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Models FlexTest IIm, FlexTest GT, and FlexTest SE Controller Hardware

Service Information:
- **Hardware Descriptions**
- **Specifications**
- **Installation**
- **Cabling**



100-147-133 E

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The status and validity of MTS' operating software is also checked during system verification and routine calibration of MTS hardware. These controlled calibration processes compare the final test results after statistical analysis against the predicted response of the calibration standards. With these established methods, MTS assures its customers that MTS products meet MTS' exacting quality standards when initially installed and will continue to perform as intended over time.

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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 MTS 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 MTS in one of the following ways.

MTS web site
www.mts.com

The MTS web site gives you access to our technical support staff by means of a Technical Support link:

www.mts.com > Contact Us > Service & Technical Support

E-mail

techsupport@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.

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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 (material testing, simulation, and so forth). The number is usually written on a label on your MTS equipment before the system leaves MTS. If you do not have or do not know your MTS site number, contact your MTS sales engineer.

Example site number: 571167

When you have more than one MTS system, the system job number identifies which system you are calling about. You can find your job number in the papers sent to you when you ordered your system.

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. You will need to tell us the:

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

Identify the problem

Describe the problem you are experiencing and know the answers to the following questions:

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

Know relevant computer information

If you are experiencing a computer problem, have the following information available:

- Manufacturer's name and model number
- Operating software type and service patch information

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- Amount of system memory
- Amount of free space on the hard drive in which 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 is displayed briefly when you launch the application, and can typically be found in the "About" selection in the "Help" menu.
- It is also helpful if the names of other non-MTS applications that are running on your computer, such as anti-virus software, screen savers, keyboard enhancers, print spoolers, and so forth are known and available.

If You Contact MTS by Phone

Your call will be registered by a Call Center agent if you are calling within the United States or Canada. Before connecting you with a technical support specialist, the agent will ask you for your site number, name, company, company address, and the phone number where you can normally be reached.

If you are calling about an issue that has already been assigned a notification number, please provide that number. You will be assigned a unique notification number about any new issue.

Identify system type

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

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

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Be prepared to troubleshoot

Prepare yourself for troubleshooting while on the phone:

- Call from a telephone when you are close to the system so that you can try implementing 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

Prepare yourself in case we need to call you back:

- Remember to ask for the notification number.
- Record the name of the person who helped you.
- Write down any specific instructions to be followed, such as data recording or performance monitoring.

After you call

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

Problem Submittal Form in MTS Manuals

Use the Problem Submittal Form to communicate problems you are experiencing with your MTS software, hardware, manuals, or service which have not been resolved to your satisfaction through the technical support process. This 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.

The Problem Submittal Form can be accessed:

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

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Preface

Before You Begin

Safety first!

Before you attempt to 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 of MTS equipment in your test facility can result in hazardous conditions that can cause severe personal injury or death and 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 MTS manuals in paper or electronic form.

If you have purchased a test system, it may include an MTS System Documentation CD. This CD contains an electronic copy of the MTS manuals that pertain to your test system, including hydraulic and mechanical component manuals, assembly drawings and parts lists, and operation and preventive maintenance manuals. Controller and application software manuals are typically included on the software CD distribution disc(s).

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Conventions

Documentation Conventions

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

Hazard conventions

As necessary, hazard notices may be embedded in this manual. These notices contain safety information that is specific to the task 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 the directions that are given. 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, equipment damage, or 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.*

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Special terms

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

Illustrations

Illustrations appear in this manual to clarify text. It is important for you to be aware that these illustrations 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.

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Chapter 1

Introduction

This manual contains installation, cabling, jumpering, and hardware interfacing information for MTS 793 Controllers. It includes setup information for the Model 493.04 PC Per Station option.

This chapter describes the hardware components and specifications of FlexTest GT, FlexTest SE, and FlexTest IIm Controllers.

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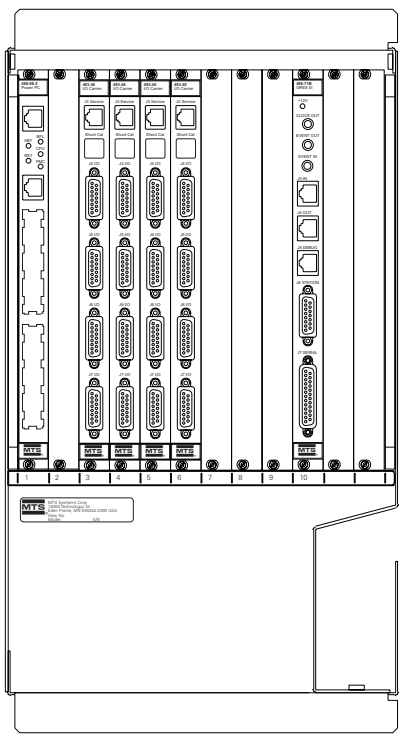
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FlexTest GT Controllers

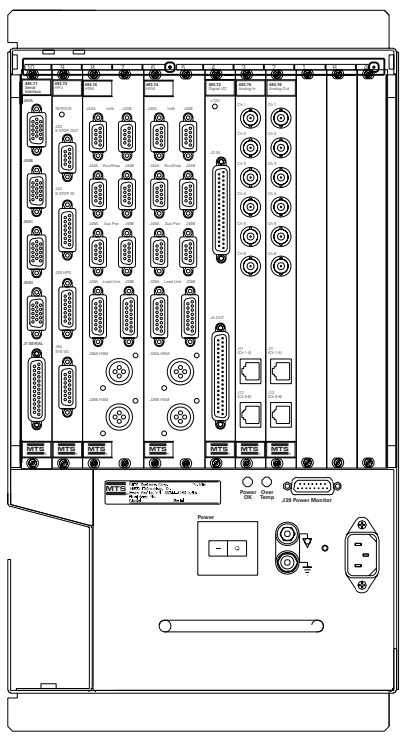
MTS FlexTest GT Controllers are fully digital Proportional, Integral, Derivative, Feedforward (PIDF) servocontrollers which use an identical chassis configuration. They provide complete control of up to eight channels distributed among up to eight stations. Optional station configurations are available (see "Hydraulic Configurations" on page 221).

Model 493.10 Chassis

FlexTest GT Controllers use the Model 493.10 Chassis. The Model 493.10 Chassis is a multi-station, multi-channel VMEbus chassis which houses up to ten MTS VMEbus modules in its front panel and up to ten transition modules in its rear panel.



Front Panel (with VMEbus Modules)



Rear Panel (with Transition Modules)

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Front panel

The Model 493.10 Chassis front panel has twelve slots; ten VMEbus slots and two slots (A and B) which are reserved.

Rear panel

The rear panel of the chassis has twelve transition bus slots. Two of these rear panel slots (slots A and B) can not be used with powered MTS transition modules. The chassis can be rack mounted or used in a floor standing configuration.

VMEbus modules

The chassis has ten VMEbus slots that support a variety of MTS VMEbus plug-in modules.

- The chassis requires at least one processor module. The processor module provides the processing power to manage the other plug-in modules that make up the controller.
- The chassis can have up to eight I/O Carrier modules. Each I/O Carrier module supports up to four mezzanine cards.
- An optional Global Resource (GRES) module provides several connections to communicate with external devices such as a remote station control module, temperature controller, and other devices.

Transition bus

Transition modules are panels plugged into the transition bus located in the rear of the chassis. Each transition module allows external devices to interface with the chassis. Transition modules provide the following:

- Hydraulic control connections
- Station control connections
- Analog input and output connections
- Digital input and output connections
- Serial connections

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Cable conduit

The chassis has a conduit that allows cables to be routed from the front VMEbus modules to the rear transition modules and out of the chassis.

Power supply

Two power supplies are used. One provides +5 V DC and ±15 V DC for the plug-in modules; the other provides ±12 V DC for plug-in modules and +24 V DC for hydraulic power and the chassis fan. The power supplies have universal inputs and will adapt to any line voltage between 90 and 264 V AC.

The power supply is protected with an external circuit breaker in the On/Off switch that trips at a 10 amp overload. An internal fuse in the power supply is not user accessible or repairable.

Cooling

The chassis is cooled with a fan. An overtemperature sensor is part of the standard power supply assembly. If the internal chassis temperature exceeds 50ºC, this sensor will light an amber indicator located on the rear of the power supply module.

Hydraulic control

Hydraulic control is handled with two transition modules.

The Model 493.73 HPU Transition module has a connection to control a hydraulic power unit. It includes connections for an emergency stop button and digital I/O for system communications.

Typically, up to four Model 493.74 HSM transition modules can be used to support up to eight HSM stations. Each HSM module includes connections to support two stations. Each station supports an HSM, a load unit, run/stop outputs, auxiliary outputs, and interlock controlled outputs.

Interlocks

Two types of interlocks are supported, the system wide interlock and station interlocks. The system wide interlock shuts down the hydraulic power unit and all stations, and the station interlock shuts down a single station leaving other stations running. The emergency stop function on the Model 493.74 HSM transition board contains two separate circuits, the system wide interlock (HPU) and the station interlock (HSM).

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System wide interlock

The emergency stop circuit consists of a loop that only runs through the rear panel transition boards of the chassis. Any board that generates an interlock by breaking this system wide loop causes the hydraulic power unit to be shut down. This will also cause all of the stations to shut down.

Note *The emergency stop circuit meets the requirements of the Machinery Safety Directive (EN 60204-1, 1992, section 9.2.5.4). This means the emergency stop circuit is hard-wired with electromechanical components.*

Station interlocks

Each station represents all of the components associated with an interlock chain. All of the modules plugged into the chassis can be assigned to stations. If one of the stations generates an interlock, all of the components assigned to the station are shut down.

Standard configurations support up to four independent stations.

Specifications

FlexTest GT Specifications (part 1 of 2)

PARAMETER	SPECIFICATION
Environmental	For indoor use only
Temperature	5°C – 40°C (41°F – 104°F)
Relative humidity	10% – 85%, noncondensing
Altitude	For use at altitudes up to 2000 m (6500 ft)
Power input	power factor corrected universal input
Input voltage*	100 – 240 V AC
Input frequency	47 – 63 Hz
Input surge	<100 A
Power	<1000 W
Insulation over voltage	Category II
Pollution degree	2

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FlexTest GT Specifications (part 2 of 2)

PARAMETER	SPECIFICATION
Power supply #1	maximum draw is 400 W total
+5 V DC	40 A
±15 V DC	7.5 A
Power supply #2	maximum draw is 400 W total
±12 V DC	4 A
+24 V DC	10 A
Weight	approximately 45 kg (100 lb) in stand alone configuration

* The specification shown conforms to CE Low Voltage Directive requirements. The specification allows for 10% of the values stated. The actual voltage the 493.10 chassis can operate is 90–264 V AC.

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FlexTest SE Controllers

The MTS Model 493.02 FlexTest SE Controller is a fully digital Proportional, Integral, Derivative, Feedforward (PIDF) servocontroller. It provides complete control of one servohydraulic channel or station in an MTS test system.

FlexTest SE Controller

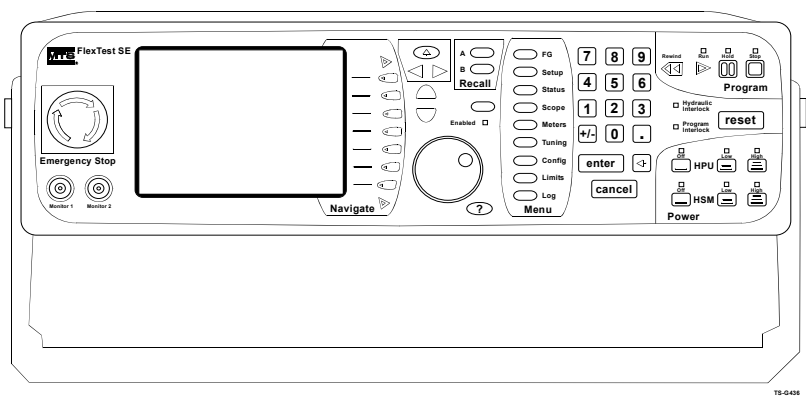
The FlexTest SE may be operated in the standalone mode from its front panel controls, or in the automated mode with MTS Model 793.00 System Software running on a connected PC.

FlexTest SE front panel controls

Operations are controlled through the controller's front panel. An easy-to-read color display shows the status of the parameter currently being adjusted or monitored. A simple scroll-through menu provides quick access to any parameter or function. All parameters are entered through a keypad or adjusted by a single multi-turn dial. The current settings are saved in a flash disk and are recalled at start up.

In addition to providing the means to adjust and monitor the test parameters, the front panel also provides program control, system hydraulic pressure control, and an Emergency Stop button that shuts down the system hydraulics in an emergency situation. BNC monitor connectors are also provided to allow you to connect easily to external readout devices.

FlexTest SE Front Panel



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FlexTest SE standalone function generation

A function generator (with a built-in cycle counter) in the controller provides basic sine, square, triangle, and ramp command waveforms.

For tests requiring complex waveforms, the controller provides an external command input to receive externally generated commands.

The function generator waveform can be output to another MTS FlexTest SE Controller (or any external device) for synchronization.

FlexTest SE automated configuration

In the automated configuration, the FlexTest SE Controller has added capabilities—it can acquire data, perform automated testing, apply complex control compensation techniques to the servoloop, and execute sophisticated test procedures that include complex triggering mechanisms.

The automated configuration includes the controller, a personal computer, and the Model 793.00 System Software bundle. It may also include optional MTS software for additional capability.

Model 493.02 Chassis

FlexTest SE Controllers use the Model 493.02 Chassis. The Model 493.02 Chassis is a single-station, single-channel VMEbus chassis which, in a typical configuration, houses three plug-in modules:

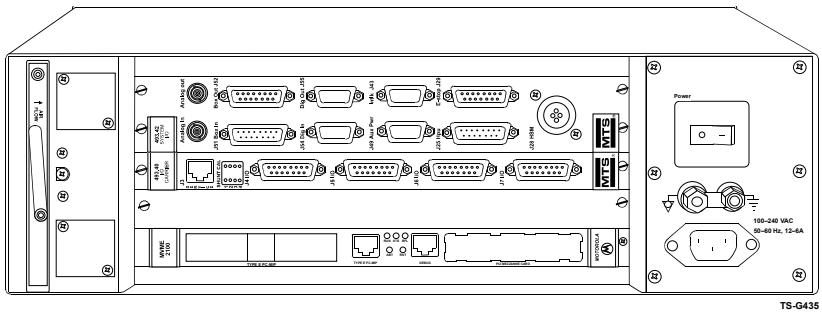
- A Series 498 Processor
- A Model 493.40 I/O Carrier module
- A Model 493.42 System I/O module

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Model 493.02 Chassis rear panel

Except for two front panel BNC connectors, all cabling is accessed through the controller's rear panel. It is not necessary to remove the chassis cover to access jumpers or switches. The chassis can be rack mounted or used in a table-top configuration.

FlexTest SE Rear Panel



Hydraulic control

The controller provides complete control of the test system hydraulics. It can be used to control a hydraulic power unit and a hydraulic service manifold to apply low and high hydraulic pressure to the test system. In multiple controller configurations, the controller provides first-on/last-off control of the hydraulic power unit in addition to control of a local hydraulic service manifold.

Interlocks

The controller provides interlocks for adjustable upper/lower limit, underpeak, error detection for each sensor conditioner installed, and others. These interlocks can be daisy-chained for multiple controller configurations.

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Specifications

FlexTest SE Specifications

PARAMETER		SPECIFICATION
Environmental		For indoor use only
	Temperature	5ºC – 40ºC (41ºF – 104ºF)
	Relative humidity	10% – 85%, noncondensing
	Altitude	For use at altitudes up to 2000 m (6500 ft)
Power input		power factor corrected universal input
	Input voltage*	100 – 240 V AC
	Input frequency	47 – 63 Hz
	Input surge	<50 A
	Insulation over voltage	Category I
	Pollution degree	2
Weight		approximately 8.6 kg (19 lb)

* The specification shown conforms to CE Low Voltage Directive requirements. The specification allows for 10% of the values stated. The actual voltage the 493.02 chassis can operate is 90–264 V AC.

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FlexTest IIm Controllers

The MTS FlexTest IIm Controller is a fully digital Proportional, Integral, Derivative, Feedforward (PIDF) servocontroller.

FlexTest IIm Controllers

The FlexTest IIm configuration provides complete control of up to sixteen channels distributed among up to four stations in an MTS test system.

The FlexTest IIm Controller is available in five standard configurations. The FlexTest IIm Controller also supports optional components and custom configurations that can add features and capability to any standard configuration.

All configurations include the following components:

- 497.01 Analog Chassis

  The analog chassis includes a complement of valve drivers and conditioners:

  - 497.14 AC Conditioner module
  - 497.22 Dual DC Conditioner module
  - 497.26 Dual Valve Driver module
  - 497,34 Multi-Station Interlock module
  - 497.36 Communications module

- 497.05 Hydraulic Control Panel

  The hydraulic control panel controls at least one Hydraulic Power Unit (HPU) or actuator manifold.

- 498.22 Test Processor Chassis

  - 498.65 ADDA module
  - 498.71B GRES III module
  - 498.96-X Processor module

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FT IIm standard configurations

- 4, 6, 8, 12, or 16 channels of control
- 16 inputs and 16 outputs of user DIO
- Per channel resources:
  - One valve driver output
  - One D/A output
  - One A/D input
  - One AC Conditioned input
  - Two DC conditioned inputs

Console

The FlexTest IIm Controller is available in a full-bay (vertical) console, a table-top console, or a roll-around console.

Note *The larger (full-bay) consoles can also accommodate rack-mount scopes, x-y recorders, and so forth.*

Customization

A standard FlexTest IIm system can be customized for specific test requirements. In these cases, the standard hardware and software can be changed to accommodate a specific customer requirement.

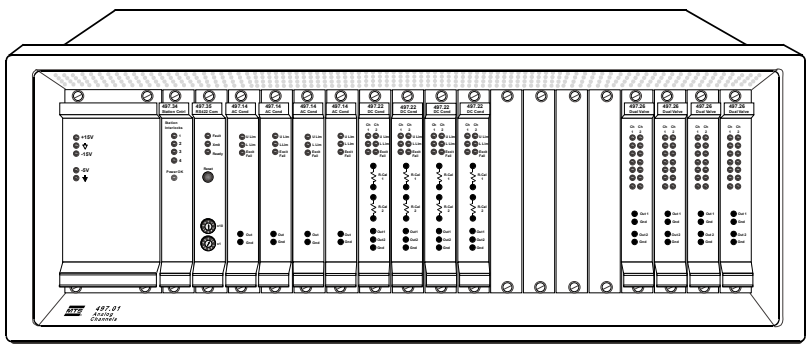
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Model 497.01 Analog Chassis

The plug-in modules installed in the 497.01 Analog Chassis provide four main functions:

- Interlock control—An interlock control plug-in module provides programmable interlock signal mapping between the test processor and the modules installed in this analog chassis.
- Processor/Analog Chassis communications—A communications module provides data conversion between the test processor and the 497 analog plug-in modules.
- Transducer conditioning—AC and DC conditioners provide transducer excitation and output signal amplification for both low-level and high-level transducers.
- Valve drive signals—Valve drivers provide drive current for two- and three-stage servovalves according to command inputs received for each channel.

Analog Chassis (Front Panel)



This chassis shows the maximum complement of modules for a standard FTIIm system. Customized systems can use all the module locations.

Note *This chassis has rear panel transition modules and I/O connectors to support up to four independent test stations.*

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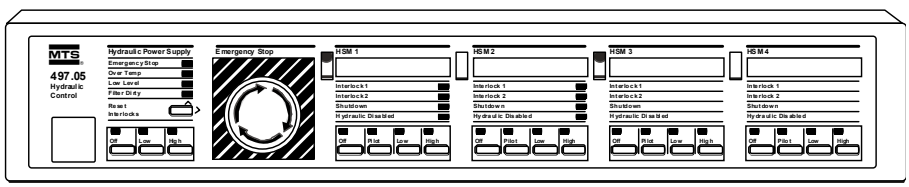
Model 497.05 Hydraulic Control Panel

The hydraulic control panel provides the following functions.

- Control of up to four independent hydraulic service manifolds
- Hydraulic power supply control
- Interlock shutdown and latched indicators to show interlock status
- Programmable interlock station assignment
- Electrical power outputs to the hydraulic service manifolds and a 497.01 Analog Chassis
- Built-in emergency stop button and connections for a remote emergency stop button

Refer to the Series 497 Electronics Product Information manual (PN 100-036-577) for details about configuring the hydraulic control panel for your system.

Hydraulic Control Panel



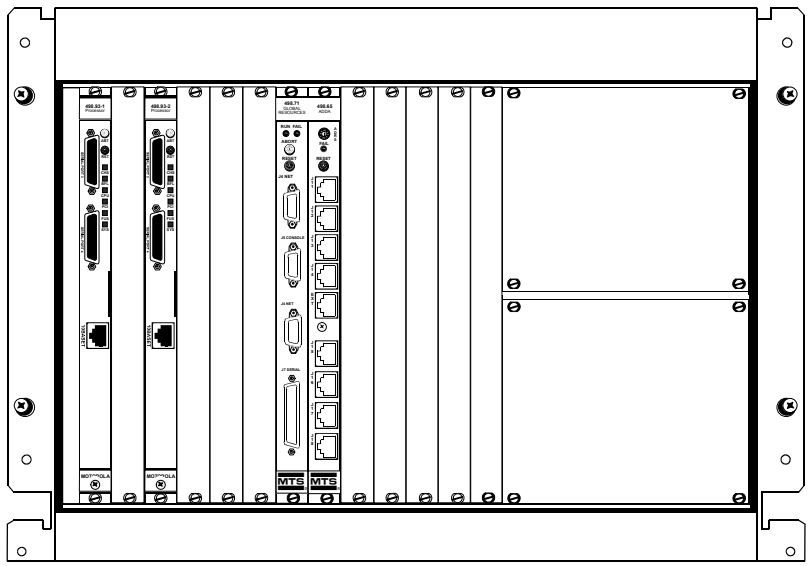
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Model 498.22 Chassis with Test Processor (FTIIm)

The 498.22 test processor chassis is a VMEbus chassis that houses up to twelve plug-in modules (including processor modules, ADDA modules, digital I/O modules, and so forth). It also accommodates various rear-panel transition modules (for connections to other hardware chassis and external equipment).

Note *The test processor is covered by a tinted, removable front panel. For more information, refer to the Series 498 Electronic Product Information manual (PN 100-036-578).*

498.22 Test Processor Chassis (Front Panel)



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Specifications

Model 497.01 Specifications

PARAMETER	SPECIFICATION
Environmental	For indoor use only
Temperature	5ºC – 40ºC (41ºF – 104ºF)
Relative humidity	10% – 85%, relative, noncondensing
Power requirements	+15 V at 6 A; -15 V at 6 A; +5 V at 6 A (standard supply maximum output, actual load depends on installed modules)
Dimensions	
Height	17.8 cm (7 in)
Width	48.3 cm (19 in)
Depth	31.1 cm (12.25 in)

Model 497.05 Specifications (part 1 of 2)

PARAMETER	SPECIFICATION
Individual solenoid current	2 A max
Total HSM solenoid current	6 A max
Solenoid operating voltage	24 V DC or 115 V AC (switch selectable)
497.05 power supply output	+24 V at 7.5 A
497.01 power supply output	+5 V at 6 A
	+15 V at 6 A
	-15 V at 6 A
Power requirements	90 - 132 V AC/180 - 264 V AC
	47 - 63 Hz
	500 W

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Model 497.05 Specifications (part 2 of 2)

PARAMETER	SPECIFICATION
Interlock logic level Inputs	0 = 0 V DC
	1 = 3.2 to 24 V DC
Dimensions	
Height	8.9 cm (3.5 in)
Width	48.3 cm (19 in)
Depth	54.6 cm (21.5 in)

Model 498.22 Chassis Specifications (part 1 of 2)

PARAMETER	SPECIFICATION
Dimensions	
Height	40 cm (15.75 in)
Width	48.3 cm (19 in)
Depth	55.9 cm (22 in)
Weight	18 kg (40 lb) plus 0.5 kg (1 lb) per module
Rack mounting requirements:	
Clearance-each side	5.7 cm (2.25 in) for air flow
Clearance-back	15.3 cm (6.0 in) for cabling
Clearance-top/bottom	No restrictions
Number of slots	12 VMEbus slots
Power requirements	100 - 120 V AC at 12 A between 50 - 60 Hz
	220 - 240 V AC at 6 A between 50 - 60 Hz

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Model 498.22 Chassis Specifications (part 2 of 2)

PARAMETER	SPECIFICATION
LED Classification	Class 1
Environmental	For indoor use only
Temperature	5ºC – 40ºC (41ºF – 104ºF) ambient
Relative humidity	0% – 85%,relative, noncondensing
Maximum altitude	2000 m (6562 ft)
Insulation over voltage	Category II
Pollution degree	2

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Chapter 2

Installation

This chapter describes how to install the Controller chassis and connect it to system components.

Contents

Installing the 493.10 Chassis (FTGT) 37
Installing the 493.02 Chassis (FlexTest SE) 48
Installing 497/498 Electronics (FTIIm) 59

Installing the 493.10 Chassis (FTGT)

The chassis can be installed in an equipment rack console or in a standalone configuration.

⚠ CAUTION

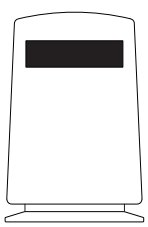
The Model 493.10 Chassis weighs about 45 kg (100 lb) in stand alone configuration.

Improper lifting techniques can cause strained muscles and back injuries.

When lifting this chassis, take the appropriate precautions to prevent injuries to yourself.

Stand-alone installation

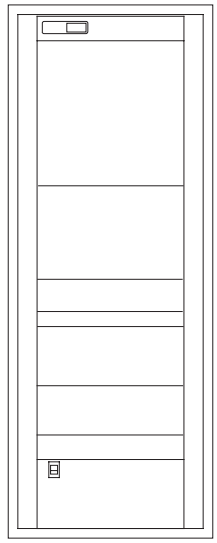
The standalone chassis can be placed on the floor. The chassis location is limited only by the length of the system cables. The front panel of the chassis can be removed to access the VMEbus plug-in modules.



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Console installation

The rack-mounted chassis can be installed in any Model 490.8x console. Install the console with the 493.10 Rack Mounting kit (056-139-502 for FlexTest GT). The Rack Mounting kit provides the hardware (L-shaped brackets) to support the chassis and mounting screws to secure the chassis to the console rack.



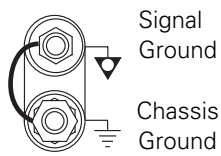
Connecting Electrical Power

Electrical connections must be made by qualified personnel and conform to local codes and regulations. An electrical service panel to provide the electrical power feed (line voltage) to the chassis is not necessary, but may be required by local electrical codes.

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

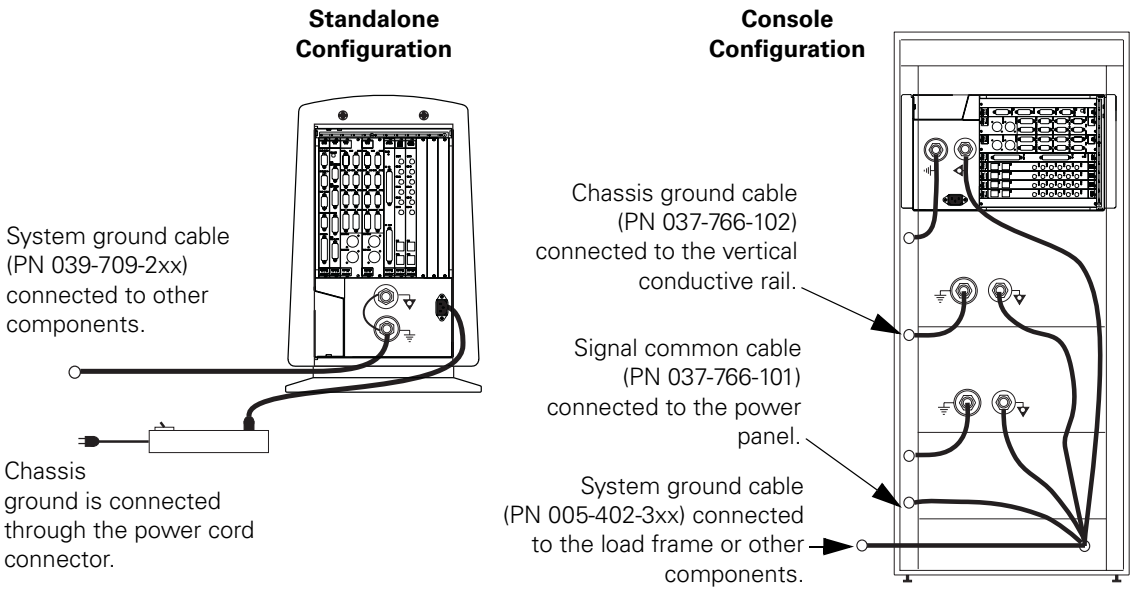
Grounding

The chassis will not function correctly if it is not grounded as shown. Be sure your power source is also properly grounded. The chassis includes two grounds: a chassis ground and a signal ground. The two grounding lugs are connected together with an external shorting bar when the chassis is manufactured.



- For the console configuration, remove the shorting bar from the ground lugs and connect the chassis ground to the console rail.
- For a standalone configuration, always connect the shorting wire to both ground lugs.

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AC grounding

The AC power ground is through the power cord. The power cord must be plugged into both the chassis and the power source for proper grounding.

⚠ CAUTION

Proper grounding is required for safe operation.

It is also required to meet EMC emission and susceptibility requirements.

Power

All equipment related to the chassis should be connected on the same fused power circuit.

- The power supply can accept single-phase voltages within 90–264 V AC at frequencies between 47–63 Hz.
- The maximum continuous power usage is approximately 1000 W. The current draw depends on the local voltage supply. A 15 amp line should be adequate for the chassis and the computer.
- The power supply automatically selects the proper voltage range and line frequency.

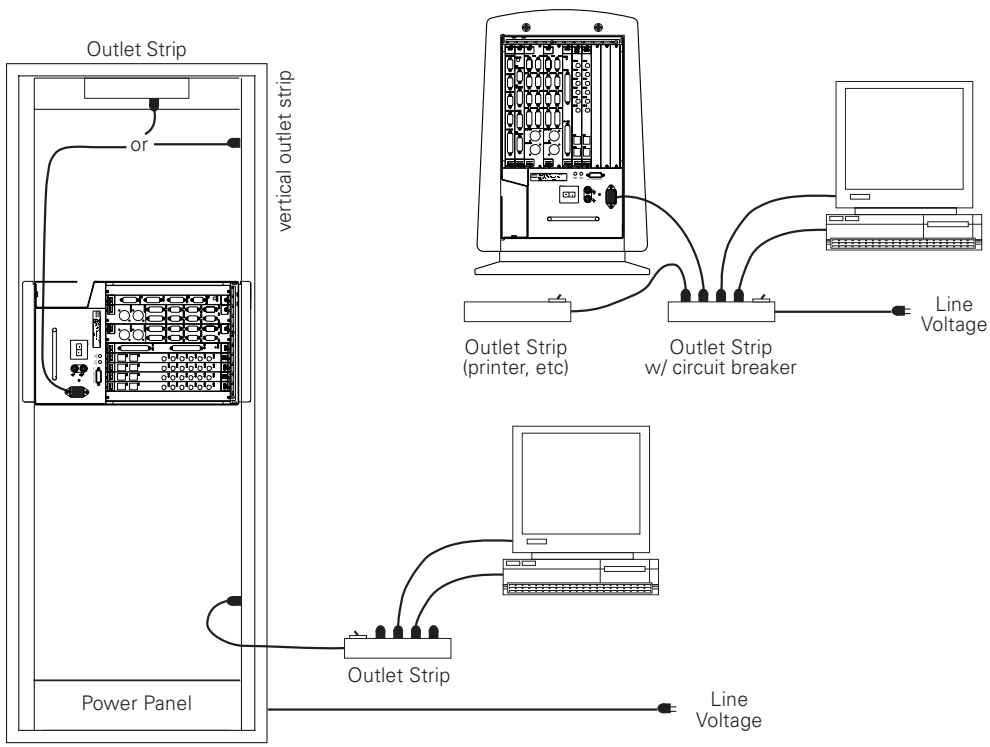
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- The power supply is protected with an external circuit breaker in the On/Off switch that trips at a 10 amp overload. An internal fuse in the power supply is not user accessible or repairable.
- An outlet strip is supplied with the floor-standing chassis.
- The computer components may be plugged directly into the outlet strip of a vertical console or a floor-standing console.

AC power disconnect

Turn off the AC power switch. Remove the AC power cord from the unit. This will remove all AC power from the 493.10 chassis.

Note *Be sure to locate the chassis so you have adequate access to disconnect the power cord from the chassis.*



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Installing the Plug-in Modules

This section describes how to install the plug-in modules into the chassis. The modules plug into a backplane connector and are secured to the chassis with a screw at the top and at the bottom of the module faceplate.

A hardware interface file (hwi file extension) defines each type of module and maps each module location for the system software. The hwi file and the physical locations for each type of module must match. Recommended standard module locations are described in the following sections. For more information on the hwi file, see the Hwi File Editor manual.

⚠ CAUTION

The plug-in modules contain static-sensitive components.

Improper handling of the module can cause component damage.

Be sure to follow these precautions when handling modules:

- Turn off electrical power before installing or removing a module.
- Use a static ground strap to ground yourself to the chassis ground before touching the chassis or a module.
- Keep unused modules in conductive bags. Also be sure you are grounded when removing a module from a conductive bag.
- Handle modules with their front panel or circuit card edges. Do not touch any circuit card components, pins, or circuit connection points.

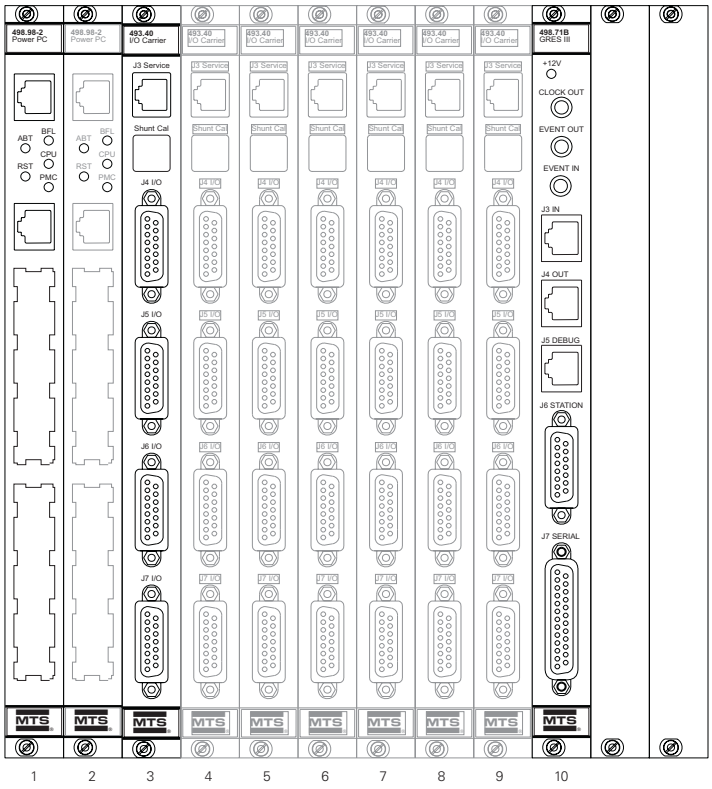
VMEbus Modules

The VMEbus compatible modules should be installed in the front panel chassis slots according to the following guidelines.

- The processor module(s) must be located in the first (and second) slots.
- The GRESIII module (if used) should be located in slot 10. It may also be located in slot 2 if a second processor is not used.
- I/O carrier modules and/or ADDA II modules can be installed in slots 3 to 10. Install a module in slot 3 and any additional modules to the right of it.

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Placement of VMEbus modules in the front panel chassis



Setting I/O Carrier addresses

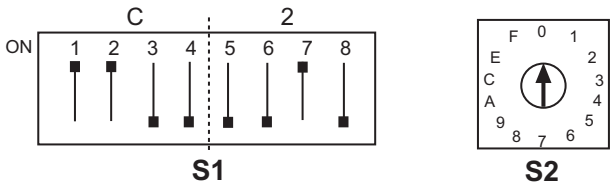
Use the dipswitch (S1) and rotary dipswitch (S2) on each I/O Carrier module to set its address in accord with its installed chassis slot as follows:

SLOT	1	2	3	4	5	6	7	8	9	10
ADDRESS	PPC		C20	C22	C24	C26	C28	C2A	C2C	C2E

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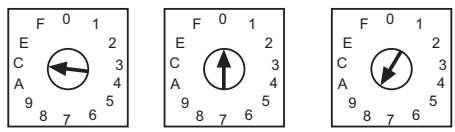
Setting I/O Carrier module addresses

The dipswitch settings for address C20 is shown below. Increment the rotary dipswitch as required to complete I/O Carrier module addressing.



Setting GRES III module addresses

The dipswitch settings for address C08 is shown below. Increment the rotary dipswitch as required to complete GRES III module addressing.

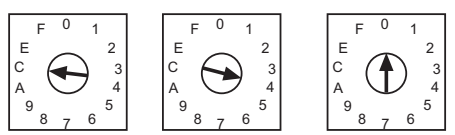


Setting ADDA II addresses

Use the onboard rotary dipswitches (**S3, S2)** and front panel rotary dipswitch on each ADDA II module to set its address in accord with its installed chassis slot as follows:

SLOT	1	2	3	4	5	6	7	8	9	10
ADDRESS	PPC	PPC		C40	C41	C42	C43	C44	C4A	C4C

The rotary dipswitch settings for address C40 are shown below. Increment the front panel dipswitch as required to complete ADDA II module addressing.



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Front Panel VMEbus Modules

Model	Module Name	Function
493.40	**I/O Carrier**	Supports up to four mezzanine cards.
493.43	**Multi-Box I/O**	The optional module allows multiple controllers to share a master hardware synchronization clock and pass station interlock state information between each other.
493.50	**ADDA II**	This optional module supports up to four 8-channel A/D (Model 493.55) or D/A (Model 493.56) mezzanine cards. This module also supports the 8-channel DSPAD, 8-channel Delta-Sigma A/D, and 4-channel Universal Encoder mezzanine cards.
498.96-X	**Processor**	Provides an interface between the controller and an external computer. The processor module also manages the plug-in modules and transition panels.
498.71B	**GRES III**	Interfaces with a Remote Station Control (RSC) module and temperature controllers.

I/O Carrier mezzanine cards (part 1 of 2)

Model	Module Name	Function
493.14	**Valve Driver**	Produces the control signal for a Series 252 Servovalve.
493.15	**3–Stage Valve Driver**	Produces the control signal for a Series 256 or 257 Servovalve.
493.21B	**Universal Conditioner**	Processes the signals from either an AC or DC-type sensors.
493.25	**Universal Conditioner**	Processes the signals from either an AC or DC-type sensors.
493.45	**A/D**	Converts up to six external analog signals to digital signals for use by the controller.
493.46	**D/A**	Converts up to six internal digital signals to analog signals for use by external devices.

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I/O Carrier mezzanine cards (part 2 of 2)

Model	Module Name	Function
493.47	**Encoder**	Processes the signals from an encoder or a Temposonics III transducer with an SSI interface.
493.48	**Acceleration Conditioner**	Processes the signals from an accelerometer. Each Acceleration Conditioner mezzanine card can support up to three accelerometers. Before installing this board, specific jumpers must be set on the I/O Carrier module. See "I/O Carrier jumper settings" on page 108 for more information on jumper settings.

ADDA II mezzanine cards

Model	Module Name	Function
493.55	**A/D**	Converts up to eight external analog signals to digital signals for use by the controller. This board requires the optional ADDA II module.
493.56	**D/A**	Converts up to eight internal digital signals to analog signals for use by external devices. This board requires the optional ADDA II module.
493.57	**DSPAD**	Converts up to eight external analog signals to digital signals for use by the controller. A DSP chip provides digital filtering. This board requires the optional ADDA II module.
493.59	**Universal Encoder**	Processes the signals from incremental, absolute, and Temposonics III encoders. This board requires the optional ADDA II module.

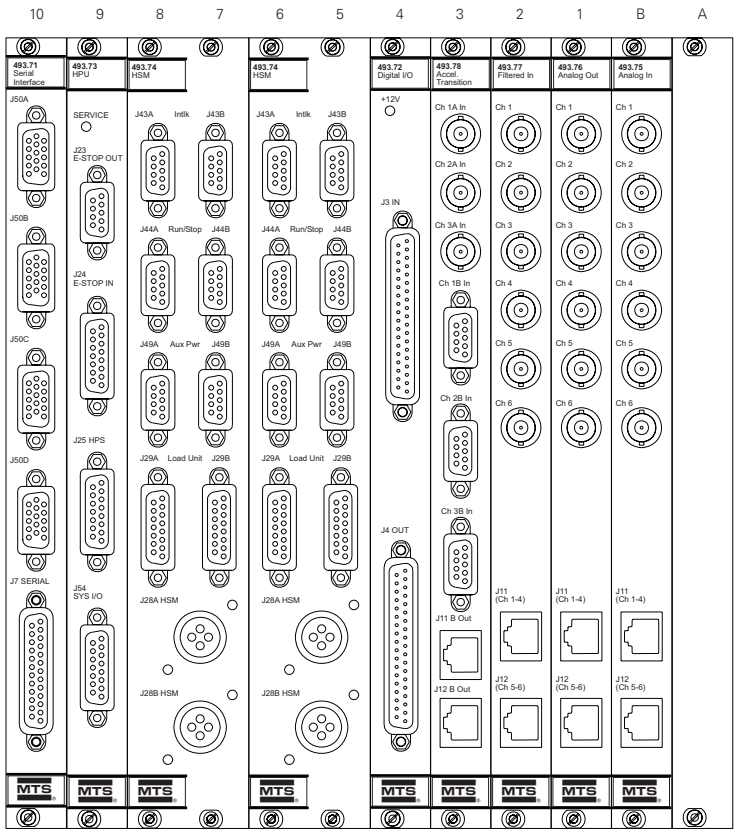
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Installing the Transition Panels

The transition panels need to be installed in specific slots of the rear panel chassis. This is done to allow proper air flow in the chassis. For consistency, install the modules according to the following guidelines.

Starting from the left chassis slot (slot 10) and working to the right, install the modules as shown. If you do not have one of the modules, install the next one you do have. Install multiple modules of the same model number next to each other.

Placement of transition panels in the rear panel chassis



Note *Other transition modules may be used, contact MTS Systems Corporation for additional information.*

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Rear Panel Transition Panels

Model	Module Name	Function
493.71	**RS485**	Provides four channels of RS-485 interface, four channels of station stop interlocks, and four channels of emergency stop interlocks. The RS-485 interface channels are used for the Remote Station Controller and/or temperature controller.
493.72	**Digital I/O**	Contains sixteen general purpose digital input channels and sixteen general purpose digital output channels.
493.73	**HPU Transition Board**	Interfaces the controller with a hydraulic power unit.
493.74	**HSM Transition Board**	Interfaces the controller with a hydraulic service manifold and other devices, up to two stations.
493.75	**Analog In BNC**	Provides six BNC channels for analog input signals. The input signals must be within ±10 V DC.
493.76	**Analog Out BNC**	Provides six BNC channels for analog output signals. The output signals are within ±10 V DC.
493.77	**Filtered Analog Input**	Provides filtering for the Model 493.45 A/D (analog-to-digital) modules.
493.78	**Accelerometer Transition Board**	Interfaces with up to three low impedance voltage mode (LIVM) accelerometers and three signal conditioned type accelerometers.
493.79	**Multiple Universal Driver Board**	Provides up to six drivers that can be used to drive standard 252 servovalves. Inputs to this board can originate from either a ADDA II board (6 outputs) or a Model 493.46 D/A board (6 outputs).
493.80	**Encoder Transition**	Interfaces with up to four encoders.
493.81	**Analog In BNC**	Provides up to eight channels of analog input to each Model 493.55 A/D module. The input signals must be within ±10 V DC.
493.82	**Analog Out BNC**	Provides eight channels of analog output from the Model 493.56 D/A modules. The output signals are within ±10 V DC.
493.83	**Filtered Analog Input**	Provides up to eight channels of filtered analog input to each Model 493.55 A/D module.

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Installing the 493.02 Chassis (FlexTest SE)

This section describes how to install the MTS FlexTest 493.02 chassis and connect it to your system components.

Contents

Installing the Plug-in Modules 41
VMEbus Modules 49
Chassis Installation Options 50
Connecting Electrical Power 52
Installing the Handle Kit 56

Installing the Plug-in Modules

This section describes how to install the plug-in modules into the chassis. The modules plug into a backplane connector and are secured to the chassis with a screw at the top and bottom of the faceplate.

⚠ CAUTION

The plug-in modules contain static-sensitive components.

Improper handling of the module can cause component damage.

Be sure to follow these precautions when handling modules:

- Turn off electrical power before installing or removing a module.
- Use a static ground strap to ground yourself to the chassis ground before touching the chassis or a module.
- Keep unused modules in conductive bags. Also be sure you are grounded when removing a module from a conductive bag.
- Handle modules with their front panel or circuit card edges. Do not touch any circuit card components, pins, or circuit connection points.

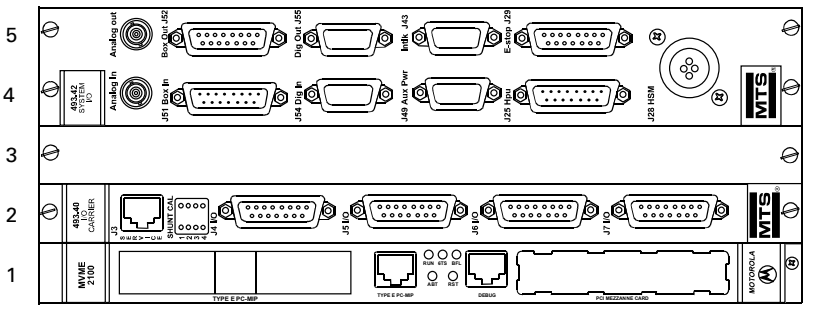
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VMEbus Modules

The VMEbus compatible modules should be installed in chassis slots according to the following guidelines.

- The processor module is installed in slot 1
- The I/O carrier module is installed in slot 2.
- The System I/O module is installed in slots 4 and 5.

