

Precision Modular Servo - Installation and Commissioning

33-008-0C

# Feedback



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# Control in a MATLAB® Environment

## Precision Modular Servo

### Installation and Commissioning



#### **Feedback**

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**Manual: 33-008-0C** Ed03 02 2002

*Printed in England by FI Ltd, Crowborough*

Feedback Part No. 1160-330080C

## Notes



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## **THE HEALTH AND SAFETY AT WORK ACT 1974**

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We are required under the Health and Safety at Work Act 1974, to make available to users of this equipment certain information regarding its safe use.

The equipment, when used in normal or prescribed applications within the parameters set for its mechanical and electrical performance, should not cause any danger or hazard to health or safety if normal engineering practices are observed and they are used in accordance with the instructions supplied.

If, in specific cases, circumstances exist in which a potential hazard may be brought about by careless or improper use, these will be pointed out and the necessary precautions emphasised.

While we provide the fullest possible user information relating to the proper use of this equipment, if there is any doubt whatsoever about any aspect, the user should contact the Product Safety Officer at Feedback Instruments Limited, Crowborough.

This equipment should not be used by inexperienced users unless they are under supervision.

We are required by European Directives to indicate on our equipment panels certain areas and warnings that require attention by the user. These have been indicated in the specified way by yellow labels with black printing, the meaning of any labels that may be fixed to the instrument are shown below:



CAUTION -  
RISK OF  
DANGER

Refer to accompanying documents



CAUTION -  
RISK OF  
ELECTRIC SHOCK



CAUTION -  
ELECTROSTATIC  
SENSITIVE DEVICE

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### **PRODUCT IMPROVEMENTS**

We maintain a policy of continuous product improvement by incorporating the latest developments and components into our equipment, even up to the time of dispatch.

All major changes are incorporated into up-dated editions of our manuals and this manual was believed to be correct at the time of printing. However, some product changes which do not affect the instructional capability of the equipment, may not be included until it is necessary to incorporate other significant changes.

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### **COMPONENT REPLACEMENT**

Where components are of a 'Safety Critical' nature, i.e. all components involved with the supply or carrying of voltages at supply potential or higher, these must be replaced with components of equal international safety approval in order to maintain full equipment safety.

In order to maintain compliance with international directives, all replacement components should be identical to those originally supplied. Any component may be ordered direct from Feedback or its agents by quoting the following information:

- |                        |                            |
|------------------------|----------------------------|
| 1. Equipment type      | 2. Component value         |
| 3. Component reference | 4. Equipment serial number |

Components can often be replaced by alternatives available locally, however we cannot therefore guarantee continued performance either to published specification or compliance with international standards.



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## **CE DECLARATION CONCERNING ELECTROMAGNETIC COMPATIBILITY**

Should this equipment be used outside the classroom, laboratory study area or similar such place for which it is designed and sold then Feedback Instruments Ltd hereby states that conformity with the protection requirements of the European Community Electromagnetic Compatibility Directive (89/336/EEC) may be invalidated and could lead to prosecution.

This equipment, when operated in accordance with the supplied documentation, does not cause electromagnetic disturbance outside its immediate electromagnetic environment.

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**Precision Modular Servo  
Installation and Commissioning**

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## 1. Introduction

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This manual contains a description of the components of the Precision Modular Servo System, and assembly and test procedures. It is intended to provide the means for validating the correct operation of the system, **before** proceeding to the more advanced functions and demonstrations using control software and MATLAB / SIMULINK.

The procedures described in this Section of the manual will ensure the correct:

- Layout and wiring interconnections for computer control
- Cable connections between the PC and the Modular Servo

Note that very comprehensive documentation is shipped with this equipment, for the use of the Modular Servo on a stand alone basis without the PC and MATLAB software.

In particular we recommend that you carefully read the manual 150-1 EdG, supplied with your system, and work through the initial assignments, before undertaking the MATLAB based assignments.

This manual and the assignments provide a comprehensive introduction to the Modular Servo and will enable you to become fully familiar with the operation of all its components and modes of operation.

### Required Equipment

- 1 Software and PC system as described in the manual 33-000-0C - Introduction and Computer Systems Installation
- 2 **Set of three "Control in a MATLAB Environment" Manuals:**
  - 33-000-0C Introduction and Software Installation
  - 33-006-0C Precision Modular Servo - Installation and Commissioning
  - 33-006-1C Precision Modular Servo - Control Experiments
- 3 Feedback Manual 150-1 EdG





## **Feedback Supplied Items**

The following items are supplied by Feedback and comprise the operating hardware of the Precision Modular Servo.

