HSL-CD2FE
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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GENERAL DESCRIPTION

1.1 FEATURES

- Performs high speed control functions of Rutherford CD2 Decorator to speeds in excess of 2000 cpm. This includes speed compensated print carriage and varnish unit trip which eliminates inside deco or 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 (PLC-based, Apache-based, etc.).

- Performs the following control functions:

    1) Detection of misloaded 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 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) Can count output pulses: good cans, running (bad can) blow-off, manual blow-offs, restart blow-offs, select-a-can blowoffs.

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

- Based on high performance M4000 PLC/PLS modules which allow easy trouble-shooting and user customization using SYSdev (DOS-based) programming package.

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

- Replaces Rutherford "Black Box" microprocessor.

1.2 GENERAL DESCRIPTION

The Rutherford CD2 high speed control package is an electronic upgrade package for the Rutherford CD2 decorator which detects misloaded cans, performs speed compensated print trip, varnish trip and three can (bad can) blow-off to speeds in excess of 2000 cpm. In addition, the package provides select-a-can pin chain blow-off for print quality checks, alarm detection including: infeed track jam, no can transfer (can on mandrel), timing signal failure, and various can count output pulses for data acquisition by the host PLC. The package interfaces directly to the machine mounted resolver, can/no can sensor, trip and blow-off solenoids as well as to the host PLC via discrete DC I/O.

SECTION 1
GENERAL DESCRIPTION

The package is not a dedicated "black box", but is instead implemented using the high performance SYSTEMS M4020 PLC/PLS and M4012 PLC modules which allow easy customization by either SEA or the end user. The M4000 series modules are programmed using the DOS-based SYSdev programming package which allows the modules to be programmed in any combination of Ladder and High-level (subset of C), as well as perform on-line monitoring and trouble-shooting. The M4000 modules incorporate a built-in PLS which interfaces directly with the machine mounted resolver and provides all machine timing, eliminating the need for an external PLS. The PLS timing channels are also programmed via SYSdev with simple to use menu commands.

The Rutherford CD2 high speed control package consists of the M4000 modules (M4020 and M4012) mounted on a sub-plate and pre-wired to a terminal strip for ease of installation, the standard CD2 high speed logic program loaded into the M4000 modules, and a high speed front end user's manual containing the program print-outs, schematic, and installation and trouble-shooting documentation.

1.3 SPEED COMPENSATED PRINT CARRIAGE TRIP CONTROL

Speed compensated print carriage trip at speeds up to 2000 cpm is incorporated in the CD2 High Speed package. The print carriage is always extended and retracted such that a misloaded 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. The package incorporates response time feedback which actually measures both the "retract" and "extend" response times, the time from solenoid actuation until the carriage breaks or makes contact with the blanket, and incorporates these times into a print carriage long response alarm which indicates an excess trip response. The control is capable of "leading" the trip point by up to two stations (60msec at 2000 cpm). The user has complete control of selecting the number of mandrels the carriage will trip for, at the detection of a misloaded can, and which mandrels the carriage will trip on via user variables in the program.

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 SPEED COMPENSATED VARNISH UNIT TRIP CONTROL

The varnish unit control algorithm incorporates the same speed compensation algorithm incorporated in the print carriage control. The user also has complete access to selecting the number of mandrels tripped for and which mandrels the varnish unit is tripped on via user variables in the program.

1.5 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 the 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 misloaded cans from the pin chain. The select-a-can feature allows the user to dial in a mandrel number at a remote PB station and blow-off one can printed on that mandrel number. 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: 8 and 24 can blow-off. The 8 can mode blows off 8 consecutive cans printed on blankets 1 through 8. The 24 can 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 shifts from machine to blow-off port (up to 500), 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 presets (used by the speed compensation algorithm). The following variables can be set by the user for the select-a-can blow-off: 1 to 24 shift offset which is used to match the actual mandrel number to the selected mandrel number, both the "on" and "off" solenoid response time presets.

1.6 ALARM DETECTION

The package detects the following high speed alarms: infeed track jam, no can transfer (can on mandrel), and timing signal fail.

INFEED TRACK JAM: The infeed track jam alarm occurs when a preset number of empty mandrels is 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.

All alarms are available to the host PLC via discrete outputs.

1.7 CAN COUNT OUTPUT PULSES

For data acquisition purposes, the package generates the following can count pulses which can be counted by the host PLC or can be used to drive discrete counters:

GOOD CANS: One pulse per good can printed.

RUNNING (BAD CAN) BLOW-OFF: One pulse per bad can blown off bad can pin chain blow-off port.

MANUAL BLOW-OFFS: One pulse per each can blown off pin chain blow-off port using the manual PB.

RESTART BLOW-OFFS: One pulse per can blown off from print or varnish location after restart or after can gate is opened.

SELECT-A-CAN BLOW OFFS: One pulse per can blown off from select-a-can blow-off port.

All can count output pulses are available to the host PLC via discrete I/O. The duration of a pulse is one half a mandrel station time.

SECTION 2
INSTALLATION

The HSL-CD2FE is shipped from the factory with the PLC program "ADV24" loaded in the M4012 module, PLC program "ADV25" loaded in the M4020 module (PLC section), and the PLS channel set-point file "CD2TMG" loaded in the PLS section of the M4020 module. These are the standard programs used to implement the standard HSL-CD2FE decorator or basecoater algorithms. In addition, as shipped, the user variables for the M4012 and M4020 are set the following defaults:

Print Carriage:
- Print Carriage retract response time (msec) _____: 045
- Print Carriage extend response time (msec) _____: 045
- Maximum Carriage response time for alarm (msec) ____: 100

Varnish Unit:
- Varnish Unit retract response time (msec) _____: 060
- Varnish Unit extend response time (msec) _____: 060

Bad Can (pin chain) Blowoff:
- Blowoff solenoid "on" response time (msec) _____: 015
- Blowoff solenoid "off" response time (msec) _____: 020
- # of bad cans to blowoff for misload _____: 003
- # of cans to blowoff from infeed open _____: 001
- # of cans to blowoff from print at restart _____: 004
- # of cans to blowoff from varnish at restart _____: 004
- # of pins to pin chain blowoff port _____: 050

QC Can (select-a-can) Blowoff:
- Blowoff solenoid "on" response time (msec) _____: 015
- Blowoff solenoid "off" response time (msec) _____: 020
- QC can blowoff port shift offset _____: 001

The "CD2TMG" 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	-	270	Pin Chain Blow-off (bad can) timing
CH06:	255	-	275	Select-A-Can (QC) Blow-off timing
CH07:	000	-	140	Can Gate Timing
CH10:	___	-	___	
CH11:	___	-	___	
CH12:	___	-	___	
CH13:	___	-	___	
CH14:	___	-	___	
CH15:	___	-	___	
CH16:	___	-	___	
CH17:	___	-	___	

SECTION 2
INSTALLATION

In most cases, the above user variables and timing channels will have to be altered to tune the HSL-CD2FE to the actual decorator it is controlling. Section 2.1 describes the steps involved in installing the HSL-CD2FE and tuning the user variables and timing to the decorator. Sections 2.2 and 2.3 describe the steps when installing a new M4020 or M4012 module not previously programmed with "ADV24", "ADV25", or "CD2TMG".

