3100/3150 - N2
Johnson Controls
N2
Slave Interface
Module
Revision 1.01

USER MANUAL

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Product Revision History

11/16/95   Revision 1.0
               Initial release of product

01/21/96   Revision 1.01 - 2
               Modifications to support more data objects

Table of Contents

1   Product Specifications

The ProSoft Technology, Inc. 3100/3150-N2 card is a hardware product designed to allow the Allen-Bradley PLC and SLC platforms to communicate with Johnson Controls N2 compatible host packages. The 3100/3150-N2 product includes the following functionality:

- Supports the following N2 Objects:

Binary Input	:	Up to 960 points
Analog Input	:	Up to 300 points
Binary Output	:	Up to 960 points
Analog Output	:	Up to 300 points

- Supported Command/Subcommands:

0/4	:	Poll Message No Acknowledge
0/5	:	Poll Message with Acknowledge
0/9	:	Status Update
1/1	:	Read Analog Input Attributes
1/2	:	Read Binary Input Attributes
1/3	:	Read Analog Output Attributes
1/4	:	Read Binary Output Attributes
2/1	:	Write Analog Input Attributes
2/2	:	Write Binary Input Attributes
2/3	:	Write Analog Output Attributes
2/4	:	Write Binary Output Attributes
7/2/3	:	Override Analog Output
7/2/4	:	Override Binary Output
F	:	Identify Device Type

  The following commands are recognized, and acknowledged, but are not communicated in any way to the PLC/SLC, and do not return any data:

0/0	:	Time Update
0/8	:	Warm Start

  All other commands return a Bad Command Error Code
- Configurable through the PLC/SLC data table for the following:
  Slave Address (assignable individually for port 1 and 2)
  Analog Input Object Count
  Binary Input Object Count
  Analog Output Object Count
  Binary Output Object Count
- Operates with the following communication configuration:

Port Type	:	RS-485
Parity	:	None
Stop Bit	:	1
Baud Rate	:	9600
Data Bits	:	8
Comm Timeout	:	300 ms

- Warning and Alarming functions performed on Analog Input and Binary Input data types
- Change Of State Response buffering
- Communication Status Error Codes and statistics returned per port
- Memory mapping is pre-assigned to optimize data access and to ease implementation
- Card plugs directly into Allen-Bradley 1771 or 1746 I/O racks

2   Installation, Configuration and Diagnostics

2.1   Card Installation Procedure

Installation of the 3100/3150-N2 card is easily accomplished. The card comes pre-programmed to support the N2 interface. Installation into a system requires only a few steps. Following is a step-by-step procedure for getting an application operational:

1. Identify rack and slot location for module.
2. Identify the data files for Block Transfer buffering and N2 data exchange
3. Use existing example logic (See attached) provided on disk as a starting point

4. Modify this logic for correct physical rack and slot locations
5. Modify the logic for the data file locations to be used
6. Assure that port jumpers are set for RS-485
7. Install the card into rack and download ladder logic
8. Make up an RS-485 cable to the front of the module
9. Power up equipment and view communication status in data table

Once the hardware has been installed and the necessary programming has been downloaded to the processor, the system is ready (Presuming all other system components are safely ready).

2.2   Ladder Logic Overview

Data transfer between the PLC/SLC ladder logic is executed using the standard Block Transfer commands, BTR/BTW in the PLC, and M0/M1 in the SLC. In order to transfer the volume of data required to support the application, the ProSoft module 'pages' data through the Block Transfer buffer, allowing a larger volume of data to be written and read between the ladder logic and the module.

> In order for the ProSoft Technology module to function, the processor must be in the RUN mode, or in the REM RUN mode. If in any other mode (Fault/PGM), the block transfers between the PLC and the module will stop, and communications will halt until block transfers resume.

2.2.1   Block Transferring to the module

Data transfer to the module from the processor is executed through the Block Transfer Write function. The different types of data which are transferred require slightly different data block structures, but the basic data structure is:

Word	Description
0	BTW Block ID code
1-63	Data

> Although the full physical 64 words of the data buffer may not be used, the BTW and M0 lengths must be configured for 64 words, otherwise module operation will be unpredictable.

BTW Block ID Code: A block page identifier code. This code is used by the ProSoft module to determine what to do with the data block. Valid codes are:

BTW Code	Description
0	Binary Input Object Data
1-5	Analog Input Object Data
255	Module Configuration Data

Data: The data to be written to the module. The structure of the data is dependent on the Block ID code. The following sections provide details on the different structures.

2.2.2   Binary Input Object Data Block [BTW Block ID 0]

The transfer of Binary Input data to the module must occur in a fashion that matches the structure expected by the module. The module monitors the BTW Block ID number and decodes the data following it based on this value. Following are the data structures for each of the blocks:

Example Ladder	BTW Buffer	Description
	0	BTW Block ID
B13:0	1	Binary Pts 1-16
B13:1	2	Binary Pts 17-32

B13:2	3	Binary Pts 33-48
	-	
B13:59	60	Binary Points 945 to 960

2.2.3   Analog Input Object Data Blocks [BTW Block ID 1 to 5]

The transfer of Analog Input data to the module must occur in a fashion that matches the structure expected by the module. The module monitors the BTW Block ID number and decodes the data following it based on this value. Following are the data structures for each of the blocks:

BTW Block ID 1

Word	Description
0	BTW Block ID = 1
1 -60	Analog Input Data points 1 - 60

BTW Block ID 2

Word	Description
0	BTW Block ID = 2
1 -60	Analog Input Data points 61 - 120

BTW Block ID 3

Word	Description
0	BTW Block ID = 3
1 -60	Analog Input Data points 121 - 180

BTW Block ID 4

Word	Description
0	BTW Block ID = 4
1 -60	Analog Input Data points 181 - 240

BTW Block ID 5

Word	Description
0	BTW Block ID = 5
1 -60	Analog Input Data points 241 - 300

BTW Block ID Code: This value is decoded by the 3100/3150-N2 module to determine which set of Analog Input data is being transferred to the module.

