This equipment manual is intended to provide information for safe operation and maintenance. Husky reserves the right to make changes to equipment in an effort to continually improve the equipment, features, and/or performance. These changes may result in different and/or additional safety measures that are communicated to customers through bulletins as changes occur.

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For non-emergency questions and issues you may also e-mail Husky at techsupport@husky.ca.

Husky Regional Service and Sales Offices

For the location closest to you, please visit www.husky.ca.

Product Upgrades

Upgrades are available that can improve your output, reduce cycle times, and add functionality to your Husky equipment.

To see what upgrades are available for your machine visit our website at www.husky.ca/partsandservice or call your sales representative.

Ordering Spare Parts

All spare parts for Husky equipment can be ordered through your nearest Husky Parts Distribution Center or online at www.husky.ca/partsandservice.

Unauthorized Modifications

Under no circumstances should any changes or modifications be made to the electrical circuits, hydraulic circuits, or the safety devices to the machine and guarding on the mold or hot runner without the prior, written permission of Husky Injection Molding Systems Ltd.
Hot Runner Refurbishing

Husky offers services for repairing, modifying, and retrofitting Husky hot runners. Please contact your Husky Regional Service and Sales office for details.

European Community (EC) Directives

Husky hot runners are designed to comply with the following European Community (EC) directives:

- Low Voltage Directive 2006/95/EC
- EN 201 Safety Requirements
- EN 60204-1 1997 Safety of Machinery - Electrical Equipment of Machines (when applicable)
- EMC Directive 89/336/EEC (when applicable)
- Machinery Directive 98/37/EC (when applicable).

Patents

Husky hot runner products and processes referenced in this document may be covered by the following patents or their foreign equivalents:

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</table>
# Table of Contents

## General Information

- Telephone Support Numbers ......................................................... iii
- Husky Regional Service and Sales Offices ................................... iii
- Product Upgrades ........................................................................ iii
- Ordering Spare Parts ................................................................... iii
- Unauthorized Modifications ............................................................ iii
- Hot Runner Refurbishing ............................................................... iv
- European Community (EC) Directives .......................................... iv
- Patents ......................................................................................... iv

## Chapter 1: Safety Summary .............................................................. 1-1

1.1 Material Safety Data Sheet (MSDS) .............................................. 1-1
1.2 Personal Protective Equipment and Safety Equipment .................. 1-1
   - Personal Protective Equipment (PPE) ......................................... 1-2
   - Safety Equipment ..................................................................... 1-2
1.3 Materials, Parts, and Processing .................................................. 1-3
1.4 Safety Hazards ........................................................................... 1-3
   - Mechanical Hazards ................................................................ 1-3
   - High Pressure Hazards ............................................................ 1-4
   - Burn Hazards .......................................................................... 1-4
   - Electrical Hazards ................................................................... 1-4
   - Gas, Vapor, and Dust Emissions .............................................. 1-4
   - Slip, Trip, or Fall Hazards ....................................................... 1-5
   - Lifting Hazards ....................................................................... 1-5
   - Pneumatic Hazards .................................................................. 1-5
1.5 Manuals .................................................................................... 1-6
   - Safety Alerts .......................................................................... 1-6
   - Other Alert Types ................................................................... 1-6
1.6 Safety Signs ............................................................................... 1-7
1.7 Qualified Personnel ................................................................. 1-8
1.8 Training .................................................................................... 1-9
1.9 Lockout/Tagout ................................................................. 1-9
1.10 Electrical Safety ....................................................................... 1-9
   - Electrical Power Wires and Cables ........................................ 1-10
1.11 Auxiliary Equipment ............................................................... 1-11
Chapter 2: Specifications and Requirements ........................................... 2-1
  2.1 Weights ................................................................. 2-1
  2.2 Operating Temperature Range ........................................... 2-1
  2.3 Electrical System .................................................... 2-1
    2.3.1 Controller Requirements ...................................... 2-2
    2.3.2 Nozzle Heaters .................................................. 2-2
    2.3.3 Manifold Heaters ............................................... 2-2
      2.3.3.1 Spare Thermocouple Wires ................................ 2-2
    2.3.4 Power Fluctuation .............................................. 2-3
  2.4 Air Connections ..................................................... 2-3
    2.4.1 General Requirements for Compressed Air ....................... 2-3
    2.4.2 Clean, Dry Air .................................................. 2-4
  2.5 Torque Specifications .................................................. 2-4

Chapter 3: Preparation ................................................................. 3-1
  3.1 Lifting and Handling .................................................... 3-1
    3.1.1 Lifting Using the Lift Bar ..................................... 3-1
    3.1.2 Lifting Using Swivel Hoist Rings ............................... 3-2
      3.1.2.1 Swivel Hoist Ring Specifications ........................ 3-3
    3.1.3 Lifting Using Lifting Eyebolts ................................ 3-4
      3.1.3.1 Understanding the Angle of Attack ....................... 3-5
      3.1.3.2 Lifting Eyebolt Specifications ............................ 3-5
    3.1.4 Laying Down a Hot Runner Assembly ............................ 3-6
    3.1.5 Picking Up a Hot Runner Assembly .............................. 3-7
  3.2 Mounting Methods .......................................................... 3-8
    3.2.1 Direct Bolting .................................................. 3-8
    3.2.2 Clamping ......................................................... 3-9
      3.2.2.1 Quick Mold Changers and Clamping Systems ............... 3-10
  3.3 Nameplate ............................................................... 3-10
  3.4 Preparation ............................................................. 3-11
  3.5 System Setup ............................................................ 3-11
    3.5.1 Thermal Gate Setup ............................................. 3-11
    3.5.2 Air Operated Valve Gate Setup ................................ 3-12
  3.6 Recommendations for Optimal Valve Gate Performance ................. 3-12

Chapter 4: Assembly ................................................................. 4-1
  4.1 Assembly Procedures .................................................... 4-1
  4.2 General Assembly .......................................................... 4-2
    4.2.1 Thermal Gate Stack System .................................... 4-3
    4.2.2 Valve Gate Stack System ....................................... 4-4
    4.2.3 Back-to-Back System .......................................... 4-5
  4.3 Assembling the Manifold Plates ........................................ 4-6
4.4 Assembling the Nozzle Stacks .................................................. 4-7
4.5 Assembling the Manifolds ......................................................... 4-7
4.5.1 Assembling Backup Insulators for Thermal Gate Systems ............ 4-7
4.5.2 Assembling Manifold Bushings .............................................. 4-8
4.5.2.1 Assembling the Threaded Manifold Bushings ......................... 4-8
4.5.2.2 Assembling the Threadless Manifold Bushings ......................... 4-10
4.5.2.3 Installing Manifold Bushings for Ultra 350 Systems (Tight Pitch Applications Only) ............................................................................. 4-11
4.5.2.4 Assembling the Manifold Bushings for Ultra 350 and Ultra 500 VGSX ................................................................................. 4-12
4.5.3 Installing the Transfer Sprue for Back-to-Back Systems ............... 4-13
4.5.4 Installing Manifolds ................................................................. 4-14
4.5.5 Installing Cross Manifolds ...................................................... 4-15
4.6 Measuring Preload ........................................................................ 4-17
4.6.1 Measuring Preload for Thermal Gate Systems ......................... 4-18
4.6.2 Measuring Preload for Ultra 350, Ultra 500, Ultra 750 and Ultra 1000 VGLX/EX .............................................................................. 4-18
4.6.3 Measuring Preload for Ultra 350 and Ultra 500 VGSX ................. 4-19
4.6.4 Measure Preload for Cross Manifolds ...................................... 4-20
4.6.5 Measuring Preload for Manifold Insulators ............................... 4-21
4.7 Measuring the Cold Clearance for Back-to-Back Systems ............... 4-21
4.8 Assembling the Valve Stems and Pistons ..................................... 4-22
4.8.1 Assembly for Ultra 350 VGSX Systems .................................... 4-22
4.8.2 Assembly for Ultra 500 VGSX Systems .................................... 4-24
4.8.3 Assembly for Ultra 350, Ultra 500 and Ultra 750 VGLX/EX Systems ..................................................................................... 4-25
4.8.4 Assembly for Ultra 1000 VGLX/EX Systems ............................ 4-26
4.8.5 Installing the Double Delta Seal ............................................... 4-28
4.9 Assembling the Sprue Bar ............................................................ 4-31
4.9.1 Assembling the Sprue Bar Adapter ............................................ 4-31
4.9.2 Assembling and Installing the Main Sprue Bar .......................... 4-32
4.9.3 Assembling the Anti-Drool, End Cap or Ball Check Bushings ....... 4-32
4.9.3.1 Assembling the Anti-Drool Bushing ...................................... 4-33
4.9.3.2 Assembling the End Cap Bushing ......................................... 4-33
4.9.3.3 Assembling the Ball Check Bushing ...................................... 4-34
4.10 Assembling the Manifold Plates .................................................. 4-36
4.10.1 Assembling the Manifold Plates for Thermal Gate and Valve Gate Systems ................................................................................ 4-36
4.10.2 Assembling Manifold Plates for Back-to-Back Systems ................ 4-38
4.10.2.1 Assembling the Center Air Plate ......................................... 4-38
4.10.2.2 Assembling the Clamp, Center Air and Injection Plates .......... 4-40
4.11 Assembling the Nozzle Tip and Heater Assemblies ....................... 4-42
4.11.1 Assembly for Thermal Gate Systems ....................................... 4-42
4.11.1.1 Assembling a HTM Heater for Ultra 250 Systems ................... 4-42
4.11.1.2 Assembling a HTM Heater for Ultra 350 Systems .......................... 4-43
4.11.1.3 Assembling a HTM Nozzle Heater for Ultra 500 Systems ........... 4-45
4.11.1.4 Assembling a Copper Heater for Ultra 500 Systems ................. 4-46
4.11.1.5 Assembling an Ultra Heater for Ultra 500 and Ultra 750 Systems . 4-48
4.11.1.6 Assembling a Bi-Metal Heater for Ultra 750 and Ultra 1000 Systems . 4-50
4.11.1.7 Assembling a Triton Heater for Ultra 750-UP Systems .................. 4-52
4.11.1.8 Assembling a Bi-Metal Heater for Ultra 750 HT-S6 Systems ......... 4-53
4.11.2 Assembly for Valve Gate Systems .............................................. 4-55
4.11.2.1 Assembling a HTM Heater for Ultra 350 Systems ...................... 4-55
4.11.2.2 Assembling a Copper Heater for Ultra 500 Systems .................. 4-56
4.11.2.3 Assembling an Ultra Heater for Ultra 500, Ultra 750 and Ultra 1000 Systems ........................................ 4-57
4.11.2.4 Assembling a Bi-Metal Heater for Ultra 500, Ultra 750 and Ultra 1000 Systems ........................................ 4-58
4.11.3 Testing Nozzle Heaters ......................................................... 4-59
4.12 Assembling Drop Limiters ...................................................... 4-59

Chapter 5: Installation, Startup and Operation ................................. 5-1
5.1 Installing the Locating Ring and Sprue Bar Guide ......................... 5-1
5.2 Installing the Heated Manifold .................................................. 5-2
5.3 Installing the Cavity Plates ...................................................... 5-3
5.4 Installing the Hot Runner ......................................................... 5-5
5.5 Startup and Operation ............................................................. 5-6
5.5.1 Startup and Operating Guidelines ........................................... 5-6
5.5.2 Startup Procedure ............................................................... 5-7

Chapter 6: Maintenance ................................................................. 6-1
6.1 Troubleshooting ...................................................................... 6-1
6.2 Periodic Maintenance ............................................................. 6-1
6.2.1 Maintenance Each Shift ......................................................... 6-1
6.2.2 Monthly Maintenance ........................................................... 6-2
6.3 Corrective Maintenance ............................................................ 6-2
6.3.1 Removal Procedures ............................................................. 6-2
6.3.2 Installation Procedures .......................................................... 6-3
6.3.3 Cleaning and Inspection Procedures ....................................... 6-4
6.4 Hot Runner Tools ................................................................... 6-4
6.4.1 Nozzle Tip Sockets and Heater Removal Tools ....................... 6-4
6.4.2 Nozzle Tip Torque Wrenches .................................................. 6-6
6.4.3 Valve Stem Removal Tools ....................................................... 6-6
6.4.4 Backup Pad Removal Tools ..................................................... 6-6
6.4.5 Tip Insert Removal Tools ........................................................ 6-7
6.4.6 SCVG Reverse Taper Valve Stem Removal Tool ....................... 6-8
6.4.7 Double Delta Piston Seal Installation Tools ............................ 6-8
6.4.8 Valve Bushing and Stem Guide Removal Tool ........................................... 6-9
6.4.9 Retaining Ring Installation Tool ............................................................. 6-10
6.4.10 Standard Nozzle Tip Sockets ............................................................... 6-10
6.4.11 Thermocouple Wire Stripping Tools .................................................. 6-11
6.4.12 Single Probe Thermocouple Removal Tools ....................................... 6-11
6.5 Removing the Hot Runner From the Machine .......................................... 6-11
6.6 Cavity Plates ......................................................................................... 6-12
6.6.1 Removing the Cavity Plates (On a Work Bench) ................................... 6-13
6.6.2 Installing the Cavity Plates (On a Work Bench) ..................................... 6-14
6.6.3 Removing the Cavity Plates (In the Machine) ....................................... 6-14
6.6.4 Installing the Cavity Plates (in the Machine) ....................................... 6-17
6.7 Manifold Plates .................................................................................... 6-19
6.7.1 Removing the Injection Manifold Plate ............................................... 6-19
6.7.2 Removing the Clamp Manifold Plate .................................................. 6-20
6.7.3 Installing the Injection and Clamp Manifold Plates ............................. 6-21
6.8 Center Air Plate .................................................................................... 6-21
6.8.1 Removing the Center Air Plate ............................................................ 6-21
6.8.2 Installing the Center Air Plate .............................................................. 6-22
6.9 Cleaning Drool from Weep Holes ........................................................... 6-22
6.10 Nozzle Tips .......................................................................................... 6-24
6.10.1 Removing Nozzle Tips for Thermal Gate Systems .............................. 6-24
6.10.1.1 Removal for Ultra 250 Systems ...................................................... 6-24
6.10.1.2 Removal for Ultra 350, Ultra 500, Ultra 750 and Ultra 1000 Systems... 6-25
6.10.1.3 Removal for Ultra 750-UP Systems ............................................... 6-26
6.10.1.4 Removal for Ultra 750 HT-S6 Systems ......................................... 6-27
6.10.1.5 Removing Nozzle Tips from Nozzle Retainers .............................. 6-27
6.10.1.5.1 With a Removal Tool ............................................................... 6-27
6.10.1.5.2 Without a Removal Tool ......................................................... 6-28
6.10.2 Installing Nozzle Tips for Thermal Gate Systems ............................... 6-29
6.10.2.1 Installation for Ultra 250 and Ultra 350 Systems ......................... 6-29
6.10.2.2 Installation for Ultra 500, Ultra 750 and Ultra 1000 Systems ........ 6-30
6.10.2.3 Installation for Ultra 750-UP Systems ......................................... 6-31
6.10.2.4 Installation for Ultra 750 HT-S6 Systems ..................................... 6-32
6.10.3 Removing Nozzle Tips for Valve Gate and Back-to-Back Systems ...... 6-33
6.10.4 Installing Nozzle Tips for Valve Gate and Back-to-Back Systems ........ 6-35
6.10.5 Troubleshooting Nozzle Tip Heights .................................................. 6-36
6.10.6 Cleaning Nozzle Tips ........................................................................ 6-37
6.10.7 Inspecting Nozzle Tips .................................................................... 6-37
6.11 Backup Pads and Piston Cylinders ......................................................... 6-37
6.11.1 Replacing Backup Insulator Pads for Thermal Gate Systems ............ 6-37
6.11.2 Replacing Backup Pads for Valve Gate and Back-to-Back Systems .... 6-38
6.11.2.1 Replacing Backup Pads on Threaded Manifold Bushings ................ 6-38
6.11.2.2 Replacing Backup Pads on Threadless Manifold Bushings .............. 6-40
6.11.2.3 Replacing Backup Pads on Ultra 350 Systems ( Tight Pitch Applications Only) .......................................................... 6-42
6.11.3 Replacing the Piston Cylinders for Ultra 350 and Ultra 500 VGSX .......... 6-42
6.12 Removing the Insulating Gate Bubbles or Nozzle Tip Insulators ................. 6-44
  6.12.1 Removing Nozzle Tip Insulators ................................................................. 6-45
  6.12.2 Cleaning the Gate Detail ................................................................. 6-45
  6.12.3 Installing Nozzle Tip Insulators ............................................................ 6-46
    6.12.3.1 Alternate Installation of Nozzle Tip Insulators ................................. 6-46
  6.12.4 Removing the Insulating Gate Bubble Removal ...................................... 6-47
6.13 Nozzle Heaters ................................................................................. 6-48
  6.13.1 Replacing the Nozzle Heater for Thermal Gate Systems ............ 6-49
    6.13.1.1 Replacing the HTM Nozzle Heater for Ultra 250 Systems .............. 6-49
    6.13.1.2 Replacing the HTM Nozzle Heater for Ultra 350 Systems .......... 6-51
    6.13.1.3 Replacing the HTM Nozzle Heater for Ultra 500 Systems .......... 6-52
    6.13.1.4 Replacing the Copper Nozzle Heater for Ultra 500 Systems ...... 6-53
    6.13.1.5 Replacing the Ultra Nozzle Heater for Ultra 500 and Ultra 750 Systems ................................................................. 6-54
    6.13.1.6 Replacing the Bi-Metal Nozzle Heater for Ultra 750, Ultra 750 HT-S6 and Ultra 1000 Systems ................... 6-55
    6.13.1.7 Replacing the Triton Nozzle Heater for Ultra 750-UP Systems ....... 6-57
  6.13.2 Replacing the Nozzle Heater for Valve Gate Systems ....................... 6-58
    6.13.2.1 Replacing the HTM Nozzle Heater for Ultra 350 Systems .......... 6-58
    6.13.2.2 Replacing the Copper Nozzle Heater for Ultra 500 Systems ...... 6-59
    6.13.2.3 Replacing the Ultra Nozzle Heater for Ultra 500 and Ultra 750 Systems ................................................................. 6-60
    6.13.2.4 Replacing the Bi-Metal Nozzle Heater for Ultra 500, Ultra 750 and Ultra 1000 Systems ................... 6-61
  6.13.3 Extending Nozzle and Sprue Heater Wire Leads ............................... 6-63
6.14 Manifolds ..................................................................................... 6-64
  6.14.1 Removing a Manifold from a Thermal Gate or Valve Gate System ...... 6-64
  6.14.2 Removing a Manifold from a Back-to-Back System ......................... 6-65
  6.14.3 Inspecting and Cleaning a Manifold .................................................. 6-67
  6.14.4 Installing a Manifold into a Thermal Gate or Valve Gate System ....... 6-68
  6.14.5 Installing a Manifold into a Back-to-Back System ............................ 6-69
6.15 Removing Resin from the Hot Runner ............................................... 6-70
  6.15.1 Plate Cleaning and Inspection ....................................................... 6-71
  6.15.2 Cleaning Using a Fluidized Bed Process ........................................... 6-72
    6.15.2.1 What is Fluidized Bed Cleaning .................................................. 6-72
    6.15.2.2 Assistance ............................................................................... 6-72
    6.15.2.3 Disassembly for Fluidized Bed Cleaning ...................................... 6-73
6.16 Nozzle Housings .......................................................................... 6-74
  6.16.1 Removing the Nozzle Housings ....................................................... 6-74
  6.16.2 Inspecting and Cleaning Nozzle Housings ......................................... 6-75
  6.16.3 Installing the Nozzle Housings .......................................................... 6-76
6.17 Sprue Bar (If Equipped) ................................................................. 6-76
  6.17.1 Removing the Sprue Bar ......................................................... 6-77
  6.17.2 Replacing the Anti-Drool Bushing ......................................... 6-77
  6.17.3 Replacing the End Cap Bushing .............................................. 6-78
  6.17.4 Replacing the Ball Check Anti-Drool Bushing ......................... 6-79
  6.17.5 Replacing the Tubular Heaters ............................................ 6-80
  6.17.6 Installing the Sprue Bar ..................................................... 6-81
  6.17.7 Inspecting the Sprue Bar Guide Wear Pads ......................... 6-81

6.18 Transfer Sprue ............................................................................. 6-82
  6.18.1 Removing the Transfer Sprue ............................................... 6-82
  6.18.2 Inspecting and Cleaning the Transfer Sprue ......................... 6-83
  6.18.3 Installing the Transfer Sprue ............................................... 6-83

6.19 Manifold Bushings ..................................................................... 6-83
  6.19.1 Removing Manifold Bushings ............................................... 6-83
  6.19.2 Inspecting and Cleaning Manifold Bushings ......................... 6-84
  6.19.3 Installing Manifold Bushings .............................................. 6-84

6.20 Valve Stem and Piston Assemblies ............................................. 6-84
  6.20.1 Removing Valve Stem and Piston Assemblies ....................... 6-84
    6.20.1.1 Removing the Valve Stems and Pistons for Ultra 350 and Ultra
             500 VGSX ................................................................. 6-85
    6.20.1.2 Removing the Valve Stems and Pistons Ultra 350, Ultra 500 and
             Ultra 750 VGLX/EX .................................................. 6-89
    6.20.1.3 Removing the Valve Stems and Pistons for Ultra 1000 VGLX/EX ....6-93
  6.20.2 Installing Valve Stem and Piston Assemblies ...................... 6-97
    6.20.2.1 Installing the Valve Stems and Pistons for Ultra 350 VGSX ....... 6-97
    6.20.2.2 Installing the Valve Stems and Pistons for Ultra 500 VGSX ....... 6-99
    6.20.2.3 Installing the Valve Stems and Pistons for Ultra 350, Ultra 500 and
             Ultra 750 VGLX/EX .................................................. 6-101
    6.20.2.4 Installing the Valve Stems and Pistons for Ultra 1000 VGLX/EX .....6-103
  6.20.3 Installing the Double Delta Seal ........................................... 6-105

6.21 Manifold Heaters and Manifold Thermocouples .......................... 6-107
  6.21.1 Manifold Heaters .............................................................. 6-107
    6.21.1.1 Testing and Inspecting the Manifold Heater .................... 6-107
    6.21.1.2 Removing the Protective Insulator Bushing for Fluidized Bed
             Cleaning ............................................................ 6-108
  6.21.2 Manifold Thermocouples ..................................................... 6-109

6.22 Testing the Electrical System .................................................... 6-109

6.23 Thermocouples .......................................................................... 6-111
  6.23.1 Thermocouple Electrical Test ............................................. 6-111
  6.23.2 Thermocouple Mechanical Test ......................................... 6-111
  6.23.3 Thermocouple Functional Test ......................................... 6-112
    6.23.3.1 With a Pyrometer .................................................... 6-112
    6.23.3.2 With a Multimeter ................................................. 6-112
Chapter 7: Split Sprue Bar Assembly, Maintenance and Troubleshooting ........................................ 7-1
  7.1 General Information ................................................................. 7-1
  7.2 Special Tools Required ........................................................... 7-2
  7.3 Molder Considerations ............................................................ 7-3
  7.4 Pre Startup Checklist ............................................................... 7-4
  7.5 Startup Procedure ................................................................. 7-5
  7.6 Maintenance ......................................................................... 7-6
  7.7 Removing the Split Sprue Bar From the Mold (Inline VG Only) ........... 7-6
  7.8 Changing the Piston Seals on the Manifold Side Without Disassembling Plates ........................................ 7-8
    7.8.1 Disassembly ................................................................. 7-8
    7.8.2 Reassembly ................................................................. 7-10
  7.9 Replacing Heaters and Thermocouples ........................................ 7-12
    7.9.1 Replacing the Sprue and Guide Body Heaters/Thermocouples (Inline VG) ........................................ 7-12
    7.9.2 Replacing the Nozzle Heaters/Thermocouples (Inline VG) ............. 7-16
    7.9.3 Manifold Side VG – Nozzle Heater/Thermocouple Replacement ........ 7-18
  7.10 Assembling/Disassembly the Inline Side VG Split Sprue Bar ................. 7-19
    7.10.1 Assembly ................................................................. 7-19
    7.10.2 Disassembly ............................................................... 7-20
  7.11 Assembling/Disassembling the Manifold Side VG Split Sprue Bar ............. 7-25
    7.11.1 Assembly ................................................................. 7-25
      7.11.1.1 Assembling the Split Sprue Bar Cross Manifold ...................... 7-27
      7.11.1.2 Assembling the Split Sprue Bar Manifold Side Nozzle ............. 7-28
    7.12 Lapping ................................................................. 7-33
    7.12.1 Parts Required ........................................................... 7-33
    7.12.2 Procedure ............................................................... 7-33
  7.13 Troubleshooting ................................................................. 7-36

Chapter 8: Customer Specials and Service Bulletins ........................................... 8-1

Chapter 9: Drawings, Schematics and Parts Lists ........................................... 9-1
Chapter 1  Safety Summary

This chapter describes general requirements and conditions for safe installation, operation, and maintenance of hot runner equipment. Personnel must read, understand, and follow all safety precautions listed in the equipment manuals. Personnel must follow applicable industry and regulatory safety requirements for safe installation, operation, and maintenance of equipment.

1.1 Material Safety Data Sheet (MSDS)

WARNING!

Some resin types produce toxic gases when heated to extreme temperatures. Always review the MSDS for the resin type being used before operating the hot runner and/or machine. Use any additional personal protective equipment (PPE) where required.

The Material Safety Data Sheet (MSDS) is a technical document which indicates the potential health effects of a hazardous product, and contains safety guidelines to protect personnel. Before handling a product, refer to the MSDS. These sheets identify hazards related to use, storage, and handling of the product, including emergency procedures. Contact the material supplier to obtain a copy of the MSDS sheet.

1.2 Personal Protective Equipment and Safety Equipment

Personal injury can be avoided when personnel wear appropriate protective gear and use special safety equipment. The following describes the safety gear and equipment that should be used when working with the equipment.
1.2.1 Personal Protective Equipment (PPE)

Wear appropriate personal protective equipment when working on or near equipment. Standard personal protective equipment includes:

- **Safety Glasses**
  For protecting the eyes from flying objects/particles, heat, sparks, splash from molten material, and more

- **Face Shield**
  For protecting the entire face area from flying objects/particles, heat, sparks, splash from molten material, and more

- **Heat Resistant Gloves**
  For protecting the hands from extreme heats

- **Hearing Protection**
  For protecting the ears from loud ambient noise

- **Safety Shoes**
  For protecting the feet from electrical shocks, crushing hazards, puncture hazards, splash from molten material, and more

- **Non-Melting Natural Fiber Pants and Long-Sleeve Shirt**
  For protecting the body from potential splash from molten material

1.2.2 Safety Equipment

Use appropriate safety equipment when working on or near equipment. Standard safety equipment includes:

- **Exhaust Fan**
  For collecting potentially harmful plastic fumes

- **Purging Container**
  For containing hot resin purged from the injection unit

- **Vacuum Cleaner**
  For collecting spilled resin pellets and other debris that may create a falling hazard

- **Stairs and Ladders**
  For ensuring safe access to areas of the machine

- **Danger Signs**
  For warning other personnel to stand clear of a component or area of the machine

- **Locks and Tags**
  For preventing the use of specific systems and components

- **Fire Extinguishers**
  For the expedient suppression of small fires

- **Telescopic Mirror**
  For safely inspecting valve gates from outside the mold area

- **Brass Hammers and Brass Rods**
  For safely removing dried resin deposits
1.3 Materials, Parts, and Processing

To prevent personal injury or damage to the equipment, make sure of the following:

- The equipment is only used for its intended purpose as described in the manuals.
- The operating temperatures do not exceed the specified permissible maximum value.
- The maximum temperature set point is set below the ignition point of the material being processed.
- Lubricants, oils, process materials, and tools used on equipment meet Husky specifications.
- Only authentic Husky parts are used.

1.4 Safety Hazards

Some common safety hazards associated with hot runner equipment are:

- Mechanical (pinching, shearing, crushing)
- High Pressure
- Burn
- Electrical
- Gas, Vapor, and Dust Emissions
- Slipping, Tripping, or Falling
- Lifting
- Pneumatic Hazards

1.4.1 Mechanical Hazards

- **Worn Hoses and Safety Restraints**
  Regularly inspect and replace all flexible hose assemblies and restraints.

- **Cooling Water Hoses**
  Cooling water hoses degrade over time and need to be replaced on a yearly basis. Degraded hoses become brittle and can break or separate from the fitting when manipulated. To minimize the risk of failure, inspect the hoses regularly and replace as required. Wait until the machine has cooled down before servicing cooling water hoses.
1.4.2 High Pressure Hazards

**WARNING!**

All nozzle and sprue heaters must be turned on when manifold heaters are turned on. Failure to do so could result in generation of dangerous pressure levels in the manifold, resulting in component failure and/or sudden release of hot resin.

Pressure inside the hot runner manifold(s) can increase to dangerous levels if the nozzle and sprue heaters are not turned on before or at the same time as the nozzle sprue.

The pressure is generated when the injection nozzle sprue is plugged with frozen resin and the residual resin in the manifold is heated. This pressure can release suddenly causing the resin plug to eject from the sprue and hot resin to spray from the nozzle tips. The risk of serious burn injuries as a result is increased.

Water leaking onto or into the hot runner can also increase the risks of this potential hazard. If the water temperature becomes critical (greater than 400 °C or 752 °F), the water temperature can be significant enough to rupture the metal housing and cause serious injury to personnel.

To avoid this hazard:

1. Always make sure all nozzle and sprue heaters are turned on any time manifold heaters are turned on outside of the mold. The nozzle and sprue heaters can be turned on independently of the manifold heaters, however, it is recommended that they be heated first or slaved to the manifold heaters so they heat up in unison.

2. Always make sure the nozzle tips are open and the nozzle housings are dry prior to applying heat to the manifold.

**IMPORTANT!**

In the event of water leaking onto or into the hot runner, the nozzle tips must be removed (cold) and the plastic in the nozzles drilled out to ensure they are open to atmosphere. This can be done using a standard twist drill with the cutting edges removed to prevent damage to the melt channel.

Replace the cavity plate prior to heating the system.

1.4.3 Burn Hazards

- **Hot Surfaces**
  Hot runners have numerous high temperature surfaces. At normal operating temperatures, contact with these surfaces will cause severe skin burns. Wear personal protective equipment (PPE) when working around a hot runner.

- **Molten Material**
  Never touch process material purged or otherwise flowing from the nozzle, mold, hot runner, or material in the feed throat area. Molten material can appear cool on the surface, but remain very hot on the inside. Wear personal protective equipment when handling purged material.
1.4.4 Electrical Hazards

Hot runners draw high amperage current at high voltage. The electrical power requirements are indicated on the electrical schematics. Connect equipment to a suitable power supply as specified in the electrical schematics and in compliance with all applicable local regulations.

1.4.5 Gas, Vapor, and Dust Emissions

Certain processed materials release harmful gas, vapors or dust. Install an exhaust system according to local codes.

1.4.6 Slip, Trip, or Fall Hazards

Do not walk, stand, climb, or sit on machine or hot runner surfaces. Use an approved platform or walkway around equipment to reach areas that are not accessible from the floor.

1.4.7 Lifting Hazards

When lifting the hot runner or hot runner components, use suitable lifting equipment, proper balancing techniques, and designated lifting points. Do not exceed the rated capacity of the lifting equipment.

1.4.8 Pneumatic Hazards

- Air Supply Hoses
  Make sure air supply hoses connected to the hot runner do not interfere with moving parts of the mold or the machine during operation. All air hoses must be sufficiently long so they will not be strained when the mold halves separate.
  Make sure air supply hoses are not routed over edges or where they could rub together, causing motion or vibration damage.

- Compressed Air
  Never use compressed air to clear valve gates. A piece of resin can fly out and injure a bystander.
  Always use a brass tool and vacuum cleaner to clear valve gates.
1.5 Manuals

Husky manuals aid in the safe and proper use of Husky products. Where applicable, the manuals provide instructions on installation, operation and maintenance. A separate drawing package includes parts lists and drawings.

Personnel should thoroughly review all manuals provided with their Husky equipment prior to performing any tasks. Proceed with tasks only if all instructions are understood and always follow applicable workplace safety requirements.

**IMPORTANT!**

Keep all manuals in a convenient location for future reference.

1.5.1 Safety Alerts

Safety alerts highlight hazardous conditions that may arise during installation, operation or maintenance and describe methods for avoiding personal injury and/or property damage. Depending on the severity of the hazard, safety alerts start with one of the following signal words: Danger, Warning or Caution.

**DANGER!**

The DANGER safety alert indicates an imminently hazardous situation that, if not avoided, will result in death or serious injury.

**WARNING!**

The WARNING safety alert indicates a potentially hazardous situation that, if not avoided, could result in death or serious injury.

**CAUTION!**

The CAUTION safety alert indicates a potentially hazardous situation that, if not avoided, could result in property damage.

1.5.2 Other Alert Types

Other non-safety related alert types used in the manual highlight important information needed by the user to install, operate or maintain the machine properly. They may also, in some cases, describe best practices, offer an expanded explanation, or reference a related section in the manual.

Non-safety related alerts start with one of the following signal words: Note, Important, or Reminder.
1.6 Safety Signs

Safety signs clearly mark potentially hazardous areas in or around equipment. For the safety of personnel involved in equipment installation, operation, and maintenance, use the following guidelines.

- Verify all signs are in the proper locations. Refer to the drawings in Chapter 9 for details.
- Do not alter signs.
- Keep signs clean and visible.
- Order replacement signs when necessary. Refer to the drawings in Chapter 9 for part numbers.

The following safety symbols may appear on safety signs:

**NOTE:** Safety signs may include a detailed explanation of the potential hazard and associated consequences.

<table>
<thead>
<tr>
<th>Safety Symbol</th>
<th>General Description of Symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="General – Warning" /></td>
<td>This symbol indicates a potential personal injury hazard. It is usually accompanied by another pictogram or text to describe the hazard.</td>
</tr>
<tr>
<td><img src="image" alt="Danger – Hazardous Voltage" /></td>
<td>Contact with hazardous voltages will cause death or serious injury. Turn off power and review electrical schematics before servicing equipment. Electrical cabinets can contain more than one live circuit. Test all circuits before handling to make sure circuits have been de-energized.</td>
</tr>
<tr>
<td><img src="image" alt="Danger – Explosion" /></td>
<td>Hot explosive plastic or gases can suddenly spurt out, causing burns. Wear protective clothes, gloves, safety glasses and face shield. Never look directly into feed throat, nozzle, or mold gates. Use a mirror.</td>
</tr>
</tbody>
</table>
1.7 Qualified Personnel

Only fully trained and qualified personnel should be permitted to maintain equipment. Qualified personnel must have demonstrated skills and knowledge related to the construction, installation and operation of the injection molding equipment and have received safety training on the hazards involved.

<table>
<thead>
<tr>
<th>Safety Symbol</th>
<th>General Description of Symbol</th>
</tr>
</thead>
</table>
| ![Warning – Lockout/Tagout](image) | **Warning – Lockout/Tagout**  
Servicing equipment without disabling all internal and external power sources can cause death or serious injury. De-energize all internal and external power sources. Electrical, hydraulic and pneumatic are examples of energy sources to consider. |
| ![Warning – Crushing and/or Impact Points](image) | **Warning – Crushing and/or Impact Points**  
Contact with moving parts can cause serious crushing injury. Do not reach over, under, around, or through guards. Always keep fixed and movable guards in place. |
| ![Warning – Hot Surfaces](image) | **Warning – Hot Surfaces**  
Contact with exposed hot surfaces will cause serious burn injury. Wear protective gloves when working near these areas. |
| ![Warning – Slip, Trip, or Fall Hazard](image) | **Warning – Slip, Trip, or Fall Hazard**  
Personnel climbing on equipment surfaces may slip, trip, or fall causing injury. Do not climb on equipment surfaces. |
| ![Warning – Read Manual Before Operation](image) | **Warning – Read Manual Before Operation**  
Personnel involved with equipment operation and maintenance should be properly trained. Personnel should read and understand all instructions in the manuals before working on equipment. |
| ![Warning - Workplace Hazardous Materials Information System (WHMIS) or Hazardous Communication (HAZCOM)](image) | **Warning - Workplace Hazardous Materials Information System (WHMIS) or Hazardous Communication (HAZCOM)**  
In addition to the safety notices in this manual, notices regarding hazardous materials may be used. The WHMIS or HAZCOM symbol for Class D Division 2 substances is used. The employer must obtain from the manufacturer the Material Safety Data Sheets (MSDS) for the substance being used, and follow the appropriate WHMIS or HAZCOM regulations. |
1.8 Training

All designated operators and maintenance personnel must be fully trained before using or servicing Husky injection molding systems.

If training is required, visit www.huskytraining.com or contact your nearest Husky Regional Service and Sales office to learn more about Husky’s training solutions.

**IMPORTANT!**

It is the obligation of the employer to properly train and instruct all personnel in safe methods of operation and maintenance. Manuals and other reference material, which have been prepared by Husky for the operation and maintenance of Husky equipment, do not in any way absolve the employer from fulfilling these obligations and Husky disclaims liability for injury to personnel which is attributable to the employer’s failure to do so.

1.9 Lockout/Tagout

**WARNING!**

Hazardous voltages, high pressure fluids, crushing or impact hazards - risk of death or serous injury. Lockout/tagout procedures must be performed in accordance with local codes. After performing the lockout/tagout procedure, allow 10 minutes for residual voltage to discharge to less than 50 Volts before performing any electrical procedures. Only qualified personnel should be permitted to perform the lockout/tagout procedure.

A lockout/tagout procedure in accordance with local codes must be performed on the machine or controller before any maintenance activities are performed. Refer to the machine or controller manufacturer’s manual for more information.

1.10 Electrical Safety

**WARNING!**

Only authorized electricians or trained service personnel are permitted to access electrical enclosures. Before servicing any electrical equipment, perform a lockout/tagout procedure to prevent inadvertent activation of the system by other personnel. Failure to lockout/tagout the machine can result in serious injury.
WARNING!

Water on the hot runner can be in close proximity to electrical connections and equipment. This can lead to a short circuit, resulting in serious electrical damage to the equipment. Always keep water lines, hoses, and hose fittings in good condition to avoid leaks.

NOTE: Damaged or worn relays and/or limit switches (e.g., micro switches, proximity switches, photo-electric switches, etc.) must be replaced, not repaired.

1.10.1 Electrical Power Wires and Cables

- The quality, rating, and insulation of electrical power wires and cables have been selected specifically for the requirements of this hot runner. Damaged cables, must be replaced immediately with the same or higher quality cables than those specified for the hot runner.

CAUTION!

Do not mix electrical power cables and thermocouple extension cables. Cables connected incorrectly will fail to either carry power or produce accurate signals (i.e. temperature readings).

- Multi-pin connectors for thermocouple and power are separated to reduce the possibility of electrical interference in thermocouple readings.
- Multi-pin connectors for electrical power must be grounded at both the hot runner and machine/controller. Power cables supplied by Husky contain green, or green and yellow colored ground wires.
- Keyed multi-pin connectors are used for electrical connections on hot runners to prevent assembly of the wrong connectors. The key pins must be in their correct position.

CAUTION!

Only the pins specified should be used in the multi-pin connectors. Damage or malfunction of the hot runner can result if inappropriate pins are installed in the multi-pin connectors. Refer to the electrical schematic diagram for correct positioning.

- Electrical wire grooves are provided in the manifold plate. The wires must not be allowed to be pinched between the mold plates. All wire clips must be installed.
1.11 Auxiliary Equipment

Husky is only responsible for the interaction of the hot runner with auxiliary equipment when Husky is the system integrator. If auxiliary equipment is removed, proper safeguards must be installed. For information about integrating non-Husky auxiliary equipment, contact your Husky Regional Service and Sales office.
Chapter 2  Specifications and Requirements

This chapter outlines the temperature, electrical, air and torque specifications and requirements for the Ultra stack hot runner system.

2.1  Weights

The mass of the entire hot runner assembly is listed on the Plan View assembly drawing. Refer to the drawing package provided with the hot runner.

2.2  Operating Temperature Range

The hot runner must operate within a specific temperature range to prevent internal resin leakage and damage to internal components as the result of thermal expansion. This temperature range is listed on the hot runner nameplate as the temperature difference between the manifold and the mold. Refer to Section 3.3 for more information.

The temperature range is critical for the hot runner system to be able to create a proper seal. It is important that the designed operating temperature window be observed at all times.

2.3  Electrical System

Refer to the electrical schematic provided in Chapter 9 for the following information:

- Control zones
- Multi-pin connector and pin position for each heater and thermocouple wire
- Connecting heater wiring in parallel (if applicable)
- Amperage, voltage and resistance of each heater
- Keypin locations
2.3.1 Controller Requirements

**WARNING!**

Electrical hazard – risk of equipment damage, fire and serious injury. Do not use a controller with an amperage rating less than that required by the heaters. Do not use a controller with a higher amperage rating than the connectors or cables to the mold. Failure to use a properly rated controller may result in the overload of electrical components, and further lead to fire or serious injury.

The number of control zones required for the heaters will depend on the size and requirements of the basic system.

The type of controller can be either:
- Automatic control, using a thermocouple to sense the temperature in each zone
- Manual control, where the controller is set to provide power during a percentage of time

**NOTE:** There may be an optional switchbox for turning ON or OFF the power to individual nozzle heaters.

**NOTE:** The controller output to the heaters must be 220-240 volts AC 50-60 Hertz single phase.

2.3.2 Nozzle Heaters

The nozzle heaters can be controlled separately or in zones by manual controllers. Refer to the electrical schematics in Chapter 9 for the correct configuration.

