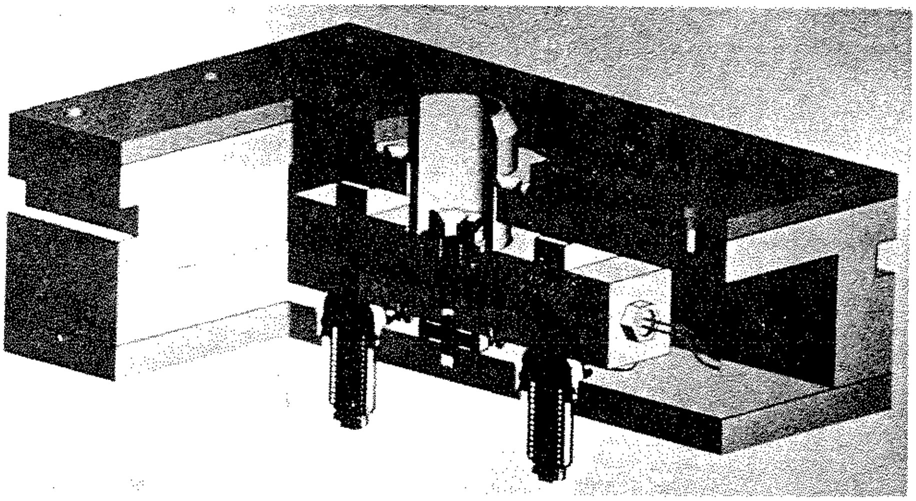
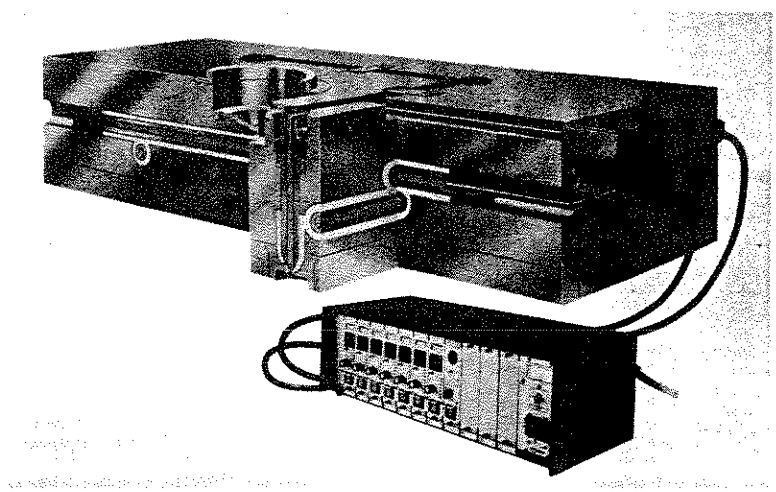
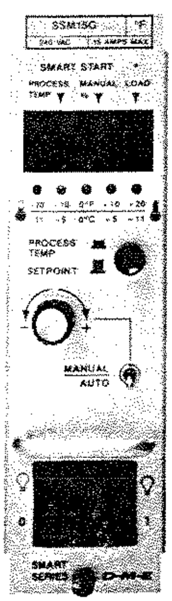
GENERAL ASSEMBLY, START-UP AND TROUBLESHOOTING GUIDE FOR D-M-E "HOT ONE" AND "COOL ONE" RUNNERLESS MOLDING SYSTEMS



"Hot One" Runnerless Molding System (Pages 1-5)

"Cool One" Runnerless Molding System (Pages 6-13)





Smart Series Module Fault Codes (Pages 14-16)

The guidelines in this manual serve as production-proven recommendations of the D-M-E Runnerless Molding Systems and are ONLY applicable to the current line of D-M-E components. Due to the wide variety of plastics materials and possible molding applications available, no warranties are expressed or implied.

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GENERAL ASSEMBLY, START-UP AND TROUBLESHOOTING GUIDE

D-M-E "HOT ONE" EXTERNALLY HEATED MANIFOLD SYSTEM

HEATERS:

1. All heaters should be checked visually for signs of damage (e.g., broken insulation, loose potting at the lead to heater connection point, pinched outer lead insulation cover, etc.).

2. Check all heaters for the correct ohm (resistance) reading, proper voltage and length.

3. Check for a resistance to ground or heater outer case. Any heater showing less than 20K ohms to ground should not be used. NOTE: Resistance readings in the 10-20K ohm range are likely to be caused by moisture. A bake-out period of 30-45 minutes in a conventional oven at 300-350°F may be used to eliminate the moisture condition.

4. Coil heaters should fit tightly on the hot nozzle shanks; loose fit conditions are not acceptable. An installation tool is supplied with replacement coil heaters which will allow the heater to be slightly unwound as it is slipped over the nozzle shank.

5. The coil heater is to be placed on the shank in such a fashion as to extend from the rear-most portion of the shank to the face of the shank. Heaters that are slightly short may be gently stretched to a proper length. Do not attempt to stretch heaters more than ½".

