OmniFlo™ Series

CONVECTION REFLOW SYSTEM

OPTIONS MANUAL

Technical Manual Part #560-97-0

Speedline technologies

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OPTIONS MANUAL

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TO OUR CUSTOMERS

The purpose of this manual is to help obtain the greatest possible return on your investment. It is suggested that new operators study the applicable sections of this manual thoroughly before operating the equipment. It is further suggested that the manual be used as a reference by maintenance personnel and as a text for training new maintenance personnel.

This manual includes instructions for this equipment available at the time this manual was approved for printing. Electrovert® reserves the right to make changes in design and specifications and/or make improvements in the product without imposing any obligations upon itself to install them on previously manufactured products.

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Customer _____

Address _____

Contact _____ Date _____

Machine Type _____ Manual Part Number _____

Translated Manual Language _____ Part Number _____

Option Manual _____ Part Number _____

1. How often do you refer to the technical manual package?
   - ❑ Frequently
   - ❑ Occasionally
   - ❑ Seldom
   - ❑ Never
2. In what instances do you refer to the technical manual package?
   - ❑ To verify process information
   - ❑ To reference procedures (operational, maintenance)
   - ❑ To order/identify parts
   - ❑ Other (please specify) _____
3. How do you rate the overall layout of the manual package?
   - ❑ Information easy to find
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4. How do you rate our manuals in comparison to your other capital equipment suppliers?
   - ❑ Higher quality
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   - ❑ Lower quality

   If same general or lower quality, please explain _____

   _____
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   - ❑ Very accurate
   - ❑ Somewhat accurate
   - ❑ Not accurate
   - ❑ Can you provide examples, with page number indicated? _____

   _____
6. What tools would make the manuals easier to use and/or find information?
   - ❑ Indexes
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   - ❑ Improved Table of Contents
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7. Who are the main users of your equipment manuals?
   - ❑ Operators
   - ❑ Maintenance personnel
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   - ❑ Very accurate
   - ❑ Somewhat accurate
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   If somewhat or not accurate, can you elaborate? _____

   _____

   _____

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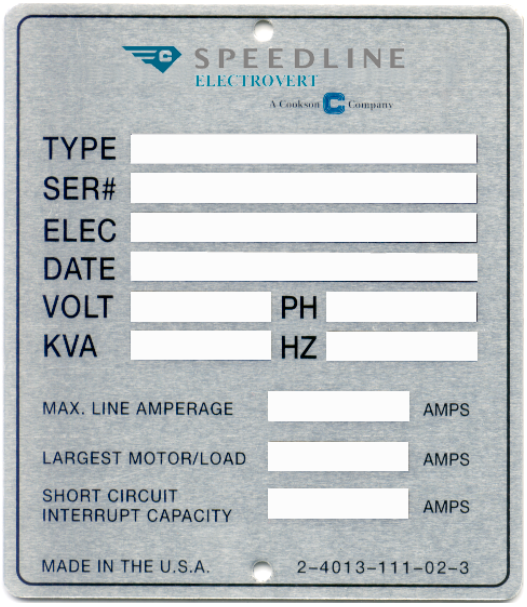


The serial tag information is to be filled by the user for technical support purposes. Please have the following information available when contacting Technical Support or when placing parts orders:

Machine Name
Model Number
Mechnical and Electrical Serial Numbers
Item/Kit Description

COMMON SAFETY WARNING LABELS

The following warning labels are used throughout this manual:

NOTE Notes point out information in this manual that may be of assistance to the operation or maintenance of the machine.

CAUTION Caution notices are used in this manual to call attention to a situation that could cause equipment damage.

WARNING Warning notices are used in this manual to emphasize hazardous voltages, high temperatures, high currents, or other conditions that could cause personal injury.

DANGER Danger notices are used in this manual to warn the operator that DEATH may result if a procedure is omitted or improperly performed.

OMNIFLO™ SERIES

OPTIONS MANUAL

TABLE OF CONTENTS

SECTION 1: SYSTEM OPTIONS

SECTION 2: CONVEYOR OPTIONS

SECTION 3: HEATING MODULE OPTIONS

SECTION 4: COOLING ZONE OPTIONS

SECTION 1: SYSTEM OPTIONS

Options available for the OmniFlo™ Series include

- Integrated Flux Management (IFM)
- Nitrogen–Ready Package
- Light Tower
- Uninterruptable Power Supply
- Output Photocell
- SMEMA
- Programmable Outputs
- SIP

1.1 INTEGRATED FLUX MANAGEMENT

THEORY OF OPERATION

CONFIGURATION

The IFM (Integrated Flux Management) option is designed for use with OmniFlo™ 7 and 10 series systems. This option is configured with two (2) condensing units and a single recirculation blower. The management system utilizes existing OmniFlo™ system water connections to supply water used to cool the condensing units when the machine is configured with an inert environment. Air configured OmniFlo™ Systems require a separate water drop or an external chiller. (See OmniFlo™ EDS for chiller specifications).

OPERATION

During the normal process of reflow soldering, the solder paste is reflowed, thus releasing the flux vapors from the solder paste. Under normal conditions, without the IFM option, these vapors eventually build up in the cooling module, creating flux deposits on system components. During the course of preventive maintenance, these flux deposits must be removed utilizing a self cleaning cycle or by manually cleaning and removing the deposits. The purpose of the Integrated Flux Management system is to remove the flux vapors from the system and condense them on the cooling coils (condensing units) inside the IFM unit. This is done by extracting the air, or inert atmosphere, from the oven area using a single blower. Cold water at approximately 10 ×C (50 ×F) +/- 3 ×C (5 ×F) circulates through the cooling coils inside the unit, allowing condensation to occur. The air containing the vapors passes over cooling coils, allowing the vapors to condense and deposit on the coils. As the air exits the IFM unit, the air passes through a filter to remove any residual airborne solids prior to passing through the blower. The cooled, cleaned air then recirculates.

MAINTENANCE

To ensure proper and efficient operation, remove the cooling coils periodically for cleaning. Provided that the recirculation blower is turned Off, the condensing units can be removed while still in operation. When removing the assemblies, close the 2 1/2 in. tank ball valves at the rear of the unit.

On inert machines, a nitrogen purge cycle is required to remove any remaining oxygen from the IFM tank upon re-assembly of the cooling coils and filter assembly. Purging is performed via two (2) 1/2 in. ball valves located at the rear sides of the IFM unit. Each valve normally remains closed. They are opened to purge the tank and then re–closed.

A filter is in line with the air flow for removal of residual solids that may still be airborne. As the air exits the unit, these solids become trapped in the filter before they can reach the blower. Replacement of this filter is especially important to ensure that as much solid is retained as possible.

COMPONENTS

BLOWER

The IFM system utilizes a blower to pull the air from the oven area to circulate it through the tank containing the condensing units.

TANK VALVES

Both the intake and output sides of the tank are configured with 2 1/2 in. ball valves. The ball valves shut off flow and circulation from either side of the tank when performing maintenance on the IFM.

CONDENSING UNIT

There are two (2) condensing units inside the tank. Module #1 on the left, and Module #2 on the right. The condensing units cool the air as it is circulated through the tank chambers, allowing vapors to condense and deposit on the units.

FILTER

A filter is configured after module #2. Any solids remaining in the air are trapped in the filter before the air gets circulated through the blower again.

TANK

The IFM tank is accessible from the front of the OmniFlo™ system. Once the OmniFlo™ system's front panel is removed, the management system's tank can easily be slid out on drawer slides. The tank houses the condensing units and filter, while providing an air tight chamber for condensation to occur.

DRAIN PLUG

The drain plug is located at the lower, left, front corner of the tank. When fluids accumulate at the bottom of the tank, the drain plug can be removed to drain the fluids from the tank.

NITROGEN PURGE VALVES

OmniFlo™ systems configured with inert atmosphere (Nitrogen option), have two (2) 1/2 in. nitrogen purge valves at the rear sides of the tank. During normal operation the valves remain closed. After performing maintenance on the condensing units and filter, the tank becomes filled with air rather than nitrogen. The valves are used to purge the air from the tank after maintenance. Once the air is removed and replaced with nitrogen, the valves need to be closed again.

COOLING LINES AND DISCONNECTS

Cooling lines with disconnects circulate cooled water to and from the condensing units. The disconnects facilitate quick and easy disassembly of the cooling lines for removal of the condensing units.

TOP AND SIDE LATCHES

The condensing units are easily removed for maintenance from the top of the IFM's tank. Each condensing unit's cover has a seal under it to ensure the unit is completely air or nitrogen tight. The latches at the top and sides of the tank are to ensure that the covers seal tightly to prevent leakage. It is important to verify these latches are engaged after performing maintenance or before operating the IFM again.

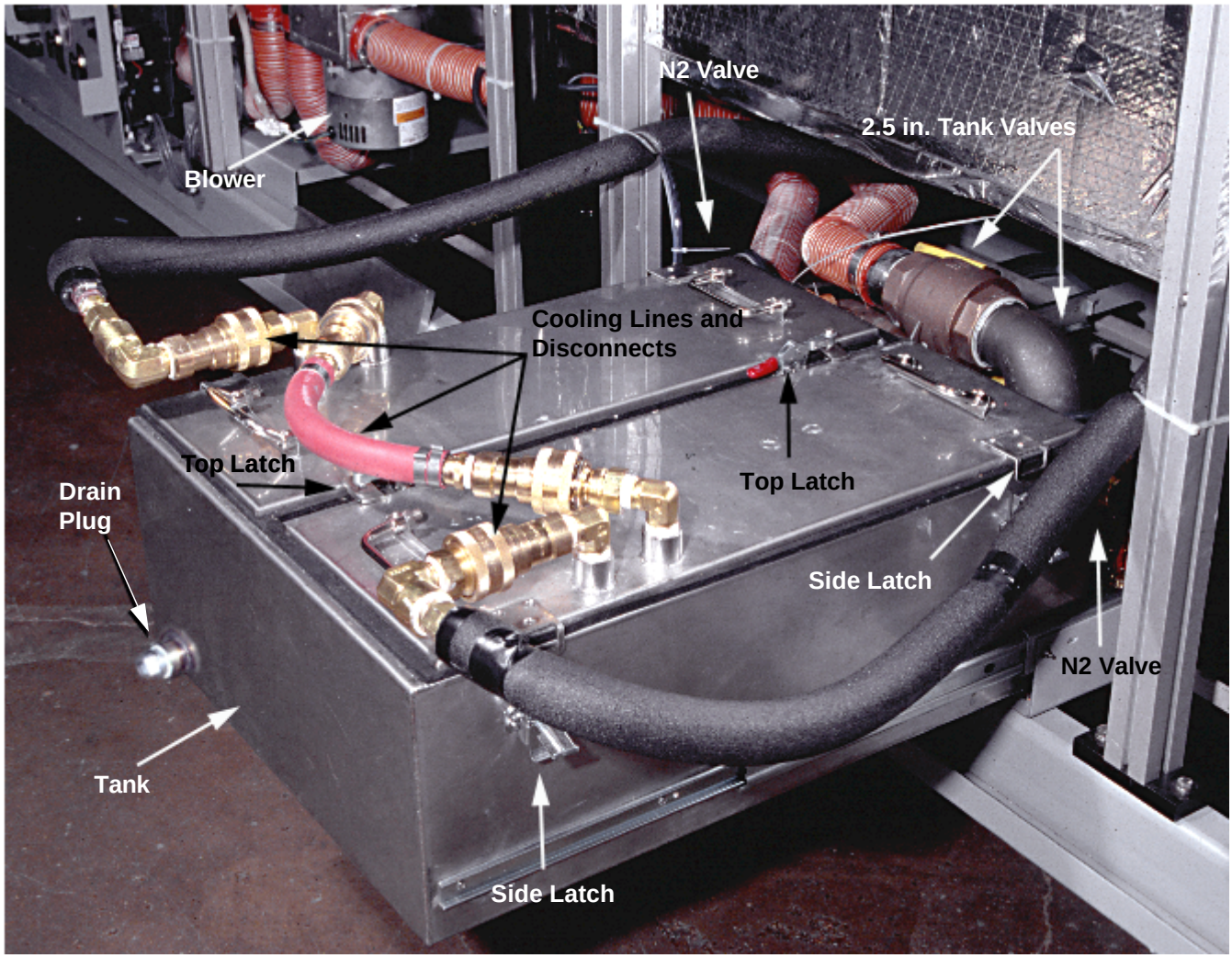


Figure 1: Flux Management Components (Closed)

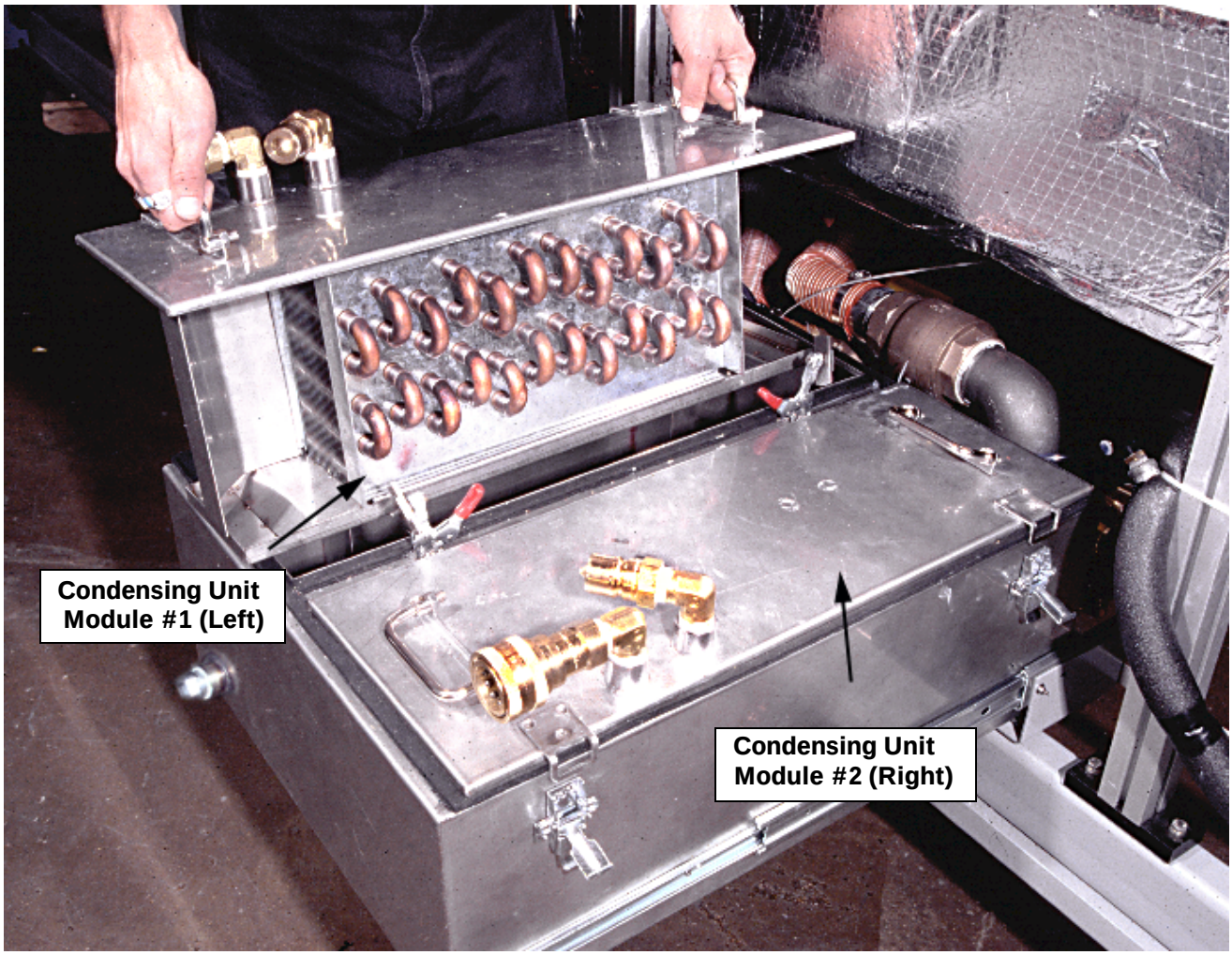


Figure 2: Flux Management System Components (Open)

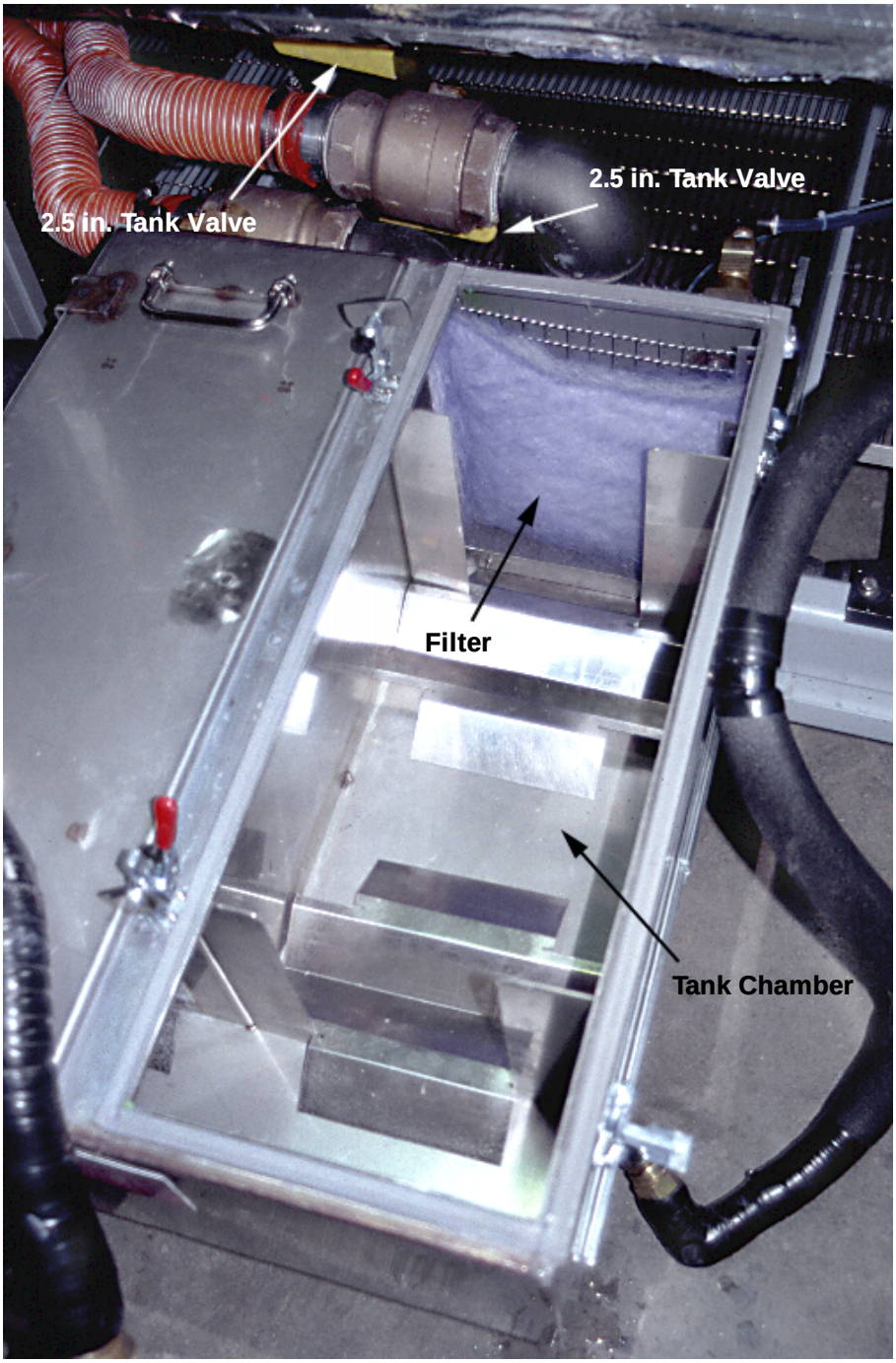


Figure 3: Filter Access

INSTALLATION

The optional IFM is internal to the OmniFlo™ system. No installation is required. However it is important to make sure when installing the OmniFlo™ system, that the water supply from the facility to the equipment is installed according to OmniFlo™ specifications.

Refer to the Technical Data that follows for the IFM water and hook up requirements.

TECHNICAL DATA

Water Requirements:

NOTE Use of the IFM option requires a chiller unit capable of the water requirements listed below. Recommended operating temperature for efficient condensation to occur is 10 ×C (50 ×F).

- Feed Temperature: 7 - 20 ×C (45 - 68 ×F)
- Inlet Fitting Size: 1/2 inch barbed fitting at the rear load end of the system.
- Flow Rate: 7.57 - 11.35 liters/min (2.0 - 3.0 US gal/min.)
- Inlet Pressure: 310 - 483 kPa (45 - 70 psi)
- Pressure Drop: 200 kPa @ 11.4 l/min (30 psi @ 3 US gal/min)

OPERATION

The functions accessible through the software for the IFM allow the user to turn the Flux Management blower On or Off. Activating and deactivating the blower also enables or disables the solenoid that controls water flow to and from the condensing units. An alarm associated with the flow valve is also configurable for this feature.

IFM BLOWER ON/ OFF

While the system is in the normal operation mode, and the Graphic Screen is visible, click on the Tabular button or press F8 on the keyboard to display the Tabular screen.

Notice that the IFM option is listed in the lower left hand column. Click on the down arrow associated with IFM under the "SetPt" column to toggle the IFM system to On or Off for Startup. Setting the "SetPt" to On allows the IFM blower to be started in the Auto Startup mode. Setting it to Off disables the blower during Auto Startup mode.

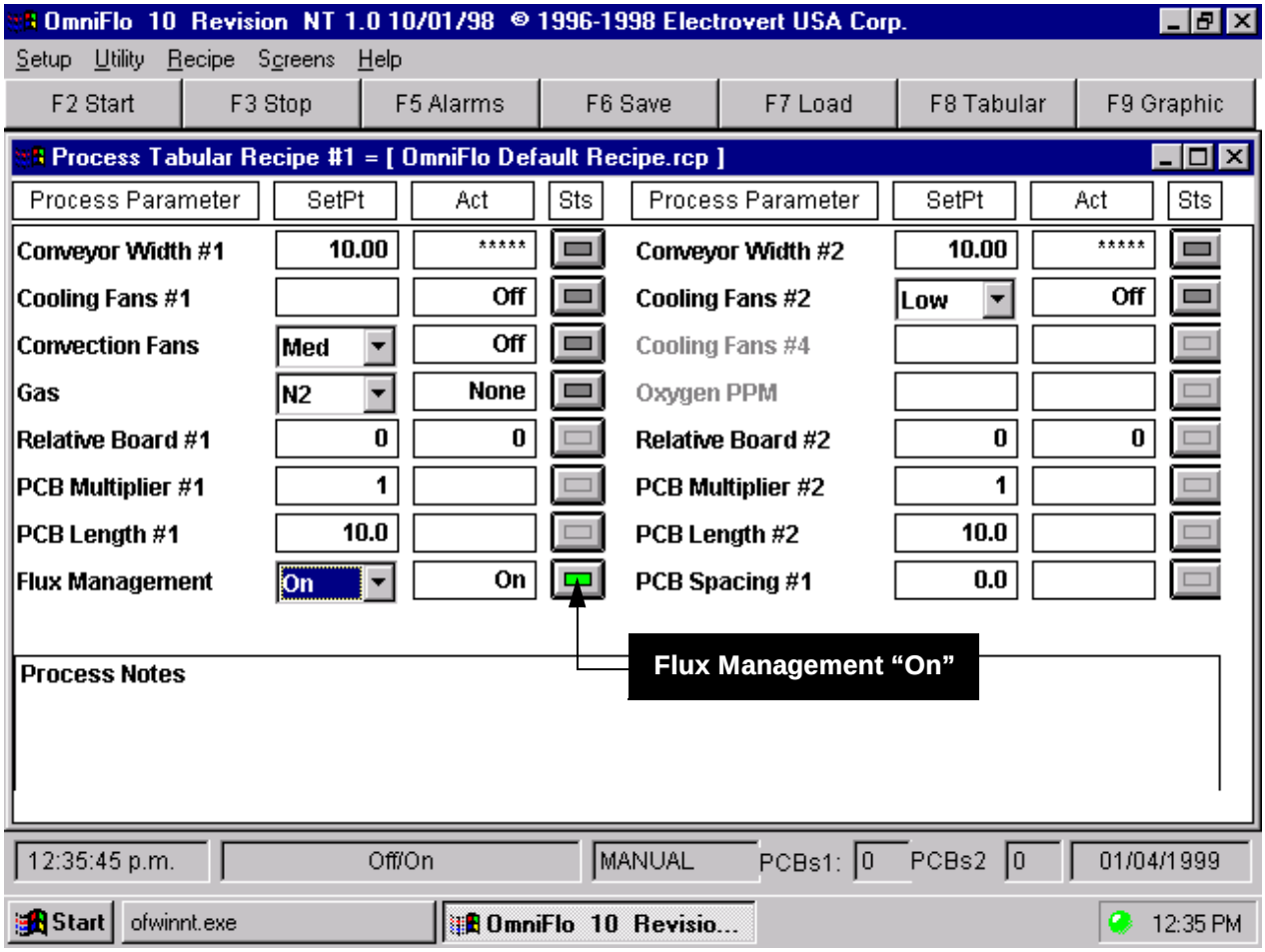


Figure 4: Process Tabular Screen

To turn the IFM system On or Off during normal operation or when performing maintenance on the Flux Management System, click on the "Sts" (status) button associated with IFM. When On, the button illuminates blue momentarily, and is green when operating. “On” is displayed under the "Act" (actual) column when the button illuminates green.

IFM Alarms Configuration

To configure the alarms for the Flux Management System, select Setup > Configure > Alarms from the pull–down menu bar.

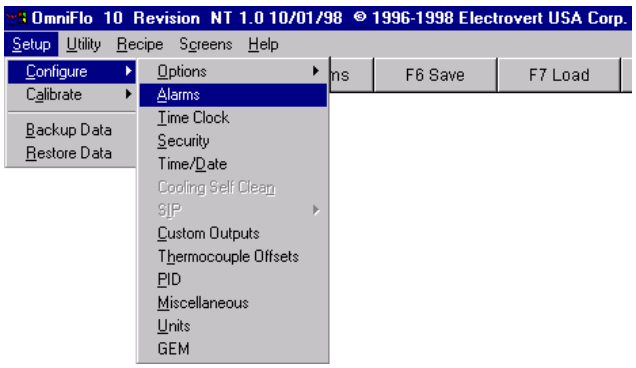


Figure 5: Setup Menu

The Configure Alarms window displays. There are two (2) alarms associated with the IFM options.

- IFM Off for 15 Minutes
- Low IFM Coolant Flow

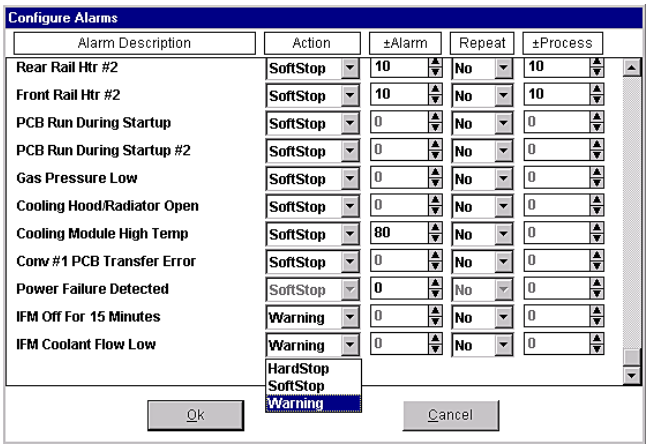


Figure 6: Alarms Configuration

IFM OFF FOR 15 MINUTES

This alarm is designed to notify personnel after 15 minutes that maintenance has been performed on the IFM and the blower has not yet been turned back on. This alarm feature can be configured one of four ways, however it is recommended to configure as WARNING so that an audible and or visual alarm is generated.

Perform the steps that follow in the order in which they are presented to configure this alarm.

1. Click on Setup in the Menu Bar of the OmniFlo™ software main Graphic screen, then click on Configure.
2. Click on Alarms to display the Configure Alarms dialog box.
3. The Configure Alarms dialog box is displayed with a scroll bar to the right.
4. Click and hold the down arrow at the bottom of the scroll bar to display the bottom portion of the Configure Alarms page.
5. Click on the down arrow under the Action column for the Alarm Description IFM Off For 15 Minutes, and select WARNING.5. Click on the OK button.

LOW IFM COOLANT FLOW

The Low IFM Coolant Flow alarm indicates when water flow being supplied is below minimum operating pressure.

To change the alarm configuration, perform steps 1 - 3 of IFM Off For 15 Minutes.

Click on the down arrow under the Action column for the Alarm Description Low IFM Coolant Flow; select the alarm condition required.

Warning — Sounds an audible alarm and displays a message on the screen.

Soft Stop — Unconditionally shuts down the machine, immediately stopping all moving parts and turning off all heaters. The conveyor remains on. The alarm sounds and the alarm message is displayed in the alarms window. The convection blowers and cooling module remain on until the machine has cooled. The conveyor continues operating until the machine has cooled and all PCB's have exited the machine, then the conveyor stops.

Hard Stop — Unconditionally shuts down the machine, immediately stopping all moving parts. The alarm sounds, and the alarm message is displayed in the

alarms window.

MAINTENANCE

PREVENTIVE MAINTENANCE CHECKLIST

Preventive maintenance has been proven to be very cost effective. Planning of periodic maintenance or scheduled down time, and defining the procedures required limits the need to disrupt normal operation of the production line for minor maintenance. Performing preventive maintenance increases the reliability of the equipment and optimizes production quality.

The following maintenance schedule is provided strictly as a guideline and should be modified as necessary to meet specific production levels. This schedule is provided strictly to enhance, not replace, any internal maintenance schedule. To assist implementation, this schedule is divided into distinct time intervals. Make copies and distribute to the appropriate maintenance personnel in order to fulfill the requirements.

Table 1: Weekly Maintenance

Flux Management System	PROCEDURE
168 Hours of Operation	**Inspect and clean the Left and Right Condensing Units if inspection warrants**
168	**Replace the filter when cleaning the Condensing Units**

NOTE The weekly maintenance schedule for the IFM is based on the volume of solder paste processed through the OmniFlo™ rather than hours of operation. Customer test results indicate that after processing 10 to 15 kilos of solder paste, the condensing units require cleaning. However, inspection is recommended after three (3) shifts of operation; 24 hours per day, seven (7) days a week until the condition of the interior is established.

WEEKLY MAINTENANCE

The following weekly maintenance procedures should be performed at the end of each week, or each seven (7) days (three shifts) of operation (every 168 hours). However, should 10 to 15 kilos of solder paste be processed through the OmniFlo™ prior to this time frame, maintenance should be performed at the interval of time elapsed. These procedures are to be performed in addition to the daily maintenance schedule outlined in the OmniFlo™ Maintenance manual.

INSPECTING AND CLEANING THE CONDENSING UNITS

This procedure may be performed while the OmniFlo™ system is in operation or while shut down for maintenance.

1. Remove the access panels:
   - On OmniFlo™ 7 systems, counting from the load end, remove the #2 and #3 front access panels.
   - On OmniFlo™ 10 systems, remove the #3 and #4 front access panels.
2. Unscrew the M8 bolt securing the slide out unit inside the OmniFlo™.
3. Slide the IFM unit out from the front of the system.
4. If performing this maintenance procedure while the OmniFlo™ is operating, go to the operator interface and click on the Tabular button to go to the Tabular screen.

NOTE If the system is shut down for maintenance, skip steps 4 and 5.

5. Click on the button in the "Sts" column associated with IFM to turn OFF the blower. Off is displayed in the "Act" column

and the button turns gray when the blower is off.

This button turns off the IFM blower and closes the solenoid for incoming water which cools the condensing units.

WARNING Hot Surfaces Burn Hazard. The blower hoses carrying the hot air from the ovens are potential burn hazards to personnel performing maintenance. The blower hoses and plumbing component's surfaces can reach temperatures up to 200C (392 F) which can cause serious burns. Wear the appropriate safety protective clothing such as long sleeved garments when shutting off the 2 1/2 in. valves. Always wear the required safety glasses. Remain aware when working with or around hot components.

WARNING Moving Parts - Blower Fan Operating While the system is operating, the lower preheat blower fans located directly above the IFM unit, are on. Use extreme caution when reaching in to turn off the tank valves so that fingers are not caught in the fans. Serious injury or dismemberment could occur.

6. Locate the $2–{}^{1}/_{2}$ in. tank valves at the rear of the slide out unit. While wearing the appropriate safety articles for handling hot components, carefully reach back and close the valves, taking caution not to burn arms or hands on the hoses or plumbing fixtures. The valves are closed when the handles are in the vertical position.
7. Disconnect the cooling lines at the cooling line disconnects on the IFM. There are four (4) disconnects.

There are two (2) cooling lines connected to the system. One is a feed line and the other is a return. A cross over line connects the two (2) condensing units so that water constantly circulates through both units while the system is in operation.

CAUTION Due to pressure build-up in the condensing units, it is important to engage dummy connectors immediately after disconnecting the cooling hoses to avoid damage to the units.

8. Install the dummy connectors on the feed and return lines.

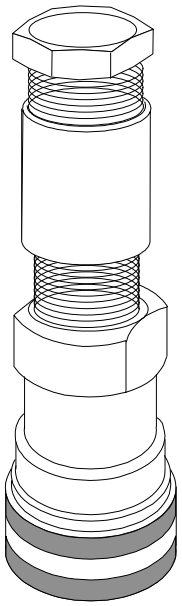


Figure 7: Pressure Relief Tool (Dummy Connector)

9. Unlatch the top and side latches for each module.
10. Lift one of the condensing units from the tank at a time.
11. Submerge the condensing unit into solvent or water soluble solution up to the lower lip of the cover. The solvent or solution must be compatible with the flux chemistry used in the process being applied in the OmniFlo™ system.

Refer to the solder paste supplier's MSDS (Material Safety Data Sheets) or contact the supplier for compatibility issues.

Use of a batch type cleaner may be used in lieu of soaking the condensing unit. The chemical process compatibility issue still applies.

12. Allow the condensing units to soak until clean. It may be necessary to allow the unit to soak overnight.

    If using a batch type cleaner, set the batch cycle for approximately 45 to 60 minutes.

    Upon removal from the cleaning solution, use any soft bristle paint brush to brush away any deposits that have loosened but not soaked loose.

    Electrovert recommends stocking two (2) spare condensing units for maintenance purposes. When the dirty units are being cleaned, the spares can be installed. The next time maintenance is performed, rotate the sets again, installing the units previously being cleaned with the units in the tank.

    Reference the following part numbers for spare condensing unit modules.

Table 1: Spare Condensing Unit Part Numbers

CONDENSING UNIT MODULES	
Description Location	**Part Number**
Condensing Unit Module #1 Left	6 0261 119 01 1
Condensing Unit Module #2 Right	6 0261 120 01 1

13. Perform the procedure "Replacing the Filter" before proceeding to step 13.
14. Install the left and right condensing units in their respective chambers of the Flux Management tank.
15. Secure the covers by latching the top and side latches.
16. Re-connect the inlet, outlet and cross over hoses at their respective disconnects.

NOTE If the OmniFlo™ is not inerted, skip Step 17 and Step 18.

17. If the OmniFlo™ is an inerted system, open both of the nitrogen ball valves at rear sides of the tank for approximately one (1) to two (2) minutes to evacuate the oxygen from the tank prior to re-starting the IFM system. The valves are open when the handles are positioned horizontally.

NOTE If the OmniFlo™ is shut down for maintenance, it needs to be re-started to activate the nitrogen purge.

18. After purging with nitrogen for one (1) to two (2) minutes, close both nitrogen valves. The valves are closed when the handles are positioned vertically.
19. Open the 2 1/2 in. tank valves that were closed in step 6.
20. Slide the IFM unit into the OmniFlo™.
21. Screw the M8 bolt that was loosened in step 2, back in, to secure the slide out unit.
22. Click on the button in the "Sts" column associated with IFM to turn ON the blower. On is displayed in the "Act" column and the button illuminates green when the blower is on.

    This button turns on the IFM blower and opens the solenoid for incoming water which cools the condensing units.

REPLACING THE FILTER

While the condensing units are out of the tank, remove the filter material from the right chamber of the tank and dispose of it in accordance to internal and/or local policies on the handling of lead waste materials.

Install the filter material, p/n 2-7999-282-00-0, in the same fashion that the piece removed was configured (four 25.4 x 25.4 cm {10 x 10 in.} square pieces back to back).

NOTE The 2.54 cm (1 in.) thick by 61 cm2 (2 square foot) of fiberglass filter is to be cut into four pieces to fit the filter housing.

1.2 NITROGEN–READY PACKAGE

The Nitrogen–Ready option is available on standard air (non–inert) machines to facilitate future nitrogen operation.

Mechanical preparation includes fittings and brackets for the Load End and Unload End isolation modules as well as a retractable nitrogen containment curtain at each end (on pin chain conveyors). Preparatory nitrogen plumbing is installed with nitrogen injector tubes in the heating chamber. Preparatory cooling water plumbing is also installed.

Electrical preparation includes circuit breakers for nitrogen and coolant solenoid valves and terminal blocks or connectors for the exhaust interlock switches. Additionally a coolant flow switch is installed as well as cooling chamber interlock switches and relays. All of the electrical preparatory components are wired into the main control panel.

1.3 LIGHT TOWER

The light tower is an available option with the OmniFlo™ Series machines. The signals provide a quick visual indication of the overall status of the reflow system. The light tower is located on the top rear section of the Unload End of the machine.

It can be configured to two (2) modes — mode #1 is compatible with FUJI placement machines light tower logic. The conditions are indicated by:

- Flashing red: Oven is in an alarm condition.
- Flashing yellow: Oven is in transition.
- Solid yellow: The system is in Manual mode and all heaters are below 70° C (158° F).
- Solid Green: Mode #1 - the oven is at setpoint and boards are in process. Mode #2 - the oven is at setpoint and no boards are in process.
- Flashing green: Mode #1 - the oven is at setpoint and no boards are in process. Mode #2 - the oven is at setpoint, and boards are in process.

