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<ul> <li>Avoid all plastic, vinyl, and Styrofoam (except antistatic versions) around printed circuit boards.</li> <li>Do not touch the components or conductors on a printed circuit board with your hands or with conductive devices.</li> </ul>

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# Chapter 1 General Information

### Introduction

This manual describes the 723 Digital Control for the 723 Position Control System. This control system consists of one 723 control, model number 8262-092 for 20-160mA actuator output or model number 8262-094 for 4-20mA actuator output, and two relays.

### Application

The 723 Position Control is used to supply the actuator output signal instead of the Woodward 505 Digital Turbine Control in case of 505 Control failure. The 723 Position Control monitors the actuator output signal from the 505 and controls two relays to switch the actuator signal source from the 505 Control to the 723 Position Control.

The functions of the 723 Position Control are as follows:

- The 723 control outputs the actuator signal instead of the 505 when it senses a signal failure from the 505.
- The actuator output signal is raised or lowered manually after the actuator signal source is switched from the 505 to the 723 Position Control.
- The actuator signal source is switched from the 723 Position Control to the 505 when the 505 function is restored.
- The 723 Position Control protects the turbine system from overspeeds.

### 723 Digital Speed Control Accessories

#### Hand Held Programmer

A Hand Held Programmer (Figure 1), part number 9907-205, is used for adjusting and monitoring the 723 control. It plugs into serial port J1 of the control.



Figure 1. Hand Held Programmer

### 723 OPERATION BOARD (Option)

The 723 Operation Board is an optional panel to operate the 723 Position Control. See Fig. 2 for an outline drawing of the panel. The Operation Board displays the actuator output level from the 723 control and the governor's operation status. The manual raise up/lower down switch to raise/lower the actuator position, the turbine shutdown switch, the Position Control system reset switch and the Manual/Auto switch are mounted on the 723 Operation Board.



Figure 2. 723 Operation Board Outline



Figure 3. 723 Position Control Outline

# Chapter 2 Electrostatic Discharge Awareness

All electronic equipment is static-sensitive, some components more than others. To protect these components from static damage, you must take special precautions to minimize or eliminate electrostatic discharges.

Follow these precautions when working with or near the 723 control.

- 1. Before doing maintenance on the position control, discharge the static electricity on your body to ground by touching and holding a grounded metal object (pipes, cabinets, equipment, etc.).
- 2. Avoid the build-up of static electricity on your body by not wearing clothing made of synthetic materials. Wear cotton or cotton-blend materials as much as possible because these do not store static electric charges as much as synthetics.
- 3. Keep plastic, vinyl, and styrofoam materials (such as plastic or styrofoam cups, cup holders, cigarette packages, cellophane wrappers, vinyl books or folders, plastic bottles, and plastic ash trays) away from the position control, the module of the position control, and the work area as much as possible.
- 4. Do not remove the printed circuit board (PCB) from the control cabinet unless absolutely necessary. If you must remove the PCB from the control cabinet, follow these precautions:
  - Do not touch any part of the PCB except the edges.
  - Do not touch the electrical conductors, the connectors, or the components with conductive devices or with your hands.
  - When replacing a PCB, keep the new PCB in the plastic antistatic protective bag it comes in until you are ready to install it. Immediately after removing the old PCB from the control cabinet, place it in the antistatic protective bag.

# Chapter 3 Installation

### Introduction

This chapter contains the general installation instructions for the 723 control, P/N 8262-092. Power requirements, environmental precautions, and location considerations are included to help you determine the best location for the control. Additional information includes unpacking instructions, electrical connections.

### Unpacking

<u>NOTICE:</u> Before handling the 723 control, read Chapter 2, Electrostatic Discharge Awareness.

Be careful when unpacking the electronic control. Check the control for signs of damage such as bent panels, scratches, and loose or broken parts. If any damage is found, immediately notify the shipper.

### **Location Considerations**

Consider these requirements when selecting the mounting location:

- adequate ventilation for cooling;
- space for servicing and repair;
- protection from direct exposure to water or to a condensation-prone environment;
- protection from high-voltage or high current device, or device which produce electromagnetic interference;
- avoidance of vibration;
- selection of a location that will provide an operating temperature range of -40 to +70 °C; The temperature range of 0 to +30 °C is best for long term stable operation.

#### **NOTICE:** The 723 Position Control must NOT be mounted on the turbine.

### **Electrical Connections**

External wiring connections and shielding requirements for each installation are described in the Plant Wiring Diagram, attached at the end of this chapter.

### **Shielded Wiring**

All analog input/output signal lines, which are specified to use shielded lines, should be shielded to prevent picking up stray signals from adjacent equipment. All shielded cable must be twisted conductor pairs. Do not attempt to tin the braided shield. Connect the shields to the terminal specified in the plant wiring drawing. Wire exposed beyond the shield should be as short as possible, not exceeding 50 mm. The other end of shields MUST be left open and insulated from any other conductor. If both ends of a shield are connected, the result may be worse than when the shield is not used.

**DO NOT** run any part of shielded signal wires along with other wires carrying high voltage or high currents. See Woodward application note 50532: Interference Control in Electronic Governing Systems, for more information.

### Power Supply (Terminals 34/35 and Terminal 36/37 of the Panel)

This control requires a voltage source of 18 to 40 Vdc (24 Vdc nominal). Connect the positive (line) to terminal 34 and negative (common) to terminal 35.

The power for the actuator signal switching relays and discrete inputs must be connected to terminal 36 (+) and to terminal 37 (common).

The power switch for the 723 control and the power switch for the relays and discrete inputs must be installed individually.

# CAUTION

To prevent damage to the Position Control, do not exceed the input voltage range.

# CAUTION

To prevent damage to the control, make sure that the alternator or other battery-charging device is turned off or disconnected before disconnecting the battery from the control.

Run the power leads directly from the power source to the control. <u>DO NOT POWER</u> <u>OTHER DEVICE WITH LEADS COMMON TO THE CONTROL</u>. Avoid long wire lengths.

# CAUTION

When starting the turbine control system, supply power to the 505 first, then supply power to the 723 Position Control next. DO NOT power the Position control until the operator recognizes the 505 is working normally.

# 505 Raise and 505 Lower outputs (Terminals 30/31 and 32/33 of the Panel)

When the actuator signal source returns to the 505 Control after being switched from the 505 to the 723 Position Control, 505 Raise and 505 Lower discrete output signals are used to change the actuator output level by raising/lowering the 505 Speed Reference.

The 505 Raise output is connected to the Speed Raise input of the 505, and the 505 Lower output is connected to the Speed Lower input of the 505.

### Speed Signal Input #1 and #2 (Terminals 1/2 and 4/5 of the Panel)

Connect speed sensor signals to terminals 1/2 and 4/5 if the overspeed protection function is used. Use shielded, twisted pair wires for speed-sensing inputs. Connect the shield of the speed sensing inputs to the ground at the Position Control side. The other end of shields MUST be left open and insulated from any other conductor.

### READOUT #1 (Terminal 7/8 of the Panel)

Select one of the following three signals to output. The default is 1: percentage of 723PLUS actuator output.

- 1: Percentage of 723PLUS actuator output (4-20 mA/0-100%)
- 2: Governor Operation Status Indicator of 723 Operation Board (0-5.6 mA)
- 3: Percentage of 505 actuator output. (4-20 mA/0-100%)
- 4: Turbine Speed Readout. (4-20 mA; Configurable at Configure Menu 3-1 and 3-2)
- 5: Position Control Mode Display. (10 or 20 mA)

Connect the wiring to terminals 7(+) and 8(–) of this panel to use this output. Use shielded, twisted conductor pairs for wiring. The maximum impedance this output channel can drive is  $600 \Omega$ .

### READOUT #2 (Terminal 10/11 of the Panel)

Select one of the following three signals to output. The default output is 2: Governor Operation State Indicator.

- 1: Percentage of 723PLUS actuator output (4-20 mA/0-100%)
- 2: Governor Operation Status Indicator of 723 Operation Board (0-5.6 mA)
- 3: Percentage of 505 actuator output. (4-20 mA/0-100%)
- 4: Engine Speed Readout. (4-20 mA; Configurable at Configure Menu 3-3 and 3-4)
- 5: Position Control Mode Display. (10 or 20 mA)

Connect the wiring to terminals 10(+) and 11(-) of this panel to use this output. Use shielded, twisted conductor pairs for wiring. The maximum impedance this output channel can drive is  $600 \Omega$ .

