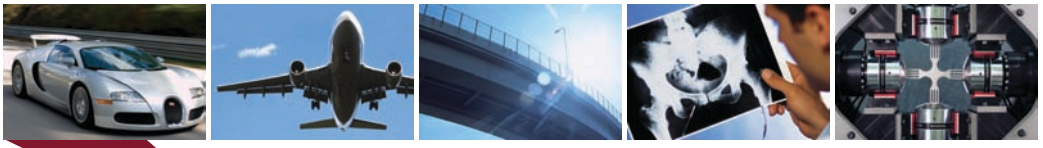

be certain.

Series 505 SilentFlo™ Hydraulic Power Unit Product Information

Model 505.60
Model 505.90
Model 505.120
Model 505.150
Model 505.180

100-006-453 U

Copyright information

Trademark information

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Molykote is a registered trademark of Dow Chemical Corporation.

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100-006-453 S	March 2008
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100-006-453 U	March 2010

Contents

Technical Support

How to Get Technical Support

Start with your manuals

The manuals supplied by MTS provide most of the information you need to use and maintain your equipment. If your equipment includes software, look for online help and README files that contain additional product information.

If you cannot find answers to your technical questions from these sources, you can use the Internet, e-mail, telephone, or fax to contact MTS for assistance.

Technical support methods

MTS provides a full range of support services after your system is installed. If you have any questions about a system or product, contact Technical Support in one of the following ways.

www.mts.com

The web site provides access to our technical support staff by means of an onlineform:

> www.mts.com > Contact MTS > Service & Technical Support button

E-mail

tech.support@mts.com

Telephone

MTS Call Center 800-328-2255
Weekdays 7:00 A.M. to 5:00 P.M., Central Time

Fax

952-937-4515
Please include “Technical Support” in the subject line.

Outside the U.S.

For technical support outside the United States, contact your local sales and service office. For a list of worldwide sales and service locations and contact information, use the Global MTS link at the MTS web site:

> www.mts.com > Global MTS > (choose your region in the right-hand column) > (choose the location closest to you)

Before You Contact MTS

MTS can help you more efficiently if you have the following information available when you contact us for support.

Know your site number and system number

The site number contains your company number and identifies your equipment type (such as material testing or simulation). The number is typically written on a label on your equipment before the system leaves MTS. If you do not know your MTS site number, contact your sales engineer.

> Example site number: 571167

When you have more than one MTS system, the system job number identifies your system. You can find your job number in your order paperwork.

> Example system number: US1.42460

Know information from prior technical assistance

If you have contacted MTS about this problem before, we can recall your file based on the:

- MTS notification number
- Name of the person who helped you

Identify the problem

Describe the problem and know the answers to the following questions:

- How long and how often has the problem occurred?
- Can you reproduce the problem?
- Were any hardware or software changes made to the system before the problem started?
- What are the equipment model numbers?
- What is the controller model (if applicable)?
- What is the system configuration?

Know relevant computer information

For a computer problem, have the following information available:

- Manufacturer's name and model number
- Operating software type and service patch information
- Amount of system memory
- Amount of free space on the hard drive where the application resides
- Current status of hard-drive fragmentation
- Connection status to a corporate network

Know relevant software information

For software application problems, have the following information available:

- The software application's name, version number, build number, and (if available) software patch number. This information can typically be found in the **About** selection in the **Help** menu.
- The names of other applications on your computer, such as:
  - Anti-virus software
  - Screen savers
  - Keyboard enhancers
  - Print spoolers
  - Messaging applications

If You Contact MTS by Phone

A Call Center agent registers your call before connecting you with a technical support specialist. The agent asks you for your:

- Site number
- Name
- Company name
- Company address
- Phone number where you can be reached

If your issue has a notification number, please provide that number. A new issue will be assigned a unique notification number.

Identify system type

To enable the Call Center agent to connect you with the most qualified technical support specialist available, identify your system as one of the following types:

- Electromechanical material test system
- Hydromechanical material test system
- Vehicle test system
- Vehicle component test system
- Aero test system

Be prepared to troubleshoot

Prepare to perform troubleshooting while on the phone:

- Call from a telephone close to the system so that you can implement suggestions made over the phone.
- Have the original operating and application software media available.
- If you are not familiar with all aspects of the equipment operation, have an experienced user nearby to assist you.

Write down relevant information

In case Technical Support must call you:

- Verify the notification number.
- Record the name of the person who helped you.
- Write down any specific instructions.

After you call

MTS logs and tracks all calls to ensure that you receive assistance for your problem or request. If you have questions about the status of your problem or have additional information to report, please contact Technical Support again and provide your original notification number.

Problem Submittal Form in MTS Manuals

Use the Problem Submittal Form to communicate problems with your software, hardware, manuals, or service that are not resolved to your satisfaction through the technical support process. The form includes check boxes that allow you to indicate the urgency of your problem and your expectation of an acceptable response time. We guarantee a timely response—your feedback is important to us.

Access the Problem Submittal Form:

- In the back of many MTS manuals (postage paid form to be mailed to MTS)
- www.mts.com > Contact Us > Problem Submittal Form button (electronic form to be e-mailed to MTS)

Preface

Before You Begin

Safety first!

Before you use your MTS product or system, read and understand the *Safety* manual and any other safety information provided with your system. Improper installation, operation, or maintenance can result in hazardous conditions that can cause severe personal injury or death, or damage to your equipment and specimen. Again, read and understand the safety information provided with your system before you continue. It is very important that you remain aware of hazards that apply to your system.

Other MTS manuals

In addition to this manual, you may receive additional manuals in paper or electronic form.

You may also receive an MTS System Documentation CD. It contains an electronic copy of the manuals that pertain to your test system, such as:

- Hydraulic and mechanical component manuals
- Assembly drawings
- Parts lists
- Operation manual
- Preventive maintenance manual

Controller and application software manuals are typically included on the software CD distribution disc(s).

Conventions

Documentation Conventions

The following paragraphs describe some of the conventions that are used in your MTS manuals.

Hazard conventions

Hazard notices may be embedded in this manual. These notices contain safety information that is specific to the activity to be performed. Hazard notices immediately precede the step or procedure that may lead to an associated hazard. Read all hazard notices carefully and follow all directions and recommendations. Three different levels of hazard notices may appear in your manuals. Following are examples of all three levels.

Note *For general safety information, see the safety information provided with your system.*

⚠ DANGER

Danger notices indicate the presence of a hazard with a high level of risk which, if ignored, *will* result in death, severe personal injury, or substantial property damage.

⚠ WARNING

Warning notices indicate the presence of a hazard with a medium level of risk which, if ignored, *can* result in death, severe personal injury, or substantial property damage.

⚠ CAUTION

Caution notices indicate the presence of a hazard with a low level of risk which, if ignored, *could* cause moderate or minor personal injury or equipment damage, or could endanger test integrity.

Notes

Notes provide additional information about operating your system or highlight easily overlooked items. For example:

Note *Resources that are put back on the hardware lists show up at the end of the list.*

Special terms

The first occurrence of special terms is shown in *italics*.

Illustrations

Illustrations appear in this manual to clarify text. They are examples only and do not necessarily represent your actual system configuration, test application, or software.

Electronic manual conventions

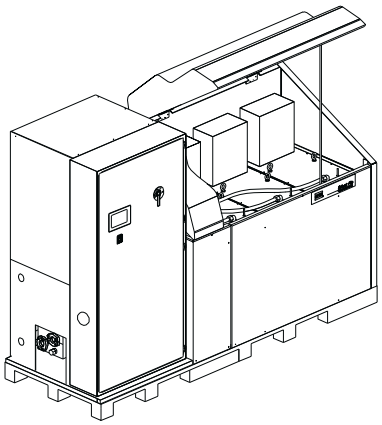
This manual is available as an electronic document in the Portable Document File (PDF) format. It can be viewed on any computer that has Adobe Acrobat Reader installed.

Hypertext links

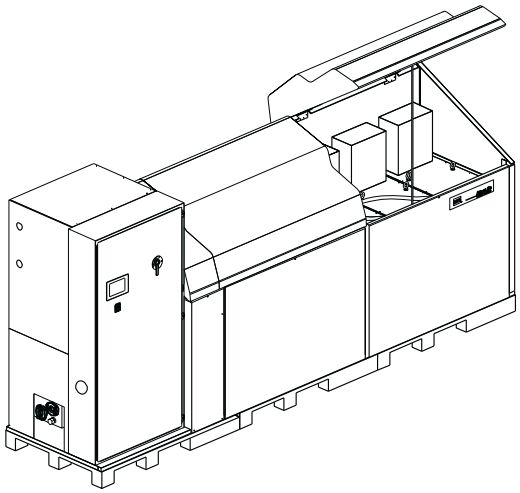
The electronic document has many hypertext links displayed in a blue font. All blue words in the body text, along with all contents entries and index page numbers, are hypertext links. When you click a hypertext link, the application jumps to the corresponding topic.

Introduction

Contents



Models 505.60/.90 HPU



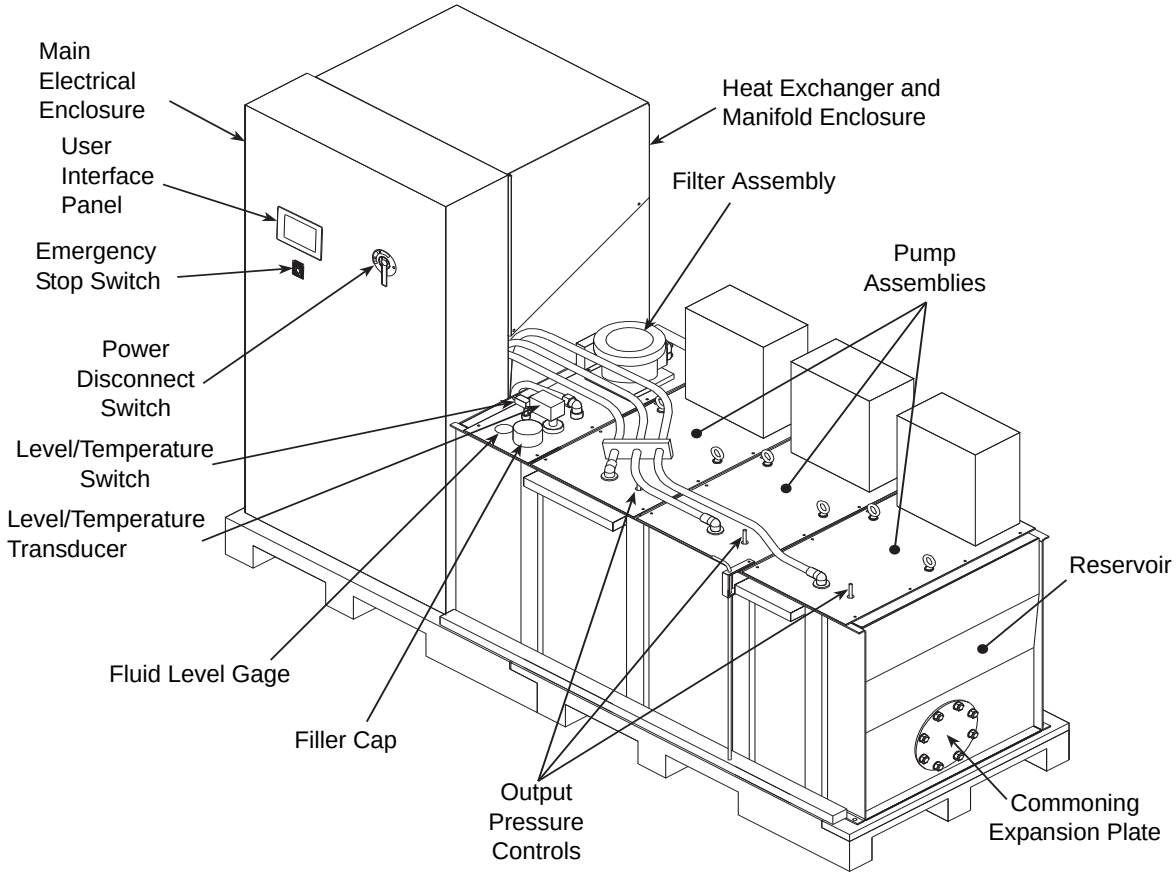
Models 505.120/.150/.180 HPU

EU Declarations

EC Declaration of Conformity (Machinery Directive 2006/42/EC Annex II 1A)

If applicable, a Declaration of Conformity is supplied with the machinery; an example of the Declaration of Conformity is provided at the end of this manual.

Model 505.60 HPU Component Identification



Component Locations (505.90 Shown)

Component Descriptions

Component	Description
Commoning Expansion Plate	Allows the HPU to be commoned with another HPU.
Electrical Enclosure	Houses the HPU's electrical and control components. The wye-delta starters for the Model 505.60/.90 HPUs are located in the electrical enclosure. The wye-delta starters for the Model 505.120/.150/.180 HPUs are located in the pump assemblies. The main power lines enter the electrical enclosure at its top. The power disconnect switch removes electrical power whenever the enclosure's door is opened.
Filler Cap	Vents the hydraulic fluid reservoir. This is where you add hydraulic fluid.
Filter	Filters particles out of the hydraulic fluid as it is returned to the HPU.
Fluid Level Gage	Indicates the reservoir hydraulic fluid level.
Heat Exchanger	Cools the hydraulic fluid using a highly efficient, stainless steel oil-to-water heat exchanger. The heat exchanger removes most of the heat generated by the HPU.
Level/Temperature Transducer	Senses the hydraulic fluid level and temperature, and produces an analog signal for display purposes.
Low Level/Temperature Switch	Senses the hydraulic fluid level and temperature. Control interlocks automatically shut the HPU down if the fluid level drops too low or the hydraulic fluid temperature rises above the sensor's setting.
Manifold	Combines the output of the individual pumps to deliver the full output of the HPU through a single port. The manifold provides solenoid control of the high/low pressure output from the individual pumps. It also contains relief valves for each pump circuit and a bypass circuit to maintain the hydraulic temperature during low flow conditions.
Output Pressure Controls	Sets the output pressure of each pump assembly.
Power Disconnect Switch	Disconnects the incoming power from the HPU. The switch is a lockable, mechanical latch. Power is removed whenever the door to the electrical enclosure is open. The switch will not allow the door to be opened when in the ON (|) position. Incoming power lines to the switch are live unless power is removed externally.
Pump Assemblies	Produces the pressurized hydraulic fluid for system use. Each pump assembly includes a motor, pump, and electrical enclosure for connecting with the main starter.
Reservoir	Holds the hydraulic fluid and houses the pump and motor.
User Interface Panel	Configures and controls the operation of the hydraulic power unit and indicates the current status of several sensors.

HPU Functional Description

Pump assemblies

Pump assemblies draw hydraulic fluid from the reservoir and pressurize it to a maximum preset pressure. Each pump assembly contains a variable volume pump, a motor, and an electrical enclosure. Each pump assembly has a flow capacity that contributes to the total hydraulic flow capacity of the HPU.

Manifold

The manifold combines the pressurized hydraulic output of the discrete pump assemblies, and provides the hydraulic connection to your hydraulic system. The manifold contains the high/low pressure solenoid valve and a nonadjustable relief valve. Check valves are located within the manifold to prevent pressurized hydraulic fluid from being forced back through the pumps.

The hydraulic power unit uses solenoid-operated valves to control when high-pressure is available to the hydraulic circuit. Start/low/high control settings are selected at the operator interface on the electrical enclosure's front panel.

The HPU is designed to start in low pressure to reduce the amperage needed for starting, which will extend the life of the pump and motor. When operating at this setting, low-pressure hydraulic fluid circulates back to the reservoir through the manifold. The direct fluid path back to the reservoir limits pressure and flow available out to the external hydraulic circuit. When high pressure is selected, the unit forces pressurized hydraulic fluid out to the hydraulic circuit.

Filtering

As hydraulic fluid returns to the reservoir, it is filtered by a full flow element. This ensures that all hydraulic fluid is filtered, whether it travels out through the circuit or returns by way of the unit's manifold under low pressure. Filter cleanliness is automatically monitored. A warning registered on the unit's operator interface signals when the filter needs to be changed.

Heat exchanger

Hydraulic fluid temperature is maintained with a high–efficiency stainless steel heat exchanger that cools the fluid. A regulating valve monitors the temperature of the hydraulic fluid and adjusts the flow of water through the plates. The flow of cooling water regulates the temperature of the hydraulic fluid. If the hydraulic fluid temperature exceeds the maximum preset temperature, a switch opens and shuts down the HPU. When the HPU is shut off, the flow of water is automatically stopped by a shutoff solenoid valve.

Options Available for the HPU

Accumulator option

Accumulators can be added to the hydraulic output lines to damp pressure line fluctuations. This option accommodates one pressure line accumulator.

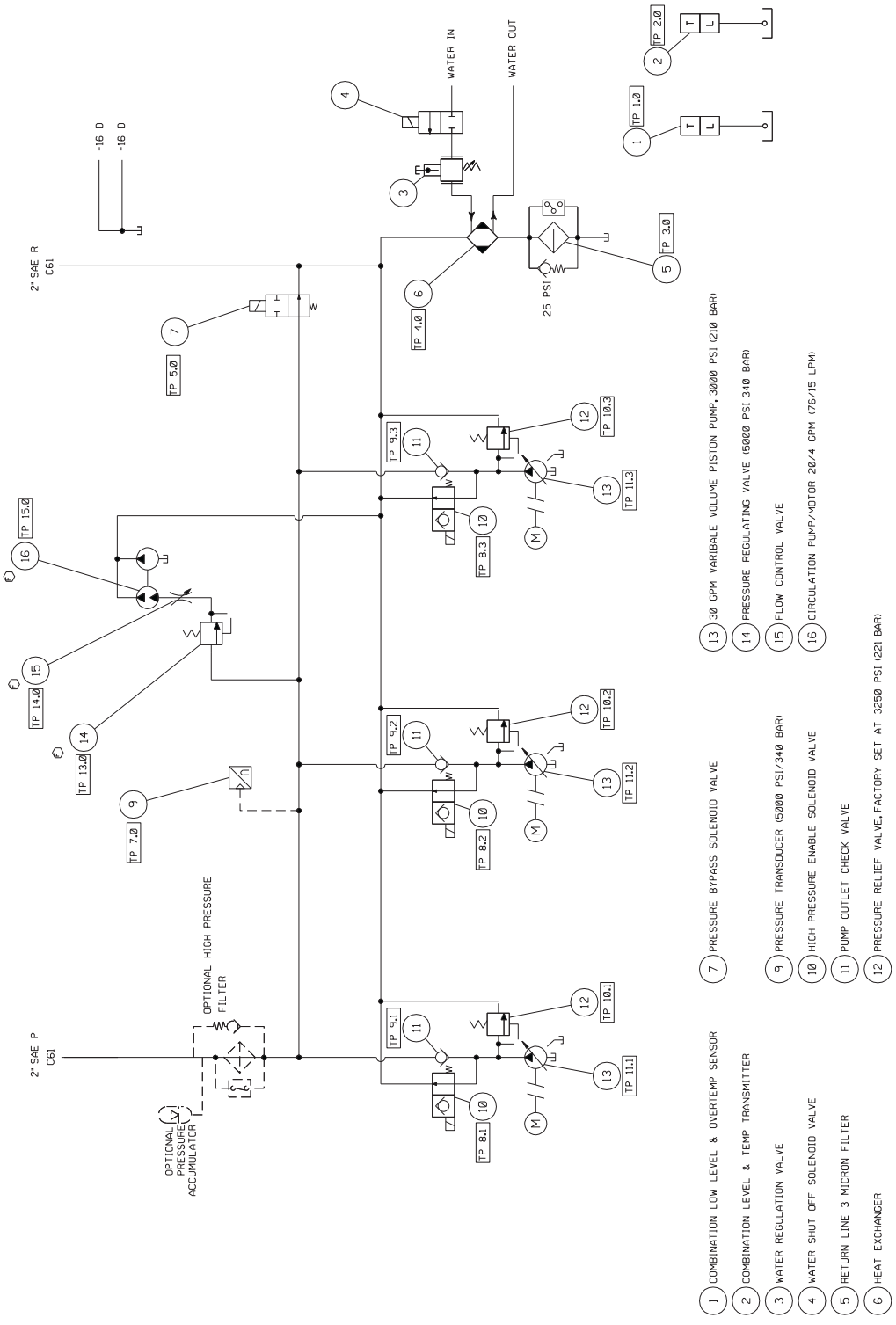
Run-on-demand option

The run-on-demand (ROD) option will turn individual pumps on and off as needed to accommodate the system's demand for hydraulic fluid. The PLC monitors the fluid flow; when flow changes beyond preset limits for a preset time, a pump will be turned on or off as needed.

The ROD option allows the HPU to turn individual pump motors on and off as your system flow demand changes. A minimum flow reserve is maintained and pump usage is equalized by sequentially turning on pumps starting with the pump with the least amount of run time, and turning the pumps off in reverse order. The cycling of these pumps is controlled by a PLC that takes into account various system parameters such as system hydraulic fluid flow (both real time and trends), the number of pumps currently running, and user configurable on/off delay settings.

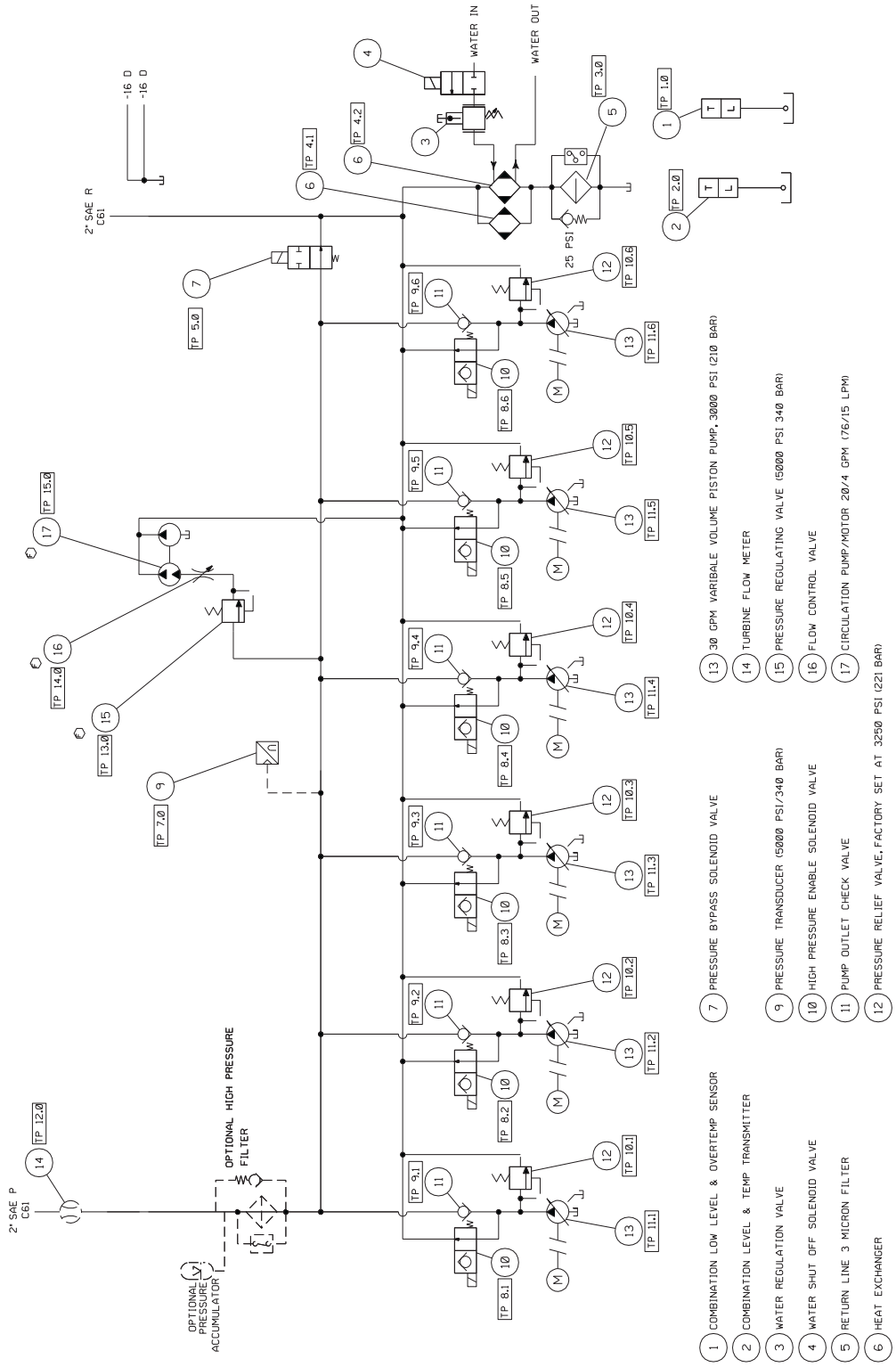
Model 505.60/.90 HPU Hydraulic Schematic

The hydraulic schematic shows the functional layout of HPU models with two or three pump assemblies (505.60/.90).



Model 505.120/.150/.180 HPU Hydraulic Schematic

The hydraulic schematic shows the functional layout of HPU models with four to six pump assemblies (505.120/.150/.180).