2.3.3 Manifold Heaters

Whenever possible, the manifold heaters are wired in parallel and controlled by a single controller zone. The circuit will be completed either at the cable connector or at the manifold.

The heaters are connected in multiple zones if the total amperage of all the heaters connected in parallel exceeds the capacity of a single controller zone.

Each zone is connected to a separate controller zone with its own thermocouple.

2.3.3.1 Spare Thermocouple Wires

The temperature of each manifold heater zone is sensed by a J-type thermocouple.

**NOTE:** Special order thermocouples may be other types.

In some cases, a spare thermocouple for each zone may also be routed to the base of the multi-pin connector to minimize down time. Should the main thermocouple fail, the spare can be easily connected without mold disassembly. The failed thermocouple can be replaced during the next mold maintenance.
The spare thermocouples can also be used to verify the condition of the first thermocouple should a sensing problem develop.

**NOTE:** To establish proper polarity when connecting thermocouples, follow the electrical schematic(s) in Chapter 9. For J-type thermocouples, the white wire is positive (+) and the red wire is negative (-). This wire color coding follows the ANSI J-Type North American Standard. The color coding and wire composition for J-type thermocouples in other parts of the world may be different and produce different readings.

### 2.3.4 Power Fluctuation

Hot runner systems are sensitive to fluctuations in power supply voltage. The nozzle and manifold heaters are rated for 240 volts (or 200 volts in special applications).

**NOTE:** Always refer to the hot runner nameplate on the operator’s side of the clamp before installing a hot runner. Refer to Section 3.3 for more information on the nameplate.

The manifold is always controlled by thermocouples and will compensate for minor voltage fluctuations.

Where the nozzle heaters are regulated by percentage timers, the heat output will be directly affected by voltage fluctuations. For example, a reduction of the voltage by only 10% will affect output (in watts) by about 20%, which will reduce the nozzle temperatures considerably. Adjustment is required.

In severe cases where the stability of the power supply is known to be unreliable, it may be advisable to install an automatic voltage stabilizer rated for the power requirements of the controller.

### 2.4 Air Connections

is used by hot runners to actuate valve stems, which open and close valve gates.

#### 2.4.1 General Requirements for Compressed Air

- Typical air pressures required is 5.52 to 8.27 bar (80 to 120 psi), unless otherwise specified in the *Mold Manual*.

  **NOTE:** For optimal performance, air pressure up to 12.41 bar (180 psi) may be required for LX and SX pistons.

- Make sure the size of air lines are large enough to permit adequate flow to the locations where air is required.

- In some cases, air accumulators are installed to provide a larger air volume supply near the point requiring air.

- Make sure air used for mold actuators is interlocked with the machine operator’s gate, so opening the gate prevents any motion.
To improve valve gate quality, locate quick exhaust valves close to the actuators they control, so the compressed air in the mold will decompress rapidly and speed operation of the actuator.

Lockout valves must be installed (ANSI Z244.1 or local regulations) to the air supply for use when:
- Servicing the mold
- Performing maintenance
- Mold installation and removal

2.4.2 Clean, Dry Air

The hot runner air circuit requires clean, dry air.

**IMPORTANT!**
Compressed air quality must meet the standards specified in DIN ISO 8573-1.

In order to clean and dry the air, the system should be set to a pressure dew point 11 °C (20 °F) below the lowest ambient temperature of the air line system.

For air system maintenance procedures, refer to the Service Manual for the machine.

2.5 Torque Specifications

Torque specifications are provided on the assembly drawing(s) in Chapter 9.

**CAUTION!**
Use of improper torque can result in equipment damage. Consult assembly drawings for torque specifications before using torque charts in this section.
Chapter 3 Preparation

This chapter describes how to move, test, inspect and generally setup the Ultra stack hot runner system.

3.1 Lifting and Handling

Hot runner assemblies must be lifted and handled using appropriate lifting devices, such as lift bars, swivel hoist rings and/or lifting eyebolts.

CAUTION!

Do not use magnetic lifting devices to lift the hot runner. These can potentially scratch a finely ground plate.

IMPORTANT!

Safety must be the primary consideration when lifting and moving a hot runner assembly. Make sure to always use suitable lifting equipment that is inspected regularly and follow the recommendations outlined in this manual.

3.1.1 Lifting Using the Lift Bar

To properly lift the hot runner assembly using a lift bar, do the following:

1. Install the lift bar to the lifting holes on the top of the component as shown in Figure 3-1.
2. Attach a suitable overhead lifting device to the swivel hoist ring and lift the hot runner assembly vertically.

NOTE: The maximum weight the bar can lift is stamped on the lift bar.
3.1.2 Lifting Using Swivel Hoist Rings

When using swivel hoist rings, make sure they are properly torqued before lifting.

NOTE: Refer to Section 3.1.2.1 for specifications and part numbers for swivel hoist rings.

NOTE: Make sure the swivel hoist ring used can support the weight of the plate or component at the chosen angle of attack.

IMPORTANT!

When using swivel hoist rings, remember the following:

• Do not lift more than the rated capacity.
• Depending upon the sling angle, the applied load may be more than the weight being lifted. Two point lifting of a 1000 kg (2000 lb) weight, with a sling angle of 30°, will result in an applied load of 1000 kg (2000 lb) to each hoist ring.
• After installation, make sure the hoist ring swivels and pivots freely in all directions. The side of the ring must not contact anything.
• Never use a hook or other lifting device which will pry or open the “U” shaped bar on center-pull hoist rings.
• Screws must be tightened to the recommended torque values.
• Do not apply shock loads. When lifting, apply force gradually.
• Do not use spacers between the hoist ring bushing and the work piece surface.
• The work piece surface must be flat, providing complete contact for the hoist ring bushing.
3.1.2.1 Swivel Hoist Ring Specifications

Metric and Imperial swivel hoist rings are available through your nearest Husky Parts Distribution Center. Swivel hoist rings purchased from other suppliers must meet or exceed the following specifications.

Table 3-1 General Hoist Ring Specifications

<table>
<thead>
<tr>
<th>Material</th>
<th>4140 certified aircraft quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Forged hoist ring</td>
</tr>
<tr>
<td>Finish</td>
<td>Phosphate per DOD-P-16232F</td>
</tr>
<tr>
<td>Safety Factor</td>
<td>5:1</td>
</tr>
<tr>
<td>Swivel</td>
<td>Pivot 180° and swivel 360°</td>
</tr>
<tr>
<td>Thread</td>
<td>ISO 261 and ISO 965 - Coarse</td>
</tr>
<tr>
<td>Surface</td>
<td>Magnetic particle inspected (ASTM E709-80)</td>
</tr>
<tr>
<td>Certification</td>
<td>Individual certificate of conformance with the serial number specified on the hoist ring for traceability</td>
</tr>
</tbody>
</table>

Table 3-2 Specifications for Metric Coarse Swivel Hoist Rings

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Rated Capacity[1]</th>
<th>Torque</th>
<th>Thread Ø</th>
<th>Minimum Full Thread Depth</th>
<th>Pitch</th>
</tr>
</thead>
<tbody>
<tr>
<td>2761800</td>
<td>1050 kg (2315 lb)</td>
<td>37 N-m (27 lbf-ft)</td>
<td>M12</td>
<td>24</td>
<td>1.75</td>
</tr>
<tr>
<td>2770570</td>
<td>1900 kg (4189 lb)</td>
<td>80 N-m (80 lbf-ft)</td>
<td>M16</td>
<td>32</td>
<td>2.00</td>
</tr>
<tr>
<td>2502267</td>
<td>4200 kg (9259 lb)</td>
<td>311 N-m (229 lbf-ft)</td>
<td>M24</td>
<td>48</td>
<td>3.00</td>
</tr>
<tr>
<td>536013</td>
<td>7000 kg (15432 lb)</td>
<td>637 N-m (470 lbf-ft)</td>
<td>M30</td>
<td>60</td>
<td>3.50</td>
</tr>
<tr>
<td>2761801</td>
<td>11000 kg (24250 lb)</td>
<td>1085 N-m (800 lbf-ft)</td>
<td>M36</td>
<td>72</td>
<td>4.00</td>
</tr>
<tr>
<td>2761803</td>
<td>12500 kg (27558 lb)</td>
<td>1085 N-m (800 lbf-ft)</td>
<td>M42</td>
<td>84</td>
<td>4.50</td>
</tr>
</tbody>
</table>

[1] Minimum rated capacity at any pull angle (between 0° horizontal pull and 90° vertical pull)

Table 3-3 Specifications for Inch UNC Swivel Hoist Rings

<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>2732764</td>
<td>1130 kg (2500 lb)</td>
<td>28 N-m (38 lbf-ft)</td>
<td>1/2</td>
<td>1.0</td>
<td>13</td>
</tr>
<tr>
<td>2732765</td>
<td>2260 kg (5000 lb)</td>
<td>100 N-m (135 lbf-ft)</td>
<td>3/4</td>
<td>1.5</td>
<td>10</td>
</tr>
<tr>
<td>2760517</td>
<td>4530 kg (1000 lb)</td>
<td>230 N-m (310 lbf-ft)</td>
<td>1</td>
<td>2.0</td>
<td>8</td>
</tr>
<tr>
<td>2732766</td>
<td>6800 kg (15000 lb)</td>
<td>470 N-m (640 lbf-ft)</td>
<td>1 1/4</td>
<td>2.5</td>
<td>7</td>
</tr>
<tr>
<td>2732767</td>
<td>10880 kg (24000 lb)</td>
<td>800 N-m (1080 lbf-ft)</td>
<td>1 1/2</td>
<td>3.0</td>
<td>6</td>
</tr>
</tbody>
</table>

[2] Minimum rated capacity at any pull angle (between 0° horizontal pull and 90° vertical pull)
3.1.3 Lifting Using Lifting Eyebolts

When using lifting eyebolts, remember the following:

**IMPORTANT!**

Husky does not recommend the use of lifting eyebolts. Use swivel hoist rings whenever possible in lifting applications.

- Apply loads along the plane of the lifting eyebolt eye. Do not apply loads in the opposite direction.
- Lifting eyebolts without a shoulder are satisfactory for vertical loading applications where the angle of attack is equal to 90°.
- Lifting eyebolts with a shoulder can be used for angular as well as vertical lifts where the angle off attack is anywhere between 0° and 90°.

**NOTE:** Refer to Section 3.1.3.1 for more information on angles of attack.

- Use a washer under the shoulder of the lifting eyebolt to stop the lifting eyebolt in the correct orientation.
- Always make sure the lifting eyebolt is tightened securely.
- Do not lift more than the rated capacity.
- Do not apply shock loads. When lifting, apply force gradually.
- Make sure the eyebolt bushing is either in full contact with the work piece surface or separated only by a washer.
- The work piece surface must be flat, providing complete contact for the eyebolt bushing.

**NOTE:** Refer to Section 3.1.3.2 for specifications and part numbers for lifting eyebolts.

**NOTE:** Make sure the lifting eyebolts used can support the weight of the plate or component at the chosen angle of attack.
3.1.3.1 Understanding the Angle of Attack

When using lifting eyebolts to lift individual plates or other heavy components, the force goes through the plane of the lifting eyebolt. For this reason, the lifting angle must be considered when lifting with lifting eyebolts.

The lifting angle, or angle of attack, is the angle between the direction the plate is being hoisted in and the surface the hoist is pulling on.

![Figure 3-3 Eyebolt Angle of Attack](image)

The recommended method for lifting with lifting eyebolts is to have the ring on a vertical plane and lift at a 0° or 90° angle.

Lifting with the ring in a horizontal plane is not recommended.

![Figure 3-4 Lifting Methods](image)

1. Recommended Lifting Method  
2. Not Recommended  
3. Acceptable Lifting Method

3.1.3.2 Lifting Eyebolt Specifications

Metric and Imperial lifting eyebolts are available through your nearest Husky Parts Distribution Center. Lifting eyebolts purchased from other suppliers must meet or exceed the following specifications.

<table>
<thead>
<tr>
<th>Table 3-4 General Lifting Eyebolt Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Material</td>
</tr>
<tr>
<td>Finish</td>
</tr>
<tr>
<td>Thread</td>
</tr>
</tbody>
</table>
3.1.4 Laying Down a Hot Runner Assembly

To properly lay a hot runner assembly on a work surface, do the following:

**NOTE:** The following procedure requires the use of a crane. Make sure the hoist ring, lifting chain and crane can support the weight of the mold and hot runner assembly.

---

**Table 3-4 General Lifting Eyebolt Specifications (Continued)**

| Marking | Symbol C15 and manufacturer’s trademark stamped on collar |
| Certification | Manufacturer must guarantee the material and finish requirements above are met |

**Table 3-5 Specifications for Metric Coarse Lifting Eyebolts**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>654246</td>
<td>340 kg (750 lb)</td>
<td>M12</td>
<td>21.3</td>
<td>1.75</td>
</tr>
<tr>
<td>625405</td>
<td>700 kg (1543 lb)</td>
<td>M16</td>
<td>28.8</td>
<td>2.00</td>
</tr>
<tr>
<td>625407</td>
<td>1800 kg (3968 lb)</td>
<td>M24</td>
<td>43.2</td>
<td>3.00</td>
</tr>
<tr>
<td>625408</td>
<td>3600 kg (7937 lb)</td>
<td>M30</td>
<td>54.0</td>
<td>3.50</td>
</tr>
<tr>
<td>625409</td>
<td>5100 kg (11244 lb)</td>
<td>M36</td>
<td>64.8</td>
<td>4.00</td>
</tr>
<tr>
<td>625410</td>
<td>7000 kg (15432 lb)</td>
<td>M42</td>
<td>75.6</td>
<td>4.50</td>
</tr>
<tr>
<td>230705</td>
<td>11500 kg (25353 lb)</td>
<td>M56</td>
<td>100.8</td>
<td>5.50</td>
</tr>
</tbody>
</table>

[^3]: Minimum rated capacity at any pull angle (between 0° horizontal pull and 90° vertical pull)

**Table 3-6 Specifications for Inch UNC Lifting Eyebolts**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>534335</td>
<td>1089 kg (2400 lb)</td>
<td>1/2</td>
<td>31.8</td>
<td>13.0</td>
</tr>
<tr>
<td>534350</td>
<td>1814 kg (4000 lb)</td>
<td>5/8</td>
<td>39.7</td>
<td>11.0</td>
</tr>
<tr>
<td>533553</td>
<td>2268 kg (5000 lb)</td>
<td>3/4</td>
<td>47.6</td>
<td>10.0</td>
</tr>
<tr>
<td>534336</td>
<td>4082 kg (9000 lb)</td>
<td>1</td>
<td>63.5</td>
<td>8.0</td>
</tr>
<tr>
<td>534337</td>
<td>6804 kg (15000 lb)</td>
<td>1 1/4</td>
<td>79.4</td>
<td>7.0</td>
</tr>
<tr>
<td>534338</td>
<td>9525 kg (21000 lb)</td>
<td>1 1/2</td>
<td>92.3</td>
<td>6.0</td>
</tr>
<tr>
<td>534339</td>
<td>17236 kg (38000 lb)</td>
<td>2</td>
<td>127.0</td>
<td>4.5</td>
</tr>
</tbody>
</table>

[^4]: Minimum rated capacity at any pull angle (between 0° horizontal pull and 90° vertical pull)
1. Using a crane with sufficient lifting capacity, lift the hot runner assembly above the work surface.

2. Secure a wood block to the work surface on the side opposite the area where the assembly will be laid down.

3. Lower the assembly slowly onto the edge of the secured wood block.

4. Continue to slowly lower the assembly until it tips over towards the work surface.

5. Lay the assembly down on the work surface.

### 3.1.5 Picking Up a Hot Runner Assembly

When lifting a hot runner assembly that has been laid down, the lifting crane may go slack just as the load is righted to the full vertical position. This may cause the assembly to swing over-center in the opposite direction.

To prevent this from happening, do the following:

**NOTE:** The following procedure requires the use of a crane. Make sure the hoist ring, lifting chain and crane can support the weight of the mold and hot runner assembly.

**WARNING!**

Inadequate lifting equipment can fail and cause injury or death. Make sure the hoist rings, chains/slings, and lifting device are rated for the load and are in safe operating condition.
1. Secure a wood block to the work surface near the foot of the hot runner assembly. This will prevent the assembly from going over-center.

2. Lift the assembly until it touches the secured wood block.

WARNING!
The hot runner assembly may attempt to swing on the crane cable in a pendulum motion just as the assembly is lifted off of the wood block. Lift slowly to reduce the pendulum motion. Stand clear of the possible swing area to prevent injury.

3. Continue to lift the assembly, keeping the tension on the crane lifting cable.
4. After the hot runner assembly has stabilized, move the assembly to a safe location and remove the wood block.

3.2 Mounting Methods

The hot runner has been designed for a certain size of machine. Changes to a larger machine will affect the requirements for hot runner mounting.

NOTE: For direct bolting and clamping, always check the quantity, size, and spacing is sufficient for the size of machine used.

3.2.1 Direct Bolting

Direct bolting uses either screws which pass directly through holes in the hot runner and into the threaded holes in a platen, or screws which pass directly through a platen into threaded holes in the hot runner.
The direct bolting method has the advantage that the maximum possible load that can be carried by the screw is available both for securing the mold weight and for resisting the opening force of the mold. The threads of the bolts should be lubricated.

Make sure Unbrako® manufactured screws are used when installing the hot runner.

**CAUTION!**

*Air impact guns can produce excessive torque and damage the hot runner. To minimize the risk of damage, install the hot runner using a torque wrench.*

### 3.2.2 Clamping

For hot runners mounted to a platen with mold clamps and clamp slots, be aware that while the holding force of a screw is always used fully in direct bolting, it is only partly used with clamping.

Clamping must be secure, since any slipping may cause damage as the mold closes. The mold and hot runner may slip from under the clamps and may even fall completely off the platens if:

- the screws are not sufficiently tightened;
- there is an insufficient number of clamps; and/or
- the clamps are not appropriately located.

**WARNING!**

*Clamps may loosen allowing the mold and hot runner to slip or even fall from the machine, possibly causing serious injury or death. Inspect and re-torque clamps regularly.*

When using mold clamps, make sure a sufficient number of clamps are used to safely retain the hot runner to the stationary platen. The clamping screws must be as close as possible to the hot runner.

When using clamps, the mold opening force must also be considered. The molds may become “frozen together” due to overpacking the cavities or malfunction of the mold. The clamps must resist the mold opening force, in addition to preventing slipping of the mold and/or hot runner. Check with the clamp manufacturer and the screw manufacturer for recommendations on the number of clamps required, their position, and the amount of torque required on the screws. Only high strength screws with a minimum yield strength of 690 MPa (100,000 psi) are recommended.

**NOTE:** It is the employer’s responsibility to make sure that clamps are of an adequate size, quantity, and positioned appropriately to mount the mold securely. Husky has no control over the selection and suitability of the clamp equipment used to mount and operate the mold and hot runner and does not recommend clamps for mold or hot runner mounting.

An alternative to using mold clamps is to machine additional mounting holes in the platen. Consult your machine manufacturer.
3.2.2.1 Quick Mold Changers and Clamping Systems

Refer to the mold changers or clamp system manufacturer’s manual for operating and safety procedures.

Any quick mold change or clamping system must be interlocked appropriately with the machine logic and guarding interlock systems.

3.3 Nameplate

Each hot runner has a unique nameplate affixed to the operator side of the manifold. The nameplate lists the project number (required for technical support), the resin type that can be used with the hot runner, the melt and mold temperatures, and other important specifications.

The melt and mold temperatures themselves are very important. They are used to determine the amount of thermal expansion required within the hot runner to create a proper sealing face and prevent internal resin leakage.

CAUTION!

Never operate the hot runner outside of the stated melt and mold temperatures indicated on the nameplate. Internal resin leakage or component damage can occur.

Figure 3-7 Hot Runner Nameplate (Sample)

1. Project Number  
2. Resin Type Allowed  
3. Melt and Mold Temperatures  
4. Power Requirements  
5. Temperature Warning
3.4 Preparation

1. Prior to assembling the manifold plates, verify all cold dimensions of the hot runner listed in the Tip Chart on the Section View Assembly drawing. Refer to Chapter 9. All dimensions must be within the tolerances specified.

2. Identify the sprue bar radius and orifice and select a machine nozzle tip that matches. Never use a machine nozzle tip that is the wrong radius or does not closely match the hot runner sprue bar orifice.

**CAUTION!**

*In order to avoid damage to the hot runner, never use more carriage pressure than what is required.*

A normal setting for the carriage force is no more than 6804 kg (15000 lb) pushing on the sprue bar. Excessive carriage force will cause damage to the hot runner and will not be covered under warranty.

3. Determine and set the carriage pressure required to seal the machine nozzle to the hot runner sprue bar using the following equation:

\[
\text{Force} = (\text{Carriage Cylinder Cross-Sectional Area} - \text{Rod Area}) \\
\times \text{Number of Cylinders} \times \text{Hydraulic Pressure}
\]

**CAUTION!**

Nozzles must be at room temperature (< 25 °C or < 77 °F) prior to installing the cavity plate to avoid damage to the system at the sealing surfaces.

4. Make sure all wires are in the retainer grooves are clear of potential pinch points.

5. Install the cavity plates. Refer to Section 6.6.

6. Install the core halves of the mold. Refer to the Mold Manual.

3.5 System Setup

The following sections describe the conditions required to startup a thermal or valve gate hot runner system.

3.5.1 Thermal Gate Setup

Thermal Gate (or hot tip) systems only require the connection of the power and thermocouple cables from the hot runner to the controller. The mold cooling system must also be connected to the hot runner and mold.
3.5.2 Air Operated Valve Gate Setup

**WARNING!**

Hot resin spray hazard – risk of serious injury. Residual pressure may be present in the hot runner and may cause hot resin to spray from the nozzle tips if released. Wear Personal Protective Equipment (PPE) including a face shield over safety glasses, heat resistant gloves and heat resistant clothing whenever entering the mold area.

Additionally, where possible, make sure the hot runner valve gates are closed and the machine nozzle is retracted from the mold sprue to reduce the chance of hot resin unexpectedly spraying into the mold area.

- Air operated valve gates require airline connections to the mold from the machine, in addition to power, thermocouple, and cooling connections.
- Typically, valve gated systems require air pressure between 5.5 to 8.3 bar (80 to 120 psi).
- The maximum available air pressure may be limited in some areas of the United States. In this case, always use the maximum air pressure set by your region if the maximum allowed is less than what is required by the hot runner.
- Use clean dry air. Do not use lubricated air. An air filter and oil separation kit is available from Husky to meet the requirements of the system. See Section 3.6 for more information.
- The controls for the solenoid air valves interlock for safe operation. This requires the valve gate air supply to be separate from the other air functions of the mold so that it can remain activated and maintain closed valve gates while other machine air is locked out.
- Never operate the valve stems for more than 2 or 3 shots at startup without resin in the system. Repeated impact of the valve stem on the bare metal of the gate may result in damage to the gate.
- The open time of the valve stems should be adjustable through timers. Generally the valve stems should close just as injection hold times out. See Section 3.6 for more information.

3.6 Recommendations for Optimal Valve Gate Performance

- A quick exhaust valve should be installed on both air lines between the hot runner and solenoid to increase the speed at which the valve stems open and close. This often improves gate quality.
- Air hoses should be rated to at least 17 bar (250 psi) to prevent ballooning of the lines during operation.
- For optimal performance, air pressures up to 12.4 bar (180 psi) may be required for LX and SX pistons.
- All air system components (hoses, valves, fittings, solenoids, exhausts, etc.) should be of adequate size to permit fast air flow to/from the hot runner system, but not so large that time is wasted filling the excess volume of the lines.
• “Airline” shut off type quick connects should not be used unless the mold was designed for their use. They may restrict the airflow.
• Air lines between the mold, quick exhausts and the solenoid valve should be as short as possible.
• In most cases the machine valve gate open signal to the valve gate air solenoid should be energized 0.2 to 0.3 seconds before the machine injection signal. This will allow enough time for the valve stem fully open and minimize the effects of side loading and resin flow over the valve stem.
• Some injection molding machines allow the valve stem to be opened prior to the mold being put under full clamp tonnage. In this case the valve stem should be energized when the mold faces first touch (clamp up). The time between clamp and latch (full tonnage) is typically enough time for the valve stem to travel to the full open position. The injection signal would only be enabled after the machine is under full clamp tonnage. This sequence allows optimization of the machine and mold without affecting the cycle time of the tool.

**NOTE:** If requested, Husky can supply complete air solenoid kits for valve gated systems, including quick exhaust valves, filters, separators and lockouts for the air supply.

![Figure 3-8 Valve Gate Air Kit](image)

1. From Air Supply  2. To Mold

**WARNING!**

Hot resin spray hazard – risk of serious injury. Residual pressure may be present in the hot runner and may cause hot resin to spray from the nozzle tips if released. Do not push on the valve stems when cleaning cavities and wear Personal Protective Equipment (PPE) consisting of a heat-resistant coat, heat-resistant gloves and a full face shield over safety glasses to avoid injury.
Figure 3-9  Schematic of Valve Gate Air Kit

1. Air Closed Circuit  2. Air Open Circuit
Chapter 4  Assembly

This chapter details the basic assembly of thermal gate, valve gate and back-to-back Ultra stack hot runners.

NOTE: The procedures outlined in this chapter are designed for new hot runners. Assembly and disassembly of hot runners that have been used to process plastic parts is described in Chapter 6.

4.1  Assembly Procedures

The following tables outline the steps required to assemble thermal gate, valve gate and back-to-back Ultra hot runners.

Table 4-1  Assembly Procedure for Valve Gate Systems

<table>
<thead>
<tr>
<th>Step</th>
<th>Task Description</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Assemble the manifold clamp and injecting manifold plates</td>
<td>Section 4.3</td>
</tr>
<tr>
<td>2</td>
<td>Assemble and install the nozzle stacks</td>
<td>Section 4.4</td>
</tr>
<tr>
<td>3</td>
<td>Assemble and install the manifold(s)</td>
<td>Section 4.5</td>
</tr>
<tr>
<td>4</td>
<td>Assemble and install the cross manifold (if equipped)</td>
<td>Section 4.5.5</td>
</tr>
<tr>
<td>5</td>
<td>Measure the preload for each manifold</td>
<td>Section 4.6</td>
</tr>
<tr>
<td>6</td>
<td>Assemble the valve stems and pistons</td>
<td>Section 4.8</td>
</tr>
<tr>
<td>7</td>
<td>Assemble the clamp and injection plates together</td>
<td>Section 4.10.1</td>
</tr>
<tr>
<td>8</td>
<td>Assemble the sprue bar</td>
<td>Section 4.9</td>
</tr>
<tr>
<td>9</td>
<td>Assemble the nozzle tips and heaters</td>
<td>Section 4.11.2</td>
</tr>
<tr>
<td>10</td>
<td>Assemble the drop limiters</td>
<td>Section 4.12</td>
</tr>
</tbody>
</table>

Table 4-2  Assembly Procedure for Back-to-Back Systems

<table>
<thead>
<tr>
<th>Step</th>
<th>Task Description</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Assemble the manifold clamp and injecting manifold plates</td>
<td>Section 4.3</td>
</tr>
<tr>
<td>2</td>
<td>Assemble and install the nozzle stacks</td>
<td>Section 4.4</td>
</tr>
<tr>
<td>3</td>
<td>Assemble and install the manifold(s)</td>
<td>Section 4.5</td>
</tr>
<tr>
<td>4</td>
<td>Assemble and install the cross manifold (if equipped)</td>
<td>Section 4.5.5</td>
</tr>
</tbody>
</table>
### Table 4-2  Assembly Procedure for Back-to-Back Systems (Continued)

<table>
<thead>
<tr>
<th>Step</th>
<th>Task Description</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>Measure the preload for each manifold</td>
<td>Section 4.6</td>
</tr>
<tr>
<td>6</td>
<td>Measure the cold clearance</td>
<td>Section 4.7</td>
</tr>
<tr>
<td>7</td>
<td>Assemble the valve stems and pistons</td>
<td>Section 4.8</td>
</tr>
<tr>
<td>8</td>
<td>Assemble the center air plate</td>
<td>Section 4.10.2.1</td>
</tr>
<tr>
<td>9</td>
<td>Assemble the clamp, center air and injection plates together</td>
<td>Section 4.10.2.2</td>
</tr>
<tr>
<td>10</td>
<td>Assemble the sprue bar</td>
<td>Section 4.9</td>
</tr>
<tr>
<td>11</td>
<td>Assemble the nozzle tips and heaters</td>
<td>Section 4.11.2</td>
</tr>
<tr>
<td>12</td>
<td>Assemble the drop limiters</td>
<td>Section 4.12</td>
</tr>
</tbody>
</table>

### 4.2 General Assembly

The following details the general assembly of thermal gate, valve gate and back-to-back systems.

**NOTE:** The nozzle type, nozzle layout and wiring paths shown in the following illustrations may vary based on hot runner options and application requirements.
4.2.1 Thermal Gate Stack System

Figure 4-1 Stack Thermal Gate Hot Runner Section View and Terminology

4.2.2 Valve Gate Stack System

Figure 4-2 Stack Valve Gate Hot Runner Section View and Terminology

5. Manifold Hold Down Bolt  6. Center Locating Insulator  7. Manifold Alignment Dowel  
20. Alignment Dowel  21. Sprue Bar  22. 23. Anti-Drool Bushing (or Ball Check, or End Cap)  
4.2.3 Back-to-Back System

Figure 4-3 Stack Back-to-Back Hot Runner Section View and Terminology

1. Clamp Manifold Plate  
2. Manifold Heater  
3. Manifold  
4. Manifold Alignment Dowel  
5. Transfer Sprue  
6. Manifold Thermocouple  
7. Center Locating Insulator  
8. Nozzle Stack Alignment Dowel  
9. Alignment Dowel  
10. Injection Manifold Plate  
11. Alignment Dowel  
12. VGSX Nozzle Stack  
13. Nozzle Anti-Rotation Dowel  
14. Manifold Hold Down Bolt  
15. Ultra Backup Insulator  
16. Cross Manifold  
17. Manifold Thermocouple  
18. VGLX/EX Nozzle Stack  
19. Retaining Bolt  
20. Sprue Bar  
21. End Cap (or Anti-Drool Bushing, or Ball Check)  
22. Heat Shield  
23. Sprue Bar Guide  
24. Locating Ring
4.3 Assembling the Manifold Plates

To assemble a clamp or injection manifold plate, do the following:

**NOTE:** The following procedure is generic to both the injection and clamp manifold plates. Assemble each manifold plate as described.

1. Place two wood blocks on a work bench and lay the manifold plate on them. The manifold plate pocket must be facing up.

**IMPORTANT!**

The wooden blocks must be high enough to prevent the nozzle tips from touching the work bench when the nozzle stacks are installed.

2. Thoroughly clean all bores, tapped holes and guide holes to make sure no burrs or oil are present.

3. Install all plate locating dowels.

4. Install the nozzle dowels and manifold locating dowels into the manifold plate pocket.

5. Insert a manifold insulator into the center of each manifold location in the manifold pocket. Make sure the spring pack side of the insulator is facing the nozzle side of the manifold plate.

6. For the clamp manifold plate only, install the cross manifold insulator into the center of the manifold pocket using a socket head cap screw. Torque the screw to the value specified on the Section View Assembly drawing. Refer to Chapter 9.

7. Measure the preload for the manifold insulators and cross manifold insulators (if equipped). Refer to Section 4.6.5.
4.4  Assembling the Nozzle Stacks

To assemble and install the nozzle stacks, do the following:

1. Make sure each manifold plate has been fully assembled and is laid on a work bench. Refer to Section 4.3 for further instructions.

2. Assemble each nozzle housing as shown in Figure 4-5.

   NOTE: Refer to the Section View Assembly drawing in Chapter 9 to verify the orientation and correct number of Ultra springs.

3. Place all housing assemblies into the nozzle bores in the manifold plate. Make sure the housing assemblies are properly aligned with the nozzle locating dowels to prevent rotation.

4.5  Assembling the Manifolds

The following procedures describe how to assemble and install manifolds for thermal gate, valve gate and back-to-back systems.

4.5.1  Assembling Backup Insulators for Thermal Gate Systems

To assemble backup insulators on the manifolds for thermal gate systems, do the following:

1. Make sure the manifold is clean and free of burrs.
2. Install a backup insulator on the opposite side of each nozzle drop using LHSCS bolts coated with a high temperature anti-seize lubricant.

4.5.2 Assembling Manifold Bushings

The following procedures describe how to assemble manifold bushings for valve gate and back-to-back systems.

4.5.2.1 Assembling the Threaded Manifold Bushings

To assemble threaded manifold bushings for Ultra 350, Ultra 500, Ultra 750 or Ultra 1000 VGLX/EX valve gate and back-to-back systems, do the following:

1. Make sure the interior of the manifold bushing holes are clean and free of burrs.
2. Install the manifold bushing locating dowel into the manifold for each manifold bushing.
3. Align the manifold bushing with the locating dowel and press the bushing into the manifold until the bushing bottoms out on the manifold. Repeat this step for all manifold bushings.

   **NOTE:** Most manifold bushings are designed with clearance to allow for easy assembly into the manifold bushing bore. However, for systems designed for high temperature or color change applications, manifold bushings are designed for press fit installation. Contact Husky for more information on removing press fit manifold bushings.

4. If the manifold bushing is not press fit into the manifold, place one metal O-ring seal over each manifold bushing to seal between the manifold and the backup pad.

   **NOTE:** The metal O-ring seals must be replaced if the manifold bushings are removed.

5. Place the backup pad over each manifold bushing. Make sure the backup pads contact the metal O-ring seals.

---

**CAUTION!**

For Ultra 500 and Ultra 750 systems, it may be necessary to add additional torque to the jam nut and then loosen the nut to the specified torque to properly seat the metal O-ring seal. The amount of additional torque will be specified on the Section View Assembly drawing if required. Refer to Chapter 9.

6. Install a jam nut to the end of each manifold bushing and torque to the value specified on the Section View Assembly drawing. Refer to Chapter 9.
4.5.2.2 Assembling the Threadless Manifold Bushings

To assemble threadless manifold bushings for Ultra 500, Ultra 750 or Ultra 1000 VGLX/EX valve gate and back-to-back systems, do the following:

1. Make sure the interior of the manifold bushing holes are clean and free of burrs.
2. Install the manifold bushing locating dowel into the manifold for each manifold bushing.

3. Align the manifold bushing with the locating dowel and press the bushing into the manifold until the bushing bottoms out on the manifold. Repeat this step for all manifold bushings.

   **NOTE:** Most manifold bushings are designed with clearance to allow for easy assembly into the manifold bushing bore. However, for systems designed for high temperature or color change applications, manifold bushings are designed for press fit installation. Contact Husky for more information on removing press fit manifold bushings.

4. Place an interior and exterior C-ring seal over each manifold bushing.
5. Place one Grafoil seal over each manifold bushing.

   **NOTE:** The C-ring seals must be replaced if the manifold bushings are removed.

6. Install a backup pad over each manifold bushing. Make sure the C-ring seals are properly aligned and seated with the backup pads.
7. Install a retaining clip into the groove at the end of each manifold bushing.

---

**Figure 4-8 Threadless Bushing Assembly**

4.5.2.3 Installing Manifold Bushings for Ultra 350 Systems (Tight Pitch Applications Only)

To install manifold bushings for Ultra 350 valve gate systems, do the following:

1. Make sure the interior of the manifold bushing is free of burrs.
2. Clean the stem bore in the manifold bushing with alcohol and cotton swabs. The interior is clean when a cotton swab can be removed from the bushing without any dirt on it.
3. Install the manifold bushing locating dowel into the manifold for each manifold bushing.

![Ultra 350 Manifold Assembly](image)

**Figure 4-9 Ultra 350 Manifold Assembly**


**WARNING!**

Burn hazard – Contact with exposed hot surfaces will cause serious burn injury. Wear Personal Protective Equipment (PPE) when working near these areas.

4. Connect the manifold to a controller and raise the manifold temperature to minimum 200 °C (392 °F) for 15 minutes.
5. After 15 minutes, lock out and tag the controller.

**WARNING!**

Burn hazard – contact with liquid nitrogen will cause serious burn injuries. Wear Personal Protective Equipment (PPE) when dispensing and handling liquid nitrogen.

6. Cool the manifold bushing in liquid nitrogen.
7. Align the manifold bushing with the locating dowel and press the bushing into the manifold until the bushing bottoms out on the manifold.
**NOTE:** Most manifold bushings are designed with clearance to allow for easy assembly into the manifold bushing bore. However, for systems designed for high temperature or color change applications, manifold bushings are designed for press fit installation. Contact Husky for more information on removing press fit manifold bushings.

8. Repeat step 4 to step 7 for all manifold bushings.

9. Place a C-ring over the hole in the manifold for the bushing. Make sure the C-ring is centered with the hole.

10. Install the retaining rings on the backup pad and backup pad insert.

11. Push the backup pad into the manifold.

12. Push the backup pad insert into the backup pad. Make sure the backup pad insert floats inside the backup pad.

### 4.5.2.4 Assembling the Manifold Bushings for Ultra 350 and Ultra 500 VGSX

To assemble manifold bushings for Ultra 350 and Ultra 500 VGSX valve gate and back-to-back systems, do the following:

1. Make sure the interior of the manifold bushing holes are clean and free of burrs.

2. Install the manifold bushing locating dowel into the manifold for each manifold bushing.

3. Align the manifold bushing with the locating dowel and press the bushing into the manifold until the bushing bottoms out on the manifold. Repeat this step for all manifold bushings.

**NOTE:** Most manifold bushings are designed with clearance to allow for easy assembly into the manifold bushing bore. However, for systems designed for high temperature or color change applications, manifold bushings are designed for...
press fit installation. Contact Husky for more information on removing press fit manifold bushings.

4. Install the piston cylinder locating dowel into the manifold for each piston cylinder.
5. Place an interior and exterior C-ring seal over each manifold bushing.
6. Place one Grafoil seal over each manifold bushing.
   
   **NOTE:** The C-ring seals must be replaced if the manifold bushings are removed.

7. Align the piston cylinder with the locating dowel and press the cylinder towards the manifold until the cylinder is fully seated on the C-rings. Repeat this step for all piston cylinders.

8. Install a retaining clip into the groove at the end of each manifold bushing.

### 4.5.3 Installing the Transfer Sprue for Back-to-Back Systems

To install the transfer sprue to the manifold in a valve gate or back-to-back system, do the following:

**NOTE:** Transfer sprue assemblies may require two or more socket head cap screws. Refer to the *Section View Assembly* drawing in Chapter 9 to determine how many are required.

---

**WARNING!**

Any contamination or damage at the transfer sprue and manifold interface may cause hot resin to spray out of the mold. The hot resin spray may result in serious burns. Both the mounting faces of the transfer sprue and the manifold must be spotlessly clean and undamaged. Torque the mounting screws to the appropriate torque.

---

1. Clean the surfaces on the transfer sprue and manifold where the two components will interface.

   ![Figure 4-11 Transfer Sprue and Manifold Sealing Faces](image)

   **Figure 4-11 Transfer Sprue and Manifold Sealing Faces**

   1. Cross Manifold  
   2. Transfer Sprue  
   3. Spigot Pocket Face  
   4. Spigot Face  
   5. Locating Diameters

2. For back-to-back systems only, place the transfer sprue in the center plate and determine the cold clearance. Refer to Section 4.7.
CAUTION!

Make sure all screws are torqued evenly using a standard torque pattern.

3. Coat the necessary number of screws with a high temperature anti-seize lubricant.
4. Install the transfer sprue to the top of the cross manifold.

![Transfer Sprue Installation](image)

5. Torque the screws to half the value specified on the Section View Assembly drawing and then torque them to the full value. Refer to Chapter 9. This will make sure an even seal is made between the transfer sprue and the manifold.

4.5.4 Installing Manifolds

To install the manifolds into the clamp manifold plates, do the following:

NOTE: The following procedure requires the use of a crane. Make sure the hoist rings, lifting chain and crane can support the weight of the plate(s) and hot runner.

1. Make sure the clamp manifold plate pocket and clamp manifold are clean and free of burrs.
2. Install a suitable hoist ring(s) in the lifting location(s) in the manifold.

WARNING!

Inadequate lifting equipment can fail and cause injury or death. Make sure the hoist rings, chains/slings, and lifting device are rated for the load and in safe operating condition.

3. Attach an overhead crane to the hoist ring(s) and lift the manifold over the clamp manifold plate pocket.
4. Lower the manifold into the manifold pocket and adjust the manifold to engage the locating features.

5. Disconnect the overhead lifting device and remove the hoist ring(s).

6. Install and hand tighten manifold hold down bolts to secure the manifold to the manifold plate. Make sure the manifold hold down bolts are coated with a high temperature anti-seize lubricant.

7. Turn the manifold hold down bolts counter-clockwise 1/4 turn and measure the preload for the manifold. Refer to section Section 4.6 for more information.

8. Hand tighten the manifold hold down bolts once the preload measurements have been verified.

9. Install the wires for the manifold heaters and label each with its pin designation.

   **NOTE:** Refer to the electrical schematic(s) in Chapter 9 for wiring information.

10. Route the wires through the wire channels in the manifold. Make sure all wires are retained in the wire channels with wire clips.

   **NOTE:** Refer to the electrical schematic(s) in Chapter 9 for wiring information.

**IMPORTANT!**

The manifold thermocouples to be installed through the manifold plates will be installed later in the assembly process.

### 4.5.5 Installing Cross Manifolds

The following procedure describes how to install the cross manifold into the clamp manifold plate and measure the preload. This procedure applies to all thermal gate, valve gate and back-to-back systems that have more than one manifold.
NOTE: The following procedure requires the use of a crane. Make sure the hoist rings, lifting chain and crane can support the weight of the plate(s) and hot runner.

