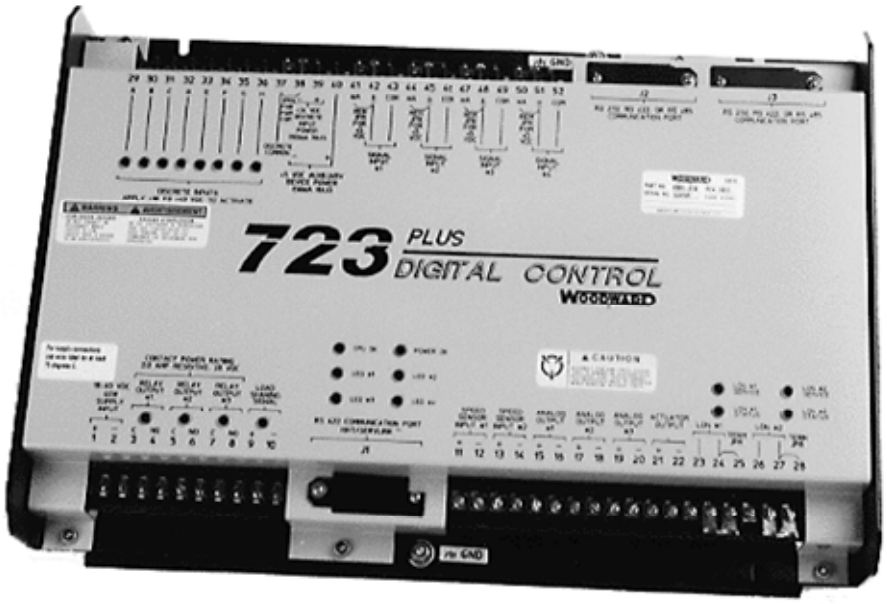
WOODWARD

Product Manual 26373
(Revision B)
Original Instructions



723PLUS Load Sharing Control
Cat ADEM

8280-1076

Woodward manual 02877 is also required.

Application Manual

General Precautions

Read this entire manual and all other publications pertaining to the work to be performed before installing, operating, or servicing this equipment.

Practice all plant and safety instructions and precautions.

Failure to follow instructions can cause personal injury and/or property damage.

Revisions

This publication may have been revised or updated since this copy was produced. To verify that you have the latest revision, check manual *26311* , *Revision Status & Distribution Restrictions of Woodward Technical Publications*, on the *publications page* of the Woodward website:

www.woodward.com/publications

The latest version of most publications is available on the *publications page*. If your publication is not there, please contact your customer service representative to get the latest copy.

Proper Use

Any unauthorized modifications to or use of this equipment outside its specified mechanical, electrical, or other operating limits may cause personal injury and/or property damage, including damage to the equipment. Any such unauthorized modifications: (i) constitute "misuse" and/or "negligence" within the meaning of the product warranty thereby excluding warranty coverage for any resulting damage, and (ii) invalidate product certifications or listings.

Translated Publications

If the cover of this publication states "Translation of the Original Instructions" please note:

The original source of this publication may have been updated since this translation was made. Be sure to check manual *26311* , *Revision Status & Distribution Restrictions of Woodward Technical Publications*, to verify whether this translation is up to date. Out-of-date translations are marked with ⚠. Always compare with the original for technical specifications and for proper and safe installation and operation procedures.

Revisions—Changes in this publication since the last revision are indicated by a black line alongside the text.

Contents

Illustrations and Tables

Warnings and Notices

Important Definitions

This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

- **DANGER**—Indicates a hazardous situation which, if not avoided, will result in death or serious injury.
- **WARNING**—Indicates a hazardous situation which, if not avoided, could result in death or serious injury.
- **CAUTION**—Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.
- **NOTICE**—Indicates a hazard that could result in property damage only (including damage to the control).
- **IMPORTANT**—Designates an operating tip or maintenance suggestion.

⚠WARNING

Overspeed / Overtemperature / Overpressure

The engine, turbine, or other type of prime mover should be equipped with an overspeed shutdown device to protect against runaway or damage to the prime mover with possible personal injury, loss of life, or property damage.

The overspeed shutdown device must be totally independent of the prime mover control system. An overtemperature or overpressure shutdown device may also be needed for safety, as appropriate.

⚠WARNING

Personal Protective Equipment

The products described in this publication may present risks that could lead to personal injury, loss of life, or property damage. Always wear the appropriate personal protective equipment (PPE) for the job at hand. Equipment that should be considered includes but is not limited to:

- **Eye Protection**
- **Hearing Protection**
- **Hard Hat**
- **Gloves**
- **Safety Boots**
- **Respirator**

Always read the proper Material Safety Data Sheet (MSDS) for any working fluid(s) and comply with recommended safety equipment.

⚠WARNING

Start-up

Be prepared to make an emergency shutdown when starting the engine, turbine, or other type of prime mover, to protect against runaway or overspeed with possible personal injury, loss of life, or property damage.

⚠WARNING

Automotive Applications

On- and off-highway Mobile Applications: Unless Woodward's control functions as the supervisory control, customer should install a system totally independent of the prime mover control system that monitors for supervisory control of engine (and takes appropriate action if supervisory control is lost) to protect against loss of engine control with possible personal injury, loss of life, or property damage.

NOTICE

Battery Charging Device

To prevent damage to a control system that uses an alternator or battery-charging device, make sure the charging device is turned off before disconnecting the battery from the system.

Electrostatic Discharge Awareness

NOTICE

Electrostatic Precautions

Electronic controls contain static-sensitive parts. Observe the following precautions to prevent damage to these parts:

- **Discharge body static before handling the control (with power to the control turned off, contact a grounded surface and maintain contact while handling the control).**
- **Avoid all plastic, vinyl, and Styrofoam (except antistatic versions) around printed circuit boards.**
- **Do not touch the components or conductors on a printed circuit board with your hands or with conductive devices.**

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

Follow these precautions when working with or near the control.

1. 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.
2. 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 1.
General Information

Introduction

The Woodward part numbers belonging to the 723PLUS Load Sharing Control/Cat ADEM are the following:

- **System:** **8280-1076**
- Hardware: 723PLUS: 9906-619
- Application software: 723PLUS: 5601-1088

The following drawings belong to the system:

- Functional block diagram: 9989-4123

The Woodward 723PLUS Load Sharing Control/Cat ADEM has the following functionality:

- Speed synchronization
- Load sharing control

Features:

- Configurable I/O ranges and assignment to I/O channels
- Use one or individual Speed-Reference inputs.
- Extensive Service and Configure menus for tuning and monitoring Hand Held Programmer (723PLUS serial port J1), Watch Window, and ServLink (723PLUS serial port J2, J1)
- Test/Override functionality for I/O signals
- Modbus® * communication available with extensive list of signals (723PLUS serial port J3)
- Communications are prepared for possible future graphic HMI software (723PLUS serial port J2)

*—Modbus is a trademark of Schneider Automation Inc.

Associated Publications

The following publications contain additional product or installation information on Load Sharing and Speed Controls, and related components. These can be ordered from any Woodward office. Manuals can be downloaded with the following link: **www.woodward.com/publications**.

Manual 02877, *723PLUS Digital Control*
Manual 25070, *Electronic Governor Installation Guide*
Manual 26260, *Governing Fundamentals and Power Management*
Manual 82715, *Guide for Handling and Protection of Electronic Controls, Printed Circuit Boards, and Modules*
Product Specification 03202, *Woodward Watch Window Standard*
Application Note 83402, *PID Control*

General Safety Precautions

Obey the following safety precautions when you install the unit:

- Obey all cautions or warnings given in the procedures.
- Never bypass or override machine safety devices.

Chapter 2.
Inputs and Outputs

Speed Sensor Inputs

The following analog input signals have been defined for this control:
- Engine A Speed-Sensor Input #1
- Engine B Speed-Sensor Input #2

These speed sensor inputs can be either passive (MPU) or active (PROXIMITY); The respective jumpers on the 723+ must be set accordingly (see manual 02877).

Using the CONFIGURATION menu, the number of teeth for these inputs can be adjusted.

Analog Inputs

The following analog input signals have been defined for this control:
- Engine A Speed-Reference Input
- Engine A Load Input
- Engine B Speed-Reference Input
- Engine B Load Input

Using the CONFIGURATION menu, these inputs can be enabled and assigned to any of the 4 analog inputs available on the 723PLUS.

Engine A/B Speed-Reference Input
This input is the nominal Speed-Reference for engine A/B. The Speed Reference Input for both engines can be assigned to the same analog input channel.

Engine A/B Load Input
This input is the load input for engine A/B. This could be based on a real kW measurement, torque measurement, or fuel rack position.

Analog Outputs

The following analog signals can be output on this control:
- Engine A Speed-Reference Output
- Engine B Speed-Reference Output
- Engine's Total Load
- Bias PID
- Analog Input #1
- Analog Input #2
- Analog Input #3
- Analog Input #4

Using the CONFIGURATION menu, these signals can be assigned to any of the 4 analog outputs available on the 723PLUS.