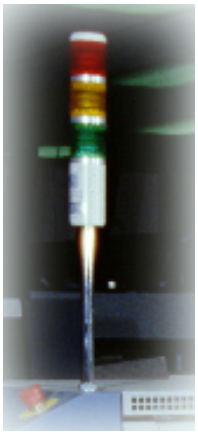


Figure 8: Light Tower

1.4 UNINTERRUPTABLE POWER SUPPLY (UPS)

DESCRIPTION

The Uninterruptable Power Supply (UPS; sometimes referred to as EPS — Emergency Power Supply) is useful in situations where line voltages may vary due to heavy loading on the facility power service, where power failures are common, or where the customer is producing valuable products which may be damaged in the even of a power failure. The UPS allows a customer to recover or purge any product from the machine if the normal process is interrupted, allowing the system to shut down safely.

The UPS allows the batteries to be used as the machine power source when:

- Feed (control) voltage is lost or reduced below operational conditions
- An over–voltage condition exists where the control voltage is above operational conditions. Once the UPS starts supplying battery power, it continues to do so until the control voltage falls to within the proper operational voltage range.

The UPS is an on-line power supply. The power to the machine circuitry first goes through the UPS. In addition to providing power in the event of a power failure, the UPS protects the circuitry against spikes, sags and noise common in industrial environments. In the event of a facility power outage, the UPS automatically draws current from the battery to supply power. The UPS automatically reverts to facility power when power is restored.

Additionally, in a low–voltage condition (i.e., brown–out) the UPS boosts facility power to meet the power required for machine operation.

The Best Fortress® UPS is installed at the factory. It is preset to provide enough power for all boards to exit the machine in the event of a power outage.

UPS VERSION

NOTE Refer to the photographs below to identity the UPS that reflects the UPS model installed on the OmniFlo™. Refer to the procedures that are specific to the UPS configured, Best Fortress or APC.

Figure 9: Best Fortress and APC model UPS systems

APC UNINTERRUPTABLE POWER SUPPLY

UPS Activation

When the OmniFlo™ is configured with the UPS option, prior to shipment, the UPS power switch is turned OFF.

Prior to initial start-up, the UPS must be turned ON or power to the OmniFlo™ will not activate.

Press the On/Test button at the front of the APC UPS (see Figure 187).

The UPS charges its battery whenever it is connected to utility power. The battery will charge fully during the first four (4) hours of normal operation. Do not expect full runtime during this initial charge period.

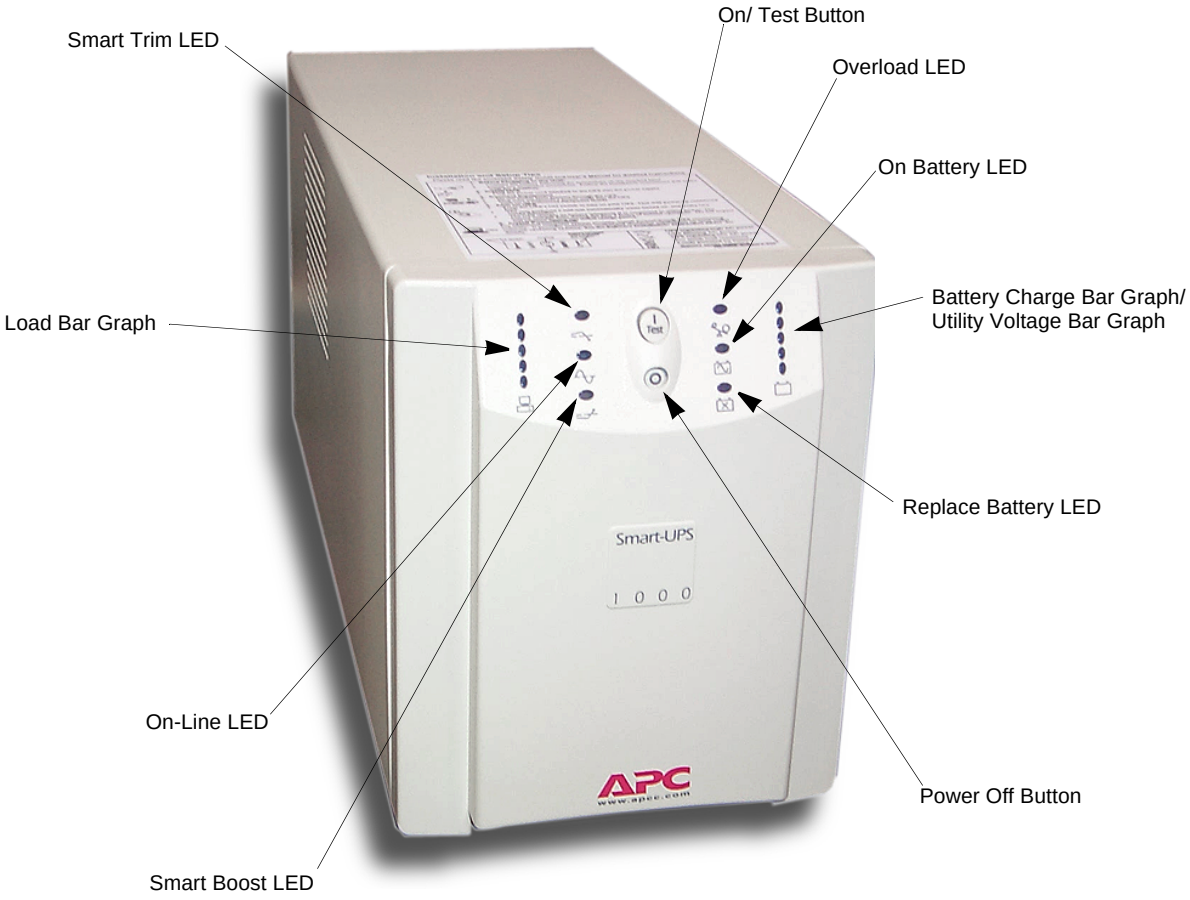


Figure 10: APC UPS On/Off

CONTROLS

Refer to Figure 187 in reference to the APC UPS control descriptions.

On/ Test Button

Press the large, upper On/Test button to supply power to the loads. The loads are immediately powered while the UPS performs a self-test.

- Self Test

  Every time the UPS is turned on, the UPS performs an automatic self-test, and every two (2) weeks thereafter. This eases the maintenance requirements by eliminating the need for periodic manual self-tests. During self-test mode, the UPS briefly operates the loads on-battery. If the self-test passes, it returns to on-line operation.

  If the UPS fails the self-test it immediately returns to on-line operation — the Replace Battery LED is illuminated.

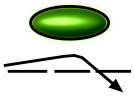
Power Off Button

Press the small, lower Off button to turn off power to the loads.

NOTE Whenever the UPS is plugged in and utility voltage is present, the charger maintains battery charge.

Load Bar Graph

The 5-LED display on the left of the front control panel indicates the power drawn from the UPS by the load. The LED's indicate the percentage of the UPS's rated capacity. For example, if three (3) LED's are illuminated, the load is drawing between 50 and 67% of the UPS's capacity. If all LED's are illuminated, thoroughly test the complete system to ensure that the UPS will not become overloaded.

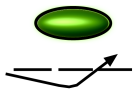


SmartTrim LED

The SmartTrim LED illuminates when the UPS is compensating for HIGH VOLTAGE.

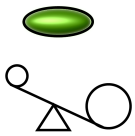
On-Line LED

The On-Line LED illuminates when the UPS is supplying utility power to the load.



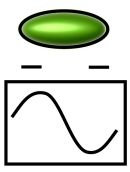
SmartBoost LED

The SmartBoost LED illuminates when the UPS is compensating for a LOW VOLTAGE.



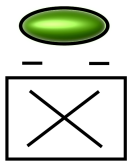
Overload LED

When loads exceed the UPS's capacity, the Overload LED illuminates, the UPS emits a sustained audible alarm, and the input circuit breader may trip (the re-settable center plunger of the circuit breaker pops out - see Figure 188). The alarm remains active until the overload is cleared. If there is AC power and the circuit breaker does not trip during overload, the loads are still powered. If the circuit breaker trips and the UPS attempts to go On-Battery, the output AC shuts down.



On Battery LED

During On-Battery operation, the LED illuminates and the UPS sounds an audible alarm (4 beeps/ 30 seconds). The alarm discontinues when the UPS returns to On-Line operation.



Replace Battery LED

If the battery fails a self-test, the UPS sounds an audible alarm in the form of short beeps for one (1) minute, then the Replace Battery LED illuminates. This alarm is repeated every five (5) hours. It is recommeded to perform the self-test procedure to confirm replace battery conditions. Once the battery passes the self-test, the audible alarm stops.

Battery Charge Bar Graph

The 5-LED Display on the right side of the front control panel indicates the present charge of the UPS's battery as a percentage of the battery's capacity. When all five (5) LED's are illuminated, the battery is completely charged. The top LED turns off whenever the battery is not 100% charged. When the LED's are flashing, it is an indication that the battery can supply less that the "Low Battery Warning Interval" time for the load.

Utility Voltage Bar Graph

The APC UPS has a diagnostic feature that displays the utility voltage. With the UPS connected to the normal utility power, press and hold the ON/Test button to see the utility voltage bar graph display. In approximately four (4) seconds, the 5-LED display on the right side of the front control panel indicates the utility input voltage.

NOTE As part of this procedure, the UPS starts a self-test. This does not affect the voltage display.

The display indicates that the voltage is between the displayed value from the list and the next higher value. For example: with three (3) LED's illuminated, the input voltage is between 115 and 123 VAC. If no LED's illuminate and the UPS is connected to a live AC power outlet, the line voltage is extremely low. On the other hand, if all five (5) LED's illuminate, the line voltage is extremely high and should be checked by an electrician.

GENERAL OPERATION

As soon as a low voltage or loss of input voltage is experienced, the software allows product to clear the machine and then shuts down the machine. The operator is then responsible to turn off the OmniFlo™ at the disconnect switch. If power is out for more than 1 to 2 days, it is important to turn off the UPS unit by pressing the Power Off button on the front of the UPS unit.

If the machine is not turned off, the UPS supplies machine power from the battery pack. Even when the machine is turned off, the UPS draws a small dc current. In both situations, the battery eventually drains to a point where the UPS no longer supplies power. If the batteries drain to this point, plug the unit in for a minimum of four (4) hours, or overnight, to attempt to recharge it. If it still does not function, contact Technical Support to replace the UPS unit.

If a POWER FAILURE (LOW or HIGH voltage) condition exists, clear the machine and shut down both the OmniFlo™ and the UPS unit until power can be controlled.

The UPS is charged before leaving the factory. An indicator on the front of the UPS displays the level of charge.

On the rear of the UPS is a sensitivity indicator light and a push button. The indicator light should be Off. If it is not Off, push the button to turn Off the indicator light. There is also a site wiring fault indicator on the rear of the UPS unit. This indicator lights only to indicate a problem. If it is On, it is necessary to correct the problem before using.

Before leaving the factory, a DB9 connector is connected to the UPS unit's RS232 port. The connection ensures proper start up and power down. There are no other configuration requirments for this UPS.

BEST UNINTERRUPTABLE POWER SUPPLY

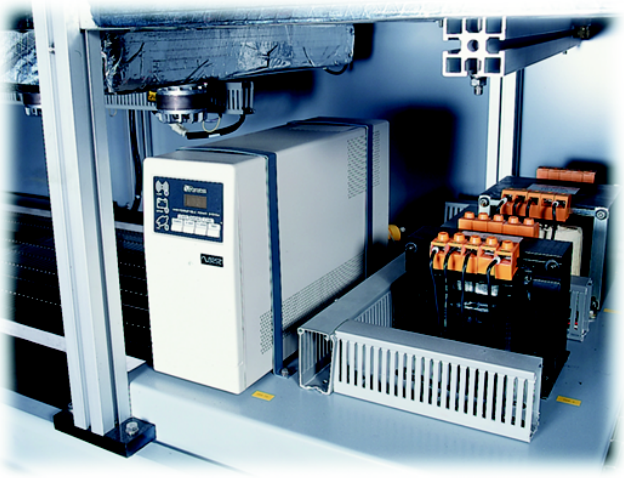


Figure 11: Best Fortress® Uninterruptable Power Supply

SETUP

The UPS is preset at the factory. To verify the operation and check point settings, refer to the following procedure..

- Turn the computer power switch to On.
- Locate the UPS battery backup in the front center cabinet.The back of the unit has an On/Off (1/0) switch. Turn the switch On (1).

After a short start–up period, a green light indicates that the unit is operational. If it does not appear, refer to the manufacturers manual that was shipped with the unit. The UPS must charge a minimum of 6.5 hours before using it for machine operation.

There are three (3) LED indicators on the front panel of the UPS:

- The green light that appears on start–up represents a normal on-line condition.
- A yellow light indicates that the battery is in use.
- A red light signals an alarm condition. Refer to the manufacturer's manual for guidelines on interpreting the alarm signals.

CAUTION To ensure a stable operating environment that protects machine circuitry and operation, it is important to let the UPS charge a minimum of 6.5 hours before use.

To ensure that the setpoints are correctly set:

- Press the CANCEL and TEST keys simultaneously and hold for a few seconds until the display reads a "1" on the left and another number on the right. The number on the left is the setpoint reference number in Level 1 and the number on the right is the current setting.
- Press the CANCEL key to step through the setpoint numbers.
- Press the V OUT key to lower a setting and the %LOAD key to increase a setting.
- Press TEST to save the settings. The screen blinks slower to indicate that the settings are saved.

To enter Level 2 setpoint programming:

- With the display at Level 1 Setpoint 9, press the CANCEL and LOAD keys simultaneously until [1,1] or [1,0] displays.
- Press CANCEL five (5) times. If the display is [6,3] proceed to the following step. If not, press CANCEL one (1) time. THe display should now be [7,3].
- Press %LOAD until the setting (number on the right) is ten (10). The display should now read [6,10] or [7, 10].
- Press TEST to save the settings.
- Press CANCEL to exit the programming mode.

The following table specifies the correct setpoints for proper installation and use of the UPS.

Table 2: UPS Setpoints

LEVEL	ONE				LEVEL	TWO			
Setpoint	Description	Default Value	Range	Set Value To:	Setpoint	Description	Default Value	Range	Set Value To:
1	Silence Alarm 1	0	0=NO 1=YES	Default	1	(not used)	0	0–1	Default
2	Silence Alarm 2	0	0=NO 1=YES	Default	2	Output Voltage Selection	2 or 3	0–3	2 (save)
3	Low Runtime	2	1–5	Default	3	Inverter Output Voltage	120 or 230	60–250	115 (save)
4	Auto Restart	1	0=NO 1=YES	Default	4	Inverter Fre-quency	0 or 1	0=50 hz 1=60 hz	As required (save)
5	Startup Test	1	0=NO 1=YES	0 (save)	5	Reserved	1	0=NO 1=YES	Default
6	(not used)	0 or 1	0–1	Default	6	Display	0	0–1	Default
7	Communica-tion Mode	1	0–4	0 (save)	7	Glitch Detect Count	20	1–20	Default
8	Low Voltage Setoint	105	80–105	Default	8	Reserved	25	5–255	Default
9	High Voltage Setpoin	136	108–137	Default	9	Ext. Contact Delay	5	0–15	Default
					0.	High Temp Setpoint	45	10–60	Default
					1.	Brownout Hysteresis	3	1–15	Default
					2.	Shutdown Logic	0	0–1	Default
					3.	Shutdown Delay	20	20–999	Default
					4.	High Line Transfer Enable	1	0=NO 1=YES	Default
					5.	PLL Slew Rate	0	0–1	Default

As soon as a low voltage or loss of input voltage is experienced, allow the product boards to clear the machine and then shut down the machine using the machine disconnect switch. IF power is out for more than 1 to 2 days, it is important to shut Off the UPS by selecting the Off (0) position at the power switch on the back of the unit.

If the machine is not turned Off, the UPS supplies machine power from the battery pack. Even when the machine is turned Off, the UPS draws a small dc current. In both situations the battery eventually drains to a point where the unit no longer functions. If the batteries drain to this point, plug the unit in overnight to attempt recharging. If it still does not work, replace the unit and contact Electrovert Technical Support.

If an OVER VOLTAGE condition exists, clear the machine and shut down both the machine and the UPS unit until power is controlled.

1.5 OUTPUT PHOTOCELL

The output photocell is used in conjunction with the input photocell to validate the board count function.

The Output Photocell provides two (2) possible alarm conditions. The first possible condition is a “PCB Dropped in Conveyor” alarm, which indicates a PCB may have fallen through the Pin Chain conveyor. This alarm generates when a PCB does not appear under the Output Photocell within the required time field based on conveyor speed. The second possible condition is a “PCB Jammed in Conveyor” alarm, which indicates a problem at the Unload End of the machine. This alarm generates when a PCB remains under the Output Photocell for a period of time extending beyond a normal product transfer.

Software Configuration

To configure the output photocell option in the machine software select Setup > Configure > Conveyor from the setup menu bar.

The Conveyor Option window appears. Select the tab Conveyor #1. Ensure that the box next to “Exit End Photocell” is selected. If the system is configured with the DualTrak™ option, select the tab labeled Conveyor #2 and repeat the procedure. The machine is now configured for the output photocell option.

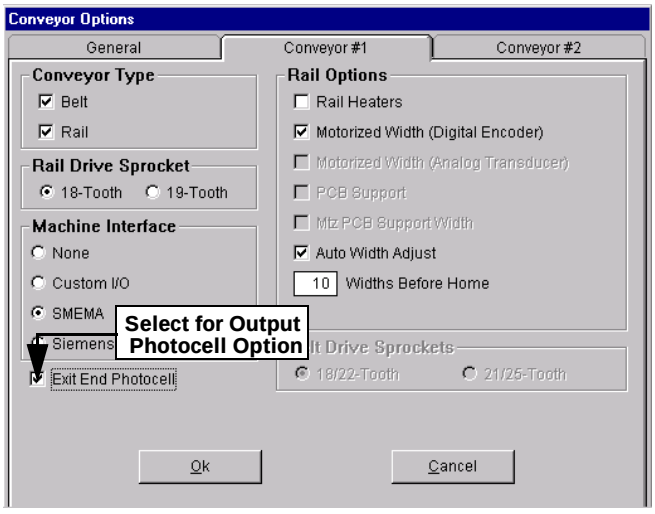


Figure 12: Conveyor Options Configuration Window

MAINTENANCE

The photocell needs to be cleaned monthly — approximately every 170 hours of machine operation.

Tools/Materials Needed

- Non-–Abrasive Lint–Free Cloth
- Anti–Static Liquid Cleaner such as Read Right™ Anti–Static Screen Cleaner™
- Alternately, an Anti–Static Cleaning Cloth such as Read Right™ One Step™.

Procedure

- Wipe the lens of the photocell using a cloth that is moistened with anti–static cleaner. Take care to ensure that the lens is not scratched.

Figure 13: Output Photocell

1.6 SMEMA OPTION

The SMEMA Option provides the electrical equipment interface protocol standard adopted by the Surface Mount Equipment Manufacturers Association. The purpose of this SMEMA 1.1 and 1.2 specifications are to provide an equipment interface standard for transfer manufacturing systems of surface-mounted printed circuit boards. Minimum requirements for both mechanical and electrical specifications must be met to conform to the SMEMA Interface Standard.

The SMEMA connectors are located at both ends of the machine. They are black circular plugs and clearly labeled.

Figure 14: SMEMA Connector (Load End)

Software Configuration

Select Setup > Configure > Options > Conveyor. Ensure that “SMEMA” is selected in the “Machine Interface” column. Select “OK” to save the configuration.

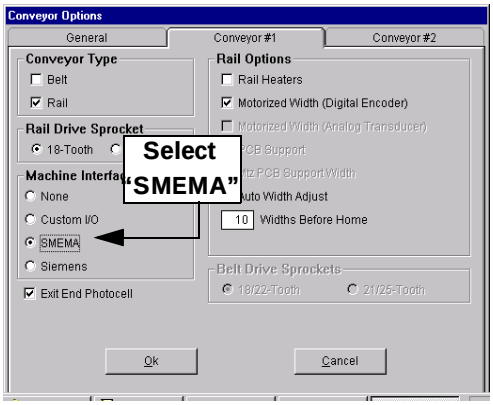


Figure 15: Conveyor Options Window

To configure SMEMA, select Setup > Configure > SMEMA. The Configure SMEMA window appears.

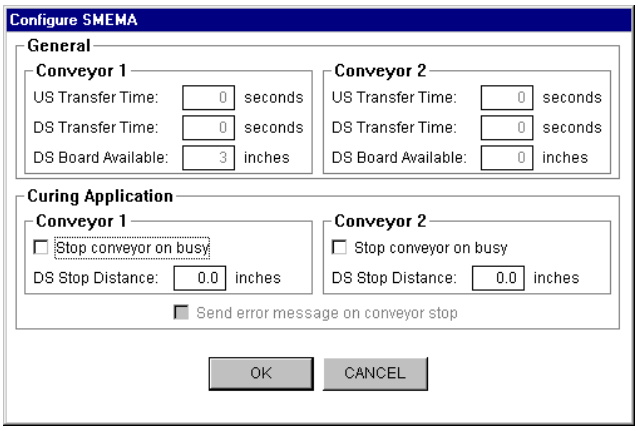


Figure 16: Configure SMEMA Window

Stop conveyor on busy: Enables stop option for the selected conveyor. If checked, the Upstream conveyor uses conventional SMEMA, but the OmniFlo stops the conveyor when the downstream conveyor is busy and a board is with DS Stop Distance from the end of the OmniFlo conveyor.

UpStream (US) Transfer Time: After the upstream conveyor releases a board, the board must reach the incoming photocell on the OmniFlo within US Transfer Time. If it does not the OmniFlo gives an upstream transfer alarm. Valid range is 30 – 150 seconds.

DownStream (DS) Transfer Time: This is the downstream Board Available signal distance setpoint. When the board reaches DS Board Available from the end of the conveyor, the downstream board available signal is set. This is used to allow the upstream conveyor to finish transferring a board. It should be set to a distance greater than boardLength + DS Stop Distance. Valid range is 0 – 250 inches.

DownStream (DS) Stop Distance: This is the distance from the end of the conveyor at which the board stops. Valid range is 0 to 3.0 in.

Send error message on conveyor stop: If checked, an alarm sounds and a message appears on the monitor when the conveyor stops due to a downstream BUSY signal. When this box is not checked, no alarm sounds when the conveyor is stopped due to a downstream BUSY signal. This box does affect any other alarm conditions. Applies to both conveyors on dual conveyors.

SMEMA Debug Data Window

There is also a SMEMA Debug Data window accessible in the OmniFlo™ software. Select Screens > Debug Data > SMEMA/Siemens. A Debug Data window appears. The following options display:

usStep Upstream step in pcb transfer

UsAlarmTimer Delay timer for upstream pcb transfer error alarm

OUT-usMachineReady Signal (high) to upstream machine that the OmniFlo™ is ready to accept pcbs. Also used (signal low) to acknowledge pcb received at the OmniFlo™.

IN-usBoardAvailableSignal (high) from upstream machine indicating that a pcb is being sent to the OmniFlo™.

usPcbw Count of PCB's that have left the upstream machine but not yet received by the OmniFlo™.

dsStep Upstream step in PCB transfer.

dsAlarmTimer Delay timer for downstream PCB transfer error alarm.

OUT-dsBoardAvailable Signal (high) to downstream machine indicating that a PCB the OmniFlo™ is sending a PCB.

IN-dsMachine ReadySignal (high) from downstream machine indicating that it is ready to accept PCB's from the OmniFlo™. Also used (signal low) to acknowledge PCB received at the downstream machine.

NOTE ***OUT-dsTransfer*** is for Siemens only.

SMEMA MECHANICAL SPECIFICATIONS

The conveyor transports can be assembled next to each other without interface hardware.

NOTE The direction of travel is assumed to be left–to–right, however the same standard applies for right–to–left systems. The equipment manufacturer must provide the direction of board movement.

Conveyor Height Conveyor height must be adjustable from 94.0 cm (37.0 in.) to 96.5 cm (38.0 in.) from the floor to the bottom of the printed circuit board.

Conveyor Width If the width of the conveyor is adjustable, the front rail is fixed and the rear rail is movable.

Edge Clearance Maximum space required by the conveyor at the side edges must not exceed 4.75 mm (0.187 in.).

Tooling Pins The recommended hole diameter for tooling pins is 3.96 mm (0.156 in.), not to exceed 4.0 mm (0.159 in.). Distance from the edge is (0.3 in.) ± 0.25mm (0.010 in.). The tooling pins should be on the front edge of the board (next to the fixed rail).

Maximum Gap The maximum gap between the in–line machine track ends is not to exceed 9.5 mm (0.375 in.).

Lead–in The minimum lead–in on the track ends of the conveyor is 3.175 mm (0.125 in.).

SMEMA ELECTRICAL SPECIFICATIONS

The electrical interface specification provides the minimum requirements that the system must meet, but does not represent a complete specification for the electrical equipment's interface. There must be a machine–to–machine electrical interface to ensure proper sequencing of the printed circuit boards.

Electrical Connections

Each machine must have a separate power connection and ground. Individual On/Off controls are standard.

Grounding

A $^{1}/_{4}$–20 earth ground stud is on each side (left and right) of the machine.

Inner–machine Control

To sequence boards properly, one or two signal lines are used. The lines are referenced as "Board Not Available" and "Board Available."

The signals may be obtained using an optical isolator or a relay. The minimum requirements are to switch 30V, 10mA. At 10mA, the output "LOW" is not to exceed 0.8 volts.

Board transfer occurs when the upstream machine (Machine A) has a board available for processing (contact closed), and the downstream machine (Machine B) is able to accept the board (contact closed). The signals may occur independently of each other, however the board transfer does not occur until both contacts are closed. The Board Available signal from the upstream machine remains closed until the board has left the machine.

The Machine Not Busy signal remains closed on the downstream machine until the board reaches the machine.

NOTE There must be $\geq$50 ms between board transfers.

The following diagram illustrates the timing sequence of the SMEMA electrical interface signals.

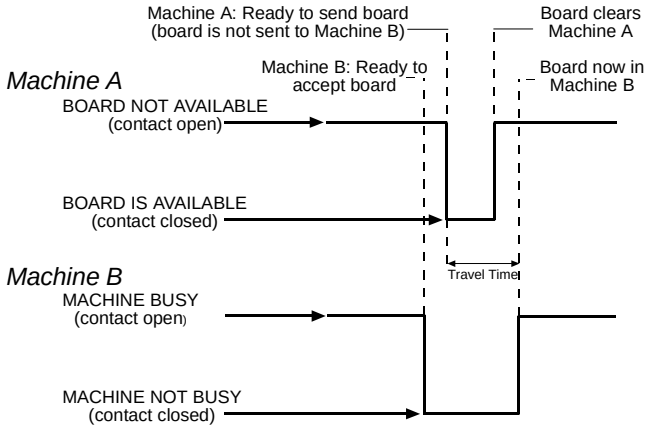


Figure 17: Timing Diagram for SMEMA Interface

NOTE Refer to Section 4.14 of the OmniFlo™ Series Maintenance Manual to see a signal flow diagram of the SMEMA option with circuit description.

1.7 PROGRAMMABLE OUTPUTS

The Programmable Outputs option provides users with three (3) programmable dry–contact custom output relays. Each output is controlled through the OmniFlo™ machine software. They provide machine status and alarm status indication to interface with an external machine.

Software Configuration

Select Configure > Custom Outputs from the menu bar. A Configure Custom Outputs window appears. Select “Open” or “Close” from the selection above the status indicators to determine what action the relay takes when activated. Assign the action(s) to the corresponding relays.

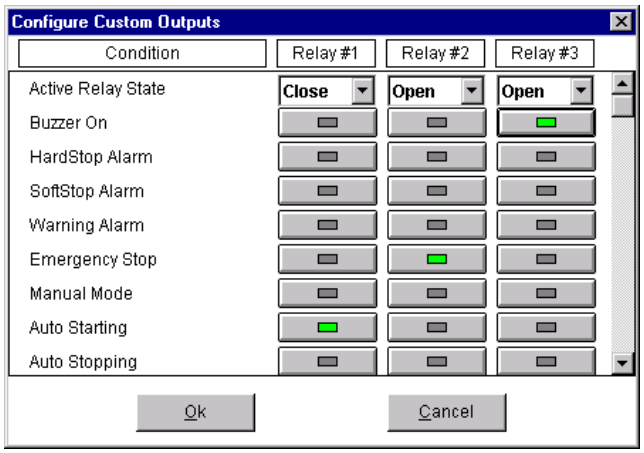


Figure 18: Configure Custom Outputs Window

NOTE The relays allow users to provide unique voltages to each of the relays for various purposes. Please consult the factory if additional information is required.

1.8 SIP (SYSTEM INTEGRATION PACKAGE)

The SIP is a communication tool which allows serial communication between the OmniFlo™ Series system and a remote computer.

Messages such as

- Board process parameters on board exit from machine
- Alarm messages
- Machine setpoint status of changes
- Machine actual values
- Machine Status (Running, Starting, Stopping, Manual)

Some messages are automatic, others are sent upon receiving a request from the host. The interface also permits remote control of the machine. Possible actions include:

- Change machine operating state from AUTO to MANUAL
- Load a recipe currently stored on the machine operating disk.

SIP information is transmitted between the machine and the remote computer via a series of predefined ASCII character strings presented at the machine’s RS-232 serial port.

SIP is a communication protocol which allows a user to develop a sophisticated communication interface with an important piece of industrial equipment. **It is recommended that only experienced computer programmers undertake this project.**

SECTION 2: CONVEYOR OPTIONS

The standard conveyor on an OmniFlo™ is a mesh belt left–to–right conveyor. The standard conveyor can be configured with or replaced by the following options:

- Right–to–Left Conveyor direction
- Pin Chain Conveyor (information contained in OmniFlo™ Maintenance Manual)
- Combination Conveyor consisting of a mesh belt and a pin chain (information contained in OmniFlo™ Maintenance Manual)
- DualTrak Conveyor consisting of two Pin Chain Conveyors side–by–side
- DualDrive (for DualTrak conveyors only) to allow the two (2) Pin Chain conveyors to travel at different speeds
- SMEMA 35mm DualTrak™ Conveyor
- Center Board Support (for Pin Chain Conveyor only)

The Pin Chain Conveyor and the Combination Conveyor's operation and maintenance are documented in the OmniFlo™ Series Operations Manual and the OmniFlo™ Series Maintenance Manual.

2.1 RIGHT–TO–LEFT CONVEYOR DIRECTION

To accommodate process line requirements, an OmniFlo™ system can be built so that the conveyor movement is from right to left.

Figure 19: Right–to–Left OmniFlo™–7 (Unload End)

Select Setup > Configure > Options > Conveyor to verify that conveyor direction is right–to–left. The initial screen has a box under "Conveyor Type" to allow for the right–to–left choice.

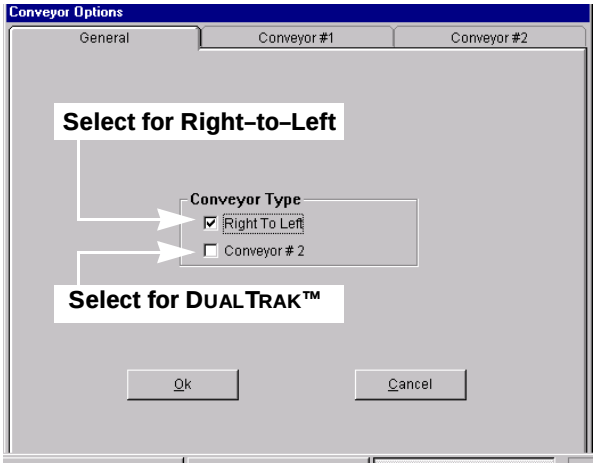


Figure 20: Conveyor Options Configuration

2.2 DUALTRAK™ CONVEYOR

The DUALTRAK™ option consists of two (2) separate conveyors, side–by–side in the same machine. The conveyors are controlled by the machine software.

The width parameters are separately controlled and are independent of each other. If the machine is configured with the DualDrive option, the conveyor's speed controls are also independent of each others'.

DualTrak™ allows for processing more than one type of board or product at the same time using the same process parameters.

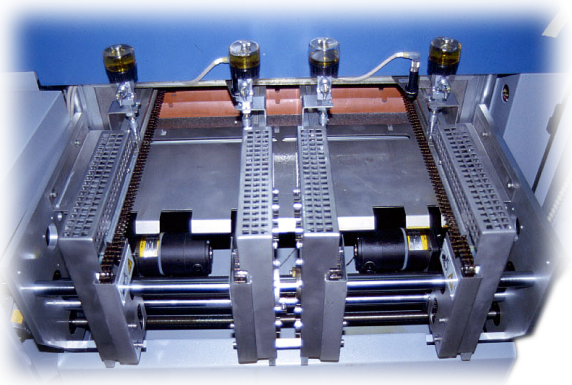


Figure 21: DUALTRAK™ Conveyor (Load End)

NOTE The DualTrak™ Option is only available on the OmniFlo™–7 and –10 systems with the Pin Chain

conveyor or the Combination Conveyor. It is not available with the standard Mesh Belt or Center Board Support Device option.

OPERATION

The machine is configured for the DUALTRAK™ option at the factory. To verify the DUALTRAK™ settings, select Setup > Configure > Options > Conveyor. When the Conveyor Options window appears, ensure that under “Conveyor Type” the box next to “Conveyor #2” is selected.

Select the tab labeled Conveyor #1 to verify the configuration of the first conveyor. Select the tab labeled Conveyor #2 to verify the configuration of the second conveyor.

After both conveyor configurations are confirmed, select “Cancel” to exit the window. If any changes were made in the configuration it is necessary to select “Ok” to implement the changes.

Process Graphics Screen

The Process Graphics screen reflects the DualTrak as two horizontal yellow bars between the upper and lower chambers.

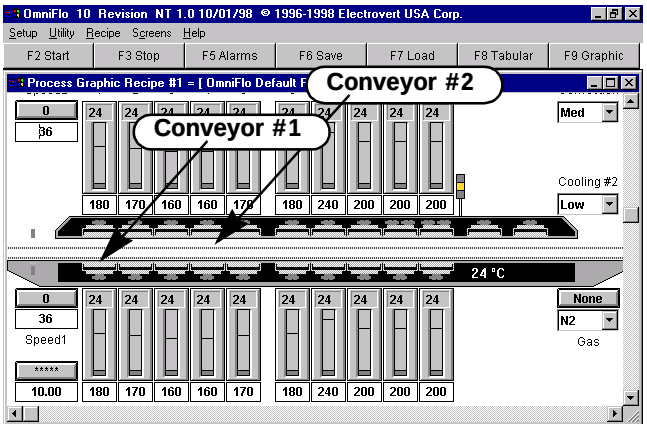


Figure 22: DUALTRAK™ Process Graphics Screen

The Actual and the Set Point Speed and Width parameters for both conveyors display on the left side of the Process Graphics Screen — the settings for Conveyor #1 toward the bottom of the screen and the settings for Conveyor #2 toward the top of the screen.

Speed — The Speed setpoint belongs to the current active recipe. When in manual mode, toggling the status button either initiates or terminates conveyor movement.

Width — The Width setpoint also belongs to the current active recipe. To position the conveyor width when in manual mode, click the status button.

On the right side of the Process Graphics Screen are the parameters for Board Length, Board Multiplier and the Relative Board Number. Again, the settings for Conveyor #1 toward the bottom of the screen and the settings for Conveyor #2 toward the top of the screen.

Board Length — The Board Length parameter defines the length of the printed circuit board used in the process. After the photocell detects the leading edge of an incoming board, the CUP uses the Board Length parameter to determine the minimum time that can elapse before expecting another board This prevents inadvertently mis–tracking when processing boards with holes or gaps.

PCB Multiplier — The PCB Multiplier is generally used when more than one board is processed on a pallet and the photocell detects the pallet as one (1) “board”. The number of PCB’s on each pallet is entered in this field to increment the board count accurately. This number is normally one (1) for non–pallet processes.

Rel Brd — The Relative Board Number is the actual number of PCB’s processed by the current recipe. If necessary, this value is modified in the setpoint field.

Process Tabular Screen

Recipe setpoints and actual values are displayed in tabular form in the Process Tabular Screen. Process parameters can be changed in manual mode by entering a new value in the setpoint field. Clicking on the status button toggles the machine component On or Off.

When the cursor is placed in a setpoint field in the Process Tabular Screen, the parameter minimum and maximum input limits for that field displays at the bottom of the screen.

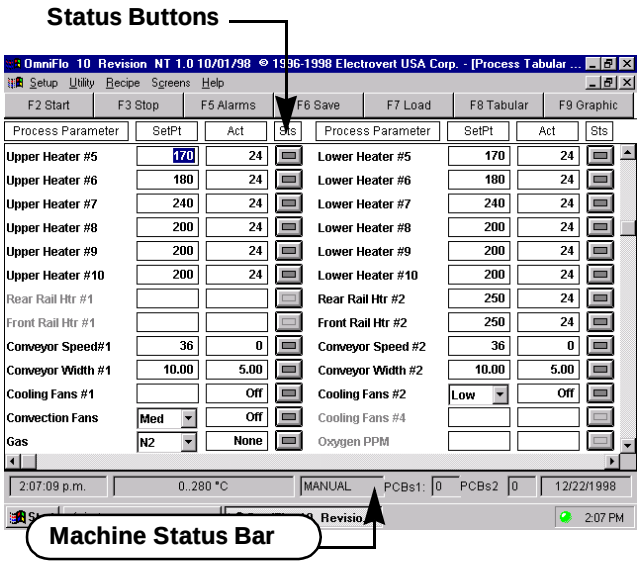


Figure 23: DUALTRAK™ Process Tabular Screen

MAINTENANCE

Conveyor Chain Lubrication

Width Screw Shafts Lubrication

Expansion Attachment Lubrication

Tol–o–matic Drive Lubrication

Periodic lubrication and the use of the correct lubricant is essential for smooth and continuous operation of the conveyor assembly.

The conveyor assemblies used to construct the DUALTRAK™ option is the same assembly that is used in the single conveyor OmniFlo™ System. (The DUALTRAK™ utilizes two assemblies.) Refer to the OmniFlo™ Series Maintenance Manual Section 7.3 Pin Chain Conveyor Maintenance for detailed information on Conveyor lubrication and Maintenance. The pin chain needs to be lubricated approximately every 100 hours of machine operation.

2.3 DUALDRIVE™

DUALDRIVE™ Option is available with the DUALTRAK™ Conveyor. DUALDRIVE™ allows independent control of each of the two conveyor speeds.

The DUALDRIVE™ Option utilizes an additional encoder to provide feedback for speed control on the second conveyor. Refer to the schematics that shipped with the OmniFlo™ system for detailed electrical reference.

