

# A-B RIO Interface Manual for Sonologic II and Weigh II

**CAUTION**

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It is essential that all instructions in this manual be followed precisely to ensure proper operation of the equipment.

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## **NOTICE**

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## Manual Addendum

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# A-B RIO Interface Manual for Sonologic II and Weigh II (97-1117-01, Rev. New)

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The following changes will be incorporated at the next revision to the manual:

- Page 3-1.** Add the following to the next-to-last paragraph in the *Introduction* section:  
Two A-B RIO Card channels can be assigned to each Sono II channel (vessel channel or math channel).
- Page 3-5.** For the Application Type command, remove '2=pmp' from the comments column.
- Page 3-9.** For the Status command, replace the Notes with the following:  
*Notes:* Description of status (bits 8-15 of data word)
 

Bit 8 - N/A	Bit 12 - COM error condition
Bit 9 - Echo Loss	Bit 13 - N/A
Bit 10 - Math computation error or over-temperature condition	Bit 14 - Eng. unit overflow
Bit 11 - Illegal average factor	Bit 15 - Negative value for math channel
- Page 3-16, Application Type command.** In the Notes, remove '2 = pmp' from the list.

- Page 3-16, Force Setpoint Mode command.** Replace the BTR Table with the following:

**BTR Table**

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	1	0	1	1	0	1	0	0	0	0	0	0	0	0

- Page 3-18, Channel Status Table.** Replace the '-' for Bit 12 with 'Over-temperature condition.'
- Page 5-1.** Add the following to the next-to-last paragraph in the *Introduction* section:  
Two A-B RIO Card channels can be assigned to each Weigh II channel (vessel channel or math channel).
- Page 5-5.** Replace commands 11 and 12 (decimal) with the following:

Scale Factor Cnts (Manual)	11	B	0-2097151		5-10
Scale Factor Weight (Manual)	12	C	0-999999	Value in selected engineering units	5-10

9. Page 5-10. Replace commands 11 and 12 (decimal) with the following:

**Scale Factor Counts (Manual Calibration)**

Dec: 11 Hex: B Range: 0-2097151

**BTW Table**

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	1	0	1	1	0	0	0	0	0	0	0	0

**BTR Table**

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
d	d	d	d	d	d	d	d	d	d	d	d	d	d	d	d
e	p	0	0	1	0	1	1	0	0	0	d	d	d	d	d

**Scale Factor Weight (Manual Calibration)**

Dec: 12 Hex: C Range: 0-999999

**BTW Table**

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0

**BTR Table**

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
d	d	d	d	d	d	d	d	d	d	d	d	d	d	d	d
e	p	0	0	1	1	0	0	0	0	0	0	d	d	d	d

From Manual Addendum 97-1117-01 Rev. A

**1. Chapter 2, Setting Up the Interface for Sonologic II, P. 2-4 and Chapter 4, Setting Up the Interface for Weigh II, p. 4-4**

For A-B RIO block transfer, the current default value for rack size (*Rck\_Siz*) is Full. It should be 1/4. Follow the procedure in *Setting Up the A-B RIO Card to Interface with the PLC* (pp. 2-4 and 2-5 for the Sono II; pp. 4-4 and 4-5 for the Weigh II) if you want to change the value for rack size.

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# Chapter 1. Introduction

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## Introduction

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This manual covers the setup and program commands for interfacing the Sonologic II Ultrasonic System (Sono II) and Weigh II signal processors with Allen-Bradley's PLC network.

The Sono II can monitor up to a total of 16 Sonocell transducers of various frequencies, accommodating multiple vessels of different heights and shapes as well as flow applications. The Weigh II can monitor up to four vessels instrumented with Kistler-Morse L-Cells, Microcells, Load Stand II's, Load Disc II's, or Load Links, or with full bridge, foil gage sensors from other manufacturers.

Both the Weigh II and the Sono II are available with an optional Allen-Bradley Remote I/O (A-B RIO) PCB. This provides an interface between the signal processor and the the Allen-Bradley Remote I/O network. Once interfaced in the Allen-Bradley network, a programmer can use an Allen-Bradley PLC and ladder logic programming language to read and write data to and from the signal processor.

Rev. A of the A-B RIO PCB supports both Weigh II and Sono II. Prior revisions of the A-B RIO PCB support only Sono II.

Chapters 2 and 3 of this manual cover the setup and program instructions for the Sono II. Chapters 4 and 5 of this manual cover the setup and program instructions for the Weigh II.

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## Manual Conventions

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Three kinds of special explanations appear throughout the manual — **WARNING**, **CAUTION**, and *Note*. The format and significance of each is defined below:

### **WARNING**

---

**Possible danger to people.  
Injury may result if this information  
is ignored.**

---

### **CAUTION**

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Possible risk to the product. The signal processor or other equipment may be damaged if this information is ignored.

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### *Note*

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Contains additional information about a step or feature critical to the installation or operation of the signal processor.

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# Chapter 2. Setting Up the Interface for Sonologic II

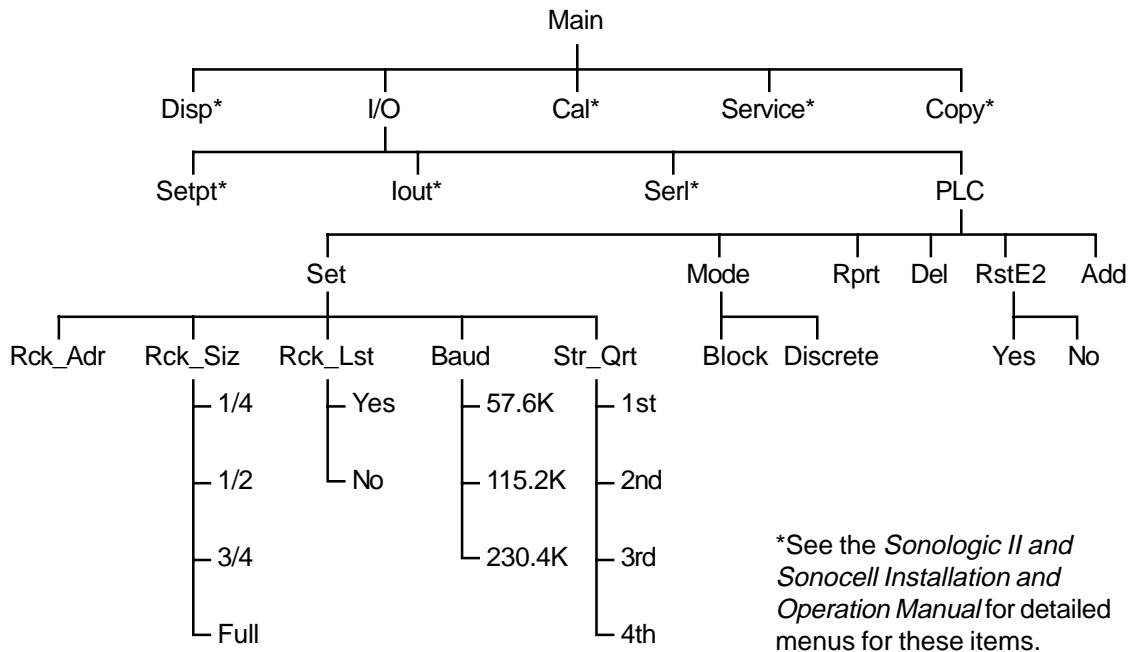


Figure 2-1. Sono II PLC Menu Tree

## Introduction

The Allen-Bradley Remote I/O Interface for Sonologic II provides a connection between the Sonologic II (Sono II) and the Allen-Bradley Remote I/O (A-B RIO) network. Once interfaced in the Allen-Bradley network, a programmer can use an Allen-Bradley PLC and ladder logic programming language to read and write data to and from the Sono II.

### Notes

1. Before adding the A-B RIO Card to the Sono II (if not pre-installed), turn off the power to the Sono II. Refer to the *Sonologic II and Sonocell Installation and Operation Manual* for details on the location of the Card in the Sono II.
2. Complete the installation and setup of the Sono II and transducers before setting up the A-B RIO Card to interface with the PLC. Refer to TI-SO.S2.RIO-01 in Appendix B and to the *Sonologic II and Sonocell Installation and Operation Manual*.

3. Before any system changes can take effect, power must be cycled on the Sono II and then on the PLC.

As shown in Figure 2-1, the *PLC* Menu has six submenus:

- *Set* — sets up the rack address, rack size, last rack, baud rate, and starting quarter
- *Mode* — selects block or discrete transfer of data
- *Rprt* — used to view the A-B RIO channel numbers assigned to the current Sono II channel
- *Del* — deletes A-B RIO channels previously assigned to the current Sono II channel
- *RstE2* — resets the nonvolatile EEPROM memory to default parameters
- *Add* — assigns A-B RIO channels to the current Sono II channel

The remaining sections of this chapter cover the use of these submenus in setting up the A-B RIO interface with the PLC.

# Setting Up the A-B RIO Card for Block or Discrete Transfer Programming

This section describes how to set up the A-B RIO RIO Card for block or discrete transfer programming. For block transfer, the A-B RIO Card has up to 32 channels available and requires 1/4 logical rack space. For discrete transfer, the A-B RIO Card has up to six channels available. Figure 2-2 illustrates the discrete transfer rack space requirements. Chapter 3, PLC Programming for Sonologic II, contains a detailed description of the two programming modes.

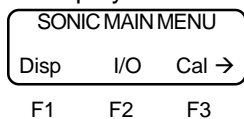
Block or discrete transfer programming mode is selected while in the menu tree for *any* Sono II channel and applies to *all* of the channels in the system. You must select block or discrete transfer programming mode before you add (assign) A-B RIO channels, as the mode affects the number of available A-B RIO channels.

**Note**

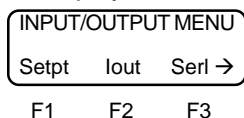
Block transfer programming is the default mode. If you are doing initial setup of your system and want to use block transfer, skip this section and proceed to *Setting Up the A-B RIO Card to Interface with the PLC*.

Follow this procedure to select the transfer programming mode. Refer to Figure 2-1 to help navigate through the PLC Menu:

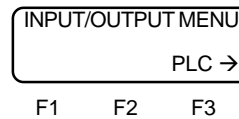
1. If the Sono II is in Auto Mode (Auto LED illuminated), press the Auto/Man Key to put the system in Manual Mode. The Auto LED turns off.
2. Press the Menu Key to display the *Main* Menu. The display shows:



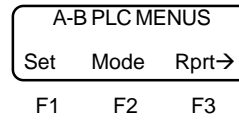
3. Press the F2 Key to access the *I/O* Menu. The display shows:



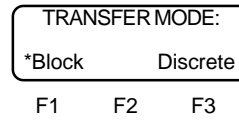
4. Press the Menu Key to display the second page of the menu. The display shows:



5. Press the F3 Key to access the *PLC* Menu. The display shows:

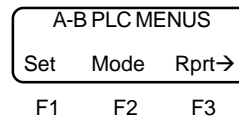


6. Press the F2 key to access the *Mode* Menu. The display shows:



An asterisk indicates the current selection.

7. Press the F1 Key for block transfer or the F3 Key for discrete transfer. The display scrolls the following message: *Attention!! The Sonologic II system power must now be cycled to activate new menu selection. Also, the PLC must be re-configured. Press any key.*
8. Press any key to stop the message from scrolling and return the display to:



**Note**

If you have completed setting up the A-B RIO Card:

- Turn Sono II power off and on to activate your selection of block or discrete transfer, so the appropriate number of channels are available when you add (assign) A-B RIO channels.
- Reconfigure the PLC to match your selection of block or discrete transfer.

It is not necessary to cycle power or reconfigure the PLC now if you have not completed setting up the A-B RIO interface (see next section). You can cycle power and reconfigure once, when you complete setting up all of the parameters in the Sono II's *PLC* Menu.

9. Press the Esc Key to scroll up the menu tree or press the Auto/Man Key to return to vessel monitoring.

Maximum A-B RIO Channels Available	Rack Space	Table																														
1	1/4	<div style="display: flex; justify-content: space-between; align-items: flex-start;"> <span>17</span> <span>0 Bit (octal)</span> </div> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 33%; height: 15px;"></td> <td style="width: 33%; height: 15px;"></td> <td style="width: 33%; height: 15px;"></td> </tr> <tr> <td colspan="3" style="height: 15px;">Word 0</td> </tr> <tr> <td colspan="3" style="height: 15px;">Word 1</td> </tr> </table>				Word 0			Word 1																							
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3	1/2	<div style="display: flex; justify-content: space-between; align-items: flex-start;"> <span>17</span> <span>0 Bit (octal)</span> </div> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 33%; height: 15px;"></td> <td style="width: 33%; height: 15px;"></td> <td style="width: 33%; height: 15px;"></td> </tr> <tr> <td colspan="3" style="height: 15px;">Word 0</td> </tr> <tr> <td colspan="3" style="height: 15px;">Word 1</td> </tr> <tr> <td colspan="3" style="height: 15px;">Word 2</td> </tr> <tr> <td colspan="3" style="height: 15px;">Word 3</td> </tr> </table>				Word 0			Word 1			Word 2			Word 3																	
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Figure 2-2. A-B RIO Discrete Transfer Rack Space Requirements

## Setting Up the A-B RIO Card to Interface with the PLC

The following A-B RIO Card setup parameters are entered in the *Set* Menu (refer to Figure 2-1): rack address (*Rck\_Adr*), rack size (*Rck\_Siz*), last rack (*Rck\_Lst*), baud rate (*Baud*), and starting quarter (*Str\_Qrt*). The setup parameters are selected while in the menu tree for *any* Sono II channel, and apply to *all* the channels in the system. Table 2-1 shows the default setup parameters.

Parameter	Default Value
<i>Rck_Adr</i>	03 D, 03 H
<i>Rck_Siz</i>	1/4 for block transfer, Full for discrete transfer
<i>Rck_Lst</i>	Yes
<i>Baud</i>	57.6K
<i>Str_Qrt</i>	1st

Table 2-1. Setup Default Parameters

Follow this procedure to set up the A-B RIO Card. Refer to Figure 2-1 during setup to help navigate through the *PLC* Menu.

1. If the Sono II is in Auto Mode (Auto LED illuminated), press the Auto/Man Key to put the system in Manual Mode. The Auto LED turns off.
2. Press the Menu Key to display the *Main* Menu. The display shows:

```
SONIC MAIN MENU
Disp  I/O  Cal →
F1    F2    F3
```

3. Press the F2 Key to access the *I/O* Menu. The display shows:

```
INPUT/OUTPUT MENU
Setpt  out  Ser1 →
F1    F2    F3
```

4. Press the Menu Key to display the second page of the menu. The display shows:

```
INPUT/OUTPUT MENU
PLC →
F1    F2    F3
```

5. Press the F3 Key to access the *PLC* Menu. The display shows:

```
A-B PLC MENU
Set  Mode  Rprt →
F1    F2    F3
```

6. Press the F1 Key to access the *Set* Menu. The display shows:

```
CHOOSE PARAMETER
Rck_Adr  Rck_Siz →
F1    F2    F3
```

7. Press the F1 Key to set the rack address. The display shows:

```
SET RACK ADDRESS
> XX Dec  YY Hex
F1    F2    F3
```

An existing address displays in place of the XXs and YYs.

8. Use the Up or Down Arrow Keys to scroll to a desired address or enter a decimal number directly with the keypad. The hexadecimal number automatically changes to correspond to the decimal number. Press the Enter Key to enter the rack address in memory. The display scrolls the following message:

*Attention!! The Sonologic II system power must now be cycled to activate new menu selection. Also, the PLC must be re-configured. Press any key.*

### Note

It is not necessary to cycle power and reconfigure the PLC to match your selection until you are done entering all setup parameters. However, the warning message will continue to appear as you enter setup parameters. You can cycle power and reconfigure the PLC once, matching all of the parameters selected in the *PLC* Menu.

9. Press any key to stop the message from scrolling and return the display to:

```
CHOOSE PARAMETER
Rck_Adr  Rck_Siz →
F1    F2    F3
```

10. Press the F3 Key to set the rack size. The display shows:

```
CHOOSE PARAMETER
3/4          * Full →
F1    F2    F3
```

An asterisk indicates the current selection.

11. If the displayed menu does not have the desired rack size, press the Menu Key to display the second page of the menu. The display shows:

```

CHOOSE PARAMETER
1/4           1/2→
F1    F2    F3
    
```

12. Press the F1 or F3 Key to select the desired rack size. The display scrolls the message described in Step 8 and the note following it.
13. Press any key to stop the message from scrolling and return the display to:

```

CHOOSE PARAMETER
Rck_Adr  Rck_Siz→
F1    F2    F3
    
```

14. Press the Menu Key to display the second page of the menu. The display shows:

```

CHOOSE PARAMETER
Rck_Lst   Baud→
F1    F2    F3
    
```

15. Press the F1 Key to indicate if the A-B RIO Card is the last rack with the same address. The display shows:

```

LAST RACK?
Yes*       No
F1    F2    F3
    
```

An asterisk indicates the current selection.

