HSL-CD4
Rutherford Decorator
High Speed Front End
User's Manual

Systems Engineering Associates, Inc.
14989 West 69th Avenue
Arvada, Colorado 80007 U.S.A.
Telephone: (303) 421-0484
Fax: (303) 421-8108
www.sea-seg.com

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WARNING

To ensure the equipment described by this User Manual, as well as the equipment connected to and used with it, operates satisfactorily and safely, all applicable local and national codes that apply to installing and operating the equipment must be followed. This includes the National Electric Code in the USA and other applicable legislation, regulations, and codes in practice elsewhere. Since codes can vary geographically and can change with time, it is the user's responsibility to determine which standards and codes apply, and to comply with them.

FAILURE TO COMPLY WITH APPLICABLE CODES AND STANDARDS CAN RESULT IN DAMAGE TO EQUIPMENT AND/OR SERIOUS INJURY TO PERSONNEL.

Persons supervising and performing installation or maintenance must be suitably qualified and competent in these duties, and should carefully study this User Manual and any other manuals referred to by it prior to installation and/or operation of the equipment.

The contents of the User Manual are believed to be correct at the time of printing; however, no responsibility is assumed for inaccuracies. In the interests of a commitment to a policy of continuous development and improvement, the manufacturer reserves the right to change the specification of the product or it's performance or the contents of the User Manual without notice.

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Performs high speed control functions of Rutherford Decorator/Basecoater to speeds in excess of 2000 CPM. This includes speed compensated print carriage and varnish unit trip, which eliminates inside deco and varnish problems, and three can pin chain (bad can) blow-off which reduces scrap.

- High speed front-end upgrade package which interfaces with existing control system.

- Performs the following control functions:
  1) Detection of miss-loaded cans.
  2) Damaged can blow-off.
  3) Speed compensated print carriage trip control.
  4) Speed compensated varnish unit trip control.
  5) Three can (bad can) pin chain blow-off.
  6) Single select-a-can QC pin chain blow-off.
  7) Can gate open/close control.
  8) Alarm detection: infeed track jam, no can transfer (can on mandrel), and timing signal fail detection.
  9) Data Acquisition: Total number of good cans printed, total number of blow-offs, trips per spindle, etc. (for both current shift and last shift)
  10) Automatic Form Roll Throw-off at infeed track jam or can gate closed.

- Built-in 2-Line X 40 character sealed display with 24 key membrane keypad allows local viewing of collected data (can count, blow-off count, trips per spindle) by operator and set-up of all user variables (key switch enabled) by authorized personnel.

- Interfaces directly with machine mounted resolver, can/no can sensor and all trip and blow-off solenoids.

- Based on high performance M4500 PLC/PLS module which, allows easy trouble-shooting and user customization using SYSdev (DOS or Windows™ based) programming package.

- Built-in PLS provides all machine timing, eliminating need for an additional PLS.

- Can be used on all Rutherford Basecoaters, (both carriage trip models and two coater roll models), as well as all Rutherford Decorator models.

SECTION 1
GENERAL DESCRIPTION

1.2 FUNCTIONAL DESCRIPTION

The HSL-CD4 Decorator/Basecoater high speed control package is an electronic upgrade package for the Rutherford decorator/basecoater which detects miss-loaded cans, performs speed compensated print trip, varnish trip, and three can (bad can) blow-off at speeds in excess of 2000 CPM.

In addition, the package provides:

1) Select-A-Can Pin Chain Blow-off for print quality verification.
2) Alarm Detection including:
   - Infeed Track Jam.
   - No Can Transfer (can on mandrel).
   - Timing Signal Failure.

3) Data Collection (both for the current shift and previous (last) shift) including:
   - Total Good Can Count.
   - Blow-off Counts
   - Trips per Spindle.

The package interfaces directly to the machine mounted resolver, can/no can sensor, trip and blow-off solenoids as well as the host PLC via discrete DC I/O.

The CD4 control system is not a dedicated "black box", but is instead, implemented using the high performance SYSTEMS M4500 PLC/PLS module. This allows easy customization by either SEA or the end user. The M4500 module is programmed using the SYSdev programming package (DOS or Windows™ based), which allows the module to be programmed in any combination of Ladder or High-level (subset of "C"), as well as perform on-line monitoring and trouble-shooting. The M4500 module incorporates a built-in PLS which interfaces directly to the machine mounted resolver and provides all machine timing, eliminating the need for an external PLS.

1.3 SPEED COMPENSATED PRINT CARRIAGE TRIP AND VARNISH UNIT CONTROL

Speed compensated print carriage and varnish unit trip at speeds in excess of 2000 CPM is incorporated to compensate for the response time of the carriage (or varnish unit). The print carriage (or varnish unit) is always extended or retracted such that a miss-loaded mandrel is not printed (or varnished) regardless of machine speed. The package achieves this by implementing a speed compensation algorithm that "leads" the trip point by the response time of the carriage (or varnish unit). The control is capable of "leading" the trip point by up to two stations (60msec at 2000 CPM).

Note: A single mandrel trip is possible at speeds up to 1200 CPM, a two station trip is recommended for speeds above 1200 CPM.

1.4 BAD CAN AND SELECT-A-CAN PIN CHAIN BLOW-OFF

Both the “Bad Can” pin chain blow-off and “Select-A-Can” pin chain blow-off incorporate speed compensation to compensate for the response time of the blow-off solenoids regardless of machine speed. This allows accurate rejection of a single can from the pin chain at speeds in excess of 2000 CPM. The bad can blow-off is activated automatically to reject miss-loaded cans from the pin chain.

The “Select-A-Can” feature allows the user to dial in a mandrel number, either at a remote PB station or from the Keypad/Display and blow-off one can printed on that mandrel. Mandrels 1 through 24 can be individually blown-off this way to verify the print quality of each mandrel. Two other select-a-can blow-off modes are also available (blanket and mandrel). The blanket mode blows off consecutive cans printed on each blanket, starting with blanket 1. The mandrel blow-off mode blows off 24 consecutive cans printed on all 24 mandrels, starting with mandrel 1.

The following variables can be set by the user for the bad can blow-off:
- Number of pins to the pin chain blow-off port (up to 999).
- Number of cans to blow-off for each bad can (three is usually required when varnish is used),
- Both the "ON" and "off" solenoid response time (used by the speed compensation algorithm).

The following variables can be set by the user for the select-a-can blow-off:
- QC shift offset (1 to 24) which is used to match the actual mandrel number to the selected mandrel number.
- Number of blankets on blanket wheel.
- Both the "ON" and "off" solenoid response times.

1.5 AUTOMATIC FORM ROLL THROW-OFF

Automatic form roll throw-off is incorporated to throw off the form rolls in the event of an infeed track jam or when the can gate is closed. This prevents the blankets from over inking when no cans are printed under these conditions, which in turn reduces the number of cans, which have to be blown off once the jam is cleared or the infeed is opened. This can also be incorporated into the ductor rolls to prevent the transfer of ink into the station under these same conditions.

1.6 ALARM DETECTION

The package detects the following alarms:

INFEED TRACK JAM: The infeed track jam alarm occurs when 6 consecutive empty mandrels are detected by the can/no can sensor after the can gate is opened.

NO CAN TRANSFER: The no can transfer alarm occurs when the no can transfer sensor detects a can on a mandrel after the disk transfer location.

TIMING SIGNAL FAIL: The timing signal fail occurs when any of the timing signals generated in the PLS section fail to change state periodically while the machine is running.

The above alarms are available to the host PLC via discrete outputs. These should be used to stop the machine and indicate the problem when any one of the alarms occurs.

1.7 DATA COLLECTION

The following data is collected for both the current shift and the previous (last) shift:

1) Total number of good cans printed
2) Total number of cans blown-off
3) Total number of miss-loaded cans (bad cans)
4) Total number of restart blow-offs
5) Total number of manual blow-offs
6) Total number of select-a-can QC blow-offs
7) Total trips per spindle (for each spindle)

This data can be viewed locally on the display sent to the host PLC via RS-232 communications (MODBUS or Allen-Bradley DF1 protocols) using the optional S4516 serial communications board. This information is updated ("current" shift transferred to "Last" shift) based on the change of state of a discrete input. This input can be activated on an 8 or 12 hour shift basis or alternatively could be activated manually on a label run basis depending on the user's preference.

In addition to the shift data collection, a separate buffer is available to collect trips per spindle counts as a diagnostics aid to the operator for trouble-shooting a loading problem on a specific mandrel. Unlike the shift data, these counts can be reset manually by the operator at will. This allows the operator to note an abnormally high count on a specific mandrel, attempt to correct the problem, reset the counts and then check the counts at a latter time to determine if the problem is corrected. This data can be viewed on the Keypad/Display.

SECTION 2
INSTALLATION

The standard HSL-CD4 package is provided for back-panel mounting inside the existing user's control cabinet. In addition, the HSL-CD4 can be purchased in a self contained NEMA 12 enclosure for mounting adjacent to the existing control cabinet by specifying part number HSL-CD4-ENCL.

2.1 WHAT'S INCLUDED

Depending on which package is purchased, verify that the following items are included when unpacking the HSL-CD4:

2.1.1 HSL-CD4 (for back-panel mounting)

1ea. HSL-CD4 back-panel for mounting in the existing user's control cabinet including the following:

- 1ea. M4500 PLC/PLS module
- 1ea. P4500 Power Supply
- 1ea. D4591 Display with ribbon cable for mounting in the existing control cabinet door
- 1ea. HSL-CD4 User's Manual
- 1ea. M4500 User's Manual
- 1ea. HSL-CD4 Program Disk

2.1.2 HSL-CD4-ENCL (with NEMA 12 ENCLOSURE)

- 1ea. HSL-CD4 NEMA 12 enclosure including the following:
- 1ea. M4500 PLC/PLS module
- 1ea. P4500 Power Supply
- 1ea. D4591 Display/Keypad
- 1ea. HSL-CD4 User's Manual
- 1ea. M4500 User's Manual
- 1ea. HSL-CD4 Program Disk

2.1.3 HSL-CD4 OPTIONS (PURCHASED SEPARATELY)

The following items can be purchased separately as required or desired. All items are compatible with both the back-panel mountable package or the NEMA 12 enclosed package:

1ea. S4516 Data Communications Board (MODBUS and DF1 protocols)
1ea. HSL-QCSTA Remote Select-A-Can PB station
1ea. HSL-DSP Remote RPM/Position Display
1ea. RSV34-MS1 Resolver
1ea. RSV-RSCBLE-XX Resolver Cable

2.2 POWER REQUIRED

The HSL-CD4 is powered from 115VAC/230VAC 50/60HZ and +24VDC. The 115VAC/230VAC is used to power the M4500 module while the +24VDC is used to power the +24VDC I/O (sensors, trip and blow-off solenoids).

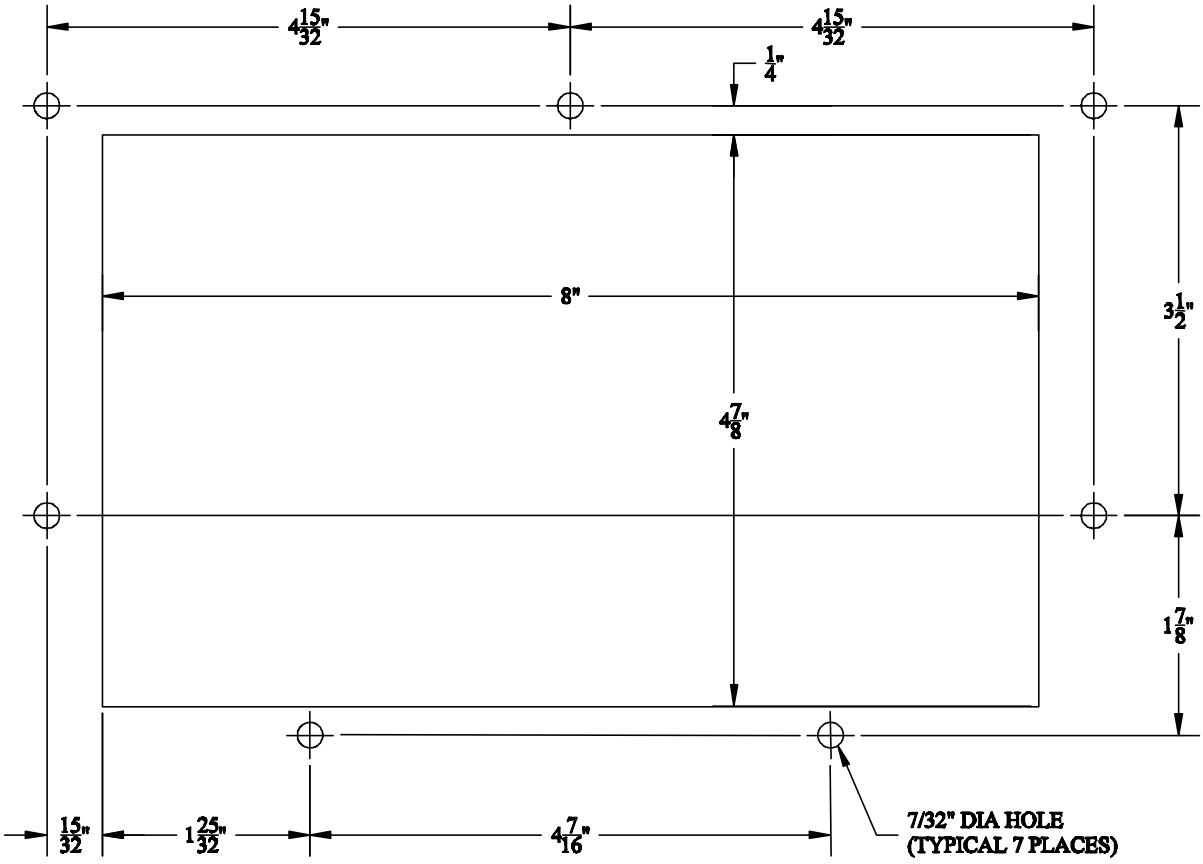
Note: +24VDC solenoids must be used for all trip and blow-off solenoids. These provide a much more consistent and repeatable response time than 115VAC solenoids.

Assuming +24VDC solenoids were used in the existing system, the +24VDC current required by the HSL-CD4 is no more than the existing systems +24VDC current requirement, therefore the existing +24VDC power supply should be adequate.

2.3 MOUNTING AND WIRING THE HSL-CD4

If installing the HSL-CD4 package mounted in the NEMA 12 enclosure, mount the HSL-CD4 NEMA 12 enclosure in proximity to the existing control cabinet. If installing the HSL-CD4-BP package, mount the back-panel in the existing control cabinet.

Referring to the figure below create a cut-out in the existing control cabinet door and mount the D4591 display.



D4591 Recommended Panel Door Cut-out

Note: The D4591 must be located within 6 feet of the M4500 module to avoid EMI pick-up on the Display ribbon cable. Connect the ribbon cable from the M4500 module to the D4591 module.

SECTION 2
INSTALLATION

Referring to the electrical control schematic at the back of this manual, wire the HSL-CD4 to the existing control system as follows:

Note: Keep all +24VDC wiring, resolver cable, and sensor cable wiring away from high voltage wiring. Wire the machine mounted resolver directly to the 8-pin resolver input connector on the M4500.

1) Incoming Power: 115VAC-230VAC to FU1, neutral to 900 and ground to GND. +24VDC to 501 and common to 500.

2) Interlocks from existing control system to HSL-CD4 (terminals I10 through I19).

3) Interlocks to existing control system from HSL-CD4 (terminals O22 through O25).

4) Carriage Trip, Varnish Unit Trip, Damaged Can Blow-off, Pin Chain Blow-off and Can Feed solenoids (terminals O10 through O21).

5) Can/No Can Sensor, Spindle No.1 I.D. Sensor and No Transfer Sensor (terminals I08, I09, I21) using three conductor shielded cables. The shields of the sensor cables should be tied to earth ground at a terminal inside the existing control cabinet and left floating at the sensors.

6) Set-Up Enable key switch (if desired) to allow entry to set-up variables through Keypad/Display.

7) Resolver cable from resolver (or existing PLS) to 8-pin resolver input connector on the M4500 using a three pair, two conductor shielded cable. The shield of the resolver cable should be tied to the "SHLD" terminal of the M4500 resolver input connector. Make sure the resolver cable shield is left floating at the resolver.

2.4 MOUNTING THE HSL-QCSTA

The HSL-QCSTA is used to blow-off a can from a selected spindle (or blanket) from the pin chain for quality verification. If the optional HSL-QCSTA remote select-a-can PB station was purchased, mount it in the vicinity of the pin chain QC blow-off port in a convenient location for the operator. Wire the HSL-QCSTA to the HSL-CD4 panel referring to the electrical control schematic at the back of this manual.

2.5 MOUNTING THE HSL-DSP REMOTE DISPLAY

The HSL-DSP is a remote 4 digit BCD display which displays either the current CPM or resolver position as selected by the operator. If the optional HSL-DSP remote RPM/Position display was purchased, make a cut-out in the operator's control console for the display where desired. Prior to mounting, remove the back cover of the display and set the dip switches as outlined on the electrical control schematic at the back of this manual. Mount the display and wire per the schematic at the back of this manual. A selector switch can also be mounted and wired as shown to select either CPM or position.

2.6 MOUNTING THE RSV34-MS1 RESOLVER (IF REQUIRED)

The HSL-CD4 is designed to interface to a resolver (not encoder) for machine timing. If the machine is not already equipped with a resolver, then the existing encoder will have to be removed and an RSV34-MS1 resolver will have to be mounted in it's place. If this is the case, refer to the RSV34-MS1 data sheet for details on mounting the resolver.

Note: The resolver must make one revolution for each spindle (24 revolutions per spindle wheel revolution). Use the RSV-RSCBLE cable to connect the resolver to the HSL-CD4. Route the resolver cable in a separate conduit, away from all other high voltage and control wiring. Wire the cable directly to the 8-pin resolver connector on the M4500 (see section 2.3– Mounting and Wiring the HSL-CD4).

2.7 MOUNTING THE SPINDLE #1 I.D. SENSOR (NOT PROVIDED)

If the machine is not already provided with a spindle #1 I.D. sensor, then one will have to be mounted. This sensor is used to determine which spindle is the #1 spindle for both the QC select-a-can blow-off and the trips per spindle count. This must see a target once every revolution of the spindle wheel (once every 24 spindles). Any non-discriminating 10-30VDC proximity sensor can be used and it can be mounted anywhere around the periphery of the spindle wheel. The target it looks at should be either a large steel bolt head or 1" by 1" square steel target mounted on the spindle wheel in the vicinity of spindle #1.

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INSTALLATION

2.8 HSL-CD4 SOFTWARE INSTALLATION

Follow the steps below to install either the Windows or DOS based setup programs and PLC application program on a PC used to support the HSL-CD4 control system.

2.8.1 WINDOWS™ BASED SETUP PROGRAM INSTALLATION

The RTFCD7 setup program is compatible with Windows 95/98/ME/2000/XP operating systems and is used to:

1) Setup (tune) the user adjustable variables.
2) Adjust the timing channel set-points.
3) Download the application program to the M4500 module.
4) Download (restore) or upload (save) the user setup variables from the M4500.
5) View “Shift” and “Trips per Spindle” data.

To install the set-up software, perform the following steps:

1) Insert the HSL-CD4 CD into the drive

2) From the Windows desktop, “Click” Start and then select run.

3) From the “Run” dialog box, “Click” the Browse button.

4) Select the drive with HSL-CD4 CD. Select the “setup.exe” file and “Click” Open and then Ok.

5) This will initiate the installation process. Follow the instructions that appear on the screen to complete the installation process. The RTFCD7 setup program can be executed from the “Systems” folder located in Programs.

2.8.2 DOS BASED SETUP PROGRAM INSTALLATION

The HSLCD4 set-up software is used to:

1) Setup (tune) the user adjustable variables.
2) Adjust the timing channel set-points.
3) Download the application program to the M4500 module.
4) Download (restore) or upload (save) the user setup variables from the M4500 to disk.
5) View “Shift” and “Trips per Spindle” data.

To install the DOS based set-up software perform the following steps:

1) Create a directory off the root for each decorator. These will be used to store the "HSLCD4.EXE" setup program and set-up data for each decorator.

   Create these directories by typing the following at the DOS prompt:

   MD \HSLDEC1<ENTER> (line 1 Decorator)
   MD \HSLDEC2<ENTER> (line 2 Decorator)
   MD \HSLDEC3<ENTER> (line 3 Decorator)
   etc.

2) Install the "PROGRAMS" disk into the drive. For each "HSLDEC" directory you created, switch to that directory and install the "HSLCD4" set-up programs by typing the following at the DOS prompt (Line 1 decorator is shown):

   CD \HSLDEC1<ENTER>
   A:INSTALL<ENTER>

3) Add each decorator's set-up program to your computer's menu software by creating a selection for each decorator called "SET-UP DECO LINE1" for the line #1 decorator, "SET-UP DECO LINE2" for the line #2 decorator, etc.. The DOS commands executed for these selections should be (Line 1 decorator is shown):

   For the "SET-UP DECO LINE1" selection:
   CD \HSLDEC1
   HSLCD4 HSLCD4
   CD \

4) To execute the respective decorator's set-up program, simply select the corresponding "SET-UP DECO LINE" selection from the menu software's menu.

2.8.3 SYSdev PROGRAM DEVELOPMENT SOFTWARE INSTALLATION

The SYSdev Program Development software is used to perform on-line trouble-shooting and program modifications to the HSL-CD4. If SYSdev was purchased with the HSL-CD4 package and is not already installed on the your computer, install SYSdev onto the hard drive of your computer following the steps in outlined in the SYSdev Program Development manual.

2.8.4 APPLICATION PROGRAM INSTALLATION

The application program is a SYSdev based program, loaded into the M4500 module and performs the HSL-CD4 logic. The program is written in a combination of Ladder logic and High-level. If the user desires to make program changes or perform on-line monitoring of the program execution the files, which constitute the HSLCD4 program, will have to be loaded onto the hard drive of the PC used to support the system. The SYSdev Program Development Software will also have to be loaded on the PC. To install this program perform the following:

1) Install the “PROGRAMS” disk into the drive.

2) For each of the "HSLDEC" directories (created in section 2.8.2), copy all the files from the disk to each of these subdirectories.

2.9 MODIFY EXISTING PLC PROGRAM

Modify the existing control system PLC program to interface with the HSL-CD4 by incorporating the following into the existing PLC ladder logic:

1) The damaged can blow-off, print carriage trip, varnish unit trip, and pin chain blow-off will be controlled by the HSL-CD4. If the existing host PLC was previously controlling these functions, this logic can optionally be removed from the existing host PLC. In most cases this logic can be left in the program as connecting the respective solenoids to the HSL-CD4 will effectively defeat the logic.

2) Add the "Infeed Track Jam" and "Can On Mandrel” (no transfer) alarms as inputs to the host PLC. These should stop the machine anytime either of these alarms are "on".

3) Add the "Carriage Auto Mode" and "Carriage Manual In" outputs into the PLC logic. When both are "off" the carriage will be retracted. When the "Manual In" is "on", the carriage will be extended (print position). When the "Auto Mode" is "on", the carriage is controlled by the can/no can sensor.

4) Add the "Varnish Auto Mode" and "Vanish Manual In" outputs into the PLC logic. When both are "off" the varnish unit will be retracted. When the "Manual In" is "on", the varnish will be extended (varnish position). When the "Auto Mode" is "on", the varnish unit is controlled by the can/no can sensor.

5) Add the "Damaged Can Auto Mode" and "Damaged Can Manual On" outputs into the PLC logic. When both are "off" the damaged can blow-off is disabled. When the "Manual On" is "on", the damaged can blow-off is "on". When the "Auto Mode" is "on", the damaged can blow-off is controlled by the can/no can sensor and infeed open.

6) Add the "Pin Chain Manual Blow-off" output to the PLC logic. This can be used as a manual blow-off. When "on", the bad can pin chain blow-off is "on". When "off", the pin chain blow-off functions normally, blowing off detected bad cans, restart cans, etc.

7) Add the "Can Feed Open" output to the PLC logic. When turned "on" while running, the infeed is timed "open" with the can feed timing signal. When turned "off" while running, the infeed is timed "closed" with the can feed timing signal. When the machine is stopped, turning this input "on" and "off" will respectively "open" and "close" the can stop.

8) Add the "Main Drive On" output to the PLC logic. This should be "on" when the drive is enabled (running) and should be "off" when the drive is disabled (this includes auto stop conditions). This is true for jog modes as well.

9) Add the "Alarm Reset" output. This signal should be "on" as long as the system reset push-button is depressed.

SECTION 2
INSTALLATION

2.10 TUNING THE HSL-CD4

The HSL-CD4 is shipped from the factory with the PLC application program loaded in the M4500 module (PLC section) and the PLS channel set-point file "CD4TMG" loaded in the PLS section. These standard programs are used to implement the decorator or basecoater algorithms. In most cases, the following user variables and timing signals may have to be altered to tune the HSL-CD4 to the actual decorator it is controlling.

Once the system is installed and powered back up, perform the following to set-up and tune the HSL-CD4. The set-up is performed using either the Keypad/Display or a PC running the set-up program.

See the HSM-CD4/CD7 Keypad Quick Reference for key depress sequences for entering the following parameters. See section 3 of this manual for a description of the Keypad commands and menu displays of the Keypad/Display. See sections 4 and 5 for a description of menus and variables and how to use the set-up programs.

2.10.1 DEFAULT SET-UP VARIABLES

As shipped, the user variables for the M4500 are set to the following defaults:

Print Carriage and Varnish Unit:
- Print Carriage retract response time (msec) _____: 45
- Print Carriage extend response time (msec) _____: 45
- Varnish Unit retract response time (msec) _____: 60
- Varnish Unit extend response time (msec) _____: 60
- Number of Shifts to Varnish Unit _____: 5

Bad Can (pin chain) Blow-off:
- # of cans to blow-off from infeed open _____: 6
- # of cans to blow-off from print at restart _____: 4
- # of cans to blow-off from varnish at restart _____: 4
- # of cans to blow-off for each misload _____: 3
- # of pins to pin chain blow-off port _____: 50
- # of cans from infeed to can PRX _____: 6
- Blow-off solenoid "on" response time (msec) _____: 15
- Blow-off solenoid "off" response time (msec) _____: 20

QC Can (select-a-can) Blow-off:
- Blow-off solenoid "on" response time (msec) _____: 15
- Blow-off solenoid "off" response time (msec) _____: 20
- QC can blow-off port shift offset _____: 1
- Blanket wheel segments _____: 8

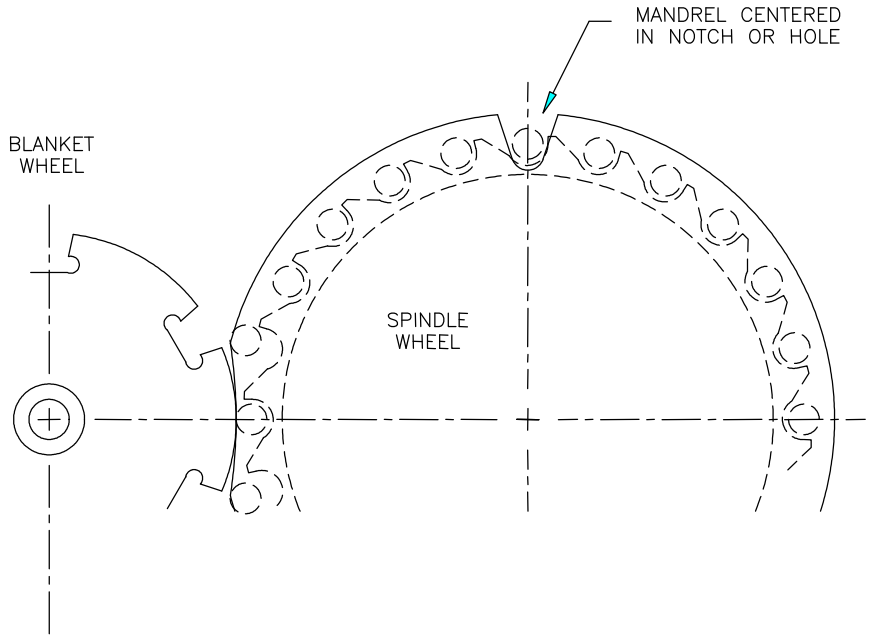
Spindle Trip Offset _____: 0

The "CD4TMG" timing channel file, as shipped, contains the following default timing set-points:

CHAN	ON	-	OFF	DESCRIPTION
CH00:	020	-	060	Carriage trip timing
CH01:	010	-	050	Varnish trip timing
CH02:	180	-	000	Can/No Can clock
CH03:	060	-	250	Damaged Can Blow-off (Low speed)
CH04:	030	-	200	Damaged Can Blow-off (High speed)
CH05:	250	-	290	Pin Chain Blow-off (bad can) timing
CH06:	255	-	295	Select-A-Can (QC) Blow-off timing
CH07:	000	-	140	Can Gate Timing
CH10:	000	-	180	PLC Clock Timing
CH11:	___	-	___	
CH12:	___	-	___	
CH13:	___	-	___	
CH14:	___	-	___	
CH15:	___	-	___	
CH16:	___	-	___	
CH17:	___	-	___	

2.10.2 SET MACHINE ZERO

1) Position the machine at machine zero.

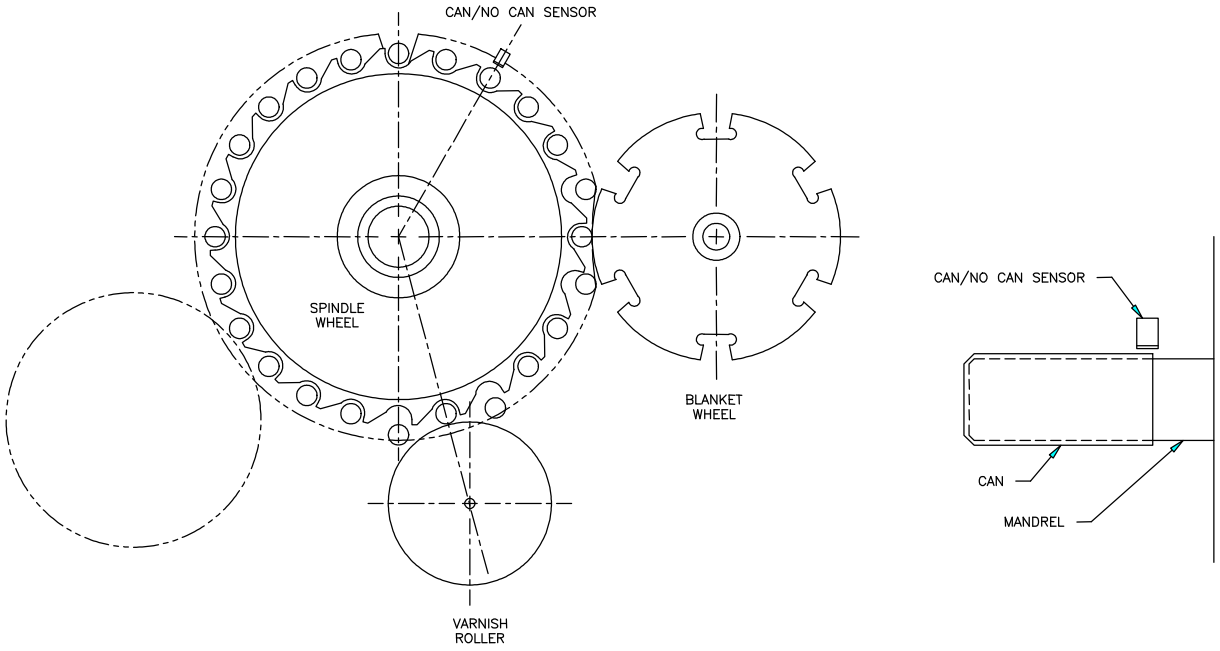


Machine Zero Position
(as seen from back of machine)

2) Set the resolver offset. Using the Keypad/Display, perform the following:
   a) Press the "Set-Up" key.
   b) Press the #5 key – Zero Machine (set resolver offset).
   c) Enter "0" to zero the resolver and set the offset. The timing channel set-up menu will be displayed, showing the position, "POS:", at zero.

2.10.3 VERIFY LOCATION OF CAN/NO CAN SENSOR

Verify that the location of the can/no can sensor is at the 2nd spindle from 12 o'clock when the machine is at zero.



Location of Can/No Can Sensor

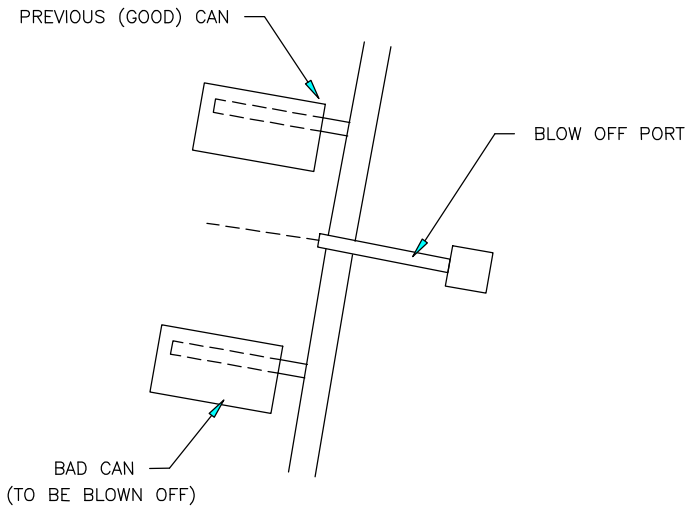
Verify the location of the Can/No Can sensor. Place a can on a spindle and slowly jog it past the sensor. The sensor should first see the can at between 300 and 0 degrees. If it does, the location of the sensor is correct.

Note: The Can/No Can sensor "ON" position can be viewed by selecting option #6 – View Critical Input Positions, from the primary setup menu using the Keypad/Display.