### CV Output (Terminal 16/17 of the Panel)

This is the actuator output channel of the Position Control. Connect the wires from the actuator to terminal 16(+) and terminal 17(-). Use shielded, twisted conductor pairs for wiring. Do not connect the shield of the actuator output line to the ground at the actuator side. Insulate it from any other conductor. The output range of model 8262-092 is 20-160 mA, and the output range of model 8262-094 is 4-20 mA.

### 505 CV Input (Terminal 13/14 of the Panel)

This is the input signal output from the 505 control's actuator output channel. Connect the wiring to terminal 13 (+) and terminal 14(–). Use shielded, twisted conductor pairs for wiring. The input range of model 8262-092 is 20-160 mA. and the input range of model 8262-094 is 4-20 mA.

### 505 CV Read (Terminal 19/20 of the Panel)

This is the input signal output from the 505 control's actuator readout output channel. Connect the wiring to terminal 19 (+) and terminal 20(–). Use shielded, twisted conductor pairs and a current loop isolator for wiring.

### 505 Failure input (Terminal 24/22 of the Panel)

Enter into the Configuration mode of the 505 and select "505 CONTROL OK" option for one of the relay output channels. Connect this relay output (normally energized) with the 505 Failure input of the 723 Position Control. If a 505 failure occurs and this relay is de-energized, the Position Control switches the actuator signal source from the 505 (505 CV Input) to the 723PLUS control inside the 723 Position Control.

The operator can choose the optional function that the Position Control switches the actuator signal source on "505 SHUTDOWN" signal as well as LOOPMATE, the former Woodward Position Control. In this case, 723 Position Control switches the actuator signal source from the 505 to the 723PLUS control any time that one of the shutdown condition occurs, including pushing the emergency stop button. This can happen even if the 505 control is working normally at the time. In case the actuator signal source is switched from the 505 to the Position Control as the result of the operator pushing the emergency stop button, it is impossible to shutdown. Therefore, input an appropriate shutdown signal to Shutdown 1 or 2 or 3 input of 723 Position Control when "505 SHUTDOWN" signal is connected to 505 Failure input so that the operator can shut down the turbine whenever necessary.

### Shutdown 1 input (Terminal 23/22 of the panel)

Input the 505 shutdown signal to this input channel.

If one of the optional relays of the 505 control is used as the "Shutdown Condition relay (normally de-energized)" and this relay output is connected to the Shutdown 1 input, the user can use the function of "SHUTDOWN1 505 PWRUP PRCT?" in Configure mode. Use this function if possible, or else add a protection circuit between the 505 control and the 723 Position Control. The Shutdown Condition relay is energized after every 505 power-up. (This is called "Power-up Trip", and this state continues about 0.8 seconds.) When Power-up Trip finished and the 505 was reset automatically, the 505 control starts program execution and de-energizes the Shutdown Condition relay.

Power-up Trip always happens after the 505 control is powered up. This
operations the Shutdown Condition relay for about 0.9 second and cause the
722 Desition Control to switch the actuator signal source from the EOE to the
Position Control if the Shutdown Condition relay is connected to the
Shutdown 1 input of the Position Control. This is an undesirable signal source
transfer. Users can remove this undesirable signal source transfer by adding
an AND circuit between the 505 and the 723 Position Control.
[Method]
Select one of the 505 optional relays as "505 Control OK" relays (normally
energized) and connect an On-delay-timer relay to this relay output. Set
the delay timer to 1.5 second. Name this Signal A.
Select one of the 505 optional relays as "Shutdown Condition" relay.
Name this Signal B.
Input Signal A and Signal B to an AND circuit and connect the output from
the AND circuit (normally de-energized) to Shutdown 1 input.

### Shutdown 2 input (Terminal 25/22 of the Panel)

Input the turbine shutdown signal to this input terminal.

The discrete input signal from the Shutdown button on the 723 Operation Board or the turbine trip signal from any overspeed protection device could be used as the turbine shutdown signal.

### Shutdown 3 input (Terminal 40/22 of the Panel)

Input the turbine shutdown signal to this input terminal.

The discrete input signal from the Shutdown button on the 723 Operation Board or the turbine trip signal from any overspeed protection device could be used as the turbine shutdown signal.

### Reset input (Terminal 26/22 of the Panel)

Input the reset signal from the Reset button on the 723 Operation Board to this terminal.

The shutdown signals to the Shutdown 1 input, Shutdown 2 input, and Shutdown 3 input are latched inside the 723 Position Control. The Reset input signal resets these latches. Do not forget to input the reset signal after a shutdown signal is received by the 723 Position Control.

### Manual/Auto input (Terminal 27/22 of the Panel)

Input the manual/auto signal from the MANU/AUTO switch on the 723 Operation Board.

If the operator turns MANU/AUTO switch to the MANU side when the 505 Failure input is "True"(i.e. 505 CONTROL OK relay is de-energized.), the operator can raise or lower the actuator signal manually. When quitting the Manual mode, the operator has to transfer the actuator signal source to the 505 control by turning MANU/AUTO switch to the AUTO side.

### Raise input (Terminal 28/22 of the Panel)

Input the actuator output raise signal from UP switch on the 723 Operation Board.

When the 505 Failure input is "True" and MANU/AUTO switch is in MANU side, this signal is used to raise the actuator output signal manually by the operator.

### Lower input (Terminal 29/22 of the Panel)

Input the actuator output lower signal from DOWN switch on the 723 Operation Board.

When the 505 Failure input is "True" and MANU/AUTO switch is in MANU side, this signal is used to lower the actuator output signal manually by the operator.



Figure 4. Position Control Panel Wiring diagram (P/N8262-092)



Figure 5. Position Control Panel Wiring diagram (P/N8262-094)

# Chapter 4 Service and Configure Menus

### Introduction

This chapter contains information on how to enter control set points through the control's menu system using the Hand Held Programmer.

### Hand Held Programmer and Menus

The Hand Held Programmer is a hand-held computer terminal that gets its power from the 723 control. The terminal connects to the RS-422 communication serial port on the control (terminal J1). To connect the terminal, slightly loosen the right-hand screw in the cover over J1 and rotate the cover clockwise to expose the 9-pin connector. Then firmly seat the connector on the terminal into J1. The terminal can be connected or disconnected at any time without affecting control operation. The hand held programmer will not work when the connector was seated into J2 or J3.

The programmer does a power-up self-test whenever it is plugged into the control. When the self-test is complete, the screen will display two lines of information. This is information relating to the application. If the information is not displayed, press "ESC" key. Pressing the "ID" key will change the display to show the part number of the software and version letter.

The programmer screen is a four-line, backlighted LCD display. The display permits you to look at two separate functions or menu items at the same time. Use the "Up/Down Arrow" key to toggle between the two displayed items. The BKSP and SPACE keys will scroll through the display to show the remainder of a prompt if it is longer than the display screen's 18 characters.

The 723 has two sets of menus; the Service menus and the Configure menus. The Service menus allow easy access and tuning while the turbine is running. The Configure menus may only be entered if the I/O is shutdown, and hence the Position Control's functions are disabled.

### **Configure Menus**

Confirm if the present turbine status permits the 723 PLUS Position Control shutdown before entering the Configure mode.

To access the Configure menus, press the . key from the master screen (where the title "WOODWARD GOVERNOR/723 POSITION CONTROL" is displayed). The display will show, 'To enable CONFIGURE, Press ENTER'. Press the ENTER key and the display will show, 'To shutdown I/O, press ENTER'. Press the ENTER key and this will allow you to enter into the Configure menus.

**Note:** If the turbine is running during this process and the 723 Position Control is in Manual mode, the actuator output of the Position Control will be shutdown due to shutting down the I/O when you pressed the ENTER key twice.

To move between the menus, use the  $\triangleright$  and  $\blacktriangleleft$  keys. To move through the set points within a menu, use the  $\blacktriangledown$  and  $\blacktriangle$  keys. Once within a menu, to return to the menu header, press the ESC key.

To leave the Configure menus press the ESC key. The set points will be automatically saved when leaving Configure, and the control will automatically reboot itself.

### **Service Menus**

Service menus are accessible either while the turbine is running or while the turbine has stopped in order to change set points or to monitor control status. To access the Service menus, press the  $\mathbf{\nabla}$  key from the master screen.

To move between menus, and to move through set points within menus follow the instructions as for the Configure menus. Also to return to the menu header, or to leave Service, follow the Configure instructions.