Analog Input Data: The analog input data values to be transmitted to the N2 host. The analog data values are transferred to the module as integer values with the range of -32767 to 32767.

2.2.4   Module Configuration Block [BTW Block ID 255]

The ProSoft Technology firmware communication parameters must be configured at least once when the card is first powered up, and any time thereafter when the parameters must be changed.

On power up, the module enters into a logical loop waiting to receive configuration data from the processor. While waiting, the module sets the second word of the BTR buffer to 255, telling the processor that the module must be configured before anything else will be done. The module will continuously perform block transfers until the communications configuration parameters block is received. Upon receipt, the module will begin execution of the command list if present, or begin looking for the command list from the processor. The configuration data block structure which must be transferred from the processor to the module is as follows:

BTW Block ID 255

PLC Ladder Example	BTW Buffer Word	Description
	0	BTW Block ID = 255
N7:0	1	Port #1 Slave Address

N7:1	2	Port #2 Slave Address
N7:2	3	Binary Input Object Count - Valid values : 0 to 960
N7:3	4	Analog Input Object Count - Valid values : 0 to 300
N7:4	5	Binary Output Object Count - Valid values : 0 to 960
N7:5	6	Analog Output Object Count - Valid values : 0 to 300
N7:6	7	Spare/Future
N7:7	8	Spare/Future
N7:8	9	Spare/Future
N7:9	10	Spare/Future

Example Ladder Program - Appendix
<u>**Communication Configuration**</u>

N7:0	1	Port 1 Slave Address
N7:1	1	Port 2 Slave Address
N7:2	16	Binary Input Object Count
N7:3	10	Analog Input Object Count
N7:4	16	Binary Output Object Count
N7:5	10	Analog Output Object Count
N7:6	0	Spare
N7:7	0	Spare
N7:8	0	Spare
N7:9	0	Spare

2.2.5   Block Transferring data from the module

Data transfer from the module to the processor is executed through the Block Transfer Read function. The different types of data which are transferred require slightly different data block structures, but the basic data structure is:

Word	Description
0	BTR Block ID Code
	0 - Slave Port Status
	1 - Binary Output Write
	2 - Analog Output Write
1	BTW Block ID Code
2-63	Data

> Although the full physical 64 words of the data buffer may not be used, the BTR and M1 lengths must be configured for 64 words, otherwise module operation will be unpredictable.

BTR Block ID Code: A block page identifier code. This code is used by the ladder logic to determine what to do with the data block. Valid codes are:

BTR Code	Description
0	Slave Port Status
1	Binary Output Write Active
2	Analog Output Write Active

BTW Block ID Code: This is the value which the ladder logic uses to setup the next BTW instruction.

Data: The data to be transferred from the module to the data table in the PLC/SLC. The structure of the data is dependent on the Block ID code. The following sections provide details on the different structures.

2.2.6   Slave Communication Status [BTR Block ID 0]
The 3100/3150-N2 module monitors communication status and statistics on each of the N2 ports. The current communication status values are transferred to the PLC/SLC in the form of a Slave Error Table. The structure of BTR buffer is as follows:

BTR Block ID 0

Word	Description
0	BTR Block ID
1	BTW Block ID
2-21	Slave Error Table

> The Slave Error Code Table is initialized to zero on power up, and every time the module receives the 255 configuration data block.

The Slave Error Table is a 20 word block. The location of the Error Table is determined by the Slave Error Table Pointer parameter in the Configuration Block.   The structure of the data block is as follows:

WORD	DESCRIPTION
Port 1	
0	Current port status
1	Last error condition
2	Total Messages to this slave
3	Total Msg responses from this slave
4	Total Msgs seen by this slave
Port 2	
5	Current port status
6	Last error condition
7	Total Messages to this slave
8	Total Msg responses from this slave
9	Total Msgs seen by this slave
System Information	
10-11	Product Name (ASCII)
12-13	Revision (ASCII)
14	Operating System Rev(ASCII)
15	Production Run Number (ASCII)
16-19	Spare

Current Port Error Status: This value represents the current value of the error code for the port. This value will only be valid if the port is configured as a Slave. The possible values are detailed in the following section.

Code	Description
0	All OK
1	Bad Command
2	Checksum Error
3	Recv buffer overflow
5	Command Data Error
16	Data Register Addr out of range
17	Field Data Error
18	Command Rejected
20	Unit not Warm Started
255	TX Timeout – RTS/CTS jumper missing

Last Error Code: This value is the last error code transmitted to the master by this slave port..

