is 5 ma (active low). When inactive, the maximum voltage rating is 30 Vdc. Refer to figure 4-26 for J22 Hyd Status connector pin designations.

![Diagram of J22 connector pin designations]

Figure 4-26. J22 Hyd Status Signals

4.6.2 J23A HYD INTLK 1 AND J23B HYD INTLK 2

Connector J23A Hyd Intlk (Hydraulic interlock) 1 and connector J23B Hyd Intlk 2 provide connections for up to four mechanical, contact closure interlocks. Connectors J23A and J23B provide an input to the interlock chain for external mechanical devices. The inputs should be normally closed contacts. Open contacts will generate an active mechanical interlock (refer to subsection 2.8) Figure 4-27 shows the required connections to J23A and J23B.

NOTE

If external devices are not connected to J23A and J23B, a jumper plug must be used to close the interlock chain. Jumper pins 1 and 2; 3 and 4 of both connectors.

4-18
4.6.3 J25 HPS

Connector J25 provides control of the hydraulic power supply (HPS) from the MicroConsole. The HPS signals are off/low/high pressure control (or on/off control, depending on the type of HPS) and HPS interlocks (low fluid level, over temperature, etc). Figure 4-28 shows the connections to J25. HPS power at J25, pin 9 can be either 24 Vdc or 115 Vac.

**NOTE**

If the 458 MicroConsole is not connected to a hydraulic power supply, a jumper plug is required to defeat the interlocks. Jumper pins 2 and 7; 3 and 7; 7 and 18; 9 and 19; 10 and 12; 11 and 18.
4.6.4 J27 HSM IN AND J28 HSM OUT

Connector J27 HSM In and connector J28 HSM Out provide connections to the system hydraulic service manifold (HSM). Connector J27 receives the necessary power (either 24 Vdc or 115 Vac depending on the voltage requirements of the solenoids) to operate the hydraulic service manifold. The output at J28 provides off/low/high pressure control (or on/off control, depending on the type of HSM). Connections to dc common or ac common depends on the HSM power input (either 24 Vdc or 115 Vac). Figure 4-29 shows the connections to J27 and J28.

**NOTE**

The power input at J27 must match the solenoid voltage requirements of the equipment connected at J28 and J27. If 115 Vac is applied to 24 Vdc solenoids, a hydraulic interlock will result to protect the equipment.
4.6.5 J29 LOAD UNIT

The Load Unit is typically used in the 458.29 MicroConsole (i.e., materials testing applications). Signals associated with J29 include emergency stop, electrical power for the crosshead lock and the crosshead unlock interlock. Figure 4-30 shows the typical connections as they apply to an MTS 318 Load Unit. If the system is configured with a different load unit, contact MTS Systems Corporation for cabling information.

NOTE

If the system is configured such that no external device is connected to J29, the following interlock jumpers must be installed on J29 to allow system operation: jumper pin 3 to pin 4, jumper pin 5 to pin 7 and jumper pin 8 to pin 11.

If the system is configured such that no external device is connected to J29 (and the interlock jumpers are installed), ensure jumpers X28 and X29 are installed on the Hydraulic Control/Power Supply circuit card (refer to subsection 4.4.10 for jumper information). Connections to AC Common or DC Common depends on the HSM Power input (either 24 Vdc or 115 Vac).
4.6.6 J30 ±15 V BACKUP

The regulated or unregulated +15 V and -15 V power can be backed up in the event of a power loss. J30, ±15 V Backup, provides a connection for an external power source to backup the ±15 Vdc regulators. In general, if batteries are used as the external power source, the regulated ±15 V power would be backed up. If capacitors are used, the unregulated ±15 V power would be backed up.

NOTE

Jumpers X5 and X6 on the MicroConsole Hydraulic Control/Power Supply circuit card are used to route the external power to the appropriate circuit components. Refer to subsection 4.4.3 for information on jumpers X5 and X6.

The +24 V, +15 V, and -15 V backup lines are bidirectional. When electrical power is applied to the MicroConsole, the lines output the respective voltage to charge the external power source. When electrical power is removed, the external power source is discharged through the lines to maintain the respective MicroConsole power. Refer to figure 4-31 for power connections to J30 ±15 V Backup.
4.6.7 J40 AUX READOUT, J41 SCOPE/RECORDERR, AND J42 CMPTR 1

Connectors J40 Aux (auxiliary) Readout, J41 Scope (oscilloscope)/Recorder and J42 Cmptr (computer) 1 provide connection to external devices for readout or data acquisition of the output of the various 488 plug-in modules. The module readout signal is selected by jumpers X100 through X600 on the MicroConsole backplane (corresponding to the chassis location). Refer to the appropriate product manual for information concerning readout signal selection. Signals shown in figure 4-32 are available at all three connectors. The module signals output at J40, J41 and J42 are jumper selectable.

Figure 4-32. J40 Aux Readout, J41 Scope/Recorder and J42 Cmptr 1 Signals
4.6.8 J43 PROG INTLK

Connector J43 Prog Intlk (program interlock) provides connections from an external device to the program interlock chain. The external program interlock input should be a set of normally closed contacts (open contacts generate an active program interlock). J43 also provides 10 kHz, a +10 Vdc reference output signal, and connections for a 10 kHz reference input signal. Figure 4-33 shows the pin designations for J43 Prog Intlk.