6. Cartridge heaters should just slip fit into their manifold heater holes. Cartridge heaters are approximately .002 under the actual I.D. of the installation bore. A "sloppy" fit between heater and bore will result in inadequate heat transfer and premature heater cartridge failure.

WIRING:

1. All additions to heater leads should be of the proper size gauge and temperature range.

2. Thermocouple wire additions must be of the "J" type when used in conjunction with any of the D-M-E Temperature Control Systems.

3. All wiring connections to original leads must be either soldered or spliced with non-plastic coated butt or ring terminal splicers. All splices must be adequately and properly insulated with a high heat electrical tape. Manifold zones with multiple heaters may be properly paralleled into two leads extended to the mold connector. However, insure that the extended lead wire is of the proper size to handle the Amp load.

4. Mold connectors/terminal mounting boxes should never be mounted on a "Hot One" manifold. Use D-M-E type terminal mounting boxes to aid in keeping mold connectors away from high heat areas and to facilitate future heater checks, replacement and maintenance. It is recommended that a piece of D-M-E Insulator Sheet be used to cover the bottom of the terminal boxes with appropriate holes machined to allow passage of heater and thermocouple leads.

NOZZLE AND MANIFOLD INSTALLATION:

1. After appropriate heater checks have been made, the nozzles can be installed in their proper bores. NOTE: It is common for a mold to have various sizes of nozzle drops. All nozzles and bores should be properly numbered to insure a proper matchup. Also, all heater and thermocouple leads should be numbered to facilitate connector wiring.

2. Inspect mold nozzle bores for proper deburring and any contamination, such as chips, plastics, dirt, etc. Check that the chamfer on the clearance bore will clear any radius between the heater cover and the body large diameter head. The nozzle must seat on the face of the head diameter and not on the radius.

3. Install the nozzles in their proper bores, insuring that the heater leads are in proper alignment with the wire channel. When installing, hold the nozzle as straight as possible in the bore to insure proper nozzle tip seal-off diameter to pocket seal-off bore diameter location. Do not "drive" the nozzle into this area with unnecessary force as shearing of metal will result in leakage during molding operations.

4. After installation, indicate the nozzle head heights. All nozzle heights should be within +-.001 to one another.

5. Indicate the support pads and/or spacer rings to the nozzle heights. Once again, all heights must be within +-.001.

6. Install the seal rings in the nozzle head grooves.

7. Position the center support pad and all other appropriate pads or spacer rings in proper alignment with the manifold hold-down bolt holes.

8. Dowel pin slots or holes should be provided in the manifold to insure proper alignment of the manifold. If the dowels are not installed in the mold base, install them at this time.

9. Install the thermocouples in the manifold. If a threaded type thermocouple is used, make sure that the threaded hole in the manifold is flat-bottomed drilled. The threaded type must lightly crush at the bottom of the threaded hole. To check, gently pull in and out on the lead as close to the hex adapter as possible. If any straight line movement is detected, the thermocouple is not properly installed, and the condition must be corrected to insure proper temperature control.

10. Place the manifold in its proper location on top of the nozzles. Install the hold-down bolts loosely, insuring that they are passing through the necessary spacer rings. After all bolts are installed loosely, start tightening the bolts from the center of the manifold outward and torque to the appropriate range for the bolt size used.

11. After tightening the manifold bolts, install the riser pads and nozzle seat if not previously installed.

12. Check the height of the assembly from the mold base support plate to the top of the riser pad and note this dimension. Next, check the height of the rails to which the clamp plate will be assembled or the depth of the ejector housing, whichever is accessible. The height of the assembly over the riser pad to the height of the rail must be within +.001-.001.

13. Install the rails or ejector housing. Make certain that all wiring is clear during assembly. After assembly, check all heater leads for any grounding or open conditions and thermocouple leads for opens.

14. Properly wire all leads to the appropriate mold connectors. Nozzle and manifold zone locations are generally specified by the end user.

15. After wiring is completed, again check heater leads for open or ground conditions and all thermocouple leads for open conditions. All D-M-E mold connector wiring instructions can be found following these general guidelines or in the Temperature Control Main Frame Manual.

16. If the assembly is to be bench checked under power, it is <u>imperative</u> that the mold be grounded to the temperature control cabinet to insure personal safety. When the grounding condition is in doubt, install an appropriate size ground wire from any point on the mold base to any point on the temperature control outer cabinet. Make sure connections are proper and secure.

PRE-STARTUP CHECKS:

1. Insure that the molding machine nozzle radius matches the radius in the "Hot One" manifold nozzle seat. Use proper size orifice diameter nozzle tip.

2. Insure that the main frame is properly wired to a power supply of the correct size. Also make sure that the power cable used is of the correct wire size for the main frame load. Use an adequate ground.

3. Prior to installing the mold power cables, place all module power switches in the "Off" position and place the main frame main breaker in the "On" position. Turn on the individual module switches one at a time, checking for the digital display to illuminate on the SSM type module; or the green power indicator light to illuminate on the SMP type module. If proper illumination is not achieved, check problem modules for blown or missing fuses and the main frame power "in" cable for proper installation. All main frames will be marked on the rear panel as to the necessary power hook-up requirements.