### **Adjusting Set Points**

To adjust a set point, use the " A Turtle Up " or the " A Rabbit Up " keys to increase the value, and the " Turtle Down " or " Rabbit Down " keys to decrease the value. The " A Rabbit Up " and " Rabbit Down " keys will make the rate of change faster than the " Turtle Up " and " Turtle Down " keys. This is useful during initial setup where a value may need to be changed significantly. Where necessary, to select TRUE, use either the " Turtle Up " or the " Rabbit Up " keys, and to select FALSE, use the " Turtle Down " or " Rabbit Down " keys.

To obtain an exact value, press the = key. Key in the required figure and press ENTER.

**NOTE:** This may only be done if the figure is within 10% of the current value.

To save set points at any time, use the SAVE key. This will transfer all new set point values into the EEPROM memory. The EEPROM retains all set points when power is removed from the control.

# CAUTION

To prevent possible damage to the turbine resulting from improper control settings, make sure you save the set points before removing power from the control. Failure to save the set points before removing power from the control causes them to revert to the previously saved settings.

The structure of the service menus, configure menus and the headers is as the Fig.5 below.



Figure 6. Service and Configure Headers

# Hand Held Programmer Keys

The programmer keys do the following functions (see Figure 6-1):

◀ (Left arrow)	Moves backward through Configure or Service, one menu at a time.
► (Right arrow)	Advances through Configure or Service, one menu at a time.
\$ (Up/Down arrow)	Toggles between the two displayed items.
▲ (Up arrow)	Moves backward through each menu, one step at a time.
▼ (Down arrow)	Advances through each menu, one step at a time. Selects Service from Master Screen.
🛆 (Turtle up)	Increases the displayed set point value slowly.
$\overline{ abla}$ (Turtle down)	Decreases the displayed set point value slowly.
🛆 (Rabbit up)	Increases the displayed set point value quickly (about 10 times faster than the turtle keys).
🕜 (Rabbit down)	Decreases the displayed set point value quickly (about 10 times faster than the turtle keys).
— (Minus)	Decreases set point values by one step at a time.
+ (Plus)	Increases set point values by one step at a time.
ID	Displays the 723 control part number and software revision level.
ESC	To return to menu header or to master screen.
SAVE	Saves entered values (set points).
<ul><li>◄ BKSP</li></ul>	Scrolls left through line of display.
► SPACE	Scrolls right through line of display.
ENTER	Used when entering exact values and accessing Configure.
= (Equals)	For entering exact values (within 10%).
. (Decimal)	To select Configure.



Figure 7. Hand Held Programmer Functions

### **TUNABLE LIST**

### **CONFIGURE MENU**

	TUNABLE RANGE	DEFAULT VALUE
1. SPEED SET		
OVERSPEED USE?	FALSE/TRUE	FALSE
OVERSPEED SYSTEM SD	FALSE/TRUE	FALSE
OVSP SD ONLY MANUAL SW ON	FALSE/TRUE	FALSE
OVERSPEED SET(rpm)	0~20000	10000
SPD1 TEETH	1~500	60
SPD2 TEETH	1~500	60
2. DI SET		
SHUTDOWN1 USE?	FALSE/TRUE	TRUE
SHUTDOWN1 NORMAL CLOSE?	FALSE/TRUE	FALSE
SHUTDOWN1 505 PWRUP PRCT?	FALSE/TRUE	TRUE
SHUTDOWN2 USE?	FALSE/TRUE	TRUE
SHUTDOWN2 NORMAL CLOSE?	FALSE/TRUE	FALSE
SD2 ENBL ONLY MANUAL MODE	FALSE/TRUE	FALSE
SHUTDOWN3 USE?	FALSE/TRUE	TRUE
SHUTDOWN3 NORMAL CLOSE?	FALSE/TRUE	FALSE
SD3 ENBL ONLY MANUAL MODE	FALSE/TRUE	FALSE
MAN/AUTO SW CLOSE FOR AUTO?	FALSE/TRUE	FALSE
3. AO SET		
READOUT1 4mA VALUE	-10000~20000	0
READOUT1 20mA VALUE	-10000~20000	100
READOUT2 4mA VALUE	-10000~20000	0
READOUT2 20mA VALUE	-10000~20000	100

### SERVICE MENU

#### TUNABLE RANGE DEFAULT VALUE

1. MONITOR		
CV_IN(%)	-	MONITOR
CV_OUT(%)	-	MONITOR
AUTO MODE	-	MONITOR
MANUAL MODE	-	MONITOR
ΤΟ Αυτο	-	MONITOR
TURBIN SPEED1	-	MONITOR
TURBIN SPEED2	-	MONITOR
2. DI		
SHUTDOWN1 DI	-	MONITOR
FAIL 505 DI	-	MONITOR
SHUTDOWN2 DI	-	MONITOR
RESET DI	-	MONITOR
MAN/AUTO DI	-	MONITOR
RAISE DI	-	MONITOR
LOWER DI	-	MONITOR
SHUTDOWN3 DI	-	MONITOR
3. ALARM		
CV_IN FAIL	-	MONITOR
SPEED #1 FAIL	-	MONITOR
SPEED #2 FAIL	-	MONITOR
SYS FAIL	-	MONITOR
PWR FLT	-	MONITOR
4. SHUTDOWN		
SHUTDOWN1	-	MONITOR
SHUTDOWN2	-	MONITOR
SHUTDOWN3	-	MONITOR
OVERSPEED	-	MONITOR

### 5. SPEED SET

SPEED1 LO PT	0~10000	200
SP1 FLT USE?	FALSE/TRUE	TRUE
SP1 FLT SPEED	0~10000	10000
SP1 FAIL ACT	0~100	100
SPEED2 LO PT	0~10000	200
SP2 FLT USE?	FALSE/TRUE	TRUE
SP2 FLT SPEED	0~10000	10000
SP2 FAIL ACT	0~100	100
6. READOUT SET		
READOUT1 SELECT	1~5	1
READOUT2 SELECT	1~5	2
STATUS AO SD/ALM INCLUDE?	FALSE/TRUE	FALSE
7. CV RAMP		
CV RAMP DELAY	1~5	3
8. DO SET FOR AUTO MODE		
CONTINUOUS OUTPUT%	0~100	25
FAST PULSE OUTPUT%	0~100	12.5
SLOW PULSE OUTPUT%	0~100	2
RST TO MANUAL	0~100	1.5
LONG INTERVAL VALUE(SEC)	0.1~30	5
SHORT INTERVAL VALUE(SEC)	0.1~30	1
CANCEL LOGIC USE?	FALSE/TRUE	FALSE
CANCEL TIME(SEC)	0~1000	10
9. DITHER		
DITHER (%)	0~20	5
DITHER (Hz)	0.1~100	25
10. ACT TUNE		
TEST MODE?	FALSE/TRUE	FALSE
ACT TEST?	FALSE/TRUE	FALSE
ACT(%)	0~100	100
ACT MIN(mA)	0~200	20 or 4
ACT MAX(mA)	0~200	160 or 20

#### **11. ACT LINEAR**

ACT X_1	-5~110	0
ACT Y_1	-5~110	0
ACT X_2	-5~110	10
ACT Y_2	-5~110	10
ACT X_3	-5~110	20
ACT Y_3	-5~110	20
ACT X_4	-5~110	30
ACT Y_4	-5~110	30
ACT X_5	-5~110	40
ACT Y_5	-5~110	40
ACT X_6	-5~110	50
ACT Y_6	-5~110	50
ACT X_7	-5~110	60
ACT Y_7	-5~110	60
ACT X_8	-5~110	70
ACT Y_8	-5~110	70
ACT X_9	-5~110	80
ACT Y_9	-5~110	80
ACT X_10	-5~110	90
ACT Y_10	-5~110	90
ACT X_11	-5~110	100
ACT Y_11	-5~110	100



### CAUTION

To prevent possible damage to the turbine resulting from improper control settings, make sure you save the set points before removing power from the control. Failure to save the set points before removing power from the control causes them to revert to the previously saved settings.

### **Entering Control Set Points**

### **CONFIGURE MENUS**

To access the Configure menus, press the . key from the master screen (where the title "WOODWARD GOVERNOR/723 POSITION CONTROL" is displayed). The display will show, 'To enable CONFIGURE, Press ENTER'. Press the ENTER key and the display will show, 'To shutdown I/O, press ENTER'. Press the ENTER key and this will allow you to enter into the Configure menus.

**Note:** If the turbine is running during this process and the 723 Position Control is in Manual mode, the actuator output of the Position Control will be shutdown due to shutting down the I/O when you pressed the ENTER key twice.

