INSTRON

Instron FastTrack 8800 Materials Test Control System

Reference Manual - Configuration

M21-10011-EN Revision C

www.instron.com

Electromagnetic Compatibility

Where applicable, this equipment is designed to comply with International Electromagnetic Compatibility (EMC) standards.

To ensure reproduction of this EMC performance, connect this equipment to a low impedance ground connection. Typical suitable connections are a ground spike or the steel frame of a building.

Proprietary Rights Notice

Trademarks

Original Instructions

General Safety Precautions

Materials testing systems are potentially hazardous.

Materials testing involves inherent hazards from high forces, rapid motions and stored energy. You must be aware of all moving and operating components that are potentially hazardous, particularly the actuator in a servohydraulic testing system or the moving crosshead in an electromechanical testing system.

Whenever you consider that safety is compromised, press the Emergency Stop button to stop the test and isolate the testing system from hydraulic or electrical power.

Carefully read all relevant manuals and observe all Warnings and Cautions. The term Warning is used where a hazard may lead to injury or death. The term Caution is used where a hazard may lead to damage to equipment or to loss of data.

Ensure that the test set-up and the actual test you will be using on materials, assemblies or structures constitutes no hazard to yourself or others. Make full use of all mechanical and electronic limits features. These are supplied to enable you to prevent movement of the actuator piston or the moving crosshead beyond desired regions of operation. Limits provide protection for your specimen and machine and reduce potential hazard.

The following pages detail various general warnings that you must heed at all times while using materials testing equipment. You will find more specific Warnings and Cautions in the text whenever a potential hazard exists.

Your best safety precautions are to obtain training in the testing equipment that you are using and to read your Operating Instructions and Reference Manual(s) to gain a thorough understanding of that equipment.

Warnings

Hazard - Protect electrical cables from damage and inadvertent disconnection.

The loss of controlling and feedback signals that can result from a disconnected or damaged cable causes an open loop condition that may drive the actuator or crosshead rapidly to its extremes of motion. Protect all electrical cables, particularly transducer cables, from damage. Never route cables across the floor without protection, nor suspend cables overhead under excessive strain. Use padding to avoid chafing where cables are routed around corners or through wall openings.

High/Low Temperature Hazard - Wear protective clothing when handling equipment at extremes of temperature.

Materials testing is often carried out at non-ambient temperatures using ovens, furnaces or cryogenic chambers. Extreme temperature means an operating temperature exceeding 60 °C (140 °F) or below 0 °C (32 °F). You must use protective clothing, such as gloves, when handling equipment at these temperatures. Display a warning notice concerning low or high temperature operation whenever temperature control equipment is in use. You should note that the hazard from extreme temperature can extend beyond the immediate area of the test.

Crush Hazard - Take care when installing or removing a specimen, assembly or structure.

Installation or removal of a specimen, assembly or structure involves working inside the hazard area between the grips or fixtures. Keep clear of the jaws of a grip or fixture at all times. Keep clear of the hazard area between the grips or fixtures during actuator or crosshead movement. Ensure that all actuator or crosshead movements necessary for installation or removal are slow and, where possible, at a low force setting.

Hazard - Do not place a testing system off-line from computer control without first ensuring that no actuator or crosshead movement will occur upon transfer to manual control.

The actuator or crosshead will immediately respond to manual control settings when the system is placed off-line from computer control. Before transferring to manual control, make sure that the control settings are such that unexpected actuator or crosshead movement cannot occur.

Warnings

Robotic Motion Hazard - Keep clear of the operating envelope of a robotic device unless the device is de-activated.

The robot in an automated testing system presents a hazard because its movements are hard to predict. The robot can go instantly from a waiting state to high speed operation in several axes of motion. During system operation, keep away from the operating envelope of the robot. De-activate the robot before entering the envelope for any purpose, such as reloading the specimen magazine.

Hazard - Set the appropriate limits before performing loop tuning or running waveforms or tests.

Operational limits are included within your testing system to suspend motion or shut off the system when upper and/or lower bounds of actuator or crosshead travel, or force or strain, are reached during testing. Correct setting of operational limits by the operator, prior to testing, will reduce the risk of damage to test article and system and associated hazard to the operator.

Electrical Hazard - Disconnect the electrical power supply before removing the covers to electrical equipment.

Disconnect equipment from the electrical power supply before removing any electrical safety covers or replacing fuses. Do not reconnect the power source while the covers are removed. Refit covers as soon as possible.

Rotating Machinery Hazard - Disconnect power supplies before removing the covers to rotating machinery.

Disconnect equipment from all power supplies before removing any cover which gives access to rotating machinery. Do not reconnect any power supply while the covers are removed unless you are specifically instructed to do so in the manual. If the equipment needs to be operated to perform maintenance tasks with the covers removed, ensure that all loose clothing, long hair, etc. is tied back. Refit covers as soon as possible.

Hazard - Shut down the hydraulic power supply and discharge hydraulic pressure before disconnection of any hydraulic fluid coupling.

Do not disconnect any hydraulic coupling without first shutting down the hydraulic power supply and discharging stored pressure to zero. Tie down or otherwise secure all pressurized hoses to prevent movement during system operation and to prevent the hose from whipping about in the event of a rupture.

Warnings

Hazard - Shut off the supply of compressed gas and discharge residual gas pressure before you disconnect any compressed gas coupling.

Do not release gas connections without first disconnecting the gas supply and discharging any residual pressure to zero.

Explosion Hazard - Wear eye protection and use protective shields or screens whenever any possibility exists of a hazard from the failure of a specimen, assembly or structure under test.

Wear eye protection and use protective shields or screens whenever a risk of injury to operators and observers exists from the failure of a test specimen, assembly or structure, particularly where explosive disintegration may occur. Due to the wide range of specimen materials, assemblies or structures that may be tested, any hazard resulting from the failure of a test specimen, assembly or structure is entirely the responsibility of the owner and the user of the equipment.

Hazard - Ensure components of the loadstring are correctly preloaded to minimize the risk of fatigue failure.

Dynamic systems, especially where load reversals through zero are occurring, are at risk of fatigue cracks developing if components of the loadstring are not correctly pre-loaded to one another. Apply the specified torque to all loadstring fasteners and the correct setting to wedge washers or spiral washers. Visually inspect highly stressed components such as grips and threaded adapters prior to every fatigue test for signs of wear or fatigue damage.

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Chapter 1
Introduction

Outline

Your FastTrack 8800 controller controls a wide range of materials testing systems, allowing you to change the configuration of the system quickly and easily. This includes adding or removing axes, or perhaps connecting your controller to a different testing system.

This manual details the procedures that you are likely to need, when changing the configuration of your FastTrack 8800 controller.

The Instron FastTrack 8800 Controllers

The FastTrack 8800 controller is available in both a single axis or a multiple axis configuration. Both versions of the controller feature full digital processing of transducer signals, improving the resolution and lowering noise levels of the feedback signals. This filtering is carried out in firmware, allowing filter parameters to be easily adjusted to suit your particular testing requirements.

Single axis controller

The FastTrack 8800D controller is the single axis version, which contains all the components required to run a single axis testing system. This controller is mounted within an enclosure that has been designed to be mounted either horizontally, similar to a “desktop PC”, or vertically, as shown in Figure 1-1 below.

Figure 1-1. FastTrack 8800D Single Axis Controller

Multiple axis controller

The multi-axis FastTrack 8800 controller provides you with up to six axes of control. This controller is available in a ‘tower’ configuration, see Figure 1-2.

To extend the number of actuators that can be controlled within a single system, the multi-axis towers can be linked together using the system synchronisation panels and hydraulic interlinks. The FastTrack 8800 tower can also be linked to existing Instron 8500 Plus and 8580 controllers.

With suitable software, running, such as FastTrack Console, the tower can run up to four, independent, tests simultaneously.

Figure 1-2. Multi-Axis FastTrack 8800 Tower

Hydraulic controls for servohydraulic actuators

When used with Instron FastTrack 8800 series load frames, the hydraulic controls for your testing system are provided by the handset included with the load frame. The handset is available to suit differing hydraulic configurations.

Single axis
With grips
Hydraulics off/low/high

Bi-axial
With grips
Hydraulics off/low/high

Figure 1-3. FastTrack 8800 handset and hydraulic controls for servohydraulic actuators

Electrical controls for electric actuators

When used with Instron FastTrack 8800 series load frames, the electrical controls for your electric actuator are provided by a control panel and handset, see Figure 1-4.

The control panel switches the electrical power to the actuator on and off and has an emergency stop button. The jog handset moves the actuator in the direction indicated by the arrows.

Figure 1-4. FastTrack 8800 handset and electrical controls for electric actuators

Application Software

A computer connected to the system runs the FastTrack software suite. You must have a suitable PC that runs the appropriate Windows™ operating system.

FastTrack Console

FastTrack Console forms the User Interface between you and your Materials Test Control System. It provides all the communications functions between your test controller and application programs. FastTrack Console has multi-test capabilities when used as an interface. It allows up to four simultaneous tests to be run.

FastTrack Console controls the test toolbar, that is used to display a summary view of any tests that are being carried out. The test toolbar is a dedicated area of the screen that cannot be minimised, closed or overlaid by any other window. You can access any application program being run from the test toolbar, allowing you to locate the relevant software program easily.

FastTrack Console contains live displays (often referred to as DVMs), that enable you to monitor signals within the control system. These displays can be customised, allowing you to select the number and type of signals to display and the size that they are displayed on the screen.

Included with the FastTrack Console software is the DAX data acquisition software, see Figure 1-5. When used in combination with FastTrack Console, DAX software can be used to gather information about a test as it progresses.

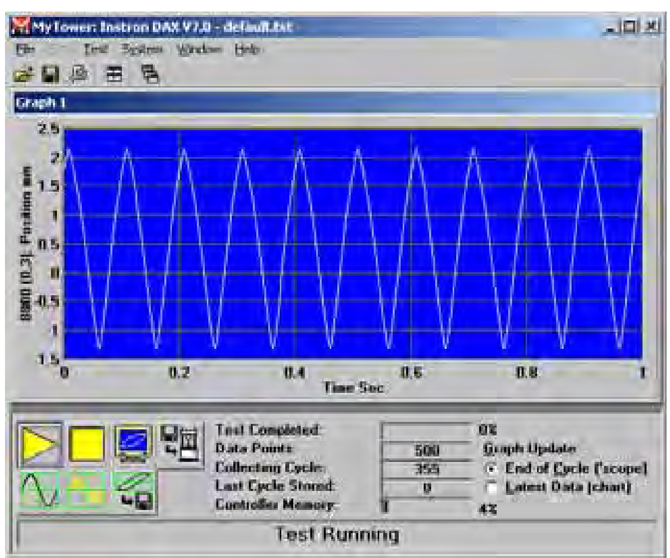


Figure 1-5. FastTrack DAX Data Acquisition Software

Software application programs work on top of the Console platform for you to control or define test parameters and design specific tests. Refer to your FastTrack Operating Instructions, or contact Instron for more information about software application programs.

About This Manual

This manual contains the information that enables you to connect your FastTrack 8800 controller to your testing system, set any switch-selectable options and carry out any diagnostic checks that may be required.

The following paragraphs detail the information found in each chapter.

Chapter 2- Contains information to be considered before your materials test system is installed.

Chapter 3- Provides details of the interconnections between your FastTrack 8800 controller and other components in your testing system.

Chapter 4- Gives you information relating to the setting up of your controller and configuring it to match your testing system.

Chapter 5- Provides information about the emergency stop system used within the FastTrack controller.

Chapter 6- Contains information about connecting auxiliary equipment to your FatTrack controller.

Chapter 7- Provides you with information about how to configure the FastTrack software.

Chapter 8- Descriptions of the FastTrack controllers' advanced in-built self-checking and diagnostics routines.

Chapter 9- Outlines routine maintenance procedures.

Appendix A- Lists electrical connections and pin-out details for the various connectors and cables that form connections to the controller.

Appendix B- Provides you with some reference drawings that may assist you in the configuring of your test system.

Chapter 2
Pre-Installation Considerations

Outline

As the FastTrack 8800 controller can be used to control a variety of different models of materials testing machines, it is impossible to document the exact installation procedures required within a generic manual.

Therefore, the information given in this chapter describes general principles to follow when planning the installation of your materials testing system.

General Considerations

You must consider several important factors when planning the site for your materials testing system:

- *acceptable floor loading levels
- the availability of three-phase mains electricity supply
- *the availability of single-phase mains electricity supply
- *the availability of a water supply for the hydraulic fluid cooling
- hydraulic pipe and hose runs
- ventilation considerations
- *suppression of noise emissions

Considerations for the siting of your Control System

When considering the location for your FastTrack 8800 controller, you should observe the following points:

- *the visibility of the testing system from the operator’s position.
- *the routing of cables between the controller and the testing system (ensure that cables do not cause personnel to trip, or that the cables do not become entangled etc.).
- *the location of any additional Emergency Stop buttons around the testing system.

Note: *Factors marked as * also apply to Electric actuators.*

Mains Electricity Supply

*Single-phase Supply

Your controller will require a single-phase electrical power supply of 220-250V or 110-120V. You may also require a supply for:

- your testing system
- any additional equipment, i.e. external signal generators

Locate the single-phase power points as close to the location of equipment it serves.

Note: *To ensure a controlled mains electrical supply environment, your computer and peripheral equipment connected to your controller must take its mains electrical supply from the filtered mains outlet on the rear of the controller. These connections should be made via the mains distribution assembly (Assembly No. A1698-1025) and cables complying to IEC320 standards (Part No. 82-10-65).*

*This section marked * also applies to electric actuators.*

Three-phase Supply

Depending upon your exact testing configuration, the hydraulic power supply for your materials testing system will usually require a three-phase electrical supply.

If this is the case, ensure that a suitable supply is available near the hydraulic power pack.

Hydraulic Power Supply System

The controller will function with several configurations of hydraulic power supply systems.

It can be connected to a dedicated hydraulic power pack that will supply just the requirements of the particular testing system, or it can be configured to control a number of shut-off blocks and apply hydraulic pressure from a ring main distribution system to the specific test configuration.

Whichever type of hydraulic power distribution system is used within your test configuration, observe the following points:

- ensure that all pipes and hoses are in good working order, and are free from any damage
- ensure that pipes and hoses are suitably routed between the various components that make up the testing system
- ensure that pipe and hose pressure ratings are correct for your system (210 or 280 bar)
- check that hoses are not likely to cause tripping hazards i.e. that they are not placed across a gangway
- route the electrical power cables and the cables from the controller in such a way as to prevent hazards i.e. to prevent tripping or damage caused by moving vehicles, testing system components etc.

Environmental Conditions

Every care has been taken in the design, assembly and testing of this equipment. However it is impossible to completely isolate it from the effects of the environment in which it has been stored prior to installation and the operating environment.

To eliminate unnecessary down time and maximise the operation of your testing equipment it is important that particular care is taken to ensure a high quality operating environment, both physical and electrical.

Physical environmental operating conditions such as high ambient temperatures or excessive humidity may cause overheating or physical damage to internal components. Long term exposure to acid vapour, carbon black or other conductive dust may cause electrical circuit problems.

Electrical disturbances can cause problems; dropped or lost data, unexplained errors, resets or other malfunctions. The a.c. power from the wall socket is often the major source of problems. For many reasons the regular electricity supply may be filled with voltage spikes, over-voltages and other unwanted noise interference. Even when the original line power supply is good, electrical disturbances may be induced along power lines by internal factory equipment, air conditioners, office machinery and fluorescent lights.

Recommended Environmental Conditions

Parameter	Specifications
Temperature (Operating)	10 to 38° C (50 to 100°F)
Temperature (Storage)	-40 to 66°C (-40 to 151°F)
Temperature (Rate of change)	2°C (3.6°F) per hour. Changes above this may affect the performance of the equipment.
Humidity (Operating)	10 to 90% (non-condensing)
Humidity (Storage)	0 to 95% (non-condensing, non-frosting)
Supply voltage	90 to 132 V.a.c. and 180 to 264 V.a.c.
Supply Frequency	50 to 60Hz ± 0.5Hz

Warning

Earth fault loop impedance (Z_S) for circuits supplying electrical equipment should not exceed the values shown in the table below.

Fuse Rating (A)	Mazimum Z_S (Ω)
6	13.0
10	7.7
16	4.4
20	2.0
25	2.4
32	1.8
40	1.4
50	1.1
63	0.86
80	0.6
100	0.45
125	0.34
160	0.27
200	0.19
250	0.16

Note: *When $U_{o,}$ the nominal voltage to earth (ground) is NOT 240V, the tabulated impedance values must be multiplied by U_o/240.*

The above figures are based upon IEE Wiring regulations, Fifteenth Edition, 1881, Section 413-5. There are no comparable US Standards, but the above values may be used as guidelines.

Noise Levels

The noise level for the Instron 8800 series of controllers is <70dB(A).

The noise level of the entire system depends on your particular system configuration. Refer to the documentation supplied with each system component for information about that component's noise level.

Chapter 3
Configuring your FastTrack 8800 Controller

Outline

The FastTrack 8800 controller allows you to control the setup and configuration of different testing systems, which have varying numbers of axes and differing configurations.

This chapter details the procedures required to setup your controller and testing system.

Electrical Connections to your Controller

The illustrations on the following pages show the locations of the various electrical connectors provided by the FastTrack 8800 controllers.

Figure 3-1 shows the electrical connections on the rear of the 8800D controller. (On this version, all electrical connections are made to the rear of the unit.)

Figure 3-2 shows the 8800D, connected to a single axis testing machine.

Figure 3-3 shows the connections on the front panel of the tower, which are visible through the door in the front panel moulding. These connections may be required for a particular test, or whilst setting up a test, but that can be easily accessed to remove them when no longer required.

Figure 3-4 shows the connections on the front panel of the tower, which are routed via the cable tray, beneath the tower assembly. These connections are likely to be added or removed occasionally for devices, such as additional transducers.

Figure 3-5 shows the rear panels of the two versions of actuator interface board, labelling the connectors found on each version.

Note: *Two versions of the Actuator Interface Card are available:*

A1721-1325*, is more commonly fitted to the FastTrack controllers. It contains a single 62-way connector and cable that connects the controller to the actuator.* ***A1721-1345****, is also available. On this version, the signals to/from each transducer are separated into different cables.*

Refer to Figure 3-5 to identify which version is connected to your system (Both types can be used together within a multi-axis system.)

Some versions of the Actuator Interface Board have an additional indicator LED fitted, marked 24V. This LED is green and should be illuminated to indicate the presence of 24V. If this LED is not illuminated, it is possible the internal fuse (part number 27-2-1028) on the 24V supply line could have blown.

If you are using the 8800D controller fitted with the hirose version of actuator interface board, you can fit either a computer or an operator panel to the connector on the actuator interface board. Refer to Figure 3-5 for the location of this connector. If you are using the 8800 tower and want to fit a computer as well as an operator panel, you must fit the operator panel to the connector on the actuator interface board, and connect the computer to the computer interface (GPIB) panel on the tower. Refer to Figure 3-6 for location of this panel.

Figure 3-6 shows the electrical connections to the rear of the tower. These are the connections that are most frequently made, such as the connections to the actuators, the hydraulic power systems and the controlling computer.

Figure 3-7 shows the tower connections for a typical bi-axial testing system.

Figure 3-8 shows a bi-axial testing system, using the tower with a single hydraulic power source that runs both axes.

Note: *It is important that, when using the tower version of the FastTrack 8800 controller, the EMC cover plate is correctly fitted when the controller is switched on. The EMC cover plate is fitted across the front of the Integrated Axis Controller Cards.*