Engine A/B Speed-Reference Output
This outputs engine A/B Speed-Reference, biased from synchronization or load control.

Engines Total Load
This outputs the total load of engine A and B

Bias PID
This outputs the load sharing control PID value.

Analog Input #1 ~ #4
Any of these analog input signals can be output and assigned to any of the analog output signals.

Discrete Inputs

The following discrete input signals have been defined for this control:

- Engine A Clutch
- Engine A Raise
- Engine A Lower
- Engine A Unload
- Engine A Stop
- Reset
- Engine B Clutch
- Engine B Raise
- Engine B Lower
- Engine B Unload
- Engine B Stop

Using the CONFIGURATION menu, these inputs can be enabled and assigned to any of the 8 discrete inputs available on the 723PLUS.

Engine A/B Clutch
When this input contact is closed, the control assumes engine A/B is connected to the common gearbox.

Engine A/B Raise
When this input contact is closed, the control increases engine A/B speed-reference output, when not in load sharing mode. You can assign the Raise command for both engines to the same contact input.

Engine A/B Lower
When this input contact is closed, the control decreases engine A/B speed-reference output, when not in load sharing mode. You can assign the Lower command for both engines to the same contact input.

Engine A/B Unload
When this input contact is closed, the control tries to unload engine A/B, when in load sharing mode.

Engine A/B Stop
When this input contact is closed, the control outputs the minimal Speed-Reference (0%, 4 mA) for engine A/B. You can assign the Stop commands for both engines to the same contact input.

Reset
The reset can be used to reset Minor and Major Alarms. The reset is the same as the “Software Reset” using the SERVICE menus.

Relay Driver Outputs / LED Driver Outputs

The following discrete signals can be output on this control:

- Minor Alarm
- Major Alarm
- Any I/O in Test/Override
- Analog Input #1 fault
- Analog Input #2 fault
- Analog Input #3 fault
- Analog Input #4 fault
- Engine A Clutch
- Engine B Clutch
- Load Sharing is Active
- Speed A equal B

Using the CONFIGURATION menu, these signals can be assigned to any of the 3 discrete outputs and/or any of the 4 LED's available on the 723PLUS.

Minor Alarm

This signal indicates a Minor Alarm is active. A Reset command might reset this, unless the cause of this Minor Alarm persists.

Major Alarm

This signal indicates a Major Alarm is active. A Reset command might reset this, unless the cause of this Major Alarm persists.

Any I/O in Test/Override

This signal indicates that any of the input or output signals has been forced manually to a test value using the SERVICE menu.

Analog Input #1~4 Fault

These signals indicate an out of range failure (wire break) for analog input #1~4.

Engine A/B Clutch

This signal indicates the engine A/B Clutch status.

Load Sharing

The signal indicates the load sharing control PID is active.

Speed A equal B

This signal indicates the absolute difference between Speed A and B is less than a tunable threshold [rpm], and stays less for a tunable delay time. The threshold and delay times can be set in the SERVICE menus.

Chapter 3.
Description of Operation

Introduction

This chapter provides an overview of the features and operation of the 723PLUS Load Sharing Control/Cat ADEM.

The control defines 4 operation modes:
- Stopped / Bypassed
- Speed-Reference Forward Mode
- Synchronization Mode
- Load Sharing Mode

Stopped / Bypassed

When the Engine A/B Stop command is used, closing of the respective contact forces the control to output minimum (0%, 4 mA) for Engine A/B Speed-Reference Output.

The Engine A/B Stop command will ignore any biases from either synchronization or load sharing control.

Speed-Reference Forward Mode

When both engine clutches are open, the control defaults to output each engine's speed-reference input directly to each engine's speed-reference output.

A CONFIGURE option is available to have just one common speed-reference for both engines. Engine B Speed-Reference will then follow the Engine A Speed-Reference input signal.

Engine A/B Raise and Lower commands are ignored. Engine A/B Load signals are ignored.

Synchronization Mode

When just one engine is clutched in, that is connected to the gearbox, the respective Raise and Lower contacts can be used to synchronize the speed of the other engine which is not clutched in.

The synchronization bias will be added to the nominal speed reference of the clutched out engine. This synchronization bias is volatile; once both engines are either clutched in or clutched out, the bias will be reset to 0.

When both speed signals from engine A and B are within a certain adjustable window, a Synchronize OK Check relay can be energized, which can be used as a clutch-in permissive.

Load Sharing Mode

When both engines are clutched in, that is, mechanically coupled to the gearbox, the control will try to load share between the two engines.

A PID controller generates speed biases for engine A and engine B such that each engine will load-share according the required ratio which is defined normally as 50% of the total load.

Unequal load sharing is possible by adjusting the LOAD RATIO setting in the SERVICE menu.

In steady state, the PID will have an output of 50%, equaling 0 rpm bias for each engine. An adjustable PID BIAS RANGE defines the absolute bias when the Load Sharing PID is at either 0% or 100%.

The Load Sharing bias for engine A and B are complementary; when engine A gets a positive bias, engine B gets the same bias negatively.

IMPORTANT **Changing the PID BIAS RANGE might require readjustment of the dynamic settings of the Load Sharing PID.**

When the second engine clutches in, the control will soft-load this second engine with an adjustable rate to the required load (normally 50% of both engines total load). When the soft-loading has finished, normal load sharing is operational.

When an unload contact is received for either engine, the load set point for that engine is set to its UNLOAD SETPOINT. The control will unload the engine with an adjustable rate; the other engine will take the remaining load.

When the unload command is removed, soft-loading will be initiated. When the soft-loading has finished, normal load-sharing is operational again.

Load sharing mode will not be possible and be disabled in the following cases:

- Engine A or B Speed-Reference Input fault
- Engine A or B Load Input fault
- Engine A or B Stop command
- Engine A or B Clutch is open

Chapter 4.
Configure and Service Menus

Introduction

This chapter describes the parameters that can be configured, tuned and monitored.

Where applicable, the nominal setting for each tunable is listed (the nominal values are provided only as a guideline). The actual settings are obtained from the engine manufacturer or determined during commissioning and should be noted in the Actual column for future reference.

Configuration and Service menus can be accessed by either using the hand held programmer or using the software tools Watch Window and ServLink DDE Server. Refer to manual 02877, *723PLUS Digital Control Hardware Manual*, for more instructions how to use these tools.

Configure Mode

IMPORTANT **To access the Configure menus, the engine(s) must be stopped.**

The Configure Mode consists of these menus:

- *Configure SpdSensing*
- *Configure AI Ch# *
- *Configure AO Sel# *
- *Configure DI Ch# *
- *Configure DO Sel# *
- *Config Minor ALM *
- *Config Major ALM *
- *Configure Modbus *

*Configure SpdSensing *

Description	Range	Nominal	Actual
#Teeth SS A	(4, 500)	#136	
#Teeth SS B	(4, 500)	#136	

#Teeth SS A
Sets the number of teeth for the gear-wheel for the engine A speed sensor.

#Teeth SS B
Sets the number of teeth for the gear-wheel for the engine B speed sensor.

*Configure AI Ch# *

Description	Range	Nominal	Actual
A SpeedRef Ch#	(0, 4)	#1	
A SpdRef DfltVal	(0.0, 5000.0)	#2300.0	
B SpdRef same as A	TRUE / FALSE	TRUE	
B SpeedRef Ch#	(0, 4)	#1	
B SpdRef DfltVal	(0.0, 5000.0)	#2300.0	
A EngLoad Ch#	(0, 4)	2	
A EngLoad DfltVal	(–25.0,125.0)	2.5	
B EngLoad Ch#	(0, 4)	3	
B EngLoad DfltVal	(–25.0,125.0)	2.5	

A SpeedRef Ch#
Assigns the Engine A Speed-Reference to any of the 4 analog input channels. When 0 is selected, **A SpdRef DfltVal** will be used and there will never be a signal failure.

A SpdRef DfltVal
This is a tunable value for Engine A Speed-Reference in case **A SpeedRef Ch#** has been set to 0. It might be used as a backup for example, in case the 4–20 mA signal fails.

B SpdRef same as A
When this option is set to **TRUE**, the **B SpeedRef Ch#** will be ignored, and Engine B Speed-Reference will be equal to Engine A Speed-Reference.

B SpeedRef Ch#
Assigns the Engine B Speed-Reference to any of the 4 analog input channels. When 0 is selected, **B SpdRef DfltVal** will be used and there will never be a signal failure.

B SpdRef DfltVal
This is a tunable value for Engine B Speed-Reference in case **B SpeedRef Ch#** has been set to 0. It might be used as a backup for example, in case the 4–20 mA signal fails.