Placement of VMEbus modules in the chassis



VMEbus Modules

Slot	Module Name	Function
Slot 1	**Processor**	Provides PIDF processing for the Controller and management of the other plug-in modules in the standalone configuration. Provides an interface between the Controller and an external computer in the automated configuration.
Slot 2	**Model 493. 40 I/O Carrier**	Supports up to four mezzanine cards that can be used for sensor conditioning, driving a servovalve, and in the automated configuration, providing A/D and/or D/A channels.
Slot 3	**Blank in standard configurations.** **May be used for additional Model 493.40 I/O Carrier (factory installed option for automated systems)**	Additional carrier chassis that can house up to four mezzanine cards for expanded sensor conditioning and A/D and D/A channels ***Note*** *This is not a standard option. It is available only for automated systems and must be configured at the factory. For more information, contact MTS.*
Slots 4, 5	**Model 493.42 System I/O**	Provides box-in and box-out connections for daisy chaining multiple Controllers, analog and digital I/O, E-Stop, and HSM and HPU control.

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Model 493.40 I/O Carrier mezzanine cards

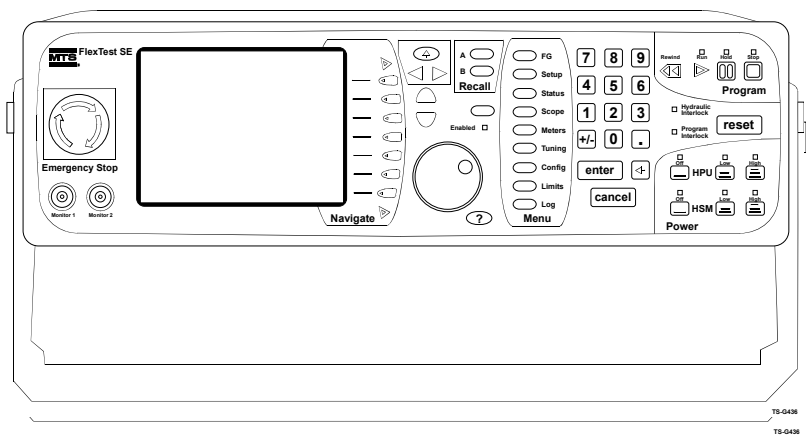
MODEL	MODULE NAME	FUNCTION
493.14	**Valve Driver**	Produces the control signal for a Series 252 Servovalve.
493.15	**3–Stage Valve Driver**	Produces the control signal for a Series 256 or 257 Servovalve.
493.25	**Universal Conditioner**	Processes the signals from either an AC or DC-type sensors.
493.45	**A/D**	Converts up to six external analog signals to digital signals for use by the controller.
493.46	**D/A**	Converts up to six internal digital signals to analog signals for use by external devices.
493.47	**Encoder**	Processes the signals from an encoder or a Temposonics III transducer with an SSI interface.

Chassis Installation Options

The chassis can be fitted with the optional handle kit for table-top use in the standalone configuration (shown below), and for the automated configuration it can be installed without the handle-kit in a standard MTS equipment rack.

Note *For information about installing the optional handle kit, see page 56.*

FlexTest SE Controller with optional handle kit



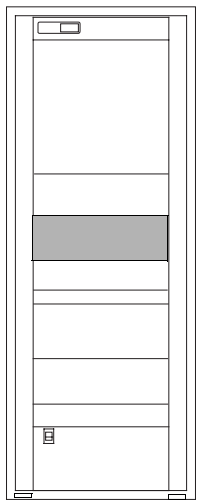
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Rack mounting requirements

When installing the chassis in an equipment rack allow a minimum of 2 in. (5.1 cm) on either side of the Controller for air flow. There are no spacing requirements for the top or bottom of the Controller. If the equipment rack is equipped with doors, allow adequate clearance for the front and rear of the Controller. The rear of the Controller requires a minimum clearance of 6 in. (15.24 cm) to accommodate cables.

The chassis can be installed in any Model 490.8x console. Install the console with the Model 493.02 chassis rack mounting kit (PN 100-063-209).

The Rack Mounting kit provides the hardware (L-shaped brackets) to support the chassis and mounting screws to secure the chassis to the console rack.



Rack Mount Option
The Controller chassis is designed to fit into a standard electronics rack.

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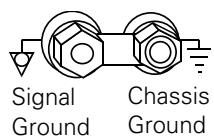
Connecting Electrical Power

Electrical connections must be made by qualified personnel and conform to local codes and regulations. An electrical service panel to provide the electrical power feed (line voltage) to the chassis is not necessary, but may be required by local electrical codes.

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

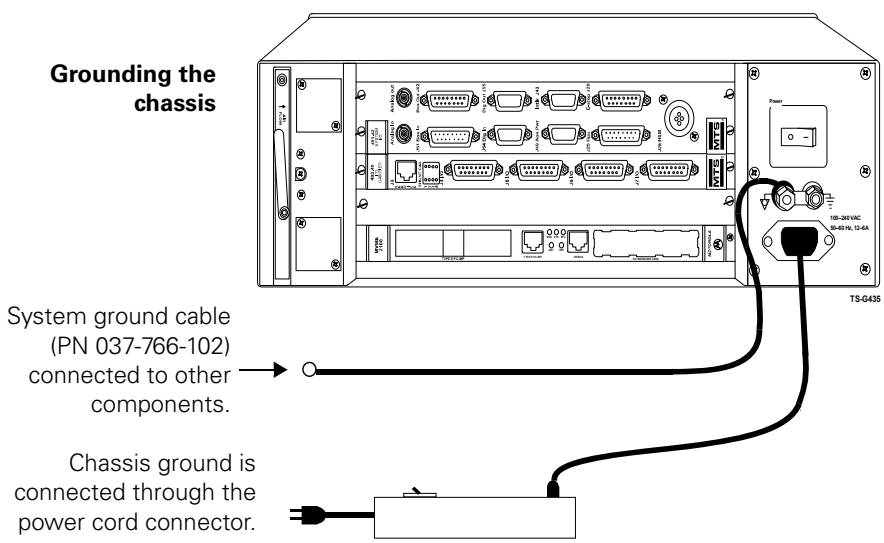
Grounding

The chassis will not function correctly if it is not grounded as shown. Be sure your power source is also properly grounded. The chassis includes two grounds: a chassis ground and a signal ground. The two grounding lugs are connected together with an external shorting bar when the chassis is manufactured.



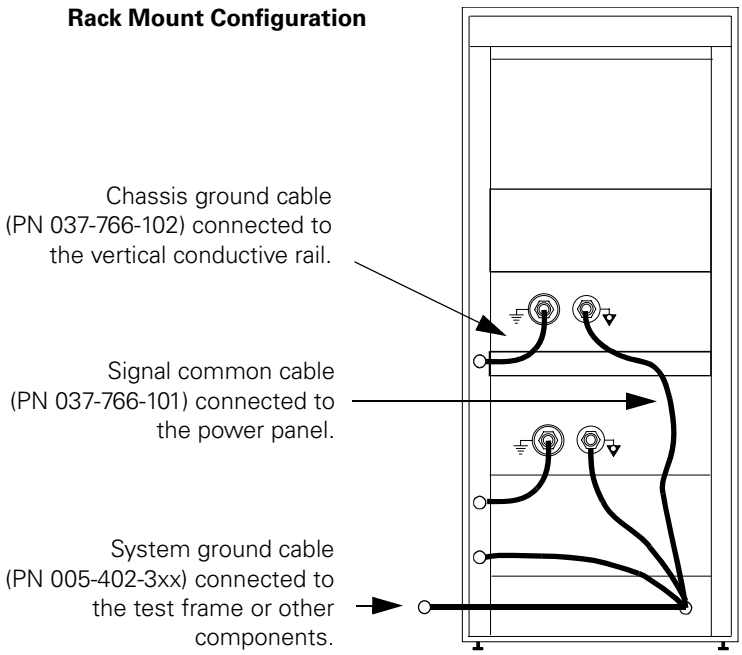
- For the console configuration, remove the shorting bar from the ground lugs and connect the chassis ground to the console rail.
- For a standalone configuration, always connect the shorting bar to both ground lugs.

Grounding the chassis



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Rack Mount Configuration



The AC power ground is through the power cord. The power cord must be plugged into both the chassis and the power source for proper grounding.

⚠ CAUTION

Proper grounding is required for safe operation.

It is also required to meet EMC emission and susceptibility requirements.

Power

All equipment related to the chassis should be connected on the same fused power circuit.

- The power supply can accept single-phase voltages within 90–264 V AC at frequencies between 47–63 Hz.
- The maximum continuous power usage is approximately 300 W. The current draw depends on the local voltage supply. A 15 amp line will be adequate for the chassis and the computer.

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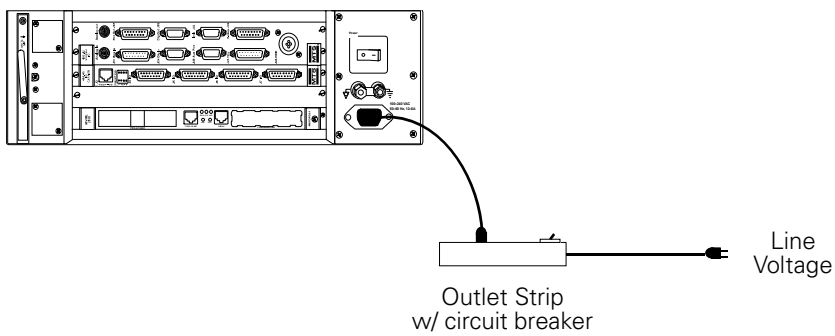
- The power supply automatically selects the proper voltage range and line frequency.
- The power supply is protected with an external circuit breaker in the On/Off switch that trips at a 5 amp overload. An internal fuse in the power supply is not user accessible or repairable.

AC power disconnect

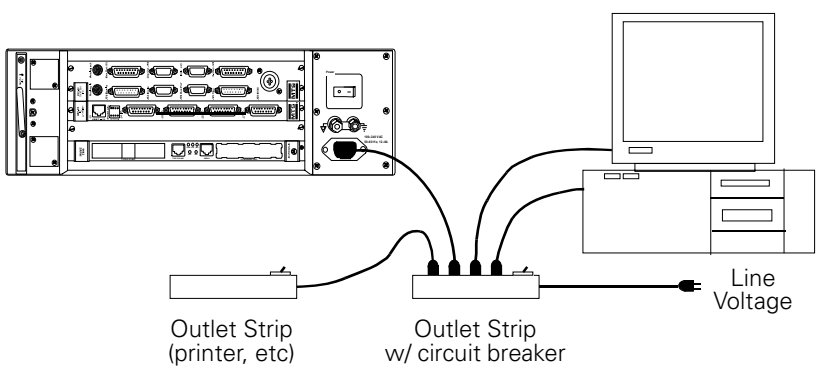
Turn off the AC power switch. Remove the AC power cord from the unit. This will remove all AC power from the 493.02 chassis.

Note *Be sure to locate the chassis so you have adequate access to disconnect the power cord from the chassis.*

Stand-Alone Configuration

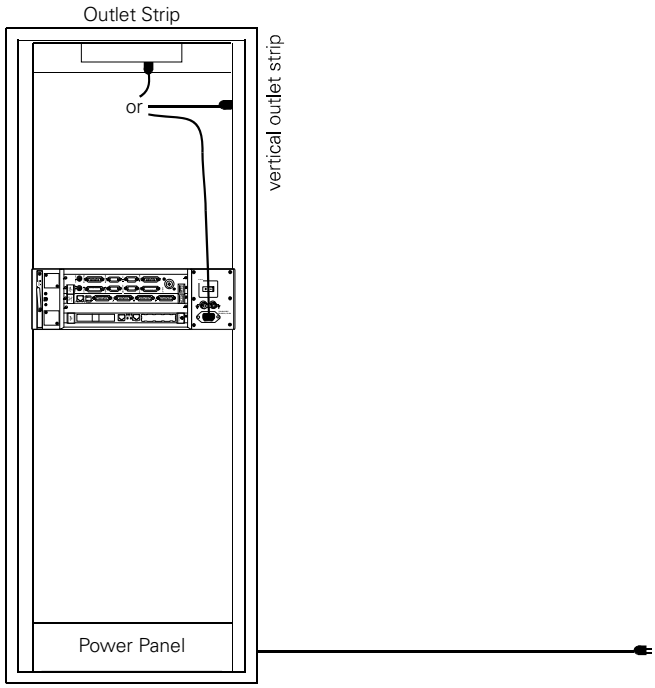


Automated Configuration



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Rack Mounted Configuration



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Installing the Handle Kit

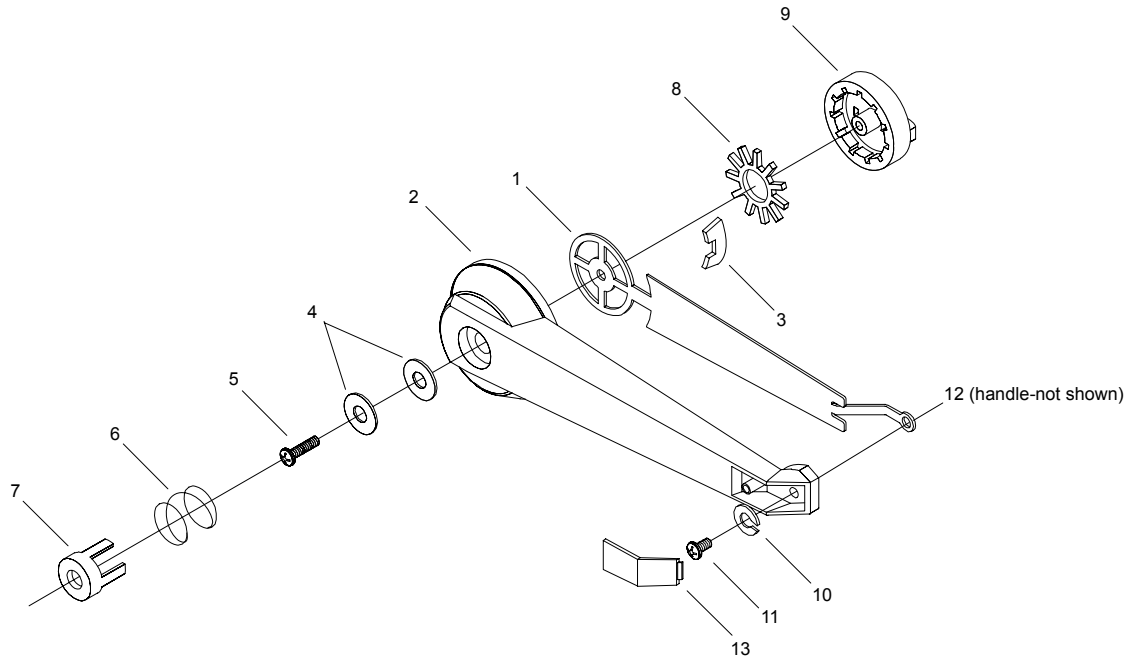
The Controller may be equipped with an optional handle kit.

The following procedure provides assembly and installation instructions for the handle kit (MTS PN 100-061-494). The following table and figure show the handle kit assembly components described in the procedure.

Handle Kit Parts

ITEM	DESCRIPTION	QUANTITY
1	Support arm	2
2	Handle side leg	2
3	Clip	2
4	Washer	4
5	Screw	2
6	Spring	2
7	Button	2
8	Ratchet	2
9	Ratchet housing	2
10	Lock washer	2
11	Handle screw	2
12	Handle	1
13	Cover	2

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Handle Kit

1. Place one support arm (1) into one handle side leg (2), as shown in the handle kit assembly figure.
2. Set one of the clips (3) in place over the slender, straight portion of the support arm (1), just behind the circular end of the support arm.
3. Insert two washers (4) and a screw (5) through the mounting hole in the handle side leg (2).
4. Insert a spring (6) and a button (7) into the handle side leg mounting hole, over the screw (5) and washers (4).
5. Press the button (7) into the handle side leg, as far as you can and push a ratchet (8) over the button (7) leg detentes, until it snaps into place over the first set of detentes. Make certain the burred or sharper edges of the ratchet are pointing toward the handle side leg.

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6. Hold a ratchet housing (9) in place over the ratchet (8) and press the posts on the back side of the ratchet housing (9) into the mounting holes on the side panel of the Controller.
7. Insert a Phillips screwdriver through the hole in the button (7) and lightly tighten the screw (5).
8. Assemble the remaining handle kit components to the other handle side leg (2) according to steps 1 through 7 and mount the side leg to the mounting holes on the opposite side of the Controller.
9. Insert a lock washer (10) and handle screw (11) through the mounting hole at the end of one handle side leg (2) and lightly tighten to handle (12). Repeat this step for the other handle side leg, then secure both screws (11). (The mounting screw for the first handle side leg may have to be loosened slightly to allow the second handle side leg to be mounted.)
10. Snap cover (13) in place over the handle screw (11) and lock washer (10).
11. Secure mounting screws (5) on each side of the Controller.
12. Press in both buttons (7) and rotate the handle assembly. The assembly should rotate up and down easily. When the buttons (7) are released, the handle should lock into a detente position and remain there. If the handle does not move easily, or if it does not lock into a detente position, an error may have been made during the assembly. Take a small straight blade screw driver and carefully remove the covers (13), loosen all screws and remove the handle assembly from the Controller. Reassemble the handle side leg assemblies according to steps 1 through 7.

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Installing 497/498 Electronics (FTIIm)

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Test Processor Transition Modules 71

Connecting the Console and Chassis Power

Each chassis installed in your console can be configured for 115 or 230 V AC service. To configure each chassis for 230 V AC service, refer to the following product manuals.

- 497.05 Hydraulic Control Panel (100-036-577)
- 497.01 Analog Chassis (100-036-577)
- 498.22/498.23 Test Processor (100-036-578)—for FlexTest IIm

How To Connect the Chassis Power Cables

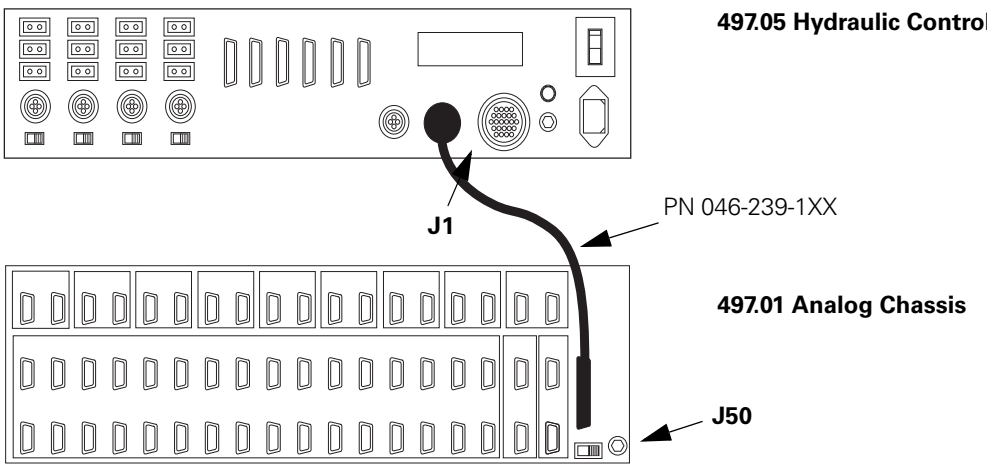
You can plug the hydraulic control panel and the test processor chassis into the AC power strip inside the console.

The analog chassis requires an external power supply. Typically, it is connected to the hydraulic control panel. If you have more than one analog chassis, you must plug each additional analog chassis into a remote power supply.

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How To Cable the Analog Chassis to the Hydraulic Control Panel

Connect **J50 DC Pwr** on the 497.01 Analog Chassis rear panel to **J50** on the 497.05 Hydraulic Control Panel rear panel.



Grounding the Console and Chassis

The system will not function correctly if it is not grounded properly.

The power ground and chassis ground terminals are wired together when the chassis is manufactured.

Remove the jumper between the two grounds and connect each terminal as follows:

- Each chassis ground should be connected to the console with a short ground cable (PN 037-766-102).
- Each power ground should be connected at a common location on the power panel (PN 037-766-1XX).
- The power panel ground should be connected to the console (PN 037-766-101).

The system ground cable connects the console to other system components (PN 005-402-3XX).

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Model 497.01 Analog Chassis

About Analog Chassis Slots

Slot pairing

Chassis slot assignments are grouped in pairs. If you have a conditioner in a slot, then you cannot have a valve driver installed in the slot paired with it. Slots are paired as follows:

Slots 1–2	Slots 9–10
Slots 3–4	Slots 11–12
Slots 5–6	Slots 13–14
Slots 7–8	Slots 15–16

Slot assignments

The analog chassis contains 18 bus-board slots for plug-in modules. Each slot is reserved for a particular type of plug-in module.

Slot A Reserved for the Model 497.34 Multistation Interlock Module.

Slot B Reserved for the Model 497.36 Communications Module.

Slots 1–4 These slots are reserved for up to four AC conditioners.

Slots 5–8 These slots are reserved for up to four DC conditioners.

Slots 9–12 These slots are reserved for options (not used with standard systems).

Slots 13–16 These slots are reserved for up to four valve drivers.

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Analog Chassis Plug-in Modules

Before you install any plug-in modules, be sure they are configured properly for your system. The following is a brief description of the plug-in modules available for the chassis.

Plug-in Modules

Model #	Plug-In Module Name	Function
497.13*	**AC Conditioner**	Processes signals from AC-type sensors such as LVDTs or RVDTs. ***Note*** *This module was designed to replace the 497.14 AC Conditioner.*
497.15	**Three-Stage Valve Driver**	Produces the control signal and inner control loop for a 256 or a 257 Servovalve.
497.22*	**Dual DC Conditioner**	Processes the signals from two DC-type sensors such as a force transducer or extensometer.
497.26	**Two-Stage Valve Driver**	Produces the control signal for one 252 Servovalve. The second valve driver is not used in standard systems.
497.34	**Multistation Interlock Controller**	Monitors the plug-in modules for interlocks. This is a part of the interlock chain between 497.05 chassis and any other 497.01 chassis.
497.36	**Communication Module**	Provides communications between the 497.01 Analog Chassis and the 498.22 Test Processor.

* This conditioner is normalized and can be swapped (with a conditioner of the same model number) without recalibrating the sensor/conditioner pair. Normalized conditioners contain an EEPROM in which normalization values are stored during manufacturing. These values compensate for variations in conditioner components.

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How To Install or Remove a Plug-in Module

⚠ CAUTION

Plug-in modules are static sensitive.

Do not install or remove a module with electrical power on. Do not place modules that contain battery backup on a metal surface. Touch the console or other ground point before handling a module. Avoid making physical contact with any circuitry on the modules. Maintain the same potential between the module circuitry and the equipment or surfaces it contacts by touching the surfaces first or wearing a wrist strap connected to chassis ground.

To install a module in the chassis:

1. Fully retract the two screws near the handles.
2. Insert the module assembly, and gently slide the module in until it connects with the backplane.
3. Ensure that the circuit card is seated in the backplane connectors and tighten the two screws.

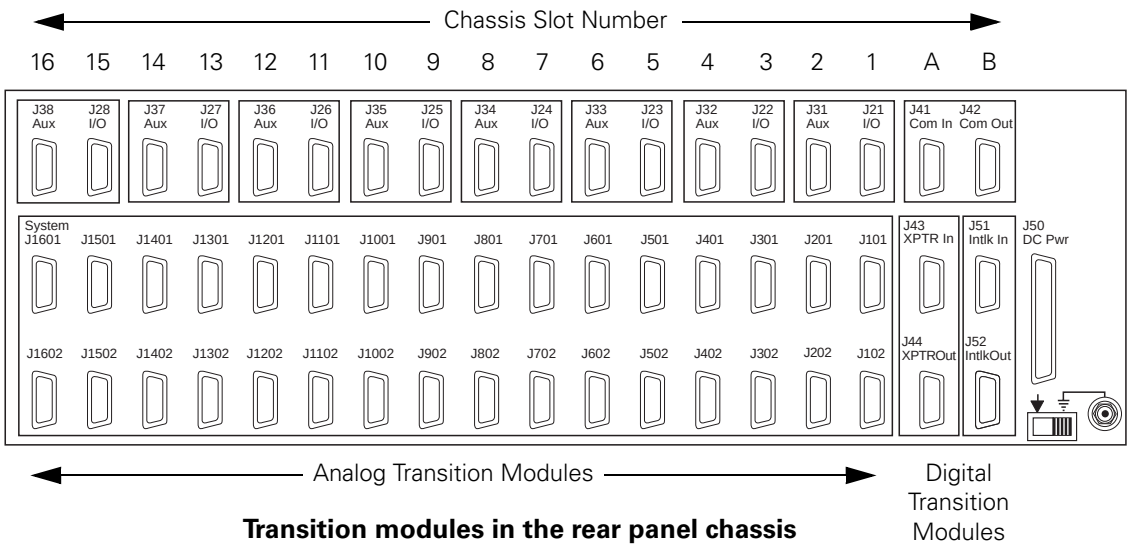
To remove a module from the chassis:

1. Loosen the two screws near the module handles.
2. Tug gently on the module to unseat it from the backplane connectors.
3. Slide the module straight out of the chassis.

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Analog Chassis Transition Modules

Transition modules located on the 497.01 rear panel provide signal transfer between the 497 modules and external devices. One digital transition module and up to eight analog transition modules can be installed in this chassis. Each transition module plugs into the backplane connectors and connects to two chassis slot locations.



Transition modules in the rear panel chassis

How To Install a Transition Module

1. To install a transition module, remove the appropriate panel cover from the analog chassis.
2. Plug the transition modules into the backplane connectors. Refer the following table for transition module slot assignments.

Slot Assignment

Module Type	Slot Assignment
Analog Transition	1–2, 3–4, 5–6, 7–8, 9–10, 11–12, 13–14, 15-16
Digital Transition	A–B

3. Replace the panel cover and fasten the screw locks on all D connectors.

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Transition Module Connectors

Cable connections to external devices are made from the 497.01 chassis rear panel connectors.

J101–J1601

System connectors **J101** through **J1601** (JX01) are 15-pin D-type connectors located on the chassis rear panel. They connect either a valve driver to a servovalve or a conditioner to a transducer. The cable that is plugged into these connectors depends on whether a valve driver or a conditioner is installed in the corresponding chassis slot location.

J102–J1602

Connectors **J102** through **J1602** (JX02) provide a second connection for dual conditioners, dual valve drivers, or three-stage valve drivers. Each module has four rear panel connectors associated with it (Jx01, Jx02, J2x, and J3x).

J21–J28

Rear panel **I/O** connectors **J21** through **J28** (J2X) are 15-pin D-type connectors located on the chassis rear panel. They are used to connect either a valve driver to D/A converters (command) or a conditioner to A/D converters (feedback).

J31–J38

Rear panel **Aux** connectors **J31** through **J38** provide the same signals as **J21** through **J28** and are used to connect external readout devices.

J41 and J42

Rear panel communication connectors **J41 Com In** and **J42 Com Out** are associated with the communication module installed in slot B. This connector allows serial communication with a host computer.

Single chassis configuration

If you have a single analog chassis, install a cable (PN 056-027-101) from a 498 host computer serial port (debug) to **J41 Com In** on the Model 407.05 Hydraulic Control Panel, then from **J42 Com Out** to **J41 Com In** on the Model 497.01 Analog Chassis.

Multi-chassis configuration

If you have a multiple analog chassis:

1. Install a cable from a 498 host computer serial port (debug) to **J41 Com In** on the Model 497.05 Hydraulic Control Panel, then from **J42 Com Out** to **J41 Com In** on the first Model 497.01 Analog Chassis.
2. Install a chassis interconnect cable (PN 046-350-902) from **J42 Com Out** of the first Model 497.01 Analog Chassis to **J41 Com In** of the next analog chassis. Install as many cables as needed to connect all the chassis.

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J43 and J44

These connectors are not used.

J51 and J52

Rear panel interlock connectors **J51 Intlk In** and **J52 Intlk Out** are associated with the interlock controller module installed in slot A. Each connector handles up to four test stations.

Single chassis configuration

If you have a single analog chassis:

First install a cable from a 498 host computer serial port (debug) to **J51 Intlk In** on the Model 497.05 Hydraulic Control Panel, then from **J52 Intlk Out** to **J51 Intlk In** on the Model 497.01 Analog Chassis. Then install jumper plug assembly (PN 046-350-701) to **J52 Intlk Out** on the analog chassis.

Multi-chassis configuration

If you have a multiple analog chassis:

1. Install the cable from the chassis to **J51 Intlk In** on the Model 497.05 Hydraulic Control Panel, then from **J52 Intlk Out** to **J51 Intlk In** on the first Model 497.01 Analog Chassis (see "Interlock Connections" on page 175).
2. Install a chassis interconnect cable from **J52 Intlk Out** of the first analog chassis to **J51 Intlk In** of the next chassis. Install as many cables as needed to connect all the chassis.
3. On the last chassis, install jumper plug assembly (PN 046-350-701) to **J52 Intlk Out**.

Adding an Analog Chassis to Your Console

To accommodate higher channel counts, it may be necessary to add one or more 497.01 Analog Chassis to your FlexTest IIm console.

Depending on the number of analog chassis installed, you may have to modify switch settings and jumpers on the communication boards in your 497.05 Hydraulic Control Panel *and* in the 497.01 Analog Chassis.

The analog chassis and the hydraulic control panel use identical communication boards. For jumper and switch locations, refer to "Jumper and switch locations" on page 67. Configure the jumpers and switches for each chassis according to the following table.

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Communication Modules Switch and Jumper Settings

CHASSIS	X1 SWITCH (S3)	JUMPERS X1, X2, X3	JUMPER X5*
For a single analog chassis:			
497.01 Analog Chassis 1	Set to **1**	Remove	Install 3 and 4
497.05 Hydraulic Control Panel	Set to **2**	Install	Install 1 and 2
For multiple analog chassis:			
497.01 Analog Chassis 1	Set to **1**	Remove	Install 3 and 4
497.01 Analog Chassis 2 (optional)	Set to **2**	Remove	Install 3 and 4
497.01 Analog Chassis 3 (optional)	Set to **3**	Remove	Install 3 and 4
497.01 Analog Chassis 4 (optional)	Set to **4**	Remove	Install 3 and 4
497.05 Hydraulic Control Panel	Set to **5**†	Install	Install 1 and 2

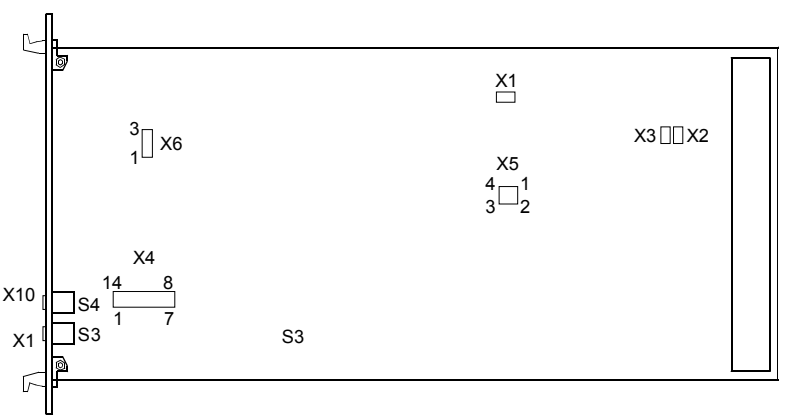
* Jumper X5 is used for the RS-232 communications link (between the first chassis and the test processor) and the RS-422 communications link (between the 497 communications modules in each chassis).

† The address switch on the hydraulic control panel should be set to the last number in the chassis chain. For example, if you have a single 497.01 Analog Chassis, you should set the 497.05 Hydraulic Control Panel address to 2; If you have two analog chassis, you should set it to 3, and so forth.

Jumper and switch locations

The following graphic illustrates the jumper locations on the 497.36 Communication Module.

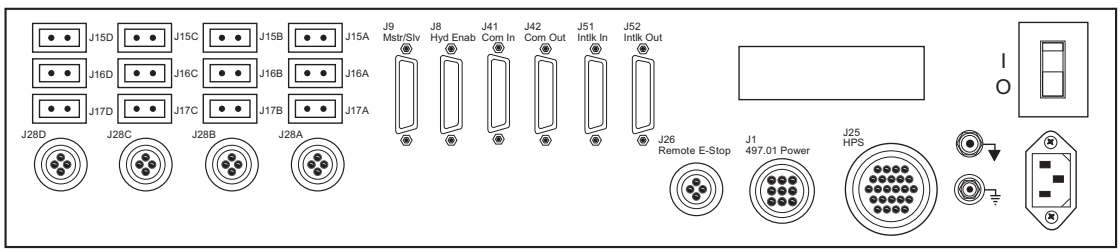
Communication Module Jumper and Switch Locations



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Model 497.05 Hydraulic Control Panel

The rear panel connectors of the hydraulic control panel are cabled to the hydraulic components of your system. The connectors also interface with the 497.01 Analog Chassis and 498.22 Test Processor chassis.



Hydraulic Control Panel

J1 The 497.05 contains the power supply for a 497.01 Analog Chassis. Connect your 497.01 Analog Chassis to **J1**.

J8 This connector communicates hydraulic status with the 498.22 Test Processor chassis.

J9 This connector is not used in a standard FlexTest IIm system.

J15A–J17D Each HSM channel has a set of three user defined interlock inputs (Interlock 1, Interlock 2, and Shutdown). These inputs can be configured to monitor contact closure or to accept logic level inputs.

J25 This connector controls the hydraulic power supply (HPS).

J26 This connector accommodates a remote **Emergency Stop** switch.

J28A–J28D These connectors control up to four hydraulic service manifolds (HSMs).

J41 and J42 These connectors create a serial communications loop between all of the chassis in your system.

J51 and J52 These connectors create an interlock communications loop with the other chassis in your system.

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Test Processor Plug-in Modules

The following table provides a brief description of the plug-in modules installed in your test processor chassis.

Test Processor Plug-in Modules

MODULE	FUNCTION
Processor Modules	Standard FlexTest IIm Controllers have two processors installed in the 498.22 Chassis: • The first processor (in slot 1) communicates with the external computer. • The second processor (in slot 3) performs the digital control functions. A third processor will be installed (in slot 3 or 5) to handle time history data acquisition if you purchased the time history data acquisition option.
498.71B Global Resources III (GRES III)	Provides the digital input and output interface to devices like external temperature controllers and remote station controllers. It provides four serial ports and monitors interlocks from the 497 modules.
498.65 ADDA	Provides analog-to-digital (A/D) processing and digital-to-analog (D/A) processing. Each function is performed by a mezzanine card. The standard ADDA module contains two A/D mezzanine cards and one D/A mezzanine card. A fourth mezzanine card can be added as an option. See the ADDA product manual.
493.50 ADDA II	This optional module supports up to four 8-channel A/D (Model 493.55) or D/A (Model 493.56) mezzanine cards. This module also supports the 8-channel DSPAD, and Universal Encoder mezzanine cards.
498.70 Digital I/O	Provides the means to monitor external logic levels and contact status, and to provide logic level outputs for external device control.

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ADDA II mezzanine cards

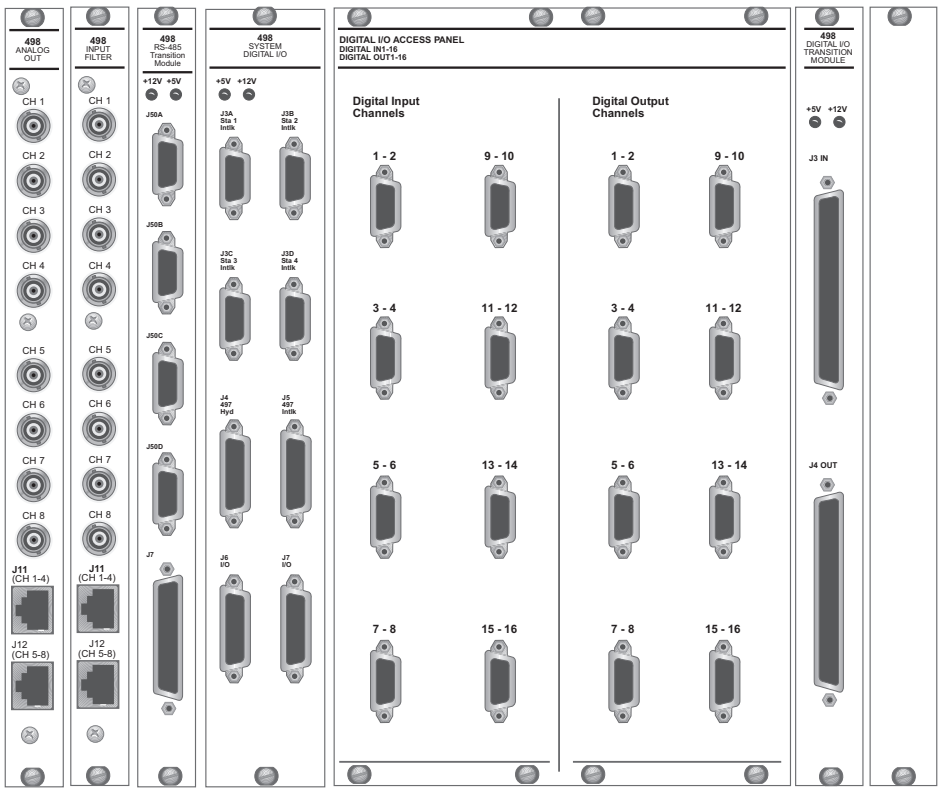
Module Name	Function
493.55 A/D	Converts up to eight external analog signals to digital signals for use by the controller. This board requires the optional ADDA II module.
493.56 D/A	Converts up to eight internal digital signals to analog signals for use by external devices. This board requires the optional ADDA II module.
493.57 DSPAD	Converts up to eight external analog signals to digital signals for use by the controller. A DSP chip provides digital filtering. This board requires the optional ADDA II module.
493.59 Universal Encoder	Processes the signals from incremental, absolute, and Temposonics III encoders. Each type of encoder requires a specific encoder mezzanine card. This board requires the optional ADDA II module.

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Test Processor Transition Modules

Transition modules are screwed into the back of the test processor chassis. Each rear-panel transition module corresponds to a plug-in module (or plug-in module mezzanine card) installed in the front of the chassis.

Transition modules interface with the other test components via connectors for external digital, analog, and communication cables.



Transition Modules (498.22 Chassis Rear Panel shown)

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Test Processor Transition Modules

TRANSITION MODULE	FUNCTION
498 Analog Out	This module includes eight BNC connectors that provide analog outputs from the 498.65 ADDA module. These outputs are associated with a D/A mezzanine card. Four analog outputs are available with the standard ADDA module. Additional outputs require a second ADDA module (or an optional fourth mezzanine card).
498 Input Filter	This module includes eight BNC connectors that provide filtered analog inputs to the 498.65 ADDA module. These inputs are associated with an A/D mezzanine card. Four-channel systems use a standard ADDA module which provides four analog inputs. For 8-channel systems, a second ADDA module (or an optional fourth mezzanine card) is required to provide the other four inputs.
498 RS-485 Transition Module	This module provides serial connections for use with remote station controllers (RSCs) or Eurotherm temperature controllers.
498 System Digital I/O Transition Module	The System Digital I/O Transition module is double-width module that provides connection to the system digital I/O and the station interlocks on the 498.71B GRES III module.
498 Digital I/O Transition Module	This transition module provides 16 channels of user-defined digital inputs and outputs. In order to use these digital inputs and outputs, this module must be connected to a 498 Digital I/O Access Panel. ***Note*** *On some custom FlexTest IIm Controllers, this module must be connected to a 498 Remote Digital I/O Access Panel.*
493.80 Encoder Transition	Interfaces with up to four encoders.
493.81 Analog In BNC	Provides up to eight channels of analog input to each Model 493.55 A/D module. The input signals must be within ±10 V DC.
493.82 Analog Out BNC	Provides eight channels of analog output from the Model 493.56 D/A modules. The output signals are within ±10 V DC.
493.83 Filtered Analog Input	Provides up to eight channels of filtered analog input to each Model 493.55 A/D module.

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Chapter 3

FlexTest GT Controller Connections

This section describes the cable connections to the Model 493.10 Chassis.

Note *For information on connecting power cables, see "Connecting Electrical Power" on page 38.*

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CE EMC Compliant Cabling

CE EMC compliant cabling is required for all systems shipped to Europe. All cabling specifications in this chapter conform to the European CE EMC requirements.

Cable fabrication

All of the cables listed on the Cable Selector drawing are CE EMC compliant when used in an MTS system. Where possible, use standard cables listed on the System Cable Plug 493 Package Selection drawing (PN 700-000-656). If it is not possible to use standard cables or you are constructing custom cables, select cables, backshells, and connection shields as described in the cable specification for each connector. See the appropriate rear panel connector for fabrication information.

Low-frequency ground loops

It is possible that grounding both ends of the overall shield can produce a low frequency ground loop current. If you experience an unacceptable low-frequency noise level, try the following in the order given:

- Connect the system (chassis) ground of the external device directly to the controller chassis.

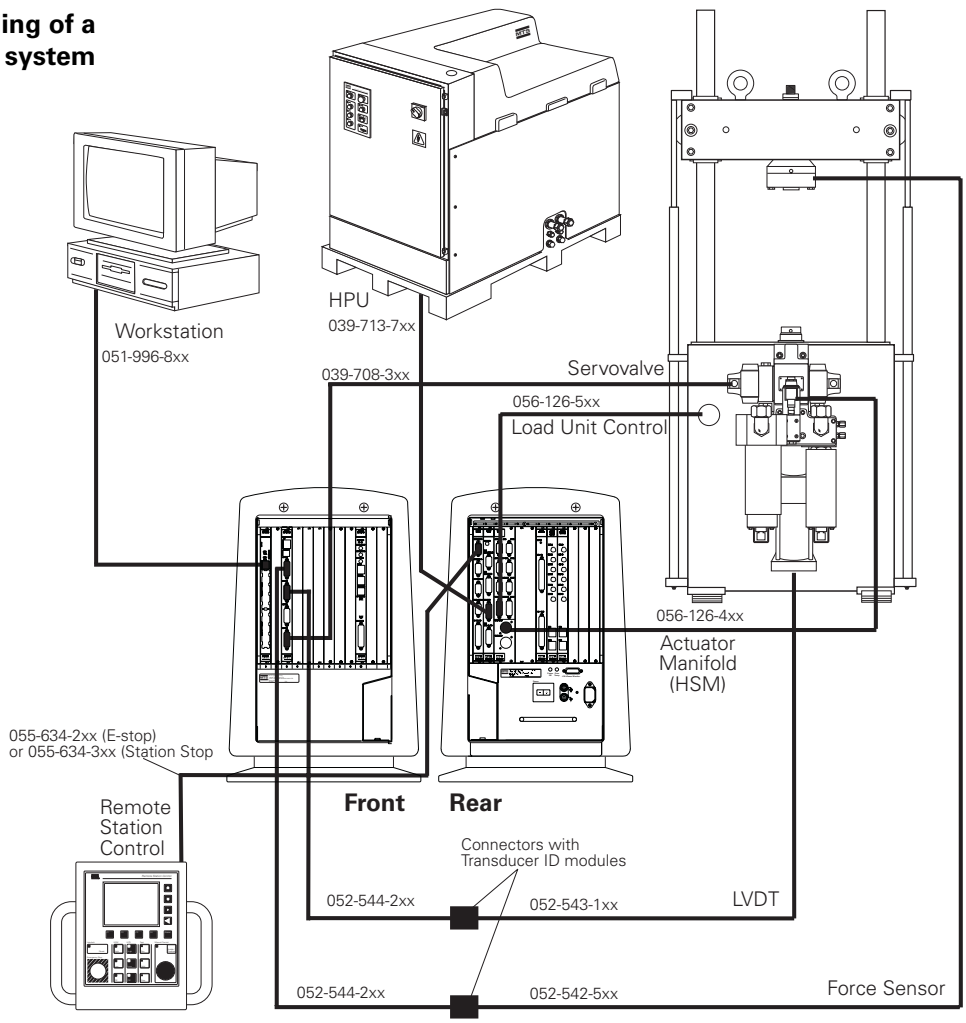
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- Disconnect the overall shield from the metallized back shell at the external device and add a capacitor (approximately 0.01 µf) to one end of the cable between the shield and the metallized backshell.
- Disconnect the overall shield from the metallized back shell at the external device.

Typical Cabling

For additional cables, see "Cable Part Numbers" on page 76.

Typical cabling of a FlexTest system



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Cable Part Numbers

System cables

The following is a list of the most common cables, see the System Cable/Jumper Plug 493 Package Selection drawing (MTS PN 700-000-656) for the most current and additional cable part numbers.

System Cables (part 1 of 2)

Cable Description	Part Number*	Module Connector	Jumper Plug†
Servovalve 252.xx single	039-708-300	493.40 J4–J7	N/A
Servovalve 252.xx dual	039-708-400	493.40 J4–J7	N/A
Servovalve 256.xx 3-stage			N/A
Valve	055-439-6XX	493.40 J4–J7	
Valve LVDT	039-708-6XX	493.40 J4–J7	
Calibration Cable Package	100-026–213	493.40 J3	
Y Adapter—Servovalve/Valve LVDT (required for 256.xx or 257.xx servovalves)	039-710-501	493.40 J4–J7	N/A
Servovalve 257.xx 3-stage			N/A
Valve	039-701-9XX		
448.16 to 257.XX	039700-2XX	493.40 J4–J7	
Valve Velocity	039700-9XX	493.40 J4–J7	
Valve LVDT	039708-6XX	493.40 J3	
Calibration Cable Package	100-026–213	493.40 J4–J7	N/A
Y Adapter—Servovalve/Valve LVDT (required for 256.xx or 257.xx servovalves)	039-710-501		
System ground (console)	005-402-3XX		N/A
System ground (floor standing)	039-709-2XX	gnd lug	
E-stop 318 Load Unit w/crosshead locks	056-126-5XX	493.74 J29	100-007-947
E-stop 318 Load Unit wo/crosshead locks	056-126-6XX	493.74 J29	100-007-947
Emergency Stop		493.73 J24	039-713-201
HPU 505 or 24V PLC Pump (see "Hydraulic Configurations" on page 221 for more information)	039-713-7XX	493.73 J25	039-713-301
HSM 298.11 on/off	039-701-5XX	493.74 J28	N/A
HSM Proportional 298.12	056-126-4XX		
HSM 290.xx/293.xx/294.xx high/low	039-701-4XX		
Interlock—Test Enclosure	056-126-3XX	493.74 J43	100-007-948

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System Cables (part 2 of 2)

Cable Description	Part Number*	Module Connector	Jumper Plug†
Interlock—Station	per system	493.74 J43	100-007-948
Remote Station Control—with E-Stop	055-634-2XX	493.71 J50	055-634-101
Remote Station Control—with Station Stop	055-634-3XX	493.71 J50	055-634-101
Workstation Link (Ethernet cable)	051-996-8XX	10/100‡	N/A
Remote Setpoint Adjust Control	100-051-058	493.40 J4–J7	N/A

* -XX specifies cable length. –01 through –09 represent 10–50 ft. in 5 ft. increments. Higher numbers represent custom cable lengths.