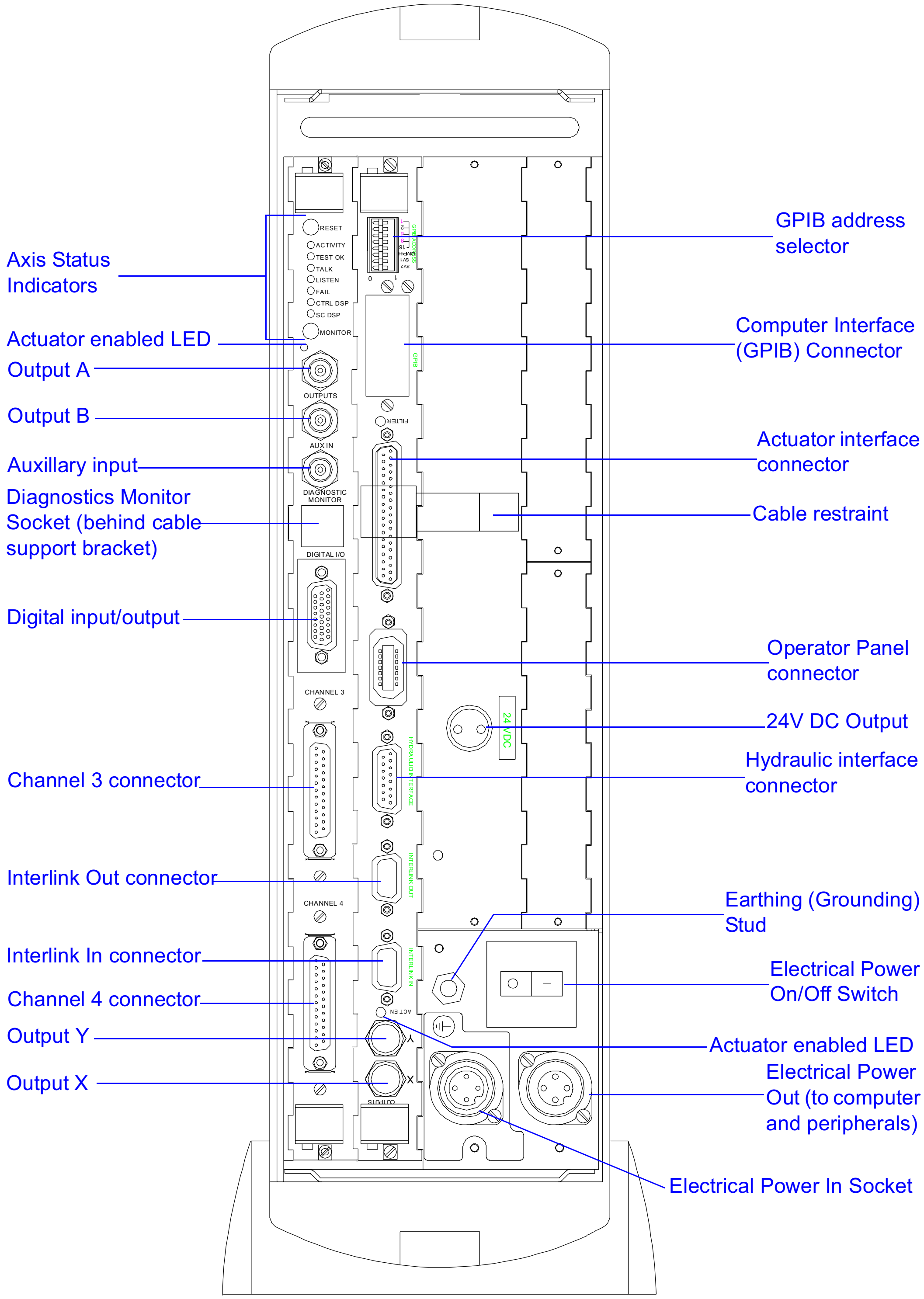


Figure 3-1. FastTrack 8800D - Connections to the Rear Panel

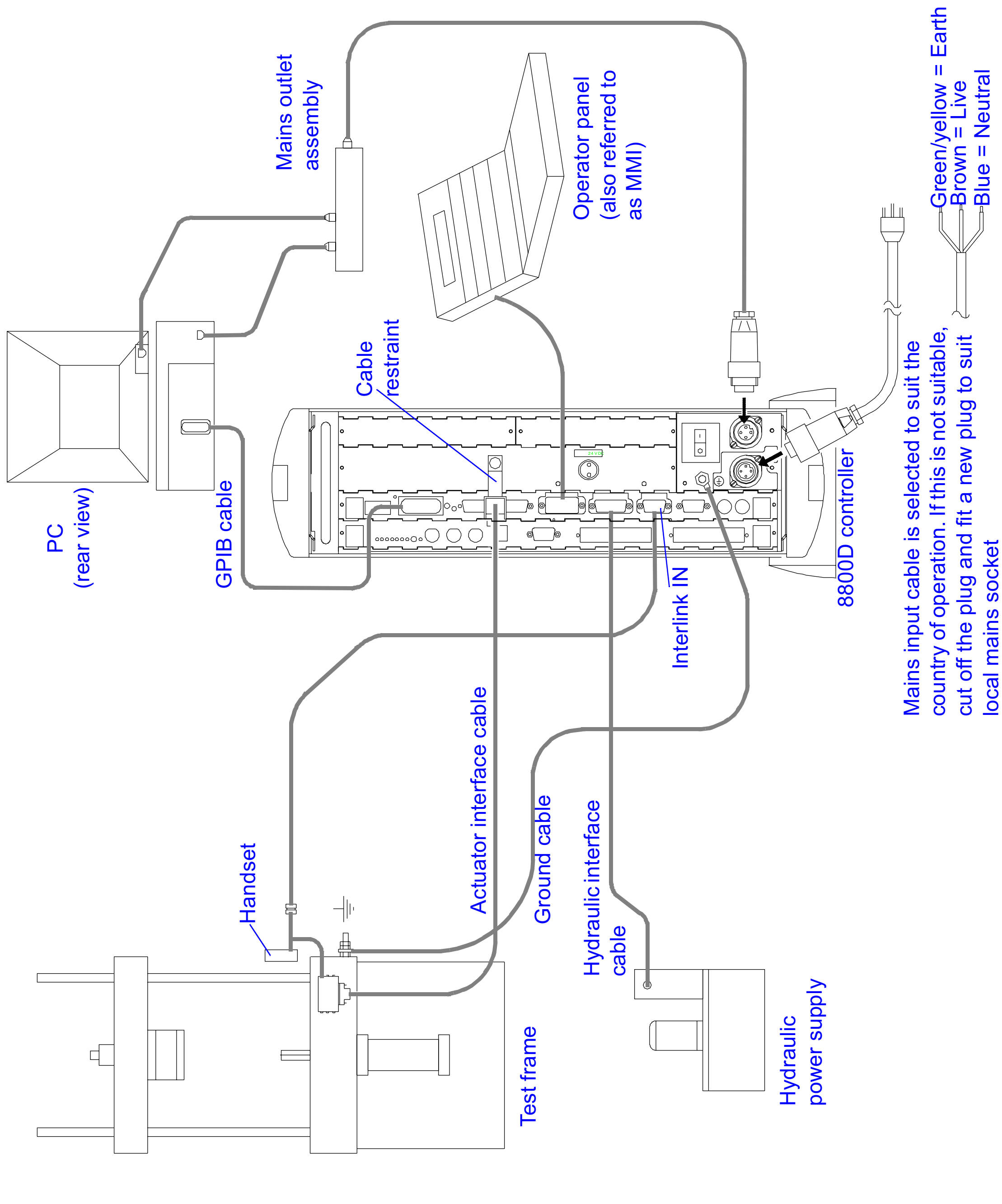


Figure 3-2. FastTrack 8800D - Typical System Connections

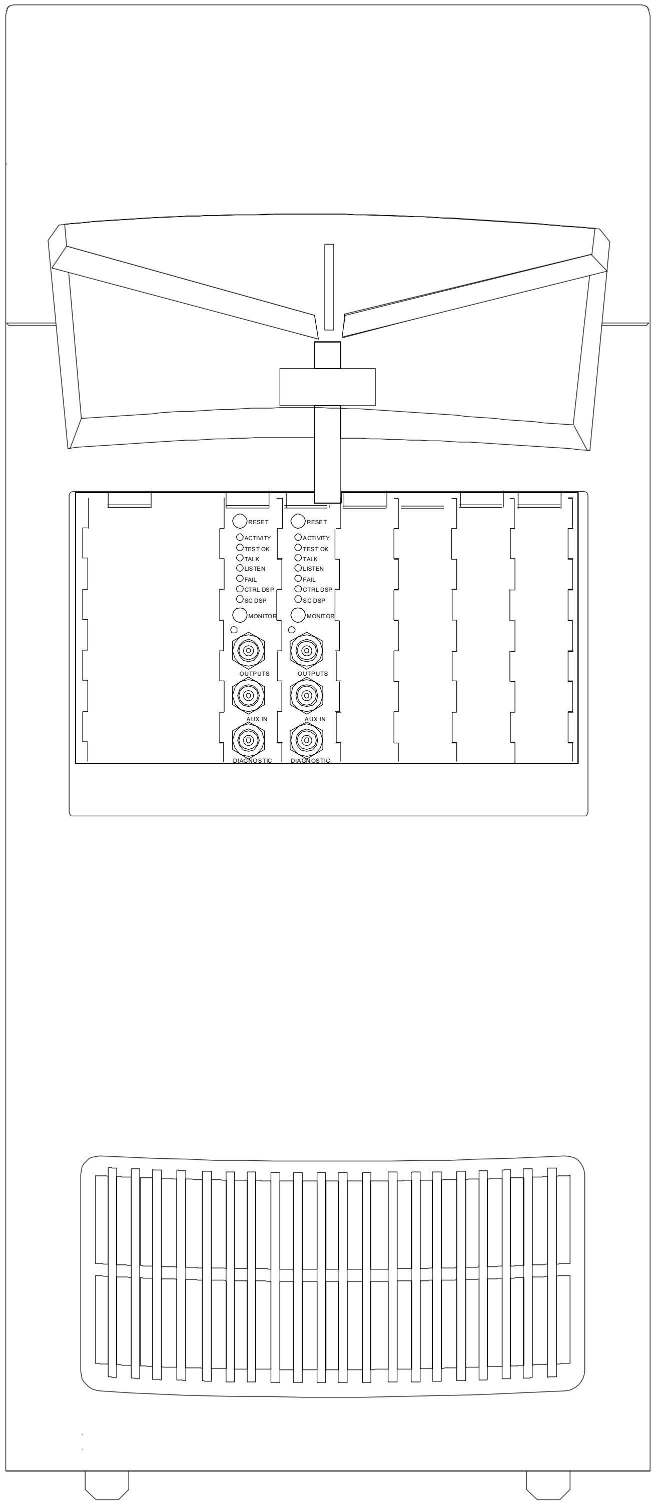


Figure 3-3. FastTrack 8800 Tower - Front Door Connections

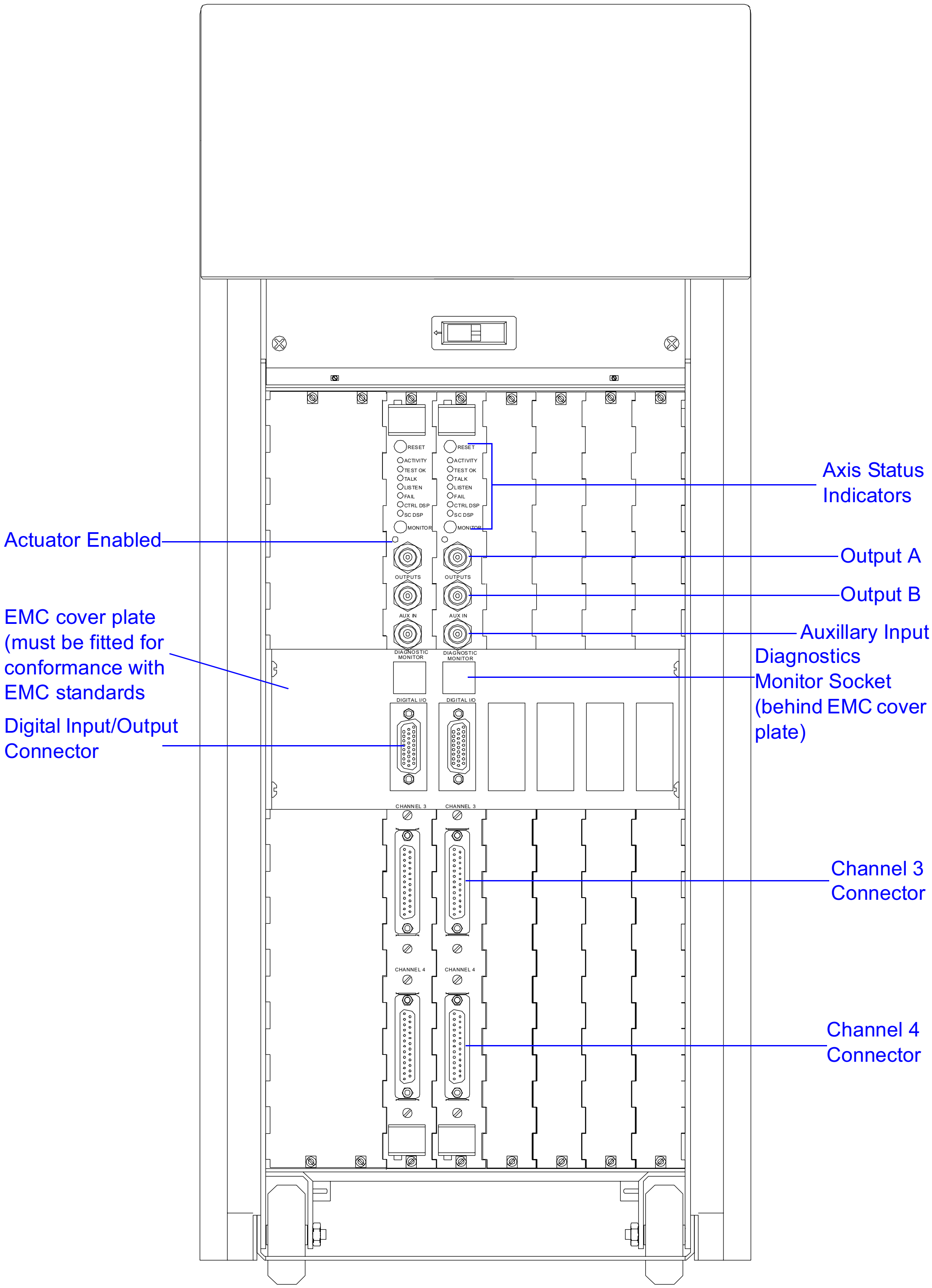


Figure 3-4. FastTrack 8800 Tower - Front Panel Connections

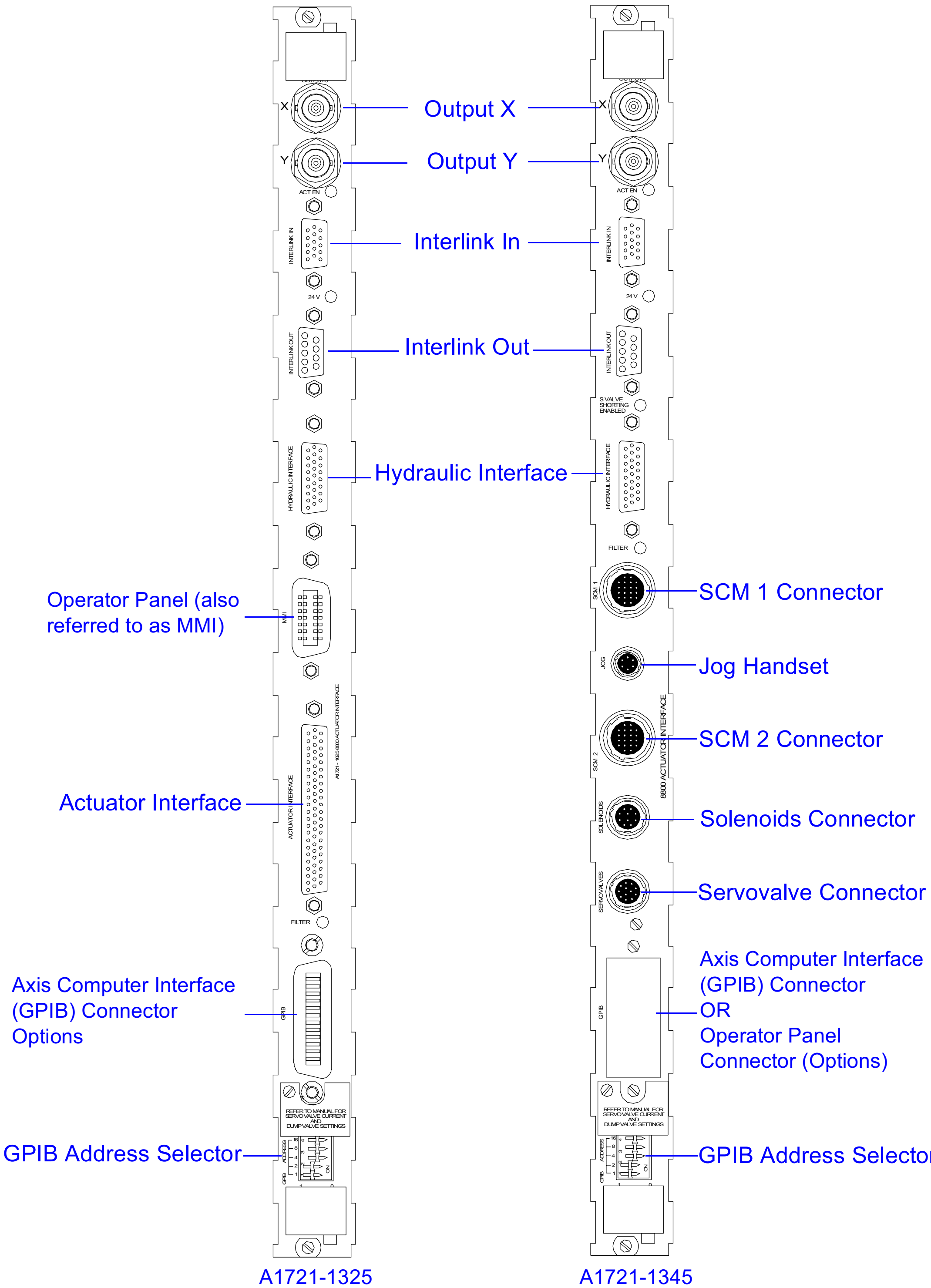


Figure 3-5. Comparison of Actuator Interface Card Connectors

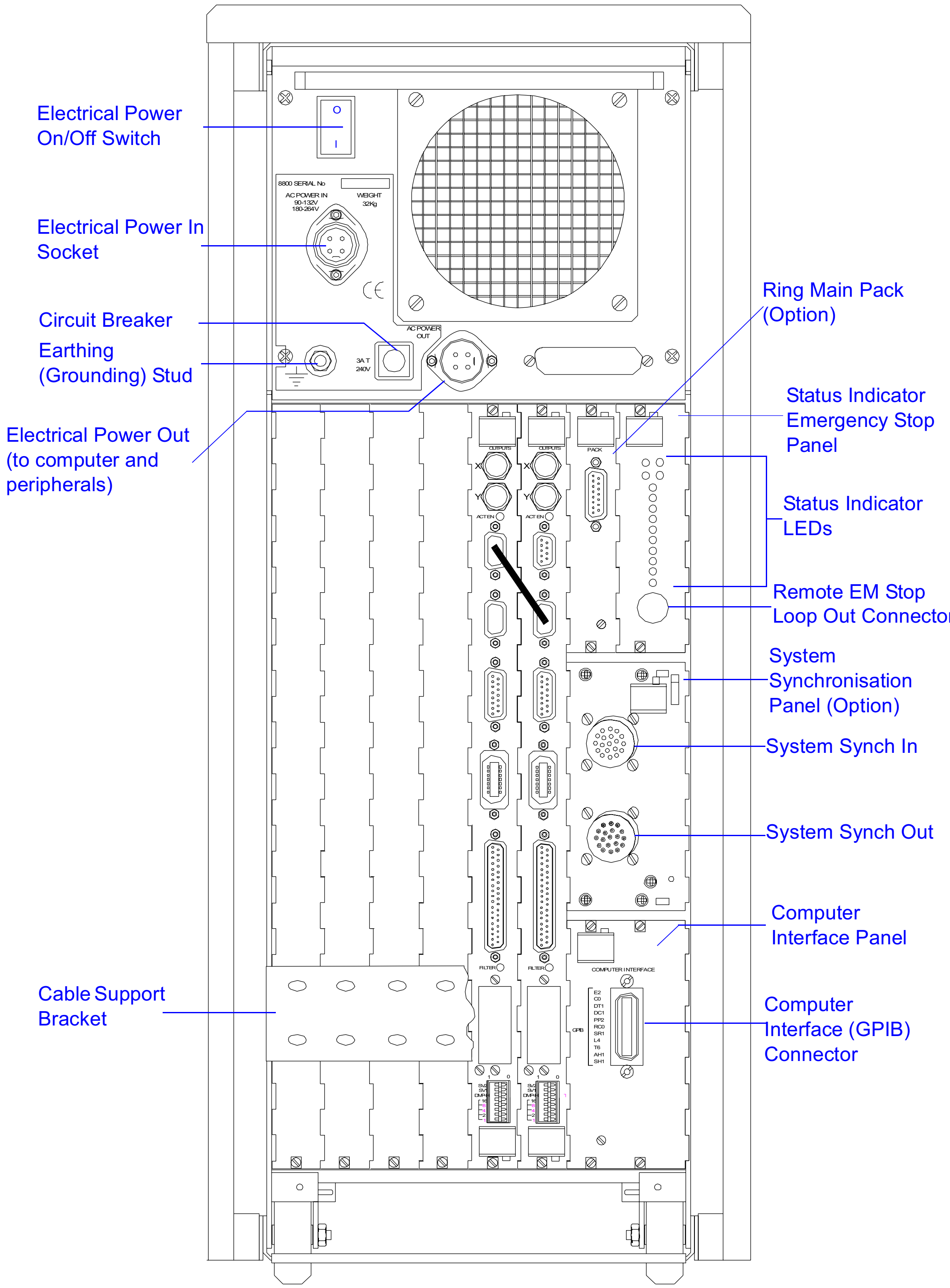


Figure 3-6. FastTrack 8800 Tower - Typical Rear Panel Connections

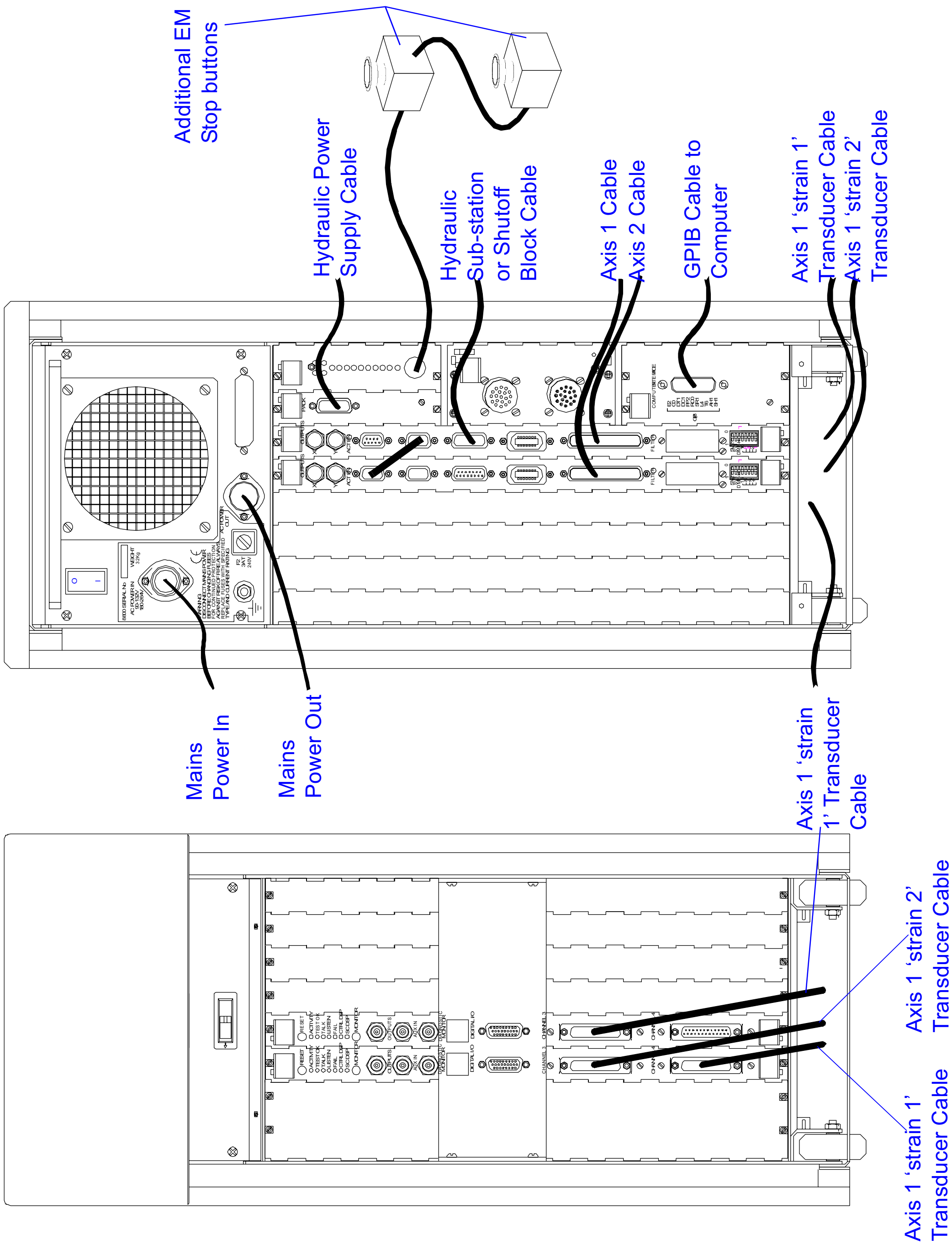


Figure 3-7. FastTrack 8800 Tower - Typical Tower Connections

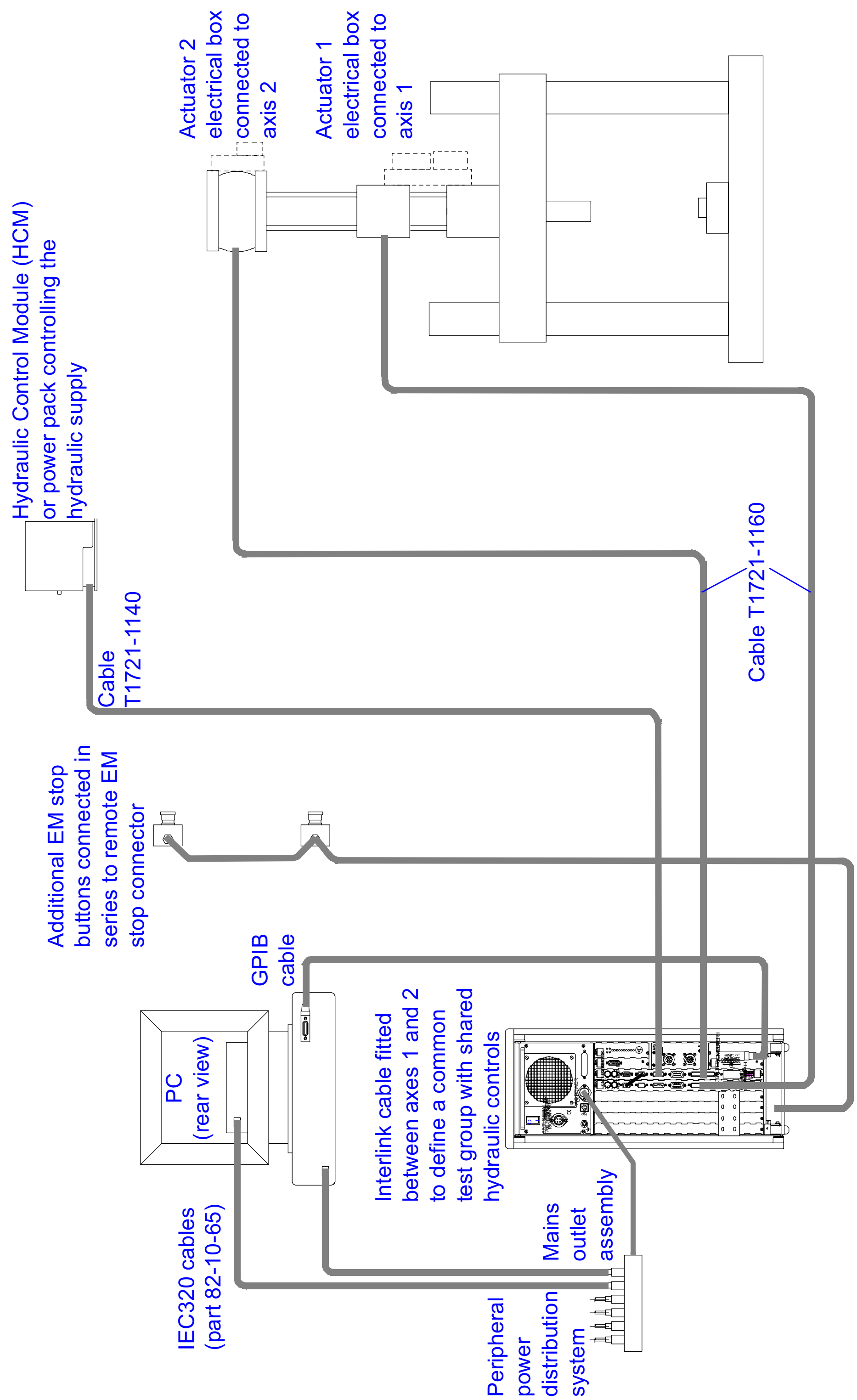


Figure 3-8. FastTrack 8800 Tower - Typical System Connections

Connecting Mains Power to your System

Warning

Disconnect the mains cable from the AC power inlet of the controller to electrically isolate the equipment.

8800 FastTrack Tower

The AC power outlet, fuse mains filter and the wiring within the 8800 enclosure remains live when the mains switch is turned off. Disconnect the mains by removing the AC power inlet cable before changing fuses or removing the covers of the enclosure.

Connect the mains electrical power to the Electrical Power In socket on the rear of the 8800 controller (refer to Figure 3-1 or Figure 3-6 for socket location).

Use the mains input cable supplied that contains a 4-pin Amphenol plug on one end. The other end is selected according to the country of operation. If this is not suitable, cut of the selected plug and fit a new plug to suit the local mains socket.

Connecting Actuators to the Controller

Depending upon the version of the Actuator Interface Card (see Figure 3-5) fitted within your controller, the actuators are connected to your controller in the following way:

Actuator Interface Card A1721-1345 (Hirose Connectors)

Actuator Interface Card A1721-1345 is not usually fitted to the FastTrack controller since it is more suited to rig applications. However, the description has been included in this manual.

This Hirose version of the Actuator Interface Card has separate connectors for two sensor conditioner modules (SCM1 and SCM2), as well as connectors for the cable to the servovalve(s) and to the solenoid valves fitted to the actuator, see Figure 3-9. A further connector allows the Jog Handset to be connected.

Connecting Transducers

Several different cables are available to connect the most commonly used types of transducers to the controller, see Table 3-1. Refer to the documentation supplied with your controller for further information on connecting and calibrating transducers.

Connecting to the Solenoid Valves fitted to the Actuator

A range of cables are available to connect the controller to a range of servohydraulic actuators with different types of solenoid controlled valves fitted. These are:

- Load release valve (also referred to as Shunt valve)
- Dump Valve
- Filter pressure switch
- Crosshead clamped pressure switch
- Emergency stop
- Manifold Pressure Switch

Connecting to the Servovalve(s) on the Actuator

The controller can be configured to control several types and combinations of servovalve. The standard cables listed in Table 3-1 are available for the connection of the most commonly used types.

Connecting the Jog Handset

A cable is available to connect a Jog Handset to each axis.

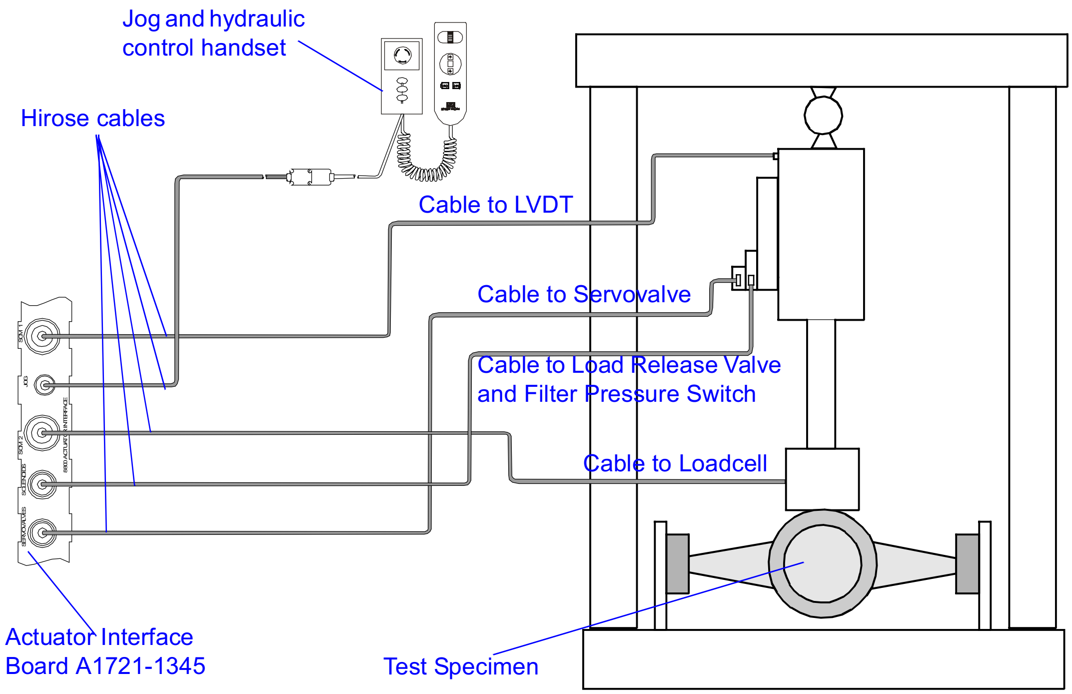


Figure 3-9. Actuator Interface Hirose Connections

Table 3-1. Commonly used cables for the Hirose version Actuator Interface Card A1721-1345

For Connection to:	Cable No.
Actuator LVDT	A1721-1113-x
Inductive Displacement Transducer	A1721-1114-x
Loadcell	A1721-1117-x
Schenck Loadcell	A1721-1116-x
Actuator Load Release Valve	A1721-1120-x
Actuator Dump Valve	A1721-1121-x
Actuator Load Release Valve & Filter Block	A1721-1122-x
Actuator Dump Valve & Filter Block	A1721-1123-x
Jog Handset	A1721-1115-x
Single Servovalve	A1721-1124-x
Dual Servovalves	A1721-1125-x
3-Stage Servovalve Internal Electronics	A1721-1126-x
Differential Pressure Transducer	A1721-1382-x

In Table 3-1, the “x” in the part number represents the available cable lengths, where:

1 = 0.5 Metres
2 = 1 Metre
3 = 3 Metres
4 = 5 Metres
5 = 10 Metres
6 = 20 metres
7 = 50 metres
8 = 15 Metres

More cables are available. Contact your local service or sales department.

Actuator Interface Card A1721-1325 (62 way connector)

Actuator Interface Card A1721-1325 is more commonly fitted to the FastTrack controller since the actuator interface box is more suited to frame applications. Several wiring options are available to connect a wide range of actuators to your controller using the actuator interface box.

The actuator interface box, see Figure 3-10, allows you to connect separate cables to individual devices and connect the 62-way actuator cable to the actuator interface board inside the controller, see Figure 3-11.

Mount the actuator interface box on a stationary piece of equipment, such as a load frame, where it will be not subjected to vibratory movements. Then connect cables for each device using cables of a suitable length, refer to Table 3-2 for connector information.

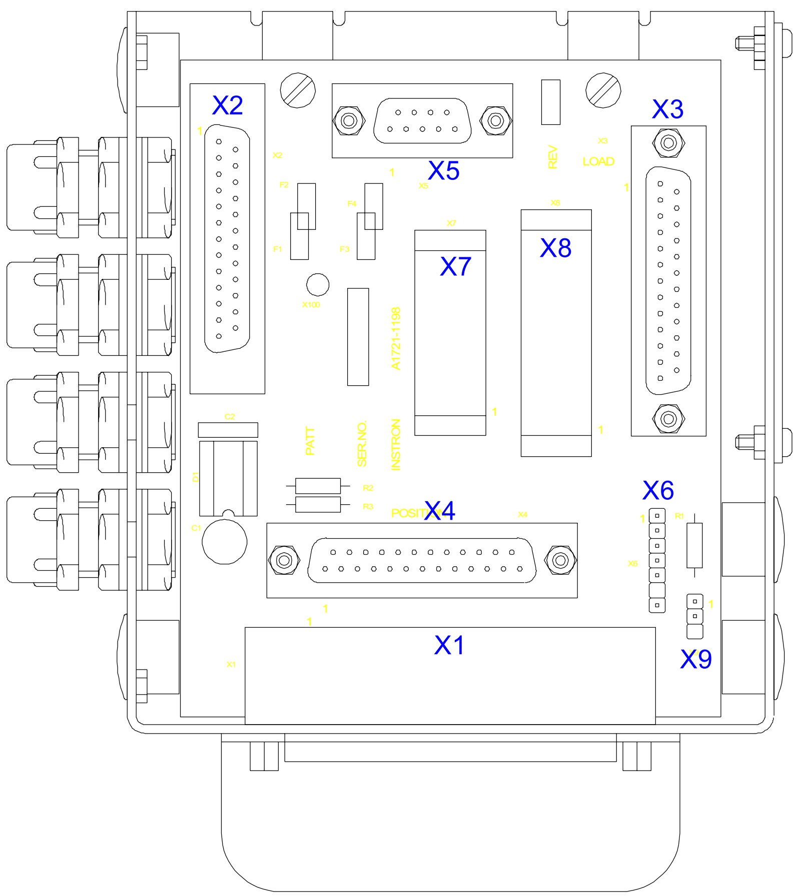


Figure 3-10. Actuator Interface Box Assembly

Table 3-2. Actuator Interface Box Connector Information

Connector	Type	Function	Cable Part Number	Comments
X1	62 way plug	Cable from controller	-	-
X2	25 way socket	3 stage valve (option)	see F8800-311	Separate cat number, fit blanking plate if not fitted
X3	25 way plug	Displacement transducer	A1735-1010	Pass cable through slot and fit blanking plate
X4	25 way plug	Load cell	Load cell plug or cable A1735-1012	Fit blanking plate if not fitted
X5	9 way plug	Differential pressure transducer	see F8800-264	Separate cat number, fit blanking plate if not fitted
-	5 pin DIN	Actuator jog (option)	8800-121	Separate cat number
X7 PINS 1&2	Terminal strip	Load Release valve	A1735-1015-x	See note 2
X7 PINS 3&4	Terminal strip	Dump valve	A1735-1015-x	See note 2
X7 PINS 5&6	Terminal strip	Servovalve 1	A1735-1011	Connect red wire to pin 5 Connect blue wire to pin 6
X7 PINS 7&8	Terminal strip	Servovalve 2 (if fitted)	A1735-1011-x (or no connection)	Connect red wire to pin 7 Connect blue wire to pin 8
X8 PINS 1&2	Terminal strip	Emergency stop (if required)	Within A1735-1047 or link A1735-1167	-
X8 PINS 3&4	Terminal strip	Actuator stop (if required)	Link A1735-1017	Normally not used
X8 PINS 5&6	Terminal strip	Manifold pressure switch	No connection	Normally not used
X8 PINS 7&8	Terminal strip	Crosshead clamp pressure switch	A1735-1025 or link A1735-1017	-
X8 PINS 9&10	Terminal strip	Filter blocked pressure switch	A1735-1016 (or no connection)	-

Note: *1. If the servovalve polarity is incorrect, reverse the wire connections.*

2. An 'x' in the cable number indicates that different cable lengths are available. Contact your local service or sales department for more information.

The type of cables and actuator connection boxes fitted to your testing system will depend upon the type of actuators that are attached to your system. Refer to Table 3-3.

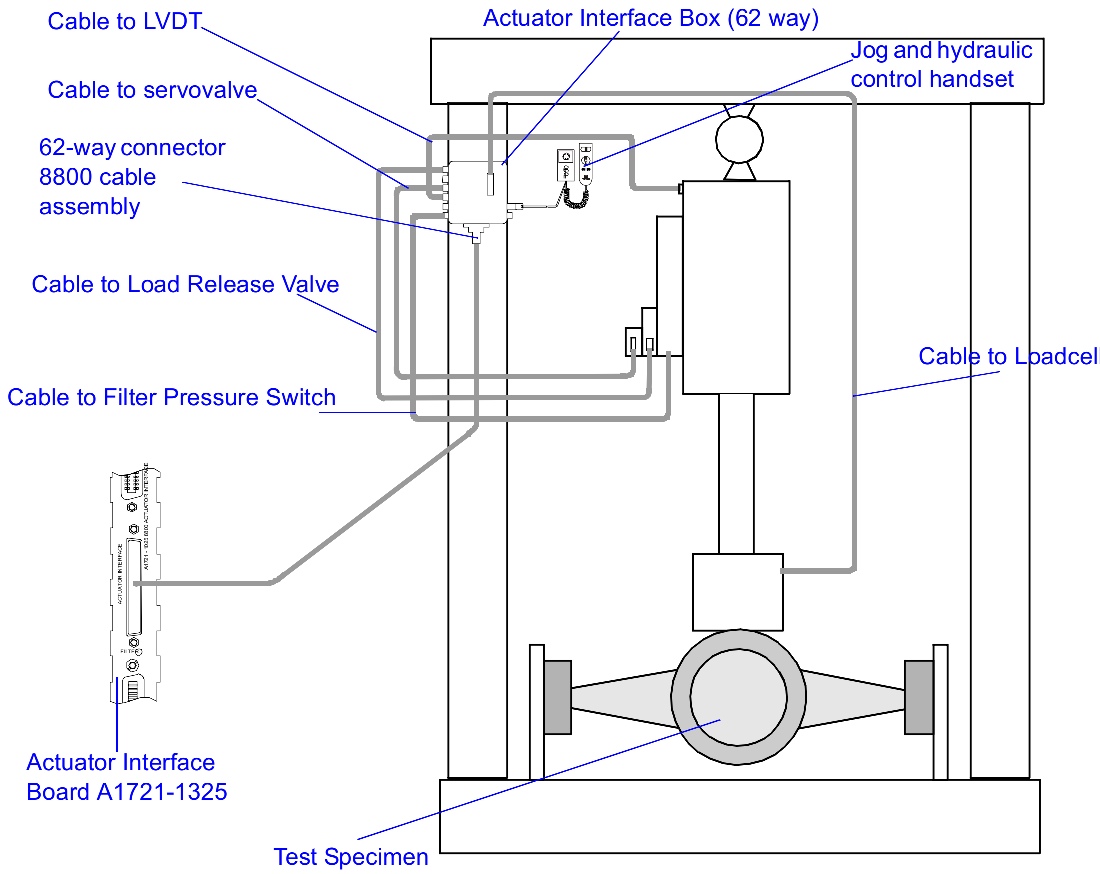


Figure 3-11. Actuator Interface 62-way Connections

The cables required to connect your actuators to your controller will depend upon the type of actuators you are using.

The following table lists some of the available actuator connector types and gives the appropriate cables to use:

Table 3-3. Actuator Cable Part Numbers

Actuators with:	Cable No.	Cable Length
Pre-8800 system (information for retrofit purposes)		
48-way Round Connectors	T1721-1110 T1721-1111 T1721-1112	5 m 10 m 20 m
90-way “Varelco” Socket	T1721-1170	1 m
“62-way to 48-way” Retrofit Cable	T1271-1171	1 m
8800 system		
62-way D-type Connectors	T1721-1160 T1721-1161 T1721-1162 T1721-1163 T1721-1164 T1721-1165 T1721-1166	5 m 10 m 20 m 1 m 3 m 2 m 4 m

When the appropriate cable has been identified and obtained, connect it to the actuator interface connector on the relevant axis. (Refer to Figure 3-5 for the location of this connector.)

Connecting Electric Actuators

The FastTrack 8800 controller can also accomodate an electric actuator. In this system the power amplifier provides power for actuator motion. The power amplifier allows you to connect separate cables to individual devices and connect the 62-way actuator cable to the actuator interface board inside the controller, see Figure 3-12.

Mount the power amplifier to the rear of the load frame, then connect cables for each device using cables of a suitable length, refer to Table 3-4 for cable information. For more information, refer to the reference manual supplied with the electric actuator.

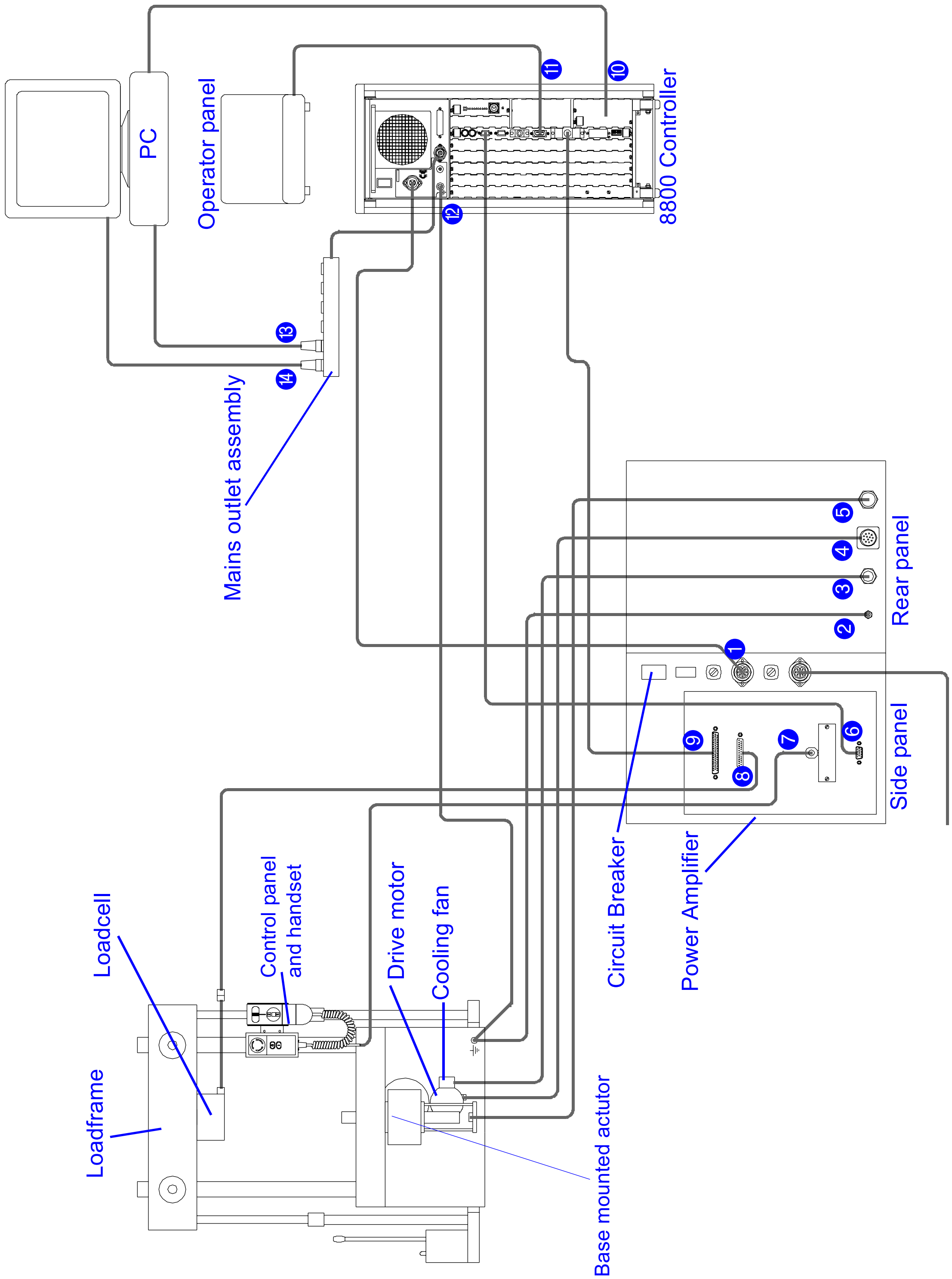


Figure 3-12. Electric actuator and power amplifier connections

Table 3-4. Electric actuator connections

	Connection	Cable No.
1	Mains Output cable from power amplifier to controller	A1735-1341
2	Ground cable from power amplifier to loadframe	A712-213
3	Power amplifier to cooling fan	A1735-1333-x
4	Power amplifier to drive motor	A1498-1030-x
5	Power amplifier to gearbox	A1498-1031-x
6	Interlink cable from controller to power amplifier	A1735-1051-x
7	Frame enable and jog control cable from power amplifier to jog handset	A1735-1167-x
8	Power amplifier to loadcell	A1735-1324-x
9	Actuator interface cable from power amplifier to controller	T1721-1164
10	GPIB control cable from controller to computer	62-51-1025
11	MMI control cable from controller to operator panel	82-10-73
12	Ground cable from controller to loadframe	A712-213
13	Mains outlet assembly to PC	82-10-65
14	Mains outlet assembly to monitor	82-10-65

An ‘x’ in the cable number indicates that different cable lengths are available. Contact your local service or sales department for more information.

Note: *Electric actuator retrofits can only be performed to base mounted actuators. On new machines the electric actuator can be mounted on the base or crosshead.*

Defining Axes and Test Groups

FastTrack Tower Only

A number of axes can be grouped together to form part of the same test group in several 8800 towers. You can also configure groups of axes within the same 8800 tower to run more than one multiple axis test group. Multiple axis testing requires the axes within the controller to be connected into different test groups using an interlink cable.

Interlink Connections

Each actuator interface card is fitted with Interlink In and Interlink Out connectors. To assign axes and define a test group, connect interlink cables to these connectors between the axes you require in the test group.

A cable must be fitted from the interlink out connector on the first member of the group to the interlink in connector on the second member of the group. Then, a second cable must be fitted from the interlink out connector on the second member of the group to the interlink in connector on the third member of the group, and so on.

The first member of the group is called the interlink “master” and any other members of the same test group are called interlink “slaves”.

The master axis is used to define the hydraulic controls and the GPIB connections for the test group. If fitted, axes 5 and 6 cannot be configured as interlink ‘master’ channels.

Table 3-5 details the cable part numbers and available lengths for these cables.

Table 3-5. Interlink Cable Part Numbers

Interlink Cable with:	Cable Number	Cable Length
15-way “D-type” plug to 9-way “D-type” Plug	T1721-1150 T1721-1151	300 mm 1 m

Multiple axis configurations

Figure 3-13 shows three example configurations:

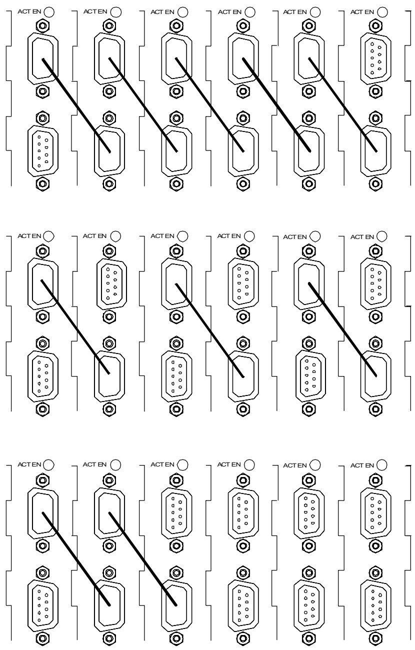


Figure 3-13. Defining the Axes in your test group

Single Axis Configurations

Single Test

The simplest type of configuration has a single actuator controlled by a single control axis (test group) within an 8800 tower. This is known as single test.

Multiple Test

Up to 4 separate single axis tests can be performed from a controller. When all axes run separate tests simultaneously from a single controller, this is known as multiple test.

Note: *A multiple test system can only be configured within a single controller.*

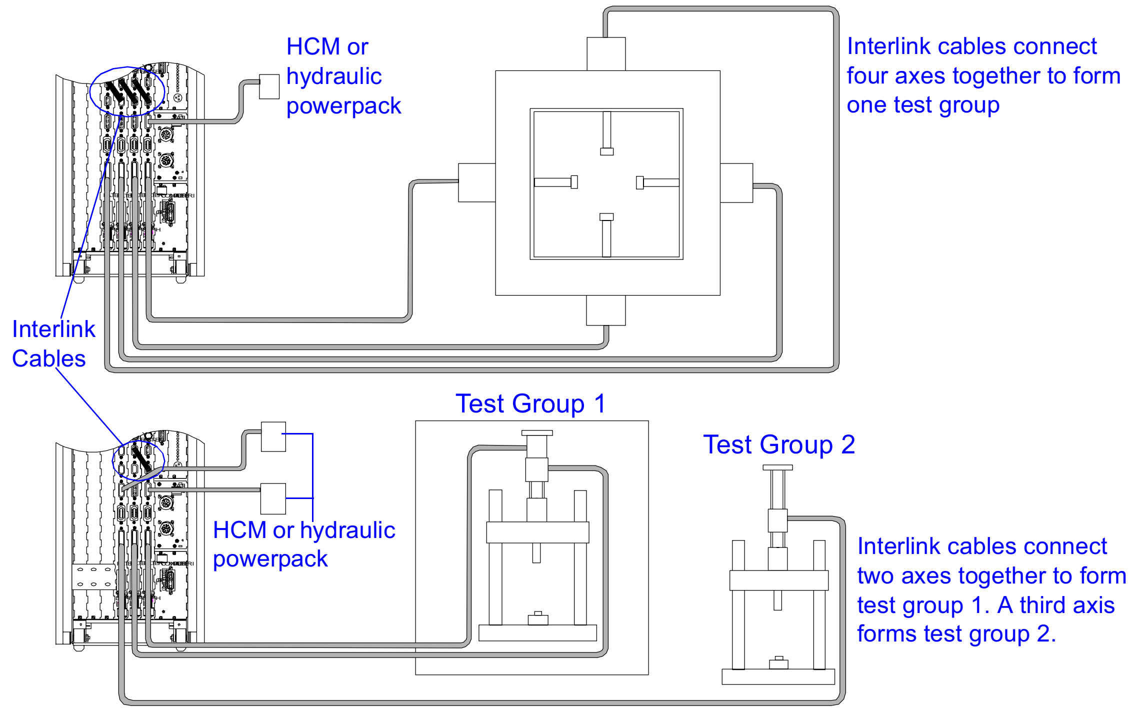


Figure 3-14. Example Multiple Axis Configurations

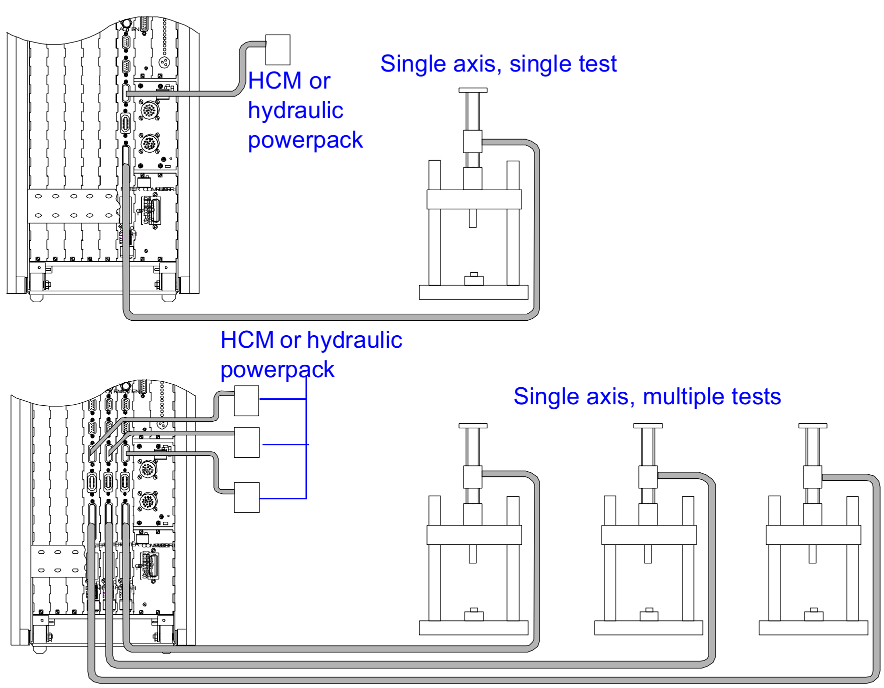


Figure 3-15. Example Single Axis Configurations

Connecting Multiple Towers- Interconnection of Controllers

System Synchronisation Panel

Multiple axis testing may require you to have several controllers linked together to form a common testing system.

To operate two or more controllers, whether tower, desktop, or rack mounted as a single testing system controller, each unit must be connected together using the (optional) “System Synchronisation” panels.

The system synchronisation panels allow the timing and synchronisation signals generated within one unit to be transferred to any connected units.

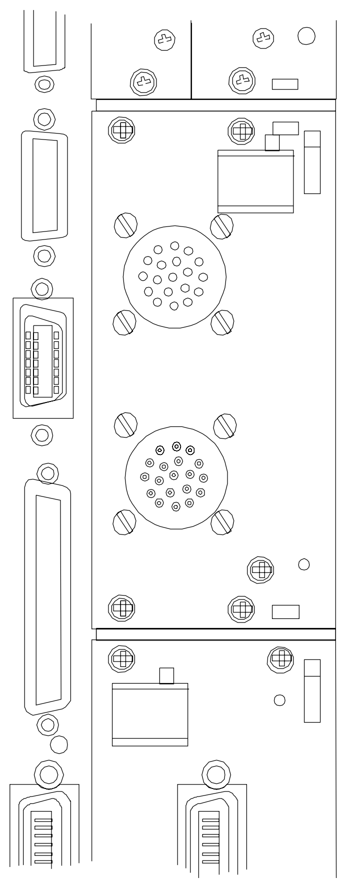


Figure 3-16. System Synchronisation Panel shown fitted to the FastTrack Tower

Connecting your Controller to your Hydraulic Power System

Figure 3-17 and Figure 3-18 shows some typical connections in a hydraulic system.

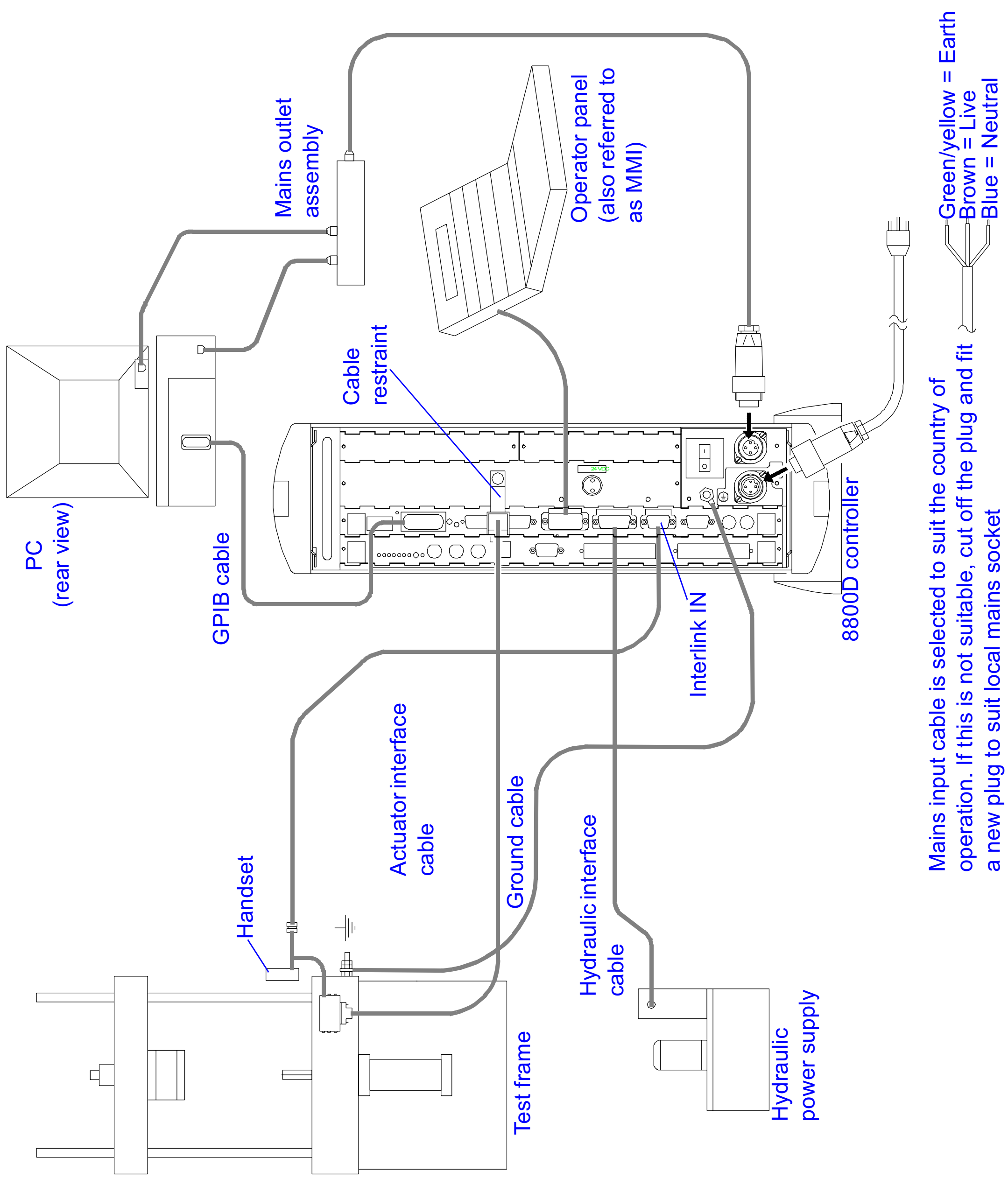


Figure 3-17. FastTrack 8800D - Typical System Connections

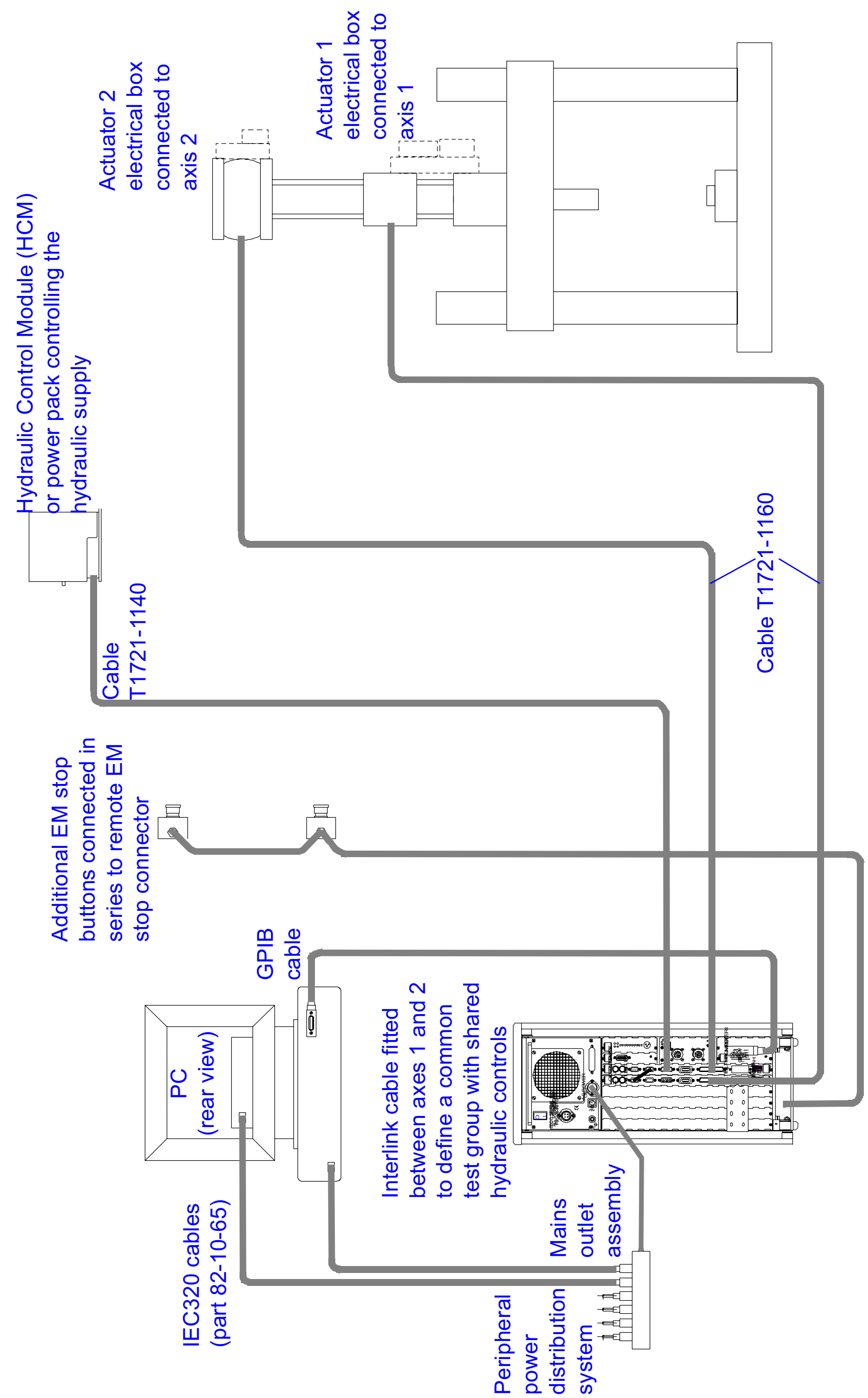


Figure 3-18. FastTrack 8800 Tower - Typical System Connections

Each interface card at the rear of your 8800 controller is fitted with a hydraulic interface connection. Also, your controller may be fitted with the optional “Ring Main Pack” Panel (Catalogue No 8800-205).

