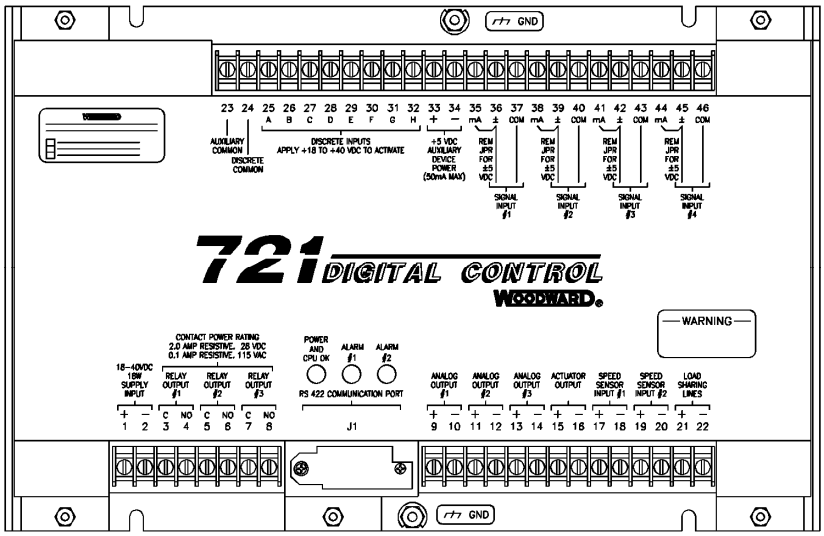
WOODWARD

Operation Manual



721 DIGITAL CONTROL
OVERSPEED SWITCH

Part Number 9907-718

WOODWARD GOVERNOR (JAPAN). LTD.,
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

Manual 26018

WARNING—DANGER OF DEATH OR PERSONAL INJURY

WARNING—FOLLOW INSTRUCTIONS

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.

WARNING—OUT-OF-DATE PUBLICATION

This publication may have been revised or updated since this copy was produced. To verify that you have the latest revision, be sure to check the Woodward website:

www.woodward.com/pubs/current.pdf

The revision level is shown at the bottom of the front cover after the publication number. The latest version of most publications is available at:

www.woodward.com/publications

If your publication is not there, please contact your customer service representative to get the latest copy.

WARNING—OVERSPEED PROTECTION

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—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.

CAUTION—POSSIBLE DAMAGE TO EQUIPMENT OR PROPERTY

CAUTION—BATTERY CHARGING

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.

CAUTION—ELECTROSTATIC DISCHARGE

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.**

IMPORTANT DEFINITIONS

- **A WARNING indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.**
- **A CAUTION indicates a potentially hazardous situation which, if not avoided, could result in damage to equipment or property.**
- **A NOTE provides other helpful information that does not fall under the warning or caution categories.**

Revisions—Text changes are indicated by a black line alongside the text.

WARNING—THIS PUBLICATION MAY BE OUT OF DATE
The Japanese original of this publication may have been updated since this translation was made. For the most current information, be sure to check whether there is a Japanese version with a later revision.

Quick Reference Guide

Table of Contents ii

Installation 7
Input/Output Operation 14
Function Operation 16
Menus 19, 20, 25, 27
Repair/Replacement 31

DRAWINGS:

721 Digital Control 2
Hand Held Programmer 3
Function Block Diagram ..... End of book
Plant Wiring Diagram ..... End of book
Control Specifications ..... inside back cover

Table of Contents

CHAPTER 1 GENERAL INFORMATION 1
Introduction 1
Application 1
Accessories 1

CHAPTER 2 ELECTROSTATIC DISCHARGE AWARENESS 5

CHAPTER 3 INSTALLATION 7
Introduction 7
Unpacking 7
Location Considerations 7
Electrical Connections 9
Installation Checkout Procedure 12

CHAPTER 4 I/O OPERATION 14
Introduction 14
Speed Signal Inputs 14
Discrete Inputs (A & H) 15
Trip Contact Output 15
MPU #1 Failed Alarm Output 15
MPU #2 Failed Alarm Output 15
Tachometer Indication Output 15

CHAPTER 5 FUNCTION OPERATION 14
MPU Failsafe Override 14
Operation 14
MPU Calibration 14
Tachometer Calibration 16

Table of Contents

CHAPTER 6 SERVICE AND CONFIGURE MENUS 19
Introduction 19
Hand Held Programmer and Menus 19
Configure Menus 20
Service Menus 20
Adjusting Set Points 20
Hand Held Programmer Keys 22
Configure Menus 25
Service Menus 27
Data Sheet for 9907-718 Control 29

CHAPTER 7 REPAIR AND REPLACEMENT 31
Returning Equipment for Repair 31
Identification 31
Packing a Control 31
Additional Instructions 31
Replacement Parts Information 32
Address and Telephone/Fax Numbers 32
Other Service Facilities 32

721 CONTROL SPECIFICATIONS ..... inside back cover

Illustrations and Tables

1-1. 721 Digital Control 2
1-2. Hand Held Programmer 3
1-3. EMI Filter 4
5-1. Input Frequency - Speed Sensor Output 14
6-1. Hand Held Programmer Functions 21
6-2. Service and Configure Headers 22
9952-202 Plant Wiring Diagram ..... End of book
9951-134 Function Block Diagram ..... End of book

Chapter 1
General Information

Introduction

This manual describes the 721 Digital Control for Overspeed Protection System 9907-718. The manual explains the installation, operation and give the configuration procedures for the system. This manual does not contain instructions for the operation of the complete turbine system. For turbine- or plant-operating instructions, contact the plant-equipment manufacture.

Before doing any installation, maintenance, adjustments, or configuration on the 721Overspeed Protection system, read manual 26018, Guide for Handling and Protection of Electronic Controls, Printed Circuit Boards.

Application

The 721 Digital Control (721DC) Overspeed Protection System is a digital overspeed trip device that senses prime mover speed through two magnetic pickups (MPUs). The speed signal circuitry in the control automatically passes the higher of the two signals and blocks the lower signal. The 721DC continuously monitor prime mover speed and de-energize a trip relay when overspeed or both speed signals failed are detected.

Accessories

A Hand Held Programmer (Figure 1-2), part number 9907-205, is used for adjusting and monitoring the 721 control. It plugs into the serial port of the control.

The EMI Filter (Figure 1-3), use part number 1755-119 is installed to power input line.