*Configure AO Sel# *

Description	Range	Nominal	Actual
AO1 Sel#	(0, 8)	#1	
AO1 DfltVal	(–25.0, 125.0)	0.0	
AO2 Sel#	(0, 8)	#2	
AO2 DfltVal	(–25.0, 125.0)	0.0	
ACT1 Sel#	(0, 8)	#3	
ACT1 DfltVal	(–25.0, 125.0)	0.0	
ACT2 Sel#	(0, 8)	#0	
ACT2 DfltVal	(–25.0, 125.0)	0.0	

The following list of signals (after scaling to 0~100%) can be output:
1. A Reference Output
2. B Reference Output
3. Total Load Output
4. CH1 input value
5. CH2 input value
6. CH3 input value
7. CH4 input value
8. Load Sharing PID value

For all output channels, the output range is: 0% = 4 mA, 100% = 20 mA

AO1~2 Sel#
Assigns any of the above signals to analog output #1~2.
When 0 is selected, **AO1~2 DfltVal** will be output.

AO1~2 DfltVal
This is a tunable value for analog output #1~2 in case **AO1~2 Sel#** has been set to 0. It might be used to output a fixed value.

ACT1~2 Sel#
Assigns any of the above signals to actuator output #1~2.
When 0 is selected, **ACT1~2 DfltVal** will be output.

ACT1~2 DfltVal
This is a tunable value for actuator output #1~2 in case **ACT1~2 Sel#** has been set to 0. It might be used to output a fixed value.

*Configure DI Ch# *

Description	Range	Nominal	Actual
A Clutch Ch#	(0, 8)	#1	
B Clutch Ch#	(0, 8)	#2	
A Raise Ch#	(0, 8)	#3	
A Lower Ch#	(0, 8)	#4	
B Raise Ch#	(0, 8)	#3	
B Lower Ch#	(0, 8)	#4	
A Unload Ch#	(0, 8)	#0	
B Unload Ch#	(0, 8)	#0	
A Stop Ch#	(0, 8)	#5	
B Stop Ch#	(0, 8)	#6	
Reset Ch#	(0, 8)	#8	

A Clutch Ch#
Assigns the Engine A Clutch signal to any of the 8 discrete input channels. When 0 is selected, this function is disabled (value is **FALSE**).

B Clutch Ch#
Assigns the Engine B Clutch signal to any of the 8 discrete input channels. When 0 is selected, this function is disabled (value is **FALSE**).

A Raise Ch#
Assigns the Engine A Raise signal to any of the 8 discrete input channels. When 0 is selected, this function is disabled (value is **FALSE**).

A Lower Ch#
Assigns the Engine A Lower signal to any of the 8 discrete input channels. When 0 is selected, this function is disabled (value is **FALSE**).

B Raise Ch#
Assigns the Engine B Raise signal to any of the 8 discrete input channels. When 0 is selected, this function is disabled (value is **FALSE**).

B Lower Ch#
Assigns the Engine B Lower signal to any of the 8 discrete input channels. When 0 is selected, this function is disabled (value is **FALSE**).

A Unload Ch#
Assigns the Engine A Unload signal to any of the 8 discrete input channels. When 0 is selected, this function is disabled (value is **FALSE**).

B Unload Ch#
Assigns the Engine B Unload signal to any of the 8 discrete input channels. When 0 is selected, this function is disabled (value is **FALSE**).

A Stop Ch#
Assigns the Engine A Stop signal to any of the 8 discrete input channels. When 0 is selected, this function is disabled (value is **FALSE**).

B Stop Ch#
Assigns the Engine B Stop signal to any of the 8 discrete input channels. When 0 is selected, this function is disabled (value is **FALSE**).

Reset Ch#
Assigns the Reset signal to any of the 8 discrete input channels. When 0 is selected, this function is disabled (value is **FALSE**).

*Configure DO Sel# *

Description	Range	Nominal	Actual
DO1 Sel#	(0, 11)	#1	
DO2 Sel#	(0, 11)	#2	
DO3 Sel#	(0, 11)	#11	
LED1 Sel#	(0, 11)	#8	
LED2 Sel#	(0, 11)	#9	
LED3 Sel#	(0, 11)	#1	
LED4 Sel#	(0, 11)	#2	

The following list of signals can be output:
1. Minor Alarm
2. Major Alarm
3. Any IO in Test/Override
4. AI CH1 Hardware Fault
5. AI CH2 Hardware Fault
6. AI CH3 Hardware Fault
7. AI CH4 Hardware Fault
8. A Clutch is closed
9. B Clutch is closed
10. Load Sharing is active
11. Speed A equal B

DO1~3 Sel#
Assigns any of the above signals to relay output #1~3.
When 0 is selected, **FALSE** will be output.

LED1~4 Sel#
Assigns any of the above signals to 723PLUS LED#1~4.
When 0 is selected, **FALSE** will be output.

Config Minor ALM

Description	Range	Nominal	Actual
AI in test	TRUE/FALSE	TRUE	
AO in test	TRUE/FALSE	TRUE	
DI in test	TRUE/FALSE	TRUE	
DO in test	TRUE/FALSE	TRUE	
A SpdRef Fault	TRUE/FALSE	TRUE	
B SpdRef Fault	TRUE/FALSE	TRUE	
A EngLoad Fault	TRUE/FALSE	TRUE	
B EngLoad Fault	TRUE/FALSE	TRUE	
Modbus Fault	TRUE/FALSE	TRUE	

AI in test
Define whether any analog input in test mode causes a Minor Alarm.

AO in test
Define whether any analog output in test mode causes a Minor Alarm.

DI in test
Define whether any discrete input in test mode causes a Minor Alarm.

DO in test
Define whether any discrete output in test mode causes a Minor Alarm.

A SpdRef Fault
Define whether a failure of analog input signal Engine A Speed-Reference causes a Minor Alarm.

B SpdRef Fault
Define whether a failure of analog input signal Engine B Speed-Reference causes a Minor Alarm.

A EngLoad Fault
Define whether a failure of analog input signal Engine A Load causes a Minor Alarm.

B EngLoad Fault
Define whether a failure of analog input signal Engine B Load causes a Minor Alarm.

Modbus Fault
Define whether a failure of the Modbus communications causes a Minor Alarm.

Config Major ALM

Description	Range	Nominal	Actual
AI in test	TRUE/FALSE	FALSE	
AO in test	TRUE/FALSE	FALSE	
DI in test	TRUE/FALSE	FALSE	
DO in test	TRUE/FALSE	FALSE	
A SpdRef Fault	TRUE/FALSE	FALSE	
B SpdRef Fault	TRUE/FALSE	FALSE	
A EngLoad Fault	TRUE/FALSE	FALSE	
B EngLoad Fault	TRUE/FALSE	FALSE	
Modbus Fault	TRUE/FALSE	FALSE	

AI in test
Define whether any analog input in test mode causes a Major Alarm.

AO in test
Define whether any analog output in test mode causes a Major Alarm.

DI in test
Define whether any discrete input in test mode causes a Major Alarm.

DO in test
Define whether any discrete output in test mode causes a Major Alarm.

A SpdRef Fault
Define whether a failure of analog input signal Engine A Speed-Reference causes a Major Alarm.

B SpdRef Fault
Define whether a failure of analog input signal Engine B Speed-Reference causes a Major Alarm.

A EngLoad Fault
Define whether a failure of analog input signal Engine A Load causes a Major Alarm.

B EngLoad Fault
Define whether a failure of analog input signal Engine B Load causes a Major Alarm.

Modbus Fault
Define whether a failure of the Modbus communications causes a Major Alarm.

*Configure Modbus *

Description	Range	Nominal	Actual
Modbus ASCII/RTU ?	(1, 2)	2	
Modbus Net Address	(1, 247)	1	

Modbus ASCII/RTU ?
1 = Modbus ASCII protocol, 2 = Modbus RTU protocol

Modbus Net Address
Defines the Modbus network address for this slave Modbus.

Service Mode

The Service Mode consists of these menus:

- *Monitor Analogs*
- *Monitor Discretes*
- *Monitor Alarms*
- *Speed Bias*
- *Load Balancing*
- *Define Range AI*
- *Define Range AO*
- Calibrate/Te
- *Calibrate/Test AO*
- *Calibrate/Test DI*
- *Calibration/Test DO*
- *Modbus Settings*
- * Port Setting J1 *

Monitor Analogs

Description	Range	Nominal	Actual
A Speed [rpm]			
B Speed [rpm]			
Speed Diff A-B [rpm]			
A SpdRef Inp [rpm]			
A SpdRef Out [rpm]			
A SpdRef Out [%]			
B SpdRef Inp [rpm]			
B SpdRef Out [rpm]			
B SpdRef Out [%]			
A Engine Load [%]			
B Engine Load [%]			
Total Eng Load [%]			
LoadShare PID [%]			
LoadShare Bias[rpm]			

A Speed [rpm]
Displays engine A speed in [rpm]

B Speed [rpm]
Displays engine B speed in [rpm]

Speed Diff A-B [rpm]
Displays the speed difference between engine A and B in [rpm]

A SpdRef Inp [rpm]
Displays the Engine A Speed-Reference input signal scaled in [rpm].

A SpdRef Out [rpm]
Displays the Engine A Speed-Reference output signal scaled in [rpm]. This is the Engine A Speed Reference nominal input signal plus the bias from either the synchronization mode or load sharing mode.

