HSL-CUP4
Cupper
High Speed Front End
User's Manual
(HSM-CUP7 BASED)

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Revised 29 January 2013

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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This section describes the features of the HSL-CUP4 Cupper High Speed Logic module. This includes the functional description, alarms detected, interlocks between the module and the existing control system, etc.

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1.1 FEATURES

- Performs the high-speed control functions of the Cupper to speeds in excess of 300 SPM. This includes clutch control, air strip control, as well as die protection (die jam and cup jam detection).

- Rapid response control of clutch/brake system for emergency stops (die protection) as well as precise TDC stops. The clutch solenoid outputs of the HSL-CUP4 are not intended as safety contacts for the cupper clutch and must not be the only interrupt to the clutch solenoids.

- Accurate die jam (no cup drop) and cup jam detection for up to 16-out presses.

- Highly repeatable air strip control to reduce die jam problems.

- Brake Wear compensation (Auto TDC timing programming) algorithm to stop press at TDC regardless of brake response. Brake response determination allows displaying of actual brake response (in degrees). Brake response alarm to indicate when brake stopping response (in degrees) has exceeded user preset limit.

- Lubricator speed reference (0-10volt analog output) provides reference to lubricator proportional to speed of cupper (user scalable).

- Alarm detection: die jam detection, cup jam detection, scrap jam detection, timing signal fail detection, clutch output failure detection, no ram motion alarm, resolver failure detection, and brake response too long alarm.

- Data Acquisition: Total number of strokes and total number of die jam/cup jam faults for each station (for both current shift and last shift).

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SECTION 1
GENERAL DESCRIPTION

- Built-in 2 Line X 40 character sealed display with 24 key membrane keypad allows local viewing of collected data (stroke count, die jams per station, brake response) by operator and set-up of all user variables (passcode protected or key switch enabled) by authorized personnel.

- Interfaces directly with machine mounted resolver, cup drop sensors and all clutch and air strip solenoids.

- Based on high performance M4503 PLC/PLS module, that allows 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.

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1.2 FUNCTIONAL DESCRIPTION

The HSL-CUP4 cupper high speed logic module is an electronic upgrade for cuppers and performs the high speed control functions of the cupper including:
- Rapid Response Clutch/Brake Control
- Accurate Die Jam/Cup Jam Detection
- Precise Air Strip Control.

Included is a "Brake Wear Compensation" feature, that automatically adjusts the TDC timing signal to stop the press at TDC regardless of brake stopping time.

Alarm detection is provided including:
- Die Jam Detection
- Cup Jam Detection
- Scrap Jam Detection
- Timing Signal Failure
- Clutch Output Failure Detection
- No Ram Motion Alarm
- Resolver Failure Detection
- Brake Response Too Long Alarm

Data collection includes (for both the current and previous shift):
- Total Stroke Count
- Die Jam/Cup Jam Faults Per Station Count

Interfaces directly to the machine mounted resolver, cup drop sensors, clutch/brake, and air strip solenoids as well as the host PLC via discrete DC I/O.

The HSL-CUP4 is not a dedicated "black box", but is instead implemented using the high performance SYSTEMS M4503 PLC/PLS module. This allows easy customization by either SEA or the end user. The M4503 module is programmed using the SYSdev programming package, that 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 M4503 module incorporates a built-in PLS that interfaces directly with the machine mounted resolver and provides all machine timing, eliminating the need for an external PLS.

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1.3 CLUTCH/BRAKE CONTROL

The clutch/brake solenoids are activated by the HSL-CUP4 through the electro-mechanical two-hand control circuitry provided externally by the user. The throughput of the HSL-CUP4 is 0.5 milliseconds. This fast throughput along with the fact that the PLS is fully integrated with the processor, allows extremely fast and repeatable de-clutching and braking response to be achieved. Normally the clutch is controlled via inputs on the HSL-CUP4 that are controlled from outputs on the host PLC. However, detection of any of the alarms (die jam fault, cup jam fault, etc.) results in an immediate de-clutch of the solenoids.

SECTION 1
GENERAL DESCRIPTION

1.3.1 CONTROL OF CLUTCH VIA HOST PLC

Six discrete DC inputs to the HSL-CUP4 from the host PLC are used
to control the clutch:
- Clutch On No.1
- Clutch On No.2
- Continuous Mode
- Single Mode
- Inch/Bar Mode
- Not Immediate Stop

The HSL-CUP4 is essential a high speed gate which implements the
TDC stop, single, inch, and bar clutch control, all based the states of
the six inputs listed above. The following description of operation
defines the requirements of the host PLC logic to activate the clutch
through the HSL-CUP4:

Continuous Mode:
1) To activate the clutch in continuous mode, turn both the "Clutch
   On No.1" and "Clutch On No.2" inputs "on" simultaneously while
   the "Continuous Mode" and "Not Immediate Stop" inputs are
   "on". The "Single" and "Inch/Bar" inputs must be "off".

2) To perform a TDC stop, turn both the "Clutch On No.1" and
   "Clutch On No.2" inputs "off" while leaving the "Not Immediate
   Stop" input "on".

3) To perform an immediate (emergency) stop, turn both the "Clutch
   On No.1" and "Clutch On No.2" as well as the "Not Immediate
   Stop" inputs "off" simultaneously. The "Not Immediate Stop"
   input is used to indicate to the HSL-CUP4 that the clutch should
   be disengaged immediately, not waiting for the TDC timing
   signal.

Single Mode:
1) To single stroke the press, with the "Single Mode" and "Not
   Immediate Stop" inputs "on", turn the "Clutch On No.1" and
   "Clutch On No.2" inputs "on" simultaneously for 5 to 50
   milliseconds. The press will make one stroke. Both the
   "Continuous" and "Inch/Bar" mode inputs must be "off".

Inch Mode:

1) To inch the press, with the "Inch/Bar" mode and "Not Immediate Stop" inputs "on", simultaneously turn "on" and "off" both the "Clutch On No.1" and "Clutch On No.2" inputs. The clutch is activated as long as both inputs are "on". Both the "Continuous" and "Single" mode inputs must be "off".

Bar Mode:

1) With both the "Inch/Bar Mode" and "Not Immediate Stop" inputs "on", the clutch can be activated by simultaneously turning both the "Clutch On No.1" and "Clutch On No.2" inputs "on". The clutch is activated as long as both inputs are "on". Both the "Continuous" and "Single" mode inputs must be "off".

Note: In all the above modes, the "Clutch On No.1" and "Clutch On No.2" inputs must be turned "on" simultaneously (within 0.5 seconds) in order for the clutch to activate.

Refer to the schematic at the back of this manual for typical HSL-CUP4 clutch connections.

IMPORTANT SAFETY WARNING - The HSL-CUP4 is intended as a high speed logic gate to provide consistent and accurate clutch control. It is not designed as a redundant, dual-processor clutch brake safety module. The HSL-CUP4 must not be the only means of controlling the cupper clutch mechanism. Good design practice dictates the use of safety interlocks on any device that starts or stops automatically that can cause personnel injury to operating or maintenance personnel. The HSL-CUP4 must be used only in conjunction with industry approved safety interlock contacts, implemented in accordance with ANSI B11.1 safety requirements, otherwise serious personnel injury may result.

SECTION 1
GENERAL DESCRIPTION

1.4 AIR STRIP CONTROL

The HSL-CUP4 provides a repeatability of 0.5 milliseconds for the air strip thus reducing die jam problems. "Air Strip (Low)", "Air Strip (Mid)", and "Air Strip (High)" timing signals are provided to activate the air strip when the press is running in the respective speeds.

1.5 BRAKE WEAR COMPENSATION

The HSL-CUP4 incorporates a brake wear compensation or automatic TDC timing feature, which stops the press at TDC regardless of the actual braking response of the clutch/brake. The stopping compensation is accomplished by automatically adjusting the TDC timing signal based on the previous stop. Any overrun is detected and a new TDC timing signal is computed such that the machine will stop at the desired location on the next stop. Three TDC signals are provided (one for low speed, one for mid speed, and one for high speed). The mid and high speed TDCs incorporate the break wear compensation feature. The appropriate TDC timing signal (mid or high) is adjusted based on the speed of the machine when the TDC stop was initiated.