A brief functional description of the Modular servo subsystems follows

### **DCM150F DC Motor**

This unit is the precision motor used as the primary control power source.

### **LU150L Magnetic Brake Load**

An eddy current brake to apply a torque load to the dc motor.

### **GT150X Gearbox/Tachometer**

The tachometer is used to measure motor *speed*. It provides an output voltage proportional to the speed. The gearbox is used to provide a different ratio of turns to the output potentiometer.

### **33-300 Digital Encoder**

Used to provide an accurate measurement of angle corresponding to the *position* of the motor. By measuring the angular rate of change it is possible to calculate the rotational speed. The data is encoded and sent as a digital signal to the I/O board.

### **PS150E Power Supply**

Power supply for the whole system. It provides + or - 15V and a 0V ground.

### **SA150D Servo Amplifier**

The amplifier which provides the controlled power to the dc motor.

### **PA150C Pre-Amplifier**

A pre-amplifier which provides the correct signal range to the servo amplifier.



**33-301                    Interface unit**

Used to set the analogue input and output to the I/O board in the PC to the correct operating range.

**AU150B                Attenuator**

Used to set the input to the motor control circuit to the correct operating level.

**IP150H                Input Potentiometer**

Used to establish a set point for manual *position* control. It provides an analogue voltage proportional to the angular position.

**OP150K                Output Potentiometer**

Used as a visual display of *position*. It provides an analogue voltage proportional to the angular position.

**MS150Z                Accessories plus Magnetic Baseplate**



## 2. Layout

If you have not already done so, unpack the Modular Servo units and lay them out on the magnetic base plate as shown in Figure 2-1.

This diagram is approximately to scale and will ensure that there is sufficient space to lay out and interconnect the system.