Model 505.60 HPU Electrical Control

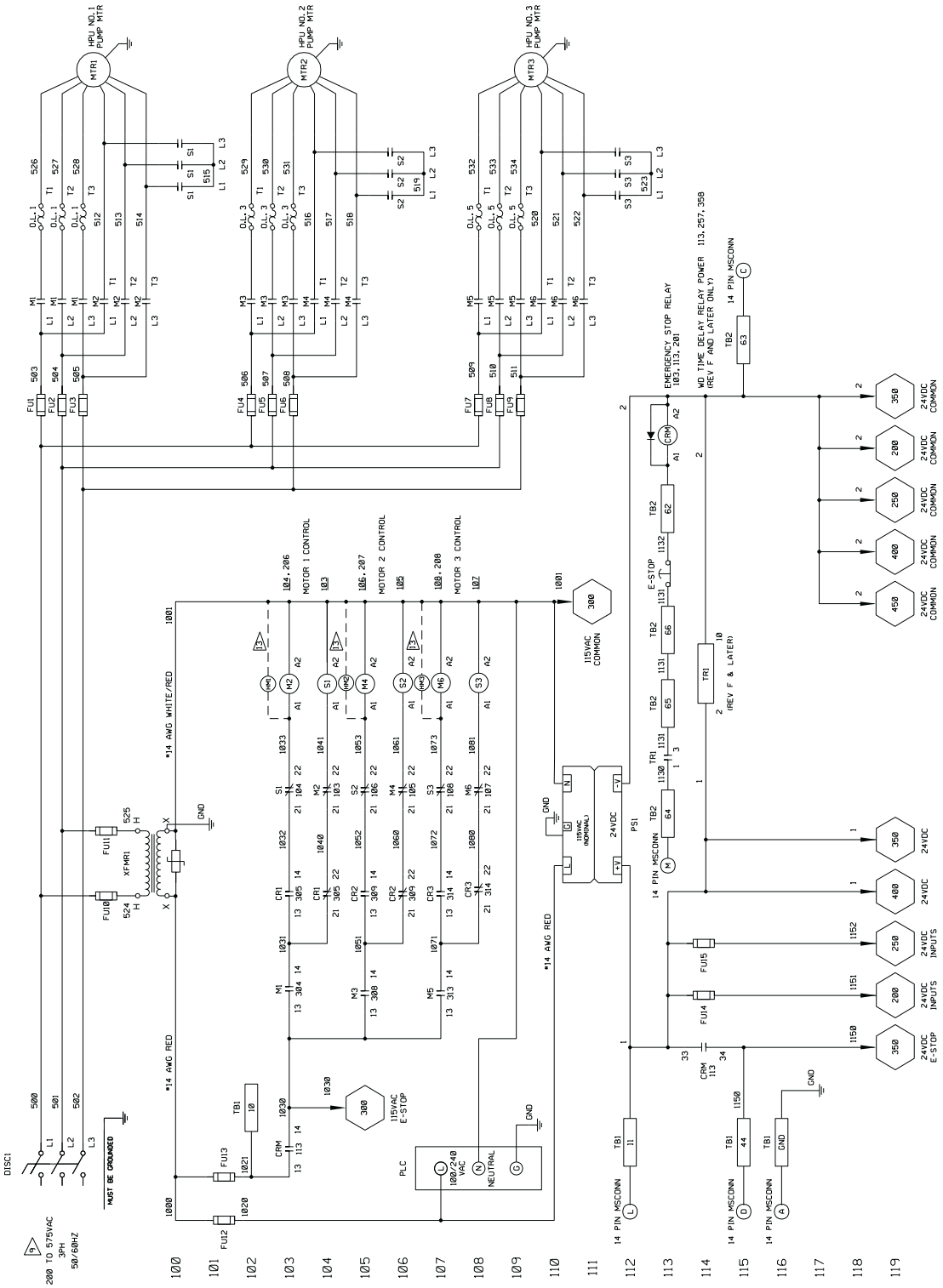
The HPU can be controlled locally using the front panel controls, or remotely through a controller via the J1 connector. A PLC (programmable logic controller) manages the electrical systems within the HPU. The electrical system includes the following:

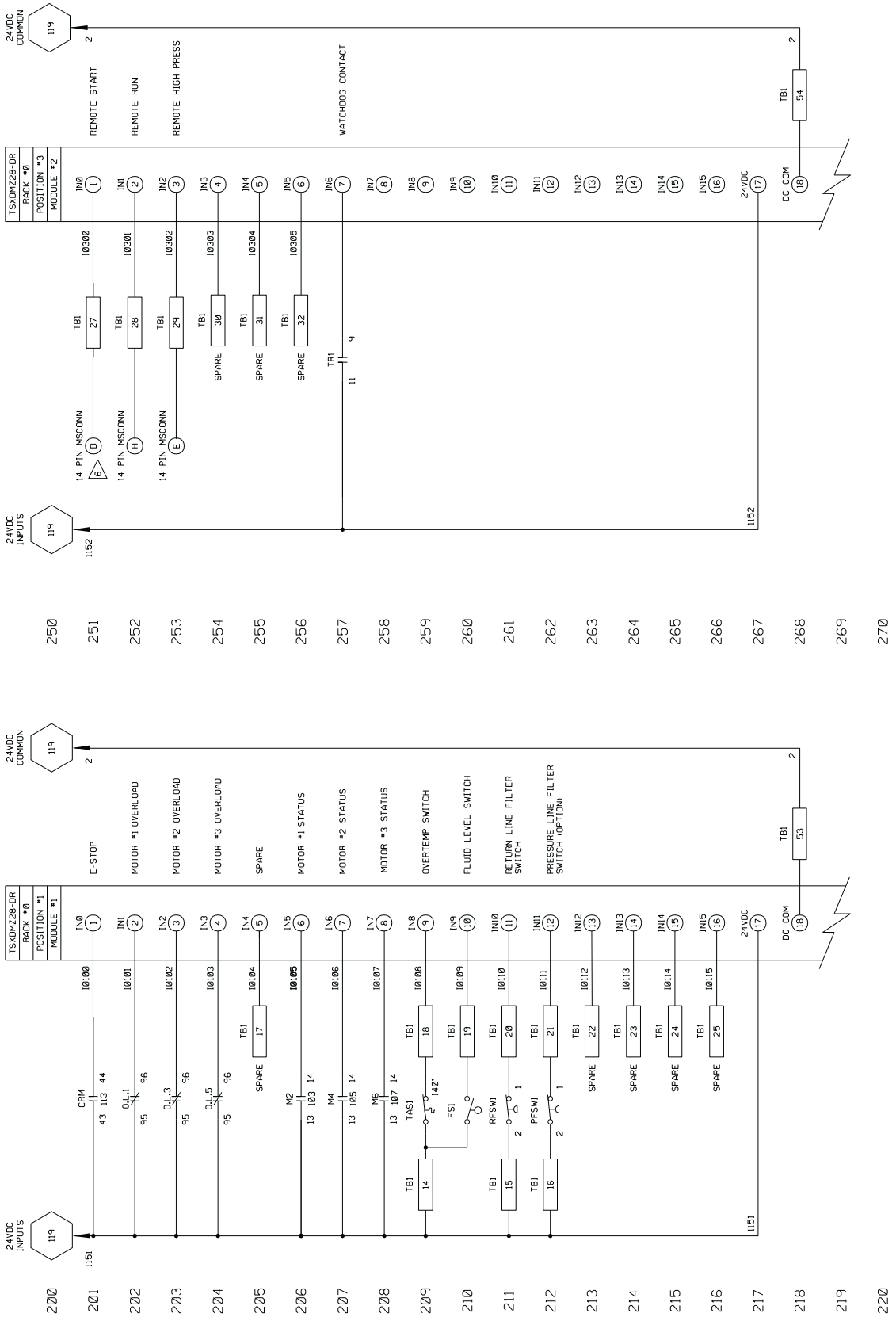
- A user interface panel that contains a touch screen to program preferences and operational settings. The screens on the user interface panel provide quick indication of the unit's condition, including motors status, running time displays for each motor, hydraulic fluid level and temperature, and filter condition.
- Wye-delta starting reduces the initial current rush when the motor starters are engaged.
- Thermal overloads protect the individual HPU motors from excessive current draw.
- A latchable **Emergency Stop** button prevents inadvertent starts.
- Interlocks protect the HPU against low hydraulic fluid level, overtemperature, and dirty filters.
- A **Reset** button brings the unit back into operation after a fault has been detected and corrected.
- A dirty filter signal will not shut the unit down, but will prevent the unit from starting.
- The power disconnect switch on the door of the main electrical enclosure ensures that power is removed whenever the door is opened. This device is both an ETL and TÜV-certified, lockable, main-disconnect switch.

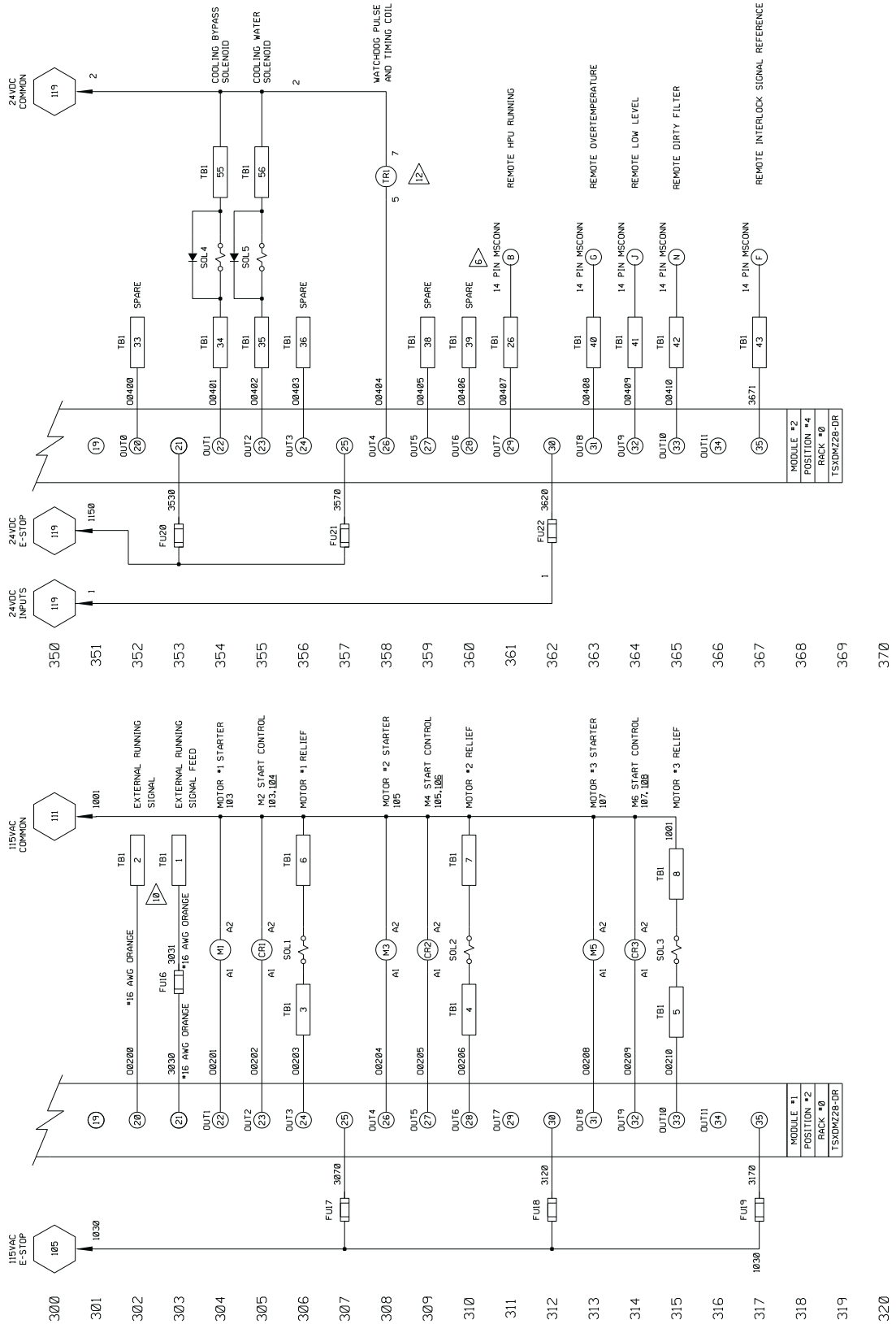
Note *The electrical schematics for the HPU are located on the following pages. The difference between the Model 505.60/.90 and Model 505.120-180 is the number of pump assemblies.*

Model 505.60/.90 Electrical Schematic

The electrical schematic shows the electrical layout of the Model 505.60/.90 HPU.

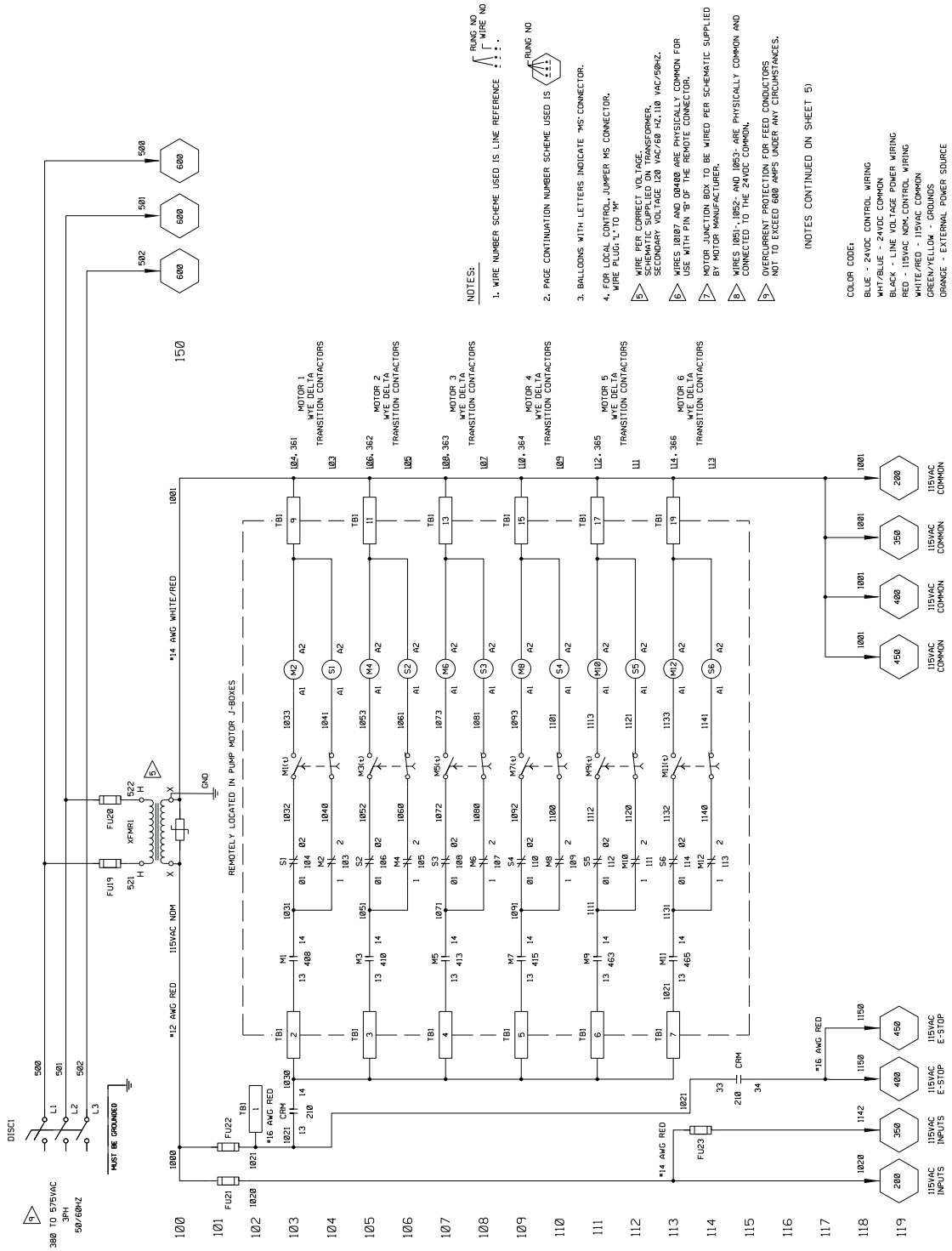


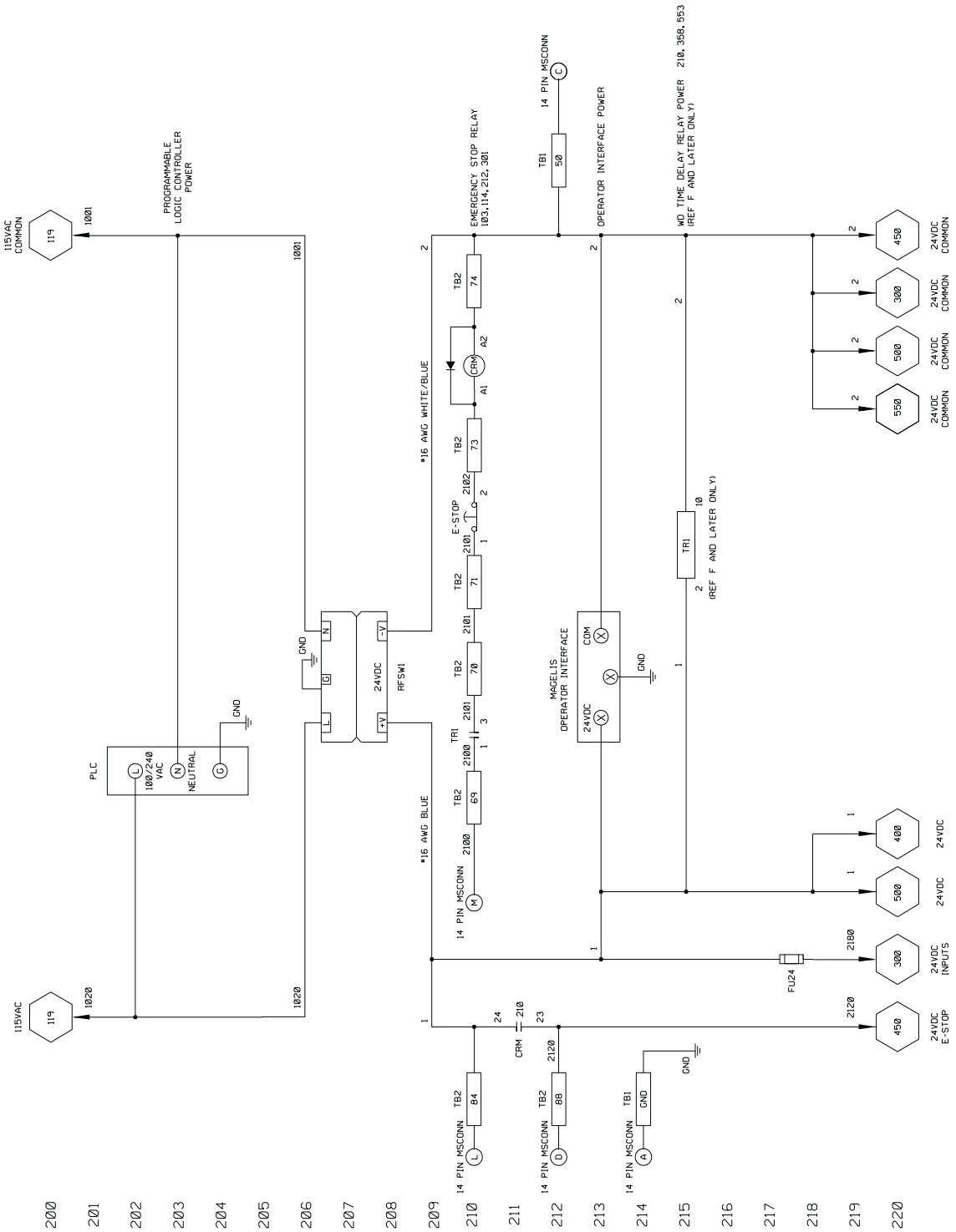

24VDC COMMON
TSXDMZ28-DR
RACK #0
POSITION #3
MODULE #2
REMOTE START
REMOTE RUN
REMOTE HIGH PRESS
WATCHDOG CONTACT
14 PIN MSCONN
SPARE
TR1
24VDC INPUTS
DC COM
TSXDMZ28-DR
RACK #0
POSITION #1
MODULE #1
E-STOP
MOTOR #1 OVERLOAD
MOTOR #2 OVERLOAD
MOTOR #3 OVERLOAD
SPARE
MOTOR #1 STATUS
MOTOR #2 STATUS
MOTOR #3 STATUS
OVERTEMP SWITCH
FLUID LEVEL SWITCH
RETURN LINE FILTER SWITCH
PRESSURE LINE FILTER SWITCH (OPTION)
TASI
FSI
RFSW1
PFSW1


24VDC COMMON
24VDC E-STOP
24VDC INPUTS
115VAC COMMON
115VAC E-STOP
COOLING BYPASS SOLENOID
COOLING WATER SOLENOID
WATCHDOG PULSE AND TIMING COIL
REMOTE HPU RUNNING
REMOTE OVERTEMPERATURE
REMOTE LOW LEVEL
REMOTE DIRTY FILTER
REMOTE INTERLOCK SIGNAL REFERENCE
EXTERNAL RUNNING SIGNAL
EXTERNAL RUNNING SIGNAL FEED
MOTOR *1 STARTER 103
M2 START CONTROL 103,104
MOTOR *1 RELIEF
MOTOR *2 STARTER 105
M4 START CONTROL 105,106
MOTOR *2 RELIEF
MOTOR *3 STARTER 107
M6 START CONTROL 107,108
MOTOR *3 RELIEF
SPARE
14 PIN MSCONN
#16 AWG ORANGE
MODULE *1
MODULE *2
POSITION *2
POSITION *4
RACK *0
TSXDMZ28-DR

Model 505.120/.150/.180 Electrical Schematic

The electrical schematic shows the electrical layout of the Model 505.120/.150/ .180 HPU.