Total Messages to This Slave: This value represents the total number of messages that have matched this slaves address on this port, whether the slave actually determined them to be good (worthy of response) or not.

Total Message Responses From This Slave: This value represents the number of good (non-error) responses that the slave has sent to the master on this port. The presumption is that if the slave is responding, the message was good.

Total Messages Seen By This Slave: This value represents the total number of commands seen by the slave on this port, regardless of the slave address.

> All counters in the Slave Error Table will rollover to 0 after reaching 65535

Product Name: These two words represent the product name of the module in an ASCII representation. In the case of the N2 product, the letters ' N2 ' should be displayed when placing the programming software in the ASCII data representation mode.

Revision : These two words represent the product revision level of the firmware in an ASCII representation. An example of the data displayed would be '1.00' when placing the programming software in the ASCII data representation mode.

Operating System Revision : These two words represent the module's internal operating system revision level in an ASCII representation.

Production Run Number: This number represents the 'batch' number that your particular chip belongs to in an ASCII representation.

2.2.7 Binary Output Write [BTR Block ID 1]
The 3100/3150-N2 module accept Binary Output write commands from the host and transfers the command to the PLC/SLC for handling. The structure of command to the this data is as follows:

BTR Block ID 1

Word	Description
0	BTR Block ID
1	BTW Block ID
2	Bit Address
3	Control Action

Bit Address: The Bit Address represents the bit which will be acted on . The ladder logic must decode this address to determine which bit to act on. The range of addresses will be 0 to 959. The Bit Address corresponds to :

Bit Address = N2 Object Number - 1

Control Action: The action commanded by the Master is transferred in this word. When the value is a 0, the addressed bit is to be reset, and when the value is a 1, the addressed bit is to be set.

2.2.8 Analog Output Point Data Results [BTR Block ID 2]
The 3100/3150-N2 module accepts Analog Output write commands from the host and transfers the command to the PLC/SLC for handling. The structure of command to the this data is as follows:

BTR Block ID 2

Word	Description
0	BTR Block ID
1	BTW Block ID
2	Destination Address
3	Data

Register Address: This value is used by the ladder logic to determine the address in the processor data in which to write the data. The processor ladder logic must decode this word to determine where to locate the data from the Master. The range of values will be 0 to 299. The destination address corresponds to;

Register Address = N2 Object Number - 1

Data: The data values written from the host. The values will be 16 bit register values, and should be placed into an integer file.

3   Communication Cables

The cable connection between the N2 host and the 3100/3150-N2 module is made through the ports on the front of the module. In the following sections, the cables are detailed.

3.1   3100/3150-N2 To Host Cable

This cable connection is an RS-232 connection. Configuration of the cable is as follows:

ProSoft Module				N2 Host
3100		3150		
DB 25 M		DB 9 F		
14	TxRxD_A	1	-------------------	N2-
25	TxRxD_B	9	-------------------	N2+
4	RTS	7	-----	
			| jumper between RTS/CTS <u>must</u> be installed	
5	CTS	8	-----	

4   Example Ladder Logic - PLC5

The following ladder logic provides an example of the PLC5 logic necessary to effect data transfer between the 3100-N2 module and the data table in the PLC. In this example we have setup the ladder logic data table with the following configuration:

Communication Configuration

N7:0	1	Port 1 Slave Address
N7:1	1	Port 2 Slave Address
N7:2	16	Binary Input Object Count
N7:3	10	Analog Input Object Count
N7:4	16	Binary Output Object Count
N7:5	10	Analog Output Object Count
N7:6	0	Spare
N7:7	0	Spare
N7:8	0	Spare
N7:9	0	Spare

Module Slave Error Status Table

N7:10	Port 1 - Current Status
N7:11	Port 1 - Last Error
N7:12	Port 1 - Total messages to this slave
N7:13	Port 1 - Total responses from this slave
N7:14	Port 1 - Total messages seen by this slave
N7:15	Port 2 - Current Status
N7:16	Port 2 - Last Error

N7:17	Port 2 - Total messages to this slave
N7:18	Port 2- Total responses from this slave
N7:19	Port 2 - Total messages seen by this slave
N7:20 'N2'	Product Name
N7:21 ' '	
N7:22 '1. '	Product Revision
N7:23 ' 01'	
N7:24 '05'	Operating System Level
N7:25 '02'	Batch Number
N7:26	Spare

Binary Input Image

This is binary information that is to be moved from the PLC to the module reflecting the on/off status of discrete information

B13/0	BI1
B13/1	BI2
B13/2	BI3
B13/3	BI4
B13/4	BI5
B13/5	BI6
B13/6	BI7
B13/7	BI8
B13/8	BI9
B13/9	BI10
B13/10	BI11
B13/11	BI12
B13/12	BI13
B13/13	BI14
B13/14	BI15
B13/15	BI16

Analog Input Image

This is analog or register information that is to be moved from the PLC to the module.