In addition to the brake wear compensation, the HSL-CUP4 also calculates the actual brake response (in degrees). This is the number of degrees from where the clutch was de-activated (TDC timing location) to where the crankshaft actually ended up stopping. This can then be displayed by the operator or maintenance personnel to determine the condition of the brake.

A "Brake Response Too Long" alarm is also generated when the actual brake response exceeds a user specified maximum allowed brake response. This can be used to indicate that service to the brake should be performed.

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1.6 ALARM DETECTION

The package detects the following alarms:

Die Jam Detection: The "Cup Drop Window" timing signal (CH06), along with the machine mounted cup drop sensors, are used to verify that the cups drop correctly each stroke. The cups for each station must drop inside the "Cup Drop Window" in order to avoid a die jam alarm. If a cup from any station fails to drop inside the "Cup Drop Window", a "Die Jam Alarm" is generated for that station. The clutch is then de-activated for a TDC stop and the station number that failed is displayed on the Keypad/Display. Die jam protection is provided for up to 16 stations

Cup Jam Detection: The "Cup Drop Window" timing signal (CH06), along with the machine mounted cup drop sensors, are used to verify that the cups do not jam in front of the cup drop sensors. If a cup for any station is detected outside the "Cup Drop Window" timing, a cup jam alarm is generated for that station. The clutch is then de-activated for a TDC stop and the station number that failed is displayed on the HSL-CUP4 display. Cup jam protection is provided for up to 16 stations.

Scrap Jam Detection: This alarm occurs when the "Scrap Jam" input is turned "on". This is generally derived from the grounded scrap discharge and is activated when scrap backs up shorting the discharge. The clutch is de-activated for a TDC stop at the detection of this fault.

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.

Clutch Output Fail (No.1/No.2): These alarms occur when the respective clutch output (no.1 or no.2) fails either "on" or "off". This indicates either a failure in the outputs of the S4568 board that drives the clutch or a short circuit or open circuit in the clutch output wiring.

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SECTION 1
GENERAL DESCRIPTION

No Ram Motion Detected: This alarm occurs when the clutch is activated and no ram motion is detected after a time delay. This could indicate either the clutch did not activate or that a failure in the resolver coupling has occurred.

Resolver Fault - Motion Detected at Stop: This alarm occurs when motion is detected after the clutch has been disengaged for a time delay. This indicates either a broken wire in the resolver cable or a failure in the resolver windings.

Brake Response Too Long: The "Brake Response Too Long" alarm is generated when the actual brake response exceeds a user specified maximum allowed brake response. This can be used to indicate that service to the brake should be performed.

The "die jam", "cup jam", and "scrap jam" alarms are available to the host PLC as discrete outputs. The balance of the alarms, are summed together into the "Not HSL Alarm" discrete output. If any of the alarms occur, the "Not HSL Alarm" is turned "off". If all alarms are cleared, the "Not HSL Alarm" is "on". These outputs should be interlocked to the existing control system to disable the clutch logic.

In the case of the "die jam" and "cup jam" alarms, four additional outputs representing the binary station number are also available such that the station that faulted can be read by the host PLC. The respective alarm message is displayed on the HSL-CUP4 display when the corresponding alarm is active.

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1.7 DATA COLLECTION

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

1) Total number of strokes
2) Total number of Die Jam/Cup Jam faults per station

This data can be viewed locally on the display by the operator or production control personnel. This information is updated ("current" shift transferred to "Last" shift) based on the change of state of the "End Of Shift" input.

The HSL-CUP4 module is provided for door mounting on the existing user's control cabinet door or console.

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2.1 WHAT'S INCLUDED

Verify that the following items are included when unpacking the HSL-CUP4 (back-panel mounting):

1ea.   HSL-CUP4 back-panel for mounting in existing control
        cabinet (includes the following):

    1ea.   M4500 PLC/PLS Module with required I/O boards
    1ea.   P4500 Power Supply
    1ea   D4591 Display with ribbon cable for mounting in the
          existing control cabinet door
    1ea.   HSL-CUP4 User's Manual
    1ea.   HSM-CUP7 Keypad Quick Reference
    1ea.   M4500 User's Manual
    1ea.   HSL-CUP4 Program Disk

The following items are optional items and can be purchased separately as required or desired:

    1ea.   RSV34-MS1 Resolver
    1ea.   RSV-RSCBLE-XX Resolver Cable

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2.2 POWER REQUIRED

The HSL-CUP4 is powered from 115/230VAC 50/60HZ and +24VDC. The 115/230VAC is used to power the M4500 module while the +24VDC is used to power the +24VDC I/O (sensors, clutch solenoids, etc.).

Note: +24VDC solenoids must be used for all clutch and air strip 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-CUP4 is no more than the existing systems +24VDC current requirement, therefore the existing +24VDC power supply should be adequate.

SECTION 2
INSTALLATION

2.3 MOUNTING THE HSL-CUP4

The HSL-CUP4 module should be mounted in the existing cabinet. Perform the following steps to mount the HSL-CUP4:

1) Refer to the "Recommended Cut-Out" in figure 1. Create a cut-out in the door of the existing control cabinet and mount the D4591 display and connect the ribbon cable from the M4500 to the display.

   Note: The D4591 must be located within 6 feet of the M4500 to avoid EMI pick-up on the display ribbon cable.
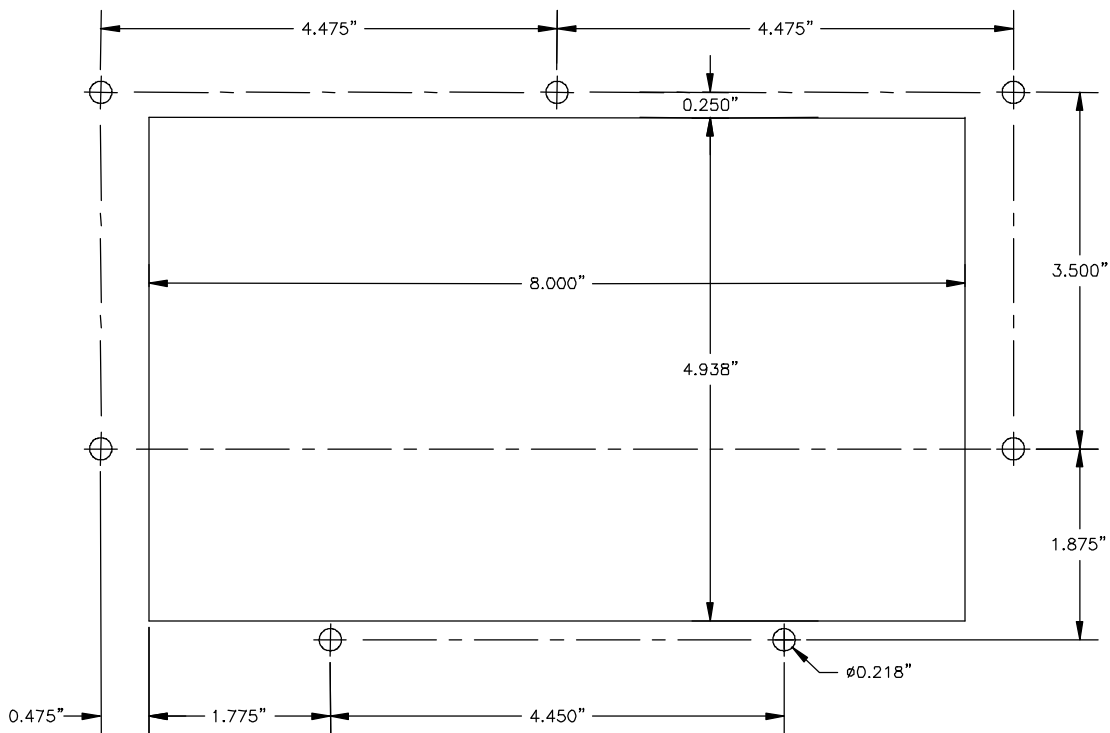
Figure 1 – D4591 Recommended Panel Door Cut-out

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2.4 WIRING THE HSL-CUP4

Referring to the electrical control schematic at the back of this manual, wire the HSL-CUP4 to the existing control system as follows:

Note: Keep all +24VDC wiring, resolver cable, sensor cable and lubricator speed reference 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-CUP4 (terminals I10 through I17).