Using the Actuator Interface Hydraulic Connector

To assign a set of hydraulic controls to each test group you have set up (see Figure 3-19) connect the hydraulic cable to the hydraulic interface connector on each “master” axis.

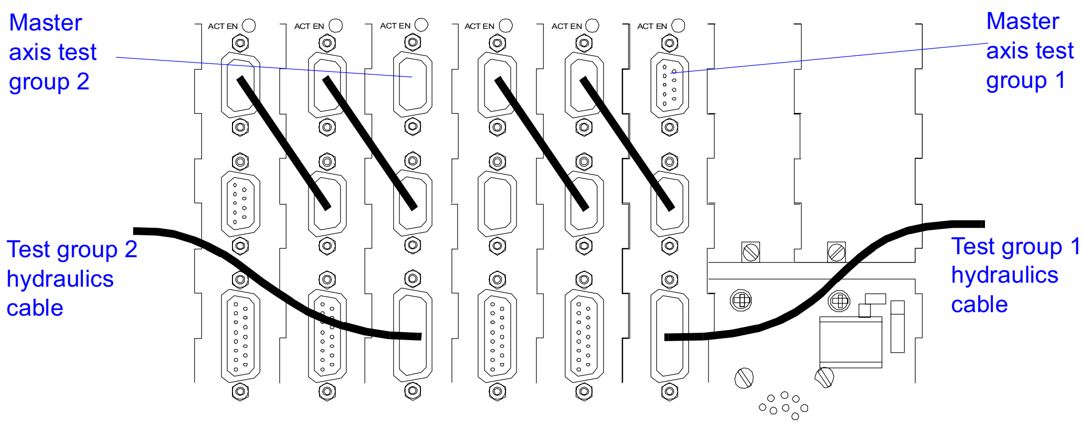


Figure 3-19. Connecting Test Group Hydraulics

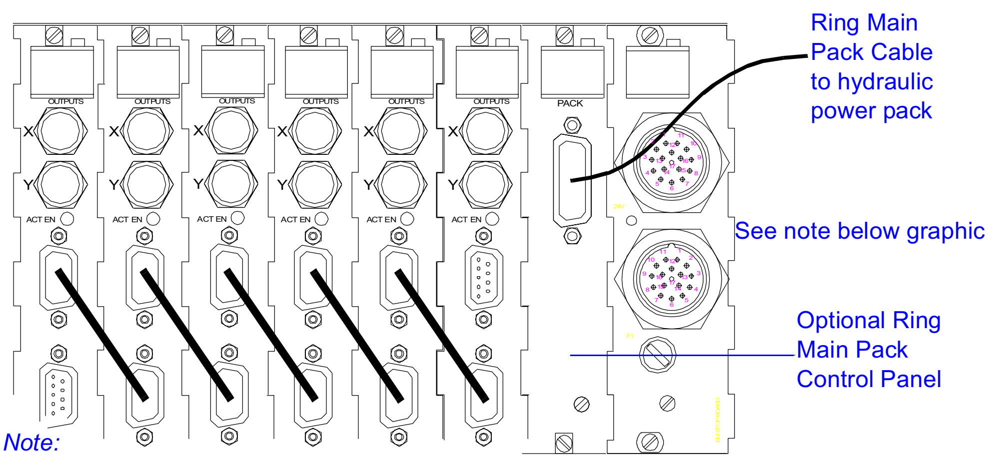
See Table 3-6 for the cables required to connect the master axis to the hydraulic component.

Table 3-6. Hydraulic Cable Part Numbers

Hydraulic Components:	Cable No.	Cable Length
Hydraulic Shut-off Manifold	T1721-1120 T1721-1121 T1721-1122 T1721-1123	5 m 10 m 20 m 1 m
Hydraulic Power Pack	T1721-1130 T1721-1131 T1721-1132	5 m 10 m 20 m
Hydraulic Control Module (and some older Hydraulic Power Packs)	T1721-1140 T1721-1141 T1721-1142	5 m 10 m 20 m

Ring Main Pack Panel (Optional)

If your system is fitted with the Ring Main Pack panel, it should be connected to your hydraulic power pack, via the 26-way high-density D-type plug, fitted to this panel.



Note:
A different version of the Emergency Stop board is shown in this illustration.

Figure 3-20. Using the (Optional) Ring Main Pack Panel

Table 3-7 shows the cables required for the different types of hydraulic power pack and HCMs that may be connected to your testing system.

Table 3-7. Hydraulic Power Pack and HCM Cables

Hydraulic Components:	Cable No.	Cable Length
Fitted with 19-way “Metalok” Connector (“Corporate Power Packs”)	T1721-1130 T1721-1131 T1721-1132	5 m 10 m 20 m
Fitted with 20-way “Varelco” Connector (“Non-corporate Power Packs”)	T1721-1140 T1721-1141 T1721-1142	5 m 10 m 20 m

Connecting a Computer to your Controller

Connecting a single computer

For most testing situations, the controller is connected to a single computer, that controls all the axes within the controller. The FastTrack 8800D can only ever be connected to a single computer.

Note: *The IEEE 488 standard for the GPIB connections states that cable lengths must NOT exceed 2 metres per node.*

The computer must be connected, via the General Purpose Instrument Bus (GPIB) to the controller, using the “controller GPIB” connector, located at the lower right corner of the rear of the controller for the tower version and top left for the 8800D controller. The signals to this connector are normally common to all axes and data acquisition boards fitted to the controller.

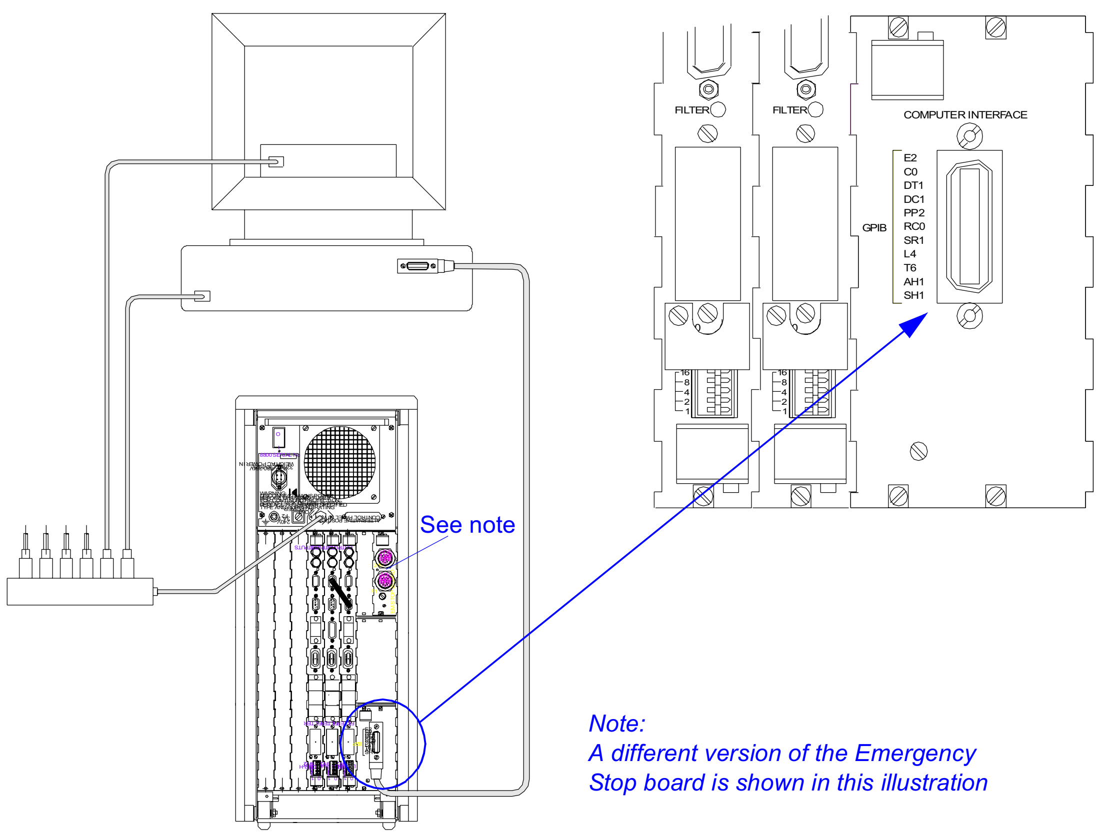


Figure 3-21. Tower version - Controller GPIB to Computer Connection

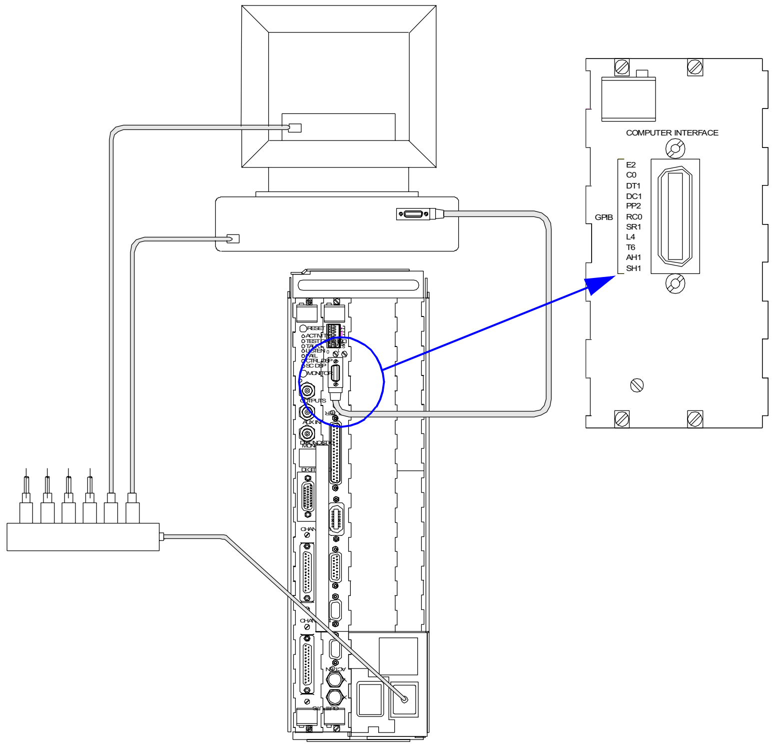


Figure 3-22.   8800D - Controller GPIB to Computer Connection

Connecting more than one Computer to your Controller

(FastTrack 8800 tower only)

To connect more than one computer to your controller, you need at least one actuator interface card with the optional “Axis GPIB” connector fitted.

This should be fitted to the first actuator interface card in the test group that is connected to the second PC.

The GPIB jumper is located between each axis on the backplane. To control test groups with different computers, remove the jumper between the test groups that will be controlled by different computers.

The axes to the right (viewed from the rear) of the jumper that has been removed, are connected to the main GPIB connector for the tower, which is connected to the first PC. The actuator interface card with the GPIB connector fitted should go to the left (viewed from the rear) of the jumper that has been removed. This is connected to the second PC.

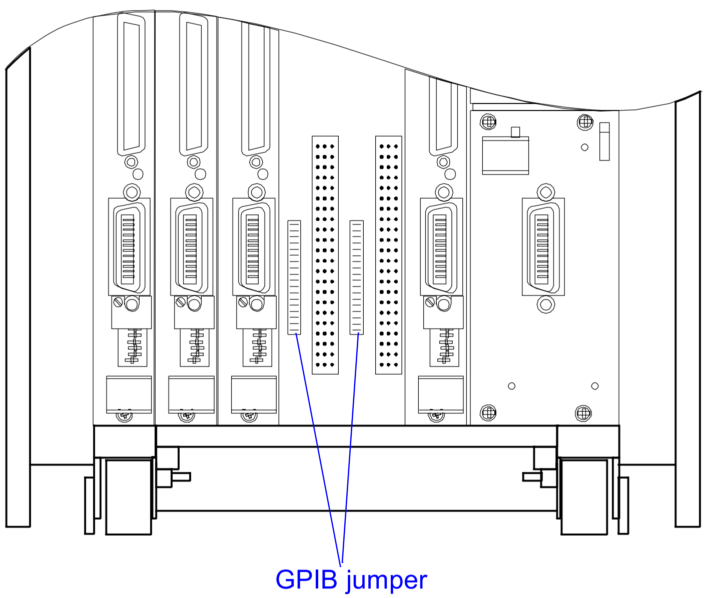


Figure 3-23. Locations of the GPIB Jumpers

Removing the GPIB Jumper

The procedure below details the steps required to remove the GPIB jumper from the backplane of the controller.

Warning

Ensure the equipment is isolated and disconnected from the Mains Electricity supply before removing any casing or other panels.

Switch off and unplug the mains electricity supply to the controller before attempting to add or remove any circuit boards or panels from the controller. Failure to observe this could cause you injury or cause damage to the equipment.

Caution

Static Electricity can damage components within your controller.

Ensure that proper anti-static precautions are taken before handling any circuit boards within your controller.

1. Switch off and disconnect any mains power to your controller.
2. Note and unplug the connectors attached to the axis interface cards either side of the test groups.
3. Remove the jumper from between the lower axis interface card connectors.
4. Replace the removed axis interface cards.
5. Reconnect the cables in the same locations as previously noted.
6. Continue with the steps detailed within this chapter to complete the setting up of the controller for control by more than one computer system.

Connecting the Computer GPIB cables

After removing the GPIB jumper from the appropriate position on the backplane of the controller, the test groups can be connected to the computers that are to control them.

This is carried out by linking the GPIB cables from the computers into the Axis GPIB socket on the relevant Actuator Interface card. See Figure 3-24.

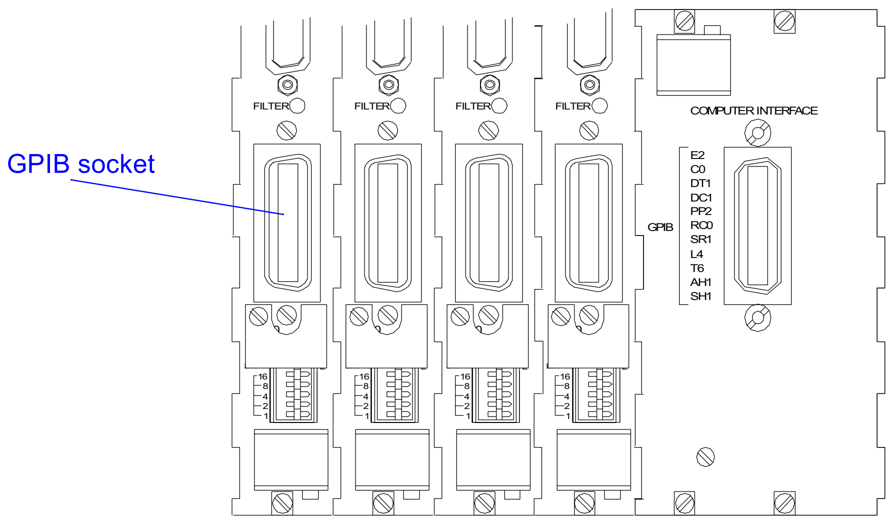


Figure 3-24. Connecting Axis GPIB Cables

Note: *The controller GPIB connector can be used to connect all axes up to the removed jumper. If you have lots of individual GPIB connectors, you should make external connections to define the test groups.*

Ensure that the axes within each test group have the correct Interlink connections (refer to “Defining Axes and Test Groups”).

After connecting your computer(s) to your controller, you must ensure the GPIB address settings on each axis correspond to those defined within the computer. Each device (Integrated Axis Controller or Data Acquisition Unit) must have a unique address.

This address is determined by the settings of the binary DIP switches located on the rear panel of each Actuator Interface board or Data Acquisition Unit, as shown in Figure 3-25.

The lower five of the eight switches sets the address. These switches are labelled GPIB ADDRESS 1, 2, 4, 8, and 16 from bottom to top. Each switch set to the 1

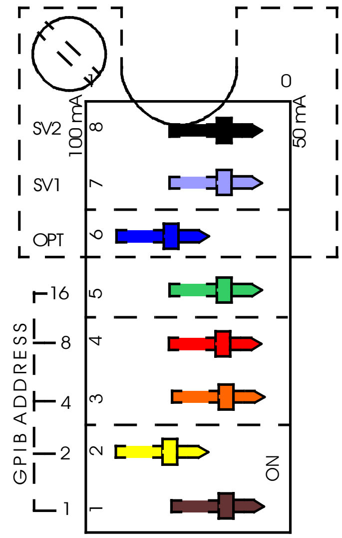


Figure 3-25. GPIB Address Switches

position (set to the left) adds that switches weighting (1, 2, 4, 8, or 16) to the GPIB address, so that any number between 0 and 31 can be set.

Valid addresses are decimal 0 through 30. Address 31 should not be selected because it effectively disables the computer interface.

The address switches are read only when the controller is reset or restarted. Changing the address switches will not have an immediate effect, and the changes will not come into effect until the controller is rebooted.

Applying Power to your Computer

To ensure a controlled mains supply environment, the computer and any peripheral equipment must be connected to the filtered mains electrical output from the 8800 controller.

Connect the mains distribution assembly (assembly number A1698-1025) to the mains outlet from the FastTrack 8800 controller. This distribution assembly provides six IEC320 outlets to supply power to the computer and its peripherals. The connections between this distribution assembly and the various components of the computer system must be made with IEC320 standard cables (part number 82-10-65).

Chapter 4
Preparation for Use

Outline

This chapter of the manual provides you with the information you require when preparing your controller for use.

Servovalve and Dump Valve Settings

Note: *To access the servovalve and dump valve switches, remove the GPIB switch cover plate by removing the screw in the top left corner of the cover plate.*

Warning

Shut down the hydraulic supply and discharge pressure in the hydraulic system before changing any settings for the servovalve or dump valve.

Setting the servovalve drive current

The controller will enable servovalves that require either 50 mA or 100 mA drive currents for each axis. To select the required drive current, set switches 7 and/or 8 to the required position.

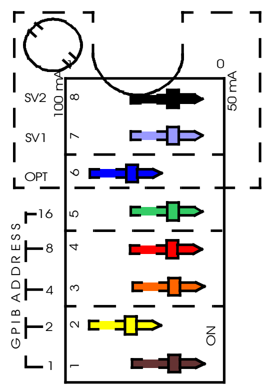


Figure 4-1. Servovalve and Dump Valve Settings

If you intend to use servovalves that require drive currents of less than 50 mA, additional components must be added to the actuator interface panel

If you require drive currents above 50 mA, changes to the current limits can be made to accommodate the required servovalves (i.e. to use 60 mA servovalves, select the 50 mA range and set the current limit to 120%.).

Setting the Hydraulic Dump Valve Settings

This is a solenoid-operated valve which is fitted to certain servohydraulic actuators. The valve connects the hydraulic pressure port to the return port when the solenoid is not energised. In some circumstances, the dump valve solenoid must be energised in the hydraulics LOW state. In other circumstances, the dump valve solenoid must be energised in the hydraulics HIGH state. This is determined by the setting of a switch at the actuator interface rear panel.

The settings for the hydraulic dump valve are not commonly used. However, they have been included to allow compatibility between the FastTrack 8800 controller and some older hydraulic equipment.

Switch 6 within the GPIB switch array allows you to set the required hydraulic dump valve operation.

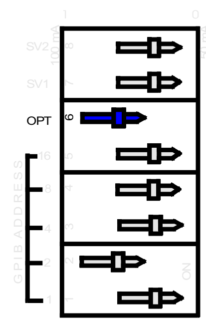


Figure 4-2. Dump Valve Setting - High Pressure

With switch 6 in the (1) position, the hydraulic dump valve will operate when high hydraulic pressure is selected.

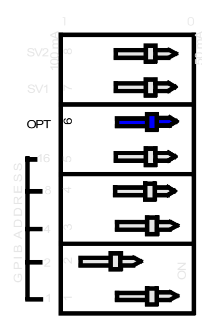


Figure 4-3. Dump Valve Setting – Pilot and Low Pressure

When position (0) is selected, the hydraulic dump valve operates when either the pilot or low hydraulic pressure is selected.

Settings for different types of servovalve

Servovalve Current Drives

The normal drives to servovalves 1 and 2 are for two-stage valves without electrical feedback (EFB), i.e. they are current drives, which may be set to 100 mA, 50 mA or custom. This is determined by the setting of switches (one for servo 1 and one for servo 2) at the actuator interface rear panel.

If a switch is set for 100 mA, the feedback resistor to the current driver for that valve is 10K. If the switch is set to 50 mA, the 10K feedback resistor is shunted by a second 10K resistor. There is a place on the actuator interface board, with the switch in the 50 mA position, for a third resistor in parallel. This is for a special servo drive current, e.g. if a 2K resistor is fitted in parallel with the (two x 10K in parallel) then this gives a total resistance of 14.29K and the current drive becomes very nearly 15 mA. These resistors, which are not normally fitted, are R46 for servo 1 and R47 for servo 2.

Refer also to“Servovalve Current Limits”

EFB servovalve Drive

For two- or three-stage electrical feedback (EFB) servovalves, the current drive for servo 2 must be converted into a voltage drive, normally in the range +/- 10 Volts. Connect the appropriate resistor across the connections for servo 2 to convert the current drive to a voltage drive. The current drive for servo 2B has a 10R feedback resistor to analogue ground, which must be included in the calculation. If the switch for servo 2 is set for 100mA then a 90R resistor connected across SV drive 2A and SV drive 2B gives a total of 100R between SV drive 2A and analogue ground, resulting in a 10Volt drive signal from a 100mA current drive. This signal may be connected to more than one EFB valve, in parallel.

Types of EFB servovalve

Two- or three-stage EFB servovalves with integral electronics may be connected with a cable to connector X2 in the actuator interface box (Catalogue Number 8800-310). A compact three-stage valve driver (Catalogue Number 8800-311) is available for valves without integral electronics. This is an intermediate assembly from connector X2 of the above the actuator interface box and is mounted on a panel in the side of the box. This is connected (with a different cable) to the pilot valve and spool LVDT.

Servovalve Null

Most types of servovalve have some form of mechanical adjustment to balance the hydraulic flow in the manifold when 0V is applied. Without servovalve drive, the mechanical null of the valve should not allow hydraulic flow to the control ports (or equal flow to both), preventing movement of the actuator piston.

The 'mechanical null adjuster' is an adjustable retainer pin, located above the 'return' port designation on the valve body. Rotate the pin that controls the position of the bush. The spool is positioned relative to the valve body for an input signal by the mechanical feedback elements. Therefore, a movement of the bushes relative to the body changes the null value.

Adjusting the servovalve null

To adjust the servovalve null you will need a 10mm wrench and a 2.5mm hex key.

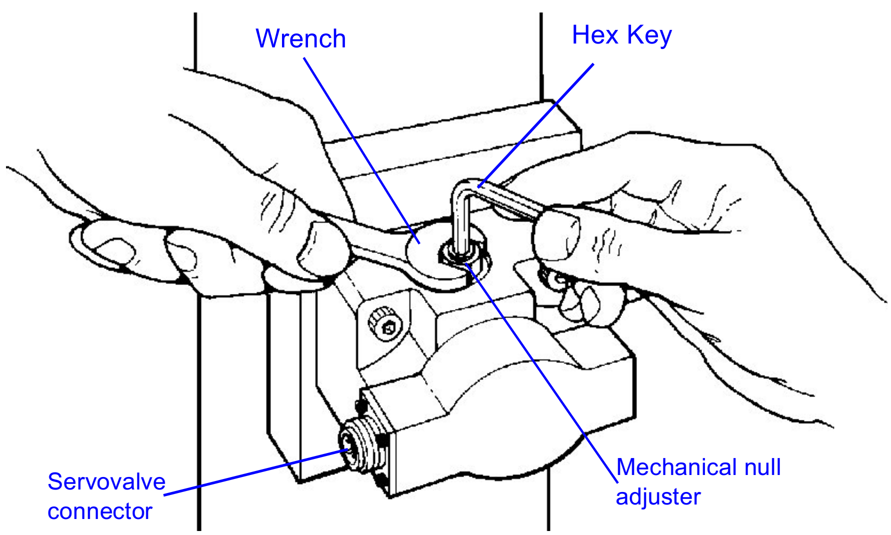


Figure 4-4. Adjusting the servovalve null

a. Using a 2.5mm hex key, rotate the mechanical null adjuster pin to obtain the desired flow null. If extra torque is required to rotate the null adjuster pin, perform Step 'b'.

Note: *Clockwise rotation of the null adjuster pin opens loop flow from port B to port A.*

b. Use a 10mm wrench to loosen, but do not remove, the self-locking fitting. Insert a 2.5mm hex key in the null adjuster pin. Tighten the self-locking fitting with the 10mm wrench until a torque of 1.13 to 1.36Nm is achieved and rotate the null adjuster pin with the 2.5mm hex key. Perform Step 'a' to establish the desired flow null.

Servovalve Null Adjustment Procedure on 8800 systems

The servovalve must be previously installed on the actuator and the system pressure must be on and set to the nominal operating pressure.

There are two ways to adjust the servovalve null according to your system set-up:

Null adjustment procedure using the 8800 Operator panel (also referred to as MMI)

1. The controller should be set to position control, without ramp and the waveform generator in the Stop mode. The hydraulics should be powered up and in high-pressure state. Loop Integrator gain should be set to zero and dithering set on.
2. To ensure the integrator is holding a zero value and will not contribute to the loop offset, reset the integrator value using the following sequence on the operator panel:
    - FUNCTION
    - INSTRON SERVICE
    - CONTINUE
    - MORE
    - RESET INT.
3. Set the live displays on the operator panel to track position and command signals.
4. Loosen the locking nut and turn the hex wrench until the command and position signals match.
5. When the signals match, the locking nut must be tightened. Ensure the hex wrench remains in the set position.
6. Set the integrator gain value to 0.2 1/sec
7. Select the following sequence on the operator panel ensuring the actuator is stationary and the command and position signals are equal.
    - FUNCTION
    - INSTRON SERVICE
    - CONTINUE
    - MORE
    - STATIC INT
8. After a ten second pause (to ensure the integrator has stabilised), press GO on the MMI unit. This will store the system static integral.

Null adjustment procedure using Console

The Console software provides a wizard that guides you through the null adjustment procedure.

1. Click on the Null parameter of the Axis Setup Checklist to open the Wizard.
2. Set the system to high pressure. The Wizard will transfer to position control and disable the integrator.
3. Follow the on-screen instructions.

Static Integrator

Where the null value changes with temperature, time, etc, the static integrator value overcomes any static offset of the mechanical null.

To track offset changes the static integrator value is saved while HIGH state is selected, and is restored next time the actuator is switched on. To ensure the value is saved correctly it is checked against the static integrator value stored in NV RAM. If the value in NV RAM is significantly different to the last saved value, the NV RAM value is used.

It is important to set the static integrator value to prevent start up transients. The static integrator can be set up through Console, refer to online help or your operating instructions for more details.

Servovalve Shorting

The drive to servovalves 1 and 2 are normally shorted when the actuator is not active. This is done by relays K7 and K8 on the actuator interface board. The actuator active status changes when the hydraulics are switched on, immediately energising relays K7 and K8 and removing the shorts. This allows the actuator to be controlled. When the hydraulics are turned off a delay occurs before the servovalve is shorted. The reason for this is to keep the valve drive active until the hydraulic pressure has decayed away.

Servovalve shorting relays K7 and K8 also work in conjunction with three-stage valves to center the spool by setting the drive to null. In this case servovalve shorting really means spool centering. Load release valves are fitted to many systems. These valves work well in conjunction with servovalve shorting as they allow oil to pass between the actuator control ports and remove any residual load when the actuator is off.

There are situations where servovalve shorting is not required such as when using actuators with unequal area pistons. In these cases a system UPS should be fitted to prevent unwanted actuator movement in the event of a power failure.

For manifolds with pilot-operated load release valves, a pressure switch at the manifold may be connected to the controller (via the actuator interface box) to delay servovalve shorting until the pilot pressure has decayed and the bleed across the control ports is open.

Enabling/Disabling servovalve shorting

The process to enable or disable servovalve shorting varies dependant upon the version of the Actuator Interface card.

On Actuator Interface Card A1721-1025 two resistors must be moved to different locations, see Figure 4-5. To enable servovalve shorting on servovalve 1, resistor R54 should be removed and replaced in the position marked R59. To enable servovalve shorting on servovalve 2, resistor R56 should be removed and replaced in the position marked R55. (To disable servovalve shorting, these positions should be reversed.)

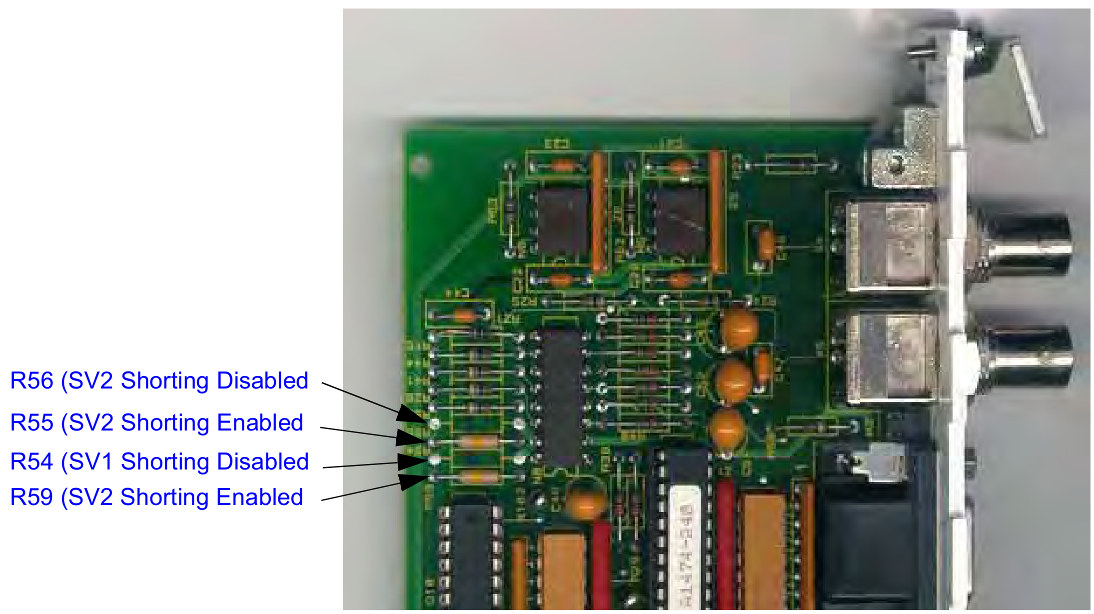


Figure 4-5. Servovalve shorting resistor locations (A1721-1025)

On Actuator Interface cards A1721-1325 and A1721-1345 a switch is fitted to enable/disable the servovalve shorting. The positions of these switches are shown in the Figure 4-6 and Figure 4-7 respectively.

Note: *The appearance of the boards shown in the figures may vary slightly to those in your test control system.*

Also, servovalve shorting enabled indicator LEDs are fitted to the connector panel of both the A1721-1325 and A1721-1345 versions of the Actuator Interface cards.

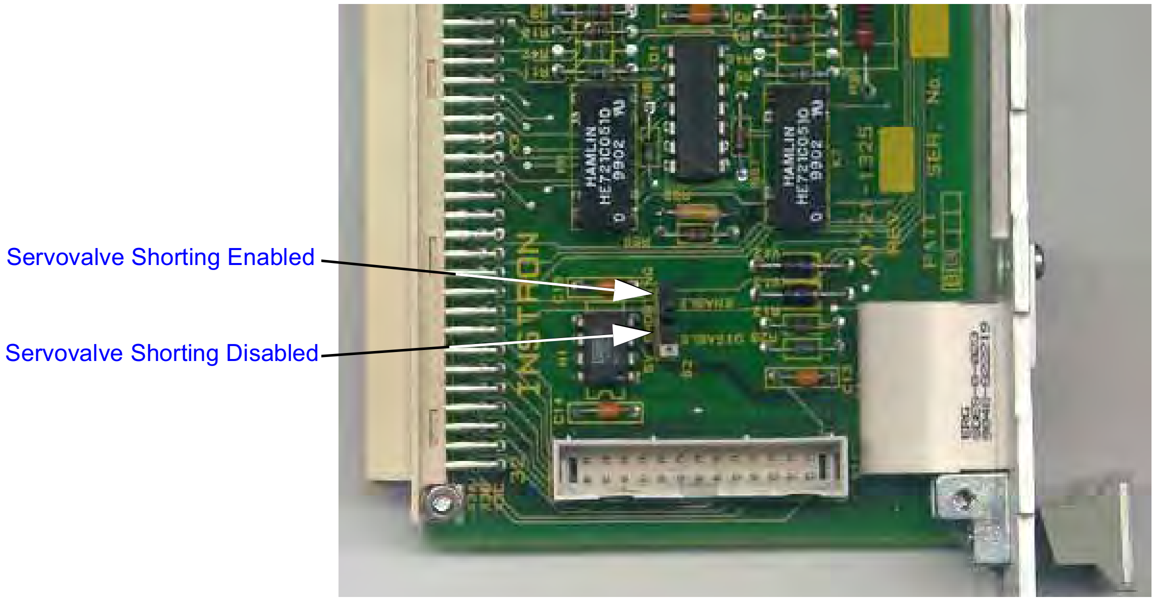


Figure 4-6. Servovalve shorting switch location (A1721-1325)

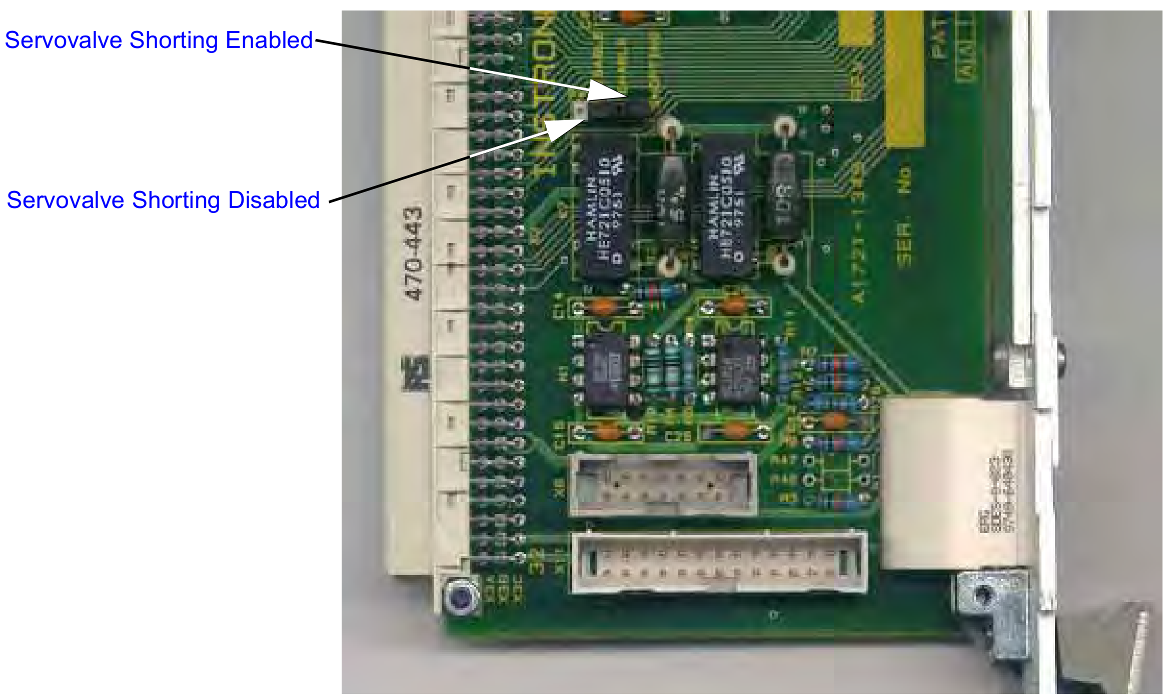


Figure 4-7. Servovalve shorting switch location (A1721-1345 Hirose Connectors)

The sequence of events that occurs when the hydraulics are switched from HIGH to OFF is as follows:

1. The hydraulics OFF switch is pressed.
2. The pump, shut-off valve or sub-station is switched off.
3. The load release valve (shunt valve) solenoid is de-energised.
4. The dump valve solenoid (if fitted) is de-energised.
5. The HIGH current limits are replaced by the LOW current limits.
6. The ACTUATOR ACTIVE signal is no longer true.
7. The pressure at the actuator and servovalve decays.
8. After a time delay (or after the manifold pressure switch has opened, indicating that pilot pressure to the load release valve is gone) relays short the coils of two-stage servovalves and disconnect the drive to EFB valve(s).

Servovalve Current Limits

The current drive to the servovalves have different limit states, expressed as a percentage of full drive, corresponding to the hydraulics LOW and HIGH states.

In the hydraulics LOW state, the solenoid is not energised. A connection (also referred to as a 'shunt') is provided across the actuator control ports which limits the differential pressure. This, with the LOW current limits, restricts the force and velocity the actuator can achieve.

When the hydraulic HIGH state is selected, the solenoid is energised and the connection across the control ports is closed. The stall force of the actuator at full system pressure can be achieved. At this time, the servovalve current limits are changed from the LOW values to the HIGH values.

Load Release Valve

The Load Release Valve (also referred to as the 'shunt valve') is a solenoid-operated unit that is fitted underneath the servovalve. The Load Release Valve may be used in conjunction with the servovalve limits to restrict the actuator force and velocity. Its operation is integrated into the normal start up and shut down sequence, see Table 4-1 below.

Table 4-1. Load Release Valve States

States	Action
OFF (0)	The hydraulic supply is switched off and the Load Release Valve is not energised, opening the connection across the control ports. The servovalve is electrically shorted at the controller.
LOW (I)	The hydraulic supply is switched on but the Load Release Valve is not energised. An open connection across the control ports limits the differential pressure that can be applied to the actuator. In conjunction with servovalve current limits it restricts the force and velocity of the actuator. The servovalve LOW current limit is applied.
HIGH (II)	The hydraulic supply is switched on and the Load Release Valve is energised. The connection across the control ports is closed so the actuator can achieve full system pressure. The servovalve shorting is removed and the servovalve HIGH current limit is applied so full value current is available.

Note: *The Load Release Valve will be fitted in most installations. On older-style actuators it is an integral part of the manifold and is pilot-operated. If the Load Release Valve is not fitted to your system, the force and velocity of the actuator cannot be limited in a 'docile' mode.*

Chapter 5
FastTrack Emergency Stop System

Outline

This chapter describes the emergency stop systems that can be fitted to the FastTrack 8800 tower.