2.4 SMEMA 35MM DUALTRAK™ CONVEYOR

The DUALTRAK™ option consists of two (2) side–by–side conveyors in the same machine. The conveyors are controlled by the machine software.

The width parameters are independently controlled. The DualDrive option controls each conveyor's speed independently'. DUALDRIVE™ utilizes an additional encoder to provide feedback for speed control on the second conveyor. Refer to the schematics that shipped with the OmniFlo™ system for detailed electrical reference.

DualTrak™ allows for processing more than one type of board or product at the same time using the same process parameters.

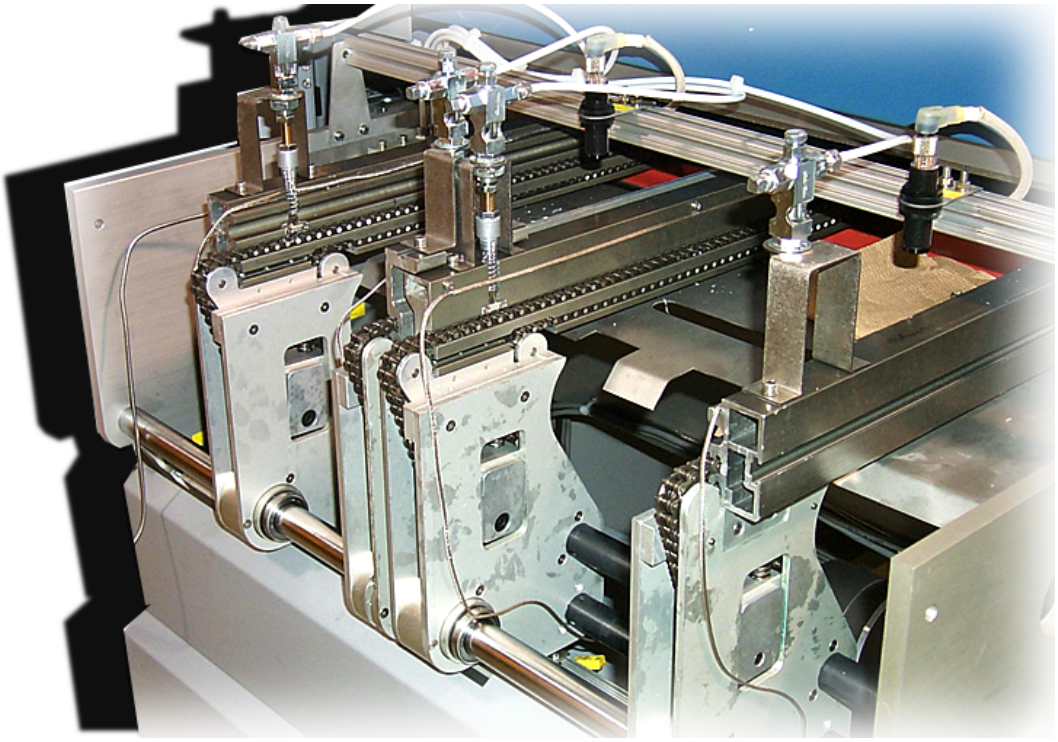


Figure 24: SMEMA 35MM DUALTRAK™ Conveyor (Load End)

OPERATION

Configuration

The machine is configured for the DUALTRAK™ option at the factory. To verify the DUALTRAK™ settings:

- Select Setup > Configure > Options > Conveyor.
- When the Conveyor Options window appears, ensure that under "Conveyor Type" the box next to "Conveyor #2" is selected.
- Select the tab labeled Conveyor #1 to verify the configuration of the first conveyor.
- Select the tab labeled Conveyor #2 to verify the configuration of the second conveyor.
- It is necessary to select "SMEMA" under the "Machine Interface" heading for both Conveyor #1 and Conveyor #2.

- After both conveyor configurations are confirmed, select “Cancel” to exit the window. If any changes were made in the configuration it is necessary to select “Ok” to implement the changes.

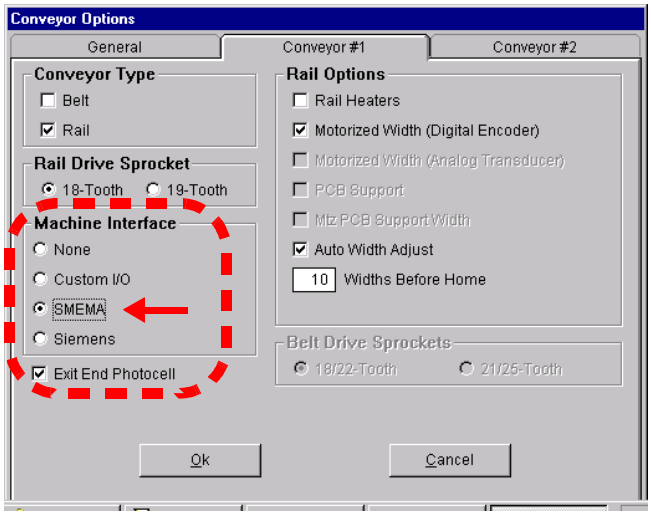


Figure 25: Configure Options — Conveyor #1 Screen

Process Graphics Screen

The Process Graphics screen reflects the DualTrak as two horizontal yellow bars between the upper and lower chambers.

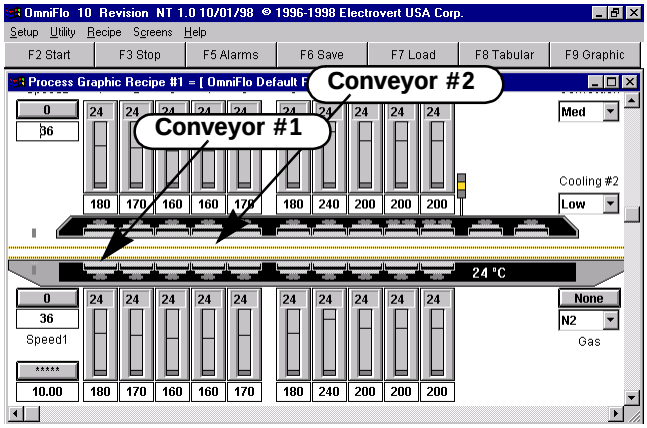


Figure 26: DUALTRAK™ Process Graphics Screen

The Actual and the Set Point Speed and Width parameters for both conveyors display on the left side of the Process Graphics Screen — the settings for Conveyor #1 toward the bottom of the screen and the settings for Conveyor #2 toward the top of the screen.

Speed — The Speed setpoint belongs to the current active recipe. When in manual mode, toggling the status button either initiates or terminates conveyor movement.

Width — The Width setpoint also belongs to the current active recipe. To position the conveyor width when in manual mode, click the status button.

On the right side of the Process Graphics Screen are the parameters for Board Length, Board Multiplier and the Relative Board Number. Again, the settings for Conveyor #1 toward the bottom of the screen and the settings for Conveyor #2 toward the top of the screen.

Board Length — The Board Length parameter defines the length of the printed circuit board used in the process. After the photocell detects the leading edge of an incoming board, the CUP uses the Board Length parameter to determine the minimum time that can elapse before expecting another board This prevents inadvertently mis–tracking when processing boards with holes or gaps.

PCB Multiplier — The PCB Multiplier is generally used when more than one board is processed on a pallet and the photocell detects the pallet as one (1) “board”. The number of PCB’s on each pallet is entered in this field to increment the board count accurately. This number is normally one (1) for non–pallet processes.

Rel Brd — The Relative Board Number is the actual number of PCB’s processed by the current recipe. If necessary, this value is modified in the setpoint field.

Process Tabular Screen

Recipe setpoints and actual values are displayed in tabular form in the Process Tabular Screen. Process parameters can be changed in manual mode by entering a new value in the setpoint field. Clicking on the status button toggles the machine component On or Off.

When the cursor is placed in a setpoint field in the Process Tabular Screen, the parameter minimum and maximum input limits for that field displays at the bottom of the screen.

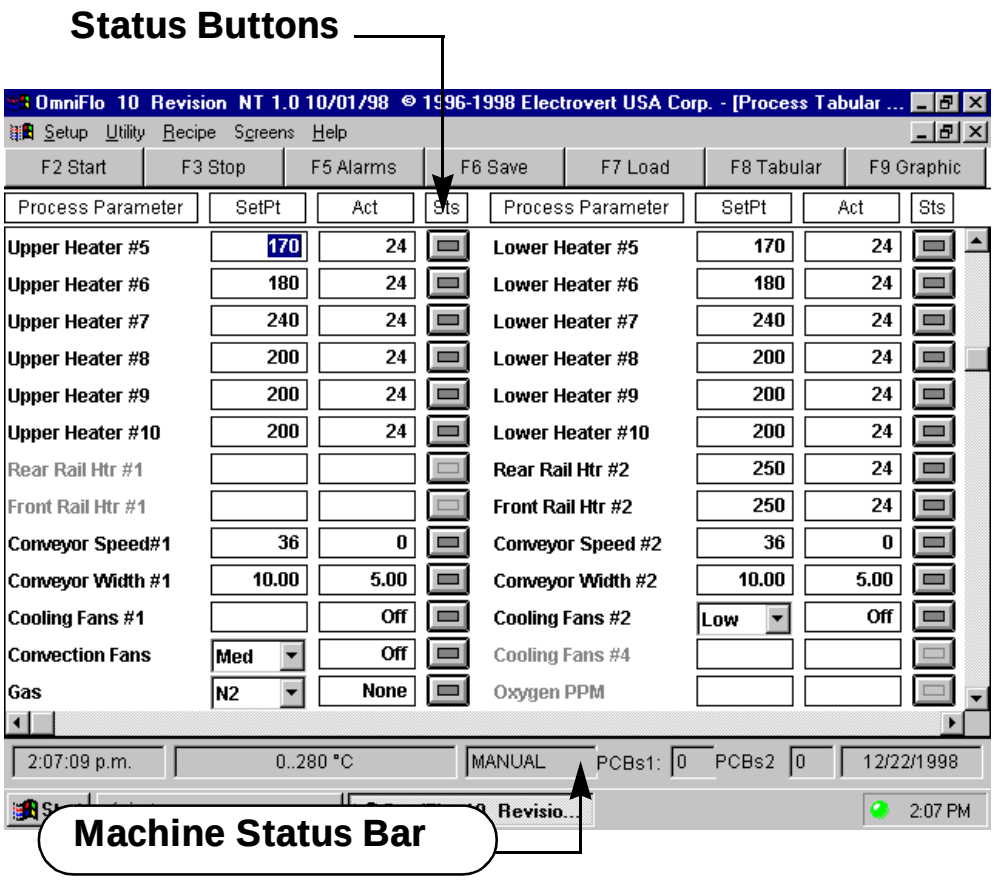


Figure 27: DUALTRAK™ Process Tabular Screen

SMEMA OPTION

The SMEMA Option provides the electrical equipment interface protocol standard adopted by the Surface Mount Equipment Manufacturers Association. The purpose of this SMEMA 1.1 and 1.2 specifications are to provide an equipment interface standard for transfer manufacturing systems of surface-mounted printed circuit boards. Minimum requirements for both mechanical and electrical specifications must be met to conform to the SMEMA Interface Standard.

The SMEMA connectors are located at both ends of the machine. They are black circular plugs and clearly labeled.

Figure 28: SMEMA Connector (Load End)

Software Configuration

Select Setup > Configure > Options > Conveyor. Ensure that “SMEMA” is selected in the “Machine Interface” column. Select “OK” to save the configuration.

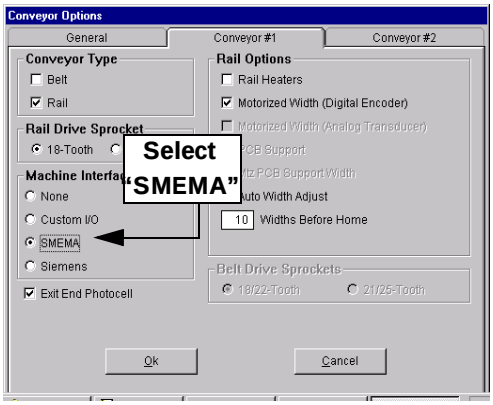


Figure 29: Conveyor Options Window

To configure SMEMA, select Setup > Configure > SMEMA. The Configure SMEMA window appears.

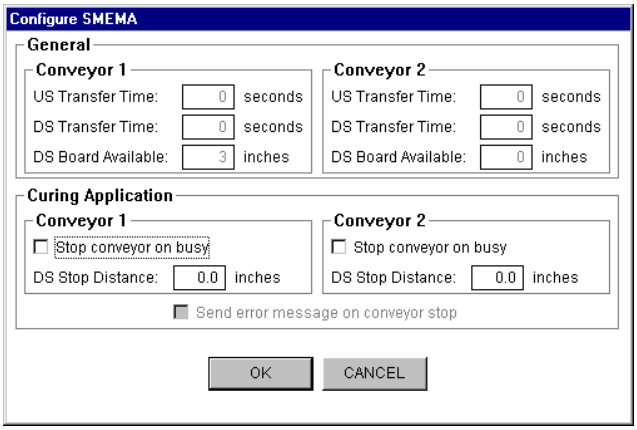


Figure 30: Configure SMEMA Window

Stop conveyor on busy: Enables stop option for the selected conveyor. If checked, the Upstream conveyor uses conventional SMEMA, but the OmniFlo stops the conveyor when the downstream conveyor is busy and a board is with DS Stop Distance from the end of the OmniFlo conveyor.

UpStream (US) Transfer Time: After the upstream conveyor releases a board, the board must reach the incoming photocell on the OmniFlo within US Transfer Time. If it does not the OmniFlo gives an upstream transfer alarm. Valid range is 30 – 150 seconds.

DownStream (DS) Transfer Time: This is the downstream Board Available signal distance setpoint. When the board reaches DS Board Available from the end of the conveyor, the downstream board available signal is set. This is used to allow the upstream conveyor to finish transferring a board. It should be set to a distance greater than boardLength + DS Stop Distance. Valid range is 0 – 250 inches.

DownStream (DS) Stop Distance: This is the distance from the end of the conveyor at which the board stops. Valid range is 0 to 3.0 in.

Send error message on conveyor stop: If checked, an alarm sounds and a message appears on the monitor when the conveyor stops due to a downstream BUSY signal. When this box is not checked, no alarm sounds when the conveyor is stopped due to a downstream BUSY signal. This box does affect any other alarm conditions. Applies to both conveyors on dual conveyors.

SMEMA Debug Data Window

There is also a SMEMA Debug Data window accessible in the OmniFlo™ software. Select Screens > Debug Data > SMEMA/Siemens. A Debug Data window appears. The following options display:

usStep Upstream step in pcb transfer

UsAlarmTimer Delay timer for upstream pcb transfer error alarm

OUT-usMachineReady Signal (high) to upstream machine that the OmniFlo™ is ready to accept pcbs. Also used (signal low) to acknowledge pcb received at the OmniFlo™.

IN-usBoardAvailableSignal (high) from upstream machine indicating that a pcb is being sent to the OmniFlo™.

usPcbw Count of PCB's that have left the upstream machine but not yet received by the OmniFlo™.

dsStep Upstream step in PCB transfer.

dsAlarmTimer Delay timer for downstream PCB transfer error alarm.

OUT-dsBoardAvailable Signal (high) to downstream machine indicating that a PCB the OmniFlo™ is sending a PCB.

IN-dsMachine ReadySignal (high) from downstream machine indicating that it is ready to accept PCB's from the OmniFlo™. Also used (signal low) to acknowledge PCB received at the downstream machine.

NOTE ***OUT-dsTransfer*** is for Siemens only.

SMEMA MECHANICAL SPECIFICATIONS

The conveyor transports can be assembled next to each other without interface hardware.

NOTE The direction of travel is assumed to be left–to–right, however the same standard applies for right–to–left systems. The equipment manufacturer must provide the direction of board movement.

Conveyor Height Conveyor height must be adjustable from 94.0 cm (37.0 in.) to 96.5 cm (38.0 in.) from the floor to the bottom of the printed circuit board.

Conveyor Width If the width of the conveyor is adjustable, the front rail is fixed and the rear rail is movable.

Edge Clearance Maximum space required by the conveyor at the side edges must not exceed 4.75 mm (0.187 in.).

Tooling Pins The recommended hole diameter for tooling pins is 3.96 mm (0.156 in.), not to exceed 4.0 mm (0.159 in.). Distance from the edge is (0.3 in.) ± 0.25mm (0.010 in.). The tooling pins should be on the front edge of the board (next to the fixed rail).

Maximum Gap The maximum gap between the in–line machine track ends is not to exceed 9.5 mm (0.375 in.).

Lead–in The minimum lead–in on the track ends of the conveyor is 3.175 mm (0.125 in.).

SMEMA ELECTRICAL SPECIFICATIONS

The electrical interface specification provides the minimum requirements that the system must meet, but does not represent a complete specification for the electrical equipment's interface. There must be a machine–to–machine electrical interface to ensure proper sequencing of the printed circuit boards.

Electrical Connections

Each machine must have a separate power connection and ground. Individual On/Off controls are standard.

Grounding A $^{1}/_{4}$–20 earth ground stud is on each side (left and right) of the machine.

Inner–machine Control

To sequence boards properly, one or two signal lines are used. The lines are referenced as "Board Not Available" and "Board Available."

The signals may be obtained using an optical isolator or a relay. The minimum requirements are to switch 30V, 10mA. At 10mA, the output "LOW" is not to exceed 0.8 volts.

Board transfer occurs when the upstream machine (Machine A) has a board available for processing (contact closed), and the downstream machine (Machine B) is able to accept the board (contact closed). The signals may occur independently of each other, however the board transfer does not occur until both contacts are closed. The Board Available signal from the upstream machine remains closed until the board has left the machine.

The Machine Not Busy signal remains closed on the downstream machine until the board reaches the machine.

NOTE There must be $\geq$50 ms between board transfers.

The following diagram illustrates the timing sequence of the SMEMA electrical interface signals.

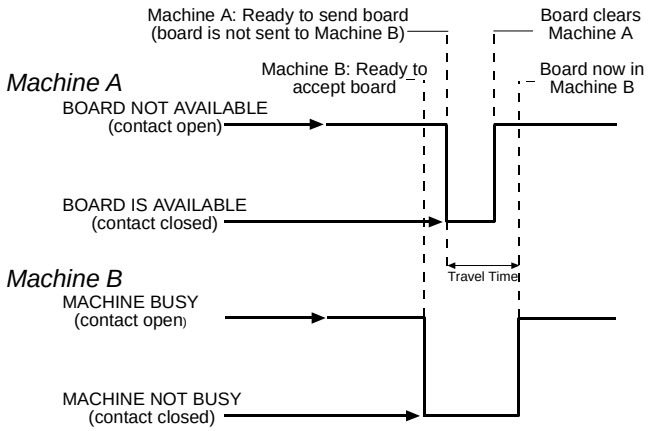


Figure 31: Timing Diagram for SMEMA Interface

NOTE Refer to Section 4.14 of the OmniFlo™ Series Maintenance Manual to see a signal flow diagram of the SMEMA option with circuit description.

CONVEYOR LUBRICATION

AUTOMATED OILERS OPERATION

The automated oilers are located on the conveyor at the Load End of the OmniFlo™. The oilers may be operated manually or automatically. A direct line of air to a solenoid controls the flow of air to the reservoir. The valve is preset at the factory to 5 psi. This ensures that the oil drips from the brushes at the recommended rate of one (1) drop every seven (7) seconds.

To change the drip rate, adjust the knob at the top of the oiler until the desired rate is achieved. It is necessary to visually inspect and verify that each oiler is operating correctly so that clogs do not prevent oil from reaching the chain.

When air enters the reservoir, oil is forced into the hoses toward the brushes. Increasing the pressure causes more oil to flow to the oilers.

The pressure is adjusted by turning the knob above the gauge. The psi is preset to a setting between 3 psi and 5 psi.

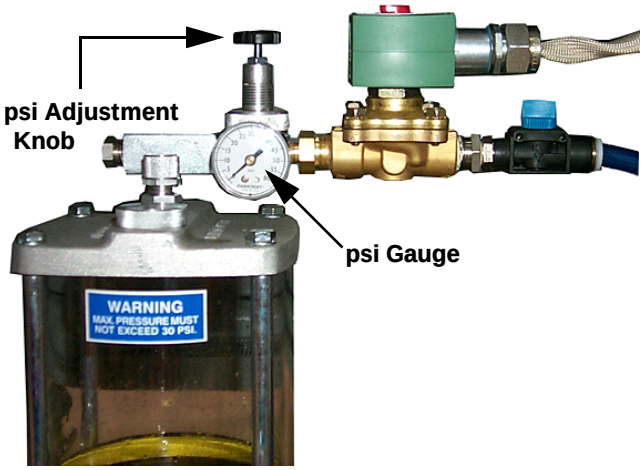


Figure 32: Oiler Reservoir

CAUTION NEVER exceed 30 psi. Equipment damage will occur.

A bleeder valve is located on the top of the oiler reservoir. The bleeder valve is slightly open; it should never be tightly closed. This valve is preset at the factory and should not be moved. Adjusting it may prevent optimal functioning of the unit.

Figure 33: Pointing to Bleeder Valve on Top of Reservoir — DO NOT ADJUST

The reservoir is filled by removing the cap on the top of the unit. It should not be filled more than half full to allow adequate air pressure for flow.

It is necessary to ensure that the air to the reservoir is turned Off before refilling it. The air is Off if the automated oiler is not in operation. When the oil level decreases to 2.5 cm (1.0 in.) the reservoir should be refilled with approximately 1.5 liters (6.3 cups) of TRIBOL 930 Synthetic Chain Oil.

WARNING TRIBOL 930 will burn if exposed to an ignition source. Avoid contact with strong oxidizers and acids. Do not smoke in work area. Product and vapors are irritants to eyes, skin, respiratory and digestive systems. Prolonged inhalation may be harmful. Refer to the manufacturer's Materials Safety Data Sheet (MSDS) for emergency contact information.

After filling the reservoir, replace the cap before resuming operation.

Figure 34: Removing the Reservoir Cap

Engaging the Automated Oilers

There are two (2) timers that control the automated oiler system for the SMEMA 35mm DualTrak™ Option. The timers are located in the rear of the OmniFlo™ in the electrical cabinet. One of the timers monitors the hours of conveyor operation. The other timer controls the length of time the oilers operate. Location in the cabinet depends upon machine configuration.

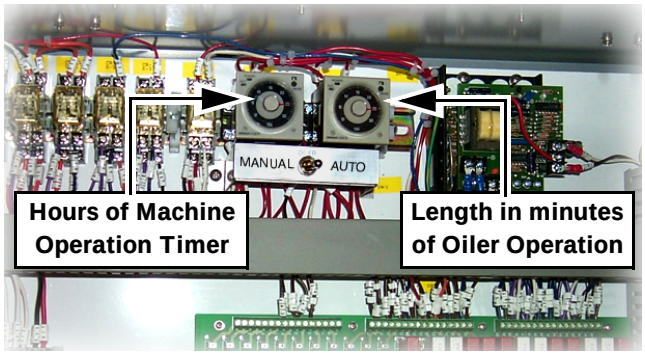


Figure 35: Electrical Cabinet

The timer to the left monitors the hours of machine operation when the conveyor is running. It is set to the time in hours that elapses between conveyor lubrication periods. This timer (TMR01) is a x10 timer, i.e., multiply the setting, in hours, by 10 to arrive at the hours of conveyor operation for which it is preset. If that timer times out, the second timer (TMR02) engages the oiler for the length of the timer is preset.

That timer is set to the amount of time in minutes that the automated oiler engages when the timer activates the solenoid. The timer on the right will not engage in Auto mode until it is activated by the timer on the left.

There is a toggle switch near the timers labeled "Manual" on the left and "Auto" on the right. During normal machine operation the switch should be positioned to "Auto".

The timer that monitors the hours of machine conveyor operation is preset at the factory to 250 hours. It appears as a x10 setting, i.e., it is set to 25, indicating an actual setting of 250 hours.

When 250 hours elapse, the hours of machine conveyor operation timer activates the timer on the right. It in turn activates the solenoid at the oiler reservoir, causing the lubrication process to engage for the length of time specified on the timer. The timer for the solenoid to the

automated oiler is preset at the factory to engage for 30 minutes. It is set up in Mode A operation, indicated in a small window on the timer. This setting should not be changed.

After 30 minutes the timer causes the solenoid to close, blocking the flow of air to the reservoir and stopping the lubrication procedure.

CAUTION Ensure that both conveyors are operating when the oiler is engaged.

Maintenance

The timers can be by–passed for maintenance by moving the toggle switch to Manual. If the toggle switch is set to Manual, the timers are eliminated from the path to the automated oiler. If the conveyor is running, the solenoid opens and causes the oiler to lubricate the machine. If the conveyor is not running, the oiler will not turn On.

It may be necessary to use the Manual mode is if the drip adjustment is not satisfactory for normal conveyor lubrication. Once the switch is placed back to the Auto mode, the oiler engages when the timers activate.

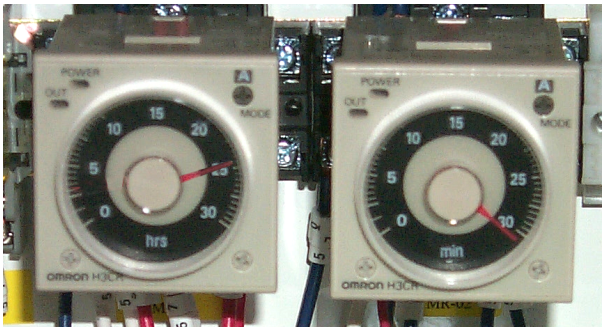


Figure 36: Timers for Automated Oiler

Refer to the schematic below for the timer operation. Note that TMR01 is preset to 250 hours and TMR02 is preset to 30 minutes.

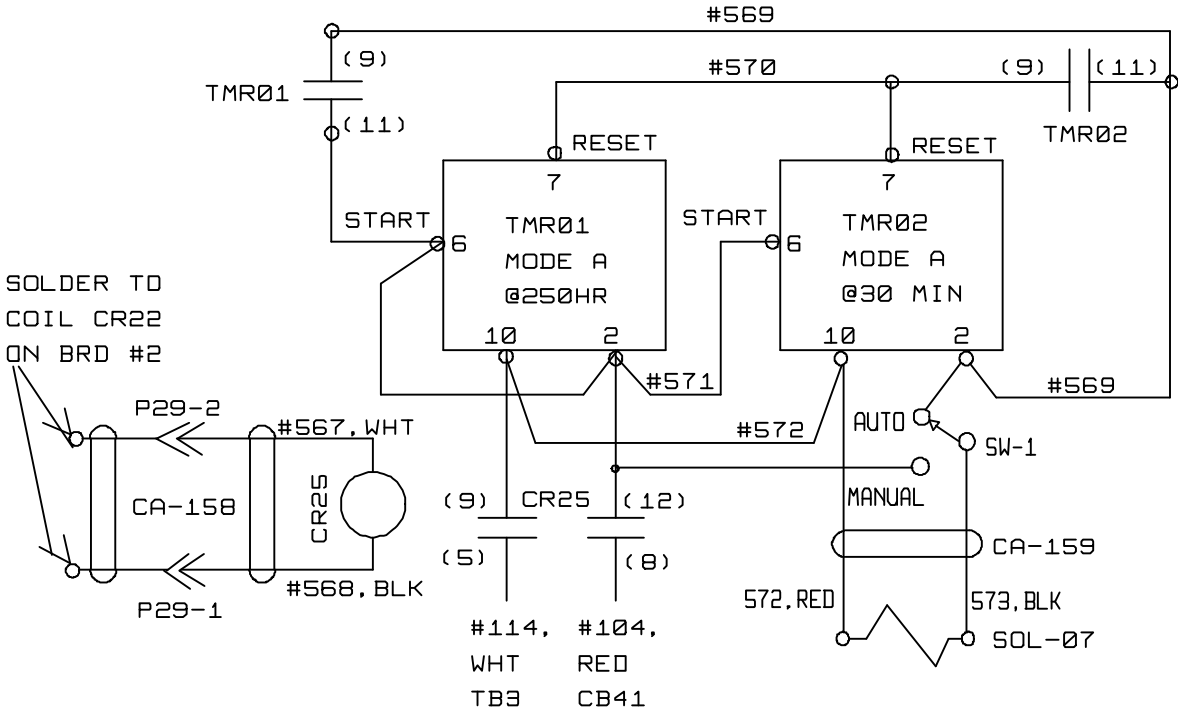


Figure 37: Timers Operation

For instance, if the timers are operated in their preset condition, then the monitoring conveyor operation is set to 250 hours and the second timer is set to 30 minutes, so after 250 hours of conveyor operation, the second timer engages the oilers for 30 minutes.

If the timer that monitors the conveyor operation is set to zero (0), then the automated oiler may be engaged manually by setting the secondary timer to the length of time it is desired to lubricate the conveyor.

SUMMARY OF AUTOMATED OILERS

Manual Operation

To operate the oilers manually, access the timers by opening the rear electrical cabinet. The timers are located near a toggle switch. The toggle switch is labeled “Manual” on one side and “Auto” on the other. (Depending on machine configuration, the toggle switch is either directly above or directly below the timers.

Ensure that the toggle switch is moved to the side that is labeled “Manual”. Set the timer to the left to zero (0). Set the timer to the right to the desired length of time for lubrication. Verify that the oilers are operating correctly, dripping approximately once every ten (10) seconds.

Automatic Operation

To operate the automated oiler automatically, set the timer to the left to the desired length of time between chain lubrication, typically 160 hours. Set the timer on the right to the desired length of time the automated oiler should lubricate the conveyor chain. If the chain appears wet long after oiling, too much lubricant is being applied. Reduce the amount of time the oiler operates. If the chain is under–oiled, it appears dull with a dry residue. Increase the amount of time the oiler operates.

To operate the automated oilers manually:

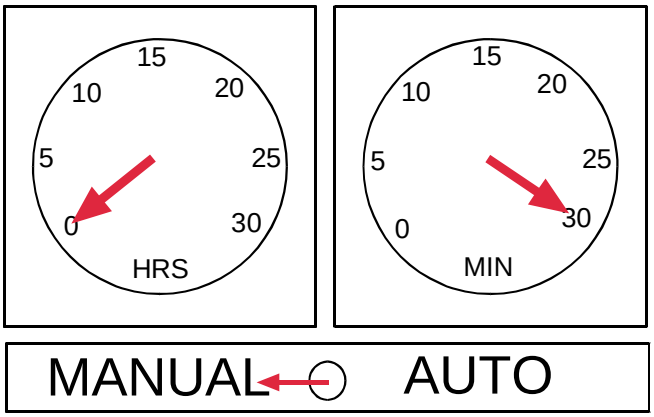


Figure 38: Settings for Manual Conveyor Lubrication

To operate the automated oilers automatically:

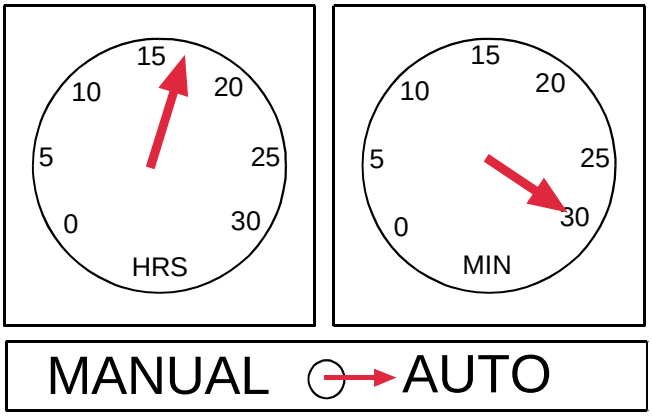


Figure 39: Settings for Automatic Conveyor Lubrication

Reservoir

- Fill between 1/4 and 3/4 full
- Do not adjust valves

CROSS WIDTH SHAFT LUBRICATION

The cross width shafts are lubricated at the factory. All purpose grease is used on components outside of the oven chamber. Use only high temperature grease when lubricating any part of the machine contained within the oven chamber.

Lubricate the screw shaft approximately every 2100 hours of operation.

Tools/Materials Needed

- Denatured Alcohol
- Krytox GPL 206 grease
- High temperature no-melt AP grease
- Brush or applicator for screw shaft
- Grease Gun
- Clean Lint-Free Cloth

Procedure

Use High Temperature No-Melt AP grease on the Load End and Unload End shafts. Use Krytox GPL 206 grease on the center width screw shaft.

- Clean the each of the width shafts with denatured alcohol to remove any accumulation of residue.
- Use a camel hair brush or similar applicator to apply the High Temperature No-Melt AP grease along the length of the Load End shaft.
- Wipe any excess with a clean lint-free cloth.
- Repeat for the Unload End width screw shaft.
- Use a camel hair brush or similar applicator to apply the Krytox GPL 206 grease to the center screw shaft.
- Wipe any excess with a clean lint-free cloth.

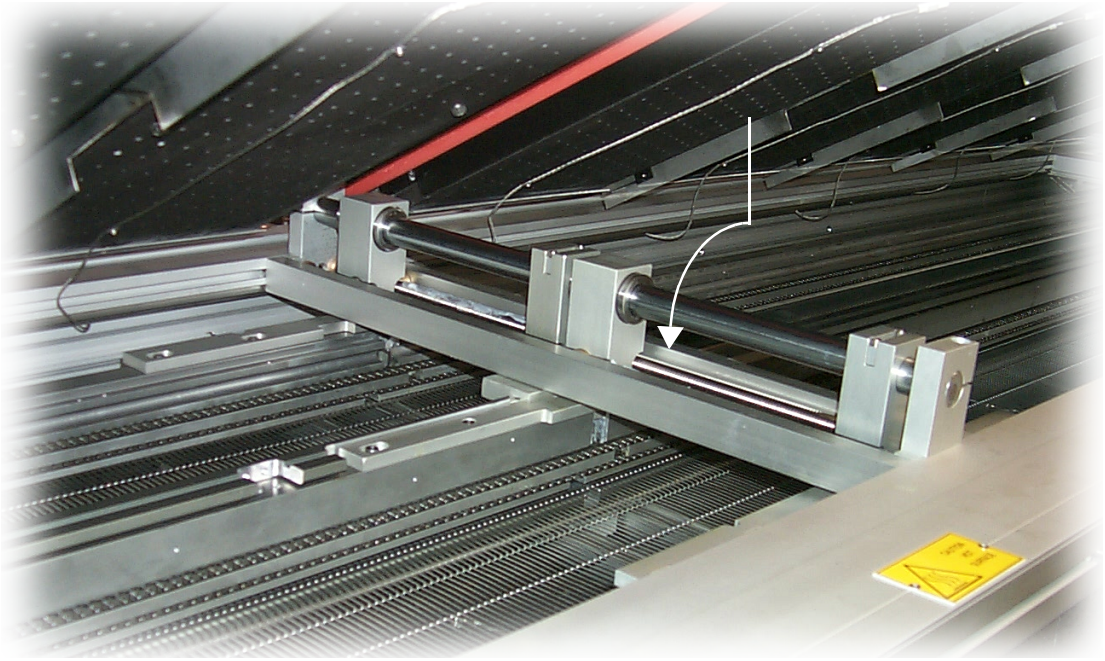


Figure 40: Center Cross Width Shaft

TOL-O-MATIC DRIVE LUBRICATION

Lubricate the angle drive every annual lubrication — approximately every 2100 hours of operation.

Tools/Materials Needed

- Standard Grease Gun
- High temperature no-melt AP grease

Procedure

There are three (3) Tol-o-matic drives located on the OmniFlo™–5 and 7 and four (4) located on the OmniFlo™–10. They are angle drives used to drive the width adjust.

The Tol-o-matic drives are located on the rear of the machine. There is two (2) at the Load End, two (2) at the Unload End and two (2) in the center — the OmniFlo™–10 has four (4), evenly spaced between the ends.

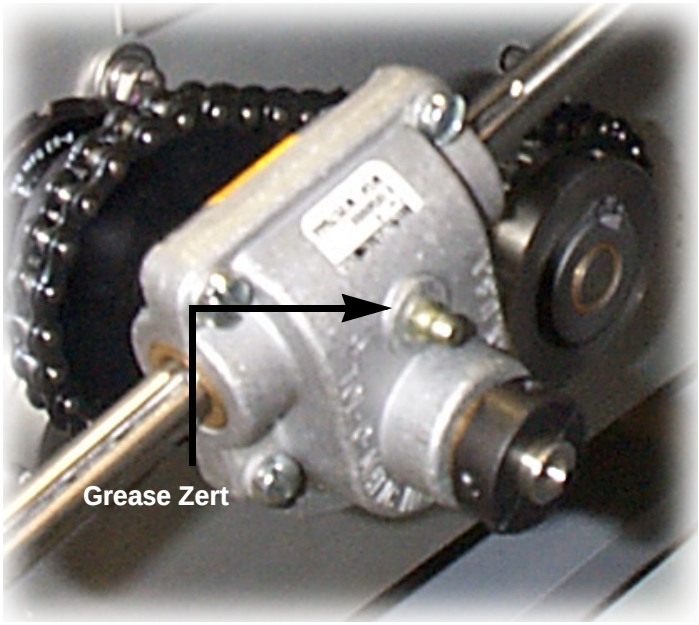


Figure 41: Tol-o-matic (Side View)

A grease zert is located on one side of the Tolematic and a screw is located on the other side.

Using a standard grease gun, pump high-temperature, no-melt AP grease into the grease zert until it is full.

NOTE Fill the Tol–O–Matic until it is completely full. Wipe any excess from the exterior of the Tol–O–Matic with a clean cloth.

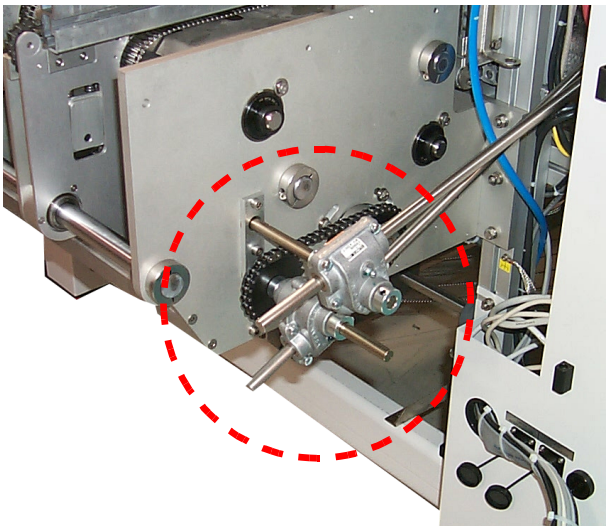


Figure 42: Load End Tolematic Drives

2.5 CENTER BOARD SUPPORT (CBS) DEVICE

OVERVIEW

The Center Board Support (CBS) Device consists of a #35 pin chain, gears and a solenoid control device, positioned between the front and rear conveyor rails. The CBS Device is used to support boards which are too flexible to be held by the conveyor without a support device.