A SpdRef Out [rpm]
Displays the **A SpdRef Out [rpm]** signal, but now scaled in [%].

B SpdRef Inp [rpm]
Displays the Engine B Speed-Reference input signal scaled in [rpm].

B SpdRef Out [rpm]
Displays the Engine B Speed-Reference output signal scaled in [rpm]. This is the Engine B Speed Reference nominal input signal plus the bias from either the synchronization mode or load sharing mode.

B SpdRef Out [rpm]
Displays the **B SpdRef Out [rpm]** signal, but now scaled in [%].

A Engine Load [%]
Displays the Engine A Load input signal scaled in [%].

B Engine Load [%]
Displays the Engine B Load input signal scaled in [%].

Total Eng Load [%]
Displays the sum of Engine A and B Load input signal [0–200%].

LoadShare PID [%]
Displays the Load sharing PID output [%].

LoadShare Bias [rpm]
Displays the **LoadShare PID [%]** signal, but now scaled in [rpm].

Monitor Discretes

Description	Range	Nominal	Actual
A Clutch Closed			
B Clutch Closed			
A Raise SpeedRef			
A Lower SpeedRef			
B Raise SpeedRef			
B Lower SpeedRef			
A Unload Engine			
B Unload Engine			
A Stop Engine			
B Stop Engine			
Reset Input			
LoadShare is active			
Speed A equal B			

A Clutch Closed
Displays the status of the Engine A Clutch contact.

B Clutch Closed
Displays the status of the Engine B Clutch contact.

A Raise SpeedRef
Displays the status of the Engine A Raise contact.

A Lower SpeedRef
Displays the status of the Engine A Lower contact.

B Raise SpeedRef
Displays the status of the Engine B Raise contact.

B Lower SpeedRef
Displays the status of the Engine B Lower contact.

A Unload Engine
Displays the status of the Engine A Unload contact.

B Unload Engine
Displays the status of the Engine B Unload contact.

A Stop Engine
Displays the status of the Engine A Stop contact.

B Stop Engine
Displays the status of the Engine B Stop contact.

Reset Input
Displays the status of the Reset Input contact.

LoadShare is active
Displays whether or not load sharing mode is active.

Speed A equal B
This indicates Speed A is equal to B (see also SERVICE menu SPEED BIAS).

Monitor Alarms

Description	Range	Nominal	Actual
Minor Alarm			
Major Alarm			
IO in Test/Override			
AI1 Hardware Fault			
AI2 Hardware Fault			
AI3 Hardware Fault			
AI4 Hardware Fault			
A SpeedRef Fault			
B SpeedRef Fault			
A Eng Load Fault			
B Eng Load Fault			
Modbus Fault			
Reset Alarms[F,T,F]	TRUE/FALSE	FALSE	
Enable Auto Reset	TRUE/FALSE	FALSE	
Auto Reset Time [s]	(0.0, 600.0)	5.0	

Minor Alarm
Displays whether a Minor Alarm is active.

Major Alarm
Displays whether a Major Alarm is active.

IO in Test/Override
Displays whether any IO is in Test/Override mode.

AI1~4 Hardware Fault
Displays whether analog input #1~4 is out of range.

A SpeedRef Fault
Displays whether the Engine A Speed-Reference input is out of range.

B SpeedRef Fault
Displays whether the Engine B Speed-Reference input is out of range.

A Eng Load Fault
Displays whether the Engine A Load input is out of range.

B Eng Load Fault
Displays whether the Engine B Load input is out of range.

Modbus Fault
Displays whether there is any Modbus communication failure.

Reset Alarms[F,T,F]
This software reset command can be used to clear (latching) alarms for which the cause has disappeared. The signal shall be toggled from FALSE to TRUE and back to FALSE to generate a reset pulse.

Enable Auto Reset
When set to TRUE, the control issues reset pulses automatically.

Auto Reset Time [s]
This is the repetition time for the automatic reset pulse feature.

Speed Bias

Description	Range	Nominal	Actual
Sync Range [+/-rpm]	(0.01, 2000.0)	200.0	
Sync Rate [rpm/s]	(0.01, 200.0)	1.0	
PID BiasRange [rpm]	(0.01, 2000.0)	25.0	
All CL out, no R/L	TRUE/FALSE	TRUE	
A equ B window [rpm]	(0.0, 250.0)	5	
A equ B Pos-Del [s]	(0.0, 60.0)	3.0	
A equ B Neg-Del [s]	(0.0, 60.0)	3.0	
A equ B always ?	TRUE/FALSE	FALSE	
Speed Offset [rpm]	(0.0, 2500.0)	0.0	

Sync Range [+/-rpm]
This defines the possible bias range for synchronizing mode.
Maximum speed-reference (Raising) will be **Nominal + Sync Range.**
Minimum speed-reference (Lowering) will be **Nominal - Sync Range.**

Sync Rate [rpm/s]
This defines the rate of change for the bias from synchronizing mode.
This rate is applicable for both Raise and Lower contacts.

PID BiasRange [rpm]
This defines the possible bias range for load sharing mode.
PID at 50%, both engine speed-references will be **Nominal.**
PID at 0%, engine A speed-reference will be **Nominal – PID BiasRange**
PID at 100%, engine A speed-reference will be **Nominal + PID BiasRange**
PID at 0%, engine B speed-reference will be **Nominal + PID BiasRange**
PID at 100%, engine B speed-reference will be **Nominal - PID BiasRange**

All CL out, no R/L
When TRUE, the Raise and Lower contacts are ignored when both engine clutches are open.

A equ B window [rpm]
This defines the window [rpm] for speed-reference output A and B in which they are considered to be equal. The "Speed-Reference Out A equal to B" status can be output on any of the relays or LEDs.

A equ B Pos-Del [s]
This defines the delay time for speed-reference output A and B to stay within the window, before really activating the status "Speed-Reference Out A equal to B"

A equ B Neg-Del [s]
This defines the sustain time for the "Speed-Reference Out A equal to B" status. When the difference between speed-reference output A and B exceeds the window, and if the status "Speed-Reference Out A equal to B" is active, it will remain active for this time.

A equ B always ?
When set to TRUE, the "Speed-A equal to B" status is checked continuously. When set to FALSE, the "Speed-A equal to B" status can only be activated when in Synchronization mode.

Speed Offset [rpm]
This parameter can be used to centre the Load Sharing bias [rpm] in steady state to 0 rpm; the offset is added to Speed Reference Output A, and subtracted from Speed Reference Output B.

This should only be used to compensate for small differences between Speed Reference Output demand [rpm] and the actual speed. If the difference is too big, it is strongly advised to recalibrate the analog input/output signals.

Load Balancing

Description	Range	Nominal	Actual
PID P-Gain	(0.0, 100.0)	1.0	
PID I-Gain	(0.0, 50.0)	0.1	
PID S_D_R	(0.01, 100.0)	10.0	
Active Delay [s]	(0.0, 60.0)	2.0	
Load Ratio [%]	(0.0, 100.0)	50.0	
UnLd Setp A [%]	(0.0, 100.0)	2.0	
UnLd Rate A [%/s]	(0.01, 200.0)	1.0	
SoftLd Rate A [%/s]	(0.01, 200.0)	1.0	
UnLd Setp B [%]	(0.0, 100.0)	2.0	
UnLd Rate B [%/s]	(0.01, 200.0)	1.0	
SoftLd Rate B [%/s]	(0.01, 200.0)	1.0	

PID P-Gain
This defines proportional gain for the load sharing PID controller.

PID I-Gain
This defines integral gain for the load sharing PID controller.

PID S_D_R
This defines the Speed Derivative Ratio for the load sharing PID controller.

When S_D_R = 1 to 100, D = 1 / (S_D_R x I),
(The controller is Feedback Dominant).
When S_D_R = 0.01 to 1, D = S_D_R / 1
(The controller is Input Dominant).

IMPORTANT

Please refer to application note 83402, *PID Control*, to learn more about adjusting the dynamic settings for the load sharing PID.

Load Ratio [%]
This defines the load ratio engine A versus engine B for load sharing.
The default value of 50% results in equal load sharing for both engines.
A **Load Ratio** of 75% splits the total load into 75% for engine A and 25% for engine B.

Active Delay [s]
After clutching in the second engine, this is the adjustable time delay before load sharing mode is really activated. This delay allows for some settling on the engine part.

UnLd Setp A [%]
This is the unload set point for engine A when the Unload contact is closed.

UnLd Rate A [%/s]
This defines the unloading rate of change for engine A load set point when the Unload contact is closed.

SoftLd Rate A [%/s]
This defines the soft loading rate of change for engine A load set point when load sharing has just been activated or the Unload contact is opened again.

UnLd Setp B [%]
This is the unload set point for engine B when the Unload contact is closed.

UnLd Rate B [%/s]
This defines the unloading rate of change for engine B load set point when the Unload contact is closed.

SoftLd Rate B [%/s]
This defines the soft loading rate of change for engine B load set point when load sharing has just been activated or the Unload contact is opened again.