Status Indicator Emergency Stop

The Status Indicator Emergency Stop circuit, located on the rear of the tower, includes a range of LEDs that indicate the status of emergency stop buttons on all axes in your testing system.

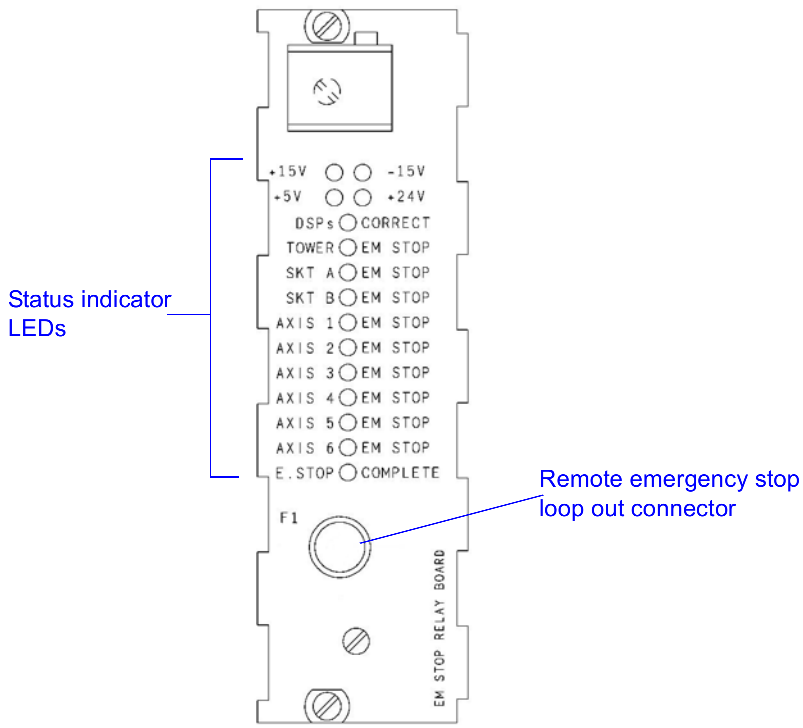


Figure 5-1. Emergency stop indicator LED Board

When an emergency stop button is pressed, the +24V power supply is disconnected from the hydraulic controls of all axes.

Additional emergency stop buttons can be connected and located in suitable positions around the testing system. Refer to the connector indicated in Figure 5-1 or “Actuator Interface Card A1721-1325 (62 way connector)” on page 3-16.

Note: *The Status Indicator Emergency Stop is suitable for single axis applications where only one controller is connected to the testing system.*

The FastTrack tower cannot be linked to other towers unless the high integrity emergency stop board is fitted, to link the emergency stop circuit between towers.

High Integrity Emergency Stop Circuit

The High Integrity Emergency Stop circuit provides your controller with a rapid means of shutting down your testing system in an emergency.

Additional emergency stop buttons can be connected and located in suitable positions around the testing system.

A number of connectors allow you to link the emergency stop circuits in all controllers to your testing system. This means all axes within your testing system to be stopped simultaneously, in the event of an emergency.

The high integrity emergency stop circuit uses six relays to provide both normally open and normally closed contacts to the emergency stop system, all of which must be in the correct position for the system to be operated.

When the electrical power to your controller is switched on, the high integrity emergency stop circuit performs a series of self-tests, all of which must be successfully passed, before the controller can take control of your testing system.

±15V Backup Circuit (Optional)

The high integrity emergency stop circuit includes an optional ±15V backup circuit. This circuit provides 450 Joules of energy, allowing sufficient time for your testing system to return to a stable condition in the event of an electrical mains power failure.

When fitted, the optional backup circuits do not require any setting up procedures, as the circuit is designed to be functional from when the controller is switched on.

Warning

The ±15V backup circuit stores electrical charge, which will be present within the backup circuit even after the controller has been switched off.

When the ±15V backup circuit is fitted, take care when removing the circuit. Due to the nature and function of this circuit board, stored energy could damage the equipment if touched against metallic surfaces or objects.

Do not place the removed high integrity emergency stop circuit and ±15V backup circuit on a conductive surface. Doing so is likely to damage the circuit board.

Connecting Items to the Emergency Stop Circuit

FastTrack Tower Only

Additional Emergency Stop Buttons

Follow the procedures below to add additional emergency stop buttons:

Before removing the trim panels from your controller, ensure that the testing system is in a stable condition and the system is safe to switch off.

1. Switch off and unplug the mains power to the controller.
2. Remove the front trim panel, by gently pulling the panel off.

If there are currently no additional emergency stop buttons fitted, the following procedures apply:

1. Unscrew to the link between pins 1 and 2 of the terminator plug, labelled "Remote Em. Stop".
2. The additional emergency stop buttons must be connected in series, connecting between pins 1 and 2 of the terminator plug. The emergency stop buttons themselves must be normally closed switches.

If you are adding further emergency stop buttons to an already extended emergency stop button loop, follow the procedures given below:

1. Connect the new emergency stop buttons in series with the existing buttons.
2. Ensure the connection on the terminating plug are made between pins 1 and 2.

Testing the new Emergency Stop Buttons.

1. Use a continuity tester to check that, with all buttons in the “normal” position, continuity exists between pins 1 and 2 of the terminator plug.
2. Check that continuity is broken when each of the emergency stop buttons are pressed in turn. (Reset each button after testing.)
3. Securely fit all additional emergency stop buttons in appropriate positions close to your testing system.
4. Replace the front trim panel
5. Reconnect and apply electrical power to the controller. Check that all the LEDs on the emergency stop board illuminate. Use the hydraulic controls to apply hydraulic pressure to the testing system. Check that pressing any of the emergency stop buttons will cause the hydraulics to be shut down and the LEDs to be extinguished.

Connecting the 8400/8800LT controller to the High Integrity Circuit

The 8800 tower can be connected to an 8400/8800LT controller. Refer to Table 5-1 for information on the hardware you will require for system sychronisation (also referred to as sync link) and emergency stop functions.

Table 5-1. Hardware for interconnection of controllers

Part Number	Description	Sync Link and Emergency Stop	Emergency Stop Only
A1745-1031	Synchronisation Cable	Connect from the 8800 tower at start of chain to the 8400/8800LT Multi-Unit Interface Module In connector	Do not fit
A1745-1029	Bridge Board	Ensure this version of the Bridge Board is fitted to the 8400/8800LT controller.	
A1745-1030	Connector Panel	You will require this version of the connector panel fitted to the 8400/8800LT controller. The remote emergency stop connector on the bridge board contains an extra 2 pins.	
A1745-1034	Emergency Stop Cable (for 8800 tower fitted with high integrity EStop)	Connect from the remote emergency stop connector on the 8400/8800LT connector panel at the start of chain to the High Integrity EStop board in the 8800 tower	

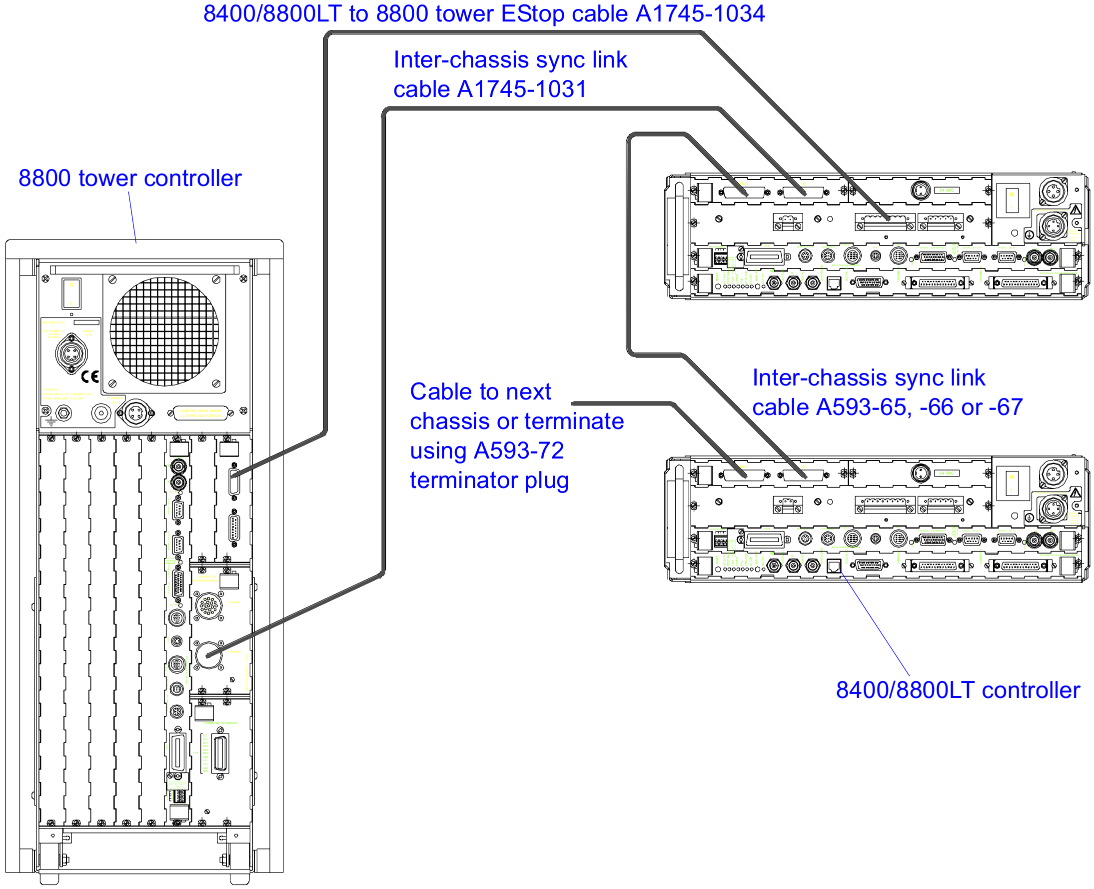


Figure 5-2. Connecting the 8400/8800LT controller to the High Integrity circuit

Chapter 6
Additional Modules

Outline

This chapter details the installation procedures and requirements for additional modules you can install within your material test control system.

Additional Control Axes

Axes Configuration

Each axis within the controller consists of two circuit board assemblies, each fitted with a panel and all the required connectors. These assemblies are the Integrated Axis Controller (IAC) and the Actuator Interface card. The IAC is fitted from the front of the FastTrack 8800 tower, whilst the Actuator Interface card is fitted from the rear.

Up to four Sensor Conditioner Modules (SCMs) can be mounted onto an IAC. SCMs provide the conditioning and interfacing electronics for position and load transducers, as well as other transducer types, such as strain, acceleration and velocity transducers. Two versions of (SCMs) are available:

SCM for Control (8800-611)

Provides signal condiitoning for transducers.

SCM for Data Acquisition (8800-612)

Display and data acquisition only.

Refer to Figure 6-1 for the locations of the SCMs for a basic configuration axis.

Fitting Additional Axes

The following sub-sections describe the procedures to fit a new IAC, Actuator Interface card and SCM to your controller. Observe the following warning and caution before attempting to add a new card to the controller.

Warning

Ensure that the equipment is isolated and disconnected from the Mains Electricity supply before removing any casing or other panels.

Before attempting to add or remove any circuit boards or panels from the controller, switch off and unplug the mains electricity supply to the controller. Failure to observe this could cause you injury or cause damage to the equipment.

Caution

Static Electricity can damage components within your controller.

Ensure that proper anti-static precautions are taken before handling any circuit boards within your controller.

Note: *1. After adding an axis of control, the firmware of the additional axis must be the same version as that already installed on your testing system.*

2. After adding (or removing) an axis of control, the NVRAM settings must be erased on every board in the tower, in order to achieve correct operation of the system.

3. Use the User States to save the settings for the previously installed boards.

Installing SCM

Note: When replacing a faulty or damaged IAC and using the previously installed SCMs, the SCMs must be fitted in the same positions if the settings have been saved in Console and are restorable.

1. Switch off and disconnect any mains power to your controller.
2. Using the finger grips provided, gently pull the front cover from the controller.
3. Remove the screws retaining the EMC cover plate, fitted across the front of the IACs on the FastTrack tower, or between the IAC and actuator interface card on the 8800D. Remove the cover plate.
4. Disconnect any cables that are attached to the IAC you are removing, and any cables on adjacent cards that may impede your progress.
5. Remove the screws attaching the IAC to which you are adding a SCM. Carefully withdraw the IAC, ensure the board does not twist.
6. Locate the SCM carefully onto the IAC so the blanking pin on the edge connector overhangs the pin header and gently push down. If the blanking pin is mis-aligned, you will not be able to insert the screws.

Caution

Ensure the blanking pin is correctly aligned. Forcing the SCM onto the IAC may damage the equipment.

Note: When adding a "load" channel SCM, adapter number A1721-1047 is required.

7. Insert and lightly tighten the screws that fix the SCM to the IAC (and, if fitting the SCM to Channel 3 or channel 4 positions, insert and lightly tighten the screws into the front panel of the IAC).
8. Follow the procedures given "Installing an Integrated Axis Controller (IAC) Card", to re-assemble the IAC into your controller.

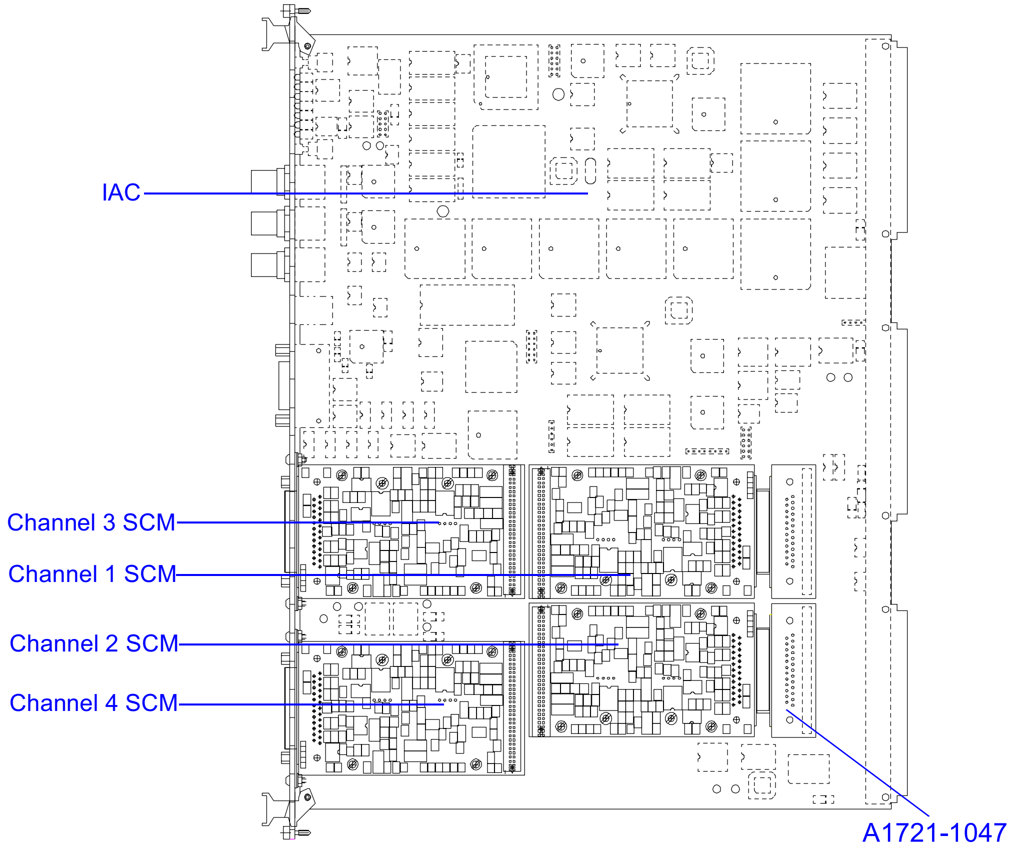


Figure 6-1. Location of the SCMs

Installing an Integrated Axis Controller (IAC) Card

Before attempting to add a new card to the controller, observe the warning and caution.

1. Switch off and disconnect any mains power to your controller.
2. Using the finger grips, gently pull the front cover from the controller.
3. Remove the screws retaining the EMC Cover plate, fitted across the front of the front panels. Remove the cover plate.
4. Unscrew the captive screws attaching the blanking plate to the controller unit. Remove the blanking plate.

Note: *The IACs are fitted in order from left to right, when viewed from the front of the controller and are numbered sequentially from the left, board 1 to board 6.*

5. Locate the IAC in the card guides of the empty slot, ensuring that it is the correct way round. Gently push the card into position.
6. Tighten the captive retaining screws at the top and bottom of the IAC panel.
7. Reposition the EMC cover plate, replacing the retaining screws to do so.
8. Replace the front cover moulding.

Installing an Actuator Interface Card

Two versions of the Actuator Interface card are available (A1721-1325 and A1721-1345, see Figure 3-5 for connector details), that give alternative methods for connecting to the actuator to be controlled. The installation instructions for both of these Actuator Interface Cards are identical.

Before attempting to add a new card to the controller, observe the warning and caution.

1. Switch off and disconnect any mains power to your controller.
2. To gain access, unplug the cables in the neighbouring rear panel position.
3. Unscrew the two retaining screws from the appropriate blanking panel on the rear of the controller. Remove the blanking plate.

Note: *The Actuator Interface boards should be fitted from the rear of the controller in order from right to left, in the same slot as the corresponding Integrated Axis Controller board.*

4. Locate the Actuator Interface board into the card guides within the controller. Carefully push the Actuator Interface assembly into the controller.

5. Tighten the captive retaining screws at the top and bottom of the Actuator Interface board.
6. Replace any cables removed in step (2.).
7. Set a new, unique GPIB address for this axis (refer to the following section “Setting the Actuator Interface GPIB Address Switches”.)
8. Connect the cables between the new boards and the actuator it is to control.

Setting the Actuator Interface GPIB Address Switches

Each axis of control requires a unique GPIB address. These addresses are set via the GPIB switch arrays, located at the bottom of each Actuator Interface panel. The GPIB address can be set to any value between 0 and 30, by selecting the position of the lower five switches within the switch array. Refer to “Servovalve and Dump Valve Settings” for information relating to the setting of the upper three switches within the switch array.

Note: *Do not set the GPIB address to value 31 (all switches ON) as this will disable the Computer Interface.*

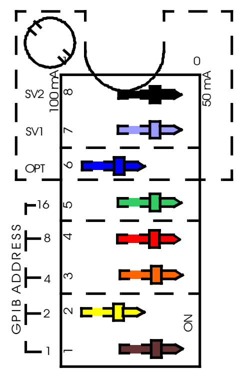


Figure 6-2. Actuator Interface GPIB Switch Settings

For Example:

To set a GPIB address of 14 (01110 Decimal), set the switches as follows:
Switch 1 to position 0
Switch 2 to position 1
Switch 3 to position 1
Switch 4 to position 1
Switch 5 to position 0

Data Acquisition Units

Your FastTrack 8800 controller can use two types of Data Acquisition units:

- Single Channel Data Acquisition Cards
- Eight Channel Data Acquisition Units

Note: *If you are using the FastTrack 8800D, only the single channel data acquisition cards can be fitted.*

Four Channel Data Acquisition (8800-103)

Data Acquisition cards each handling a single channel of acquired data, can be added to unused sensor conditioner slots on the IAC. This card allows you to acquire data from up to 4 transducers connected to your FastTrack 8800 controller. Console recognises the Data Acquisition card fitted so each channel available will not be supplied with the control function.

Note: *Data Acquisition cards can only be used with transducers that are connected to the same IAC.*

Eight Channel Data Acquisition (8800-233)

FastTrack Tower only

The 8 channel Data Acquisition Unit consists of two parts:

- Data Acquisition card- fitted to the front of the controller
- Data Acquisition Interface panel- fitted to the rear of the controller.

The eight channel, high speed, Data Acquisition unit is only compatable with RS Plus and MAX application software. A maximum of five 8800-233 Data Acquisition units can be used within the controller variant of the controller.

Refer to “Fitting Additional Axes” for installation instructions.

Digital Inputs and Outputs

General

Each IAC contains four digital inputs and four digital outputs which are defined as HIGH or LOW. The connector for the inputs and outputs is a 26-way 1½ density D-type socket on the IAC panel on the front of the tower.

A HIGH input may be connected to an external power supply using an external switching element. The LOW input must be connected to the ground of the same power supply.

A HIGH output may be connected to an external power supply and then to some external logic that can 'read' the output. The LOW output must then be connected to the appropriate ground of the same power supply.

Alternatively, the 26-way connector has four pins that have series resistors to the +5V power supply on the IAC. One of these may be connected, via some external switching element, to the HIGH input (or HIGH output). The LOW input (or LOW output) must then be connected to one of the pins that is connected to the chasis.

The digital input and output signals described above may be connected to the internal +5V power supply of the IAC or to some external power supply. However, you may need to switch at a higher voltage and higher currents than the opto-couplers on the IAC can handle. The digital I/O module described next is used for this purpose.

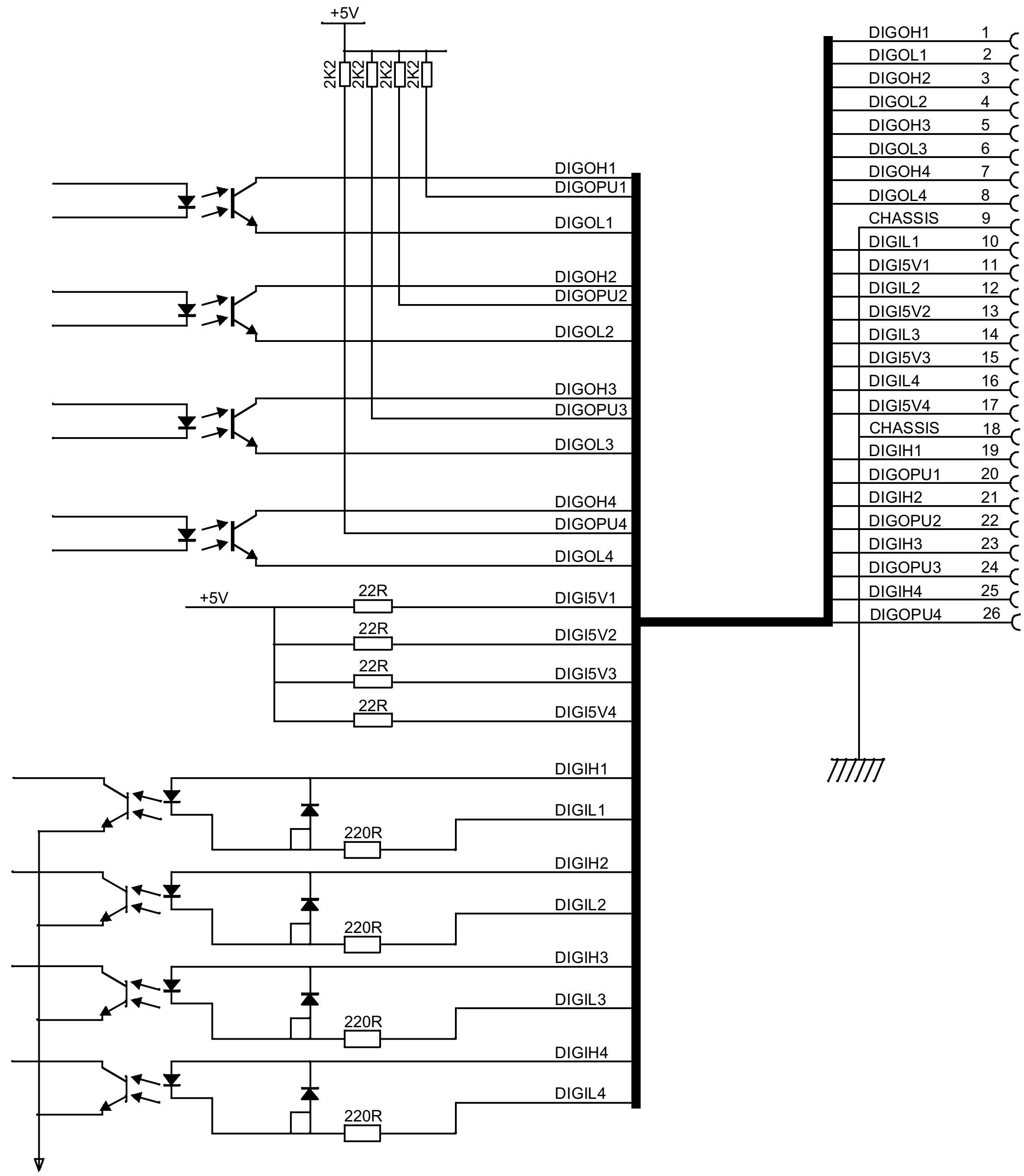


Figure 6-3. Digital I/O Connections

Additional Modules

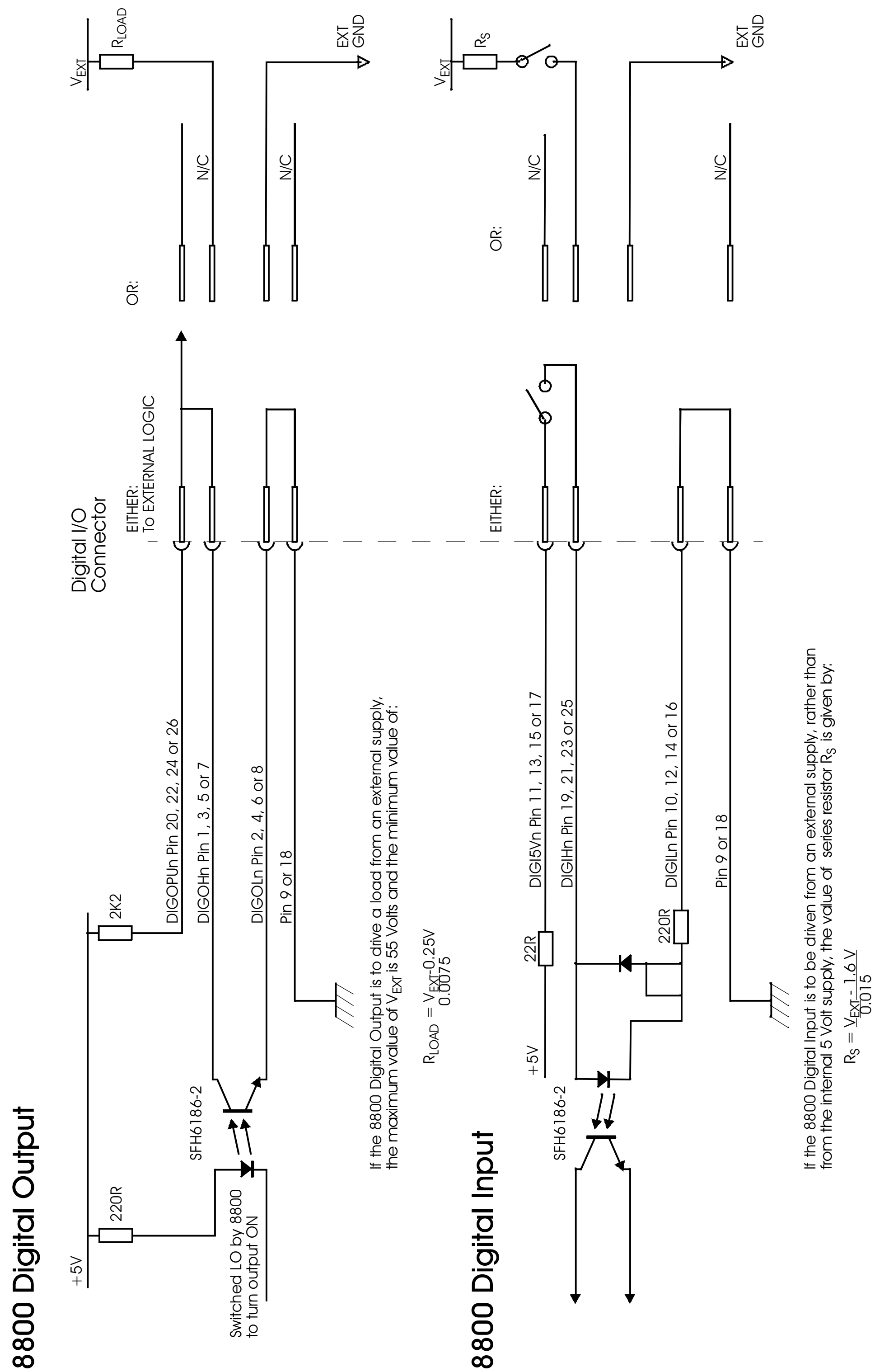


Figure 6-4. Calculating Resister and Voltage Values

3-Stage Valve Driver Board

A 3-Stage valve consists of a pilot (2 stage) valve that controls the opening of the main (3rd stage) spool. The main spool is attached to the LVDT. The output from the LVDT is conditioned and the signal closes the control loop, providing feedback to the valve driver to give a measure of main spool displacement.

The 3-stage valve driver board is made up of a number of circuits that includes an excitation oscillator and demodulator circuit, the summing junction and error conditioning circuit and the current drive to the pilot valve is also included. See the block diagram in Figure 6-5.

The circuit contains adjustment potentiometers for NULL (zero), SPAN (feedback gain) and P.GAIN (proportional gain), back up capacitors for the ±15Volt supplies and a BNC socket for monitoring the spool LVDT output voltage.

The 3-stage valve driver board is available in two configurations, each described in the following section.

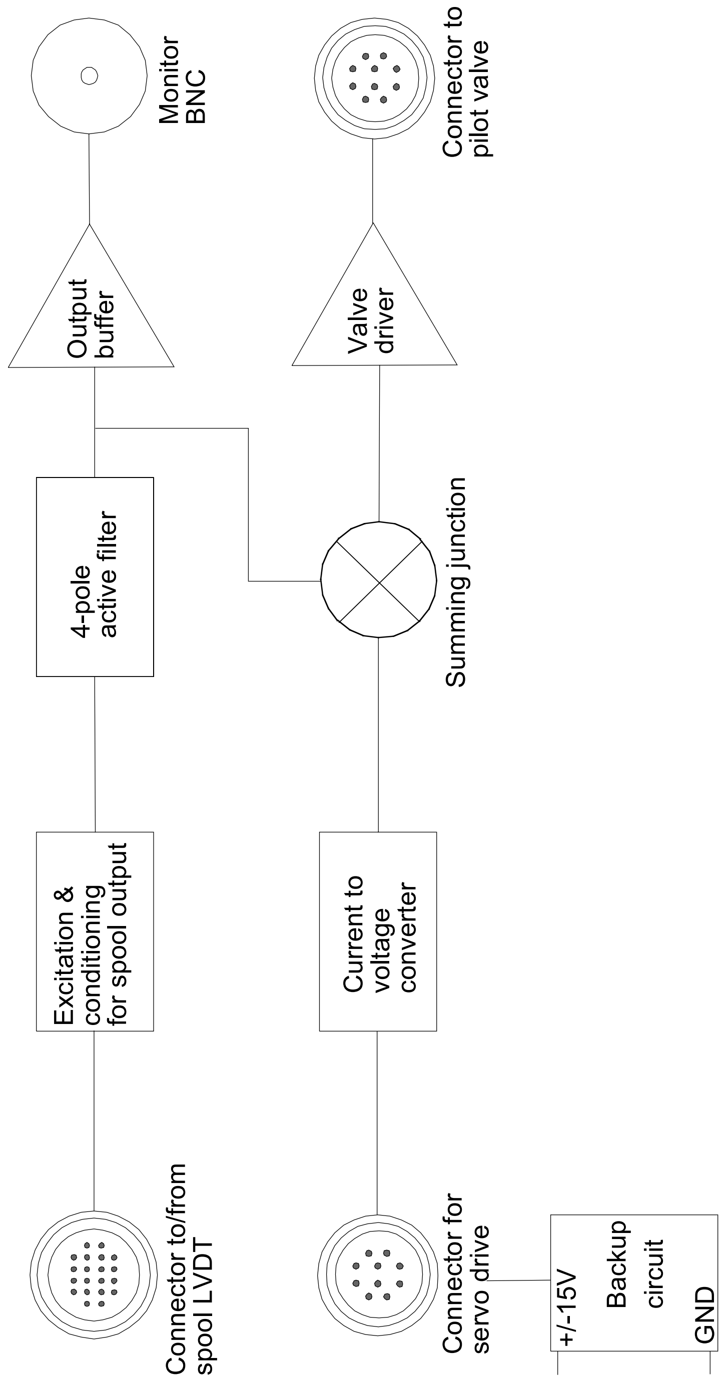


Figure 6-5. 3-Stage Valve Driver Board Block Diagram

Module Type

Actuator Interface Box Installation (8800-268)

Consists of a box and adapter cables to suit the actuator interface box (catalogue number 8800-310) for use with the 8800 controller. The 3-stage valve driver is installed in a steel box that fits below the actuator interface box.

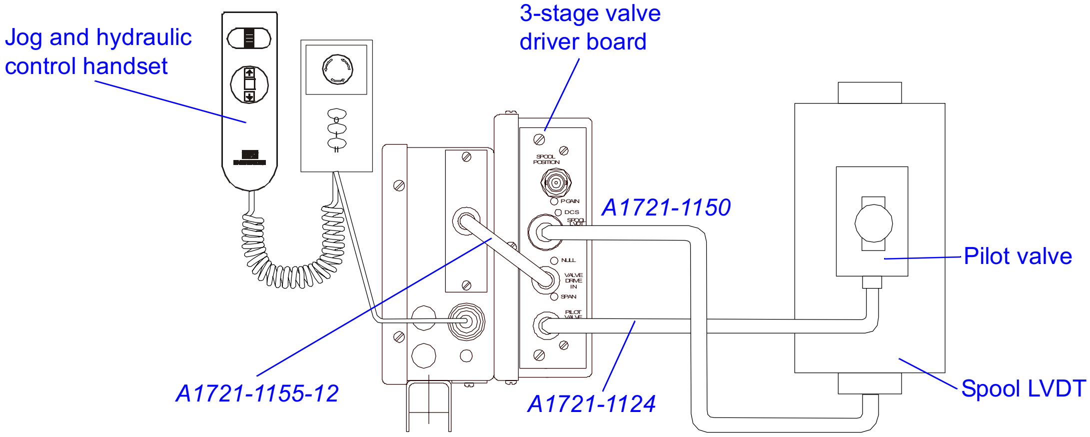


Figure 6-6. 3-Stage Valve Driver Board for actuator interface box

8800 Tower Version (8800-911/2)

Uses PCB assembly A1721-1454. For use with the hirose connector version of actuator interface board. Consists of one (**8800-911**) or two (**8800-912**) boards fitted in a panel that is installed in the slot normally occupied by the IAC in 8800 tower.

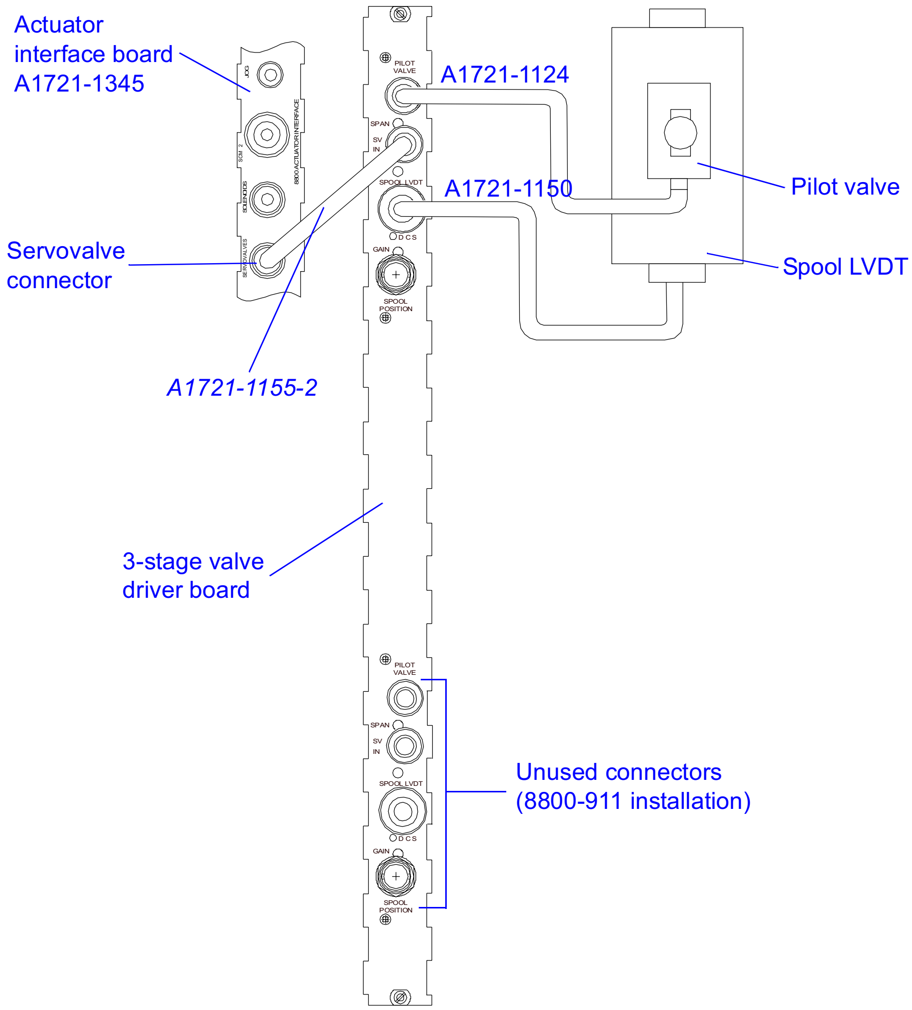


Figure 6-7. 3-Stage Valve Driver Board for 8800 Tower

Connecting Cables

8800-911/2

Connect one or two cables A1721-1155-2 between the SERVOVALVES connector of the actuator interface board and the SV IN connector on the 3-stage valve driver.

8800-268

Connect cable A1721-1152-supplied from the SERVOVALVE and 3-STAGE VALVE connectors on the board in the actuator interface box to a panel mounted hirose socket on the side of the box. Also included is cable A1721-1155-12 to be fitted from this panel to the 3-stage valve driver board.

Cables to the 3-stage pilot valve and spool LVDT are not included in this version and must be ordered separately. This is because the cable required varies according to the setup of your system.

All versions

Connect cable A1721-1124-n or equivalent from the 12-way hirose socket on the 3-stage valve driver board to the PILOT VALVE connector. If the actuator has a 2-stage resolution valve, use cable A1721-1125-n

Note: *A resolution valve is a low-flow 2-stage valve that may be connected in parallel with the 3-stage valve. This should not be confused with the pilot stage of the 3-stage valve. Note that servovalve 1 is for the pilot stage of the 3-stage valve and servovalve 2 is for the resolution valve.*

Connect cable A1721-1150-n or equivalent from the 20-way hirose socket on the 3-stage valve driver board to the SPOOL LVDT connector.

Setting Up

1. Calibrate the actuator main LVDT as described in your connecting and calibrating transducers document. Reduce the main loop Proportional Gain significantly.
2. Remove the 2-stage resolution valve if fitted and fit a blanking plate.
3. To access the test points, remove the cover of the box or pull out the panel.
4. Monitor the spool LVDT output on test point X104 with respect to X100 (AGND) using a DVM.
5. Monitor the spool LVDT output on the BNC socket using an oscilloscope.

Perform the following steps with the isolation valve electrically disconnected, so the spool loop is active but the actuator does not respond. Isolate the 3-stage valve from the actuator if you have a solenoid-operated shut-off manifold. If not, reduce the main loop proportional gain significantly. Check the servovalve polarity (Instron service function) is set to NORMAL and INVERTED.

1. Switch on the pilot pressure to the 3-stage valve. Turn the hydraulics to LOW to activate the servo drive. Set the LOW servovalve current limits to +100%, and drive the valve spool hard one way. The reading on the DVM should be positive. Set the LOW servovalve current limit to -100% and drive the valve spool hard the opposite way. The reading on the DVM should be negative. Adjust the NULL pot so the readings are approximately opposite and equal. Adjust the SPAN pot between +/- 10 Volts and +/- 12 Volts on the DVM so as not to saturate the spool output under normal operating conditions. If the signal on the DVM from test point X104 does not change, this indicates that there is
   - no pilot pressure
   - a wiring fault
   - something wrong with the pilot valve.
2. If the signal on the DVM does change but has the opposite polarity to that stated above, then either the servo drive is inverted (or mis-wired) or the inner loop has positive feedback. To check this, monitor the signal to the valve on test point X105, with respect to text point X100 (AGND). Turn the hydraulics to LOW to activate the servo drive. Set the LOW servo drive current limits to -10% and drive the spool hard one way.The reading on the DVM should be approximately -1V. If the signal is =1V, the servovalve polarity is inverted and will require setting back to normal.
3. Monitor the LVDT output on test point X104, with respect to test point X100 (AGND). When the servovalve drive on test point X105 is positive, the spool LVDT output on test point X104 should be negative. If it is not, the inner loop

has positive feedback. Reverse either the drive to the pilot valve or the spool LVDT output (but not both).

4. Set the LOW servovalve current limit to +/- 100%. Make the set point to equal the current feedback. Set a 5Hz squarewave and start the function generator. Adjust the amplitude so that the 3-stage valve spool LVDT follows the squarewave. Monitor the valve command and output on the oscilloscope with valve command test point X105. Adjust the P.GAIN (proportional gain) pot on the 3-stage valve board until the squarewave response is not oscillatory and has an overshoot of approximately 15%. Stop the function generator.