If the sensor first sees the can between 0 and 30 degrees, the system will still function correctly but the Damaged Can Blow-off (HI - CH04) and (LOW - CH03) timing signals may have to be adjusted. If the Can/No Can sensor first sees the can outside the 300 to 30 degree range, the sensor should be moved to within the 300 to 0 degree range.

2.10.4 SET PIN CHAIN BLOW-OFF TIMING

1) Set the bad can (pin chain) blow-off timing (CH05) such that the timing signal just turns “ON” when the pin chain blow-off port is centered between Cans.



Location of Blow-off Timing “ON” Position
(channel 05 or 06)

2) From the primary setup menu using the Keypad/Display, select option #3 – Set Machine Timing (set-points, etc.) and perform the following:
   a) With the machine stopped, view the resolver position.
   b) Select timing channel CH05 – Pin Chain Blow-off.
   c) Clear the channel (press the “CLEAR CHAN” key).
   d) Enter a new set-point (press the “ENTER SET-POINT” key). The “ON” SETPOINT should be the current position of the resolver (press the “ENTER” key). The “OFF” SETPOINT should be set 40 degrees after the “ON” set-point (press the “ENTER” key).
   e) Search the channel to confirm only one set-point (one on setting and one off setting).

2.10.5 SET # OF PINS TO PIN CHAIN BLOW-OFF PORT

Perform the following to set the "# of pins to pin chain blow-off port":

Note: That the chain take-up must be after the bad can pin chain blow-off port for reliable pin chain blow-off. If the take-up is before the port, the relative position of the port to the blow-off timing will vary as the take-up moves, causing partial blow-offs to occur.

1) Count the number of pins from the spindle wheel to disc transfer location to the bad can pin chain blow-off port

2) From the primary setup menu using the Keypad/Display, select option #2 – Set Pin Chain/QC Blow-off Parameters. Press the “NEXT” key until “# PINS TO PIN CHAIN BLOW-OFF PORT:” is displayed.

3) The number entered is the number counted minus 2 (this is still just an approximation).

4) Set the "# CANS TO BLOW-OFF FOR EACH MISLOAD" (press the “PREV” key) equal to five.

5) Run the machine at low speed. Open the infeed and allow cans to load and be printed. After cans have passed the pin chain blow-off port, close the infeed and observe the number of cans blown off.

   Note: Half prints or silver cans may get through the line until this variable is set-up properly.

   Adjust the number of pins to pin chain blow-off such that whenever the infeed is closed, one (half printed) can is consistently blown off.

   If no cans are blown off, the number of pins to pin chain blow-off is too high (blow-off comes on too late). Reduce the number of pins to pin chain blow-off and repeat this step again.

   If more than one can is blown off, the number of pins is too low (blow-off comes on too early). Increase the number of pins to pin chain blow-off and repeat this step again.

6) Set the "# CANS TO BLOW-OFF FOR EACH MISLOAD" equal to 3.Run the machine at low speed with cans and verify that for each miss-loaded can, three bad cans are blown off (miss-loaded silver can blown off at damaged can blow-off port, half print cans ahead and behind miss-loaded can blown off at pin chain port). If not adjust "# of pins to pin chain blow-off port" accordingly until they are.

Note: Once this variable is set, it may be desirable to set the "# of cans to blow-off for each misload" equal to 4 or 5 until the print carriage and varnish unit response times are set in steps 5 and 6. This is done so that the cans following the miss-load can be verified for proper print. Once this is done, the "# of cans to blow-off for each misload" can be set back to 3.

2.10.6 SET # OF CANS TO BLOW-OFF AT RESTART

From the primary setup menu using the Keypad/Display, select option #2 – Set Pin Chain/QC Blow-off Parameters. Set the following infeed open/restart blow-off parameters (as desired):

a) "# of Cans to Blow-off at Infeed Open"
b) "# of Cans to Blow-off from Print at Restart"
c) "# of Cans to Blow-off from Varnish at Restart"

2.10.7 SET # OF CANS FROM INFEED TO CAN PRX

This parameter is used to adjust the number of stations from the can gate solenoid to can/no can sensor. Default value is set to 6 stations. Some Rutherford decorators utilize an infeed star wheel, adding an additional 6 (total 12) stations from infeed to can PRX.

Perform the following to set the "# of Cans from Infeed to Can PRX":

1) From the primary setup menu using the Keypad/Display, select option #2 – Set Pin Chain/QC Blow-off Parameters. Press the “NEXT” key until “# OF CANS FROM INFEED TO CAN PRX:” is displayed.

2) Initially set this value to 6. If an infeed star wheel is used, set this value to 12.

3) Run the machine at low speed. Open the infeed and allow cans to load and be printed. From the default display of the Keypad/Display, observe the “BLOWOFFS” field. At “Infeed Open” this number should increment up by the number of cans to blow-off at infeed open. Observe that this same number of cans are blown off at the bad can pin chain blow-off port.

4) If the number of cans blown off was less than the number counted, increase the number of cans from infeed to can PRX by the difference.

5) If the number of cans blown off was more than the number counted, decrease the number of cans from infeed to can PRX by the difference.

6) Continue to adjust this parameter until the actual number of cans blown off at infeed open is equal to the desired.

2.10.8 SET PRINT CARRIAGE AND VARNISH UNIT "RETRACT"/"EXTEND" RESPONSE TIMES

The retract and extend response times is the amount of time the control system will lead the trip point (CH00 for the print carriage, CH01 for the varnish unit) to compensate for the mechanical response time of the machine. To verify the print carriage and varnish unit trip control, run the machine at high speed, induce miss-loads and observe the cans blown off at the pin chain blow-off.

Note: Pressing the “Blank Key” on the Keypad/Display while the default display is shown will electronically induce a misload into the system.

The miss-loaded can should be completely silver. The can ahead of the miss-load (can the carriage retracted on) should be blown off at the pin chain blow off port and should be 1/4 to 1/2 printed. The can behind the miss-load (the can the carriage extended on) should be blown off at the pin chain blow off port and should be 1/2 to 3/4 printed. Any additional cans blown off following the half print behind the miss-load should be fully printed and of good quality print.

From the primary setup menu using the Keypad/Display, select option #1 – Set Carriage/Varnish Response Times.

If the can ahead of the miss-load (carriage retracted on) is fully printed or more than half printed, the "Print Carriage retract (out) response time" is too short and the carriage is not retracting soon enough. Increase the "Print Carriage retract (out) response time" by 5 milliseconds and try again. Continue increasing this time until this can is 1/4 to 1/2 printed. If this can is less than 1/4 printed or silver, the "Print Carriage retract (out) response time" is too long and the carriage is retracting too soon. Decrease the "Print Carriage retract (out) response time" by 5 milliseconds and try again. Continue decreasing this time until this can is 1/4 to 1/2 printed (press the “NEXT” key).

If the can behind the miss-load (carriage extended on) is less than 1/2 printed or silver, the "Print Carriage extend (in) response time" is too short and the carriage is not extending soon enough. Increase the "Print Carriage extend (in) response time" by 5 milliseconds and try again. Continue increasing this time until this can is 1/2 to 3/4 printed. If this can is more than 3/4 printed or fully printed, the "Print Carriage extend (in) response time" is too long and the carriage is extending too soon. Decrease the "Print Carriage extend (in) response time" by 5 milliseconds and try again. Continue decreasing this time until this can is 1/2 to 3/4 printed.

Note: The "extend (in)" time is a function of the "retract (out)" time. Therefore the "retract (out)" time should always be set as desired first, before setting the "extend (in)" time.

Prior to setting the varnish unit retract/extend response times, set the number of shifts to the varnish unit. For older generation Rutherford Decorators, this is set to "5". For newer decorators, this is set to "4". In general, this is set such that the varnish unit retracts out on the can ahead of the misloaded spindle.

Set the varnish extend and retract response times in the same fashion as was done for the carriage. In general, the miss-loaded can should have no varnish on it, the can ahead and behind should be approximately 2/3 varnished.

2.10.9 SET QC BLOW-OFF SHIFT OFFSET

If the QC Can (select-a-can) feature is used, set the "QC can blow-off port shift offset" as follows:

1) Dial in spindle #1 on the Select-A-Can thumbwheel switch. This function can also be performed from the Keypad/Display utilizing the “QC BLOW-OFF” key and entering “1”.

2) With the machine running slowly, mark cans printed on spindle #1 so they can be identified while on the pin chain.

3) Press the Select-A-Can pushbutton and compare the can that was actually blown off with the location of a can marked on spindle #1.

4) From the primary setup menu using the Keypad/Display, select option #2 – Set Pin Chain/QC Blow-off Parameters. Press the “NEXT” key until “# QC BLOW-OFF SHIFT OFFSET (1-24):” is displayed. Add the difference between the can actually blown off and the marked can on spindle #1 to the QC blow-off shift offset and enter this as the new offset number.

5) Continue to adjust the offset number until a can marked on spindle #1 is blown off.

Note: This variable must be a number between 1 and 24 as there is always a can printed on spindle #1 every 24 cans.

2.10.10 SET BLANKET WHEEL SEGMENTS

The blanket wheel segments is the value used to blow-off a consecutive number of cans (starting with blanket #1) whenever a “Blanket” QC Blow-off is initiated (QC blow-off code #25).

Set the number of “Blanket Wheel Segments” as follows:

1) From the primary setup menu using the Keypad/Display, select option #2 – Set Pin Chain/QC Blow-off Parameters. Press the “NEXT” key until “BLANKET WHEEL SEGMENTS (4-12):” is displayed (last setup parameter in this menu).

2) Enter the number of segments on the blanket wheel.

2.10.11 SET SPINDLE TRIP SHIFT OFFSET

Set the "Spindle Trip Shift Offset" as follows:

1) From the primary setup menu using the Keypad/Display, select option #2 – Set Pin Chain/QC Blow-off Parameters. Press the “NEXT” key until “SPINDLE TRIP SHIFT OFFSET (0-23):” is displayed (last setup parameter in this menu).

2) Initially set the "Spindle Trip Offset" to zero.

3) Wrap a piece of tape around spindle #1 such that cans will not load on this spindle. With the machine running slowly open the can gate and verify that cans do not load on spindle #1 and that the print carriage is tripped for that spindle.

4) Observe the “Trips per Spindle” data and determine which spindle number is being incremented. The spindle number that should be incrementing is spindle #1. If it is not, subtract 1 from the spindle number that is being incremented and enter this value as the “Spindle Trip Shift Offset”.

5) Verify that the spindle #1 count is incremented every time the carriage trips for spindle #1. If it still increments another spindle number, continue adjusting the "Spindle Trip Shift Offset" until it does. Stop the machine and remove the tape from spindle #1. The machine is now set-up and ready to run.

SECTION 2
INSTALLATION

2.11 M4500/P4500/D4591 INSTALLATION

The following is provided only as a reference. These steps are performed by the factory prior to shipping the HSL-CD4. These steps need only be performed in the event either the M4500 module, P4500 power supply, or D4591 display need to be replaced. Refer to the M4500 User's Manual for general details on installing the M4500, P4500, and D4591.

2.11.1 M4500 MODULE INSTALLATION

To install the M4500 module, perform the following:

1) Remove the cover from the M4500 chassis (retained with three captive screws on the lower front of the cover and two captive screws on each side of the M4500 chassis).

2) Install S4563 (SLOT0-0): Set the slot address dip switches (SW1) on the S4563 to the following positions (slot0):

   S4563: SW1 switch1 = "OFF"
   SW1 switch2 = "OFF"

   Install the S4563 in Slot0-0 (furthest left slot) of the M4500 chassis.

3) Install S4568 (SLOT0-1): Set the slot address dip switches (SW1) on the S4568 to the following positions (slot1):

   S4568: SW1 switch1 = "ON"
   SW1 switch2 = "OFF"

   Install the S4568 in Slot0-1 (slot next to S4563) of the M4500 chassis.

4) Install S4573 (SLOT0-2): Set the slot address dip switches (SW1) on the S4573 to the following positions (slot2):

   S4573: SW1 switch1 = "OFF"
   SW1 switch2 = "ON"

   Install the S4573 in Slot0-2 (slot next to S4568) of the M4500 chassis.

5) Install S4516 (SLOT0-3) (OPTIONAL): Set the slot address dip switches (SW2) on the S4516 to the following positions (slot3):

   S4516: SW2 switch1 = "ON"
   SW2 switch2 = "ON"

   Set the RS-232/RS-422 select dip switches (SW1) on the S4516 to the following positions (RS-232 selected):

   S4516: SW1 switch1 = "ON"
   SW1 switch2 = "OFF"

   Install the S4516 in Slot0-3 (slot next to S4573) of the M4500 chassis.

6) Install the cover back over the M4500, making sure all the board connectors protrude the slots in the cover. Tighten the three captive screws on the lower front of the cover and the two captive screws on each side of the M4500 chassis.

7) Connect the display ribbon cable to the connector on the back of the M4500 (the connector on the cable is polarized and should mate with the connector on the M4500 only one way).

8) Mount the M4500 chassis to the HSL-CD4 back panel using four 8-32 screws.

9) With power to the P4500 "off", install the P4500 power supply cable to the +5/C/+12/C/-12 connector on the M4500 (the connector on the cable is polarized and should mate with the connector on the M4500 only one way).

10) Install the respective field wiring arms on all the I/O boards of the M4500 (I/O slots0 thru 2, serial communications connector on USER PORT, resolver connector, and IN0/IN1 connector). Make sure all field wiring connectors are fully mated in the M4500.

2.11.2 P4500 POWER SUPPLY INSTALLATION

To install the P4500, perform the following steps:

1) Mount the P4500 to the HSL-CD4 in the mounting holes next to the M4500 (left side) using two 8-32 screws.

2) With power to the P4500 "off", install the P4500 power supply cable to the +5/C/+12/C/-12 connector on the M4500 (the connector on the cable is polarized and should mate with the connector on the M4500 only one way).

2.11.3 D4591 KEYPAD/DISPLAY INSTALLATION

To install the D4591, perform the following steps:

1) With the gasket installed on the mounting studs of the D4591, install the D4591 in the cut-out either in the HSL-CD4 enclosure or the cut-out in the user's existing control cabinet. Secure the display to the enclosure using 7ea. 8-32 nuts and external lock washers.

2) Connect the display ribbon cable to the connector on the lower back of the display (the connector on the cable is polarized and should mate with connector on the M4500 only one way).

2.11.4 DOWNLOAD HSLCD4 PROGRAM AND SET-UP DATA TO M4500

Once the M4500/P4500/D4591 are installed, perform the following to download the HSLCD4 application program to the M4500 as well as download the previously saved set-up data and timing channel set-points:

1) Power up the M4500 and the IBM PC or compatible used to interface with the HSL-CD4.

2) Connect an RS-232 cable from the computer COM port to the "PROG" port on the M4500.

3) Initiate the respective setup program (RTFCD7 for Windows systems, HSLCD4.exe for DOS systems).

4) Download the HSLCD4 application program to the M4500. See section 4.2.3 for Windows based systems, see section 5.7 for DOS.

5) Download the PLS timing set-points to the M4500. See section 4.2.4 for Windows based systems, section 5.3 for DOS.

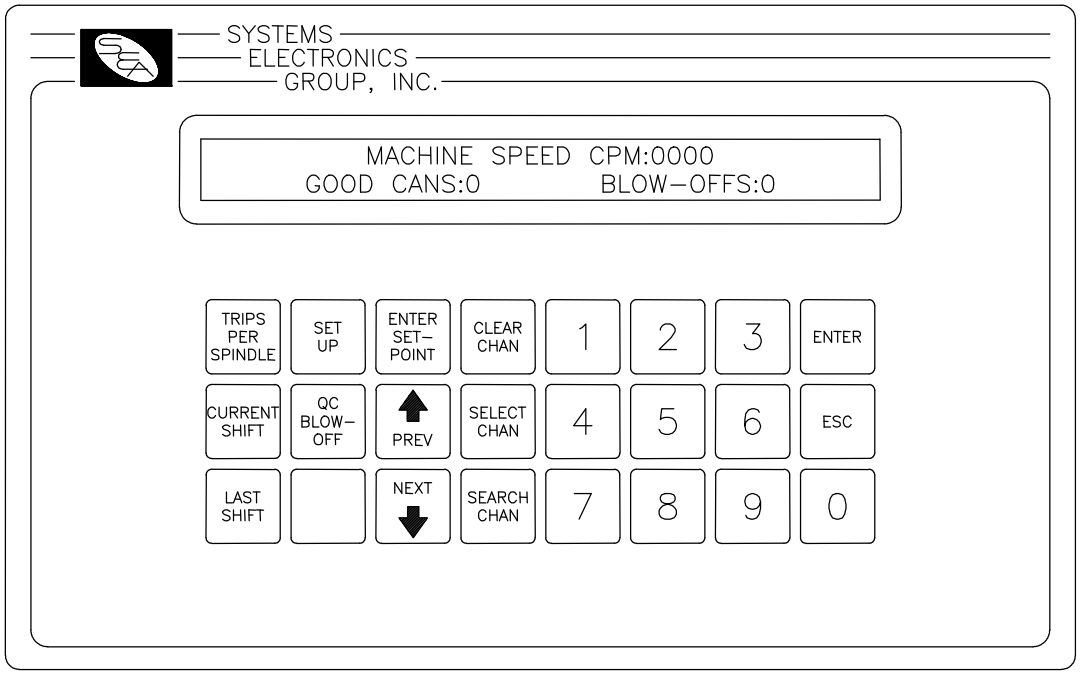
6) Download the previously saved set-up data to the M4500. See section 4.2.4 for Windows based systems, section 5.8 for DOS.

7) The M4500 is now ready to run, loaded with HSLCD4 application program, timing set-points, and set-up data.

Note: Double check the machine zero position and re-zero the resolver if necessary, prior to running the machine.

SECTION 3
USING THE KEYPAD/DISPLAY

The keypad/display of the HSL-CD4 contains 24 keys consisting of 12 function keys, and a numeric keypad and a 2 line by 40 character back-lit LCD display. The keypad/display can be used to view data or activate the select-a-can QC blow-off to adjust the timing and all set-up parameters.



The keypad/display allows the following to be viewed or adjusted:

1) Set Carriage/Varnish Response Times
2) Set Pin Chain/QC Blow-off Parameters
3) Set Machine Timing
4) Set Number of Shifts to Varnish Unit
5) Set Machine Zero
6) View Can/No Can ON Position
7) View the Number of Trips per Spindle
8) View the Shift Data
9) Activate the select-a-can QC blow-off
10) Test Print Carriage and Varnish Unit Trip Control.

The definitions of the keypad commands and menus are described in the following sections.

Note: For virtually all the menus, the "NEXT" and "PREV" keys can be used to advance to the next item of the menu or return to the previous item on the menu.

SECTION 3
USING THE KEYPAD/DISPLAY

3.1 DEFAULT SCREEN

The default screen (displayed when no other commands are active) contains the following data:

MACHINE SPEED (CPM):xxxx
GOOD CANS:xxxxxxx BLOW-OFFS:xxxxxx

Where the "Machine Speed" is the current speed of the decorator, the "Good Cans" field is the total number of good cans printed so far into the current shift, and the "Blow-offs" field is the total number of cans blown-off the machine (scrap) so far into the current shift. This display effectively replaces a speed meter, and two can counters. This screen is always returned to when no commands are active.

3.2 "TRIPS PER SPINDLE" KEY

The Number of trips per spindle menu is provided to aid in the trouble-shooting of a loading problem with a spindle or spindles. The total number of trips for each spindle since the last reset or end of shift is displayed. The operator can reset these counts at any time to aid in the trouble-shooting process. The data can be viewed simply be pressing this key. The display shows a series of screens each with four spindles from 1 through 24 as shown below:

-- TRIPS (MIS-LOADS) PER SPINDLE --
1:xxxx 2:xxxx 3:xxxx 4:xxxx

Where the numbers 1 through 4 are the first 4 spindles and the "xxxx" would be the actual counts for the respective spindles. Screens for spindles 5 thru 8, 9 thru 12, etc. are shown in this fashion each for a time delay of 10 seconds. In addition, the user can advance to the next screen or retard to the previous screen by pressing the "NEXT" or "PREV" key respectively.

The final screen of this menu, prompts the user to reset the counts by pressing "0" or not to by pressing "ESC". This provides the operator with the opportunity to reset the counts if desired for trouble-shooting. If the counts are to be reset, press the "0" key, if not, press the "ESC" key. The default screen will now be displayed again.

The "ESC" key can also be used at any time to abort the trips per spindle data display and return to the default screen.

3.3 "CURRENT SHIFT" KEY

The Current shift data menu displays the following information:

- Mis-loads:
- Restart Blow-offs:
- Manual Blow-offs:
- QC Blow-offs:
- Trips (Mis-loads) per Spindle (1-24):

Note: The Current shift "Good Cans" and "Blow-offs" are displayed as part of the default screen

This data is the totals so far into the current shift. This data is transferred to the "Last shift" data when the end of shift input transfers from a "0" to a "1". This can be at the end of either an 8 or 12 hour shift or alternatively could be done at label changes such the data collected would be for label runs rather than complete shifts. This data cannot be reset by the operator, only at the end of shift input transition.

Good Cans: This is the total number of good cans printed so far into the shift. This is essentially a can counter.

Blow-offs: This is the total number of cans blown-off the machine. This includes all types of blow-offs: the three cans blown-off for every miss-loaded can, infeed open blow-offs, restart blow-offs, manual blow-offs, select-a-can QC blow-offs, etc.

Mis-loads: This is the total number of miss-loaded cans (trips). These would be the actual number of damaged cans that did not load properly on the machine. This gives an indication of conveying/can handling problems.

Restart Blow-offs: This is the total number of cans blown off when the infeed opened and from the print station and varnish station at machine restart.

Manual Blow-offs: This is the total number of cans blown-off by the operator using the Manual Blow-off PB or selector switch.

QC Blow-offs: This is the total number of cans blown-off by the operator with the Select-A-Can QC station or QC Blow-off key on the HSL-CD4 keypad for quality verification.

Trips (Mis-loads) per Spindle (1-24): This is the total trips (mis-loads) for each spindle. A disproportionately high count for a particular spindle indicates a loading problem for that spindle.

3.4 "LAST SHIFT" KEY

The "Last Shift" data is identical to the current shift data except it is for the previous 8 or 12 hour shift or previous label run, how ever the shift collection is set-up. This allows data collection and diagnostics to take place automatically over a two shift period. Refer to section 3.3 – “Current Shift” Key, for definitions of the data fields in the "Last Shift" data menu.

3.5 "SET-UP" KEY

This selection is used to invoke the primary set-up menu. This consists of the following four selections:

1: SET CARRIAGE/VARNISH RESPONSE TIMES
2: SET PIN CHAIN/QC BLOW-OFF PARAMETERS
3: SET MACHINE TIMING (SET-POINTS, ETC.)
4: SET NUMBER OF SHIFTS TO VARNISH UNIT
5: ZERO MACHINE (SET RESOLVER OFFSET)
6: VIEW CRITICAL INPUT POSITIONS

The set-up menu can be key switch protected such that only authorized personnel (those with the key) can activate the selection. The "Set-up Enable" input must be "ON" to invoke the set-up menu. When selected, each of the above selections will bring up a sub-menu with the corresponding set-up parameters. The following sections describe these sub-menus and the definitions of the corresponding variables. To select the respective set-up sub-menu, simply press the corresponding numeric key (1 thru 6).

3.5.1 SET CARRIAGE/VARNISH RESPONSE TIMES

This menu is activated when the "1" key (SET CARRIAGE / VARNISH RESPONSE TIMES) is pressed while the primary set-up menu is active. See section 2.10.8 for a complete description of how to adjust the print carriage and varnish unit response times.

The following four set-up parameters may then be adjusted or viewed:

PRINT CARRIAGE RETRACT (OUT) RESPONSE TIME (msec): This is the time used to lead the trip point to retract the print carriage (time from solenoid actuation to first break with blanket) in milliseconds. The M4500 will activate the retract solenoid this amount of time ahead of the print carriage unit trip timing (CH00) (usually set at 40 to 50 milliseconds).

PRINT CARRIAGE EXTEND (IN) RESPONSE TIME (msec): This is the time used to lead the trip point to extend the carriage unit (time from solenoid actuation to first contact with blanket) in milliseconds. The M4500 will activate the extend solenoid this amount of time ahead of the print carriage unit trip timing (CH00) (usually set at 40 to 50 milliseconds).

VARNISH UNIT RETRACT (OUT) RESPONSE TIME (msec): This is the time used to lead the trip point to retract the varnish unit (time from solenoid actuation to first break with varnish wheel) in milliseconds. The M4500 will activate the extend solenoid this amount of time ahead of the varnish unit trip timing (CH01) (usually set at 60 milliseconds).

VARNISH UNIT EXTEND (IN) RESPONSE TIME (msec): This is the time to lead the trip point to extend the varnish unit (time from solenoid actuation to first contact with varnish wheel) in milliseconds. The M4500 will activate the extend solenoid this amount of time ahead of the varnish unit trip timing (CH01) (usually set at 60 milliseconds).

The "NEXT" and "PREV" keys can be used to advance to the next response time or the previous time respectively. To change the currently displayed response time, simply enter the new value on the numeric keypad and press <ENTER>. The value will be entered and the next response time variable will automatically be displayed. When the last response time (Varnish extend time) is entered, the primary set-up menu is again displayed. Pressing <ESC> at anytime will also exit you back to the primary set-up menu.

Note: All response times entered must be in the range of 5 to 80 milliseconds.

3.5.2 SET PIN CHAIN/QC BLOW-OFF PARAMETERS

This menu is activated when the "2" key (SET PIN CHAIN / QC BLOW-OFF PARAMETERS) is pressed while the primary set-up menu is active. The following blow-off set-up parameters may then be adjusted or viewed:

 # CANS TO BLOW-OFF AT INFEED OPEN: This is the number of cans which will be blown off when the infeed is first opened. Valid range: 0 to 99.

 # TO BLOW-OFF FROM PRINT AT RESTART: This is the number of cans which will be blown off from the print station when the machine is restarted. Valid range: 0 to 99.

 # CANS TO BLOW-OFF FROM VARNISH AT RESTART: This is the number of cans which will be blown off from the varnish station when the machine is restarted. Valid range: 0 to 99.

 # CANS TO BLOW-OFF FOR EACH MISLOAD: This is the number of cans blown off at the pin chain port when one miss-loaded can is detected (typically set at 3 cans).

 # PINS TO PIN CHAIN BLOW-OFF PORT: This is the number of pins from the spindle wheel to disk transfer location to the first can blown off at the Pin Chain blow-off port minus two. This can be a number from 0 to 999.

 # OF CANS FROM INFEED TO CAN PRX: This parameter is used to adjust the number of stations from the can gate solenoid to can/no can sensor. Default value is set to 6 stations. Some Rutherford decorators utilize an infeed star wheel, adding an additional 6 (total 12) stations from infeed to can PRX.

PIN CHAIN (BAD CAN) SOLENOID "ON" RESPONSE TIME (msec): This is the time used as the "on" response time of the pin chain blow-off port (time from "on" solenoid actuation to first air out port) in milliseconds. The M4500 will activate the solenoid this amount of time ahead of the Pin Chain blow-off timing (CH05) (usually set at 15 to 20 milliseconds). Valid range: 5 to 60 msec.

PIN CHAIN (BAD CAN) SOLENOID "OFF" RESPONSE TIME (msec): This is the time used as the "off" response time of the pin chain blow-off port (time from "off" solenoid actuation to air stopping at port) in milliseconds. The M4500 will activate the solenoid this amount of time ahead of the Pin Chain blow-off timing (CH05) (usually set at 15 to 20 milliseconds for double acting solenoids and set at 25 to 30 milliseconds for single acting solenoids). Valid range: 5 to 60 msec.

QC BLOW-OFF SOLENOID "ON" RESPONSE TIME (msec): This is the time used as the "on" response time of the QC blow-off port (time from "on" solenoid actuation to first air out port) in milliseconds. The M4500 will activate the solenoid this amount of time ahead of the QC blow-off timing (CH06) (usually set at 15 to 20 milliseconds). Valid range: 5 to 60 msec.

QC BLOW-OFF SOLENOID "OFF" RESPONSE TIME (msec): This is the time used as the "off" response time of the QC blow-off port (time from "off" solenoid actuation to air stopping at port) in milliseconds. The M4500 will activate the solenoid this amount of time ahead of the QC blow-off timing (CH06) (usually set at 15 to 20 milliseconds for double acting solenoids and set at 25 to 30 milliseconds for single acting solenoids). Valid range: 5 to 60 msec.

QC BLOW-OFF SHIFT OFFSET: This is the number of spindles difference from detection of the spindle #1 flag to the QC blow-off port. This is a number between 1 and 24 and is empirically set by selecting spindle #1 for blow-off and adjusting this value until the can from spindle #1 is the can that is blown off.

BLANKET WHEEL SEGMENTS (4-12): The blanket wheel segments is the value used to blow-off a consecutive number of cans (starting with blanket #1) whenever a “Blanket” QC Blow-off is initiated (QC blow-off code #25).

SPINDLE TRIP SHIFT OFFSET: This is the number of spindle difference from the detection of the spindle #1 flag to the Can/No Can sensor. This is a number between 0 and 23 and is empirically such that a miss-loaded can on spindle #1 increments the spindle #1 count in the "Trips per spindle" menu (see section 2.10.11 – Set Spindle Trip Shift Offset).

The "NEXT" and "PREV" keys can be used to advance to the next parameter or the previous parameter respectively. To change the currently displayed parameter, simply enter the new value on the numeric keypad and press <ENTER>. The value will be entered and the next parameter will automatically be displayed. When the last parameter (Spindle trip shift offset) is entered , the primary set-up menu is again displayed. Pressing <ESC> at anytime will also exit you back to the primary set-up menu.

3.5.3 SET MACHINE TIMING (SET-POINTS, ETC.)

This selection brings up the timing set-point menu which displays the following fields:

```
CHuu  SETPOINT:xxx   []  "channel name"
RPM:yyyy    POS:zzz     OFFSET:wwww  SCALE:360
```

Each field is defined as follows:

Field	Definition
Chuu	Currently selected channel (CH00 thru CH17) where "uu" is the octal channel number.
SETPOINT:xxx	Channel "on" or "off" set-point where "xxx" is the set-point position
[]	State of channel set-point (blank = "off", solid block character = "on")
"channel name"	selected channel name: (CH00) PRINT CARRIAGE TRIP, (CH01) VARNISH UNIT TRIP, etc.
RPM:yyyy	Current machine speed where "yyyy" is in CPM.
POS:zzz	Current resolver position where "zzz" is in degrees.
OFFSET:wwww	Resolver offset where "wwww" is the offset in degrees.
SCALE:360	Resolver SCALE FACTOR (360 degrees per revolution).

In addition to displaying the timing set-point menu, the following keys are also enabled: "ENTER SET-POINT", "CLEAR CHANNEL", "SELECT CHANNEL", and "SEARCH CHANNEL".

The "ENTER SET-POINT" key is used to enter a new set-point (both "on" and "off" set-points) in the selected channel. The "CLEAR CHANNEL" key is used to clear all set-points from the selected channel. The "SELECT CHANNEL" key is used to select a new channel for programming. The "SEARCH CHANNEL" is used to view both the "on" and "off" set-points in the selected channel.

Searching Channel: To view the set-points in a channel simply press the "SEARCH CHANNEL" key. The next "off" to "on" or "on" to "off" position is shown in the "SETPOINT" field. If the transition was "off" to "on", the state character [] will be a solid block. If the transition was "on" to "off", the state character [] will be blank.

Entering or Adjusting Set-point: To set or adjust a timing channel, perform the following:

1) Select the channel to be adjusted by pressing the "SELECT CHANNEL" key, entering the channel number (00 to 17) and pressing enter. In addition, the "NEXT" and "PREV" keys can be used to advance to the next channel or retard to the previous channel.

2) Press "CLEAR CHANNEL" to clear the existing set-point out.

   Note: Entering a new set-point does not automatically clear the old set-point out. If the two set-points are not in the same place, the channel will simply have two set-points in it if the old one is not cleared out first. Therefore always clear the channel before entering a new set-point. A set-point may, however, be "extended" by programming another set-point onto an existing set-point using either the existing "on" or "off" set-point as the starting position for the new set-point. This will result in one larger set-point.

3) Press "ENTER SET-POINT" to enter the new set-point. The display will then prompt ""ON" SETPOINT:". Enter the position (in degrees) where the set-point should go "on" and press <ENTER>. The display will now prompt ""OFF" SETPOINT:". Enter the position (in degrees) where the set-point should go "off" and press <ENTER>. The channel will now be programmed with a set-point that goes "on" at the "on" position entered and "off" at the "off" position entered.

4) Exit back to the primary set-up menu by pressing <ESC>. Exit back to the default screen by pressing <ESC> again.

3.5.4 SET NUMBER OF SHIFTS TO VARNISH UNIT

This is the number of spindles from the Can Sensor to the varnish unit minus 2. In general, this is set such that the varnish unit retracts out on the can ahead of the misloaded spindle. For older generation Rutherford Decorators, this is set to "5". For newer decorators, this is set to "4".

3.5.5 ZERO MACHINE (SET RESOLVER OFFSET)

This selection is used to auto zero the resolver. To set the machine zero (resolver offset) perform the following:

1) Select "3: SET MACHINE TIMING" and observe the "POS:" field. Verify that as the machine is rotated forward (either jogging or barred) that the position increases linearly from 0 through 359. If not, swap the S1 and S3 leads of the resolver at the M4500 resolver connector. Then verify that the position then indeed does increase with forward movement. Press "ESC" to exit back to the primary set-up menu.

2) Position the machine at machine zero (spindle aligned with V notch at top backside of the machine frame, see section 2.10.2 - Set Machine Zero).

3) Auto zero the resolver by selecting "4: ZERO MACHINE" from the primary set-up menu. Enter "0" to zero the resolver. The timing set-up menu will be displayed, now showing the "POS:" at zero.