115VAC COMMON
119
1001
PROGRAMMABLE LOGIC CONTROLLER POWER
1001
EMERGENCY STOP RELAY 103.114.212.301
14 PIN MSCONN
C
TB1
50
OPERATOR INTERFACE POWER
WD TIME DELAY RELAY POWER (REF F AND LATER ONLY) 210.358.553
TB2
74
CRM
A2
A1
*16 AWG WHITE/BLUE
TB2
73
E-STOP
2102
2101
TB2
71
TB2
70
2101
TR1
2100
3
TB2
69
2100
14 PIN MSCONN
M
*16 AWG BLUE
GND
N
G
L
24VDC
+V
-V
RFSW1
PLC
L
100/240 VAC
N
NEUTRAL
G
GND
MAGELIS OPERATOR INTERFACE
COM
24VDC
GND
TR1
10
(REF F AND LATER ONLY)
450
24VDC COMMON
300
24VDC COMMON
500
24VDC COMMON
550
24VDC COMMON
400
24VDC
500
24VDC
FU24
2180
300
24VDC INPUTS
2120
450
24VDC E-STOP
1020
115VAC
119
1020
24
CRM
210
23
TB2
84
14 PIN MSCONN
L
2120
TB2
88
14 PIN MSCONN
D
TB1
GND
14 PIN MSCONN
A
GND
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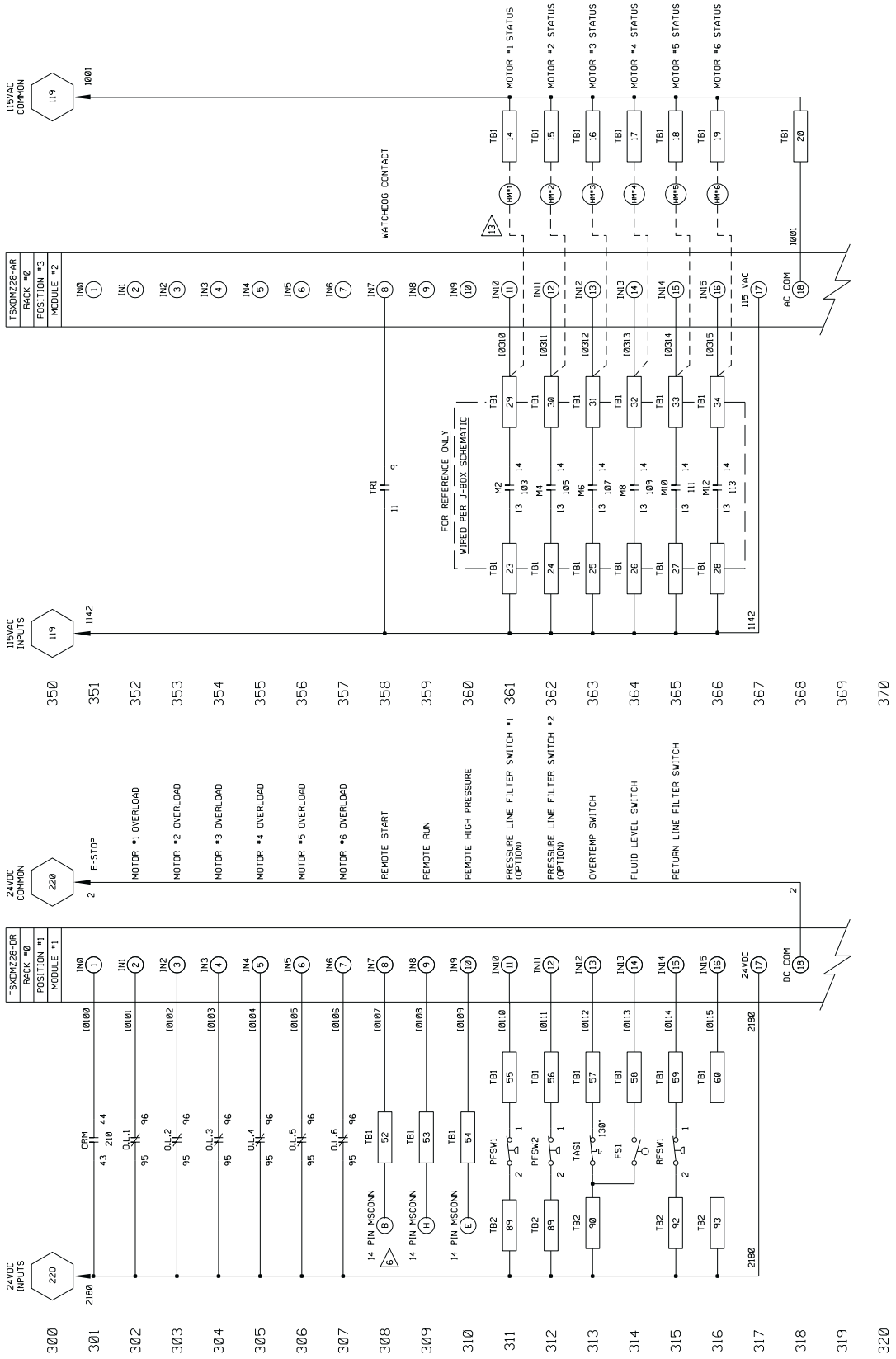
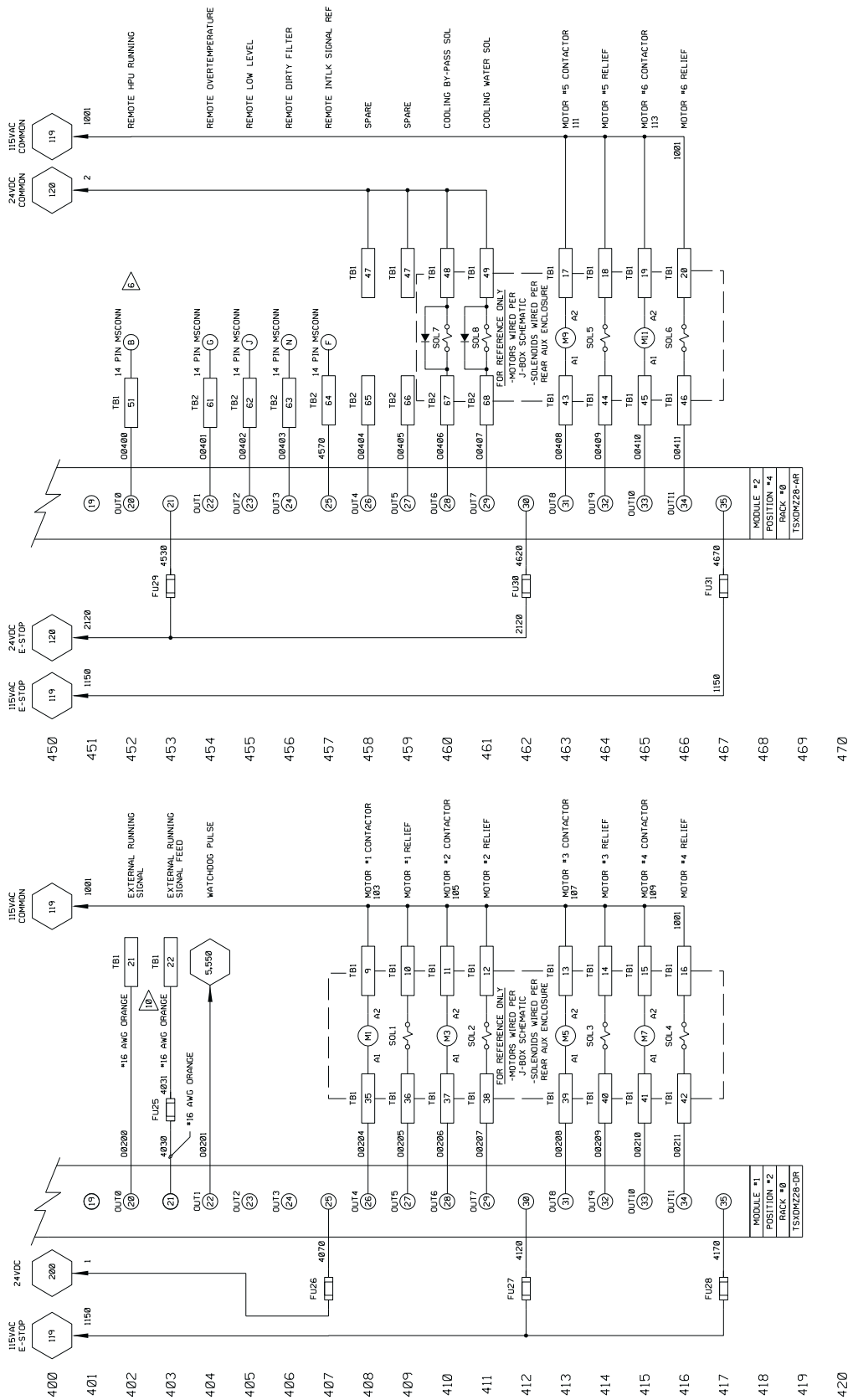
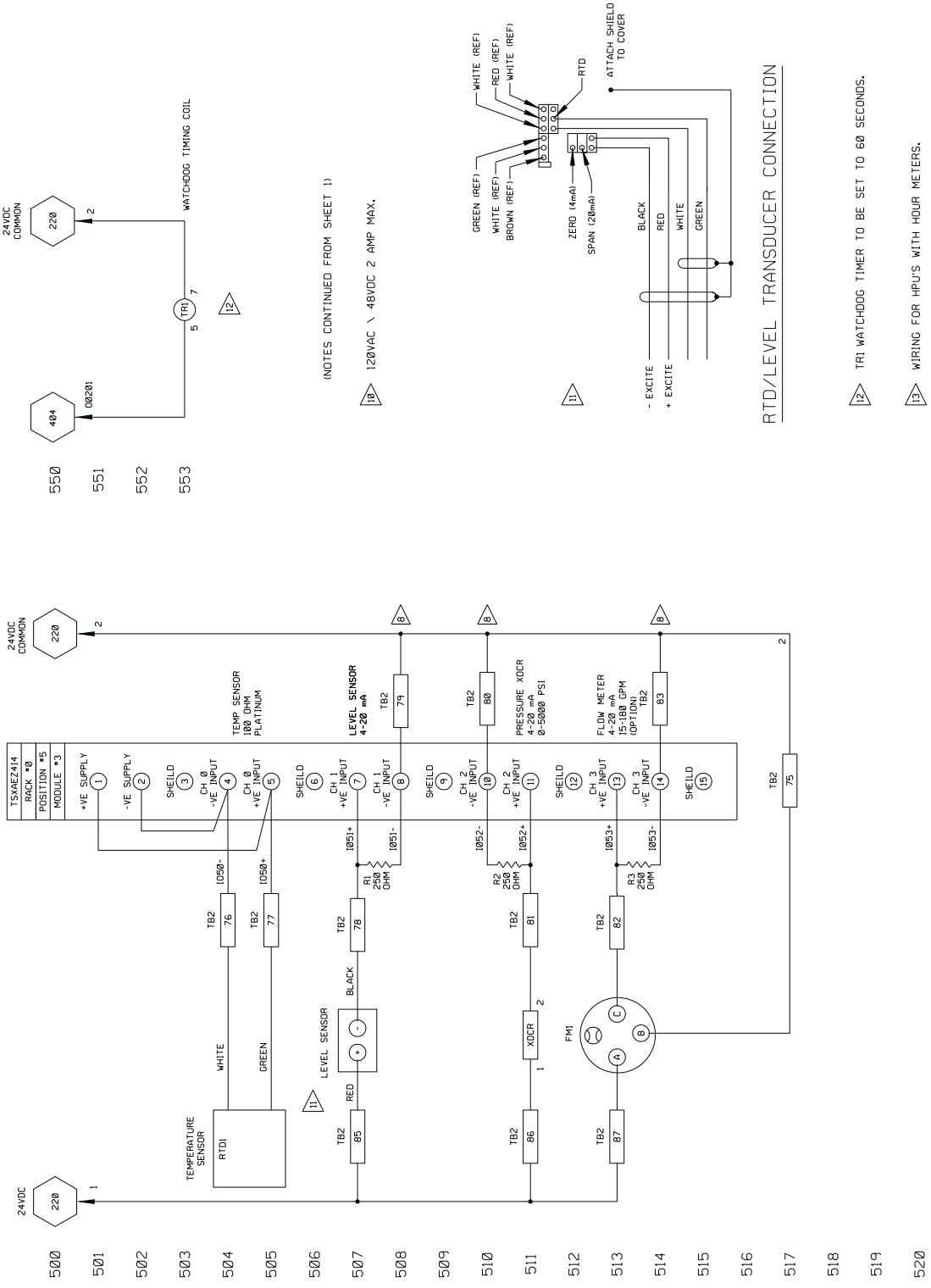
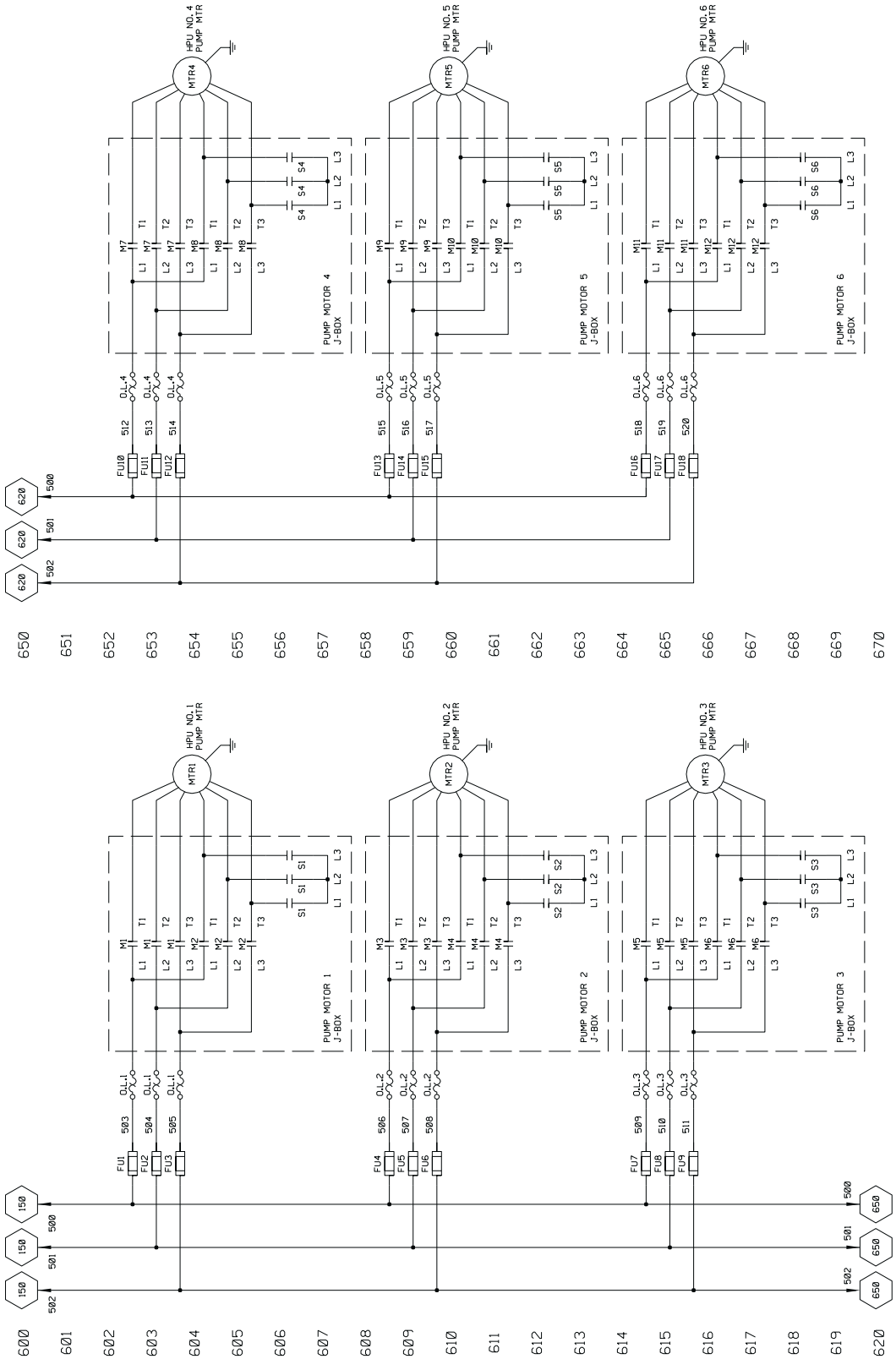

24VDC INPUTS
24VDC COMMON
115VAC INPUTS
115VAC COMMON
TSXDMZ28-DR
TSXDMZ28-AR
RACK #0
POSITION #1
POSITION #3
MODULE #1
MODULE #2
E-STOP
MOTOR #1 OVERLOAD
MOTOR #2 OVERLOAD
MOTOR #3 OVERLOAD
MOTOR #4 OVERLOAD
MOTOR #5 OVERLOAD
MOTOR #6 OVERLOAD
REMOTE START
REMOTE RUN
REMOTE HIGH PRESSURE
PRESSURE LINE FILTER SWITCH #1 (OPTION)
PRESSURE LINE FILTER SWITCH #2 (OPTION)
OVERTEMP SWITCH
FLUID LEVEL SWITCH
RETURN LINE FILTER SWITCH
WATCHDOG CONTACT
MOTOR #1 STATUS
MOTOR #2 STATUS
MOTOR #3 STATUS
MOTOR #4 STATUS
MOTOR #5 STATUS
MOTOR #6 STATUS
FOR REFERENCE ONLY
WIRED PER J-BOX SCHEMATIC
14 PIN MSCONN
DC COM
AC COM
115 VAC


115VAC COMMON
24VDC COMMON
115VAC E-STOP
24VDC E-STOP
24VDC
REMOTE HPU RUNNING
REMOTE OVERTEMPERATURE
REMOTE LOW LEVEL
REMOTE DIRTY FILTER
REMOTE INTLK SIGNAL REF
SPARE
SPARE
COOLING BY-PASS SOL
COOLING WATER SOL
MOTOR #5 CONTACTOR
MOTOR #5 RELIEF
MOTOR #6 CONTACTOR
MOTOR #6 RELIEF
EXTERNAL RUNNING SIGNAL
EXTERNAL RUNNING SIGNAL FEED
WATCHDOG PULSE
MOTOR #1 CONTACTOR
MOTOR #1 RELIEF
MOTOR #2 CONTACTOR
MOTOR #2 RELIEF
MOTOR #3 CONTACTOR
MOTOR #3 RELIEF
MOTOR #4 CONTACTOR
MOTOR #4 RELIEF
14 PIN MSCONN
FOR REFERENCE ONLY
-MOTORS WIRED PER
J-BOX SCHEMATIC
-SOLENOIDS WIRED PER
REAR AUX ENCLOSURE
#16 AWG ORANGE
MODULE #2
POSITION #4
RACK #0
TSXDM228-AR
MODULE #1
POSITION #2
RACK #0
TSXDM228-DR


24VDC COMMON
220
2
WATCHDOG TIMING COIL
TRI
7
5
12
404
00201
550
551
552
553
(NOTES CONTINUED FROM SHEET 1)
10
120VAC \ 48VDC 2 AMP MAX.
WHITE (REF)
RED (REF)
WHITE (REF)
RTD
ATTACH SHIELD TO COVER
GREEN (REF)
WHITE (REF)
BROWN (REF)
ZERO (4mA)
SPAN (20mA)
BLACK
RED
WHITE
GREEN
11
- EXCITE
+ EXCITE
RTD/LEVEL TRANSDUCER CONNECTION
12
TRI WATCHDOG TIMER TO BE SET TO 60 SECONDS.
13
WIRING FOR HPU'S WITH HOUR METERS.
TSXAEZ414
RACK =0
POSITION =5
MODULE =3
+VE SUPPLY
-VE SUPPLY
SHEILD
CH 0 -VE INPUT
CH 0 +VE INPUT
SHEILD
CH 1 +VE INPUT
CH 1 -VE INPUT
SHEILD
CH 2 -VE INPUT
CH 2 +VE INPUT
SHEILD
CH 3 +VE INPUT
CH 3 -VE INPUT
SHEILD
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
TEMP SENSOR 100 OHM PLATINUM
LEVEL SENSOR 4-20 mA
PRESSURE XDCR 4-20 mA 0-5000 PSI
FLOW METER 4-20 mA 15-180 GPM (OPTION)
TB2 79
TB2 80
TB2 83
TB2 75
I050-
I050+
I051+
I051-
I052-
I052+
I053+
I053-
R1 250 OHM
R2 250 OHM
R3 250 OHM
TB2 76
TB2 77
TB2 78
TB2 81
TB2 82
TB2 85
TB2 86
TB2 87
WHITE
GREEN
BLACK
RED
TEMPERATURE SENSOR
RTDI
LEVEL SENSOR
XDCR
FM1
A
B
C
24VDC
220
1
8
2
500
501
502
503
504
505
506
507
508
509
510
511
512
513
514
515
516
517
518
519
520


HPU NO.4 PUMP MTR
MTR4
HPU NO.5 PUMP MTR
MTR5
HPU NO.6 PUMP MTR
MTR6
PUMP MOTOR 4 J-BOX
PUMP MOTOR 5 J-BOX
PUMP MOTOR 6 J-BOX
HPU NO.1 PUMP MTR
MTR1
HPU NO.2 PUMP MTR
MTR2
HPU NO.3 PUMP MTR
MTR3
PUMP MOTOR 1 J-BOX
PUMP MOTOR 2 J-BOX
PUMP MOTOR 3 J-BOX
620
500
501
502
150
650

Specifications

Model 505.60–505.180 HPU General Specifications

Parameter	Specification
Environmental	For use in a controlled environment.
Operating temperature	5–40°C (40–104°F)
Humidity	0–85% noncondensing
Hydraulic fluid	Exxon Mobil DTE 25 or Shell Tellus 46 AW
Typical operating temperature range	43–49°C (110–120°F)
Filtration (microns)	3 microns nominal
Output Pressure	21 MPa (3000 psi)
Non-adjustable relief valve setting	22.4 MPa (3250 psi)
Heat exchanger	Water-cooled
Water pressure	0.2–0.3 MPa (35–45 psi differential)
Maximum pressure	0.8 MPa (120 psi)
Water hose (.60/.90) **Water hose (.120/.150/.180)**	38 mm (1.5 in) NPT 51 mm (2 in) NPT
Typical operating range	43-49°C (110-120°F)
Max tempinterlock pre-set	55°C (131°F)
Hydraulic connections	
Pressure	2 inch SAE
Return	2 inch SAE
Drain	-16 JIC
Electrical Power	
Line voltage	380–575 V AC
Control voltage	24 V DC

Model 505.60 HPU Specifications

Parameter	Specification
Pump/Motor	Wye-Delta starter configuration
Number of pump/motors	2
Maximum continuous pressure	21 MPa (3000 psi)
Maximum flow capacity	200 L/m (53.2 gpm) at 50 Hz 227 L/m (60 gpm) at 60 Hz
Motor rating*	45 kW (60 hp) at 50/60 Hz
Current draw†	156 A continuous at 460 V AC 60 Hz 188 A continuous at 380 V AC 50 Hz
Reservoir capacity	950 L (250 gal) maximum 605 L (160 gal) minimum
Water flow rating (input temperature)	
10°C (50°F)	34.1 L/m (9.0 gpm)
15.5°C (60°F)	41.6 L/m (11 gpm)
21.1°C (70°F)	56.8 L/m (15 gpm)
26.7°C (80°F)	83.3 L/m (22 gpm)
32.2°C (90°F)	177.9 L/m (47 gpm)
Heat load (maximum)	89.6 kW (306,000 Btu/hr)
Dimensions	
Length	2870 mm (113 in)
Height	2006 mm (79 in)
Width	990 mm (39 in)
Weight	
Empty	1703 kg (3754 lb)
With hydraulic fluid	2276 kg (5017 lb) minimum fluid level 2615 kg (5766 lb) maximum fluid level
Noise‡ rating at 1 m	68 dB(A) fully compensated

* For one motor

† For all motors

‡ Sound pressure level [dB(A)] is expressed as a free field value. Readings may vary with the acoustic environment.

Model 505.90 HPU Specifications

Parameter	Specification
Pump/Motor	Wye-Delta starter configuration
Number of pump/motors	3
Maximum continuous pressure	21 MPa (3000 psi)
Maximum flow capacity	300 L/m (80 gpm) at 50 Hz 340 L/m (90 gpm) at 60 Hz
Motor rating*	45 kW (60 hp) at 50/60 Hz
Current draw†	233 A continuous at 460 V AC 60 Hz 281 A continuous at 380 V AC 50 Hz
Reservoir capacity	950 L (250 gal) maximum 605 L (160 gal) minimum
Water flow rating (input temperature)	
10°C (50°F)	56.0 L/m (14.8 gpm)
15.5°C (60°F)	64.3 L/m (17 gpm)
21.1°C (70°F)	83.3 L/m (22 gpm)
26.7°C (80°F)	128.7 L/m (34 gpm)
32.2°C (90°F)	268.7 L/m (71 gpm)
Heat load (maximum)	134.4 kW (459,000 Btu/hr)
Dimensions	
Length	2870 mm (113 in)
Height	2006 mm (79 in)
Width	990 mm (39 in)
Weight	
Empty	2138 kg (4714 lb)
With hydraulic fluid	2711 kg (5977 lb) minimum fluid level 3051 kg (6726 lb) maximum fluid level
Noise‡ rating at 1 m	68 dB(A) fully compensated

* For one motor

† For all motors

‡ Sound pressure level [dB(A)] is expressed as a free field value. Readings may vary with the acoustic environment.

Model 505.120 HPU Specifications

Parameter	Specification
Pump/Motor	Wye-Delta starter configuration
Number of pump/motors	4
Maximum continuous pressure	21 MPa (3000 psi)
Maximum flow capacity	400 L/m (106.4 gpm) at 50 Hz 454 L/m (120 gpm) at 60 Hz
Motor rating*	45 kW (60 hp) at 50/60 Hz
Current draw†	310 A continuous at 460 V AC 60 Hz 374 A continuous at 380 V AC 50 Hz
Reservoir capacity	1893 L (500 gal) maximum 1211 L (320 gal) minimum
Water flow rating (input temperature)	
10°C (50°F)	68.1 L/m (18.0 gpm)
15.5°C (60°F)	71.9 L/m (19 gpm)
21.1°C (70°F)	90.8 L/m (24 gpm)
26.7°C (80°F)	113.6 L/m (30 gpm)
32.2°C (90°F)	174.1 L/m (46 gpm)
Heat load (maximum)	179.2 kW (612,000 Btu/hr)
Dimensions	
Length	4270 mm (168 in)
Height	2006 mm (79 in)
Width	990 mm (39 in)
Weight	
Empty	2896 kg (6384 lb)
With hydraulic fluid	3954 kg (8717 lb) minimum fluid level 4561 kg (10056 lb) maximum fluid level
Noise‡ rating at 1 m	70 dB(A) fully compensated

* For one motor

† For all motors

‡ Sound pressure level [dB(A)] is expressed as a free field value. Readings may vary with the acoustic environment.

Model 505.150 HPU Specifications

Parameter	Specification
Pump/Motor	Wye-Delta starter configuration
Number of pump/motors	5
Maximum continuous pressure	21 MPa (3000 psi)
Maximum flow capacity	500 L/m (133 gpm) at 50 Hz 567 L/m (150 gpm) at 60 Hz
Motor rating*	45 kW (60 hp) at 50/60 Hz
Current draw†	387 A continuous at 460 V AC 60 Hz 476 A continuous at 380 V AC 50 Hz
Reservoir capacity	1893 L (500 gal) maximum 1211 L (320 gal) minimum
Water flow rating (input temperature)	
10°C (50°F)	87.8 L/m (23.2 gpm)
15.5°C (60°F)	94.6 L/m (25 gpm)
21.1°C (70°F)	121.1 L/m (32 gpm)
26.7°C (80°F)	159.0 L/m (42.0 gpm)
32.2°C (90°F)	265.0 L/m (70 gpm)
Heat load (maximum)	224 kW (765,000 Btu/hr)
Dimensions	
Length	4270 mm (168 in)
Height	2006 mm (79 in)
Width	990 mm (39 in)
Weight	
Empty	3313 kg (7305 lb)
With hydraulic fluid	4372 kg (9638 lb) minimum fluid level 4979 kg (10977 lb) maximum fluid level
Noise‡ rating at 1 m	71 dB(A) fully compensated

* For one motor

† For all motors

‡ Sound pressure level [dB(A)] is expressed as a free field value. Readings may vary with the acoustic environment.

Model 505.180 HPU Specifications

Parameter	Specification
Pump/Motor	Wye-Delta starter configuration
Number of pump/motors	6
Maximum continuous pressure	21 MPa (3000 psi)
Maximum flow capacity	600 L/m (160 gpm) at 50 Hz 681 L/m (180 gpm) at 60 Hz
Motor rating*	45 kW (60 hp) at 50/60 Hz
Current draw†	464 A continuous at 460 V AC 60 Hz 560 A continuous at 380 V AC 50 Hz
Reservoir capacity	1893 L (500 gal) maximum 1211 L (320 gal) minimum
Water flow rating (input temperature)	
10°C (50°F)	112.0 L/m (29.6 gpm)
15.5°C (60°F)	128.7 L/m (34 gpm)
21.1°C (70°F)	166.5 L/m (44 gpm)
26.7°C (80°F)	257.4 L/m (68 gpm)
32.2°C (90°F)	537.5 L/m (142 gpm)
Heat load (maximum)	269 kW (918,000 Btu/hr)
Dimensions	
Length	4270 mm (168 in)
Height	2006 mm (79 in)
Width	990 mm (39 in)
Weight	
Empty	3731 kg (8226 lb)
With hydraulic fluid	4789 kg (10559 lb) minimum fluid level 5397 kg (11898 lb) maximum fluid level
Noise‡ rating at 1 m	72 dB(A) fully compensated

* For one motor

† For all motors

‡ Sound pressure level [dB(A)] is expressed as a free field value. Readings may vary with the acoustic environment.

Safety

General Safety Practices: Hydraulic Power Units and Hydraulic Service Manifolds

The hydraulic power unit (HPU) provides high pressure hydraulic fluid to system components for system operation. The hydraulic service manifold (HSM) controls distribution of that hydraulic fluid pressure. This section provides general information about safety issues that pertain to system hydraulic supply and distribution components. These issues include statements to the intended use and foreseeable misuse of the system and definition for the graphical hazard labeling that is affixed to your product, and other (more general) safety information that relates to the high-pressure and high-performance characteristics of MTS servohydraulic and electromechanical systems.

When you prepare to operate a system that includes environmental components, ensure the following:

- Do not use or allow personnel to operate the system who are not experienced, trained, or educated in the inherent dangers associated with high-performance servo hydraulics and who are not experienced, trained, or educated with regard to the intended operation as it applies to this test system.
- Do not disable safety components or features (including limit detectors, light curtains, or proximity switches/detectors).
- Do not attempt to operate the system without appropriate personal safety gear (for example, hearing, hand, and eye protection).
- Do not modify the system or replace system components using parts that are not MTS component parts or effect repairs using parts or components that are not manufactured to MTS specifications.
- Do not use the system in a test area where uncontrolled access to the test system is allowed when the system is in operation.
- For servohydraulic systems, do not operate the system unless an interlock is installed to monitor supply pressure into the HSM and initiate a system interlock if a low or no pressure event occurs.

If you have system related responsibilities (that is, if you are an operator, service engineer, or maintenance person), you should study safety information carefully before you attempt to perform any test system procedure.

You should receive training on this system or a similar system to ensure a thorough knowledge of your equipment and the safety issues that are associated with its use. In addition, you should gain an understanding of system functions by studying the other manuals supplied with your test system. Contact MTS for information about the content and dates of training classes that are offered.