2.1 HSL-CD2FE INSTALLATION

2.1.1 POWER REQUIRED

The HSL-CD2FE is powered from +24VDC only. This power must be derived from a regulated (+/-10%) power supply. In addition, the modules on the HSL-CD2FE will draw an additional 2 amps above and beyond the normal amount of current necessary to drive the existing +24VDC trip and blowoff solenoids. If the existing +24VDC power supply cannot provide the additional 2 amps required, an additional +24VDC power supply should be added. If this is the case, the ideal situation is to have the new power supply provide +24VDC to wire #501 (module internal circuitry power) and to have the existing +24VDC power supply provide +24VDC to wire #502 (I/O power). See drawing #14-4503-10 for details.

2.1.2 MOUNTING AND WIRING THE HSL-CD2FE

Mount the HSL-CD2FE either in the existing control cabinet or the optionally purchased HSL-CD2ENCL enclosure. Wire the HSL-CD2FE to the existing control system as necessary keeping all +24VDC wiring away from high voltage wiring. Wire the machine mounted resolver directly to the 8-pin resolver input connector on the M4020 module using a three pair, two conductor shielded cable. The shield of the resolver cable should be tied to R2 of the M4020 resolver input connector. Make sure the resolver cable shield is left floating at the resolver. Refer to drawing #14-4503-10 for details.

2.1.3 TUNING THE HSL-CD2FE

Once the HSL-CD2FE is installed and the control system is powered back up, perform the following to set-up and tune the HSL-CD2FE. The set-up is performed using the "SETUPCD2" program. See section 3 for a description of the SETUPCD2 menus and variables and how to use the SETUPCD2 program.

1) Position the machine at machine zero and set the M4020 offset per section 4.2

2) Verify the location of the Can/No Can sensor by placing a can on a spindle and slowly jogging the machine until the Can/No Can sensor sees the can. The sensor should first see the can at between 300 and 0 degrees. If it does, the location of the sensor is correct. If the sensor first sees the can between 0 and 50 degrees, the HSL-CD2FE will still function correctly but the Damaged Can Blowoff (HI - CH04) and (LOW - CH03) timing signals may have to be adjusted (see sections 4.4 and 4.8). If the Can/No Can sensor first sees the can outside the 300 to 50 degree range, the sensor should be moved to within the 300 to 0 degree range.

3) From the "Machine Timing" selection, set the bad can (pin chain) blowoff timing (CH05) such that the timing signal just turns "on" when the chain blowoff port is centered between pins on the chain (see figure 5 of drawing 14-4503-14). The signal should be 20 degrees wide.

4) From the "Bad Can/QC Can Blowoff Set-up" menu, set the "# of pins to pin chain blowoff port" by counting the number of pins from the spindle wheel to disc transfer location to the bad can pin chain blowoff port. The number entered is the number counted minus 2 (this is still just an approximation). Set the "# of bad cans to blowoff for misload" equal to three. Run the machine at low speed with cans and verify that for a misload the three bad cans are blown off (misloaded silver can blown off at damaged can blowoff port, half print cans ahead and behind misloaded can blown off at pin chain port). If not adjust "# of pins to pin chain blowoff port" accordingly until they are.

   Note: Half prints or silver cans may get through the line until this variable is set-up properly. Once this is set, it may be desirable to set the "# of bad cans to blowoff for misload" equal to 4 or 5 until the print carriage trip and varnish trip is set-up in steps 5 and 6. This is done so that the cans following the misload can be verified for proper print. Once this is done, the "# of bad cans to blowoff for misload" can be set back to 3 again. Also, the chain take-up must be after the bad can pin chain blowoff port for reliable pin chain blowoff. If the take-up is before the port, the relative position of the port to the blowoff timing will vary as the take-up moves, causing partial blowoffs to occur.

5) From the “Carriage/Varnish Trip set-up” menu, verify the print carriage trip by running the machine at high speed, inducing misloads and observing the cans blown off at the pin chain blowoff. The misloaded can should be blown off at the damaged can blowoff and should be completely silver. The can ahead of the misload (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 misload (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 misload should be fully printed and of good quality print.

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

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

6) Set the varnish extend and retract response times in the same fashion as was done for the carriage. In general, the misloaded can should have no varnish on it, the can ahead and behind should be partially varnished.

7) From the “Bad Can/QC Can Blowoff Set-up” menu set the “# of cans to blowoff from infeed open”, the “# of cans to blowoff from print at restart”, and the “# of cans to blowoff from varnish at restart” as desired.

   Note: For all these numbers, the actual number blown off is one minus the number entered.

8) If the QC Can (select-a-can) feature is used, from the “Bad Can/QC Can Blowoff Set-up” menu set the “QC can blowoff port shift offset” as follows: dial in spindle #1 on the select-a-can thumbwheel switch and, with the machine running slowly, mark cans printed on spindle #1 so they can be identified while they are on the chain. Press the select-a-can pushbutton and observe the can that was actually blown off with the location of a can printed on spindle #1. Add the number of cans difference between the can actually blown off and the can printed on spindle number one to the “QC can blowoff port shift offset”.

   Note: This variable must be a number between 1 and 24 as there is always a can printed on spindle #1 every 24 cans. Once set-up, verify that a can from spindle #1 is blown off when 1 is dialed in on the thumbwheel and the select-a-can pushbutton is pressed.

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2.2 M4020 MODULE INSTALLATION

Perform the following steps when either replacing the M4020 module or initially installing the M4020:

1) Set both resolver references select dip switches on the left side of the module to the 1.45V position.

2) Install the M4020 to the backpanel, install the respective field wiring connectors and power up the M4020.

3) Power up computer (PC) and invoke SYSdev from the root directory of the hard drive by typing SYSdev<ENTER>. From the SYSdev shell, select the “DECO” directory by pressing “F3: Select Dir”, positioning the arrow at “DECO” and then pressing <ENTER>.

4) Select the “ADV25” program by positioning the arrow at “ADV25” and then press <ENTER> or “F2: Edit Prog”.

5) Select “6: Target Board Interface” from the main development menu.

6) Connect the RS-232 cable from the “COM” port on the PC running SYSdev to the “PROG” port on the M4020.

7) Download program “ADV25” to the M4020 using the “1: Download program to target board” menu selection from the “Target Board Interface Menu”.

8) Exit back from the “Target Board Interface” menu by pressing 12<ENTER>. Exit back to the SYSdev shell by again pressing 12<ENTER>.