![Diagram of J43 Prog Intlk](image)

Figure 4-33. J43 Prog Intlk Signals

4.6.9 J44 AND J45 RUN/STOP

Connectors J44 and J45 Run/Stop provide relay control to start and stop up to four external devices. The contacts are rated 2 A @ 30 Vdc (0.5 A @ 125 Vac). Figure 4-34 shows the contact configuration of J44 and J45.

4-24
4.6.10 J46 EXT METER INPUT

One of the selections for readout on the MicroConsole front panel digital display is External Input (refer to subsection 2.2.1, Display Controls and Indicators). The external ±10 V (fullscale) input signal can be connected to either J46 Ext (external) Meter Input on the backplane assembly or the MicroConsole front panel External Input BNC type connector. The EXT INPUT SELECT switch (S1) on the Readout/Counter card determines which BNC connector is routed to the digital meter (refer to subsection 4.3.1).

4.6.11 J47 METER OUTPUT

Connector J47 Meter Output provides a dc signal to an external readout device. The output signal at J47 is the same as the signal selected for MicroConsole front panel digital meter readout with the following exceptions (i.e., the following signals cannot be output at J47):

- Transducer Peak Memory
- Transducer Full Scale
- Preset Count
- Current Count

Also, if peak display mode is selected, the signal at J47 will be the actual level of the selected signal, not the peak level. The peak level is available on J49.
Connector J48 CompTr 2 (computer) provides various input and output signals to/from an external device to control and monitor several operating functions. Figure 4-35 shows the input/output signals at J48 CompTr 2. Signal levels at the various pin of J48 are as follows:

- **The Status Output**: the output voltage is jumper selectable (refer to subsection 4.4.6). The status signals are active high, 5 volt logic or 24 volt logic.

- **The End-of-Count Interlock**: the output signal is an active high, 5 volt logic signal.

- **The End-of-Count Rollover Pulse**: the output signal is a 1 ms active high pulse, 5 volt logic signal.

- **Maximum Peak Ready and Minimum Peak Ready**: each output signal is a 200 ms active high pulse, 5 volt logic signal.

- **The Control Transfer Enable and Shunt Calibration**: these input signals are active high, 5 volt logic signals.

- **The Remote Inputs**: these inputs may be an active high, 5 volt logic signal or an active open switch contact signal. The input electronics must comply with the type of input signal (refer to subsections 4.4.6, 4.4.9, and 4.4.11).

- **The Auxiliary Counter input**: the input signal may be a 5 volt logic signal or ±10 volt full-scale analog input. The input electronics must comply with the type of input (refer to subsection 4.3.5).
Figure 4-35. J48 Cnptr 2 Signals
Connector J49 Cmptr 3 (computer) provides various input and output signals from/to an external device to control and monitor several operating functions. Figure 4-36 shows the input/output signals at J49 Cmptr 3. Signal levels at the various pins of J49 are as follows:

- Function Generator Remote Amplitude Control: the input controls the amplitude of the Model 458.90 Function Generator (refer to the product manual). The signal level must be within 0 to +10 Vdc.
- Function Generator Remote Frequency Control: the input controls the frequency of the Model 458.90 Function Generator (refer to the product manual). The signal level must be within +0.1 to +10 Vdc.
- Maximum Peak and Minimum Peak: the output is within ±10 volts from the MicroConsole peak detect circuit. The signals are active when the respective MAX/Min Peak Ready signals active (refer to connector J48).
- Master Set Point: the input is bussed to selected ac and dc controllers (refer to the appropriate product manuals). The input signal must be within ±10 volts.
- Master Span: the input signal is bussed to selected ac and dc controllers (refer to the appropriate product manual). The required input signals are 5 volt logic signals, they are: Load, active low; Clock, active low; Data, 12 bit serial active high.

![Figure 4-36. J49 Cmptr 3 Signals](image-url)
4.6.14 J50 FUNCTION GEN EXT

Connector J50, Function Gen Ext, allows the input of an external function generator to the internal program bus. If an external function generator is connected to J50, ensure any function generator module plugged into the MicroConsole chassis is disconnected from the internal program bus (refer to the appropriate product manual). Figure 4-37 shows the signals associated with J50 Function.Gen Ext.

NOTE

If the internal program module is a Model 458,90 Function Generator, the output waveform can be disconnected from the internal program bus by removing a jumper on the circuit card. Refer to the function generator product manual for further information.

```
J50
1 +
2 -
3 Shield
6 NULL
7 Dwell
8 Com
```

Figure 4-37. J50 Function Gen Ext Signals

4.6.15 J51 COUNTER INPUT

Connector J51 Counter Input is a BNC type connector which provides input to the 458 MicroConsole counter from an external source. The input signal to the counter is selected by jumpers on the Readout/Counter circuit card. Refer to subsections 4.3.5 and 4.3.6 for information on the counter input jumper configurations. The input signal to J51 may be a cyclic analog signal within ±10 V or a 5 volt logic signal.

4.6.16 J61 THROUGH J66 (CUSTOM CABLING REQUIREMENTS)

In the standard 458 MicroConsole, connector locations J61 through J66 are open slots in the rear panel and are covered with a blank panel. J61 through J66 are provided to allow access to the signals at the backplane pins associated with the various plug-in modules. For custom applications or modified operating requirements, connections can be made to the backplane pins and wired to a cable connector secured to the appropriate slot on the rear panel.
The MicroConsole can accommodate 6 modules with connectors J100 through J600 (JX00). The signals at pins 1 - 24 and pins 51 - 74 are biased to all 6 module connectors (signal bus). The signals at pins 25 - 44 and pins 50 - 100 are determined by the module installed in connector JX00 (module specific). Figure 4-37 shows the signals and pin numbers of connectors JX00.