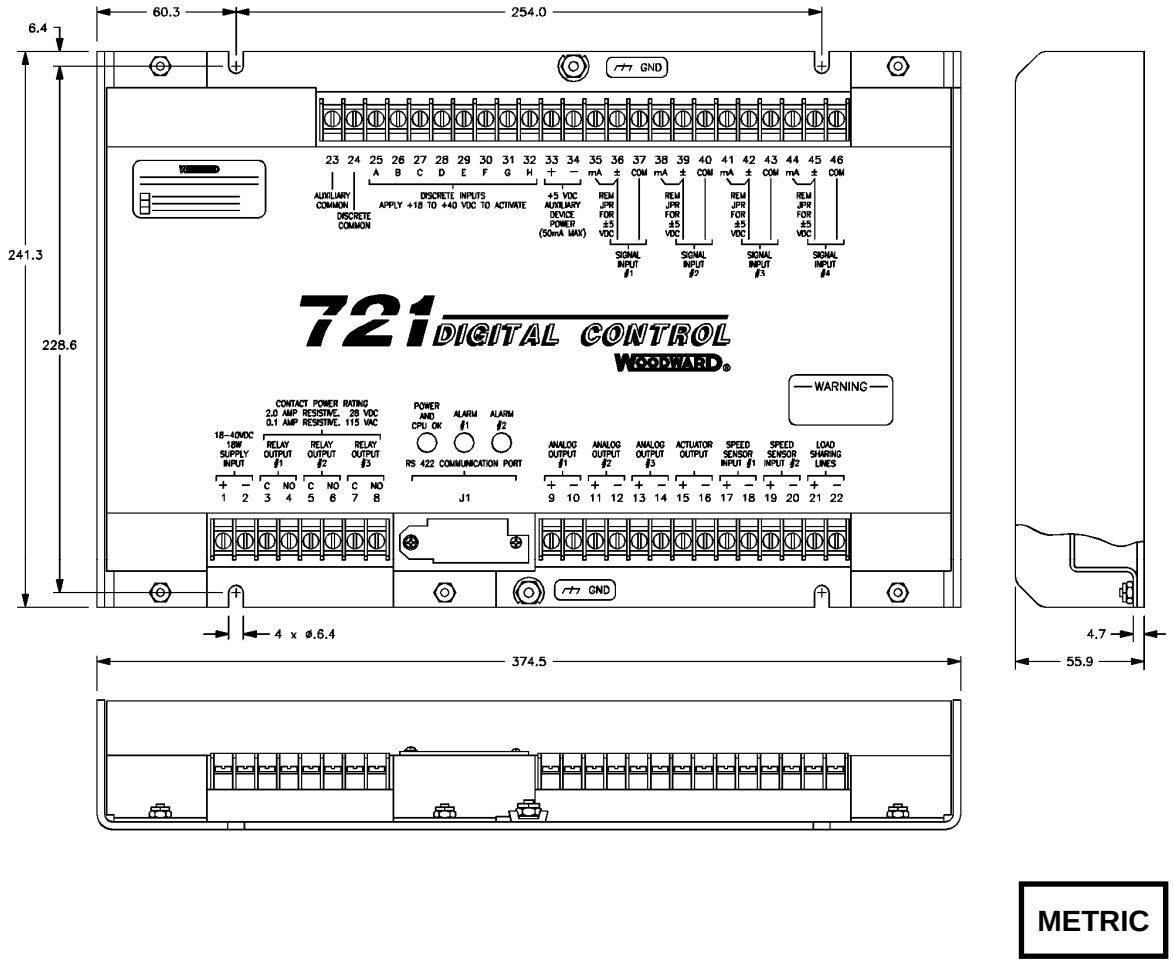


Figure 1-1 721 Digital Control

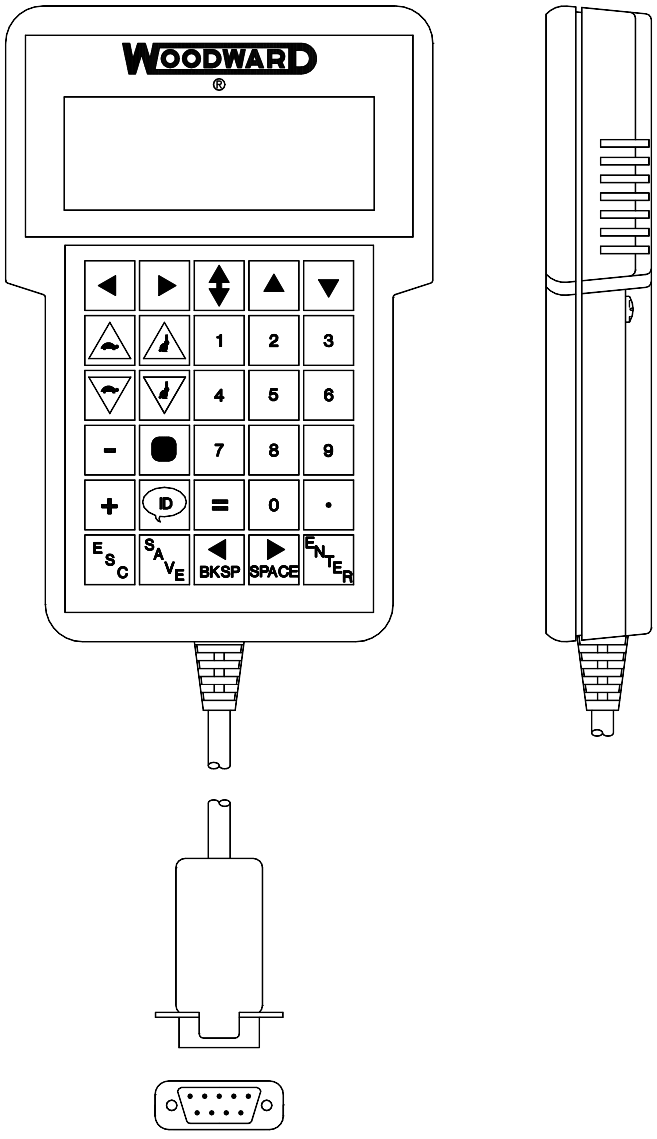


Figure 1-2 Hand Held Programmer

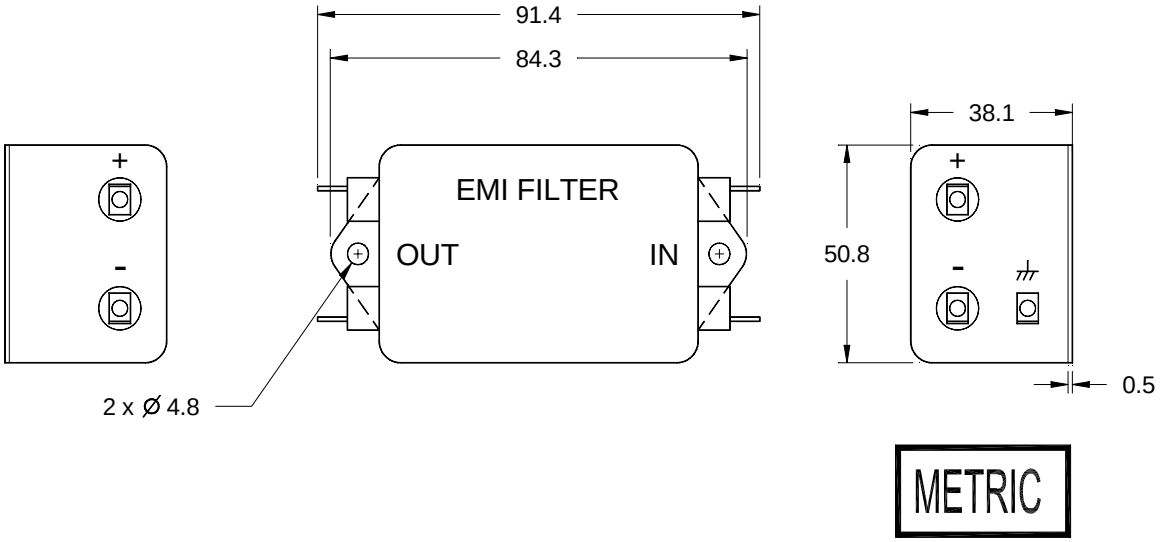


Figure 1-3 EMI Filter

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 control.

1. Before doing maintenance on the electronic 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 control, the modules, 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 721 control 9907-718. 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, and installation checkout procedures.

Unpacking

NOTICE: Before handling the 721 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 deg.C;

Electrical Connections

External wiring connections and shielding requirements for each installation are described in the Plant Wiring Diagram 9952-202 that is attached at the end of book.

Shielded Wiring

All shielded cable must be twisted conductor pairs. Do not attempt to tin the braided shield. All signal lines should be shielded to prevent picking up stray signals from adjacent equipment. Connected the shields to the nearest chassis ground. Wire exposed beyond the shield should be as short as possible, not exceeding 50mm. The other end of shields must be left open and insulated from any other conductor. DO NOT run shielded signal wires along with other carrying large currents.

Where shielded cable is required, cut the cable to the desired length and prepare the cable as instructed below.

1. Strip outer insulation from BOTH ENDS, exposing the braided or spiral wrapper shield. DO NOT CUT THE SHIELD.

2. Using a sharp, pointed tool, carefully spread the strands of the shield.

3. Pull inner conductor(s) out of the shield. If shield is the braided type, twist is to prevent fraying.

4. Remove 6 mm of insulation from the inner conductors.

Power Supply (Terminals 1/2)

This control requires a voltage source of 18 to 40VDC (24VDC nominal). Connect the positive (line) to the terminal 1 and negative (common) to the terminal 2 through the EMI Filter.

CAUTION

To prevent damage to the 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 directory from the power source to the EMI Filter. DO NOT POWER OTHER DEVICE WITH LEADS COMMON TO THE CONTROL. Avoid long wire lengths.

CAUTION

To prevent damage to the turbine, apply power to the 721 control at least than fifteen seconds prior to starting the turbine. The control must have time to do its power up diagnostics and become operation. Do not start the turbine unless the green POWER OK AND CPU OK indicator on the control cover comes on, because test failure turns off the output of the control.

Relay Output (Terminals 3/4, 5/6, 7/8)

The trip contact is output from terminals 3 and 4. This contact is normally closed (energized) when the unit is powered, indicating no trip.

The MPU #1 Failed alarm is output from terminals 5 and 6. This contact is normally closed (energized) when the unit is powered, indicating no speed signal failure.

The MPU #2 Failed alarm is output from terminals 7 and 8. This contact is normally closed (energized) when the unit is powered, indicating no speed signal failure.

Tachometer Indication Output (Terminals 9/10 & 11/12)

The tachometer indication output #1 (4-20 mA) and #2 (4-20 mA) are output from terminals 9(+) and 10(-), 11(+) and 12(-). Use shielded twisted-pair wires for connections. For an electrical isolated input device such as a 4-20mA analog meter, the shield should be grounded at the control end of the cable. For input to other device, use the recommendation of the device manufacture.

Speed Signal Inputs (Terminals 17/18, 19/20)

Connect a first magnetic pick-up (MPU) to terminals 17 and 18. Connect a second MPU to terminals 19 and 20. Use shielded twisted-pair wire for all MPU connections. The shield should be grounded at the control end only.

Discrete Inputs (Terminals 24/25 & 32)

Discrete inputs are the switch input commands to the 721 control. The discrete inputs should be powered by 24VDC external voltage. Connect external voltage source negative(-) to terminal 24. Then run the voltage source positive(+) to appropriate switch or relay contact and then to the corresponding discrete input. Refer plant wiring for detail of each contact input. The plant wiring diagram is attached at the end of the manual.

Installation Checkout Procedure

With the installation complete, do the following checkout procedure before beginning set point entry or initial start-up adjustments.

Visual Inspection

A. Check for correct wiring in accordance with the plant wiring diagram. The plant wiring diagram is attached at the end of book.

B. Check for broken terminals loose terminal screws.

C. Check the speed sensor(s) for visible damage. Check the clearance between the gear and the sensor, and adjustment if necessary. Clearance should be between 0.3 - 1.2mm at the closest point. Make sure the gear run out dose not exceed the pickup gap.

Check For Grounds

Check for grounds by measuring the resistance from all control terminals to chassis. All terminals except terminals 2 and 24 should measure 7M ohm or grater resistance (the resistance of terminal 2 and 24 depends on whether a floating or grounded power source is used). If a resistance less than 7M ohm is obtained, remove connections from each terminal one at a time until the resistance is 7M ohm or grater. Check the line that was removed last to locate the fault.

Chapter 4
I/O Operation

Introduction

This chapter contains the general input and output description for the 721 control P/N 9907-718.

Speed Signal Inputs

The two speed sensor inputs can be used with a magnetic pickup (MPU) for high speed signals (200-15000 Hz). The maximum sensing speed of 721DC is 20000 rpm.

"MPU #1 Gear Teeth" should be set to the number of gear teeth on the speed sensing gear where speed sensor #1 is mounted. "MPU #1 Max Hz" needs to be set above the maximum speed signal in hertz that will ever be seen by speed signal input #1. This value should be set to slightly above the max. overspeed setting range. The frequency can be calculated using this formula:

WARNING

An actual speed input(Hz) higher than the MPU Max. Hz, reading speed is limited at Max. Hz will cause the 721 control can not detect overspeed. The control uses this setting to fix the speed sensor resolution.

WARNING

The number of gear teeth is used by the control to convert pulses from the speed sensing device to turbine rpm. To prevent possible serious injury from an overspeed, make sure the control is properly programmed to convert the gear tooth count into turbine rpm. Improper conversion could cause turbine overspeed.

Discrete Inputs (A & H)

Two discrete inputs are available in this control, other inputs (B, C, D, E, F, G) are not assigned by the application software.

Input A:
RESET : Momentary close this contact to reset alarm.

Input H:
SPEED FAILSAFE OVERRIDE : Close this contact to disable speed failsafe function.

Trip Contact Output (Relay Output #1)

The trip contact output is normally closed (energized) when the unit is powered, indicating no trip. The contact is opened if occurred overspeed or both MPU failure, if the CPU shuts down, or the 721 loses power.

MPU #1 Failed Alarm (Relay Output #2)

The MPU #1 failed alarm output is normally closed (energized) when the unit is powered, indicating no fault. The contact is opened if occurred #1 speed sensor failure.

MPU #2 Failed Alarm (Relay Output #3)

The MPU #2 failed alarm output is normally closed (energized) when the unit is powered, indicating no fault. The contact is opened if occurred #2 speed sensor failure.

Tachometer Indication Outputs (Analog Output #1 & #2)

Two analog outputs are available for the tachometer indication. The tachometer rage can be set by Hand Held Programmer.

Chapter 5
Function Operation

The 9907-718 application contains several functions in software.

MPU Failsafe Override

The speed failsafe override contact (discrete input H) should be closed for start and stop.

When the turbine starting, close override contact then momentary close reset contact (discrete input A), ALARM #1 and #2 are cleared and all relay outputs are closed (energize), also alarm LEDs turn off.
The speed failsafe override contact should be open after speed is more than MPU fail setpoint.

When the turbine stopping, the speed failsafe override contact should be close before speed decrease to the MPU fail setpoint. For restart, alarm reset will not be required

OPERATION

If an overspeed occurs, the 721 control trips and trip relay is de-energized and ALARM #1 and ALARM #2 LEDs are flashing. This status is latched until reset command is received and actual speed is below trip speed setpoint.

In case both MPU signals failure, MPU frequency of less than MPU fail setpoint is measured. The 721 control also de-energize trip relay and both LEDs turn on, not flashing. The alarms can be cleared after overridden.

When either MPU loss of signal occurs, only MPU #1 Failed or #2 Failed relay de-energize and ALARM #1 or #2 LED turn on. An MPU failed alarm can not clear until a speed signal is restored.

MPU CALIBRATION

The speed sensor of 721 control requires to calibrate internal speed sensing block. However, the 721 control has been calibrated in factory according to customers specification. Normally, calibration is not required.

WARNING

Incorrect calibration could cause turbine overspeed. If the specification is changed, the 721 control should be calibrated.

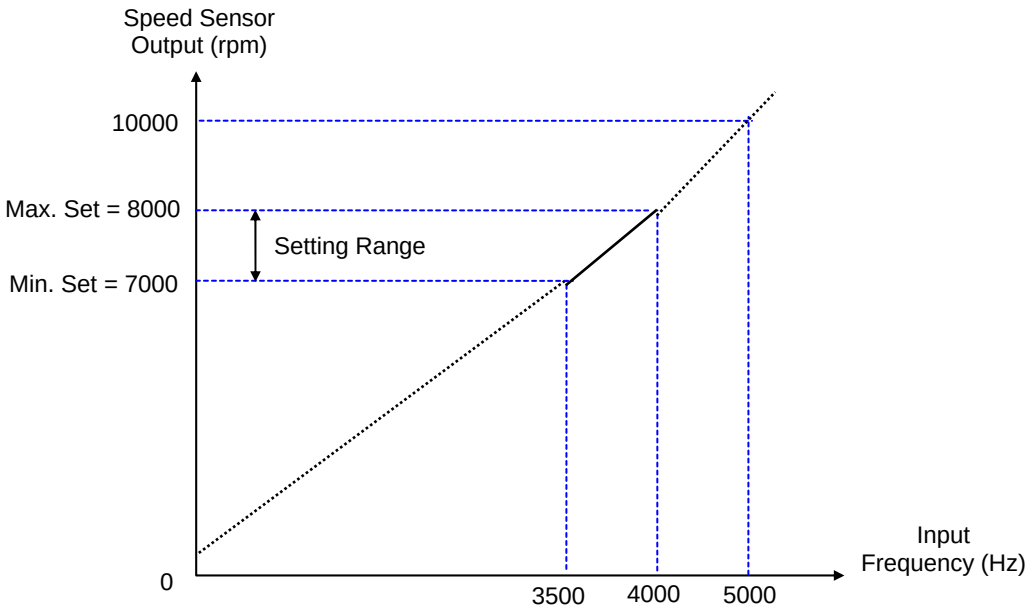


Figure 5-1 Input Frequency (Hz) - Speed Sensor Output (rpm)

MPU #1 CALIBRATION

1. Display “Speed MPU #1 (rpm)” in “MONITOR” menu on upper screen.
2. Display “#1 Calibration, X_2” in “MPU CALIBRATION” menu on lower screen.
3. Input frequency to MPU #1 for Max. Overspeed Setpoint calibration.
4. Reading “Speed MPU #1 (rpm)” and adjust “#1 Calibration, X_2” is equal to input speed.
5. Display “#1 Calibration, X_1” in “MPU CALIBRATION” menu on lower screen.
6. Input frequency to MPU #1 for Min. Overspeed Setpoint calibration.
7. Reading “Speed MPU #1 (rpm)” and adjust “#1 Calibration, X_1” is equal to input speed.
8. Repeat above steps until displayed speed is equal to input speed.
9. Input frequency below trip point, increase frequency and check the actual trip point.