Define Range AI

Description	Range	Nominal	Actual
A SpdRef 4 mA [rpm]	(0.0, 5000.0)	500.0	
A SpdRef 20 mA [rpm]	(0.0, 5000.0)	3000.0	
A SpdRef Inp [rpm]			
B SpdRef 4 mA [rpm]	(0.0, 5000.0)	500.0	
B SpdRef 20 mA [rpm]	(0.0, 5000.0)	3000.0	
B SpdRef Inp [rpm]			
A EngLoad 4 mA [%]	(–9999, 9999)	0.0	
A EngLoad 20 mA [%]	(–9999, 9999)	100.0	
A EngLoad [%]			
B EngLoad 4 mA [%]	(–9999, 9999)	0.0	
B EngLoad 20 mA [%]	(–9999, 9999)	100.0	
B EngLoad [%]			

A SpdRef 4 mA [rpm]
This defines the engine A speed-reference [rpm] at 0% = 4 mA input.

A SpdRef 20 mA [rpm]
This defines the engine A speed-reference [rpm] at 100% = 20 mA input.

A SpdRef Inp [rpm]
This displays the engine A speed-reference [rpm] based on above scaling and the actual current into the configured analog input channel.

B SpdRef 4 mA [rpm]
This defines the engine B speed-reference [rpm] at 0% = 4 mA input.

B SpdRef 20 mA [rpm]
This defines the engine B speed-reference [rpm] at 100% = 20 mA input.

B SpdRef Inp [rpm]
This displays the engine B speed-reference [rpm] based on above scaling and the actual current into the configured analog input channel. If **B SpdRef same as A** has been configured to TRUE, above scaling for speed-reference B is ignored, since B will be equal to A.

A EngLoad 4 mA [%]
This defines the engine A engine load [%] @ 4 mA input.

A EngLoad 20 mA [%]
This defines the engine A engine load [%] @ 20 mA input.

A EngLoad Inp [%]
This displays the engine A load [%] based on above scaling and the actual current into the configured analog input channel.

B EngLoad 4 mA [%]
This defines the engine B engine load [%] at @ 4 mA input.

B EngLoad 20 mA [%]
This defines the engine B engine load [%] @ 20 mA input.

B EngLoad Inp [%]
This displays the engine B load [%] based on above scaling and the actual current into the configured analog input channel.

Define Range AO

Description	Range	Nominal	Actual
A SpdRef 4 mA [rpm]	(0.0, 5000.0)	500.0	
A SpdRef 20 mA [rpm]	(0.0, 5000.0)	3000.0	
B SpdRef 4 mA [rpm]	(0.0, 5000.0)	500.0	
B SpdRef 20 mA [rpm]	(0.0, 5000.0)	3000.0	
Total Load 4 mA [%]	(-100.0, 250.0)	0.0	
Total Load 20 mA [%]	(-100.0, 250.0)	200.0	

A SpdRef 4 mA [rpm]
This defines the engine A speed-reference [rpm] at 0% = 4 mA output.

A SpdRef 20 mA [rpm]
This defines the engine A speed-reference [rpm] at 100% = 20 mA output.

B SpdRef 4 mA [rpm]
This defines the engine B speed-reference [rpm] at 0% = 4 mA output.

B SpdRef 20 mA [rpm]
This defines the engine B speed-reference [rpm] at 100% = 20 mA output.

Total Load 4 mA [%]
This defines the total load [%] at 4 mA output.

Total Load 20 mA [%]
This defines the total load [%] at 20 mA output.
Note that the Total Load nominally ranges from 0%~200%

Calibrate/Test AI

Description	Range	Nominal	Actual
AI1 Gain	(0.1,10.0)	1.0	
AI1 Offset [%]	(-100.0, 100.0)	0.0	
Test AI1	TRUE/FALSE	FALSE	
Test Value AI1	(-50.0,150.0)	0.0	
AI1 [%]			
AI2 Gain	(0.1,10.0)	1.0	
AI2 Offset [%]	(-100.0, 100.0)	0.0	
Test AI2	TRUE/FALSE	FALSE	
Test Value AI2	(-50.0,150.0)	0.0	
AI2 [%]			
AI3 Gain	(0.1,10.0)	1.0	
AI3 Offset [%]	(-100.0, 100.0)	0.0	
Test AI3	TRUE/FALSE	FALSE	
Test Value AI3	(-50.0,150.0)	0.0	
AI3 [%]			
AI4 Gain	(0.1,10.0)	1.0	
AI4 Offset [%]	(-100.0, 100.0)	0.0	
Test AI4	TRUE/FALSE	FALSE	
Test Value AI4	(-50.0,150.0)	0.0	
AI4 [%]			

The normal calibrated range for the analog input channels is:
4 mA = 0%, 20 mA = 100%

With the Service menu *Define Range AI*, the real engineering units are mapped onto this 0~100% input range.

The Gain and Offset per individual channel can be used to compensate for inaccurate 4–20 mA transmitters.

AI1~4 Gain
This defines gain for analog input channel #1~4

AI1~4 Offset [%]
This defines offset [%] for analog input channel #1~4

Test AI1~4
Set to TRUE to switchover from 4–20 mA input to **Test Value AI1~4**

Test Value AI1~4
This value [%] is used for the analog input ch#1~4 when **Test AI1~4** is set to TRUE.

AI1~4 [%]
Displays the final value [%] (Gain and Offset applied, or test value) for analog input ch#1~4

Calibrate/Test AO

Description	Range	Nominal	Actual
AO1 Gain	(0.1,10.0)	1.0	
AO1 Offset [%]	(-100.0, 100.0)	0.0	
Test AO1	TRUE/FALSE	FALSE	
Test Value AO1	(-50.0,150.0)	0.0	
AO2 Gain	(0.1,10.0)	1.0	
AO2 Offset [%]	(-100.0, 100.0)	0.0	
Test AO2	TRUE/FALSE	FALSE	
Test Value AO2	(-50.0,150.0)	0.0	
ACT1 Gain	(0.1,10.0)	1.0	
ACT1 Offset [%]	(-100.0, 100.0)	0.0	
Test ACT1	TRUE/FALSE	FALSE	
Test Value ACT1	(-50.0,150.0)	0.0	
ACT2 Gain	(0.1,10.0)	1.0	
ACT2 Offset [%]	(-100.0, 100.0)	0.0	
Test ACT2	TRUE/FALSE	FALSE	
Test Value ACT2	(-50.0,150.0)	0.0	

The normal calibrated range for the analog output channels is:
4 mA = 0%, 20 mA = 100%

With the Service menu *Define Range AO*, the real engineering units are mapped onto this 0~100% output range.

The Gain and Offset per individual channel can be used to compensate for inaccurate 4–20 mA receivers.

AO1~2 Gain
This defines gain for analog output channel #1~2.

AO1~2 Offset [%]
This defines offset [%] for analog output channel #1~2.

Test AO1~2
Set to TRUE to switchover from configured output signal to **Test Value AO1~2.**

Test Value AO1~2
This value [%] is used for the analog output ch#1~2 when **Test AO1~2** is set to TRUE.

ACT1~2 Gain
This defines gain for actuator output channel #1~2.

ACT1~2 Offset [%]
This defines offset [%] for actuator output channel #1~2.

Test ACT1~2
Set to TRUE to switchover from configured output signal to **Test Value ACT1~2.**

Test Value ACT1~2
This value [%] is used for the actuator output ch#1~2 when **Test ACT1~2** is set to TRUE.

Calibrate/Test DI

Description	Range	Nominal	Actual
DI1 rev Acting ?	TRUE/FALSE	FALSE	
Test DI1	TRUE/FALSE	FALSE	
Test Value DI1 [T/F]	TRUE/FALSE	FALSE	
DI1 [T/F]			
DI2 rev Acting ?	TRUE/FALSE	FALSE	
Test DI2	TRUE/FALSE	FALSE	
Test Value DI2 [T/F]	TRUE/FALSE	FALSE	
DI2 [T/F]			
DI3 rev Acting ?	TRUE/FALSE	FALSE	
Test DI3	TRUE/FALSE	FALSE	
Test Value DI3 [T/F]	TRUE/FALSE	FALSE	
DI3 [T/F]			
DI4 rev Acting ?	TRUE/FALSE	FALSE	
Test DI4	TRUE/FALSE	FALSE	
Test Value DI4 [T/F]	TRUE/FALSE	FALSE	
DI4 [T/F]			
DI5 rev Acting ?	TRUE/FALSE	FALSE	
Test DI5	TRUE/FALSE	FALSE	
Test Value DI5 [T/F]	TRUE/FALSE	FALSE	
DI5 [T/F]			
DI6 rev Acting ?	TRUE/FALSE	FALSE	
Test DI6	TRUE/FALSE	FALSE	
Test Value DI6 [T/F]	TRUE/FALSE	FALSE	
DI6 [T/F]			
DI7 rev Acting ?	TRUE/FALSE	FALSE	
Test DI7	TRUE/FALSE	FALSE	
Test Value DI7 [T/F]	TRUE/FALSE	FALSE	
DI7 [T/F]			
DI8 rev Acting ?	TRUE/FALSE	FALSE	
Test DI8	TRUE/FALSE	FALSE	
Test Value DI8 [T/F]	TRUE/FALSE	FALSE	
DI8 [T/F]			

DI1~8 rev Acting ?
This defines whether discrete input ch#1~8 is close or open for function.