The "Auto mode" of the 723 Position Control is the operation mode where the 505 control is driving the actuator. The "Manual mode" of the 723 Position Control is the operation mode where the 723 Position Control drives the actuator instead of the 505 control after the 505 control fault happened.

### 1. SPEED SET

#### 1-1. OVERSPEED USE?

Set to 'True' when the Overspeed Protection function of this control is used.

#### 1-2. OVERSPEED SYSTEM SD

If this set point is set to 'True', the operation mode of the 723 Position Control is switched to the Manual mode automatically on detecting the speed signal from either of MPU exceeded the OVERSPEED SET value. Because the Position Control can switch the operation mode whenever necessary, the turbine will be shutdown whatever the 505 operation status will be.

#### 1-3. OVSP SD ONLY MANUAL SW ON

If this set point is set to 'True', the turbine will be shutdown on detecting the speed signal from either of MPU exceeded the overspeed set point only when the Position Control is in the Manual mode. While the Position Control is in the Auto mode (at this time, the actuator is driven by the 505 control), nothing will happen even if it detects the turbine overspeed (and if OVERSPEED SYSTEM SD is set to 'False').

#### 1-4. OVERSPEED SET(rpm)

Set this value to the turbine overspeed trip speed.

#### 1-5. SPD1 TEETH

Set the number of teeth on the speed sensing gear for speed sensor #1.

#### 1-6. SPD2 TEETH

Set the number of teeth on the speed sensing gear for speed sensor #2.

### 2. DI SET

#### 2-1. SHUTDOWN1 USE?

Set to 'True' if the Shutdown 1 input is used.

#### 2-2. SHUTDOWN1 NORMAL CLOSE?

Set to 'True' if the relay contact connected to the Shutdown 1 input is normally closed.

#### 2-3. SHUTDOWN1 505 PWRUP PRCT?

Set this set point to 'True' in cases of:

- 505 Fail input of the 723 Position Control is connected to the "505 Control OK" relay of the 505 control.
- And, Shutdown 1 input of the 723 Position Control is connected directly to the "Shutdown Condition" relay of the 505 control.

Otherwise, set this set point to 'False'.

If this set point is set to 'True', the 723 Position Control ignores the Shutdown 1 input for 1.5 second after the 505 Control's power-up.



### CAUTION

This function is not available when other shutdown signals (for instance a signal from an overspeed protection device) are connected to the Shutdown 1 input with the Shutdown Condition signal making an OR circuit, because the shutdown will not occur when the 505 control's CPU fail caused it as "505 Control OK" relay is opened at this time.

#### 2-4. SHUTDOWN2 USE?

Set this set point to 'True' if the Shutdown 2 input is used.

#### 2-5. SHUTDOWN2 NORMAL CLOSE?

Set to 'True' if the relay contact connected to the Shutdown 2 input is normally closed.

#### 2-6. SHUTDOWN2 ONLY MANUAL MODE?

Set to 'True' if the 723 Position Control accepts the Shutdown 2 input signal only in the Manual mode.

#### 2-7. SHUTDOWN3 USE?

Set this set point to 'True' if the Shutdown 3 input is used.

#### 2-8. SHUTDOWN3 NORMAL CLOSE?

Set to 'True' if the relay contact connected to the Shutdown 3 input is normally closed.

#### 2-9. SHUTDOWN3 ONLY MANUAL MODE?

Set to 'True' if the 723 Position Control accepts the Shutdown 3 input signal only in the Manual mode.

#### 2-10.MAN/AUTO SW CLOSE FOR AUTO?

Set this set point to 'True' if the "Auto" mode is selected when the MANU/AUTO switch is in the "closed" state.

#### 3. AO SET

#### 3-1. READOUT1 4mA VALUE

Do this set point tuning only if 4 (Engine Speed Readout) has been selected at 6-1 READOUT1 SELECT set point in Service mode. Set this set point to the engine speed when 4 mA is output as the speed readout signal.

#### 3-2. READOUT1 20mA VALUE

Do this set point tuning only if 4 (Engine Speed Readout) has been selected at 6-1 READOUT1 SELECT set point in Service mode. Set this set point to the engine speed when 20 mA is output as the speed readout signal.

#### 3-3. READOUT2 4mA VALUE

Do this set point tuning only if 4 (Engine Speed Readout) has been selected at 6-2 READOUT2 SELECT set point in Service mode. Set this set point to the engine speed when 4 mA is output as the speed readout signal.

#### 3-3. READOUT2 20mA VALUE

Do this set point tuning only if 4 (Engine Speed Readout) has been selected at 6-2 READOUT2 SELECT set point in Service mode. Set this set point to the engine speed when 20 mA is output as the speed readout signal.

Press the ESC key once or twice when the operator has finished entering the set points of the Configure menus. The message "SAVING CHANGES/ ReBooting Control" will be displayed and the 723 Plus will restart the software. If the power to the 723 Plus is turned off, the set points will revert to the previously saved values. Pressing SAVE key to save set points is allowed even while the operator is changing set points in the Configure menu.



### CAUTION

To prevent possible damage to the turbine resulting from improper control settings, make sure you save the set points before removing power from the control. Failure to save the set points before removing power from the control causes them to revert to the previously saved settings.

### SERVICE MENUS

Service menus are accessible either while the turbine is running or while the turbine has stopped in order to change set points or to monitor control status. To access the Service menus, press the  $\mathbf{\nabla}$  key from the master screen.

### **1. MONITOR**

These menus are used to monitor analog input/output values and control status.

#### 1-1. CV\_IN(%)

The 505 actuator output signal to the 723 Position Control (505 CV READ) is displayed.

#### 1-2. CV\_OUT(%)

The actuator output signal from the 723 Position Control is displayed.

#### 1-3. AUTO MODE

When the 723 Position Control is operating in "Auto mode", 'True' is displayed.

#### 1-4. MANUAL MODE

When the 723 Position Control is operating in "Manual mode", 'True' is displayed.

#### 1-5. TO AUTO

When the 723 Position Control operation mode is transferring from the Manual mode to the Auto mode, 'True' is displayed.

#### 1-6. TURBIN SPEED 1

The turbine speed sensed with the speed sensor #1 is displayed.

#### 1-7. TURBIN SPEED 2

The turbine speed sensed with the speed sensor #2 is displayed.

### 2. DI

These menus are used to display the status of discrete inputs.

#### 2-1. SHUTDOWN1 DI

The Shutdown 1 input status is displayed. 'True' indicates the "Shutdown Condition" relay is closed.

#### 2-2. FAIL 505 DI

The 505 Failure input status is displayed. 'True' indicates the "505 Control OK" relay is closed.

#### 2-3. SHUTDOWN2 DI

The Shutdown 2 input status is displayed. 'True' indicates the relay or the switch connected to this input channel is closed.

#### 2-4 RESET DI

The Reset switch input status is displayed. 'True' indicates the Reset switch contact is closed.

#### 2-5. MAN/AUTO DI

The Manual/Auto switch input status is displayed. If the switch is in the Manual side, 'True' is displayed, else 'False' is displayed.

#### 2-6. RAISE DI

The Raise switch input status is displayed. 'True' indicates the Raise switch contact is closed.

#### 2-7. LOWER DI

The Lower switch input status is displayed. 'True' indicates the Lower switch contact is closed.

#### 2-8. SHUTDOWN3 DI

The Shutdown 3 input status is displayed. 'True' indicates the relay or the switch connected to this input channel is closed.

### 3. ALARM

These menus are used to display the status of alarms.

#### 3-1. CV\_IN FAIL

'True' is displayed when the 505 actuator output signal to the 723 Position Control (505 CV READ analog input channel) is less than 2 mA or greater than 22 mA.

#### 3-2. SPEED #1 FAIL

'True' is displayed when the speed sensor #1 failure happened.

#### 3-3. SPEED #2 FAIL

'True' is displayed when the speed sensor #2 failure happened.

#### 3-4. SYS FAIL

'True' is displayed when the 723 Position Control sensed any hardware error.

#### 3-5. PWR FLT

'True' is displayed when the 723 Position Control sensed a power failure.

#### 4. SHUTDOWN

These menus are used to display the status of Shutdown inputs.

#### 4-1. SHUTDOWN1

When the Shutdown 1 input is set to use in the Configure mode and if the shutdown signal is input to this input channel, the turbine will be shut down and 'True' is displayed here.

#### 4-2. SHUTDOWN2

When the Shutdown 2 input is set to use in the Configure mode and if the shutdown signal is input to this input channel, the turbine will be shut down and 'True' is displayed here.