The chain has specially designed tabs to allow for maximum component placement on boards for processing. Refer to Figure 21. The CBS Device requires a clear path 3 mm (0.125 in.) wide down the center length of the board. The chain device rises when engaged to allow the tabs on the chain to support the center of the board. Width positioning and vertical retraction are computer-controlled. The speed of the conveyor is synchronized with the pin chain conveyor speed.

The CBS Device provides a minimum process width of 7 cm (2.75 in.) and a maximum process width of 50.8 cm (20 in.).

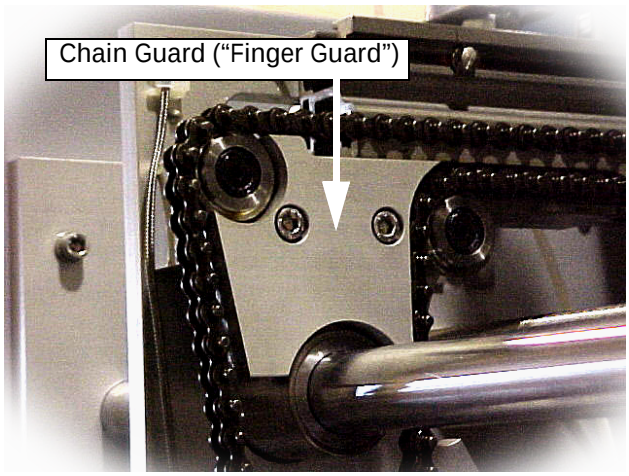


Figure 43: Chain Guard on Outer Rails

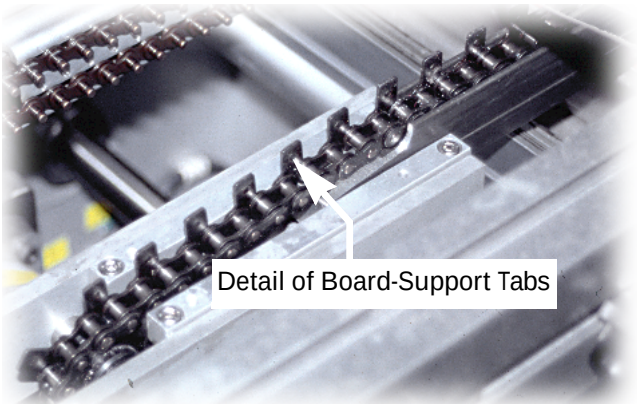


Figure 44: CBS Chain Detail

SET-UP

The CBS Device is configured with the software at the factory. If new software is installed or it is otherwise necessary to set-up the conveyor for the CBS Device option, select Setup > Configure > Options > Conveyor. Refer to Figure 22.

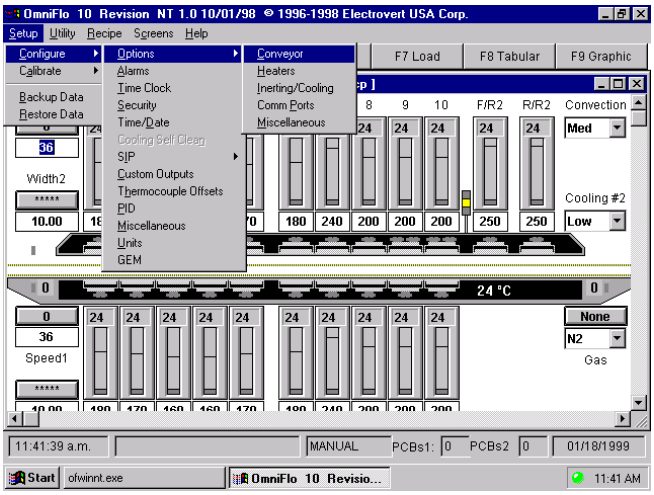


Figure 45: Setup Pulldown Menu

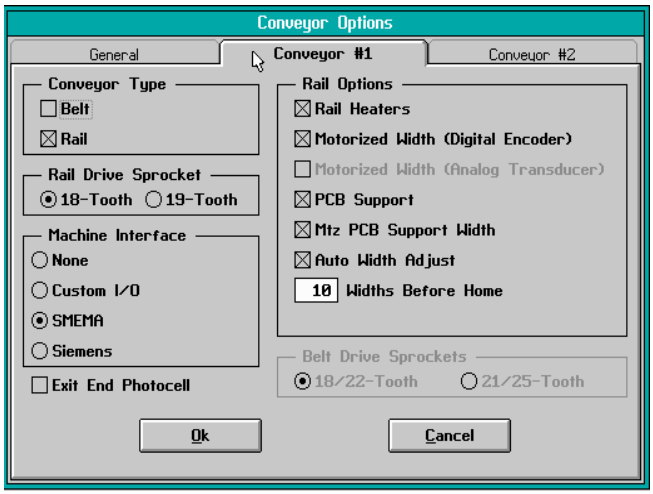


Figure 46: Conveyor Configuration Window

A window appears to configure the software for the conveyor. Refer to Figure 23. Select the PCB Support Option. Select Mtz PCB Support Width. Configure any other options applicable to the machine and select OK to close the window.

ENGAGING THE CBS DEVICE

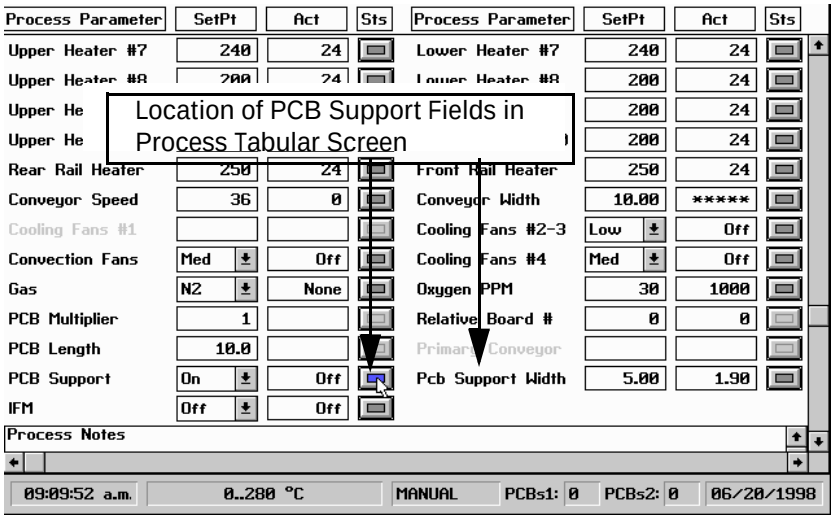


Figure 47: Process Tabular Screen

In the Process Graphic Screen, press function key F8 to enter the Process Tabular Screen. Asterisks entered in the Actual (“Act”) field allow the conveyor to go to home position for accuracy by resetting its starting point measurement. If it is desired to home the conveyor before entering a setpoint, click the status button in the PCB Support Width field. Refer to Figure 24.

The distance between the inside pins of the front rail to the outside (front) of the CBS device chain is the PCB Support Width. Enter the value needed for the process in the Set Point Column. The value must be between 3 cm (1.25) and 25.4 (10 in.).

If the CBS Device is disengaged, clicking the PCB Support field button in the Status column causes the CBS to engage by rising 1.2 cm (0.5 in.) to support the underside of the board. If the CBS is engaged, clicking the button in the Status column causes the CBS Device to disengage.

CBS Device configuration is entered into the recipe and saved with the recipe. When the recipe is selected and the machine is Auto Started, the CBS Device will automatically engage.

CALIBRATION

Tools Needed

- Precision Straight Edge or T – Square

Procedure

The CBS Device is calibrated through the software interface in the Setup Menu. The system is calibrated at the factory. If it is necessary to re-calibrate the machine, select Setup from the Menu bar.

In the Setup Pulldown Menu, select Calibrate. From the Calibrate Menu, select PCB Support Width. A series of windows will appear to initiate and direct the calibration. Refer to Figure 25.

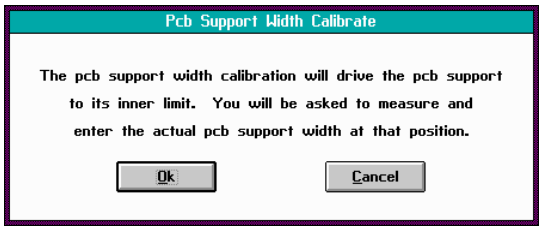


Figure 48: Initial Calibration Window

The software will drive the CBS Device to its inner limit position. The operator will be required to measure the distance between the pin chains and enter the measurement into the interface window. Refer to Figure 26.

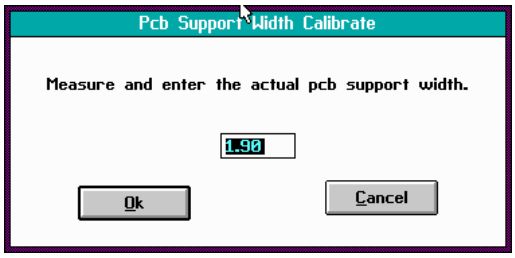


Figure 49: Calibration Data Entry Window

The CBS Device will then travel to its outer limit. The operator will again be asked to measure the distance between the pin chains and enter the measurement into the interface window.

When the measurements are completed and entered, select “OK” to finish calibration. A window will appear indicating that calibration is complete.

LUBRICATION

Chain lubrication is performed at the same time the pin chain conveyor is lubricated. A semi-automatic chain oiler is mounted on the Load End of the machine. Refer to Figure 27. Lubrication of the pin chain conveyor is required after 80 to 500 hours of operation depending on the operating conditions.

Use Tribol 930 synthetic oil to lubricate the Chain. Load the oiler by the same method the semi-automatic oilers are loaded for the pin Chain.

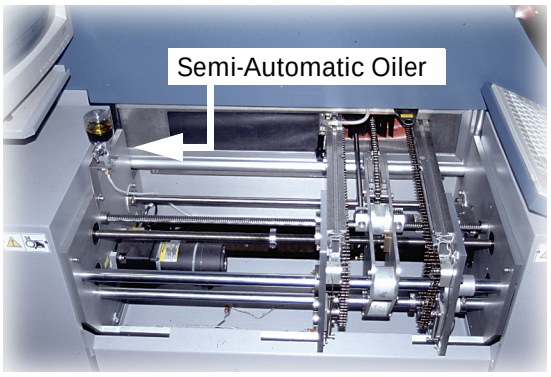


Figure 50: Load End Module and Oiler Location

- Lubricate at 80 to 100 hours for high temperature operations only.
- Lubricate at 170 to 200 hours for most reflow operations.
- Lubricate at 300 to 500 hours for curing applications with the time period depending on curing temperatures used.

CBS DEVICE REMOVAL

Some maintenance procedures, such as replacement of a bottom heater panel, will require the CBS Device to be removed. Before it can be removed, the chain should be removed from the device itself, or if the chain requires replacement, the old chain should be fed entirely out before the new one is installed.

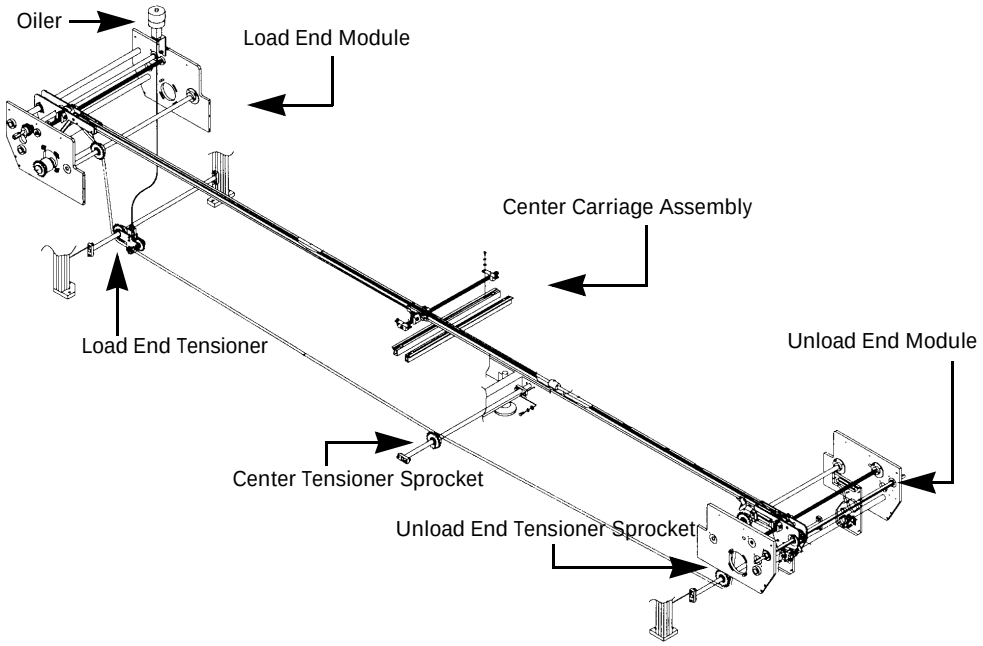


Figure 51: OmniFlo™–7 CBS Device

CHAIN REMOVAL

Tools Needed

- 13 mm Open End Wrench or Deep Socket Wrench
- #25 – #60 Chain Break

Procedure

NOTE Before removing the Chain, conduct a visual inspection to aid in correct replacement.

1. Turn the conveyor Off.
2. Disengage the CBS Device by pressing the toggle button in the PCB Support Field in the Process Tabular Screen to the Off position.
3. Open the front Load End panel to access the Chain for the CBS.
4. If necessary to loosen the tension to aid in removal of the Chain, access the rod where the Tensioner Sprocket is located. Refer to Figure 29. Loosen the four (4) M8 X 20 Hex Head Nuts that secure the tensioner rod. There are two (2) bolts on each end of the rod.

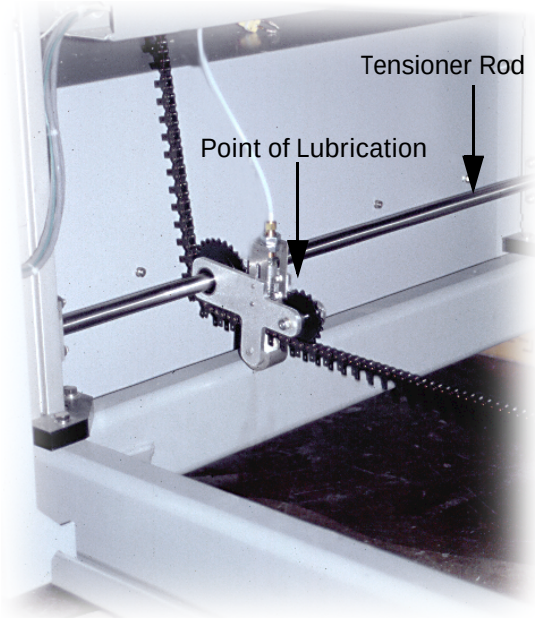


Figure 52: Load End Tensioner Sprockets and Oiler Assembly

5. Use a Chain Break for #25 – #60 Chain to remove a pin from a link in the Chain.
6. Reserve the link to use when the Chain is re-attached.

7. Feed the Chain out the Unload End of the machine until it is completely free of the machine.

If removing the Chain for the purpose of removing the Shaft to access a bottom heater panel, it is necessary only to remove the Chain along the chamber areas of the machine.

RAIL REMOVAL

Tools Needed

- 3 mm Hex Wrench

Procedure

Once the Chain is removed, it is necessary to remove the Rail that supports the Chain to access the bottom chambers.

1. On the Unload End Module, locate and remove the four (4) M4 x 20 Socket Head Cap Screws that fasten the Rail Riser to the base. Refer to Figures 30 and 31.

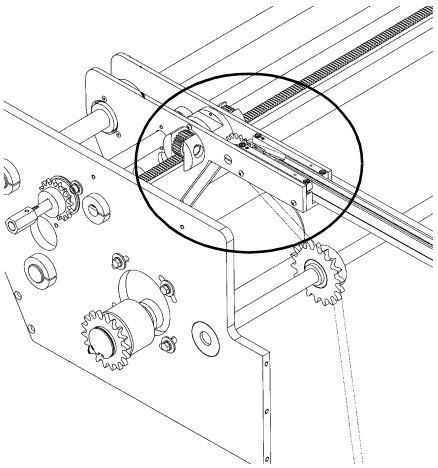


Figure 53: Rail Riser

NOTE Each threaded hole for each M4 x 20 Screw contains a compression spring. If the spring becomes dislodged during removal of the Rail, replace the spring into the base of the Rail Riser.

2. Repeat Step 1 on the Rail Risers that are located on the Center Carriage and the Load End Module.
3. Lift the Rail out and place it where access to the bottom chambers is not inhibited.

NOTE A 6mm x 35mm Shaft inserted into the Rail causes the Riser to lift out with the Rail. Reserve the Riser to replace when the Rail is replaced.

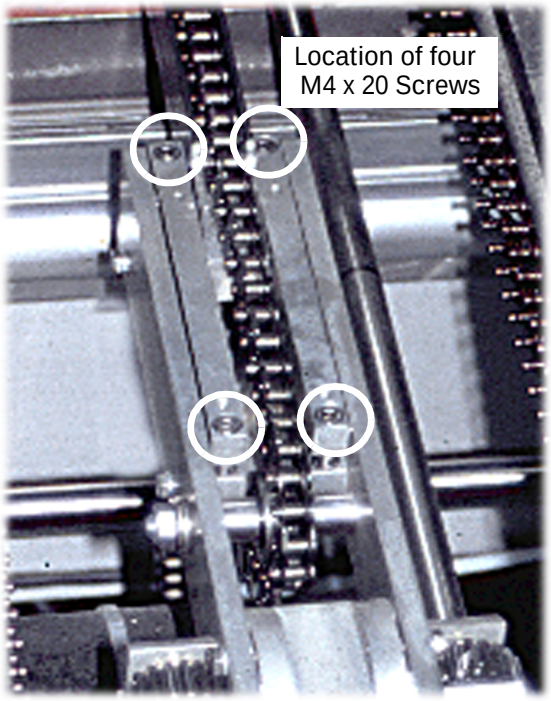


Figure 54: Rail Riser

SHAFT REMOVAL

Tools Needed

- 4 mm Hex Wrench

Procedure

To remove the CBS Shaft, it is necessary to first disconnect it from the center coupling before removing it from the Unload and Load Ends of the machine.

1. Loosen the two (2) M5 x 10 Set Screw located on the Center Shaft $^{1}/_{2}$ x $^{1}/_{2}$ Coupling.
2. Slide the Coupling toward the Unload End of the machine, so that the Shaft is no longer joined.
3. Pull the Shaft toward the Load End of the machine, so that the Shaft is free of the Unload End of the machine.

NOTE A 1/8 X 1/2 in. Square Key is present in the Key Way in the gear that the Shaft is inserted. It is important to ensure that the key is not dropped in the process of removing the Shaft. Pulling the Shaft out of the gear may cause the key to fall. If it falls out, it needs to be replaced before the Shaft is re-inserted.

4. Lay the Shaft where access to the bottom chambers is not inhibited.
5. Pull the Shaft inserted into the Load End toward the Unload End, sliding it through the opening in the Center Carriage Assembly until it is free from both the Load End Module and the Center Carriage Assembly.
6. Lay the Shaft where access to the bottom chambers is not inhibited.

NOTE The OmniFlo™ 10 and OmniFlo™ 10 Extended have two (2) Center Carriage Assemblies. Both need to be accessed to remove the Rail and Shaft.

CBS DEVICE REPLACEMENT

RAIL REPLACEMENT

Tools Needed

- 3 mm Hex Wrench

Procedure

1. Lay the Rail across the length of the conveyor, placing it along the base Rail Risers.
2. At either end of the machine, replace the Rail Risers onto the pins and fit it onto the base of the Rail Riser.
3. Do the same at the Center Carriage Assembly and then at the remaining end.
4. Replace the four (4) M4 x 20 screws in each of the Rail Risers. Refer to Figures 30 and 31.

SHAFT REPLACEMENT AND PARALLELISM

Tools Needed

- Precision T – Square
- 4 mm Hex Wrench

Procedure

NOTE Refer to Figure 28 for aid in identifying location of the components.

1. Slide the Shaft that was removed from the Load End through the Center Carriage Assembly toward the Load End of the machine.
2. If the Square Key is not in the Key Way in the gear, remove the gear, replace the Square Key and return it to the Carriage.
3. Line the Key Way of the Shaft up with the Square Key and insert the Shaft into the gear.
4. Measure the distance between the Rail Riser on the Load End Module and the Fixed Rail of the Pin Chain Conveyor.
5. Measure the distance between the Center Carriage Rail Riser and the Fixed Rail of the Pin Chain Conveyor.
6. Ensure that the two distance measurements are within 0.5 mm (0.02 in.).
7. If necessary to adjust the distance, turn the gear slightly in the appropriate direction.
8. Ensure that the Square Key is in the Key Way in the gear in the Carriage on the Unload End of the machine.
9. Line the Key Way of the Shaft with the Square Key and insert the Shaft into the gear.
10. Slide the Coupling over the joint to support both shafts, but do not tighten it.
11. Measure the distance between the Rail Riser on the Unload End and the fixed Rail of the Pin Chain Conveyor.
12. If the distance measurement is greater than +/- 0.5 mm (0.02 in.), adjust the gear slightly in the appropriate directions.
13. When all measurements are within 0.5 mm (0.02 in.), tighten the M5 x 10 Set Screws on the Coupling.

CHAIN REPLACEMENT

Tools/Materials Needed

- Center Punch
- Steel Block
- Pin for link (reserved from Chain break)
- Precision Straight Edge or T – Square
- String Line

Procedure

To replace the Chain, it is necessary to hand feed the Chain through the sprockets and carrier plate.

1. Replace the Chain by feeding it across the carrier plate sprocket at the Load End of the machine. Refer to Figure 32.
2. Lay the Chain along the top of the CBS Rail, feeding it through the Center Carriage Support.
3. Continue to feed the Chain through the Drive Sprocket and into the bottom of the Unload cabinet.
4. Reattach the Chain at the bottom of the Load cabinet, using the pin that was reserved when the Chain was broken to secure the links.

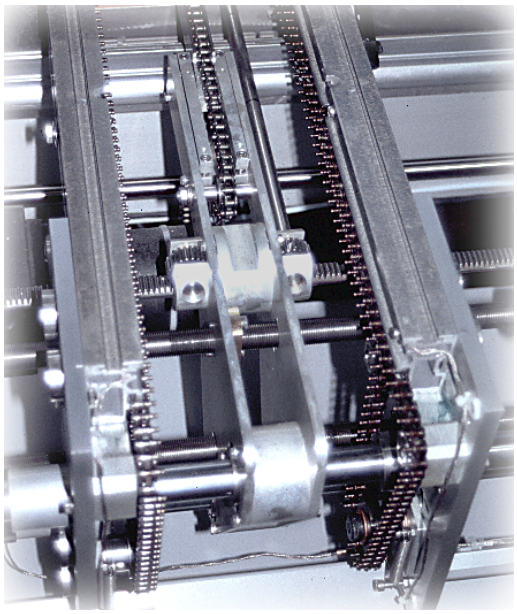


Figure 55: Load End Module

CHAIN SPLICE (RE-ATTACHMENT)

When the Chain is in place, connect the links of each free end and insert a pin into the connection.

NOTE The Chain on the CBS Device does NOT contain a master link.

Place a Steel Block behind the link and use a Center Punch to flare the pin. Refer to Figure 33.

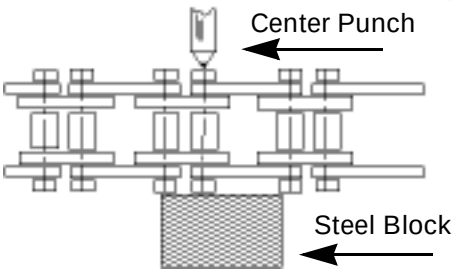


Figure 56: Chain Splice

Tension Adjustment

NOTE It will require a minimum of two (2) people to perform the adjustment.

To prevent contact with the machine, it is important that the tension of the Chain is adjusted correctly.

1. With a precision straight edge, measure the distance between the top of the Chain at the Center Tensioner Sprocket (the Chain rides across the top of the Center Tensioner Sprocket) and the top of the machine frame.
2. Next measure the distance between the top of the Chain at the Unload End Tensioner Sprocket (the top of the Chain rides under the End Tensioner Sprocket) and the machine frame.
3. The two distance measurements should be within +/- 3 mm (0.125 in.). If they are not equal, adjust the tension by accessing the rod where the Unload End Tensioner Sprocket is located.
4. There are two (2) bolts on each end of the rod. Loosen the four (4) M8 X 20 Hex Head Bolts that secure the tensioner rod. Slide the rod either up or down to achieve proper tension. Refer to Figure 29.
5. Tightly run a string line between the top of the Chain at the Load End Oiler Sprocket (the top of the Chain feeds underneath the Load End Oiler Sprocket) and the top of the Chain at the Center Tensioner Sprocket.
6. Visually inspect the string to determine the point that the string and the Chain are furthest apart.
7. Measure the distance at that point between the Chain and the string. The distance should be 25 mm (1.0 in.) +/- 5 mm (0.2 in.).
8. If the distance measurements are not equal, access the rod where the Load End Tensioner Sprocket is located and adjust it by the procedure referenced in Step 4.

HEIGHT ADJUSTMENT

Tools Needed

3 mm Hex Wrench

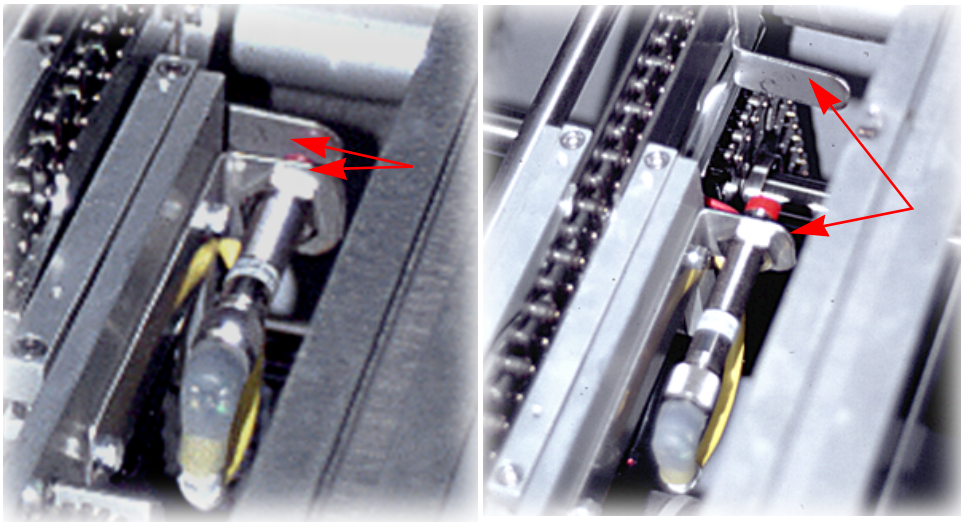
Procedure

The Rail height is calibrated accurately at the factory. If it is removed, it may be necessary to adjust the height when it is replaced.

1. Turn the conveyor Off. Engage the CBS device.
2. Place a Printed Circuit Board (PCB) on the Load End of the machine.
3. Adjust each of the four (4) M4 x 20 Socket Screws on the Rail Riser so that the Chain is supporting the center of the PCB. Refer to Figures 30 and 31 to identify the Rail Riser.
4. Tighten each of the smaller four (4) M4 x 8 Socket Set Screws to secure the position.
5. Move the PCB to the Center Carriage Assembly and repeat the procedure on the Rail Riser of the Center Carriage Assembly.
6. Move the PCB to the Unload End of the machine and repeat the procedure on the Rail Riser of the Unload End Module.

CBS PHOTOCELL

The CBS Device has a photocell mounted on the unload end carrier plate parallel to the rail. The photocell is a proximity switch that detects when the CBS device is raised by the nearness of a metal tab on the CBS Device. If the tab is not near enough for the proximity switch to sense of if the signal is not seen by the CPU, the CPU sends a signal to lower the device. Note in Figure 14 the difference in the distance when the CBS Device is up compared to the distance when it is down.



CBS Device Engaged (Up) **CBS Device Disengaged (Down)**

Figure 57: Photocell Detecting CBS Engagement

WARNING If the CBS Device is engaged (Up) and the machine is turned On, breaking the signal path between the proximity switch and the metal tab on the device causes the CPU to interpret the device as disengaged. The device will immediately and quickly lower. It is important, if adjusting the photocell, to use caution. Injury to hands or fingers is possible.

ELECTRICAL BLOCK DIAGRAM

When the width adjust mechanism is activated through the software, CR22 allows SC01 to control the width circuitry at max speed with a 10V input. When the computer generates a MOVE IN (WIDTHIN PER) or MOVE OUT (WIDTHOUT PER) signal, Pin 5 and Pin 6 of P 27 on Board 2 apply a voltage across M34 Width Motor, causing the motor to power the moveable rail. The rail moves inward toward the fixed rail if it is a MOVE IN signal or away from the fixed rail if it is a MOVE OUT signal until it reaches its specified set point unless a limit switch is reached. If a limit switch is physically contacted by the rail, Pin 19 of P4 on Board 1 goes high. By opening limit switches the emitters of the optical couplers are closed, de-energizing CR26 if it is the inner limit switch or CR25 if it is the outer limit switch, causing the rail to stop moving.

A signal applied to Pin 29 of P20 on Board 2 causes CR32 and CR5 to energize, raising the center board support device. If CR5 is de-energized, the support is lowered. A signal applied to Pin 17 of P 20 selects the CBS width adjust by energizing CR28 and CR6.

A proximity switch sends a low signal to Pin 21 of P13 on Board 1 if the CBS Device is engaged. If it does not see the signal, it will lower the CBS.

A proximity switch LS05 is attached to the CBS device rear carrier plate. If the limit switch opens from physically contacting a moveable rail, a signal is sent to the CPU which initiates a software stop.

If an Emergency Stop is pushed, the 24V to the relay coils is removed, de-energizing CR22, stopping the width adjust.

The width encoder, ENC03, sends pulses to the computer through Board 1. A 50% duty cycle can be observed at Pin 10 and Pin 37 of P2 on Board 1.

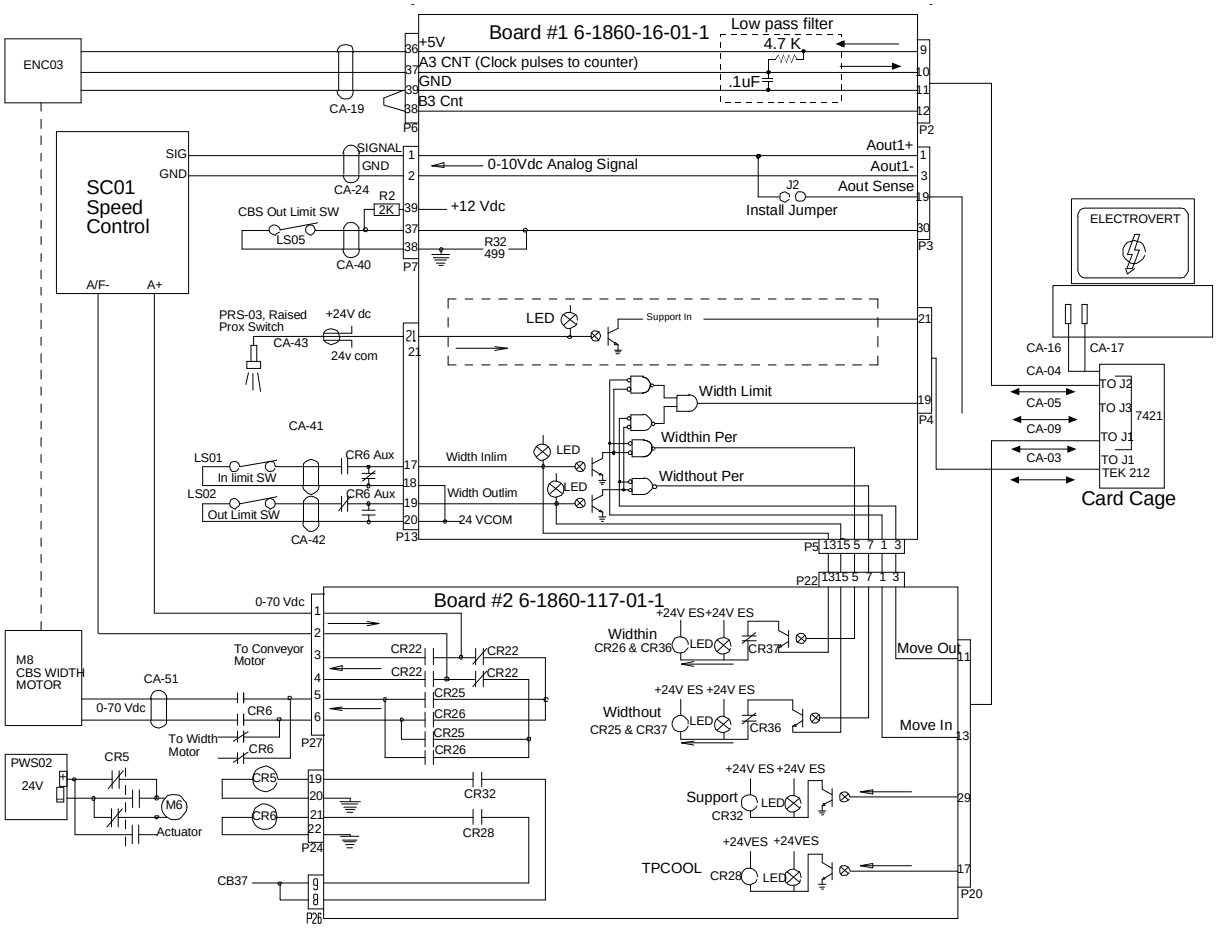


Figure 58: Center Board Support Width Control Electrical Block Diagram

SECTION 3: HEATING MODULE OPTIONS

The heating zones have the following options available:

- RailHeat
- Independent High Temperature Safety Circuit (IHTSC)

Additionally, inert atmosphere machines have available an Oxygen Analyzer and a Quick Purge Option.

The Oxygen Analyzer and the Quick Purge options are both documented in the OmniFlo™ Series Maintenance Manual.

3.1 RAILHEAT™

RAILHEAT™ is patented rail heaters designed to provide additional control over thermal temperature deltas in the reflow portion of the thermal profile. These tubular heating elements are fastened to each of the pin chain conveyor rail extrusions through the last one–and–a–half zones of the heated tunnel, and are positioned approximately 13 mm (0.5 in.) above the pin chain conveyor and product flow. The rail heaters are controlled separately from one another through software, as well as independent of the top and bottom panel heaters, to provide flexibility and process control over the entire reflow portion of the thermal profile.

The rail heaters are useful in applications where circuit assemblies may have a large thermal mass variation from side–to–side. They may also be used to provide additional control of the reflow spike in applications which demand a very tight process window, such as thin substrate assemblies with low temperature plastic connectors or PCB's which have uneven high mass grounding planes.

Software Configuration

The OmniFlo™ System is preset at the factory for machine configuration. To verify that the system is configured for RAILHEAT™, select Setup > Configure > Options > Conveyor.

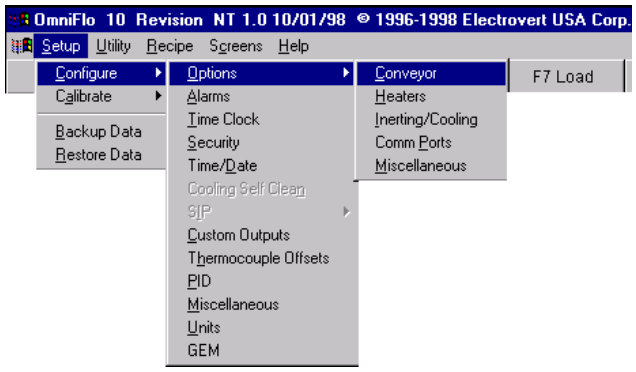


Figure 59: Setup Menu

A configuration screen appears for the conveyor. Select the tab that is labeled Conveyor #1.

On the Conveyor Options screen, ensure that "Rail Heaters" under "Rail Options" is selected.

Select Center Tab

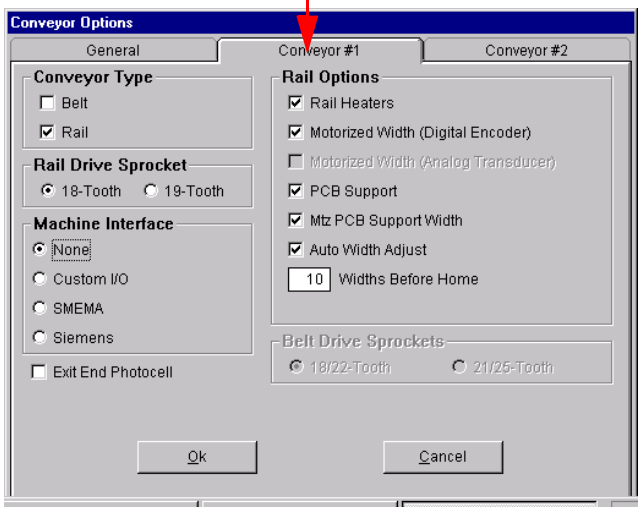


Figure 60: Conveyor Options Configuration

Maintenance

RAILHEAT™ maintenance is documented in the OmniFlo™ Series Maintenance Manual.

NOTE The RAILHEAT™ option is available only with the Pin Chain Conveyor, Combination Conveyor or DUALTRAK™ Conveyor options. (DUALTRAK™ requires two (2) assemblies; one (1) for each conveyor.)

3.2 INDEPENDENT HIGH TEMPERATURE SAFETY CIRCUIT (IHTSC)

The IHTSC provides independent backup again thermal runaway. It is totally independent of machine process controls — not dependent on machine software.