Test DI1~8
Set to TRUE to switchover from configured input signal to **Test Value DI1~8.**

Test Value DI1~8
This value is used for the discrete input ch#1~8 when **Test DI1~8** is set to TRUE.

DI1~8 [T/F]
Displays the final value (reversing applied, or test value) for discrete input ch#1~8.

Calibrate/Test DO

Description	Range	Nominal	Actual
DO1 rev Acting ?	TRUE/FALSE	FALSE	
Test DO1	TRUE/FALSE	FALSE	
Test Value DO1 [T/F]	TRUE/FALSE	FALSE	
DO2 rev Acting ?	TRUE/FALSE	FALSE	
Test DO2	TRUE/FALSE	FALSE	
Test Value DO2 [T/F]	TRUE/FALSE	FALSE	
DO3 rev Acting ?	TRUE/FALSE	FALSE	
Test DO3	TRUE/FALSE	FALSE	
Test Value DO3 [T/F]	TRUE/FALSE	FALSE	
LED1 rev Acting ?	TRUE/FALSE	FALSE	
Test LED1	TRUE/FALSE	FALSE	
Test Value LED1 [T/F]	TRUE/FALSE	FALSE	
LED2 rev Acting ?	TRUE/FALSE	FALSE	
Test LED2	TRUE/FALSE	FALSE	
Test Value LED2 [T/F]	TRUE/FALSE	FALSE	
LED3 rev Acting ?	TRUE/FALSE	FALSE	
Test LED3	TRUE/FALSE	FALSE	
Test Value LED3 [T/F]	TRUE/FALSE	FALSE	
LED4 rev Acting ?	TRUE/FALSE	FALSE	
Test LED4	TRUE/FALSE	FALSE	
Test Value LED4 [T/F]	TRUE/FALSE	FALSE	

DO1~3 rev Acting ?
This defines whether relay output ch#1~3 is NC or NO.

Test DO1~3
Set to TRUE to switchover from configured output signal to **Test Value DO1~3.**

Test Value DO1~3
This value is used for the relay output ch#1~3 when **Test DO1~3** is set to TRUE.

LED1~4 rev Acting ?
This defines whether 723PLUS LED#1~4 is NC or NO.

Test LED1~4
Set to TRUE to switchover from configured output signal to **Test Value LED1~4.**

Test Value LED1~4
This value is used for the 723PLUS LED#1~4 when **Test LED1~4** is set to TRUE.

Modbus Settings

Description	Range	Nominal	Actual
HW configuration	(1, 3)	1	
Baud Rate	(1, 7)	6	
Stop Bits	(1, 3)	1	
Parity	(1, 3)	1	
Modbus TimeOut [s]	(0.0, 60.0)	5.0	

HW configuration
This sets the required electrical communications protocol:
1 = RS-232
2 = RS-422
3 = RS-485

Baud Rate
1 = 1200
2 = 1800
3 = 2400
4 = 4800
5 = 9600
6 = 19200
7 = 38400

Stop Bits
1 = 1 stop bit
2 = 1.5 stop bit
3 = 2 stop bits

Parity
1 = Off
2 = Odd
3 = Even

Modbus TimeOut [s]
Defines the delay before a Modbus communication fault will be initiated.

* Port Setting J1 *

Description	Range	Nominal	Actual
Set Download Mode ?	(1, 2)	2	

Set Download Mode ?
This sets the 723PLUS com port J1 usage setting:
1 = ServLink
2 = Hand-Held

IMPORTANT **After every reboot of the 723PLUS control, Set Download Mode ? is set back to 2, which is Hand-Held usage.**

Chapter 5.
Functional Block Diagram

This chapter contains Functional Block Diagram 9989-4123.