**Figure 4-38. Module Signal Bus**
In the standard 458 MicroConsole, Cable Entry is an open slot in the rear panel and is covered with a blank panel. The Cable Entry slot is provided to allow connection to J900 Multi-Chassis Interconnect (located behind the rear panel on the backplane). Connector J900 provides connection to/from a 458.01 Expansion MicroConsole (used in multi-chassis applications). The signals associated with J900 are shown in figure 4-39.

Figure 4-39. J900 Multi-Chassis Signal Bus

4.6.19 DESIGNATED MODULE CONNECTIONS (JX01, JX02, JX03 AND JX04)

Signals associated with lower backplane connectors JX01, JX02, JX03 and JX04 are dependent on the module installed in the Expansion MicroConsole. Each Expansion MicroConsole module location has a set of four connectors associated with it.
For example, connectors J101, J102, J103 and J104 are associated with the module installed in module location J100. The signals available at the designated module connections are described in appropriate product manuals. Figure 4-40 shows the location of the designated module connectors.

![Diagram of module connections]

<table>
<thead>
<tr>
<th>Module 6</th>
<th>Module 5</th>
<th>Module 4</th>
<th>Module 3</th>
<th>Module 2</th>
<th>Module 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>J600</td>
<td>J500</td>
<td>J400</td>
<td>J300</td>
<td>J200</td>
<td>J100</td>
</tr>
</tbody>
</table>

Figure 4-40. Designated Module Connections
Refer to table 4-3 for information pertaining to the MicroConsole rear panel and backplane mating connectors. The table lists the parts included in the mating connector kits. Part number 409470-01 provides crimp contacts and part number 409470-01 provides solder contacts.

### Table 4-3. MicroConsole Mating Connector Part Numbers

<table>
<thead>
<tr>
<th>Plug Number</th>
<th>Description</th>
<th>Connector Type</th>
<th>MTS Connector Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>P22, P23A, P23B, P50</td>
<td>plug - 9 pin D pin contacts clamp</td>
<td>D9P1</td>
<td>409470-01 crimp contacts</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P25</td>
<td>plug - 24 pin pin contacts clamp</td>
<td>CPC-24S1</td>
<td></td>
</tr>
<tr>
<td>P27</td>
<td>plug - 4 pin pin contacts clamp</td>
<td>CPC-4S1</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P28, P30</td>
<td>plug - 4 pin pin contacts clamp</td>
<td>CC-4P1</td>
<td></td>
</tr>
<tr>
<td>P29</td>
<td>plug - 14 pin pin contacts clamp</td>
<td>CPC-14P1</td>
<td></td>
</tr>
<tr>
<td>P40, P41, P42, P43, P48, P49</td>
<td>plug - 25 pin D pin contacts clamp</td>
<td>D-25P1</td>
<td></td>
</tr>
<tr>
<td>P44, P45</td>
<td>plug - 9 pin D pin contacts clamp</td>
<td>D-9S1</td>
<td></td>
</tr>
<tr>
<td>J46, J47, JX03, JX04</td>
<td>BNC</td>
<td>BNC</td>
<td></td>
</tr>
<tr>
<td>P101 - P601</td>
<td>plug - 15 pin D pin contacts clamp</td>
<td>D-15P1</td>
<td></td>
</tr>
<tr>
<td>P102 - P602</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. extraction tool part number 111231-18
2. male screw locks (2 per plug) 100441-23
3. extraction tool part number 11131-19
4. crimp tool amp 220187-1

4-33
SECTION V
THEORY OF OPERATION

This section describes the operation of the 458 MicroConsole circuitry. The schematics referenced in this section may be found in section VII. Electronic components are referenced by the schematic page number, letter and number designator and pin numbers. For example, 4AR11-4, 8 represents sheet 4 of the schematic, component AR11, pins 7 and 8. Additional information concerning jumper configurations and switch positions may be found in section IV. Several test connectors are available for test points on the circuit cards. Listings of the signals may be found in section III.

The MicroConsole provides the circuitry to support six plug-in modules, voltage regulation, hydraulic control, display control, peak detection, backplane connections for external devices, system interlocks and operator controls. The Readout/Counter circuit card includes a microcomputer, the peak detection, cycle counter and front panel interface circuits. The Hydraulic Control/Power Supply circuit card includes the regulators for the various voltages, interlock control and hydraulic control. The backplane includes several connectors to support external monitoring devices and remote control of several MicroConsole functions.

5.1 READOUT/COUNTER CARD

Refer to schematic 399001-01 during the following discussion of the Readout/Counter circuits. The Readout/Counter card is controlled by a microprocessor which controls the logic of the MicroConsole. The Readout/Counter performs the following functions:

- MicroConsole Control Logic
- A/D Conversion
- A/D Selection
- Min/Max Peak Detection
- Cycle Counting
- Underpeak Detection

5.1.1 MICROCONSOLE CONTROL LOGIC

Refer to figure 5-1 for the following discussion. The microprocessor (51U27) controls the operation of the Readout/Counter card according to the program recorded in the EPROM (51U29). The speed of the program is determined by the 6 MHz crystal (5Y1). The program begins with a self test whenever power is applied or when the reset switch (6S3) is pressed. The self test checks the RAM, EPROM, A/D subsystem, front panel interlock LEDs and the battery voltage. If any of the self tests fail, the appropriate error message is displayed briefly on the front panel readout. Refer to table 5-2 for the listing of error messages.