4. Set the control modules to a temperature setting of 200°-250°F and turn the main frame main power breaker to the "Off" position and all individual module switches to the "Off" position.

5. With the main power off and the individual module switches off, plug the temperature control main frame power and thermocouple cables properly into their respective mold connector and main frame connector receptacles.

6. With the mold power and thermocouple cables properly connected, place the main breaker in the "On" position. Turn on the #1 individual module switch checking for the following:

   a) Temperature to rise to the setpoint 200-250°F in a reasonable time frame and hold.

   b) Check for any fault indicators to appear in the digital display on SSM and CSS type controllers, or fault indicator lights to illuminate on SMP/CMP type controllers, and correct fault indications as necessary.

   c) Make all checks and corrections prior to powering up the next module, continuing the procedure until all modules have been checked.

d) A fault indication of "SHO" in the digital display of the SSM/CSS modules indicates a shorted thermocouple condition. This condition will appear if the module does not see a rise in temperature over a time period of 50 seconds with full power applied. On initial start-up, this condition could easily indicate a cross wiring problem within the mold wiring. Check all heater power and thermocouple leads for proper zone location and wiring sequence.

e) A "pinched" thermocouple lead condition will be the other condition resulting in a "SHO" fault indication.

f) "SHO" indications will result in power to heater shutdown. The fault condition must be corrected before automatic temperature control is restored.

START-UP & TROUBLESHOOTING:

1. Set manifold and nozzle temperature control zones at a reasonable and adequate molding temperature.

2. Fill the system with the extruder under adequate back pressure to force the melt through the system and out of the gates. Continue the extrusion procedure until the melt is flowing from all gate orifices.

3. The above extrusion start-up procedure will facilitate proper shot size setting and aid in eliminating unnecessary short shot conditions.

4. After the melt has flown from all gate orifices, eliminate the back pressure and set the shot size according to part size requirements.

5. After a proper shot size setting, the mold can be started under the same criteria as a conventional runner mold. However, during the first 15-20 minutes of run time, make continuing checks for melt leakage at the manifold to nozzle seal off points and at manifold flow channel plug areas.

6. At any time during the molding operation, a loss of shot size is an excellent indicator of a leak condition.

GENERAL GUIDE AND TROUBLESHOOTING PROCEDURES

D-M-E "COOL ONE" RUNNERLESS MOLDING SYSTEM

IMPORTANT:

Before applying power to system, be certain that the instructions enclosed with your temperature control main frame package have been read and thoroughly understood. A great deal of time and money can be saved if preliminary checks are made to the mold before setting it into the machine.

It is strongly suggested that the following system checks be made:

1) The electrical insulation should be checked from the heater leads to the heater case. The heaters should not be used with any reading below 20K ohms.

2) Be sure that the wiring covers have not "pinched" the lead wires and the wiring is not too tight.

3) If there is any possibility of cooling water contaminating the system, it is recommended that a hydrostatic (80 psi) test be made.

4) Visually inspect the position (concentricity) of the probes in their gates. If the probe point is eccentric, dimensional checks should be made before proceeding any further.

5) Check the protrusion of the probes in the gates. At this stage, a visual check is close enough. However, if there appears to be an excessive amount of variation, the mold should be checked dimensionally. Refer to page 11.

6) Be sure that the cartridge heaters in the distributor tubes are correctly positioned. The "overlap" must be equal and to specification (1½" minimum).

TEMPERATURE CONTROL SYSTEM CHECK

A preliminary check of the mold should be made before mounting it into the machine:

1) Connect the power cable(s) from the mold to the appropriate output connector(s) on the main frame.

2) Connect the thermocouple cable(s) from the mold to the appropriate input connector(s) on the main frame.

3) Making certain that the ON/OFF switch of each module is in the "OFF" position, turn the main frame circuit breaker "ON."

4) Adjust the module temperatures to approximately 200°F (93°C).

5) Turn the individual modules "ON."

6) Adjust each module according to its instruction sheet.

7) After adjusting each module, turn them "OFF" (full instructions are supplied with each main frame package).

MACHINE NOZZLE

It is important that the nozzle is adequately heated and the hole size is .312" (8mm); otherwise, material can freeze up and cause problems that may be falsely blamed on the system.

AT THE MACHINE

When filling a mold, be sure that it is "COLD" (at room temperature). Do not fill the mold when it is "HOT" (at running temperature) or with excessive pressure; that is:

1) Purge the nozzle in the normal manner and leave the screw forward (in the unrecovered position).

2) Select "Manual" mode and bring the machine nozzle forward to engage the mold.

3) Adjust back pressure and screw speed to maximum and extrude material in the cold distributor block. Material should appear at the gates. The screw will automatically recover, indicating that the mold is full.

4) Set all operating temperatures to the recommended settings for the material being run. The system operating temperatures at initial start-up may have to be slightly higher than the machine nozzle temperature.