9) Select the “CD2TMG” channel set-point timing program by positioning the arrow at “CD2TMG” and pressing <ENTER> or “F2: Edit Prog”.

10) Connect the RS-232 cable from the “COM” port on the PC to the “CHAN” port on the M4020.

11) Download the channel set-point program “CD2TMG” to the M4020 using the “4: Download Channels to PLS” selection from the PLSdev main development menu.

12) Exit back to the SYSdev shell by pressing 12<ENTER>.

13) Set the user variables of the M4020 using the "SETUPCD2" program as outlined in Section 3.

2.3 M4012 MODULE INSTALLATION

Perform the following steps when either replacing the M4012 module or initially installing the M4012:

1) Install the M4012 to the backpanel, install the respective field wiring connectors and power up the M4012.

2) Power up computer (PC) and invoke SYSdev from the root directory of the hard drive by typing SYSdev<ENTER>. From the SYSdev shell, select the "DECO" directory by pressing "F3: Select Dir", positioning the arrow at "DECO" and then pressing <ENTER>.

3) Select the "ADV24" program by positioning the arrow at "ADV24" and then press <ENTER> or "F2: Edit Prog".

4) Select "6: Target Board Interface" from the main development menu.

5) Connect the RS-232 cable from the "COM" port on the PC running SYSdev to the "PROG" port on the M4012.

6) Download program "ADV24" to the M4012 using the "1: Download program to target board" menu selection from the "Target Board Interface Menu".

7) Exit back from the "Target Board Interface" menu by pressing 12<ENTER>. Exit back to the SYSdev shell by again pressing 12<ENTER>.

8) Set the user variables of the M4012 using the "SETUPCD2" program as outlined in Section 3.

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SECTION 3
USER VARIALBES SET-UP USING "SETUPCD2"

The SETUPCD2 program is a DOS based menu driven program which allows the user to easily view or alter the HSL-CD2FE user variables without having to enter SYSdev. In addition to setting the user variables, SETUPCD2 can be used to set the machine timing (machine offset, timing signal locations, etc.). The user variables are used to configure and tune the HSL-CD2FE to match the configuration and performance of the specific decorator. In general, the M4020 generates all the machine timing in addition to providing the carriage trip and varnish trip control. The M4012 provides the damaged can blow-off, chain blow-off, select-a-can blow-off and the balance of the high speed alarm detection.

SETUPCD2 contains three primary menus: the Main Menu (used to select the other menus), the Print Carriage/Varnish Unit set-up menu (used to set the user variables in the M4020), and the Bad Can/Qc Can blowoff set-up menu (used to set the user variables in the M4012). Sections 3.4 and 3.5 provide a complete description of these menus and the variables in them. In addition, SETUPCD2 provides the PLS programming menus found in SYSdev used to program the PLS section of the M4020. See the M4020 User's Manual for details on these menus. See section 4 for a description of the timing channels used by the HSL-CD2FE and the recommended locations of these timing channels.

3.1 SUMMARY OF USER VARIABLES

The following shows a summary of the variables in each module and the respective SETUPCD2 menu used to set the variables:

Print Carriage/Varnish Unit set-up menu (M4020)

Print Carriage:
- Print Carriage retract response time (msec) _____: _____
- Print Carriage extend response time (msec) _____: _____
- Maximum Carriage response time for alarm (msec) ____: _____

Varnish Unit:
- Varnish Unit retract response time (msec) _____: _____
- Varnish Unit extend response time (msec) _____: _____

Bad Can/QC (pin chain) blowoff set-up menu (M4012)

Bad Can (pin chain) Blowoff:
- Blowoff solenoid "on" response time (msec) _____: _____
- Blowoff solenoid "off" response time (msec) _____: _____
- # of bad cans to blowoff for misload _____: _____
- # of cans to blowoff from infeed open _____: _____
- # of cans to blowoff from print at restart _____: _____
- # of cans to blowoff from varnish at restart _____: _____
- # of pins to pin chain blowoff port _____: _____

QC Can (select-a-can) Blowoff:
- Blowoff solenoid "on" response time (msec) _____: _____
- Blowoff solenoid "off" response time (msec) _____: _____
- QC can blowoff port shift offset _____: _____

SECTION 3
USER VARIALBES SET-UP
USING “SETUPCD2”

3.2 INSTALLING AND RUNNING SETUPCD2

To install the program on your computer, load the diskette into drive A, switch to the root directory of the hard drive you want to install it on and type “A:INSTALL”. The install program will create a directory called “HSLSETUP” and copy the files on the diskette to this directory. The setup program consists of the main executable file “SETUPCD2.EXE”, the PLS programming executable “PLSDEV.EXE” and the “CD2TMG” channel data files.

To execute the “SETUPCD2” program, change to the “HSLSETUP” directory and type SETUPCD2<ENTER>. The program will be invoked and the Main Menu will be displayed. The main menu is used to select any of the three other menus described in the following sections. This program was designed to be used on-line with the respective module you are setting up, however you can review the menus off-line simply by pressing any key when the “Cannot communicate with module” prompts appear.

3.3 MACHINE TIMING MENUS (M4020 - CHAN PORT)

The 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 M4020). When selected, the PLS programming main development menu will be invoked using the default CD2TMG channel set-point file. If another file is to be used (as would be the case if different decorators or basecoaters in the plant had different timing settings), simply select “8: Select PLS Program” and enter the name of the new program. It is recommended that a PLS program naming convention is used as follows: CD2TMGL1 for line 1 decorator timing, CD2TMGL2 for line 2 decorator timing, etc. The PLS Programming main development menu allows you to copy, backup and restore these PLS program files as necessary using the File Utilities selection of the menu.

For descriptions on the timing channels used by the HSL-CD2FE and how to set or alter their locations, see section 4 of this manual. For a complete description of the PLS programming menus and commands, see the M4020 User’s Manual.

Note: Prior to selecting the Machine Timing selection, make sure the RS-232 cable is connected from the COM1 port on the computer to the CHAN PORT on the M4020.

3.4 PRINT CARRIAGE/VARNISH UNIT SET-UP MENU (M4020)

The Carriage/Varnish Unit set-up menu is used to set the variables in the M4020. This menu is invoked by selecting "2: Carriage/Varnish Trip Set-up (M4020 - PROG PORT)" from the Main Menu.

Note: Prior to selecting this selection, make sure the RS-232 cable is connected from the COM1 port on the computer to the PROG PORT on the M4020.

3.4.1 CARRIAGE/VARNISH VARIABLE DEFINITIONS

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 M4020 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 M4020 will activate the extend solenoid this amount of time ahead of the Carriage unit trip timing (CH00) (usually set at 40 to 50 milliseconds).

Maximum Carriage response time for alarm: This is the maximum allowed trip response time, either retract or extend, for the print carriage. If the trip response time is greater than this time, the "carriage long response" alarm will be set (typically this is set at 70 to 100 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 M4020 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 M4020 will activate the extend solenoid this amount of time ahead of the Varnish unit trip timing (CH01) (usually set at 60 milliseconds).