16. Press the F1 Key for Yes or the F3 Key for No. The display scrolls the message described in Step 8 and the note following it.
17. Press any key to stop the message from scrolling and return the display to:

```

CHOOSE PARAMETER
Rck_Lst   Baud→
F1    F2    F3
    
```

18. Press the F3 Key to set up the baud rate. The display shows:

```

CHOOSE DATA RATE
57.6K*    115.2K→
F1    F2    F3
    
```

An asterisk indicates the current selection.

19. If the displayed menu does not have the desired baud rate, press the Menu Key to display the second page of the menu. The display shows:

```

CHOOSE DATA RATE
230.4K    →
F1    F2    F3
    
```

20. Press the F1 or F3 Key to select the desired baud rate. The display scrolls the message described in Step 8 and the note following it.
21. Press any key to stop the message from scrolling and return the display to:

```

CHOOSE PARAMETER
Rck_Lst   Baud→
F1    F2    F3
    
```

22. Press the Menu Key to display the third page of the menu. The display shows:

```

CHOOSE PARAMETER
Str_Qrt   →
F1    F2    F3
    
```

23. Press the F1 Key to select the starting quarter. The display shows:

```

STARTING QUARTER
1st*      2nd →
F1    F2    F3
    
```

An asterisk indicates the current selection.

24. If the displayed menu does not have the desired starting quarter, press the Menu Key to display the second page of the menu. The display shows:

```

STARTING QUARTER
3rd       4th→
F1    F2    F3
    
```

25. Press the F1 or F3 Key to select the desired starting quarter. The display scrolls the message described in Step 8 and the note following it.
26. Press any key to stop the message from scrolling and return the display to:

```

CHOOSE PARAMETER
Str_Qrt   →
F1    F2    F3
    
```

27. Press the Esc Key to scroll up the menu tree or press the Auto/Man Key to return to vessel monitoring.

**Note**

Turn the Sono II power off and on and reconfigure the PLC to match the Sono II parameters you entered.

## Adding and Deleting A-B RIO Channels

The *Add* Function is used to add (assign) A-B RIO channels to a Sono II channel (transducer or math channel). Note that an A-B RIO channel **MUST BE ADDED** for the PLC to communicate with the corresponding Sono II channel. Up to two A-B RIO channels can be assigned per Sono II channel and up to a total of six channels for discrete transfer and 32 channels for block transfer. It is not necessary to assign the A-B RIO channels sequentially to the Sono II channels.

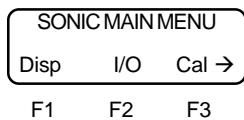
The *Delete* Function allows previously added A-B RIO channels to be removed.

**Note**

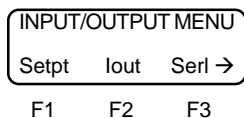
Select the mode of transfer programming (block or discrete) before adding channels, as the mode affects the number of A-B RIO channels available.

Follow this procedure to add or delete A-B RIO channels. Refer to Figure 2-1 to help navigate through the *PLC* Menu.

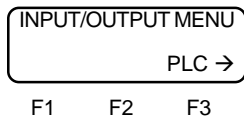
1. If the Sono II is in Auto Mode (Auto LED illuminated), press the Auto/Man Key to put the system in Manual Mode. The Auto LED turns off.
2. Use the Up and Down Arrow Keys to scroll the display to the Sono II channel for which you want to add or delete the A-B RIO channel(s).
3. Press the Menu Key to display the *Main* Menu. The display shows:



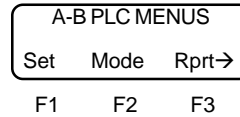
4. Press the F2 Key to access the *I/O* Menu. The display shows:



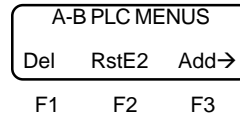
5. Press the Menu Key to display the second page of the menu. The display shows:



6. Press the F3 Key to access the *PLC* Menu. The display shows:

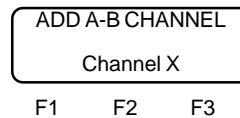


7. Press the Menu Key to access the second page of the menu. The display shows:

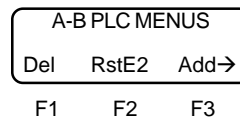


To add A-B RIO channels, continue with Step 8. To delete A-B RIO channels, skip Steps 8 through 11 and continue with Step 12.

8. Press the F3 Key to add a channel. The display shows the channel number of the first available A-B RIO channel:



9. Press the Up and Down Arrow Keys to cycle through the available A-B RIO channels until the one you want is displayed. Press the Enter Key to add the channel. The display flashes a message acknowledging your selection and returns to:

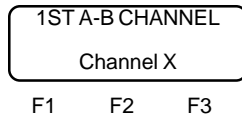


10. Repeat Steps 8 and 9 to add an additional A-B RIO channel to this Sono II channel if available and desired (up to two A-B RIO channels per Sono II channel).
11. Press the Esc Key scroll up the menu tree or the Auto/Man Key to return the display to vessel monitoring.

**Note**

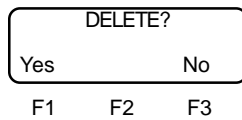
A maximum of six A-B RIO channels (discrete mode) or 32 A-B RIO channels (block mode) can be assigned to each Sono II. To assign additional A-B RIO channels to other channels in the Sono II, return to vessel monitoring, scroll to a different Sono II channel using the Up and Down Arrow Keys, and repeat Steps 1 through 11.

12. The remaining steps in this procedure deal with deleting an A-B RIO channel, if desired. Press the F1 Key to delete an A-B RIO channel. The display looks like this:

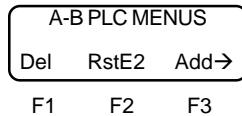


The channel number of the first available A-B RIO channel displays instead of the 'X.'

13. Press the Up and Down Arrow Keys to cycle through the assigned A-B RIO channels until the one you want is displayed. Press the Enter Key to delete the channel. The display shows:



14. Press the F1 Key to delete the channel. The display flashes a message acknowledging your selection and returns to:



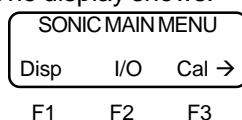
15. Follow Steps 12 through 14 to delete another channel, press the Esc Key to scroll up the menu tree, or press the Auto/Man Key to return the display to vessel monitoring.

## Resetting the A-B RIO Card to Default Parameters

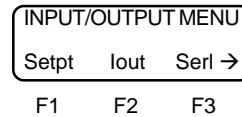
The A-B RIO Card default setup parameters are listed in Table 2-1. If you want to reset the parameters to the default values, use the *RstE2* function.

Follow this procedure to reset to default parameters. Refer to Figure 2-1 to help navigate through the *PLC* Menu.

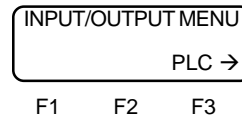
1. If the Sono II is in Auto Mode (Auto LED illuminated), press the Auto/Man Key to put the system in Manual Mode. The Auto LED turns off.
2. Press the Menu Key to display the *Main* Menu. The display shows:



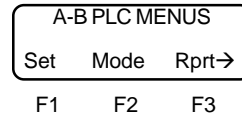
3. Press the F2 Key to access the *I/O* Menu. The display shows:



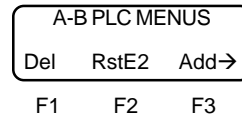
4. Press the Menu Key to display the second page of the menu. The display shows:



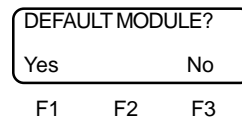
5. Press the F3 Key to access the *PLC* Menu. The display shows:



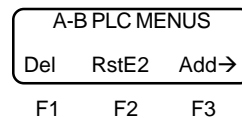
6. Press the Menu Key to display the second page of the menu. The display shows:



7. Press the F2 Key to access the *RstE2* Menu. The display prompts you to enter the Service Code if you have not already entered it while in the Manual Mode in the menu tree. Then, the display shows:



8. Press the F1 Key to select *Yes*. The parameters are automatically defaulted and the display scrolls the following message:  
*Attention!! The Sonologic II system power must now be cycled to activate new menu selection. Also, the PLC must be re-configured.*
9. Press any key to stop the message from scrolling and return the display to:



10. Press the Esc Key to scroll up the menu tree or press the Auto/Man Key to return to vessel monitoring.

### Note

Turn the Sono II power off and on and reconfigure the PLC to match the Sono II parameters you defaulted to.

## Channel Report

The Sono II allows you to view the A-B RIO channel numbers of the channels assigned to the current Sono II channel. Follow this procedure:

1. If the Sono II is in Auto Mode (Auto LED illuminated), press the Auto/Man Key to put the system in Manual Mode. The Auto LED turns off.
2. Use the Up and Down Arrow Keys to scroll the display to the Sono II channel for which you want to view the channel report.
3. Press the Menu Key to display the *Main* Menu. The display shows:

```
SONIC MAIN MENU
Disp  I/O  Cal →
F1    F2    F3
```

4. Press the F2 Key to access the *I/O* Menu. The display shows:

```
INPUT/OUTPUT MENU
Setpt  Iout  SerI →
F1    F2    F3
```

5. Press the Menu Key to display the second page of the menu. The display shows:

```
INPUT/OUTPUT MENU
PLC →
F1    F2    F3
```

6. Press the F3 Key to access the *PLC* Menu. The display shows:

```
A-B PLC MENUS
Set  Mode  Rprt →
F1    F2    F3
```

7. Press the F3 Key to access the *Rprt* Menu. The display shows:

```
1ST A-B CHANNEL
Channel X
F1    F2    F3
```

In place of 'X' is the first assigned A-B RIO channel number for the current Sono II channel.

8. Press the Up or Down Arrow to view the second A-B channel (if assigned).

9. Press the Esc Key to return the display to:

```
A-B PLC MENUS
Set  Mode  Rprt →
F1    F2    F3
```

10. Press the Esc Key to scroll up the menu tree or press the Auto/Man Key to return to vessel monitoring.
11. Repeat Steps 1 through 10 as required to view the A-B RIO channel numbers assigned to other Sono II channels.

# Chapter 3. PLC Programming for Sonologic II

## Introduction

The information contained in this chapter documents Kistler-Morse's program commands for interfacing with Allen-Bradley's PLC network. This material is written for users who are competent with Allen-Bradley's PLC programming. We assume that you have Allen-Bradley PLC programming documentation available for reference.

### Note

For installation, setup, and calibration of the Sono II and transducers, refer to the *Sonologic II and Sonocell Installation and Operation Manual*.

The Kistler-Morse A-B RIO Card provides an interface for Sono II systems into the Allen-Bradley I/O network. Kistler-Morse A-B RIO Card supports block or discrete transfer capability. The material in this chapter is organized into two major parts:

- Block transfer commands
- Discrete transfer commands

For block transfer, the A-B RIO Card memory is set up as 64 words, 16 bits per word (refer to Figure 3-1A). Two words are allocated for each A-B RIO Card channel (refer to Figures 3-2 and 3-3). This gives a capacity of 32 channels for each A-B RIO Card. Two A-B RIO Card channels can be assigned to each Sono II channel (transducer channel or math channel).

Discrete transfer has eight words, 16 bits per word (refer to Figure 3-1B). Two words are for commands, giving a capacity of six channels for each A-B RIO Card.

The procedure describing how to select block or discrete transfer programming is in Chapter 2, Setting Up the Interface for Sonologic II.

## A-B RIO Block Transfer Commands

This section describes the table structures, commands, and channel status reports for

block transfer. Follow the procedure in Chapter 2, Setting Up the Interface for Sonologic II, to set the A-B RIO Card for block transfer programming.

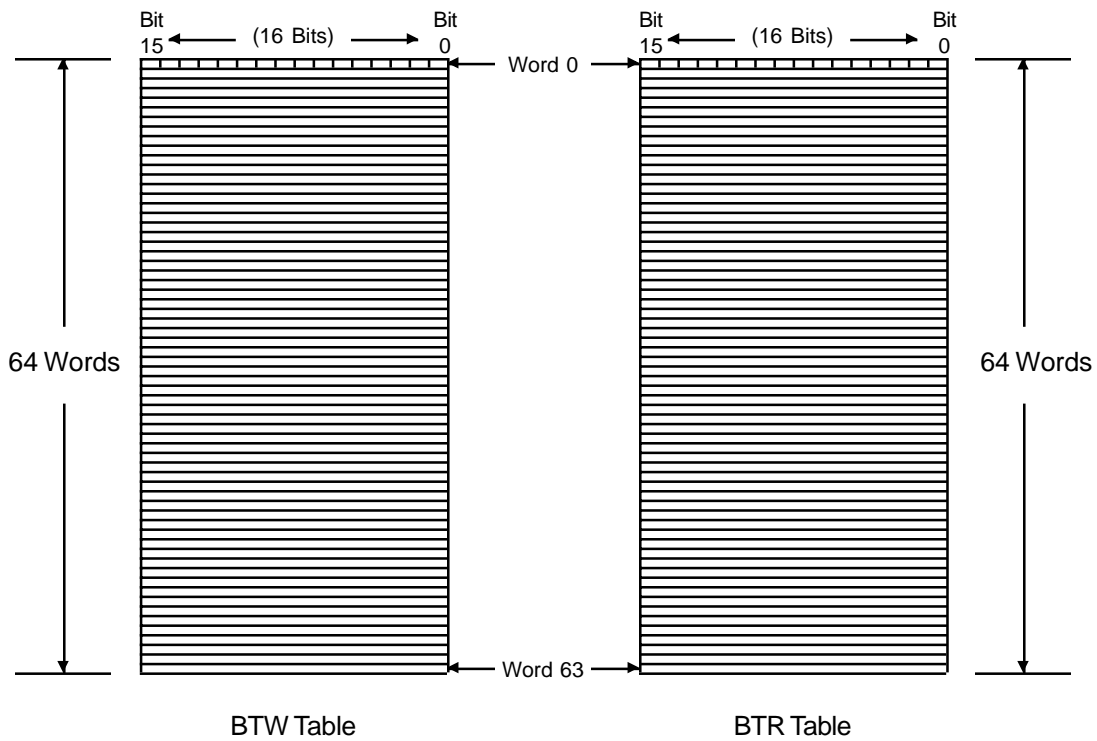
The PLC processor transfers data to and from the A-B RIO Card using BTW (Block Transfer Write) and BTR (Block Transfer Read) instructions in your ladder logic program.

The data obtained from the A-B RIO Card using BTR is set up by instructions sent by BTW commands. Figure 3-2 shows the BTW bit/word configuration. The first word of each channel is the data word. Data is placed here if the command is to send data from the PLC to the Sono II. The second word of each channel is the command word, which may include subcommands and additional data (if the data could not fit within the 16 bits of the first word). Bit 15 of the command word is called the Write Bit. Bit 15 is set to '1' when the command is to send data from the PLC to the Sono II. Bit 15 is set to '0' when the command is to send data from the Sono II to the PLC. After the BTW instruction has been completed, a BTR instruction is used.

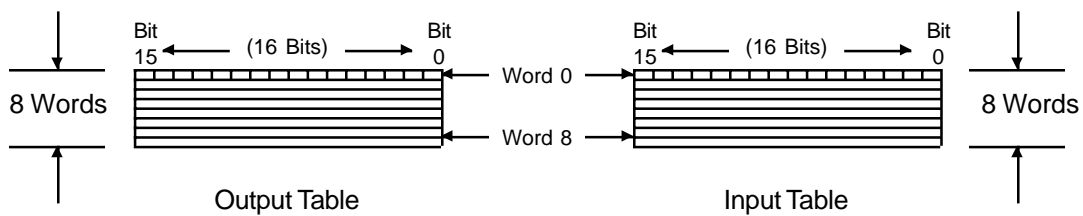
Figure 3-3 shows the BTR bit/word configuration. The first word of each channel is the data word. Data is placed here if the command in the BTW table is to send data from the Sono II to the PLC. The second word of each channel is the command word. The command used in the BTW is echoed here to confirm the command has been processed. Bit 14 of the command word is the polarity bit ('0' = +, '1' = -). Bit 15 of the command word is the error bit. If bit 15 is set to '1,' use the Status Command ('7') to determine the error source. If the error condition is cleared, Bit 15 is reset to '0.'

The Quick Command Reference Table lists all of the commands, parameters, and value ranges needed to program the PLC to interface with the Sono II. The tables that follow the Quick Command Reference Table are the individual BTW and BTR tables for each command.