3) Interlocks to existing control system from HSL-CUP4 (terminals O24, O25 and O18 through O25).

4) Main Clutch solenoids (O10 and O11). Air Strip solenoids (FU4 through FU7).

5) Cup Drop Sensors (I24 through I39) using three conductor shielded cable. 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. Any un-used cup drop inputs on the HSL-CUP4 should be tied to the "PLC Timing", output O17. This defeats the die jam detection for the un-used stations by simulating a cup drop.

6) Set-Up Enable, passcode by-pass (I19), key switch (if desired).

7) Resolver cable from resolver or existing PLS to RO-S4 connector on M4500 using a three pair, two-conductor shielded cable. The shield of the resolver cable should be tied to the "SHLD" terminal of the resolver input connector. Make sure the resolver cable shield is left floating at the resolver.

8) Lubricator Speed reference (0-10V analog output - 701,702) to lubricator drive (if used). It may be necessary to use an analog isolation amplifier (not provided) to isolate the drive from the M4500 to prevent damage to the module.

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SECTION 2
INSTALLATION

2.5 MOUNTING THE RSV34-MS1 RESOLVER
(if required)

The HSL-CUP4 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. Use the RSV-RSCBLE cable to connect the resolver to the HSL-CUP4. 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 2.4).

2.6 HSL-CUP4 SOFTWARE INSTALLATION

The HSL-CUP4 set-up software is used to
- Download the Program to the M4500
- Tune (Set-Up) the User Adjustable Variables
- Download and Upload (Save) the User Set-Up Variables to Disk
- View Shift Data

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-CUP4 control system.

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2.6.1 WINDOWS™ BASED SET-UP PROGRAM INSTALLATION

The HSMCUP7 setup program is compatible with Windows 95/98/ME/2000/XP operating systems.

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

1) Insert the HSL-CUP4 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-CUP4 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 HSMCUP7 setup program can be executed from the "Systems" folder located in Programs.

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2.6.2 DOS BASED SET-UP PROGRAM INSTALLATION

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

1) Create one directory off the root directory of the PC for each Cupper the HSL-CUP4 will be used on (called "HSLCUP1" for cupper #1, "HSLCUP2" for cupper #2, etc). These will be used to store the "HSLCUP4.EXE" setup programs and HSLCUP4 set-up data for each cupper. Create these directories by typing the following at the DOS prompt:

   MD \HSLCUP1<ENTER>
   MD \HSLCUP2<ENTER>
      etc.

2) Install the disk labeled "HSL-CUP4 PROGRAMS" into the A: drive. For each "HSLCUP" directory you created in the previous step, switch to that directory and install the "HSL-CUP4" set-up programs by typing the following at the DOS prompt (cupper #1 is shown):

   CD \HSLCUP1<ENTER>
   A:INSTALL<ENTER>

3) Add each cupper's HSL-CUP4 set-up program to your computer's menu software by creating a selection for each cupper called "SET-UP CUPPER #1" for cupper #1, "SET-UP CUPPER #2" for cupper #2, etc.. The DOS commands executed for these selections should be (cupper #1 shown):

   For the "SET-UP CUPPER #1" selection:
      CD \HSLCUP1
      HSLCUP4 HSLCUP4
      CD \

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

2.6.3 SYSdev PROGRAM DEVELOPMENT SOFTWARE INSTALLATION

The SYSdev Program Development software is used to perform on-line trouble-shooting and program modifications to the HSL-CUP4. If SYSdev was purchased with the HSL-CUP4 package and is not already installed on the your computer, install SYSdev onto the hard drive of your computer following the steps in the SYSdev Program Development manual.

2.6.4 APPLICATION PROGRAM INSTALLATION

The application program is a SYSdev based program, loaded into the M4500 module and performs the HSL-CUP4 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 HSLCUP4, the 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 "HSLCUP4" directories (created in section 2.6.2), copy all the files from the disk to each of these subdirectories.

2.7 MODIFY EXISTING PLC PROGRAM

Modify the existing control system PLC program to interface with the HSL-CUP4 by incorporating the following into the existing PLC ladder logic:

1) The HSL-CUP4 now controls:
   - The Clutch TDC Stop
   - Air Strip
   - Die Jam
   - Cup Jam Detection

   Defeat the existing Die jam and cup jam detection in the PLC and add both the "Die Jam Alarm" and "Cup Jam Alarm" inputs from the HSL-CUP4 and the "No HSL Alarm" interlock.

   Note: These alarms must immediately disable the clutch logic in the PLC. The "Die Jam" and "Cup Jam" alarms are true logic ("ON" when alarm detected) while the "No HSL Alarm" is inverted logic ("off" when alarm is detected).

2) Add the "Clutch On No.1" and "Clutch On No.2" outputs into the PLC logic. In general, these can be derived from the logic that use to drive the clutch solenoids by removing the TDC timing signal from the original logic.

3) Add the "Continuous", "Single", and "Inch/Bar" Mode outputs to the existing PLC logic. The respective output should be "on" when the corresponding mode is selected.

4) Add the "Not Immediate Stop" output to the PLC logic. This should be "on" when no E-stop or immediate stop condition is present and turn "off" as soon as either condition occurs. In general, the clutch control as interfaced with the above six interlocks, should be implemented as defined in section 1.3.

5) Add the "Coil Stock O'Ride" output into the PLC program. The signal is used to by-pass the die jam and cup jam detection when the press is stroked without coil stock.

   Note: The HSL-CUP4 will produce an "COIL STOCK MODE" fault if cups are detected dropping while the coil stock override is "on". This prevents the machine from being run in production with the coil stock override accidentally left "on".

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

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2.8 HSL-CUP4 SET-UP

The HSL-CUP4 is shipped from the factory with the PLC program loaded into the PLC section of the module. The PLS channel set-point file "CUP7TMG" loaded in the PLS section. In most cases, the following user variables and timing channels may have to be altered to tune the HSL-CUP4 to the actual cupper it is controlling.

Once installed and the control system is powered back up, perform the following to set-up and tune the HSL-CUP4. The set-up is performed using the Keypad/Display or a PC running the set-up program. See section 3 for a description of the Keypad commands and menu displays of the HSL-CUP4 Keypad/Display. See section 4 for a description of the menus, variables and how to use the Windows based set-up program. See section 5 for a description of the menus, variables and how to use the DOS based set-up program.

2.8.1 DEFAULT SET-UP VARIABLES

As shipped, the user variables for the HSL-CUP4 are set to the following defaults:

```
Brake Wear Compensation:
    Enabled _____: N
    Desired TDC Stop Position (Mid Speed) _____: 000
    Desired TDC Stop Position (High Speed) _____: 000

Maximum Allowed Stopping Response (degrees) _____: 300

Cupper Running Speeds:
    Low Speed (SPM) _____:100
    High Speed (SPM) _____:250

Lubricator Speed Reference:
    Maximum Speed _____: 250
    Idle Speed (Cupper stopped) _____: 075
```

The "CUP7TMG" timing channel file, as shipped, contains the following default timing set-points:

```
CHAN      ON  -  OFF     DESCRIPTION

CH00:     120  -  140    TDC (High) timing
CH01:     160  -  180    TDC (Mid) timing
CH02:     200  -  220    TDC (Low) timing
CH03:     120  -  200    Air Strip (High) timing
CH04:     140  -  220    Air Strip (Mid) timing
CH05:     150  -  230    Air Strip (Low) timing
CH06:     140  -  120    Cup Drop Window timing
CH07:     000  -  020    PLC Timing
CH10:     ___  -  ___
CH11:     ___  -  ___
CH12:     ___  -  ___
CH13:     ___  -  ___
CH14:     ___  -  ___
CH15:     ___  -  ___
CH16:     ___  -  ___
CH17:     ___  -  ___
```

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2.8.2 SET CUPPER SET-UP PARAMETERS

The Cupper set-up parameters include:
*   Enabling or Disabling The Brake Wear Compensation
*   Setting the Desired Mid and High Speed Stopping Points (if the brake wear compensation is enabled)
*   Setting the Maximum Allowed Stopping Response
*   Setting the Cupper Running Low and High Speeds

Brake Wear Compensation: If the brake wear compensation is used, enable it by setting the "Brake Wear Compensation Enable" to "Y" and set the "Desired TDC Stop Position (Mid)" and "(High)". The "Desired TDC Stop positions" is the location of the ram when it comes to rest after a TDC stop. Both the "Mid" and "High" desired stopping positions are generally set to 000 degrees. Enabling the brake wear compensation allows the HSL-CUP4 to automatically adjust the TDC timing channels (CH00-High) and (CH01-Mid) as necessary, such that the press will stop at the desired stopping position regardless of the actual brake response.

