Operation

This section only describes basic operation of the Superflex 4 System. Refer to the machine manufacturer's instructions for additional information on operating your equipment.

General

The Superflex 4 System essentially converts joystick handle movement into an electrical output signal to drive the electro-hydraulic valve. The output signal increases proportionally to the amount of joystick movement.

The dual range digital (switched) input provides two independently adjustable output ranges. The low range is an adjustable percentage of the maximum output.

In a typical application, the AUX1 (auxiliary) output turns on whenever any of the eight valve outputs are active.

Functions for this application (Appendix 1)

Refer to the information in appendix 1 for any additional features and functions that have been included in your specific application. (This does not apply to the typical application described above).

Optimizer

Figure 13 on the next page identifies the display and important keys. The key functions will be described below. To use the Optimizer, plug its cable into the Superflex Controller. The Optimizer display will look like this, assuming that no joysticks are operated (and the Superflex outputs are off).

```
RUN MODE,  NORMAL
FUNCTIONS  OFF
```

When a joystick is operated, the Optimizer display will change to this. The upper right portion identifies the active channel or function, and the lower right portion indicates the actual output value. In this example, function 1

```
RUN:      ROTATE L
Fn1B      72.5 %
```

direction B (Fn1B) is active, with an output PWM duty cycle of 72.5%. This channel has been customized to read "Rotate Left". As the joystick is moved, the displayed value will change. If more than one joystick is operated at the same time, so that several outputs are active, the Optimizer display will show the channel who's joystick was most recently moved.

There are five adjustment select keys - Threshold, Maxout, Low Range, Ramp Up and Ramp Down. These keys are used to select one of these 5 parameters to adjust.

The Direction Select key toggles (alternates between) the A and B direction. This key only functions when all joystick controllers are off. The Optimizer automatically selects the direction when a joystick is operated; this makes active adjustments easy to perform.

The Function Select chooses one of the 4 channels for adjusting. This key only operates when all controllers are off. Each time this key is pressed, the next function (or channel) is selected, that is 1 ... 2 ... 3 ... 4 ... 1 ... etc. The Optimizer automatically selects the function (channel) whenever a joystick is operated, making active adjustments easy to perform.
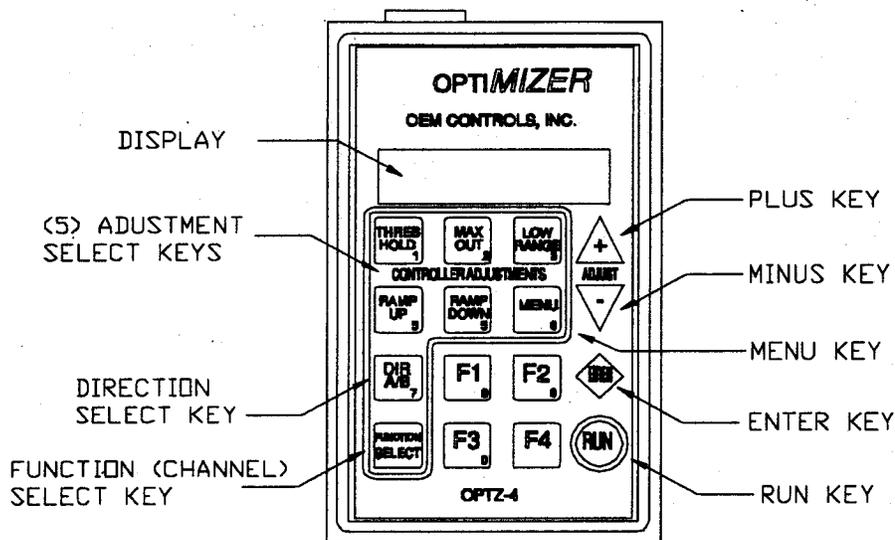
Figure 13

The Menu key accesses less frequently used items, other information and diagnostics. A "three key menu" system allows additional functions and features to be easily added to SF4 while still having a universal Optimizer. The Enter key is used to step through the various menu items. The section "Diagnostic Menus" below describes the Menu and Enter key functions.

The Plus and Minus keys are used for changing the various adjustments (threshold, ramp, etc.). The process is described below. The Run key must be pressed after making an adjustment so the new value is saved.

Figure 14 identifies various items that are displayed when you are making an adjustment. The "value" is flashing (blinking on and off) and will change as the Plus or Minus keys are pressed. The Channel (Function) and Direction are displayed generically on the bottom line, and as the actual machine's functions on the top line. The parameter being adjusted (in this example threshold) is shown at the upper left.
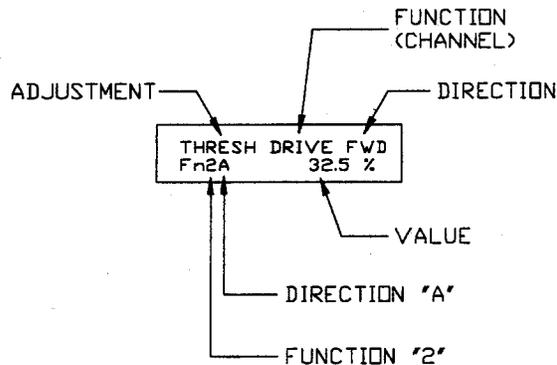
CAUTION - Be sure to press the RUN key after making an adjustment or the new setting will be lost

Figure 14

Adjustments

Threshold is the amount of output that causes the machine to just start to move or operate. The Threshold value represents a PWM percent duty cycle, which corresponds to the initial voltage signal driving the valve when the Joystick handle is moved slightly from its off position.