N10:0	AI1
N10:1	AI2
N10:2	AI3
N10:3	AI4
N10:4	AI5
N10:5	AI6
N10:6	AI7
N10:7	AI8
N10:8	AI9
N10:9	AI10

Binary Output Image

B14/0	BO1
B14/1	BO2
B14/2	BO3
B14/3	BO4
B14/4	BO5
B14/5	BO6
B14/6	BO7
B14/7	BO8
B14/8	BO9
B14/9	BO10
B14/10	BO11
B14/11	BO12
B14/12	BO13
B14/13	BO14

| B14/14 | BO15 |
| B14/15 | BO16 |

Analog Output Image

N10:50	AO1
N10:51	AO2
N10:52	AO3
N10:53	AO4
N10:54	AO5
N10:55	AO6
N10:56	AO7
N10:57	AO8
N10:58	AO9
N10:59	AO10

Jumper Configurations

Hardware Overview

When purchasing the ProSoft product, there are two available choices for each platform. These choices are as follows:

Description	ProSoft Cat Num	
	PLC	SLC
Module provided by ProSoft	3100	3150

When purchasing the module from ProSoft Technology, many of the jumper configurations will have been factory set. When purchasing the firmware from ProSoft Technology and the Allen-Bradley module from another source, particular attention must be paid to hardware configuration.

Module Jumper Configurations

The following section details the available jumper configurations for the 1771 and 1746 platform solutions. As needed, differences between the module based solutions and the firmware based solutions are highlighted.

3100/3101 for the 1771 Platform

Following are the jumper positions for the ProSoft Technology 3100 module:

Jumper	3100
JW1	N/A
JW2	N/A
JW3	N/A
JW4	Flash Pgm/Run Mode
JW5	8 Pt
JW6	Not Used
JW7	Enabled
JW8	RS-485
JW9	RS-485

JW1   Watchdog Enable / Disable   Enable

The position of this jumper does not affect the operation of the unit under normal operations. In order to enable the watchdog function, simply place the jumper in the Enabled position.

JW4   Flash Pgm/Run Mode Select   Run Position

The position of this jumper should only be changed if needing to reprogram the MCM FLASH memory. This will only need to be done if the module is to be upgraded in the field to a later version of firmware.

JW5   Backplane 8/16 point   8 Point

The module should be operated in the 8 point configuration unless specifically directed otherwise by the factory.

JW7   Battery Enable / Disable   Enabled

This jumper should be placed in the Enabled position when the module is powered up. Although not critical to the operation of the module, this will back up some data registers in the module during a power failure or reset.

JW8/9   RS Configuration for Port 1 and 2   Set for RS-485

The default from factory is RS-232. Change the jumper to RS-485, or 2-wire mode.

3150/3151 for the 1746 Platform
Following are the jumper positions for the ProSoft Technology 3150 module:

Jumper	3150
JW1	As Needed
JW2	As Needed
JW3	N/A
JW4	N/A

JW1/2   RS configuration for port 1 and 2   See following diagram
The default from factory is RS-232, but all options are supported by the firmware

<u>**Communication Port**</u>
<u>**Jumper Settings for 3150/3151 Modules - JW1 & JW2**</u>

Jumper JW1 Settings

RS-232

Daughter Board

RS-422 4-wire

Daughter Board

RS-485 2-wire

Daughter Board

2 4 6 8 10
1 3 5 7 9

Daughter Board

JW1

Mother Board

JW3

Daughter Board

JW4

JW2

Daughter Board

9 7 5 3 1
10 8 6 4 2

Jumper JW2 Settings

Daughter Board   **RS-232**

Daughter Board   **RS-422 4-wire**

Daughter Board   **RS-485 2-wire**
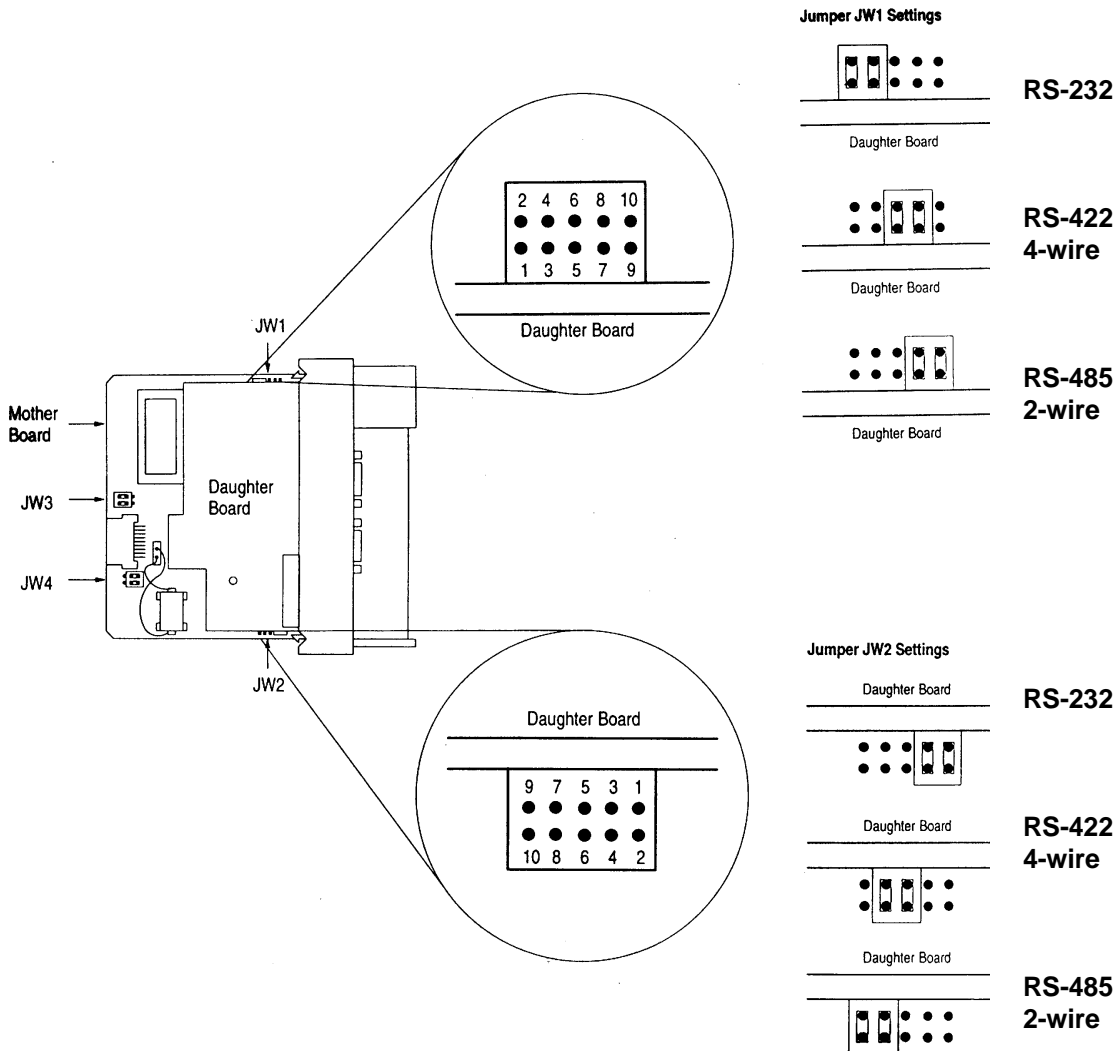
For the 3150/3151-N2 Solution, use the RS-485/2-wire jumper configuration

