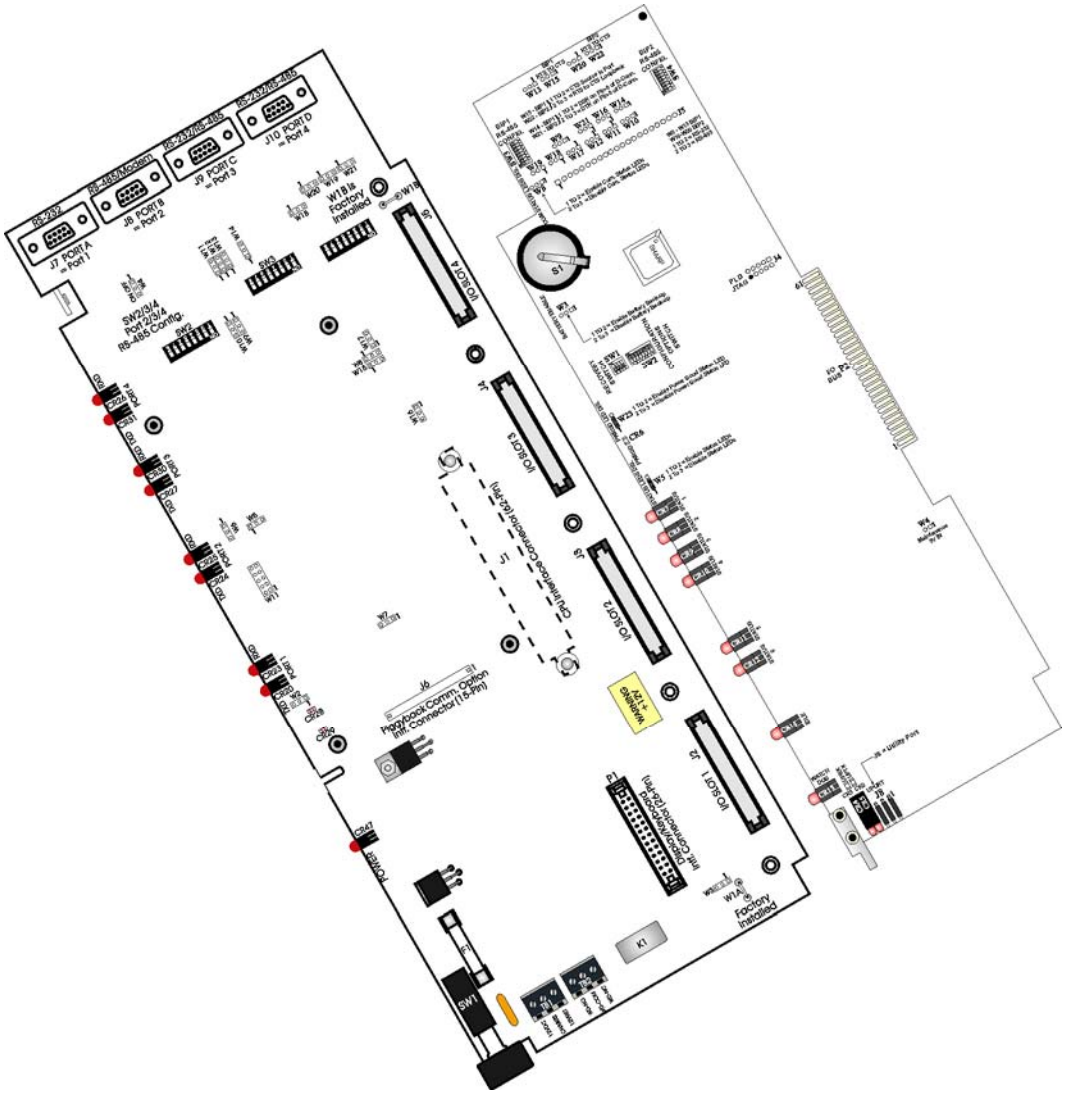
ControlWave_**10**
HARDWARE INSTALLATION GUIDE

For upgrade of the 3310 RTU



ControlWave

IMPORTANT! READ INSTRUCTIONS BEFORE STARTING!

Be sure that these instructions are carefully read and understood before any operation is attempted. Improper use of this device in some applications may result in damage or injury. The user is urged to keep this book filed in a convenient location for future reference.

These instructions may not cover all details or variations in equipment or cover every possible situation to be met in connection with installation, operation or maintenance. Should problems arise that are not covered sufficiently in the text, the purchaser is advised to contact Bristol for further information.

EQUIPMENT APPLICATION WARNING

The customer should note that a failure of this instrument or system, for whatever reason, may leave an operating process without protection. Depending upon the application, this could result in possible damage to property or injury to persons. It is suggested that the purchaser review the need for additional backup equipment or provide alternate means of protection such as alarm devices, output limiting, fail-safe valves, relief valves, emergency shutoffs, emergency switches, etc. If additional in-formation is required, the purchaser is advised to contact Bristol .

RETURNED EQUIPMENT WARNING

When returning any equipment to Bristol for repairs or evaluation, please note the following: The party sending such materials is responsible to ensure that the materials returned to Bristol are clean to safe levels, as such levels are defined and/or determined by applicable federal, state and/or local law regulations or codes. Such party agrees to indemnify Bristol and save Bristol harmless from any liability or damage which Bristol may incur or suffer due to such party's failure to so act.

ELECTRICAL GROUNDING

Metal enclosures and exposed metal parts of electrical instruments must be grounded in accordance with OSHA rules and regulations pertaining to "Design Safety Standards for Electrical Systems," 29 CFR, Part 1910, Subpart S, dated: April 16, 1981 (OSHA rulings are in agreement with the National Electrical Code).

The grounding requirement is also applicable to mechanical or pneumatic instruments that include electrically-operated devices such as lights, switches, relays, alarms, or chart drives.

EQUIPMENT DAMAGE FROM ELECTROSTATIC DISCHARGE VOLTAGE

This product contains sensitive electronic components that can be damaged by exposure to an electrostatic discharge (ESD) voltage. Depending on the magnitude and duration of the ESD, this can result in erratic operation or complete failure of the equipment. Read supplemental document S14006 at the back of this manual for proper care and handling of ESD-sensitive components.

WARRANTY

A. Bristol warrants that goods described herein and manufactured by Bristol are free from defects in material and workmanship for one year from the date of shipment unless otherwise agreed to by Bristol in writing.

B. Bristol warrants that goods repaired by it pursuant to the warranty are free from defects in material and workmanship for a period to the end of the original warranty or ninety (90) days from the date of delivery of repaired goods, whichever is longer.

C. Warranties on goods sold by, but not manufactured by Bristol, are expressly limited to the terms of the warranties given by the manufacturer of such goods.

D. All warranties are terminated in the event that the goods or systems or any part thereof are (i) misused, abused or otherwise damaged, (ii) repaired, altered or modified without Bristol's consent, (iii) not installed, maintained and operated in strict compliance with instructions furnished by Bristol, or (iv) worn, injured or damaged from abnormal or abusive use in service time.

E. THESE WARRANTIES ARE EXPRESSLY IN LIEU OF ALL OTHER WARRANTIES EXPRESS OR IMPLIED (INCLUDING WITHOUT LIMITATION WARRANTIES AS TO MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE), AND NO WARRANTIES, EXPRESS OR IMPLIED, NOR ANY REPRESENTATIONS, PROMISES, OR STATEMENTS HAVE BEEN MADE BY BRISTOL UNLESS ENDORSED HEREIN IN WRITING. FURTHER, THERE ARE NO WARRANTIES WHICH EXTEND BEYOND THE DESCRIPTION OF THE FACE HEREOF.

F. No agent of Bristol is authorized to assume any liability for it or to make any written or oral warranties beyond those set forth herein.

REMEDIES

A. Buyer's sole remedy for breach of any warranty is limited exclusively to repair or replacement without cost to Buyer of any goods or parts found by Seller to be defective if Buyer notifies Bristol in writing of the alleged defect within ten (10) days of discovery of the alleged defect and within the warranty period stated above, and if the Buyer returns such goods to Bristol's Watertown office, unless Bristol's Water-town office designates a different location, transportation prepaid, within thirty (30) days of the sending of such notification and which upon examination by Bristol proves to be defective in material and workmanship. Bristol is not responsible for any costs of removal, dismantling or reinstallation of allegedly defective or defective goods. If a Buyer does not wish to ship the product back to Bristol, the Buyer can arrange to have a Bristol service person come to the site. The Service person's transportation time and expenses will be for the account of the Buyer. However, labor for warranty work during normal working hours is not chargeable.

B. Under no circumstances will Bristol be liable for incidental or consequential damages resulting from breach of any agreement relating to items included in this quotation, from use of the information herein or from the purchase or use by Buyer, its em-ployees or other parties of goods sold under said agreement.

How to return material for Repair or Exchange

Before a product can be returned to Bristol for repair, upgrade, exchange, or to verify proper operation, form (GBU 13.01) must be completed in order to obtain a RA (Return Authorization) number and thus ensure an optimal lead time. Completing the form is very important since the information permits the Bristol Repair Dept. to effectively and efficiently process the repair order.

You can easily obtain a RA number by:

A. FAX
Completing the form (GBU 13.01) and faxing it to (860) 945-3875. A Bristol Repair Dept. representative will return call (or other requested method) with a RA number.

B. E-MAIL
Accessing the form (GBU 13.01) via the Bristol Web site (www.bristolbabcock.com) and sending it via E-Mail to brepair@bristolbabcock.com. A Bristol Repair Dept. representative will return E-Mail (or other requested method) with a RA number.

C. Mail
Mail the form (GBU 13.01) to

Bristol Inc.
Repair Dept.
1100 Buckingham Street
Watertown, CT 06795

A Bristol Repair Dept. representative will return call (or other requested method) with a RA number.

D. Phone
Calling the Bristol Repair Department at (860) 945-2442. A Bristol Repair Department representative will record a RA number on the form and complete Part I, then send the form to the Customer via fax (or other requested method) for Customer completion of Parts II & III.

A copy of the completed Repair Authorization Form with issued RA number should be included with the product being returned. This will allow us to quickly track, repair, and return your product to you.

Bristol Inc. Repair Authorization Form (off-line completion)

(Providing this information will permit Bristol Inc. to effectively and efficiently process your return. Completion is required to receive optimal lead time. Lack of information may result in increased lead times.)

Date_____ **RA #**_____**SH**_ **Line No.**_____

Standard Repair Practice is as follows: Variations to this is practice may be requested in the "Special Requests" section.

- Evaluate / Test / Verify Discrepancy
- Repair / Replace / etc. in accordance with this form
- Return to Customer

Please be aware of the Non warranty standard charge:

- There is a $100 minimum evaluation charge, which is applied to the repair if applicable (√ in "returned" B,C, or D of part III below)

Part I Please complete the following information for single unit or multiple unit returns

Address No. _____ **(office use only)** **Address No.** _____ **(office use only)**

Bill to :_____ **Ship to:**_____

_____ _____

_____ _____

Purchase Order:_____ **Contact Name:**_____

Phone:_____ **Fax:**_____**E-Mail:** _____

Part II Please complete Parts II & III for each unit returned

Model No./Part No._____ **Description** _____

Range/Calibration _____ **S/N** _____

Reason for return : ☐ Failure ☐ Upgrade ☐ Verify Operation ☐ Other _____

1. Describe the conditions of the failure (Frequency/Intermittent, Physical Damage, Environmental Conditions, Communication, CPU watchdog, etc.)

_____

_____

_____

_____(Attach a separate sheet if necessary)

2. Comm. interface used: ☐ Standalone ☐ RS-485 ☐ Ethernet ☐ Modem (PLM (2W or 4W) or SNW) ☐Other:_____

3. What is the **Firmware** revision? _____ What is the **Software** &version? _____

Part III If checking "replaced" for any question below, check an alternate option if replacement is not available

A. If product is within the warranty time period but is excluded due to Bristol's warranty clause, would you like the product: ☐ repaired ☐ returned ☐ replaced ☐ scrapped?

B. If product were found to exceed the warranty period, would you like the product: ☐repaired ☐ returned ☐ replaced ☐ scrapped?

C. If product is deemed not repairable would you like your product: ☐ returned ☐ replaced ☐ scrapped?

D. If Bristol is unable to verify the discrepancy, would you like the product: ☐ returned ☐ replaced ☐ *see below?

* Continue investigating by contacting the customer to learn more about the problem experienced? The person to contact that has the most knowledge of the problem is: _____ phone_____

If we are unable to contact this person the backup person is: _____ phone_____

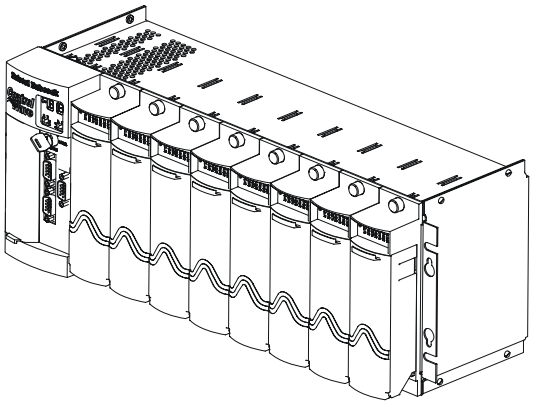
Special Requests: _____

_____

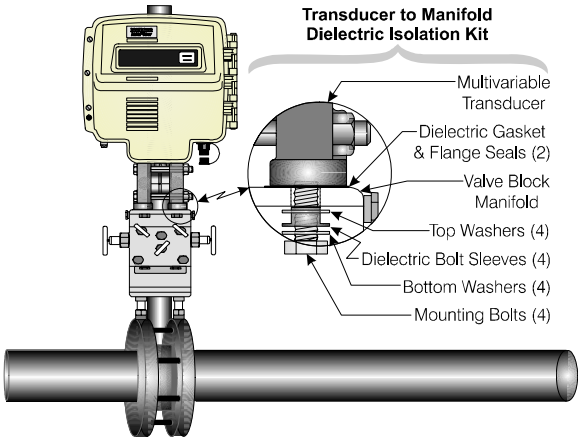
Ship prepaid to: **Bristol Inc., Repair Dept., 1100 Buckingham Street, Watertown, CT 06795**
Phone: 860-945-2442 Fax: 860-945-3875 Form GBU 13.01 Rev. B 04/11/06

Bristol
Training

GET THE MOST FROM YOUR BRISTOL BABCOCK INSTRUMENT OR SYSTEM



- Avoid Delays and problems in getting your system on-line
- Minimize installation, start-up and maintenance costs.
- Make the most effective use of our hardware and software.
- Know your system.



As you know, a well-trained staff is essential to your operation. Bristol Inc. offers a full schedule of classes conducted by full-time, professional instructors. Classes are offered throughout the year at three locations: Houston, Orlando and our Watertown, CT headquarters. By participating in our training, your personnel can learn how to install, calibrate, configure, program and maintain any and all Bristol products and realize the full potential of your system.

For information or to enroll in any class, contact our training department in Watertown at (860) 945-2343. For Houston classes, you can also contact our Houston office, at (713) 685-6200.

A Few Words About Bristol Inc.

For over 100 years, Bristol® has been providing innovative solutions for the measurement and control industry. Our product lines range from simple analog chart recorders, to sophisticated digital remote process controllers and flow computers, all the way to turnkey SCADA systems. Over the years, we have become a leading supplier to the electronic gas measurement, water purification, and wastewater treatment industries.

On off-shore oil platforms, on natural gas pipelines, and maybe even at your local water company, there are Bristol Inc. instruments, controllers, and systems running year-in and year-out to provide accurate and timely data to our customers.

Getting Additional Information

In addition to the information contained in this manual, you may receive additional assistance in using this product from the following sources:

Help Files / Release Notes

Many Bristol software products incorporate help screens. In addition, the software typically includes a 'read me' release notes file detailing new features in the product, as well as other information which was available too late for inclusion in the manual.

Contacting Bristol Inc. Directly

Bristol's world headquarters is located at 1100 Buckingham Street, Watertown, Connecticut 06795, U.S.A.

Our main phone numbers are:

(860) 945-2200
(860) 945-2213 (FAX)

Regular office hours are Monday through Friday, 8:00AM to 4:30PM Eastern Time, excluding holidays and scheduled factory shutdowns. During other hours, callers may leave messages using Bristol's voice mail system.

Telephone Support - Technical Questions

During regular business hours, Bristol's Application Support Group can provide telephone support for your technical questions.

For technical questions about TeleFlow products call (860) 945-8604.

For technical questions about **Control**Wave call (860) 945-2394 or (860) 945-2286.

For technical questions regarding Bristol's **OpenEnterprise** product, call (860) 945-3865 or e-mail: **scada@bristolbabcock.com**

For technical questions regarding **ACCOL** products, **OpenBSI Utilities**, **UOI** and all other software except for **Control**Wave and **OpenEnterprise** products, call (860) 945-2286.

For technical questions about **Network 3000** hardware, call (860) 945-2502.

You can e-mail the Application Support Group at: **bsupport@bristolbabcock.com**

The Application Support Group maintains an area on our web site for software updates and technical information. Go to: **www.bristolbabcock.com/services/techsupport/**

For assistance in interfacing Bristol hardware to radios, contact Bristol's **Communication Technology Group** in Orlando, FL at **(407) 629-9463 or (407) 629-9464**.

You can e-mail the Communication Technology Group at:
orlandoRFgroup@bristolbabcock.com

Telephone Support - Non-Technical Questions, Product Orders, etc.

Questions of a non-technical nature (product orders, literature requests, price and delivery information, etc.) should be directed to the nearest sales office (listed on the rear cover of this manual) or to your Bristol-authorized sales representative.

Please call the main Bristol Inc. number (860-945-2200) if you are unsure which office covers your particular area.

Visit our Site on the World Wide Web

For general information about Bristol Inc. and its products, please visit our site on the World Wide Web at: **www.bristolbabcock.com**

Training Courses

Bristol's Training Department offers a wide variety of courses in Bristol hardware and software at our Watertown, Connecticut headquarters, and at selected Bristol regional offices, throughout the year. Contact our Training Department at **(860) 945-2343** for course information, enrollment, pricing, and scheduling.