1. Make sure the clamp manifold plate pocket, cross manifold and cross manifold bore holes are clean and free of burrs.

2. Using a depth micrometer, measure the distance between the top face of each transfer sprue to the injection side face of the clamp manifold. Record the distance as measurement "A".

3. Measure the distance between the top face of the backup pad to the injection side face of the clamp manifold. Record the distance as measurement "B".

4. Subtract measurement "B" from measurement "A" and record the result as measurement "C".

5. Install a suitable hoist ring(s) in the lifting location(s) in the cross manifold.

WARNING!

Inadequate lifting equipment can fail and cause injury or death. Make sure the hoist rings, chains/slings, and lifting device are rated for the load and in safe operating condition.

6. Attach an overhead crane to the lifting eyebolt(s)/hoist ring (s) and lift the cross manifold over the clamp manifold plate pocket.

7. Lower the cross manifold into the clamp manifold pocket over the manifold insulator and adjust the cross manifold to engage the locating features.
8. Disconnect the overhead lifting device and remove the hoist ring(s).

9. Install and hand tighten manifold hold down bolts to secure the cross manifold to the clamp manifold plate. Make sure the manifold hold down bolts are coated with a high temperature anti-seize lubricant.

10. Turn the manifold hold down bolts counter-clockwise 1/4 turn.

11. Using a depth micrometer, measure the distance from the injection side face of the cross manifold to the injection side face of the clamp manifold plate. Record the distance as measurement "D".

12. Measure the depth of the cross manifold and record the depth as measurement "E".

13. Subtract measurement "E" from measurement "D" record the result as measurement "F".

14. Subtract measurement "C" from measurement "F" to determine the final preload.
   
   **NOTE:** If the preload value is not within the tolerances given on the Tip Chart, review the assembly for obstructions or debris.

15. Measure the preload on the other side of the cross manifold.

16. Hand tighten the manifold hold down bolts once the preload measurements have been verified.

17. Install the wires for the cross manifold heaters and label each with its pin designation.
   
   **NOTE:** Refer to the electrical schematic(s) in Chapter 9 for wiring information.

18. Route the wires through the wire channels in the manifold. Make sure all wires are retained in the wire channels with wire clips.
   
   **NOTE:** Refer to the electrical schematic(s) in Chapter 9 for wiring information.

---

### 4.6 Measuring Preload

Preload measurements from various sections of the hot runner must be taken and verified before the plates are assembled and when the hot runner is at room temperature (< 25 °C or < 77 °F). Damage to the plates, backup pads or backup insulators, and nozzle stacks could occur if the preload measurements are not within the allowed tolerances.

**IMPORTANT!**

Before measuring the preload on a manifold or cross manifold system, make sure the manifold hold down bolts are hand tightened and then turned counter-clockwise 1/4 turn. Overtightening the manifold hold down bolts could over-extend the nozzle housings or damage components under the manifold that are not properly seated.

**IMPORTANT!**

Always measure preload in more than one section of the hot runner to make sure that preload is consistent.
4.6.1 Measuring Preload for Thermal Gate Systems

To measure the preload for all thermal gate systems, do the following:

1. Using a depth micrometer, measure the distance from the top face of the manifold plate to the face of the manifold(s). Subtract this value from the height of the backup insulators (refer to the Section View Assembly drawing in Chapter 9) to determine the preload value.

   **NOTE:** Alternatively, if a spare backup insulator is available, place the backup insulator on the manifold and measure the distance from the top of the backup pad to the manifold plate. The value obtained will be the preload value.

2. Take preload measurements from all other corners of the manifold(s) to make sure preload is consistent.

3. Compare the preload values to the C dimension values listed on the Tip Chart. Refer to the Section View Assembly drawing in Chapter 9.

   **NOTE:** If the value is not within the tolerances given on the Tip Chart, review the assembly for obstructions or debris.

---

**CAUTION!**

Do not tighten the manifold hold down bolts to reduce the preload value. Manifold hold down bolts should be hand tightened and then turned counter-clockwise 1/4 turn before preload measurements are taken.

---

4.6.2 Measuring Preload for Ultra 350, Ultra 500, Ultra 750 and Ultra 1000 VGLX/EX

To measure the preload for Ultra 350, Ultra 500, Ultra 750 and Ultra 1000 valve gate and back-to-back systems, do the following:

---

**IMPORTANT!**

Make sure all manifolds and cross manifolds (if used) are assembled in the clamp manifold plate before measuring preload. The manifold hold down bolts must be loose.

1. Using a depth micrometer, measure the distance from the top face of the clamp manifold plate to the face of the manifold(s). Subtract this value from the height of the backup pads (refer to the Section View Assembly drawing in Chapter 9) to determine the preload value.

   **NOTE:** Alternatively, if a spare backup pad is available, place the backup pad on the manifold and measure the distance from the top of the backup pad to the manifold plate. The value obtained will be the preload value.
2. Take preload measurements from all other corners of the manifold(s) to make sure preload is consistent.

3. Take preload measurements from all corners of the manifold(s) in the injection manifold plate using the same method.

4. Compare the preload values to the C dimension values listed on the Tip Chart. Refer to the Section View Assembly drawing in Chapter 9.

   **NOTE:** If the values are not within the tolerances given on the Tip Chart, review the assembly for obstructions or debris.

---

**CAUTION!**

Do not tighten the manifold hold down bolts to reduce the preload value. Manifold hold down bolts should be hand tightened and then turned counter-clockwise 1/4 turn before preload measurements are taken.

---

### 4.6.3 Measuring Preload for Ultra 350 and Ultra 500 VGSX

To measure the preload for Ultra 350 and Ultra 500 VGSX valve gate and back-to-back systems, do the following:

---

**IMPORTANT!**

Make sure all manifolds and cross manifolds (if used) are assembled in the clamp manifold plate before measuring preload. The manifold hold down bolts must be loose.

---

1. Measure the dimensions of the piston cylinder bore depth and verify them with those in the Section View Assembly drawing. Refer to Chapter 9.

2. Using a depth micrometer, measure the distance from the top of the piston cylinder to the manifold plate. Record the distance as measurement "A".
3. On the center air plate or injection manifold plate, measure the distance from the plate surface to the sealing surface in the piston cylinder bore. Record the distance as measurement "B".

   **NOTE:** The sealing surface is where the piston cylinder makes contact with the center air plate or injection manifold plate.

4. Subtract measurement "B" from measurement "A" to determine the preload measurement (i.e. A-B = Preload).

   **NOTE:** If the value is not within the tolerances given on the Tip Chart, review the assembly for obstructions or debris.

5. Take preload measurements from all other corners of the manifold(s) to make sure preload is consistent.

6. Compare the preload values to the C dimension values listed on the Tip Chart. Refer to the *Section View Assembly* drawing in Chapter 9.

   **NOTE:** If the values are not within the tolerances given on the Tip Chart, review the assembly for obstructions or debris.

**CAUTION!**

*Do not tighten the manifold hold down bolts to reduce the preload value. Manifold hold down bolts should be hand tightened and then turned counter-clockwise 1/4 turn before preload measurements are taken.*

### 4.6.4 Measure Preload for Cross Manifolds

Cross manifold preload is measured during the installation of the cross manifold into the clamp manifold plate. Refer to *Section 4.5.5* for more information on the cross manifold installation and preload measurement procedure.
4.6.5  Measuring Preload for Manifold Insulators

To measure the preload for manifold and cross manifold insulators, do the following:

1. Using a depth micrometer, measure the distance from the top of the manifold plate to the top of the manifold insulator.

2. Subtract the thickness of the manifold plate and backup pad from the depth micrometer measurement to determine the preload measurement.

3. Compare the preload value to the dimension values listed on the Tip Chart. Refer to the Section View Assembly drawing in Chapter 9.

   **NOTE:** If the value is not within the tolerance given on the Tip Chart, review the assembly for obstructions or debris.

4.7  Measuring the Cold Clearance for Back-to-Back Systems

To measure the cold clearance between the top of the center plate to the transfer sprue, do the following:

1. Using a depth micrometer, measure the inside depth of the center plate. Record the depth as measurement “A”.

2. Measure the distance from the top of the center plate to the transfer sprue. Make sure to position the depth micrometer close to the melt channel. Record the distance as measurement “B”.

**Figure 4-17  Measuring the Center Plate Depth**
3. Subtract measurement “B” from measurement “A” and multiply by 2.

4. Add the thickness of the cross manifold and subtract the thickness of the center plate to determine the final cold clearance for the center plate.

\[ (A-B) \times 2 + \text{Cross Manifold Thickness} + \text{Center Plate Thickness} = \text{Cold Clearance} \]

Divide the cold clearance by 2 to determine the cold clearance for each side of the center plate.

\[ (A-B) \times 2 + \text{Cross Manifold Thickness} + \text{Center Plate Thickness} \div 2 = \text{Cold Clearance for Each Side} \]

5. Compare the cold clearance value to the dimension values listed on the Tip Chart. Refer to the Section View Assembly drawing in Chapter 9.

**NOTE:** If the value is not within the tolerance given on the Tip Chart, review the assembly for obstructions or debris.

### 4.8 Assembling the Valve Stems and Pistons

The following procedures describe how to assemble valve stems and pistons for valve gate and back-to-back systems.

#### 4.8.1 Assembly for Ultra 350 VGSX Systems

The following procedure is for installing valve stem and piston assemblies into a new Ultra 350 VGSX system.

**NOTE:** If resin has been run through the hot runner system, refer to Section 6.20.2.2 for installation instructions.

1. Clean the piston to make sure no dirt or oil is present.

**NOTE:** Make sure the O-ring seal is not twisted in the seal groove.
2. Insert the valve stem into the stem bore in the piston.
3. Slide the spacer carefully over the valve stem until it bottoms out on the piston.
4. Apply a coat of liquid teflon to the threads of two flat head screws.
5. Install the flat head screws through the back of the piston to the spacer to secure the valve stem to the piston. Torque all screws to the value specified on the Section View Assembly drawing. Refer to Chapter 9.
6. Rotate the valve stem in the piston to make sure no binding has occurred.
   **NOTE:** Make sure the valve stem can rotate freely within the piston.
7. Install a new double delta or O-ring seal:
   a. If the assembly uses a double delta seal, refer to Section 4.8.5.
   b. If the assembly uses an O-ring seal, coat the seal groove in the piston with a high temperature lubricant and install a new O-ring seal into the seal groove. Do not remove any excess silicone.
      **NOTE:** Make sure the O-ring seal is not twisted in the seal groove.
      **NOTE:** High temperature lubricant is only used for teflon encapsulated seals.
8. Carefully guide the completed valve stem and piston assembly into the manifold bushing, gently pushing by hand until the spacer rests on the manifold bushing.
   **NOTE:** There should be no resistance on the valve stem in the bushing. If there is resistance, make sure no debris is present by running a pipe cleaner or brass brush through the manifold bushing bore and blowing it out with compressed air.
4.8.2 Assembly for Ultra 500 VGSX Systems

The following procedure is for installing valve stem and piston assemblies into a new Ultra 500 VGSX system.

NOTE: If resin has been run through the hot runner system, refer to Section 6.20.2.2 for installation instructions.

1. Clean the piston to make sure no dirt or oil is present.
   NOTE: Make sure the O-ring seal is not twisted in the seal groove.

2. Insert the valve stem into the stem bore in the piston.

3. Slide the spacer carefully over the valve stem until it bottoms out on the piston.

4. Install two socket head cap screws through the back of the piston to the spacer to secure the valve stem to the piston. Torque all screws to the value specified on the Section View Assembly drawing. Refer to Chapter 9.

5. Rotate the valve stem in the piston to make sure no binding has occurred.
   NOTE: Make sure the valve stem can rotate freely within the piston.

6. Install a new double delta or O-ring seal:
   a. If the assembly uses a double delta seal, refer to Section 4.8.5.
   b. If the assembly uses an O-ring seal, coat the seal groove in the piston with a high temperature lubricant and install a new O-ring seal into the seal groove. Do not remove any excess silicone.
      NOTE: Make sure the O-ring seal is not twisted in the seal groove.
      NOTE: High temperature lubricant is only used for teflon encapsulated seals.

---

Figure 4-20 Valve Stem and Piston Assembly
7. Carefully guide the completed valve stem and piston assembly into the manifold bushing, gently pushing by hand until the spacer rests on the manifold bushing.

**NOTE:** There should be no resistance on the valve stem in the bushing. If there is resistance, make sure no debris is present by running a pipe cleaner or brass brush through the manifold bushing bore and blowing it out with compressed air.

---

### 4.8.3 Assembly for Ultra 350, Ultra 500 and Ultra 750 VGLX/EX Systems

The following procedure is for installing valve stem and piston assemblies into a new Ultra 350, Ultra 500 or Ultra 750 VGLX/EX system.

**NOTE:** If resin has been run through the hot runner system, refer to Section 6.20.2.3 for installation instructions.

1. Clean the piston to make sure no dirt or oil is present.

![Figure 4-21 Valve Stem and Piston Assembly](image)

- **1.** Piston
- **2.** Double Delta or O-ring Seal
- **3.** Valve Stem
- **4.** Set Screw
- **5.** Piston Cylinder

2. Insert the valve stem through the center hole in the piston. Make sure the point of the valve stem is on the opposite end of the threads in the piston.

3. Install the set screw into the piston and torque to the value specified on the *Section View Assembly* drawing. Refer to Chapter 9.

**NOTE:** Make sure the set screw and piston threads are clean and dry. No lubricants should be present.

4. Rotate the valve stem in the piston to make sure no binding has occurred.

**NOTE:** Make sure the valve stem can rotate freely within the piston.
5. Install a new double delta or O-ring seal:
   a. If the assembly uses a double delta seal, refer to Section 4.8.5.
   b. If the assembly uses an O-ring seal, coat the seal groove in the piston with a high temperature lubricant and install a new O-ring seal into the seal groove. Do not remove any excess silicone.
      
      **NOTE:** Make sure the O-ring seal is not twisted in the seal groove.
      
      **NOTE:** High temperature lubricant is only used for teflon encapsulated seals.

6. Carefully guide the completed valve stem and piston assembly into the manifold bushing, gently pushing by hand until the piston bottoms out on the manifold bushing.
   
   **NOTE:** There should be no resistance on the valve stem in the bushing. If there is resistance, make sure no debris is present by running a pipe cleaner or brass brush through the manifold bushing bore and blowing it out with compressed air.

**CAUTION!**

Do not use any form of lubricant on double delta piston seals.

7. Place the cylinder over the valve stem piston assembly in the manifold bushing. Make sure the piston cylinder is bottomed out on the backup pad.
   
   **NOTE:** The piston cylinder is installed during the double delta seal installation procedure.

4.8.4 Assembly for Ultra 1000 VGLX/EX Systems

The following procedure is for installing valve stem and piston assemblies into a new Ultra 1000 VGLX/EX system.

**NOTE:** If resin has been run through the hot runner system, refer to Section 6.20.2.4 for installation instructions.

1. Clean the piston to make sure no dirt or oil is present.
2. Insert the valve stem into the piston spacer.

3. Thread the piston spacer onto the piston and torque to the value specified on the Section View Assembly drawing. Refer to Chapter 9.

4. Rotate the valve stem in the piston to make sure no binding has occurred.
   
   NOTE: Make sure the valve stem can rotate freely within the piston.

5. Install a new double delta or quad seal:
   
   a. If the assembly uses a double delta seal, refer to Section 4.8.5.

   b. If the assembly uses a quad seal, coat the seal groove in the piston with a high temperature lubricant and install a new quad seal into the seal groove. Do not remove any excess silicone.

      NOTE: Make sure the quad seal is not twisted in the seal groove.

      NOTE: High temperature lubricant is only used for teflon encapsulated seals.

6. Carefully guide the completed valve stem and piston assembly into the manifold bushing, gently pushing by hand until the piston bottoms out on the manifold bushing.

   NOTE: There should be no resistance on the valve stem in the manifold bushing. If there is resistance, make sure no debris is present by running a pipe cleaner or brass brush through the manifold bushing bore and blowing it out with compressed air.

   CAUTION!

   Do not use any form of lubricant on double delta piston seals.

7. Place the piston cylinder over the valve stem piston assembly in the manifold bushing. Make sure the piston cylinder is bottomed out on the backup pad.
NOTE: The piston cylinder is installed during the double delta seal installation procedure.

4.8.5 Installing the Double Delta Seal

To install the double delta seal on Ultra 350, Ultra 500, Ultra 750 and Ultra 1000 valve gate pistons, do the following:

NOTE: This procedure is for systems that have not been used to process resin. For systems that contain resin in the manifolds and melt channels, refer to Section 6.20.3.

NOTE: The following procedure uses the double delta piston seal installation tool. Refer to Section 6.4.7 for part numbers.

1. Assemble the valve stem, set screw and piston.
2. Place the piston in a vise with soft jaws.
3. Install the interior O-ring seal into the seal groove by rolling it over the piston. No tools are required.
4. Place the seal installation tool on top of the piston.
5. Install the outer seal by pushing the seal over the seal installation tool until it sits over the O-ring seal.

![Image: Installing the Outer Seal]

6. Remove the seal installation tool.
7. Insert the piston cylinder into the cylinder cap base tool. Make sure the tool is sitting on a solid work surface.

![Image: Piston Cylinder in Cylinder Cap Base Tool]

8. Install the seal compression tool over the piston cylinder.

![Image: Installing the Seal Compression Tool]

9. Insert the piston assembly into the seal compression tool with the valve stem pointing up.
10. Slide the hammer tool over the valve stem and use it to press the piston assembly into the piston cylinder.

   **NOTE:** Make sure the piston assembly is pushed to the bottom of the piston cylinder.

11. Remove the hammer and seal compression tools.

12. Remove the piston cylinder assembly from the cylinder cap base tool.
4.9 Assembling the Sprue Bar

Sprue bars maintain the melt temperature of the resin injected into the hot runner. The following sections describe how to assemble the sprue bar and its various end configurations.

4.9.1 Assembling the Sprue Bar Adapter

The sprue bar adapter is required if the sprue bar orientation is different from the mounting holes in the manifold or cross manifold.

To install the sprue bar adapter, do the following:

1. Clean the surfaces on the sprue bar adapter and manifold where the two components will interface.

2. Coat the screws used to install the sprue bar adapter with a high temperature anti-seize lubricant.

3. Install the sprue bar adapter to the injection side of the manifold or cross manifold.

---

**Figure 4-31 Sprue Bar Adapter and Manifold Sealing Faces**

1. Manifold or Cross Manifold  
2. Spigot Pocket Face  
3. Spigot Face  
4. Locating Diameters  
5. Sprue Bar Adapter

---

CAUTION!

Make sure all screws are torqued evenly using a standard torque pattern.

---

CAUTION!

The supplied mounting screws are of a special quality and must not be substituted.

4. Torque the screws to half the value specified on the Section View Assembly drawing and then torque them to the full value. Refer to Chapter 9.
This will make sure an even seal is made between the transfer sprue and the manifold.

### 4.9.2 Assembling and Installing the Main Sprue Bar

To assemble and install the main sprue bar, do the following:

**NOTE:** This procedure applies to center and offset sprue bars.

1. Push a piece of clean cloth down the sprue bar channel and sprue bar heater holes with a brass rod to remove oil and dirt.
2. Use compressed air to remove dirt from the thermocouple channels and screw bores.
3. Install the end cap or anti-drool bushing. Refer to Section 4.9.3.

#### CAUTION!

*Wear personal protective equipment (PPE). Sprue bar heater wires are covered with a fiberglass insulation that may cause minor skin irritation.*

4. Insert the sprue bar heaters into the heater holes in the sprue bar. Gently push the heaters all the way down the channel until they reach the end cap.
5. Install the thermocouple probe ends and secure the thermocouple wires in the wire channels using button head cap screws coated with a high temperature anti-seize lubricant.
6. Complete the sprue bar assembly as shown in the *Section View Assembly* drawing. Refer to Chapter 9.
7. Install the sprue bar using SHCS coated with a high temperature anti-seize lubricant. Make sure to pull the thermocouple and sprue bar heater wires back during installation.
8. Torque the screws to the value specified in the *Section View Assembly* drawing. Refer to Chapter 9.
9. Route the thermocouple and heater wires through the wire grooves in the injection manifold plate and connect them to the multi-pin connectors. Make sure all wires are retained in the wire grooves using wire clips.

**NOTE:** Refer to the electrical schematic(s) in Chapter 9 for wiring information.
10. Test the thermocouple and heaters according to the instructions given in Section 4.11.3.
11. Slide the heat shield over the sprue bar until it makes contact with the injection manifold plate.

### 4.9.3 Assembling the Anti-Drool, End Cap or Ball Check Bushings

Anti-drool, end cap and ball check bushings minimize the amount of resin that leaks out of the sprue bar after the plastic parts have been ejected from the mold. Each sprue bar is equipped with one bushing, which is selected based on the application.

The following describes who to assemble anti-drool, end cap, and ball check bushings.
4.9.3.1 Assembling the Anti-Drool Bushing

To assemble the anti-drool bushing, do the following:

1. Clean the surfaces on the anti-drool bushing and the sprue bar where the two components will interface.

2. Install a set screw in the bottom sprue heater channel.

3. Insert the anti-drool bushing into the sprue bar melt channel.

4. Thread the sprue extension plug into the sprue bar though the clearance hole in the anti-drool bushing. Tighten the plug by hand only.

4.9.3.2 Assembling the End Cap Bushing

To assemble the end cap bushing, do the following:

1. If equipped, coat the two locating dowels with a high temperature anti-seize lubricant and install in the injection side of the sprue bar.
2. Slide the end cap onto the locating dowels.

3. Coat screws (two or four depending on the end cap size) with a high temperature anti-seize lubricant and install them into the end cap.

**CAUTION!**

Make sure all screws are torqued evenly using a standard torque pattern.

4. Secure the end cap bushing to the sprue bar with the screws. Torque the screws to half the value specified on the *Section View Assembly* drawing and then torque them to the full value. Refer to Chapter 9.

### 4.9.3.3 Assembling the Ball Check Bushing

To assemble the ball check bushing, do the following:

1. Place the ball stop in the ball check bushing.
2. Place the ball bearing in the ball check insert.

3. Thread the ball check insert into the ball check bushing, making sure the ball stop and ball bearing do not fall out. Torque the ball check insert to the value specified on the Section View Assembly drawing. Refer to Chapter 9.

4. Insert the ball check bushing into the sprue bar melt channel.

5. Thread the sprue extension plug into the sprue bar though the clearance hole in the anti-drool bushing. Tighten the plug by hand only.

6. Install a set screw in the bottom sprue heater channel.
4.10  Assembling the Manifold Plates

The following procedures describe how to assemble the manifold plates.

4.10.1  Assembling the Manifold Plates for Thermal Gate and Valve Gate Systems

To assemble the clamp and injection manifold plates for thermal gate and valve gate systems, do the following:

**NOTE:** The following procedure requires the use of a crane. Make sure the hoist rings, lifting chain and crane can support the weight of the plate(s) and hot runner.

1. Make sure both manifold plates are clean and free of pry marks around the pry slots. Clean the manifold plate surfaces with a medium India stone (240 grit oilstone) as needed.
2. Verify that all the proper alignment dowels and locating dowels are in place before installing the backing plate.
3. Verify that all clearance holes are cut into the manifold plates to match with the manifold thermocouple locations in the manifold.
4. For valve gate systems only, measure the dimensions of the piston cylinder bore depth and verify them with those in the Section View Assembly drawing. Refer to Chapter 9.
5. Install a suitable hoist ring(s) in the lifting location at the top of the injection manifold plate.

**WARNING!**

Inadequate lifting equipment can fail and cause injury or death. Make sure the hoist rings, chains/slings, and lifting device are rated for the load and in safe operating condition.

6. Attach an overhead crane to the hoist ring(s) and lift the injection manifold plate until it is vertical.
7. Rotate the injection manifold plate and lay it on the wood blocks with the injection side facing up.
8. Disconnect the overhead lifting device and remove the hoist ring(s).
9. Remove the hoist ring(s) and install it to the injection side of the injection manifold plate.
10. Attach the overhead crane to the hoist ring(s) and lift the injection manifold plate over the clamp manifold plate.
11. Align the alignment dowels in the injection manifold plate with the alignment holes in the clamp manifold plate. Lower the manifold plate onto the clamp manifold plate.
12. Disconnect the overhead lifting device and remove the hoist ring(s).
13. Apply a light coat of high temperature lubricant to the threaded bores in the injection manifold plate where the retaining bolts will be installed.
14. Install retaining bolts and torque them to the value specified on the Section View Assembly drawing (refer to Chapter 9) in the cross pattern shown in Figure 4-35.

![Figure 4-35 Retaining Bolt Torque Sequence](image)

15. Install the manifold thermocouples to the manifolds through the access holes in the injection manifold plate.

   **NOTE:** To avoid losing the bolt, assemble the bolt with the thermocouple and pull the wires back when inserting the bolt through the manifold plate. This will create enough tension to keep the assembly together until the bolt is started in the manifold thread.

16. Label each wire with its pin designation.

   **NOTE:** Refer to the electrical schematic(s) in Chapter 9 for wiring information.

17. Route the wires through the wire grooves and connect them to the multi-pin connectors. Make sure all wires are retained in the wire grooves using wire clips.

   **NOTE:** Refer to the electrical schematic(s) in Chapter 9 for wiring information.

18. Install a suitable hoist ring(s) in the lifting location at the top of the clamp manifold plate.

---

**WARNING!**

Inadequate lifting equipment can fail and cause injury or death. Make sure the hoist rings, chains/slings, and lifting device are rated for the load and in safe operating condition.

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19. Attach an overhead crane to the hoist ring(s) and lift the hot runner until it is vertical.

20. Rotate the hot runner and lay it on the wood blocks with the clamp manifold plate facing up.

21. Install the manifold thermocouples to the manifolds through the access holes in the clamp manifold plate.

   **NOTE:** To avoid losing the bolt, assemble the bolt with the thermocouple and pull the wires back when inserting the bolt through the manifold plate. This will create enough tension to keep the assembly together until the bolt is started in the manifold thread.

22. Label each wire with its pin designation.

   **NOTE:** Refer to the electrical schematic(s) in Chapter 9 for wiring information.
23. Route the wires through the wire grooves in the plate and connect them to the multi-pin connectors. Make sure all wires are retained in the wire grooves using wire clips.

**NOTE:** Refer to the electrical schematic(s) in Chapter 9 for wiring information.

### 4.10.2 Assembling Manifold Plates for Back-to-Back Systems

The following procedures describe how to assemble the clamp, center air and injection manifold plates for a back-to-back system.

#### 4.10.2.1 Assembling the Center Air Plate

To assemble a center air plate for a back-to-back system, do the following

**WARNING!**

Inadequate lifting equipment can fail and cause injury or death. Make sure the hoist rings, chains/slings, and lifting device are rated for the load and in safe operating condition.

**NOTE:** The following procedure requires the use of a crane. Make sure the hoist rings, lifting chain and crane can support the weight of the plate(s) and hot runner.

1. Make sure the fully assembled clamp manifold plate is on a work bench with the manifold pocket facing up. The plate must be supported by two wooden blocks.

**IMPORTANT!**

The wooden blocks must be high enough to prevent the nozzle tips from touching the work bench when the nozzle stacks are installed.

2. Thoroughly clean all bores, tapped holes, and guide holes to make sure no burrs or oil are present.

3. Coat the inside of the alignment dowel bores in the clamp manifold plate with a high temperature lubricant.

4. Make sure the locating dowels for the center air plate are installed in the clamp manifold plate.

**NOTE:** Refer to the Section View Assembly drawing in Chapter 9 to determine which side of the center air plate mates with the clamp manifold plate.

5. Coat the tips of the alignment dowels with a high temperature lubricant.

6. Install a suitable hoist ring(s) in the center air plate lifting location(s) on the side opposite the clamp manifold plate.
7. Attach an overhead crane to the hoist ring(s) and lift the center air plate over the clamp manifold plate.

8. Align the center air plate with the alignment dowels and lower the center air plate onto the clamp manifold plate.

9. Disconnect the overhead lifting device and remove the hoist ring(s).

10. Install a suitable hoist ring(s) to the lifting location(s) on top of the clamp manifold plate.

11. Slowly lift the clamp manifold plate and center air plate until they are on a 45° angle.

12. Apply a light coat of high temperature lubricant to the inside of two bores in the clamp manifold plate and center air plate.

13. Install two retaining bolts through the clamp manifold plate and hand tighten.

14. Continue to lift the clamp manifold plate and center air plate until they are vertical to the work bench.

15. Apply a light coat of high temperature lubricant to the inside of the remaining bores in the clamp manifold plate and center air plate.

16. Install the remaining retaining bolts through the clamp manifold plate and torque them to the value specified on the Section View Assembly drawing (refer to Chapter 9) in the cross pattern shown in Figure 4-37.

**WARNING!**

Inadequate lifting equipment can fail and cause injury or death. Make sure the hoist rings, chains/slings, and lifting device are rated for the load and in safe operating condition.
17. Install the manifold thermocouples to the manifolds through the access holes in the clamp manifold plate.

**NOTE:** To avoid losing the bolt, assemble the bolt with the thermocouple and pull the wires back when inserting the bolt through the manifold plate. This will create enough tension to keep the assembly together until the bolt is started in the manifold thread.

18. Label each wire with its pin designation.

**NOTE:** Refer to the electrical schematic(s) in Chapter 9 for wiring information.

19. Route the wires through the wire grooves in the plate and connect them to the multi-pin connectors. Make sure all wires are retained in the wire grooves using wire clips.

**NOTE:** Refer to the electrical schematic(s) in Chapter 9 for wiring information.

20. Lower the assembly down onto two wooden blocks with the clamp manifold plate facing down.

21. Remove the hoist ring(s) from the clamp manifold plate.

### 4.10.2.2 Assembling the Clamp, Center Air and Injection Plates

To assemble the clamp, center air and injection manifold plates for a back-to-back system, do the following:

**WARNING!**

Inadequate lifting equipment can fail and cause injury or death. Make sure the hoist rings, chains/slings, and lifting device are rated for the load and in safe operating condition.

**NOTE:** The following procedure requires the use of a crane. Make sure the hoist rings, lifting chain and crane can support the weight of the plate(s) and hot runner.

1. Make sure the fully assembled clamp manifold plate and center air plate are on a work bench with the center air plate on top. The plates must be supported by two wooden blocks.
2. Install a suitable hoist ring(s) in the lifting location(s) in the injection manifold plate.

**WARNING!**

Inadequate lifting equipment can fail and cause injury or death. Make sure the hoist rings, chains/slings, and lifting device are rated for the load and in safe operating condition.

3. Attach an overhead crane to the hoist ring(s) and lift the injection manifold plate over the center air plate.

4. Align the alignment dowels in the injection manifold plate with the alignment holes in the center air plate. Lower the manifold plate onto the center air plate.

5. Disconnect the overhead lifting device and remove the hoist ring(s).

6. Apply a light coat of high temperature lubricant to the tips of the retaining bolts used to secure the injection manifold plate and center air plate together.

7. Install the retaining bolts and torque them to the value specified on the Section View Assembly drawing (refer to Chapter 9) in the cross pattern shown in Figure 4-38.

8. Install the manifold thermocouples to the manifolds through the access holes in the injection manifold plate.

   **NOTE:** To avoid losing the bolt, assemble the bolt with the thermocouple and pull the wires back when inserting the bolt through the manifold plate. This will create enough tension to keep the assembly together until the bolt is started in the manifold thread.

9. Label each wire with its pin designation.

   **NOTE:** Refer to the electrical schematic(s) in Chapter 9 for wiring information.

10. Route the wires through the wire grooves in the plate and connect them to the multi-pin connectors. Make sure all wires are retained in the wire grooves using wire clips.
4.11 Assembling the Nozzle Tip and Heater Assemblies

The following procedures describe how to install and test nozzle tip and heater assemblies for thermal gate and valve gate systems.

4.11.1 Assembly for Thermal Gate Systems

The following procedures describe how to install nozzle tip and heater assemblies for thermal gate systems.

4.11.1.1 Assembling a HTM Heater for Ultra 250 Systems

To assemble the nozzle tip and HTM heater assembly for an Ultra 250 thermal gate system, do the following:

1. Slide the nozzle heater assembly over the nozzle housing until it bottoms out on the housing.

   **NOTE:** The nozzle heater assembly includes the retaining sleeve, nozzle heater and thermocouple.

**Figure 4-39  Heater Assembly for Ultra 250 Systems (HTM Heater)**

2. Route the nozzle heater and thermocouple wires through the wire grooves in the manifold plate.

3. Unscrew the set screw at the tip of the retaining sleeve so it does not interfere when installing the nozzle tip.

4. Inspect the nozzle tip and nozzle housing threads for potential contamination. Remove any contamination found. The threads and all sealing surfaces must be clean and dry.

5. Install the nozzle tip and torque it to the value printed on the side of the nozzle tip using a nozzle tip socket. The torque value is also specified on the Section View Assembly drawing. Refer to Chapter 9.

   **NOTE:** Refer to Section 6.4 for a listing of special Husky tools and order numbers.

6. Pull the nozzle heater assembly up until it makes contact with the hex section of the nozzle tip.

7. Torque the set screw at the end of the retaining sleeve to the value specified on the Section View Assembly drawing. Refer to Chapter 9.

8. Install wire clips in the wire grooves to protect the wires from pinching and excess heat.

9. Label each wire with the heater zone number.

10. Crimp the wire ends and connect the wires to the appropriate multi-pin connectors. Refer to the electrical schematic(s) in Chapter 9.

11. Test each nozzle heater zone according to the instructions in Section 4.11.3.

### 4.11.2 Assembling a HTM Heater for Ultra 350 Systems

To assemble the nozzle tip and HTM heater assembly for an Ultra 350 thermal gate system, do the following:

1. Inspect the nozzle tip and nozzle housing for potential contamination. Remove any contamination found. The threads and all sealing surfaces must be clean and dry.
2. Thread the nozzle tip onto the nozzle housing. Torque the nozzle tip to the torque value printed on the side of the nozzle tip using a nozzle tip socket. The torque value is also specified on the Section View Assembly drawing. Refer to Chapter 9.

**NOTE:** Refer to Section 6.4 for a listing of special Husky tools and order numbers.

3. Slide the wave springs onto the nozzle housing. The number of wave springs required is listed on the Plan View Assembly drawing. Refer to Chapter 9.

4. Slide the nozzle heater assembly over the nozzle housing far enough to show the retaining clip groove on the tip retainer.

**NOTE:** The nozzle heater assembly includes the retaining sleeve, nozzle heater and thermocouple.

5. Install the retaining clip on the tip retainer and pull the nozzle heater assembly up against it.

6. Route the nozzle heater and thermocouple wires through the wire grooves in the manifold plate. Make sure all wiring is properly retained in the wire grooves using wire clips.

**NOTE:** All wiring along the nozzle heater must be either a high temperature braid or sleeved using a high temperature sleeving.

7. Label each wire with the heater zone number.

8. Crimp the wire ends and connect the wires to the appropriate multi-pin connectors. Refer to the electrical schematic(s) in Chapter 9.

9. Test each nozzle heater zone according to the instructions in Section 4.11.3.
4.11.3 Assembling a HTM Nozzle Heater for Ultra 500 Systems

To assemble the nozzle tip and HTM heater assembly for an Ultra 500 thermal gate system, do the following:

1. Inspect the tip insert, tip retainer and nozzle housing for potential contamination. Remove any contamination found. The threads and all sealing surfaces must be clean and dry.

2. Insert the tip insert into the tip retainer and thread the tip retainer onto the nozzle housing. Torque the tip retainer to the torque value printed on the side of the retainer using a nozzle tip socket. The torque value is also specified on the Section View Assembly drawing. Refer to Chapter 9.

**NOTE:** Refer to Section 6.4 for a listing of special Husky tools and order numbers.

**NOTE:** When installing thermal sprue (TS) tips, first verify the flow pin orientation before installing the tip, as shown in Figure 4-44.
Unscrew the set screw at the tip of retaining sleeve so it does not interfere during the installation of the nozzle heater assembly.

Slide the nozzle heater assembly over the nozzle housing far enough to show the retaining clip groove on the tip retainer.

NOTE: The nozzle heater assembly includes the retaining sleeve, nozzle heater and thermocouple.

Install the retaining clip on the tip retainer and pull the nozzle heater assembly up against it.

Torque the set screw at the end of the retaining sleeve to the value specified on the Section View Assembly drawing. Refer to Chapter 9.

Route the nozzle heater and thermocouple wires through the wire grooves in the manifold plate. Make sure all wiring is properly retained in the wire grooves using wire clips.

NOTE: All wiring along the nozzle heater must be either a high temperature braid or sleeved using a high temperature sleeving.

Label each wire with the heater zone number.

Crimp the wire ends and connect the wires to the appropriate multi-pin connectors. Refer to the electrical schematic(s) in Chapter 9.

Test each nozzle heater zone according to the instructions in Section 4.11.3.

4.11.1.4 Assembling a Copper Heater for Ultra 500 Systems

To assemble the nozzle tip and copper heater assembly for an Ultra 500 thermal gate system, do the following:

1. Inspect the tip insert, tip retainer and nozzle housing for potential contamination. Remove any contamination found. The threads and all sealing surfaces must be clean and dry.
2. Insert the tip insert into the tip retainer and thread the tip retainer onto the nozzle housing. Torque the tip retainer to the torque value printed on the side of the retainer using a nozzle tip socket. The torque value is also specified on the Section View Assembly drawing. Refer to Chapter 9.

**NOTE:** Refer to Section 6.4 for a listing of special Husky tools and order numbers.

**NOTE:** When installing thermal sprue (TS) tips, first verify the flow pin orientation before installing the tip, as shown in Figure 4-44.

3. Slide the nozzle heater over the nozzle housing far enough to show the retaining clip groove on the tip retainer.
4. Install the retaining clip on the tip retainer.

5. Install the thermocouple probe end into the probe hole on the nozzle heater as shown in Figure 4-43.

   **NOTE:** A slot is cut into the nozzle heater to allow the thermocouple to be set in place with the retaining sleeve.

6. Slide the retaining sleeve over the nozzle heater and thermocouple.

   **CAUTION!**

   The front ring holds the thermocouple in place for proper reading of the nozzle heater temperature. Caution should be taken when wiring the thermocouple to not pull the thermocouple out from under the front ring. This could result in faulty temperature readings and possible over heating of the nozzle heater and other components.

7. Pull the nozzle heater up against the retaining clip.

8. Hand tighten the front ring onto the nozzle heater.

9. Route the nozzle heater and thermocouple wires through the wire grooves in the manifold plate. Make sure all wiring is properly retained in the wire grooves using wire clips.

   **NOTE:** All wiring along the nozzle heater must be either a high temperature braid or sleeved using a high temperature sleeving.

10. Label each wire with the heater zone number.

11. Crimp the wire ends and connect the wires to the appropriate multi-pin connectors. Refer to the electrical schematic in Chapter 9.

12. Test each nozzle heater zone according to the instructions in Section 4.11.3.

### 4.11.1.5 Assembling an Ultra Heater for Ultra 500 and Ultra 750 Systems

To assemble the nozzle tip and Ultra heater assembly for an Ultra 500 and 750 thermal gate system, do the following:

1. Inspect the tip insert, tip retainer, and nozzle housing for potential contamination. Remove any contamination found. The threads and all sealing surfaces must be clean and dry.
2. Insert the tip insert into the tip retainer and thread the tip retainer onto the nozzle housing. Torque the tip retainer to the torque value printed on the side of the retainer using a nozzle tip socket. The torque value is also specified on the Section View Assembly drawing. Refer to Chapter 9.

**NOTE:** Refer to Section 6.4 for a listing of special Husky tools and order numbers.

**NOTE:** When installing thermal sprue (TS) tips, first verify the flow pin orientation before installing the tip, as shown in Figure 4-46.

3. Install the thermocouple retaining ring over the nozzle heater.
4. Orient the thermocouple retaining ring so the wires are on the same side as the nozzle heater wires.

5. Slide the nozzle heater onto the nozzle assembly. The thermocouple retaining ring will snap onto the retaining clip groove in the nozzle heater. If required, the thermocouple ring can be opened slightly with a flat head screwdriver.

6. Route the nozzle heater and thermocouple wires through the wire grooves in the manifold plate. Make sure all wiring is properly retained in the wire grooves using wire clips.

**NOTE:** All wiring along the nozzle heater must be either a high temperature braid or sleeved using a high temperature sleeving.

7. Label each wire with the heater zone number.

8. Crimp the wire ends and connect the wires to the appropriate multi-pin connectors. Refer to the electrical schematic in Chapter 9.

9. Test each nozzle heater zone according to the instructions in Section 4.11.3.

**4.11.1.6 Assembling a Bi-Metal Heater for Ultra 750 and Ultra 1000 Systems**

To assemble the nozzle tip and bi-metal heater assembly for an Ultra 750 and 1000 thermal gate system, do the following:

1. Inspect the tip insert, tip retainer and nozzle housing for potential contamination. Remove any contamination found. The threads and all sealing surfaces must be clean and dry.

2. Insert the tip insert into the tip retainer and thread the tip retainer onto the nozzle housing. Torque the tip retainer to the torque value printed on the side of the retainer using a nozzle tip socket. The torque value is also specified on the Section View Assembly drawing. Refer to Chapter 9.
NOTE: Refer to Section 6.4 for a listing of special Husky tools and order numbers.

NOTE: When installing thermal sprue (TS) tips, first verify the flow pin orientation before installing the tip, as shown in Figure 4-48.

3. Slide the nozzle heater over the nozzle housing far enough to show the retaining clip groove on the tip retainer.
4. Install the retaining clip on the tip retainer and pull the nozzle heater upwards until it stops against the retaining clip.
5. Install the thermocouple probe end into the probe hole on the nozzle heater end as shown in Figure 4-47.