MPU #2 CALIBRATION

1. Display “Speed MPU #2 (rpm)” in “MONITOR” menu on upper screen.
2. Display “#2 Calibration, X_2” in “MPU CALIBRATION” menu on lower screen.
3. Input frequency to MPU #2 for Max. Overspeed Setpoint calibration.
4. Reading “Speed MPU #2 (rpm)” and adjust “#2 Calibration, X_2” is equal to input speed.
5. Display “#2 Calibration, X_1” in “MPU CALIBRATION” menu on lower screen.
6. Input frequency to MPU #2 for Min. Overspeed Setpoint calibration.
7. Reading “Speed MPU #2 (rpm)” and adjust “#2 Calibration, X_1” is equal to input speed.
8. Repeat above steps until displayed speed is equal to input speed.
9. Input frequency below trip point, increase frequency and check the actual trip point.

MPU FAIL SETPOINT CALIBRATION

1. Display “MPU Failed Set Adj.” In “MPU CALIBRATION” menu.
2. Input frequency above MPU failed point to both MPU inputs.
3. Decrease input frequency and adjust MPU Fail Point.

TACHOMETER CALIBRATION

This calibration is not required because it has been finished in factory.

Chapter 6
Service and Configure Menus

Introduction

Due to the variety of installations, plus system and component tolerances, the 721 control must be tuned to each system for optimum performance.

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

WARNING

An improperly calibrated control could cause an engine overspeed or other damage to the engine. To prevent possible serious injury from an overspeeding engine, read this entire procedure before starting the engine.

Hand Held Programmer and Menus

The Hand Held Programmer is a hand-held computer terminal that gets its power from the 721 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 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. 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 721 has two sets of menus; the Service menus and the Configure menus. The Service menus allow easy access and tuning while the engine is running. The Configure menus may only be entered if the I/O is shutdown, and hence the engine stopped.

Configure Menus

To access the Configure menus, the engine must be shut down. Open the run/stop contact. Press the " **.** " key. 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 into the Configure menus. **Note:** If the engine is running during this process, it will be shut down due to shutting down the I/O of the control. To move between the menus, use the ▶ and ◀ keys. To move through the set points within a menu, use the ▼ and ▲ 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

To access the Service menus press the ▼ 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 " **Turtle Up** " or the " **Rabbit Up** " keys to increase the value, and the " **Turtle Down** " or " **Rabbit Down** " keys to decrease the value. The " **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 engine 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.

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 Main Screen.
(Turtle up)	Increases the displayed set point value slowly.
(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)	Increases set point values by one step at a time.
+ (Plus)	Decreases set point values by one step at a time.
■ **(Solid square)**	Not used.
ID	Displays the 721 control part number and software revision level.
ESC	To return to menu header or to main screen.
SAVE	Saves entered values (set points).
◀ **BKSP**	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.

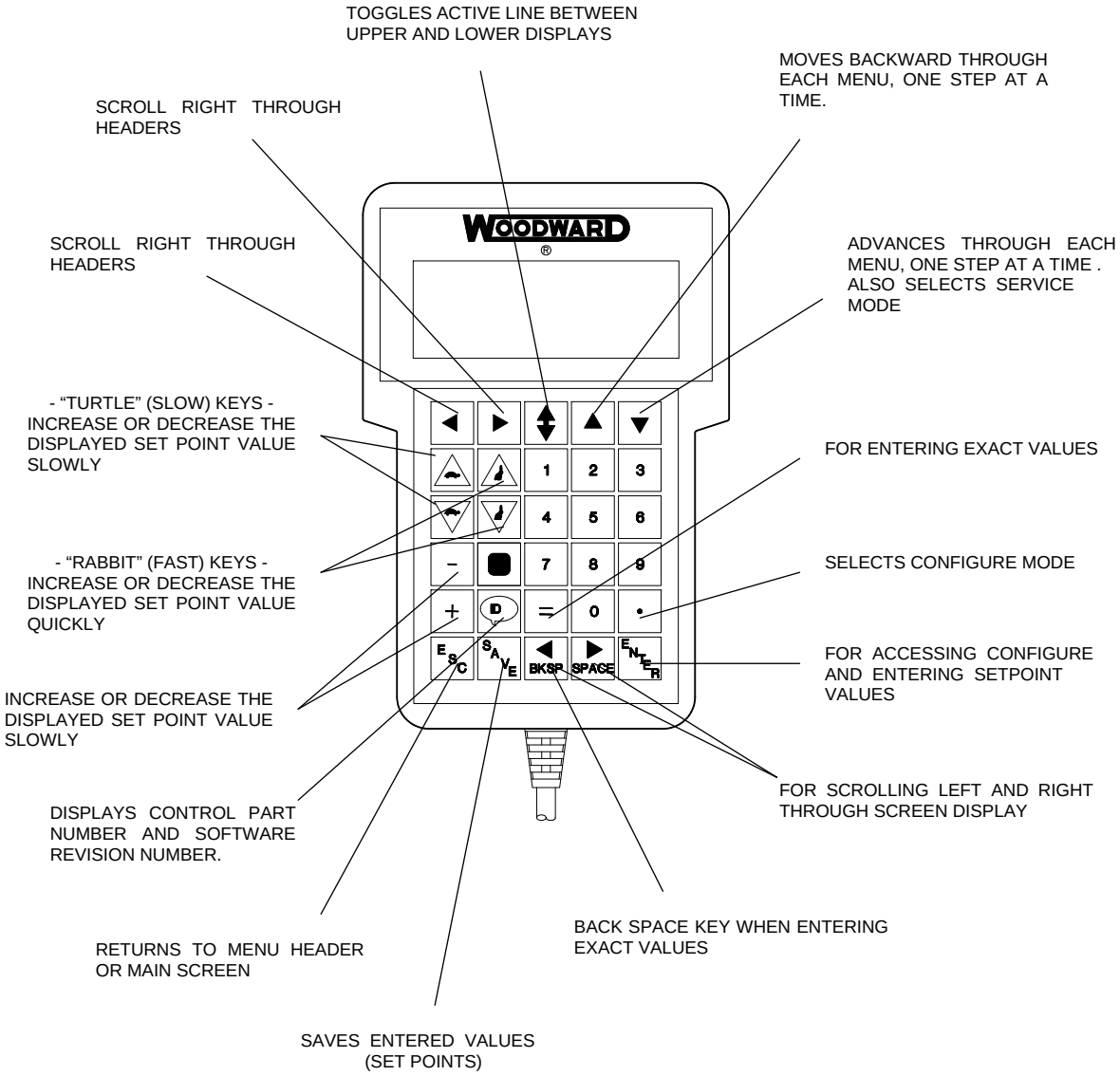


Figure 6-1. Hand Held Programmer Functions

Under the service and configure menus are the headers. Some of the service header is password protected. The password in the * Calibration Key * service header must be set correctly before the password-protected header will appear on the hand held. The protected header will remain active for only thirty minute after that. There is a password for I/O calibration. The password is 715. Once a password-protected header is displayed, it will remain on screen until it is written over. Some of the service headers are displayed only if their function is enabled during configuration.

CAUTION

Any values that are adjusted or tuned must be saved prior to removing power to the 721 control, otherwise they will revert back to their original settings. Saving is done by pressing the "SAVE" key on the hand held programmer.

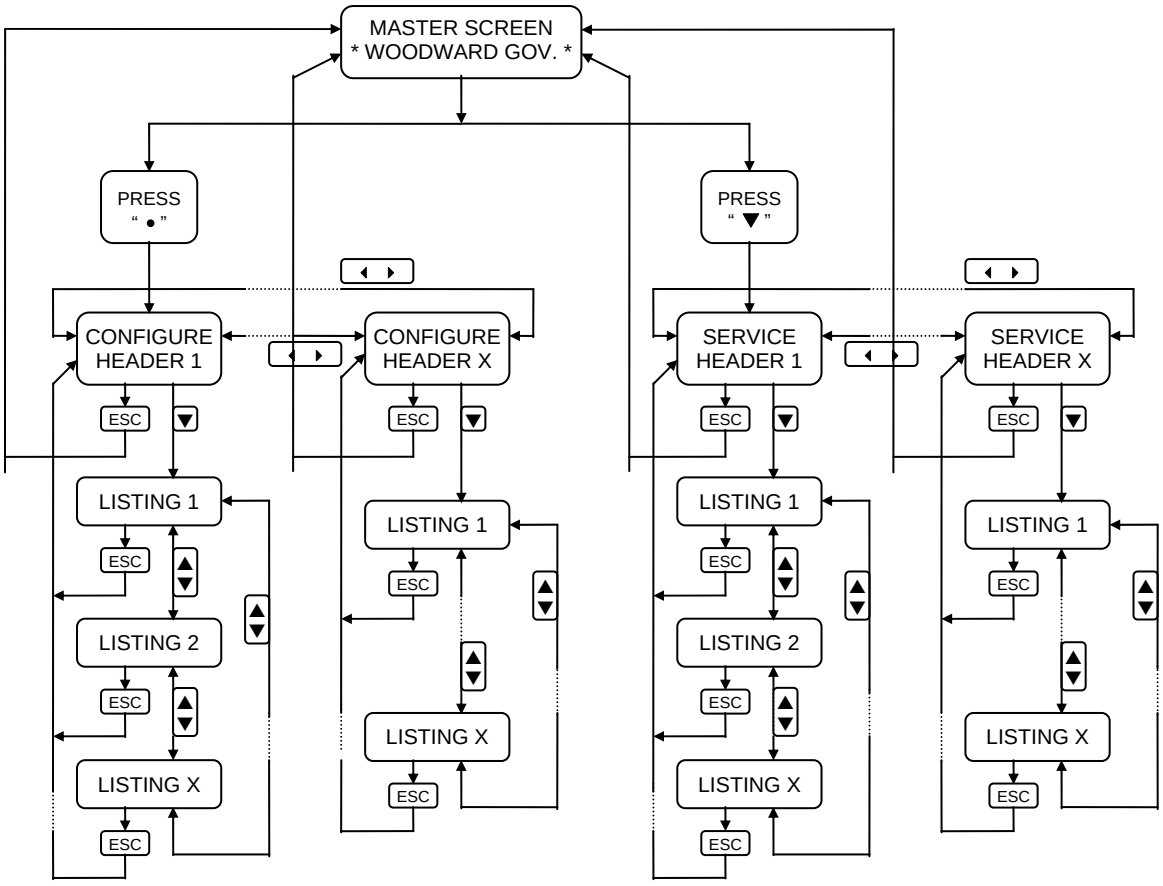


Figure 6-2. Service and Configure Headers

Configure Menus

*** CONFIGURE MENU ***

1. Overspeed Set (rpm) (* 250 ~ 20000 rpm):
   Set this value to the overspeed trip speed.

WARNING

Setting this value incorrectly could result in an engine overspeed.

2. MPU Fail Set (rpm) (* 200 ~ 20000 rpm):
   Set this value to the failsafe speed of the turbine.

3. MPU #1 Gear Teeth (* 1 ~ 300):
   This is the number of teeth on the speed sensing gear for speed sensor #1.

WARNING

Setting this value incorrectly could result in an engine overspeed.

4. MPU #2 Gear Teeth (* 1 ~ 300):
   This is the number of teeth on the speed sensing gear for speed sensor #2.

WARNING

Setting this value incorrectly could result in an engine overspeed.

5. MPU #1 Max Freq (Hz) (* 1000 ~ 15000 Hz):
   This is the maximum frequency seen by the speed sensing input #1.

WARNING

This should be set at least as high as the primary overspeed protection device or 1.25 times the rated speed frequency.