5-1
The purpose of the microprocessor is to control the data bus (D0-7) according to the program recorded in the EPROM. The microprocessor writes an 8-bit address on the data bus, then enables SU28-11 to latch the address in SU28. The microprocessor also uses part of the port bus to write the address because the EPROM (SU29) has a 12-bit address. The microprocessor enables the EPROM to read the address. The EPROM writes the information of the address on the data bus to be read by the microprocessor.

The microprocessor can be interrupted by the signals: POWER FAIL, COUNT AVAIL INT and A/D DAT AVAL INT. An interrupt (INT) at SU27-6 will cause the microprocessor to stop the program and read ports P10 through P17 to determine which interrupt is active. An active interrupt will cause the microprocessor to jump to a subprogram to handle the specific interrupt. When the interrupt is completed, the microprocessor continues the program where it left off.

The microprocessor can enable an IC on the data bus to read or write onto the data bus. Information to be stored will be recorded in the RAM IC (SU24). Information from the front panel (i.e., switch status) is accessed onto the data bus through the buffers SU26 and SU31 (and by 2 ICs on the front panel). Information is sent to the front panel (i.e., LEDs) by flip-flops T047 and T049 (T047 also writes the data to the backplane). Information from the backplane (i.e., module ID) is written on the data bus through buffers SU58 and SU44. The A/D converter input is written on the data bus by SU21. The microprocessor uses the port bus to write to the port expanders SU34 and SU43 to increase the number of locations data may be used.

Figure 5-1. Block Diagram of the MicroConsole Control Logic
The watch dog timer (6U39) must be triggered every 3 seconds by the microprocessor through 6U34-4. The purpose of the watch dog timer is to be sure the microprocessor is running. If the timer is not triggered, the microprocessor will be reset. The watch dog timer is initially clocked by the power fail signal going inactive and generating a pulse through 6U34-4 and the microprocessor generates a pulse through 6U43-4 when power is applied. When power is removed, 6CR23 and tU41-1 act as a power fail circuit to reset the microprocessor when the ±5 volt supply drops below ±3 volts (this prevents writing to the RAM).

5.1.2 A/D CONVERTER

Figure 5-2 illustrates the A/D circuit. The A/D converter (4U20) changes an analog input voltage to a digital output which the microprocessor can read and display on the front panel readout. The primary inputs to the A/D converter are a reference voltage, clock frequency, run/hold signal and an analog input. The A/D converter input voltage is compared to the reference voltage to determine the value of the input. The clock frequency determines how fast a conversion is completed. The microprocessor selects one of two clock frequencies through the I/O expander (6U43-22). A 100 kHz clock is used in the dc mode for optimum 50 and 60 Hz noise reduction and 200 kHz is used in the peak mode for fast updating of the display. In the dc mode, the RUN/HALT signal is set high allowing the input to be converted continuously (according to the clock frequency). When in the peak mode, the RUN/HALT signal is low and pulsed high when a peak reading is to be converted. The output of the A/D converter is buffered through 4U21 and applied to the data bus.

![A/D Circuit Simplified Schematic](image)

Figure 5-2. A/D Circuit Simplified Schematic
5.1.3 A/D INPUT SELECTION

Figure 5-2 illustrates the A/D circuit. The input selection of the A/D converter is displayed on the front panel readout and lights the appropriate LED. When a display selection is made, the microprocessor clocks 5U25, 5U30 and 7U47 to read the data bus. The microprocessor identifies the chassis (CHASSIS SCALE SEL) and the module (MODULE SCALE SEL) from buffer 5U58. The output of 7U47 writes a readout selection on the backplane data bus (and to the front panel LEDS) to be read by the appropriate module. The module routes the selection to the backplane data bus. The Readout/Counter card receives the selected readout signal through J310-17, 57. The outputs of 5U25 and 5U31 enable the appropriate inputs of the four quad analog switches (2U1, 2U2, 2U3 and 2U4) to route the display selection to the A/D input.

For example, the Set Point voltage has been selected on the front panel while in the peak mode. Since the Peak mode is not valid for the set point voltage, the microprocessor will activate 5U25-5 DC SEL to remove the Peak mode (the Peak LED will stay on). The microprocessor clocks 7U47 to write the A/D selection on the backplane data bus. The active module decodes the data bus and routes the Set Point voltage to the backplane analog bus where it is input to the Readout/Counter card. The microprocessor activates the READOUT INPUT ENABLE signal (5U30-2) which in turn activates the analog switch output 2U2-7, 10 (the Set Point voltage from the backplane). The signal is also buffered at 2AR3 and output to the METER OUTPUT 347 on the backplane. The signal is passed through a 2 Hz filter (2AR2-7) and applied to 2U4-11. The DC SEL signal turns on gate 2 of 2U4 to route the selected conditioner voltage to the to the A/D input. The signal is buffered at 2AR5 before being input to the A/D converter.

5.1.4 PEAK DETECTION

Refer to figure 5-3 for the following discussion. The peak detection circuit derives the minimum and maximum peak signals from the PEAK DET INPUT signal which begins at differentiai amplifier 2AR2-1. The signal is input to both the max peak detector (3U8) and the min peak detector (3U13). The signal to 3C13 is inverted by 3AR5. If the peak mode is not selected (or a non-peak input is selected from the front panel) the MASTER PK RESET signal will be active. This causes 3U5 to reset both peak detectors, 3U8 and 3U13, to -10 volts. When the peak mode is selected, the MASTER PK RESET is released and the peak detectors become active.