Support, Service and Warranty

Technical Support

ProSoft Technology survives on its ability to provide meaningful support to its customers. Should any questions or problems arise, please feel free to contact us at:

Factory/Technical Support
ProSoft Technology, Inc.
9801 Camino Media, Suite 105
Bakersfield, CA 93311
(805) 664-7208
(800) 326-7066
(805) 664-7233 (fax)
E-mail address: prosoft@prosoft-technology.com
Web Site : http://www.prosoft-technology.com

Before calling for support, please prepare yourself for the call. In order to provide the best and quickest support possible, we will most likely ask for the following information (you may wish to fax it to us prior to calling):

1. Product Version Number
2. Configuration Information
   - Communication Configuration
   - Master Command List
   - Jumper positions
3. System hierachy
4. Physical connection information
   - RS-232, 422 or 485
   - Cable configuration
5. Module Operation
   - Block Transfers operation
   - LED patterns

An after-hours answering service (on the Bakersfield number) allows pager access to one of our qualified technical and/or application support engineers at any time to answer the questions that are important to you.

Module Service and Repair

The ProSoft product is an electronic product, designed and manufactured to function under somewhat adverse conditions. As with any product, through age, misapplication, or any one of many possible problems, the card may require repair.

When purchased from ProSoft Technology, the module has a one year parts and labor warranty according to the limits specified in the warranty. Replacement and/or returns should be directed to the distributor from whom the product was purchased. If you need to return the card for repair, it is first necessary to obtain an RMA number from ProSoft Technology. Please call the factory for this number and display the number prominently on the outside of the shipping carton used to return the card.

General Warranty Policy

ProSoft Technology, Inc. (Hereinafter referred to as ProSoft) warrants that the Product shall conform to and perform in accordance with published technical specifications and the accompanying written materials, and shall be free of defects in materials and workmanship, for the period of time herein indicated, such warranty period commencing upon receipt of the Product.

This warranty is limited to the repair and/or replacement, at ProSoft's election, of defective or non-conforming Product, and ProSoft shall not be responsible for the failure of the Product to perform specified functions, or any other non-conformance caused by or attributable to: (a) any misapplication of misuse of the Product; (b) failure of Customer to adhere to any of ProSoft's specifications or instructions; (c) neglect of, abuse of, or

accident to, the Product; or (d) any associated or complementary equipment or software not furnished by ProSoft.

Limited warranty service may be obtained by delivering the Product to ProSoft and providing proof of purchase or receipt date. Customer agrees to insure the Product or assume the risk of loss or damage in transit, to prepay shipping charges to ProSoft, and to use the original shipping container or equivalent. Contact ProSoft Customer Service at (805) 664-7208 for further information.

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Where directed by State Law, some of the above exclusions or limitations may not be applicable in some states. This warranty provides specific legal rights; other rights that vary from state to state may also exist. This warranty shall not be applicable to the extent that any provisions of this warranty is prohibited by any Federal, State or Municipal Law that cannot be preempted.

Hardware Product Warranty Details

Warranty Period : ProSoft warranties hardware product for a period of one (1) year.
Warranty Procedure : Upon return of the hardware Product ProSoft will, at its option, repair or replace Product at no additional charge, freight prepaid, except as set forth below. Repair parts and replacement Product will be furnished on an exchange basis and will be either reconditioned or new. All replaced Product and parts become the property of ProSoft. If ProSoft determines that the Product is not under warranty, it will, at the Customer's option, repair the Product using current ProSoft standard rates for parts and labor, and return the Product freight collect.