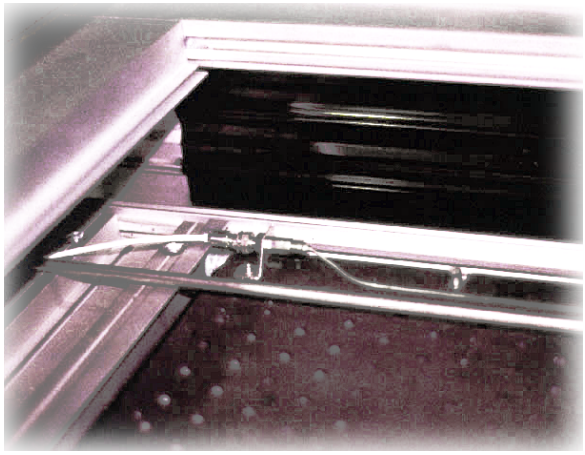


Figure 61: Thermal Circuitry Hardware

The IHTSC cuts power to all heaters if the temperature at any heater reaches 410° C (770° F). It is designed to provide additional protection for the machine against thermal runaway which may be caused from the loss of computer control or a defective solid state relay. The high temperature safety circuit function completely independent of the machine's control computer and is a stand–alone system.

The safety circuit consists of a control board, two sensing elements mounted inside the heated portion of the tunnel, connecting cables, plugs and an alarm indicator lamp mounted on the front of the machine near the keyboard. If the machine computer fails to detect a thermal runaway problem, the IHTSC is additional protection to the machine and the process

The independent high temperature safety circuit prevents the "meltdown" of internal heater(s). It is useful in applications where technicians or machine operators are not always readily available to respond to machine alarms and warnings, or to manually shut down the system in the event of a thermal runaway.

If the safety circuit is activated, it is necessary to reset the main disconnect switch on the machine before applying power to the machine. An alarm sounds and remains active until the machine is powered Off.

Circuit Operation

The sensing element contains a barriar of eutectic salt between the outer sheath and the conductor. The sensor element (the center conductor) resistence to ground (outer sheath) is in excess of !.0 megaohm in its normal state. When the heat exceeds a minimum limit, the resistance of the eutectic salt within the sensing element drops sharply, causing current to flow between the outer sheath and the center conductor. This current flow is sensed by the control unit, which produces a signal to activate the output relay.

The signal at P13 pin 5 goes high, signalling the computer that Thermal Runaway has occurred. When the output relay triggers the alarm, the alarm latches (NC 9 – 1 contacts on CR2 latch open) and cannot be reset unless power is removed.

When in normal operating mode with power applied, the voltage at the unit's two (2) sensor connections, terminal block to ground, should be approximately 200 mV. When a heat source greater than 312° C (594° F) is applied anywhere along the length of the sensor inside the chamber, the voltage drops to near zero. Refer to the schematics that shipped with the documentation for specific terminal block reference numbers.

SECTION 4: COOLING ZONE OPTIONS

The Cooling Zone options include the following:

- NitroCool™ Gas Knife cooling
- Extended Cooling
- External Cool
- Matched External Water Chiller

Additionally, an on–board chiller is available for systems equipped with NitroCool™.

NOTE The Matched External Water Chiller is manufactured by an external supplier and ships with its own manufacturer's documentation.

4.1 NITROCOOL™

Figure 62: NITROCOOL™ Module (OmniFlo™–7 shown)

The NITROCOOL™ option consists of one or two modules, based on the machine configuration. The OmniFlo™–5 uses only the primary module. The primary module houses the three (3) nitrogen knives and a heat exchanger.

The OmniFlo™–7 and OmniFlo™–10 machines use two modules for cooling. The second module consists of a chamber with a blower unit. This option allows for cooling in an inert environment without disruption of the nitrogen environment.

In the first module cooling is accomplished when the gas knife directs a stream of nitrogen directly toward the printed circuit board as it passes through the cooling chamber. The gas knife stream pulls the ambient gas over the heat exchange, producing a cool gas flow over the board.

The second module uses the cooled nitrogen and directs it onto the board at a speed controlled by machine software.

The machine exhaust and nitrogen gas injection are adjusted to that outside air is not drawn into the machine, which would disrupt the inert environment.

INTRODUCTION

The NITROCOOL™ option is used primarily for inert systems, but it can be used in non–inert environments as well.

The NITROCOOL™ option has an automatic cleaning process to reduce maintenance down

time. The knives are cleaned periodically (user defined) by the system software. Each knife has a heater unit clipped directly to the gas knife surface. To remove the flux residue from the surface of the knife, it is necessary to activate the self–clean cycle through the software every 8 hours of machine operation. When the profile indicates cooling performance is deteriorating, the knives need to be removed for cleaning.

OPERATION

To use this option, the machine must be configured for NITROCOOL™.

Configuring NITROCOOL™:

1. Select Setup > Configure > Options > Inerting/Cooling.

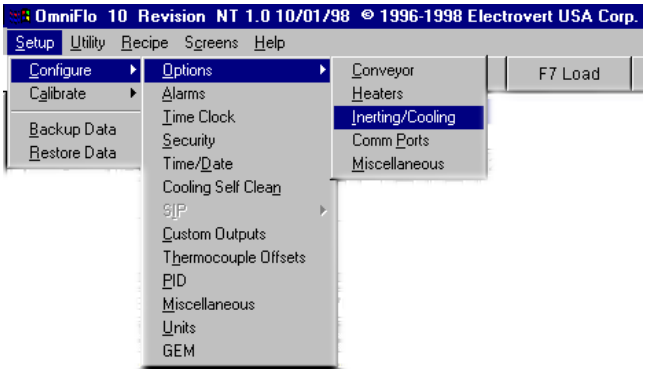


Figure 63: Setup Menu

2. In the Inerting/Cooling screen, click on the box next to “Inerting Option”.
3. Select the circle next to “Gas Knife” for Cooling #1.
4. If the machine has a second cooling module, select the circle next to “Inert” for Cooling #2.
5. Select Cooling Self Clean – this feature allows the user to specify the automatic cleaning cycle for the gas knives.
6. If selecting 3–Speed Cooling #2, not that this is available only to the OmniFlo™–7 and 10. For the Extended Cooling option, 3–Speed cooling is standard. Three speed cooling allows the user to regulate the fan speeds of the remaining cooling module(s) through software.
7. Extended Cooling is selected for those machines built with an extended cooling area allowing for a total of four (4) cooling modules – the first one is the gas knife, the following three(3) are regulated by cooling fans.

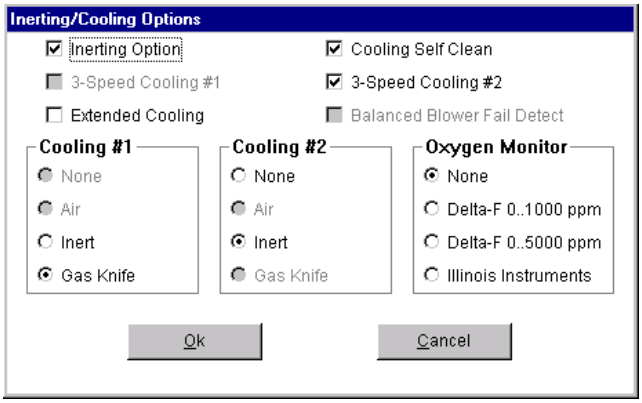


Figure 64: Inerting/Cooling Configuration Screen

ACTIVATING THE GAS KNIVES

1. In the Process Graphic Screen, activate the nitrogen gas by moving the cursor to the N2 button and clicking the mouse. The N2 button turns green, indicating that the nitrogen flow is turned On to the system.
2. Set the cooling fan speed on the second cooling unit using the graphics screen. Move the cursor to the Cooling #2 button and select Low, Med or Hi speed for the cooling fan (if configured).

NOTE Normal process flows to the gas knife module are typically in the range of 4.25 to 17 m^3/hr (150 to 600 ft^3/hr) per knife.

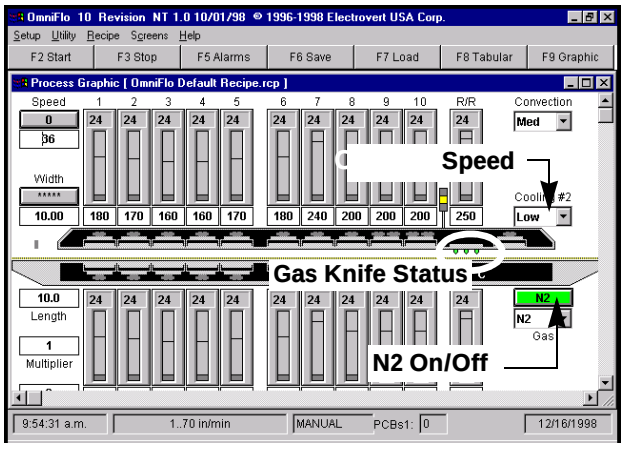


Figure 65: Process Graphics Screen

THE CLEANING CYCLE

Integral to the operation of the gas knife cooling system is a cleaning cycle which removes flux deposits from the flow actuators (gas knives). This cleaning cycle should be run every 8 hours of operation. The Gas Knives occasionally need to be removed and cleaned with a solvent. If the self–clean cycle is activated after every eight–hour shift, the knives typically would require monthly removal for cleaning. Process profiles more accurately reflect when cooling capabilities begin to deteriorate than a visual inspection.

Cycle Description

During the cleaning cycle, the flow to each gas knife is reduced to approximately 1.4 m^3/hr (50 ft^3/hr). The flow is reduced to decrease the thermal loading on the knife, allowing it to heat up faster. Concurrent with flow reduction, heaters attached to each gas knife are energized to increase each knife's temperature to a preset value — typically 185° C (391° F).

The status of gas cooling is displayed in the Process Graphics Screen as a color–coded icon. It is located in the cooling area of the graphics screen. The icon is

- Red while in self–clean mode
- Green while nitrogen is On in cooling mode
- Gray when Off.

CYCLE OPTIONS

There are four (4) choices for the Cleaning Cycle mode setting. This selection is made from the Setup > Configure > Cooling Self Clean screen.

OFF	Self–cleaning mode is disabled until switched from Off to one of the other modes.
MANUAL	Self–cleaning mode may be turned On by setting a cycle time (typically 15 to 20 minutes). The cycle is terminated automatically at the end of the "Cycle Time" and after the gas knife cools below the user–programmed cooling module High Temperature Alarm setting. The cycle can be manually started or stopped from the Screens > Cooling Self Clean window. Manual termination of the cycle is not recommended because the cycle should run for the full length of time to obtain maximum cleaning effect.
TIMER	Self clean mode is initiated by a seven (7) day, three (3) even Auto start timer. The cycle will not begin if boards are in process. When initiated by the timer, the cycle remains active for the length of time set by the "cycle time".
AUTO	Self–clean mode initiates automatically if boards are in process when the preset time is reached. In the AUTO mode the cycle and board intervals define when the cycle runs. The cycle interval is programmable in the Setup > Configure > Cooling Self Clean screen and is the minimum time between cycles. The board interval represents the length of time the machine must be idle before the cleaning cycle runs. Both of these conditions must be met before the cycle engages in the Auto mode. The length and temperature of the cleaning cycle is based on parameter settings.

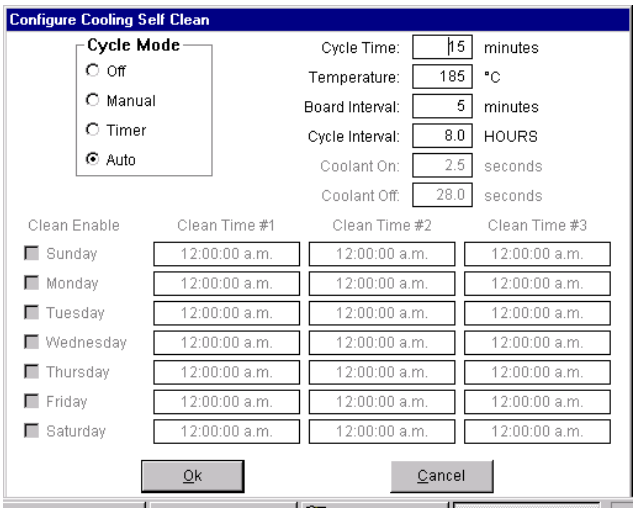


Figure 66: Cooling Self–Clean Configuration Screen

PARAMETER DESCRIPTIONS

Cycle Time

Cycle time is the operating time of the gas knife self–clean cycle in minutes. This applies for manual, timer and automatic self–clean cycle modes.

Valid ranges are from 5 to 30 minutes. Typically the cycle length will be 15 minutes. Enter the data by using the cursor to highlight the present value in the cycle time box, then type the new value and press “Enter”.

Temperature

The temperature entered is the degree to which each gas knife is heated during the self–clean cycle. Valid temperatures range between 100° C – 250° C (212° F – 482° F). The temperature is typically set to 185° C (391° F).

Board Interval (for Automatic mode only):

This is the amount of time in minutes that the machine must be idle before the self clean cycle initiates in the automatic mode. This setting works in conjunction with the “cycle interval” setting. Valid time range is from 1 to 500 minutes. Typical values of this parameter are three (3) to eight (8) minutes depending on upstream process delays.

The automatic gas knife self clean cycle energizes when the “board interval” and “cycle interval” values are exceeded. The automatic self clean cycle operates for the duration of the “cycle time”. The automatic self–clean cycle terminates immediately if a board is introduced in to the machine.

Cycle Interval

The cycle interval is the time interval between each automatically initiated, gas knife self–clean cycle. Valid ranges are from 0.1 to 999.9 hours. The length of each self–clean cycle is based on the cycle time parameter setting.

The automatic self–clean mode aborts if boards are introduced into the machine during the cycle. Subsequent self–clean cycles activate as programmed.

The cycle needs to run to completion to adequately remove flux deposits from the gas knives. Do not routinely interrupt the cycle. Routine interruption of the cleaning cycle allows flux buildup on the knives and increases the preventive maintenance necessary for the machine.

Self Clean Timer/Clock

This section of the screen allows three (3) start times per day to be entered in a seven (7) day format to activate the gas knife self–cleaning cycle. Each day is selected by moving the cursor to the square beside the day and pressing “Enter”. The time settings are used when the gas knife cycle mode is set for TIMER mode. The cleaning cycle length is based on the “cycle time” setting.

In the “timer” mode the self–clean cycle runs until the cycle length period expires, a board enters the machine, or the cycle is manually terminated.

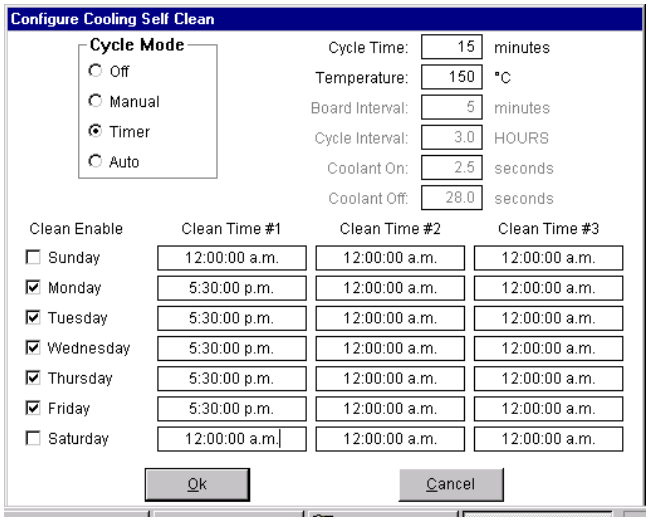


Figure 67: Self–Clean Screen Configured for Timer Operation

SELF–CLEANING

Nitrogen flow through the knives during the cleaning cycle is pre–set at the factory using the following procedure:

- At the front of the nitrogen control panel the nitrogen flow is adjusted to the following:
  - The valve labeled Knife #1 is set to 50 scfh.
  - The valve labeled Knife #2 & #3 is adjusted to 100 scfh.

STARTING NITROCOOL™ SELF–CLEANING

Set Mode:

- If the Timer is used for activation control, set the timer parameters via the Configuration Screen.
- If the Automatic method is used, set the machine to Automatic.
- If Manual mode is used, set the machine to Manual.

Manual Mode Self–Cleaning:

Select Screens > Cooling Self Clean from the menu bar. The Status button is located at the bottom of the screen display. By selecting the Status button, the Gas Knife icon — three (3) points — turns from green to red, indicating that the heaters activated.

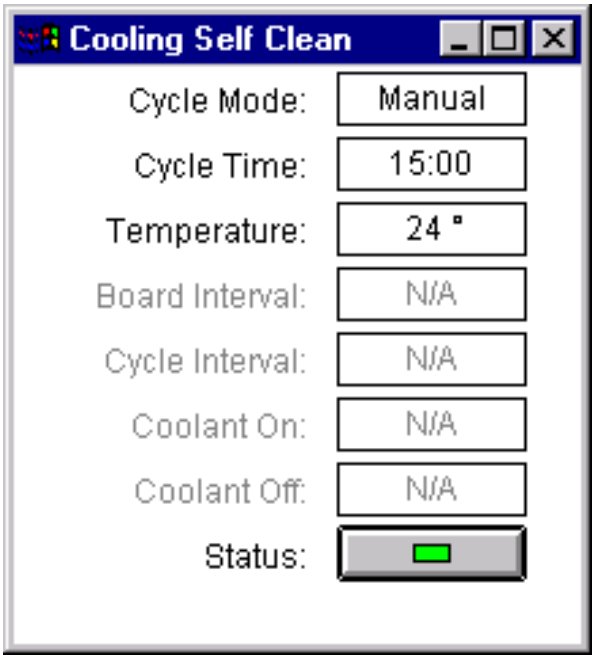


Figure 68: Manual Cooling Screen

The cleaning process continues until the time indicated by the status display elapses. The cooling module returns to a temperature below the user–programmed Cooling High Temperature Alarm setting when the self–cleaning operation is nearing completion — typically it completes within five (5) minutes.

PREVENTIVE MAINTENANCE SCHEDULE

Planning periodic maintenance, and defining the procedures required, limits the need to disrupt the production line for minor maintenance. Performing preventive maintenance increases the reliability of the machine and optimizes production quality.

The maintenance schedule is a guideline that should be modified to meet specific production levels.

Table 2: Daily Maintenance

Cooling Zone	PROCEDURE				
8 Hours of Operation	Activate N2 Cooling Cleaning Cycle				

Table 3: Weekly Maintenance

Cooling Zone	PROCEDURE				
40 — 160 Hours of Operation	Inspect the cooling tray for debris (remove debris).				
40 — 160 Hours of Operation	Inspect heat exchanger for residue and any debris. Brush flux residues from the surface of the heat exchanger.				

Table 4: Monthly Maintenance

Internal Chiller Unit (Option)	PROCEDURE				
170 — 340 Hours of Operation	Inspect the water chiller reservoir for water. Fill to level indicator mark on side of unit.				
Cooling Zone	**PROCEDURE**				
240 Hours of Operation	Inspect the heat exchangers for damage and efficient air flow. Remove and clean if necessary.				
170 — 340 Hours of Operation	Inspect the Gas Knives. If cooling is compromised due to flux build–up, remove and clean before continuing production.				
Cooling Zone Blowers	**PROCEDURE**				
240 Hours of Operation	Remove dust accumulation from the external surface of the blower.				

GENERAL MAINTENANCE

GAS KNIFE MODULE

The gas knife module consists of the three (3) gas knives and the heat exchanger. Maintenance involves the replacement or cleaning of the gas knives and the heat exchanger fins. Chilled water must also be maintained to the inlet feeding the heat exchanger.

HEAT EXCHANGER REMOVAL AND REPLACEMENT

The Heat Exchangers are located above the Gas Knives. Flux residues tend to accumulate on the Gas Knives. It is recommended to clean the Heat Exchangers monthly — approximately every 170 – 340 hours of operation.

Tools/Materials Required

- Pressure Relief Tool (“Dummy Connector”)

Heat Exchanger Removal:

1. Lift the hood of the cooling module to expose the Gas Knife module.
2. Turn the machine Off.

WARNING **Electric Shock Hazard**: Failure to remove power to the machine before performing this procedure exposes maintenance personnel to dangerous voltage levels.

3. Turn the nitrogen Off at the nitrogen control panel located on the front unload end of the machine. Allow enough time for the machine to cool sufficiently before accessing the machine.
4. Disconnect the coolant inlet and outlet hoses by pushing the quick disconnect collars that secure them.

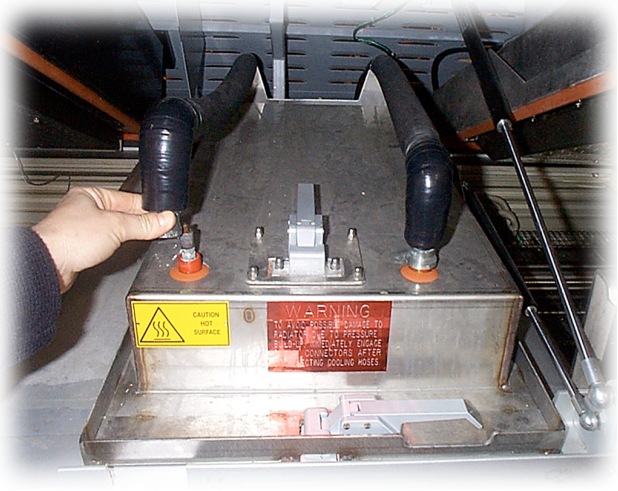


Figure 69: Releasing Quick Disconnect

5. Insert one pressure relief tool (“dummy connector”) into one (1) of the two (2) water connections on the heat exchanger.

CAUTION This tool is used to allow the cold water–filled heat exchanger to expand when it warms to room temperature. If this tool is not used when the heat exchangers are first disconnected, pressure builds from the normal warming process. Difficulty may occur when re–connoting the heat exchangers to the quick disconnects — enough so that damage may result to either the tubing or the connectors.

6. Remove the pressure relief tool from the connection.

Figure 70: Dummy Connector

7. Release the latch that secures the cooling chamber to the machine. It is the lower of the two visible latches located on the front of the cooling module. It lifts from right to left.
8. Lift the cooking module.

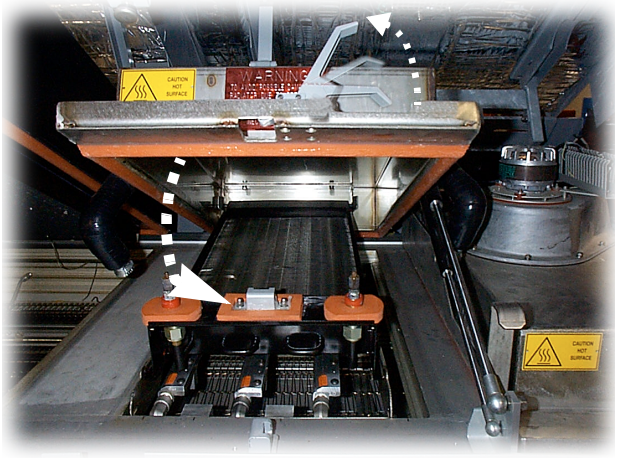


Figure 71: Heat Exchanger in Gas Knife Module

9. To remove the hat exchanger, lift the upper latch to a vertical position with one hand, while holding the Heat Exchanger with the other hand. It will free the front of the heat exchanger.
10. Remove the rear of the Heat Exchanger by lifting it up and over the “hooks” in the rear bracket that support the rear of the heat exchanger.

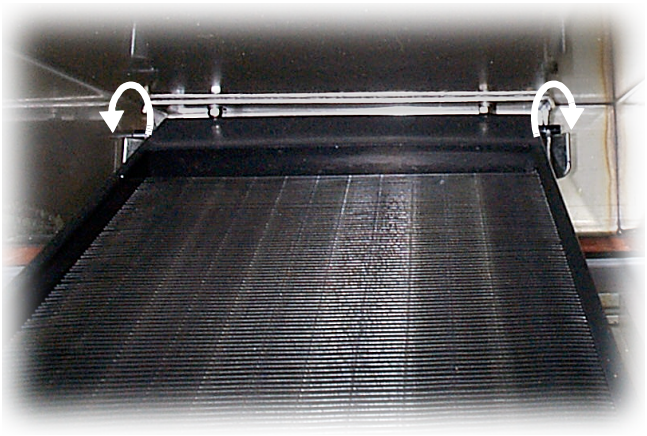


Figure 72: Heat Exchanger in Rear Bracket

If the heat exchanger is replaced with a substitute kept in stock, the replacement can be installed so that production resumes.

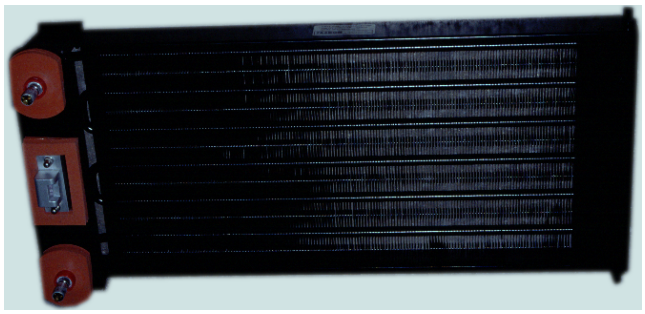


Figure 73: Heat Exchanger

CLEANING

Clean the heat exchanger unit by soaking it in an appropriate solvent recommended by the flux manufacturer. The heat exchanger needs to soak until the flux residue dissolves from the surface. It may aid in cleaning to use a non-abrasive brush. Prevent bending the fins by brushing them along the length.

Allow the heat exchanger to dry before replacing it in the machine.

Heat Exchanger Replacement

1. Place the metal support pins that extend from each side of the rear of the heat exchanger into the bracket that supports them.
2. Lift the heat exchanger into the hood of the cooling module, ensuring that the coolant inlet and outlet connections line up properly with the openings toward the front of the unit.
3. Secure the upper latch by pulling it down toward the front of the machine. It pulls

the heat exchanger unit closer to the machine as it tightens.

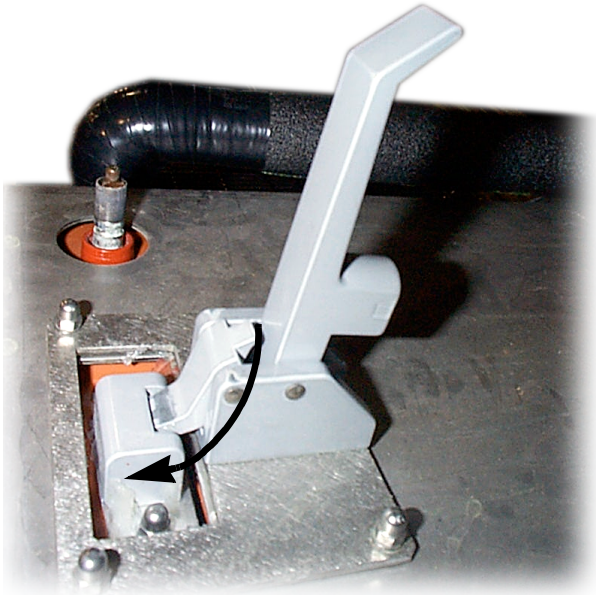


Figure 74: Latching the Heat Exchanger to the Cooling Module

4. Close the cooling module lid. Secure it by closing the lower latch.
5. Replace the coolant inlet and outlet hoses by attaching them at the quick disconnects. A clicking sound is heard when the collars are secure.

GAS KNIFE REMOVAL AND REPLACEMENT

Removal

The Gas Knives need replaced when they no longer cool within process requirements. Regular, scheduled, self–cleaning of the Gas Knives prolongs their reliability.

1. Raise the hood of the cooling module to expose the Gas Knife module.
2. Turn the machine Off.

WARNING Electric Shock Hazard: Failure to remove power to the machine before performing this procedure exposes maintenance personnel to dangerous voltage levels.

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3. A quick–disconnect collar is located on each gas knife at the front of the machine. Push the release button into the base of the disconnect collar to release the knife.

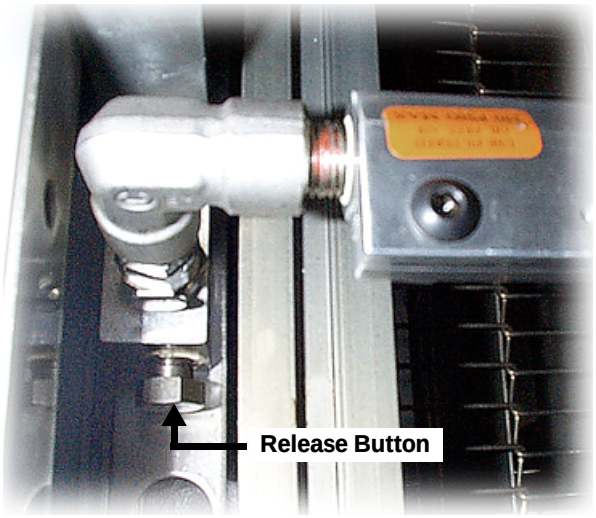

Figure 75: Front of Gas Knife

4. The knife lifts out of the bracket at the rear of the machine.

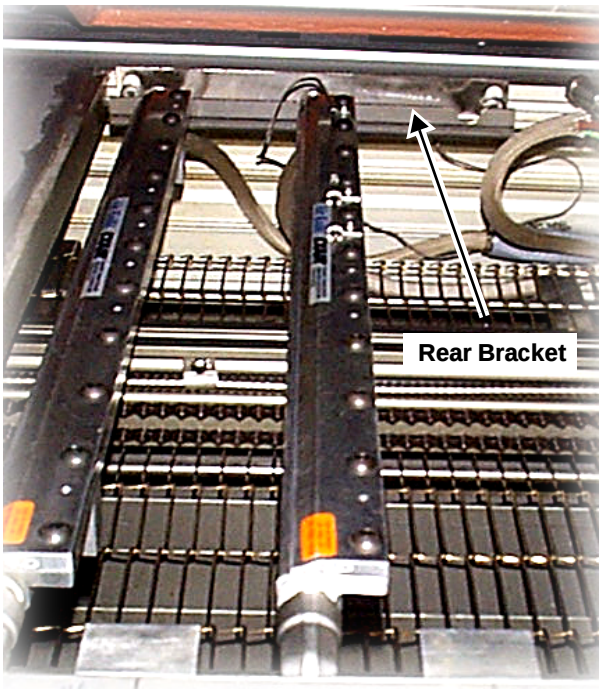

Figure 76: Gas Knives (One Removed)

5. The wiring connects to the Gas Knife heaters at the rear of the knives. Disconnect the heater power wires by opening the latch that joins the connector.

Figure 77: Disconnecting Gas Knife Wiring

6. Using a hex wrench, loosen the set screws that secure the clamp to the heater. Remove the heater when the clamps are loose enough to allow the heater to slide out.

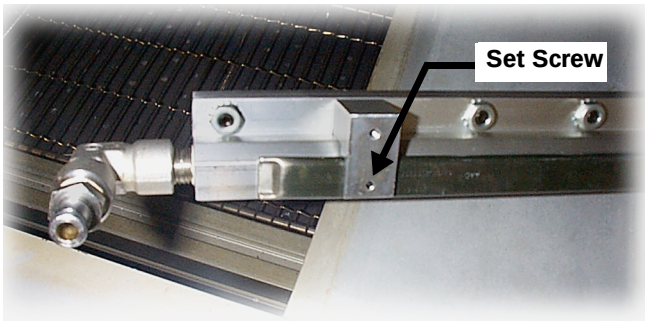

Figure 78: Underside of Gas Knife

Cleaning

Clean the knife by soaking it in an approved solvent until flux residues dissolve. A non–abrasive cleaning pad may be used if necessary.

Replacement

1. Replace the heater on the knife by sliding it into the clamps on the Gas Knife. Tighten the set screws with a hex wrench until they secure the heater.

NOTE If installing a new Gas Knife, a new heater is mounted on the knife. It is necessary to disconnect the wires of the old heater at the connecting clamp. Wire the new heater to the clamp.

2. Place the rear of the Gas Knife into the bracket located in the rear of the machine.
3. Press the front of the Gas Knife into the quick disconnect collar located at the front of the chamber.

4.2 INTEGRATED AIR–TO–LIQUID HEAT EXCHANGER

The Integrated Air–to–Liquid Heat Exchanger (“on–board chiller”) is used to provide cooled water to the Heat Exchanger in the NitroCool™ module. When facility–chilled water is not available, the Integrated Air–to–Liquid Heat Exchanger provides a means of supplying heat dissipation for the NITROCOOL™ module.

A manual flow control valve adjusts cooled water flow to the Heat Exchanger to regulate the temperature. In most circumstances it is advisable to open the valve fully.

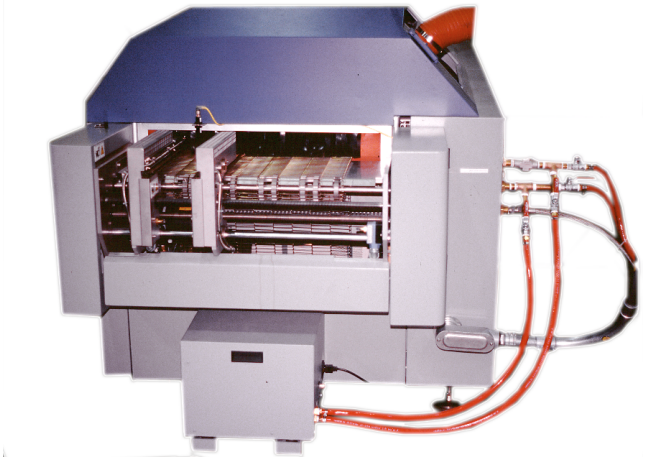

Figure 79: Air–to–Liquid Heat Exchanger

NOTE This unit does not meet the heat dissipation requirements of the standard inert cooling module.

4.3 REFRIGERATED ON–BOARD RECIRCULATING CHILLER

The Refrigerated On–Board Chiller provides cooled water to the OmniFlo™ and recirculates it through the chiller. This continuous process through a closed loop contains the system pump, temperature sensor, reservoir, and internal and external plumbing line and fittings. The recirculating chiller maintains process tempereature by energizing the condensing unit on demand from the temperature controller output.

Table 3: Refrigerated On–Board Chiller Technical Data

Compressor rating	1.5 HP Compressor
Cooling Capacity	4900 W @ 20° C water temp and 20° ambient air
Temperature Range	5° C (41° F) to 30° C (86° F)
Pump Capacity	Positive Displacement Pump rated at 4.4 gpm @ 20 psi
Reservoir Capacity	5.6 l (1.5 gal.)
Filters	Internal Condenser Air Filter, Internal In-Line Particle Filter
Electrical Power	208–230V AC (+10%, -5%), 60 Hz, 1PH, 19.6 Amps 200V AC (+10%, -5%), 50 Hz, 1PH, 19.4 Amps
Case Dimensions	110.2 cm W x 41.4 D x 45.7 cm H (43.4”W x 16.3”D x 18”H)
Low Flow Switch	Preset to 1.0 gpm

The chiller is preset to a temperature of 7.2° C (45° F). Through testing, this is found to be the optimal setpoint for the chiller. The chiller is most efficient when the compressor runs continuously. At the preset set point, it optimizes the compressor operation. Actual water temperature is process dependent, but remains between 7.2° C (45° F) and 30° C (86° F).

If filling the chiller for the first time, it is necessary to fill the reservoir, turn the chiller On for a few seconds, turn it Off and fill it again. Repeat this process until the water level is within 13 cm (about 5”) from the top while running. Overfilling the reservoir causes the water to overflow when the unti is turned Off.

Access the reservoir through the small cover located on top of the chiller. Do not use de–ionized water or automotive antifreeze in the reservoir. The rust inhibitors in the automotive antifreeze causes premature failure of the pump seals and voids the warranty.

Soft or distilled water is recommended. Avoid using local water with high mineral content.

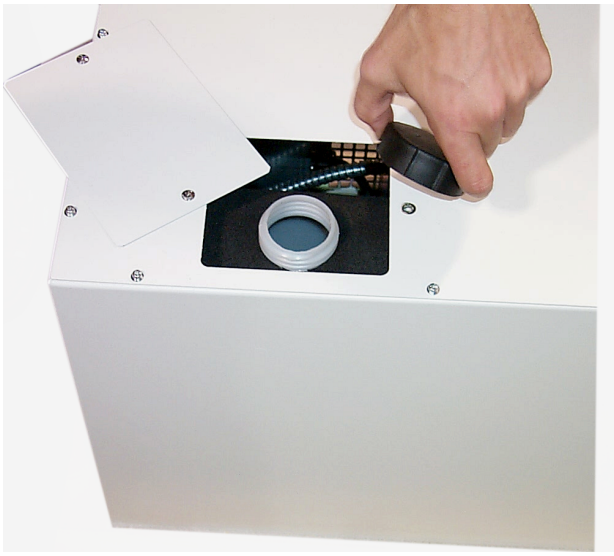

Figure 80: Accessing Chiller Reservoir

OPERATION OF THE DIGITAL TEMPERATURE CONTROL

NOTE The following parameters are preset at the factory. They do not need adjusted unless the unit has malfunctioned and reprogramming is necessary.

The controller is a micro–processor based, fully programmable process controller for single temperature set point applications. The front keypad offers alphanumeric prompts to configure the controller for specific applications. The digital temperature control is

located instide of the chiller cabinet. To access the controller, it is necessary to remove the 24 Phillips head screws securing the cover, and remove the cover.

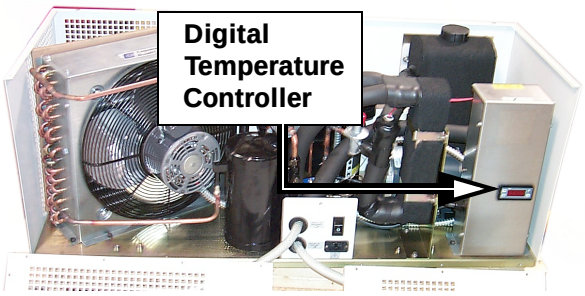

Figure 81: Chiller Interior (Rear View)

Front Keypad:

Set: Pushed once, the set point value displays for 3 seconds (LED “out” blinks). Change the set point with the “UP” or “DOWN” button.

UP: Used to increase the set point value, as well as teh parameter value when programming. When held down for a few seconds, the change rate accelerates.

Down: Same function as “UP” except values decrease.

LED “OUT”: Status llight of the output. Blinks when in set point display/change mode or during programming.

Parameter Programming

Hold the “SET” button down for more than 4 seconds to access the programming mode. The first parameter displays while the status light LED “OUT” remains blinknig during the programmin period. Other parameters are accessed with the “UP” and “DOWN” button. With the “SET” button, the current actual setting of each parameter displays. To change a parameter setting, push the “SET” plus the “UP” or “DOWN”.

Description of Parameters:

d1: Set point differential. The switching differential (hysteresis) can be set to a positive value (make on rise) or a negative value (make on fall). See parameter HC1.

LS1: Lower Set 1. This is the lower limit below which the user cannot change the set point; normally set at the lowest value recommended for the sensor.

