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July 24, 2002

Process Control Remote Communications Guide - Profibus Protocol

MD-0052 Rev C

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Original Printing - May 2001

Printed in the United States of America

Special Icons and Text Styles

The following icons are used in this manual to indicate items of special interest.

Icon	Type	Description
	Note	The Note icon is used to draw the reader's attention to crucial information within the manual. Ignoring a Note would not cause equipment damage or personal injury, but could result in wasted time or effort.
	Electrical	The Electrical icon is used to indicate the possibility of high electrical current or electrostatic discharge. Use caution when working around or handling this equipment.
	Caution	The Caution icon is used to denote the possibility of damage to the equipment or a task requiring precautionary measures.
	Warning	The Warning icon is only used when an action could result in serious injury to personnel or severe damage to the equipment. Always pay close attention to the warnings in this manual.

Specific buttons on the console are represented by capitalized, bold text enclosed in angle brackets. For example, “Press the **<RECIPE>** key.”

Revision History

Revision	Page(s)	Change
-	All	Initial release.
A	All	Added sections for continuous blenders and Gravitrol.
B	Sections 1 and 2	Changes to section describing GSD file. Changes to example in section 2.13.
C	Sections 2, 3, and 4	Added: • Bit definitions for Regular Mode Button • Description of Rate Speed Factor bit

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- ✔ Introduction
- ✔ Hardware
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- ✔ How It Works
- ✔ The PCC Default Configuration

1.1 Introduction

This document is intended for experienced computer programmers. It provides information that you need in order to program a PC or a PLC to communicate with Process Control equipment on a Profibus network. PROFIBUS is the abbreviation of **PRO**cess **FI**eld **BUS**.

Profibus is a vendor independent FieldBus protocol designed to handle large amounts of data, at high speed, in industrial applications. The most widely accepted international networking standard, Profibus enables you to connect up to 126 devices and communicate with them at a speed of up to 12Mbps.

The Profibus standard consists of hardware and software components. Process Control Corporation equipment implements the Profibus DP standard for cyclic data exchange. (There are also Profibus standards for non-cyclic messages, but Process Control only uses cyclic messages.)

1.2 Hardware

Process Control's implementation of Profibus uses a master/slave configuration. The master is the PC or PLC for which you are writing a program, and the slave is a blender or Gravitrol™ that this program controls. The master and slave devices communicate via shared memory, which is synchronized automatically by the hardware.

1.2.1 Masters

The master on a Profibus network can be either:

- a PLC with Profibus capability, or
- a PC with a Profibus network interface card installed. Such cards are available from several manufacturers, in PCI, ISA, and PCMCIA configurations.

1.2.2 Slaves

A Process Control blender or Gravitrol™ unit can become a slave on a Profibus network with the addition of a Profibus communication board installed inside the operator control panel. Profibus communication boards connect to the control panel's PC/104 bus.

Board Setting

Profibus communication boards are configured via hardware straps. Process Control ships boards with correct hardware strapping, as shown below:

Interrupt:	Disable
Physical address:	Default of 0xCA000*

*If additional communication boards are used, each board must have a unique address. The address must be selected to ensure that the memory on the board does not overlap the memory of either the device or another board.

The Profibus communication board is shipped with the Sycon configuration software, which runs on Microsoft Windows PCs. Since the board ships preconfigured, you do not have to install or use the Sycon utility.

The PCC equipment automatically detects the Profibus hardware and provides a menu option (under **<SETUP>**) to enable the Profibus software. To enable the Profibus interface:

1. Press **<SETUP> 925**.
2. Use the arrow keys to select “PROFIBUS.” (This option appears only if a Profibus card is installed and detected.)
3. Press **<ENTER>**. The prompt “PROFIBUS ENABLED?” is displayed.
4. Press **<YES> <ENTER>**. The prompt “BYTE ORDER?” is displayed.
5. The correct byte order to use is determined by the type of processor in the master device. Select either “M/L BYTE M/L WORD” for a Motorola-based master, or “L/M BYTE L/M WORD” for an Intel-based master. (Other choices are available, but are seldom needed.)

1.2.3 Cables

Be careful when connecting the 9-pin Profibus cable. **Profibus cables should only be connected to Profibus connectors.** The female connector on the Profibus board connects to the Profibus network, while the male connector connects to the diagnostic cable. The diagnostic cable is used to configure the Profibus board.

You can damage equipment by

•connecting non-Profibus cables to the Profibus connectors, or

•connecting Profibus cables to non-Profibus connectors.

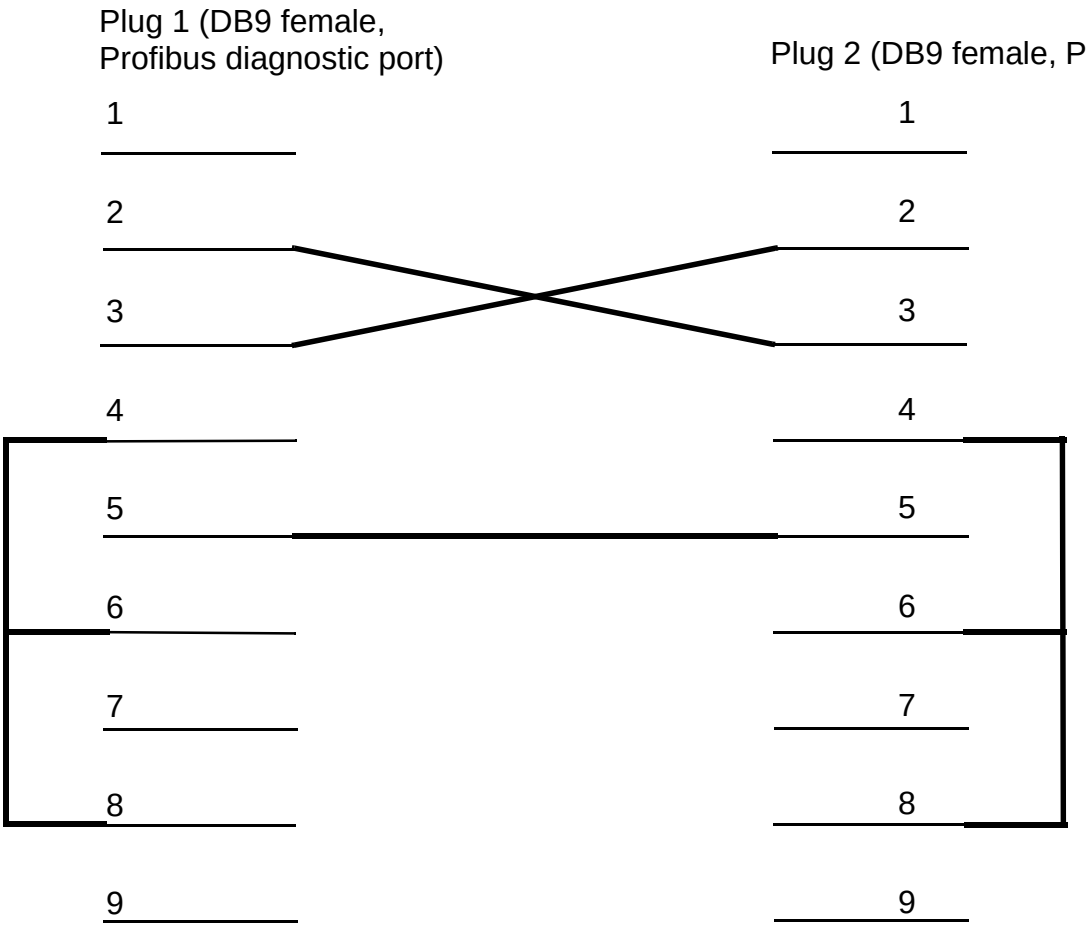

Figure 1 - 1 Pin out for the Diagnostic Cable

1.3 Software

The software drivers that enable you to communicate with devices on your Profibus network should be included with the Profibus hardware that works with the Master device.

1.4 How It Works

The Profibus Slave communication module maintains two data areas, known as the Input and Output data areas, which are mirrored in the Profibus master. The values placed into the Output data are considered as commands to the slave device, while data in the Input data area is the response from the slave device.

The contents of the shared memory is controlled by the setup of the User Control Blocks (UCBs) that are associated with the registers to be accessed. UCBs are indirection registers which consist of pairs of address and value registers. Each address register in a UCB contains the *address* of a register in the slave device. The corresponding value reg-

ister contains the *value* of that register in the slave device. There are a total of 10 UCB blocks, each with 50 registers.

The diagram below illustrates the relationship between the address and value registers of the UCBs

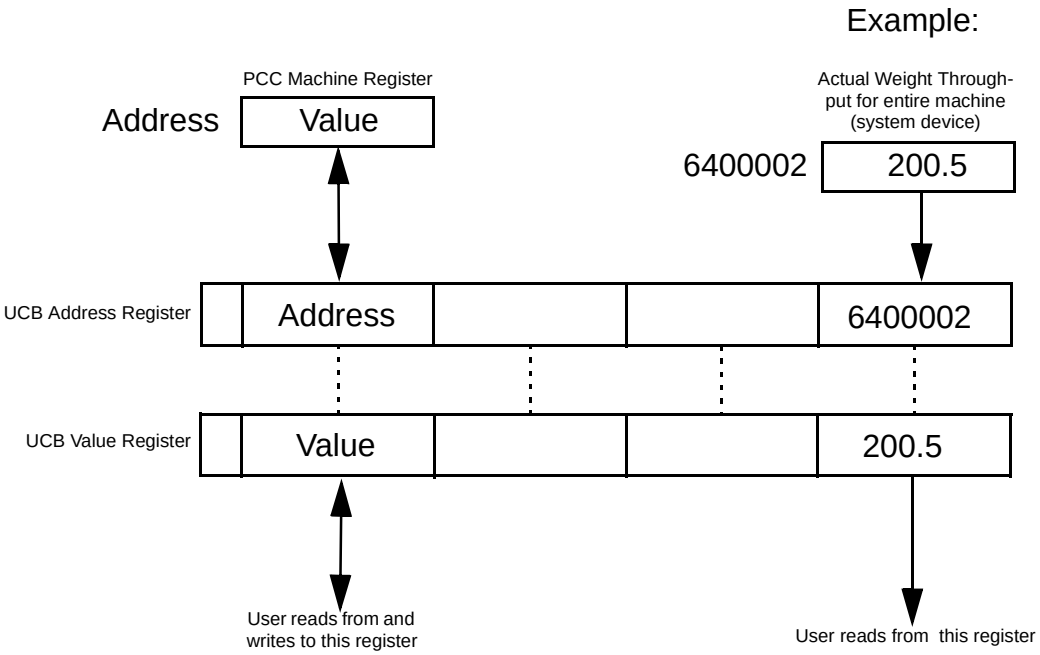

Figure 1 - 2 UCB Registers

The UCB address registers can be accessed either via the Setup/Communications menu or remotely via the Profibus itself. (See “Setting up the UCB via the front panel:” on page 2-21 and “Setting Up The UCB via Profibus” on page 2-23.) Setting up the UCB remotely is recommended only during equipment startup (such as the start of a program that runs on a PLC). However, it does guarantee that the UCB values will match the users equipment program.

1.4.1 Profibus Data Areas

Profibus GSD file

Every Profibus device is provided with a Profibus configuration file, also known as a GSD file. GSD files are also available from the Profibus web site (www.profibus.com). You can view a GSD file with any program that can read an ASCII text file.

The GSD file defines several modules. The default configuration uses these two modules:

64 word input con (0x40,0FF)
64 word output con (0x80,0xFF)

The above modules are used as control blocks for the Process Control equipment. Some master devices, such as Siemens PLCs, can only transfer a maximum of 112 bytes in one message. Because of this limitation, the largest block size that you can use is 32 words.

Control Blocks

The control blocks are divided into two areas:

- The first 8 words of the module control the input/output of data and the mode of the PCC equipment.
- The rest of the module is an array of data entries, each two words long. The number of data entries used depends upon the values placed in the ‘count’ fields of the control blocks.