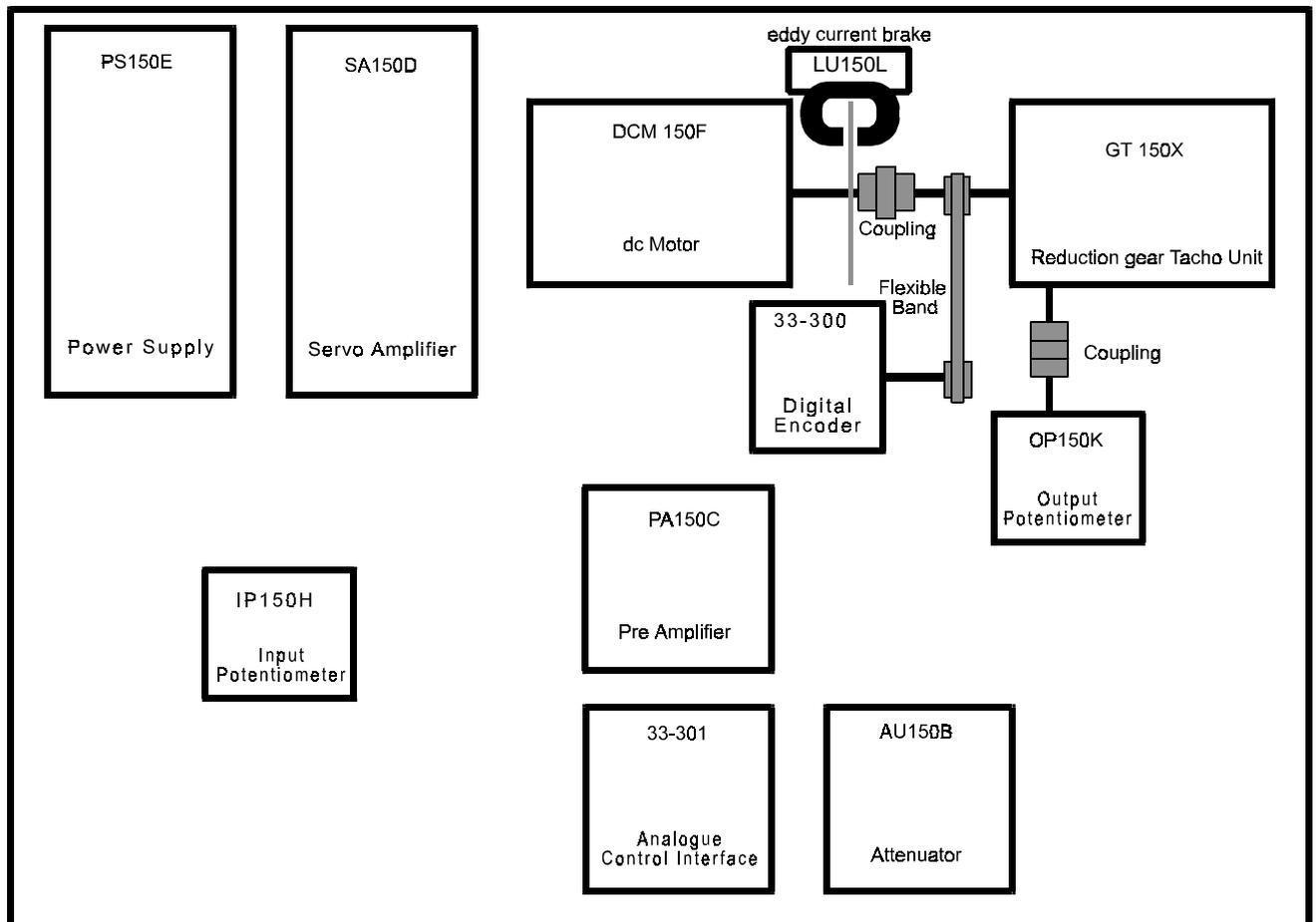


Figure 2-1



**Precision Modular Servo  
Installation and Commissioning**

**CHAPTER 2**

**Layout**

Notes



### 3. Computer Connections

#### PCL 812PG EISA

Following the installation of the software and the interface card into your PC, you are now ready to connect the cables from the PC to the 33-220 Twin Rotor MIMO System.

Connect the wide ribbon cable from the PC to the Modular Servo Digital Encoder unit (33-300). Connect the narrow ribbon cable from the PCL-812 connector CN2 (*nearest* to the motherboard) to the 33-301 Analogue Control Interface unit. See Figure 3-1 and Figure 3-2 for details.

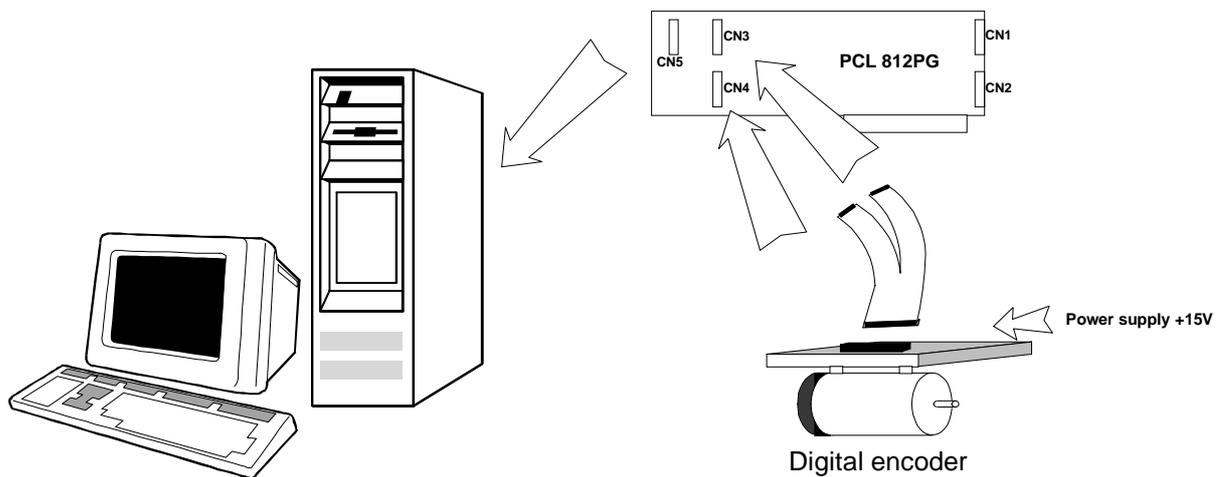


Figure 3-1: Connecting the digital encoder

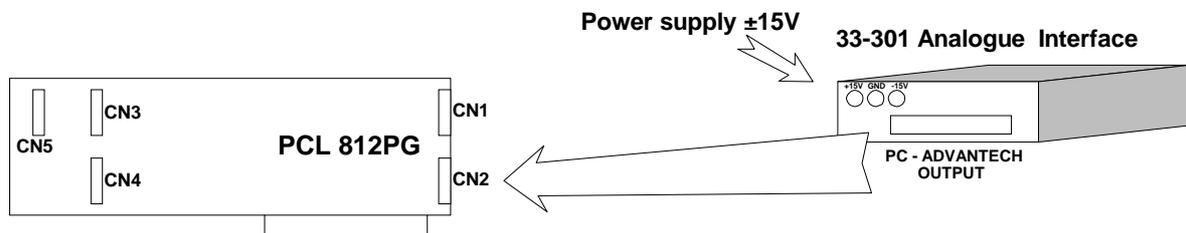


Figure 3-2: Data acquisition board and the 33-301 Analogue Control Interface connection