Max Out or maximum output is the amount of output that causes the machine to operate at maximum desired speed. The Max Out value also represents a percent duty cycle, corresponding to the voltage signal driving the valve when the Joystick handle is fully deflected (and high range is selected).

<u>Low Range</u> sets the limited amount of output signal when the Joystick handle is fully deflected. The Low ange setting represents a percentage of the Maximum Output value.

Threshold, Max Out and Low Range adjustments are made in 0.5 % steps.

<u>Ramp Up</u> sets the time the machine's function will take to increase (accelerate) from off to full on. This adjustment is made in tenths of a second.

<u>Ramp Down</u> sets the time required for the machine's function to decrease (decelerate) from full on to off. Ramp Down adjustments are also in tenths of a second.

Diagnostic Menus

Various pieces of information are available in the Diagnostic Menu mode. This mode is started by pressing the "Menu" key. The Optimizer displays the first menu item. Press the Enter key to step through all of the menu items. The first four menu items display fixed data. Two examples are shown at the right.

```
FREQUENCY 1 2
      100 Hz
```

The valve PWM frequency for the first two outputs (channels 1 and 2) is followed by the valve frequency for the second two outputs (channels 3 and 4). Next the OEM part number and serial number are shown.

```
OEM PART NUMBER
SF4-4-200.001x
```


The next three menu items are active displays showing input and output signals. These screens are useful for troubleshooting. The switched digital inputs (see figure15) can be tested on this display. If an input is On, the display is a "1" and if it is Off or 0 volts, the display is a "0". Likewise the AUX outputs and Digisensor inputs can be displayed. The Troubleshooting guide has additional information.
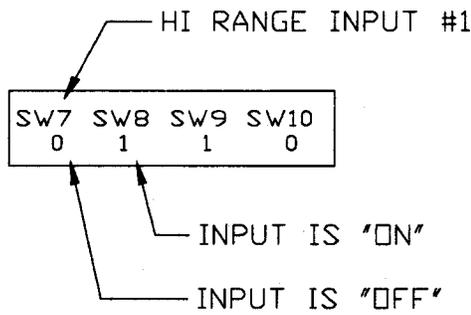
Figure 15

The next menu item is "Restore Factory Defaults" and is used to reset all of the adjustable parameters to the settings that were programmed in by the factory. The display looks like this, with the bottom line flashing. Pressing the Plus key will restore the default values. Pressing the Enter key will step to the next menu item.

```
RESTORE DEFAULT?
 Yes=+ No=Enter
```

The final three menu selections go together. They provide an alternate method of choosing adjustments, channels and the direction for making changes. At each of these screens, the selected item (e.g.: TH, MX, RU, RD or LR) will flash. Use the Plus key to select and the Enter key to go to the next menu. After proceeding through these 3 menus, you will be able to adjust the selected variable.

```
CONTROL ADJUST
TH MX RU RD LR
```

```
FUNCTION SELECT
Fn1 Fn2 Fn3 Fn4
```

```
   DIRECTION
DIR A    DIR B
```

Customized Display (Appendix 2)

Your particular Superflex 4 System application may be customized to easily identify the machine's function. Nine characters may be specified for each function, channel and direction. For example - you might choose "DRIVE FWD" for the machines drive forward, "BOOM LIFT" and "ROTATE R" for boom functions, etc. Refer to the customized data located in Appendix 2 of this manual.

Adjustments and Calibration

Two different methods may be used to calibrate the system: 1) Active or 2) Bench / Static. In the Active mode, the equipment is actually operated with the joystick controllers while making the adjustments. The Bench / Static mode does not require operating the equipment or moving the joystick handles. For best results, the Active method is recommended.

NOTE - After making an adjustment, <u>always press the RUN key</u> to save the new value. If the RUN key is not pressed, the new settings will be lost as soon as the Optimizer is unplugged or the Superflex 4 power is turned off.

Active Adjustments
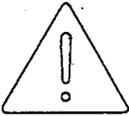
WARNING - Your machine will be operated during this calibration procedure. Be sure to locate the machine in an area which is suitable for safe operation.

NOTE - The Action (Channel) and the Direction are automatically selected when a Joystick controller is operated. Plug in the Optimizer and turn on power. Follow any additional procedures specified by the equipment manufacturer.

* To adjust THRESHOLD (initial starting or creep speed) -

> Move the joystick handle (of the function to adjust) just far enough so that the Optimizer display changes from "Run Mode Functions Off" to "RUN: ... Fn..." At this point, the channel is operating. Continue to hold the joystick handle in this position and perform the following steps.

> Press the Threshold key. The Threshold value is displayed, and it blinks (flashes) to indicate that it can be adjusted.

