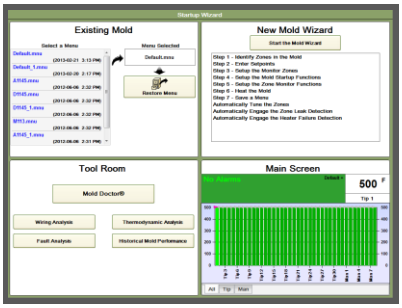
GAMMAFLUX G24

HOT RUNNER TEMPERATURE CONTROLLER
OPERATOR'S MANUAL



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1
Safety

To protect the operator at the work place, ensure that all safety devices installed on the machine and mold are functioning correctly. Never disable or by-pass a safety device. Follow the machine and mold manuals for safe procedures and safety checks.

Reference to Standards:
Important: For machine or mold rebuild, repair or maintenance, lockout/tagout procedures must be followed as recommended in ANSI Z24a4a.1-1982 (The American National Standards Institute) and as specified in OSHA 29CFR PART 1910.14a7.

Throughout this manual references are made to various standards: ANSI (American National Standards Institute), OSHA (Occupational Safety and Health Act) and CE (Conformity in Europe) for safety or operating protocol. We recommend that these standards be the minimum used. If there are more stringent local standards, they must be followed.

Personal Protection: The operator must wear safety glasses, face shield, heat-resistant gloves and protective clothing when working around the feed throat, purging the machine or clearing the gates of the mold. Operators must be aware of the possibility and danger of hot resin and/or gases spurting from gates, machine nozzle and feed throat of the hopper.

Lockout/Tagout: Throughout this manual instructions are given to lockout/tagout power sources. Usually no instructions are given to turn the power source back ON. This is assumed to have been covered by the instruction to perform any operation requiring the power source provided that all steps in the instructions prior to the power being applied have been completed. If the power source must again be turned OFF the instruction to lockout/tagout is repeated.

Housekeeping: Clearly define areas for the controller to be positioned. Provide clear access to the front and rear of the cabinet in case of an emergency. Do not position the equipment so that it is difficult to operate the disconnecting device. Check frequently for frayed or worn electrical cables located on the rear of the cabinet. Replace any frayed or worn cable immediately once it is found. Never place any materials on or near the controller cabinet that would block air flow near the cabinet ventilation ports. Never clean the mold, machine or hot runner controller while it is operating. Never place any materials on top of the hot runner controller cabinet. Make certain that all cable connectors on the rear of the cabinet are securely clamped down and held in place. If any are loose, secure them before operating the controller.

Safety Symbols Used in this Manual: There are various symbols used with text and graphics to convey safety messages in this manual or in the product itself. They follow the standard IEC 61010-1 Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use.

Symbol	Description	Notes
	Caution/ Attention refer to manual	
	Protective Conductor Terminal	For safety purposes
	Caution, High voltage is present inside, possibility of electric shock	
	Alternating current	
	Power ON	
	Power OFF	
	Earth (ground) Terminal	For non-safety related functions, i.e. functional earth terminal
	Frame or Chassis Terminal	

Figure 1 Safety Terms and Symbols

Hazard Alert symbols are used to indicate the hazard alert message regardless of the hazard level. The hazard level is conveyed by the use of the appropriate signal word. Graphics within the triangle are used to further identify the specific hazard such as:

CAUTION: The G24 Operator's manual must be consulted in all cases where this symbol is used in order to find out the nature of the potential hazards and any actions which have to be taken to avoid them.

CAUTION: HIGH VOLTAGE. NEVER REMOVE THE COVER, TRY TO OPEN THE CABINET OR DISCONNECT CABLES WITHOUT TURNING OFF THE MAINS CIRCUIT BREAKER UNLESS YOU ARE PROPERLY TRAINED IN ELECTRICAL SAFETY AND AUTHORIZED TO WORK ON THE CABINET. THERE ARE HIGH VOLTAGE ELECTRICAL CIRCUITS INSIDE THE CABINET.

CAUTION: ALWAYS LOCKOUT/TAGOUT THE MAIN POWER BREAKER BEFORE OPENING THE CONTROLLER ENCCLOSURE. DO NOT CLOSE THE MAIN BREAKER IF THE CONTROLLER CABINET IS OPEN.

CAUTION: ALL CONTROLLERS HAVE A PROTECTIVE CONDUCTOR TERMINAL (EARTH LUG) ON THE REAR OF THE CABINET. WITH A 6AWG (16mm^2) GREEN WIRE, CONNECT THE TERMINAL TO EARTH. THIS IS A SAFETY WIRE AND MUST BE INCLUDED IN THE CONTROLLER SETUP. UNAUTHORIZED PERSONNEL SHOULD NOT BE ALLOWED ACCESS TO THE INTERIOR OF THE CABINET.

CAUTION: ANY CONTROLLER USING "J" TYPE THERMOCOUPLES SHOULD NOT BE SET FOR A TEMPERATURE HIGHER THAN 400 DEGREES C (760 DEGREES F). AT THIS TEMPERATURE "J" TYPE THERMOCOUPLES CAN BEGIN TO OXIDIZE AND BECOME NON-LINEAR (LOSE THEIR CALIBRATION OR REPEATABILITY). IN ADDITION, MOST THERMOPLASTIC RESINS ARE MOLDED AT LOWER TEMPERATURES. HIGHER TEMPERATURES COULD CAUSE THE MATERIALS TO DEGRADE (BURN).

CAUTION: LIFT THE G24 SYSTEM ONLY WITH A MECHANICAL LIFTING DEVICE IN SUCH A MANNER THAT THE LIFTING DEVICE'S WEIGHT BEARING SURFACES MAKE CONTACT WITH THE BOTTOM OF THE G24 SYSTEM'S PEDESTAL. THE ENTIRE WEIGHT OF THE G24 SYSTEM NEEDS TO BE SUPPORTED BY THE PEDESTAL DURING ANY MOVEMENT. THERE ARE NO HANDLES OR LIFTING POINTS ON THE SYSTEM OTHER THAN THE PEDESTAL.

CAUTION: FOR PERMANENTLY CONNECTED EQUIPMENT REQUIRING AN EXTERNAL SWITCH OR CIRCUIT BREAKER (CB), USE A SWITCH OR CB OF APPROPRIATE AMPERAGE AND VOLTAGE RATINGS TO SAFELY HANDLE THE SYTEM'S LABELED AMPERAGE AND VOLTAGE RATING. PLACE THE SWITCH OR CB NEAR THE EQUIPMENT.

CAUTION: ALL POWER-UP PROCEDURES SHOULD BE DONE BY A TRAINED, QUALIFIED SETTER OR ELECTRICIAN. PROPER TRAINING PROVIDED BY GAMMAFLUX IS A MUST FOR QUALIFICATION TO SET-UP THE EQUIPMENT SAFELY.

CAUTION: BE SURE MAIN POWER IS LOCKED OUT/TAGGED OUT DURING PRE START-UP PROCEDURES.

CAUTION: MAKE CERTAIN THAT EACH CONNECTION IN ANY THERMOCOUPLE CIRCUIT IS BETWEEN EITHER TWO RED OR TWO WHITE WIRES. DO NOT CONNECT RED AND WHITE THERMOCOUPLE WIRES TOGETHER EVEN IF THIS MAY APPEAR TO CORRECT AN OPERATING PROBLEM.

CAUTION: THE THERMOCOUPLE WIRES ARE NOT RATED TO CARRY THE POWER-LINE VOLTAGE. ALWAYS LOCKOUT/TAGOUT THE MAIN POWER BREAKER WHEN WORKING ON THE THERMOCOUPLE OR MOLD POWER WIRES.

CAUTION: DO NOT USE A HIGH VOLTAGE TEST ON ANY TERMINALS WITHIN THE CABINET WHEN ALL THE ELECTRONIC CARDS ARE INSTALLED. THE HIGH VOLTAGE ASSOCIATED WITH THESE TESTS COULD DAMAGE ELECTRONIC CIRCUITS WITHIN THE CABINET.

CAUTION: IT IS COMMON FOR OUTPUT TRIACS TO SHORT WHEN A FUSE BLOWS. A SHORTED TRIAC CANNOT BE REGULATED AND WILL APPLY FULL POWER TO THE HEATER. ALWAYS CHECK A CONTROLLED ZONE THAT HAS A BLOWN FUSE BY ADJUSTING POWER FROM ZERO TO 100 % IN THE MANUAL MODE. THE VOLTAGE SHOULD GO FROM ZERO TO 240 VOLTS (OR FULL VOLTAGE) RESPECTIVELY.

CAUTION: WHEN REPLACING FUSES, MAKE CERTAIN THAT THE AC MAIN CIRCUIT BREAKER HAS BEEN TURNED OFF.

CAUTION: THE SAFETY OF ANY SYSTEM INCORPORATING THE G24 IS THE RESPONSIBILITY OF THE ASSEMBLER OF THE SYSTEM.

CAUTION: IF THE EQUIPMENT IS USED IN A MANNER NOT SPECIFIED BY GAMMAFLUX, THE PROTECTION BY THE EQUIPMENT MAY BE IMPAIRED.

CAUTION: DISCONNECT SYSTEM FROM MAINS. VERIFY EQUIPMENT IS SAFE AFTER REPAIR. MEASURE RESISTANCE BETWEEN EACH MAINS SUPPLY CONDUCTOR AND THE PROTECTIVE EARTH CONDUCTOR AND ENSURE THERE IS NOT A SHORT CIRCUIT. MEASURE THE RESISTANCE OF THE PATH FROM AN ACCESSIBLE ENCLOSURE POINT TO THE PROTECTIVE CONDUCTOR TERMINAL OF THE MAINS SUPPLY PLUG/WIRING AND VERIFY IT IS LOW ENOUGH TO COMPLY WITH APPLICABLE STANDARDS.

2
General Information

The **GAMMAFLUX G24 Series** Hot Runner Temperature Controller system is a compact, industry hardened and attractively styled controller. The controller is based upon single module integrity using microprocessor based temperature control modules. The modular enclosure packaging allows for a small footprint.

Figure 2a G24 D3 Enclosure

All Gammaflux temperature controllers feature Triangulated Control Technology®. Using this unique technology, Gammaflux controllers:

1) Sense: Gammaflux controllers precisely measure the temperature 20 times per second.
2) Control: The proprietary self-optimizing Gammaflux PID^2 control algorithm adjusts if the actual temperature deviates 0.03F (0.014C) from set point. The second derivative (PID^2) monitors the actual temperature rate of change. As a result, the output to the heater is regulated in advance of the typical proportional band to limit or eliminate over or undershoot.
3) Actuate: Using phase angle fired output (0.1% resolution, 1000 steps), the Gammaflux controller delivers smooth and exact power to each heater for the ultimate in temperature control.

Triangulating your process with a Gammaflux controller means achieving better temperature control that could result in reduced scrap, improved part weight consistency, material savings, higher profit margins and enhanced part quality.

Gammaflux products lead the market in reliability. The expected life is 10 - 15 years based on the quality of heater electrical maintenance. Some controllers have been in continuous operation for more than 25 years. Each control module has the Gammaflux proprietary PID^2 control algorithm. This algorithm is time tested and proven on hot runner systems around the world.

The G24 uses phase angle fired outputs. Phase angle firing provides major benefits compared to time proportioning outputs. With phase angle fired outputs, output voltage to the heater can be adjusted to any level from 0 VAC to full voltage with great precision. Time proportioning controllers are limited to providing only 0 VAC and full voltage to heaters.

The G24 computer normally comes with a 12.1" TFT, 1028x768 pixel touchscreen that enables the operator access to all data pertinent to the operation of the G24. The screen design

enables the operator to become quickly familiarized with the controller while giving the operator access to a wide array of tools to maximize hot runner performance. The G24 touchscreen uses easy-to-understand icons to identify the control functions, process values and alarm status. All hot runner set up, mold performance and monitoring information is accessed by using the touchscreen located on top of the enclosure (touchscreen can also be mounted remotely). With the proper security password, a user can customize many of the features of the G24. A USB memory drive is included for easy uploading and downloading of information.

The Gammaflux G24 is designed to provide the user with the most powerful hot runner diagnostic tools available. Features such as heater resistance, wattage monitoring, settable alarm limits, field calibration capability and interactive graphic representation of the mold are standard. The G24 supports digital communication using a USB interface.

To meet the needs of the international markets, the G24 accommodates field selection of "J" Type or "K" Type thermocouples, degrees F or degrees C temperature configuration, and either Delta or Wye main input power.

The G24 has been designed to include a vast array of features that provide the user with the industry's best temperature control along with the industry's most complete package of process information and diagnostic tools. Features include:

Ease of Use / Flexibility
Expanded use of universally accepted icons
4 security levels increase or decrease operator options and availability of screens
Flexible packaging includes integrated or remote screen placement
On screen display of reports of up to 48 hours of data
Databases
Alarm History
Monitor function enables user to alarm temperature inputs that are not being controlled by the G24 such as cooling water temperatures
Group tab creation - view all zones or only the zones in each group
Tool graphics with real time zone data overlay
Network communication capability
Boost – temporarily raises a zone or group of zones temperature to eliminate cold slugs on start up.
Standby – lowers a group of zones to the standby temperature while the process is idle.
Trim – permanent set point shift (e.g. 10F) for the zone or zones selected. User can quickly shift setpoint for a group of zones even if the setpoints are different.
Operator Identification - Create an authorized users list with individual user codes that must be entered by an operator before changes can be made
Selectable "Auto On" feature automatically returns to controlling at setpoint after temporary power outage.
Programmable array of automatic heat up and cool down features including Sequence Start, Sequence Powerup, Even Heat, Even Cool and Sequence Cool
"Auto load %" feature for quick loading of manual percentages based on actual zone data
"Find this module" LED enables user to quickly locate the hardware location of any zone.
Global input power flexibility
Daisy-chain 2 or more G24 enclosures for large systems, view on one screen
Small footprint

Control
Enhanced control algorithms employing proprietary Gammaflux PID^2
High resolution thermocouple input
High resolution voltage output
Automatic switching to learned manual setting when thermocouple fails

Remote Inputs (up to 4):
Machine cycle/material protection

Control Inhibit (turns off outputs)
OK to Run
Remote Standby
Remote Boost (Sections 10 and 11)
Remote Sequence Start (Sections 11 and 14)
Remote Sequence Cool (Sections 11 and 14)
Remote Sequence Powerup (Sections 11 and 14)
Remote Even Cool (Sections 11 and 14)
Remote Restore Menu
Mold ID (optional)
Water Flow Sensor
OK to Run input

Outputs (up to 4):
Resettable alarm output relay
Non-resettable alarm output relay
Critical high temperature alarm relay trip
"OK to Run" contact (user configurable) to notify machine that temperatures are high enough to start molding

Diagnostics
Ground Fault and Heater Bakeout provide superior heater protection during startup and during heater shorts. On startup, the G24 will initially provide a very low voltage (1-5 VAC) to the heater and the heater current will be monitored. If the current draw is excessive, the G24 will "bakeout" the heater by providing a low voltage pulse to the heater. Once the heater is dry, the G24 will ramp the zone's output to full voltage in a few line cycles while continuing to monitor the current draw. Ground Fault detection can be used to prohibit affected zones from turning on until condition has cleared.

Mold Monitor provides extensive on-line monitoring of the heaters' resistance and wattage values to ensure efficiency and to provide preventative maintenance information. A machine cycling input signal can be monitored to ensure the injection molding machine is operating. If the machine stops for a designated period of time, the controllers' outputs will go to Standby mode to reduce material degradation in the tool. Early material leak detection is featured using a wattage alarm to detect elevated wattage demand.

Mold Doctor® provides off-line tools to troubleshoot the mold. Tests include:
Wiring Analysis: checks the tools wiring. The software clearly notifies the user of miswired zones along with any thermocouple or heater problems.
Fault Analysis: quickly identifies thermocouple open, thermocouple reversed, thermocouple pinched, open fuse, heater open, heater wet and heater short issues.
Thermodynamic Analysis: automatically ramps all selected zones to 400º F (204º C) and then cools zones to 330F. During the heating and cooling process Mold Doctor® provides and records critical information. By providing zone-by-zone data for resistance, power consumption, heating and cooling rates, tool maintenance becomes a much easier task. This data is saved so that it can be compared to future tool data.
Historical Mold Performance: allows the user to easily compare a known "good" thermodynamic analysis baseline to the current thermodynamic analysis. Intuitively troubleshoot your mold with hard data.

Field Calibrator enables in-house calibration at the user's convenience.
Databases can be sent to experts to assist in troubleshooting.
Controller can be operated from a laptop computer in the event of a screen failure.

Languages
A variety of languages are available with more being added. Contact Gammaflux for more information.

3
Cabinet & Wiring

The **G24** hot runner mold controller uses a "block" style of architecture. Each block contains up to 24 zones of control. Circuit Breakers are sized up to 150A Delta or 80A Wye for enclosures with up to 3 blocks (72 zones) of control. Up to 300A Delta or 200A Wye circuit breakers are available for larger systems.

Figure 3a shows the T2 enclosure (meaning 2 blocks, no casters). It includes up to 48 zones of control and up to a 150A Delta or 80A Wye circuit breaker.

The 12.1" TFT, 1028x768 pixel touchscreen can be mounted on top of the enclosure (standard) as shown in Figure 3a or mounted remotely.

Figure 3a G24 T2 Enclosure

Primary AC power is distributed from the each block's circuit breaker to each output zone control module. The AC power is distributed so that the load is as equally distributed as possible. Zone output modules are sequentially wired to different phases.

Regulated output power is routed from the output modules to the appropriate mold power connector on the rear of the cabinet. High current plug-in connectors are used to transfer AC power to and from the mold. In a similar fashion, the thermocouple signals are routed into the controller using plug-in connectors clearly marked for thermocouple inputs.

Figure 3b indicates the maximum number of zones along with the dimensions of the controller cabinets and the mobile stands (without the screen attached).

Enclosure Type	Max Zones	Height (mm)	Width(mm)	Depth(mm)
T1 (no casters)	24	25.75 / 654	10 / 254	23 / 584
T2 (no casters)	48	36.50 / 927	10 / 254	23 / 584
S1	24	39.50 / 1003	20 / 508	23 / 584
S2	48	39.50 / 1003	20 / 508	23 / 584
S3	72	50.25 / 1276	20 / 508	23 / 584
D2	96	39.50 / 1003	20 / 508	23 / 584
D3	144	50.25 / 1276	20 / 508	23 / 584
D4	192	61.00 / 1549	20 / 508	23 / 584

Figure 3b Cabinet Maximum Number of Zones and Dimensions (without screen)

Figure 3c Cabinet

System Set-Up and Input Power Connections
Connector Drawings are with the system. Place the control cabinet in position. The cables that correspond to the appropriate thermocouple and power output are labeled with letters so that they may be matched without confusion. When installing the cable sets, match the labels up exactly on the cable set hood and cabinet.

For permanently connected equipment without factory supplied wiring, use wire of appropriate amperage and voltage ratings to safely handle the system's labeled amperage and voltage rating.

The standard AC input power cable provided is Type SO and it is approximately 10 feet (3.048 meters) long with color-coded "flying leads". Its diameter is determined by the size of the specified circuit breaker in that it is sized to carry the same amount of current. See Figure 3d for common color codes. Standard power input is 220/230/240 VAC Delta three phase or 380/400/415 VAC Wye (230VAC to the controller) three phase. Other voltage configurations are available. A step down transformer is available as an option.

Phase	4-wire (Standard)	5-wire (optional)	European (optional)
L1	Red	Red	Brown
L2	White	Orange	Black
L3	Black	Black	Black
Neutral	-	White	Blue
Safety Ground	Green	Green	Green / Yellow

Figure 3d Power Input Wiring

CAUTION: BEFORE APPLYING AC LINE POWER TO THE CONTROLLER, CHECK TO ENSURE THAT THE AC LINE POWER MATCHES THE POWER RATING INDICATED ON THE LABEL ATTACHED TO THE REAR OF THE G24 ENCLOSURE. CONFIRM THAT THE AC LINE POWER MATCHES THE CONTROLLER CONFIGURATION

OF DELTA OR WYE (STAR). CONFIRM THAT THE ACTUAL VOLTAGES DO NOT EXCEED THE CONTROLLER RATING, THE INPUT POWER WIRING IS CONNECTED PROPERLY AND THAT THE CONTROLLER IS PROPERLY GROUNDED. INCORRECT WIRING OR APPLICATION OF VOLTAGES THAT EXCEED THE CONTROLLER RATING WILL RESULT IN SEVERE DAMAGE TO THE CONTROLLER.

The circuit breaker sizes are determined at time of order entry based upon information supplied by the user. Circuit breakers are located on the back side of each block.

CAUTION: FAULT CURRENTS IN EXCESS OF THE CIRCUIT BREAKER's RATING MUST BE PROTECTED BY THE BUILDING SUPPLY IN ACCORDANCE WITH LOCAL AND NATIONAL WIRING REGULATIONS.

Input Control Modules

There is one Input Control Module (ICM) per block. The purpose of the ICM is to communicate between the screen (computer), the thermocouple input cards and the output cards. In addition, each ICM board provides one remote input function and one remote output function selectable by the user. Each ICM contains 4 LEDs that can be used for diagnostic purposes. The LEDs have the following purposes (starting with the LED closest to the ribbon cable):

1) Monitors USB communication between the screen (computer) and ICM board. The LED is off when communicating properly. It blinks red when communication is lost. If the software is being updated, the LED will blink green once to show the software has been properly loaded.
2) Monitors control loop activity. The LED blinks green when indicating that the control loops are functioning normally. It goes blank when control activity stops.
3) Monitors output module communication. The LED blinks green when the output modules are communicating properly with the ICM board. It goes blank when communication is lost.
4) Monitors thermocouple board communication. The LED blinks green when the thermocouple input cards are communicating properly with the ICM board. It is not lit when communication is lost.

Output Cards

Each output card contains two zones capable of running a load of up to 15A each. The circuit breaker size of the block determines the cumulative amperage the output cards in that block can control.

There are four 20A, 500 VAC, very-fast acting fuses (SIBA 70.125.40.20) on each output card as shown in Figure 3g. It is important to replace the fuses with the same style of fuse. Regular fuses will not give adequate protection to the boards. Smaller fuses can be used if the zones are running at lower amperages. Never replace a fuse with a fuse rated for higher amperage than the factory standard.

Remote I/O Connections

The G24 can be ordered with no remote I/O options, 1 input / 1 output (Versions A & E), or 2 inputs / 2 outputs (Versions C & G). The HA10 Remote I/O Connector (single latch receptacle) is located near the input power cable at the rear of the G24 controller. The HA10 is used for a variety of Remote I/O functions including alarm functions (Section 12). The wiring layout is shown in Figure 3e.

A 24VDC supply is supplied across pins 3(+) and 8(-). If the audible alarm option has been specified (Versions A & C), it displaces one of the outputs.

The factory has assigned the input and output functions as described below. With the exception of the audible alarm, they can be reassigned to different functions in the field as described in Section 12 of this manual.

The Remote / Input options are:

A: One input (#1 - Standby), one output (not available - used by audible alarm).

C: Two inputs (#1 – Standby, #2 – Control Inhibit), two outputs (#1 – OK to Run, #2 – not available – used by audible alarm).

E: One input (#1 – Standby), one output (OK to Run). No audible alarm.

G: Two inputs (#1 – Standby, #2 – Control Inhibit), two outputs (#1 – OK to Run, #2 – user assignable). No audible alarm.

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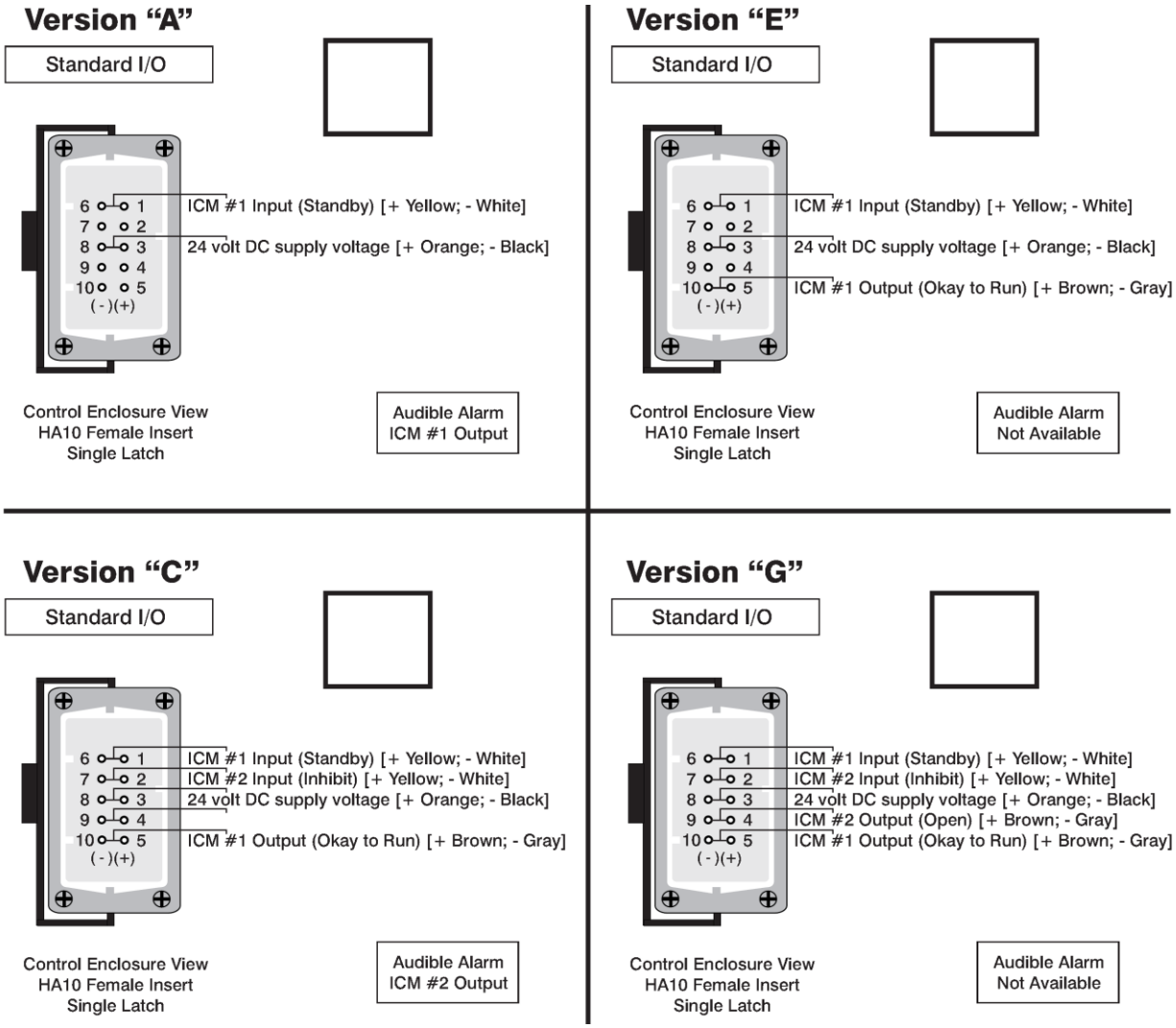


Figure 3e HA10 Remote Input Output Connections

Figure 3f shows an example of using a remote contact on the injection molding machine to activate or deactivate a remote input function (such as Standby) on the G24. Select Remote Standby in the Remote IO setup (Section 12) as the function associated with ICM#1 Input. Then wire the 24VDC signal (pin 3) to the external contact used on the machine, then back to pin 1. Finally, wire pin 6 to pin 8 as shown in Figure 3f.

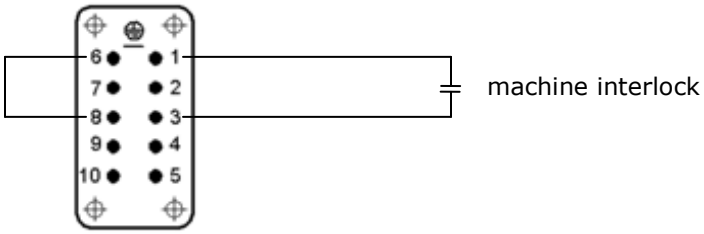


Figure 3f HA10 Remote Input Example (ICM #1 Input)

The connector may be mounted differently than shown in Figure 3f. The connector may be rotated or the pin numbers may switch sides.

Figure 3g shows an example of using a remote contact on the injection molding machine to interface with a remote output signal (such as OK to Run) from the G24. Select OK to Run in the Remote IO setup (Section 12) as the function associated with ICM#1 Output (Versions C, E & G shown in Figure 3e). Then wire the 24VDC signal (pin 3) to the ICM #1 Output (pin 5). Then wire the other ICM #1 Output (pin 10) to the machine interlock. Wire from the machine interlock back to Common (pin 8).

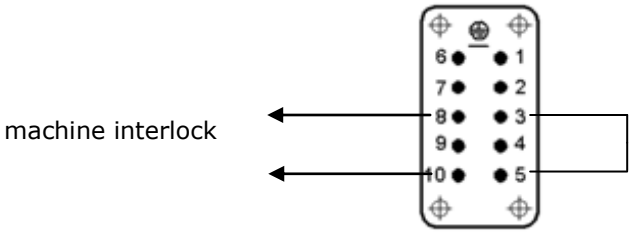


Figure 3g HA10 Remote Output Example (ICM #1 Output)

The connector may be mounted differently than shown in Figure 3g. The connector may be rotated or the pin numbers may switch sides.

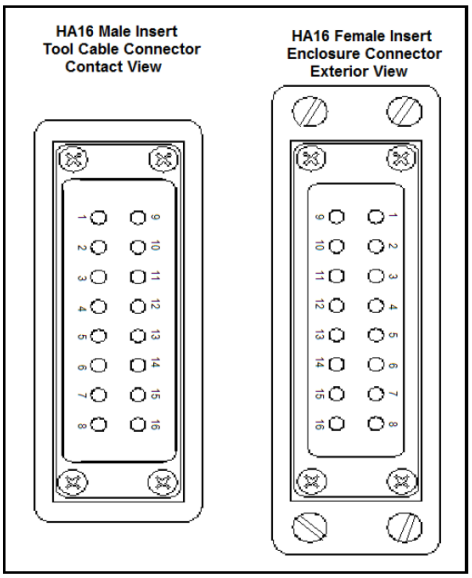
<u>Flow Monitoring Option</u>

The input module uses an input mode where there are two input channels (dual channel sensor) sharing a single input common. These pin pairs are:

Pin 1 Sensor 1 - Input 1a
Pin 2 Sensor 1 - Input 1b
Pin 9 Sensor 1 Common
Pin 3 Sensor 2 - Input 2a
Pin 4 Sensor 2 - Input 2b
Pin 11 Sensor 2 - Common
Pin 5 Sensor 3 - Input 3a
Pin 6 Sensor 3 - Input 3b
Pin 14 Sensor 3 - Common
Pin 7 Sensor 4 - Input 4a
Pin 8 Sensor 4 - Input 4b
Pin 16 Sensor 4 - Common

Figure 3h shows the connector pinout for the signals for 'dual channel' sensors for flow input Sensors 1-4. The pattern would be replicated in additional connectors for Sensors 5-8, Sensors 9-12 and Sensors 13-16.

Pin 1 Sensor 1 - Input 1a
Pin 2 Sensor 1 - Input 1b
Pin 3 Sensor 2 - Input 2a
Pin 4 Sensor 2 - Input 2b
Pin 5 Sensor 3 - Input 3a
Pin 6 Sensor 3 - Input 3b
Pin 7 Sensor 4 - Input 4a
Pin 8 Sensor 4 - Input 4b



Pin 9 Sensor 1 - Common
Pin 10 Sensor 1 & 2 Foil Shield
Pin 11 Sensor 2 - Common
Pin 12 Excitation Supply Positive
Pin 13 Excitation Supply Negative
Pin 14 Sensor 3 - Common
Pin 15 Sensor 3 & 4 Foil Shield
Pin 16 Sensor 4 - Common

Figure 3h Flow Meter Channel Connections

Mold ID Wiring: Mold ID is an optional feature. For more information, see Section 29.

The G24 controller and the mold cables are usually packaged in the same shipment container. Upon receipt, carefully check the shipping container for damage that may have occurred in transit. Note any damage on the shipping documents when receipt is verified. During unpacking of the shipment, if any hidden damage is discovered, the carrier should be notified immediately so that a claim can be filed. All technical drawings provided with the system should be retained for documentation and systems support.
Figure 3h shows the fuse information for the G24 controller.

Fuse	Amp, Volt Rating	Size	Notes
15A Output Module: F20, F21, F40, F41	20A 500VAC	.25 x 1.25 in 6.35 x 32 mm	SIBA 70.125.40.20 Very-fast acting (FF)
Input Control Module (ICM): F1	3.15A, 250 VAC	5 x 20 mm	Bussman GDA-3.15A Littelfuse 0216 3.15 Schurter 0001.1009 UL recognized
Operator Panel (OP)	2A 250 VAC	5 x 20 mm	HAL OP.

Figure 3i Fuse Information

Figure 3j shows the amperage and insulation voltage ratings of cables used with the G24.

Connector	**Amps ($A_{AC\text{-}RMS}$)**	**Insulation (VAC_{RMS})**	**Notes**
Mains Input	*	300	*Refer to unit label for amperage rating Refer to circuit breaker datasheet.
Power Output	*	300	*Refer to unit label for amperage rating. Refer to connector datasheet
T/C Input	1	300	Refer to connector datasheet
Remote I/O	5	300	
Mold ID	1	300	
USB	1	300	
Ethernet	1	300	
RS-232	1.76	300	
Operator Panel Power Input	2A	300	

Figure 3j Amperage and Insulation Voltage Ratings of Cables

4
Startup Wizard

The G24 is shipped with the Startup Wizard option selected. Whenever the Startup Wizard option is selection the Startup Wizard shown in Figure 4a will appear when the unit is powered on. The operator can choose between four screens:

a) **Existing Mold** – Use this screen to run a tool that has been run before on the controller and has an existing menu. Restore the appropriate menu for that tool and then select the Main Screen to run the tool. See Section 18 regarding more information on Menus.

b) **Tool Room** – Use this section to run the Mold Doctor® off-line diagnostics on the tool. See Section 20 regarding more information on Mold Doctor®.

c) **Main Screen –** Use this section to run the tool after a menu has been restored or after the New Mold Wizard has been completed. The screen shown is similar to the Pilot screen and is updated to show existing conditions in the mold. If the control outputs are off and no alarms exist, the top area of the screen will have a gray background as shown in Figure 4a. If the outputs are on, the background will be green when no alarms exist. If alarms exist, the background will be red and the alarms will be listed in the red area. The groups and zone names are updated if a menu is restored. Select Main Screen to exit the Wizard screens and go to the regular graphs and tables described in Section 7.

d) **New Mold Wizard -** When a tool is being setup on the controller for the first time, the New Mold Wizard is an excellent tool that can be used to guide the user through the initial setup. The New Mold Wizard quickly walks the operator through the setup procedure which includes the following tasks:

a) Identify zones in the mold
b) Name the zones
c) Arrange the zones under group tabs
d) Enter the basic setpoints
e) Choose the method to heat up and cool the tool
f) Heat the tool
g) Automatically select tuning, watt alarm and resistance alarm settings
h) Save the setpoints and settings as a menu

The G24 can be set up to go directly to the screen that was last displayed and skip the Startup Wizard. To deactivate the Startup Wizard, refer to Mold screen described in Section 15. Even if the Startup Wizard is deactivated, the user can still do the following via the Mold screen as an "express" version of the wizard:

a) Identify the zones in the mold
b) Name the zones
c) Arrange the zones under group tabs

New Mold Wizard

To setup a new tool, press the **Start the Mold Wizard** button shown in the upper right quadrant of the screen shown in Figure 4a. The wizard will turn off all zones, unlock all zones and reset all settings to default settings. All zones will be temporarily named "Zones" and any existing group tabs will be cleared from the bottom of the screen.

After pressing the **Yes** button in the popup screen, the screen in Figure 4b will appear.

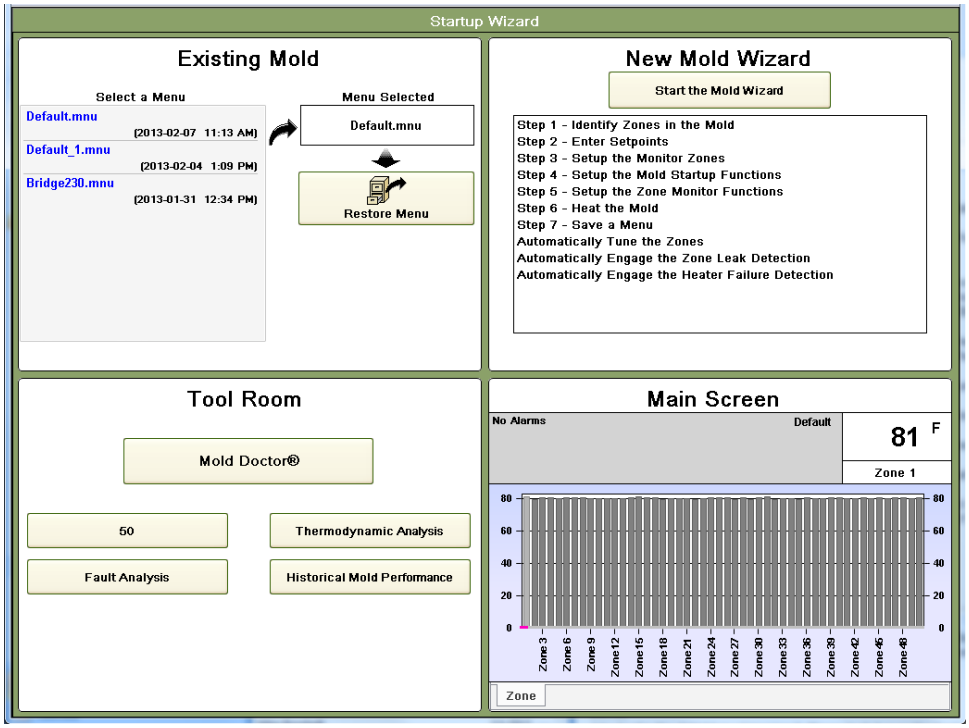


Figure 4a Startup Wizard

Step 1 – Identify Zones in the Mold

This step is used to automatically determine whether each zone is a tip, manifold, spare or monitor-only zone. The G24 determines this based on the maximum amperage detected when the zone is turned on. The default setting is 3A. The zones will be automatically labeled in the following manner:

a) Tips - Zones with less than 3A.
b) Mans - Zones detected with current above 3A.
c) Spares - Zones that have no thermocouple readings. Their outputs will be locked off.
d) Monitor - Zones that have thermocouple readings, but no output. Their outputs will be locked off.

To change the amperage threshold setting or to change the default Tips label to something else (such as Drops), use the **Options** button shown in the upper right corner of Figure 4b. When this button is pressed the screen in Figure 4c will be displayed. Choose a different Threshold Amperage or Zone Type label if desired and press **Done**.

Press **Start the Zone Analysis** to have the G24 controller determine the Zone Type for the zones. Once the Zone Types have been determined, the user can override any of the labels by selecting the box in the Zone Type column for the zone and choosing a different label from the popup box. For example, in Figure 4d, the controller determined that the first 32 zones were Tip zones. It determined that Zones 33 to 40 were Manifold zones. Zone 33 was manually changed to Sprue zone by pressing the Zone Type box next to Zone 33 and selecting Sprue from the available choices shown in Figure 4e. As a result of this setup, Zones 1-32 will be assigned as Tips 1-32 and will appear in the Tips tab at the bottom of G24 screens. Zone 33 will be assigned Sprue. Zones 34-40 will be assigned Mans 1-7. The Sprue and Man zones will be grouped in the Man-Sprue tab at the bottom of G24 screens. In Figure 4d, no zones were discovered without thermocouple input or without an output, so no Spare or Monitor zones were detected. The Comments column will display alarms or faults. An OK in every box means that no alarms or faults were detected. If an alarm or fault is detected, the Zone Type will be left blank. The number of Zone Types left blank will be shown at the top of the screen. The Accept Results button will not work until the operator fills in the blank Zone Types. Please note

that a zone with a broken thermocouple input will be labeled as a Spare zone. To change this setting, press the **Zone Type** box for that zone and choose the appropriate label. Press **Accept Results** when the table displays the desired labels.

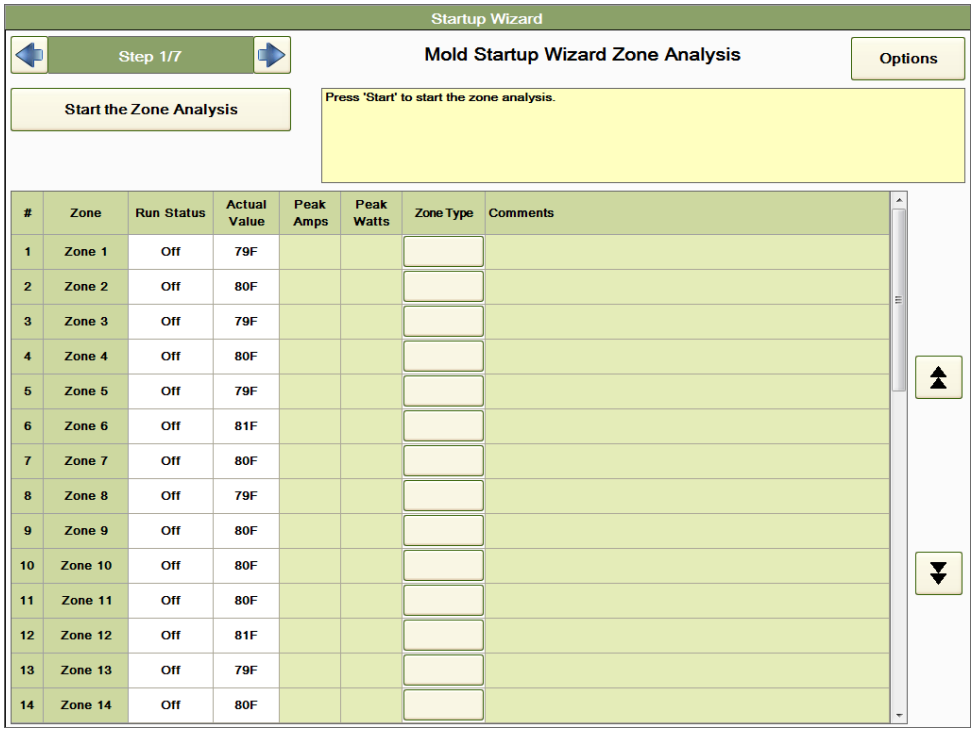


Figure 4b Step 1 - Mold Startup Wizard Zone Analysis

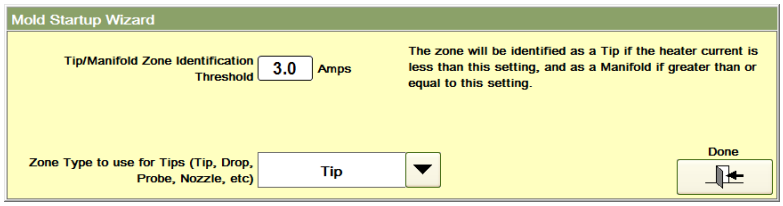
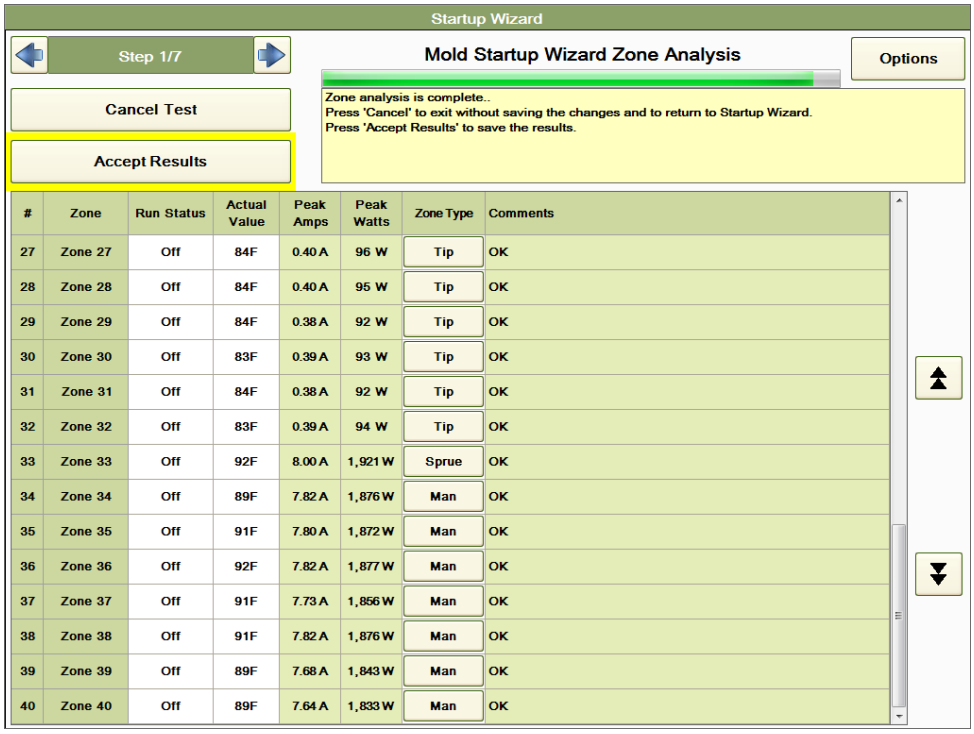


Figure 4c Options



#	Zone	Run Status	Actual Value	Peak Amps	Peak Watts	Zone Type	Comments
27	Zone 27	Off	84F	0.40 A	96 W	Tip	OK
28	Zone 28	Off	84F	0.40 A	95 W	Tip	OK
29	Zone 29	Off	84F	0.38 A	92 W	Tip	OK
30	Zone 30	Off	83F	0.39 A	93 W	Tip	OK
31	Zone 31	Off	84F	0.38 A	92 W	Tip	OK
32	Zone 32	Off	83F	0.39 A	94 W	Tip	OK
33	Zone 33	Off	92F	8.00 A	1,921 W	Sprue	OK
34	Zone 34	Off	89F	7.82 A	1,876 W	Man	OK
35	Zone 35	Off	91F	7.80 A	1,872 W	Man	OK
36	Zone 36	Off	92F	7.82 A	1,877 W	Man	OK
37	Zone 37	Off	91F	7.73 A	1,856 W	Man	OK
38	Zone 38	Off	91F	7.82 A	1,876 W	Man	OK
39	Zone 39	Off	89F	7.68 A	1,843 W	Man	OK
40	Zone 40	Off	89F	7.64 A	1,833 W	Man	OK

Figure 4d Mold Startup Wizard Zone Analysis (Results)

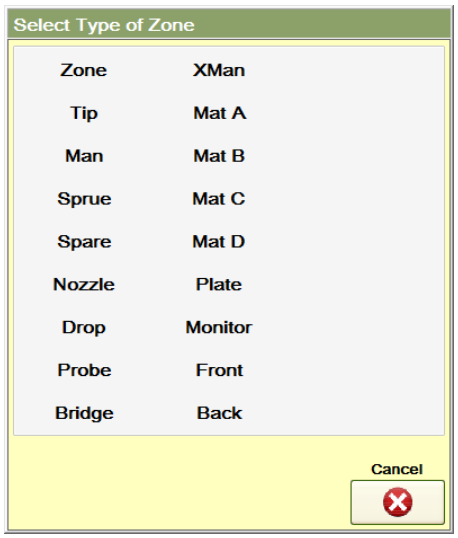


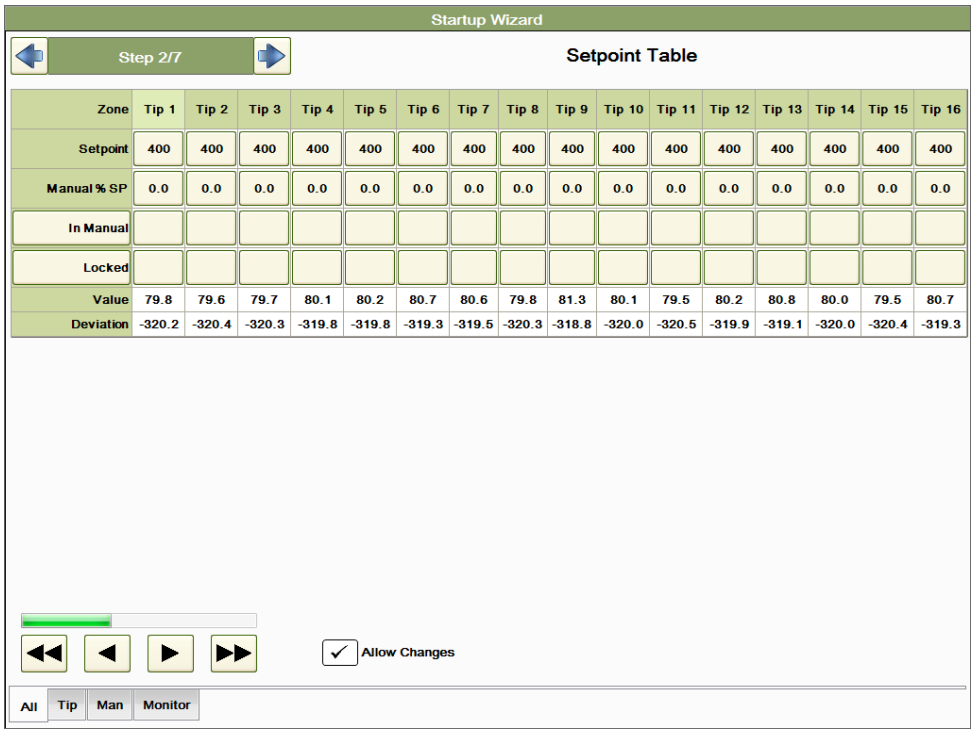
Figure 4e Select Type of Zone

After **Accept Results** is pressed, press the right blue arrow on the **Step** box in the top left corner of the screen to advance to the Step 2.

Step 2 – Enter Setpoints

The screen shown in Figure 4f will appear where the operator can enter the initial setpoints for the tool. The operator can enter temperature setpoints and manual output setpoints for when the zone is in manual mode. The zone will be in Automatic Mode (output of the zone is based on the deviation between setpoint and actual temperature) unless the operator touches the **In Manual** box for a particular zone or group of zones. If the **Locked** box is selected for a zone or group of zones, the output will remain off for the selected zones when all the other zones

are turned on. The temperature Value and Deviation (from setpoint) is shown at the bottom of the table. The **Allow Changes** box must be selected in order to make a change.
When the **Allow Changes** box is selected and a zone **Setpoint** box is selected, the screen shown in Figure 4f will appear to enable the operator to change one or more setpoints. The window will show the zone that was selected on the Setpoint Table screen. Once the chosen setpoint is selected, the operator can enter this setpoint for the zone selected (Tip 1 in Figure 4g) or for all the zones is any of the groups of zones (All, Tip, Man, Monitor).



Zone	Tip 1	Tip 2	Tip 3	Tip 4	Tip 5	Tip 6	Tip 7	Tip 8	Tip 9	Tip 10	Tip 11	Tip 12	Tip 13	Tip 14	Tip 15	Tip 16
Setpoint	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400
Manual % SP	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
In Manual																
Locked																
Value	79.8	79.6	79.7	80.1	80.2	80.7	80.6	79.8	81.3	80.1	79.5	80.2	80.8	80.0	79.5	80.7
Deviation	-320.2	-320.4	-320.3	-319.8	-319.8	-319.3	-319.5	-320.3	-318.8	-320.0	-320.5	-319.9	-319.1	-320.0	-320.4	-319.3

Figure 4f Step 2 - Setpoint Table

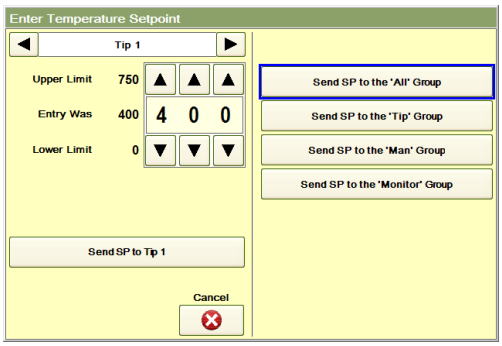


Figure 4g Enter Temperature Setpoint

Press the right blue arrow in the Step box to proceed to Step 3/7 or Step 4/7 (if no Monitor zones exist).

Step 3 – Setup the Monitor Zones
If any zones have been assigned as Monitor zones, the following will appear as Step 3 in the Mold Wizard procedure. Otherwise, the wizard will skip to Step 4. As shown in Figure 4h, the operator can set up high and low alarms for the Monitor zones (zones with thermocouple input

and no output). Enter the information in the same manner that the Setpoint Table information was entered. The Monitor zone alarms can be set up to **Alarm Only, Activate Standby for the "Remote Standby" group when a Monitor Alarm is detected,** or to **Turn Off all the zones in the controller when a Monitor Zone is detected.** Also the operator can select **Include Monitor Zone Alarms in the "OK to Run" output. The Monitor Alarm Delay Time (sec)** setting can be used to only trigger the alarm after a selected amount of time has passed with the Monitor Alarm still on. For more information on alarms, see Section 8.

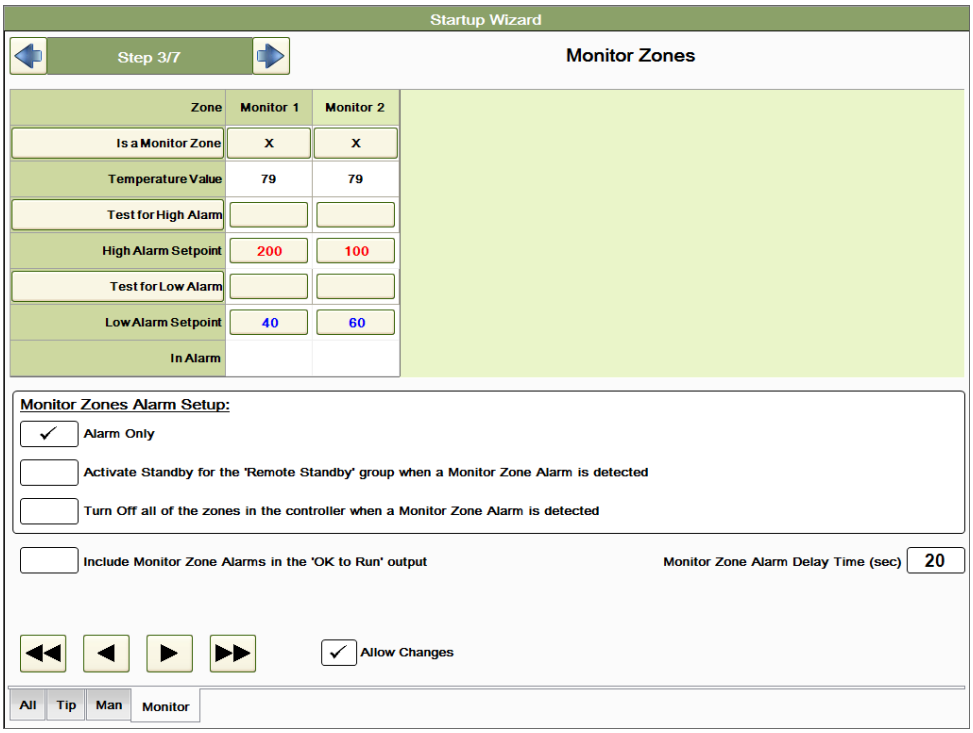


Figure 4h Step 3 - Monitor Zones

Once the Monitor Zones settings have been completed, press the blue arrow on the right side of the Steps button to advance to Step 4.

Step 4 – Setup the Mold Startup Functions

As shown in Figure 4i, the operator can setup and select one or more of the following methods to use in heating up and cooling down the tool:

- **Sequence Start** – The tool can be heated up in stages. For example the Man group can be brought up to temperature and soaked for a specified amount of time before the tip zones are brought up.
- **Sequence Cool** – The tool can be cooled down in stages.
- **Even Heat** – Groups of zones can be brought in a way that all zones stay within 20F (11C) of each other. This can be used to prevent the tips zones from rapidly rising to setpoints while the Man zones are at a much lower temperature.
- **Even Cool** – Groups of zones can be cooled in a way that all zones stay within 20F (11C) of each other.

If none of these methods are used, each zone will heat up as fast as it can with no regard to what the other zones are doing at the time. The zones will cool down as fast as they can when the power to all zones is turned off.

See Section 15 for more information regarding Sequence Start, Sequence Cool, Even Heat and Even Cool.

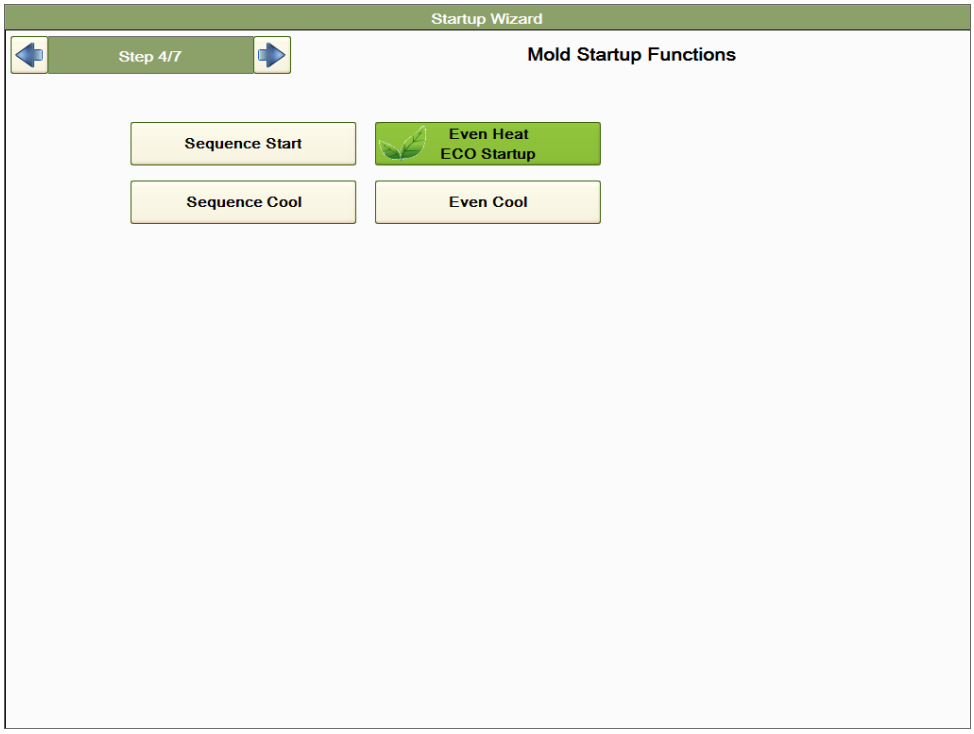


Figure 4i Step 4 - Mold Startup Functions

Once the Mold Startup settings have been completed, press the right blue arrow on the **Step** button to advance to Step 5.

Step 5 – Setup the Zone Monitor Functions (Mold Monitor)
The Mold Monitor screen will appear as shown in Figure 4j.
The G24 is equipped with various features that can be used to protect the tool by early detection of plastic leakage and early prediction of heater failure. The Mold Monitor screen can be used to enable these features and to set the Tolerance of the Watt Alarm that is used to detect plastic leakage in the tool.
See Section 21 for more information regarding Watt Alarms and Heater Resistance Alarms.
In addition, the operator can select **Automatically Save Auto-Select Tuning to the Tuning Setpoint After the Zones have Heated**. If selected, this feature locks in the tuning values for a specific tool so that the next time the tool is run, no auto-tuning will be required.
See Section 23 for more information regarding Tuning.
Once the Mold Monitor screen selections are made, press the right blue arrow on the **Step** button to proceed to Step 6.

Step 6 - Heat the Mold
The tool can now be heated using the Heat the Mold screen shown in Figure 4k. To turn on any or all zones, press the On button. The Turn Zone On popup box will appear as shown in Figure 4l. Select which zone or group of zones should be turned on and select the appropriate button. **Note:** The zones will heat up as quickly as they can. They will not initially use the Mold Startup procedures selected in Step 4. This is because the tuning information is being determined on this initial startup.

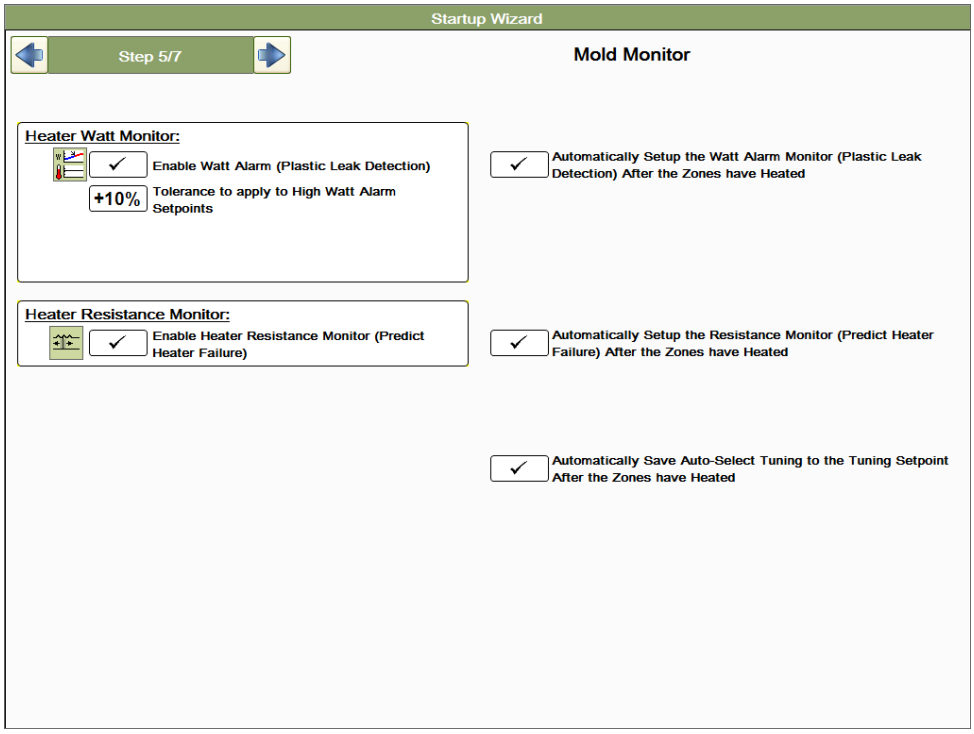


Figure 4j Step 5 - Mold Monitor

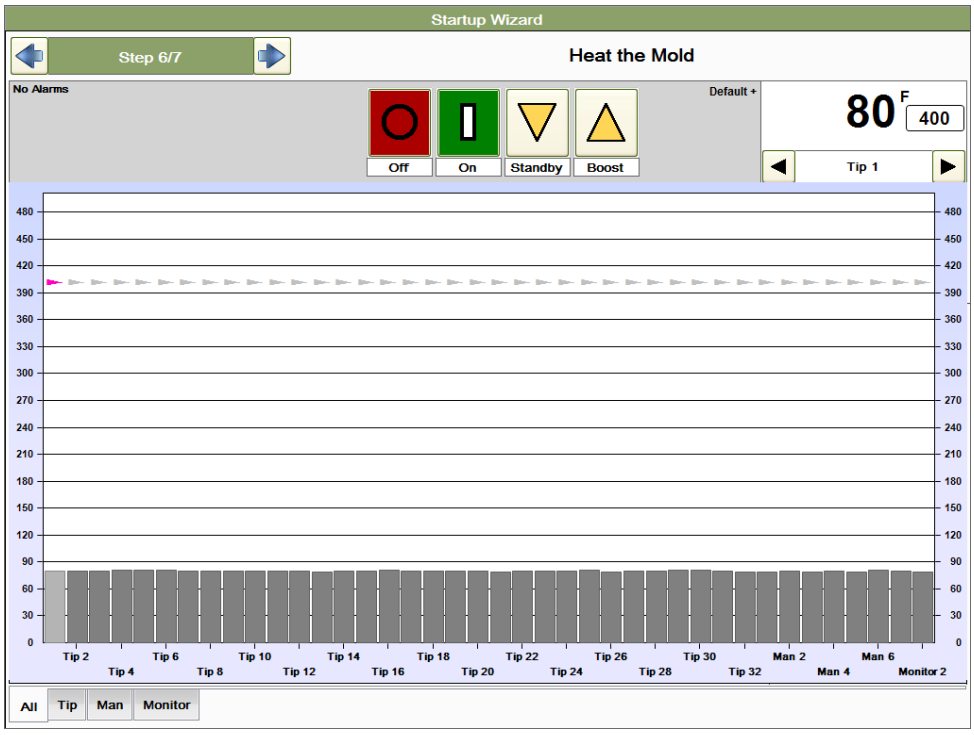


Figure 4k Step 6 - Heat the Mold

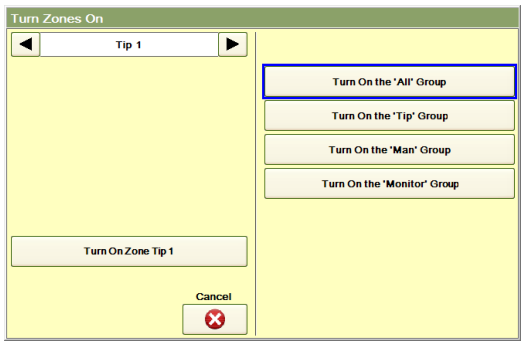


Figure 4l Turn Zones On

After the zones have reached setpoint and have soaked for awhile, the Making Good Parts popup box shown in Figure 4m will appear. Select **Yes** if good parts are being made. The G24 will wait sixty minutes, then calculate the Watt alarm setting and the Resistance alarm setting. These calculated settings will automatically be saved to the menu running at the time.

Figure 4m Making Good Parts

Note: It is necessary for the tool to continue to run for sixty minutes after pressing **Yes** in the Making Good Parts box. If the zones are turned off before the controller makes its Watt alarm and Resistance alarm calculations, the alarms will not be set. Also, the sixty minutes required will start again if a zone setpoint is changed, if Boost is activated or if Standby is activated.

To turn zones off, press the **Off** button shown in Figure 4k. The Turn Zones Off popup box will appear as shown in Figure 4n. The selected zone or any group of zones can be turned off from this screen.

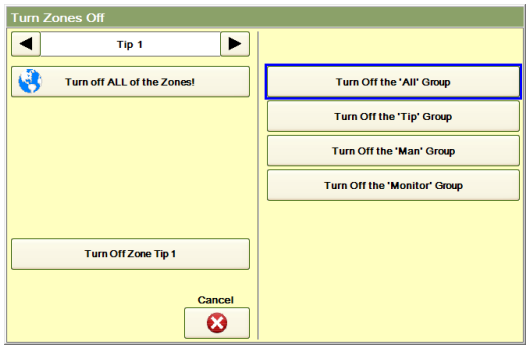


Figure 4n Turn Zones Off

Proceed to Step 7 by pressing the right blue arrow on the Steps button. This arrow can also be pressed before the Making Good Parts box appears. It does not affect the calculations unless the zones are turned off.

Step 7 - Save the Menu
This is the final step of the Mold Startup Wizard. The Save the Menu screen shown in Figure 4o will appear.