It is very important that you study the following safety information to ensure that your facility procedures and the system's operating environment do not contribute to or result in a hazardous situation. Remember, you cannot eliminate all the hazards associated with this system, so you must learn and remain aware of the hazards that apply to your system at all times. Use these safety guidelines to help learn and identify hazards so that you can establish appropriate training and operating procedures and acquire appropriate safety equipment (such as gloves, goggles, and hearing protection).

Each test system operates within a unique environment which includes the following known variables:

- Facility variables (facility variables include the structure, atmosphere, and utilities)
- Unauthorized customer modifications to the equipment
- Operator experience and specialization
- Test specimens

Because of these variables (and the possibility of others), your system can operate under unforeseen circumstances that can result in an operating environment with unknown hazards.

Improper installation, operation, or maintenance of your system can result in hazardous conditions that can cause death, personal injury, or damage to the equipment or to the specimen. Common sense and a thorough knowledge of the system's operating capabilities can help to determine an appropriate and safe approach to its operation.

Read all manuals

Study the contents of this manual and the other manuals provided with your system before attempting to perform any system function for the first time. Procedures that seem relatively simple or intuitively obvious may require a complete understanding of system operation to avoid unsafe or dangerous situations.

Locate and read hazard placards/labels

Find, read, and follow the hazard placard instructions located on the equipment. These placards are placed strategically on the equipment to call attention to areas such as known crush points, electrical voltage, and high pressure hazards.

Specimen temperature changes

During environmental testing, the specimen temperature can become hot enough to cause burns. Wear personal protection equipment (gloves) when handling specimens.

Know facility safe procedures

Most facilities have internal procedures and rules regarding safe practices within the facility. Be aware of these safe practices and incorporate them into your daily operation of the system.

Know controls

Before you operate the system for the first time, make a trial run through the operating procedures with the power off. Locate all hardware and software controls and know what their functions are and what adjustments they require. If any control function or operating adjustment is not clear, review the applicable information until you understand it thoroughly.

Have first aid available

Accidents can happen even when you are careful. Arrange your operator schedules so that a properly trained person is always close by to render first aid. In addition, ensure that local emergency contact information is posted clearly and in sight of the system operator.

Know potential crush and pinch points

Be aware of potential crush and pinch points on your system and keep personnel and equipment clear of these areas.

Remember, when hydraulic power is interrupted on a servohydraulic system, it is likely that stored accumulator pressure will persist for some time within the system. In addition, it is likely that as stored energy dissipates, gravity will cause portions of the system to move.

Be aware of component movement with hydraulics off

The actuator rod can also drift down when hydraulics are turned off hitting anything in its path. This uncommanded movement is because of oil movement between the pressure/return ports and oil blow by across the piston hub. Be aware that this can happen and clear the area around the actuator rod when hydraulics are turned off.

Know electrical hazards

When the system electrical power is turned on, minimize the potential for electrical shock hazards. Wear clothing and use tools that are properly insulated for electrical work. Avoid contact with exposed wiring or switch contacts.

Whenever possible, turn off electrical power when you work on or in proximity to any electrical system component. Observe the same precautions as those given for any other high-voltage machinery.

Make sure that all electrical components are adequately grounded. Grounds must remain connected and undisturbed at all times.

Keep bystanders safely away

Keep bystanders at a safe distance from all equipment. Never allow bystanders to touch specimens or equipment while the test is running.

Wear proper clothing

Do not wear neckties, shop aprons, loose clothing or jewelry, or long hair that could get caught in equipment and result in an injury. Remove loose clothing or jewelry and restrain long hair.

Remove flammable fluids

Remove flammable fluids from their containers or from components before you install the container or component. If desired, you can replace the flammable fluid with a non-flammable fluid to maintain the proper proportion of weight and balance.

Check bolt ratings and torques

To ensure a reliable product, fasteners (such as bolts and tie rods) used in MTS-manufactured systems are torqued to specific requirements. If a fastener is loosened or the configuration of a component within the system is modified, refer to information in this product manual to determine the correct fastener, fastener rating, and torque. Overtorquing or undertorquing a fastener can create a hazardous situation due to the high forces and pressures present in MTS test systems.

On rare occasions, a fastener can fail even when it is correctly installed. Failure usually occurs during torquing, but it can occur several days later. Failure of a fastener can result in a high velocity projectile. Therefore, it is a good practice to avoid stationing personnel in line with or below assemblies that contain large or long fasteners.

Practice good housekeeping

Keep the floors in the work area clean. Hydraulic fluid that is spilled on any type of floor can result in a dangerous, slippery surface. Do not leave tools, fixtures, or other items not specific to the test, lying about on the floor, system, or decking.

Protect hoses and cables

Protect electrical cables from spilled hydraulic fluid and from excessive temperatures that can cause the cables to harden and eventually fail. Ensure that all cables have appropriate strain relief devices installed at the cable and near the connector plug. Do not use the connector plug as a strain relief.

Protect all system hoses and cables from sharp or abrasive objects that can cause the hose or cable to fail. Never walk on hoses or cables or move heavy objects over them. Consider hydraulic distribution system layout and route hoses and cables away from areas that expose them to possible damage.

Provide proper hydraulic fluid filtration

If the system is equipped with a non-MTS hydraulic power unit, ensure proper filtration to the hydraulic distribution system and testing components. Particles present in hydraulic fluid and cause erratic or poor system response.

Protect accumulators from moving objects

Protect accumulators with supports or guards. Do not strike accumulators with moving objects. This could cause the accumulator(s) to separate from the manifold resulting in equipment damage and personal injury.

Do not exceed the Maximum Supply Pressure

For hydraulic grips and fixtures. make sure that the hydraulic supply pressure is limited to the maximum pressure defined by the grip or fixture identification (ID) tag.

Do not disable safety devices

Your system may have active or passive safety devices installed to prevent system operation if the device indicates an unsafe condition. Do not disable such devices as it may result in unexpected system motion.

Use appropriately sized fuses

Whenever you replace fuses for the system or supply, ensure that you use a fuse that is appropriately sized and correctly installed. Undersized or oversized fuses can result in cables that overheat and fuses that explode. Either instance creates a fire hazard.

Provide adequate lighting

Ensure adequate lighting to minimize the chance of operation errors, equipment damage, and personal injury. You need to see what you are doing.

Provide means to access out-of-reach components

Make sure you can access system components that might be out of reach while standing on the floor. For example, ladders or scaffolding might be required to reach load cell connectors on tall load units.

Wear appropriate personal protection

Wear eye protection when you work with high-pressure hydraulic fluid, breakable specimens, or when anything characteristic to the specimen could break apart.

Wear ear protection when you work near electric motors, pumps, or other devices that generate high noise levels. Some systems can create sound pressure levels that exceed 70 dbA during operation.

Wear appropriate personal protection equipment (gloves, boots, suits, respirators) whenever you work with fluids, chemicals, or powders that can irritate or harm the skin, respiratory system, or eyes.

Handle chemicals safely

Whenever you use or handle chemicals (for example, cleaning fluids, hydraulic fluid, batteries, contaminated parts, electrical fluids, and maintenance waste), refer to the appropriate MSDS documentation for that material and determine the appropriate measures and equipment required to handle and use the chemical safely. Ensure that the chemical is disposed of appropriately.

Know system interlocks

Interlock devices should always be used and properly adjusted. Interlock devices are designed to minimize the chance of accidental damage to the test specimen or the equipment. Test all interlock devices for proper operation immediately before a test. Do not disable or bypass any interlock devices as doing so could allow hydraulic pressure to be applied regardless of the true interlock condition. The **Reset/Override** button is a software function that can be used to temporarily override an interlock while attempting to gain control of the system.

Know system limits

Never rely on system limits such as mechanical limits or software limits to protect you or any personnel. System limits are designed to minimize the chance of accidental damage to test specimens or to equipment. Test all limits for proper operation immediately before a test. Always use these limits and adjust them properly.

Do not disturb sensors

Do not bump, wiggle, adjust, disconnect, or otherwise disturb a sensor (such as an accelerometer or extensometer) or its connecting cable when hydraulic pressure is applied.

Ensure secure cables

Do not change any cable connections when electrical power or hydraulic pressure is applied. If you attempt to change a cable connection while the system is in operation, an open control loop condition can result. An open control loop condition can cause a rapid, unexpected system response which can result in severe personal injury, death, or damage to equipment. Also, ensure that all cables are connected after you make any changes in the system configuration.

Stay alert

Avoid long periods of work without adequate rest. In addition, avoid long periods of repetitious, unvarying, or monotonous work because these conditions can contribute to accidents and hazardous situations. If you are too familiar with the work environment, it is easy to overlook potential hazards that exist in that environment.

Contain small leaks

Do not use your fingers or hands to stop small leaks in hydraulic or pneumatic hoses. Substantial pressures can build up, especially if the hole is small. These high pressures can cause the oil or gas to penetrate your skin, causing painful and dangerously infected wounds. Turn off the hydraulic supply and allow the hydraulic pressure to dissipate before you remove and replace the hose or any pressurized component.

Stay clear of moving equipment/avoid crush points

Stay clear of mechanical linkages, connecting cables, and hoses that move because you can get pinched, crushed, tangled, or dragged along with the equipment. High forces generated by the system can pinch, cut, or crush anything in the path of the equipment and cause serious injury. Stay clear of any potential crush points. Most test systems can produce sudden, high-force motion. Never assume that your reactions are fast enough to allow you to escape injury when a system fails.

Know the causes of unexpected actuator motions

The high force and velocity capabilities of MTS actuators can be destructive and dangerous (especially if actuator motion is unexpected). The most likely causes of unexpected actuator response are operator error and equipment failure due to damage or abuse (such as broken, cut, or crushed cables and hoses; shorted wires; overstressed feedback devices; and damaged components within the servocontrol loop). Eliminate any condition that could cause unexpected actuator motion.

Do not use RF transmitters

Keep radio frequency (RF) transmitters away from the workstation computers, remote terminals, and electronics consoles. Intense RF fields can cause erratic operation of the more sensitive circuits in the system.

Know compressed gas hazards

Some environmental chambers use liquid nitrogen or some inert gas to achieve a required test atmosphere. Typically these gasses are supplied in pressurized tanks.

Observe the following safety practices when you work with high-pressure air or gases:

- When you charge an accumulator, follow all the charging instructions provided in the appropriate product information manuals. When precharging accumulators, properly identify the type of gas to be used and the type of accumulator to be precharged.
- Use only dry-pumped nitrogen to precharge nitrogen-charged accumulators. (Dry-pumped nitrogen can also be labeled “oil pumped” or “dry water pumped.”) Do not use compressed air or oxygen for precharging: the temperature increase caused by rapid gas compression can result in highly explosive conditions when hydraulic fluid is in the presence of oxygen or compressed air.
- Always follow the recommended bleeding procedures before you remove or disassemble components that contain pressurized gas. When you bleed a gas or remove a fitting, hose, or component that contains a gas, remember that many gases cannot support life. Therefore, as the ratio of released gas to oxygen increases, so does the potential for suffocation.
- Wear appropriate safety devices to protect your hearing. Escaping air or gas can create a noise level that can damage your hearing.
- Ensure that all pressurized air or gas is bled out of a pneumatic or gas-charged device before you start to disassemble it. A thorough understanding of the assembly and its pressurized areas is necessary before you undertake any maintenance. Refer to the appropriate product information for the correct bleeding procedure.

  It may not be obvious or intuitive which bolts or fittings are used to restrain a pressurized area. On some assemblies, you must remove a cover plate to gain access to the structural bolts. Sometimes, to protect you from a rapid release of trapped gases, a small port is exposed when you remove this cover plate. Exposing this port ensures that the gas precharge is fully bled before disassembly. However, this is not the recommended procedure for bleeding a pneumatic or gas-charged device, because it can expose you to the dangers of escaping compressed gas and particulates that are expelled from the chamber or around the seals. Do not assume that cover plates and ports are installed in all the critical locations.

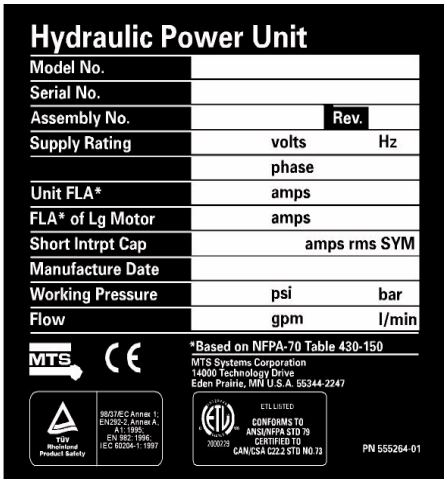
Consult MTS when in doubt about the safety or reliability of any system-related procedure or modification that involves devices that contain any type of compressed gas.

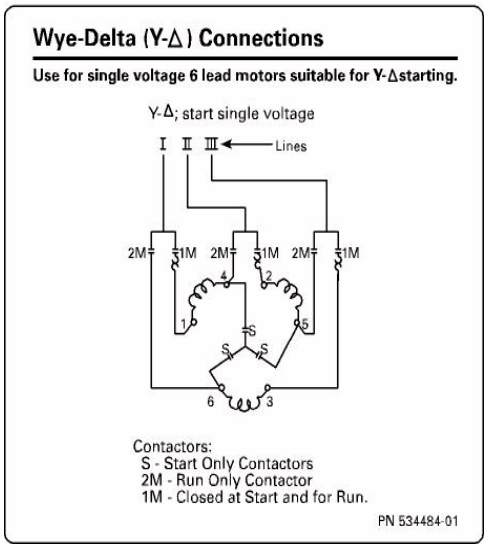
Hazard Placard Placement

Hazard placards contain specific safety information and are affixed directly to the system so they are plainly visible.

Each placard describes a system-related hazard. When possible, international symbols (icons) are used to graphically indicate the type of hazard and the placard label indicates its severity. In some instances, the placard may contain text that describes the hazard, the potential result if the hazard is ignored, and general instructions about how to avoid the hazard.

The following labels and placards are typically located on the HPU.

Label	Description
	Hydraulic Power Unit information label. Part # 055-526-401
	Overcurrent protection provided at machine supply terminals. Part # 100-008-434

Label	Description
	Caution To prevent equipment damage and impede performance, remove red shipping plug under filler cap before operating. Replace with black plastic snap in strainer. Part # 050-174-101
	Warning Disconnect unit from the electrical supply before opening enclosure. Part # 100-008-037
	Wye-Delta Connections Use for single voltage 6 lead motors suitable for wye-delta starting. Part # 053-448-401

Installation

Contents

Model 505.60—505.180 HPU Electrical, Hydraulic, and Water Connections

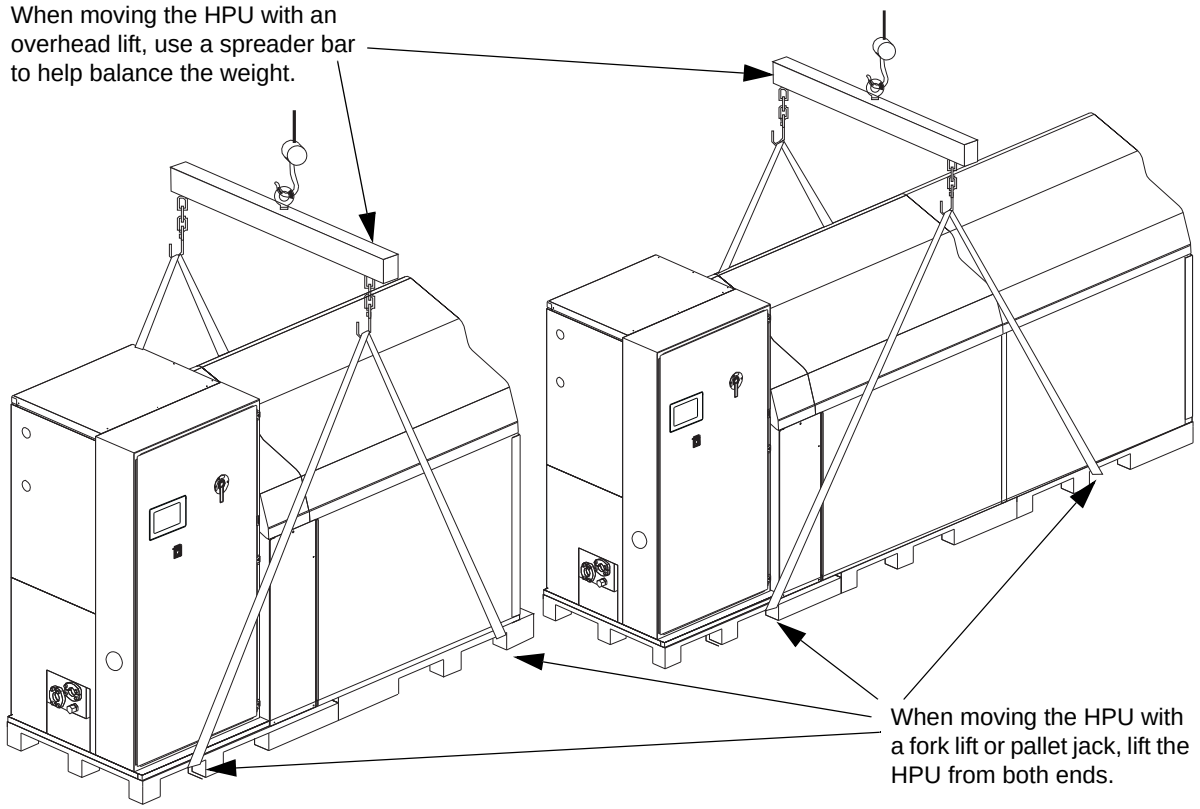
1. Position the hydraulic power unit.

⚠ CAUTION

Lifting the HPU in the middle of its chassis can strain the structural integrity of the HPU.

Do not lift the HPU in the middle of its chassis.

Lift the HPU from each end of the chassis, as shown in the next figure.



2. Determine where to put the HPU. Consider the following:

- The room dimensions must be adequate to accommodate the HPU.
  - Refer to your local electrical codes for the required free space surrounding the HPU.
  - A minimum of 914.4 mm (36 in) between the ends of the HPU and any obstruction.
  - The rear of the HPU can be as close as 25.4 mm (1 in) to the wall.
  - A minimum of 2362.2 mm (93 in) from the floor to an overhead obstruction.
- The HPU can fit through a standard 1.04-m or 41-in door.
- The HPU can be moved by a fork lift, pallet jack, or over head crane. Read the caution on the previous page.
- Placement considerations should include proximity to the facility electric power and the hydraulic components. Positioning the HPU close to the hydraulic components can reduce the cost of hydraulic distribution.
- The HPU produces no more than 72 dB (A) of sound pressure level fully compensated in a free field acoustic environment.

3. Connect the electrical service to the HPU.

Note *Local electrical codes supersede any information found here.*

Electrical connections must be made by qualified personnel and conform to local codes and regulations. The electrical box has a power disconnect switch that must be off (**O**) in order to open the electrical box. An electrical service panel to provide the electrical power feed (line voltage) to the HPU is not necessary, but may be required by local electrical codes.

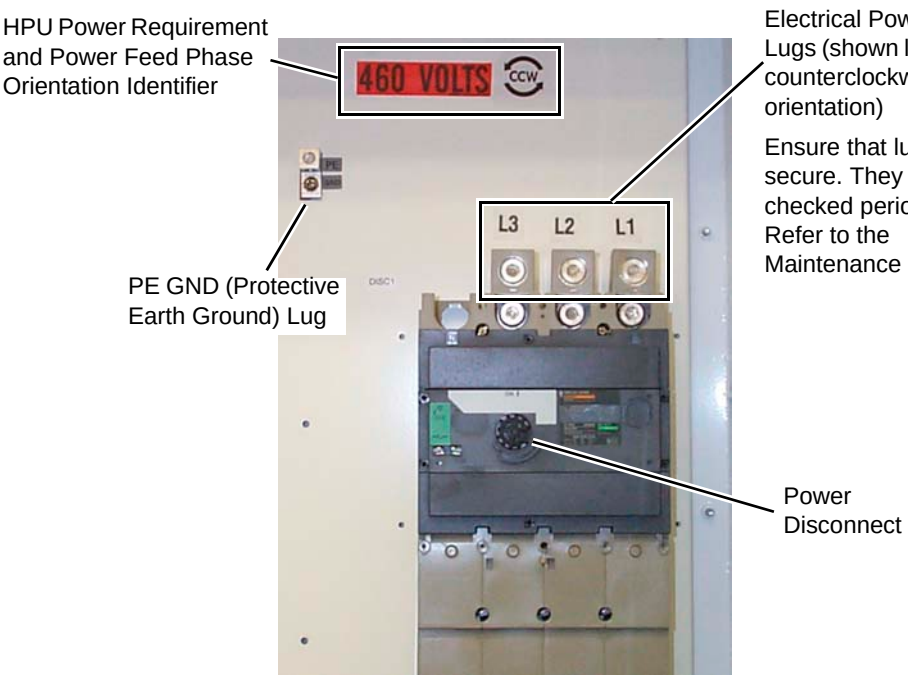
A. Connect the three or six (if parallel phase conductors are used) electrical power feed wires to the input lugs of the power disconnect in a counterclockwise phase orientation as indicated by the L3, L2, and L1 labels shown in the next figure (Model 505.90 shown, the location of the disconnect and ground varies slightly on other models).

⚠ CAUTION

Incorrect motor rotation at high pressure can cause severe damage to your HPU.

It is imperative that you verify proper motor rotation while in low pressure, as described in Step 6, to assure proper operation of the HPU and to prevent damage to the HPU.

B. Connect the grounding wire to the lug labeled PE GND (protective earth ground).

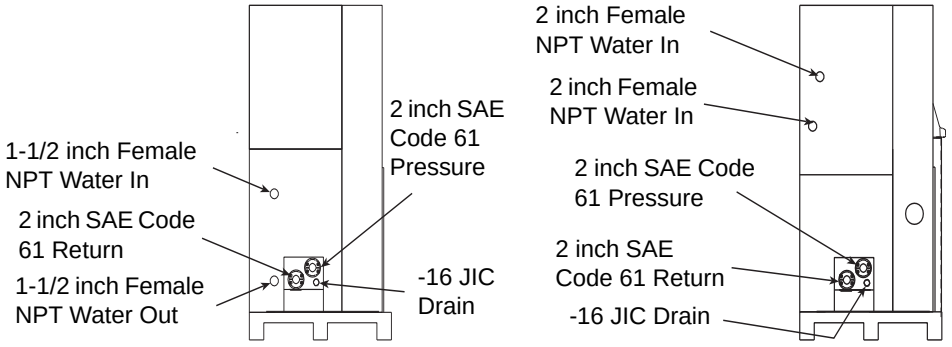


4. Connect the hydraulic and water lines.

Note *For hydraulic connections to air-cooled units, refer to the Air-Cooler to SilentFlo HPU Integration Product Information manual (MTS part number 100-135-073).*

Each port is labeled on the manifold. Take care to identify and correctly make these connections. Failure to make proper connection could lead to water in the hydraulic fluid, hydraulic fluid in the cooling water, or pressurization of low pressure lines.

The HPU requires connection to a suitable water supply to cool the hydraulic fluid. The differential pressure required between the HPU water inlet and outlet connections is 0.2–0.3 MPa (30–45 psi). The maximum allowable water inlet pressure is 0.8 MPa (120 psi).



505.60/.90 **505.120/.180**

A. Connect the hydraulic pressure and drain lines to the hydraulic fluid distribution system or directly to a hydraulic device. Use hydraulic line or hose that is rated to handle the maximum hydraulic pressure of the HPU.

Note *If check valves are installed on the pressure or return ports, an extension tube might be required on the drain port to aid in final connection to the system drain line.*

B. An appropriate shutoff valve should be installed between the water source and HPU.

C. Connect the water supply to the HPU **Water In** port. Connect the **Water Out** port to your drain line.

D. A regulating valve must be adjusted according to your water temperature. For a description of how to set the water regulating valve see, the “Changing the Water Flow” procedure.

The water supply must also be capable of maintaining water flow at a rate listed in the following table.

Water Temperature	Model Number				
	505.60	505.90	505.120	505.150	505.180
10.0°C (50°F)	34.1 L/m (9.0 gpm)	56.0 L/m (14.8 gpm)	68.1 L/m (18.0 gpm)	87.8 L/m (23.2 gpm)	112.0 L/m (29.6 gpm)
15.5°C (60°F)	41.6 L/m (11 gpm)	64.3 L/m (17 gpm)	71.9 L/m (19 gpm)	94.6 L/m (25 gpm)	128.7 L/m (34 gpm)
21.1°C (70°F)	56.8 L/m (15 gpm	83.3 L/m (22 gpm)	90.8 L/m (24 gpm)	121.1 L/m (32 gpm)	166.5 L/m (44 gpm)
26.7°C (80°F)	83.3 L/m (22 gpm)	128.7 L/m (34 gpm)	113.6 L/m (30 gpm)	159.0 L/m (42 gpm)	257.4 L/m (68 gpm)
32.2°C (90°F)	177.9 L/m (47 gpm)	268.7 L/m (71 gpm)	174.1 L/m (46 gpm)	265.0 L/m (70 gpm)	537.5 L/m (142 gpm)

5. Add hydraulic fluid to the reservoir.

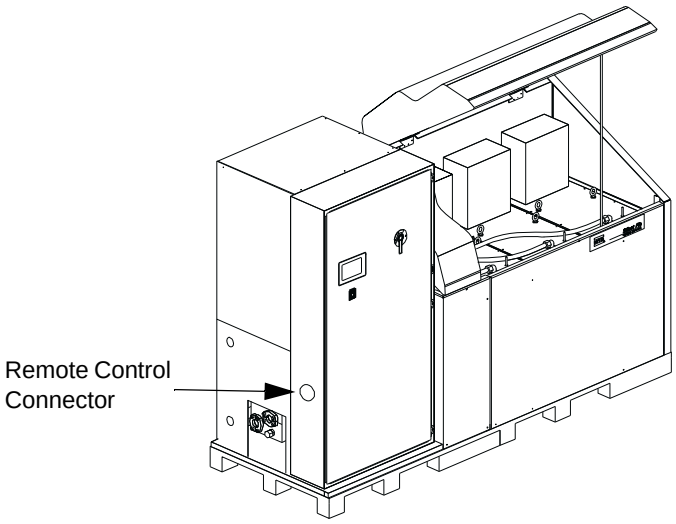
   The unit is shipped with a plug in the filler cap. Remove the red filler cap plug and install the screen in the fill port on the top of the reservoir. The screen is shipped in the electrical enclosure.