PIP-CW_10 Upgrade Kit
Hardware Installation Guide

TABLE OF CONTENTS

PIP-CW_10 Upgrade Kit
Hardware Installation Guide

TABLE OF CONTENTS

APPENDICES

REFERENCED BRISTOL CUSTOMER INSTRUCTION MANUALS

ControlWave_10
HARDWARE INSTALLATION GUIDE

SECTION 1 - ControlWave_10 INTRODUCTION

An RTU 3310 can be field upgraded to become a **Control**Wave_10 RTU (herein referred to as **CW_10**) by utilizing the hardware provided in an installation kit. Upgrade will require replacement of the standard RTU 3310 CPU and Multi-Function Interface Boards with the **CW_10** CPU (CPU) and **CW_10** Multi-Function Interface (MFIB) Boards provided in the upgrade kit.

ControlWave® products have been designed and integrated as a highly adaptable, high performance Distributed Open Controller family with exceptional networking capability that provides a complete Process Automation Management Solution. The CPU and MFIB Boards were designed with an emphasis on providing high performance with low power consumption and scalability.

The CPU Board utilizes Sharp's LH7A400 System-on-Chip Advanced RISC Machine (ARM) microprocessor with 32-bit ARM9TDMI Reduced Instruction Set Computer (RISC) Core. In addition to the microprocessor and control logic, the CPU Board includes two communication ports that can be individually configured for RS-232 or RS-485 operation, 1MB of battery backed Static RAM (SRAM), 4MB of Synchronous Dynamic RAM (SDRAM), 512kB Boot/Downloader FLASH, 16MB simultaneous read/write FLASH, and an I/O Bus Connector.

In addition to Idle and Watchdog LEDs, there are six status LEDs located on the CPU Board that will display run time status information. Two LEDs are also provided for each Comm. Port.

CW_10 Distributed Process Controllers provide the following key features:

- ARM processor provides exceptional performance and low power consumption
- Four independently configurable asynchronous serial communication ports (RS-232/RS-485), one asynchronous serial RS-232 communication port, one asynchronous serial RS-485/modem communication port and one 3-wire serial RS-232 Utility Port
- Wide temperature range: (-40 to +70°C) (-40 to 158°F)
- Utilizes existing RTU 3310 Chassis and I/O Boards
- RS-232/RS-485 Comm. Ports provided with LED status Indicators
- Battery backup for the real-time clock and the system's SRAM is provided by a 3.0V, 300mA-hr lithium coin cell battery located on the CPU Board Ass'y.
- Class I, Div. 2 Hazardous Location approval

SECTION 2 - ControlWave PROGRAMMING ENVIRONMENT

The **Control**Wave programming environment uses industry-standard tools and protocols to provide a flexible, adaptable approach for various process control applications in the water treatment, wastewater treatment, and industrial automation business.

The **Control**Wave programming environment consists of a set of integrated software tools which allow a user to create, test, implement, and download complex control strategies for use with Bristol's **CW_10** Remote Terminal Unit.

The tools that make up the programming environment are:

- **Control**Wave **Designer** load building package offers several different methods for generating and debugging control strategy programs including function blocks, ladder logic, structured languages, etc. The resulting process control load programs are fully compatible with **IEC 61131-3** standards. Various communication methods are offered, including TCP/IP, serial links, as well as communication to Bristol's **Open BSI** software and networks.

- The **I/O Configuration Wizard**, accessible via a menu item in **Control**Wave Designer, allows you to define **process I/O modules** in the **CW_10** and configure the individual mapping of I/O points for digital and analog inputs and outputs.

- The **ACCOL3 Firmware Library** which is imported into **Control**Wave Designer, includes a series of Bristol specific function blocks. These pre-programmed function blocks accomplish various tasks common to most user applications including alarming, historical data storage, as well as process control algorithms such as PID control.

- The **OPC Server** (**O**bject Linking and Embedding (OLE) for **P**rocess **C**ontrol) allows real-time data access to any OPC [Object Linking and Embedding (OLE) for Process Control] compliant third-party software packages.

- A series of **Configuration Controls** are available for setting up various aspects of the system such as historical data storage, system security, and soft switches. Additional **Data Access Controls** are also available for retrieval of real-time data values and communication statistics. The configuration controls and the data access controls utilize **ActiveX** technology and are called through a set of fixed Web pages, compatible with Microsoft® Internet Explorer. Alternatively, developers can place the controls in third-party ActiveX compatible containers such as Visual BASIC or Microsoft® Excel.

- **User-defined Web Pages** - If desired, user-defined web pages can be stored within a PC to provide a customized human-machine interface (HMI).

- **Flash Configuration Utility** – Parameters such as the BSAP local address, IP address, etc. are set using the Flash Configuration Utility, accessible via Open BSI LocalView or NetView.

Note: RTU 3310s that are upgraded with "CW_10 Hardware," must have their ACCOL application load converted to an IEC 61131 ControlWave Program Load. This is accomplished via the ACCOL Translator (see User Guide D5086).

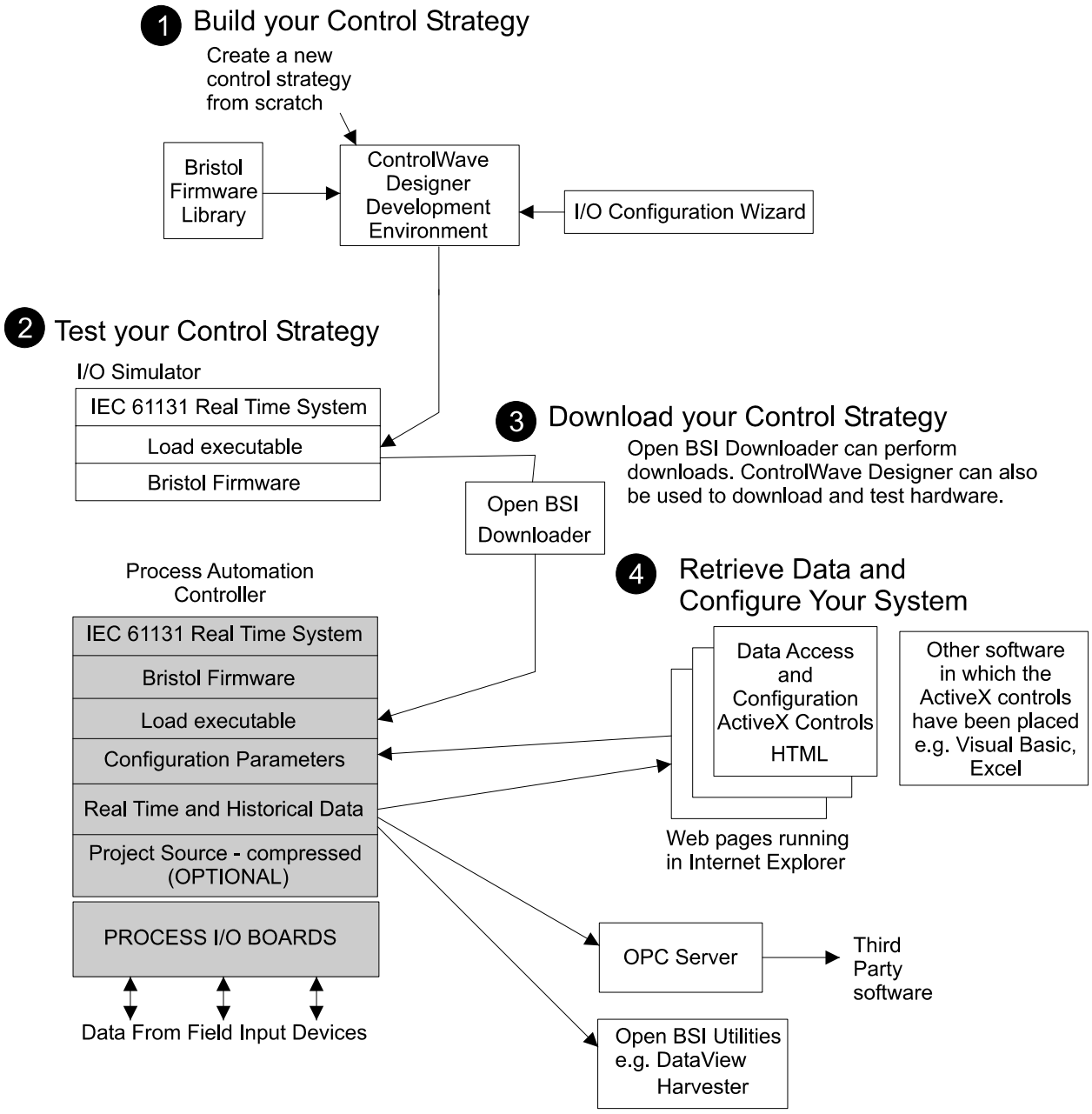


Figure 1 - ControlWave - Control Strategy Software Diagram

SECTION 3 - PHYSICAL DESCRIPTION

CW-10 Upgrade kits are comprised of the following major components:

- **CW_10** CPU Board (CPU) Overview (Section 3.1)
- **CW_10** Multi-Function Interface Board (MFIB) Overview (Section 3.2)

3.1 CW_10 CPU Board Overview

The multilayer CPU Board provides **CW_10** CPU, I/O monitor/control, memory and communication functions. **CW_10** CPU Boards operate over an extended temperature range with long-term product reliability.

CW_10 CPU Boards are based on a 32-bit ARM9TDMI RISC Core Processor. CPU Boards are specified to operate on **CW_10** (+12Vdc or +24Vdc systems) and with a system clock speed of 150 MHz. In addition to the microprocessor and control logic, the **CW_10** CPU Board includes two independently (DIP-Switch) configurable communication ports (RS-232/RS-485) (COM5 & COM6), CPU Memory consists of 1MB of battery backed Static RAM (SRAM), 512kB Boot/Downloader FLASH and 16MB simultaneous read/write FLASH.

CPU Boards are provided backup power via a coin cell socket that accepts a 3.0V, 300mA-hr lithium battery. This 3.0V battery provides backup power for the real-time clock and the system's Static RAM (SRAM). Backup power is enabled when Configuration Jumper W3 (just below the battery) is installed in position 1 to 2.

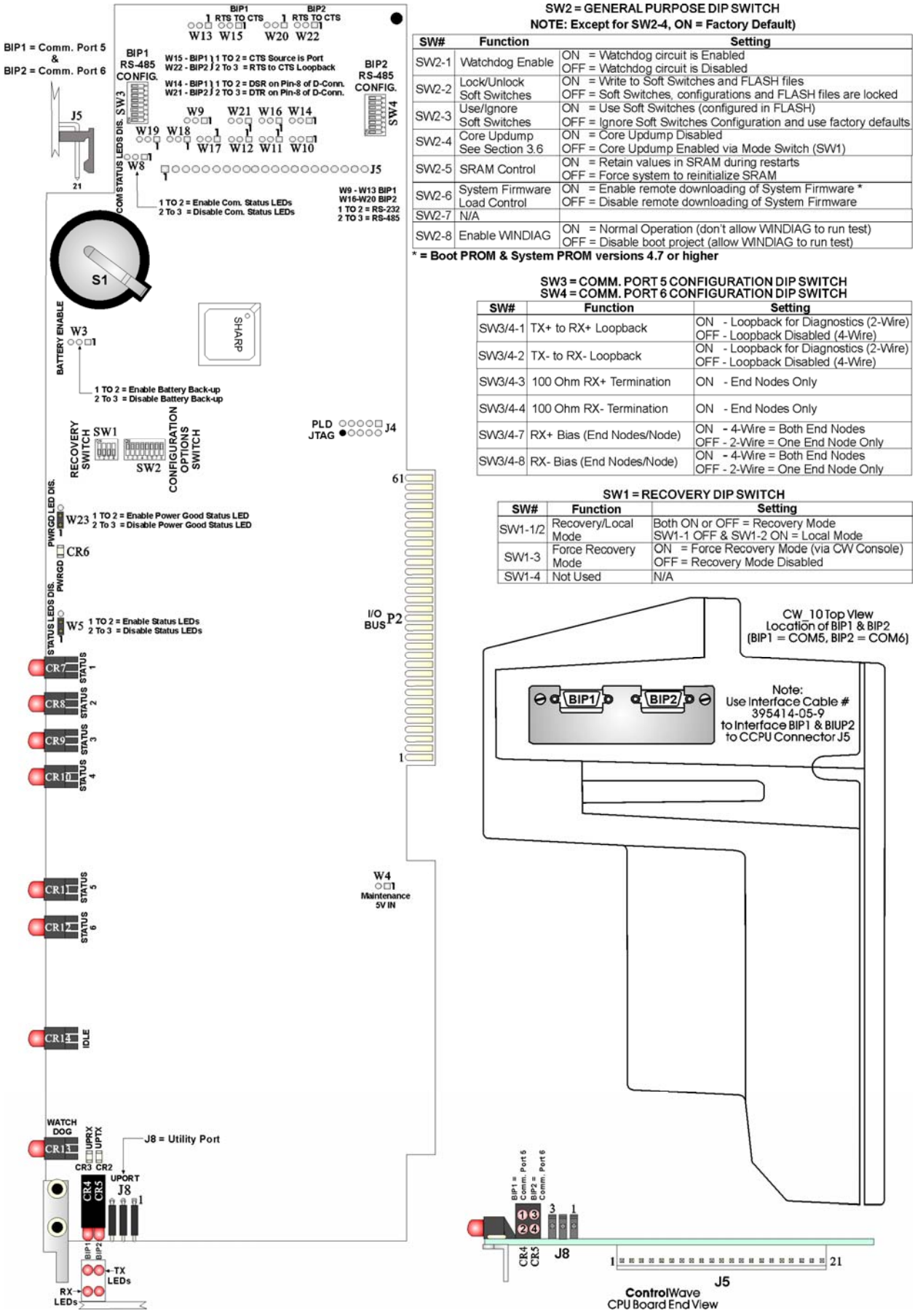
If the 3.3Vdc that powers the unit goes out of specification, a supervisory circuit on the CPU Board switches the battery voltage to the CPU's SRAM and RTC.

The system SRAM is specified to have a standby current of 20µA for each part (1MB), (40µA maximum) (plus 2uA for the RTC). For a system containing 1MB of system SRAM, a worst-case current draw of 42µA allows a battery life of approximately 7142 hours.

A supervisory circuit is used to switch to battery power when VCC falls out of specification. For maximum shelf life, the battery may be isolated from the circuit by removing the Backup Enable Jumper W3 from position 1 to 2 and then installing it in position 2 to 3. If the Real-time clock looses its battery backup a ControlWave Designer system variable bit (_QUEST_DATE) is set. This bit can be used to post a message or alarm to the PC (see the ControlWave Designer Programmer's Handbook - D5125, System Variables Section).

Basic CCPU Board components and features are summarized as follows:

- LH7A400 System-on-Chip 32-bit ARM9TDMI RISC Core microprocessor
- Supports process control loads that are fully compatible with IEC 61131-3 standards
- 512KB FLASH Boot/Downloader, 29LV040B, 90 nS, 8-bit access
- 1MB SRAM, 3.3V, 256 x 16, 70 nsec., with Battery Back-up
- 4 MB SDRAM via two 1M x 16, 100MHz SDRAMs configured as a 1M x 32-bit array.
- 16MB simultaneous read/write FLASH, 90 nsec.
- 2 user configurable serial Comm. ports (RS-232/RS-485) (COM5 & COM6) (compatible with existing 3310 communication cables)
- I/O Bus Interface, control for up to 4 I/O Boards
- Spread Spectrum clock for lower EMI
- Serial Real Time Clock with battery backup
- 8-Position general-purpose switch bank plus a 4-Position recovery switch bank
- Coin cell socket accepts a 3.0V, 300mA-hr lithium battery
- Six Status LEDs, 6 Comm. Port LEDs plus Watchdog, Idle and Comm. Port LEDs
- 3-wire (RS-232) Utility Port



SW2 = GENERAL PURPOSE DIP SWITCH
NOTE: Except for SW2-4, ON = Factory Default)

SW#	Function	Setting
SW2-1	Watchdog Enable	ON = Watchdog circuit is Enabled OFF = Watchdog circuit is Disabled
SW2-2	Lock/Unlock Soft Switches	ON = Write to Soft Switches and FLASH files OFF = Soft Switches, configurations and FLASH files are locked
SW2-3	Use/Ignore Soft Switches	ON = Use Soft Switches (configured in FLASH) OFF = Ignore Soft Switches Configuration and use factory defaults
SW2-4	Core Updump See Section 3.6	ON = Core Updump Disabled OFF = Core Updump Enabled via Mode Switch (SW1)
SW2-5	SRAM Control	ON = Retain values in SRAM during restarts OFF = Force system to reinitialize SRAM
SW2-6	System Firmware Load Control	ON = Enable remote downloading of System Firmware * OFF = Disable remote downloading of System Firmware
SW2-7	N/A	
SW2-8	Enable WINDIAG	ON = Normal Operation (don't allow WINDIAG to run test) OFF = Disable boot project (allow WINDIAG to run test)

*** = Boot PROM & System PROM versions 4.7 or higher**

SW3 = COMM. PORT 5 CONFIGURATION DIP SWITCH
SW4 = COMM. PORT 6 CONFIGURATION DIP SWITCH

SW#	Function	Setting
SW3/4-1	TX+ to RX+ Loopback	ON - Loopback for Diagnostics (2-Wire) OFF - Loopback Disabled (4-Wire)
SW3/4-2	TX- to RX- Loopback	ON - Loopback for Diagnostics (2-Wire) OFF - Loopback Disabled (4-Wire)
SW3/4-3	100 Ohm RX+ Termination	ON - End Nodes Only
SW3/4-4	100 Ohm RX- Termination	ON - End Nodes Only
SW3/4-7	RX+ Bias (End Nodes/Node)	ON - 4-Wire = Both End Nodes OFF - 2-Wire = One End Node Only
SW3/4-8	RX- Bias (End Nodes/Node)	ON - 4-Wire = Both End Nodes OFF - 2-Wire = One End Node Only

SW1 = RECOVERY DIP SWITCH

SW#	Function	Setting
SW1-1/2	Recovery/Local Mode	Both ON or OFF = Recovery Mode SW1-1 OFF & SW1-2 ON = Local Mode
SW1-3	Force Recovery Mode	ON = Force Recovery Mode (via CW Console) OFF = Recovery Mode Disabled
SW1-4	Not Used	N/A

Figure 2 - CW_10 CPU Board Component Identification Diagram

3.1.1 CW_10 CPU Board Serial Comm. Port Connectors

CPU Boards supports up to two serial communication ports (COM5 and COM6). COM5 and COM6 are interconnected to the Connector Mounting Plate on the top of the **CW_10** cover, which contains two Female D-Type connectors (see Table 10 for D-type connector pin assignments). One end of the interface cable is connected to J5 on the **CW_10** CPU Board. The other end of the cable is terminated into the two 9-pin D-type connectors on the Connector Mounting Plate. Connector Mounting Plate Assembly Connector BIP1 supports Comm. Port 5 while connector BIP2 supports Comm. Port 6. When configured for RS-485 operation Comm. 5 and Comm. 6 receivers are enabled by DTR the RS-485 driver is enabled by RTS. An eight position DIP-Switch (SW3) is assigned to Comm. Port 5 and another (SW4) is assigned to Comm. Port 6. These switches provide user configuration of RS-485 port receiver biasing and termination as well as 2-wire or 4-wire operation.