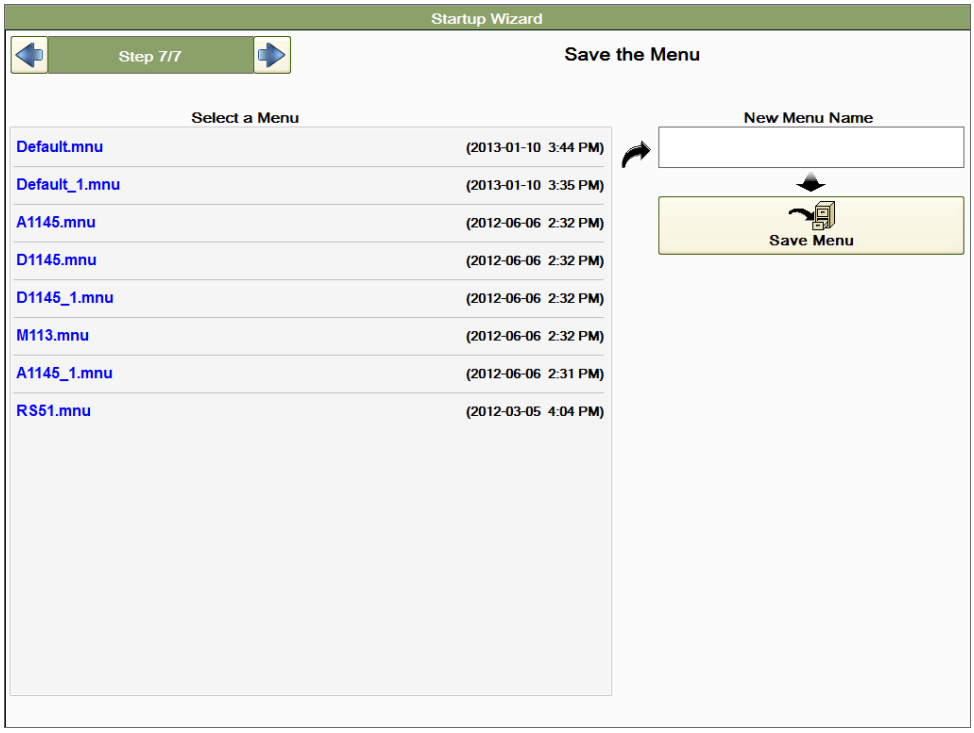


Figure 4o Step 7 - Save the Menu

The column on the left of the Save the Menu screen shows menus (setpoints and settings) that have been saved before. To save all the information that has been entered during the operation of the Mold Startup Wizard, type the name of a menu in the **New Menu Name** box. When the **Save Menu** button is pressed, the menu will be saved and will appear in alphabetical order in the column on the left. If the menu already exists, the G24 will ask if the operator wants to replace the old menu. If the operator proceeds, the new menu will be created. The old menu with that name will have a "-1" attached as A1145-1 and others show in Figure 4o. This gives the operator access to the previous version of the menu.

Pressing the right blue button on the Steps button returns the operator to the initial screen in Figure 4a.

5
Basic Operation

The temperature and setpoint of any zone can be found at the top right corner of the G24 screen. In Figure 5a, the screen indicates that Tip 16 has a setpoint of 400F and the temperature of Tip 16 is 80F. If the thermocouple is open for the displayed zone, the display will indicate "***" instead of a temperature reading. Other zones can be accessed by using the increase and decrease arrows under the temperature display or by touching a zone on the displayed graph (the color associated with zone 1 is a different color than the other zones, indicating that it has been selected).

Colors are used on many screens to indicate the status of the zone:

Gray – Zone is Off as shown in the Actual and Power columns of Figure 4a
Green – Zone is On and not in alarm.
Red – Zone is On and in alarm

Data on the graphs and tables are displayed in groups. In Figure 4a, the Tip group tab is selected at the bottom of the screen so only the Tip zones are currently displayed on the graph. A different group can be displayed simply by touching another group tab. Groups can be set up using the Minicontroller screen (Section 7).

A zone can be selected on the screen in several ways:

1) Touch the desired zone on the graph or table.
2) Use the increase and decrease buttons located on either side of the selected zone in the upper right hand corner of the screen.
3) Press the selected zone in the upper right hand corner of the screen. A dropdown box will appear from which any zone in the group can be selected.

Zone	Setpoint	Actual	Power	Auto Manual	Mode
Tip 1	400 F	400 F	32.6 %	Auto	I
Tip 2	400 F	400 F	33.1 %	Auto	I
Tip 3	400 F	400 F	33.0 %	Auto	I
Tip 4	400 F	400 F	31.7 %	Auto	I
Tip 5	400 F	402 F	29.5 %	Auto	I
Tip 6	400 F	400 F	31.5 %	Auto	I
Tip 7	400 F	400 F	32.1 %	Auto	I
Tip 8	400 F	400 F	31.5 %	Auto	I
Tip 9	400 F	400 F	31.4 %	Auto	I
Tip 10	400 F	400 F	34.7 %	Auto	I
Tip 11	400 F	400 F	32.3 %	Auto	I
Tip 12	400 F	400 F	33.9 %	Auto	I

Zone	Setpoint	Actual	Power	Auto Manual	Mode
Tip 13	400 F	400 F	31.4 %	Auto	I
Tip 14	400 F	400 F	32.8 %	Auto	I
Tip 15	400 F	400 F	31.4 %	Auto	I
Tip 16	400 F	400 F	31.8 %	Auto	I
Tip 17	400 F	400 F	31.5 %	Auto	I
Tip 18	400 F	400 F	32.5 %	Auto	I
Tip 19	400 F	400 F	34.5 %	Auto	I
Tip 20	400 F	400 F	31.6 %	Auto	I
Tip 21	400 F	400 F	32.3 %	Auto	I
Tip 22	400 F	400 F	32.2 %	Auto	I
Tip 23	400 F	400 F	33.9 %	Auto	I
Tip 24	400 F	400 F	32.8 %	Auto	I

Figure 5a Typical G24 Screen (EZ Screen Shown)

Setpoint: To change a setpoint, press the setpoint displayed in the upper right hand corner of the screen. The setpoint box shown in Figure 5b will pop up. The setpoint is changed by pressing the up and down button above each digit of the setpoint. Then the operator can either send the setpoint to the zone selected (Tip 1 in Figure 5b) or to all of the zones in any of the group tabs at the bottom of the screen (Tips, Man/Spr and All in Figure 5b). If no change is desired, press the **Cancel** button.

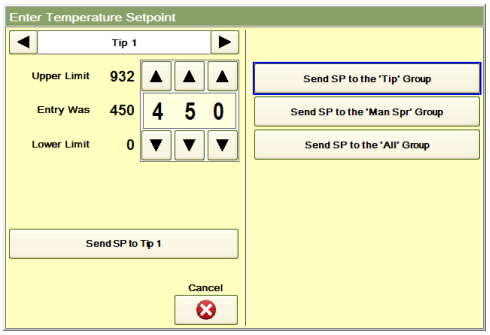


Figure 5b Setpoint Screen

On: To turn zones on, press the green **On** button at the top center of the screen shown in Figure 5a. The screen in Figure 5c appears:

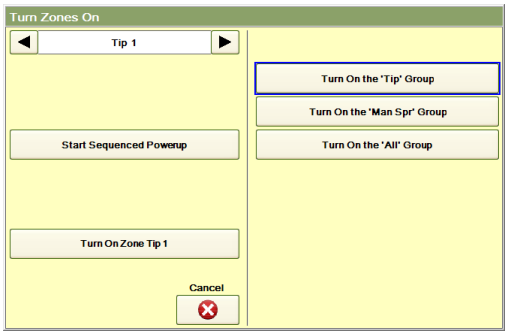


Figure 5c Turn Zones On

The operator has the choice of turning on the zone selected (Tip 1 in Figure 5c) or turning on any of the groups that are shown at the bottom of Figure 5a. In addition, if the Sequence Start (Section 15) or Sequence Powerup (Section 15) features are being used, they can be started from this screen also.

Off: To turn off zones, press the red **Off** button at the top center of the screen shown in Figure 5a to see the screen shown in Figure 5d. The operator has the choice of turning off ALL the zones, the zone selected or any of the groups that are shown at the bottom of Figure 5a. In addition, if the Sequence Cool (Section 15) or Even Cool (Section 15) features are being used, they can be started from this screen also.

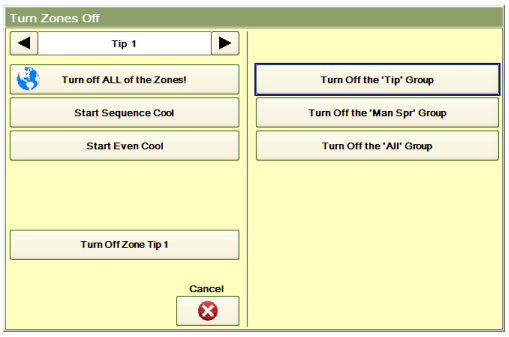


Figure 5d Turn Zones Off

If a Menu (Section 18) is in use, the name of the menu will appear just to the left of the temperature reading at the top of the screen (RS51 in Figure 5a). A "+" will appear at the end of the menu name (as it does in Figure 5a) if any setpoints have been changed since the menu was loaded. It is a reminder that if the changes are to be saved to the menu, the user should do so in the Menu screen. Menus can also be setup to automatically update to include setpoint changes as discussed in Menus (Section 18).

Standby: This is a feature that enables the operator to lower (or raise in unusual circumstances) the selected group of zones (e.g., Tip, Man/Spr, All) to a predetermined **Auto Standby** setpoint. The setpoint can be selected here by entering it on the popup box that appears when the **Stndby** box is pressed, in the Setpoint Table (Section 7) or in the Zone Details display (Section 6). Normally, this feature is used to lower the tip and manifold temperature settings when the machine is not cycling. The temperature should be warm enough that the plastic does not freeze and cool enough that the plastic does not quickly degrade. The default value is 220F (104C). When the **Stndby** button is pressed, the screen shown in Figure 5e will appear. Press **Standby Timeout** to set the amount of time the group will use the Auto Standby temperature setting before the timer times out and returns the group to its normal temperature setpoints. An entry of 0 will disable the timeout and Standby will remain in effect until the **Stndby** button is pressed again to leave the Standby mode. When the Standby mode is active, the **Stndby** button will be animated and the word **Standby** will appear to the right of the **Boost** button. Pressing the **Stnby** button while in the Standby mode will cancel Standby and return all zones to their normal setpoints.

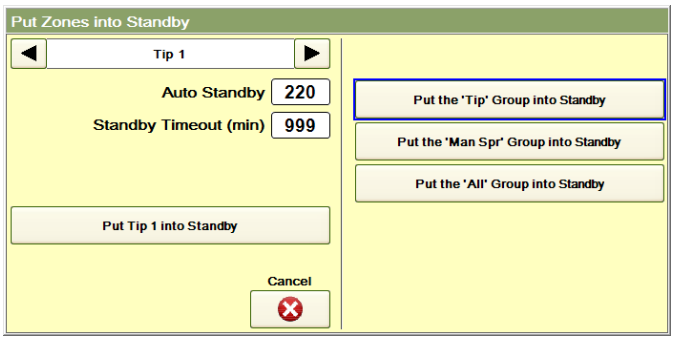


Figure 5e Put Zones into Standby

Boost: This is a feature that enables the user to *temporarily* raise ("boost") the temperature setpoints for all the zones in the selected group of zones (e.g., Tips, Man/Spr, All). Normally, Boost is used to quickly raise the tip temperatures just before cycling the machine after the tips have been in an idle or standby mode. This helps eliminate any cold slugs that may exist at the gates. When the **Boost** button is pressed, the screen shown in Figure 5f appears. The number of degrees that Boost adds to the setpoints and the amount of time Boost is applied can be set on this screen. Select the zone or group which is to be boosted (normally Tip).

When Boost is active, the **Boost** button is animated. The word Boost will appear to the right of the Boost button along with the amount of Boost Time left. The setpoints for the selected group will be immediately boosted. Pressing the **Boost** button while in the Boost mode will cancel Boost.

Boost Recovery Time is a setting that can cause the OK to Run status to be unaffected by the deviation alarms created by the Boost function. This is needed, because when Boost is pressed, low deviation alarms may become active due to the temperatures being lower than the boosted setpoints. When Boost times out, high deviation alarms may occur since the temperatures are now higher than the regular setpoints. It is generally recommended that the **Boost Recovery Time** be set to approximately three times the **Boost Time** to enable the temperatures to return to their regular setpoints.

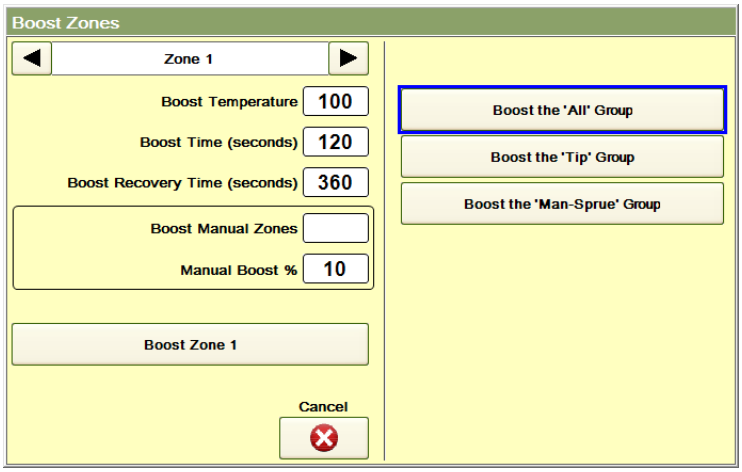


Figure 5f Boost Zones

If the **Boost Manual Zones** box is selected, zones that are in the boosted group that are in Manual mode will also be boosted. The amount of boost for these zones is set in the Manual Boost % selection.

6
Zone Details Display

More information can be learned about each zone by pressing the temperature of the zone in the top right corner of the screen (400F for Tip 17 in Figure 6a). A dropdown box similar to that shown in Figure 6a appears.

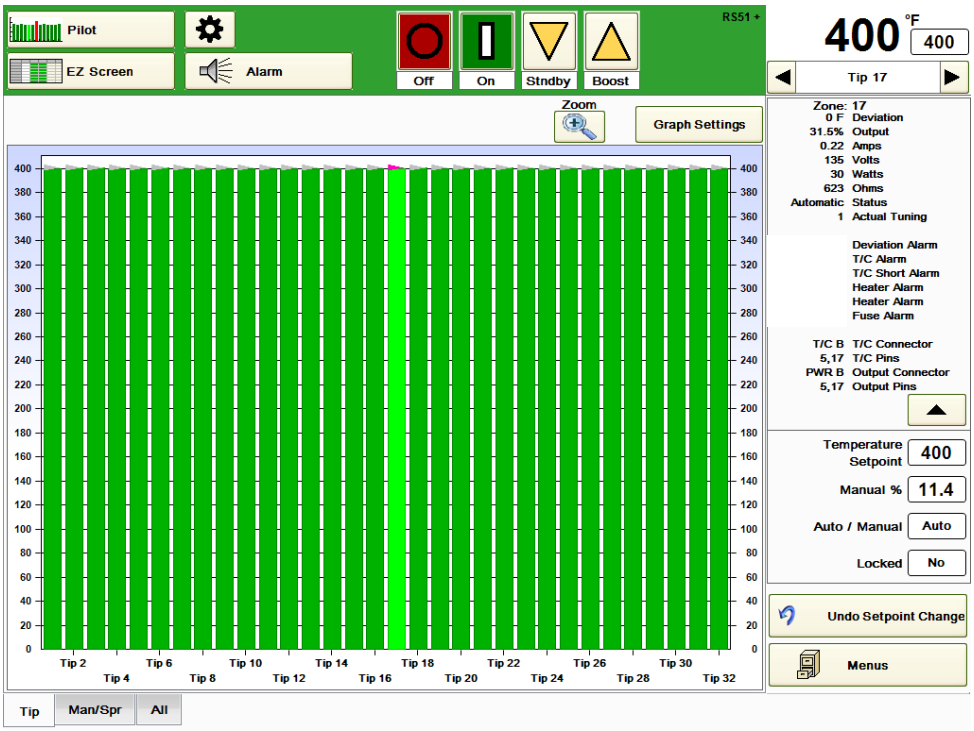


Figure 6a Zone Details (Top Half)

In the top section of the screen, the information for the zone includes the *actual data* for the zone such as the **Zone Number**, **Deviation** (the number of degrees the temperature is away from setpoint), **Output** percentage, **Amps, Volts**, **Watts**, **Ohms** (heater), **Status** (Off, Auto, Manual), **Actual Tuning** Parameter, Alarms (description such as High, Low, Open, Shorted will appear will shown text if alarm is present) and the wiring information for that zone.

Press the down arrow next to Output Pins to see the rest of the screen as shown in Figure 6b. In the lower section of the screen the information for the zone includes the *settings* for the zone.
Note: Features that are not available to the user (determined by the user's security level) do not appear on the screen. They reappear when a user with a higher security level enters the appropriate code. This approach eliminates confusion by only showing buttons that the user can access.

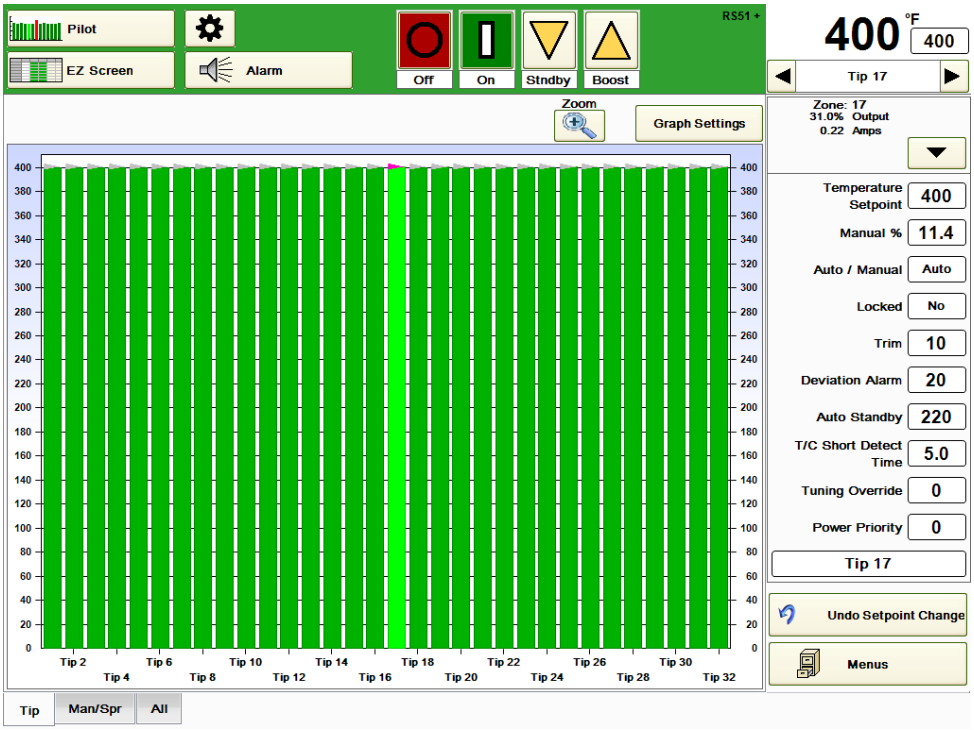


Figure 6b Zone Details (Lower Half)

The settings available in the lower half of the screen include:

Temperature Setpoint: Press this box to change the setting.

Manual % output setting: If the zone is on and if the Auto/Manual setting displays Auto, the output will be calculated by the G24. This setting is only used when the zone is placed is in the manual mode. Press this box to change the setting. When a zone is in Manual mode, the output will be internally adjusted to compensate for fluctuations in incoming power, thereby providing consistent power to the heater.

Auto/Manual: Auto indicates the controller is calculating the output based on the actual temperature reading and the temperature setpoint of the zone. Manual indicates that the zone output is not being adjusted automatically by the G24 tuning. Instead, the output is being manually overridden and is providing a fixed output equal to the setting in the Manual % box above. If the Auto/Manual box is pressed, a popup box will appear where the setting can be changed as shown in Figure 6c will appear.
The G24 automatically switches to the manual mode when it senses a thermocouple has broken. This enables the tool to continue making good parts until maintenance can replace the thermocouple in the tool. There are other ways to determine the output such as Copy Output (Section 19) and Copy % Output to Manual % Setpoint in Setpoint Table (Section 7).

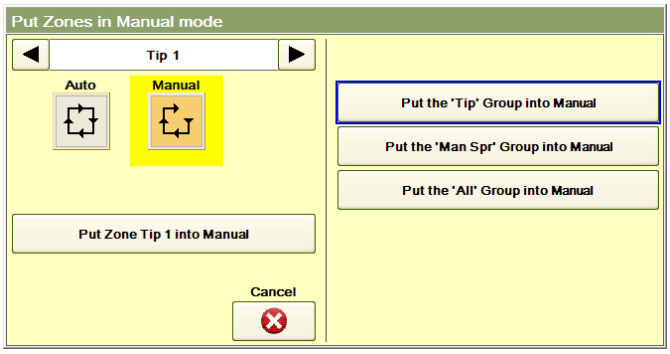


Figure 6c Auto / Manual Output Mode Selection

Locked: If a zone is not being used it can be locked off so that when all zones are turned on, it remains off. The locked/unlocked status of any group tab can be changed by touching the box and making a selection from the popup screen shown in Figure 6d.

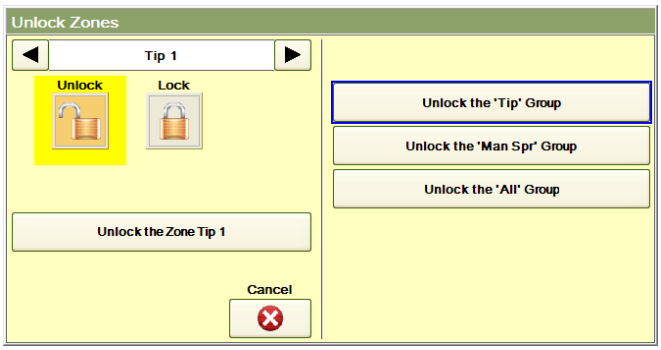


Figure 6d Lock / Unlock Selection

Trim: Trim is a feature that enables the user to raise or lower the setpoint of a zone or group of zones by a certain number of degrees even if all of the setpoints are different. The trim limit setting (Section 14) determines the maximum number of degrees a user can trim (plus or minus) a zone or group of zones at one time.

Deviation Alarm: This setting determines at what temperature the alarm will activate. The setting is added to and subtracted from the setpoint for the zone. For example, a 20F setting will cause a zone with a setpoint of 400F to alarm below 380F and above 420F.

Auto Standby: This is the temperature setpoint that the zone will use while in the Standby mode.

TC Short Detection: Thermocouple short detection is a valuable protection feature. Whenever a zone is calling for 98-100% output, an internal timer starts for that zone. This is the setting for the timer for this zone. If the zone's temperature does not increase by at least 20F (11C) before the timer times out, the G24 will activate the thermocouple short alarm. The assumption is that if the thermocouple is not sensing a heat rise with the maximum output, the thermocouple may be shorted. Another possibility is that the heater is too old or undersized to raise the temperature even with maximum output.

Tuning Override: This setting should only be changed if the user has a good grasp of tuning procedures. The number is displayed is the tuning setting that is currently in use. See Section 23 for more detail.

Power Priority: This is another tuning setting that should only be changed if the user has a complete understanding of tuning issues. See Section 23 for more detail.

Undo Setpoint Change: Press this button to cause the screen in Figure 6e to appear. The last setpoint change will be shown. To undo the change and have the setpoint resort back to its previous setting, press **Change it Back**. If **Done** is pressed without pressing the **Change it Back** button, the setpoint will not be changed.

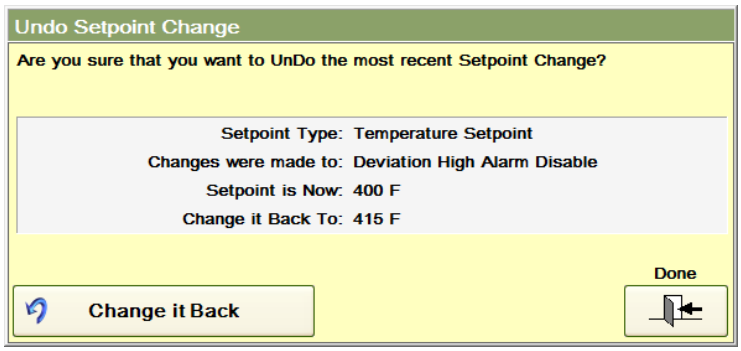


Figure 6e Undo Setpoint Change

Menus: Press this button to go to the Menus screen (Section 18).

The user can change the language used on the screens (Section 11).

7
Graphs and Tables

The operator can select which two screen buttons to set up as presets in the upper left corner. To change the preset, press and hold down the button that is to be changed, wait until the pop-up shows all of the choices (as shown in Figure 7a) and select one. The preset buttons can also be assigned using the Program Screen Paths screen described in Section 9.

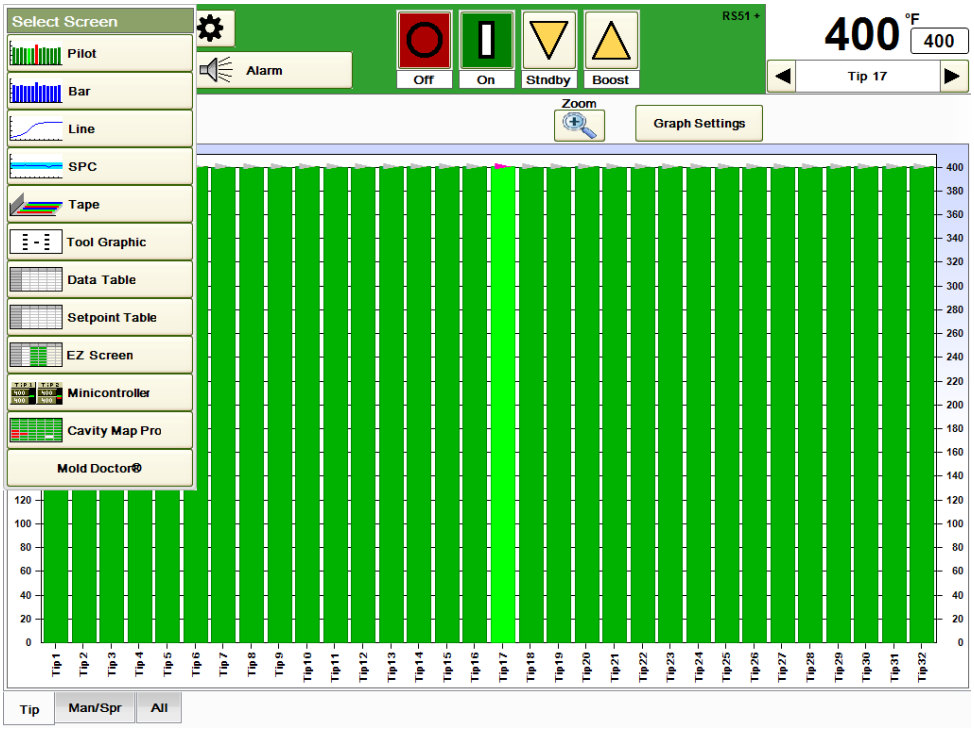


Figure 7a Pilot Screen

The preset choices include:

Pilot Graph	Data Table
Bar Graph	Setpoint Table
Line Graph	EZ Screen
SPC Graph	Minicontroller
Tape Graph	Cavity Map Pro™
Tool Graphic	Mold Doctor®

Pilot: Pressing this button enables the user to view the screen shown in Figure 7a. The setpoints are represented by gray triangles. The setpoint triangle changes to a magenta color when that zone is selected by the operator (Tip 15 in Figure 7a). The temperatures are shown as vertical bars. If the zone is Off, the bar is gray. If the zone is On and no alarms exist, the bar is green. If the zone is On and an alarm exists on that zone, the bar is red. If the zone is selected by the operator (Tip 15 in Figure 7a), the bar will show up as a slightly different color (white for Off, bright green for On with no alarms, bright red for On with alarms). If a zone is in manual, a gray box will appear at the base of the vertical bar (Tip 18 in Figure 7a).
A zone can be selected by:

a) Pressing the vertical bar for that zone
b) Pressing the increase or decrease arrows below the zone display in the top left of the screen

c) Selecting the zone number from the dropdown box that appears when the zone number is pressed below the numerical temperature display in the top right corner of the screen.

When the **Zoom** button is pressed, the highlighted zone will be shown as the first zone shown on the graph with 10 zones shown in all. This would include Tips 15-24 if the Zoom button were pressed in Figure 7a. Pressing the **Zoom** button again returns to the normal view.

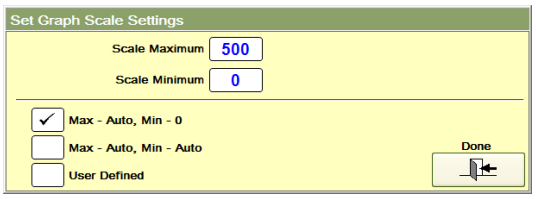


Figure 7b Graph Scale Settings (Pilot, Bar, Line Graphs)

Pressing Graph Settings will cause the screen shown in Figure 7b to appear. The available settings are:

a) Max – Auto, Min – 0. This is the most common setting. It keeps the bottom of the y-axis of the graph set to zero while the top of the y-axis is being automatically scaled by the controller.

b) Max – Auto, Min – Auto. This is most commonly used when Deviation (from setpoint) data is being displayed.

c) User Defined. The operator can fix the bottom and top of the y-axis.

.

Figure 7c EZ Screen

EZ Screen: Pressing this button enables the user to view the screen shown in Figure 7c. The setpoint, actual temperature, percent power, alarm status, auto/manual status and on/off status of each zone is shown. If there are more than 24 zones, the additional zones can be viewed using the increase and decrease buttons on the bottom left of the screen.

To make a change, press the Allow Changes box. A checkmark will appear in the box.
To make a setpoint change, press the setpoint and the following box will pop up:

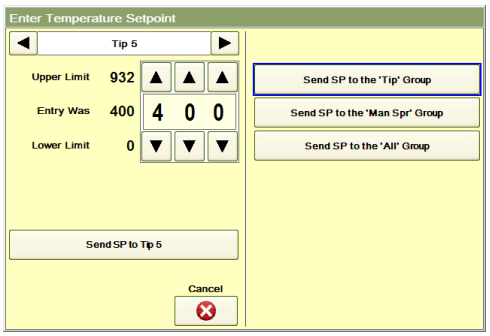


Figure 7d Temperature Setpoint

Use the up and down arrows to change each digit. The setpoint can then be assigned to that one zone or to all the zones in any of the groups displayed at the bottom of each screen.

To toggle the auto/manual status of a zone between Auto, Manual, Monitor and Locked Off, press the Auto Manual box next to the zone. Auto means that the controller will base its output on the thermocouple reading. Manual means that the controller will hold the output at the manual % setting assigned. When the zone is changed to Manual, the Setpoint box on the EZ Screen will display the percent output setpoint instead of the temperature setpoint. In manual, the Actual box will display the actual amperage output. The output can be assigned in the same fashion as most everything else – for that zone or for all zones in any group. Monitor means that there is no output associated with the zone, but the temperature reading can be monitored and alarmed. Locked Off means that the zone has to be unlocked before it can be turned on.

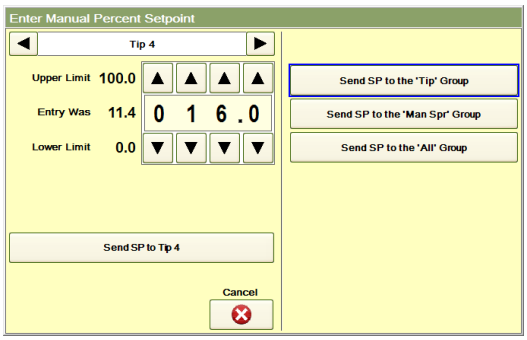


Figure 7e Manual Percent Output

To toggle the on/off status of the zone, press the Mode box next to the zone. "I" is on, "O" is off. To turn all zones in the selected group off or on, the buttons at the bottom right of the screen can be used. A zone's Actual and Power data will have a gray background when off (Tip 5 in Figure 7c), a green background when no alarms exist and a red background for zones in alarm.
Pressing the left arrows on the bottom of the screen causes lower numbered zones to be displayed. Pressing the right arrows causes the higher numbered zones to be displayed. The green horizontal scroll bar next to the arrows moves with the use of the arrows. If the green scroll is all the way to the right there are no more zones above the ones being displayed.
The function of the Graph Settings button (see Figure 7b) is the same as that described for the Pilot Graph.

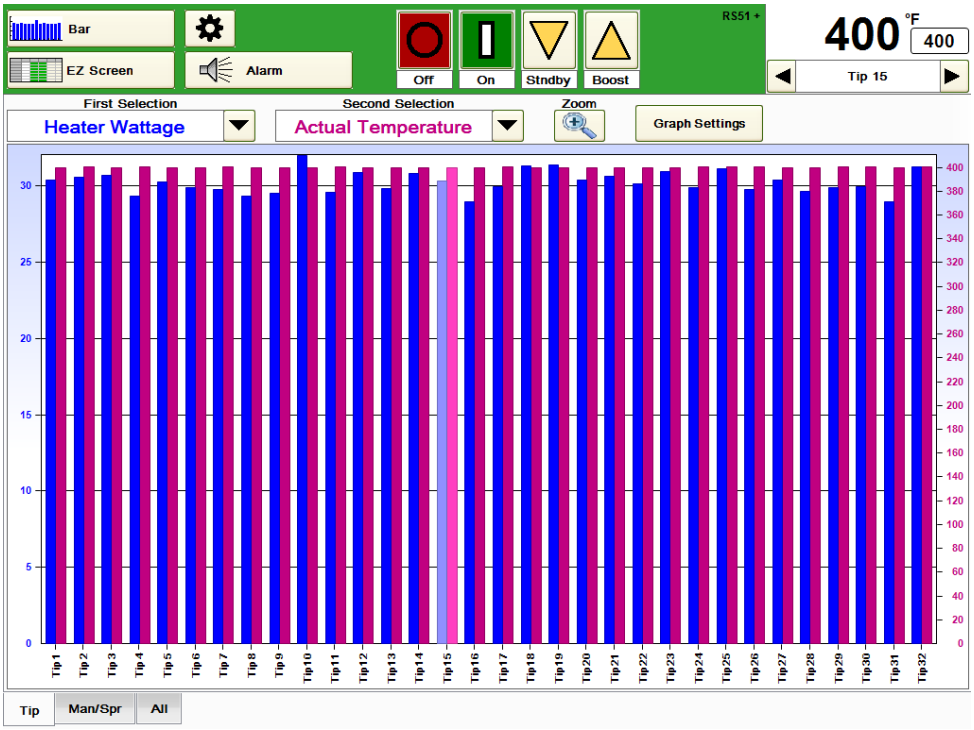


Figure 7f Bar Graph

Bar Graph: Data is shown in a format similar to Pilot Graph. Setpoint triangles are not displayed (see Figure 7f). Up to two variables can be displayed at once. To choose which variables are to be displayed, press the First Selection and the Second Selection boxes. The choices include Actual Temperature, Deviation (from setpoint), Percent Output, Heater Current (amperage), Heater Voltage, Heater Resistance, Temperature Setpoint and Manual % Output Setpoint. In Figure 7f, Actual Temperature and Percent Output are chosen. Each variable has its own scaling. The first variable is shown in blue has its graph scale shown on the left side of the graph. The second variable is shown in purple and has its graph scale shown on the right side of the graph. The colors do not change when an alarm is active. To select a zone, simply touch the bar display for the appropriate zone. The zone color will turn a lighter shade (Tip 15 in Figure 7f).

When the **Zoom** button is pressed, the highlighted zone will be shown as the first zone shown on the graph with 10 zones shown in all. This would include Tips 15-24 if the Zoom button were pressed in Figure 7f. Pressing the **Zoom** button again returns to the normal view.

The function of the Graph Display button (see Figure 7b) is the same as that described for the Pilot Graph.

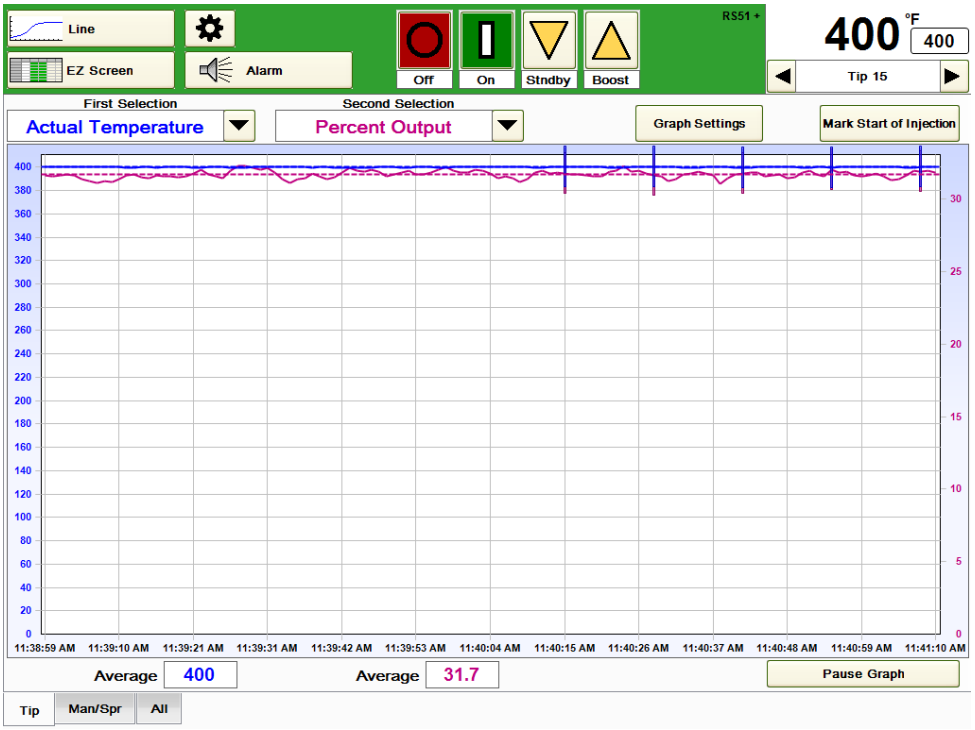


Figure 7g Line Graph

Line Graph: Data is shown in a format similar to Bar Graph except that only one zone's data is shown as a line graph versus time. Setpoint triangles are not displayed (see Figure 7f). Up to two variables can be displayed at once. To choose which variables are to be displayed, press the First Selection and the Second Selection boxes. The choices include Actual Temperature, Deviation (from setpoint), Percent Output, Heater Current (amperage), Heater Voltage, Heater Resistance, Temperature Setpoint and Manual % Output Setpoint. In Figure 7g, Actual Temperature and Percent Output are chosen. Each variable has its own scaling. The first variable is shown in blue and has its scale shown on the left side of the graph. The second variable is shown in purple and has its scale shown on the right side of the graph. The colors do not change when an alarm is active. At the bottom of the screen, the average of each of the plotted values is shown. In addition, the average for each of the plotted values is represented by a dashed line (blue for the first variable, purple for the second variable) on the graph. The **Mark Start of Injection** button can be pressed to insert a vertical blue line on the graph as shown in Figure 7g. This can be useful in evaluating cyclical influences. If the Cycle Start remote input signal is in use (see Section 12), the vertical blue line will automatically be inserted.

The **Pause Graph** button can be pressed to pause the scrolling. A yellow border will appear. The operator can freely select different variables for that zone or even different zones to observe their behavior at that moment. Pause only stops the Line graph, other graphs and screens are not affected. Sampling of line graph data continues in the background.

The **Resume Sampling** button will appear in place of the Pause Graph button whenever the Pause Graph button is selected. When the **Resume Sampling** button is pressed, the data shown on the Line graph will be refreshed as if the graph had never been paused.

The function of the **Graph Settings** button (see Figure 7b) is the same as that described for the Pilot Graph.

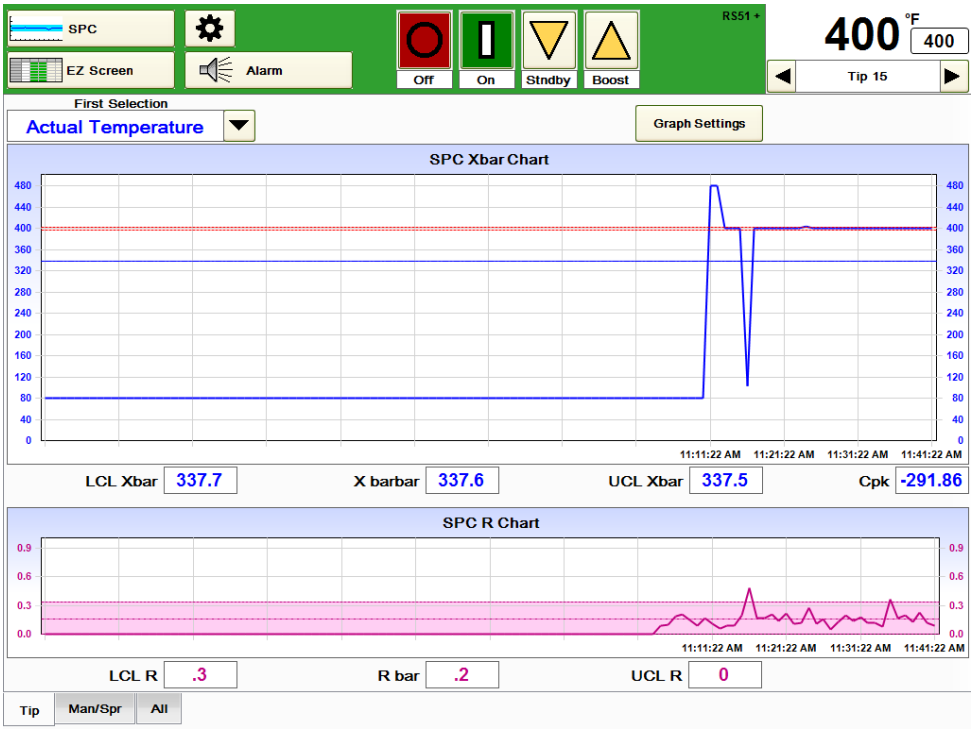


Figure 7h SPC Graph

SPC Graph: This graph shows the statistical process control Xbar and R Chart for any variable. The choices include Actual Temperature, Deviation (from setpoint), Percent Output, Heater Current (amperage), Heater Voltage, Heater Resistance, Temperature Setpoint and Manual % Output Setpoint. In Figure 7h, Actual Temperature data is displayed. The lower control limit (LCL Xbar), the mean (X barbar) and the upper control limit (UCL Xbar) and the capability index (Cpk) are calculated and displayed beneath the top graph. The Range (R) of the value is calculated and displayed in the lower graph along with the lower control limit (LCL R), the mean range (Rbar) and the upper control limit (UCL R).

Regardless of what is being displayed, the G24 is always performing SPC sampling of all variables for all zones.

The function of the Graph Settings button (see Figure 7b) is the same as that described for the Pilot Graph with the following additions:

a) SPC Interval (settings range from 0 to 120.0 minutes).
b) SPC Subgroup Size (settings range from 2 to 10)
c) Time to Fill SPC Chart (displayed in HH:MM:SS format). This is calculated by the G24.
d) Upper (UCL) and Lower (LCL) Control Limits. These are calculated by the G24 for the Xbar and R charts. These are displayed numerically on the screen. They are also displayed as blue or red shaded bands on the graphs with a blue or red border line.
e) A set of Upper Spec Limit (USL) and Lower Spec Limit (LSL) setpoints are available on the Graph Setup popup screen. These are used for the Cpk calculation. Cpk is only calculated for the Actual Temperature channel. These are user entered and are an offset above and below the Temperature Setpoint of the zone. The position of the USL and LSL are displayed on the Xbar graph as red lines across the graph. The scaling of the graph does not auto scale to fit these within the viewable graph. The graph may have to be set to User Defined to see them if there is not a lot of variance in the graph of the actual temperate.
f) Clear SPC Graph – This clears all historical data and gives the SPC charts a fresh start.

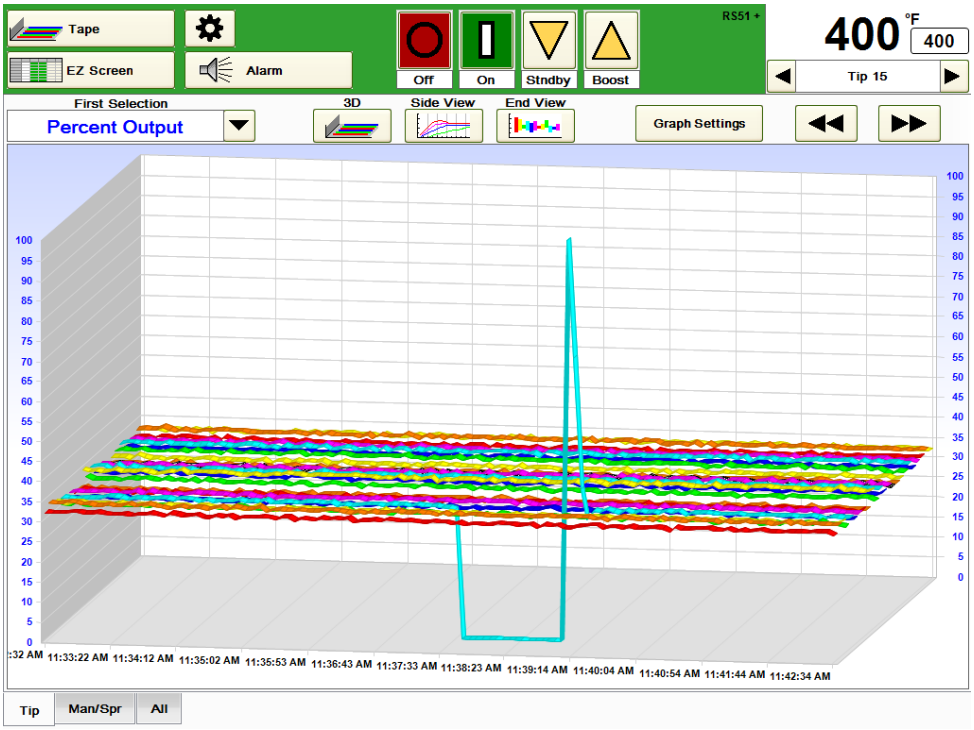


Figure 7i Tape Graph – 3D

Figure 7j Tape Graph – Side View

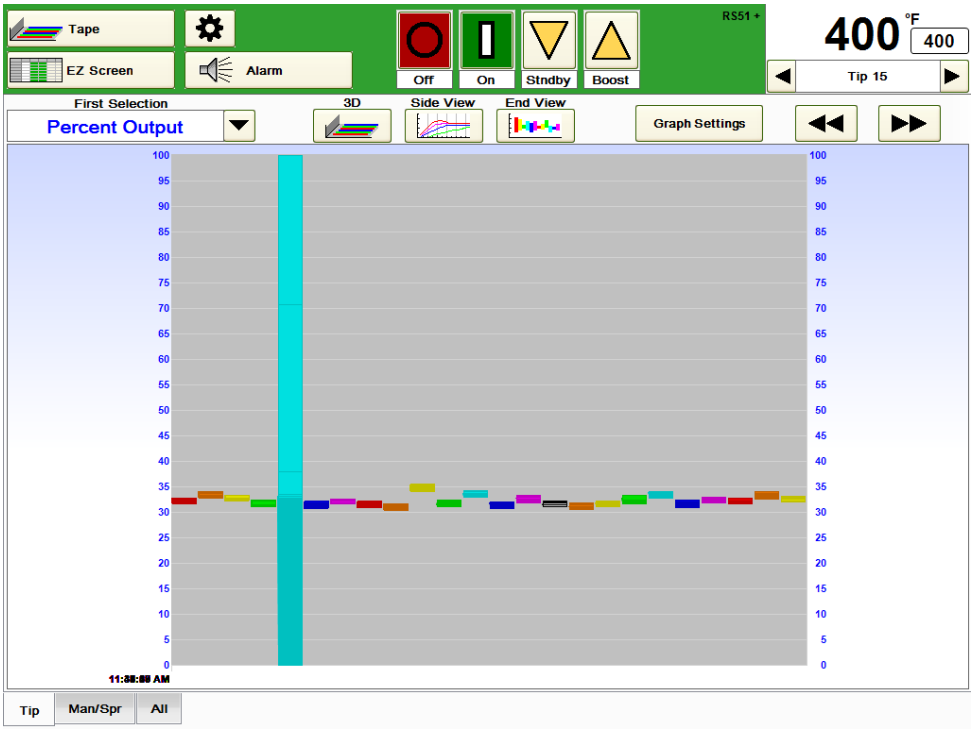


Figure 7k Tape Graph – End View

Tape Graph: Each zone's data is displayed as a colored ribbon showing changes over a period of time as shown in Figures 6i, 6j and 6k. This display can be useful in showing how different zones compare over time. Only one variable is plotted at a time. The choices include Actual Temperature, Deviation (from setpoint), Percent Output, Heater Current (amperage), Heater Voltage, Heater Resistance, Temperature Setpoint and Manual % Output Setpoint. In Figure 7i, 6j and 6k, Percent Output is plotted. To select a particular zone, choose it in the upper right corner of the screen. The selected zone's data will displayed as the black bar on the graph (Tip 15 in Figures 6i, 6j and 6k).
The tape graph can display up to 25 zones at a time. Use the << or >> buttons to view the rest of the zones.
The screen can be rotated by touching anywhere in the displayed graph area. The display will rotate away from where the screen was touched. Touching the 3D, Side View or End View will restore the graph to its normal position.

Three views are selectable:
a) 3D – shown in Figure 7i
b) Side View – shown in Figure 7j
c) End View – shown in Figure 7k. This view is useful in showing the relative stability of the zone. If one zone has more swing in a variable, it may be less stable than the other zones.

The function of the Graph Display button (see Figure 7b) is the same as that described for the Pilot Graph with the following additions:
a) Tape Graph Seconds per Update (settable from 1 to 999 seconds). 5 seconds is the default. The smaller the number, the faster the screen fills.
b) Time to Fill Tape Graph (displayed in HH:MM:SS format). This is calculated by the G24 and related to the Tape Graph Seconds per Update.

Figure 7l Tool Graphic

Tool Graphic: A picture file with a .wmf or .bmp extension can be shown on the screen as seen in Figure 7l. Wmf files will stretch to fit the screen. An aspect ratio of 2.1:1 will provide an undistorted picture. Bmp files will be displayed 798 pixels wide by 380 pixels high. Pictures cannot be zoomed. Files are saved in the D:\G24\Tool directory.

Up to 50 interactive data readings (e.g., actual temperature, wattage, amperage) or setpoints can be placed anywhere on each picture. This enables the user to show a graphic display of the tool and choose a variable to display at critical places such as temperatures or wattages. Text will be green unless the zone is in alarm mode. When a zone is in alarm, the text for that zone will be red.

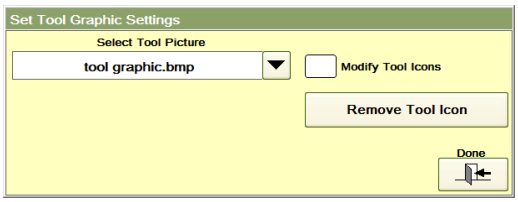


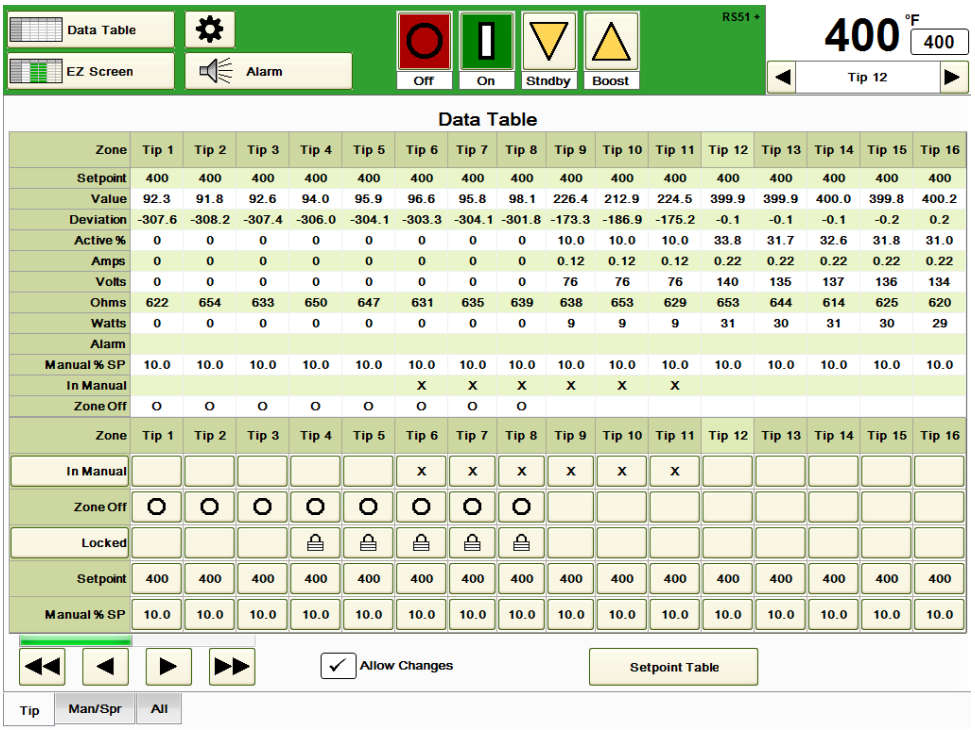
Figure 7m Set Tool Graphics Settings Tool Graphic

The user can set up a library of pictures (bmp, jpg, jpeg and wmf formats) in the D:\G24\Tool directory and select which is to be displayed with a group tab using the Graph Settings button. The image size available on the G24 screen is 1016 x 626 pixels. Pictures larger than this will be shrunk to fit without distortion. Pictures with fewer pixels will be automatically centered on the screen. Each picture can be Select the group tab button on the bottom of the screen. Choose the picture using the Select Tool Picture dropdown box shown in Figure 7m. Interactive setpoints and values can be set to appear on the picture.

To add a zone's data to a tool picture:
a) Select Graph Settings.
b) Select Modify Tool from the Set Tool Graphic Settings popup box (shown in Figure 7m) and then select Done.
c) Touch the location on the tool picture to add the zone 's data (the zone displayed in the upper right corner of the screen). It can be relocated by touching a different spot on the picture.

To remove a zone's data from a tool picture:
a) Select Graph Settings.
b) Select Remove Tool Icon and then select Done.
c) Clicking on the tool picture to remove the zone that is displayed in the upper right corner.

Each group has its own picture and value settings. For example, the tool graphic shown in Figure 7l is associated with the Tip group.
When a user touches one of the interactive boxes, the top of the G24 display will indicate data for that zone. This makes it easy for the user to make quick adjustments to that zone.

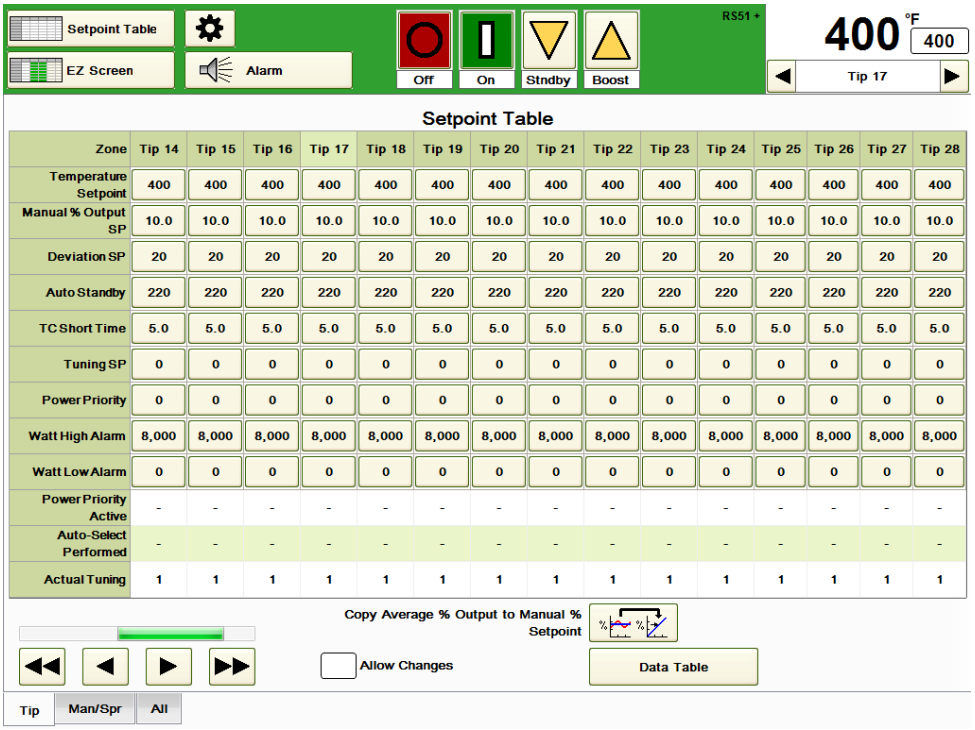


Zone	Tip 1	Tip 2	Tip 3	Tip 4	Tip 5	Tip 6	Tip 7	Tip 8	Tip 9	Tip 10	Tip 11	Tip 12	Tip 13	Tip 14	Tip 15	Tip 16
Setpoint	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400
Value	92.3	91.8	92.6	94.0	95.9	96.6	95.8	98.1	226.4	212.9	224.5	399.9	399.9	400.0	399.8	400.2
Deviation	-307.6	-308.2	-307.4	-306.0	-304.1	-303.3	-304.1	-301.8	-173.3	-186.9	-175.2	-0.1	-0.1	-0.1	-0.2	0.2
Active %	0	0	0	0	0	0	0	0	10.0	10.0	10.0	33.8	31.7	32.6	31.8	31.0
Amps	0	0	0	0	0	0	0	0	0.12	0.12	0.12	0.22	0.22	0.22	0.22	0.22
Volts	0	0	0	0	0	0	0	0	76	76	76	140	135	137	136	134
Ohms	622	654	633	650	647	631	635	639	638	653	629	653	644	614	625	620
Watts	0	0	0	0	0	0	0	0	9	9	9	31	30	31	30	29
Alarm																
Manual % SP	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
In Manual						X	X	X	X	X	X					
Zone Off	O	O	O	O	O	O	O	O								

Zone	Tip 1	Tip 2	Tip 3	Tip 4	Tip 5	Tip 6	Tip 7	Tip 8	Tip 9	Tip 10	Tip 11	Tip 12	Tip 13	Tip 14	Tip 15	Tip 16
In Manual						X	X	X	X	X	X					
Zone Off	O	O	O	O	O	O	O	O								
Locked				🔒	🔒	🔒	🔒	🔒								
Setpoint	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400
Manual % SP	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0

Figure 7n Data Table

Data Table: All zone data and settings are shown as seen in Figure 7n. At the bottom of the screen, a zone can be toggled between auto and manual, on and off, locked and unlocked. Setpoints and Manual % Setpoints can also be viewed and changed. In Figure 7n, Tips 1-8 are off, Tips 4-8 are locked off and Tips 6-11 are in the manual mode. To make changes, select Allow Changes and select the Setpoint or Manual % SP box that is to be changed (Tip 12 in Figure 7n).
Pressing the Setpoint Table box toggles the screen to the Setpoint Table screen.



Zone	Tip 14	Tip 15	Tip 16	Tip 17	Tip 18	Tip 19	Tip 20	Tip 21	Tip 22	Tip 23	Tip 24	Tip 25	Tip 26	Tip 27	Tip 28
Temperature Setpoint	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400
Manual % Output SP	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Deviation SP	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Auto Standby	220	220	220	220	220	220	220	220	220	220	220	220	220	220	220
TC Short Time	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Tuning SP	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Power Priority	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Watt High Alarm	8,000	8,000	8,000	8,000	8,000	8,000	8,000	8,000	8,000	8,000	8,000	8,000	8,000	8,000	8,000
Watt Low Alarm	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Power Priority Active	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Auto-Select Performed	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Actual Tuning	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

Figure 7o Setpoint Table

Setpoint Table: All zone assigned setpoints are shown and are available for change on this screen as shown in Figure 7o. To make changes, select Allow Changes and make the desired changes. If there are more than 24 zones, the other zones can be selected by using the increase and decrease buttons on the bottom left corner.
A handy feature is available on this screen. Pressing the **Copy Average % Output to Manual % Setpoint** copies all the average percent outputs currently in use by each zone into the **Manual % Output SP** boxes. This enables the operator to use a manual percentage setpoint that works for that zone. The Data Table button can be used to toggle to the Data Table screen.

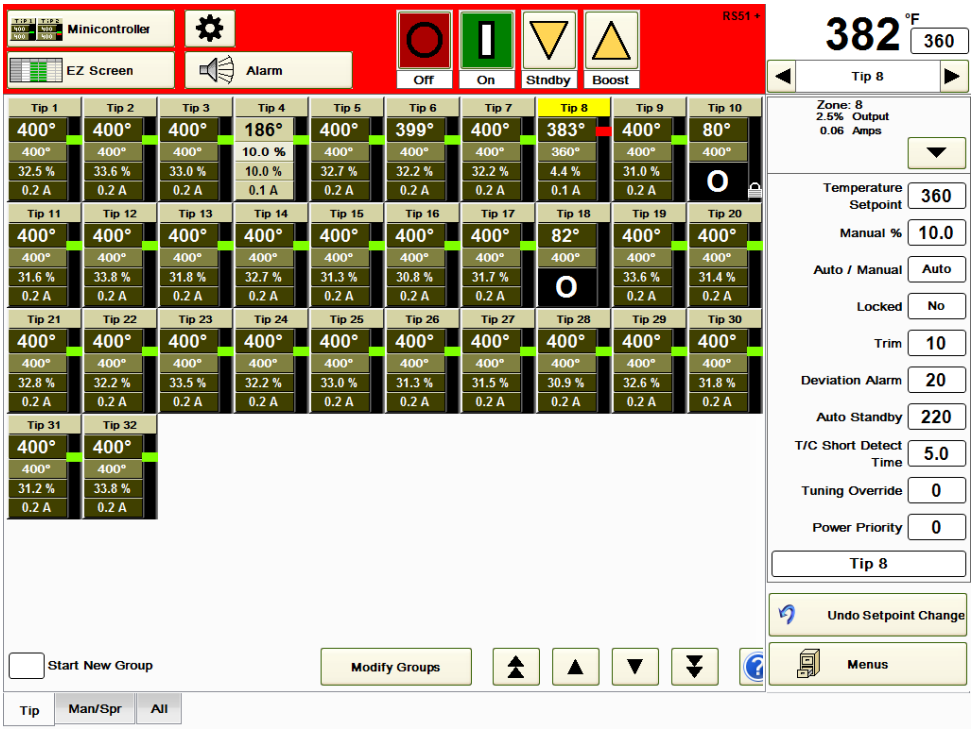


Figure 7p Minicontroller

Minicontroller: This screen shows the actual temperature, temperature setpoint, % output and amperage output for each zone. To select a zone, touch anywhere in the zone's box of data. The zone number will be highlighted in yellow (Tip 8 in Figure 7p). Zones that are on and not in alarm will have a green rectangle displayed. Zones that are on and in alarm (Tip 8 in Figure 7p) will have a red rectangle displayed. Zones in manual (Tip 4 in Figure 7p) will have data displayed in a lighter shade and will display the manual % output setpoint instead of the temperature setpoint. Zones that are off (Tips 10 and 18 in Figure 7p) will display an "O" in the % Output and Amps fields. Zones that are locked off (Tip 10 in Figure 7p) will have an "O" in the % Output and Amps fields with a lock symbol displayed to the right.
The Minicontroller screen is a convenient place to add, remove or modify group tabs on the bottom of the screen.

To add a group, select **Start New Group.** Touch the zone(s) that are to be in the new group. Press **Make Group** and name the group in the popup box. The popup box includes commonly used group names that can be used or a custom name (Tips 13-24 in Figure 7q) can be entered. If a language other than English is selected, the choices shown in the dropdown box are translated as well.
For a shortcut, select "Start New Group", then slide your finger from the lowest zone to the highest zone desired in the new group. Zones can still be added or subtracted by touching those zones after sliding.

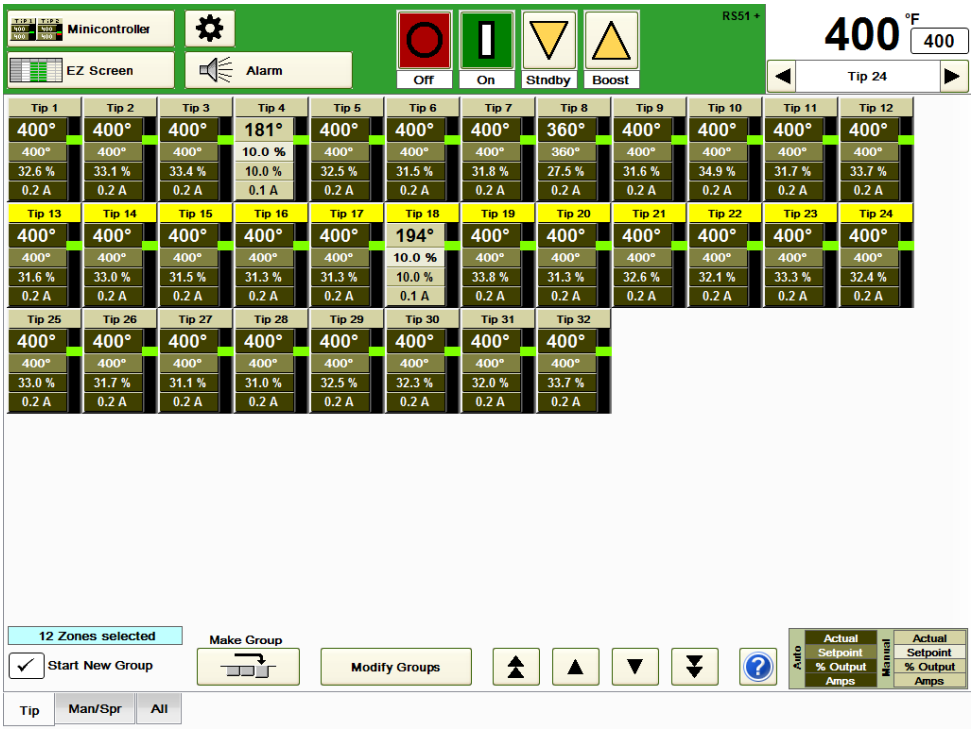


Figure 7q Minicontroller (Adding a Group)

Once a group is set up, it can be modified by pressing the Modify Groups button shown in Figure 7r. Select the group tab that needs to modify and make any of the selections on the screen. After changes are made, select **Save Changes** or **Exit Without Saving Changes**. If there are more than 48 zones in the system, the increase and decrease buttons can be used to access the other zones.