   Pump hydraulic fluid (filtered to 10 microns) into the reservoir. Stop when the fluid level reaches the maximum fluid level as indicated by the oil level dial gage

6. If provided, check the precharge pressure of the optional surge suppressor. Refer to the appropriate procedure for complete instructions.

7. Connect the controller cable (if used).

   The controller cable provides a means to connect a remote controller to the HPU. When connected, your controller can remotely start and stop the unit and switch between the low and high pressure selections. The cable also permits the controller to monitor the low level, over temperature, and dirty filter status. For information about the connection, see the appropriate electrical schematics.



Note *If a controller is not used, the installed jumper plug must be used or the unit will not start.*

Model 505.60 HPU Setup

The following procedure should only be performed at HPU installation to verify settings, when you replace the user interface panel, or if you need to change a selection.

1. Rotate the power disconnect switch to the on (|) position.

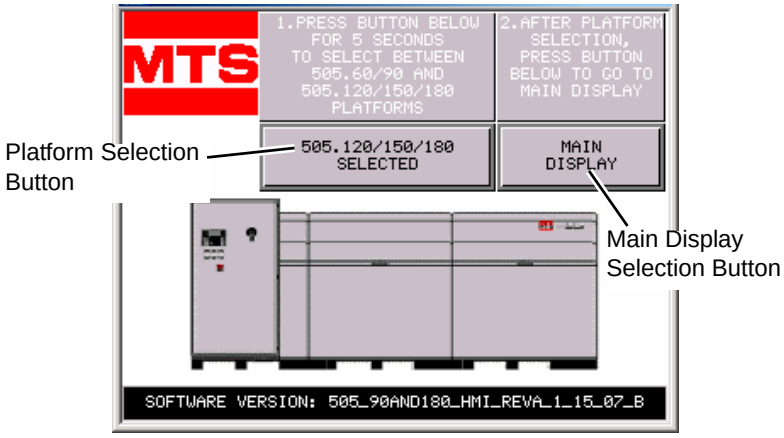
   When you apply power to the HPU the startup screen displays on the user interface panel.

2. Verify that the platform displayed corresponds with the HPU model you are installing.

   - **505.60/.90 Selected**—for a Model 505.60 or 505.90 HPU.
   - **505.120/.150/.180 Selected**—for a Model 505.120 or 505.150 or 505.180 HPU.

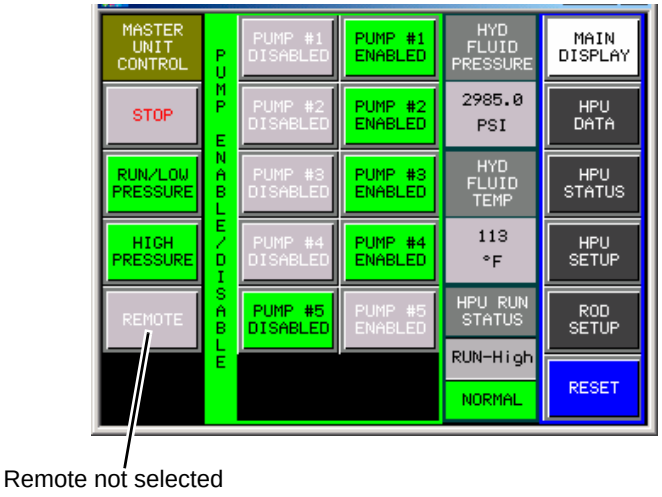
   If the displayed platform is not correct, press and hold the platform selection button until the selection changes (5 seconds).

Note *This selection can also be made from the* ***HPU Setup*** *panel.*



Startup Screen (505.120/150/180 Platform selection shown)

3. On the user interface Main Display ensure that the **Remote** button under the **Master Unit Control** is not selected (gray), indicating the HPU is in local mode.



4. Press the **Reset** button to clear the interlock conditions that are the result of initially applying power to the HPU.

5. On the user interface panel, press and hold the **HPU Setup** button for five seconds to display the **HPU Setup** panel.

6. Verify that the correct pumps are present for the HPU model installed.
   - For Model 505.60, typically two pumps are present (three buttons are displayed).
   - For Model 505.90, typically three pumps are present (three buttons are displayed).
   - For Model 505.120, typically four pumps are present (six buttons are displayed).
   - For Model 505.150, typically five pumps are present (six buttons are displayed).
   - For Model 505.180, typically six pumps are present (six buttons are displayed).

Note *You can use these buttons to intentionally take a pump offline. For example: in the figure above, pumps #1 through #5 are present (online), pump #6 is not present (offline). This prevents pump #6 from being enabled on the Main Panel. Clicking on the* ***Pump #6 Not Present*** *button will place it online (the button turns green). Clicking on any of the green* ***Pump Present*** *buttons will take that pump offline.*

7. Check and, if desired, change the following selections:

   A. Select your preference for temperature units.

   Press the **Temp Display** button to display the desired units: **Temp Display in °C** or **Temp Display in °F**.

   B. Select your preference for the hydraulic pressure units:

   Press the **Pressure Display** button to display the desired units: **Pressure Display in MPa** or **Pressure Display in psi**.

C. If you are controlling the HPU with an external device connected to the 14-pin MS connector, select the polarity of the remote interlock signals from the HPU to the controller.

Press the **Remote Logic** button to select: **Remote Logic Normal** (active high) or **Remote Logic Reverse** (active low).

D. If a watchdog timer is present, press the **Watchdog** button to display **Watchdog Present**.

If a watchdog timer is not present, press the **Watchdog** button to display **Watchdog Not Present**.

E. Determine if the optional pressure filter is installed.

If the pressure filter is present, press the **Pressure Filter** button to display **Pressure Filter Present.**

If the pressure filter is not present, press the **Pressure Filter** button to display **Pressure Filter Not Present.**

Note *Skip Step F if you do not have a device that requires the auxiliary contacts.*

F. An auxiliary contact is available for the Model 505.120, 505.150, or 505.180 HPUs. This contact can be used to control an external device such as a warning lamp or a remote cooling circuit.

This contact has two adjustment parameters. One controls the polarity of the active states of the contact: **Normal** (active high) and **Reverse** (active low). The other parameter controls whether the contact is active whenever a pump motor is running (**Aux Contact: On/Off**) or whenever a pump motor is running and the temperature of the hydraulic fluid in the reservoir reached the trip temperature (**Aux Contact: On/Off/Temp**).

– Press the **Aux Polarity:** button to display **Aux Polarity: Normal** to cause the contact to close when it is active.

– Press the **Aux Polarity:** button to display **Aux Polarity: Reverse** to cause the contact to open when it is active.

– Press the **Aux Contact:** button to display **Aux Contact: On/Off** to to activate the contact when at least one pump motor is running, and to deactivate when no pump motors are running.

– Press the **Aux Contact:** button to display **Aux Contact: On/Off/Temp** to activate the contact when at least one pump motor is running and the fluid temperature in the reservoir is above the temperature trip level and to deactivate the contact when either the temperature is lower than the temperature trip level or no pump motors are running.

– Press the **Press to Set Aux Temp** button to display the trip temperature setup controls.

Press the up arrow to increase the trip temperature level.

Press the down arrow to decrease the trip temperature level.

Press **Enter** when the desired trip temperature level is displayed in the **HPU Setup** panel.

Press **Esc** to disregard any changes and close the popup window.

8. Set up the optional ROD parameters.

   If you have the run-on-demand option, refer to the appropriate procedure.

Testing Model 505.60 HPU Operation

Note *If power is already on and the **Main Display** is showing on the User Interface panel, start with Step 4.*

1. Rotate the power disconnect switch to the on (|) position.

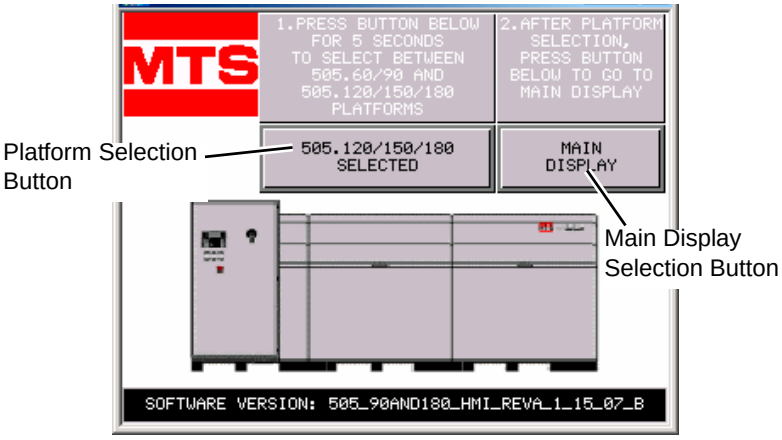
   When you apply power to the HPU, the startup screen appears on the user interface panel.

2. Verify that the platform displayed corresponds with the HPU model you are installing.

   - **505.60/.90 Selected**—for a Model 505.60 or 505.90 HPU.
   - **505.120/.150/.180 Selected**—for a Model 505.120 or 505.150 or 505.180 HPU.

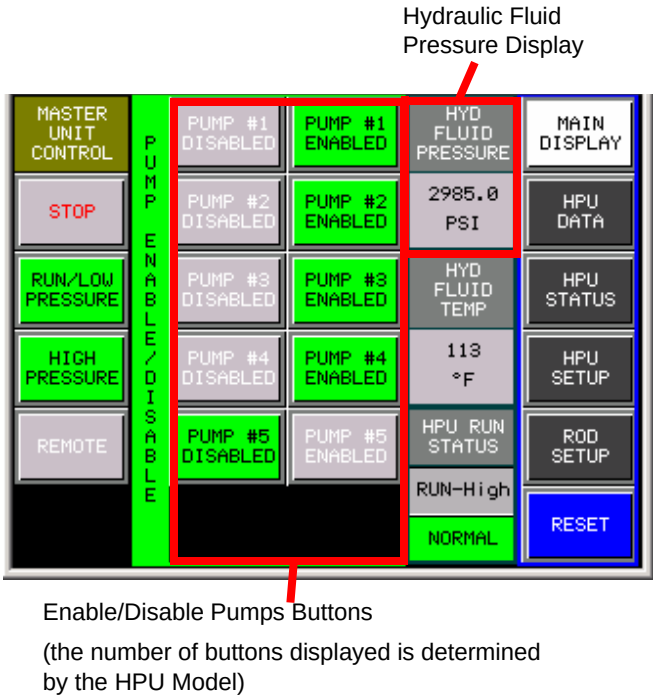
   If the displayed platform is not correct, press and hold the platform selection button until the selection changes (5 seconds).

Note *This selection can also be made from the **HPU Setup** panel.*



Startup Screen (505.120/150/180 Platform selection shown)

3. Press the **Main Display** button to go to the Main Display panel.



4. Press the **Reset** button to clear any active interlock conditions.

   For interlocks that do not clear, determine and correct the cause and then press **Reset**.

5. Press the **Pump #1 Enabled** button to enable the first pump.

Note *The following step only applies when the HPU is first turned on after the electrical power has been connected.*

6. Verify the motor rotation (the pump motor can start with the wrong rotation). Momentarily start the motor by pressing the **Run/Low Pressure button**. The enabled pump will sequence on and start running in low pressure.

   - If the motor is rotating properly, the **Hyd Fluid Pressure** display should read approximately 0.34 MPa (50 psi). Proceed to the next step.
   - If the **Hyd Fluid Pressure** display shows no pressure, press the **Stop** button to shut down the unit (do not run more than 10 seconds in the wrong direction). Have a qualified electrician make a change in the electrical phase to the HPU electrical power feed wires at the lugs labeled L1, L2, and L3.
   - If the connections were changed, repeat this step (Step 6) to confirm that the pump is now outputting approximately 0.34 MPa (50 psi). If it is not, contact MTS.

7. Verify the rotation of the remaining pump motors.

   A. Disable the currently enabled pump and enable the next successive pump.

   B. Momentarily start the motor by pressing the **Run/Low Pressure button**. The enabled pump will sequence on and start running in low pressure.

   C. If the motor is rotating properly, the pressure on the operator interface should read approximately 0.34 MPa (50 psi), repeat this step for each remaining pump.

   D. If the operator interface shows no pressure, press the **Stop** button to shut down the unit (do not run more than 10 seconds in the wrong direction). Make a note identifying the pump. Repeat this step for each remaining pump.

   E. Have a qualified electrician compare the power feeds coming into the individual starter boxes of the pumps that are rotating correctly with the pumps that are rotating incorrectly. The wiring sequence should be the same for all boxes; for example black, white, red. If necessary, correct the connection sequence and verify pump operation. Otherwise contact MTS.

   F. Check each pump for unusual noises or leaks. If a problem is found, press the **Stop** button. You must correct the problem before you continue.

8. Verify the correct output pressure.

A. Enable the first pump.

B. Press the **Run/Low Pressure** button. The enabled pump will sequence on and start running in low pressure.

C. Press the **High Pressure** button. The enabled pump will sequence to high pressure.

D. Check for unusual noises or leaks. If a problem is found, press the **Stop** button. You must correct the problem before you continue.

E. Verify that the **Hyd Fluid Pressure** display indicates high pressure [typically 21 MPa (3000 psi)].

F. If necessary, refer to the appropriate procedure, and adjust the hydraulic pressure for the enabled pump.

G. Press the **High Pressure** button to return to the low pressure mode.

H. Enable the next pump and disable the pump you just checked.

I. Repeat Step 8C through 8H for each remaining pump.

J. Enable one pump only and select low pressure.

K. Run the pump in low pressure for about three hours to filter the new hydraulic fluid.

9. After filtering is complete, press the **Stop** button.

Precharging the Optional Surge Suppressor Accumulator

The surge suppressor, if provided, smooths out the ripple caused by the pulsing action of the pump as it pressurizes the hydraulic fluid. The surge suppressor is a cylinder that has an outer sleeve that is pressurized with nitrogen. The gas pressurized sleeve dampens the pressure pulses.

The surge suppressor is mounted to the output of the hydraulic pump inside the reservoir.

It is normal for a small amount of surge suppressor precharge loss to occur during operation. Because of this gradual reduction in precharge pressure, the pressure should be checked and recharged (if necessary) at regular intervals.

Determining a pressure check interval

The precharge pressure checking intervals of your surge suppressor depends on how your system is used. Vigorous use causes more rapid pressure loss and thus requires checking and recharging more often.

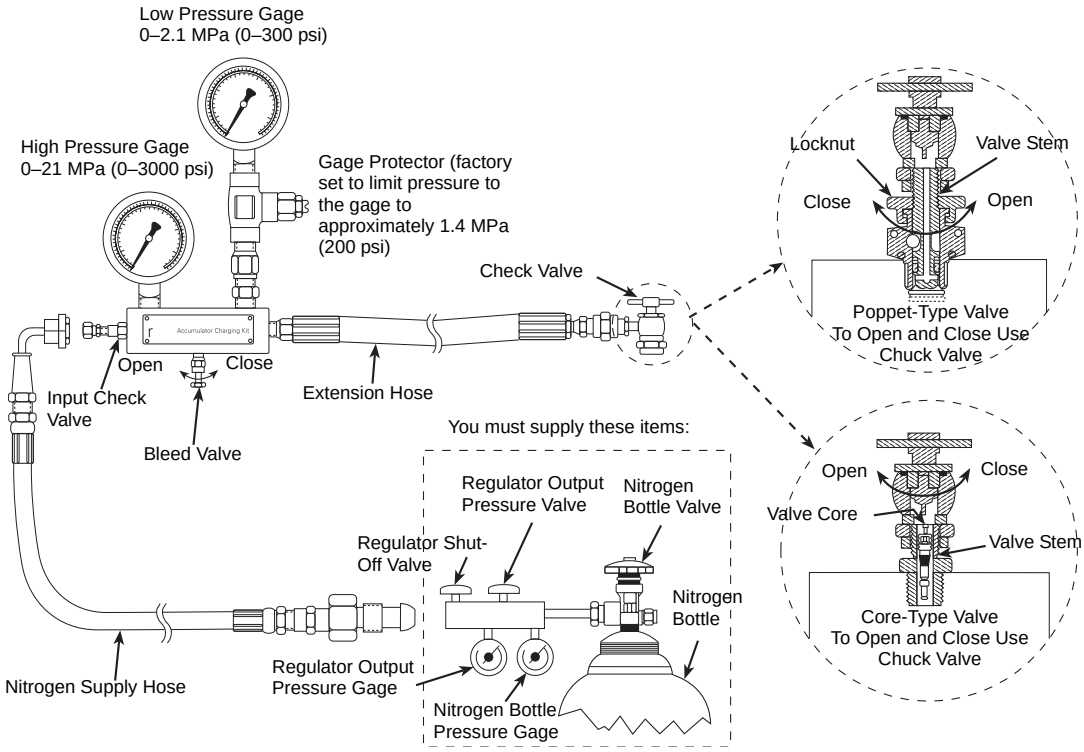
Initially, check the surge suppressor precharge pressure every month or 160 operating hours. If the precharge pressure changes more than 1.4 MPa (200 psi) during this time period, recharge the surge suppressor and check the pressure twice as often in the future. If the precharge pressure changes less than 1.4 MPa (200 psi), check the pressure half as often.

When you have established a regular interval for checking the precharge pressure, note the amount of pressure loss that occurs each time the pressure is checked. An increase in pressure loss during the period between checks might indicate that the surge suppressor seals or bladder require replacement.

Checking the precharge pressure

The nitrogen precharge should be about 50–60% of the output pressure. To check the accumulator precharge:

1. Turn the HPU off and ensure that the hydraulic pressure is zero before proceeding.
2. Connect the charging kit chuck valve to the valve stem on the accumulator, or to the remote charge valve on the reservoir top, if supplied.
3. With an open-end wrench, turn the locknut counterclockwise on the accumulator valve assembly to open the valve. Read the pressure on the high pressure gage.
   - If the pressure reading is outside the range of 10.3–12.5 MPa (1500–1800 psi), perform the procedure “Changing the Precharge Pressure.”
   - If the pressure level is within the range of 10.3–12.5 MPa (1500–1800 psi), turn the locknut clockwise to close the valve and continue this procedure.
4. Open the bleed valve on the accumulator charging kit and remove the chuck valve from the accumulator. Replace the valve stem cap and protective cover on the accumulator.



Charging Kit

Changing the precharge pressure

The nitrogen precharge should be within the range of 10.3–12.5 MPa (1500–1800 psi) which is 50–60% of the output pressure (21 MPa or 3000 psi). Perform one of the following procedures to change the precharge pressure.

Decreasing pressure

To decrease the precharge pressure:

1. Slowly open the bleed valve on the charging kit until gas begins to escape. When the pressure reading on the appropriate pressure gage drops to the level required, close the bleed valve.
2. Close the locknut. Open the bleed valve on the accumulator charging kit and remove the chuck valve from the accumulator.
3. Install the valve stem cap and protective cover.

Increasing pressure

To increase the precharge pressure:

1. Close the locknut on the accumulator.
2. Open the bleed valve two turns.

⚠ WARNING

Precharging with a gas other than dry nitrogen will cause the existing nitrogen within the surge suppressor to be mixed with the new gas.

Mixing gases can produce unpredictable results.

Use only dry nitrogen gas to precharge the surge suppressors.

3. Connect the nitrogen supply hose from the supply bottle pressure regulator output to the input check valve on the charging kit.
4. Open the nitrogen bottle valve. Check the nitrogen bottle pressure gage on the regulator. (The bottle must contain sufficient pressure to provide an adequate gas volume.)
5. Monitor the regulator output pressure gage and adjust the regulator output pressure valve to the required level.

⚠ CAUTION

Avoid rapid and extreme pressure transitions.

Rapid flow rates with pressure differentials of more than 2.1 MPa (300 psi) across the input check valve can damage the valve seal(s).

Do not allow rapid flow rates. Open the regulator shut-off valve only far enough to permit a gradual transfer of gas.

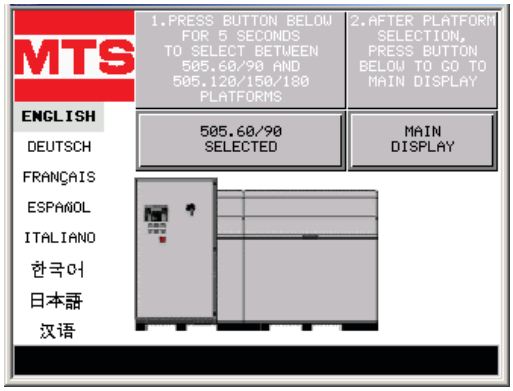
6. Slowly open the regulator shut-off valve until gas is heard escaping from the accumulator charging kit bleed valve. Allow gas to slowly escape for approximately ten seconds, and then close the bleed valve. Immediately close the regulator shut-off valve before the pressure reading on either the high or low charging kit pressure gage exceeds the pressure level of the accumulator.
7. Open the locknut. Slowly open the regulator shut-off valve until the pressure indicator on either the high or low charging kit pressure gage begins to rise. When the pressure is at the required pressure level, close the regulator shut-off valve.
8. Close the locknut.
9. Open the bleed valve on the charging kit and remove the chuck valve from the accumulator.
10. Install the valve stem cap and protective cover. Close the valve on the nitrogen bottle.

Operation

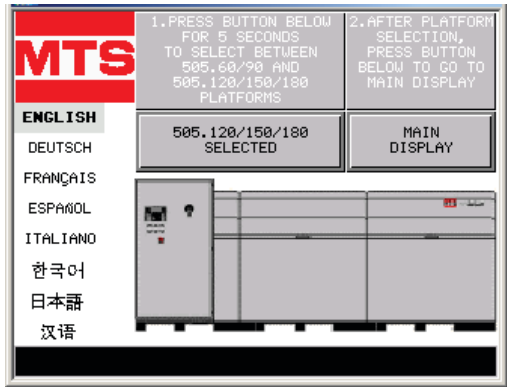
Contents

Model 505.60 HPU Startup Panel

The Series 505.60/.90 and 505.120–.180 HPUs have similar user interface panels. The primary difference is the number of pumps that are displayed. This is determined by the HPU Model. The controls for the various panels are shown and described on the following page.



505.60/90 Platform



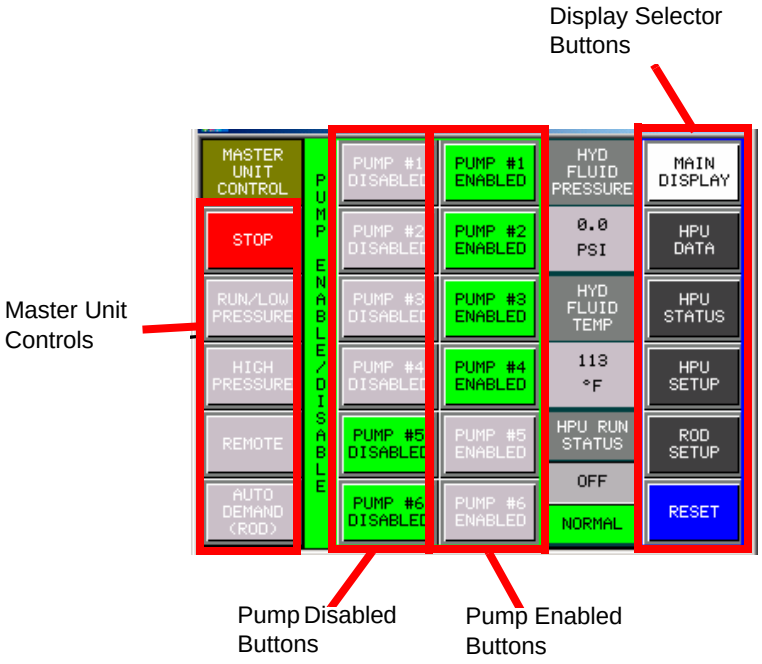
505.120/150/180 Platform

The Startup Screen displays whenever power is first applied to the HPU through the power disconnect switch on the starter box.

Startup Screen Controls Descriptions

Control	Description
Language buttons	Select user interface language. Language can be re-selected at HPU power up.
505.60/.90 Selected, 505.120/.150/.180 Selected toggle button	Selects the HPU platform. The selected platform corresponds to the Model of the HPU installed. This button uses a 5 second delay to prevent inadvertent switching of the HPU platform. Pressing and holding the button for five seconds switches from the platform that is displayed to the other HPU platform.
Main Display button	Click on this button the open the **Main Display** panel.

Model 505.60 HPU Main Display



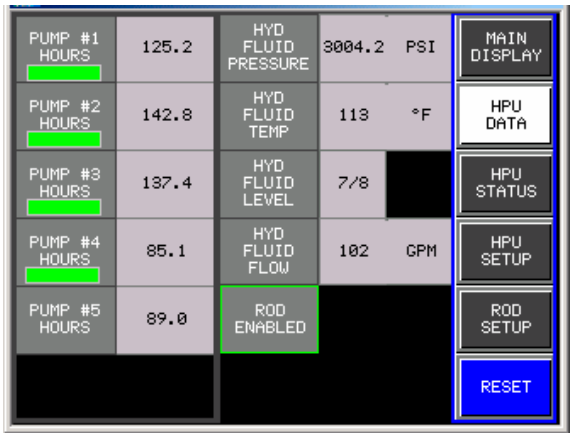
Main Panel Display Controls

Control	Descriptions
Master Unit Controls	
Stop button	Turns off hydraulic pressure to the system. The button turns red when the HPU is stopped.
Run/Low Pressure button	Turns each enabled pump on in low pressure mode. The button turns green when it is on.
High Pressure button	Toggles each running pump between low and high pressure. The button turns green when high pressure is selected and turns gray when low pressure is selected.
Remote button	Enables the interface with your system controller. When selected (green) your system controller can turn the HPU on and off, select low and high pressure, and monitor HPU status such as oil temperature, fluid level, and filter status. When in **Remote**, the **Run/Low Pressure** and **High Pressure** buttons on the user interface panel are disabled.
Auto Demand (ROD) (optional) button	When selected (green) automatically controls pump operation as system demand changes.