Rung 2:0

```
                    BT READ AND REGISTER TRANSFER FROM MODULE DECODING
                    BT READ from module.  If BT READ Block ID is 0, then transfers the module's
                    error table, else check to see if an A0 or B0 command has been received.
| BT WRITE   |BT READ                                                        BT READ          |
| ENABLE     |ENABLE                                                         FROM             |
|                                                                            MODULE           |
|   N7:300    N7:400                                             +BTR--------------------+     |
+----]/[--------]/[------------------------------------------+--------------+BLOCK TRANSFER READ  +-(EN)+-+
|     15         15                                           |              |Rack             00|  |  | |
|                                                             |              |Group             2+-(DN)|  |
|                                                             |              |Module            0|  |  | |
|                                                             |              |Control block  N7:400+-(ER)| |
|                                                             |              |Data file      N7:410|  |  | |
|                                                             |              |Length            64|  |  | |
|                                                             |              |Continuous         N|  |  | |
|                                                             |              +--------------------+   |  |
|                                                             |                                       |  |
|                                                             |      DECODE           ERROR          |  |
|                                                             |      BT READ          STATUS         |  |
|                                                             |      BLOCK ID          TABLE         |  |
|                                                             |+EQU--------------+    +COP---------------+| |
|                                                             ++EQUAL        +------+COPY FILE       ++   |
|                                                             ||Source A   N7:410|   |Source      #N7:412|| |
|                                                             ||           3|   |Destination #N7:10|| |
|                                                             ||Source B        0|   |Length         20|| |
|                                                             ||                 |   +---------------+| |
|                                                             |+----------------+                    |  |
|                                                             |      DECODE       B0 CMD    |B0 CMD   |  |
|                                                             |      BT READ      ACTION     |         |  |
|                                                             |      BLOCK ID                          |  |
|                                                             |+EQU--------------+   N7:413      B14   |  |
|                                                             ++EQUAL          ++---] [--------(L)----+---+
|                                                             ||Source A   N7:410||    0      [N7:412] |   | |
|                                                             ||           3||B0 CMD  |B0 CMD   |   | |
|                                                             ||Source B        1||ACTION   |         |   | |
|                                                             ||                || N7:413       B14   |   | |
|                                                             |+----------------++---]/[--------(U)----+   |  |
|                                                             |                    0      [N7:412]       |  |
|                                                             |      DECODE           MOVE CMD          |  |
|                                                             |      BT READ          AOUT              |  |
|                                                             |      BLOCK ID                           |  |
|                                                             |+EQU--------------+ +MOV---------------+| |
|                                                             ++EQUAL          +-+MOVE            ++   |
|                                                             ||Source A   N7:410| |Source        N7:413|| |
|                                                             ||           3| |                 0|| |
|                                                             ||Source B        2| |Destination N11[N7:412]|| |
|                                                             ||                | |                 0|| |
|                                                             |+----------------+ +---------------+| |
|                                                             |                     ENCODES          |  |
|                                                             |                     BT WRITE          |  |
|                                                             |                     BLOCK ID          |  |
|                                                             |                    +MOV-------------+| |
|                                                             +-----------------------+MOVE          ++   |
|                                                             |                    |Source      N7:411|| |
|                                                             |                    |                 0|| |
|                                                             |                    |Destination N7:310|| |
|                                                             |                    |                81|| |
|                                                             |                    +---------------+| |
|                                                             |                                       |  |
|                                                             |                                       |  |
|                                                             |                                       |  |
|                                                             |                                       |  |
|                                                             |                                       |  |
|                                                             |                                       |  |
|                                                             |                                       |  |
|                                                             |                                       |  |
|                                                             |                                       |  |
|                                                             |                                       |  |
|                                                             vvv                                   vvv|
```