HS1: Higher Set 1. Similar to ‘LS1’, except this is the upper limit for the setpoint.

od: Output delay. This provides a delay selection for the output in applications where “noise” may cause brief erroneous signals from the sensor to the controlller.

CAL: Calibration. this adjusts the read out, either increase or decrease.

HC1: Heating/Cooling mode. Relay switch function. H = heating; C = cooling.

NOTE The controller must be in th ecooling (C) mode for proper operation with the OmniFlo™.

rP1: Relay protection. Determines the status of the relay in case of sensor defect. ro = relay open and rc = relay closed.

LF1: LED function. Determines whether the status light is On or Off in relation to the output.
di = direct = light is On when the output is energized.
in = reverse = light is Off when the output is energized.

dP*: Decimal point. Choose whether the resolution is required with or without decimal point.
oF = without decimal point.
on = with decimal point.
*a) The decimal point of models with current or voltage input is shifted: the actual value of parameter Lci and Hci must be multiplied by 10.
*b) On all versions, if a unit is

changed from “without decimal point” to “with decimal point”, all paramter values expressed in degrees will automatically be divided by 10, **including the set point**.

hdd: Half digit display. This sets the display mode for the digit that is on the right of the display. If half digit display is selected (“Y”) then the last number is always either a 0 or a 5. If half digit display is not selected (“N”) then the last number displays the actual value represented by the digits 0–9. For example:

hdd=n — 070, 074, 079 (no decimal point) or 70.0, 70.4, 70.9 (with decimal point)

hdd=y — 070, 075, 080 (no decimal point) or 70.0, 70.5, 80.0 (with decimal point)

tAB: Table of parameters. Index of parameter’s configuration. This is preset at the manufacturer and is not adjustable.

Table 4: Default Settings — Standard Models

PARAMETER	DESCRIPTION	DEFAULT	UNIT OF MEASUREMENT
d1	Differential set point	.+2 (C) /-2 (H)	°C/°F
LS1	Lower Set limit	Preset at Manufacturer	°C/°F
HS1	Higher Set Limit	Preset at Manufacturer	°C/°F
od	Output delay	00	Seconds
CAL	CALibration	00	°C/°F
HC1	Heating/Cooling	H/C	flag
rP1	relay Protection	ro	flag
LF1	LED Function	di	flag
dp	Decimal Point	oF	flag
hdd	half digit display	not adjustable	flag
tAB	table or parameters	not adjustable	flag

SYSTEM MAINTENANCE

The refrigerated chiller requires minimal maintenance. Inspect the chiller weekly to ensure that there are not abnormal noises or leaks. Any abnormal sound or substantial increase in noise leve may indicate an impending fan or pump problem.

If fluid is leaking from the unit, it is necessary to determine the source of the leak. Also, any significant drop in the coolant level requres investigation.

Reservoir

Periodically inspect the fluid inside the reservoir. The fluid should be clean and free of algae growth. If cleaning is necessary, flush the reservoir with a cleaning fluid compatible with the system and the cooling fluid. It is important to flush, drain and refill the chiller every 6 months .

Keep the reservoir cover in place to restrict the growth of algae.

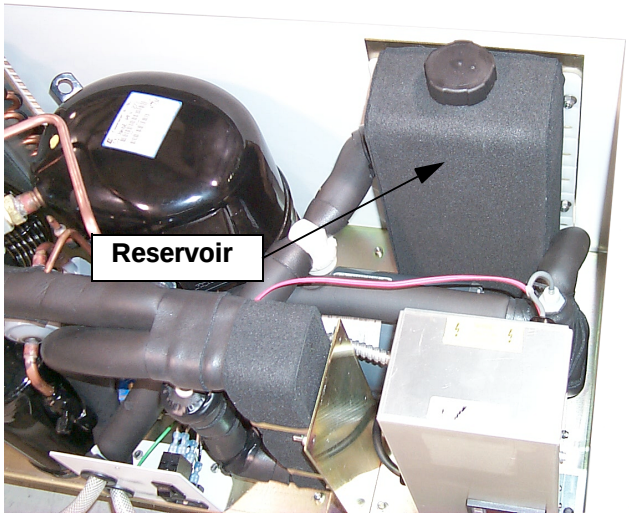

Figure 82: Chiler Interior Components

Water Filter

A dirty water filter decreases system performance in a short period of time. Clean the filter after the first month of operation to ensure it is running at maximum capacity. After the initial cleaning, it is necessary to clean the filter every six (6) months under normal operating conditions. Extreme process conditions may require more frequent cleaning.

To access the water filter it is necessary to remove the 24 Philips head screws that secure the cover to the chiller. Remove the cover. The water filter is contained within a white plastic case located in the plumbing line attached to the side of the reservoir. Unscrew the bottom of the case by rotating it counterclockwise. Remove the mesh filter and rinse it to remove any sediment that is present. Replace the filter and the cover.

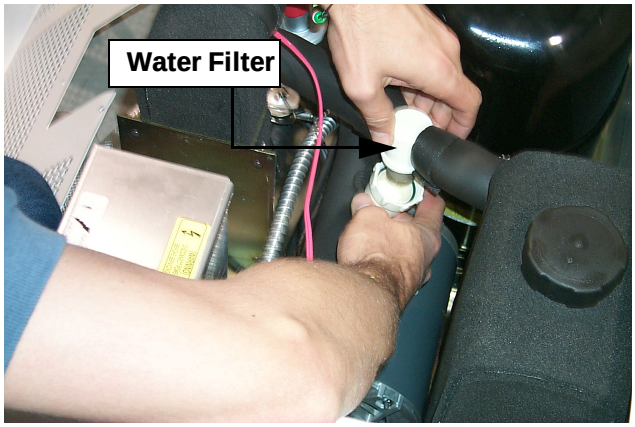

Figure 83: Replacing Water Filter

Air Filter

Visually inspect the filter monthly until a pattern is established for the frequency of replacement. During proper operation the unit circulates substantial amounts of air. A build up of dust or debris on the air filter leads to a loss of cooling capacity. The frequency of replacement depends on the process environment.

To access the air filter it is necessary to remove teh 24 Phillips head screws that secure the cover to the chiller. Remove the cover. The air filter is at the intake of the blower. It is wedged into the unit at a diagonal. It is necessary to gently pull the sides of the chiller free of the air filter to gain the clearance to remove it.

Figure 84: Replacing the Air Filter

4.4 EXTENDED COOLING

Description

Extending Cooling provides additional cooling zones for the OmniFlo™–7 and OmniFlo™–10. The OmniFlo™–7 has one (1) additional zone and the OmniFlo™–10 has two (2) additional zones.

The cooling zones have a recirculating blower in the top section only and have a separate nitrogen feed to provide recirculated inert air. Each zone has a heat exchanger with quick disconnects.

The cooling in the first zone may be standard inert or NitroCool. Standard inert cooling modules comprise the remaining zones.

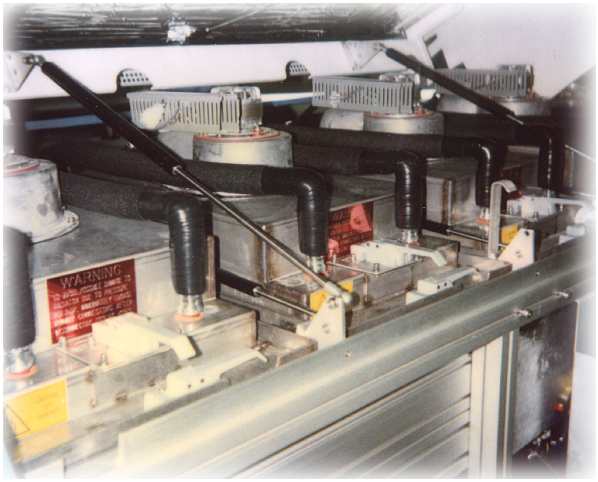

Figure 85: Extended Cooling (Hood Open)

Blower Rating

The blower flow is rated at 270M^3/hr (160 cfm) for 60 Hz. and 256 M^3/hr (152 cfm) for 50 Hz operation. All blowers have three (3) speed control, and Zones 2 and 3 run at the same speed.

Printed circuit board (PCB) exit temperatures are typically 45° — 70° C (113° — 158° F) cooler at the end of the reflow process when Extended Cooling is utilized.

Software Configuration

Extended Cooling is configured in the software at the factory. To verify the machine is configured for the option, select Setup > Configure > Options > Inerting/Cooling.

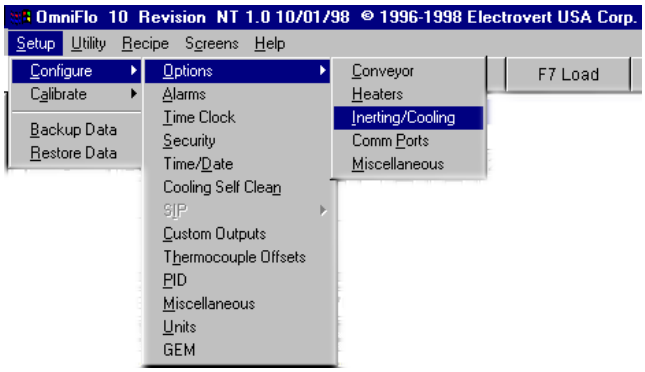

Figure 86: Setup Menu

The Inerting/Cooling Screen appears. If NitroCool is installed in the first zone, select the circle next to NitroCool. Otherwise, select the circle next to “Inert” under “Cooling #1.

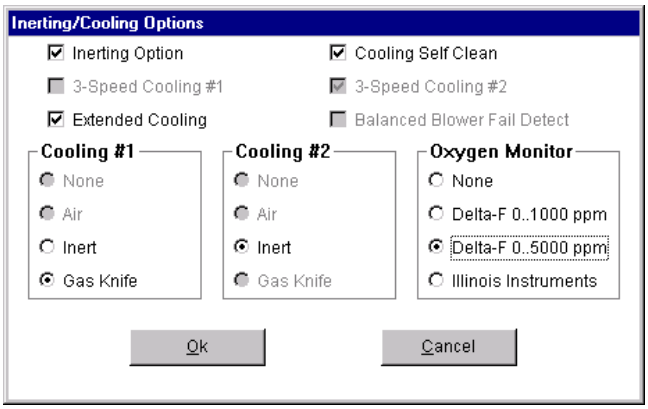

Figure 87: Inerting/Cooling Screen Configured for Extended Cooling

The Process Graphics Screen reflects Extended Cooling configuration by displaying the additional cooling zones.

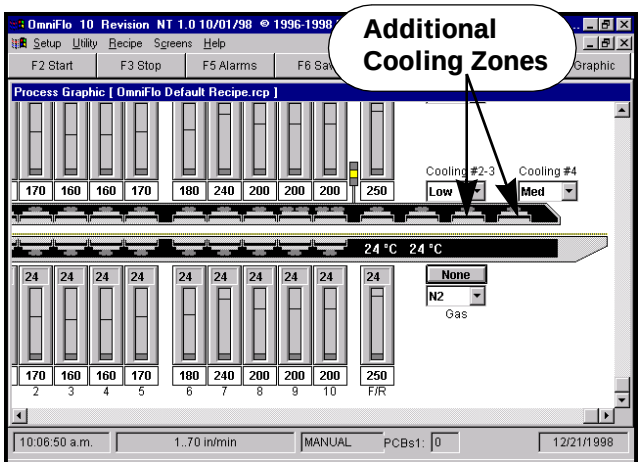

Figure 88: Process Graphics Screen Configured for Extended Cooling (OmniFlo™–10)

Maintenance

Maintenance of the Extended Cooling Zone involves Gas Knife maintenance, if applicable, as detailed in the previous section.

Clean the cross–flow blowers every 120 — 150 hours of use as detailed in the OmniFlo™ Series Maintenance Manual Section 9.13.

4.5 EXTERNAL COOL

External Cool consists of an additional cross–flow blower mounted on the Unload End of the OmniFlo™ System. Exit temperatures are typically 15° – 20° C (59° – 68° F) cooler using this option.

Figure 89: External Cooling Module

The External Cool module mounts directly on the Unload End of the machine using existing screws.

Figure 90: Unload End before Mounting External Cool Module

The External Cool blower is wired electrically into a terminal block. Refer to the schematics that shipped with the machine for electrical details.

The module has an adjustable damper to adjust the volume of air flow. The damper plate is fastened to the blower support tray with M5 Hex Head bolts. To adjust the flow of air, use an M8 wrench to loosen the bolts securing the damper. Slide the damper in the applicable direction.

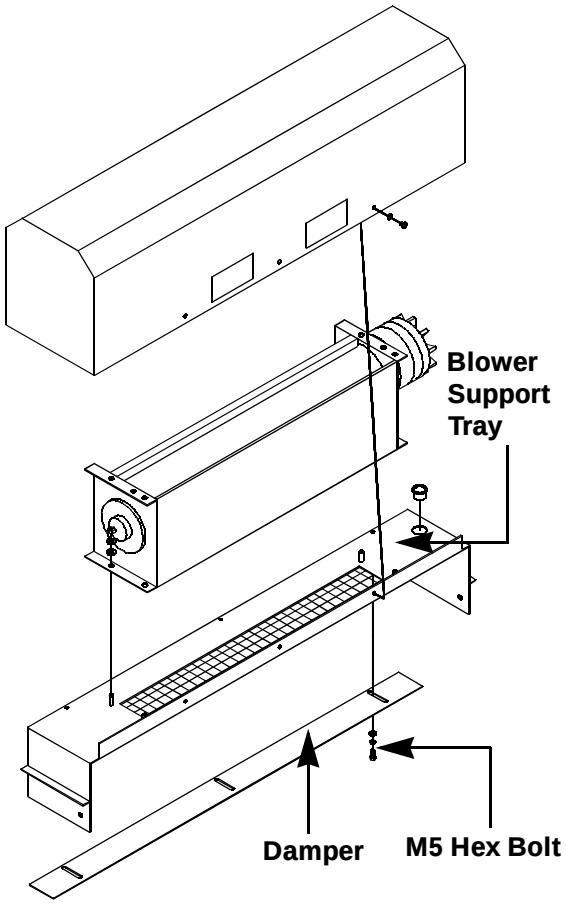

Figure 91: External Cool Assembly

Maintenance

Maintenance of the External Cool blower is essentially the same as for any other blower in the cooling zone. Refer to Sections 9.10 through 9.12 in the OmniFlo™ Series Maintenance Manual.

SECTION 5: GEM (GENERIC EQUIPMENT MODEL)

The SEMI Generic Equipment Model (GEM) standard was developed by a group of major semiconductor manufacturers. It defines a set of capabilities equipment must have to work effectively with semiconductor factory automation systems.

Typically a single host computer manages multiple machines on a line. The host computer monitors equipment operations through collection events and alarms. Collection events report significant normal and abnormal activity. Alarms notify the host computer when an alarm condition is detected.

5.1 GEM TERMINOLOGY

GEM Equipment An "intelligent system" that complies to the GEM standard and "communicates with a host." [SEMI E4, 2.1]

Status Variables "Status variables may include any parameters that can be sampled in time such as temperature or quantity of a consumable." [SEMI E5, 6.5]

Equipment Constants Equipment constants are "settable by the Host" [SEMI E5 6.6]

Data Variables Data variables "may only be valid upon the occurrence of a particular event." [SEMI E5 6.6]

Collection Event A collection event is "a detectable occurrence significant to the equipment." It is "considered to be significant to the host." [SEMI E30,2]

Report A set of variables

Host "An intelligent system which communicates with the equipment." [SEMI E4, 2.1]

Alarm "An alarm is related to any abnormal situation on the equipment that may endanger people, equipment, or material being processed." [SEMI E30, 2]

Process Program A recipe.

Recipe A file containing a set of instructions for the equipment.

SECS-II Message Each unique SEC-II message is identified by its stream number (S) and function number (F).

HSMS–SS High Speed Message Service–Single Session — defines TCP/IP network communication used for host – equipment communication. It is replacing the SECS–I standard.

SECS–I SECS–I is the SEMI Equipment Communications Standard 1 Message Transfer defines RS–232 serial communication.

SECS–II SECS–II is the SEMI Equipment Communications Standard 2 Message Content. GEM is an implementation of the SECS–II standard.

Data Gathering

There are six methods of data gathering through GEM:

- Status variable values may be requested at any time.
- Equipment constant values may be requested at anytime.
- Status variable, data variables and equipment constant values may be generated in a report at any time
- Reports may be attached to a collection event so that the report is automatically transmitted with the collection event.
- Status variables may be transmitted periodically through a host–defined trace, so that values are transmitted at a regular interval.
- Host–defined limit boundaries can be set to monitor when a specified variable goes out of a setpoint range. This eliminates the need for the host to poll critical values if the host is only concerned that the actual values remain within setpoint values.

5.2 CONFIGURING GEM IN THE OMNIFLO™ SOFTWARE

The configuration for OmniFlo™ GEM is in the OmniFlo menu. To access the GEM configuration menu, select Setup > Configure > Configure GEM from the menu bar. The menu displays configuration for both serial and HSMS (TCP/IP based Ethernet) GEM.

The two GEM modes, serial and HSMS are mutually exclusive.

The device ID is the device number that the OmniFlo™ system uses to identify itself. Valid ranges are 0 – 32767.

“Establish Comm Delay” is the time in seconds that the OmniFlo™ waits to issue a connection request after the communications state Valid ranges are 0 – 1800 seconds.

HSMS GEM

IP Address The Ethernet address of the PC on which the OmniFlo™ is running. This is on the system itself, not the host (remote) machine.

T3 Timeout Reply timeout, the maximum time in seconds that the OmniFlo™ waits after sending a primary message. Valid range is 1 – 120 seconds.

T6 Timeout Control Message Reply timeout, the max time in seconds the OmniFlo™ waits after sending a Connect request or a Linktest request message. If the T6 expires the OmniFlo™ application terminates the TCP/IP connection. The T6 value should be less than T3, with a typical value of 20 seconds.

Assurance

T7 Timeout Connect Timeout, the maximum time in seconds the OmniFlo™ waits for the HSMS select request control message after the TCP/IP connection is established. A typical value is 10.

T8 Timeout Inter–character timeout. A typical value is 10 seconds.

Circuit The frequency at which the OmniFlo™ application issues the HSMS Linktest control transaction to verify that the link remains functional. A smaller value causes more frequent control messages. SDR sends Linktest transactions only during idle periods. If 0 is specified, SDR does not initiate linktest transactions, and does not verify that the link remains active. A typical value is 15 or 0.

The following screen depicts GEM configured for HSMS communication. The Device ID is set to 20, the Establish Comm Delay is 30, and Port 1 is selected. The IP address is 456.4F4.43A.000. Timouts are entered as follows: T3 is 30 (seconds), T6 is 10 (seconds), T7 is 10 (seconds) and T8 is 10 (seconds).

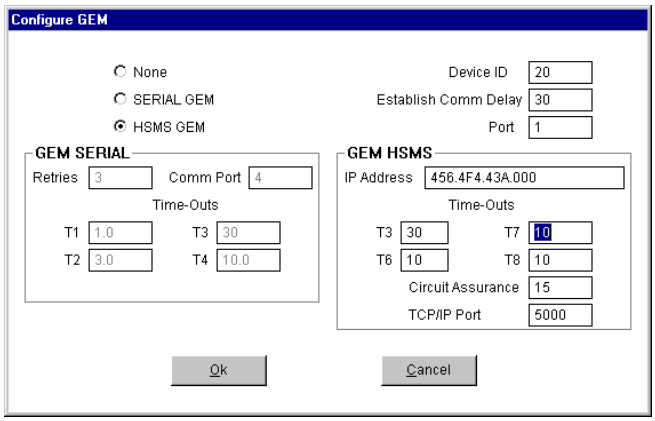

Figure 92: GEM Configuration Window

SERIAL GEM

T1 Timeout Inter–character timeout. Valid range is 0.1 to 25.5 seconds. Typical value is set at 0.5 seconds.

T2 Timeout Block Protocol timeout. Valid ranges are 0.1 to 25.5 seconds. Typical value is set at 3.0 seconds.

T3 Timeout Reply timeout, the maximum time in seconds that the OmniFlo™ waits after sending a primary message. Valid range is 1 – 120 seconds. Typical value is set at 30 seconds.

T4 Timeout Inter–Block timeout. The range is from 1.0 to 120 seconds. A typical value is 10 seconds.

Retries Message retry limit. The valid range is 0 to 31. A typical value is 3.

Com Port Denotes which com port serial GEM uses.

The following screen depicts GEM configured for Serial communication. Retries is set to 3 and Comm Port is set to 4. The time–outs are set as follows: T1 is 0.5 (seconds), T2 is 3 (seconds), T3 is 30 (seconds) and T4 is 10 (seconds).

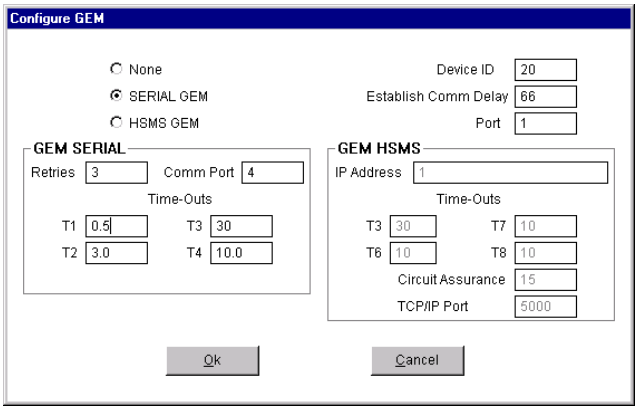

Figure 93: GEM Configuration Window

5.3 OMNIFLO™ SYSTEM GEM FUNCTIONALITY

The following ourlines the GEM functionality implemented for the OmniFlo™ System. Each area of GEM functionality is explained in terms of which GEM streams and functions are supported.

GEM EQUIPMENT VARIABLES

The GEM Equipment variables implemented are divided into Status Variables and Equipment Constants.

Variables Format

The format of all Equipment Variables defined in this document is:

Variable <Format [count]>”xxxxID” nnnnn, “Units” = units

Where:

“Variable” is the name of the OmniFlo™ variable

“Format” is a format defined by GEM E5–94 standard. The possible formats and “codes” are:

- ACSII–”A”,
- Binary – “B”,
- SIgned Integer 1, 2, and 4 byte — “I1”, “I2” or “I4”
- Unsigned Integer 1, 2 and 4 byte “U1”, “U2” or “U4”
- Floating Point 4 and 8 byte — “F4” or “F8”
- Boolean

“Count is the number of elements in the item. A “x...y” indicates that there can be x to y elements in the item. GEM does not provide for “arrays” of items as such, but allows “lists”, which are groups of items. Lists can contain specific items or other lists.

“xxxxID” is either Status Variable SV or Equipment Constant — EC ID. Nnnnn is the values assigned.

“Units” is the units for the variable. Where possible the unites for the GEM OmniFlo are based on the GEM E5–94 section 9.4 “SECS–II Units of Measure Identifiers.”

Standard GEM Equipment Constants

These Equipment Constants are part of the standard GEM definition. These define several aspects of GEM operation, such as initialization, default message usage etc.

1. GemOfflineSubstrate <U1 [1]> – VID = 30004. This defines the “Off–line” substrate that the Equipment GEM enters into by default. Values are:

   1 — offline / Equipment offline
   2 — offline / Attempt online
   3 — offline / Host offline (Default)

2. GemInitControlState <U1 [1]> – VID = 30002. This defines the initial Control State that the Equipment GEM enters into by default. Values are:

   1 — Offline
   2 — Online (Default)

3. GemOnLineSubstate <U1 [1]> - VID = 30006 This defines the Online substate that the Equipment enters into be default.

   4 — On-line / Local (Default)
   5 — On-line / Remote

4. GemOnLIneFailed <U1 [1]> - VID = 3000 - This defines the On-line substate that the Equipment transitions to after a failed attempt to go On-line. Values are:

   1 — Off-line / Equipment Off-line
   3 — Off-line / Host Off-line(Default)

5. GemConfigConnect <U1 [1]> - VID = 30010 - This defines the message used to establish communications with the Host.

   0 — S1/F1
   1 — S1/F65
   2 — S1/F13 (Default)

6. GemEsabCommDelay <U2 [1]> - VID = 30012, Units = seconds Defines the delay between attempted Connection requests. Valid range is 0 to 1800 seconds. A value of 0 indicates that the Equipment does not attempt a Connection Request, but waits for the Host to establish communications. The Default value is 30 seconds.

7. GemPollDelay <U2 [1]> - VID = 30014, Units = seconds Defines the heartbeat or S1/F1 rate from the Equipment. Range is 0 - 1800 seconds. A value of 0 indicates that S1/F1 will not be sent by the Equipment. (This is not considered to be GEM compliant, since the S1/F1 is the mechanism that the Host uses to determine that the SECS-I link has failed.)

8. GemInitCommState <U1 [1]> – VID = 30016 This defines the initial communication state upon power up. Values are:

   0 — Disabled

   1 — Enabled (Default)

9. GemConfigAlarms <U1 [1]> - VID = 30018 Defines the default Stream 5 messages to be used to report Alarms. Values are:

   0 — S5/F1 (Default)

   1 — S5/F71

   2 — S5/F73

10. GemConfigEvents <U1 [1]> - VID = 30020 Defines the Stream 6 messages used to report Events. Values are:

    0 — S6/F9 & S6/F3

    1 — S6/F11 & S6/F13 (Default)

11. GemConfigSpool <U1 [1]> - VID = 30102 Defines the operation of the Equipment side Spooling in the event that communications fail between the Host and Equipment. Values are:

    0 — Spooling Disabled

    1 — Spooling Enabled(Default)

12. GemOverWriteSpool <BOOLEAN [1]> - VID = 30104 Defines the action the Equipment takes when the Spool becomes full. Values are:

    TRUE — The Spool is overwritten, with older messages deleted first.

    FALSE — The Spool is not overwritten, and the newer messages are discarded.

13. GemMaxSpoolTransmit <U4 [1]> - VID = 30106 Defines the maximum number of messages the Equipment will transmit in response to a single S6/F23 "Transmit Spooled Messages" request from the Host. A value of 0 (Default) indicates that all messages will be sent.

14. GemRpType <BOOLEAN [1]> - VID = 17 Defines which messages are used to report events, either Annotated or Normal. Possible values are:

    TRUE — Annotated Report, using S6/F3 & S6/F13 messages.

    FALSE — Normal Report, using S6/F9 & S6/F11 messages

GEM STATUS VARIABLES

These are GEM Standard status variables, which report the state of various aspects of the Equipment side GEM. These values are not assignable, but can be used for example, by the Stream 1 / Function 3 , Selected Equipment Status Request from the Host.

1. GemControlState <U1 [1]> SVID 11002. The current Control state of the Equipment GEM. Possible values returned are:

   1 — Off-line / Equipment Off-line

   2 — Off-line / Attempt On-line

   3 — Off-line / Host Off-line

   4 — On-line / Local

   5 — On-line / Remote

2. GemPreviousControlState <U1 [1]> SVID 11004. The previous state of the Control State of the Equipment GEM. Possible return values are identical to GemControlState.

3. GemPreviousProcessState <U1 [1]> SVID 11006. The previous value of the Equipment Process state.

4. GemSOFTREV <A [6]> - SVID = 11008 Returns the Equipment GEM Software Revision number. Currently this is not the OmniFlo software revision.

5. GemDeviceName <A [20]> - SVID = 11010 Returns the Equipment Name, "OmniFlo".

6. GemEventsEnabled <U4 [n]> - SVID = 11012 Returns the list of the U4 CEIDs which are currently enabled. This Host can enable or disable individual events via the S2/F37 Enable / Disable Event Reports.

7. GemLinkState <U1 [1]> - SVID = 11014 Returns the value of the current communication state. Possible Values are:

   0 — Disabled

   1 — Enabled / Not Communicating

   2 — Communicating

8. GemMDLN - <A [6]> - SVID = 11016 Returns the value the "Model Number" to the Host. Currently this is simply the string "NT".

9. GemPreviousCEID <U4 [1]> - SVID 11018 Returns the value if the last CEID.

10. GemTime <A [12] - SVID = 11020 Returns the Equipment's clock value in the form "yymmddhhmmss".

11. GemSpoolStartTime <A [16]> - SVID = 11102 Returns a clock string value that of the time when Spooling is initiated on the Equipment side of the GEM link due to a communication failure with the Host. The 16 character string is of the format "YYYYMMDDhhmmsscc", where:

    YYYY = Year, MM = Month, DD = Day, hh = hour, mm = minute, ss = second and cc = hundreths of seconds.

12. GemSpoolFullTime <A [16]> - SVID = 11104 Returns the clock value string value of the time at which the Equipment side Spool is filled. The string is of the format YYYMMDDhhmmsscc, the same as GemSpoolStartTime.

13. GemSpoolCountActual <U4 [1]> - SVID = 11106 Returns the number of primary messages currently contained in the Equipment's Spool area. This values ceases to increase once the Equipment Spool is full.

14. GemSpoolCountTotal <U4 [1]> - SVID = 11108 Returns the total number of primary messages written to the Equipment Spool area since spooling began. This value is incremented regardless of whether the Spool is full, representing the total number of messages attempted to be written to the Spool.

15. GemSpoolState <U1 [1]> - SVID = 11110 Returns the current status of the Equipment Spool. Possible Values are:

    1 - Spool Inactive

    2 - Spool Active

16. GemSpoolLoadSubstate <U1 [1]> - SVID = 11112 - Returns the Spool Load state the Equipment is in within the Spool Load super-state (Refers to SEMI Standards for full State Model of GEM Spooling State). Indicates the current state of the Equipment Spool loading. Possible values are:

    6 — Spool Not Full 7 — Spool Full

17. GemSpoolUnloadSsubstate <U1 [1]> - SVID - 11114 - Returns the Spool Unload State the Equipment is currently in the Spool super-state. Possible values are:

    3 — Purge Spool
    4 — Transmit Spool
    5 — No Spool Output

18. GemAlarmId <U4 [1]> - SVID = 22 - Returns the ALIS of the last alarm.

19. GemAlarmsEnables <U4 [n]> - SVID = 23 - Returns a list of the "n" ALIDs for the set of enabled Alarms.

20. 20. GemAlarmsSet <U4 [n]> - SVID = 24 - Returns a list of the "n" ALIDs for all alarms which are on (set).

21. GemAlarmState <U4 [1]> - SVID = 25 - Returns the transition type of the last Alarm message. A "0" indicates that the last Alarm message was a transition to an "OFF" Alarm state and a "1" indicates that the last Alarm message was a transition to an "ON" Alarms state.

22. GemASer <U4 [1]> - SVID = 26 - Returns a running count of Alarm transitions that have occurred on the Equipment. This does not indicate how many Alarms where set, but how many transitions occurred.

OMNIFLO STATUS VARIABLES

These are the Status Variables that the OmniFlo™ control system will be able to report back to the Host. While Status Variables can be reported to the Host at any time, these values are actually valid only while the Equipment is running.

At this point no conversions are done on the status variables for units. The values reported are in imperial units only. Also if no "count" is included in the definition then it is 1.

The base value for Status Variables will be 10000.

1. UpperHeater <F4 [10]> SVID 10002, Units = degF - The upper Heater actual temps.

2. LowerHeater <F4 [10]> SVID 10004, Units = degF - The lower Heater actual temps.

3. FrontRailHeater <F4> SVID 10006, Units = degF - The Front Rail Heater actual temp for Conveyor #1.

4. RearRailHeater <F4> SVID 10008, Units = degF - The Rear Rail Heater actual temp for Conveyor #1.

5. ConvSpeed <F4> SVID 10010, Units = in / min - The conveyor #1 actual speed

6. ConvWidth <F4> SVID 10012, Units = in - The actual conveyor width of Conveyor #1.

7. RelBoardNum <I4> SVID 10014 - The actual number of relative PCBs processed.

8. OxygenPPM <I2> SVID 10016, Units = PPM - The density of Oxygen PPM in the heater chamber.

9. ConvectionFans <I2> SVID 10018 - Actual speed of Convection Fans. Possible values are:

    1 — Low Speed
    2 — Medium Speed
    3 — High Speed

10. Cooling1FanSpeed <I2> SVID 10020 - Actual speed of the Cooling #1 Fan Speed. Possible values are:

    1 — Low Speed
    2 — Medium Speed
    3 — High Speed

11. Cooling2FanSpeed <I2> SVID 10022 - Actual speed of the Cooling #2 Fan Speed.
    1 — Off
    2 — Low Speed
    3 — Medium Speed
    4 — High Speed

12. Gas <I2> SVID 10024 Presence of Gas in inerting chamber

13. PcbSupport <I2> SVID 10026 Existence of PCB support

14. PcbSupportWidth <F4> SVID 10028, Units = in Width of PCB support

15. CoolingTemp1 <F4> SVID 10030, Units = degF Actual temp of Cooling Zone #1.

16. CoolingTemp2 <F4> SVID 10032, Units = degF Actual temp of Cooling Zone #2.

17. EntryPcbs <I2> SVID 10034 Actual no. of PCBs being tracked by Entry Photocell for Conveyor #1.

18. ExitPcbs <I2> SVID 10036 Actual no. of PCBs being tracked by Exit Photocell for Conveyor #1.

19. Cooling4FanSpeed <U1> SVID 10038, Actual Fan Speed of Cooling Fan #4. Possible values are:
    1 — Off
    2 — Low Speed
    3 — Medium Speed
    4 — High Speed

20. CoolingTemp4 <U2> SVID 10040, Units = degF - Actual temp of Cooling Zone #4.

21. FrontRailHeater2 <F4> SVID 10042, Units = degF - Actual temp of Front Rail Heater for conveyor #2.

22. RearRailHeater2 <F4> SVID 10044, Units = degF - Actual temp of Rear Rail Heater for conveyor #2.

23. Conv2Speed <F4> SVID 10046, Units = in / min - Actual speed of conveyor #2.

24. Conv2Width <F4> SVID 10048, Units = in - Actual width of conveyor #2.

25. RelBoardNum2 <I4> SVID 10050 - Actual number of relative boards for conveyor #2

26. EntryPcbs2 <I2> SVID 10052 - Actual number of boards being tracked by Entry Photocell #2 for conveyor #2.

27. ExitPcbs2 <I2> SVID 10054 - Actual number of boards being tracked by the Exit Photocell for conveyor #2.

28. RelBoard2 <U1> SVID 10058 - Indicates the relative board No. processed by Conveyor #2. Range 0 to 999999.

29. MachineState <I2> SVID 10060 - Indicates the Current Processing status of the machine. Possible values are:
    1 — Manual
    2 — Starting
    3 — Running
    4 — Stopping

OMNIFLO DATA VARIABLES

Data Variables represent data that is generated as a result of the processing performed on raw material passed through the Equipment. The function of the OmniFlo™ Equipment being a reflow oven is to perform a manufacturing process on PCBs. For this reason there is no appreciable amount of data generated by the Omniflow Equipment, and currently no Data Variables. In future software releases of the Omniflow control system, things like profiling may produce data, which would fall into this category.

OMNIFLO EQUIPMENT CONSTANTS

Equipment Constants are values that are used to control the Equipment, the operational parameters essentially. These values usually correspond to the items found in an Equipment's recipe file and / or "system" file, which are used to fine-tune individual pieces of Equipment.

The Omniflow Equipment Constants are taken from the Recipe file ("ofrecipe.db") and the system file ("ofsystem.db"). The Equipment Constants ID (ECID) start at 20000. For all ECs of type Boolean the options are the standard 1 = True, 0 = False. The Equipment Constants are comprised of several groups. Each subsequent group has its "base" Equipment Constant ID.

OmniFlo Machine Configuration

The first group listed is Equipment Constants related to machine configuration. These items define the components and makeup of the Omniflow machine. These are:

1. CfgLanguage <U1> ECID 20002 The Language the Equipment runs interface in. The possible values for CfgLanguage options are:
   1 — English
   2 — French
   3 — Deutsch
   4 — Italiano
   5 — Espanol

2. CfgConvRightToLeft <Boolean> ECID 20004 Indicates whether the conveyor system runs Right to Left instead of the conventional Left to Right.

3. CfgConveyorNo2 <Boolean> ECID 20006 Indicates whether the second conveyor is configured into the system.

4. CfgConveyorType1 <U1> ECID 20008 Specifies which type of conveyor is on machine for conveyor 1. Options are 1 = Belt, 2 = Rail.

5. CfgConveyorType2 <U1> ECID 20010 Specifies which type of conveyor is on machine for conveyor 2. Options are 1 = Belt, 2 = Rail.

6. CfgRailDriveSpocket1 <U1> ECID 20012 Specifies the no. of teeth on the rail drive sprocket for conveyor 1. Options are 1 = 18 teeth, 2 = 19 teeth.

7. CfgRailDriveSpocket2 <U1> ECID 20014 Specifies the no. of teeth on the rail drive sprocket for conveyor 2. Options are 1 = 18 teeth, 2 = 19 teeth.

8. CfgExitEndPhotocell1 <Boolean> ECID 20016 Specifies whether an exit photocell is present for conveyor 1.

9. CfgExitEndPhotocell2 <Boolean> ECID 20018 Specifies whether an exit photocell is present for conveyor 2.

10. CfgWidthBeforeHome1 <U2> ECID 20020, Units = In. Number of moves before homing conveyor 1. Range is from 0.0 to 999.0.

11. CfgWidthBeforeHome2 <U2> ECID 20022, Units = In. The number of moves homing conveyor 2. Range is from 0.0 to 999.0.

12. CfgAutoWidthAdjust1 <Boolean> ECID 20024 Specifies whether Auto Width Adjust is configured for conveyor 1.

13. CfgAutoWidthAdjust2 <Boolean> ECID 20026 Specifies whether Auto Width Adjust is configured for conveyor 2.

14. CfgRailHeaters1 <Boolean> ECID 20028 Specifies whether Rail Heaters are configured for conveyor 1.

15. CfgRailHeaters2 <Boolean> ECID 20030 Specifies whether Rail Heaters are configured for conveyor 2.

16. CfgMtzWidthEncoder1 <Boolean> ECID 20032 Specifies whether the Digital Motorized Width Encoder is configured for conveyor 1. This option is mutually exclusive with the MtzWidthXducer for conveyor 1.

17. CfgMtzWidthEncoder2 <Boolean> ECID 20034 Specifies whether the Digital Motorized Width Encoder is configured for conveyor 2. This option is mutually exclusive with the MtzWidthXducer for conveyor 2.