4) The M4500 will calculate the actual offset value required to make this the 000 position and will display this number in the offset field.

5) Exit back to the primary set-up menu by pressing <ESC>. Exit back to the default screen by pressing <ESC> again.

3.5.6 VIEW CRITICAL INPUT POSITIONS

This selection is used to view the “On” position of the Can/No Can sensor. To view critical input positions perform the following:

1) Select "6: VIEW CRITICAL INPUT POSITIONS" and observe the can/no can PRX "POS:" field. Verify the location of the Can/No Can sensor. Place a can on a spindle and slowly jog it past the sensor. The sensor should first see the can at between 300 and 0 degrees. If it does, the location of the sensor is correct.

2) If the sensor first sees the can between 0 and 30 degrees, the system will still function correctly but the Damaged Can Blow-off (HI - CH04) and (LOW - CH03) timing signals may have to be adjusted. If the Can/No Can sensor first sees the can outside the 300 to 30 degree range, the sensor should be moved to within the 300 to 0 degree range. Press "ESC" to exit back to the primary set-up menu.

3.6 "QC BLOW-OFF" KEY

This key is used to blow-off a can from a selected spindle at the Pin Chain QC Blow-off port. To blow-off a can, press the "QC BLOW-OFF" key. The display will then prompt "Enter Spindle to Blow Can off:". Enter the desired spindle number (1-24) and press enter. One can from that spindle will be blown off at the Pin Chain QC blow-off port.

Note: Entering in a 25 or 26 will initiate a consecutive can blow-off. Code 25 will initiate a "Blanket" blow-off (one can from each blanket, starting with blanket #1). Code 26 will initiate a "Mandrel" blow-off (one can from each mandrel, starting with mandrel #1).

SECTION 3
USING THE KEYPAD/DISPLAY

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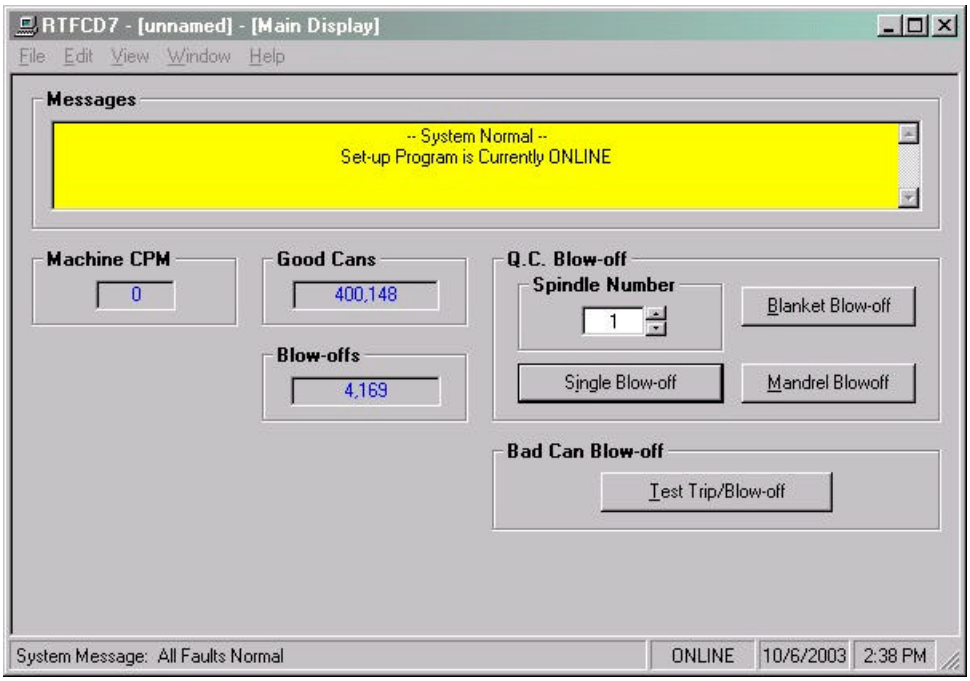
The Windows based set-up program is menu driven, allowing the user to easily view data, alter set-up variables or set machine timing (machine offset, timing signal locations, etc.), using a PC running the Windows (95/98/ME/2000/XP/NT) operating system. The set-up variables are used to configure and tune the M4500 to match the configuration and performance of the specific decorator (see Tuning the HSL-CD4, section 2.10).

Note: The set-up program is an on-line communications program used to interface with the M4500 module. The data displayed and set in the windows is communicated directly to the module, while in the "Online" edit mode. Therefore, prior to going online with the processor, make sure an RS-232 cable is connected from the COM port on the computer to the "PROG" port on the M4500. The variables displayed while in the "Online" edit mode are read directly from the processor. Data is saved to a "Set-up Data" file (*.sdt) whenever changes are made to a parameter or if the data is uploaded from the processor.



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4.1 GENERAL DESCRIPTION

Title Bar: At the top of the window is the "Title Bar". The title bar is used to display the name of the working "Set-up Data" file, as well as, the name of the active "Window". The title bar is dark if the window is active and grayed if another window is active. The color depends on the settings of the Display Properties of the Control Panel.

Status Bar: At the bottom of the window is the "Status Bar". The status bar is used to display system messages, online or offline mode, as well as, the current time and date as set by the operating system. The system messages panel displays general information about operation of the system. The Online/Offline mode panel displays the status of the current set-up program mode of operation. The mode of operation can be changed by simply double clicking the online/offline mode panel.

Hot Keys: Hot keys are activated by holding down the "ALT" key and simultaneously pressing the underlined letter of the desired function. Almost every function can be activated by either pressing a series of hot keys or using the "TAB" key to move between fields.

Online/Offline Modes: The set-up program allows the user to make changes while "Online" with the processor. The "Offline" mode is used to preset parameters prior to download. All functions are available to the user while "Online", however, specific "Online" functions are disabled in the "Offline" edit mode.

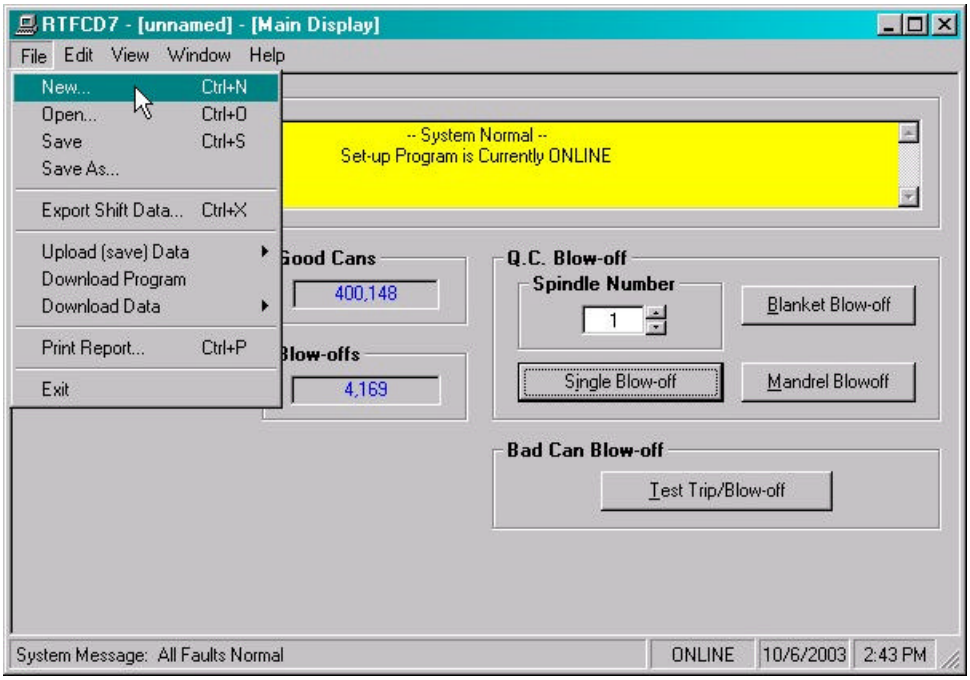
Note: Offline changes can only be made by enabling "Offline Editing", accessed under the "Edit" menu.

Getting Help: The entire contents of the user's manual is contained within the help file. Pressing Ctrl+H will display the help file window. Pressing the F1 key will display the contents file. Hot spots allow jumps to other topics to display additional information as desired. Selecting About RTFCD7 from the Help menu will display a dialog box listing information about the current revision of the setup program and how to obtain technical support.

4.2 THE FILE MENU

The "File" menu allows the user to perform the following functions:

- Create a "New" set-up "Data File".
- Open an existing "Data File".
- Save any changes made to the current "Data File" to disk.
- Upload (save) Data from the Processor.
- Download a SYSdev (.sdv) program to the processor
- Download (restore) Data from the current set-up "Data File" to the processor
- Print a Report of the current set-up parameters.
- Exit the set-up program



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4.2.1 THE SET-UP DATA FILE

The set-up "Data File" (.sdt) is a binary access file, designed for fast file I/O operation. When the set-up program is first invoked, the default set-up parameters are loaded into memory. If changes are made to any of the set-up parameters (either online or offline), as well as shift data, the user will be flagged to "Save Changes" upon exit of the program.

Note: Any windows based "Set-up" program can open a set-up "Data File", however, the data tables will not be properly aligned. The user will be alerted to the problem if a set-up data file has been created by either a different set-up program or a different revision of the software.

The set-up "Data File" is similar to that of a word processing file. When the program first starts a default file is loaded and the user is able to make any changes as desired. The set-up program is unaware of the settings and parameters that exist within the M4500. Therefore, to normalize the set-up program with the processor, the user should define or open an existing file, then upload "All" variables from the processor. This allows the user to either create a backup of the data or maintain an existing file. The user can even open a data file for another decorator, save the file to a new name, make the necessary changes and simply download the new parameters to another processor.

The following functions can be accessed any time, from any set-up or display windows.

New: To create a "New" data file, select "New" from the "File" menu or press "Ctrl + N". This creates a completely new file, loaded with the default variables and the word "[unnamed]" is displayed in the title bar. If any changes were made to the existing file, the user is prompted to save changes to the existing file.

Open: To "Open" and existing data file, select "Open" from the "File" menu or press "Ctrl + O". This displays a dialog box allowing the user to select an existing data file to open. The name of the file will be displayed in the title bar. If any changes were made to the existing file, the user will be prompted to save any changes before terminating the program.

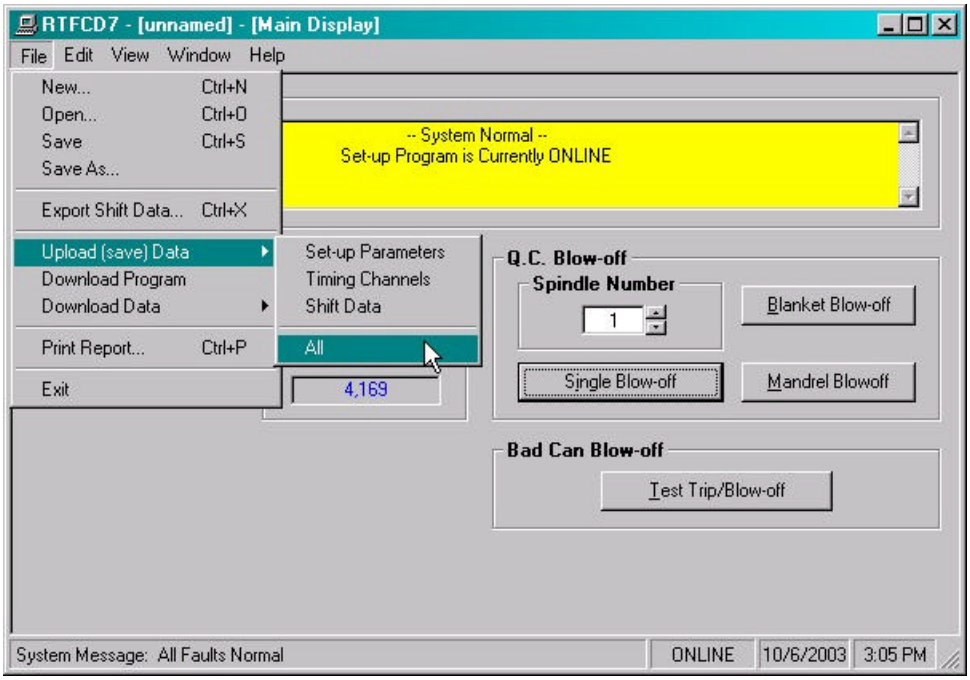
Save: To "Save" data file to disk, select "Save" from the "File" menu or press "Ctrl + S". This displays a dialog box allowing the user to select a folder and enter a name for the file. The user will be notified if the file already exists and the extension ".sdt" will automatically be added to the file name. If this is a "New" file, the user will be prompted to enter a file name.

Save As: To save the data file to a new name, select "Save As" from the "File" menu.. This displays a dialog box allowing the user to select a folder and enter in a new name for the file. The user will be notified if the file exists and the extension ".sdt" will automatically be added to the file name.

Export Shift Data…: This function allows the user to export the shift data to a "Tab Delimited" text file. This allows the user to easily use the shift data to produce production reports.

4.2.2 UPLOAD (SAVE) DATA

The "Set-up" program allows the user to upload blow-off parameters, timing channel set-points and shift data from the M4500 into a set-up "Data File". This function is accessed from the "File" menu and the user is given the choice of the following options:



Set-up Parameters: This option uploads the "Set-up" data from the M4500. This includes the print carriage and varnish unit response times, as well as, blow-off parameters.

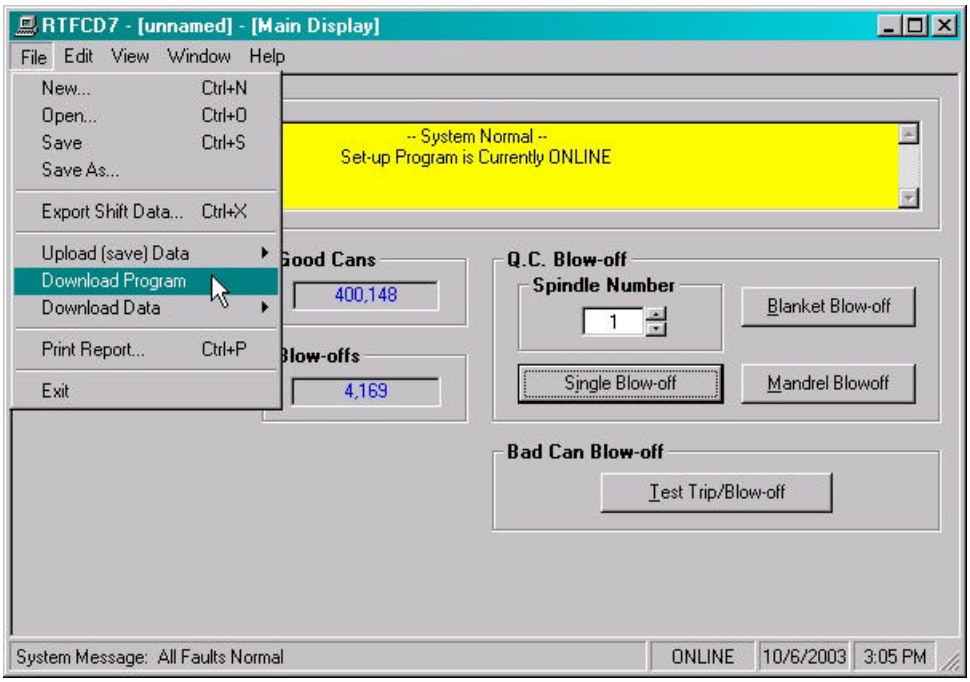
Timing Channels: This option uploads the "Machine Timing" channel set-points, as well as, the PLS configuration and scale factor.

Shift Data: This option uploads the "Shift Data" from the M4500. This includes the "Trips per Spindle" data, the "Current Shift" and the "Last Shift" data.

All: This option allows the user to completely upload "All" of the set-up parameters, timing channel set-points and shift data from the M4500.

4.2.3 DOWNLOAD PROGRAM

The “Set-up” program allows the user to “Download” any SYSdev program file to the M4500.



Note: To “Download” a SYSdev program to the processor, the program must be “Online”. If “Online” mode cannot be achieved, program download will not be executed. If the program is currently “Offline”, the user will be prompted to first go “Online”.

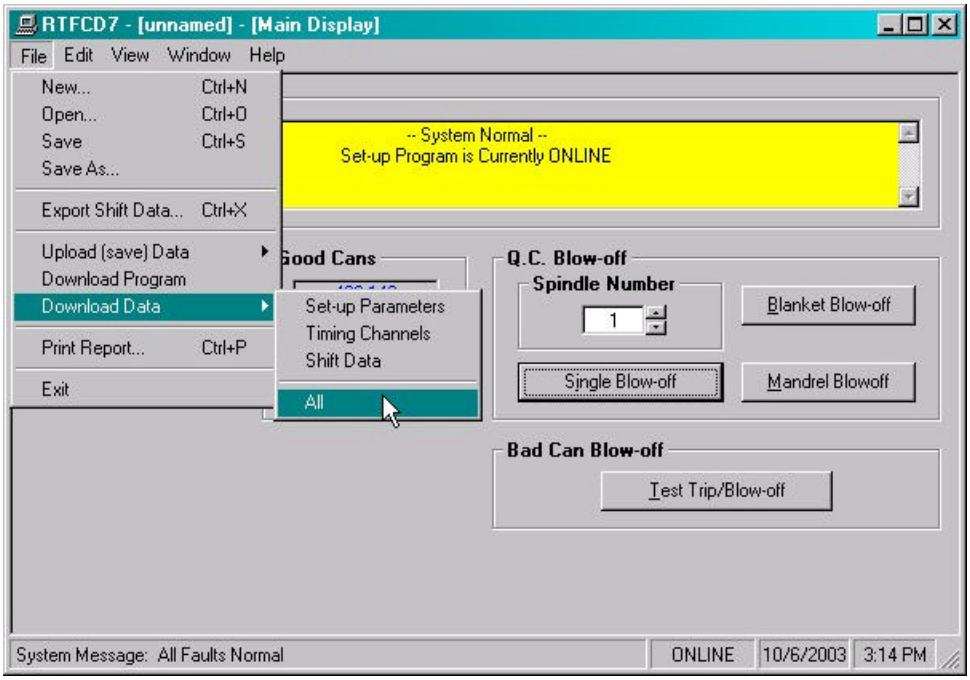
Once selected, and the set-up program “Online” with the processor, a dialog box will be displayed, allowing the user to select the SYSdev file to download.

Note: Only the files with the “.sdv” file extension will be displayed. It is important to keep in mind that only a valid M4500 PLC SYSdev file can be downloaded through the set-up program. Care should be taken when selecting a program to download.

Once selected, a message box is displayed informing the user of the current program, revision and checksum of the program loaded in the processor, as well as, that of the selected program. The user must confirm their selection by clicking the “Yes” command button. After the user confirms their choice, program download is initiated and the current program download address is displayed. When program download is complete, the user is prompted to acknowledge. Control is passed back to the main program and the set-up program remains in an “Online” edit mode.

4.2.4 DOWNLOAD (RESTORE) DATA

The set-up program allows the user to download "Set-up" parameters, timing channel set-points and shift data to the M4500 from the set-up "Data File". This function is accessed from the "File" menu and the user is given the choice of the following options:



Set-up Parameters: This option downloads the "Set-up" data to the M4500. This includes print carriage and varnish unit response times and blow-off parameters.

Timing Channels: This option downloads the "Machine Timing" channel set-points, as well as the PLS configuration and scale factor to the M4500 PLS.

Shift Data: This option downloads the "Shift Data" to the M4500. This includes the "Trips per Spindle" data, the "Current Shift" and the "Last Shift" data.

All: This option allows the user to completely download "All" of the set-up parameters, timing channel set-points and shift data to the M4500.

Note: Only the values contained within the current data file are used. If the validity of the current data file is questionable, review the data in an "Offline" mode prior to download.

4.2.5 PRINT REPORT

The "Set-up" program allows the user to generate a "Report" printout of all the set-up parameters, timing channel set-points and shift data. This function is accessed from the "File" menu.

At the top of each page, the report displays the name of the set-up file being printed. At the bottom of each page is the date and time the document was printed, as well as, the page number.

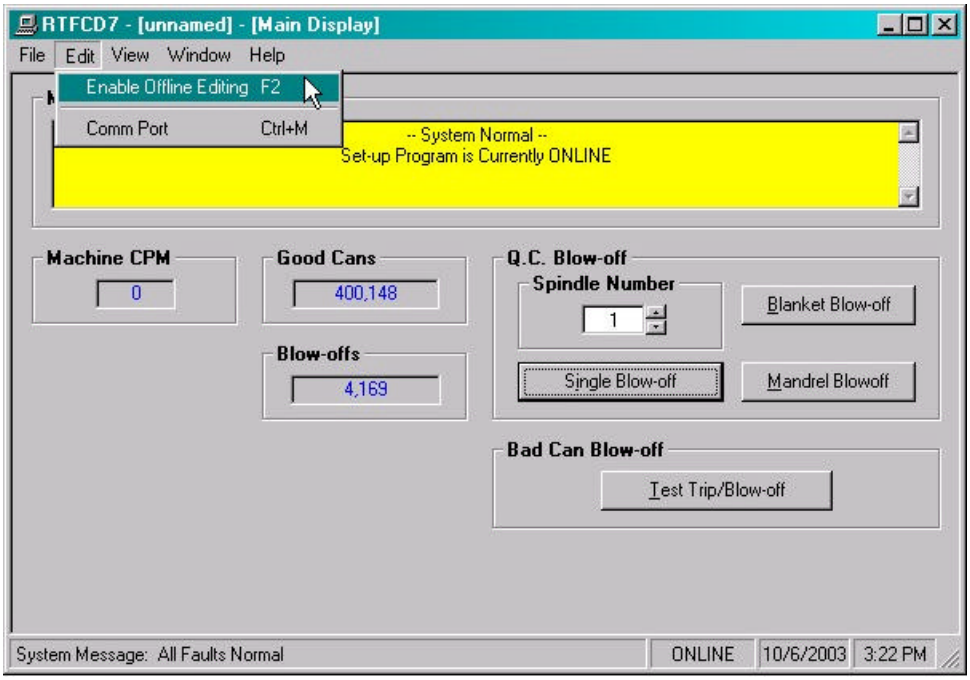
To printout a report of the settings contained in the set-up "Data File", perform the following:

1) From the "File" menu, select "Print Report" or press "Ctrl + P". This displays the "Print Setup" dialog box, allowing the user to select a printer, as well as, the paper size and orientation. Once the user selects "OK", the report is generated and sent to the specified printer device. This function makes use of the windows print manager, which allows the user to continue with their work while the document is being printed.

4.3 THE EDIT MENU

The "Edit" menu allows the user to perform the following functions:

- Enable/Disable Offline Editing.
- Set-up the Comm Port.



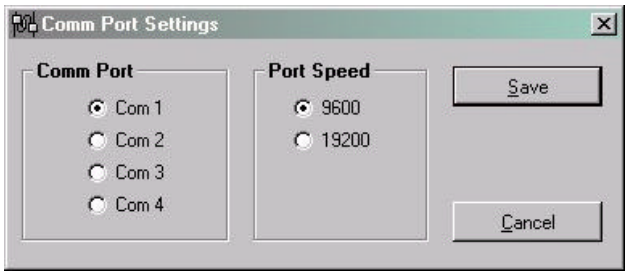
4.3.1 ENABLE OFFLINE EDITING

This function allows the user to perform “Offline” editing on the currently loaded set-up data file. This allows the user the ability to make any necessary changes to the set-up parameters while not online with the processor.

If offline editing is not enabled, the user is only able to view the set-up parameters and shift data. When the program is first invoked, the default setting is offline editing disabled. The user will need to specifically select “Enable Offline Editing” from the edit menu (or press function key F2) to enable/disable this feature.

4.3.2 SETUP COMM PORT

This function allows the user to specify the serial communications port and rate to talk to the M4500. The programming port of the M4500 is set to 9600 baud.



Once selected, a dialog box requesting the user to select a “Comm Port” and “Baud Rate” will be displayed. The default setting is COM1 at 9600 baud. The option to select the 19200 baud rate is to allow the user to communicate with the processor via the S4516 serial communications board.

In most cases the user will only need to specify the communications port and leave the baud rate at 9600. If communication problems occur, make sure there is a secure connection from the PC to the PLC. Then check the Comm port. In most cases the user will only need to select a new Comm port. If communication problems persist there may be another program causing a conflict with the port. Check the port configuration from the “Settings” folder.

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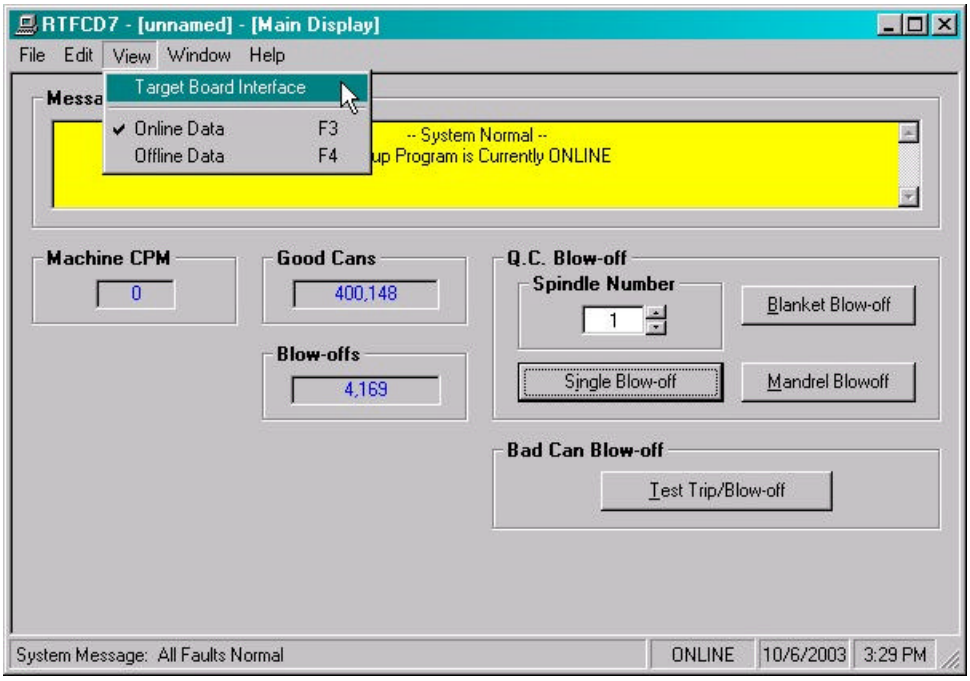
4.4 THE VIEW MENU

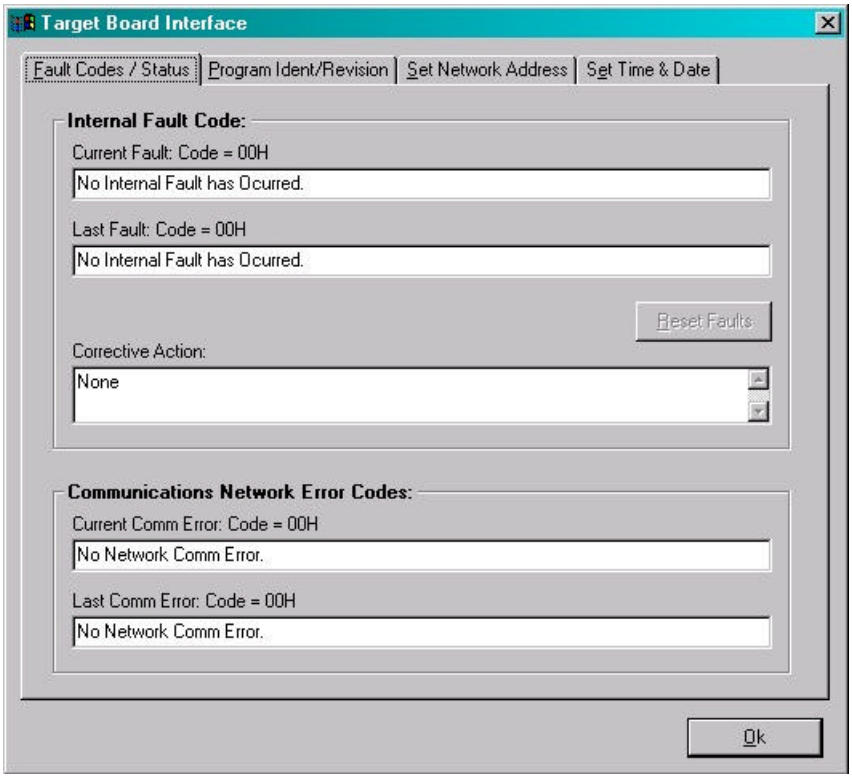
The "View" menu allows the user to perform the following functions:

- View the "Target Board Interface"
- View "Online" Data
- View "Offline" Data



4.4.1 TARGET BOARD INTERFACE

This function allows the user to view fault codes, S3000 network communication error codes and review the current "Ident" and "Revision" of the application program. This is accessed by the "View" menu, by selecting "Target Board Interface".



Once invoked, the set-up program will prompt the user to select a program to compare with the one existing in the processor. Whether a program is selected or the user cancels, the setup program will attempt to communicate with the M4500. If unsuccessful a warning message will be displayed, prompting the user to either "Retry" or "Cancel" the operation. If the operation is canceled and communication with the processor cannot be established the system will be placed in an "Offline" mode, however the "Target Board Interface" window will be displayed.

4.4.2 VIEW ONLINE DATA

This function allows the user to place the set-up program in an "Online" mode with the processor. This is accessed by the "View" menu, by selecting "Online Data" or by simply pressing the "F3" function key.

Note: The program can be toggled between "Offline" and "Online" by simply double clicking on the "Online" or "Offline" panel displayed in the status bar at the bottom of the window.

Once invoked, the set-up program will attempt to open the Comm port and communicate with the M4500. If the set-up program is unsuccessful, a warning message will be displayed prompting the user to either "Retry" or "Cancel" the operation. If the operation is canceled and communication with the processor cannot be established the system will be placed in an "Offline" edit mode.

Note: Anytime while the set-up program is "Online" with the processor and communication is interrupted, a warning message will be displayed, prompting the user to either "Retry" or "Cancel" the operation.

4.4.3 VIEW OFFLINE DATA

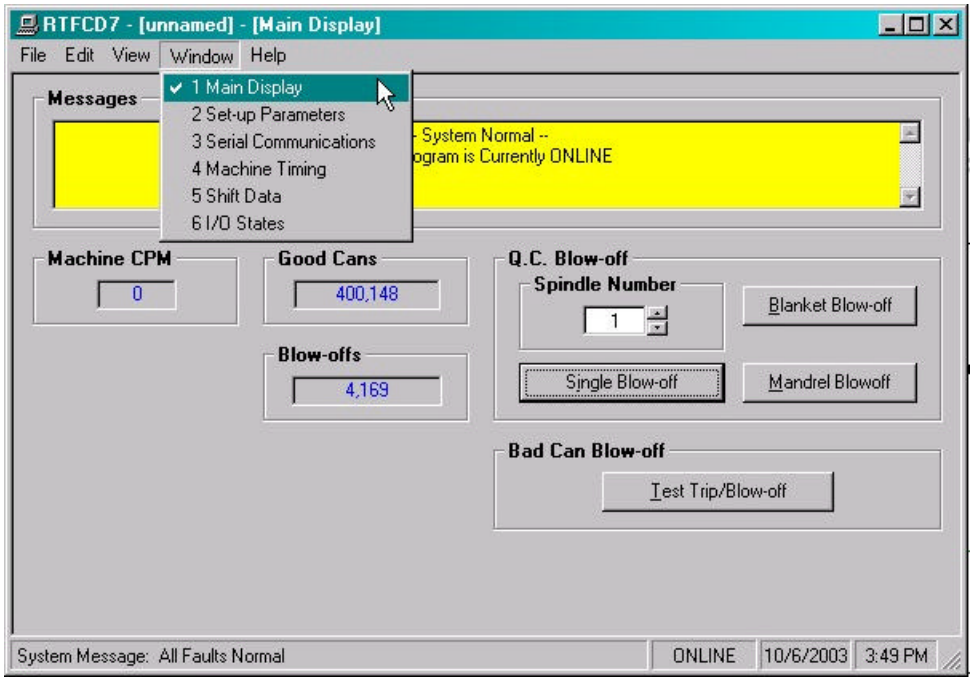
This function allows the user to place the set-up program in an "Offline" mode. This is accessed by the "View" menu, by selecting "Offline Data" or by simply pressing the "F4" function key. This allows the user to perform "Offline" editing. All values displayed in "Offline" edit mode reflect the actual values contained in the currently loaded set-up data file.

Note: The program can be toggled between "Online" and "Offline" by simply double clicking on the "Online" or "Offline" panel displayed in the status bar at the bottom of the window.

Once invoked, the set-up program will close the Comm port and cease communication with the M4500.

4.5 THE WINDOW MENU

The "Window" menu allows the user to select one of six different Display/Set-up windows to modify set-up parameters, view shift data or receive feedback about the current status of the control system.



Once a window menu item is selected, a check mark is placed next to the selected item and the selected window is displayed with the name changed in the title bar of the main window.

Note: "Read" only variables are displayed in blue with a gray background. Any variables that can be altered by the user are displayed in black with a white background. In most cases, a parameter that can be changed by the user will have associated with it increment and decrement controls. The user can either click on the desired parameter to adjust and enter in a new value, or use the increment or decrement controls to change the value by 1 unit.