![Figure 5-3. Peak Detection Simplified Schematic](image-url)
The max peak detector (3U8) holds the highest voltage applied to it. The input and output to 3U8 are monitored by 3AR7. When the difference between the input and output exceeds 25 mV (and), 3AR7 is triggered and clocks 3U11 and 3U12 (the trigger level is selectable, see note 1 in the schematics). The min peak detector is reset by 3U12. The output of 3U11 causes 3U9 to hold the value from 3U8. The output also generates the MAX PK RDY signal to the microprocessor. When the A/D is ready, the microprocessor selects the MAX PEAK OUT as the A/D input for conversion. When the conversion is complete (0.2 ms), the microprocessor pulses the MAX PK READY CLR for 3 ms to reset 3U11. The minimum peak detector is a twin circuit of the maximum peak detector.

5.1.5 COUNTER

The counter accumulates the number of cycles during a program run in a RAM location. Several options are available for selection of the input to the counter. Refer to section IV, subsection 4.3 for information concerning jumper configurations. Figure 5-4 illustrates the counter circuit.

The EXT COUNTER INPUT and AUX COUNTER INPUT are buffered by 4AR9. The internal counter input originates from the Model 455,90 Function Generator. Jumpers 4X3 and 4X4 determine the input to the counter. The COUNT LVL ADJ (4R85) can set the trip level to signal a count at any positive-going point in a cycle. The count signal clocks flip-flop 4U17 which generates COUNT AVAL INT interrupt. The input is to the microprocessor input port 5U27-32 and OR gate 6U38-3. OR gate 6U38 generates the interrupt signal to the microprocessor (5U27-4). When the microprocessor is interrogated, it stops the program and checks the input ports (P10-P17) to identify the COUNTER AVAL INT signal and increments the count stored in the RAM (U24) by one. The microprocessor continues the program.

5.1.6 UNDERPEAK DETECTION

Refer to figure 5-5 for the following discussion. The underpeak detection circuit monitors the output of the active controller for comparison with the minimum and maximum underpeak settings. The MAX UNDERPK AMPLITUDE and the MIN UNDERPK AMPLITUDE are adjusted on the front panel and can be monitored on the display. These settings are buffered at 5AR13 and compared to the UNDERPEAK INPUT at 8AR15 (MAX) and 8AR16 (MIN). When the UNDERPEAK INPUT equals the MAX UNDERPK AMPLITUDE the output of 8AR15 clocks flip-flop 8U53-3 and also triggers 8U54. When the UNDERPEAK INPUT equals the MIN UNDERPK AMPLITUDE the output of 8AR16 clocks flip-flop 8U53-11 and also triggers 8U54. The output of 8U54-3 clears flip-flop 8U52 twice each cycle.

Figure 5-4. Counter Simplified Schematic

5-5
The UNDERPEAK INPUT is amplified (clipped at 12 V) and centered on the UNDERPEAK MEAN LV. (the sum of the min and max amplitude settings) at 8AR14. The positive and negative halves of the signal are detected by 8US0. Each half of the signal is shaped to a 5 V pulse. At each half cycle 8US1-4 clocks 8US2. Normally 8US2 is cleared by 8US4-3 each time it is clocked. If it is clocked without being cleared, an underpeak interlock condition exists. The logic circuit consisting of 8UF4, 8US1 and 8US5 ensure that the INTLK RESET and INTLK LOCKOUT signals are high before generating the UNDERPEAK INTLK signal at flip-flop 8US2-1.

![Underpeak Detect Simplified Schematic](image)

Figure 5-5. Underpeak Detect Simplified Schematic

The UNDERPEAK EN/DIS (enable/disable) signal controls the underpeak detection circuit. The signal originates from the push button on the front panel. The UNDERPEAK EN/DIS signal controls flip-flop 8US7. To enable the underpeak detection circuit, the RUN/STOP must be in RUN and the front panel Enab LED must be on. This is checked at 8JS5. Once enabled, the green indicator will flash until both maximum and minimum levels have been exceeded.

5.7 FRONT PANEL

The front panel has two functions. Operator input is provided by the keyboard, switches and the MIN/MAX UNDERPEAK AMPLITUDE adjustments. Operator information is provided by the readout display and LEDs. Two jacks are provided for an external input and common. The front panel circuit card services the Readout/Counter card and the Hydraulic Control/Power Supply card. Refer to the Front Panel schematic, 407661-01 and figure 5-6 for the following discussion.
Most of the switches on the front panel are in a matrix format. The keyboard encoders (2U9 and 2U10) continually scan the switches by pulsing the column outputs. If a switch is pressed, the signal will return to 2U9 or 2U10 through the row input. The combination of a column output and a row input determine which switch is pressed. The 600 Hz scan rate is established by 2C1 and 2C2. The row inputs are debounced for 10 ms (established by 2C3 and 2C4). The switch selection is encoded at 2U9 or 2U10. The data is latched at 2U11 and 2U12 to be read by the microprocessor. The DATA AVAL signal from pin 12 of the keyboard encoders is delayed by the R/C circuit (2R7 and 2C5) to allow the latches (2U11 and 2U12) to set-up the data. The microprocessor enables one of the latches with KEYBD-#1-GE (2U11-1) or KEYBD-#2-GE (2U12-1) to be read. The microprocessor then generates the read (RD) signal which puts the switch data on the data bus.