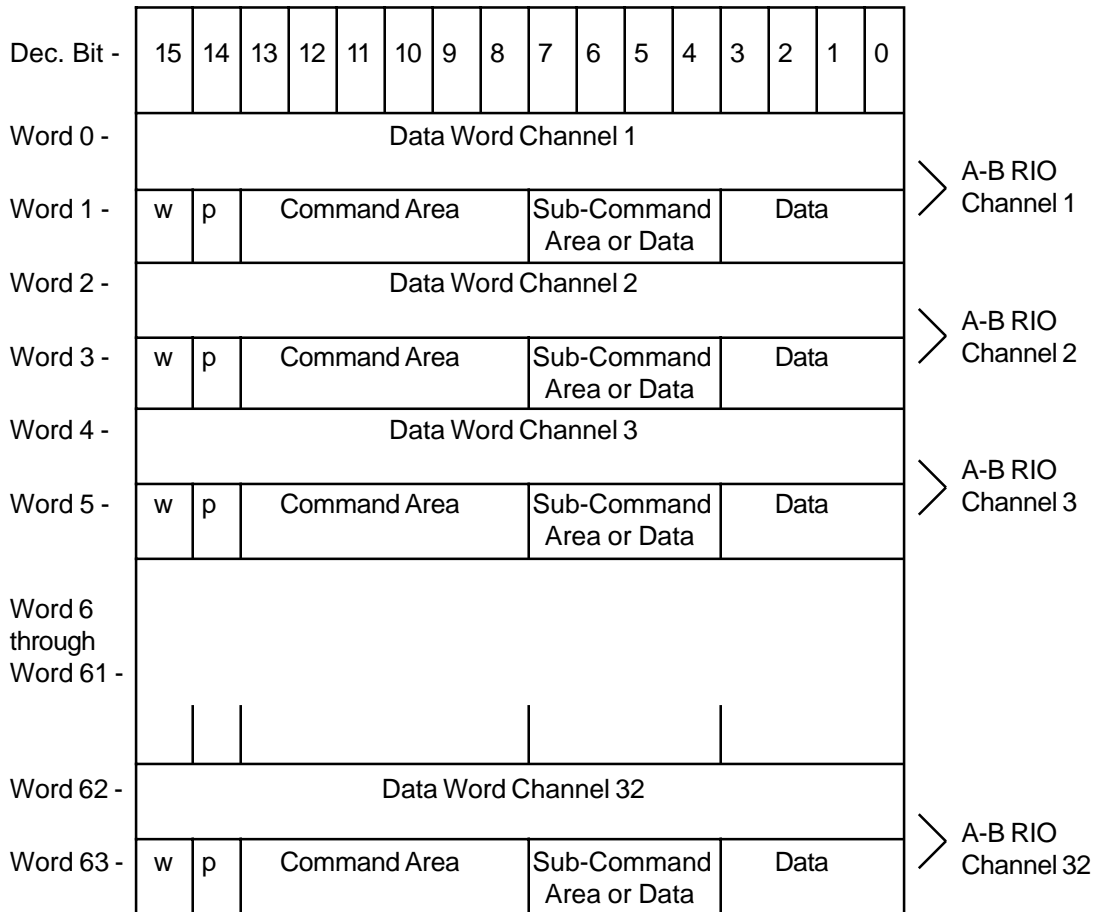
**Figure 3-1A: Block Transfer**



**Figure 3-1B: Discrete Transfer**



*Figure 3-1. Illustration of Allen-Bradley and A-B RIO Card Memory Registers*

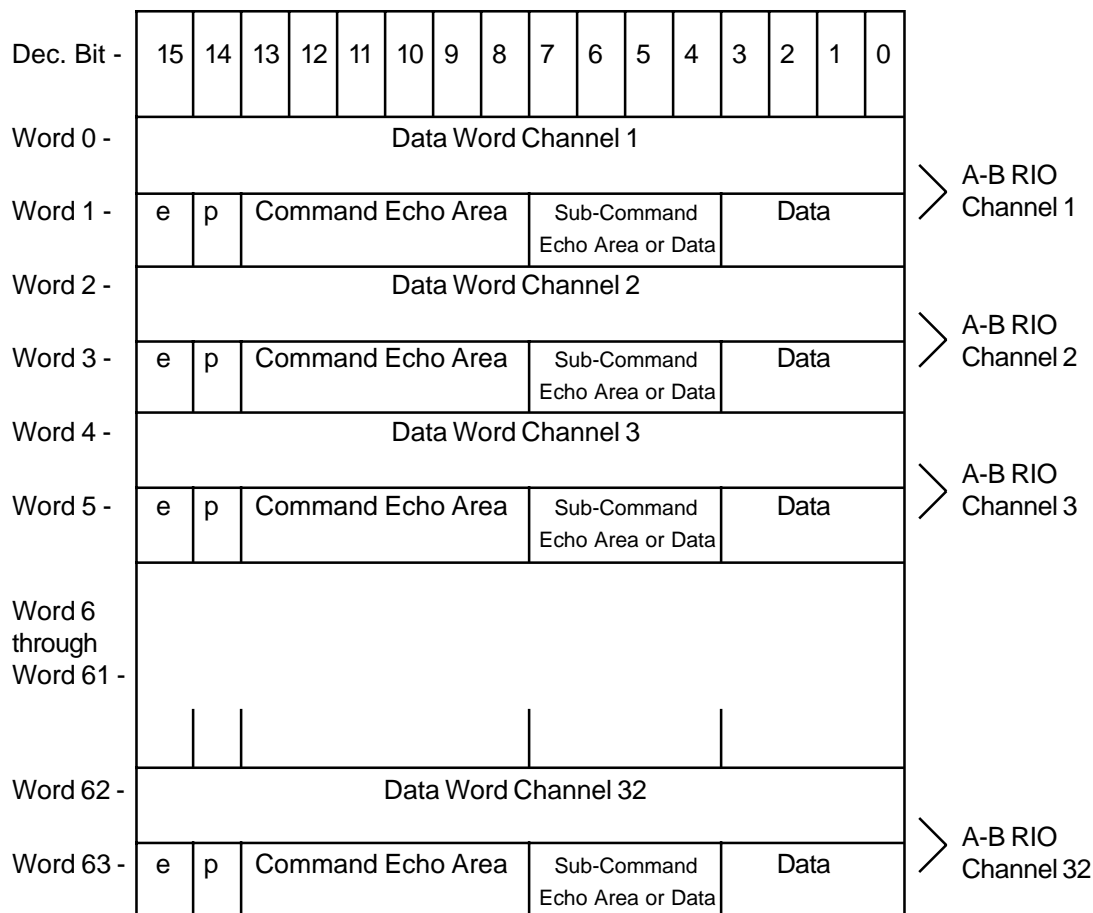


### Block Transfer Write Table

*Notes:*

1. Two words are used per A-B RIO channel. The first word is called the Data Word and the second word is called the Command Word.
2. Description of the Command Word:
  - Bits 0-7 is the data area. This area is used when 21 bit data is to be sent/received (not applicable to the Sono II). Data Bits 0-15 are in the Data Word in the first word for the channel and the remaining data, bits 16-20, are in this area.
  - Bits 4-7 is the Sub-Command Area. This area is used (when not being used for 21 bit data) to point to specific setpoints or current outputs for the Sono II channel.
  - Bits 8-13 is the Command Area.
  - Bit 14 is the Polarity bit (p): '0' = +, '1' = -
  - Bit 15 is the Write bit (w). Set this bit to '1' when sending data from the PLC to the Sono II. Set this bit to '0' when requesting that data be sent from the Sono II to the PLC.

Figure 3-2. Basic Bit/Byte Word Configuration for Block Transfer Write Table



**Block Transfer Read Table**

*Notes:*

1. Two words are used per A-B RIO channel. The first word is called the Data Word and the second word is called the Command Word.
2. Description of the Command Word:
  - Bits 0-7 is the data area. This area is used when 21 bit data is to be sent/received (not applicable to the Sono II). Data Bits 0-15 are in the Data Word in the first word for the channel and the remaining data, bits 16-20, are in this area.
  - Bits 4-7 is the Sub-Command Echo Area. This area is used (when not being used for 21 bit data) to point to specific setpoints or current outputs for the Sono II channel.
  - Bits 8-13 is the Command Echo Area.
  - Bit 14 is the Polarity bit (p): '0' = +, '1' = -
  - Bit 15 is the Error bit (e).

*Figure 3-3. Basic Bit/Byte Word Configuration for Block Transfer Read Table*

## Quick Command Reference Table for A-B RIO Card

System Parameters	Command Dec	Hex	Range	Comments	Page No.
Null Command	0	0	—	Returns zero in all data/command fields	3-7
A-B Device & Revision Report	5	5	0-255	MSB A-B RIO firmware revision: 0-127=XNEW-XZZV, 128-255=NEW-ZZV. LSB Signal processor type: 0=MVS, 1=Sono 5000 series-ITU-SSU, 2=STX, 5=ITX, 10=1000, 11=1020, 7=Sono II, 80 = Weigh II	3-7

Sono II Parameters	Command Dec	Hex	Range	Comments	Page No.
Level Data	1	1	0-65535	Material mode: level/head (flow apps.) Air Space mode: air space	3-8
Flow Data	2	2	0-65535	For flow applications only	3-8
Main Totalizer Low Word	3	3	0-65535	For flow applications only	3-8
Main Totalizer High Word	4	4	0-65535	For flow applications only	3-9
Status (includes errors)	7	7	0-255		3-9
Full Point	8	8	0-9999	If polarity bit is 1, value is negative	3-9
Operating Span	9	9	0-65535		3-10
Standard Display Format	10	A	0-14	0=ft, 1=0.1ft, 2=0.01ft, 4=in, 5=0.1in, 6=0.01in, 8=m, 9=0.1m, 10=0.01m, 11=0.001m, 12=cm, 13=0.1cm, 14=0.01cm	3-10
Air/Material Mode	11	B	0-1	0=air space mode, 1=material mode	3-10
Window	12	C	0-65535	In standard display units/format	3-11
Minimum Range	13	D	0-65535	In standard display units/format	3-11
Maximum Range	14	E	0-65535	In standard display units/format	3-11
Special Display Units	15	F	0-65535	Maximum value of special display unit	3-12
Averaging Factor	16	10	1-255		3-12
Echo Loss Timer	20	14	0-65535		3-12
Power	22	16	0-1000	0 to 100.0%	3-13
Near Gain	23	17	0-10000	0 to 100.00%	3-13
Echo Detection Threshold	24	18	0-1000	0 to 100.0%	3-13
Peak Detection Threshold	25	19	0-1000	0 to 100.0%	3-14
Active TVG	26	1A	0-10000	0 to 100.00%	3-14
TVG High Limit	27	1B	0-10000	0 to 100.00%	3-14
TVG Low Limit	28	1C	0-10000	0 to 100.00%	3-15
Transmit Cycles	29	1D	0-100	Transmit burst in cycles	3-15
Raw Target in Inches (cm)	35	23	0-65535	To .01 inches or .01 cm (format xxx.xx)	3-15
Application Type	39	27	0-99	0=level, 1=flow, 2=pmp, 3=differential level detection, 99=math channel	3-16
Force Setpoint Mode	45	2D	0-2		3-16

Legend: Dec = numbers in decimal form; Hex = numbers in hexadecimal form

## **Block Transfer Command Format Notes**

Three types of commands are used when interfacing between the PLC and the Sono II:

1. **Read only** commands are used to read a calculated parameter, such as a level or flow. This type of command is **always** used to send data from the **Sono II to the PLC**. The BTW and BTR tables for these commands reflect that the data can only go from the Sono II to the PLC. These commands are identified as “read only” in the Block Transfer Commands that follow.
2. **Set only** commands are used to set a parameter, such as a command to force a setpoint. This type of command is **always** used to send data from the **PLC to the Sono II**. The BTW and BTR tables for these commands reflect that the data can only go from the PLC to the Sono II. These commands are identified as “set only” in the Block Transfer Commands that follow.
3. **Read or Set** commands are used to read a parameter value **or** set a parameter value, such as a command for Averaging Factor. This type of command can be used to send data from the Sono II to the PLC or from the PLC to the Sono II. Note that the BTW and BTR tables for these commands in the Block Transfer Commands that follow are written for the case where the data is being sent from the Sono II to the PLC. However, these commands can be used to set parameters as well.

## Block Transfer Commands: A-B RIO Card

### Null Command

Dec: 0 Hex: 0 Range: 0

**BTW Table**

Dec. Bit -	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 0 -	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Word 1 -	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Data Word  
Command Word

**BTR Table**

Dec. Bit -	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 0 -	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Word 1 -	e	p	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Data Word  
Command Word

### A-B Device and Revision Report (read only)

Dec: 5 Hex: 5 Range: 0-255 MSB, 0-255 LSB

**BTW Table**

Dec. Bit -	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 0 -	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Word 1 -	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0

Data Word  
Command Word

**BTR Table**

Dec. Bit -	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 0 -	d	d	d	d	d	d	d	d	d	d	d	d	d	d	d	d
Word 1 -	e	p	0	0	0	1	0	1	0	0	0	0	0	0	0	0

Data Word  
Command Word

*Notes:* MSB A-B RIO firmware revision: 0-127=XNEW-XZZV, 128-255=NEW-ZZV.

LSB Signal processor type: 0=MVS, 1=Sono 5000 series-ITU-SSU, 2=STX, 5=ITX, 10=1000, 11=1020, 7=Sono II, 80 = Weigh II

## Block Transfer Commands: A-B RIO Card

### Level Data (read only)

Dec: 1 Hex: 1 Range: 0-65535

**BTW Table**

Dec. Bit -	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 0 -	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Word 1 -	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0

Data Word  
Command Word

**BTR Table**

Dec. Bit -	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 0 -	d	d	d	d	d	d	d	d	d	d	d	d	d	d	d	d
Word 1 -	e	p	0	0	0	0	0	1	0	0	0	0	0	0	0	0

Data Word  
Command Word

### Flow Data (read only)

Dec: 2 Hex: 2 Range: 0-65535

**BTW Table**

Dec. Bit -	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 0 -	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Word 1 -	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0

Data Word  
Command Word

**BTR Table**

Dec. Bit -	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 0 -	d	d	d	d	d	d	d	d	d	d	d	d	d	d	d	d
Word 1 -	e	p	0	0	0	0	1	0	0	0	0	0	0	0	0	0

Data Word  
Command Word

### Main Totalizer Low Word (read only)

Dec: 3 Hex: 3 Range: 0-65535

**BTW Table**

Dec. Bit -	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 0 -	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Word 1 -	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0

Data Word  
Command Word

**BTR Table**

Dec. Bit -	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 0 -	d	d	d	d	d	d	d	d	d	d	d	d	d	d	d	d
Word 1 -	e	p	0	0	0	0	1	1	0	0	0	0	0	0	0	0

Data Word  
Command Word

Legend: Dec = # in decimal form; Hex = # in hexadecimal form; e = error; p = polarity; ddd... = data; D... = subcommand

## Block Transfer Commands: A-B RIO Card

### Main Totalizer High Word (read only)

Dec: 4 Hex: 4 Range: 0-65535

**BTW Table**

Dec. Bit -	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 0 -	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Word 1 -	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0

Data Word  
Command Word

**BTR Table**

Dec. Bit -	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 0 -	d	d	d	d	d	d	d	d	d	d	d	d	d	d	d	d
Word 1 -	e	p	0	0	0	1	0	0	0	0	0	0	0	0	0	0

Data Word  
Command Word

### Status (read only)

Dec: 7 Hex: 7 Range: 0-255

**BTW Table**

Dec. Bit -	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 0 -	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Word 1 -	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0

Data Word  
Command Word

**BTR Table**

Dec. Bit -	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 0 -	d	d	d	d	d	d	d	d	0	0	0	0	0	0	0	0
Word 1 -	e	p	0	0	0	1	1	1	0	0	0	0	0	0	0	0

Data Word  
Command Word

Notes: Description of status (bits 8-15 of data word)

- |                                 |  |
|---------------------------------|--|
| Bit 8 -N/A                      | Bit 13 - Requested setpoint or current output not assigned |
| Bit 9 - Echo Loss               | Bit 14 - Eng. unit overflow                                |
| Bit 10 -Math computation error  | Bit 15 - N/A   |
| Bit 11 - Illegal average factor |  |
| Bit 12 - COM error condition    |  |

### Full Point

Dec: 8 Hex: 8 Range: 0-9999

**BTW Table**

Dec. Bit -	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 0 -	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Word 1 -	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0

Data Word  
Command Word

**BTR Table**

Dec. Bit -	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 0 -	0	0	d	d	d	d	d	d	d	d	d	d	d	d	d	d
Word 1 -	e	p	0	0	1	0	0	0	0	0	0	0	0	0	0	0

Data Word  
Command Word

Legend: Dec = # in decimal form; Hex = # in hexadecimal form; e = error; p = polarity; ddd... = data; D... = subcommand