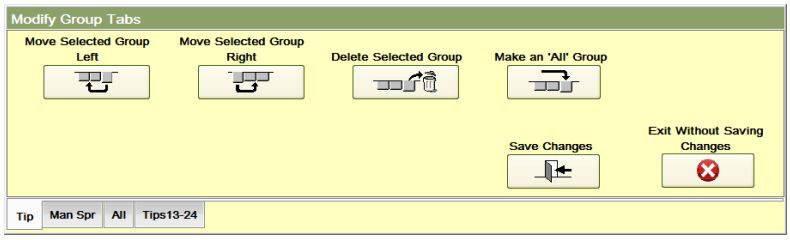


Figure 7r Modify Group Tabs

It is also possible to perform functions on the highlighted set of zones without making them into a group tab. For example, if Tips 13-24 are highlighted as shown in Figure 7q, these zones can be turned On, Off, setpoints changed and most other functions performed without selecting the **Make Group** button. If the **Boost** button is pressed, the screen shown in Figure 7s will appear. In addition to the regular choices, the phrase **Boost the Highlighted Zones** is shown. A similar screen would appear for putting the highlighted zones into Standby, changing the highlighted zones' setpoints, putting the highlighted zones into manual mode and other functions.

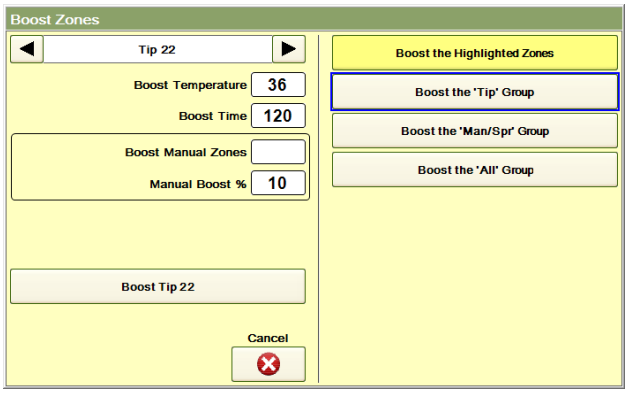


Figure 7s Highlighted Zone Functions (Boost shown)

Pressing the information ("?") button at the bottom of the screen will cause a popup box to appear that describes the functions of the Minicontroller screen.

Cavity Map Pro™: This screen displays the layout of the tool as described in Section 16.
Mold Doctor®: This screen displays the mold diagnostic tests that can be performed as described in Section 20.

8
Alarms

The G24 has a large array of alarms to assist the operator. All alarm settings are selected in the Setpoint Table (Section 7). When an alarm occurs, the background of the top of the screen changes from green to red as shown in Figure 8a, the **Alarm** button becomes animated and the red light flashes on top of the screen. Pressing the **Alarm** button acknowledges the alarm and turns off the light. If there is still an alarm condition, the button remains animated and the background remains red. When the alarm is no longer in effect the background color returns to green and the **Alarm** button is no longer animated. When the **Alarm** button is pressed, the screen indicates which alarms are currently active. If a new alarm occurs for more than 5 seconds, the alarm light will turn red and once again the Alarm button will become animated.

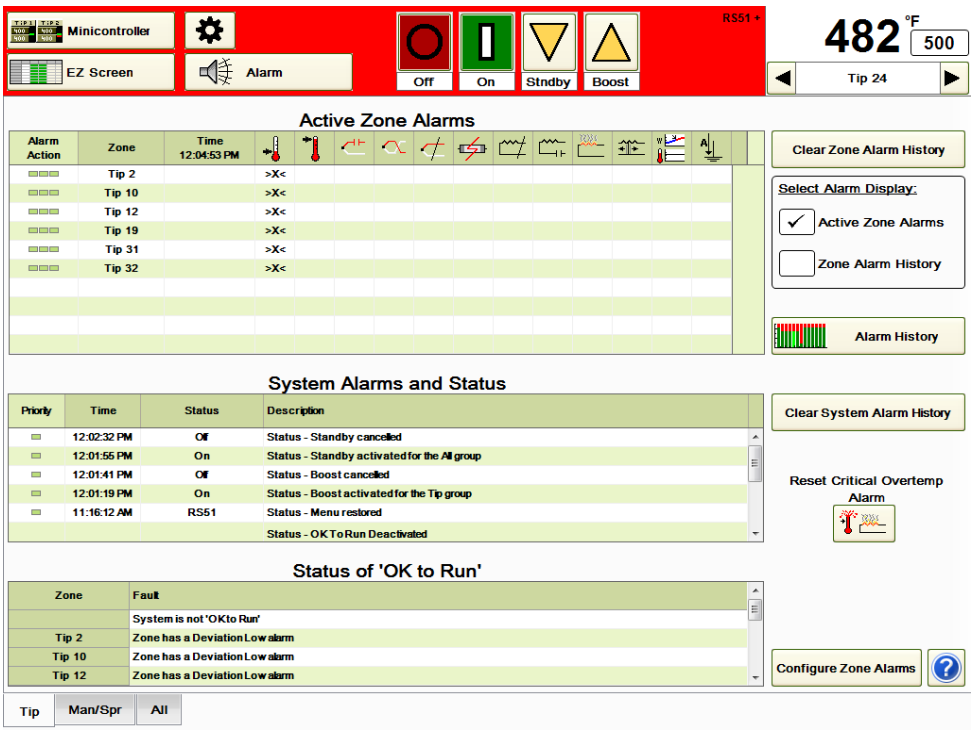


Figure 8a Alarms

The **Select Alarm Display** on the right side of the screen is used to select whether the screen shows **Active Zone Alarms** or the **Zone Alarm History**.

Active Zone Alarms: This section of the screen as shown in Figure 8a displays the zones that are currently in alarm (shown with an >X<). Note that the alarms displayed are *only for the group selected* at the bottom of the screen (Tip in Figure 8a). If the Tips group is selected, manifold and sprue zone alarms will not be shown on this screen. Selecting the All group will cause all alarms to be displayed on the screen.

Zone Alarm History: This section of the screen as shown in Figure 8b displays the alarm history since the controller zones were turned on. Note that the alarms displayed are *only for the group selected* at the bottom of the screen. Alarms that are currently active appear as ">X<". Alarms that occurred previously, but are no longer active, appear as "X". No alarm next to a zone and time indicate the alarm for that zone cleared at the time shown as shown in Figure 8b where Tip 20's alarm cleared at 11:10:49 AM.

Pressing the **Clear Zone Alarm History** button clears all historical alarms *for all zones in all groups.*

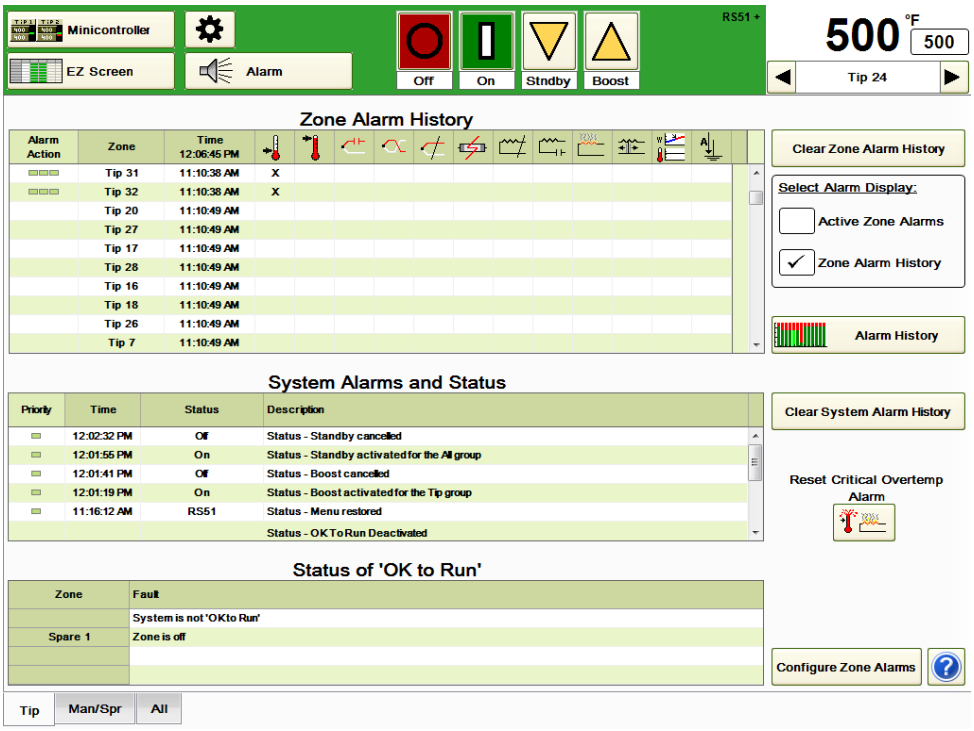


Figure 8b Zone Alarm History

Alarm History: Press the **Alarm History** button to view the alarms in a bar graph format such as the one shown in Figure 8c. In this graph, the zones are shown in gray when they are off, green when they are on and not in alarm and red when they are in alarm.
As time passes, the segments will be scrolled to the top of the graph. The entire time period of the graph is 2 hours.

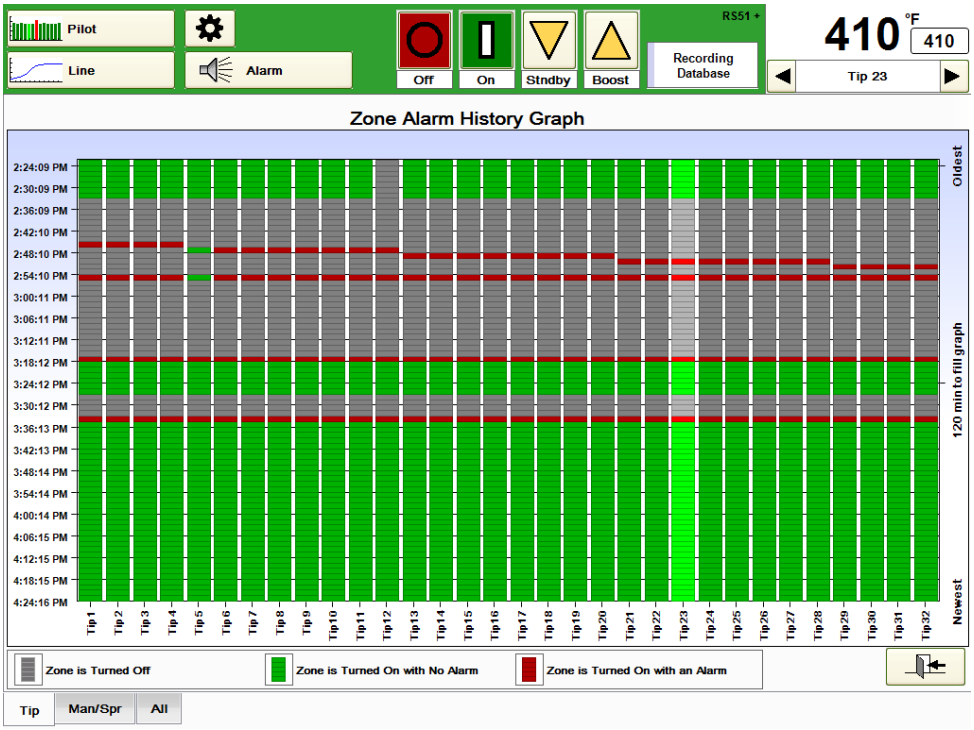


Figure 8c Alarm History

Pressing the blue question mark in the lower right corner of the screen causes the legend in Figure 8d to appear that explains the alarm icons shown at the top of the alarm table:

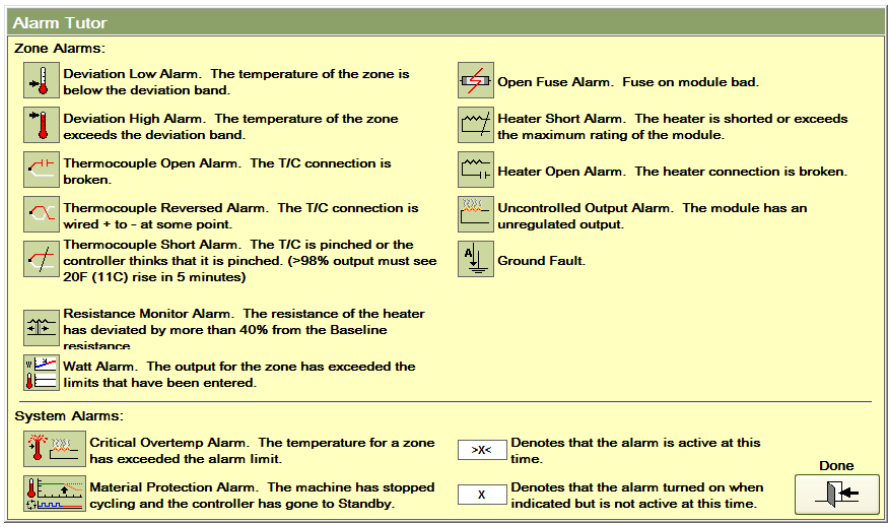


Figure 8d G24 Alarm Screen Legend

Deviation Low Alarm: This alarm is activated whenever the measured temperature value is less than the temperature setpoint minus the Deviation Alarm Setpoint. For example, if the temperature setpoint is 400F and the Deviation Alarm Setpoint is 20F, then the alarm would be active whenever the temperature reading is below 380F. The alarm is only active when the zone is in Automatic mode (closed loop) control and the output is turned on. The alarm value

can be set in the Setpoint Table (Section 7) or in the Zone Details (Section 6) display. The controller default setting is 20F (11C). Low Temperature Deviation Alarms occur on start-up and stay active until temperatures exceed the low temperature deviation alarm setting. The Low Temperature Deviation Alarms are given the lowest priority on the Active Alarm screens and are displayed below any other active alarms.

Deviation High Alarm: This alarm is activated whenever the measured temperature value is greater than the Temperature Setpoint plus the Deviation Alarm Setpoint. For example, if the temperature setpoint is 400F and the Deviation Alarm Setpoint is 20F, then the alarm would be active whenever the temperature reading is above 420F. This alarm is only active when a zone is in Automatic mode (closed loop) control and the output is turned on. The alarm value can be set in the Setpoint Table (Section 7) or in the Zone Details display (Section 6). The controller default setting is 20F (11C).

Thermocouple Open Alarm: This alarm is activated when at least one of the thermocouple input wires is open. The zone will display "***" in the Temperature Display area. This alarm is only active in automatic mode (closed loop) control. When a thermocouple fails on a zone, the zone output will switch to a "learned" manual output that has been determined by averaging the zone's recent output level. This enables the controller to continue to make parts in the manual mode until the operator shuts power off to the G24 or changes the manual percentage output of the zone. In this case, the zone can be put into manual mode and run with an operator selectable percent output (manual) setpoint.

Thermocouple Reversed Alarm: If a thermocouple wire is installed with the plus and minus leads reversed, applying heat will result in a decrease in the temperature reading while the actual temperature is rising. When the temperature reading goes below 0F° (occurs when the actual temperature is approximately 140F), the Thermocouple Reversed Alarm is activated. A Thermocouple Reversed Alarm will cause the zone to shut off. The alarm is only active in Automatic mode (closed loop) control.

Thermocouple Short Alarm: A thermocouple may have its leads pinched or shorted together somewhere between the thermocouple junction at the mold and the hot runner temperature controller. When this occurs, the temperature reading will be that of the shorted location and not the temperature at the thermocouple tip. The Thermocouple Short Alarm will activate when the temperature climbs less than 20F (11C) while the output has been at 98% or higher for a certain time duration. The duration is a timer setting, called **T/C short Detection Time** and can be set in the Setpoint Table (Section 7). The default setting for each zone is 5 minutes.
For example, a thermocouple short may occur at a location where the temperature is room temperature. As the zone attempts to raise the temperature to setpoint, the output will be at 100% output. While the temperature at the short continues to indicate to the controller that the temperature is only room temperature, the real temperature at the tip is climbing rapidly due to the heater receiving 100% output from the controller. As soon as the G24 output reaches 98% output or higher, a timer is energized (settable up to 54 minutes). If the temperature does not climb 20F before the timer times out, the output for that zone will be

shut off. This can save the tool from heat-related damage. Note that setting the timer to 54 minutes actually disables the feature.

Note: The Low Temperature Alarm would also activate immediately following a short in this example since the temperature at the short would most likely be well under the Low Temperature Alarm setting.
This alarm may also activate when a heater is unable to raise the temperature to a high setpoint. An old heater may be running at 100% and still not reach setpoint. When this happens the Shorted Thermocouple Alarm will activate because the temperature is not going up 20F in the time allowed while the output is at 100%.

Open Fuse Alarm: This alarm is active when an output module load fuse is open and the zone is turned on. The physical location of the fuse can be determined quickly using the "Find This Zone" feature (Section 18).

Heater Short Alarm: This alarm is active when the zone is turned on and the output module senses a heater load greater than the load the output module can carry. The default setting for the alarm is just above 15A, but this can be changed by changing the Maximum Zones Amps settings in Limits (Section 16). On startup, the G24 employs a very effective heater bake out procedure. The G24 initially provides a very low voltage (1-5 VAC) to the heater while monitoring the current. As long as the current is within expected limits, the voltage will ramp up to full voltage over a few line cycles while the current is continuously monitored. If, at any point, the current draw exceeds expected limits, the Heater Short Alarm will be activated and the cycle will be repeated. The G24 "bakes out" the heater by providing the low voltage pulse to the heater. Once the heater is dry, the G24 will ramp the zone's output to full voltage within a few line cycles while continuing to monitor the current draw. A major benefit of this approach is that the G24 actually measures the current and applies the bake out procedure only when required. Another benefit is that the use of a low voltage output during Heater Bakeout avoids heater damage often caused by controllers that cannot adjust the voltage level. If desired, however, the zone can instead be shut off if a heater short is detected when the zone is turned on (see GF Alarm description below).
During regular operation, the G24 continues monitoring for heater shorts. If a short is detected, the alarm will become active. The controller will cut back the output voltage, applying a very low voltage on a repeating basis to determine if the short still exists.

Heater Open Alarm: This alarm is active when the zone is turned on and the output module senses a load of less than 0.2 amperes. This can be caused by a blown heater or open cable circuits.

Uncontrollable Output Alarm: This alarm is activated if the G24 determines that a zone is heating when the zone is calling for zero output. This can occur if an output module triac or solid state relay has failed in the conducting mode. If the problem persists, the temperature may climb and activate the Critical Over Temperature Alarm Setting. When the alarm is active, the module with the "uncontrollable zone" will shut off both zones on that output module with the use of a relay on the module. The alarm can be cleared by toggling the alarming zone's operating mode between AUTO and MANUAL.

Resistance Monitor Alarm: This is a unique feature that enables the controller to indicate when a heater is beginning to fail. This is an excellent preventative maintenance tool. Heater resistance is monitored whenever the zone is within 3F of setpoint and the output is greater than 4%. If the heater deviates by more than 40% of its normal (baseline) value, this alarm will activate. This feature can be activated on the Mold Monitor screen (Section 14). This alarm will cause the alarm light to light, but will not change the status of the alarm contacts. If the user wants the alarm contacts to change when this alarm is active, the setting can be changed in the Configuration Alarm section (Section 8).

Watt Alarm: This alarm will activate when the wattage of a zone output is lower than the user-selectable low alarm setting or higher than the user-selectable high alarm setting. The wattage value must be outside the limits for approximately a minute while the temperature is within the high and low deviation alarm settings found in the Setpoint Table (Section 7). This alarm will cause the alarm light to light, but will not change the status of the alarm contacts. If the user wants the alarm contacts to change when this alarm is active, the setting can be changed in the Configuration Alarm section (Section 8).

Ground Fault Alarm: The G24 checks each output module for excessive current to ground the first time either zone in an output module is turned on. On two-zone G24 output modules, a Ground Fault test will be performed on both zones when either of the two zones is initially turned ON. If the other zone is turned on at a later time, no additional Ground Fault test will occur. The Ground Fault Alarm will activate anytime a ground fault is detected. The module will still turn ON unless Enable Ground Fault Protection is enabled on the Setup screen (Section 12). If Enable Ground Fault Protection is enabled and a ground fault is detected, both zones on the module will remain OFF until the ground fault issue is resolved.

System Alarms and Status: This table shown in the middle of the screen on Figure 8a and Figure 8e are used to show the status of special functions. It indicates if boost, standby and any timed sequence have been started or ended. It also includes the status of the **Critical Overtemp Alarm** and **Material Protection Alarm**. Press the **Clear System Alarm History** button to clear the table. More detail can be shown by pressing the **(Press for expanded detail)** area of the table.

Critical Overtemp Alarm: This alarm is active when any zone in the G24 exceeds the Critical Over-Temperature Alarm setting selected by the user. The alarm will show up in the **System Alarms and Status** section of the alarm screen shown in Figure 8a. The G24 shuts off all zones. The alarm will remain activated until all temperatures are below the setting and the **Reset Critical Overtemp Alarm** button on the right side of the screen is pushed to clear the alarm. This alarm is useful in situations where the user has a miswired tool, causing power to be incorrectly applied to one or more zones. The button changes background colors and is animated while in the alarm condition.

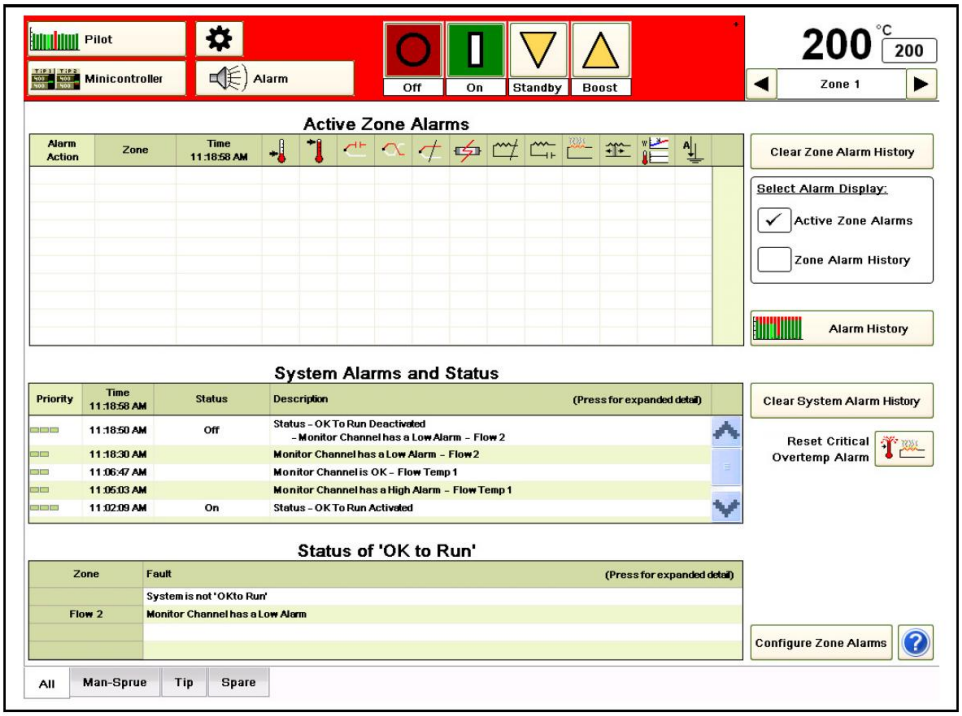


Figure 8e Alarms (showing flow monitor signals in alarm)

Material Protection Alarm: This alarm appears on the screen only if the user has selected this feature on the Mold Monitor screen (Section 14). The alarm becomes active when the external input from the injection molding machine is not received in the user-specified amount of time. The alarm timer does not start until the zones have risen far enough to clear the low deviation alarms. The button changes background colors and is animated while in the alarm condition. Zones that are assigned to the Remote Standby Group will be put in Standby while this alarm is active. Pushing the animated button clears the alarm and reinitializes the timer. The alarm will show up in the **System Alarms and Status** section of the alarm screen shown in Figure 8a.

Status of "OK to Run": This section is at the bottom of the Alarm screen shown in Figure 8a and 8e. The screen displays whether the system is OK or not OK to Run. If the system is not OK to Run, the reason(s) will be displayed below the message. In Figure 8a, the "System is not OK to Run" because the Sprue zone has an active deviation alarm among other reasons. In Figure 8e, the "System is not OK to Run" because one of the analog input monitor channels has a low alarm. To see more detail select the "**(Press for expanded detail)"** area of the table.

'OK to Run' Contact
The controller can provide a normally open contact closure (Section 23) to the injection molding machine to denote that the mold is heated and is ready for injection.
The 'OK to Run' contact is 'open' (not 'OK') when:
1) The controller is not powered.
2) The interlink cable between the controller and the injection molding machine is not connected.
3) Any unlocked zone is off.
4) There is a zone alarm within the controller. An exception to this can occur when the controller is in or has just completed a Boost operation. The deviation alarms momentarily created in the boosted zones will be ignored for the length of time designated in the **Boost Recovery Time setting**. This gives the process time to recover from a Boost without changing the status of the OK to Run contact. See Boost in Section 5.

5) All of the zones in the controller are locked off.
6) Any flowmeter channel input (flow rate or temperature) is in alarm.

The OK to Run contact is closed (OK) when:
1) There is a least one zone that is not locked off.
2) All of the unlocked zones are turned On.
3) There are no zone alarms within the controller.

Configure Zone Alarms: Press the **Configure Zone Alarms** button shown in Figure 8a to access the table shown in Figure 8f. This table can be used to set up which alarms turn on the alarm light on top of the screen and which turn on the alarm contacts. With the exception of the Heater Wattage Alarm and the Heater Resistance Alarms, all alarms are set up to turn on the light and contacts. This table can be used to disable any alarm or to reinstate any alarm. Press the **Allow Changes** box to make any changes to the screen. The left column shows all available types of settable alarms.

The **Alarm Action** column includes the setting that decides if the alarm:
1= Causes no action (no activation of flasher and alarm contact)
2= Activates the flasher only
3= Activates both the flasher and alarm contacts

In Figure 8e all zones have a low deviation alarm. A zone alarm is shown with the red cell background (whether it is disabled or not). The low deviation alarms for Tips 2-7 have been disabled by placing an "X" in those zones' Deviation Low boxes.
If there are any non-disabled zone alarms, then the cell at the bottom for 'Zone is in Alarm' will be shown with a red cell background as shown in Figure 8e.
If the alarms are disabled, then the cell at the bottom will be shown with a white cell background as shown for Tips 2-7 in Figure 8e.
This can be a very useful feature. Perhaps the user would like to shut down the machine if certain alarms occur. These alarms should have their Alarm Action setting set to 3 (activates the flasher and alarm contacts). The others should be set to 1 or 2 so that they will affect the alarm contacts.

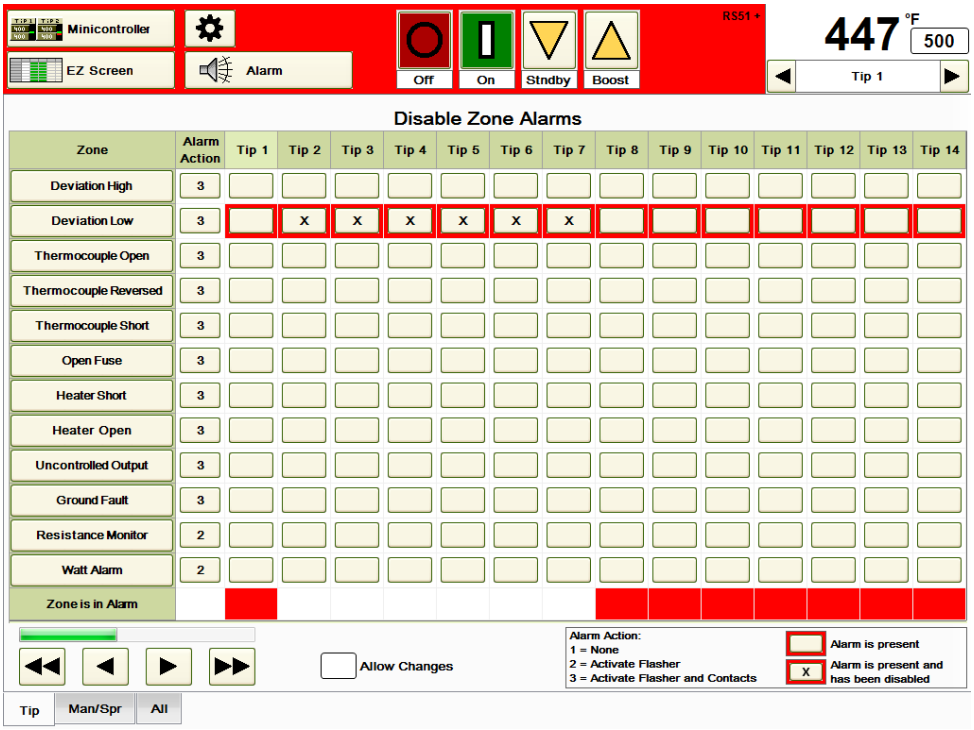


Figure 8e Configuration Zone Alarms

9
Program Screen Paths

The two buttons at the top left of the screen (Line and Minicontroller in Figure 9) are programmable by the user.

Press the Gear icon at the top of the screen and press the **Program Screen Paths** button to get to the screen shown in Figure 9. The user can assign any of the following shortcuts to the buttons by pressing the dropdown box arrow next to Screen Buttons 1 and 2 as shown in Figure 9:

Pilot Graph	Data Table
Bar Graph	Setpoint Table
Line Graph	EZ Screen
SPC Graph	Minicontroller
Tape Graph	Cavity Map Pro™
Tool Graphic	Mold Doctor®

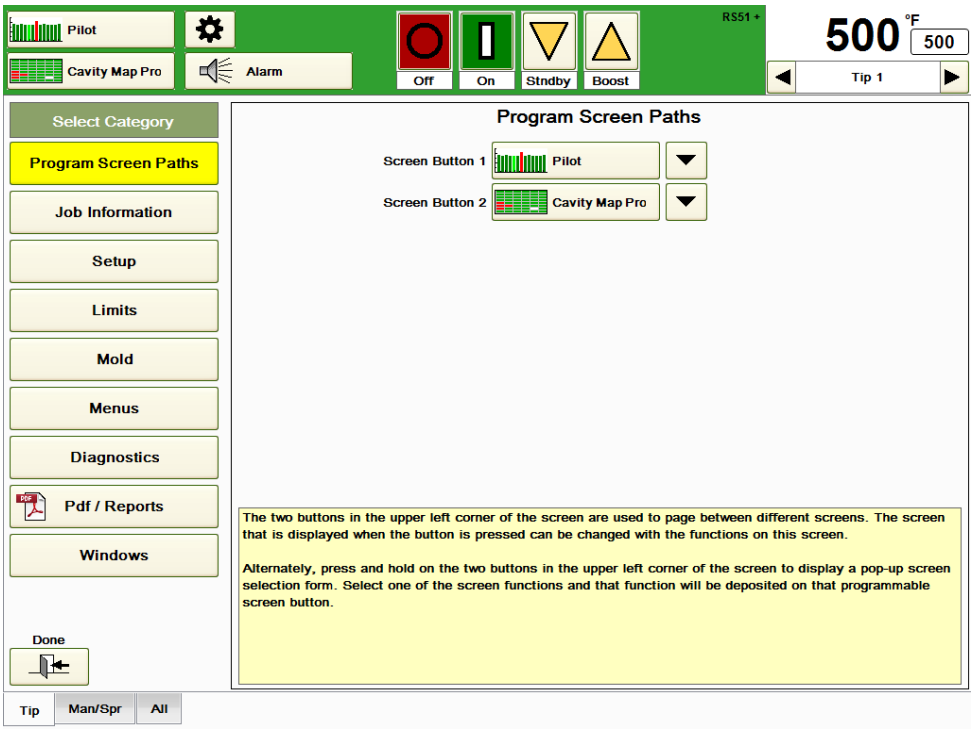


Figure 9 Program Screen Paths

An easier way to do the same thing is to press and hold either of the two buttons at the top left of the screen until the popup box appears for that Screen Button. The selection can be made there without going to the Program Screen Paths button if desired.

10
Job Information

The "Job Information" button is used to gain access to tool information. When the Information button is pressed, the screen shown in Figure 10 will appear.

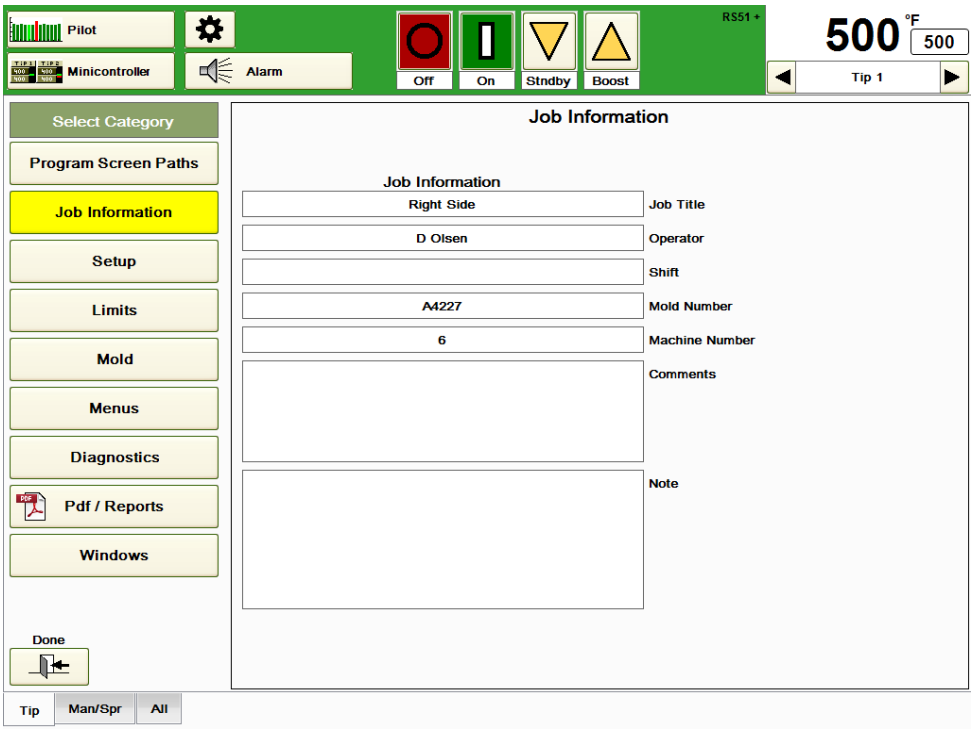


Figure 10 Information

The user can enter information into any of the Job Title, Operator, Shift, Mold Number, Machine Number, Comments and Note areas using the alphanumeric keypad that appears on the screen when an area is touched. If a menu is stored after entering information on this screen, all information other than that shown in the Note area will be saved as part of the menu.

11
Setup

The Setup Screen includes settings for temperature scale, thermocouple type, temperature display, ground fault protection, output power up status and remote group settings as shown in Figure 11.

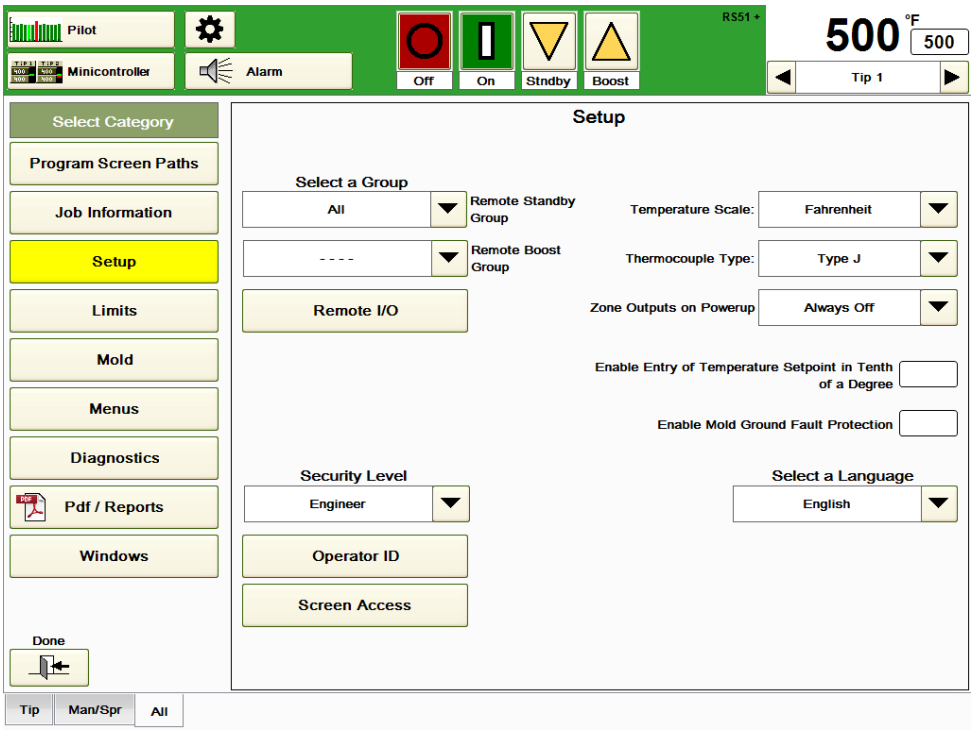


Figure 11 Setup

Remote Standby Group: The G24 can be placed into the Remote Standby mode by the reception of an external signal. The setpoint of each zone in the group selected (Tip in Figure 12a) will go to the Standby setpoint assigned for that zone. Zones in manual output mode will go to 50% of the manual output percentage setting. Upon the release of the external signal, the zones return to their normal setpoints. While there are other uses for this setting, the temperature setting is most commonly set to a temperature that the user wants the zones to go to when the machine is not molding, but in an idling condition. Default setting is 220F (104C). Range is 0-932F (0-500C).

Remote Boost Group: The G24 can be placed into the Remote Boost mode by the reception of an external signal. The setpoint of each zone in the group selected (none in Figure 12a) will be "boosted" according to the Boost Setpoint and Boost Time settings found in Section 5. When the boost time expires, setpoints for the selected group will automatically return to their normal values.

Temperature Scale: Select F (Fahrenheit) or C (Celsius). All setpoints and values are immediately converted. Default setting is F.

Thermocouple Type: Select Type J or Type K. This is a critical setting, because the two types have different temperature vs. millivolt characteristics. The great majority of thermocouples used in injection molding applications are Type J, but Type K may be found on some Japanese

tools. Type J normally has a white (+) and a red (-) wire, while Type K normally has a yellow (+) and a red (-) wire.

Enable Outputs on Powerup: This setting determines what state the heater outputs will be in when the power is turned on by the main breaker:
Always Off: This selection causes outputs to remain off following power up or when a menu is restored. The user must use the **On** button to turn the zones on. This is commonly used to give the user time to select what he wants to do before the zones start heating.
Ask the Operator: The outputs will initially be as they were when power was lost. A box will appear, asking the user if the zones that were on should remain on. If the user does not respond in 10 seconds, power to all zones will be turned OFF. **Ask the Operator** is the default setting.
Auto Turn On Zones that are Turned On in the Menu: This selection enables the zones' on/off status to automatically return to the same status the output was in when power was turned off to the G24. Plants that have frequent power outages may want to use this selection so that the user does not need to go to every controller to power up the heaters after a short power outage.

Temperature Display: The G24 reacts to 0.03F temperature changes whether this feature is selected or not. Selecting this feature enables the user to read the temperature and to set the setpoint to .1F or .1C resolution.

Enable Mold Ground Fault Protection: Enabling this option will cause the G24 to check for a ground fault when a zone is turned on. The G24 does this by turning on only one leg (the leg with the triac) of the output to the heater. It then checks for a ground fault (a path for current flow from the output to ground). If one exists, then the output of this zone (and the output of the other zone on the same output card) will not be turned on. The outputs for the two zones will only be turned on once the ground fault has cleared.
If this feature is not enabled, the G24 will turn on the outputs and use the heater protection feature to bake out the moisture in the circuit. It does this by providing a 1-5 VAC signal until the moisture is gone and then ramping up to full output over a few line cycles once the problem has cleared.

Select a Language: Languages other than English can be selected from the dropdown box. All feasible words will be translated including suggested names for labels in dropdown boxes used in setting up new groups and renaming connectors.

For **Remote IO**, see Section 12.
For **Security Level**, **Operator ID** and **Screen Access** see Section 13.

12
Remote IO

The G24 can use remote inputs to control the on/off status of certain functions. The G24 can also provide remote outputs that can be used by external devices. To access the Remote IO screen, press the Remote IO button on the Setup screen shown in Figure 12a.

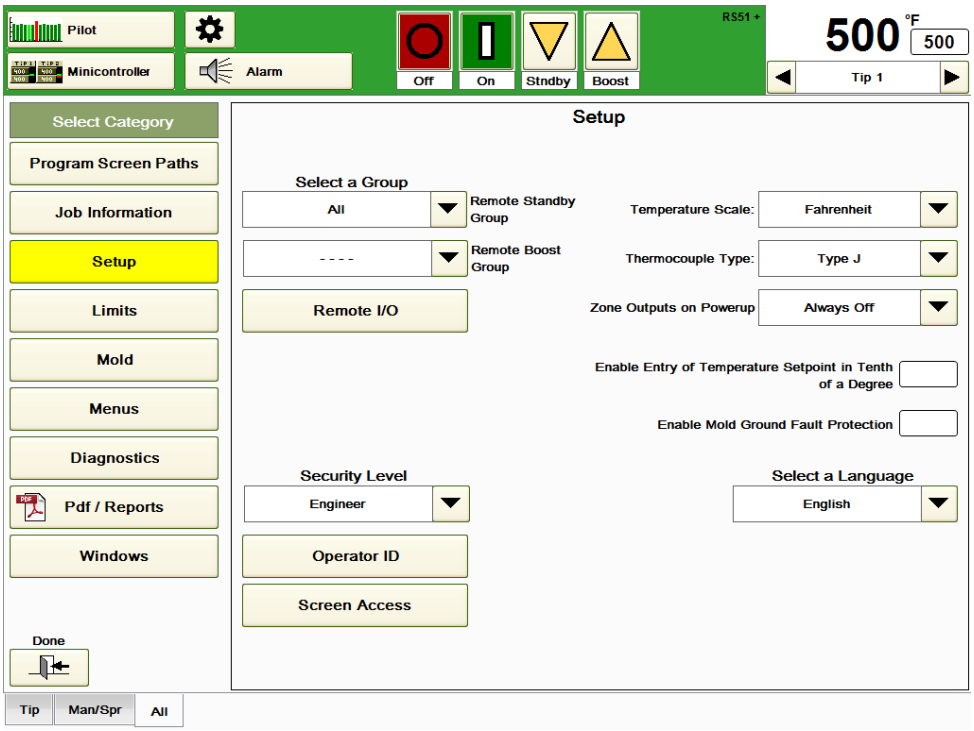


Figure 12a Setup

Select Remote Input Function: Up to twelve remote inputs are available as an option. One or two remote inputs are most common. In Figure 12b, the remote inputs selected are "Sequence Start trigger: On to activate" and "Remote Boost: On to activate". The radio button next to the Remote Inputs indicates the on (lit) / off status of the input. Press either of the Select Remote Input Function boxes (with the Allow Changes box checked) to make a selection from the dropdown box. The G24 remote input signals need to be 24VDC.
Remote inputs can be used to trigger the following functions or to indicate the status of an external device:
Control Inhibit: Turns off the zones' outputs of the G24.
Control Allow: Allows zones' outputs of the G24 to be on.
Remote Standby (Section 11)
Remote Boost (Section 11)
Sequence Start (Section 15)
Sequence Cool (Section 15)
Sequence Powerup (Section 15)
Even Cool (Section 15)
Cycle Start
Mold ID (Section 29)
Water Flow Sensor: Can be used to notify G24 that cooling water is on or off in machine
Restore Menu (Section 18)
OK to Run input: Can be used to notify G24 that machine is ready for G24 to apply heat.

Select Remote Output Function: Most commonly,1 or 2 remote outputs are available. More can be used in custom configurations. In Figure 12b, the remote outputs selected are "Audible Alarm" and "OK to Run Output". Anytime the G24 comes with an audible alarm, Output 1 will used by the Audible Alarm. The radio buttons next to the Remote Inputs and Outputs indicate their on (lit) / off status. Press either of the Select Remote Output Function boxes (with the Allow Changes box checked) to make a selection from the dropdown box. A 24VDC supply signal is available across pins 3 (+) and 8 (-).

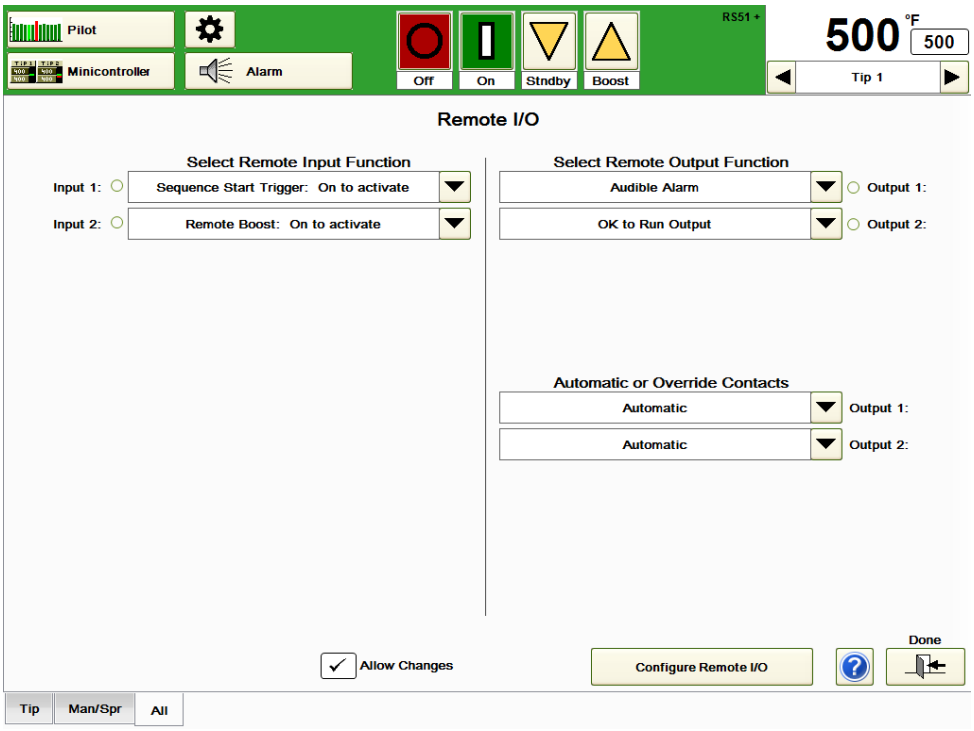


Figure 12b Remote IO

Remote outputs can be used to trigger the following functions or to indicate the status of an external device:

Resettable Alarm: When a zone continuously has an alarm active for five seconds, the alarm contact will turn "ON". Pressing the Clear Alarm button will turn the alarm contact "OFF". If a new alarm occurs after the Clear Alarm button is pressed and is active for five seconds, the alarm contact will turn "ON" again. The Resettable Alarm contact can be connected to a horn or external light. Pressing the Clear button will silence the alarm.

Non-resettable Alarm: When any zone continuously has an alarm active for five seconds, the alarm contact will turn "ON". Pressing the Clear Alarm button will not change the condition of the alarm contact. The alarm contact will turn 'OFF' when all of the alarms in the controller are cleared.

OK to Run Output: The controller can provide a contact closure to the injection molding machine to denote that the mold is heated and is ready for injection. The contact is of the NO type.

The 'OK to Run' contact is 'open' (not 'OK') when one or more of the following is true:

1) The controller is not powered.
2) The interlink cable between the controller and the injection molding machine is not connected.
3) Any unlocked zone is off.
4) There is an active alarm within the controller that is used to turn off this output.
5) All of the zones in the controller are locked off.

The 'OK to Run' contact is 'closed' ('OK') when all of the following are true:

1) There is a least one zone that is not locked off.
2) All of the unlocked zones are turned On.
3) There are no active alarms within the controller that are used to turn off this output.

Audible Alarm: This output is used to activate the G24 audible alarm.

Configure Remote IO: This button is used to access the setup of the remote functions using the screen shown in Figure 12c. Selections on the screen include:

Input Delay Time: This setting determines how long the remote input signal has to be present before the G24 acts on it.
Output Delay Time: This setting determines how long the condition exists before the G24 will turn on the remote output.
OK to Run Delay Time: This setting determines how long the OK to Run input signal needs to be on before the G24 will act on it.
Select an I/O Module: This area is where the number of I/O pairs (1 input, 1 output) are selected and where they are located (I/O Modules #1 through #4).

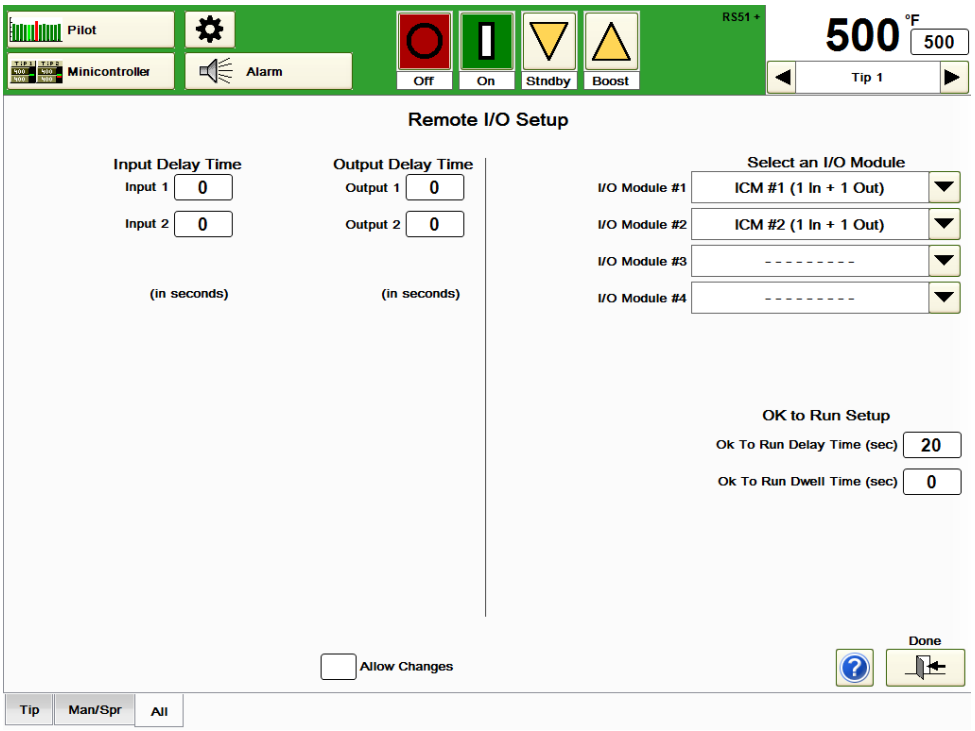


Figure 12c Remote IO Setup

13
Security

This section describes how security levels affect the accessibility and functionality of the G24.

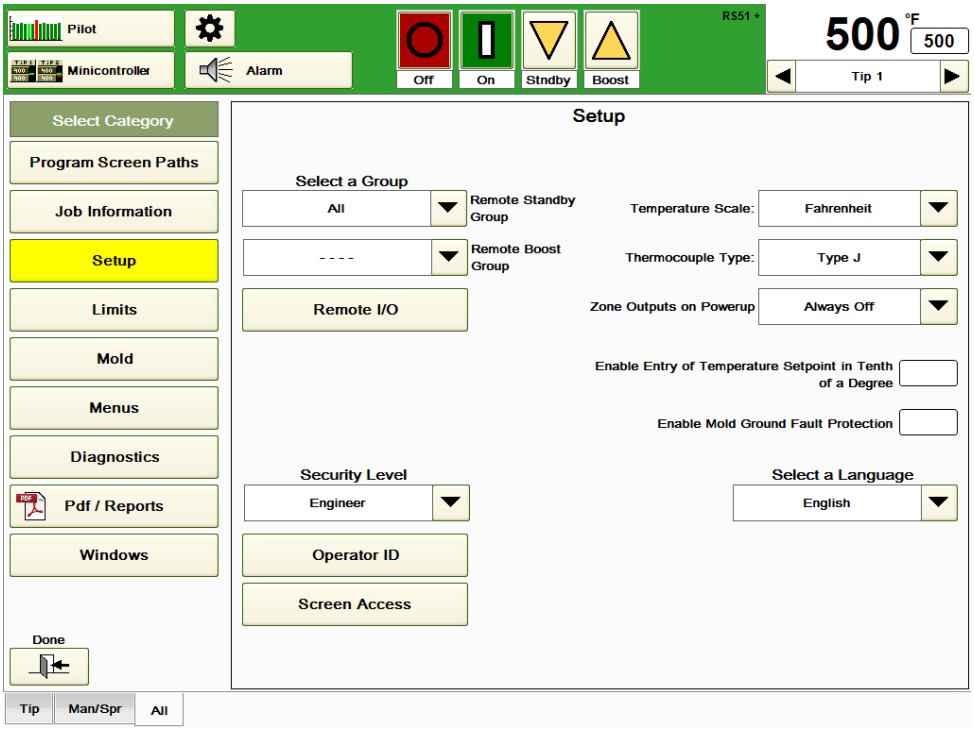


Figure 13a Setup

Security Level: Security levels can be used to control access to the G24. This serves two functions. First, it enables supervisors to set up parameters that cannot be changed by personnel with lower security levels. Second, it simplifies the screens for the user. Any buttons that the user cannot access are automatically removed from the screen, thereby eliminating confusion. The buttons reappear when the higher security level is reentered.

There are 4 security levels (from highest access down):
Engineer: Total access to all settings and information in the G24. The Engineer level is required for Mold Doctor® and Field Calibration.
Supervisor: Typically used for setup of controller other than calibration, wiring, or tool diagnostics.

Same as Engineer level except:
No access to Field Calibration
No access to Mold Doctor®

Operator: Typically used to change setpoints without having access to more detailed setup information.

Same as Supervisor level except:
No access to alarm setpoints
No access to upper and lower limits of setpoints

Monitor: Typically used when no changes are permitted. The operator can view data, but can only turn zones Off, not On.

To increase the level of security, use the following procedure:
1) Touch the box under Security Level.

2) Enter the security code for the level immediately above the level displayed (contact Gammaflux for the security codes). The level can only be changed one security level at a time in order to maximize security (e.g., from Monitor to Operator or from Operator to Supervisor or from Supervisor to Engineer).
3) To increase another level, repeat steps 1 and 2.

To decrease the level of security, use the following procedure:
1) Touch the box under Security Level.
2) Enter "0" to decrease the security level one level from the level displayed.
3) To decrease the level again, repeat steps 1 and 2.

Operator ID: The G24 can be set up to require an operator ID code to be entered before entering any setpoint. Pressing the **Operator ID** button in Figure 13a causes a screen similar to the one in Figure 13b to appear. To assign an operator a 3-digit code, press the **Add New Operator** button. A box will pop up where the new operator's code number can be assigned. Once the number is assigned, another box will pop up where the new operator's name will be entered. It will then appear on the table in Figure 13b with the others. To remove an operator, select the name from the Operator column and press the **Remove Operator** button. The name will be removed after answering Yes in the "Are you sure…" box that appears.
Once operator codes have been assigned, a keypad box will appear stating "Enter Operator ID" whenever a setpoint change is attempted. After a valid code is entered, the screens will stay unlocked for a couple of minutes so that the operator does not have to enter his code for every setpoint change.
NOTE: If the Operator function has 1 or more names assigned, setpoints cannot be entered without first entering a valid Operator ID. Do not use this function unless all personnel who need to make setpoint changes have an Operator ID.

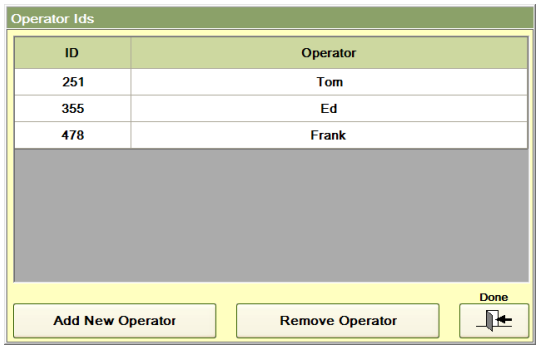


Figure 13b Operator ID

Screen Access: Figure 13c shows which functions are accessible for each security level. The default values are shown with a green border.
To change the security level of a setting, select **Allow Changes** and touch the box in the column of the lowest security level desired for that setting.
For example, in the default setup, the Monitor security level only allows outputs to be turned Off. If it is desirable to enable the user to turn on outputs whenever the system is in the Monitor security level, simply touch the box in the Monitor column next to Turn Zone On. A checkmark will appear indicating the zones will now be able to be turned on while in the Monitor security level. Pressing any box causes the setting to toggle.

Figure 13c Security Levels

If all checks are removed for a function, that function will be removed from the screen set. For example, removing the three checkmarks next to Trim Setpoint in Figure 13c will cause the Trim Setpoint to disappear from the screen set. The setting for Trim setpoint will stay at the last setting entered before it was removed from the screen or until a new menu is used.
When all changes have been made, select **Accept Changes**, **Discard Changes** or **Restore Security Matrix to Factory Defaults** (checkmarks return to yellow highlighted boxes). If the **Done** button is pressed without first pressing **Accept Changes**, the changes made during the session will not be implemented.

14
Limits

The Limits screen includes the limit settings for variables that apply to all zones as shown in Figure 14a. It also includes a link to the Zone Maximum Amps screen where amperage limits can be placed on each zone. The Setpoint Table and Data Table buttons are also included on this screen button.

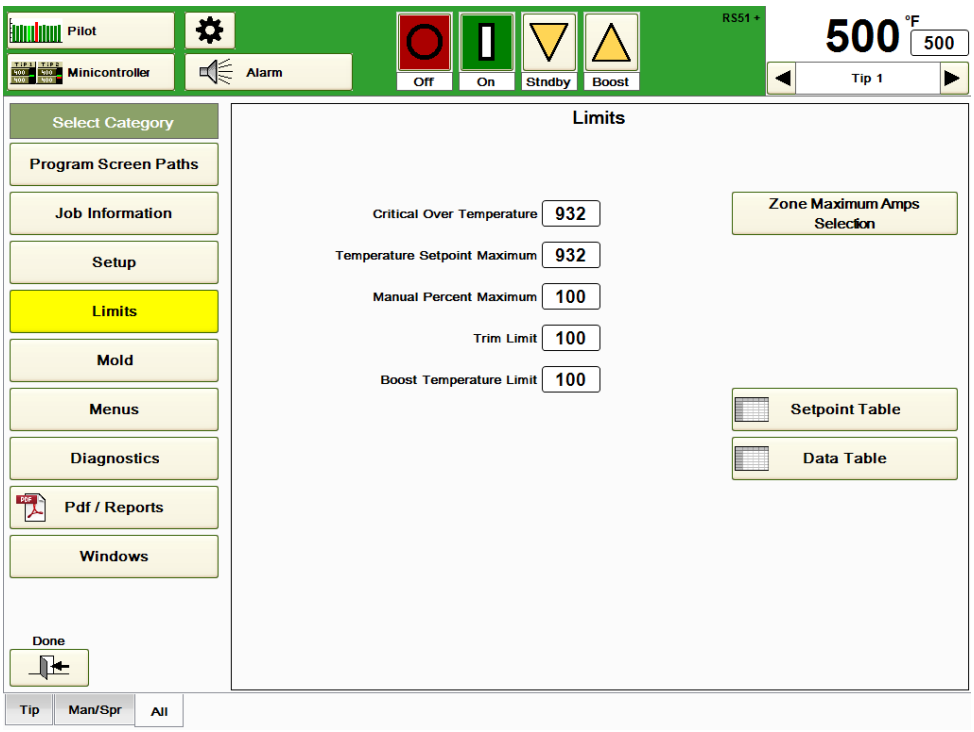


Figure 14a Limits

The limit settings include:
Critical Over Temperature: The G24 controller will shut off all outputs if the temperature of any zone exceeds this setting. This setting is used to help prevent an uncontrollable zone from rising to a temperature that might damage the tool. It can also provide useful protection in the event of a miswired tool. The alarm will remain activated until all temperatures are below the setting and the animated button on the Alarm screen is pushed to clear the alarm. The default setting is 932F (500C). Range is 0-932F (0-500C).
Note: Do not set the **Critical Over Temperature Alarm** setting to a value that the controller might exceed under normal circumstances, because all zones will be turned off if it occurs.

Temperature Setpoint Maximum: This setting limits how high individual zone setpoints can be set. This prevents a user from setting a setpoint too high. Default value is 932F (5007C). Range is 0-932F (0-500C).

Manual Percent Maximum Limit: The setting limits how high a manual output level can be set on any zone. This setting does not set the manual percentage. It only limits how high it can be set. Default value is 100%. Range is 0-100%.

Trim Limit: Trim is a feature that enables the user to raise or lower the setpoint of a zone or group of zones by a certain number of degrees even if all of the setpoints are different. The trim limit setting determines the maximum number of degrees a user can trim (plus or minus)

a zone or group of zones at one time. This setting does not set the trim setpoint (see **Trim** setting in Section 6). It only limits how high the trim setting can be set. Default trim limit setting is 100F (56C). Range is 0 to 932F (0 to 500C).

Boost Temperature Limit: Boost is a feature that enables the operator to *temporarily* raise (or lower) the setpoint of a zone or group of zones by a certain pre-set number of degrees (boost) for a pre-set amount of time (boost time). When time has expired, the setpoints automatically return to their previous values. This feature is commonly used to heat tips to ensure that the plastic at the gates is molten before restarting the machine cycling. This setting does not set the boost temperature (see **Boost** button in Section 5). It only sets the maximum setting for the boost temperature. Default boost limit is 50F (28C). Range is 0-932F (0-500C).

Zone Maximum Amps Selection: This button will cause the table in Figure 14b to be displayed. This setting can be used for current limiting zones to 15A that normally pull 15-30A. For example, a zone that would normally pull 23A would be limited to a maximum of 15A.
For zones that pull less than 15A, this setting still has an application. No current limiting occurs on zones under 15A, but the heater short alarm will be initiated whenever the current exceeds this setting. For example, if a zone normally pulls 3A, the Maximum Current setting might be set to 4A. If the zone current exceeds 4A, the zone's heater short alarm will initiate and the heater bakeout procedure will occur for that zone as long as this condition exists.
Output Attenuation can be used as a load limiter in the sense that it limits the highest percentage output that a zone can deliver. For example, if the Output Attenuation setting for a zone is left at 100% (default setting), there will be no effect on the output. A setting of 80% would cause the zone to provide 80% of whatever the controller would normally provide. For example, if the controller calculates that the output should be 60%, an output attenuation setting of 80 would cause the output to be 48% (80% of 60) instead of 60%.
It is possible to change a zone's output from the normal phase angle fired output to a time proportioning format using this screen.
The G24 balances the zones outputs across three phases. Approximately 1/3 of the zones are on each phase. The phase of each zone's output is displayed on the bottom of the table. Use the increase and decrease buttons on the lower left portion of the screen to see the other zones.

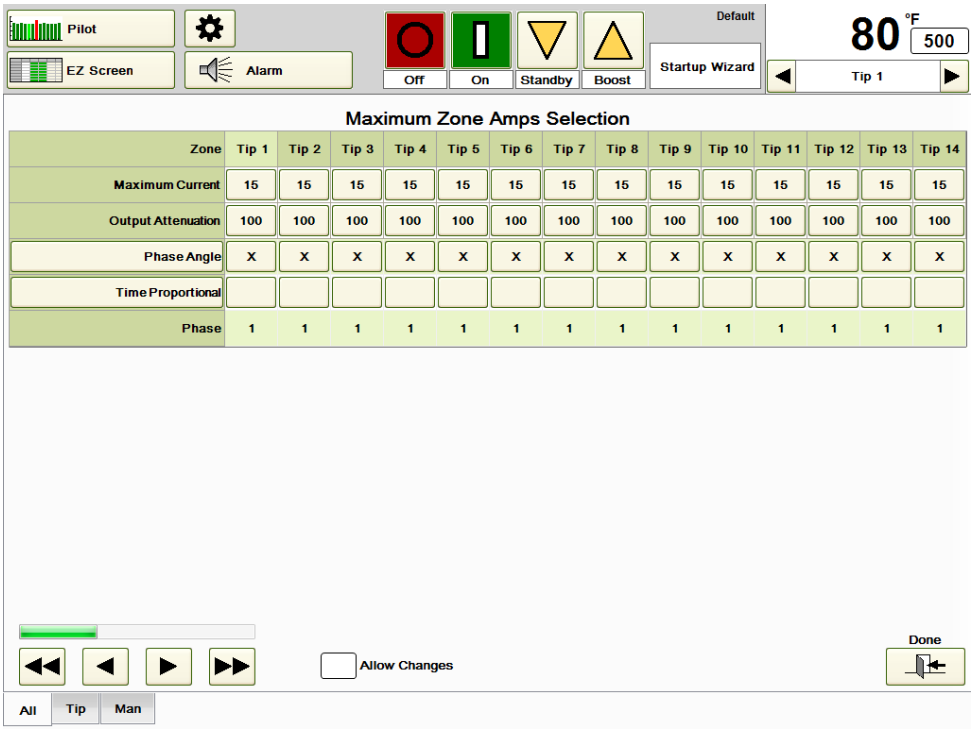


Figure 14b Maximum Zone Amps Selection

All zone's settings can be set on the Setpoint Table. The Data Table can be used for changing a zone's on/off, auto/manual and locked/unlocked status.

For more description of the Setpoint and Data Tables, see Section 7.

15
Mold

The Mold screen shown in Figure 15a includes settings that are particular to a mold. Sequences for warming up and cooling down the mold are set up here. Group setup, input/output manipulation and mold mappings are also done here.

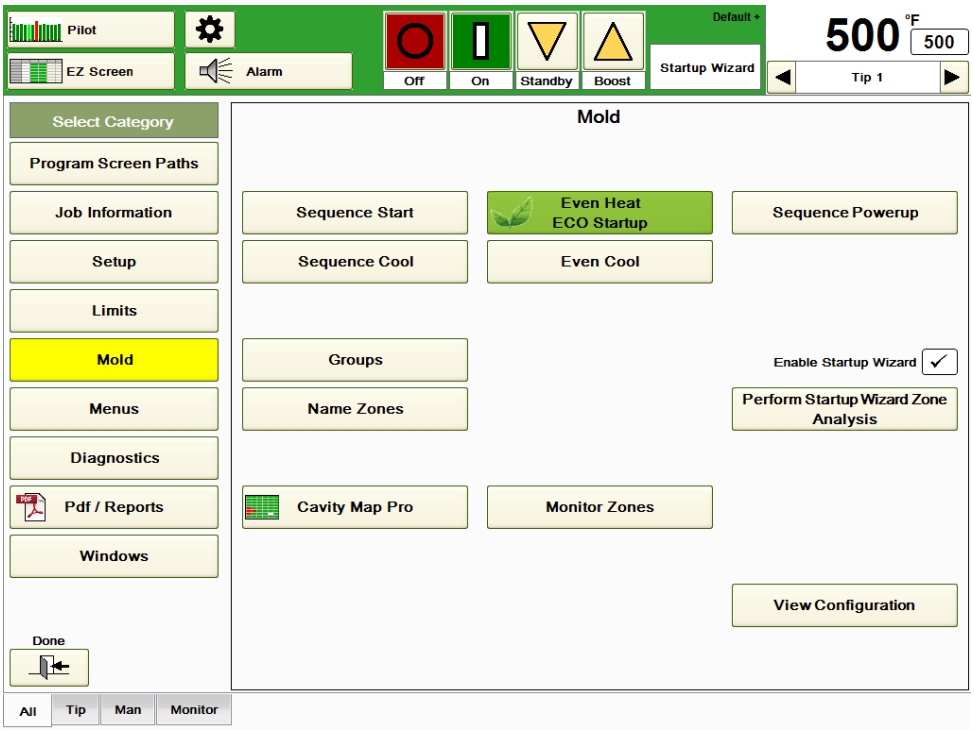


Figure 15a Mold

Sequence Start: This feature is used to start up different groups of zones in stages. For example, it is often desired to turn on the sprue and manifold zones for awhile before turning on the tip zones. It is also common to have the manifold and sprue zones "soak" at setpoint for a short time before finally turning on the lower mass tip zones which typically rise quickly to setpoint. This method is effective in maintaining the integrity of the manifold seal by controlling heat expansion. This approach can also eliminate material degradation that occurs when plastic in the tip zones is heated too long while waiting for the slower manifolds to heat up.