5) Turn the system controllers "ON" and select the desired operating temperatures.

6) When the system has stabilized, normal mold start-up can begin.

BALANCING THE "COOL ONE" SYSTEM

This is achieved by adjusting individual cavity temperatures up or down so that all cavities fill at the same rate. Having "short shot" the mold a number of times and making temperature corrections, increase the shot weight to fill the component. As a general rule, keep the same difference between temperature settings whether raising or lowering. If in doubt, "short shot" the mold slightly to recheck the balance. This can also be done by extruding material in the "mold open" position. Having now balanced the mold, it is only necessary to apply normal molding techniques to produce good parts.

TROUBLESHOOTING

The "Cool One" System is dependent upon many factors. Most problems can be identified by noting the behavior of the machine or the characteristics of the part.

NOTE: Runnerless systems are not plasticizing units; they will only maintain temperatures.

PAUSING DURING INJECTION

CAUSE: Cold material in the machine nozzle or in the system.

REMEDY 1: Retract the machine nozzle and as quickly as possible, insert a penetration probe of the type used with D-M-E Temp-Sure Digital Pyrometer into the machine nozzle. Initially insert the probe only ½" (12mm) and note the reading. Continue to insert the probe until the tip is directly under the nozzle thermocouple or, if the nozzle is not equipped with a thermocouple, the tip of the probe should be inserted until it is in the center of the band heater. Note the difference in the two readings. Compare the readings with the resin supplier's specifications and make adjustments to achieve a uniform temperature along the nozzle.

REMEDY 2: Increase the primary tube temperatures 100°F (38°C). If the pausing is eliminated or significantly reduced, then the maximum land length (.187) at the nozzle locator may have been exceeded. (Machine to specifications if required.) If pausing has not been eliminated, return temperature to normal. Refer to page 11.

REMEDY 3: Repeat the above test on the secondary tube(s). If pausing is eliminated, measure the center-to-center dimension between the primary and secondary tubes. Check both ends of the bored holes in case they may have "drifted" during machining. If the pausing is still present, return the secondary tube temperatures to their original settings. Refer to page 11.

REMEDY 4: Having eliminated the other checked areas as problems, the pausing must be in the probe area. Increase the probe temperature 100° to 125°F (38° to 52°C).

CHECK: 1) The center-to-center distance between probes and the secondary tube. If correct:

2) Check the gate mark on the component. If a cold slug mark is evident, then either the probe is not penetrating the gate or, if a finned probe is used, the axial or diametrical clearance between the probe fins and the counterbore or the insert is too small. These clearances are critical and must be exactly as specified on the D-M-E mini-prints. Refer to page 11.

3) Remove the bolts securing the cavity plate to the distributor block in order to expose the probe tips with the plastic intact.

4) Remove the plastic from around the probe and measure from the bottom flats of the fins to the distributor block. Compare this measurement with the depth measurement of the counterbore on the cavity plate. There must be a difference consistent with the charted clearances for the probe being used at room temperature (e.g., clearance charted with AFP-410 = .028). Refer to page 11.

STRINGING ON GATE

Some materials are more prone to stringing than others, but stringing can be reduced or eliminated by:

1) setting the temperature lower.

2) increasing the hold time or packing the molded part.

3) moving the probe in toward the cavity to give a "doughnut" gate mark.

4) sandblasting the probe tip before assembly.

5) having adequate suckback (decompression).

GATE MARKS - AUTO-FIXED PROBES (Finned and Finless)

Generally speaking, the gate should be shaped like a "doughnut." If a projection is evident, it could be caused either by the probe being too far back from the gate or the land in the orifice exceeding .005". Correct to specifications on the instruction sheet. To prevent drool and a cold slug mark on the part, decompression should be used in most cases. The amount of decompression necessary varies with each material used and should be adjusted to the job accordingly.

CARTRIDGE HEATERS

Proper care and maintenance:

1) Heaters should be stored in a dry area, especially during periods of excessive humidity.

2) Protect leads from abuse, abrasion, fatigue, etc.

3) Maintain temperature controllers in good working condition to avoid an overheating condition.

4) When storing heaters, do not remove from the plastic bag supplied.