## Block Transfer Commands: A-B RIO Card

### Operating Span

Dec: 9 Hex: 9 Range: 0-65535

**BTW Table**

Dec. Bit -	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 0 -	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Word 1 -	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0

Data Word  
Command Word

**BTR Table**

Dec. Bit -	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 0 -	d	d	d	d	d	d	d	d	d	d	d	d	d	d	d	d
Word 1 -	e	p	0	0	1	0	0	1	0	0	0	0	0	0	0	0

Data Word  
Command Word

### Standard Display Format

Dec: 10 Hex: A Range: 0-14

**BTW Table**

Dec. Bit -	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 0 -	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Word 1 -	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0

Data Word  
Command Word

**BTR Table**

Dec. Bit -	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 0 -	0	0	0	0	0	0	0	0	0	0	0	0	d	d	d	d
Word 1 -	e	p	0	0	1	0	1	0	0	0	0	0	0	0	0	0

Data Word  
Command Word

Note: 0=ft, 1=0.1 ft, 2=0.01 ft, 4=in, 5=0.1 in, 6=0.01 in, 8=m, 9=0.1 m, 10=0.01m, 11=0.001m, 12=cm, 13=0.1 cm, 14=0.01 cm

### Air/Material Mode

Dec: 11 Hex: B Range: 0-1

**BTW Table**

Dec. Bit -	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 0 -	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Word 1 -	0	0	0	0	1	0	1	1	0	0	0	0	0	0	0	0

Data Word  
Command Word

**BTR Table**

Dec. Bit -	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 0 -	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	d
Word 1 -	e	p	0	0	1	0	1	1	0	0	0	0	0	0	0	0

Data Word  
Command Word

Note: 0 = air space mode, 1 = material mode

## Block Transfer Commands: A-B RIO Card

### Window

Dec: 12 Hex: C Range: 0-65535

BTW Table

Dec. Bit -	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 0 -	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Word 1 -	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0

Data Word  
Command Word

BTR Table

Dec. Bit -	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 0 -	d	d	d	d	d	d	d	d	d	d	d	d	d	d	d	d
Word 1 -	e	p	0	0	1	1	0	0	0	0	0	0	0	0	0	0

Data Word  
Command Word

### Minimum Range

Dec: 13 Hex: D Range: 0-65535

BTW Table

Dec. Bit -	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 0 -	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Word 1 -	0	0	0	0	1	1	0	1	0	0	0	0	0	0	0	0

Data Word  
Command Word

BTR Table

Dec. Bit -	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 0 -	d	d	d	d	d	d	d	d	d	d	d	d	d	d	d	d
Word 1 -	e	p	0	0	1	1	0	1	0	0	0	0	0	0	0	0

Data Word  
Command Word

### Maximum Range

Dec: 14 Hex: E Range: 0-65535

BTW Table

Dec. Bit -	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 0 -	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Word 1 -	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0

Data Word  
Command Word

BTR Table

Dec. Bit -	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 0 -	d	d	d	d	d	d	d	d	d	d	d	d	d	d	d	d
Word 1 -	e	p	0	0	1	1	1	0	0	0	0	0	0	0	0	0

Data Word  
Command Word

Legend: Dec = # in decimal form; Hex = # in hexadecimal form; e = error; p = polarity; ddd... = data; D... = subcommand

## Block Transfer Commands: A-B RIO Card

### Special Display Units (maximum value)

Dec: 15 Hex: F Range: 0-65535

**BTW Table**

Dec. Bit -	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 0 -	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Word 1 -	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0

Data Word  
Command Word

**BTR Table**

Dec. Bit -	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 0 -	d	d	d	d	d	d	d	d	d	d	d	d	d	d	d	d
Word 1 -	e	p	0	0	1	1	1	1	0	0	0	0	0	0	0	0

Data Word  
Command Word

### Averaging Factor

Dec: 16 Hex: 10 Range: 1-255

**BTW Table**

Dec. Bit -	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 0 -	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Word 1 -	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0

Data Word  
Command Word

**BTR Table**

Dec. Bit -	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 0 -	0	0	0	0	0	0	0	0	d	d	d	d	d	d	d	d
Word 1 -	e	p	0	1	0	0	0	0	0	0	0	0	0	0	0	0

Data Word  
Command Word

### Echo Loss Timer

Dec: 20 Hex: 14 Range: 0-65535

**BTW Table**

Dec. Bit -	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 0 -	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Word 1 -	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0

Data Word  
Command Word

**BTR Table**

Dec. Bit -	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 0 -	d	d	d	d	d	d	d	d	d	d	d	d	d	d	d	d
Word 1 -	e	p	0	1	0	1	0	0	0	0	0	0	0	0	0	0

Data Word  
Command Word

Legend: Dec = # in decimal form; Hex = # in hexadecimal form; e = error; p = polarity; ddd... = data; D... = subcommand

## Block Transfer Commands: A-B RIO Card

### Power

Dec: 22 Hex: 16 Range: 0-1000 (100.0%)

BTW Table

Dec. Bit -	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 0 -	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Word 1 -	0	0	0	1	0	1	1	0	0	0	0	0	0	0	0	0

Data Word  
Command Word

BTR Table

Dec. Bit -	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 0 -	0	0	0	0	0	0	d	d	d	d	d	d	d	d	d	d
Word 1 -	e	p	0	1	0	1	1	0	0	0	0	0	0	0	0	0

Data Word  
Command Word

### Near Gain

Dec: 23 Hex: 17 Range: 0-10000 (100.00%)

BTW Table

Dec. Bit -	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 0 -	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Word 1 -	0	0	0	1	0	1	1	1	0	0	0	0	0	0	0	0

Data Word  
Command Word

BTR Table

Dec. Bit -	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 0 -	0	0	d	d	d	d	d	d	d	d	d	d	d	d	d	d
Word 1 -	e	p	0	1	0	1	1	1	0	0	0	0	0	0	0	0

Data Word  
Command Word

### Echo Detection Threshold

Dec: 24 Hex: 18 Range: 0-1000 (100.0%)

BTW Table

Dec. Bit -	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 0 -	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Word 1 -	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0

Data Word  
Command Word

BTR Table

Dec. Bit -	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 0 -	0	0	0	0	0	0	d	d	d	d	d	d	d	d	d	d
Word 1 -	e	p	0	1	1	0	0	0	0	0	0	0	0	0	0	0

Data Word  
Command Word

Legend: Dec = # in decimal form; Hex = # in hexadecimal form; e = error; p = polarity; ddd... = data; D... = subcommand

## Block Transfer Commands: A-B RIO Card

### Peak Detection Threshold

Dec: 25 Hex: 19 Range: 0-1000 (100.0%)

**BTW Table**

Dec. Bit -	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 0 -	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Word 1 -	0	0	0	1	1	0	0	1	0	0	0	0	0	0	0	0

Data Word  
Command Word

**BTR Table**

Dec. Bit -	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 0 -	0	0	0	0	0	0	d	d	d	d	d	d	d	d	d	d
Word 1 -	e	p	0	1	1	0	0	1	0	0	0	0	0	0	0	0

Data Word  
Command Word

### Active TVG (read only)

Dec: 26 Hex: 1A Range: 0-10000 (100.00%)

**BTW Table**

Dec. Bit -	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 0 -	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Word 1 -	0	0	0	1	1	0	1	0	0	0	0	0	0	0	0	0

Data Word  
Command Word

**BTR Table**

Dec. Bit -	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 0 -	0	0	d	d	d	d	d	d	d	d	d	d	d	d	d	d
Word 1 -	e	p	0	1	1	0	1	0	0	0	0	0	0	0	0	0

Data Word  
Command Word

### TVG High Limit

Dec: 27 Hex: 1B Range: 0-10000 (100.00%)

**BTW Table**

Dec. Bit -	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 0 -	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Word 1 -	0	0	0	1	1	0	1	1	0	0	0	0	0	0	0	0

Data Word  
Command Word

**BTR Table**

Dec. Bit -	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 0 -	0	0	d	d	d	d	d	d	d	d	d	d	d	d	d	d
Word 1 -	e	p	0	1	1	0	1	1	0	0	0	0	0	0	0	0

Data Word  
Command Word

Legend: Dec = # in decimal form; Hex = # in hexadecimal form; e = error; p = polarity; ddd... = data; D... = subcommand

## Block Transfer Commands: A-B RIO Card

### TVG Low Limit

Dec: 28 Hex: 1C Range: 0-10000 (100.00%)

BTW Table

Dec. Bit -	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 0 -	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Word 1 -	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0

Data Word  
Command Word

BTR Table

Dec. Bit -	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 0 -	0	0	d	d	d	d	d	d	d	d	d	d	d	d	d	d
Word 1 -	e	p	0	1	1	1	0	0	0	0	0	0	0	0	0	0

Data Word  
Command Word

### Transmit Cycles

Dec: 29 Hex: 1D Range: 0-100

BTW Table

Dec. Bit -	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 0 -	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Word 1 -	0	0	0	1	1	1	0	1	0	0	0	0	0	0	0	0

Data Word  
Command Word

BTR Table

Dec. Bit -	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 0 -	0	0	0	0	0	0	0	0	0	d	d	d	d	d	d	d
Word 1 -	e	p	0	1	1	1	0	1	0	0	0	0	0	0	0	0

Data Word  
Command Word

### Raw Target in Inches (centimeters) (read only)

Dec: 35 Hex: 23 Range: 0-65535

BTW Table

Dec. Bit -	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 0 -	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Word 1 -	0	0	1	0	0	0	1	1	0	0	0	0	0	0	0	0

Data Word  
Command Word

BTR Table

Dec. Bit -	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 0 -	d	d	d	d	d	d	d	d	d	d	d	d	d	d	d	d
Word 1 -	e	p	1	0	0	0	1	1	0	0	0	0	0	0	0	0

Data Word  
Command Word

Note: To .01 inches or .01 cm (format xxx.xx)

Legend: Dec = # in decimal form; Hex = # in hexadecimal form; e = error; p = polarity; ddd... = data; D... = subcommand

## Block Transfer Commands: A-B RIO Card

### Application Type (read only)

Dec: 39 Hex: 27 Range: 0-99

BTW Table

Dec. Bit -	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 0 -	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Word 1 -	0	0	1	0	0	1	1	1	0	0	0	0	0	0	0	0

Data Word  
Command Word

BTR Table

Dec. Bit -	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 0 -	0	0	0	0	0	0	0	0	0	d	d	d	d	d	d	d
Word 1 -	e	p	1	0	0	1	1	1	0	0	0	0	0	0	0	0

Data Word  
Command Word

Notes: 0 = level, 1 = flow, 2 = pmp, 3 = differential level detection, 99 = math channel

### Force Setpoint Mode (set only)

Dec: 45 Hex: 2D Range: 0-2

BTW Table

Dec. Bit -	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 0 -	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	d
Word 1 -	1	0	1	0	1	1	0	1	0	D	D	D	0	0	0	0

Data Word  
Command Word

BTR Table

Dec. Bit -	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 0 -	0	0	0	0	0	0	0	0	0	0	0	0	0	0	d	d
Word 1 -	0	0	1	0	1	1	0	1	0	0	0	0	0	0	0	0

Data Word  
Command Word

#### Notes:

- Bits 4, 5, and 6 are the setpoint number (000=Setpoint 1 through 111=Setpoint 8).
- To activate the Force Mode, set bit 1 of the Data Word to 1 and set the write bit (bit 15) to 1. To deactivate the Force Mode, set bit 1 of the Data Word to 0 and set the write bit (bit 15) to 1.
- Bit 0 of the Data Word represents the state of the setpoint (1=On, 0=Off) when the Force Mode is active. When the force mode is inactive, the setpoint is controlled by the Sono II microprocessor card.

#### CAUTION

The Force Setpoint Mode command removes control of the indicated setpoint from the Sono II and gives it to the PLC. The Sono II does not activate the setpoints based on the input value (for example: level, head, flow, etc.) when the Force Setpoint Mode is active.

## A-B RIO Discrete Transfer Commands

This section describes the table structures, commands, and channel status reports for discrete transfer. Follow the procedure in Chapter 2, Setting Up the Interface for Sonologic II, to set the A-B RIO Card for discrete transfer programming.

The A-B RIO Card supports six channels using eight words of data. Those words are structured as shown in Figures 3-4 and 3-5.

The command word (Word 0 and Word 4 in Figure 3-4) supports three channels. Bit 17 is

not used. The desired command from the Discrete Transfer Command Table is entered in the first three bits of each channel in the Output Table. The first three bits of each channel in the Input Table echo the command. Bits 3, 10, and 15 indicate polarity (0 = '+', 1 = '-') and bits 4, 11, and 16 indicate status. If a status bit contains '1,' status/error information can be found using Command 7.

Parameters, commands, and value ranges for discrete transfer are listed in the Discrete Transfer Command Table. Channel status is given in the Channel Status Table. Use this information when entering commands in the Discrete Output Table and reading the requested information in the Discrete Input Table.

17	16	15	14	13	12	11	10	7	6	5	4	3	2	1	0	Octal Bits
N/U	N/U	N/U	Command CH3			N/U	N/U	Command CH2			N/U	N/U	Command CH1			Word 0
																Word 1
																Word 2
																Word 3
N/U	N/U	N/U	Command CH6			N/U	N/U	Command CH5			N/U	N/U	Command CH4			Word 4
																Word 5
																Word 6
																Word 7

Figure 3-4. Discrete Output Table

17	16	15	14	13	12	11	10	7	6	5	4	3	2	1	0	Octal Bits
N/U	s	p	Command CH3			s	p	Command CH2			s	p	Command CH1			Word 0
Return Data for Channel 1																Word 1
Return Data for Channel 2																Word 2
Return Data for Channel 3																Word 3
N/U	s	p	Command CH6			s	p	Command CH5			s	p	Command CH4			Word 4
Return Data for Channel 4																Word 5
Return Data for Channel 5																Word 6
Return Data for Channel 6																Word 7

Figure 3-5. Discrete Input Table

Legend: N/U = not used; s = status; p = polarity

**Discrete Transfer Command Table**

Parameter	Command		Range	Comments
	Dec	Hex		
Null Command	0	0	—	Returns zero in all data/command fields (including error and polarity bits)
Level	1	1	0-65535	Level/head
Flow	2	2	0-65535	Valid for flow applications only
Main Totalizer Low Word	3	3	0-65535	Valid for flow applications only
Main Totalizer High Word	4	4	0-65535	Valid for flow applications only
A-B Revision Report	5	5	0-255	MSB (1st byte of the word) is Sono II RIO card firmware revision: 0-127 = XNEW-XZZV, 128-255 = NEW-ZZV. LSB (2nd byte of the word) is signal processor type: 0=MVS, 1=Sono series 5000-ITU-SSU, 2=STX, 5=ITX, 10=1000, 11=1020, 7=Sono II, 80=Weigh II
Reserved	6	6		
Status (includes errors)	7	7	0-255	Channel status (errors included) is reported as shown in the Channel Status Table.

*Note:* The Command Number is echoed back in the Discrete Input Table when complete. Polarity and error status are also updated in the Discrete Input Table.

**Channel Status Table (Bit set to 1)**

Bit 17	Bit 16	Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10
—	Engineering unit overflow error	—	COM error	Illegal averaging factor	—	Echo loss	—

Legend: Dec = numbers in decimal form; Hex = numbers in hexadecimal form

# Chapter 4. Setting Up the Interface for Weigh II

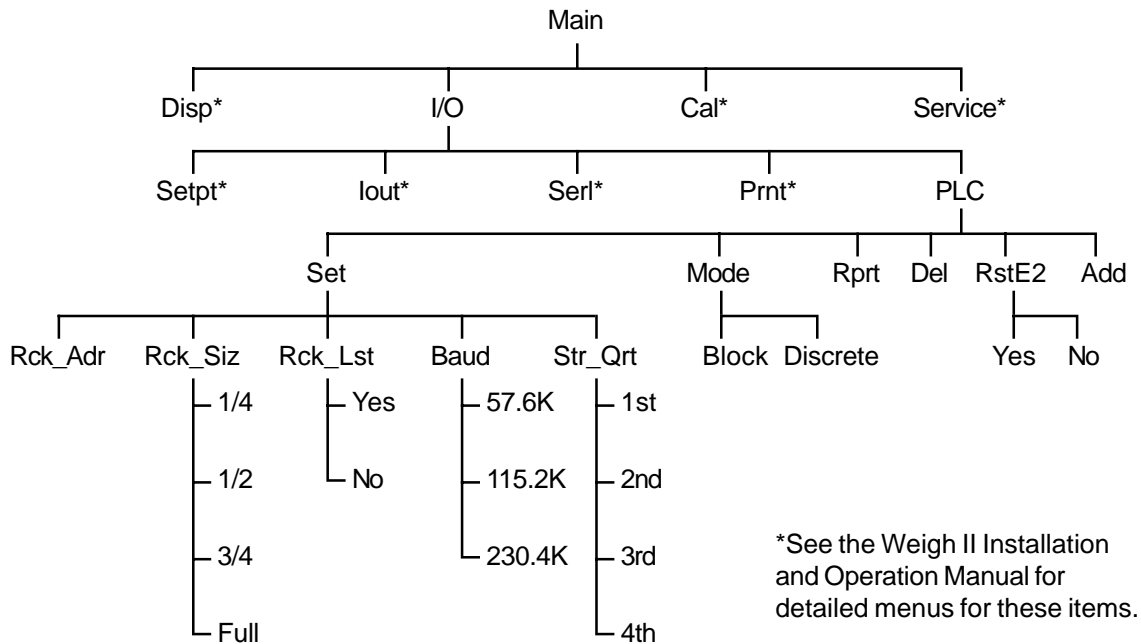


Figure 4-1. Weigh II PLC Menu Tree

## Introduction

The Allen-Bradley Remote I/O Interface for Weigh II provides a connection between the Weigh II and the Allen-Bradley Remote I/O (A-B RIO) network. Once interfaced in the Allen-Bradley network, a programmer can use an Allen-Bradley PLC and ladder logic programming language to read and write data to and from the Weigh II.