3.4.2 CARRIAGE/VARNISH MENU SELECTIONS

The menu selections on the "Print Carriage/Varnish Unit set-up" menu allow you to set the Carriage/Varnish variables listed under the following menu selections:

1: Set Print Carriage extend/retract response times
- Print Carriage retract response time
- Print Carriage extend response time

2: Set Varnish Unit extend/retract response times
- Varnish Unit retract response time
- Varnish Unit extend response time

3: Set maximum Carriage response time for alarm
- Maximum Carriage response time for alarm

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

3.5 BAD CAN/QC CAN BLOWOFF SET-UP MENU (M4012)

The Bad Can/QC Can Blowoff set-up menu is used to set the variables in the M4012. This menu is invoked by selecting "3: Bad Can/QC Can Blowoff Set-up (M4012 - PROG PORT)" from the Main Menu.

Note: Prior to selecting this selection, make sure the RS-232 cable is connected from the COM1 port on the computer to the PROG PORT on the M4012.

3.5.1 BAD CAN/QC CAN VARIABLE DEFINITIONS

Bad Can Blowoff 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 M4012 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 Blowoff 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 M4012 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 blowoff for misload: This is the number of cans blown off at the pin chain port when one misloaded can is detected (typically set at 3 cans).

# of cans to blowoff from infeed open: This is the number of cans which will be blown off when the infeed is first opened minus one. To blow off no cans at infeed open, set equal to 1, to blow off one can set equal to 2, etc.

# of cans to blowoff from print at restart: This is the number of cans which will be blown off from the print station when the machine is restarted minus one. To blow off no cans at restart, set equal to 1, to blow off one can set equal to 2, etc.

# of cans to blowoff from varnish at restart: This is the number of cans which will be blown off from the varnish station when the machine is restarted minus one. To blow off no cans at restart, set equal to 1, to blow off one can set equal to 2, etc.

# of pins to pin chain blowoff 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 one. This can be a number from 1 to 599.

QC Can Blowoff 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 M4012 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 Blowoff 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 M4012 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 Blowoff 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.

3.5.2 BAD CAN/QC CAN MENU SELECTIONS

The menu selections on the "Bad Can/QC Can blowoff set-up" menu allow you to set the Bad Can/QC Can variables listed under the following menu selections:

1: Set Bad Can (pin chain) blowoff response times
- Bad Can Blowoff solenoid "on" response time
- Bad Can Blowoff solenoid "off" response time

2: Set number of cans to blowoff pin chain
- # of bad cans to blowoff for misload
- # of cans to blowoff from infeed open
- # of cans to blowoff from print at restart
- # of cans to blowoff from varnish at restart

3: Set number of pins to pin chain blowoff port
- # of pins to pin chain blowoff port

4: Setup QC (select-a-can) blowoff
- QC Can Blowoff solenoid "on" response time
- QC Can Blowoff solenoid "off" response time
- QC Can Blowoff port shift offset

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

SECTION 4
PLS TIMING CHANNEL SET-UP

4.1 SUMMARY OF TIMING CHANNELS

The following timing channels are resident in the PLS section of the M4020 and are used to provide all machine timing (both internal to the HSL-CD2FE and to the external host PLC):

CHAN	ON	-	OFF	DESCRIPTION
CH00:	_____	-	_____	Carriage trip timing
CH01:	_____	-	_____	Varnish trip timing
CH02:	_____	-	_____	Can/No Can clock
CH03:	_____	-	_____	Damaged Can Blow-off (Low speed)
CH04:	_____	-	_____	Damaged Can Blow-off (High speed)
CH05:	_____	-	_____	Pin Chain Blow-off (bad can) timing
CH06:	_____	-	_____	Select-A-Can (QC) Blow-off timing
CH07:	_____	-	_____	Can Gate Timing
CH10:	_____	-	_____	
CH11:	_____	-	_____	
CH12:	_____	-	_____	
CH13:	_____	-	_____	
CH14:	_____	-	_____	
CH15:	_____	-	_____	
CH16:	_____	-	_____	
CH17:	_____	-	_____	

4.2 SETTING MACHINE ZERO

The PLS section of the M4020 is electronically zeroed by performing the following steps:

1) Power up computer (PC) and invoke SYSdev from the root directory of the hard drive by typing SYSdev<ENTER>. From the SYSdev shell, select the “DECO” directory by pressing “F3: Select Dir”, positioning the arrow at “DECO” and then pressing <ENTER>.

2) Select the “CD2TMG” program by positioning the arrow at “CD2TMG” and then press <ENTER> or "F2: Edit Prog".

3) Connect the RS-232 cable from the “COM” port on the PC running SYSdev to the “CHAN” port on the M4020.

4) Select “2: Online Channel Setpoint Programming” from the Main Development Menu.

5) Rotate machine and verify that the angular position displayed on the front of the M4020 increases with positive rotation (verify POS/RPM switch on M4020 is in POS). If not, reverse the S1 and S3 leads on the 8-pin connector of the M4020.

6) Position the machine at machine zero (spindle aligned with V notch at top backside of machine frame - see figure 1 on drawing 14-4503-14).

7) Read the position displayed on the front of the M4020 (make sure POS/RPM switch on M4020 is in POS).

8) Select “F10: Set Offset”. Enter the number displayed on the front of the M4020 in the offset field and press <ENTER>.

9) The M4020 will calculate the actual offset value required to make this the 000 position and will display this number for a few seconds. The position will then read 0.

10) Exit back to the Main Development Menu by pressing <ESC>.

4.3 SETTING THE TIMING CHANNEL SET-POINTS

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

1) Perform steps (1) thru (3) in section 4.2 above if not already at the PLSdev Main Development Menu.

2) Select “2: Online Channel Setpoint Programming” from the Main Development Menu.

3) Set all channels per section 4.4 below. 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 this 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.

4) Once all channels are programmed, press <ESC> to exit back to the Main Development Menu. The new channels will be saved both in the M4020 and in the “CD2TMG” file on the hard drive.

4.4 GENERAL TIMING SIGNAL LOCATIONS

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

CH00: CARRIAGE TRIP TIMING: This signal should just turn "on" when a spindle is at the midpoint of a blanket (see figure 3 of drawing 14-4503-14). 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 20 degrees wide.

CH01: VARNISH TRIP TIMING: This signal should just turn "on" when a spindle is centered on the varnish wheel (see figure 4 of drawing 14-4503-14). 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 20 degrees wide.

CH02: CAN/NO CAN CLOCK: This signal is used to clock in whether or not a can was present at the can/no can sensor. 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 the "off" to "on" transition of the can/no can sensor when the sensor sees a can. If the two do coincide, retard CH02 away from the point where the sensor first sees the can.