6. MPU #2 Max Freq (Hz) (* 1000 ~ 15000 Hz):
   This is the maximum frequency seen by the speed sensing input #2.

WARNING

This should be set at least as high as the primary overspeed protection device or 1.25 times the rated speed frequency.

7. Trip Both MPU Fail? (* TRUE / FALSE):
   Set this value true to trip when both MPU signal failed.

8. Tach at 4mA (rpm) (* 0 - 20000 rpm):
   Set this value to the tachometer range.

9. Tach at 20mA (rpm) (* 0 - 20000 rpm):
   Set this value to the tachometer range.

*** CALIBRATION MENU ***

1. Enbl TACH CAL Menu? (* TRUE / FALSE):
   Set this value TRUE to enable the “TACH CALIBRATION” menu in service menu.

2. Enbl MPU CAL Menu? (* 200 ~ 2000 rpm):
   Set this value TRUE to enable the “MPU CALIBRATION” menu in service menu.

Service Menus

*** MONITOR ***

1. Speed HSS_BUS (rpm):
   This monitor is the current sensed turbine speed.

2. Speed MPU #1 (rpm):
   This monitor is the #1 speed sensor input

3. Speed MPU #2 (rpm):
   This monitor is the #2 speed sensor input..

*** ALARM ***

1. Overspeed Trip :
   This screen indicates TRUE if the overspeed trip occurred.

2. MPU #1 Failed :
   This screen indicates TRUE if the MPU #1 signal failed.

3. MPU #2 Failed :
   This screen indicates TRUE if the MPU #2 signal failed.

3. Alarm Reset? :
   Once to change TRUE could be reset alarms by Hand Held Terminal.

*** DI/DO STATUS ***

1. Reset Contact :
   This screen indicates TRUE if the reset command input is presents.

2. Override Contact :
   This screen indicates TRUE if the override command is presents.

3. Relay #1 Status :
   This screen indicates TRUE if the overspeed trip or both MPU failed occurred.

3. Relay #2 Status :
   This screen indicates TRUE if the MPU #1 failed.

4. Relay #3 Status :
   This screen indicates TRUE if the MPU #2 failed.

* TACH CALIBRATION * (If Enabled)

1. AOUT #1 Offset :
   Adjust this value to 4 mA reading analog output #1 if necessary.

2. AOUT #1 Gain :
   Adjust this value to 20 mA reading analog output #1 if necessary.

3. AOUT #2 Offset :
   Adjust this value to 4 mA reading analog output #2 if necessary.

4. AOUT #2 Gain :
   Adjust this value to 20 mA reading analog output #2 if necessary.

* MPU CALIBRATION * (If Enabled)

1. #1 Calibration, X_1 :
   Input the speed signal #1 as much as "#1 Min. Set (rpm)", adjust this value to displayed "Speed MPU #1 (rpm)" is equal to input speed.

2. #1 Min. Set (rpm) :
   Set this value to min. set of overspeed trip setting range

3. #1 Calibration, X_2 :
   Input the speed signal #1 as much as "#1 Max. Set (rpm)", adjust this value to displayed "Speed MPU #1 (rpm)" is equal to input speed.

4. #1 Max. Set (rpm) :
   Set this value to max. set of overspeed trip setting range.

5. #2 Calibration, X_1 :
   Input the speed signal #2 as much as "#2 Min. Set (rpm)", adjust this value to displayed "Speed MPU #2 (rpm)" is equal to input speed.

6. #2 Min. Set (rpm) :
   Set this value to min. set of overspeed trip setting range

7. #2 Calibration, X_2 :
   Input the speed signal #2 as much as "#2 Max. Set (rpm)", adjust this value to displayed "Speed MPU #2 (rpm)" is equal to input speed.

8. #2 Max. Set (rpm) :
   Set this value to max. set of overspeed trip setting range.

9. MPU Failed Set Adj. :
   Adjust this value and offset the failsafe point by speed input signals.

Data Sheet for 9907-718 Control

Project: _____
S/N: _____
Date: _____
Rev: NEW

CONFIGURE

* CONFIGURE MENU *

	Range	Default	Set Value
Overspeed Set (rpm)	* 250 ~ 20000 rpm	8000	
MPU Fail Set (rpm)	* 200 ~ 20000 rpm	400	
MPU #1 Gear Teeth	* 1 ~ 300 Teeth	30	
MPU #2 Gear Teeth	* 1 ~ 300 Teeth	30	
MPU #1 Max Hz	* 1000 ~ 15000 Hz	5000	
MPU #2 Max Hz	* 1000 ~ 15000 rpm	5000	
Trip Both MPU Fail?	* T / F	TRUE	
Tach at 4mA (rpm)	* 0 ~ 20000 rpm	0	
Tach at 20mA (rpm)	* 0 ~ 20000 rpm	10000	

* CALIBRATION MENU *

	Range	Default	Set Value
Enbl Tach CAL Menu?	* T / F	FALSE	
Enbl MPU CAL Menu?	* T / F	FALSE	

Project: _____
S/N: _____
Date: _____
Rev: NEW

SERVICE

* TACH CALIBRATION * (If Enabled)

	Range	Default	Set Value
AOUT #1 Offset	* -20 ~ 20	0	_____
AOUT #1 Gain	* 0 ~ 2	1	_____
AOUT #2 Offset	* -20 ~ 20	0	_____
AOUT #2 Gain	* 0 ~ 2	1	_____

* MPU CALIBRATION * (If Enabled)

	Range	Default	Set Value
#1 Calibration, X_1	* 1000 ~ 20000	7000	_____
#1 Min. Set (rpm)	* 1000 ~ 20000 rpm	7000	_____
#1 Calibration, X_2	* 1000 ~ 20000	8000	_____
#1 Max. Set (rpm)	* 1000 ~ 20000 rpm	8000	_____
#2 Calibration, X_1	* 1000 ~ 20000	7000	_____
#2 Min. Set (rpm)	* 1000 ~ 20000 rpm	7000	_____
#2 Calibration, X_2	* 1000 ~ 20000	8000	_____
#2 Max. Set (rpm)	* 1000 ~ 20000 rpm	8000	_____
MPU Failed Set Adj.	* -100 ~ 100	0	_____

Chapter 7
Repair and Replacement

Returning Equipment for Repair

Identification

If the electronic control is to be returned to Woodward Governor (Japan), Ltd. for repair, attach a tag to the part with the following information:

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

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.*

Packing a Control

Use the following materials when returning a control:

- 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, please telephone and ask for the Customer Service Department. They will help expedite the processing of your order through our distributors or local service facility.

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.

Address and Telephone / Fax Numbers

Use the following address when shipping or corresponding:

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

TELEPHONE: +81 (43)-213-2198
FAX: +81 (43)-213-2199

Other Service Facilities

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

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
NEW	E/C 504464	99-02	MAk

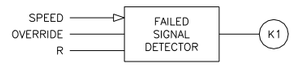
FUNCTIONAL BLOCK DIAGRAM NOTES

REV STATUS OF SHEETS	
SHEET	REV
1	NEW
2	NEW
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	
16	
17	
18	
19	
20	
21	
22	
23	
24	
25	
26	
27	
28	
29	
30	
31	
32	
33	
34	
35	
36	
37	
38	
39	
40	
41	
42	
43	
44	
45	
46	
47	
48	
49	
50	

SIGNAL FLOW

SIGNAL FLOW IS FROM LEFT TO RIGHT. ALL INPUTS FROM THE LEFT. ALL OUTPUTS EXIT TO THE RIGHT. EXCEPTIONS ARE NOTED. SIGNAL VALUES ARE SHOWN WITH AN ARROW. LOGIC SIGNALS ARE SHOW WITHOUT AN ARROW.

EXAMPLE



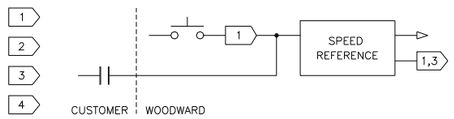
CUSTOMER INPUT/OUTPUT (I/O)

INPUTS ORIGINATE ON THE LEFT SIDE OF THE DRAWING. OUTPUTS TERMINATE ON THE RIGHT SIDE OF THE DRAWING. WITH THE EXCEPTION OF RELAYS. WHICH ARE SHOWN NEAR THEIR ASSOCIATED FUNCTION BLOCK. VERTICAL DASHED LINES SEPARATE SIGNAL FLOW BETWEEN WOODWARD GOVERNOR AND CUSTOMER EQUIPMENT.

INTERCONNECT CODE

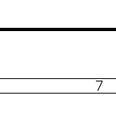
THE ⬠ SYMBOL INDICATES INTERCONNECTING SIGNAL FLOW BY CABLES WITH CONNECTORS ON BOTH ENDS. NO CUSTOMER WIRING REQUIRED. EACH CABLE IS DISTINGUISHED WITHIN THE BLOCK DIAGRAM NUMERICALLY AND GENERALLY EACH RACK WILL BE SHOWN ON SEPARATE SHEETS.

EXAMPLE



OPERATOR CONTROL PANELS

THE FOLLOWING SYMBOLS ARE USED TO DISPLAY OPERATOR CONTROL PANEL FUNCTIONS.



PUSHBUTTON SWITCH

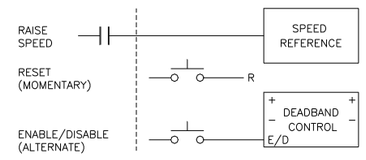
METER

INDICATOR: LED,LAMP OR BACKLIGHTED PUSHBUTTON SWITCH. COLOR SHOWN IN CIRCLE: G = GREEN, R = RED, W = WHITE, Y = YELLOW.

OPERATOR CONTROL PANELS

UNLESS OTHERWISE NOTED. ALL SWITCH CONTACTS CLOSE TO MAKE THE INPUT DESCRIPTION TRUE AND OPEN TO MAKE IT FALSE. SOME INPUTS ONLY REQUIRE A MOMENTARY CONTACT CLOSURE TO MAKE THE INPUT DESCRIPTION TRUE. THEY ARE LABELED AS MOMENTARY. SOME INPUTS REQUIRE AN ALTERNATE ACTION SWITCH CONTACT TO MAKE THE FIRST DESCRIPTION TRUE WHEN THE CONTACT IS CLOSED AND THE SECOND TRUE WHEN CONTACT IS OPENED. THEY ARE LABELED AS ALTERNATE.

EXAMPLE



FUNCTION CONNECTORS

TO REDUCE THE NUMBER OF LINES ON THE DRAWING. SOME FUNCTIONS ARE CONNECTED TOGETHER BY USING LIKE CHARACTERS, WORDS, OR TIEPOINT SYMBOLS.

R – RESET
A SINGLE INPUT, RESET IS DISTRIBUTED TO ALL OF THE LATCHING FUNCTIONS. AFTER THE INPUT SIGNAL RETURNS TO NORMAL. A RESET IS REQUIRED TO RESTORE THE OUTPUT TO A NORMAL STATE.

S – SHUTDOWN
MULTIPLE INPUTS CAN INITIATE A SHUTDOWN. THE SHUTDOWN FUNCTION BLOCK IS USUALLY LOCATED PHYSICALLY ON THE DRAWING NEAR THE FINAL DRIVER.

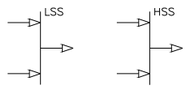
A – ALARM
MULTIPLE INPUTS CAN INITIATE AN ALARM. THE ALARM FUNCTION BLOCK IS USUALLY LOCATED ON THE DRAWING NEAR THE FINAL DRIVER.

⬠ – TIEPOINT SYMBOLS

BUSES

SIGNAL BUSES ARE SHOWN AS HEAVY LINES.

EXAMPLE

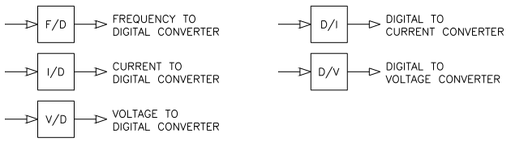


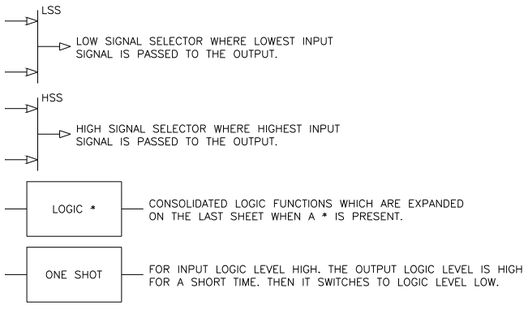
FUNCTION SYMBOLS

COMMON GOVERNOR FUNCTIONS ARE REPRESENTED BY RECTANGULAR BLOCKS. A DESCRIPTION OF THE FUNCTION IS SHOWN INSIDE THE BLOCK.