### Notes

1. Before adding the A-B RIO Card to the Weigh II (if not pre-installed), turn off the power to the Weigh II. Refer to the *Weigh II Installation and Operation Manual* for details on the location of the Card in the Weigh II.
2. Complete the installation and setup of the Weigh II and sensors before setting up the A-B RIO Card to interface with the PLC. Refer to TI-SP.W2.RIO-01 in Appendix B and to the *Weigh II Installation and Operation Manual*.

3. Before any system changes can take effect, power must be cycled on the Weigh II and then on the PLC.

As shown in Figure 4-1, the *PLC* Menu has six submenus:

- *Set* — sets up the rack address, rack size, last rack, baud rate, and starting quarter
- *Mode* — selects block or discrete transfer of data
- *Rprt* — used to view the A-B RIO channel numbers assigned to the current Weigh II channel
- *Del* — deletes A-B RIO channels previously assigned to the current Weigh II channel
- *RstE2* — resets the nonvolatile EEPROM memory to default parameters
- *Add* — assigns A-B RIO channels to the current Weigh II channel

The remaining sections of this chapter cover the use of these submenus in setting up the A-B RIO interface with the PLC.

## Setting Up the A-B RIO Card for Block or Discrete Transfer Programming

This section describes how to set up the A-B RIO RIO Card for block or discrete transfer programming. For block transfer, the A-B RIO Card has up to 32 channels available and requires  $\frac{1}{4}$  logical rack space. For discrete transfer, the A-B RIO Card has up to six channels available. Figure 4-2 illustrates the discrete transfer rack space requirements. Chapter 5, PLC Programming for Weigh II, contains a detailed description of the two programming modes.

Block or discrete transfer programming mode is selected while in the menu tree for *any* Weigh II channel and applies to *all* of the channels in the system. You must select block or discrete transfer programming mode before you add (assign) A-B RIO channels, as the mode affects the number of available A-B RIO channels.

### Note

Block transfer programming is the default mode. If you are doing initial setup of your system and want to use block transfer, skip this section and proceed to *Setting Up the A-B RIO Card to Interface with the PLC*.

Follow this procedure to select the transfer programming mode. Refer to Figure 4-1 to help navigate through the PLC Menu:

1. If the Weigh II is in Auto Mode (Auto LED illuminated), press the Auto/Man Key to put the system in Manual Mode. The Auto LED turns off.
2. Press the Menu Key to display the *Main* Menu. The display shows:

```

  WII MAIN MENU
  Disp  I/O  Cal →
  F1    F2    F3
  
```

3. Press the F2 Key to access the *I/O* Menu. The display shows:

```

  INPUT/OUTPUT MENU
  Setpt  Iout  SerI →
  F1     F2     F3
  
```

4. Press the Menu Key to display the second page of the menu. The display shows:

```

  INPUT/OUTPUT MENU
  Prnt    PLC →
  F1     F2     F3
  
```

5. Press the F3 Key to access the *PLC* Menu. The display shows:

```

  A-B PLC MENU
  Set    Mode  Rprt →
  F1     F2     F3
  
```

6. Press the F2 key to access the *Mode* Menu. The display shows:

```

  TRANSFER MODE:
  *Block    Discrete
  F1     F2     F3
  
```

An asterisk indicates the current selection.

7. Press the F1 Key for block transfer or the F3 Key for discrete transfer. The display scrolls the following message: *Attention!! The Weigh II system power must now be cycled to activate new menu selection. Also, the PLC must be re-configured. Press any key.*
8. Press any key to stop the message from scrolling and return the display to:

```

  A-B PLC MENU
  Set    Mode  Rprt →
  F1     F2     F3
  
```

### Note

If you have completed setting up the A-B RIO Card:

- Turn Weigh II power off and on to activate your selection of block or discrete transfer, so the appropriate number of channels are available when you add (assign) A-B RIO channels.
- Reconfigure the PLC to match your selection of block or discrete transfer.

It is not necessary to cycle power or reconfigure the PLC now if you have not completed setting up the A-B RIO interface (see next section). You can cycle power and reconfigure once, when you complete setting up all of the parameters in the Weigh II's *PLC* Menu.

9. Press the Esc Key to scroll up the menu tree or press the Auto/Man Key to return to vessel monitoring.

Maximum A-B RIO Channels Available	Rack Space	Table																														
1	1/4	<div style="display: flex; justify-content: space-between; align-items: flex-start;"> <span>17</span> <span>0 Bit (octal)</span> </div> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 33%; height: 15px;"></td> <td style="width: 33%; height: 15px;"></td> <td style="width: 33%; height: 15px;"></td> </tr> <tr> <td colspan="3" style="height: 15px;">Word 0</td> </tr> <tr> <td colspan="3" style="height: 15px;">Word 1</td> </tr> </table>				Word 0			Word 1																							
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Word 1																																
3	1/2	<div style="display: flex; justify-content: space-between; align-items: flex-start;"> <span>17</span> <span>0 Bit (octal)</span> </div> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 33%; height: 15px;"></td> <td style="width: 33%; height: 15px;"></td> <td style="width: 33%; height: 15px;"></td> </tr> <tr> <td colspan="3" style="height: 15px;">Word 0</td> </tr> <tr> <td colspan="3" style="height: 15px;">Word 1</td> </tr> <tr> <td colspan="3" style="height: 15px;">Word 2</td> </tr> <tr> <td colspan="3" style="height: 15px;">Word 3</td> </tr> </table>				Word 0			Word 1			Word 2			Word 3																	
Word 0																																
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4	3/4	<div style="display: flex; justify-content: space-between; align-items: flex-start;"> <span>17</span> <span>0 Bit (octal)</span> </div> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 33%; height: 15px;"></td> <td style="width: 33%; height: 15px;"></td> <td style="width: 33%; height: 15px;"></td> </tr> <tr> <td colspan="3" style="height: 15px;">Word 0</td> </tr> <tr> <td colspan="3" style="height: 15px;">Word 1</td> </tr> <tr> <td colspan="3" style="height: 15px;">Word 2</td> </tr> <tr> <td colspan="3" style="height: 15px;">Word 3</td> </tr> <tr> <td style="width: 33%; height: 15px;"></td> <td style="width: 33%; height: 15px;"></td> <td style="width: 33%; height: 15px;"></td> </tr> <tr> <td colspan="3" style="height: 15px;">Word 4</td> </tr> <tr> <td colspan="3" style="height: 15px;">Word 5</td> </tr> </table>				Word 0			Word 1			Word 2			Word 3						Word 4			Word 5								
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6	Full	<div style="display: flex; justify-content: space-between; align-items: flex-start;"> <span>17</span> <span>0 Bit (octal)</span> </div> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 33%; height: 15px;"></td> <td style="width: 33%; height: 15px;"></td> <td style="width: 33%; height: 15px;"></td> </tr> <tr> <td colspan="3" style="height: 15px;">Word 0</td> </tr> <tr> <td colspan="3" style="height: 15px;">Word 1</td> </tr> <tr> <td colspan="3" style="height: 15px;">Word 2</td> </tr> <tr> <td colspan="3" style="height: 15px;">Word 3</td> </tr> <tr> <td style="width: 33%; height: 15px;"></td> <td style="width: 33%; height: 15px;"></td> <td style="width: 33%; height: 15px;"></td> </tr> <tr> <td colspan="3" style="height: 15px;">Word 4</td> </tr> <tr> <td colspan="3" style="height: 15px;">Word 5</td> </tr> <tr> <td colspan="3" style="height: 15px;">Word 6</td> </tr> <tr> <td colspan="3" style="height: 15px;">Word 7</td> </tr> </table>				Word 0			Word 1			Word 2			Word 3						Word 4			Word 5			Word 6			Word 7		
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Figure 4-2. A-B RIO Discrete Transfer Rack Space Requirements

## Setting Up the A-B RIO Card to Interface with the PLC

The following A-B RIO Card setup parameters are entered in the *Set* Menu (refer to Figure 4-1): rack address (*Rck\_Adr*), rack size (*Rck\_Siz*), last rack (*Rck\_Lst*), baud rate (*Baud*), and starting quarter (*Str\_Qrt*). The setup parameters are selected while in the menu tree for *any* Weigh II channel, and apply to *all* the channels in the system. Table 4-1 shows the default setup parameters.

Parameter	Default Value
<i>Rck_Adr</i>	03 D, 03 H
<i>Rck_Siz</i>	<sup>1</sup> / <sub>4</sub> for block transfer Full for discrete transfer
<i>Rck_Lst</i>	Yes
<i>Baud</i>	57.6K
<i>Str_Qrt</i>	1st

Table 4-1. Setup Default Parameters

Follow this procedure to set up the A-B RIO Card. Refer to Figure 4-1 during setup to help navigate through the *PLC* Menu.

1. If the Weigh II is in Auto Mode (Auto LED illuminated), press the Auto/Man Key to put the system in Manual Mode. The Auto LED turns off.
2. Press the Menu Key to display the *Main* Menu. The display shows:

```

WII MAIN MENU
Disp  I/O  Cal →
F1    F2  F3
    
```

3. Press the F2 Key to access the *I/O* Menu. The display shows:

```

INPUT/OUTPUT MENU
Setpt  Iout  Serl →
F1     F2   F3
    
```

4. Press the Menu Key to display the second page of the menu. The display shows:

```

INPUT/OUTPUT MENU
Prnt           PLC →
F1     F2     F3
    
```

5. Press the F3 Key to access the *PLC* Menu. The display shows:

```

A-B PLC MENU
Set   Mode  Rprt →
F1    F2    F3
    
```

6. Press the F1 Key to access the *Set* Menu. The display shows:

```

CHOOSE PARAMETER
Rck_Adr  Rck_Siz →
F1       F2     F3
    
```

7. Press the F1 Key to set the rack address. The display shows:

```

SET RACK ADDRESS
> XX Dec  YY Hex
F1       F2     F3
    
```

An existing address displays in place of the XXs and YYs.

8. Use the Up or Down Arrow Keys to scroll to a desired address or enter a decimal number directly with the keypad. The hexadecimal number automatically changes to correspond to the decimal number. Press the Enter Key to enter the rack address in memory. The display scrolls the following message: *Attention!! The Weigh II system power must now be cycled to activate new menu selection. Also, the PLC must be re-configured. Press any key.*

### Note

It is not necessary to cycle power and reconfigure the PLC to match your selection until you are done entering all setup parameters. However, the warning message will continue to appear as you enter setup parameters. You can cycle power and reconfigure the PLC once, matching all of the parameters selected in the *PLC* Menu.

9. Press any key to stop the message from scrolling and return the display to:

```

CHOOSE PARAMETER
Rck_Adr  Rck_Siz →
F1       F2     F3
    
```

10. Press the F3 Key to set the rack size. The display shows:

```

CHOOSE RACK SIZE
3/4           * Full →
F1     F2     F3
    
```

An asterisk indicates the current selection.

11. If the displayed menu does not have the desired rack size, press the Menu Key to display the second page of the menu. The display shows:

```

CHOOSE RACK SIZE
1/4           1/2→
F1    F2    F3
    
```

12. Press the F1 or F3 Key to select the desired rack size. The display scrolls the message described in Step 8 and the note following it.
13. Press any key to stop the message from scrolling and return the display to:

```

CHOOSE PARAMETER
Rck_Adr  Rck_Siz→
F1    F2    F3
    
```

14. Press the Menu Key to display the second page of the menu. The display shows:

```

CHOOSE PARAMETER
Rck_Lst   Baud→
F1    F2    F3
    
```

15. Press the F1 Key to indicate if the A-B RIO Card is the last rack with the same address. The display shows:

```

LAST RACK?
Yes*       No
F1    F2    F3
    
```

An asterisk indicates the current selection.

16. Press the F1 Key for Yes or the F3 Key for No. The display scrolls the message described in Step 8 and the note following it.
17. Press any key to stop the message from scrolling and return the display to:

```

CHOOSE PARAMETER
Rck_Lst   Baud→
F1    F2    F3
    
```

18. Press the F3 Key to set up the baud rate. The display shows:

```

CHOOSE DATA RATE
57.6K*    115.2K→
F1    F2    F3
    
```

An asterisk indicates the current selection.

19. If the displayed menu does not have the desired baud rate, press the Menu Key to display the second page of the menu. The display shows:

```

CHOOSE DATA RATE
230.4K    →
F1    F2    F3
    
```

20. Press the F1 or F3 Key to select the desired baud rate. The display scrolls the message described in Step 8 and the note following it.
21. Press any key to stop the message from scrolling and return the display to:

```

CHOOSE PARAMETER
Rck_Lst   Baud→
F1    F2    F3
    
```

22. Press the Menu Key to display the third page of the menu. The display shows:

```

CHOOSE PARAMETER
Str_Qrt   →
F1    F2    F3
    
```

23. Press the F1 Key to select the starting quarter. The display shows:

```

STARTING QUARTER
1st*      2nd →
F1    F2    F3
    
```

An asterisk indicates the current selection.

24. If the displayed menu does not have the desired starting quarter, press the Menu Key to display the second page of the menu. The display shows:

```

STARTING QUARTER
3rd       4th→
F1    F2    F3
    
```

25. Press the F1 or F3 Key to select the desired starting quarter. The display scrolls the message described in Step 8 and the note following it.
26. Press any key to stop the message from scrolling and return the display to:

```

CHOOSE PARAMETER
Str_Qrt   →
F1    F2    F3
    
```

27. Press the Esc Key to scroll up the menu tree or press the Auto/Man Key to return to Weigh II vessel monitoring.

**Note**

Turn the Weigh II power off and on and reconfigure the PLC to match the Weigh II parameters you entered.

## Adding and Deleting A-B RIO Channels

The *Add* Function is used to add (assign) A-B RIO channels to a Weigh II channel (vessel monitoring or math channel). Note that an A-B RIO channel **MUST BE ADDED** for the PLC to communicate with the corresponding Weigh II channel. Up to two A-B RIO channels can be assigned per Weigh II channel and up to a total of six channels for discrete transfer and 32 channels for block transfer. It is not necessary to assign the A-B RIO channels sequentially to the Weigh II channels.

The *Delete* Function allows previously added A-B RIO channels to be removed.

### Note

Select the mode of transfer programming (block or discrete) before adding channels, as the mode affects the number of A-B RIO channels available.

Follow this procedure to add or delete A-B RIO channels. Refer to Figure 4-1 to help navigate through the *PLC* Menu.

1. If the Weigh II is in Auto Mode (Auto LED illuminated), press the Auto/Man Key to put the system in Manual Mode. The Auto LED turns off.
2. Use the Up and Down Arrow Keys to scroll the display to the Weigh II channel for which you want to add or delete the A-B RIO channel(s).
3. Press the Menu Key to display the *Main* Menu. The display shows:

```

WII MAIN MENU
Disp  I/O  Cal →
F1    F2    F3
  
```

4. Press the F2 Key to access the *I/O* Menu. The display shows:

```

INPUT/OUTPUT MENU
Setpt  Iout  Ser1 →
F1     F2     F3
  
```

5. Press the Menu Key to display the second page of the menu. The display shows:

```

INPUT/OUTPUT MENU
Pmnt           PLC →
F1     F2     F3
  
```

6. Press the F3 Key to access the *PLC* Menu. The display shows:

```

A-B PLC MENUS
Set    Mode  Rprt →
F1     F2     F3
  
```

7. Press the Menu Key to access the second page of the menu. The display shows:

```

A-B PLC MENUS
Del    RstE2  Add →
F1     F2     F3
  
```

To add A-B RIO channels, continue with Step 8. To delete A-B RIO channels, skip Steps 8 through 11 and continue with Step 12.