If the brake wear compensation is not used, disable it by setting the "Brake Wear Compensation Enable" to "N". Disabling the brake wear compensation requires the TDC (High) timing (CH00) and the TDC (Mid) timing (CH01) signals to be set manually such that the press stops at TDC.

Note: If the brake response then changes, the press will not stop at the desired position if the brake wear compensation is disabled.

Maximum Allowed Stopping Response: This parameter defines the maximum allowed brake response before a "Brake Response Too Long" alarm is generated. If the actual brake response (number of degrees from when the brake is activated to the position where the press ends up at rest) when a TDC stop is performed is longer than this number, the alarm is generated. If the actual brake response is less, the alarm is not generated. Set this parameter to the value where the brake response is considered too long and service to the brake should be performed (typically 270 to 300 degrees).

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Cupper Running Speeds: Set the Cupper running "Low Speed" and "High Speed" to the speeds that the cupper will actually run at when the respective speed is selected.

Note: This is not a speed reference but is instead parameters used by the HSL-CUP4 to know when to switch between the TDC (Low), TDC (Mid), and TDC (High) timing as well as the Air Strip (Low), Air Strip (Mid), and (High) timing etc.

See section 3.5.1 (Using the Keypad/Display), section 4.5.2 (Windows set-up program reference) or section 5.1.3 (DOS set-up program reference) for details on setting the set-up parameters.

2.8.3 SET LUBRICATOR SPEED REFERENCES

Set the "Lubricator Maximum Speed" and "Lubricator Idle Speed" as desired. These parameters are used to control the speed of the lubricator (via the 0-10Volt lubricator speed reference output of the HSL-CUP4 module).

Lubricator Maximum Speed: The "Lubricator Maximum Speed" parameter is used to scale the 0-10VDC analog output such that when the cupper is running at the speed entered in "Lubricator Maximum Speed", the analog output will be at 10 volts.

Lubricator Idle (Minimum) Speed: This parameter determines the speed the lubricator will run at when the cupper is stopped (de-clutched).

Note: When the cupper is running, the lubricator speed reference is proportional (as set by the "Lubricator Maximum Speed" scaling) to the speed of the cupper. This parameter is used to provide the speed reference when the cupper speed is zero (for lubricator jog, etc.).

See section 3.5.2 (Using the Keypad/Display), section 4.5.2 (Windows set-up program reference) or section 5.1.4 (DOS set-up program reference) for details on setting the set-up parameters.

2.8.4 SET MACHINE ZERO

Inch the cupper up to top dead center (TDC) and set the HSL-CUP4 resolver offset. See section 3.5.4 (Using the Keypad/Display), section 4.5.3 (Windows set-up program reference) or section 5.2.1 (DOS set-up program reference) for details on setting machine zero.

2.8.5 VERIFY LOCATION OF CUP DROP WINDOW (CH06)

By inching the machine, verify that the "Cup Drop Window" timing (CH06) of the HSL-CUP4 first turns "on" at the point where the cups are first freed from the punches (see figure 2). This is the earliest point the sensors might see the cups drop. The "Cup Drop Window" should then be set to stay "on" all the way up to about 20 degrees before this location (this is almost one complete stroke). This allows the greatest amount of time for the cups to drop.

The "Die Jam" alarm is generated if a cup from any station fails to drop within the "Cup Drop Window" timing (CH06). The "Cup Jam" alarm is generated if any cup is detected when the "Cup Drop Window" is "off" (cups must be clear by this time).

See section 3.5.3 (Using the Keypad/Display), section 4.5.3 (Windows set-up program reference) or section 5.2.2 (DOS set-up program reference) for details on setting the location of the cup drop window (CH06).
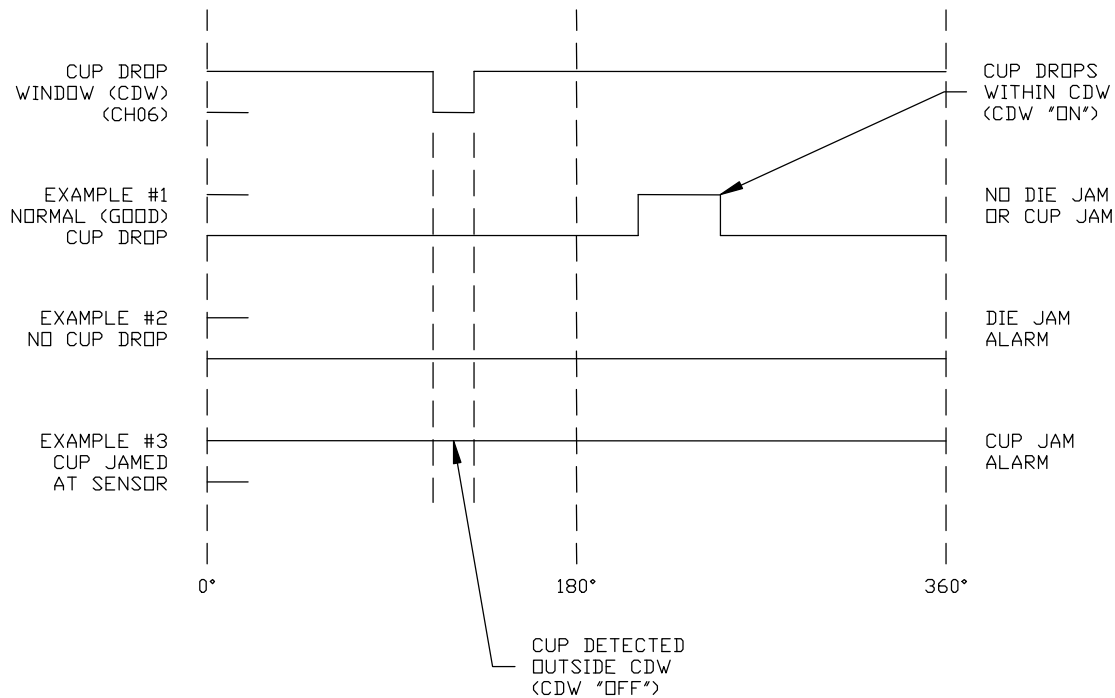
Figure 2 – Cup Drop Check Timing Sequence

2.8.6 VERIFY MACHINE OPERATION

Once steps 2.8.2 thru 2.8.5 are complete, run the machine in normal production (at all speeds where practical) and verify the following:

Verify Air Strip Timing: With the machine running with the coil stock, verify that the cups are dropped with-out any problems (verify at low, medium, and high speed). If a problem is occurring, adjust the respective "Air Strip" timing (CH03-High Speed, CH04-Mid Speed, CH05-Low Speed) until the problem is corrected. See section 3.5.3 (Using the Keypad/Display), section 4.5.3 (Windows set-up program reference) or section 5.2.2 (DOS set-up program reference) for details on adjusting CH03 thru and CH05.