† Jumper plugs are required if a cable is not installed.

‡ The connector is the 10/100 BaseT connector on the power PC module.

Model 493.40 I/O Carrier Connections

Each Model 493.40 I/O Carrier module can include up to four mezzanine cards. Each installed mezzanine card is assigned a specific I/O Carrier module front panel connector (**J4–J7 I/O**).

A hardware interface file (hwi) defines each type of module (and their associated mezzanine cards) and maps each module location for the system software. The hwi file and the physical locations for each type of module and associated mezzanine cards must match. Also, the I/O Carrier module address setting (on the module) must match the hwi file address. For more information on the hwi file, see the *MTS 793 Utility Software* manual.

- Transducer connections require a conditioner mezzanine card to be installed in the I/O Carrier module. The following conditioners can be installed:
  - Model 493.21B Digital Universal Conditioner
  - Model 493.25 Digital Universal Conditioner
  - Model 493.47 Encoder
  - Model 493.48 Acceleration Conditioner

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- Valve connections require a valve driver mezzanine card be installed in the I/O Carrier module. The following valve drivers can be installed:
  - Model 493.14 Valve Driver
  - Model 493.15 3-Stage Valve Driver
- Analog I/O connections require an A/D or D/A mezzanine card be installed in the I/O Carrier module. The following analog mezzanine cards can be installed:
  - Model 493.45 A/D Converter
  - Model 493.46 D/A Converter

Sensor Connections

Sensor connections require a conditioner mezzanine card be installed in the I/O Carrier module. The following conditioners can be installed:

Note *Model 493.21B Digital Universal Conditioners are not compatible with standalone FlexTest SE Controllers.*

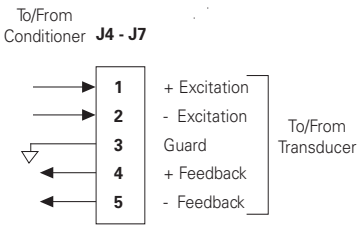
- Model 493.21B Digital Universal Conditioner
- Model 493.21BC Digital Universal Conditioner
- Model 493.25 Digital Universal Conditioner
- Model 493.47 Encoder
- Model 493.48 Acceleration Conditioner

Each Carrier module can include up to four mezzanine cards. Each installed mezzanine card is assigned a specific I/O Carrier module front panel connector (**J4–J7 I/O**). These connections can be used for any type of sensor (provided the appropriate mezzanine card is installed).

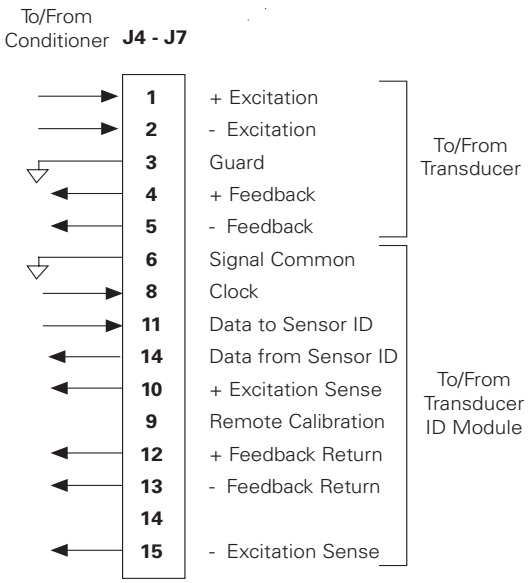
A hardware interface file (.hwi) defines each type of module (and their associated mezzanine cards) and maps each module location for the system software. The hwi file and the physical locations for each type of module and associated mezzanine cards must match.

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Excitation and feedback signals are passed through to the transducer, as shown.



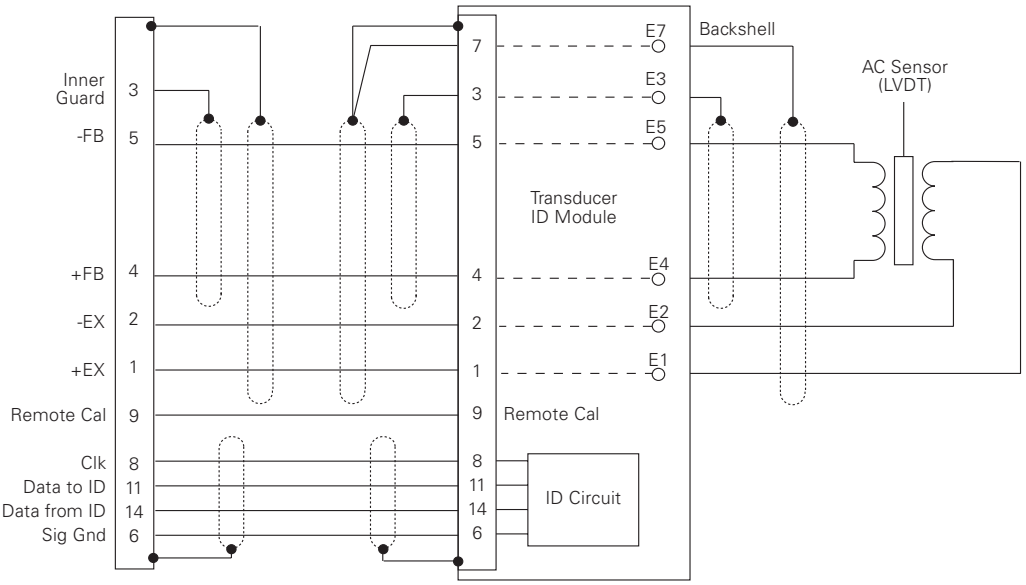
If purchased as an option, a transducer ID module is located in the transducer cable. Excitation and feedback signals are passed through to the transducer.



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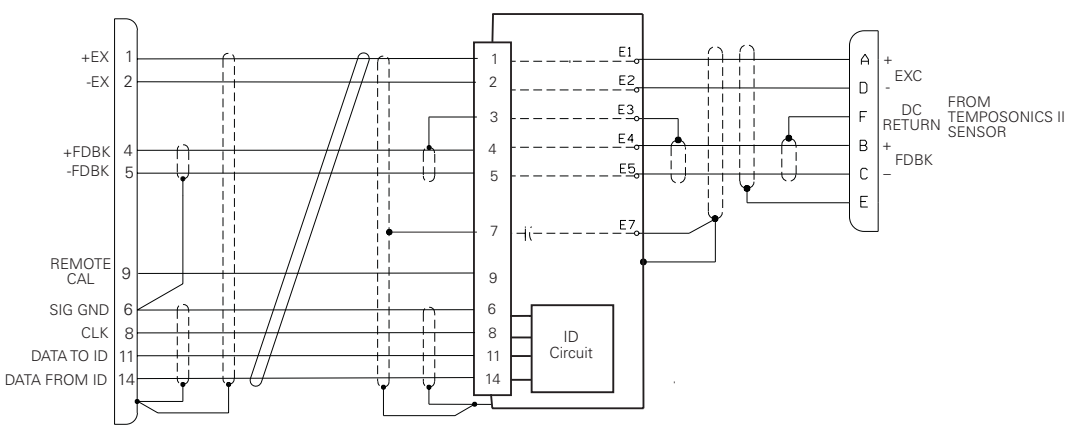
LVDT connections

An LVDT requires an AC conditioning mezzanine card.



Temposonics II

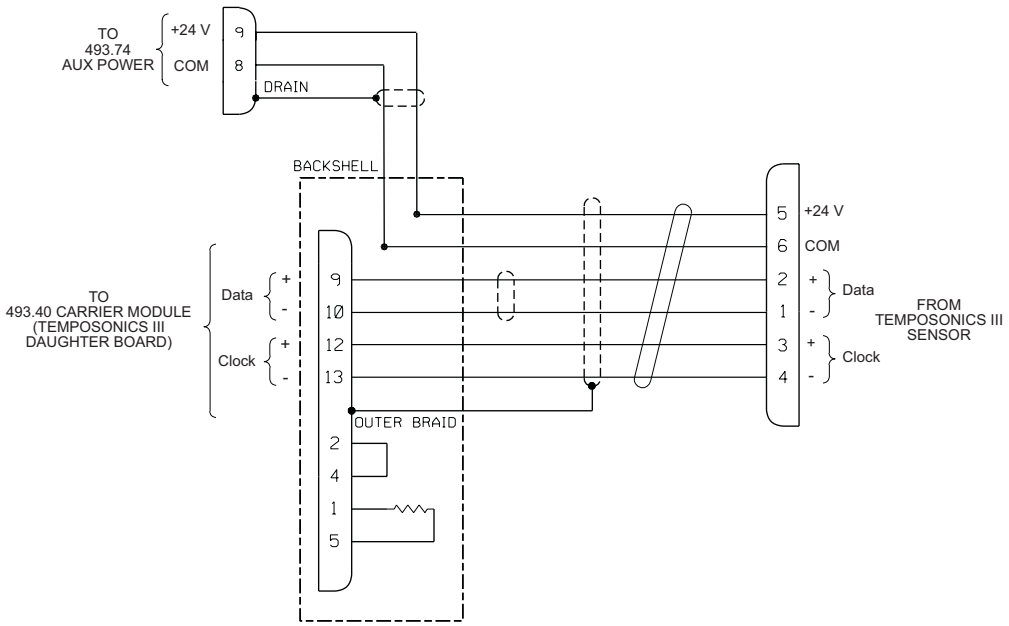
The connection requires a DC conditioning mezzanine card.



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Temposonics III

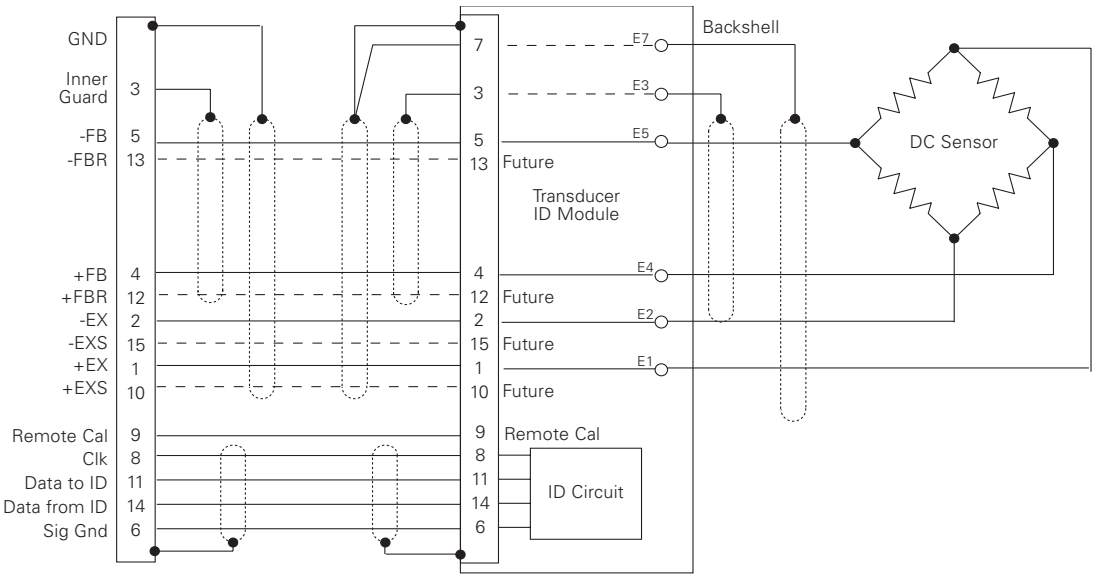
The connection requires a DC conditioning mezzanine card.



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Force/strain sensor connections

Force and strain sensors require a DC conditioning mezzanine card.



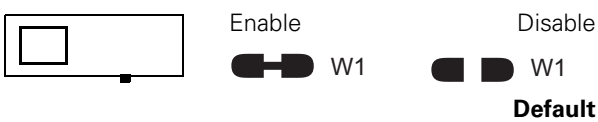
Model 493.21B (DUC B) Jumpers

The following jumpers are for the Model 493.21B Digital Universal Conditioner). The jumpers are labeled W instead of X; the W jumpers are solder pads. The following jumper descriptions are from the 493.XX Module Setup configuration drawing (PN 049-336-301).

Active guard

Jumper W1 enables or disables an active guard for the sensor cable.

Active guard is usually not required. In particular environments, active guard drive may reduce transducer noise.



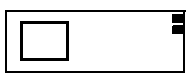
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4- or 8-wire sensor cable

Jumpers W2 and W3 establish the correct shunt calibration connections for 4-wire and 8-wire sensor cables. The length of the sensor cable determines which type of cable is used. Short cables are typically 4-wire cables while long cables are typically 8-wire cables.

- Jumper W2 selects a 4- or 8-wire transducer for positive feedback.
- Jumper W3 selects a 4- or 8-wire transducer for negative feedback.
- The setting of jumper W8 (single ended excitation enable) may affect your choices for these jumpers (W2 and W3).

Note *+/– excitation (–excitation is standard). See XDCR ID-W1.*



Default
–EX to –FB shunt in 4-wire config



-EX to +FB shunt in 4-wire config



–EX to –FBR shunt in 8-wire config

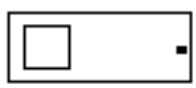


-EX to +FBR shunt in 8-wire config



Bridge balance

Jumper W4 changes the offset of the bridge balance circuit. If the zero offset is too large when the sensor bridge is balanced, you should enable this feature (it adds a 100 kΩ resistor to the input of the conditioner preamp).



Disable
Default



Disable

Enable



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Excitation

Jumpers W5 and W7 select the local (on board) or remote (through a cable) excitation sensor connection.

- The local selection is used with 4-wire transducer connections.
- The remote selection is used with 8-wire transducer connections.
- Jumper W7 configures the + excitation signal.
- Jumper W5 configures the – excitation signal.
- Both jumpers need to be set for the same configuration.



Single ended excitation

Jumper W8 connects -EX to ground for situations requiring single-ended excitation.

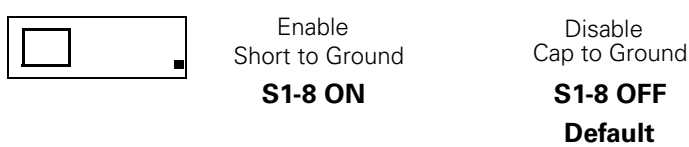


Digital Universal Conditioner (DUC BC) Switches

The following switch settings are for the Model 493.21BC Digital Universal Conditioner. The switches are labeled S1 1-8 and replace the former solder pads. The following descriptions are from the 493.XX Module Setup configuration drawing (PN 049-336-301).

Active guard

Switch S1-8 enables or disables the guard connection to ground (GND) for the sensor cable.



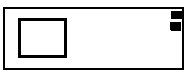
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4- or 8-Wire sensor cable

Switches S1-1, S1-2, S1-3, and S1-4 establish the correct shunt calibration connections for 4-wire and 8-wire sensor cables. The length of the sensor cable determines which type of cable is used. Short cables are typically 4-wire cables while long cables are typically 8-wire cables.

- Switches S1-1 and S1-2 select a 4- or 8-wire transducer for positive feedback.
- Switches S1-3 and S1-4 select a 4- or 8-wire transducer for negative feedback.
- The setting of jumper W8 (single ended excitation enable) may affect your choices for these switches.

Note *+/– excitation (–excitation is standard). See XDCR ID-W1.*



Sensor Cable Settings (4/8-Wire)

REQUIRED CONNECTION	SWITCH SETTINGS
-EX to -FB shunt in 4-wire configuration **DEFAULT**	S1-1 OFF S1-2 OFF S1-3 ON S1-4 OFF
-EX to +FB shunt in 4-wire configuration	S1-1 ON S1-2 OFF S1-3 OFF S1-4 OFF

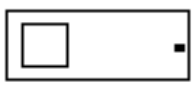
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Sensor Cable Settings (4/8-Wire)

REQUIRED CONNECTION	SWITCH SETTINGS
-EX to -FBR shunt in 8-wire configuration	S1-1 OFF S1-2 OFF S1-3 OFF S1-4 ON
-EX to +FBR shunt in 8-wire configuration	S1-1 OFF S1-2 OFF S1-3 ON S1-4 OFF

Bridge balance

Switch S1-5 changes the offset of the bridge balance circuit. If the zero offset is too large when the sensor bridge is balanced, you should enable this feature (it adds a 100 kΩ resistor to the input of the conditioner preamp).



Disable

S1-5 OFF

Default

Enable

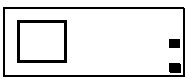
S1-5 ON

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Excitation sense

Switches S1-6 and S1-7 select the local (on board) or remote (through a cable) excitation sensor connection.

- The local selection is used with 4-wire transducer connections.
- The remote selection is used with 8-wire transducer connections.
- Switch S1-7 configures the + excitation signal.
- Switch S1-6 configures the – excitation signal.
- Both switches need to be set for the same configuration.



Remote

S1-6 OFF
S1-7 OFF

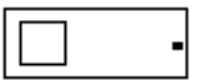
Local

S1-6 ON
S1-7 ON

Default

Single ended excitation

Jumper W8 connects -EX to ground for situations requiring single-ended excitation.



–EX = –EX

Default



–EX = GND



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Full-Range Digital Universal Conditioner (FRDUC) Jumpers

The following jumpers are for the Model 493.25 Full-Range Digital Universal Conditioner. The jumpers are labeled W instead of X; the W jumpers are solder pads. The following jumper descriptions are from the 493.XX Module Setup configuration drawing (PN 049-336-301).

Active guard

Jumper W1 enables or disables an active guard for the sensor cable. A passive guard drive is the default.

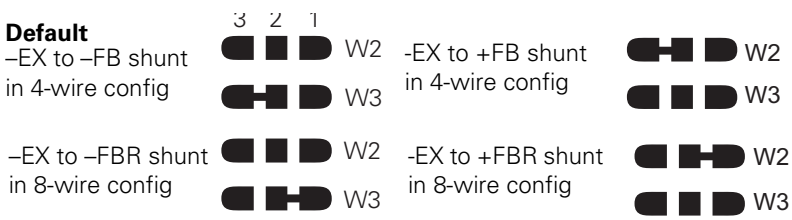


4- or 8-wire sensor cable

Jumpers W2 and W3 establish the correct shunt calibration connections for 4-wire and 8-wire sensor cables. The length of the sensor cable determines which type of cable is used. Short cables are typically 4-wire cables while long cables are typically 8-wire cables.

- Jumper W2 selects a 4- or 8-wire transducer for positive feedback.
- Jumper W3 selects a 4- or 8-wire transducer for negative feedback.
- The setting of jumper W8 (single ended excitation enable) may affect your choices for these jumpers (W2 and W3).

Note *+/– excitation (–excitation is standard). See R33 or XDCR ID-W1.*



Excitation sense

Jumpers W5 and W7 select the local (on board) or remote (through a cable) excitation sensor connection.

- The local selection is used with 4-wire transducer connections.
- The remote selection is used with 8-wire transducer connections.
- Jumper W7 configures the + excitation signal.
- Jumper W5 configures the – excitation signal.

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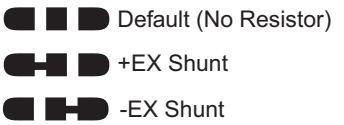
- Both jumpers should be set for the same configuration.



±Shunt cal

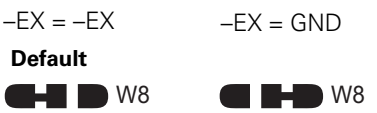
The shunt calibration resistor can be installed on the Full Range Digital Universal Conditioner module, or, in the transducer ID module. R33 assigns a positive or negative excitation to the shunt calibration resistor if installed on the Full Range Digital Universal Conditioner module (not the transducer ID module).

R33



Single ended excitation

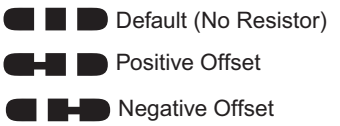
Jumper W8 connects -EX to ground for situations requiring single-ended excitation.



Bridge balance

R32 changes the offset of the bridge balance circuit. If the zero offset is too large when the sensor bridge is balanced, you should add an appropriately sized resistor.

R32



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Sensor Cables

A typical system is provided with a standard set of sensor cables as specified on the System Cable/Jumper Plug 493 Package Selection drawing (PN 700-000-656). Refer to this drawing for the most current part numbers. Standard sensor cables do not have ID modules.

Sensor cables with an ID module built into them are available as an option. Sensor cables with ID modules use a system cable to bridge the sensor cable to the appropriate connector on the rear panel of the chassis.

Sensor cable specifications

- 15 contact type D male EMI connector
- Backshell–EMI metallized plastic
- Cable type–For all applications including CE EMC Compliance, use MTS cable material PN 050-530-101 (two 22 AWG twisted pairs with inner and outer braided shield for the excitation and feedback signals, plus a twisted quad for the ID signals, and a single wire for the shunt calibration signal).
- If purchased as an option, each sensor includes one cable with a transducer ID module and a system extension cable. A system cable is required between the transducer ID cable and the controller's chassis.

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Sensor cable part numbers

Sensor cables without ID Module

See the System Cable/Jumper Plug 493 Package Selection drawing (PN 700-000-656) for the most current sensor cable part numbers.

Sensor Cables and Connectors

Cable Description	Cable	Connector
ADT 120º	056-234-8XX	493.40 J4–J7
300º	056-253-1XX	493.40 J4–J7
Extensometer 633 capacitive	051-649-5XX	493.40 J4–J7
Force Transducer w/PT connector	046-440-2XX	493.40 J4–J7
w/MS connector	046-440-6XX	493.40 J4–J7
w/PC	056-252-9XX	493.40 J4–J7
LVDT	046-440-3XX	493.40 J4–J7
ΔP control	047-927-6XX	493.40 J4–J7
Pressure Control (Sensotec)	056-253-0XX	493.40 J4–J7
Strain w/Amphenol connector	056-233-6XX	493.40 J4–J7
w/PT connector	050-120-0XX	493.40 J4–J7
Temposonics	049-153-2XX	493.40 J4–J7
Temposonics II (low power conditioner)	056-253-2XX	493.40 J4–J7
Temposonics III	056-316-7XX	493.40 J4–J7
RVDT w/MS connector	051-202-8XX	493.40 J4–J7

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Sensor cables with ID Module

See the System Cable/Jumper Plug 493 Package Selection drawing (PN 700-000-656) for the most sensor cable current part numbers.

Each sensor includes a cable with an ID module built into it. Use a system cable to bridge the sensor cable to the rear panel of the controller chassis.

Sensor Cables and Connectors (ID Module)

Cable Description	ID Module w/Cable	System Cable*	Module Connector
ADT 120º	052-543-5XX	056-125-8XX	493.40 J4–J7
300º	052-443-6XX	056-125-9XX	493.40 J4–J7
Extensometer 633 capacitive	052-543-4XX	052-544-3XX	493.40 J4–J7
Force Transducer w/PT connector	052-542-5XX	052-544-2XX	493.40 J4–J7
w/PC connector	052-542-6XX	052-544-2XX	493.40 J4–J7
w/MS connector	052-542-7XX	052-544-2XX	493.40 J4–J7
LVDT	052-543-1XX	052-544-2XX	493.40 J4–J7
ΔP control	052-543-2XX	052-544-2XX	493.40 J4–J7
Pressure Control (Sensotec)	052-543-3XX	052-544-2XX	493.40 J4–J7
Strain w/Amphenol connector	052-542-9XX	052-544-2XX	493.40 J4–J7
w/PT connector	052-543-0XX	052-544-2XX	493.40 J4–J7
Temposonics	052-543-7XX	056-126-0XX	493.40 J4–J7
Temposonics II (low power conditioner)	052-543-8XX	052-544-7XX	493.40 J4–J7
RVDT w/MS connector	052-750-8XX	052-544-2XX	493.40 J4–J7

* -XX specifies cable length. –01 through –09 represent 10–50 ft. in 5 ft. increments. Higher numbers represent custom cable lengths.

Shunt Calibration/Bridge Completion Resistor Installation

On a typical system, shunt calibration and bridge completion resistor installation is completed on the I/O Carrier module.

If you have purchased optional sensor cables with transducer ID modules, shunt calibration and bridge resistors are installed on these modules.

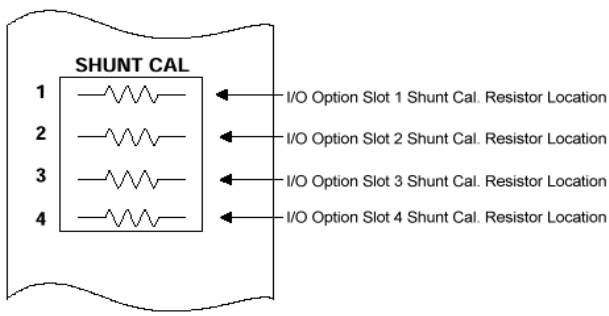
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I/O Carrier Module

Shunt calibration connector

The I/O Carrier module has a shunt calibration connector on its front panel that allows up to four shunt resistors (1 per slot) to be plugged in. The **SHUNT CAL** connector is labeled to indicate which slot the shunt calibration resistor is tied to.

Each shunt calibration resistor is soldered to a 2-pin holder (MTS PN 011-433-826). This holder plugs into the front panel connector shown below. Refer to the 493.40/41 Carrier I/O Shunt Calibration Kit (MTS PN 100-028-185) for more detailed information on kit components and installation.



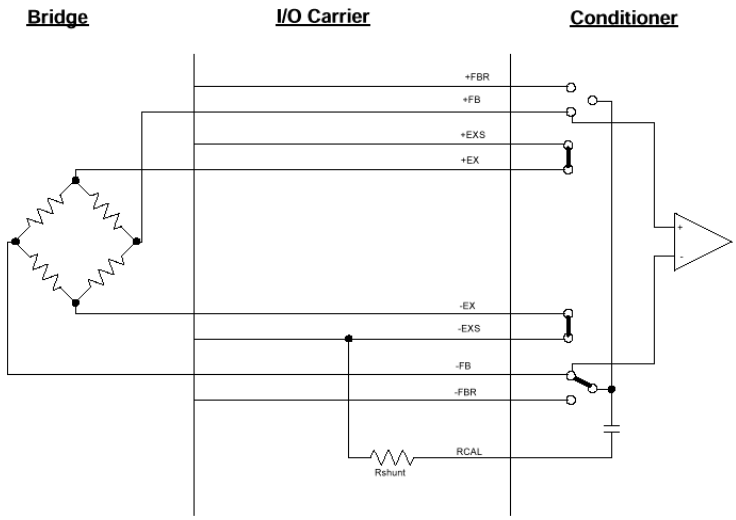
Bridge completion circuits

Each of the four I/O option card slots on the I/O Carrier module provides support for up to three bridge completion resistors as well as a shunt calibration resistor. The bridge completion resistors can be installed into sockets on the I/O Carrier printed wiring board. The shunt calibration resistor sockets are accessible from the I/O Carrier front panel.

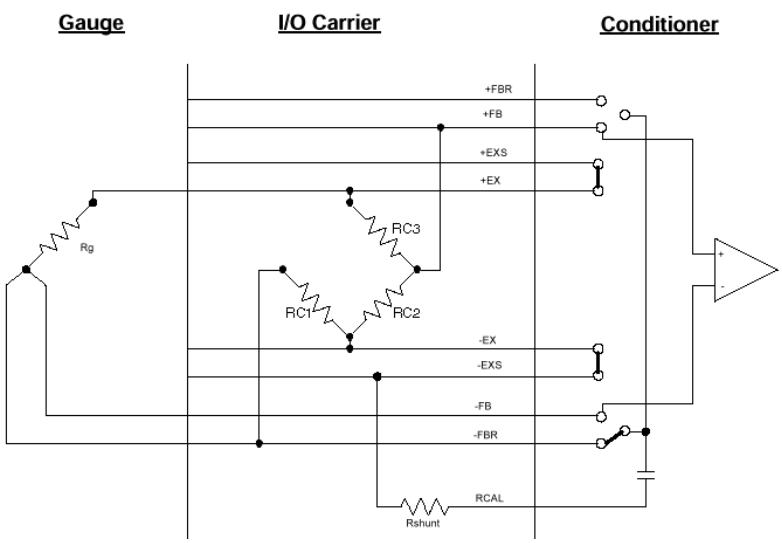
The following figures show three typical bridge configurations for a DC conditioner installed on an I/O Carrier module.

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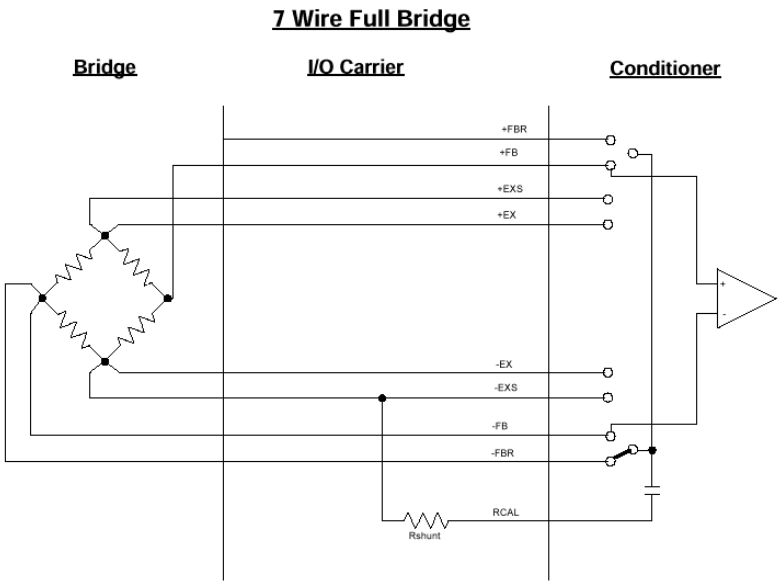
4 Wire Full Bridge



3 Wire Quarter Bridge



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Transducer Identification Modules

Transducer ID modules (located at the end of the sensor cable) are optional components that can store sensor calibration information just like a sensor calibration file. Since the calibration information stays with the sensors, transducer ID modules make it easier to change sensors.

Calibration information can be stored in the transducer ID EEPROM or in a sensor calibration file. When you load a station that does not have a sensor file assigned to one or more of its signals, by default, the system software looks for calibration information in the transducer ID.

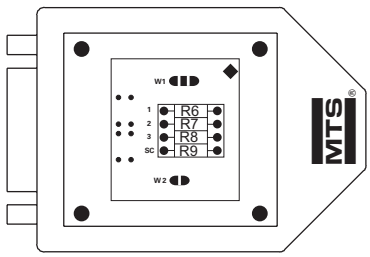
The molded ID module has a removable cover and includes provisions for:

- A shunt calibration resistor
- Up to three bridge completion resistors
- A transducer ID circuit card

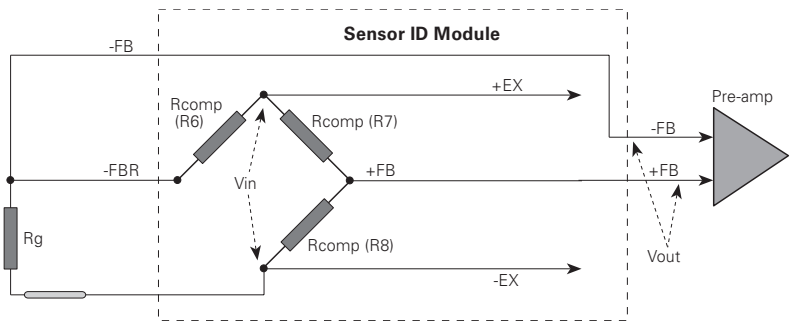
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The circuit card has the bridge completion and shunt calibration resistors on one side, and the transducer ID circuit on the other.

- R6, R7, and R8 are the bridge completion resistors
- R9 is the shunt calibration resistor



The following is the schematic diagram of the bridge balance and bridge completion circuit.



Note *Refer to the MTS 793 Control Software manual for information about assigning sensors and saving data with Transducer ID Modules.*

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Valve Connections

The following types of valve connections are supported:

- Single or dual Series 252 Servovalve(s) can be controlled with a Model 493.14 Valve Driver mezzanine card.
- A Series 256 Servovalve can be controlled with a Model 493.15 3 Stage Valve Driver mezzanine card.
- A Series 257 Servovalve can be controlled with a Model 493.15 3 Stage Valve Driver mezzanine card and a Model 448.16C Power Driver chassis.
- Refer to the servovalve product manual (included with the System Documentation CD) for single and dual valve configuration wiring information.

⚠ CAUTION

Improper operation can damage valve driver cards.

Damage can occur if you connect a high-level signal to a valve driver card when the chassis power is off.

Do not apply a high-level signal to a valve driver card when the chassis power is off. Disconnect power from any externally powered devices **before** you switch the chassis power off.

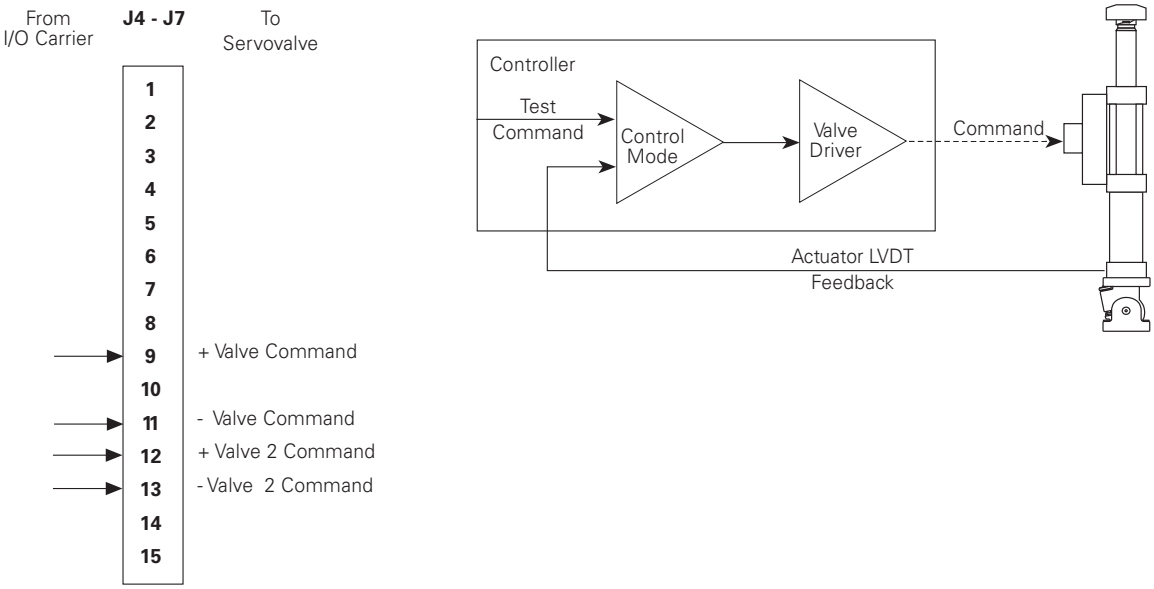
Cable specification

- 15-contact type D male EMI connector
- Backshell–EMI metallized plastic
- Cable type–4 conductor w/foil shield and drain (PN 010-093-580 or equivalent) with the drain wire connected to metallized plastic backshell at the chassis.
- For 256 and 257 servovalves, the valve LVDT uses the same type of connectors as the actuator LVDT.
- Servovalve/valve LVDT Y cable required for Series 256 or 257 servovalves (PN 039-710-5XX).

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252 servovalve connections

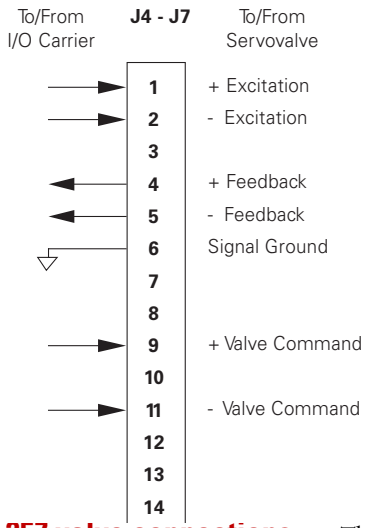
The Series 252 Servovalve is a 2-stage servovalve. The Model 493.14 Valve Driver supports single or dual valve configurations. The following figure shows the connections at the valve driver and the connections between the valve and the valve driver. See "Cable Part Numbers" on page 76 to connect the valve to the I/O Carrier module.

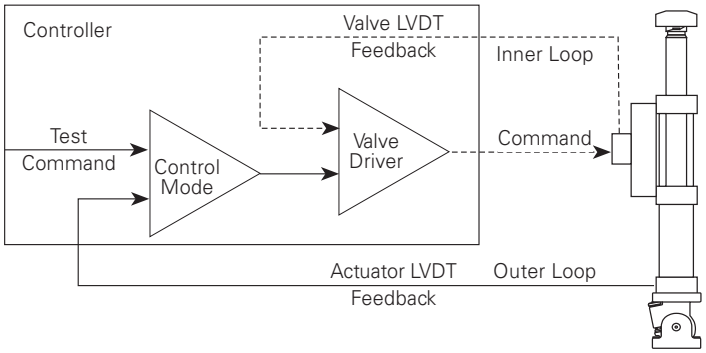


256 servovalve connections

The Series 256 Servovalve is a 3-stage servovalve. The Model 493.15 Valve Driver supports the inner loop signals. The following figure shows the connections between the valve driver and the valve. See "Cable Part Numbers" on page 76 to connect the valve to the I/O Carrier module.

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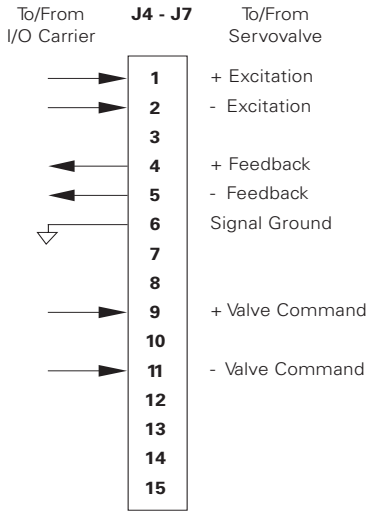


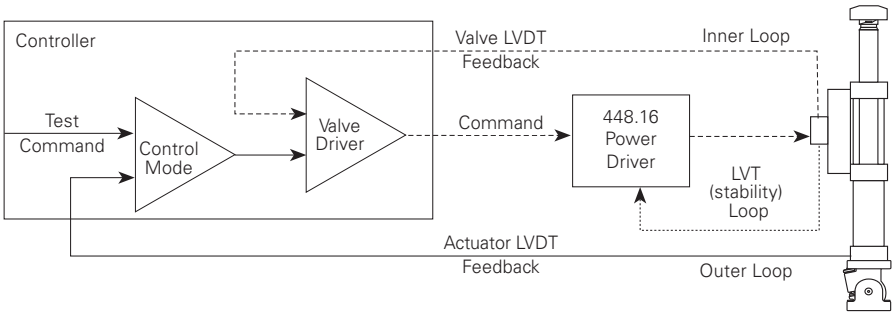


257 valve connections

The Series 257 Servovalve is a 3-stage servovalve that requires a power driver. The Model 493.15 Valve Driver supports the inner loop signals. The following figure shows the connections between the valve driver and the valve. See "Cable Part Numbers" on page 76 to connect the valve to the I/O Carrier module.

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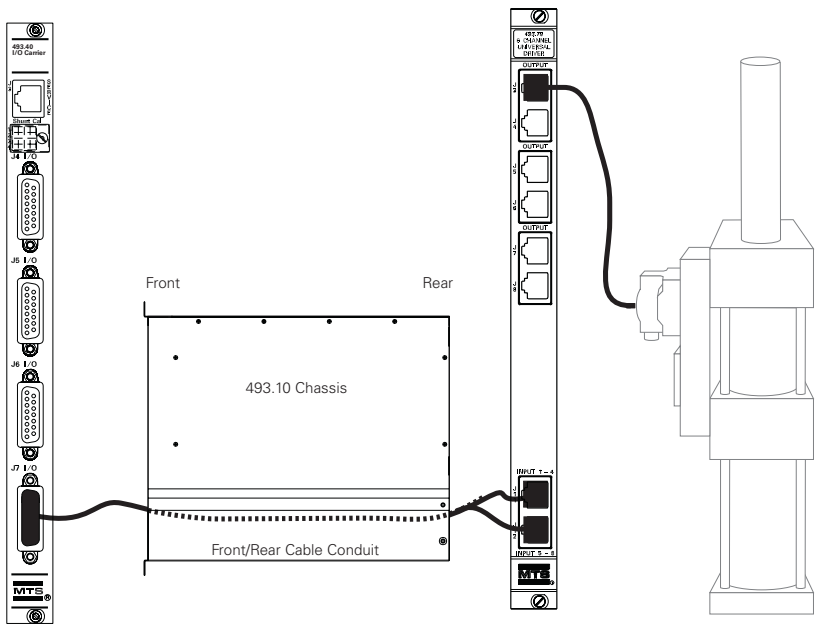


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Multiple Universal Driver Connections

For special applications, the Model 493.79 Multiple Universal Driver (MUD) board provides up to six drivers that can be used to drive standard 252 servovalves. Inputs to this board originate from a Model 493.46 D/A board on a Model 493.40 I/O Carrier Module.

A Y-cable (PN 100-006-173) connects the I/O Carrier module (15 pin, D-Type) to J9/J10 on a MUD board (RJ45).



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Output connections

Each valve driver output is an RJ50 connection that contains two valve drive output lines and a cable loss detection loop.

Cable loss detection

The cable loss detection wire loops out to the servovalve and back to the driver output allowing MUD board logic to detect a cable break or a cable disconnect at the MUD board output. A cable loss will not be detected if the cable is disconnected at the servovalve.

J3 - J8	To Servovalve
1	
2	+ Valve Command
3	- Valve Command
4	+ Cable Loss
5	- Cable Loss
6	
7	
8	
9	
10	

Note *Different customer actuator sign conventions might require alterations to the cable polarity. Contact MTS for more information.*

⚠ CAUTION

Improper operation can damage valve driver cards.

Damage can occur if you connect a high-level signal to a valve driver card when the chassis power is off.

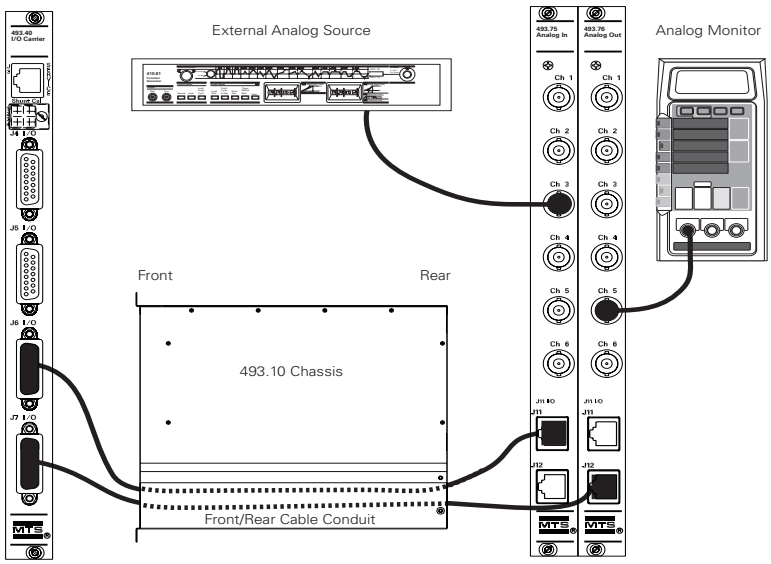
Do not apply a high-level signal to a valve driver card when the chassis power is off. Disconnect power from any externally powered devices **before** you switch the chassis power off.

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Analog I/O Connections

The Model 493.45 A/D and Model 493.46 D/A mezzanine cards are installed in the Model 493.40 I/O Carrier front panel module. A connection from the front panel mezzanine card to a rear panel BNC transition module allows easy access to the analog channels.

Note *The external analog source can be a stand alone function generator, another controller, or a computer controlled analog output.*

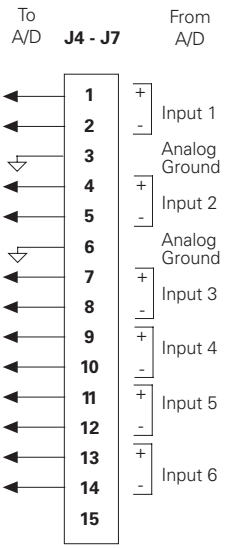


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Analog inputs

The analog-to-digital mezzanine cards accommodate up to six analog input signals. Each A/D input signal must be within ±10 volts.

- Use pin 3 or 6 to prevent problems with floating grounds between devices.
- Analog inputs can be connected at the BNC connectors of a Model 493.75 Analog In transition module and the outputs from this module are connected to the Model 493.40 I/O Carrier module.
- Analog inputs can be connected at the BNC connectors of a Model 493.77 Filtered Analog Input transition module and the outputs from this module are connected to the Model 493.40 I/O Carrier module.



493.77 filter modules

The following filter modules are available for board mounting at the BNC connectors of a Model 493.77 Filtered Analog Input transition module:

Filter Module Specifications

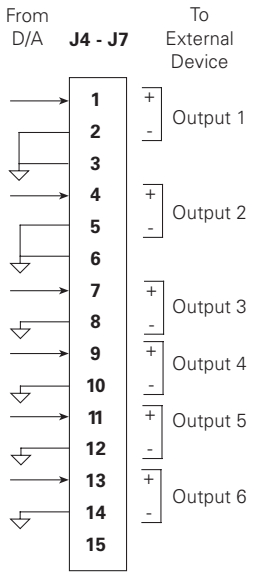
Assembly Number	Hz	Type
047-774-401	50	Bessel
047-774-402	100	Bessel
047-774-403	200	Bessel
047-774-404	500	Bessel
047-774-405	1000	Bessel
047-774-406	2000	Bessel
047-774-407	5000	Bessel
047-774-408	120	Bessel
047-774-409	300	Bessel

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D/A Connections

Digital-to-analog mezzanine cards support up to six program or readout signals to external devices. Each D/A signal is an analog output within ±10 volts.