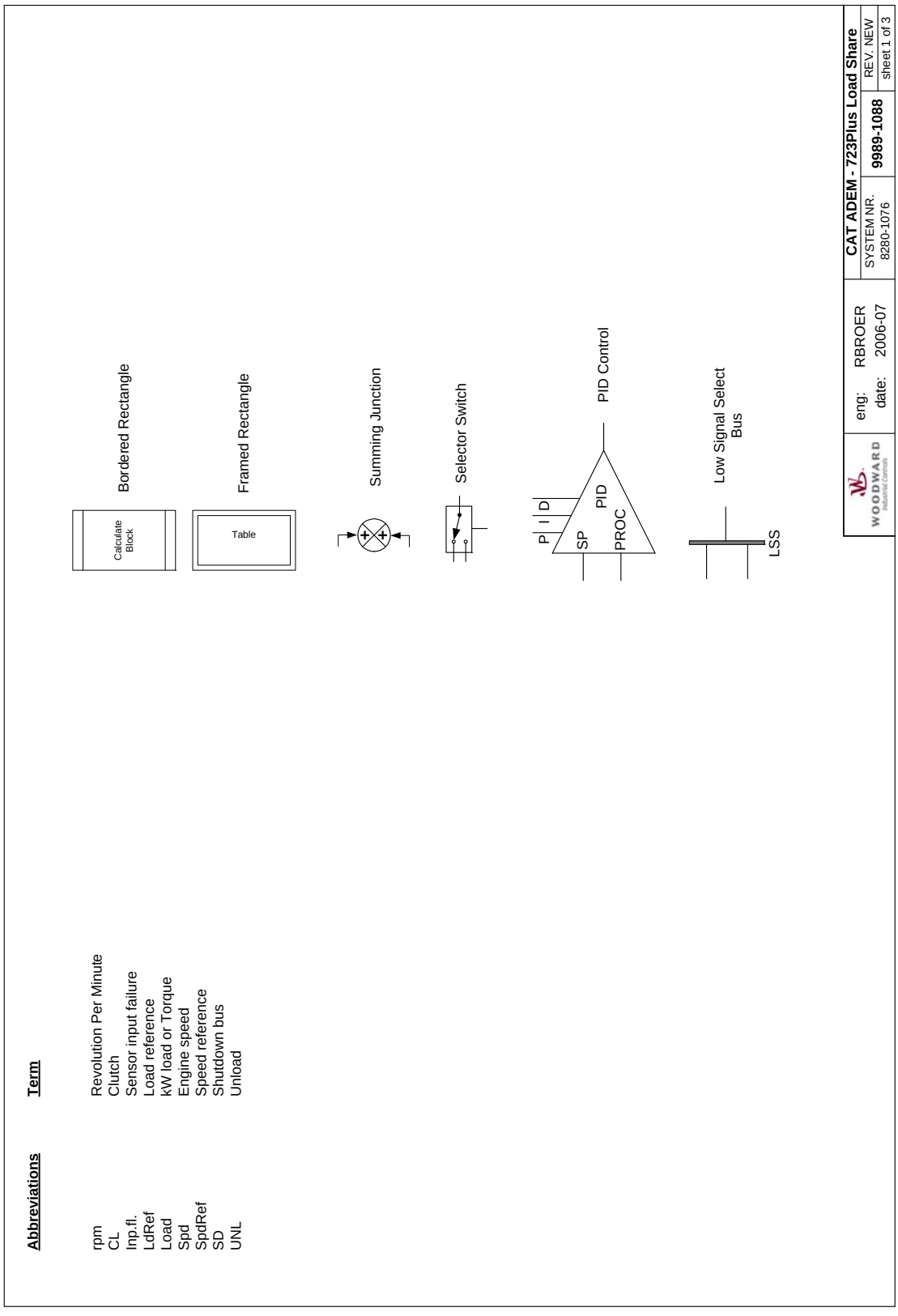


Figure 5-1a. Functional Block Diagram 9989-4123

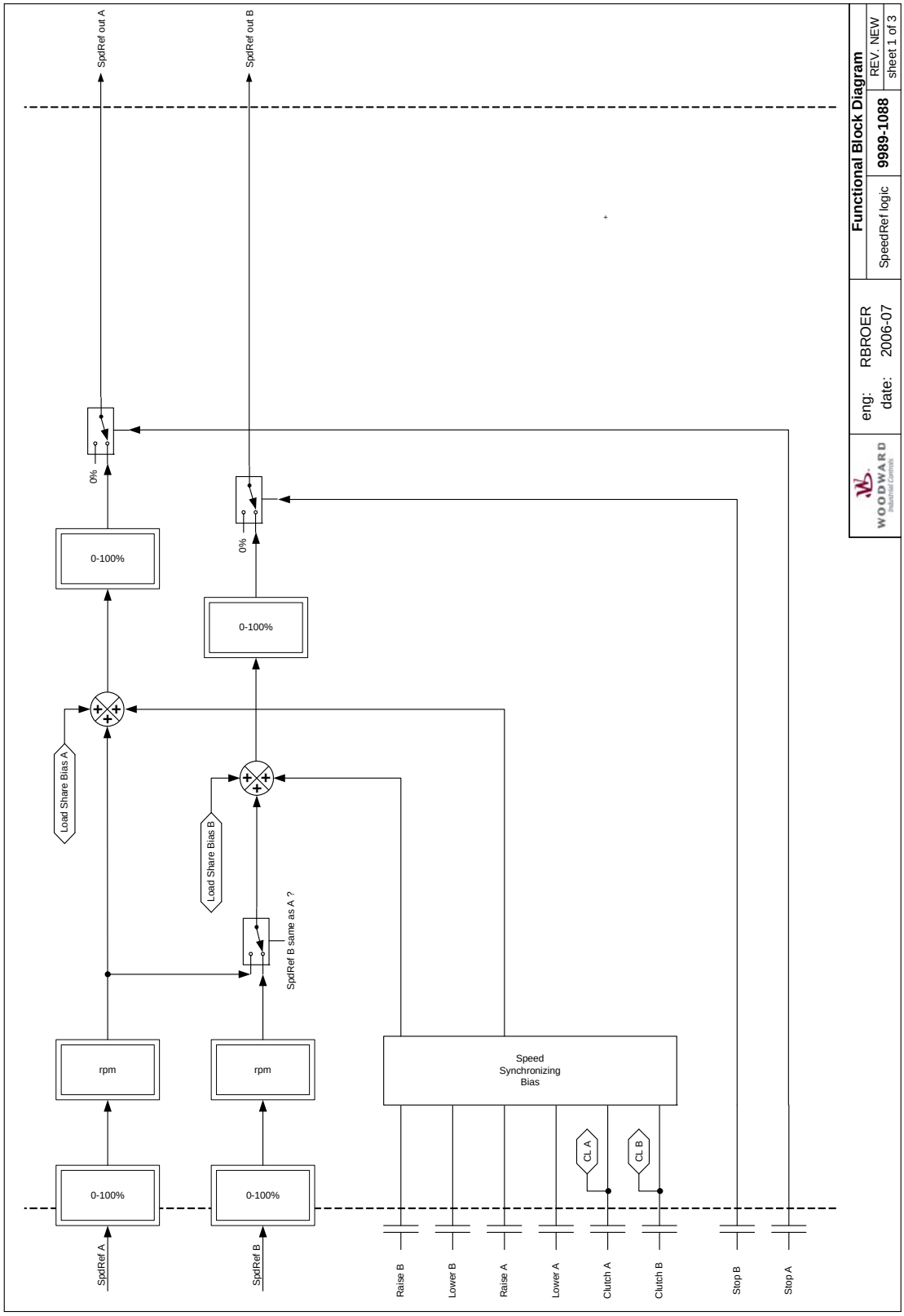


Figure 5-1b. Functional Block Diagram 9989-4123

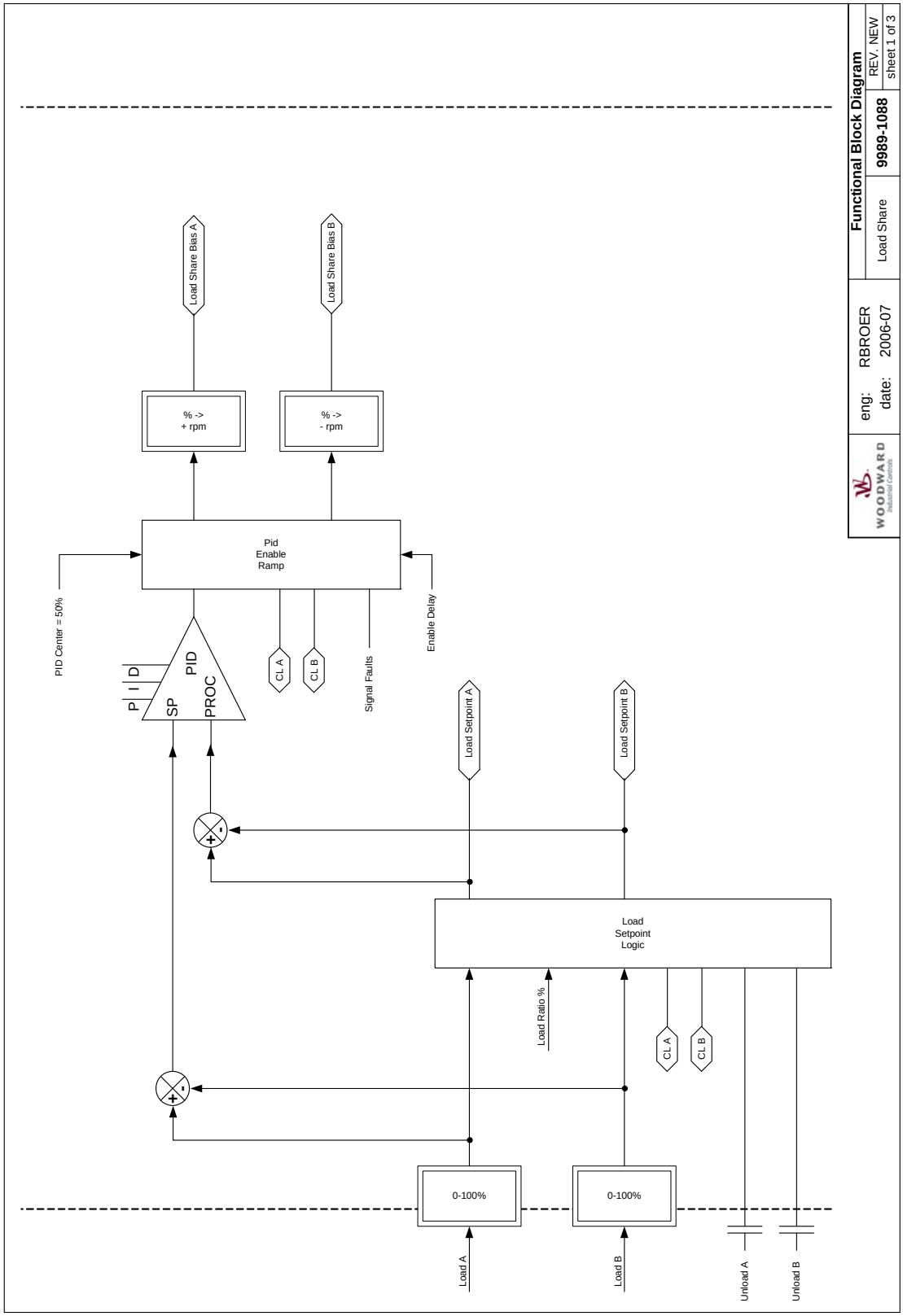


Figure 5-1c. Functional Block Diagram 9989-4123

Chapter 6.
Modbus Signals List

This chapter lists the Modbus List with 723PLUS Load Sharing Control/Cat ADEM system parameters which are available for monitoring by external systems (SCADA, PLC etc.)

The 723PLUS Modbus is always “slave”.

Boolean Writes

Address	Description
0:0001	Not Applicable

Boolean Reads

Address	Description
1:0001	Discrete Input ch#1
1:0002	Discrete Input ch#2
1:0003	Discrete Input ch#3
1:0004	Discrete Input ch#4
1:0005	Discrete Input ch#5
1:0006	Discrete Input ch#6
1:0007	Discrete Input ch#7
1:0008	Discrete Input ch#8
1:0009	Engine A Clutch
1:0010	Engine B Clutch
1:0011	Engine A Raise
1:0012	Engine A Lower
1:0013	Engine B Raise
1:0014	Engine B Lower
1:0015	Engine A Unload
1:0016	Engine B Unload
1:0017	Engine A Unload
1:0018	Engine B Unload
1:0019	Reset Input
1:0020	723PLUS LED#1
1:0021	723PLUS LED#2
1:0022	723PLUS LED#3
1:0023	723PLUS LED#4
1:0024	Relay Out #1
1:0025	Relay Out #2
1:0026	Relay Out #3
1:0027	Minor Alarm active
1:0028	Major Alarm active
1:0029	Any IO in Test/Override
1:0030	Load Sharing is active
1:0031	Engine A is softload active

Address	Description
1:0032	Engine B is softload active
1:0033	Analog input ch#1 fault
1:0034	Analog input ch#2 fault
1:0035	Analog input ch#3 fault
1:0036	Analog input ch#4 fault
1:0037	AI in Test/Override Minor Alarm
1:0038	AO in Test/Override Minor Alarm
1:0039	DI in Test/Override Minor Alarm
1:0040	DO in Test/Override Minor Alarm
1:0041	Speed-Ref A Minor Alarm
1:0042	Speed-Ref B Minor Alarm
1:0043	Engine Load A Minor Alarm
1:0044	Engine Load A Minor Alarm
1:0045	Modbus fault Minor Alarm
1:0046	AI in Test/Override Major Alarm
1:0047	AO in Test/Override Major Alarm
1:0048	DI in Test/Override Major Alarm
1:0049	DO in Test/Override Major Alarm
1:0050	Speed-Ref A Major Alarm
1:0051	Speed-Ref B Major Alarm
1:0052	Engine Load A Major Alarm
1:0053	Engine Load A Major Alarm
1:0054	Modbus fault Major Alarm
1:0055	Speed-A equal to B