CAUTION!
The front ring holds the thermocouple in place for proper reading of the nozzle heater temperature. Caution should be taken when wiring the thermocouple to not pull the thermocouple out from under the front ring. This could result in faulty temperature readings and possible over heating of the nozzle heater and other components.

6. Secure the thermocouple to the nozzle heater by hand tightening the heater front ring on the nozzle heater.
7. Route the nozzle heater and thermocouple wires through the wire grooves in the manifold plate. Make sure all wiring is properly retained in the wire grooves using wire clips.
   NOTE: All wiring along the nozzle heater must be either a high temperature braid or sleeved using a high temperature sleeving.
8. Label each wire with the heater zone number.
9. Crimp the wire ends and connect the wires to the appropriate multi-pin connectors. Refer to the electrical schematic in Chapter 9.
10. Test each nozzle heater zone according to the instructions in Section 4.11.3.
4.11.1.7 Assembling a Triton Heater for Ultra 750-UP Systems

To assemble the nozzle tip and Triton heater assembly for an Ultra 750-UP thermal gate system, do the following:

1. Inspect the tip insert, tip retainer and nozzle housing for potential contamination. Remove any contamination found. The threads and all sealing surfaces must be clean and dry.

2. Insert the tip insert into the tip retainer and thread the tip retainer into the nozzle housing. Torque the tip retainer to the torque value printed on the side of the retainer using a nozzle tip socket. The torque value is also specified on the Section View Assembly drawing. Refer to Chapter 9.

3. Slide the wave springs onto the nozzle housing. The number of wave springs required is listed on the Plan View Assembly drawing. Refer to Chapter 9.

4. Slide the nozzle heater over the nozzle housing far enough to show the retaining clip groove on the tip retainer.

   **NOTE:** Each wave spring can be compressed up to approximately 3 mm (0.12 in).

5. Install the thermocouple retaining ring over the nozzle heater.

6. Orient the thermocouple retaining ring so the wires are on the same side as the nozzle heater wires.

7. While holding the nozzle heater and thermocouple retaining ring firmly against the wave springs, install the retaining clip into the groove in the nozzle housing.
8. Route the nozzle heater and thermocouple wires through the wire grooves in the manifold plate. Make sure all wiring is properly retained in the wire grooves using wire clips.

**NOTE:** All wiring along the nozzle heater must be either a high temperature braid or sleeved using a high temperature sleeving.

9. Label each wire with the heater zone number.

10. Crimp the wire ends and connect the wires to the appropriate multi-pin connectors. Refer to the electrical schematic in Chapter 9.

11. Test each nozzle heater zone according to the instructions in Section 4.11.3.

### 4.11.8 Assembling a Bi-Metal Heater for Ultra 750 HT-S6 Systems

To assemble the nozzle tip and Triton heater assembly for an Ultra 750 HT-S6 thermal gate system, do the following:

1. Inspect the nozzle tip and nozzle housing for potential contamination. Remove any contamination found. The threads and all sealing surfaces must be clean and dry.

2. Thread the nozzle tip into the nozzle housing. Torque the nozzle tip to the torque value printed on it. The torque value is also specified on the Section View Assembly drawing. Refer to Chapter 9.

**NOTE:** Refer to Section 6.4 for a listing of special Husky tools and order numbers.
3. Slide the nozzle heater over the nozzle housing far enough to show the retaining clip groove on the tip retainer.

4. Install the retaining clip on the tip retainer and pull the nozzle heater upwards until it stops against the retaining clip.

5. Install the thermocouple probe end into the probe hole on the nozzle heater end as shown in Figure 4-51.

**CAUTION!**
The front ring holds the thermocouple in place for proper reading of the nozzle heater temperature. Caution should be taken when wiring the thermocouple to not pull the thermocouple out from under the front ring. This could result in faulty temperature readings and possible over heating of the nozzle heater and other components.

6. Secure the thermocouple to the nozzle heater by hand tightening the heater front ring on the nozzle heater.

7. Route the nozzle heater and thermocouple wires through the wire grooves in the manifold plate. Make sure all wiring is properly retained in the wire grooves using wire clips.

   **NOTE:** All wiring along the nozzle heater must be either a high temperature braid or sleeved using a high temperature sleeving.

8. Label each wire with the heater zone number.

9. Crimp the wire ends and connect the wires to the appropriate multi-pin connectors. Refer to the electrical schematic(s) in Chapter 9.

10. Test each nozzle heater zone according to the instructions in Section 4.11.3.
4.11.2 Assembly for Valve Gate Systems

The following procedures describe how to install nozzle tip and heater assemblies for valve gate systems.

4.11.2.1 Assembling a HTM Heater for Ultra 350 Systems

To assemble the nozzle tip and HTM heater assembly for an Ultra 350 valve gate system, do the following:

1. Inspect the nozzle tip and nozzle housing threads for potential contamination. Remove any contamination found. The threads and all sealing surfaces must be clean and dry.

2. Install the nozzle tip onto the nozzle housing and torque it to the value printed on the side of the nozzle tip using a nozzle tip socket. The torque value is also specified on the Section View Assembly drawing. Refer to Chapter 9.

   NOTE: Refer to Section 6.4 for a listing of special Husky tools and order numbers.

3. Slide the wave springs onto the nozzle housing. The number of wave springs required is listed on the Plan View Assembly drawing. Refer to Chapter 9.

4. Slide the nozzle heater assembly over the nozzle housing far enough to show the retaining clip groove on the nozzle tip.

   NOTE: The nozzle heater assembly includes the retaining sleeve, nozzle heater and thermocouple.

5. Install the retaining clip on the nozzle tip and pull the nozzle heater assembly up against it.

6. Route the nozzle heater and thermocouple wires through the wire grooves in the manifold plate. Make sure all wiring is properly retained in the wire grooves using wire clips.
NOTE: All wiring along the nozzle heater must be either a high temperature braid or sleeved using a high temperature sleeving.

7. Label each wire with the heater zone number.
8. Crimp the wire ends and connect the wires to the appropriate multi-pin connectors. Refer to the electrical schematic(s) in Chapter 9.
9. Test each nozzle heater zone according to the instructions in Section 4.11.3.

4.11.2.2 Assembling a Copper Heater for Ultra 500 Systems

To assemble the nozzle tip and copper heater assembly for an Ultra 500 valve gate system, do the following:

1. Inspect the nozzle tip and nozzle housing threads for potential contamination. Remove any contamination found. The threads and all sealing surfaces must be clean and dry.

2. Install the nozzle tip onto the nozzle housing and torque it to the value printed on the side of the nozzle tip using a nozzle tip socket. The torque value is also specified on the Section View Assembly drawing. Refer to Chapter 9.

   NOTE: Refer to Section 6.4 for a listing of special Husky tools and order numbers.

3. Slide the nozzle heater over the nozzle housing and nozzle tip.
4. Install the retainer ring around the nozzle tip or nozzle retainer.
5. Connect the thermocouple to the nozzle heater.
6. Pull the nozzle heater up against the retainer ring.
7. If required, install the retaining sleeve over the thermocouple and nozzle tip.
8. Install the front ring and tighten by hand.

9. Route the nozzle heater and thermocouple wires through the wire grooves in the manifold plate. Make sure all wiring is properly retained in the wire grooves using wire clips.

   **NOTE:** All wiring along the nozzle heater must be either a high temperature braid or sleeved using a high temperature sleeving.

10. Label each wire with the heater zone number.

11. Crimp the wire ends and connect the wires to the appropriate multi-pin connectors. Refer to the electrical schematic in Chapter 9.

12. Test each nozzle heater zone according to the instructions in Section 4.11.3.

### 4.11.2.3 Assembling an Ultra Heater for Ultra 500, Ultra 750 and Ultra 1000 Systems

To assemble the nozzle tip and Ultra heater assembly for an Ultra 500, Ultra 750 or Ultra 1000 valve gate system, do the following:

1. Inspect the nozzle tip and nozzle housing threads for potential contamination. Remove any contamination found. The threads and all sealing surfaces must be clean and dry.

   ![Figure 4-54 Nozzle Tip and Heater Assembly for Ultra 500 and Ultra 750 VG Systems (Ultra Heater)](image)

   **1. Thermocouple Retaining Ring**  
   **2. Nozzle Heater (Ultra)**  
   **3. Nozzle Tip**

2. Install the nozzle tip onto the nozzle housing and torque it to the value printed on the side of the nozzle tip using a nozzle tip socket. The torque value is also specified on the Section View Assembly drawing. Refer to Chapter 9.

   **NOTE:** Refer to Section 6.4 for a listing of special Husky tools and order numbers.

3. Orient the thermocouple retaining ring so the wires are on the same side as the nozzle heater wires.

4. Slide the nozzle heater onto the nozzle assembly. The thermocouple retaining ring will snap onto the retaining clip groove in the nozzle heater. If required, the thermocouple ring can be opened slightly with a flat head screwdriver.
5. Route the nozzle heater and thermocouple wires through the wire grooves in the manifold plate. Make sure all wiring is properly retained in the wire grooves using wire clips.

**NOTE:** All wiring along the nozzle heater must be either a high temperature braid or sleeved using a high temperature sleeving.

6. Label each wire with the heater zone number.

7. Crimp the wire ends and connect the wires to the appropriate multi-pin connectors. Refer to the electrical schematic in Chapter 9.

8. Test each nozzle heater zone according to the instructions in Section 4.11.3.

### 4.11.2.4 Assembling a Bi-Metal Heater for Ultra 500, Ultra 750 and Ultra 1000 Systems

To assemble the nozzle tip and bi-metal heater assembly for an Ultra 500, Ultra 750 or Ultra 1000 valve gate system, do the following:

1. Inspect the nozzle tip and nozzle housing threads for potential contamination. Remove any contamination found. The threads and all sealing surfaces must be clean and dry.

   ![Figure 4-55 Nozzle Tip and Heater Assembly for Ultra 500, Ultra 750, and Ultra 1000 VG Systems (Bi-Metal Heater)](image)

   1. Front Ring  
   2. Retainer Ring  
   3. Nozzle Heater (Bi-Metal)  
   4. Thermocouple  
   5. Nozzle Tip

2. Install the nozzle tip onto the nozzle housing and torque it to the value printed on the side of the nozzle tip using a nozzle tip socket. The torque value is also specified on the Section View Assembly drawing. Refer to Chapter 9.

   **NOTE:** Refer to Section 6.4 for a listing of special Husky tools and order numbers.

3. Slide the nozzle heater over the nozzle housing and nozzle tip.

4. Install the retainer ring around the nozzle tip.

5. Connect the thermocouple to the nozzle heater.

6. Pull the nozzle heater up against the retainer ring.
7. Install the front ring and tighten by hand.

8. Route the nozzle heater and thermocouple wires through the wire grooves in the manifold plate. Make sure all wiring is properly retained in the wire grooves using wire clips.

   **NOTE:** All wiring along the nozzle heater must be either a high temperature braid or sleeved using a high temperature sleeving.

9. Label each wire with the heater zone number.

10. Crimp the wire ends and connect the wires to the appropriate multi-pin connectors. Refer to the electrical schematic in Chapter 9.

11. Test each nozzle heater zone according to the instructions in Section 4.11.3.

### 4.11.3 Testing Nozzle Heaters

To confirm a nozzle heater is functioning properly, do the following:

1. Using a multimeter set to ohms, measure the resistance through each nozzle heater zone. Refer to the electrical schematic(s) in Chapter 9 for the ohms measurements required for each zone. The normal tolerance for nozzle heaters is ±5%.

   **CAUTION!**

   A common problem with nozzle heaters is moisture absorption due to the hygroscopic nature of the insulation. A heater with a low case to center conductor insulation reading (< 10K ohms) should be baked out and retested to determine if moisture was the cause. Contact your Husky Regional Service and Sales office for more information.

2. Using a multimeter set to ohms, measure the resistance through each lead to ground. A measurement from either lead to ground that is below 100K ohms indicates a short to ground. A measurement from 100 kilohms to 1 megohms is often associated with a wet heater. A measurement greater than 1 megohms is good.

   **NOTE:** A short reading can be the result of either a pinched wire or a broken heater element. Inspect the wires first to make sure there are no pinched or damage lead wires. A heater wire can be spliced, however, this should only be done by a certified electrician. The splice should include dual layer heat shrink tubing with an adhesive inner layer to avoid potential water shorts. The heat shrink should be rated for 150 ºC (302 ºF) minimum.

   **NOTE:** Refer to the electrical schematic(s) in Chapter 9 for resistance information.

### 4.12 Assembling Drop Limiters

Drop limiters are installed to prevent the hot runner from falling between the tie bars if the center supports fail. There are various types of limiters available, the use of each dependent on how the hot runner is supported.
To install the drop limiters, do the following:

1. Secure the drop limiter to the side or top corner of the hot runner.

**CAUTION!**

Make sure all screws are torqued evenly using a standard torque pattern.

2. Torque the screws to half the value specified on the Section View Assembly drawing and then torque them to the full value. Refer to Chapter 9.

3. Repeat this procedure for the opposite side of the hot runner.
Chapter 5  Installation, Startup and Operation

This chapter describes how to install, startup and operate the Ultra stack hot runner.

**IMPORTANT!**
Always refer to the hot runner installation procedure or guidelines included in the Service Manual for the machine and/or Mold Manual before installing the hot runner.

5.1  Installing the Locating Ring and Sprue Bar Guide

To install the locating ring and sprue bar guide onto a sprue bar, do the following:

**WARNING!**
Burn hazard - risk of serious injury. Machine surfaces can be hot. Wear Personal Protective Equipment (PPE).

1. Retract the injection nozzle.
2. Lock out and tag the machine. Refer to Section 1.9.
3. Assemble the two halves of the sprue bar guide with the wear pads provided.

![Figure 5-1 Locating Ring and Sprue Bar Guide Installation](image)


4. Attach the sprue bar guide to the locating ring.
5. If the sprue bar is designed to disengage from the sprue bar guide when the mold is open:
   a. Open the purge guard.
   b. Install the locating ring and sprue bar guide to the injection or mold side of the stationary platen. Torque the screws to the value specified on the *Section View Assembly* drawing. Refer to Chapter 9.
   c. Close the purge guard.

6. If the sprue bar is not designed to disengage from the sprue bar guide when the mold is open:
   a. Open the operator’s side gate.
   b. Install the locating ring and sprue bar guide to the mold side of the stationary platen. Torque the screws to the value specified on the *Section View Assembly* drawing. Refer to Chapter 9.
   c. Close the operator’s side gate.

7. Remove all locks and tags. Refer to Section 1.9.

### 5.2 Installing the Heated Manifold

Heated manifolds are non-Ultra, single face hot runners required only for offset sprue bar applications.

To install a heated manifold into a machine, do the following:

**WARNING!**

Crushing hazard – risk of death or serious injury. Inadequate lifting equipment can fail and cause death or serious injury. Make sure all lifting equipment is rated for the load and in safe operating condition.

**NOTE:** The following procedure requires the use of a crane. Make sure the hoist rings, lifting chain and crane can support the weight of the plate(s) and hot runner.

1. Make sure the mold is open.
2. Lock out and tag the machine. Refer to Section 1.9.
3. Clean the stationary platen to make sure no dirt or oil is present.
4. Clean the backing plate and sprue bushing to make sure no dirt or oil is present.
5. Install a suitable hoist ring(s) in the lifting location(s) in the backing plate.
6. Attach an overhead crane to the hoist ring(s) and lift the heated manifold into the clamp area. Make sure the backing plate faces the stationary platen.
7. Align the locating ring with the sprue nozzle and position the heated manifold against the stationary platen.
8. Install the bolts that secure the heated manifold to the stationary platen and torque them to the torque specified on the *Section View Assembly* drawing. Refer to Chapter 9.
9. Connect any electrical cables to the electrical connectors on the heated manifold. Refer to the electrical schematic(s) in Chapter 9 for further information.

10. Remove all locks and tags. Refer to Section 1.9.

5.3 Installing the Cavity Plates

To install the cavity plates, do the following:

NOTE: Before assembling the cavity plates to the hot runner, refer to the mold and hot runner assembly drawings. The hot runner assembly drawings are included in Chapter 9.

1. Make sure the hot runner is on a work bench with the clamp side facing up. Refer to Section 3.1 for lifting information.

2. Make sure the nozzle and cavity plate sealing diameters are clean and free of burrs.

CAUTION!

Equipment damage – risk of serious damage to nozzle or cavity plate sealing diameters. Severe damage to the nozzle or cavity plate sealing diameters could occur if the mold is closed when the nozzles or manifold are hot. Allow the nozzles and manifolds to cool to room temperature (< 25 °C or < 77 °F) before closing the mold.

3. Make sure all nozzle tips are clean.

4. If nozzle tip insulators are used, install them in the gate detail before the cavity plate is installed. Refer to Section 6.12.3.

5. Apply a coat of high temperature lubricant to the clamp-side alignment dowels.

6. Install a suitable hoist ring(s) in the lifting location(s) in the clamp-side cavity plate.
**WARNING!**

Crushing hazard – risk of death or serious injury. Inadequate lifting equipment can fail and cause death or serious injury. Make sure all lifting equipment is rated for the load and in safe operating condition.

7. Attach an overhead crane to the hoist ring(s) and lift the cavity plate over the hot runner.

**IMPORTANT!**

When assembling the cavity plate to the hot runner, special attention should be given to prevent damage to the nozzle tips and valve stems. The cavity plate should mate with the hot runner without any resistance. If a plate encounters resistance, remove the plate and check for interference points.

**NOTE:** Do not attempt to force the plate into position as serious damage can result.

8. Align the cavity plate with the alignment dowels and lower the cavity plate.

**NOTE:** Make sure the wires in the hot runner wire grooves are not pinched between the plates while closing.

9. Install the cavity plate retaining screws and tighten. Refer to the *Mold Manual* for specific torque values.

10. Install the hot runner lift bar to the hot runner and attach an overhead crane.

11. Lift the hot runner and rotate it 180°. Set the hot runner down on the wood blocks with the injection manifold plate facing up.

12. Apply a coat of high temperature lubricant to the injection side alignment dowels.

13. Install a suitable hoist ring(s) in the lifting location(s) in the injection side cavity plate.

14. Attach an overhead crane to the hoist ring(s) and lift the cavity plate over the hot runner.

**IMPORTANT!**

When assembling the cavity plate to the hot runner, special attention should be given to prevent damage to the nozzle tips and valve stems. The cavity plate should mate with the hot runner without any resistance. If a plate encounters resistance, remove the plate and check for interference points.

**NOTE:** Do not attempt to force the plate into position as serious damage can result.

15. Align the cavity plate with the alignment dowels and lower the cavity plate.

**NOTE:** Make sure the wires in the hot runner wire grooves are not pinched between the plates while closing.

16. Install the cavity plate retaining screws and tighten. Refer to the *Mold Manual* for specific torque values.

17. Check the electrical circuits with an ohmmeter to make sure no wires have been shorted during assembly. Refer to Section 6.22 for more information.

18. Install the mold and hot runner into the machine.
NOTE: Refer to the *Mold Manual* for mold startup instructions.
NOTE: Refer to Section 5.5 for hot runner startup instructions.

## 5.4 Installing the Hot Runner

The following is a recommended procedure for installing the hot runner to a machine. This procedure should be used in cooperation with similar procedures from the *Service Manual* for the machine and *Mold Manual*.

To install a fully assembled hot runner into a machine, do the following:

**NOTE:** It is recommended that both cavity plates be installed on the hot runner before the hot runner is installed in the machine. Refer to Section 5.3 for further instructions.

1. Install the cavity plates. Refer to Section 5.3.
2. Make sure the machine is level before installing the hot runner. Refer to the *Service Manual* for the machine for more information.
3. Measure the shut height between the clamp and stationary platens and add 25 mm (1 in). Set the mold shut height position of the clamp to this value.
4. Open the clamp to maximum daylight.
5. Retract the injection nozzle to prevent the nozzle from interfering with the installation of the sprue bar.
6. Measure the distance from the mold center (keyway slots) to the end of the sprue bar. Make sure the distance is less than the distance from the stationary platen face to the carrier centerline (keys).

**IMPORTANT!**

If the distance between the mold center and the end of the sprue bar is greater than the space available, move the mold carrier away from the stationary platen. This may require removing the front and rear linkage mechanism, if installed. Refer to the *Service Manual* for the machine for more information.

7. Lock out and tag the machine. Refer to Section 1.9.

**CAUTION!**

*Never use a machine nozzle tip that is the wrong radius or does not closely match the hot runner sprue bar orifice.*

8. Verify the machine nozzle tip matches the sprue bar radius and orifice.
9. Install a suitable hoist ring(s) in the lifting location on top of the hot runner.
10. Attach an overhead crane to the hoist ring(s) and lift the hot runner over the mold area in the machine.
CAUTION!
For Husky H90 to H/HL500 machines, loosen the bolts on the linear bearings on the operator’s side before installing the hot runner into the carrier.

11. Align the keyway slots on the side of the hot runner with the mold carrier. Lower the hot runner into the carrier over the keys until the hot runner bottoms out on the top keys.

IMPORTANT!
For Husky H90 to H/HL500 machines, torque the bolts on the linear bearings to specification. Refer to the Service Manual for the machine for more information.

12. Install screws in all accessible holes in the mold carrier to secure the hot runner to the mold carrier. Hand tighten the screws.

13. Disconnect the overhead crane and remove the hoist ring(s).

14. Remove all locks and tags. Refer to Section 1.9.

15. Close the moving platen while verifying that the sprue bar fits correctly into the locating bushing in the stationary platen.

16. Apply clamp tonnage.

17. Lock out and tag the machine. Refer to Section 1.9.

18. Install screws in the remaining locations in the mold carrier. Torque the screws to the value specified in the Service Manual for the machine or Mold Manual.

19. Remove all locks and tags. Refer to Section 1.9.

20. Open the mold.

21. Lock out and tag the machine. Refer to Section 1.9.

22. Install the cavity plates. Refer to Section 5.3.


24. For sprue bars, slide the heat shield over the sprue bar until it makes contact with the injection side cavity plate.

25. Lock out and tag the machine. Refer to Section 1.9.

5.5 Startup and Operation

The following procedure and guidelines describe how to startup and operate an Ultra hot runner.

5.5.1 Startup and Operating Guidelines

The following guidelines must be followed during hot runner startup and operation:
NOTE: Make sure to follow the guidelines and instructions in the Service Manual for the machine and Mold Manual as well.

- Sprue break must be used to allow the injection unit to break contact with the hot runner’s spruebar before the start of mold open. This is crucial to prevent hot runner and/or injection unit damage.
- When calibrating the injection carriage, the mold must be closed and clamped.
- Some systems or applications may require extra heat at the end of the sprue bar near the injection unit. This can be accomplished by closing/clamping the mold and bringing the injection carriage forward to make contact while the hot runner is heating up.

### 5.5.2 Startup Procedure

To startup the hot runner, do the following:

1. Lock out and tag the machine. Refer to Section 1.9.
2. Verify the machine nozzle orifice and radius match the sprue bar. Processing problems can occur if the two systems do not match.

**WARNING!**

Electrocution hazard – risk of death or serious injury. Make sure all power cables are properly grounded.

3. Make sure the hot runner is installed properly.
4. Make sure the mold is installed properly. Refer to the Mold Manual.
5. Verify that the resin type being used matches the required type indicated on the nameplate. Refer to Section 3.3.
6. Make sure the mold and hot runner are properly secured.
7. Remove all latches.
8. Remove all locks and tags. Refer to Section 1.9.
9. Open the mold slowly.
10. Lock out and tag the machine. Refer to Section 1.9.
11. Install all cooling lines, testing each loop with air to verify its continuity.
12. Remove all locks and tags. Refer to Section 1.9.
13. Initiate cooling control of the hot runner temperature using the temperatures indicated on the nameplate as a starting point.

    **NOTE:** Core temperature is often run -15 to -12 °C (5 to 10 °F) cooler than the cavity to generate equal surface temperatures and reduce warpage.

14. Lock out and tag the machine. Refer to Section 1.9.
15. Connect the hot runner to a controller, making sure that the cables and controller cables are properly grounded.
16. Remove all locks and tags. Refer to Section 1.9.
17. Turn on the machine barrel heats.

**WARNING!**

**Burn hazard – risk of serious injury.** To avoid serious burns, wear Personal Protective Equipment (PPE) consisting of a heat-resistant coat, heat-resistant gloves, and a full face shield over safety glasses. Use adequate ventilation for fumes.

**WARNING!**

**In the event of water leaking into the hot runner, the nozzle housings must be mechanically cleaned out prior to turning the heaters on.**

18. Set the manifold temperatures to match the “Melt Temperature” indicated on the nameplate. Refer to Section 3.3.

**IMPORTANT!**

**Determine if the controller is set to Celsius (°C) or Fahrenheit (°F) and set temperatures accordingly.**

**IMPORTANT!**

For most Ultra hot runner systems, it is important there be a soak time once the entire system has reached the set-point temperature. Do not start injection until the system has soaked at the set-point temperature for approximately 10 minutes (more if it is a larger system) to make sure the plastic has reached the processing temperature.

**WARNING!**

**Hot resin spray hazard – risk of death or serious injury.** Sprue heaters must be turned on when the manifold heaters are on. Failure to do so could result in the generation of dangerous pressure levels in the manifold, resulting in the sudden release of hot resin.

19. Once the barrel heats have reached the set-point temperature, turn on the manifold and sprue bushing zones. The temperatures of the manifold and sprue bushing zones should match the resin melt temperature.
20. Turn on the nozzle heaters.

**IMPORTANT!**

When inspecting mold gates in between cycles, always follow these guidelines:

- Do not look directly at the gates. Always use a telescopic mirror.
- Remove any material that has drooled from the gates.
- Do not push on valve gate stems (if equipped).
- A hardwood or soft brass chisel and a vacuum cleaner are recommended for the removal of drool.
- Do not use pressurized air to clean the gates.
- A hardwood chisel is recommended for highly polished surfaces to prevent damage to the molding surface.

**CAUTION!**

To avoid resin degradation, do not turn on the nozzle heaters until the manifolds and sprue bushing have reached operating temperature. The manifolds and sprue bushing require more time to heat up than nozzle drop zones.

21. Open the mold fully and then move the moving platen towards the stationary platen. Make sure the mold halves are separated enough for you to see the gates with a telescopic mirror.

22. Inject resin into the hot runner until resin appears at the gates.

23. Lock out and tag the machine. Refer to Section 1.9.

**WARNING!**

Hot resin spray hazard – risk of serious injury. Residual pressure may be present in the hot runner and may cause hot resin to spray from the nozzle tips if released. Do not look directly at the mold gates. Use a telescopic mirror to inspect mold gates and wear Personal Protective Equipment (PPE) consisting of a heat-resistant coat, heat-resistant gloves and a full face shield over safety glasses to avoid injury.

**WARNING!**

Burn hazard – risk of serious injury. Manifolds, nozzles and all hot runner components stay hot for long periods of time after heat has been shut off. Wear Personal Protective Equipment (PPE) and place a warning sign if leaving nozzles unattended.

**WARNING!**

Burn hazard – risk of serious injury. Never handle plastic purgings or drool until they have completely cooled. Purging may appear solid, but may still be hot and cause serious burns. Never allow purgings or drool to drop onto a conveyor. They may be carried away to other work stations where people could pick them up and be burned.
24. Clean the resin from the gates.
25. Remove all locks and tags. Refer to Section 1.9.
26. Set the shot size to half of the expected shot size requirement and start the full cycle.

**CAUTION!**

For valve gate systems only. If a high pressure spike occurs during the first half of the injection pressure profile, make sure the valve gates open fully before injection occurs. Refer to Section 3.6 for more information.

27. Continue to increase the shot size in small increments for every cycle. Avoid producing flash parts.

**NOTE:** With the injection hold time set to 0.1 seconds, the optimum shot size should fill the part 95-98% and still retain a cushion. Add hold time and pressure while increasing the shot size to maintain a cushion of 6 to 12 mm (1/4 to 1/2 in).

28. Once a full part is made, it may be necessary to change the nozzle tip temperature to improve quality. Raising and lowering the tip temperature should be done while recording the results and retaining samples to establish the best gate quality set-point.

**NOTE:** Tip temperatures can vary across a system to produce the best gate quality.

**CAUTION!**

For valve gate systems, make sure the valve pins are in the open position during tool shutdown.
Chapter 6 Maintenance

This chapter contains assembly and disassembly procedures used to perform specific maintenance tasks on the Ultra stack hot runner system. A list of available removal tools is also provided.

The exact details of your hot runner system can be found in the drawings located in Chapter 9.

6.1 Troubleshooting

Troubleshooting methods, terminology, and procedures are discussed in the interactive hot runner Service Investigation Guide (P/N 3719181). Contact your Husky Regional Service and Sales office for more information.

6.2 Periodic Maintenance

The following maintenance procedures must be performed on a regular basis.

6.2.1 Maintenance Each Shift

The following are the maintenance tasks that must be performed at the start of each shift:

**WARNING!**

*Burn hazard – risk of serious injury. To avoid serious burns, wear Personal Protective Equipment (PPE) consisting of a heat-resistant coat, heat-resistant gloves, and a full face shield over safety glasses. Use adequate ventilation for fumes.*

1. Follow all safety procedures outlined in Chapter 1.
2. Lock out and tag the machine. Refer to Section 1.9.
3. Inspect the finish on the cavity plates, core plates, and other contact surfaces.
4. Check the cleanliness of the parting line air vents.
5. Check the operation of the mold-to-machine interlocks.
6. Remove all locks and tags. Refer to Section 1.9.
6.2.2 Monthly Maintenance

The following are the maintenance tasks that must be performed on a monthly basis:

**WARNING!**

Burn hazard – risk of serious injury. To avoid serious burns, wear Personal Protective Equipment (PPE) consisting of a heat-resistant coat, heat-resistant gloves, and a full face shield over safety glasses. Use adequate ventilation for fumes.

1. Review the production of the mold for the past month and compare it to the previous months performance.
2. Review the processing parameters of the mold and hot runner for the past month and compare it to the previous months performance. Look for trends to indicate changes in the process.
3. Check the product dimensions and compare them to the previous months dimensions.
4. Review the Statistical Process Control information for the past month and compare it to the previous months.
5. Disassemble the sprue bar guide and inspect the wear pads for excess wear or damage. Refer to Section 6.17.7.

6.3 Corrective Maintenance

The following are procedures performed during corrective maintenance of specific components. The procedures are organized by component and listed separately for each type of Ultra system.

6.3.1 Removal Procedures

<table>
<thead>
<tr>
<th>Component</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Backup Pad</td>
<td>Ultra 250: —</td>
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<tr>
<td></td>
<td>Ultra 350: —</td>
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<tr>
<td></td>
<td>Ultra 500: Section 6.11.2</td>
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<tr>
<td></td>
<td>Ultra 750:</td>
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<td></td>
<td>Ultra 1000:</td>
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<tr>
<td>Cavity Plate</td>
<td>Ultra 250: Section 6.6.1</td>
</tr>
<tr>
<td></td>
<td>Ultra 350: (On a Work Bench)</td>
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<td>Ultra 750:</td>
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<td>Hot Runner</td>
<td>Ultra 250: Section 6.5</td>
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<tr>
<td>Manifold</td>
<td>Ultra 250: Section 6.14.1</td>
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<td>Manifold Bushing</td>
<td>Ultra 250: Section 6.19.1</td>
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<tr>
<td>Nozzle Heater (Thermal Gate)</td>
<td>Ultra 250: Section 6.13.1</td>
</tr>
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</table>
### 6.3.2 Installation Procedures

**NOTE:** With the exception of the hot runner installation, installation procedures in this chapter differ from the assembly procedures in Chapter 4 in that they are for hot runners that have been used to process parts.

<table>
<thead>
<tr>
<th>Component</th>
<th>Reference</th>
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<tbody>
<tr>
<td></td>
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<tr>
<td></td>
<td>Ultra 250</td>
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<tr>
<td>Nozzle Heater (Valve Gate)</td>
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<tr>
<td>Nozzle Tip (Thermal Gate)</td>
<td>Section 6.13.1</td>
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<td>Nozzle Tip (Valve Gate)</td>
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<tr>
<td>Transfer Sprue</td>
<td>Section 6.18.1</td>
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<tr>
<td>Valve Stem and Piston</td>
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6.3.3 Cleaning and Inspection Procedures

<table>
<thead>
<tr>
<th>Component</th>
<th>Reference</th>
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<tbody>
<tr>
<td>Cavity Plate</td>
<td>Section 6.12.2, Cleaning the Gate Detail</td>
</tr>
<tr>
<td>Hot Runner</td>
<td>Section 6.15, Removing Resin from the Hot Runner</td>
</tr>
<tr>
<td>Manifold</td>
<td>Section 6.14.3, Inspecting and Cleaning a Manifold</td>
</tr>
<tr>
<td></td>
<td>Section 6.9, Cleaning Drool from Weep Holes</td>
</tr>
<tr>
<td>Manifold Bushings</td>
<td>Section 6.19.2, Inspecting and Cleaning Manifold Bushings</td>
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<tr>
<td>Nozzle Tips</td>
<td>Section 6.10.6, Cleaning Nozzle Tips</td>
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<td>Section 6.10.7, Inspecting Nozzle Tips</td>
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<tr>
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<td>Section 6.16.2, Inspecting and Cleaning Nozzle Housings</td>
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<td>Section 6.18.2, Inspecting and Cleaning the Transfer Sprue</td>
</tr>
<tr>
<td>Valve Stem and Piston Assemblies</td>
<td>Section 6.9, Cleaning Drool from Weep Holes</td>
</tr>
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</table>

6.4 Hot Runner Tools

The following sections list various component-specific tools developed by Husky for use during maintenance of hot runner systems. Contact your nearest Husky Regional Service and Sales office to order Husky tools applicable to your hot runner system.

6.4.1 Nozzle Tip Sockets and Heater Removal Tools

<table>
<thead>
<tr>
<th>Nozzle</th>
<th>Tip</th>
<th>Nozzle Tip Socket</th>
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<tr>
<td>Ultra 250</td>
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<td>Nozzle</td>
<td>Tip</td>
<td>Nozzle Tip Socket</td>
<td>Heater Removal Tool</td>
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<td>Ultra 500</td>
<td>HT &lt; 16 Drop</td>
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<td>Ultra 750</td>
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<td></td>
<td>Ultra PET</td>
<td>533533 (14 mm - 12 pts - 3/8&quot;)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ultra 750-UP</td>
<td>3722920 (20 mm - 6 pts - 1/2&quot;)</td>
<td>3756216</td>
</tr>
<tr>
<td></td>
<td>Ultra Packaging (UP)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ultra 1000</td>
<td>3311845 (22 mm - 6 pts - 1/2&quot;)</td>
<td>2410903</td>
</tr>
<tr>
<td></td>
<td>HT- &amp; TS</td>
<td>3274535 (21 mm - 12 pts - 1/2&quot;)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>HT-CAP</td>
<td>2449784 (15 mm - 6 pts - 3/8&quot;)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>VX</td>
<td>2816672 (22 mm - 12 pts - 1/2&quot;)</td>
<td></td>
</tr>
</tbody>
</table>
6.4.2 Nozzle Tip Torque Wrenches

<table>
<thead>
<tr>
<th>Description</th>
<th>Tool Assembly</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ultra 250</td>
<td>2996144[1]</td>
</tr>
</tbody>
</table>


6.4.3 Valve Stem Removal Tools

<table>
<thead>
<tr>
<th>Nozzle</th>
<th>Tool for Stems ≤ 160 mm</th>
<th>Tool for Stems &gt; 160 mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ultra350</td>
<td>SX 2785586</td>
<td>2785587</td>
</tr>
<tr>
<td>Ultra 500</td>
<td>LX 2785590</td>
<td>2785591</td>
</tr>
<tr>
<td>Ultra 750</td>
<td>LX 2785590</td>
<td>2785591</td>
</tr>
<tr>
<td></td>
<td>EX 2785590 with adaptor 4270799</td>
<td>2785591 with adaptor 4270799</td>
</tr>
<tr>
<td>Ultra 1000</td>
<td></td>
<td>2505612</td>
</tr>
</tbody>
</table>

Figure 6-1  Typical Valve Stem Removal Tool for Ultra 500 and Ultra 750


6.4.4 Backup Pad Removal Tools

<table>
<thead>
<tr>
<th>Description</th>
<th>Tool Assembly</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ultra 350 VG</td>
<td></td>
</tr>
<tr>
<td>Ultra 500 VG</td>
<td>2603927</td>
</tr>
<tr>
<td>Ultra 750 VG</td>
<td></td>
</tr>
<tr>
<td>Ultra 1000 VG</td>
<td>2948588</td>
</tr>
</tbody>
</table>
6.4.5 Tip Insert Removal Tools

<table>
<thead>
<tr>
<th>Description</th>
<th>Tool Assembly</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ultra 500 HT</td>
<td>2789767</td>
</tr>
<tr>
<td>Ultra 750 HT</td>
<td>2787663</td>
</tr>
<tr>
<td>Ultra 750 HT Ultra Flow</td>
<td>3341023</td>
</tr>
<tr>
<td>Ultra 1000 HT</td>
<td>2641085</td>
</tr>
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</table>
### 6.4.6 SCVG Reverse Taper Valve Stem Removal Tool

<table>
<thead>
<tr>
<th>Description</th>
<th>Tool Assembly</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ultra 350-SCVG</td>
<td></td>
</tr>
<tr>
<td>Ultra 500-SCVG</td>
<td>4339984</td>
</tr>
<tr>
<td>Ultra 750-SCVG</td>
<td></td>
</tr>
<tr>
<td>Ultra 1000-SCVG</td>
<td></td>
</tr>
</tbody>
</table>

![Figure 6-4 SCVG Reverse Taper Valve Stem Removal Tool](image)

### 6.4.7 Double Delta Piston Seal Installation Tools

<table>
<thead>
<tr>
<th>Description</th>
<th>Tool Assembly</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ultra 350/Ultra 500 SX</td>
<td>3446999</td>
</tr>
<tr>
<td>Ultra 500/Ultra 750 LX (35 mm Piston)</td>
<td>3087823</td>
</tr>
<tr>
<td>Ultra 500/Ultra 750 EX (45 mm Piston)</td>
<td>3446982</td>
</tr>
<tr>
<td>Ultra 1000 (60 mm Piston)</td>
<td>3500798</td>
</tr>
</tbody>
</table>
6.4.8 Valve Bushing and Stem Guide Removal Tool

<table>
<thead>
<tr>
<th>Description</th>
<th>Tool Assembly</th>
</tr>
</thead>
<tbody>
<tr>
<td>PET Gen 4.1</td>
<td></td>
</tr>
<tr>
<td>Reverse Taper Valve Bushing Removal Tool Assembly (Ultra 500 and Ultra 750 VG/LX Reverse Taper Hot Runners)</td>
<td>3985781</td>
</tr>
<tr>
<td>Reverse Taper Stem Guide Removal Tool Assembly (VG-SX Reverse Taper Hot Runners)</td>
<td>3176439</td>
</tr>
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</table>
6.4.9 Retaining Ring Installation Tool

<table>
<thead>
<tr>
<th>Description</th>
<th>Tool Assembly</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ultra 350</td>
<td>4405801</td>
</tr>
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</table>

6.4.10 Standard Nozzle Tip Sockets

<table>
<thead>
<tr>
<th>Nozzle Tip Socket</th>
<th>Size</th>
<th>Points</th>
<th>Drive</th>
</tr>
</thead>
<tbody>
<tr>
<td>622974</td>
<td>4 mm</td>
<td>6 (Allen Key)</td>
<td>3/8 inch</td>
</tr>
<tr>
<td>622972</td>
<td>6 mm</td>
<td>6 (Allen Key)</td>
<td>3/8 inch</td>
</tr>
<tr>
<td>533942</td>
<td>6 mm</td>
<td>6</td>
<td>3/8 inch</td>
</tr>
<tr>
<td>2996145</td>
<td>8 mm</td>
<td>6</td>
<td>1/4 inch</td>
</tr>
<tr>
<td>3436695</td>
<td>8 mm</td>
<td>12</td>
<td>1/4 inch</td>
</tr>
<tr>
<td>1501813</td>
<td>8 mm</td>
<td>6</td>
<td>3/8 inch</td>
</tr>
<tr>
<td>3253169</td>
<td>10 mm</td>
<td>12</td>
<td>3/8 inch</td>
</tr>
<tr>
<td>3320712</td>
<td>11 mm</td>
<td>6</td>
<td>3/8 inch</td>
</tr>
<tr>
<td>531983</td>
<td>11 mm</td>
<td>12</td>
<td>3/8 inch</td>
</tr>
<tr>
<td>2338059</td>
<td>12 mm</td>
<td>6</td>
<td>3/8 inch</td>
</tr>
<tr>
<td>536678</td>
<td>13 mm</td>
<td>6</td>
<td>3/8 inch</td>
</tr>
<tr>
<td>533533</td>
<td>14 mm</td>
<td>12</td>
<td>3/8 inch</td>
</tr>
<tr>
<td>2449784</td>
<td>15 mm</td>
<td>6</td>
<td>3/8 inch</td>
</tr>
<tr>
<td>3253170</td>
<td>15 mm</td>
<td>12</td>
<td>3/8 inch</td>
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</table>
6.4.11 Thermocouple Wire Stripping Tools

<table>
<thead>
<tr>
<th>Nozzle Tip Socket</th>
<th>Size</th>
<th>Points</th>
<th>Drive</th>
</tr>
</thead>
<tbody>
<tr>
<td>2402461</td>
<td>16 mm</td>
<td>6</td>
<td>3/8 inch</td>
</tr>
<tr>
<td>2816670</td>
<td>16 mm</td>
<td>12</td>
<td>3/8 inch</td>
</tr>
<tr>
<td>2308879</td>
<td>17 mm</td>
<td>6</td>
<td>3/8 inch</td>
</tr>
<tr>
<td>3274535</td>
<td>21 mm</td>
<td>12</td>
<td>1/2 inch</td>
</tr>
<tr>
<td>3311845</td>
<td>22 mm</td>
<td>6</td>
<td>1/2 inch</td>
</tr>
<tr>
<td>2816672</td>
<td>22 mm</td>
<td>12</td>
<td>1/2 inch</td>
</tr>
<tr>
<td>1502743</td>
<td>29 mm</td>
<td>6</td>
<td>1/2 inch</td>
</tr>
<tr>
<td>535571</td>
<td>30 mm</td>
<td>6</td>
<td>1/2 inch</td>
</tr>
<tr>
<td>2192309</td>
<td>1/2 inch</td>
<td>6</td>
<td>3/8 inch</td>
</tr>
</tbody>
</table>

6.4.12 Single Probe Thermocouple Removal Tools

<table>
<thead>
<tr>
<th>Description</th>
<th>Tool Assembly</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strippers for Thermocouple Wires</td>
<td>4240042</td>
</tr>
</tbody>
</table>

6.5 Removing the Hot Runner From the Machine

The following procedure describes how to remove a fully assembled hot runner from an injection molding machine:

**NOTE:** The cavity plates can be separated from the hot runner before or after this procedure. If the cavity plates need to be separated before the hot runner is removed from the machine, perform the procedure in Section 6.6.3. If the cavity plate is to be separated after the hot runner is removed from the machine, perform the procedure in Section 6.6.1 after completing this procedure.
**WARNING!**

Crushing hazard – risk of death or serious injury. Inadequate lifting equipment can fail and cause death or serious injury. Make sure all lifting equipment is rated for the load and in safe operating condition.