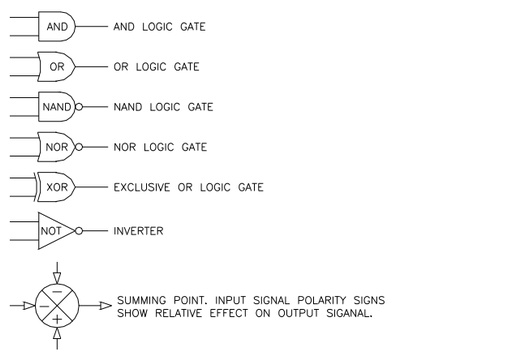
EXAMPLE

COMMONLY USED ABBREVIATED FUNCTIONS ARE:





COMMONLY USED ABBREVIATED FUNCTIONS ARE: (CONT)



UNLESS OTHERWISE SPECIFIED:
ALL DIMENSIONS ARE IN MILLIMETERS INCHES.
DRAWING DEFINITIONS AND TOLERANCES SHALL BE FOUND IN SS-112

THIRD ANGLE PROJECTION

MATERIALS:

3082-169	
5414-111	
8237-735	9907-718
NEXT LEVEL	FINAL LEVEL
APPLICATION	

C/C		
APPROV	YOT	99-02
CHECKED	MAk	99-02
DRAWN	MAk	99-02
CAD OPR.	MAk	99-02
APPROVAL		

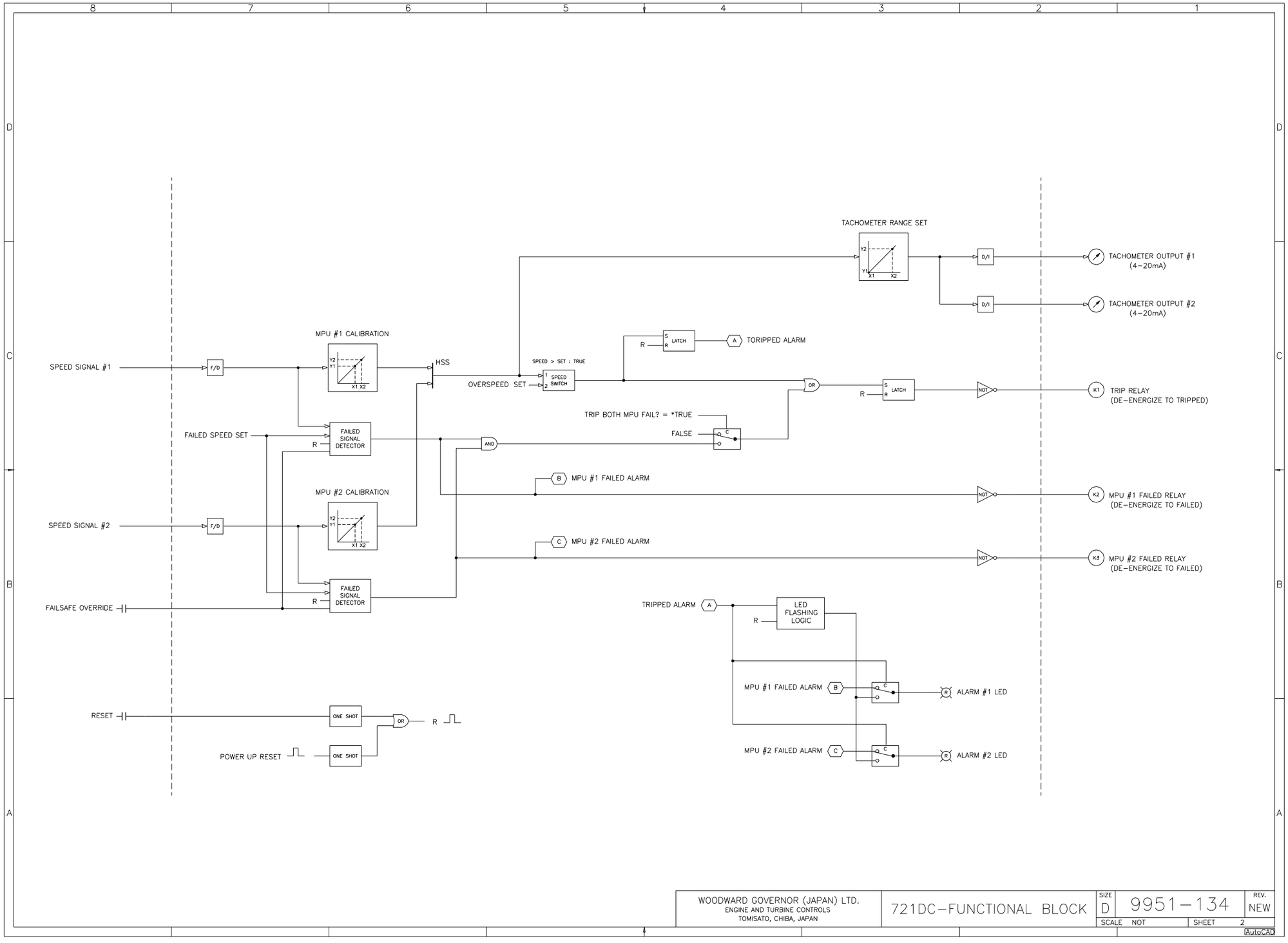
WOODWARD GOVERNOR (JAPAN) LTD.
ENGINE CONTROLS DIVISION
TOMISATO, CHIBA, JAPAN

DIAGRAM – FUNCTIONAL BLOCK
721 DC OVERSPEED SWITCH
FOR MHI-YOKOHAMA

SIZE	CODE IDENT NO.	
D	31361	9951-134

SCALE | WEIGHT | SHEET 1 OF 2

AutoCAD


TACHOMETER RANGE SET
TACHOMETER OUTPUT #1 (4–20mA)
TACHOMETER OUTPUT #2 (4–20mA)
MPU #1 CALIBRATION
SPEED SIGNAL #1
HSS
SPEED > SET : TRUE
OVERSPEED SET
TORIPPED ALARM
TRIP RELAY (DE–ENERGIZE TO TRIPPED)
TRIP BOTH MPU FAIL? = *TRUE
FALSE
FAILED SPEED SET
MPU #1 FAILED ALARM
MPU #1 FAILED RELAY (DE–ENERGIZE TO FAILED)
MPU #2 CALIBRATION
SPEED SIGNAL #2
MPU #2 FAILED ALARM
MPU #2 FAILED RELAY (DE–ENERGIZE TO FAILED)
FAILSAFE OVERRIDE
TRIPPED ALARM
LED FLASHING LOGIC
MPU #1 FAILED ALARM
ALARM #1 LED
RESET
POWER UP RESET
MPU #2 FAILED ALARM
ALARM #2 LED
WOODWARD GOVERNOR (JAPAN) LTD.
ENGINE AND TURBINE CONTROLS
TOMISATO, CHIBA, JAPAN
721DC–FUNCTIONAL BLOCK
SIZE D
9951–134
REV. NEW
SCALE NOT
SHEET 2
AutoCAD

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
NEW	E/C 504464	99-02	MAk

NOTES:

1. SHIELDED WIRES TO BE TWISTED PAIR OR THREE CONDUCTORS AS NEEDED, WITH SHIELD GROUND AT ONE END ONLY.
   SHIELDS MUST BE GROUNDED AT ANY EXTERNAL POINT UNLESS OTHERWISE NOTED.
   ALL SHIELDS MUSE BE CARRIED CONTINOUSLY THROUGH ALL TERMINAL BLOCKS AND MUST NOT BE TIED TO OTHER SHIELDS EXCEPT AT THE COMMON GROUND POINT. THE SHIELDS ARE TIED TOGETHER AT GROUND STUD.
2. REMOVE JUMPER FOR 1-5V DC VOLTAGE INPUT.
3. ANALOG INPUT SIGNALS FROM OTHER SYSTEMS MUST BE ISOLATED FROM GROUND EITHER BY DESIGN OR EMPLOYMENT OF ISOLATION AMPLIFIERS.
4. ANALOG OUTPUTS TO OTHER SYSTEMS MUST BE ISOLATED FROM GROUND EITHER BY DESIGN OR EMPLOYMENT OF ISOLATION AMPLIFIERS.
5. SHIELDED WIRES TO BE TWISTED PAIR CONDUCTORS, WITH SHIELD GROUND AT ONE END ONLY.
   SHIELDS MUST BE GROUNDED AT EITHER CONTROL'S GRANDING POINT ONLLY UNLESS OTHERWISE NOTED.
6. DISCRETE INPUTS ARE ISOLATED FROM OTHER CIRCUITS AND INTENDED TO BE POWERED BY THE SAME SOURCE AS CONTROL SUPPLY VOLTAGE. INPUTS IS NORMALLY 10mA PER INPUT INTO 2210 OHMS.
7. RELAY CONTACT RATINGS: RESISTIVE – 2.0A AT 28V DC
   0.1A AT 115V AC 50 TO 400Hz
   INDUCTIVE – 0.75A AT 28V DC 200mH
   0.1A AT 28V DC LAMP
8. WHEN MOUNTING CONTROL TO BULKHEAD, USE THE GROUNDING STUT AND HARDWARE SUPPLY WITH THE CHASSIS TO ENSURE PROPER GROUNDING.
9. THE TERMINALS MARKED "NO CONNECTION" MUST REMAIN OPEN.
10. INTERNAL POWER SUPPLY PROVIDES DC ISOLATION BETWEEN POWER SOURCE AND ALL OTHER INPUTS AND OUTPUTS.

REV STATUS OF SHEETS					
SHT	REV	SHT	REV	SHT	REV
1	NEW	6		11	
2	NEW	7		12	
3	NEW	8		13	
4		9		14	
5		10		15	

UNLESS OTHERWISE SPECIFIED:
ALL DIMENSIONS ARE IN MILLIMETERS INCHES.
DRAWING DEFINITIONS AND TOLERANCES SHALL BE FOUND IN SS-112.

3082-169	
5414-111	
8237-735	9907-718
NEXT LEVEL	FINAL LEVEL
APPLICATION	

MATERIAL:

THIRD ANGLE PROJECTION

APPROVED	YOT	99-02
CHECKED	MAk	99-02
DRAWN	MAk	99-02
CAD OPR.	MAk	99-02
APPROVAL		

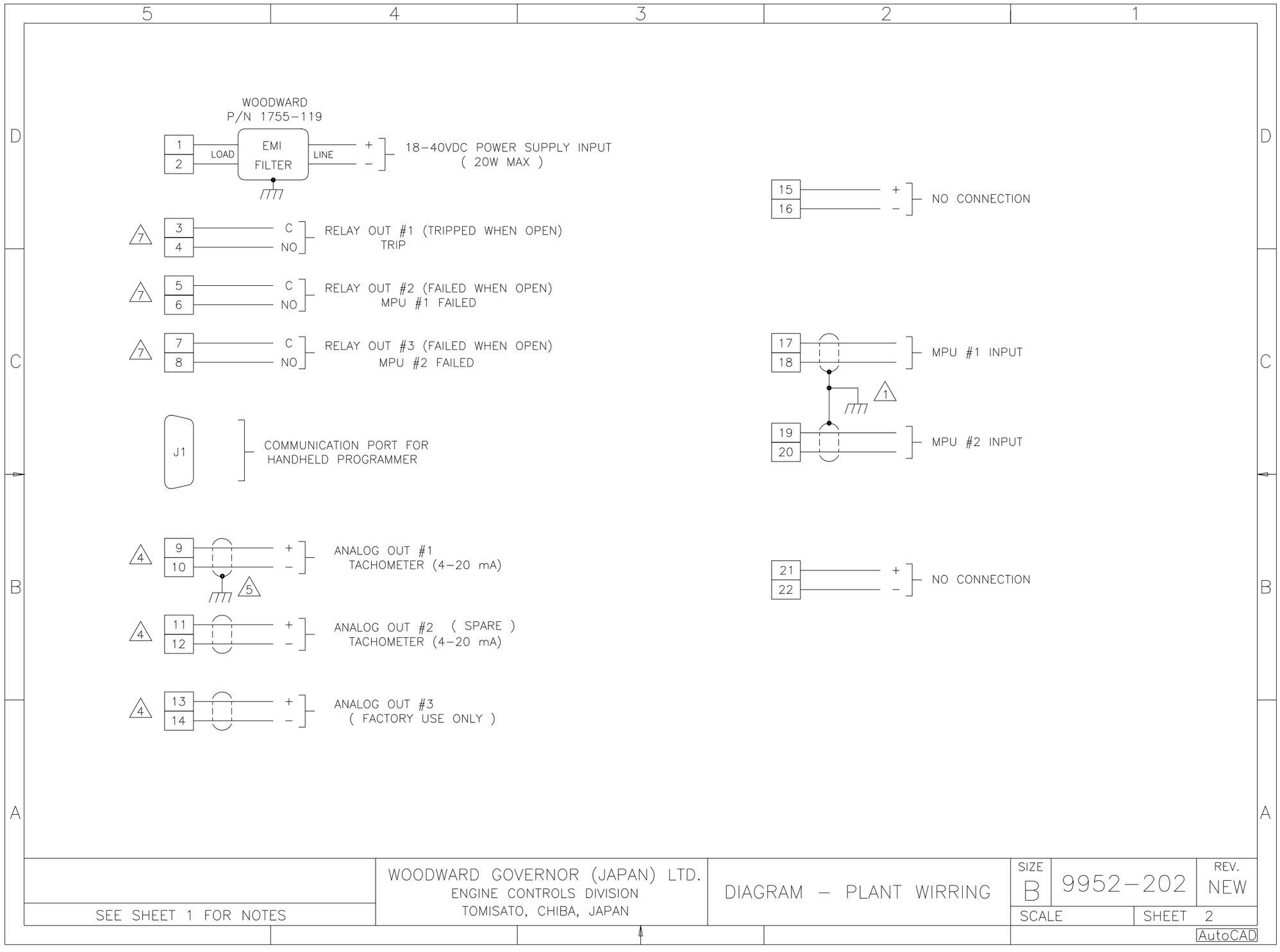
WOODWARD GOVERNOR (JAPAN) LTD.
ENGINE CONTROLS DIVISION
TOMISATO, CHIBA, JAPAN

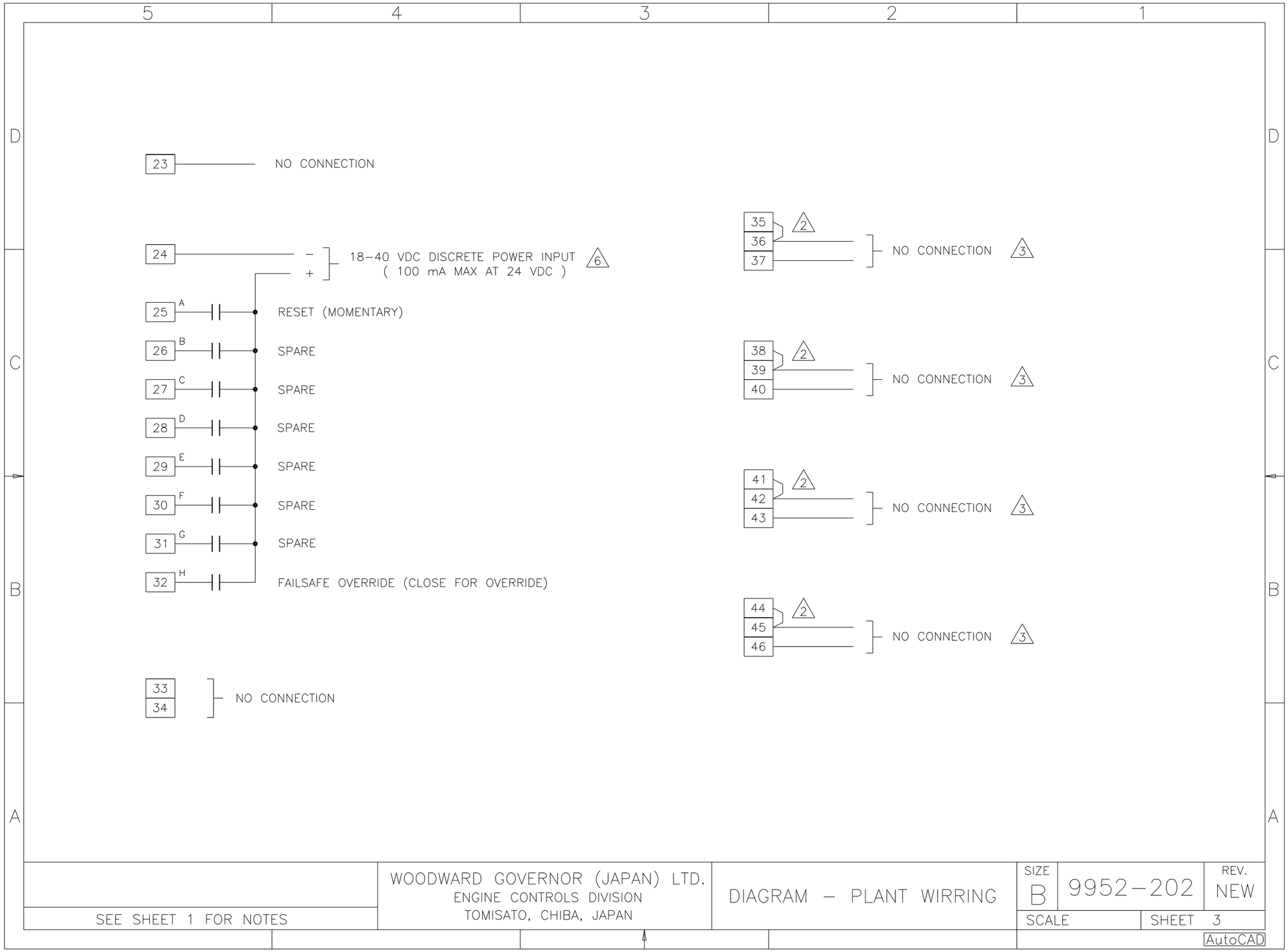
DIAGRAM – PLANT WIRING
721 DC OVERSPEED SWITCH
FOR MHI-YOKOHAMA

SIZE	CODE IDENT NO.	
B	31361	9952-202

SCALE | WT. | SHEET 1 OF 3

AutoCAD


WOODWARD
P/N 1755-119
1
2
LOAD
EMI
FILTER
LINE
+
–
18-40VDC POWER SUPPLY INPUT
(20W MAX)
7
3
4
C
NO
RELAY OUT #1 (TRIPPED WHEN OPEN)
TRIP
5
6
RELAY OUT #2 (FAILED WHEN OPEN)
MPU #1 FAILED
7
8
RELAY OUT #3 (FAILED WHEN OPEN)
MPU #2 FAILED
J1
COMMUNICATION PORT FOR
HANDHELD PROGRAMMER
4
9
10
5
ANALOG OUT #1
TACHOMETER (4-20 mA)
11
12
ANALOG OUT #2 (SPARE)
TACHOMETER (4-20 mA)
13
14
ANALOG OUT #3
(FACTORY USE ONLY)
15
16
NO CONNECTION
17
18
MPU #1 INPUT
1
19
20
MPU #2 INPUT
21
22
NO CONNECTION
SEE SHEET 1 FOR NOTES
WOODWARD GOVERNOR (JAPAN) LTD.
ENGINE CONTROLS DIVISION
TOMISATO, CHIBA, JAPAN
DIAGRAM - PLANT WIRRING
SIZE
B
9952-202
REV.
NEW
SCALE
SHEET 2
AutoCAD


5
4
3
2
1
D
C
B
A
23 NO CONNECTION
24 – + 18–40 VDC DISCRETE POWER INPUT (100 mA MAX AT 24 VDC) 6
25 A RESET (MOMENTARY)
26 B SPARE
27 C SPARE
28 D SPARE
29 E SPARE
30 F SPARE
31 G SPARE
32 H FAILSAFE OVERRIDE (CLOSE FOR OVERRIDE)
33 34 NO CONNECTION
35 36 37 2 NO CONNECTION 3
38 39 40 2 NO CONNECTION 3
41 42 43 2 NO CONNECTION 3
44 45 46 2 NO CONNECTION 3
SEE SHEET 1 FOR NOTES
WOODWARD GOVERNOR (JAPAN) LTD.
ENGINE CONTROLS DIVISION
TOMISATO, CHIBA, JAPAN
DIAGRAM – PLANT WIRRING
SIZE B
9952–202
REV. NEW
SCALE
SHEET 3
AutoCAD

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
NEW	E/C 504464	99-02	MAk

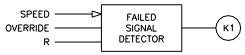
REV STATUS OF SHEETS	
SHEET	REV
1	NEW
2	NEW
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	
16	
17	
18	
19	
20	
21	
22	
23	
24	
25	
26	
27	
28	
29	
30	
31	
32	
33	
34	
35	
36	
37	
38	
39	
40	
41	
42	
43	
44	
45	
46	
47	
48	
49	
50	

FUNCTIONAL BLOCK DIAGRAM NOTES

SIGNAL FLOW

SIGNAL FLOW IS FROM LEFT TO RIGHT. ALL INPUTS FROM THE LEFT. ALL OUTPUTS EXIT TO THE RIGHT. EXCEPTIONS ARE NOTED. SIGNAL VALUES ARE SHOWN WITH AN ARROW. LOGIC SIGNALS ARE SHOW WITHOUT AN ARROW.

EXAMPLE



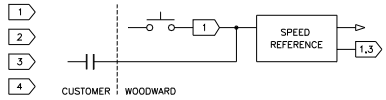
CUSTOMER INPUT/OUTPUT (I/O)

INPUTS ORIGINATE ON THE LEFT SIDE OF THE DRAWING. OUTPUTS TERMINATE ON THE RIGHT SIDE OF THE DRAWING. WITH THE EXCEPTION OF RELAYS. WHICH ARE SHOWN NEAR THEIR ASSOCIATED FUNCTION BLOCK. VERTICAL DASHED LINES SEPARATE SIGNAL FLOW BETWEEN WOODWARD GOVERNOR AND CUSTOMER EQUIPMENT.

INTERCONNECT CODE

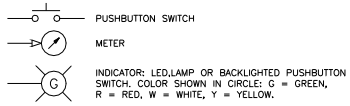
THE ⬠ SYMBOL INDICATES INTERCONNECTING SIGNAL FLOW BY CABLES WITH CONNECTORS ON BOTH ENDS. NO CUSTOMER WIRING REQUIRED. EACH CABLE IS DISTINGUISHED WITHIN THE BLOCK DIAGRAM NUMERICALLY AND GENERALLY EACH RACK WILL BE SHOWN ON SEPARATE SHEETS.

EXAMPLE



OPERATOR CONTROL PANELS

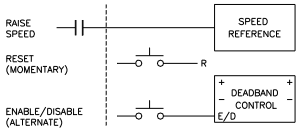
THE FOLLOWING SYMBOLS ARE USED TO DISPLAY OPERATOR CONTROL PANEL FUNCTIONS.



OPERATOR CONTROL PANELS

UNLESS OTHERWISE NOTED. ALL SWITCH CONTACTS CLOSE TO MAKE THE INPUT DESCRIPTION TRUE AND OPEN TO MAKE IT FALSE. SOME INPUTS ONLY REQUIRE A MOMENTARY CONTACT CLOSURE TO MAKE THE INPUT DESCRIPTION TRUE. THEY ARE LABELED AS MOMENTARY. SOME INPUTS REQUIRE AN ALTERNATE ACTION SWITCH CONTACT TO MAKE THE FIRST DESCRIPTION TRUE WHEN THE CONTACT IS CLOSED AND THE SECOND TRUE WHEN CONTACT IS OPENED. THEY ARE LABELED AS ALTERNATE.

EXAMPLE



FUNCTION CONNECTORS

TO REDUCE THE NUMBER OF LINES ON THE DRAWING. SOME FUNCTIONS ARE CONNECTED TOGETHER BY USING LIKE CHARACTERS, WORDS, OR TIEPOINT SYMBOLS.