Main Panel Display Controls (Continued)

Control	Descriptions
Pump Enable/Disable	The number of buttons displayed is determined by the model of the HPU and the selection made on the **HPU Setup** screen.
Pump #1 through 6 Disabled buttons	Disables the associated pump. The button is green if the pump is disabled.
Pump #1 through 6 Enabled buttons	Enables the associated pump. The button is green if the pump is enabled.
Hyd Fluid Pressure display	Displays the output pressure (in MPa or psi) of the HPU.
Hyd Fluid Temp display	Displays the temperature (in °F or °C) of the hydraulic fluid in the reservoir.
HPU Run Status	
Run Status display	Displays the current run status of the HPU. The status conditions may be: • **Off** • **Run-Low** • **Run- High** • Auto-Mode
Fault Status display	Displays the current fault status of the HPU. If one or more faults exist, the button will blink red and the message will alternate between **Faulted** and the existing fault conditon(s). The display condition may be: • **Normal** (steady green) • **Faulted** • **Overtemp** • **Hyd Fluid Level** • **Motor Overload** • **Dirty** • **Filter** • **E-stop**
Panel selector buttons	Click on a gray button to display the screen for the selection. The selected button turns white. The screens are described on the following pages.
Reset	The button is blue when all systems are normal. The button is light blue when an interlock condition exists. Clears any interlocks caused by the HPU (provided the reason fro the interlock has been corrected). This switch operates independently from any other reset functions in your control system.

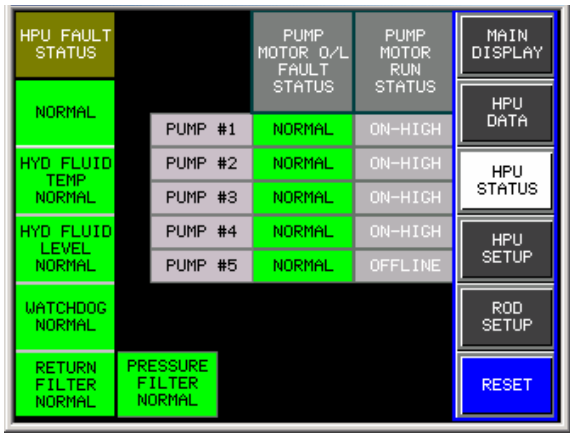
Model 505.60 HPU Data



HPU Data

Control	Descriptions
Pump Hours display	Displays the running hours for each pump. The green bar indicates those pumps that are currently enabled but not running (blinking green) and those pumps currently enabled and running (solid green). The running hour display for each pump can be changed if desired.
Hyd Fluid Pressure display	Displays the highest pressure of the running pumps.
Hyd Fluid Temp display	Display the temperature of the hydraulic fluid in the reservoir.
Hyd Fluid Level display	Displays the level of the hydraulic fluid in the reservoir in 1/8 increments. The level is relative to the bottom of the sensor, not the bottom of the reservoir
Hyd Fluid Flow display	Displays if a flow meter is installed in the system. Displays the total hydraulic fluid flow from all running pumps.
ROD Enabled display	Displays only if the run-on-demand option is installed and if the option is enabled from the **Auto Demand (ROD)** button on the **Main Display** screen**.**

Model 505.60 HPU Status



HPU Status Screen

Control	Descriptions
HPU Fault Status	All these indicators should be green if they are within normal operating parameters.
Normal display	Indicator the HPU is operating properly.
Hyd Fluid Temp display	Displays **Hyd Fluid Temp Normal** (green) when the temperature of the hydraulic fluid in the reservoir is within normal limits. If the temperature of the hydraulic fluid exceeds 55°C (131°F) the indicator will turn red and indicate an over-temperature fault. An over-temperature condition causes an interlock and turns off the HPU. For more information, see the “Changing the Water Flow” procedure. After reducing the temperature of the hydraulic fluid, press the **Reset** button to clear the interlock. The indicator returns to **Hyd Fluid Temp Normal** (green).
Hyd Fluid Level display	The **Hyd Fluid Level** indicator turns red when the hydraulic fluid is below a preset level. Low fluid level will cause an interlock and turn the HPU off. The interlock signal can be monitored by your system controller. After adding hydraulic fluid to the reservoir, press the **Reset** button to clear the interlock.
Watchdog display	This indicator is green when the PLC that controls the HPU is operating normally. This indicator turns red (indicating a watchdog fault) if the PLC stops operating correctly. A watchdog fault cause the HPU to shutdown.
Return Filter display	Indicates yellow when the filter needs replacement. A dirty filter condition will prevent the HPU from being started, but it will not stop the HPU while it is running. The signal can be monitored from the system controller. Refer to the appropriate filter replacement procedure if necessary. After replacing the filter, press the **Reset** button to clear the indication. The indicator returns to **Return Filter Normal** (green).

HPU Status Screen (Continued)

Control	Descriptions
Pressure Filter display	Indicates yellow when the filter needs replacement. The signal can be monitored from the system controller. Refer to the appropriate filter replacement procedure if necessary. After replacing the filter, press the **Reset** button to clear the indication. The indicator returns to **Pressure Filter Normal** (green).
Pump Motor Overload Fault Status display	Monitors each enabled pump motor and indicates red when a thermal overload has been detected.
Pump Motor Run Status display	Indicates the current run status of each pump. The possible conditions are: • **Enabled** • **Offline** • **On-Low** • **On-High** • **Standby** (After the first pump starts, this term displays on all remaining enabled pumps until they start.)

Model 505.60 HPU Setup

To select this screen you must press and hold the **HPU Setup** button for five seconds.

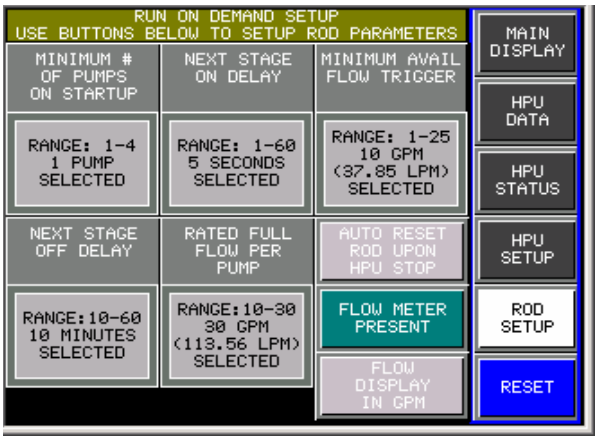
HPU Setup

Control	Descriptions
Pump Motor Selection	The number of buttons displayed is determined by the HPU model.
Pump Present/ Pump Not Present buttons	These buttons are used to place pumps online or take pumps offline. A pump is online when the button is green and indicates **Pump #_ Present**. A pump is offline when the button is red and indicates **Pump #_ Not Present**.
HPU Setup buttons	
Temp Display In °F or **°C** button	Use this button to select the desired temperature units for the HPU displays. Click on this button to toggle between units: **°F** or **°C**.
Pressure Display In PSI or **MPa** button	Use this button to select the desired pressure units for the HPU displays. Click on this button to toggle between units: **PSI** or **MPa**.
Remote Logic Normal or **Reverse** button	This button allows you to change the polarity of the interlock signals to make them compatible with a non-MTS controller. Contact MTS before changing this setting. Click on this button to toggle between **Remote Logic Normal** (remote mode selection is indicated by a positive transition of this signal) and **Remote Logic Reverse** (remote mode selection is indicated by a negative transition of this signal).
Watchdog Present or **Watchdog Not Present** button	Select **Watchdog Present** (typical) if the HPU PLC has a watchdog timer. Select **Watchdog No Present** if the HPU PLC does not have a watchdog timer.
Pressure Filter Present or **Pressure Filter Not Present** button	Select **Pressure Filter Present** if an optional high pressure filter is installed in the HPU. Select **Pressure Filter Not Present** if no high pressure filter is installed in the HPU.
Aux Contact: On/ Off or **On/Off/Temp** button	This button is associated with the auxiliary run contact in the HPU. Selecting **Aux Contact: On/Off** activates the auxiliary run contact whenever at least one pump is running and deactivates the contact when no pumps are running. Selecting **Aux Contact: On/Off/Temp** activates the auxiliary run contact whenever at least one pump is running and the temperature of the hydraulic fluid is above the trip level and deactivates the contact when the temperature of the hydraulic fluid in the reservoir is below the trip level or no pumps are running.
Aux Polarity Normal or **Reverse** button	Select **Aux Polarity Normal** to cause the contact to close when it is active Select **Aux Polarity Reverse** to cause the contact to open when it is active.

HPU Setup (Continued)

Control	Descriptions
Temp Setting display button	This button displays the temperature setting, in °F and °C, that will activate the auxiliary contact. To change the temperature setting, click on the button and use the four-button window that displays to change the setting. Click on the up arrow to increment or the down arrow to decrement the temperature in 1.0°F (1.8°C) increments. Click on **ESC** to close to window without accepting the changes. Click on **Enter** to accept the changes and close the window.
505.60/.90 Selected, **505.120/ 150/180 Selected** display	Displays the currently selected platform.
User Interface Setup button	This button is only for authorized personnel and is password protected.

ROD Setup



Flow Meter Present must be selected to display the contents of this screen.

To select this screen, press and hold the **ROD Setup** button for five seconds.

ROD Setup

Control	Descriptions
Minimum # of Pumps on Startup display and button	Displays the adjustment range (in pumps) and how many of those pumps will be running at startup for run-on-demand.
Next Stage On Delay display and button	Displays the adjustment range (in seconds) for the on delay and the current delay setting. The flow must be at or above the trigger level for this amount of time before the next pump motor will turn on.
Minimum Available Flow Trigger display and button	Displays the adjustment range (in gpm and lpm) for the minimum flow trigger and the current setting for the trigger.
Next Stage Off Delay display and button	Displays the adjustment range (in minutes) for the off delay and the current delay setting. The flow must be below the trigger level for this amount of time before the a pump motor will turn off.
Rated Full Flow Per Pump display and button	Displays the adjustment range (in gpm and lpm) for the flow of each pump and the current full flow setting.
Flow Meter Present or **Flow Meter Not Present** button	If **Flow Meter Not Present**, no other buttons are displayed on the screen. Flow Meter Present must be selected to display the buttons on this screen.
Flow Display in gpm or **lpm** button	Use this button to select the desired flow units for the HPU displays. Click on this button to toggle between units: gpm or lpm.
Auto Reset ROD Upon HPU Stop or **Do Not Reset ROD Upon HPU Stop** button	Select **Auto Reset ROD Upon HPU Stop to disable the Auto Demand (ROD) button on the Main Panel when you press the Stop button.** Select **Do Not Reset ROD Upon HPU Stop to hold the Auto Demand (ROD) button on the Main Panel enabled when the you push the Stop button.**

More about ROD setup

To setup the system for run-on-demand you first need to know what your system flow requirements will be for the full compliment of tests or test systems you will be using.

For example, you determine that all the tests you expect to be running will require 70 gpm of hydraulic fluid flow. Therefore you will need three pumps (90 gpm) to meet this demand. Using the ROD startup procedure for the HPU model you have, you enable the three pumps you want to run that day, setup the **ROD Setup,** and start the HPU under ROD control. The HPU starts with one pump running (the one with the lowest number of running hours) in high pressure and the other two in standby mode.

You begin testing using two 7-gpm testing stations. The total hydraulic fluid flow for the HPU is now 14 gpm. When a third 7-gpm test station starts, the system flow increases to 21 gpm. This leaves nine gpm of available flow for the HPU. The available flow is below the 10 gpm set for the **Minimum Avail Flow Trigger**, so after 5 seconds at this flow level, the HPU starts the enabled pump motor with the next lowest number of running hours on it. The total full flow for the HPU is now 60 gpm and the available, or reserve, flow is 39 gpm. As more testing stations are started and the available flow once again goes below the 10 gpm minimum level for 5 seconds, the third pump starts.

If tests are halted and the system flow becomes less than 50 gpm for a period of 10 minutes (the **Next Stage Off Delay**), the HPU will turn off the pump with the highest number of running hours on it. This cycling of pumps on and off continues as the flow demand changes.

If it is determined that more (or fewer) pump modules are needed while in ROD control, pumps can be enabled (or disabled) from the **Main Display** screen while the HPU is running.

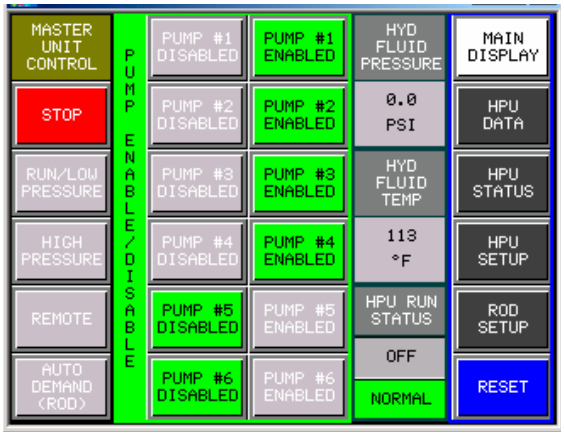
Additionally, the ROD control mode can be disabled by pressing the **Auto Demand (ROD)** button on the **Main Display** screen (the button turns gray). This causes all enabled pumps to start and the HPU will be running in manual mode. The ROD control mode can be re-enabled by pressing the **Auto Demand (ROD)** button again (the button turns green).

Operating the Model 505.60 HPU Locally or Remotely

The HPU can be operated locally using the controls on the user interface panel or remotely using your system controller.

Local operation

1. Make a general inspection of the HPU. Ensure that all cooling water valves are open. Ensure the **Emergency Stop** button is released.



2. If not already displayed, press the **Main Display** button to open the **Main Display** screen.
3. Verify that the **Remote** button is gray. If the button is green, press the button to change it to gray (indicating local mode).

4. Verify that at least one pump is enabled. Enable additional pumps as necessary.
5. Press **Run/Low Pressure** to start the pumps. The pumps start sequentially to prevent an electrical overload. Each pump starts in low pressure mode.
6. Check the HPU for leaks and unusual sounds. Stop the HPU immediately if leaks or unusual sounds are noted. Determine the cause and fix the problem before restarting the HPU.
7. Press **High Pressure** to turn on high hydraulic pressure.

Note *If the HPU generates an interlock during operation (such as low fluid level or high temperature), the HPU will stop. Once the cause has been corrected, press the **Reset** button before restarting.*

8. Run the HPU for about 30 minutes or until the hydraulic fluid is up to operating temperature [typically 43–49°C (110–120°F)] before using your test system.
9. When in high pressure mode, press the **High Pressure** button to return to low pressure mode.
10. To stop the HPU, press the **Stop** button.

Remote operation

Remote operation can occur at a remote control panel or from your system controller. The controller must be connected to the HPU.

1. Make a general inspection of the HPU. Ensure that all cooling water valves are open. Ensure the **Emergency Stop** button is released.
2. If not already displayed, press the **Main Display** button to open the **Main Display** screen.
3. Verify that the **Remote** button is green. If the button is not green, press the button to change it to green (indicating remote mode).
4. Verify that at least one pump is enabled. Enable additional pump as necessary.
5. Start the HPU in low pressure at your controller.
6. Check the HPU for leaks and unusual sounds. Stop the HPU immediately if leaks or unusual sounds are noted. Determine the cause and fix the problem before restarting the HPU.
7. Select high pressure at your system controller.

Note *If the HPU generates an interlock during operation (low fluid level or high temperature), the HPU will be stopped. Once the cause has been corrected, press the **Reset** button on the HPU user interface before restarting.*

8. Run the HPU for about 30 minutes or until the hydraulic fluid is up to operating temperature [typically 43–49°C (110–120°F)] before using your test system.
9. Stop the HPU with the controller.

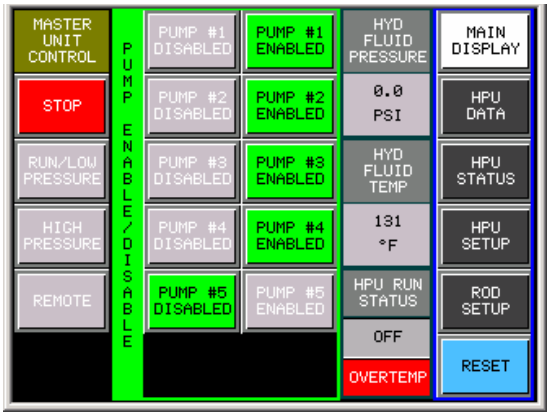
Power save mode

If the user interface is unused for 30 minutes, it will enter a power save mode. The display screen will go dark. The green power indicator on the bezel will remain lit. Touch and release anywhere on the display screen to reactivate the screen at the last accessed panel.

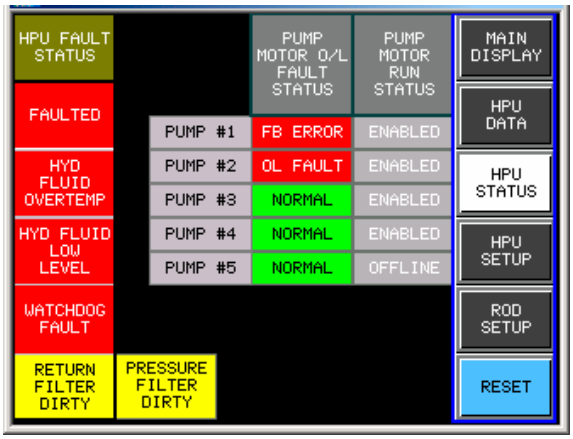
Recovering From an Interlock

This section describes how to reset each type of HPU interlock. If a fault occurs (Low Level, Over temperature, Dirty Filter), the HPU will not start. You must determine the source of the interlock and correct the cause before using the HPU.

If the **Main Display** is selected, the presence of a fault condition is evident by the **Reset** button turning light blue and the **HPU Run Status** indicators turning to **Off** and **Normal** (steady green) changing to flashing red and sequencing between **Faulted** and the existing fault condition (see the next figure).



Click on the **HPU Status** button to display the **HPU Status** screen and identify the fault conditions (see the next figure).



Hyd fluid low level

The **HPU Fault Status** on the user interface panel displays **Hyd Fluid Low Level** when the hydraulic fluid falls below the setting of the low level/over temperature sensor mounted through the top of the reservoir. Perform the following steps to correct a low level interlock:

1. Determine the cause for the low fluid level and correct it.
2. Add hydraulic fluid to the reservoir until the sight glass on the side of the HPU indicates the proper level.
3. Verify that the hydraulic fluid level sensor is detecting the proper fluid level by selecting the **HPU Data** screen and checking that **Hyd Fluid Level** indicates **Max**
4. Press **Reset** to clear the interlock and change the unit status back to **NORMAL**.

Hyd fluid overtemperature

The **HPU Fault Status** on user interface panel displays **Hyd Fluid Overtemp** when the temperature exceeds 55°C (131°F). The temperature is detected by the low level/over temperature sensor mounted through the top of the reservoir. The HPU cannot be restarted until the fluid has cooled. Perform the following to correct an over temperature interlock:

1. Check the actual temperature of the hydraulic fluid by selecting the **HPU Data** screen and checking **Hyd Fluid Temp** on the display.
2. Determine if the hydraulic fluid is receiving adequate cooling.
   - The cooling water inlet temperature affects the efficiency of cooling the hydraulic fluid.
   - Check the cooling water inlet-to-outlet pressure differential. It should be between 0.24–0.31 MPa (35–45 psi). If necessary, adjust the water pressure at its source.
3. If necessary, cool the hydraulic fluid by circulating hydraulic fluid through the heat exchanger.

A. Press the **Main Display** button to select the **Main Display** screen.

B. Ensure that pump #1 is present (the **Pump #1 Enabled and Pump #1 Disabled** button will be visible on the **Main Display** screen).

   If these buttons are not visible, go to the **HPU Setup** screen and press the **Pump #1 Not Present** button to change it to **Pump #1 Present**.

C. Press and hold the **Run/Low Pressure button**. After 15 seconds, pump #1 will start and run to circulate the hydraulic fluid through the heat exchanger. If you stop holding the **Run/Low Pressure button** for more than five seconds, the pump will stop.

4. After the displayed **Hyd Fluid Temp** display drops below 55°C (131°F), release the **Run/Low Pressure** button after five seconds, the pump will stop.

   Press the **Reset** button to clear the interlock and turn the indicator off.

Watchdog fault

The **HPU Fault Status** on the user interface panel displays **Watchdog Fault** if the watchdog timer stops operating properly. A watchdog fault causes the HPU to shutdown. Perform the following procedure to attempt to recover from this fault.

1. Turn the power disconnect switch on the main enclosure to off.
2. Wait at least 60 seconds, then close the power disconnect switch.
3. From the Startup Screen, press the **Main Display** button.
4. On the **Main Display** screen, press the **Reset** button.
5. If the **Watchdog Fault** condition does not clear, contact MTS Systems.

Dirty filter

The **HPU Fault Status** on the user interface panel displays **Return Filter Dirty or Pressure Filter Dirty (if a pressure filter is installed)** when the filter capacity has reached a critical level. A dirty filter condition will prevent the HPU from being started, but it will not stop the HPU while it is running.

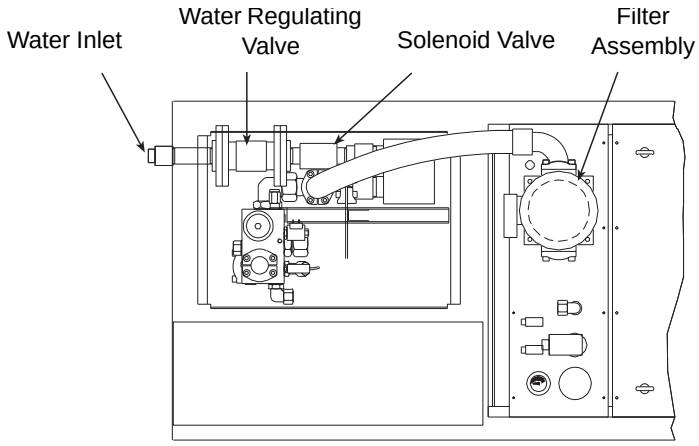
1. Replace the dirty hydraulic fluid filter. Refer to procedures for return line filter replacement and high pressure filter replacement as required.
2. Press **Reset** to clear the interlock and turn the indicator off.

Changing the Water Flow

On water-cooled units, water is used to maintain hydraulic fluid temperature. (See Air-Cooling Product Information manual, MTS part number 100-135-073, regarding air-cooled units.) The water regulating valve, located on the water inlet line of the HPU, senses the hydraulic fluid temperature and automatically controls water flow to the heat exchanger.

Note *When the HPU is turned off, a solenoid valve also shuts off the flow of water to the heat exchanger.*

The water-regulating valve is adjusted at MTS Systems Corporation to maintain the hydraulic fluid temperature within the range of 43–49°C (110–120°F). However, the temperature of your water might require you to readjust the regulator.



To set the operating temperature of the hydraulic fluid.

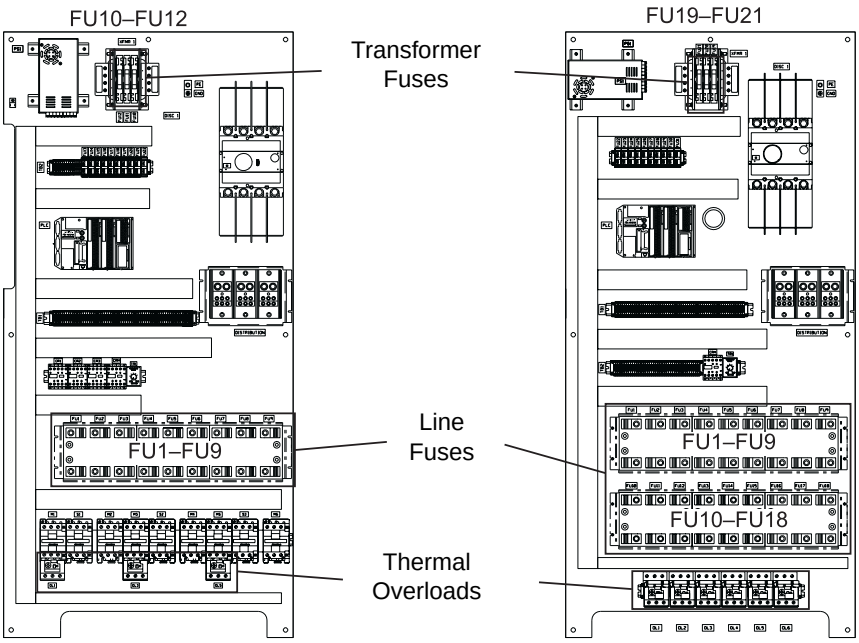
1. If not already selected, press the **Main Display** button on the user interface panel to select the **Main Display**.
2. Press **Run/Low Pressure** to start the HPU in low pressure.
3. Press the **High Pressure** button to select the high-pressure mode.
4. Observe the **Hyd Fluid Temp** on the **Main Display** screen as the hydraulic fluid temperature rises. Note the temperature where the hydraulic fluid temperature stabilizes.
5. Adjust the water-regulating valve. One full turn (360°) of the adjusting screw produces a change in hydraulic fluid temperature a few degrees.
   - Adjust the screw clockwise to decrease the operating temperature.
   - Adjust counterclockwise to increase the operating temperature.
6. Note the effect after 15 minutes.
7. Repeat Steps 5 and 6 until the hydraulic fluid temperature stabilizes between 43°C–49°C (110°F–120°F).

Resetting the Thermal Overloads

The electrical power feed line for each pump motor has a thermal overload switch in the main electrical enclosure. If any pump motor draws too much current, its thermal overload switch trips and disconnects that pump motor from the electrical power feed.

Additional protection is provided by line fuses (FU1–FU9 for the Model 505.60/.90 and FU1-FU18 for the Model 505.120–.180) and transformer fuses (FU10–FU12 for the Model 505.60/.90 and FU19–FU21 for the Model 505.120–.180). These cartridge-type fuses must be replaced with fuses of the same size, type, and rating, which vary according to the voltage configuration.

A tripped thermal overload or a blown fuse indicates a potential short circuit, too much heat in the electrical box, or a component failure (mechanical or electrical).