A default Profibus configuration file contains the following structure:

Table 1.1: Control Block Structure

Symbolic Name	Type	Offset			Description
		word	byte	bit	
OutputBlockNo	Short	0	0		The User Configurable Block (UCB) to which you are writing. Valid values are from 1-10.
UCB_OutputAccess		0	0	15	This is the most significant bit in InputBlockNo. If it is 0, a write command writes the registers that the UCB values point to. If it is 1, a write command writes the UCB itself.
OutputIndexNo	Short	1	2		The register number of the first register you are writing in the UCB.
OutputCount	Short	2	4		The number of values you are writing.

Table 1.1: Control Block Structure

Symbolic Name	Type	Offset			Description
		word	byte	bit	
InputBlockNo	Short	3	6		The UCB to which you are reading. Valid values are from 1-10.
UCB_InputAccess		3	6	15	This is the most significant bit in OutputBlockNo. If it is 0, a read command reads the registers that the UCB values point to. If it is 1, a read command reads the UCB itself.
InputIndexNo	Short	4	8		The register number of the first register you are reading in the UCB.
InputCount	Short	5	10		The number of values you are reading.
StatusWord	Long	6	12		32 bit Mode of slave. See “The Status Word” on page 1-9.
01Float	Float	8	16		32 bit float value being read from or written to the UCB.
01Word_Low	Word	8	16		16 bit value being read from or written to the UCB.
01Word_High	Word	9	18		16 bit value being read from or written to the UCB.
.....	Float	...	...	...	...
XXFloat	Float	XX * 2 + 6			32 bit float value being read from or written to the UCB.
XXWord_Low	Word	XX * 2 + 6			16 bit value being read from or written to the UCB.
XXWord_High	Word	XX * 2 + 6			16 bit value being read from or written to the UCB.

XX is a two digit value from 01 to 28.

The first six entries in the above structure control the reading and writing of values to the data areas by defining

- the UCB block (OutputBlockNo and InputBlockNo),
- the offset into the UCB (OutputIndexNo and InputIndexNo), and
- the number of entries to process (OutputCount and InputCount.)

The easiest way to understand this concept is to imagine that each read and write opens a “window” into the data area. The BlockNo variables (InputBlockNo or OutputBlockNo) and the IndexNo variables (InputIndexNo or OutputIndexNo) control the location of the window, while the Count variable (InputCount or OutputCount) controls the size of the window. The illustration below shows some examples. Note that the concept is the same for reading and writing.

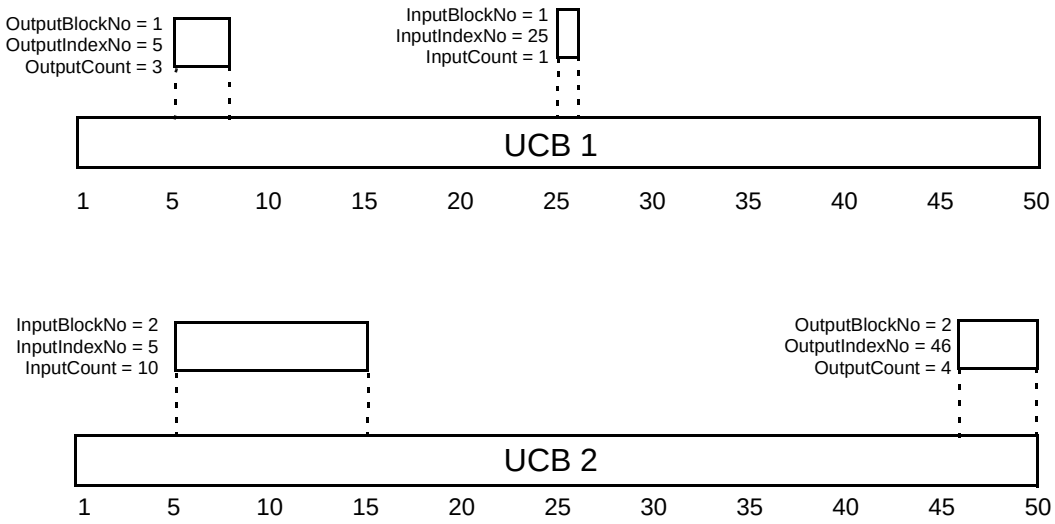

Figure 1 - 3 Memory Mapping

Values are limited by the number of UCB blocks defined in the slave device and the number of entries in the slave UCB block.

The numbering of the UCB block and index starts at one. However, the block number, index, and count all default to zero. When writing, they must all have non-zero values, or nothing will be written. When reading, zero values are treated as one.

The UCB_InputAccess and UCB_OutputAccess control access to the UCB. If the bit is set, values are read or written to the UCB. If the bit is cleared, values are read or written to the registers that the UCB registers point to. For example,

- If the bit is *set* and you write the value “12” to a UCB register that currently has the value “27”, that register will receive the value “12”.

- If the bit is *cleared* and you write the value “12” to a UCB register that currently has the value “27”, the UCB register will still have the value “27”, but register 27 will receive the value “12”.

Placing a value into the block number overwrites the UCB access bit. When writing to the UCB values, write a value into the block that has the Access bit ‘on’ or hold the count at zero until the block number and access bit are set.

General rules:

- Write control block entries are disabled if set to zero
- Read control block entries default to 1 if set to zero.

The Status Word

The Status Word is used to read and control the mode of operation (pause, automatic, etc.) of the slave device. Each bit in the status word is part of a *group*, and each group can have only one bit set at any given time. (Some groups have only one bit.) An example of a group is the first four bits—since the extruder can be in only one mode, you can set only one of the first four bits. Invalid bit settings are ignored.

Bytes are machine-dependent. For example, if there is no extruder, the first four bytes would be reserved. See the machine’s hardware manual for the meaning of each bit.

Table 1.2: Status/Control Word Bits

Bit	Value		Symbolic Name	Description
	Decimal	Hexa-decimal		
0	1	1	Pause_Extruder	Extruder to “Pause” mode
1	2	2		Reserved
2	4	4	Manual_Extruder	Extruder to “Manual” mode
3	8	8	Auto_Extruder	Extruder to “Auto” mode
4	16	10	Pause_Blender	Blender to “Pause” mode
5	32	20	Pause_Complete	Pause after completing current batch

Table 1.2: Status/Control Word Bits

Bit	Value		Symbolic Name	Description
	Decimal	Hexa-decimal		
6	64	40	Manual_Blender	Blender to “Manual” mode
7	128	80	Auto_Blender	Blender to “Auto” mode
8	256	100		Reserved
9	512	200		Reserved
10	1024	400		Reserved
11	2048	800	Clear_Rate_Speed	The effect depends on the device. On a continuous blender or Gravitrol, this bit clears the rate speed table. On a Guardian, it sets the prompt “New material in any hopper?” to “Yes”. (Reads 0)
12	4096	1000		Reserved
13	8192	2000	Clear_Shift	Clear Shift Totals (reads 0)
14	16384	4000	Clear_Inventory	Clear Inventory Totals (reads 0)
15	32768	8000	Clear_Alarm	Clear Alarms (reads 0)
16	65536	10000	Invalid Recipe	Set if new recipe is invalid (read only)

Variables

The variables defined by the default PCC Profibus configuration is a set of 28 entries. Each entry is four bytes long and is the union of a floating point variable with two shorts.

The variables’ symbolic names are assigned using the following scheme:

- All variables begin with a two digit number
- The Float prefix number is the entry in the array
- The Float prefix number is 1 based like the UCB entries
- The two short ‘union’ with the float have the same number prefix
- The two shorts have suffixes based upon the bit values of Intel processor
    - Low: bits 31-16 have the Least Significant Bits (LSB)

- High: bits 15 - 0 have the Most Significant Bits (MSB)

Table 1.3: Profibus Variables

Symbolic Name	Offset		Length		Data Type
	byte	word	byte	word	
XXFloat	0	0	4	2	IEEE float
XXWord_Low	0	0	2	1	short, LSB_MSB
XXWord_High	2	1	2	1	short, LSB_MSB

XX is a two digit value from 01 to 28.

Data Format

Depending on the type of processor used in the remote system (the master), the data in the two shorts can be arranged in one of two ways:

- The first bit can be the most significant bit. This is the data format expected by remote systems with Motorola processors.
- The first bit can be the least significant bit. This is the default data format, and is the format expected by remote systems with Intel processors.

See the documentation for the remote system to determine the correct setting. If this is not possible, use the Status Word as a test:

1. Manually determine the status of the slave device using its control panel.
2. Using Table 1.2 on page 1-9, manually calculate the value of the Status Word.
3. Use the remote (master) system to read the Status Word. If it is not the value that you calculated, then you need to change the data format on the slave device.

To change the data format on the slave device, follow the procedure in “Slaves” on page 1-2.

Repetitive Values

When the Master changes the data in the shared memory, the Profibus hardware automatically detects the change and updates the Slave's memory to match. Duplicate writes of the same save are blocked.

UCB entry numbering starts at one, not zero! If you write to UCB entries that contain zero, the write will fail and the failure will not be reported. (The Profibus slave device does not perform range check on the variables.)

Resetting Totals

Some registers (such as the system shift totals) contain "real world" information that you should not be able to change. To reset any of these registers, write to it. When you write any value to these registers, they do not accept the value that you write to them, but instead act as if you had written a zero. In other words, the only number that you can put into these registers is zero.

To ensure that the reset has occurred:

- Change the value written each time you reset the register. A good way to do this is to alternate between two values, such as zero and one.
- Monitor the totals after resetting them.

1.5 The PCC Default Configuration

The PCC default configuration is defined as an input module and an output module. Both modules

- are 64 words (128 bytes) long,
- have the consistence attribute,
- have identical structure, and
- have a starting address of 0.

1.5.1 Modifying the Default Configuration

Process Control provides a default configuration for the Profibus card installed in PCC equipment. You can change the configuration by using the SyCon utility provided with the Profibus card. The SyCon utility is provided by Synergetic/Hilscher Corporation—Process Control does not support this utility.

1. Install the software on a Microsoft Windows-based system.
2. Start the SyCon Utility.
3. Click on **File** on the main menu.
4. Select **Open**.
5. Select the default configuration file from the browser window. The screen is displayed as follows:

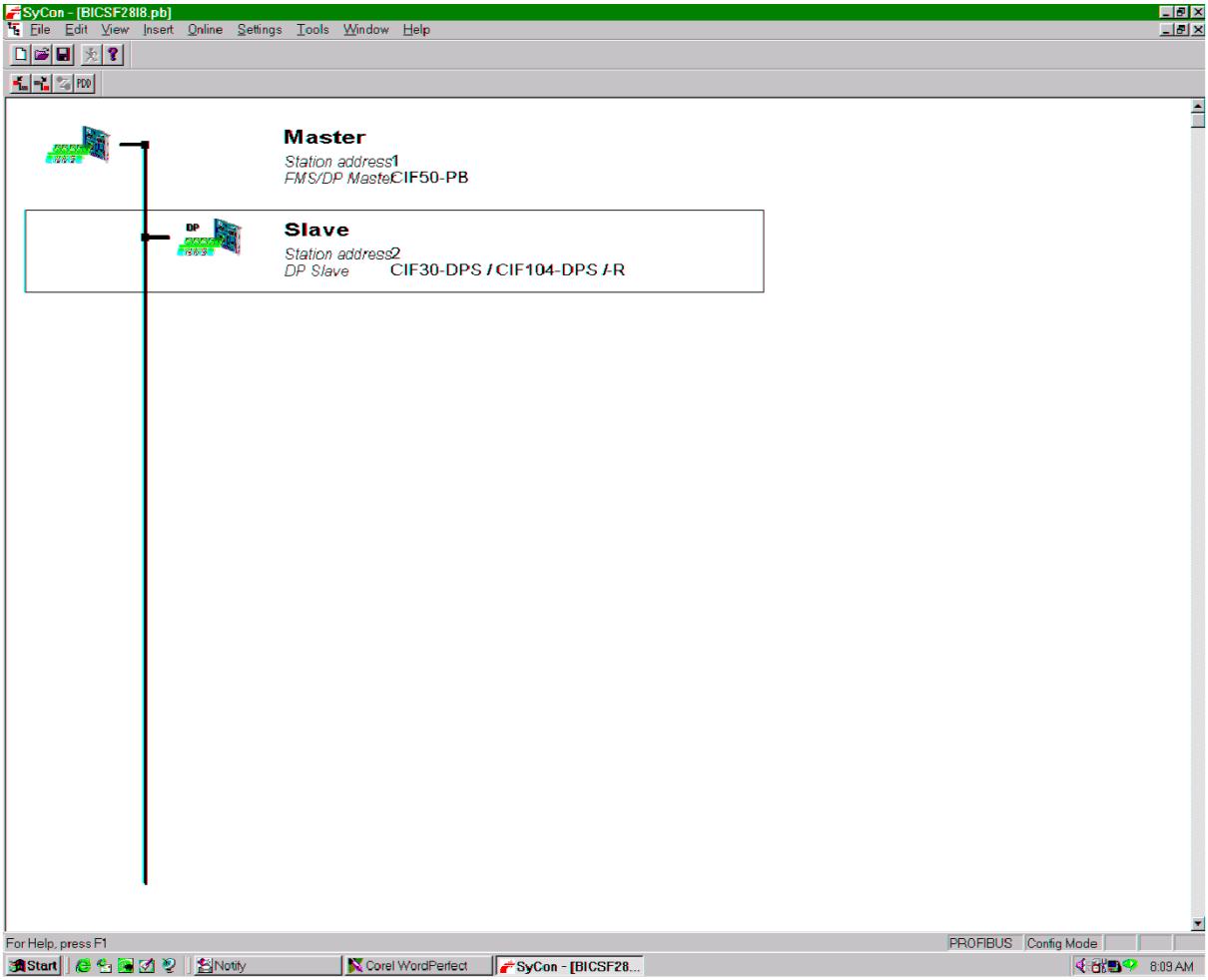

Figure 1 - 4 Default Configuration

If the box does not appear around the Slave device, click on the Slave.