In Figure 15b, the Man/Spr group is programmed to turn on first. Once the temperatures are within 20F of setpoint (because the **Wait for Zones to Get Within Deviation of the Setpoint box** is checked), the delay timer (set at 15 minutes in the example shown) will start. Then the All group (using the Tip group would have had the same effect) will turn on. Press the **Start Sequence Start** button to commence with the sequencing. If it is desired to use Sequence Start every time zones are turned on, select **Must Use Sequence Start to Turn Zones On.**

Up to four groups of zones can be staged before the remaining zones turn on.

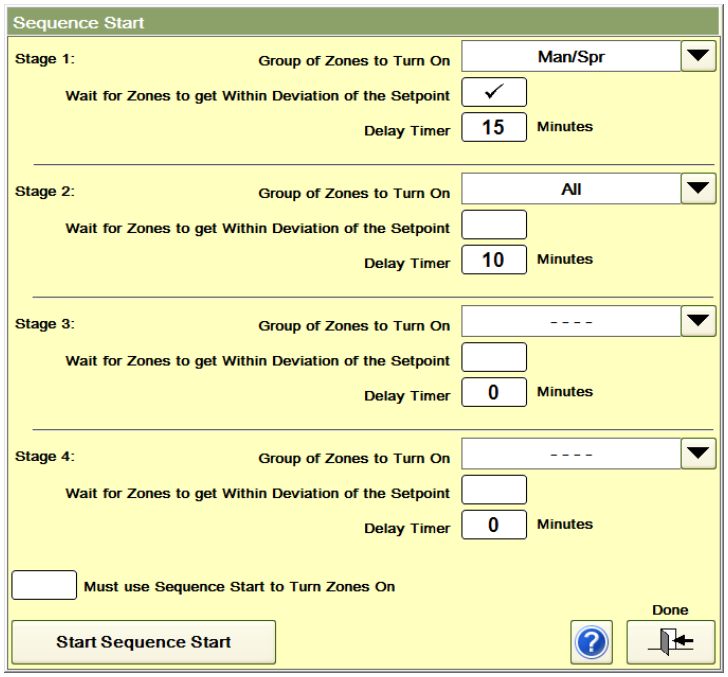


Figure 15b Sequence Start

Sequence Cool: This feature is used to turn off different groups of zones in stages. In Figure 15c, the Tip group is programmed to be turned off and to drop below 300F for 10 minutes before everything else is turned off. Press the **Start Sequence Cool** to commence with the sequencing. If it is desired that Sequence Cool is used every time that zones are turned off select **Must use Sequence Cool to Turn Zones Off**.

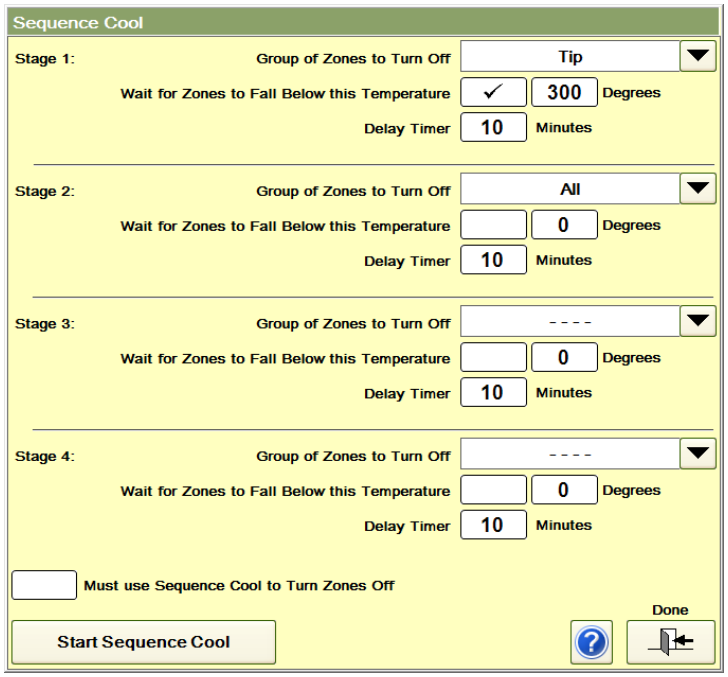


Figure 15c Sequence Cool

Even Heat: This feature is used to heat all zones up at the same rate (within 20F of each other) to setpoint. In Figure 15d, the All group is selected.

Figure 15d Even Heat

Even Cool: This feature is used to keep all temperatures within 20F as they fall until they reach the set temperature (200F in Figure 15e). Press the **Start Even Cool** button to commence cooling. The zones can be returned to their normal setpoint by pressing the **Return to Setpoint** button. If it is desired that Even Cool be used every time zones are turned off, select **Must use Even Cool to Turn Zones Off**.

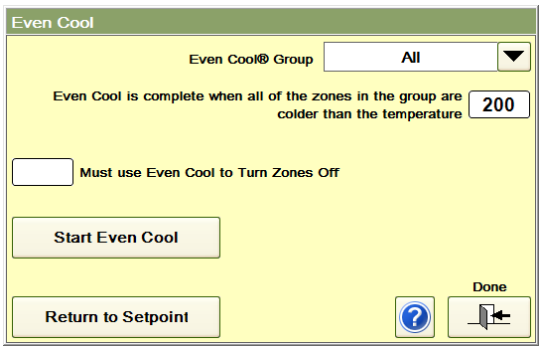


Figure 15e Even Cool

Sequenced Powerup: This feature is used to start up the tool in stages using different menus for different lengths of time. In Figure 15f, four different menus were used to stage the startup. Menu D1145a is used for 10 minutes and then menu D1145b is used for 10 minutes. Menu D1145c then runs for 10 minutes before the final menu D1145 settings are used. Press the **Start Sequence Powerup** button to commence the startup sequence. If it is desired to use Sequenced Power Up every time zones are turned on, select **Must use Sequenced Powerup to Turn Zones On**.

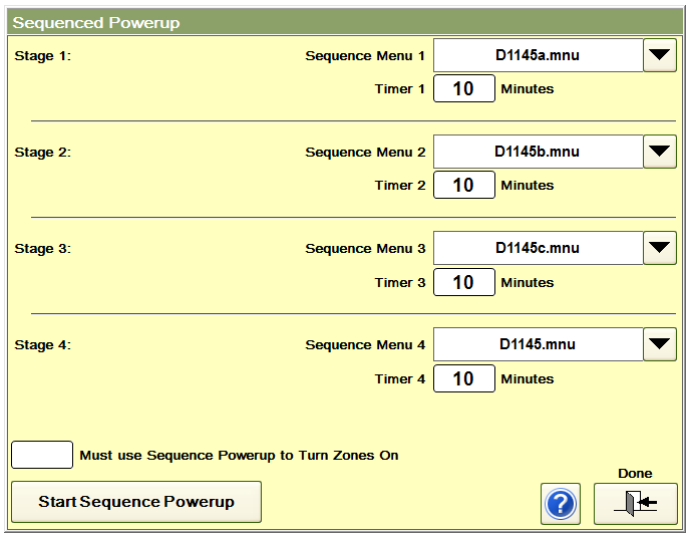


Figure 15f Sequenced Powerup

Groups: Pressing the Group button in Figure 15a causes the Minicontroller screen to appear. Adding or modifying existing groups is the same as described in the Minicontroller section in Section 7. In Figure 15g, the group Tips 6-20 is formed by:

a) Pressing the **Start New Group** button
b) Sliding a finger from Tip 6 through Tip 20
c) Pressing Make Group
d) Entering the name Tips 6-20 in the popup box that appears.
e) Press the Create Group in the same popup box.

Press the **Modify Group** button if the user wants to move a group tab or delete a group tab. The All group can also be created here which will include all zones. In Figure 15h, the Tips 6-20 tab was moved by selecting the Tips 6-20 tab and pressing **Move Selected Group Left** three times. Press **Save Changes** to keep the modifications or **Exit Without Saving Changes** button.

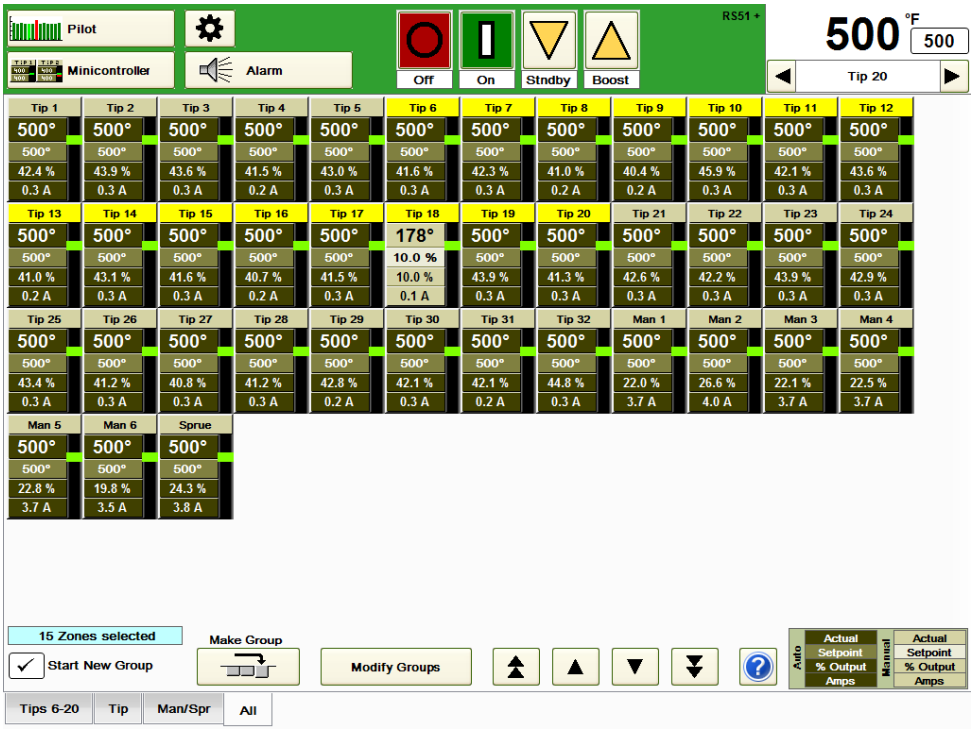


Figure 15g Adding a Group

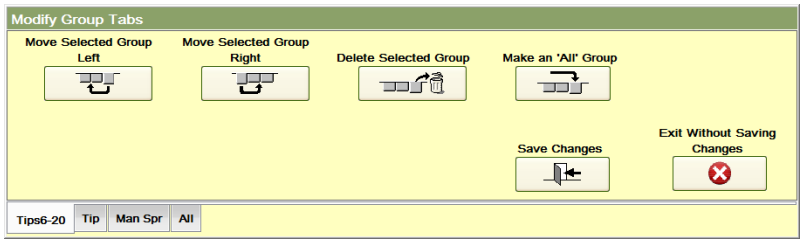


Figure 15h Modify Group Tabs

Name Zones: The names of the zones can be edited by pressing the Edit Names tab which accesses the screen shown in Figure 15i.

To change the names of the zones:

1) In the lower left, select the range of zones that are to be renamed (Zones 1-32 for Figure 15i).
2) Press the Select Zone ID button to select from the various popular label names such as Tip, Man, Drop, etc. If the desired label is not shown in the dropdown box, a new label can be created using the **New Zone ID** entry on the right and typing in the new label name. Choose the label desired (Drop in Figure 15i for Zones 1-32).
3) Select the **Start Numbering With** box. Enter the number for the first zone that is being changed. For example, if Drop is chosen and the first tip zone is to be called Drop 1, enter a "1". Normally this will be set to 1.
4) Press the **Set Zones Name** button to make the changes. In the example shown in Figure 15i, pressing the Set Zones Name button would cause the name of Zones 1-32 to change from Tip 1-32 to Drop 1-32. Press the **Reverse Range** and **Set Zone Name** buttons to reverse the order of the zone names (this would change the name of Drop 1 to Drop 32). The changes are not official until the **Save** button is pressed and the **Accept Changes** button is pressed on the View Configuration screen.

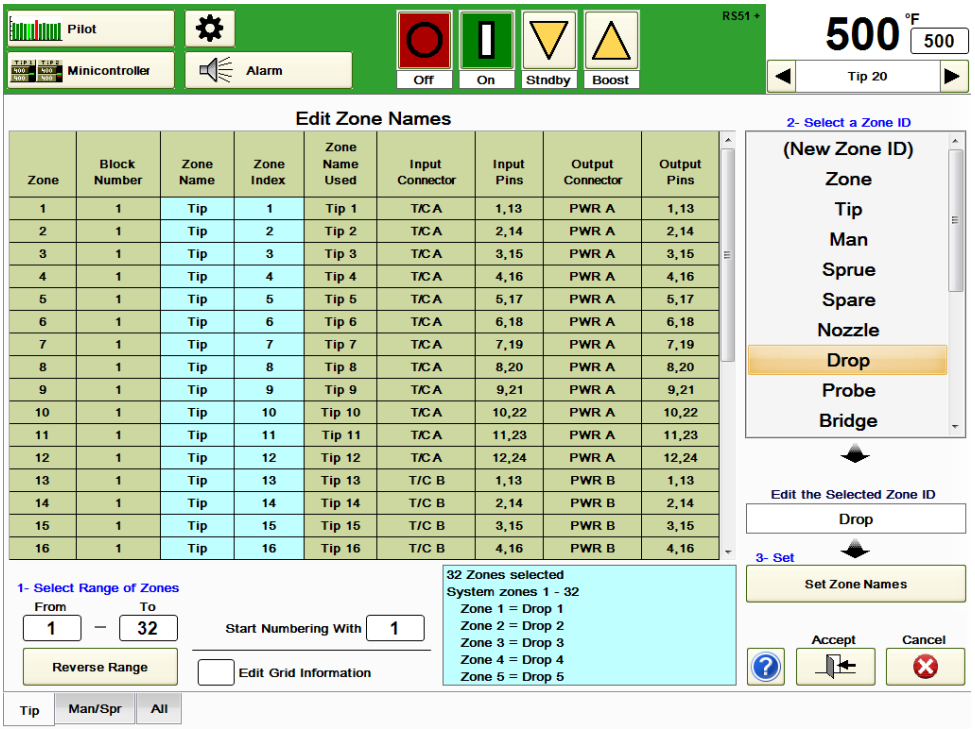


Figure 15i Name Zones (Edit Zone Names)

Remove ID from List: Unneeded labels can be removed from the Select Zone ID dropdown box by selecting the label and pressing this button.

Edit Grid Information: If this box is selected, individual zones can be renamed using the popup keyboard.

Enable Startup Wizard: This box in Figure 15a determines whether the Startup Wizard appears when the G24 Controller powers up. If the box is checked the screen will power up to the screen shown and described in Section 4. If it is not checked, then the controller will power up to the screen that was in use when the controller last powered down (e.g. Pilot Screen or EZ Screen).

Perform Startup Wizard Zone Analysis: If the **Enable Startup Wizard** box is checked, pressing this button will call up the Startup Wizard as shown and described in Section 4. If the **Enable Startup Wizard** box is unchecked, pressing this button will call up the screen shown in Figure 15j. This is a scaled down or "express" version of the Startup Wizard that can be used to do the following tasks:

a) Identify the zones in the mold
b) Name the zones
c) Arrange the zones under group tabs

Tip/Manifold Zone Identification Threshold: This is the amperage setting that is the dividing point between Tips and Mans. It can be changed. If, for example, the operator knows that the sprue zone pulls 3A while the Tips zones pull 1.1A, it would be advantageous to change the threshold setting to 2A. This would cause the Sprue zone to be grouped with the Man zones which is normally the best approach.

Zone Typed to Use for Tips: If a label other than Tips is preferred such as Nozzles or Drops, the label can be selected from this dropdown box in Figure 15j.

Note: Only run this procedure while not making parts and the tool cooled down. This procedure is accomplished by the controller turning on the zones for a short period of time.

By measuring the amperage of the zone at 100% output, the zones will be automatically labeled in the following manner:

a) Tips - Zones with less than 3A (or other selected threshold amperage).
b) Mans - Zones detected with current above 3A (or other selected threshold amperage).
c) Spares - Zones that have no thermocouple readings. Their outputs will be locked off.
d) Monitor - Zones that have thermocouple readings, but no output. Their outputs will be locked off.

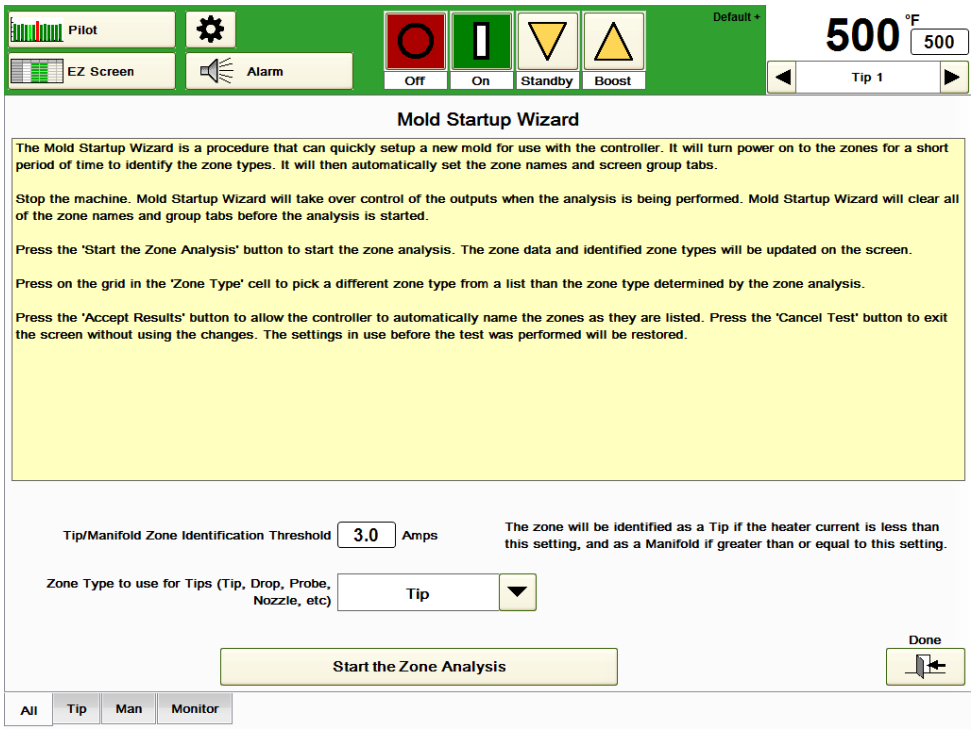


Figure 15j Mold Startup Wizard (express)

Start the Zone Analysis: Pressing the button causes the screen shown in Figure 15k to appear. Press the Start the Zone Analysis button in Figure 15K to start the analysis.

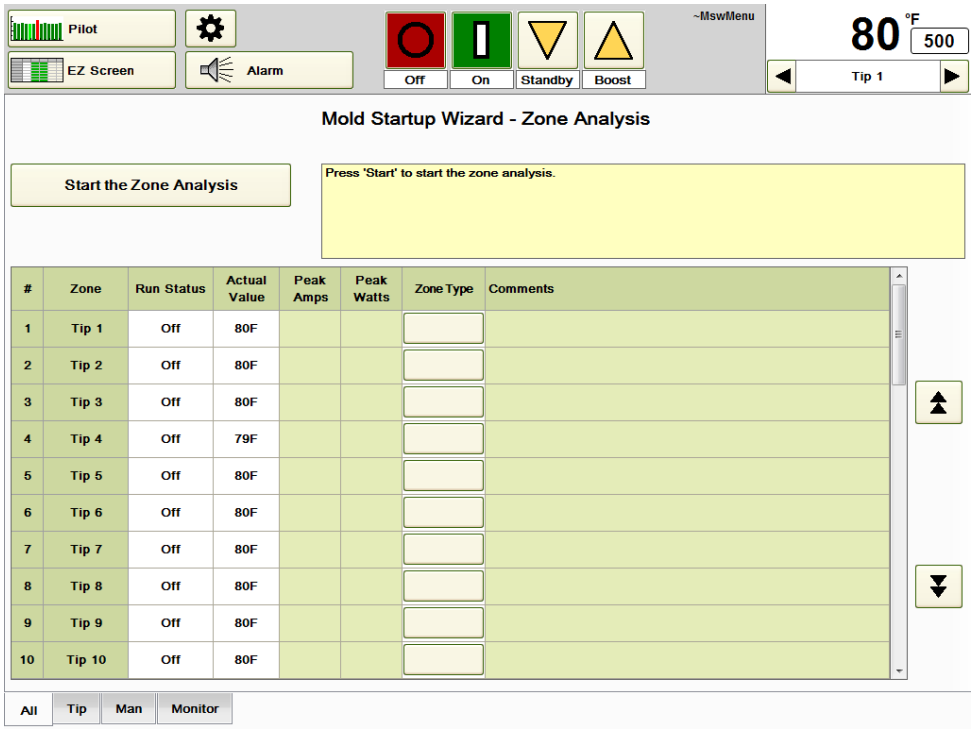


Figure 15k Start the Zone Analysis

The controller will apply power to the zones, measure the Peak Amps, Peak Watts and determine the Zone Type. The operator can overwrite any of the determined Zone Types by simply pressing the Zone Type box in Figure 15l and selecting a different label from the available choices.

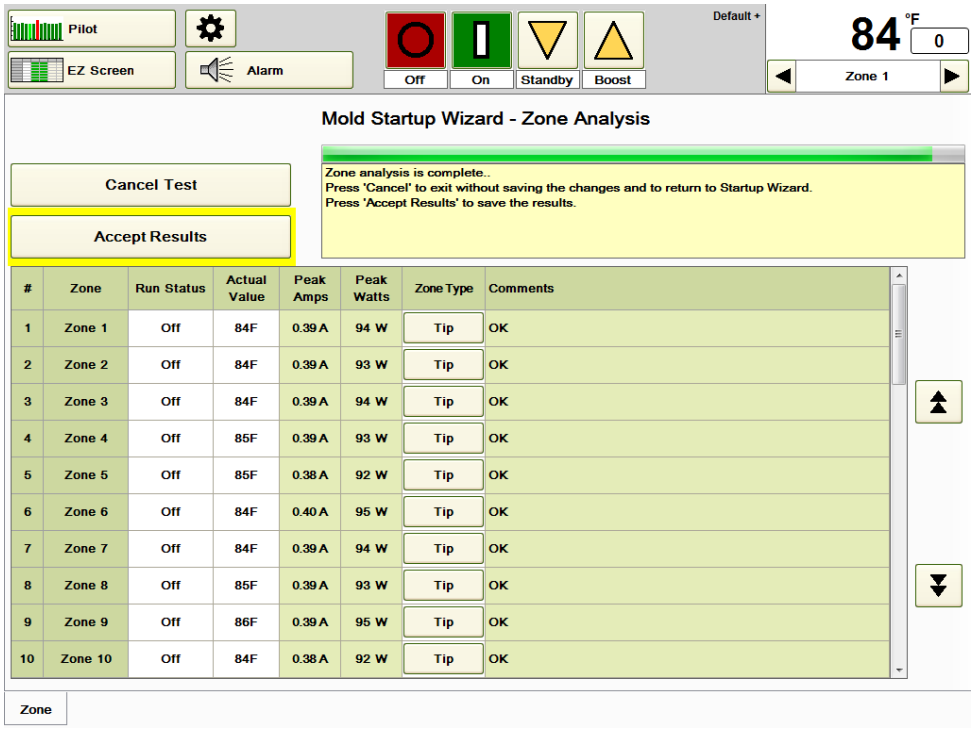
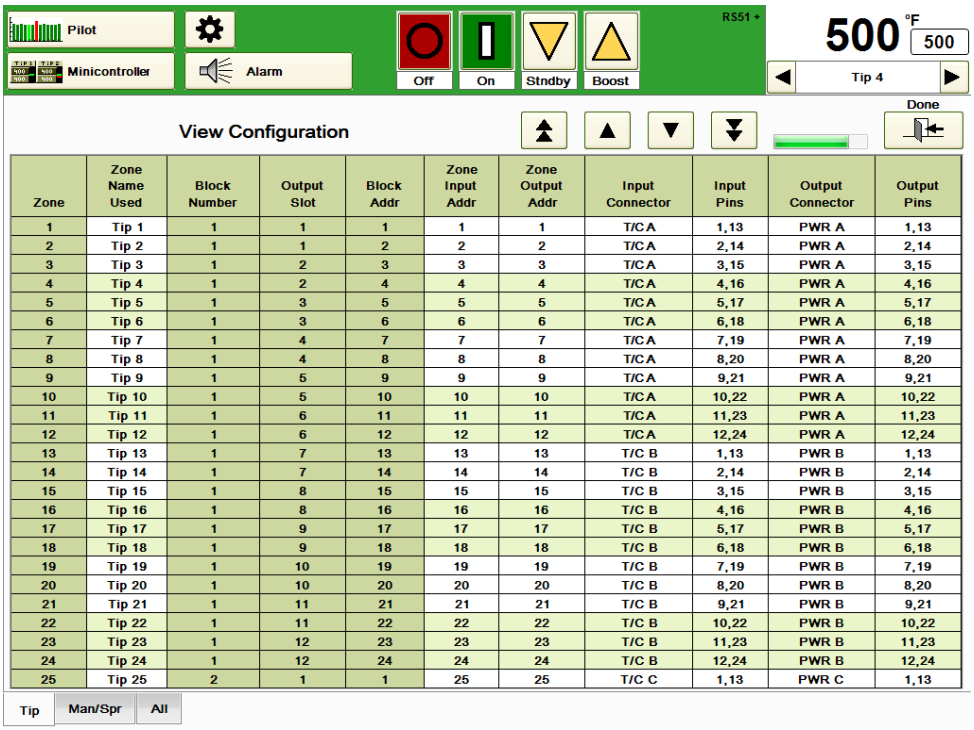


Figure 15l Start the Zone Analysis (Results)

Once the Zone Type labels are determined to be correct, press the **Accept Results** button in Figure 15l. The labels will be put into effect and the appropriate group tabs will appear at the bottom of the screen.

View Configuration: Press this button to view the configuration information. The information shown is for the group selected using the group tab at the bottom of the screen (Tip in Figure 15m). Nothing can be affected or changed on this screen. The screen shows the name, location and wiring information associated with each zone.



Zone	Zone Name Used	Block Number	Output Slot	Block Addr	Zone Input Addr	Zone Output Addr	Input Connector	Input Pins	Output Connector	Output Pins
1	Tip 1	1	1	1	1	1	T/C A	1,13	PWR A	1,13
2	Tip 2	1	1	2	2	2	T/C A	2,14	PWR A	2,14
3	Tip 3	1	2	3	3	3	T/C A	3,15	PWR A	3,15
4	Tip 4	1	2	4	4	4	T/C A	4,16	PWR A	4,16
5	Tip 5	1	3	5	5	5	T/C A	5,17	PWR A	5,17
6	Tip 6	1	3	6	6	6	T/C A	6,18	PWR A	6,18
7	Tip 7	1	4	7	7	7	T/C A	7,19	PWR A	7,19
8	Tip 8	1	4	8	8	8	T/C A	8,20	PWR A	8,20
9	Tip 9	1	5	9	9	9	T/C A	9,21	PWR A	9,21
10	Tip 10	1	5	10	10	10	T/C A	10,22	PWR A	10,22
11	Tip 11	1	6	11	11	11	T/C A	11,23	PWR A	11,23
12	Tip 12	1	6	12	12	12	T/C A	12,24	PWR A	12,24
13	Tip 13	1	7	13	13	13	T/C B	1,13	PWR B	1,13
14	Tip 14	1	7	14	14	14	T/C B	2,14	PWR B	2,14
15	Tip 15	1	8	15	15	15	T/C B	3,15	PWR B	3,15
16	Tip 16	1	8	16	16	16	T/C B	4,16	PWR B	4,16
17	Tip 17	1	9	17	17	17	T/C B	5,17	PWR B	5,17
18	Tip 18	1	9	18	18	18	T/C B	6,18	PWR B	6,18
19	Tip 19	1	10	19	19	19	T/C B	7,19	PWR B	7,19
20	Tip 20	1	10	20	20	20	T/C B	8,20	PWR B	8,20
21	Tip 21	1	11	21	21	21	T/C B	9,21	PWR B	9,21
22	Tip 22	1	11	22	22	22	T/C B	10,22	PWR B	10,22
23	Tip 23	1	12	23	23	23	T/C B	11,23	PWR B	11,23
24	Tip 24	1	12	24	24	24	T/C B	12,24	PWR B	12,24
25	Tip 25	2	1	1	25	25	T/C C	1,13	PWR C	1,13

Figure 15m View Configuration

Cavity Map Pro™: See Section 16.

16
Cavity Map Pro™

Cavity Map Pro™ is used to represent how the cavities are arranged on a tool. This can be quite valuable when an operator wants to see the zone numbers as they are arranged in the tool.

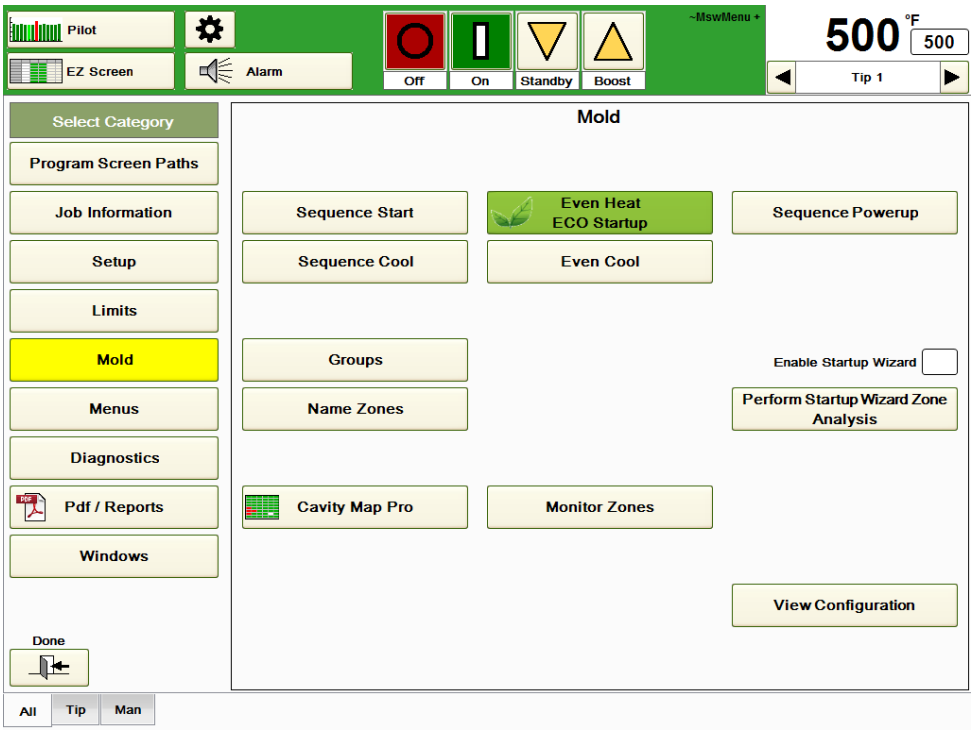


Figure 16a Mold

Cavity Map Pro: Press this button to access the Cavity Map screen shown in Figure 16b. Before the Cavity Map Pro screen can be viewed, it needs to be set up as shown in Figure 16c.

Figure 16b Cavity Map Pro™

To set up Cavity Map Pro™ for a typical rectangular configuration of tips:

1) Press the **Setup** button shown in Figure 16b. The screen shown in Figure 16c will appear. The words "Top" and "Operator Side" are used to help orient the user.
2) Press the **Select Mold Type** button and select **Single Face** or **Stack Mold**. Press **Done**. In the example, **Single Face** will be used.
3) With the **Allow Changes** button checked, enter the number of nozzles per row and how many rows are in the tool. The example shows 32 tips with eight rows of four nozzles each.
4) Make sure the circular red arrows button at the bottom center of the screen shows **Movable Side**. If it says **Stationary Side** press the button to toggle it to **Movable Side**.
5) Enter the lowest number zone in the **First Zone of the Pattern** box. This is normally Tip 1 as shown in the example.
6) Select the pair of parallel arrows that match the tool. The red square shows in which corner of the map the first zone will appear on the map. The red square's arrow shows whether the zones will go right, left, up or down from that corner. The white square indicates where the lowest number zone of the next row or column will go. The white square's arrow indicates whether the zones will move the same or the opposite direction of the first zones. The rest of the rows and columns will repeat the pattern of the first two rows.
7) If desired, touch the circular red arrows button on the bottom center of the screen to toggle the zones layout between the **Movable Side** and the **Stationary Side**. In effect, the zones are flipped in a left to right fashion.
8) To undo the map layout and return to the default setup, press **Remove all Cavity Map Pro™ Assignments** before pressing **Done**.
9) The map can be saved as part of the menu if desired (Section 18).

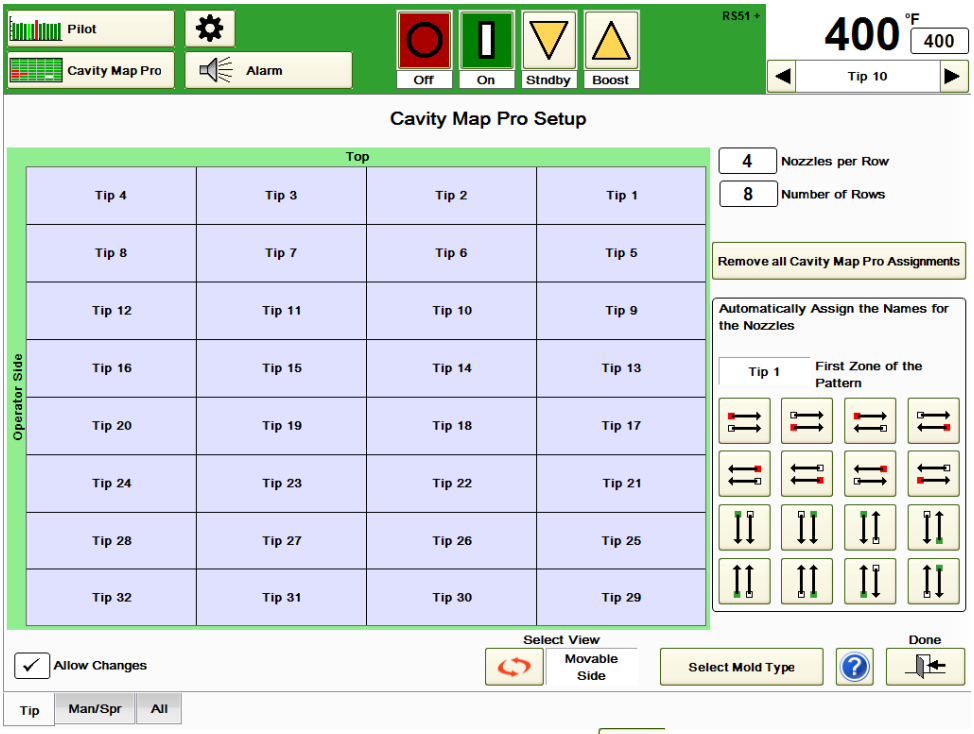


Figure 16c Cavity Map Pro™ Setup (pattern selected)

To set up Cavity Map Pro™ for a tool that does not have a rectangular configuration (such as the tool shown in Figure 16d):

1) Press the **Setup** button shown in Figure 16b. The words "Movable Side" and "Stationary Side" are used to help orient the user.
2) Press the **Select Mold Type** button and select **Single Face** or **Stack Mold**. Press **Done**. In the example, **Stack Mold** will be used. When Stack Mold is selected, Face A and Face B appear as choices on the bottom of the screen.
3) With the Allow Changes button checked, press a square on the screen. Select the Zone name that goes there from the popup table. To clear a square, press the blank button in the top left hand corner of the popup box.
4) If desired, touch the circular red arrows button on the bottom center of the screen to toggle the zones layout between the **Movable Side** and the **Stationary Side**. In effect, the zones are flipped in a left to right fashion.
5) To undo the map layout and return to the default setup, press **Remove all Cavity Map Pro™ Assignments** before pressing **Done**.
6) The map can be saved as part of the menu if desired (Section 18).

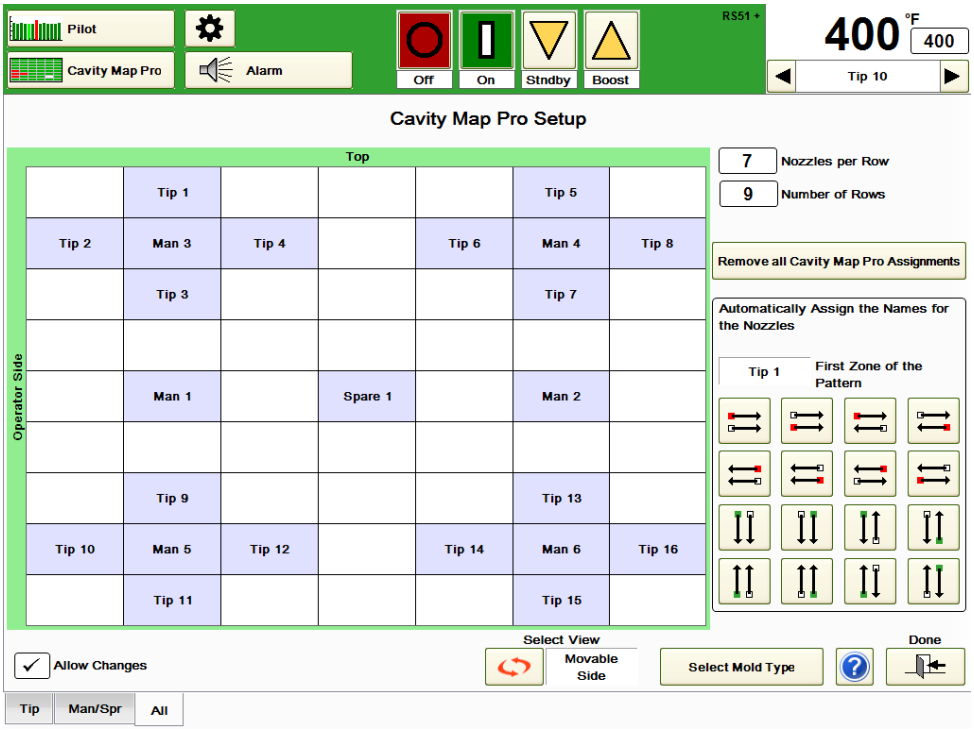


Figure 16c Cavity Map Pro™ (non-rectangular pattern)

Now, the user can access the Cavity Map Pro™ by selecting Cavity Map Pro™ on the Menu screen shown in Figure 16a. The Cavity Map Pro™ screen will appear similar to the one shown in Figure 16d (using the map set up in Figure 16b).

Figure 16d Cavity Map Pro™

The user can choose any two variables to display on the map using the **First Selection** and **Second Selection** dropdown arrow boxes. The choices include None, Actual Temperature, Deviation, Percent Output, Heater Current, Heater Voltage, Heater Wattage, Heater Resistance, Temperature Setpoint and Manual % Output Setpoint. In Figure 16d, Actual Temperature and Percent Output are used. Zones that are off will have a gray background. Zones that are locked off will have a gray background with a lock symbol displayed (Tip 12 in Figure 16d). Zones in alarm will have a red background. Zones that are turned on and that are not in alarm will have a green background.
Zones can be selected one at a time to change a setting or multiple zones can be selected simply by pressing the zones on the screen. Selected zones will have a yellow border such as the eight zones shown in Figure 16d. Tips 3, 4, 7, 8, 11, 12, 15 and 16 were selected by touching Tip 4 and dragging to Tip 15. Then Tips 5 and 26 were selected individually. Now any function such as turning zones Off, On, setpoints changed or auto/manual status changed can be performed on this highlighted group. If the Setpoint is pressed the screen shown in Figure 16e will appear. In addition to the normal choices, **Send SP to the Highlighted Zones** will appear.

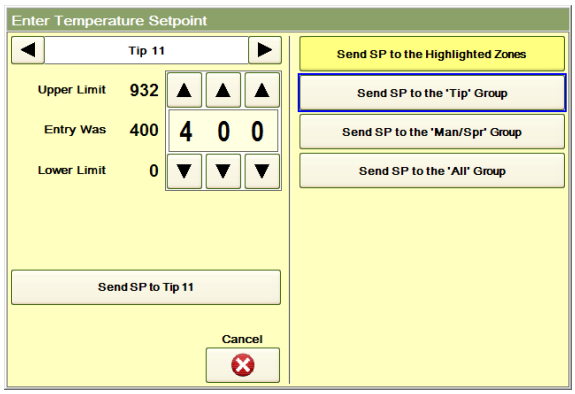


Figure 16e Highlighted Zones Functions (Setpoint Change)

17
Flow Monitor Inputs (Analog Inputs)

The G24 Controller can accept analog input signals. These inputs are typically used for water flow functions, though they can be used with any 4-20ma or 0-10 VDC linear input. The G24 can handle up to 32 flow monitor inputs (16 pairs – typically 1 flow and 1 temperature signal per pair). There are 16 inputs (8 pairs) on each flow monitor input module. Each pair of inputs shares a common connection on the flow monitor input module.
A typical flow monitor screen graph is shown in Figure 17a.

4-20mA Inputs
Signals from 4-20 mA transmitters are converted to 2-10VDC with a Gammaflux-supplied precision 500-ohm resistor on the input connector. For Input #1, the resistor should be mounted across pins 1 and 3. For Input #2, the resistor should be mounted across pins 2 and 3. Gammaflux's part number for this resistor is RZZ-0006 (Vendor part numbers are Riedon SM10-500RB and Vishay MR705 0R500B).

A typical flow monitor screen graph is shown in Figure 17a.

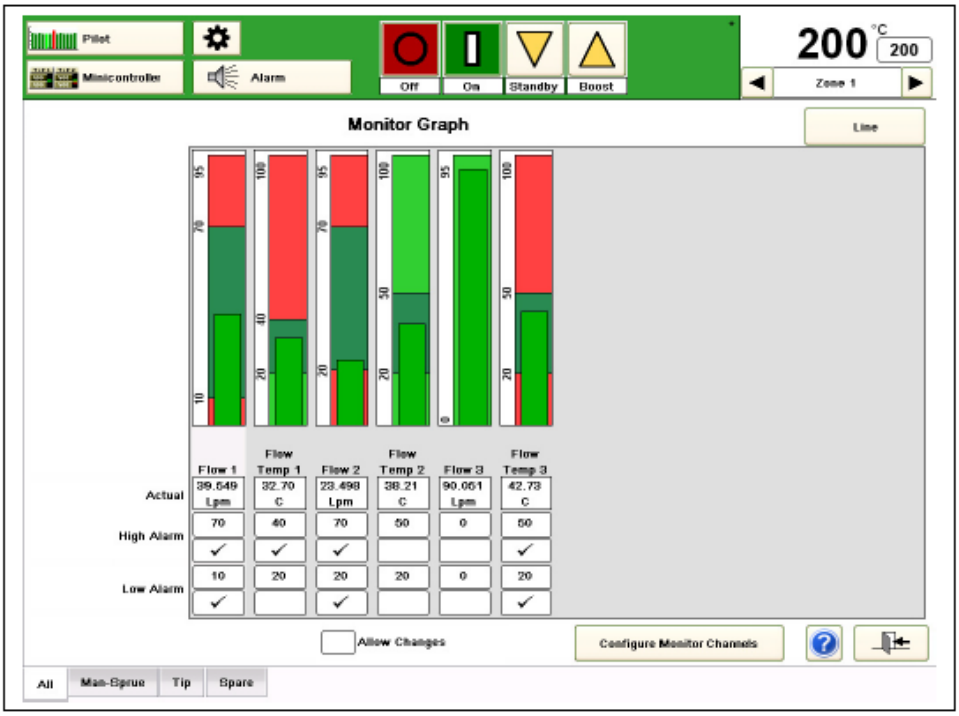


Figure 17a Flow Monitor Graph

Configuration of Flow Monitor Inputs

To initially configure the water flow inputs, select the **Monitor Waterflow** from the **Mold** screen shown in Figure 17b.

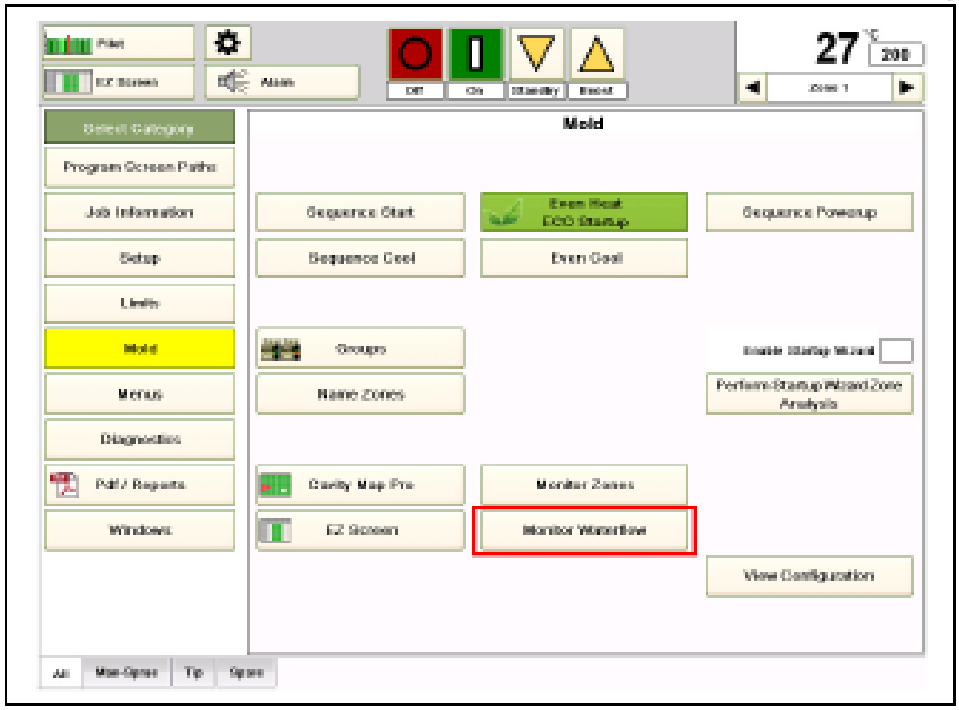


Figure 17b Mold Screen

Then press, Configure Monitor Channels on the Monitor Graph Screen shown in Figure 17c.

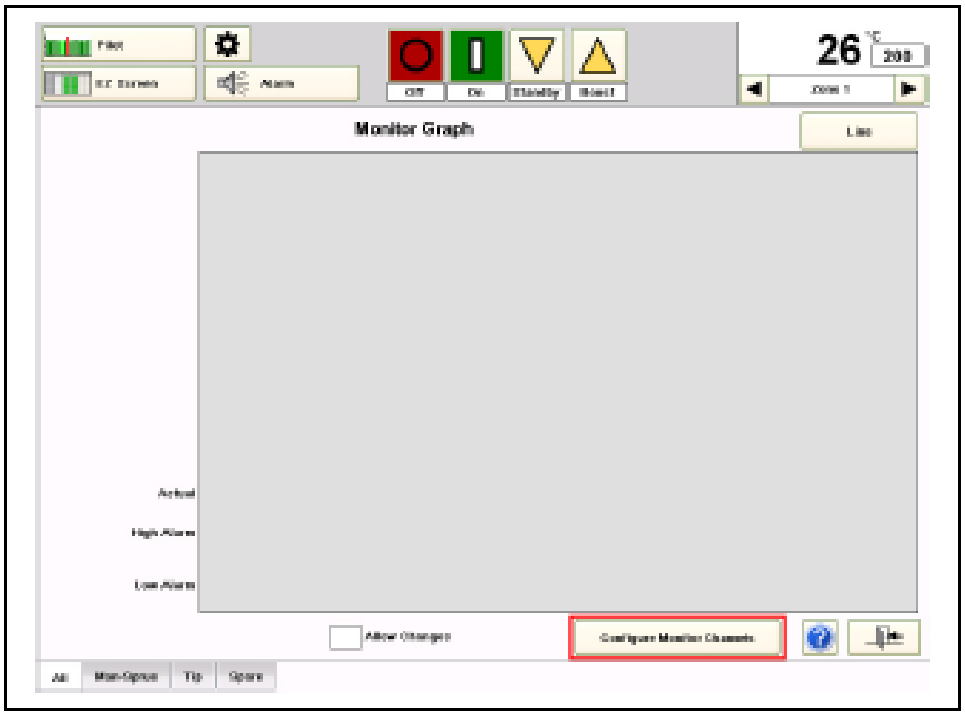


Figure 17c Monitor Graph Screen

The **Configure Monitor Channels** screen will appear as shown in Figure 17d. To configure an input channel, select **Yes** in the appropriate block in the **Channel Used** column. Enter the desired **Channel Name** in the next column and the **Sensor Output Type** in the following column as shown in Figure 17e. Select '**4-20 mA (2-10v)**' for the selection of **Sensor Output Type** when setting up the 4-20 mA input channel using a 500 ohm resistor on the Configure Monitor Channel screen.

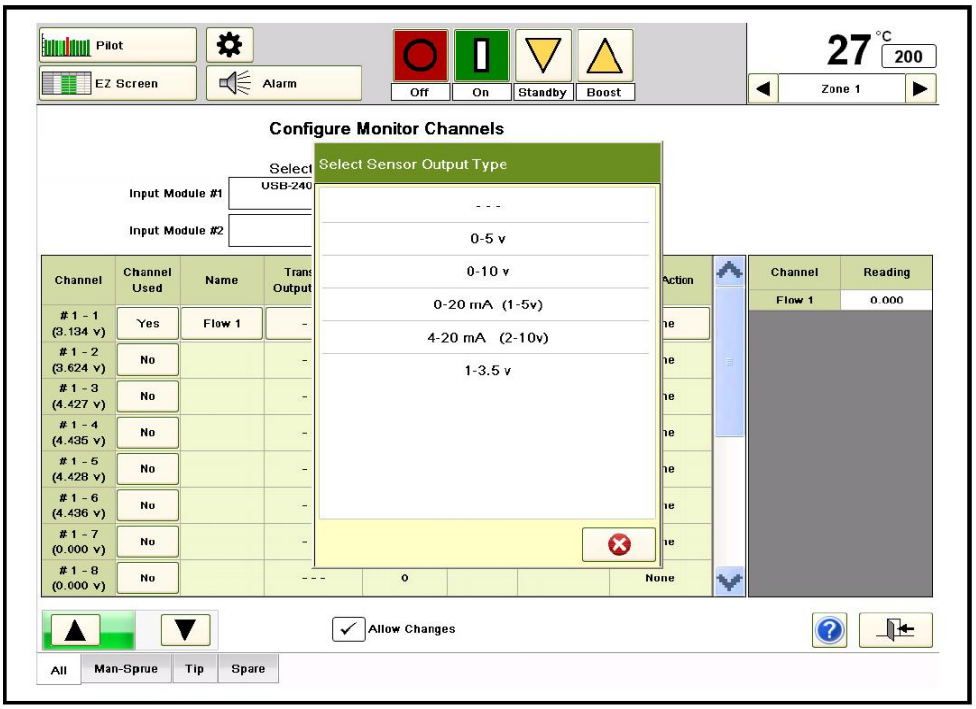


Figure 17d Configure Monitor Channels

Press **Transmitter Reading @ Maximum** to enter the maximum reading of the sensor. Then Select **Units** to select the units of measure as shown in Figure 17e.

Flow monitor configuration is not saved with specific menus. They work on all the menus until the configuration is changed.

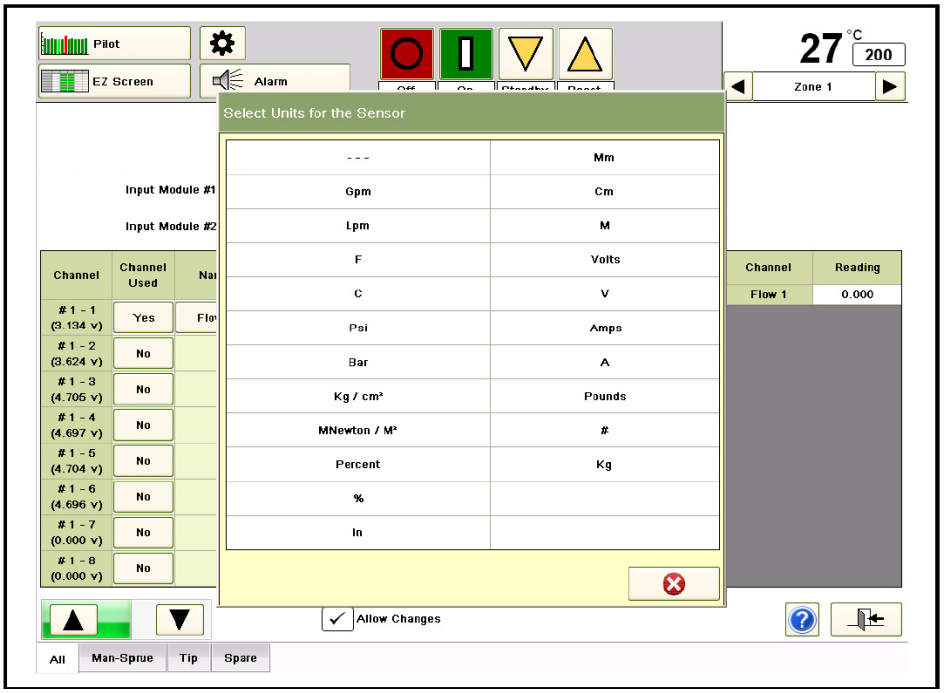


Figure 17e Sensor Units

Next, press **Alarm Action** and select the action to be taken when an alarm is detected for that channel.
Figure 17f shows how the screen should look if 3 dual channel meters (each flow meter provides a flow signal and a water temperature signal) were configured. The Input Module #1 data shown indicates that these flow meters' signals are wired to the first Input Module. To see additional channel inputs on Input Modules #1, press the decrease button on the lower left of the screen.
The **Alarm Action** column indicates that if any of the "flow" signals go into alarm that the G24 will drop the OK to Run signal that may be wired to the machine. This would normally be used by the machine program to prevent injection from occurring when the water is off or not flowing at an acceptable rate. The flow meters' temperature alarms are set up in this example to activate the G24 alarm. The actual readings for the sensors are shown on the right side of the screen.

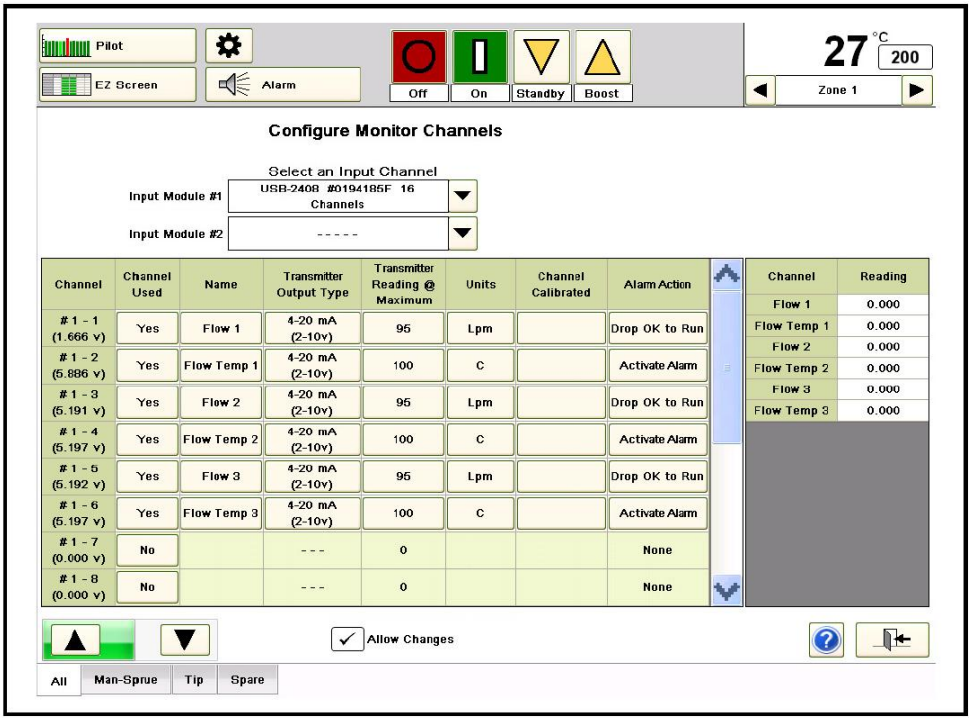


Figure 17f Configure Monitor Channels

Calibration of Input Channels

The input channels need to be calibrated to match the sensors. There are two methods of calibration. If the sensor can be manually driven to its low and high calibration points, the **2 Point Calibration** method is preferred. If the sensor cannot be driven to its high and low calibration points, then the sensor should be placed at a known reference point and calibrated using the **1 Point Calibration** method.

Use the Configure Monitor Channels to select the 1 or 2 Point Calibration method as shown in Figure 17g.

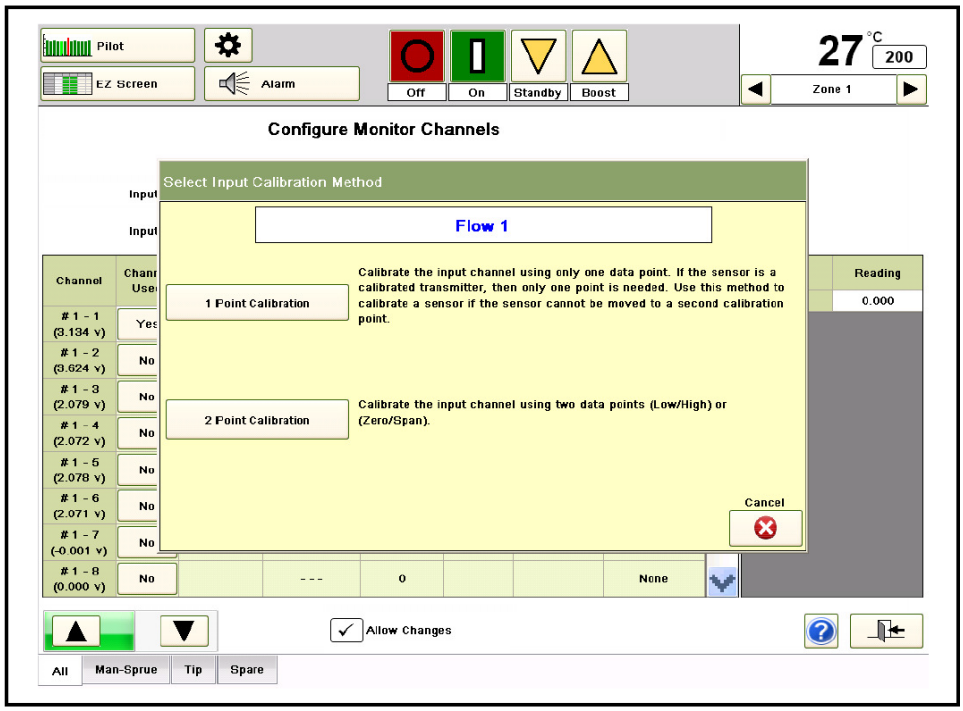


Figure 17g Input Calibration Method

2 Point Calibration

If 2 Point Calibration is chosen, the screen in Figure 17h appears.

1) Drive the sensor to the Low Calibration Point.
2) Press **Sensor Reading At Low Calibration Point** and enter the actual reading in the box.
3) Press **At Low Calibration Point**. The **Input Voltage** indicator will show the signal value and the **Sensor Reading** will show the corresponding value.
4) Drive the sensor to the High Calibration Point.
5) Press **Sensor At High Calibration Point** and enter the actual reading in the box.
6) Press **At High Calibration Point**. The **Input Voltage** indicator will show the signal value and the **Sensor Reading** will show the corresponding value.
7) Press **Accept Calibrate** to accept the results or **Cancel** to exit without saving the calibration.

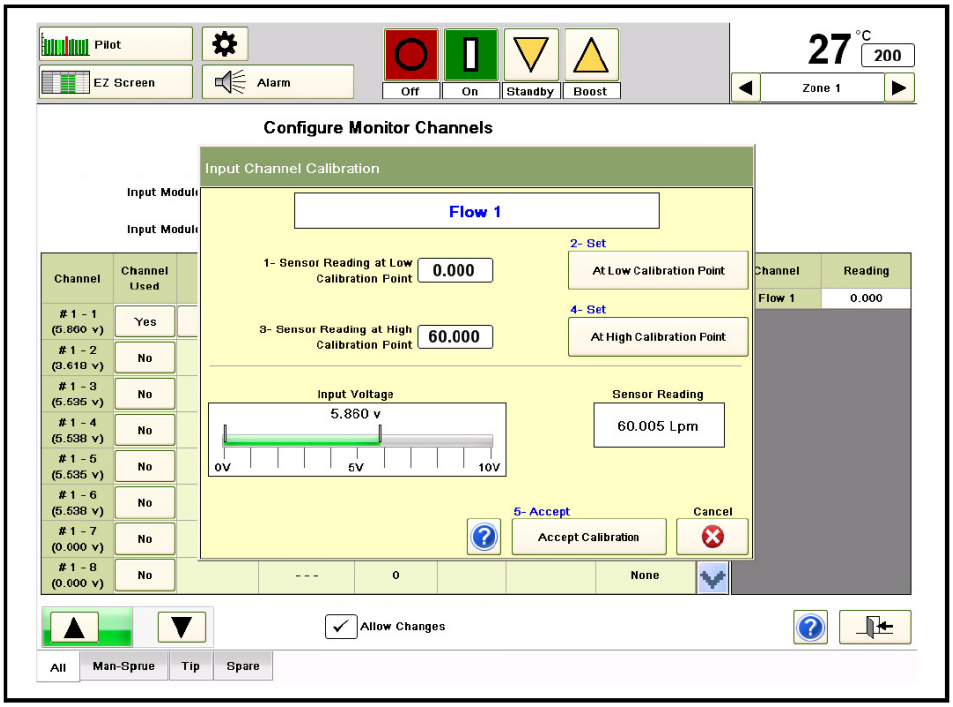


Figure 17h 2 Point Calibration

1 Point Calibration

If 1 Point Calibration is chosen, the screen in Figure 17i appears. In this example, a water meter with a 4-20mA output is being used to indicate the water temperature (0-100C).

1) Press **Sensor Reading At Minimum** and enter the reading for the low point in the box (0C in this example).
3) Press **Sensor Reading at Maximum** and enter the reading for the high point of the transmitter range (100C in this example).
4) Press **Transmitter Output at Minimum** and enter the signal for the low point (4mA in this example).
5) Press **Transmitter Output at Maximum** and enter the signal for signal for the high point (20mA in this example).
6) Press **Sensor Reading at Calibration Point** and enter the actual sensor reading (30C in this example).
7) Press **At Calibration** Point to perform the calibration. The **Input Voltage** indicator will show the signal value and the **Sensor Reading** will show the corresponding value.
8) Press **Accept Calibrate** to accept the results or **Cancel** to exit without saving the calibration.

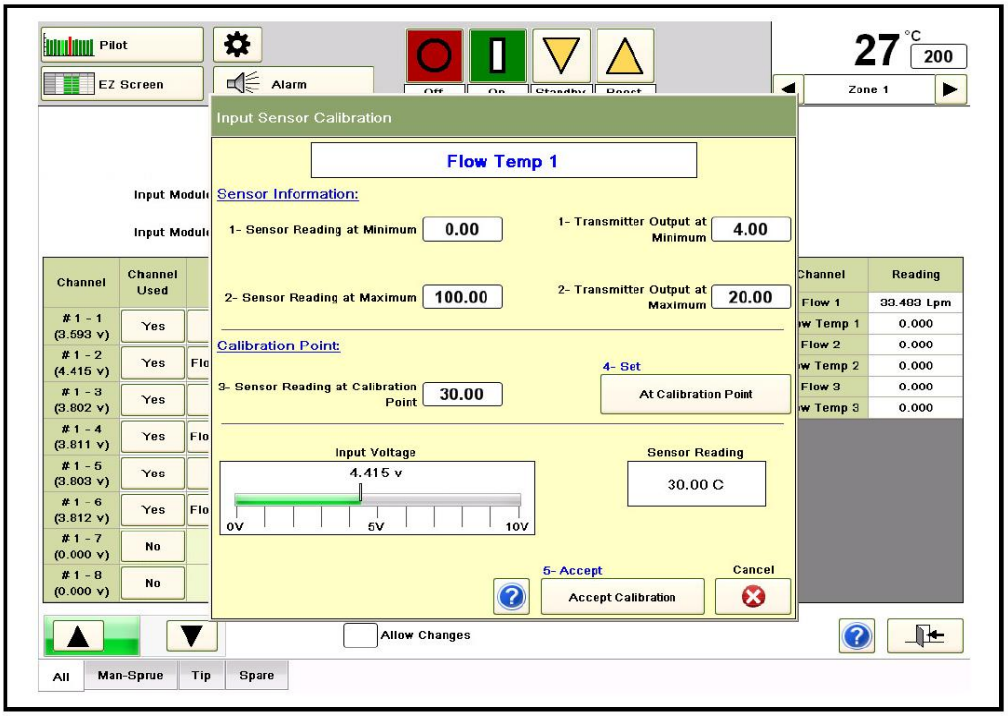


Figure 17i 1 Point Calibration

Pilot Graph Screen

One of the two ways to view flow monitor inputs is the Pilot Graph screen (Line Graph screen is the other) as shown in Figure 17j. The other is the Line Graph screen shown in the next section. Up to 12 channels can be shown at a time. If more than 12 channels are used, navigation buttons appear for accessing the other channels. The screen can be used to view the values (flow and temperature in Figure 17j) with respect to the alarm limits. The actual value bar for each input will be shown in green if it is not in the alarm range. It will be shown in red if it is in the alarm range. The alarm settings can be entered at the bottom of the screen. The alarm will not change condition until the reading has been in the alarm condition or the non-alarm condition for 5 seconds.