Verify Cup Drop Timing: With the machine running with the coil stock, verify that no false die jam or cup jam faults are occurring. If false die jams or cup jams are occurring, verify that the cup drop sensors are detecting the cups when they drop. If the sensors are detecting the cups, adjust the "Cup Drop Window" timing as necessary to eliminate the false die jam or cup jam faults. The cups must drop inside the "Cup Drop Window" in order to avoid a die jam and must not be detected outside the "Cup Drop Window" in order to avoid a cup jam..

Verify that the die jam detection is working correctly by removing the coil stock from the press and then stroking the press with the coil stock override "off". The press should stop with a die jam alarm for station #1 displayed (die jams for all stations actually occur, but #1 is displayed since it is the lowest numbered station to fault).

Verify TDC Stops: If the brake wear compensation is enabled, verify that the press does stop at the desired location in both the high and the mid speeds.

Note: When the HSL-CUP4 is first installed, it will take a few successive stops for the algorithm to program the TDC timing channels to the correct position. Also, the compensation is enabled after the press has been running at a fixed speed in continuous. The TDC timing channels will not be modified when single strokes are made or if press is started in continuous and then immediately stopped again. Wait about 5 seconds after the press is started before performing the TDC stop to verify the stop position.

If the brake wear compensation is disabled, manually adjust both the TDC (High) timing (CH00) and the TDC (Mid) timing (CH01) such that the press stops at back dead center at both respective speeds.

Note: The TDC (Low) timing must be set manually since it does not incorporate the compensation algorithm. See section 3.5.3 (Using the Keypad/Display), section 4.5.3 (Windows set-up program reference) or section 5.2.2 (DOS set-up program reference) for details on adjusting CH00 and CH01.

The Machine Is Now Set-Up And Ready To Run!

2.9 M4500/P4500/D4591 INSTALLATION

The following is provided as a reference only. These steps are performed by the factory prior to shipping the HSL-CUP4. 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.

2.9.1 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 the S4568 (SLOT0-0, furthest left slot): Set the slot address dip switches (SW1) to the following positions:

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

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

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

4) Install the S4563 (SLOT0-2, slot next to S4568): Set the slot address dip switches (SW1) to the following positions:

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

5) Install the on the M4500, making sure all the board connectors protrude through 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.

6) Connect the display ribbon cable to the connector on the back of the M4500 (the connector will mate with the connector on the M4500 only one way).

7) Mount the M4500 chassis to the HSL-CUP4 back panel using four 8-32 screws.

8) 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 will mate with the connector on the M4500 only one way).

9) Install the respective field wiring arms on all the I/O boards of the M4500 (I/O slots0 thru 2, resolver connector, and IN0/IN1 connector). Make sure all field-wiring connectors are fully mated to the M4500.

2.9.2 P4500 POWER SUPPLY INSTALLATION

To install the P4500, perform the following steps:

1) Mount the P4500 to the HSL-CUP4 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 will mate with the connector on the M4500 only one way).

2.9.3 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 of 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.

**SECTION 2
INSTALLATION**

2.9.4 DOWNLOAD HSLCUP4 PROGRAM AND SET-UP DATA TO M4500

Once the M4500/P4500/D4591 are installed, perform the following to download the application program as well as the previously saved set-up data and timing channel set-points:
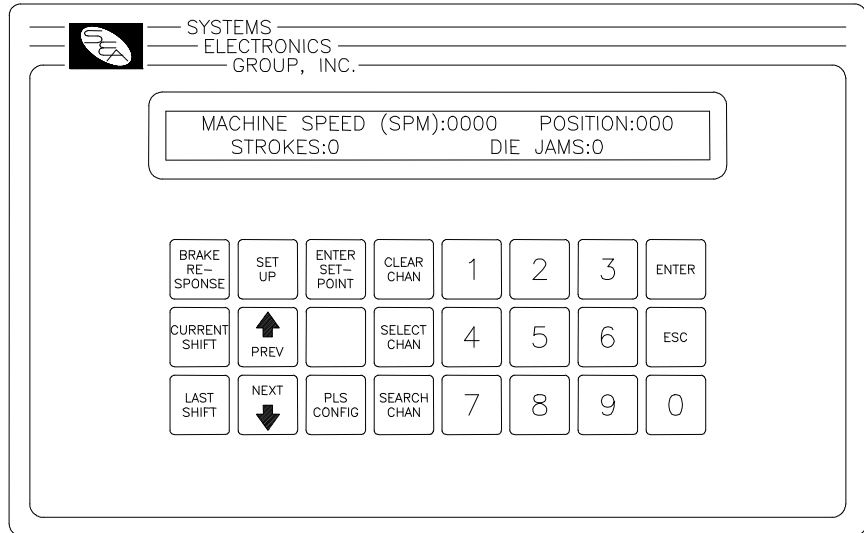
1) Power up the M4500 and the PC used to interface with the HSL-CUP4.

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

3) Initiate the respective setup program (HSMCUP7 for Windows systems, HSLCUP4.exe for DOS systems).

4) Download the HSLCUP4 application program to the M4500. See section 4.2.3 for Windows based systems, see section 5.4 for DOS.

5) Download the PLS timing set-points to the M4500. See section 4.2.4 for Windows based systems, section 5.2 for DOS.

6) Download the previously saved set-up data to the M4500. See section 4.2.4 for Windows based systems, section 5.5 for DOS.

7) The M4500 is now ready to run, loaded with HSLCUP4 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.

The keypad of the HSL-CUP4 contains 24 keys consisting of data display commands, set-up commands, and a numeric keypad. The display of the HSL-CUP4 is a 2 line by 40 character back-lit LCD display which displays the selected data and set-up menus. The keypad/display can be used by the operator to view data or can be used to adjust the timing and all set-up parameters.

```
 ———————— SYSTEMS ————————
 ———————— ELECTRONICS ————————
 ———————— GROUP, INC. ————————

    MACHINE  SPEED  (SPM):0000    POSITION:000
           STROKES:0                DIE  JAMS:0


 BRAKE    SET   ENTER   CLEAR
 RE-      UP    SET-    CHAN     1     2     3    ENTER
 SPONSE         POINT

 CURRENT  ⬆          SELECT
 SHIFT   PREV        CHAN        4     5     6     ESC

 LAST    NEXT   PLS   SEARCH
 SHIFT   ⬇     CONFIG CHAN       7     8     9     0
```

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

1) Set the Cupper Set-Up Parameters
2) Set the Lubricator Set-Up Parameters
3) Set Machine Timing
4) Set Machine Zero
5) View the Actual Brake Response (in degrees)
6) View the Current Shift Data
7) View the Last Shift Data

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 retard to the previous item on the menu. To change a set-up 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 is entered, the primary set-up menu will be displayed. Pressing <ESC> at anytime will also exit you back to the primary set-up 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 (SPM):xxxx   POSITION:xxx
> STROKES:xxxxxxx   DIE JAMS:xxxxxx

- The "Machine Speed" is the Current Speed of the Cupper (in strokes per minute)
- The "Position" is the Current Angular Position of the Cupper Crankshaft (in degrees)
- The "Strokes" Field is the Total Number of Strokes (so far into the current shift)
- The "Die Jams" Field is the Total Number of Die Jams or Cup Jams for All Stations (so far into the current shift)

This display effectively replaces a speed meter, a position display, and two counters. This screen is always returned to when no commands are active.

3.2 "BRAKE RESPONSE" KEY

This displays the brake response for both "Low" and "High" speed stops. The response is the number of degrees it takes the press to stop from when the clutch is de-activated for a TDC stop to the position that the machine comes to rest. This can be used to determine the general condition of the brake and whether servicing of the brake is required. To exit back to the default screen, simply press the "ESC" key.

3.3 "CURRENT SHIFT" KEY

The Current shift menu displays:
- The Number of "Die Jams/Cup Jams" Per Station for the Current Shift

This can be used to help trouble shoot a die problem on a particular station by observing an excessive number of die jams or cup jams for that station.

Note: The Current shift "Stroke Count" and "Total Die Jams" is displayed as part of the default screen (see section 3.1).