6. To display the slave configuration, right click on the Slave and select **Slave Configuration**. The screen updates as shown below:

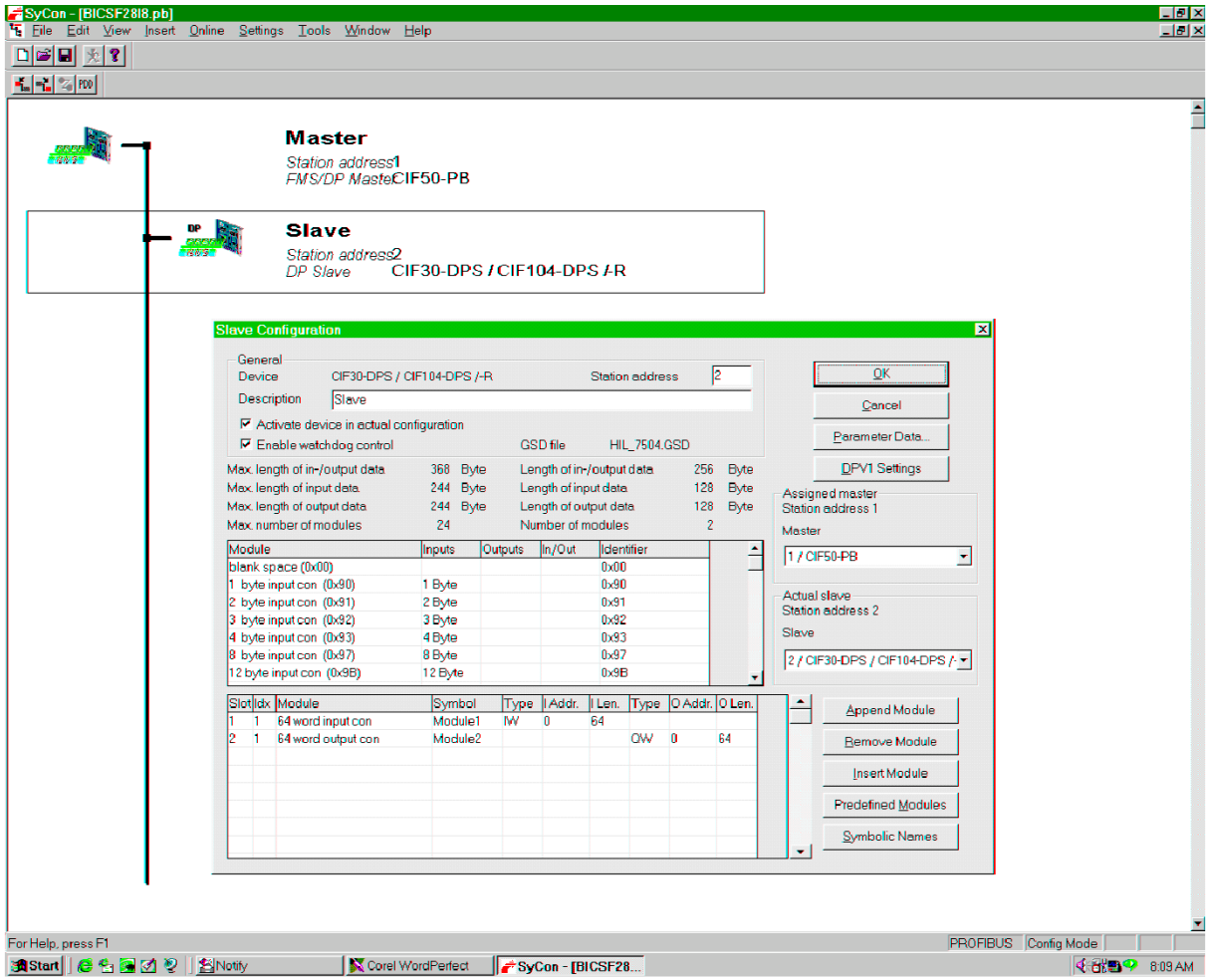

Figure 1 - 5 Slave Configuration

Module Size

If 128 bytes is too large for your Profibus master, you can use a smaller module. However, it must meet the following criteria:

- Modules must use word addressing.
- Modules selected must have the consistence attribute.
- The Input and Output modules must be the same size.
- Modules must be at least 10 words (20 bytes).
  - The first 8 words are reserved for PCC device control.
  - Modules must have at least one double word entry.

The size of the module determines the number of entries that can be read or written in a single block.

To determine the number of entries:

1. Subtract 8 words from the size of the Input module.
2. Divide the result by 2.

   Example 1: One module, 64 words (0x80, 0xFF)
   (64 words - 8 words) / 2 = 28 entries

   Example 2: One module, 32 words (0x80, 0xDF)
   (32 words - 8 words) / 2 = 12 entries

When selecting a module size, determine the maximum number of parameters that you will need to change or monitor in one message. For example, if a blender contains four hoppers and you need to monitor each hopper, then you need at least four (4) entries to monitor that blender. For optimum system performance, use a few large messages rather than many small messages.

If one module can not hold the number of entries that you need, you can use multiple modules. Additional modules do not need to contain PCC device control information—the entire module is divided into 2 word entries. Additional modules must meet the following criteria:

- Modules must meet PCC criteria listed above.
- The physical addresses of all modules must be non-overlapping and contiguous.
- Total module size and number must not exceed the hardware limitation.
- The total message size can not exceed 244 bytes. This is a Profibus limitation.
- The total number of modules must not exceed 24.

To calculate the total number of entries in a module:

1. Multiply the number of additional modules by their size in words.
2. Divide the result by two. (Each entry uses two words.)
3. Add the number of entries in the first module.

Example:

If one additional 16 word module is used with the default module, the total number of entries is 28 + 8 or 36.

Module 1, 64 words (0x40, 0xFF)
(64 words - 8 words) / 2 = 28 entries

Module 2, 16 word input con (0xDF)
16 words / 2 = 8 entries

Total entries= 36 entries

1.6 Examples

All Profibus communication with Process Control equipment is handled through a buffer that maps to the User Control Blocks (UCBs). If you are not familiar with Profibus buffers, see “Profibus Data Areas” on page 1-5.

Each example consists of two parts:

- setting up the UCB.
- using the UCB to access the registers in the blender or Gravitrol.

Setting up the UCB:

- only needs to be done once, then you can use it whenever you need it.
- can be done at the device’s control panel, as well as remotely.
- when done remotely, consists of:
  - writing to the buffer.
  - writing the buffered data to the UCB.

Examples of Profibus communication with Guardian blenders, continuous blenders, and Gravitrols are included at the end of chapters 2, 3, and 4.

SECTION 2 - Guardian Profibus Registers

TOPICS DISCUSSED IN THIS CHAPTER

- ✔ Device and Subdevice Definitions
- ✔ Register Definitions for Extruder
- ✔ Register Definitions for Ingredient Hoppers
- ✔ Register Definitions for Batch Weigh Hopper
- ✔ Register Definitions for Mixer
- ✔ Register Definitions for Refeed or Gravifluff Feeder
- ✔ Register Definitions for Width/ID/OD Device
- ✔ Register Definitions for Gravifluff Loader Hopper
- ✔ User Configurable Blocks
- ✔ Register Definitions for System Device
- ✔ Examples

2.1 Guardian Register Numbering System

The Profibus interface supports two data types: IEEE float and unsigned integer. Registers from 1 - 299 are IEEE floats, while registers 300 - 500 are unsigned integers. There is a two digit designation for device and a two digit designation for sub-device. Registers are assigned with the following format: **ddssrrr**

Where: **dd**: Device number (0-99)

ss: Subdevice number (0-99)

rrr: Registers number (1-500)

2.2 Guardian Device and Subdevice Definitions

The Guardian has the following device and subdevice numbers. Ranges not defined in the following table are reserved by Process Control. The **dd** is the device number (00 - 99) and **ss** is the subdevice number, defined below:

Table 2.1: Guardian Devices and Subdevices

dd	ss	Description
00	00	Extruder
00	01-16	Ingredient Hopper A - Hopper P
00	96	Batch Weigh Hopper
00	97	Mixer
00	98	Refeed
50	00	Haul Off (NIP/Capstan/Chill Roll/Puller etc.)
50	01	Secondary Hauloff (Winder/Spooler etc.)
52	00	Width Controller
53	00	Gravifluff
58	00-09	UCB Definitions
59	00-09	UCB Data
60		Recipe Data (not yet available)
61		Recipe Name (not yet available)
62		Resin Data (not yet available)

Table 2.1: Guardian Devices and Subdevices (Continued)

dd	ss	Description
63		Resin Name (not yet available)
64	00	System Data

2.3 Guardian User Configurable Block (UCB)

2.3.1 Definition Device (dd = 58)

This device enables you to define UCBs which are user configured blocks of registers. They enable you to group registers of the same type (float or int) in a block, then read or write the entire block with one command. Using UCBs results in much less communication overhead. There are 10 UCBs available, each containing 50 registers. The format of the UCB definition address is **580b0rr** where **b** is the UCB block number (0=UCB1,1=UCB2 etc.), and **rr** is the register number (00-50). The value that is placed in the UCB register is the register address of the parameter you wish to access. For example, to define UCB 2 to read the inventory weight of hopper A, B, and C do the following:

Write a value of 1026 to address 5801001 (block 2, reg 1)
Write a value of 2026 to address 5801002 (block 2, reg 2)
Write a value of 3026 to address 5801003 (block 2, reg 3)

2.3.2 Data Device (dd = 59)

This device enables you to read data from or write data to the registers defined in the UCB blocks. The format of the UCB definition address is **590b0rr** where **b** is the UCB block number (0=UCB1,1=UCB2 etc.), and **rr** is the register number (00-50). Assuming that UCB 2 is defined as in the UCB definition example above, to read the inventory weight of hoppers A, B, and C do the following:

Read address 5901001 (block 2, reg 1)
Read address 5901002 (block 2, reg 2)
Read address 5901003 (block 2, reg 3)

2.4 Guardian Device Register Definitions

The register numbers are unique to each device but are identical for each subdevice within a device. Below are definitions for each of the device/subdevice combinations.