5. If the 3-stage valve was isolated from the actuator by disconnecting the isolation valve, switch off the hydraulics and reconnect the isolation valve.

6. Re-start the hydraulics and check the actuator is in control at LOW. If the actuator moves to one end, and moves to the other end to reverse an error, the main loop has positive feedback. Check the main LVDT shows the correct polarity, that is the positive displacement when the actuator piston is retracted into the body and a negative displacement when the piston is extended. If the main LVDT polarity is incorrect, reverse the connections (either the excitation or the outputs). If the main LVDT polarity is correct but there is positive feedback, reverse the connections to the pilot valve and to the spool LVDT (but not the main LVDT).

7. If the actuator is in control but the main LVDT polarity is incorrect, switch off the hydraulics and change the following, referring to Figure 6-8:

   - Reverse the connections or change the switch position of the pilot valve
   - Reverse the connections or change the switch position of the spool LVDT
   - Reverse the connections to the main actuator LVDT

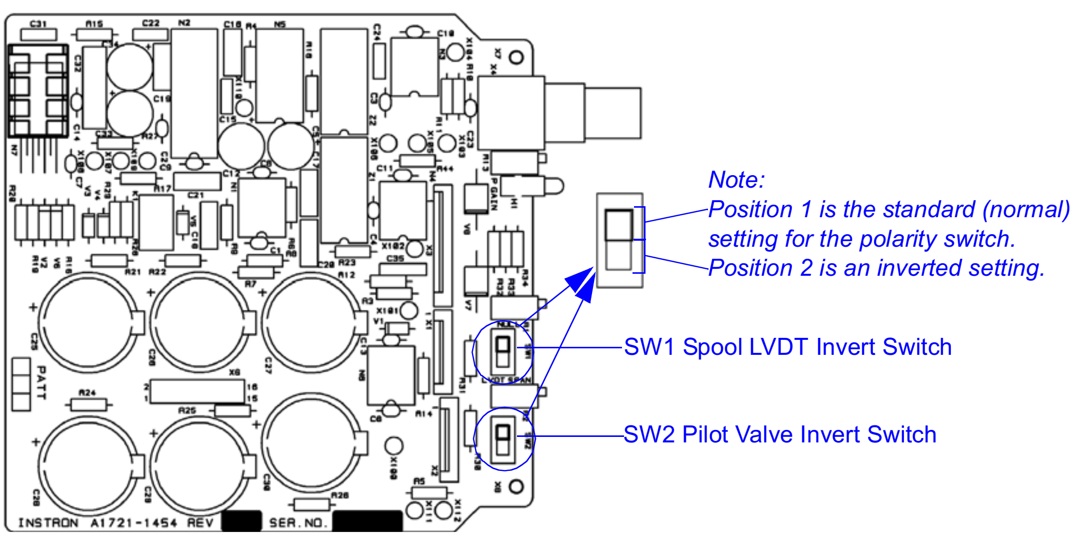


Figure 6-8. Polarity Switches

8. Make the set point zero and go to HIGH. Monitor command and position feedback with the oscilloscope. Set a squarewave with frequency 5Hz and amplitude 1% of actuator stroke. Start the function generator. Adjust the 8800 main loop position proportional gain for a squarewave response that is not oscillatory but has some overshoot. Adjust the main loop position derivative gain to reduce the overshoot, then adjust the proportional gain for the optimum respose. Stop the function generator.

9. Monitor command and error with the oscilloscope. Set a triangle wave with frequency 1Hz and amplitude 10% of actuator stroke. Start the function generator. Adjust the integral gain for a square wave response or error waveform. See Figure 6-9 for waveform examples:

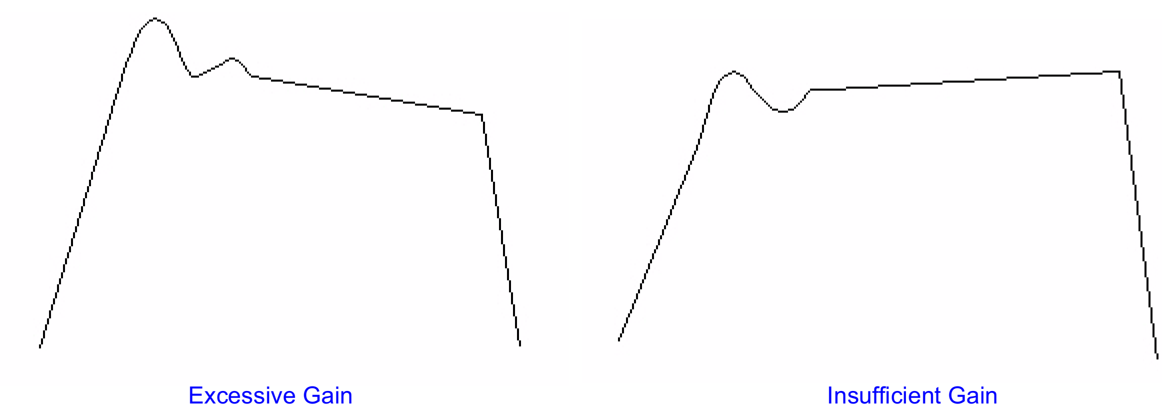


Figure 6-9. Adjusting the integral gain

10. With the actuator stationary and in control at mid-stroke, monitor the valve command on test point X105 with a DVM and adjust the NULL pot to zero Volts. Note that as the actuator is stationary, the main spool must be in zero-flow position. If the spool LVDT output is anything other than zero, the conditioned error (the command to the 3-stage valve summing junction) must be equal and opposite to the offset. Adjusting the NULL pot changes the output but, because the system is in closed loop control, the command also changes. The aim is to set the command to zero so that, when the system is switched off or a mains failure occurs, the main spool stays in the zero-flow position until hydraulic pressure has decayed.

11. If a resolution valve was removed in stage 2 above, switch off the hydraulics and reconnect the resolution valve. Switch on the hydraulics and check the loop response, adjusting the PID settings if necessary.

Table 6-1. Fault-Finding Table

Step in procedure	Test condition/symptom	Fault	Corrective action
7	LOW current limits both +100% then -100%. No change in output at test point X104 when current limits are changed from Positive to negative	No pilot pressure Actuator not active Faulty wiring to pilot valve or spool LVDT	Check, eg, hand valve shut Switch hydraulics to LOW (for low current limits) Check continuity, valve and spool impedance, etc.
8	LOW current limits set to +10%, voltage at X105 is negative	Servovalve drive polarity is inverted	Set valve drive polarity to NORMAL (Instron Service Function menu)
9	LOW current limits set to +10%, voltage at X104 is postitive	Inner loop has postive feedback	Reverse the connections to either the pilot valve or the spool LVDT
12	No control of actuator, main LVDT polarity is correct	Main loop has positive feedback	Reverse the connection to the main LVDT or Reverse the connections to both the pilot valve and the spool LVDT
13	Actuator is controlled but LVDT polarity is incorrect	Main LVDT and the inner loop are backwards	Reverse the connections to the pilot valve, the spool valve, the spool LVDT and the main LVDT

Connecting Operator Panels

Each Actuator Interface board is provided with a suitable connector to attach a operator panel (also referred to as a Man-Machine Interface or MMI).

Attaching an operator panel allows you to control that axis, without requring a computer running FastTrack Console. This also allows you to monitor the progress of the self-test routines (refer to Chapter 8 “Self-Test and Diagnostics”).

Before connecting the operator panel, ensure the testing system is in a stable condition. Shut down the hydraulics and close the controlling software. Once this has been carried out, switch off the FastTrack 8800 controller, removing the mains electrical power supply from the unit. For the axis to be controlled, connect the cable from the operator panel to the connector on the control panel.

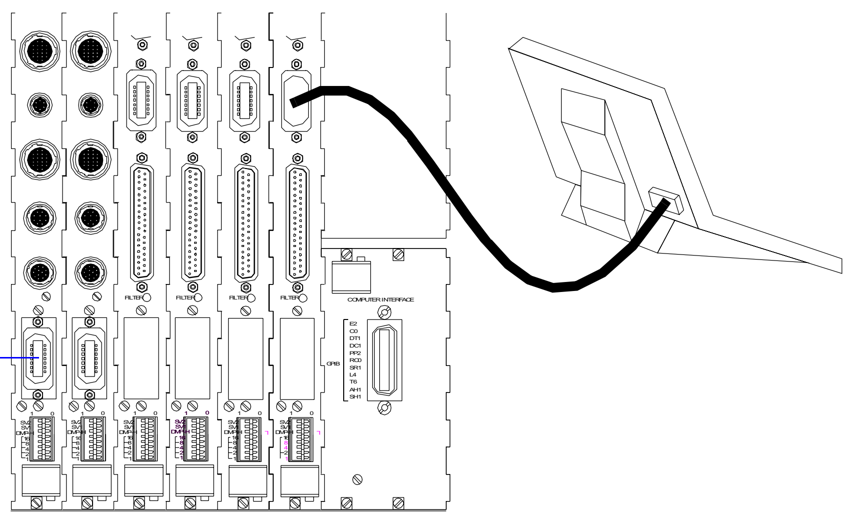


Figure 6-10. Connecting the Operator Panel to the Axis Interface Cards

Note: *If you have the Hirose connector type of Actuator Interface Card (A1721-1245), the operator panel connector is an option that may be fitted in the position shown in Figure 6-10.*

Connecting a Jog and Hydraulic Control Handset

A jog handset can be connected to each axis of your controller, allowing you to adjust the position of each axis without using either the operator panel or the FastTrack Console software.

The jog handset is particularly useful when setting up a specimen on the test machine, allowing you to move an axis slightly to allow the alignment of the specimen or holding fixtures.

Axes fitted with Actuator Interface Board A1721-1325

This type of actuator interface board has a 62-way connector for connection, via an appropriate cable, to the actuator interface box (cat number 8800-310).

Connect the cables from the jog and hydraulic control handset to connectors X6 and X8 in the actuator interface box. One cable should be connected to the Interlink In connector on the actuator interface board. See Figure 6-11.

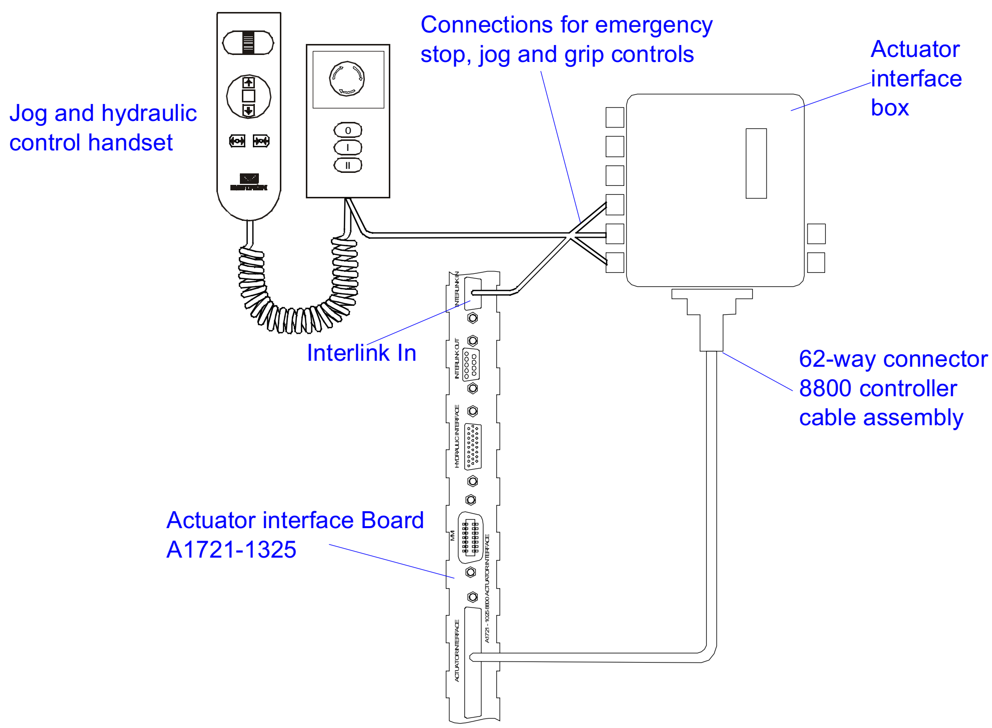


Figure 6-11. Connecting jog handset and hydraulic controls to A1721-1325 assembly

Axes fitted with Actuator Interface Board A1721-1345

This variant of the Actuator Interface Board has a hirose connector into which the jog extension cable may be connected.

The extension cable has a 7 pin DIN socket into which the jog and hydraulic control handset may be connected.

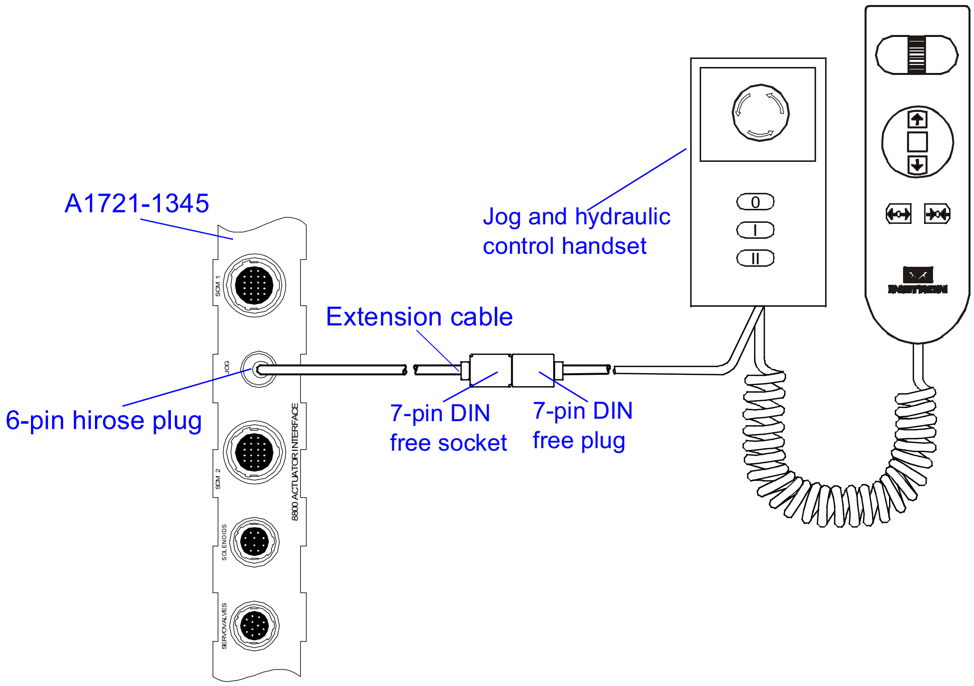


Figure 6-12. Connecting jog handset and hydraulic controls to A1721-1345 assembly

Chapter 7
Configuring the FastTrack Console Software

Outline

After you have defined the physical configuration of your FastTrack 8800 controller, you will need to configure the FastTrack Console software before you can use your materials testing system.

Overview

FastTrack2 Console (also referred to as FT Console) provides you with the tools you require for setting up and configuring your FastTrack 8800 controller to communicate and control your materials testing machine correctly.

Several of these tools are in the form of software wizards. (A software wizard is a series of steps that must be carried out by the operator, before the next relevant step is performed.) The software wizards have been designed to simplify the processes required to set up and configure the actuators, transducers and other components that make up an axis of control.

Where relevant, the software also provides check list tables of actions, giving both a visible indication of the current status within the set up process and a simple route to get to the relevant software wizards and set up screens.

Setting Device Configuration and Registry Information

FT Console allows you to set up and save device registry information relating to the configuration of your testing system.

Note: *Windows ™ use registry files to store information about the installed software and the options that apply to it. The FastTrack2 suite of software uses the Windows registry to store the information relating to the configuration of the software and the configuration of your testing system, such as the number of axes and the types of transducers fitted to them.*

These tools are located within the menu options, as the Configuration Manager. The Configuration Manager is selected from the **Start** button as shown below:

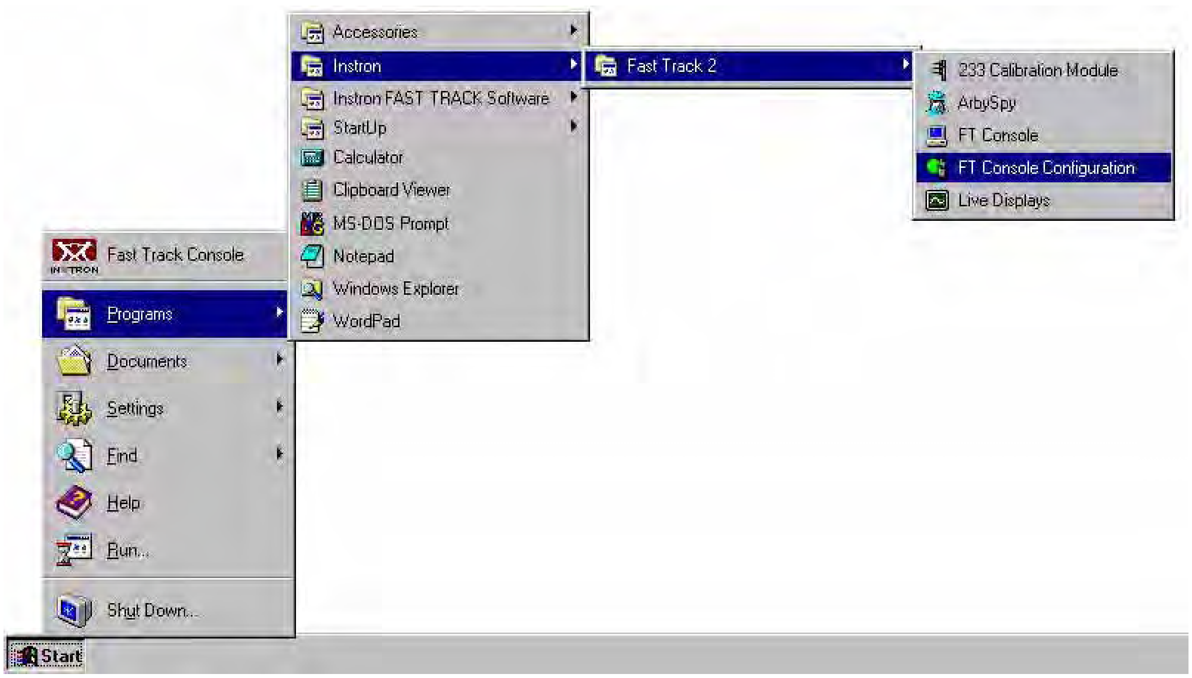


Figure 7-1. Starting the Configuration Manager

Note: *The Configuration Manager tools cannot be accessed if either FT Console or the GPIB Manager is already running. To shut down FT Console, select the exit option from the file menu. To shut down the GPIB Manager, select the close option from the toolbar menu, obtained by right-clicking the GPIB Manager icon on the Windows toolbar.*

Using the FT Console Configuration Options

The FT Console configuration options allow you to adjust settings in the software to match the configuration of your materials test control system.

When you select configuration, the system will scan your hardware and system registry, to find attached and registered devices. If any registered devices cannot be found attached to your controller, the following window will be displayed:

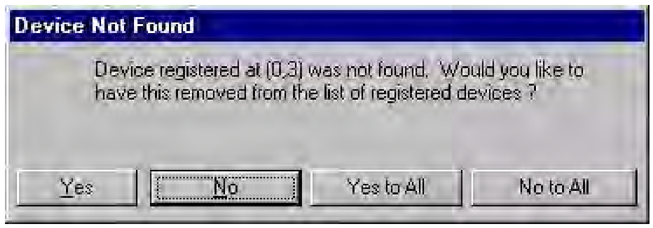


Figure 7-2. Device Not Found

Selecting either the **Yes** or **Yes to All** buttons will remove the device entries within the Windows™ registry. The **No** and **No to All** buttons keep the existing entries in the registry files, allowing you to assign and rename etc. these devices within the configuration screens.

About the Configuration Manager

The Configuration Manager provides you with a number of different screens that allow you to setup and organise your device properties.

A typical opening screen of the configuration option is shown in Figure 7-3.

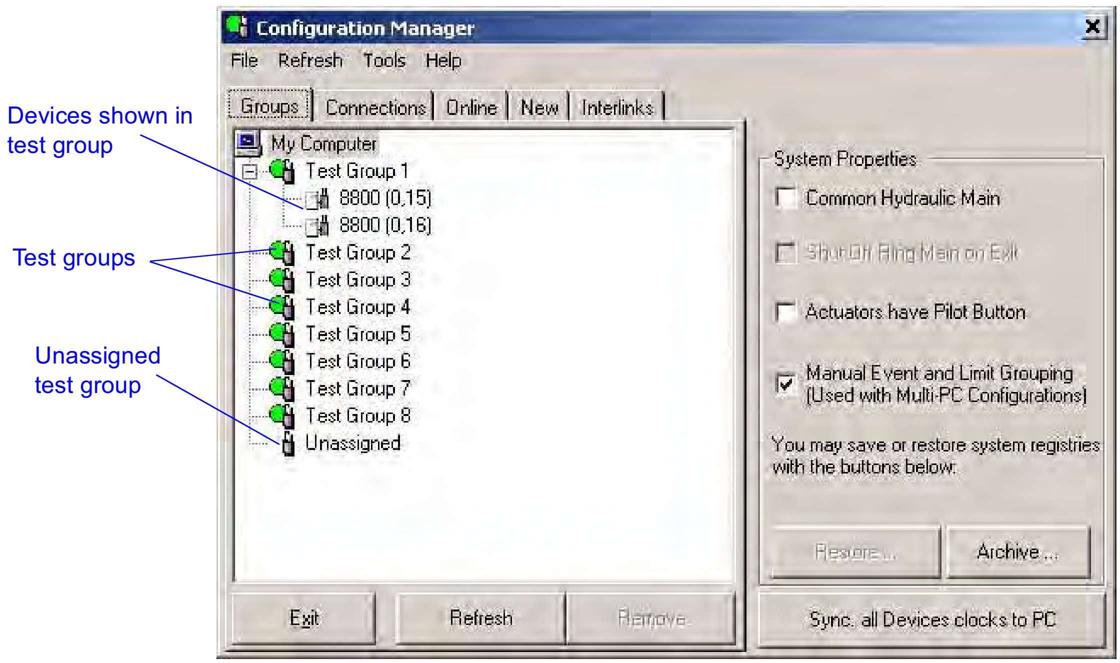


Figure 7-3. Configuration Manager

Red Cross Against a Device

A red cross against a device indicates a device that is not present in the current registry, or a device that is registered but no longer present**.**

If it is a new device, install it to make it part of the current registry. If it is a device that is no longer attached to your system, click on the **Remove** button to remove the device from the registry. If it is an existing device, check all connections.

The Unassigned Test Group

In addition to the four concurrent test groups you have available, the Configuration Manager provides you with an additional Unassigned test group.

The Unassigned test group is used to temporarily store devices you want to remove from certain test groups. This allows you to disable certain devices, without having to disconnect the device from your testing system or losing any setup and calibration information.

All new devices connected to your testing system are automatically entered into the Unassigned test group.

The following sections outline the procedures required to carry out specific tasks using the FT Console configuration functions.

Selecting your View of the Configuration Manager

The Configuration Manager allows you to view connected and registered devices within your control system.

You select how you view connections by selecting the appropriate tab, see Figure 7-3, for one of the view options:

- By Group
- By Connection
- Online
- New
- Interlinks

By Group

Presents you with a view of your axes and devices according to the test groups that you have defined.

Figure 7-4. "Group" Tab

By Connection

Displays the devices by their physical GPIB connections within your materials test control system.

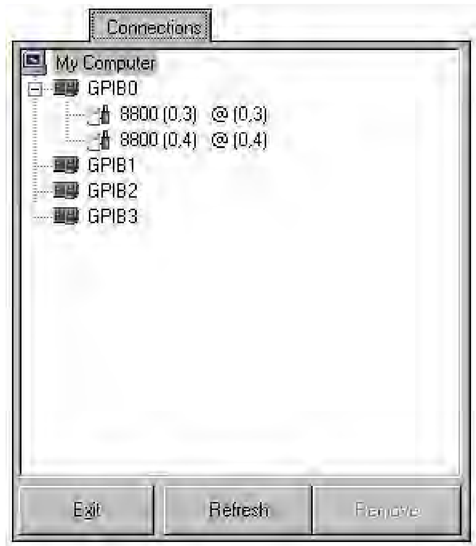


Figure 7-5. "Connection" Tab

Online

Displays devices that have been found and are registered in the device registry files.

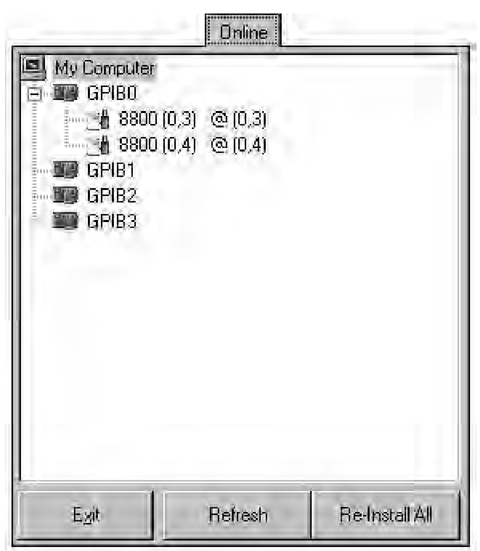


Figure 7-6. "Online" Tab

New

Displays unregistered devices found within your control system.

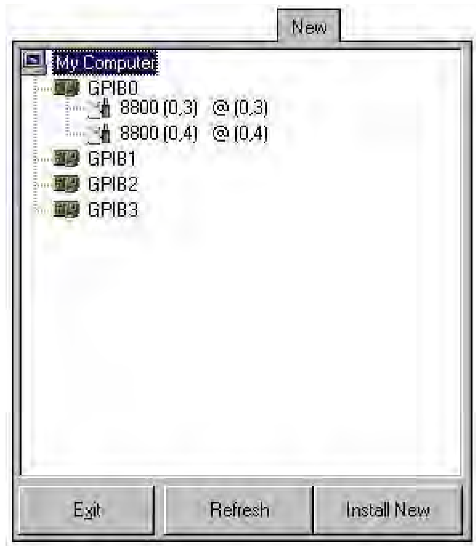


Figure 7-7. "New" Tab

Interlinks

Displays the hydraulic groupings formed by the physical connections of the interlink cables for all online devices with hydraulics OFF.

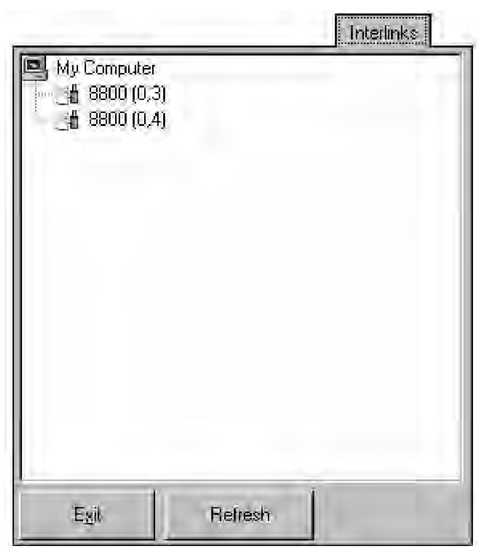


Figure 7-8. "Interlinks" Tab

Setting your System Properties

Caution

Take care to set the appropriate properties for your testing system before running any waveforms or tests.

The System Properties are included to provide a way of indicating the actual configuration of your system. Failure to set these properties correctly could cause the incorrect operation of your testing system or damage to equipment.

Manual Event & Limit Grouping (for Multiple Computer Support)

Note: *Manual Event and Limit Grouping only needs to be setup when you have more than one computer connected to a single 8800 tower controller.*

Console allows you to configure your system so that you can control different test groups from different computers. This feature is restricted to axes and devices connected to the same controller.

This feature supports up to 4 computers attached to a single controller. Each computer is used to control a single test group.

The user must assign a unique **event and limit group number** to each test group, controlled from each computer. This ensures that any event or limit action will only be performed on the individual test group whose axes have the same unique group number.

Failure to set a unique group number will cause events or limit actions to affect all axes within the testing system.

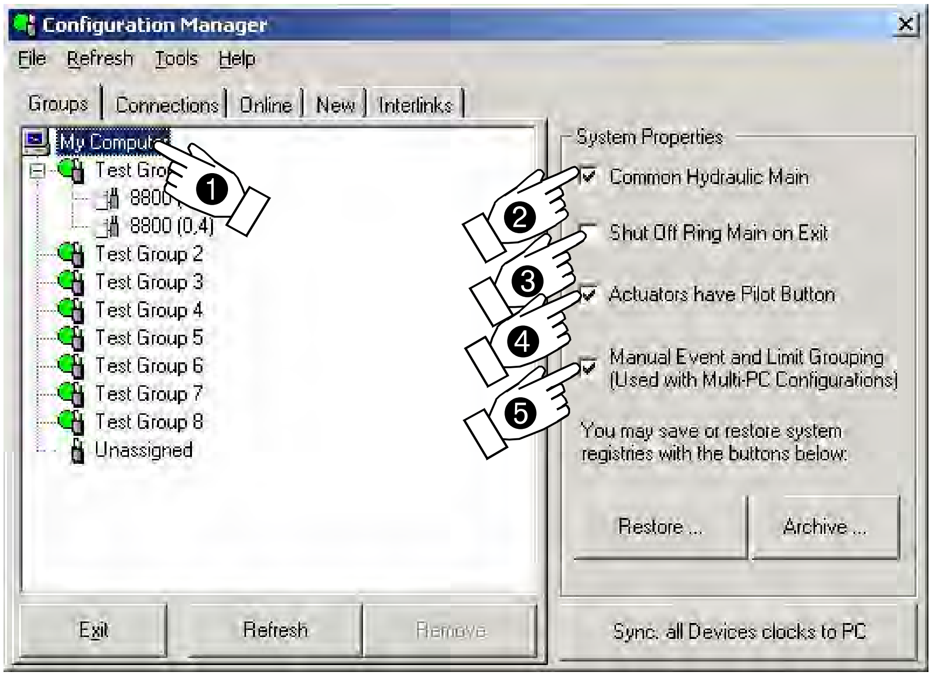


Figure 7-9. Configuration Manager - System Properties

	Action	Result
❶	Click the **My Computer** icon	Configuration Manager displays the system properties information check boxes.
❷	If required, check the **Common Hydraulic Main** checkbox	The control system now recognises that your testing system is connected to a ring main hydraulic supply.
❸	If required, check the **Shut Off Ring Main on Exit** checkbox	This option is only available if the **Common Hydraulic Main** box is checked. The control system now shuts off the ring main when you exit from Console.
❹	If required, check the **Actuators have Pilot Button**	The control system now recognises that your actuators use Pilot Pressure.
❺	If required, check the **Manual Event and Limit Grouping** checkbox	(Only required for multiple computer, single tower controller configurations.) The control system will now allow you to assign manual event and limit groups. Click on a group icon to display the group properties and assign a manual event and limit group number.

Archiving your Current Device Configuration

The manual configuration option allows you to create and restore archive files of your system configuration. The following procedures detail the steps to archive your current configuration and device registry information.

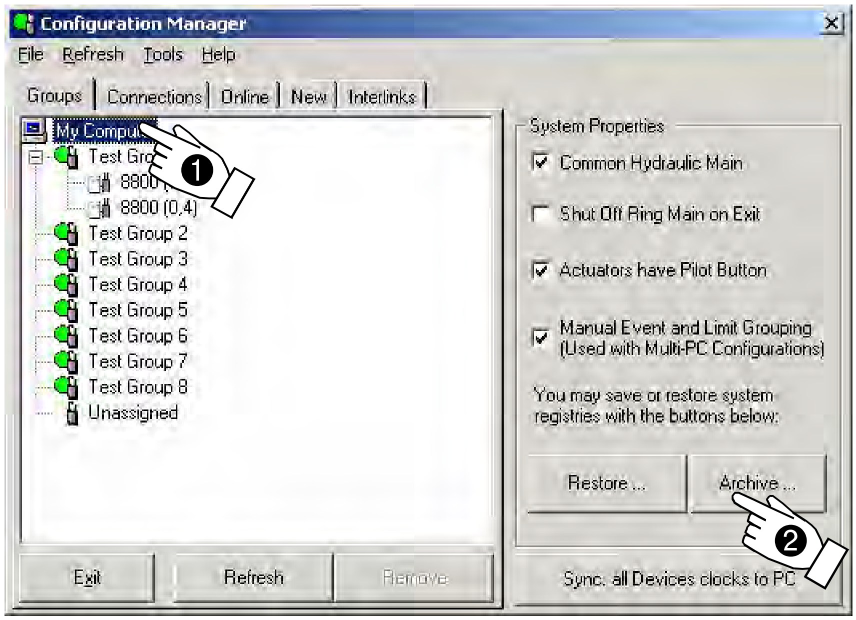


Figure 7-10. Archiving Current Configuration

	Action	Result
❶	Click the **My Computer** icon	Configuration Manager displays the system properties information check boxes.
❷	Click the **Archive** button	Configuration Manager displays a window that prompts you to enter a name for the archive file.

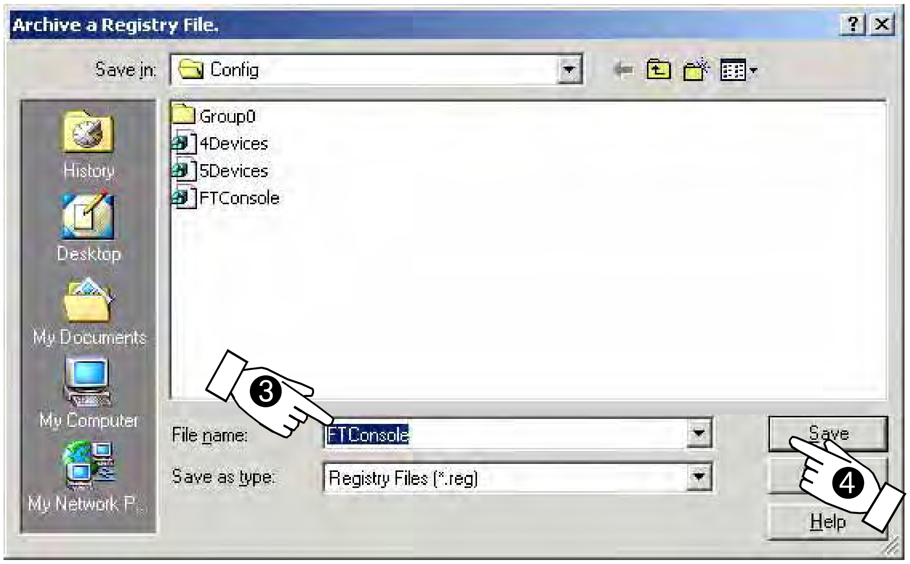


Figure 7-11. "Enter name for Archive" Window

	Action	Result
❸	Type the required file name, without spaces or a file extension.	The filename is displayed within the text box.
❹	Click the **Save** button	The software creates an archive file using your entered filename.

Restoring a Previously Archived Device Configuration

The procedures to restore a previously archived configuration are shown below:

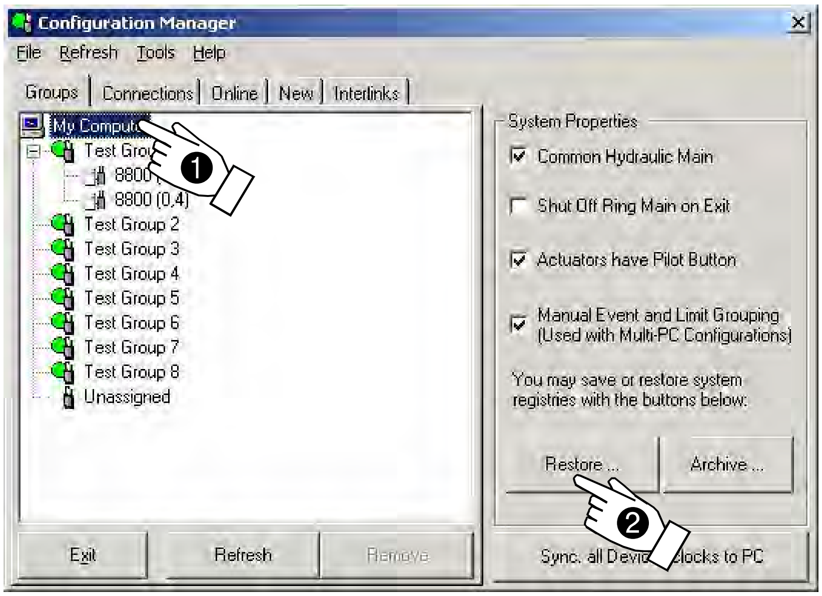


Figure 7-12. Restoring Configurations

	Action	Result
❶	Click the **My Computer** icon	Configuration Manager displays the system properties information check boxes.
❷	Click the **Restore** button	Configuration Manager displays a window that prompts you to enter the name of the archive file.

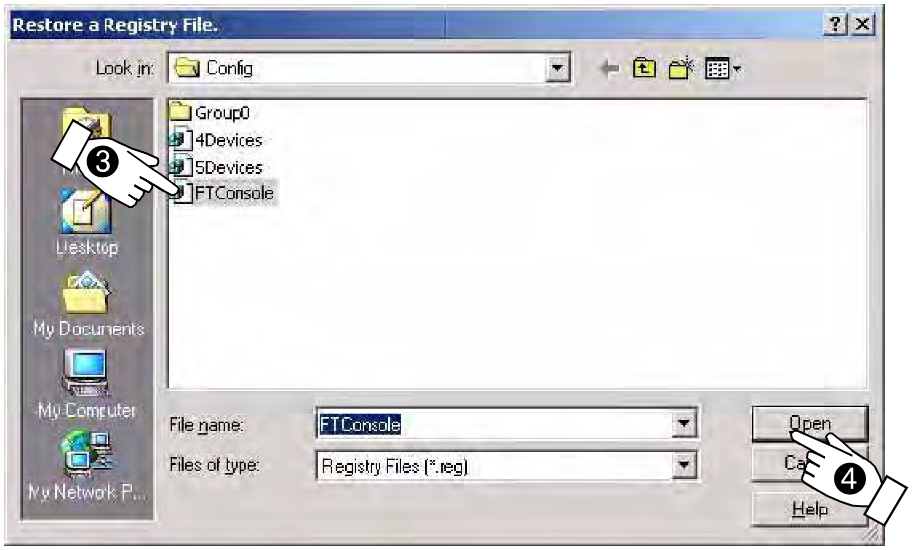


Figure 7-13. "Name of Archive to Restore" Window

Action	Result
❸ Select the name of the archive file to restore	The filename is displayed within the text box.
❹ Click the **Open** button	The current configuration and device registry files are destroyed and the archived information is restored to your system.

Forming a Test Group

All recently installed devices appear in the Unassigned test group. Drag devices into the Test Group that you want them to form part of.

Changing Test Group Properties

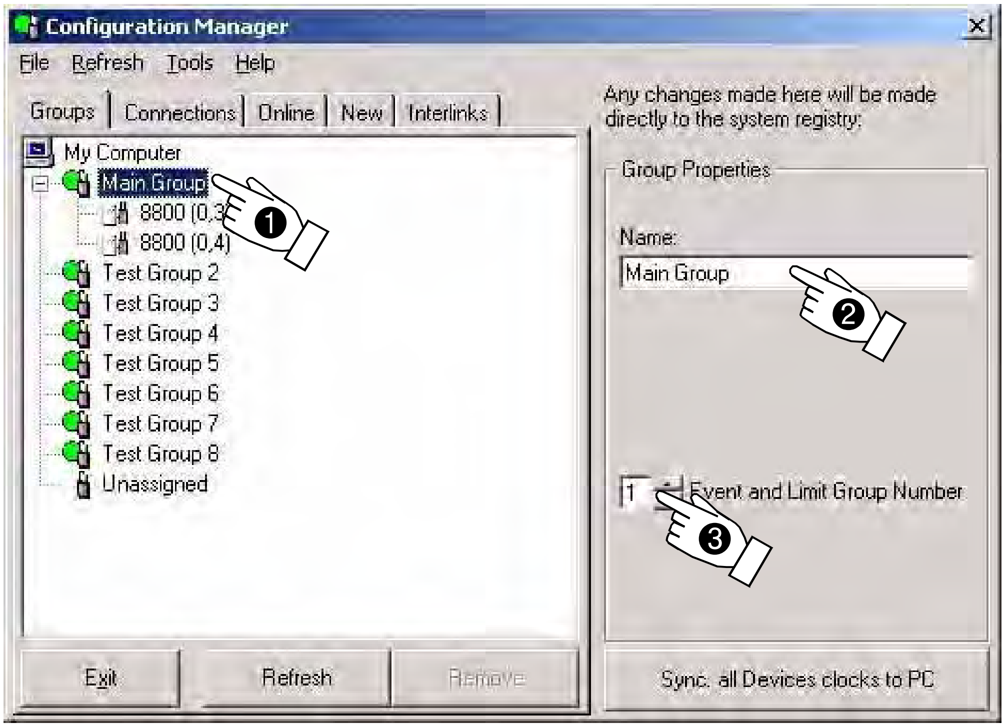


Figure 7-14. Changing Test Group Properties

	Action	Result
❶	Select the test group that you want to change	The test group name in the “tree view” area is highlighted and appears in the **Group Properties - Name** text box.
❷	Type the new name in the **Group Properties - Name** text box	The name of the selected test group is updated within the “tree view” window.
❸	Select a unique Manual Event and Limit Grouping number Each test group defined must have a different number	The control system will now allow you to assign manual event and limit groups. Click on a group icon to display the group properties and assign a manual event and limit group number.