#### 4-3. SHUTDOWN3

When the Shutdown 3 input is set to use in the Configure mode and if the shutdown signal is input to this input channel, the turbine will be shut down and 'True' is displayed here.

#### 4-4. OVERSPEED

When the Overspeed Protection function is set to use in the Configure mode, and if the turbine speed exceeds the overspeed set point value, the turbine will be shutdown and 'True' is displayed here.

#### 5. SPEED SET

Enter the set points with turbine speed in this menu.

#### 5-1. SPEED1 LO PT

Set the lowest value (in rpm) of the speed sensing. Set the turbine speed 10 rpm greater than the rpm which is sensed with the 400 Hz speed signal.

#### 5-2. SP1 FLT USE?

Set to 'True' if the speed sensor failure alarm function for speed sensor #1 is used.

#### 5-3 SP1 FLT SPEED

Set the rpm where the speed sensor #1 failure alarm is activated.

#### 5-4. SP1 FAIL ACT

Set the actuator output value (in percent) which produces the turbine speed to activate the speed sensor #1 failure alarm.

#### 5-5. SP2 FLT USE?

Set to 'True' if the speed sensor failure alarm function for speed sensor #2 is used.

#### 5-6 SP2 FLT SPEED

Set the rpm where the speed sensor #2 failure alarm is activated.

#### 5-7. SP2 FAIL ACT

Set the actuator output value (in percent) which produces the turbine speed to activate the speed sensor #2 failure alarm.

#### 6. READOUT SET

Enter the set points with the analog outputs.

#### 6-1. READOUT1 SELECT

Select one of five outputs below. The default is 1. percentage of 723PLUS actuator output.

- 1: Percentage of 723PLUS actuator output (4-20 mA/0-100%)
- 2: Governor Operation State Indicator of 723 Operation Board (0-5.6 mA)
- 3: Percentage of 505 actuator output. (4-20 mA/0-100%)
- 4: Turbine Speed Readout. (4-20 mA; Configurable at Configure Menu 3-1 and 3-2)
- 5: Position Control Mode Display. (10 mA:Manual mode, 20 mA:Auto Mode)

#### 6-2. READOUT2 SELECT

Select one of three outputs below. The default is 1. percentage of 723PLUS actuator output.

- 1: Percentage of 723PLUS actuator output (4-20 mA/0-100%)
- 2: Governor Operation State Indicator of 723 Operation board (0-5.6 mA)
- 3: Percentage of 505 actuator output. (4-20 mA/0-100%)
- 4: Turbine Speed Readout. (4-20 mA; Configurable at Configure Menu 3-3 and 3-4)
- 5: Position Control Mode Display. (10 mA:Manual mode, 20 mA:Auto Mode)

#### 6-3. STATUS AO SD/ALM INCLUDE?

If '2' was selected at READOUT 1 or 2 SELECT above, set this set point to 'True' to use the LED to indicate the status of alarms and shutdowns with its blink pattern. When alarm/shutdown status is set to indicate on the LED, the alarm/shutdown indication has higher priority than the operation mode indication.

Blink pattern while neither alarm nor shutdown exists:

AUTO mode - The LED illuminates

 $MANUAL \ mode-The \ LED \ extinguishes$ 

MANUAL mode  $\rightarrow$  AUTO mode – The LED blinks

Blink pattern while an alarm or a shutdown exists:

ALARM – The blink pattern in which the second blink is longer than others is repeated.

 $\ensuremath{\mathsf{SHUTDOWN}}$  – The blink pattern in which the third blink is longer than others is repeated.

ALARM & SHUTDOWN – The blink pattern for the alarm and the blink pattern for the shutdown are repeated alternately.

If 5:Position Control Mode Display has been selected at READOUT 1/2 SELECT set point above, neither alarm display nor shutdown display is done.

### 7. CV RAMP

#### 7-1. CV RAMP

In case the 723 Position Control tracks the input signal, set the delay time from when the position input signal starts to when the Position Control takes control of the position input signal as the goal of tracking. The operator can choose one of following delay times;

- 1: 10 msec
- 2:20 msec
- 3: 100 msec
- 4: 500 msec
- 5: 1000 msec

### 8. DO SET FOR AUTO MODE

#### 8-1. CONTINUOUS OUTPUT%

If the difference between the 505 CV input and the CV output is greater than this set point value, the 505 RAISE/LOWER signal is output not as pulses but as a discrete signal (the state is ON).

#### 8-2. FAST PULSE OUTPUT%

If the difference between the 505 CV input and the CV output is greater than or equal to this set point value, the 505 RAISE/LOWER signal is output not as short pulses but as long pulses.

#### 8-3. SLOW PULSE OUTPUT%

If the difference between the 505 CV input and the CV output is smaller than this set point value, the operation mode of the Position Control is switched to 'Auto mode'.

#### 8-4. RST TO MANUAL%

Until the difference between the 505 CV input and the CV output is smaller than this set point value, the 505 RAISE/LOWER signal is output as short pulses.

#### 8-5. LONG INTERVAL VALUE(SEC)

Set the relay's de-energized time of the 505 RAISE/LOWER pulse signal while the difference between the 505 CV input and the CV output is equal to 'RST TO MANUAL'.

#### 8-6. SHORT INTERVAL VALUE(SEC)

Set the relay's de-energized time of the 505 RAISE/LOWER pulse signal while the difference between the 505 CV input and the CV output is equal to 'FAST PULSE OUTPUT%'.

When the difference between the 505 CV input and the CV output is greater than or equal to 'RST TO MANUAL' and less than or equal to 'FAST PULSE OUTPUT%', the relay's de-energized time of 505 RAISE/LOWER signal is interpolated between 'SHORT INTERVAL VALUE' and 'LONG INTERVAL VALUE'.

#### 8-7. CANCEL LOGIC USE?

Set this set point to 'TRUE' if the 505 RAISE/LOWER signal should not be output as a discrete ON/OFF signal when the 505 CV input signal is greater than or equal to 97% or less than or equal to 3% (this too high or too low CV input shows there is a big gap between the 505 speed reference and the actual speed), even if the difference between the 505 CV input and the CV output is greater than 'CONTINUOUS OUTPUT%' (in order to prevent the 505 speed reference from exceeding the position where it should stop). When the 505 CV input is greater than 3% and less than 97% (this shows the speed reference is close to the actual speed), the Position Control pauses to send the 505 RAISE/LOWER signal for the preset time (at 8-8 term below). This function is used to remove the overshoot or undershoot of the speed reference when it is approaching the actual speed. Set this set point to 'True' to use this function.

#### 8-8. CANCEL TIME(SEC)

See 8-7. 'CANCEL LOGIC USE?'.

### 9. DITHER

9-1. DITHER(%)

Set the amplitude of the dither signal in actuator output percent peak to peak.

#### 9-2. DITHER(Hz)

Set the frequency of the dither signal.

### **10. ACT TUNE**

#### 10-1. TEST MODE?

Set this set point to 'True' when tuning the actuator.

#### 10-2. ACT TEST

Set this set point to 'True' when tuning the actuator.

#### 10-3. ACT(%)

Set this set point to a value for a new actuator position to change the actuator output manually.

#### 10-4. ACT MIN(mA)

Set this set point to the minimum actuator output current.

#### 10-5. ACT MAX(mA)

Set this set point to the maximum actuator output current (exp. 20 mA or 4 mA).

### **11. ACT LINEAR**

In case the set points of 'ACT 1 LINEALIZATION' or 'ACT 2 LINEALIZATION' are set in the 505 Control, set the similar curve for the Position Control to change the CV output values so that the manual CV output is equivalent to the 505 Control's actuator output value.

### CAUTION

To prevent possible damage to the turbine resulting from improper control settings, make sure you save the set points before removing power from the control. Failure to save the set points before removing power from the control causes them to revert to the previously saved settings.



Figure 8. Wiring between the Position Control terminals and the 723PLUS control.(P/N8262-092)



Figure 9. Wiring between the Position Control terminals and the 723PLUS Control.(P/N8262-094)

# Chapter 5 Function Operation

### Introduction

This chapter describes the operation of the 723 Position Control. Refer to the function block diagram 9951-855 for detail of each function.

### The Operation of the 723 Position Control

#### 1. Booting the 505 Control

Check if the 24 Vdc power is connected to POWER SUPPLY DC24V FOR RELAY of the 723 Position Control (terminal 36/37 of the panel).

Apply power and boot the 505 Control. The discrete output to the 505 FAIL input of the Position Control will be closed. If the SHUTDOWN discrete input of the 723 Position Control is used, verify that the Shutdown signal is showing the correct state.