Several switches are not matrixed. These normally-open switches are dedicated lines to the Readout/Counter and Hydraulic Control/Power Supply cards. Switches S15, S16 and S22 through S26 are dedicated to the Readout/Counter card. Switches S27 through S34 are dedicated to the Hydraulic Control/Power Supply card.

5.2.1 KEYBOARD AND SWITCHES

Figure 5-6. Front Panel Simplified Schematic
5.2.2 READOUT DISPLAY AND LEDS

The readout display is a 14 segment, 15 character vacuum fluorescent device (1U28). The readout display requires a controller (2U7) to coordinate the data with the proper display timing of the segments and digits. The data is written to 2U7 is a serial format. Two 8-bit words are written, the first is the control and the second is the data. The controller enables a digit, then scans each of the 14 segments and lights the appropriate segments for that digit. The controller continually scans each segment of each digit, lighting one segment of one digit at a time. The scan frequency is high enough to make the display appear to light the segments of all the digits simultaneously.

The display requires a 5.0 Vac filament voltage with a -20.5 volt offset. It also requires -26.5 volts and +5.5 volts to turn on the segments of the digits. The controller requires -10 Vdc and +5 Vdc for its logic.

The LEDs associated with the display signals are selected through the data bus from the Readout/Counter card. All other LEDs are turned on through dedicated lines. An LED selection on the data bus is decoded at 2U1, 2U2, and 2U3. The purpose of 2U1 is to decode the IC selection and enable output A or B of 2U2 or 2U3. The LED selection is decoded by 2U2 or 2U3 and outputs to drivers 2U4, 2U5 or 2U6. The input to LED drivers 2U6, 3U13, 3U14 and 3U15 come directly from the Readout/Counter and Hydraulic Control/Power Supply cards.

5.3 HYDRAULIC CONTROL

The circuitry for the interlock logic and the hydraulic control logic is located on the Hydraulic Control/Power Supply card. The interlock logic monitors various signals and external components. The hydraulic control logic selects options for the hydraulic pressure switches. The circuit card utilizes connectors J26A and J26B (located near the top of the circuit card) as test points. Refer to the Hydraulic Control/Power Supply schematic 413535-01 for the following discussion.

5.3.1 INTERLOCK LOGIC

There are two types of interlocks: program interlocks and hydraulic interlocks. Figure 5-7 illustrates the interlock circuit. Program interlocks will stop the MicroConsole program and maintain hydraulic pressure. Hydraulic interlocks will shut down the hydraulic pressure and stop the program. When an interlock condition is detected, an interlock lockout signal is generated to keep other interlocks from firing. All interlocks (except emergency stop) may be overridden by the interlock reset switch. Refer to Figure 5-7.

The Emergency Stop interlock monitors the Emergency Stop switches on the front panel (4J23) and the load unit (4J23). These normally closed switches are connected in series and turn off 5U28 (opto isolator) when one of the switches is pushed.
The End of Count interlock compares the preset count with the actual cycle count. When they are equal, an End of Count interlock is active. The End of Count signal is generated at the Readout/Counter card and is input to the Hydraulic Control/Power supply card at t120-17. The EOC INTLK signal mode is selected at 6X23. In the PROG INTLK mode, the signal is routed to the front panel indicator and through 6U55 and 6U60 (PROG INTLK ACTIVE) to 6U53, which generates the program stop signal. In the HYD INTLK mode, the signal is routed to 5U41 (INTLK LOCKOUT) and 5U53 (HYD INTLK), which generates the hydraulic interlock.

The Program Aux interlock monitors 6J20 to ensure pins 13 and 64 are jumpered. This indicates an external device is connected. If an external device is not connected, pins 53 and 64 of 6J20 must be jumpered (via J43-1-2 on the backplane). The Program Aux interlock connection is isolated by 6U54. The low output of 6U54-5 is buffered at 6U59-10, inverted at 6U58-4 and applied to 6J60-4. The output of 6J60-6 sets 6U63-6 while removing the clear signal through 6U62. The output of 6U63-1 via 6U65-8 and 6U68-8 turns on the front panel indicator and triggers 5U53-9 to generate the program stop signal.

The Hydraulic interlock monitors if the pump is on and three HPS interlocks (i.e. low fluid, high temp, etc.). These inputs are isolated by opto isolators 4U20 through 4U24 to prevent noise and isolate external power supplies from affecting the performance of the Hydraulic Control/Power Supply circuit card. The outputs of the opto isolators are tied together at 4U25. If any of the outputs goes low, a hydraulic interlock condition is detected (4U25-1).
The Controller interlock monitors the power fail signal, the reference voltage interlock signal, module interlock chain and the remote hydraulic interlock signal. If any of these signals become active, SU41-1 will generate the controller interlock signal through flip-flop SU31-1 and light the front panel LED through SU52-8.

The Mechanical interlock monitors the devices connected to SU23. If any of these devices are disconnected from the daisy chain, a mechanical interlock will be detected. The mechanical interlock turns on SU19 which sets SU37-13, activating the mechanical interlock and lighting the front panel LED through SU52-6.

Once an interlock is detected, the interlock lockout signal prevents other signals from generating an interlock until the first interlock is corrected. The Emergency Stop switch will generate a hydraulic interlock regardless of the condition of the lockout signal. When the interlocks (and E-STOP) are active, they set flip-flops SU37 and SU38. The EOC INTLK and UNDER PEAK INTLK signals are checked with the INTLK RESET signal at SU36. The INTLK RESET signal must be high to clear the flip-flops for the interlock signals to be enabled. All the interlock signals are applied to the exclusive OR gates SU50 or SU53. If any one of the interlocks are tripped, the HYD INTLK ACTIVE signal is generated. To shut down the hydraulics, the HYD INTLK ACTIVE signal is checked at SU55 with the RUN/STOP signal. The status of the front panel Hydraulic Pressure switches is checked at SU76. If the hydraulic pressure is on, a hydraulic shutdown begins.