2.5 Register Definitions for Extruder

Table 2.2: Register Definitions for Extruder

Description	Register	Data Type	Read/Write
Set Weight Throughput	0000001	Float	Read
Actual Weight Throughput	0000002	Float	Read
Set Density	0000003	Float	Read
Actual Density	0000004	Float	Read
Set Parts	0000011	Float	Read
Actual Parts	0000012	Float	Read
Manual Start Speed	0000013	Float	Read
Set Ratio Speed	0000017	Float	Read/Write
Actual Ratio Speed	0000018	Float	Read
Set Speed	0000019	Float	Read/Write
Actual Speed	0000020	Float	Read
Hopper Weight	0000024	Float	Read
Shift Weight	0000025	Float	Read/Write*
Inventory Weight	0000026	Float	Read/Write*
New Parts	0000030	Float	Read/Write
New Density	0000031	Float	Read
New Manual Start Speed	0000032	Float	Read/Write
Status	0000302	Integer	Read
Current Alarms	0000303	Integer	Read/Write**
Latched Alarms	0000304	Integer	Read/Write**

*Write to register clears value

**Write to register acknowledges alarms

Table 2.3: Bit Definitions for Extruder Status

Bit	Description
0	Loading
1	Ramping
3	Not in gravimetric
5	1 = rate speed factor *IS NOT* present, 0 = rate speed factor *IS* present
6	No calibration

Table 2.4: Bit Definitions for Extruder Current Alarms and Latched Alarms

Bit	Description
0	EXD Hardware Failure
1	EXD Software Failure
2	EXD Software Out of Date
3	EXD Network Failure
5	EXD Drive Inhibited (Drive Stopped)
6	EXD In Manual Backup
8	Weigh Module Hardware Failure
9	Weigh Module Software Failure
10	Weigh Module Software Out of Date
11	Weigh Module Network Failure
12	Weigh Hopper Over Maximum Weight
14	Weigh Module in Manual Backup
15	Weigh Module Loss of Extruder Screw Synchronization Signal
16	Weigh Hopper Low Dump Size
17	Weigh Hopper Below Low Weight

Table 2.4: Bit Definitions for Extruder Current Alarms and Latched Alarms (Continued)

Bit	Description
18	Weigh Hopper Below Critical Low Weight
19	Weigh Hopper Below Minimum Weight
20	Extruder Below Minimum Alarm Speed
21	Weight Loss Control Out of Specification
22	Weigh System Unstable - Can Not Run in Gravimetric
23	Extruder Above Maximum Alarm Speed
24	No Weight Loss Detected (Drive System Failure)

2.6 Register Definitions for Ingredient Hoppers

The Hoppers are defined with Hopper A corresponding to ss = 01, Hopper B to ss = 02, etc.

Table 2.5: Register Definitions for Ingredient Hoppers

Description	Register	Data Type	Read/Write
Set Weight	00ss001	Float	Read
Actual Weight	00ss002	Float	Read
Set Density	00ss003	Float	Read
Actual Density	00ss004	Float	Read
Set Parts	00ss011	Float	Read
Actual Parts	00ss012	Float	Read
Shift Weight	00ss025	Float	Read/Write*
Inventory Weight	00ss026	Float	Read/Write*
Remaining Weight	00ss027	Float	Read
New Parts	00ss030	Float	Read/Write
New Density	00ss031	Float	Read/Write

Table 2.5: Register Definitions for Ingredient Hoppers (Continued)

Description	Register	Data Type	Read/Write
Status	00ss302	Integer	Read
Current Alarms	00ss303	Integer	Read/Write**
Latched Alarms	00ss304	Integer	Read/Write**

*Write to register clears value

**Write to register acknowledges alarms

Table 2.6: Bit Definitions for Ingredient Hopper Status

Bit	Description
7	Hopper is feeding

Table 2.7: Bit Definitions for Ingredient Hopper Alarms

Bit	Description
18	Hopper Critical Low (out of material)
21	Dispensed amount out of specification

2.7 Register Definitions for Batch Weigh Hopper

Table 2.8: Register Definitions for Batch Weigh Hopper

Description	Register	Data Type	Read/Write
Maximum Weight Throughput	0096001	Float	Read
Actual Weight Throughput	0096002	Float	Read
Set Density	0096003	Float	Read
Actual Density	0096004	Float	Read
Batch Hopper Weight	0096024	Float	Read

Table 2.8: Register Definitions for Batch Weigh Hopper (Continued)

Description	Register	Data Type	Read/Write
Batch Size	0096025	Float	Read
Status	0096302	Integer	Read
Current Alarms	0096303	Integer	Read/Write**
Latched Alarms	0096304	Integer	Read/Write**

*Write to register clears value

**Write to register acknowledges alarms

Table 2.9: Bit Definitions for Batch Weigh Hopper Status

Bit	Description
8	Batch weigh hopper gate open

Table 2.10: Bit Definitions for Batch Weigh Hopper Current Alarms and Latched Alarms

Bit	Description
12	Batch Weigh Hopper Over Maximum Weight
14	Batch Weigh Hopper in Manual Backup (keyswitch)
19	Batch Weigh Hopper Under Minimum Weight
22	Batch Weigh Hopper Weight Unstable
26	Batch Weigh Hopper Cannot Dump Material

2.8 Register Definitions for Mixer

Table 2.11: Register Definitions for Mixer

Description	Register	Data Type	Read/Write
Maximum Weight Throughput	0097001	Float	Read/Write
Set Mix Time	0097003	Float	Read/Write
Remaining Mix Time	0097004	Float	Read
New Set Mix Time	0097030	Float	Read/Write
Status	0097302	Integer	Read
Current Alarms	0097303	Integer	Read/Write**
Latched Alarms	0097304	Integer	Read/Write**

*Write to register clears value

**Write to register acknowledges alarms

Table 2.12: Bit Definitions for Mixer Status

Bit	Description
9	Mixer Gate Open
10	Mixer Motor On
12	External Material Request Active

Table 2.13: Bit Definitions for Mixer Current Alarms and Latched Alarms

Bit	Description
23	Mixer Motor Failure
27	Interlock Open

2.9 Register Definitions for Refeed or Gravifluff Feeder

Table 2.14: Register Definitions for Refeed or Gravifluff Feeder

Description	Register	Data Type	Read/Write
Set Weight Throughput	0098001	Float	Read
Actual Weight Throughput	0098002	Float	Read
Set Density	0098003	Float	Read
Actual Density	0098004	Float	Read
Set Parts	0098011	Float	Read
Actual Parts	0098012	Float	Read
Manual Start Speed	0098013	Float	Read
Set Ratio Speed	0098017	Float	Read/Write
Actual Ratio Speed	0098018	Float	Read
Set Speed	0098019	Float	Read/Write
Actual Speed	0098020	Float	Read
Hopper Weight	0098024	Float	Read
Shift Weight	0098025	Float	Read/Write*
Inventory Weight	0098026	Float	Read/Write*
New Parts	0098030	Float	Read/Write
New Density	0098031	Float	Read
New Manual Start Speed	0098032	Float	Read/Write
Status	0098302	Integer	Read
Current Alarms	0098303	Integer	Read/Write**
Latched Alarms	0098304	Integer	Read/Write**

*Write to register clears value

**Write to register acknowledges alarms

Table 2.15: Bit Definitions for Refeed or Gravifluff Feeder Status

Bit	Description
0	Loading
1	Ramping
3	Not in gravimetric
5	1 = rate speed factor *IS NOT* present, 0 = rate speed factor *IS* present
6	No calibration

Table 2.16: Bit Definitions for Refeed or Gravifluff Feeder Current Alarms and Latched Alarms

Bit	Description
0	EXD Hardware Failure
1	EXD Software Failure
2	EXD Software Out of Date
3	EXD Network Failure
5	EXD Drive Inhibited (Drive Stopped)
6	EXD In Manual Backup
8	Weigh Module Hardware Failure
9	Weigh Module Software Failure
10	Weigh Module Software Out of Date
11	Weigh Module Network Failure
12	Weigh Hopper Over Maximum Weight
14	Weigh Module in Manual Backup
15	Weigh Module Loss of Extruder Screw Synchronization Signal
16	Weigh Hopper Low Dump Size
17	Weigh Hopper Below Low Weight

Table 2.16: Bit Definitions for Refeed or Gravifluff Feeder Current Alarms and Latched Alarms (Continued)

Bit	Description
18	Weigh Hopper Below Critical Low Weight
19	Weigh Hopper Below Minimum Weight
20	Extruder Below Minimum Alarm Speed
21	Weight Loss Control Out of Specification
22	Weigh System Unstable - Can Not Run in Gravimetric
23	Refeed or Gravifluff Feeder Above Maximum Alarm Speed
24	No Weight Loss Detected (Drive System Failure)

Table 2.17: Register Definitions for Haul Off

Description	Register	Data Type	Read/Write
Set Length Throughput	5000001	Float	Read
Actual Length Throughput	5000002	Float	Read
Manual Start Speed	5000013	Float	Read
Set Ratio Speed	5000017	Float	Read/Write
Actual Ratio Speed	5000018	Float	Read
Set Speed	5000019	Float	Read/Write
Actual Speed	5000020	Float	Read
Shift Length	5000025	Float	Read/Write*
Inventory Length	5000026	Float	Read/Write*
New Length Throughput	5000030	Float	Read/Write
New Manual Start Speed	5000032	Float	Read/Write
Status	5000302	Integer	Read
Current Alarms	5000303	Integer	Read/Write**
Latched Alarms	5000304	Integer	Read/Write**

*Write to register clears value

**Write to register acknowledges alarms

Table 2.18: Bit Definitions for Haul Off Status

Bit	Description
1	Ramping
5	1 = rate speed factor *IS NOT* present, 0 = rate speed factor *IS* present
6	No Calibration

Table 2.19: Bit Definitions for Haul Off Current Alarms and Latched Alarms

Bit	Description
0	EXD Hardware Failure
1	EXD Software Failure
2	EXD Software Out of Date
3	EXD Network Failure
5	EXD Drive Inhibited (Drive Stopped)
6	EXD In Manual Backup
20	Haul Off Drive Below Minimum Alarm Speed
21	Haul Off Control Out of Specification
22	Encoder Signal Unstable - Can Not Run in Closed Loop
23	Haul Off Drive Above Maximum Alarm Speed
24	No Encoder Pulses Detected (Drive System Failure)

Table 2.20: Register Definitions for Secondary Haul Off

Description	Register	Data Type	Read/Write
Actual Length Throughput	5001002	Float	Read
Set Stretch Factor	5001011	Float	Read
Actual Stretch Factor	5001012	Float	Read
New Stretch Factor	5001031	Float	Read/Write
Status	5001302	Integer	Read
Current Alarms	5001303	Integer	Read/Write**
Latched Alarms	5001304	Integer	Read/Write**

*Write to register clears value

**Write to register acknowledges alarms

Table 2.21: Bit Definitions for Secondary Haul Off Status

Bit	Description
6	No Calibration

Table 2.22: Bit Definitions for Secondary Haul Off Alarms

Bit	Description
0	EXD Hardware Failure
1	EXD Software Failure
2	EXD Software Out of Date
3	EXD Network Failure

2.10 Register Definitions for Width/ID/OD Device

Table 2.23: Register Definitions for Width/ID/OD Device

Description	Register	Data Type	Read/Write
Set Width	5200001	Float	Read
Actual Width	5200002	Float	Read
Set Inner Diameter	5200003	Float	Read
Actual Inner Diameter	5200004	Float	Read
Set Outer Diameter	5200005	Float	Read
Actual Outer Diameter	5200006	Float	Read
New Set Width	5200030	Float	Read/Write
New Inner Diameter	5200031	Float	Read/Write
New Outer Diameter	5200032	Float	Read/Write
Status	5200302	Integer	Read
Current Alarms	5200303	Integer	Read/Write**
Latched Alarms	5200304	Integer	Read/Write**

*Write to register clears value

**Write to register acknowledges alarms

Table 2.24: Bit Definitions for Width/ID/OD Status

Bit	Description
	No bits yet defined

Table 2.25: Bit Definitions for Width/ID/OD Current Alarms and Latched Alarms

Bit	Description
0	Device Failure

Table 2.25: Bit Definitions for Width/ID/OD Current Alarms and Latched Alarms (Continued)

Bit	Description
2	Not Compatible
3	No Communication
4	Device in Manual Control
5	Product Break
6	Measurement Error
12	Over Maximum
13	Under Minimum
21	Out of Specification