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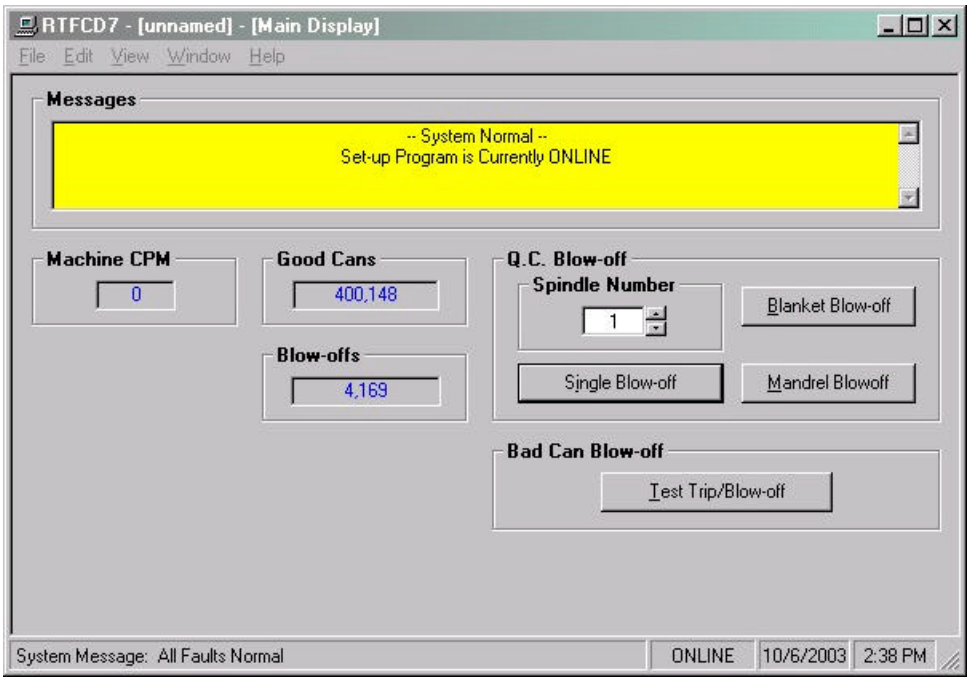
4.5.1 THE MAIN DISPLAY WINDOW

The “Main Display” window is used to display the general state of the control system. This window is selected from the “Window”.



The following is a list of the functions of the “Main Display” window.

Messages: The “Messages” display is continuously updated. It displays alarm and status messages specific to the M4500, as well as, the current “Online” or “Offline” status of the set-up program. By simply scrolling the display, the user is able to view all active alarm and status messages. If no alarm or status messages are active, a default message is displayed.

Machine CPM: This display is only active while “Online” and displays the current speed of the machine in “Cans Per Minute”.

Good Cans: This display is the “Current Shift” good can count.

Blow-offs: This display is the “Current Shift” total blow-off count.

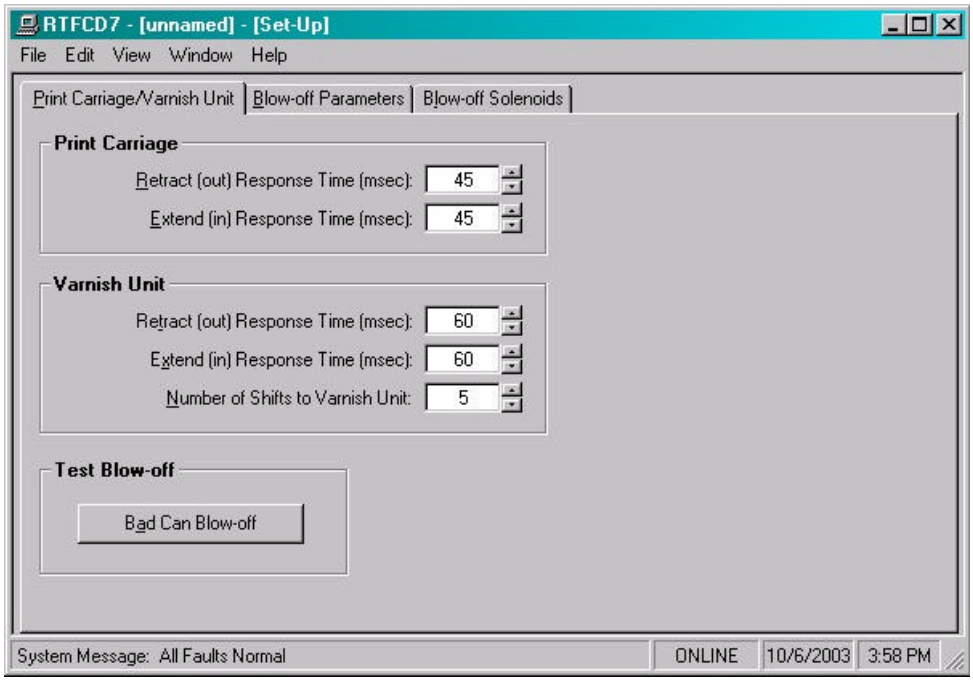
Q.C. Blow-off: This display is only active while "Online" and it allows the operator to perform a "QC Select-A-Can" blow-off.

- The operator can perform a "Single" blow-off by entering in the desired spindle number and clicking the "Single Blow-off" command button.
- The operator can perform a "Blanket" blow-off by clicking the "Blanket Blow-off" command button. The blanket blow-off will initiate a blow-off sequence such that a can printed by each blanket is blown off at the QC blow-off port, starting with a can printed by blanket #1.
- The operator can perform a "Mandrel" Blow-off by clicking the "Mandrel Blow-off" command button. The mandrel blow-off will initiate a blow-off sequence such that a can printed on each mandrel will be consecutively blown off at the QC blow-off port, starting with mandrel #1.

Bad Can Blow-off: This display is only active while "Online" and it allows the operator to test the action of the control system by electronically inducing a mis-loaded or "Bad Can" into the system. By clicking on the Test Trip/Blow-off command button, a "Bad Can" will be electronically induced into the system to test the response of the control system due to a "Mis-Loaded" can.

4.5.2 THE SETUP PARAMETERS WINDOW

The "Set-up Parameters" window is used to view and adjust any of the set-up parameters. This window is selected from the "Window" menu.



This window utilizes a "TAB" control to divide the set-up parameters into three categories, similar to that of the Keypad/Display.

Print Carriage/Varnish Unit: This section is used to set the print carriage "Retract/Extend" response times and the varnish unit "Retract/Extend" response times in the M4500. This section contains the following selections:

1) **Print Carriage Retract (out) Response Time (msec):** This is the time used as the retract response time of the carriage unit (time from solenoid actuation to first break with blanket) in milliseconds. This will activate the retract solenoid this amount of time ahead of the Carriage unit trip timing (CH00) (usually set at 40 to 50 milliseconds).

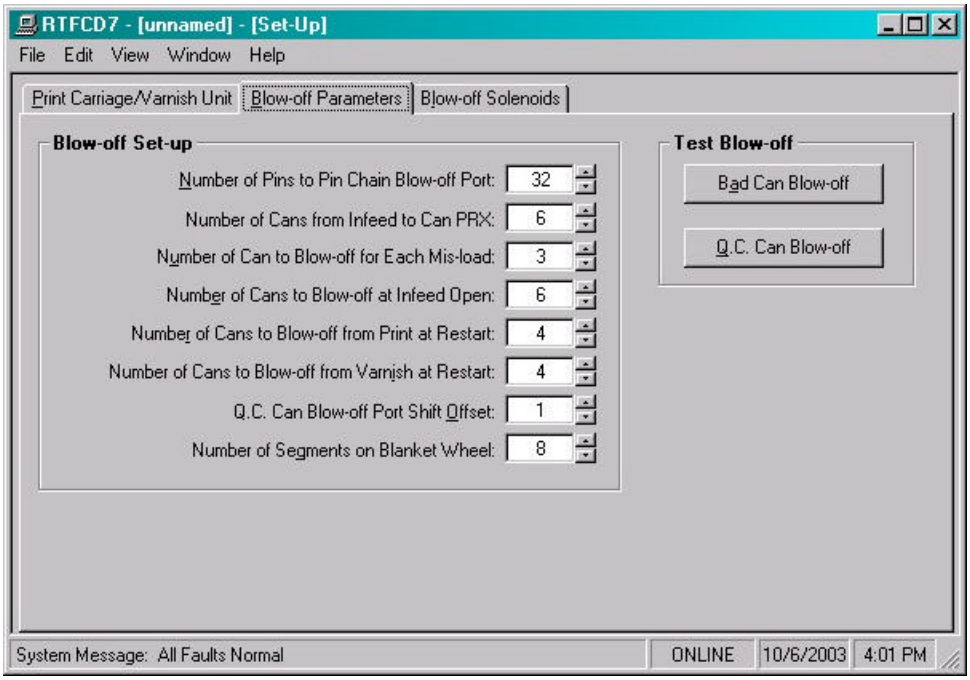
2) **Print Carriage Extend (in) Response Time (msec):** This is the time used as the extend response time of the carriage unit (time from solenoid actuation to first contact with blanket) in milliseconds. This will activate the extend solenoid this amount of time ahead of the Carriage unit trip timing (CH00) (usually set at 40 to 50 milliseconds).

3) **Varnish Unit Retract (out) Response Time (msec):** This is the time used as the retract response time of the varnish unit (time from solenoid actuation to first break with varnish wheel) in milliseconds. This will activate the extend solenoid this amount of time ahead of the Varnish unit trip timing (CH01) (usually set at 60 milliseconds).

4) **Varnish Unit Extend (in) Response Time (msec):** This is the time used as the extend response time of the varnish unit (time from solenoid actuation to first contact with varnish wheel) in milliseconds. This will activate the extend solenoid this amount of time ahead of the Varnish unit trip timing (CH01) (usually set at 60 milliseconds).

5) **Number of Shifts to Varnish Unit:** This is the number of spindles from the Can Sensor to the varnish unit minus 2. In general this is set such that the varnish unit retracts out on the can ahead of the misloaded spindle. For older generation Rutherford Decorators this is set to "5". For newer decorators, this is set to "4".

Blow-off Parameters: This section is used to set the "Pin Chain/QC Blow-off" parameters in the M4500.



Note: The "Bad Can Blow-off" command button will electronically induce a mis-loaded can into the system, as well as, the "Q.C. Can Blow-off" will blow-off a can printed on spindle #1 at the QC blow-off port.

1) **Number of Pins to Pin Chain Blow-off Port:** This is the number of pins from the spindle wheel to disk transfer location to the first can blown off at the Pin Chain blow-off port minus two. This can be a number from 0 to 999.

2) **Number of Cans from Infeed to Can PRX:** This parameter is used to adjust the number of stations from the can gate solenoid to can/no can sensor. Default value is set to 6 stations. Some Rutherford decorators utilize an infeed star wheel, adding an additional 6 (total 12) stations from infeed to can PRX.

3) **Number of Cans to Blow-off for Each Mis-load:** This is the number of cans blown off at the pin chain port when one mis-loaded can is detected (typically set at 1 can).

4) **Number of Cans to Blow-off at Infeed Open:** This is the number of cans which will be blown off when the infeed is first opened. To blow off no cans at infeed open, set equal to 0, to blow off one can set equal to 1, etc.

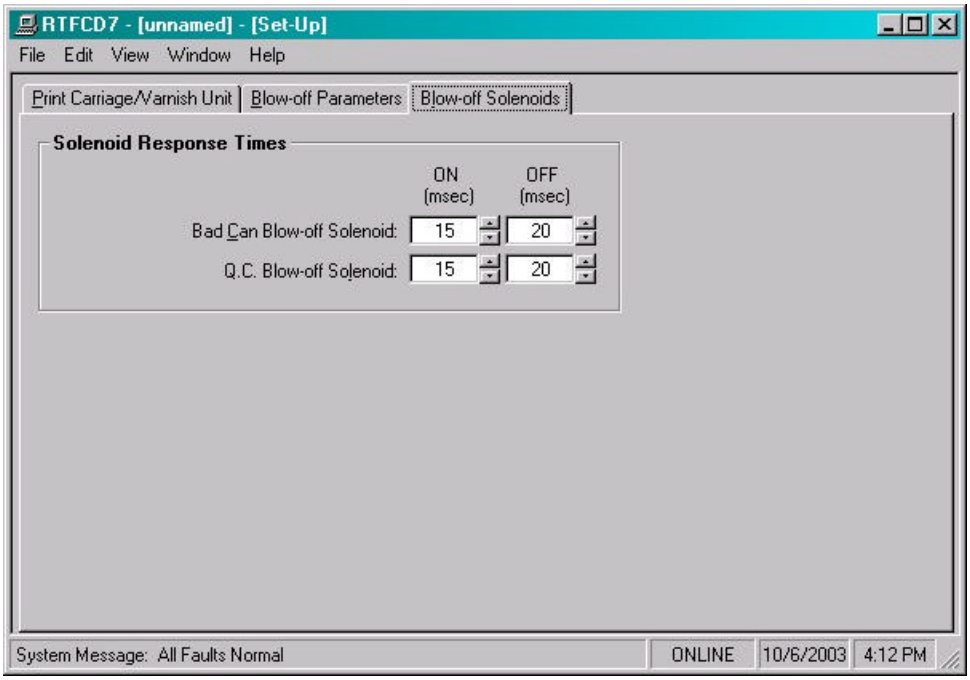
5) **Number of Cans to Blow-off from Print at Restart:** This is the number of cans which will be blown off from the print station when the machine is restarted. To blow off no cans at restart, set equal to 0, to blow off one can set equal to 1, etc.

6) **Number of Cans to Blow-off from Varnish at Restart:** This is the number of cans which will be blown off from the varnish station when the machine is restarted. To blow off no cans at restart, set equal to 0, to blow off one can set equal to 1, etc.

7) **Q.C. Can Blow-off Port Shift Offset:** This is the number of spindles difference from detection of the spindle #1 flag to the QC blow-off port. This is a number between 1 and 24 and is empirically set by selecting spindle #1 for blow-off and adjusting this value until the can from spindle #1 is the can that is blown off.

8) **Number of Segments on Blanket Wheel:** The blanket wheel segments is the value used to blow-off a consecutive number of cans (starting with blanket #1) whenever a “Blanket” QC Blow-off is initiated (QC blow-off code #25).

Blow-off Solenoids: This section is used to adjust the response times of the “Bad Can” and “QC” blow-off solenoid in the M4500.



1) **Bad Can Blow-off Solenoid “ON” Response Time:** This is the time used as the "on" response time of the pin chain blow-off port (time from "on" solenoid actuation to first air out port) in milliseconds. The M4500 will activate the solenoid “ON” this amount of time ahead of the Pin Chain blow-off “ON” position (usually set at 15 to 20 milliseconds).

2) **Bad Can Blow-off Solenoid “Off” Response Time:** This is the time used as the "off" response time of the pin chain blow-off port (time from "off" solenoid actuation to air stopping at port) in milliseconds. The M4500 will activate the solenoid “OFF” this amount of time ahead of the Pin Chain blow-off “ON” position (usually set at 15 to 20 milliseconds for double acting solenoids and set at 25 to 30 milliseconds for single acting solenoids).

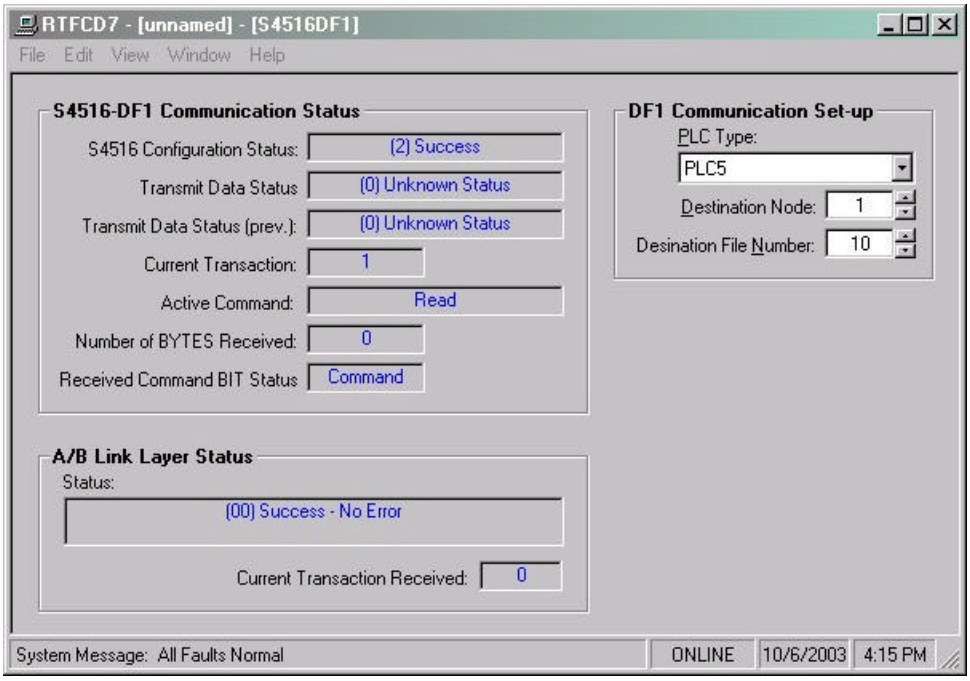
3) **Q.C Can Blow-off Solenoid “ON” Response Time:** This is the time used as the "on" response time of the QC blow-off port (time from "on" solenoid actuation to first air out port) in milliseconds. The M4500 will activate the solenoid “ON” this amount of time ahead of the QC blow-off timing “ON” position (usually set at 15 to 20 milliseconds).

4) **Q.C. Can Blow-off Solenoid “Off” Response Time:** This is the time used as the "off" response time of the QC blow-off port (time from "off" solenoid actuation to air stopping at port) in milliseconds. The M4500 will activate the solenoid “OFF” this amount of time ahead of the QC blow-off timing “ON” position (usually set at 15 to 20 milliseconds for double acting solenoids and set at 25 to 30 milliseconds for single acting solenoids).

4.5.3 THE SERIAL COMMUNICATIONS WINDOW

The Serial Communications window is used to view the configuration status of the S4516 serial communications board (if installed), as well as, view the status of the Allen-Bradley DF1 communication protocol and set-up the Allen-Bradley PLC communication parameters. From this window the user can view or adjust the following parameters:

- View the S4516 configuration status.
- View the S4516-DF1 serial communication status.
- View the Allen-Bradley Link Layer serial communication status.
- Select the Allen-Bradley PLC type (PLC5 or SLC500) to communicate to.
- View/Set the Allen-Bradley PLC destination node.
- Select the starting Allen-Bradley PLC destination file number.



S4516 Configuration Status: This displays the current state of the configuration of the S4516 serial communications board. System function sfunc19(); (S4516 configuration) is used to set the S4516 configuration (network node address, network baud rate and USER port baud rate). This must be executed prior to executing ether system functions 10, 11 or 13. System function 19 is generally executed in the "Initialization" file of the user program.

The following values are returned from a system function 19 call:

1 = Busy.
2 = Done (S4516 Successfully configured).
3 = Invalid Parameter (either network node address, network baud rate or USER port baud rate is invalid).
4 = Timeout (no response form S4516)
32 = Hardware ACK error from S4516
34 = Invalid S4516 Slot Address (W8156 must be loaded with the slot address of the S4516, prior to executing system function 19).

Transmit Data Status: This represents the state of the data packet transmission and will typically display either "Busy" or "Done". If there are problems delivering the message packet, the response code, along with a description, will be displayed.

Note: The "Transmit Data Status (prev.)" is used to view the last or previous status.

Current Transaction: This is the "Transaction" number delivered to the Allen-Bradley PLC.

Active Command: This displays either "Read" or "Write". This is used to view the command type of the current transaction.

Number of BYTES Received: This displays the current number of bytes received from either a "Command" or "Reply" message packet.

Received Command BIT Status: This displays the state of the command received. If this displays a "Reply", then the command was sent from the M4500. If this displays "Command", then a command action was received by the M4500.

A/B Link Layer Status: This displays the status of the receipt of the message packet sent to the Allen-Bradley PLC. If the delivery is not successful, an error code along with a description is displayed. Refer the to the Allen-Bradley Communication Protocol and Command Set reference manual for more information on "Link Layer" error codes.

A/B Link Layer – Current Transaction Received: This is the "Transaction" number received from the Allen-Bradley PLC.

PLC Type: This is used to specify the "Type" of PLC the M4500 will communicate to. The user can choose from "PLC5" or "SLC500".

Note: This parameter should be set prior to communicating with an A/B processor.

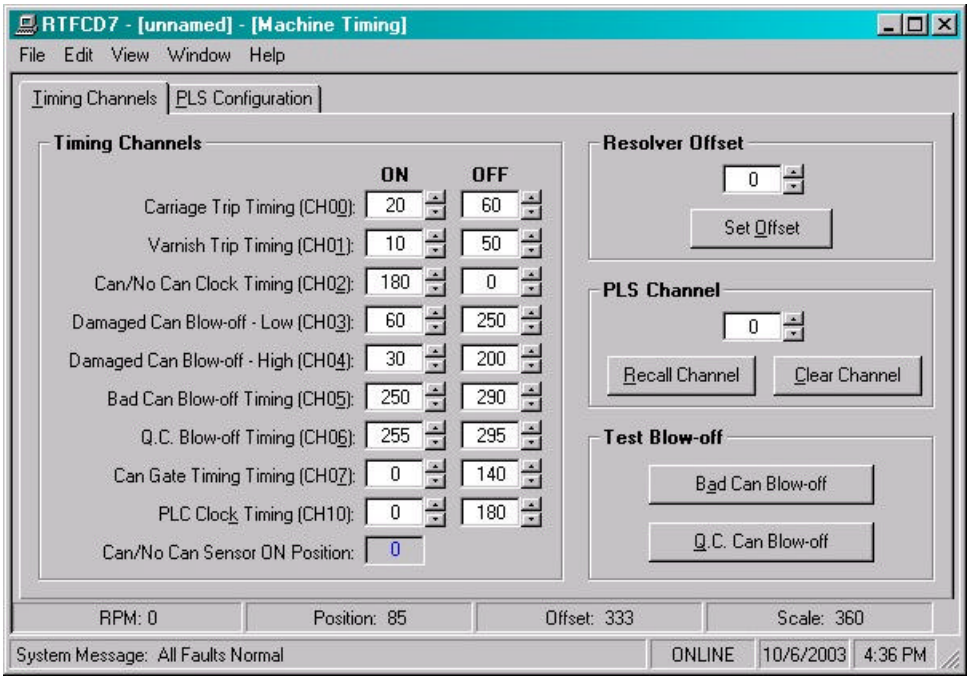
Destination Node: This is used to set the node number of the A/B PLC to send and receive data from. This also displays the node number of the A/B PLC that send a "Command" message packet.

Destination File Number: This is the file number the M4500 will read and write data from. See Appendix B for a description of the data read from and written to an Allen-Bradley PLC.

4.5.4 THE MACHINE TIMING WINDOW

The Machine Timing window is used to invoke the PLS programming command menus. From this window, the user can view or adjust the following parameters:

- Adjust Timing Channel setpoints.
- Set the Main Crank resolver offset.
- Clear or Recall a PLS timing channel.
- View the current PLS configuration
- Reset the PLS configuration to default settings.



In addition, the following parameters are displayed at the bottom of this window:

RPM: This is the current speed in "Revolutions per Minute" of the main crank resolver.

Position: This is the current "Position" in degrees of the main crank resolver.

Offset: This is the current resolver offset (set in degrees).

Scale: This is the scale factor of the resolver or the number of divisions in one revolution.

Note: The General Timing Signal Locations section provides a complete description of each timing channel signal.

Zeroing the Machine (setting the resolver offset): To set machine zero, perform the following:

1) Connect an RS-232 SYSdev cable from the COM port on the computer to the "PROG" port on the M4500.

2) From the "Window" menu, select "Machine Timing".

3) From the "View" menu, select "Online Data". The set-up program will attempt to communicate with the processor and place the system into an "Online" mode of operation.

4) Observe the "Position" field at the bottom of the window. Verify that as the machine is rotated forward, that the position increases linearly from 0 through 359 degrees. If not, swap the S1 and S3 leads at the resolver connector on the M4500. Then, verify that the position does indeed increase with forward movement.

5) Position the machine at machine zero (spindle aligned with V notch at top backside of machine frame, see section 2.10.2 - Set Machine Zero).

6) Auto zero the resolver by entering "0" in the "Resolver Offset" field and clicking the "Set Offset" command button. A message box will appear, prompting the user to confirm their choice. Select "Yes" to set the resolver offset.

7) The M4500 will calculate the actual offset value required to make this the "0" position. The new offset value will be displayed in the "Offset" field and the position will then read zero.

Adjusting the Timing Channel Setpoints: To set any of the timing signal setpoints, perform the following:

Note: Any changes made to the timing channel setpoints will be saved as part of the setup data file.

1) Connect an RS-232 SYSdev cable from the COM port on the computer to the "PROG" port on the M4510.

2) From the "Window" menu, select "Machine Timing".

3) From the "View" menu, select "Online Data". The set-up program will attempt to communicate with the processor and place the system into an "Online" mode of operation.

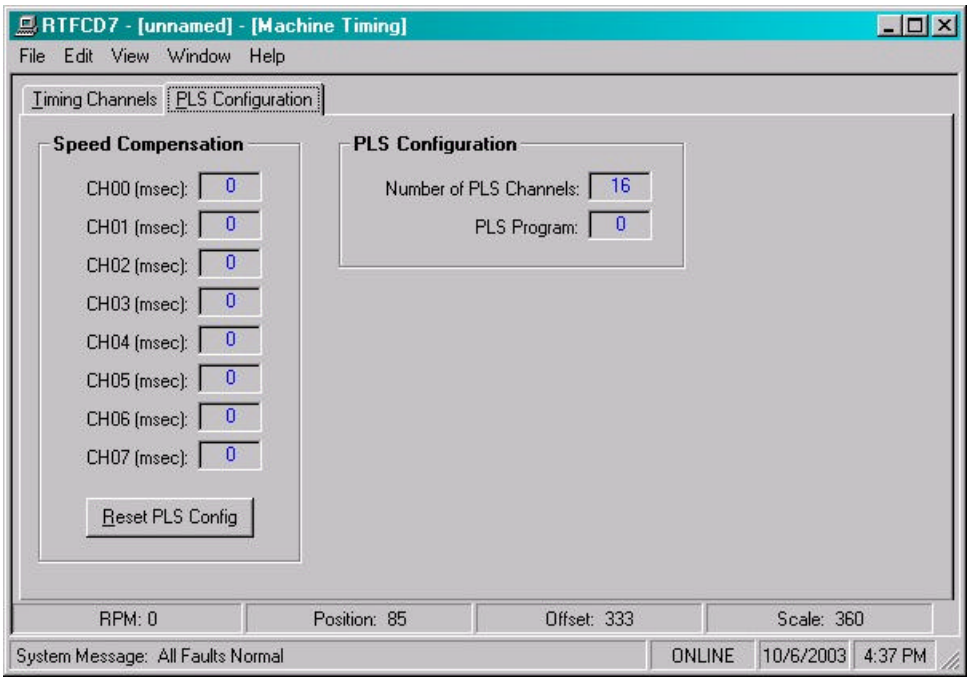
4) Set all channels per the section 6 – General Timing Signal Locations. Set-points for a particular channel are either entered in the field or adjusted by using the increment/decrement controls.

   Note: Only one set-point is used per channel.

5) If a channel needs to be "Recalled" or "Cleared", enter the desired channel number into the "PLS Channel" field. Click the "Recall Channel" command button to recall the setpoints. Click the "Clear Channel" command button the completely clear all setpoints for the selected channel.

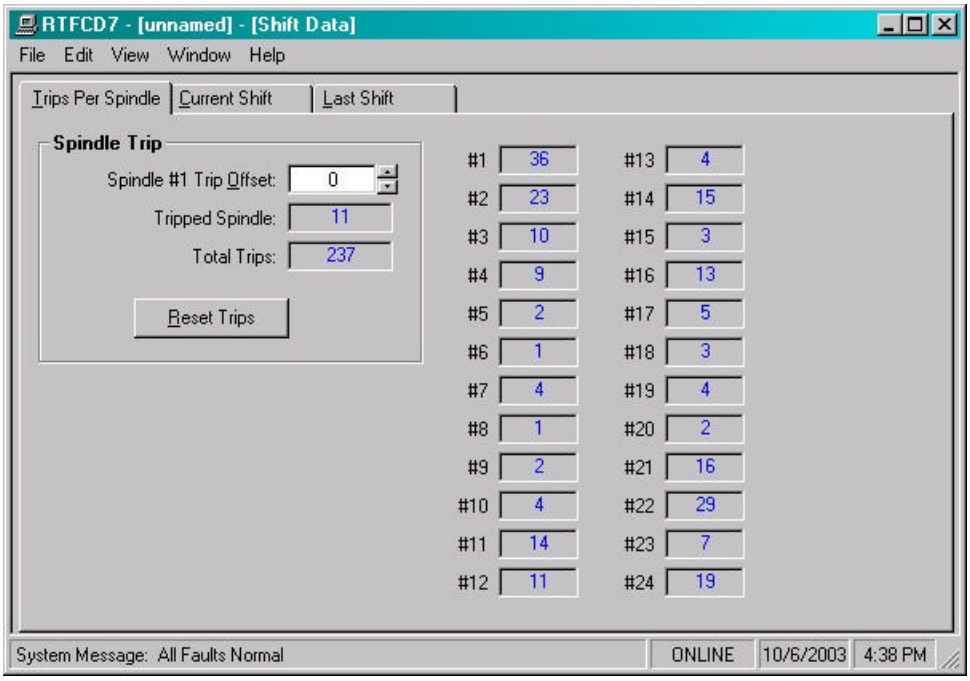
   Note: If a channel has been cleared or the "On" and "Off" setpoints have the same setting, the set-point will be displayed as "*****".

Resetting the PLS Configuration: As an aid to the user the current PLS configuration is displayed in the "PLS Configuration" tab of this window. The PLS configuration should only be reset if a new module has been installed. To reset the PLS configuration, click the "Reset PLS Config" command button. This function only resets the PLS configuration to the default settings.



4.5.5 THE SHIFT DATA WINDOW

The “Shift Data” window is used to view the shift data collected by the M4500. This window is selected from the “Window” menu.



This window utilizes a “TAB” control to divide the set-up parameters into three categories, similar to that of the Keypad/Display. These sections are as follows:

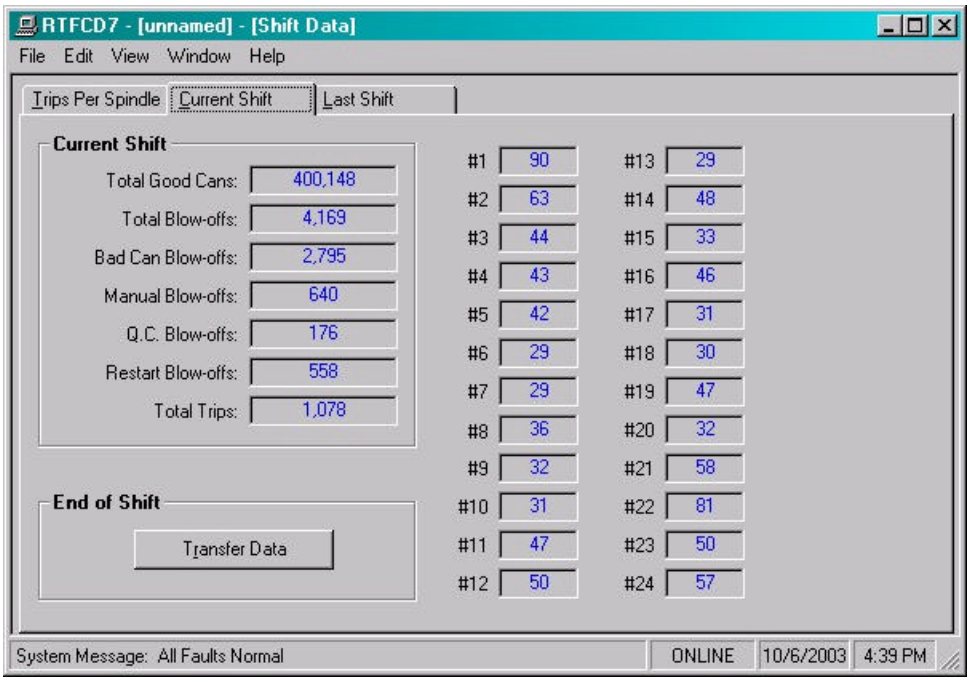
Trips per Spindle: The Number of trips per spindle display is provided to aid in the trouble-shooting of a loading problem with a spindle or spindles. The total number of trips for each spindle since the last reset or end of shift is displayed. The operator can reset these counts at anytime to aid in the trouble-shooting process.

The following data is displayed in the "Trips per Spindle" section:

1) **Spindle #1 Trip Offset:** The "Spindle Trip Offset" can be entered from this section. This is used to compensate for the location of the can/no can sensor and the spindle #1 I.D. sensor location. Use the “Tripped Spindle” display to adjust the offset value. Follow the procedure outlined in section 2.10.11 – Set Spindle Trip Shift Offset.

2) **Spindle #xx Trips:** This is the total number of trips for each spindle. This data is displayed and updated continuously in the respective field for each spindle. A disproportionately high count for a particular spindle indicates a loading problem for that spindle.

Current Shift Data: This section is used to view the “Current Shift” data. This data is the totals so far into the shift. This data is transferred to the "Last shift" at the end of either an 8 or 12 hour shift or alternatively could be done at label changes such that the data collected would be for label runs rather than complete shifts. This data can be reset by the user from this section.



Note: The “Transfer Data” command button is only active while “Online”.

1) **Total Good Cans:** This is the total number of good cans printed so far into the shift. This is essentially a can counter.

2) **Total Blow-offs:** This is the total number of cans blown-off the machine. This includes all types of blow-offs: the can(s) blown-off for each mis-load, infeed open blow-offs, restart blow-offs, manual blow-offs, select-a-can QC blow-offs, etc.

3) **Total Bad Cans or Mis-loads:** This is the total number of mis-loaded cans (trips). These would be the actual number of damaged cans that did not load properly on the machine. This gives an indication of conveying/can handling problems.