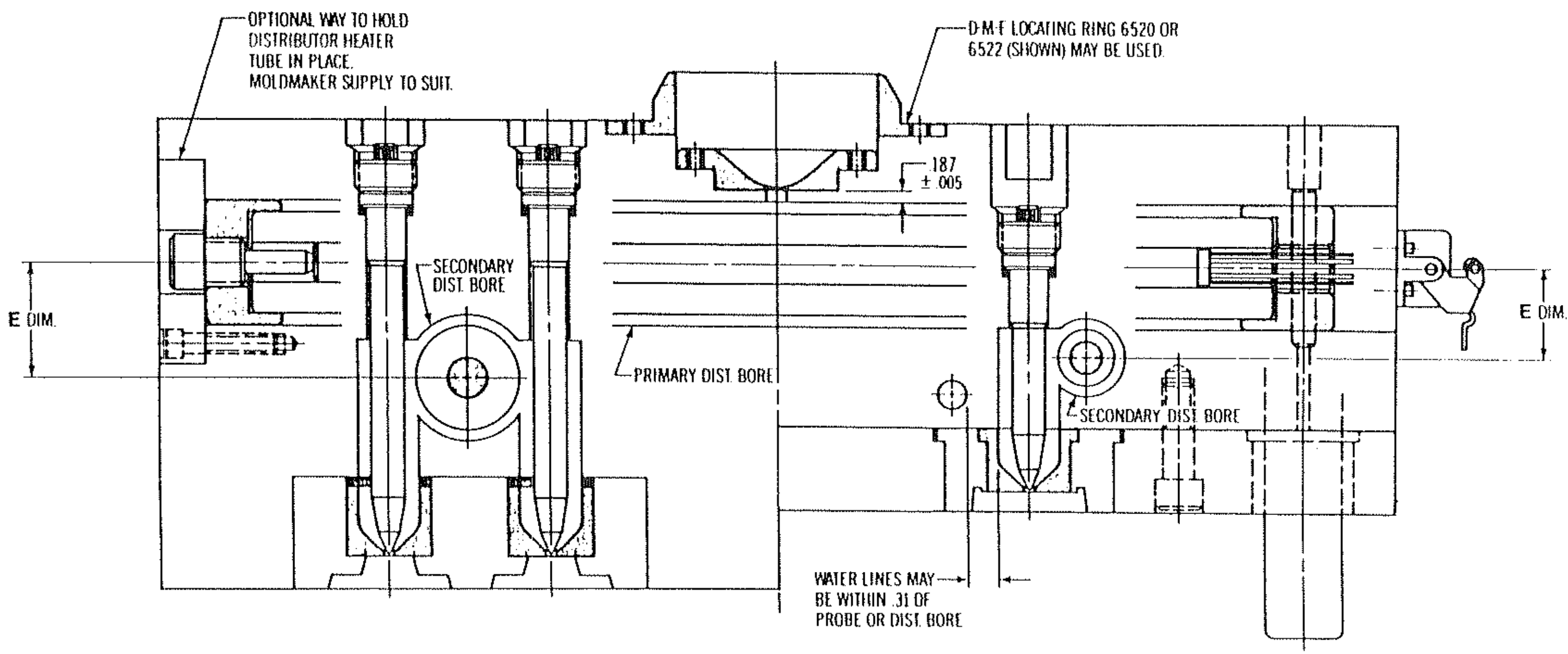
5) Avoid contamination from plastics, oil, grease, dirt or water entering any parts or areas of the electrical or heater system.

GENERAL

This start-up procedure is intended to be a general guide for starting the D-M-E "Cool One" Runnerless Molding System.

Should you have any questions of a more specific nature, contact your local D-M-E representative.

FINLESS & FINNED PROBE INSTALLATION DRAWING

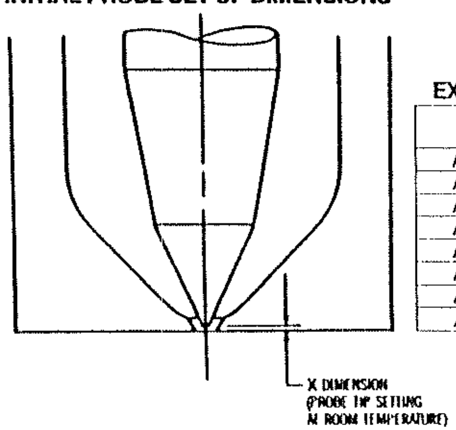


INTERSECTION BETWEEN DISTRIBUTOR BORES

PRIMARY DIST. BORE	SECONDARY DIST. BORE	E DIM.
2"	2"	1.812 ±.030
2"	1.25"	1.437 ±.030
*1.25"	1.25"	1.062 ±.030

*The 2" distributor bore with 1.62 dia. tube is recommended.

FINLESS
INITIAL PROBE SET-UP DIMENSIONS



THERMAL EXPANSION FACTORS

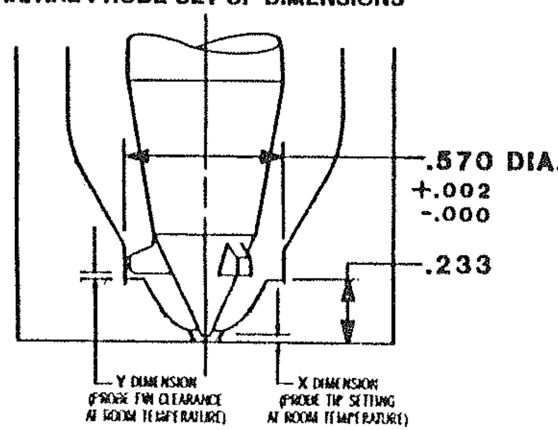
PROBE CAT. NO.	X DIM.
AFPN-310	.003
AFPN-410	.006
AFPN-510	.009
AFPN-610	.012
AFPN-720	.014
AFPN-820	.016
AFPN-920	.018
AFPN-1020	.020