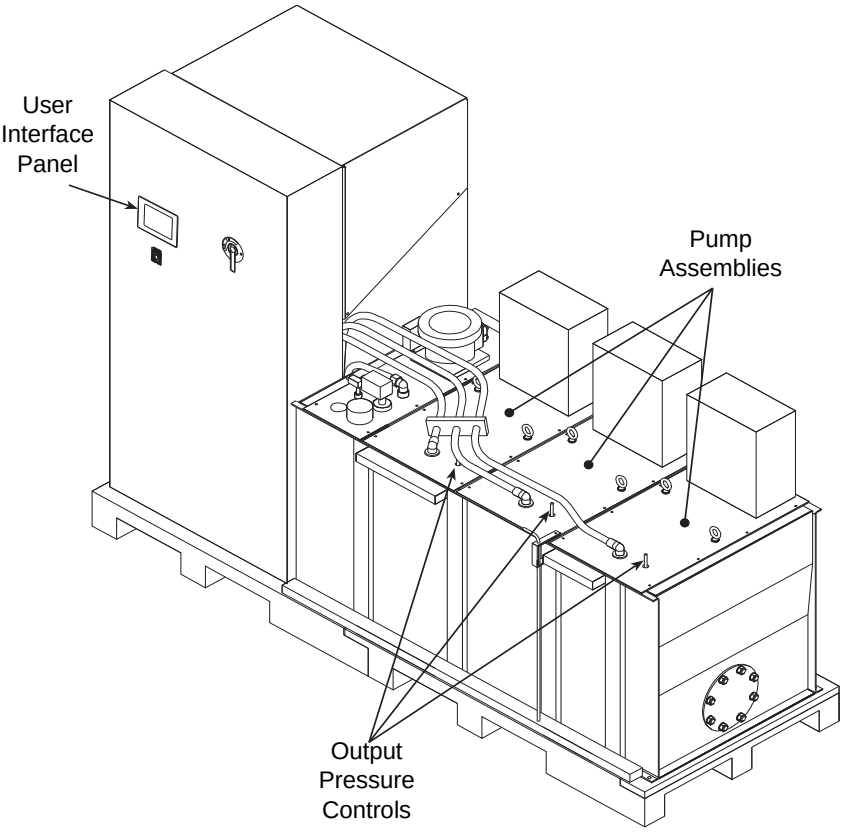


Reset the thermal overload switches or replace the fuses as follows:

1. Turn the main disconnect switch counterclockwise to remove power from the electrical control box.
2. Loosen the three bolts securing the door of the electrical enclosure and open the door.
3. Locate the thermal overload switch. Press **Reset** to clear the switch. If the thermal overload switch trips again, wait until the switch cools.

Adjusting the Model 505.60 Hydraulic Pressure

The output pressure can be adjusted from a low pressure value of 1 MPa (145 psi) to the maximum setting of 21 MPa (3000 psi). If you have a special testing requirement, you can reduce the HPU output pressure.



Control Locations (505.69/90 shown)

Perform the following procedure to adjust the output pressure. Perform this procedure on one pump at a time.

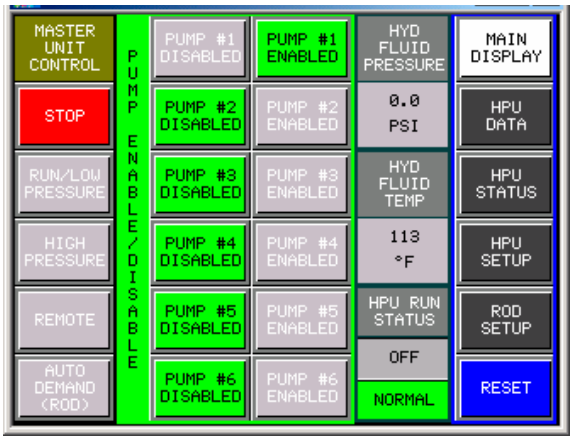
⚠ CAUTION

The pump and motor are designed to operate below a specified pressure.

Setting the hydraulic pressure above 21 MPa (3000 psi) can damage the pump and its motor

Do not adjust the output pressure higher than 21 MPa (3000 psi).

1. If not already selected, press the **Main Display** button on the user interface panel to select the **Main Display**.



2. Press the **Pump #_ Enabled** for the first pump to be adjusted.

   Press **Pump #_ Disabled** for all the other pumps.

3. Press **Run/Low Pressure** to start the HPU in low pressure. Ensure that there are no flow demands by the system. Run the pump in this mode until the hydraulic fluid is at normal operating temperature.

4. Press the **High Pressure** button to select high pressure mode.

5. Loosen the nut securing the output pressure control.

6. While an assistant monitors the **Hydraulic Fluid Pressure** on the **Main Display** screen, adjust the output pressure as follows until the desired pressure is displayed.

   - Turn the output pressure control clockwise to increase the pressure.
   - Turn the output pressure control counterclockwise to decrease the pressure.

7. Hold the output pressure control to prevent it from moving and tighten the nut to secure it.

8. Check the **Hydraulic Fluid Pressure** on the **Main Display** screen to ensure that the desired hydraulic pressure is being maintained.

9. Press the **Pump #_ Enabled** for the next pump to be adjusted.

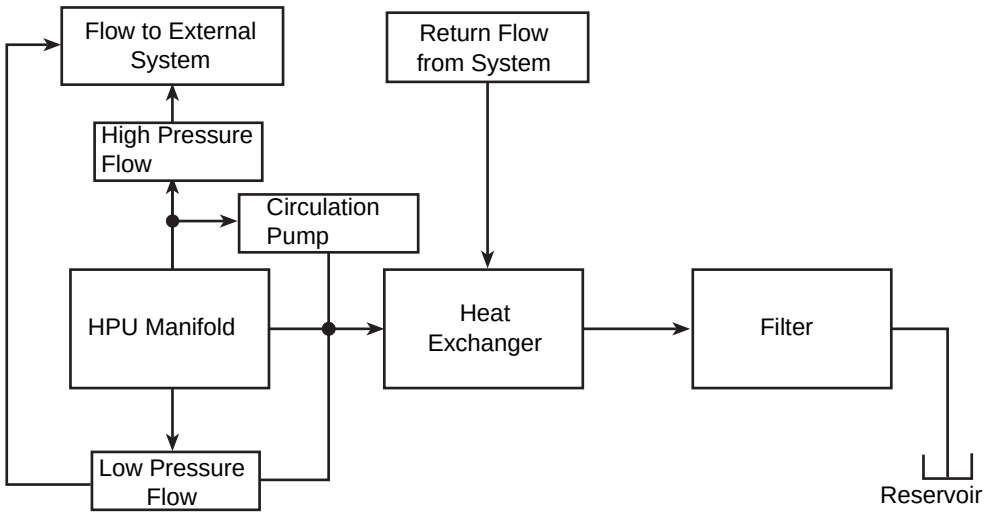
   Press **Pump #_ Disabled** for the previously adjusted pump.

10. Repeat Steps 5 through 9 until all pumps have been adjusted to the desired pressure.

11. After the output pressure has been adjusted on all the pumps, enable the pumps you want operational for testing.

Low/High Pressure Functionality

This section clarifies the low and high pressure functionality of the HPU. There are certain cases where it is advantageous to use the HPU in low pressure versus high pressure. Low/High functionality is illustrated in the block diagram below:



Low pressure

Series 505 HPUs are started in low pressure to reduce the amount of current inrush at motor start-up. A solenoid valve that opens a direct flow path to the return line commands the pressure setting. Since this direct path offers little resistance to the full flow, minimal system pressure is developed (low pressure). Low pressure operation of a Series 505 HPU provides several useful functions when high pressure is not required by the external system.

System commissioning

Best practices for system commissioning include flushing the hard line and related equipment. This process “conditions” the hydraulic fluid to a cleanliness level that supports high performance servovalve systems. Refer to the *Hydraulic Fluid Care Guide* (part number 050-000-536) for information on fluid cleanliness.)

A logical progression of fluid conditioning that begins at the HPU is required to minimize problems when commissioning a system.

- With the HPU running in low pressure, acceptable particle counts are obtained in a relatively short time.
- Keeping the HPU in low pressure effectively isolates the external or system flow because the relative back pressure is normally much higher in the external system circuit.
- Running the HPU in low pressure maximizes fluid flow, allowing the HPU to circulate the reservoir contents across the filter more times per hour.
- Starting the commissioning process with an isolated HPU reduces the possible number of problems encountered during start-up.

Once the HPU has cleaned the reservoir hydraulic fluid, sections of the system should be isolated and sequentially cleaned. Flushing of hard line sections takes place in high pressure mode. If the HPU is run in low pressure, flow losses in the system will minimize the external flow and reduce the effectiveness of the system flushing and fluid conditioning.

System cooling

A Series 505 HPU running in low pressure maximizes the cooling efficiency of the unit:

- Because the motor is not working to pressurize the fluid, it runs at a low power level, producing less waste heat.
- Flow rates are high in low pressure mode, providing an ample volume of coolant (hydraulic fluid) with a lower BTU per gallon heat content to the heat exchanger. The heat exchanger operates with greater efficiency when flows are near the designed flow rate as boundary layers are minimized.

Energy consumption

All Series 505 HPUs have variable volume pumps. Switching from high to low pressure operation when external demands are absent will conserve energy and water:

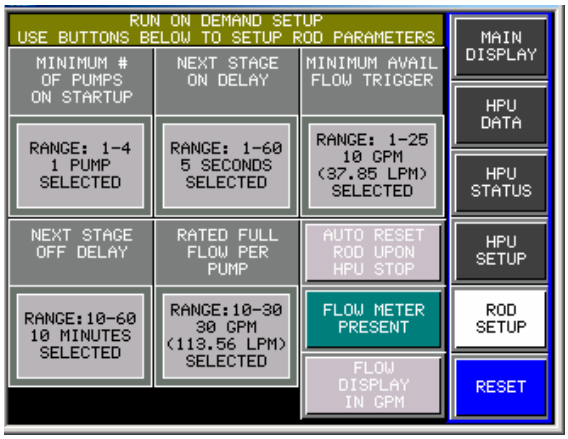
- Leaving an HPU idling in high pressure mode uses roughly 40% more electrical power than idling in low pressure mode.
- When the hydraulic fluid is pressurized, cooling water usage is higher. When operating in low pressure, the motor consumes less energy and less heat needs to be removed by the heat exchanger.

High pressure

When the Series 505 HPUs are running in high pressure, a considerable amount of heat is generated. During normal testing this heat is dissipated by running the hydraulic fluid through the system to the return line to the heat exchanger. During periods of low system demand, this heat is dissipated by running the hydraulic fluid through the circulation pump to the heat exchanger.

Setting Up Run-On-Demand

The run-on-demand (ROD) option automatically starts or stops pumps to meet the hydraulic flow demand from the system. The PLC monitors the hydraulic fluid flow. When the flow changes beyond a trigger point for a set period of time, one of the pumps is turned on or off.



From the current screen, press and hold **the ROD Setup button on the user interface** for five seconds. When the **ROD Setup** screen displays, if only the **Flow Meter Not Present** button is displayed, press this button to display the setup parameters buttons.

1. Check the **Minimum # of Pumps on Startup**. The range shown is dependant on the HPU model.

   If necessary, press the **Range: 1-4 _ Pump Selected**. to change the pump number. The following popup panel displays.

   Press the up or down arrow as necessary until the desired number of pumps displays. Press **Enter** to select the value.

2. Check the **Next Stage On Delay**.

   If necessary, press the **Range: 1-60 _ Seconds Selected**. to change the delay time. Use the popup panel described above to increase or decrease the delay.

3. Check the **Minimum Available Flow Trigger**.

   If necessary, press the **Range: 1-25 _ gpm (_lpm) Selected**. to change the minimum flow value. Use the popup panel described above to increase or decrease the trigger value.

4. Check the **Next Stage Off Delay**.

   If necessary, press the **Range: 10-60 _ Minutes Selected**. to change the delay time. Use the popup panel described above to increase or decrease the delay.

5. Check the **Rated Full Flow Per Pump**.

   This value should only require change if the HPU is provided with pumps that have a different full flow rating.

6. Select as required **Auto Reset ROD Upon HPU Stop** or **Do Not Reset ROD Upon HPU Stop**.

Model 505.60/.90 only

After you have defined the run-on-demand parameters:

1. Press the **HPU Data** button. On the **HPU Data** screen, identify the enabled pump with the least number of hours.
2. Press the **Main Display** button to return to the **Main Display** screen.
3. Press the **Pump #_ Enabled** button for the pump identified in Step 1.
4. Press **Run/Low Pressure** to start the selected pump in low pressure.
5. Press **High Pressure** to select high pressure mode.
6. Press and hold the **Auto Demand ROD** button for five seconds to enable the run-on-demand option.
7. Press the **Pump #_ Enabled** button for any other pumps you want running under run-on-demand control.
8. To disable run-on-demand after it is running, without turning off the HPU, momentarily pressing the **Reset** button will disable it.
9. To turn off the HPU and disable run-on-demand pressing the **Stop** button. Repeat Steps 3 through 6 to re-enable run-on-demand.

Models 505.120-.180 only

After you have defined the run-on-demand parameters:

1. Press the **Main Display** button to return to the **Main Display** screen.
2. Momentarily press the **Auto Demand ROD** button to enable the run-on-demand option. The button will turn green.
3. Press the **Pump #_ Enabled** button for those pumps you want active for run-on-demand.
4. Press **Run/Low Pressure** to start the HPU in low pressure.
5. Press **High Pressure** to select high pressure mode.

   The number of pumps running will be determined by the setting on the **ROD Setup** screen.

6. To disable run-on-demand after it is running, without turning off the HPU, momentarily pressing the **Reset** button will disable it.
7. Pressing the **Stop** button will:

   - Turn off the HPU and disable run-on-demand if **Auto Reset ROD Upon HPU Stop** was selected on the **ROD Setup** screen.

8. Turn off the HPU but leave the run-on-demand enabled if **Do Not Reset ROD Upon HPU Stop** was selected on the **ROD Setup** screen.

Maintenance

Contents

Routine Maintenance Overview Checklist

Recommended service to be performed at each running time interval noted

Calendar Time using 8 hour Running Time rate per day	Daily	Weekly	Monthly				Annually		
Running Time-Hours	**8**	**40**	**160**	**500**	**1000**	**1,500**	**2,000**	**5,000**	**10,000**
Check electronic enclosure ventilation	X *								
Check dirty filter indicators	X								
Check for leaks	X								
Check oil level	X								
Check pressure	X								
Check fluid color and odor		X							
Check interlock devices		X							
Check cables and connectors			X						
Check console air filter			MTS †						
Check all accumulators for proper precharge pressure and oil				MTS	MTS	MTS	MTS		
Check condition of all electrical cables and cable connections				MTS	MTS	MTS	MTS		
Check HPU hydraulic fluid color and odor				MTS	MTS	MTS	MTS		
Check HPU operating pressure and temperature				MTS	MTS	MTS	MTS		
Clean control cabinet air filter, replace if required				MTS	MTS	MTS	MTS		
Inspect heat exchanger for leaks or “flow (when off)”				MTS	MTS	MTS	MTS		
Inspect pump hoses for leaks				MTS	MTS	MTS	MTS		
Lubricate-grease motor bearings (non 505)				MTS	MTS	MTS	MTS		
Verify dirty filter indicators status				MTS	MTS	MTS	MTS		
Verify HPU hydraulic fluid level				MTS	MTS	MTS	MTS		
Verify warning and interlock devices				MTS	MTS	MTS	MTS		

Recommended service to be performed at each running time interval noted

Calendar Time using 8 hour Running Time rate per day	Daily	Weekly	Monthly				Annually		
Running Time-Hours	**8**	**40**	**160**	**500**	**1000**	**1,500**	**2,000**	**5,000**	**10,000**
Replace all filters					MTS		MTS		
Verify operation and settings of psi control and relief valves					MTS		MTS		
Check pump/motor coupling for wear and debris							MTS		
Check pump voltage and current							MTS		
Check case drain flow							MTS		
Recommend MTS Hydraulix oil sample				MTS	MTS	MTS	MTS		
Recommend replacement or rebuild of heat exchanger								MTS	MTS
Recommend replacement of hoses									MTS
Recommend replacement of motor bearings								MTS	MTS
Recommend replacement or rebuild of pump									MTS
Recommend replacement or rewind of motor									MTS
Recommend hydraulic fluid change & clean pump inlet strainer									MTS

*Symbol denotes services performed by equipment operators. Most of these procedures involve visual checks that should not interfere with test system operation. These checks are also completed by trained field service engineers on each Routine Maintenance visit.

†Symbol denotes service performed by trained field service engineers as part of an MTS Routine Maintenance plan. Some of these procedures require special service tools and/or specific service training to complete.

Models 505.60/.90/.120/.150/.180 HPU Maintenance Schedule

The following table lists the recommended interval for each maintenance procedure.

Maintenance Schedule

What to Do	When to Do It	How to Do It
Make daily visual inspections	Before the start of each day's testing.	Check electronic enclosure ventilation. Check dirty filter indicators. Look for signs of fluid leakage. Check the fluid level in the sight gage and replenish as required. Check system operating pressure and adjust as required.
Check fluid quality and condition	Every 40 hours or 1 week (whichever occurs first).	Compare the condition of the fluid to that of your sample, including odor and color.
Check functionality of warning and interlock devices	Every 40 hours or 1 week (whichever occurs first).	Depress Emergency Stop button(s) to verify that warning and interlock devices are functioning properly.
Check the precharge pressure in optional accumulator*	Every 160 hours or 1 month (whichever occurs first).	Refer to the accumulator product information manual for complete instructions.
If installed, check the precharge pressure in the surge suppressor	Every 160 hours or 1 month (whichever occurs first).	Refer to the procedure for precharging the surge suppressor accumulator.
Conduct external inspection of the heat exchanger†	Every 500 hours or 3 months (whichever occurs first).	Look for dents, bulges, leaks, damaged gaskets, corrosion, and worn, frayed, or leaking hoses.
Inspect hydraulic hoses, replace as required	Every 1000 hours or 6 months (whichever occurs first).	Look for signs of wear, check for fluid leaks, tighten connections as needed.
Inspect incoming power lines for loose connections or defects	Every 1000 hours or 6 months (whichever occurs first), or when electric power is disconnected.	Have inspection preformed by a qualified electrician. Observe all local codes and safety precautions. Ensure all connections are secure. Screws should be torqued to values specified on associated labeling.
Replace fluid filter	Every 1000 hours or 6 months (whichever occurs first), or when the dirty-filter indicator is displayed.	Refer to procedure for replacing the Return Line Filter.
Check for hydraulic fluid leakage across piston style accumulators*	Every 1000 hours or 6 months (whichever occurs first).	Refer to the accumulator product information manual for complete instructions.
Verify functionality of HPU interlocks‡	Every 1000 hours or 6 months (whichever occurs first).	Contact MTS Systems Corporation.

Maintenance Schedule (Continued)

What to Do	When to Do It	How to Do It
Check motor overload functionality‡	Every 1000 hours or 6 months (whichever occurs first).	Contact MTS Systems Corporation.
Verify proper operation of hydraulic valves§	Every 1000 hours or 6 months (whichever occurs first).	Contact MTS Systems Corporation.
Conduct a hydraulic fluid analysis	Every 1000 hours or 6 months (whichever occurs first), or sooner if duty is severe§.	Obtain a sample and submit it for analysis. MTS recommends that the sample be analyzed by our contracted service. Ask your Field Service Engineer for information.
Replace hydraulic fluid§	If fluid analysis is not to specifications.	Refer to procedure for replacing hydraulic fluid.
Conduct internal inspection of heat exchanger†,‡	Every 2000 hours or yearly (whichever occurs first).	Look for signs of fouling or corrosion; conduct chemical or mechanical internal cleaning as inspection warrants. Consult the *Heat Exchanger Care Guide* for more information.
Check case drain flow of hydraulic pump	Every 2000 hours or yearly (whichever occurs first).	Contact MTS Systems Corporation.
Replace the PLC battery	Every 4000 hours or 2 years (whichever occurs first).	Contact MTS Systems Corporation.
Replace heat exchanger†,‡	Every 5000 hours or 3 years (whichever occurs first).	Replace as inspection warrants. Contact MTS Systems Corporation for special training.
Inspect the motor and pump. Replace motor bearings‡	Every 30,000 hours or 5 years (whichever occurs first).	Motors may be rewound or replaced as required by inspection. Hydraulic pumps may be rebuilt or replaced as required by inspection. Contact MTS Systems Corporation for special training
Replace hydraulic hoses‡	Every 10,000 hours or 5 years (whichever occurs first).	Contact MTS Systems Corporation for special training.

* See the *Series 111 Accumulator Product Information* manual (part number 011-553-304). An accumulator is an optional feature that can be added to the pressure line.

† See the *Heat Exchanger Care Guide* (part number 015-164-000).

‡ Special Training Required. Contact MTS Systems Corporation.

§ See the *Hydraulic Fluid Care Guide* (part number 050-000-536).

Spare parts

Parts that are specified in the maintenance procedures of this section can be obtained from MTS Systems Corporation. See “Contact information” on the back of the title page to order spare parts.

Lockout/tagout

For your safety, follow all appropriate lockout/tagout procedures while performing HPU maintenance.

Operating the HPU

When running the HPU, become familiar with the sounds and smells of the HPU. Changes in the sounds and smells of the HPU might indicate that maintenance or service is needed.

Checking the Hydraulic Fluid

Hydraulic fluid contamination and deterioration normally occur in most hydraulic systems. Failure to keep your fluid sufficiently free of contaminants or to change the fluid before severe fluid breakdown occurs will cause poor system performance and may lead to expensive system cleanups. Servovalves are especially susceptible to damage from dirty hydraulic fluid.

To avoid these problems, you must maintain a clean hydraulic system. Regularly test samples of your hydraulic fluid and follow the recommended maintenance procedures described here. For more information on hydraulic fluid care, refer to the *Hydraulic Fluid Care Guide* (part number 050-000-536).

Important *To prevent problems with inconsistent and inferior fluids, MTS recommends only Exxon Mobil DTE 25 or Shell Tellus 46 to its customers.*

Procedure

Perform the following checks of the hydraulic fluid's condition weekly. If you suspect contamination of the hydraulic fluid, take a sample and have it analyzed.

1. Check the fluid level on the oil level gage to verify the fluid level is correct.
   - A low level can indicate a leak. If necessary, add enough fluid to bring the reservoir level up to the proper operating level.
   - A high level can indicate water contamination from the heat exchanger.
2. Check the hydraulic fluid color. Clean hydraulic fluid is amber in color.

   Keep a sample of brand-new hydraulic fluid in a clean glass container for comparison. A change in color can mean that the fluid is contaminated or that it has broken down chemically. If the hydraulic fluid appears different than the clean sample, see the "Appearance of Hydraulic Fluid Sample" table.
3. Open the filler cap and check the smell the hydraulic fluid. Burnt-smelling hydraulic fluid can indicate a chemical breakdown.

   If you detect a distinct change in the smell of hydraulic fluid, have it chemically analyzed by the manufacturer.
4. Keep records of the maximum reservoir temperature.

   High operating temperatures can cause the fluid to break down. If your records indicate a pattern of overheating, consult your MTS Field Service Engineer to determine if changes or adjustments to your hydraulic system are required.

5. Check and adjust the hydraulic fluid delivery system so that:
   - Hydraulic fluid temperature stabilizes within the parameters given in the Specifications table when the HPU is operating at high pressure.
   - Pressure line reading is maintained at 21 MPa (3000 psi) maximum static value.
   - Maximum drain line back pressure is limited to 0.1 MPa (15 psi).

   If you need to adjust the water-regulating valve, over-temperature switch or pressure control valves, refer to the procedure on changing the water flow.

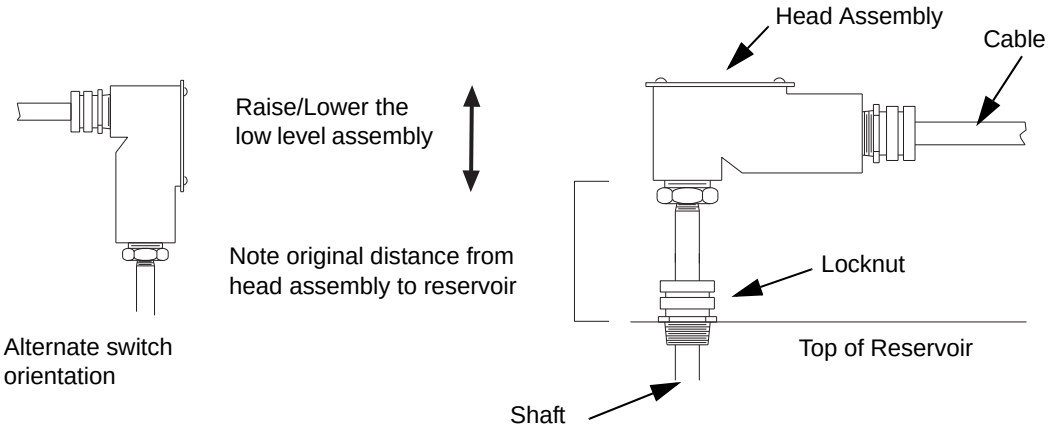
Checking the Low Level/Temperature Detector

The low level/temperature fixture monitors the temperature and level of hydraulic fluid in the reservoir. Check the functionality of the low level/ temperature detector every 6 months.

CAUTION

Running the pump motors with hydraulic fluid below the top of the motors can cause them to fail.

The low level position is factory set. Set the replacement fixture to the same level.



How to check the low level switch

1. Note the distance between the head assembly of the fixture and the top of the reservoir.
2. Turn on power to the hydraulic power unit.
3. Loosen the locknut on top of the reservoir that holds the assembly in place.
4. Raise the low level assembly high enough to cause the HPU Run Status to flash between **Faulted** and **Low Level**. If the **Low Level** does not display, replace the low level assembly (Step 5). If the low level assembly is OK, go to Step 6.

5. Detach the cable and remove the existing low level/temperature fixture. Install the replacement fixture and attach the cable.

Note *Ensure that the new fixture has the same length as the old one.*

Raise the low level assembly high enough to cause the operator interface to flash **Low Level**.

6. Lower the fixture back into the reservoir to match the distance between the head assembly of the fixture and the top of the reservoir.
7. Press the **Reset** button on the user interface to clear the interlock and change the **HPU Run Status** back to **NORMAL**.

How to check the over temperature switch

To check the fixture:

1. Turn on power to the hydraulic power unit.
2. Turn off the water flow to the HPU (this prevents the heat exchanger from working).
3. Monitor the temperature on the **Main Display** on the user interface. When the hydraulic fluid temperature exceeds 55°C (131°F), **HPU Run Status** should flash between **Faulted** and **Over Temp**. If **Over Temp** does not display, replace the low level assembly.
4. Turn on the water flow to the HPU.
5. Press the **Reset** button to clear the interlock and turn the indicator off.