15

```
|                                                   ^^^                                           ^^^|
|                                                   |USER CFG                    ENCODES            | |
|                                                   |DOWNLOAD                     BT WRITE          | |
|                                                   |SELECT                       BLOCK ID          | |
|                                                   |   B3                   +MOV---------------+   | |
|                                                   +---] [-------------------+MOVE             ++   |
|                                                        0                    |Source         255|  |
|                                                                             |                  |  |
|                                                                             |Destination N7:310|  |
|                                                                             |               81|   |
|                                                                             +-----------------+   |
|                                                                                                   |

Rung 2:1
                    WRITES DATA OR CONFIGURATION BLOCK TO MODULE
                    Based on the value in the BTW Block ID, either BI data or AI is written to the
                    module.  Note that the Block ID numbers are controlled by the module based on
                    the configuration values entered in the 255 configuration block.
| BT READ    |BT WRITE                                                 DECODE             WRITE TO        |
| ENABLE     |ENABLE                                                   BT WRITE           BT WRITE        |
|                                                                      BLOCK              BUFFER          |
|  N7:400     N7:300                                                +EQU--------------+ +COP-------------------+ |
+----]/[--------]/[-----------------------------------------------++EQUAL           +--+COPY FILE          ++-+
|    15          15                                               ||Source A  N7:310| |Source       #B13:0|| |
|                                                                 ||             81| |Destination  #N7:311|| |
|                                                                 ||Source B       0| |Length          60|| |
|                                                                 ||                | +---------------------+| |
|                                                                 |+----------------+                       | |
|                                                                 |    DECODE             WRITE TO          | |
|                                                                 |    BT WRITE           BT WRITE          | |
|                                                                 |    BLOCK              BUFFER            | |
|                                                                 |+EQU--------------+ +COP-------------------+| |
|                                                                 ++EQUAL           +--+COPY FILE          ++ |
|                                                                 ||Source A  N7:310| |Source       #N10:0|| |
|                                                                 ||             81| |Destination  #N7:311|| |
|                                                                 ||Source B       1| |Length          60|| |
|                                                                 ||                | +---------------------+| |
|                                                                 |+----------------+                       | |
|                                                                 |    DECODE             WRITE TO          | |
|                                                                 |    BT WRITE           BT WRITE          | |
|                                                                 |    BLOCK              BUFFER            | |
|                                                                 |+EQU--------------+ +COP-------------------+ | |
|                                                                 ++EQUAL           +++COPY FILE          +++ |
|                                                                 ||Source A  N7:310||| Source       #N7:0||| |
|                                                                 ||             81||| Destination   #N7:311||| |
|                                                                 ||Source B     255||| Length          10||| |
|                                                                 ||                ||| +---------------------+|| |
|                                                                 |+----------------+||                USER CFG||| |
|                                                                 |                 ||                DOWNLOAD||| |
|                                                                 |                 ||                SELECT  ||| |
|                                                                 |                 ||                  B3    ||| |
|                                                                 |                 +-----------------(U)----+| |
|                                                                 |                                      0    | |
|                                                                 |                       BT WRITE            | |
|                                                                 |                       TO MODULE           | |
|                                                                 |                 +BTW-------------------+  | |
|                                                                 +-----------------+BLOCK TRANSFER WRITE  +-(EN)+ |
|                                                                 |Rack               00|                     | |
|                                                                 |Group               2+-(DN)                | |
|                                                                 |Module              0|                     | |
|                                                                 |Control block   N7:300+-(ER)               | |
|                                                                 |Data file       N7:310|                     | |
|                                                                 |Length             64|                     | |
|                                                                 |Continuous          N|                     | |
|                                                                 +---------------------+                     | |
|                                                                                                             |

Rung 2:2
|                                                                                                             |
+------------------------------------------------------------------------[END OF FILE]------------------------------+
|                                                                                                             |
```

Address	0	1	2	3	4	5	6	7	8	9
N7:0	1	1	16	10	16	10	0	0	0	0
N7:10	16	16	-28548	18494	-28548	16	0	1263	678	1263
N7:20	20018	8224	12590	12337	12342	8242	0	0	0	0
N7:30	0	0	0	0	0	0	0	0	0	0
N7:40	0	0	0	0	0	0	0	0	0	0
N7:50	1	1	3	0	10	50	0	0	0	0
N7:60	1	1	4	20	10	70	0	0	0	0
N7:70	1	1	16	0	10	0	0	0	0	0
N7:80	1	1	1	0	80	90	0	0	0	0
N7:90	0	1	2	0	80	95	0	0	0	0
N7:100	0	1	5	0	1	4000	0	0	0	0
N7:110	0	1	15	0	80	3084	0	0	0	0
N7:120	0	0	0	0	0	0	0	0	0	0
N7:130	0	0	0	0	0	0	0	0	0	0

N10:0

Address	0	1	2	3	4	5	6	7	8	9
N10:0	120	0	0	0	0	0	0	0	1	1
N10:10	1	0	0	0	0	0	0	0	0	0
N10:20	0	0	0	0	0	0	0	0	0	0
N10:30	0	0	0	0	0	0	0	0	0	0
N10:40	0	0	0	0	0	0	0	0	0	0
N10:50	0	0	0	0	0	0	0	0	0	0
N10:60	0	0	0	0	0	0	0	0	0	0
N10:70	0	0	0	0	0	0	0	0	0	0
N10:80	0	0	0	0	0	0	0	0	0	0
N10:90	0	0	0	0	0	0	0	0	0	0
N10:100	0	0	0	0	0	0	0	0	0	0
N10:110	0	0	0	0	0	0	0	0	0	0
N10:120	0	0	0	0	0	0	0	0	0	0
N10:130	0	0	0	0	0	0	0	0	0	0
N10:140	0	0	0	0	0	0	0	0	0	0
N10:150	0	0	0	0	0	0	0	0	0	0
N10:160	0	0	0	0	0	0	0	0	0	0
N10:170	0	0	0	0	0	0	0	0	0	0
N10:180	0	0	0	0	0	0	0	0	0	0
N10:190	0	0	0	0	0	0	0	0	0	0

Address	0	1	2	3	4	5	6	7	8	9
N11:0	0	55	55	55	55	55	55	55	55	55
N11:10	0	0	0	0	0	0	0	0	0	0
N11:20	0	0	0	0	0	0	0	0	0	0
N11:30	0	0	0	0	0	0	0	0	0	0
N11:40	0	0	0	0	0	0	0	0	0	0
N11:50	0	0	0	0	0	0	0	0	0	0
N11:60	0	0	0	0	0	0	0	0	0	0
N11:70	0	0	0	0	0	0	0	0	0	0
N11:80	0	0	0	0	0	0	0	0	0	0
N11:90	0	0	0	0	0	0	0	0	0	0