- Each readout signal is from a 16 bit digital to analog converter.
- Each output is a ±10 V analog output.
- The Model 493.46 D/A mezzanine card provides analog signals to the Model 493.76 Analog Out transition module. Analog outputs are available at the BNC connectors of a Model 493.76 Analog Out transition module for external devices (DVM, oscilloscope).



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Cable specification

The cable specifications apply to both the analog inputs and analog outputs.

The cable from the front panel of the I/O Carrier module has the following specification:

- 15-contact type D male EMI connector.
- Backshell–EMI metallized plastic.
- Cable type–up to 6 shielded twisted pairs, each with the drain wire connected to the signal source.

The cable to the **Ch 1 - Ch 6** connectors on the rear panel have the following specifications:

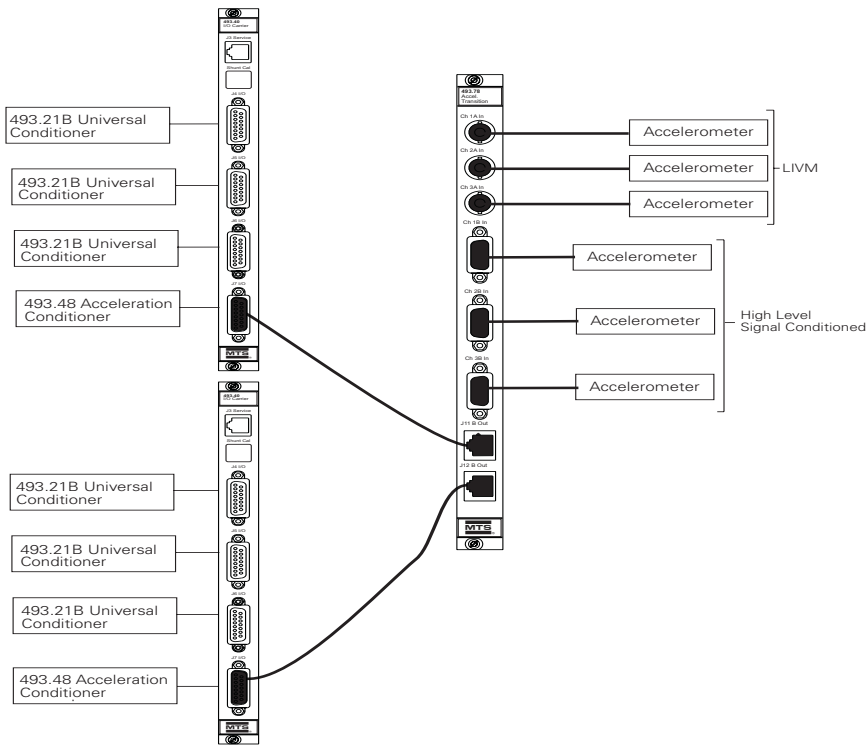
- BNC connector UG88/U
- Cable–RG-58 coaxial
- Use of a smaller coaxial cable and a RG-174 BNC connector with an appropriate cable end is permissible.

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Accelerometer Connections

An accelerometer requires the Model 493.48 Acceleration mezzanine card (installed in a Model 493.40 I/O Carrier module) and the Model 493.78 Accelerometer Transition Board.

- Each Model 493.48 Acceleration mezzanine card supports up to three accelerometers.
- The transition board accommodates two types of accelerometers: Low impedance Voltage Mode (LIVM) type accelerometers and High Level Signal Conditioned type accelerometers.

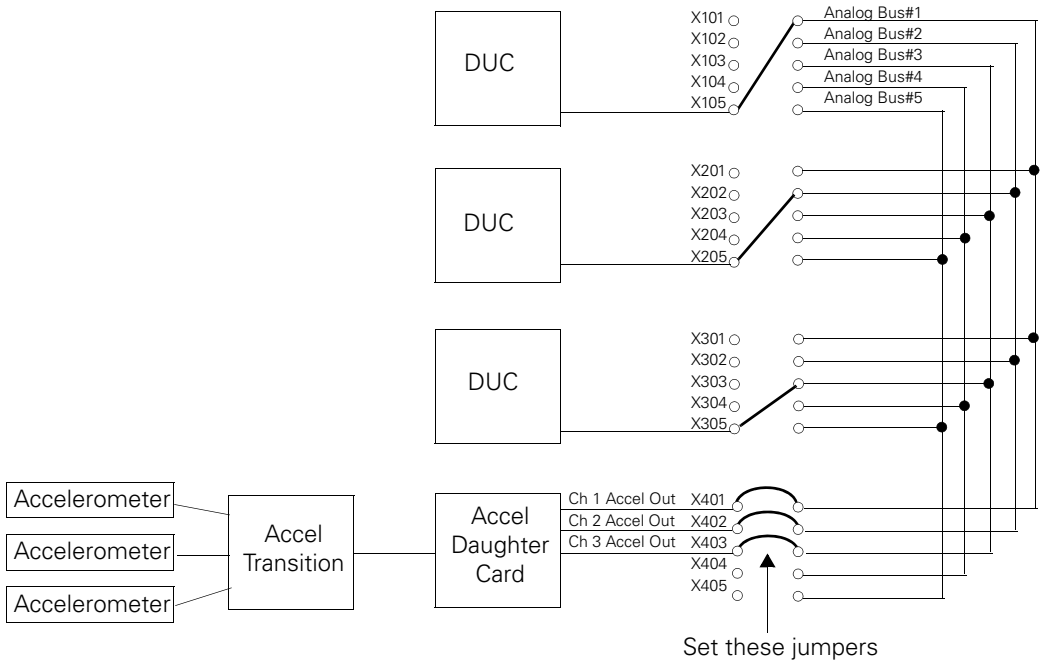


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I/O Carrier jumper settings

Before installing a Model 493.48 Acceleration Conditioner mezzanine card in a Model 493.40 I/O Carrier module, specific jumpers must be set. Jumper settings depend on the number and configuration of your system accelerometers.

In the example shown below, the Acceleration Conditioner supports three accelerometers. The indicated three jumpers must be set on the I/O Carrier module

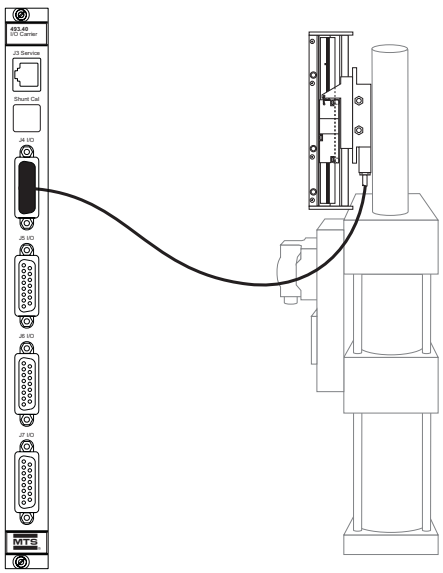


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Encoder Connections

I/O Carrier Module Configuration

For an ADDA configuration using an I/O Carrier module, each encoder requires installation of a Model 493.47 Encoder Interface mezzanine card on the Model 493.40 I/O Carrier board. The I/O Carrier connector is based on the location of the mezzanine card installed on the board of the I/O Carrier module.

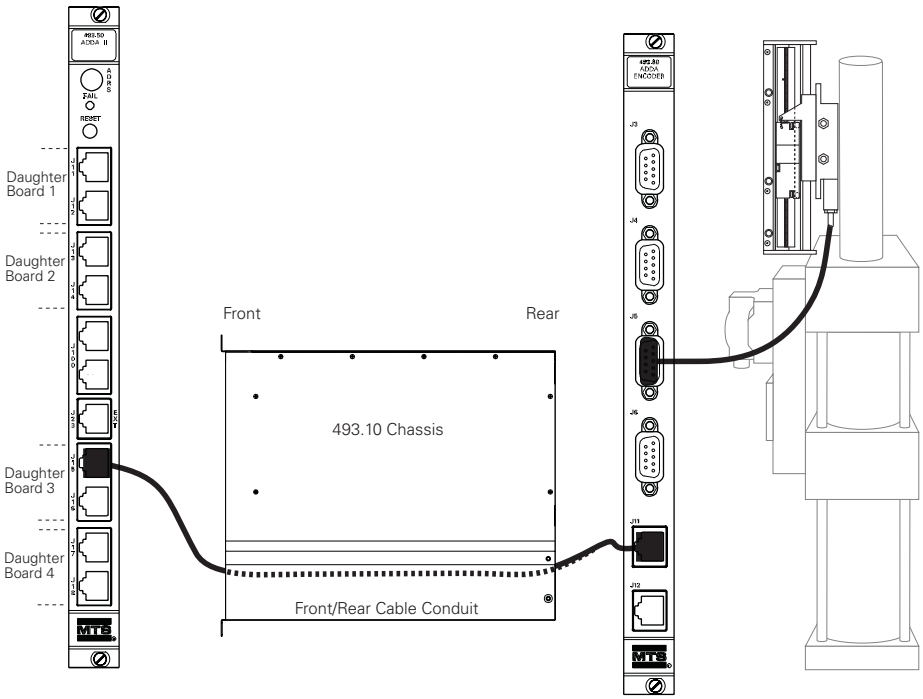


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Optional ADDA II Configuration

For the optional ADDA II configuration, each encoder requires installation of a Model 493.59 Universal Encoder mezzanine card on the Model 493.50 ADDA II module.

The Model 493.80 Encoder Transition module provides up to four channels of encoder interface between the Model 493.50 ADDA II module and various incremental, Temposonics, or other digital or serial transducers.



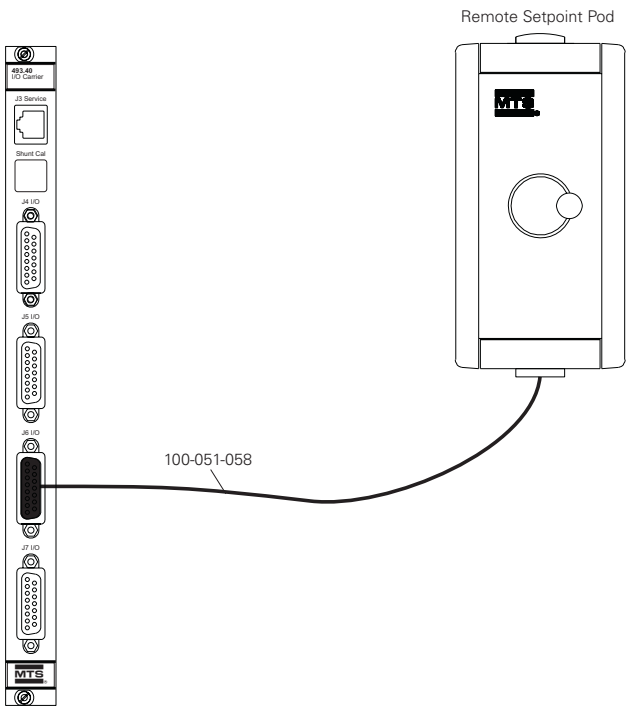
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Remote Setpoint Adjust Connections

A Remote Setpoint Adjust (RSA) control is an optional, standalone hardware device that uses an incremental or absolute encoder to control actuator setpoints.

Each RSA control pod requires installation of a Model 493.47 Encoder Interface mezzanine card on the Model 493.40 I/O Carrier board. The I/O Carrier connector is based on the location of the mezzanine card installed on the board of the I/O Carrier module.

See “Setting Up the Remote Setpoint Adjust” in the *MTS 793 Control Software* manual for more information.



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ADDA II Connections

Each optional Model 493.50 ADDA II module supports up to four mezzanine cards. Each installed mezzanine card is assigned a specific ADDA II module front panel connector (**J11–J18**).

A hardware interface file (hwi) defines each type of module (and their associated mezzanine cards) and maps each module location for the system software. The hwi file and the physical locations for each type of module and associated mezzanine cards must match. Also, the ADDA II module address setting (on the module) must match the hwi file address. For more information on the hwi file, see the *MTS 793 Utility Software* manual.

The following A/D or D/A mezzanine cards can be installed:

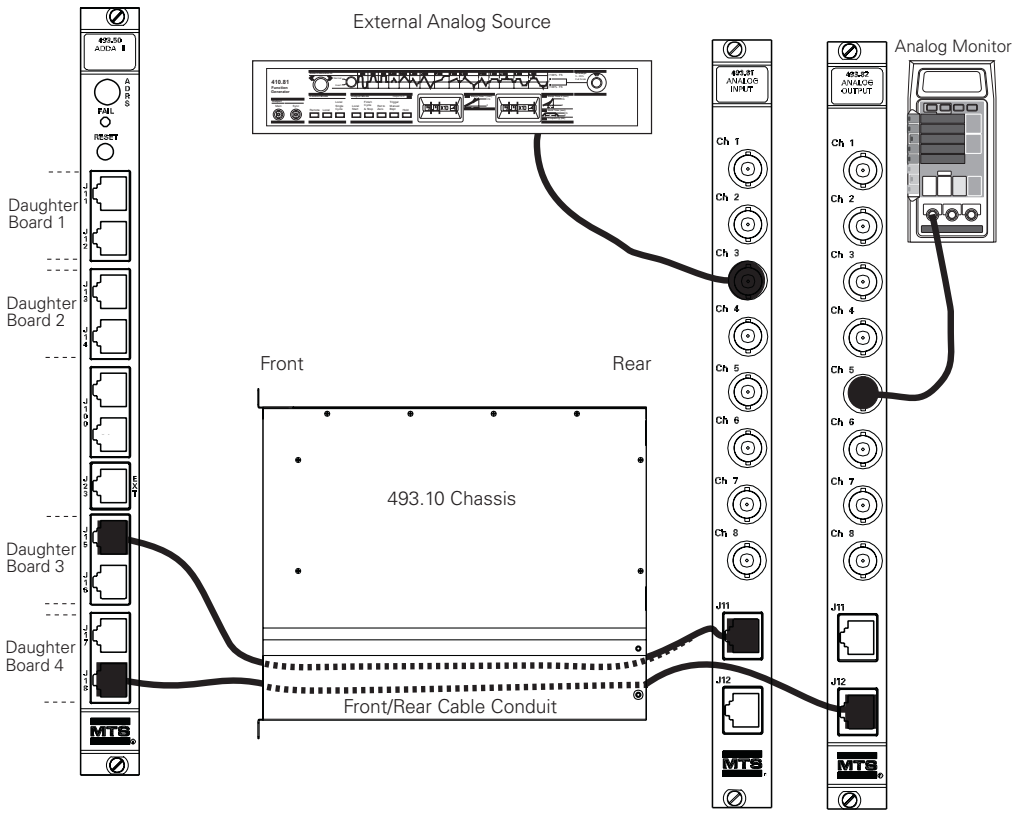
- Model 493.55 A/D
- Model 493.56 D/A
- Model 493.57 DSPAD
- Model 493.59 Universal Encoder

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ADDA II Module I/O Connections

The Model 493.55 A/D, Model 493.57 DSPAD, and Model 493.56 D/A mezzanine cards are installed in the Model 493.50 ADD II module assembly. A connection from the front panel connector to a rear panel BNC transition module allows easy access to the analog channels.

Note *The external analog source can be a stand alone function generator, another controller, or a computer controlled analog output.*

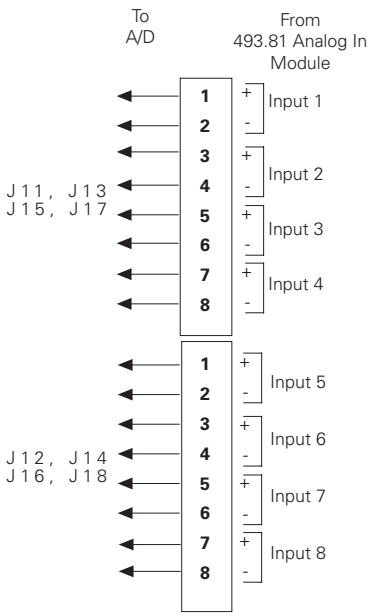


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Analog inputs

The analog-to-digital mezzanine cards accommodate up to eight analog input signals. Each A/D input signal must be within ±10 volts.

- Analog inputs can be connected at the BNC connectors of a Model 493.81 Analog In transition module and the outputs from this module are connected to the Model 493.50 ADDA II module.
- Analog inputs can be connected at the BNC connectors of a Model 493.83 Filtered Analog Input transition module and the outputs from this module are connected to the Model 493.50 ADDA II module.



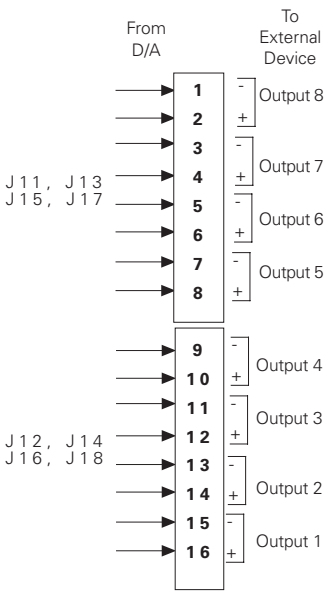
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D/A Connections

Digital-to-analog mezzanine cards support up to eight program or readout signals to external devices. Each D/A signal is an analog output within ±10 volts.

- Each readout signal is from a 16 bit digital to analog converter.
- Each output is a ±10 V analog output.
- The Model 493.56 D/A mezzanine card provides analog signals to the Model 493.82 Analog Out transition module. Analog outputs are available at the BNC connectors of a Model 493.82 Analog Out transition module for external devices (DVM, oscilloscope).

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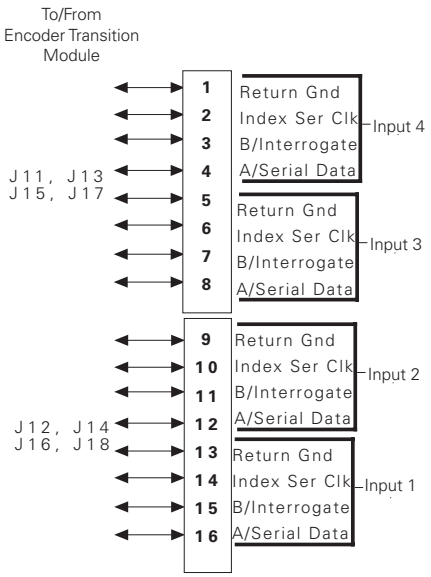


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ADDA II Universal Encoder Connections

Each encoder requires a Model 493.59 Universal Encoder mezzanine card installed on the Model 493.50 ADDA II module.

Up to four encoders can be connected to the Model 493.80 ADDA II Encoder Transition module when the Model 493.50 ADDA II module is fully populated with Universal Encoder cards.

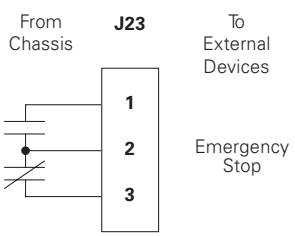


Emergency Stop Connections

Connectors **J23 E-STOP Out** and **J24 E-STOP In** are located on the Model 493.73 HPU transition board. The emergency stop switch and signal are part of a controller-wide interlock system.

Emergency stop output

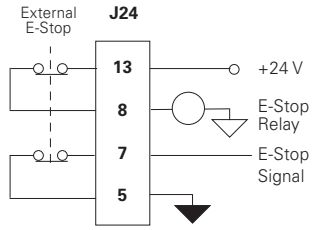
Connector **J23 E-STOP Out** provides an output to external devices when an emergency stop signal is generated. The inactive status is shown in the figure.



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Emergency stop input

Connector **J24 E-STOP In** accommodates an external emergency stop switch. As shown, several connectors maintain the continuity of the emergency stop interlock.



Cable specifications

J23 E-STOP Out is a 9 pin type D male connector

- 9-contact type D female EMI connector
- Cable—24 AWG, 10 conductor with overall foil shield, (Carol C0745 or equivalent) with drain wire connected to metallized plastic backshell to the chassis.

J24 E-STOP In is a 15 pin type D female connector.

- 15-contact type D male EMI connector.
- Backshell–EMI metallized plastic.
- Cable–24 AWG 4 connector with overall foil shield, (Belden 9534 or equivalent) with drain wire connected to metallized plastic backshell at the chassis and to ground at the emergency stop station.

Jumper plug required

If connector **J24** is not used, you must install a jumper plug to maintain the integrity of the interlocks. Use jumper plug PN 039-713-201 or jumper pins: 5 and 7; 8 and 13.

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J25 Hydraulic Power Unit Connection

Connector **J25 HPS** on the Model 493.73 HPU transition board controls the hydraulic power unit (HPU).

- The module produces 24 V logic signals to control the HPU.
- The Model 493.07 HPU Converter Box allows any MTS HPU to be connected to the chassis with the following exceptions:
  - 506.52-.92 HPUs (24 volt, PLC compatible)
  - All Series 505 HPUs

  The converter box is used with other configurations, see "Hydraulic Configurations" on page 221 for more information.

⚠ CAUTION

Control voltages for hydraulic power units vary between models.

The HPU interface between the Model 493.73 HPU transition board and an HPU is 24 volt logic signals. Connecting J25 to a non-compliant HPU can damage the module.

DO NOT connect 24 V DC relay circuitry or 115 V AC circuitry to the HPU connector J25.

Service LED

The Service LED turns on when electrical power is applied and it turns off when the chassis makes contact with the personal computer and processor has successfully booted.

Cable specification

J25 HPS is a 15 pin type D male connector.

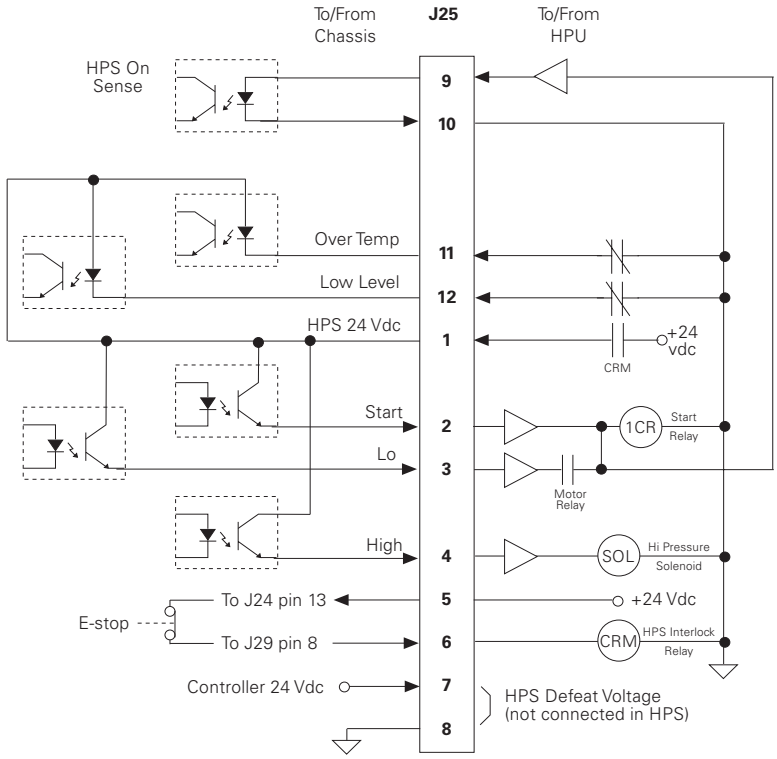
- 15-contact type D female EMI connector.
- Cable—24 AWG, 10 conductor with overall foil shield, (Carol C0745 or equivalent) with drain wire connected to metallized plastic backshell to the chassis.

Jumper plug required

If connector **J25 HPS** is not used, you must install a jumper plug to maintain the integrity of the interlocks. Use jumper plug PN 039-713-301 or jumper pins: 1–7, 2–3–5, 6–9, 8–10–11–12.

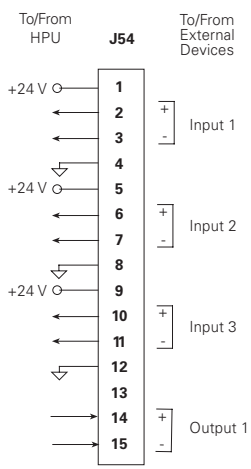
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J25 Diagram



System I/O

Connector **J54 Sys I/O** provides three digital inputs and one digital output. The inputs are connected to the high and low inputs of an opto-isolator. The output is from the collector (+) and emitter (-). See the "Digital I/O Connections" on page 126 for circuit drawings.



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Cable specification

J54 Sys I/O is a 15-contact type D female connector.

- 15-contact type D male EMI connector.
- Backshell–EMI metallized plastic.
- Cable–24 AWG 4 connector with overall foil shield, (Belden 9534 or equivalent) with drain wire connected to metallized plastic backshell at the chassis and to ground at the emergency stop station.

Station Connections

Each Model 493.74 HSM transition board controls up to two stations. A standard chassis configuration supports up to four stations. Each station has the following connections

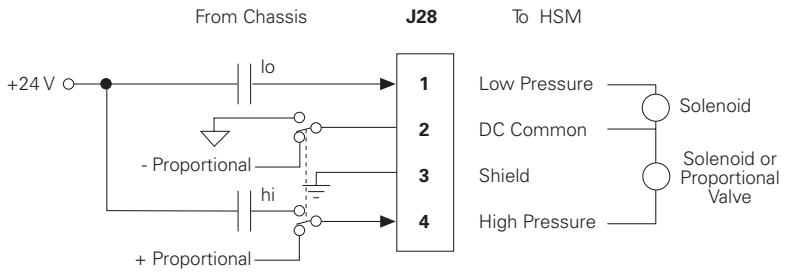
- J28 Hydraulic service manifold (HSM)
- J29 Load unit
- J43 Interlock
- J44 Remote run/stop
- J49 Auxiliary power

As a system option, the 493.10 chassis can be configured to support for six or eight stations. See "Optional Station Configurations" on page 231.

J28 Hydraulic Service Manifold Connector

Connector **J28 HSM** controls the pressure of a hydraulic service manifold. The controller software can configure the connector for solenoid or proportional control of a 24 volt hydraulic service manifold.

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Cable specification

- P28 is a 4-contact CPC male connector (AMP Incorporated).
- Cable for on/off HSMs–18 AWG/2 conductor with overall foil shield (Carol C2534 or equivalent) with drain wire connected to pin 3 at the chassis.
- Cable for high/low HSMs–18 AWG/4 conductor with overall foil shield (Carol C2543 or equivalent) with drain wire connected to pin 3 at the chassis.

Proportional output

The proportional output is configured with the controller software.

- The output signal can be ramped from 20 mA (minimum) to 700 mA (maximum) which corresponds with 50 psi (0.4 MPa) and 3000 psi (21 MPa). By default, low pressure is factory set at 500 psi and high pressure is set at 3000 psi.
- The ramp rate from zero to high pressure can be set to two or four seconds. The ramp rate from high pressure to zero can be set to zero, two or four seconds.
- The ramp rate is constant (set to the two or four second rate), The amount of time to reach low pressure depends on the low pressure setting.

hwi file settings

The following items can be specified in the hwi file. For more information, see the *MTS 793 Utility Software* manual.

- HSM ramp rate from zero to high pressure (**HSM RATE**):

  SLOW = zero to high pressure in approximately 4 seconds
  FAST = zero to high pressure in approximately 2 seconds

- HSM high pressure to zero mode (**HSM OFF MODE**):

  STEP = HSM steps from high pressure to zero (default)
  RAMP = HSM ramps from high pressure to zero

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Important *Unless there is a special need,* ***HSM OFF MODE*** *should not be set to* ***RAMP****. For your safety, keep this setting at* ***STEP****.*

- HSM low pressure setting as a percentage of full-scale (**LOW PERCENT**)
- HSM high pressure setting as a percentage of full-scale (**HIGH PERCENT**)
- HSM type can be set to **PROPORTIONAL**, **SOLENOID**, or **ON_OFF_SOLENOID**.

  If you select **ON_OFF_SOLENOID** only 2 HSM control buttons (OFF/ON) will appear on the Station Manager **Station Controls** panel. For the other selections, 3 HSM control buttons will appear (OFF/LOW/HIGH).

J29 Load Unit

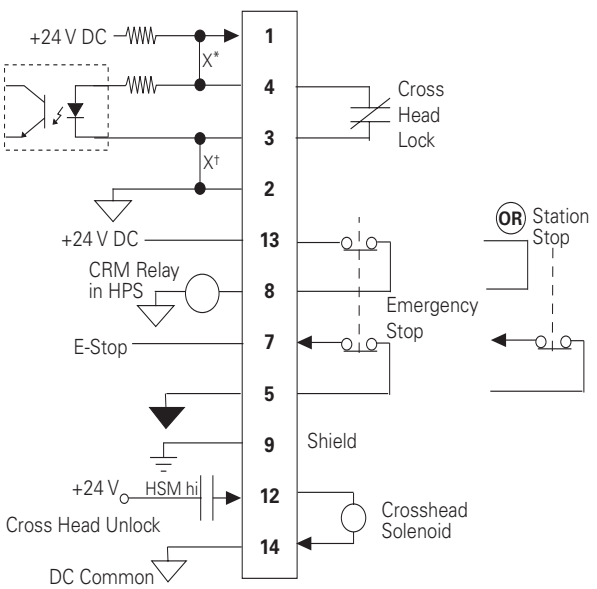
Connector **J29 Load Unit** connects to the load unit lift/lock panel.

Pins 1, 2, 3, and 4 can be configured for contacts (with jumpers X* and X†) or a logic signal (without jumpers X* and X†).

X* = Jumper X2 for Channel A
Jumper X1 for Channel B

X† = Jumper X4 for Channel A
Jumper X3 for Channel B

Pins 5, 7, 8, and 13 maintain the continuity of the emergency stop interlock.



Cable specification

- P29 is a 15-contact, type D, male, EMI connector.
- Cable for load frames with crosshead locks built after 1985, 18 AWG, 8 conductor with overall foil shield Alpha 5388C or equivalent with drain wire connected to pin 9 at both ends of the cable.

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- Cable for all load frames without crosshead locks–22 AWG, 6 conductor with overall foil shield Alpha 5386C or equivalent with drain wire connected to pin 9 at both ends of the cable (pin 9 may be pin E at the load frame).

Jumper plug

If connector **J29** is not used, you must install a jumper plug to maintain the integrity of the interlocks. Use jumper plug 100-007-947 or jumper pins: 3 and 4; 5 and 7; 8 and 13.

Station stop

The Emergency Stop connection can also be configured as a station stop. When this is done, be sure that you have other Emergency Stop boxes near by. Pressing **Station Stop** will shut down the hydraulics to an individual station without shutting down power to the hydraulic power unit.

Note *A Model 493.73 HPU Transition Board must be installed for the Emergency Stop connection to be enabled.*

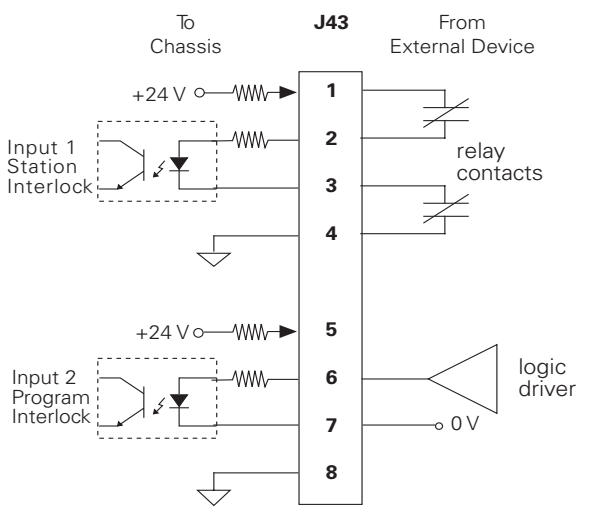
J43 Interlock

Connector **J43 Interlock** accommodates two general purpose inputs to be connected to the interlock chain.

- Input 1 is dedicated as a station interlock.
- Input 2 is dedicated as a program interlock.
- Both inputs are optically isolated.
- If just one contact is used, the other must be jumped.

Both inputs can accept relay contacts or a logic signal. Both configurations are shown.

Each input can be have either configuration.



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Cable specification

- 9-contact type D male EMI connector.
- Backshell–EMI metallized plastic.
- Cable–shielded twisted pairs (24 AWG minimum) with drain wire(s) connected to the metallized backshell at the chassis.

Power characteristics

Channel inputs can be 3 volts (minimum) and 26 volts (maximum) from an external voltage source.

Jumper plug

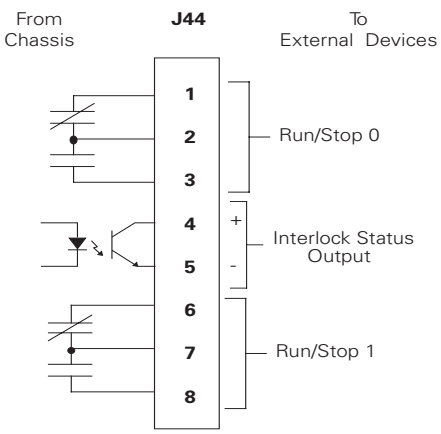
If connector **J43** is not used, you must install a jumper plug to maintain the integrity of the interlocks. Use jumper plug PN 100-007-948 or jumper pins 1 and 2; 3 and 4; 5 and 6; 7 and 8.

J44 Run/Stop

Run/Stop status

Connector **J44 Run/Stop** provides the run/stop status of the controller to external devices.

- Two form C contacts provide the run/stop status.
- The contacts are rated 1.0 A at 30 V (AC or DC).



Interlock status

Connector **J44 Run/Stop** also provides opto-isolator outputs that indicate the interlock status of each station to an external device. These interlock status outputs are normally on and will turn off when an interlock occurs. See "Digital outputs" on page 128 for detailed circuit drawings.

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Output specifications

The specifications for the interlock status opto-isolator outputs are as follows:

- Output Format: open collector, open emitter transistor
- Maximum Voltage: 26 V DC
- Minimum Guaranteed Output Current Drive: 20 mA (30 mA typical) @ 1.0 V max

Jumper X5

Jumper setting **X5** selects the source for interlock status output. The following jumper settings select the indicated interlock source:

- **X5** Jumpered = HSM Board Interlocks Only
- **X5** Not Jumpered = Station and HPU Interlocks

Jumpers W8/W9

Jumper settings **W8/W9** determine the output polarity of the opto-isolators.

Cable specification

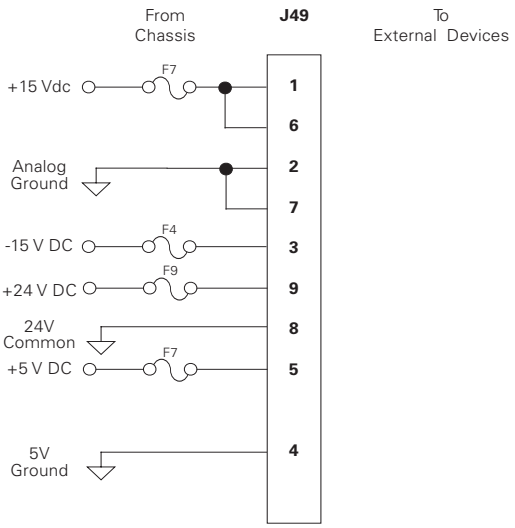
- 9-contact type D female EMI connector
- Backshell–EMI metallized plastic
- Cable–shielded twisted pairs (24 AWG minimum) with drain wire(s) connected to the metallized backshell at the chassis.

J49 Auxiliary Power

Connector **J49 Aux Pwr** provides +5 V DC, ±15 V DC, and 24 V DC from the chassis internal power supply to drive external high level conditioners, proximity switches, solenoids, and so forth.

- The outputs are fused at 0.75 A to protect the power supply from an external short.
- The fuses can be reset by shutting off power and waiting a few minutes (the fuses automatically reset when cooled) then reapplying power.

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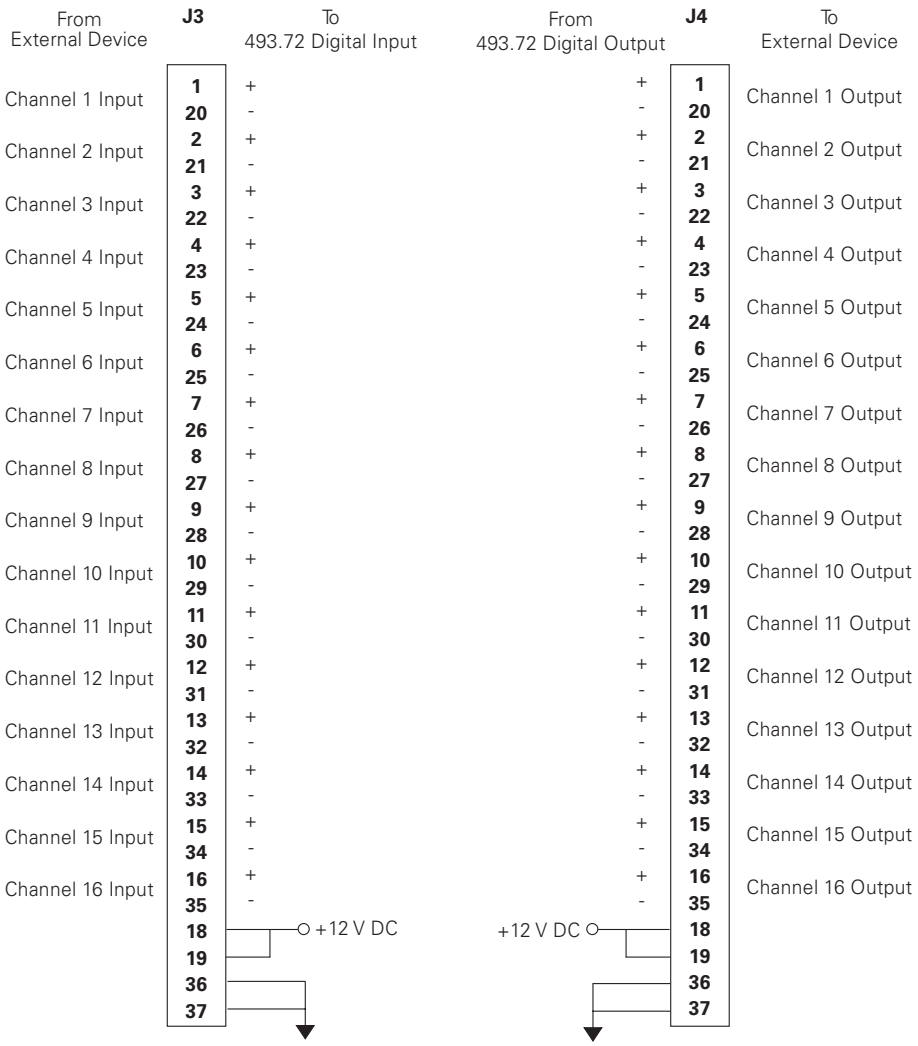
Cable specification

- 9-contact type D male EMI connector
- Backshell–EMI metallized plastic
- Cable–shielded twisted pairs (22 AWG minimum) with drain wire(s) connected to the metallized backshell at the chassis.

Digital I/O Connections

The Model 493.72 Digital I/O transition module has two connectors; one provides connections for sixteen digital inputs and the other provides connections for sixteen digital outputs.

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Digital inputs

The **J3 In** connector accommodates up to sixteen digital signals from external devices. You can use digital input signals to trigger test events with your controller applications.

- All of the inputs are optically isolated and support relay contacts or logic inputs (see the following figure).
- Channel inputs can be 3 volts (minimum) and 26 volts (maximum) from an external voltage source.

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- Jumpers select the debounce time for each group of four inputs.

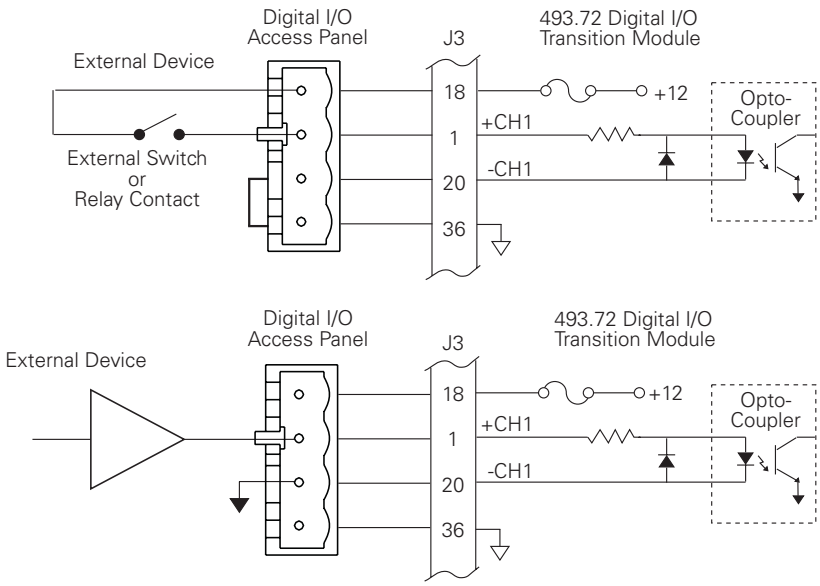
  Jumper X2 configures inputs 1–4. Jumper X3 configures inputs 5–8. Jumper X4 configures inputs 9–12. Jumper X5 configures inputs 13–16.

  – Not using a jumper sets the debounce to 20 msec.

  – Jumper pins 1 and 4 to set the debounce to 10 msec.

  – Jumper pins 2 and 3 to set the debounce to 1 msec.

  – Jumper pins 1 and 4, and 2 and 3 to set the debounce to 0.1 msec.



Digital outputs

Connector **J4 Out** provides sixteen general purpose digital outputs that can send digital logic signals to external switches or logic devices.

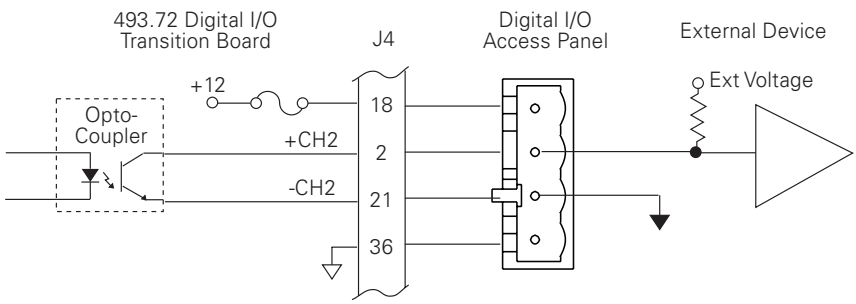
- Minimum output current drive is 6 mA. Maximum output current drive is 20 mA.

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Note *The maximum output current can vary from unit to unit. The minimum guaranteed output current is 6 mA and the maximum output current is 20 mA. You can connect the digital outputs in parallel to increase the current drive. When connected in parallel, the station must be configured so all paralleled outputs are driven from the same event.*

- The output is rated for a maximum of 30 V DC.
- Fused 12 V DC is available at pins 18 and 19.

  Install a current-limiting resistor that is appropriate for the external device.
- If an output is not used, a jumper is not needed to complete a circuit.
- The outputs are optically isolated.
- The outputs are triggered by the system controller.



Cable specification

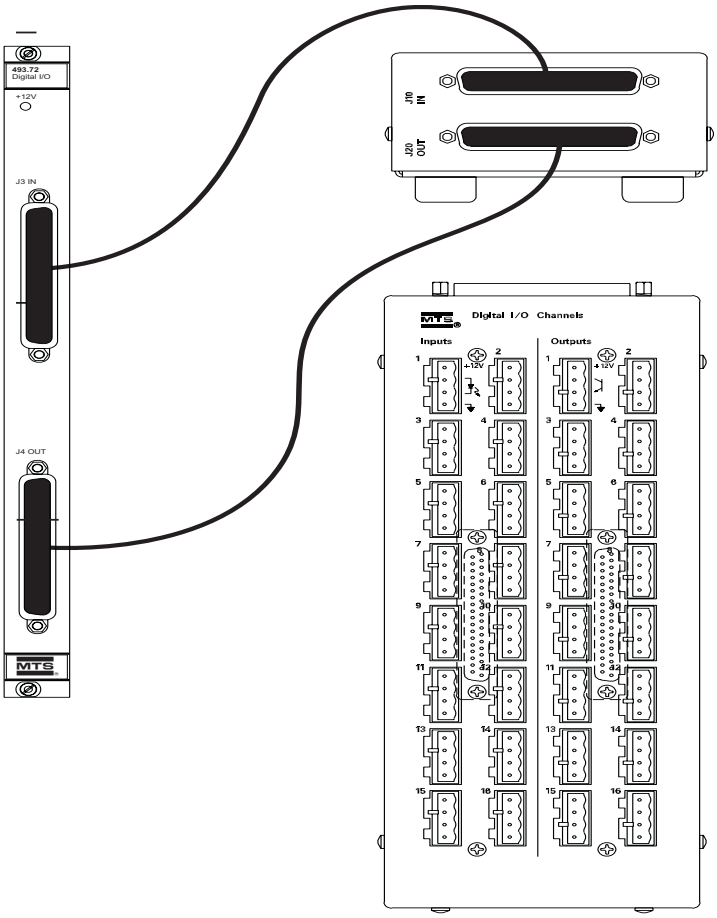
The cabling information shown assumes a single cable destination (with an overall shield). In other applications, the cable may have more than one destination. For these applications an overall shield is not practical and non-EMI connectors and back shells are permissible.

- 37-contact type D male EMI connector
- Back shell–EMI metallized plastic
- Cable–shielded twisted pairs as required (24 AWG minimum) with drain wire(s) connected to the metallized backshell at the chassis.

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Digital I/O access panel

The digital inputs and outputs can be cabled to an optional digital I/O access box. The box is a convenient way to wire digital sources and destination to the Model 493.72 Digital I/O transition module.

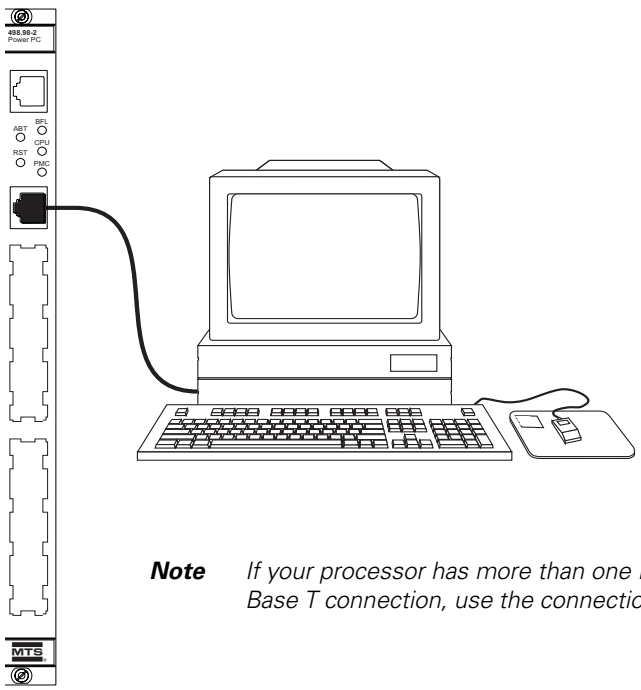


Connectors J10 and J20 on the side of the module and on top of the module are the same. The top connectors are used when the module is configured for use in a console.