5.3.2 HYDRAULIC LOGIC

The hydraulic pressure is controlled by the front panel switches labeled Off, Low and High. These switches can be redefined by switch 751 and jumpers 4X20 and 4X21 on the Hydraulic Control/Power Supply card. Refer to section IV, subsection 4.4 for information concerning switch settings and jumper configurations. Figure 5-8 illustrates the logic to control the hydraulics.

![Hydraulic Logic Diagram](image-url)

Figure 5-8. Hydraulic Logic Diagram

5-10
The Low switch on the front panel is monitored at 7J21-19 of the Hydraulic Control/Power Supply card. When the Low switch (or High switch) is pressed, the signal is checked with the RUN/STOP switch at 7U65-11. The signal is checked with the Off switch status at 7U78-3 and then checked with the HYD INTLK ACTIVE signal status at 7U78-6. If the program is stopped and no interlocks are active, the Low switch signal is applied to 7U72 (through 7U77 and 7U62) to turn on relay 7K1.

Relay 7K1 is the start relay. The purpose of 7K1 is to start the hydraulic pump. The opto-isolator (4U20) senses the voltage applied to the pump and generates the PUMP ON/OFF signal. The PUMP ON/OFF signal is delayed by 4U26, 4CR56, 4C59, and 4U27, for approximately 30 ms when turned off. The 30 ms delay is required to allow one cycle of power loss without turning off the pump. The output of 4U27-2 is inverted at 4U27-4 to be the PUMP ON signal and generate the PUMP OFF PULSE through 4U62-13. The PUMP ON signal normally enables gate 7U25 which signals 7U71 to signal 7U72 to energize relay 7K2. The purpose of relay 7K2 is to hold the pump on after it has been started providing constant hydraulic pressure.

The high switch is monitored at 7J21-17 of the Hydraulic Control/Power Supply card. When the high switch is pressed (with the pump on and the program is stopped) 7U71 signals 7U72 to energize relay 7K3. The relay applies power to a solenoid which controls the pump and/or HSM high/low pressure.

The RUN and STOP switches on the front panel are monitored at 6J21-20 and 35 respectively. When RUN is pressed, 6U40 clocks flip-flop 6U63. The output of 6U63-13 turns on the RUN LED, is output to the backplane to start other modules and signals 7U72 to energize relay 7K4 to run up to 4 external devices. The RUN/STOP signal goes low when STOP is pressed or an interlock is active.

5.4 POWER SUPPLY

The 458 power supply provides the following voltages:

- +15 Vdc
- -15 Vdc
- +24 Vdc
- -26.5 Vdc
- 5.8 Vac
- +10 Vdc
- -10 Vdc

Other functions include power fail detection, power fail backup for the reference voltages and mutual shutdown of the +15 and -15 volt supplies and the 10 kHz oscillator. The transformer, bridge rectifiers and filter capacitors are located on the power supply bracket assembly. The pass transistors are located on the left side panel. The regulating and current limiting circuitry is located on the Hydraulic Control/Power Supply card. Refer to schematic 413535-01 for the following discussion.

5-11
5.4.1 +5, +15, -15 VOLT SUPPLIES

NOTE

The +5, +15 and -15 volt power supplies are similar circuits. The following discussion of circuit operation applies to these three voltages. Refer to sheet three of the schematics.

The inputs from the transformer secondary are rectified at the bridge rectifiers, then filtered by the capacitors to produce the unregulated voltages. The unregulated voltages are routed to the collectors of the pass transistors (emitter for -15 V). The regulated outputs of the emitters (collector for -15 V) are input to the Hydraulic Control/Power Supply card and available to the system. The voltage regulators control the bases of the pass transistors by comparing the regulated outputs to an internal reference.

Current limiting is provided by resistor networks in conjunction with pins 2 and 3 of the voltage regulators. As the current draw on the supply increases, the voltage drop across the resistor network also increases. When the voltage at pin 2 is 0.5 V higher than pin 3 of the voltage regulator, an internal transistor turns on, causing the output at pin 10 of the regulators to reduce the current to the base of the pass transistors which reduces the current from the supply.

5.4.2 +24 VOLT SUPPLY

The +24 volt supply is available to select the voltage for the CMPTR 2 INTLK STATUS output (5120-27 through 34). The +24 volts is provided by a bridge rectifier (BR3) and filter capacitor (C4) on the power supply mounting bracket. The +24 volts is unregulated and non-adjustable. The voltage is selected by 5X23 to supply a pull up resistor network 523, 623 and 723 on the Hydraulic Control/Power Supply card.

5.4.3 -26.5 VDC AND 5.8 VAC READOUT SUPPLY

The -26.5 volt supply is provided for the readout display. The voltage is used to bias the data lines between the alpha display controller and the vacuum fluorescent display. The input to the -26.5 volt supply is rectified by the bridge consisting of 3CR22 through 3CR25. Filtration is provided by 3C36. The unregulated -26.5 Vdc is regulated by the pass transistor 3Q6. The output of 3Q6 is compared with the voltage drop across 3CR15 by 3Q7. The base of 3Q6 is controlled by 3Q7 to regulate the -26.5 Vdc output. The -26.5 Vdc supply is adjusted by 3R130 which sets the bias of 3Q7.