R – RESET
A SINGLE INPUT, RESET IS DISTRIBUTED TO ALL OF THE LATCHING FUNCTIONS. AFTER THE INPUT SIGNAL RETURNS TO NORMAL, A RESET IS REQUIRED TO RESTORE THE OUTPUT TO A NORMAL STATE.

S – SHUTDOWN
MULTIPLE INPUTS CAN INITIATE A SHUTDOWN. THE SHUTDOWN FUNCTION BLOCK IS USUALLY LOCATED PHYSICALLY ON THE DRAWING NEAR THE FINAL DRIVER.

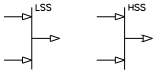
A – ALARM
MULTIPLE INPUTS CAN INITIATE AN ALARM. THE ALARM FUNCTION BLOCK IS USUALLY LOCATED ON THE DRAWING NEAR THE FINAL DRIVER.

⬡ – TIEPOINT SYMBOLS

BUSES

SIGNAL BUSES ARE SHOWN AS HEAVY LINES.

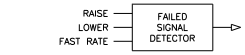
EXAMPLE



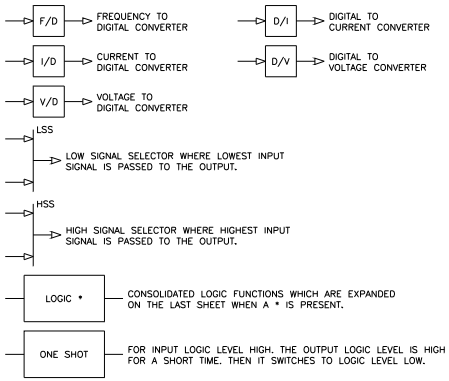
FUNCTION SYMBOLS

COMMON GOVERNOR FUNCTIONS ARE REPRESENTED BY RECTANGULAR BLOCKS. A DESCRIPTION OF THE FUNCTION IS SHOWN INSIDE THE BLOCK.

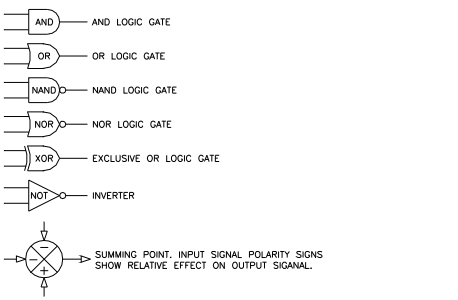
EXAMPLE

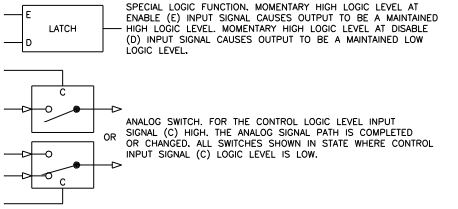


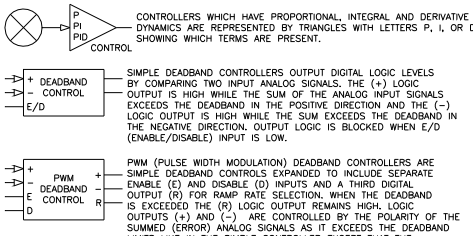
COMMONLY USED ABBREVIATED FUNCTIONS ARE:



COMMONLY USED ABBREVIATED FUNCTIONS ARE: (CONT)







UNLESS OTHERWISE SPECIFIED:
ALL DIMENSIONS ARE IN MILLIMETERS INCHES.
DRAWING DEFINITIONS AND TOLERANCES SHALL BE FOUND IN SS-112

MATERIALS:

3082-169	
5414-111	
8237-735	9907-718
NEXT LEVEL	FINAL LEVEL
APPLICATION	

THIRD ANGLE PROJECTION

C/C		
APPROV	YOT	99-02
CHECKED	MAk	99-02
DRAWN	MAk	99-02
CAD OPR.	MAk	99-02
APPROVAL		

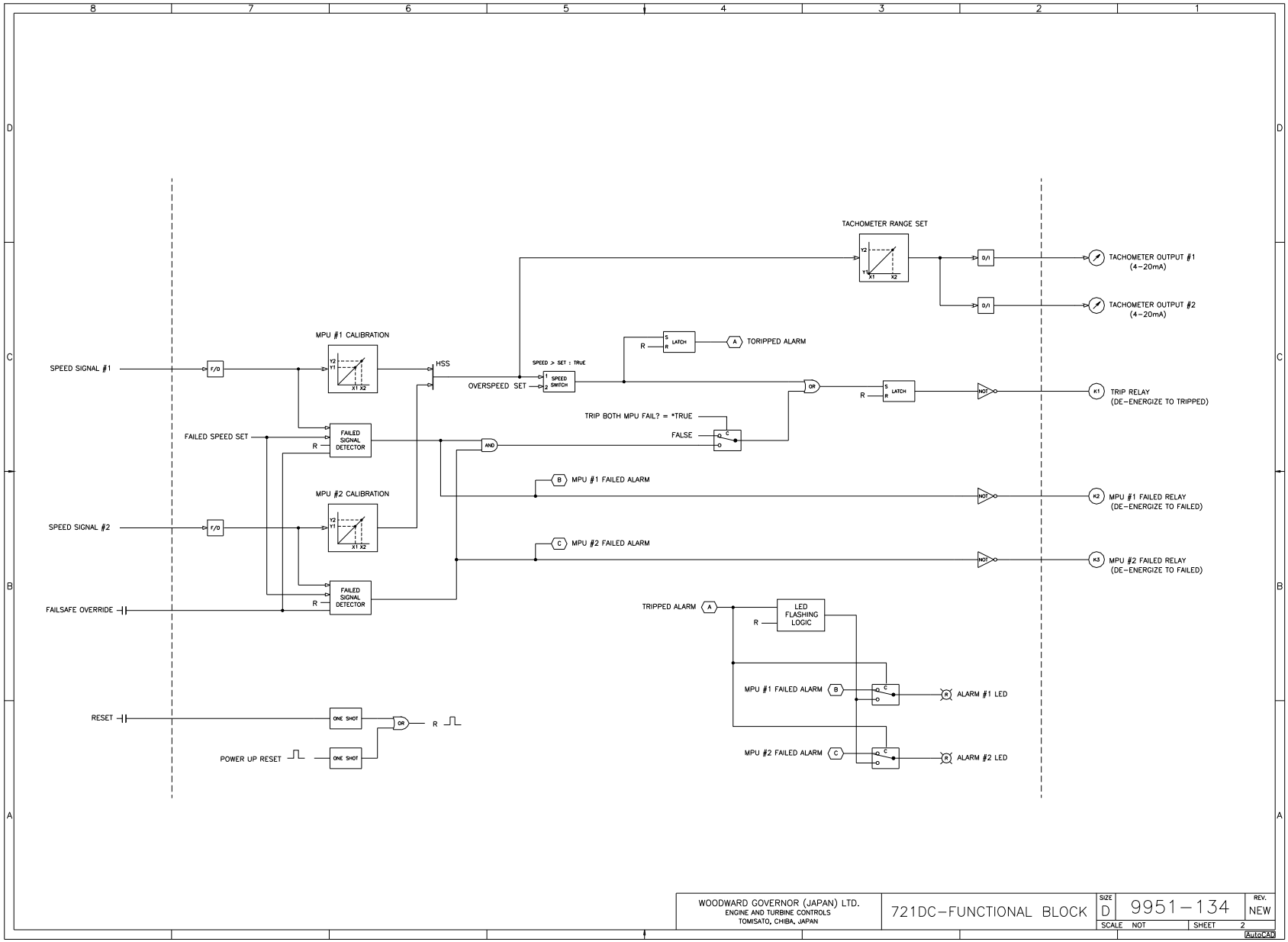
WOODWARD GOVERNOR (JAPAN) LTD.
ENGINE CONTROLS DIVISION
TOMISATO, CHIBA, JAPAN

DIAGRAM – FUNCTIONAL BLOCK
721 DC OVERSPEED SWITCH
FOR MHI–YOKOHAMA

SIZE D | CODE IDENT NO. 31361 | 9951–134

SCALE | WEIGHT | SHEET 1 OF 2

AutoCAD


TACHOMETER RANGE SET
TACHOMETER OUTPUT #1 (4-20mA)
TACHOMETER OUTPUT #2 (4-20mA)
MPU #1 CALIBRATION
SPEED SIGNAL #1
HSS
SPEED > SET : TRUE
OVERSPEED SET
TORIPPED ALARM
TRIP RELAY (DE-ENERGIZE TO TRIPPED)
FAILED SPEED SET
TRIP BOTH MPU FAIL? = *TRUE
FALSE
MPU #1 FAILED ALARM
MPU #1 FAILED RELAY (DE-ENERGIZE TO FAILED)
MPU #2 CALIBRATION
SPEED SIGNAL #2
MPU #2 FAILED ALARM
MPU #2 FAILED RELAY (DE-ENERGIZE TO FAILED)
FAILSAFE OVERRIDE
TRIPPED ALARM
LED FLASHING LOGIC
ALARM #1 LED
ALARM #2 LED
RESET
POWER UP RESET
WOODWARD GOVERNOR (JAPAN) LTD.
ENGINE AND TURBINE CONTROLS
TOMISATO, CHIBA, JAPAN
721DC-FUNCTIONAL BLOCK
SIZE D
9951-134
REV. NEW
SCALE NOT
SHEET 2

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
NEW	E/C 504464	99-02	MAk

NOTES:

1. SHIELDED WIRES TO BE TWISTED PAIR OR THREE CONDUCTORS AS NEEDED, WITH SHIELD GROUND AT ONE END ONLY.
   SHIELDS MUST BE GROUNDED AT ANY EXTERNAL POINT UNLESS OTHERWISE NOTED.
   ALL SHIELDS MUSE BE CARRIED CONTINOUSLY THROUGH ALL TERMINAL BLOCKS AND MUST NOT BE TIED TO OTHER SHIELDS EXCEPT AT THE COMMON GROUND POINT. THE SHIELDS ARE TIED TOGETHER AT GROUND STUD.
2. REMOVE JUMPER FOR 1-5V DC VOLTAGE INPUT.
3. ANALOG INPUT SIGNALS FROM OTHER SYSTEMS MUST BE ISOLATED FROM GROUND EITHER BY DESIGN OR EMPLOYMENT OF ISOLATION AMPLIFIERS.
4. ANALOG OUTPUTS TO OTHER SYSTEMS MUST BE ISOLATED FROM GROUND EITHER BY DESIGN OR EMPLOYMENT OF ISOLATION AMPLIFIERS.
5. SHIELDED WIRES TO BE TWISTED PAIR CONDUCTORS, WITH SHIELD GROUND AT ONE END ONLY.
   SHIELDS MUST BE GROUNDED AT EITHER CONTROL'S GRANDING POINT ONLLY UNLESS OTHERWISE NOTED.
6. DISCRETE INPUTS ARE ISOLATED FROM OTHER CIRCUITS AND INTENDED TO BE POWERED BY THE SAME SOURCE AS CONTROL SUPPLY VOLTAGE. INPUTS IS NORMALLY 10mA PER INPUT INTO 2210 OHMS.
7. RELAY CONTACT RATINGS: RESISTIVE – 2.0A AT 28V DC
   0.1A AT 115V AC 50 TO 400Hz
   INDUCTIVE – 0.75A AT 28V DC 200mH
   0.1A AT 28V DC LAMP
8. WHEN MOUNTING CONTROL TO BULKHEAD, USE THE GROUNDING STUT AND HARDWARE SUPPLY WITH THE CHASSIS TO ENSURE PROPER GROUNDING.
9. THE TERMINALS MARKED "NO CONNECTION" MUST REMAIN OPEN.
10. INTERNAL POWER SUPPLY PROVIDES DC ISOLATION BETWEEN POWER SOURCE AND ALL OTHER INPUTS AND OUTPUTS.

REV STATUS OF SHEETS					
SHT	REV	SHT	REV	SHT	REV
1	NEW	6		11	
2	NEW	7		12	
3	NEW	8		13	
4		9		14	
5		10		15	

UNLESS OTHERWISE SPECIFIED:
ALL DIMENSIONS ARE IN MILLIMETERS INCHES.
DRAWING DEFINITIONS AND TOLERANCES SHALL BE FOUND IN SS-112.