CH03: DAMAGED CAN BLOWOFF (LO) TIMING: This signal is used to activate the damaged can blowoff solenoid at low speeds (below 800CPM). The damaged can blowoff "on" solenoid will actually be "on" for the duration of CH03 when a misloaded 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 BLOWOFF (HI) TIMING: This signal is used to activate the damaged can blowoff solenoid at high speeds (above 800CPM). The damaged can blowoff "on" solenoid will actually be "on" for the duration of CH04 when a misloaded 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 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.

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 figure 5 of drawing 14-4503-14). This signal should be 20 degrees wide.

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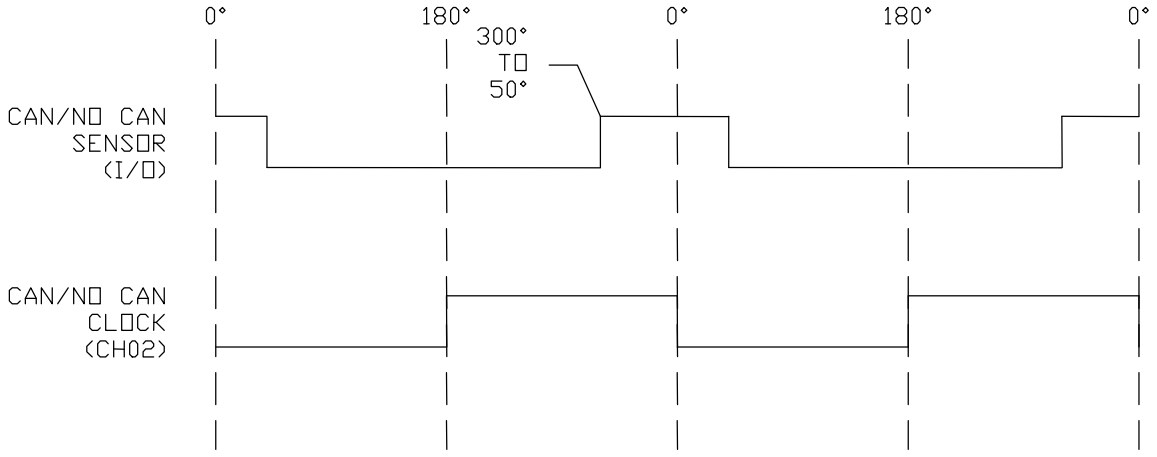
CH06: QC CAN BLOW-OFF TIMING: This should turn "on" when the select-a-can chain blow-off port is centered between pins on the chain (see figure 5 of drawing 14-4503-14). This signal should be 20 degrees wide - starting at 0.

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

4.5 CAN/NO CAN SENSOR TO CAN/NO CAN CLOCK (CH02) TIMING SEQUENCE



NOTES: (1) Can Sensor leading edge ("Off" to "On" transitions) should occur between 300° to 50° and should be "On" for at least 40°. At the very minimum, the leading edge of the can sensor signal must occur at least 50° before the leading edge of the Can/No Can clock timing signal (CH2).

(2) The Can/No Can clock (CH2) is used to clock the carriage trip, varnish trip, and chain blowoff shift registers. Because of this, the carriage trip timing (CH00), varnish trip timing (CH01) and pin chain (bad can) blow off timing (CH05), timing signal leading edges (off-to-on), must not occur within 30° ahead or 30° after the leading edge of the Can/No Can clock (CH2).

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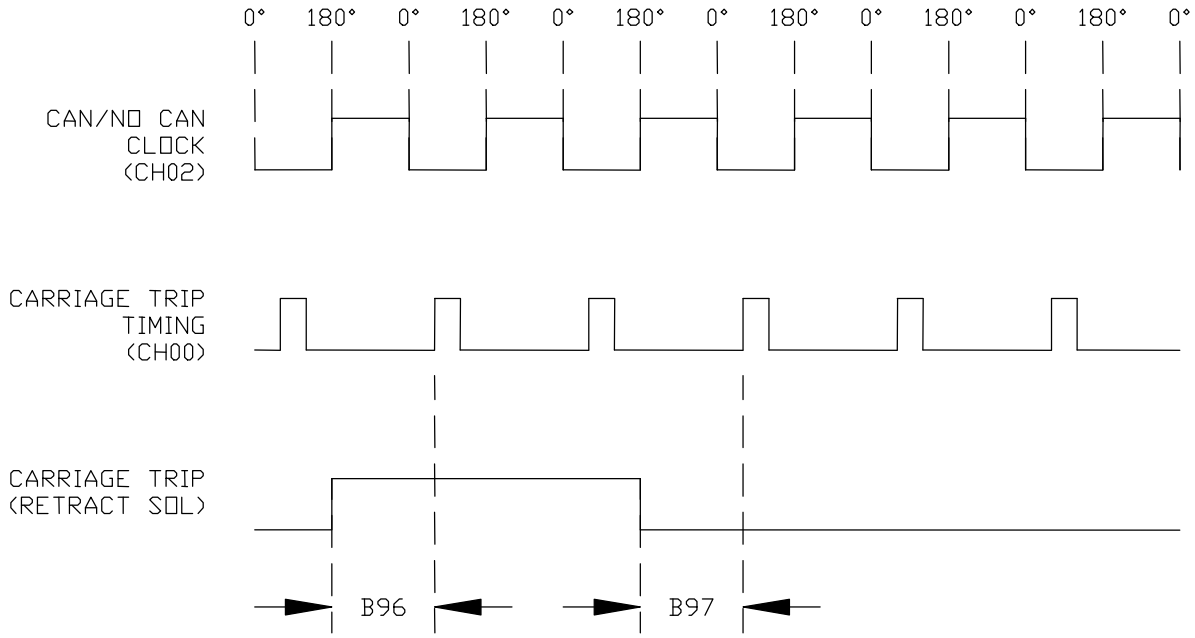
PLS TIMING CHANNEL SET-UP