3.4 "LAST SHIFT" KEY

The Last shift data menu displays:
- The "Total Stroke" Count
- The "Total Die Jams/Cup Jams" Fault Counts Per Station

This data is the totals for the last (previous) shift. This is transferred from the current shift when the end of shift input transitions from a "0" to a "1". This can be at the end of either an 8 or 12 hour shift. This data cannot be reset by the operator, only at the end of shift transition.

The Last shift data is defined as follows:

Strokes: This is the total number of strokes made for the previous shift. This is essentially a counter.

Die Jams: This is the total number of die jam or cup jam faults that occurred for all stations on the previous shift.

Die Jams/Cup Jams per Station: This is the number of die jam or cup jam faults that occurred on each station on the previous shift.

SECTION 3
USING THE KEYPAD/DISPLAY

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 CUPPER PARAMETERS
    2: SET LUBRICATOR PARAMETERS
    3: SET MACHINE TIMING (SET-POINTS, ETC.)
    4: ZERO MACHINE (SET RESOLVER OFFSET)

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 4).

Note: The primary set-up menu is passcode protected. When the set-up key is first depressed, an "ENTER PASSCODE:" prompt is displayed. At this point, a 5-digit passcode must be entered followed by pressing the <ENTER> key. If the passcode is correct, the primary set-up menu is displayed and any of the parameters accessed by this menu may be changed. If the passcode is incorrect, the message "INCORRECT PASSCODE" will be displayed. The passcode may be entered again or the <ESC> key can be pressed to return to the main menu.

When the passcode is entered, the digits entered are not displayed. Instead "*" characters are displayed as each digit is entered. This prevents observation of the passcode as it is entered. In addition, the "ENTER PASSCODE" prompt is only displayed for a maximum of 60 seconds. The correct passcode must be entered within a 60 second period otherwise the set-up mode is aborted and the main menu is displayed.

Refer to section 3.6 (Set Keypad/Display passcode) for details on setting the passcode as desired.

A keyed switch can then be wired to the "Set-Up Enable" input such that when the switch is in the enable position, the input is "on". When this input is "on", the passcode prompt is bypassed and access to the primary set-up menu is provided immediately. If the "Set-Up Enable" input is "off", then the normal passcode prompt is displayed.

3.5.1 SET CUPPER PARAMETERS

This menu is activated when the "1" key (SET CUPPER PARAMETERS) is pressed while the primary set-up menu is active. The following set-up parameters may then be adjusted or viewed:

Brake Wear Comp Enable? (0=No, 1=Yes): This prompt is used to enable or disable the brake wear compensation. If the compensation is to be disabled, enter "0" and press <ENTER>. If the compensation is to be enabled, enter "1" and press <ENTER>.

Desired TDC Stop POS (Mid Speed): This is the desired stopping location (in degrees) for a TDC stop in mid speed when the brake wear compensation is enabled. This is typical set to 000 degrees (Top Dead Center). This prompt is only displayed when the brake wear compensation is enabled.

Desired TDC Stop POS (High Speed): This is the desired stopping location (in degrees) for a TDC stop in high speed when the brake wear compensation is enabled. This is typical set to 000 degrees (Top Dead Center). This prompt is only displayed when the brake wear compensation is enabled.

Maximum Allowed Stopping Response: This defines what the maximum allowed brake response is before the "Brake Response Too Long" alarm is generated. If the actual brake response (number of degrees from when the brake is activated to the position where the press ends up at rest) when a TDC stop is performed is longer than this number, the alarm is generated. If the actual brake response is less, the alarm is not generated. Set this parameter to the value where the brake response is considered too long and service to the brake should be performed (typically 270 to 300 degrees).

Running Cupper Low Speed (SPM): This is the speed the cupper will run when in low speed.

Running Cupper High Speed (SPM): This is the speed (in strokes per minute) that the cupper will run when in high speed.

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3.5.2 SET LUBRICATOR PARAMETERS

This menu is activated when the "2" key (SET LUBRICATOR PARAMETERS) is pressed while the primary set-up menu is active. The following lubricator set-up parameters may then be adjusted or viewed:

Lubricator Maximum Speed (SPM): The "Lubricator Maximum Speed" parameter is used to scale the 0-10VDC analog output such that when the cupper is running at the speed entered in "Lubricator Maximum Speed", the analog output will be at 10 volts. This is typically set to the running high speed of the Cupper or slightly higher.

Lubricator Minimum Speed (SPM): This parameter determines the speed the lubricator will run at when the cupper is stopped (de-clutched).

Note: When the cupper is running, the lubricator speed reference is proportional (as set by the "Lubricator Maximum Speed" scaling) to the speed of the cupper. This parameter is used to provide the speed reference when the cupper speed is zero (for lubricator jog, etc.).

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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) TDC (HIGH) TIMING, (CH01) TDC (LOW) TIMING, etc.
RPM:yyyy	Current machine speed where "yyyy" is in SPM.
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".

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SECTION 3
USING THE KEYPAD/DISPLAY

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, however, may 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 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 inched or barred) that the position increases linearly from 0 through 359. If not, swap the S1 and S3 leads of the resolver at the HSL-CUP4 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 (top dead center).

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.

3.6 SET KEYPAD/DISPLAY "SET-UP" PASSCODE

The "Set Passcode" input to the HSL-CUP4 is used to set or view the passcode of the set-up menu. Normally this input should be "off". To set the passcode, jumper this input to +24VDC and press the "Set-Up" key. The "ENTER PASSCODE" prompt will be displayed along with the current passcode. This allows the passcode to be viewed.

To change the passcode, enter any number between 0 and 64999 and press <ENTER>.

Note: Set the passcode to "0" to disable passcode protection. When prompted for the passcode, press <ENTER> to proceed to the set-up menu. If the passcode protection is used, set the passcode to a number between 1 and 64999. A valid passcode will then have to be entered to gain access to the set-up menu. Once the passcode is set, turn the "Set Passcode" input "off".

The Windows based set-up program is menu driven, allowing the user to easily view data, alter set-up variables or set machine timing (resolver 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 cupper (see HSL-CUP4 Set-up, section 2.8).

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.
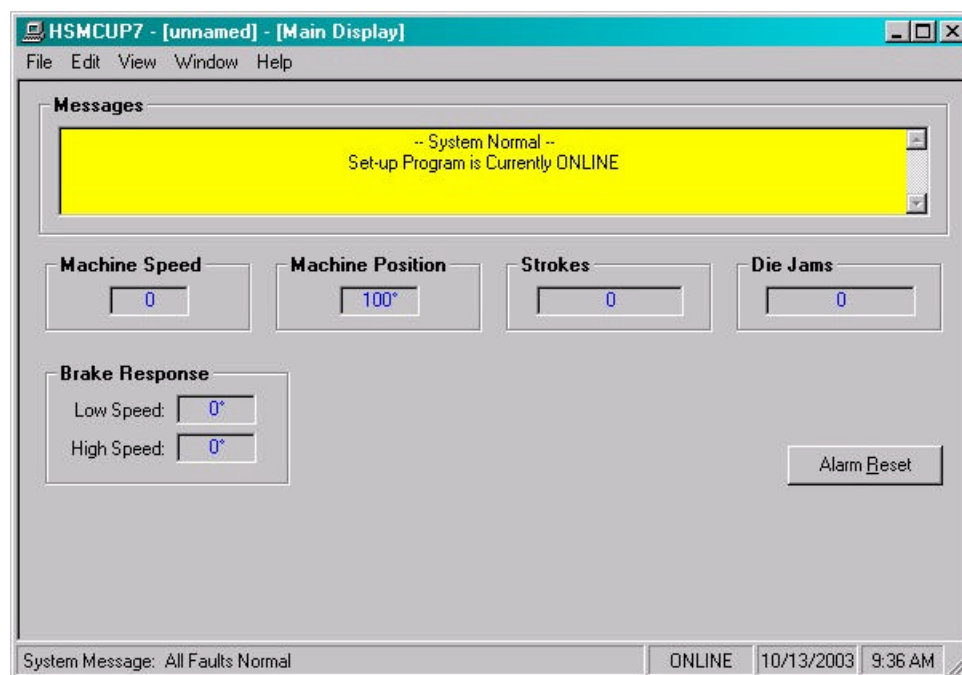
SECTION 4
HSMCUP7 WINDOWS BASED
SET-UP PROGRAM REFERENCE

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 from the "Edit" menu.