> Press the Plus key to start or speed up this function if it does not move. OR Press the Minus key to stop or slow down the function if it moves too fast.

> Press the RUN key to save the new value.

> Repeat these steps for adjusting the Threshold in the opposite direction.

* To adjust MAXOUT (full speed) -

> If the machine has two speeds (Dual Range), make sure the High range is selected. (If this is not possible, then temporarily adjust the Low Range to 100%.

> Move the joystick handle fully on (to the end of its travel) in the direction to be adjusted, and hold it there. Allow time for the machine function to accelerate to full speed.

Press the Maxout key. The Maximum Output value is displayed and flashes.

Press the Plus key to increase the function speed. OR Press the Minus key to decrease the function speed.

Press the RUN key to save the new value.

Repeat these steps for adjusting Maxout in the opposite direction.

- To adjust LOW RANGE (a slower speed range) -

  NOTE - the Maxout adjustment should be made first. The Low Range speed is affected by the Maxout setting; low range is actually a percentage of the maximum output.

  Select the "low range" machine function. This may be a selector switch or other device.

  Move the joystick handle fully on (to the end of its travel) in the direction to be adjusted, and hold it there. Allow time for the machine function to accelerate to full speed.

  Press the Low Range key. The Low Range value is displayed, and will be flashing.

  Press the Plus key to increase the function speed. OR Press the Minus key to decrease the function speed.

  Press the RUN key to save the new value.

  Repeat these steps for adjusting Low Range in the opposite direction.

- To adjust RAMP UP (acceleration time) -

  Ramp Up determines the time it will take for the machine function to accelerate from off to full on when the joystick handle is moved abruptly. Ramp up time is used to prevent sudden jerky movements of the machine. Ramp up (and ramp down) time is adjustable in tenths of a second increments.

  If the machine has two speeds (Dual Range), make sure the High range is selected. (If this is not possible, then temporarily adjust the Low Range to 100%.

  Press the Ramp Up key. The Ramp Up value is displayed and flashing.

  Move the joystick handle very quickly to its fully on position (to the end of its travel) in the direction to be adjusted. Observe the machine's response.

  If the machine starts too quickly and/or is jerky, press the Plus key to increase the ramp up time.

  OR If the machine takes too long to start up, press the Minus key to decrease the ramp up time.

  Press the RUN key to save the new value.

  Repeat these steps for adjusting the Ramp Up time in the opposite direction.

• To adjust RAMP DOWN (deceleration time) -

Ramp Down determines the time it will take for the machine function to decelerate from full on to off when the joystick handle is moved abruptly. Ramp down time is used to prevent sudden jerky movements of the machine and allow smooth stopping.

CAUTION - Setting the Ramp Down time too high will increase the time it takes for the machine function to stop.

If the machine has two speeds (Dual Range), make sure the High range is selected. (If this is not possible, then temporarily adjust the Low Range to 100%.

Press the Ramp Down key. The Ramp Down value is displayed and will flash.

Move the joystick handle fully on in the direction to be adjusted. Allow the machine to reach full speed. Then quickly move the joystick handle to its off position. Observe the machine's response.

If the machine slows down too quickly and/or is jerky, press the Plus key to increase the ramp down time.

OR If the machine takes too long to stop, press the Minus key to decrease the ramp down time.

Press the RUN key to save the new value.

Repeat these steps for adjusting the Ramp Down time in the opposite direction.

After all adjustments have been made for the desired machine performance, it would be helpful to record all of these settings for future reference. The following table can be used to record the settings.

	1A	1B	2A	2B	3A	3B	4A	4B
Threshold								
Maxout								
Low Range								
Ramp up								
Ramp down								

Bench / Static Adjustments

Any adjustment can be made without operating the machine. This process is known as "static" or "on the bench" calibration. Use the following steps -

Provide power to the Superflex 4 Controller. Connect the Optimizer.

Select a "function" (channel) by pressing the Function Select key one or more times, until the desired channel (1 through 4) is displayed.

Select a direction (A or B) by pressing the DIR A/B key.

Select a controller adjustment by pressing one of Threshold, Maxout, Low Range, Ramp Up or Ramp Down keys.

Use the Plus and Minus keys to make the adjustment.

Press RUN to save the changes before powering down or disconnecting the Optimizer.

Factory Default Values (Appendix 3)

All defaults (preset values) as well as upper and lower limits to each adjustment range may be specified by the customer. These setting are installed by OEM Controls when your Superflex 4 Controller is manufactured. After making adjustments with the Optimizer, it may be desirable to return to these default values. This task is easily accomplished with the Optimizer.

Apply power to the Superflex 4 Controller and connect the Optimizer.

Press the Menu key. Then press the Enter key several times, until the Optimizer displays "Restore Defaults?".

Press the Plus key to restore the default values. The Optimizer displays "BUSY" while the original values are copied. This may take several seconds, depending on how many values need to be restored. Then the Optimizer will momentarily display "DONE" and return to the default run screen. Be sure to wait for this to happen before disconnecting the Optimizer or turning off power to the Superflex 4 Controller.