Note: *The Manual Event and Limit Grouping box is only displayed if you have set your System Properties accordingly. See item ❺ Figure 7-9. This setting is only required when you are using multiple computers to control multiple test groups attached to a single 8800 tower controller.*

Hydraulic groups are formed by the physical connections of the interlink cables. These are shown on the Interlinks tab of the configuration manager providing the devices are on-line and the hydraulics are off.

Changing Device Properties

You can use the manual configuration options to change properties of the attached devices. These properties include the renaming of a device, moving a device from one test group to another and specifying the GPIB boards within the computer and the GPIB addresses that the device is connected to. This is achieved as shown in Figure 7-15:

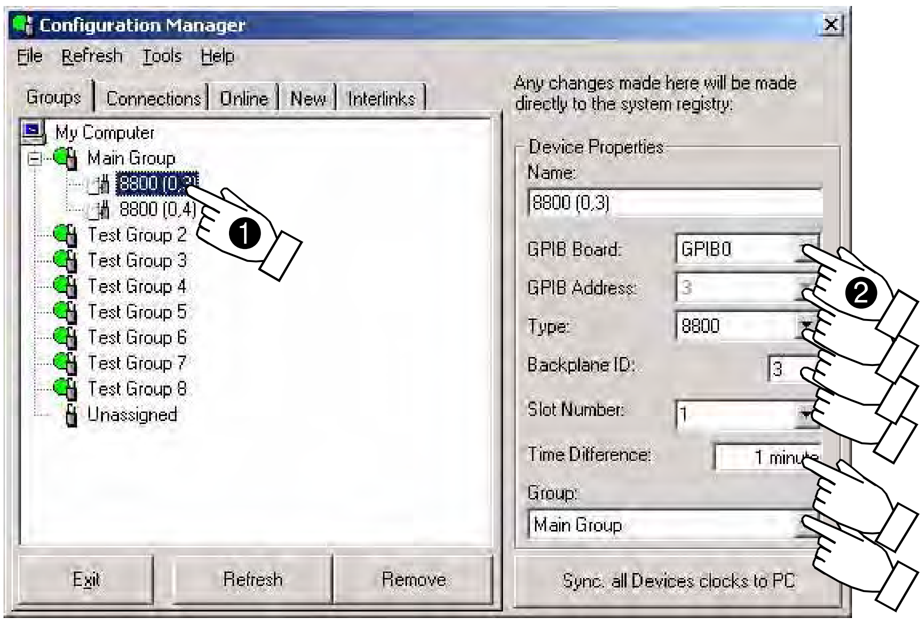


Figure 7-15. Changing Device Properties

	Action	Result
❶	Select the required device	The selected device is highlighted and its properties are displayed on the right hand side of the screen.
❷	Change the required properties as described below	The properties for the selected device are changed.

Name

This is the name that appears within FT Console for the selected device and can be changed from this text box.

GPIB Board

If you have changed the GPIB board that the device is connected to, you must adjust this parameter to match the actual settings.

GPIB Address

If you have changed the GPIB address for a particular device, or connected a device to a new GPIB board, you must ensure that the address shown matches the address that you have set.

Type

Indicates the type of device that is connected. The possible device types are:

- 8800
- 5800
- 103
- 233
- RDM
- Single Output RDM
- Other

Backplane ID

Each tower within the control system requires a unique backplane ID, to identify the particular tower. The backplane ID is user selectable.

Slot Number

Indicates the slot position within the tower to which the device is connected. This must match the actual position found.

Note: *When used with the tower and viewed from the rear of the controller, backplane position 6 is to the left, counting down to position 1 on the right.*

Time Difference

Shows the difference between the times in the PC and the device.

Group

Indicates which of the test groups the device is associated with.

Sync all Devices Clocks to PC

Click here to synchronise the clocks in all of the devices to the clock in the PC.

Setting up each Axis

You must define the actuator groups using the configuration wizard before FT Console can run applications programs. The software must ensure that information exists regarding the type of actuator and the transducers fitted to it. If this information does not exist, it must be obtained before FT Console will allow tests to run on your materials testing system.

Axis Setup Checklist

The axis setup checklist is designed to simplify this setup procedure.

The checklist displays a list of items that must be set up on each axis of your testing system. When you click on an item the required window is displayed for you to adjust the required item. A check mark is displayed on completion of each procedure.

To open the axis setup checklist, follow the procedures described below:

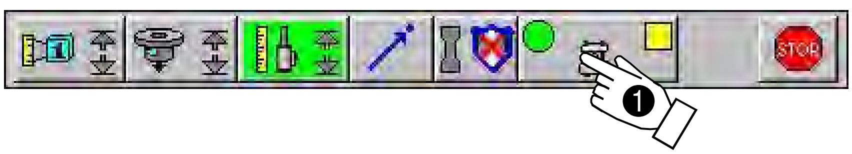


Figure 7-16. Starting the axis checklist

	Action	Result
1	Click the axis button	The controller properties are displayed.

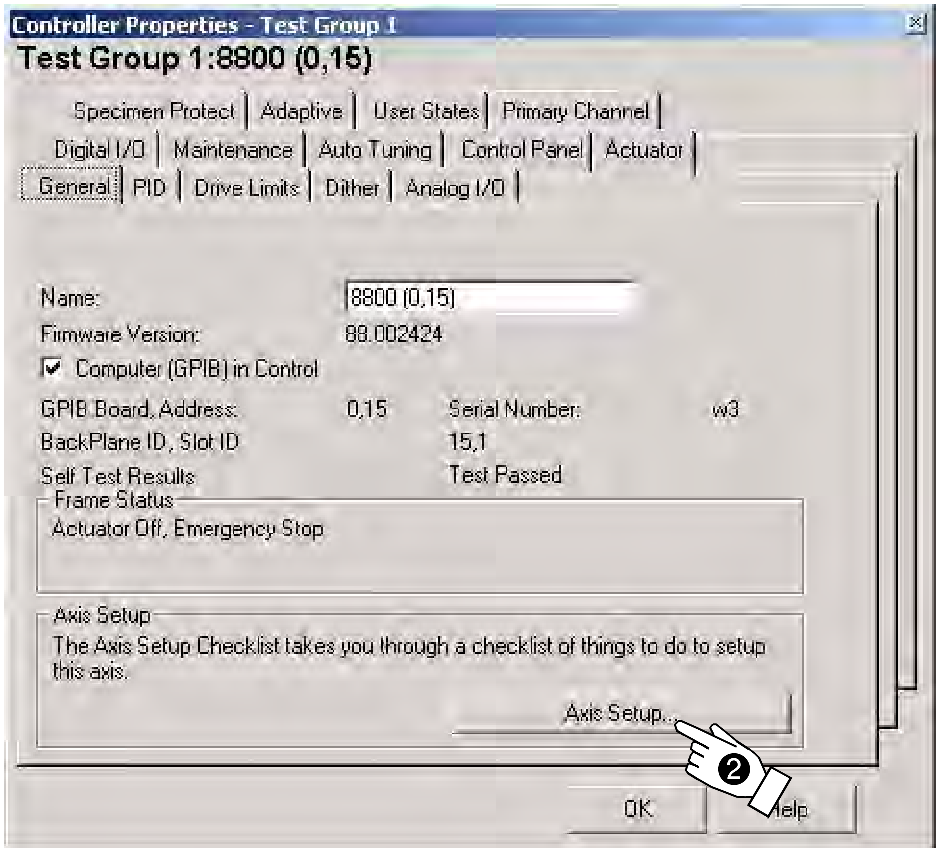


Figure 7-17. Starting the axis checklist

	Action	Result
❷	Click the **Axis Setup** button	The axis setup checklist is then displayed.

The illustration shows how the axis setup checklist groups each item into related functions.

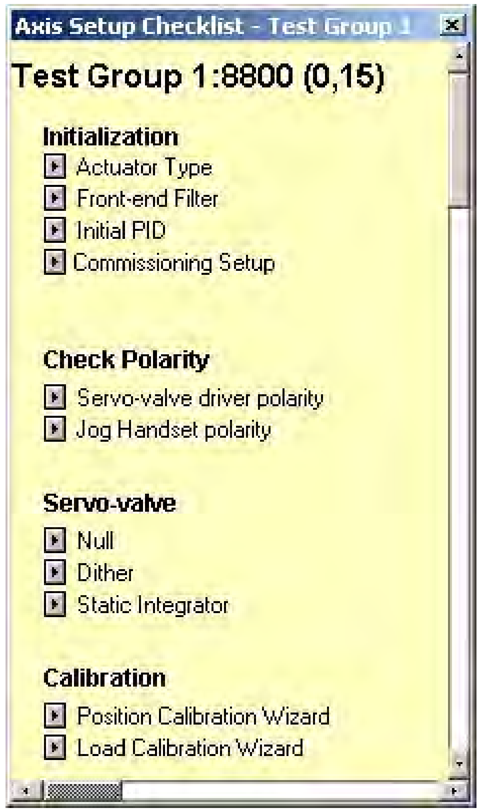


Figure 7-18. Axis Checklist

Note: *In order for FT Console to be compatible with a range of PC screen resolutions, you may need to scroll the axis setup checklist screen using the scroll bars provided to see the complete list of items.*

The full list of items are:

Initialisation

- Actuator Type
- Front-end Filter
- Initial PID
- Commissioning Set-up

Check Polarity

- Servo-valve driver polarity
- Jog Handset polarity

Servovalve

- Null
- Dither
- Static Integrator

Calibration

- Position Calibration wizard
- Load Calibration Wizard

Resonance Compensation

- Loop Tuning Tool

Loop Shaping

- Loop Tuning Tool

Low Pressure Mode

- Low Pressure Drive Limits

Limits

- Position Limits
- Load Limits

Adaptive

- Auto Tuning
- Advanced

User States

- User States Setup

To adjust a particular item, click the mini-button shown to the left of the item.

Setting Drive Limits

Before setting up your testing system, you should reduce the drive limits to reduce the risk of damage to the specimen being tested or the testing system itself.

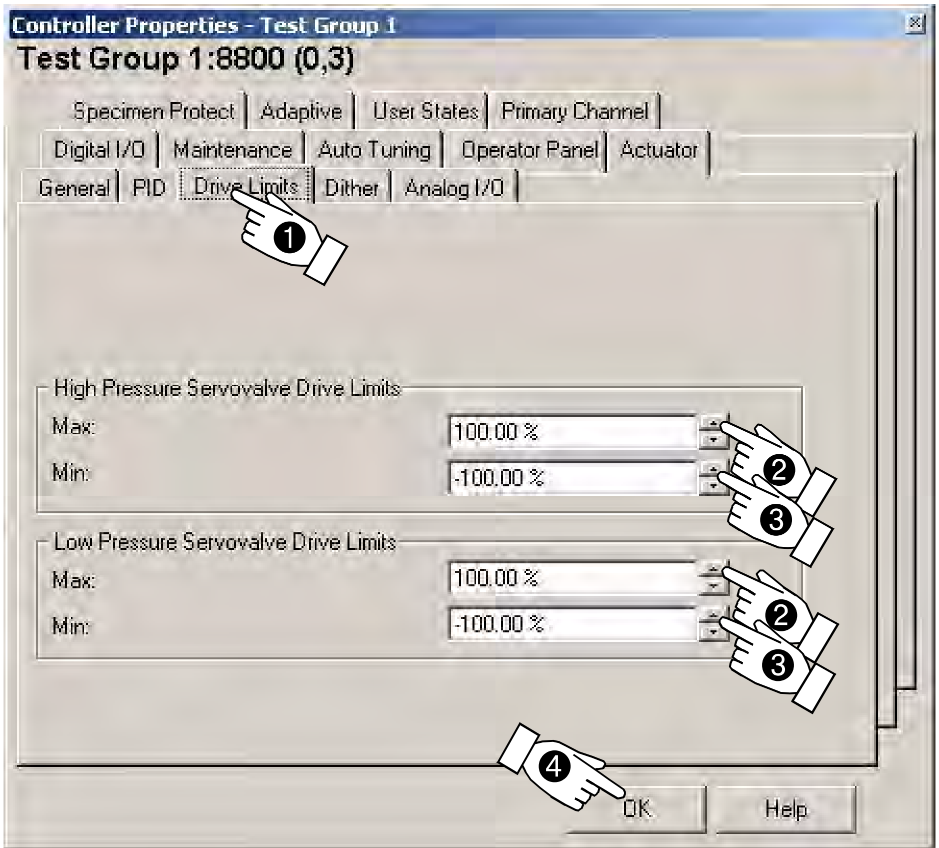


Figure 7-19.   Setting Drive Limits

	Action	Result
❶	Click the **Drive Limits** tab	Displays the drive limits tab options.
❷	Click the max. scroll buttons	The value for the maximum drive limits is adjusted.
❸	Click the min. scroll buttons	The value for the minimum drive limits is adjusted.
❹	Click the **OK** button	The drive limit values are entered into memory.

Note: If you have 60mA servovalves, set the high pressure drive limits to ±120%. Refer to “Settings for different types of servovalve” on page 4-4.

Setting Initialisation Parameters

The items grouped within the Initialisation section of the axis setup checklist are:

Initialisation

- Actuator Type
- Front-end Filter
- Initial PID
- Commissioning Setup

The procedures below detail the steps required to set the initialisation parameters.

Warnings

Set appropriate operating limits before attempting to carry out loop tuning, run waveforms or carry out testing.

Operating limits are included within your testing system to limit actuator movement. Failure to set these limits appropriately could result in injury to personnel or damage to equipment.

Use extreme caution when adjusting gain values.

Setting excessive gain values for your system can make the actuator response unstable and leave the actuator uncontrollable.

If the actuator becomes unstable, strike the Emergency Stop Button.

Allowing an actuator to remain in an unstable condition could cause injury to personnel or damage to equipment.

Setting the Actuator Type and Entering Commissioning Information

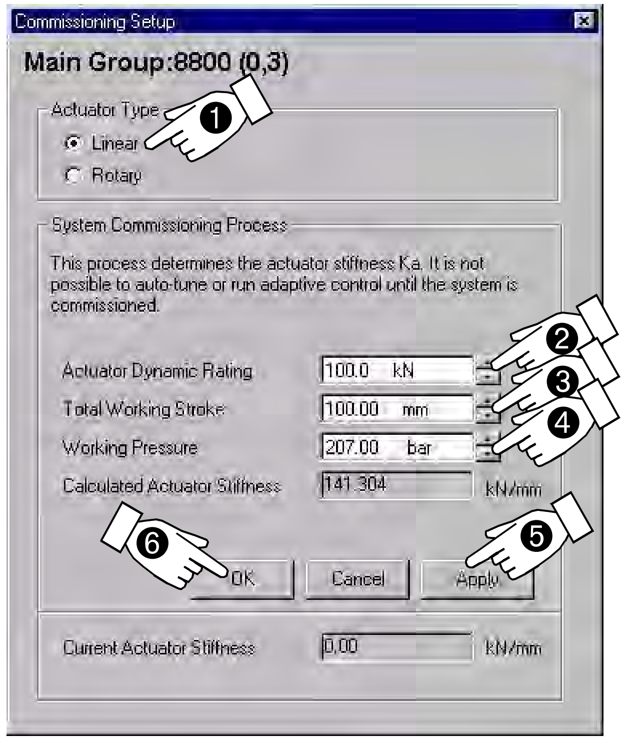


Figure 7-20. Setting Initialisation Parameters

	Action	Result
❶	Select either the **Linear** or the **Rotary** actuator option button	The option button displays the selected symbol.
❷	Enter the actuator dynamic rating for the actuator being connected	Information about your system is entered into the controller, so that calculations can be performed.
❸	Enter the total working stroke for the actuator being connected	Information about your system is entered into the controller, so that calculations can be performed.
❹	Enter the working pressure for your system	System Information is entered, allowing calculations to be performed.
❺	Click the **Apply** button	The actuator stiffness calculations are carried out.
❻	Click the **OK** button	The settings are entered into memory and the window is removed from the screen.

Setting the Front-end Filter Options

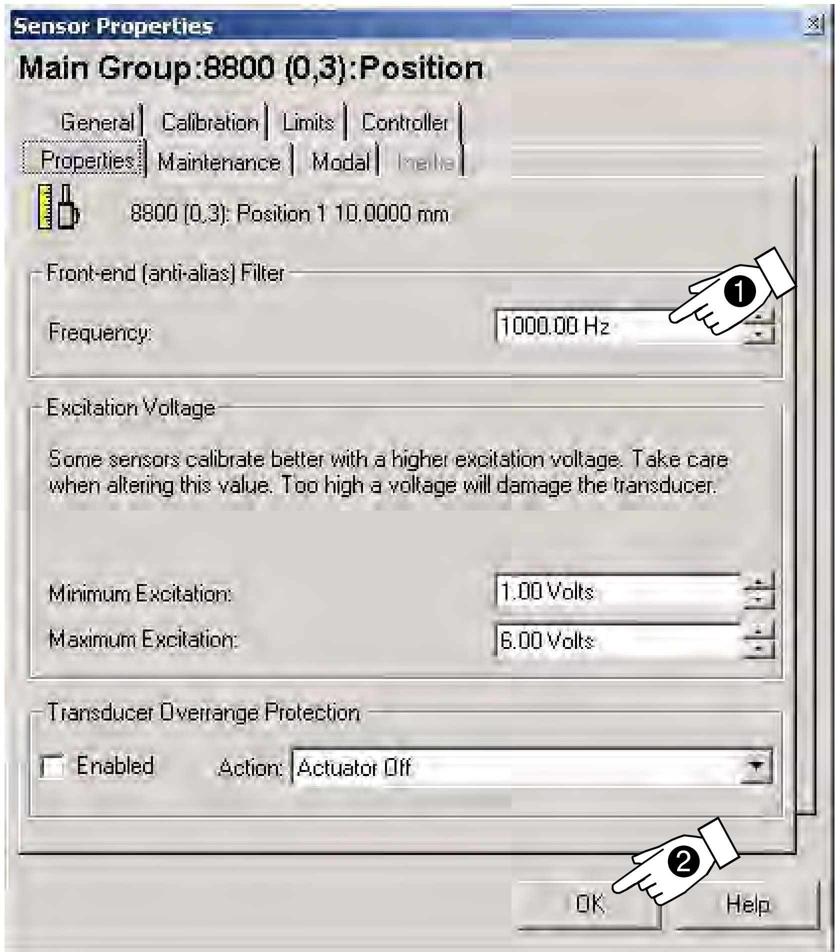


Figure 7-21. Setting Front End Filter Frequency

Note: *The front end filter frequency can only be set when the sensor is in an "uncalibrated" state.*

	Action	Result
❶	Click the scroll buttons	The value for the frequency is adjusted.
❷	Click the **OK** button	The settings are entered into memory and the dialog box is closed.

Setting the Initial PID Values

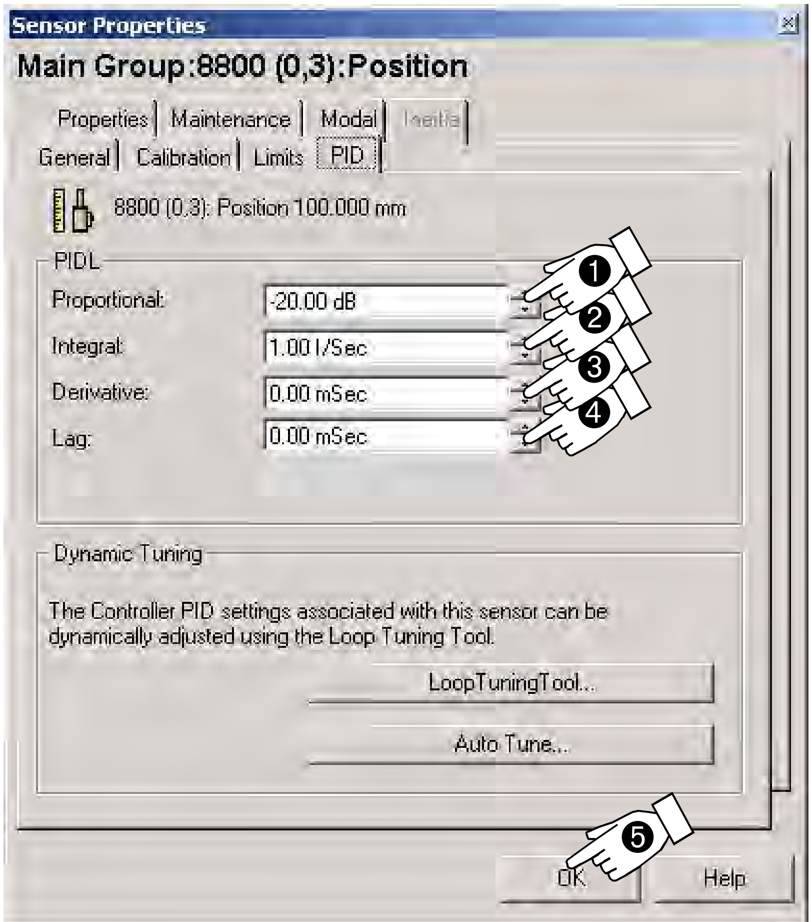


Figure 7-22. Setting PID Values

	Action	Result
❶	Click the proportional gain scroll buttons	The value for the proportional gain term is adjusted.
❷	Click the integral gain scroll buttons	The value for the integral gain term is adjusted.
❸	Click the derivative scroll buttons	The value for the derivative term is adjusted.
❹	Click the lag scroll buttons	The value for the lag term is adjusted.
❺	Click the **OK** button	The PIDL values are entered into memory.

Setting the Check Polarity Options

Two options can be found within the Check Polarity section of the axis setup checklist:

Check Polarity

- Servovalve driver polarity
- Jog Handset polarity

Servovalve Driver Polarity

The servovalve driver polarity can be switched between normal and inverted, to allow for differing configurations of actuators and manifolds. FT Console displays a warning message, asking if you wish to continue with changing the polarity. Selecting the servovalve driver polarity option will display the following window:

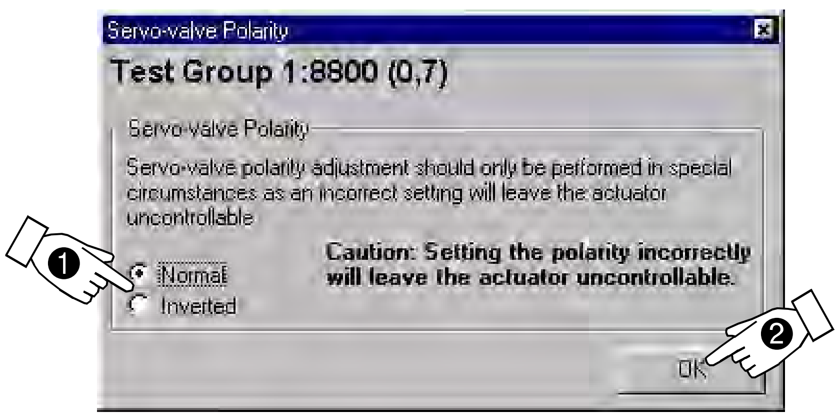


Figure 7-23. Servovalve Polarity Window

Caution

Only use the software to change the polarity as a temporary, debugging, measure. Once it is verified that polarity does need changing, this should be achieved by hard-wiring the servovalve, as the software setting will be lost when NV RAM is erased, leaving the actuator uncontrollable.

	Action	Result
1	Select either **Normal** or **Inverted** option button	Selects either normal polarity or inverted polarity.
2	Click the **OK** button	The selected polarity for the servovalve drivers is saved in memory and the window is closed.

Jog Handset Polarity

Set the jog handset polarity option to match the direction of movement shown on the jog handset with the actual direction of movement for the actuator.

Selecting the jog handset polarity option displays the following window on the screen:

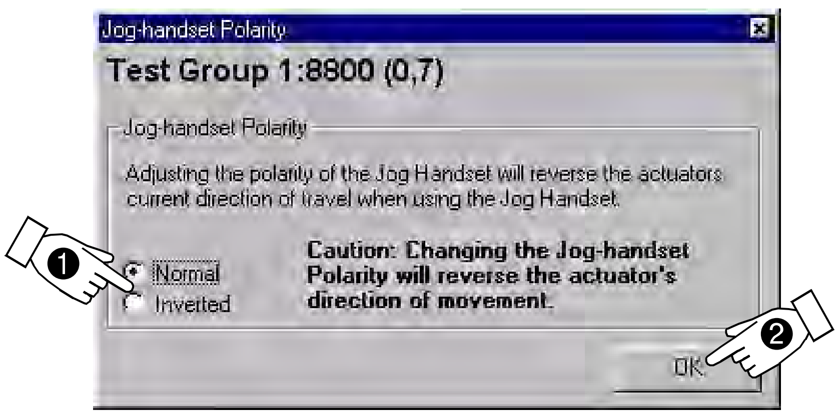


Figure 7-24. Selecting the Jog Handset Polarity

Caution

Only adjust the polarity if it is required. Setting the polarity incorrectly will leave the actuator uncontrollable.

	Action	Result
1	Select either **Normal** or **Inverted** option button	Selects either normal polarity or inverted polarity.
2	Click the **OK** button	The selected polarity for the jog handset is saved in memory and the window is closed.

Setting the Servovalve Options

The following parameters can be adjusted within the servovalve group of options:

Servovalve

- Null
- Dither
- Static Integrator

Follow the instructions given on the screens and provide information relevant to your testing system when prompted to do so.

The first screen of the wizards available for the servovalve options are displayed below.

Servovalve Null settings

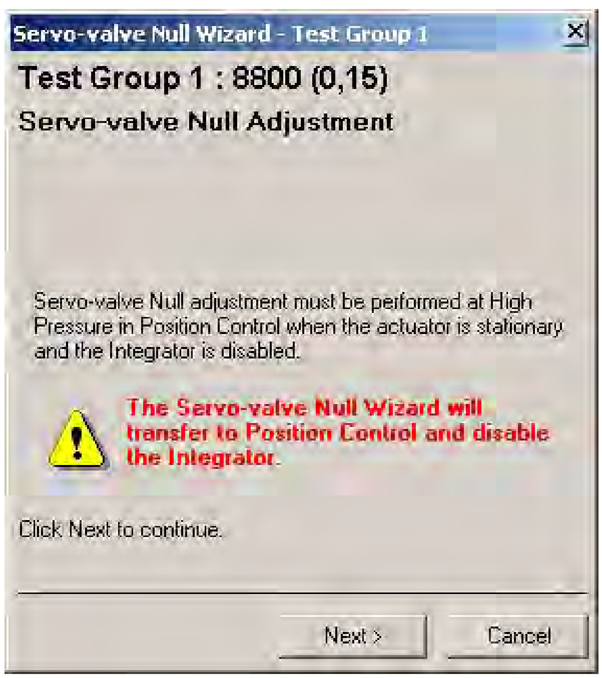


Figure 7-25. Servovalve Null Wizard

Setting the Dither Value

Figure 7-26. Dither Wizard

Setting the Static Integrator

Figure 7-27. Static Integrator Wizard

Configuring the FastTrack Console Software

Setting the Calibration Options

Calibration

▶ Position Calibration Wizard

▶ Load Calibration Wizard

The Calibration options provide you with the software tools to calibrate the sensors, also referred to as transducers, within your testing system. These tools are presented in the form of calibration wizards, to easily guide you through the calibration process for the relevant sensor type.

The opening screen for the calibration wizard is shown below:

Figure 7-28. Position Calibration Wizard

Follow the instructions given on the screen, supplying information relating to your sensors when prompted.

Setting Resonance Compensation Options

Resonance Compensation

Loop Tuning Tool

FT Console allows you to 'tune out' any resonances that may occur within your actuator. The loop tuning tool shown in Figure 7-29 is used to achieve this.

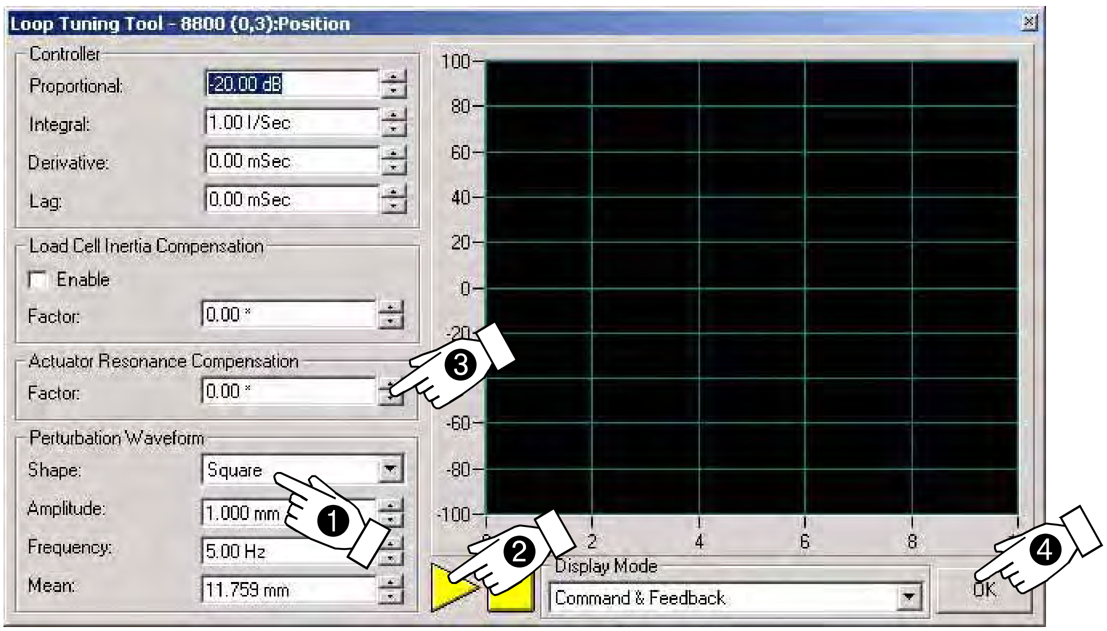


Figure 7-29. Using the "Loop Tuning Tool for Resonance Compensation

	Action	Result
❶	Select the required waveform shape from the drop down list	The selected waveform shape will be used in the loop tuning process.
❷	Click the start button	The oscilloscope screen will display two traces: Red = Command Signal Green = Feedback signal.
❸	Adjust the resonance compensation value	Adjust until the resonance within the feedback signal has reduced to an acceptable level.
❹	Click the **OK** button	The new resonance compensation value is entered into the controller system.

Setting Loop Shaping Options

Loop Shaping

Loop Tuning Tool

Warnings

Set appropriate operating limits before attempting to carry out loop tuning, run waveforms or carry out testing.

Operating limits are included within your testing system to limit actuator movement. Failure to set these limits appropriately could result in injury to personnel or damage to equipment.

Use extreme caution when adjusting gain values.

Setting excessive gain values for your system can make the actuator response unstable and leave the actuator uncontrollable.

If the actuator becomes unstable, strike the Emergency Stop button.

Allowing an actuator to remain in an unstable condition could cause injury to personnel or damage to equipment.

Within the loop shaping section of the axis setup checklist, you will find the position loop tuning tool. This tool allows you to set accurate optimum values for the control loop on the currently selected axis.

The opening screen of the loop tuning tool is shown in Figure 7-30:

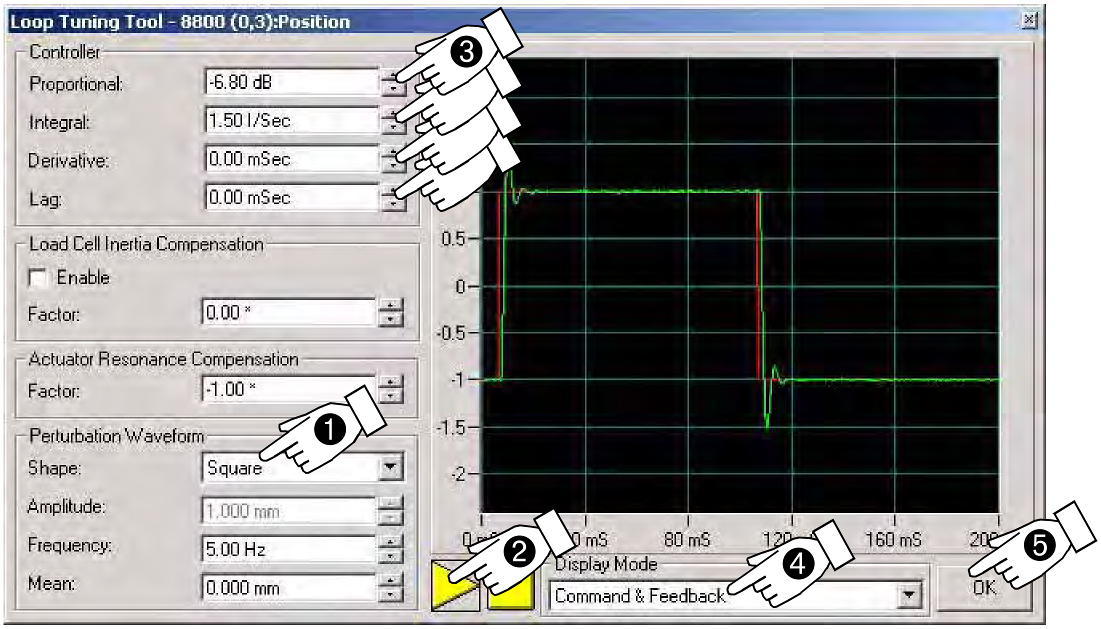


Figure 7-30. Loop Shaping using the Loop Tuning Tool

	Action	Result
❶	Select the required waveform shape from the drop down list	The selected waveform shape will be used in the loop tuning process.
❷	Click the start button	The oscilloscope screen will display two traces Red = Command Signal Green = Feedback signal.
❸	Adjust the PIDL values	Adjust until the feedback signal most closely resembles the command signal.
❹	Select a display mode from the drop down list	The oscilloscope screen will display the selected trace.
❺	Click the **OK** button	The new PIDL values are entered into the controller system.

Setting the Low Pressure Mode

Low Pressure Mode

Low Pressure Drive Limits

FT Console allows you to set differing servovalve drive limits for high and low pressure running. This enables you to set up a test, without operating at maximum hydraulic flow. The low pressure drive limits the force capacity of the actuators.

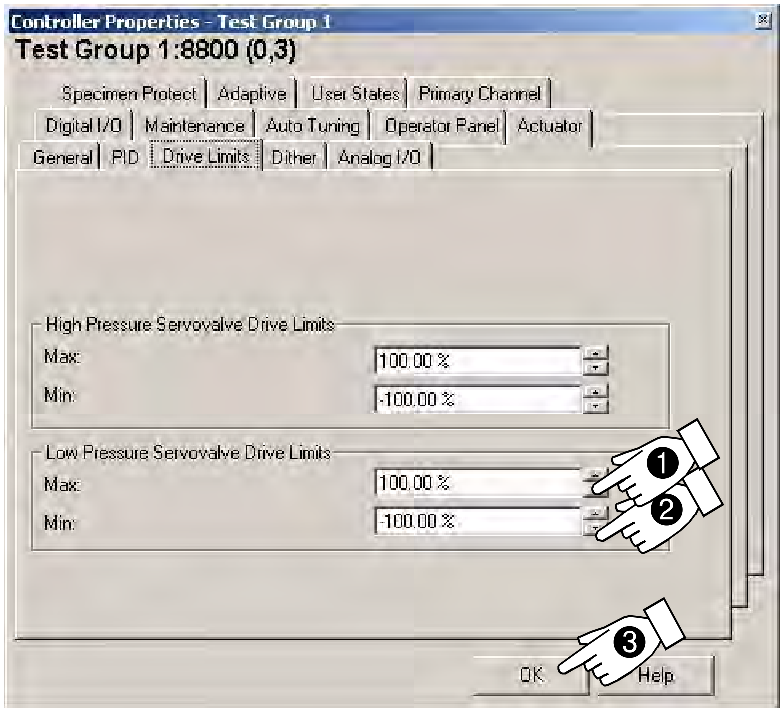


Figure 7-31. Setting the Low Pressure Mode

	Action	Result
❶	Adjust Max. value	The new value is displayed on the screen.
❷	Adjust Min. value	The new value is displayed on the screen.
❸	Click the **OK** button	The specified values are entered into the controller system.

Note: *The high pressure servovalve drive limits are normally set to 100%. Only change these settings to cater for specific testing requirements.*

Chapter 8
Self-Test and Diagnostics

Outline

Your FastTrack 8800 controller includes a comprehensive suite of diagnostic self-test routines to ensure that, before you can use your controller to run your testing system, all control axes are functioning correctly.

This chapter details the messages and indications that the self-test routines may display when the controller is switched on. It also gives a description of the 'normal' and 'diagnostic' modes of operation used during the self-test procedure.

Using the Reset and Monitor Buttons

Reset Button

The *Reset Button* is located on the front panel of the IAC, above the seven indicator LEDs. Pressing this button will re-start the system. If your testing system passed all the self-test routines when you last turned the power on, the self-test routines will be skipped during this reset. Resetting the controller will cause any volatile setup information currently held within memory to be lost.

If the IAC did not complete and pass all the self-test routines since last being powered up, the self-test routines will be run again.

Monitor Button

The *Monitor Button* is located below the Indicator LEDs on the IAC front panel. This button is located within a recess to prevent it being pressed accidentally.

The *Monitor Button* stops the IAC performing the current process, and moves the system into “diagnostic” mode. If the IAC is already in “diagnostic” mode when the *Monitor Button* is pressed, the self-test routines will enter “cyclic” mode. It will continually cycle through the routines until the *Monitor Button* is pressed again, the system is reset using the *Reset Button* or power is removed and reapplied to the system.

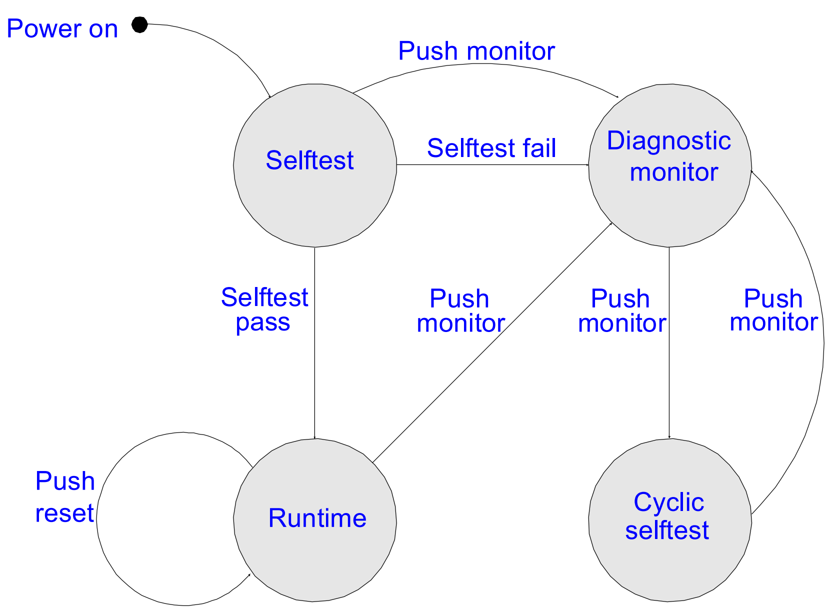


Figure 8-1. Monitor and Reset Buttons - Logic Diagram

Monitoring the self-test procedures

You can monitor the progress of the self-test routines in several ways, including:

- Observing the in-built indicator LEDs
- Using an operator panel (often referred to as MMI)
- Using the FT Console software
- Using the diagnostic monitor interface, using a suitable "dumb" terminal (such as Windows™ Terminal or Windows™ Hyper-Terminal)

The following sub-sections will deal with each of these methods in turn.

Observing the Indicator LEDs

Each Integrated Axis Controller (IAC) incorporates a set of indicator light emitting diodes (LEDs) that provide status information during self-testing procedures and subsequently during the operation of the controller. Seven LEDs are located at the top of each IAC front panel, behind the hinged door, whilst the eighth is located above the "Interlink In" connector on the rear of the controller.

As the self-testing routines continue through the start-up sequence, the LEDs will progress through a series of "states", where the LEDs will be either On, Off, Flashing or Dim (the Dim state is flashing too fast to be observed). The following illustration details the arrangement of the LED's for the different states.