4) **Manual Blow-offs:** This is the total number of cans blown-off by the operator using the Manual Blow-off PB or selector switch.

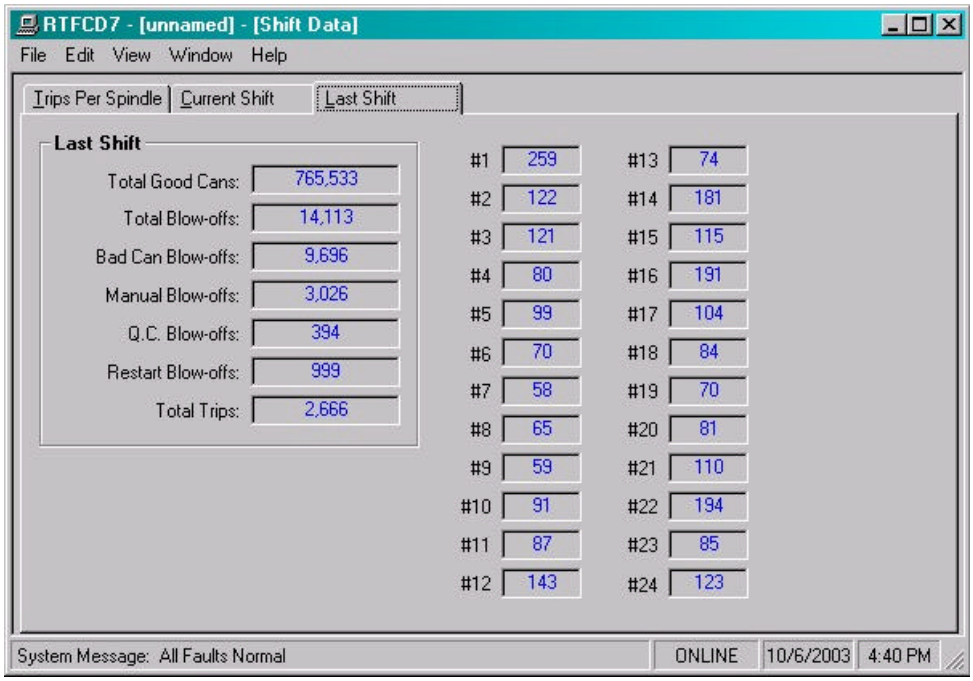
5) **QC Blow-offs:** This is the total number of cans blown-off by the operator with the Select-A-Can QC station or QC Blow-off key on the M4500 keypad for quality verification.

6) **Restart Blow-offs:** This is the total number of cans blown off when the infeed opened and from the print station and varnish station at machine restart.

7) **Total Trips:** This is the total number of trips (sum of the individual trips per spindle) for the shift.

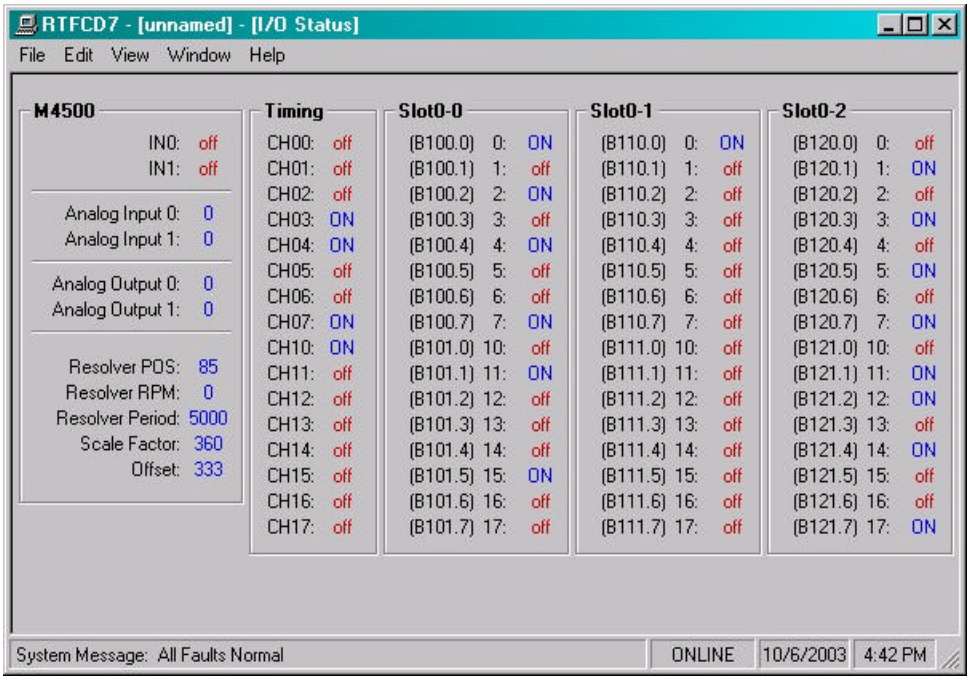
8) **Spindle #01 through #24:** This is the total trips (mis-loads) for each spindle. A disproportionately high count for a particular spindle indicates a loading problem for that spindle.

Last Shift Data: The "Last Shift" data is identical to the current shift data except it is for the previous 8 or 12 hour shift or previous label run, however the shift collection is set-up. This allows data collection and diagnostics to take place automatically over a two shift period.



4.5.6 THE I/O STATES WINDOW

The "I/O States" window is provided to display states of the inputs and outputs. The control boards, the states of the timing channels, as well as states of the M4500 are shown. This includes the interrupt inputs (IN0 and IN1), the analog I/O and the resolver. These values are displayed as read by the M4500 processor.



SECTION 4
RTFCD7 WINDOWS BASED
SETUP PROGRAM REFERENCE

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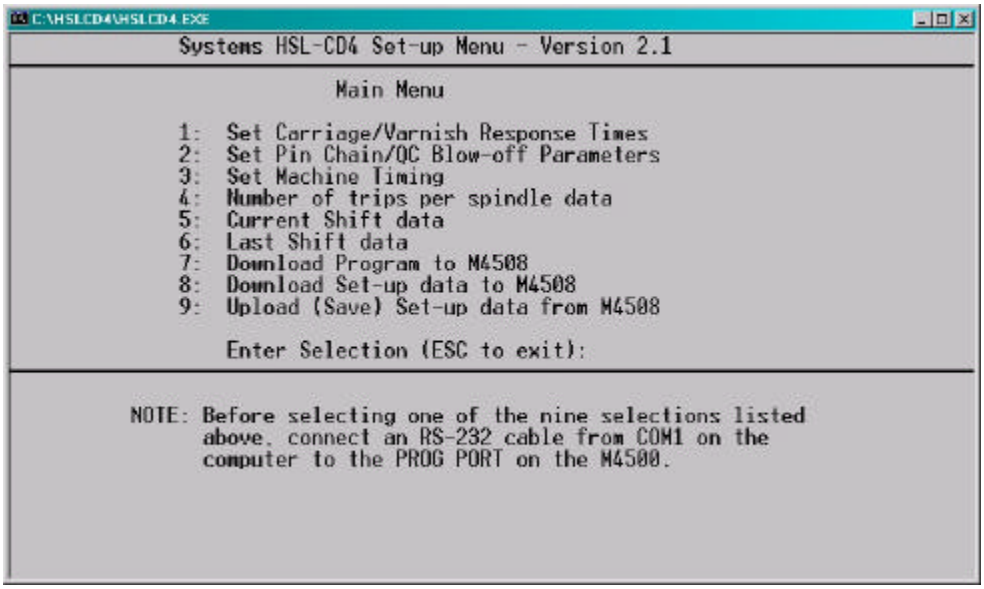
SECTION 5
HSLCD4 DOS BASED
SETUP PROGRAM REFERENCE

The DOS based "HSLCD4" set-up program is menu driven, allowing the user to easily view data, alter set-up variables and set the machine timing (machine offset, timing signal locations, etc.) using a laptop or personal computer. The set-up variables are used to configure and tune the HSLCD4 to match the configuration and performance of the specific decorator (see Tuning the HSL-CD4, section 2.10).

The main menu of the "HSLCD4" set-up program incorporates the following menu selections:



Note: The "HSLCD4" program is an on-line communications program used to interface with the M4500 module. The data displayed in the menus and set in the menus is communicated directly to the M4500. Therefore, prior to selecting any of the above selections, make sure an RS-232 cable is connected from the COM port on the computer running "HSLCD4" to the "PROG" port on the M4500.

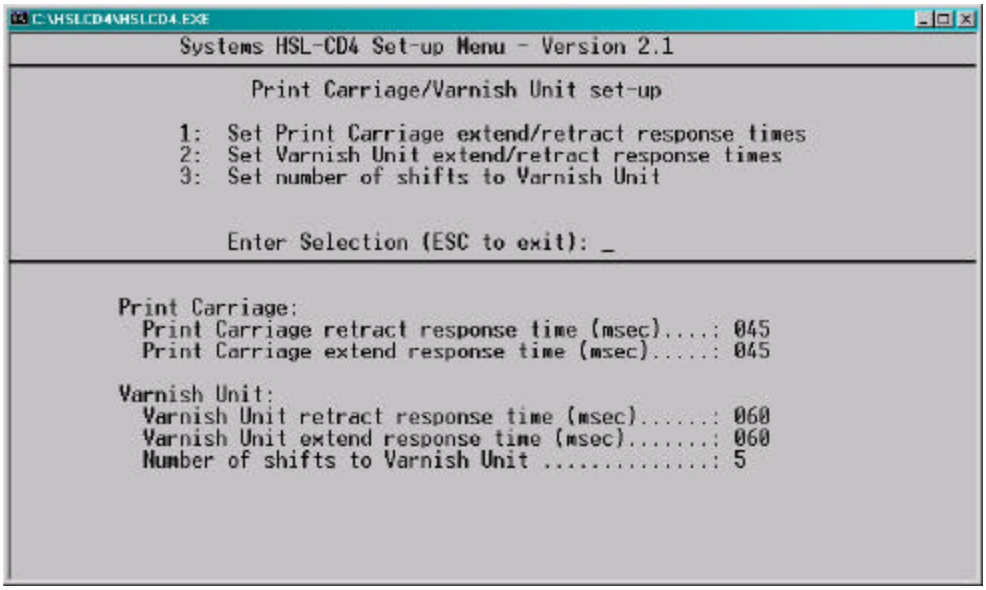
The following sections are a complete description of the "HSLCD4" selections and menus.

SECTION 5
HSLCD4 DOS BASED
SETUP PROGRAM REFERENCE

5.1 SET CARRIAGE/VARNISH RESPONSE TIMES

The Carriage/Varnish Unit set-up menu is used to set the print carriage and varnish unit response times in the M4500. This menu is invoked by selecting "1: Set Carriage/Varnish Response Times" from the Main Menu. The menu selections on the "Print Carriage/Varnish Unit set-up" menu allow the user to set the Carriage/Varnish variables listed under the following menu selections:

To set a particular variable, select the corresponding menu selection and follow the prompts as they occur.



Note: Prior to selecting this selection, make sure the RS-232 cable is connected from the COM port on the computer to the PROG PORT on the M4500.

Print Carriage retract response time: This is the time used as the retract response time of the carriage unit (time from solenoid actuation to first break with blanket) in milliseconds. The M4500 will activate the retract solenoid this amount of time ahead of the Carriage unit trip timing (CH00) (usually set at 40 to 50 milliseconds).

Print Carriage extend response time: This is the time used as the extend response time of the carriage unit (time from solenoid actuation to first contact with blanket) in milliseconds. The M4500 will activate the extend solenoid this amount of time ahead of the Carriage unit trip timing (CH00) (usually set at 40 to 50 milliseconds).

Varnish Unit retract response time: This is the time used as the retract response time of the varnish unit (time from solenoid actuation to first break with varnish wheel) in milliseconds. The M4500 will activate the extend solenoid this amount of time ahead of the Varnish unit trip timing (CH01) (usually set at 60 milliseconds).

Varnish Unit extend response time: This is the time used as the extend response time of the varnish unit (time from solenoid actuation to first contact with varnish wheel) in milliseconds. The M4500 will activate the extend solenoid this amount of time ahead of the Varnish unit trip timing (CH01) (usually set at 60 milliseconds).

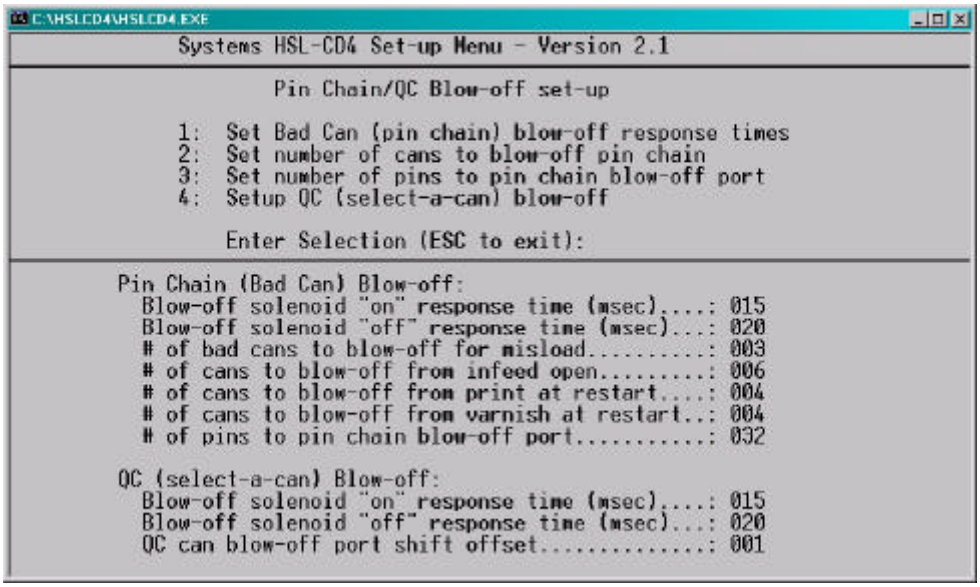
Number of Shifts to Varnish Unit: This is the number of spindles from the Can Sensor to the varnish unit minus 2. In general, this is set such that the varnish unit retracts out on the can ahead of the misloaded spindle. For older generation Rutherford Decorators, this is set to "5". For newer generation decorators, this is set to "4".

SECTION 5
HSLCD4 DOS BASED
SETUP PROGRAM REFERENCE

5.2 SET PIN CHAIN/QC BLOW-OFF PARAMETERS

The Pin Chain/QC Can Blow-off set-up menu is used to set the Pin Chain/QC Blow-off parameters in the M4500. This menu is invoked by selecting "2: Set Pin Chain/QC Blow-off Parameters" from the Main Menu. The menu selections on the "Pin Chain/QC blow-off set-up" menu allow the user to set the Pin Chain/QC Blow-off variables listed under the following menu selections:

To set a particular variable, select the corresponding menu selection and follow the prompts as they occur.



Note: Prior to selecting this selection, make sure the RS-232 cable is connected from the COM port on the computer to the PROG PORT on the M4500.

Bad Can Blow-off solenoid "on" response time: This is the time used as the "on" response time of the pin chain blow-off port (time from "on" solenoid actuation to first air out port) in milliseconds. The M4500 will activate the solenoid this amount of time ahead of the Pin Chain blow-off timing (CH05) (usually set at 15 to 20 milliseconds).

Bad Can Blow-off solenoid "off" response time: This is the time used as the "off" response time of the pin chain blow-off port (time from "off" solenoid actuation to air stopping at port) in milliseconds. The M4500 will activate the solenoid this amount of time ahead of the Pin Chain blow-off timing (CH05) (usually set at 15 to 20 milliseconds for double acting solenoids and set at 25 to 30 milliseconds for single acting solenoids).

# of bad cans to blow-off for misload: This is the number of cans blown off at the pin chain port when one miss-loaded can is detected (typically set at 3 cans).

# of cans to blow-off from infeed open: This is the number of cans which will be blown off when the infeed is first opened. To blow off no cans at infeed open, set equal to 0, to blow off one can set equal to 1, etc.

# of cans to blow-off from print at restart: This is the number of cans which will be blown off from the print station when the machine is restarted. To blow off no cans at restart, set equal to 0, to blow off one can set equal to 1, etc.

# of cans to blow-off from varnish at restart: This is the number of cans which will be blown off from the varnish station when the machine is restarted. To blow off no cans at restart, set equal to 0, to blow off one can set equal to 1, etc.

# of pins to pin chain blow-off port: This is the number of pins from the spindle wheel to disk transfer location to the first can blown off at the Pin Chain blow-off port minus two. This can be a number from 0 to 999.

QC Can Blow-off solenoid "on" response time: This is the time used as the "on" response time of the QC blow-off port (time from "on" solenoid actuation to first air out port) in milliseconds. The M4500 will activate the solenoid this amount of time ahead of the QC blow-off timing (CH06) (usually set at 15 to 20 milliseconds).

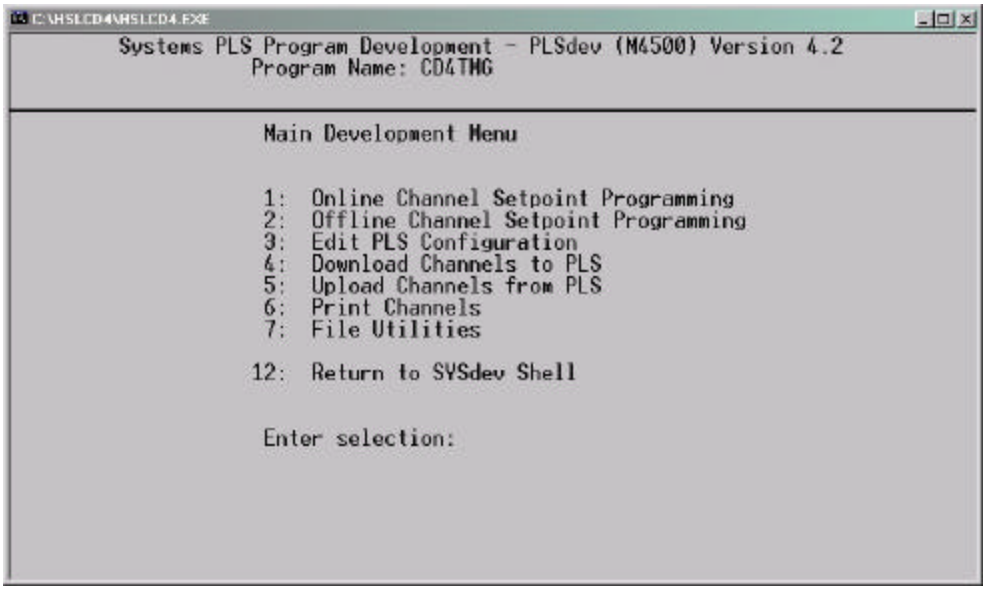
QC Can Blow-off solenoid "off" response time: This is the time used as the "off" response time of the QC blow-off port (time from "off" solenoid actuation to air stopping at port) in milliseconds. The M4500 will activate the solenoid this amount of time ahead of the QC blow-off timing (CH06) (usually set at 15 to 20 milliseconds for double acting solenoids and set at 25 to 30 milliseconds for single acting solenoids).

QC Can Blow-off port shift offset: This is the number of spindles difference from detection of the spindle #1 flag to the QC blow-off port. This is a number between 1 and 24 and is empirically set by selecting spindle #1 for blow-off and adjusting this value until the can from spindle #1 is the can that is blown off.

SECTION 5
HSLCD4 DOS BASED
SETUP PROGRAM REFERENCE

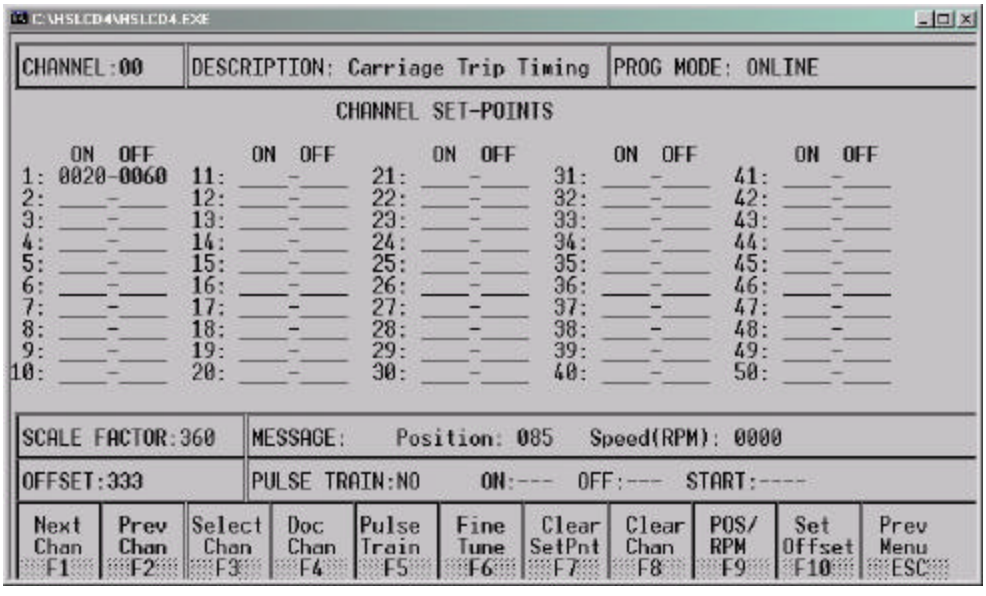
5.3 SET MACHINE TIMING

The Set Machine Timing selection is used to invoke the PLS programming command menus (these are the same menus used in SYSdev to program the PLS section of the M4500).



Note: Prior to selecting the Machine Timing selection, make sure the RS-232 cable is connected from the COM port on the computer to the CHAN PORT on the M4500.

When selected, the PLS programming main development menu will be invoked using the default CD4TMG channel set-point file .



From this menu, the user can zero the machine (set the resolver offset) and adjust the timing signal set-points.

Note: Section 6 provides a complete description of each timing signal.

5.3.1 ZEROING THE MACHINE

To set the machine zero (resolver offset) perform the following:

1) Connect the RS-232 cable from the COM port on the computer to the "PROG" port on the M4500.

2) Select the "3: Set Machine Timing" selection from the HSL-CD4 set-up program main menu.

3) Select "1: Online Channel Setpoint Programming" from the Main Development menu.

4) Select "F9: POS/RPM" and observe the "POS:" field. Verify that as the machine is rotated forward (either jogging or barred) that the position increases linearly from 0 through 359. If not, swap the S1 and S3 leads of the resolver at the M4500 resolver connector. Then verify that the position then indeed does increase with forward movement. Press "ESC" to exit the "POS/RPM" update.

5) Position the machine at machine zero (spindle aligned with V notch at top backside of machine frame, see section 2.10.2 – Set Machine Zero).

6) Auto zero the resolver by selecting "F10: Set Offset". Enter "0" in the offset field and press <ENTER>.

7) The M4500 will calculate the actual offset value required to make this the 000 position and will display this number in the offset field. The position will now read 0.

8) Exit back to the PLS Main Development menu by pressing <ESC>. Exit back to the "HSLCD4" set-up main menu by pressing <ESC> again.

5.3.2 ADJUSTING THE TIMING CHANNEL SET-POINTS

To set or alter any of the timing signal set-points, perform the following:

1) Connect the RS-232 cable from the COM port on the computer to the "PROG" port on the M4500.

2) Select the "3: Set Machine Timing" selection from the HSL-CD4 set-up program main menu.

3) Select "1: Online Channel Setpoint Programming" from the Main Development menu.

4) Set all channels per section 6. Set-points are entered for a particular channel simply by typing in the set-point in the form XXX-YYY<ENTER> in the first set-point of the given channel.

   Note: Up to 50 set-points may be entered for any channel. However, for the decorator, only one set-point is used per channel and should be entered in the number 1 set-point.

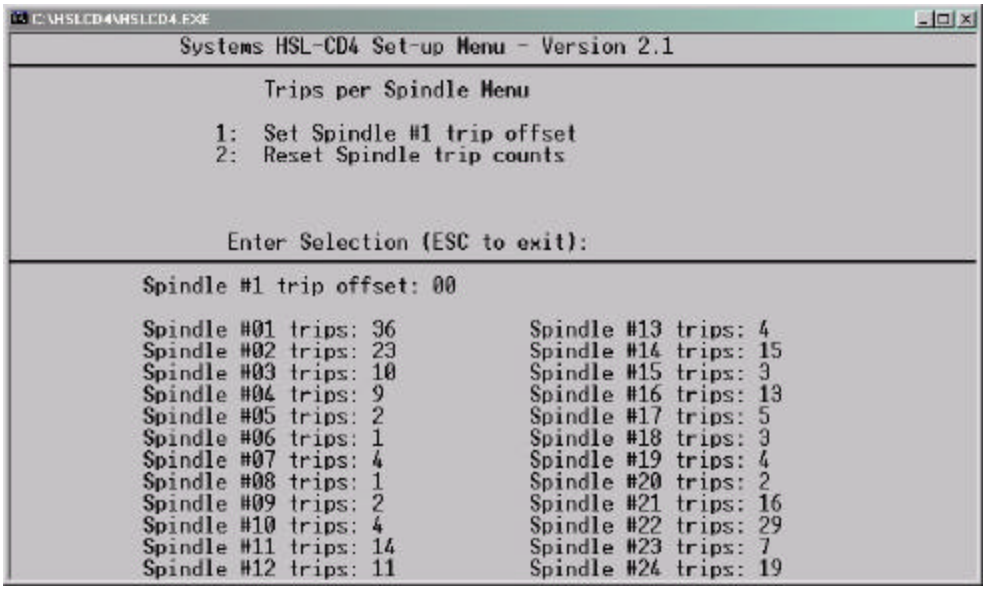
   The XXX is the location the set-point will turn "on" while YYY is the location where the set-point will turn "off". Use the PgUp, PgDn, F1:Next Chan, or F2: Prev Chan keys to select the desired channel for programming.

5) Once all channels are programmed, press <ESC> to exit back to the PLS Main Development Menu. Press <ESC> again to exit back to the "HSLCD4" set-up main menu. The new channels will be saved both in the M4500 and in the "CD4TMG" file on the hard drive.

5.4 NUMBER OF TRIPS PER SPINDLE DATA

The Number of trips per spindle menu is provided to aid in the trouble-shooting of a loading problem with a spindle or spindles. The total number of trips for each spindle since the last reset or end of shift is displayed. The operator can reset these counts at any time to aid in the trouble-shooting process. In addition, the "Spindle Trip Offset" can be entered from this menu. This is used to compensate for the location of the can/no can sensor and the spindle #1 I.D. sensor location.

When the "4: Number of Trips per Spindle" selection is selected from the main menu, the total trips per spindle is displayed and updated continuously in fields that read "Spindle #xx trips:" for each spindle. To exit back to the main menu, press <ESC>. A disproportionately high count for a particular spindle indicates a loading problem for that spindle.



Note: Prior to selecting this selection, make sure the RS-232 cable is connected from the COM port on the computer to the "PROG" port on the M4500.

The menu selections on the "Trips Per Spindle" menu allow you to reset the trips per spindle counts or set the "Spindle Trip Shift Offset. The selections are listed below:

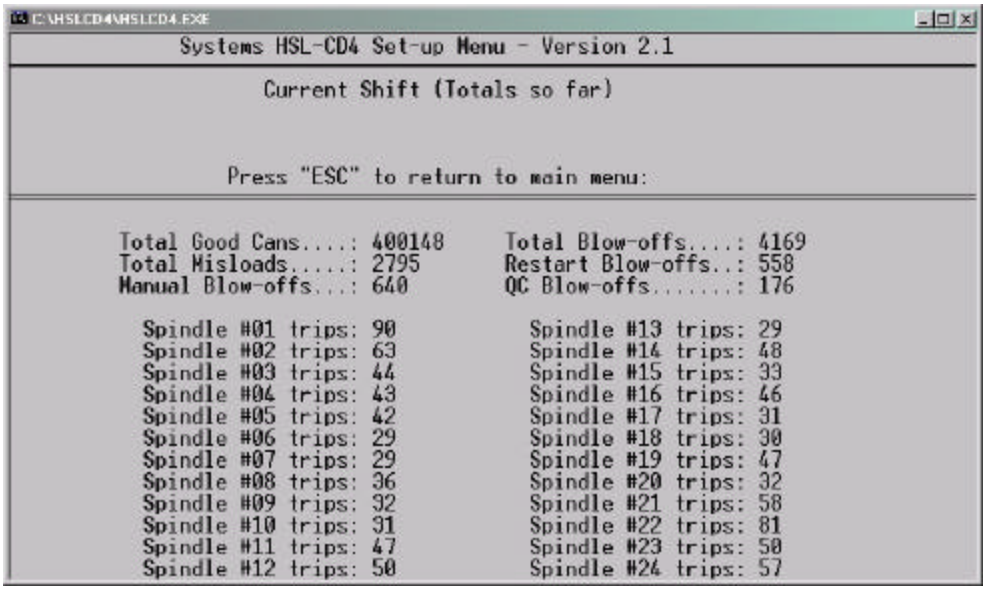
1: Set Spindle #1 trip offset
2: Reset Spindle trip counts

To set the spindle trip offset, select "1" and enter the required offset (see section 2.10.11 – Set Spindle Trip Shift Offset) and press <ENTER>. To reset the spindle trip counts, simply press "2". The counts will be reset in the M4500. To exit back to the main menu, press <ESC>.

SECTION 5
HSLCD4 DOS BASED
SETUP PROGRAM REFERENCE

5.5 CURRENT SHIFT DATA

The Current shift data menu displays the following information:



This data is the totals so far into the shift. This data is transferred to the "Last shift" data when the end of shift input transfers from a "0" to a "1". This can be at the end of either an 8 or 12 hour shift or alternatively could be done at label changes such that the data collected would be for label runs rather than complete shifts. This data cannot be reset either from this menu or by the operator, only at the end of shift input transition. To exit back to the main menu, press <ESC>.

Total Good Cans: This is the total number of good cans printed so far into the shift. This is essentially a can counter.

Total Blow-offs: This is the total number of cans blown-off the machine. This includes all types of blow-offs: the three cans blown-off for every miss-loaded can, infeed open blow-offs, restart blow-offs, manual blow-offs, select-a-can QC blow-offs, etc.

Total Mis-loads: This is the total number of miss-loaded cans (trips). These would be the actual number of damaged cans that did not load properly on the machine. This gives an indication of conveying/can handling problems.

Restart Blow-offs: This is the total number of cans blown off when the infeed opened and from the print station and varnish station at machine restart.

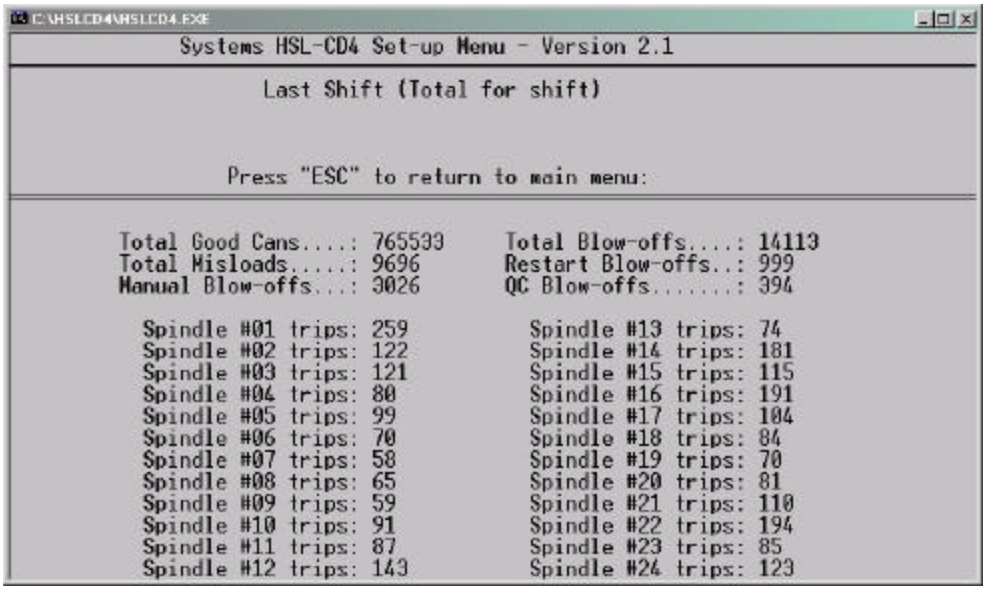
Manual Blow-offs: This is the total number of cans blown-off by the operator using the Manual Blow-off PB or selector switch.

QC Blow-offs: This is the total number of cans blown-off by the operator with the Select-A-Can QC station or QC Blow-off key on the HSL-CD4 keypad for quality verification.

Spindle #01 trips thru Spindle #24 trips: This is the total trips (mis-loads) for each spindle. A disproportionately high count for a particular spindle indicates a loading problem for that spindle.

5.6 LAST SHIFT DATA

The "Last Shift" data is identical to the current shift data except it is for the previous 8 or 12 hour shift or previous label run, how ever the shift collection is set-up. This allows data collection and diagnostics to take place automatically over a two shift period. Refer to section 5.5 – Current Shift Data for definitions of the data fields in the "Last Shift" data menu.



SECTION 5
HSLCD4 DOS BASED
SETUP PROGRAM REFERENCE

5.7 DOWNLOAD PROGRAM TO M4500

This selection is used to download the HSLCD4 application program to the M4500 module. This should only be performed when replacing the M4500 module (see section 2.11 – M4500/P4500/D4591 Installation) or whenever changes have been made to the source code.

Note: Program download cannot be performed while the machine is running. All outputs are turned "off" and no program execution is performed. Any miss-loaded cans will not be tripped for resulting in inside litho.

To download the program, perform the following:

1) Connect the RS-232 cable from the COM port on the computer to the "PROG" port on the M4500.