8. Press the F3 Key to add a channel. The display shows the channel number of the first available A-B RIO channel:

```

ADD A-B CHANNEL
Channel X
F1     F2     F3
  
```

9. Press the Up and Down Arrow Keys to cycle through the available A-B RIO channels until the one you want is displayed. Press the Enter Key to add the channel. The display flashes a message acknowledging your selection and returns to:

```

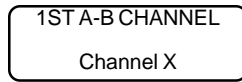
A-B PLC MENUS
Del    RstE2  Add →
F1     F2     F3
  
```

10. Repeat Steps 8 and 9 to add an additional A-B RIO channel to this Weigh II channel if available and desired (up to two A-B RIO channels per Weigh II channel).
11. Press the Esc Key go up through the menu tree or the Auto/Man Key to return the display to vessel monitoring.

### Note

A maximum of six A-B RIO channels (discrete mode) or 32 A-B RIO channels (block mode) can be assigned to each Weigh II. To assign additional A-B RIO channels to other channels in the Weigh II, return to vessel monitoring, scroll to a different Weigh II channel using the Up and Down Arrow Keys, and repeat Steps 1 through 11.

- The remaining steps in this procedure deal with deleting an A-B RIO channel, if desired. Press the F1 Key to delete an A-B RIO channel. The display looks like this:



F1 F2 F3

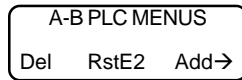
The channel number of the first available A-B RIO channel displays instead of the 'X.'

- Press the Up and Down Arrow Keys to cycle through the assigned A-B RIO channels until the one you want is displayed. Press the Enter Key to delete the channel. The display shows:



F1 F2 F3

- Press the F1 Key to delete the channel. The display flashes a message acknowledging your selection and returns to:



F1 F2 F3

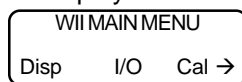
- Follow Steps 12 through 14 to delete another channel, press the Esc Key to scroll up the menu tree, or press the Auto/Man Key to return the display to vessel monitoring.

## Resetting the A-B RIO Card to Default Parameters

The A-B RIO Card default setup parameters are listed in Table 4-1. If you want to reset the parameters to the default values, use the *RstE2* function.

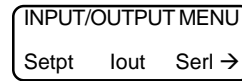
Follow this procedure to reset to default parameters. Refer to Figure 4-1 to help navigate through the *PLC* Menu.

- If the Weigh II is in Auto Mode (Auto LED illuminated), press the Auto/Man Key to put the system in Manual Mode. The Auto LED turns off.
- Press the Menu Key to display the *Main* Menu. The display shows:



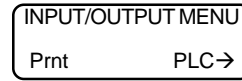
F1 F2 F3

- Press the F2 Key to access the *I/O* Menu. The display shows:



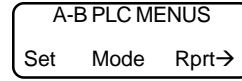
F1 F2 F3

- Press the Menu Key to display the second page of the menu. The display shows:



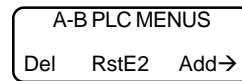
F1 F2 F3

- Press the F3 Key to access the *PLC* Menu. The display shows:



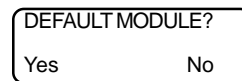
F1 F2 F3

- Press the Menu Key to display the second page of the menu. The display shows:



F1 F2 F3

- Press the F2 Key to access the *RstE2* Menu. The display prompts you to enter the Service Code (if you have not already entered it while in the Manual Mode in the menu tree). Then, the display shows:

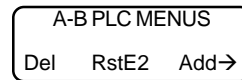


F1 F2 F3

- Press the F1 Key to select *Yes*. The parameters are automatically defaulted and the display scrolls the following message:

*Attention!! The Weigh II system power must now be cycled to activate new menu selection. Also, the PLC must be re-configured.*

- Press any key to stop the message from scrolling and return the display to:



F1 F2 F3

- Press the Esc Key to back up through the menu tree or press the Auto/Man Key to return to vessel monitoring.

### Note

Turn the Weigh II power off and on and reconfigure the PLC to match the Weigh II parameters you defaulted to.

## Channel Report

The Weigh II allows you to view the A-B RIO channel numbers of the channels assigned to the current Weigh II channel. Follow this procedure:

1. If the Weigh II is in Auto Mode (Auto LED illuminated), press the Auto/Man Key to put the system in Manual Mode. The Auto LED turns off.
2. Use the Up and Down Arrow Keys to scroll the display to the Weigh II channel for which you want to view the channel report.
3. Press the Menu Key to display the *Main* Menu. The display shows:

```

WII MAIN MENU
Disp  I/O  Cal →
F1    F2    F3
    
```

4. Press the F2 Key to access the *I/O* Menu. The display shows:

```

INPUT/OUTPUT MENU
Setpt  Iout Serl →
F1    F2    F3
    
```

5. Press the Menu Key to display the second page of the menu. The display shows:

```

INPUT/OUTPUT MENU
Prnt          PLC →
F1    F2    F3
    
```

6. Press the F3 Key to access the *PLC* Menu. The display shows:

```

A-B PLC MENUS
Set  Mode  Rprt →
F1    F2    F3
    
```

7. Press the F3 Key to access the *Rprt* Menu. The display shows:

```

1ST A-B CHANNEL
Channel X
F1    F2    F3
    
```

In place of 'X' is the first assigned A-B RIO channel number for the current Weigh II channel.

8. Press the Up or Down Arrow to view the second A-B channel (if assigned).

9. Press the Esc Key to return the display to:

```

A-B PLC MENUS
Set  Mode  Rprt →
F1    F2    F3
    
```

10. Press the Esc Key to scroll up the menu tree or press the Auto/Man Key to return to vessel monitoring.
11. Repeat Steps 1 through 10 as required to view the A-B RIO channel numbers assigned to other Weigh II channels.

# Chapter 5. PLC Programming for Weigh II

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## Introduction

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The information contained in this chapter documents Kistler-Morse's program commands for interfacing with Allen-Bradley's PLC network. This material is written for users who are competent with Allen-Bradley's PLC programming. We assume that you have Allen-Bradley PLC programming documentation available for reference.

### Note

For installation, setup, and calibration of the Weigh II, refer to the *Weigh II Installation and Operation Manual*.

The Kistler-Morse A-B RIO Card provides an interface for Weigh II systems into the Allen-Bradley I/O network. Kistler-Morse A-B RIO Card supports block or discrete transfer capability. The material in this chapter is organized into two major parts:

- Block transfer commands
- Discrete transfer commands

For block transfer, the A-B RIO Card memory is set up as 64 words, 16 bits per word (refer to Figure 5-1A). Two words are allocated for each A-B RIO Card channel (refer to Figures 5-2 and 5-3). This gives a capacity of 32 channels for each A-B RIO Card. Two A-B RIO Card channels can be assigned to each Weigh II channel (vessel channel or math channel).

Discrete transfer has eight words, 16 bits per word (refer to Figure 5-1B). Two words are for commands, giving a capacity of six channels for each A-B RIO Card.

The procedure describing how to select block or discrete transfer programming is in Chapter 4, Setting Up the Interface for Weigh II.

---



---

## A-B RIO Block Transfer Commands

---



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This section describes the table structures, commands, and channel status reports for

block transfer. Follow the procedure in Chapter 4, Setting Up the Interface for Weigh II, to set the A-B RIO Card for block transfer programming.

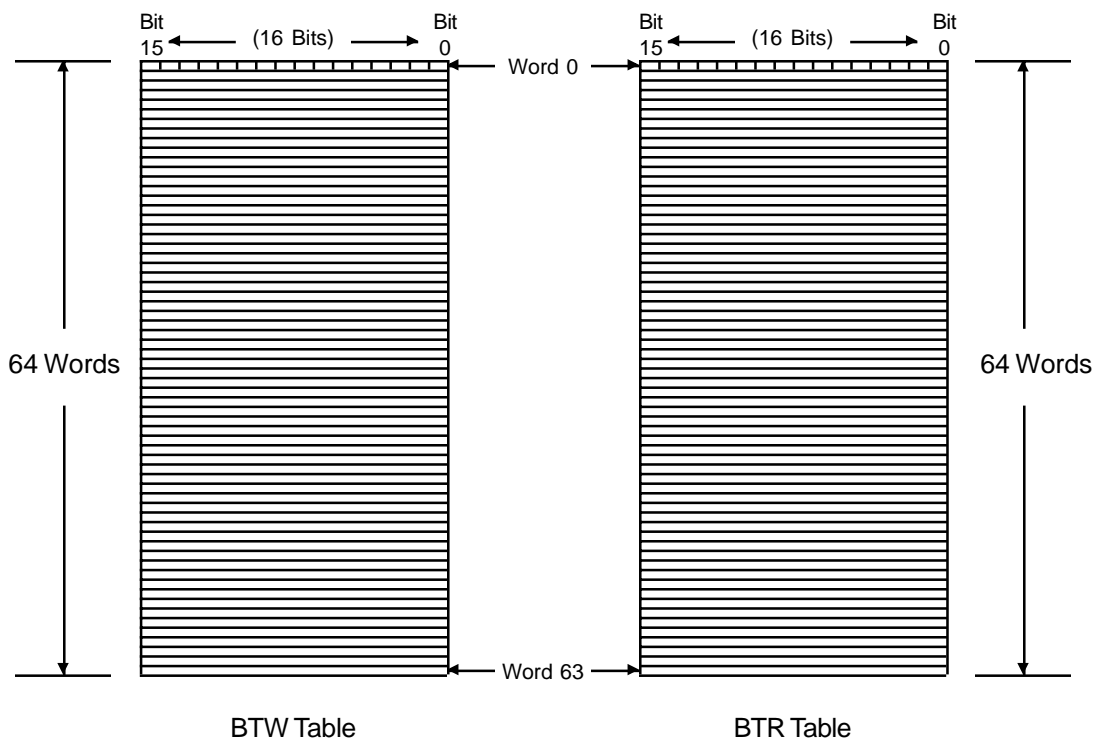
The PLC processor transfers data to and from the A-B RIO Card using BTW (Block Transfer Write) and BTR (Block Transfer Read) instructions in your ladder logic program.

The data obtained from the A-B RIO Card using BTR is set up by instructions sent by BTW commands. Figure 5-2 shows the BTW bit/word configuration. The first word of each channel is the data word. Data is placed here if the command is to send data from the PLC to the Weigh II. The second word of each channel is the command word, which may include subcommands and additional data (if the data could not fit within the 16 bits of the first word). Bit 15 of the command word is called the Write Bit. Bit 15 is set to '1' when the command is to send data from the PLC to the Weigh II. Bit 15 is set to '0' when the command is to send data from the Weigh II to the PLC. After the BTW instruction has been completed, a BTR instruction is used.

Figure 5-3 shows the BTR bit/word configuration. The first word of each channel is the data word. Data is placed here if the command in the BTW table is to send data from the Weigh II to the PLC. The second word of each channel is the command word. The command used in the BTW is echoed here to confirm the command has been processed. Bit 14 of the command word is the polarity bit ('0' = +, '1' = -). Bit 15 of the command word is the error bit. If bit 15 is set to '1,' use the Status Command ('7') to determine the error source. If the error condition is cleared, Bit 15 is reset to '0.'

The Quick Command Reference Table lists all of the commands, parameters, and value ranges needed to program the PLC to interface with the Weigh II. The tables that follow the Quick Command Reference Table are the individual BTW and BTR tables for each command.

**Figure 5-1A: Block Transfer**



**Figure 5-1B: Discrete Transfer**

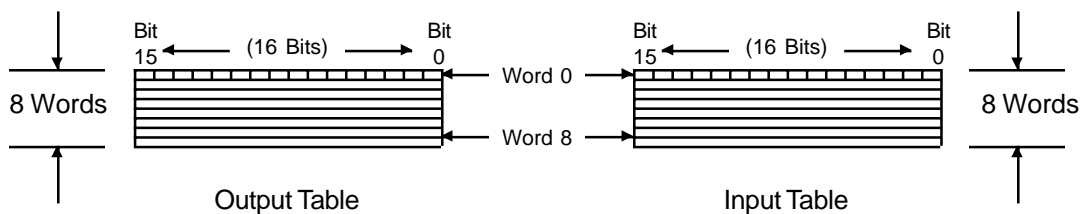
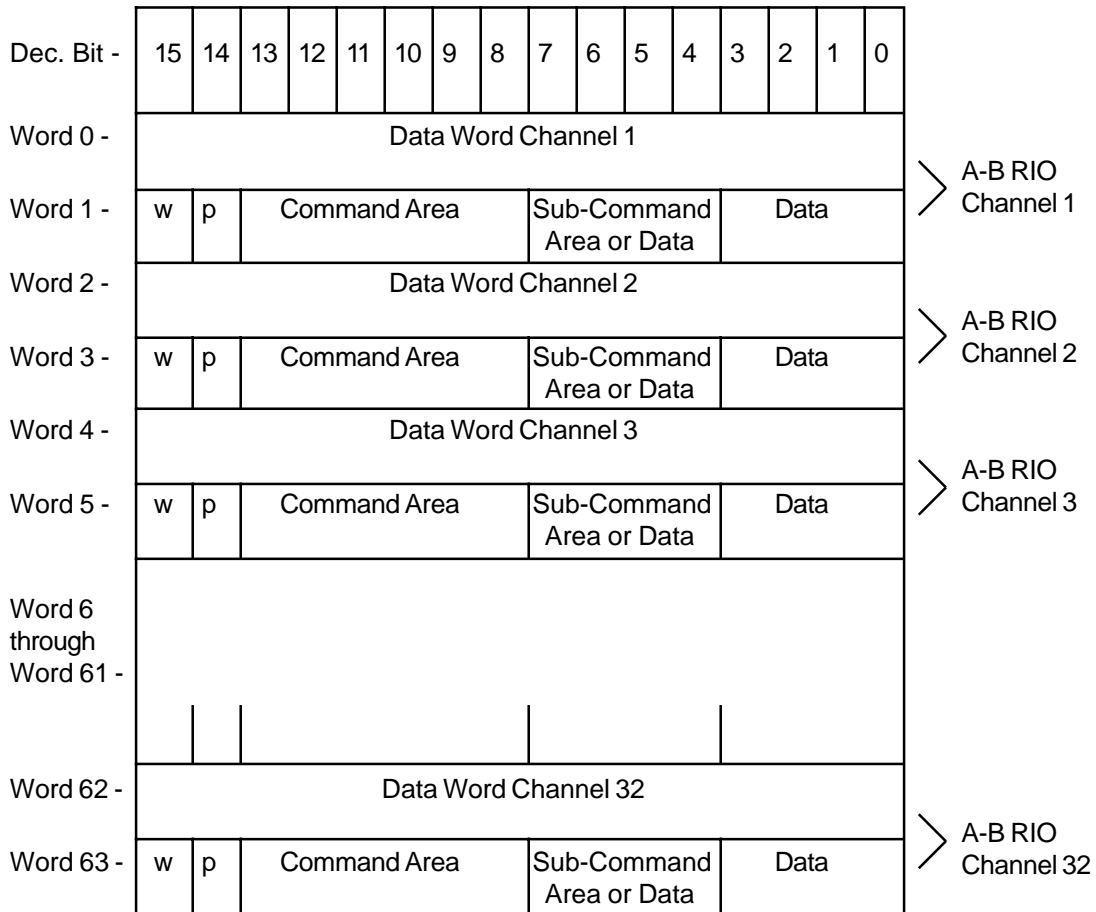