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Workstation Connection

The workstation computer is connected to the Model 498.96 Processor module installed in the VMEbus of the chassis. It is an Ethernet 10/100 Base-T connection. The workstation computer must have a dedicated Ethernet compatible connector.



Note *If your processor has more than one Ethernet 10/100 Base T connection, use the connection labeled LAN 1.*

⚠ CAUTION

The symbol shown here indicates that you must not connect telecommunications equipment to the equipment showing this symbol.



Several modules have connectors that look similar to a phone connector. Special cables are required. Installing telecommunications equipment cables can cause equipment damage to the electrical components of the chassis or to your telecommunications system.

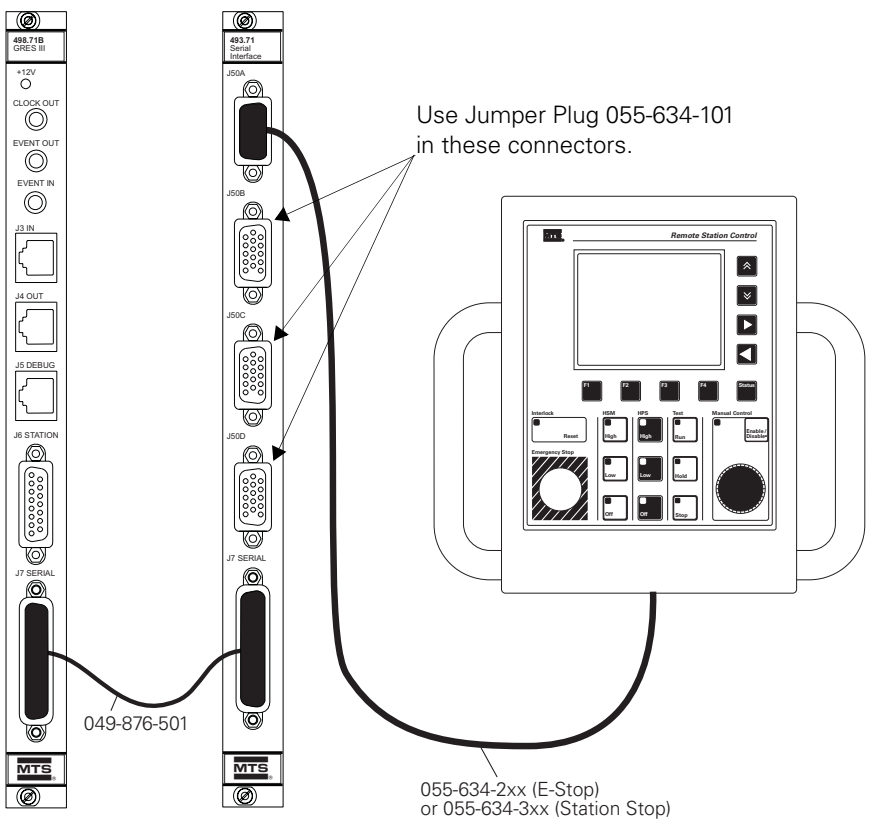
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Remote Station Controller Connection

The optional Remote Station Controller (RSC) module requires a Model 498.71B GRES III VMEbus module and a Model 493.71 Serial Interface transition module to be installed in the chassis. The RSC can be connected to any of the four J50 connectors of the serial interface. An interlock is permanently assigned to each J50 connector (e.g., J50A= Interlock 1). Connecting an RSC automatically assigns the RSC pod to the interlock.

The hwi file defines which connector is used for each station. For more information, see "Hwi file additions" on page 133.

The RSC control panel is available in two configurations; one provides an E-Stop and HPS control for single station configurations, and the other provides a Station Stop with no HPS control for multi-station configurations.



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Hwi file additions

In order to use one or more RSCs with your Model 493.10 Chassis, two sections must be added to your hwi file, an RSC section and a GRES III section.

Note *Remote Station Controllers are not available with the optional 6 or 8-station system configurations*

Note *If you specified RSC support when you ordered your test system, these sections will be added to your hwi file at the factory. For information on editing your hwi file to accommodate RSCs, see the MTS 793 Utility Software manual.*

Service Connections

The Model 493.10 Chassis can have several service connectors. There are two types of connectors:

- The chassis connection monitors the power supply.
- The connection on the I/O Carrier module monitors the output of each mezzanine card.

Chassis service

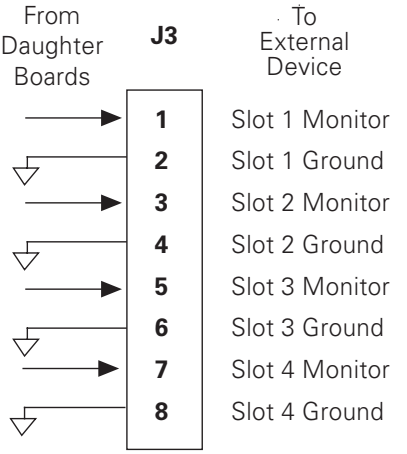
The **J39 Power Monitor** connector is located on the rear panel of the chassis. It functions as test points for a service technician. It allows you to check all of the power supply voltages along with the status of the over-temperature sensor and the power fail circuit.

+5 Volts	2
+12 Volts	3
-12 Volts	4
+15 Volts	5
-15 Volts	6
+24 Volts	7
Ground	8
2.5 Volts Reference	9
Ground	11
Temperature	14

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I/O Carrier service

The **J3 Service** connector on the Model 493.40 I/O Carrier module provides the monitor output from each of the four I/O option cards installed. It is an 8-pin RJ-45 connector.



Important *The signals at the **J3 Service** connector are provided for service and troubleshooting only. These signals are defined by the I/O option mezzanine cards that are installed on a respective Model 493.40 I/O Carrier module. Some of these signals may be uncalibrated. Before use, take appropriate steps to determine the characteristics of these signals.*

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Cabling and Programming Model 407 Controllers

This section describes:

- Cabling and programming the FlexTest GT Controller to analog program and feedback signals from a Model 407 Controller.
- Connecting FlexTest GT Controllers to interlock signals from a Model 407 Controller.
- Setting up a Model 407 Controller to send and receive signals from FlexTest GT Controllers.

Important *When used as a programmer, FlexTest GT Controllers do not have automated mode switching capabilities. Control mode selection on these controllers do not effect the control mode of the controller to which they are sending test commands.*

How to Provide Program to a Model 407 Controller

1. **Cable the 793 and 407 Controllers together.**

   Cable the analog inputs and outputs between the Model 493.10 chassis and a Model 407 Controller as follows:

   Note *Analog I/O connectors are located on the rear panel of the chassis.*

   A. Connect a Model 493.76 Analog Out BNC connector to the program (analog) input on the 407 Controller. Connections for single or multiple Model 407 Controllers are shown.

   B. If you intend to monitor sensor feedback for data acquisition or control feedback, connect the external controller's conditioner output to a Model 493.77 Filtered Analog Input BNC connector. For conditioner output locations on various MTS devices, see "Miscellaneous Conditioner Output Connections" on page 150.

   C. Make interlock connections as appropriate. Refer to "Connecting Interlock Signals to 407 Controllers" on page 140.

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WARNING

Do not interrupt Model 493.10 Chassis power when you are programming another controller. A power interrupt may cause the external controller to react to a zero command and move the actuator unexpectedly.

Ensure power cannot be removed accidently while a test is in progress.

For more detailed information about analog I/O connections, see "Analog I/O Connections" on page 103.

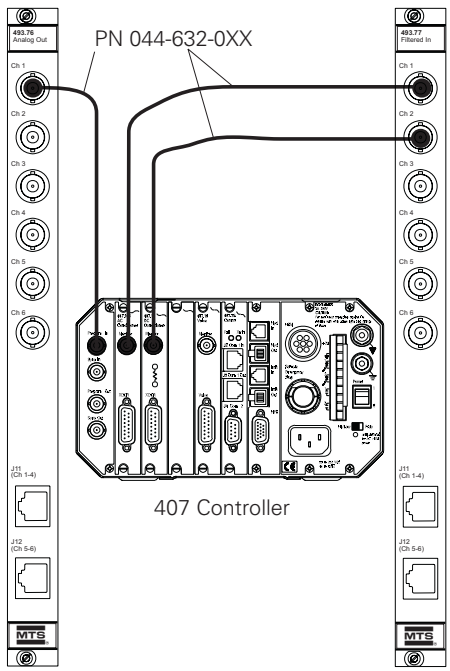
Single 407 Controller Connections

Transition modules on the rear panel of the Model 493.10 chassis are used for analog inputs and outputs.

493.76 Analog Out

This module includes 6 BNC connectors that provide analog outputs from a Model 493.46 D/A mezzanine card.

Six analog outputs are available with each D/A mezzanine card installed on the Model 493.40 I/O Carrier module.



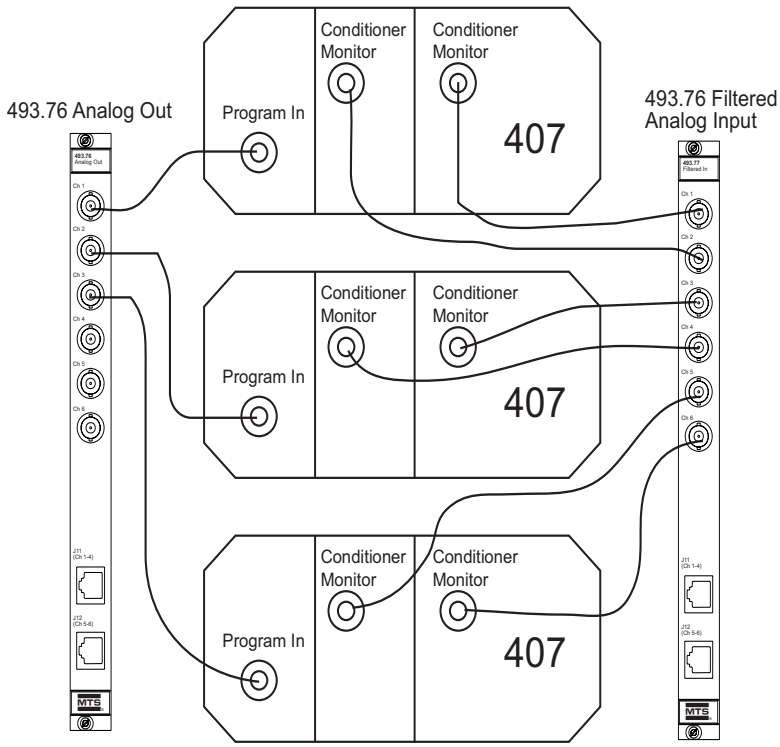
493.77 Filtered Analog Input

This module includes 6 BNC connectors that provide filtered analog inputs to a Model 493.45 A/D mezzanine card.

Six analog inputs are available with each A/D mezzanine card installed on the Model 493.40 I/O Carrier module.

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Multiple 407 Controller Connections



2. **On the 793 Controller, create a station configuration file.**

   Use the Station Builder application to define controller resources to provide program to the 407 Controller. When you create this type of station configuration, you typically select an analog output for the channel output resource, and Program Only or Program with Feedback for the channel type.

   If you create a Program with Feedback channel, you typically select analog inputs for the control mode input resources. This allows you to receive 407 control mode feedback. You also select unit type and dimension.

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Note *Because of wiring considerations between 793 and 407 Controllers, you must assign an HSM in the station configuration file even if an HSM does not control power to the external controller.*

3. **On the 793 Controller, adjust the program signals.**

   Use the Station Manager application to adjust the full scale, polarity, gain, and offset for the external controller channel (Display menu > Station Setup).

   If your station configuration includes sensor feedback, you can also adjust the full scale, gain, polarity, and offset of the incoming sensor signals, as well as limits.

4. **On the 793 Controller, set up the program.**

   Define a program with the Function Generator, Basic TestWare, or Multipurpose TestWare applications.

   Note *It is good practice to use tapered wave shapes to apply the program command to the external controller slowly.*

   The Basic TestWare application allows you to create simple test programs that do not require complex signal management or mode switches for station configuration files. To create more sophisticated test programs use the optional MultiPurpose TestWare application.

5. **On the 407 Controller, select the External program source.**

   On the **Function Generator** menu, select **Waveform**, then scroll through the selections to select **External**.

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Note *The operational sequence in the following step may not be intuitive. This sequence is necessary because of how the 793 and 407 Controllers are cabled together. The following step assumes that at power up, hydraulics are off, the 793 Controller has a hydraulic and a program interlock active, and the 407 Controller has a hydraulic interlock active.*

6. Apply the program.

To apply the program from the 793 Controller to 407 Controller:

A. On the Station Manager application's **Station Controls** panel, click **Reset** to clear the **Hydraulic** interlock.

B. On the Station Manager application's **Station Controls** panel, click **HPU Power Low** and then **HPU Power High** to turn on the HPU.

C. On the Station Manager application's **Station Controls** panel, click **HSM Power Low** and then **HSM Power High** to turn on the HSM.

D. On the 407 Controller, clear the hydraulic **Interlock**:

- Press the **Alt Function** button.
- Press the **Reset** button ("**9**" on the key pad). The **Interlock** indicator on the front panel should extinguish.

E. On the 407 Controller, apply hydraulic pressure with the **Hydraulic Pressure** buttons.

F. On the 407 Controller, press **Run**. This step readies the 407 Controller to receive program from the 793 Controller.

G. On the Station Manager application's **Station Controls** panel, click **Reset** to clear the **Program** interlock.

H. On the Station Manager application's **Station Controls** panel, click the  (Program Run). This step sends program from the 793 Controller to the 407 Controller.

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Connecting Interlock Signals to 407 Controllers

The Model 793 Controller monitors digital I/O interlock signals through the Model 493.74 HSM transition module's **J43A** and **J43B** connectors. Use these connectors when connecting to Model 407 Controllers.

Model 493.74 HSM transition module connectors are as shown in the figure that follows.

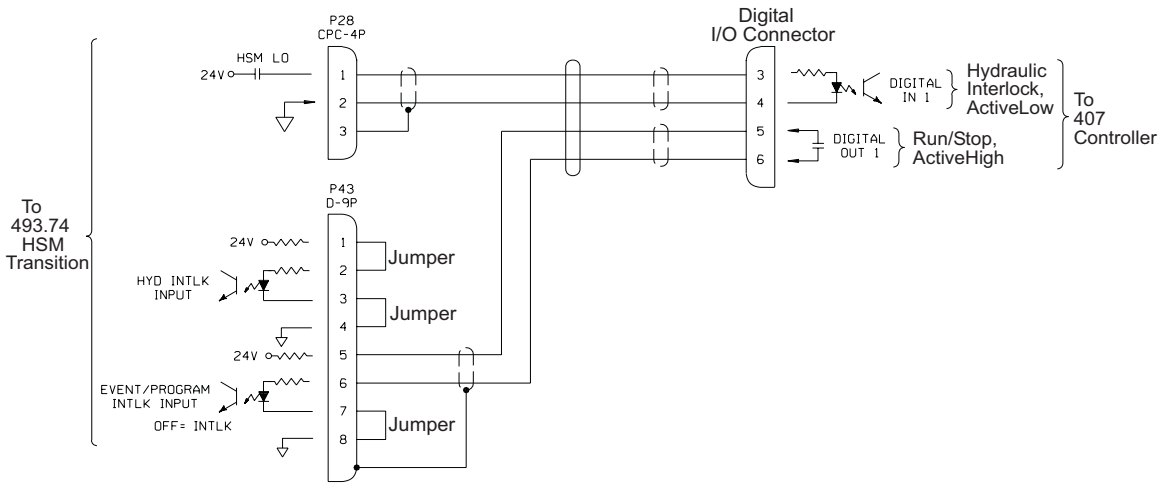
Interlock cabling to Model 407 Controllers depends on your system's configuration. There are three possible configurations:

- Single station—one Model 407 Controller runs a single test program.
- Multiple stations—two or more independent Model 407 Controllers each run different test programs.
- Master-dependent station—one master Model 407 Controller daisy-chained with other dependent Model 407 Controllers together run a single test program.

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Single 407 Controller Interlock Connections

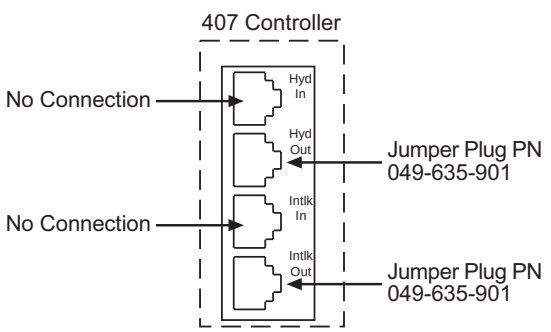
The following figure shows how to cable interlocks for a single station Model 407 Controller to the Model 493.10 Chassis (via its Model 493.74 HSM transition module). Use the specified interlock cable (PN 056-455-0xx) to make these connections.



Interlock Cable PN 056-455-0XX

How to Jumper the Hydraulic Terminal on a Single Station 407 Controller

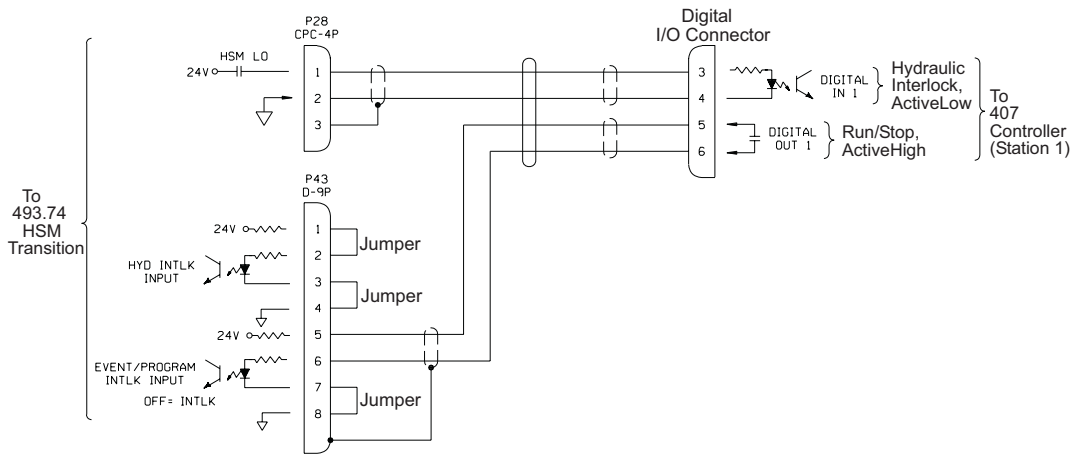
The following figure shows how to cable the hydraulic terminal on a single station Model 407 Controller.



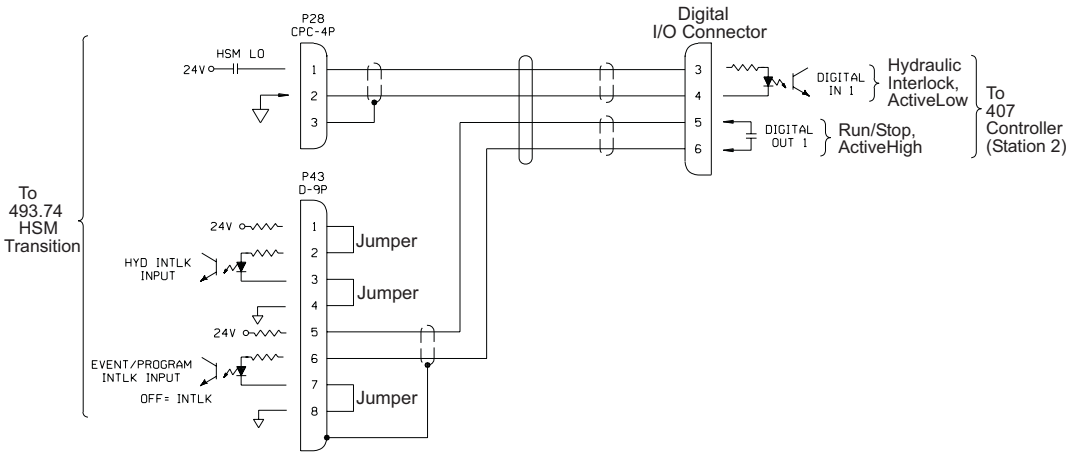
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Multiple 407 Controller interlock connections

The following figure shows how to cable interlocks for multiple Model 407 Controllers to the Model 493.10 Chassis (via its Model 493.74 HSM transition module). Use the specified interlock cable (PN 056-455-0xx) to make these connections for each Model 407 Controller station.



Interlock Cable PN 056-455-0XX

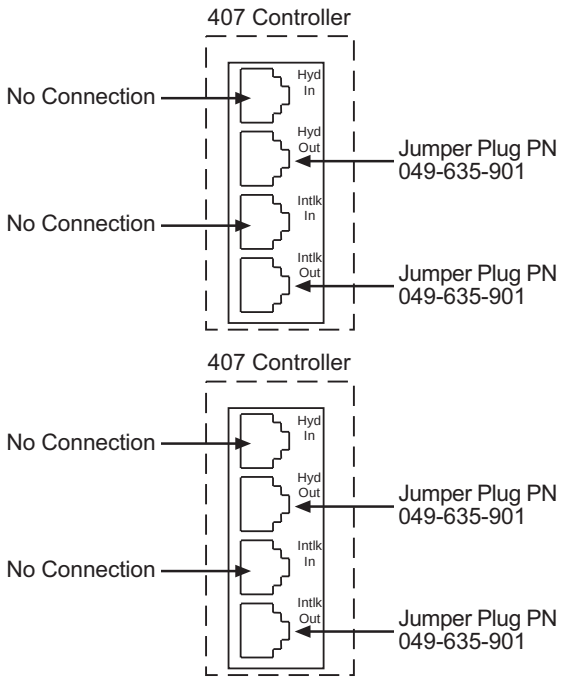


Interlock Cable PN 056-455-0XX

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How to connect hydraulic terminals on multiple station 407 Controllers

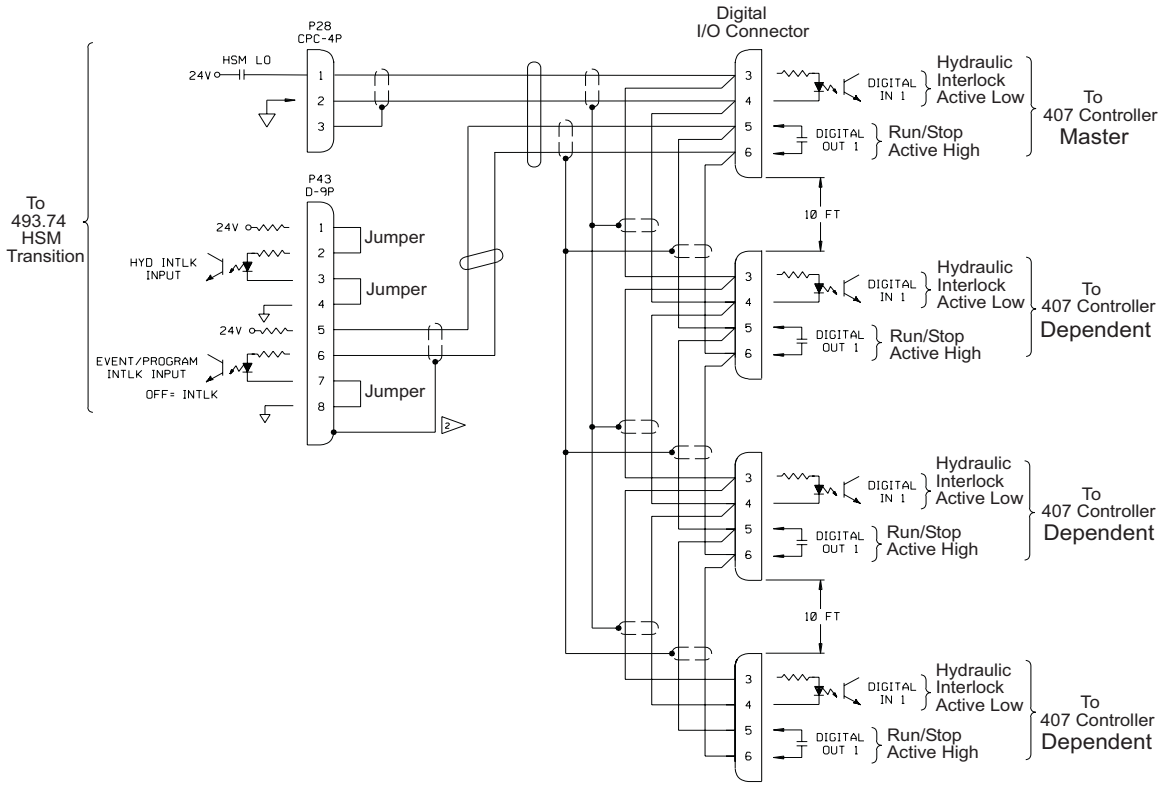
The following figure shows how to cable hydraulic terminals on multiple station Model 407 Controllers, where each Model 407 Controller can run an independent test program. Repeat this scheme for each additional Model 407 Controller.



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Interlock connections for master/dependent 407 Controllers

The following figure shows how to cable interlocks when a master Model 407 Controller is daisy-chained with three other dependent Model 407 Controllers to run a single test program on a FlexTest GT Controller (via its Model 493.74 HSM transition module). Use the specified four-channel master/dependent interlock cable (PN 056-448-9XX) to make these connections for each Model 407 Controller station.

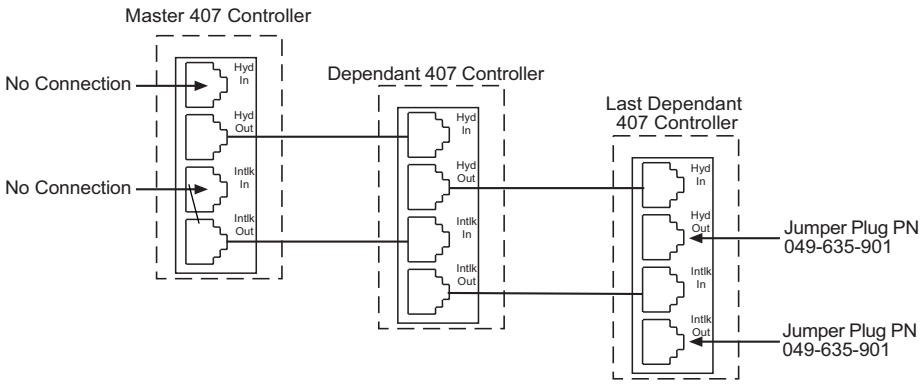


Master/Dependent Interlock Cable (PN 056-448-9XX)

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How to connect hydraulic terminals on master-dependent 407 Controllers

The following figure shows how to cable hydraulic terminals on three Model 407 Controllers in a master-dependent daisy-chain. Note that the last dependent controller in any daisy-chain must have jumper plugs installed in its **Hyd Out** and **Intlk In** terminals.



Sending and Receiving Signals to a Model 407 Controller

After cabling the Model 407 Controller, you must configure it to receive and send signals from the FlexTest GT Controller. The tables below list typical menu settings. Refer to the *Model 407 Controller Product Information Manual* for more information.

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407 Configuration Menu

PARAMETER	SETTING
Eng Units	—
EOC Act	—
CYC Src	PROGRAM
SetPt R	150%/s (or highest)
Span R	300%/s (or highest)
Hyd Cnfg	—
Intlk Cnfg	MASTER*
P/V Sens	—
Span Cnfg	1X
CMD Sel	EXT IN
Prog Out	—

* Always designate one 407 in a station as a MASTER. If there are other 407s in the same station, daisy-chain their interlocks designate them as DEPENDENT.

407 Function Generator Menu

PARAMETER	SETTING
Wvform	EXTERN
Freq	—
Setpnt	—
Span	—
Preset	—

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407 Amplitude Control Menu

PARAMETER	SETTING
Ampl Cntrl	OFF
Fdback	—
Mean	—
Ampl	—
AMC Gain	—

407 Digital I/O Menu

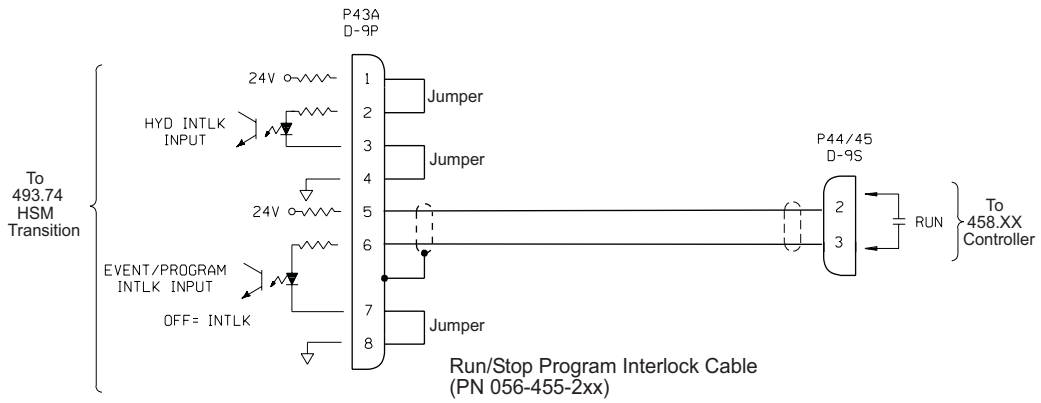
PARAMETER	SETTING
Din1 Definition	Program in RUN
Din1	RUN/STOP
Din1Pol	ACT HI
Din2 Definition	Hydraulic Interlock
Din2	Interlock
Din2Pol	ACT LOW
Dout1 Definition	Hydraulics ON*
Dout1	HYD OFF
Dout1Pol	ACT LOW
Din2 Definition	—
Dout2	—
Dout2Pol	—

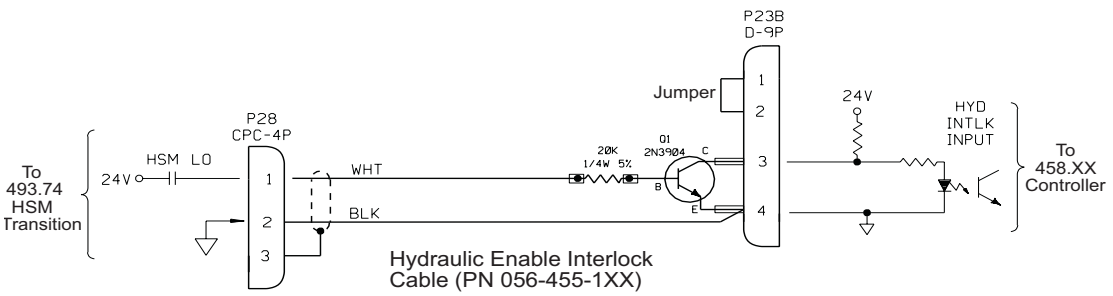
* Or Run/Stop (ACT HI), Interlock (ACT LOW), None (ACT HI).

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Connecting Interlock Signals to 458 Controllers

FlexTest GT Controllers monitor digital I/O interlock signals through the Model 493.74 HSM transition module.





Eurotherm Temperature Controller Connection

When equipped with a Model 498.71B GRES III plug-in module, your controller can program and control one or more Series 2200/2400 Eurotherm Temperature Controllers via the **J50** serial connectors on a Model 493.71 Serial Interface transition module.

In order to use this configuration, a special temperature controller resource must be added to your hwi file.

J50 connectors

The temperature controller can be connected to any of the four **J50** connectors on the serial interface.

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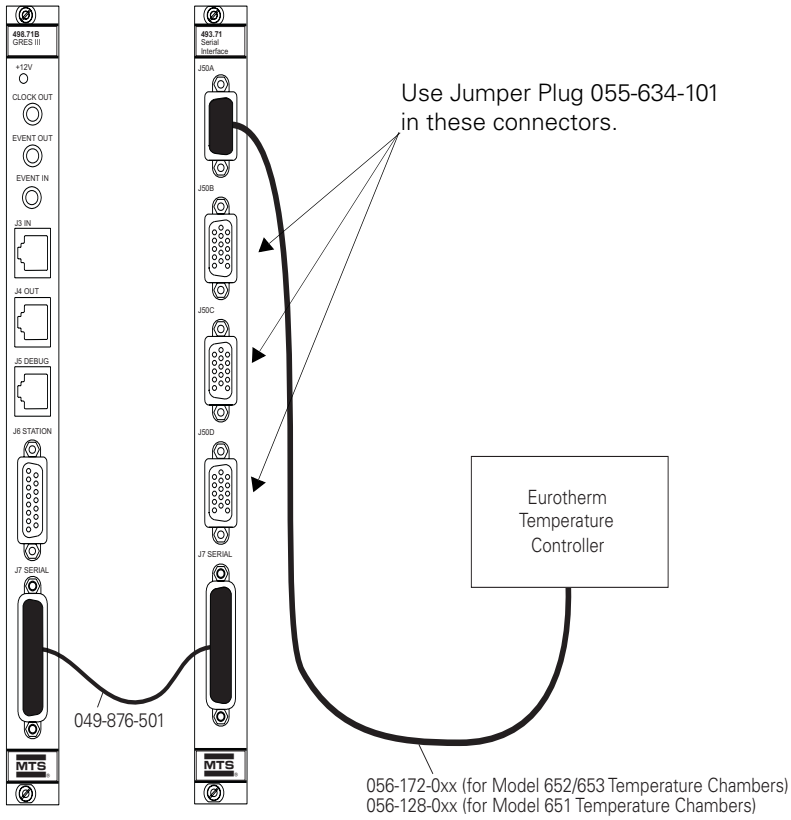
Temperature controller hardware resource

For more information on adding the Eurotherm hwi file resource, see the *MTS 793 Utility Software* manual.

Program the temperature controller

Use Station Builder to configure a Eurotherm temperature controller.

.



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Miscellaneous Conditioner Output Connections

The following table shows connector assignments for various MTS products you can use with your the Model 493.10 Chassis.

Conditioning Sensors with Other MTS Products

MTS Product	Sensor Output
Model 408.81 Testing Panel/ Model 408.82 DC Conditioner	Sensor output is available at the rear-panel connector **J201** or **J202**.
Model 409.81C Temperature Controller	Temperature output (via an analog signal) is available at rear-panel connector **J1**.
Model 448.82/85 Test Controller with Model 448.21/22 AC and DC Conditioners	Sensor output is available at rear-panel connector **J335**. Ensure sensor conditioners are set as follows: X1: 2&3 X2: 2&3
Model 458.10/20 MicroConsole® with Model 458.11/12/13/14 AC and DC Controllers	Sensor output is available at the MicroConsole rear-panel connector **Jx03**. Connector **Jx03** represents the module location (J100–J600). MicroConsole jumper Jx00 should be set to 1&2 (standard setting).

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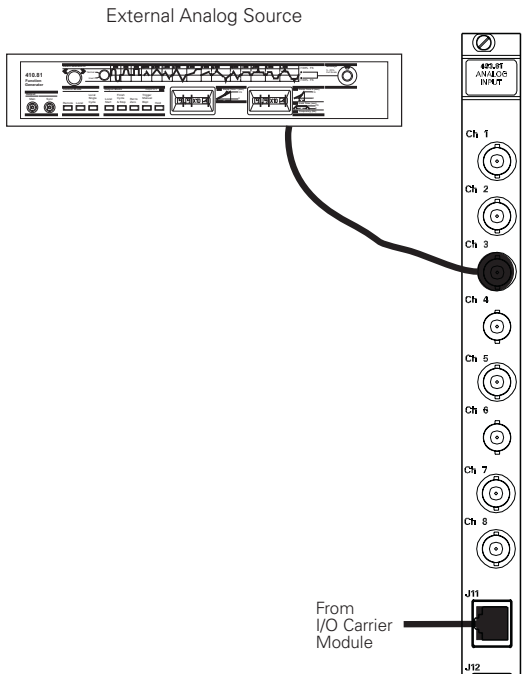
Cabling for External Command Inputs

Cabled properly, Model 793 Controllers can receive programming from an external controller.

How to Enable and Run External Command Inputs

1. **Cable the controllers.**

   Cable the external programmer analog out connector to a Model 493.75 Analog In module BNC connector.



2. **Allocate external command resources in Station Builder.**

   Using Station Builder, allocate controller resources to receive programming from an external controller.

3. **Adjust the command signal with Station Manager.**

4. **Start the External Command.**

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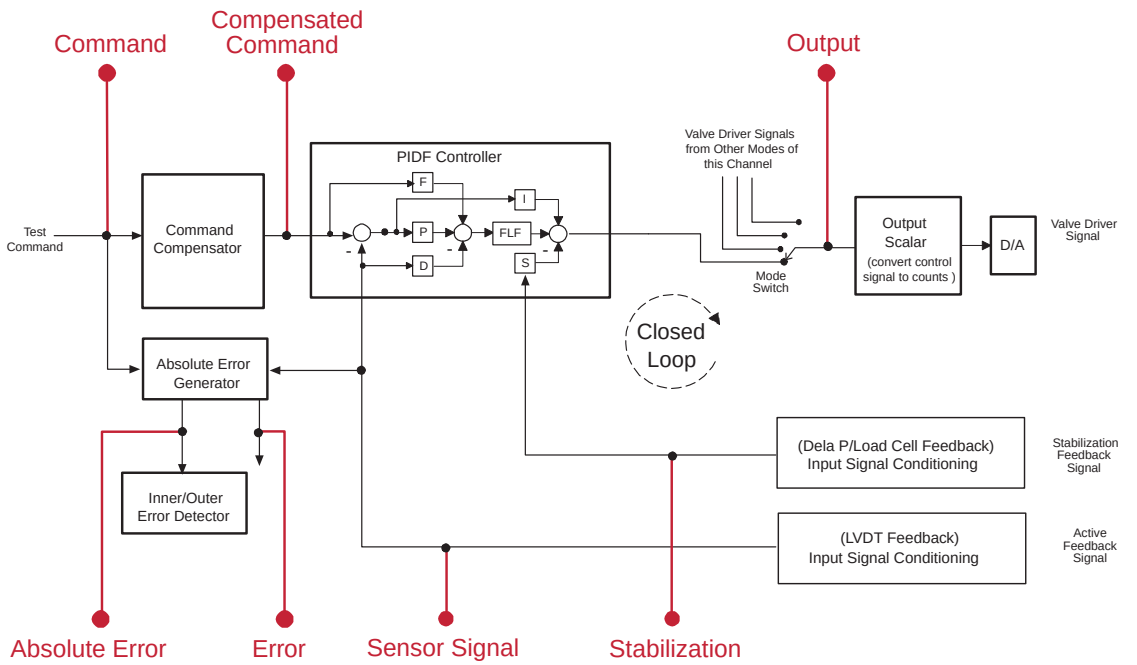
Cabling and Using External Readout Devices

Cabled appropriately, your controller can send station signals to external readout devices such as oscilloscopes and digital-volt-meters. You define which signal is sent to the readout device using the **Station Setup** window's **Readout** panel.

Refer to "Working with Readout Devices" in the *MTS 793 Control Software* manual for more information.

Station signal diagram

The block diagram identifies the station signals you can monitor.



Station signal descriptions

Except for time and auxiliary data signals, station signals listed in your software windows include the name of their associated control channel. For example, if your channel is labeled **Ch. 1**, the available station signals would be **Ch.1 Output**, **Ch. 1 Command**, and so forth.

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The following table provides a description of the various station signals.

Station Signals

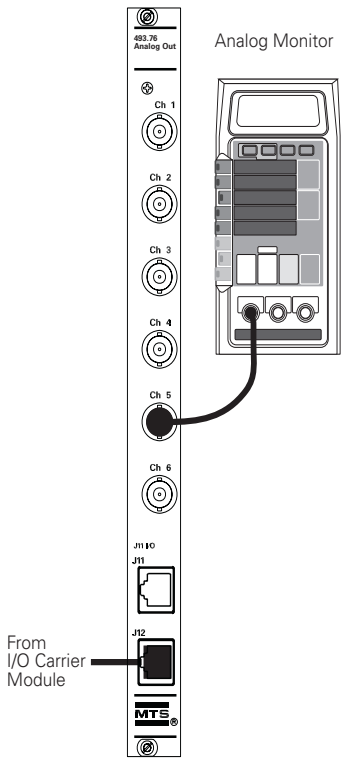
SIGNAL	DESCRIPTION
Time	Displays the time reference signal derived from the internal clock that increments continually. This signal exists to support data acquisition by test program applications, such as Basic TestWare and MultiPurpose TestWare. It is not practical to monitor the time signal with an external readout device.
Rollover Time	Displays the time reference signal derived from the internal clock that resets every hour. Like the time signal, this signal exists to support data acquisition by test program applications. It is not practical to monitor the hourly rollover time with external readout devices.
Output	Displays the test control signal sent to the valve driver in volts.
Command	Displays the program command signal in engineering units.
Comp. Cmd	Displays the value of the compensated command signal in engineering units. This signal is only valid when using PVP, PVC, AIC, APC, or ALC compensators.
Count	Displays the number of segments played out so far in the selected control channel. When using a Station Manager meter, this signal is only available for the Timed meter.
Error	Displays the error signal in engineering units. The error is the difference between the command signal and the sensor feedback signal.
Abs. Error	Displays the absolute value of the error signal in engineering units.

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How to Send Signals to External Readout Devices

1. **Cable your controller to the readout device.**

   Cable your FlexTest IIm analog output connector to the readout device. Analog I/O connectors are located on the rear of the test processor chassis. Connect an external readout device analog input to a BNC connector on a Model 493.76 Analog Out module.



2. **Create a readout channel with Station Builder.**

3. **Adjust the readout signal in Station Manager.**

   Use Station Manager to adjust the readout signal.

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Multi-Box I/O Module

The optional Model 493.43 Multi-Box I/O module allows multiple controllers to share a master hardware synchronization clock and pass station interlock state information between each other. In addition, this front panel module also provides user station interlock inputs and outputs.

Module features

- 4 optically isolated station interlock inputs (J8)
- 4 station interlock outputs with relay contacts (J9)
- Box In (J51) and Box Out (J52) to connect multiple MTS controller boxes to share station interlock status and the master synchronization clock.
- 32 Mb FLASH disk on board
- Box address switch (software readable) allows you to set a unique address for each controller in a multi-box chain.

J8 Interlock IN

Connector **J8 Interlock IN** provides four station interlock inputs that can be connected to external interlock chains.

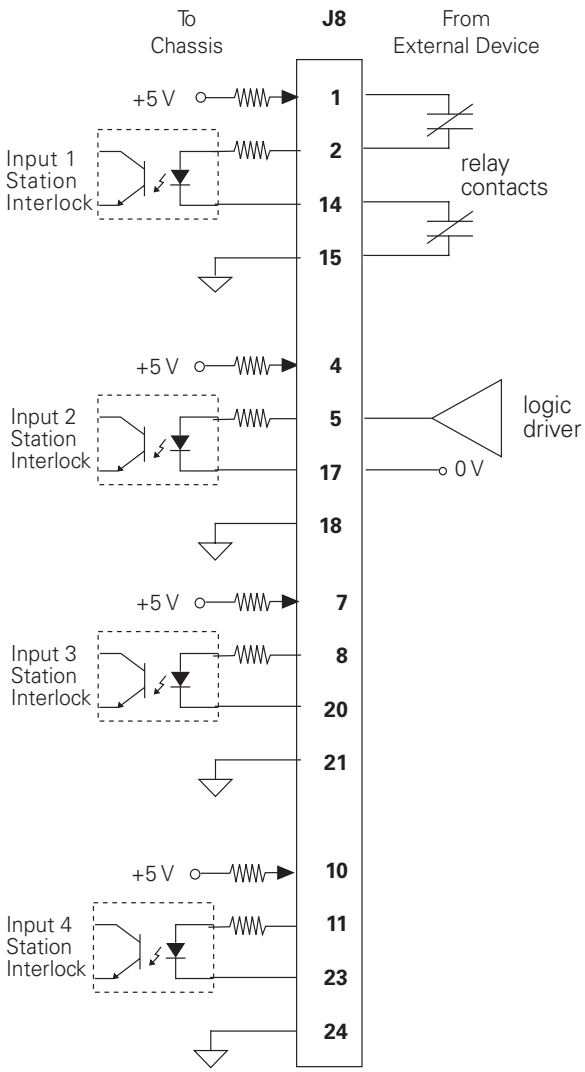
- Inputs 1 through 4 are dedicated as a station interlock.
- All inputs are optically isolated.

Electrical specifications

Refer to the following table for input electrical specifications:

PARAMETER	SPECIFICATION
Input Type	Contact (Open = Interlock) Logic (0 = Interlock)
Input Debounce Time	12-16 msec
Input Resistance	2.7 kΩ
Minimum Input Off Voltage	0.8 V (Interlock)
Maximum Input Voltage	26 V
Minimum Input On Voltage	3 V @ 1 mA (No Interlock)

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Cable specifications

- Connector: 25-contact, type D, male, EMI
- Backshell: EMI, metalized plastic
- Twisted pairs with overall braided shield. Braided shield is terminated to conductive backshell at the chassis.

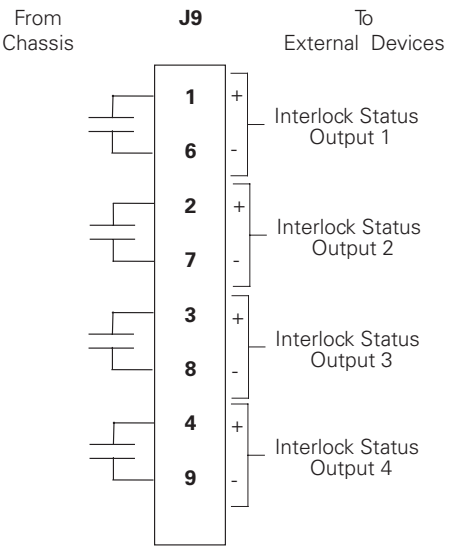
Jumper plug

Use MTS jumper plug PN 100-079-233.

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J9 Interlock OUT

Connector **J9 Interlock OUT** provides four station interlock outputs that can be connected to a multiple MTS controller box interlock chain.