#### 2. Booting the 723 Position Control

Connect the 24 Vdc power to POWER SUPPLY DC24V FOR 723 (terminal 34/35) of the panel to supply the power to the 723 Position Control.

The current to indicate the Position Control status is output from READOUT#2 (analog output channel #2) to illuminate an indicator or a LED. (If the 723 OPERATION BOARD is used, this LED is GOVERNOR OPERATION STATE INDICATOR.)

The present status is the normal status (i.e. Auto mode). Start the 505 Control at this state.

While in Auto mode, the signal to 505 CV INPUT (terminal 13/14 of the panel) is passed to CV OUTPUT (terminal 16/17) through the relay K1 without any processing, and the Position Control is monitoring the actuator output level at 505 CV READ (terminal 19/20). The 723 Position Control is outputting the same actuator drive current as the 505 Control's actuator output at this time.

#### 3. Manual mode

If any 505 fault happened, the relay of the 505 Control's 505 FAIL output (505 Control OK relay) is opened, consequently the input signal to K1 relay is changed. By this switching of K1 relay, the source of the actuator drive signal (CV OUTPUT) is switched from the 505 Control's actuator output, which was input to 505 CV INPUT, to the 723 PLUS control's actuator output. This state is the Manual mode.

The switching time, the time from when 505 FAIL relay was opened to when K1 relay's switching action completes, is the time simply to complete the switching action. (i.e. less than 10 ms, typically around  $4\sim 5$  ms) However, when factors outside of the 723 Position Control affects the Position Control operation, the switching time may change a little. (Factors include the time for 505 FAIL relay opening action, the 505 actuator output change rate, etc.)

The current to indicate the Position Control status is not output from READOUT#2 (analog output channel #2) in the Manual mode, and the indicator or the LED will be extinguished. (If the 723 OPERATION BOARD is used, this LED is GOVERNOR OPERATION STATE INDICATOR.)

#### 4. Manual mode operation and transfer to Auto mode

When the difference between 505 CV INPUT and CV OUTPUT is greater than 'SLOW PULSE OUTPUT %(the default value of this setpoint is 2%)', the operation mode of the Position Control will not transfer to Auto mode even if the 505 FAIL output was closed.

To change CV OUTPUT value at this state, turn the Manual/Auto switch to the Manual side, and close the switch or the contact connected to RAISE/LOWER discrete input of the Position Control. (If 723 OPERATION BOARD is used, turn MANU/AUTO switch to MANU side and press UP/DOWN button to raise/lower CV OUTPUT value.) At this time, the current to indicate the Position Control status is not output from READOUT#2 (analog output channel #2) and the indicator or the LED will be extinguished. (If the 723 OPERATION BOARD is used, this LED is GOVERNOR OPERATION STATE INDICATOR.)

If the switch connected to SHUTDOWN2 input is closed, (in case the 723 OPERATION BOARD is used, if SHUTDOWN switch was pressed) CV OUTPUT will be shut down.

If the 505 FAIL relay is closed and the Manual/Auto switch is opened, (in case the 723 OPERATION BOARD is used, if MAN/AUTO switch is turned to AUTO side) the Position Control will behave as follows.

The Position Control's READOUT#2 (analog output channel #2) outputs 0 mA or 5.60 mA alternately and the indicator or the LED connected to this output will blink. (If the 723 OPERATION BOARD is used, this LED is GOVERNOR OPERATION STATE INDICATOR.)

Transferring the operation mode to Auto mode depends on whether the 505 actuator output can approach CV OUTPUT value only with 505 RAISE/LOWER signal from the 723 Position Control without any special tuning.

- A. Until the difference between 505 CV INPUT and CV OUTPUT is equal to or less than 'CONTINUOUS OUTPUT%', the 505 raise/lower command signal is output not as pulses but as discrete ON/OFF signals.
- B. Until the difference between 505 CV INPUT and CV OUTPUT is equal to or less than 'FAST PULSE OUTPUT%', the 505 raise/lower command signal is output as long pulses.
- C. Until the difference between 505 CV INPUT and CV OUTPUT is equal to or less than 'RST TO MANUAL%', the 505 raise/lower command signal is output as short pulses.
- D. If the difference between 505 CV INPUT and CV OUTPUT is equal to or less than 'SLOW PULSE OUTPUT%', the operation mode of the Position Control will transfer to Auto mode.

### 5. Shutdown

If a shutdown command (from SHUTDOWN1, SHUTDOWN2 or SHUTDOWN3) is input to the 723 Position Control, the actuator output of the Position Control will be shut down. To start the Position Control again after a shutdown command input, close the switch connected to the reset input. (If the 723 OPERATION BOARD is used, press RESET switch.)

### 6. To remove the 505 Control

To remove the 505 Control from the prime mover control system, set the operation mode of the Position Control to the Manual mode.

As the result, the output current from READOUT#2 of the Position Control will be shut down, and the LED connected to this output channel will extinguish. (If the 723 OPERATION BOARD is used, this LED is GOVERNOR OPERATION STATE INDICATOR.)

Turn off the power to the 505 Control, then disconnect the wiring from the 505 Control.

### 7. To remove the 723 Position Control

If the 723PLUS Control in the 723 Position Control system experiences a problem and it is necessary to replace the 723PLUS Control, set the operation mode of the Position Control to the Auto mode. 5.6 mA current to indicate the Position Control status is output from READOUT#2 (analog output channel #2) to illuminate the indicator or the LED. (If the 723 OPERATION BOARD is used, this LED is GOVERNOR OPERATION STATE INDICATOR.)

At this stage, turn off the power to the 723 PLUS Control, then disconnect the wiring to the 723 PLUS. (The power terminals are POWER SUPPLY DC24V FOR 723 +/–.)

### CAUTION

DO NOT TURN OFF THE POWER TO RELAYS ON THE POSITION CONTROL (POWER SUPPLY DC24V FOR RELAY).

The explanation for LEDs:	The following 6 LEDs on the panel of the 723PLUS Control
	show the operation status of the Position Control.
CPU OK	indicates the 723PLUS Control is operating normally.
POWER OK	indicates the power to the 723PLUS Control is supplied
	normally.
LED#1	extinguishes in Auto mode, illuminates in Manual mode,
	and blinks while transferring from Manual mode to Auto mode.
LED#2	illuminates in Test mode.
LED#3	illuminates in shutdowns.
LED#4	illuminates in alarms.

Set Point List for P/N8262-092

**723 POSITION CONTROL** 

		S/N:	
		Date:	
CONFIGURE MENU			
	TUNABLE RANGE	DEFAULT VALUE PRO	OGRAMMED VALUE
1. SPEED SET			
OVERSPEED LISE?	FAI SE/TRUE	EALSE	
	FALSE/TRUE	FALSE	
	FALSE/TRUE	FALSE	
	0~20000	10000	
	1~500	60	
	1~500	60 60	
SFD2 TEETT	1.000	00	
2. DI SET			
SHUTDOWN1 USE?	FALSE/TRUE	TRUE	
SHUTDOWN1 NORMAL CLOSE?	FALSE/TRUE	FALSE	
SHUTDOWN1 505 PWRUP PRCT?	FALSE/TRUE	TRUE	
SHUTDOWN2 USE?	FALSE/TRUE	TRUE	
SHUTDOWN2 NORMAL CLOSE?	FALSE/TRUE	FALSE	
SD2 ENBL ONLY MANUAL MODE	FALSE/TRUE	FALSE	
SHUTDOWN3 USE?	FALSE/TRUE	TRUE	
SHUTDOWN3 NORMAL CLOSE?	FALSE/TRUE	FALSE	
SD3 ENBL ONLY MANUAL MODE	FALSE/TRUE	FALSE	
MAN/AUTO SW CLOSE FOR AUTO?	FALSE/TRUE	FALSE	
3. AO SET			
READOUT1 4mA VALUE	-10000~20000	0	
READOUT1 20mA VALUE	-10000~20000	100	
READOUT2 4mA VALUE	-10000~20000	0	
READOUT2 20mA VALUE	-10000~20000	100	

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<u>M/V</u>:

# OVSF

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### SERVICE MENU

	TUNABLE RANGE	DEFAULT VALUE	PROGRAMMED	VALUE
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#### **1. MONITOR**

- CV\_IN(%)
- CV\_OUT(%)
- AUTO MODE
- MANUAL MODE
- ΤΟ Αυτο
- TURBIN SPEED1
- TURBIN SPEED2
- 2. DI

- FOR MONITORING FOR MONITORING
- FOR MONITORING
   FOR MONITORING
- FOR MONITORING

FOR MONITORING

FOR MONITORING

FOR MONITORING

FOR MONITORING

SHUTDOWN1 DI FOR MONITORING FAIL 505 DI FOR MONITORING SHUTDOWN2 DI FOR MONITORING \_ RESET DI FOR MONITORING \_ MAN/AUTO DI FOR MONITORING RAISE DI FOR MONITORING \_ FOR MONITORING LOWER DI SHUTDOWN3 DI FOR MONITORING

#### 3. ALARM

- CV\_IN FAIL
- SPEED #1 FAIL
- SPEED #2 FAIL
- SYS FAIL
- PWR FLT FOR MONITORING

\_

### 4. SHUTDOWN

SHUTDOWN1-FOR MONITORINGSHUTDOWN2-FOR MONITORINGSHUTDOWN3-FOR MONITORINGOVERSPEED-FOR MONITORING

### 5. SPEED SET

SPEED1 LO PT	0~10000	200	
SP1 FLT USE?	FALSE/TRUE	TRUE	
SP1 FLT SPEED	0~10000	10000	
SP1 FAIL ACT	0~100	100	
SPEED2 LO PT	0~10000	200	
SP2 FLT USE?	FALSE/TRUE	TRUE	
SP2 FLT SPEED	0~10000	10000	
SP2 FAIL ACT	0~100	100	
6. READOUT SET			
READOUT1 SELECT	1~5	1	
READOUT2 SELECT	1~5	2	
STATUS AO SD/ALM INCLUDE?	FALSE/TRUE	FALSE	
7. CV RAMP			
CV RAMP DELAY	1~5	3	
8. DO SET FOR AUTO MODE			
CONTINUOUS OUTPUT%	0~100	25	
FAST PULSE OUTPUT%	0~100	12.5	
SLOW PULSE OUTPUT%	0~100	2	
RST TO MANUAL	0~100	1.5	
LONG INTERVAL VALUE(SEC)	0.1~30	5	
SHORT INTERVAL VALUE(SEC)	0.1~30	1	
CANCEL LOGIC USE?	FALSE/TRUE	FALSE	
CANCEL TIME(SEC)	0~1000	10	
9. DITHER			
DITHER (%)	0~20	5	

### **10. ACT TUNE**

TEST MODE?	FALSE/TRUE	FALSE	
ACT TEST?	FALSE/TRUE	FALSE	
ACT(%)	0~100	100	
ACT MIN(mA)	0~200	20	
ACT MAX(mA)	0~200	160	
11. ACT LINEAR			
ACT X_1	-5~110	0	
ACT Y_1	-5~110	0	
ACT X_2	-5~110	10	
ACT Y_2	-5~110	10	
ACT X_3	-5~110	20	
ACT Y_3	-5~110	20	
ACT X_4	-5~110	30	
ACT Y_4	-5~110	30	
ACT X_5	-5~110	40	
ACT Y_5	-5~110	40	
ACT X_6	-5~110	50	
ACT Y_6	-5~110	50	
ACT X_7	-5~110	60	
ACT Y_7	-5~110	60	
ACT X_8	-5~110	70	
ACT Y_8	-5~110	70	
ACT X_9	-5~110	80	
ACT Y_9	-5~110	80	
ACT X_10	-5~110	90	
ACT Y_10	-5~110	90	
ACT X_11	-5~110	100	
ACT Y 11	-5~110	100	

End of Data Sheet

Set Point List for P	/N8262-094		Sheet(1/3) Rev. A
723 POSITION CONTRO	DL	<u>M/V:</u>	
		<u>S/N:</u>	
		Date:	
CONFIGURE MENU			
	TUNABLE RANGE	DEFAULT VALUE PR	OGRAMMED VALUE
OVERSPEED USE?	FALSE/TRUE	FALSE	
OVERSPEED SYSTEM SD	FALSE/TRUE	FALSE	
OVSP SD ONLY MANUAL SW ON	FALSE/TRUE	FALSE	. <u></u>
OVERSPEED SET(rpm)	0~20000	10000	. <u></u>
SPD1 TEETH	1~500	60	. <u></u>
SPD2 TEETH	1~500	60	
2. DI SET			
SHUTDOWN1 USE?	FALSE/TRUE	TRUE	
SHUTDOWN1 NORMAL CLOSE?	FALSE/TRUE	FALSE	
SHUTDOWN1 505 PWRUP PRCT?	FALSE/TRUE	TRUE	
SHUTDOWN2 USE?	FALSE/TRUE	TRUE	
SHUTDOWN2 NORMAL CLOSE?	FALSE/TRUE	FALSE	
SD2 ENBL ONLY MANUAL MODE	FALSE/TRUE	FALSE	
SHUTDOWN3 USE?	FALSE/TRUE	TRUE	
SHUTDOWN3 NORMAL CLOSE?	FALSE/TRUE	FALSE	. <u></u>
SD3 ENBL ONLY MANUAL MODE	FALSE/TRUE	FALSE	. <u></u>
MAN/AUTO SW CLOSE FOR AUTO?	FALSE/TRUE	FALSE	
3. AO SET			
READOUT1 4mA VALUE	-10000~20000	0	
READOUT1 20mA VALUE	-10000~20000	100	
READOUT2 4mA VALUE	-10000~20000	0	
READOUT2 20mA VALUE	-10000~20000	100	

### SERVICE MENU

	TUNABLE RANGE	DEFAULT VALUE	PROGRAMMED	VALUE
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#### **1. MONITOR**

- CV\_IN(%)
- CV\_OUT(%)
- AUTO MODE
- MANUAL MODE
- ΤΟ Αυτο
- TURBIN SPEED1
- TURBIN SPEED2
- 2. DI

- FOR MONITORING FOR MONITORING
- FOR MONITORING

FOR MONITORING

FOR MONITORING

FOR MONITORING

FOR MONITORING

SHUTDOWN1 DI FOR MONITORING FAIL 505 DI FOR MONITORING SHUTDOWN2 DI FOR MONITORING RESET DI FOR MONITORING \_ MAN/AUTO DI FOR MONITORING RAISE DI FOR MONITORING \_ FOR MONITORING LOWER DI SHUTDOWN3 DI FOR MONITORING

#### 3. ALARM

- CV\_IN FAIL
- SPEED #1 FAIL
- SPEED #2 FAIL
- SYS FAIL
- PWR FLT FOR MONITORING

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### 4. SHUTDOWN

SHUTDOWN1-FOR MONITORINGSHUTDOWN2-FOR MONITORINGSHUTDOWN3-FOR MONITORINGOVERSPEED-FOR MONITORING

### 5. SPEED SET

SPEED1 LO PT	0~10000	200	
SP1 FLT USE?	FALSE/TRUE	TRUE	
SP1 FLT SPEED	0~10000	10000	
SP1 FAIL ACT	0~100	100	
SPEED2 LO PT	0~10000	200	
SP2 FLT USE?	FALSE/TRUE	TRUE	
SP2 FLT SPEED	0~10000	10000	
SP2 FAIL ACT	0~100	100	
6. READOUT SET			
READOUT1 SELECT	1~5	1	
READOUT2 SELECT	1~5	2	
STATUS AO SD/ALM INCLUDE?	FALSE/TRUE	FALSE	
7. CV RAMP			
CV RAMP DELAY	1~5	3	
8. DO SET FOR AUTO MODE			
CONTINUOUS OUTPUT%	0~100	25	
FAST PULSE OUTPUT%	0~100	12.5	
SLOW PULSE OUTPUT%	0~100	2	
RST TO MANUAL	0~100	1.5	
LONG INTERVAL VALUE(SEC)	0.1~30	5	
SHORT INTERVAL VALUE(SEC)	0.1~30	1	
CANCEL LOGIC USE?	FALSE/TRUE	FALSE	
CANCEL TIME(SEC)	0~1000	10	
9. DITHER			
DITHER (%)	0~20	5	
DITHER (Hz)	0.1~100	25	