THERMAL EXPANSION FACTORS

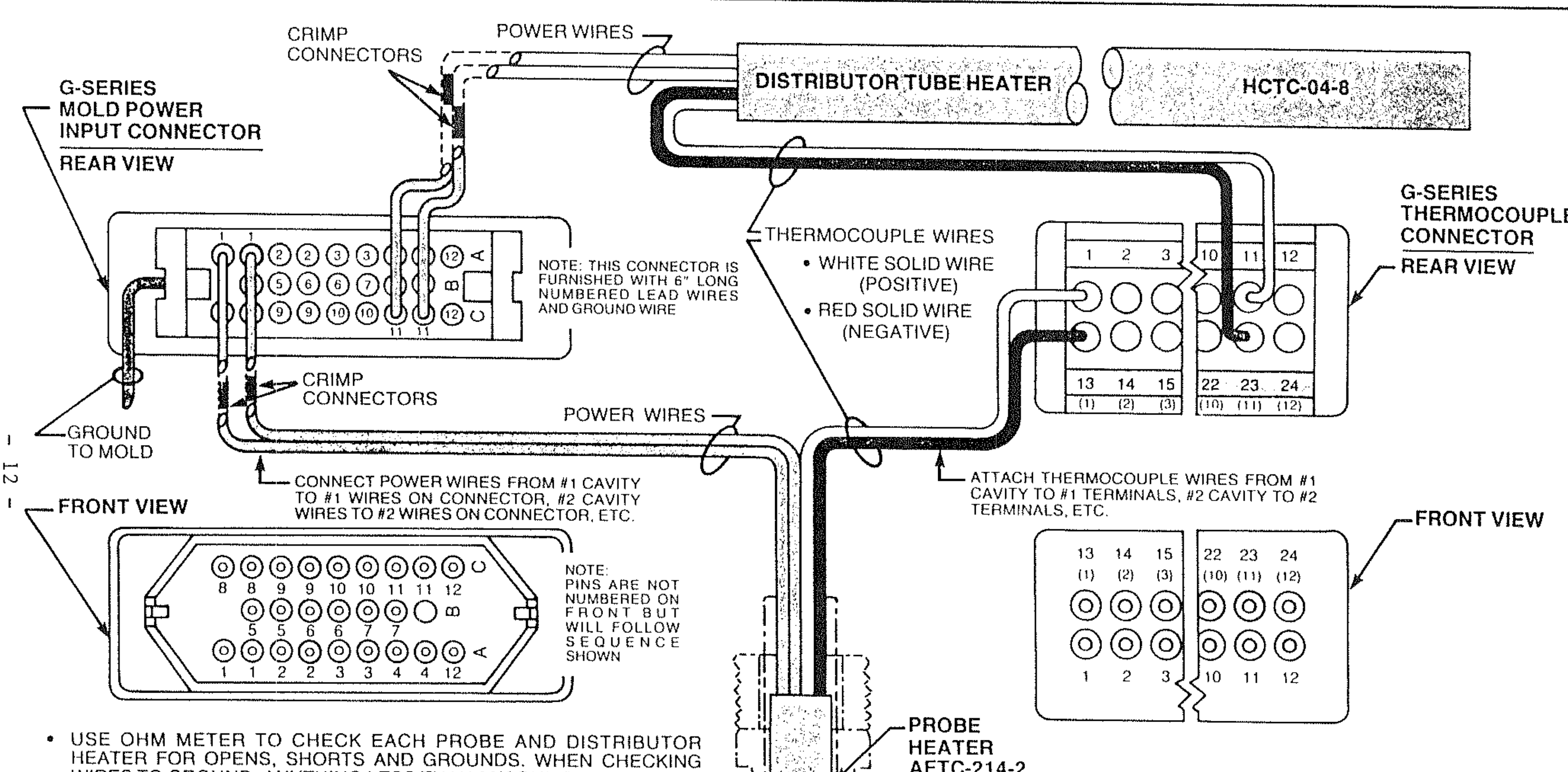
PROBE CAT. NO.	X DIM.	Y DIM.
AFP-310	.003	.025
AFP-410	.006	.028
AFP-510	.009	.031
AFP-610	.012	.034

NOTE: **X** or **Y** dimensions are for initial probe set-up and may require further adjustment. Final position of probe tip will be determined by gate cosmetics.