2) Select "7: Download Program to M4500". A prompt will be displayed asking to continue or abort. To continue, press any key except the <ESC> key. To abort, press the <ESC> key. If a prompt stating that the "HSLCD4.REV" file could not be opened is displayed, then the "HSLCD4" application program is not installed in the current directory. To install the program, perform the steps in section 2.8.4 – Application Program Installation.

3) Once program download is initiated, M4500 program execution will cease, the current address being downloaded will be displayed, and the "RUN" LED on the M4500 will flash continuously.

4) Once the download is complete, the "RUN" LED on the M4500 will illuminate solid and program execution in the M4500 will resume. Press any key to return back to the "HSLCD4" main menu.

5.8 DOWNLOAD SET-UP DATA TO M4500

This selection is used to download the previously uploaded (saved) set-up variables to the M4500. This should only be performed when replacing the M4500 module (see section 2.11 – M4500/P4500/D4591 Installation).

Note: The set-up data consists of the carriage/varnish response times, pin chain/QC blow-off parameters and the spindle trip shift offset. Timing channel set-points are not stored as part of the set-up data. To download the set-up data, perform the following:

1) Connect the RS-232 cable from the COM port on the computer to the "PROG" port on the M4500.

2) Select "8: Download Set-up data to M4500". A prompt will be displayed asking to continue or abort. To continue, press any key except the <ESC> key. To abort, press the <ESC> key.

3) Once data download is initiated, the current address being downloaded will be displayed.

   Note: Program execution is not ceased, therefore data download can be performed while the machine is running.

4) Once set-up data download is complete, press any key to return to the "HSLCD4" main menu.

5.9 UPLOAD (SAVE) SET-UP DATA FROM M4500

This selection is used to save the set-up variables from the M4500 to the hard drive (current directory selected). This should be performed anytime any of the set-up variables have been changed.

Note: When the set-up variables are changed, they are changed directly in the M4500, not on the file in the computer. By uploading (saving) the set-up variables to disk, they can be downloaded to the M4500 in the event the module must be replaced. The set-up data consists of the carriage/varnish response times, pin chain/QC blow-off parameters and the spindle trip shift offset. Timing channel set-points are not stored as part of the set-up data. To upload the set-up data, perform the following:

1) Connect the RS-232 cable from the COM port on the computer to the "PROG" port on the M4500.

2) Select "9: Upload (Save) Set-up data from M4500". A prompt will be displayed asking to continue or abort. To continue, press any key except the <ESC> key. To abort, press the <ESC> key.

3) Once data upload is initiated, the current address being uploaded will be displayed.

   Note: Program execution is not ceased, therefore data upload can be performed while the machine is running.

4) Once set-up data upload is complete, press any key to return to the "HSLCD4" main menu.

SECTION 5
HSLCD4 DOS BASED
SETUP PROGRAM REFERENCE

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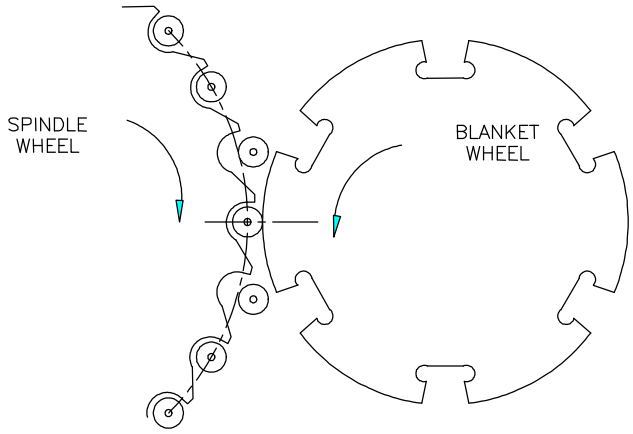
SECTION 6
GENERAL TIMING SIGNAL LOCATIONS

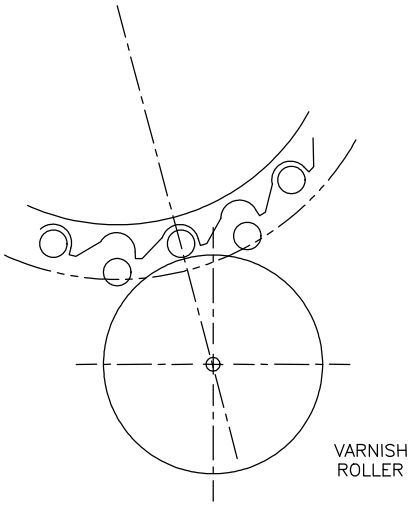
The following is a general description of the timing signals and the locations they should be set at:

CH00: PRINT CARRIAGE TRIP: This signal should just turn "on" when a spindle is at the midpoint of a blanket. For a bad can, the carriage is retracted midway of the can previous to the bad can and extended midway on the can following the bad can. This signal should be 40 degrees wide.



Location of Print Carriage Trip Timing
(CH00 – ON Set-point)

CH01: VARNISH UNIT TRIP: This signal should just turn "on" when a spindle is centered on the varnish wheel. For a bad can, the varnish unit is retracted midway on the can previous to the bad can and extended midway on the can following the bad can. This signal should be 40 degrees wide.



Location of Varnish Unit Trip Timing
(CH01 – ON Set-point)

SECTION 6
GENERAL TIMING SIGNAL LOCATIONS

CH02: CAN/NO CAN CLOCK: This signal is used to clock the bad can shift register which activates the carriage, varnish, and pin chain blow-off for miss-loaded cans. It is also used as a general purpose clock for all shift registers, counters, etc. The can/no can clock is generally set "on" at 180 degrees and "off" at 000 degrees. The "off" to "on" transition of CH02 cannot however coincide with either the CH00 (Carriage trip), CH01 (Varnish trip), or CH05 (Pin Chain Blow-off) timing signals. These timing signals must be set at least 30 degrees ahead or behind the CH02 "off" to "on" transition.

CH03: DAMAGED CAN BLOW-OFF (LO) TIMING: This signal is used to activate the damaged can blow-off solenoid at low speeds (below 1000CPM). The damaged can blow-off "on" solenoid will actually be "on" for the duration of CH03 when a miss-loaded can is detected. This signal should be set "on" 10 degrees before air starts to leave the damaged can port and set "off" 20 degrees before air stops leaving the port.

CH04: DAMAGED CAN BLOW-OFF (HI) TIMING: This signal is used to activate the damaged can blow-off solenoid at high speeds (above 1000CPM). The damaged can blow-off "on" solenoid will actually be "on" for the duration of CH04 when a miss-loaded can is detected. This signal should be set "on" 25 degrees before CH03 turns "on" and set "off" 50 degrees before CH03 turns "off".

Note: The can/no can sensor must normally first see a good can at least 30 degrees prior to the "off" to "on" transition of CH04, if not retard both CH03 and CH04 as necessary. CH04 is the timing channel that actually clocks in the good can/bad can data from the can/no can sensor.

CH05: PIN CHAIN (BAD CAN) BLOW-OFF TIMING: This should turn "on" when the chain blow-off port is centered between pins on the chain (see section 2.10.4 – Set Pin Chain Blow-off Timing). This signal should be 40 degrees wide.

CH06: QC (SELECT-A-CAN) BLOW-OFF TIMING: This should turn "on" when the select-a-can chain blow-off port is centered between pins on the chain (see section 2.10.4 – Set Pin Chain Blow-off Timing). This signal should be 40 degrees wide.

CH07: CAN GATE TIMING: This signal is used to open and close the can gate. Set as necessary for proper can gating.

CH10: PLC CLOCK TIMING: This signal is provided to the PLC via a discrete DC output. This is used for whatever purpose required by the host PLC to clock once per spindle data. In general this should be set "on" for 180 degrees and "off" for 180 degrees. Otherwise set as desired. This signal is not used by the HSL-CD4 package internally in any way.

SECTION 7
RECOMMENDED SPARE PARTS

The following are recommended spares for the HSL-CD4. These parts are available through Systems Engineering Assoc. Inc.

Quantity	Part Number	Description
1ea.	M4500	PLC/PLS Processor/Chassis – 4 Slot
1ea.	P4500	Power Supply
1ea.	S4563	16 Point 10-30VDC Input Board
1ea.	S4568	8 input/8 output 10-30VDC I/O Board
1ea.	S4573	16 point 10-30VDC Output Board
1ea.	D4591	Display/Keypad

SECTION 7
RECOMMENDED SPARE PARTS

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APPENDIX A
MODBUS COMMUNICATIONS

MODBUS PORT CONFIGURATION

The MODBUS driver uses the following data format and parameters (the MODBUS port on the MODICON PLC must be set to match these):

MODBUS Port (PLC address):	5
MODBUS Baud:	19.2K
MODBUS framing mode:	RTU
Number of start bits:	1
Number of data bits:	8
Number of stop bits:	1
Parity:	NONE

The MODBUS communications driver uses the S4516 communications board to both read and write data to a MODICON PLC.

DATA WRITTEN TO THE MODICON PLC

The following data is written to the MODICON PLC:

MODICON Dest. 4x Address	Data Definition	M4500 Source Address
401700	Speed (CPM)	W182
401701	Resolver Position	W180
401702	Number of Good Cans (Lo-0 to 9,999)	W1100
401703	Number of Good Cans (Hi-10,000's)	W1102
401704	Total Blow-offs (Lo-0 to 9,999)	W1104
401705	Total Blow-offs (Hi-10,000's)	W1106
401706	Total Misloads	W1108
401707	Restart Blow-offs	W1112
401708	Manual Blow-offs	W1116
401709	QC (select-a-can) Blow-offs	W1120
401710	Trips per Spindle #1 (for Shift)	W1124
thru	thru	thru
401733	Trips per Spindle #24 (for Shift)	W1170
401734	Trips per Spindle #1 (Diagnostics)	W1020
thru	thru	thru
401757	Trips per Spindle #24 (Diagnostics)	W1066
401758	Status (to MODICON)	W690

APPENDIX A
MODBUS COMMUNICATIONS

The definitions of the data sent from the M4500 to the MODICON are as follows:

401700: Speed - Current strokes per minute of the cupper

401701: Resolver Position - Current angular position of the cupper crankshaft (in degrees)

401702: Number of Good Cans - This is the total number of good cans printed so far into the shift. This is essentially a can counter.

401704: Total Blow-offs - This is the total number of cans blown-off the machine. This includes all types of blow-offs: the three cans blown-off for every miss-loaded can, infeed open blow-offs, restart blow-offs, manual blow-offs, select-a-can QC blow-offs, etc.

401706: Total Misloads - This is the total number of miss-loaded cans (trips). These would be the actual number of damaged cans that did not load properly on the machine. This gives an indication of conveying/can handling problems.

401707: Restart Blow-offs - This is the total number of cans blown off when the infeed opened and from the print station and varnish station at machine restart.

401708: Manual Blow-offs - This is the total number of cans blown-off by the operator using the Manual Blow-off PB or selector switch.

401709: QC (select-a-can) Blow-offs - This is the total number of cans blown-off by the operator with the Select-A-Can QC station or QC Blow-off key on the HSL-CD4 keypad for quality verification.

401710: Trips per Spindle #1-#24 (for Shift) - This is the total trips (mis-loads) for each spindle so far into the current shift. A disproportionately high count for a particular spindle indicates a loading problem for that spindle.

401734: Trips per Spindle #1-#24 (Diagnostics) - This is the total trips (mis-loads) for each spindle. These counts can be reset by the operator whenever desired. A disproportionately high count for a particular spindle indicates a loading problem for that spindle.

The bits of the Status register (to the MODICON from the M4500) are mapped as follows:

W690: Status to MODICON (4x address 401758 in MODICON)

B690.0:	Zero Speed
B690.1:	Infeed Track Jam Alarm
B690.2:	Transfer Jam Alarm
B690.3:	Timing Signal Fail Alarm
B690.4:	Not Used
thru	
B691.7:	Not Used

The Status bits sent to the MODICON PLC are defined as follows:

B690.0: Zero Speed - This bit is set to a "1" when the decorator speed is below 30CPM. This bit is set to a "0" when the speed is greater than 30CPM.

B690.1: Infeed Track Jam Alarm - The infeed track jam alarm occurs when 6 consecutive empty mandrels are detected by the can/no can sensor after the can gate is opened.

B690.2: Transfer Jam Alarm - The no can transfer alarm occurs when the no can transfer sensor detects a can on a mandrel after the disk transfer location.

B690.3: Timing Signal Fail Alarm - The timing signal fail occurs when any of the timing signals generated in the PLS section fail to change state periodically while the machine is running.

APPENDIX A
MODBUS COMMUNICATIONS

DATA READ FROM THE MODICON PLC

The following data is read from the MODICON PLC:

MODICON Dest. 4x Address	Data Definition	M4500 Source Address
401760	Status/Control (from MODICON)	W900
401761	CH00 "On" - Carriage Trip Timing	W902
401762	CH00 "Off" - Carriage Trip Timing	W904
401763	CH01 "On" - Varnish Trip Timing	W906
401764	CH01 "Off" - Varnish Trip Timing	W908
401765	CH02 "On" - Can/No Can Clock Timing	W910
401766	CH02 "Off" - Can/No Can Clock Timing	W912
401767	CH03 "On" - Damaged Can Blow-off (Lo)	W914
401768	CH03 "Off" - Damaged Can Blow-off (Lo)	W916
401769	CH04 "On" - Damaged Can Blow-off (Hi)	W918
401770	CH04 "Off" - Damaged Can Blow-off (Hi)	W920
401771	CH05 "On" - Pin Chain Blow-off Timing	W922
401772	CH05 "Off" - Pin Chain Blow-off Timing	W924
401773	CH06 "On" - QC Blow-off Timing	W926
401774	CH06 "Off" - QC Blow-off Timing	W928
401775	CH07 "On" - Can Gate Timing	W930
401776	CH07 "Off" - Can Gate Timing	W932
401777	Print Carriage Retract Response Time	W934
401778	Print Carriage Extend Response Time	W936
401779	Varnish Unit Retract Response Time	W938
401780	Varnish Unit Extend Response Time	W940
Bad Can (Pin Chain) Blow-off:		
401781	Blow-off Solenoid "On" Response Time	W942
401782	Blow-off Solenoid "Off" Response Time	W944
401783	# of bad cans to blow-off for misload	W946
401784	# of cans blow-off from infeed open	W948
401785	# of cans blow-off from print at restart	W950
401786	# of cans blow-off from varnish at restart	W952
401787	# of pins to pin chain blow-off port	W954
QC Can (Select-a-can) Blow-off:		
401788	Blow-off Solenoid "On" Response Time	W956
401789	Blow-off Solenoid "Off" Response Time	W958
401790	QC can blow-off port shift offset	W960
401791	Spindle Trip Offset	W962

The definitions of the data read from the MODICON to the M4500 are as follows:

401761: CH00 "On" - Carriage Trip Timing
thru
401776: CH07 "Off" - Can Gate Timing
Variables 401761 thru 401776 are the "On" and "Off" timing set-points for CH00 thru CH07 respectively. This allows the MODICON to program these timing channels when the "Timing Channel Program Enable" bit (401760.3 from the MODICON) is set to a "1". These are the same "On" and "Off" set-points that would normally be set through the HSL-CD4 keypad (see section 3.5.3 – Set Machine Timing) or set through the HSLCD4 set-up program (See section 4.5.4 – The Machine Timing Window or section 5.3 – Set Machine Timing). See section 6 for the definitions of the CH00 through CH07 timing channels.

401777: Print Carriage Retract Response Time - This is the time used as the retract response time of the carriage unit (time from solenoid actuation to first break with blanket) in milliseconds. The M4500 will activate the retract solenoid this amount of time ahead of the Carriage unit trip timing (CH00) (usually set at 40 to 50 milliseconds).

401778: Print Carriage Extend Response Time - This is the time used as the extend response time of the carriage unit (time from solenoid actuation to first contact with blanket) in milliseconds. The M4500 will activate the extend solenoid this amount of time ahead of the Carriage unit trip timing (CH00) (usually set at 40 to 50 milliseconds).

401779: Varnish Unit Retract Response Time - This is the time used as the retract response time of the varnish unit (time from solenoid actuation to first break with varnish wheel) in milliseconds. The M4500 will activate the extend solenoid this amount of time ahead of the Varnish unit trip timing (CH01) (usually set at 60 milliseconds).

401780: Varnish Unit Extend Response Time - This is the time used as the extend response time of the varnish unit (time from solenoid actuation to first contact with varnish wheel) in milliseconds. The M4500 will activate the extend solenoid this amount of time ahead of the Varnish unit trip timing (CH01) (usually set at 60 milliseconds).

401781: Blow-off Solenoid "On" Response time - This is the time used as the "on" response time of the pin chain blow-off port (time from "on" solenoid actuation to first air out port) in milliseconds. The M4500 will activate the solenoid this amount of time ahead of the Pin Chain blow-off timing (CH05) (usually set at 15 to 20 milliseconds). Valid range: 5 to 60 msec.

401782: Blow-off Solenoid "Off" Response time - This is the time used as the "off" response time of the pin chain blow-off port (time from "off" solenoid actuation to air stopping at port) in milliseconds. The M4500 will activate the solenoid this amount of time ahead of the Pin Chain blow-off timing (CH05) (usually set at 15 to 20 milliseconds for double acting solenoids and set at 25 to 30 milliseconds for single acting solenoids). Valid range: 5 to 60 msec.

401783: # of bad cans to blow-off for misload - This is the number of cans blown off at the pin chain port when one miss-loaded can is detected (typically set at 3 cans).

401784: # of cans blow-off from infeed open - This is the number of cans which will be blown off when the infeed is first opened. Valid range: 0 to 99.

401785: # of cans blow-off from print at restart - This is the number of cans which will be blown off from the print station when the machine is restarted. Valid range: 0 to 99.

401786: # of cans blow-off from varnish at restart - This is the number of cans which will be blown off from the varnish station when the machine is restarted. Valid range: 0 to 99.

401787: # of pins to pin chain blow-off port - This is the number of pins from the spindle wheel to disk transfer location to the first can blown off at the Pin Chain blow-off port minus two. This can be a number from 0 to 999.

401788: Blow-off Solenoid "On" Response time - This is the time used as the "on" response time of the QC blow-off port (time from "on" solenoid actuation to first air out port) in milliseconds. The M4500 will activate the solenoid this amount of time ahead of the QC blow-off timing (CH06) (usually set at 15 to 20 milliseconds). Valid range: 5 to 60 msec.

401789: Blow-off Solenoid "Off" Response time - This is the time used as the "off" response time of the QC blow-off port (time from "off" solenoid actuation to air stopping at port) in milliseconds. The M4500 will activate the solenoid this amount of time ahead of the QC blow-off timing (CH06) (usually set at 15 to 20 milliseconds for double acting solenoids and set at 25 to 30 milliseconds for single acting solenoids). Valid range: 5 to 60 msec.

401790: QC can blow-off port shift offset - This is the number of spindles difference from detection of the spindle #1 flag to the QC blow-off port. This is a number between 1 and 24 and is empirically set by selecting spindle #1 for blow-off and adjusting this value until the can from spindle #1 is the can that is blown off.

401791: Spindle Trip Offset - This is the number of spindle difference from the detection of the spindle #1 flag to the Can/No Can sensor. This is a number between 0 and 23 and is empirically such that a miss-loaded can on spindle #1 increments the spindle #1 count in the "Trips per spindle" menu.

Note: The above parameters (401777 thru 401791) are effective only when the "Set-Up Parameters Enable" bit (401760.2 from the MODICON) is set to a "1". Otherwise, these variables are not updated in the M4500.

The bits of the Status/Control register (from the MODICON to M4500) are mapped as follows:

W900: Status/Control from MODICON (4x address 401760 in MODICON)
- B900.0: End of Shift
- B900.1: Spindle Trip Reset
- B900.2: Set-Up Parameters Enable
- B900.3: Timing Channel Program Enable
- B900.4: Set Resolver Zero (Auto-Zero)
- B900.5: Alarm Reset
- B900.6: Not Used
  thru
- B901.7: Not Used

The Status/Control bits sent from the MODICON PLC are defined as follows:

B900.0: End of Shift - Setting this bit to a "1" transfers the current shift data in the M4500 to the last shift data and clears the current shift data (to start data collection for the next shift). The current shift data in the MODICON should be saved to the last shift data stack prior to setting this bit.

B900.1: Spindle Trip Reset - Setting this bit to a "1" resets the "Trips per Spindle #1 - #24" counts stored in MODICON 4x variables 401734 thru 401757.

B900.2: Set-Up Parameters Enable - Setting this bit to a "1" enables the set-up parameters (401777 thru 401791 in the MODICON) to be used in the M4500. If this bit is set to a "0", the values in 401777 thru 401791 in the MODICON are not used as the set-up parameters, the M4500 instead uses the values set-up thru the HSL-CD4 keypad or the "HSLCD4" set-up program.

B900.3: Timing Channel Program Enable - Setting this bit to a "1" enables the CH00 thru CH07 "On" and "Off" set-points (401761 thru 401776) from the MODICON to be used as the set-points for CH00 thru CH07 in the PLS section of the M4500. If this bit is set to a "0", the values in 401761 thru 401776 in the MODICON are not used as the set-points, the M4500 instead uses the values set-up thru the HSL-CD4 keypad or the "HSLCD4" set-up program.

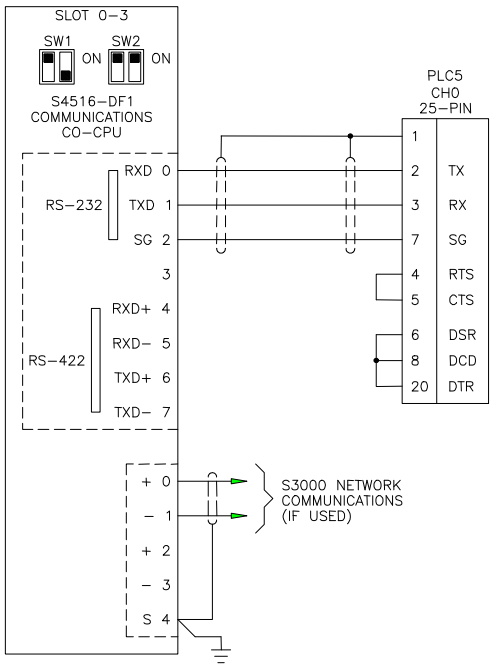
B900.4: Set Resolver Zero (Auto Zero) - Setting this bit sets the PLS offset such that the current position is "0". To set the resolver zero, position the machine at machine zero and then set this bit to a "1". The resolver position will now read 000. Reset this bit back to "0" when done.

B900.5: Alarm Reset - Setting this bit to a "1" resets the Infeed Track Jam alarm, Transfer Jam alarm, and the Timing Signal Fail alarm.

HARDWARE

DF1 communication takes place via the Channel 0 port of the Allen Bradley PLC. The RS-232 cable should be constructed and connected as shown below:

S4516-DF1 to PLC5



Internally, the PLC-5 should be set up for RS-232C communication. Refer to the dip-switch settings guide on the side of the processor.

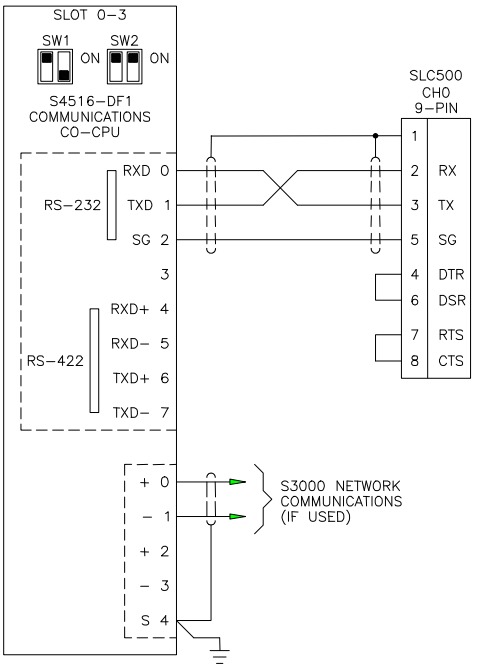
Note: The S4516-DF1 should be switched for RS-232 communication.

Dip switch SW1 is the RS-232/RS-422 dip switch should be set to:
POLE 1 = ON
POLE 2 = OFF

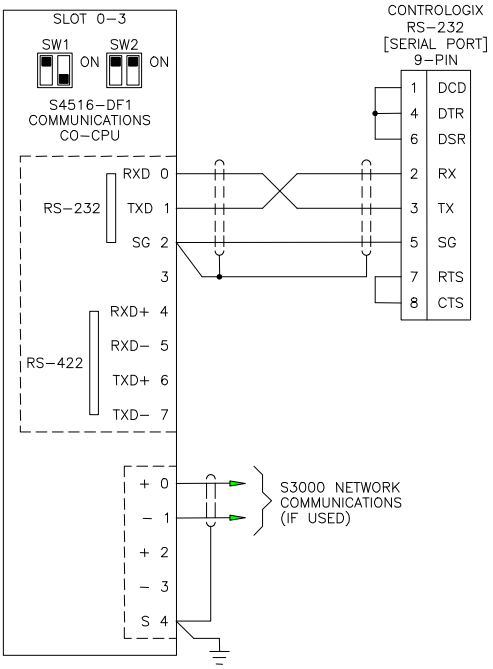
Dip switch SW2 is the slot address, and is dependent upon the rest of the cards in the M4500 rack. For the HSL-CD4 or HSM-CD7 control system, SW2 should be set to slot 0-3:
POLE 1 = ON
POLE 2 = ON

APPENDIX B
DF1 COMMUNICATIONS

S4516-DF1 to SLC



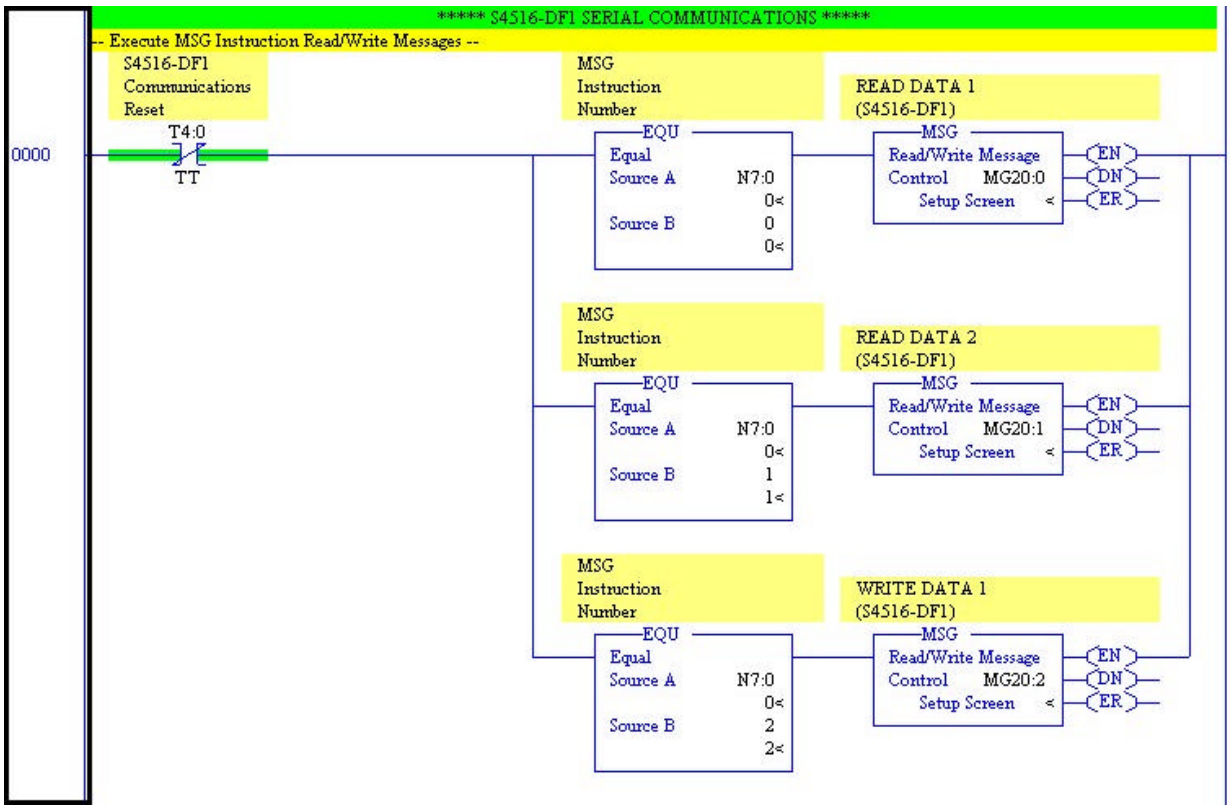
S4516-DF1 to ControLogix



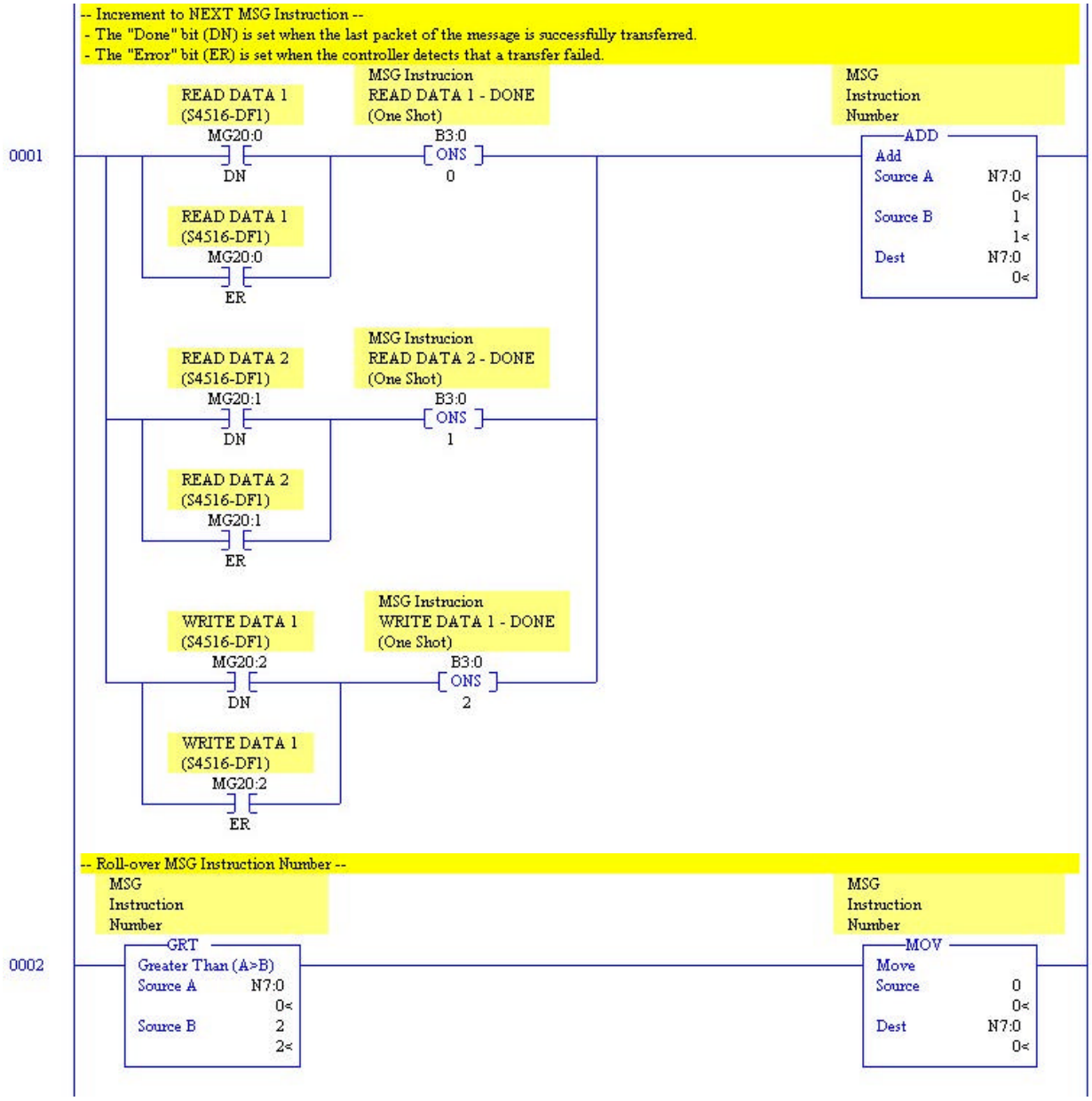
SOFTWARE

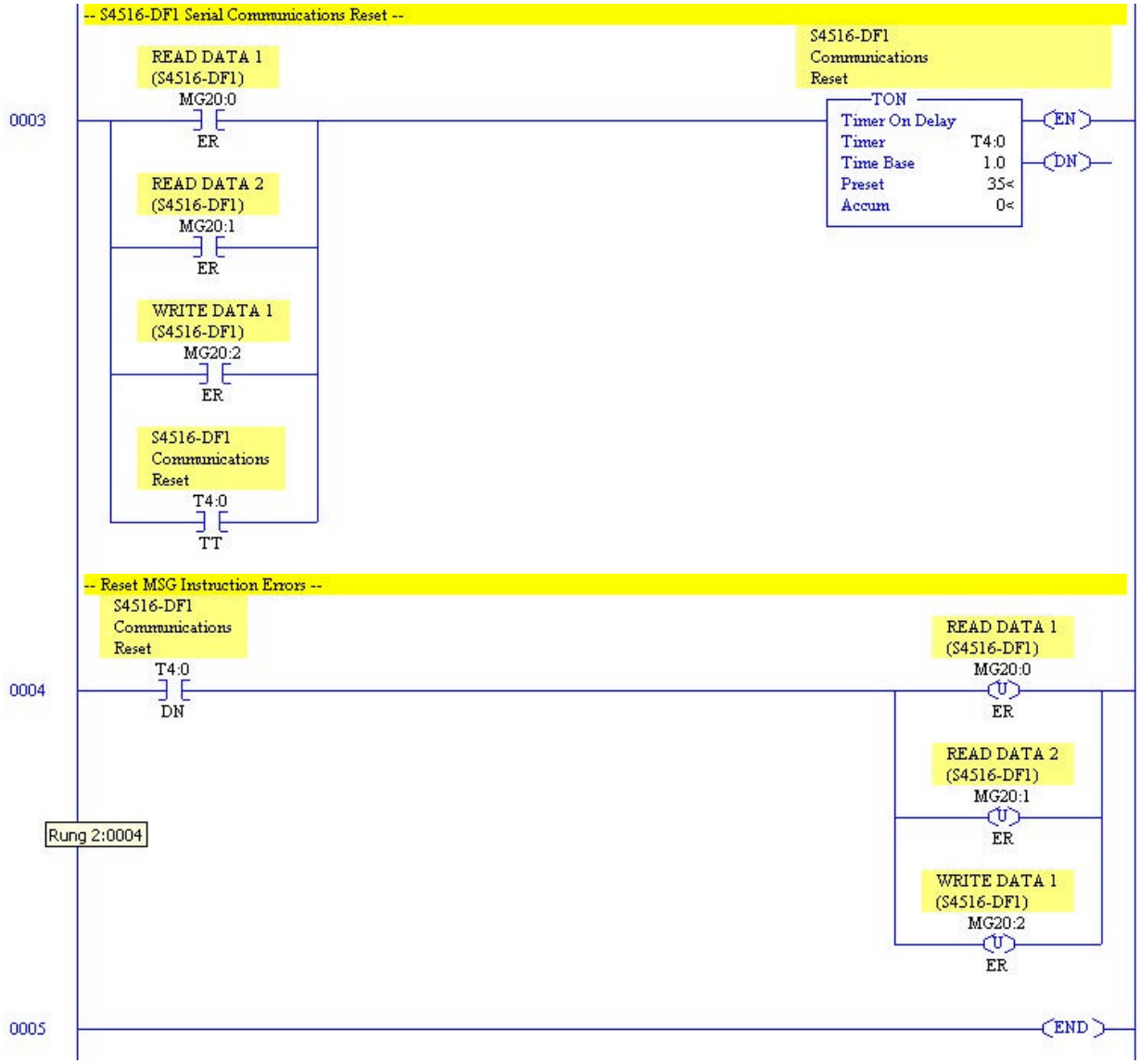
PLC5

The following sample RSLogix5 code is used to execute the message control function to allow a PLC5 processor to communicate with the S4516-DF1 serial communications board.