Figure 5-1. Illustration of Allen-Bradley and A-B RIO Card Memory Registers

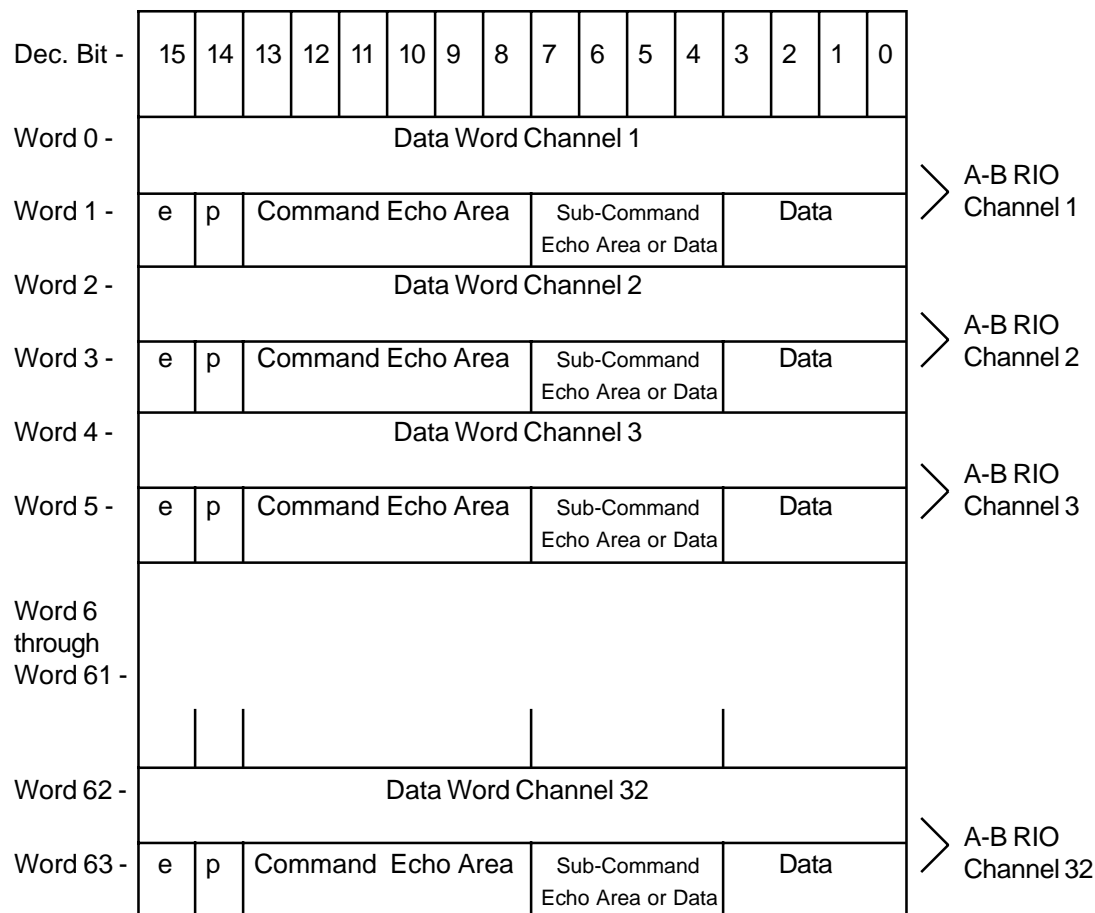


### Block Transfer Write Table

*Notes:*

1. Two words are used per A-B RIO channel. The first word is called the Data Word and the second word is called the Command Word.
2. Description of the Command Word:
  - Bits 0-7 is the data area. This area is used when 21 bit data is to be sent/received. Data Bits 0-15 are in the Data Word in the first word for the channel and the remaining data, bits 16-20, are in this area.
  - Bits 4-7 is the Sub-Command Area. This area is used (when not being used for 21 bit data) to point to specific setpoints, current outputs, or entries in the linearization table for the Weigh II channel.
  - Bits 8-13 is the Command Area.
  - Bit 14 is the Polarity bit (p): '0' = +, '1' = -
  - Bit 15 is the Write bit (w). Set this bit to '1' when sending data from the PLC to the Weigh II. Set this bit to '0' when requesting that data be sent from the Weigh II to the PLC.

Figure 5-2. Basic Bit/Byte Word Configuration for Block Transfer Write Table



**Block Transfer Read Table**

*Notes:*

1. Two words are used per A-B RIO channel. The first word is called the Data Word and the second word is called the Command Word.
2. Description of the Command Word:
  - Bits 0-7 is the data area. This area is used when 21 bit data is to be sent/received. Data Bits 0-15 are in the Data Word in the first word for the channel and the remaining data, bits 16-20, are in this area.
  - Bits 4-7 is the Sub-Command Echo Area. This area is used (when not being used for 21 bit data) to point to specific setpoints, current outputs, or entries in the linearization table for the Weigh II channel.
  - Bits 8-13 is the Command Echo Area.
  - Bit 14 is the Polarity bit (p): '0' = +, '1' = -
  - Bit 15 is the Error bit (e).

*Figure 5-3. Basic Bit/Byte Word Configuration for Block Transfer Read Table*

## Quick Command Reference Table for A-B RIO Card

System Parameters	Command Dec	Hex	Range	Comments	Page No.
Null Command	0	0	—	Returns zero in all data/command fields	5-7
A-B Device & Revision Report	5	5	0-255	MSB A-B RIO firmware revision: 0-127=XNEW-XZZV, 128-255=NEW-ZZV. LSB Signal processor type: 0=MVS, 1=Sono 5000 series-ITU-SSU, 2=STX, 5=ITX, 10=1000, 11=1020, 7=Sono II, 80 = Weigh II	5-7

Weigh II Parameters	Command Dec	Hex	Range	Comments	Page No.
Gross Weight	1	1	0-999999	Value in selected engineering units	5-8
Net Weight	2	2	0-±999999	Value in selected engineering units	5-8
Tare	6	6	—		5-8
Status (includes errors)	7	7	0-255		5-9
Zero Cal (Auto)	8	8	0-999999	Value in selected engineering units	5-9
Lo Span Cal (Auto)	9	9	0-999999	Value in selected engineering units	5-9
Hi Span Cal (Auto)	10	A	0-999999	Value in selected engineering units	5-10
Scale Factor Weight (Manual)	11	B	0-999999	Value in selected engineering units	5-10
Scale Factor Cnts (Manual)	12	C	0-2097151		5-10
Zero Counts (Manual)	13	D	0-2097151		5-11
Excitation	14	E	0-255		5-11
Averaging Factor	16	10	1-255		5-11
Raw Input Counts	30	1E	0-2097151	For linearization table. Bits 5, 6, & 7 of Command Word is Linear Table Entry Number: 0=1st, 1=2nd, 2=3rd, 3=4th, 4=5th	5-12
Corrected Output Counts	31	1F	0-2097151	For linearization table. Bits 5, 6, & 7 of Command Word is Linear Table Entry Number: 0=1st, 1=2nd, 2=3rd, 3=4th, 4=5th	5-12
Linearization Enable	32	20	0-1	0=linearization off, 1=linearization on	5-12
Raw A/D Counts	33	21	0-2097151		5-13
Application Type	39	27	0-99	0=weight device, 99=math channel	5-13

Legend: Dec = numbers in decimal form; Hex = numbers in hexadecimal form

## **Block Transfer Command Format Notes**

Three types of commands are used when interfacing between the PLC and the Weigh II:

1. **Read only** commands are used to read a calculated parameter, such as a gross weight or net weight. This type of command is **always** used to send data from the **Weigh II to the PLC**. The BTW and BTR tables for these commands reflect that the data can only go from the Weigh II to the PLC. These commands are identified as “read only” in the Block Transfer Commands that follow.
2. **Set only** commands are used to set a parameter, such as a command to tare a channel. This type of command is **always** used to send data from the **PLC to the Weigh II**. The BTW and BTR tables for these commands reflect that the data can only go from the PLC to the Weigh II. These commands are identified as “set only” in the Block Transfer Commands that follow.
3. **Read or Set** commands are used to read a parameter value **or** set a parameter value, such as a command for Lo Span Calibration. This type of command can be used to send data from the Weigh II to the PLC or from the PLC to the Weigh II. Note that the BTW and BTR tables for these commands in the Block Transfer Commands that follow are written for the case where the data is being sent from the Weigh II to the PLC. However, these commands can be used to set parameters as well.

## Block Transfer Commands: A-B RIO Card

### Null Command (read only)

Dec: 0 Hex: 0 Range: 0

BTW Table

Dec. Bit -	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 0 -	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Word 1 -	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Data Word  
Command Word

BTR Table

Dec. Bit -	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 0 -	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Word 1 -	e	p	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Data Word  
Command Word

### A-B Device and Revision Report (read only)

Dec: 5 Hex: 5 Range: 0-255 MSB, 0-255 LSB

BTW Table

Dec. Bit -	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 0 -	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Word 1 -	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0

Data Word  
Command Word

BTR Table

Dec. Bit -	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 0 -	d	d	d	d	d	d	d	d	d	d	d	d	d	d	d	d
Word 1 -	e	p	0	0	0	1	0	1	0	0	0	0	0	0	0	0

Data Word  
Command Word

*Notes:* MSB A-B RIO firmware revision: 0-127=XNEW-XZZV, 128-255=NEW-ZZV.

LSB Signal processor type: 0=MVS, 1=Sono 5000 series-ITU-SSU, 2=STX, 5=ITX, 10=1000, 11=1020, 7=Sono II, 80 = Weigh II

## Block Transfer Commands: A-B RIO Card

### Gross Weight (read only)

Dec: 1 Hex: 1 Range: 0-999999

**BTW Table**

Dec. Bit -	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 0 -	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Word 1 -	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0

Data Word  
Command Word

**BTR Table**

Dec. Bit -	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 0 -	d	d	d	d	d	d	d	d	d	d	d	d	d	d	d	d
Word 1 -	e	p	0	0	0	0	0	1	0	0	0	0	d	d	d	d

Data Word  
Command Word

### Net Weight (read only)

Dec: 2 Hex: 2 Range: 0-±999999

**BTW Table**

Dec. Bit -	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 0 -	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Word 1 -	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0

Data Word  
Command Word

**BTR Table**

Dec. Bit -	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 0 -	d	d	d	d	d	d	d	d	d	d	d	d	d	d	d	d
Word 1 -	e	p	0	0	0	0	1	0	0	0	0	0	d	d	d	d

Data Word  
Command Word

### Tare (set only)

Dec: 6 Hex: 6 Range: N/A

**BTW Table**

Dec. Bit -	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 0 -	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Word 1 -	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0

Data Word  
Command Word

**BTR Table**

Dec. Bit -	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 0 -	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Word 1 -	e	p	0	0	0	1	1	0	0	0	0	0	0	0	0	0

Data Word  
Command Word

Note: To set tare, set bit 0 of Data Word to 1 and use the Write bit.

## Block Transfer Commands: A-B RIO Card

### Status (read only)

Dec: 7 Hex: 7 Range: 0-255

BTW Table

Dec. Bit -	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 0 -	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Word 1 -	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0

Data Word  
Command Word

BTR Table

Dec. Bit -	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 0 -	d	d	d	d	d	d	d	d	0	0	0	0	0	0	0	0
Word 1 -	e	p	0	0	0	1	1	1	0	0	0	0	0	0	0	0

Data Word  
Command Word

Notes: Description of status (bits 8-15 of data word)

Bit 8 -Net units negative

Bit 9 - N/A

Bit 10 - During Auto Cal "Warning: Move More Material"

Bit 11 - During Auto Cal: "Ambiguous Error"

lo\_cnt&gt;hi\_cnt. Other: Illegal average factor

Bit 12 - COM error condition

Bit 13 - Analog input overrange

Bit 14 - Engineering unit overflow

Bit 15 - Gross units negative

### Zero Cal (Auto Calibration)

Dec: 8 Hex: 8 Range: 0-999999

BTW Table

Dec. Bit -	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 0 -	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Word 1 -	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0

Data Word  
Command Word

BTR Table

Dec. Bit -	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 0 -	d	d	d	d	d	d	d	d	d	d	d	d	d	d	d	d
Word 1 -	e	p	0	0	1	0	0	0	0	0	0	0	d	d	d	d

Data Word  
Command Word

Note: You must move material when performing Auto Cal. See Weigh II Installation and Operation Manual.

### Lo Span Cal (Auto Calibration)

Dec: 9 Hex: 9 Range: 0-999999

BTW Table

Dec. Bit -	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 0 -	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Word 1 -	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0

Data Word  
Command Word

BTR Table

Dec. Bit -	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 0 -	d	d	d	d	d	d	d	d	d	d	d	d	d	d	d	d
Word 1 -	e	p	0	0	1	0	0	1	0	0	0	0	d	d	d	d

Data Word  
Command Word

Note: You must move material when performing Auto Cal. See Weigh II Installation and Operation Manual.

Legend: Dec = # in decimal form; Hex = # in hexadecimal form; e = error; p = polarity; ddd... = data; D... = subcommand

## Block Transfer Commands: A-B RIO Card

### Hi Span Cal (Auto Calibration)

Dec: 10 Hex: A Range: 0-999999

**BTW Table**

Dec. Bit -	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 0 -	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Word 1 -	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0

Data Word  
Command Word

**BTR Table**

Dec. Bit -	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 0 -	d	d	d	d	d	d	d	d	d	d	d	d	d	d	d	d
Word 1 -	e	p	0	0	1	0	1	0	0	0	0	0	d	d	d	d

Data Word  
Command Word

Note: You must move material when performing Auto Cal. See Weigh II Installation and Operation Manual.

### Scale Factor Weight (Manual Calibration)

Dec: 11 Hex: B Range: 0-999999

**BTW Table**

Dec. Bit -	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 0 -	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Word 1 -	0	0	0	0	1	0	1	1	0	0	0	0	0	0	0	0

Data Word  
Command Word

**BTR Table**

Dec. Bit -	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 0 -	d	d	d	d	d	d	d	d	d	d	d	d	d	d	d	d
Word 1 -	e	p	0	0	1	0	1	1	0	0	0	0	d	d	d	d

Data Word  
Command Word

### Scale Factor Counts (Manual Calibration)

Dec: 12 Hex: C Range: 0-2097151

**BTW Table**

Dec. Bit -	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 0 -	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Word 1 -	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0

Data Word  
Command Word

**BTR Table**

Dec. Bit -	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 0 -	d	d	d	d	d	d	d	d	d	d	d	d	d	d	d	d
Word 1 -	e	p	0	0	1	1	0	0	0	0	0	d	d	d	d	d

Data Word  
Command Word

Legend: Dec = # in decimal form; Hex =# in hexadecimal form; e = error; p = polarity; ddd... = data; D... = subcommand

## Block Transfer Commands: A-B RIO Card

### Zero Counts (Manual Calibration)

Dec: 13 Hex: D Range: 0-2097151

BTW Table

Dec. Bit -	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 0 -	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Word 1 -	0	0	0	0	1	1	0	1	0	0	0	0	0	0	0	0

Data Word  
Command Word

BTR Table

Dec. Bit -	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 0 -	d	d	d	d	d	d	d	d	d	d	d	d	d	d	d	d
Word 1 -	e	p	0	0	1	1	0	1	0	0	0	d	d	d	d	d

Data Word  
Command Word

### Excitation

Dec: 14 Hex: E Range: 0-255

BTW Table

Dec. Bit -	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 0 -	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Word 1 -	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0

Data Word  
Command Word

BTR Table

Dec. Bit -	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 0 -	0	0	0	0	0	0	0	0	d	d	d	d	d	d	d	d
Word 1 -	e	p	0	0	1	1	1	0	0	0	0	0	0	0	0	0

Data Word  
Command Word

### Averaging Factor

Dec: 16 Hex: 10 Range: 1-255

BTW Table

Dec. Bit -	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 0 -	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Word 1 -	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0

Data Word  
Command Word

BTR Table

Dec. Bit -	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 0 -	0	0	0	0	0	0	0	0	d	d	d	d	d	d	d	d
Word 1 -	e	p	0	1	0	0	0	0	0	0	0	0	0	0	0	0

Data Word  
Command Word

Legend: Dec = # in decimal form; Hex = # in hexadecimal form; e = error; p = polarity; ddd... = data; D... = subcommand

## Block Transfer Commands: A-B RIO Card

### Raw Input Counts (Linearization Table)

Dec: 30 Hex: 1E Range: 0-2097151

BTW Table

Dec. Bit -	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 0 -	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Word 1 -	0	0	0	1	1	1	1	0	D	D	D	0	0	0	0	0

Data Word  
Command Word

BTR Table

Dec. Bit -	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 0 -	d	d	d	d	d	d	d	d	d	d	d	d	d	d	d	d
Word 1 -	e	p	0	1	1	1	1	0	0	0	0	d	d	d	d	d

Data Word  
Command Word

Note: Bits 5, 6, & 7 of Command Word is Linear Table Entry Number (0=1st, 1=2nd, 2=3rd, 3=4th, 4=5th)

### Corrected Output Counts (Linearization Table)

Dec: 31 Hex: 1F Range: 0-2097151

BTW Table

Dec. Bit -	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 0 -	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Word 1 -	0	0	0	1	1	1	1	1	D	D	D	0	0	0	0	0

Data Word  
Command Word

BTR Table

Dec. Bit -	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 0 -	d	d	d	d	d	d	d	d	d	d	d	d	d	d	d	d
Word 1 -	e	p	0	1	1	1	1	1	0	0	0	d	d	d	d	d

Data Word  
Command Word

Note: Bits 5, 6, & 7 of Command Word is Linear Table Entry Number (0=1st, 1=2nd, 2=3rd, 3=4th, 4=5th)

### Linearization Enable

Dec: 32 Hex: 20 Range: 0-1

BTW Table

Dec. Bit -	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 0 -	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Word 1 -	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0

Data Word  
Command Word

BTR Table

Dec. Bit -	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 0 -	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	d
Word 1 -	e	p	1	0	0	0	0	0	0	0	0	0	0	0	0	0

Data Word  
Command Word

Note: 0 = linearization off, 1 = linearization on

Legend: Dec = # in decimal form; Hex = # in hexadecimal form; e = error; p = polarity; ddd... = data; D... = subcommand

## Block Transfer Commands: A-B RIO Card

### Raw A/D Counts (read only)

Dec: 33 Hex: 21 Range: 0-2097151

BTW Table

Dec. Bit -	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 0 -	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Word 1 -	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0

Data Word  
Command Word

BTR Table

Dec. Bit -	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 0 -	d	d	d	d	d	d	d	d	d	d	d	d	d	d	d	d
Word 1 -	e	p	1	0	0	0	0	1	0	0	0	d	d	d	d	d

Data Word  
Command Word

### Application Type (read only)

Dec: 39 Hex: 27 Range: 0-99

BTW Table

Dec. Bit -	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 0 -	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Word 1 -	0	0	1	0	0	1	1	1	0	0	0	0	0	0	0	0

Data Word  
Command Word

BTR Table

Dec. Bit -	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 0 -	0	0	0	0	0	0	0	0	0	d	d	d	d	d	d	d
Word 1 -	e	p	1	0	0	1	1	1	0	0	0	0	0	0	0	0

Data Word  
Command Word

Note: 0 = weight device, 99 = math channel

## A-B RIO Discrete Transfer Commands

This section describes the table structures, commands, and channel status reports for discrete transfer. Follow the procedure in Chapter 4, Setting Up the Interface for Weigh II, to set the A-B RIO Card for discrete transfer programming.