Getting Help: The entire 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 HSMCUP7" 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.


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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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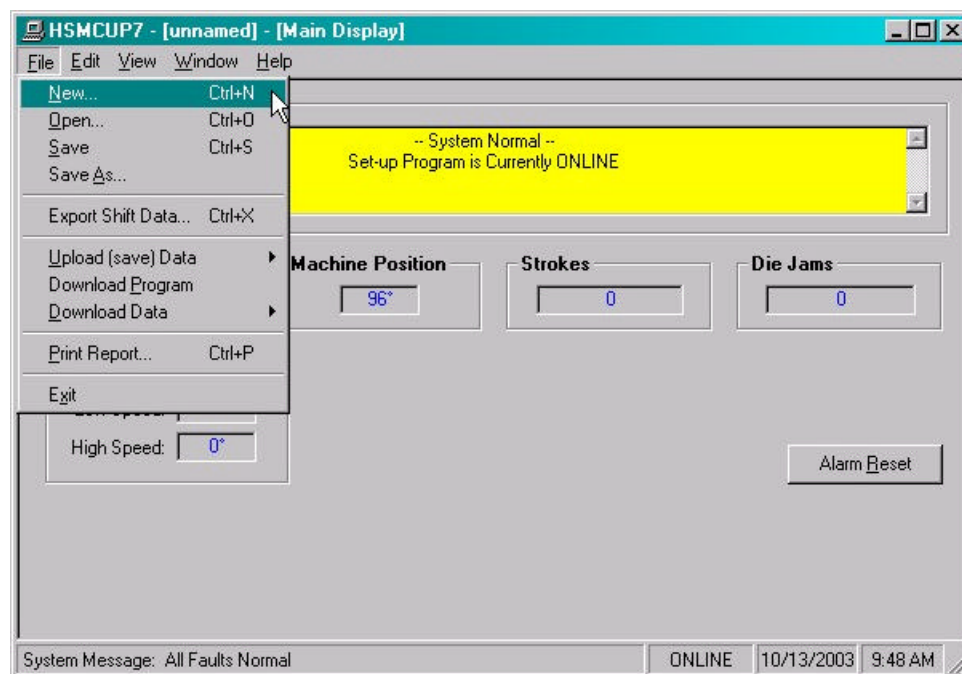
4.2.1 THE SET-UP DATA FILE

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 cupper, 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.

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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 set-up 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:
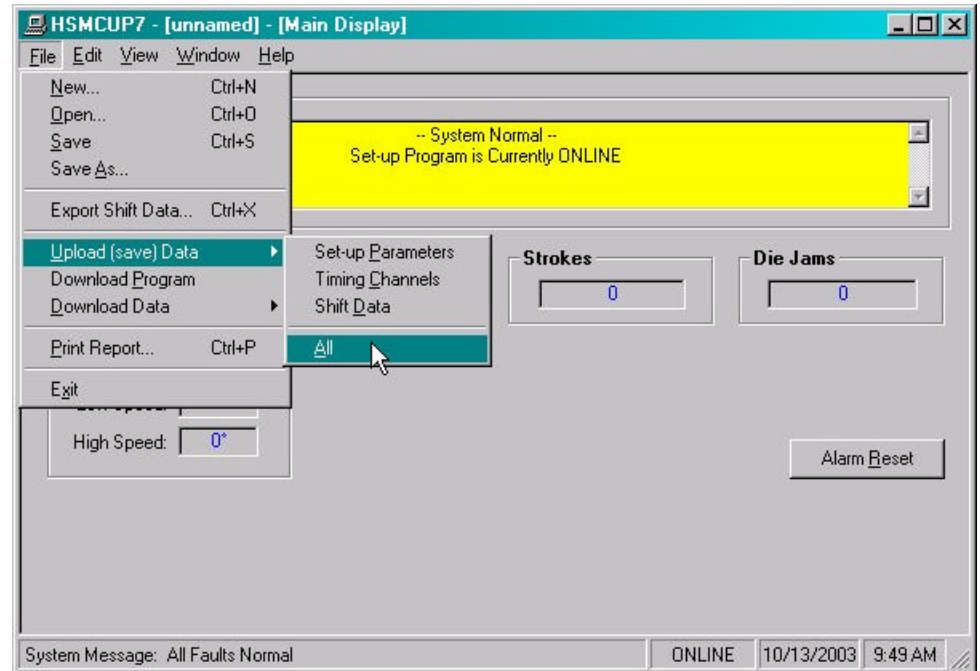
Set-up Parameters: This option uploads the "Set-up" data from the M4500. This includes cupper and lubrication set-up parameters.

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 total strokes, total die jams and die jams per station for both the current and last shifts.
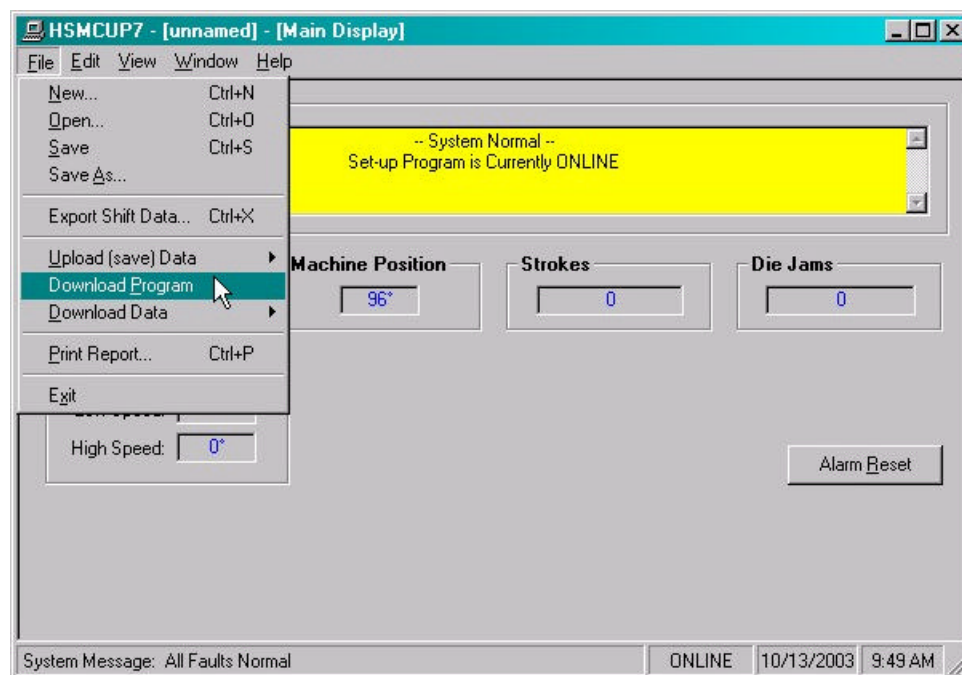
All: This option allows the user to completely upload "All" of the set-up parameters, timing channel set-points and shift data from the M4500.