4.6 CARRIAGE TRIP TIMING SEQUENCE



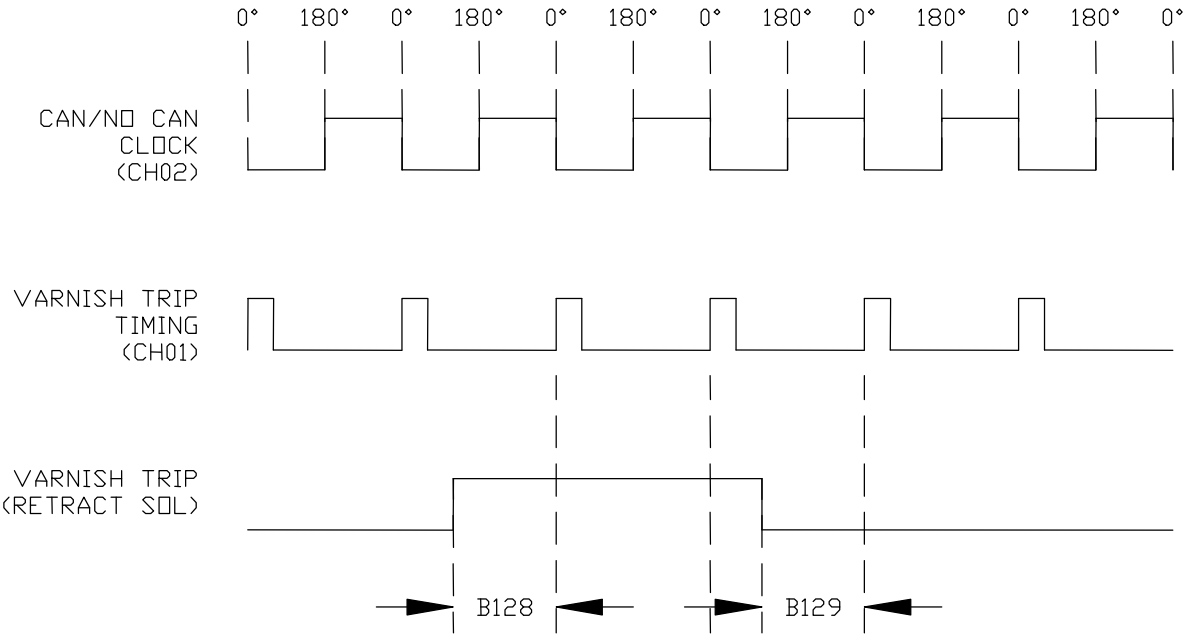
NOTES: (1) The carriage trip (Retract - "On", Extend - "Off") solenoids will "lead" the leading edge of carriage trip timing (CH00) by the time entered in B96 (M4020) in milliseconds. This is the retract response time of the carriage. The carriage extend (Retract - "Off", Extend - "On") will "lead" the leading edge of the carriage trip timing (CH00) by the time entered in B97 (M4020). This is true regardless of machine speed. Thus at high speeds, the solenoids may be activated over a full station in advance of the carriage trip timing.

(2) The above timing diagram shows a one can (bad can) trip sequence.

(3) The carriage trip timing (CH00) leading edge must not occur within 30° before or 30° after the Can/No Can clock (CH02) timing signal leading edge.

(4) The carriage trip timing signal (CH00) should be set per Figure 3 of drawing #14-4503-14.

4.7 VARNISH TRIP TIMING SEQUENCE



NOTES: (1) The varnish trip retract (Retract - "On", Extend - "Off") solenoids will "lead the leading edge of the varnish trip timing (CH01) by the time entered in B128 (M4020) in milliseconds. This is the "retract" response time of the varnish unit. The varnish extend (Retract - "Off", Extend - "On") will "lead" the leading edge of the varnish trip timing (CH01) by the time entered in B129 (M4020). This is the "extend" response time.

(2) The above timing diagram shows a one can (bad can) trip sequence.

(3) The varnish trip timing (CH01) leading edge must not occur within 30° before or 30° after the Can/No Can clock (CH02) timing signal leading edge.

(4) The varnish trip timing signal (CH01) should be set per Figure 4 of drawing #14-4503-14.

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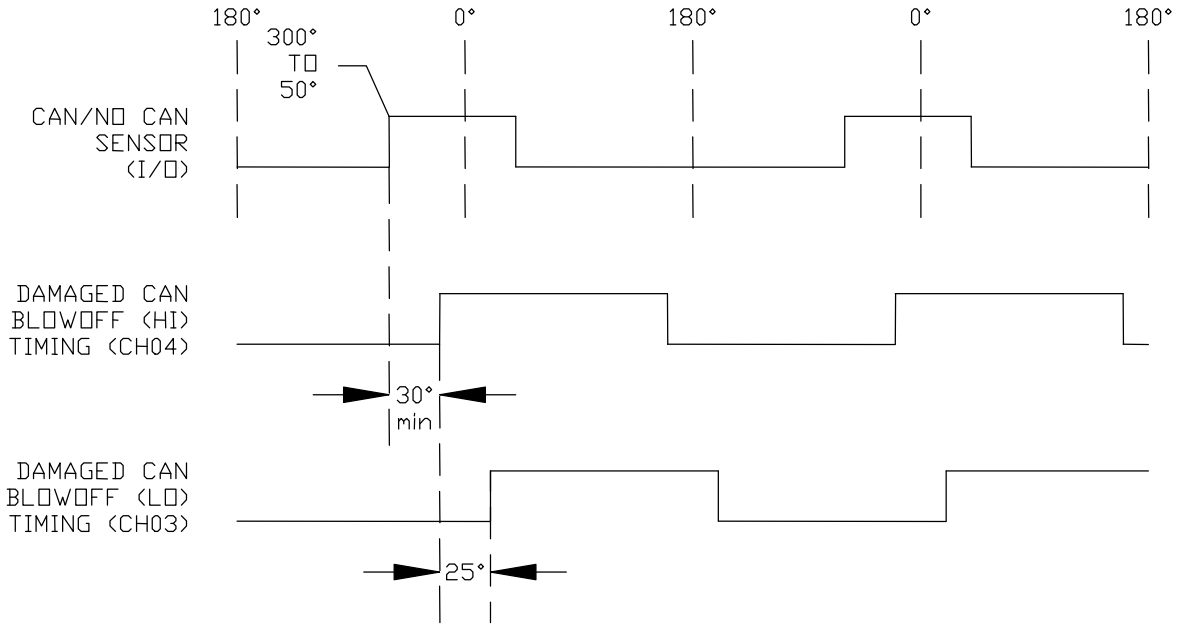
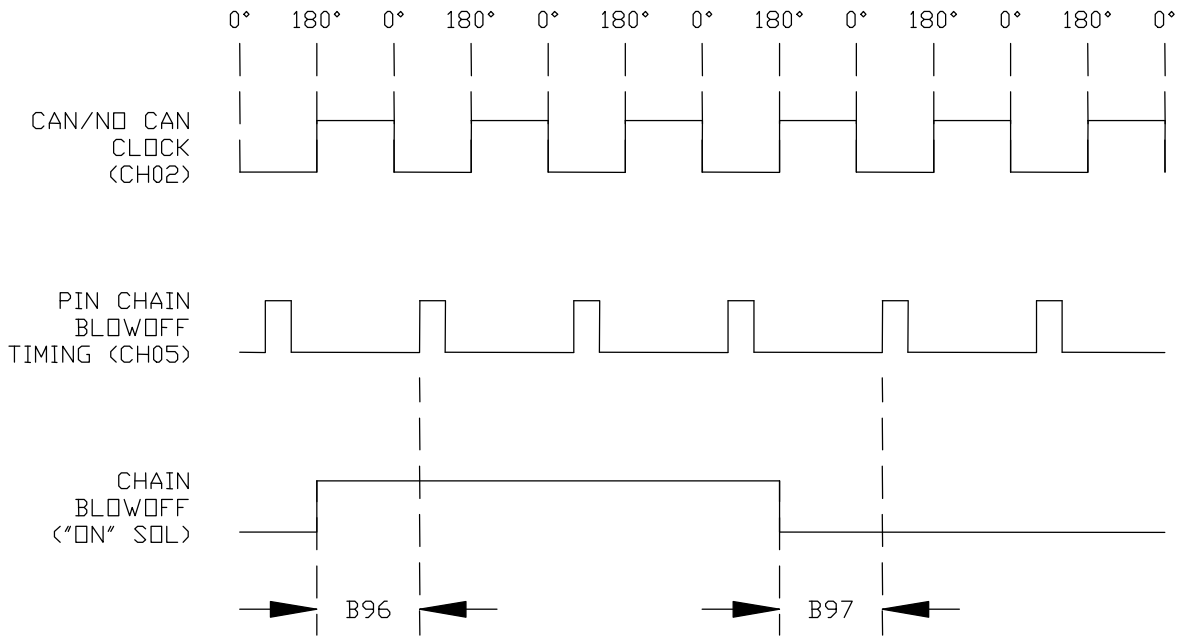
4.8 DAMAGED CAN BLOWOFF TIMING SEQUENCE