3.1.2 CW_10 CPU Board Memory

Boot/downloader FLASH
Boot/download code is contained in a single 512Kbytes FLASH IC. 4-Position DIP-Switch SW1's position 3 allows start-up menu options to be displayed or boot-up from system FLASH. If SW1-3 is closed (ON) when a reset occurs, the boot-up code will cause a recovery menu to be sent out the Utility Port (on the CPU Board) to a terminal program running on an external host computer. *Note: Recovery Mode will also be initiated if CPU Board Switch SW1 positions 1 and 2 are both set **ON** or **OFF** when a reset occurs.*

FLASH Memory
The base version of the CPU Module has 16Mbytes of 3.3V, simultaneous read/write (DL) FLASH memory. System Firmware and the Boot Project are stored here.

System Memory (SRAM)
The CPU Board has 1Mbyte of static RAM, implemented with two 256K x 16, 70 nanosecond asynchronous SRAMs. All random access memory retained data is stored in SRAM. During power loss periods, SRAM is placed into data retention mode (powered by a backup 3.0V lithium battery). SRAM's operates at 3.3V and are packaged in a 44-pin uTSOP. Critical system information that must be retained during power outages or when the system has been disabled for maintenance is stored here. Data includes: Last states of all I/O, historical data, retain variables and pending alarm messages not yet reported. The SRAM supports 32-bit accesses.

Synchronous Dynamic RAM (SDRAM)
The **CW_10** CPU Board contains 4 Mbytes of Synchronous Dynamic RAM (SDRAM) implemented with two 1M x 16, 100MHz Synchronous DRAMs. The running application is stored here. This allows the system to run faster than it will from the FLASH memory. SDRAM is not battery-backed.

3.1.3 CW_10 CPU Board Configuration Jumpers

CW_10 CPU Boards are provided with 18 User Configuration Jumpers that function as follows:

- W3 - Enable/Disable Battery Back-up Selection
  1 to 2 = Enable Battery Back-up
  2 to 3 = Disable Battery Back-up

- W5 - Status LED Enable/Disable Selection
  1 to 2 = Enable Status LEDs
  2 to 3 = Disable Status LEDs

- W8 - Serial Comm. Port Status LED Enable/Disable Selection
  1 to 2 = Enable Serial Comm. Port Status LEDs
  2 to 3 = Disable Serial Comm. Port Status LEDs

- W9 - BIP1 (Comm. Port 5) Configuration Selection **Note: W10 through W13 ditto**
  1 to 2 = Set for RS-232 Operation
  2 to 3 = Set for RS-485 Operation

- W14 - BIP1 (Comm. Port 5) DSR/DTR Control
  1 to 2 = DSR on Pin-8 of D-type Connector
  2 to 3 = DTR on Pin-8 of D-type Connector

- W15 - BIP1 (Comm. Port 5) Control
  1 to 2 = CTS Source is from Port
  2 to 3 = RTS to CTS Loopback

- W16 - BIP2 (Comm. Port 6) Configuration Selection **Note: W17 through W20 ditto**
  1 to 2 = Set for RS-232 Operation
  2 to 3 = Set for RS-485 Operation

- W21 - BIP2 (Comm. Port 6) DSR/DTR Control
  1 to 2 = DSR on Pin-8 of D-type Connector
  2 to 3 = DTR on Pin-8 of D-type Connector

- W22 - BIP2 (Comm. Port 6) Control
  1 to 2 = CTS Source is from Port
  2 to 3 = RTS to CTS Loopback

- W23 - Power Good LED Control
  1 to 2 = Enable Power Good LED
  2 to 3 = Disable Power Good LED

3.1.4 CW_10 CPU Board Configuration Switches

Four user-configurable DIP Switches are provided on the **CW_10** CPU Board. Eight-bit DIP-Switch SW2 is provided for user configuration settings while four-bit DIP-Switch SW1 provides forced recovery functions. Eight-bit DIP-Switch SW3 provides loopback, termination control, and receiver bias settings for the Comm. Port 5 (BIP1) when BIP1 has been configured for RS-485 operation (via jumpers W9 through W13). Eight-bit DIP-Switch SW4 provides loopback, termination control, and receiver bias settings for Comm. Port 6 (BIP2) when BIP2 has been configured for RS-485 operation (via jumpers W16 through W20).

Table 1 - CW_10 CPU Board (General Purpose Switch SW2) Assignments
Note: Except for SW2-4, ON = Factory Default

SW#	Function	Setting - (ON = Factory Default)
SW2-1	Watchdog Enable	ON = Watchdog circuit is enabled OFF = Watchdog circuit is disabled
SW2-2	Lock/Unlock Soft Switches	ON = Write to Soft Switches and FLASH files OFF = Soft Switches, configurations and FLASH files are locked
SW2-3	Use/Ignore Soft Switches	ON = Use Soft Switches (configured in FLASH) OFF = Ignore Soft Switch Configuration and use factory defaults
SW2-4	Core Updump See Section 3.6	ON = Core Updump Disabled OFF = Core Updump Enabled via Recovery Switch (SW1)
SW2-5	SRAM Control	ON = Retain values in SRAM during restarts OFF = Force system to reinitialize SRAM
SW2-6	System Firmware Load Control	ON = Enable remote downloading of System Firmware ***** OFF = Disable remote downloading of System Firmware
SW2-7	N/A	
SW2-8	Enable WINDIAG	ON = Normal Operation (don't allow WINDIAG to run test) OFF = Disable boot project (allow WINDIAG to run test)

*** = Boot PROM version 4.7 or higher and System PROM version 4.6 or higher**

Table 2 - CW_10 CPU Board (Switch SW1) Assignments CPU/System Recovery Mode/Local Mode Control (Note: SW1-4 not used)

SWITCH	Function	Setting
SW1-1/2	Recovery/Local Mode *****	Both ON or OFF = Recovery Mode SW1 OFF & SW2 ON = Local Mode
SW1-3	Force Recovery Mode	ON = Force Recovery Mode (via CW Console) OFF = Recovery Mode disabled

*** Note: Only the CCPU Switch SW1 settings listed in this table have been tested.**

Table 3 - CW_10 CPU Board Switch SW3/SW4 Assignments
RS-485 Loopback & Termination Control (COM5 = SW3 & COM6 = SW4)

SWITCH #	RS-485 Function Switch ON	Setting
SW3/4-1	TX+ to RX+ Loopback/2-Wire	ON - Only for Diagnostics
SW3/4-2	TX– to RX– Loopback/2-Wire	ON - Only for Diagnostics
SW3/4-3	100 Ohm RX+ Termination	ON - End Nodes Only
SW3/4-4	100 Ohm RX– Termination	ON - End Nodes Only
SW3/4-7	RX+ Bias (End Nodes/Node)	ON - 4-Wire = Both End Nodes ON - 2-Wire = One End Node Only
SW3/4-8	RX– Bias (End Nodes/Node)	ON - 4-Wire = Both End Nodes ON - 2-Wire = One End Node Only

3.1.5 CW_10 CPU Board LEDs

CW_10 CPU Boards are equipped with 15 LEDs. Table 4 provides CPU Board LED assignments. Table 5 provides definitions for the six Status LEDS.

Table 4 - Assignment of CW_10 CPU Board LEDs

LED Ref.	Function	Color	LED Ref.	Function	Color
CR2	Utility Port TX	Red	CR8	Status 2	Red
CR3	Utility Port RX	Red	CR9	Status 3	Red
CR4 - Top	COM5 (BIP1) TX	Red	CR10	Status 4	Red
CR4 - Bottom	COM5 (BIP1) RX	Red	CR11	Status 5	Red
CR5 - Top	COM6 (BIP2)TX	Red	CR12	Status 6	Red
CR5 - Bottom	COM6 (BIP2) RX	Red	CR13	Watchdog	Red
CR6	Power Good	Green	CR14	Idle	Red
CR7	Status 1	Red			

Two red LEDs provide for the following status conditions when lit: WD (CR13 - Indicates a Watchdog condition has been detected) & IDLE (CR14 - Indicates that the CPU has free time at the end of its execution cycle. Normally, it should be ON most of the time. When the Idle LED is OFF, it indicates that the CPU has no free time, and may be overloaded). The green Power Good LED (CR6) is on when power is within specification. Six status LEDs provide run time status codes.

Table 5
System Status Codes for Status LCDs CW_10 CPU Board (see Figure 3)

LED 6 CR12	LED 5 CR11	LED 4 CR10	LED 3 CR9	LED 2 CR8	LED 1 CR7	Status In Hex	Indication Definition
0	0	0	0	0	0	00	Application Running
0	0	0	0	0	1	01	Unit in Diagnostic Mode
0	0	0	0	1	1	03	Unit Running Diagnostics
0	0	0	1	0	0	04	Flash XSUM Error
0	0	0	1	0	1	05	Error Initializing Application Device
0	0	0	1	1	1	07	Flash Programming Error
0	0	1	0	0	0	08	Using Factory Defaults *
0	0	1	0	0	1	09	Battery Failure Detected *
0	0	1	0	1	0	0A	Currently Loading the Boot Project
0	0	1	0	1	1	0B	System Initialization in Progress
0	1	0	0	0	0	10	Waiting in Recovery Mode
0	1	0	0	1	0	12	Error Testing SRAM
1	0	0	0	0	0	20	Application Loaded
1	0	1	0	0	0	28	Stopped at a Break Point
1	1	0	0	0	0	30	No Application Loaded
1	1	1	0	0	0	38	Running with Break Points
1	1	1	0	1	1	3B	Waiting for Power-down (after NMI)
1	1	1	1	1	0	3E	Waiting for Updump to be Performed
1	1	1	1	1	1	3F	Unit Crashed (Watchdog Disabled)

*** = Flashed at startup**

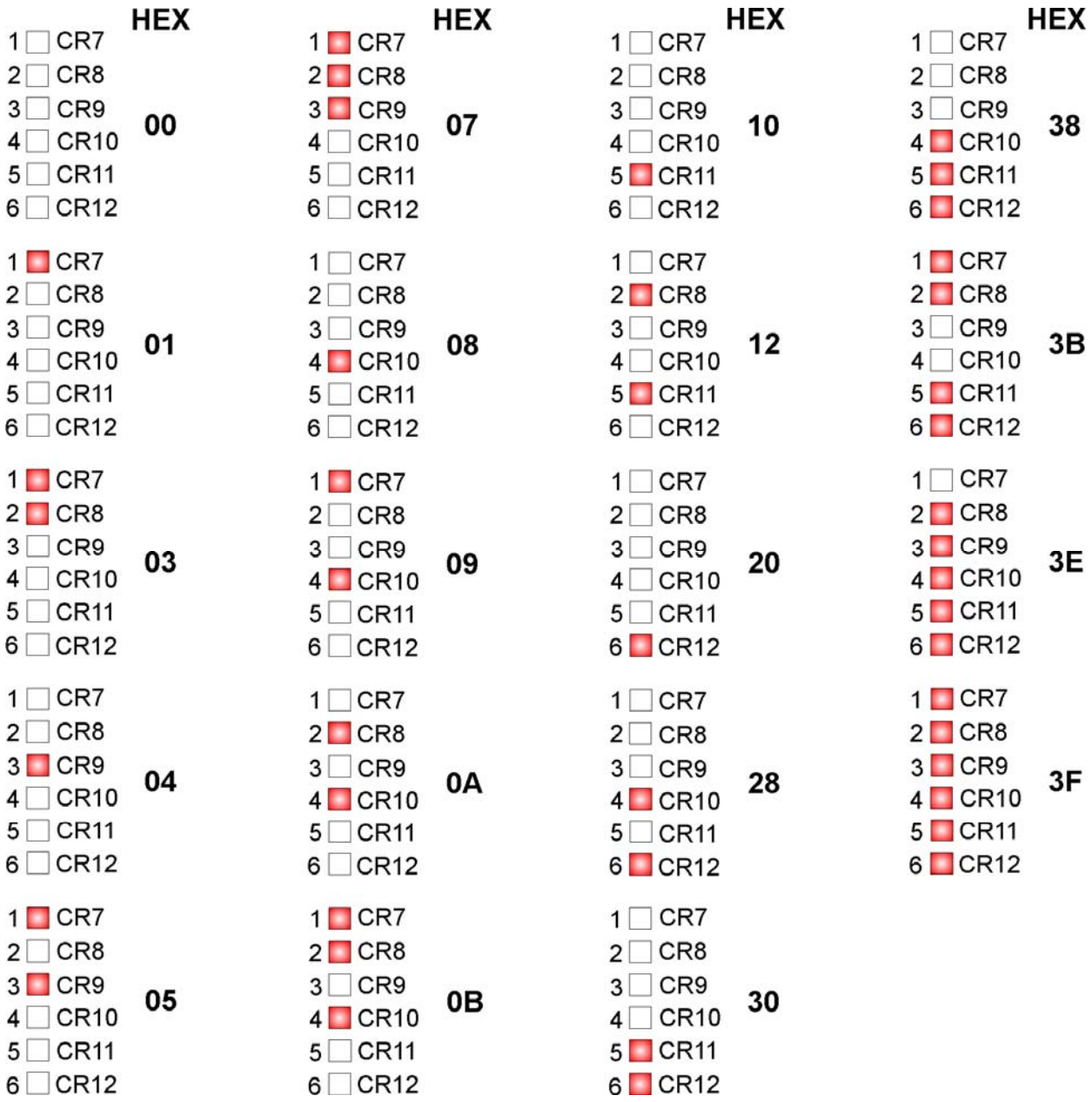


Figure 3 - CW_10 CPU Status LED Hexi-decimal Codes

3.2 CW_10 Multi-Function Interface Board (MFIB) Overview

Multi-Function Interface Boards provides plug-in connections for each PC board and I/O Module used in the RTU CW-10. MFIBs generate +15Vdc, -15Vdc and +5Vdc outputs from an integral DC-to-DC Converter and also provide other precision voltages required to operate the RTU. Termination for dc power, Form "C" watchdog contacts are provided for field wiring connections. The CMFIB also provides four communication ports which utilize 9-pin, D-Type, female connectors. Communications Ports 1 through 4 are identified in Figure 5A and Figure 5B.

Standard 9-Pin D-Type Connectors are used. Communication Port 1 is dedicated to RS-232 operation and Comm. Port 2 is factory configured for RS-485 operation but may be user configured (via Jumpers) for operation with a piggyback mounted Bristol modem. Communication Ports 3 and 4 can be configured for an RS-485 or RS-232 interface. The former is required for BSAP network communications, while the latter is required for devices such

as a PC or printer. However; these ports can also be configured for other applications. For example, port 3 can be configured to interface with a PC while port 4 can be configured for use with options such as an external modem or printer.

3.2.1 Setting MFIB Board DIP Switches

MFIB Boards contains three DIP switches (SW2, SW3 and SW4) for RS-485 operation configuration of Comm. Ports 2 through 4 respectively. When an individual switch (toggle) is pressed to the right it is set to its ON position (see Figure 4). Switches SW2 through SW4 control port configuration and are assigned as follows:

SW2 - Controls Port 2
SW3 - Controls Port 3
SW4 - Controls Port 4

Switch functions are provided for RS-485 operation, in Tables 7.

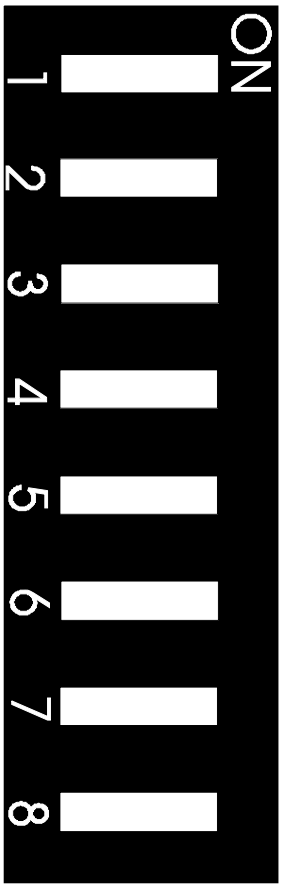


Figure 4 - Enlarged View of SW2-SW4

Setting switches SW2 through SW4 does not complete the set-up configuration. The jumpers listed in Table 8 must also be set to complete the procedure.

Note: When the RTU is specified with an internal (Port 2 only) 1200 bps Private Line (PL) Modem, a 1200 bps PL/PSTN Modem, a 9600 bps Publicly Switched Telephone Network (PSTN) Modem, refer to the appropriate Customer Instruction Manual, i.e., CI-1200-PL, CI-1200 (PL/PSTN), CI-9600 (PSTN) or CI-9600A (PSTN). For details on the Fiber Optic Interface, refer to Appendix FA of Instruction Manual CI-3310.