Electrical specifications

Normally, Open = Interlock, 1 A maximum @ 30 V DC/AC maximum

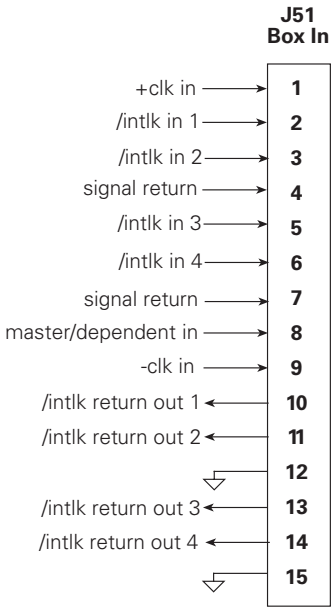
Cable specification

- Connector: 9-contact, type D, male, EMI
- Backshell: EMI metalized plastic
- Twisted pairs with overall braided shield. Braided shield is terminated to conductive backshell at the chassis.

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J51 Box In

The J51 Box In connector provides an interface for connecting multiple MTS controller boxes together to allow sharing of station interlock status and a master synchronization clock.



Master/dependent input

The master/dependent input setting (connector pin 8) determines whether a controller box is master or dependent in the multi-box chain. If this pin is jumpered to ground the controller is dependent, if not it is the master. Upon a CPU or interlock reset, software checks the state of this pin, and configures the controller box accordingly.

Cable specification

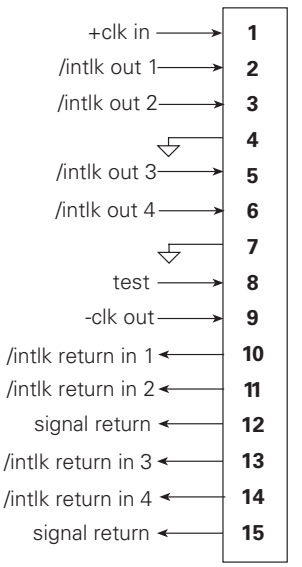
Use MTS cable PN 056-534-1xx.

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J52 Box Out

The J52 Box Out connector provides an interface for connecting multiple MTS controller boxes together to allow sharing of station interlock status and a master synchronization clock.

J52 Box Out



Last controller jumper

The last controller box in a chain must have a jumper plug (MTS PN 100-079-126) on its **J52 Box Out** connector. This jumper allows the return of the composite station interlock signal for all controllers in the chain to monitor.

Note *If there is only one controller, a jumper is still required on its **Box Out** connector.*

Cable specification

Use MTS cable PN 056-534-1xx.

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Chapter 4

FlexTest IIm Controller Connections

Note *For information on connecting power cables, see "Connecting the Console and Chassis Power" on page 59.*

Note *For information about CE compliance, see "CE EMC Compliant Cabling" on page 74.*

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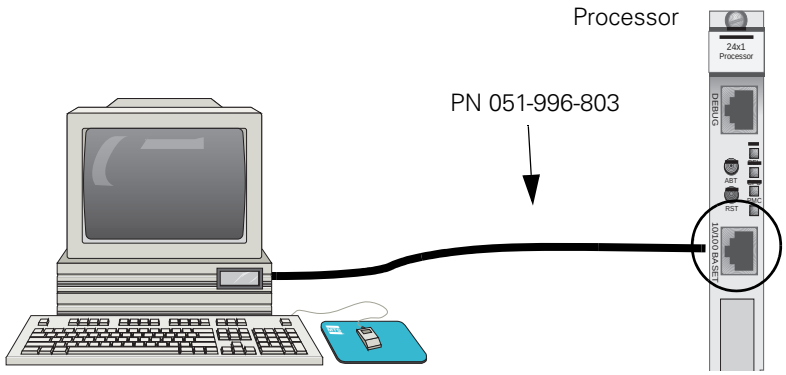
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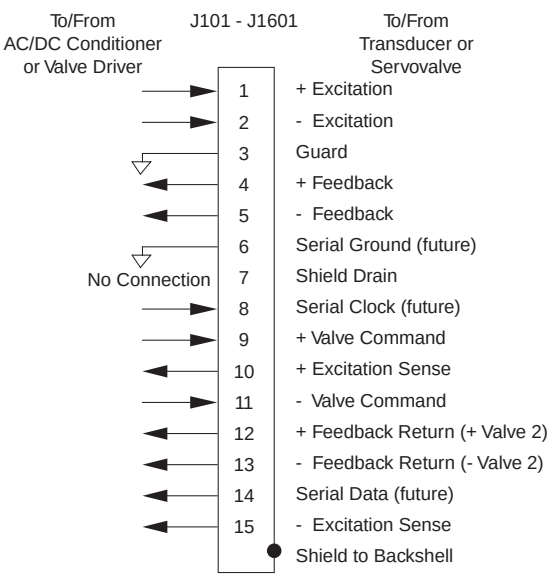
Workstation Connection

Connect the computer's network interface card to the **10/100 BaseT** connector on the front panel of the processor installed in slot 1.



Sensor and Valve Connections

The 497.01 Analog Chassis connectors **J101** through **J1601** are 15-pin D-type connectors located on the chassis rear panel. They connect either a valve driver to a servovalve or a conditioner to a transducer. Connectors **J102** through **J1602** provide a second connection for dual conditioners, dual valve drivers, or three-stage valve drivers.



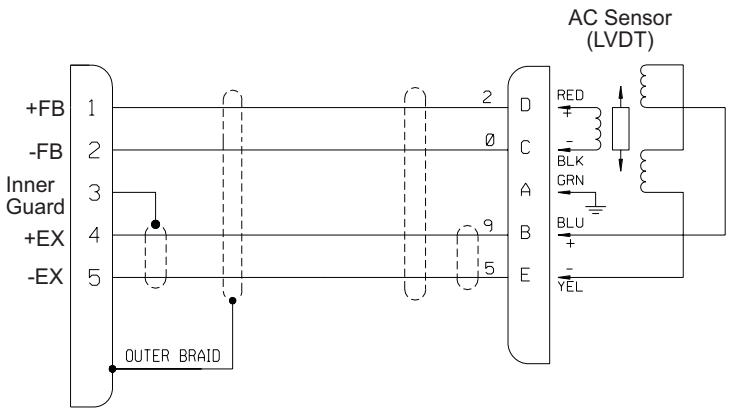
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Cable specification

Cable (sensor)–Two twisted shielded pairs with an overall braided shield (MTS material 003-724-401). Cable outer shield drain wire to pin 7 (optional) and cable outer braid folded back under the EMI backshell clamp.

Cable (valve)–18 AWG, 4-conductor shielded (Belden 9418 or equivalent). Cable outer shield drain wire to pin 7 (optional) and to the EMI backshell.

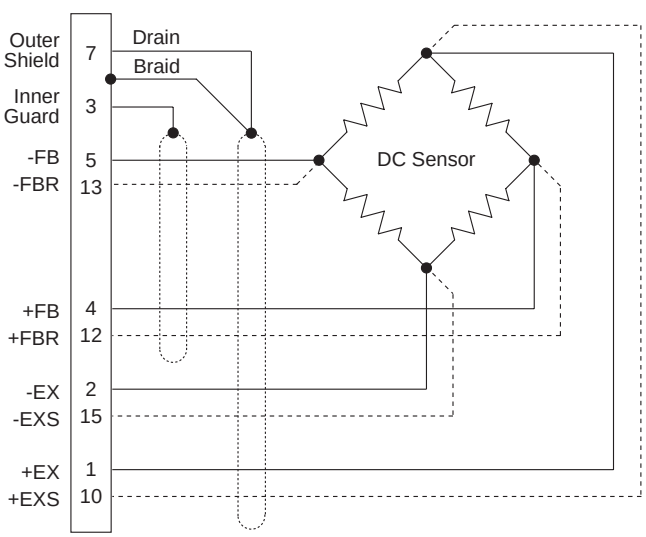
AC sensor connection



DC sensor connection

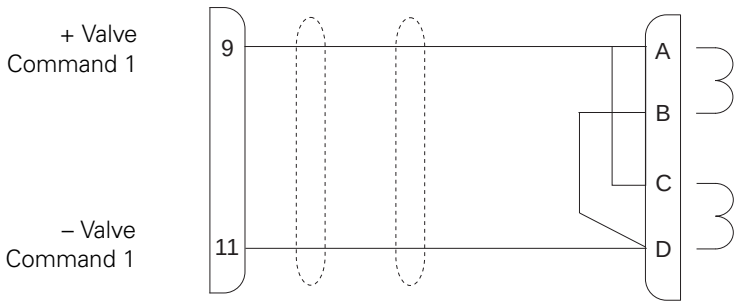
4-wire connections are the most common. An 8-wire connection is typically used for long cables.

The additional wires for an 8-wire connection are shown with dashed lines.

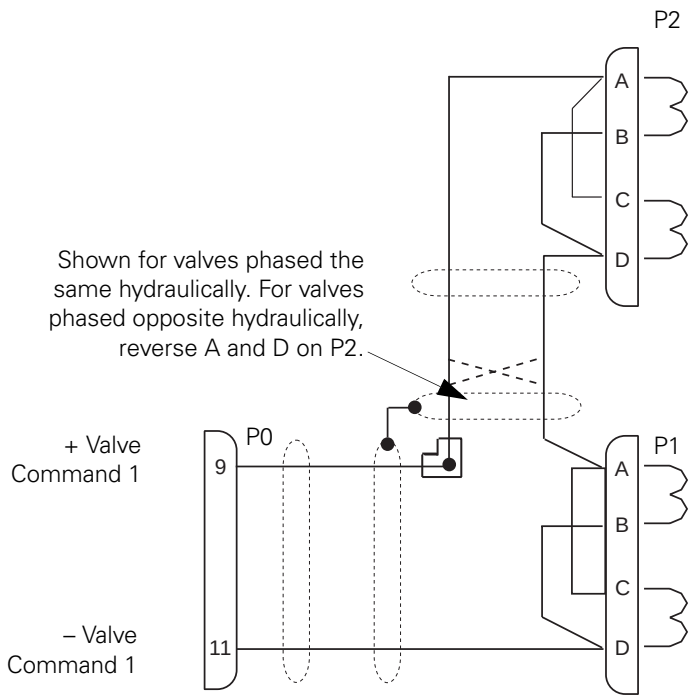


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Single-valve connection



Dual-valve connection

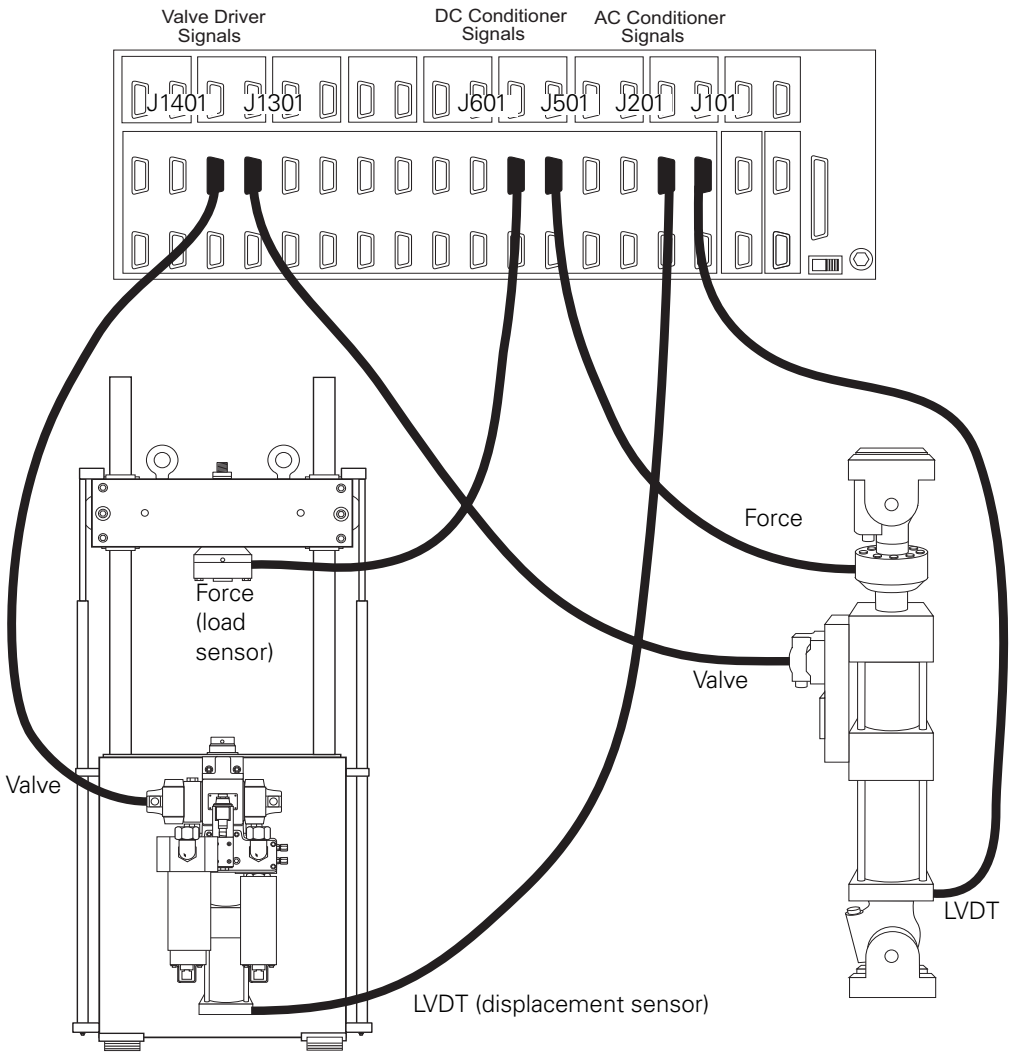


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Sample control channel

The following graphic illustrates sample connections to a sensor and a servovalve.

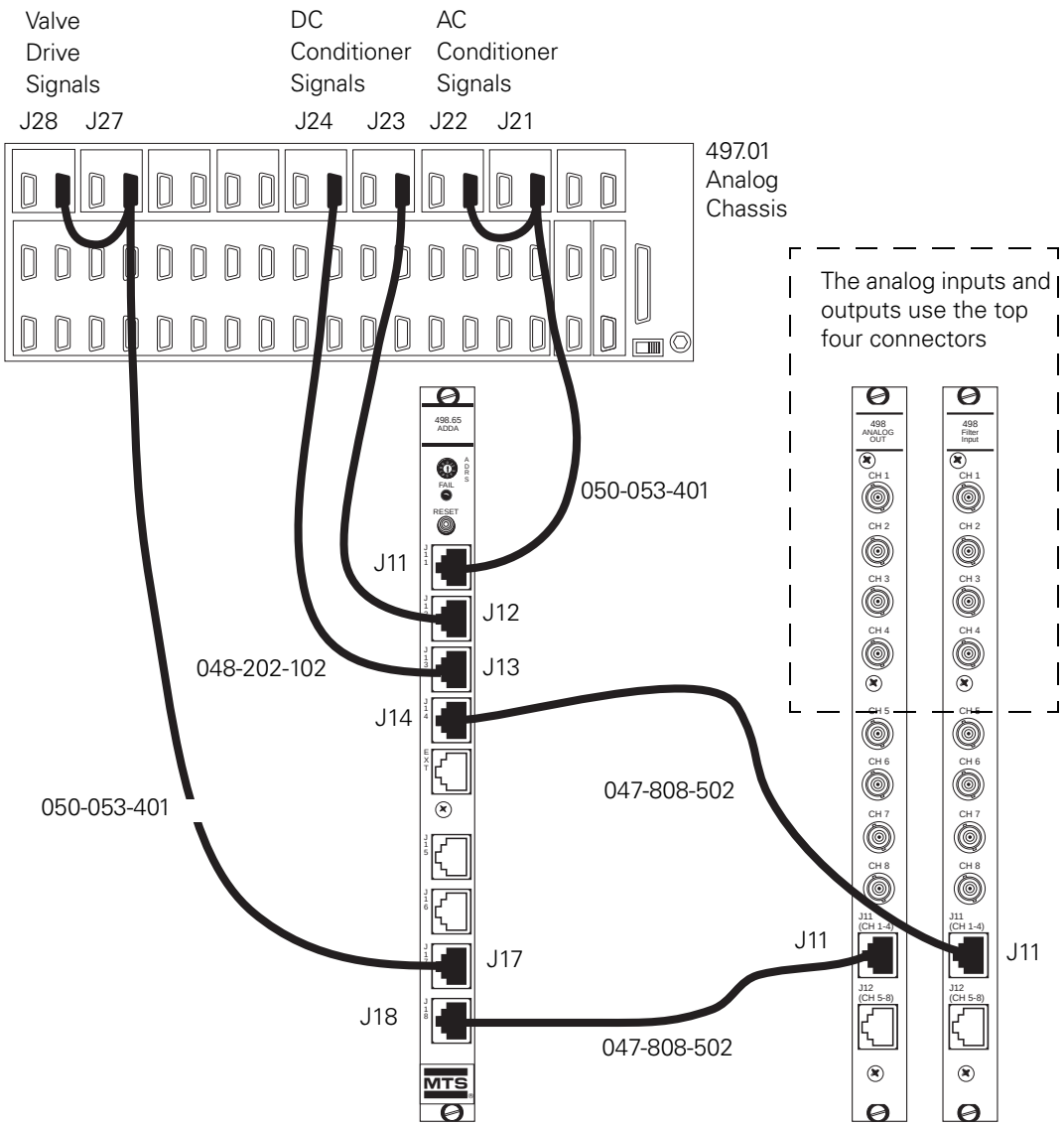
Model 497.01 Analog Chassis Rear Panel



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ADDA Module Connections

In order to process A/D and D/A signal conversion, you must connect your Model 497.01 Analog Chassis to your Model 498.65 ADDA plug-in module. The following graphic illustrates the connections for a Model 497.01 Analog Chassis containing four AC conditioners, dual DC conditioners, and valve drivers.



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ADDA II Connections

Each optional Model 493.50 ADDA II module supports up to four mezzanine cards. Each installed mezzanine card is assigned a specific ADDA II module front panel connector (**J11–J18**).

A hardware interface file (hwi) defines each type of module (and their associated mezzanine cards) and maps each module location for the system software. The hwi file and the physical locations for each type of module and associated mezzanine cards must match. Also, the ADDA II module address setting (on the module) must match the hwi file address.

The following mezzanine cards can be installed:

- Model 493.55 A/D
- Model 493.56 D/A
- Model 493.57 DSPAD
- Model 493.59 Universal Encoder

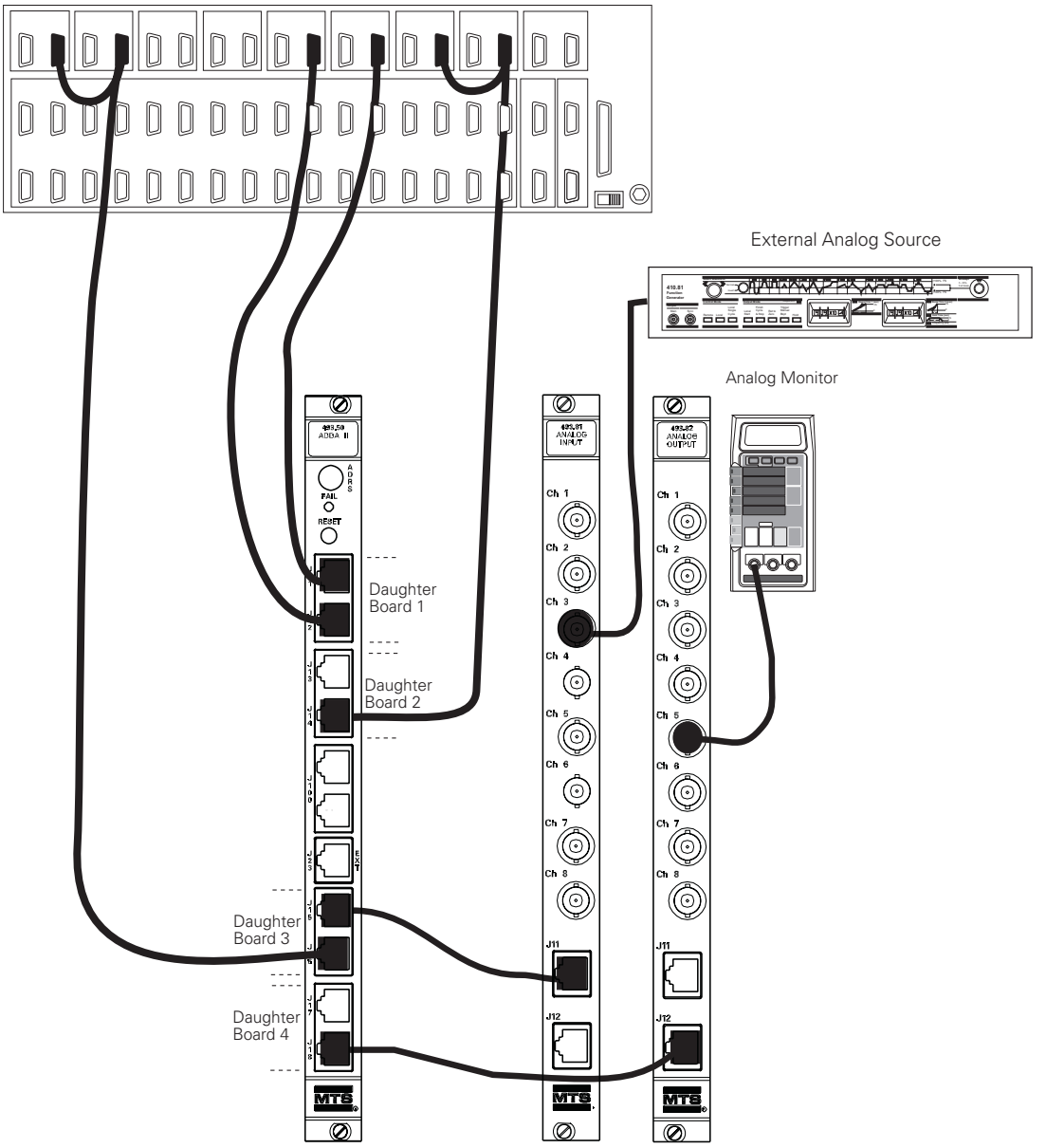
ADDA II Module I/O Connections

The Model 493.55 A/D, Model 493.57 DSPAD, and Model 493.56 D/A mezzanine cards can be installed in the Model 493.50 ADD II module assembly as needed. A connection from the front panel connector to a rear panel BNC transition module allows easy access to the analog channels.

Note *The external analog source can be a stand alone function generator, another controller, or a computer controlled analog output.*

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ADDA II Module I/O Connections

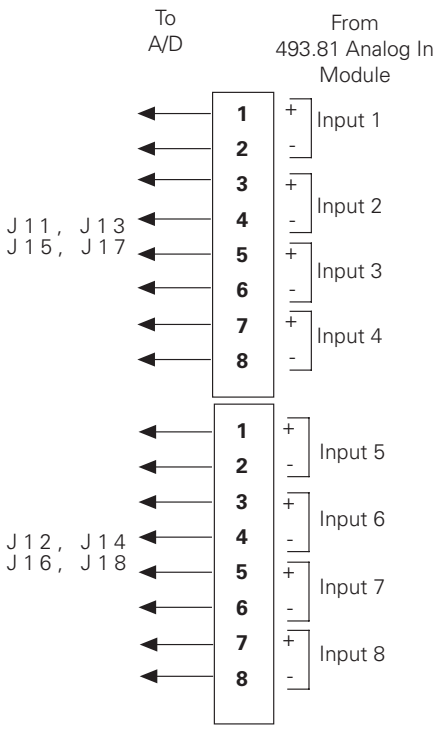


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Analog inputs

The analog-to-digital mezzanine cards accommodate up to eight analog input signals. Each A/D input signal must be within ±10 volts.

- Analog inputs can be connected at the BNC connectors of a Model 493.81 Analog In transition module and the outputs from this module are connected to the Model 493.50 ADDA II module. This configuration is typically used for DSPAD mezzanine cards that provide on-board digital filtering.
- Analog inputs can be connected at the BNC connectors of a Model 493.83 Filtered Analog Input transition module and the outputs from this module are connected to the Model 493.50 ADDA II module. This configuration is typically used for A/D mezzanine cards that requires filtering.



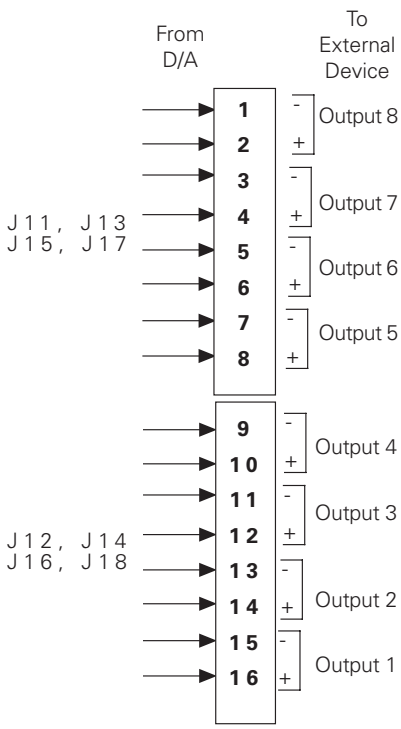
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D/A Connections

Digital-to-analog mezzanine cards support up to eight program or readout signals to external devices. Each D/A signal is an analog output within ±10 volts.

- Each readout signal is from a 16 bit digital to analog converter.
- Each output is a ±10 V analog output.
- The Model 493.56 D/A mezzanine card provides analog signals to the Model 493.82 Analog Out transition module. Analog outputs are available at the BNC connectors of a Model 493.82 Analog Out transition module for external devices (DVM, oscilloscope)

.

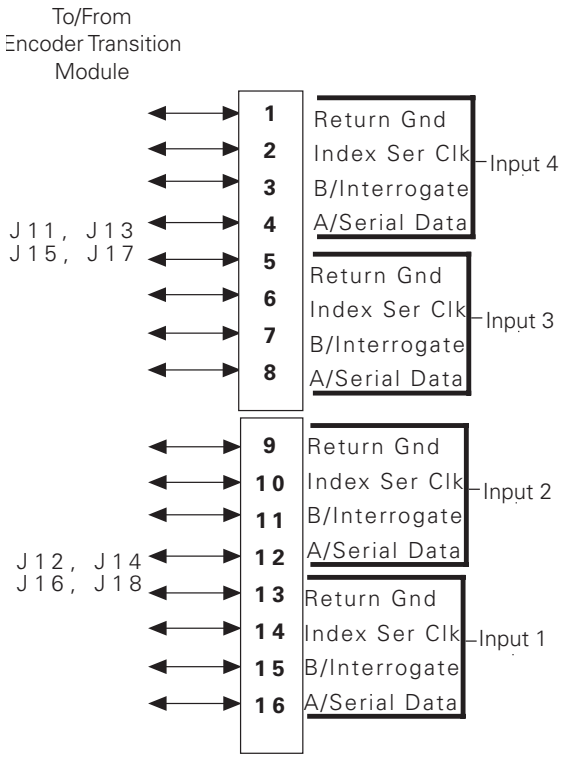


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ADDA II Universal Encoder Connections

Each encoder requires a Model 493.59 Universal Encoder mezzanine card installed on the Model 493.50 ADDA II module.

Up to sixteen encoders can be connected to the Model 493.80 ADDA II Encoder Transition module when the Model 493.50 ADDA II module is fully populated with Universal Encoder cards.

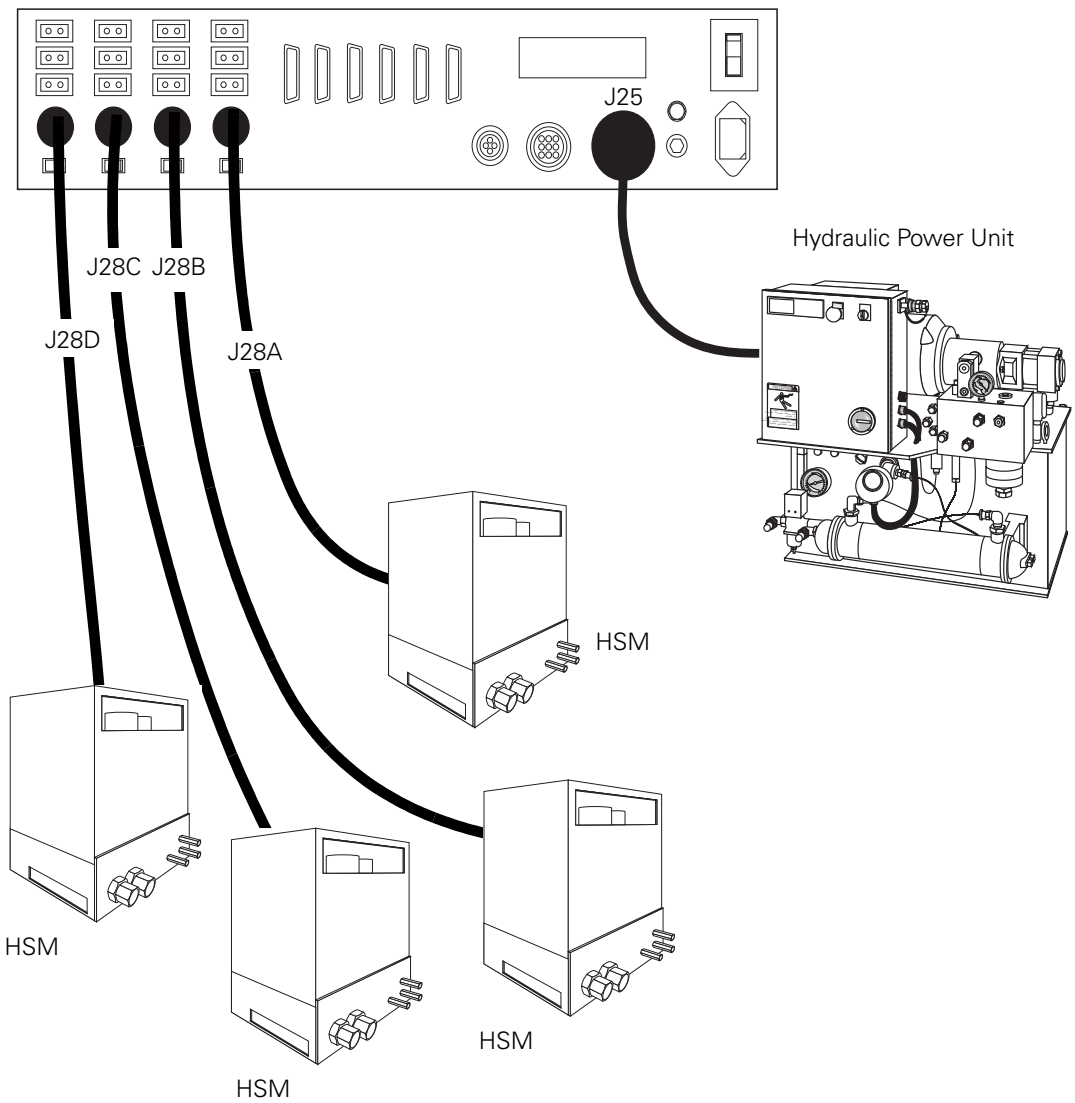


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Hydraulic Connections

You must connect your external hydraulic equipment to the Model 497.05 Hydraulic Control Panel. The FlexTest IIm hardware supports control of up to four hydraulic stations simultaneously.

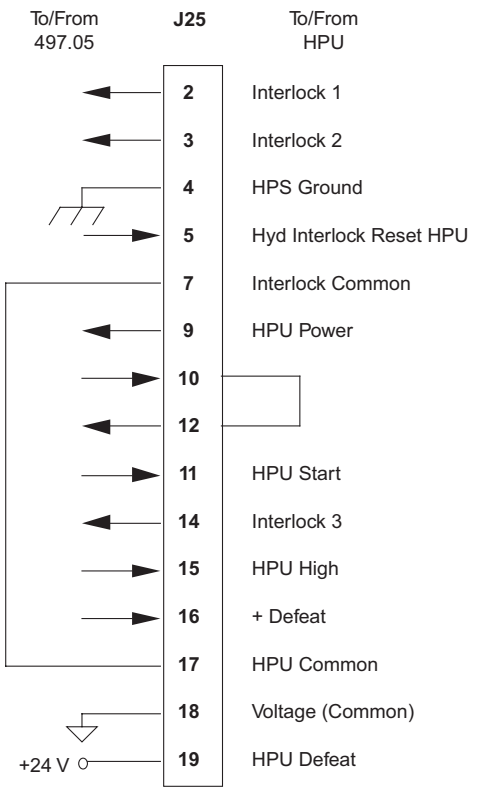
FlexTest IIm Hydraulic Connections



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HPU Connections

Connector J25 controls the hydraulic power unit.



Cable specification

- P25 is a 24-contact CPC female connector (AMP Incorporated)
- Cable—18 AWG, 14 conductor rated for 300 V
- Compatible with MTS 24 V DC or 115 V AC control cables
- Cable assembly numbers PN 039-708-7XX (24 V DC), 039-708-8XX (115 V AC)
- Uses special MTS cable material (PN 044-297-301)

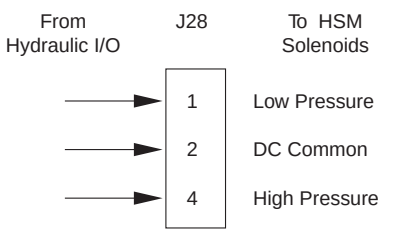
Jumper plug

If an HPU is not connected to the digital controller, a jumper plug is required to maintain the integrity of the interlocks. Use jumper plug 039-719-901 or jumper pins: 2 and 3; 3 and 7; 9 and 19; 10 and 12; 11 and 16; 17 and 18.

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HSM Connections

The outputs provide 24 V DC to turn on the HSM solenoids.



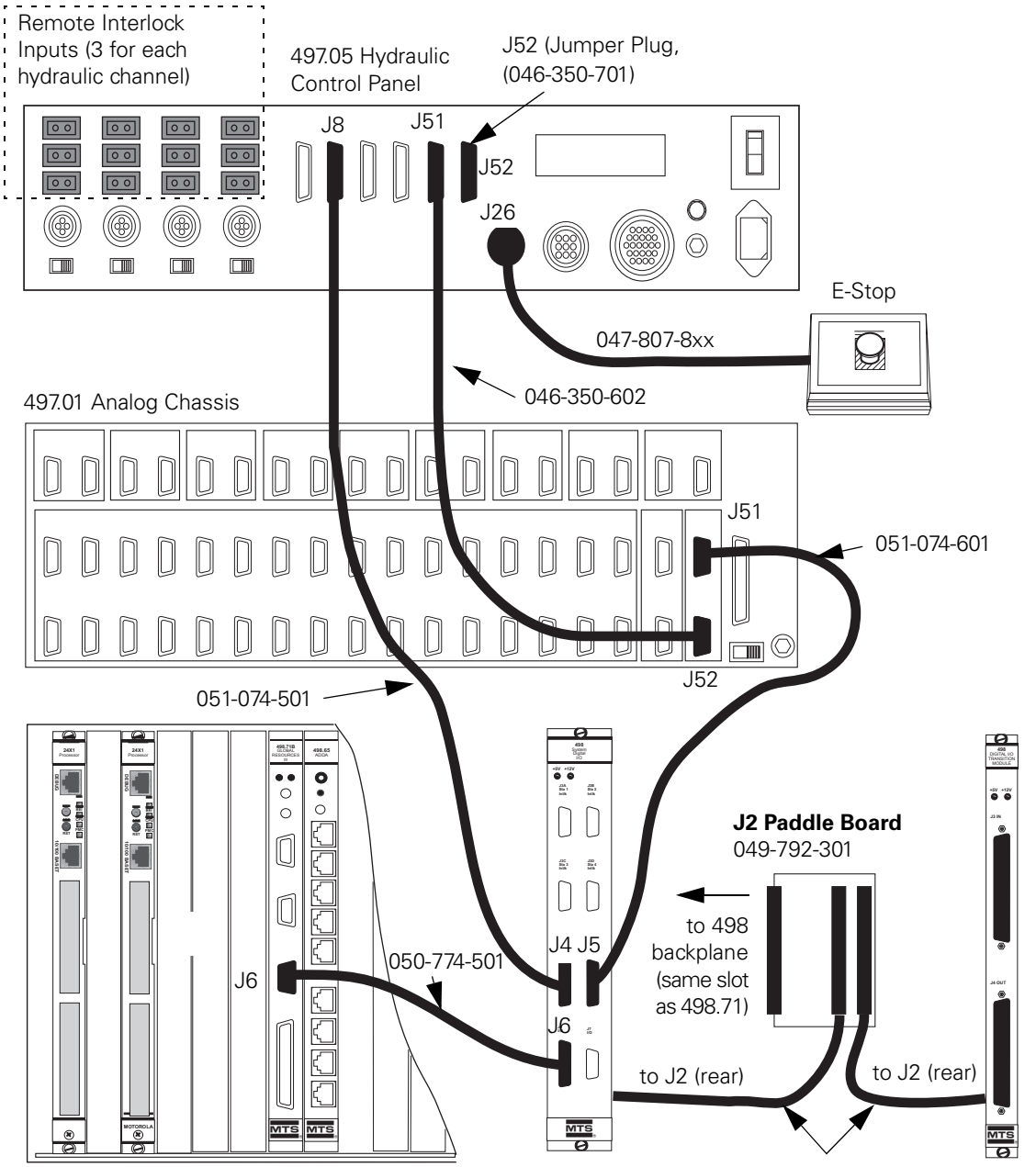
Connector J28 controls the low-pressure and high-pressure solenoids of a hydraulic service manifold.

Cable specification

- P28 is a 4-contact CPC male connector (AMP Incorporated).
- Cable–18 AWG/2 connector type SJOOW-A for on/off HSMs 18 AWG/3 connector type SJOOW-A for high/low HSMs
- Cable assembly numbers:
  - 290.XX HSM, on/off, 24 V DC, PN 039-705-3XX 18/2 SJO
  - 290.XX/294.XX HSM, high/low, 24 V DC, PN 039-705-5XX 18/3 SJO
  - 298.11 HSM, on/off, 24 V DC, PN 039-708-1XX 18/2 SJO

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Interlock Connections



The System Digital I/O and Digital I/O transition modules along with the paddle board are located on the rear panel of the 498.XX Test Processor.

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Interlock Jumper Plugs

Several jumper plugs must be installed to maintain the integrity of the interlock chain. Each jumper plug represents a place where you can add a custom connection to the interlock chain.

497.05 Hydraulic Control Panel

Any interlocks connected to the hydraulic control panel will generate a hydraulic interlock which shuts down the hydraulic power supply. This type of interlock shuts down all test stations.

- Connector **J52** requires a jumper plug to close the interlock chain.
- If **J26** is not connected, it needs a jumper plug.
- Connectors **J15A–J17C** (Remote Interlock Inputs) each require a jumper plug unless it is being used. Jumper both pins of each connector.

498 System Digital I/O

Any interlock connected to the 498 System Digital I/O transition module can generate a station interlock to disable pressure (the HSM) to that station.

The 498 System Digital I/O transition module supports:

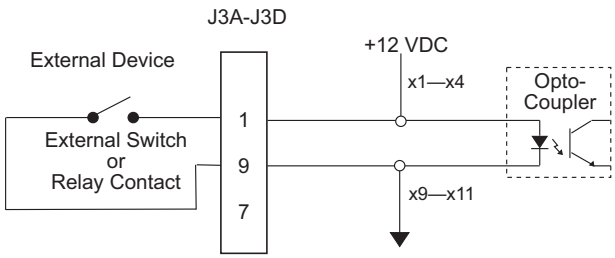
- Four stations of Hydraulics On digital inputs
- Four stations of Hydraulics Hi digital inputs
- Four stations of Hydraulics Enables
- Four stations of Remote Stop/Run outputs
- Four stations of program interlocks
- Four stations of auxiliary interlocks
- Four stations of 497 interlock inputs
- Four stations of 497 interlock outputs
- Four stations of auxiliary interlock inputs
- Four stations of auxiliary interlock outputs
- Two spare digital inputs
- Two spare digital outputs

The interlock connectors require jumpers under the following conditions:

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- If you do not use the external hydraulic/program interlocks on any of the D-15S connectors (**J3A Sta 1**, **J3B Sta 2**, **J3C Sta 3**, and **J3D Sta 4**). Use an external jumper plug (PN 052-750-501) on each connector not used.
- If you use the system digital I/O as a standalone unit. That is, if you do not connect the System Digital I/O Module to a 497.xx Chassis, you must use an external jumper plug (PN 050-774-701) on the **J5 497 Intlk** connector.

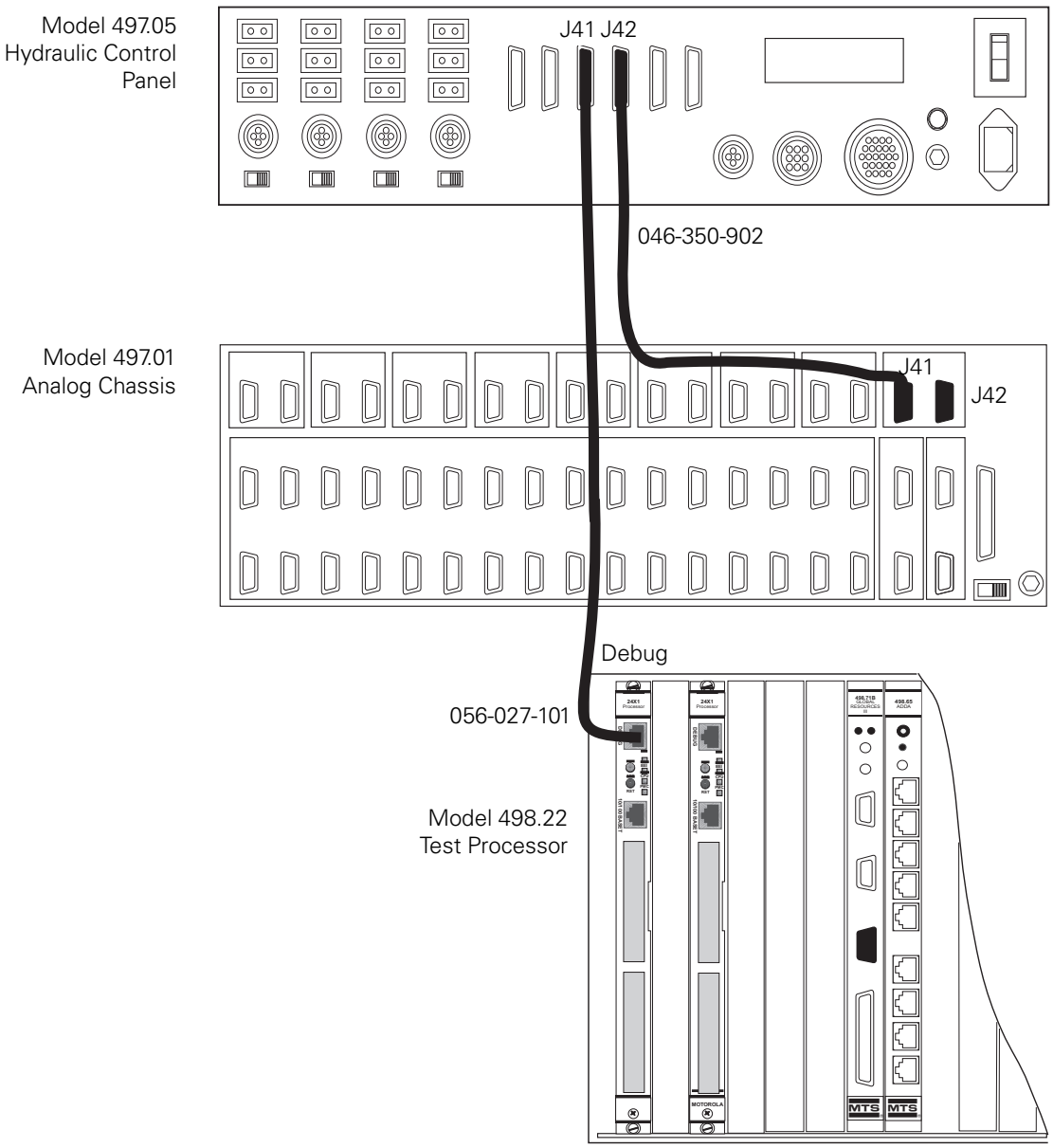
This shows how to connect an external switch or set of relay contacts to one of the station interlocks:



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Serial Communications

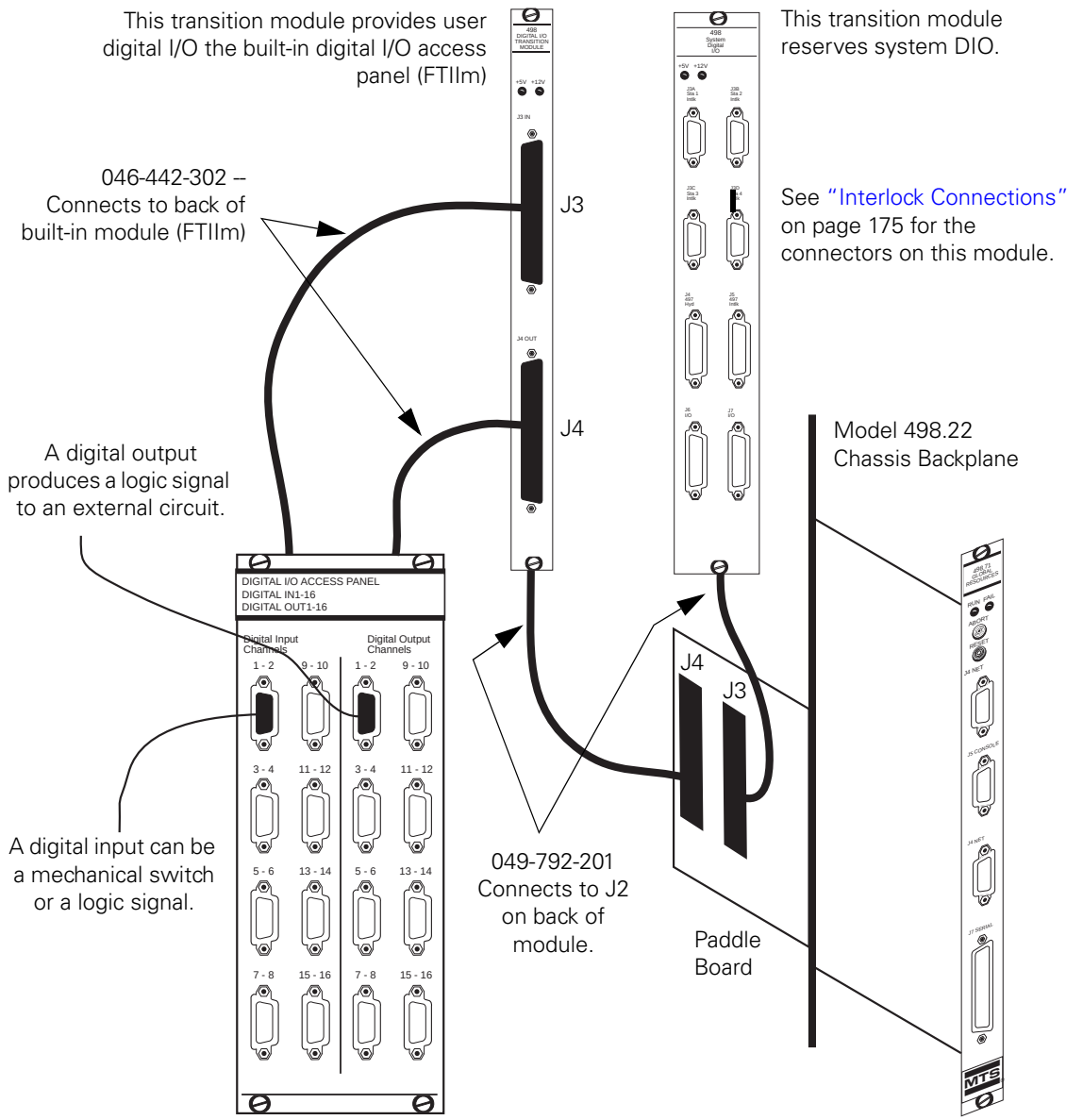
Each chassis communicates with each other through a serial communications cable.