The A-B RIO Card supports six channels using eight words of data. Those words are structured as shown in Figures 5-4 and 5-5.

The command word (Word 0 and Word 4 in Figure 5-4) supports three channels. Bit 17 is

not used. The desired command from the Discrete Transfer Command Table is entered in the first three bits of each channel in the Output Table. The first three bits of each channel in the Input Table echo the command. Bits 3, 10, and 15 indicate polarity (0 = '+', 1 = '-') and bits 4, 11, and 16 indicate status. If a status bit contains '1,' status/error information can be found using Command 7.

Parameters, commands, and value ranges for discrete transfer are listed in the Discrete Transfer Command Table. Channel status is given in the Channel Status Table. Use this information when entering commands in the Discrete Output Table and reading the requested information in the Discrete Input Table.

17	16	15	14	13	12	11	10	7	6	5	4	3	2	1	0	Octal Bits
N/U	N/U	N/U	Command CH3			N/U	N/U	Command CH2			N/U	N/U	Command CH1			Word 0
																Word 1
																Word 2
																Word 3
N/U	N/U	N/U	Command CH6			N/U	N/U	Command CH5			N/U	N/U	Command CH4			Word 4
																Word 5
																Word 6
																Word 7

Figure 5-4. Discrete Output Table

17	16	15	14	13	12	11	10	7	6	5	4	3	2	1	0	Octal Bits
N/U	s	p	Command CH3			s	p	Command CH2			s	p	Command CH1			Word 0
Return Data for Channel 1																Word 1
Return Data for Channel 2																Word 2
Return Data for Channel 3																Word 3
N/U	s	p	Command CH6			s	p	Command CH5			s	p	Command CH4			Word 4
Return Data for Channel 4																Word 5
Return Data for Channel 5																Word 6
Return Data for Channel 6																Word 7

Figure 5-5. Discrete Input Table

Legend: N/U = not used; s = status; p = polarity

Discrete Transfer Command Table

Parameter	Command		Range	Comments
	Dec	Hex		
Null Command	0	0	—	Returns zero in all data/command fields (including error and polarity bits)
Gross Weight	1	1	0-999999	
Net Weight	2	2	0-±999999	
Reserved	3	3		
Reserved	4	4		
A-B Revision Report	5	5	0-255	MSB (1st byte of the word) is Weigh II RIO card firmware revision: 0-127 (XNEW-XZZV), 128-255 (NEW-ZZV). LSB (2nd byte of the word) is signal processor type: 0=MVS, 1=Sono 5000 series-ITU-SSU, 2=STX, 5=ITX, 10=1000, 11=1020, 7=Sono II, 80=Weigh II
Tare	6	6		Weigh II channel is tared
Status (includes errors)	7	7	0-255	Channel status (errors included) is reported as shown in the Channel Status Table.

*Note:* The Command Number is echoed back in the Discrete Input Table when complete. Polarity and error status are also updated in the Discrete Input Table.

Channel Status Table (Bit set to 1)

Bit 17	Bit 16	Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10
Gross units negative	Engineering unit overflow error	Analog input overranging A/D converter	COM error	—	—	—	Net units negative

Legend: Dec = numbers in decimal form; Hex = numbers in hexadecimal form



# Appendix A. Kistler-Morse Service and Warranty

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## Product Warranty

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A complete, unabridged copy of our product warranty is available upon request from Kistler-Morse. A summary of the warranty, *subject to the terms and conditions listed fully in the warranty*, follows:

Kistler-Morse warrants equipment of its own manufacture to be free from defects in material and workmanship for one year from date of shipment to original user. Kistler-Morse will replace or repair, at our option, any part found to be defective. Buyer must return any part claimed defective to Kistler-Morse, transportation prepaid.

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## Service

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Kistler-Morse maintains a fully trained staff of field service personnel who are capable of providing you with complete product assistance. Our field service staff is based in Bothell, Washington USA (corporate headquarters); Antwerp, Belgium (European office); and Singapore (Asian/Pacific Rim office).

### Phone Consultation

Our Field Service staff provides the following services by telephone, via our regular and toll free number (toll free in USA and Canada only), *at no charge*:

- Technical, application, and troubleshooting assistance
- Spare parts assistance
- Warranty (replacement) assistance

### On-Site Consultation

Kistler-Morse's Field Service staff can provide additional services at your request. Contact Kistler-Morse at the closest office for rate and scheduling information for the following services:

- Technical, application, startup, and troubleshooting assistance on-site
- Training on-site or at our corporate office
- Service calls
- Equipment updates to our latest configuration

General descriptions of some of these standard services follow. Of course, if your service needs vary from those described, we are available to discuss them with you.

### Installation, Startup Assistance, and On-Site Training

#### Notes

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1. For vessels to be instrumented with Microcells, L-Cells, or Sonocells, the customer may contract to have Kistler-Morse install the sensors/transducers. For all other types of sensors and transducers, installation must be performed by the customer.
  2. Field wiring, conduit installation, junction box mounting, and signal processor mounting must be performed by the customer. The AC power must be connected to the signal processor, but not energized, prior to Kistler-Morse beginning work.
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All field wiring will be checked for errors. The system will be powered up and checked out for proper electrical operation. Calibration will be performed if possible. If it is not possible to calibrate, a pre-calibration will be performed. Recommendations for the optimum performance of the system will be provided.

On-site training will include simulation of the calibration process (if calibration could not be performed while Kistler-Morse is on site) and instruction covering operation and maintenance of the system.

*Note*

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The sensor and junction box installation, wiring of the sensors to the junction boxes, startup assistance, and on-site training described above is included in the price for Kistler-Morse's *Silo Solution*, instrumenting skirt-supported vessels with L-Cells or Microcells.

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### **Troubleshooting**

Kistler-Morse will troubleshoot systems for mechanical, electrical, calibration, and wiring errors. Normal component repair and wiring errors will be corrected, including replacement of non-repairable printed circuit boards.

### **Service Calls**

Kistler-Morse will perform on-site repair/replacement services.

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## **Return Material Authorization**

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If a part needs to be sent to the factory for repair, contact Kistler-Morse's corporate office and ask for a Return Material Authorization (RMA) number. The RMA number identifies the part and the owner and must be included with the part when it is shipped to the factory.

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## **Address and Telephone Numbers**

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### ***Corporate Office***

**Kistler-Morse Corporation**  
19021 120th Avenue NE  
Bothell, WA 98011-9511 USA

Phone: 425-486-6600  
Toll Free (U.S.A. and Canada): 800-426-9010  
Fax: 425-402-1500

### ***European Office***

**Kistler-Morse Corporation**  
Rucaplein 531  
B2610 Antwerp, Belgium

Phone: 32-3-218-99-99  
Fax: 32-3-230-78-76

### ***Asian/Pacific Rim Office***

**Kistler-Morse Corporation**  
246 MacPherson Road  
#08-01 BeTime Building  
Singapore 348578

Phone: 65-745-0368  
Fax: 65-745-0636

# ***Appendix B. Technical Drawings***

This appendix contains the following technical drawings for the Allen-Bradley RIO PCB cards:

<b>Drawing No.</b>	<b>Drawing Title</b>
TI-SP.W2.RIO-01	Wiring Diagram, A-B Remote I/O Interface, Weigh II
TI-S0.S2.RIO-01	Wiring Diagram, A-B Remote I/O Interface, Sono II



**WEIGH-II ALLEN-BRADLEY REMOTE I/O INTERFACE BOARD**  
(SLOTS 2 or 3)

REVISIONS				
LTR	DESCRIPTION	CHECKED	APPROVED	DATE

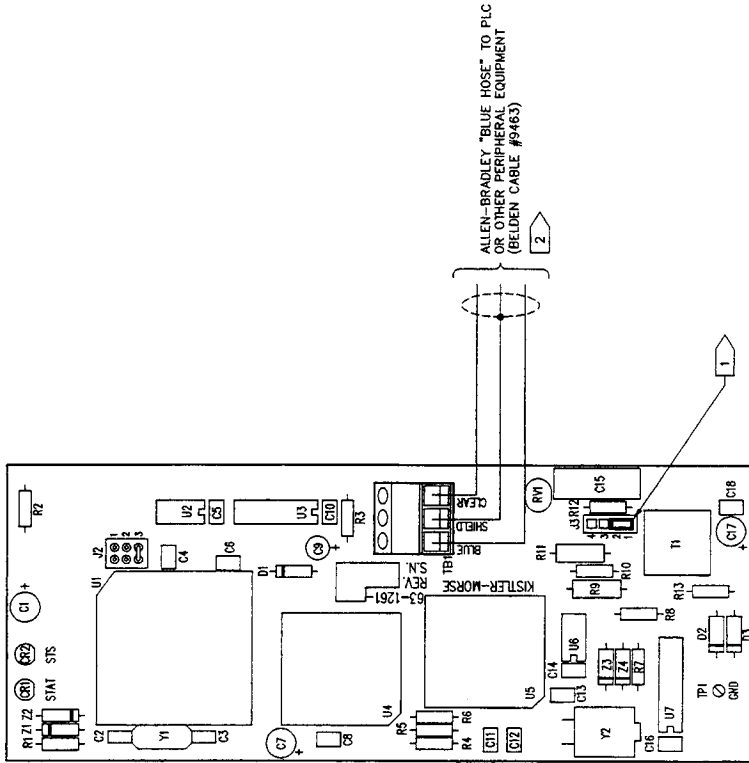
**NOTES (UNLESS OTHERWISE SPECIFIED):**

1 A TERMINATION RESISTOR MUST BE INSTALLED ON THE LAST BLOCK IN A SERIES. RESISTOR INSTALLATION CAN BE DONE BY MAKING THE PROPER JUMPING ON 'J3' PER TABLE BELOW.

BAUD RATE	JUMPER POSITION	TERMINATION RESISTOR VALUE
---	1-2	NO CONNECTION
57.6K AND 115.2K	2-3	150 OHMS
* 230.4K	3-4	82 OHMS

\* NOTE: DEVICES THAT ARE OPERATING AT 230.4K BAUD MUST HAVE 82 OHM TERMINATION RESISTOR JUMPER 3-4 OF J3 IN PLACE FOR PROPER OPERATION.

2 MAXIMUM OF 2 REMOTE I/O CABLE CONNECTIONS PERMITTED. CABLE SHIELD MUST BE CONNECTED TO CHASSIS GROUND ONLY AT THE SCANNER END OF THE REMOTE I/O.



ECO ACCUMULATION		APPROVALS		DATE		DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED	
ECO No. 1:		DRAWN:	Paul M. Colledge	7/8/97	DECIMAL ANGULAR	XX	3..*
ECO No. 2:		CHECKED:			DO NOT SCALE DRAWING	XXX	3..*
ECO No. 3:		PROJ. ENGR.:	SAZICPA	11/5/97	SCALE	1 = 1	FINISH
ECO No. 4:		PRODUCTION:			USED ON: (REF ONLY)		
ECO No. 5:		PURCHASING:					

	<b>Kistler-Morse Corp.</b> Bothell, WA 98011
TITLE <b>A-B REMOTE I/O INTERFACE, WEIGH-II</b>	
SIZE (DWG. NO.)	<b>B</b>   <b>T1-SP, W2, RIO-01</b>   <b>New</b>
ACAD #	SPW2R101   DATE: 07/24/97   BKT. 1 OF 1

ORIGINAL



**SONO-II ALLEN-BRADLEY REMOTE I/O INTERFACE BOARD**  
(SLOTS 1, 2 or 3)

REVISIONS				
LTR	DESCRIPTION	CHECKED	APPROVED	DATE

NOTES (UNLESS OTHERWISE SPECIFIED):

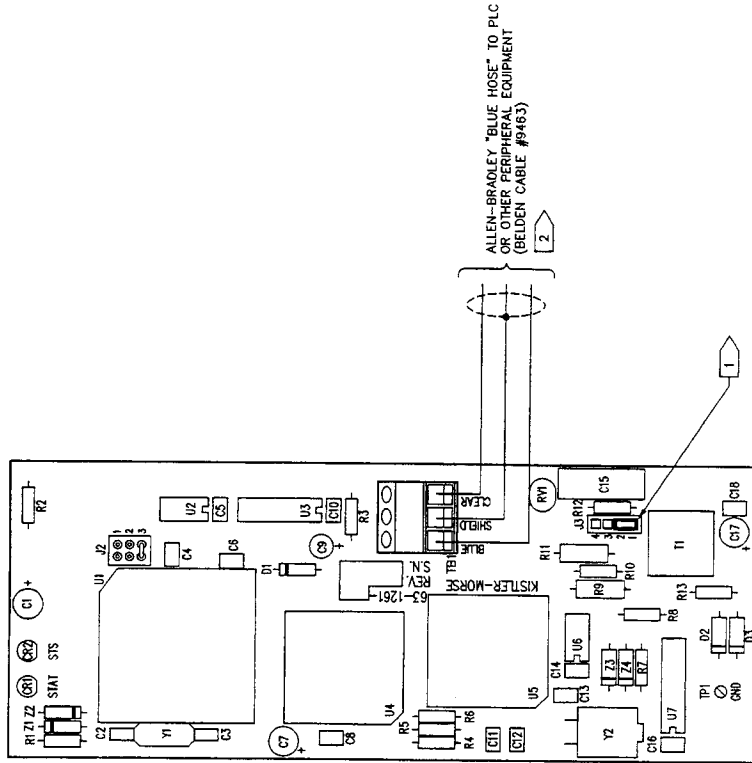
1 A TERMINATION RESISTOR MUST BE INSTALLED ON THE LAST BLOCK IN A SERIES. RESISTOR INSTALLATION CAN BE DONE BY MAKING THE PROPER JUMPING ON "J3" PER TABLE BELOW.

**"J3" JUMPER TABLE**

BAUD RATE	JUMPER POSITION	TERMINATION RESISTOR VALUE
--	1-2	NO CONNECTION
57.6K AND 115.2K	2-3	150 OHMS
* 230.4K	3-4	82 OHMS

\* NOTE: DEVICES THAT ARE OPERATING AT 230.4K BAUD MUST HAVE 82 OHM TERMINATION RESISTOR (JUMPER "3-4" OF J3) IN PLACE FOR PROPER OPERATION.

2 MAXIMUM OF 2 REMOTE I/O CABLE CONNECTIONS PERMITTED. CABLE SHIELD MUST BE CONNECTED TO CHASSIS GROUND ONLY AT THE SCANNER END OF THE REMOTE I/O.



ECO ACCUMULATION:		APPROVALS		MILSER DIMENSIONS SPECIFIED:	
ECO No. 1	DATE	DRAWN	DATE	DECIMAL	TOLERANCES
	7/0/37 <td>Ray M. Colado <td>7/0/37 <td>ANGULAR <td> </td> </td></td></td>	Ray M. Colado <td>7/0/37 <td>ANGULAR <td> </td> </td></td>	7/0/37 <td>ANGULAR <td> </td> </td>	ANGULAR <td> </td>	
ECO No. 2		CHECKED:		.XXS	±. . .
ECO No. 3		PROD. ENGR.	11/5/97	.XXS	
ECO No. 4		PRODUCTION:		DO NOT SCALE DRAWING	
ECO No. 5		PURCHASING:		SCALE	1 : 1
				FINISH	
				USED ON: REF ONLY	

Kistler-Morse Corp. Bothell, WA 98011	
TITLE A-B REMOTE I/O INTERFACE, SONO-II	
SIZE DWG. NO.	REV.
B	T1-S0-S2-R10-01 New
ACAD # S022R101	DATE/REVISED
	SHT. 1 OF 1

ORIGINAL