Replacing the Return-line Filter

The standard fine filter for the Model 505.60/.90 and Model 505.120/.180 HPUs is a return-line filter. The HPU will have one of two filter housing designs. The filter housing design is distinguished by the method used to secure the cover. Either a clamp holds the cover to the head assembly or cap screws secure filter cap. There is also an optional high pressure filter that can exist on any particular unit.

Clamp-Style Housing Filter Replacement

The return-line filter element of the HPU should be replaced for the following reasons:

- When the dirty-filter detector trips
- Whenever the hydraulic fluid is changed
- The filter manufacturer’s recommended maximum interval (1000 hours or 6 months)

Required equipment

- Filter element (MTS part number 100-015-519)
- O-rings (MTS part number 100-030-032 and 100-030-053)

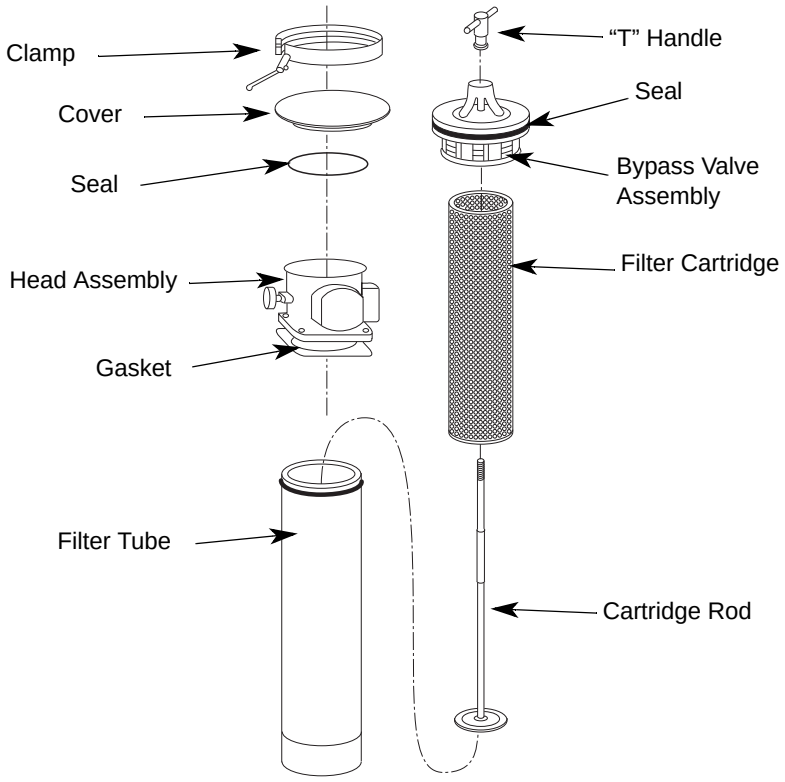
  OR

- MTS Filter Element Seal Kit part number (100-030-199)

Procedure

Note *The dirty-filter indicator may light when the HPU is first started due to low hydraulic fluid temperature. When the HPU is at normal operating temperature, recheck the indicator to determine if the element actually needs replacement.*

1. Turn off the HPU. Ensure that the hydraulic pressure is at zero before proceeding.



Filter Components

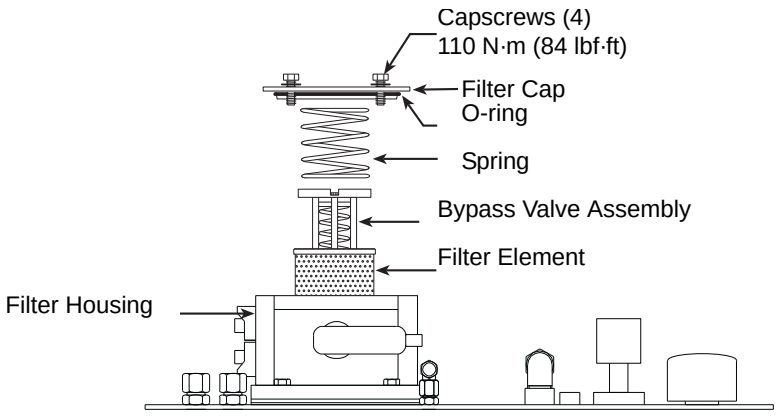
2. Unlock and open the small cover next to the electrical enclosure to access the filter assembly.
3. Release the clamp securing the cover to the head assembly.

Important *You will need a minimum clearance of 712 mm (28 in) above the filter housing to remove the filter.*

4. Place a drain pan nearby to catch drippings from the filter.
5. Use the "T" handle to pull the filter cartridge out of the filter tube. Be careful not to spill any hydraulic fluid.

6. Replace the O-ring(s) seals in the bypass valve assembly and under the cover. (Reference MTS part number 100-030-032 and 100-030-053.)
7. Unscrew the “T” handle from the cartridge rod and remove the filter cartridge.
8. Install a new filter on the cartridge rod and secure it with the “T” handle.
9. Install the filter cartridge assembly into the head assembly and into the filter tube.
10. Replace the cover and clamp it to the head assembly.
11. Turn on the HPU and switch to high-pressure mode. Inspect the seal between the housing, filter, and cover for any signs of leakage.
12. If leakage occurs, repeat this procedure (without replacing the filter element). If leakage persists, contact MTS Systems Corporation.
13. If you are changing the filter because the dirty filter indicator tripped, run the HPU for two to four hours to remove contaminants. Then take a fluid sample and have it analyzed.
14. Continue to clean the fluid if it does not meet an ISO cleanliness level of 16/13/9 or better.
15. Press the **Reset** button on the user interface panel to reset any interlocks and turn off the **Return Filter Dirty** indicator.

Capscrew-Style Housing Filter Replacement



The return-line filter element of the HPU should be replaced for the following reasons:

- When the dirty-filter detector trips
- Whenever the hydraulic fluid is changed
- The filter manufacturer’s recommended maximum interval (1000 hours or 6 months)

Required equipment

- Filter element (MTS part number 100-029-989)
- O-ring (MTS part number 010-010-927)

Procedure

To change the filter element:

WARNING

The system pressure does not immediately drop to zero when the HPU is turned off.

Residual pressure can produce a high pressure spray that can hurt you.

Do not start this procedure until all pressure gages read zero

1. Turn off the HPU. Ensure that the hydraulic pressure is at zero before proceeding.
2. Unlock and open the small cover next to the electrical enclosure to access the filter assembly.
3. Remove the four cap screws that secure the filter cap to the filter housing.
4. Remove the spring, bypass valve assembly, and filter element. Discard the dirty element according to local environmental codes.
5. Clean the bypass valve and spring, as needed.
6. Check the filter housing for signs of serious contamination such as large pieces of grit, rubber particles, and metal shards.
7. Find and correct the cause of this contamination before operating your system again.
8. Install the new filter element, bypass valve, and spring.
9. Reinstall the filter cap. Make sure that its O-ring has remained in place. Torque the four cap screws to 110 N•m (84 lbf-ft).
10. Apply low pressure and check for leaks.

Replacing the Optional High-Pressure Filter

The high pressure filter element of the HPU should be replaced for the following reasons:

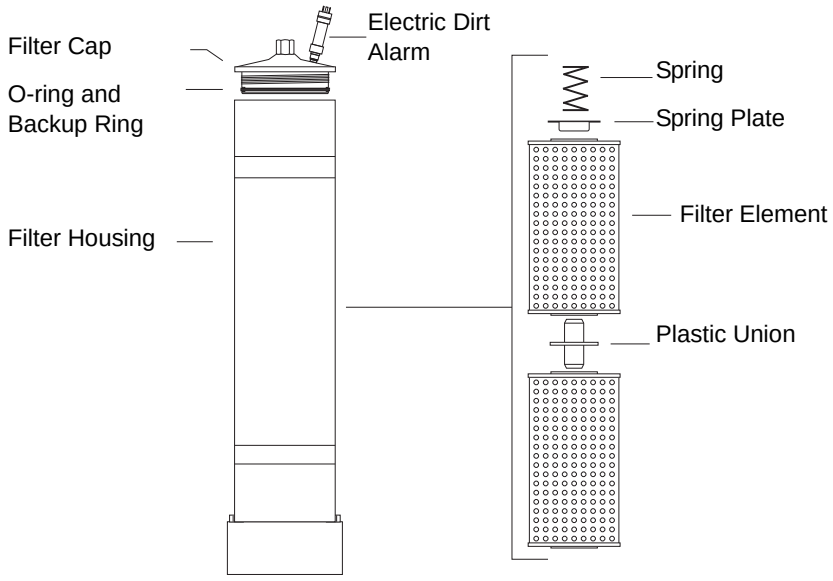
- When the electric dirt alarm goes off
- Whenever the hydraulic fluid is changed
- The filter manufacturer’s recommended maximum interval (1000 hours or 6 months)

Required equipment

You will need a filter element (MTS part number 010-053-305) and seal kit (MTS part number 011-425-803). Also available is the O-ring used at the base inlet and outlet (MTS part number 010-010-907).

Procedure

To change the filter element:



Filter Components

1. Turn off the HPU. Ensure that the hydraulic pressure is at zero before proceeding. Wait until all pressure gages read zero before starting the next step.
2. Remove the dirty filter element.
   A. Use a 7/8 inch socket or wrench to unscrew the filter cap.
   B. Remove the spring, spring plate, and two dirty filter elements.
   C. Save the plastic union that commons the two filter elements. Discard the dirty elements, following applicable environmental guidelines.

⚠ WARNING

When working with hydraulic components, hydraulic fluid can spill and collect on floors or work platforms.

Floors or work platforms with spilled hydraulic fluid are very slippery. Injury or death can result from personnel falling on slippery surfaces.

Do not allow personnel to stand on or walk through hydraulic fluid. Place warning signs around the spill area to alert personnel of the hazard. Clean and dry the spill promptly.

3. Clean and inspect the filter housing.
   A. Clean and inspect the filter cap O-ring and backup ring. Replace them if necessary.
   B. Lubricate the O-ring with clean hydraulic fluid.

C. Look inside the housing for signs of serious contamination such as pieces of grit, rubber particles, and metal shards. Correct the cause of this contamination before operating your system again.

4. Install the new elements.

   A. Insert two clean elements, with the plastic union between them, into the filter housing.

   B. Insert the spring plate and spring.

   C. Screw down the filter cap. Take care not to damage its O-ring and backup ring. Torque the filter cap to the value stated on its label.

5. Operate the pump at low pressure for 5 minutes to remove air from the filter housing. Check for leaks before going to high pressure operation.

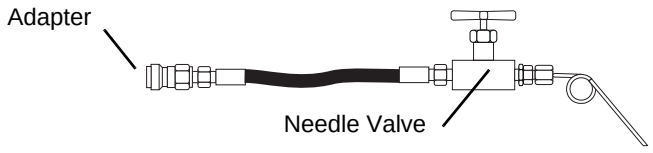
Sampling the Hydraulic Fluid

This section describes how to check the quality of the hydraulic fluid. Review the following hints before obtaining your sample:

- Avoid contamination.
  - Keep the sample bottle in the storage box of the hydraulic fluid sampling kit until it is needed.
  - Do not remove the cap from the bottle until immediately before taking the sample.
  - Do not set the cap down on a dirty surface or in an area where airborne dust can settle.
- For additional information on hydraulic fluid care, see the *Hydraulic Fluid Care Guide* (part number 050-000-536) found in the documentation package inside the electrical control box.
- Hold the hose valve assembly still when taking a sample.
- Do not let the sample line in the bottle or let it touch the mouth of the bottle.

Prerequisite

You will need a hydraulic fluid sampling kit (MTS part number 055-589-601) and a fluid analysis kit (MTS part number 011-860-301) or a clean, 180 ml sample bottle.

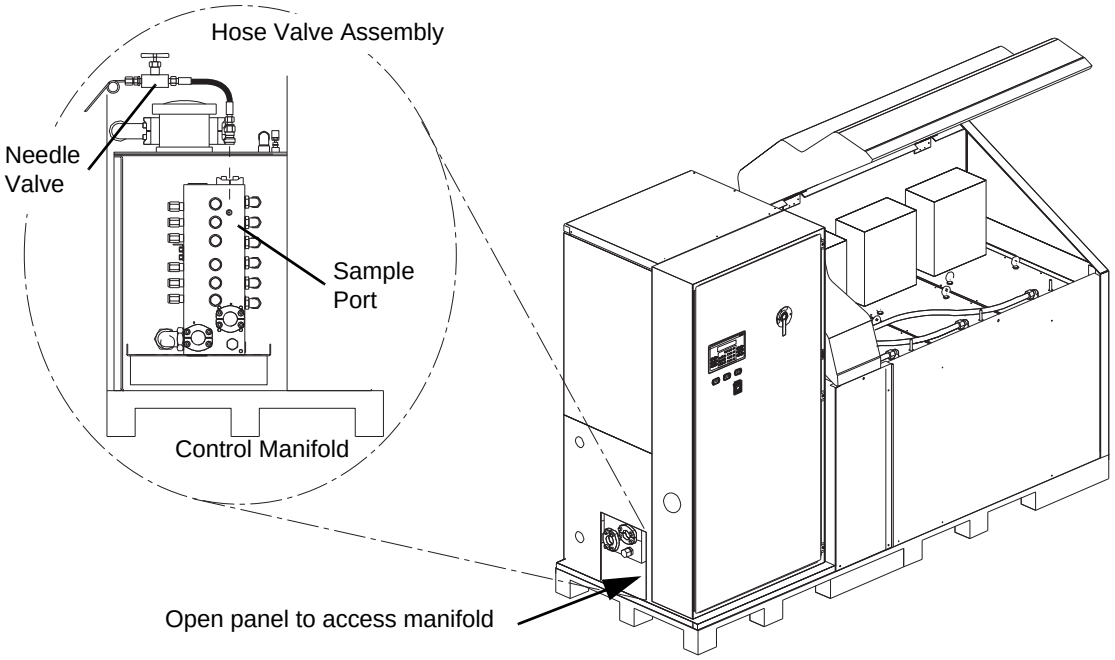


Hose Valve Assembly for Fluid Sampling

Procedure

Take a fluid sample from the reservoir to get a visual indication of the fluid level and relative contamination. Clean hydraulic fluid is clear and has an amber color. If the composition of the fluid appears to have changed, obtain a sample of the hydraulic fluid from the sample port and check the fluid qualities.

1. Operate the HPU until the hydraulic fluid is at normal operating temperature (about 30 minutes).
2. Open the bottom side panel to access the control manifold.
3. Close the needle valve. Connect the hose valve assembly to the sample port located on the control manifold.



Location of Sample Port on Control Manifold

4. Open the needle valve, and flush 1 liter (1 quart) of hydraulic fluid though the sampling assembly. This fluid can be directed to a waste container or back into the HPU reservoir.
5. Obtain a sample of the hydraulic fluid after flushing the valve hose assembly.
   A. Without closing the valve, quickly place the sample bottle into the fluid stream (keep the sample bottle sealed until the sample is to be taken).
   B. Fill the sample bottle (175 mL/6 oz) with fluid.
   C. Close the valve on the hose valve assembly and cap the sample bottle.
6. Check the fluid qualities of the sample by comparing it to a small jar of clean hydraulic fluid. Clean hydraulic fluid has an amber color.

   Consult the table, “Appearance of Hydraulic Fluid Sample” for indicators of unacceptable fluid qualities.
7. If there still is any uncertainty regarding fluid quality, obtain another sample of the fluid and have it analyzed. The fluid tests should include chemical analysis, particle count, and viscosity checks. Most oil companies have facilities for performing these tests, or consult MTS Systems Corporation.

8. Remove the hose and valve assembly.

Appearance of Hydraulic Fluid Sample

Fluid Properties	Problem	What to Do
Dark colored fluid	Indicates chemical breakdown or the hydraulic fluid has been allowed to rise above the maximum recommended temperature (severe overheating)	Analyze the fluid and replace as required by the analysis. If the cause was overheating, flush the entire system to remove varnish or residue. Consult your MTS Field Service Engineer to determine if changes or adjustments to your hydraulic system are required.
Burnt odor	Indicates chemical breakdown or the hydraulic fluid has been allowed to rise above the maximum recommended temperature (severe overheating)	Analyze the fluid and replace as required by the analysis. If the cause was overheating, flush the entire system to remove varnish or residue. Consult your MTS Field Service Engineer to determine if changes or adjustments to your hydraulic system are required.
Opaque fluid	Indicates chemical breakdown	Replace the fluid
Milky appearance	Indicates water is present in the fluid	Check the heat exchanger for damage. Look for other water sources if the water does not appear to be coming from the heat exchanger. Identify and correct the source of the water leakage and replace the fluid if necessary.
Sediment at the bottom of the sample container (after sample has stood overnight)	Indicates collapsed, ruptured, or clogged filter(s)	Analyze the fluid and replace all filter elements. Clean the fluid or replace it as required by the analysis.

Replacing the Hydraulic Fluid

Replace the hydraulic fluid in the HPU reservoir whenever you have determined that the hydraulic fluid is no longer suitable for use.

Recommended equipment

- A transfer pump with a 10 micron filter (such as the Model 590.01 Fluid Transfer Pump) with 915 mm (36 inch) suction tube.
- Synasol or a similar cleaning solvent
- Lint-free cloths or manufactured lint-free rags
- A hydraulic fluid sampling kit (MTS part number 055-589-601)
- A new filter

Prerequisites

- Sample the hydraulic fluid to determine if the hydraulic fluid should be replaced.
- Identify and correct any sources of contamination.

CAUTION

Mixing different brands of hydraulic fluid can contaminate your system.

Contaminated hydraulic fluid can cause premature wear of the hydraulic components in your system.

Do not mix different brands of hydraulic fluid. MTS Systems Corporation recommends using Exxon Mobil DTE-25 or Shell Tellus 46 AW hydraulic fluid.

Procedure

Refer to the Component Identification figure as needed to identify the components called out in the following procedure.

1. Prepare the HPU.
   A. Press **Stop** on the user interface panel to turn off the HPU. Remove electrical power to the HPU via a circuit breaker at the power source.
   B. Open the top cover of the HPU.
   C. Remove the filler cap.
2. Remove the hydraulic fluid.
   A. Use the transfer pump to remove the old hydraulic fluid from the reservoir and into an appropriate container.
   B. Remove the motor/pump cover assembly as needed to clean the reservoir.
   C. Drain the hydraulic fluid from hoses and accumulators in the system.
3. Clean the inside of the reservoir using clean cloths dampened with Synasol. Clean the pump, motor, and bottom of the cover plate as well.
4. Use a dry, lint-free cloth to wipe away the solvent.
5. Install the motor/pump cover assembly.
6. Replace the HPU filter element(s). Refer to the Return Line Filter replacement procedure.
7. Add new hydraulic fluid to the reservoir.
   A. Replace the filter in the transfer pump and transfer fresh hydraulic fluid (filtered to 10 microns) into the reservoir. Stop when the fluid level gets close to the full mark on the gage.
   B. Reinstall the filter cap’s strainer assembly.
8. Run the HPU.

A. Turn on power to the HPU. Rotate the power disconnect switch to the on (|) position.

B. Select **Main Panel** from the **Startup** screen.

C. Press **Reset** on the **Main Panel** to clear interlock conditions resulting from applying power to the HPU.

D. Press **Run/Low Pressure** on the **Main Panel**.

E. Run the HPU at low pressure for about three hours to filter the new hydraulic fluid.

F. Press the **High Pressure** button to select the high pressure mode. Check the HPU for fluid leaks.

G. Press **Stop**.

H. Check for a Filter Dirty indication on the **HPU Run Status** indicator on the **Main Panel**. Replace the filter element and continue to filter the fluid as needed.

Inspecting the Heat Exchanger

Prerequisite

Perform an *external* inspection of the heat exchanger after every 500 hours of operation (see Step 2 below).

Perform an *internal* inspection of the heat exchanger after every 2000 hours of operation or when you notice a decrease in the heat exchanger performance. Refer to the *Heat Exchanger Care Guide* (part number 015-164-000) for additional information on heat exchangers and causes of heat exchanger failure.

Important *This procedure requires special training and familiarity with heat exchanger operation. You must unbolt and remove the heat exchanger from the reservoir in order to inspect it. Consult MTS before you perform an internal inspection or any maintenance on the heat exchanger.*

Procedure

To inspect the heat exchanger:

1. Shut off the HPU and the cooling water supply.
2. Externally inspect the exchanger for:
   - Dents, bulges, corrosion and leaks
   - Damaged gaskets
   - Worn, frayed, and leaking hoses
3. Drain all hydraulic fluid from the heat exchanger.
4. Drain all water from the exchanger.
5. Clean all filters and screens.

6. Begin with an external inspection of the heat exchanger. Visually inspect for:
   - Corrosion
   - Signs of a previous repair
   - Leakage
7. A marked decrease in pressure and/or reduction in performance usually indicates cleaning is necessary. The following are suggested methods of cleaning either side of the heat exchanger.
   - Back-flush the heat exchanger with a high pressure stream of hot water to remove loose deposits
   - Circulate hot wash oil or light distillate to remove sludge or similar soft deposits.
   - To remove more stubborn deposits, use a commercial cleaning compound. Follow the manufacturers instructions for using the cleaning compound.

Important *It is recommended that you contact a representative of the manufacturer of the cleaning compound to determine the correct cleaning compound for your type of scaling problem and its compatibility with the metals and alloys used in the heat exchanger.*

8. If the heat exchanger is excessively fouled and cannot be cleaned using the commercial cleaning methods, then replacement of the heat exchanger is recommended.

Hydraulic Power Unit Maintenance and Service Logs

Contents

8 Hours/Daily

8 Hours/Daily Service Interval Recommendation

	Check Console Verification	Check Dirty Filter Indicators	Check for Leaks	Check oil Level	Check Pressure	
Date	Performed by	Performed by	Performed by	Performed by	Performed by	Notes

40 Hours/Weekly

40 Hours/Weekly Service Interval Recommendation

	Check Fluid Color and Odor	Check Interlock Devices	
Date	Performed by	Performed by	Notes

160 Hours/Biweekly

160 Hours/Monthly Service Interval Recommendation

	Check Cables and Connectors	Check Console Air Filter	
Date	Performed by	Performed by	Notes

500 Hours

500 Hours Service Interval Recommendation

	Check All Accumulators for Proper Precharge Pressure and Oil	Check Condition of All Electrical Cables and Cable Connections	Check HPU Hydraulic Fluid Color, and Odor	Check HPU Operating Pressure and Temperature	Clean Control Cabinet Air Filter, Replace if Required	Inspect Heat Exchanger for Leaks or “flow (when off)”	
Date	Performed by	Performed by	Performed by	Performed by	Performed by	Performed by	Notes

500 Hours Service Interval Recommendation

	Inspect Pump Hoses for Leaks	Lubricate-Grease motor Bearings (non-505)	Verify Dirty Filter Indicators Status	Verify HPU Hydraulic Fluid Level	Verify Warning and Interlock Devices	
Date	Performed by	Performed by	Performed by	Performed by	Performed by	Notes

1000 Hours

1000 Hours Service Interval Recommendation

	All 500 hr Maintenance Procedures	Replace All Filters	Verify Operation and Settings of psi Control and Relief Valves	
Date	Performed by	Performed by	Performed by	Notes

2000 Hours

2000 Hours Service Interval Recommendation

	All 1000 hr Maintenance Procedures	Check Pump/ Motor Coupling for Wear and Debris	Check Pump Voltage and Current	Check Case Drain Flow	Recommend MTS Hydraulix Oil Sample	
Date	Performed by	Performed by	Performed by	Performed by	Performed by	Notes

5000 Hours

5000 Hours Service Interval Recommendation

	Recommend R/R Heat Exchanger	Recommend Replacement of Motor Bearings	
Date	Performed by	Performed by	Notes

10,000 Hours

10,000 Hours Service Interval Recommendation

	Recommend R/R Heat Exchanger	Recommend Replacement of Hoses	Recommend Replacement of Motor Bearings	Recommend Replacement or Rebuild of Pump	Recommend Replacement or Rebuild of Motor	Recommend Hydraulic Fluid Change & Clean Pump Inlet	
Date	Performed by	Performed by	Performed by	Performed by	Performed by	Performed by	Notes

10,000 Hours

MTS Systems Corporation
14000 Technology Drive
Eden Prairie, MN 55344-2290
Telephone 952-937-4000
Fax 952-937-4515

ORIGINAL

DECLARATION OF CONFORMITY
IN ACCORDANCE WITH ANNEX II 1A OF COUNCIL DIRECTIVE 2006/42/EC

Equipment Identification:

Hydraulic Power Unit Model	Serial No. (select one only)
505.07	
505.11	
505.20	
505.30	
505.60	
505.90	
505.120	
505.150	
505.180	
Optional Equipment:	**Serial No. (or other similar identification)**
Air Cooler Assembly	

Equipment Description:
The Hydraulic Power Unit with an integral water cooled heat exchanger provides hydraulic power for servo-hydraulic testing systems. The Air Cooler Assembly is alternate equipment that is used to cool the hydraulic fluid from Hydraulic Power Unit by forced air cooling.
The Hydraulic Power Unit and the Air Cooler Assembly are supplied with Product Information Manuals that allow them to be assembled and integrated to work as assemblies of machinery.

Manufacturer:
MTS Systems Corporation
14000 Technology Drive
Eden Prairie, MN 55344-2290, U.S.A.

Authorized Representative:
Stefan Strand
MTS Systems Norden AB
Södra Långebergsgatan 16
SE-421 32 Västra Frölunda, Sweden

Applicable Directive(s):
Machinery Safety Directive 2006/42/EC
Low Voltage Directive 2006/95/EC
EMC Directive 2004/108/EC

Harmonized or Other Standards Referenced:
EN ISO 12100-2 Safety of machinery - Basic concepts, general principles for design - Part 2: Technical principles
EN 60204-1 Safety of machinery - Electrical equipment of machines - Part 1: General requirements
EN 982 Safety of machinery - Safety requirements for fluid power systems and their components - Hydraulics

Technical Construction File in accordance with Annex VII Part A:
A copy (electronic and paper) of the Technical Construction File for this machinery is available on request from:
Authorized Representative

We, MTS Systems Corporation, hereby declare that the machinery described above conforms with the relevant provisions of Annex I Essential Health and Safety Requirements of Directive 2006/42/EC and that the Annex VIII Conformity Assessment Procedure has been carried out.	
Place of Issue:	Eden Prairie, MN 55344, USA
Date of Issue:	
Signature:	
Name and Title:	Rich Baker, Vice President (Engineering)

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ISO 9001 Certified QMS