NOTES: (1) The damaged can blowoff (Hi) timing (CH04) leading edge must occur at least 30° after (or more) the leading edge of the Can/No Can sensor (when good cans are being detected). The damaged can blowoff (Lo) timing (CH03) must then occur at 25° after the leading edge of the damaged can blowoff (Hi) timing (CH04).

(2) See Section 4.4 for details on setting the width of both CH03 (Lo) and CH04 (Hi).

4.9 CHAIN BLOWOFF TIMING SEQUENCE



NOTES: (1) The chain blowoff "On" solenoid and "Off" solenoid will "lead" the leading edge of chain blowoff timing (CH05) by the time entered in B96 (M4012) in milliseconds. This is the "On" response time. The blowoff "Off" and "On" solenoids will cut the air ahead of the leading edge of the chain blowoff timing (CH05) by the time entered in B97 (M4012) milliseconds. This is the "Off" response time.

(2) The above timing diagram shows a three can blowoff (B99=3, M4012) when a single can is misloaded.

(3) The blowoff timing location is set per Figure 5 of Drawing #14-4503-14.

Note: When changing the chain blow off timing, it may be necessary to add or subtract one count from W148 (# of shifts to chain blowoff port). When changing this timing, double check that the correct cans are being blown off the chain (one ahead of bad can, bad can, and one behind bad can).

(4) The chain blow off timing (CH05) leading edge must not occur within 30° before or 30° after the Can/No Can clock (CH02) timing signal leading edge (180°). For instance, if the desired blowoff timing location (port midway between two pins) is at 170°, make the blowoff timing 150° - 190° (leading edge of CH05 30° before leading edge of CH02). If the desired blowoff timing location is at 200°, make CH05 210° - 250° (again leading edge of CH05 30° after leading edge of CH02). If the desired blowoff timing is 100°, make the CH05 timing at 100° - 140°.

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PLS TIMING CHANNEL SET-UP

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SECTION 5
USER VARIABLES SET-UP
USING SYSDEV

If the SETUPCD2 program is not available, the user variables can be setup directly through SYSdev. The following variables are used to configure and tune the HSL-CD2FE to match the configuration and performance of the specific decorator. In general, the M4020 generates all the machine timing in addition to providing the carriage trip and varnish trip control. The M4012 provides the damaged can blow-off, chain blow-off, select-a-can blow-off and the balance of the high speed alarm detection.

5.1 SUMMARY OF USER VARIABLES

The following is a summary of the variables used in each module:

MODULE #1 (M4020)

B096	(Carriage Unit retract response time)	= _____msec
B097	(Carriage Unit extend response time)	= _____msec
B098	(Number of shifts to carriage trip)	= _____
B099	(Number of shifts carriage will trip for)	= _____
B128	(Varnish unit retract response time)	= _____msec
B129	(Varnish unit extend response time)	= _____msec
B130	(Number of shifts to varnish trip)	= _____
B131	(Number of shifts varnish will trip for)	= _____
B143	(Maximum Carriage/Varnish trip time)	= _____
B144.0	(Auto Carriage response enable)	= _____
B144.1	(Auto Varnish response enable)	= _____
B144.2	(Enter new variable command)	= _____

MODULE #2 (M4012)

B096	(Chain blow-off “on” response time)	= _____msec
B097	(Chain blow-off “off” response time)	= _____msec
B098	(Number of shifts bad can shift in)	= _____
B099	(Number of (bad can) blow-offs)	= _____
B128	(QC blow-off “on” response time)	= _____msec
B129	(QC blow-off “off” response time)	= _____msec
B130	(QC blow-off shift offset)	= _____
B100	(# of cans blown off at infeed open)	= _____
B101	(# of cans blown off from print - restart)	= _____
B102	(# of cans blown off from varnish restart)	= _____
W148	(# of pins to chain blow-off port)	= _____
B131.0	(Enter new variable command)	= _____

5.2 SETTING THE USER VARIABLES

The following variables are set by connecting the PC running SYSdev from the COM port on the PC to the PROG port on the M4020 or M4012, whichever is to be set, and performing the following:

1) Invoke SYSdev from the root directory of the hard drive by typing SYSdev<ENTER>. From the SYSdev shell, select the "DECO" directory by pressing "F3: Select Dir", positioning the arrow at "DECO" and then pressing <ENTER>.

2) To set the variables in the M4012, select the "ADV24" program by positioning the arrow at "ADV24" and then press <ENTER> or "F2: Edit Prog". To set the variables in the M4020, select the "ADV25" program by positioning the arrow at "ADV25" and then press <ENTER> or "F2: Edit Prog".

3) From the Main Development Menu, select "1: Edit Program/On-line Funcs".

4) Select "F1: Main Prog".

5) Select "F9: Online Funcs".

6) To set the variables, select "F2: Assign Value".

7) Now type the variable to be set and what it is to be set to in the form Variable=Value<ENTER>. As an example, to set B096 equal to 50, simply type B096=50<ENTER> at the "Enter "Var=Value"" prompt.

8) If the machine is running while variables are entered, the new variable command bit will have to be set after the variable is entered in order for the module to actually enter the new value. This is done by setting B131=1 in the M4012 and setting B144=4 in the M4020. The module will ignore the new variable setting until either the machine is stopped or B131/B144 is set as described.

9) To view any of the variables, select "F1: Online Mon" after step (5) above and enter the variable to be viewed in the 12 element variable array at the bottom of the screen by typing the variable and pressing <ENTER>.