**NOTE:** The following procedure requires the use of a crane. Make sure the hoist rings, lifting chains, and crane can support the weight of the plate(s) and hot runner.

1. Open the mold and turn off all heaters.

**CAUTION!**

For valve gate systems, make sure the valve pins are in the open position during tool shutdown.

2. Cool the hot runner by running coolant through it until the nozzles and manifold(s) are at room temperature ($< 25 \degree C$ or $< 77 \degree F$). This may take 1/2 to 4 hours depending on the size of the hot runner.

3. Lock out and tag the machine. Refer to Section 1.9.

4. Remove all electrical cables and connectors from the hot runner and mold.

5. Purge all coolant from the cooling lines to minimize the risk of a coolant spill should a hose come loose during maintenance.

6. Disconnect all air and water hoses.

7. Remove the sprue bar.

8. Install a suitable hoist ring(s) in the lifting location(s) on top of the hot runner.

9. Attach an overhead crane to the hoist ring(s) and lift only until the lifting chain has a slight tension on it.

10. Remove the bolts that secure the hot runner to the mold carrier.

11. Lift the hot runner out of the mold carrier and machine. Move it to a clean work area and make sure it is fully supported to prevent it from falling or tipping over.

**IMPORTANT!**

If the hot runner is set on a work bench with the nozzle tips facing down, make sure supports are placed under both sides of the manifold plate. The supports must be tall enough to prevent the nozzle tips from touching the work bench.

### 6.6 Cavity Plates

Nozzle tips, nozzle heaters, nozzle thermocouples and manifold thermocouples can be accessed for maintenance purposes by removing the cavity plate. This can be done either when the hot runner is on the stationary platen or if the hot runner is on a work bench.
The following procedures describe how to remove and install the cavity plate from the hot runner. For the purpose of clarity, the hot runner is considered to be on the stationary platen. However, these procedures can also be done on a work bench.

Refer to Section 3.1 before moving the hot runner and cavity plate assembly to a work bench.

**NOTE:** The following procedures require the use of a crane. Make sure the hoist rings, lifting chain and crane can support the weight of the plate(s) and hot runner.

---

**WARNING!**

Crushing hazard – risk of death or serious injury. Inadequate lifting equipment can fail and cause death or serious injury. Make sure all lifting equipment is rated for the load and in safe operating condition.

---

### 6.6.1 Removing the Cavity Plates (On a Work Bench)

To remove the cavity plates while the hot runner is on a work bench, do the following:

**NOTE:** The following procedure requires the use of a crane. Make sure the hoist rings, lifting chain and crane can support the weight of the plate(s) and hot runner.

**CAUTION!**

For valve gate systems, make sure the valve pins are in the open position during tool shutdown.

**CAUTION!**

The nozzles and manifolds must be at room temperature (< 25 °C or < 77 °F) before the cavity plate is separated from the hot runner. Severe damage to the nozzle or cavity plate sealing diameters can result if the mold is still hot.

1. Make sure the mold is cooled to room temperature (< 25 °C or < 77 °F).
2. Remove the hot runner from the machine and set it on a work bench with the clamp manifold plate facing down. Refer to Section 6.5.
3. If equipped, remove the heat shield from the sprue bar.

**WARNING!**

Crushing hazard – risk of death or serious injury. Inadequate lifting equipment can fail and cause death or serious injury. Make sure all lifting equipment is rated for the load and in safe operating condition.

4. Install a suitable hoist ring(s) in the lifting location(s) in the injection side cavity plate.
5. Attach an overhead crane to the hoist ring(s).
6. Remove all retaining screws from the injection side cavity plate.
7. Separate the injection side cavity plate from the hot runner. Use the pry slots between the hot runner and cavity plate to assist in separation.

   **NOTE:** The cavity plate is on alignment dowels to protect the nozzle and cavity plate sealing diameters from damage.

8. Move the injection side cavity plate out of the work area and store it in a location where the plate cannot fall or tip over.

9. Remove the sprue bar from the hot runner.

10. Install the hot runner lift bar to the hot runner and attach an overhead crane.

11. Lift the hot runner and rotate it 180°. Set the hot runner down on the wood blocks with the clamp-side cavity plate facing up.

12. Remove all retaining screws.

13. Separate the clamp-side cavity plate from the hot runner. Use the pry slots between the hot runner and cavity plate to assist in separation.

   **NOTE:** The cavity plate is on alignment dowels to protect the nozzle and cavity plate sealing diameters from damage.

14. Move the clamp-side cavity plate out of the work area and store it in a location where the plate cannot fall or tip over.

### 6.6.2 Installing the Cavity Plates (On a Work Bench)

Refer to Section 5.3 for instructions on how to install the cavity plates while the hot runner is on a work bench.

### 6.6.3 Removing the Cavity Plates (In the Machine)

To remove the cavity plates while the hot runner is in the machine, do the following:

---

**CAUTION!**

For valve gate systems, make sure the valve pins are in the open position during tool shutdown.
**CAUTION!**

*Equipment damage – risk of serious damage to nozzle or cavity plate sealing diameters.* Severe damage to the nozzle or cavity plate sealing diameters could occur if the cavity plate is removed from the hot runner when the nozzles or manifold are hot. Allow the nozzles and manifolds to cool to room temperature (< 25 °C or < 77 °F) before removing the cavity plate.

1. Cool the hot runner by running coolant through it until the nozzles and manifold(s) are at room temperature (< 25 °C or < 77 °F). This may take 1/2 to 4 hours depending on the size of the hot runner.
2. Purge all coolant from the cooling lines to minimize the risk of a coolant spill should a hose come loose during maintenance.
3. Open the mold.
4. Lock out and tag the machine. Refer to Section 1.9.
5. Install safety latches between the cavity plates and the hot runner on both sides of the mold. A minimum of two safety latches must be used.

---

**CAUTION!**

Equipment damage – risk of serious damage to nozzle or cavity plate sealing diameters. Severe damage to the nozzle or cavity plate sealing diameters could occur if the cavity plate is removed from the hot runner when the nozzles or manifold are hot. Allow the nozzles and manifolds to cool to room temperature (< 25 °C or < 77 °F) before removing the cavity plate.

1. Cool the hot runner by running coolant through it until the nozzles and manifold(s) are at room temperature (< 25 °C or < 77 °F). This may take 1/2 to 4 hours depending on the size of the hot runner.
2. Purge all coolant from the cooling lines to minimize the risk of a coolant spill should a hose come loose during maintenance.
3. Open the mold.
4. Lock out and tag the machine. Refer to Section 1.9.
5. Install safety latches between the cavity plates and the hot runner on both sides of the mold. A minimum of two safety latches must be used.

---

![Figure 6-8 Latches and Cavity Plate Retaining Screw (View Top of Hot Runner)](image)


6. Remove the retaining screws for both cavity plates.
7. Remove all locks and tags. Refer to Section 1.9.
8. Reduce the machine clamp opening and closing speed.
9. Slowly close the mold.
10. Lock out and tag the machine. Refer to Section 1.9.

**CAUTION!**

Check hose lengths to be sure the cavity plate hoses are long enough to allow latching without damaging the hoses. In some cases it may be necessary to relieve residual pressure in the system and then disconnect the hoses.

11. Remove the latches from the cavity plates and hot runner.
12. Install safety latches on both sides of the mold to the clamp-side cavity plate and core plate. A minimum of two safety latches must be used.
13. Install safety latches on both sides of the mold to the injection side cavity plate and core plate. A minimum of two safety latches must be used.

![Figure 6-9 Latching the Core and Cavity Plates (View From Top of Hot Runner)](image)

**Figure 6-9**  Latching the Core and Cavity Plates (View From Top of Hot Runner)

1. Latch

**CAUTION!**

The nozzles and manifolds must be at room temperature (< 25 °C or < 77 °F) before the cavity plates are separated from the hot runner. Severe damage to the nozzle or cavity plate sealing diameters can result if the mold is still hot.

14. Remove all locks and tags. Refer to Section 1.9.
15. Open the mold.
16. Lock out and tag the machine. Refer to Section 1.9.

The nozzle tips, nozzle heaters, and nozzle thermocouples are now fully exposed for maintenance.
6.6.4 Installing the Cavity Plates (in the Machine)

To install the cavity plates while the hot runner is in the machine, do the following:

1. Lock out and tag the machine. Refer to Section 1.9.
2. Make sure the nozzle and cavity plate sealing diameters are clean and free of burrs.

3. Make sure all nozzle tips are clean.
4. If nozzle tip insulators are used, install them in the gate detail before the cavity plate is installed. Refer to the procedure in Section 6.12.3 for more information.
5. Apply a coat of high temperature lubricant to the alignment dowels.
6. Remove all locks and tags. Refer to Section 1.9.

CAUTION!
The nozzles must be at room temperature (< 25 °C or < 77 °F) before assembling the cavity plate. Severe damage to the nozzle or cavity plate sealing diameters can result if the nozzles are still hot.

7. Slowly close the mold to mate the cavity plates with the hot runner. Make sure the wires in the hot runner wire grooves are not pinched between the plates while closing.
8. Lock out and tag the machine. Refer to Section 1.9.
9. Remove the latches from the cavity plates and core plates.

NOTE: Do not attempt to force the plate into position as serious damage can result.
10. Install safety latches on both sides of the mold between the cavity plates and the hot runner. A minimum of two safety latches must be used.

11. Remove all locks and tags. Refer to Section 1.9.

12. Slowly open the mold.

13. Lock out and tag the machine. Refer to Section 1.9.

15. Remove the latches and store them in an appropriate place.

16. Check the electrical circuits with an ohmmeter to make sure no wires have been shorted during assembly. Refer to Section 6.22 for more information.

   **NOTE:** Refer to the *Mold Manual* for mold startup instructions.

### 6.7 Manifold Plates

The following procedures describe how to install and remove the injection and clamp manifold plates.

#### 6.7.1 Removing the Injection Manifold Plate

To remove the injection manifold plate from the hot runner, do the following:

**WARNING!**

Crushing hazard – risk of death or serious injury. Inadequate lifting equipment can fail and cause death or serious injury. Make sure all lifting equipment is rated for the load and in safe operating condition.
NOTE: The following procedure requires the use of a crane. Make sure the hoist rings, lifting chain and crane can support the weight of the plate(s) and hot runner.

1. Remove the hot runner from the machine and set it on a work bench with the clamp manifold plate facing down. Refer to Section 6.5.
2. Remove the bolts from the injection manifold plate.
3. Disconnect the sprue bar and sprue thermocouple wires from the multi-pin connector(s). Remove the wires from the wire grooves in the injection manifold plate.
4. Disconnect any manifold thermocouples that are accessed from the injection manifold plate and remove the wires from the manifold wire grooves. Determine if it is necessary to disconnect the thermocouple wires from the multi-pin connector(s).
5. Install a suitable hoist ring(s) into the lifting location(s) in the injection manifold plate.

WARNING!

Crushing hazard – risk of death or serious injury. Inadequate lifting equipment can fail and cause death or serious injury. Make sure all lifting equipment is rated for the load and in safe operating condition.

6. Lift the injection manifold plate in stages, using the pry slots between the plates to assist in separation.

6.7.2 Removing the Clamp Manifold Plate

To remove the clamp manifold plate from the hot runner, do the following:

WARNING!

Crushing hazard – risk of death or serious injury. Inadequate lifting equipment can fail and cause death or serious injury. Make sure all lifting equipment is rated for the load and in safe operating condition.

NOTE: The following procedure requires the use of a crane. Make sure the hoist rings, lifting chain and crane can support the weight of the plate(s) and hot runner.

1. Remove the hot runner from the machine and set it on a work bench with the injection manifold plate facing down. Refer to Section 6.5.
2. Remove the bolts from the clamp manifold plate.
3. Disconnect any manifold thermocouples that are accessed from the clamp manifold plate and remove the wires from the manifold wire grooves. Determine if it is necessary to disconnect the thermocouple wires from the multi-pin connector(s).
4. Install a suitable hoist ring(s) into the lifting location(s) in the clamp manifold plate.
5. Lift the clamp manifold plate in stages, using the pry slots between the plates to assist in separation.

### 6.7.3 Installing the Injection and Clamp Manifold Plates

Refer to Section 4.5 for instructions on how to install the injection and clamp manifold plates when the hot runner is on a work bench.

### 6.8 Center Air Plate

The following procedures describe how to remove and install the center air plate in valve gate and back-to-back systems.

#### 6.8.1 Removing the Center Air Plate

To remove the center air plate, do the following:

**WARNING!**

Crushing hazard – risk of death or serious injury. Inadequate lifting equipment can fail and cause death or serious injury. Make sure all lifting equipment is rated for the load and in safe operating condition.

**NOTE:** The following procedure requires the use of a crane. Make sure the hoist rings, lifting chain and crane can support the weight of the plate(s) and hot runner.

1. Remove the hot runner from the machine and set it on a work bench with the clamp manifold plate facing down. Refer to Section 6.5.
2. Remove the injection manifold plate. Refer to Section 6.7.1.
3. Remove the bolts from the back of the center air plate.
4. Install a suitable hoist ring(s) into the lifting location(s) in the center air plate.
5. Lift the center air plate in stages, using the pry slots between the clamp manifold plate and center air plate to assist in separation.

6. Set the center air plate on supports in a clean, flat work area.

**WARNING!**
Crushing hazard – risk of death or serious injury. Inadequate lifting equipment can fail and cause death or serious injury. Make sure all lifting equipment is rated for the load and in safe operating condition.

6.8.2 Installing the Center Air Plate

Refer to Section 4.10.2.1 for instructions on how to install the center air plate.

6.9 Cleaning Drool from Weep Holes

Valve stem and piston assemblies are designed to allow excess resin to weep or bleed out of the piston area through specially designed bleed holes. Excessive weepage can inhibit valve stem performance, create manifold thermal control issues, and damage electrical wiring.
When using certain low viscosity resins such as high melt polypropylenes and TPE, weepage should be monitored on a regular basis. Different processing conditions will result in different rates of weepage. For these resins, start by inspecting weepage after one month of run time and after three months of run time to assess weepage accumulation rates.

Weepage should be cleaned before it completely fills the back side of the manifold pocket or covers any electrical wiring. Based on observations made during an inspection, determine an appropriate interval for cleaning the manifold pocket and bleeder holes.

CAUTION!

Do not extend the cleaning interval beyond six months. If the rate of weepage increases significantly, valve stem and manifold bushings should be inspected for wear and replaced if needed.

To clean drool from the valve stem and piston assemblies, do the following:

NOTE: The following procedure requires the use of a crane. Make sure the hoist rings, lifting chain and crane can support the weight of the plate(s) and hot runner.

1. Remove the hot runner from the machine. Refer to Section 6.5.
2. Remove the heat shield from the sprue bar.
3. Remove the injection side cavity plate from the hot runner. Refer to Section 6.6.
4. Remove the sprue bar from the hot runner.
5. Remove the injection manifold plate. Refer to Section 6.7.3.
6. Using a brass rod or chisel, remove any resin on the outside of the piston cylinders, backup pads, or backup insulators.
7. Using a brass rod or chisel, remove any resin that has bled into the manifold pocket area.

CAUTION!

Do not scratch or score any sealing surfaces.

8. If removal of the valve stem and piston assemblies is required, refer to Section 6.20.
9. Clean the mating surfaces of any manifold insulators.
10. Check all manifold wiring and heaters using an ohmmeter.
    NOTE: Refer to the electrical schematic(s) in Chapter 9 for specific wire and heater resistances.
    NOTE: Use only Husky recommended high temperature power and thermocouple wire.
11. Install the injection manifold plate. Refer to Section 4.10.1.
12. Install the hot runner lift bar to the hot runner and attach an overhead crane.
13. Lift the hot runner and rotate it 180°. Set the hot runner down on the wood blocks with the clamp side cavity plate facing up.
14. Remove the clamp side cavity plate from the hot runner. Refer to Section 6.6.
15. Remove the clamp manifold plate. Refer to Section 6.7.3.
16. Repeat step 6 through step 10 to clean the clamp side of the hot runner.
17. Install the clamp manifold plate. Refer to Section 6.7.3.
18. Install the clamp side cavity plate. Refer to Section 6.6.
19. Lift the hot runner and rotate it 180°. Set the hot runner down on the wood blocks with the injection manifold plate facing up.
20. Install the sprue bar. Refer to Section 6.17.6.
21. Install the injection side cavity plate. Refer to Section 6.6.
22. Install the heat shield for the sprue bar.

6.10 Nozzle Tips

The following procedures describe how to remove, clean, inspect and install nozzle tips for thermal gate, valve gate and back-to-back systems.

NOTE: For Ultra 350, Ultra 500, Ultra 750, and Ultra 1000 thermal gate nozzles, refer to Section 6.10.1.5 for instructions on separating the nozzle tip from the nozzle retainer.

6.10.1 Removing Nozzle Tips for Thermal Gate Systems

The following procedures describe how to remove thermal gate tips from Ultra 250, Ultra 500, Ultra 750 and Ultra 1000 systems.

6.10.1.1 Removal for Ultra 250 Systems

To remove thermal gate nozzle tips from Ultra 250 systems, do the following:

1. Separate the cavity plate from the hot runner. Refer to Section 6.6.
2. Lock out and tag the machine. Refer to Section 1.9.
3. Remove the insulating gate bubble or nozzle tip insulator. Refer to Section 6.12.
4. Use a nozzle tip socket to remove the nozzle tip from the nozzle housing.

   NOTE: Refer to Section 6.4.1 for a list of nozzle tip sockets and order numbers.
5. Inspect the nozzle tip for excessive wear, scoring, or other damage. Replace if necessary.
6. Remove any resin inside the nozzle tip and nozzle housing using a wire brush or equivalent. Make sure all sealing surfaces are clean.
7. Remove any resin from the exterior of the nozzle housing using a wire brush or equivalent. Make sure all sealing surfaces are clean.

   IMPORTANT!
   Care must be taken to prevent damage to the nozzle tip and nozzle sealing surfaces.

   NOTE: Do not remove locks and tags until the nozzle tips are installed.
### 6.10.1.2 Removal for Ultra 350, Ultra 500, Ultra 750 and Ultra 1000 Systems

To remove thermal gate nozzle tips from all Ultra 350, Ultra 500, Ultra 750 and Ultra 1000 systems, do the following:

1. Separate the cavity plate from the hot runner. Refer to Section 6.6.
2. Lock out and tag the machine. Refer to Section 1.9.
3. Remove the insulating gate bubble or nozzle tip insulator. Refer to Section 6.12.
4. Remove the front ring and retainer ring.
5. Remove all nozzle heater components except for the nozzle heater and thermocouple. Refer to Section 6.13.1.
6. Connect the hot runner to a controller.
7. Remove all locks and tags. Refer to Section 1.9.
8. Increase the temperature of the nozzle housings to a temperature high enough to soften the resin around the nozzle tip threads. The Vicat Softening Temperature for the resin type is recommended. Refer to the resin suppliers documentation for more information.
9. Lock out and tag the machine. Refer to Section 1.9.

---

**WARNING!**

Unexpected release of hot resin spray from valve gates may cause serious burns. Wear adequate personal protective equipment whenever entering the mold area.

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**WARNING!**

Burn hazard – risk of serious injury. To avoid serious burns, wear Personal Protective Equipment (PPE) consisting of a heat-resistant coat, heat-resistant gloves, and a full face shield over safety glasses. Use adequate ventilation for fumes.

---

**WARNING!**

In the event of water leaking into the hot runner, the nozzle housings must be mechanically cleaned out prior to turning the heaters on.

---

**WARNING!**

Do not leave the hot manifold unattended. If necessary, leave a sign in a visible location indicating “Danger: Hot, Do Not Touch”.

---

**IMPORTANT!**

Do not allow the nozzle tips to overheat or degraded material will have to be cleaned out of the nozzle housing before a new nozzle tip can be installed.
CAUTION!

Support nozzle tip sockets squarely over the nozzle tips to prevent side-load on the tip.

10. Using an appropriate nozzle tip socket, loosen each nozzle tip retainer that will be removed. Do not unscrew or remove the nozzle tip retainers.

11. Remove the nozzle tip retainers and tip inserts.

12. If necessary, remove the nozzle tips from the nozzle retainers. Refer to Section 6.10.1.5.

13. Fully remove the nozzle heaters. Refer to Section 6.13.1.

14. Remove any resin from the interior of the nozzle tip retainer using a soft wire brush or equivalent. Make sure all sealing surfaces are clean.

15. Remove any resin from the interior and exterior of the nozzle housing using a soft wire brush or equivalent. Make sure all sealing surfaces are clean.

IMPORTANT!

Care must be taken to prevent damage to the nozzle tip and nozzle sealing surfaces.

NOTE: Do not remove locks and tags until the nozzle tips are installed.

6.10.1.3 Removal for Ultra 750-UP Systems

To remove thermal gate nozzle tips from Ultra 750-UP systems, do the following:

1. Separate the cavity plate from the hot runner. Refer to Section 6.6.

2. Lock out and tag the machine. Refer to Section 1.9.

3. Remove the insulating gate bubble or nozzle tip insulator. Refer to Section 6.12.

CAUTION!

Support nozzle tip sockets squarely over the nozzle tips to prevent side-load on the tip.

4. Using an appropriate nozzle tip socket, loosen each nozzle tip retainer that will be removed.

5. Remove the nozzle tip retainers and tip inserts.

6. If necessary, remove the nozzle tips from the nozzle retainers. Refer to Section 6.10.1.5.

7. Fully remove the nozzle heaters. Refer to Section 6.13.1.

8. Remove any resin from the interior of the nozzle tip retainer using a soft wire brush or equivalent. Make sure all sealing surfaces are clean.

9. Remove any resin from the interior and exterior of the nozzle housing using a soft wire brush or equivalent. Make sure all sealing surfaces are clean.

IMPORTANT!

Care must be taken to prevent damage to the nozzle tip and nozzle sealing surfaces.
**NOTE:** Do not remove locks and tags until the nozzle tips are installed.

### 6.10.1.4 Removal for Ultra 750 HT-S6 Systems

To remove thermal gate nozzle tips from Ultra 750 HT-S6 systems, do the following:

1. Separate the cavity plate from the hot runner. Refer to Section 6.6.
2. Lock out and tag the machine. Refer to Section 1.9.
3. Remove the insulating gate bubble or nozzle tip insulator. Refer to Section 6.12.

**CAUTION!**

Support nozzle tip sockets squarely over the nozzle tips to prevent side-load on the tip.

4. Using an appropriate nozzle tip socket (refer to Section 6.4), loosen each nozzle tip that will be removed.
5. If necessary, remove the nozzle tips from the nozzle retainers. Refer to Section 6.10.1.5.
6. Fully remove the nozzle heaters. Refer to Section 6.13.1.
7. Remove any resin from the interior and exterior of the nozzle tips and nozzle heaters using a soft wire brush or equivalent. Make sure all sealing surfaces are clean.

**IMPORTANT!**

Care must be taken to prevent damage to the nozzle tip and nozzle sealing surfaces.

**NOTE:** Do not remove locks and tags until the nozzle tips are installed.

### 6.10.1.5 Removing Nozzle Tips from Nozzle Retainers

#### 6.10.1.5.1 With a Removal Tool

To remove a nozzle tip from a nozzle tip retainer using a nozzle tip removal tool, do the following:

**NOTE:** This procedure applies to Ultra 500, Ultra 750, and Ultra 1000 thermal gate systems.

1. Place the nozzle retainer in the tip removal tool.
   **NOTE:** Refer to Section 6.4.5 for a listing of tip insert removal tools and order numbers.
2. Turn the knob on top of the tool clockwise until the tip insert is free of the retainer.
3. Inspect the nozzle tip for excessive wear, scoring, or other damage. Replace if necessary.

6.10.1.5.2 Without a Removal Tool

To remove a nozzle tip from a nozzle tip retainer without the use of a nozzle tip removal tool, do the following:

**NOTE:** This procedure applies to Ultra 500, Ultra 750, and Ultra 1000 thermal gate systems.

**NOTE:** Once the nozzle tip has been removed using this method, the nozzle tip must be replaced. This method destroys the nozzle tip geometry.

1. Remove the nozzle tip retainer and nozzle tip and set on a suitable work bench.

---

**WARNING!**

Burn and fire hazard. Use of an open flame to remove resin can produce harmful gases (depending on the resin type), damage components, and increase the risk of fire. Only use open flames sparingly and in a controlled environment.

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**WARNING!**

Burn hazard – risk of serious injury. To avoid serious burns, wear Personal Protective Equipment (PPE) consisting of a heat-resistant coat, heat-resistant gloves, and a full face shield over safety glasses. Use adequate ventilation for fumes.

---

2. Carefully heat the nozzle tip retainer with a propane torch enough to soften the resin inside.

3. Press the nozzle tip out of the nozzle retainer using a brass rod or equivalent. The brass rod or equivalent tool must have an outer diameter smaller than the nozzle tip retainers inside diameter.

---

**CAUTION!**

This method will damage the tip insert.
6.10.2 Installing Nozzle Tips for Thermal Gate Systems

The following procedures describe how to install thermal gate nozzle tips on Ultra 250, Ultra 350, Ultra 500, Ultra 750 and Ultra 1000 systems.

6.10.2.1 Installation for Ultra 250 and Ultra 350 Systems

To install thermal gate nozzle tips on Ultra 250 and Ultra 350 systems, do the following:

1. Lock out and tag the machine. Refer to Section 1.9.
2. Inspect the nozzle tips and nozzle housing threads for potential contamination. Remove any contamination found. The threads and all sealing surfaces must be clean and dry.
3. Install new or high quality used nozzle tips and torque to the value printed on the side of the nozzle tips using a nozzle tip socket. The torque value is also specified on the Section View Assembly drawing. Refer to Chapter 9.
4. Measure the height of the nozzle tip using a depth micrometer and compare the measurement to the tip height listed on the Tip Chart in the Section View Assembly drawing. Refer to Chapter 9.
6.10.2 Installation for Ultra 500, Ultra 750 and Ultra 1000 Systems

To install thermal gate nozzle tips on all Ultra 500, Ultra 750 and Ultra 1000 systems, do the following:

1. Lock out and tag the machine. Refer to Section 1.9.
2. Install new or high quality nozzle tips into the nozzle tip retainers.
3. Install a retainer ring around each nozzle tip retainer.
4. Inspect the tip inserts, nozzle tip retainers, and nozzle housing threads for potential contamination. Remove any contamination found. The threads and all sealing surfaces must be clean and dry.
5. Install the nozzle tip retainer and tip insert. Torque the nozzle tip retainers to the torque value printed on the side of the retainer using a nozzle tip socket. The torque value is also specified on the Section View Assembly drawing. Refer to Chapter 9.
6. Install the front ring and tighten by hand.
7. Measure the height of the tip insert using a depth micrometer and compare the measurement to the tip height listed on the Tip Chart in the Section View Assembly drawing. Refer to Chapter 9.
If the nozzle tip height is outside the tolerances listed on the Tip Chart, refer to Section 6.10.5.

8. Remove all locks and tags. Refer to Section 1.9.

6.10.2.3 Installation for Ultra 750-UP Systems

To install thermal gate nozzle tips on Ultra 750-UP systems, do the following:

1. Lock out and tag the machine. Refer to Section 1.9.
2. Install new or high quality nozzle tips into the nozzle tip retainers.
3. Inspect the tip inserts, nozzle tip retainers, and nozzle housing threads for potential contamination. Remove any contamination found. The threads and all sealing surfaces must be clean and dry.
4. Install the nozzle tip retainer and tip insert. Torque the nozzle tip retainers to the torque value printed on the side of the retainer using a nozzle tip socket. The torque value is also specified on the Section View Assembly drawing. Refer to Chapter 9.
5. Measure the height of the tip insert using a depth micrometer and compare the measurement to the tip height listed on the Tip Chart in the Section View Assembly drawing. Refer to Chapter 9.
If the nozzle tip height is outside the tolerances listed on the Tip Chart, refer to Section 6.10.5.

6. Remove all locks and tags. Refer to Section 1.9.

6.10.2.4 Installation for Ultra 750 HT-S6 Systems

The following procedure describes how to install thermal gate nozzle tips on Ultra 750 HT-S6 systems:

1. Lock out and tag the machine. Refer to Section 1.9.
2. Inspect the nozzle tips and nozzle housings for potential contamination. Remove any contamination found. The threads and all sealing surfaces must be clean and dry.
3. Thread new or high quality used nozzle tips into the nozzle housings.
4. Torque the nozzle tips to the torque value printed on them using a nozzle tip socket. The torque value is also specified on the Section View Assembly drawing (refer to Chapter 9).
5. Measure the height of the nozzle tip using a depth micrometer and compare the measurement to the tip height listed on the Tip Chart in the Section View Assembly drawing. Refer to Chapter 9.
If the nozzle tip height is outside the tolerances listed on the Tip Chart, refer to Section 6.10.5.

6. Remove all locks and tags. Refer to Section 1.9.

6.10.3 Removing Nozzle Tips for Valve Gate and Back-to-Back Systems

To remove valve gate nozzle tips from Ultra 350, Ultra 500, Ultra 750 and Ultra 1000 systems, do the following:

1. Separate the cavity plate from the hot runner. Refer to Section 6.6.
2. Lock out and tag the machine. Refer to Section 1.9.
3. Remove the nozzle tip insulators or insulating gate bubbles from the nozzle tips. Refer to Section 6.12.
4. Remove all nozzle heater components except for the nozzle heater and thermocouple. Refer to Section 6.13.2 for more information.
5. Connect the hot runner to a controller.
6. Remove all locks and tags. Refer to Section 1.9.

WARNING!
Unexpected release of hot resin spray from valve gates may cause serious burns. Wear adequate personal protective equipment whenever entering the mold area.

WARNING!
Burn hazard – risk of serious injury. To avoid serious burns, wear Personal Protective Equipment (PPE) consisting of a heat-resistant coat, heat-resistant gloves, and a full face shield over safety glasses. Use adequate ventilation for fumes.
6–34 Removing Nozzle Tips for Valve Gate and Back-to-Back Systems

**WARNING!**

In the event of water leaking into the hot runner, the nozzle housings must be mechanically cleaned out prior to turning the heaters on.

**WARNING!**

Do not leave the hot manifold unattended. If necessary, leave a sign in a visible location indicating “Danger: Hot, Do Not Touch”.

7. Increase the temperature of the nozzle housings to a temperature high enough to soften the resin around the nozzle tip threads. The Vicat Softening Temperature for the resin type is recommended. Refer to the resin suppliers documentation for more information.

**IMPORTANT!**

Do not allow the nozzle tips to overheat or degraded material will have to be cleaned out of the nozzle housing before a new nozzle tip can be installed.

8. Lock out and tag the machine. Refer to Section 1.9.

**CAUTION!**

Support nozzle tip sockets squarely over the nozzle tips to prevent side-load on the tip.

9. Using an appropriate nozzle tip socket, loosen each nozzle tip that will be removed. Do not unscrew or remove the nozzle tips.

**WARNING!**

Burn hazard – risk of serious injury. To avoid serious burns, wear Personal Protective Equipment (PPE) consisting of a heat-resistant coat, heat-resistant gloves, and a full face shield over safety glasses. Use adequate ventilation for fumes.

10. If the nozzle tips are internally threaded:

   a. Wearing heat-resistant gloves, hand-tighten the nozzle tips while the resin is still soft until they touch the nozzle housing.

   b. Allow the nozzle tips to cool to room temperature (< 25 °C or < 77 °F). This may take 1/2 to 4 hours depending on the size of the mold. However, this step will allow for the quick removal of the nozzle tips, while preventing resin from solidifying on the nozzle tip sealing surface.

11. Remove the nozzle tips using the nozzle tip socket.

12. Fully remove the nozzle heaters. Refer to Section 6.13.2.

13. Remove any resin from the interior of the nozzle tip using a soft wire brush or equivalent.
14. Remove any resin from the interior and exterior of the nozzle housing using a soft wire brush or equivalent.

**IMPORTANT!**
Care must be taken to prevent damage to the nozzle tip and nozzle sealing surfaces.

**NOTE:** Do not remove locks and tags until the nozzle tips are installed.

### 6.10.4 Installing Nozzle Tips for Valve Gate and Back-to-Back Systems

To install valve gate nozzle tips onto Ultra 350, Ultra 500, Ultra 750 and Ultra 1000 systems, do the following:

**IMPORTANT!**
Make sure of the following before installing nozzle tips:
- All nozzle tips are cleaned. Refer to Section 6.10.6
- All nozzle tips are inspected. Refer to Section 6.10.7
- All nozzle housings are inspected. Refer to Section 6.16.2

**NOTE:** Nozzle tips must be installed when the resin and nozzle housings are cold.

1. Lock out and tag the machine. Refer to Section 1.9.
2. Install a retainer ring around each nozzle tip.
3. Inspect the nozzle tip and nozzle housing threads for potential contamination. Remove any contamination found. The threads and all sealing surfaces must be clean and dry.
4. Install the nozzle tip and torque to the value printed on the side of the nozzle tip using a nozzle tip socket. The torque value is also specified on the Section View Assembly drawing in Chapter 9.
5. If not already installed, install the nozzle heater. Refer to Section 6.13.2.2 if the nozzle heater is copper, or Section 6.13.2.4 if the nozzle heater is an Ultra or bi-metal heater.
6. Install the front ring and tighten by hand.
7. Measure the height of the nozzle tip using a depth micrometer and compare the measurement to the tip height listed on the Tip Chart in the Section View Assembly drawing. Refer to Chapter 9.
If the nozzle tip height is outside the tolerances listed on the Tip Chart, refer to Section 6.10.5.

8. Remove all locks and tags. Refer to Section 1.9.

### 6.10.5 Troubleshooting Nozzle Tip Heights

The following describes reasons and corrective action for nozzle heights that are less or more than the values listed on the Tip Chart.

<table>
<thead>
<tr>
<th>Problem</th>
<th>Reason</th>
<th>Action</th>
</tr>
</thead>
</table>
| Dimension is shorter than required tip height | Nozzle tip has been overtightened, worn, or damaged | a. Remove the nozzle tip  
b. Clean resin from the nozzle tip and nozzle housing  
c. Replace or install new nozzle tip |
| Dimension is longer than required tip height | Nozzle tip is damaged  
**OR**  
Nozzle tip is being prevented from seating in the nozzle housing by resin under the nozzle tip seating surface. | a. Remove the nozzle tip  
b. Clean resin from the nozzle tip and nozzle housing  
c. Re-apply the torque to the nozzle tip  
d. Verify the nozzle tip height |
6.10.6 Cleaning Nozzle Tips

If resin or other residue is not thoroughly cleaned off the threads and seating areas of both the nozzle tip and the nozzle housing, the result could lead to the following:

- Compressive overload of the tip, even at the correct torque recommendation, causing damage to the tip (permanently shortened).
- A tip which is no longer tight after it has been heated up and cooled down.
- Poor performance or quality of the gate due to the incorrect tip position (too far back or too far forward).
- Leakage between the nozzle tip and the nozzle tip insulator (where used) permitting the formation of degraded resin.
- The initiation of thread stripping.

6.10.7 Inspecting Nozzle Tips

To inspect nozzle tips, do the following:

1. Remove the resin found on the nozzle tips.
2. Measure the tip height of each previously used nozzle tip and compare it with the dimensions listed on the Tip Chart in the Section View Assembly drawing. Refer to Chapter 9.

   If the tip heights are outside of the required dimensions, refer to Section 6.10.5 for troubleshooting information.

6.11 Backup Pads and Piston Cylinders

The following procedures describe how to remove and install backup pads and piston cylinders.

6.11.1 Replacing Backup Insulator Pads for Thermal Gate Systems

Backup insulator pads are installed to the manifolds using screws. Remove the screws to disassemble the pads.
6.11.2 Replacing Backup Pads for Valve Gate and Back-to-Back Systems

The following procedures describe how to replace backup pads in valve gate and back-to-back systems.

6.11.2.1 Replacing Backup Pads on Threaded Manifold Bushings

To replace backup pads on threaded manifold bushings, do the following:

1. Remove any resin deposits on the backup pads.

   ![Backup Pad Assembly for ThreadLess Manifold Bushings](Image)


2. Remove the jam nuts from each backup pad.

3. Place the alignment post on the backup pad removal tool into the valve stem hole of the manifold bushing.

   **NOTE:** Refer to Section 6.4.4 for a listing of backup pad removal tools and order numbers.

4. Install the pull posts as shown in Figure 6-26.

   ![Aligning the Backup Pad Removal Tool](Image)

   Figure 6-22 Aligning the Backup Pad Removal Tool
5. Turn the socket head cap screw on the backup pad removal tool clockwise to remove the backup pad.

6. Discard the metal O-ring seal.

7. Clean or replace the backup pads as needed.

8. Place one new metal O-ring seal over each manifold bushing to seal between the manifold and the backup pad.

9. Place the backup pad over each manifold bushing. Make sure the backup pads contact the metal O-ring seals.

**CAUTION!**

For Ultra 350, Ultra 500 and Ultra 750 systems, it may be necessary to add additional torque to the jam nut and then loosen the nut to the specified torque to properly seat the metal O-ring seal. The amount of additional torque will be specified on the Section View Assembly drawing if required. Refer to Chapter 9.

10. Install a jam nut to the end of each manifold bushing and torque to the value specified on the Section View Assembly drawing. Refer to Chapter 9.
6.11.2.2 Replacing Backup Pads on Threadless Manifold Bushings

To replace backup pads on threadless manifold bushings, do the following:

1. Remove any resin deposits on the backup pads.
2. Remove the retaining clips from each backup pad.
3. Place the alignment post on the backup pad removal tool into the valve stem hole of the manifold bushing.
   **NOTE:** Refer to Section 6.4.4 for a listing of backup pad removal tools and order numbers.
4. Install the pull posts as shown in Figure 6-26.
5. Turn the socket head cap screw on the backup pad removal tool clockwise to remove the backup pad.

6. Discard the Grafoil seal, interior C-ring seal, and exterior C-ring seal.

7. Clean or replace the backup pads as needed.

8. Inspect the retaining clips and replace any that are damaged or worn.

9. Place one new interior C-ring seal over each manifold bushing.

10. Place one new Grafoil seal over each manifold bushing.

11. Coat the bottom of each backup pad with a high temperature lubricant and insert a new exterior C-ring seal.

12. Install a backup pad over each manifold bushing. Make sure the backup pads are fully seated against the C-ring seals.

13. Install a retaining clip into the groove of each manifold bushing.
6.11.2.3 Replacing Backup Pads on Ultra 350 Systems (Tight Pitch Applications Only)

To replace backup pads on Ultra 350 manifold bushings, do the following:

**IMPORTANT!**
The following procedure is only for tight pitch applications where the nozzle tip pitch is 18.0 mm to < 25.4 mm.

1. Remove any resin deposits on the backup pads.
2. Remove the backup pad.
3. Remove the backup pad insert from the backup pad.
4. Remove any resin deposits inside the backup pad and on the backup pad insert.
5. Replace the retaining rings on the backup pad and backup pad insert.
6. Replace the C-ring on the bottom of the backup pad.
7. Push the backup pad into the manifold.
8. Push the backup pad insert into the backup pad.

![Backup Pad Assembly for Ultra 350 Systems](image)

Figure 6-28 Backup Pad Assembly for Ultra 350 Systems


6.11.3 Replacing the Piston Cylinders for Ultra 350 and Ultra 500 VGSX

To replace the piston cylinders in Ultra 350 and Ultra 500 VGSX systems, do the following:

1. Remove any resin deposits on the piston cylinders.
2. Remove the retaining clips from each piston cylinder.
3. Remove the piston cylinders.
4. Clean or replace the piston cylinders as needed.
5. Inspect the retaining clips and replace any that are damaged or worn.
6. Discard the Grafoil seal, interior C-ring seal and exterior C-ring seal.
7. Clean or replace the backup pads as needed.
8. Inspect the retaining clips and replace any that are damaged or worn.
9. Place one new interior C-ring seal over each manifold bushing.
10. Place one new Grafoil seal over each manifold bushing.
11. Coat the bottom of each piston cylinder with a high temperature lubricant and insert a new exterior C-ring seal.

Figure 6-29  Piston Cylinder Assembly


Figure 6-30  C-Ring Installation

1. Exterior C-Ring Seal  2. Interior C-Ring Seal
12. Align the piston cylinder with the locating dowel and press it towards the manifold until the cylinder is fully seated on the C-rings. Repeat this step for all piston cylinders.