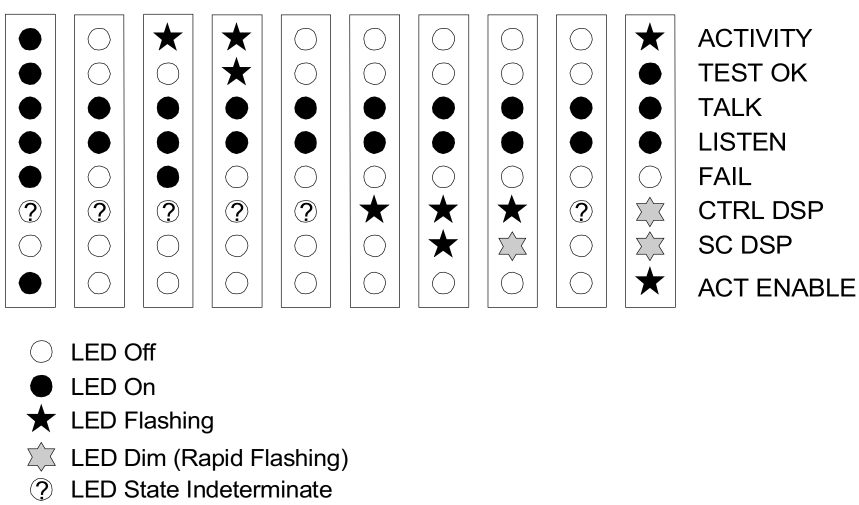


Figure 8-2. LED Indicator States

The ten "states" indicate the following stages within the self-testing routines have been reached:

Table 8-1. LED State Indications

State	Description	Comments
1	System is powering up and the Xilinx chips are loaded with firmware	Power Switched On
2	System has powered up and the hardware has been initialised	Initialising system
3	IAC is looking for firmware in flash memory	Activity LED flashes once
4	Starting system diagnostics	Activity and test LEDs flash twice
5	System self-test has started, checks on 68340 and peripherals underway	68K self-tests
6	Control DSP self-test in progress	Control DSP self-tests
7	Sensor DSP self-test initialising	Initialising conditioner DSP
8	Sensor DSP self-test in progress	Conditioner self-test
9	Failed self-test, system enters Diagnostic Monitor mode	Self-test failed
10	Passed self-test, application firmware being run	Self-test passed

Using operator panel

Each IAC allows the use of an operator panel, to receive status messages from the IAC and send General Purpose Interface Bus (GPIB) commands to the IAC. This also allows you to monitor the progress of the self-test procedures.

An operator panel can only relay the self-test progress information for a single IAC card. To monitor all axes, you require as many hardware front panels as you have IACs fitted to your controller. However, if you find that only one IAC fails its self-test, whilst all others pass, you can connect an operator panel to the board that has failed. After re-booting the system, each axis will again run through the self-test routines, with the error messages etc. relating to the previously failed axis being displayed on the operator panel.

The upper display on the operator panel shows the number of the current self-test routine being performed. This is useful in the event of a severe IAC or hardware failure, as the display shows the number of the routine that was running when the failure occurred. This eliminates previously tested areas from the diagnostic process.

Should your controller fail any of the self-test routines, a list of the failed tests is generated and displayed on the lower operator panel displays. This allows the reason for the failure to be identified. See “Self-test Error Codes” for information relating to error codes.

Using the FT Console Software

Currently, FT Console reports the results of the self-test procedures, via the “Controller Properties” dialogue box. On the “General” tab, the status message is displayed against the “self test results” message.

Using the Diagnostic Monitor Interface

The diagnostic monitor socket is located on the IAC behind the EMC cover plate. To access the diagnostic monitor socket, remove the cover plate and replace it after you have finished.

Using Windows Hyperterminal

If connecting to a computer, the HyperTerminal programs offer suitable interfaces that allow you to display messages and save status information from:

- self-testing procedures
- operation of the controller.

Connect a cable from the diagnostics monitor socket on front of the IAC to a COM port on the rear of a computer or terminal. Start the hyperterminal program as shown in Figure 8-3.

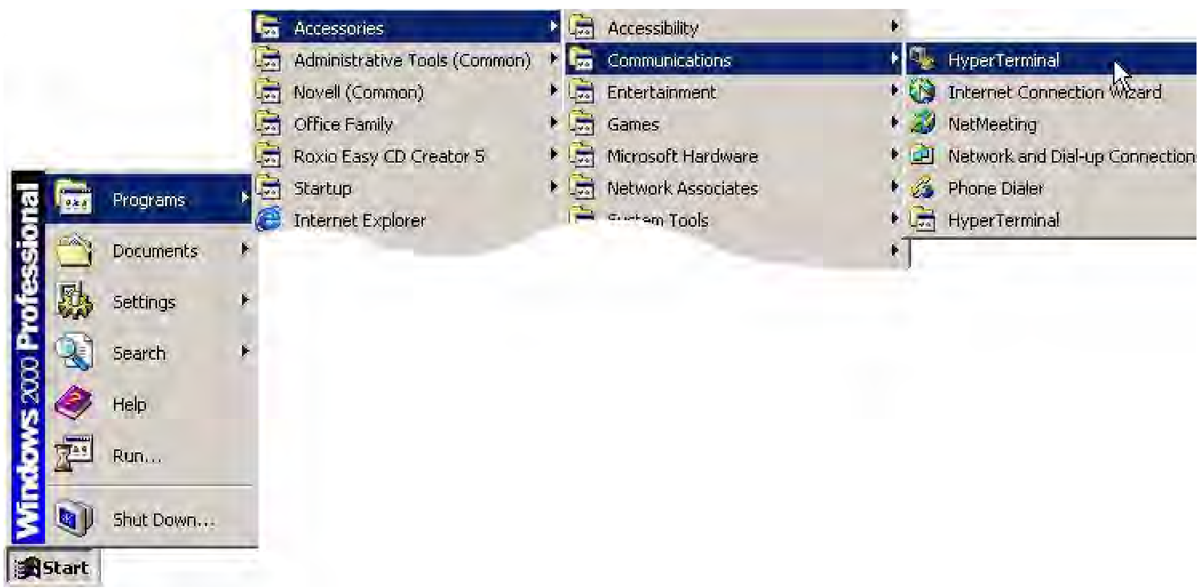


Figure 8-3. Starting the Hyperterminal Program

You must enter a connection name when prompted and define the COM port in which the cable is connected. Use the COM port settings shown in Figure 8-4, in order to display enable data.

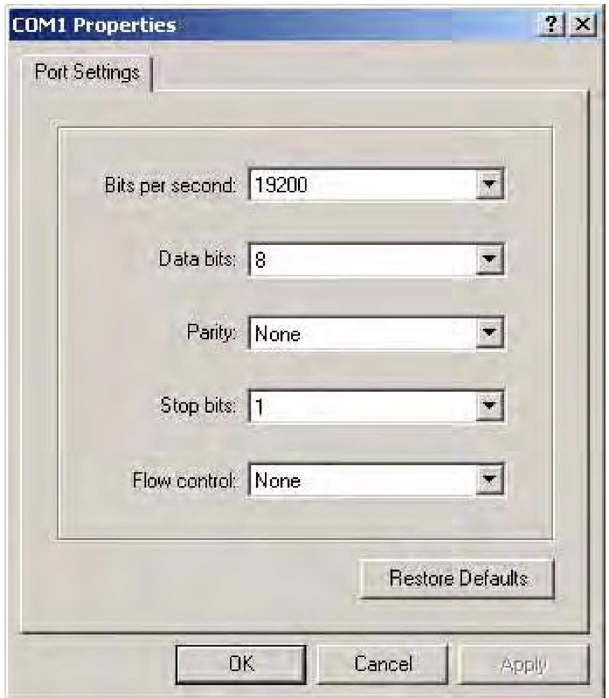


Figure 8-4. COM port settings

When the connection between the IAC and the terminal is correctly established, you can monitor the progress of the self-test procedures and also view any error messages produced. If you want to change the connection settings, go to 'File' menu and select 'Properties', see Figure 8-5.

Note: *Ensure you check the box for 'Send line ends with line feeds'.*

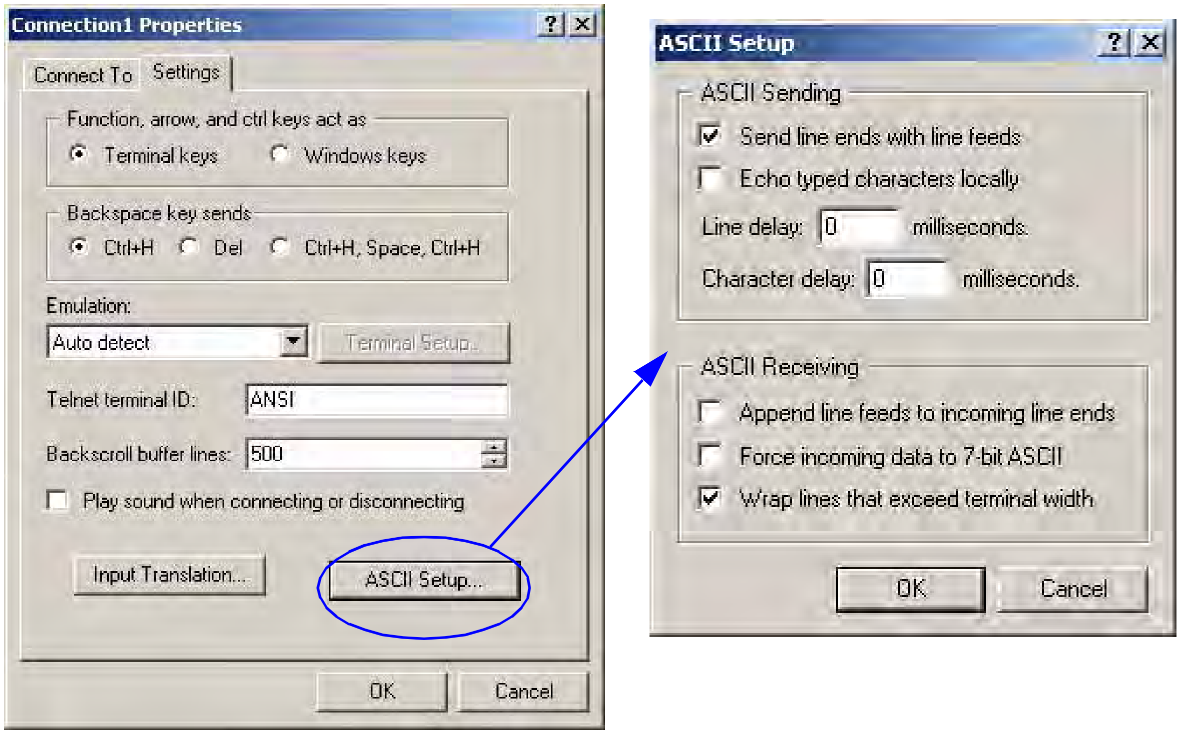


Figure 8-5. Changing the connection properties

You can output the hyperterminal log to a file or printer for off-line analysis by a service engineer, go to the ‘File’ menu and select ‘Save as’ or ‘Print’. If you experience any problems with your system, send your hyperterminal log to your local service department.

Modes of operation for the self-tests

Different "modes" of operation have been incorporated within the self-testing system. This allows the diagnosis and cure of any problems found when the FastTrack 8800 controller is going through its boot-up and self-testing routines.

"Normal" Mode

When the Integrated Axis Controller (IAC) starts the self-testing routines, it is in the "normal" mode of operation. If all the self-tests pass, this mode will then go on to load and run the main application code within the memory areas of the three processors (per IAC).

"Diagnostic" Mode

Should any of the self-tests produce a "fail" condition, the IAC will be placed in "diagnostic" mode. This mode of operation will allow limited access, via the General Purpose Interface Bus (GPIB), to diagnose and, if possible, fix the problem.

Self-test Error Codes

The following sections give information about the self-test error codes that may be generated during the self-test processes, with comments on what the error is and how to fix the problem being reported.

Table 8-2. Self Test Error Codes

Error and what it does	How to fix the error
M1.1 Boot-ROM area check	
Calculates a checksum of the ROM area of the boot-ROM and compares it with a stored value	Replace boot-ROM on IAC
M1.2 Boot-ROM RAM area check	
Performs a memory test using several test patterns on the RAM portion of the boot-ROM	Replace boot-ROM on IAc
M2.1 Xilinx Ready check	
Checks that the two Xilinx gate arrays have loaded their program code and are ready	Replace boot-ROM, if this does not solve problem, replace IAC
M2.2 Xilinx Lock Local Bus check	
Verifies that the Xilinx is able to arbitrate the local bus and lock ownership to the 68k	Replace boot-ROM, if this does not solve problem, replace IAC
M2.3 Xilinx Release Local Bus check	
Verifies that the Xilinx is able to arbitrate the local bus and release ownership from the 68k	Replace boot-ROM, if this does not solve problem, replace IAC
M3.1 Core Program Ram Check	
Verifies the Program Ram by running a series of pattern and bit-walk tests	Replace IAC
M3.2 Fast Data Ram Check	
Verifies the Program Ram by running a series of pattern and bit-walk tests	Replace IAC
M4.1 FLASH Memory Checksum test	
Calculates the check sum of the data stored in Flash memory and compares with a stored value	Download firmware again. If persistent failure check GPIB cable <4m and no expander box during upgrade. If still persistent replace IAC

Table 8-2. Self Test Error Codes

Error and what it does	How to fix the error
M5.1 Mains power normal test	
Checks the power monitor line in the mains power supply for indication of bad mains power	Check mains supply is in tolerance. Check power supply
M5.2 +15V power check	
Checks that the +15v rail is present. Does not check for overvoltage	Replace Tower/Power Supply
M5.3 -15V power check	
Checks that the -15v rail is present. Does not check for overvoltage	Replace Tower/Power Supply Disconnect all cables in case of a short.
M6.1 Realtime clock rate check	
Compares the clock rate of the time and date chip with the timer in the CPU	Replace IAC
M7.1 NV Ram check	
Ensures the correct operation of the NV RAM chip	Replace IAC
M8.1 Power Fail interrupt stuck check	
Checks that the power fail interrupt is not permanently active	Does M5.1 fail too? If yes, see M5.1. Replace Power Supply/Card Cage
M8.2 Diags button interrupt stuck check	
Checks that the diag button interrupt is not permanently active	Ensure there is no obstruction holding the button in. Replace IAC
M9.x GPIB Interface Tests	
Checks functionality of the GPIB communications hardware on the IAC. This does not check communications off-board to the PC	Replace IAC
M10.1 VME Bus test	
Checks the VME Broadcast Ram	Verify backplane is current revision, not with a pending ECR. Replace affected IACs and/or backplane
Core Self-tests C00	
Check Control DSP core functionality	Replace IAC

Table 8-2. Self Test Error Codes

Error and what it does	How to fix the error
Local Self-tests: C01	
Check Analog and timing electronics for Control DSP	Check Sync Link Cable & Boards. Replace IAC Check crystal on 8800 backplane
Note: *For the following transducer tests: xx = transducer number 00 = Position, 01 = Load, 02 = Strain1, 03 = Strain2.*	
Sxx.00 SCM Revision Check	
Checks that the SCM is a valid production revision	Replace with current hardware
Sxx.01Resistive ID check	
Checks the resistive ID circuit	Replace SCM
Sxx.02 5V Supply check	
Checks the +5v reference voltage on the SCM	Check for shorts in transducer cabling Replace SCM
Sxx.03 15V Supply check	
Checks the +15v and -15v supply voltage on the SCM	Check for shorts in transducer cabling Replace SCM
Sxx.04 Excitation Check	
Checks the output excitation voltage is within tolerance	Check for shorts in transducer cabling Check for too low load impedance Replace SCM
Sxx.05 Gain Ranges check	
Checks each gain range is working correctly	Replace SCM

Chapter 9
Routine Maintenance Procedures

Outline

The FastTrack 8800 controller is designed for minimal maintenance. However, this chapter details the air filter maintenance procedure you should carry out regularly

Maintenance Procedures

Changing the air filter

Your controller is fitted with an air filter, to stop the cooling fans from sucking dust and dirt into the controller.

At regular intervals, remove the filter from the controller and examine it. Replace the air filter if there is a noticeable build-up of dirt and dust.

If you find that each time you check the air cleaner, it has an excessive build-up of dirt, then you should reduce this cleaning interval to perhaps every four months.

Upgrading the firmware

The firmware that provides the functionality for the controller is stored on each Integrated Axis Controller (IAC) within Flash memory. Firmware upgrades are normally carried out by Instron/IST service personnel. Instructions are included in a read me file supplied on floppy disk or CD with your controller.

Functional Control Maintenance

When the controller is switched on it runs through a series of self-tests to ensure that the testing system is stable. If you make any changes to the emergency stop function you should test the emergency stop system by:

- operating and releasing each emergency stop button and
- switching the mains power off and on, to ensure the relays in the emergency stop circuit operate properly.

Appendix A
8800 Electrical Connector Pinouts

Outline

This appendix contains the pinout information for each of the major connections on the FastTrack 8800 controller.

Actuator Interface Board Connections

Two versions of the Actuator Interface Card are available, as detailed on the following page.

One version, Part No. A1721-1325, contains all the connections required to the actuator (servovalves, position transducer, load transducer, Δp etc.) contained within a single, 62-way D-type connector. This actuator interface board is the type which is normally fitted.

The second version, Part No. A1721-1345, has separate connectors for each of the signal groups (servovalves, position transducer, load transducer, Δp etc.) required by the actuator. These connections are through a variety of Hirose, BNC and D-type connectors. This version of the actuator interface board is not normally fitted, however, it has been included here as an option.

The following pages detail the pin-out information for each connector.

Note: *If a connector is common to both versions of the Actuator Interface card, (Common to Both Cards) will appear next to the connector name in the following lists. If a connector is specific to one or other Actuator interface Card, it will be clearly labeled as one version only.*

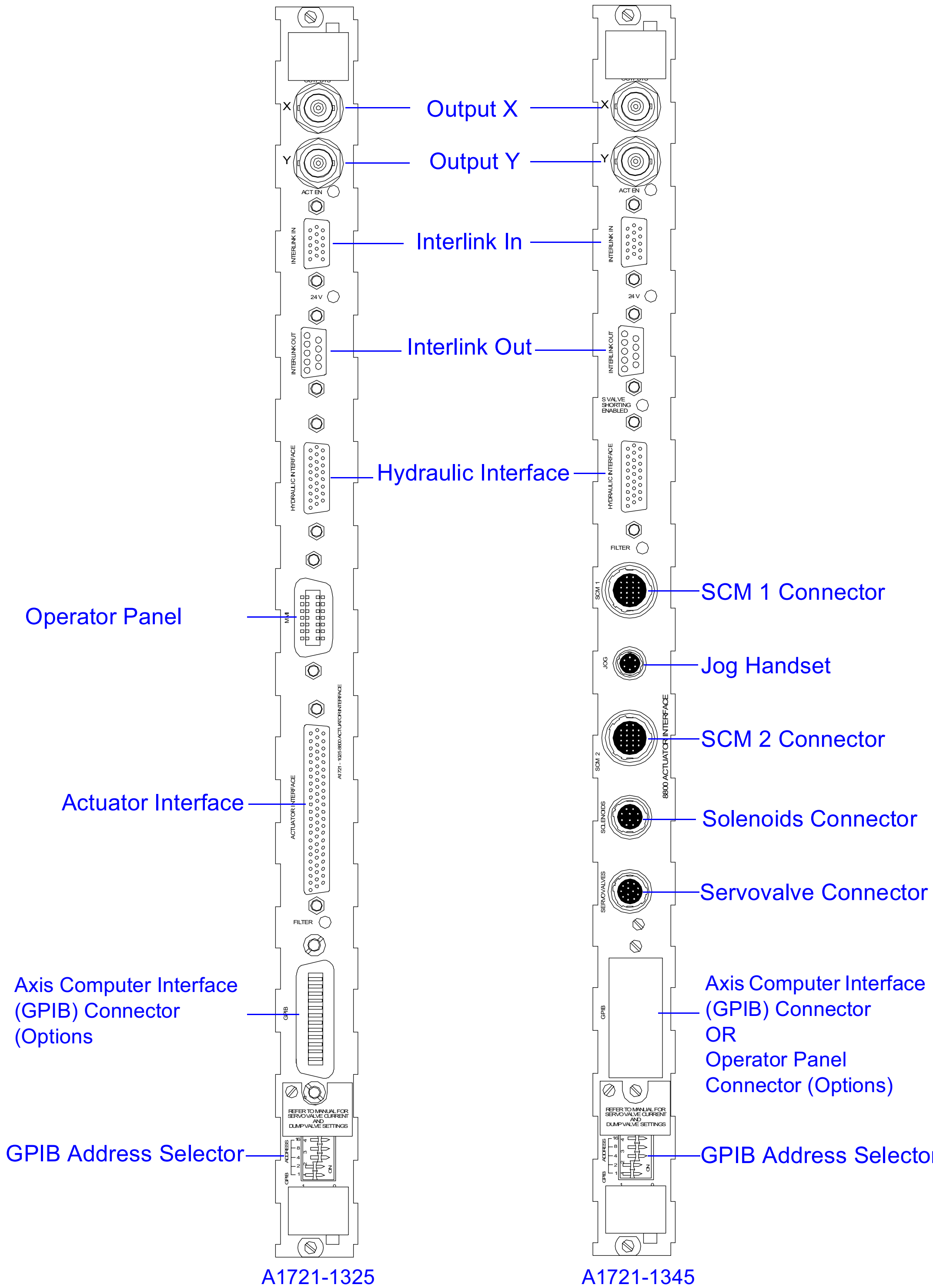


Figure A-1. Comparison of Actuator Interface Card Connectors

Interlink In Connector (Common to Both Cards)

Table A-1. Interlink In Connections

Pin	Signal	Function	Comment
1	/OFF *	Input to select Off at slave	Active LO, from master to slave(s)
2	/PILOT *	Input to select Pilot at slave	Active LO, from master to slave(s)
3	/LOW *	Input to select Low at slave	Active LO, from master to slave(s)
4	/HIGH *	Input to select High at slave	Active LO, from master to slave(s)
5	/SLAVE *	Input to select axis as slave	Active LO, from master to slave(s)
6	LP OK #	Output to confirm LP is latched at slave(s)	HI if OK (or not connected)
7	HP OK #	Output to confirm HP is latched at slave(s)	HI if OK (or not connected)
8	/DUMP #	Output to cause shutdown	Active LO, from slave(s) to master
9	CHASSIS	Chassis	
10	DGND	Ground for remote switches	Normally not used
11	+5V	+5 Volts for remote LEDs	Normally not used
12	/OFFLED #	Output for remote LED	Active LO, normally not used
13	/PPLED #	Output for remote LED	Active LO, normally not used
14	/LOLED #	Output for remote LED	Active LO, normally not used
15	/HILED #	Output for remote LED	Active LO, normally not used

Interlink Out Connector (Common to Both Cards)

Table A-2. Interlink Out Connections

Pin	Signal	Function	Comment
1	/OFF #	Output to select Off	Active LO, from master to slave(s)
2	/PILOT #	Output to select Pilot	Active LO, from master to slave(s)
3	/LOW #	Output to select Low	Active LO, from master to slave(s)
4	/HIGH #	Output to select High	Active LO, from master to slave(s)
5	/SLAVE #	Output to select axis as slave	Active LO, from master to slave(s)
6	LP OK *	Input to confirm LP is latched at slave(s)	HI if OK (or not connected)
7	HP OK *	Input to confirm HP is latched at slave(s)	HI if OK (or not connected)
8	/DUMP *	Input to cause shutdown	Active LO, from slave(s) to master
9	CHASSIS	Chassis	

Note: *1. The purpose of the interlinks In/Out connectors is to provide a mechanism for connecting axes, which are common to the same multi-axis rig, such that they all operate from a single set of hydraulic controls. The controls for the first axis (the interlink master) are operative and the associated LEDs are illuminated, whereas the controls for subsequent axes (the interlink slaves) are inoperative and the associated LEDs are not illuminated.*

2. The interlinks In/Out connectors are intended to be connected, as required, with cables T1721-1150 (300mm long) or T1721-1151 (1metre long). A cable is connected from the Out connector of the interlink master to the In connector of the first slave. A second cable may be connected from the Out connector of the first slave to the In connector of the second slave, and so on.

3. These cables connect pins 1-9 of the Out connector to pins 1-9, respectively, of the In connector. Pins 10-15 of the In connector are not normally used. The signals on pins 10-15 are provided for a remote hydraulic control switch panel or handset, connected to the In connector (with a different cable), to enable the switches and to illuminate the associated LEDs.

*4. The interlinks cables are bi-directional, in that signals pass from master to slave(s) to select functions and from slave(s) to master to confirm that the functions are latched and all is well. Input signals have a * suffix and output signals have a # suffix.*

Hydraulic Interface Connector (Common to Both Cards)

Table A-3. Hydraulic Interface Connector (26 Way D-Type Socket)

Pin	Signal	Function	Comment
1	START (LP)	+24V to select Low Pressure	Momentary signal when LP selected
2	PGND	Power ground	+24V return
3	INHIBIT1	Potential-free	Closes to INHIBIT2 on start
4	INHIBIT2	Potential-free	Closes to INHIBIT1 on start
5	STATUS COMMON	Common to status lines	This signal is connected to chassis
6	FAULT	HI= Fault	Switch to Pin 5 for no fault
7	/PRESSURE	HI=/Pressure	Switch to Pin 5 for pressure OK
8	OIL LEVEL LOW	HI= Oil level low	Switch to Pin 5 for oil level OK
9	OIL TEMP HIGH	HI= Oil temperature high	Switch to Pin 5 for oil temp OK
10	FILTER (CORPORATE)	HI= Filter blocked	Switch to Pin 5 for filter OK
11	PACK POWER	HI= Pack Mains power off	Switch to Pin 5 for pack power OK
12	MOTOR TEMP	HI= Motor hot	Switch to Pin 5 for motor temp OK
13	FILTER (NON-CORPORATE)	Filter blocked (Older style)	Switch to PGND for filter blocked
14	UNDER PRESSURE	HI= Oil pressure too low	Switch to Pin 5 for pressure OK
15	OIL LEVEL WARNING	HI= Oil level going low	Switch to Pin 5 for oil level OK
16	OVER PRESSURE	HI= Oil pressure too high	Switch to Pin 5 for pressure OK
17	CORPORATE PACK	Corporate pack connected	Connect to chassis for corporate pack
18	CHASSIS	Chassis	Connect to screen of cable
19	+24 V(PILOT)	+24V to sub-station	eg. Pilot pressure to 3-stage servovalve
20	+24 V(PILOT)	+24V to sub-station	eg. Pilot pressure to 3-stage servovalve

Table A-3. Hydraulic Interface Connector (26 Way D-Type Socket)

Pin	Signal	Function	Comment
21	LPGNDLINK	Latches low Pressure	See notes 4 and 5
22	PGND	Power ground	+24V return
23	PGND	Power ground	+24V return
24	HPGNDLINK	Latches High Pressure	See notes 4 and 5
25	HP +24V	+24V to select High Pressure	Momentary signal when HP selected
26	SUB/SHUT-OFF	Sub-station, shut-off manifold or older style power pack connected	Connect to Chassis for sub-station, shut-off manifold or older style power pack

Table A-4. Priority-encoded Hydraulic Status Signals

Signal Priority	Status	Pin Number (if applicable)
Highest	Emergency Stop	——
..	Oil temperature	Pin 9
..	Oil level too low	Pin 8
..	Motor temperature	Pin 12
..	Over pressure	Pin 16
..	Under pressure	Pin 14
..	Filter blocked	Pin 10
..	Oil level warning	Pin 15
..	Actuator at low pressure	——
Lowest	System normal	——

Note: *1. When a cable is connected to the 26-way socket, either CORPORATE PACK (pin 17) or SUB/SHUT-OFF (pin 26) must be connected to STATUS COMMON (pin 5) or CHASSIS (pin 18).*

2. If a CORPORATE PACK is connected, then all the HI status signals (pins 6-12 and 14-16) are reported. The FAULT and /PRESSURE signals are mandatory and must go LO (e.g. through a pressure switch or relay contact closure to STATUS COMMON) to latch the START (LP) and HP signals. The other HI status signals are optional. Any HI status signal which is not supported should be connected to STATUS COMMON. With the exception of FAULT and PACK POWER (which have individual status lines) the status signals are priority-encoded. See table for the weighting of the priority-encoded status signals.

3. If SUB/SHUT-OFF (pin 26) is connected to STATUS COMMON to indicate that an older (non-corporate) pack or sub-station is connected, then FILTER blocked (pin 13) is the only status signal that is reported. Note that this signal should be connected to PGND (not CHASSIS) if the filter is blocked. If this pin is left unconnected (e.g. if there is no filter pressure switch) then there is no FILTER BLOCKED status message. This is the inverse of the signal on pin10, for a newer (corporate) pack, which should be connected to STATUS COMMON if the filter is not blocked.

4. The signal +24V (PILOT), on pins 19 and 20, is a continuous 24Volt signal which is present when PILOT, LOW or HIGH has been selected. The START (LP) signal, on pin 1, is a momentary 24Volt signal which is present only when LOW is selected. An older (non-corporate) pack or sub-station should latch itself in the LOW pressure state once it has been selected. To convert this momentary START (LP) signal to a continuous 24Volt signal on pin 1 for a newer (corporate) pump, LPGNDLINK (pin 21) must be connected to PGND (pin 22 or 23). Similarly, HP +24V is a momentary 24Volt signal which is present only when HIGH is selected. An older (non-corporate) pack or sub-station should latch itself in the HIGH pressure state once it has been selected. If there is no external latch for HP +24V, HPGNDLINK (pin 24) must be connected to PGND (pin 22 or 23).

5. For a shut-off manifold, LPGNDLINK (pin 21) should be connected to a pressure switch which is downstream (actuator side) of the shut-off solenoid and which closes to PGND (pin 22 or 23) when the shut-off solenoid is energised and pressure is present. As there is no external latch for HP +24V, HPGNDLINK (pin 24) must be connected to PGND (pin 22 or 23).

6. The lines INHIBIT1 (pin 3) and INHIBIT2 (pin4) are a potential-free contact which is open in the OFF and PILOT pressure states and is closed in the LOW and HIGH pressure states.

Actuator Interface Connector (A1721-1325 Only)

Table A-5. Actuator Interface Connector (A1721-1325 only)

Pin	Signal	Function	Comment
1	LVDT EXCB+	Position transducer excitation	AC (5kHz) excitation1
2	POSITION CODE A	Position code resistor A	Normally a link to code B
3	POSITION CODE B	Position code resistor B	Normally a link to code A
4	PXID0	Position XID 0	Normally not connected, i.e. 1.
5	PXID1	Position XID 1	1 (N/C) = AC. 0 (link to GND) = DC
6	LOAD EXCB+	Load transducer excitation	AC (5kHz) excitation
7	LOAD EXCB-	Load transducer excitation	AC (5kHz) excitation
8	LOAD CODE A	Load code resistor A	Look-up table for standard cells
9	LOAD CODE B	Load code resistor B	Look-up table for standard cells
10	L XID0	Load XID 0	Normally 0 (link to GND)
11	L XID1	Load XID 1	1 (N/C) = AC. 0 (link to GND) = DC
12	+15V BACKUP	Capacitor backup (option)	For 3-stage valves at mains failure.
13	-15V BACKUP	Capacitor backup (option)	For 3-stage valves at mains failure.
14	SERVO DRIVE 1A	Current drive to 1st valve	For first 2-stage valve.
15	SERVO DRIVE 1B	Current feedback, 1st valve	For first 2-stage valve.
16	JOG ENABLE	LO = enabled	Allows jogging of actuator
17	JOG UP	Signal from jog buttons	From UP or UP FAST
18	JOG DOWN	Signal from jog buttons	From DOWN or DOWN FAST
19	JOG FAST	Signal from jog buttons	From UP FAST or DOWN FAST
20	DUMP +24V	To dump valve solenoid	For older-style actuators only
21	PGND	Power ground	+24V return
22	LVDT EXCB-	Position transducer excitation	AC (5kHz) excitation
23	POSITION HI I/P A	Position high level input	Output from displacement transducer
24	PSID CLK	Clock for Position serial ID	For position serial PROM (if fitted)

Table A-5. Actuator Interface Connector (A1721-1325 only)

Pin	Signal	Function	Comment
25	N/C	Not connected	-
26	CAL +5V	+5V for calibration relays	-
27	POSITION CAL L	Switches Position cal relay	Position cal relay normally not fitted
28	LOAD LO I/P A	Load low level input	Output from load cell
29	LOAD LO I/P B	Load low level input	Output from load cell
30	LSID CLK	Clock for load serial ID	For load serial PROM (if fitted)
31	N/C	Not connected	-
32	ACC/VEL+	Acceleration/velocity signal (or delta P)	signal for compensation
33	ACC/VEL-	Acceleration/velocity signal (or delta P)	signal for compensation
34	3-STAGE DRIVE	Voltage to 3-stage valve	If resistor is fitted across 2nd valve
35	AGND	Analogue ground	Reference for 3-stage valve drive
36	SERVO DRIVE 2A	Current drive to 2nd valve	For second 2-stage valve.
37	SERVO DRIVE 2B	Current feedback, 2nd valve	For second 2-stage valve.
38	MANIFOLD HPL	LO = manifold pressure off	Only used for old-style shunt valves
39	+24 VOLTS	+24 Volts	To shunt valve, frame filter lamp, etc
40	XHD CLAMP	LO = crosshead clamped	Switched to chassis when clamped
41	ACT. STOP	Actuator stop, LO = OK	Stops this axis if open-circuit
42	CHASSIS	Chassis	-
43	POSITION SCREEN	Position transducer screen	-
44	POSITION HI I/P B	Position high level input	Output from displacement transducer
45	PSID_DR	Position serial data output	For position serial PROM (if fitted)
46	PSID_DT/FS	Position serial data input	For position serial PROM (if fitted)
47	POSITION LO I/P A	Position low level input	Normally not used
48	POSITION LO I/P B	Position low level input	Normally not used

Table A-5. Actuator Interface Connector (A1721-1325 only)

Pin	Signal	Function	Comment
49	LOAD SCREEN	Load transducer screen	-
50	LOAD CAL L	Switches load cal relay	For shunt calibration of load cell
51	LSID_DR	Load serial data output	For load serial PROM (if fitted)
52	LSID_DT/FS	Load serial data input	For load serial PROM (if fitted)
53	LOAD HI I/P A	Load high level input	e.g. DC input to load channel
54	LOAD HI I/P B	Load high level input	e.g. DC input to load channel
55	AGND	Analogue ground	-
56	FRAME +15V	+15 Volt supply	-
57	AGND	Analogue ground	-
58	FRAME –15V	-15 Volt supply	-
59	SHUNT (PGND)	Shunt valve solenoid return	Switches to PGND for shunt valve
60	FRAME FILTER	Frame filter blocked	Switches to PGND when blocked
61	EM. STOP A	Emergency stop (+24Volts)	+24V to actuator emergency stop
62	EM. STOP B	Emergency stop (+24Volts)	+2 from Emergency stop

Jog Connector (A1721-1345 Only)

Table A-6. 6-Way Hirose Jog Handset Connector

Pin	Signal	Function	Comment
1	+5V	+5V for LEDs and logic	
2	JOG ENABLE	LO = enabled	Allows jogging of actuator
3	JOG UP	Signal from jog buttons	From UP or UP FAST
4	JOG DOWN	Signal from jog buttons	From DOWN or DOWN FAST
5	JOG FAST	Signal from jog buttons	From UP FAST or DOWN FAST
6	CHASSIS	Chassis	

Solenoids and Switches Connector (A1721-1345 Only)

Table A-7. 10-Way Hirose Solenoids and Switched Connector

Pin	Signal	Function	Comment
1	+24 VOLTS	+24 Volts	To shunt valve, frame filter lamp, etc
2	SHUNT (PGND)	Shunt valve solenoid return	Switches to PGND for shunt valve
3	DUMP +24V	To dump valve solenoid	For older-style actuators only
4	PGND	Power ground	+24V return
5	FRAME FILTER	Frame filter blocked	Switches to PGND when blocked
6	CHASSIS	Chassis	
7	XHD CLAMP	LO = crosshead clamped	Switched to chassis when clamped
8	ACT. STOP	Actuator stop, LO = OK	Stops this axis if open-circuit
9	CHASSIS	Chassis	
10	MANIFOLD HPL	LO = pressure at manifold	Only used for old-style shunt valves

Note: *1. For a machine or rig with no crosshead clamp pressure switch, XHD CLAMP (pin 7) should be linked to CHASSIS (pin 9).*

2. For a machine or rig with no actuator stop switch, ACT. STOP (pin 8) should be linked to CHASSIS (pin 9).

3. There is no emergency stop switch at each actuator (unlike the 62-way D-type connectors). EM. STOP A is linked to EM. STOP B on each actuator interface board.

Servovalves and Differential Pressure (ΔP) Connector (A1721-1345 Only)

Table A-8. 12-Way Hirose Servovalve and Differential Pressure Connector

Pin	Signal	Function	Comment
1	SERVO DRIVE 1A	Current drive to 1st valve	For first 2-stage valve.
2	SERVO DRIVE 1B	Current feedback, 1st valve	For first 2-stage valve.
3	SERVO DRIVE 2A	Current drive to 2nd valve	For second 2-stage valve.
4	SERVO DRIVE 2B	Current feedback, 2nd valve	For second 2-stage valve.
5	3-STAGE DRIVE	Voltage to 3-stage valve	If resistor is fitted across 2nd valve
6	+15V	+15 Volt supply	
7	AGND	Analogue ground	
8	-15V	-15 Volt supply	
9	ACC/VEL+	Acceleration/velocity signal	(or ΔP) signal for compensation
10	ACC/VEL-	Acceleration/velocity signal	(or ΔP) signal for compensation
11	SERVO SHORTING	HI = Servovalve shorted	New signal
12	SPARE	Unused pin	

Note: *For a machine or rig with a 3-stage valve, a suitable resistor must be connected across the current drive for the second valve, i.e. across pins 3 and 4, to convert the current drive to a voltage to the 3-stage valve.*

8800-103 Data Acquisition-only Rear Panel

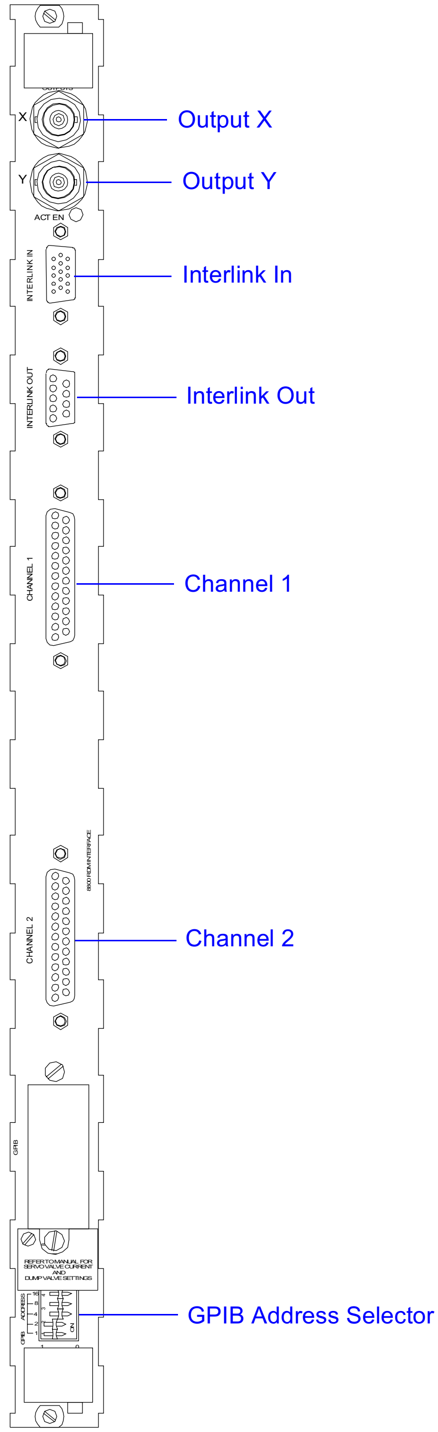


Figure A-2. Data Acquisition only (8800-103) Rear Panel Connectors

8800-103 Interlink In Connector

Table A-9. 8800-103 Interlink In Connections

Pin	Signal	Function	Comment
1	/OFF *	Input to select Off at slave	Active LO, from master to slave(s)
2	/PILOT *	Input to select Pilot at slave	Active LO, from master to slave(s)
3	/LOW *	Input to select Low at slave	Active LO, from master to slave(s)
4	/HIGH *	Input to select High at slave	Active LO, from master to slave(s)
5	/SLAVE *	Input to select axis as slave	Active LO, from master to slave(s)
6	LP OK #	Output to confirm LP is latched at slave(s)	HI if OK (or not connected)
7	HP OK #	Output to confirm HP is latched at slave(s)	HI if OK (or not connected)
8	/DUMP #	Output to cause shutdown	Active LO, from slave(s) to master
9	CHASSIS	Chassis	
10	DGND	Ground for remote switches	Normally not used
11	+5V	+5 Volts for remote LEDs	Normally not used
12	/OFFLED #	Output for remote LED	Active LO, normally not used
13	/PPLED #	Output for remote LED	Active LO, normally not used
14	/LOLED #	Output for remote LED	Active LO, normally not used
15	/HILED #	Output for remote LED	Active LO, normally not used

8800-103 Interlink Out Connector

Table A-10. 8800 Interlink Out Connections

Pin	Signal	Function	Comment
1	/OFF #	Output to select Off	Active LO, from master to slave(s)
2	/PILOT #	Output to select Pilot	Active LO, from master to slave(s)
3	/LOW #	Output to select Low	Active LO, from master to slave(s)
4	/HIGH #	Output to select High	Active LO, from master to slave(s)
5	/SLAVE #	Output to select axis as slave	Active LO, from master to slave(s)
6	LP OK *	Input to confirm LP is latched at slave(s)	HI if OK (or not connected)
7	HP OK *	Input to confirm HP is latched at slave(s)	HI if OK (or not connected)
8	/DUMP *	Input to cause shutdown	Active LO, from slave(s) to master
9	CHASSIS	Chassis	

Note: *1. The purpose of the interlinks In/Out connectors is to provide a mechanism for connecting axes, which are common to the same multi-axis rig, such that they all operate from a single set of hydraulic controls. The controls for the first axis (the interlink master) are operative and the associated LEDs are illuminated, whereas the controls for subsequent axes (the interlink slaves) are inoperative and the associated LEDs are not illuminated.*

2. The interlinks In/Out connectors are intended to be connected, as required, with cables T1721-1150 (300mm long) or T1721-1151 (1metre long). A cable is connected from the Out connector of the interlink master to the In connector of the first slave. A second cable may be connected from the Out connector of the first slave to the In connector of the second slave, and so on.