2.11 Register Definitions for Gravifluff Loader Hopper

Table 2.26: Register Definitions for Gravifluff Loader Hopper

Description	Register	Data Type	Read/Write
Hopper Weight	5300024	Float	Read
Status	5300302	Integer	Read
Current Alarms	5300303	Integer	Read/Write**
Latched Alarms	5300304	Integer	Read/Write**

*Write to register clears value

**Write to register acknowledges alarms

Table 2.27: Bit Definitions for Gravifluff Loader Hopper Status

Bit	Description
6	No Calibration

Table 2.28: Bit Definitions for Gravifluff Loader Hopper Current Alarms and Latched Alarms

Bit	Description
8	Weigh Module Hardware Failure
9	Weigh Module Software Failure
10	Weigh Module Software Out of Date
11	Weigh Module Network Failure
12	Weigh Hopper Over Maximum Weight
14	Weigh Module in Manual Backup
17	Weigh Hopper Below Low Weight
18	Weigh Hopper Below Critical Low Weight
19	Weigh Hopper Below Minimum Weight

2.12 Register Definitions for System Device

Table 2.29: Register Definitions for System Device

Description	Register	Data Type	Read/Write
Set Weight Throughput	6400001	Float	Read
Actual Weight Throughput	6400002	Float	Read
Set Density	6400003	Float	Read
Actual Density	6400004	Float	Read
Set Weight Per Length	6400005	Float	Read
Actual Weight Per Length	6400006	Float	Read
Set Thickness	6400007	Float	Read
Actual Thickness	6400008	Float	Read
Set Master Speed Ratio	6400017	Float	Read/Write
Actual Master Speed Ratio	6400018	Float	Read

Table 2.29: Register Definitions for System Device (Continued)

Description	Register	Data Type	Read/Write
Total Shift Weight	6400025	Float	Read/Write*
Total Inventory Weight	6400026	Float	Read/Write*
Job Weight	6400027	Float	Read
Job Weight Completed	6400028	Float	Read
New Weight Throughput	6400030	Float	Read/Write
New Weight Per Length	6400031	Float	Read/Write
New Thickness	6400032	Float	Read/Write
New Job Weight	6400040	Float	Read/Write
Set Mode	6400300	Integer	Read/Write
Current Mode	6400301	Integer	Read
Status	6400302	Integer	Read
Current Alarms	6400303	Integer	Read/Write**
Latched Alarms	6400304	Integer	Read/Write**

*Write to register clears value

**Write to register acknowledges alarms

Table 2.30: Bit Definitions for System Status

Bit	Description
4	Invalid Recipe

Table 2.31: Bit Definitions for System Set Mode

Bit	Description
0	Set Extruder to Pause Mode
2	Set Extruder to Manual Mode

Table 2.31: Bit Definitions for System Set Mode (Continued)

Bit	Description
3	Set Extruder to Auto Mode
4	Set Blender to Pause Mode
5	Set Blender to Pause At End of Batch
6	Set Blender to Manual Backup Mode
7	Set Blender to Auto Mode

Table 2.32: Bit Definitions for System Current Mode

Bit	Description
0	Extruder is in Pause Mode
2	Extruder is in Manual Mode
3	Extruder is in Auto Mode
4	Blender is in Pause Mode
5	Blender is Pausing At End of Batch
6	Blender is in Manual Backup Mode
7	Blender is in Auto Mode

Table 2.33: Bit Definitions for System Current Alarms and Latched Alarms

Bit	Description
22	Auxiliary Alarm (User defined input & alarm text)
24	Battery Needs Replacement
26	Power Supply Failure
28	Check Printer Alarm

Table 2.33: Bit Definitions for System Current Alarms and Latched Alarms (Continued)

Bit	Description
29	Information Alarm Present
30	General Alarm Present
31	System Shutdown Alarm Present

2.13 Guardian Batch Blender Example

This example

- sets up a 4 element Guardian batch blender for recipe entry and recipe readout, and
- displays the batch hopper weight.

1. Set up the Profibus configuration to the default of a 64 word input module and a 64 word output module. This example does not need that much space, but such a configuration allows for expansion space for additional registers.
2. Set up the UCBs. We will use UCB block 1, index 1 as the starting point for the output (write) data and UCB block 2, index 1 as the starting point for the input (read) data. UCB setup can be done either through the use of the blender's **<SETUP>** key or via the Profibus interface. (See "Setting up the UCB via the front panel:" on page 2-21 and "Setting Up The UCB via Profibus" on page 2-23 for the procedures.)
3. Enable the Profibus interface to start processing data by setting up the Control Block (the first six words in the output block.)
   A. Write the value 2 to the InputBlockNo. (This sets the input block to UCB2.)
   B. Write the value 1 to the InputIndexNo. (This sets the initial register of the input block to 1.)
   C. Write the value 9 to the InputCount. (This sets the number of input registers read back.)
   D. Read the first four values (the "New Parts") of the input block and copy them to the first four values of the output block. (This prevents the output block from changing the current recipe when it is enabled.) If there are any other values written, initialize these as well.
   E. Write the value 1 to the OutputBlockNo. (This sets the output block to UCB1.)
   F. Write the value 1 to the OutputIndexNo. (This sets the initial register to 1.)
   G. Write the value 4 to the OutputCount. (This sets the number of output registers written to the blender.)

4. Now data can be written to and read from the blender. To write a new recipe to the blender, write the new recipe values into the output block addresses “01Float” through “04Float”. The Profibus hardware automatically transfers them to the blender's “Hopper A New Parts” through “Hopper D New Parts”.
5. To activate a new recipe, the “Auto” bit in the status word must be written. To do this:

   A. Write the value 128 (bit 7 set) to the status word in the output block.

   If the blender is already in Auto:

   A. Write a 0 to the status word in the output block.
   B. Write a 128 (bit 7 set) to the status word of the output block. The blender will detect the change of state and start using the new recipe.

To monitor the blender, read the current set values and the batch weigh hopper weight:

- The current set values are in the input block, in registers “05Float” through “08Float”. These show what the blender is actually doing at any particular time.
- The batch weigh hopper weight is in the input block register “09Float”. This weight changes up and down as the blender feeds and dispenses material from the batch weigh hopper.

You can monitor or change other variables by using the above methods. See “Guardian Device Register Definitions” on page 2-3.

2.13.1 Setting up the UCB via the front panel:

1. Make sure that you are at security level SUPERVISOR by pressing the security key (the key with the lock on it) and entering the supervisor password.
2. Press **<SETUP> 925 <ENTER>**.
3. Scroll up/down to [USER CONFIGURABLE BLOCKS], press **<ENTER>**.
4. Set up the input (write) UCB.

   A. Type **1 <ENTER>** to select UCB 1. This will be the input (write) UCB.

   B. Type **1 <ENTER>** to select register 1 in UCB 1.

   C. Type **1030 <ENTER>** to enter the register number for the Hopper A New Parts into the address register for UCB1 register 1.

   D. Press **<ENTER>** to select register 2 in UCB 1.

   E. Type **2030 <ENTER>** to enter the register number for the Hopper B New Parts into the address register for UCB1 register 2.

   F. Press **<ENTER>** to select register 3.

G. Type **3030 <ENTER>** to enter the register number for the Hopper C New Parts into the address register for UCB1 register 3.

H. Press **<ENTER>** to select register 4.

I. Type **4030 <ENTER>** to enter the register number for the Hopper D New Parts into the address register for UCB1 register 4.

J. Type **0 <ENTER>** to exit register setup for UCB1.

5. Set up the output (read) UCB.

A. Type **2 <ENTER>** to select UCB2. This will be the output (read) UCB.

B. Type **1 <ENTER>** to select register 1 in UCB2.

C. Type **1030 <ENTER>** to enter the register number for the Hopper A New Parts into the address register for UCB2 register 1.

D. Press **<ENTER>** to select register 2.

E. Type **2030 <ENTER>** to enter the register number for the Hopper B New Parts into the address register for UCB2 register 2.

F. Press **<ENTER>** to select register 3.

G. Type **3030 <ENTER>** to enter the register number for the Hopper C New Parts into the address register for UCB2 register 3.

H. Press **<ENTER>** to select register 4.

I. Type **4030 <ENTER>** to enter the register number for the Hopper D New Parts into the address register for UCB2 register 4.

J. Press **<ENTER>** to select register 5.

K. Type **1011 <ENTER>** to enter the register number for the Hopper A Set Parts into the address register for UCB2 register 5.

L. Press **<ENTER>** to select register 6.

M. Type **2011 <ENTER>** to enter the register number for the Hopper B Set Parts into the address register for UCB2 register 6.

N. Press **<ENTER>** to select register 7.

O. Type **3011 <ENTER>** to enter the register number for the Hopper C Set Parts into the address register for UCB2 register 7.

P. Press **<ENTER>** to select register 8.

Q. Type **4011 <ENTER>** to enter the register number for the Hopper D Set Parts into the address register for UCB2 register 8.

R. Press **<ENTER>** to select register 9.

S. Type **96024 <ENTER>** to enter the register number for the Batch Weigh Hopper Weight address register for UCB2 register 9.

The UCBs are now set up.

The same register numbers for the “Hopper New Parts” were used in both the UCB used for the Output block and the UCB used for the Input block. This is because we want to be able to read back the recipe that is currently being entered (the “New” values). The current recipe set values are contained in the second set of “Set” value register.

2.13.2 Setting Up The UCB via Profibus

Instead of setting up the UCB manually from the control panel, you can write the following procedure into the begininning of the program that controls the blender.

1. Write the value 0 to OutputCount of the output block. This prevents data from being transferred from the buffer to the UCB until you have completed setting up the buffer.
2. Write the value 1 to OutputIndexNo of the output block. This sets up register 1 in the UCB block as the starting output data register.
3. Set up UCB block 1 as the output data block:
   A. Write the value hex 8001 to the OutputBlockNo of the output block. This sets up UCB block 1 as the output data block, with the UCB_OutputAccess bit set.
   B. Write the value 1030 to the first Profibus value register, 01Float. The data should be in integer format. This is the address for Hopper A New Parts.
   C. Write the values 2030 to 02Float, 3030 to 03Float, and 4040 to 04Float. These are the addresses for Hoppers B through D New Parts.
   D. Write the value 4 to OutputCount. This will enable the data transfer of the values to the UCB address register locations for the Output block (UCB1, registers 1-4).
   E. Write the value 0 to OutputCount to disable writing.
   F. Write the value 1 to OutputIndexNo of the output block. This sets up register 1 in the UCB block as the starting output data register.
4. Set up UCB block 2 as the output data block.
   A. Write the value hex 8002 to the OutputBlockNo of the output block. This sets up UCB block 2 as the output data block, with the UCB_OutputAccess bit set.
   B. Write the value 1030 to the first Profibus value register, 01Float. The data should be in integer format. This is the address for Hopper A New Parts.
   C. Write the values 2030 to 02Float, 3030 to 03Float, and 4040 to 04Float. These are the addresses for Hoppers B through D New Parts.

D. Write the values 1011 to 05Float, 2011 to 06Float, 3011 to 07Float, 4011 to 08Float. These are the addresses for Hoppers A through D Set Parts.

E. Write the value 96024 to 09Float. This is the address of the Batch Weigh Hopper Weight.

F. Write the value 9 to OutputCount. This will enable the data transfer of the values to the UCB address register locations for the Output block (UCB2, registers 1-9).

G. Write the value 0 to OutputCount to disable writing.

H. Write the value 1 to OutputBlockNo to reset its UCB block number to 1, and set for value transfer instead of address transfer.