APPENDIX B
DF1 COMMUNICATIONS

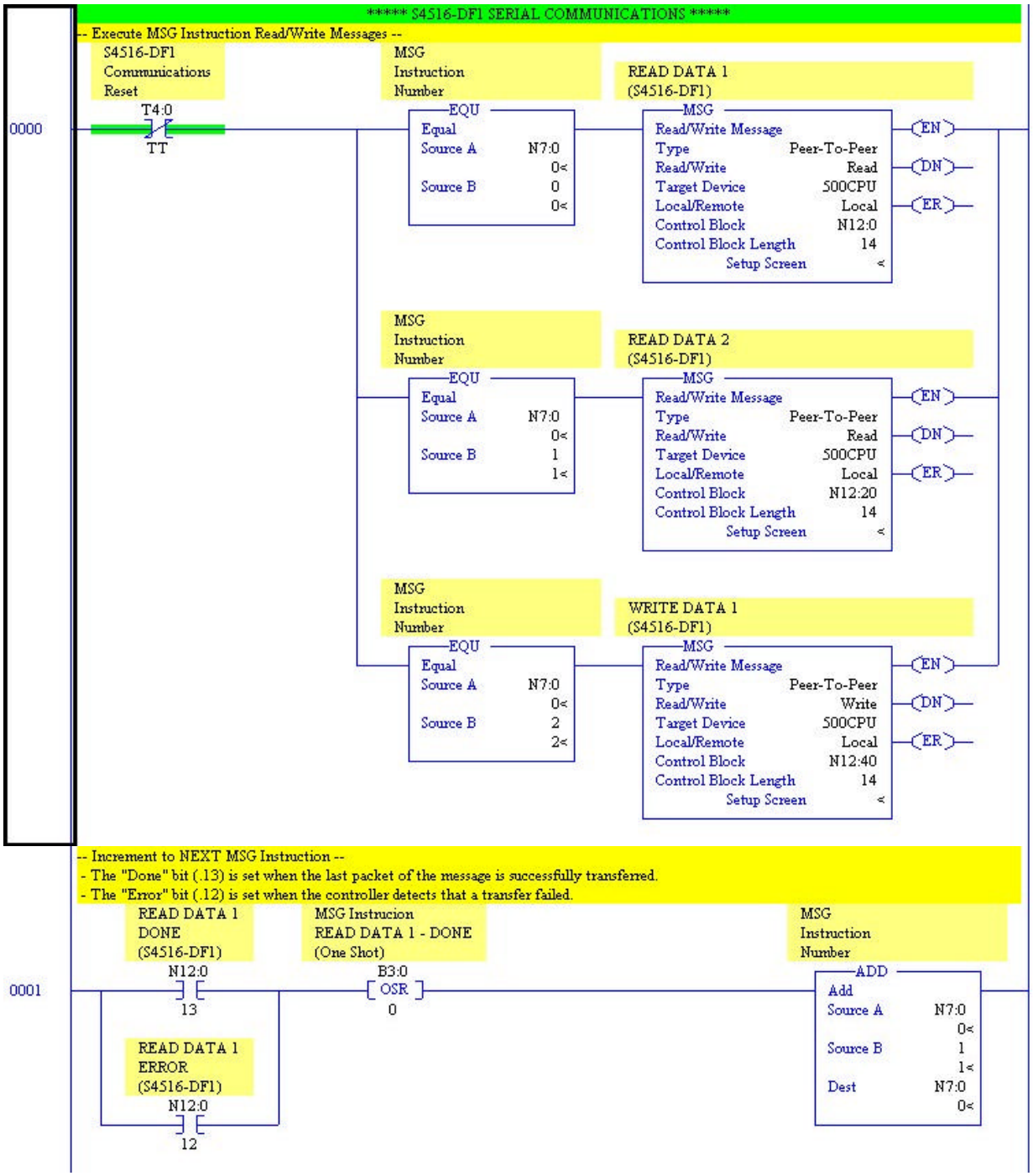


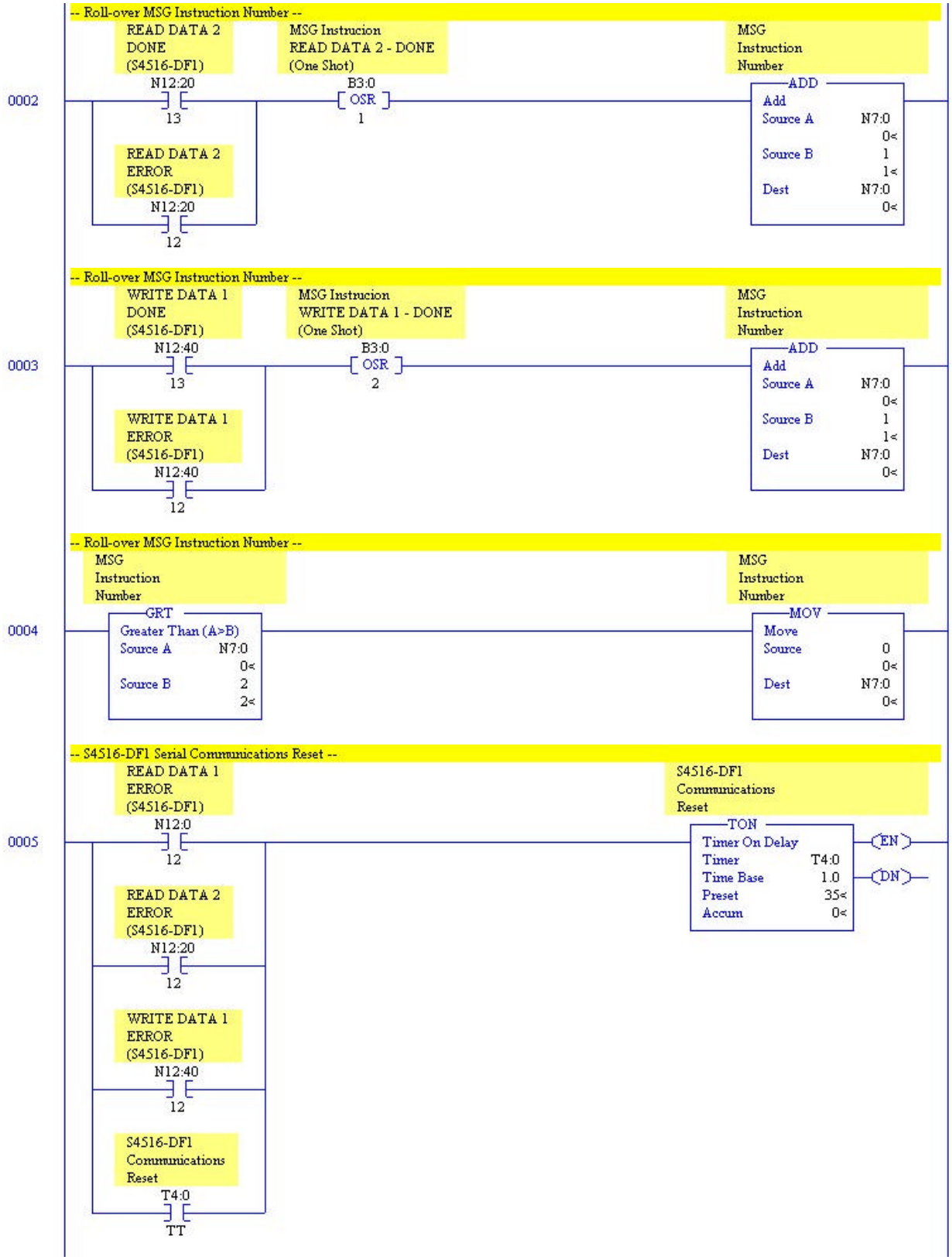

-- S4516-DF1 Serial Communications Reset --
READ DATA 1 (S4516-DF1)
MG20:0
ER
READ DATA 2 (S4516-DF1)
MG20:1
ER
WRITE DATA 1 (S4516-DF1)
MG20:2
ER
S4516-DF1 Communications Reset
T4:0
TT
0003
S4516-DF1 Communications Reset
TON
Timer On Delay
Timer T4:0
Time Base 1.0
Preset 35<
Accum 0<
EN
DN
-- Reset MSG Instruction Errors --
S4516-DF1 Communications Reset
T4:0
DN
0004
Rung 2:0004
READ DATA 1 (S4516-DF1)
MG20:0
U
ER
READ DATA 2 (S4516-DF1)
MG20:1
U
ER
WRITE DATA 1 (S4516-DF1)
MG20:2
U
ER
0005
END

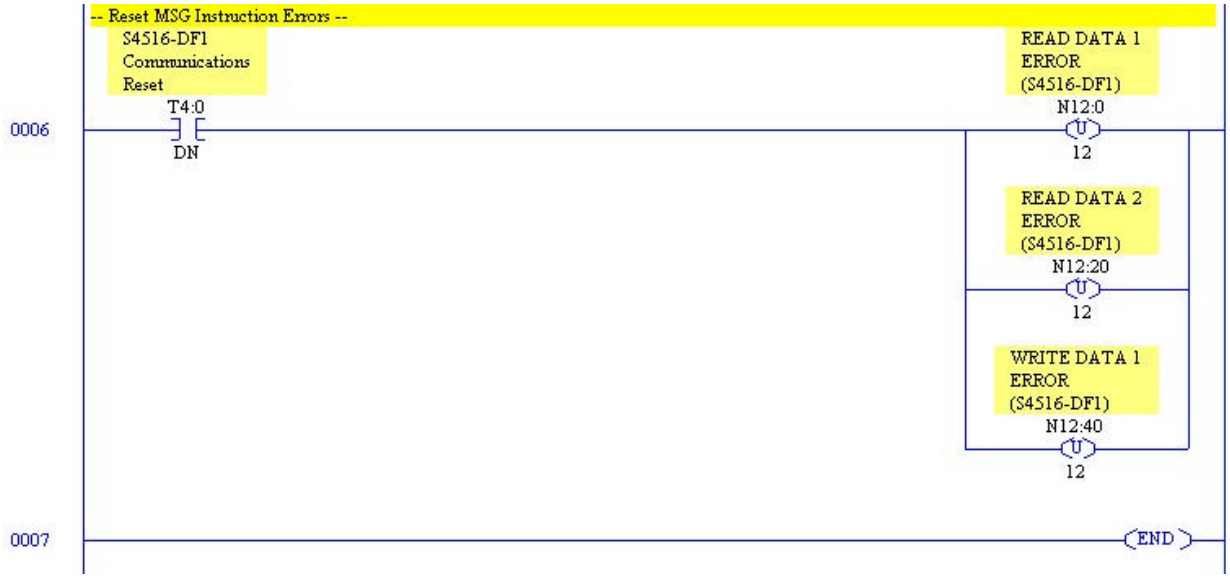
APPENDIX B
DF1 COMMUNICATIONS

SLC500

The following sample RSLogix500 code is used to execute the message control function to allow a SLC500 processor to communicate with the S4516-DF1 serial communications board.

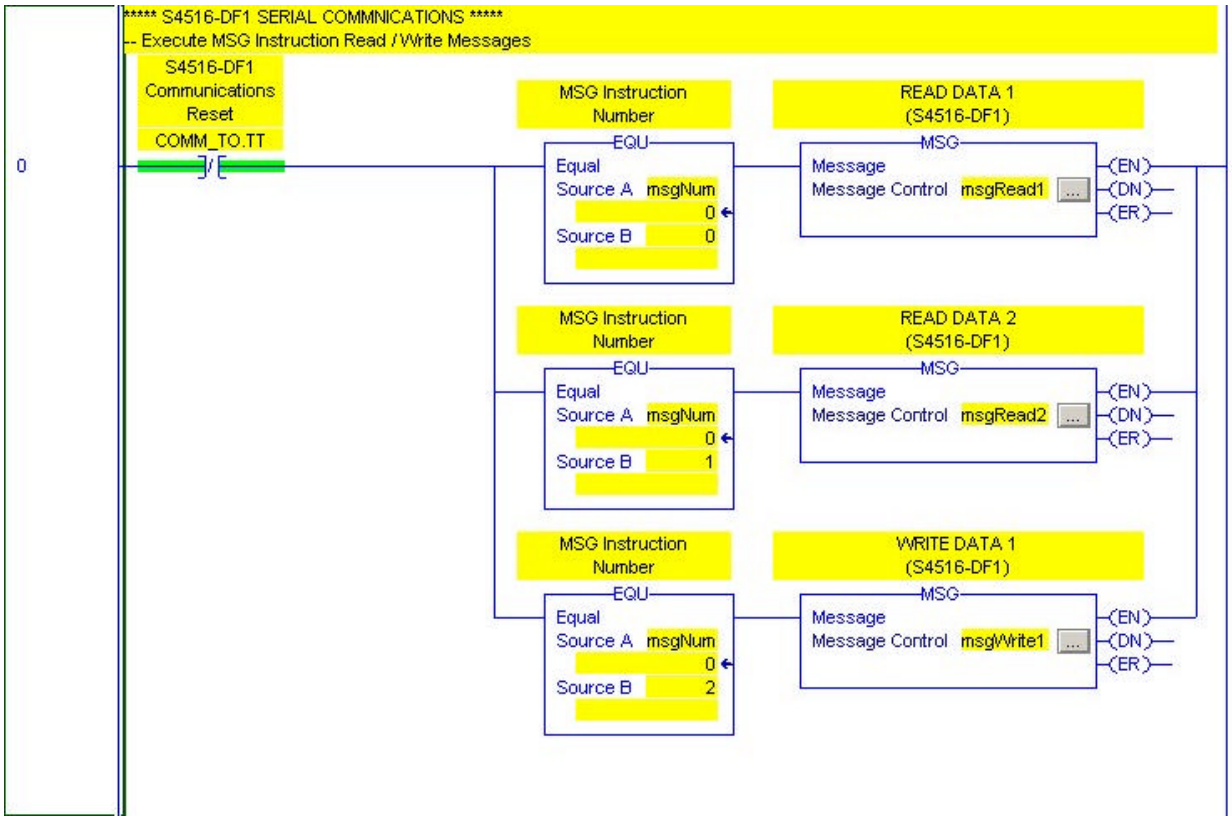



-- Roll-over MSG Instruction Number --
READ DATA 2 DONE (S4516-DF1)
N12:20
13
MSG Instrucion READ DATA 2 - DONE (One Shot)
B3:0
OSR
1
MSG Instruction Number
ADD
Add
Source A N7:0 0
Source B 1 1
Dest N7:0 0
READ DATA 2 ERROR (S4516-DF1)
N12:20
12
0002
-- Roll-over MSG Instruction Number --
WRITE DATA 1 DONE (S4516-DF1)
N12:40
13
MSG Instrucion WRITE DATA 1 - DONE (One Shot)
B3:0
OSR
2
MSG Instruction Number
ADD
Add
Source A N7:0 0
Source B 1 1
Dest N7:0 0
WRITE DATA 1 ERROR (S4516-DF1)
N12:40
12
0003
-- Roll-over MSG Instruction Number --
MSG Instruction Number
GRT
Greater Than (A>B)
Source A N7:0 0
Source B 2 2
MSG Instruction Number
MOV
Move
Source 0 0
Dest N7:0 0
0004
-- S4516-DF1 Serial Communications Reset --
READ DATA 1 ERROR (S4516-DF1)
N12:0
12
S4516-DF1 Communications Reset
TON
Timer On Delay
Timer T4:0
Time Base 1.0
Preset 35
Accum 0
EN
DN
READ DATA 2 ERROR (S4516-DF1)
N12:20
12
WRITE DATA 1 ERROR (S4516-DF1)
N12:40
12
S4516-DF1 Communications Reset
T4:0
TT
0005


-- Reset MSG Instruction Errors --
S4516-DF1
Communications
Reset
T4:0
DN
0006
READ DATA 1
ERROR
(S4516-DF1)
N12:0
U
12
READ DATA 2
ERROR
(S4516-DF1)
N12:20
U
12
WRITE DATA 1
ERROR
(S4516-DF1)
N12:40
U
12
0007
END

ControlLogix and CompactLogix

The following sample RSLogix5000 code is used to execute the message control function to allow a ControLogix or CompactLogix processor to communicate with the S4516-DF1 serial communications board.



APPENDIX B
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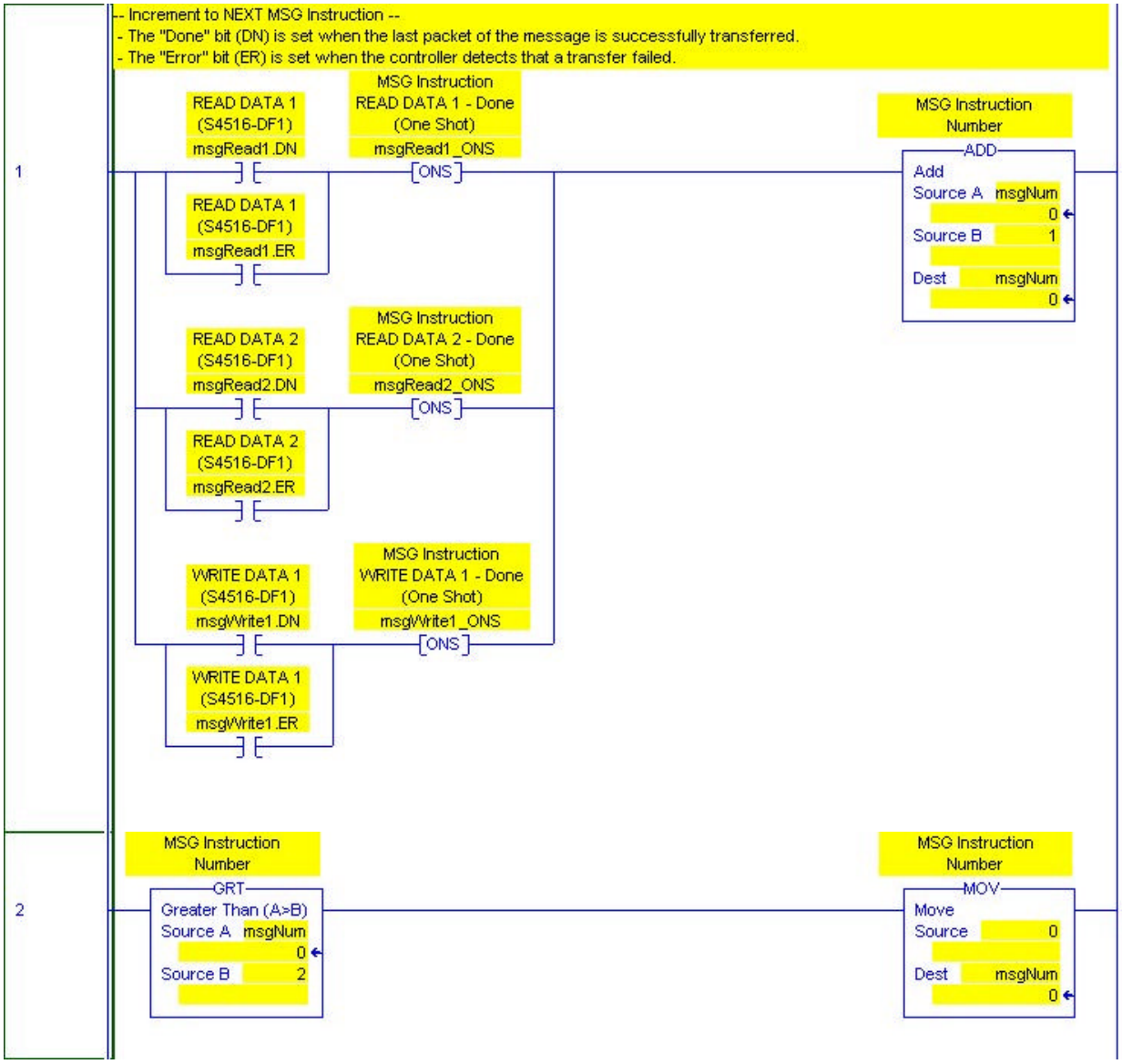
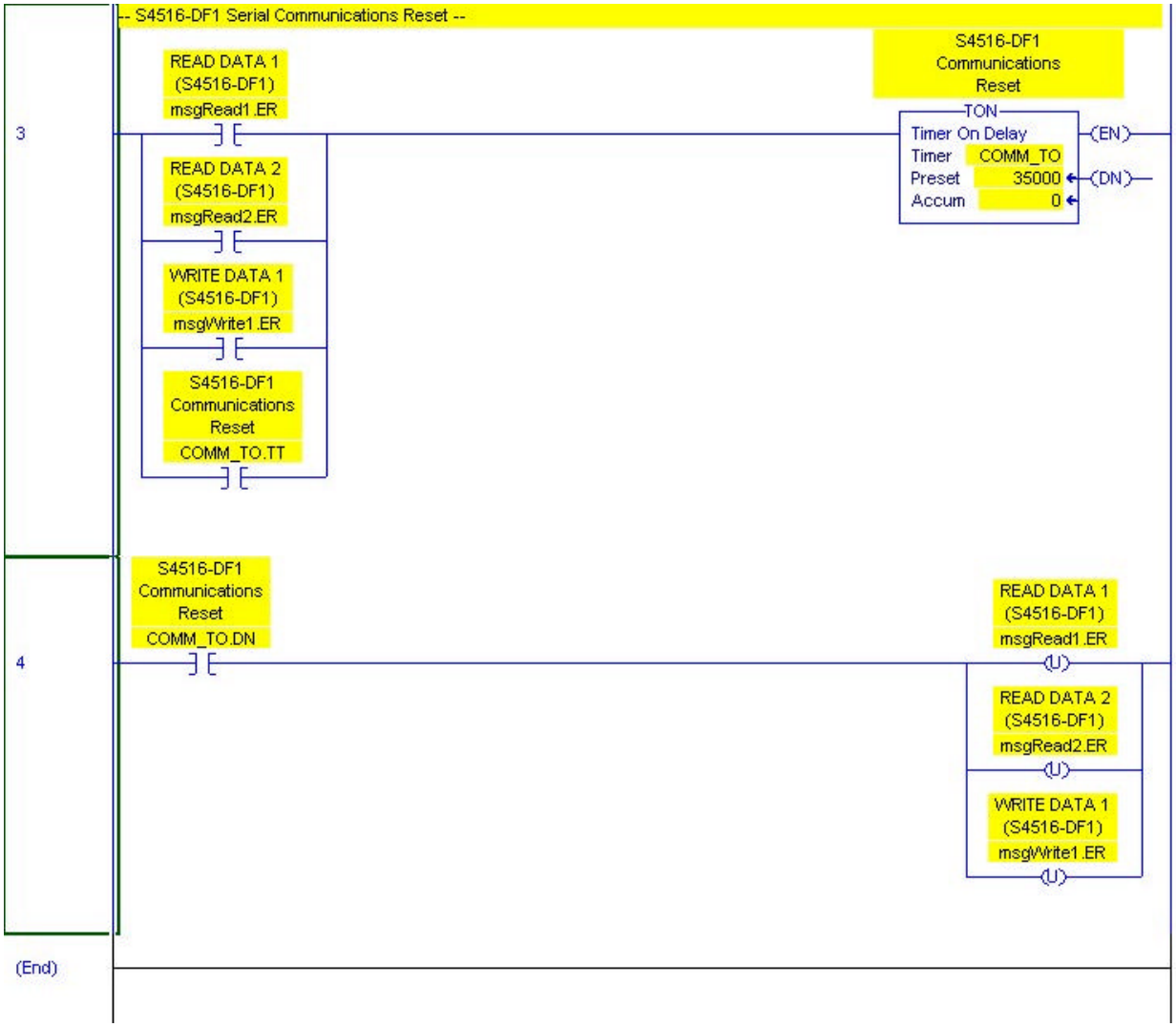


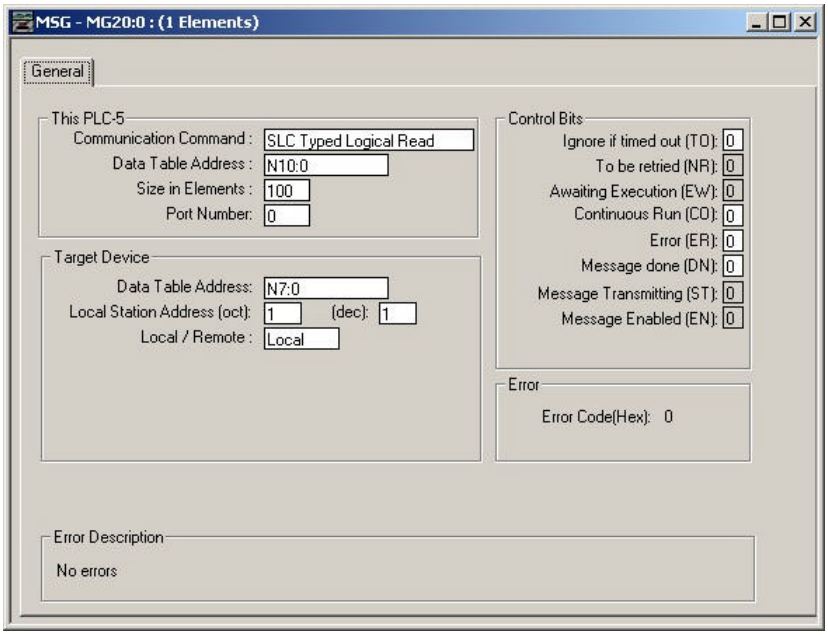

-- S4516-DF1 Serial Communications Reset --
3
READ DATA 1
(S4516-DF1)
msgRead1.ER
READ DATA 2
(S4516-DF1)
msgRead2.ER
WRITE DATA 1
(S4516-DF1)
msgWrite1.ER
S4516-DF1
Communications
Reset
COMM_TO.TT
S4516-DF1
Communications
Reset
TON
Timer On Delay
Timer COMM_TO
Preset 35000
Accum 0
EN
DN
4
S4516-DF1
Communications
Reset
COMM_TO.DN
READ DATA 1
(S4516-DF1)
msgRead1.ER
U
READ DATA 2
(S4516-DF1)
msgRead2.ER
U
WRITE DATA 1
(S4516-DF1)
msgWrite1.ER
U
(End)

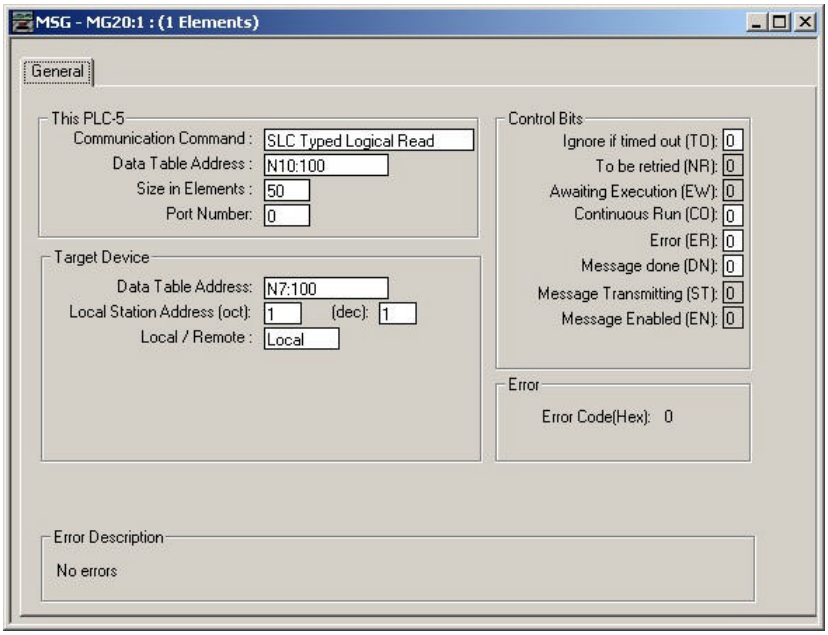
APPENDIX B
DF1 COMMUNICATIONS

USING THE MSG INSTRUCTION

READ INSTRUCTION – PLC5

The read message (MSG) command for a PLC5 is setup as follows:



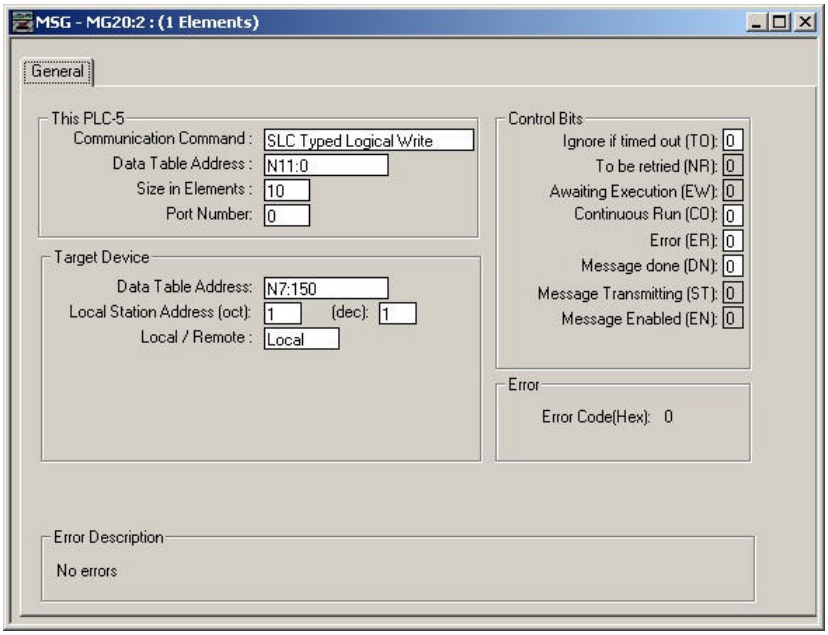


Note: The "Communication Command" is SLC Typed Logical Read. The Data Table Address can be any integer file address. The 150 elements (total) read from the M4500 PLC are defined in the last section – Read/Write Data Definitions.

The Local Station Address is only necessary to define if communications with the S4516-DF1 is executed over a Data Highway network (via a DataLink Module).