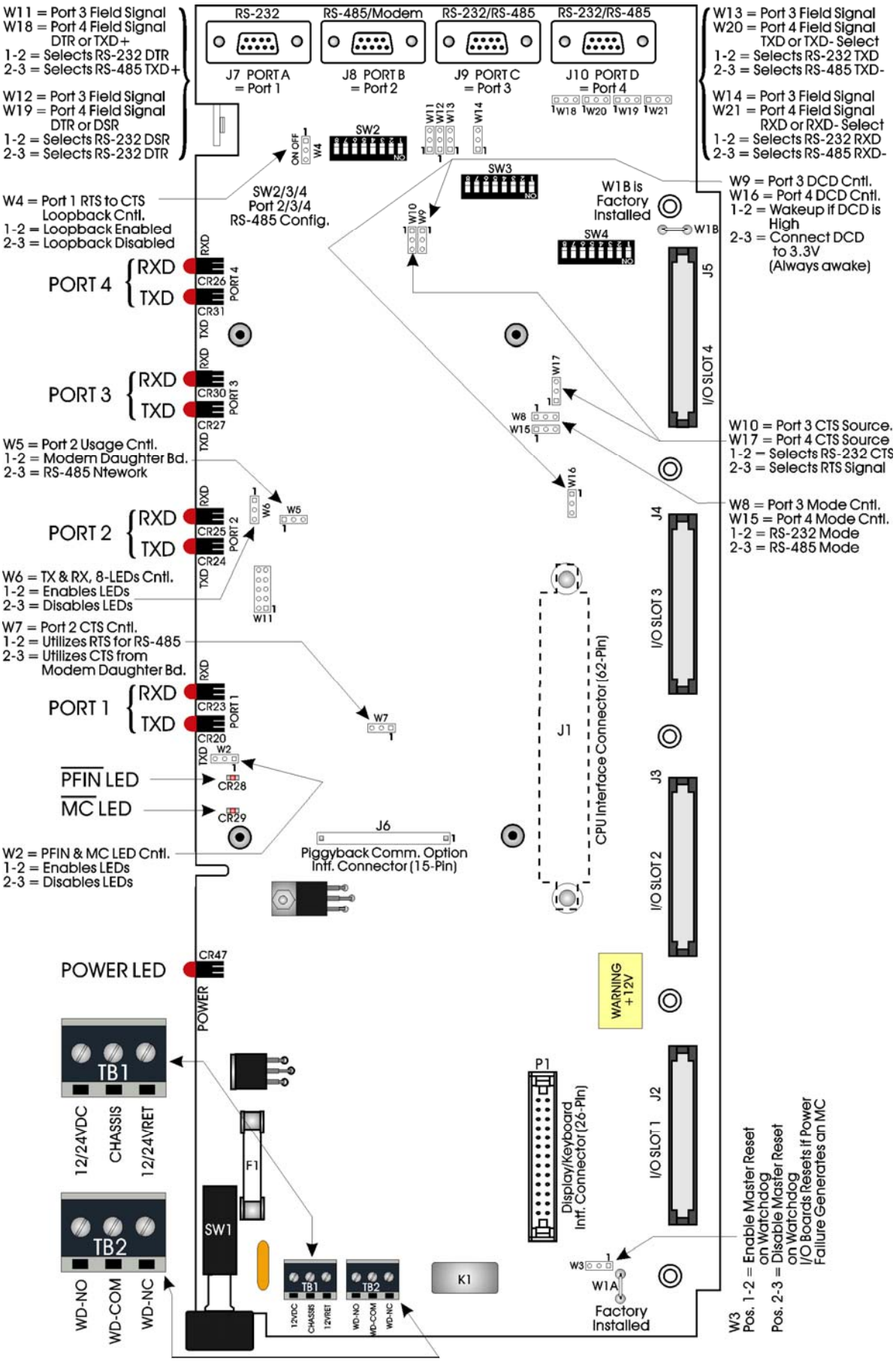


Figure 5A - CW_10 - MFIB Board Component Identification Diagram (Original Version)

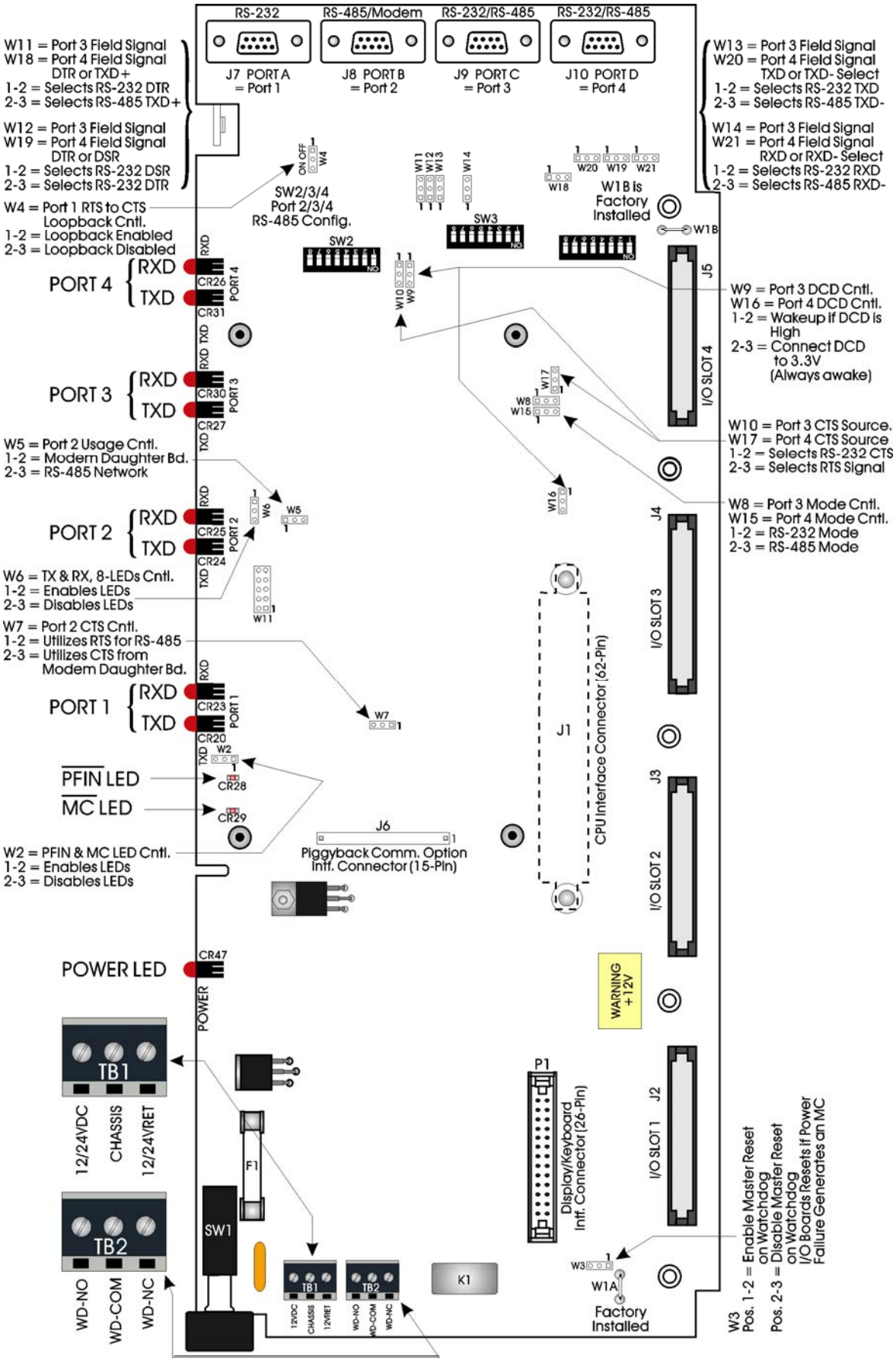


Figure 5B - CW_10 - MFIB Board Component Identification Diagram (Present Version)

Table 6 - MFIB Board DIP Switches SW2 - SW4 - RS-485 Configuration Selections

SW1- SW4	Function	Setting
1	TX+ to RX+ Loopback	ON = Loopback Enabled, 2-Wire OFF = Loopback Disabled, 4-Wire
2	TX– to RX– Loopback	ON = Loopback Enabled, 2-Wire OFF = Loopback Disabled, 4-Wire
3	RS-485 Termination	ON = Termination Installed OFF = No Termination
4	RS-485 Termination	ON = Termination Installed OFF = No Termination
5	OFF	
6	OFF	
7	RS-485 Bias Termination	ON = Bias Enabled (Pos. side of bias to +15Vdc) OFF = No Bias
8	RS-485 Bias Termination	ON = Bias Enabled (Neg. side of bias to -15Vdc) OFF = No Bias

3.2.2 Setting MFIB Board Configuration Jumpers

MFIB Boards contains up to twenty user configuration jumpers to set various communication and operating parameters. The location of these jumpers is shown in Figure 5A and Figure 5B. Jumpers are set according to Table 7.

Table 7 - MFIB Board Configuration Jumper Settings

Jumper	Description	Setting	Configuration
W2	PFIN & MC LED Control	1 to 2 2 to 3	Enable PFIN & MC LEDs Disable PFIN & MC LEDs
W3	Master Reset Control	1 to 2 2 to 3	Enable I/O Board Reset on Watchdog Disable I/O Board Reset on Watchdog* *I/O Boards reset if Power Failures Generates on MC
W4	Port 1 RTS/CTS Loopback Control	1 to 2 2 to 3	Loopback Enabled Loopback Disabled
W5	Port 2 Usage Control	1 to 2 2 to 3	Port 2 = Has Modem Daughter Board Port 2 = RS-485 Network
W6	Ports 1 through 4 TX/RX LED Control	1 to 2 2 to 3	Enables TX/RX LEDs Disabled TX/RX LEDs
W7	Port 2 CTS Source Control	1 to 2 2 to 3	Utilize RTS for RS-485 Utilize CTS from Modem Daughter Bd.
W8	Port 3 Mode Control	1 to 2 2 to 3	Port 3 = RS-232 Port 3 = RS-485
W9	Port 3 DCD Control	1 to 2 2 to 3	Wakeup if DCD is High Connect DCD to 3.3Vdc (Always awake)
W10	Port 3 CTS Source Control	1 to 2 2 to 3	Utilize Port 3 RS-232 CTS Signal Utilize Port 3 RTS Signal
W11	Port 3 Field Signal Selection DTR or TXD+	1 to 2 2 to 3	Utilize RS-232 DTR Utilize RS-485 TXD+
W12	Port 3 Field Signal Selection DTR or DSR	1 to 2 2 to 3	Utilize RS-232 DSR Utilize RS-232 DTR
W13	Port 3 Field Signal Selection TXD or TXD–	1 to 2 2 to 3	Utilize RS-232 TXD Utilize RS-485 TXD–

Table 7 - MFIB Board Configuration Jumper Settings (Continued)

Jumper	Description	Setting	Configuration
W14	Port 3 Field Signal Selection RXD or RXD–	1 to 2 2 to 3	Utilize RS-232 RXD Utilize RS-485 RXD–
W15	Port 4 Mode Control	1 to 2 2 to 3	Port 4 = RS-232 Port 4 = RS-485
W16	Port 4 DCD Control	1 to 2 2 to 3	Wakeup if DCD is High Connect DCD to 3.3Vdc (Always awake)
W17	Port 4 CTS Source Control	1 to 2 2 to 3	Utilize Port 4 RS-232 CTS Signal Utilize Port 4 RTS Signal
W18	Port 4 Field Signal Selection DTR or TXD+	1 to 2 2 to 3	Utilize RS-232 DTR Utilize RS-485 TXD+
W19	Port 4 Field Signal Selection DTR or DSR	1 to 2 2 to 3	Utilize RS-232 DSR Utilize RS-232 DTR
W20	Port 4 Field Signal Selection TXD or TXD–	1 to 2 2 to 3	Utilize RS-232 TXD Utilize RS-485 TXD–
W21	Port 4 Field Signal Selection RXD or RXD–	1 to 2 2 to 3	Utilize RS-232 RXD Utilize RS-485 RXD–

3.2.3 MFIB Board LED Indicators

In addition to power on (POWER) Power Fail Indication NOT (PFIN) and Master Clear NOT (MC) LEDs, MFIB Boards provide a TX and RX indicator for each communication channel. TX will light when the channel is transmitting data and RX lights when the channel is receiving data. Depending upon the data activity, the TX/RX LEDs may blink or appear continuously lit during communication activity. The TX/RX LEDs will be out when there is no activity (see Figures 5A & 5B).

3.2.4 MFIB Board Communication Port Information

MFIB Boards have 4 serial communication ports that are supported by 9-pin female D-type connectors that have pinouts similar to RTU 3310 MFIB Boards (see Figures 5A & 5B and Table 9). CMFIB Board Communication Ports 3 and 4 can be individually user configured for RS-232 or RS-485 operation. Communication Port 1 is dedicated to RS-232 operation. Communication Port 2 can be configured for RS-485 or piggyback modem operation.

The following information is provided to support use of MFIB Board Comm. Ports:

- When configured for RS-232 operation, MFIB Comm. Ports support RTS, DTR, CTS, DCD and DSR modem control signals.

- RS-232 transceivers are enabled by the port's DTR signal, i.e., when DTR goes high the port becomes active.

- Each RS-232 transceiver has one active receiver (DCD) while in the power-down mode (disabled). DCD is connected to the active receiver.

- When configured for RS-485 operation, the MFIB Comm. Port receiver is enabled by DTR while the driver is enabled by RTS.

- For RS-485 operation, an eight-position DIP switch (one per port 2 through 4) enables receiver biasing and termination as well as two-wire and 4-wire selection.

- MFIB RS-485 configured Comm. Port 4 is surge protected by a LC04-6 device.

- A 15-pin header (J6) supports the following **CW_10** external communication device options on MFIB Board Comm. Port 2: Radio Delay Interface (RDI), Transmitter Interface Board (TIB), 1200 Baud, 9600 Baud and Fiber Optic Modems.

- Optional Piggy-back modems are supported by Comm. Port 2 only.

Table 8 - MFIB Board Connector J6 - Modem Option Header Pin Designations

Pin #	Signal
2	GND
3	+5V
4	+15V
5	-15V
6	TXD
7	RTS NOT
8	DTR NOT
9	RXD
10	CTS NOT
11	DSR NOT
12	DCD NOT

Note: Pins 1, 13, 14 and 15 are unpopulated.

Table 9 - MFIB Board RS-232/RS-485 D-Type Connector Pin Assignments
Note: Identical to CW_10 Ports 5 & 6 on Connector Mounting Plate

Pin #	Signal RS-232	Description: RS-232 Signals	Signal RS-485	Description: RS-485 Signals
1	DTR	Data Terminal Ready Output	TXD+	Transmit Data +
2	TXD	Transmit Data Output	TXD–	Transmit Data –
3			RXD+	Receive Data +
4	RXD	Receive Data Input	RXD–	Receive Data –
5	RTS	Request To Send Output		
6	CTS	Clear To Send Input		
7	DCD	Data Carrier Detect Input		
8	DSR	Data Set Ready Input		
9	GND	Ground	GND	Ground

SECTION 4 - ControlWave_10 CONFIGURATION

There are seven (7) main steps required to configure a **CW_10** RTU. This document provides an overview of these steps with an emphasis on the installation and configuration of the hardware. This section is also intended to serve as a reference for users who may have already upgraded at least one **CW_10** RTU.

4.1 Step 1 - Hardware Configuration

This involves unpacking the **CW_10** upgrade hardware, setting switches and setting jumpers on the new **CW_10** boards, replacing the 3310's CPU and MFIB Boards with the **CW_10** boards, reconnecting any permanent communication cables, and connecting a communications cable to a PC workstation to facilitate downloading the application load. To upgrade the 3310 RTU to a **CW_10**, follow Hardware Configuration steps 1 through 6 below:

1. Remove the **CW_10** boards from their carton. Remove all communication cables and the CPU, I/O and MFIB Boards from the 3310 RTU being upgraded. (see Figures 2, 5A & 5B as required). **Note make sure the Comm. Cables are identified for proper reinstallation.**

2. Configure the DIP Switches and Jumpers on the MFIB (see Figures 4, 5A & 5B). Section 3.2.1 and Table 6 provide information on MFIB Board DIP Switches. Table 7 provides information on MFIB Board Jumpers. If required remove the optional modem from the MFIB Board removed from the 3310 RTU in Hardware Configuration step # 1 and reinstall the modem onto the replacement MFIB Board. Install the replacement MFIB Board into the **CW_10**.

3. Make sure that the Lithium Backup Battery has been enabled, i.e., Backup Battery Jumper W3 on the **CW_10** CPU should be installed across jumper posts 1 and 2. Configure the **CW_10** CPU Board's DIP Switches and Jumpers. Figure 2 and Tables 1 through 3 provide information on Switch Settings. Jumper settings are provided in Figure 2 and in section 3.1.4. Install the **CW_10** CPU Board into the **CW_10**.

4. Re-install any I/O Module(s) removed in Hardware Configuration steps 1.

5. Connect the communication port cables removed in step 1. Connect the **CW_1**0 CPU's 3-Wire Utility to a Communication Port of a PC (typically PC COMM. Port 1).

   A **CW_10** can be configured as a Master or Slave node on either a MODBUS network or a BSAP network. A variety of communication schemes are available. Three communication ports are contained on the **CW_10** CPU Board. These communication ports are discussed in Sections 3.1.2, 3.1.4 and 3.1.5 (CPU) and 3.2, 3.2.1, 3.2.2 and 3.2.4 (MFIB) and are designated as follows:

   CW_10 CPU Board:

   COM5 - Port BIP1 (physically located on the Connector Mounting Plate: (9-Pin Female D-Type) RS-232 or RS-485 operation (Configured by CPU Jumpers W9 through W15) (RS-485 operation utilizes CPU Switch SW3). **Note: This port was named BIP1 on original 3310 RTUs.** When set for factory defaults, COM5 defaults to 9600 baud, 8-bits, no parity, 1 stop bit, BSAP/ControlWave Designer protocol operation.