18. CfgMtzWidthXducer1 <Boolean> ECID 20036 Specifies whether the Analog Motorized Width Transducer is configured for conveyor 1. This option is mutually exclusive with the MtzWidthEncoder for conveyor 1.

19. CfgMtzWidthXducer2 <Boolean> ECID 20038 Specifies whether the Analog Motorized Width Transducer is configured for conveyor 2. This option is mutually exclusive with the MtzWidthEncoder for conveyor 2.

20. CfgPCBSup1 <Boolean> ECID 20040 Specifies whether the PCB Supports are configured for conveyor 1.

21. CfgPCBSup2 <Boolean> ECID 20042 Specifies whether the PCB Supports are configured for conveyor 2.

22. CfgMtzPCBSup1 <Boolean> ECID 20044 Specifies whether the motorized PCB Supports are configured for conveyor 1. For this to be a valid option for conveyor 1, PCBSup1 must be configured.

23. CfgMtzPCBSup2 <Boolean> ECID 20046 Specifies whether the motorized PCB Supports are configured for conveyor 1. For this to be a valid option for conveyor 1, PCBSup2 must be configured.

24. CfgMachineIF <U1> ECID 20048 Specifies if the type of machine Interface for Conveyor #1. Options are:
    - 0 — None
    - 1 — Custom I/O
    - 2 — SMEMA
    - 3 — Siemens

25. 25. CfgMachineIF2 <U1> ECID 20050 Specifies the type of machine interface for Conveyor #2. Options are:
    - 0 — None
    - 1 — SMEMA
    - 2 — Siemens

26. 26. CfgMachineType <U1> ECID 20054 Specifies which basic type of machine is configured. Options are:
    1 — 5 Zone
    2 — 7 Zone - 194"
    3 — 7 Zone - 199"
    4 — 7 Zone - 212"
    5 —10 Zone
    6 —10 Zone - 256"

27. CfgConvectionSpeedNo1 <U1> ECID 20056 - Specifies the Convection speed for zone #1. Options are: 1 = Normal, 2 = Low

28. CfgUpperHeater <Boolean [10]> ECID 20058 - Specifies whether the Upper Heaters 1 - 10 are configured for the Omniflow oven. Heaters (list elements) 1 - 5 are valid for all systems, Heaters 6 & 7 are valid for 7 and 10 zone systems only and Heaters 8 - 10 are valid for 10 zone systems only.

29. CfgLowerHeater <Boolean [10]> ECID 20060 - Specifies whether the Lower Heaters 1- 10 are configured for the Omniflow oven. This is valid for all systems. Heaters (list elements) 1 - 5 are valid for all systems, Heaters 6 & 7 are valid for 7 and 10 zone systems only and Heaters 8 - 10 are valid for 10 zone systems only.

30. Cfg50HtzPower <Boolean> ECID 20062 - Specifies whether the system uses a 50-Hertz Power.

31. CfgPowerLimiting <U1> ECID 20064 - Specifies if any power limiting is to be enabled. Options are:
    1 — Never
    2 — Startup Only
    3 — Running Only
    4 — Always

32. CfgVoltage <U1> ECID 20066, Units = VAC - Specifies the voltage that the Equipment is to be using. Options are 1 = 220-240 VAC, 2 = 380-415 VAC, 3 = 440-480 VAC.

33. CfgInerting <Boolean> ECID 20068 - Specifies if Inerting is configured for the system.

34. CfgOxygenMonitor <U1> ECID 20070 - Specifies the Oxygen Monitor is configured for this system. This is valid only if Inerting is True. Possible values are:
    1 — None
    2 — Delta F. 0 - 1000 PPM
    3 — Delta F. 0 - 5000 PPM
    4 — Illinois Instruments

35. CfgCooling#1 <U1> ECID 20072 - Specifies the type of Cooling for cooling zone #1. This is a valid option only if CfgInertingCooling is True. If CfgInertingCooling is False, then the option defaults to "Air". Options 1, 3 & 4 are valid only if CfgInertingCooling is True. Options are:
    1 — None
    2 — Air
    3 — Inert
    4 — Gas Knife

36. CfgCooling#2 <U1> ECID 20074 Specifies the type of Cooling for cooling zone #2. This is a valid Option only if CfgInertingCooling is True and the CfgMachineType is not a 5 zone system. Options 1 & 3 are valid only if CfgInertingCooling is True. If CfgInertingCooling is False the option defaults to "Air". Also for some reason option 4 "Gas Knife" is never enabled. Options are:
    1 — None
    2 — Air
    3 — Inert
    4 — Gas Knife

37. CfgCoolingSelfClean <Boolean> ECID 20078 Specifies whether Cooling Self Cleaning is enabled for the system. This is a valid option only if CfgInertingCooling is True.

38. CfgBalanceBlowerDetect <Boolean> ECID 20080 Specifies whether the Balance blower detection is configured for the system. This is a valid option only if CfgInertingCooling is True and CfgCooling#1 is not set to "Gas Knife".

39. CfgThreeSpeedCooling#2 <Boolean> ECID 20082 Specifies whether the Three Speed Cooling Zone #2 is configured in the system. This is a valid option only if CfgCooling#2 is set to "Inert".

40. CfgExtendedCooling <Boolean> ECID 20084 Specifies whether the Extended Cooling Zones are configured for the system. This is a valid option only if the CfgMachineType is a 10–zone system.

41. CfgLightTower <U1> ECID 20094 Specifies which Light Tower mechanism is configured in the system. Options are:
    1 — None
    2 — Mode #1 (Fuji)
    3 — Mode #2
    4 — Hitachi

42. CfgEPS <Boolean> ECID 20096 Specifies if the Emergency Power Supply is configured in the system.

43. ExhaustRelayPresent <Boolean> ECID 20098 Specifies if the Exhaust Relay is present in the machine.

44. CfgExhaustRelay <U1> ECID 20100, Units = Min. Specifies the Exhaust Relay Timer time. Range is from 0 to 120 minutes.

OMNIFLO EQUIPMENT CONSTANTS — SETPOINTS

OmniFlo setpoint are the control setting for the Equipment.

1. CfgConvSpeed <F4> ECID 20110, Units = in/ min Specifies the Conveyor #1 speed. Range 0–70 in./min.

2. CfgConvSpeed2 <F4> ECID 20112, Units = in/min Specifies the Conveyor #2 speed. Range 0 – 70 in / min.

3. CfgGas <U1> ECID 20114. Specifies the type of inerting Gas. Valid only if Inerting (CfgInerting, ECID 20068) is enabled. Valid values are 1 = None, 2 = O2, 3 = N2.

4. CfgUHeaterSP <F4 [5…10]> ECID 20116, Units = Deg F. Sets the setpoints of the Upper Heaters. Range 0 to 536 F.

5. CfgLHeaterSP <F4 [5…10]> ECID 20118, Units = Deg F. Sets the setpoints of the Lower Heaters. Range 0 to 536 F.

6. CfgPPMSP <I2> ECID 20124. Sets the Oxygen Monitor PPM setpoint. Range 0 to 1000 for Delta and Illinois Oxygen Monitors, 0 to 5000 for Delta 0 to 5000 Oxygen Monitor. Valid only if the Oxygen Monitor is configured in the Inerting options.

7. CfgRelBoard1Sp <I2> ECID 20126. Sets the Relative board setpoint for conveyor #1. Range is 0 to 999999.

8. CfgRelBoard2Sp <I2> ECID 20128. Sets the Relative board setpoint for conveyor #2. Range 0 to 999999.

9. CfgPCBMultiplier1SP <U1> ECID 20130. Sets the PCB Multiplier for conveyor #1. Range 1 to 100.

10. CfgPCBMultiplier2SP <U1> ECID 20132. Sets the PCB Multiplier for conveyor #2. Range 1 to 100.

11. CfgPCBLengthSP <F4> ECID 20134, Units = in. Sets the PCB Length for Conveyor #1. Range 2.0 to 100.0.

12. CfgPCBLength2SP <F4> ECID 20136, Units = in. Sets the PCB Length for Conveyor #2. Range 2.0 to 100.0.

13. CfgFrontRailSP <F4> ECID 20138, Units = Deg F. Sets the setpoint for the Front Rail Heater on Conveyor #1. Range 0 to 536 F. Valid only if Rail Heaters are selected for Conveyor #1.

14. CfgRearRailSP <F4> ECID 20140, Units = Deg F. Sets the setpoint for the Rear Rail Heater on Conveyor #1. Range 0 to 536 F. Valid only if Rail Heaters are selected for Conveyor #1.

15. CfgFrontRail2SP <F4> ECID 20142, Units = Deg F. Sets the setpoint for the Front Rail Heater on Conveyor #2. Range 0 to 536 F. Valid only if Rail Heaters are selected for Conveyor #2.

16. CfgRearRail2SP <F4> ECID 20144, Units = Deg F. Sets the setpoint for the Rear Rail Heater on Conveyor #2. Range 0 to 536 F. Valid only if Rail Heaters are selected for Conveyor #2.

17. CfgConvWIdSP <F4> ECID 20146, Units = in. Sets the Conveyor #1 width setpoint. Range 5.10 to 18.90 in. Valid only if conveyor #1 is a Rail and a motorized width is enabled.

18. CfgConvWid2SP <F4> ECID 20148, Units = in. Sets the Conveyor #2 width setpoint. Range 5.10 to 18.90 in. Valid only if conveyor #2 is a Rail and a motorized width is enabled.

19. CfgProcessNotes1SP <A [1..1024]> ECID 20150. Sets the Process notes for Conveyor #1.

20. CfgProcessNotes2SP <A [1..1024]> ECID 20152. Sets the Process notes for Conveyor #2.

21. CfgConvectionFanSP <U1> ECID 20154. Sets the Fan Speed for the Convection Fans. Possible Values are: 1 — Low, 2 — Medium, 3 — High.

22. CfgCooling1FanSpeedSP <U1> ECID 20156. Sets the Fan speed for Cooling #1. Possible values are 1 — Low, 2 — Medium, 3 — High.

23. CfgCooling2FanSpeedSP <U1> ECID 20158. Sets the Fan speed for Cooling #2 Possible values depend on the 3 speed Cooling #2 option in inerting / Cooling (CfgThreeSpeedCooling#2 ECID 20082). If Three Speed Cooling #2 is not selected the options are 0 — Off and 1 — On. If the Three–Speed Cooling #2 is enabled, then the options are 0 — Off, 1 — Low, 2 — Medium, 3 — High.

24. CfgCooling4FanSP <U1> ECID 20160. Sets the Fan speed for Cooling #4. This is valid only when Inerting and Extended Cooling options in Inerting / Cooling are enable. Valid values are: 0 — Off, 1 — Low, 2 — Medium, 3 — High

ALARM EQUIPMENT CONSTANTS

The next group of Equipment Constants is related to Alarm configuration. These items define the machine actions, the allowable variance from actual value, allowable variance from the process value and the max. number of times the alarm should be repeated per violation. Unless otherwise noted, for all Equipment Constants that are Alarm Actions (of the name nnnn"Act") the option values are as follows:

1 — Ignore
2 — Warning
3 — SoftStop
4 — HardStop

One note, not all Equipment Constants of this kind has all four options. The Equipment Constants ID values start at 21000. The ECs in this group are:

1. CfgAlmThermoFailAct <U1> ECID 21002 Specifies the machine action for the Thermocouple failure Alarm occurrence.

2. CfgAlmThermoFailRp <BOOLEAN> ECID 21004 Specifies whether the Thermocouple Fail alarm should be repeated. Options are 0 = No, 1 = Yes.

3. CfgAlmBlowerFailDetectAct <U1> ECID 21006 Specifies the machine action for the Blower Fail Detect alarm.

4. CfgBlowerFailDetectRp <BOOLEAN> ECID 21008 Specifies whether the Blower Fail Detect alarm should be repeated. Options are 0 — No, 1 — Yes.

5. CfgAlmConvSpeedAct <U1> ECID 21010 Specifies the machine action when the Conveyor Speed Alarm occurs for Conveyor #1.

6. CfgAlmConvSpeedVar <U1> ECID 21012, Units = in / min Specifies the allowable variance from the actual Conveyor speed. The Conveyor #1 Speed alarm will be triggered if the actual speed varies by more than +/– this value. Range 1 to 70 in / min.

7. CfgAlmConvSpeedRp <BOOLEAN> ECID 21014 Specifies if the Conveyor Speed alarm should be repeated for Conveyor #1. Options are 0 = No, 1 = Yes.

8. CfgAlmConvSpeedPro <U1> ECID 21016, Units = in / min Specifies the allowable variance from the actual Conveyor process value. Range 1 to 70 in / min.

9. CfgAlmConWidAct <U1> ECID 21018, Units = in. Specifies the action to be taken if the Motorized Conveyor width varies from the specified tolerance for Conveyor #1.

10. CfgAlmConvWidRp <U1> ECID 21020 Specifies the Conveyor Motorized Width Alarm should be repeated for Conveyor #1.

11. CfgAlmConvWidPro <U1> ECID 21022, Units = in. Specifies the allowable variance from the actual Conveyor process value. List element 1 corresponds to Conveyor #1, List element 2 to Conveyor #2. Range = –0.25 to 0.05.

12. CfgAlrmConvWidVar <U1> ECID 21024, Units = in. Specifies the allowable variance for the Conveyor Motorized width values for Conveyor #1. Range = –0.25 to 0.05.

13. CfgAlmAllHeatersAct <U1> ECID 21026 Specifies the machine action when the All Heaters alarm occurs. This is a single alarm setting for all heater zones.

14. CfgAlmAllHeatersVar <U1> ECID 21028, Units = Deg. F Specifies the allowable variance for any of the Heater zones. Range 9 – 536 Deg. F.

15. CfgAlmAllHeatersRp <BOOLEAN> ECID 21030 Specifies if the All Heaters alarm should be repeated. Options are 0 = No, 1 = Yes.

16. CfgAlmAllHeatersPro <U1> ECID 21032 Specifies the allowable variance from the process for the All Heaters alarm. Range 9 — 536. F.

17. CfgAlmUpperHeatAct <U1 [10]> ECID 21034 Specifies the Omniflow action when the Upper Heater alarm(s) occur. Only items in the List that pertain to configured Upper Heaters will apply, i.e. if the system is a 5 zone machine, List elements 6 —10 will be ignored.

18. CfgAlmLowerHeatAct <U1 [10]> ECID 21036 Specifies the Omniflow action when the Lower Heater alarm(s) occur. Only items in the List that pertain to configured Lower Heaters will apply, i.e. if the system is a 5 zone machine, List elements 6 —10 will be ignored.

19. CfgAlmUpperHeatVar <U1 [10]> ECID 21038, Units = Deg. F Specifies the allowable temperature variance for the Upper Heaters. Range 9 — 536 F.

20. CfgAlmLowerHeatVar <U1 [10]> ECID 21040, Units = Deg. F Specifies the allowable temperature variance for the Lower Heaters. Range 9 — 536. F.

21. CfgAlmUpperHeatRp <Boolean [10]> ECID 21042 Specifies if the alarm(s) for the Upper Heater Zones should repeat.

22. CfgAlmLowerHeatRp <Boolean [10]> ECID 21044 Specifies if the alarm(s) for the Lower Heater Zones should repeat.

23. CfgAlmUpperHeatPro <U1 [10]> ECID 21046, Units = Deg. F Specifies the allowable variance between the Upper Heaters and the process band. Range 9 — 536 F.

24. CfgAlmLowerHeatPro <U1 [10]> ECID 21048, Units = Deg. F Specifies the allowable variance between the Lower Heaters and the process band. Range 9 — 536 F.

25. CfgAlmPCBRunAct <U1> ECID 21050 Specifies the Omniflow action when the PCB Run During Startup alarm occurs.

26. CfgAlmPCBRunRp <BOOLEAN> ECID 21052 Specifies if the PCB Run During Startup alarm for Conveyor #1 should repeat. Options are 0 = No, 1 = Yes.

27. CfgAlmGasPressLowAct <U1> ECID 21054 Specifies if the Omniflow action when the Gas Pressure Low alarm occurs.

28. CfgAlmGasPressLowRp <BOOLEAN> ECID 21056 Specifies if the Gas Pressure Low alarm should repeat. Options are 0 = No, 1 = Yes.

29. CfgAlmCoolHoodOpenAct <U1> ECID 21058 Specifies the action for the Omniflow machine when the Cooling Hood Open alarm occurs.

30. CfgAlmCoolHoodOpenRp <BOOLEAN> ECID 21060 Specifies if the Cooling Hood Open alarm should repeat. Options 0 = No, 1 = Yes.

31. CfgAlmCoolModHighTempAct <U1> ECID 21062, Specifies the Omniflow machine action when the Cooling Module High Temperature exceeds the Cooling Module High Temp. Options are Warning, SoftStop, HardStop.

32. CfgAlmCoolModHighTempRp <U1> ECID 21166, Units = Deg. F. Specifies if the CfgAlmCoolModHighTempRp Alarm should repeat. Options 0 = No, 1 = Yes.

33. CfgAlmCoolModHighTempVar <U1> ECID 21064, Units = Deg. F Specifies the allowable variance for the Cooling Module High Temp. Range 90 — 207 F.

34. CfgAlmPCBDroppedAct <U1 > ECID 21066 Specifies the Omniflow machine action when the PCB Dropped alarm occurs. This is valid only if the Exit Photocell exists and is enabled for Conveyor #1.

35. CfgAlmPCBDroppedRp <BOOLEAN> ECID 21068 Specifies if the PCB Dropped alarm should be repeated. Options are 0 = No, 1 = Yes. This is valid only if the Exit Photocell exists and is enabled for Conveyor #1.

36. CfgAlmPCBJamAct <U1 > ECID 21070 Specifies if the Omniflow machine action when the PCB Jammed in Machine alarm occurs.

37. CfgAlmPCBJamRp <BOOLEAN> ECID 21072 Specifies if the PCB Jammed in machine alarm should be repeated. Options are 0 = No, 1 = Yes.

38. CfgAlmConv2SpeedAct <U1> ECID 21074 Specifies the actions for the Conveyor 2 Speed alarm.

39. CfgAlmConv2SpeedRp <BOOLEAN > ECID 21076 Specifies if the Conveyor #2 alarm should repeat. Options are 0 = No, 1 = Yes.

40. CfgAlmConv2SpeedVar <F4> ECID 21078 Specifies the allowable variance for Conveyor #2. Range 1.0 to 70.0.

41. CfgAlmConv2SpeedPro <F4> ECID 21080 Specifies the allowable Specifies the allowable variance between the Conveyor #2 speed and the process band. Range 0.0 — 70.0.

42. CfgAlmConv2WidAct <U1> ECID 21082 Specifies the Conveyor #2 width alarm action.

43. CfgAlmConv2WidRp <U1> ECID 21084 Specifies if the Conveyor #2 width alarm should be repeated. Options are 0 = No, 1 = Yes.

44. CfgAlmConv2WidPro <F4> ECID 21086 Specifies the allowable variance between Conveyor #2 and the Process Band. Range 0.20 — 18.90.

45. CfgAlmConv#2WidVar <F4> ECID 21088 Specifies the allowable variance for Conveyor #2 width alarm. Range 0.20 — 18.90.

46. CfgAlmFrontRailHeaterAct <U1> ECID 21090 Specifies the action for the Front Rail Heater alarm for Conveyor #1.

47. CfgAlmFrontRailHeatRp <BOOLEAN> ECID 21092 Specifies if the Front Rail Heater for Conveyor #1 alarm should be repeated. Options are 0 = No, 1 = Yes.

48. CfgAlmFrontRailHeaterPro <F4> ECID 21094, Units = Deg F Specifies the allowable variance for the Conveyor #1 Front Rail Heater and the Process band. Range is 9 to 536.

49. CfgAlmFrontRailHeaterVar <F4> ECID 21096, Units = Deg F Specifies the allowable variance on the Front Rail Heater for Conveyor #1. Range is 9 — 536 F.

50. CfgAlmRearRailHeaterAct <U1> ECID 21098 Specifies the actions for the Rear Rail Heater alarm for Conveyor #1.

51. CfgAlmRearRailHeaterRp <BOOLEAN> ECID 21100 Specifies if the Rear Rail Heater for Conveyor #1 should repeat. Options are 0 — No, 1 — Yes.

52. CfgAlmRearRailHeaterPro <F4> ECID 21102 Specifies the allowable variance between the Rear Rail Heater and the Process band for Conveyor #1. Range 9 — 536 F.

53. CfgAlmRearRailHeaterVar <F4> ECID 21104 Specifies the allowable variance for the Rear Rail Heaters for Conveyor #1. Range 9 — 536 F.

54. CfgAlmFrontRailHeater2Act <U1> ECID 21106 Specifies the action for the Front Rail Heater alarm for Conveyor #2.

55. CfgAlmFrontRailHeater2Rp <BOOLEAN> ECID 21108 Specifies if the Front Rail Heater for Conveyor #2 should repeat. Options are 0 — No, 1 — Yes.

56. CfgAlmFrontRailHeater2Pro <F4> ECID 21110 Specifies the allowable variance between the Front Rail Heater for Conveyor #2 and the Process band. Range 9 — 536 F.

57. CfgAlmFrontRailHeater2Var <F4> ECID 21112 Specifies the allowable variance for the Front Rail Heater for Conveyor #2. Range 9 — 536 F.

58. CfgAlmRearRailHeater2Act <U1> ECID 21114 Specifies the action for the Rear Rail Heater for Conveyor #2.

59. CfgAlmRearRailHeater2Rp <U1> ECID 21116 Specifies if the Rear Rail Heater alarm for Conveyor #2 should repeat. Options are 0 — No, 1 — Yes.

60. CfgAlmRearRailHeater2Pro <F4> ECID 21118 Specifies the allowable variance between the Rear Rail Heater for Conveyor #2 and the Process band. Range 9 — 536 F.

61. CfgAlmRearRailHeater2Var <F4> ECID 21120 Specifies the allowable variance for the Rear Rail Heater for Conveyor #2. Range 9 — 536 F.

62. CfgAlmOxygenContentAct <U1> ECID 21122 Specifies the action for the Oxygen Content alarm.

63. CfgAlmOxygenContentRp – <BOOLEAN> ECID 21124 Specifies if the Oxygen Content alarm should repeat. Options are 0 — No, 1 — Yes.

64. CfgAlmConv1PcbXferAct – <U1> ECID 21126 Specifies the action for the Conveyor #1 PCB transfer alarm. This is valid only if SMEMA is selected as the Machine Interface for Conveyor #1.

65. CfgAlmConv1PcbXferRp – <BOOLEAN> ECID 21128 Specifies if the Conveyor #1 PCB transfer alarm should repeat. Options are 0 — No, 1 — Yes.

66. CfgAlmConv2PcbXferAct <U1> ECID 21130 Specifies the action for Conveyor #2 PCB transfer alarm. This is valid only if SMEMA is selected as the Machine Interface for Conveyor #2.

67. CfgAlmConv2PcbXferRp <BOOLEAN> ECID 21132 Specifies if the Conveyor #2 PCB transfer alarm should repeat. Options are 0 — No, 1 — Yes.

68. CfgAlmPCB2DroppedAct <U1> ECID 21134 Specifies the action for the Conveyor #2 PCB dropped alarm. This is valid only if the Exit Photocell exists and is enabled for Conveyor #2.

69. CfgAlmPCBDroppedRp <BOOLEAN> ECID 21136 Specifies if the Conveyor #2 PCB dropped alarm should repeat. This is valid only if the Exit Photocell exists and is enabled for Conveyor #2.

70. CfgAlmPCB2JamAct <U1> ECID 21138 Specifies the action for Conveyor #2 PCB jammed alarm. This is valid only if the Exit Photocell exists and is enabled for Conveyor #2.

71. CfgAlmPCB2JamAct <BOOLEAN> ECID 21140 Specifies if the Conveyor #2 PCB jammed alarm should repeat. This is valid only if the Exit Photocell exists and is enabled for Conveyor #2.

72. CfgAlmCustomIO1Act <U1> ECID 21142 Specifies the action for #1 CustomIO input #1 alarm. This is valid only if Conveyor #1 has CustomIO selected as a Machine Interface.

73. CfgAlmCusomIO1Rp <BOOLEAN> ECID 21144 Specifies if the CusomIO #1 alarm should repeat. This is valid only if Conveyor #1 has CustomIO selected as a Machine Interface.

74. CfgAlmCustomIO2Act <U1> ECID 21146 Specifies the action for Custom IO #2 input alarm. This is valid only if Conveyor #1 has CustomIO selected as a Machine Interface.

75. CfgAlmCustomIO2Rp <BOOLEAN> ECID 21148 Specifies if the alarm for CustomIO #2 should repeat. This is valid only if Conveyor #1 has CustomIO selected as a Machine Interface.

76. CfgAlmSelfCleanFailAct <U1> ECID 21150 Specifies the action for the Self–Clean Fail alarm. This is only valid if both Inerting and Self–Clean Cool are enabled.

77. CfgAlmSelfCleanFailRp <BOOLEAN> ECID 21152 Specifies if the Self–Clean Fail alarm should repeat. This is only valid if both Inerting and Self–Clean Cool are enabled.

78. CfgAlmPCBSuptAct <U1> ECID 21154 Specifies the action for the PCB Support Fail alarm This is only valid if the system has only one conveyor, that is only a Rail, and a PCB Support is enabled.

79. CfgAlmPCBSuptRp <BOOLEAN> ECID 21156 Specifies if the PCB Support Fail alarm should repeat. This is only valid if the system has only one conveyor, that is only a Rail, and a PCB Support is enabled.

80. CfgAlmPCBSuptWidAct <U1> ECID 21158 Specifies the action for the PCB support width alarm. This is valid only if a PCB support is present and has a motorized width enabled

81. CfgAlmPCBSuptWidRp – <BOOLEAN ECID 21160 Specifes if the PCB support width alarm should repeat. This is valid only if a PCB support is present and has a motorized width enabled

82. CfgAlmPCBSuptWidPro – <F4> ECID 21162 Specifies the allowable variance between the PCB support width and Process band. Range is 0.00 to 10.0. This is valid only if a PCB support is present and has a motorized width enabled.

83. CfgAlmPCBSuptWidVar – <F4> ECID 21164 Specifies the allowable variance of the PCB support width. Range is 0.00 to 10.0. This is valid only if a PCB support is present and has a motorized width enabled.

84. CfgAlmPCB2RunAct <U1> ECID 21168 Specifies the action for the PCB run during startup alarm for Conveyor #2.

85. CfgAlmPCB2RunRp <BOOLEAN> ECID 21170 Specifies if the PCB run during startup for Conveyor #2 should repeat.

TIME CLOCK EQUIPMENT CONSTANTS

The next set of Equipment Constants is for the Time Clock parameters. The Time Clock controls the Auto start / stop feature of the Omniflow machine. The Equipment Constant IDs base is at 22000. Formats for the time clock On / Off fields can be of the following four types, which are the possible time formats used by the OmniFlo

A) HH:MM:SS p.m.
B) HH:MM p.m.
C) HH:MM:SS
D) HH:MM

Where HH is hour, MM is minute, SS is seconds and a.m. / p.m. For formats A and B, the hours are 0 to 12 with the a.m. / p.m. designation. For formats C and D the hour is 0 to 23 in lieu of the a.m. / p.m. designation. OmniFlo GEM will accept any time format regardless of the current Time configuration used by the OmniFlo software.

The ECs are:

1. CfgTimeClkEnable <Boolean> ECID 22002 Specifies if the Time Clock is enabled / disabled. Options 0 = Disabled, 1 = Enabled.
2. CfgTimeOnSun <A [4..20]> ECID 22004 Time Clock Sunday On field.
3. CfgTimeOnMon <A [4..20]> ECID 22006 Time Clock Monday Time On field.
4. CfgTimeOnTue <A [4..20]> ECID 22008 Time Clock Tuesday Time On field.
5. CfgTimeOnWed <A [4..20]> ECID 22010 Time Clock Wednesday Time On field
6. CfgTimeOnThur <A [4..20]> ECID 22012 Time Clock Thursday Time On field
7. CfgTimeOnFri <A [4..20]> ECID 22014 Time Clock Friday Time On field
8. CfgTimeOnSat <A [4..20]> ECID 22016 Time Clock Saturday Time On field
9. CfgTimeOffSun <A [4..20]> ECID 22018 Time Clock Sunday Time Off field
10. CfgTimeOffMon <A [4..20]> ECID 22020 Time Clock Monday Time Off field
11. CfgTimeOffTue <A [4..20]> ECID 22022 Time Clock Tuesday Time Off field
12. CfgTimeOffWed <A [4..20]> ECID 22024 Time Clock Wednesday Time Off field
13. CfgTimeOffThur <A [4..20]> ECID 22026 Time Clock Thursday Time Off field
14. CfgTimeOffFri <A [4..20]>ECID 22028 Time Clock Friday Time Off field
15. CfgTimeOffSat <A [4..20]> ECID 22030 Time Clock Saturday Time Off field

SECURITY EQUIPMENT CONSTANTS

The Security Equipment Constants modify the menu security attributes on the OmniFlo. The menu security is a mechanism, which restricts operator access of the menus. The menu security consists of a "System" level and up to four "user" levels. Each level of security has a password associated with it (required to even change security options). At this point the password is a valid Equipment Constant modifiable by the Host. This may change if the customer doesn't want the ability to change passwords remotely. The Security ECIDs base is 23000.

1. CfgSecuritySysPassReq - <Boolean> ECID 23002 Specifies whether System level menu access requires a password. Options: 0 = No, 1= Yes.

2. CfgSecuritySysPassword - <A[1..50]> ECID 23004 The ASCII password string.

3. CfgSecuritySysPassTime - <U1> ECID 23006 Units = seconds The amount of time to enter a password. Range 0 - 60, 0 indicating no time-out.

4. CfgSecuritySysLoadRec - <Boolean> ECID 23008 Specifies whether System level has access to Loading Recipes. Options 0 = No, 1 = Yes.

5. CfgSecuritySysStartStop - <Boolean> ECID 23010 Specifies whether System level has access to starting / stopping the machine. Options 0 = No, 1 = Yes.

6. CfgSecuritySysSetup - <Boolean> ECID 23012 Specifies whether System level has access to setup functions. Options 0 = No, 1 = Yes.

7. CfgSecuritySysMaint - <Boolean> ECID 23014 Specifies whether System level has access to maintenance functions. Options 0 = No, 1 = Yes.

8. CfgSecuritySysUtil - <Boolean> ECID 23016 Specifies whether System level has access to Utility functions. Options 0 = No, 1 = Yes.

9. CfgSecuritySysModRec - <Boolean> ECID 23018 Specifies whether System level has access for Modification of Recipes. Options 0 = No, 1 = Yes.

10. CfgSecuritySysSaveDel - <Boolean> ECID 23020 Specifies whether System level has access to Save or Delete a recipe. Options 0 = No, 1 = Yes.

11. CfgSecuritySysrelBoard - <Boolean> ECID 23420 Specifies whether the System level security has access to change the relative board no.

The following ECs pertain to User level security. There are four separately configurable users. The following items are all 4 element lists, with the first element corresponding to User #1, element 2 to User #2 etc.

12. CfgSecurityUserPassReq - <Boolean [4]> ECID 23022 Specifies if a password is required for the four User access levels. Options 0 = No, 1 = Yes

13. CfgSecurityUserPass1 - <A [1..50]> ECID 23424 The ASCII password for user #1.

14. CfgSecurityUserPass2 - <A [1..50]> ECID 23426 ASCII password for user #2.

15. CfgSecurityUserPass3 - <A [1..50]> ECID 23428 ASCII password for user #3.

16. CfgSecurityUserPass4 - <A [1..50]> ECID 23430 ASCII password for user #4.

17. CfgSecurityUserPassTime - <U1 [4]> ECID 23026, Units = seconds The four User level password time-outs. Range 0 - 60 seconds. 0 indicates no time-out.

18. CfgSecurityUserLoadRec - <Boolean [4]> ECID 23028 The four User level access privileges to Load Recipes.

19. CfgSecurityUserStartStop - <Boolean [4]> ECID 23030 The four User level access privileges to Start / Stop the Omniflow machine.

20. CfgSecurityUserSetup - <Boolean [4]> ECID 23032 The four User level access privileges for Setup functions on the Omniflow machine.

21. CfgSecurityUserMaint - <Boolean [4]> ECID 23034 The four User level access privileges for Maintenance functions of the Omniflow machine.

22. CfgSecurityUserUtil - <Boolean [4]> ECID 23036 The four User level access privileges for Utility functions on the Omniflow machine.

23. CfgSecurityUserModRec - <Boolean [4]> ECID 23038 The four User level access privileges for modifying Recipes.

24. CfgSecurityUserSaveDel - <Boolean [4]> ECID 23040 The four User level access privileges for Saving or Deleting Recipes on the Omniflow hard drive.

25. CfgSecurityUserRelBoard - <Boolean [4]> ECID 23442 The four User level access privileges to modify the Relative Board no.

TIME DATE FORMAT EQUIPMENT CONSTANTS

The Time Date Format ECs specify the format of the time and date to be used by the Omniflow machine. The ECs ID will continue from the previous section. The ECs are

1. CfgTimeFormat <U1> ECID 23042 Specifies the particular Time Format. Options are:

   1 — hh:mm:ss p.m.
   2 — hh:mm p.m.
   3 — hh:mm:ss
   4 — hh:mm
   Where hh = hours range 1 - 12, mm = minutes range 1 - 59 and ss = seconds range 1 - 59.

2. CfgDateFormat <U1> ECID 23044 Specifies the Date Format for use by the Omniflow machine. Options are:

   1 — mm/dd/yyyy
   2 — dd/mm/yyyy
   Where mm = Month, dd = day and yyyy = year.

3. CfgCurTime <A 20> ECID 23046 Specifies the current time to reset the Omniflow machine. The format is determined by the Time Format (CfgTimeFormat).

4. CfgCurDate <A 20> ECID 23048 Specifies the current date to reset the Omniflow machine. The format is determined by the Date Format (CfgDateFormat).

SELF CLEAN EQUIPMENT CONSTANTS

The Self Clean function of the Omniflow machine has a configuration menu. This menu and therefore the following ECs are valid only if the Self Clean configuration option is active (ECID 20074, CfgCoolingSelfClean). The ECID values will continue from the previous section. The configuration options for Self Clean are:

1. CfgSCMode <U1> ECID 23050 Specifies the mode of operation for the Self Clean function. Options are
   1 — Off
   2 — Manual
   3 — Timer
   4 — Auto

2. CfgSCCycleTime <U1> ECID 23052, Units = min. Specifies the interval at which the Self Clean cycle will be done. This is a valid option only if the Self Clean Mode (CfgSCMode) is Manual or Timer. Range 5 - 30 minutes.

3. CfgSCTemp <U1> ECID 23054, Units = Deg F Specifies the temperature at which the Self Clean cycle will run. This is a valid option only if the Self Clean Mode (CfgSCMode) is Manual or Timer. Range 212 - 392 F.

4. CfgSCEnable <Boolean [7]> ECID 23056 Specifies if the Self Clean cycle is enabled for each of the seven days of the week. List element 0 corresponds to Sunday, list element 1 to Monday, list element 2 to Tuesday, etc. This is a valid option only if the Self Clean Mode (CfgSCMode) is in Timer Mode.

5. CfgCleanTimeSun1 <A [5..20]> ECID 23058 Specifies the time of the Self Clean cycle for Sunday Clean Time #1. This is a valid option only if the Self Clean Mode (CfgSCMode) is set to Timer. Format: The format of the ASCII Time strings is dependent on the Time format specified by the Time Format configuration (CfgTimeFormat ECID 23042).

6. CfgCleanTimeSun2 <A [5..20]> ECID 23060 Specifies the time of the Self Clean cycle for Sunday Clean Time #2.

7. CfgCleanTimeSun3 <A [5..20]> ECID 23062 Specifies the time of the Self Clean cycle for Sunday Clean Time #3.

8. CfgCleanTimeMon1 <A [5..20]> ECID 23064 Specifies the time of the Self Clean cycle for Monday Clean Time #1.

9. CfgCleanTimeMon2 <A [5..20]> ECID 23066 Specifies the time of the Self Clean cycle for Monday Clean Time #2.

10. CfgCleanTimeMon3 <A [5..20]> ECID 23068 Specifies the time of the Self-Clean cycle for Monday Clean Time #3.

11. CfgCleanTimeTue1 <A [5..20]> ECID 23070 Specifies the time of the Self-Clean cycle for Tuesday Clean Time #1.

12. CfgCleanTimeTue2 <A [5..20]> ECID 23072 Specifies the time of the Self-Clean cycle for Tuesday Clean Time #2.

13. CfgCleanTimeTue3 <A [5..20]> ECID 23074 Specifies the time of the Self-Clean cycle for Tuesday Clean Time #3.

14. CfgCleanTimeWed1 <A [5..20]> ECID 23076 Specifies the time of the Self-Clean cycle for Wednesday Clean Time #1.

15. CfgCleanTimeWed2 <A [5..20]> ECID 23078 Specifies the time of the Self-Clean cycle for Monday Clean Time #2.

16. CfgCleanTimeWed3 <A [5..20]> ECID 23080 Specifies the time of the Self-Clean cycle for Wednesday Clean Time #3.

17. CfgCleanTimeThur1 <A [5..20]> ECID 23082 Specifies the time of the Self-Clean cycle for Thursday Clean Time #1.

18. CfgCleanTimeThur2 <A [5..20]> ECID 23084 Specifies the time of the Self-Clean cycle for Thursday Clean Time #2.

19. CfgCleanTimeThur3 <A [5..20]> ECID 23086 Specifies the time of the Self-Clean cycle for Thursday Clean Time #3.

20. CfgCleanTimeFri1 <A [5..20]> ECID 23088 Specifies the time of the Self-Clean cycle for Friday Clean Time #1.

21. CfgCleanTimeFri2 <A [5..20]> ECID 23090 Specifies the time of the Self-Clean cycle for Friday Clean Time #2.

22. CfgCleanTimeFri3 <A [5..20]> ECID 23092 Specifies the time of the Self-Clean cycle for Friday Clean Time #3.

23. CfgCleanSat1 <A [5..20]> ECID 23094 Specifies the time of the Self-Clean cycle for Saturday Clean Time #1.

24. CfgCleanTimeSat2 <A [5..20]> ECID 23096 Specifies the time of the Self-Clean cycle for Saturday Clean Time #2.

25. CfgCleanTimeSat3 <A [5..20]> ECID 23098 Specifies the time of the Self-Clean cycle for Saturday Clean Time #3.

26. CfgSCBoardInterval <U1> ECID 23100 Units = min. Specifies the time interval between Self-Clean cycles. This is a valid option only if the Self-Clean Mode (CfgSCMode ECID 23050) is Auto. Range is 1 to 500 minutes.