WRITE INSTRUCTION – PLC5

The write message (MSG) command for a PLC5 is setup as follows:

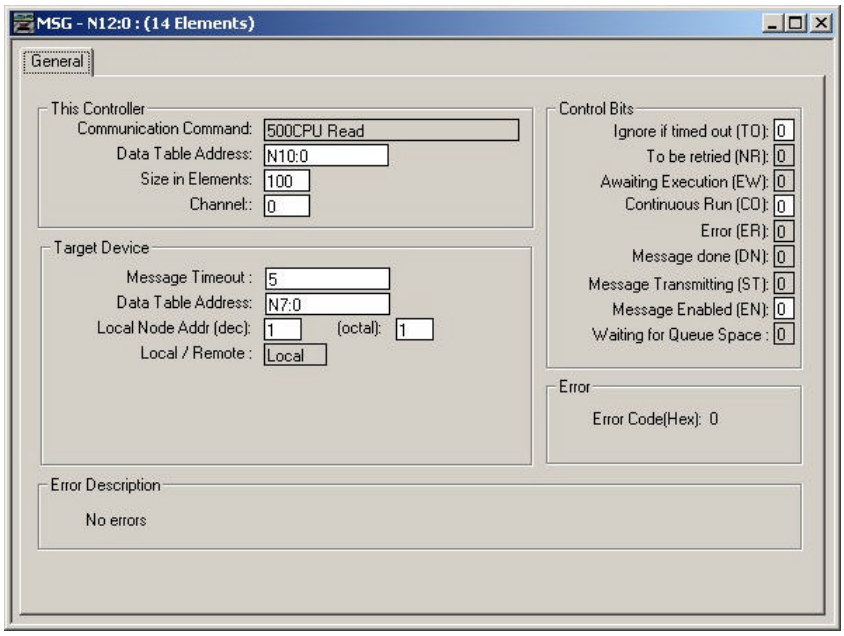


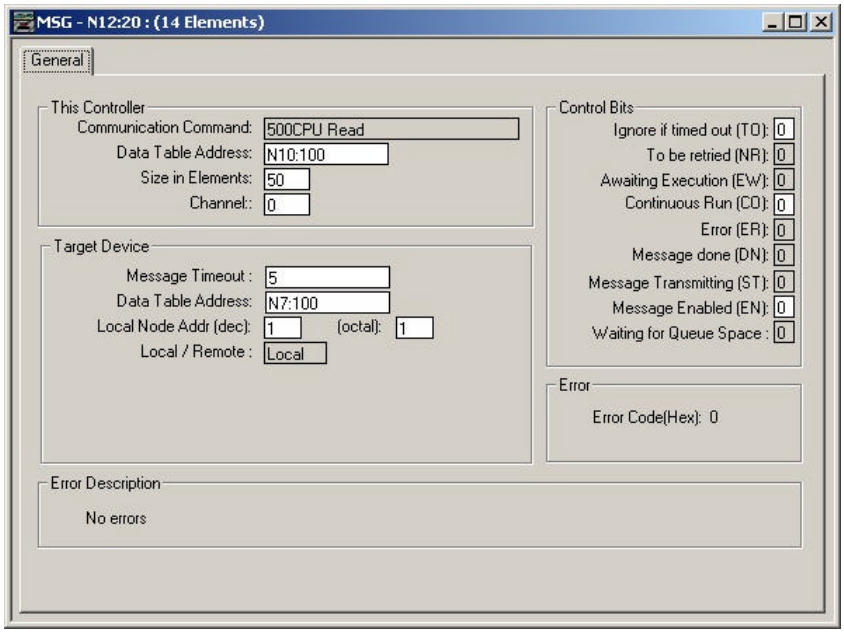
Note: The "Communication Command" is SLC Typed Logical Write. The Data Table Address can be any integer file address. The 10 elements written to the M4500 PLC are defined in the last section – Read/Write Data Definitions.

APPENDIX B
DF1 COMMUNICATIONS

READ INSTRUCTION – SLC500

The read message (MSG) command for a SLC500 is setup as follows:



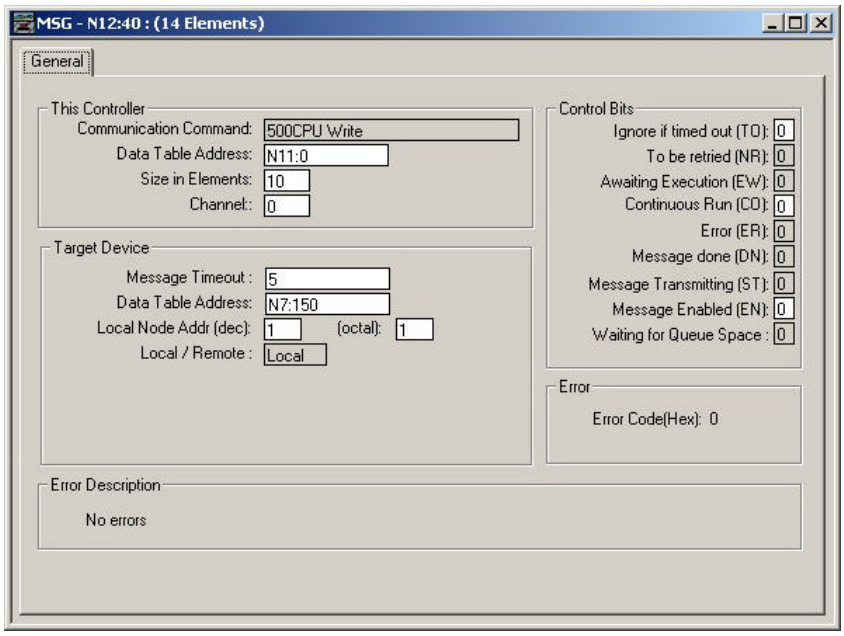


Note: The Data Table Address can be any integer file address. The 150 elements (total) read from the M4500 PLC are defined in the last section – Read/Write Data Definitions.

The Local Station Address is only necessary to define if communications with the S4516-DF1 is executed over a Data Highway network (via a DataLink Module).

WRITE INSTRUCTION – SLC500

The write message (MSG) command for a SLC500 is setup as follows:

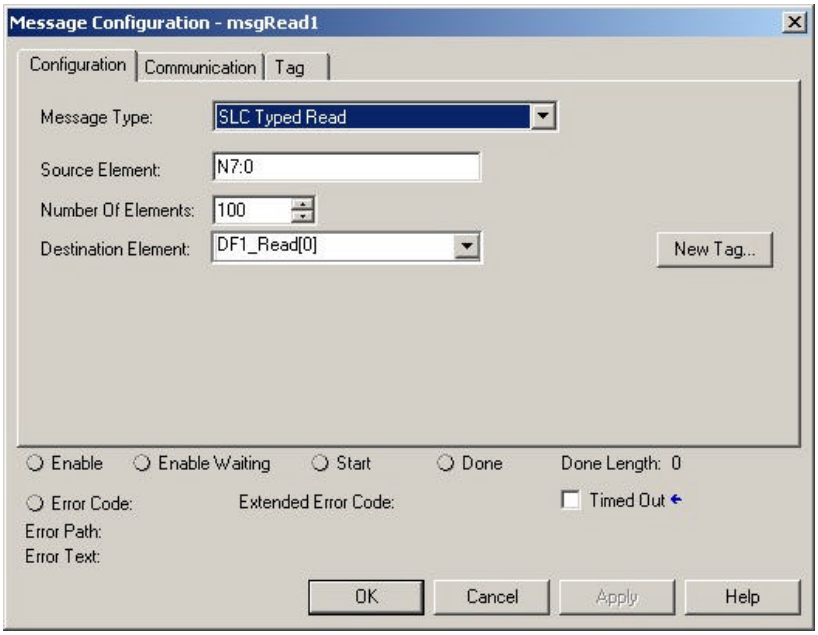


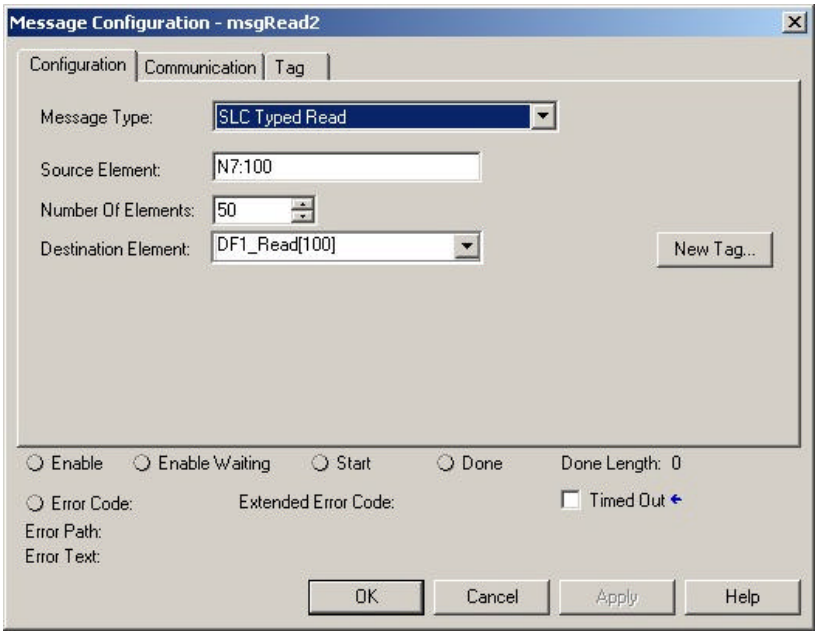
Note: The Data Table Address can be any integer file address. The 10 elements written to the M4500 PLC are defined in the last section – Read/Write Data Definitions.

APPENDIX B
DF1 COMMUNICATIONS

READ INSTRUCTION CONFIGURATION – CONTROLOGIX

The read message (MSG) configuration for a ControLogix PLC is setup as follows:

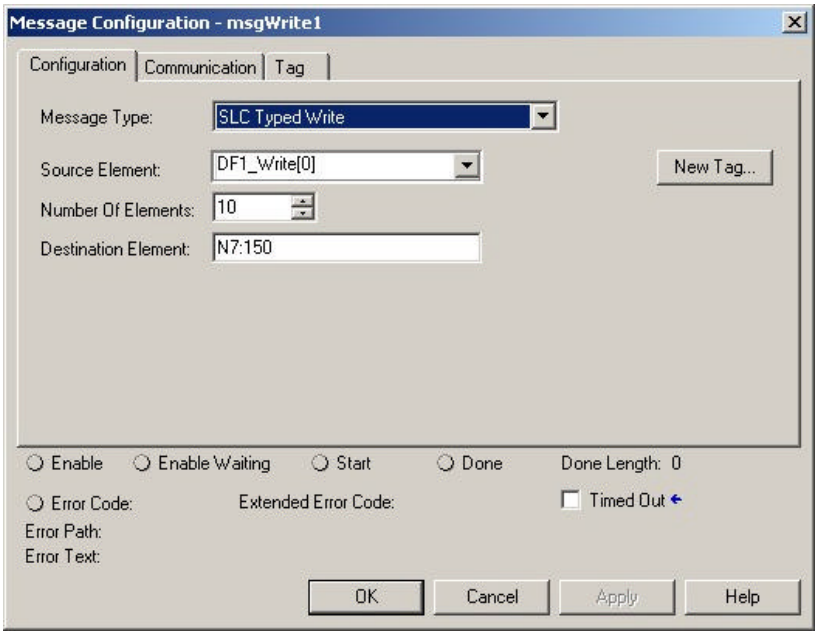




Note: The "Message Type" is SLC Typed Read. The Destination Element can be any integer array. The 150 elements (total) read from the M4500 PLC are defined in the last section – Read/Write Data Definitions.

WRITE INSTRUCTION CONFIGURATION – CONTROLOGIX

The write message (MSG) configuration for a ControLogix PLC is setup as follows:

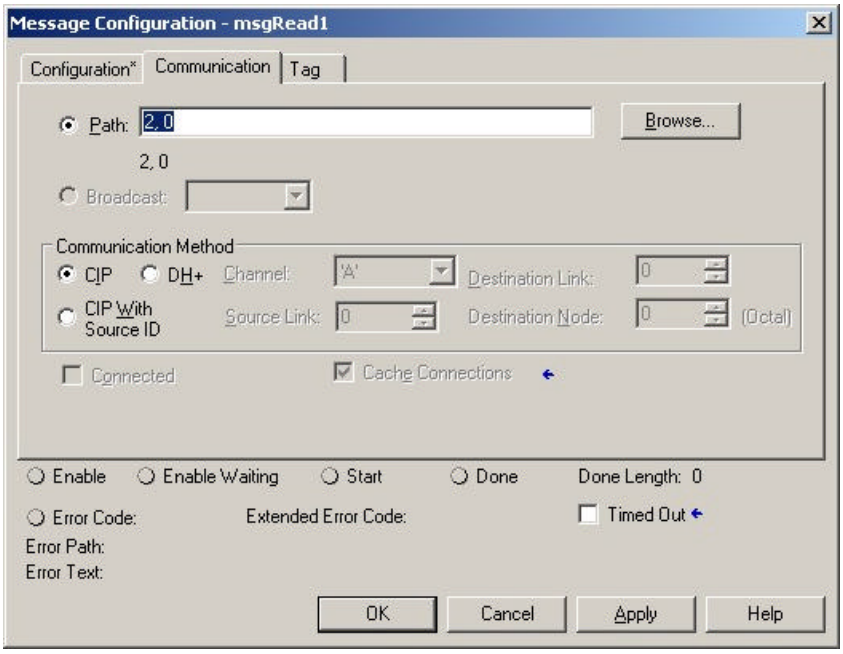


Note: The "Message Type" is SLC Typed Write. The Source Element can be any integer array. The 10 elements written to the M4500 PLC are defined in the last section – Read/Write Data Definitions.

APPENDIX B
DF1 COMMUNICATIONS

COMMUNICATION TAB - CONTROLOGIX

The communication configuration for a ControLogix PLC is setup as follows:

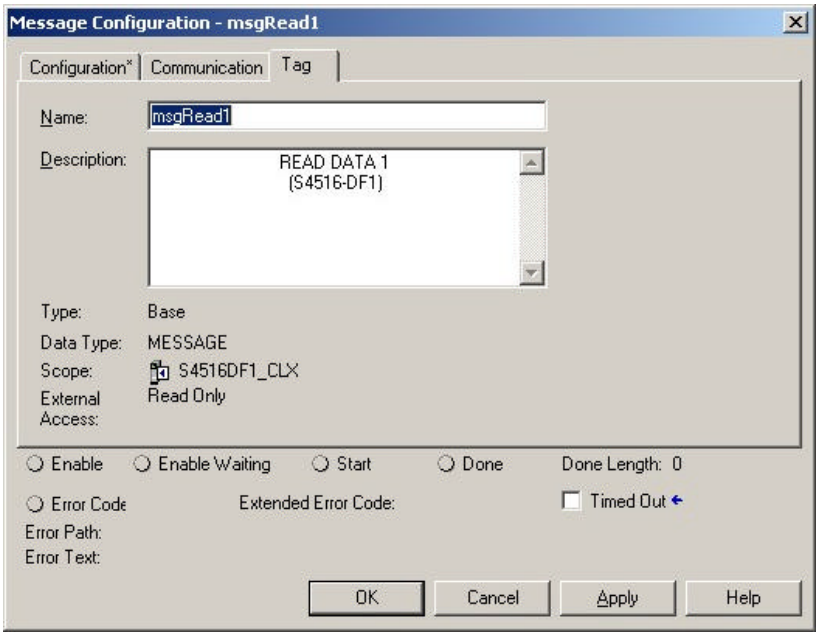


The "Path" describes the route the message takes to get to the destination. The format of the "Path" uses this format:
port, next_address

For serial DF1 communications, the *port* is "DF1 serial, channel 0" (Type = 2), *next_address* is for the station address (0-254). Since there is only the direct link from channel 0 to the User Port on the S4516-DF1 board, the *next_address* is set for station 0.

TAG TAB - CONTROLOGIX

The Tag configuration for a ControLogix PLC is setup as follows:

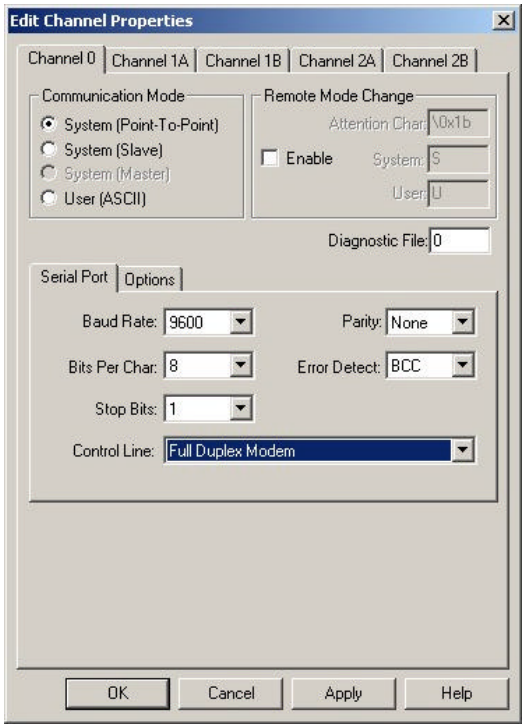


Note: The tag "Data Type" must be MESSAGE and must be defined at the "Controller" scope level.

CHANNEL 0 SETUP

PLC5

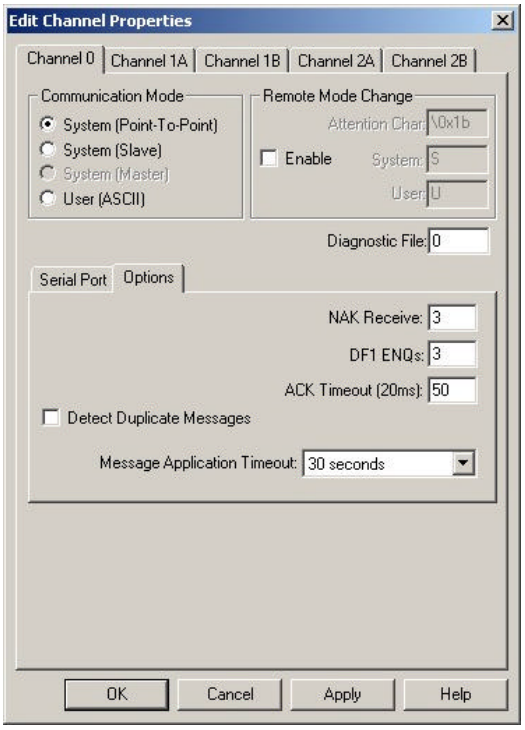
The Channel 0 Serial Port should be setup as follows:



Note: The Communication Mode is setup for System (Point-to-Point).

PLC5

The Channel 0 Options are setup as follows:

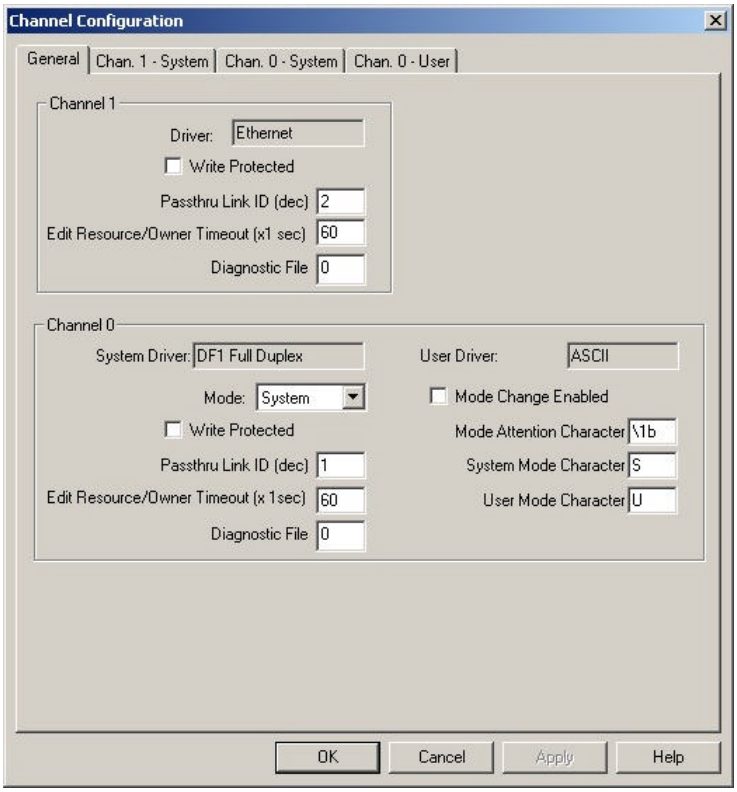


Note: The "Detect Duplicate Messages" should be unchecked.

APPENDIX B
DF1 COMMUNICATIONS

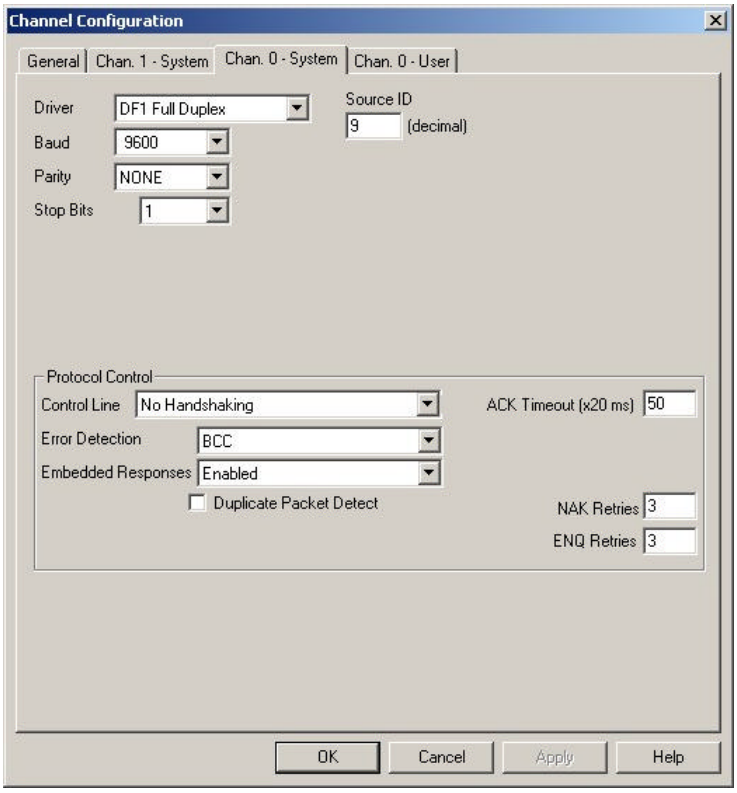
SLC500

The Channel 0 Serial Port should be setup as follows:



SLC500

The Channel 0 Options are setup as follows:

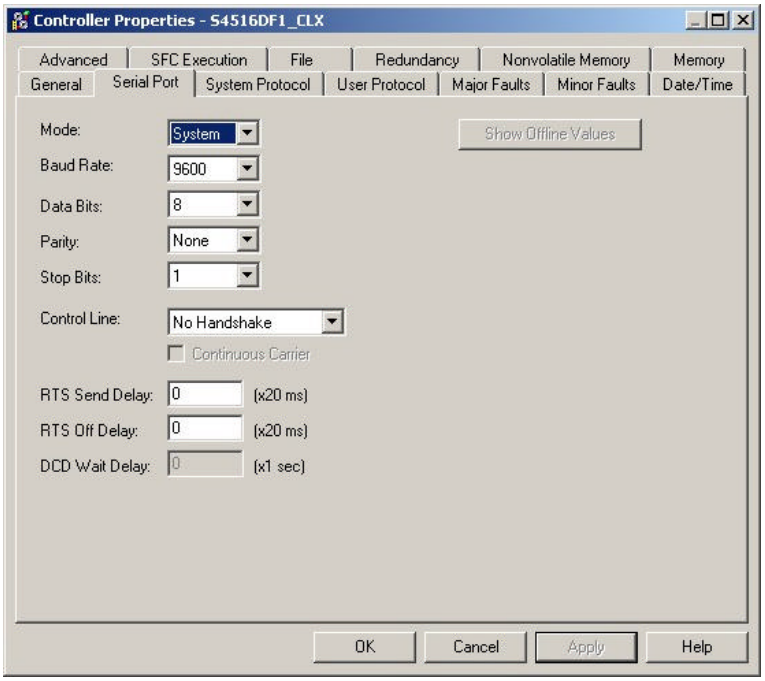


Note: The "Duplicate Packet Detect" should be unchecked.

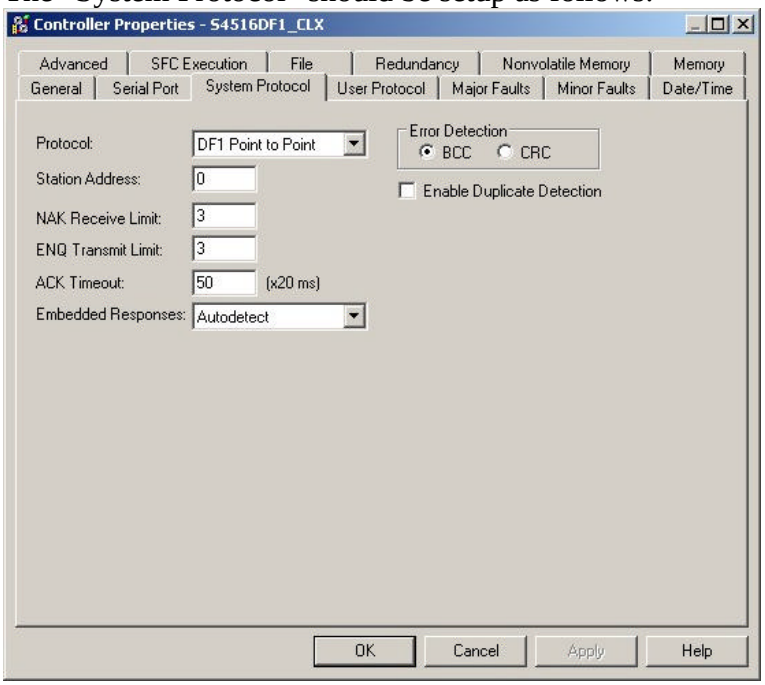
APPENDIX B
DF1 COMMUNICATIONS

CONTROLOGIX

The Serial Port (Channel 0) should be setup as follows:



The "System Protocol" should be setup as follows:



Note: The "Enable Duplicate Detection" should be unchecked.

READ/WRITE DATA DEFINITIONS

Data Read From The M4500 (150 Elements) Is Defined As Follows:

Description	M4500 Add	Mapped Add	PLC Add	Function
General:				
M4500 Status Word 1 (to PLC)		W4600	N7:0	R/O
Zero Speed (Bit 00)	F119	B4600.0	N7:0/0	
Spare (Bit 01)		B4600.1	N7:0/1	
Spare (Bit 02)		B4600.2	N7:0/2	
thru		thru	thru	
Spare (Bit 14)		B4601.6	N7:0/14	
Spare (Bit 15)		B4601.7	N7:0/15	
M4500 Status Word 2 (to PLC)		W4602	N7:1	R/O
Zero Speed Output (Bit 00)	B121.4	B4602.0	N7:1/0	
Infeed Track Jam (Bit 01)	B121.5	B4602.1	N7:1/1	
No Can Transfer (Bit 02)	B121.6	B4602.2	N7:1/2	
Timing Signal Fail (Bit 03)	F124	B4602.3	N7:1/3	
Spare (Bit 04)		B4602.4	N7:1/4	
Spare (Bit 05)		B4602.5	N7:1/5	
thru		thru	thru	
Spare (Bit 14)		B4603.6	N7:1/14	
Spare (Bit 15)		B4603.7	N7:1/15	
Resolver Pos.	W180	W4604	N7:2	R/O
Resolver RPM	W182	W4606	N7:3	R/O
Resolver Period	W184	W4608	N7:4	R/O
Resolver Scale Factor	W186	W4610	N7:5	R/O
Resolver Offset	W188	W4612	N7:6	R/O

APPENDIX B
DF1 COMMUNICATIONS

Description	M4500 Add	Mapped Add	PLC Add	Function
Shift Data (Trips Per Spindle):				
Last Spindle Tripped	B598	W4614	N7:7	R/O
Trips Per Spindle #1	W1020	W4616	N7:8	R/O
thru	thru	thru	thru	R/O
Trips Per Spindle #24	W1066	W4662	N7:31	R/O
Shift Data (Current Shift):				
Good Cans (Lo)	W1100	W4664	N7:32	R/O
Good Cans (Hi)	W1102	W4666	N7:33	R/O
Total Blowoffs (Lo)	W1104	W4668	N7:34	R/O
Total Blowoffs (Hi)	W1106	W4670	N7:35	R/O
Misload Count (Lo)	W1108	W4672	N7:36	R/O
Misload Count (Hi)	W1110	W4674	N7:37	R/O
Restart Blowoffs (Lo)	W1112	W4676	N7:38	R/O
Restart Blowoffs (Hi)	W1114	W4678	N7:39	R/O
Manual Blowoffs (Lo)	W1116	W4680	N7:40	R/O
Manual Blowoffs (Hi)	W1118	W4682	N7:41	R/O
QC Blowoffs (Lo)	W1120	W4684	N7:42	R/O
QC Blowoffs (Hi)	W1122	W4686	N7:43	R/O
Trips Per Spindle #1	W1124	W4688	N7:44	R/O
thru	thru	thru	thru	R/O
Trips Per Spindle #24	W1170	W4734	N7:67	R/O
Shift Data (Last Shift):				
Good Cans (Lo)	W1200	W4736	N7:68	R/O
Good Cans (Hi)	W1202	W4738	N7:69	R/O
Total Blowoffs (Lo)	W1204	W4740	N7:70	R/O
Total Blowoffs (Hi)	W1206	W4742	N7:71	R/O
Misload Count (Lo)	W1208	W4744	N7:72	R/O
Misload Count (Hi)	W1210	W4746	N7:73	R/O
Restart Blowoffs (Lo)	W1212	W4748	N7:74	R/O
Restart Blowoffs (Hi)	W1214	W4750	N7:75	R/O
Manual Blowoffs (Lo)	W1216	W4752	N7:76	R/O
Manual Blowoffs (Hi)	W1218	W4754	N7:77	R/O
QC Blowoffs (Lo)	W1220	W4756	N7:78	R/O
QC Blowoffs (Hi)	W1222	W4758	N7:79	R/O
Trips Per Spindle #1	W1224	W4760	N7:80	R/O
thru	thru	thru	thru	R/O
Trips Per Spindle #24	W1270	W4806	N7:103	R/O

Description	M4500 Add	Mapped Add	PLC Add	Function
Setup (Print Carriage/Varnish Unit):				
Print Carriage Retract (out) Response Time	B1012	W4808	N7:104	R/O
Print Carriage Extend (in) Response Time	B1013	W4810	N7:105	R/O
Varnish Unit Retract (out) Response Time	B1014	W4812	N7:106	R/O
Varnish Unit Extend (in) Response Time	B1015	W4814	N7:107	R/O
Setup (Bad Can Pin Chain Blowoff):				
# to Blowoff from Infeed Open	B1000	W4816	N7:108	R/O
# to Blowoff from Print at Restart	B1001	W4818	N7:109	R/O
# to Blowoff from Varnish at Restart	B1002	W4820	N7:110	R/O
# to Blowoff for each Misload	B1003	W4822	N7:111	R/O
Pins to Pinchain Blowoff Port	W1004	W4824	N7:112	R/O
Blowoff Solenoid ON Response Time	B1006	W4826	N7:113	R/O
Blowoff Solenoid off Response Time	B1007	W4828	N7:114	R/O
Setup (QC Pin Chain Blowoff):				
Blowoff Solenoid ON Response Time	B1008	W4830	N7:115	R/O
Blowoff Solenoid off Response Time	B1009	W4832	N7:116	R/O
QC Can Blowoff Port Shift Offset	B1010	W4834	N7:117	R/O
Spindle Trip Shift Offset	B1011	W4836	N7:118	R/O
Setup Passcode	W1070	W4838	N7:119	R/O
Timing Channel Setpoints:				
CH00 - Carriage Trip Timing (on)		W4840	N7:120	R/O
CH00 - Carriage Trip Timing (off)		W4842	N7:121	R/O
CH01 - Varnish Trip Timing (on)		W4844	N7:122	R/O
CH01 - Varnish Trip Timing (off)		W4846	N7:123	R/O
CH02 - Can/No Can Clock (on)		W4848	N7:124	R/O
CH02 - Can/No Can Clock (off)		W4850	N7:125	R/O
CH03 - Damaged Can Blowoff Low Speed (on)		W4852	N7:126	R/O
CH03 - Damaged Can Blowoff Low Speed (off)		W4854	N7:127	R/O
CH04 - Damaged Can Blowoff High Speed (on)		W4856	N7:128	R/O
CH04 - Damaged Can Blowoff High Speed (off)		W4858	N7:129	R/O
CH05 - Pin Chain Blowoff Timing (on)		W4860	N7:130	R/O
CH05 - Pin Chain Blowoff Timing (off)		W4862	N7:131	R/O
CH06 - QC Blowoff Timing (on)		W4864	N7:132	R/O
CH06 - QC Blowoff Timing (off)		W4866	N7:133	R/O
CH07 - Can Gate Timing (on)		W4868	N7:134	R/O
CH07 - Can Gate Timing (off)		W4870	N7:135	R/O
CH10 - PLC Clock Timing (on)		W4872	N7:136	R/O
CH10 - PLC Clock Timing (off)		W4874	N7:137	R/O

APPENDIX B
DF1 COMMUNICATIONS

Description	M4500 Add	Mapped Add	PLC Add	Function
Setup:				
Infeed Open Number of Shifts	B1019	W4876	N7:138	R/O
Number of Segments on Blanket wheel	B1018	W4878	N7:139	R/O
Spare Registers:				
Spare		W4880	N7:140	R/O
Spare		W4882	N7:141	R/O
thru		thru	thru	thru
Spare		W4896	N7:148	R/O
Spare		W4898	N7:149	R/O

Data Written To The M4500 (10 Elements) Is Defined As Follows:

Description	M4500 Add	Mapped Add	PLC Add	Function
General:				
PLC Status Word 1 (from PLC)		W4900	N7:150	W/O
Reset Spindle Trips (Bit 00)		B4900.0	N7:150/0	
End of Shift (Bit 01)		B4900.1	N7:150/1	
QC Initiate (Bit 02)		B4900.2	N7:150/2	
Trip Test (Bit 03)		B4900.3	N7:150/3	
Spare (Bit 04)		B4900.4	N7:150/4	
Spare (Bit 05)		B4900.5	N7:150/5	
thru		thru	thru	
Spare (Bit 14)		B4901.6	N7:150/14	
Spare (Bit 15)		B4901.7	N7:150/15	
PLC Status Word 2 (from PLC)			N7:151	W/O
Spare (Bit 00)		B4902.0	N7:151/0	
Spare (Bit 01)		B4902.1	N7:151/1	
thru		thru	thru	
Spare (Bit 14)		B4903.6	N7:151/14	
Spare (Bit 15)		B4903.7	N7:151/15	
QC Spindle Number (1-24, 25,26)		W4904	N7:152	W/O
Spare		W4906	N7:153	W/O
Spare		W4908	N7:154	W/O
thru		thru	thru	thru
Spare		W4916	N7:158	W/O
Spare		W4918	N7:159	W/O