   COM6 - Port BIP2 (physically located on the Connector Mounting Plate: (9-Pin Female D-Type) RS-232 or RS-485 operation (Configured by CPU Jumpers W16 through W22) (RS-485 operation utilizes CPU Switch SW4). **Note: This port was named BIP2 on original 3310 RTUs.** When set for factory defaults, COM6 defaults to 9600 baud, 8-bits, no parity, 1 stop bit, BSAP/ControlWave Designer protocol operation.

   Utility Port - 3-Wire RS-232 (for FLASH Firmware and Core Updumps) (Utilizes CPU Switch SW1). The Utility Port operates at 115.2 Kbaud and utilizes the 1KXModem or Xmodem protocol.

   CW_10 MFIB Boards:

   COM1 - Port 1 (J7): (9-Pin Female D-Type) RS-232 (Configured by MFIB Jumper W4). **Note: This port was named A on original RTU 3310s.** When set for factory defaults, COM1 defaults to 115 Kbaud (RS-232), BSAP operation.

   COM2 - Port 2 (J8): (9-Pin Female D-Type) RS-232 or Piggyback Modem operation (Configured by MFIB Jumpers W5 and W7) (RS-485 operation utilizes MFIB Switch SW2). **Note: This port was named B on original RTU 3310s.** When

set for factory defaults, COM2 defaults to 9600 baud, 8-bits, no parity, 1 stop bit, BSAP/ControlWave Designer protocol operation.

COM3 - Port 3 (J9): (9-Pin Female D-Type) RS-232 or RS-485 operation (Configured by MFIB Jumpers W8 through W14) (RS-485 operation utilizes MFIB Switch SW3). **Note: This port was named C on original RTU 3310s.** When set for factory defaults, COM3 defaults to 9600 baud, 8-bits, no parity, 1 stop bit, BSAP/ControlWave Designer protocol operation.

COM4 - Port 4 (J10): (9-Pin Female D-Type) RS-232 or RS-485 operation (Configured by MFIB Jumpers W15 through W21) (RS-485 operation utilizes MFIB Switch SW4). **Note: This port was named D on original RTU 3310s.** When set for factory defaults, COM4 defaults to 9600 baud, 8-bits, no parity, 1 stop bit, BSAP/ControlWave Designer protocol operation.

Communication Ports COM1 through COM6 and the Utility Port support serial asynchronous operation as listed above. Communication ports COM1 through COM6 can be configured for local communications, i.e., connected to a PC loaded with **Control**Wave Designer and OpenBSI software. The Utility Port (J8 on the **CW_10** CPU Board) is used for FLASH firmware loads or Core Updumps. The pin labels for the various RS-232/485 interface connectors are provided in Table 9 (see Figure 6 for RS-232 wiring diagrams and CPU Port J8 Pin assignments).

4.1 Step 1 - Hardware Configuration (Continued)

RS-232 & RS-485 Interfaces

CW_10 RTU RS-232 & RS-485 communication schemes are discussed herein.

RS-232 Ports

An RS-232 interface supports Point to Point, half-duplex and full-duplex communications (20 feet maximum, using data quality cable). Half-duplex communications supported by the **CW_10** utilize MODBUS or BSAP protocol, while full-duplex is supported by the Point to Point (PPP) protocol. **CW_10** RS-232 ports utilize the cable shown in Figure 6A - Top to interconnect with other devices such as a PC or a **Control**Wave series unit (other than a **CW_10/30/35** the **CW_10** RTU is communicating using the full-duplex PPP protocol. The half-duplex cable of Figures 6A (Bottom), is utilized when the **CW_10** is connected to a **Control**Wave series unit other than a **CW_10/30/35** and is running other than the PPP protocol. If communicating with a Bristol series 3305, 3310, 3330, 3335 RTU/DPC or to another **CW_10/30/35** RTU/DPC, one of the cables shown in Figure 6B must be used.

CW_10 RTU CPU Board's Utility Port utilizes the cable shown in Figure 6C.

Note: The following facts regarding **CW_10** RS-232 serial communication ports should be observed when constructing communications cables:

- DCD must be high to transmit (except when dialing a modem)
- Each RS-232 transceiver has one active receiver while in powerdown mode (disabled); the DCD signal is connected to the active receiver.
- CTS must be high to transmit.
- When port is set for full-duplex operation - RTS is always ON.
- DTR is always high (when port is active); DTR enables RS-232 Transceivers.
- When port is set for half-duplex operation - CTS must go low after RTS goes low.
- All RS-232 Comm. ports support RTS, DTR, CTS, DCD and DSR control signals.

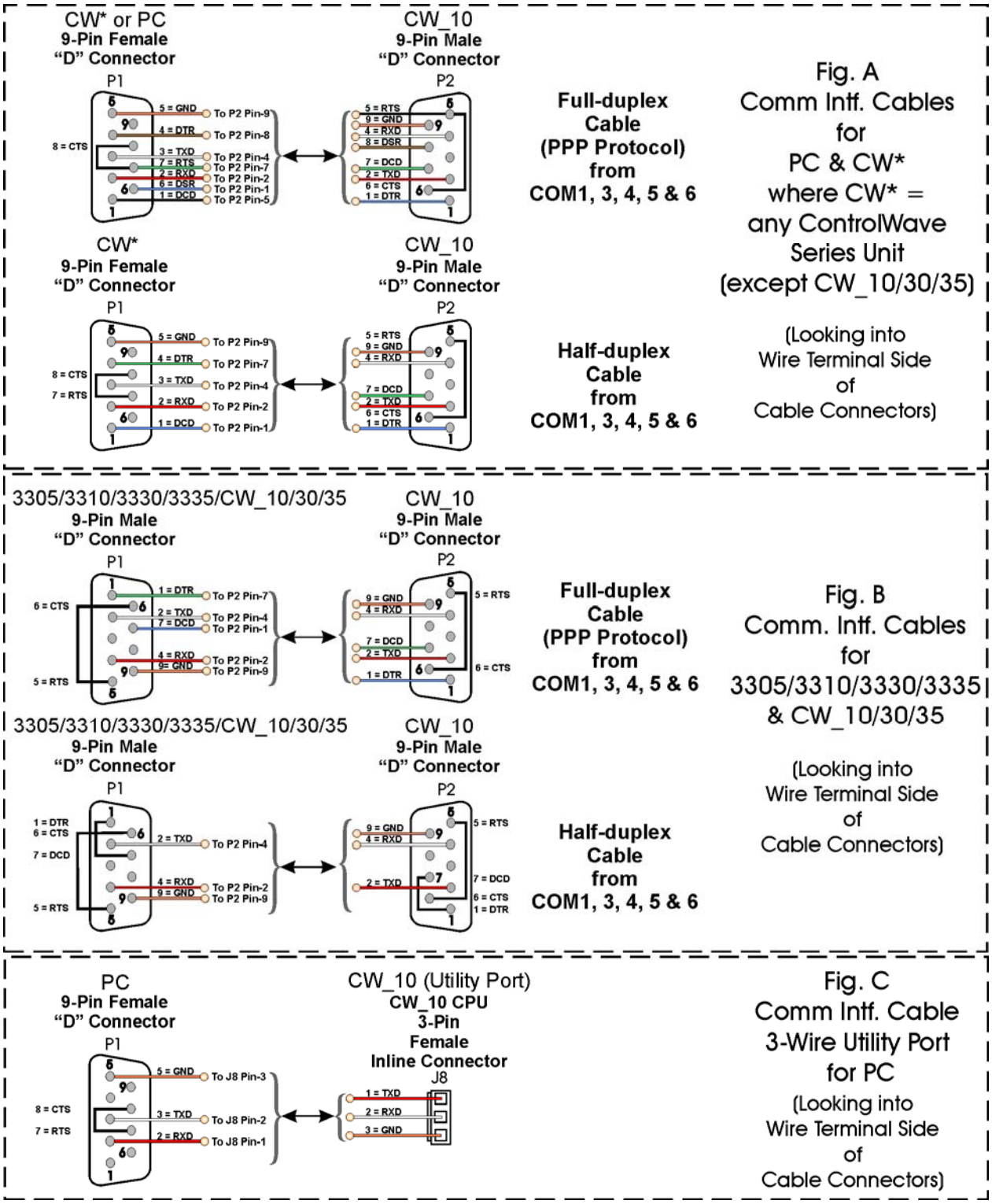


Figure 6 - Communication Port RS-232 Cable Wiring Diagram

4.1 Step 1 - Hardware Configuration (Continued)

RS-485 Ports

CW_10 RTUs can use an RS-485 communication port for local network communications to multiple nodes up to 4000 feet away. Since this interface is intended for network communications, Table 11 provides the appropriate connections for wiring the master, 1st slave, and nth slave. Essentially, the master and the first slave transmit and receive

data on opposite lines; all slaves (from the first to the "nth") are paralleled (daisy chained) across the same lines. The master node should be wired to one end of the RS-485 cable run.

A 24-gauge paired conductor cable, such as Belden 9843 should be used. *Note: Only half-duplex RS-485 networks are supported*

Table 10 - RS-485 Port
Connector Pin Assignments (COM 2 through COM6))

Pin #	Signal RS-485	Description: RS-485 Signals
1	TXD+	Transmit Data + Output
2	TXD–	Transmit Data – Output
3	RXD+	Receive Data + Input
4	RXD–	Receive Date – Input
9	Power Ground	Ground

Receiver biasing and termination as well as 2-wire or 4-wire selection are enabled by eight-position DIP-Switches situated on the **CW_10** CPU Board for COM5 and COM6 or on **CW_10** MFIB Boards for COM 2 through COM 4 as follows:

COM2: MFIB Board Switch SW2 (see Figures 5A & 5B) (see Table 6)
COM3: MFIB Board Switch SW3 (see Figures 5A & 5B) (see Table 6)
COM4: MFIB Board Switch SW4 (see Figures 5A & 5B) (see Table 6)
COM5: CPU Board Switch SW3 (see Figure 2) (see Table 3)
COM6: CPU Board Switch SW4 (see Figure 2) (see Table 3)

Table 10 provides the connector pin assignments for all **CW_10** RS-485 communication ports. Tables 3 & and 6 provide the RS-485 termination and loopback control Switch Settings for the RS-485 Ports on the CPU and MFIB Boards (respectively).

To ensure that the "Receive Data" lines are in a proper state during inactive transmission periods, certain bias voltage levels must be maintained at the master and most distant slave units (end nodes). These end nodes also require the insertion of 100-Ohm terminating resistors to properly balance the network. CPU Board and MFIB Board switches must be configured at each node to establish proper network performance. This is accomplished by configuring the appropriate CPU/MFIB Board Switches so that the 100-Ohm termination resistors and biasing networks are installed at the end nodes and are removed at all other nodes on the network (see Table 3 for CPU Boards and Table 6 for MFIB Boards).

Table 11 - RS-485 Network Connections
(see Table 10 for **CW_10** RS-485 Port Pin # Assignments)

From Master	To 1st Slave	To nth Slave
TXD+	RXD+	RXD+
TXD–	RXD–	RXD–
RXD+	TXD+	TXD+
RXD–	TXD–	TXD–
GND	GND	GND

Note: Pins 1, 2, 3, 4 & 9 of Series 3305, 3310, 3330, 3335 & 3340 RTU/DPC RS-485 Comm. Ports are assigned as follows: 1 = TXD+, 2 = TXD-, 3 = RXD+, 4 = RXD- & 9 = ISOGND.

4.1 Step 1 - Hardware Configuration (Continued)

6. Apply power to the **CW_10** RTU. Continue with Steps 2 through 7 below (Sections 4.2 through 4.7 and Section 5.1) and the **CW_10** will be ready for on line operation.

4.2 Step 2 - Software Installation on the PC Workstation

ControlWave **Designer** software must be installed on the PC. This is accomplished by installing the **Control**Wave **Designer Package** from the Open BSI CD ROM.

You must install the **Open BSI Network Edition**. For information on minimum system requirements and more details of the installation, see the installation procedure in Chapter 2 of the *Open BSI Utilities Manual* (document # D5081).

IMPORTANT:

When you start ControlWave Designer, you will be reminded to register the software. Unregistered software can only be used for a maximum of 30 days. For more information on the registration process, see Chapter 2 of the Open BSI Utilities Manual (document# D5081).

4.3 Step 3 - Establish Communications using either LocalView or NetView, and run the Flash Configuration Utility

Communications must be established with the **CW_10** using either LocalView or NetView.

The **CW_10** CPU Board ships from the factory with a default Flash configuration. Most users will need to edit this configuration to set the IP address (if using Ethernet – default IP address = 10.0.1.1 with IP Mask = 255.255.255.0), BSAP local address, user accounts, and port parameters. This can be done in one of two ways:

- Either open the supplied Flash Configuration Profile (FCP) file and modify it, directly in the Flash Configuration Utility, or in a text editor,
- Or retrieve existing Flash Parameters directly from the unit, and edit them in the Flash Configuration Utility.

Detailed information on the Flash Configuration Utility and LocalView is included in Chapter 5 of the *Open BSI Utilities Manual* (document # D5081). NetView is described in Chapter 6 of that same manual.

4.4 Step 4 - Create an Application-specific Control Strategy in ControlWave **Designer**

At this point, you can create your application-specific control strategy using **Control**Wave Designer. If you are upgrading this unit from an RTU 3310 ACCOL II-based unit, you can start by using the ACCOL Translator utility to take an existing ACCOL II load, and convert it to a ControlWave Designer project. You will then need to examine the translated project, and modify it, as necessary, to re-work logic that is unsupported in ControlWave Designer.

If you don't have a pre-existing ACCOL load to translate, you can create an all-new project in ControlWave Designer. This involves opening a new project using the '**Control**Wave **MICRO**' template, defining I/O boards using the I/O Configurator, and creating a program using one or more of the five supported IEC 61131 languages (FBD, ST, SFC, LD, or IL). Some of these languages are text based, others use graphical diagrams. The choice is up to you, depending upon your particular application.

The ***Control****Wave* ***MICRO*** *Quick Setup Guide* (document # D5124) includes a simple LD example. Additional examples are included in the manual, *Getting Started with* ***Control****Wave Designer* (document # D5085). More detailed information about **Control**Wave Designer and IEC 61131 is included in the ***Control****Wave Designer Reference Manual* (document # D5088).

The ACCOL3 Firmware Library, which is automatically accessible through the template referenced above, includes a series of function blocks which perform a variety of process control and communication functions. These can be included within your program to perform various duties including PID control, alarming, calculations, etc. Detailed information about each function block is included in the **Control**Wave Designer on-line help files.

On the variables declaration page(s) in **Control**Wave Designer, you will need to mark any variable you want to make accessible to external programs, such as Open BSI's DataView utility, as **"PDD"**. Similarly, any variables which should be collected into a database, or exported using the **O**LE for **P**rocess **C**ontrol (OPC) Server must be marked as **"OPC".** Variables marked as OPC can be built into a text file by the **Open BSI Signal Extractor.** The text file can then be used in the creation of a database for human machine interface (HMI) software such as OpenEnterprise, or Iconics' Genesis. These HMI software packages require that the **"Datatype conversion enable"** option be selected when generating the file using Signal Extractor. Information about the Open BSI Signal Extractor is included in Chapter 12 of the *Open BSI Utilities Manual* (document # D5081).

Once the program has been created, it is assigned to an executable task. The entire project is then saved and compiled.

Debugging of your completed control strategy program can be performed using the built-in debugger. Optionally, you can also use the I/O Simulator to simulate the outputs on your I/O boards, as your project executes. Note, however, that the I/O Simulator only supports the IPC*xx* resource; therefore, to use it, you will need to add a *second* resource (IPC*xx*) to your project, and make copies of your tasks and global variable worksheets under the new resource.

NOTE:
From this point on, the order of steps may be varied, somewhat, depending upon the requirements of the user's application.

4.5 Step 5 - Create Application-specific Web Pages (OPTIONAL)

ControlWave-series controllers, including the **CW_10**, can optionally export data to user-created web pages.

A series of ActiveX controls for data collection and configuration are provided on the Open BSI CD that can be included as part of these web pages (For information on the ActiveX controls, see the *Web_BSI Manual* (document# D5087).

You can use whichever HTML creation package you want to create the pages, however, all **Control**Wave web pages must be viewed within Microsoft® Internet Explorer.

The web pages may reside either on the PC workstation, or they can be downloaded into FLASH memory at the **CW_10**. If stored at the **CW_10**, you must use the ControlView utility to retrieve the page (using FTP) for viewing in Internet Explorer.

4.6 Step 6 - Create an Open BSI Network Containing the CW_10, or add the CW_10 to an Existing Open BSI Network

In order for the **CW_10** unit to function as part of a Bristol network, it is necessary to include it in the Bristol network.

If no Bristol network exists:

You need to run Open BSI's NetView software on the PC workstation in order to define a Bristol network. A series of software wizards are used to define a Network Host PC, a network, and the DPC/RTUs (controllers) assigned to the network. Finally, communication lines must be specified which handle the address assigned to the **CW_10**. Chapters 3 and 4 of the *Open BSI Utilities Manual* (document # D5081) include 'quick start' examples for performing these steps. More detailed information is included in the NetView chapter (Chapter 6) of D5081.

If a Bristol network already exists:

You will need to add the **CW_10** to the existing network using NetView's RTU Wizard. Chapter 6 of the *Open BSI Utilities Manual* (document # D5081) includes different subsections depending upon whether you are adding the unit to a BSAP network, or an IP network.

4.7 Step 7 - Download the Application-specifc Control Strategy into the CW_10 RTU

Either **Control**Wave Designer or the Open BSI 1131 Downloader allows you to download your completed control strategy (application load) file into the **CW_10** RTU. Users download the control strategy into the BOOT Project area of FLASH memory; this ensures that if the **CW_10** RTU is reset, or if there has been a failure of the backup battery, that the control strategy can be restarted from the beginning, i.e., from the BOOT Project in FLASH memory.

The Open BSI 1131 Downloader also allows the user to download files (such as user-created web pages) into FLASH memory in the **CW_10** RTU. These can be uploaded to the PC using the ControlView utility. To download the application load, see Section 5.1 titled Downloading the Application Load.