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Digital I/O Connections

Digital I/O hardware enables two-way communication between your test and external logic devices.



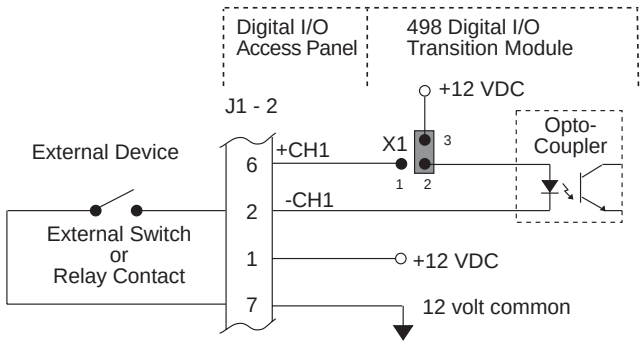
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Digital inputs

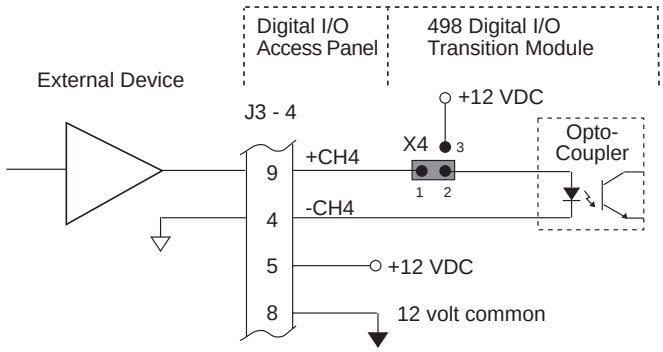
- Digital inputs can be wired to allow the input from a switch contact, a relay contact, or a logic signal.
- All digital inputs are optically isolated at the 498 Digital I/O transition module.
- For example, an action defined in the can be selected, in the Station Setup window's Digital Input panel, as an Action
- The digital inputs are used by the Digital Input process in the MultiPurpose TestWare application. They can also be monitored from the Station Manager application.
- You can use the Event-Action Editor window to define an action that occurs in response to a digital input event. The defined action can then be selected in the Station Setup window's Digital Input panel.
- Sixteen jumpers located on the 498 Digital I/O transition module allow each input to be configured for a relay contact or logic signal.
- Each digital input connector on the built-in Digital I/O Access panel (FlexTest IIm) supports two channels.
- Each digital input supports a differential TTL to +30 V DC signal or a switch or relay contact switching the on-board 12 V supply.

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This shows how to connect an external switch or a set of relay contacts to channel 1 of the digital inputs.



This shows how to connect an external logic signal to channel 4 of the digital inputs.

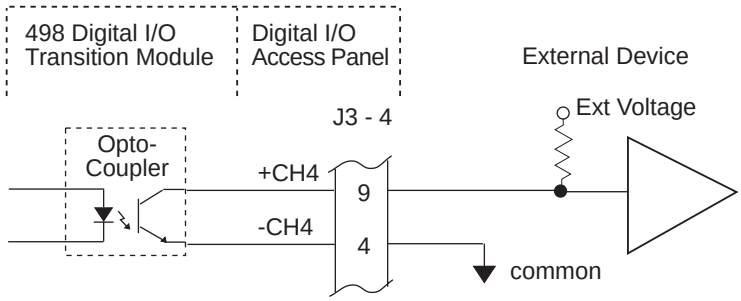


Digital Outputs

- Digital outputs provide an optically isolated open collector/open emitter output.
- The digital outputs are controlled by the Digital Output process in the MultiPurpose TestWare application. They can also be controlled manually in the Station Manager application.
- Each digital output connector located on the Digital I/O Access Panel supports two channels.
- Each digital output is an open collector/open emitter rated at 30 V DC max at 50 mA max.

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This figure shows how to connect to an external circuit using an external power supply.

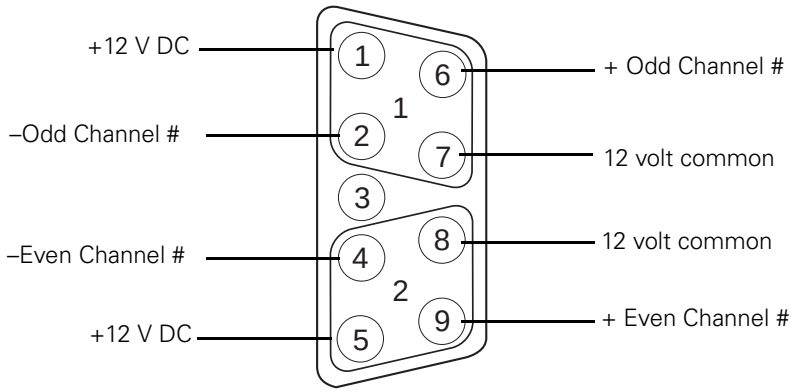


Connector pinouts

The pin connections for the digital inputs and digital outputs are the same. Each "D" style connector supports two channels.

For example, the pins associated with channels 1 and 2 are outlined.

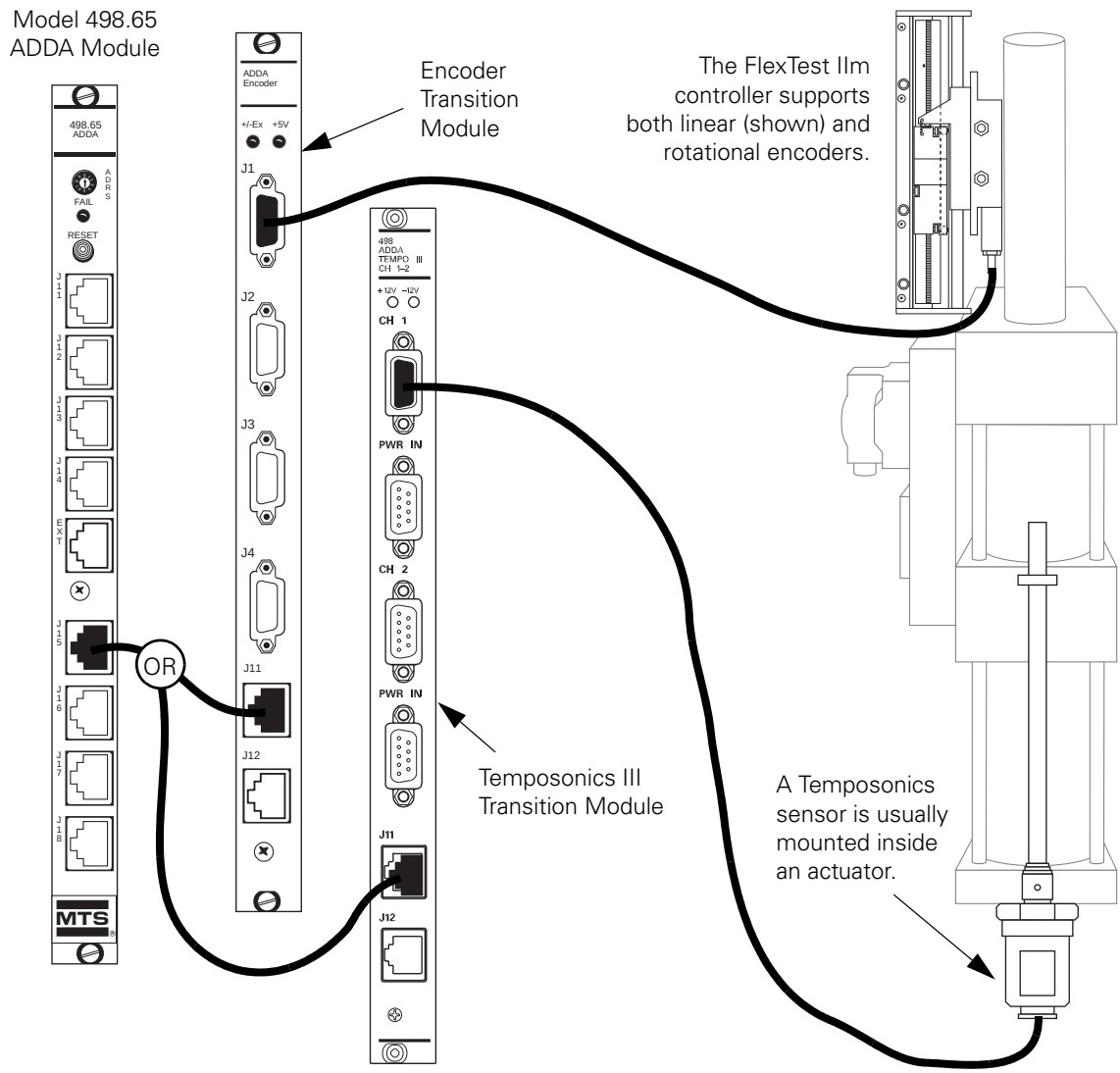
The 12 volt supply is reserved for the digital inputs and should not be used to power external devices (it is rated for maximum 250 mA current).



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Encoder/Temposonics Connections

Encoders and Temposonics® sensors are connected to the FlexTest IIm controller in a similar way. Each type of sensor requires a different jumper configuration on the Model 498.65 transition module and a different mezzanine card for the 498.65 ADDA Module.



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Jumper configurations

The 498 transition module can be configured for a Temposonics sensor, a 5 V DC encoder, a 12 V DC encoder, a 24 V DC encoder. The following is a list of the configuration drawings:

- 049-035-301Absolute Encoder
- 049-035-401+5 Volt Encoder
- 049-035-501+12 Volt Encoder
- 049-035-601+24 Volt Encoder
- 049-035-701Temposonics II
- 053-070-201Temposonics III

ADDA mezzanine cards

The ADDA module requires special mezzanine cards to support encoders and Temposonics sensors.

mezzanine cards for encoders and Temposonics sensors support four input channels.

mezzanine cards for multiturn encoders (Heidenhain 417/425) and Temposonics III position sensors support two channels.)

- The encoder mezzanine card counts pulses from the encoder to determine the displacement of an actuator.
- The Temposonics mezzanine card interprets the pulses from the Temposonics sensor to determine the displacement of an actuator.

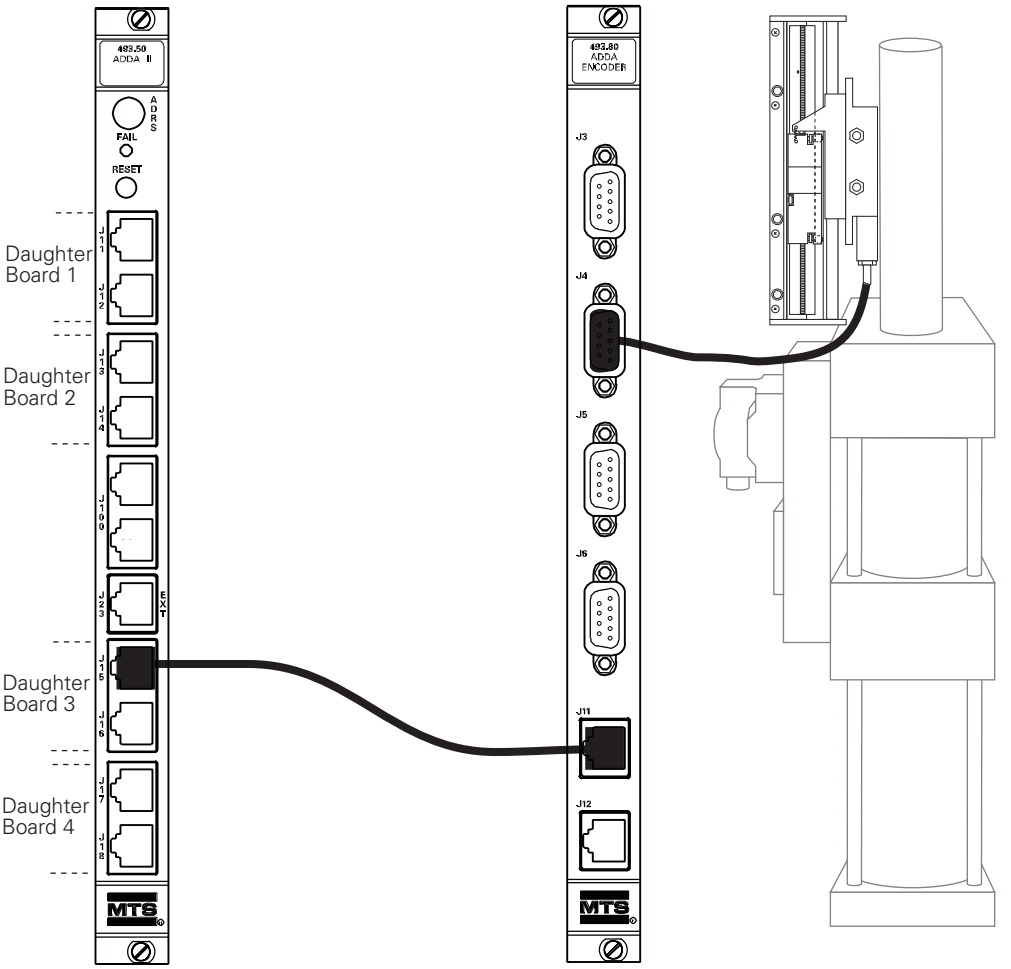
Optional ADDA II Configuration

For the optional ADDA II configuration (using the Model 493.50 ADDA II module), each encoder requires installation of a Model 493.59 Universal Encoder mezzanine card on the Model 493.50 ADDA II module.

The Model 493.80 Encoder Transition module provides up to four channels of encoder interface between the Model 493.50 ADDA II module and various incremental, Temposonics, or other digital and serial data transducers.

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ADDA II Configuration

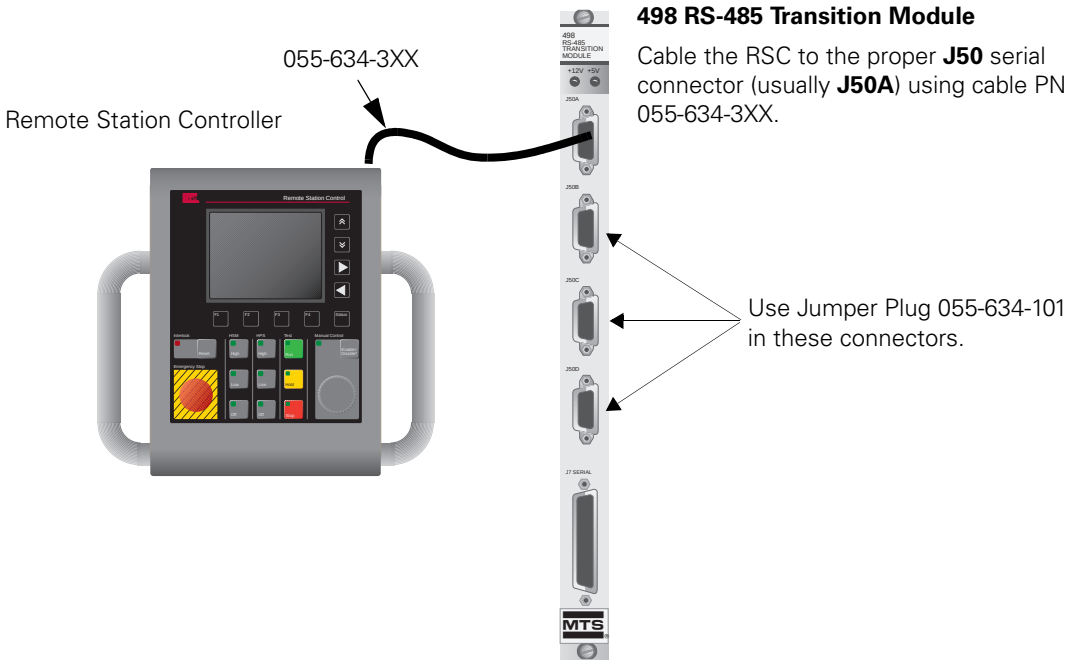


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Remote Station Controller (RSC) Connections

When equipped with a GRES III plug-in module and a corresponding 498 RS-485 transition module, your FlexTest IIm controller can accommodate up to four remote station controllers (one RSC for each station).

Each RSC connects to a **J50** serial connector on the 498 RS-485 transition module. The hwi file defines which connector is used for each station.



hwi file additions

In order to use one or more RSCs with your FlexTest controller, two sections must be added to your hwi file, an RSC section and a GRES III section.

Note *If you specified RSC support when you ordered your test system, these sections will be added to your hwi file at the factory.*

Note *For information on editing your hwi file to accommodate RSCs, refer to the Hwi File Editor manual.*

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Cabling and Programming External Controllers

Cabled properly, you can use your FlexTest controller to send test commands to another controller. For detailed setup information, see "How to Program an External Controller" on page 187.

When programming Series 2200 and 2400 Eurotherm temperature controllers, the FlexTest IIm controller supports a special serial connection and software setup. For more information, see "Programming Eurotherm Temperature Controllers" on page 191.

How to Program an External Controller

To send programming to an external controller, you must:

1. "Cable the controllers." on page 187.
2. "Create your configuration file with Station Builder." on page 190.
3. "Adjust the signals with Station Manager." on page 190.
4. "Set up your program." on page 191.

Task 1 Cable the controllers.

Standard Configuration

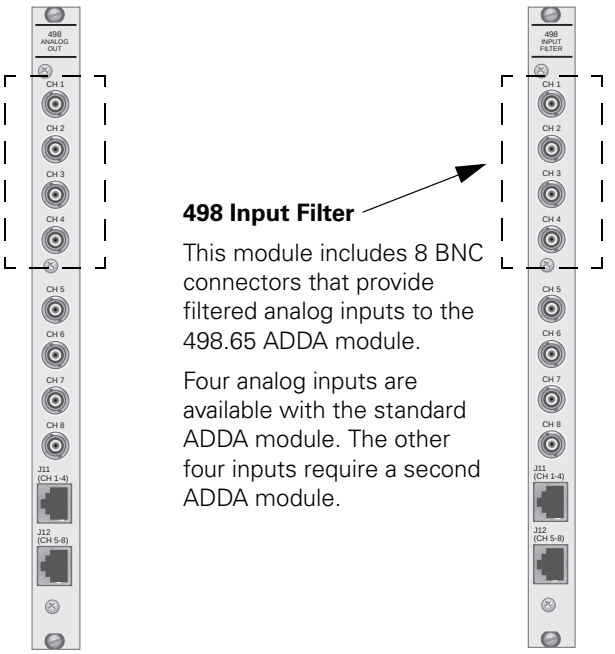
For a standard configuration (using the 498.65 ADDA module), cable the analog inputs and outputs between your FlexTest controller and the external controller. Analog I/O connectors are located on the rear of the test processor chassis.

1. Connect a 498 Analog Out connector to the external controller program (analog) input.
2. If you will monitor sensor feedback for data acquisition or control feedback, connect the external conditioner output to a 498 Input Filter connector.

   For conditioner output locations on various MTS devices, see "Sample conditioner output connections" on page 190.

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Transition modules on the back of the 498 test processor chassis are used for analog inputs and outputs.



498 Analog Out

This module includes 8 BNC connectors that provide analog outputs from the 498.65 ADDA module.

Four analog outputs are available with the standard ADDA module. The other four outputs require a second ADDA module.

498 Input Filter

This module includes 8 BNC connectors that provide filtered analog inputs to the 498.65 ADDA module.

Four analog inputs are available with the standard ADDA module. The other four inputs require a second ADDA module.

WARNING

Do not interrupt FlexTest controller power when you are programming another controller. A power interrupt may cause the external controller to react to a zero command and move the actuator unexpectedly.

Ensure power cannot be removed accidently while a test is in progress.

Optional ADDA II Configuration

For the optional ADDA II configuration (using the Model 493.50 ADDA II module), cable the analog inputs and outputs between the FlexTest controller and the external controller as follows:

Note *Analog I/O connectors are located on the rear panel of the 498 test processor chassis.*

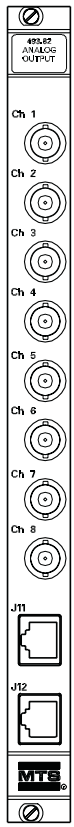
1. Connect a 493.82 Analog Out BNC connector to the external controller program (analog) input.
2. If you will monitor sensor feedback for data acquisition or control feedback, connect the external conditioner output to a 493.83 Filtered Analog Input BNC connector.

   For conditioner output locations on various MTS devices, see "Sample conditioner output connections" on page 190.

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Transition Module Connections

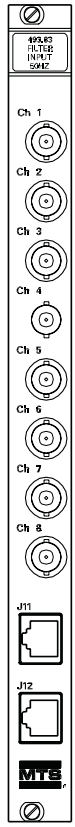
Transition modules on the rear panel of the 498 test processor chassis are used for analog inputs and outputs.



493.82 Analog Out

This module includes 8 BNC connectors that provide analog outputs from a Model 493.56 D/A mezzanine card.

Eight analog outputs are available with each D/A mezzanine card installed on the Model 493.50 ADDA II module.



493.83 Filtered Analog Input

This module includes 8 BNC connectors that provide filtered analog inputs to the Model 493.55 A/D mezzanine cards.

Eight analog inputs are available with the each A/D mezzanine card installed on the Model 493.50 ADDA II module.

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Sample conditioner output connections

This table shows connector assignments for various MTS products you can use with your FlexTest IIm controller.

Conditioning Sensors with Other MTS Products

MTS Product	Sensor Output
Model 408.81 Testing Panel/ Model 408.82 DC Conditioner	Sensor output is available at the rear-panel connector **J201** or **J202**.
Model 409.81C Temperature Controller	Temperature output (via an analog signal) is available at rear-panel connector **J1**.
Model 448.82/85 Test Controller with Model 448.21/22 AC and DC Conditioners	Sensor output is available at rear-panel connector **J335**. Ensure sensor conditioners are set as follows: X1: 2&3 X2: 2&3
Model 458.10/20 MicroConsole® with Model 458.11/12/13/14 AC and DC Controllers	Sensor output is available at the MicroConsole rear-panel connector **Jx03**. Connector **Jx03** represents the module location (J100–J600). MicroConsole jumper Jx00 should be set to 1&2 (standard setting).

Task 2 Create your configuration file with Station Builder.

Using Station Builder, define controller resources to provide programming to an external controller.

Refer to "How to Create Your Station Configuration File" and "Creating Program Channels" in the *MTS 793 Control Software* manual for more information.

Task 3 Adjust the signals with Station Manager.

Adjust Program Signal

Adjust the outgoing program signal for the required external controller channel.

Refer to "How to Adjust Program Output Signals" in the *MTS 793 Control Software* manual for more information.

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Adjust Feedback Signals

If you will monitor sensor feedback for data acquisition or control feedback, adjust the incoming feedback signals.

Refer to "How to Configure an Externally Conditioned Feedback Signal" in the *MTS 793 Control Software* manual for more information.

Task 4 Set up your program.

Define a program with the Function Generator, Basic TestWare, or Multipurpose TestWare applications.

Using Function Generator

Refer to "How to Program with the Function Generator" in the *MTS 793 Control Software* manual.

Using Basic TestWare

The Basic TestWare application allows you to create simple test programs that do not require complex signal management or mode switches for station configuration files.

Refer to "Defining the Test Command" in the *MTS 793 Control Software* manual.

> ***Note*** *It is good practice to use tapered wave shapes to apply the program command to the external controller slowly.*

Using MultiPurpose TestWare

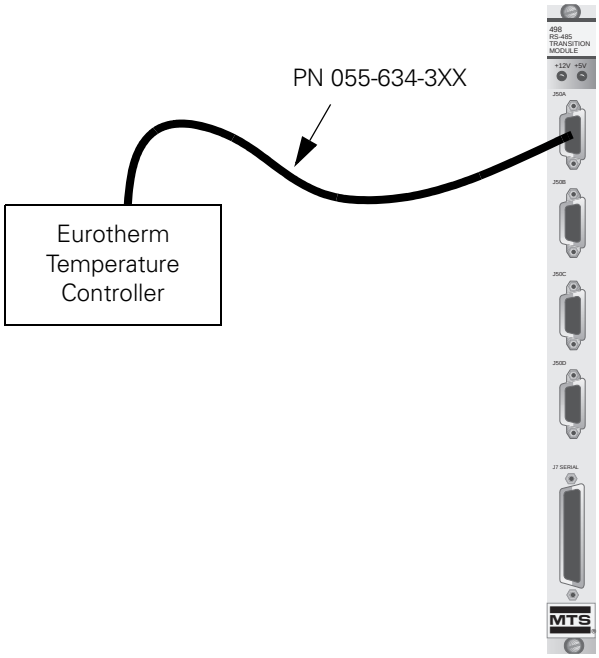
To create more sophisticated test programs use the optional MultiPurpose TestWare application.

Refer to the *MTS 793 Application Software* manual.for more information.

Programming Eurotherm Temperature Controllers

When equipped with a GRES III plug-in module, your FlexTest IIm controller can program and control one or more Series 2200/2400 Eurotherm Temperature Controllers via the **J50** serial connectors on the 498 RS-485 transition module.

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498 RS-485 Transition Module

Cable the Eurotherm temperature controller to the proper **J50** serial connector using cable PN 055-634-3XX.

J50 connector

The **J50** connectors provide two-way communication between the FlexTest controller and the Eurotherm temperature controller.

Temperature controller hardware resource

For more information on adding the Eurotherm hwi file resource, see the Hwi File Editor manual.

Program Eurotherm Temperature Controller

Use Station Builder to configure a Eurotherm temperature controller.

Refer to "How to Program a Eurotherm Temperature Controller" in the *MTS 793 Control Software* manual for more information.

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Cabling for External Command Inputs

Cabled properly, your FlexTest controller can receive programming from an external controller.

How to Enable and Run External Command Inputs

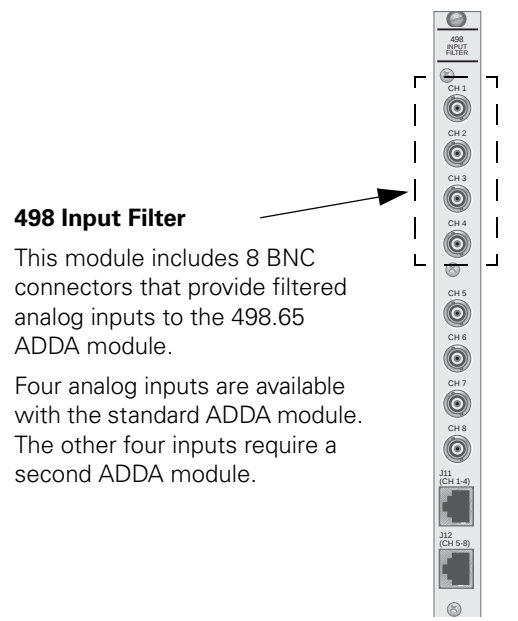
To enable an external command source, perform the following:

1. "Cable the controllers." on page 193.
2. "Allocate external command resources in Station Builder." on page 194.
3. "Adjust the command signal with Station Manager." on page 194.
4. "Start the External Command." on page 194.

Task 1 Cable the controllers.

Cable the external programmer analog out connector to a 498 Input Filter connector. Analog I/O connectors are located on the rear of the test processor chassis.

Note *If you cable the hardware before you create a station configuration file, note the connector you use on the FlexTest IIm rear console.*



498 Input Filter

This module includes 8 BNC connectors that provide filtered analog inputs to the 498.65 ADDA module.

Four analog inputs are available with the standard ADDA module. The other four inputs require a second ADDA module.

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Task 2 Allocate external command resources in Station Builder.

Using Station Builder, allocate controller resources to receive programming from an external controller.

Refer to "Enabling External Command Inputs" in the *MTS 793 Control Software* manual. for more information.

Task 3 Adjust the command signal with Station Manager.

Refer to "How to Enable and Run External Command Inputs" in the *MTS 793 Control Software* manual for more information.

Task 4 Start the External Command.

Refer to "How to Enable and Run External Command Inputs" in the *MTS 793 Control Software* manual for more information.

Cabling and Using External Readout Devices

Cabled appropriately, your FlexTest controller can send station signals to external readout devices such as oscilloscopes and digital-volt-meters. You define which signal is sent to the readout device with the **Adjust Readouts** window.

For a diagram and description of signals available to the station, refer to "Station signal descriptions" on page 152.

How to Send Signals to External Readout Devices

To send station signals to an external readout device, you must:

1. "Cable your controller to the readout device." on page 195.
2. "Create a readout channel with Station Builder." on page 195.
3. "Adjust the readout signal in Station Manager." on page 195.

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Task 1 Cable your controller to the readout device.

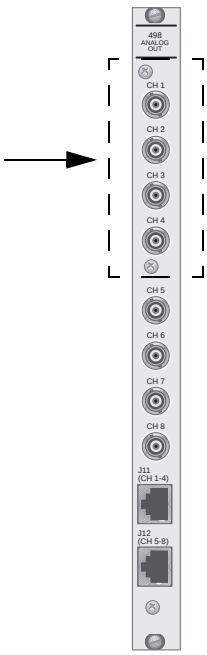
Cable your FlexTest IIm analog output connector to the readout device. Analog I/O connectors are located on the rear of the test processor chassis.

Connect a 498 Analog Out connector to the external readout device analog input.

498 Analog Out

This module includes 8 BNC connectors that provide analog outputs from the 498.65 ADDA module.

Four analog outputs are available with the standard ADDA module. The other four outputs require a second ADDA module.



Task 2 Create a readout channel with Station Builder.

Refer to "How to Create a Readout" in the *MTS 793 Control Software* manual for more information.

Task 3 Adjust the readout signal in Station Manager.

Use Station Manager to adjust the readout signal.

For a detailed description of readout signal configuration and adjustment, refer to "How to Configure a Signal for External Readout" in the *MTS 793 Control Software* manual for more information.

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Cable Part Numbers

Refer to the following table for cable part numbers used to connect test hardware to the Model 497.01 Analog Chassis rear-panel connectors.

DESCRIPTION	CABLE PART NUMBER
Load cell, 661.xx w/MS connector	046-440-6XX
Load cell, 661.xx w/PT connector	046-440-2XX
Strain w/PT connector	050-120-0XX
LVDT	046-440-3XX
ADT–120°	048-341-1XX
Remote E-stop/X-head Interlock-load frame	054-145-4XX
Servovalve, 252.xx single	046-440-1XX
Servovalve, 252.xx dual	046-440-4XX (in-phase); 046-440-5XX (out-of-phase)
Jumper plug 2nd servovalve eliminator	039-705-901
Servovalve, 256.xx w/valve	046-440-1XX
Servovalve, 256.xx w/valve LVDT	046-440-8XX
ΔP stability	047-927-6XX
ΔP stability–dual cells	048-049-6XX
System ground–console MTD FlexTest	005-402-3XX
HSM on-off	039-705-3XX (24 V DC); 039-719-1XX (115 V AC)[1]
HSM high-low 292.xx/298.xx	039-705-5XX (24 V DC); 039-719-2XX (115 V AC)[1]
HSM on-off 292.xx/298.xx	039-708-1XX (24 V DC)[1]
413.07 Hydraulic interface to 298.12 prop HSM	042-664-5XX (24 V DC)
497.05 Control Panel to 413.07	042-075-701 (24 V DC)[1]
HPS (HSM power not included)	039-708-7XX (24 V DC); 039-708-8XX (115 V AC)[1]
Y adapter at HPS	005-407-801 (24 V DC); 005-401-801 (115 V AC)

1. For CE configurations, there are CE versions of these cables. Refer to the System Cable Package Selection-FlexTest drawing (PN 047-922-501) for these cable numbers.

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Chapter 5

FlexTest SE Controller Connections

This section describes the connections to the MTS 493.02 Chassis.

Note *For information on connecting power cables, see "Connecting Electrical Power" on page 52.*

Note *For information about CE compliance, see "CE EMC Compliant Cabling" on page 74.*

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- Analog I/O Connections 205
- Encoder Connections 206
- Workstation Connection 207
- Service Connection 207

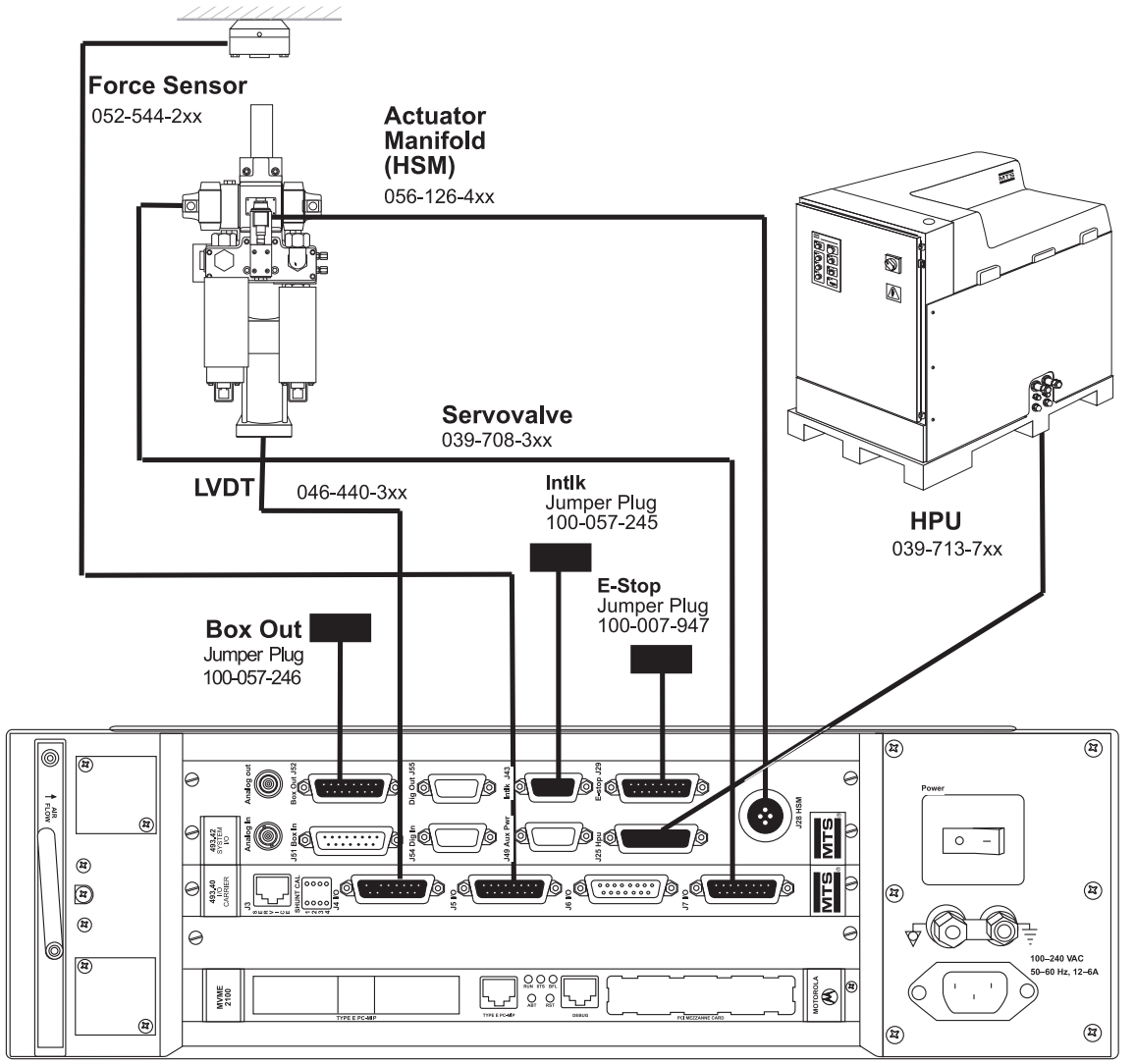
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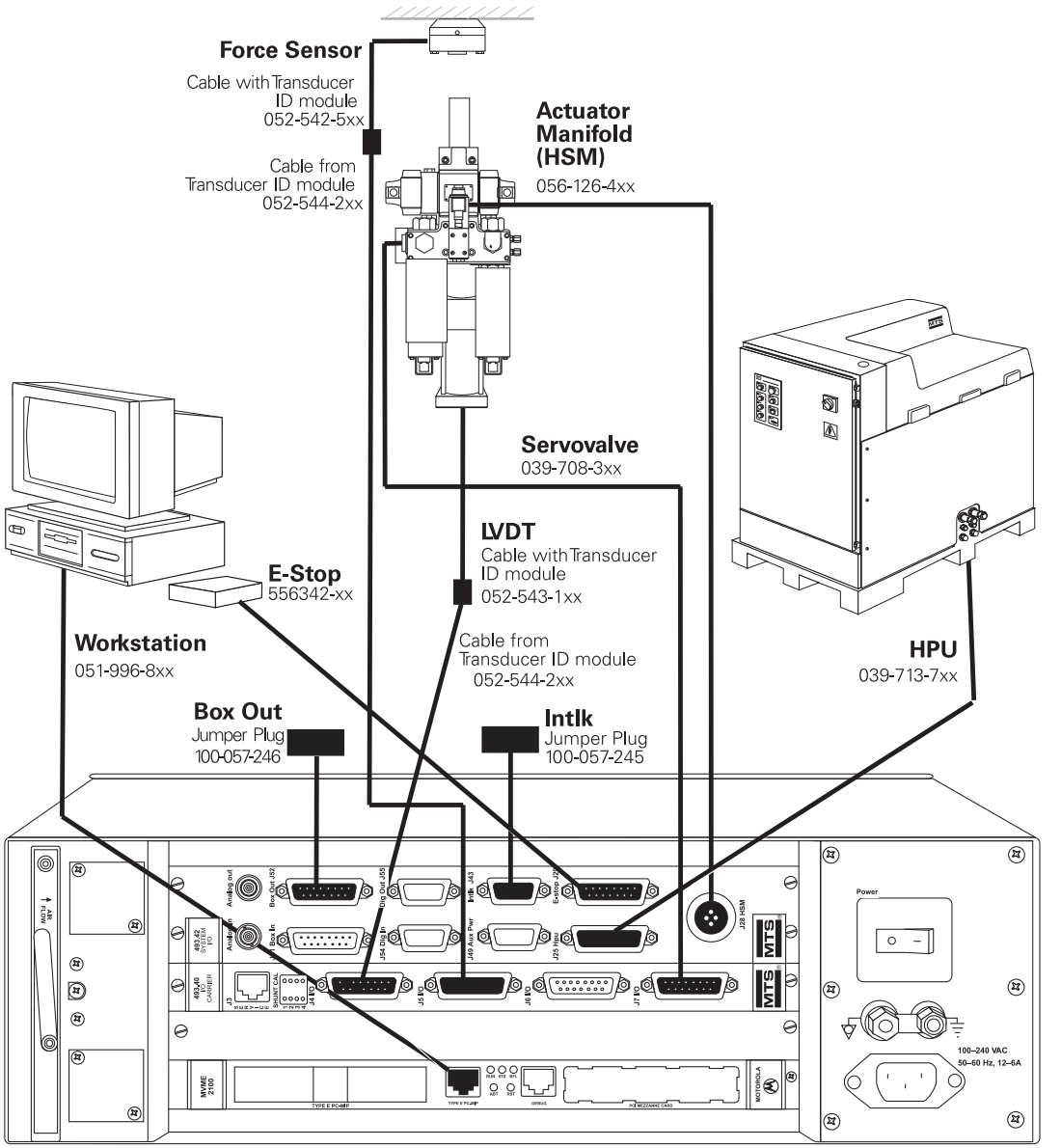
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Standalone Cabling Overview



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Automated Cabling Overview



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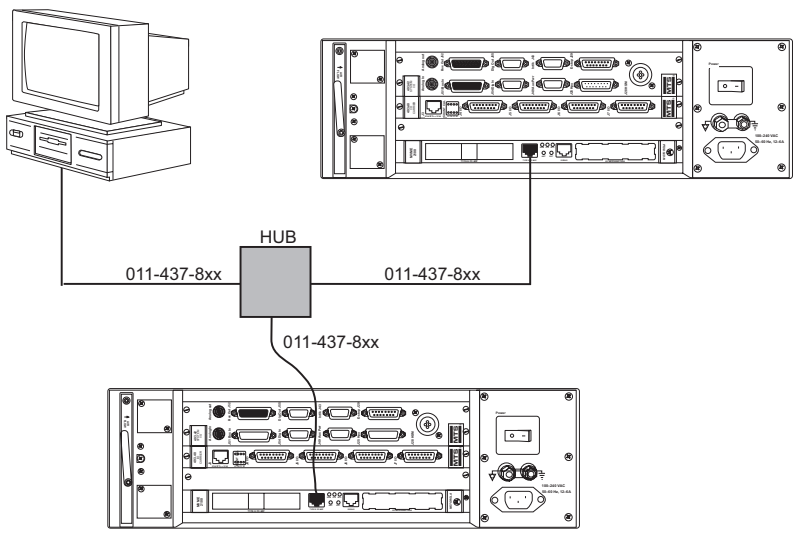
Multiple Controller Connections

About multiple Controller networks

Some characteristics of a multiple Controller network are as follows:

- Each Controller in the network provides control for one station with up to two channels.
- A hub connects each Controller in the network to the supervising PC.
- A single network may have a maximum of four stations (regardless of the number of Controllers cabled to the hub).
- When used in a network, Controllers must be registered for automation and operate in the automation mode.
- Each Controller in the network must have a unique ID and name.

For more information about setting up multiple controller networks for FlexTest SE Controllers, see *Appendix D, Using Multiple Automated Controllers* in the FlexTest SE User's Manual.



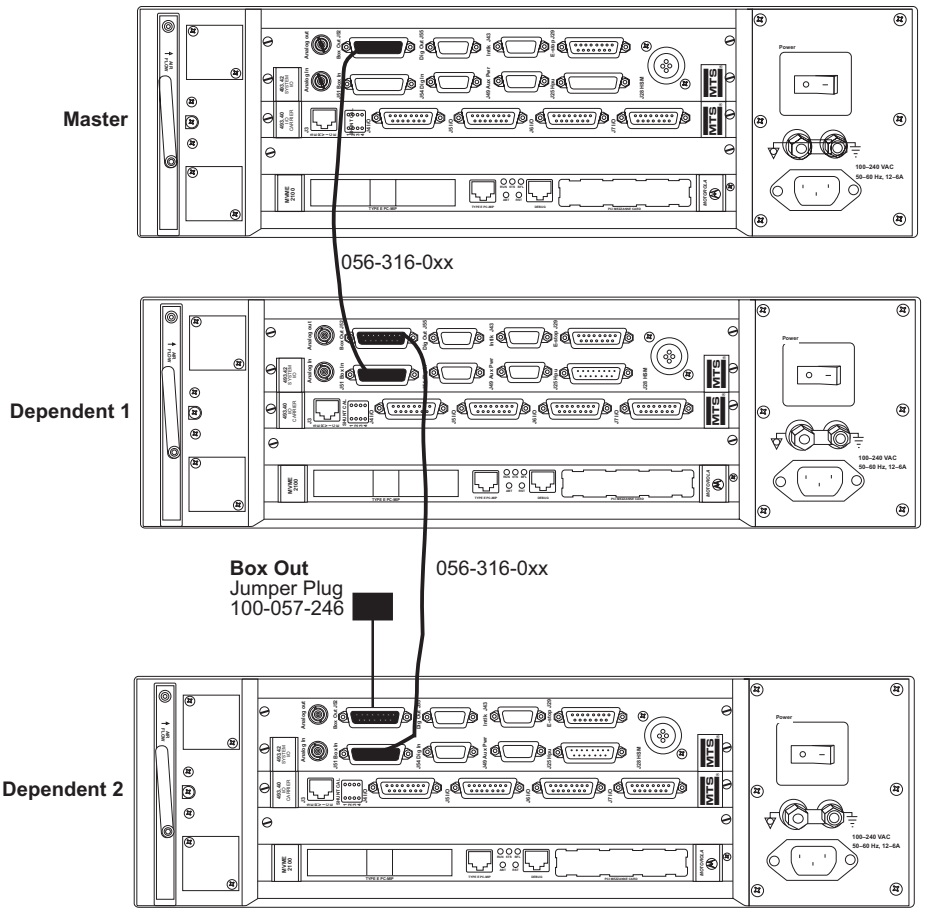
Typical multiple controller cabling

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Master-dependent FlexTest SE Controllers

Connect two or more FlexTest SE Controllers in a master-dependent configuration as shown below.

Note *The indicated cables on each controller must be connected before the controllers are turned on.*



Use the J51 Box In and J52 Box Out connectors on the 493.42 System I/O module in the Controller's rear panel to connect one Controller to another.

The master Controller will have an open Box In connector, and a cable attached to the Box Out connector. A middle-run dependent Controller will have cables attached to both the Box In and Box Out connectors. The end-of-run dependent will have a cable attached to the Box In connector, and a jumper plug attached to its Box Out connector.

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Interlock function

Power must be applied to all Controllers in the chain for proper interlock operation. If power is not applied to any one of the Controllers, you will not be able to clear an interlock condition in any of the Controllers.