3. These cables connect pins 1-9 of the Out connector to pins 1-9, respectively, of the In connector. Pins 10-15 of the In connector are not normally used. The signals on pins 10-15 are provided for a remote hydraulic control switch panel or handset, connected to the In connector (with a different cable), to enable the switches and to illuminate the associated LEDs.

*4. The interlinks cables are bi-directional, in that signals pass from master to slave(s) to select functions and from slave(s) to master to confirm that the functions are latched and all is well. Input signals have a * suffix and output signals have a # suffix.*

8800-103 Channel 1 and 2 Connectors

Table A-11. 8800-103 Channel 1 and 2 Connectors

Pin	Signal	Function	Comment
1	EXCA+	In phase component of balanced bridge excitation signal	Paired with EXCB- AC (5kHz) excitation
2	EXCB-	Anti-phase component of balanced bridge excitation signal	Paired with EXCA+ AC (5kHz) excitation
3	SCRN	Cable Screen Connection	
4	RIDA, Sense	Connection for transducer identification resistor	Paired with RIDB, Drive
5	RIDB, Drive	Connection for transducer identification resistor	Paired with RIDA, Sense
6	SID. CLK	Clock signal for serial ID device (TTL)	Serial ID for Serial PROM (if fitted)
7	CALL	Shunt Calibration Relay control signal	Paired with +5V Switches calibration relay (if fitted)
8	SID. DT/FS	Data Transmit for serial ID device (TTL)	Serial ID for Serial PROM (if fitted)
9	SID. DT/ FS.OC	Data Transmit for serial ID device (Open Collector)	Serial ID for Serial PROM (if fitted)
10	+5V	+5V supply for Shunt Calibration Relay	Paired with CALL
11	-15V	-15V supply	
12	RTN	Analogue Ground (Reference)	
13	+15V	+15V supply	
14	OPB-	Low level, Anti-phase input from transducer	Paired with XOPA+
15	OPA+	Low level, In phase input from transducer	Paired with XOPB-
16	OPC	Link to XOPD	
17	OPD	Link to XOPC	
18	DC-	High level negative input from transducer	Paired with XDC+

Table A-11. 8800-103 Channel 1 and 2 Connectors

Pin	Signal	Function	Comment
19	DC+	High level positive input from transducer	Paired with XDC-
20	SID.DR	Data receive for serial ID device (TTL)	Serial ID for Serial PROM (if fitted)
21	CHASSIS	Chassis	
22	XID0	Transducer ID Link 0	Transducer Type. May be linked to DGND
23	XID1	Transducer ID Link 1	Transducer Type. May be linked to DGND
24	XID2	Transducer ID Link 2	Transducer Type. May be linked to DGND
25	XID3	Transducer ID Link 3	Transducer Type. May be linked to DGND

Note: *Refer to the documentation supplied for further information on connecting transducers to your controller.*

Ring Main Pack Board Connections

FastTrack 8800 Tower only

Table A-12. Ring Main Connector

Pin	Signal	Function	Comment
1	START (LP)	+24V to select Start (LP)	Momentary signal when LP selected
2	PGND	Power ground	+24V return
3	INHIBIT1	Potential-free	Closes to Inhibit2 on Start
4	INHIBIT2	Potential-free	Closes to Inhibit1 on Start
5	STATUS COMMON	Common to status lines	This signal is connected to chassis
6	FAULT	HI = Fault	Switch to Pin 5 for no fault
7	/PRESSURE	HI = /Pressure	Switch to Pin 5 for pressure OK
8	OIL LEVEL LOW	HI = Oil level low	Switch to Pin 5 for oil level OK
9	OIL TEMP HIGH	HI = Oil temperature high	Switch to Pin 5 for oil temp OK
10	FILTER (CORPORATE)	HI = Filter blocked	Switch to Pin 5 for filter OK
11	PACK POWER	HI = Pack mains power off	Switch to Pin 5 for pack power OK
12	MOTOR TEMP	HI = Motor hot	Switch to Pin 5 for motor temp OK
13	FILTER (NON-CORPORATE)	(Older-style) Filter blocked	Switch to PGND for filter blocked
14	UNDER PRESSURE	HI = Oil pressure too low	Switch to Pin 5 for pressure OK
15	OIL LEVEL WARNING	HI = Oil level going low	Switch to Pin 5 for oil level OK
16	OVER PRESSURE	HI = Oil pressure too high	Switch to Pin 5 for pressure OK
17	CORPORATE PACK	Corporate pack connected	Connect to chassis for corporate pack
18	CHASSIS	Chassis	Connect to screen of cable
19	+24V	+24V to older-style pack	

Table A-12. Ring Main Connector

Pin	Signal	Function	Comment
20	+24V	+24V to older-style pack	
21	LPGNDLINK	Latches START	See notes 2 and 3
22	PGND	Power ground	+24V return
23	PGND	Power ground	+24V return
24	N/C	Not connected	
25	SHUNT (HP)	+24V to select High Press	Momentary signal when HP selected
26	NON-CORP	Older style (non-corp) power pack connected	Connect to chasis for older style power pack

Table A-13. Priority-encoded Hydraulic Status Signals

Signal Priority	Status	Pin Number (if applicable)
Highest	Emergency Stop	——
..	Oil temperature	Pin 9
..	Oil level too low	Pin 8
..	Motor temperature	Pin 12
..	Over pressure	Pin 16
..	Under pressure	Pin 14
..	Filter blocked	Pin 10
..	Oil level warning	Pin 15
..	Actuator at low pressure	——
Lowest	System normal	——

Note: *1. When a cable is connected to the 26-way socket, either CORPORATE PACK (pin 17) or NON-CORPORATE (pin 26) must be connected to STATUS COMMON (pin 5) or CHASSIS (pin 18). If there is no cable connected, the front panel switches are inoperative and the associated LEDs are not illuminated.*

2. If a CORPORATE PACK is connected, then all the HI status signals (pins 6-12 and 14-16) are reported. The FAULT and /PRESSURE signals are mandatory and must go LO (e.g. through a pressure switch or relay contact closure to STATUS COMMON) to latch the START (LP) signal. To convert this momentary START (LP) signal to a continuous 24Volt signal on pin 1 for a newer (corporate) pump,

LPGNDLINK (pin 21) must be connected to PGND (pin 22 or 23).
Once the FAULT and /PRESSURE signals are LO, the pack should latch itself in the ON state. The LED in the pack ON switch is illuminated and the LED in the pack OFF switch is not. Note that it is necessary to keep the switch pressed until this has occurred. The other HI status signals are optional. Any HI status signal which is not supported should be connected to STATUS COMMON. With the exception of FAULT and PACK POWER (which have individual status lines) the status signals are priority-encoded. See table for the weighting of the priority-encoded status signals.

3. If NON-CORPORATE (pin 26) is connected to CHASSIS to indicate that an older (non-corporate) pack is connected, then FILTER blocked (pin 13) is the only status signal that is reported. Note that this signal should be connected to PGND (not CHASSIS) if the filter is blocked. If this pin is left unconnected (e.g. if there is no filter pressure switch) then there is no FILTER BLOCKED status message. This is the inverse of the signal on pin10, for a new (corporate) pack, which should be connected to STATUS COMMON if the filter is not blocked. For an older (non-corporate) pack, the link LPGNDLINK to PGND should not be made as the START (LP) signal should be momentary and the pack should latch itself in the ON state.

4. The signal +24V, on pins 19 and 20, is a continuous 24Volt signal which is present when pack ON is selected and remains once it is latched. The START (LP) signal, on pin 1, is a momentary 24Volt signal which is present only when pack ON is selected. For an older (non-corporate) pack, there is also a signal called SHUNT (HP) on pin 25, which is a momentary 24Volt signal which is present only when pack ON is selected. Once the pump motor has started and the starter has changed from star to delta, the SHUNT (HP) signal selects full pressure. Then the pack should latch itself in the ON state. The LED in the pack ON switch is illuminated and the LED in the pack OFF switch is not. Note that it is necessary to keep the switch pressed until this has occurred.

5. The lines INHIBIT1 (pin 3) and INHIBIT2 (pin 4) are a potential-free contact which is open in the OFF state and is closed in the ON state.

6. The FAULT, PACK POWER and encoded hydraulic status signals from the ring main pack board are connected, via the backplane, to all the actuator interface boards. At each axis, the signals are decoded, gated with the appropriate signals from that actuator interface board and then are priority encoded again. The FAULT and PACK POWER signals are active LO and are pulled HI at the actuator interface boards. Also, the encoded hydraulic status bits are all HI for system normal, so that if there is no ring main pack board fitted then there is no fault or status message via this route. Similarly, if there is a ring main pack board fitted but no cable connected then there is no fault or status message via this route. If there is a ring main pack board fitted and a cable is connected then the pack must be running before it is possible to start the hydraulics for any axis. Under these circumstances, if the ring main pack stops, for whatever reason, the hydraulics shut down for all axes.

Integrated Axis Controller (IAC) Card Connectors

Digital Input/Output Connector

Table A-14. Digital input/Output Connector

Pin	Signal	Function	Comment
1	DIGOH1	HI pin of digital output #1	Collector of photo-transistor
2	DIGOL1	LO pin of digital output #1	Emitter of photo-transistor
3	DIGOH2	HI pin of digital output #2	Collector of photo-transistor
4	DIGOL2	LO pin of digital output #2	Emitter of photo-transistor
5	DIGOH3	HI pin of digital output #3	Collector of photo-transistor
6	DIGOL3	LO pin of digital output #3	Emitter of photo-transistor
7	DIGOH4	HI pin of digital output #4	Collector of photo-transistor
8	DIGOL4	LO pin of digital output #4	Emitter of photo-transistor
9	CHASSIS	Chassis	
10	DIGIL1	LO pin of digital input #1	Cathode of photo-diode
11	DIGI5V1	Pull-up to 5V for input #1	Via 22R resistor to internal 5V supply (if required)
12	DIGIL2	LO pin of digital input #2	Cathode of photo-diode
13	DIGI5V2	Pull-up to 5V for input #2	Via 22R resistor to internal 5V supply (if required)
14	DIGIL3	LO pin of digital input #3	Cathode of photo-diode
15	DIGI5V3	Pull-up to 5V for input #3	Via 22R resistor to internal 5V supply (if required)
16	DIGIL4	LO pin of digital input #4	Cathode of photo-diode
17	DIGI5V4	Pull-up to 5V for input #4	Via 22R resistor to internal 5V supply (if required)
18	CHASSIS	Chassis	
19	DIGIH1	HI pin of digital input #1	Anode of photo-diode
20	DIGOPU1	Pull-up to 5V for Output #1	Via 2K2 resistor to internal 5V supply (if required)
21	DIGIH2	HI pin of digital input #2	Anode of photo-diode
22	DIGOPU2	Pull-up to 5V for Output #2	Via 2K2 resistor to internal 5V supply (if required)
23	DIGIH3	HI pin of digital input #3	Anode of photo-diode

Table A-14. Digital input/Output Connector

Pin	Signal	Function	Comment
24	DIGOPU3	Pull-up to 5V for Output #3	Via 2K2 resistor to internal 5V supply (if required)
25	DIGIH4	HI pin of digital input #4	Anode of photo-diode
26	DIGOPU4	Pull-up to 5V for Output #4	Via 2K2 resistor to internal 5V supply (if required)

Note: *1. Each digital input is the photo-diode of an opto-coupler. The anode and cathode (which has a series resistor of 220 Ohms to limit the current) may be connected, via some external switching element, to an external power supply. Alternatively, the internal 5Volt supply may be used (via an internal 22 Ohm resistor) and then the current must be returned to chassis.*

2. Each digital output is the photo-transistor of an opto-coupler. The collector and emitter may be connected, via some external switching element, to an external power supply. Alternatively, the internal 5Volt supply may be used with an internal 2K2 Ohm pull-up resistor and then the current must be returned to chassis.

High Integrity Emergency Stop Connections

FastTrack 8800 Tower only

Emergency Stop Loop In Connector

This is a 15-way D-type socket at the emergency stop interface panel at the rear of the 8800 tower.

Table A-15. Emergency Stop “Loop In” Connector

Pin	Signal	Function	Comment
1	+24V	+24 Volts	From First Tower only
2	+24V	+24 Volts	From First Tower only
3	+24V	+24 Volts	From First Tower only
4	N/C	Not connected	
5	K1/K4	To relays K1 and K4	Passes through to all linked towers
6	K2/K5	To relays K2 and K5	Passes through to all linked towers
7	PGND	24V Return	To PGND of first tower only
8	PGND	24V Return	24V Return
9	EM. STOP A	To front panel EM. STOP	Start of Em. Stop for this 8800 tower
10	EM. STOP D	From N/O relay contact	Relay on Em. Stop interface p.c.b.
11	RESET	To relays K3 and K6	Passes through to all linked towers
12	N/C	Not Connected	
13	N/C	Not Connected	
14	N/C	Not Connected	
15	RETURN	24V return	Passes through to all linked towers

Emergency Stop Loop Out Connector

This is a 15-way D-type plug at the emergency stop interface panel at the rear of the 8800 tower.

Table A-16. Emergency Stop "Loop Out" Connector

Pin	Signal	Function	Comment
1	N/C	Not connected	
2	N/C	Not connected	
3	N/C	Not connected	
4	N/C	Not connected	
5	K1/K4	To relays K1 and K4	Passes through to all linked towers
6	K2/K5	To relays K2 and K5	Passes through to all linked towers
7	N/C	Not connected	
8	N/C	Not connected	
9	SYNC. STOP	From System Sync.(if fitted)	End of Em. Stop for this 8800 tower
10	EM. STOP E	From N/O relay contact	Relay on Em. Stop interface p.c.b.
11	RESET	To relays K3 and K6	Passes through to all linked towers
12	N/C	Not connected	
13	EM. STOP E	From N/O relay contact	Relay on Em. Stop interface p.c.b.
14	SYNC. STOP	From System Sync.(if fitted)	End of Em. Stop for this 8800 tower
15	RETURN	24V return	Passes through to all linked towers

Emergency Stop Power Out Connector

This is a 5-way connector with mating terminal strip at the emergency stop main board panel at the front of the 8800 tower.

Table A-17. Emergency Stop 'Power Out' Connector

Pin	Signal	Function	Comment
1	+24V	+24 Volts	General purpose 24Volts.
2	PGND	24V return	Return of general purpose 24Volts
3	COMP.CTRL	Enables computer control of hydraulics	Normally not used
4	STOPLINE 1	Connected to STOPLINE 2 if Em. Stop is not broken	Potential-free contact
5	STOPLINE 2	Connected to STOPLINE 1 if Em. Stop is not broken	Potential-free contact

Remote Emergency Stop Connector

This is a 3-way connector with mating terminal strip at the emergency stop main board panel at the front of the 8800 tower.

Table A-18. Remote Emergency Stop Button Connector

Pin	Signal	Function	Comment
1	EM. STOP B	To remote emergency stop	Link if not used
2	EM. STOP C	From remote emergency stop	Link if not used
3	N/C	Not connected	

Note: *1. The first 8800 tower must have a terminating plug A1721-1092 fitted to the Loop In socket. This connects +24Volts from the first tower via links between pins 1-9, 2-10 and 3-11. It also provides the return path to PGND (24V return) of the first 8800 tower via a link between pins 7-15.*

2. The Loop Out plug of the first 8800 tower is connected with cable A1721-1094 to the Loop In plug of the second 8800 tower. The Loop Out plug of the second 8800 tower is connected with cable A1721-1094 to the Loop In plug of the third 8800 tower, and so on. These cables connect pins 1-15 of the Out connector to pins 1-15, respectively, of the In connector.

3. The last 8800 tower must have a terminating plug A1721-1093 fitted to the Loop Out socket. This loops back the two stop lines to the relays in all the towers via links between pins 5-13 and 6-14.

4. The general purpose 24Volt supply (pin 1 of the power out connector) has a reset fuse, rated at 8Amps, on the emergency stop board. This supply, if used, must be returned to the correct PGND, i.e. pin 2 of the power out connector.

3 Stage Valve Driver Board Connections

Table A-19. Valve Drive In (12-way Servo valve connector)

Pin Number	Signal	Function	Comment
1	SV DRIVE 1A	Drive (+) to 3-stage valve	For first (3-stage) valve.
2	SV DRIVE 1B	Drive (-) to 3-stage valve	For first (3-stage) valve.
3	SV DRIVE 2A	Current drive to 2nd valve	For second (2-stage) valve.
4	SV DRIVE 2B	Current feedback, 2nd valve	For second (2-stage) valve.
5	N/C	No connection	
6	+15V	+15 Volt supply	
7	AGND	Analogue ground	
8	-15V	-15 Volt supply	
9	ACC/VEL+	Acceleration/velocity signal	(or ΔP) signal for compensation
10	ACC/VEL-	Acceleration/velocity signal	(or ΔP) signal for compensation
11	SPOOL CENTERING	Changes state when actuator is switched OFF or ON	HI = Servovalve shorted (actuator OFF)
12	SPARE	Unused pin	

Note: *The current drive to/from the first valve becomes the voltage drive to the 3-stage valve driver circuit.*

The servovalve shorting signal from the actuator interface board is used to switch from the drive voltage to analogue ground when the actuator goes from active to off. This becomes the drive to the pilot stage. If the 3-stage valve spool output is not zero, then this drives the spool back to the centre (zero) position.

All other signals pass through from the Valve Drive In (12-way plug) connector to the Pilot valve (12-way socket) connector.

Table A-20. Pilot Valve (12-way Servo valve connector)

Pin Number	Signal	Function	Comment
1	3-STAGE SV DRIVE A	Drive (+) to pilot valve	Current drive to pilot valve.
2	3-STAGE SV DRIVE B	Drive (-) to pilot valve	Connected to analogue ground
3	SV DRIVE 2A	Current drive to 2^{nd} valve	For second (2-stage) valve.
4	SV DRIVE 2B	Current feedback, 2^{nd} valve	For second (2-stage) valve.
5	N/C	No connection	
6	+15V	+15 Volt supply	
7	AGND	Analogue ground	
8	-15V	-15 Volt supply	
9	ACC/VEL+	Acceleration/velocity signal	(or ΔP) signal for compensation
10	ACC/VEL-	Acceleration/velocity signal	(or ΔP) signal for compensation
11	N/C	No connection	
12	SPARE	Unused pin	

Table A-21. Spool LVDT (20-way Transducer Connector)

Pin Number	Signal	Function	Comment
1	N/C	No connection	
2	N/C	No connection	
3	LVDT EXCB-	Spool LVDT excitation (-)	Excitation to spool LVDT
4	N/C	No connection	
5	N/C	No connection	
6	N/C	No connection	
7	N/C	No connection	
8	LVDT EXCB+	Spool LVDT excitation (+)	Excitation to spool LVDT
9	N/C	No connection	
10	POSN SCN	Screen	Transducer screen
11	N/C	No connection	
12	N/C	No connection	
13	N/C	No connection	
14	N/C	No connection	
15	POSN HI I/P B	Spool LVDT output B	Output from spool LVDT
16	POSN HI I/P A	Spool LVDT output A	Output from spool LVDT
17	N/C	No connection	
18	N/C	No connection	
19	N/C	No connection	
20	N/C	No connection	

Note: This connector is the same as the other Hirose connectors for transducers

The spool LVDT output signals are connected to the high-level inputs.

Electric Actuator Connections

This section provides information on connections that are unique to the electric actuator. Refer to other sections in Appendix A for other connections.

Table A-22. 23-Way Metalok Socket for Frame Gearbox

Pin	Signal	Function	Comment
A	CHASSIS	Chassis	
B	CHASSIS	Chassis	
C	POS CODE A	Position code resistor A	Fitted with link to ensure frame cable is fitted for actuator to be enabled
D	POS CODE B	Position code resistor B	
E	LVDT EXCB +	LVDT excitation (+)	
F	(A) LVDT OUTPUT LO	LVDT output A	Pins linked
G	(B) LVDT OUTPUT HI	LVDT output B	
H	LVDT EXCB -	LVDT excitation (-)	
J	POS HI I/P B	Position input B	
K	POS LO I/P A	Position input B	
L	0V TRANSISTOR	Connection to ground	
M	0V LED	Connection to ground	
N	TRAVEL LIMIT	Extreme + & - travel limit	
P	LIMIT LED	Limit indicator	
R	UPPER LIM NC	Normally closed	Not used
S	LOWER LIM W	Lower working limit	Not used
T	LIM UP W/LOW NC	Normally closed	Not used
U	LOWER LIMIT NO	Lower limit normally open	
V	UPPER LIMIT NO	Upper limit normally open	
W	TACHO +		
X	TACHO -		
Y	CHASSIS	Chassis	
Z	N/C	Not connected	Not used

Table A-23. 12-Way Metalok Socket for Drive Motor

Pin	Signal	Function	Comment
A	Motor -ve	Motor Drive -ve	Each signal is paralleled x 4
B	Motor -ve	Motor Drive -ve	
C	Motor -ve	Motor Drive -ve	
D	Motor +ve	Motor Drive +ve	
E	Motor +ve	Motor Drive +ve	
F	Motor +ve	Motor Drive +ve	
G	Earth	Earth	
H	Earth	Earth	
J	Earth	Earth	
K	Motor -ve	Motor Drive -ve	
L	Motor +ve	Motor Drive +ve	
M	Earth	Earth	

Appendix B
Reference Drawings

Outline

This appendix contains circuit diagrams for modules used with the FastTrack 8800 controller.

Cable Circuits

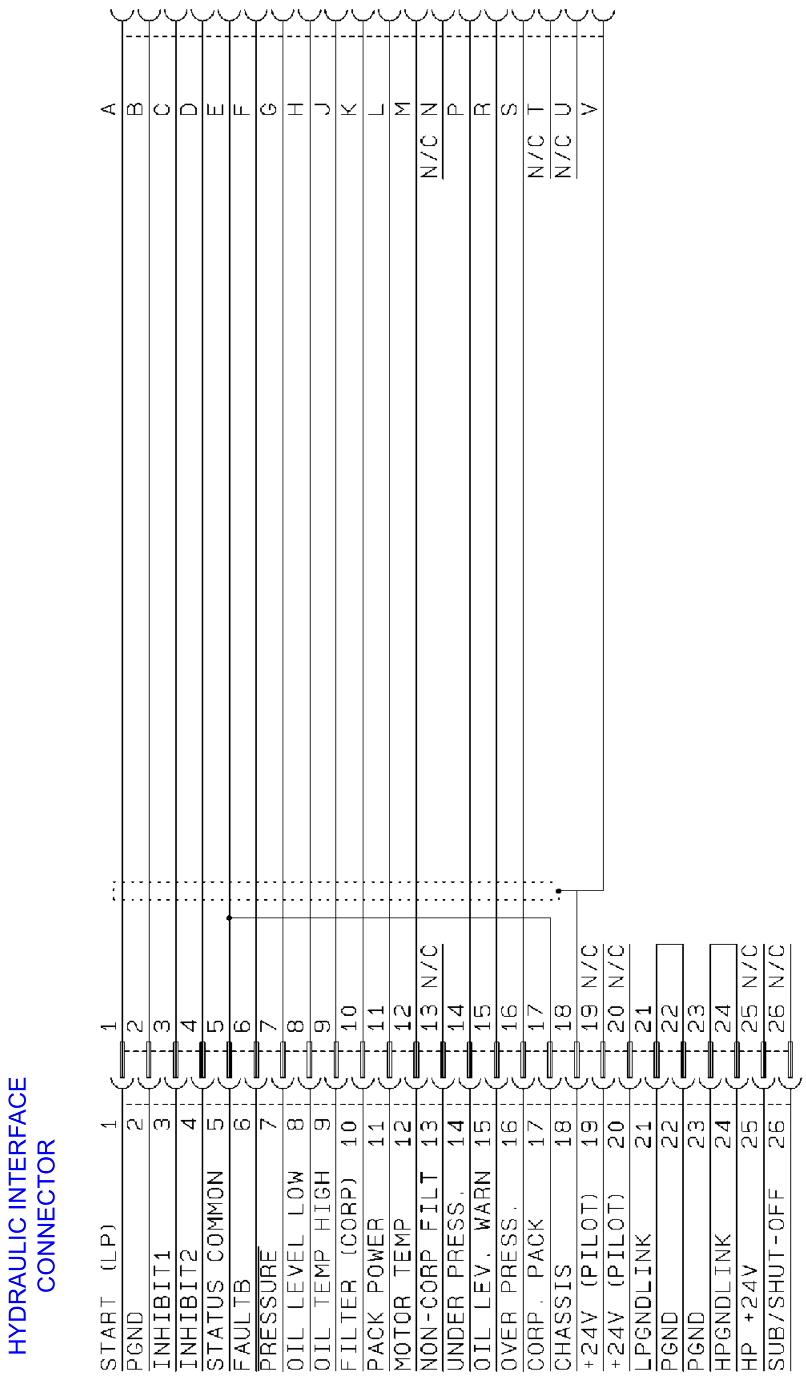


Figure B-1. Cable from hydraulic interface to 19-way metalok socket

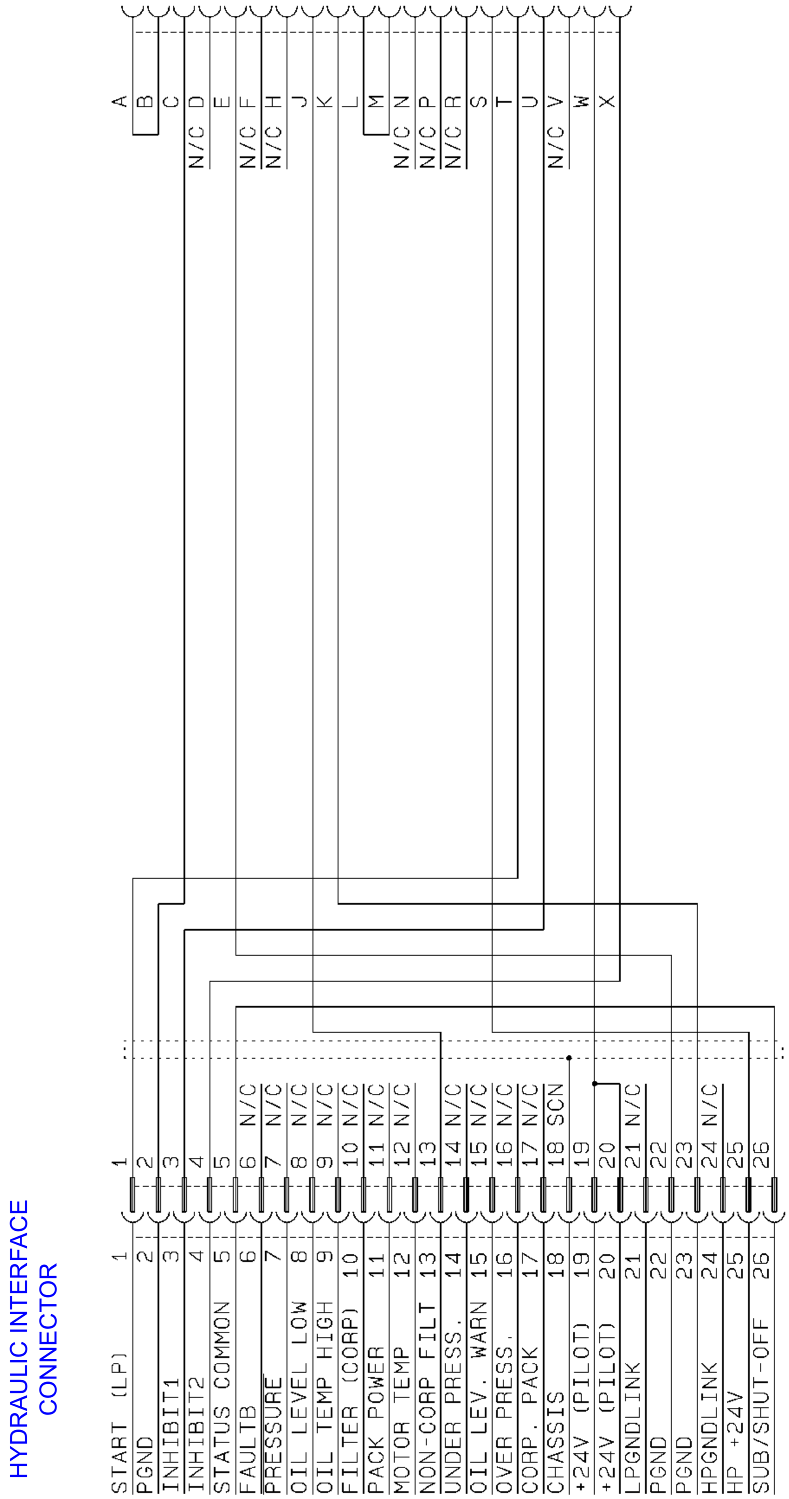


Figure B-2. Cable from hydraulic interface to 20-way varelco socket

Reference Drawings

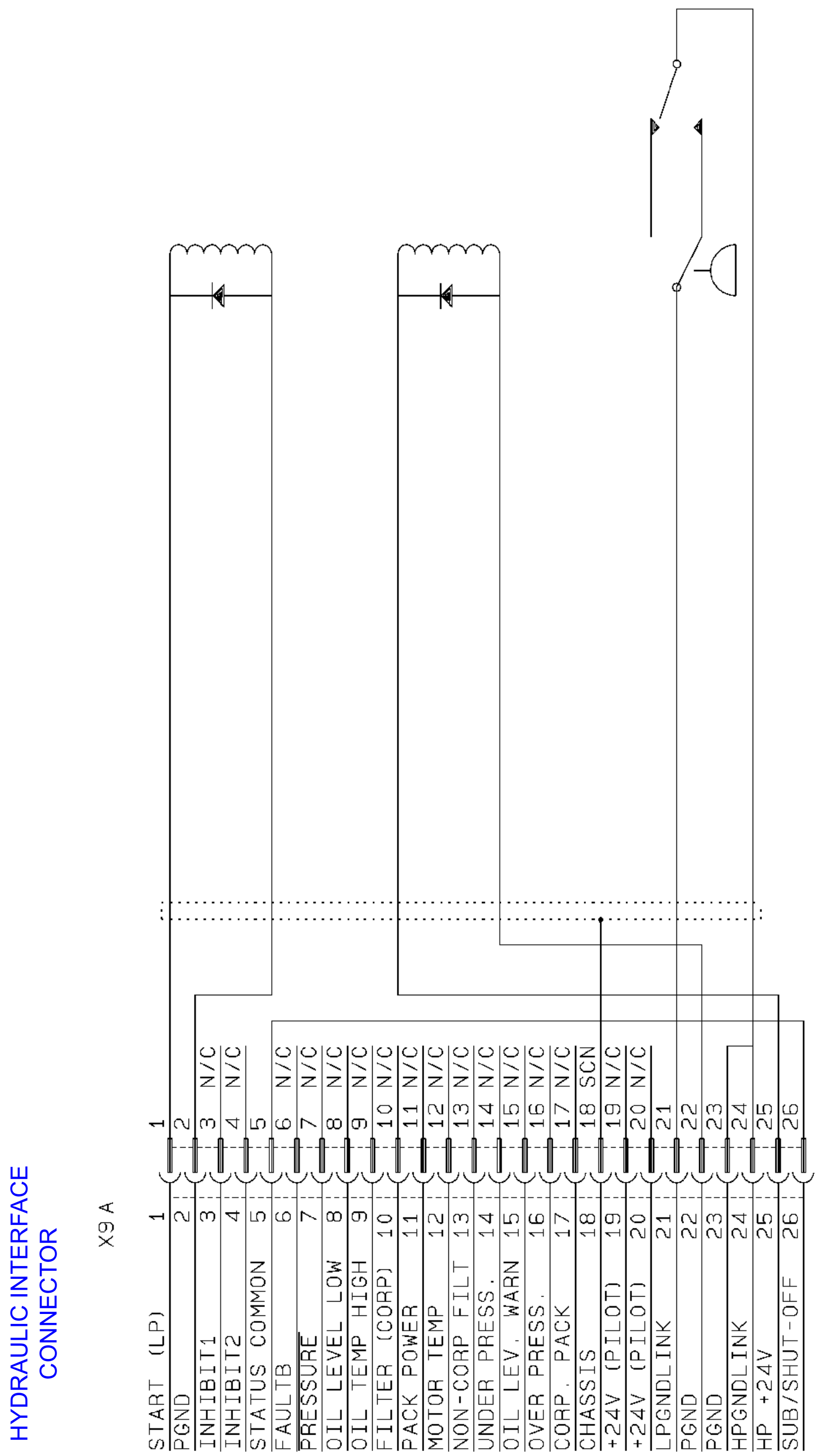


Figure B-3. Cable from hydraulic interface to shutoff manifold & shunt valve

Mains Wiring diagram

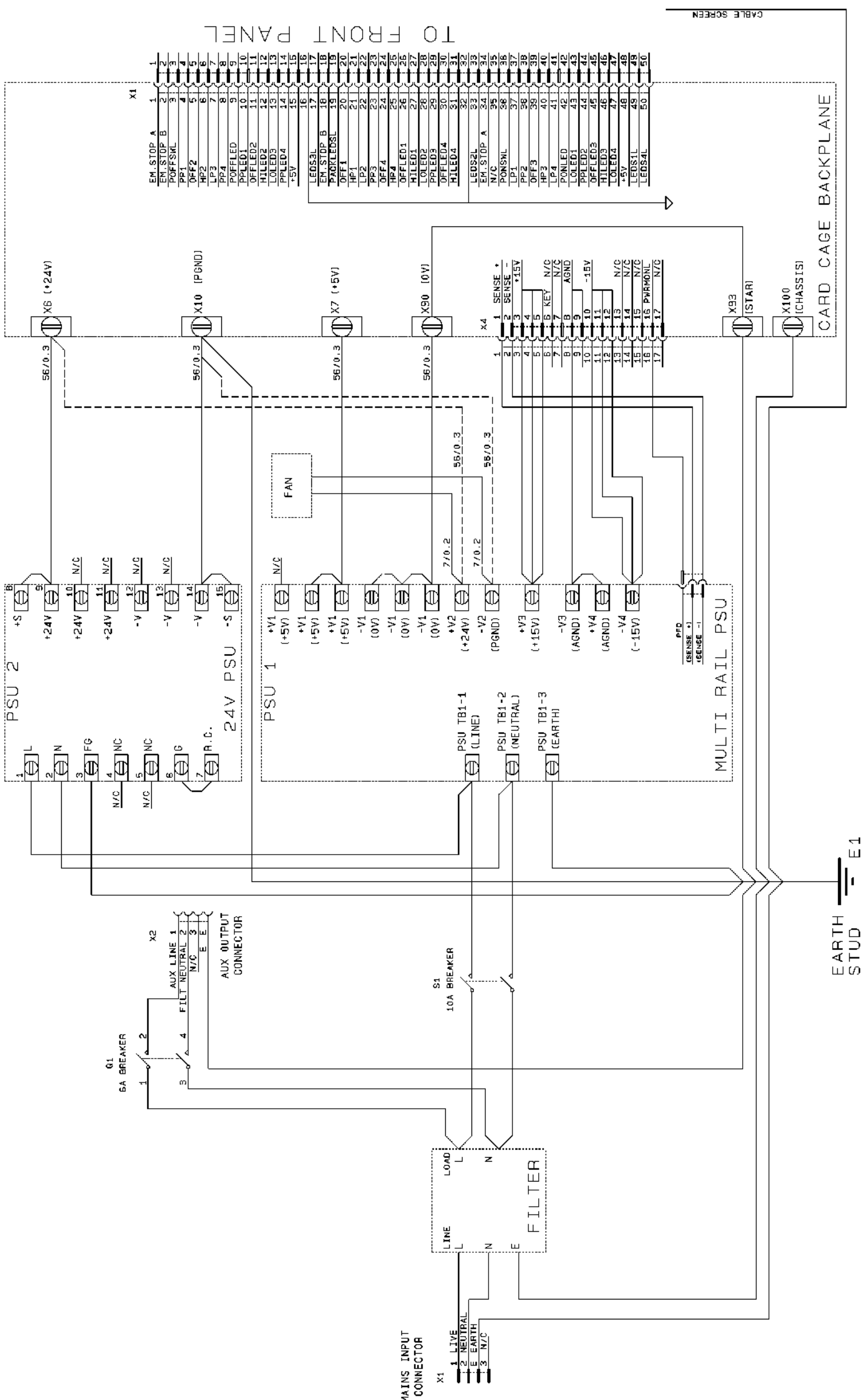


Figure B-4. Mains Wiring Diagram of 8800 Tower

Connector Pinouts

D-Type

Figure B-5 shows the location for pin 1 on a 1½ density D-Type connector viewed from the wiring side.

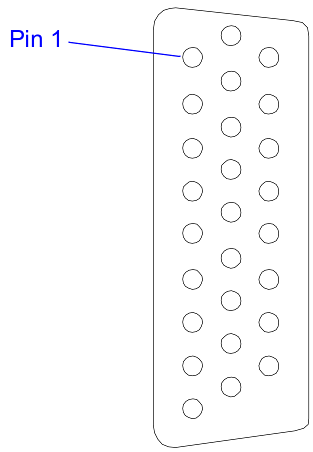


Figure B-5. D-Type connector pin 1

Hirose

Figure B-6 shows the pinouts for a number of Hirose connectors. For further information on assembly instructions, tightening torques and end termination, refer to the drawing supplied with the connector kit.

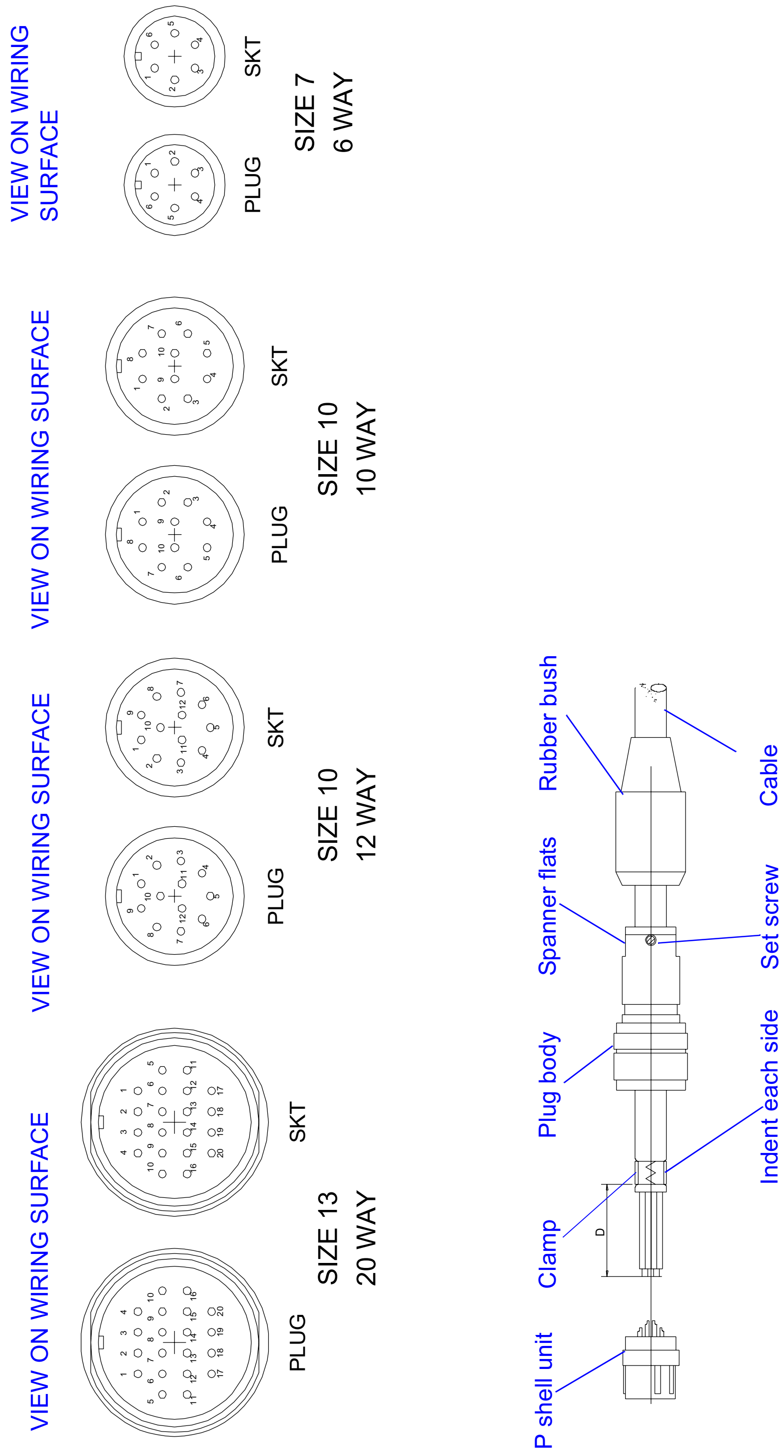


Figure B-6. Hirose pinouts

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