SECTION 5 - OPERATIONAL DETAILS

CW_10 RTUs are shipped from the factory with firmware that allows the unit to be configured in conjunction with an IEC 61131, application program. This section provides information as follows:

- Steps required to download the application load and place the unit into 'Run' mode.
- Steps required to download system firmware.
  Core Updumps

5.1 Downloading the Application Load

Any **CW_10** RTU must have a configured application load before it can be placed into operation. For units being upgraded with the hardware discussed herein, this will require connection of the **CW_10** RTU to a PC running Windows NT (4.0 or higher), Windows 2000 or Windows XP Professional and equipped with **Control**Wave Designer software & OpenBSI software. Configuration of the application load must be performed by an individual familiar with the various programming tools. The following software user documentation is referenced:

Getting Started with **Control**Wave Designer Manual - D5085
ControlWave Designer Reference Manual - D5088
Open BSI Utilities Manual - D5081
Web_BSI Manual - D5087

An application load download can be initiated, i.e., from **Control**Wave Designer, or from the OpenBSI 1131 Downloader for **CW_10** RTU Nodes.

1. Make sure that the **CW_10** CPU's Recovery Switch (SW1) is set in 'Local Mode,' i.e., SW1-1 set to the **OFF** position and SW1-2 set to the **ON** position.

   Note:
   From the factory, COM1 defaults to 115.2 Kbaud (RS-232) using the BSAP Protocol. Don't connect COM1 to a PC unless the PC's RS-232 port in question has been configured for BSAP operation.

2. Once the **CW_10** RTU project has been defined, communications and configuration parameters have been set, perform the download according to either '**Control**Wave Designer' (see D5088 - chapter 11) or 'The Open BSI 1131 Downloader' (see D5081 - Chapter 7).

3. After the download has been completed leave the CPU Mode Switch (SW1) in the 'Local Mode' position.

5.2 Upgrading CW_10 Firmware

CW_10 CPU Boards ship from the factory with system firmware already installed. If an upgrade of the system firmware is required, use one of the procedures below to download the new or replacement firmware from the PC.

Upgrade of system firmware via LocalView FLASH Mode requires OpenBSI 5.1 (or newer). If you have an older version of OpenBSI, FLASH upgrades are to be performed via HyperTerminal. You will need a binary (*.BIN) system firmware file that is read as follows: c_30450.bin (where c_3 is the product code and 0450 is the release number). Upgrade of an unattended **CW_10** can be accomplished from a remote PC. This capability is introduced in Section 5.2.3.

5.2.1 Using LocalView to Upgrade CW_10 Firmware

NOTE
Your CW_10 RTU must be set to Recovery Mode ENABLE (ON) prior to performing the FLASH upgrade, then, set to Recovery Mode DISABLE (OFF) after the upgrade. On CW_10 RTUs this is accomplished via the CPU Board's Recovery

Switch SW1. Set SW1-3 to the ON position for Recovery Mode. After setting SW1-3 to the ON position, turn power OFF and then ON again.

A communication cable (see Figure 6C) must be connected to the Utility Port on the **CW_10** CPU Board and to any RS-232 port on the associated PC. The PC's RS-232 port used for this purpose must be set to run at 115.2 Kbaud. **CW_10** RTU CPU Switch SW1, position, 3 must be set ON.

Start LocalView, Choose FLASH, Enter A Name, Click on [Create]

Start LocalView by clicking on: **Start → Programs → OpenBSI Tools → LocalView**. The New View Mode dialog box will appear (see Figure 7).

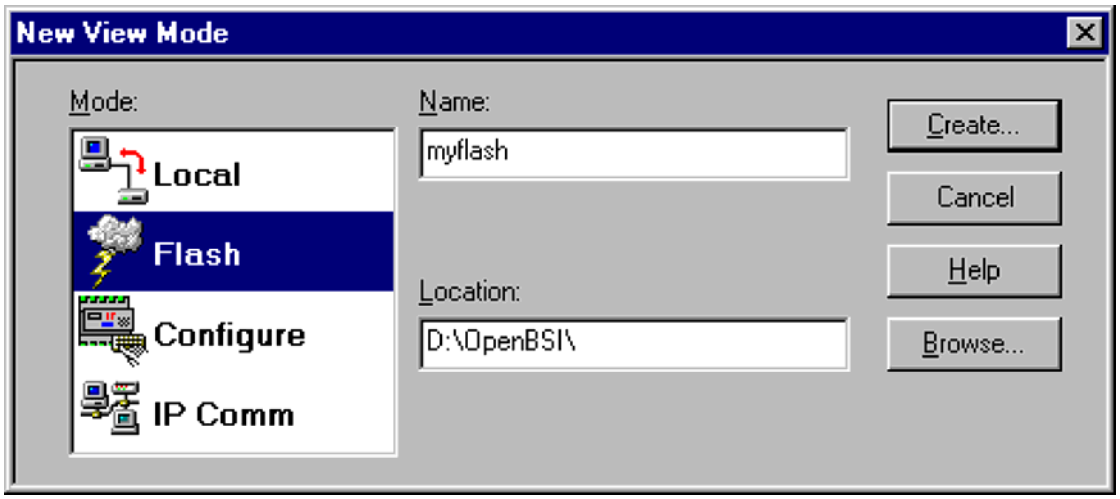


Figure 7 - Local View - New View Mode Menu

"Mode"
Choose 'Flash' for the mode.

"Name"
Enter a name for the View Mode File in the **"Name"** field.

"Location"
If you want to store the View Mode File in a directory other than that shown in the **"Location"** field, enter the new location there, or use the **[Browse]** push button to find the directory.

When the **"Mode"**, **"Name"**, and **"Location"** have been specified, click on the **[Create]** push button to activate the Communication Setup Wizard.

Step 1 - Communication Setup

Choose the communication port you want in the **What port would you like to use:** field. Click on the **[Next]** pushbutton to activate the next wizard.

Figure 8 - Communication Setup: Step 1 Menu

Step 2 - Flash RTU Setup

In the Flash RTU Setup Wizard, you need not set the RTU type or local address, since these are unused in this mode. Click on the **[Next]** push button to activate the Flash Data Setup Wizard.

Figure 9 - Flash RTU Setup Menu

Step 3 - Flash Data Setup

Complete the following fields in the Flash Data Setup Wizard:

"Please enter the name of the binary file to Flash"

To upgrade system firmware, you must specify the path and name of a binary (*.BIN) file on your hard disk containing the firmware.

Click on **[Finish]** to install the specified BIN file in FLASH memory at the RTU.

Once the Flash download has begun, you will NOT be allowed to shut down LocalView, unless you cancel the download, or it has been completed.

The progress of the Flash download will be displayed in the window. Any mismatch in file versions, or if the type of .BIN file does not match the type of RTU/DPC, the download will be aborted.

Figure 10 - Flash Data Setup Menu

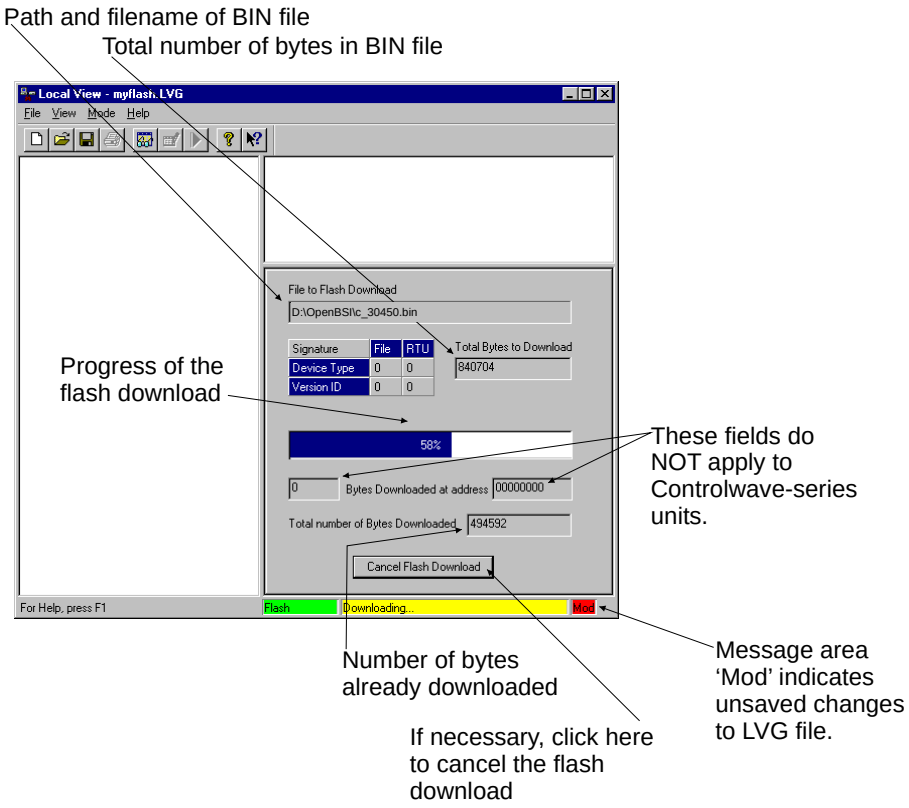


Figure 11 - Local View Downloading System Firmware Menu

Once the download has completed, set CPU Switch SW1-3 to the OFF position and then turn power OFF and then ON again.

5.2.2 Using HyperTerminal to Upgrade CW_10 Firmware

A communication cable (see Figure 6C) must be connected to the **CW_10** CPU Board Utility Port and to any RS-232 port on the associated PC. The PC's RS-232 port used for this

purpose must be set to run at 115.2 Kbaud. **CW_10** CPU Board Switch SW1, position, 3 must be set to the **ON** position.

1. If not already running, apply power to the associated PC.

2. Start the HyperTerminal program on the PC. Note: HyperTerminal is a Windows 95 (or newer) application utility program. If using HyperTerminal for the first time, set the communications properties (for the PC Port being utilized) via the Properties Menu as follows: Bits per second: = 115200, Data bits: = 8, Parity: = None, Stop bits: = 1, and Flow control: = None. After setting the communications properties, click OK.

3. Set the **CW_10** CPU Board's Recover Switch (SW1) for 'Recovery Mode,' i.e., set CPU Board Switch SW1-3 to the ON position.

4. Apply power to the **CW_10** RTU. The resident BIOS will initialize and test the hardware, this process is referred to as POST (Power On Self Test).

   Unless there is a problem status code 10 (Status LED #5 ON) will be posted to the CCPU Board's Status LEDs. Detection of a fault during POST will be posted on the Status LEDs. When the Power On Self Test has completed, a system status code will be posted to the Status LEDs (see Table 5 and Figure 3).

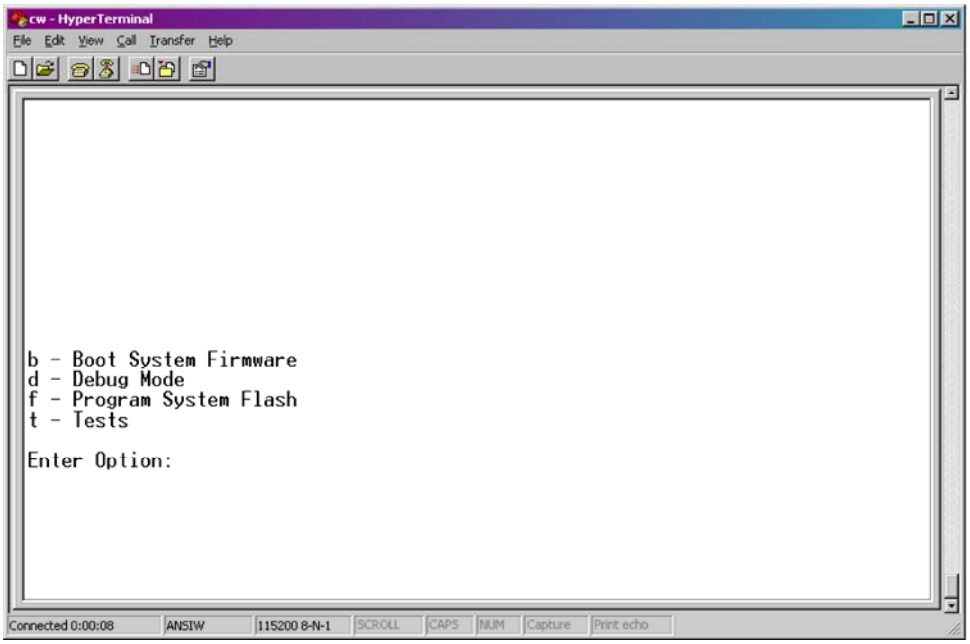


Figure 12 - HyperTerminal Recovery Mode Menu

From the HyperTerminal Recovery Mode menu (Figure 12), press the 'F' key to enter FLASH download. A message will be displayed warning that the FLASH is about to be erased; press the 'Y' key at the prompt. The screen will display dots as the flash devices are being erased; this could take a few minutes.

5. When the FLASH is ready for download the letter C will be displayed on the screen. In the HyperTerminal command bar click on Transfer and then Send File (see Figure 13). In the Send File Dialog Box (see Figure 14), select "1KXmodem" for the protocol, enter the filename of the appropriate .bin file in the format "C_3*xxxx*.bin" (where *xxxx* varies from release to release). Click on the Send button to start the download (see Figure 14).

When the HyperTerminal Recovery Mode Menu of Figure 12 appears, the download has completed.

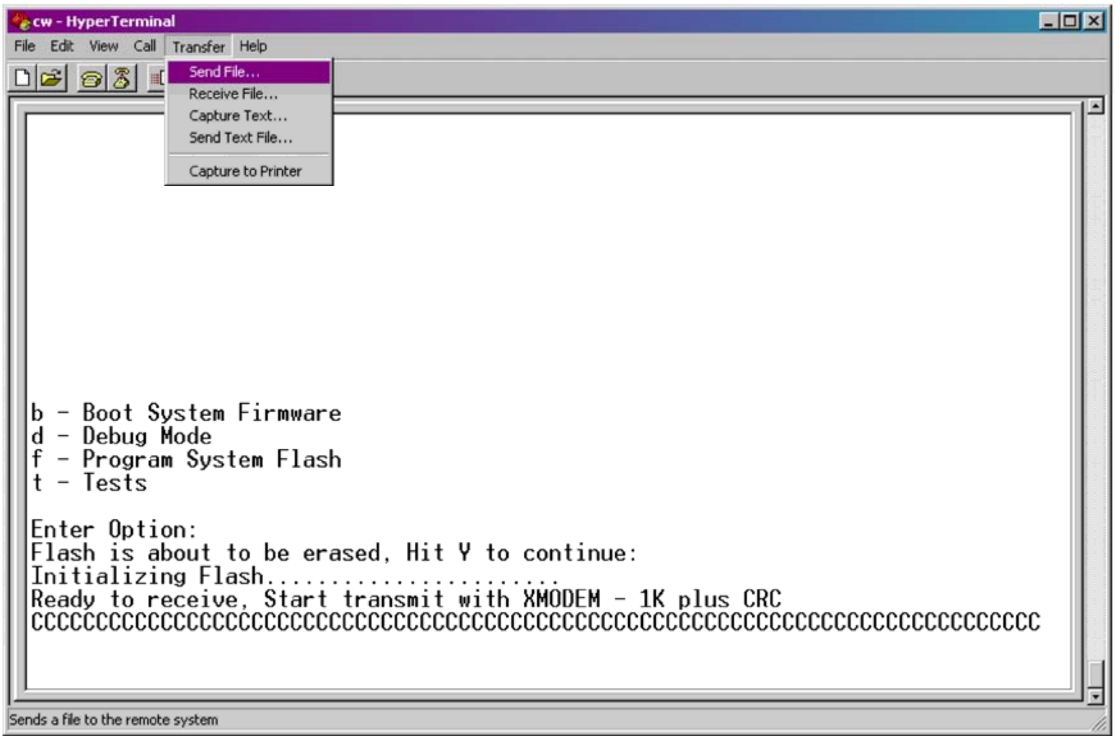


Figure 13 - HyperTerminal FLASH Download Menu (Ready to Download) - (Transfer/Send File Selected)

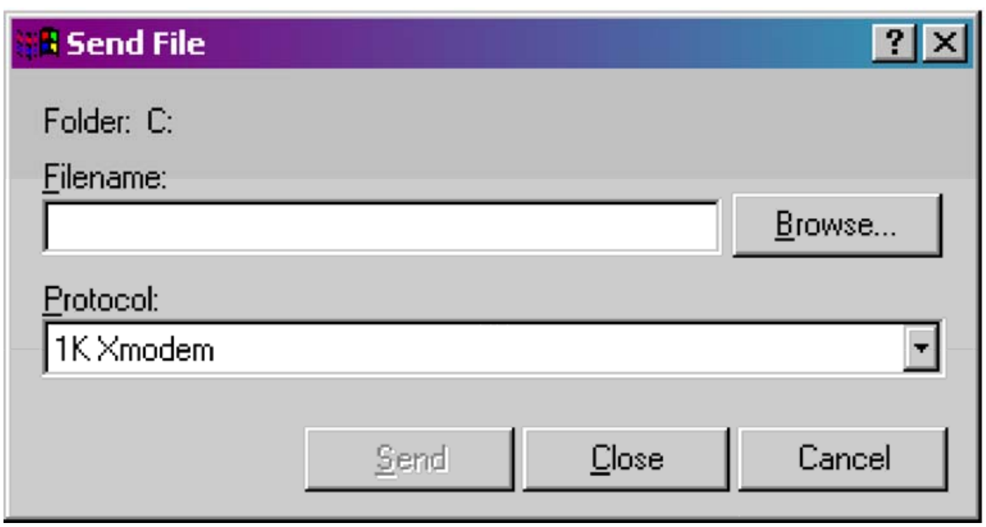


Figure 14 - HyperTerminal Flash Download (Send File Dialog Box)

6. Close the HyperTerminal program. The communication cable connected between the **CW_10** RTU and the PC can be removed if desired.

7. Set the CPU Board's Recovery Switch (SW1) for 'Local Mode,' i.e., set SW1-1 OFF and SW1-2 ON). Set SW1-3 OFF and then switch power OFF/ON.