FINNED
INITIAL PROBE SET-UP DIMENSIONS



WIRING DIAGRAM FOR THE D-M-E RUNNERLESS MOLDING SYSTEM AND G-SERIES MOLD CONNECTORS



- USE OHM METER TO CHECK EACH PROBE AND DISTRIBUTOR HEATER FOR OPENS, SHORTS AND GROUNDS. WHEN CHECKING WIRES TO GROUND, ANYTHING LESS THAN 20K OHMS SHOULD NOT BE USED.
- USE OHM METER TO CHECK RESISTANCE OF EACH HEATER.
  - APPROPRIATE RESISTANCE READINGS:
    DISTRIBUTOR TUBE HEATER HCTC-04-8 = 70 OHMS APPROX.
    PROBE HEATER AFTC-214-2 = 260 OHMS APPROX.
  - FOR RESISTANCE READINGS OF OTHER HEATERS, USE THE FOLLOWING FORMULAS:

$$\text{AMPS} = \frac{\text{WATTS}}{\text{VOLTS}} \qquad \text{RESISTANCE READING (IN OHMS)} = \frac{\text{VOLTS}}{\text{AMPS}}$$

- CHECK CONNECTIONS OF RED AND WHITE WIRES TO RED (−) AND WHITE (+) TERMINALS TO INSURE PROPER POLARITY.
- USE OHM METER TO CHECK EACH PROBE AND DISTRIBUTOR HEATER FOR OPENS AND CONTINUITY.
  - THERMOCOUPLE WIRES MAY SHOW LOW RESISTANCE TO GROUND.
  - THERMOCOUPLE WIRES SHOULD SHOW LOW RESISTANCE (RED TO WHITE).
  - THERMOCOUPLE WIRES MUST SHOW HIGH RESISTANCE TO POWER WIRES. ANYTHING LESS THAN 20K OHMS SHOULD NOT BE USED.

START-UP PROCEDURE FOR D-M-E RUNNERLESS MOLDING SYSTEM

Mold Check-Out (on bench)

1. Probe Depth:
   Be sure all probes are properly installed with the appropriate clearances specified on D-M-E Mini-Prints.
2. Probe Heaters:
   Be sure all probe bores for cartridge heaters are clean.
   Install Heater Stop Sleeves before connecting wires to power and thermocouple connectors.
   Check power connectors for opens, shorts and grounds; and thermocouple connections for opens and proper polarity (see wiring diagram).
   To facilitate any subsequent troubleshooting, probe #1 should be inserted in cavity #1 with heater power wires connected to #1 lead wires on power input connector, and thermocouple wires connected to #1 terminals on thermocouple connector for control by module #1 in Main Frame, etc.
3. Distributor Tube Heaters:
   Be sure heater is positioned for appropriate overlap of intersecting probes (see D-M-E Mini-Prints).
   Check power and thermocouple connections as with probe heaters.
   Identify control module for each tube in system.

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Main Frame Check-Out (with mold on bench)

1. Be sure input power to Main Frame matches internal wiring arrangements of frame. 208-240 VAC, 3 phase is standard.
2. Connect power cable(s) from mold to appropriate output connector(s) on Main Frame.
3. Connect thermocouple cable(s) from mold to appropriate input connector(s) on Main Frame.
4. With individual modules turned "OFF", turn Main Frame Circuit Breaker/Disconnect switch to "ON" (POWER ON LIGHT on panel will illuminate).
5. Adjust all modules to desired temperature setpoints.
6. With modules set to their AUTO mode, turn all modules "ON". Both the POWER ON and POWER TO LOAD lights will come on. The POWER ON light (amber for FC and PMR modules; green for SMP and CMP modules) indicates that the module is on. The POWER TO LOAD light (red for FC and PMR modules; amber for SMP and CMP modules) indicates that power is being delivered to the heater. As the deviation meter nears the setpoint temperature the following will occur:
   FC modules — red light will start to blink
   SMP and CMP modules — amber light will remain on, but red UNDER TEMPERATURE light will stop blinking
   If further adjustments or troubleshooting of a module are required, please refer to troubleshooting chart on Main Frame or see Operating Instructions.

Filling Distributor Block (with mold in machine)

1. Having checked all electrical connections as outlined in "Mold and Main Frame Check-Out" procedures, set and clamp mold in machine.
2. Make all cable connections from mold to Main Frame. Leave Main Frame power off, distributor tubes and probes cold or at room temperature.
3. Bring barrel up to required temperature, purge barrel, and leave screw forward (in nonrecovered position).
4. With machine in "Manual" mode, open mold and bring machine cylinder fully forward to molding position with nozzle contacting nozzle locator in mold.
5. Turn screw back pressure and rpm to maximum, and extrude material into cold distributor block until filled. Material may appear at gates, and screw will automatically recover, indicating that distributor block is full. Setting back pressure and screw rpm to max. are for filling block only — not for use during processing.
6. Turn on modules with setpoints adjusted to same temperature used for machine barrel.
7. When deviation meters have stabilized, the temperature setpoints have been attained and normal mold start-up can now begin.

NOTE:
If an extension nozzle is used, it is extremely important for it to be heated along its entire length and kept at the front zone temperature.

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SMART SERIES MODULE FAULT CODES

The Smart Series Module has three separate fault codes. The module's built-in microprocessor is programmed to analyze temperature and power conditions at any given time and to determine if everything in the system is operating properly or if a fault condition exists. If a fault condition exists, the module will inhibit power and alternate the display between the setpoint and the existing fault code. The three separate fault codes are as follows:

" oPE " - OPEN THERMOCOUPLE

The module recognizes an open thermocouple by seeing a temperature rise which exceeds the upper temperature limit of the module. This condition is forced by biasing the thermocouple input lines so that whenever the thermocouple opens, the input temperature appears to go to infinity.