Also, if a cable becomes disconnected from a dependent controller's **Box In** connector, or if a cable is inadvertently connected to the **Box In** connector on the master controller, an interlock is set which cannot be reset until all controllers are restarted.

Cable Part Numbers

System cables

The following is a list of the most common cables, see the System Cable/Jumper Plug 493 Package Selection drawing (MTS PN 700-000-656) for the most current and additional cable part numbers.

Model 493.02 Chassis Cables (part 1 of 2)

Cable Description	Part Number*	Module Connector	Jumper Plug†
Servovalve 252.xx single	039-708-3XX	493.40 J4–J7	N/A
Servovalve 252.xx dual	039-708-4XX	493.40 J4–J7	N/A
Servovalve 256.xx 3-stage			N/A
Valve	055-439-6XX	493.40 J4–J7	
Valve LVDT	039-708-6XX	493.40 J4–J7	
Calibration Cable Package	100-026--213	493.40 J3	
Y Adapter—Servovalve/Valve LVDT (required for 256.xx or 257.xx servovalves)	039-710-501	493.40 J4–J7	N/A
Workstation Link (Ethernet cable)	051-996-8XX	10/100‡	N/A
System ground (table top)	005-402-3XX		N/A
System ground (rack mount)	039-709-2XX	gnd lug	
Hydraulic Power Unit (HPU) (see "Hydraulic Configurations" on page 221 for more information)	039-713-7XX	493.42 J25	039-713-301
Hydraulic Service Manifold (HSM)	039-701-5XX	493.42 J28	N/A
Emergency Stop (E-STOP)		493.42 J29	100-007-947
Interlock (Intlk)	Per System	493.42 J43	100-057-245

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Model 493.02 Chassis Cables (part 2 of 2)

Cable Description	Part Number*	Module Connector	Jumper Plug†
Auxiliary Power (Aux Pwr)	Per System	493.42 J48	N/A
Box In	056-316-0xx	493.42 J51	N/A
Box Out	056-316-0xx	493.42 J52	100-057-246
Digital Input (Dig In)	Per System	493.42 J54	N/A
Digital Output (Dig Out)	Per System	493.42 J55	N/A
Analog In (Anlg In)	Per System	493.42	N/A
Analog Out (Anlg Out)	Per System	493.42	N/A

* -XX specifies cable length. –01 through –09 represent 10–50 ft. in 5 ft. increments. Higher numbers represent custom cable lengths.

† Jumper plugs are required if a cable is not installed.

‡ The connector is the 10/100 BaseT connector on the power PC module.

Sensor cables

See "Sensor Cables" on page 90 for a detailed list of sensor cables and part numbers.

For the most current part numbers, see the System Cable/Jumper Plug 493 Package Selection drawing (PN 700-000-656).

Model 493.40 I/O Carrier Connections

See Model 493.40 I/O Carrier Connections 77

Automated option

Automated FlexTest SE Controllers are designed to be used with a PC, MTS 793 software, and various types of support files, including a hardware interface file (hwi) file. The hwi file defines each type of electronic module in the chassis (and associated mezzanine cards), and maps each module location for the MTS 793 software. The hwi file and the physical locations for each type of module and associated mezzanine cards must match. Also, the I/O Carrier module address setting (on the module) must match the hwi file address.

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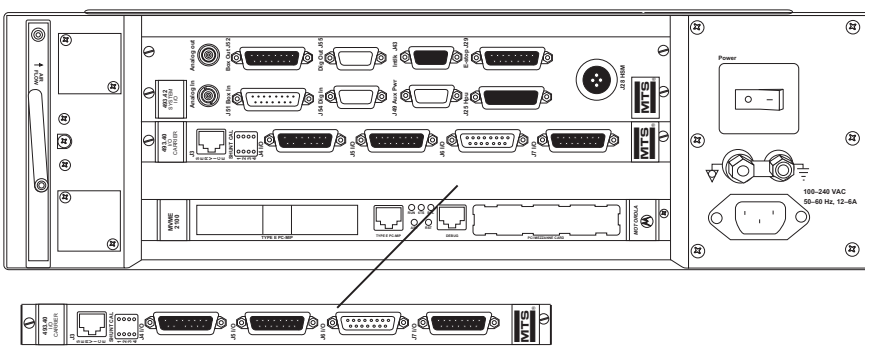
Adding I/O Carrier

For automated controllers, a second I/O Carrier module can be added to support a second channel or to expand sensor conditioning. Its addition can also be used to support more A/D and D/A channels.

Note *If you are upgrading your system, a faster processor may be required. Contact MTS for information on system upgrade requirements.*

To add a second I/O Carrier module, complete the following:

1. Install the required mezzanine cards in the I/O Carrier module.
2. Install a second Model 493.40 I/O Carrier module in slot 3 of the controller chassis.



3. Change your hwi file to reflect the added I/O Carrier module and its mezzanine cards.
4. Use Station Builder to allocate resources for the additional hardware.

Sensor Connections

See Sensor Connections 78.

See Sensor Cables 90.

See Shunt Calibration/Bridge Completion Resistor Installation 92.

See Transducer Identification Modules 95.

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Valve Connections

See Valve Connections 97.

See 252 servovalve connections 98.

See 256 servovalve connections 98.

See 257 valve connections 99.

Analog I/O Connections

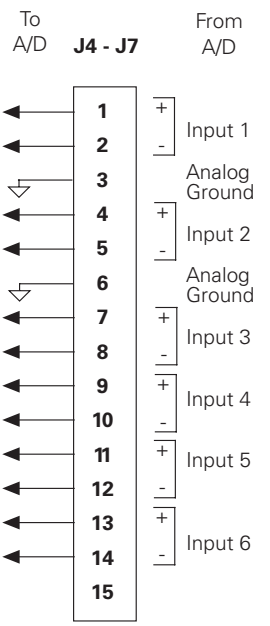
The Model 493.45 A/D and Model 493.46 D/A mezzanine cards are installed in the Model 493.40 I/O Carrier front panel module.

Note *The external analog source can be a standalone function generator, another controller, or a computer controlled analog output.*

A/D Connections

The analog-to-digital mezzanine cards accommodate up to six analog input signals.

- Each A/D input signal must be within ±10 volts.
- Use pin 3 or 6 to prevent problems with floating grounds between devices.

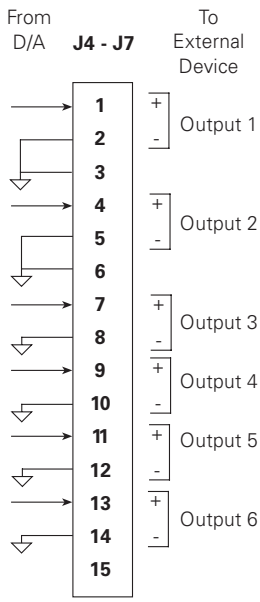


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D/A Connections

Digital-to-analog mezzanine cards support up to six program or readout signals to external devices.

- Each D/A signal is an analog output within ±10 volts.
- Each readout signal is from a 16 bit digital to analog converter.
- Each output is a ±10 V analog output.



Cable specification

The cable specifications apply to both the analog inputs and analog outputs.

The cable from the front panel of the I/O Carrier module has the following specification:

- 15 contact type D male EMI connector.
- Backshell–EMI metallized plastic.
- Cable type–up to 6 shielded twisted pairs, each with the drain wire connected to the signal source.

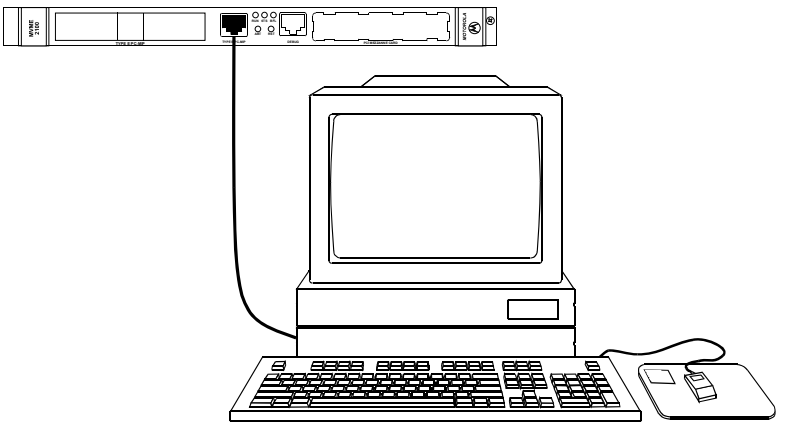
Encoder Connections

See Encoder Connections 109.

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Workstation Connection

The workstation computer is connected to the processor module installed in the VMEbus of the chassis. It is an Ethernet 10/100 Base-T connection. The workstation computer must have an Ethernet compatible connector.



⚠ CAUTION

The symbol shown here indicates that you must not connect telecommunications equipment to the equipment showing this symbol.



Several modules have connectors that look similar to a phone connector. Special cables are required. Installing telecommunications equipment cables can cause equipment damage to the electrical components of the chassis or to your telecommunications system.

Service Connection

See I/O Carrier service 134.

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Model 493.42 System I/O Connections

The Model 493.42 System I/O module is a dual-wide VME-based slave board used in the Model 493.02 chassis.

- Provides box-in and box-out, analog and digital I/O, E-Stop, and HSM and HPU control.
- Contains three general purpose digital input channels and three general purpose digital output channels.
- Interfaces the controller with a hydraulic power unit.
- Interfaces the controller with a hydraulic service manifold and other devices.
- Provides one BNC channel for analog output signals. The output signals are within ±10 V DC.
- Provides one BNC channel of analog input. The input signals must be within ±10 V DC.

J25 Hydraulic Power Unit Connection

Connector **J25 HPU** controls the hydraulic power unit (HPU).

- The connector provides 24 V logic signals to control the HPU.
- The connector may be connected directly to MTS Series 505 HPUs, other MTS HPUs via the Model 493.07 HPU Converter Box, and 24 V PLC compliant HPUs.

Note *See "Hydraulic Configurations" on page 221 for more information.*

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⚠ CAUTION

Control voltages for hydraulic power units vary between models.

The HPU interface between the Model 493.42 System I/O board and an HPU is 24 volt logic signals. Connecting J25 to a non-compliant HPU can damage the module.

DO NOT connect 24 V DC relay circuitry or 115 V AC circuitry to connector J25 on the Model 493.42 System I/O board.

Cable specification

The **J25 HPU** and **J51 Box In** connectors are 15 pin type D male connectors.

- 15 contact type D female EMI connector.
- Cable—24 AWG, 10 conductor with braided shield with drain wire connected to metallized plastic backshell to the chassis.

Jumper plug required

If connector **J25 HPU** is not used, you must install a jumper plug to maintain the integrity of the interlocks. Use jumper plug PN 039-713-301 or jumper pins: 1–7, 2–3–5, 6–9, 8–10–11–12, 6-9.

For an electrical diagram of J25, see page 119.

J28 Hydraulic Service Manifold Connector

See J28 Hydraulic Service Manifold Connector 120

J29 Emergency Stop Connections

Connector **J29 E-STOP** provides an output to external devices when an emergency stop signal is generated. This connector may also be used with an external E-stop.

J29 Connector Pin Assignments (part 1 of 2)

PIN	NAME	FUNCTION
1	xhead 24V	Fused +24V
2	xhead intlk com	24V common
3	Program interlock low (xhead interlock low)	Low side of opto-isolator, jumpered to common
4	Program interlock high (xhead interlock high)	High side of opto-coupler, pulled up to 24V (opto on = intlk)

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J29 Connector Pin Assignments (part 2 of 2)

PIN	NAME	FUNCTION
5	Local E stop	Local E stop loop (connected to pin 7)
6	N/C	No connection
7	Local E stop	Local E stop loop (connected to pin 5)
8	HPU E stop	E stop loop from HPU (connect to pin 13)
9	N/C	No connection
10	N/C	No connection
11	N/C	No connection
12	xhead power	+24 V crosshead unlock power output (from HSM high relay contact)
13	HPU E stop	E stop loop from HPU (connect to pin 8)
14	xhead power return	24 V common for crosshead unlock power output
15	N/C	

Cable specification

- 15 contact type D male EMI connector.
- Backshell–EMI metallized plastic.
- Cable–24 AWG 4 connector with braided shield, with the braid connected to a metallized plastic backshell at the chassis and to ground at the emergency stop station.

Jumper plug required

If connector **J29** is not used, you must install a jumper plug to maintain the integrity of the interlocks. Use jumper plug PN 100-007-947B or jumper pins: 3-4, 5-7, 8-13.

J43 Interlock

Connector **J43 Interlock** contains one optically isolated interlock input and one relay contact interlock output.

Note *The intlk out relay (Pin 6) is normally energized when no interlocks are active. So even though Pin 6 is a NO (normally open) relay contact, it is actually normally closed when no interlocks are active. Similarly, the intlk out relay (Pin 8) is normally closed when no interlocks are active, so even though Pin 8 is a NC (normally closed) relay, it is actually normally open when no interlocks are active.*

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J43 Connector Pin Assignments

Pin	Name	Function
1	intlk in 24V	24 V through 6.6K resistor
2	intlk in high	High side of opto-isolator (opto off = intlk)
3	intlk in low	Low side of opto-isolator
4	intlk in comm	24 V common
5	N/C	No connection
6	intlk out NO	Normally open relay contact
7	intlk out COM	Common relay contact
8	intlk out NC	Normally closed relay contact
9	N/C	No connection

Cable specification

- 9 contact type D male EMI connector.
- Backshell–EMI metallized plastic.
- Cable–shielded twisted pairs (24 AWG minimum) with drain wire(s) connected to the metallized backshell at the chassis.

Power characteristics

Channel inputs can be 3 volts (minimum) and 26 volts (maximum) from an external voltage source.

Jumper plug required

If connector **J43** is not used, you must install a jumper plug to maintain the integrity of the interlocks. Use jumper plug PN 100-057-245, or jumper pins: 1-2, 3-4.

J49 Auxiliary Power

See J49 Auxiliary Power 125.

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CJ51 Box In

Connector **J51 Box In** allows the Model 493.02 chassis to receive clock, hydraulic, and interlock signals from another Model 493.02 chassis.

J51 Connector Pin Assignments

PIN	NAME	FUNCTION
1	+clk in	+External clock input
2	hyd high in	Hydraulic high input
3	reset in	Interlock reset request input
4	signal return	Signal return for optically isolated inputs
5	/intlk in	Hydraulic interlock input
6	hyd low in	Hydraulic low input
7	signal return	Signal return for optically isolated inputs
8	master/slave in	Master -/Slave select input
9	- clk in	- External clock input
10	hyd hi return out	Hydraulic high return output
11	reset return out	Interlock reset return output
12	ground	Signal ground
13	/intlk return out	Hydraulic interlock return output
14	hyd low return out	Hydraulic low return output
15	ground	Signal ground

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J52 Box Out

Connector **J52 Box Out** allows the Model 493.02 chassis to send clock, hydraulic, and interlock signals to another Model 493.02 chassis.

J52 Connector Pin Assignments

PIN	NAME	FUNCTION
1	+clk in	+External clock output
2	hyd high out	Hydraulic high output
3	reset out	Interlock reset request output
4	ground	Signal ground
5	/intlk out	Hydraulic interlock output
6	hyd low out	Hydraulic low output
7	ground	Signal ground
8	N/C	No connection
9	- clk out	- External clock output
10	hyd hi return in	Hydraulic high return input
11	reset return in	Interlock reset return input
12	signal return	Signal return for optically isolated inputs
13	/intlk return in	Hydraulic interlock return input
14	hyd low return in	Hydraulic low return input
15	signal return	Signal return for optically isolated inputs

Jumper plug required

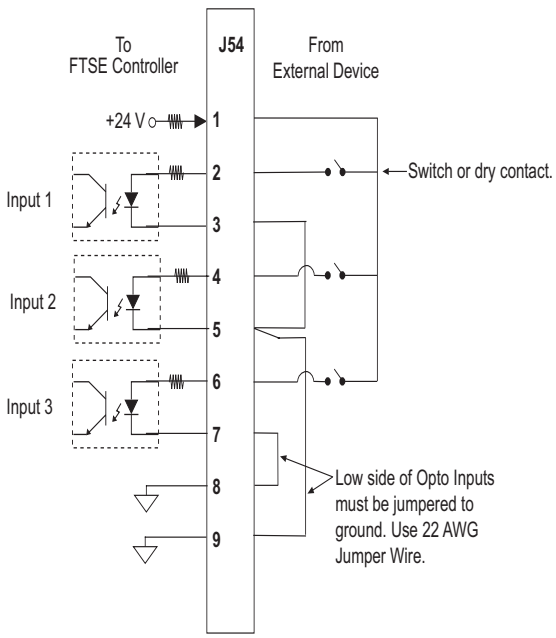
If connector **J52 Box Out** is not used, you must install a jumper plug to maintain the integrity of the interlocks. Use jumper plug PN 100-057-246 or jumper pins: 2-10, 3-11, 4-12, 5-13, 6-14, 7-15.

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J54 Digital Inputs

Connector **J54 Dig In** accommodates up to three digital signals from external devices. You can use digital input signals to trigger test events with your controller applications.

- All of the inputs are optically isolated.
- Channel inputs can be 3 volts (minimum) and 26 volts (maximum) from an external voltage source.



Cable specification

The cabling information shown assumes a single cable destination (with an overall shield). In other applications, the cable may have more than one destination. For these applications an overall shield is not practical and non-EMI connectors and back shells are permissible.

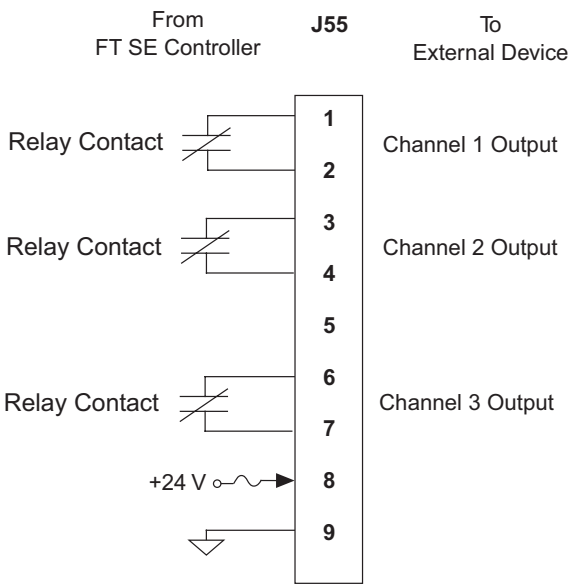
- 9 pin contact type D male EMI connector
- Back shell–EMI metallized plastic
- Cable–shielded twisted pairs as required (24 AWG minimum) with drain wire(s) connected to the metallized backshell at the chassis.

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J55 Digital Outputs

Connector **J55 Dig Out** provides three general purpose digital outputs that can send digital logic signals to external switches or logic devices.

- The digital output relays are rated for a maximum of 1 Amp max, 30 V DC/AC max.
- The outputs are optically isolated.



Cable specification

The cabling information shown assumes a single cable destination (with an overall shield). In other applications, the cable may have more than one destination. For these applications an overall shield is not practical and non-EMI connectors and back shells are permissible.

- 9 pin contact type D male EMI connector
- Back shell–EMI metallized plastic
- Cable–shielded twisted pairs as required (24 AWG minimum) with drain wire(s) connected to the metallized backshell at the chassis.

Run/Stop setup

If required, digital output 1 (pins 1 and 2) can be set up as a Run/Stop connector. Use the following procedures to set up this Run/Stop connector:

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Standalone mode

1. Press **Setup** on the console front panel menu.
2. Scroll down the Setup menu to **Digital Output 1**.
3. Press the button next to **Digital Output 1**.
4. Press the button next to **Assignment** until the state **Run/Stop** is shown.
5. Press **Polarity** to select **Normal** or **Inverted**.

Automation mode

1. Ensure that digital outputs have been added using Station Builder.
2. In the **Station Manager** window's **Display** menu, select **Station Setup**.
3. In the **Station Setup** window's navigation pane, double-click **Digital Inputs/Outputs** and then click **Outputs**.
4. On the **Digital Outputs** window, use **Assignment** for **Digital Output 1** to assign **Run/Stop**.
5. Use **Polarity** to select the required polarity (**Normal** or **Inverted**) for **Digital Output 1.**

Eurotherm Temperature Controller Connection

Automated FlexTest SE Controllers can program and control a single Eurotherm temperature controller.

Note *Standalone FlexTest SE Controllers are not equipped for use with temperature controllers.*

To use a temperature controller with a FlexTest SE Controller, perform the following:

1. Configure the FlexTest SE Controller's **Debug Serial Port**.
2. Cable the temperature controller to the FlexTest SE Controller.
3. Add a temperature controller resource to the hardware interface file (hwi).

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4. Add a temperature control channel to the station configuration file.

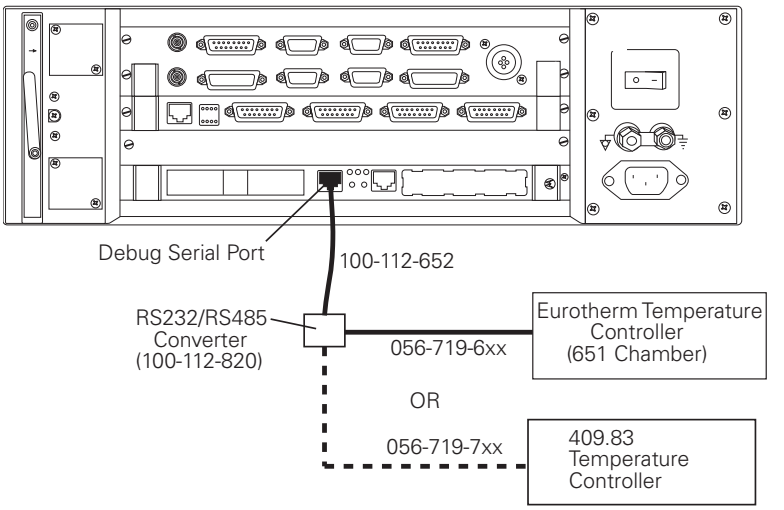
Configuring the Debug Serial Port

To use a FlexTest SE Controller with a temperature controller, configure the **Debug Serial Port** as follows:

1. Access the 498.96 processor circuit card in the Controller's chassis.
2. Locate switch S3.
3. Set bit 8 to the off (open) position.

Cabling the temperature controller

Two cables and an RS 232/RS 485 converter are required to connect the FlexTest SE Controller to a temperature controller, as shown.



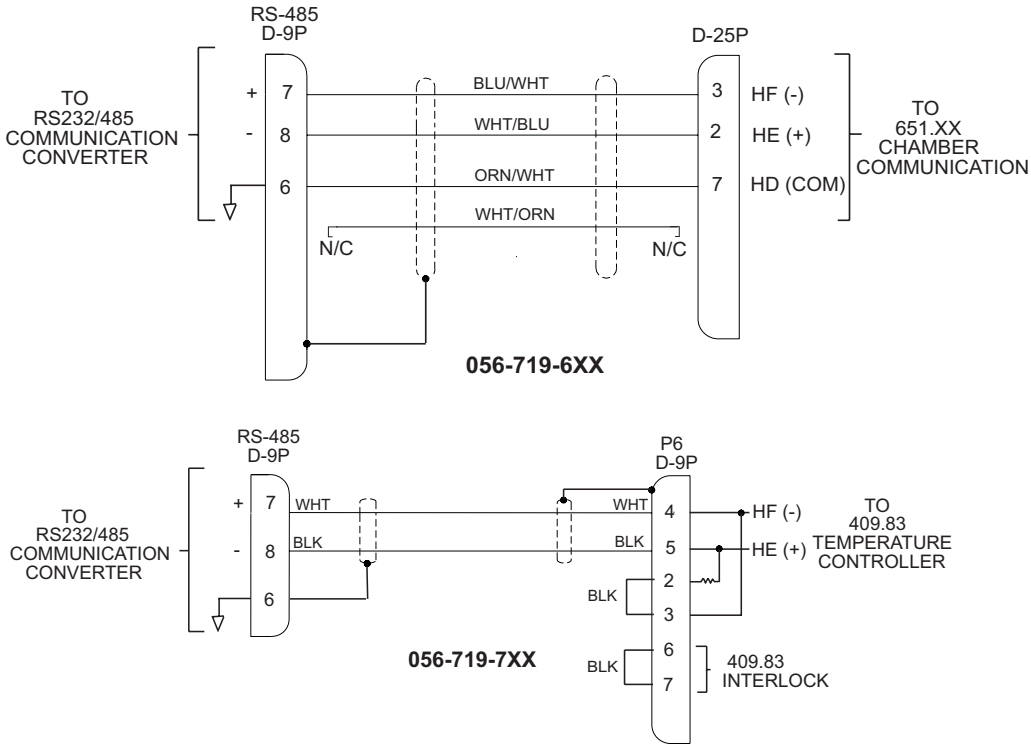
Debug serial port

Two different cables can be used to connect the converter to the temperature controller:

- For Eurotherm Temperature Controllers used with Series 651 chambers, use cable assembly PN 056-719-6xx.

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- For MTS Model 409.83 Temperature Controllers (equipped with Eurotherm control modules), use cable assembly PN 056-719-7xx.



Adding a temperature controller resource to the hardware interface file

To use a temperature controller with your FlexTest SE Controller, you must add a temperature controller resource to the Controller's hardware interface file (hwi). This adds a temperature controller resource to the inventory of hardware resources available for station configuration files.

To do this, use the MTS HWI File Editor application (installed with MTS 793 software) to open the Controller's hardware interface file. (The typical path to this application is: Start > Programs > MTS Systems Software > Service Tools > HWI File Editor.)

To add the resource, select the **Miscellaneous** tab and select **1** for temperature controllers, then save the file. The application automatically adds the required information in the proper syntax to the text in the hardware interface file.

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Adding a temperature control channel to the station configuration file

After updating the hardware interface file, you must add a temperature control channel to the Controller's station configuration file.

To do this, use the Station Builder application to open the station configuration file, then add temperature controller input (Temp Control 1-Input) and output (Temp Control 2-Output) resources to a Program w/Feedback type channel. This creates a temperature control channel.

For detailed instructions, refer to "How to Program a Eurotherm Temperature Controller" in the *MTS 793 Control Software* manual for more information.

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Appendix A

Hydraulic Configurations

This section describes how to connect the Model 493.10 Chassis (FlexTest GT Controllers) and the Model 493.02 Chassis (FlexTest SE) to a variety of MTS hydraulic configurations.

Use the following connectors and cables to connect the Model 493.10/02 Chassis to your HPU with a Model 493.07 Converter Box:

Note *See Appendix B: Model 493.07 Converter Box on page 227 for jumpering information.*

493 Chassis to 493.07 Converter Box

- 15 contact type D female EMI connector at J25 of the Model 493.73 HPU Transition module in the rear panel of the Model 493.10 Chassis. Backshell–EMI metallized plastic.
- 14 contact type CPC male connector at J1 of the Model 493.07 Converter Box chassis.
- Cable–24 AWG 10 conductor with overall foil shield, (Carol C0745 or equivalent) with drain wire connected to metallized plastic backshell at the 493.10 chassis, and pin 14 at the Model 493.07 Controller Box chassis.

493.07 Converter Box to HPU

- 24 contact type CPC female connector at J25 of the Model 493.07 Converter Box chassis.
- 14 contact type MS connector at J1 of the HPU.
- Cable–18 AWG 14 conductor with overall foil shield, (Alpha 2248C or equivalent) with drain wire connected to pin 4 of connector J25 and pin A of the pump connector.

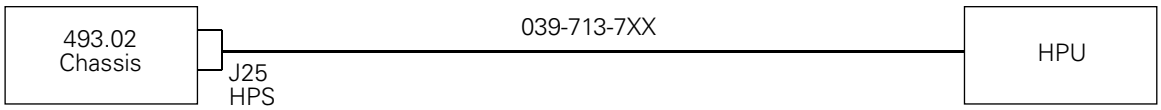
Hydraulic pump configurations

The following diagrams show how to connect the chassis to a hydraulic power unit.

- Single 493 chassis with a 24 V PLC (programmable logic controller) pump or 505 pump
- Single 493 chassis with a non-PLC pump
- Multiple 493 chassis with a non-PLC pump
- Compatible controllers controlling a pump

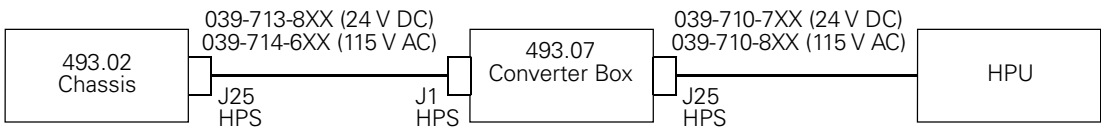
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Single Model 493.02 chassis with a 24 V PLC pump (506.52-.92) or 505 pump

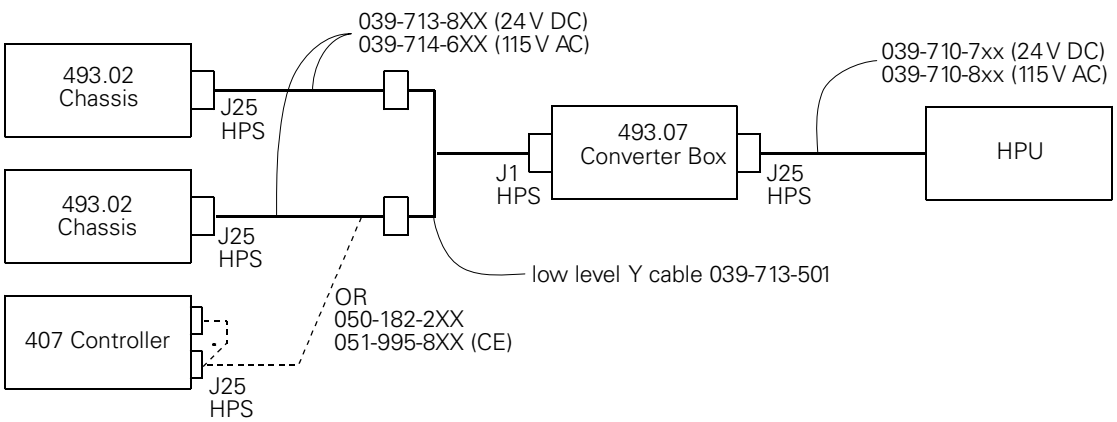


Note *The following three configurations have cables to support both 24 V DC and 115 V AC control voltages. A Model 493.07 Converter Box is available for each voltage (not both). Be sure the cables and Converter Box are rated for the same voltage.*

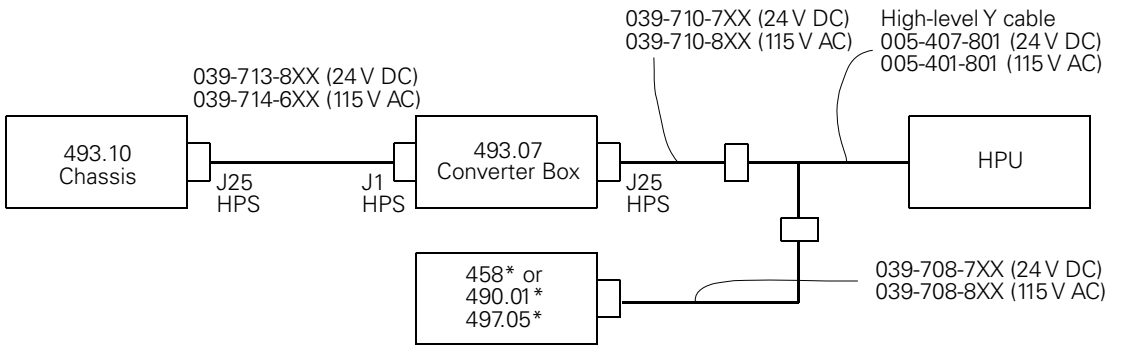
Single Model 493.02 chassis with a non-PLC pump



Multiple Model 493.02 chassis' and 407 Controllers



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* For standard Model 493.07 Converter Box jumper setting only. Alternate settings are required for Model 436.11 and 413.05 controllers. See *Appendix B: Model 493.07 Converter Box*.

You can mix Model 493.07, 458, 490, and 497.05 Controllers directly on the same HPU (without the use of an HPU isolation box).

You cannot mix Model 493.07, 458, 490, and/or 497.05 Controllers with 436, 413.05, or 413.8X Controllers unless you use an isolation box.

You can jumper the Model 493.07 Converter box so you can use it directly with 436 and 413.05 Controllers. However, if you do this you must use an isolation box if you attempt to use the Converter Box with Model 458, 490, and 497.05 Controllers. See Appendix B, "Model 493.07 Converter Box" on page 227.

Model 493.02 Chassis Multiple Controller Interconnections

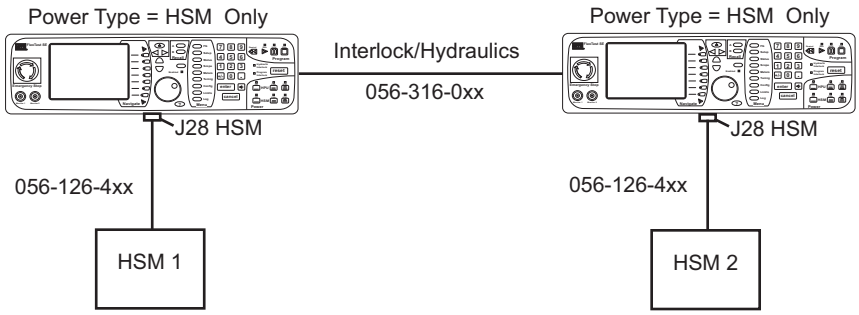
FlexTest SE Controllers support the following hydraulic interconnections for multiple controller configurations:

- Independent HSM control with no HPU
- Independent HSM control with a shared HPU
- Shared HSM with an HPU
- Shared HSM without HPU
- Independent HSM controlled with a shared HPU using first-on-last-off

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See"Multiple Controller Connections" on page 200 and the FlexTest SE User's Manual for more detailed information multiple controller configurations.

Independent HSM (no HPU)

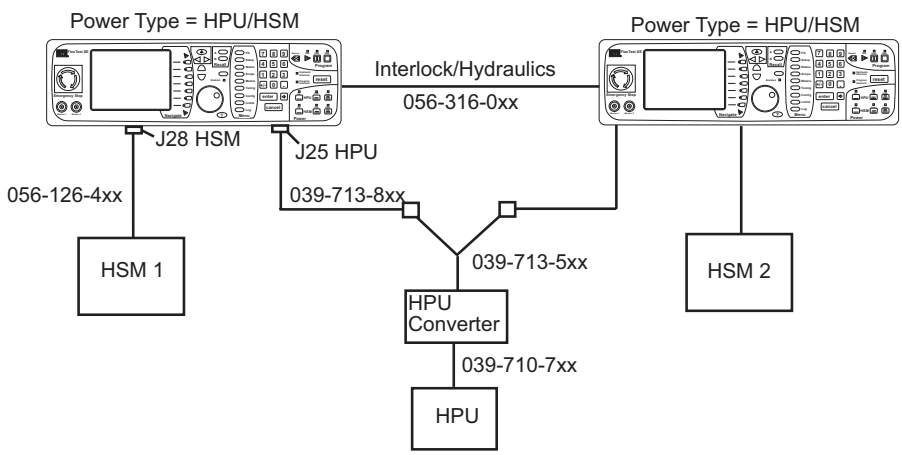


For this multiple controller configuration:

- Each controller has an independent hydraulic service manifold (HSM).
- No hydraulic power unit (HPU) is connected.
- Select **HSM Only** for Power Type on each connected controller.

  Path: **Config** > **Edit Hardware** > **Power Options** > **Power Type** > **HSM Only**

Independent HSM (shared HPU)



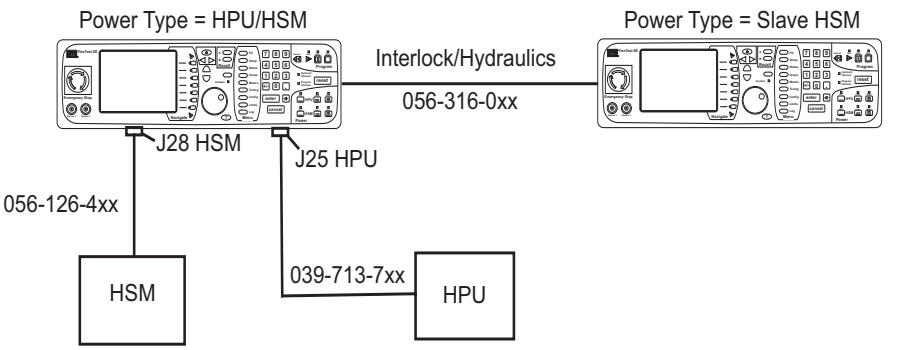
For this multiple controller configuration:

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- Each controller has an independent hydraulic service manifold (HSM).
- An HPU is shared by all connected controllers via Y-cables.
- Select **HPU/HSM** for Power Type on each connected controller.

  Path: **Config** > **Edit Hardware** > **Power Options** > **Power Type** > **HPU/HSM**

Shared HSM (with HPU)



For this multiple controller configuration:

- The HSM and HPU are connected to one controller only.
- Select **HPU/HSM** for Power Type on the controller to which the HSM and HPU is connected.

  Path: **Config** > **Edit Hardware** > **Power Options** > **Power Type** > **HPU/HSM**

- Select **Slave HSM** for Power Type on controllers connected to the master controller.

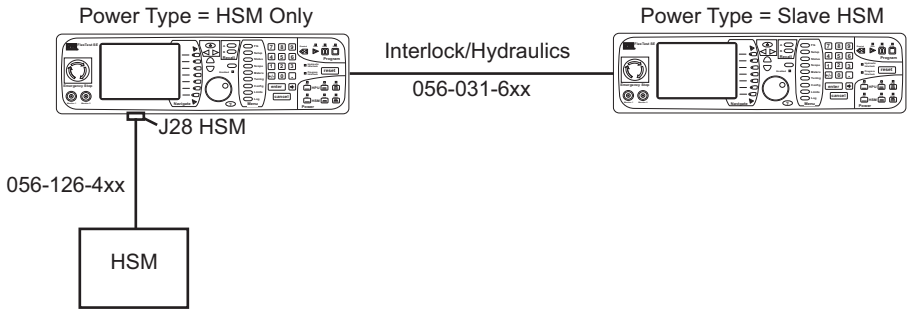
Shared HSM (no HPU)

For this multiple controller configuration:

- An HSM is connected to one controller only.
- Select **HSM Only** for Power Type on the controller to which the HSM is connected.

  Path: **Config** > **Edit Hardware** > **Power Options** > **Power Type** > **HSM Only**

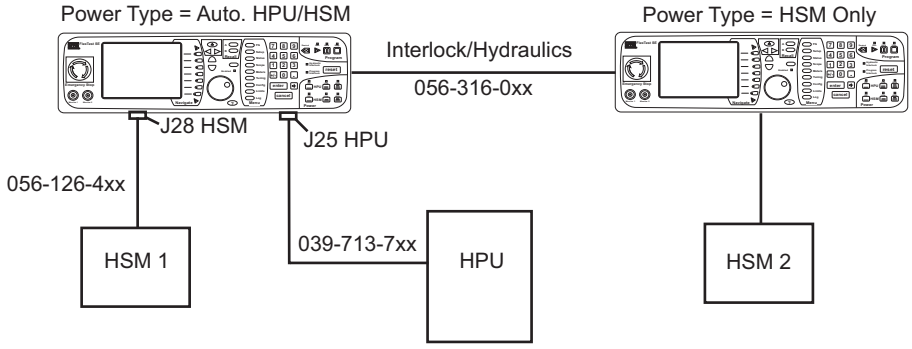
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- Select **Slave HSM** for Power Type on controllers connected to the master controller.

Independent HSM with HPU (FO-LO)

Note *This interconnect option is only available for controllers on the same interlock.*



For this controller configuration:

- Two or more FlexTest SE Controllers are connected.
- An HSM is connected to each controller only.
- Select **Auto. HPU/HSM** for Power Type on the controller to which both a HSM and HPU is connected.

  Path: **Config** > **Edit Hardware** > **Power Options** > **Power Type** > **Auto. HPU/HSM**

- Select **HSM Only** for Power Type on controllers with an independent HSM, but no HPU.

Note *The HPU can be connected to any controller in the interconnected group of controllers.*

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Appendix B

Model 493.07 Converter Box

This section describes how to jumper the Model 493.07 Converter Box to connect the Model 493.10 chassis and other controller types to a hydraulic power unit (HPU). The Converter Box converts logic-level signals to and from the Model 493.10 chassis to relay signals used by the HPU pump.

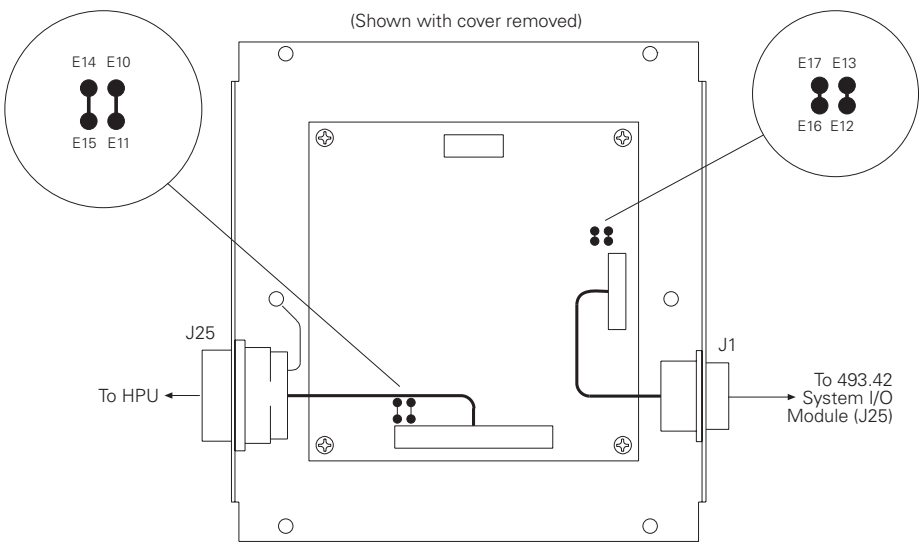
For pumps that are 24 V PLC compliant, the Converter Box is not needed. This includes all Series 505 HPUs and 506.52-.92 HPUs.

⚠ CAUTION

You must have the Model 493.07 Converter Box designed for the correct voltage before installation. Connecting a 24 V Converter Box to a 115 V (AC) HPU causes improper operation.

Be sure the voltage marked on the cover of the Converter Box matches the required voltage for the HPU.

The following figure shows the main components of the 493.07 Converter Box, including connectors and jumpers.



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⚠ CAUTION

Disconnect all cables from the Model 493.07 Converter Box before removing the cover. Failure to do so could expose the operator to dangerous voltages.

If the Converter Box remains connected to a 120 volt HPU, this voltage will be present. Always remove all cable before removing the cover.

Jumper configurations

As shipped, the HPU interface on the Model 493.07 Converter Box is compatible with Model 458.10/.20, 490.01, 493.xx, and 497.05 components.

The Model 493.07 Converter Box may be connected to other controllers (as shown in the following table) using a "Y" cable.

Note *If the Model 493.10 chassis is the only device connected to the HPU, the jumper settings do not matter.*

COMPATIBLE WITH	JUMPERS
Model 458.05/.10/.20/.40 **Model 490.01** **Model 497.05**	**Standard jumper setting:** **E10–E11install** **E12–E13 install** **E14–E15 install** **E16–E17 install** **E10–E13 remove** **E14–E17 remove**
Model 413.05 **Model 436.11** **Model 407.05**	**Jumper change required:** **E10–E11 remove** **E12–E13 remove** **E14–E15 remove** **E16–E17 remove** **E10–E13 install** **E14–E17 install**

Note *The Model 493.07 Converter Box cannot be used with both groups of controllers at the same time. If this functionality is needed, use an HPU isolation box.*

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Appendix C

Chassis Maintenance

This section describes how to maintain your MTS controller chassis.

Cleaning the chassis

Remove any dust from the chassis with Endust™ for Electronics or equivalent.

Cleaning the air filter

Be sure the cooling fan is operational and not clogged. Clean or replace the filter as required.

The filter is typically located in the top of the chassis, and can be accessed from the rear.

To clean the air filter:

1. Remove the filter from the chassis.
2. Immerse the filter in a large pan filled with warm water and a mild detergent, and allow it to soak a few minutes.
3. Gently agitate the filter to loosen debris.
4. Rinse the filter thoroughly with clean water.

Note *Do not use compressed air to help dry the filter. Compressed air may damage the filter element.*

5. Allow to drip until completely dry.

Note *The air filter has a distinct top and bottom. Ensure you orient the filter properly.*

6. Replace the filter in the chassis.

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Appendix D

Optional Station Configurations

This section describes how to configure your Model 493.10 Chassis (FlexTest GT Controllers) to support an optional six or eight stations.

When configuring your system for a six or eight stations you must consider the following:

- Ensure that the hwi file is correctly set for the desired multi-station configuration, especially the interlock and HSM board settings.
- Power to each HSM is limited.
- Cross-head interlocks with solenoid power are not supported.
- Remote Station Control (RSC) is not supported.
- AC input power must be at least 115 V AC.
- Auxiliary power out of J49 on the Model 493.74 HSM Transition board is not supported.

6-Station Configuration

The 6-station configuration can provide either six or eight channels of control.

A typical 6-channel/6-station configuration requires 12 Digital Universal Conditioners and 6 two-stage valve drivers.

A typical 8-channel/6-station configuration requires 16 Digital Universal Conditioners and 8 two-stage valve drivers.

HSM power limits

HSM power current is limited to 1.5 A per HSM.

Interlocks

For 6-station configurations the hwi file must contain the line **INTERLOCKS=6**. This line must be a discrete entry, not part of any other hwi section.

Cross-head interlocks with solenoid power are not supported for 6-station configurations.

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RSC Remote Station Control (RSC) is not supported for 6-station configurations.

8-Station Configuration

The 8-Station configuration can provide eight channels of control.

A typical 8-Channel/8-Station configuration requires 16 Digital Universal Conditioners and 8 two-stage valve drivers.

HSM power limits HSM power current is limited to 1.5 A per HSM.

Interlocks For 8-station configurations the hwi file must contain the line **INTERLOCKS=8**. This line must be a discrete entry, not part of any other hwi section.

Cross-head interlocks with solenoid power are not supported for 8-station configurations.

RSC Remote Station Control (RSC) is not supported for 8-station configurations.

A/D analog inputs Only one set of six A/D analog inputs is supported for 8-station configurations.

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