Once the **CW_10** RTU is running its application load, status codes will be posted to the six Status LEDs on the CPU Board. These Status LED (Hex) Codes are listed in Table 5 (see Figure 3).

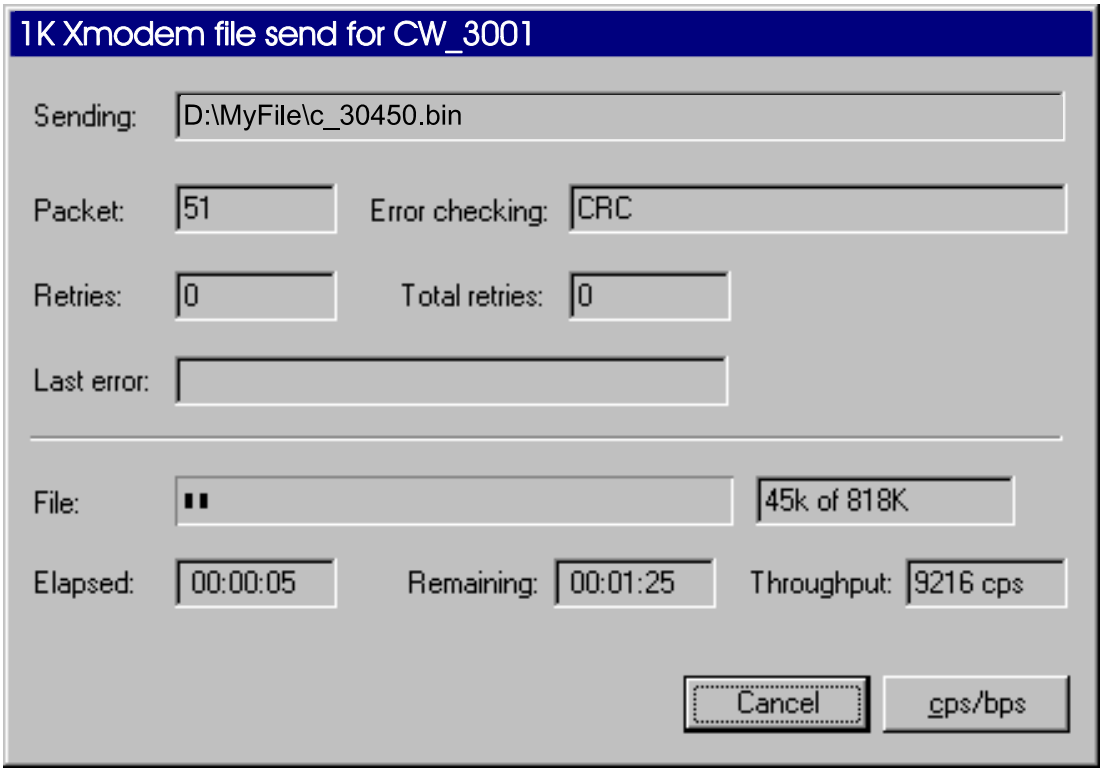


Figure 15 - HyperTerminal FLASH Download (Download in Process)

5.2.3 Remote Upgrade of CW_10 Firmware

It is possible to download system firmware into an unattended remote **CW_10** RTU. This function can only be accomplished if CPU Board Switch SW2-6 (associated with the unit in question) is set in the ON position (factory default). The procedure for performing a remote download of system firmware is discussed in Appendix J of the Open BSI Utilities Manual (document D5081). **Note: Remote Upgrade of CW_10 Firmware requires Boot PROM version 4.7 or higher and System PROM version 4.7 or higher.**

5.3 Core Updump

In some cases a copy of the contents of SRAM and SDRAM can be uploaded to a PC for evaluation by Bristol, Inc. engineers. This upload is referred to as a 'Core Updump.' A Core Updump may be required if the **CW_10** Remote Terminal Unit repeatedly enters a 'Watchdog State' thus ill effecting system operation. A Watchdog State is entered when the system crashes, i.e., a CPU timeout occurs due to improper software operation, a firmware glitch, etc. In some cases the Watchdog State may reoccur but may not be logically reproduced.

'Crash Blocks' (a function of firmware provided for watchdog troubleshooting) are stored in CPU RAM. The user can view and save the 'Crash Blocks' by viewing the Crash Block Statistic Web Page (see Chapter 4 of the Open BSI Technician's Toolkit - D5087). Crash Block files should be forwarded to Bristol, Inc. for evaluation. If additional information is required to evaluate the condition, a Core Updump may be requested by Bristol. Once the

file generated by the Core Updump has been forwarded to Bristol, it will be evaluated and the results will be provided to the user.

Follow the five steps below to perform a Core Updump.

1. Set CPU Board Switch SW2-1 OFF (Disable Watchdog Timer). If Switch SW2-4 is ON, set it to OFF (Enable Core Updump). **Note: The factory default setting for SW2-4 is OFF.**

2. Wait for the error condition (typically 3F on CPU Status LEDs).

3. Connect **CW_10** RTU's Utility Port to a PC (see Figure 6C).

4. Set CPU Board Switch (SW1- Recovery) so that SW1-1 and SW1-2 are both in either the **ON** position or the **OFF** position.

5. Start the PC's HyperTerminal Program (at 115.2kbaud) and generate a file using the 1KX-Modem protocol. Save the resulting Core Updump in a file to be forwarded to Bristol for evaluation.

When the Core Updump has been completed, set the CPU Board's Recovery Switch as follows: SW1-1 is in the **OFF** position & SW1-2 is in the **ON** position.

SECTION 6 - GENERAL SERVICE NOTES

Certain questions or situations frequently arise when servicing the **CW_10** RTU. Some items of interest are provided in Sections 6.1 through 6.3.

6.1 Extent of Field Repairs

Field repairs to a **CW_10** RTU are strictly limited to the replacement of complete modules. Component replacement on a **CW_10** RTU Module constitutes tampering and will violate the warranty. Defective **CW_10** RTU components (printed circuit boards, LCD Displays, etc.) must be returned to Bristol, Inc. for authorized service.

6.2 Disconnecting RAM Battery

The **CW_10** RTU's Lithium RAM battery cannot be replaced while power is on. Once the RAM battery has been replaced, the unit will still execute its FLASH-based application load (Boot Project) upon power-up, but all of the current process data will have been lost. Upon power-up, the unit will act as though it had just been booted and it will revert back to the initial values specified in its application load. The battery may be disabled by setting the **CW_10** CPU Board's Battery Backup Board Jumper (W3) in position 2 to 3.

6.3 Maintaining Backup Files

It is essential to maintain a backup disk of each application load file to guard against an accidental loss of process configuration data. Without a backup record, it will be necessary to reconfigure the entire application load; that can be a very time consuming procedure. Always play it safe and keep backup copies of your operating system loads. A copy of the application load can be loaded into **CW_10** RTU FLASH memory and/or saved to a PC's Hard Drive as a ZIP file.

SECTION 7 - WINDIAG DIAGNOSTICS

Bristol's WINDIAG Software is a diagnostic tool used for testing **CW_10** RTU electronics including, I/O circuitry, CPU memory, communications ports, etc., for proper performance. The **CW_10** RTU must be communicating with a PC equipped with the WINDIAG program. **CW_10** CPU Board configuration switch SW2-8 must be set to the OFF (Closed) position to enable diagnostics. Communication between the **CW_10** RTU (with/without application loaded) and the PC can be made via a Local or Network Port with the following restrictions:

- **CW_10** CPU Board Switch SW2-8 must be OFF to run the WINDIAG program. Setting SW2-8 OFF will prevent the 'Boot Project' from running and will place the unit into diagnostic mode.

- The **CW_10** communication port connected to the PC (running the WINDIAG program) must match the speed of the PC. All serial communication ports (except COM1) can be configured for 9600 baud, 8-bits, no parity, 1 stop bit, BSAP/**Control**Wave Designer protocol operation by setting **CW_10** CPU Switch SW2-3 OFF. This can also be accomplished via user defined Soft Switches.

- Communication port COM1 is forced to 9600 baud operation when **CW_10** CPU Switches SW2-3 and SW2-8 have both been set OFF. COM1 can also be set to 9600 baud operation via user defined Soft Switches.

To use the WINDIAG program place any critical process (associated with the **CW_10** RTU unit in question) under manual control. WINDIAG cannot be run while the **CW_10** RTU application is running. Set **CW_10** CPU Board Switch SW2-8 to the OFF position. Perform steps 1 through 6 below.

1. Start the OpenBSI NetView Program. A menu similar to Figure 16 will appear.

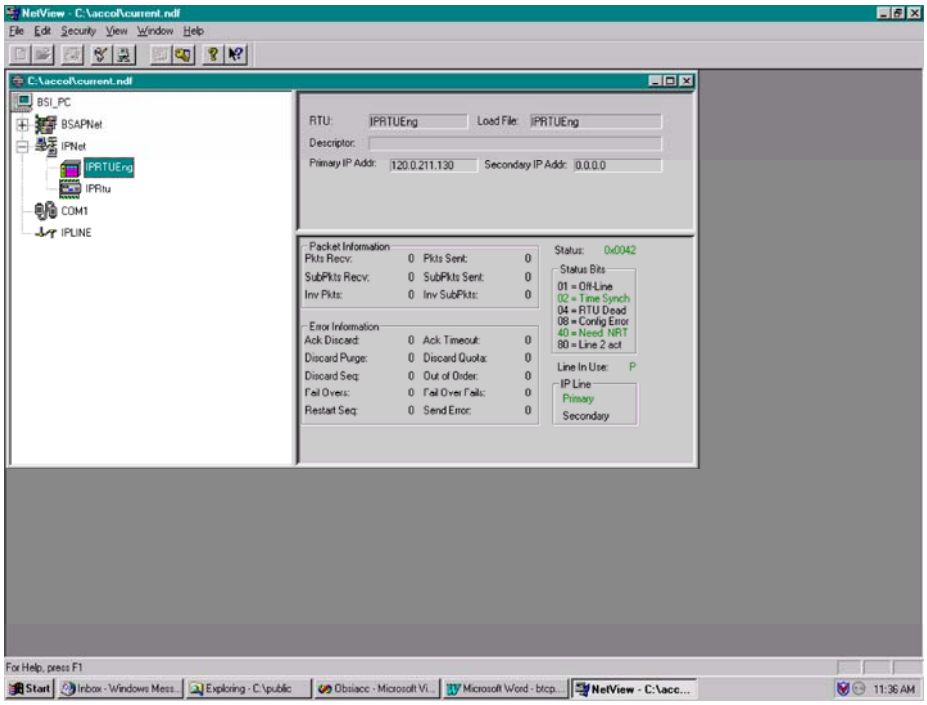


Figure 16 - NetView Startup Menu - Example with Multiple Networks

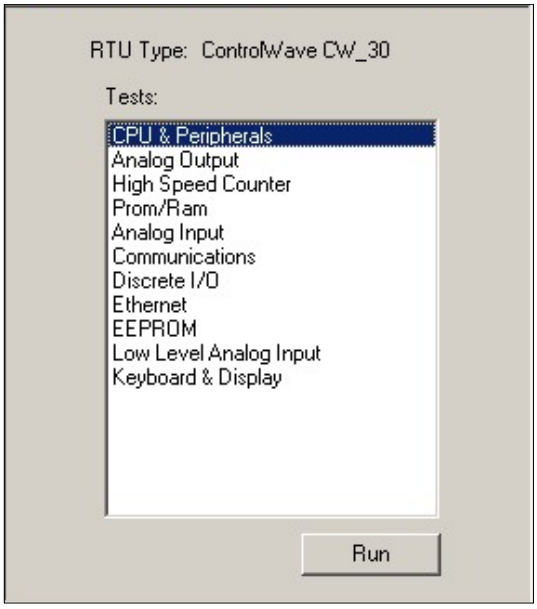


Figure 17 - WINDIAG Main Diagnostics Menu
(RTU Type is posted as CW_30 since CW_10s & CW_30s utilize the same Firmware)

2. To start the WINDIAG program, go to the Start Program's menu, select OpenBSI Tools, then select Utilities Programs and then select Diagnostics.

3. Once WINDIAG has been entered, the Main Diagnostics Menu of Figure 17 will appear.

4. Select the module to be tested. Enter any prompted parameters (slot #, etc.). WINDIAG will perform the diagnostics and display pass/fail results.

5. After all diagnostic testing has been performed, exit the WINDIAG program and then exit the NetView Program if there aren't any other **CW_10** RTUs to be tested.

   When you close the NetView program you will be prompted as to whether or not you want to close the OpenBSI program; select Yes.

6. Set **CW_10** CPU Board Switch SW2-8 to the ON (Open) position and reboot the unit. The **CW_10** RTU should resume normal operation.

7.1 Diagnostics Using WINDIAG

CW_10 electronics can be tested using the WINDIAG program. From WINDIAG's Main Diagnostics Menu (see Figure 17) the following diagnostic tests can be performed:

CPU & Peripherals Diagnostic:	Checks the CPU Board [except for RAM & PROM (FLASH)].
PROM/RAM Diagnostic:	Checks the CPU Board's RAM and PROM (FLASH) hardware.
EEPROM Diagnostic:	Checks I/O Module EEPROM on an I/O Module.
Communications Diagnostic:	Checks all Comm. Ports - The External loop-back tests require the use of a loop-back plug.
Ethernet Diagnostic:	Currently unavailable.
Analog Output Diagnostic:	Checks AOs on various AO Modules.

Analog Input Diagnostic:	Checks AIs on various AI Modules.
Low Level Analog Input Diag.:	Checks AIs on the Low Level AI Module.
Discrete I/O Diagnostic:	Checks DIs or DOs on various DI and DO Modules.
High Speed Counter Diagnostic:	Checks HSCs on various High Speed Counter Modules.
Keyboard & Display Diagnostics	Checks Keyboard/Keypad & Display hardware

Information on serial communication port loop-back testing is provided herein. For additional information on WINDIAG tests, see document D4041A.

7.1.1 Communication Diagnostic Port Loop-back Tests

WINDIAG's Communications Diagnostic Menu (see Figure 20) provides for selection of the communication port to be tested. Depending on the type of network (RS-232 or RS-485) and the port in question, a special loop-back plug is required as follows:

Ports 1 through 6 - RS-232:	use a 9-pin male D-type loop-back plug or loop-back wires (see Fig. 18).
Ports 2 through 6 - RS-485:	use a 9-pin male D-type loop-back plug or loop-back wires (see Fig. 19) or configure **CW_10** CCPU Switches (SW3 and SW4) and/or CMFIB Switches (SW2, SW3 and SW4) for loopback operation (see Tables 3 & 6).

This group of tests verifies the correct operation of the Communication Interface. COM1, through COM6 can be tested with this diagnostic. The **CW_10** communication port that is connected to the PC (local or network and used for running these tests) can't be tested until diagnostics has been established via one of the other ports, i.e., to test all **CW_10** serial RS-232/485 communication ports (via WINDIAG), communications with the PC will have to be established twice (each time via a different port). It should be noted that the **CW_10** communication port that is connected to the PC (RS-232, RS-485 or Ethernet) must be good for WINDIAG to run the Communications Diagnostics

7.1.2 Serial Comm. Port External Loop-back Test Procedure

1. Connect an external loop-back plug or loop-back wires to the Communications Port to be tested (see Figures 18 and 19). For RS-485 Loopback testing, CPU Switches SW3 and SW4 (see Table 3) or MFIB Switches SW2 through SW4 (see Table 6) can be configured for loopback operation

2. Type "1," "2," "3," etc. (up to "10") for the port to test.

3. Set baud rate to test to 115200 baud or ALL ASYNC and the number of passes to 5.

4. Click on RUN button next to External loop-back.

   - Test responses:
     a) Success - All sections of test passed
     b) Failure - TXD RXD Failure
     - CTS RTS Failure

   - Execution time < 5 sec.

9-Pin Male
"D" Connector
Loop-back Plug
(Looking from rear/wire side of Plug)

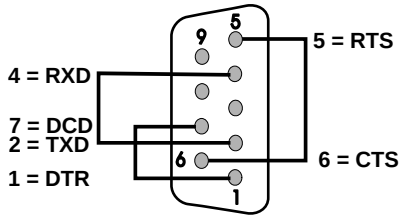


Figure 18 - RS-232 Loop-back Plug/Wires

9-Pin Male
"D" Connector
Loop-back Plug
(Looking from rear/wire side of Plug)

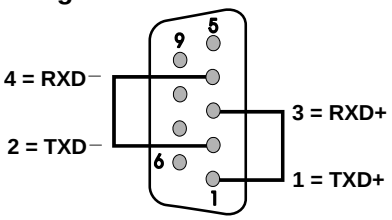


Figure 19 - RS-485 Loop-back Wires

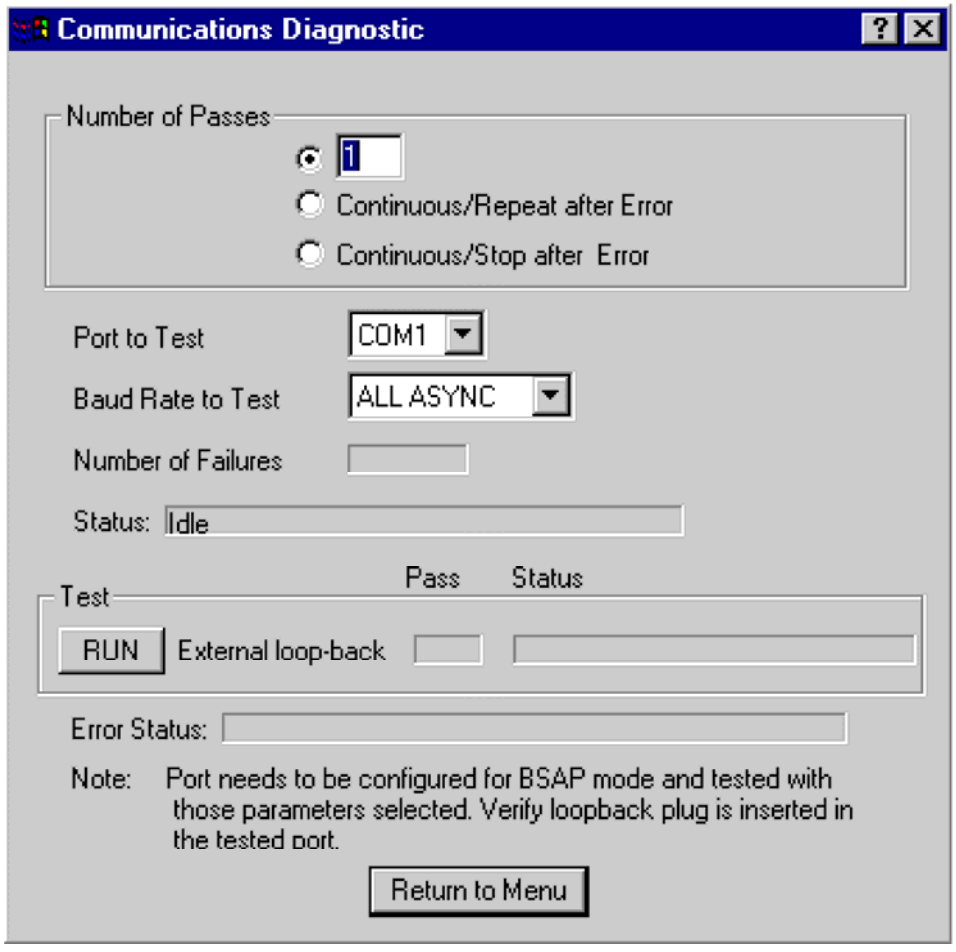


Figure 20 - WINDIAG's Communications Diagnostic Menu

SECTION 8 - CW_10 SPECIFICATIONS

8.1 CW_10 CPU Board Specifications

Processor: Sharp's LH7A400 32-bit System-on-Chip with 32-bit ARM9TDMI RISC Core

Memory: 16 Mbytes of simultaneous read/write FLASH
1 Mbyte of on-board SRAM
512 Kbytes FLASH Boot/Downloader
4 Mbytes of SDRAM

Real Time Clock: A Semtech SH3000 support IC provides a full BCD clock calender with programmable periodic/wakeup interrupt and a programmable clock generator with adjustable spectrum spreading.