B13:0

Address	15	Data	0
B13:0	0000	0000 1111	1111
B13:1	1111	1111 0000	0000
B13:2	0000	0000 0000	0001
B13:3	0000	0000 0000	0001
B13:4	0000	0000 0000	0001
B13:5	0000	0000 0000	0000
B13:6	0000	0000 0000	0000
B13:7	0000	0000 0000	0000
B13:8	0000	0000 0000	0000
B13:9	0000	0000 0000	0000
B13:10	0000	0000 0000	0000
B13:11	0000	0000 0000	0000
B13:12	0000	0000 0000	0000
B13:13	0000	0000 0000	0000
B13:14	0000	0000 0000	0000
B13:15	0000	0000 0000	0000
B13:16	0000	0000 0000	0000
B13:17	0000	0000 0000	0000
B13:18	0000	0000 0000	0000
B13:19	0000	0000 0000	0000
B13:20	0000	0000 0000	0000
B13:21	0000	0000 0000	0000
B13:22	0000	0000 0000	0000
B13:23	0000	0000 0000	0000
B13:24	0000	0000 0000	0000
B13:25	0000	0000 0000	0000
B13:26	0000	0000 0000	0000
B13:27	0000	0000 0000	0000
B13:28	0000	0000 0000	0000
B13:29	0000	0000 0000	0000
B13:30	0000	0000 0000	0000
B13:31	0000	0000 0000	0000
B13:32	0000	0000 0000	0000
B13:33	0000	0000 0000	0000
B13:34	0000	0000 0000	0000
B13:35	0000	0000 0000	0000
B13:36	0000	0000 0000	0000
B13:37	0000	0000 0000	0000
B13:38	0000	0000 0000	0000
B13:39	0000	0000 0000	0000
B13:40	0000	0000 0000	0000
B13:41	0000	0000 0000	0000
B13:42	0000	0000 0000	0000
B13:43	0000	0000 0000	0000
B13:44	0000	0000 0000	0000
B13:45	0000	0000 0000	0000
B13:46	0000	0000 0000	0000
B13:47	0000	0000 0000	0000
B13:48	0000	0000 0000	0000
B13:49	0000	0000 0000	0000
B13:50	0000	0000 0000	0000
B13:51	0000	0000 0000	0000
B13:52	0000	0000 0000	0000
B13:53	0000	0000 0000	0000
B13:54	0000	0000 0000	0000
B13:55	0000	0000 0000	0000
B13:56	0000	0000 0000	0000
B13:57	0000	0000 0000	0000
B13:58	0000	0000 0000	0000
B13:59	0000	0000 0000	0000

```
  Address      15     Data      0
B14:0         0000 0000 0000 0001
B14:1         0000 0000 0000 0000
B14:2         0000 0000 0000 0000
B14:3         0000 0000 0000 0000
B14:4         0000 0000 0000 0000
B14:5         0000 0000 0000 0000
B14:6         0000 0000 0000 0000
B14:7         0000 0000 0000 0000
B14:8         0000 0000 0000 0000
B14:9         0000 0000 0000 0000
B14:10        0000 0000 0000 0000
B14:11        0000 0000 0000 0000
B14:12        0000 0000 0000 0000
B14:13        0000 0000 0000 0000
B14:14        0000 0000 0000 0000
B14:15        0000 0000 0000 0000
B14:16        0000 0000 0000 0000
B14:17        0000 0000 0000 0000
B14:18        0000 0000 0000 0000
B14:19        0000 0000 0000 0000
B14:20        0000 0000 0000 0000
B14:21        0000 0000 0000 0000
B14:22        0000 0000 0000 0000
B14:23        0000 0000 0000 0000
B14:24        0000 0000 0000 0000
B14:25        0000 0000 0000 0000
B14:26        0000 0000 0000 0000
B14:27        0000 0000 0000 0000
B14:28        0000 0000 0000 0000
B14:29        0000 0000 0000 0000
B14:30        0000 0000 0000 0000
B14:31        0000 0000 0000 0000
B14:32        0000 0000 0000 0000
B14:33        0000 0000 0000 0
B14:34        0000 0000 0000 0000
B14:35        0000 0000 0000 0000
B14:36        0000 0000 0000 0000
B14:37        0000 0000 0000 0000
B14:38        0000 0000 0000 0000
B14:39        0000 0000 0000 0000
B14:40        0000 0000 0000 0000
B14:41        0000 0000 0000 0000
B14:42        0000 0000 0000 0000
B14:43        0000 0000 0000 0000
B14:44        0000 0000 0000 0000
B14:45        0000 0000 0000 0000
B14:46        0000 0000 0000 0000
B14:47        0000 0000 0000 0000
B14:48        0000 0000 0000 0000
B14:49        0000 0000 0000 0000
B14:50        0000 0000 0000 0000
B14:51        0000 0000 0000 0000
B14:52        0000 0000 0000 0000
B14:53        0000 0000 0000 0000
B14:54        0000 0000 0000 0000
B14:55        0000 0000 0000 0000
B14:56        0000 0000 0000 0000
B14:57        0000 0000 0000 0000
B14:58        0000 0000 0000 0000
B14:59        0000 0000 0000 0000
B14:60        0000 0000 0000 0000
```