SECTION 3 - Continuous Blender Profibus Registers

TOPICS DISCUSSED IN THIS CHAPTER

- ✔ Device and Subdevice Definitions
- ✔ Register Definitions for Extruder
- ✔ Register Definitions for Ingredient Hoppers
- ✔ Register Definitions for Downcomer
- ✔ Register Definitions for Refeed
- ✔ Register Definitions for Haul-Off
- ✔ Register Definitions for Secondary Haul-Off
- ✔ Register Definitions for Width/ID/OD Device
- ✔ Register Definitions for Gravifluff Loader Hopper
- ✔ User Configurable Blocks
- ✔ Register Definitions for System Device
- ✔ Examples

3.1 Continuous Blender Register Numbering System

The Profibus interface supports two data types: IEEE float and unsigned integer. Registers from 1 - 299 are IEEE floats, while registers 300 - 500 are unsigned integers. There is a two digit designation for device and a two digit designation for sub-device. Registers are assigned with the following format: **ddssrrr**

Where: **dd**: Device number (0-99)

ss: Subdevice number (0-99)

rrr: Registers number (1-500)

3.2 Continuous Blender Device and Subdevice Definitions

The Guardian has the following device and subdevice numbers. Ranges not defined in the following table are reserved by Process Control. The **dd** is the device number (00 - 99) and **ss** is the subdevice number, defined below:

Table 3.1: Continuous Blender Devices and Subdevices

dd	ss	Description
00	00	Extruder/Downcomer
00	01-16	Ingredient Hopper A - Hopper P
00	98	Refeed
50	00	Haul Off (NIP/Capstan/Chill Roll/Puller etc.)
50	01	Secondary Hauloff (Winder/Spooler etc.)
52	00	Width Controller
53	00	Gravifluff
58	00-09	UCB Definitions
59	00-09	UCB Data
60		Recipe Data (not yet available)
61		Recipe Name (not yet available)
62		Resin Data (not yet available)
63		Resin Name (not yet available)
64	00	System Data

3.3 User Configurable Block (UCB)

3.3.1 Definition Device (dd = 58)

This device enables you to define UCBs which are user configured blocks of registers. They enable you to group registers of the same type (float or int) in a block, then read or write the entire block with one command. Using UCBs results in much less communication overhead. There are 10 UCBs available, each containing 50 registers. The format of the UCB definition address is **580b0rr** where **b** is the UCB block number (0=UCB1,1=UCB2 etc.), and **rr** is the register number (00-50). The value that is placed in the UCB register is the register address of the parameter you wish to access. For example, to define UCB 2 to read the inventory weight of hopper A, B, and C do the following:

Write a value of 1026 to address 5801001 (block 2, reg 1)
Write a value of 2026 to address 5801002 (block 2, reg 2)
Write a value of 3026 to address 5801003 (block 2, reg 3)

3.3.2 Data Device (dd = 59)

This device enables you to read data from or write data to the registers defined in the UCB blocks. The format of the UCB definition address is **590b0rr** where **b** is the UCB block number (0=UCB1,1=UCB2 etc.), and **rr** is the register number (00-50). Assuming that UCB 2 is defined as in the UCB definition example above, to read the inventory weight of hoppers A, B, and C do the following:

Read address 5901001 (block 2, reg 1)
Read address 5901002 (block 2, reg 2)
Read address 5901003 (block 2, reg 3)

3.4 Continuous Blender Device Register Definitions

The register numbers are unique to each device but are identical for each subdevice within a device. Below are definitions for each of the device/subdevice combinations.

3.5 Register Definitions for Extruder

Table 3.2: Register Definitions for Extruder

Description	Register	Data Type	Read/Write
Set Weight Throughput	0000001	Float	Read
Actual Weight Throughput	0000002	Float	Read
Set Density	0000003	Float	Read
Actual Density	0000004	Float	Read
Set Parts	0000011	Float	Read
Actual Parts	0000012	Float	Read
Manual Start Speed	0000013	Float	Read
Set Ratio Speed	0000017	Float	Read/Write
Actual Ratio Speed	0000018	Float	Read
Set Speed	0000019	Float	Read/Write
Actual Speed	0000020	Float	Read
Hopper Weight	0000024	Float	Read
Shift Weight	0000025	Float	Read/Write*
Inventory Weight	0000026	Float	Read/Write*
New Parts	0000030	Float	Read/Write
New Density	0000031	Float	Read
New Manual Start Speed	0000032	Float	Read/Write
Status	0000302	Integer	Read
Current Alarms	0000303	Integer	Read/Write**
Latched Alarms	0000304	Integer	Read/Write**

*Write to register clears value

**Write to register acknowledges alarms

Table 3.3: Bit Definitions for Extruder Status

Bit	Description
1	Ramping
5	1 = rate speed factor *IS NOT* present, 0 = rate speed factor *IS* present
6	No Calibration

Table 3.4: Bit Definitions for Extruder Current Alarms and Latched Alarms

Bit	Description
0	EXD Hardware Failure
1	EXD Software Failure
2	EXD Software Out of Date
3	EXD Network Failure
5	EXD Drive Inhibited (Drive Stopped)
6	EXD In Manual Backup
8	Weigh Module Hardware Failure
9	Weigh Module Software Failure
10	Weigh Module Software Out of Date
11	Weigh Module Network Failure
12	Weigh Hopper Over Maximum Weight
14	Weigh Module in Manual Backup
15	Weigh Module Loss of Extruder Screw Synchronization Signal
16	Weigh Hopper Low Dump Size
17	Weigh Hopper Below Low Weight
18	Weigh Hopper Below Critical Low Weight
19	Weigh Hopper Below Minimum Weight

Table 3.4: Bit Definitions for Extruder Current Alarms and Latched Alarms (Continued)

Bit	Description
20	Extruder Below Minimum Alarm Speed
21	Weight Loss Control Out of Specification
22	Weigh System Unstable - Can Not Run in Gravimetric
23	Extruder Above Maximum Alarm Speed
24	No Weight Loss Detected (Drive System Failure)

3.6 Register Definitions for Ingredient Hoppers

The Hoppers are defined with Hopper A corresponding to ss = 01, Hopper B to ss = 02, etc.

Table 3.5: Register Definitions for Ingredient Hoppers

Description	Register	Data Type	Read/Write
Set Weight Throughput	00ss001	Float	
Actual Weight Throughput	00ss002	Float	
Set Density	00ss003	Float	Read
Actual Density	00ss004	Float	Read
Set Parts	00ss011	Float	Read
Actual Parts	00ss012	Float	Read
Set Speed	00ss019	Float	Read/Write***
Actual Speed	00ss020	Float	Read
Hopper Weight	00ss024	Float	Read
Shift Weight	00ss025	Float	Read/Write*
Inventory Weight	00ss026	Float	Read/Write*
New Parts	00ss030	Float	Read/Write
New Density	00ss031	Float	Read/Write
Status	00ss302	Integer	Read

Table 3.5: Register Definitions for Ingredient Hoppers (Continued)

Description	Register	Data Type	Read/Write
Current Alarms	00ss303	Integer	Read/Write**
Latched Alarms	00ss304	Integer	Read/Write**

*Write to register clears value

**Write to register acknowledges alarms

***Can only be written when current mode is Manual Backup

Table 3.6: Bit Definitions for Ingredient Hopper Status

Bit	Description
0	Loading
1	Ramping
3	Not in gravimetric
5	1 = rate speed factor *IS NOT* present, 0 = rate speed factor *IS* present
6	No calibration

Table 3.7: Bit Definitions for Ingredient Hopper Current Alarms and Latched Alarms

Bit	Description
0	EXD Hardware Failure
1	EXD Software Failure
2	EXD Software Out of Date
3	EXD Network Failure
5	EXD Drive Inhibited (Drive Stopped)
6	EXD In Manual Backup
8	Weigh Module Hardware Failure
9	Weigh Module Software Failure

Table 3.7: Bit Definitions for Ingredient Hopper Current Alarms and Latched Alarms (Continued)

Bit	Description
10	Weigh Module Software Out of Date
11	Weigh Module Network Failure
12	Weigh Hopper Over Maximum Weight
14	Weigh Module in Manual Backup
15	Weigh Module Loss of Extruder Screw Synchronization Signal
16	Weigh Hopper Low Dump Size
17	Weigh Hopper Below Low Weight
18	Weigh Hopper Below Critical Low Weight
19	Weigh Hopper Below Minimum Weight
20	Extruder Below Minimum Alarm Speed
21	Weight Loss Control Out of Specification
22	Weigh System Unstable - Can Not Run in Gravimetric
23	Extruder Above Maximum Alarm Speed
24	No Weight Loss Detected (Drive System Failure)

3.7 Register Definitions for Refeed or Gravifluff Feeder

Table 3.8: Register Definitions for Refeed or Gravifluff Feeder

Description	Register	Data Type	Read/Write
Set Weight Throughput	0098001	Float	Read
Actual Weight Throughput	0098002	Float	Read
Set Density	0098003	Float	Read
Actual Density	0098004	Float	Read
Set Parts	0098011	Float	Read
Actual Parts	0098012	Float	Read

Table 3.8: Register Definitions for Refeed or Gravifluff Feeder (Continued)

Description	Register	Data Type	Read/Write
Manual Start Speed	0098013	Float	Read
Set Ratio Speed	0098017	Float	Read/Write
Actual Ratio Speed	0098018	Float	Read
Set Speed	0098019	Float	Read/Write
Actual Speed	0098020	Float	Read
Hopper Weight	0098024	Float	Read
Shift Weight	0098025	Float	Read/Write*
Inventory Weight	0098026	Float	Read/Write*
New Parts	0098030	Float	Read/Write
New Density	0098031	Float	Read
New Manual Start Speed	0098032	Float	Read/Write
Status	0098302	Integer	Read
Current Alarms	0098303	Integer	Read/Write**
Latched Alarms	0098304	Integer	Read/Write**

*Write to register clears value

**Write to register acknowledges alarms

Table 3.9: Bit Definitions for Refeed or Gravifluff Feeder Status

Bit	Description
0	Loading
1	Ramping
3	Not in gravimetric
5	1 = rate speed factor *IS NOT* present, 0 = rate speed factor *IS* present
6	No calibration

Table 3.10: Bit Definitions for Refeed or Gravifluff Feeder Current Alarms and Latched Alarms

Bit	Description
0	EXD Hardware Failure
1	EXD Software Failure
2	EXD Software Out of Date
3	EXD Network Failure
5	EXD Drive Inhibited (Drive Stopped)
6	EXD In Manual Backup
8	Weigh Module Hardware Failure
9	Weigh Module Software Failure
10	Weigh Module Software Out of Date
11	Weigh Module Network Failure
12	Weigh Hopper Over Maximum Weight
14	Weigh Module in Manual Backup
15	Weigh Module Loss of Extruder Screw Synchronization Signal
16	Weigh Hopper Low Dump Size
17	Weigh Hopper Below Low Weight
18	Weigh Hopper Below Critical Low Weight
19	Weigh Hopper Below Minimum Weight
20	Extruder Below Minimum Alarm Speed
21	Weight Loss Control Out of Specification
22	Weigh System Unstable - Can Not Run in Gravimetric
23	Refeed or Gravifluff Feeder Above Maximum Alarm Speed
24	No Weight Loss Detected (Drive System Failure)

3.8 Register Definitions for Haul-Off

Table 3.11: Register Definitions for Haul-Off

Description	Register	Data Type	Read/Write
Set Length Throughput	5000001	Float	Read
Actual Length Throughput	5000002	Float	Read
Manual Start Speed	5000013	Float	Read
Set Ratio Speed	5000017	Float	Read/Write
Actual Ratio Speed	5000018	Float	Read
Set Speed	5000019	Float	Read/Write
Actual Speed	5000020	Float	Read
Shift Length	5000025	Float	Read/Write*
Inventory Length	5000026	Float	Read/Write*
New Length Throughput	5000030	Float	Read/Write
New Manual Start Speed	5000032	Float	Read/Write
Status	5000302	Integer	Read
Current Alarms	5000303	Integer	Read/Write**
Latched Alarms	5000304	Integer	Read/Write**

*Write to register clears value

**Write to register acknowledges alarms

Table 3.12: Bit Definitions for Haul Off Status

Bit	Description
1	Ramping
5	1 = rate speed factor *IS NOT* present, 0 = rate speed factor *IS* present
6	No calibration

Table 3.13: Bit Definitions for Haul Off Alarms

Bit	Description
0	EXD Hardware Failure
1	EXD Software Failure
2	EXD Software Out of Date
3	EXD Network Failure
5	EXD Drive Inhibited (Drive Stopped)
6	EXD in Manual Backup
20	Haul Off Drive Below Minimum Alarm Speed
21	Haul Off Control Out of Specification
22	Encoder Signal Unstable—Can Not Run in Closed Loop
23	Haul Off Drive Above Maximum Alarm Speed
24	No Encoder Pulses Detected (Drive System Failure)