Connectors: (see Table 12)

Table 12 - CPU Board Connector Summary

Ref.	# Pins	Function	Notes
P2	62-pin	Backplane Intf.	CW_10 I/O Bus Interface
J2	8-Pin	Ethernet Female Port # 1	10/100Base-T
J3	8-Pin	Ethernet Female Port # 2	10/100Base-T
J5	21-pin	Off-board Serial Comm. Port Intf. Connector (RS-232/485)	Interfaced via a cable to COM5 and COM6 on Interface Board Ass'y. No. 392574-01-2.
J8	3-pin	RS-232 Utility Port	115.2 Kbaud to PC for Firmware Flash and Core Updumps

8.1.1 CPU Board Communication Port Specifications

CPU Board Comm. Ports: J8: 3-pin In-line - Utility Port (RS-232)
J5: 21-pin Interface (Via cable) to Off-board serial Comm. Ports BIP1/COM5 and BIP2/COM6 (which reside on Interface Board Assembly 392574-01-2) COM5 & COM6 are individually configurable for RS-232 or RS-485 operation and utilize 9-Pin D-Type Female Connectors

Baud Rate: 300 to 115Kbps for RS-232 or RS-485
See Table 10 for connector pin assignments

8.1.2 CPU Board 3.3V Power Supply Specifications

Input: +5Vdc

Output Voltages: +3.3Vdc ±1%

Output Current: 0.6A Max. @ 3.3Vdc

Output Ripple P/P: +3.3V Output: 10mV

8.1.3 CPU Board Environmental Specifications

Temperature:	Operating:	-40 to +158 °F (-40 to +70 °C)
	Storage:	-40 to +185 °F (-40 to +85 °C)
Relative Humidity:	0-95% Non-condensing (Operating & Storage)	
Vibration:	1g acceleration over 10 to 150 Hz .5g acceleration over 150 to 2000 Hz	
RFI/Emissions:	In conformity with the following standards: ENV 50140 Radio-frequency electromagnetic field amplitude modulated EMV	

8.2 CW_10 Multi-Function Interface Board (MFIB) Specifications

8.2.1 MFIB Board Connectors

Table 13 - MFIB Board Connector Summary

Ref.	# Pins	Function	Notes
J1	62-pin	CPU Interface	Female Card Receptacle
P1	26-pin	Display/Keyboard Interface	Mass Termination Header
J2	36-pin	I/O Board Slot #1	Female Card Receptacle
J3	36-pin	I/O Board Slot #2	Female Card Receptacle
J4	36-pin	I/O Board Slot #3	Female Card Receptacle
J5	36-pin	I/O Board Slot #4	Female Card Receptacle
J6	15-pin	Optional Comm. Interface	On or Off-board Comm. Options
J8	9-pin	RS-232/485 Serial Comm. Port 1	Female D-Type
J9	9-pin	RS-232/485 Serial Comm. Port 2	Female D-Type
J10	9-pin	RS-232/485 Serial Comm. Port 3	Female D-Type
J11	9-pin	RS-232/485 Serial Comm. Port 4	Female D-Type

8.2.2 MFIB Board Communication Port Specifications

Comm. Ports:	see Table 13
Baud Rate:	300 to 115Kbps for RS-232 or RS-485 See Table 9 for connector pin assignments
RS-485 Port Protection:	Surge Protection (by LC04-6 device) (ANSI/IEEE C37.90 - 1978)

8.2.3 MFIB Board Power Supply Specifications

DC to DC Supply Specifications

Input Power Range:	12Vdc: (10.5 to 30.0 Vdc) (Factory Configured) 24Vdc: (22.0 to 30.0 Vdc) (Factory Configured)
Inrush Current:	4A Peak Duration 2 msec
Fusing:	4A for 10.5 to 30.0 Vdc

Efficiency:	70% Min. @ 10.5Vdc
Reverse Voltage Protection:	Diode Clamp
Overvoltage Protection:	Transorb Clamp
Output Voltages/Currents:	+5Vdc @ 1.2A (Regulated, Non-isolated) +5Vdc @ 50mA Minimum Load -5Vdc @ 40mA (from Regulated -15Vdc) +15Vdc @ 250mA (Regulated, Non-isolated) -15Vdc @ 150mA (Regulated, Non-isolated)
Regulation (Line): Regulation (Load):	5V: .2% for +10.5 to +30.0 Vdc 5V: .1% for 100% Load Change
Ripple (RMS):	.1% or 10mV RMS Max.
Ripple (Peak to Peak):	1% or 50mV (whichever is greater)
Transient Response:	Output Voltage returns to within 1% in less than 500µsec in response to a 25% load step on 5V output. Maximum excursion is less than 200mV from normal.
Overshoot:	Overload and Short Circuit Protection
Current Limit:	150% of Combined Rated Load
Overvoltage Protection:	Transorbs on +5, +15 and –15 Vdc Non-isolated Outputs Diode Clamp on -5Vdc Output

Sequencer Circuit Specifications

12V Operation:	OFF to ON Transition - Vin > 10.5Vdc ON to OFF Transition - Vin < 10.0Vdc
24V Operation:	OFF to ON Transition - Vin > 22.0Vdc ON to OFF Transition - Vin < 21.0Vdc
Low Supply Voltage Trip Points:	+5V Supply: +4.750Vdc –5V Supply: –4.750Vdc +15V Supply: +14.25Vdc -15V Supply: –14.25Vdc

8.2.4 MFIB Board Environmental Specifications

Temperature:	Operating: -40 to +158 °F (-40 to +70 °C) Storage: -40 to +185 °F (-40 to +85 °C)
Relative Humidity:	0-95% Non-condensing (Operating & Storage)
Vibration:	1g acceleration over 10 to 150 Hz .5g acceleration over 150 to 2000 Hz

ControlWave_**10**
Material Safety Data Sheets

A Material Safety Data Sheet is provided herein to comply with OSHA's Hazard Communication Standard, 29 CFR 1910.1200. This standard must be consulted for specific requirements.

Material Safety Data Sheets are provided in the order listed in Table Z-1 below.

TABLE Z-1
MSDS for Control Wave_**10 Instruction Document**
(PIP-CW_10 Upgrade Kit)

Manufacturer	General Description	Part Number
DURACELL	3V Lithium Manganese Dioxide Battery	DL 2450

Bristol, Inc Part Number = 395620-01-5

The 3V Lithium Manganese Dioxide Battery is situated on the **CW_10** CCPU Board.

Gillette
Environment
Health and Safety

37 A Street
Needham, MA 02492
Tel 781.292.8151

MATERIAL SAFETY DATA SHEET

NAME: DURACELL LITHIUM MANGANESE DIOXIDE COIN BATTERIES

CAS NO: Not applicable **Effective Date:** 8/8/03 **Rev:** 3

A. — IDENTIFICATION

	%	
Manganese Dioxide (1313-13-9)	65-75	Formula: Mixture — Mixture
Propylene Carbonate (108-32-7)	10-15	Molecular Weight: NA
Lithium (7439-93-2)	5-10	Synonyms: Lithium Manganese Dioxide Coin Cells: 3V-DL2016; DL2025; DL2430; DL2450; DL2032; DL1616; DL1620
Graphite, synthetic (7440-44-0)	5-10	
1,2-Dimethoxyethane (110-71-4)	1-10	
Lithium Perchlorate (7791-03-9)	<1.5	

B. — PHYSICAL DATA

Boiling Point: NA °F NA °C	Melting Point: NA °F NA °C	Freezing Point: NA °F NA °C
Specific Gravity (H_2O=1): NA	Vapor Density (air=1): NA	Vapor Pressure @ ____ °F: NA mm Hg
Evaporation (Ether =1): NA	Saturation in Air (by volume@ ____ °F): NA	Autoignition Temperature: ____ °F ____ °C: NA
% Volatiles: NA	Solubility in Water: NA	pH: NA

Appearance/Color: Coin cells. Contents dark in color.

Flash Point and Test Method(s): 1,2-Dimethoxyethane (Approximately 3-7% of contents): 42.8 °F, 6°C (Closed Cup)

Flammable Limits in Air (% by volume): Lower NA % Upper NA %

C. — REACTIVITY

Stability	[X]	stable	[ ]	unstable	Polymerization	[ ]	may occur	[X]	will not occur

Conditions to Avoid	Conditions to Avoid
Do not heat, crush, disassemble, short circuit or recharge.	Not applicable
Incompatible Materials	**Hazardous Decomposition Products**
Contents incompatible with strong oxidizing agents.	Thermal degradation may produce hazardous fumes of manganese and lithium; oxides of carbon and other toxic by-products.

*** IF MULTIPLE INGREDIENTS, INCLUDE CAS NUMBERS FOR EACH** **NA=NOT AVAILABLE**

Footnotes

Not applicable

D. — HEALTH HAZARD DATA

Occupational Exposure Limits PEL's, TLV's, etc.)

8-Hour TWAs: Manganese Dioxide (as Mn) - 5 mg/m^3 (Ceiling) (OSHA); 0.2 mg/m^3 (ACGIH/Gillette)
1,2-Dimethoxyethane - 0.15 ppm (Gillette)
Graphite (all kinds except fibrous) - 2 mg/m^3 (synthetic, ACGIH); 15 mg/m^3 (total, OSHA); 5 mg/m^3 (respirable, OSHA)

These levels are not anticipated under normal consumer use conditions.

Warning Signals

Not applicable

Routes/Effects of Exposure

These chemicals and metals are contained in a sealed can. For consumer use, adequate hazard warnings are included on both the package and on the battery. Potential for exposure should not exist unless the battery leaks, is exposed to high temperature, is accidentally swallowed or is mechanically, physically, or electrically abused.

1. Inhalation	Not anticipated. Respiratory (and eye) irritation may occur if fumes are released due to heat or an abundance of leaking batteries.
2. Ingestion	An initial x-ray should be obtained promptly to determine battery location. Batteries lodged in the esophagus should be removed immediately since leakage, burns and perforation can occur as soon as 4-6 hours after ingestion. Irritation to the internal/external mouth areas may occur following exposure to a leaking battery.
3. Skin	a. Contact Irritation may occur following exposure to a leaking battery. b. Absorption Not anticipated.
4. Eye Contact	Irritation may occur following exposure to a leaking battery.
5. Other	Not applicable

E. — ENVIRONMENTAL IMPACT

1. Applicable Regulations	All ingredients listed in TSCA inventory.
2. DOT Hazard Class -	Not applicable
3. DOT Shipping Name -	Not applicable

While lithium batteries are regulated by IATA and ICAO, the type of lithium batteries offered for sale by DURACELL are considered non-hazardous per provision A45 of the IATA Dangerous Goods Regulations and provision A45 of the ICAO Technical Instructions For The Safe Transport Of Dangerous Goods By Air. Per section A45 of the IATA and ICAO regulations, properly marked, labeled and packaged DURACELL consumer lithium batteries, which are of the solid cathode type, with less than 1g lithium per cell and less than 2g lithium per battery, are exempt from further regulation. When these batteries are separated to prevent short circuits and properly packaged in strong packaging (except when installed in electronic devices), they are acceptable for air transport as airfreight without any other restrictions. In addition, when installed in equipment or when no more than 24 cells or 12 batteries meeting the A45 provision are shipped, they are not subject to special packaging, marking, labeling or shipping documentation requirements. Thus, these batteries are not considered hazardous under the current regulations and are acceptable for air transport.

Environmental Effects

These batteries pass the U. S. EPA's Toxicity Characteristic Leaching Procedure and therefore, maybe disposed of with normal waste.

F. — EXPOSURE CONTROL METHODS

Engineering Controls

General ventilation under normal use conditions.

Eye Protection

None under normal use conditions. Wear safety glasses when handling leaking batteries.

Skin Protection

None under normal use conditions. Use butyl gloves when handling leaking batteries.

Respiratory Protection

None under normal use conditions.

Other

Keep batteries away from small children.

G. — WORK PRACTICES

Handling and Storage

Store at room temperature. Avoid mechanical or electrical abuse. **DO NOT** short or install incorrectly. Batteries may explode, pyrolize or vent if disassembled, crushed, recharged or exposed to high temperatures. Install batteries in accordance with equipment instructions. Replace all batteries in equipment at the same time. Do not carry batteries loose in pocket or bag.

Normal Clean Up

Not applicable

Waste Disposal Methods

No special precautions are required for small quantities. Large quantities of open batteries should be treated as hazardous waste. Dispose of in accordance with federal, state and local regulations. Do not incinerate, since batteries may explode at excessive temperatures.

H. — EMERGENCY PROCEDURES

Steps to be taken if material is released to the environment or spilled in the work area

Evacuate the area and allow vapors to dissipate. Increase ventilation. Avoid eye or skin contact. **DO NOT** inhale vapors. Clean-up personnel should wear appropriate protective gear. Remove spilled liquid with absorbent and contain for disposal.

Fire and Explosion Hazard	Extinguishing Media
Batteries may burst and release hazardous decomposition products when exposed to a fire situation. See Sec. C.	As for surrounding area. Dry chemical, alcohol foam, water or carbon dioxide. For incipient fires, carbon dioxide extinguishers are more effective than water.

Firefighting Procedures

Cool fire-exposed batteries and adjacent structures with water spray from a distance. Use self-contained breathing apparatus and full protective gear.

I. — FIRST AID AND MEDICAL EMERGENCY PROCEDURES

Eyes

Not anticipated. If battery is leaking and material contacts eyes, flush with copious amounts of clear, tepid water for 30 minutes. Contact physician at once.

Skin

Not anticipated. If battery is leaking, irrigate exposed skin with copious amounts of clear, tepid water for a least 15 minutes. If irritation, injury or pain persists, consult a physician.

Inhalation

Not anticipated. Respiratory (and eye) irritation may occur if fumes are released due to heat or an abundance of leaking batteries. Remove to fresh air. Contact physician if irritation persists.

Ingestion

Consult a physician. Published reports recommend removal from the esophagus be done endoscopically (under direct visualization). Batteries beyond the esophagus need not be retrieved unless there are signs of injury to the GI tract or a large diameter battery fails to pass the pylorus. If asymptomatic, follow-up x-rays are necessary only to confirm passage of larger batteries. Confirmation by stool inspection is preferable under most circumstances. If mouth area irritation/burning has occurred, rinse the mouth and surrounding area with clear, tepid water for at least 15 minutes.

Notes to Physician

1) For information on treatment, telephone (202)-625-3333 collect.
2) Potential leakage of less than 50 milligrams of propylene carbonate (CAS #108-32-1) and dimethoxyethane (CAS #110-71-4).
3) Dimethoxyethane readily evaporates.
4) Under certain misuse conditions and by abusively opening the battery, exposed lithium can react with water or moisture in the air causing potential thermal burns or fire hazard.

Replaces # 1461

Emerson Process Management
Bristol, Inc.
1100 Buckingham Street
Watertown, CT 06795
Phone: +1 (860) 945-2262
Fax: +1 (860) 945-2525
www.EmersonProcess.com/Bristol

Emerson Electric Canada, Ltd.
Bristol Canada
6338 Viscount Rd.
Mississauga, Ont. L4V 1H3
Canada
Phone: 905-362-0880
Fax: 905-362-0882
www.EmersonProcess.com/Bristol

Emerson Process Management
BBI, S.A. de C.V.
Homero No. 1343, 3er Piso
Col. Morales Polanco
11540 Mexico, D.F.
Mexico
Phone: (52-55)-52-81-81-12
Fax: (52-55)-52-81-81-09
www.EmersonProcess.com/Bristol

Emerson Process Management
Bristol Babcock, Ltd.
Blackpole Road
Worcester, WR3 8YB
United Kingdom
Phone: +44 1905 856950
Fax: +44 1905 856969
www.EmersonProcess.com/Bristol

Emerson Process Management
Bristol, Inc.
22 Portofino Crescent,
Grand Canals Bunbury, Western Australia 6230
Mail to: PO Box 1987 (zip 6231)
Phone: +61 (8) 9725-2355
Fax: +61 (8) 8 9725-2955
www.EmersonProcess.com/Bristol

EMERSON
Process Management