Analog Reads

Address	Description	Multiplier
3:0001	Analog input ch#1 [%]	100
3:0002	Analog input ch#2 [%]	100
3:0003	Analog input ch#3 [%]	100
3:0004	Analog input ch#4 [%]	100
3:0005	Analog output ch#1 [%]	100
3:0006	Analog output ch#2 [%]	100
3:0007	Analog output ch#3 [%]	100
3:0008	Analog output ch#4 [%]	100
3:0009	Speed-Reference A Input [rpm]	1
3:0010	Speed-Reference B Input [rpm]	1
3:0011	Engine Load A Input [%]	100
3:0012	Engine Load B Input [%]	100
3:0013	Total Engine Load [0~200%]	100
3:0014	Engine A Load Setpoint [%]	100
3:0015	Engine B Load Setpoint [%]	100
3:0016	Load Ratio A versus B [%]	100
3:0017	Load Share PID output [%}	100
3:0018	Load Share Bias output [rpm}	100
3:0019	Load Share Bias A output [rpm}	100

Address	Description	Multiplier
3:0020	Load Share Bias B output [rpm}	100
3:0021	Synchronizing Bias A output [rpm}	100
3:0022	Synchronizing Bias B output [rpm}	100
3:0023	Speed-Reference A output [rpm]	1
3:0024	Speed-Reference B output [rpm]	1
3:0025	Speed-Reference A final output [%]	100
3:0026	Speed-Reference B final output [%]	100
3:0027	Engine Speed A [rpm]	1
3:0028	Engine Speed B [rpm]	1

Analog Writes

Address	Description	Multiplier
4:0001	Not Applicable	

Chapter 7.
Product Support and Service Options

Product Support Options

If you are experiencing problems with the installation, or unsatisfactory performance of a Woodward product, the following options are available:

1. Consult the troubleshooting guide in the manual.
2. Contact the **OE Manufacturer or Packager** of your system.
3. Contact the **Woodward Business Partner** serving your area.
4. Contact Woodward technical assistance via email (**EngineHelpDesk@Woodward.com**) with detailed information on the product, application, and symptoms. Your email will be forwarded to an appropriate expert on the product and application to respond by telephone or return email.
5. If the issue cannot be resolved, you can select a further course of action to pursue based on the available services listed in this chapter.

OEM or Packager Support: Many Woodward controls and control devices are installed into the equipment system and programmed by an Original Equipment Manufacturer (OEM) or Equipment Packager at their factory. In some cases, the programming is password-protected by the OEM or packager, and they are the best source for product service and support. Warranty service for Woodward products shipped with an equipment system should also be handled through the OEM or Packager. Please review your equipment system documentation for details.

Woodward Business Partner Support: Woodward works with and supports a global network of independent business partners whose mission is to serve the users of Woodward controls, as described here:

- A **Full-Service Distributor** has the primary responsibility for sales, service, system integration solutions, technical desk support, and aftermarket marketing of standard Woodward products within a specific geographic area and market segment.
- An **Authorized Independent Service Facility (AISF)** provides authorized service that includes repairs, repair parts, and warranty service on Woodward's behalf. Service (not new unit sales) is an AISF's primary mission.
- A **Recognized Engine Retrofitter (RER)** is an independent company that does retrofits and upgrades on reciprocating gas engines and dual-fuel conversions, and can provide the full line of Woodward systems and components for the retrofits and overhauls, emission compliance upgrades, long term service contracts, emergency repairs, etc.

A current list of Woodward Business Partners is available at **www.woodward.com/directory**.

Product Service Options

Depending on the type of product, the following options for servicing Woodward products may be available through your local Full-Service Distributor or the OEM or Packager of the equipment system.

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

Replacement/Exchange: Replacement/Exchange is a premium program designed for the user who is in need of immediate service. It allows you 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 option allows you to call your Full-Service Distributor in the event of an unexpected outage, or in advance of a scheduled outage, to 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. You replace your field control unit with the like-new replacement and return the field unit to the Full-Service Distributor.

Flat Rate Repair: Flat Rate Repair is available for many of the standard mechanical products and some of the electronic products in the field. This program offers you repair service for your products with the advantage of knowing in advance what the cost will be.

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 you in "like-new" condition. This option is applicable to mechanical products only.

Returning Equipment for Repair

If a control (or any part of an electronic control) is to be returned for repair, please contact your Full-Service Distributor in advance to obtain Return Authorization and shipping instructions.

When shipping the item(s), attach a tag with the following information:
- return number;
- name and location where the control is installed;
- name and phone number of contact person;
- complete Woodward part number(s) and serial number(s);
- description of the problem;
- instructions describing the desired type of repair.

Packing a Control

Use the following materials when returning a complete control:
- protective caps on any 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.

NOTICE

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

Replacement Parts

When ordering replacement parts for controls, include the following information:
- the part number(s) (XXXX-XXXX) that is on the enclosure nameplate;
- the unit serial number, which is also on the nameplate.

Engineering Services

Woodward's Full-Service Distributors offer various Engineering Services for our products. For these services, you can contact the Distributor by telephone or by email.

- Technical Support
- Product Training
- Field Service

Technical Support is available from your equipment system supplier, your local Full-Service Distributor, or from many of Woodward's worldwide locations, depending upon the product and application. This service can assist you with technical questions or problem solving during the normal business hours of the Woodward location you contact.

Product Training is available as standard classes at many Distributor locations. Customized classes are also available, which can be tailored to your needs and held at one of our Distributor locations or at your site. This training, conducted by experienced personnel, will assure that you will be able to maintain system reliability and availability.

Field Service engineering on-site support is available, depending on the product and location, from one of our Full-Service 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 information on these services, please contact one of the Full-Service Distributors listed at **www.woodward.com/directory**.

Contacting Woodward's Support Organization

For the name of your nearest Woodward Full-Service Distributor or service facility, please consult our worldwide directory published at **www.woodward.com/directory**.

You can also contact the Woodward Customer Service Department at one of the following Woodward facilities to obtain the address and phone number of the nearest facility at which you can obtain information and service.

Products Used In Electrical Power Systems

Facility	Phone Number
Brazil	+55 (19) 3708 4800
China	+86 (512) 6762 6727
Germany:	
Kempen	+49 (0) 21 52 14 51
Stuttgart	+49 (711) 78954-510
India	+91 (129) 4097100
Japan	+81 (43) 213-2191
Korea	+82 (51) 636-7080
Poland	+48 12 295 13 00
United States	+1 (970) 482-5811

Products Used In Engine Systems

Facility	Phone Number
Brazil	+55 (19) 3708 4800
China	+86 (512) 6762 6727
Germany	+49 (711) 78954-510
India	+91 (129) 4097100
Japan	+81 (43) 213-2191
Korea	+82 (51) 636-7080
The Netherlands	+31 (23) 5661111
United States	+1 (970) 482-5811

Products Used In Industrial Turbomachinery Systems

Facility	Phone Number
Brazil	+55 (19) 3708 4800
China	+86 (512) 6762 6727
India	+91 (129) 4097100
Japan	+81 (43) 213-2191
Korea	+82 (51) 636-7080
The Netherlands	+31 (23) 5661111
Poland	+48 12 295 13 00
United States	+1 (970) 482-5811

For the most current product support and contact information, please visit our website directory at **www.woodward.com/directory**.

Technical Assistance

If you need to contact technical assistance, you will need to provide the following information. Please write it down here before contacting the Engine OEM, the Packager, a Woodward Business Partner, or the Woodward factory:

General

Your Name _____

Site Location _____

Phone Number _____

Fax Number

Prime Mover Information

Manufacturer _____

Engine Model Number _____

Number of Cylinders _____

Type of Fuel (gas, gaseous, diesel, dual-fuel, etc.) _____

Power Output Rating _____

Application (power generation, marine, etc.)

Control/Governor Information

Control/Governor #1

Woodward Part Number & Rev. Letter _____

Control Description or Governor Type _____

Serial Number

Control/Governor #2

Woodward Part Number & Rev. Letter _____

Control Description or Governor Type _____

Serial Number

Control/Governor #3

Woodward Part Number & Rev. Letter _____

Control Description or Governor Type _____

Serial Number

Symptoms

Description _____

_____

If you have an electronic or programmable control, please have the adjustment setting positions or the menu settings written down and with you at the time of the call.

We appreciate your comments about the content of our publications.

Send comments to: icinfo@woodward.com

Please reference publication 26373B.

PO Box 1519, Fort Collins CO 80522-1519, USA
1000 East Drake Road, Fort Collins CO 80525, USA
Phone +1 (970) 482-5811 • Fax +1 (970) 498-3058

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.

2012/10/Colorado