The 5.8 Vac is required to power the filament of the vacuum fluorescent display.

5.4.4 ±10 VOLT REFERENCE

The ±10 volt reference is provided as a reference voltage to the modules that can be installed. The ±10 volt supply is generated by 2U3 which is a precision regulator. The regulator is used to regulate +10 Vdc down to +10 Vdc. The ±10 Vdc output is adjusted by 2R32 and fine tuned by 2R31.

The ±0 volt reference is derived from the ±10 volt supply and generated by 2AR4, 2R24, 2R27, 2R28, 2R30 and 2R7. The ±10 Vdc reference is inverted by 2AR4 and adjusted by 2R30 to produce the ±10 Vdc reference.

5-12
5.4.5 10 KHZ OSCILLATOR

The 10 kHz oscillator is composed of 2AR2, 2AR3, 2AR5, 2AR6, 2Q3 and their related passive components. The oscillator frequency is established by the Wien bridge oscillator configuration of 2CT, 2CS, 2AR2 and 2R33 through 2R36. The output of 2AR2-1 passes through 2R37 and 2C11 which act as a low pass filter. The signal is buffered at 2AR7 and compared with a +5 volt reference at 2AR3. Each time the buffered signal exceeds the +5 volt reference, 2AR3 is triggered. The oscillator amplitude is adjusted by 2R45. The signal is applied to the integrator (2AR6) causing the output of 2AR7 to go negative. This controls the FET (2Q3) which is used as a voltage controlled resistance to modify the gain of the oscillator. The oscillator output is buffered by 2AR5. Refer to section IV, subsection 4.4.2 for jumper configurations.

5.4.6 ±19 V SHUTDOWN

The mutual shutdown circuit protects the +15 or -15 volt supplies in the event one of the two voltages is shorted out. A voltage divider is formed across the +15 and -15 volt supplies by 3R93 and 3R94 to bias the base of 3U5 slightly negative (keeping it turned off). If the -15 volt supply is shorted out, the base of 3U5 goes positive (turning it on) and causes 3U7 to shut down the +15 volt supply. For the +15 volt supply, 3R108 and 3R199 form the voltage divider across the +15 and -15 volt supplies to bias the base of 3Q9 slightly positive (keeping it turned off). If the +15 volt supply is shorted out, 3Q9 turns on, shunts the base drive of 3Q5 to ground and shuts down the -15 volt supply.

5.4.7 POWER FAIL DETECTION

Power fail detection resets the microprocessor, shuts down the ±15 volt power supplies and protects the RAM memory from being written to. The POWER FAIL SENSE input at 2J31-4,5 is an ac voltage from the transformer secondary winding. The voltage is rectified by 2CR1 through 2CR4. The output triggers 2AR1-1 every half cycle to clock 2U1. If a cycle is missed, 2U1 times out and causes the output to go low to turn off 2Q3. This will generate the POWER FAIL signal. A second power fail circuit is used to monitor the ±15 volt supply. If the ±15 volt supply drops to a preset level, the output of 3U4 will turn off 3Q1, remove the ±5 volts from 3Q1 and generate the POWER FAIL signal. Low line voltage can also cause a power fail interlock. The output of the bridge rectifier, 3CR1 through 3CR4, charges 3C8. When the line voltage drops 20%, the charge on 3C3 also drops. If the charge on 3C3 drops to a specified level, 3AR1-7 will be tripped low to turn off 3Q2 and generate the POWER FAIL signal.

5.4.8 POWER BACKUP

The power backup circuit is used to power the ±10 volt references and the 10 kHz oscillator during a power loss situation. During normal operation, 8C100 is charged to ±30 volts and 8C103 is charged to ±30 volts. The POWER FAIL signal turns on 8U13 and disconnects the gate of 8Q4 to ±15 Vdc. When 0Q4 turns on, 8C100 and 8C103 are tied together and discharge through 8U10 and 8U11 which regulate the stored voltage to approximately ±14 volts. The voltage is maintained for approximately 1 second which is enough time for an orderly system shutdown.
SECTION VI
SCHEMATIC DIAGRAMS AND COMPONENT PARTS LISTS

This section contains the schematic diagrams and component parts list for the Model 458.10/.20 MicroConsole.

The diagrams included in this section are:

- 399715-01 Controller Chassis Schematic
- 407661-01 Readout/HYD Control Front Panel Schematic
- 405384-01 Power Supply, Side Panel Schematic
- 399001-01 Readout/Counter Schematic
- 413535-01 HYD Control/Power Supply Schematic
- 394293-01 Backplane Schematic
- 404415-01 Wiring Layout Drawing
- 411927-01 458 Chassis and Module Set-up Configuration
  (for use with the Model 458.10/.20 MicroConsole)

The component parts list contains the MTS System Corporation part number, description and vendor name (when available) of the components included in the various assemblies which make up the 458.10/.20 MicroConsole. The items listed in the REF. DESIGNATOR column correspond to the component labeling foiled on the circuit card assembly and the reference designator on the schematic. The assemblies included in the components parts list are:

- 407663-01 Front Panel Circuit Card Assembly
- 398996-01 Side Panel Assembly
- 399003-01 Readout/Counter Circuit Card Assembly
- 413537-01 Hydraulic Control/Power Supply Circuit Card Assembly
- 394399-01 Backplane Circuit Card Assembly
- 398685-01 Rear Panel Assembly