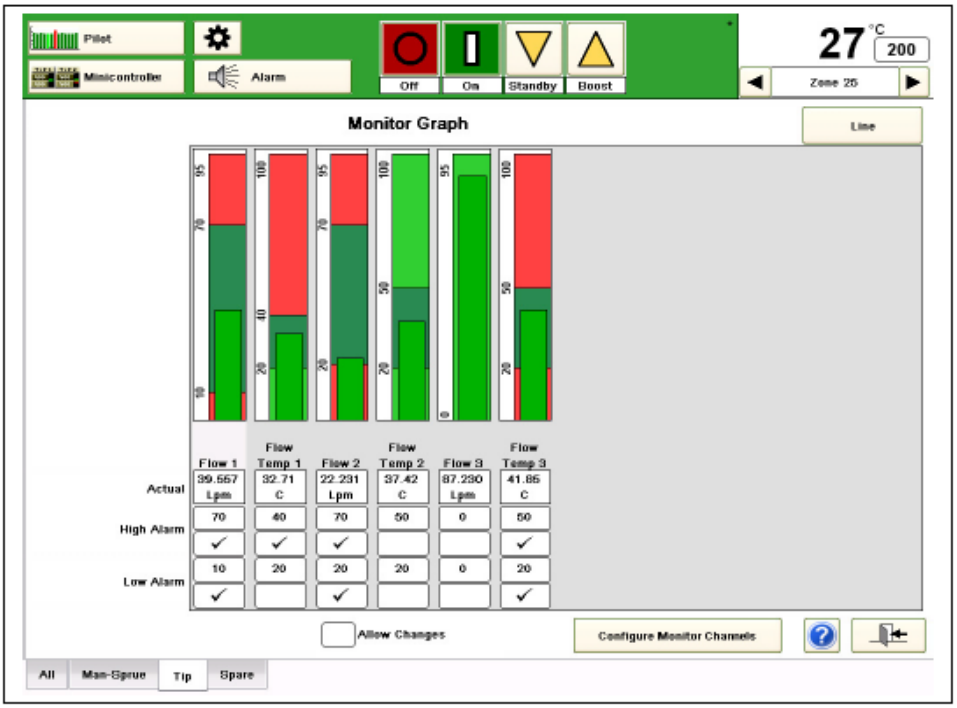


Figure 17j Pilot Screen (Monitor Graph)

Line Graph Screen

The Line Graph screen displays data one channel at a time as shown in Figure 17k. Press Channel in the upper left side of the screen to select which channel is to be viewed. Press Graph Time Scale to select the time frame for the graph shown. If an alarm is in the alarm condition, it will be highlighted in red on the right side of the screen in the Channel Readings area. Graph Settings can be used to select the scale for the graph.

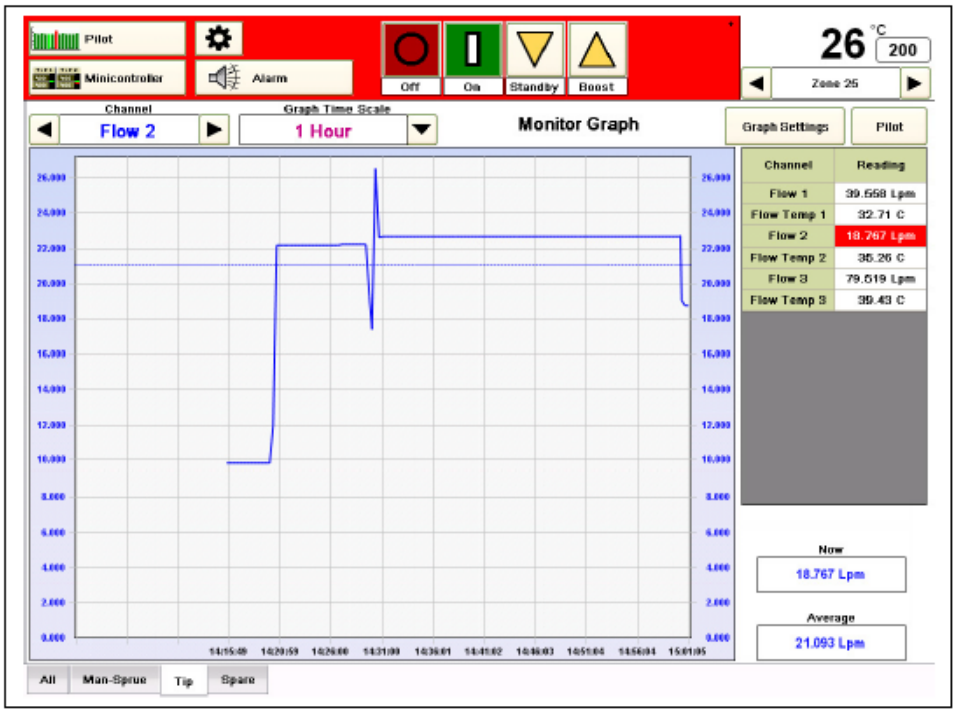


Figure 17k Bar Graph (Monitor Graph)

<u>Alarm Screen</u>

Whenever a channel is in alarm it will show up in the System Alarms and Status as described in Section 8. If the alarm is set up to affect the OK to Run contact, it will be listed in the Status of the OK to Run section of the alarm screen.

18
Menus

A menu is a file that contains a collection of zone setpoints, group settings and graph settings for all groups. Menus may be thought of as recipes for certain tools or applications. A menu includes every setting available. A user may want to set up different menus for different tools, different days (August-1.mnu), tool tests or specific part runoffs. Tool graphics are also associated with Menus. Menus should be saved once the setpoints and information have been entered on the G24 screens for a specific tool. The G24 will save each menu for future use. When the Menu button is pressed, the screen in Figure 18a appears. An Operator, Supervisor or Engineer security level is required.

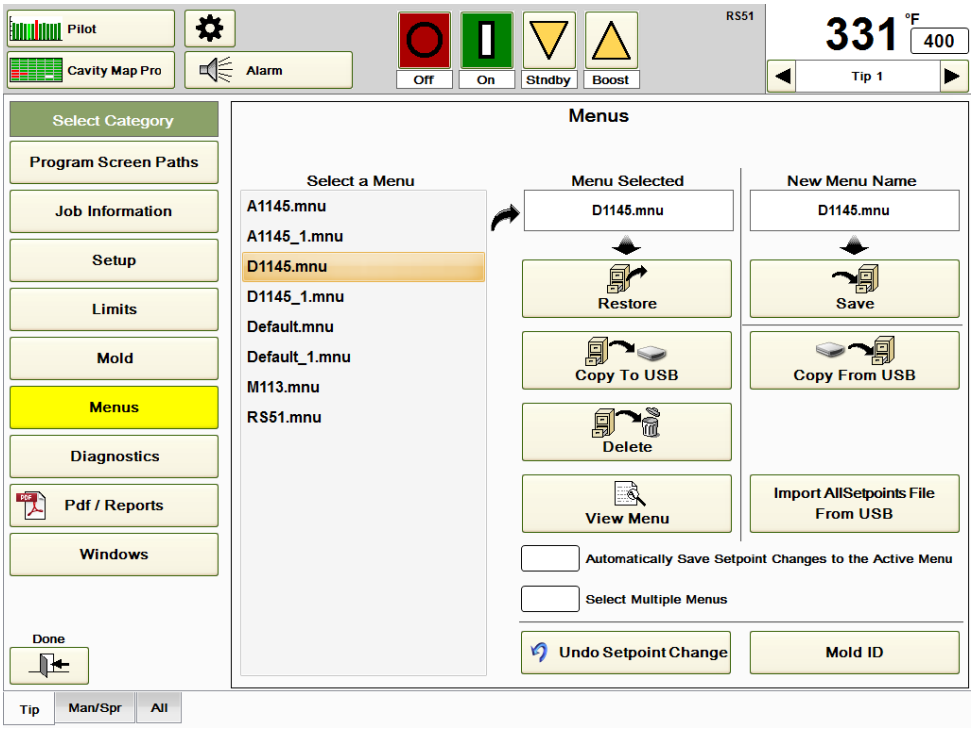


Figure 18a Menus

The menu name that is in effect is always shown in the upper right corner of the screen just left of the Setpoint box (RS51 in Figure 18a). A "+" sign next to the menu name is displayed whenever a setpoint has been changed since the menu was last saved. If it is desirable to automatically save setpoint changes in the menu, select **Automatically Save Setpoint Changes to the Active Menu**.

All existing menus are shown in the **Select a Menu** area. To select a menu, simply select it from the list.

The name of the selected menu will appear in the **Menu Selected** area. All menus are stored in the D:\G24\Menus directory. Menus are Microsoft Access 9.0 compatible.

Menus can also be automatically selected using the Mold ID feature if the unit is equipped with this option (Section 29).

Note that there are two menus shown in Figure 18a that include the word "Default". The **Default.mnu** is the current collection of all setpoints and settings being used by the G24. Every time a setpoint or setting is changed, a new Default.mnu menu is automatically created

by the G24. Anytime the unit is turned on, the Default.mnu settings are in effect until the user selects a different menu. The previous menu is then automatically saved and named **Default_1.mnu**. Anytime a menu is saved with an existing menu name, the previous (older) menu will have a "_1" added to the menu name, just as the previous Default.mnu was renamed Default_1.mnu.

Pressing the **Restore** button will cause the menu file displayed in the **Menu Selected** area to be used by the G24. A message asking "Are you sure…?" will appear where the user can select "OK" or "Cancel".

Software rewiring information can be part of a menu. When a menu is restored that includes software rewiring information, a message appears asking the operator if the swapped thermocouple information is to be loaded with the menu.

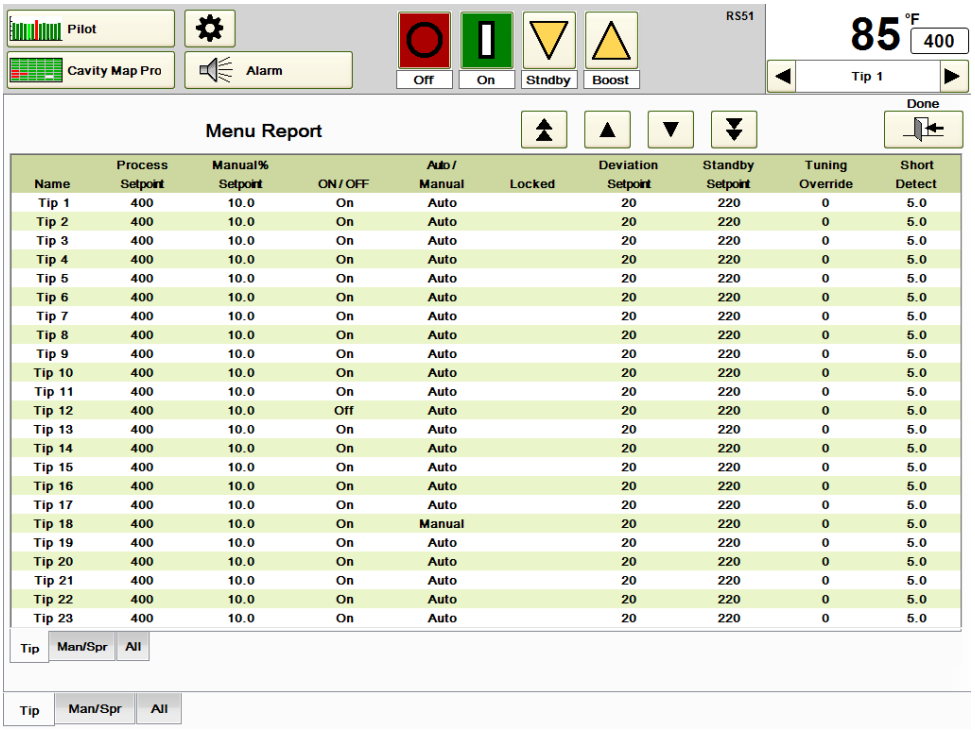
The user can copy any menu from the G24 to the on-board USB memory drive located on the back of the screen. Simply select the menu name from the Select a Menu area, make sure a USB stick is in the USB memory drive and press **Copy to USB**. The G24 will compress the file before transferring the file to the USB stick.

A menu can also be loaded from a USB stick. When the **Copy from USB** button is pressed, a screen will appear listing the valid menu files that are contained on the USB stick. The user then can select which file to copy. When the **Enter** button is pressed, the menu will be copied to the hard drive of the G24 and it will appear in the Select a Menu list.

To delete a menu from the G24 Menus directory, simply select the menu name from the Select a Menu area and press **Delete**. A message asking "Are you sure…?" will appear where the user can select "OK" or "Cancel".

The **View Menu** button gives the user the opportunity to view the settings of the menu before loading the menu. Pressing the **View Menu** button will display the Menu Report which includes information such as date of creation and any notes the creator recorded. Press **View Menu** on the Menu Report screen to see the settings for the selected menu as shown in Figure 18b.

Import the Setpoints.txt file from USB: Press this button to transfer setpoints to the G24 from a USB drive. These setpoints will override what is currently in use in the G24. The AllSetpoints.txt includes the temperature setpoint, manual percent setpoint, manual / automatic mode status and On / Off status. As an addition, temperature deviation alarm settings can be included. See Setup Network Access in Section 27 Windows for more details.



Name	Process Setpoint	Manual% Setpoint	ON / OFF	Auto / Manual	Locked	Deviation Setpoint	Standby Setpoint	Tuning Override	Short Detect
Tip 1	400	10.0	On	Auto		20	220	0	5.0
Tip 2	400	10.0	On	Auto		20	220	0	5.0
Tip 3	400	10.0	On	Auto		20	220	0	5.0
Tip 4	400	10.0	On	Auto		20	220	0	5.0
Tip 5	400	10.0	On	Auto		20	220	0	5.0
Tip 6	400	10.0	On	Auto		20	220	0	5.0
Tip 7	400	10.0	On	Auto		20	220	0	5.0
Tip 8	400	10.0	On	Auto		20	220	0	5.0
Tip 9	400	10.0	On	Auto		20	220	0	5.0
Tip 10	400	10.0	On	Auto		20	220	0	5.0
Tip 11	400	10.0	On	Auto		20	220	0	5.0
Tip 12	400	10.0	Off	Auto		20	220	0	5.0
Tip 13	400	10.0	On	Auto		20	220	0	5.0
Tip 14	400	10.0	On	Auto		20	220	0	5.0
Tip 15	400	10.0	On	Auto		20	220	0	5.0
Tip 16	400	10.0	On	Auto		20	220	0	5.0
Tip 17	400	10.0	On	Auto		20	220	0	5.0
Tip 18	400	10.0	On	Manual		20	220	0	5.0
Tip 19	400	10.0	On	Auto		20	220	0	5.0
Tip 20	400	10.0	On	Auto		20	220	0	5.0
Tip 21	400	10.0	On	Auto		20	220	0	5.0
Tip 22	400	10.0	On	Auto		20	220	0	5.0
Tip 23	400	10.0	On	Auto		20	220	0	5.0

Figure 18b View Menu (Menu Report)

To create a new menu:

1) Press the blank area under **New Menu Name** in Figure 18a.
2) In the **Change To:** area, enter a name using the alphanumeric keypad that appears. All saved menus are automatically given an mnu extension. For example, if the operator enters Menu1 as the name for a new menu, the G24 will name it Menu1.mnu. If the user enters a name that is already used, an error message will state that the menu name already exists. Enter the name again to write over the pre-existing menu.
3) Press the **Save** button. The new menu will contain all setpoints and settings that are in use at the time the new menu name is created. The new menu name will appear in the Select a Menu list.

Mold ID: See Section 29.

19
Diagnostics

The Diagnostics screen is divided into two sections – Mold Diagnostics and Controller Diagnostics. A Supervisor or Engineer security level is required to access this screen.

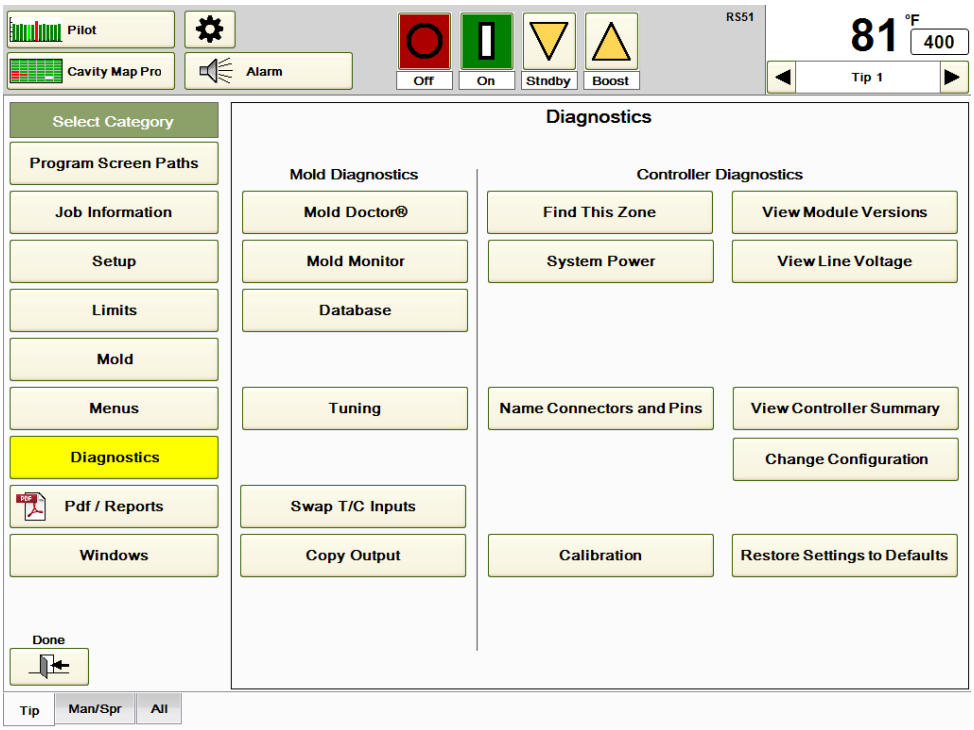


Figure 19a Diagnostics

Mold Doctor®: This is an off – line tool for diagnosing thermocouple, heater and wiring problems as well as tool inefficiencies. An Engineer security level is required. See Section 20 Mold Doctor®.

Mold Monitor: This is a set of three features that can be used to activate an alarm when normal wattage levels change, activate an alarm when a heater resistance value has changed and to drop the temperature setpoints to Standby to minimize material degradation when an external input signal to the G24 controller indicates that the machine has stopped cycling. See Section 21 Mold Monitor.

Databases: The G24 can record all process data in database form. See Section 22 Databases.

Tuning: This button is used to gain access to and change the tuning of one or more zones. See Section 23 Tuning.

Change Configuration: This is where the factory setup information was entered. It can be changed in the field if necessary. See Section 24 Configuration.

Calibration: This is an off - line tool that enables thermocouple calibration at the user's convenience. See Section 25 Calibration.

Swap T/C Inputs: Press this button shown in Figure 19a to see the screen shown in Figure 19b. This screen can be used to change the assignment of thermocouples to zones. It is most

commonly used when it is discovered that two or more thermocouples are wired incorrectly in the tool. Instead of taking the time to open the tool and correct the problem, it may be desirable to temporarily change the thermocouple assignment in software. In Figure 19b, the example shows how to swap thermocouples on Tips 7 and 8 using the following procedure:

1) Select one of the two zones that are to be swapped (Tip 7 in Figure 19b).
2) Select the other zone that is to be swapped (Tip 8 in Figure 19b).
3) Press **Swap Inputs** to make the change. The results of the swap can be seen by pressing the **Display Assignments** button.
4) The swap can be undone by pressing **Remove the Swap Input Wiring for this Zone**.
5) Press **Remove All T/C Swap Input Wiring** to return all wiring to its original state.
6) Press **Done** to accept all changes or **Cancel** to nullify all changes made while this screen was open.

Software rewiring information can be saved to the menu (Section 18). When a menu is restored that includes software rewiring information, a message appears asking the operator if the swap information is to be loaded with the menu.

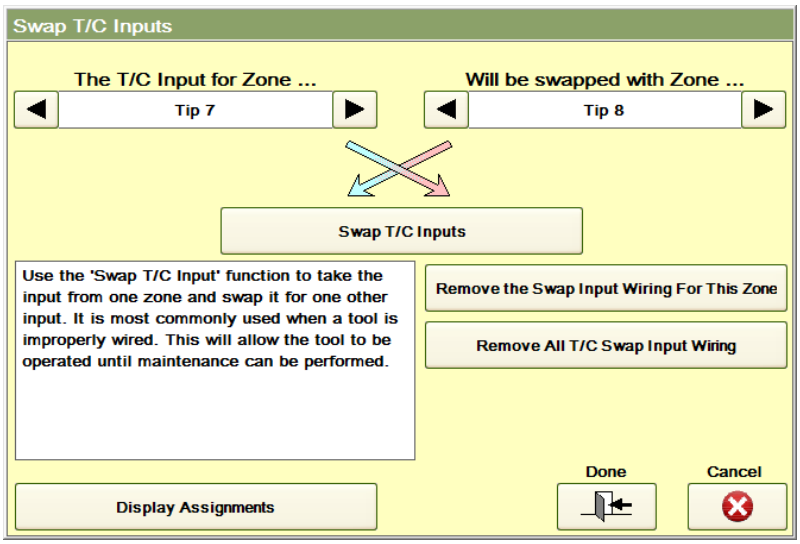


Figure 19b Swap Inputs

Copy Output: Press this button to display the screen shown in Figure 19c. This feature is most commonly used when a thermocouple has been lost or if no thermocouple exists. The output percentage of any zone can be used on additional zones. In the example shown in Figure 13j, the output percentage of Zone 10 can also be used for Zone 14 using the following procedure:

1) Select the zone whose output is to be copied (Tip 10 in Figure 19c).
2) Select the zone the output percentage is to be copied to (Tip 14 in Figure 19c).
3) The results can be seen by pressing the **Display Assignments** button.
4) The swap can be undone by pressing **Remove the Copy Output Wiring for this Zone**.
5) Press **Remove All Copy Output Wiring** to return all wiring to its original state.
6) Press **Done** to accept all changes or **Cancel** to nullify all changes made while this screen was open.

The Copy Output information can be saved to the menu (Section 18).

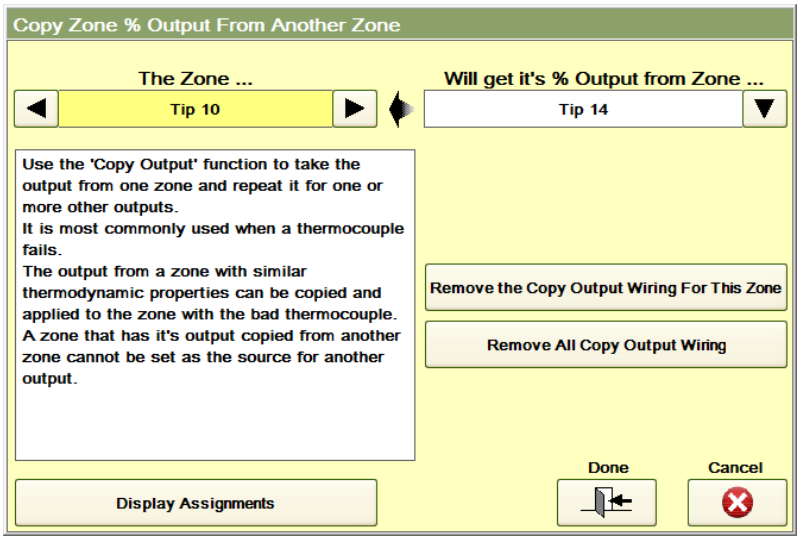


Figure 19c Copy Zone % Output

Find This Zone: This can be used to help the user quickly locate the hardware associated with the zone selected in the Zone area of the screen (upper right corner). When the **Find This Zone** button is touched, the screen shown in Figure 19d appears. Block location, slot location, fuse location, power connector pin numbers, thermocouple connector pin numbers and thermocouple input location that are associated with the selected zone (Tip 6 in Figure 19d) are displayed.

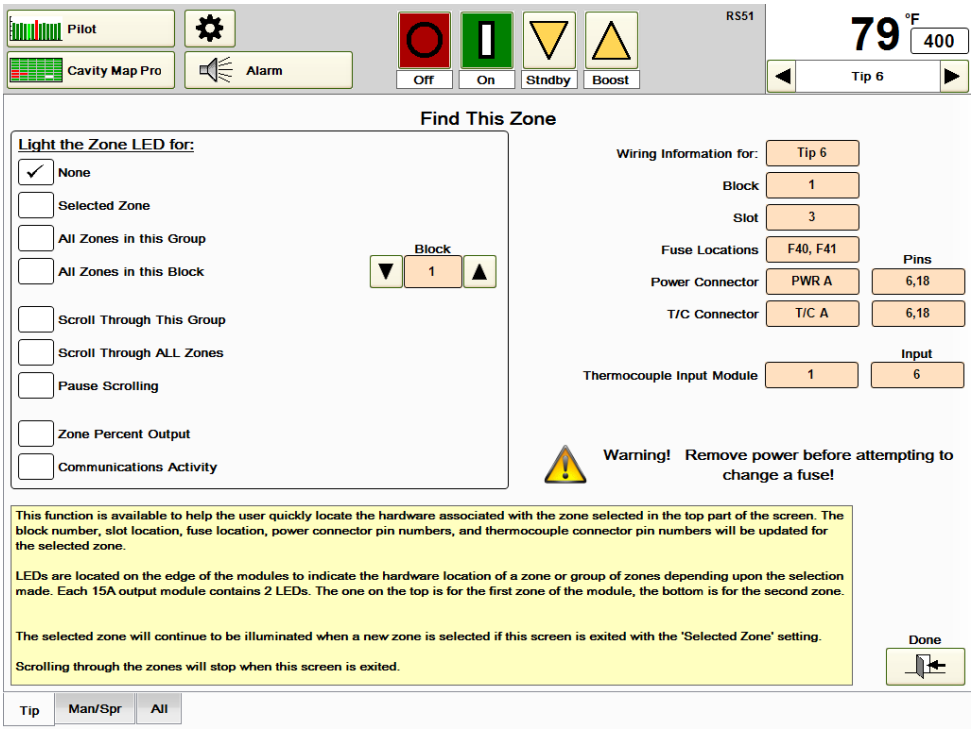


Figure 19d Find This Zone

A module light can be used to indicate the hardware location of a zone or group of zones. There are two zones on each output card, therefore there are two LEDs on each output card.

The top LED is associated with the first zone on the board. The bottom LED is associated with the second zone on the card.

When **Find This Zone** is used, LEDs can be used to find the zone or others associated with it.
Light the Zone LED for:

None: No LED will be lit.
Selected Zone: Module light lights on the output board that includes the selected zone (Tip 6 in Figure 19d).
All Zones in this Group: Module lights will light on all zones in the selected group (Tip in Figure 19d).
All Zones in this Block: Module lights will light on all zones in the selected block (Block 1 in Figure 19d). There are up to 24 zones are located in each block.
Scroll Through Group: Module light scrolls through each zone in the group selected on the screen (Tip in Figure 19d).
Scroll Through All Zones: Module light scrolls through all zones. This can be used to prove the controller is recognizing all zones.
Pause Scrolling: Module light stops scrolling until this selection is pressed again.
Zone Percent Output: Module light will blink on and off with the output of the selected zone's output.
Communications Activity: Module light will blink on and off rapidly showing proper communications.

System Power: This screen displays the Instant, Average, Maximum and Minimum wattage readings for the total system as shown in Figure 19e. The Average, Maximum and Minimum settings are all calculated based on the period of time that it takes to fill the Tape Graph window. To read or change the time, go to the Tape Graph display, select Graph Settings and refer to the **Time to Fill Tape Graph** reading as shown in Figure 19f. Increasing the Tape Graph Seconds per Update setting increases the Time to Fill Tape Graph reading. In the example shown, an Update rate of once every 60 seconds will cause the Tape Graph to fill up in 2 hours and 1 minute. This setting would result in the Average, Maximum and Minimum wattage readings to be based on the last 2 hours and 1 minute of data or less if the zones have not been on that long.

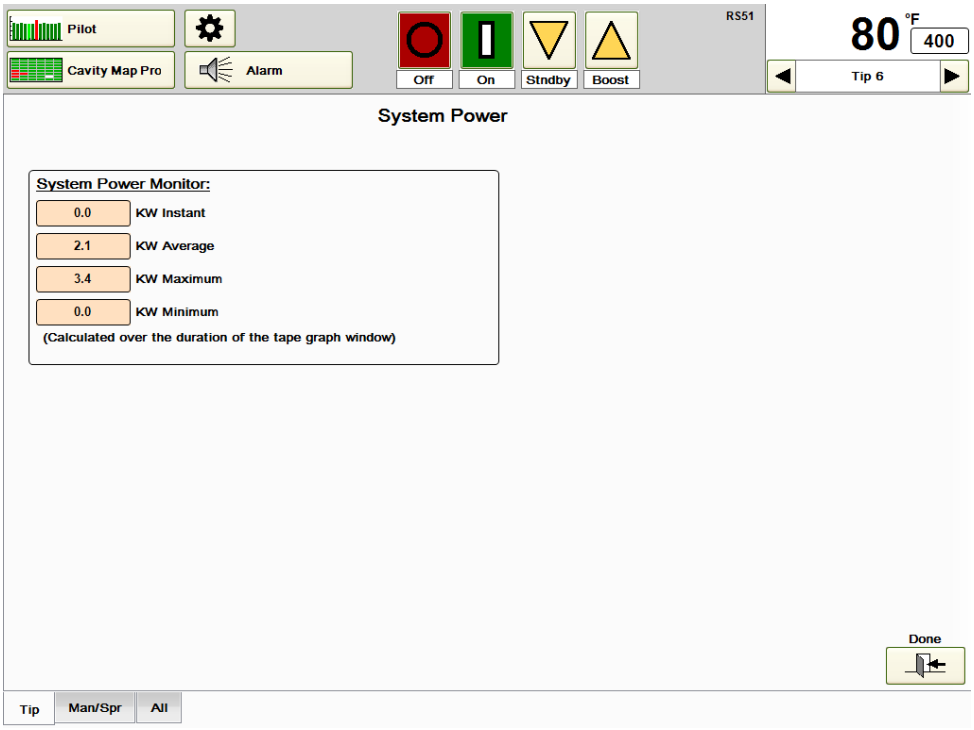


Figure 19e System Power

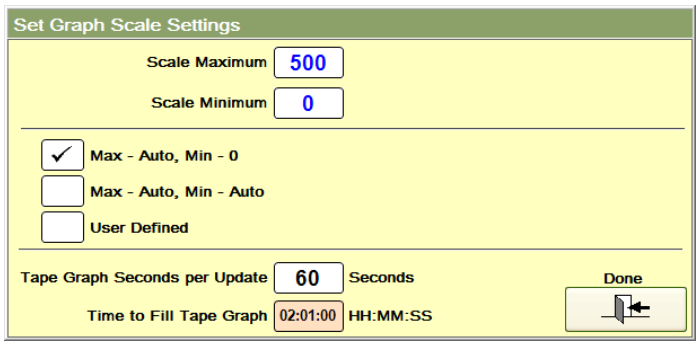
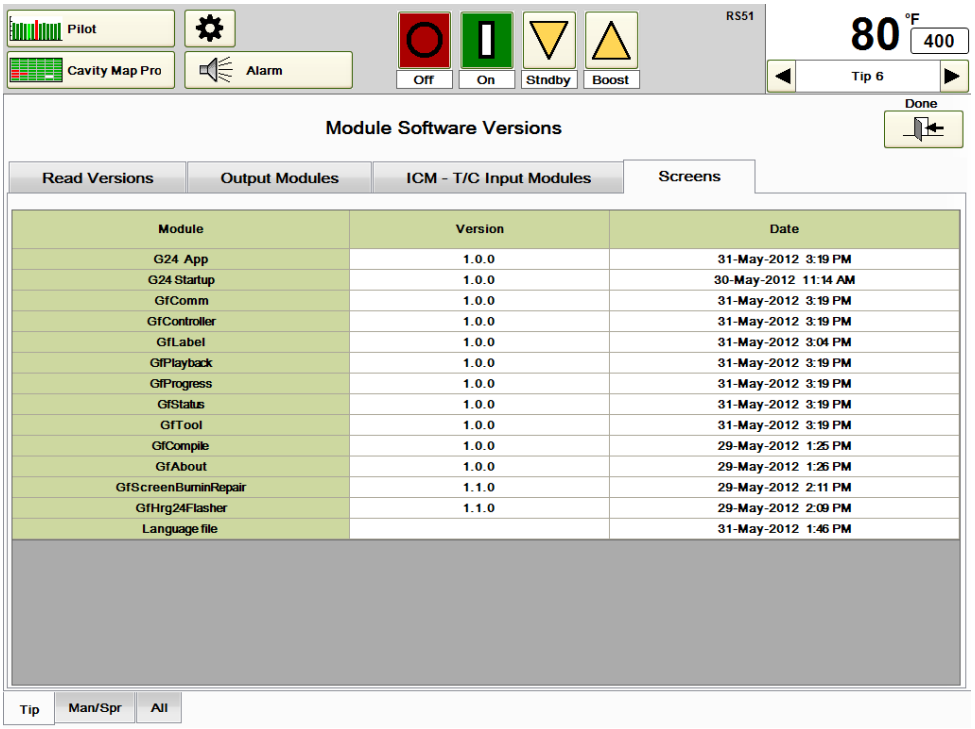


Figure 19f Time to Fill Tape Graph Setting

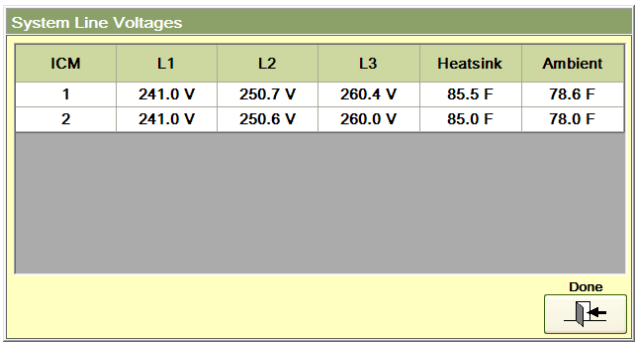
View Module Versions: Press this button to access the information shown in Figure 19g. This screen is normally for Gammaflux use, but can also be used to see the block and slot number of each zone.



Module	Version	Date
G24 App	1.0.0	31-May-2012 3:19 PM
G24 Startup	1.0.0	30-May-2012 11:14 AM
GfComm	1.0.0	31-May-2012 3:19 PM
GfController	1.0.0	31-May-2012 3:19 PM
GfLabel	1.0.0	31-May-2012 3:04 PM
GfPlayback	1.0.0	31-May-2012 3:19 PM
GfProgress	1.0.0	31-May-2012 3:19 PM
GfStatus	1.0.0	31-May-2012 3:19 PM
GfTool	1.0.0	31-May-2012 3:19 PM
GfCompile	1.0.0	29-May-2012 1:25 PM
GfAbout	1.0.0	29-May-2012 1:26 PM
GfScreenBurninRepair	1.1.0	29-May-2012 2:11 PM
GfHrg24Flasher	1.1.0	29-May-2012 2:09 PM
Language file		31-May-2012 1:46 PM

Figure 19g Module Software Versions (Screens Tab Selected)

View Line Voltages: Press this button to access the screen shown in Figure 19h. This screen displays the line voltage of each phase in addition to the ambient temperature and temperature at the heat sink of each block. If some of the zones are not coming up to temperature, this screen may be used to determine if the G24 is seeing the proper input voltage on all three phases.



System Line Voltages

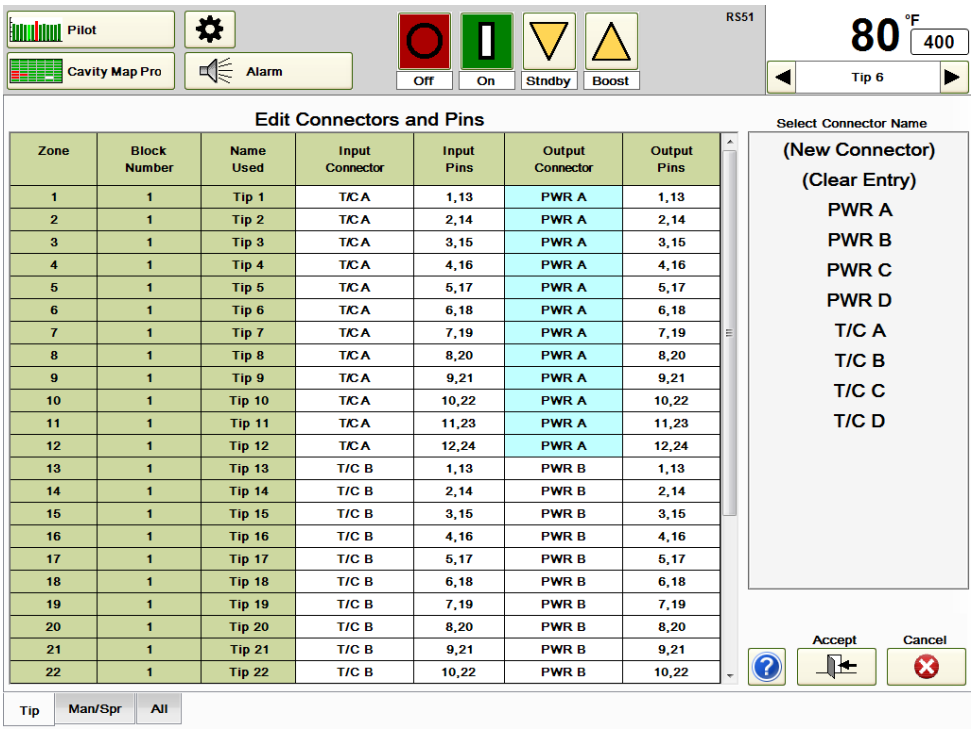
ICM	L1	L2	L3	Heatsink	Ambient
1	241.0 V	250.7 V	260.4 V	85.5 F	78.6 F
2	241.0 V	250.6 V	260.0 V	85.0 F	78.0 F

Done

Figure 19h System Line Voltages (View Line Voltages)

Name Connectors and Pins: Press this button shown on Figure 19a to display the screen shown in Figure 19i. This table shows the layout and names of the controller's cable connections. Inputs and outputs cannot be moved using this screen. That has to be physically done or done by using the swap input and copy output % features. This screen is just about labels. If the operator wants to change the labels on the controller, the labels can be renamed here as well. In the example shown in Figure 19i, the controller heater (power) connectors have been originally been labeled PWR A, PWR B, PWR C and PWR D. They can be renamed to PWR 1, PWR 2, PWR 3 and PWR 4 by using the following procedure:

1) Press New Connector (shown on right side of Figure 19i) and enter PWR 1. Do the same for PWR 2, PWR 3 and PWR 4.
2) Under the Output Connector column, touch Tip 1 and slide down to Tip 12. Tips 1-12 will become highlighted (as shown in Figure 19i). Select PWR 1 from the Select Connector Name column on the right.
3) Repeat step 2 for Tips 13-24 using PWR 2, Tips 25-32 using PWR 3 and Spr through Man5 using PWR 4.
4) Select **Done** to accept the changes or **Cancel** to nullify the changes.



Pilot | Cavity Map Pro | Alarm | Off | On | Stndby | Boost | RS51 | 80 °F | 400 | Tip 6

Edit Connectors and Pins

Zone	Block Number	Name Used	Input Connector	Input Pins	Output Connector	Output Pins
1	1	Tip 1	T/C A	1,13	PWR A	1,13
2	1	Tip 2	T/C A	2,14	PWR A	2,14
3	1	Tip 3	T/C A	3,15	PWR A	3,15
4	1	Tip 4	T/C A	4,16	PWR A	4,16
5	1	Tip 5	T/C A	5,17	PWR A	5,17
6	1	Tip 6	T/C A	6,18	PWR A	6,18
7	1	Tip 7	T/C A	7,19	PWR A	7,19
8	1	Tip 8	T/C A	8,20	PWR A	8,20
9	1	Tip 9	T/C A	9,21	PWR A	9,21
10	1	Tip 10	T/C A	10,22	PWR A	10,22
11	1	Tip 11	T/C A	11,23	PWR A	11,23
12	1	Tip 12	T/C A	12,24	PWR A	12,24
13	1	Tip 13	T/C B	1,13	PWR B	1,13
14	1	Tip 14	T/C B	2,14	PWR B	2,14
15	1	Tip 15	T/C B	3,15	PWR B	3,15
16	1	Tip 16	T/C B	4,16	PWR B	4,16
17	1	Tip 17	T/C B	5,17	PWR B	5,17
18	1	Tip 18	T/C B	6,18	PWR B	6,18
19	1	Tip 19	T/C B	7,19	PWR B	7,19
20	1	Tip 20	T/C B	8,20	PWR B	8,20
21	1	Tip 21	T/C B	9,21	PWR B	9,21
22	1	Tip 22	T/C B	10,22	PWR B	10,22

Select Connector Name: (New Connector), (Clear Entry), PWR A, PWR B, PWR C, PWR D, T/C A, T/C B, T/C C, T/C D

Accept | Cancel

Tip | Man/Spr | All

Figure 19i Name Connectors and Pins

View Controller Summary: Press this button to access the screen shown in Figure 19j. It shows how the controller is constructed. The information is shown for all zones regardless of which group tab is selected. Terms used on this screen include:

Block: There are two types of blocks. One block has up to 24 zones running on a 100A (50A Wye) circuit breaker. The other type of block has up to 12 zones running on a 150A (80A Wye) circuit breaker. In Figure 19j, there are 24 zones in the first block and the remaining 16 zones are in the second block.

Zones: This column shows how many zones are associated with each block.

First Zone/Last Zone: These columns indicate the first and last zone associated with each block.

Input Modules: There are up to 12 thermocouple inputs on each input module. Since the first block houses 24 zones, 2 input modules are required. The remaining 16 zones in the second block also require 2 input modules.

Output Modules: Each output module includes 2 zones rated at up to 15A each. There are up to 12 output modules in the block with the 100A Delta (50A Wye) circuit breaker and up to 6 output modules in the block with the 150A Delta (80A Wye) circuit breaker.

The total number of blocks, zones, input modules and output modules are shown on the lower section of the screen.

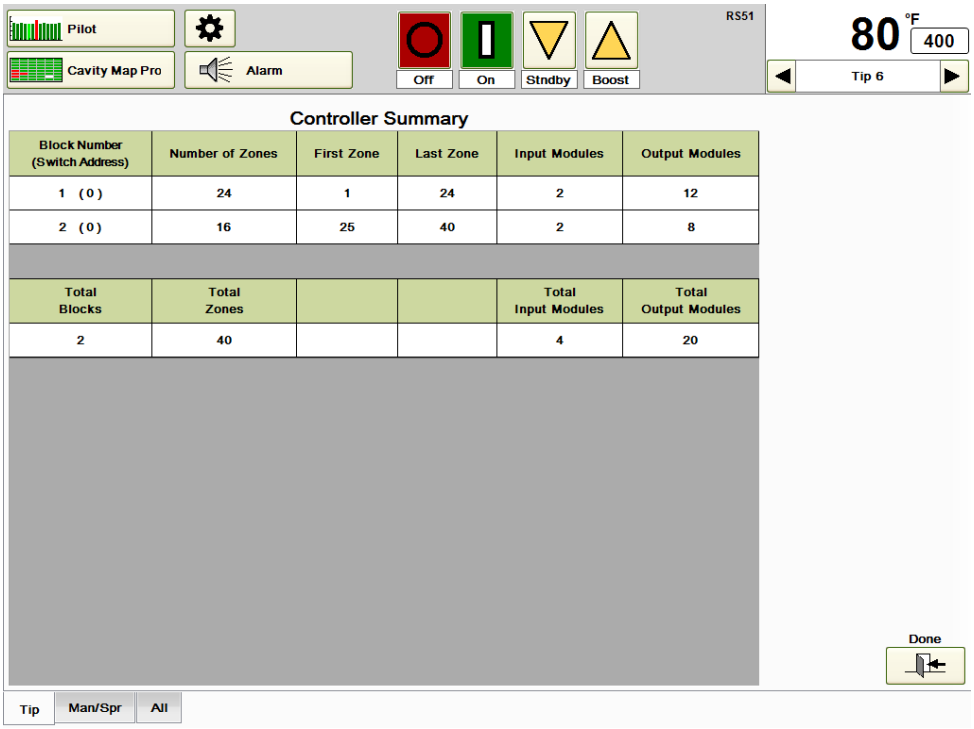


Figure 19j Controller Summary

20
Mold Doctor®

Mold Doctor® is an off-line set of diagnostic tools that enables the user to detect tool problems or inefficiencies. Ideally, these tests would be run in the tool room before the tool is placed in the machine. This way, diagnosed problems can be fixed before they result in lost production time on the floor. Access to the Mold Doctor® screens is found on the Diagnostics screen shown in Figure 20a.

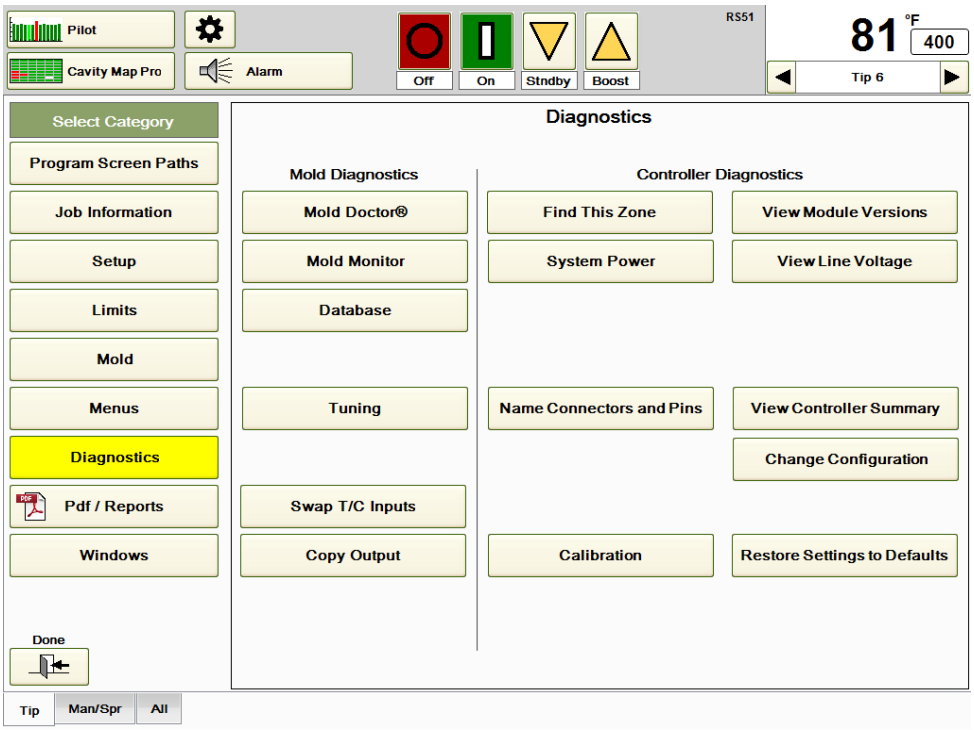


Figure 20a Diagnostics

Press the **Mold Doctor®** button to access the screen shown in Figure 20b.
The four major Mold Doctor® tests include:

1) Wiring Analysis: The G24 locates any thermocouple or heater problems in the tool. In addition, the test will reveal if any zones have been miswired. It does this by turning on one zone at a time and checking to see how each zone's output affects all zones.
2) Fault Analysis: This test is the same as the Wiring Analysis test, except that it does not check for zones that have been miswired. It turns on all zones at the same time.
3) Thermodynamic Analysis: This test measures a variety of important variables including heater resistances, percent outputs, amperages, heating rate per zone and cooling rate per zone.
4) Historical Mold Performance: This test compares the results of any two Thermodynamic Analysis tests. It will highlight differences between the two, thereby indicating how the tool has changed since it was last tested.

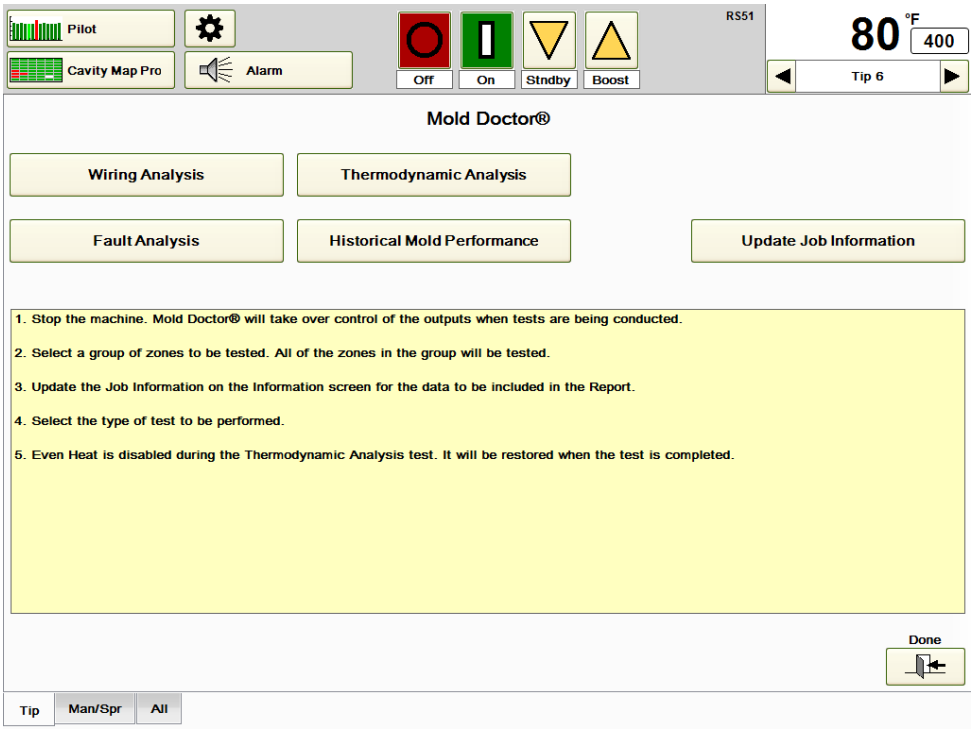


Figure 20b Mold Doctor®

Update Job Information: Press this button if the job information screen needs to be reviewed or updated before the test results from the Mold Doctor® reports are saved.

Wiring Analysis: Press the **Wiring Analysis** button in Figure 20b to see the screen shown in Figure 20c. The Wiring Analysis procedure detects open thermocouples, reversed thermocouples, shorted thermocouples, shorted heaters, open heaters and open fuses. It also detects cross-wired zones, which cause one zone to heat another zone. The controller powers up the first zone of the group selected at the bottom of the screen (Tip in Figure 20c), determines if the zone is heating and then determines if any other zone is heating. Once the testing of the first zone is completed, it repeats the same test for every zone in the group. Since the G24 is checking for cross-wired zones, the Copy Output Wiring function can be detrimental here. The Copy Output function enables the output of one zone to be copied to other zones. During the Wiring Analysis test, the controller will detect that the output of one zone is causing the zone to heat and will give an error statement. To eliminate these error statements, the **Remove Copy Output Wiring For This Zone** (the zone selected in the upper right corner) button or the **Remove All Copy Output Wiring** button can be used. If the G24 detects that zones are cross-wired, they can be "rewired in software" by using the Apply Wiring Analysis Results. Again, pressing this button will cause the G24 to adapt to the cross-wired zones, rewiring them in software so that the thermocouples and heaters are associated with each other zone per zone.
Note: Gammaflux does not recommend rewiring zones in software. Gammaflux recommends that the cross-wired zones be fixed permanently in the tool.

To run Wiring Analysis:
1) Select the group that is to be tested from the group tabs at the bottom of the screen. Zones that are in manual mode or locked off will not be tested.
2) Press **Start the Wiring Analysis Test**. The test can be cancelled at any time by pressing the **Cancel Test** button.
3) The results of the test will appear on the screen as shown in Figure 20d. Progress information will appear in the yellow box on the right.

4) The report can be saved by touching the **Make Report** button shown in Figure 20d and choosing USB drive or the D:\G24\Reports directory.

The **Maximum Starting Temperature for Mold Doctor Tests** is set to 200F for best results, but it can be changed. Mold Doctor® tests will not start until all zone temperatures are lower than this setting. It should be set at least 200F lower than the expected production setpoints for those zones.

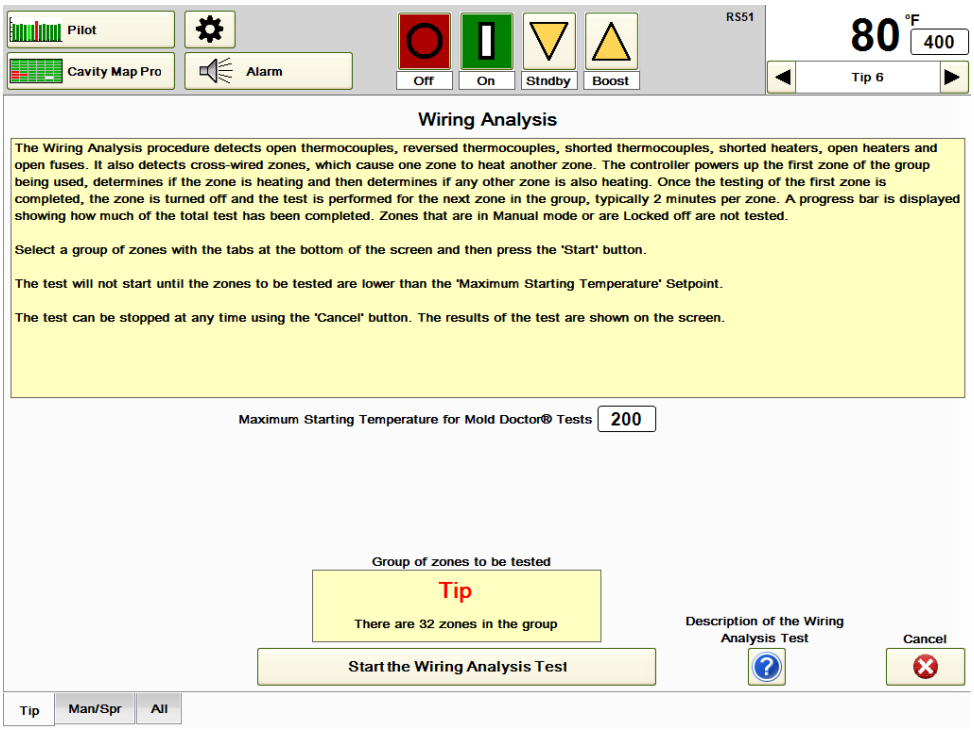


Figure 20c Wiring Analysis

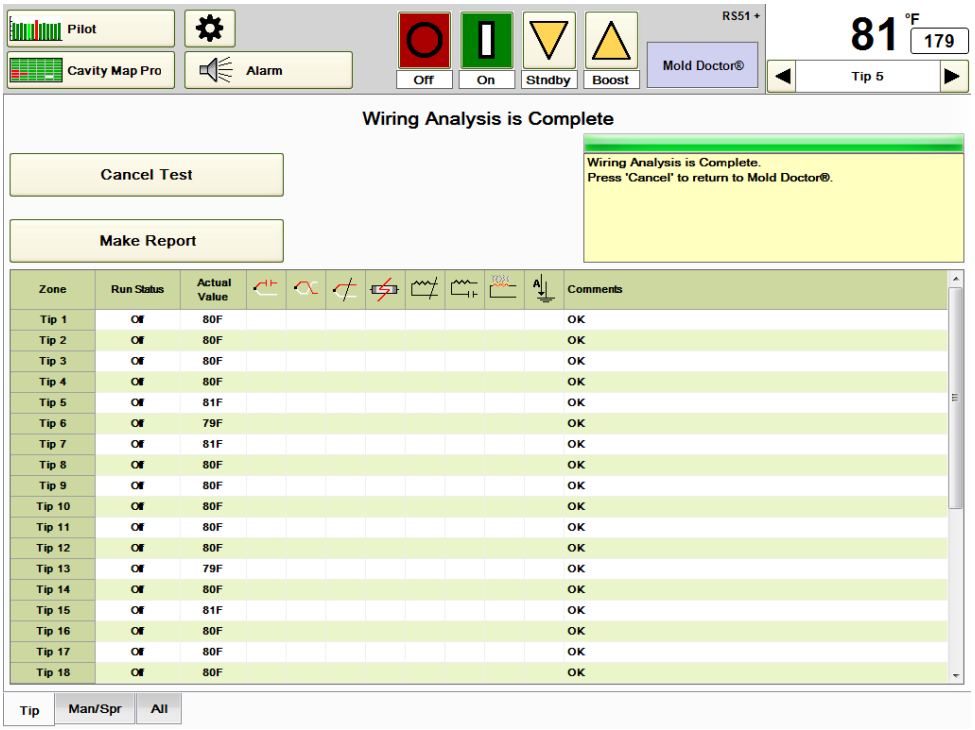


Figure 20d Wiring Analysis in Operation

Fault Analysis: This procedure detects open thermocouples, reversed thermocouples, shorted thermocouples, shorted heaters, open heaters and open fuses. It is similar to the Wiring Analysis, except that it does not check for cross-wiring of zones. This test is often run once the tool is known to be wired correctly. This test generally takes approximately 5 minutes. The test can be aborted at any time using the Cancel button.

To run Fault Analysis:

1) Select the group that is to be tested from the group tabs at the bottom of the screen. Zones that are in manual mode or locked off will not be tested. In the example shown in Figure 20e, Tip 5 is in manual and is not tested.
2) Press **Start the Fault Analysis Test**. The test can be cancelled at any time by pressing the **Cancel Test** button. The zones will all be turned on at once and will heat until they are at least 20F above the initial starting temperature.
3) The results of the test will appear on the screen. Progress information will appear in the yellow box on the right.
4) The report can be saved by touching the **Make Report** button shown in Figure 20e and choosing USB drive or the D:\G24\Reports directory.

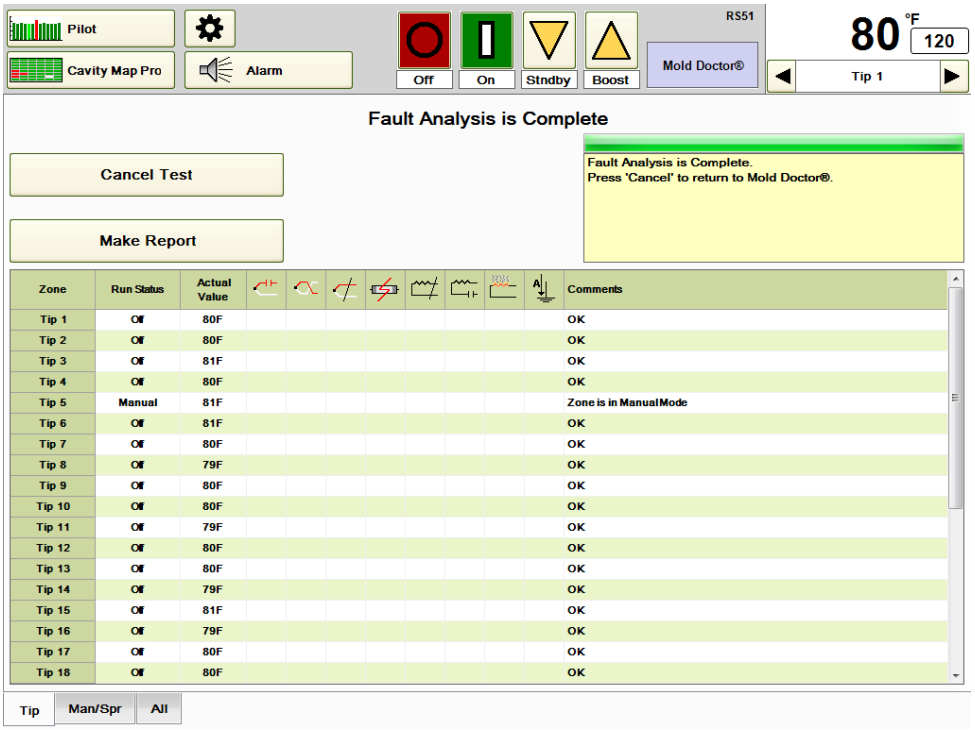


Figure 20e Fault Analysis

Thermodynamic Analysis: This procedure provides information that can be useful for a variety of personnel. While providing preventative maintenance information such as heater resistance of each zone, it also indicates heating and cooling rates of each zone for process engineering personnel. With this test, the key is to locate zones that are inconsistent when compared with similar zones. For example, the user may run a test on the Tip group. If one tip is heating up at a much slower rate than similar tips, it may be an indication that the heater is starting to burn out or that the thermocouple and heater have different spacing than other tips. A review of heater resistances or percent outputs for the suspicious zones may further indicate if the problem is with the heater.

To run Thermodynamic Analysis:

1) Select the group that is to be tested from the group tabs at the bottom of the screen. Zones that are in manual mode or locked off will not be tested.
2) If cooling water is available, select **Perform Analysis of the Cooling Rate during Thermodynamic Analysis Test**. If this is selected, cooling data will be provided as shown in Figure 20g.
3) Press **Start the Thermodynamic Analysis Test**. The controller will bring all zones in the group to the 400F or whatever is selected in the **Operating Temperature for the Mold Doctor Thermodynamic Analysis Test** box. It will soak for the time selected in the **Soak Time ...** setting (5 minutes is the default setting. The zones will then be cooled to 330F. This test generally takes about 30 minutes to perform, partly dependent upon the cooling efficiency of the tool test. The test can be aborted at any time using the **Cancel** button.
4) The results of the test will appear on the screen as shown in Figure 20g. Progress information will appear in the yellow box on the right.
5) Press the Save TDA File and enter a file name to save it as.
6) The report can be sent to a USB drive or the D:\G24\Reports directory by touching the **Make Report** button shown in Figure 20g.

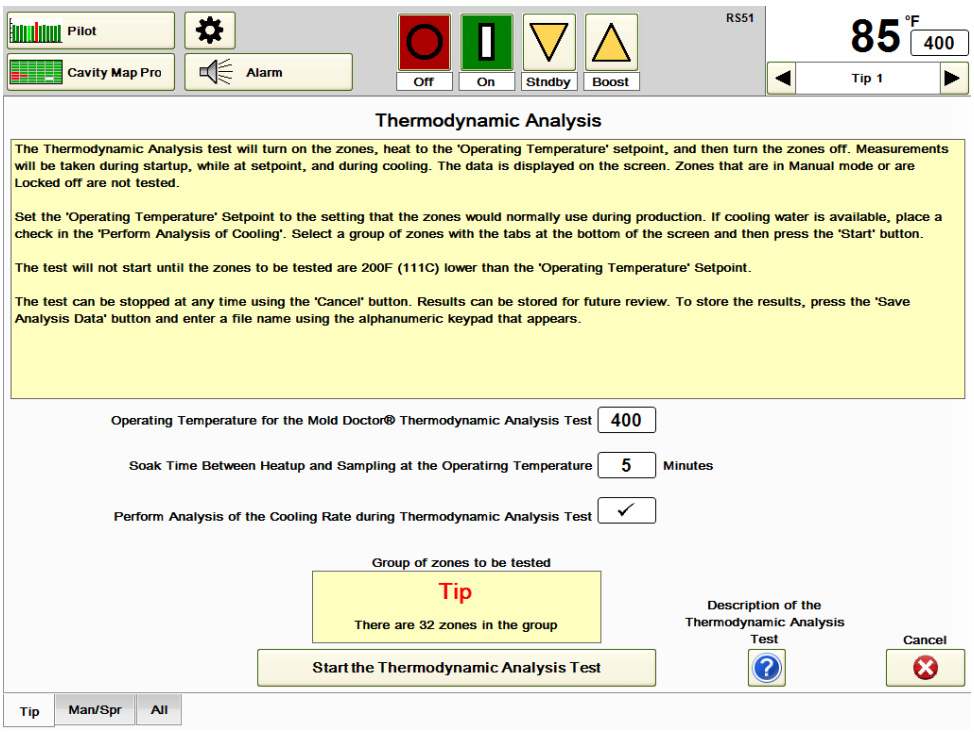
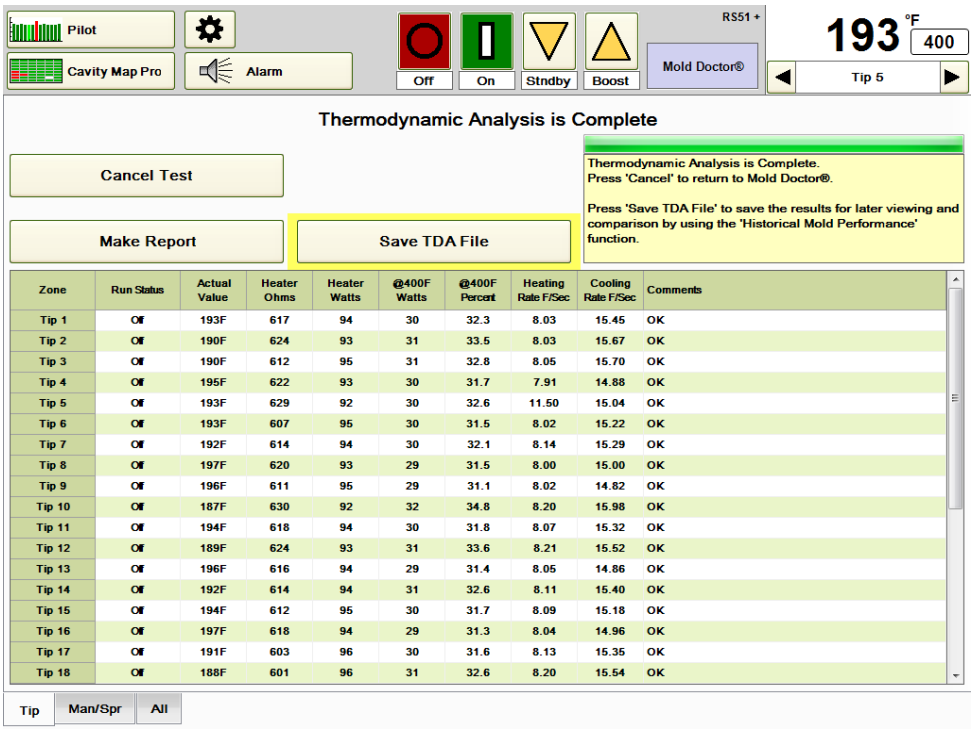


Figure 20f Thermodynamic Analysis



Zone	Run Status	Actual Value	Heater Ohms	Heater Watts	@400F Watts	@400F Percent	Heating Rate F/Sec	Cooling Rate F/Sec	Comments
Tip 1	Off	193F	617	94	30	32.3	8.03	15.45	OK
Tip 2	Off	190F	624	93	31	33.5	8.03	15.67	OK
Tip 3	Off	190F	612	95	31	32.8	8.05	15.70	OK
Tip 4	Off	195F	622	93	30	31.7	7.91	14.88	OK
Tip 5	Off	193F	629	92	30	32.6	11.50	15.04	OK
Tip 6	Off	193F	607	95	30	31.5	8.02	15.22	OK
Tip 7	Off	192F	614	94	30	32.1	8.14	15.29	OK
Tip 8	Off	197F	620	93	29	31.5	8.00	15.00	OK
Tip 9	Off	196F	611	95	29	31.1	8.02	14.82	OK
Tip 10	Off	187F	630	92	32	34.8	8.20	15.98	OK
Tip 11	Off	194F	618	94	30	31.8	8.07	15.32	OK
Tip 12	Off	189F	624	93	31	33.6	8.21	15.52	OK
Tip 13	Off	196F	616	94	29	31.4	8.05	14.86	OK
Tip 14	Off	192F	614	94	31	32.6	8.11	15.40	OK
Tip 15	Off	194F	612	95	30	31.7	8.09	15.18	OK
Tip 16	Off	197F	618	94	29	31.3	8.04	14.96	OK
Tip 17	Off	191F	603	96	30	31.6	8.13	15.35	OK
Tip 18	Off	188F	601	96	31	32.6	8.20	15.54	OK

Figure 20g Thermodynamic Analysis Results

Historical Mold Performance: This procedure can be used to view saved Thermodynamic Analysis files and to automatically compare any two Thermodynamic Analysis tests.