27. CfgSCCycleInterval <F4> ECID 23102 Units = hours Specifies the Cycle interval between Self-Clean passes. This is a valid option only if the Self-Clean Mode (CfgSCMode ECID 23050) is Auto. Range is 1 to 999.9 hours.

28. CfgSCCoolantOn <F4> ECID 23104 Units = seconds Specifies the interval for which the Coolant should be turned on. Range 1.0 to 10.0 seconds.

29. CfgSCCoolantOff <F4> ECID 23106 Units = seconds Specifies the interval for which the Coolant should be turned off. Range 5.0 to 40.0 seconds.

SIP EQUIPMENT CONSTANTS

SIP, Serial Interface Protocol Equipment constants are valid if the Configuration for Communications has the SIP option selected (ECID 20088). SIP is currently under development for the OmniFlo software and may not yet be implemented. Equipment Constants defined here are subject to change.

1. CfgSIPMessagesA <Boolean> ECID 23202 Specifies if the A type messages are configured for SIP.
2. CfgSIPMessagesB <Boolean> ECID 23204 Specifies if the B type messages are configured for SIP.
3. CfgSIPMessagesC <Boolean> ECID 23206 Specifies if the C type messages are configured for SIP.
4. CfgSIPMessagesD <Boolean> ECID 23208 Specifies if the D type messages are configured for SIP.
5. CfgSIPSetPtLH <U1 [10]> ECID 23210 Specifies if the Set points for the Lower Heater are selected for SIP.
6. CfgSIPSetPtUH <U1 [10]> ECID 23212 Specifies if the Set points for the Upper Heater are selected for SIP.

CUSTOM OUTPUTS EQUIPMENT CONSTANTS

Custom Outputs are configured based on the Conveyor Option Machine Interface, CfgMachineInterface ECID 20050. If this option is locally set to Custom I/O (value = 2 for ECID 20050) then the following Equipment Constants are valid. For All BOOLEAN types of the Custom I/O config items are 3 element lists. List element #1 corresponds to Relay #1, List element #2 to Relay #2 and List Element #3.

1. CfgCIOActiveRelayState <Boolean [3]> ECID 23302 - Indicates the Active Relay State for the three custom output relays. Options are 1 = Open, 2 = Closed.
2. CfgCIOBuzzerOn <Boolean [3]> ECID 23304 Specifies if the Buzzer On is active for Custom I/O.
3. CfgCIOHardStopAlm <BOOLEAN [3]> ECID 23306 Specifies if the Hard Stop Alarm is active for Custom I/O.
4. CfgCIOSoftStopAlm <BOOLEAN [3]> ECID 23308 Specifies if the Soft Stop Alarm is active for Custom I/O.
5. CfgCIOWarningAlm <BOOLEAN [3]> ECID 23310 Specifies if the Warning Alarm is active for Custom I/O.
6. CfgCIOEStop <BOOLEAN [3]> ECID 23312 Specifies if the Emergency Stop is active for Custom I/O.
7. CfgCIOManMode <BOOLEAN [3]> ECID 23314 Specifies if Manual Mode is active to set the Custom I/O relay(s).
8. CfgCIOAutoStart <BOOLEAN [3]> ECID 23316 Specifies if Auto Start is active to set the Custom I/O relay(s).
9. CfgCIOAutoStop <BOOLEAN [3]> ECID 23318 Specifies if Auto Stop is active to set the Custom I/O relay(s).
10. CfgCIOReadyEmpty <BOOLEAN [3]> ECID 23320 Specifies if the if Machine state of Running with no PCBs in machine will set the Custom I/O relay(s).
11. CfgCIOReadyRun <BOOLEAN [3]> ECID 23322 Specifies if the Machine state of Running WITH PCBs in the machine will set the Custom I/O relay(s).

12. CfgCIOPCBPresent <BOOLEAN [3]> ECID 23324 Specifies if the PCB in Machine event is to set the Custom I/O relay(s).

13. CfgCIOConveyorOn <BOOLEAN [3]> ECID 23326 Specifies if the Conveyor On event is to set the Custom I/O relay(s).

14. CfgCIOConWidMoving <BOOLEAN [3]> ECID 23328 Specifies if the Conveyor Width Moving event is to set the Custom I/O relays(s).

15. CfgCIOHoodOpen <BOOLEAN [3]> ECID 23330 Specifies if the HoodOpen is to set the Custom I/O relay(s).

16. CfgCIONitroOn <BOOLEAN [3]> ECID 23332 Specifies if the Nitrogen On (Inerting) is to set the Custom I/O relay(s).

17. CfgCIOCoolantOn <BOOLEAN [3]> ECID 23334 Specifies if the Coolant On is to set the Custom I/O relay(s).

THERMOCOUPLE OFFSET EQUIPMENT CONSTANTS

Thermocouple offsets are temperature offsets added to the values read from the Heater and Cooling Hardware. These offsets are also used for "Demo" mode where there is no actual hardware. For all Thermocouple Offsets the units are Units = Deg. F range -27 to 27 F.

1. CfgTCOTopZone <F4 [10]> ECID 23110, Specifies the Thermocouple Offset for the top Heater zones of the Omniflow machine. This is a 10 element list with element 0 corresponding to top Heater Zone #1 etc.

2. CfgTCOBotZone <F4 [10]> ECID 23112 Specifies the Thermocouple Offset for the bottom Heater zones. This is a 10 element list with element 0 corresponding to bottom Heater zone #1 etc.

3. CfgTCOFrontRail1 <F4> ECID 23114 Specifies the Thermocouple Offsets for the Front Rail Heaters.

4. CfgTCOCoolZone1 <F4> ECID 23116 Specifies the Thermocouple Offsets for the Cooling Zones #1.

5. CfgTCORearRail1 <F4]> ECID 23118 Specifies the Thermocouple Offsets for the Rear Rail Heaters #1.

6. CfgTCOCurve <F4 [6]> ECID 23120 Specifies the Thermocouple Offsets for the 6 Profiler curves.

7. CfgTCOFrontRail2 <F4> ECID 23502 Specifies the Thermocouple Offsets for the Front Rail on Conveyor #2.

8. CfgTCOCoolZone2 <F4> ECID 23504 Specifies the Thermocouple Offsets for Cooling Zone #2.

9. CfgTCORearRail2 <F4> ECID 23506 Specifies the Thermocouple Offsets for the Rear rail on Conveyor #2.

PID CONFIGURATION EQUIPMENT CONSTANTS

The Heater zones as well as the fixed and Rear Rail heaters have configurable PID control parameters. These are the Proportion, Integer and Derivative values used to control current to the Heaters. There are no units, and the Range for all PID values is -99.999 to 99.999.

1. CfgPIDUpperP <F4 [10]> ECID 23122 Specifies the Proportion for the 10 Upper Heater zones.

2. CfgPIDUpperI <F4 [10]> ECID 23124 Specifies the Integer for the 10 Upper Heater zones. Range

3. CfgPIDUpperD <F4 [10]> ECID 23126 Specifies the Derivative for the 10 Upper Heater zones.

4. CfgPIDLowerP <F4 [10]> ECID 23128 Specifies the Proportion for the 10 Lower Heater zones.
5. CfgPIDLowerI <F4 [10]> ECID 23130 Specifies the Integer for the 10 Lower Heater zones.
6. CfgPIDLowerD <F4 [10]> ECID 23132 Specifies the Derivative for the 10 Lower Heater zones.
7. CfgPIDRearP <F4> ECID 23134 Specifies the Proportion for the Conveyor #1 Rear Rail heater.
8. CfgPIDRearI <F4> ECID 23136 Specifies the Integer for the Conveyor #1 Rear Rail heater.
9. CfgPIDRearD <F4> ECID 23138 Specifies the Derivative for the Conveyor #1 Rear Rail heater.
10. CfgPIDFrontP <F4> ECID 23140 Specifies the Proportion for the Conveyor #1 Front Rail heater.
11. CfgPIDFrontI <F4> ECID 23142 Specifies the Integer for the Conveyor #1 Front Rail heater.
12. CfgPIDFrontD <F4> ECID 23144 Specifies the Derivative for the Conveyor #1 Front Rail heater.
13. CfgPIDRear2P <F4]> ECID 23462 Specifies the Proportion for the Conveyor #2 Rear Rail heater.
14. CfgPIDRear2I <F4> ECID 23464 Specifies the Integer for the Conveyor #2 Rear Rail Heater.
15. CfgPIDRear2D <F4> ECID 23466 Specifies the Derivative for the Conveyor #2 Rear Rail Heater.
16. CfgPIDFront2P <F4> ECID 23468 Specifies the Proportion for the Conveyor #2 Front Rail Heater.
17. CfgPIDFront2I <F4> ECID 23470 Specifies the Integer for the Conveyor #2 Front Rail Heater.
18. CfgPIDFront2D <F4> ECID 23472 Specifies the Derivative for the Conveyor #2 Front Rail Heater.

MISCELLANEOUS CONFIGURATION EQUIPMENT CONSTANTS

1. CfgGasPurgeTime <U1> ECID 23146, Units = minutes Specifies the Gas Purge Time-out period. Range 5 - 15 minutes.
2. CfgOxMonInterval <U1> ECID 23148, Units = minutes Specifies the Oxygen Monitor Sample Interval. Range 0 to 60 minutes.
3. CfgUnits <U1> ECID 23150 Specifies the Units configuration for the machine. Options are: 1 - Metric, 2 - Imperial, 3 - Mixed
4. CfgLightCurtain <Boolean> ECID 23754 Specifies if the Light Curtain is configured in the system.
5. CfgVoiceSignal <Boolean> ECID 23756 Specifies if the Voice Signal is configured in the system.
6. CfgHoodOpen <Boolean> ECID 23758 Specifies if the Hood Open Signal is configured in the system.
7. CfgHoodOpenTimeout <U1> ECID 23760 Specifies the timeout for the Hood Open delay timer. Range is 0 - 60 seconds.
8. CfgVoiceEntryTimeout <U1> ECID 23762 Specifies the Voice Entry timeout value. Range 0 - 999 seconds.

PRINTER EQUIPMENT CONSTANTS

Printer configuration Equipment Constants

1. CfgPrBlackToWhite <Boolean> ECID 23152 Specifies if the Black / White should be reversed for printouts.

2. CfgPrOrientation <U1> ECID 23154 Specifies the paper orientation in the printer. Options: 1 = Portrait, 2 = Landscape.

3. CfgPrIntensity <U1> ECID 23156 Specifies the intensity for the printer. Options: 1 = Full, 2 = Half.

4. CfgPrPageWidth <F4> ECID 23158, Units = in. Specifies the printer page width.

5. CfgPrPageDepth <F4> ECID 23160, Units = in Specifies the printer page depth.

6. CfgPrImageWidth <F4> ECID 23162, Units = in. Specifies the printer image width.

7. CfgPrImageDepth <F4> ECID 23164, Units = in. Specifies the printer image depth

8. CfgPrLeftMargin <F4> ECID 23166, Units = in. Specifies the printer Left Margin.

9. CfgPrTopMargin <F4> ECID 23168, Units = in. Specifies the Printer Top Margin.

5.4 GEM FUNCTIONALITY

LIMITS MONITORING

Limits monitoring allows the Host to assign limits for Equipment Status Variables. This enables the Equipment to monitor the actual values and generate events if the limits are exceeded. Limits monitoring requires Collection Events to be associated with Status Variables, defined in the next section.

COLLECTION EVENTS

Collections Events are normal process events that the Equipment can report to the Host. For the most part these are process related, i.e. a PCB board entered or exited the Machine etc. Collection Events differ from Alarms in that they are predictable occurrences versus Alarms which indicate that there is a personnel or material safety situations.

As part of the definition Collection Events must be assigned unique IDs. The base ID is for Collection Events is 50000.

1. ConvStart1 CEID 50002 Conveyor #1 started

2. ConvStop1CE CEID 50004 Conveyor #1 stopped.

3. ConvStart2CE CEID 50006 Conveyor #2 Started.

4. ConvStop2CE CEID 50008 Conveyor #2 Stopped

5. PcbEntry1CE CEID 50010 Entry of PCB on Conveyor #1

6. PcbExit1CE CEID 50012 Exit of PCB on Conveyor #1

7. PcbEntry2CE CEID 50014 Entry of PCB on Conveyor #2

8. PcbExit2CE CEID 50016 Exit of PCB on Conveyor #2.

9. HoodFullOpenCE CEID 50018 Oven Hood reaches fully opened position.

10. HoodOpenCE CEID 50020 Oven Hood has started to open.

11. HoodFullCloseCE CEID 50022 Oven Hood has reached fully closed position

12. HoodCloseCE - CEID 50024 Oven Hood has started closing.

13. LightTowerRedCE CEID 50026 The Light Tower has turned Red.

14. LightTowerYellowCE CEID 50028 The Light Tower has turned Yellow.
15. LightTowerGreenCE CEID 50030 The Light Tower has turned Green.
16. ProcessStateManualCE CEID 50032 The machine process state is now Manual.
17. ProcessStateStartingCE CEID 50034 The machine process state is now Starting.
18. ProcessStateRunningCE CEID 50036 The machine process state is now Running.
19. ProcessStateStoppingCE CEID 50038 The machine process state is now Stoppng.
20. MachineRecipeLoadedCE CEID 50040 A new recipe has been loaded from disk.
21. MachineRecipeSavedCE CEID 5042 The current recipe has been saved to disk.
22. SelfCleanStartCE CEID 50044 The Cooling Self Cleaning sequence has begun.
23. SelfCleanFinishCE CEID 50046 The Cooling Self Cleaning sequence has finished.
24. PasswordFailCE CEID 50048 A local operator has failed to enter a correct password.
25. TimedStartCE CEID = 50050, The Time Clock has Auto started the Omniflow machine.
26. TimedStopCE CEID 50052, The Time Clock has Auto Stopped the Omniflow machine.
27. LightTowerFlashingGreenCE CEID 50060, The Light Tower has begun flashing Green.
28. LightTowerFlashingRedCE CEID 50062, The Light Tower has begun flashing Red.
29. LightTowerFlashingYellowCE CEID 50064, The Light Tower has begun flashing Yellow.
30. SelfCleanAbortCE CEID 50066, The Self Clean Cycle has been aborted.

ALARMS

The GEM architecture requires that Equipment be able to report Alarms conditions that occur on the Equipment. Alarms are defined to be any abnormal conditions, which can occur at any time. Further, the Alarm reporting must include "leading" and "trailing" edge, which means when the Alarm goes on as well as when it goes off. The GEM standard defines eight categories, or levels of severity of Alarms. They range from Personal and Equipment safety, the most severe to "Attention Flags" and "Data Integrity". Some of the severity levels are true Alarms. A couple of the severity categories almost seem to overlap the definition of Events. Due to the rather simple function of the Omniflow software only the most severe Alarms, categories of Personal and Equipment safety will be defined.

This is the list of Alarms for the Omniflow system. As part of the definition the Alarm On and Alarm Off Collection Event ID (CEID) is given, the Alarm ID, along with a short description. The Alarm ID is part of the Stream 5 Alarms message (S5/F1 ARS). The Omniflow software will generate the actual text string. Also indicated is whether the Alarm is operator configurable from the local machine. The base for Alarm CEIDs will be 56000;

ExhaustLow - CEIDOn = 56002, CEIDOff = 56004, ALID = 100. Exhaust is Low. Non-Configurable

ConveyorSpeed CEIDOn = 56006, CEIDOff = 56008, ALID = 110. Conveyor Speed #1 out of tolerance.

UpperHeater1Temperature CEIDOn = 56010, CEIDOff = 56012, ALID = 120.Upper Heater #1 out of tolerance.

UpperHeater2Temperature CEIDOn = 56014, CEIDOff = 56016, ALID = 130. Upper Heater #2 out of tolerance.

UpperHeater3Temperature CEIDOn = 56018, CEIDOff = 56020, ALID = 140. Upper Heater #3 out of tolerance.

UpperHeater4Temperature CEIDOn = 56022, CEIDOff = 56024, ALID = 150. Upper Heater #4 out of tolerance.

UpperHeater5Temperature CEIDOn = 56026, CEIDOff = 56028, ALID = 160. Upper Heater #5 out of tolerance.

UpperHeater6Temperature CEIDOn = 56030, CEIDOff = 56032, ALID = 170. Upper Heater #6 out of tolerance.

UpperHeater7Temperature CEIDOn = 56034, CEIDOff = 56036, ALID = 180. Upper Heater #7 out of tolerance.

UpperHeater8Temperature CEIDOn = 56038, CEIDOff = 56040, ALID = 190. Upper Heater #8 out of tolerance.

UpperHeater9Temperature CEIDOn = 56042, CEIDOff = 56044, ALID = 200. Upper Heater #9 out of tolerance.

UpperHeater10Temperature CEIDOn = 56046, CEIDOff = 56048, ALID = 210. Upper Heater #10 out of tolerance.

LowerHeater1Temperature CEIDOn = 56050, CEIDOff = 56052, ALID = 220. Lower Heater #1 out of tolerance.

LowerHeater2Temperature CEIDOn = 56054, CEIDOff = 56056, ALID = 230. Lower Heater #2 out of tolerance.

LowerHeater3Temperature CEIDOn = 56058, CEIDOff = 56060, ALID = 240. Lower Heater #3 out of tolerance.

LowerHeater4Temperature CEIDOn = 56062, CEIDOff = 56064, ALID = 250. Lower Heater #4 out of tolerance.

LowerHeater5Temperature CEIDOn = 56066, CEIDOff = 56068, ALID = 260. Lower Heater #5 out of tolerance.

LowerHeater6Temperature CEIDOn = 56070, CEIDOff = 56072, ALID = 270. Lower Heater #6 out of tolerance.

Lower Heate7Temperature CEIDOn = 56074, CEIDOff = 56076, ALID = 280. Lower Heater #7 out of tolerance.

LowerHeater8Temperature CEIDOn = 56078, CEIDOff = 56080, ALID = 290. Lower Heater #8 out of tolerance.

LowerHeater9Temperature CEIDOn = 56082, CEIDOff = 56084, ALID = 300. Lower Heater #9 out of tolerance.

LowerHeater10Temperature CEIDOn = 56086, CEIDOff = 56088, ALID = 310. Lower Heater #10 out of tolerance.

BoardDuringStartup CEIDOn = 56090, CEIDOff = 56092, ALID = 320. A board entered the system on Conveyor #1 during startup.

OxygenContent CEIDOn = 56094, CEIDOff = 56096, ALID = 330. The Oxygen content has exceeded the Oxygen PPM setting.

O2/N2GasPressureLow CEIDOn 56098, CEIDOff = 56100, ALID = 340. The O2 / N2 Gas pressure is low.

ConveyorWidth CEIDOn = 56102, CEIDOff = 56102, ALID = 350. The Conveyor Width has had an error moving and has exceeded the inner or outer limit.

CoolantFlowLow CEIDOn = 56104, CEIDOff = 56106, ALID = 360. The Coolant Flow is Low. Non-Configurable

CustomInput1 CEIDOn = 56108, CEIDOff = 56110, ALID = 370. The Custom Input #1 failed.

CustomInput2 CEIDOn = 56112, CEIDOff = 56114, ALID = 380. The Custom Input #2 failed.

FixedRailHeater1 CEIDOn = 56116, CEIDOff = 56118, ALID = 390. The Front Rail Heater is out of tolerance.

MovableRailHeater1 CEIDOn = 56120, CEIDOff = 56122, ALID = 400. The Rear Rail Heater is out of tolerance.

EmergencyStop CEIDOn = 56124, CEIDOff = 56126, ALID = 410. The Emergency Stop button was pressed. Non-Configurable.

PowerFail CEIDOn = 56128, CEIDOff = 56130, ALID = 420. The system experienced a power failure.

CoolingHoodOpen CEIDOn = 56132, CEIDOff = 56134, ALID = 430. The Cooling Hood is open.

CoolingHighTemperature CEIDOn = 56136, CEIDOff = 56138, ALID = 440. The Cooling High Temp has been exceeded.

MachineHighTemperature CEIDOn = 56140, CEIDOff = 56142, ALID = 460. The Machine High temperature has been exceeded. Non-Configurable.

ThermalRunaway CEIDOn = 56144, CEIDOff = 56148, ALID = 480. The Thermal Runaway sensor cannot be read, or the hottest Heater has exceeded 600 F. Non-Configurable.

HoodOpen CEID = 56150, CEIDOff = 56152, ALID = 500. The Heater zone hood is open. Non-Configurable.

BlowerFailConvectionGroup1 CEIDOn = 56154, ALID = 480. CEIDOff = 56156, ALID =

510. The Blower for Convection group #1 failed.

BlowerFailConvectionGroup2 CEIDOn = 56158, CEIDOff = 56160, ALID = 520. The Blower for Convection group #2 failed.

BlowerFailConvectionGroup3 CEIDOn = 56162, CEIDOff = 56164, ALID = 530. The Blower for Convection group #3 failed.

UpperHeaterTC1 CEIDOn = 56166, CEIDOff = 56168, ALID = 540. The Thermocouple for Upper Heater Zone #1 failed.

UpperHeaterTC2 CEIDOn = 56170, CEIDOff = 56172, ALID = 550. The Thermocouple for Upper Heater Zone #2 failed.

UpperHeaterTC3 CEIDOn = 56174 , CEIDOff = 56176, ALID = 560. The Thermocouple for Upper Heater Zone #3 failed.

UpperHeaterTC4 CEIDOn = 56178, CEIDOff = 56180, ALID = 570. The Thermocouple for Upper Heater Zone #4 failed.

UpperHeaterTC5 CEIDOn = 56182, CEIDOff = 56184, ALID = 580. The Thermocouple for Upper Heater Zone #5 failed.

UpperHeaterTC6 CEIDOn = 56186, CEIDOff = 56188, ALID = 590. The Thermocouple for Upper Heater Zone #6 failed.

UpperHeaterTC7 CEIDOn = 56190, CEIDOff = 56192, ALID = 600. The Thermocouple for Upper Heater Zone #7 failed.

Upper HeaterTC8 CEIDOn = 56194, CEIDOff = 56196, ALID = 610. The Thermocouple for Upper Heater Zone #8 failed.

Upper HeaterTC9 CEIDOn = 56198, CEIDOff = 56200, ALID = 620. The Thermocouple for Upper Heater Zone #9 failed.

Upper HeaterTC10 CEIDOn = 56202, CEIDOff = 56204, ALID = 630. The Thermocouple for Upper Heater Zone #10 failed.

Lower HeaterTC1 CEIDOn = 56206, CEIDOff = 56208, ALID = 640. The Thermocouple for Lower Heater Zone #1 failed.

Lower HeaterTC2 CEIDOn = 56210, CEIDOff = 56212, ALID = 650. The Thermocouple for Lower Heater Zone #2 failed.

Lower HeaterTC3 CEIDOn = 56214, CEIDOff = 56216, ALID = 660. The Thermocouple for Lower Heater Zone #3 failed.

Lower HeaterTC4 CEIDOn = 56218, CEIDOff = 56220, ALID = 670. The Thermocouple for Lower Heater Zone #4 failed.

Lower HeaterTC5 CEIDOn = 56222, CEIDOff = 56224, ALID = 680. The Thermocouple for Lower Heater Zone #5 failed.

Lower HeaterTC6 CEIDOn = 56226, CEIDOff = 56228, ALID = 690. The Thermocouple

for Lower Heater Zone #6 failed.

Lower HeaterTC7 CEIDOn = 56230, CEIDOff = 56232, ALID = 700. The Thermocouple for Lower Heater Zone #7 failed.

Lower HeaterTC8 CEIDOn = 56234, CEIDOff = 56236, ALID = 710. The Thermocouple for Lower Heater Zone #8 failed.

Lower HeaterTC9 CEIDOn = 56238, CEIDOff = 56240, ALID = 720. The Thermocouple for Lower Heater Zone #9 failed.

Lower HeaterTC10 CEIDOn = 56242, CEIDOff = 56244, ALID = 730. The Thermocouple for Lower Heater Zone #10 failed.

FrontRailHeater1TC CEIDOn = 56246, CEIDOff = 56248, ALID = 740. The Thermocouple for the Front Rail Heater on Conveyor #1 failed.

RearRailHeater1TC CEIDOn = 56250, CEIDOff = 56252, ALID = 750. The Thermocouple for the Rear Rail Heater on Conveyor #1 failed.

CoolingZone1TC CEIDOn = 56254, CEIDOff = 56256, ALID = 760. The Cooling Zone Thermocouple on Conveyor #1 failed.

O2AnalyzerCellFailure CEIDOn = 56282, CEIDOff = 56284, ALID = 830. The O2 Analyzer Cell sensor failed.

SMEMADownstreamError CEIDOn = 56286, CEIDOff = 56288, ALID = 840. A Downstream SMEMA error has occurred.

SMEMAUpstreamError CEIDOn = 56290, CEIDOff = 56292, ALID = 850. An Upstream SMEMA error has occurred.

AllHeaters CEIDOn = 56294, CEIDOff = 56296, ALID = 860. This is an all encompassing Alarm that is triggered if any of the Heaters exceed their limits.

O2PurgeFailure CEIDOn = 56298, CEIDOff =56300, ALID = 870. The O2 Purge sensor has failed.

ClearingPcbs CEIDOn = 56302, CEIDOff = 56304, ALID = 880. Conveyor #1 is in the process of clearing PCBs.

PowerOff CEIDOn = 56306, CEIDOff = 56308, ALID = 890. The power to the Omniflow machine has failed. This Alarm indicates to the Operator to shut off main power to save the EPS (external power supply). This Alarm will only be generated if power fails and an EPS is on the Omniflow machine.

PcbSupportWidth CEIDOn = 56310, CEIDOff = 56312, ALID = 900. The PCB support width motor has experienced a error while moving.

PcbSupport CEIDOn = 56314, CEIDOff = 56316, ALID = 910. The PCB support sensor has failed.

PcbDrop1 CEIDOn = 56318, CEIDOff = 56320, ALID = 920. A PCB has dropped from

Conveyor #1.

PcbDrop2 CEIDOn = 56322, CEIDOff = 56324, ALID = 930. A PCB has dropped from Conveyor #2.

CoolingZone2TC CEIDOn = 56326, CEIDOff = 56328, ALID = 940. The Thermocouple for Cooling Zone #2 has failed.

BlowerFailCG1 CEIDOn = 56330, CEIDOff = 56332, ALID = 950. The Blower for Cooling Group #1 has failed.

BlowerFailCG2 CEIDOn = 56334, CEIDOff = 56336, ALID = 960. The Blower for Cooling Group #2 has failed.

BlowerFailCG3 CEIDOn = 56338, CEIDOff = 56340, ALID = 970. The Blower for Cooling Group #3 has failed.

ConveyorSpeed2 CEIDOn = 56342, CEIDOff = 56344, ALID = 980. The speed for Conveyor #2 has gone out of tolerance.

BoardDuringStartup2 CEIDOn = 56346, CEIDOff = 56348, ALID = 990. A board has entered the Omniflow machine on conveyor #2 during startup.

ClearingPcbs2 CEIDOn = 56350, CEIDOff = 56352, ALID = 1000. Conveyor #2 is clearing PCBs.

PcbJam2 CEIDOn = 56356, CEIDOff = 56358, ALID = 1020. A PCB has become jammed in conveyor #2.

Conveyor2Width CEIDOn = 56360, CEIDOff = 56362, ALID = 1030. The conveyor #2 width motor has had an error while moving.

FrontRailHeater2 CEIDOn = 56364, CEIDOff = 56366, ALID = 1040. The Front Rail Heater for conveyor #2 has gone out of tolerance.

RearRailHeater2 CEIDOn = 56368, CEIDOff = 56370, ALID = 1050. The Rear Rail Heater for conveyor #2 has gone out of tolerance.

SMEMA2Downstream CEIDOn = 56372, CEIDOff = 56374, ALID = 1060. Conveyor #2 has had a Downstream SMEMA error.

SMEMA2Upstream CEIDOn = 56376, CEIDOff = 56378, ALID = 1070. Conveyor #2 has had an Upstream SMEMA error.

FrontRailHeater2TC CEIDOn = 56380, CEIDOff = 56382, ALID = 1080. The Thermocouple for the Front Rail Heated on conveyor #2 has failed.

RearRailHeater2TC CEIDOn = 56384, CEIDOff = 56386, ALID = 1090. The Thermocouple for the Moveable Rail Heater on conveyor #2 has failed.

BlowerPowerFail CEIDOn = 56388, CEIDOff = 56390, ALID = 1100. This is a general Alarm triggered if any of the Convection Blowers fail.

PcbJam CEIDOn = 56392, CEIDOff = 56394, ALID = 1110. A PCB has jammed in Conveyor #1.

ConveyorWidth2 CEIDOn = 56396, CEIDOff = 56398, ALID = 1120. Conveyor #2 has had an error while moving.

SelfCleanFail CEIDOn = 56400, CEIDOff = 56410, ALID = 1130. Self Clean has failed during a cycle.

REMOTE CONTROL

Remote Control functionality is the ability to have the Host computer issue commands that can normally be issued by an operator at the local Equipment console. The requirement of Remote Control is to implement a cooperative control mechanism, which allows either the Host or the local operator to completely control the machine. The Remote Control functionality has two main components. The first is the Control State model which defines the rules for arbitrating the Host vs. local control of the Equipment. The second is the actual Remote Commands, which define the specific process options that the Host can issue. In order to allow the local operator to configure how the Equipment functions in the Control State model, the GEM Standard specifies that the Equipment will have a local User Interface. It is defined in "GEM User Interface" section.

As this is a somewhat simple software system, there is only a small number of Remote Commands. There are two distinct stream 2 messages that can be used to sent Remote Control messages to the OmniFlo.

1. Stream 2 / Function 21 - Remote Command Send (RCS)

Each command is given a unique number, or RCMD. The remote commands are:

1. Start - RCMD = 1, Command to Start the Omniflow machine.
2. Stop - RCMD = 2, Command to Stop the Omniflow machine.
3. TAB Screen - RCMD = 3, Bring up the Tabular display. This behaves exactly as the "F8" key. If the Tab screen is already up, but iconized, it will only highlite the icon.
4. Graphics Screen - RCMD = 4, Bring up the Graphics Screen. This behaves exactly as the "F9" key. If the Graphics screen is already up but iconized, then this command will only highlite the icon.
5. Stop Conveyor 1 - RCMD = 5, Command to stop Conveyor #1. The same action as if the operator selected the Conveyor #1 Actual speed on the Graphics screen or the Conveyor #1 Status bar on the Tabular screen. This command is only valid if a) The OmniFlo is in Remote Mode and b) the OmniFlo is not in starting or running process state.
6. Stop Conveyor #2 - RCMD = 6, The same as RCMD 5 above, but for Conveyor #2.

2. Stream 2 / Function 41 - Host Command Send (HCS)

The Host Command Send (HCS) allows remote commands to be sent with parameters. The S2/F41 remote commands pertain to Recipe File management. The generic S2/F41 format is as follows:

```
S2/F41
        LIST [2 elements]
        ASCII "RCMD"
                LIST #1 [2 elements]
                        ASCII "PPID"
                        ASCII "CP VALUE 1"
                LIST #2 [2 elements] (Optional)
                        ASCII "CONVID"
                        ASCII "CP VALUE 2"
```

Values for "RCMD" can be:

1. PP-LOAD - Loads a recipe.
2. PP-SAVE - Saves a recipe
3. PP_DELETE - Deletes a recipe

   The list #1 element 1 should be "PPID", which identifies that the first parameter as the name of the Recipe (Process Program). Element #2, CP VALUE 1 should be the name of the Recipe to be loaded, saved or deleted. List #2 is optional and is used to identify the conveyor number. List #2, element #1 should be "CONVID" and the CP VALUE 2 should simply be an ASCII "1" or "2" to identify the conveyor number to load, save or delete the recipe. IF LIST #2 IS NOT INCLUDED THEN THE CONVEYOR NUMBER IS DEFAULTED TO 1. The following example will load a recipe named "testing to conveyor #2.

```
S2/F41
        <A "PP-LOAD">
        <L [2]>
                <L [2]>
                        <A "PPID">
                        <A "testing">
                <L [2]>
                        <A "CONVID">
                        <A "2">
```

PROCESS PROGRAMS

Process Programs are the "Recipe" files that contain the configuration and process specification parameters for the Equipment. GEM Allows the transfer of Process Programs to be initiated be either by the Host or the Equipment. In this implementation the Host is not seen as having editing capabilities for Process Programs. Therefore the Equipment doesn't have a real need to initiate a Download of a Process. The Process Program Management in the Omniflow system are:

1. Host initiated Upload. This is the S7/F5 PPR message. When GW GEM receives this message it invokes an Extension Routine. This Extension Routine will access the Equipment Process Program library for the specified Process Program in its entirety and forward it to GW GEM. GW GEM then transfer it to the Host.

2. Equipment Initiated Upload. This is the same as A, but in reverse. GW GEM requires a file containing the Process Program which it then Uploads to the Host.

3. Process Program Directory. This is the S7/F19 RER message. GW GEM invokes an Extension Routine. This Extension Routine is required to provide to GW GEM a null terminated array of strings of all the Process Programs. GW GEM then Uploads this to the Host.

4. Process Program Delete. This is the S7/F17 DPS message. GW GEM only invokes an Extension Routine which must actually delete the Process Program on the Equipment. The Process Program then provides a success / fail status, which GW GEM returns to the Host.

The format of the Process Program as discussed will be ASCII. The contents are:

- RecipeCRC — Verification CRC for the Recipe.
- RecipeName — 41 char Name
- RecipeTime — Time recipe was written, using time format of Time Date configuration.
- RecipeDate — Date recipe was written, also in time date format
- ProcessNotes — 1K ASCII buffer.
- UpperHeater [11] — Upper Heater Zone temperature set points .
- LowerHeater [11] — Lower Heater temperature set points.
- FixedRailHeater — Front Rail Heater temperature setpoints.
- MovableRailHeater; — Rear Rail Heater temperature setpoints.
- ConvSpeed — Conveyor Speed.
- ConvWidth — Conveyor Width
- PcbMultiplier;— PCB mutiplier
- Liquidus Temp — Liquidus temp setpoint
- PcbLength — size of PCBS
- RelBoardNum
- OxygenPPM — Oxygen PPM ;
- ConvectionFans — Convection Fans config.;
- Cooling1— Cooling Zone #1 config.
- Cooling2 — Cooling Zone #2 config.
- Gas — Gas Inerting config
- PcbSupport — Boolean for PCB Support config
- PcbSupportWidth — PCB Support width
- Cooling4 — Cooling Zone #4 config

  CURRENTLY PROCESS PROGRAM FUNCTIONALITY HAS NOT BEEN IMPLEMENTED.

TERMINAL SERVICES

Stream 10 - Terminal Services allows the local Equipment operator a mechanism to exchange text messages with the Host. The terminal services will utilize the local GEM User Interface as a text display and input device, defined in section IV below. The GEM standard allows any text message size with a minimum of 160 characters. Unless there is any outstanding reason the Omniflow implementation will provide for 160 characters. The Omniflow GEM implementation has implemented the following Stream 10 Terminal Services:

1. Host to Equipment text messages. This includes S10/F3 Terminal Display, Single (VTN), S10/F5 Terminal Display, Multi-Block or S10/F9 Broadcast (BCN) message. These messages contain a text message that must be displayed on text display device.

2. Equipment to Host. S10 / F1 Terminal Request.

Most of the implementation of the Terminal Services falls under the Local GEM User Interface. This is to due to the fact that the Local GEM User Interface is where the Terminal Services text display and input will be located.

CURRENTLY TERMINAL SERVICES HAVE NOT BEEN IMPLEMENTED.

LOCAL GEM USER INTERFACE

The GEM standard calls for a local GEM User Interface on the Equipment. This is the interface that the local operator has to GEM. The Local GEM UI has two primary functions. The first is to provide the operator with certain GEM state information. The second is to allow the local operator to modify GEM Equipment Constants which affect how GEM controls the Equipment and interfaces to the remote Host. The language of the GEM standard specifies that the local GEM UI essentially must be persistent. This means that the GEM UI cannot be destroyed.

The Local GEM UI has two primary functions explained above:

1. State Model information. This state model info must be displayed as part of the GEM UI at all times:

   A. Communication State — Indicating one of the following Communication states: DISALBED, ENABLED /NOT COMMUNICATING or ENABLED / COMMUNICATING.

   B. Control State — Indicating the following Control states: EQUIPMENT OFFLINE, ATTEMPT ONLINE, HOST OFFLINE, LOCAL or REMOTE.

   C. Spool State — Indicating on of the following Spool states: INACTIVE., ACTIVE or FULL.

2. Required GEM Equipment Constant options. The Local GEM UI must allow the local operator to be able to perform the following GEM operations:

   a. ENABLE — Communications State (Reference the Communications State section for full detail).

   b. DISABLE — Communications State

   c. ONLINE — Control State (Reference the Control State section for full detail).

   d. OFFLINE — Control State.

   e. LOCAL — Control State

   f. REMOTE — Control State

5.5 GEM COMPLIANCE

GEM Compliance is the term used to indicate that an implementation of GEM meets certain criteria. This criteria is an agreed upon subset of GEM functionality. This is meant to establish a common baseline among Host and Equipment developers. The goal here is to have GEM developers create an implementation that interfaces smoothly and in a robust manner with other Host or Equipment implementations.

Two lists are presented, the Fundamental GEM requirements and the added GEM capabilities. The items are divided into to categories: Next to each is a check indicating whether this is addressed by the Omniflow GEM implementation.

Table 5: Fundamental GEM Requirements

GEM REQUIREMENTS	IMPLEMENTED
GEM Requirements	**Implemented**
State Models	**Yes**
Equipment Processing States	**Yes**
S1 F13/F14 Scenario	**Yes**
Event Notification	**Yes**
On–Line Identification	**Yes**
Error Messages	**Yes**
Control (Operator Initiated)	**Yes**
Documentation	**Yes**

Table 6: Additional Capabilities

GEM FUNCITONALITY	IMPLEMENTED
Establish Communications	**Yes**
Dynamic Event Reports	**No**
Variable Data Collection	**No**
Trace Data Collection	**No**
Status Data Collection	**Yes**
Alarm Management	**Yes**
Remote Control	**Yes**
Equipment Constants	**Yes**
Process Program Management	**No**
Material Movement	**No**
Equipment Terminal Services	**No**
Clock	**No**
Limits Monitoring	**Yes**
Spooling	**Yes**
Control (Host Initiated)	**Yes**

APPENDIX A: INDEX

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