3082-169	
5414-111	
8237-735	9907-718
NEXT LEVEL	FINAL LEVEL
APPLICATION	

MATERIAL:

THIRD ANGLE PROJECTION

APPROVED	YOT	99-02
CHECKED	MAk	99-02
DRAWN	MAk	99-02
CAD OPR.	MAk	99-02
APPROVAL		

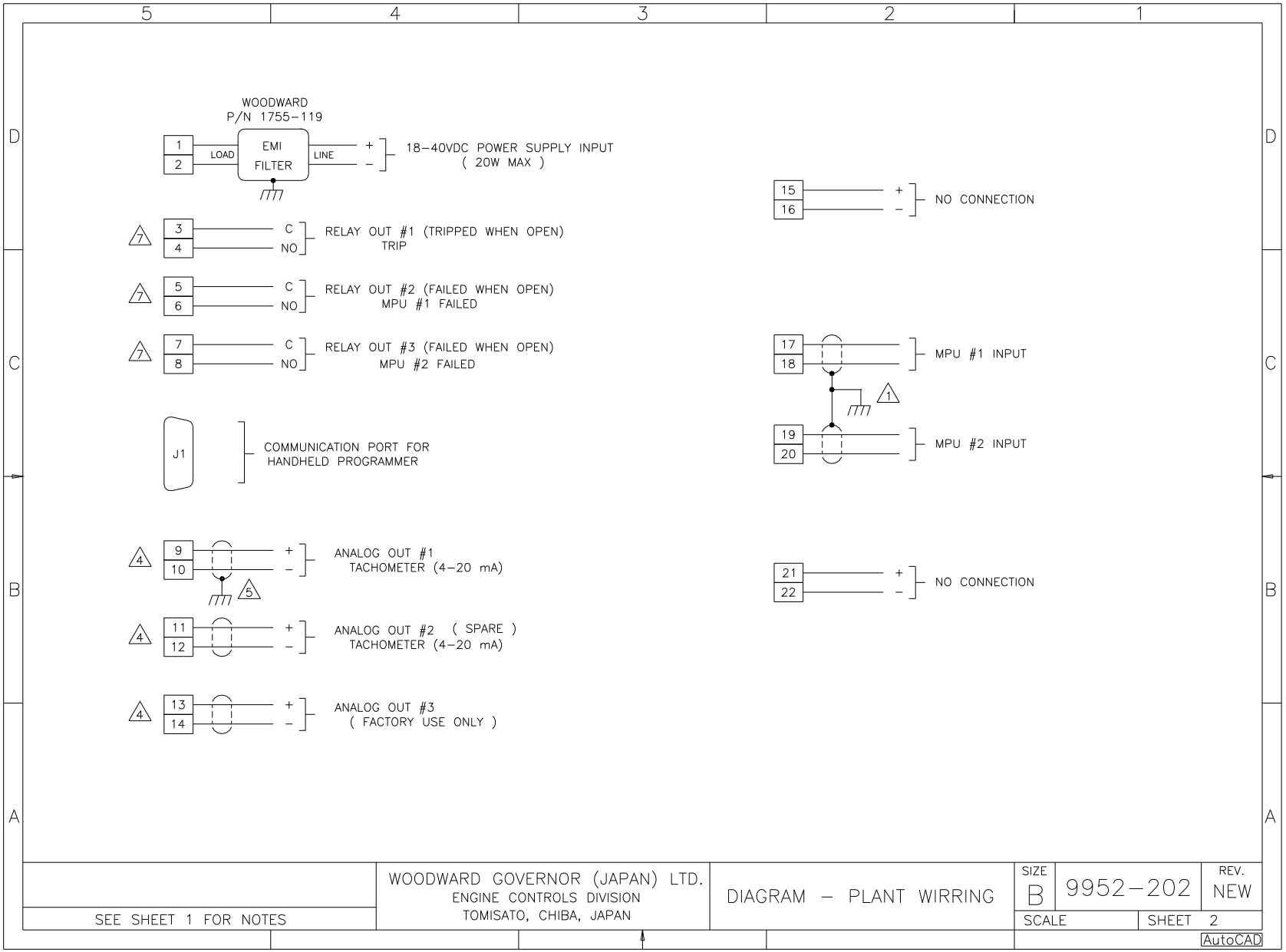
WOODWARD GOVERNOR (JAPAN) LTD.
ENGINE CONTROLS DIVISION
TOMISATO, CHIBA, JAPAN

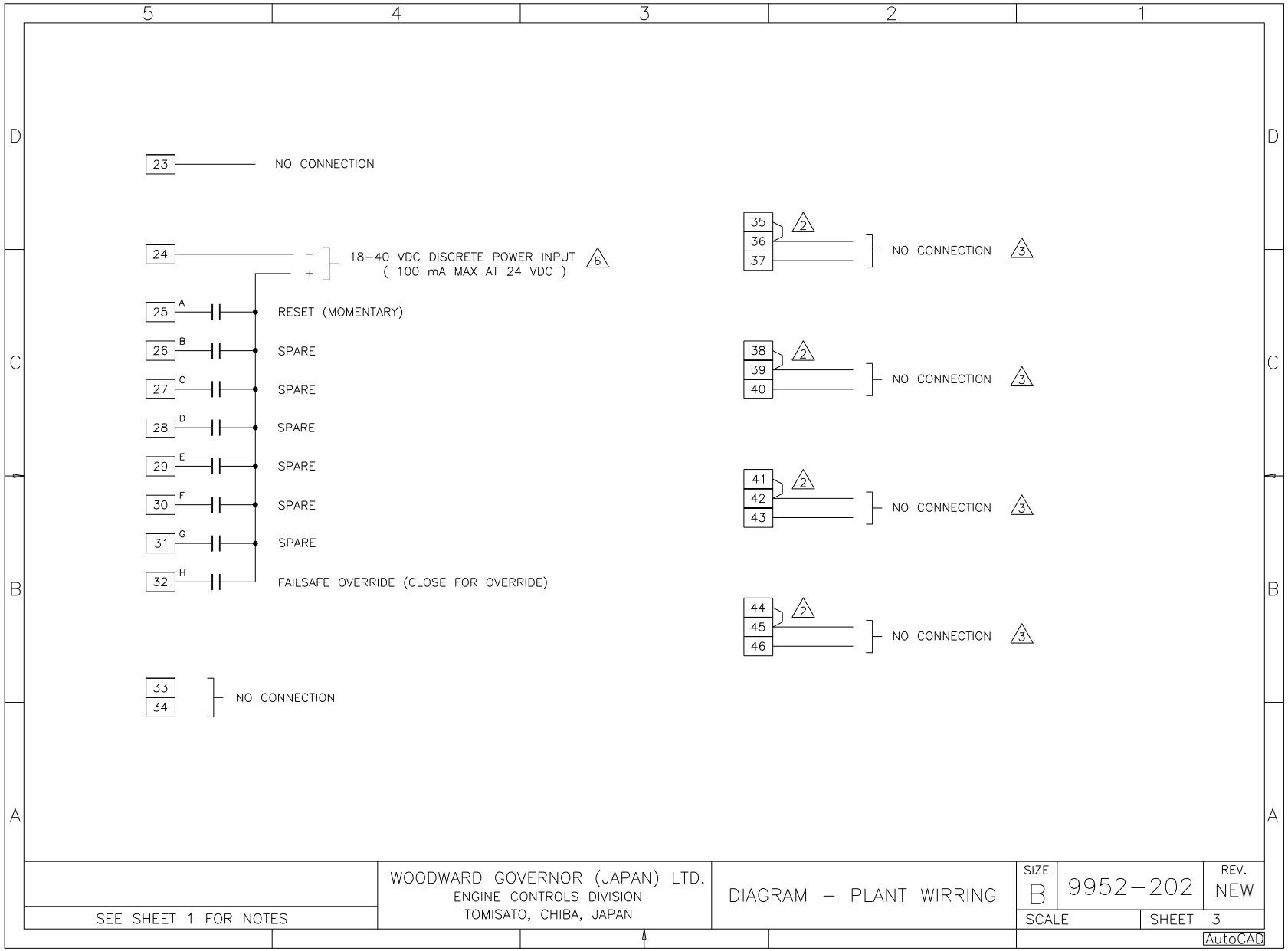
DIAGRAM – PLANT WIRING
721 DC OVERSPEED SWITCH
FOR MHI-YOKOHAMA

SIZE	CODE IDENT NO.	
B	31361	9952-202

SCALE | WT. | SHEET 1 OF 3

AutoCAD


WOODWARD
P/N 1755-119
1
2
LOAD
EMI
FILTER
LINE
+
–
18-40VDC POWER SUPPLY INPUT
(20W MAX)
15
16
NO CONNECTION
3
4
C
NO
RELAY OUT #1 (TRIPPED WHEN OPEN)
TRIP
5
6
RELAY OUT #2 (FAILED WHEN OPEN)
MPU #1 FAILED
7
8
RELAY OUT #3 (FAILED WHEN OPEN)
MPU #2 FAILED
17
18
MPU #1 INPUT
19
20
MPU #2 INPUT
J1
COMMUNICATION PORT FOR
HANDHELD PROGRAMMER
9
10
ANALOG OUT #1
TACHOMETER (4-20 mA)
11
12
ANALOG OUT #2 (SPARE)
TACHOMETER (4-20 mA)
13
14
ANALOG OUT #3
(FACTORY USE ONLY)
21
22
NO CONNECTION
SEE SHEET 1 FOR NOTES
WOODWARD GOVERNOR (JAPAN) LTD.
ENGINE CONTROLS DIVISION
TOMISATO, CHIBA, JAPAN
DIAGRAM - PLANT WIRRING
SIZE
B
9952-202
REV.
NEW
SCALE
SHEET 2
AutoCAD


5
4
3
2
1
D
C
B
A
23
NO CONNECTION
24
–
+
18–40 VDC DISCRETE POWER INPUT
(100 mA MAX AT 24 VDC)
6
25 A
RESET (MOMENTARY)
26 B
SPARE
27 C
SPARE
28 D
SPARE
29 E
SPARE
30 F
SPARE
31 G
SPARE
32 H
FAILSAFE OVERRIDE (CLOSE FOR OVERRIDE)
33
34
NO CONNECTION
35
36
37
2
NO CONNECTION
3
38
39
40
2
NO CONNECTION
3
41
42
43
2
NO CONNECTION
3
44
45
46
2
NO CONNECTION
3
SEE SHEET 1 FOR NOTES
WOODWARD GOVERNOR (JAPAN) LTD.
ENGINE CONTROLS DIVISION
TOMISATO, CHIBA, JAPAN
DIAGRAM – PLANT WIRRING
SIZE
B
9952–202
REV.
NEW
SCALE
SHEET 3
AutoCAD

721 Control Specification

Power Supply Rating	18 - 40 VDC (24 VDC nominal)
Power Consumption	18 W nominal
MPU Inputs (2 ch.)	200 - 15000 Hz (1 Vrms minimum)
Discrete Inputs (2 ch.)	10mA / ch. at 24 VDC
Analog Outputs (2 ch.)	4 - 20 mA
Relay Outputs (3 ch.)	2 A Resistive at 28 VDC 0.75 A Inductive at 28 VAC 0.1 A Resistive at 115 VAC
Programmer Serial Port	RS - 422, 9pin D Connector, 1200baud, Full duplex
Accuracy	Trip Point ± 4 Hz at 25 deg. C (< 5000 Hz)
Total Response Time	40 msec max.
Ambient Operating Temperature	- 40 to 70 dec. C
Storage Temperature	- 55 to 105 dec. C
Humidity	95% at 38 dec. C
EMI/RFI Emissions/Susceptibility	EN50081-2 and EN50082-2
Humidity	US MIL-STD 810D, Method 507.2, Procedure 3
Mechanical Vibration	24 - 2000Hz swept sin wave, 2.5Gs constant acceleration, resonant dwells - 1 million cycles, total time 6 hours/axis
Mechanical Shock	US MIL-STD 810C, Method 516.2, Procedure 1 (basic design test), Procedure 2 (transit drop test, packaged), Procedure 5 (bench handling)
Salt Spray	ASST. B 117-73

We appreciate your comments about the content of our publications.

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

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

ISO 9001
BUREAU VERITAS
Certification

WOODWARD

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.

2008/8/Makuhari