3.9 Register Definitions for Secondary Haul-Off

Table 3.14: Register Definitions for Secondary Haul-Off

Description	Register	Data Type	Read/Write
Actual Length Throughput	5001002	Float	Read
Set Stretch Factor	5001011	Float	Read
Actual Stretch Factor	5001012	Float	Read
New Stretch Factor	5001031	Float	Read/Write
Status	5001302	Integer	Read
Current Alarms	5001303	Integer	Read/Write**
Latched Alarms	5001304	Integer	Read/Write**

*Write to register clears value

**Write to register acknowledges alarms

Table 3.15: Bit Definitions for Secondary Haul Off Status

Bit	Description
6	No Calibration

Table 3.16: Bit Definitions for Secondary Haul Off Current Alarms and Latched Alarms

Bit	Description
0	EXD Hardware Failure
1	EXD Software Failure
2	EXD Software Out of Date
3	EXD Network Failure

3.10 Register Definitions for Width/ID/OD Device

Table 3.17: Register Definitions for Width/ID/OD Device

Description	Register	Data Type	Read/Write
Set Width	5200001	Float	Read
Actual Width	5200002	Float	Read
Set Inner Diameter	5200003	Float	Read
Actual Inner Diameter	5200004	Float	Read
Set Outer Diameter	5200005	Float	Read
Actual Outer Diameter	5200006	Float	Read
New Set Width	5200030	Float	Read/Write
New Inner Diameter	5200031	Float	Read/Write

Table 3.17: Register Definitions for Width/ID/OD Device (Continued)

Description	Register	Data Type	Read/Write
New Outer Diameter	5200032	Float	Read/Write
Current Mode	5200301	Integer	Read
Status	5200302	Integer	Read
Current Alarms	5200303	Integer	Read/Write**
Latched Alarms	5200304	Integer	Read/Write**

*Write to register clears value

**Write to register acknowledges alarms

Table 3.18: Bit Definitions for Width/ID/OD Status

Bit	Description
	No bits yet defined

Table 3.19: Bit Definitions for Width/ID/OD Current Alarms and Latched Alarms

Bit	Description
0	Device Failure
2	Not Compatible
3	No Communication
4	Device in Manual Control
5	Product Break
6	Measurement Error
12	Over Maximum
13	Under Minimum
21	Out of Specification

3.11 Register Definitions for Gravifluff Loader Hopper

Table 3.20: Register Definitions for Gravifluff Loader Hopper

Description	Register	Data Type	Read/Write
Hopper Weight	5300024	Float	Read
Status	5300302	Integer	Read
Current Alarms	5300303	Integer	Read/Write**
Latched Alarms	5300304	Integer	Read/Write**

*Write to register clears value

**Write to register acknowledges alarms

Table 3.21: Bit Definitions for Gravifluff Loader Hopper Status

Bit	Description
6	No Calibration

Table 3.22: Bit Definitions for Gravifluff Loader Hopper Current Alarms and Latched Alarms

Bit	Description
8	Weigh Module Hardware Failure
9	Weigh Module Software Failure
10	Weigh Module Software Out of Date
11	Weigh Module Network Failure
12	Weigh Hopper Over Maximum Weight
14	Weigh Module in Manual Backup
17	Weigh Hopper Below Low Weight
18	Weigh Hopper Below Critical Low Weight

Table 3.22: Bit Definitions for Gravifluff Loader Hopper Current Alarms and Latched Alarms (Continued)

Bit	Description
19	Weigh Hopper Below Minimum Weight

3.12 Register Definitions for System Device

Table 3.23: Register Definitions for System Device

Description	Register	Data Type	Read/Write
Set Weight Throughput	6400001	Float	Read
Actual Weight Throughput	6400002	Float	Read
Set Density	6400003	Float	Read
Actual Density	6400004	Float	Read
Set Weight Per Length	6400005	Float	Read
Actual Weight Per Length	6400006	Float	Read
Set Thickness	6400007	Float	Read
Actual Thickness	6400008	Float	Read
Set Master Speed Ratio	6400017	Float	Read/Write
Actual Master Speed Ratio	6400018	Float	Read
Total Shift Weight	6400025	Float	Read/Write*
Total Inventory Weight	6400026	Float	Read/Write*
Job Weight	6400027	Float	Read
Job Weight Completed	6400028	Float	Read
New Weight Throughput	6400030	Float	Read/Write
New Weight Per Length	6400031	Float	Read/Write
New Thickness	6400032	Float	Read/Write
New Job Weight	6400040	Float	Read/Write
Set Mode	6400300	Integer	Read/Write

Table 3.23: Register Definitions for System Device (Continued)

Description	Register	Data Type	Read/Write
Current Mode	6400301	Integer	Read
Status	6400302	Integer	Read
Current Alarms	6400303	Integer	Read/Write**
Latched Alarms	6400304	Integer	Read/Write**

*Write to register clears value

**Write to register acknowledges alarms

Table 3.24: Bit Definitions for System Status

Bit	Description
4	Invalid Recipe

Table 3.25: Bit Definitions for System Set Mode

Bit	Description
0	Set Extruder to Pause Mode
2	Set Extruder to Manual Mode
3	Set Extruder to Auto Mode
4	Set Blender to Pause Mode
6	Set Blender to Manual Backup Mode
7	Set Blender to Auto Mode
11	Rate Speed Request (write to this bit to force the blender to calculate the rate vs. speed relationship, read this bit to see if the blender is calculating it now.)
13	Clear Shift Totals
14	Clear Inventory Totals
15	Clear Alarms

Table 3.26: Bit Definitions for System Current Mode

Bit	Description
0	Extruder is in Pause Mode
2	Extruder is in Manual Mode
3	Extruder is in Auto Mode
4	Blender is in Pause Mode
6	Blender is in Manual Backup Mode
7	Blender is in Auto Mode

Table 3.27: Bit Definitions for System Current Alarms and Latched Alarms

Bit	Description
22	Auxiliary Alarm (User defined input & alarm text)
24	Battery Needs Replacement
26	Power Supply Failure
28	Check Printer Alarm
29	Information Alarm Present
30	General Alarm Present
31	System Shutdown Alarm Present

3.13 Examples

The following are some examples using register numbers found in the blender register list. See “Guardian Batch Blender Example” on page 2-20 for UCB setup and usage.

Example 1

Recipe entry for a continuous blender with 3 hoppers, running in continuous mode, with recipes entered in percent.

Write 20.0 to register 0001030 - sets hopper A to 20%
Write 30.0 to register 0002030 - sets hopper B to 30%
Write 50.0 to register 0003030 - sets hopper C to 50%
Write 128 to register 6400300 - "presses" **<AUTO>** button, copies new recipe into running recipe

Example 2

Recipe entry for a continuous blender with 3 hoppers, running in on-off mode, with recipes entered in percent.

Write 20.0 to register 0001030 - sets hopper A to 20%
Write 30.0 to register 0002030 - sets hopper B to 30%
Write 50.0 to register 0003030 - sets hopper C to 50%
Write 850.0 to register 6400030 - total line weight throughput to 850.0
Write 128 to register 6400300 - "presses" **<AUTO>** button, copies new recipe into running recipe

Example 3

Continuous blender with 2 hoppers, line speed control, and extruder control, with recipes entered in percent and weight per length selected.

Write 80.0 to register 0001030 - sets hopper A to 80%
Write 20.0 to register 0002030 - sets hopper B to 20%
Write 125.0 to register 6400031 - sets up weight per running length to 125.0
Write 650.0 to register 5000030 - sets total line length throughput to 650.0
Write 136 (128 for blender + 8 for extruder) to register 6400300 - "presses" **<AUTO>** button, copies new recipe into running recipe

SECTION 4 - Gravitrol Profibus Registers

TOPICS DISCUSSED IN THIS CHAPTER

- ✔ Definitions for Devices and Subdevices
- ✔ Register Definitions for Ingredient Hoppers
- ✔ Register Definitions for Downcomer
- ✔ Register Definitions for Haul-Off
- ✔ Register Definitions for Secondary Haul-Off
- ✔ Register Definitions for Width/ID/OD Device
- ✔ Register Definitions for Refeed or Gravifluff Feeder
- ✔ Register Definitions for Gravifluff Loader Hopper
- ✔ Register Definitions for System Device
- ✔ Register Definitions for Batch Weigh Hopper
- ✔ Register Definitions for Mixer
- ✔ Register Definitions for Extruder
- ✔ User Configurable Blocks
- ✔ Examples

4.1 Gravitrol Register Numbering System

The Profibus interface supports two data types: IEEE float and unsigned integer. Registers from 1 - 299 are IEEE floats, while registers 300 - 500 are unsigned integers. There is a two digit designation for device and a two digit designation for sub-device. Registers are assigned with the following format: **ddssrrr**

Where: **dd**: Device number (0-99)

ss: Subdevice number (0-99)

rrr: Registers number (1-500)

4.2 Gravitrol Device and Subdevice Definitions

The Gravitrol has the following device and subdevice numbers. Ranges not defined in the following table are reserved by Process Control. The **dd** is the device number (00 - 99) and **ss** is the subdevice number, defined below:

Table 4.1: Gravitrol Devices and Subdevices

dd	ss	Description
00-19	00	Extruders Total Devices
00-19	01	Main Hopper (if additives are present)
00-19	02-09	Additives
00-19	98	Refeed
50	00	Haul Off (NIP/Capstan/Chill Roll/Puller etc.)
50	01	Secondary Hauloff (Winder/Spooler etc.)
52	00	Width Controller
53	00	Gravifluff
58	00-09	UCB Definitions
59	00-09	UCB Data
60		Recipe Data (not yet available)
61		Recipe Name (not yet available)
62		Resin Data (not yet available)
63		Resin Name (not yet available)

Table 4.1: Gravitrol Devices and Subdevices (Continued)

dd	ss	Description
64	00	System Data

4.3 Gravitrol User Configurable Block (UCB)

4.3.1 Definition Device (dd = 58)

This device enables you to define UCBs which are user configured blocks of registers. They enable you to group registers of the same type (float or int) in a block, then read or write the entire block with one command. Using UCBs results in much less communication overhead. There are 10 UCBs available, each containing 50 registers. The format of the UCB definition address is **580b0rr** where **b** is the UCB block number (0=UCB1,1=UCB2 etc.), and **rr** is the register number (00-50). The value that is placed in the UCB register is the register address of the parameter you wish to access. For example, to define UCB 2 to read the inventory weight of extruder A, B, and C do the following:

Write a value of 0000026 to address 5801001 (block 2, reg 1)
Write a value of 0100026 to address 5801002 (block 2, reg 2)
Write a value of 0200026 to address 5801003 (block 2, reg 3)

4.3.2 Data Device (dd = 59)

This device enables you to read data from or write data to the registers defined in the UCB blocks. The format of the UCB definition address is **590b0rr** where **b** is the UCB block number (0=UCB1,1=UCB2 etc.), and **rr** is the register number (00-50). Assuming that UCB 2 is defined as in the UCB definition example above, to read the inventory weight of extruders A, B, and C do the following:

Read address 5901001 (block 2, reg 1)
Read address 5901002 (block 2, reg 2)
Read address 5901003 (block 2, reg 3)

4.4 Register Definitions for Extruders and Additives/Refeed

In the table below, dd is the device number, and ss is the subdevice number.