Change Historical image to screen shot after the first TDA has been selected.
The user selects the file names of the two files to be compared. The controller will then display the data, specifically showing which data has changed and by what percentage. If the data for a particular value in both files is within 10%, the word "OK" will appear in the table. Changes in heater resistances, output percentages and other data could be an early indication that a heater is about to fail. To get the most out of this report, the two Thermodynamic Analysis tests being compared should be completed under similar conditions. For example, if cooling rate data is being compared, it is important that the same water temperature and water flow rates are used in the two Thermodynamic Analysis tests. Otherwise, it would be expected that the test results would vary.

To run Historical Mold Performance:

1) Select by pressing the Select the First TDA File shown in Figure 20h and selecting from the available files as shown in Figure 20i. The data from this test will be displayed on the screen.
2) Select the 2nd Thermodynamic Analysis file to be compared in the same manner.
3) The results of the test will appear on the screen as shown in Figure 20j. The test can be cancelled at any time using the Cancel button.
4) The report can be saved by touching the **Make Report** button shown in Figure 20j and choosing USB drive or the D:\G24\Reports directory.

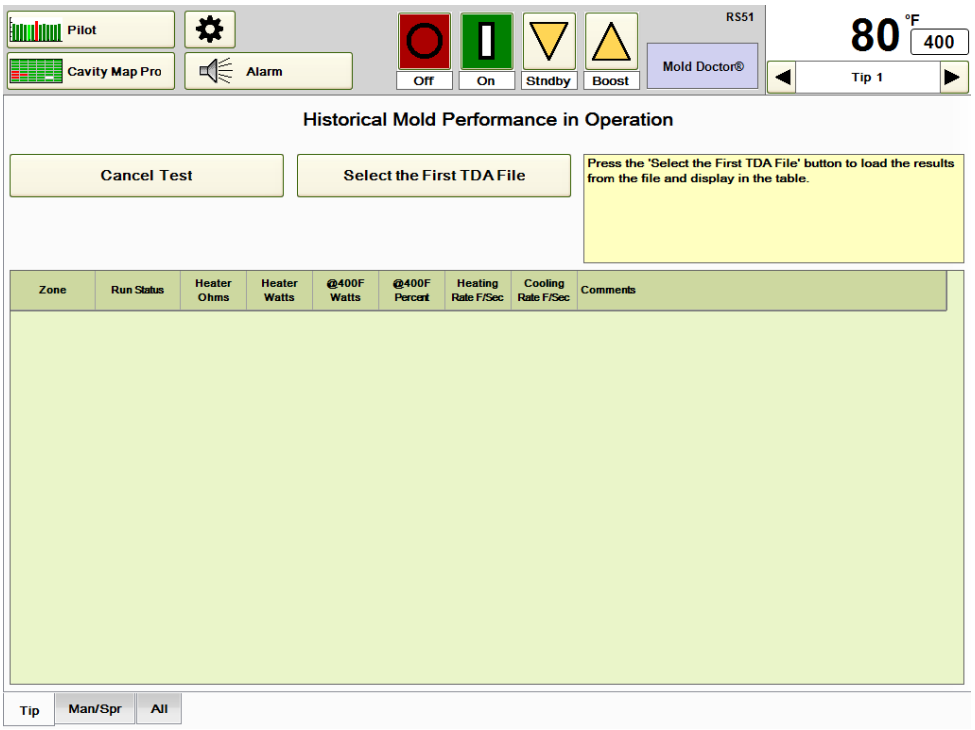


Figure 20h Historical Mold Performance

Figure 20i Selecting the 1st TDA File

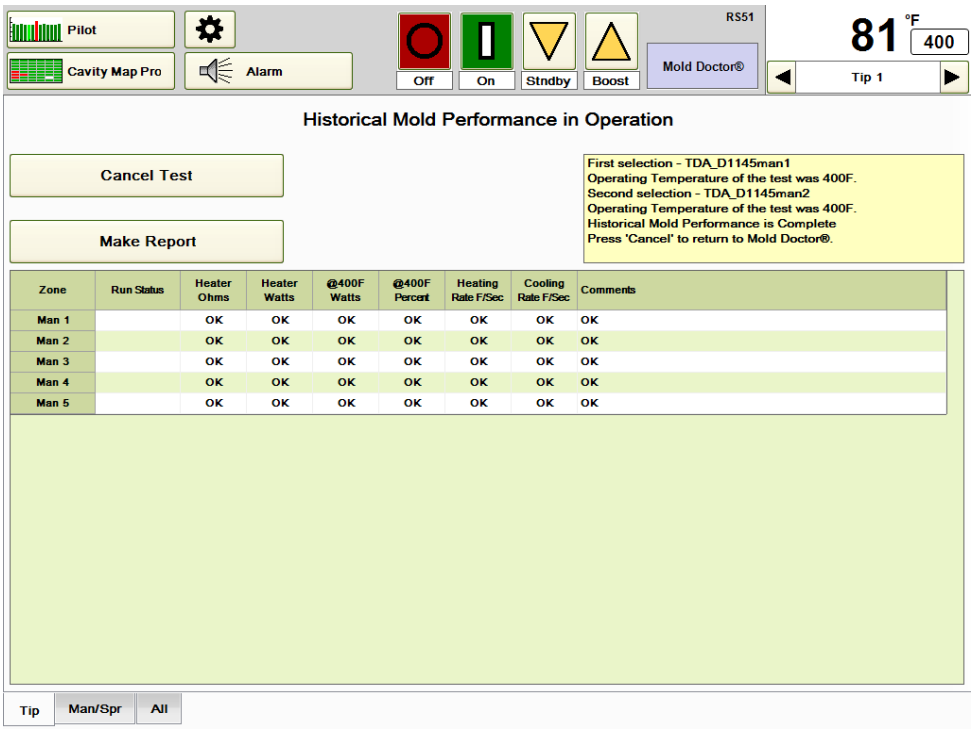


Figure 20j Historical Mold Performance Results

21
Mold Monitor

Mold Monitor is a set of three features that can be used to:
1) Activate an alarm based on each zone's normal wattage levels changing.
2) Activate an alarm based on each zone's normal heater resistance value changing.
3) Drop the temperature setpoints to Standby to minimize material degradation when an external input signal to the G24 controller indicates that the machine has stopped cycling.

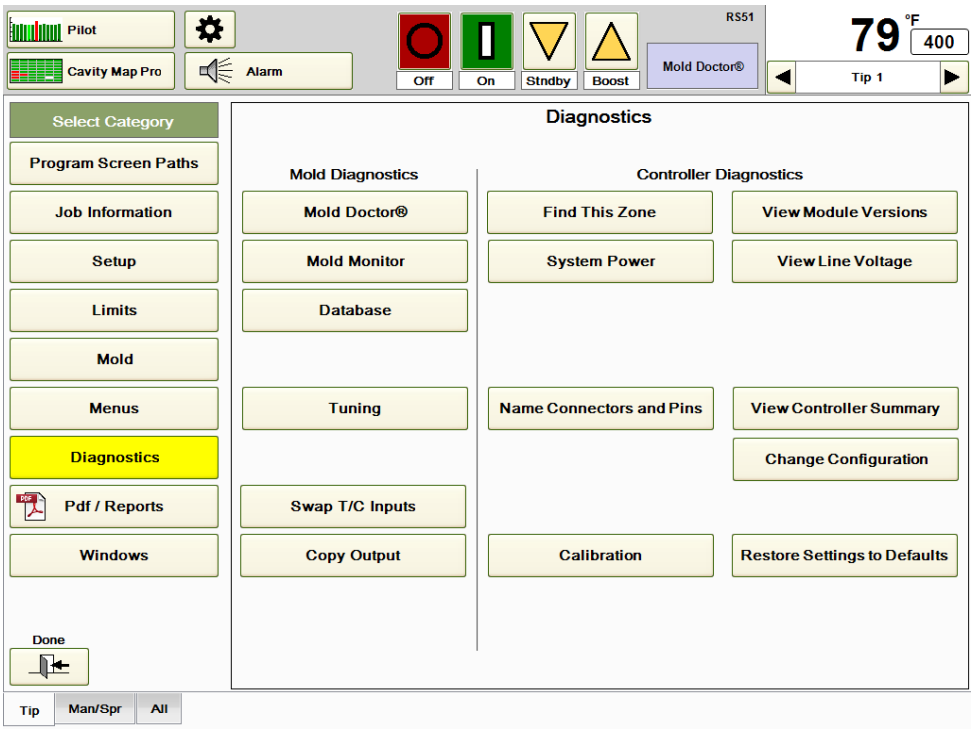


Figure 21a Diagnostics

Heater Watt Monitor: This function will cause a zone's Watt Alarm to activate when the wattage of the zone exceeds the normal wattage plus the % tolerance setting. This can be an excellent tool in detecting material leaks in the mold. Typically, when material leaks into the air spaces of a tool, the material acts as a heat sink, pulling heat away from where it is supposed to go. This causes the heaters near the leak to work harder to maintain setpoint which means more wattage will be applied. By detecting this abnormal level of wattage in a zone, the G24 thereby provides an early warning of a leak. Catching the problem early can greatly minimize the time needed to clean up the leak in the tool.
Press the **Mold Monitor** button shown in Figure 21a to display the Mold Monitor screen shown in Figure 21b. To set up the Watt Alarm:
1) Select the percentage (tolerance) above normal that the alarms should activate. For example, if a manifold zone normally pulls 10A, setting the tolerance to +10% would cause the manifold zone to activate the Watt Alarm at 11A. Setting it to 20% will cause the alarm to activate on the manifold zone at 12A.
2) The **Set High Alarm Setpoints** button should only be pressed once the tool is running properly for at least 30 minutes during normal production. The alarm tolerance will be added to the watt readings on each zone at the time the Set High Alarm button is pressed.
3) Touch the Enable Watt Alarm box to activate watt alarm monitoring. When Heater Watt Monitor is enabled, the Line Graph can be used to show the alarm value as a solid line and the area where the alarm will activate (shaded blue in Figure 21c because Heater Wattage

is the First Selection) when Heater Wattage is viewed. It may be necessary to edit the Graph Settings using User Defined settings to see the shaded area).

Note: It is possible that an increase in a zone's temperature setpoint will cause the alarm to activate since the zone will pull more wattage. If setpoints are raised the Set High Alarm Setpoints button should be pressed after temperatures have been stabilized for 30 minutes.

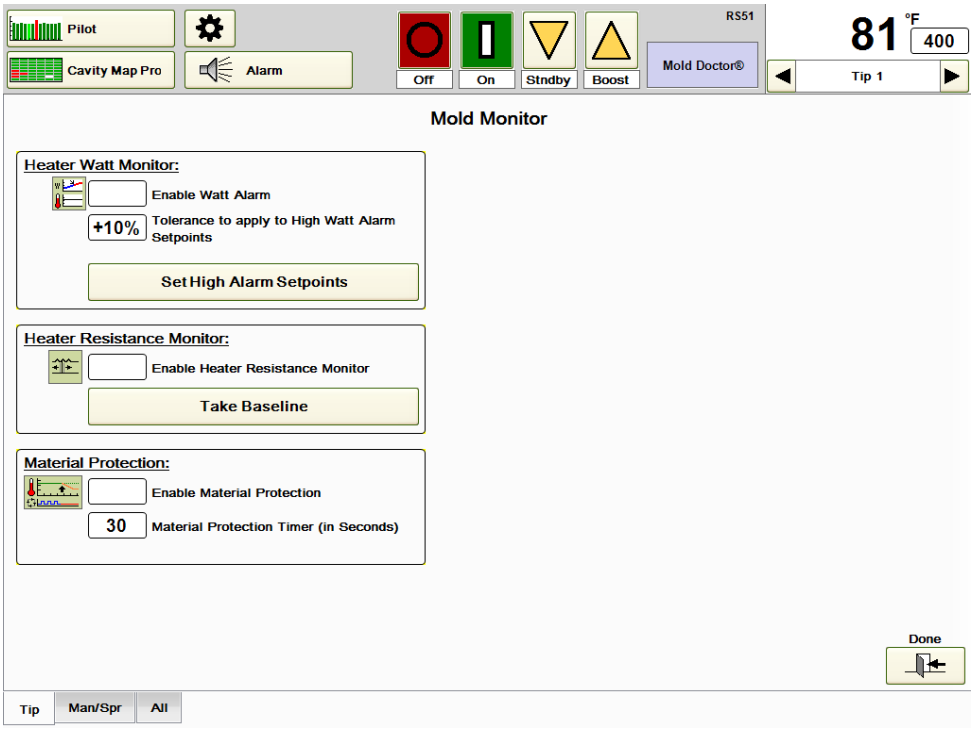


Figure 21b Mold Monitor

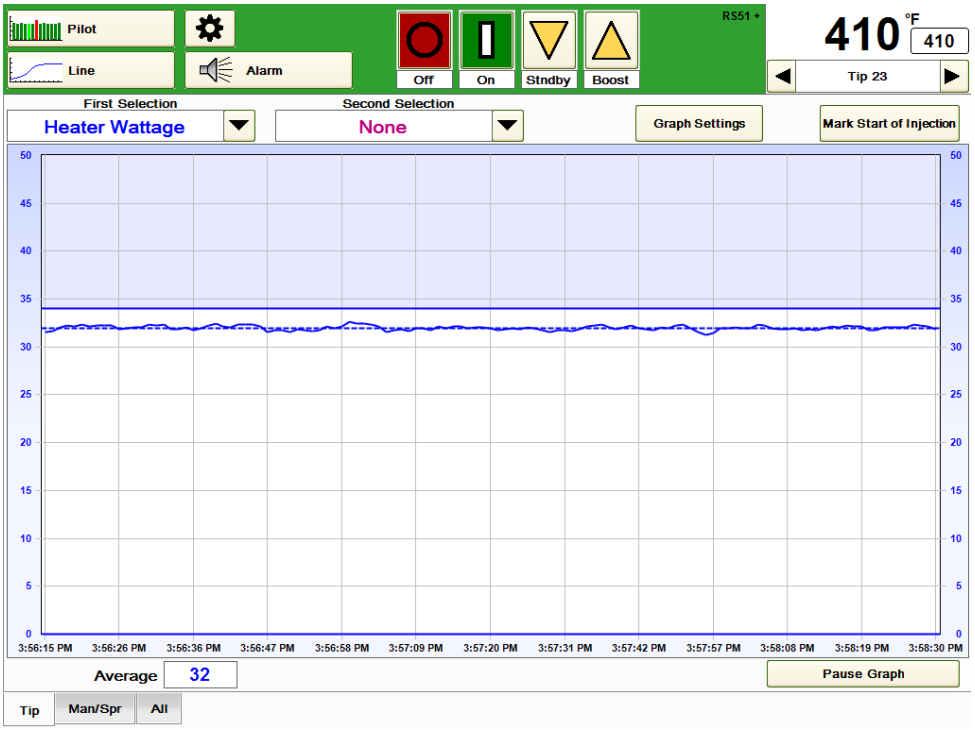


Figure 21c Line Graph (displaying Wattage with User Defined scale)

Heater Resistance Monitor: This function will cause a zone's Heater Alarm to activate when the resistance of a zone exceeds 40% of the value when the **Take Baseline** button was pushed. Many times, the heater will continue to function after an alarm has indicated that it is bad. The alarm should be used as an indicator that the heater has weakened significantly and that it should be replaced as soon as it is practical. To set up the Heater Resistance Alarm:

1) Press the **Take Baseline** button only after the machine has been running for awhile. It is recommended that the user wait at least a couple of hours after startup before pressing the **Take Baseline** button. Heaters, by nature, tend to change resistance when they heat up. When the **Take Baseline** button is pushed, the heater resistance of every zone will be retained. The G24 retains the baseline readings in memory when power is turned off. Baseline values are also stored in menus.
2) Touch the **Enable Heater Resistance Monitor** button to activate heater resistance monitoring.

Material Protection: This feature is used to help prevent material degradation by dropping the setpoint temperatures to Standby when the machine is not cycling. This function requires a signal from the injection molding machine. If the signal is not present for a selected period of time, the G24 will activate the Remote Standby Group (Section 11). The radio button in the Material Protection box will be filled in when the remote signal is present and empty when it is not. To set up the Material Protection function:

1) An assignment for the Remote IO input (Section 12) must be made **Cycle Start Off to On** or **Cycle Start On to Off**.
2) Make sure that the remote input signal is present when the machine is cycling. If it is not, the temperatures will drop to standby as soon as the zones reach setpoint and the material protection timer times out.
3) Enter the desired timer setting in the **Material Protection Timer** box. This setting determines the time the signal from the injection molding machine must be absent before the zones are shut off. For example, if 30 seconds is used as shown in Figure 21b, the zones in the Remote Standby Group will go to Standby if the G24 does not receive a signal from the machine within 30 seconds. The timer will not be active until all low temperature alarms have cleared on startup. If the timer times out, the timer must be reset by

pressing the Material Protection Alarm button (Section 8) on the Alarm screen. Default setting is 0 seconds. Range is 0-999 seconds.

4) To activate, touch the Enable Material Protection box.

22
Databases

Databases can be recorded, saved and even played back while the controller is controlling. Databases record data for all zones, not just for the group selected at the bottom of the screen. The **Database** button is found on the Diagnostics screen shown in Figure 22a.

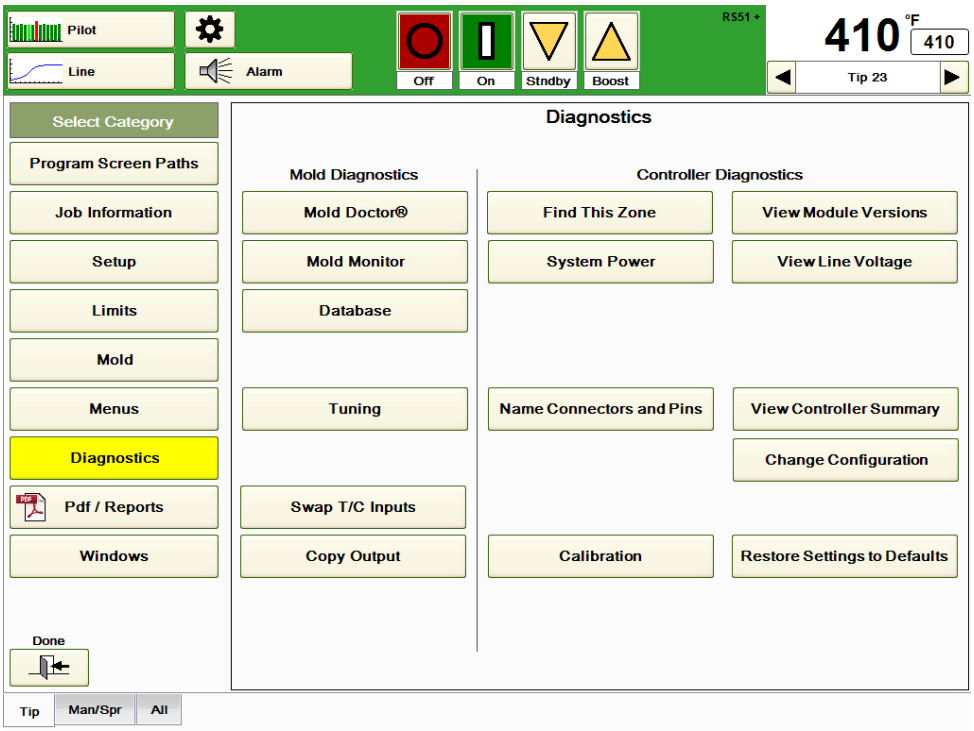


Figure 22a Diagnostics

Pressing the **Database** button will cause the screen in Figure 22b to appear. Settings on this screen include:

Recording Status:
Monitor Only: When this box is selected, the G24 is not recording data. It will continue to display current data.

Record Data: If this selection is chosen, the G24 will immediately begin recording data in the file shown to the left (RS51_0060512.mdb in Figure 22b). A **Recording Database** message appears above the Database Location section of the screen and to the left of the temperature display on top of the screen as shown in Figure 22b. If the user wants to record to a different file name or a new file name, the area to the left of **Record Data** should be pressed. The user will have a choice of choosing a new database file name with the alphanumeric keypad that appears or typing in the name of an existing database. Each database file name has an mdb extension. If the user does not enter it, the G24 will automatically do so. Database files created by the G24 are compatible with Microsoft Access 9.0. So, in addition to viewing databases on the G24 screen, databases can be downloaded to a USB flash drive and viewed on any computer running Microsoft Access 9.0 software.

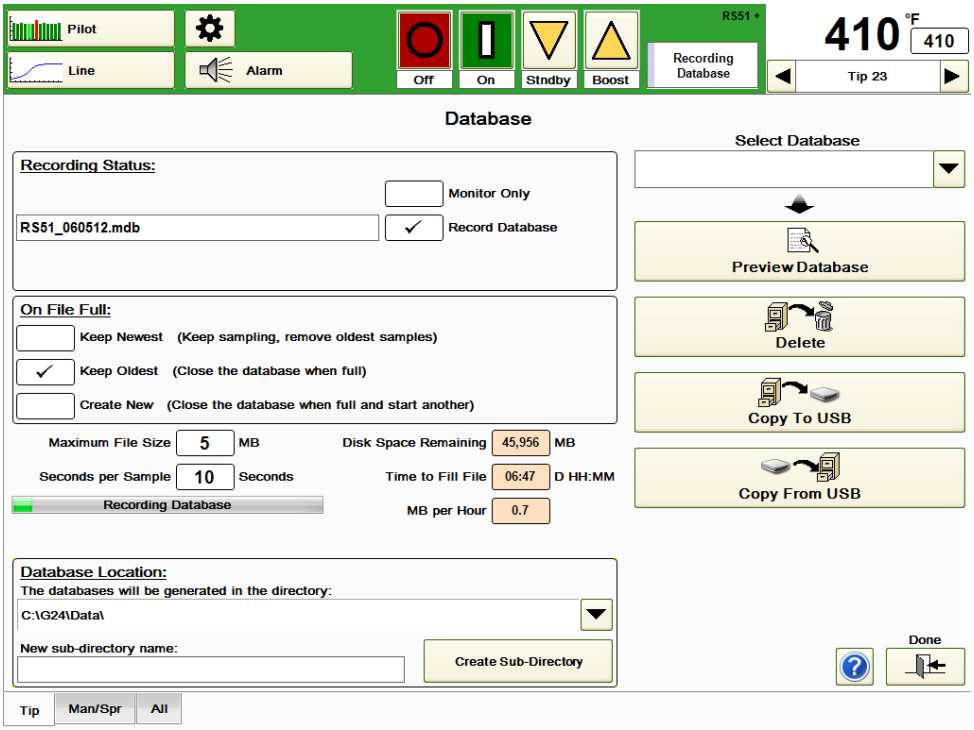


Figure 22b Database

<u>On File Full</u>:
Keep Newest: If this selection is chosen, the database file will fill to the chosen size. Then the oldest data will be removed as more new data is recorded. This is the most common setting.

Keep Oldest: If this selection is chosen, the database file will fill up and then stop recording.

Create New: If this selection is chosen, new files that are date and time-stamped will be created automatically when the previous files are filled.

Maximum File Size: The file size is directly related to the **Time to Fill File** value shown at the bottom of the screen. The user should choose a file size that results in the number of hours or days of data that is desired.

Seconds per Sample: This setting determines how frequently a complete system sample is recorded. The faster the sampling, the faster the file will fill. In the example shown in Figure 22b, the setting is set to 10 seconds. This means all data will be sampled and recorded every 10 seconds.

Disk Space Remaining: This reading shows how much hard drive space is still available.

Time to Fill File: This is a calculation made by the controller. The calculated time is a function of the number of zones, the file size and the Database Seconds per update settings. In our example in Figure 22b, the file will fill up in 6 hours and 47 minutes. To increase the time, the Database Seconds per update can be raised or the Maximum File Size can be increased.

Select Database: If the user wants to preview, delete or copy an existing database, the specific database should be selected by touching the area under Select Database. The user can then select the database from the list of existing databases that appears on the screen.

Preview Database: Pressing this button will cause the screen in Figure 22c to appear. It will show information relating to the file shown in the Select Database field. Information includes

date and time of creation along with user's notes. The purpose of this selection is to give the user the opportunity to confirm that this is the file the user wants to access.

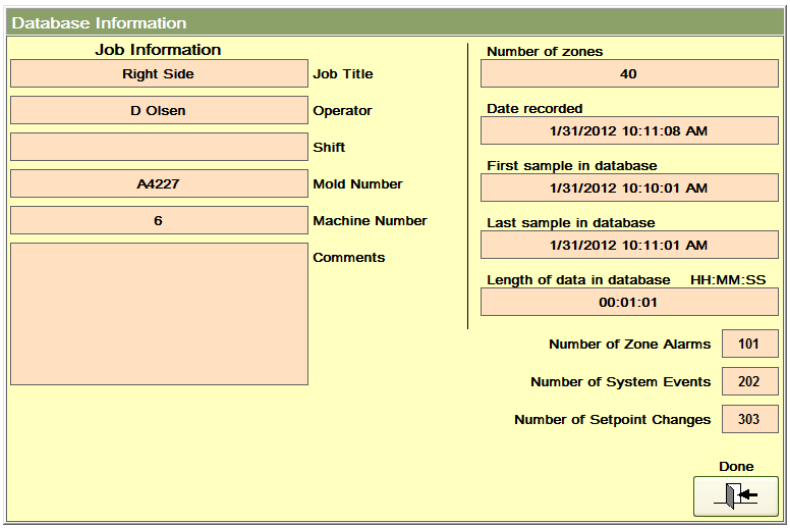


Figure 22c Preview Database Information

Delete: Pressing this button will cause the file displayed in the Select Database area to be deleted.

Copy to USB: Pressing this button will cause the file displayed in the Select Database area to be compressed and copied to a USB flash drive if inserted in the slot on the back of the G24 screen.

Copy from USB: Pressing this button will cause a screen to appear that lists the files that are located on the USB mounted on the back of the G24 screen. Select the appropriate file and enter. The file will be copied into the list of databases on the G24.

Database Location: This setting enables the user to determine where database files should be saved. The default setting is in D:\G24\Reports, but an additional subdirectory of the Reports files can be created with reports stored there.

23
Tuning

The G24 automatically determines its tuning parameters. The **Tuning** screens enable the user to display existing tuning parameters and to make changes in those unusual situations where tuning needs to be adjusted. Tuning values can be manually changed by entering different numbers in the Tuning SP setting on the Zone Details display (Section 6), in the Setpoint Table (Section 7) or on the Tuning screen shown in Figure 23b.
Press the Tuning button shown on Figure 23a to display the Tuning screen shown in Figure 23b.

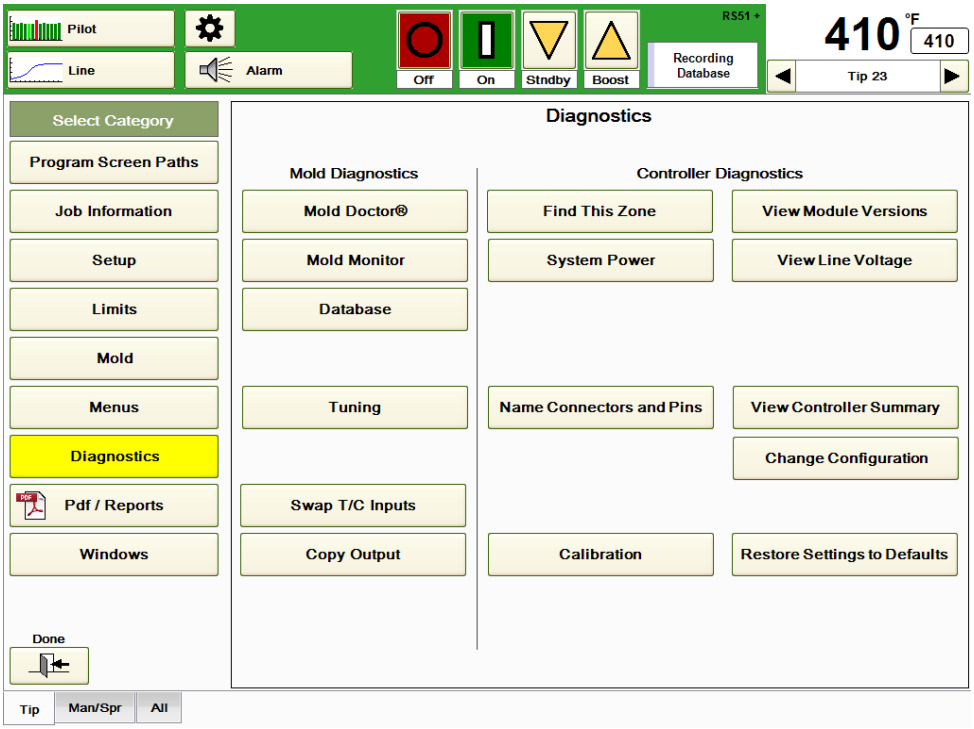


Figure 23a Diagnostics

One of the key factors in tuning is delay time. This is the measured amount of time that it takes for a change in heater output to be sensed by the thermocouple. Zones with long delay times are considered to be "slower" than other zones. Zones with short delay times are considered to be "faster" than other zones. Manifold zones tend to have more delay than tip zones.

The tuning number displayed indicates that the zone is set up as the following:
-31 to -30 = Ultra fast, low mass (-30 setting works well for Husky 250 Series)
-27 to -20 = Fast tip (-27 is fastest setting).
-17 to –10 = Fast manifold (-17 is fastest setting).
-1 = Manual entry for fast tips (not as fast as –27 to –20 settings)
0 = Standard tuning. The controller will determine the setting.
1 = Controller displays this value when using standard tuning and zone behaves like a tip. This setting is identical a setting of 10.
2 = Controller displays this value when using standard tuning and zone behaves like a manifold. This setting is identical to a setting of 20.
10 to 17 = Tip (17 is slowest setting).
20 to 27 = Manifold (27 is slowest setting).

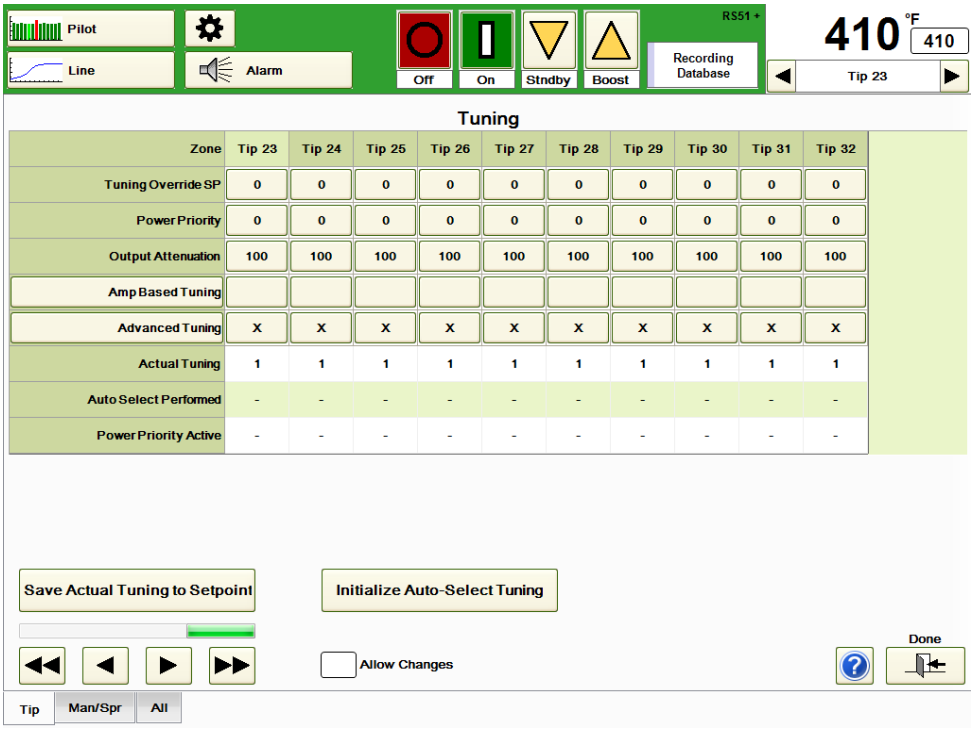


Figure 23b Tuning

The user can select between **Amp Based Tuning, Advanced Tuning** or can manually select the **Tuning Range Override** setting. **Advanced Tuning** is the most commonly used and is the default setting. If there is an issue with a zone oscillating, Amp Based tuning can be selected for that zone. The calculated tuning setting is displayed in the Actual Tuning row.

Tuning Range Override: This setting is normally set to zero. A setting of zero indicates that the controller is automatically tuning the zone and is displaying the calculated tuning value in the Actual Tuning row. If there is any setting other than 0, the controller will use that tuning setting instead of what the controller is calculating. In Figure 23b, the Tuning Range overrides are set to "0" and the Actual Tuning calculated values are "1" ("2" would be a more common number for manifolds) for each of the manifold and sprue zones.
If the user decides to enter a setting other than 0 for one or more zones, here is a tuning suggestion:

1) Determine the amount of temperature swing in the zone that is being changed. For example, assume that Man 3 has an oscillation of 7F below setpoint to 8F degrees above setpoint. This would be a swing of 15F.
2) Divide the temperature swing by 3 if using degrees F (use 1.7 if using degrees C). For a swing of 15F, the answer would be 5.
3) Add that to the value shown in the Actual Tuning table (assume for this example that the Actual Tuning value is 2. A 1 in the table really represents a 10 and that a 2 really represents a value of 20. So for our example, add 5 to 20 and set the Tuning Range Override to 25.
4) If this makes the oscillation worse, subtract the number from step 2 to the value shown in the Actual Tuning table. For our example, a Tuning Range Override of 15 would be applied.

The true effect of a tuning change will not be apparent until a major setpoint change is introduced or until the zone is turned off and back on again.

Power Priority™: "Low mass" or extremely small hot runner nozzles are a unique challenge to control. To smooth the power and ultimately the melt heat history, Gammaflux has created

Power Priority™. Power Priority™ smoothes the power output fluctuations on individual zones. Users have the option to manually apply a Power Priority™ setpoint from 1 (light effect) to 4 (heavy effect), providing unparalleled control for applications where it is most needed. It can be set here, on the Zone Details screen (Section 6) or on the Setpoint Table (Section 7). When in use, the Power Priority Active row will indicate an "x" for the appropriate zone(s).

Output Attenuation: This is another tool to handle unusual tuning situations. It is, in effect, a load limiter in the sense that it limits the highest percentage output that a zone can deliver. For example, if the Output Attenuation setting for a zone is left at 100% (default setting), there will be no effect on the output. A setting of 80% would cause the zone to provide 80% of whatever the controller would normally provide. For example, if the controller calculates that the output should be 60%, an output attenuation setting of 80 would cause the output to be 48% (80% of 60) instead of 60%.

Amp Based Tuning: This is an alternate method of tuning that can be used if the regular autotuning method is not providing excellent results. If an "x" is placed in the table, the G24 will apply Amp Based tuning to that zone. The G24 will use a value of "1" (the normal value for a tip zone) if the maximum amperage of the zone is 4 amps or less. A value of "2" (the normal value for a manifold zone) will be used if the maximum amperage of the zone is above 4 amps. The value selected will be displayed in the Actual Tuning row of the table shown in Figure 23b.

Advanced Tuning: This is the normal autotuning method and should only be changed when oscillations occur. It is the default setting. The G24 does not require an upset to the system or oscillations on start-up to make its calculations.

Save Actual Tuning to Setpoint: The **Actual Tuning** calculated tuning values can be copied to the Tuning Range Override by pressing this button. Note: This should only be done if the user wants to lock in the Actual Tuning values and to prevent the controller from making automatic changes.

Initialize Auto Select Tuning: Press this setting to re-tune the group selected at the bottom of the screen (Man/Spr in Figure 23b). The set point must be 200 degrees more than the actual temperature value to initiate a tune. The auto tune will pick from 16 different tuning values based on the thermodynamics of the zone. Manifold zones will receive a value of (20 – 27). Tip zones could receive values of (+10, +11, -20, -21, -22, -23, -24, -25, -26, -27). If the auto tune routine is unable to complete its calculation of the tuning (e.g., Even Heat is in use), the tuning settings will be set to +10. The controller will attempt to tune again the next time the zones are heated. Once the auto tune procedure is completed an "x" will appear in the Auto Select Performed row to indicate that the Actual Tuning values were calculated using the Auto Select Tuning procedure.

24
Configuration

Configuration is the assignment of zone names and addresses to thermocouple and output module hardware. Configuration of the G24 is done prior to shipment at Gammaflux per customer specifications.

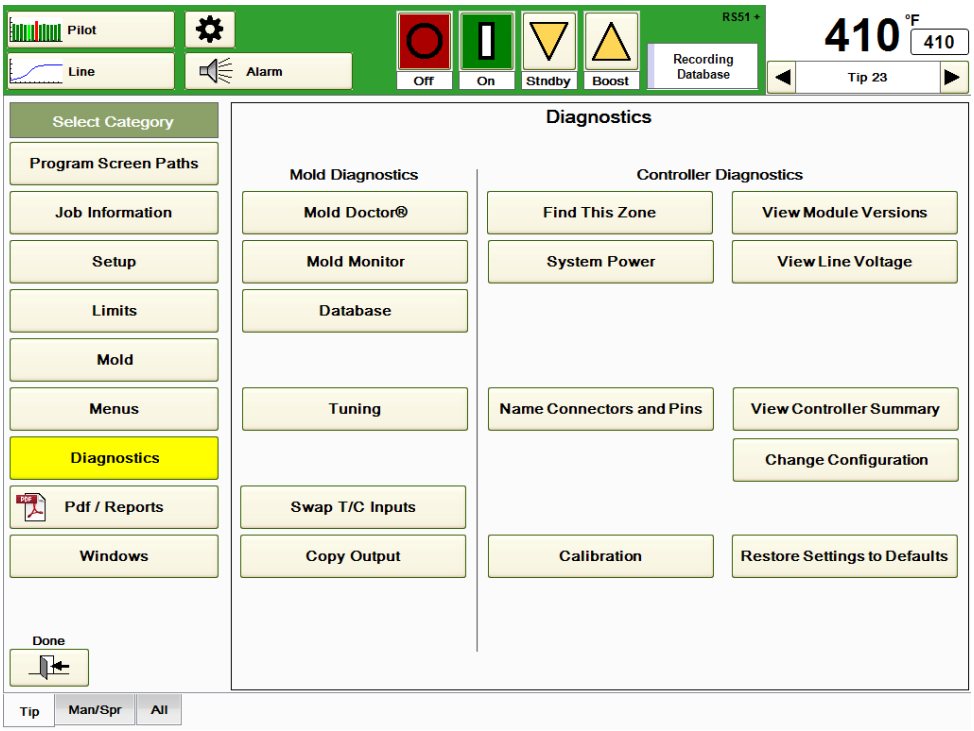


Figure 24a System Information

CHANGES MADE IN THESE AREAS CAN SIGNIFICANTLY AFFECT ON THE OPERATION OF THE G24. CHANGES SHOULD ONLY BE MADE WITH A THOROUGH UNDERSTANDING OF THEIR IMPLICATIONS. IF THERE IS ANY QUESTION ABOUT HOW TO PROCEED, CONTACT GAMMAFLUX PERSONNEL FOR ASSISTANCE.

Change Configuration: Press this button on the System Information screen in Figure 24a to access the **View Configuration** screen shown in Figure 24c. First, however, a password box and the warning box shown in Figure 24b will appear. It warns that changes can have major effects on the G24 operation and changes should only be made by expert users. All zones will be turned off by the G24. In addition to the **Edit Configuration** button, the **Locate Zones** button is here.

Edit Configuration: Select this button in Figure 24b to proceed to the View Configuration screen shown in Figure 24c. Once this screen is accessed, the Import/Export Configuration File, Block Assignment, Edit Names, Edit Addresses and Edit Connectors screens are available.

Locate Zones: This function will clear all zone names and group names and rewiring information. The G24 will determine how many zones are in the system and clear all other information.

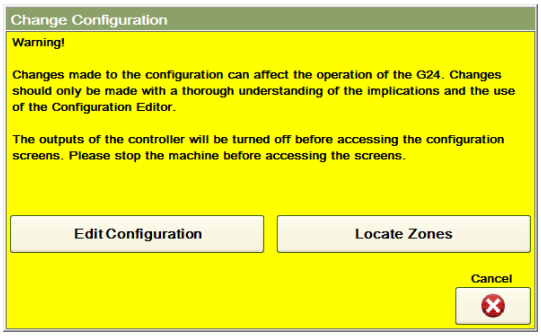


Figure 24b Edit Configuration / Locate Zones

View Configuration: The screen shown in Figure 24c shows a summary of the total configuration of the G24. Adjustments can be made on all the screens that follow. None of the changes will be finalized until the **Accept Changes** button is pressed. At that point, the changes become part of the config.sav file. If the **Exit** button is pressed instead, none of the changes made during the configuration session will be used.

View Configuration | Block Assignments | Edit Names | Edit Addresses | Edit Connectors

View Configuration

Zone	Block Number	Output Slot	Block Addr	Zone Name	Zone Index	Zone Name Used	Zone Input Addr	Zone Output Addr	Input Connector	Input Pins	Output Connector	Output Pins
1	1	1	1	Tip	1	Tip 1	1	1	T/C A	1,13	PWR A	1,13
2	1	1	2	Tip	2	Tip 2	2	2	T/C A	2,14	PWR A	2,14
3	1	2	3	Tip	3	Tip 3	3	3	T/C A	3,15	PWR A	3,15
4	1	2	4	Tip	4	Tip 4	4	4	T/C A	4,16	PWR A	4,16
5	1	3	5	Tip	5	Tip 5	5	5	T/C A	5,17	PWR A	5,17
6	1	3	6	Tip	6	Tip 6	6	6	T/C A	6,18	PWR A	6,18
7	1	4	7	Tip	7	Tip 7	7	7	T/C A	7,19	PWR A	7,19
8	1	4	8	Tip	8	Tip 8	8	8	T/C A	8,20	PWR A	8,20
9	1	5	9	Tip	9	Tip 9	9	9	T/C A	9,21	PWR A	9,21
10	1	5	10	Tip	10	Tip 10	10	10	T/C A	10,22	PWR A	10,22
11	1	6	11	Tip	11	Tip 11	11	11	T/C A	11,23	PWR A	11,23
12	1	6	12	Tip	12	Tip 12	12	12	T/C A	12,24	PWR A	12,24
13	1	7	13	Tip	13	Tip 13	13	13	T/C B	1,13	PWR B	1,13
14	1	7	14	Tip	14	Tip 14	14	14	T/C B	2,14	PWR B	2,14
15	1	8	15	Tip	15	Tip 15	15	15	T/C B	3,15	PWR B	3,15
16	1	8	16	Tip	16	Tip 16	16	16	T/C B	4,16	PWR B	4,16
17	1	9	17	Tip	17	Tip 17	17	17	T/C B	5,17	PWR B	5,17
18	1	9	18	Tip	18	Tip 18	18	18	T/C B	6,18	PWR B	6,18
19	1	10	19	Tip	19	Tip 19	19	19	T/C B	7,19	PWR B	7,19
20	1	10	20	Tip	20	Tip 20	20	20	T/C B	8,20	PWR B	8,20
21	1	11	21	Tip	21	Tip 21	21	21	T/C B	9,21	PWR B	9,21
22	1	11	22	Tip	22	Tip 22	22	22	T/C B	10,22	PWR B	10,22
23	1	12	23	Tip	23	Tip 23	23	23	T/C B	11,23	PWR B	11,23
24	1	12	24	Tip	24	Tip 24	24	24	T/C B	12,24	PWR B	12,24
25	2	1	1	Tip	25	Tip 25	25	25	T/C C	1,13	PWR C	1,13
26	2	1	2	Tip	26	Tip 26	26	26	T/C C	2,14	PWR C	2,14
27	2	2	3	Tip	27	Tip 27	27	27	T/C C	3,15	PWR C	3,15
28	2	2	4	Tip	28	Tip 28	28	28	T/C C	4,16	PWR C	4,16
29	2	3	5	Tip	29	Tip 29	29	29	T/C C	5,17	PWR C	5,17

Configuration OK
Number of zones = 40

Accept Changes

Exit, Do not change anything

Figure 24c View Configuration

Block Assignment: Each G24 controller consists of "blocks". Each block houses up to 24 zones. Therefore, a 40-zone controller could consist of 2 blocks as shown in Figure 24d. It may be desirable to change the order of the blocks on a system which would, in effect, change the order of the zones as they appear in the screens. Normally, in a 40-zone system the first 24 zones would be on the first block with the remaining 16 zones would reside in the second block. The order of the blocks can be changed on this screen. To make a change, select the block to be moved, move it up or down with the appropriate arrow on the bottom left side of

the screen and press **Save**. Changes are not put into effect until the **Save** button is pressed and the **Accept Changes** button is pressed on the View Configuration screen. Once this is done, visual confirmation can be accomplished by returning to the Block Assignments screen and pressing the block to be reviewed. The LEDs on the output modules for that block will blink, toggling back and forth between red and green.

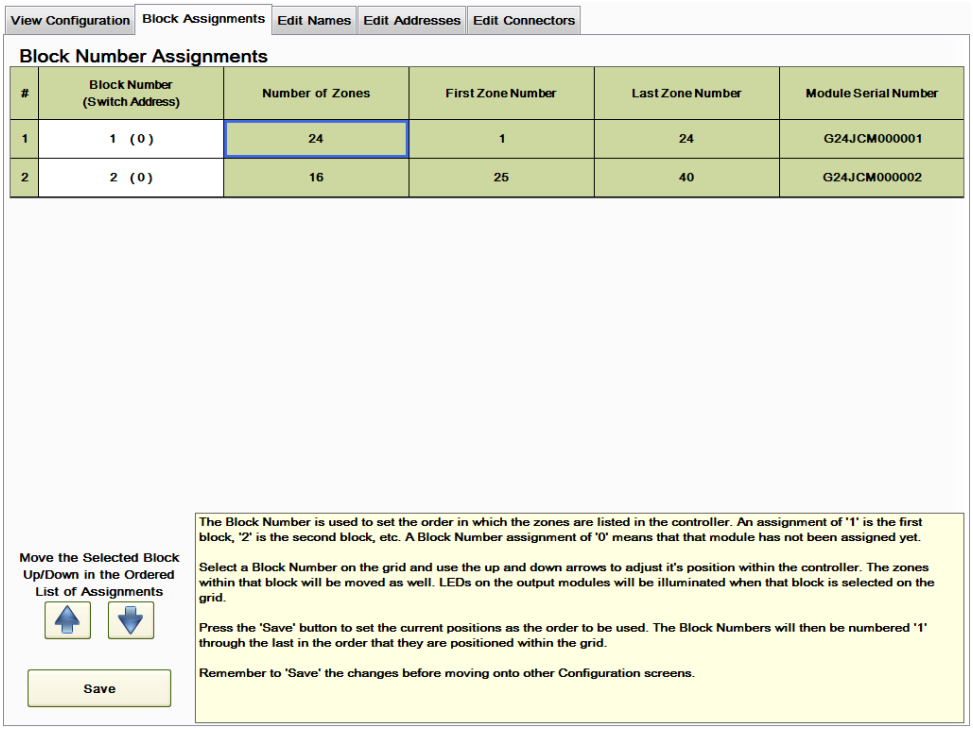


Figure 24d Block Assignment

Edit Names: The names of the zones can be edited by pressing the Edit Names tab which accesses the screen shown in Figure 24e.
To change the names of the zones:

1) In the lower left, select the range of zones that are to be renamed (Zones 33-39 for Figure 24f).
2) Press the Select Zone ID button to select from the various popular label names such as Tip, Man, etc. If the desired label is not shown in the dropdown box, a new label can be created using the **Add New ID to List** button on the right and typing in the new label name. Choose the label desired (Man in Figure 24e for Zones 33-39).
3) Select the **Start Numbering With** box. Enter the number for the first zone that is being changed. For example, if Tip is chosen and the first tip zone is to be called Tip 1, enter a "1". Normally this will be set to 1.
4) Press the **Set Zones Name** button to make the changes. In the example shown in Figure 24e, pressing the Set Zones Name button caused the name of Zones 33-39 to change to Man 1-32. Press the **Reverse Range** and **Set Zone Name** buttons to reverse the order of the zone names (this would change the name of Man 1 to Man 7). The changes are not official until the **Save** button is pressed and the **Accept Changes** button is pressed on the View Configuration screen.

Remove ID from List: Unneeded labels can be removed from the Select Zone ID dropdown box by selecting the label and pressing this button.

Edit Grid Information: If this box is selected, individual zones can be renamed using the popup keyboard.

View Configuration | Block Assignments | Edit Names | Edit Addresses | Edit Connectors

Edit Zone Names

Zone	Block Number	Output Slot	Zone Name	Zone Index	Zone Name Used	Input Connector	Input Pins	Output Connector	Output Pins
20	1	10	Tip	20	Tip 20	T/C B	8,20	PWR B	8,20
21	1	11	Tip	21	Tip 21	T/C B	9,21	PWR B	9,21
22	1	11	Tip	22	Tip 22	T/C B	10,22	PWR B	10,22
23	1	12	Tip	23	Tip 23	T/C B	11,23	PWR B	11,23
24	1	12	Tip	24	Tip 24	T/C B	12,24	PWR B	12,24
25	2	1	Tip	25	Tip 25	T/C C	1,13	PWR C	1,13
26	2	1	Tip	26	Tip 26	T/C C	2,14	PWR C	2,14
27	2	2	Tip	27	Tip 27	T/C C	3,15	PWR C	3,15
28	2	2	Tip	28	Tip 28	T/C C	4,16	PWR C	4,16
29	2	3	Tip	29	Tip 29	T/C C	5,17	PWR C	5,17
30	2	3	Tip	30	Tip 30	T/C C	6,18	PWR C	6,18
31	2	4	Tip	31	Tip 31	T/C C	7,19	PWR C	7,19
32	2	4	Tip	32	Tip 32	T/C C	8,20	PWR C	8,20
33	2	5	Man	1	Man 1	T/C D	1,13	PWR D	1,13
34	2	5	Man	2	Man 2	T/C D	2,14	PWR D	2,14
35	2	6	Man	3	Man 3	T/C D	3,15	PWR D	3,15
36	2	6	Man	4	Man 4	T/C D	4,16	PWR D	4,16
37	2	7	Man	5	Man 5	T/C D	5,17	PWR D	5,17
38	2	7	Man	6	Man 6	T/C D	6,18	PWR D	6,18
39	2	8	Man	7	Man 7	T/C D	7,19	PWR D	7,19
40	2	8	Sprue	1	Sprue 1	T/C D	8,20	PWR D	8,20

2- Select a Zone ID

(New Zone ID)
Zone
Tip
Man
Sprue
Spare
Nozzle
Drop
Probe
Bridge
XMan
Mat A
Mat B
Mat C
Mat D

1- Select Range of Zones

From 33 – To 39

Start Numbering With 1

Reverse Range

Edit Grid Information

7 Zones selected
System zones 33 - 39

Edit the Selected Zone ID

Man

3- Set

Set Zone Names

Figure 24e Edit Names

Edit Addresses: This screen, as shown in Figure 24g, can be used to swap the thermocouple inputs and copy outputs from one zone to others in software.

View Configuration | Block Assignments | Edit Names | Edit Addresses | Edit Connectors

Edit Input and Output Assignments

Zone	Zone Name Used	Zone Input Addr	Zone Output Addr	Input Connector	Input Pins	Output Connector	Output Pins
1	Tip 1	1	1	T/C A	1,13	PWR A	1,13
2	Tip 2	2	2	T/C A	2,14	PWR A	2,14
3	Tip 3	3	3	T/C A	3,15	PWR A	3,15
4	Tip 4	4	4	T/C A	4,16	PWR A	4,16
5	Tip 5	5	5	T/C A	5,17	PWR A	5,17
6	Tip 6	6	6	T/C A	6,18	PWR A	6,18
7	Tip 7	7	7	T/C A	7,19	PWR A	7,19
8	Tip 8	8	8	T/C A	8,20	PWR A	8,20
9	Tip 9	9	9	T/C A	9,21	PWR A	9,21
10	Tip 10	10	10	T/C A	10,22	PWR A	10,22
11	Tip 11	11	11	T/C A	11,23	PWR A	11,23
12	Tip 12	12	12	T/C A	12,24	PWR A	12,24
13	Tip 13	13	13	T/C B	1,13	PWR B	1,13
14	Tip 14	14	14	T/C B	2,14	PWR B	2,14
15	Tip 15	15	15	T/C B	3,15	PWR B	3,15
16	Tip 16	16	16	T/C B	4,16	PWR B	4,16

Select Range of Zones

From 13 – To 24

Undo Last Swap or Copy

Remove All Rewiring

Edit Grid Information

Swap Inputs | Copy Outputs

Select First Zone

Select Second Zone

Inputs Tip 1 - Tip 12
12 Zones

Inputs Tip 13 - Tip 24
12 Zones

Outputs Tip 1 - Tip 12
System Zones 1 - 12

Outputs Tip 13 - Tip 24
System Zones 13 - 24

Swap Inputs

Use the 'Swap Input' function to change the assignment of thermocouples.
It is most commonly used when it is discovered that two or more thermocouples are wired incorrectly in the tool. The inputs can be swapped temporarily without having to take the time to open the tool and correct the problem.

Figure 24f Edit Addresses (Swap Inputs)

Swap Inputs: This is most commonly used when it is discovered that two or more thermocouples are wired incorrectly in the tool. Instead of taking the time to open the tool and correct the problem, it may be desirable to temporarily change the thermocouple assignment in software. Gammaflux recommends that the physical wiring error be corrected instead of just swapping the thermocouple inputs in software. In the example shown in Figure 24f, Tip 1-12 is swapping thermocouples with Tip 13-24.

To Swap Inputs:

1) Press the **Swap Input**s tab shown in Figure 24f.
2) Select the Zone or Range of Zones that are the first to be swapped. In the example shown in Figure 24f, the first **Range of Zones** selected were Zones 1-12 (Tips 1-12). The first selection is highlighted in blue. If only one zone is selected, it can simply be touched in the **Zone Input** column.
3) Select the Zone or Range of Zones that are to be swapped with the Range of Zones selected in step 2. In the example shown in Figure 24f, the second Range of Zones selected were Zones 13-24 (Tips 13-24). The second selection is highlighted in pink. If only one zone is selected, it can simply be touched in the **Zone Input** column.
4) Press **Swap Inputs**. The swap will not actually occur until **Accept Changes** is pressed on the View Configuration screen shown in Figure 24c.

Copy Outputs: This is most commonly used when a thermocouple fails in a zone. Instead of putting the zone in manual mode, it may be desirable to use the same output percentage as another zone. In the example shown in Figure 24g, Man 2's output is being copied to Man 3.

1) Press the **Copy Outputs** tab shown in Figure 24g.
2) Select the Zone or Range of Zones that are to be copied. In the example shown in Figure 24g, the **Range of Zones** selected were Zones 34-34 (Man 2). The first selection is highlighted in blue. If only one zone is selected as it was in this case, it can simply be touched in the **Zone Input** column.
3) Select the Zone or Range of Zones that are to be copied to with the Range of Zones selected in step 2. In the example shown in Figure 24g, the Range of Zones selected were Zones 35-35 (Man 3). The second selection is highlighted in pink. If only one zone is selected, it can simply be touched in the **Zone Input** column.
4) Press **Copy Outputs**. This will not actually occur until **Accept Changes** is pressed on the View Configuration screen shown in Figure 24c.

The **Undo Last Swap or Copy** and **Remove All Rewiring** buttons can be used to void the last change or all changes made during this session. The **Edit Grid Information** can be pressed to enable the user to make individual assignment changes in the Zone Input and Zone Output columns.

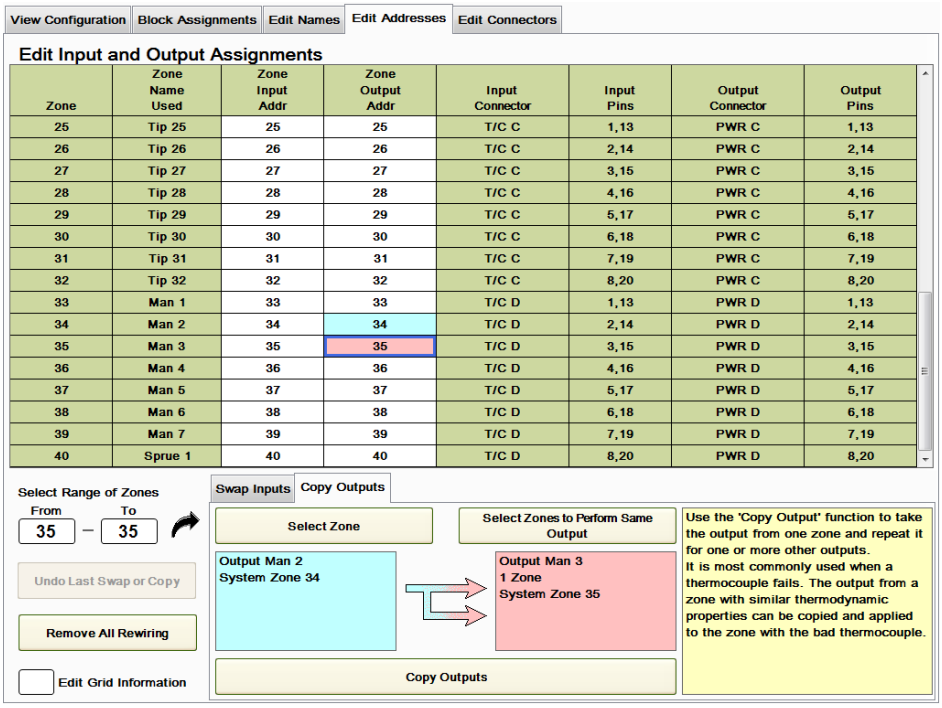


Figure 24g Edit Addresses (Copy Outputs)

Edit Connectors: This screen, as shown in Figure 24h, can be used to change the names of the connectors and the associated pin numbers. It is very similar to the functionality of the Name Connectors and Pins feature described in the Diagnostics Section (Section 19). The actual wiring is not changed, just the labels of the connectors and what pin numbers are associated with the zone. For example, the user may want to change the labels on the thermocouple cables from T/C 1,2,3 to T/C A,B,C).

To edit the connectors' names:

1) Press the **Select Connector** tab shown in Figure 24h.
2) Select of number of pins in the connector being edited in the **Number Of Pins Per Connector** box.
3) Select the zone numbers in the **Select Range of Zones** area. In the example shown in Figure 24h, Zones 1-12 (Tips 1-12) are selected. Another way to select the range of zones is to touch the first zone that is being edited in the Input or Output connector column. The selected area will be highlighted in blue.
4) Choose the new name of the connector from the list of suggestions in the **Select Connector** dropdown box (T/C A in Figure 24h). The suggested names in this table can be added to or deleted by using the **Add New Connector to List** or **Remove Connector from List** buttons.
5) Press the **Set Connector Names** button to make the change. The swap is not official until the **Accept Changes** button is pressed on the View Configuration screen. The **Undo Last Change** button can be used to void the last change.

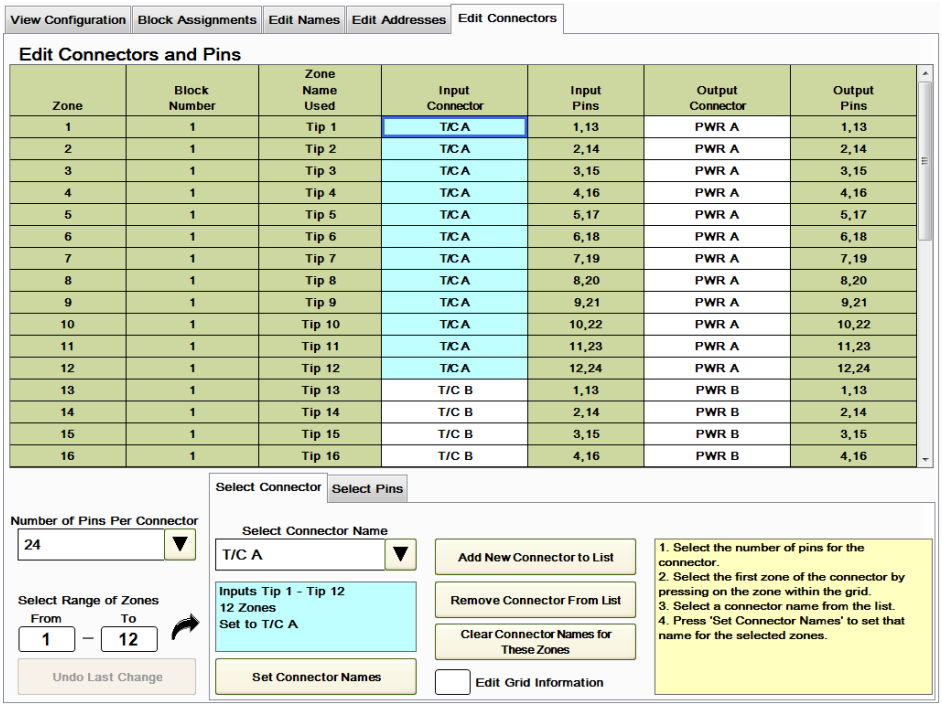


Figure 24h Edit Connectors (Select Connector)

To edit the pin numbers:

1) Press the **Select Pins** tab shown in Figure 24i.
2) Select of number of pins in the connector being edited in the **Number Of Pins Per Connector** box.
3) Select the zone numbers in the **Select Range of Zones** area. In the example shown in Figure 24i, Zones 1-12 (Tips 1-12) are selected. Another way to select the range of zones is to touch the first zone that is being edited in the Input or Output connector column. The selected area will be highlighted in blue.
4) Choose the pin numbering pattern using the **Select a Numbering Pattern** box. A list of the common pin patterns are listed in the dropdown box. In Figure 24i, (1,13), (2,14), (3,15) … were used. The suggested pin patterns in this table can be added to or deleted by using the **Add Pins to List** or **Remove Pins from List** buttons.
5) Press the **Set Pin Numbers** button to make the change. The swap is not official until the **Accept Changes** button is pressed on the View Configuration screen. The **Undo Last Change** button can be used to void the last change.

Clear Connector Names for These Zones: Press this button to erase the connector names for the blue highlighted zones.
Enter Grid Information: Press this button to manually enter connector in the Input Connector and Output Connector columns using the popup keyboard.

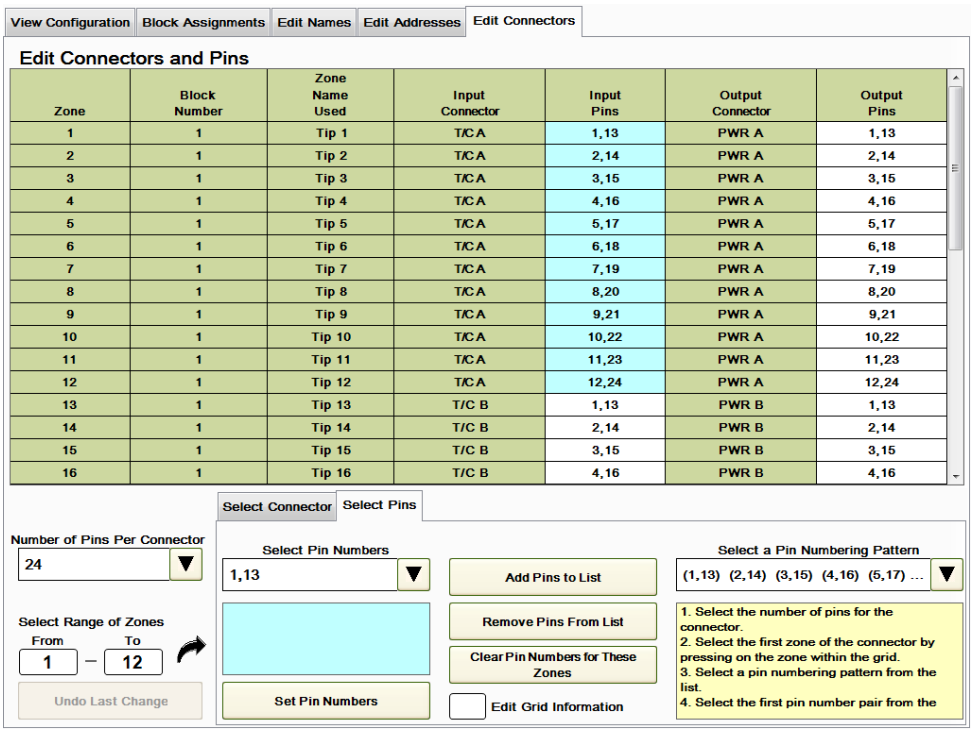


Figure 24i Edit Connectors (Select Pins)

25
Calibration

Field Calibrator is an off - line procedure that can be performed at the convenience of the user. A calibrated thermocouple simulator is required to provide an accurate thermocouple signal to the G24. If the user does not have a calibrated thermocouple source, one can be obtained from a variety of sources such as the Omega CL125 Digital Temperature Calibrator available from Omega Engineering in Stamford, CT at www.omega.com.