13. Install a retaining ring into the groove at the end of each manifold bushing.

6.12 Removing the Insulating Gate Bubbles or Nozzle Tip Insulators

Access to the insulating gate bubbles or nozzle tip insulators is available when the cavity plate is removed from the hot runner. The gate bubble or nozzle tip insulators must be removed to gain further access to the nozzle tips.

The difference between an insulating gate bubble and a nozzle tip insulator is as follows:

- Insulating gate bubbles are the same color as the resin
- Nozzle tip insulators are brown or black
6.12.1 Removing Nozzle Tip Insulators

To remove the nozzle tip insulators, do the following:

**WARNING!**
Burn hazard – risk of serious injury. To avoid serious burns, wear Personal Protective Equipment (PPE) consisting of a heat-resistant coat, heat-resistant gloves, and a full face shield over safety glasses. Use adequate ventilation for fumes.

1. Separate the cavity plate from the hot runner. Refer to Section 6.6.
   
   **NOTE:** Some of the nozzle tip insulators may stay in the gate detail in the cavity plate.

2. Lock out and tag the machine. Refer to Section 1.9.

**CAUTION!**
Care must be taken to make sure that no molten resin is allowed to drip onto the nozzle tip insulator.

3. Pull the nozzle tip insulator off the nozzle tip using needle nose pliers. Be careful not to damage the tip.

4. After removal of the insulator, the nozzle tip should be perfectly clean and in “as new” condition.

   If resin is present on the insulator, the insulator is leaking and will not function as required.

   Determine the following:

   - The cause of the leak by inspecting the gate insert dimensions.
   - The nozzle tip position to make sure it is correct before a new insulator is installed Section 6.10.

   **NOTE:** Care must be taken not to damage the nozzle tip sharp point or nozzle sealing surfaces.

5. Remove all locks and tags. Refer to Section 1.9.

6.12.2 Cleaning the Gate Detail

To clean the gate detail, do the following:

1. Separate the cavity plate from the hot runner. Refer to Section 6.6.
   
   **NOTE:** Some of the nozzle tip insulators may stay in the gate detail.

2. To remove a nozzle tip insulator from the gate detail use a 10 mm or 3/8”-18 NPT tap or pipe.

3. Clean the gate detail in the gate insert by using a pointed hardwood stick and soft cloth or 3M Scotch-Brite™ No. 7447 (Maroon). Care must be taken not to scratch the cylindrical sealing surfaces between the gate insert and the nozzle housing. Even a slight scratch may cause leaks at high injection pressures.
6.12.3 Installing Nozzle Tip Insulators

To install nozzle tip insulators in the gate detail, do the following:

1. Install new or good used nozzle tip insulators in the gate detail.

   If the “L” dimension is very long and installing the nozzle tip insulators is difficult, refer to Section 6.12.3.1 for an alternate method.

   **NOTE:** The actual preload of the nozzle tip insulator to nozzle tip will be less than 0.64 mm (0.025 in). Each nozzle tip design has preload designed based on the operating temperatures of the mold. New nozzle tips will not be seated as well in the gate and will create more resistance to closing the mold. Molds with used nozzle tip insulators which have not been removed will not have the same resistance to mold closing.

2. Make sure all nozzle tip insulators are installed before installing the cavity plate.

3. Install the cavity plate following the instructions in Section 6.6.

### 6.12.3.1 Alternate Installation of Nozzle Tip Insulators

When the “L” Dimension is very long, installing nozzle tip insulators in the gate detail and maintaining alignment may be difficult. In this case, two alternatives are possible:

- Install the nozzle tip insulator on a wooden dowel and insert the insulator into the gate detail or,
- Install the nozzle tip insulator on the nozzle tip.

A used nozzle tip insulator will last much longer, if it is re-installed on the same nozzle tip in the same cavity. The orientation of the nozzle tip insulator with the nozzle tip is critical.

**NOTE:** A nozzle tip insulator that falls off, but is caught in the gate detail will damage the gate and nozzle tip.
6.12.4 Removing the Insulating Gate Bubble Removal

Some hot runner systems have a bubble of resin at the nozzle tip that acts as an insulator. This bubble can be removed from the nozzle tip for expediting color change.

**NOTE:** The new resin color should be run through the system prior to bubble removal. This will minimize the color change time required.

To remove the insulating gate bubble, do the following:

1. Separate the cavity plate from the hot runner. Refer to Section 6.6.
2. Lock out and tag the machine. Refer to Section 1.9.
3. Inspect the nozzle tips to make sure the gate bubbles are intact. If a gate bubble is missing, inspect the matching cavity in the cavity plate.
4. Connect the hot runner to a controller.

**IMPORTANT!**
Care must be taken not to damage the insulators when servicing the mold. All cracked, burned, or otherwise damaged insulators should be replaced.

**WARNING!**
Do not leave the hot manifold unattended. If necessary, leave a sign in a visible location indicating “Danger: Hot, Do Not Touch”.

1. Separate the cavity plate from the hot runner. Refer to Section 6.6.
2. Lock out and tag the machine. Refer to Section 1.9.
3. Inspect the nozzle tips to make sure the gate bubbles are intact. If a gate bubble is missing, inspect the matching cavity in the cavity plate.
4. Connect the hot runner to a controller.

**WARNING!**
Burn hazard – risk of serious injury. To avoid serious burns, wear Personal Protective Equipment (PPE) consisting of a heat-resistant coat, heat-resistant gloves, and a full face shield over safety glasses. Use adequate ventilation for fumes.

**WARNING!**
In the event of water leaking into the hot runner, the nozzle housings must be mechanically cleaned out prior to turning the heaters on.

**WARNING!**
Do not leave the hot manifold unattended. If necessary, leave a sign in a visible location indicating “Danger: Hot, Do Not Touch”.

5. Increase the temperature of the nozzle housings to a temperature high enough to soften the gate bubble. The Vicat Softening Temperature for the resin type is recommended. Refer to the resin suppliers documentation for more information.

6. Lock out and tag the machine. Refer to Section 1.9.
CAUTION!
Damage to the nozzle tip can occur if care is not taken when removing the gate bubble.

7. Remove the gate bubble with a clean, soft cloth or soft wire brush

WARNING!
Burn and fire hazard. Use of an open flame to remove resin can produce harmful gases (depending on the resin type), damage components, and increase the risk of fire. Only use open flames sparingly and in a controlled environment.

WARNING!
Burn hazard – risk of serious injury. To avoid serious burns, wear Personal Protective Equipment (PPE) consisting of a heat-resistant coat, heat-resistant gloves, and a full face shield over safety glasses. Use adequate ventilation for fumes.

8. Remove any gate bubbles in the cavity plate. If required, carefully heat the gate bubbles with a propane torch and then wipe the deposits away with a clean, soft cloth or soft wire brush. This may have to be repeated several times.

9. Disconnect the hot runner from the controller and reassemble the cavity plate. Refer to Section 6.6.

10. Remove all locks and tags. Refer to Section 1.9.

6.13 Nozzle Heaters

To maximize heat control at the nozzle gate, all nozzle heaters must be located the same distance from the front of each nozzle housing. This ensures the uniform heating of all nozzle tips.

During installation, the distance between the tip of the nozzle heater and the manifold plates (clamp and injection) should be verified against the dimensions listed on the Section View Assembly drawing in Chapter 9.

NOTE: Always use the correct wattage and length of nozzle heater. Refer to the Section View Assembly drawing in Chapter 9 to determine the nozzle heater required for your system.

When changing a nozzle heater, care must be taken not to damage the nozzle tip retainer or housing sealing diameter. Make sure all electrical and thermocouple wires have been properly connected to their multi-pin connector(s). The wires must be properly fitted in the wire grooves to prevent interference and possible pinching when the cavity plates are reassembled.
6.13.1 Replacing the Nozzle Heater for Thermal Gate Systems

The following procedures describe how to replace nozzle heaters on thermal gate systems.

6.13.1.1 Replacing the HTM Nozzle Heater for Ultra 250 Systems

To replace the HTM nozzle heaters on Ultra 250 thermal gate systems, do the following:

1. Separate the necessary cavity plate from the hot runner. Refer to Section 6.6.
2. Lock out and tag the machine. Refer to Section 1.9.
3. Remove the insulating gate bubble or nozzle tip insulator. Refer to Section 6.12.
4. Unscrew the set screw at the tip of the retaining sleeve so it does not interfere when removing the nozzle tip.

CAUTION!

Nozzle heaters must not touch the cavity steel or interfere with the sealing diameter.

IMPORTANT!

Husky nozzle heaters are rugged and have a long service life. They should only be replaced with Husky approved parts. Use of components not sold or approved by Husky will void the hot runner warranty.
5. Remove the nozzle tip. Refer to Section 6.10.1.1.
6. Remove the necessary wire clips to expose the nozzle heater wires.
7. Remove the nozzle heater assembly.
   **NOTE:** The nozzle heater assembly includes the retaining sleeve, nozzle heater and thermocouple.
8. Slide a new nozzle heater assembly over the nozzle housing until it bottoms out on the housing.
9. Re-install the nozzle tip onto the nozzle housing. Refer to Section 6.10.2.1.
10. Pull the nozzle heater assembly up until it makes contact with the hex section of the nozzle tip.
11. Torque the set screw at the end of the retaining sleeve to the value specified on the Section View Assembly drawing. Refer to Chapter 9.
12. Route the nozzle heater and thermocouple wires through the wire grooves in the clamp or injection manifold plate. Make sure all wiring is properly retained in the wire grooves using wire clips.
   **NOTE:** All wiring along the nozzle heater must be either a high temperature braid or sleeved using a high temperature sleeving.
13. Label each wire with the heater zone number.
14. Crimp the wire ends and connect the wires to the appropriate multi-pin connectors. Refer to the electrical schematic(s) in Chapter 9.
15. Test each nozzle heater zone according to the instructions in Section 4.11.3.
16. Remove all locks and tags. Refer to Section 1.9.

6.13.1.2 Replacing the HTM Nozzle Heater for Ultra 350 Systems

To replace the HTM nozzle heaters on Ultra 350 thermal gate systems, do the following:

1. Separate the cavity plate from the hot runner. Refer to Section 6.6.
2. Lock out and tag the machine. Refer to Section 1.9.
3. Remove the insulating gate bubble or nozzle tip insulator. Refer to Section 6.12.
4. Remove the retaining clip from the nozzle tip.

5. Remove the necessary wire clips to expose the nozzle heater and thermocouple wires.
6. Remove the nozzle heater assembly.

**NOTE:** The nozzle heater assembly includes the retaining sleeve, nozzle heater and thermocouple.
7. Replace the wave springs.
8. Slide the nozzle heater assembly over the nozzle housing far enough to show the retaining clip groove on the tip retainer.

**NOTE:** The nozzle heater assembly includes the retaining sleeve, nozzle heater and thermocouple.
9. Install the retaining clip on the nozzle tip and pull the nozzle heater assembly up against it.
10. Route the nozzle heater and thermocouple wires through the wire grooves in the manifold plate. Make sure all wiring is properly retained in the wire grooves using wire clips.

![Diagram of Nozzle Tip and Heater Assembly for Ultra 350 Systems (HTM Heater)](image-url)
**NOTE:** All wiring along the nozzle heater must be either a high temperature braid or sleeved using a high temperature sleeving.

11. Label each wire with the heater zone number.
12. Crimp the wire ends and connect the wires to the appropriate multi-pin connectors. Refer to the electrical schematic(s) in Chapter 9.
13. Test each nozzle heater zone according to the instructions in Section 4.11.3.
14. Remove all locks and tags. Refer to Section 1.9.

### 6.13.1.3 Replacing the HTM Nozzle Heater for Ultra 500 Systems

To replace the HTM nozzle heaters on Ultra 500 thermal gate systems, do the following:

1. Separate the cavity plate from the hot runner. Refer to Section 6.6.
2. Lock out and tag the machine. Refer to Section 1.9.
3. Remove the insulating gate bubble or nozzle tip insulator. Refer to Section 6.12.
4. Remove the retaining clip from the tip retainer.

5. Remove the necessary wire clips to expose the nozzle heater and thermocouple wires.
6. Remove the nozzle heater assembly.
   **NOTE:** The nozzle heater assembly includes the retaining sleeve, nozzle heater and thermocouple.
7. Slide a new nozzle heater assembly over the nozzle housing far enough to show the retaining clip groove on the tip retainer.
8. Install the retaining clip on the tip retainer.
9. Torque the set screw at the end of the retaining sleeve to the value specified on the Section View Assembly drawing. Refer to Chapter 9.
10. Route the nozzle heater and thermocouple wires through the wire grooves in the manifold plate. Make sure all wiring is properly retained in the wire grooves using wire clips.

   **NOTE:** All wiring along the nozzle heater must be either a high temperature braid or sleeved using a high temperature sleeving.

11. Label each wire with the heater zone number.

12. Crimp the wire ends and connect the wires to the appropriate multi-pin connectors. Refer to the electrical schematic(s) in Chapter 9.

13. Test each nozzle heater zone according to the instructions in Section 4.11.3.

14. Remove all locks and tags. Refer to Section 1.9.

### 6.13.1.4 Replacing the Copper Nozzle Heater for Ultra 500 Systems

To replace the copper nozzle heaters on Ultra 500 thermal gate systems, do the following:

1. Separate the necessary cavity plate from the hot runner. Refer to Section 6.6.

2. Lock out and tag the machine. Refer to Section 1.9.

3. Remove the insulating gate bubble or nozzle tip insulator. Refer to Section 6.12.

4. Remove the front ring.

5. If equipped, remove the retaining sleeve that fits over the thermocouple and nozzle heater.

6. Disconnect the thermocouple from the nozzle heater.

7. Remove the retaining clip from the nozzle tip.

8. Remove the necessary wire clips to expose the nozzle heater and thermocouple wires.
9. Remove the nozzle heater and thermocouple.

10. Slide a new nozzle heater over the nozzle housing far enough to show the retaining clip groove on the tip retainer.

11. Install the retaining clip on the tip retainer.

12. Install the thermocouple probe end into the probe hole on the nozzle heater as shown in Figure 6-35.

   **NOTE:** A slot is cut into the nozzle heater to allow the thermocouple to be set in place with the retaining sleeve.

13. Slide the retaining sleeve over the nozzle heater and thermocouple.

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**CAUTION!**

The front ring holds the thermocouple in place for proper reading of the nozzle heater temperature. Caution should be taken when wiring the thermocouple to not pull the thermocouple out from under the front ring. This could result in faulty temperature readings and possible over heating of the nozzle heater and other components.

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14. Pull the nozzle heater up against the retainer ring.

15. Hand tighten the front ring onto the nozzle heater.

16. Route the nozzle heater and thermocouple wires through the wire grooves in the clamp or injection manifold plate. Make sure all wiring is properly retained in the wire grooves using wire clips.

   **NOTE:** All wiring along the nozzle heater must be either a high temperature braid or sleeved using a high temperature sleeving.

17. Label each wire with the heater zone number.

18. Crimp the wire ends and connect the wires to the appropriate multi-pin connectors. Refer to the electrical schematic(s) in Chapter 9.

19. Test each nozzle heater zone according to the instructions in Section 4.11.3.

20. Remove all locks and tags. Refer to Section 1.9.

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**6.13.1.5 Replacing the Ultra Nozzle Heater for Ultra 500 and Ultra 750 Systems**

To replace the Ultra nozzle heaters on Ultra 500 and Ultra 750 thermal gate systems, do the following:

1. Separate the necessary cavity plate from the hot runner. Refer to Section 6.6.

2. Lock out and tag the machine. Refer to Section 1.9.

3. Remove the insulating gate bubble or nozzle tip insulator. Refer to Section 6.12.

4. Remove the thermocouple retaining ring from the nozzle heater.
5. Remove the necessary wire clips to expose the nozzle heater and thermocouple wires.
6. Remove the nozzle heater.
7. Orient the thermocouple retaining ring so the wires are on the same side as the nozzle heater wires.
8. Slide a new nozzle heater onto the nozzle assembly. The thermocouple retaining ring will snap onto the retaining clip groove in the nozzle heater. If required, the thermocouple ring can be opened slightly with a flat head screwdriver.
9. Route the nozzle heater and thermocouple wires through the wire grooves in the clamp or injection manifold plate. Make sure all wiring is properly retained in the wire grooves using wire clips.

**NOTE:** All wiring along the nozzle heater must be either a high temperature braid or sleeved using a high temperature sleeving.

10. Label each wire with the heater zone number.
11. Crimp the wire ends and connect the wires to the appropriate multi-pin connectors. Refer to the electrical schematic(s) in Chapter 9.
12. Test each nozzle heater zone according to the instructions in Section 4.11.3.
13. Remove all locks and tags. Refer to Section 1.9.

### 6.13.1.6 Replacing the Bi-Metal Nozzle Heater for Ultra 750, Ultra 750 HT-S6 and Ultra 1000 Systems

To replace the bi-metal nozzle heaters on Ultra 750 and Ultra 1000 thermal gate systems, do the following:

1. Separate the necessary cavity plate from the hot runner. Refer to Section 6.6.
2. Lock out and tag the machine. Refer to Section 1.9.
3. Remove the insulating gate bubble or nozzle tip insulator. Refer to Section 6.12.
4. Remove the front ring.

5. Disconnect the thermocouple from the nozzle heater.

6. Remove the retainer clip from the tip retainer.

7. Remove the necessary wire clips to expose the nozzle heater and thermocouple wires.

8. Remove the nozzle heater and thermocouple.

9. Slide a new nozzle heater over the nozzle housing far enough to show the retaining clip groove on the tip retainer.

10. Install the retaining clip on the tip retainer and pull the nozzle heater upwards until it stops against the retaining clip.

11. Install the thermocouple probe end into the probe hole on the nozzle heater end as shown in Figure 6-37.

**CAUTION!**

The front ring holds the thermocouple in place for proper reading of the nozzle heater temperature. Caution should be taken when wiring the thermocouple to not pull the thermocouple out from under the front ring. This could result in faulty temperature readings and possible over heating of the nozzle heater and other components.

12. Secure the thermocouple to the nozzle heater by hand tightening the front ring on the nozzle heater.

13. Route the nozzle heater and thermocouple wires through the wire grooves in the clamp or injection manifold plate. Make sure all wiring is properly retained in the wire grooves using wire clips.

**NOTE:** All wiring along the nozzle heater must be either a high temperature braid or sleeved using a high temperature sleeving.

14. Label each wire with the heater zone number.
15. Crimp the wire ends and connect the wires to the appropriate multi-pin connectors. Refer to the electrical schematic(s) in Chapter 9.

16. Test each nozzle heater zone according to the instructions in Section 4.11.3.

17. Remove all locks and tags. Refer to Section 1.9.

6.13.1.7 Replacing the Triton Nozzle Heater for Ultra 750-UP Systems

To replace the Triton nozzle heaters on Ultra 750-UP thermal gate systems, do the following:

1. Separate the necessary cavity plate from the hot runner. Refer to Section 6.6.

2. Lock out and tag the machine. Refer to Section 1.9.

3. Remove the insulating gate bubble or nozzle tip insulator. Refer to Section 6.12.

4. Remove the retaining clip from the nozzle housing.

5. Remove the necessary wire clips to expose the nozzle heater and thermocouple wires.

6. Disconnect the thermocouple retaining ring from the nozzle heater.

7. Remove the nozzle heater and thermocouple retaining ring.

8. Slide a new nozzle heater over the nozzle housing far enough to show the retaining clip groove on the tip retainer.

   NOTE: Each wave spring (5) can be compressed up to approximately 3 mm (0.12 in).

9. Install the thermocouple retaining ring over the nozzle heater.

10. Orient the thermocouple retaining ring so the wires are on the same side as the nozzle heater wires.

11. While holding the nozzle heater and thermocouple retaining ring firmly against the wave springs, install the retaining clip into the groove in the nozzle housing.

12. Route the nozzle heater and thermocouple wires through the wire grooves in the clamp or injection manifold plate. Make sure all wiring is properly retained in the wire grooves using wire clips.
NOTE: All wiring along the nozzle heater must be either a high temperature braid or sleeved using a high temperature sleeving.

13. Label each wire with the heater zone number.
14. Crimp the wire ends and connect the wires to the appropriate multi-pin connectors. Refer to the electrical schematic(s) in Chapter 9.
15. Test each nozzle heater zone according to the instructions in Section 4.11.3.
16. Remove all locks and tags. Refer to Section 1.9.

6.13.2 Replacing the Nozzle Heater for Valve Gate Systems

The following procedures describe how to replace nozzle heaters on valve gate systems.

6.13.2.1 Replacing the HTM Nozzle Heater for Ultra 350 Systems

To replace the HTM nozzle heaters on Ultra 350 valve gate systems, do the following:

1. Separate the necessary cavity plate from the hot runner. Refer to Section 6.6.
2. Lock out and tag the machine. Refer to Section 1.9.
3. Remove the insulating gate bubble or nozzle tip insulator. Refer to Section 6.12.
4. Remove the retaining clip from the nozzle tip.
5. Remove the necessary wire clips to expose the nozzle heater and thermocouple wires.
6. Remove the nozzle heater assembly.

NOTE: The nozzle heater assembly includes the retaining sleeve, nozzle heater and thermocouple.
7. Replace the wave springs.

Figure 6-39 Nozzle Tip and Heater Assembly for Ultra 350 Systems (HTM Heater)

8. Slide the nozzle heater assembly over the nozzle housing far enough to show the retaining clip groove on the nozzle tip.

   **NOTE:** The nozzle heater assembly includes the retaining sleeve, nozzle heater and thermocouple.

9. Install the retaining clip on the nozzle tip and pull the nozzle heater assembly up against it.

10. Route the nozzle heater and thermocouple wires through the wire grooves in the manifold plate. Make sure all wiring is properly retained in the wire grooves using wire clips.

   **NOTE:** All wiring along the nozzle heater must be either a high temperature braid or sleeved using a high temperature sleeving.

11. Label each wire with the heater zone number.

12. Crimp the wire ends and connect the wires to the appropriate multi-pin connectors. Refer to the electrical schematic(s) in Chapter 9.

13. Test each nozzle heater zone according to the instructions in Section 4.11.3.

14. Remove all locks and tags. Refer to Section 1.9.

### 6.13.2.2 Replacing the Copper Nozzle Heater for Ultra 500 Systems

To replace the copper nozzle heaters on Ultra 500 valve gate systems, do the following:

1. Separate the necessary cavity plate from the hot runner. Refer to Section 6.6.

2. Lock out and tag the machine. Refer to Section 1.9.

3. Remove the insulating gate bubble or nozzle tip insulator. Refer to Section 6.12.

4. Remove the front ring.

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**Figure 6-40** Heater Assembly for Ultra 500 VG Systems (Copper Heater)

5. If equipped, remove the retaining sleeve that fits over the thermocouple and nozzle heater.
6. Disconnect the thermocouple from the nozzle heater.
7. Remove the retaining ring from the nozzle tip.
8. Remove the necessary wire clips to expose the nozzle heater and thermocouple wires.
9. Remove the nozzle heater and thermocouple.
10. Slide a new nozzle heater over the nozzle housing and nozzle tip.
11. Install the retaining ring around the nozzle tip or nozzle retainer.
12. Connect the thermocouple to the nozzle heater.
13. Pull the nozzle heater up against the retainer ring.
14. If required, install the retaining sleeve over the thermocouple and nozzle tip or nozzle tip retainer.
15. Install the front ring and tighten by hand.
16. Route the nozzle heater and thermocouple wires through the wire grooves in the clamp or injection manifold plate. Make sure all wiring is properly retained in the wire grooves using wire clips.

**NOTE:** All wiring along the nozzle heater must be either a high temperature braid or sleeved using a high temperature sleeving.

17. Label each wire with the heater zone number.
18. Crimp the wire ends and connect the wires to the appropriate multi-pin connectors. Refer to the electrical schematic(s) in Chapter 9.
19. Test each nozzle heater zone according to the instructions in Section 4.11.3.
20. Remove all locks and tags. Refer to Section 1.9.

### 6.13.2.3 Replacing the Ultra Nozzle Heater for Ultra 500 and Ultra 750 Systems

To replace the Ultra nozzle heaters on Ultra 500 and Ultra 750 valve gate systems, do the following:

1. Separate the necessary cavity plate from the hot runner. Refer to Section 6.6.
2. Lock out and tag the machine. Refer to Section 1.9.
3. Remove the insulating gate bubble or nozzle tip insulator. Refer to Section 6.12.
4. Remove the thermocouple retaining ring from the nozzle heater.
5. Remove the necessary wire clips to expose the nozzle heater and thermocouple wires.

6. Remove the nozzle heater.

7. Orient the thermocouple retaining ring so the wires are on the same side as the nozzle heater wires.

8. Slide a new nozzle heater onto the nozzle assembly. The thermocouple retaining ring will snap onto the retaining clip groove in the nozzle heater. If required, the thermocouple ring can be opened slightly with a flat head screwdriver.

9. Route the nozzle heater and thermocouple wires through the wire grooves in the clamp or injection manifold plate. Make sure all wiring is properly retained in the wire grooves using wire clips.

   NOTE: All wiring along the nozzle heater must be either a high temperature braid or sleeved using a high temperature sleeving.

10. Label each wire with the heater zone number.

11. Crimp the wire ends and connect the wires to the appropriate multi-pin connectors. Refer to the electrical schematic(s) in Chapter 9.

12. Test each nozzle heater zone according to the instructions in Section 4.11.3.

13. Remove all locks and tags. Refer to Section 1.9.

6.13.2.4 Replacing the Bi-Metal Nozzle Heater for Ultra 500, Ultra 750 and Ultra 1000 Systems

To replace the bi-metal nozzle heaters on Ultra 500, Ultra 750 and Ultra 1000 valve gate systems, do the following:

1. Separate the necessary cavity plate from the hot runner. Refer to Section 6.6.

2. Lock out and tag the machine. Refer to Section 1.9.

3. Remove the insulating gate bubble or nozzle tip insulator. Refer to Section 6.12.

4. Remove the front ring.
5. Disconnect the thermocouple from the nozzle heater.

6. Remove the retainer ring from the nozzle tip.

7. Remove the necessary wire clips to expose the nozzle heater and thermocouple wires.

8. Remove the nozzle heater and thermocouple.

9. Slide a new nozzle heater over the nozzle housing and nozzle tip.

10. Install the retainer ring around the nozzle tip or nozzle retainer.

11. Connect the thermocouple to the nozzle heater.

12. Pull the nozzle heater up against the retainer ring.

13. Install the front ring and tighten by hand.

14. Route the nozzle heater and thermocouple wires through the wire grooves in the clamp or injection manifold plate. Make sure all wiring is properly retained in the wire grooves using wire clips.

**NOTE:** All wiring along the nozzle heater must be either a high temperature braid or sleeved using a high temperature sleeving.

15. Label each wire with the heater zone number.

16. Crimp the wire ends and connect the wires to the appropriate multi-pin connectors. Refer to the electrical schematic(s) in Chapter 9.

17. Test each nozzle heater zone according to the instructions in Section 4.11.3.

18. Remove all locks and tags. Refer to Section 1.9.
6.13.3 Extending Nozzle and Sprue Heater Wire Leads

The following procedure describes how to install the nozzle and sprue heater lead splice kit (P/N 4047310) to extend the length of the nozzle and sprue heater wires. This kit may be required on systems where the wire leads are not long enough to reach the electrical connectors.

**IMPORTANT!**

- This procedure is only for nozzle and sprue heater leads when standard lead lengths are not long enough.
- This procedure is not to be used for extending thermocouple wire leads. Splicing thermocouple wires will cause false and/or erratic temperature readings.
- When required, standard thermocouples are available with longer wire lead lengths.

To install the kit, do the following:

1. Strip the ends of the wire and the wire supplied with the kit until 6 mm (0.2 in) of wire lead is exposed on both.
2. Insert the wires into both ends of the butt connector until no wire lead is visible.
3. Using a crimping tool, crimp one end of the butt connector at a time.
4. Slide heat shrink tubing over the butt connector. Make sure the butt connector is centered in the tubing.
5. Shrink the tubing using a heat gun.
6. Seal the ends of the heat shrink tubing where the tubing meets the wire lead insulation.
6.14 Manifolds

The following procedures describe how to remove, maintain and install the manifolds.

6.14.1 Removing a Manifold from a Thermal Gate or Valve Gate System

To remove a manifold from a thermal gate or valve gate system, do the following:

**WARNING!**

Crushing hazard – risk of death or serious injury. Inadequate lifting equipment can fail and cause death or serious injury. Make sure all lifting equipment is rated for the load and in safe operating condition.

**NOTE:** The following procedure requires the use of a crane. Make sure the hoist rings, lifting chain and crane can support the weight of the plate(s) and hot runner.

1. Remove the hot runner from the machine and lay it on a work bench. Refer to Section 6.5.

   The resin may hold the nozzle housings to the manifold(s) when the manifold(s) is removed.
2. Remove the cavity plates. Refer to Section 6.6.1.
3. Remove all nozzle heaters. Refer to Section 6.13.
4. If necessary, remove all nozzle tips. Refer to Section 6.10.
5. Remove the manifold thermocouples.
6. Remove the injection manifold plate. Refer to Section 6.7.3.
7. Remove the transfer sprue. Refer to Section 6.18.1.
8. Remove any weepage or resin leakage from the manifold. Refer to Section 6.9.
9. For valve gate systems, remove the valve stem and piston assemblies from the injection side of the manifold. Refer to Section 6.20.
10. Disconnect all manifold heaters and related thermocouple wires from the multi-pin connectors and wire channels.
11. Remove the manifold hold down bolts.
12. Use the lifting eyebolt holes in the manifold to attach a crane and lift the manifold out of the clamp manifold plate pocket.
13. Place the manifold on a work bench supported by two wood blocks. For valve gate systems, make sure the valve stems are facing down.
14. For valve gate systems, remove the remaining valve stem and piston assemblies.
15. If necessary, remove the nozzle housings. Refer to Section 6.16.1.
16. Separate the manifolds and any cross manifolds.

### 6.14.2 Removing a Manifold from a Back-to-Back System

To remove a manifold from a back-to-back system, do the following:

**WARNING!**

Crushing hazard – risk of death or serious injury. Inadequate lifting equipment can fail and cause death or serious injury. Make sure all lifting equipment is rated for the load and in safe operating condition.

**NOTE:** The following procedure requires the use of a crane. Make sure the hoist rings, lifting chain and crane can support the weight of the plate(s) and hot runner.

1. Remove the hot runner from the machine and lay it on a work bench. Refer to Section 6.5.
   The resin may hold the nozzle housings to the manifold(s) when the manifold(s) is removed.
2. Remove the cavity plates. Refer to Section 6.6.1.
3. Remove all nozzle heaters. Refer to Section 6.13.
4. If necessary, remove all nozzle tips. Refer to Section 6.10.
5. Remove the manifold thermocouples.
6. Remove the injection manifold plate. Refer to Section 6.7.3.
7. If the manifold to be removed is in the clamp manifold plate:
   a. Remove the center air plate. Refer to Section 6.8.1.
   b. Remove the transfer sprue. Refer to Section 6.18.1.
   c. Remove the cross manifold.
8. Remove any weepage or resin leakage from the manifold. Refer to Section 6.9.
9. For valve gate systems, remove the valve stem and piston assemblies from the injection side of the manifold. Refer to Section 6.20.
10. Disconnect all manifold heaters and related thermocouple wires from the multi-pin connectors and wire channels.
11. Remove the manifold hold down bolts.
12. Use the lifting eyebolt holes in the manifold to attach a crane and lift the manifold out of the injection or clamp manifold plate pocket.
13. Place the manifold on a work bench supported by two wood blocks. For valve gate systems, make sure the valve stems are facing down.
14. For valve gate systems, remove the remaining valve stem and piston assemblies.
15. If necessary, remove the nozzle housings. Refer to Section 6.16.1.
16. Separate the manifolds and any cross manifolds.
6.14.3 Inspecting and Cleaning a Manifold

To inspect and clean a manifold, do the following:

**NOTE:** A fluidized bed cleaning process is recommended for cleaning manifolds and manifold components. Refer to section Section 6.15 for more information.

1. If a fluidized bed cleaning process is unavailable, do the following:
   a. Using brass scrapers, remove any resin left protruding from the manifold. Do not damage the sharp corners or sealing surfaces.
   b. Clean the manifold bushing and seating surfaces using brass scrapers. Do not damage the sharp corners or sealing surfaces.
   c. Clean all drool from the weep holes. Refer to Section 6.9.

2. Clean the mating surfaces on the manifold with a medium India stone (240 grit oilstone). Do not scratch the manifold.
   Make sure all contact surfaces on the injection and clamp manifold plates are clean and free of residue, scratches, nicks or burrs.

3. Clean the mating surfaces on the manifold insulators with a medium India stone (240 grit oilstone). Do not scratch the manifold insulators.

**CAUTION!**

If the sealing surfaces on the nozzle housings are damaged in any way, the nozzle housings must be replaced.

**CAUTION!**

Do not stone the back surface of the nozzle housing to remove nicks and burrs. The back surface is a precision made section of the housing with a contoured surface. Stoning this section will cause the system to leak and void the leak proof guarantee for the hot runner.

4. Inspect the nozzle housings. Make sure they are free of nicks, burrs, and any resin, especially in the melt channels.

5. Make sure the manifolds and cross manifolds are clean and flat.

6. Check all manifold, heater, and thermocouple wiring. Replace as required.
   **NOTE:** Use only Husky recommended high temperature power and thermocouple wire.
   **NOTE:** Refer to the electrical schematic(s) in Chapter 9.
6.14.4 Installing a Manifold into a Thermal Gate or Valve Gate System

To install a manifold into a thermal gate or valve gate system, do the following:

**WARNING!**

Crushing hazard – risk of death or serious injury. Inadequate lifting equipment can fail and cause death or serious injury. Make sure all lifting equipment is rated for the load and in safe operating condition.

**NOTE:** The following procedure requires the use of a crane. Make sure the hoist rings, lifting chain and crane can support the weight of the plate(s) and hot runner.

1. Replace the manifold bushings as necessary. Refer to Section 6.19 for more information.
2. Make sure all contact surfaces on the injection manifold plate, clamp manifold plate, and manifold bushings are clean and free of resin, scratches, nicks, or burrs.
3. Install the manifold locating insulator(s) and retaining screw(s) into the clamp manifold plate.
4. Install the manifold locating dowels into the clamp manifold plate.
5. If removed previously, install the nozzle housings in the injection and clamp manifold plates. Refer to Section 6.16.3.
6. Attach the manifold to a suitable overhead lifting device and lift the manifold over the clamp manifold plate pocket.

7. Lower the manifold into position onto the manifold insulator and manifold locating dowel. Adjust the manifold to engage the locating features.
8. Disconnect the overhead lifting device.
9. Install and hand tighten the manifold hold down bolts to secure the manifold to the clamp manifold plate. Make sure the manifold hold down bolts are coated with a high temperature anti-seize lubricant.
10. Turn the manifold hold down bolts counter-clockwise 1/4 turn and measure the preload for the manifold. Refer to section Section 4.6 for more information.

11. Hand tighten the manifold hold down bolts once the preload measurements have been verified.

12. If equipped, install the cross manifold. Refer to Section 4.5.5.

13. Install the manifold heater wires into the connector bases and secure the wires neatly under the wire clips in the wire channels.

14. Connect the wires to the multi-pin connector(s). Refer to the electrical drawings in Chapter 9 for more information.

15. Install the transfer sprue, if removed previously. Refer to Section 6.18.3.

16. Install the injection manifold plate. Refer to Section 6.7.3.

6.14.5 Installing a Manifold into a Back-to-Back System

To install a manifold into a back-to-back system, do the following:

**WARNING!**

Crushing hazard – risk of death or serious injury. Inadequate lifting equipment can fail and cause death or serious injury. Make sure all lifting equipment is rated for the load and in safe operating condition.

**NOTE:** The following procedure requires the use of a crane. Make sure the hoist rings, lifting chain and crane can support the weight of the plate(s) and hot runner.

1. Replace the manifold bushings as necessary. Refer to Section 6.19 for more information.

2. Make sure all contact surfaces on the injection manifold plate, clamp manifold plate, center air plate, and manifold bushings are clean and free of resin, scratches, nicks, or burrs.

3. Install the manifold locating insulator(s) and retaining screw(s) into the injection or clamp manifold plate.

4. Install the manifold locating dowels into the injection or clamp manifold plate.

5. If removed previously, install the nozzle housings in the injection and clamp manifold plates. Refer to Section 6.16.3.

6. Attach the manifold to a suitable overhead lifting device and lift the manifold over the clamp manifold plate pocket.
7. Lower the manifold into position onto the manifold insulator and manifold locating dowel. Adjust the manifold to engage the locating features.
8. Disconnect the overhead lifting device.
9. Install and hand tighten the manifold hold down bolts to secure the manifold to the clamp manifold plate. Make sure the manifold hold down bolts are coated with a high temperature anti-seize lubricant.
10. Turn the manifold hold down bolts counter-clockwise 1/4 turn and measure the preload for the manifold. Refer to section Section 4.6 for more information.
11. Hand tighten the manifold hold down bolts once the preload measurements have been verified.
12. Install the cross manifold. Refer to Section 4.5.5.
13. If removed previously, install the center air plate. Refer to Section 6.8.2.
14. Install the manifold heater wires into the connector bases and secure the wires neatly under the wire clips in the wire channels.
15. Connect the wires to the multi-pin connector(s). Refer to the electrical drawings in Chapter 9 for more information.
16. Install the transfer sprue, if removed previously. Refer to Section 6.18.3.
17. Install the injection manifold plate. Refer to Section 6.7.3.

6.15 Removing Resin from the Hot Runner

Occasionally, resin may be left in the hot runner or a leakage of resin may occur due to a component failure. The resin will have to be removed at this point. However, removing the resin without damaging components requires careful attention.
The following sections describe how to remove resin from the hot runner and hot runner components carefully.

6.15.1 Plate Cleaning and Inspection

The following procedure describes a general cleaning and inspection process for plates. After this procedure has been completed, the application of a fluidized bed process heat is recommended.

**NOTE:** The recommended procedure for removing resin from hot runner components is a controlled fluidized bed process heat. Refer to Section 6.15.2 for more information.

To inspect and clean plates, do the following:

**IMPORTANT!**

The use of an open flame to remove resin is not recommended due to the possible gases given off by some resins and the risk of burns while working around hot resin. In addition, there exists a potential for fire when using a torch to heat and melt resin. The heat from the torch may also overheat and damage small components.

1. Using brass or hardwood scrapers, clean the manifold plates of any resin deposits.
2. Remove all cooling fittings and plugs.
3. Clean the deposits from the cooling hoses.
4. Clean the entire plate using a medium India stone (240 grit oilstone) on flat surfaces and 3M Scotch-Brite™ No. 7447 (Maroon) on difficult to reach areas.
5. Remove any deposits from the alignment bushings and alignment dowels.
6. Check the plate for the following:
   - Wear at the alignment bushings and alignment dowels
   - Corrosion in the cooling channels
   - Cracks (especially around the mold mounting bolt holes or clamp mounting slots)
   - Damage to the dowel holes
   - Sharp edges around the wire grooves

**WARNING!**

Use an appropriate breathing apparatus as protection while using a brass wire bush or wheel. See the material safety data sheet (MSDS) from the resin supplier. As a minimum, a particle mask is recommended.

7. Rework or replace the plates as required.
   **NOTE:** Before re-installing components, the plate pocket(s) must be thoroughly cleaned. An electric hand drill with a brass wire wheel or a brass chisel may be used. This will prevent unnecessary scratching.
8. Install the fittings with new pipe plugs.
9. Pressure test the cooling circuits in the backing plate to be sure there are no coolant leaks.
10. Brush the plate surfaces with a brass wire brush and collect any dust with a vacuum.

**CAUTION!**

Do not damage manifold and nozzle seal off surfaces on the plates.

11. Clean the plate with 3M Scotch-Brite™ No. 7447 (Maroon) for final clean up.

**NOTE:** Resin on plates may also be removed using the fluidized bed cleaning process, provided that all brass and copper components are removed from the plate and the plate assembly is disassembled completely. Refer to Section 6.15.2 for more information.

### 6.15.2 Cleaning Using a Fluidized Bed Process

The following sections describe fluidized bed cleaning and how to prepare the hot runner for it.

#### 6.15.2.1 What is Fluidized Bed Cleaning

Cleaning the manifold passages is rarely required. However, when necessary, manifold passages must be cleaned using the fluidized bed process. Only the fluidized bed cleaning process will successfully remove the resin completely from the melt channels of the hot runner components.

Fluidized bed cleaning is a process with aluminum oxide particles in a high temperature retort. The heated air at 320 to 385 °C (750 to 900 °F) levitates the aluminum oxide particles creating a liquid-like behavior. The temperature and flow of the fluidized bed pyrolizes (thermally decomposes) the polymer.

#### 6.15.2.2 Assistance

Husky provides a full system repair and cleaning service. Husky is also able to assist customers in finding a fluidized bed cleaning process.
6.15.2.3 Disassembly for Fluidized Bed Cleaning

When disassembling a hot runner for fluidized bed cleaning, do the following:

**IMPORTANT!**
Before disassembling a hot runner for fluidized bed cleaning, please note the following:
- When removing resin from the mold, make sure the faces of the manifold are kept scratch free. Scratches around the nozzle housing, valve bushing, manifold bushing and piston cylinder, or sprue bushing/sprue bar surfaces may cause severe resin leakage.
- The thickness of the manifold(s) is extremely important for the performance of the hot runner. There is a risk that cleaning the surface through grinding or sanding would change the total height of the stack and thereby increase the cold clearance. This would result in a resin leak.