" bAc " - REVERSED (BACKWARD) THERMOCOUPLE

This condition is indicated by the module alternating the display between setpoint temperature and " b A c ." The module recognizes this condition by seeing the temperature going in a negative direction when it should be rising in a positive direction. When it reaches a pre-determined negative value, it goes into the " b A c " fault condition.

" SHo " - SHORTED THERMOCOUPLE

This is the third and most complicated fault condition which is intended to indicate a shorted thermocouple. We say intended because it could also be activated by four other fault conditions:

1) Open heater;
2) **Heater not large enough to bring load up to desired temperature;**
3) Thermocouple (sensor) located too far from the heat source (heater);
4) Thermocouple or heater wires crossed (i.e., heater wires from zone #1 are connected to module #1, but thermocouple wires from zone #1 are connected to module #2 while thermocouple wires from zone #2 are connected to module #1); or heater wires could be reversed and the thermocouple wires connected properly. Either situation would result in lack of control and cause a fault condition.

In order to troubleshoot this condition, it is important that you understand the analysis that the module's microprocessor is going through before it displays this condition.

The logic for "shorted thermocouple" is if full power is applied for a given period of time, a temperature increase must result; but if the thermocouple is shorted at some point in the system, the point where the short has occurred is the temperature that the module is measuring. Thus, application of power to the heater does not result in an increase in temperature. Therefore, a shorted thermocouple is indicated and the output power of the module is inhibited. This keeps the temperature of the heater from rising to excessively high levels.

Another logic condition is tied to this fault indication. After the module's output power is inhibited, the microprocessor continues to look at the temperature. If after 50 seconds the temperature has started to fall, the module will come out of the shorted thermocouple condition, because obviously if the temperature is changing, the thermocouple is not shorted. However, it is possible or even likely that one of the other four fault conditions previously listed exist:

1) Understand that if the heater leads are open at any point or if the heater itself is damaged (open), the module cannot supply current to it. As a result, the temperature will not rise even though the module is supplying 100% output. Due to the open in the heater circuit, there is no current flow, and the heater cannot receive any power. Under these conditions, a shorted thermocouple would be indicated because the module's output is 100% but the temperature is not increasing.

2) If the heater is too small (not enough wattage) to bring the temperature up to the setpoint under full power conditions, the temperature will rise to a certain point and stall. Under these conditions, the module will indicate " S H o " and inhibit the output. However, unlike a shorted thermocouple or open heater, when the power is inhibited, the temperature will fall and the module's microprocessor will see that fall in temperature and will turn the power back on and try to bring the temperature up to setpoint. When the temperature reaches the point where it will no longer rise because there is not enough available wattage, the module will go back into the fault condition. **This sequence will continue until someone recognizes the problem and corrects it by increasing the size of the heater.**

3) If the thermocouple (sensor) is located too far from the heater, the lag time (i.e., the time that it takes the heat to travel from the heater to the sensor) will be too long for proper control. If when full power is applied to the heater it takes longer than one minute for the thermocouple to see a rise in temperature, the module's microprocessor will see a full power condition with no temperature rise and will activate the " S H o " fault condition. While this is not a shorted thermocouple, it is still a fault condition. If the lag time between full power being applied and a temperature rise being seen at the thermocouple is longer than one minute, the process is not within desirable control limits and unstable oscillatory control will result. This situation can be corrected by moving the thermocouple physically closer to the heater.

4) If adjacent zones are cross-wired, power being supplied by zone #1 will cause the temperature to rise in zone #2. This will cause zone #2 to go into an over-temperature condition and will result in the output from module #2 to be shut off, which will result in module #1 giving full output power with no temperature rise. Under these conditions, module #1 thinks that it is in a shorted thermocouple condition and the microprocessor will indicate a " S H o " fault condition. Cross-wiring of modules can be checked by selecting the manual mode on the controllers in question and adjusting the outputs from 0 to 100% power while watching all zones for increasing temperature changes.

<u>Example:</u> If zone #1 and zone #2 are cross-wired and if you set module #1 to "0" output power and set module #2 to 100% output power, the temperature of zone #2 will not increase as it would normally; but if you check zone #1 where the temperature should not be rising because the power is set to "0" and you find that the temperature is rising, you know immediately that you have cross-wired heaters or thermocouples. Make sure you allow enough time for the thermocouple to respond to the heater. This time will vary, but in no case should it be longer than one minute.

While common wiring errors may cross-connect adjacent zones, keep in mind that it is possible to cross-wire any two zones in a given system. Therefore, all zones in a system should be checked for cross-wiring. This condition can be corrected by tracing the wiring from the mold to the modules until the wiring error is found. The most common wiring error occurs at the mold connectors. Much less likely but still possible are the cables or main frame.