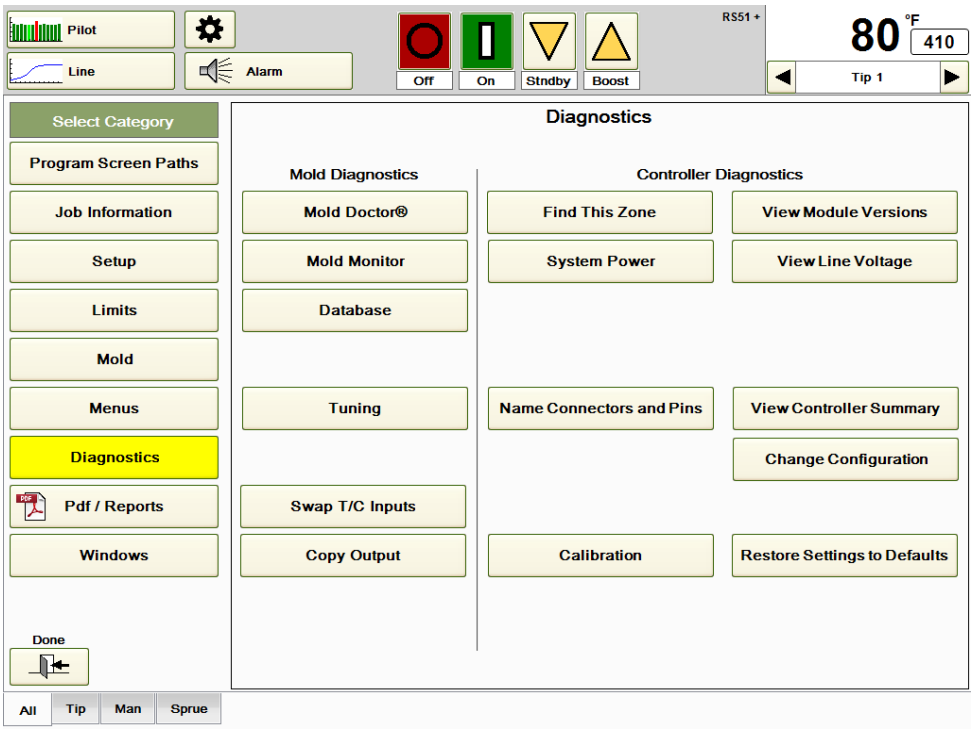
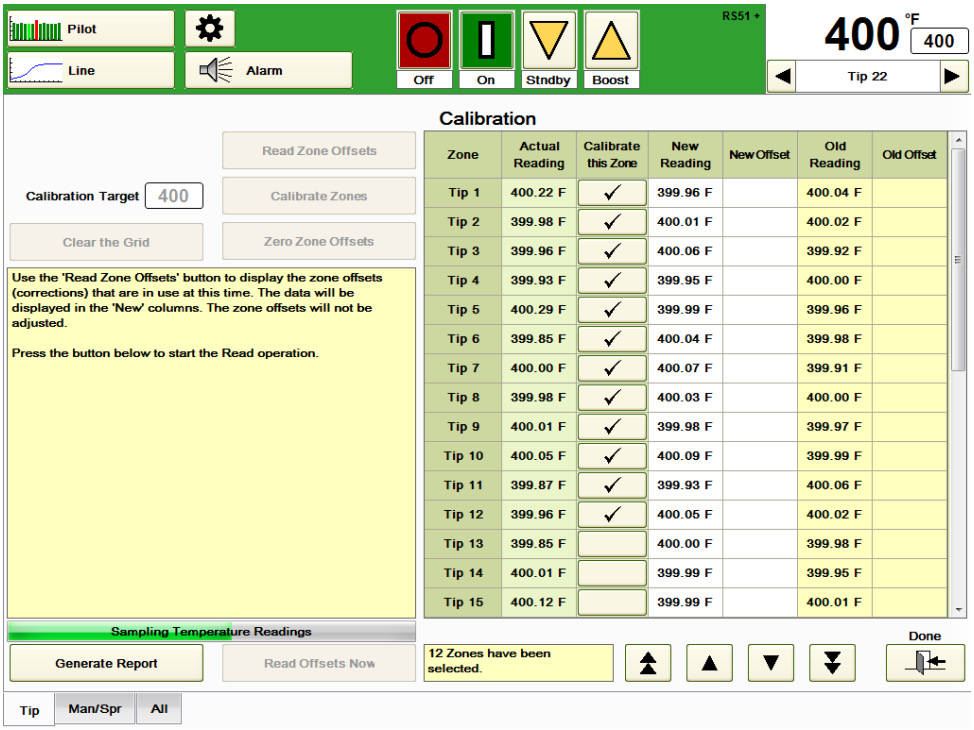


Figure 25a Diagnostics

During calibration, the target temperature is compared against the incoming thermocouple signal. Any error found between the target and the actual is corrected by the G24 assigning a **New Offset** for each zone. The controller remembers both the **New Offset** and the **Old Offset**, which was the setting from the previous calibration procedure. Pressing the **Calibration** button will cause the screen in Figure 25b to appear.



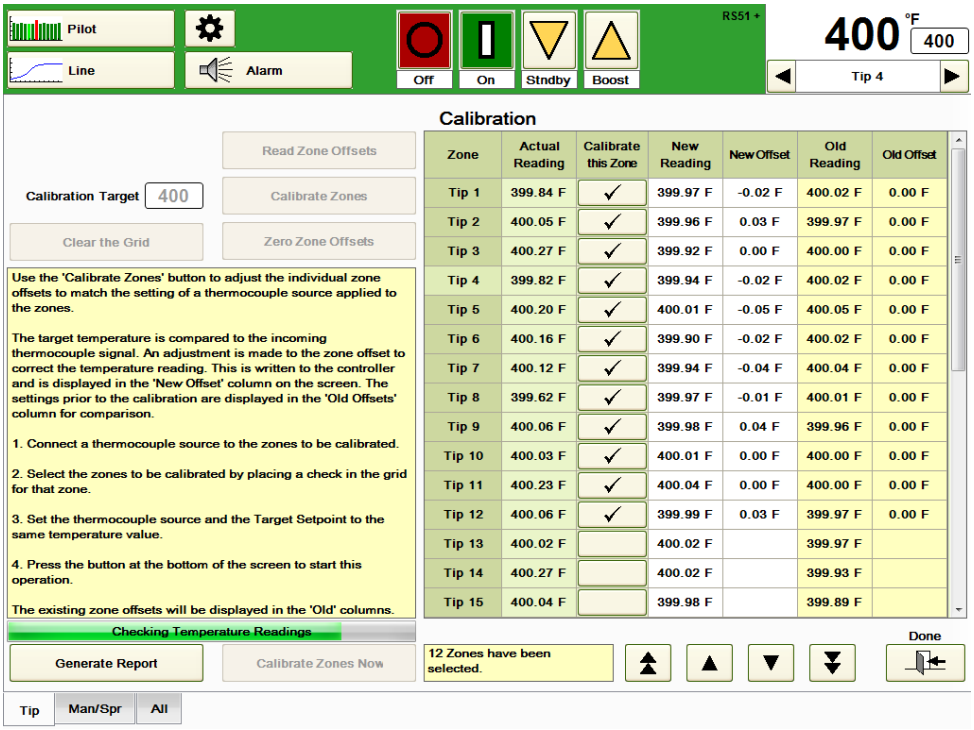
Zone	Actual Reading	Calibrate this Zone	New Reading	New Offset	Old Reading	Old Offset
Tip 1	400.22 F	✓	399.96 F		400.04 F	
Tip 2	399.98 F	✓	400.01 F		400.02 F	
Tip 3	399.96 F	✓	400.06 F		399.92 F	
Tip 4	399.93 F	✓	399.95 F		400.00 F	
Tip 5	400.29 F	✓	399.99 F		399.96 F	
Tip 6	399.85 F	✓	400.04 F		399.98 F	
Tip 7	400.00 F	✓	400.07 F		399.91 F	
Tip 8	399.98 F	✓	400.03 F		400.00 F	
Tip 9	400.01 F	✓	399.98 F		399.97 F	
Tip 10	400.05 F	✓	400.09 F		399.99 F	
Tip 11	399.87 F	✓	399.93 F		400.06 F	
Tip 12	399.96 F	✓	400.05 F		400.02 F	
Tip 13	399.85 F		400.00 F		399.98 F	
Tip 14	400.01 F		399.99 F		399.95 F	
Tip 15	400.12 F		399.99 F		400.01 F	

Figure 25b Read Zone Offsets

To calibrate the G24:

1) Choose a temperature on the external calibration input source (400F is a common choice).
2) Set the **Calibration Target** setting to the same temperature.
3) Select the group tab for the group that is to be calibrated.
4) Place a check in the **Calibrate this Zone** column for each zone that is to be calibrated.
5) Make sure the calibration input source is providing a signal to all the checked zones in the Calibrate this Zone column. A connector can be made up by the user that would have all the positive thermocouple signal pins jumpered together and another jumper that would be used to jumper all the negative thermocouple signal pins together. Then, the thermocouple simulator could be wired to one pair on the connector and plugged into the appropriate thermocouple connector on the back of the G24 enclosure. This will enable the user to calibrate the zones in groups instead of one zone at a time.
6) Select **Read Zone Offsets** and then **Read Offsets Now** at the bottom of the screen. The temperature reading of each zone will be displayed in the **New Reading** column. The new Zone Offsets will be shown in the **New Offset** column as shown in Figure 25b. The box below the table shows the number of zones selected.
7) To replace the existing Zone Offsets with newly calibrated values, press **Calibrate Zones.** Then press **Calibrate Zones Now**. When Calibration is performed, the existing temperature readings (in the **New Reading** column) and Zone Offsets will shift over to the Old Reading and Old Offset columns. The new calibration data will take its place in the New Reading and New Offset columns. New data will be shown with a white background.
8) If a mistake is made or if the operator wants to redo the calibration, **Zero Zone Offsets** can be used to set the offsets to zero in the G24 as it was shipped from the factory. Also, **Clear the Grid** can be used to clear the table so that new data is easier to read.
9) Press **Generate Report** if a report is required. It will be saved in the D:\G24\Reports directory.
10) Press **Done**.

This group is now calibrated. Calibration has an accuracy of ± 0.2º F or ± 0.1º C.



Zone	Actual Reading	Calibrate this Zone	New Reading	New Offset	Old Reading	Old Offset
Tip 1	399.84 F	✓	399.97 F	-0.02 F	400.02 F	0.00 F
Tip 2	400.05 F	✓	399.96 F	0.03 F	399.97 F	0.00 F
Tip 3	400.27 F	✓	399.92 F	0.00 F	400.00 F	0.00 F
Tip 4	399.82 F	✓	399.94 F	-0.02 F	400.02 F	0.00 F
Tip 5	400.20 F	✓	400.01 F	-0.05 F	400.05 F	0.00 F
Tip 6	400.16 F	✓	399.90 F	-0.02 F	400.02 F	0.00 F
Tip 7	400.12 F	✓	399.94 F	-0.04 F	400.04 F	0.00 F
Tip 8	399.62 F	✓	399.97 F	-0.01 F	400.01 F	0.00 F
Tip 9	400.06 F	✓	399.98 F	0.04 F	399.96 F	0.00 F
Tip 10	400.03 F	✓	400.01 F	0.00 F	400.00 F	0.00 F
Tip 11	400.23 F	✓	400.04 F	0.00 F	400.00 F	0.00 F
Tip 12	400.06 F	✓	399.99 F	0.03 F	399.97 F	0.00 F
Tip 13	400.02 F		400.02 F		399.97 F	
Tip 14	400.27 F		400.02 F		399.93 F	
Tip 15	400.04 F		399.98 F		399.89 F	

Figure 25c Calibrate Zones

26
Pdf /Reports

The Pdf / Reports screen includes links to all Pdfs, reports and databases.

Databases are described in Section 22 Databases.

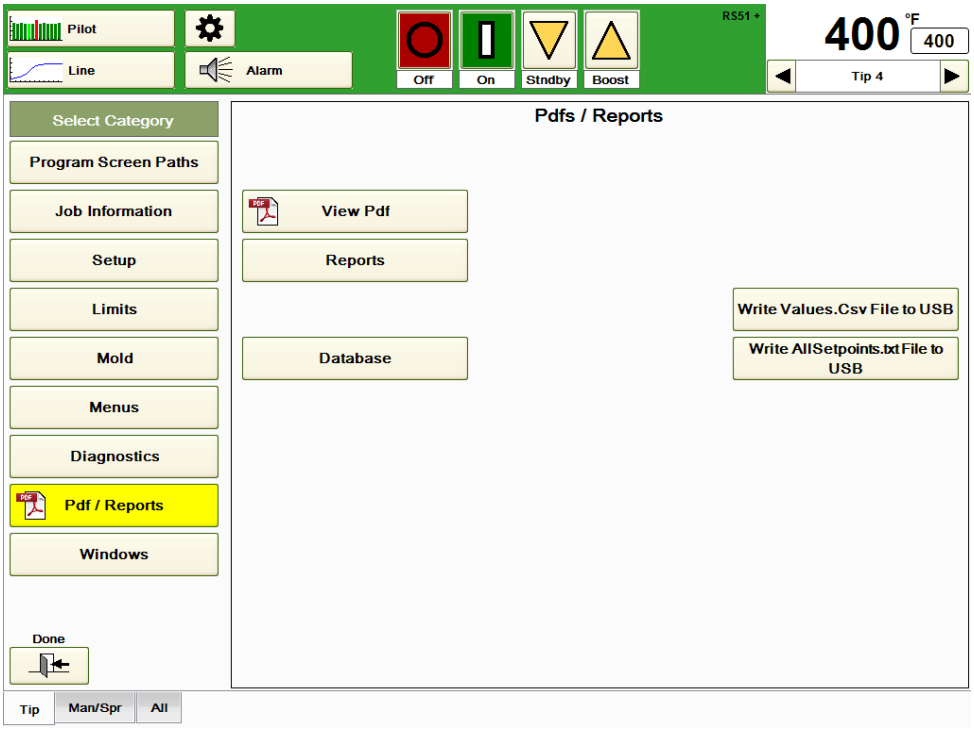


Figure 26a Pdfs / Reports

Write the Values.csv file to USB: The **Values.csv** file contains the temperature value, % output and amperage of each zone. Press this button to load the latest values to a USB drive. This button does not update the Values.csv file that is in the D:\G24\Network directory. All values will be transferred in Degrees F unless selected otherwise in the Setup Network Access section described in Section 27 Windows. See Setup Network Access in Section 27 Windows for my setup options.

Write the AllSetpoints.txt file to USB: The **AllSetpoints.txt** file contains the temperature setpoint, on/off status, auto/manual status and % manual output percentage setpoint for each zone. Press this button to load the latest setpoints to a USB drive. This button does not update the AllSetpoints.txt file that is in the D:\G24\Network directory. All setpoints will be transferred in Degrees F unless selected otherwise in the Setup Network Access section described in Section 27 Windows. See Setup Network Access in Section 27 Windows for my setup options.

View Pdf: Press this button to view the screen shown in Figure 26b.

To view a Pdf report:
1) Press the Find Pdf Report button shown in Figure 26b.
2) Select the folder from the popup box that appears showing all the folders that contain Pdf reports. The Pdf reports in that folder will appear in the **Select a Pdf File** column on the left hand side of the screen.
3) Select the desired Pdf report (DataSummary 03m_07d_17h) from the Select a Pdf File column. The selected file will then appear in the Pdf File Selected box in the center of the screen.
4) Press the **View Pdf** button. The report will appear on the screen in a similar fashion to the Data Summary Report does in Figure 26c.

Pdf files can be copied to or from a USB drive using the **Copy Reports to USB** or **Copy From USB** buttons. Files can be deleted using the **Delete** button. The **Select All Pdf Files** and **Select Multiple Pdf Files** buttons can be used to select all Pdfs or a group of selected Pdfs in the **Select a Pdf** column.

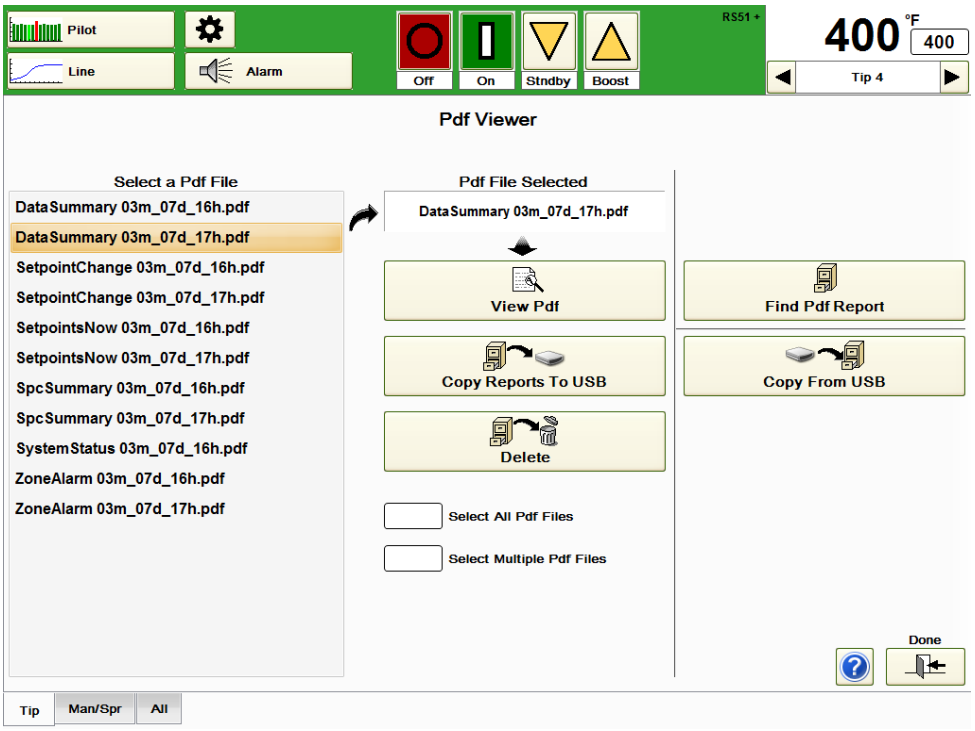
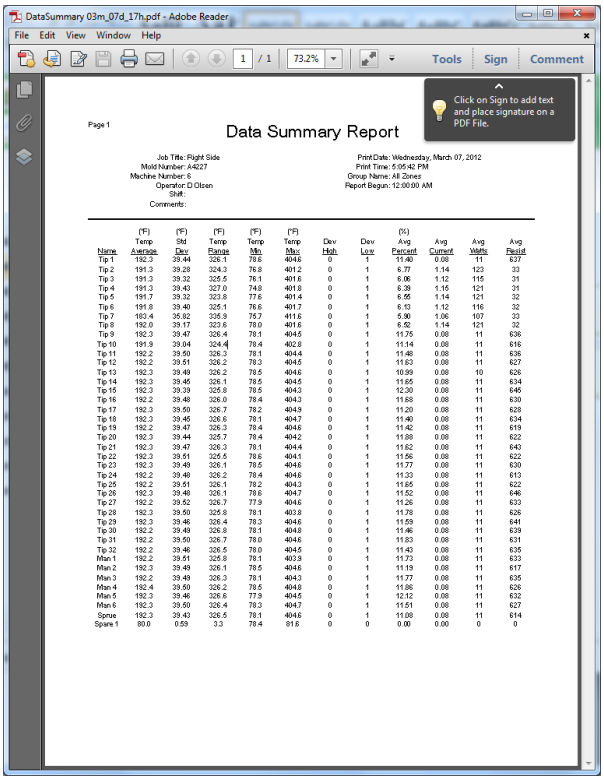


Figure 26b Pdf Viewer (Pdf Viewer)



DataSummary 03m_07d_17h.pdf - Adobe Reader

File Edit View Window Help

1 / 1 73.2% Tools Sign Comment

Click on Sign to add text and place signature on a PDF File.

Page 1

Data Summary Report

Job Title: Right Side
Mold Number: A4227
Machine Number: 6
Operator: D Olsen
Shift:
Comments:

Print Date: Wednesday, March 07, 2012
Print Time: 5:05:42 PM
Group Name: All Zones
Report Begun: 12:00:00 AM

Name	(°F) Temp Average	(°F) Std Dev	(°F) Temp Range	(°F) Temp Min	(°F) Temp Max	Dev High	Dev Low	(%) Avg Percent	Avg Current	Avg Watts	Avg Restrt
Tip 1	192.3	39.44	326.1	78.6	404.6	0	1	11.40	0.08	11	637
Tip 2	191.3	39.28	324.3	76.8	401.2	0	1	6.77	1.14	123	33
Tip 3	191.3	39.32	325.5	76.1	401.6	0	1	6.06	1.12	115	31
Tip 4	191.3	39.40	327.0	74.0	401.0	0	1	6.29	1.15	121	31
Tip 5	191.7	39.32	323.8	77.6	401.4	0	1	6.55	1.14	121	32
Tip 6	191.8	39.40	325.1	76.6	401.7	0	1	6.13	1.12	116	32
Tip 7	193.4	35.92	325.9	75.7	411.6	0	1	5.90	1.06	107	33
Tip 8	192.0	39.17	323.6	78.0	401.6	0	1	6.52	1.14	121	32
Tip 9	192.3	39.47	326.4	78.1	404.5	0	1	11.75	0.08	11	636
Tip 10	191.9	39.04	324.4	78.4	402.8	0	1	11.14	0.08	11	616
Tip 11	192.2	39.50	326.3	78.1	404.4	0	1	11.48	0.08	11	636
Tip 12	192.2	39.51	326.2	78.3	404.5	0	1	11.63	0.08	11	627
Tip 13	192.3	39.49	326.2	78.5	404.6	0	1	10.99	0.08	10	626
Tip 14	192.3	39.45	326.1	78.5	404.5	0	1	11.65	0.08	11	634
Tip 15	192.3	39.39	325.8	78.5	404.3	0	1	12.30	0.08	11	646
Tip 16	192.2	39.48	326.0	78.4	404.3	0	1	11.68	0.08	11	630
Tip 17	192.3	39.50	326.7	78.2	404.9	0	1	11.20	0.08	11	628
Tip 18	192.3	39.45	326.6	78.1	404.7	0	1	11.40	0.08	11	634
Tip 19	192.2	39.47	326.3	78.4	404.6	0	1	11.42	0.08	11	619
Tip 20	192.3	39.44	325.7	78.4	404.2	0	1	11.88	0.08	11	622
Tip 21	192.3	39.47	326.3	78.1	404.4	0	1	11.62	0.08	11	643
Tip 22	192.3	39.51	325.5	79.5	404.1	0	1	11.56	0.08	11	622
Tip 23	192.3	39.49	326.1	78.5	404.6	0	1	11.77	0.08	11	630
Tip 24	192.2	39.48	326.2	78.4	404.6	0	1	11.33	0.08	11	613
Tip 25	192.2	39.51	326.1	78.2	404.3	0	1	11.65	0.08	11	622
Tip 26	192.3	39.48	326.1	78.6	404.7	0	1	11.52	0.08	11	646
Tip 27	192.2	39.52	326.7	77.9	404.6	0	1	11.26	0.08	11	633
Tip 28	192.3	39.50	325.9	79.1	403.8	0	1	11.79	0.08	11	626
Tip 29	192.3	39.46	326.4	78.3	404.6	0	1	11.59	0.08	11	641
Tip 30	192.2	39.49	326.8	78.1	404.8	0	1	11.46	0.08	11	639
Tip 31	192.2	39.50	326.7	78.0	404.6	0	1	11.83	0.08	11	631
Tip 32	192.2	39.46	326.5	78.0	404.5	0	1	11.43	0.08	11	635
Man 1	192.2	39.51	325.8	78.1	403.9	0	1	11.73	0.08	11	633
Man 2	192.3	39.49	326.1	78.5	404.6	0	1	11.19	0.08	11	617
Man 3	192.2	39.49	326.3	78.1	404.3	0	1	11.77	0.08	11	635
Man 4	192.4	39.50	326.2	78.5	404.8	0	1	11.96	0.08	11	626
Man 5	192.3	39.46	326.6	77.9	404.5	0	1	12.12	0.08	11	632
Man 6	192.3	39.50	326.4	78.3	404.7	0	1	11.51	0.08	11	627
Sprue	192.3	39.43	326.5	78.1	404.6	0	1	11.08	0.08	11	614
Spare 1	80.0	0.59	3.3	78.4	81.6	0	0	0.00	0.00	0	0

Figure 26c Data Summary Report

Reports: The G24 can generate a wide array of useful reports. Press the **Reports** button in Figure 26a to see the **Report Selection** screen shown in Figure 26d. The reports can be viewed, saved and printed.

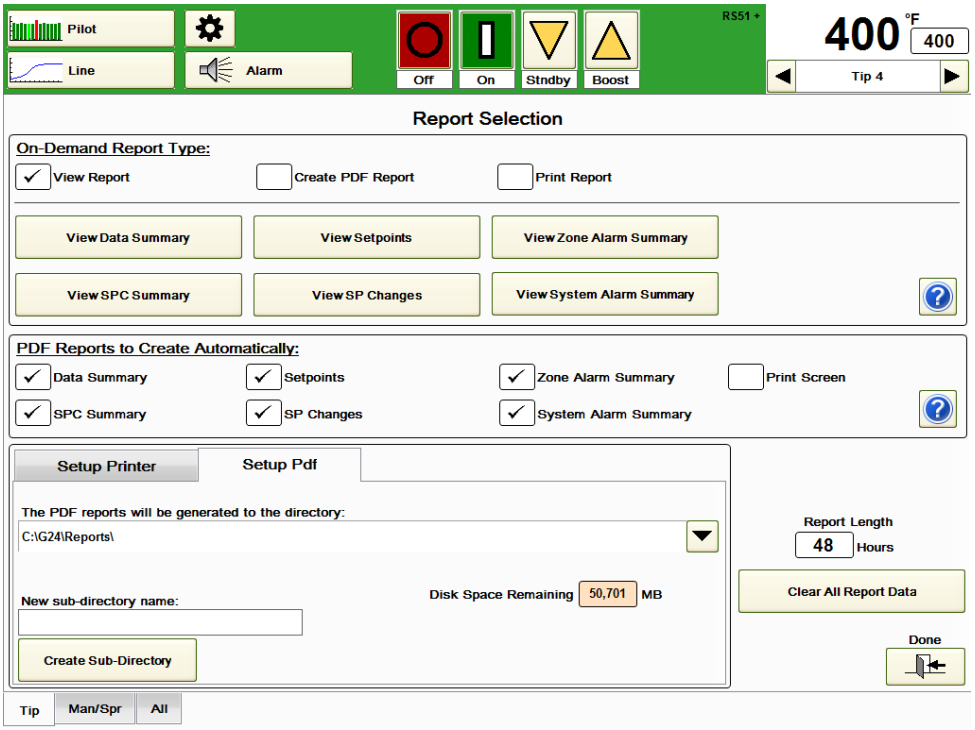


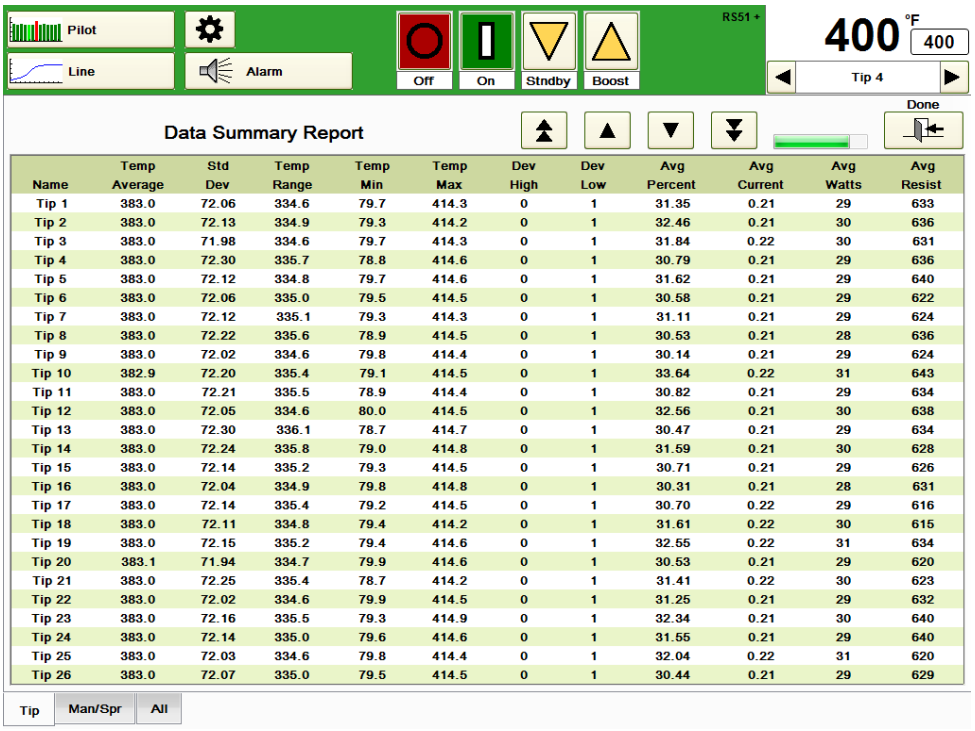
Figure 26d Report Selection

A report can be handled in three ways:
View Report: Select this box (as shown in Figure 26d) if the report is only to be viewed, not saved or printed.
Create PDF Report: Select this box to save a report as a PDF file. The report selected will be date-stamped and saved in a subdirectory (formatted as YYYY_MM) of the G24\Reports directory. The report name will include the type of report along with date and hour. For example, an SPC Summary report saved on July 10, 2012 at 2:00 PM would be saved as: D:\G24\Reports\2012_07\SpcSummary 07m_10d_14i.pdf.
If more than one report of the same type is saved in the same hour, the file names will have letters added to the name such as D:\G24\Reports\2012_07\SpcSummary 07m_10d_14i_A.pdf.
Print Report: Select this box to immediately print a report to the printer that has been setup using the Setup Printer button on this same screen.

The G24 controller can be set up to automatically save reports as Pdf files:
PDF Reports to Create Automatically: Check the boxes that are to be automatically saved. The files will be saved automatically when the report collects data for the amount of time shown in the Report Length box. The files will be saved to the G24/Reports directory unless a different location is chosen in the **"New sub-directory name:"** box under the **"The PDF reports will be generated to the directory:"** tab as shown in Figure 26d. The **Disk Space Remaining** is also shown in the Setup Pdf section of the screen. Reports will be saved for one year and then automatically erased to save computer drive space. Any files that are to be permanently saved should be moved to another directory to avoid deletion.
The length of any report can be set using the **Report Length** setting on this page. The report length can be set from .1 hour to 48 hours.

The **Clear All Report Data** button should be pressed to start a report over. This may be handy whenever a problem in a tool is fixed and the operator wants the data to reflect conditions after the fix.

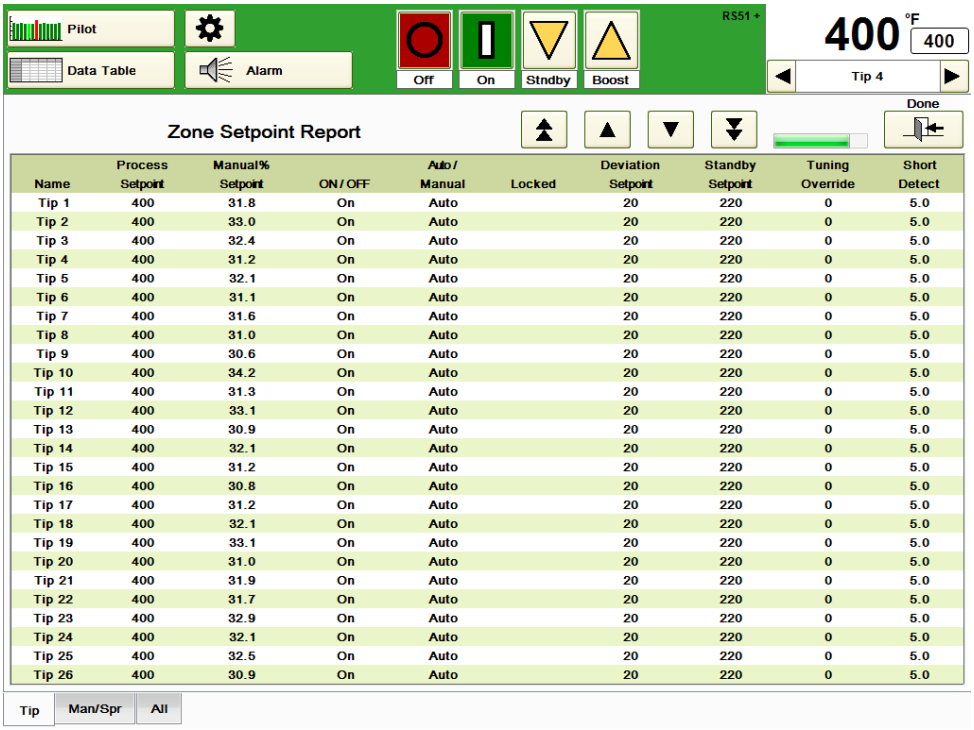
The available reports are Data Summary, Setpoints, Zone Alarm Summary, SPC Summary, Setpoint (SP) Changes and System Alarm Summary.



Name	Temp Average	Std Dev	Temp Range	Temp Min	Temp Max	Dev High	Dev Low	Avg Percent	Avg Current	Avg Watts	Avg Resist
Tip 1	383.0	72.06	334.6	79.7	414.3	0	1	31.35	0.21	29	633
Tip 2	383.0	72.13	334.9	79.3	414.2	0	1	32.46	0.21	30	636
Tip 3	383.0	71.98	334.6	79.7	414.3	0	1	31.84	0.22	30	631
Tip 4	383.0	72.30	335.7	78.8	414.6	0	1	30.79	0.21	29	636
Tip 5	383.0	72.12	334.8	79.7	414.6	0	1	31.62	0.21	29	640
Tip 6	383.0	72.06	335.0	79.5	414.5	0	1	30.58	0.21	29	622
Tip 7	383.0	72.12	335.1	79.3	414.3	0	1	31.11	0.21	29	624
Tip 8	383.0	72.22	335.6	78.9	414.5	0	1	30.53	0.21	28	636
Tip 9	383.0	72.02	334.6	79.8	414.4	0	1	30.14	0.21	29	624
Tip 10	382.9	72.20	335.4	79.1	414.5	0	1	33.64	0.22	31	643
Tip 11	383.0	72.21	335.5	78.9	414.4	0	1	30.82	0.21	29	634
Tip 12	383.0	72.05	334.6	80.0	414.5	0	1	32.56	0.21	30	638
Tip 13	383.0	72.30	336.1	78.7	414.7	0	1	30.47	0.21	29	634
Tip 14	383.0	72.24	335.8	79.0	414.8	0	1	31.59	0.21	30	628
Tip 15	383.0	72.14	335.2	79.3	414.5	0	1	30.71	0.21	29	626
Tip 16	383.0	72.04	334.9	79.8	414.8	0	1	30.31	0.21	28	631
Tip 17	383.0	72.14	335.4	79.2	414.5	0	1	30.70	0.22	29	616
Tip 18	383.0	72.11	334.8	79.4	414.2	0	1	31.61	0.22	30	615
Tip 19	383.0	72.15	335.2	79.4	414.6	0	1	32.55	0.22	31	634
Tip 20	383.1	71.94	334.7	79.9	414.6	0	1	30.53	0.21	29	620
Tip 21	383.0	72.25	335.4	78.7	414.2	0	1	31.41	0.22	30	623
Tip 22	383.0	72.02	334.6	79.9	414.5	0	1	31.25	0.21	29	632
Tip 23	383.0	72.16	335.5	79.3	414.9	0	1	32.34	0.21	30	640
Tip 24	383.0	72.14	335.0	79.6	414.6	0	1	31.55	0.21	29	640
Tip 25	383.0	72.03	334.6	79.8	414.4	0	1	32.04	0.22	31	620
Tip 26	383.0	72.07	335.0	79.5	414.5	0	1	30.44	0.21	29	629

Figure 26e Data Summary Report

Data Summary Report: As shown in Figure 26e, data is shown for each zone including average temperature, standard deviation and temperature range (max temperature minus minimum temperature). Minimum and maximum temperatures are shown. The Dev High and Dev Low columns indicate the number of times that the alarms have been activated during the time length of the report. Average output percentage, average current output, average heater wattage and average heater resistance values are also shown for each zone in the group. Data is updated whenever the screen is displayed or scrolled. The averages shown are calculated based upon the report length setting on the Information screen (described above). On all the reports, a green, horizontal scroll bar is located below the temperature display area that shows what portion of the report is being displayed. The scroll bar shown in Figure 26e is all the way to the left indicating that the first 26 zones are displayed. As the down arrows are pressed to show zones above Tip 26, the green bar will move to the right.



Name	Process Setpoint	Manual% Setpoint	ON / OFF	Auto / Manual	Locked	Deviation Setpoint	Standby Setpoint	Tuning Override	Short Detect
Tip 1	400	31.8	On	Auto		20	220	0	5.0
Tip 2	400	33.0	On	Auto		20	220	0	5.0
Tip 3	400	32.4	On	Auto		20	220	0	5.0
Tip 4	400	31.2	On	Auto		20	220	0	5.0
Tip 5	400	32.1	On	Auto		20	220	0	5.0
Tip 6	400	31.1	On	Auto		20	220	0	5.0
Tip 7	400	31.6	On	Auto		20	220	0	5.0
Tip 8	400	31.0	On	Auto		20	220	0	5.0
Tip 9	400	30.6	On	Auto		20	220	0	5.0
Tip 10	400	34.2	On	Auto		20	220	0	5.0
Tip 11	400	31.3	On	Auto		20	220	0	5.0
Tip 12	400	33.1	On	Auto		20	220	0	5.0
Tip 13	400	30.9	On	Auto		20	220	0	5.0
Tip 14	400	32.1	On	Auto		20	220	0	5.0
Tip 15	400	31.2	On	Auto		20	220	0	5.0
Tip 16	400	30.8	On	Auto		20	220	0	5.0
Tip 17	400	31.2	On	Auto		20	220	0	5.0
Tip 18	400	32.1	On	Auto		20	220	0	5.0
Tip 19	400	33.1	On	Auto		20	220	0	5.0
Tip 20	400	31.0	On	Auto		20	220	0	5.0
Tip 21	400	31.9	On	Auto		20	220	0	5.0
Tip 22	400	31.7	On	Auto		20	220	0	5.0
Tip 23	400	32.9	On	Auto		20	220	0	5.0
Tip 24	400	32.1	On	Auto		20	220	0	5.0
Tip 25	400	32.5	On	Auto		20	220	0	5.0
Tip 26	400	30.9	On	Auto		20	220	0	5.0

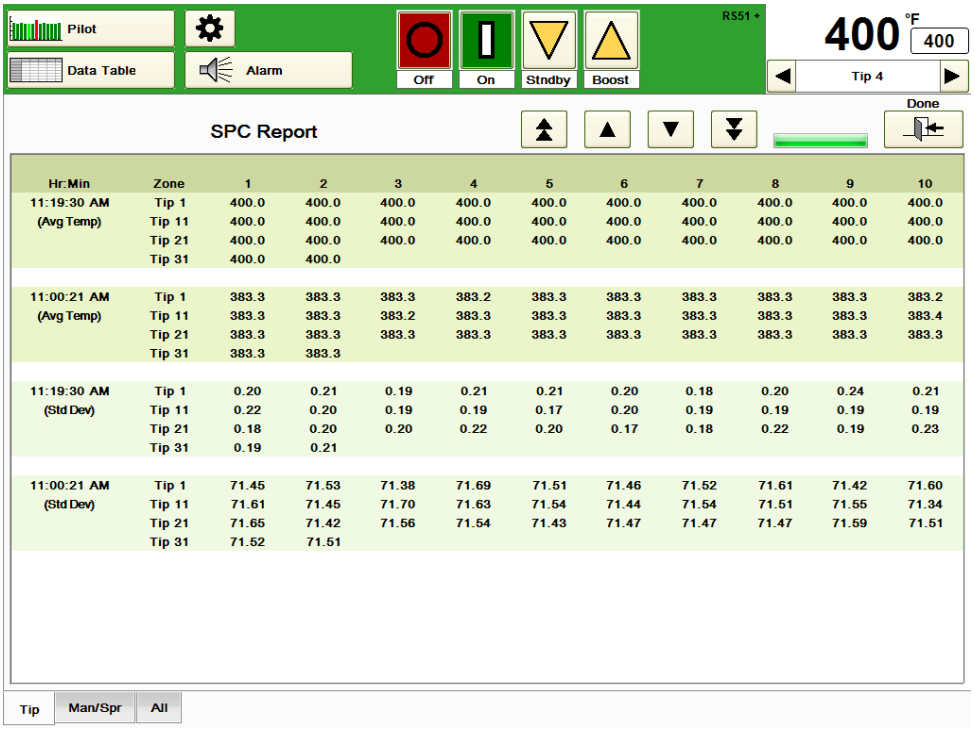
Figure 26f Zone Setpoint Report

Zone Setpoint Report: Press **View Setpoints** on the **Report Selection** screen (Figure 26d) to view the **Zone Setpoint Report** shown in Figure 26f. All current setpoints for the group tab selected at the bottom of the screen will be shown. Settings cannot be changed from this screen.

Action	Zone	Time												
	Tip 1	11:01:15 AM												
	Tip 1	11:01:06 AM	X											
	Tip 2	11:01:15 AM												
	Tip 2	11:01:06 AM	X											
	Tip 3	11:01:15 AM												
	Tip 3	11:01:06 AM	X											
	Tip 4	11:01:15 AM												
	Tip 4	11:01:06 AM	X											
	Tip 5	11:01:15 AM												
	Tip 5	11:01:06 AM	X											
	Tip 6	11:01:15 AM												
	Tip 6	11:01:06 AM	X											
	Tip 7	11:01:15 AM												
	Tip 7	11:01:06 AM	X											
	Tip 8	11:01:15 AM												
	Tip 8	11:01:06 AM	X											
	Tip 9	11:01:15 AM												
	Tip 9	11:01:06 AM	X											

Figure 26g Zone Alarm Summary Report

Zone Alarm Summary Report: This report indicates every alarm that occurred for the group, what time it occurred and what time it cleared (if it has) during the report time length. In the example shown in Figure 26g, Tip1 experienced a low temperature alarm at 1:23:16 PM that cleared at 1:23:24 PM.

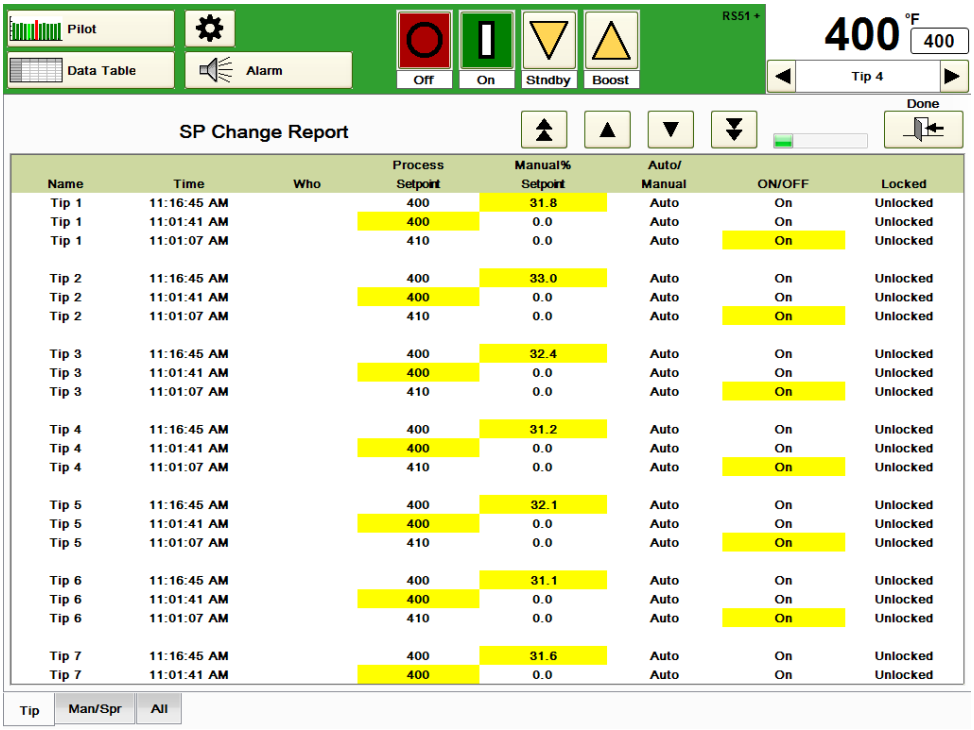


Hr:Min	Zone	1	2	3	4	5	6	7	8	9	10
11:19:30 AM	Tip 1	400.0	400.0	400.0	400.0	400.0	400.0	400.0	400.0	400.0	400.0
(Avg Temp)	Tip 11	400.0	400.0	400.0	400.0	400.0	400.0	400.0	400.0	400.0	400.0
	Tip 21	400.0	400.0	400.0	400.0	400.0	400.0	400.0	400.0	400.0	400.0
	Tip 31	400.0	400.0								
11:00:21 AM	Tip 1	383.3	383.3	383.3	383.2	383.3	383.3	383.3	383.3	383.3	383.2
(Avg Temp)	Tip 11	383.3	383.3	383.2	383.3	383.3	383.3	383.3	383.3	383.3	383.4
	Tip 21	383.3	383.3	383.3	383.3	383.3	383.3	383.3	383.3	383.3	383.3
	Tip 31	383.3	383.3								
11:19:30 AM	Tip 1	0.20	0.21	0.19	0.21	0.21	0.20	0.18	0.20	0.24	0.21
(Std Dev)	Tip 11	0.22	0.20	0.19	0.19	0.17	0.20	0.19	0.19	0.19	0.19
	Tip 21	0.18	0.20	0.20	0.22	0.20	0.17	0.18	0.22	0.19	0.23
	Tip 31	0.19	0.21								
11:00:21 AM	Tip 1	71.45	71.53	71.38	71.69	71.51	71.46	71.52	71.61	71.42	71.60
(Std Dev)	Tip 11	71.61	71.45	71.70	71.63	71.54	71.44	71.54	71.51	71.55	71.34
	Tip 21	71.65	71.42	71.56	71.54	71.43	71.47	71.47	71.47	71.59	71.51
	Tip 31	71.52	71.51								

Figure 26h SPC Report

Zone SPC Report: The report shows the average temperatures and standard deviations of each zone in the group in 15 minute intervals. The averages are shown first with the standard deviations shown below. Each row shows data for ten zones. In Figure 26h, the average temperature for Tip 20 at 11:00:21 AM is 383.4F. The standard deviation for Tip 23 at 11:00:21 PM is 71.56.

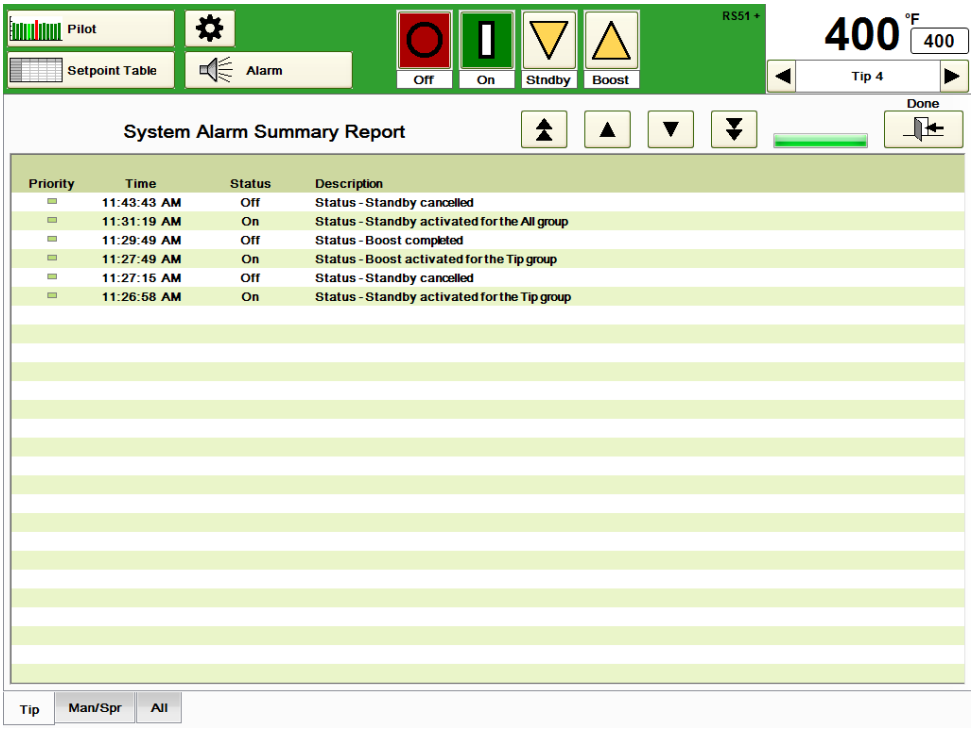
Zone SP Change Report: This report highlights in yellow all changes to the setpoint, manual % setpoint, Auto/Manual Status, On/Off status and Locked/Unlocked status of each zone in the group tab selected during the time length of the report. For example, in Figure 26i, Tip 7 was switched from auto to manual mode at 2:58:35 PM. All zones in Figure 26i were switched from 0% manual output to a percentage above 30% (using the Copy Average % Output to Manual % Output feature on the Setpoint Table screen) at 11:16:45 AM. In addition, all zones were turned On at 11:01:07 AM. If the Operator ID feature is in use (Section 13), the operator's name who made the change would appear in the Who column.



Name	Time	Who	Process Setpoint	Manual% Setpoint	Auto/ Manual	ON/OFF	Locked
Tip 1	11:16:45 AM		400	31.8	Auto	On	Unlocked
Tip 1	11:01:41 AM		400	0.0	Auto	On	Unlocked
Tip 1	11:01:07 AM		410	0.0	Auto	On	Unlocked
Tip 2	11:16:45 AM		400	33.0	Auto	On	Unlocked
Tip 2	11:01:41 AM		400	0.0	Auto	On	Unlocked
Tip 2	11:01:07 AM		410	0.0	Auto	On	Unlocked
Tip 3	11:16:45 AM		400	32.4	Auto	On	Unlocked
Tip 3	11:01:41 AM		400	0.0	Auto	On	Unlocked
Tip 3	11:01:07 AM		410	0.0	Auto	On	Unlocked
Tip 4	11:16:45 AM		400	31.2	Auto	On	Unlocked
Tip 4	11:01:41 AM		400	0.0	Auto	On	Unlocked
Tip 4	11:01:07 AM		410	0.0	Auto	On	Unlocked
Tip 5	11:16:45 AM		400	32.1	Auto	On	Unlocked
Tip 5	11:01:41 AM		400	0.0	Auto	On	Unlocked
Tip 5	11:01:07 AM		410	0.0	Auto	On	Unlocked
Tip 6	11:16:45 AM		400	31.1	Auto	On	Unlocked
Tip 6	11:01:41 AM		400	0.0	Auto	On	Unlocked
Tip 6	11:01:07 AM		410	0.0	Auto	On	Unlocked
Tip 7	11:16:45 AM		400	31.6	Auto	On	Unlocked
Tip 7	11:01:41 AM		400	0.0	Auto	On	Unlocked

Figure 26i SP Change Report

System Alarm Summary: As shown in Figure 11g, this report indicates the Status of any System Alarm changes. Figure 26j indicates that that Boost was activated for the Tip group at 11:27:49 AM and completed at 11:29:49 AM. Standby was activated for the All group at 11:31:19 AM and cancelled at 11:43:43 AM.



Priority	Time	Status	Description
	11:43:43 AM	Off	Status - Standby cancelled
	11:31:19 AM	On	Status - Standby activated for the All group
	11:29:49 AM	Off	Status - Boost completed
	11:27:49 AM	On	Status - Boost activated for the Tip group
	11:27:15 AM	Off	Status - Standby cancelled
	11:26:58 AM	On	Status - Standby activated for the Tip group

Figure 26j System Alarm Summary Report

27
Windows

The G24 runs on the Windows xP Operating System. At times it is desirable to access Windows screens or programs. The **Windows Information** screen gives the user access to the Windows screens along with an on-screen keyboard. A screen burn-in repair utility is available along with a path to the touch screen calibration.

See Section 28 Setup Network Access for a description on the Setup Network Access button.

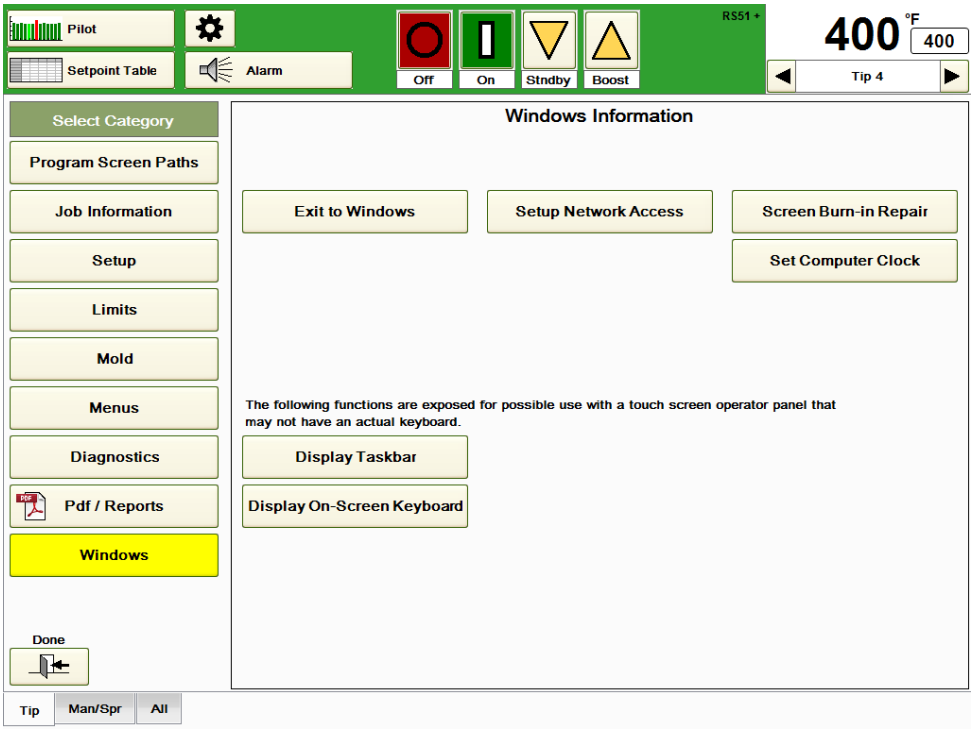


Figure 27a Windows Information

Exit to Windows: Press this button to exit to Windows. A yellow warning box will pop up stating that any zones that are turned on will remain on. The engineering security code is required to exit to Windows.

Screen Burn-in Repair: The G24 does not use a screen saver. Generally, it is not needed. However, if over time any screen burn-in occurs, this utility can be used to reduce the effect. The controller will continue to control while this procedure is being done. When the button is pressed, the pop-up box shown in Figure 27c will appear.

Set Computer Clock: Press this button to access the computer clock. This is important since alarms, databases and reports all are time stamped.

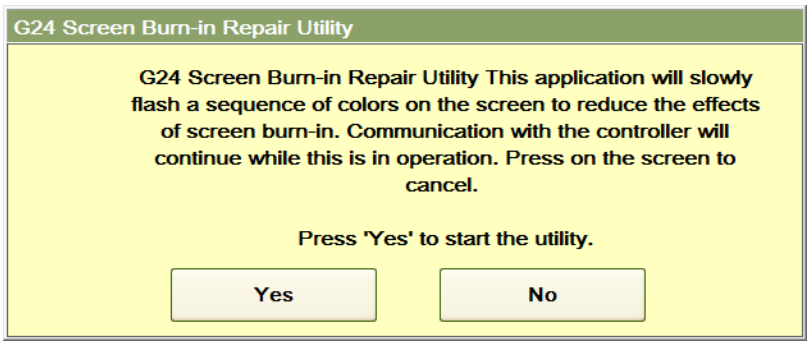


Figure 27b Screen Burn-in Repair Utility

Display Taskbar: Use this button to access the Windows taskbar that will appear at the bottom of the screen.

Display On-Screen Keyboard: Press this button to see the popup keyboard shown in Figure 27c.

Touch Screen Calibration: Over time, an alignment problem may occur where the touch screen cursor does not respond accurately to where the screen is touched. The screen can be calibrated after touching this button.

Figure 27c On-Screen Keyboard

Administrator Mode: Since the G24 uses the Windows XPe Operating System, the process of adding a printer or moving files is similar to the procedure used with any computer running Windows xP software. The difference is that the user must enter the Administrator Mode to make the changes. The Administrator Mode is used to unlock the computer, make the changes and relock the computer.

The procedure to enter the Administrator Mode is:

1) Attach a PS2 or USB keyboard to the touchscreen.
2) Turn on the Touchscreen. If it was on previously, reboot.
3) Press the **Exit to Windows** button, enter the **987** security code and press **OK**.
4) Press the Windows **Start** button.
5) Press **SHUT-DOWN**.
6) Select **LOG OFF USER** and press **OK**.
7) Enter **administrator** as the user name.
8) Enter **fluxxer** as the password name and press **OK**.
9) Unlock the Disk Drive Protection by pressing the **Unlock & Restart XPe**. The computer will reboot itself to unlock the disk drive.
10) Log into the Administrator account by repeating steps 7 and 8.
11) Make the desired changes in Windows such as adding a printer or changing the clock in Control Panel.
12) Press the **Lock & Restart XPe** button and press **Enter**.

To install a printer:

1) Enter the Administrator Mode using steps 1-10 in the process above.
2) Attach a printer.
3) Go to Control Panel within Windows.
4) Select Add Printer. The computer will detect the attached printer. If it already has the driver information in Windows, the process is complete. Otherwise, Windows may ask the user to select where to find the driver for the printer. If so, load the printer driver onto a USB drive and have Windows search the USB drive.
5) Press the **Lock & Restart XPe** button and press **Enter**.

28
Setup Network Access

The G24 provides the ability to easily communicate over an Ethernet network using the Gammaflux Ethernet Network File Transfer Protocol. Setpoints and menus can be sent from the network to the G24. Process values, setpoints, menus add status can be sent form the G24 to the network. Files are exchanged through the Network folder, typically located in the G24 directory.
The G24 Operator Panel (screen) detects when a command file has been received in the Network directory from the ethernet network. It opens it and performs the listed commands. Upon performance, the command file is deleted from the Network folder and will continue checking for the presence of new command files.

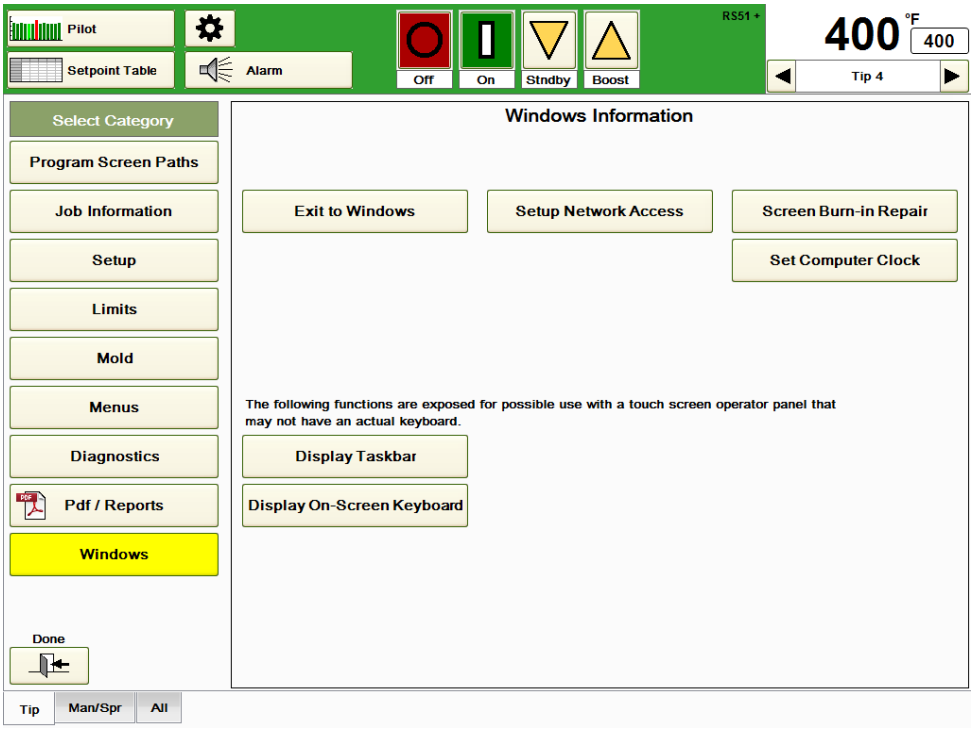


Figure 28a Windows Information

The types of files within the file transfer protocol are:

Setpoints.txt: This file is placed in the Network folder by the external computer. It is read & then deleted by the Operator Panel. It is used to change Setpoints and may instruct the Operator Panel to report active settings and process values.

Setpoints_Error.txt: This file is used by the Operator Panel to save the errant file when an error is detected in a Setpoints.txt file.

AllSetpoints.txt: This file is placed in the Network folder by the Operator Panel in response to a Setpoints.txt file command. It is used to report all active Setpoints.

Values.csv: This file is placed in the Network folder by the Operator Panel in response to a Setpoints.txt file command. It is used to report all active value and status information.

Menu.txt: This file is placed in the Network folder by the external computer. It is read and then deleted by the Operator Panel. It is used to instruct the Operator Panel to install the stated Menu.

MenusList.txt: This file is placed in the Network folder by the Operator Panel in response to a Menu.txt file command. It is used to report the contents of ALL menus in a memory folder.

Menu_Error.txt: Used by the Operator Panel to save the errant file when an error is detected in a Menu.txt file.

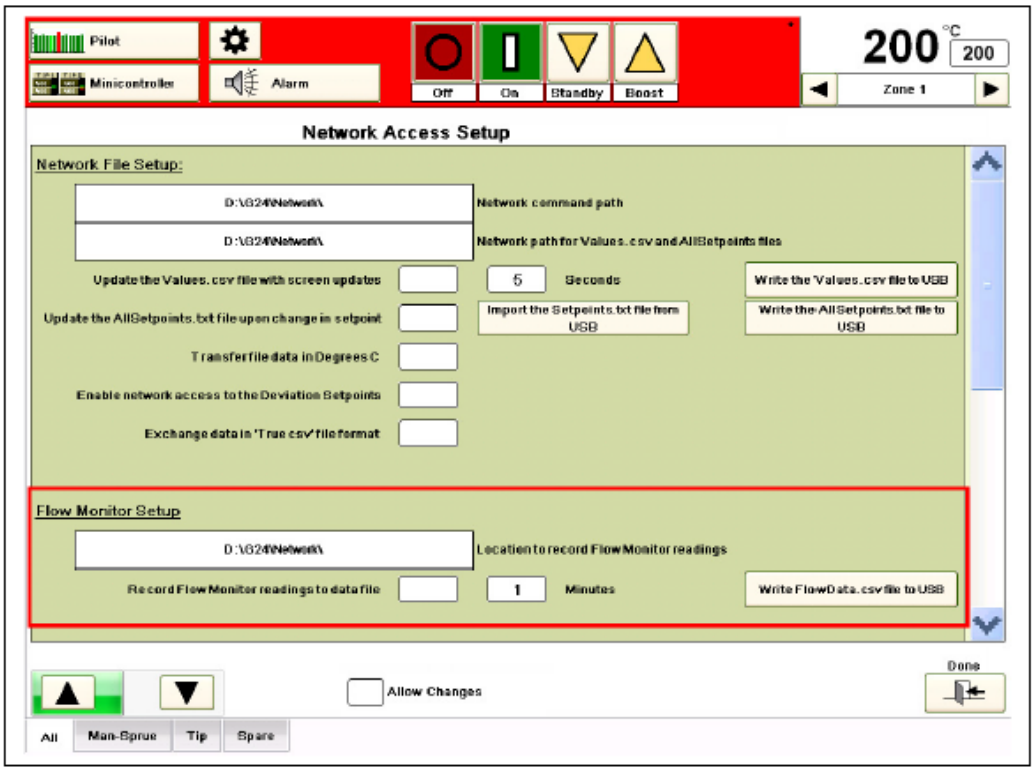


Figure 28b Network Access Setup

Setup Network Access: Press this button to access the screen shown in Figure 28b.

<u>Network Access Setup:</u>
Network Command Path: Click on this box to browse through the folders to find the folder that will be used to contain the network files. The default location will normally be C:\G24\Network (the example shows drive C).

Network path for Values.csv and AllSetpoints Files: Click on this box to indicate where the Values.csv and Allsetpoints.txt files can be found. The default location for these files is C:\G24\Network.

Update the Values.csv file with screen updates: If this box is checked the values in the **Values.csv** file will be updated every 1-120 seconds based on the **Seconds** selection shown immediately to the right. If this box is left empty, the file will only be updated when an external computer requests that the file be generated.

Update the AllSetpoints.txt file upon change in setpoint: Check this box to always have an up-to-date collection of setpoints. If this box is left empty, the file will only be updated when an external computer requests that the file be generated.
Transfer file data in Degrees C: Process values and setpoints are generated in Degrees F regardless of what the G24 screens indicate. Check this box to transfer the information in Degrees C.

Enable network access to the Deviation Setpoints: Check this box if it is desired to add deviation setpoints (temperature alarm settings) to the AllSetpoints.txt file.

Exchange data in 'True csv' file format: The AllSetpoints.txt file normally includes a colon after each zone name preceding the values for that zone. Check this box to replace the colon with a comma.

Import the AllSetpoints.txt file from USB: Press this button to transfer the AllSetpoints.txt file to the G24 from a USB drive. These setpoints will override what is currently in use in the G24.

Write the Values.csv file to USB: Press this button to load the latest values to a USB drive. This button does not update the Values.csv file that is in the D:\G24\Network directory.

Write the AllSetpoints.txt file to USB: Press this button to load the latest setpoints to a USB drive. This button does not update the AllSetpoints.txt file that is in the D:\G24\Network directory.

Path Button Setup:
Launch an application on G24 screen startup: At times, other vendor software may be integrated on the G24 screen. If there is integrated software in use on the G24, this button should be pressed. This box is normally left empty.

Application to start on G24 screen startup: If the **Launch an application on G24 screen startup** box is checked, press this box to browse and select the appropriate application that will start up with the G24.

Task name of the application: Enter the name that will be displayed in the application's screen title bar when the application is selected using the button in the lower right hand corner of the screen.

Phrase displayed on the button: Enter the name of the application that will be displayed on a button on the screen if desired.

Place a button in the lower right hand corner of the screen: Select this if it is desired to have a screen path to the other application.

Networking Protocol
In the G24 folder is a folder named Network (C:\G24\Network). The Network folder should have the shared attribute set to 'shared' when the operator panel is set up by the administrator. Manipulation of setpoints and files is done by sending simple text only files of the type created by Windows Notepad. Start each command at the first position of the line. The text files used to command operations are selectable, but normally placed within the C:\G24\Network directory. The G24 controller detects that the files are now present, opens them up and performs the operations as commanded. The files are deleted when the command is complete. The command files are acted upon once per update period as set with the Seconds per Update setpoint within the G24 screen set.

Setpoints and Values
Changing a setpoint or many setpoints can be done in a similar fashion. A simple text file named Setpoints.txt is created and copied to the C:\G24\Network folder. When the Setpoints.txt file is read by the G24 the setpoints are sent to the controller and then the file is

automatically deleted. If an error is found in the file a Setpoints_Error.txt file is created which is just the Setpoints.txt file renamed. Some operations may be completed in the event of an error.

Four (five if deviation alarm settings are included) setpoints may be changed using the Setpoints.txt file:
Process temperature setpoint,
Manual percent setpoint,
Manual / automatic mode status
On / Off Mode status
Deviation Alarm (if the **Enable network access to the Deviation Setpoints** button is selected in Figure 28b)

The process temperature setpoint is set in Degrees F unless the **Transfer file data in Degrees C** button is selected as described above.

F= process temperature setpoint in degrees F
C= process temperature setpoint in degrees C
%= Manual percent setpoint
M= 1 for manual mode, 0 for automatic mode
O= 1 for zone on, 0 for zone off
DF= Deviation alarm setpoint in degrees F (if selected)
DC= Deviation alarm setpoint in degrees C (if selected)

To set a setpoint enter a line in the Setpoints.txt file as shown by the example:

Tip 17: F=400

This will set the process temperature setpoint of zone Tip 17 to 400°F. Note that the first entry of the line is the zone ID followed by a space, followed by the zone number and then followed by a colon (:). It is very important to start the line in this manner and to spell the zone name correctly. It may be easier to create an AllSetpoints.txt file (described later) and modify it than to create one from scratch.