**CAUTION!**
Do not remove any surface or melt channel plugs. This will void the leak proof guarantee for the hot runner. Plugs can only be removed by Husky.

1. Any system that is to be sent for fluidized bed cleaning is to be completely disassembled. However do not send the following items for cleaning:
   - Set screws
   - Surface hex head plugs
   - Nozzle tip insulators
   - Nozzle heaters
   - Sprue bushing heaters

2. Make sure all electrical wiring and thermocouples are removed.

3. Do not use the fluidized bed process to clean Beryllium Copper components, such as the following:

**CAUTION!**
Contact Husky for verification of the item material before cleaning it with a fluidized bed process.
• Manifold bushings
• Manifold inserts
• Some nozzle tips and tip retainers

The process will anneal the Beryllium Copper (BeCu) causing rapid failure of the components when returned to service.

Mechanical cleaning of BeCu components must not damage any of the sealing surfaces. Use only soft brass, hardwood sticks, Scotch Brite®, or soft brass brushes. Do not use abrasive methods to clean BeCu components.

**WARNING!**

*Do not use abrasives to clean BeCu. Airborne particles of beryllium are known carcinogens. Rework of BeCu using abrasives can be completed under flood coolants to prevent airborne particles.*

**IMPORTANT!**

The Husky Warranty does not cover BeCu components used outside the operating temperature range, or cleaned using the Fluidized Bed process.

4. When packing for shipment, make sure the manifold heater ends do not get damaged during shipping.

   The best method is to pack the manifold in a crate where it cannot move, or place the manifold between two pieces of plywood cut approximately 50 mm (2 in) larger all around. Hold the manifold and plywood pieces together with bolts using existing hold down holes or clearance holes in the manifold. Only use plywood thick enough to protect the manifold and absorb impacts if the manifold is dropped.

5. Send a complete packing list of all the components shipped to make sure nothing is overlooked when the components are returned.

6. Follow the assembly and installation instructions in Chapter 4 when the components are received.

### 6.16 Nozzle Housings

The following procedures describe how to remove, maintain and install the nozzle housings.

### 6.16.1 Removing the Nozzle Housings

To remove the nozzle housings, do the following:

1. Remove the nozzle heaters and all thermocouples. Refer to Section 6.13.
2. Remove the insulating gate bubble or nozzle tip insulators. Refer to Section 6.12.
3. If equipped, disassemble and remove all valve stem and piston assemblies. Refer to Section 6.20 for more information.

4. Remove the nozzle tips. Refer to Section 6.10.

5. Remove the manifold from the manifold plate and place it on a clean, flat work surface. Refer to Section 6.14.1.

CAUTION!

Use a brass rod to protect the manifold and nozzle from damage.

6. Break the resin around the nozzle housing with a side impact against the nozzle flange at the manifold face.

7. Pull the nozzle stack assembly out of the manifold and disassemble.

8. Inspect all nozzle stack components for damage or wear. Replace as necessary.

6.16.2 Inspecting and Cleaning Nozzle Housings

To inspection and clean the nozzle housings after they have been removed, do the following:

CAUTION!

Do not stone the back surface of the nozzle housing to remove nicks and burrs. The back surface is a precision made section of the housing with a contoured surface. Stoning this section will cause the system to leak and void the leak proof guarantee for the hot runner.

1. If the nozzle housing has an internal thread, clean the nozzle tip seating surface at the bottom of the nozzle housing bore. This step is not required for nozzle housings that have an external thread.

2. Clean the thread with a soft wire brush.
3. Remove all resin from the melt channel in the nozzle housing.
4. Remove all resin from the nozzle housing bore in the manifold plate.

### 6.16.3 Installing the Nozzle Housings

To install the nozzle housings, do the following:

1. Assemble each nozzle housing as shown in Figure 6-51.
   **NOTE:** Refer to the Section View Assembly drawing in Chapter 9 to verify the orientation and correct number of Ultra springs.

2. Place all housing assemblies into the nozzle bores in the manifold plate. Make sure the housing assemblies are properly aligned with the nozzle locating dowels to prevent rotation.

3. Install the manifold. Refer to Section 6.14.4.

### 6.17 Sprue Bar (If Equipped)

The following procedures describe how to remove, maintain and install the sprue bar.

**NOTE:** The sprue bar may be equipped with either an anti-drool bushing, end cap bushing or ball check bushing.
6.17.1 Removing the Sprue Bar

To remove the sprue bar, do the following:

1. Remove the hot runner from the machine. Refer to Section 6.5.
2. Remove the heat shield from the sprue bar.
3. Remove the injection side cavity plate from the hot runner. Refer to Section 6.6.
4. Remove the sprue bar from the hot runner.

6.17.2 Replacing the Anti-Drool Bushing

To replace the anti-drool bushing on the sprue bar, do the following:

1. Remove the sprue extension plug from the sprue bar.

![Figure 6-52 Replacing the Anti-Drool Bushing](image)

**WARNING!**

Burn and fire hazard. Use of an open flame to remove resin can produce harmful gases (depending on the resin type), damage components, and increase the risk of fire. Only use open flames sparingly and in a controlled environment.

**WARNING!**

Burn hazard – risk of serious injury. To avoid serious burns, wear Personal Protective Equipment (PPE) consisting of a heat-resistant coat, heat-resistant gloves, and a full face shield over safety glasses. Use adequate ventilation for fumes.

2. Slide the anti-drool bushing out of the sprue bar. If necessary, carefully heat the bushing with a propane torch enough to soften the resin inside.
3. Clean the sliding surface and sealing surface of the sprue bar, making sure not to damage either surface.

4. Inspect the dimensions of the sliding surfaces of the sprue bar and the new bushing. There should be a difference in diameter of 0.005 mm to 0.015 mm. If the difference is outside of this specification, contact your Husky Regional Service and Sales office.

5. Insert the new anti-drool bushing into the sprue bar.

6. Thread the sprue extension plug into the sprue bar though the clearance hole in the anti-drool bushing. Tighten the plug by hand only.

6.17.3 Replacing the End Cap Bushing

To replace the end cap bushing on the sprue bar, do the following:

1. Remove the screws from the end cap bushing.

**WARNING!**

*Burn and fire hazard. Use of an open flame to remove resin can produce harmful gases (depending on the resin type), damage components, and increase the risk of fire. Only use open flames sparingly and in a controlled environment.***

**WARNING!**

*Burn hazard – risk of serious injury. To avoid serious burns, wear Personal Protective Equipment (PPE) consisting of a heat-resistant coat, heat-resistant gloves, and a full face shield over safety glasses. Use adequate ventilation for fumes.*
2. Slide the end cap bushing out of the sprue bar. If necessary, carefully heat the bushing with a propane torch enough to soften the resin inside.

3. Clean the sliding surface and sealing surface of the sprue bar, making sure not to damage either surface.

4. If equipped, coat the ends of the two locating dowels with a high temperature anti-seize lubricant.

5. Coat the screws used to secure the bushing to the sprue bar with a high temperature anti-seize lubricant.

6. Secure the end cap bushing to the sprue bar with the screws. Torque the screws to half the value specified on the Section View Assembly drawing and then torque them to the full value. Refer to Chapter 9.

6.17.4 Replacing the Ball Check Anti-Drool Bushing

To replace the ball check anti-drool bushing on the sprue bar, do the following:

1. Remove the sprue extension plug from the sprue bar.

![Figure 6-54 Replacing the Ball Check Anti-Drool Bushing](image)

**Figure 6-54  Replacing the Ball Check Anti-Drool Bushing**


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**WARNING!**

Burn and fire hazard. Use of an open flame to remove resin can produce harmful gases (depending on the resin type), damage components, and increase the risk of fire. Only use open flames sparingly and in a controlled environment.
2. Slide the ball check anti-drool bushing out of the sprue bar. If necessary, carefully heat the bushing with a propane torch enough to soften the resin inside.

3. Clean the sliding surface and sealing surface of the sprue bar, making sure not to damage either surface.

4. Inspect the dimensions of the sliding surfaces of the sprue bar and the new bushing. There should be a difference in diameter of 0.005 mm to 0.015 mm. If the difference is outside of this specification, contact your Husky Regional Service and Sales office.

5. Place the new ball stop into the new ball check anti-drool bushing.

6. Place the new ball bearing into the new ball check insert.

7. Thread the ball check insert into the ball check anti-drool bushing, making sure the ball stop and ball bearing do not fall out. Torque the insert to the value specified on Section View Assembly drawing. Refer to Chapter 9.

8. Insert the new ball check anti-drool bushing into the sprue bar.

9. Thread the sprue extension plug into the sprue bar though the clearance hole in the ball check anti-drool bushing. Tighten the plug by hand only.

### 6.17.5 Replacing the Tubular Heaters

To remove and replace a tubular heater, do the following:

**NOTE:** Tubular heaters must be functional at the same time. If a tubular heater fails and is not replaced, the difference in thermal expansion from one side to the other will bend the sprue bar, causing excessive wear and damage to components and the hot runner. A resistance test (ohms) at the multi-pin connectors will determine if both heaters are functional.

**CAUTION:**

Wear personal protective equipment (PPE). Tubular heater wires are covered with a fiberglass insulation that may cause minor skin irritation.

1. Place the sprue bar in a soft jaw vice with the bushing facing up.
2. Remove the bushing.
3. Install a screw into the end of the failed tubular heater. Pull the heater out of the sprue bar.
4. Push a piece of clean cloth down the tubular heater hole with a brass rod to remove oil and dirt.
5. Install the bushing.
6. Rotate the sprue bar 180° in the soft jaw vice.
7. Install a new tubular heater into the tubular heater hole until it makes contact with either the bushing.

8. Clean the sprue bar, making sure not to damage the manifold sealing surfaces.

6.17.6 Installing the Sprue Bar

To install the sprue bar, do the following:

1. Clean the surface on the sprue bar and manifold were the two components will interface.

CAUTION!
The supplied mounting screws are of a special quality and must not be substituted.

2. Coat the screws used to secure the sprue bar to the manifold with a high temperature anti-seize lubricant.

3. Install the sprue bar through the clearance hole in the injection plate and onto the top of the manifold using the mounting screws.

4. Torque the screws to half the value specified on the Section View Assembly drawing and then torque them to the full value. Refer to Chapter 9.

   This will make sure an even seal is made between the transfer sprue and the manifold.

6.17.7 Inspecting the Sprue Bar Guide Wear Pads

To inspect the condition of the sprue bar guide wear pads, do the following:

1. Lock out and tag the machine. Refer to Section 1.9.

2. Remove the sprue bar guide and locating ring from the machine.

3. Separate the sprue bar guide from the locating ring.
4. Disassemble the sprue bar guide and inspect the condition of the wear pads. Replace
the wear pads if they are worn or damaged.
5. Assemble the sprue bar guide with the wear pads.
6. Install the sprue bar guide and locating ring. Refer to Section 5.1.

6.18 Transfer Sprue

The following procedures describe how to remove, maintain and install the transfer sprue.

6.18.1 Removing the Transfer Sprue

To remove the transfer sprue, do the following:
1. Remove the sprue bar. Refer to Section 6.17.1.
2. Remove the injection side cavity plate. Refer to Section 6.6.
3. Remove the injection manifold plate. Refer to Section 6.7.1.

WARNING!
Burn hazard – risk of serious injury. To avoid serious burns, wear Personal Protective
Equipment (PPE) consisting of a heat-resistant coat, heat-resistant gloves, and a full
face shield over safety glasses. Use adequate ventilation for fumes.

4. Remove the transfer sprue mounting screws.
5. Remove the resin slug from the transfer sprue melt channel with a brass rod.
6.18.2 Inspecting and Cleaning the Transfer Sprue

To inspect and clean the transfer sprue, do the following:

1. Clean the transfer sprue. Do not damage the sealing surfaces.
2. Check and repair the injection nozzle radius, if required.

6.18.3 Installing the Transfer Sprue

Refer to the transfer sprue installation instructions in Section 4.5.3.

6.19 Manifold Bushings

The following procedures describe how to remove, maintain and install manifold bushings.

Manifold bushings need to be removed if the following occurs:
- The valve stem is stuck and cannot be removed
- The valve stem bore is worn and leaking heavily back into the piston area
- The manifold bushing is collapsed from overheating
- There is a need to clean the manifold
- The air seal face is damaged
- The manifold bushing is damaged in a way that renders it unusable

NOTE: Husky provides two styles of manifold bushings – press fit or slip fit. Press fit manifold bushings are typically used in systems designed to process heat-sensitive resins. Slip fit manifold bushings are used in systems designed to process resins that are not heat-sensitive. Refer to the Section View Assembly drawing in Chapter 9 to determine if the manifold bushings are press fit or slip fit.

NOTE: It is recommended that press fit bushings be removed and replaced by Husky. Contact your Husky Regional Service and Sales office for more information and quoting on removing press fit manifold bushings.

6.19.1 Removing Manifold Bushings

To remove manifold bushings from a manifold, do the following:

1. Disconnect the manifold and thermocouple wires from the manifold(s).
2. Remove the nozzle heaters and thermocouples from the nozzle housings. Refer to Section 6.13.
3. Remove the nozzle tips. Refer to Section 6.10.
4. Remove the nozzle housings. Refer to Section 6.16.1.
5. Remove the manifold from the manifold plate pocket. Refer to Section 6.14.1.
6. If the manifold is used in a valve gate system, remove the valve stem and piston assemblies. Refer to Section 6.20.

7. Remove the backup pads or backup insulators from the manifold bushings.

8. Press the manifold bushings out of the manifold using a heavy brass punch. Take care not to damage the bushings or manifold.

6.19.2 Inspecting and Cleaning Manifold Bushings

To inspect and clean manifold bushings, do the following:

1. Remove any resin from the manifold bushing pockets and seating area in the manifold plate using brass scrapers. Do not damage the sharp corners or sealing surfaces.

2. Remove any resin from the exterior of the manifold bushing(s) with brass scrapers. Do not damage the sharp corners or sealing surfaces.

3. Visually inspect and clean the interior of the manifold bushing(s). Make sure the inside is clean of all resin.

4. Use a medium India stone (240 grit oil stone) to clean all mating surfaces on the manifold. Do not scratch the manifold.

5. Check that all contact surfaces on the manifold plate, backing plate, and manifold bushings are clean and free of residue, scratches, nicks, or burrs.

6.19.3 Installing Manifold Bushings

To install manifold bushings onto a manifold, do the following:

1. Make sure the manifold bushing locating dowel is installed in the manifold.

2. Align the manifold bushing with the locating dowel and press the bushing into the manifold until the bushing bottoms out on the manifold. Repeat this step for all manifold bushings.

6.20 Valve Stem and Piston Assemblies

The following procedures describe how to remove and install valve stems and piston assemblies from valve gate and back-to-back systems.

6.20.1 Removing Valve Stem and Piston Assemblies

The following procedures describe how to remove valve stem and piston assemblies.
To remove valve stem and piston assemblies from an Ultra 350 and Ultra 500 VGSX systems, do the following:

1. Inspect the interior and exterior of the piston cylinders for drool (or weepage). Refer to Section 6.9 for information on how to remove drool from weep holes.

2. Remove any resin deposits from the outside of the piston cylinder and the manifold pocket area. If required, carefully heat the resin deposits with a propane torch and then wipe the deposits away with a clean, soft cloth. This may have to be repeated several times.

3. If required, use a brass rod to clean the inside of the piston cylinders. Do not scratch or score the piston cylinder surface.

4. Reconnect any thermocouples that were disconnected when the backing plate was removed.

5. Loosen the socket head cap screws in the piston and use them to pull the piston out of the piston cylinder.

   **NOTE:** Do not attempt to remove the valve stem. This will be done later in this procedure using special Husky tools.

6. Connect the hot runner to a controller.

**WARNING!**

Sprue heaters must be turned on when manifold heaters are on. Failure to do so could result in generation of dangerous pressure levels in the manifold, resulting in explosion or sudden release of hot resin.

**WARNING!**

Burn hazard – risk of serious injury. To avoid serious burns, wear Personal Protective Equipment (PPE) consisting of a heat-resistant coat, heat-resistant gloves, and a full face shield over safety glasses. Use adequate ventilation for fumes.
1. Increase the temperature of the manifold heaters, nozzles, and sprue to a temperature high enough to soften the resin in the melt channels. The Vicat Softening Temperature for the resin type is recommended. Refer to the resin suppliers documentation for more information.

2. Lock out and tag the machine. Refer to Section 1.9.

3. Install the valve stem removal tool base shown in Figure 6-56 over the piston cylinder.

![Figure 6-56 Installing the Valve Stem Removal Tool Base](image)

1. Valve Stem Removal Tool Base

4. Install the piston head adapter as shown in Figure 6-57.
11. Attach the piston head adapter to the valve stem removal tool adapter as shown in Figure 6-58.

12. Assemble the remaining components of the valve stem removal tool. Refer to Section 6.4.3 for part numbers.
13. Turn the nut at the top of the tool clockwise with an appropriately sized wrench to remove the valve stem and piston.

14. Allow the manifold to cool to room temperature (< 25 °C or < 77 °F) once the valve stem and piston assemblies have been removed.

15. Inspect the gate end of each valve stem to make sure there is no damage or wear. If possible, use a new valve stem for comparison.

**WARNING!**

Burn and fire hazard. Use of an open flame to remove resin can produce harmful gases (depending on the resin type), damage components, and increase the risk of fire. Only use open flames sparingly and in a controlled environment.
16. Remove any resin deposits from the valve stems. If required, carefully heat the resin deposits with a propane torch and then wipe the deposits away with a clean, soft cloth. This may have to be repeated several times.

17. Make sure the valve stems are not overheated, scratched, scored, or bent. Replace any valve stem that shows signs of this type of damage.

18. Replace valve stems as required. If the valve stems are being replaced due to severe wear or leakage at the manifold bushing and cylinder, both the valve stem and the manifold bushing must be replaced to guarantee seal quality.

19. Cut and discard the piston seals.

20. Install new piston seals.

21. Inspect the manifold wiring and heaters for damage and replace where required.

NOTE: Use only Husky recommended high temperature power and thermocouple wire.

NOTE: Refer to the electrical schematic(s) in Chapter 9 for wiring information.

6.20.1.2 Removing the Valve Stems and Pistons Ultra 350, Ultra 500 and Ultra 750 VGLX/EX

To remove valve stems and piston assemblies from Ultra 350, Ultra 500 or Ultra 750 VGLX/EX systems, do the following:

1. Remove the piston cylinders from each valve stem and piston assembly.
2. Inspect the bleeder holes in the base of each backup pad and the manifold pocket for excess resin weepage. Refer to Section 6.9 for information on the effects of excess resin weepage.

WARNING!

Burn and fire hazard. Use of an open flame to remove resin can produce harmful gases (depending on the resin type), damage components, and increase the risk of fire. Only use open flames sparingly and in a controlled environment.
3. Remove any resin deposits from the outside of the backup pads and the manifold pocket area. If required, carefully heat the resin deposits with a propane torch and then wipe the deposits away with a clean, soft cloth. This may have to be repeated several times.

4. If required, use a brass rod to clean the inside of the backup pads. Do not scratch or score the backup pad surface.

5. Reconnect any thermocouples that were disconnected when the backup plate was removed.

6. Remove the set screws from each piston using a 1/4" Allen wrench. To prevent the pistons from rotating during this step, install socket head cap screw into the manifold and hold the piston in place with a 16 mm wrench.

7. Connect the hot runner to a controller.

**WARNING!**

Burn hazard – risk of serious injury. To avoid serious burns, wear Personal Protective Equipment (PPE) consisting of a heat-resistant coat, heat-resistant gloves, and a full face shield over safety glasses. Use adequate ventilation for fumes.

**WARNING!**

Sprue heaters must be turned on when manifold heaters are on. Failure to do so could result in generation of dangerous pressure levels in the manifold, resulting in explosion or sudden release of hot resin.

**WARNING!**

Burn hazard – risk of serious injury. To avoid serious burns, wear Personal Protective Equipment (PPE) consisting of a heat-resistant coat, heat-resistant gloves, and a full face shield over safety glasses. Use adequate ventilation for fumes.
8. Increase the temperature of the manifold heaters, nozzles, and sprue to a temperature high enough to soften the resin in the melt channels. The Vicat Softening Temperature for the resin type is recommended. Refer to the resin suppliers documentation for more information.

9. Lock out and tag the machine. Refer to Section 1.9.

10. Install the piston head adapter shown in Figure 6-61. Attach the adapter to the piston head with a socket head cap screw.

11. Place the valve stem removal tool base over the piston head adapter and then attach the valve stem adapter to piston head adapter as shown in Figure 6-62.

WARNING!
In the event of water leaking into the hot runner, the nozzle housings must be mechanically cleaned out prior to turning the heaters on.

WARNING!
Do not leave the hot manifold unattended. If necessary, leave a sign in a visible location indicating “Danger: Hot, Do Not Touch”.

IMPORTANT!
Do not allow the nozzles to overheat or degraded material will have to be cleaned out of the nozzle housing before the valve stem can be re-installed later on.

CAUTION!
Do not allow the hot runner to cool off during the valve stem removal process. A valve stem could be broken during removal if the system cools.
12. Assemble the remaining components of the valve stem removal tool. Refer to Section 6.4.3 for part numbers.

**CAUTION!**

Be careful not to bend the valve stem when removing it. Bent valve stems can not be re-used.

**CAUTION!**

If the valve stem and piston do not pull out easily, the valve stem may have seized in the manifold bushing. If this is the case, remove the manifold bushing from the manifold and then remove the valve stem. Contact your Husky Regional Service and Sales office for more information.

13. Turn the nut at the top of the tool clockwise with an appropriately sized wrench to remove the valve stem and piston.

14. Allow the manifold to cool to room temperature (< 25 °C or < 77 °F) once the valve stem and piston assemblies have been removed.

15. Inspect the gate end of each valve stem to make sure there is no damage or wear. If possible, use a new valve stem for comparison.

**WARNING!**

Burn and fire hazard. Use of an open flame to remove resin can produce harmful gases (depending on the resin type), damage components, and increase the risk of fire. Only use open flames sparingly and in a controlled environment.
16. Remove any resin deposits from the valve stems. If required, carefully heat the resin deposits with a propane torch and then wipe the deposits away with a clean, soft cloth. This may have to be repeated several times.

17. Make sure the valve stems are not overheated, scratched, scored, or bent. Replace any valve stem that shows signs of this type of damage.

**CAUTION!**

Abrasives should never be used to clean the valve stems, as this can damage the critical sealing surfaces.

18. Replace valve stems as required. If the valve stems are being replaced due to severe wear or leakage at the manifold bushing and cylinder, both the valve stem and the manifold bushing must be replaced to guarantee seal quality.

19. Cut and discard the piston seals.

20. Inspect the manifold wiring and heaters for damage and replace where required.

**NOTE:** Use only Husky recommended high temperature power and thermocouple wire.

**NOTE:** Refer to the electrical schematic(s) in Chapter 9 for wiring information.

**6.20.1.3 Removing the Valve Stems and Pistons for Ultra 1000 VGLX/EX**

To remove valve stems and piston assemblies from Ultra 1000 VGLX/EX systems, do the following:

1. Remove the piston cylinders from each valve stem and piston assembly.

2. Inspect the bleeder holes in the base of each backup pad and the manifold pocket for excess resin weepage. Refer to Section 6.9 for information on the effects of excess resin weepage.

**WARNING!**

Burn and fire hazard. Use of an open flame to remove resin can produce harmful gases (depending on the resin type), damage components, and increase the risk of fire. Only use open flames sparingly and in a controlled environment.

**WARNING!**

Burn hazard – risk of serious injury. To avoid serious burns, wear Personal Protective Equipment (PPE) consisting of a heat-resistant coat, heat-resistant gloves, and a full face shield over safety glasses. Use adequate ventilation for fumes.
3. Remove any resin deposits from the outside of the backup pads and the manifold pocket area. If required, carefully heat the resin deposits with a propane torch and then wipe the deposits away with a clean, soft cloth. This may have to be repeated several times.

4. If required, use a brass rod to clean the inside of the backup pads. Do not scratch or score the backup pad surface.

5. Reconnect any thermocouples that were disconnected when the backup plate was removed.

6. Connect the hot runner to a controller.

**WARNING!**

Sprue heaters must be turned on when manifold heaters are on. Failure to do so could result in generation of dangerous pressure levels in the manifold, resulting in explosion or sudden release of hot resin.

**WARNING!**

Burn hazard – risk of serious injury. To avoid serious burns, wear Personal Protective Equipment (PPE) consisting of a heat-resistant coat, heat-resistant gloves, and a full face shield over safety glasses. Use adequate ventilation for fumes.

**WARNING!**

In the event of water leaking into the hot runner, the nozzle housings must be mechanically cleaned out prior to turning the heaters on.

**WARNING!**

Do not leave the hot manifold unattended. If necessary, leave a sign in a visible location indicating “Danger: Hot, Do Not Touch”.

7. Increase the temperature of the manifold heaters, nozzles, and sprue to a temperature high enough to soften the resin in the melt channels. The Vicat Softening Temperature for the resin type is recommended. Refer to the resin suppliers documentation for more information.

**IMPORTANT!**

Do not allow the nozzles to overheat or degraded material will have to be cleaned out of the nozzle housing before the valve stem can be re-installed later on.

8. Lock out and tag the machine. Refer to Section 1.9.
9. Install the piston head adapter shown in Figure 6-61. Attach the adapter to the piston head with a socket head cap screw.

10. Place the valve stem removal tool base over the piston head adapter and then attach the valve stem adapter to piston head adapter as shown in Figure 6-62.

11. Assemble the remaining components of the valve stem removal tool. Refer to Section 6.4.3 for part numbers.

CAUTION!

Be careful not to bend the valve stem when removing it. Bent valve stems can not be re-used.
12. Turn the nut at the top of the tool clockwise with an appropriately sized wrench to remove the valve stem and piston.

13. Allow the manifold to cool to room temperature (< 25 °C or < 77 °F) once the valve stem and piston assemblies have been removed.

14. Inspect the gate end of each valve stem to make sure there is no damage or wear. If possible, use a new valve stem for comparison.

WARNING!
Burn and fire hazard. Use of an open flame to remove resin can produce harmful gases (depending on the resin type), damage components, and increase the risk of fire. Only use open flames sparingly and in a controlled environment.

15. Remove any resin deposits from the valve stems. If required, carefully heat the resin deposits with a propane torch and then wipe the deposits away with a clean, soft cloth. This may have to be repeated several times.

16. Make sure the valve stems are not overheated, scratched, scored, or bent. Replace any valve stem that shows signs of this type of damage.

WARNING!
Burn hazard – risk of serious injury. To avoid serious burns, wear Personal Protective Equipment (PPE) consisting of a heat-resistant coat, heat-resistant gloves, and a full face shield over safety glasses. Use adequate ventilation for fumes.

17. Replace valve stems as required. If the valve stems are being replaced due to severe wear or leakage at the manifold bushing and cylinder, both the valve stem and the manifold bushing must be replaced to guarantee seal quality.

18. Cut and discard the piston seals.

19. Inspect the manifold wiring and heaters for damage and replace where required.

NOTE: Use only Husky recommended high temperature power and thermocouple wire.

NOTE: Refer to the electrical schematic(s) in Chapter 9 for wiring information.
6.20.2 Installing Valve Stem and Piston Assemblies

The following procedures describe how to install valve stem and piston assemblies.

6.20.2.1 Installing the Valve Stems and Pistons for Ultra 350 VGSX

To install valve stems and piston assemblies into Ultra 350 VGSX systems, do the following:

NOTE: The following procedure is for installing valve stem and piston assemblies into previously operated hot runner systems. If resin has not been processed through the hot runner, refer to Section 4.8.1 for installation instructions.

1. Clean the piston to make sure no dirt or oil is present.
2. Insert the valve stem into the stem bore in the piston.
3. Slide the spacer carefully over the valve stem until it bottoms out on the piston.
4. Apply a coat of liquid teflon to the threads of two flat head screws.
5. Install the flat head screws through the back of the piston to the spacer to secure the valve stem to the piston. Torque all screws to the value specified on the Section View Assembly drawing. Refer to Chapter 9.
6. Rotate the valve stem in the piston to make sure no binding has occurred.
   NOTE: Make sure the valve stem can rotate freely within the piston.
7. Install a new double delta or O-ring seal:
   a. If the assembly uses a double delta seal, refer to Section 6.4.7.
   b. If the assembly uses an O-ring seal, coat the seal groove in the piston with a high temperature lubricant and install a new O-ring seal (2) into the seal groove. Do not remove any excess silicone.

Figure 6-65 Valve Stem and Piston Assembly

NOTE: Make sure the O-ring seal is not twisted in the seal groove.
NOTE: High temperature lubricant is only used for teflon encapsulated seals.

8. Connect the hot runner to a controller.

WARNING!
Sprue heaters must be turned on when manifold heaters are on. Failure to do so could result in generation of dangerous pressure levels in the manifold, resulting in explosion or sudden release of hot resin.

WARNING!
Burn hazard – risk of serious injury. To avoid serious burns, wear Personal Protective Equipment (PPE) consisting of a heat-resistant coat, heat-resistant gloves, and a full face shield over safety glasses. Use adequate ventilation for fumes.

WARNING!
In the event of water leaking into the hot runner, the nozzle housings must be mechanically cleaned out prior to turning the heaters on.

WARNING!
Do not leave the hot manifold unattended. If necessary, leave a sign in a visible location indicating “Danger: Hot, Do Not Touch”.

9. Increase the temperature of the manifold heaters, nozzles, and sprue to a temperature high enough to soften the resin in the melt channels. The Vicat Softening Temperature for the resin type is recommended. Refer to the resin suppliers documentation for more information.

IMPORTANT!
Do not allow the nozzles to overheat or degraded material will have to be cleaned out of the nozzle housing before the valve stem can be re-installed later on.

10. Lock out and tag the machine. Refer to Section 1.9.

CAUTION!
Do not allow the hot runner to cool off during the valve stem installation process. A valve stem could be bent during installation if the system cools.

11. Carefully guide the completed valve stem and piston assembly into the manifold bushing, gently pushing by hand until the spacer rests on the manifold bushing.

12. Allow the manifold to cool to room temperature (< 25 °C or < 77 °F) once the valve stem and piston assemblies have been installed.
6.20.2.2 Installing the Valve Stems and Pistons for Ultra 500 VGSX

To install valve stems and piston assemblies into an Ultra 500 VGSX system, do the following:

**NOTE:** The following procedure is for installing valve stem and piston assemblies into previously operated hot runner systems. If resin has not been processed through the hot runner, refer to Section 4.8.2 for installation instructions.

1. Clean the piston to make sure no dirt or oil is present.

2. Insert the valve stem into the stem bore in the piston.

3. Slide the spacer carefully over the valve stem until it bottoms out on the piston.

4. Install two socket head cap screws through the back of the piston to the spacer to secure the valve stem to the piston. Torque all screws to the value specified on the Section View Assembly drawing. Refer to Chapter 9.

5. Rotate the valve stem in the piston to make sure no binding has occurred.

**NOTE:** Make sure the valve stem can rotate freely within the piston.

6. Install a new double delta or O-ring seal:
   a. If the assembly uses a double delta seal, refer to Section 6.4.7.
   b. If the assembly uses an O-ring seal, coat the seal groove in the piston with a high temperature lubricant and install a new O-ring seal into the seal groove. Do not remove any excess silicone.

**NOTE:** Make sure the O-ring seal is not twisted in the seal groove.

**NOTE:** High temperature lubricant is only used for teflon encapsulated seals.

7. Connect the hot runner to a controller.
Increase the temperature of the manifold heaters, nozzles, and sprue to a temperature high enough to soften the resin in the melt channels. The Vicat Softening Temperature for the resin type is recommended. Refer to the resin suppliers documentation for more information.

Lock out and tag the machine. Refer to Section 1.9.

Carefully guide the completed valve stem and piston assembly into the manifold bushing, gently pushing by hand until the spacer rests on the manifold bushing.

Allow the manifold to cool to room temperature (< 25 °C or < 77 °F) once the valve stem and piston assemblies have been installed.
6.20.2.3 Installing the Valve Stems and Pistons for Ultra 350, Ultra 500 and Ultra 750 VGLX/EX

To install valve stems and piston assemblies into Ultra 350, Ultra 500 or Ultra 750 VGLX/EX systems, do the following:

**NOTE:** The following procedure is for installing valve stem and piston assemblies into previously operated hot runner systems. If resin has not been processed through the hot runner, refer to Section 4.8.3 for installation instructions.

1. Clean the piston to make sure no dirt or oil is present.
2. Insert the valve stem into the center hole of the piston.
   **NOTE:** Make sure the piston thread is clean and dry.
4. Install the set screw into the piston and torque to the value specified on the Section View Assembly drawing. Refer to Chapter 9.
5. Rotate the valve stem in the piston to make sure no binding has occurred.
   **NOTE:** Make sure the valve stem can rotate freely within the piston.
6. Install a new double delta or O-ring seal:
   a. If the assembly uses a double delta seal, refer to Section 6.4.7.
   b. If the assembly uses an O-ring seal, coat the seal groove in the piston with a high temperature lubricant and install a new O-ring seal into the seal groove. Do not remove any excess silicone.
      **NOTE:** Make sure the O-ring seal is not twisted in the seal groove.
      **NOTE:** High temperature lubricant is only used for teflon encapsulated seals.
7. Connect the hot runner to a controller.
8. Increase the temperature of the manifold heaters, nozzles, and sprue to a temperature high enough to soften the resin in the melt channels. The Vicat Softening Temperature for the resin type is recommended. Refer to the resin suppliers documentation for more information.

9. Lock out and tag the machine. Refer to Section 1.9.

CAUTION!
Do not allow the hot runner to cool off during the valve stem installation process. A valve stem could be bent during installation if the system cools.

10. Carefully guide the completed valve stem and piston assembly into the manifold bushing, gently pushing by hand until the piston bottoms out on the manifold bushing.

11. Place the piston cylinder over the valve stem piston assembly in the manifold bushing. Make sure the piston cylinder is bottomed out on the backup pad.
NOTE: The piston cylinder is installed during the double delta seal installation procedure.

12. Allow the manifold to cool to room temperature (< 25 °C or < 77 °F) once the valve stem and piston assemblies have been installed.

### 6.20.2.4 Installing the Valve Stem s and Pistons for Ultra 1000 VGLX/EX

To install valve stems and piston assemblies into Ultra 1000 VGLX/EX systems, do the following:

**NOTE:** The following procedure is for installing valve stem and piston assemblies into previously operated hot runner systems. If resin has not been processed through the hot runner, refer to Section 4.8.4 for installation instructions.

1. Clean the piston to make sure no dirt or oil is present.

2. Insert the valve stem into the piston spacer.

3. Thread the piston spacer (4) onto the piston and torque to the value specified on the Section View Assembly drawing. Refer to Chapter 9.

4. Rotate the valve stem in the piston to make sure no binding has occurred.
   **NOTE:** Make sure the valve stem can rotate freely within the piston.

5. Install a new double delta or O-ring seal:
   a. If the assembly uses a double delta seal, refer to Section 6.4.7.
   b. If the assembly uses an O-ring seal, coat the seal groove in the piston with a high temperature lubricant and install a new O-ring seal into the seal groove. Do not remove any excess silicone.
      **NOTE:** Make sure the O-ring seal is not twisted in the seal groove.
      **NOTE:** High temperature lubricant is only used for teflon encapsulated seals.
6. Connect the hot runner to a controller.

**WARNING!**

Sprue heaters must be turned on when manifold heaters are on. Failure to do so could result in generation of dangerous pressure levels in the manifold, resulting in explosion or sudden release of hot resin.

**WARNING!**

Burn hazard – risk of serious injury. To avoid serious burns, wear Personal Protective Equipment (PPE) consisting of a heat-resistant coat, heat-resistant gloves, and a full face shield over safety glasses. Use adequate ventilation for fumes.

**WARNING!**

In the event of water leaking into the hot runner, the nozzle housings must be mechanically cleaned out prior to turning the heaters on.

**WARNING!**

Do not leave the hot manifold unattended. If necessary, leave a sign in a visible location indicating “Danger: Hot, Do Not Touch”.

7. Increase the temperature of the manifold heaters, nozzles, and sprue to a temperature high enough to soften the resin in the melt channels. The Vicat Softening Temperature for the resin type is recommended. Refer to the resin suppliers documentation for more information.

**IMPORTANT!**

Do not allow the nozzles to overheat or degraded material will have to be cleaned out of the nozzle housing before the valve stem can be installed.

8. Lock out and tag the machine. Refer to Section 1.9.

**CAUTION!**

Do not allow the hot runner to cool off during the valve stem installation process. A valve stem could be bent during installation if the system cools.

9. Carefully guide the completed valve stem and piston assembly into the manifold bushing, gently pushing by hand until the piston bottoms out on the manifold bushing.

10. Place the piston cylinder over the valve stem piston assembly in the manifold bushing. Make sure the piston cylinder is bottomed out on the backup pad.
**NOTE:** The piston cylinder is installed during the double delta seal installation procedure.

11. Allow the manifold to cool to room temperature (< 25 °C or < 77 °F) once the valve stem and piston assemblies have been installed.

### 6.20.3 Installing the Double Delta Seal

To install the double delta seal on valve gate pistons, do the following:

**NOTE:** This procedure is for systems that have been used to process resin. For systems that do not contain resin in the manifolds and melt channels, refer to Section 4.8.5.

**NOTE:** The following procedure uses the double delta piston seal installation tool. Refer to Section 6.4.7 for part numbers.

1. Remove the clamp or injection manifold plate. Refer to Section 6.7.
2. If necessary, remove the center air plate. Refer to Section 6.8.1.
3. Remove the piston cylinders and inspect them for damage. Replace as necessary.

4. Clean all piston cylinders.

**CAUTION!**

*Do not damage the pistons when removing the seals. This will later diminish the integrity of the new seals.*

5. Remove the outer and inner seals from the pistons.
6. Remove any loose debris or grease from the pistons and surrounding area.

**IMPORTANT!**

Pistons should be cleaned before new seals are installed. Any debris or grease present will shorten the service life of the seals.
7. Install the interior O-ring seal into the seal groove by rolling it over the piston. No tools are required.

8. Place the seal installation tool on top of the piston.

9. Install the outer seal by pushing the seal over the seal installation tool until it sits over the O-ring seal.

10. Remove the seal installation tool.

11. Side the seal compression tool over the piston to compress the seals. This will prevent them from getting damaged during the installation of the piston cylinder.

12. Inspect the piston assembly for damage, debris, or grease.

   **NOTE:** Install the piston cylinders shortly after the seal compression tool has been removed to make the installation easier.

13. Install the piston cylinders.
6.21 Manifold Heaters and Manifold Thermocouples

The following procedures describe how to maintain manifold heaters and manifold thermocouples.

6.21.1 Manifold Heaters

The manifold(s) is heated by an electrically heated tube referred to as the manifold heater. Manifold heaters are terminated at each end by a protective insulator bushing and connector held to the lead wires with two socket head set screws and a high temperature silicone insulation boot.

![Manifold Heater Electrical Assembly](image)

**Figure 6-72  Manifold Heater Electrical Assembly**

1. Manifold Heater Lead Wire  
2. Socket Set Screw Flat (M4 x 6 Long)  
3. Manifold Heater Wire Connector 
4. Protective Insulator Bushing  
5. Manifold Heater

**CAUTION!**

Refer to Section 6.21.1.2 if the manifold heater will be cleaned using a fluidized bed process.

6.21.1.1 Testing and Inspecting the Manifold Heater

To test and inspect a manifold heater, do the following:

1. Using a multimeter set to ohms, measure the resistance through each manifold heater zone. Refer to the electrical schematic(s) in Chapter 9 for the ohms measurements required for each zone. The normal tolerance for manifold heaters is +10% or -5%.

**CAUTION!**

A common problem with manifold heaters is moisture absorption due to the hygroscopic nature of the insulation. A heater with a low case to center conductor insulation reading (< 10K ohms) should be baked out and retested to determine if moisture was the cause. Contact your Husky Regional Service and Sales office for more information.
2. Using a multimeter set to ohms, measure the resistance through each lead to ground. A measurement from either lead to ground that is below 100K ohms indicates a short to ground. A measurement from 100 kilohms to 1 megohms is often associated with a wet heater. A measurement greater than 1 megohms is good.

**CAUTION!**

**Lead wires must be replaced if the lead wire resistance is greater than 0.1 ohms.**

3. Check for loose terminal connections, damaged or melted insulation, and signs of overheating.

4. Inspect the manifold heater for nicks, burrs, cracks, or other damage. Replace or repair as required.

5. Inspect the lead wires for damage. Replace damaged lead wires with Teflon or fiberglass insulation wire of the same gage and insulation rating. For Teflon insulation wires, the insulation rating should be 250 °C (482 °F). For fiberglass insulation wires, the insulation rating should be 450 °C (842 °F).

**CAUTION!**

**Never use a heater lead wire that has bare insulation or a low resistance reading.**

NOTE: Contact your Husky Regional Service or Sales office if a manifold heater must be replaced.

### 6.21.1.2 Removing the Protective Insulator Bushing for Fluidized Bed Cleaning

The protective insulator bushing must be removed before the manifold heater is run through a “fluidized bed” cleaning process. The temperatures experienced during a “fluidized bed” cleaning process can reach approximately 454 °C (850 °F), which would destroy the protective insulator bushing.

To remove the protective insulator bushing, twist the bushing in a clockwise or counterclockwise direction approximately 1/4 turn to “break” the adhesive used to attach it.

NOTE: The protective insulator bushing must be re-installed before the manifold lead wire is attached to protect the manifold heater end. It is not necessary to apply new adhesive when the bushing is re-installed.
6.21.2 Manifold Thermocouples

Manifold thermocouple assemblies include a main thermocouple wire and a spare thermocouple wire. The main thermocouple wire is connected to the electrical connector, while the spare thermocouple wire is left loose inside the electrical connector box.