5.3 USER VARIABLES DEFINITIONS

MODULE #1 (M4020)

The M4020 contains the following user variables:

Addr	Definition

B096: Carriage Unit retract default response time - This is the assumed retract response time of the carriage unit (time from solenoid actuation to first break with blanket) in milliseconds. The M4020 will activate the retract solenoid this amount of time ahead of the carriage unit trip timing (CH00) (approximately 50 milliseconds).

B097: Carriage Unit extend default response time - This is the assumed extend response time of the carriage unit (time from solenoid actuation to first contact with blanket) in milliseconds. The M4020 will activate the extend solenoid this amount of time ahead of the carriage unit trip timing (CH00) (approximately 40 milliseconds).

B098: Number of shifts to carriage trip - This is the number of spindles from the can/no can sensor to the location where the carriage should trip minus two spindles (approximately 2 spindles).

B099: Number of shifts carriage will trip for - This is the number of spindles the carriage will trip for when a misloaded can is detected (1 or 2 spindles).

B128: Varnish Unit retract default response time - This is the assumed retract response time of the varnish unit (time from solenoid actuation to first break with varnish wheel) in milliseconds. The M4020 will activate the retract solenoid this amount of time ahead of the varnish unit trip timing (CH01) (approximately 60 milliseconds).

B129: Varnish Unit extend default response time - This is the assumed extend response time of the varnish unit (time from solenoid actuation to first contact with varnish wheel) in milliseconds. The M4020 will activate the extend solenoid this amount of time ahead of the varnish unit trip timing (CH01) (approximately 50 milliseconds).

B130: Number of shifts to varnish trip - This is the number of spindles from the can/no can sensor to the location where the varnish should trip minus two spindles (approximately 8 spindles).

B131: Number of shifts varnish will trip for - This is the number of spindles the varnish unit will trip for when a misloaded can is detected (typically 2 spindles).

Addr	Definition

B143: Maximum response time - This is the maximum allowed trip response time, either retract or extend, for either the carriage or varnish unit that the auto response time feedback algorithm will adjust the response when the auto response algorithm is enabled (see B144 below) (typically 70 milliseconds).

B144.0: Auto carriage response time feedback enabled - Setting this bit to a "1" enables the auto response time feedback for the carriage unit. The measured response time of the carriage unit is used to "lead" the carriage timing instead of the default extend and retract times entered in B096 and B097.

Note: The carriage response time sensor must be mounted on the machine in order for the auto response algorithm to work. Setting B144.0 to a "0" will disable the auto response algorithm and use the default extend and response times in B096 and B097 to "lead" the carriage timing.

B144.1: Auto varnish response time feedback enabled - Setting this bit to a "1" enables the auto response time feedback for the varnish unit. The measured response time of the varnish unit is used to "lead" the varnish timing instead of the default extend and retract times entered in B128 and B129.

Note: The varnish response time sensor must be mounted on the machine in order for the auto response algorithm to work. Setting B144.1 to a "0" will disable the auto response algorithm and use the default extend and response times in B128 and B129 to "lead" the varnish timing.

B144.2: Enter new variable command - Normally, if the machine is at zero speed, any changes to the above variables will be updated as soon as they are entered. However, if the machine is running, any changes made to the variables will not be updated until the machine stops. This is done to reduce the program execution overhead and increase the scan time during machine operation. Setting B144.2 to a "1" commands the M4020 to go ahead and update the variables changed while the machine is running. When this bit is set, the M4020 updates the variables then clears B144.2. Thus, if the machine is running, B144.2 must be set after any variable has been changed.

In addition to the above variables, which are set by the user in the M4020, the following two variables can be viewed in the M4020:

Addr	Definition
B146:	Actual Carriage “retract” response time - This is the actual carriage retract response time, in milliseconds, as measured by the carriage response feedback sensor.
B147:	Actual Carriage “extend” response time - This is the actual carriage extend response time, in milliseconds, as measured by the carriage response feedback sensor.
B148:	Number of spindles varnish is held retracted after restart - This is the number of spindles the varnish unit will be held retracted after the decorator is restarted minus one. To hold the varnish retracted for zero spindles, set B148 = 1, to retract for 2 spindles, set B148 = 3, etc.

MODULE #2 (M4012)

The M4012 contains the following user variables:

Addr	Definition
B096:	Pin Chain Blow-off "on" default response time - This is the assumed "on" response time of the pin chain blow-off port (time from "on" solenoid actuation to first air out port) in milliseconds. The M4012 will activate the solenoid this amount of time ahead of the Pin Chain blow-off timing (CH05) (approximately 20 milliseconds).
B097:	Pin Chain Blow-off "off" default response time - This is the assumed "off" response time of the pin chain blow-off port (time from "off" solenoid actuation to air stopping at port) in milliseconds. The M4012 will activate the solenoid this amount of time ahead of the Pin Chain blow-off timing (CH05) (approximately 30 milliseconds).
B098:	Number of shifts bad can shift in - This is the number of spindles from the can/no can sensor to the spindle wheel to disk transfer location minus one spindle (approximately 14 spindles).
B099:	Number of (bad can) blow-offs - This is the number of cans blown off at the pin chain port when one misloaded can is detected (typically 3 cans).
B128:	QC Blow-off "on" default response time - This is the assumed "on" response time of the QC blow-off port (time from "on" solenoid actuation to first air out port) in milliseconds. The M4012 will activate the solenoid this amount of time ahead of the QC blow-off timing (CH06) (approximately 20 milliseconds).
B129:	QC Blow-off "off" default response time - This is the assumed "off" response time of the QC blow-off port (time from "off" solenoid actuation to air stopping at port) in milliseconds. The M4012 will activate the solenoid this amount of time ahead of the QC blow-off timing (CH06) (approximately 30 milliseconds).
B130:	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.
B100:	Number of cans blown off at infeed open - This is the number of cans which will be blown off when the infeed is first opened minus one. To blow off no cans at infeed open, set B100 = 1, to blow off one can set B100 = 2, etc.

Addr	Definition

B101: Number of cans blown off from print station at restart - This is the number of cans which will be blown off from the print station when the machine is restarted minus one. To blow off no cans at restart, set B101 = 1, to blow off one can set B101 = 2, etc.

B102: Number of cans blown off from varnish station at restart - This is the number of cans which will be blown off from the varnish station when the machine is restarted minus one. To blow off no cans at restart, set B102 = 1, to blow off one can set B102 = 2, etc.

W148: 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 one. This can be a number from 1 to 599.

B131.0: Enter new variable command - Normally, if the machine is at zero speed, any changes to the above variables will be updated as soon as they are entered. However, if the machine is running, any changes made to the variables will not be updated until the machine stops. This is done to reduce the program execution overhead and increase the scan time during machine operation. Setting B131.0 to a “1” commands the M4012 to go ahead and update the variables changed while the machine is running. When this bit is set, the M4012 updates the variables then clears B131.0. Thus, if the machine is running, B131.0 must be set after any variable has been changed.