Any number of the setpoints may be included on the line if more than one setpoint per zone is to be changed. For example:

Man 3: F=410, %=15.3, M=0, O=1

This will set the process temperature setpoint to 410°F, the manual setpoint to 15.3%, turn off manual mode (turn on automatic mode), and turn the zone on.
Any number of zones may be set in one file, just use a new line for each zone.

In addition to setting setpoints the Setpoints.txt file may include the following special instructions.

Setpoints=1	(create a new AllSetpoints.txt file)
Values=1	(to create Values.csv file automatically)
Values=0	(to stop creating the Values.csv file)
Scale=C	(for degrees C)
Scale=F	(for degrees F)

Adding the Setpoints=1 instruction causes the G24 to create an AllSetpoints.txt file in the Network folder. The AllSetpoints.txt is a list of all of the four (or five) setpoints for each zone.

The following is a few of the lines within an AllSetpoints.txt file:

Tip 1: F=410, %=15.0, M=0, O=1
Tip 2: F=410, %=15.0, M=0, O=1
Tip 3: F=415, %=17.0, M=0, O=1
Tip 4: F=415, %=17.0, M=0, O=1

The following is a couple of lines within an AllSetpoints.txt file with the optional setting to report the Deviation Setpoints:

Tip 1: F=410, %=15.0, M=0, O=1, DF=20
Tip 2: F=410, %=15.0, M=0, O=1, DF=20
Tip 3: F=415, %=17.0, M=0, O=1, DF=20
Tip 4: F=415, %=17.0, M=0, O=1, DF=20

Adding **Values = 1** instruction causes a file named **Values.csv** to be created in the Network folder. This file is updated (recreated) based on the settings described above. Only the last file is available. This is a "comma separated values" file and may be imported directly into Microsoft Excel, Microsoft Word and others. All of the values for all of the zones are always included in every Values file. Each zone is on a separate line. Like the Setpoints file the zone ID is followed by a space followed by the zone number within the ID. This is followed by a comma. After the comma is a list of all of the following values, in the order:

Zone name
Process value
Active percent output
Amps
Volts
Auto/Manual output mode status (0=auto, 1=manual)
Zone On/Off status (0=off, 1=on)
Alarm status
Zone Status (1=Ground Fault, 2=Zone Locked)

Alarm status is a binary number with the following bit assignments

Bit	Assignment	Weight
0	Thermocouple Open	1
1	Thermocouple Reversed	2
2	Uncontrolled Output	4
3	Heater Short	8
4	Heater Open	16
5	Open Fuse	32
6	Deviation High	64
7	Deviation Low	128
8	Thermocouple Short	256
9	Heater Resistance	512
10	Zone Off	1024
11	Manual Mode	2048
12	Auto Standby	4096
13	Control Inhibit	8192
14	Undefined	16384
15	Watt alarm	32768

G24 Zone status is a binary number with the following bit assignments

Bit	Assignment	Weight
0x0001	Ground Fault	1
0x0002	Zone Locked	2

The following is an example of two lines in the **Values.csv** file. Note that Tip 1 is in manual mode, On, has a low alarm and a ground fault. Tip 2 is in manual mode and has an active deviation low alarm (2048+128=2176).

Tip 1,351.2,29.7,.87,94.1,1,1,1,128,1
Tip 2,355.1,30.6,.84,93.2,1,1,1,2176,0

Adding the setting **Values=0** to the **Setpoints.txt** file will cause the automatic updating to stop. This may improve performance at the G24. Note that the setting of **Values=0** or **1** is NOT SAVED when the G24 is powered down or exited and restarted. The powerup default is to not create the file.

Adding **Scale = C** to the **Setpoints.txt** file causes both the **AllSetpoints.txt** process temperature setpoints and the **Values.csv** process values to be reported in degrees C. **Scale = F** causes those values to be in degrees F. The power up default is degrees F. The scale setting is NOT SAVED when the G24 is powered down or exited and restarted.

Menus

Menus are manipulated with a text file named "***Menu.txt***" that is created and placed into the D:\G24\Network folder. When the Operator Panel detects a **Menu.txt** file it opens the file and performs the operation as commanded and then deletes the Menu.txt file. If an error is found in the file, that **Menu.txt** file is renamed as **Menu_Error.txt** file. Some operations may still be completed in the event of an error. Multiple commands and multiple lines may be placed in the **Menu.txt** command file. Commands are executed in the order they appear in the file.

The following characters cannot be used as part of the menu file name passed within the command file:

/ ` , \ : | " + ; < = > ? [ ]

The commands that can be used in the Menu.txt file are:
Create: Save a menu from the Active settings into \Menus
Activate: Restore a menu from \Menus to the Active settings
Send: Copy a menu from \Network to \Menus
Get: Copy a menu from \Menus to \Network
Delete: Delete a menu in \Menus
List: Make a list of available menus located in \Menus
CreateFloppy: Save a menu from the Active settings to the removable storage drive
ActivateFloppy: Restore a menu from the removable storage drive to the Active settings
CopyToFloppy: Copy a menu from \Menus to the removable storage drive
CopyFromFloppy: Copy a menu from the removable storage drive to \Menus
DeleteFloppy: Delete a menu in the removable storage drive
ListFloppy: Make a list of available menus located in the removable storage drive
BackupToFloppy: Copy ALL of the menus from \Menus to the removable storage drive
BackupFromFloppy: Copy ALL of the menus from the removable storage drive to \Menus

The **Create** and **Activate** commands can be used to remotely command the Operator Panel to save and restore menus without the user having to go to the Operator Panel screen to perform the operation. The **Create** and **Activate** commands transfer information between the menus and the active settings that are currently in use on the controller.

Create: This command creates (or 'Save's) a new OPERATOR PANEL menu. The new menu is placed in the \Menus directory. If there is already a menu present with that same name, then the existing menu will be renamed with a '_1" attached to the end of the filename and the new one will be created. The command has the form:

Create = Sample.mnu

Activate: This command activates (or 'Restore's) a menu. The menu is restored from the \Menus directory. The command has the form:

Activate = Sample.mnu

The **Send**, **Get**, **Delete** and **List** commands are used to manage the menus of several Operator Panel controllers on a shop floor from a production manager's computer. This will allow the menus to be stored and archived in a common location. The menus can be transferred from the archive, through the ethernet connection and downloaded to the Operator Panel prior to them being needed. The **Send** command is used to copy it from the \Network folder into the \Menu folder. When the job is complete, then the **Get** command can be used to copy the menu from the \Menus folder to the \Network folder. It can then be copied out with the use of the ethernet connection back into the archive location. The menu located in the OPERATOR PANEL \Menus folder can be deleted with the use of the **Delete** command.

Send: This command transfers a menu file from the \Network folder to the \Menus folder. This command does not open or restore the menu. It is only copied. The **.mnu** file does not contain any tool pictures. The command has the form:

Send: Sample.mnu

Get: This command transfers a menu file from the \Menus folder to the \Network folder. This command does not open or create the menu. It is only copied. The **.mnu** file does not contain any tool pictures. The command has the form:

Get = Sample.mnu

Delete: This command removes a menu file located in the \Menus folder. The command has the form:

Delete = Sample.mnu

List: This command generates a contents listing for the available menus in the \Menus folder. The operators panel software will create a text file called **'MenusList.txt'** and put it in the Network folder. This may then be moved up the network and viewed there. The command has the form:

List

CreateFloppy: This command creates or (or 'Save's) a new Operator Panel menu on a removable drive. The new menu is created storing the current operating setpoints and is placed in the directory as commanded. Any menu present with that same name will be overwritten. The menu and any tool pictures referenced are included in the file written to the floppy. The files are zipped into one final file. The command has the form:

CreateFloppy = Sample.mnz

ActivateFloppy: This command activates (or 'Restore's) a menu on the removable drive. The menu contents replaces the current operating setpoints. Any included tool pictures are moved to the appropriate active location. The command has the form:

ActivateFloppy = Sample.mnz

DeleteFloppy: This command erases or deletes a menu file located in the removable drive. The command has the form:

DeleteFloppy = Sample.mnz

CopyToFloppy: This command copies a menu already on the HDD to the removable drive. Any tool pictures referenced in the menu are zipped with the menu and written into one final file. The command has the form:

CopyToFloppy = Sample.mnz

CopyFromFloppy: This command copies a menu already on the removable drive to the HDD. The setpoints within the menu are not distributed to the controller. Any included tool pictures are moved to the appropriate location. The command has the form:

CopyFromFloppy = Sample.mnz

BackupToFloppy: This command will compress and copy ALL of the menus that are in the HDD to the removable drive. Any tool pictures referenced in the menu are zipped with the menu and written into one final file. Exception, the Default menu is not transferred with this command. A filename is not used with this command. The command has the form:

BackupToFloppy

BackupFromFloppy: This command will copy and de-compress ALL menus on the removable drive. The setpoints within each the menu are not distributed to the controller. Any included tool pictures are moved to the appropriate location. A filename is not used with this command. The command has the form:

BackupFromFloppy

ListFloppy: This command generates a contents listing for the available menus in the removable drive. The Operator Panel software will create a text file called 'MenusList.txt' and put it in the Network folder. This file may be moved up the network and viewed there. The command has the form:

ListFloppy

Example of a Menu.txt file might be:

Get=Mold123.txt
Delete=Mold123.mnu
List

This file would move the menu Mold123 from the Menus directory in the Operator Panel to the Network directory, delete the menu and then list the remaining menus.

The menus on the removable drive have a different file extension of ".mnz". The mnz files are zipped and contain the list of all of the setpoints within the GF controller as well as the pictures that are used on the Tool Graph screens. The ".mnu" files in the Network directory do not contain the picture files.

The **ActivateFloppy** and the **CopyFromFloppy** commands will perform the zip extraction function automatically and will place the picture files in the correct location.

Note: To avoid the Operator Panel from opening a Menu.txt file from the host computer before the host has finalized the file, a temporary file name is recommended such as Menu-temp.txt. Once the host has completed working with the file, the host would then rename the file Menu.txt.

Operator Panel Special Function Commands

Storage Directory Command

The location of the removable storage media for the menus written to the removable drive can be redirected with the use of the *Gammaflux.txt* file. The file is created and placed in the same directory as the Gammaflux Operator Panel program (C:\G24). If the file is not present, then the default location is the removable drive is A:. The redirection is read on power up of the Operator Panel software. The following are some samples:

RemovableMediaPath = A:\
RemovableMediaPath = E:\
RemovableMediaPath = E:\Hot Runner\Menus\

The redirected storage location is also used for other forms of storage as well. An example would be the location used by the removable drive commands of the database function. This location would be used to import tool pictures and other types of files.

Menu Function Suppression Commands

Several of the menu buttons on the Gammaflux menu screen can be removed with the use of a command in the *Gammaflux.txt* file. The buttons that are removed are the Save, Restore, Delete, Copy to Diskette, and Copy From Diskette. The suppression is read on power up of the Operator Panel software.

SuppressMenu = 1

When a menu is stored to the HDD of the OPERATOR PANEL with the "Save" command and that filename already exists, the existing menu file is renamed with a "_1.mnu" attached to the end of the filename. The file can be used to recover the menu if a new menu was accidentally saved with the same name.

The creation of that duplicate file with the "_1" can be suppressed with the following command in the ***Gammaflux.txt*** command file:

SuppressBackupMenu = 1

Launch Application Command

An optional command can be placed into the *Gammaflux.txt* file to automatically start another program when the Gammaflux G24.exe Operator Panel program is started. This program that is launched is not terminated when the OPERATOR PANEL Operator Panel program is exited. The command has the format of:

LaunchApplication = C:\G24\ ????.exe

Manual Boost Command

An optional command can be placed into the *Gammaflux.txt* file to change the operation of the Boost function. The Manual Boost only operates on the zones that are set to Manual mode. The zones set to Automatic mode are not impacted by Manual Boost. The Boost function is performed on the zones that are located on the group when the function is activated. The Manual boost setpoint is the output of the boosted zones, not a percentage that is added to the Manual percent output setpoint. The Manual Boost function is activated and canceled with the pressing of the Boost button. There is no timeout of a Manual Boost function.

The Boost Manual % setpoint is located on the screen where the Boost Temperature SP and the Boost Time SP were previously displayed. The picture displayed on the Boost button is changed to reflect that the Boost function does not time out. The Manual % Output SP will be

displayed on the screen under the Boost button where the Boost Remaining time was displayed when the Boost is in operation. The default setting is 80%.

If this command is not used, then the system works normally and the offset Boost will only affect the zones that are set to Automatic. The command has the format of:

EnableManualBoost = 1

Security Modification Commands

An optional command can be placed into the *Gammaflux.txt* file to suppress the entry of the Engineer password prior to execution of the function to Exit to Windows. If the command is not used, then the system works normally and will prompt for the security code when the Exit to Windows function is pressed. The command has the format of:

SuppressSecurityOnExitToWindows = 1

An optional command can be placed into the *Gammaflux.txt* file to add a point where the user has to enter the Engineer security level password to access the Software Rewire screen. This allows normal access to the Rename Zones screens and provides another level of warning prior to the entry to the Software Rewire screens. If the command is not used, then the system works normally and does not require the entry of a password to access the Software Rewire screen. The command has the format of:

AddSecurityToEntryToSoftwareRewire = 1

Redirect Values File Command

When this optional command is placed into the *Gammaflux.txt* file, it changes the destination of **Values.csv** (the file containing the instantaneous process data for all of zones). The default file destination is the \network folder. This command can be used to extend the life of the Flash Card of the WinXPe Operator Panels. The Flash Card drives do not have an unlimited write capability like the disk drives of a typical computer. The C: drive of the Operator Panels is write protected with a Microsoft protection function. Any files written to the protected drive are not actually written to the Flash Card, but are written to a RamDisk function. This command can be used to re-direct the location of the **Values.csv** file. The output file can be accessed like any other file. The command has the format of:

ValuesCsvPath = C:\G24\Network

If the path is not present, it will be created. Keep the path to 1 sub-directory level as shown in the example, the software cannot create several levels at the same time. If the path points into the RamDisk, this sub-directory will be lost when the computer is turned off. It will be created again the next time the Operator Panel program is started up again the next time.

MakeValuesCsvFile Command

When this optional command is placed into the *Gammaflux.txt* file, the Values.csv and Allsetpoints.txt files will be deposited in the folder listed. The default location for these files is D:\G24\Network. This function can also be activated using the Network Access Setup Screen shown in Figure 28b.

MakeAllSetpointsFile Command

When this optional command is placed into the *Gammaflux.txt* file, the <Setpoints=1> command is not needed in the Setpoints.txt file. The **AllSetpoints.txt** file is created immediately after every setpoint change. This function can also be activated using the Network Access Setup Screen shown in Figure 28b.

NetworkValuesInDegreesC Command
When this optional command is placed into the *Gammaflux.txt* file, the <Scale=C> command is not needed in the Setpoints.txt file. The **AllSetpoints.txt and Values.Csv** file will report temperatures in Degrees C. This function can also be activated using the Network Access Setup Screen shown in Figure 28b.

Pathkey Command
A button can be placed in the lower right corner of the Gammaflux Operator Panel screen to access another program. A text file is used to set the letters appearing on the button and the program that is displayed when the button that is pressed. The button is used to path to another application that is already running on the computer. The other program would then have a method to path back to the Gammaflux screens. The button is used to display the other program, it does not launch the program.
The *PathKey.txt* file is created and placed in the same directory as the Gammaflux Operator Panel program. (typically C:\G24). The command **button** is used to set the letters that are displayed on the button on the screen. The command **title** is the phrase used in the title bar of the program that is to be displayed. The character "**|**" is used to delimit the portion of the line to be used for the phrases. Sometimes the title of an application program contains a space character at the end of its title. This "**|**" character allows the space character to be placed within the delimiters.

button = | Mold ID |
title = |Mold ID|

This function can also be activated using the Network Access Setup Screen shown in Figure 28b.

The following is an example shows 5 lines of an example Gammaflux.txt file.
RemovableMediaPath = E:\
ValuesCsvPath = C:\CustomMolder\Network
MakeValuesCsvFile = 1
MakeAllSetpointsFile = 1
NetworkValuesInDegreesC = 1

This file would cause the G24 to:
1) Change the location of the removable storage path (perhaps USB drive) from A: to E:
2) Move the location of the Values file from the C:/Network drive to C:\Custom Molder\Network drive.
3) Make a Values file.
4) Make a Setpoints file
5) Have the values reported in Degrees C instead of F

Flow Monitor Setup

The screens can be set to write the actual monitoring data to a text file in .csv format.
Place a check in the **Record Flow Reading to Data File** box to command the data to be written periodically. Enter the desired file update rate. Press the **Write FlowData.csv to USB** to command the data to be written to a selectable folder on a USB memory device. The data is written each time the **Write FlowData.csv to USB** button is pressed.
If the Record Flow Readin to Data File box is checked, the data for all channels is written each update period.

The following is a list of the data sent for each channel and in the order it is sent:

1- Timestamp date
2- Timestamp time
3- Channel number
4- Channel name
5- Reading
6- Units
7- Voltage
8- Low Alarm SP
9- High Alarm SP
10- Alarm Action
11- Alarm status:

Bit	Assignment
0x0001	Low alarm unflitered
0x0002	High alarm unflitered
0x0004	Low alarm filtered
0x0008	High alarm filtered
0x0010	Low alarm enabled
0x0020	High alarm enabled
0x1000	Calibration not performed
0x2000	Module communication fault

12- Alarm status rendered in hexadecimal format
13- Unused 1 = 0
14- Unused 2 = 0
15- Unused 3 = 0
16- Unused 4 = 0

The following is an example of the contents of the file:

2014-11-24, 12:41:50, 1, Flow 1, 39.413, Lpm, 4.348, 10.000, 70.000, 2, 48, 0x0030, 0, 0, 0, 0
2014-11-24, 12:41:50, 2, Flow Temp 1, 30.14, C, 2.352, 20.00, 40.00, 1, 32, 0x0020, 0, 0, 0, 0
2014-11-24, 12:41:50, 3, Flow 2, 20.839, Lpm, 3.482, 30.000, 70.000, 2, 53, 0x0035, 0, 0, 0, 0
2014-11-24, 12:41:50, 4, Flow Temp 2, 36.55, C, 3.482, 20.00, 50.00, 1, 0, 0x0000, 0, 0, 0, 0
2014-11-24, 12:41:50, 5, Flow 3, 84.131, Lpm, 3.482, 0.000, 0.000, 2, 0, 0x0000, 0, 0, 0, 0
2014-11-24, 12:41:50, 6, Flow Temp 3, 40.88, C, 3.482, 20.00, 50.00, 1, 48, 0x0030, 0, 0, 0, 0

29
Mold ID

Mold ID is an option. If the G24 is specified with this option, it enables the G24 to automatically select a menu based on the detection of the tool that is connected to the controller. Up to 63 tools can be independently detected and associated with menus.

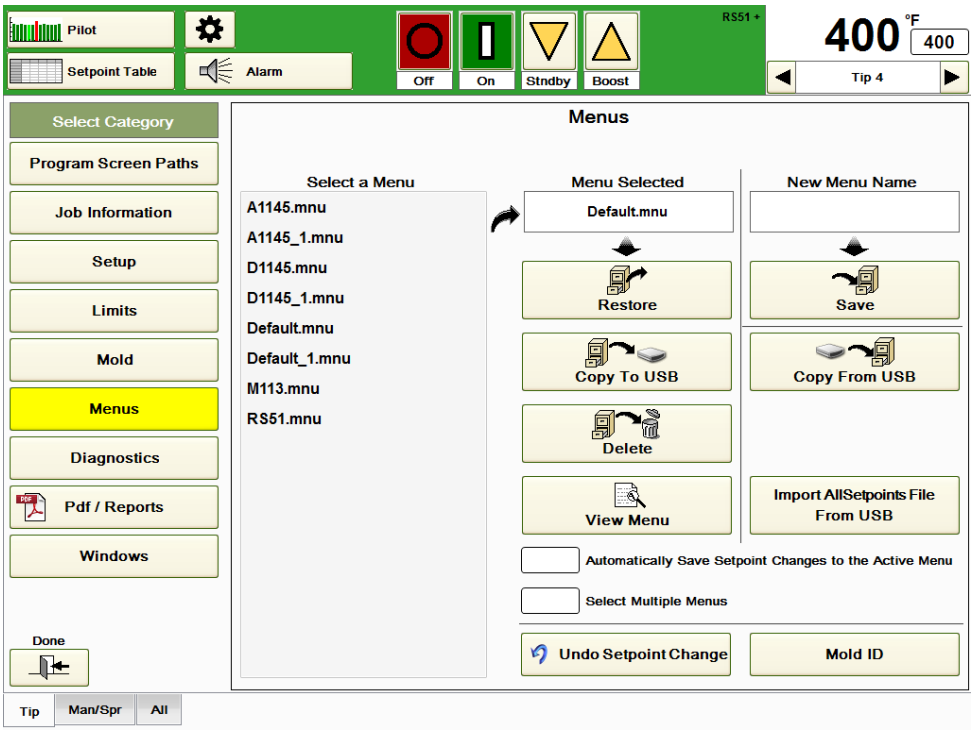


Figure 29a

The Mold ID shown in Figure 29b is accessed by pressing the Mold ID button on the Menus screen shown in Figure 29a.

Figure 29b Mold ID

An HA10 connector is mounted on the back of the controller if the Mold ID feature is included. The tool number is determined by reading the position of a set of user-installed jumpers on the connector's mating connector. An internal digital input module sends a low level voltage through the HA10 and reads the signals coming back from the mating connector. The information is then conveyed to the G24 Operator Panel via an ethernet connection.

This mating connector is placed into a connector hood. The assembly is latched onto the controller when the tool is connected to the controller.

The connector and hood act like a "Mold ID key". The mold would ideally include a latching hood for storage of the key while the tool is not loaded into the press. When production is done with the tool, the mold is removed from the machine, the key is attached to the mold and they are placed back into storage. The next tool to be run is brought to the machine, the power and T/C cables are attached and the key is connected to the controller.

Mold ID continuously monitors the inputs. It watches for instances where the address key is attached and detached. When the address key is attached, no action is taken for several seconds to verify that the connection is permanent. Mold ID loads menus only when the Mold ID address key connection is made. The user can still use the hot runner screens normally by changing setpoints, saving menus and restoring menus.

Menu Selection: This table shows the menus that will be used with each different tool. The example in Figure 28b shows the menus that will be used for three tools. To select a menu for a tool, press the box in the Menu Selection column. A dropdown box will appear showing all existing menus. Choose the appropriate menu for that tool. A menu can be removed from the table by selecting that menu and then selecting the blank menu entry **"- - - - - - - -"**from the list of available menus. No action is taken when an address key attachment is made for a Mold ID that does not have a menu selected for it.
Status: This table shows which Inputs (shown in Figure 29d) are jumpered to Common.
Mold ID Address From Inputs: This table which tool is connected.

Enable Menu Restore When Mold ID is Connected: When this box is selected, the menu associated with the tool will be automatically loaded.
Turn Off Outputs When Mold ID is Disconnected: When this box is selected, all zones' outputs will be turned off when the Mold ID connector is disconnected from the G24.

A number of short wire jumpers are inserted into an HA10 male insert. The jumpers are inserted in a binary pattern to identify the tool. The HA10 is then covered with the mating connector as shown in Figure 26c. It is recommended that the insert be attached to the mold to ensure that the correct key is used with each mold.

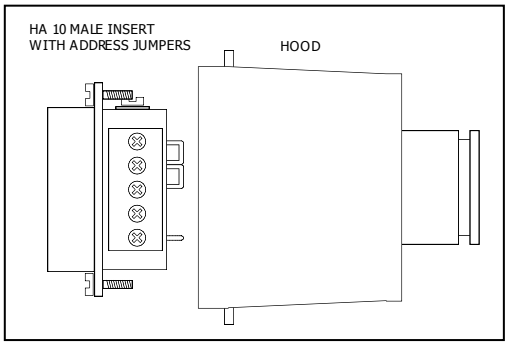


Figure 29c HA10 with Mating Hood

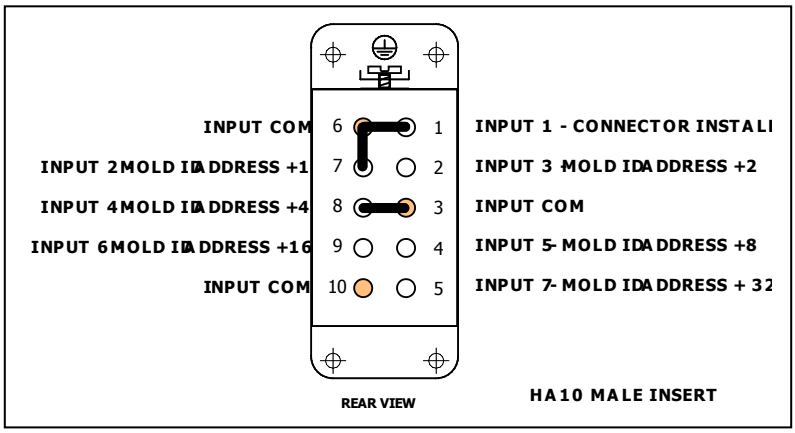


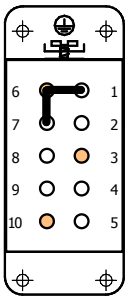
Figure 29d Connector Pin (Example shown is Mold ID 5)

Use the diagrams provided below to install the correct combination of jumpers. In Figure 28d, the jumper pattern shown would be associated with a Mold ID "5". This is determined by the Input 2 (+1) and the Input 4(+4) pins having jumpers attached to Input Common. For another example, Mold ID "20" would have jumpers installed from Input 4 (+4) to Common and Input 6 (+16) to Common.

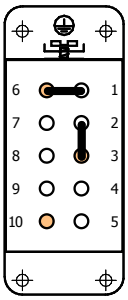
The following diagrams show the jumper pin configurations for each Mold ID.

HA10 MALE INSERT - REAR VIEW

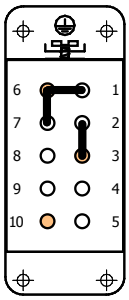
MOLD ID ADDRESS #1



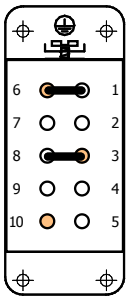
MOLD ID ADDRESS #2



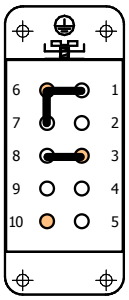
MOLD ID ADDRESS #3



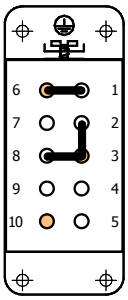
MOLD ID ADDRESS #4



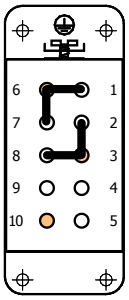
MOLD ID ADDRESS #5



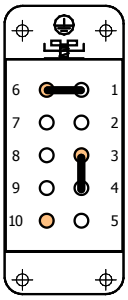
MOLD ID ADDRESS #6



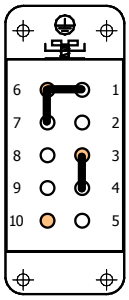
MOLD ID ADDRESS #7



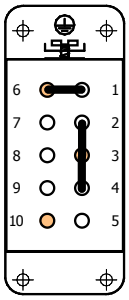
MOLD ID ADDRESS #8



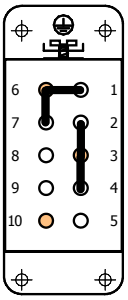
MOLD ID ADDRESS #9



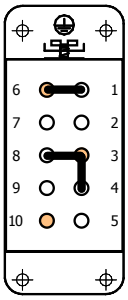
MOLD ID ADDRESS #10



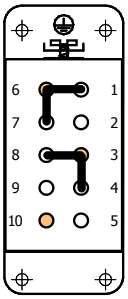
MOLD ID ADDRESS #11



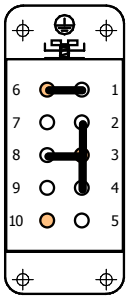
MOLD ID ADDRESS #12



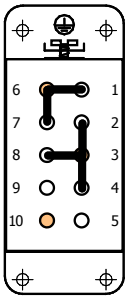
MOLD ID ADDRESS #13



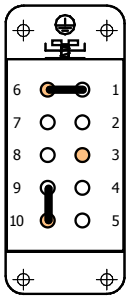
MOLD ID ADDRESS #14



MOLD ID ADDRESS #15



MOLD ID ADDRESS #16



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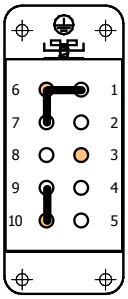

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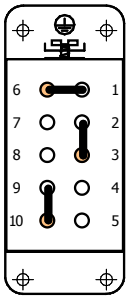
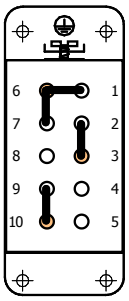
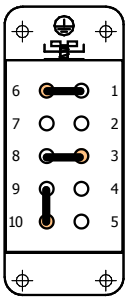


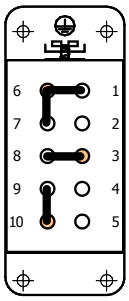
MOLD ID ADDRESS #19



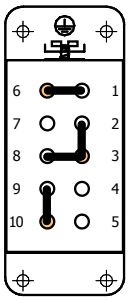
MOLD ID ADDRESS #20



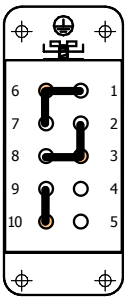
MOLD ID ADDRESS #21



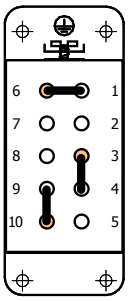
MOLD ID ADDRESS #22



MOLD ID ADDRESS #23

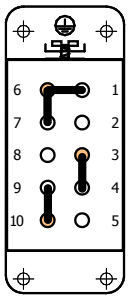


MOLD ID ADDRESS #24

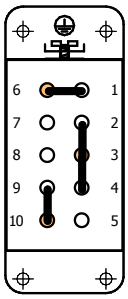


HA10 MALE INSERT - REAR VIEW

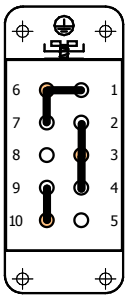
MOLD ID ADDRESS #25



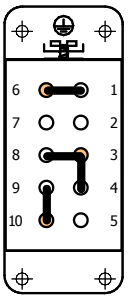
MOLD ID ADDRESS #26



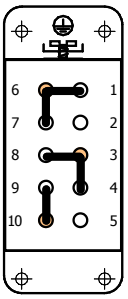
MOLD ID ADDRESS #27



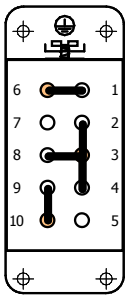
MOLD ID ADDRESS #28



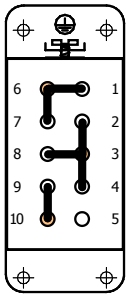
MOLD ID ADDRESS #29



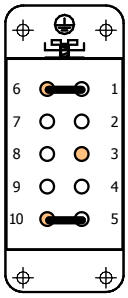
MOLD ID ADDRESS #30



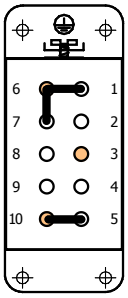
MOLD ID ADDRESS #31



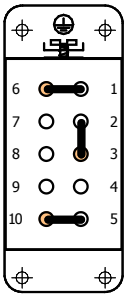
MOLD ID ADDRESS #32



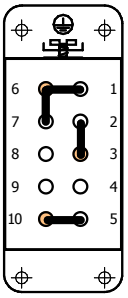
MOLD ID ADDRESS #33



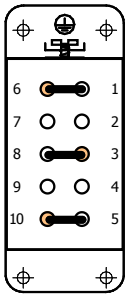
MOLD ID ADDRESS #34



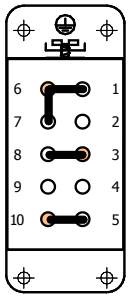
MOLD ID ADDRESS #35



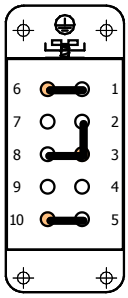
MOLD ID ADDRESS #36



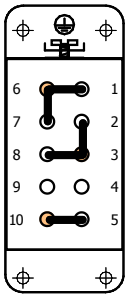
MOLD ID ADDRESS #37



MOLD ID ADDRESS #38



MOLD ID ADDRESS #39



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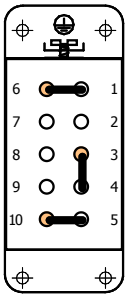

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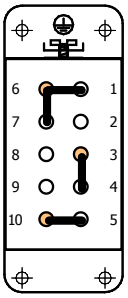

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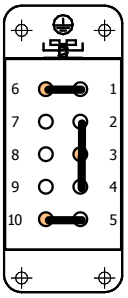

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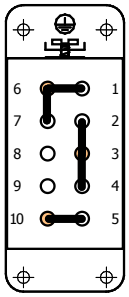

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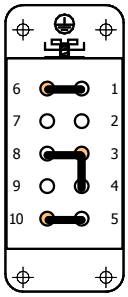

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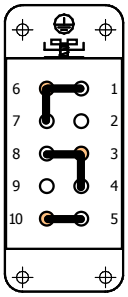

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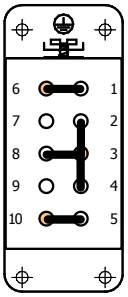

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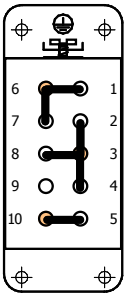

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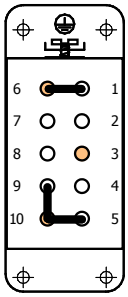
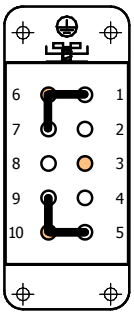


HA10 MALE INSERT - REAR VIEW

MOLD ID ADDRESS #49



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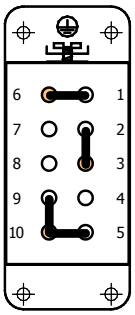

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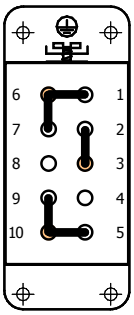

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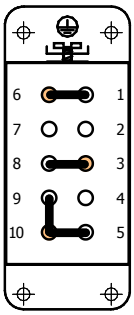

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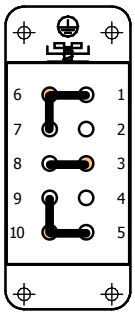

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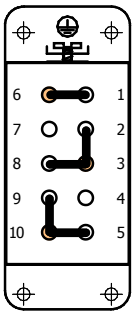

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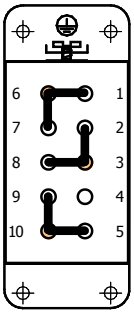

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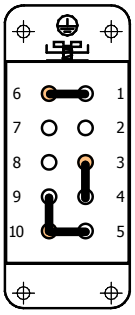

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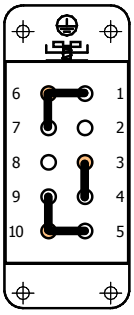

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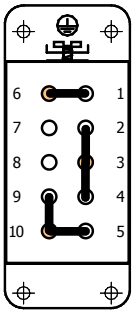

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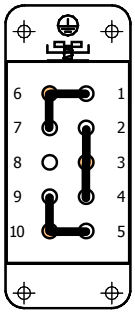

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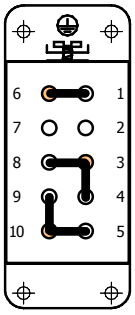

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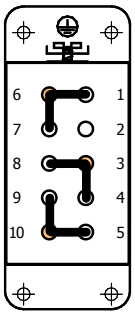
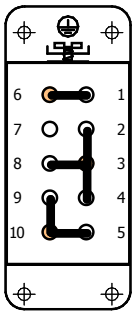
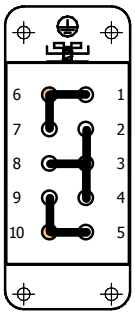


MOLD ID ADDRESS #62



MOLD ID ADDRESS #63



30
Express Update

G24 Express Update is an application that is used to update the software within the G24 controller. Updates are applied to the control modules via communications while still in the controller. Disassembly is not required. The software is loaded onto a USB memory drive and inserted into the touchscreen to be automatically accessed.

USB Memory Drive Setup:
Contact Gammaflux to get access to software update files.
To load the software to the USB drive:

1) Create a folder on the USB memory device. Select and use any one of the listed directory structures. ("E:" is used for an example of the USB drive letter.)
   E:\
   E:\G24ExpressUpdate\
   E:\Gammaflux\
   E:\Gammaflux\G24\
   E:\Gammaflux\G24ExpressUpdate\
   E:\Gammaflux\G24\G24ExpressUpdate\
   E:\G24\
   E:\G24\G24ExpressUpdate\
2) Copy the **G24 Express Update.exe, G24 Screens.msi** and **Setup.exe** files to that folder.
3) Copy the G24 Output Module firmware file to that folder. These files are typically named something like **GD630A01.hxo**. The prefix "GD630" refers to the G24 Output module assembly. The "A01" refers to the version and revision of the firmware.
4) Copy the G24 ICM Module firmware file to that folder. These files are typically named something like **GD633A01.hxi**. The prefix "GD633" refers to the G24 ICM module assembly. The "A01" refers to the version and revision of the firmware.

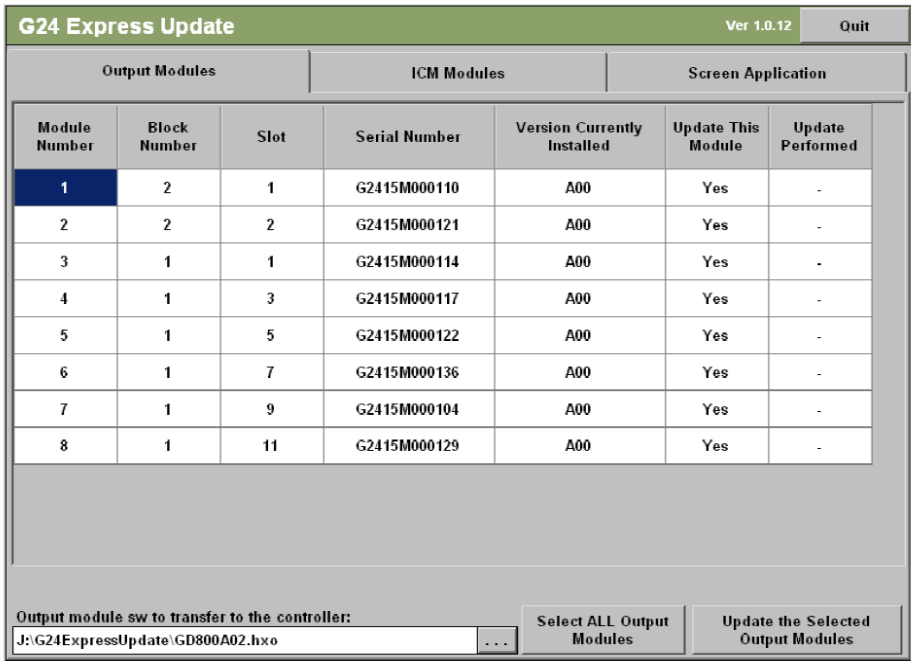
Update Procedure
To perform an update, do the following:

1) Turn off the injection molding machine and G24 controller.
2) Insert the USB memory drive into the USB port on the G24 touchscreen.
3) Turn on the G24. When the G24 screen application is started, it looks to the USB drive to see if the G24 Express Update application is present. If so, the G24 Express Update application is automatically started. If not present, then the regular G24 screen application is started.
4) Select Yes when asked if G24WindowsUpdate.exe should be permitted to make changes to the computer. The screen in Figure 30a will be displayed. The file shown in the bottom left corner of the screen GD800A02.hxo in Figure 30a will be the new file that will be installed. Files with the hxo extension are output module files.
5) Press "Select All Output Modules".
6) Press "Update the Selected Output Modules". Blue horizontal bars will indicate the progress of the output module update process as shown in Figure 30b. The top blue bar indicates the progress of the module currently being updated. The lower blue bar shows the overall progress for all the selected output modules. The Update Performed column will indicate Yes as each module is successfully updated. In the rare occurrence that a module is not successfully updated, a yellow highlighted Fault message will appear.
7) Select the ICM Modules tab at the top of the screen.
8) Press "Select All ICM Modules". The screen in Figure 30c will appear.
9) Press Update the Selected ICM Modules". Status bars will appear and the Update Performed column will be completed as shown in Figure 30d.
10) Select the Screen Application tab at the top of the screen. The screen in Figure 30e will appear. The Version After the Update column will indicate which files will be

updated with those files highlighted green.

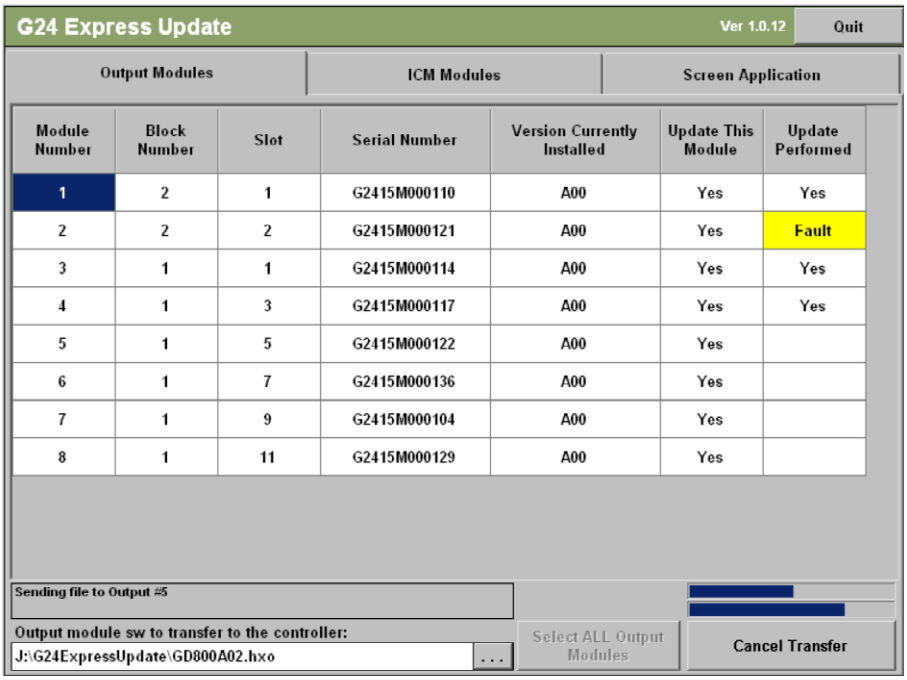
11) Press the Update the G24 Screen Application. A screen similar to the one in Figure 30f will appear. The Version Currently Installed and the Version After the Update columns will display the same file versions indicating that the update was successful.

12) The Exit G24 Express Update screen will appear as shown in Figure 30g will appear. Press Exit G24 Express Update and start the G24 Screen Application. The update is complete.



Module Number	Block Number	Slot	Serial Number	Version Currently Installed	Update This Module	Update Performed
1	2	1	G2415M000110	A00	Yes	-
2	2	2	G2415M000121	A00	Yes	-
3	1	1	G2415M000114	A00	Yes	-
4	1	3	G2415M000117	A00	Yes	-
5	1	5	G2415M000122	A00	Yes	-
6	1	7	G2415M000136	A00	Yes	-
7	1	9	G2415M000104	A00	Yes	-
8	1	11	G2415M000129	A00	Yes	-

Figure 30a Output Modules Updates



Module Number	Block Number	Slot	Serial Number	Version Currently Installed	Update This Module	Update Performed
1	2	1	G2415M000110	A00	Yes	Yes
2	2	2	G2415M000121	A00	Yes	Fault
3	1	1	G2415M000114	A00	Yes	Yes
4	1	3	G2415M000117	A00	Yes	Yes
5	1	5	G2415M000122	A00	Yes	
6	1	7	G2415M000136	A00	Yes	
7	1	9	G2415M000104	A00	Yes	
8	1	11	G2415M000129	A00	Yes	

Figure 30b Output Modules Updates (in Progress)

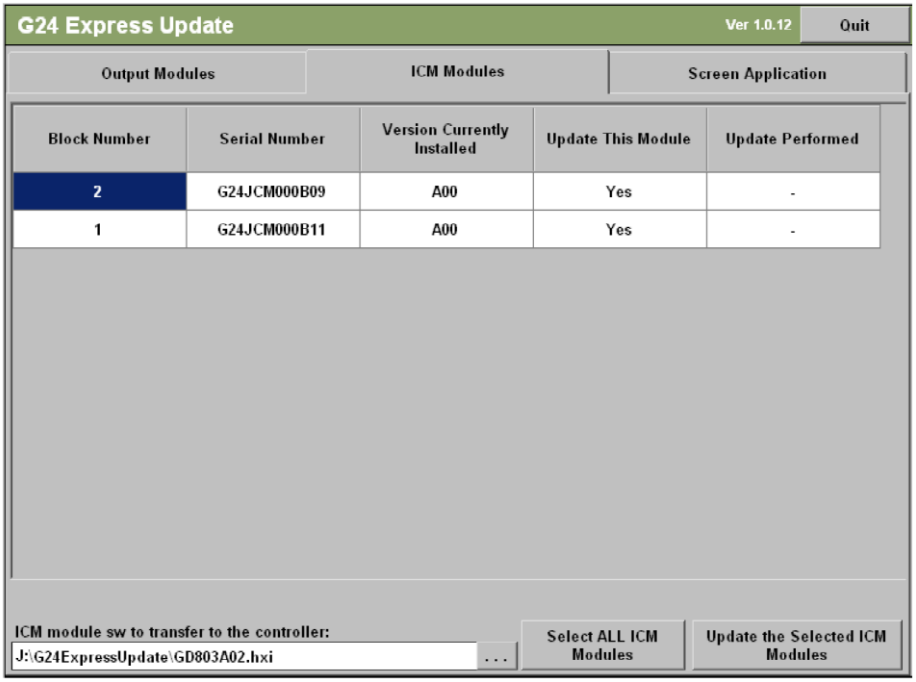


Figure 30c Input Control Modules Updates

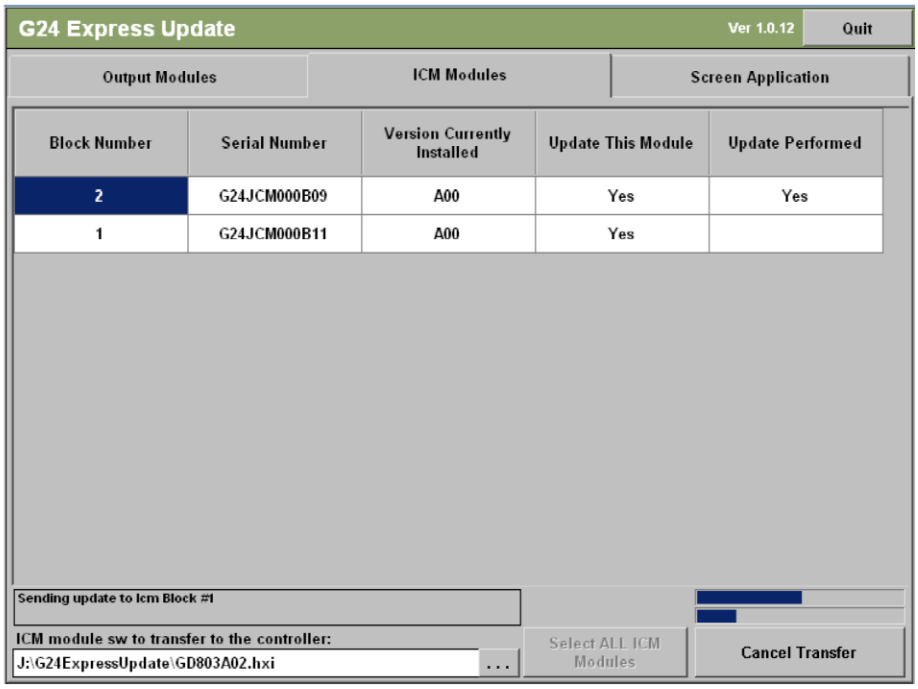


Figure 30d Input Control Modules Updates (in Progress)

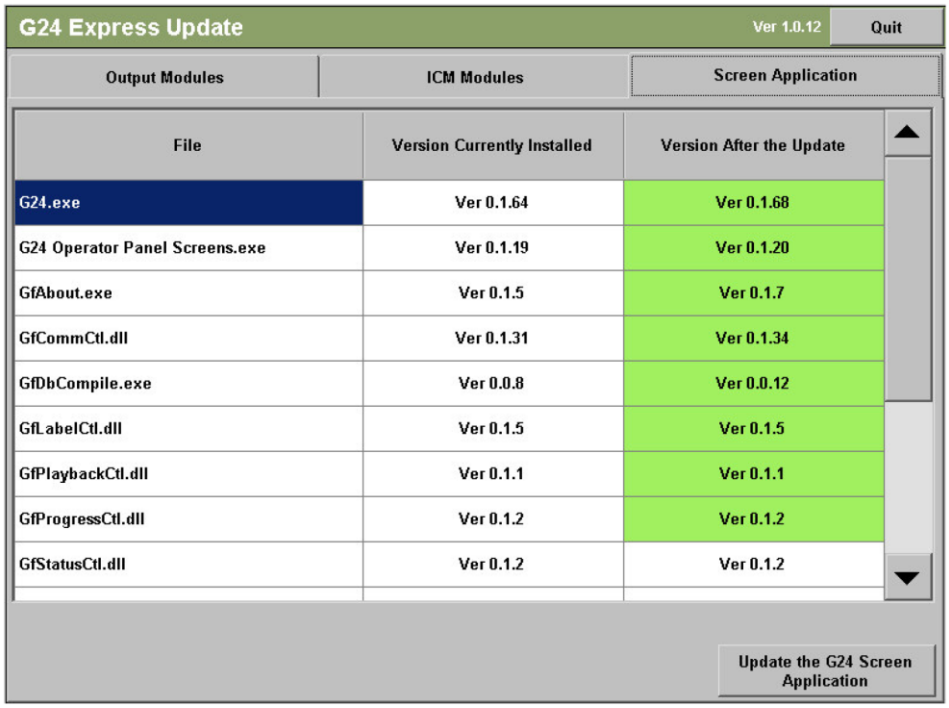


Figure 30e Screen Application Updates

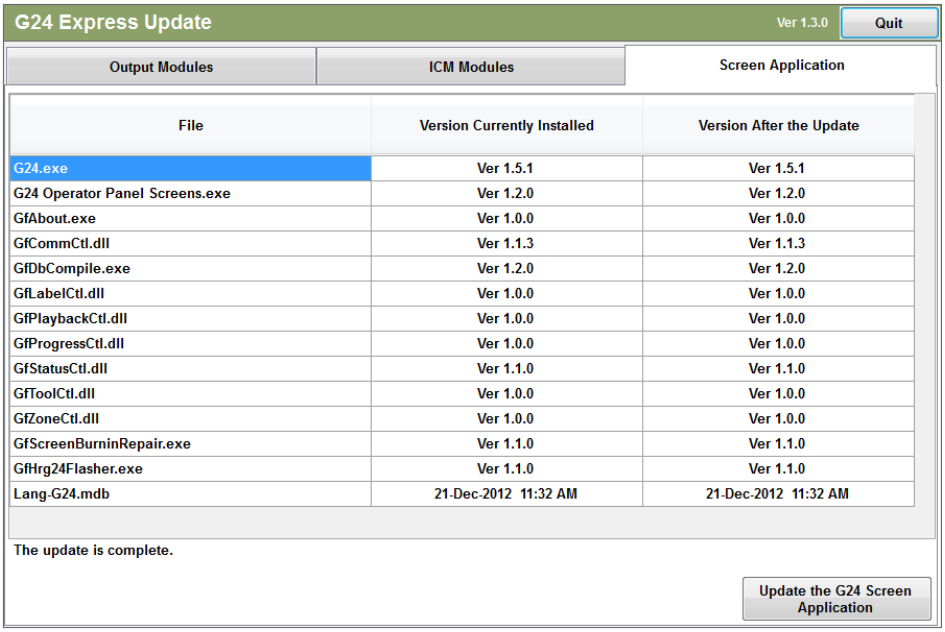


Figure 30f Screen Application Updates (completed)

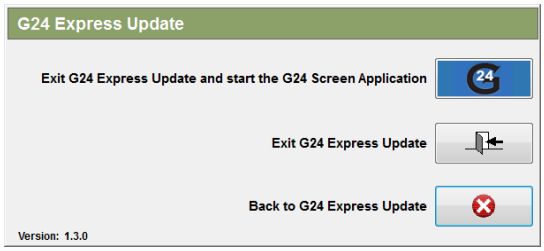


Figure 30g Exit Express Update

31
Specifications

Specifications

Calibration Accuracy	0.2 F (0.1C)
Control Accuracy	+/- 0.1F (0.05C)
Power Control Time	8.3 msec (120 times per second) at 60 Hertz
Process Sampling	50 msec (20 times per second)
Control Algorithm	Automatic, self optimizing, manual override
Degrees F or C	Field Selectable
Operating Range	0-932F (0-500C)
Output Voltage	0-240 VAC, Phase angle fired, 0.1% resolution
Standby Temperatures	User selectable (0-932F, 0-500C)
Remote Input	24 VDC

Thermocouple Input Specifications:

Thermocouple	Type J (standard), Type K (selectable).
Cold Junction Compensation	Internal to enclosure
External Resistance	10M ohms
Temperature Variation due to T/C length	None

Analog Input Specifications (Flow Channel Inputs):

Input Signals	4-20mA (converted to 0-10 VDC with 500-ohm resistor supplied by Gammaflux), 0—10VDC
Number of inputs	16 or 32
Sensor Excitation Voltage	12VDC provided by G24

Electrical Specifications:

Input Power	180-265 VAC Delta/Wye (phase voltage)
Frequency	47-53 Hz, 57-63 Hz
Ambient Temperature	32-122F (0-50C)
Humidity Range	10-95% non-condensing
Output Module Range	2-zone, 15A per zone, 3600W@240 VAC
Communications	Industrial USB 2.0

Performance Standard:

US, Canadian and International	CE Mark; EMC: I.E.C. 61000 (62, 64, 42, 43 44, 45, 46, 411)
Designed to Meet	Safety IEC 61010, UL 508, UL 873 and CSA

32
Default Settings and Limits

G24 Default / Limit	Default	Limit / Range
Multiple Language Capability	English	Multiple Languages
Power Status	Off	On/Off
Automatic Set Point	0F	0-932F; 0-500C
Manual Set Point	0%	0 - 100%
Automatic Mode/Manual Mode	Automatic	Auto/Man
Security Level	Operator	Monitor, Operator, Supervisor, Engineer
Security Codes - Up One Level at a Time, Enter 0 to go Down One Level at a Time	321, 654, 987	Mon-Oper, Oper-Supr, Supr-Engineer
Tuning	Autotune (0)	-31 to 27
Temperature Set Point Maximum Limit	932F	0-932F; 0-500C
Manual Percent Maximum Limit	100%	0-100%
Temperature Deviation Alarm Set Point	+/- 20F	+/- 1-999F; +/- 1-537C
Boost Set Point	20F	User Selectable (0-932F; 0-500C)
Boost Set Point Limit	+/- 50F	0-932F; 0-500C(Range is bipolar)
Boost Time Set Point	60 sec.	0-300 sec.
Trim Set Point	0F	User Selectable (0-932F; 0-500C)
Trim Limit	+/- 100F	0-932F; 0-500C
Standby Set Point	220F	0-932F; 0-500C
Standby Group	None	User Selectable
Thermocouple Pinch Detection Time	0 (0 = 5 min)	.1 – 54 minutes
Degrees F or C Selectable	F	F or C
Thermocouple Input	J	J or K
Alarms Latched	Disabled	Enabled/Disabled
Operator ID	None	Enter Operator ID's to enable
Material Protection	Disabled	Enabled/Disabled
Material Protection Time (in seconds)	0	0-999
Heater Resistance Monitoring	Disabled	Enabled/Disabled
Heater Wattage Monitoring	Disabled	Enabled/Disabled
Watt High Alarm	8000	0-8000
Watt Low Alarm	0	0-8000
Critical Over Temperature Alarm	932F	0-932F; 0-500C
Outputs on Power Up question - uninterrupted running	Ask	Always On, Ask, Always Off
Graph Setting Defaults	Auto Scaling	User Selectable
Seconds Per Update	1	.5 seconds - 65.5 seconds
Time Compression	1:1	1:1 - 1:300
Scale Max (both)	100	-999 - +999
Scale Min (both)	0	-999 - +999
Tool Pictures	None	User Generated

Database Max File Size	1 Meg	.1 - 100 Meg
Database Seconds per Update	1:1	1:1 - 300:1
Database - What to do "On File Full"	Keep Newest	Keep Newest or Oldest, Create New
Report Length	1 Hour	1 - 48 Hours
Report Type	View	View / Print

33
Troubleshooting

CAUTION: ALWAYS LOCK OUT/TAG OUT THE AC POWER MAIN CIRCUIT BREAKER BEFORE REMOVING OR INSTALLING TEMPERATURE OUTPUT MODULES.

CAUTION: ONLY TRAINED AND QUALIFIED SET-UP OR ELECTRICAL PERSONNEL SHOULD PERFORM THE TROUBLESHOOTING PROCEDURES. PROPER TRAINING PROVIDED BY GAMMAFLUX IS A MUST FOR QUALIFICATION TO TROUBLESHOOT THE EQUIPMENT SAFELY.

CAUTION: REPLACEMENT OUTPUT MODULES ARE MUST BE SUPPLIED BY GAMMAFLUX.

General Troubleshooting
Figure 33a shows general troubleshooting tips.

Symptom or Error Message	Possible Causes	Action
Active Alarm		See Section 8 Alarms
Temperature Overshoot on Start-up	1) Too much separation of thermocouple and heater 2) Improper Tuning	1) Check proper layout and sizing of thermocouple (TC) and heater 2) Change Tuning.
Temperature much higher that thermocouple reading	1) Celsius selected instead of Fahrenheit 2) Type K thermocouple used where Type J is selected on G24. 3) Improper location of thermocouple	1) Change C to F. 2) Match J or K selection to thermocouple used. 3) Evaluate thermocouple location.
Zone too hot, output % very low	1) Shear causing heat rise 2) Miswired zone	1) Consider lowering setpoints of upstream zones. 2) Run Mold Doctor Wiring Analysis.
Zone too cold, output % very high	1) Undersized heater 2) Shorted thermocouple	1) Consider larger wattage heater. 2) Shorted thermocouple alarm will activate.
Zone above setpoint, % output high	Output may be locked on	Put zone in manual at 0% output. If problem remains, replace output card.
1 zone hot with low output, 1 zone low with high output	Miswired	Run Mold Doctor Wiring Analysis

Symptom or Error Message	Possible Causes	Action
Zone does not reach setpoint	1) Thermocouple short 2) Undersized or old heater 3) Output may be bled off to other zones 4) Thermocouple or output miswired 5) Incoming power may be low 6) TC may be too far from heater	1) TC short alarm will activate 2) Replace heater 3) Run Mold Doctor Wiring Analysis 4) Run Mold Doctor Wiring Analysis 5) Check View Voltages 6) Evaluate TC placement
Temperature Fluctuation +/- 20F	1) Loose wiring or AC voltage on thermocouples 2) Ungrounded thermocouple 3) Incorrect Tuning	1) Check TC for tight wiring 2) Ground ungrounded TCs only 3) Evaluate tuning
1/3 zones are below setpoint	Lost phase of incoming power	1) Check brightness of 3 yellow incoming power LEDs on cabinet 2) Check View Voltages

Figure 33a General Troubleshooting

Input Control Module LEDs

The G24 has an Input Control Module (ICM) board that is located on each rack of the enclosure near the rear of the enclosure as shown in Figure 33c. This board is responsible for communication between the touchscreen, the thermocouple cards (attached to the ICM) and the output cards on that rack. There are four LEDs mounted vertically on the ICM located just below the ribbon cable that can be very useful in diagnosing any communication problem that arises. Figure 33b indicates the LED light status for each of the four LEDs with Notes listed for each possible condition.

From Top	Note 1	Note 2	Note 3	Note 4	Note 5	Note 6	Note 7
USB	Green Flicker	Red Slow Flash	Red	Off	Off	Green Rough	Green & Red
CPU	Green Flicker	Green Flicker	Off	Green Flicker	Off	Green & Red Rough	Green & Red
Outputs	Green Flicker	Green Flicker	Off	Green Flicker	Green Flash	Off	Off
Thermocouples	Green Flicker	Green Flicker	Off	Green Flicker	Green Flicker	Green Flicker	Off

Figure 33b ICM Board – LED Status

Notes

1. Normal operation, communicating with Operator Panel, T/C input module, Output Module and running PID^2 in application mode. While all four of these LEDs flicker, the USB LED flickers at a somewhat slower rate than the other three.
2. Red USB flashing every 2 seconds. ICM is not communicating with the touchscreen via USB, but is otherwise running normally.
3. USB lines held low by malfunctioning touchscreen or USB hub preventing CPU from running. Disconnecting the USB cable will allow CPU to run, but USB communications will still need to be debugged and reestablished.
4. Connected to touchscreen and USB communications are OK, but G24 software is not running on the touchscreen.
5. The normal state when in Express Update but BEFORE sending down data files.
6. Normal software update using Express Update while data is downloading.
7. Rare state indicating software encountered a problem on power up preventing application to run correctly.

Remote Input / Output LEDS
Just below the four ICM LEDs are two more LEDS that indicate the status of remote inputs and outputs if remote inputs and outputs have been ordered. See Figure 33c. The LEDs are located between the USB cable connector and the green Remote Input / Output connector below the Input Control Modules LEDs. The first remote input and output are found on the first ICM board. If there is another pair of I/O, it will be located on the ICM on the next enclosure below.

Input LED (on top) – Green when input signal is present, otherwise off.
Output LED (on bottom) – Orange (green and red lit simultaneously) when output relay is closed, otherwise off.

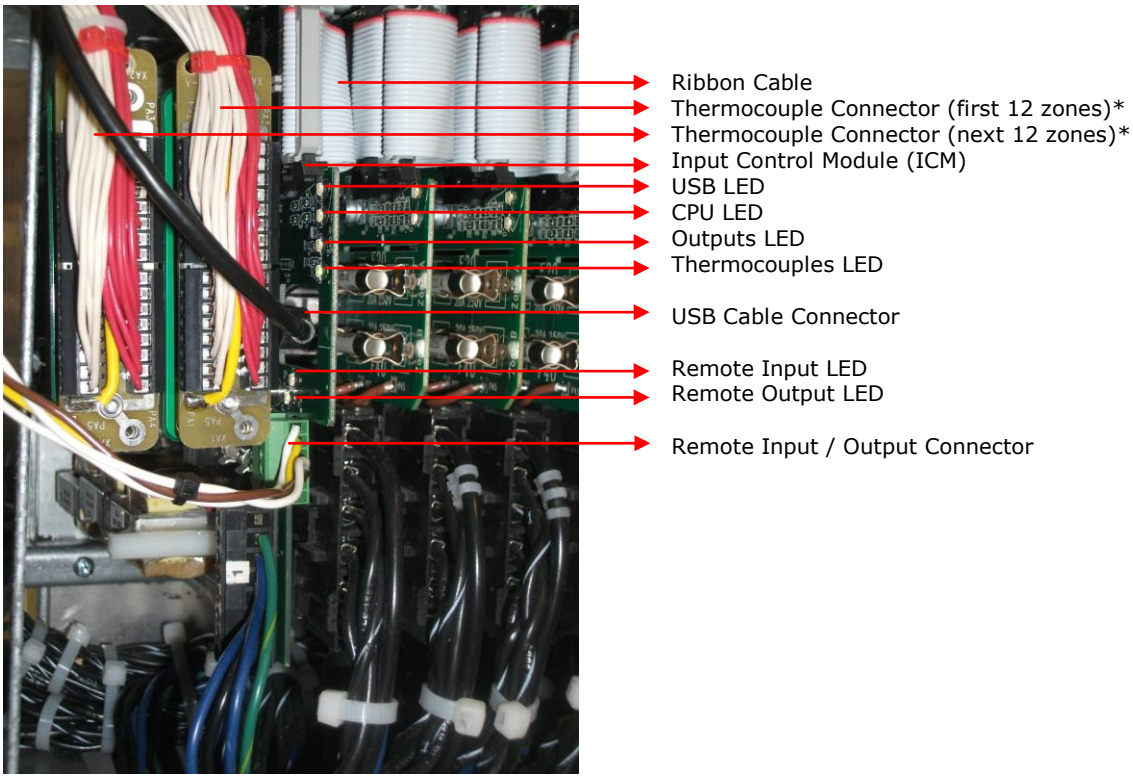


Figure 33c ICM Board LED Locations (left side block)*

* Figure 33c shows the layout for the ICM board for those blocks that have enclosure doors that open to the left side of the controller. For blocks with enclosure doors that open to the right side of the controller, the second thermocouple connector on the board will be in a different location. The second thermocouple board will be mounted on the forward side of the ICM board and forward in relationship to the first thermocouple board.

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Maintenance

Cleaning: For the exterior of the cabinet, apply a non-abrasive cleaner that contains isopropanol (isoprophyl alcohol) and will not attack plastic to a soft cloth and gently wipe down the metal portions of the cabinet. To clean the screen of the G24, use a soft, moist cloth and gently wipe it down. Do not spray liquids directly on the screen or into the cabinet.
Note: No attempt should be made to clean the interior of the cabinet. Should cleaning ever be required, please contact Gammaflux.

Check Power and Thermocouple Cables: Only check cables with the circuit breaker locked off. It is very important to routinely check all the cables on the rear of the cabinet. These routine checks should be carried out by a qualified electrician every six months. Make certain all the thermocouple and power cable connectors are well seated and all latches are secured in their locking positions. Inspect all cables for possible wear and/or abuse that would necessitate replacing a cable. If a cable pulls away from its housing strain relief, the cable should be replaced immediately. Any visible nicks or flat spots in cables should be viewed as good candidates for replacement. If any part of a connector base or hood appears loose, the repair should be done immediately or replaced if necessary.

Check the Earth Ground Connection: Earth ground should only be checked with the G24 circuit breaker locked off. Checking the earth ground connection should also be performed every six months. Installation and connection of the green (yellow/green Europe) earth wire from the G24 cabinet lug to ground is a MUST. In most locations, it is a LAW to have all the safety connections that are required by the local electrical codes. This connection should be routinely checked, not only for connection but for continuity.

Check the Operation of Cooling Fans: Every six months, check the internal fans of the G24 for operation. Usually a strip of paper held over the vented areas of the cabinet will flutter when the fans are operational. If one of the fans has failed, the fan should be replaced immediately.

Check Temperature Calibration: The maintenance schedule for recalibration of all temperature zones in the G24 system is dependent upon the nature of your molding process and the standards you are required to follow. We recommend that your calibration be checked at least every two years by a qualified technician. This can be readily accomplished by using the Calibration procedure described in Section 20.

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Contact Information

Literature, manuals, technical information and contact information can be found on our websites.

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