Table 4.2: Register Definitions for Extruders/Addditives/Refeed

Description	Register	Data Type	Read/Write
Set Weight Throughput	ddss001	Float	Read
Actual Weight Throughput	ddss002	Float	Read
Set Density	ddss003	Float	Read
Actual Density	ddss004	Float	Read
Set Weight/Length	ddss005	Float	Read
Actual Weight/Length	ddss006	Float	Read
Set Thickness	ddss007	Float	Read
Actual Thickness	ddss008	Float	Read
Set Weight/Area	ddss009	Float	Read
Actual Weight/Area	ddss010	Float	Read
Set Parts	ddss011	Float	Read
Actual Parts	ddss012	Float	Read
Manual Start Speed	ddss013	Float	Read
Set Ratio Speed	ddss017	Float	Read/Write
Actual Ratio Speed	ddss018	Float	Read
Set Speed	ddss019	Float	Read/Write
Actual Speed	ddss020	Float	Read
Hopper Weight	ddss024	Float	Read
Shift Weight	ddss025	Float	Read/Write*
Inventory Weight	ddss026	Float	Read/Write*
New Parts (units depend upon recipe entry)	ddss030	Float	Read/Write
New Density	ddss031	Float	Read
New Manual Start Speed	ddss032	Float	Read/Write
Set Mode	ddss300	Integer	Read
Current Mode	ddss301	Integer	Read/Write

Table 4.2: Register Definitions for Extruders/Addditives/Refeed (Continued)

Description	Register	Data Type	Read/Write
Status	ddss302	Integer	Read
Current Alarms	ddss303	Integer	Read/Write**
Latched Alarms	ddss304	Integer	Read/Write**
Define Subdevice	ddss499	Integer	Read/Write
Define Device	ddss500	Integer	Read/Write

*Write to register clears value

**Write to register acknowledges alarms

Table 4.3: Bit Definitions for Extruder/Additive/Refeed Status

Bit	Description
0	Loading
1	Ramping
3	Not in Gravimetric
5	1 = rate speed factor *IS NOT* present, 0 = rate speed factor *IS* present
6	No Calibration

Table 4.4: Bit Definitions for Extruder/Additive/Refeed Current Alarms and Latched Alarms

Bit	Description
0	EXD Hardware Failure
1	EXD Software Failure
2	EXD Software Out of Date
3	EXD Network Failure
5	EXD Drive Inhibited (Drive Stopped)

Table 4.4: Bit Definitions for Extruder/Additive/Refeed Current Alarms and Latched Alarms (Continued)

Bit	Description
6	EXD In Manual Backup
8	Weigh Module Hardware Failure
9	Weigh Module Software Failure
10	Weigh Module Software Out of Date
11	Weigh Module Network Failure
12	Weigh Hopper Over Maximum Weight
14	Weigh Module in Manual Backup
15	Weigh Module Loss of Extruder Screw Synchronization Signal
16	Weigh Hopper Low Dump Size
17	Weigh Hopper Below Low Weight
18	Weigh Hopper Below Critical Low Weight
19	Weigh Hopper Below Minimum Weight
20	Extruder Below Minimum Alarm Speed
21	Weight Loss Control Out of Specification
22	Weigh System Unstable - Can Not Run in Gravimetric
23	Extruder Above Maximum Alarm Speed
24	No Weight Loss Detected (Drive System Failure)

4.5 Register Definitions for Haul Off (fd=50)

Table 4.5: Register Definitions for Haul Off

Description	PCC2 Register	Data Type	Read/Write
Set Length Throughput	5000001	Float	Read

Table 4.5: Register Definitions for Haul Off (Continued)

Description	PCC2 Register	Data Type	Read/Write
Actual Length Throughput	5000002	Float	Read
Manual Start Speed	5000013	Float	Read
Set Ratio Speed	5000017	Float	Read/Write
Actual Ratio Speed	5000018	Float	Read
Set Speed	5000019	Float	Read/Write
Actual Speed	5000020	Float	Read
Shift Length	5000025	Float	Read/Write*
Inventory Length	5000026	Float	Read/Write*
New Length Throughput	5000030	Float	Read/Write
New Manual Start Speed	5000032	Float	Read/Write
Status	5000302	Integer	Read
Current Alarms	5000303	Integer	Read/Write**
Latched Alarms	5000304	Integer	Read/Write**

*Write to register clears value

**Write to register acknowledges alarms

Table 4.6: Bit Definitions for Haul Off Status

Bit	Description
1	No bits yet defined
5	1 = rate speed factor *IS NOT* present, 0 = rate speed factor *IS* present
6	No Calibration

Table 4.7: Bit Definitions for Haul Off Current Alarms and Latched Alarms

Bit	Description
0	EXD Hardware Failure
1	EXD Software Failure
2	EXD Software Out of Date
3	EXD Network Failure
5	EXD Drive Inhibited (Drive Stopped)
6	EXD In Manual Backup
20	Haul Off Drive Below Minimum Alarm Speed
21	Haul Off Control Out of Specification
22	Encoder Signal Unstable - Can Not Run in Closed Loop
23	Haul Off Drive Above Maximum Alarm Speed
24	No Encoder Pulses Detected (Drive System Failure)

4.6 Register Definitions for Secondary Haul Off

Table 4.8: Register Definitions for Secondary Haul Off

Description	PCC2 Register	Data Type	Read/Write
Actual Length Throughput	5001002	Float	Read
Stretch Factor	5001011	Float	Read
Actual Stretch Factor	5001012	Float	Read
New Stretch Factor	5001031	Float	Read/Write
Status	5001302	Integer	Read
Current Alarms	5001303	Integer	Read/Write**
Latched Alarms	5001304	Integer	Read/Write**

*Write to register clears value

**Write to register acknowledges alarms

Table 4.9: Bit Definitions for Secondary Haul Off Status

Bit	Description
	No bits yet defined

Table 4.10: Bit Definitions for Secondary Haul Off Alarms

Bit	Description
0	EXD Hardware Failure
1	EXD Software Failure
2	EXD Software Out of Date
3	EXD Network Failure

4.7 Register Definitions for Width/ID/OD Device

Table 4.11: Register Definitions for Width/ID/OD Device

Description	Register	Data Type	Read/Write
Set Width	5200001	Float	Read
Actual Width	5200002	Float	Read
Set Inner Diameter	5200003	Float	Read
Actual Inner Diameter	5200004	Float	Read
Set Outer Diameter	5200005	Float	Read
Actual Outer Diameter	5200006	Float	Read
New Set Width	5200030	Float	Read/Write
New Inner Diameter	5200031	Float	Read/Write
New Outer Diameter	5200032	Float	Read/Write

Table 4.11: Register Definitions for Width/ID/OD Device (Continued)

Description	Register	Data Type	Read/Write
Status	5200302	Integer	Read
Current Alarms	5200303	Integer	Read/Write**
Latched Alarms	5200304	Integer	Read/Write**

*Write to register clears value

**Write to register acknowledges alarms

Table 4.12: Bit Definitions for Width/ID/OD Status

Bit	Description
	No bits yet defined

Table 4.13: Bit Definitions for Width/ID/OD Current Alarms and Latched Alarms

Bit	Description
0	Device Failure
2	Not Compatible
3	No Communication
4	Device in Manual Control
5	Product Break
6	Measurement Error
12	Over Maximum
13	Under Minimum
21	Out of Specification

4.8 Register Definitions for Gravifluff Loader Hopper

Table 4.14: Register Definitions for Gravifluff Loader Hopper

Description	Register	Data Type	Read/Write
Hopper Weight	5300024	Float	Read
Status	5300302	Integer	Read
Current Alarms	5300303	Integer	Read/Write**
Latched Alarms	5300304	Integer	Read/Write**

*Write to register clears value

**Write to register acknowledges alarms

Table 4.15: Bit Definitions for Gravifluff Loader Hopper Status

Bit	Description
6	No Calibration

Table 4.16: Bit Definitions for Gravifluff Loader Hopper Current Alarms and Latched Alarms

Bit	Description
8	Weigh Module Hardware Failure
9	Weigh Module Software Failure
10	Weigh Module Software Out of Date
11	Weigh Module Network Failure
12	Weigh Hopper Over Maximum Weight
14	Weigh Module in Manual Backup
17	Weigh Hopper Below Low Weight
18	Weigh Hopper Below Critical Low Weight

Table 4.16: Bit Definitions for Gravifluff Loader Hopper Current Alarms and Latched Alarms (Continued)

Bit	Description
19	Weigh Hopper Below Minimum Weight

4.9 Register Definitions for System Device

Table 4.17: Register Definitions for System Device

Description	Register	Data Type	Read/Write
Set Weight Throughput	6400001	Float	Read
Actual Weight Throughput	6400002	Float	Read
Set Density	6400003	Float	Read
Actual Density	6400004	Float	Read
Set Weight Per Length	6400005	Float	Read
Actual Weight Per Length	6400006	Float	Read
Set Thickness	6400007	Float	Read
Actual Thickness	6400008	Float	Read
Set Weight Per Area	6400009	Float	Read
Actual Weight Per Area	6400010	Float	Read
Set Parts	6400011	Float	Read
Act Parts	6400012	Float	Read
Set Master Speed Ratio	6400017	Float	Read/Write
Actual Master Speed Ratio	6400018	Float	Read
Total Shift Weight	6400025	Float	Read/Write*
Total Inventory Weight	6400026	Float	Read/Write*
New Set Weight Throughput	6400030	Float	Read/Write
New Set Weight Per Length	6400031	Float	Read/Write
New Set Thickness	6400032	Float	Read/Write

Table 4.17: Register Definitions for System Device (Continued)

Description	Register	Data Type	Read/Write
New Set Weight/Area	6400033	Float	Read/Write
Set Mode	6400300	Integer	Read/Write
Current Mode	6400301	Integer	Read
Status	6400302	Integer	Read
Current Alarms	6400303	Integer	Read/Write**
Latched Alarms	6400304	Integer	Read/Write**

*Write to register clears value

**Write to register acknowledges alarms

Table 4.18: Bit Definitions for System Status

Bit	Description
4	Invalid Recipe

Table 4.19: Bit Definitions for System Set Mode

Bit	Description
0	Set Extruder to Pause Mode
2	Set Extruder to Manual Mode
3	Set Extruder to Auto Mode

Table 4.20: Bit Definitions for System Current Mode

Bit	Description
0	Extruder is in Pause Mode
2	Extruder is in Manual Mode
3	Extruder is in Auto Mode

Table 4.21: Bit Definitions for System Current Alarms and Latched Alarms

Bit	Description
22	Auxiliary Alarm (User defined input & alarm text)
24	Battery Needs Replacement
26	Power Supply Failure
28	Check Printer Alarm
29	Information Alarm Present
30	General Alarm Present
31	System Shutdown Alarm Present

4.10 Examples

The following are some examples using register numbers found in the Gravitrol register list.

Example 1

Gravitrol is paused. To bring line up to speed:

1. Set speeds.

   Write 4 to register 6400300 - sets Gravitrol to manual mode
   Write 0.0 to register 6400017 - sets Master Speed Ratio
   Write 30.0 to register 0000017 - sets extruder A Set Speed Ratio to 30%
   Write 25.0 to register 0100017 - sets extruder B Set Speed Ratio to 25%

Write 40.0 to register 0200017 - sets extruder C Set Speed Ratio to 40%

2. Start the line.

   Write 10.0 to register 6400012 - sets Master Speed Ratio to 10%. This also brings extruder A to 3% speed (10% of 30% is 3%), extruder B to 2.5% speed, and extruder C to 4% speed.

   Write other values to the Master Speed Ratio to raise or lower all speeds.

3. Put in the recipe.

   Write 20.0 to register 0000030 - sets extruder A New Parts to 20%
   Write 30.0 to register 0100030 - sets extruder B New Parts to 30%
   Write 50.0 to register 0200030 - sets extruder C New Parts to 50%
   Write 500.0 to register 6400030 - sets New Total Line Rate to 500 pph

4. When line reaches the new production speed, put it in AUTO.

   Write 8 to register 6400300 - “presses” **<AUTO>** button, sets Gravitrol to AUTO mode

SECTION 5 - Sample Configuration

TOPICS DISCUSSED IN THIS CHAPTER

- ✔ Sample Configuration

The file **MOD10.db** is a sample configuration that contains 10 modules. The Input and Output modules are reconfigured into 5 separate modules. The first 2 modules contain the PCC device control values, the third module contains the mode and status values and the last two modules contain floating point values.

Table 5.1: Sample Configuration

Module	Description	Parameter(s)	Word Offset	Byte Offset
1	Input control	Input Block Number	0	0
	Input Index Number	1	2	
	Input Count	2	4	
2	Output Control	Output Block Number	3	6
	Output Index Number	4	8	
	Output Count	5	10	
3	Mode/Status	Mode & status bits	6	12
4	Floats, variables 1 - 6	PCC2 register values (12 words)	7	16
5	Floats, variables 7 -10	PCC2 register values (8 words)	20	40

Numerics

A

B

C

D

E

F

G

H

I

J

L

M

N

O

P

R

S

T

U

V

W

X