### **10. ACT TUNE**

TEST MODE?	FALSE/TRUE	FALSE	
ACT TEST?	FALSE/TRUE	FALSE	
ACT(%)	0~100	100	
ACT MIN(mA)	0~200	4	
ACT MAX(mA)	0~200	20	
11. ACT LINEAR			
ACT X_1	-5~110	0	
ACT Y_1	-5~110	0	
ACT X_2	-5~110	10	
ACT Y_2	-5~110	10	
ACT X_3	-5~110	20	
ACT Y_3	-5~110	20	
ACT X_4	-5~110	30	
ACT Y_4	-5~110	30	
ACT X_5	-5~110	40	
ACT Y_5	-5~110	40	
ACT X_6	-5~110	50	
ACT Y_6	-5~110	50	
ACT X_7	-5~110	60	
ACT Y_7	-5~110	60	
ACT X_8	-5~110	70	
ACT Y_8	-5~110	70	
ACT X_9	-5~110	80	
ACT Y_9	-5~110	80	
ACT X_10	-5~110	90	
ACT Y_10	-5~110	90	
ACT X_11	-5~110	100	
ACT Y_11	-5~110	100	

End of Data Sheet



Figure 10. Wiring between the 505, the 723, relays and the actuator

# CHAPTER 6 SERVICE OPTIONS

### **PRODUCT SERVICE OPTIONS**

The following are the factory options available for the service of Woodward equipment:

- Replacement/Exchange (24-hour service)
- Flat Rate Repair
- Flat Rate Remanufacture

If you are experiencing problems with installation or unsatisfactory performance of an installed system, the following options are available:

• Contact Woodward technical assistance (see HOW TO CONTACT WOODWARD later in this chapter) and discuss your problem. In most cases, your problem can be resolved over the phone. If not, you can select which course of action you wish to pursue based on the available services listed in this section.

### Replacement/Exchange

Replacement/Exchange is a premium program designed for the user who is in need of immediate service. It allows the user to request and receive a like-new replacement unit in minimum time (usually within 24 hours of the request), providing a suitable unit is available at the time of the request, thereby minimizing costly downtime. This is also a Flat Rate structured program.

This option allows customers to call in advance of a scheduled outage or an unexpected outage and request a replacement control unit. If the unit is available at the time of the call, it can usually be shipped out within 24 hours. The customer replaces his field control unit with the like-new replacement and returns the field unit to the Woodward facility as explained later in this chapter. Charges for the Replacement/Exchange service are based on a flat rate plus shipping expenses. The customer is invoiced the flat rate charge at the time the replacement unit is shipped and must return the field unit to Woodward within 30 days. If the unit is not received within that time frame, the customer is invoiced the difference between the flat rate replacement/exchange charge and the current list price of a new unit.

**Return Shipment Authorization Label.** To ensure prompt receipt of the core, and avoid additional charges, the package must be properly marked. A return authorization label is included with every Replacement/Exchange unit that leaves Woodward. The core should be repackaged and the return authorization label affixed to the outside of the package. Without the authorization label, receipt of the returned core could be delayed and cause additional charges to be applied.

### Flat Rate Repair

Flat Rate Repair is available for the majority of standard products in the field. This program offers the user repair service for their products with the advantage of knowing in advance what the cost will be. All repair work carries a 180-day warranty on replaced parts and labor.

### Flat Rate Remanufacture

Flat Rate Remanufacture is very similar to the Flat Rate Repair option with the exception that the unit will be returned to the user in "like new" condition. This option is applicable to mechanical products only.

### **RETURNING EQUIPMENT FOR REPAIR**

If any part of the electronic control is to be returned to Woodward Governor Company for repair, attach a tag to the part with the following information:

- name and location where the control is installed;
- name and phone number of contact person;
- complete Woodward Governor Company part number(s) and serial number(s);
- description of the problem;
- instructions describing the desired type of repair.



Explosion Hazard—Do not connect or disconnect while circuit is live, unless area is known to be non-hazardous.

Explosion Hazard—Substitution of components may impair suitability for Class I, Division 2

# CAUTION

To prevent damage to electronic components caused by improper handling, read and observe the precautions in Woodward Governor Company Manual 82715, Guide for Handling and Protection of Electronic Controls, Printed Circuit Boards, and Modules.

### **Replacement Parts Information**

When ordering replacement parts for electronic controls, include the following information:

- the part number(s) that is on the enclosure nameplate;
- the unit serial number, which is also on the nameplate.

### **Packing a Control**

Use the following materials when returning a complete control:

- protective caps on all connectors;
- · antistatic protective bags on all electronic modules;
- packing materials that will not damage the surface of the unit;
- at least 100 mm (4 inches) of tightly packed, industry-approved packing material;
- a packing carton with double walls;
- a strong tape around the outside of the carton for increased strength.

### Additional Instructions

When returning equipment to Woodward (Japan), please telephone and ask for the Customer Service Department [81 (476) 93-4668]. They will help expedite the processing of your order through our distributors or local service facility. Factory repairs will be greatly expedited if a purchase order has been issued for the item(s) to be repaired. Make arrangements in advance if possible.

### **REPLACEMENT PARTS INFORMATION**

When ordering replacement parts for electronic controls, include the following information:

the part number(s) (XXXX-XXX) that is on the enclosure nameplate;
the unit serial number, which is also on the nameplate.

### HOW TO CONTACT WOODWARD

Use the following address when shipping or corresponding:

Woodward Governor (Japan), LTD Customer Service Department 19F WBG (World Business Garden) Marive West 2-6 Nakase, Mihama-ku, Chiba-shi, Chiba, 261-7119 JAPAN

PHONE: +81 (43)-213-2191 FAX: +81 (43)-213-2199

Woodward Internet address is "http://www.woodward.com".

### **OTHER SERVICE FACILITIES**

Contact Woodward Governor (Japan), LTD., Customer Service Department for the name of your nearest Woodward distributor or service facility.

### **ENGINEERING SERVICES**

Woodward Industrial Controls Engineering Services offers the following after-sales support for Woodward products. For these services, you can contact us by telephone, by email, or through the Woodward website.

- Technical Support
- Product Training
- Field Service

Contact information:

Telephone—+1 (970) 482-5811 Toll-free Phone (in North America)—1 (800) 523-2831 Email—icinfo@woodward.com Website—www.woodward.com

Technical Support is available through our many worldwide locations or our authorized distributors, depending upon the product. This service can assist you with technical questions or problem solving during normal business hours. Emergency assistance is also available during non-business hours by phoning our toll-free number and stating the urgency of your problem. For technical support, please contact us via telephone, email us, or use our website and reference *Customer Services* and then *Technical Support*.

Product Training is available at many of our worldwide locations (standard classes). We also offer customized classes, which can be tailored to your needs and can be held at one of our locations or at your site. This training, conducted by experienced personnel, will assure that you will be able to maintain system reliability and availability. For information concerning training, please contact us via telephone, email us, or use our website and reference *Customer Services* and then *Product Training*.

Field Service engineering on-site support is available, depending on the product and location, from one of our many worldwide locations or from one of our authorized distributors. The field engineers are experienced both on Woodward products as well as on much of the non-Woodward equipment with which our products interface. For field service engineering assistance, please contact us via telephone, email us, or use our website and reference *Customer Services* and then *Technical Support*.

# 723 Control Specification

### Input Power

Power Supply Rating	18 - 40 Vdc ( Nominal 24 Vdc )
Power Consumption	40 W nominal

## Signal Inputs

Current Inputs ( x 4 )	4 - 20 mA
MPU Inputs ( x 2 )	400 - 15 000 Hz / 1 - 50 Vrms
Discrete Inputs ( x 8 )	10 mA / port at 24 Vdc
Load Sharing Input ( x 1 )	0 - 3 Vdc

### Signal Outputs

Actuator Outputs ( x 2 )	0 - 180 mA and/or 4-20 mA
Analog Outputs ( x 2 )	4 - 20 mA / Max Load 600 ohm
Relay Contact Outputs (x 3)	2 Amp Resistive at 28 Vdc
	0.5 Amp Resistive at 125 Vdc

### Environment

C	Operating Temperature	-40 to 70 °C
	Storage Temperature	-55 to 105 °C
	Humidity	95% at +20 to +55 °C
		Lloyd's Register of Shipping Specification Humidity Test 1
	Mechanical Vibration	Lloyd's Register of Shipping Specification Vibration Test 1
	Mechanical Shock	US MIL-STD 810C, Method 516.2, Proc. I, II, V
	EMI/RFI Specification	Lloyd's Register of Shipping Specification
		EN 50081-2 and EN 50082-2

We appreciate your comments about the content of our publications.

Please send comments to: Woodward Governor (Japan), LTD

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Please include the manual number from the front cover of this publication.



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Email and Website-www.woodward.com

Woodward has company-owned plants, subsidiaries, and branches, as well as authorized distributors and other authorized service and sales facilities throughout the world.

Complete address / phone / fax / email information for all locations is available on our website.

2008/08/Makuhari