**PCI1711 PCI**

See Figure 3-3 - Cabling for PCI Bus

You should have two ribbon cables - one narrow and one wide.

Connect the PCI1711 board to the SCSI Adapter Box using the standard 68 way SCSI cable supplied.

Connect the wide socket on the 33-300 Modular Servo Digital Encoder to the wide socket PL1 on the SCSI Adapter Box with the wide ribbon cable.

Connect the connector on the 33-301 Analogue Interface Box to connector PL3 on the SCSI Adapter Box, using the narrow cable.

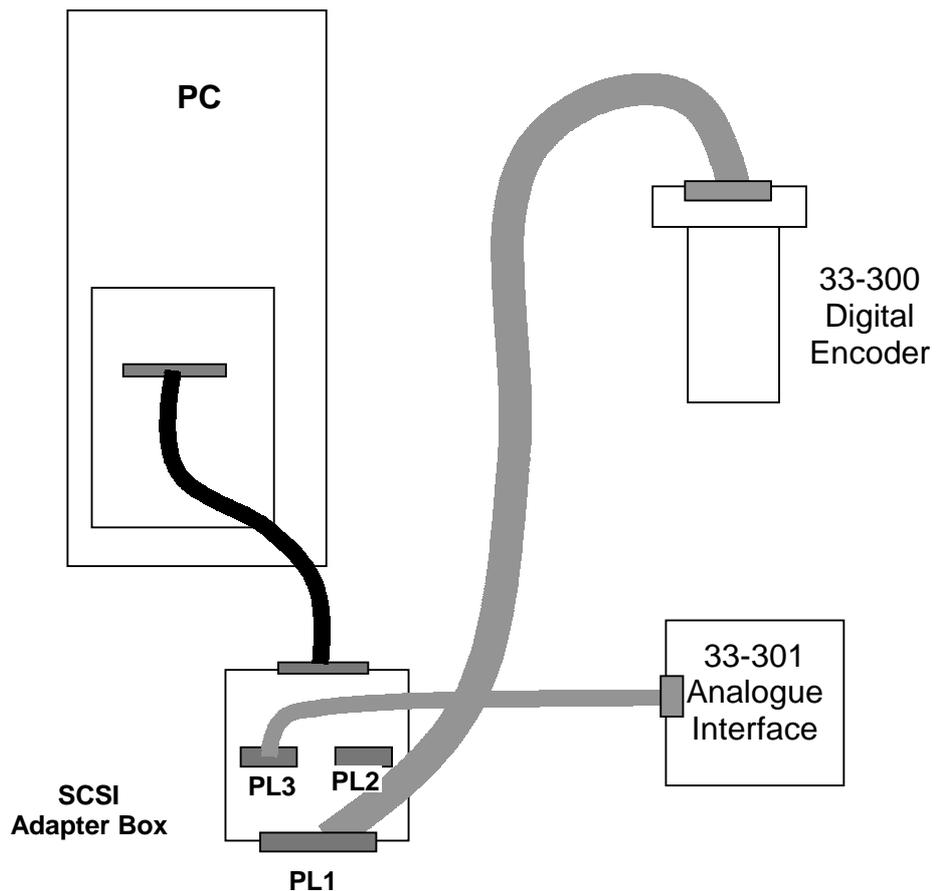


Figure 3-3: Cabling for PCI bus



## 4. System Patching

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Connect **AD1** input to point **3** on the Output Potentiometer, OP150K

Connect **AD2** input to point **2** on the Gearbox Tachogenerator, GT150X

Connect **DA2** output to point **1** on the Attenuator Unit AU150B

Connect **AD3** input to point **3** on the Input Potentiometer IP150H

Connect up all the modules as shown in Figure 4-1.

Set the switch in the middle of the PA150C to the centre (normal) position.