The spare thermocouple wire can be used to replace the main thermocouple wire at the electrical connector should the main wire fail during operation. This allows you to quickly repair the hot runner without having to completely disassemble it.

The spare thermocouple wire is indicated by an "S" that follows the zone number on the wire label.

**NOTE:** Refer to the thermocouple test procedures in Section 6.23.

6.22 Testing the Electrical System

After any periodic maintenance or service of the hot runner, and before the hot runner is assembled to the cavity plate, a pre-assembly warm up and electrical test should be performed.

To perform an electrical test on the hot runner, do the following:

1. Check the hot runner for electrical shorts or open circuits with an ohmmeter. Use electrical schematic(s) included in Chapter 9 to identify each zone.

   **NOTE:** The electrical schematic(s) references all information for specific wire and heater resistances.

   **NOTE:** To establish proper polarity when connecting thermocouples, follow the electrical schematic(s) in Chapter 9. For J-type thermocouples, the white wire is positive (+) and the red wire is negative (-). This wire color coding follows the ANSI J-Type North American Standard. The color coding and wire composition for J-type thermocouples in other parts of the world may be different and produce different readings.
2. Verify that all circuits are correct.
3. Connect the hot runner to the controller.

   **NOTE:** Some controllers are built into the injection molding machine, while others are external.

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**WARNING!**

Explosion hazard - risk of serious injury. Molten material at high pressure can be present. Wear Personal Protective Equipment (PPE). Clear the area of all non-essential personnel. Never purge the barrel when the nozzle tip is outside the purge guard.

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**WARNING!**

Burn Hazard. Manifolds, nozzles, and all other hot runner components stay hot for long periods after heat has been shut off. Wear protective equipment and place a warning sign if leaving nozzles unattended.

---

4. Turn on and test each heater zone one at a time, starting with the smallest mass zones (i.e. nozzles) and ending with the largest mass zones (i.e. manifolds). The zones should be allowed to rise 10 to 17 °C (50 to 63 °F) above room temperature.

5. When all zones have reached 10 to 17 °C (50 to 63 °F) above room temperature, heat all manifolds to 60 °C (140 °F) to make sure the zones are working properly.

---

**CAUTION!**

The nozzles must be at room temperature before closing the mold. Severe damage to the nozzle or cavity plate sealing diameters could result if the mold is closed when the nozzles are hot.

---

6. Where applicable, install the cavity plate retaining screws and torque as specified in the Mold Manual.

7. Check electrical circuits with an ohmmeter to make sure that no wires have been shorted during assembly.

8. The hot runner and/or cavity plate are now ready for installation into the machine.

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**IMPORTANT!**

If the melt channels in the hot runner are filled with resin and the hot runner is not fully assembled, do not increase the hot runner temperature to full operating temperature. The resin will leak between the shut-off areas.
6.23 Thermocouples

The following procedures describe how to perform electrical, mechanical and functional tests on thermocouples.

CAUTION!

Thermocouple wires should never be spliced. This could result in faulty temperature readings and possible over heating of the nozzle heater and other components.

6.23.1 Thermocouple Electrical Test

Test the electrical resistance in thermocouples as follows:

NOTE: The following electrical test is for J-type thermocouples only.

1. Using a multimeter set to Ohms, measure the resistance between the two thermocouple leads. Specifically, hold the red meter probe on the white (+) lead and hold the black meter probe on the red (-) lead. The resistance from lead-to-lead should be less than 30 Ohms.

NOTE: Actual resistances may vary with lead length, however, most thermocouples will read from 6-12 Ohms.

NOTE: The resistance for all thermocouples of a specific type (manifold or nozzle heater) should be within 25% of each other.

NOTE: The positive (+) lead wire on K-type thermocouples is yellow and the negative (-) lead wire is red. K-type thermocouples are rarely used in Husky hot runners.

2. Repeat the previous step for all leads.

3. Using the multimeter, measure the resistance between the white (+) leads and ground. Specifically, hold the red meter probe on the white (+) lead and the black meter probe on the manifold plate. The resistance reading should be 25% of the lead-to-lead reading for that lead.

4. Repeat the previous step for all leads.

5. Using the multimeter, measure the resistance between the red (-) leads and ground. Specifically, hold the red meter probe on the red (-) lead and the black meter probe on the manifold plate. The resistance reading should be 80% of the lead-to-lead reading for that lead.

6. Repeat the previous step for all leads.

6.23.2 Thermocouple Mechanical Test

Inspect each thermocouple for the following and replace or correct as required:

- Mechanical damage on the metal sheath, such as nicks, kinks, or cracks
- Pinched or damaged lead wires
- Damage on molded transition
6.23.3 Thermocouple Functional Test

The following procedures describe how to perform a functional test on a thermocouple with a pyrometer or multimeter.

6.23.3.1 With a Pyrometer

To perform a functional test with a pyrometer, do the following:

1. Connect the thermocouple leads to a pyrometer.
2. Insert the thermocouple into a container of boiling water along with a thermometer.
3. Set the pyrometer to 100 °C (212 °F) and verify the temperature at the thermocouple with the thermometer.

6.23.3.2 With a Multimeter

To perform a functional test with a multimeter, do the following:

NOTE: This procedure is to be used if a pyrometer is unavailable.

1. Using a multimeter set to Ohms, place the red meter probe on the white (+) lead and the black meter lead on the red (-) lead.
2. Insert the thermocouple into a container of boiling water and monitor the resistance reading. The resistance should increase as the temperature of the thermocouple increases.

- Thermocouple is making good contact with the heated surface
- Proper ferrules (orange) have been installed
Chapter 7  Split Sprue Bar Assembly, Maintenance and Troubleshooting

This chapter describes how to assemble, maintain and troubleshoot Ultra stack hot runners equipped with a split sprue bar.

7.1  General Information

The split sprue bar (SSB) is a stack mold solution that delivers melt from the machine nozzle to the manifold of a stack mold hot runner. It has the following benefits over standard sprue bars:

- Eliminates the need for mechanical shutoff on injection units
- Open access for part handling
- No drool or stringing
- Operator friendly molding surface accessibility
- Wide operating window

The SSB is available in either an Inline or Offset version. The Inline (Figure 7-1) directs plastic through the center of the mold. The offset version (Figure 7-2) directs it to the top, bottom or sides via a transfer manifold on the stationary side.

The SSB uses a sliding and fixed nozzle combination. These nozzles can be located on either half of the mold.
7.2 Special Tools Required

Stem lapping tools (supplied with every new system):

- Nozzle Mount 4345224, Qty 1
- Stem Guide 4345358, Qty 1
- SHCS 600599, Qty 2
Coarse Diamond Compound (Recommend HPN 4606820, Medium Cut Heavy #45 Brown 5g or similar)
High Finish Diamond Compound (Recommend HPN 4606821, high finish heavy #9 green 5g or similar)

7.3 Molder Considerations

All Molders must understand the following before shooting plastic:

- There are a number of unique components in each Split Sprue Bar Stack Hot Runner. Husky will support the procurement of these items through our Spare Part Centers. However, Husky cannot guarantee rapid delivery in the event of a customer down situation. Therefore, Husky recommends the end user stock at least one of each custom item. Contact your Husky representative for a list/quote of parts that are recommended to have on-hand.
- To obtain the maximum performance from the Husky SSB through process optimization, Husky recommends that each SSB valve stem be controlled by a separate air circuit. This provision should be available on the IMM or Hot Runner controller used with this Hot Runner. During process setup, the center section stem should be set to shut first (after machine decompression) and then the stationary side, 0.2 seconds later. Additional air circuits may be required to control the valve gates in the Hot Runner (if equipped).
- SSB performance relies on proper decompression of the hot runner before the mold opens. If the mold is pressurized during mold open, the pressurized plastic can force its way out of the stem/tip interface. This risk can be minimized with lapping the stem to the tip for a very good fit (done on new systems before leaving Husky), but proper decompression is also essential. The idea is to relieve as much of the pressure as possible before closing the SSB stems, which will then trap the leftover pressure. Often both decompression stroke and a ‘dwell time’ are required. The dwell time allows the plastic farthest away from the injection unit of your machine to catch up. It is NOT instantaneous.
- If possible, reduce the carriage pressure as much as possible during mold open while still maintaining a positive seal. This eliminates the additional stress on the molds stationary half.
- During operation of the SSB, the Molder can expect some performance differences compared to a Standard Sprue Bar.
- Temperature overshoot at the parting line due to shear generated heat through the SSB nozzle tips is normal.
- SSB nozzles engage before the mold is closed. Approximately 1,000 lbf (4,448 Newtons) of load will be generated during the last one millimeter of mold closing stroke. Mold protection may need to be adjusted to compensate/overcome this additional load.
- Do NOT clamp mold after plastic is in system without the SSB thermocouple reading a temperature that is at or above the resins melting point. The SSB sliding nozzle must move freely or damage can occur.
- For Inline split sprue bars only, the machine injection nozzle must have a 14.29 mm (0.56 in) inlet diameter.
7.4 Pre Startup Checklist

**WARNING!**

Hot resin spray hazard – risk of serious injury. Residual pressure may be present in the hot runner and may cause hot resin to spray from the nozzle tips if released. Wear Personal Protective Equipment (PPE) including a face shield over safety glasses, heat resistant gloves and heat resistant clothing whenever entering the mold area.

- High pressure hot plastic could be unexpectedly released from the nozzles or split sprue bar inlet on the moving half during a cycle interruption. During cycle interruption pressure can build in the moving half melt channels due to plastic thermal expansion and gas generation. This creates a hazard if an operator is working in the clamp and the pressure causes the nozzle to unexpectedly discharge plastic.

**NOTE:** Measurements can be taken cold, but if plastic is in the hot runner, they must be taken hot.

1. Make sure the warning plates provided with the split sprue bar are installed on the mold.
2. Verify the SSB nozzle tip height and stem protrusion to the SSB Assembly and Installation drawing. Refer to Chapter 9.
   The nozzle tip height is crucial because it determines how much SSB spring compression occurs when the mold closes. This affects performance, mold closing force and life of the SSB components.
3. Follow the recommendations on valve gate air setup in Section 3.5.2 and Section 3.6.
4. Turn on mold cooling.
5. Turn hot runner heats on and after the SSB zones have reached the resin melting temperature clamp up the mold. Allow the heats to soak for an additional 15 minutes before starting a cycle.
6. Verify both SSB stems are actuating at operating temperature and timing is set correctly.
7. At operating temperature the stems should move swiftly with no sluggish movement. If they do not, refer to Section 7.13.
8. Optimal valve stem Open timing is to open all stems just before injection starts. They must open AFTER the mold is closed.
9. Optimal valve stem CLOSE timing:
   - Stems on Molded Part Gate (if applicable) = end of hold
   - SSB moving side stem = After decompression

**WARNING!**

Do not clamp mold if plastic is in the hot runner and heats are not at resin melting temperature. Damage can occur to the SSB sliding nozzle.
SSB stationary side stem = 0.2 seconds after SSB moving side stem (must be before mold opens)

10. For offset systems only, verify the offset spring pack (Figure 7-3) has been installed in the mold. Refer to the Section View Assembly drawing located in Chapter 9 for more information.

![Offset Spring Pack](image)

**Figure 7-3 Offset Spring Pack**

### 7.5 Startup Procedure

After performing the Pre Start-up Checklist (Section 7.4), the system is ready to run.

Along with the valve gate timing that was already configured, decompression is essential for performance of the system, especially when high injection pressures are being used to fill the cavity. When the split sprue bar valve stems shut, plastic is trapped inside the hot runner. If the hot runner is pressurized too much during mold open, the pressurized plastic can force its way out of the stem/tip interface. You must relieve as much of this pressure as possible before closing the SSB stems, which will then trap the leftover pressure. Often both a decompression stroke and a *dwell time* are required. The dwell time allows the plastic farthest away from the injection unit of your machine to catch up. It is NOT instantaneous. More decompression is required for systems with very high injection pressure. Lower injection pressure often requires no decompression.

There are two ways to achieve decompression when it is required:

1. If the machine has a nozzle shutoff:
   a. Open all valve stems.
   b. Inject/pack/hold.
   c. Close hot runner drop valve stems (if applicable).
   d. Screw pulls back after hold and pauses.
   e. Close SSB Center Stem.
   f. Close SSB stationary stem.
   g. IMM shutoff nozzle closes.
   h. Screw rotates for recovery.

2. If the machine does not have a nozzle shutoff:
   a. Open all valve stems.
   b. Inject/pack/hold.
7.6 Maintenance

Table 7-1  SSB Recommended Component Replacement Schedule

<table>
<thead>
<tr>
<th>Interval</th>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 Million Cycles</td>
<td>SSB piston seals</td>
</tr>
<tr>
<td>4 Million Cycles</td>
<td>SSB sliding nozzle and fixed nozzle tip</td>
</tr>
<tr>
<td>4 Million Cycles</td>
<td>SSB springs</td>
</tr>
<tr>
<td>4 Million Cycles</td>
<td>SSB wedge collars</td>
</tr>
</tbody>
</table>

7.7 Removing the Split Sprue Bar From the Mold (Inline VG Only)

The split sprue bar for inline valve gate systems must be removed when cleaning or changing seals and other components.

1. Lock out and tag the machine. Refer to Section 1.9.
2. Turn off the air supply and disconnect the hoses.
3. If the stationary side of the mold is still in the machine it must be removed. Remove the purge collar if it is still attached before pulling out the mold. To do this, rotate the collar until it disengages from the slots.
4. Disconnect the heater and thermocouple wires from the electrical connectors and remove them from the wire channels.

5. Remove the four SHCS that secure the locating ring.

6. Remove the four SHCS that hold the unit to the plates.

7. Slide the unit out of the plates.
7.8 Changing the Piston Seals on the Manifold Side Without Disassembling Plates

7.8.1 Disassembly

1. The mold (usually cavity) plate that covers the access hole will need to be removed. In most cases, this can be done in the molding machine. The manifold plate that holds the SSB cylinder should then be exposed.

2. Remove the four SHCS securing the cylinder to the manifold.

3. Remove the cylinder from the plates by using pliers and grabbing on the webbing in the center of the cylinder. Two taps are also located on the cylinder with which the SHCS removed in step 2 can be threaded into and used to pull on the cylinder.

4. Remove the four SHCS from the piston. To avoid the piston rotating while removing the bolts, use a hex bit located in the center with your other hand.
5. With the piston out of the mold, remove the two retaining clips.

6. Slide the piston seals off. Use brass or another soft material if they are difficult to remove.
7. Remove the piston spacer.
8. Clean all parts, especially the piston. If any plastic is seen around valve stem, clean out as much as possible.

**NOTE:** DO NOT try to pull the valve stem out. It is a reverse taper and must be pulled from the nozzle side.

---

## 7.8.2 Reassembly

1. Install the new seals in the correct orientation. DO NOT use any lubricant on the seals.
2. Install the two retaining clips.

3. Install a new O-ring on the piston spacer and place it over the stem.

4. Insert the piston over the stem head and spacer. Apply high temperature anti-seize to the SHCS threads and under the head. Thread the bolts through the piston, into the
spacer and torque to the value specified on the Section View Assembly drawing. Refer to Chapter 9.

5. Check the two cylinder O-rings with a straight edge to determine if they are damaged or worn. If no gap exists or there is obvious damage, replace them and lubricate with silicone or equivalent.

6. Install the cylinder being careful to push it on straight without tilting it, which could cause seal damage. Install the bolts and torque to the value specified on the Section View Assembly drawing. Refer to Chapter 9.

7. Apply air pressure to the stem closed and then the open air ports to check for leaks and watch for smooth stem movement (clean units only). No air should be heard in the closed and a small amount in the open. If the air leakage is > 5 LPM in the open, then a seal or sealing surface is damaged. Remove cylinder and check.

7.9 Replacing Heaters and Thermocouples

7.9.1 Replacing the Sprue and Guide Body Heaters/Thermocouples (Inline VG)

1. Lock out and tag the machine. Refer to Section 1.9.
2. Remove the inline valve gate split sprue bar from the mold. Refer to Section 7.7.
3. Remove the wire cover from the sprue body.
4. If only replacing a thermocouple, do the following:

5. Remove the thermocouple.

6. Make sure the thermocouple hole/slot is clean of plastic and debris.

7. Install a new thermocouple into the hole and gently bend it towards the slot. Use a rubber tipped mallet to gently push/tap the wire into the slot.

8. Insert the retaining screw and tighten. Label the wire leads according to the Section View Assembly drawing in Chapter 9.

9. Remove the wire and barrel connectors from the heater being replaced.
10. Remove the failed heater from the dove-tailed slot by gently prying it out using brass or another soft tool.

11. There are two different length heaters. Verify the part number (located on one end) on the Section View Assembly drawing in Chapter 9.

12. Find the white marking on the heater that designates its center and bend the heater by hand to match the shape in the center of the groove.

13. With the heater positioned directly over the groove, gently tap it in with a rubber mallet. Be careful to start in the center and work outwards. Make sure the heater is completely in the groove before moving the mallet to the next section. Bend the heater by hand to make sure it is directly over the groove before hitting it with the mallet.
14. Remove the rubber piece on the heater lead.

15. Clip the heater leads if a gap exists when installing the barrel connectors so they fit snugly against the ceramic sleeve.

16. Tighten barrel connectors onto the heater lead and install the wire. Refer to Figure 7-17.
17. Slide the insulating sleeve over the heater. If it is deteriorated, replace the sleeve with a new piece approximately 30 cm (12 in) long. The ceramic sleeve should be covered.

18. Position the heater leads as shown in Figure 7-22.

19. Install the wire cover. Refer to Figure 7-15.

20. Assemble the unit back into the mold, being careful not to pinch any of the nozzle heater/thermocouple wires. Refer to Section 7.7 and reverse the procedure.

### 7.9.2 Replacing the Nozzle Heaters/Thermocouples (Inline VG)

1. Lock out and tag the machine. Refer to Section 1.9.

2. Remove the inline valve gate split sprue bar from the mold. Refer to Section 7.7.

**WARNING!**

*Burn hazard – risk of serious injury. To avoid serious burns, wear Personal Protective Equipment (PPE) consisting of a heat-resistant coat, heat-resistant gloves, and a full face shield over safety glasses. Use adequate ventilation for fumes.*

3. If the hot runner has the sliding nozzle on the inline side, it must be removed. If plastic is in the system, heat the nozzle using a hot runner controller (if equipped). Carefully remove the sliding nozzle with all springs and wedge seals attached. If they have plastic on them, clean them off.

**WARNING!**

*Burn and fire hazard. Use of an open flame to remove resin can produce harmful gases (depending on the resin type), damage components, and increase the risk of fire. Only use open flames sparingly and in a controlled environment.*

Alternatively, if a controller is not equipped, slide the nozzle heaters down, remove the thermocouple and heat the nozzle with a torch. Be careful not to touch the heaters or thermocouples with the flame. Carefully remove the sliding nozzle with all springs and wedge seals attached. If they have plastic on them, clean them off.
4. Replace the damaged heater or thermocouple, being careful to have wires on the same side as the sprue body leads. There is a small cutout in the plate that these leads must exit on.

![Figure 7-23 Cutout in Plate for Heater Leads](image)

1. Cutout

5. Insert the thermocouple into the hole and bend it around the nozzle, gently tapping it into the groove with a rubber mallet as you go. The wire should exit near where it started and then continue through the slot in the heater. Do not pinch the thermocouple with the heater. Be sure to label the wire leads per the Electrical Drawing. Refer to Chapter 9.

![Figure 7-24 Nozzle Heater and Thermocouple Assembly](image)


6. Place an insulating sleeve over the thermocouple to protect the wires from damage.
7. Use a metal band or wire to gently hold the heater/thermocouple leads to the nozzle housing being careful that they align with the slot in the plate.

8. Assemble the unit back into the mold, being careful not to pinch any of the nozzle heater/thermocouple wires. Refer to Section 7.7 and reverse the procedure.

### 7.9.3 Manifold Side VG – Nozzle Heater/Thermocouple Replacement

**NOTE:** This procedure can be done in the machine for most split sprue bar designs.

1. Lock out and tag the machine. Refer to Section 1.9.
2. Latch the cavity plate over to expose the split sprue bar nozzle.

---

**WARNING!**

Burn hazard – risk of serious injury. To avoid serious burns, wear Personal Protective Equipment (PPE) consisting of a heat-resistant coat, heat-resistant gloves, and a full face shield over safety glasses. Use adequate ventilation for fumes.

3. If the hot runner has the sliding nozzle on the inline side, it must be removed. If plastic is in the system, heat the nozzle using a hot runner controller (if equipped). Carefully
remove the sliding nozzle with all springs and wedge seals attached. If they have plastic on them, clean them off.

**WARNING!**

*Burn and fire hazard. Use of an open flame to remove resin can produce harmful gases (depending on the resin type), damage components, and increase the risk of fire. Only use open flames sparingly and in a controlled environment.*

Alternatively, if a controller is not equipped, slide the nozzle heaters down, remove the thermocouple and heat the nozzle with a torch. Be careful not to touch the heaters or thermocouples with the flame. Carefully remove the sliding nozzle with all springs and wedge seals attached. If they have plastic on them, clean them off.

4. Remove the damaged heater or thermocouple.

5. Install a new heater or thermocouple. If the thermocouple is being replaced or reassembled, place an insulated sleeve over the lead wire and insert it into the hole, bending it around the nozzle. Gently tap it into the groove with a rubber mallet as you go. The wire should exit near where it started and then continue through the slot in the heater. Do not pinch the thermocouple with the heater. Be sure to label the wire leads per the Electrical Drawing. Refer to Chapter 9.

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**Figure 7-27 Nozzle Heater and Thermocouple Assembly**


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### 7.10 Assembling/Disassembly the Inline Side VG Split Sprue Bar

#### 7.10.1 Assembly

To assemble the inline side of a valve gate split sprue bar, reverse the procedure in Section 7.10.2 and refer to the following assembly notes:

- Apply high temperature anti-seize to all SHCS threads and head seats.
• Tighten all SHCS to torque listed on SSB Assembly & Installation drawing. Refer to Chapter 9.
• Carefully inspect all surfaces that seal plastic to ensure they do not have any damage. Any plastic or carbon build-up on these surfaces must be completely removed to prevent leakage.
• Crush rings MUST be replaced every time they are unloaded.
• DO NOT use lubricant on piston seals.
• After installing the unit into the plates, measure the nozzle height and stem protrusion on the SSB Assembly & Installation drawing. Refer to Chapter 9.

7.10.2 Disassembly

1. If the unit is installed in the mold, remove the inline valve gate split sprue bar from the mold. Refer to Section 7.7.

WARNING!
Burn hazard – risk of serious injury. To avoid serious burns, wear Personal Protective Equipment (PPE) consisting of a heat-resistant coat, heat-resistant gloves, and a full face shield over safety glasses. Use adequate ventilation for fumes.

2. If the hot runner has the sliding nozzle on the inline side, it must be removed. If plastic is in the system, heat the nozzle using a hot runner controller (if equipped). Carefully remove the sliding nozzle with all springs and wedge seals attached. If they have plastic on them, clean them off.

WARNING!
Burn and fire hazard. Use of an open flame to remove resin can produce harmful gases (depending on the resin type), damage components, and increase the risk of fire. Only use open flames sparingly and in a controlled environment.

Alternatively, if a controller is not equipped, slide the nozzle heaters down, remove the thermocouple and heat the nozzle with a torch. Be careful not to touch the heaters or
thermocouples with the flame. Carefully remove the sliding nozzle with all springs and wedge seals attached. If they have plastic on them, clean them off.

3. If the stem, nozzle housing, locating insulator or guide body are being replaced, remove the nozzle heaters/thermocouples.

4. Secure the nozzle housing or guide body in a vise using soft jaws to prevent damage.
   
   **NOTE:** Only perform step 5 and step 6 if the sprue bushing or sprue body is being replaced. Otherwise, proceed to step 7.

5. Remove the two SHCS that secure the drool guard. Pull the drool guard off.

6. Remove the four SHCS that secure the sprue bushing. Gently pry it off using the two slots.

7. Remove the two BHCS that secure the wire cover to the sprue body. Remove the wire cover.

8. Label all wires and terminals where they connect at the heater or thermocouple to help when reassembling. Disconnect the wires.

9. Remove the four SHCS that connect the guide and sprue bodies. Pull the two pieces apart. You may need to tap the sprue body with a rubber mallet to break the two plastic slugs.

10. Remove the four SHCS that secure the air plate to the cylinder.
    
    **NOTE:** If the cylinder is new, install two set screws with Teflon tape or pipe dope.

11. Remove the four SHCS that hold the cylinder to the guide body. Gently pull the cylinder straight off, being careful not to lose the four spacers.
NOTE: If reassembling, air test immediately after torquing the cylinder SHCS. Stem closed should have no air leakage. Stem open may have a little (<5 LPM), but it should be coming from the weepage fitting. Remove the cylinder and check for piston seal damage for air leakage >5 LPM.

Figure 7-30  Spacer

Figure 7-31  Actuating Valve Stems
1. Stem Closed Port  2. Stem Open Port

Figure 7-32  Weepage Fitting

NOTE: Only perform step 12 to step 16 if you need to replace the piston seals. Otherwise, proceed to step 17.
12. Remove the four SHCS from the piston. To avoid the piston rotating while removing the SHCS, utilize the hex located in the pistons center by securing it with an allen wrench/socket.

13. Remove the two retaining clips.

14. Slide the piston seals off. Use brass or another soft material if they are difficult to remove.

15. Clean all parts, especially the piston.

16. Install two new piston seals in the correct orientation and the two retaining clips.

17. Remove the piston spacer and replace the seal if needed.
NOTE: DO NOT try to pull the valve stem out. It is a reverse taper and must be pulled from the nozzle side.

NOTE: If replacing the valve stem, it must be lapped to the nozzle. Refer to Section 7.12.

18. Remove the four SHCS that secure the piston stop and housing to the guide body. Remove the piston stop.

WARNING!
Burn and fire hazard. Use of an open flame to remove resin can produce harmful gases (depending on the resin type), damage components, and increase the risk of fire. Only use open flames sparingly and in a controlled environment.

WARNING!
Burn hazard – risk of serious injury. To avoid serious burns, wear Personal Protective Equipment (PPE) consisting of a heat-resistant coat, heat-resistant gloves, and a full face shield over safety glasses. Use adequate ventilation for fumes.

19. If plastic is in the system, heat the nozzle using a hot runner controller (if equipped) or torch. If using a torch, be careful not to have the flame touch the heaters or
thermocouples. Carefully remove the guide body with the valve stem attached. Now heat the guide body (do not touch heater/thermocouple with the flame) and pull the stem out through the nozzle side. If it does not come out easily, tap it with a brass hammer or rod. Do not force it out. If it does not come out, it likely requires more heat.

**NOTE:** If replacing the nozzle, it must be lapped to the valve stem. Refer to the Lapping Procedure section of the manual.

20. Remove the locating insulator from the nozzle.

### 7.11 Assembling/Disassembling the Manifold Side VG Split Sprue Bar

**NOTE:** The following procedure is for assembly of the unit. To disassemble it, follow the procedure in reverse.

**WARNING!**

Before servicing, turn off power to hot runner controller at main disconnect.

#### 7.11.1 Assembly

Before assembling the manifold side of a valve gate split sprue bar, refer to the following assembly notes:

- Apply high temperature anti-seize to all SHCS threads and head seats.

- Tighten all SHCS to torque listed on *SSB Assembly & Installation* drawing. Refer to Chapter 9.

- Carefully inspect all surfaces that seal plastic to ensure they do not have any damage. Any plastic or carbon build-up on these surfaces must be completely removed to prevent leakage.

- Crush rings MUST be replaced every time they are unloaded.
• DO NOT use lubricant on piston seals.
• After installing the unit into the plates, measure the nozzle height and stem protrusion on the SSB Assembly & Installation drawing. Refer to Chapter 9.

To assemble the manifold side of a valve gate split sprue bar, do the following:
1. Assemble the manifold clamp and injection manifold plates. Refer to Section 4.3.
2. Assemble the nozzle stacks. Refer to Section 4.4.
3. Finish manifold assemblies
4. For thermal gate systems only, assemble and install the backup insulators. Refer to Section 4.5.1.
5. For valve gate systems only, assemble and install the manifold bushings.
   • For systems that use threaded manifold bushings, refer to Section 4.5.2.1.
   • For systems that use threadless manifold bushings, refer to Section 4.5.2.2.
   • For systems that use Ultra 500 VGSX nozzles, refer to Section 4.5.2.3.
6. Assemble the backup pad on the cross manifold. Refer to Section 7.11.1.1.
7. Assemble and install the manifold or manifolds (if applicable, be very careful not to damage the backup pad and cylinder). Refer to Section 4.5.4.
8. Assemble and install the cross manifolds being very careful to not damage the backup pad and cylinder, if applicable. Refer to Section 4.5.5.
9. Measure the preload for each manifold.
   • For Thermal Gate Systems, refer to Section 4.6.1.
   • For Ultra 500, Ultra 750 or Ultra 1000 VGLX/EX nozzles, refer to Section 4.6.2.
   • For Ultra 500 VGSX, refer to Section 4.6.3.

10. For valve gate systems only, assemble the valve stems and pistons.
    • For systems that use Ultra 500 VGSX nozzles, refer to Section 4.8.2.
    • For systems that use Ultra 500 and Ultra 750 VGLX/EX nozzles, refer to Section 4.8.3.
    • For systems that use Ultra 1000 VGLX/EX nozzles, refer to Section 4.8.4.

11. For back-to-back systems only, assemble the center air plate. Refer to Section 4.10.2.1.

12. Assemble the clamp, center air (if applicable), and injection plates together.
    • For thermal gate or valve gate systems, refer to Section 4.10.1.
    • For back-to-back valve gate systems, refer to Section 4.10.2.

13. Test the split sprue bar and other valve gates (if applicable) for any air leaks.

14. Assemble the nozzle tips and heaters.
    • For systems with Ultra 500 nozzles and copper heaters, refer to Section 4.11.2.2.
    • For systems with Ultra 500, Ultra 750, Ultra 1000 nozzles and Ultra heaters, refer to Section 4.11.2.3.
    • For systems that use Ultra 500, Ultra 750, or Ultra 1000 nozzles and Bi-metal heaters, refer to Section 4.11.2.4.

15. Assemble the split sprue bar nozzle.

7.11.1 Assembling the Split Sprue Bar Cross Manifold

To assemble the split sprue bar into the cross manifold, do the following:

1. Make sure the manifold bushing is installed. If it is not, contact Husky Service.
2. Install new inner and outer crush rings on the manifold bushing.

3. Install a new air seal crush ring
   
   **NOTE:** Do NOT reuse crush rings. Every time they are unloaded they must be replaced or leakage will occur.

4. Install the backup pad.

5. Install the retaining clip.

6. Install the valve stem from the manifold bushing side. It should be easily pushed through the bushing with one hand. If it does not fit, stop and clean the manifold bushing hole.
   
   **NOTE:** If replacing the valve stem, it must be lapped to the nozzle. Refer to Section 7.12.

7. Install the piston and cylinder. Refer to Section 7.8.

### 7.11.1.2 Assembling the Split Sprue Bar Manifold Side Nozzle

**NOTE:** All split sprue bars have a sliding and fixed nozzle. The sliding nozzle can be located on either side of parting line, depending on how it was designed. Refer to Section 7.1 for a description and the Section View Assembly in Chapter 9.

**NOTE:** Be very careful with the sliding nozzle. It has a delicate edge and precision fit to the mating nozzle housing.
1. Make sure the nozzle housing is clean and free of plastic on the outside heating surface, TC groove/hole and mating surface to the manifold.

2. Install the two springs over the nozzle.

3. Install the nozzle spring plate without the SHCS for now.

4. Install the heaters leaving equal gaps between them. The amount of heaters you have depends on the nozzle length. Refer to Section View Assembly drawing in Chapter 9. Before the last heater is placed over the end of the tip, the thermocouple must be installed. Insert the thermocouple into the hole and bend it around the nozzle, gently tapping it into the groove with a rubber mallet as you go. The wire should exit near where it started and then continue through the slot in the heater. Do not pinch the thermocouple with the heater. Be sure to label all of the wire leads per the Electrical Drawing. Refer to Chapter 9.
5. Install the crush ring on the manifold.

6. Place the nozzle assembly over the manifold bushing, being careful to align the slot on the nozzle with the dowel.

7. Apply high temperature anti-seize and tighten the four SHCS that secure the nozzle to the manifold following a sequence (Figure 7-43) and tightening in 30-70-100% torque increments. Refer to the SSB Assembly and Installation drawing in Chapter 9 for torque value.

8. If your system has a sliding nozzle on manifold side, assemble the SSB sliding nozzle and take the following measurements during assembly:
   
   a. Pressurize the valve stem closed and measure the stem position and nozzle height to either the manifold plate or cavity plate surface. Refer to the SSB Assembly and Installation drawing in Chapter 9 for dimension specifications.
b. Place the six springs over the sliding nozzle being careful to orient them correctly.

c. Place the wedge and collar seals over the nozzle.

d. Insert the sliding nozzle assembly into the receiving nozzle, being careful not to damage the delicate end.

**NOTE:** If replacing the nozzle, it must be lapped to the valve stem. Refer to the Section 7.12.

9. Assemble the cavity plate without the split sprue bar nozzle cover.

10. If the system has a sliding nozzle on manifold side, do the following:

   a. Pressurize the stem open and measure the distance from the nozzle (near the stem hole) to the cavity plate surface that will be under tonnage.
b. Install the four SHCS that secure the nozzle cover to the cavity plate following a sequence and tightening in 30-70-100% torque increments.

c. With stem still pressurized open, re-measure the distance from the nozzle (near the stem hole) to the cavity plate surface that will be under tonnage.

d. Pressurize stem closed and measure the stem protrusion from stem face to nozzle face just outside of the stem hole.
7.12 Lapping

The split sprue bar has valve stems with tapered shutoffs on both sides of the parting line. For top performance these valve stems need to be lapped to the mating nozzle. This creates a good seal to prevent resin from drooling out when the stems are closed and the mold is open. Because the components are lapped before leaving Husky, they are a matched set. If the stem or nozzle is replaced with a new part, they must be re-lapped to maintain top performance. There is one set of lapping tools that work on every split sprue bar configuration and they are supplied with every new stack hot runner that contains a split sprue bar.

7.12.1 Parts Required

Universal stem lapping tool (shipped with every SSB stack hot runner)
- Nozzle Mount 4345224, Qty 1
- Stem Guide 4345358, Qty 1
- SHCS 600599, Qty 2

Coarse Diamond Compound
- Recommend MSC 05652581, Medium Cut Heavy #45 Brown 5G

High Finish Diamond Compound
- Recommend MSC 05652516, High Finish Heavy #9 Green 5G

7.12.2 Procedure

1. Slide the valve stem through the lapping tool. Figure 7-50 shows the possible lapping tool configurations depending on your system.
2. Apply the coarse diamond compound to the end of the stem with the taper ()

3. Slide nozzle into the tool and rotate with fingers while applying downward pressure. Do this for a few minutes.

4. Remove nozzle. Clean end of stem with a rag. Remove stem. Place rag over stem and insert into the nozzle, rotating to clean the debris left from lapping.
5. Reassemble the components and measure the stem protrusion (how far it protrudes past the nozzle face). Compare to the value listed on the assembly drawing. If protrusion is less than value listed on assembly drawing, repeat step 1 to step 4 using coarse diamond compound again. Recheck measurement and repeat if necessary.

6. After measurements are correct, repeat step 1 to step 4 using the high finish diamond compound. This needs to be done only once for a few minutes to smooth the surfaces.

7. When lapping is completed, clean the lapping residue out of nozzle and valve stem using a rag, cotton swab and isopropyl alcohol or mold cleaner. Refer to Figure 7-52.

8. Repeat procedure for all split sprue bar interfaces (reconfigure the universal tool per Figure 7-50).

9. The stem and nozzle are now a matched set. Do not mix them up.

![Figure 7-53 Valve Stem Protrusion](image)

1. Sliding Nozzle Housing  2. Rigid Nozzle Housing
## 7.13 Troubleshooting

<table>
<thead>
<tr>
<th>Problem</th>
<th>Potential Cause</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drooling from SSB tips</td>
<td>Chipped/cracked SSB tip</td>
<td>Clean both tips and visually inspect to see if they are worn or the stems are not making proper contact.</td>
</tr>
<tr>
<td>Stem timing is not correct</td>
<td>The center section SSB stem should close 1st to allow the material to be pushed into the stationary side SSB. Approximately 0.2 seconds later the stationary side stem can be closed. This helps to prevent material from being trapped between the two stems.</td>
<td></td>
</tr>
<tr>
<td>Decompression not sufficient</td>
<td>If high pressures exist in the hot runner when the mold opens, then drooling is likely. These pressures need to be reduced using decompression between hold and recovery. Decompression 'dwell' time may also be required. This is allowing the screw to sit after it pulls back but before rotation and allows the pressure further downstream to be relieved before SSB stems close.</td>
<td></td>
</tr>
<tr>
<td>SSB sliding nozzle seized into the bushing</td>
<td>If the stem seizes in the bushing it may not properly preload with the fixed nozzle at mold close. To check this, remove the SSB nozzle cover with the mold open and measure against the print. The nozzle should push out as the cover is removed. If not, first check the nozzle heater and thermocouple are working properly and the nozzle is heated at or above the melting temperature of the resin.</td>
<td></td>
</tr>
<tr>
<td>Problem</td>
<td>Potential Cause</td>
<td>Solution</td>
</tr>
<tr>
<td>----------------------------------------------</td>
<td>----------------------------------</td>
<td>--------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Plastic leakage into SSB piston area</td>
<td>Reverse taper worn/damaged</td>
<td>The ‘reverse taper’ geometry on the SSB valve stem/bushing helps to create a seal when the stem is in the open position. If this area is damaged then that seal is compromised.</td>
</tr>
<tr>
<td><strong>NOTE:</strong> Purge another color and run for 10 minutes before shutting down to investigate the problem. This makes it easier to pinpoint the origin of the leak.</td>
<td>Reverse taper not touching off</td>
<td>Check for stem/bushing, piston/seal/cylinder damage, etc. Any area that would prevent the stem from coming all the way back.</td>
</tr>
<tr>
<td></td>
<td>Internal crush ring on top of manifold bushing is not sealing.</td>
<td>Replace this crush ring (and any other that is unloaded during the disassembly/assembly process).</td>
</tr>
<tr>
<td>Plastic leakage outside of plates</td>
<td>Crack in the manifold/bushing/etc.</td>
<td>Investigate for cracks near the origin of the leak. If crack is found, contact Husky.</td>
</tr>
<tr>
<td><strong>NOTE:</strong> Purge another color and run for 10 minutes before shutting down to investigate the problem. This makes it easier to pinpoint the origin of the leak.</td>
<td>Crush ring leaking</td>
<td>Replace crush rings as required. (Be sure that any other crush ring that is unloaded during disassembly/assembly is replaced).</td>
</tr>
<tr>
<td></td>
<td>Manifold Plug has backed out</td>
<td>Investigate origin of leak. If plug is leaking, contact Husky.</td>
</tr>
<tr>
<td>Problem</td>
<td>Potential Cause</td>
<td>Solution</td>
</tr>
<tr>
<td>-------------------------</td>
<td>----------------------------------------</td>
<td>------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Sluggish valve stems</td>
<td>Insufficient air supply</td>
<td>Place a pressure gauge in-line on the stem close/open lines of the stem that is having issues. Make sure the gage is as close to the hot runner as possible. Actuate and watch the pressure gage. If the pressure does not rise very quickly and reach at least 80psi, there is an issue. The issue is either: a) sticky solenoid b) insufficient line diameter c) insufficient air volume d) line length too long between solenoid/mold and/or compressor/solenoid e) insufficient air pressure f) blocked airline.</td>
</tr>
<tr>
<td>Stem/bushing issue</td>
<td>The valve stem might be too tight in the bushing. This could have been caused by a) carbon build-up reducing the gap b) foreign matter c) stem or bushing damage.</td>
<td></td>
</tr>
<tr>
<td>Piston/Cylinder/Seal</td>
<td>If the piston or cylinder has damage, they can seize together or cause sluggish stems. The seal can be torn and wedged between the piston/cylinder. The seal could also simply be worn and allowing air to pass by it. This can be checked by pressuring the stems open, removing the closed line and feeling the close port on the hot runner for air flow. If air flow is felt, the piston seal is leaking. A small amount of leakage here is normal. Maximum allowable air leakage in the system is 5 LPM before issues will occur. This can be checked with a flow meter placed in-line with the supply airline.</td>
<td></td>
</tr>
</tbody>
</table>
Chapter 8  Customer Specials and Service Bulletins

This chapter describes special options ordered by the Customer. In some instances, the descriptions here replace the corresponding items in the rest of this manual.

This section also contains any Safety or Service Bulletins pertaining to the Customer’s machine and issued since the last documentation revision. It can serve as a convenient location for storing any such bulletins as may be issued after receiving the equipment.
Chapter 9  Drawings, Schematics and Parts Lists

This section includes reference material required for troubleshooting, assembly, and replacement parts ordering.

Drawings and Schematics

Drawings and schematics provided in this manual include:

- Plan View Assembly Drawing
- Section View Assembly Drawing
- Electrical Schematic
- Gate Detail
- Nameplate Drawing

Parts List

The parts list is the Bill of Material (BOM) for the hot runner assembly. It lists all replaceable hot runner parts by part number and provides a description and quantity for each.

Use the drawings provided in co-ordination with the parts list to identify each part in the hot runner assembly.

Under the terms of the warranty, all parts to be replaced must be returned to Husky for proper credit. Damaged or worn parts are used to continuously improve Husky products by assessing the root cause of the failure. Not providing the damaged or worn part could result in an invoice from Husky for the replacement part.