Set the scales on the IP150H Input Potentiometer and the OP150K Output Potentiometer to zero divisions

Set the potentiometer on the AU150B attenuator to 8 divisions

Switch on all units,

Adjust the Set Zero potentiometer on the PA150C pre-amplifier until the motor stops rotating

Your system is now ready to work with the Feedback Software for MATLAB.

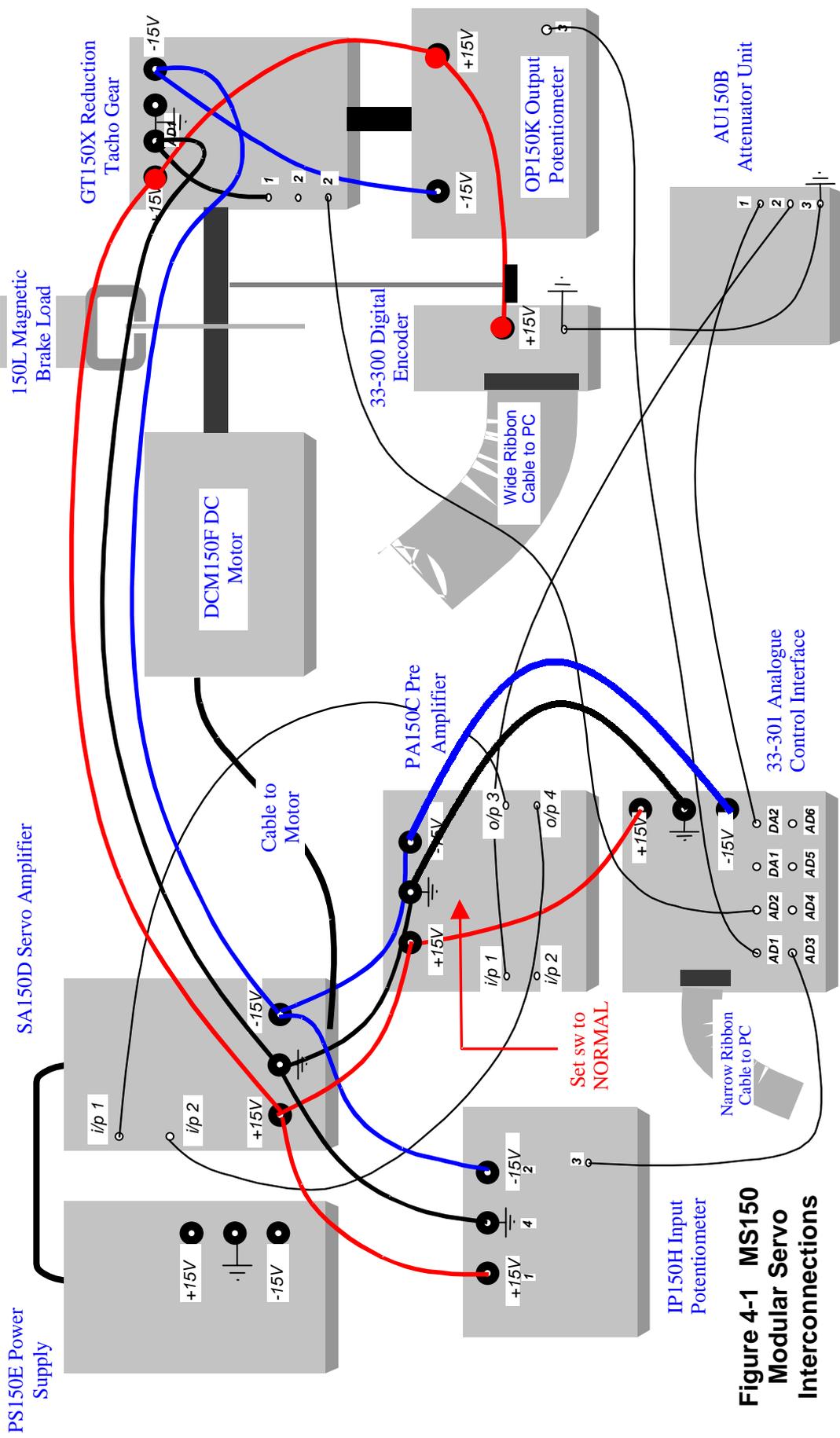


Notes



# Precision Modular Servo Installation and Commissioning

# Chapter 4 System Patching



**Figure 4-1 MS150  
Modular Servo  
Interconnections**