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:
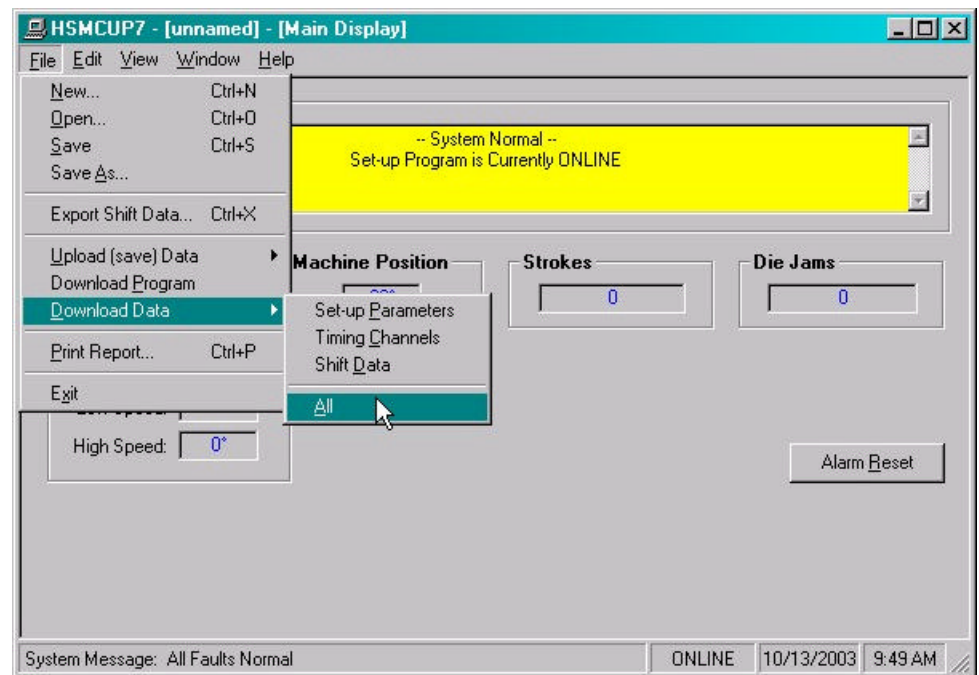
Set-up Parameters: This option downloads the "Set-up" data to
the M4500. This includes cupper and lubrication set-up parameters.

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 total strokes, total die jams and die jams per station for both the current and last shifts.

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.

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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.
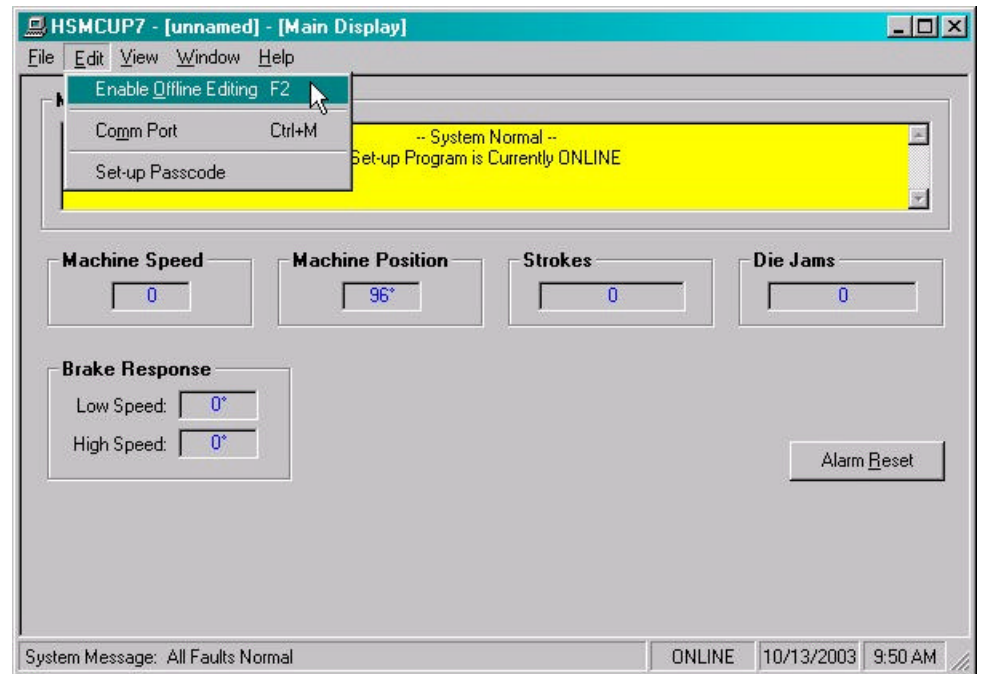
_____

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.
- Set the Set-up Passcode


_____

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 baud rate to talk to the M4500. The programming port of the M4500 is set to 9600 baud.
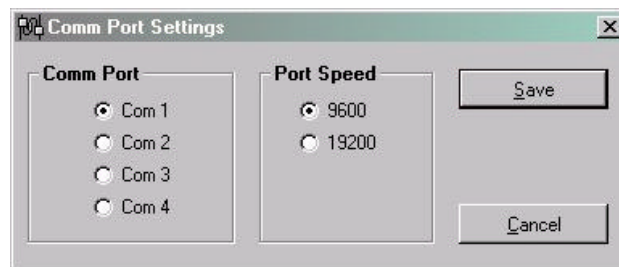
Once selected, a dialog box requesting the user to select a "Comm Port" and "Baud Rate" will be displayed. The default setting is COM1 at 9600 baud. The option to select the 19200 baud rate is to allow the user to communicate with the processor via the S4516 serial communications board.

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.

4.3.3 EDIT SET-UP PASSCODE

The edit "Set-up Passcode" is an "Online" function only. This allows
the user the ability to directly change the value of the "Set-up
Passcode". The passcode is not included as part of the setup data file.

Once selected, an input box is displayed, allowing the user to view the
current "Passcode" setting and to change the value if necessary. If the
passcode is set to zero, passcode entry is disabled. The operator can
press the Set-up key on the Keypad/Display and simply press the
<ENTER> key to gain access to the set-up parameters without having
to enter a zero.

If the value of the passcode is a value between 1 and 65,000,
"Passcode Entry" is enabled. This requires the operator to enter in the
"Correct" passcode to gain access to the set-up parameters.

Note: Passcode entry is only in effect when the "Set-up Enable"
selector switch is in the "Disable" position.

If an invalid value is entered, the passcode value will not be reset and
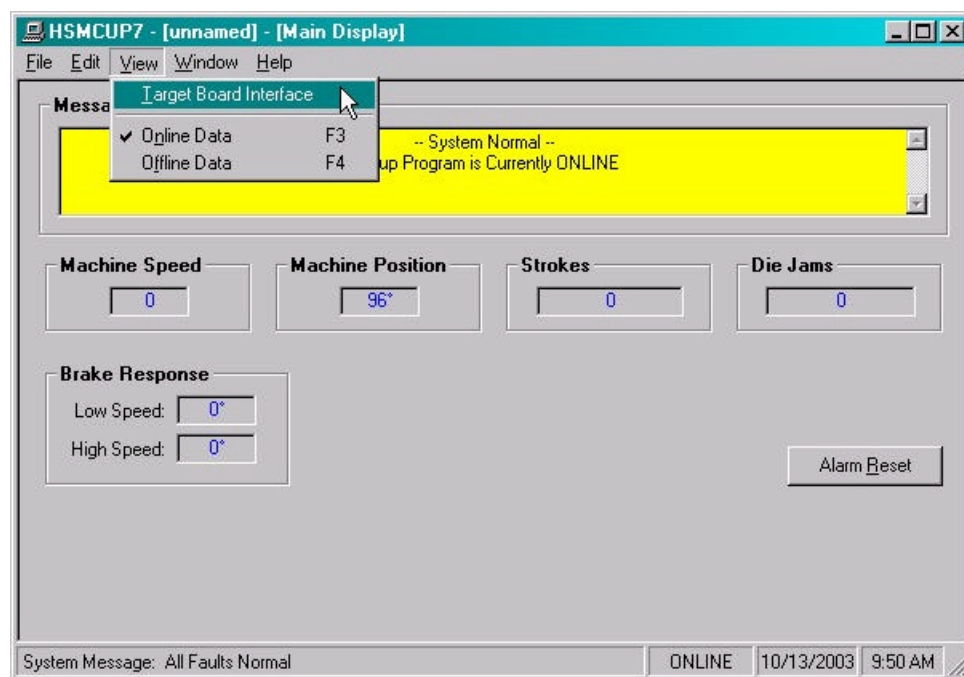a message box notifying the user of the error is displayed.

4.4 THE VIEW MENU

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

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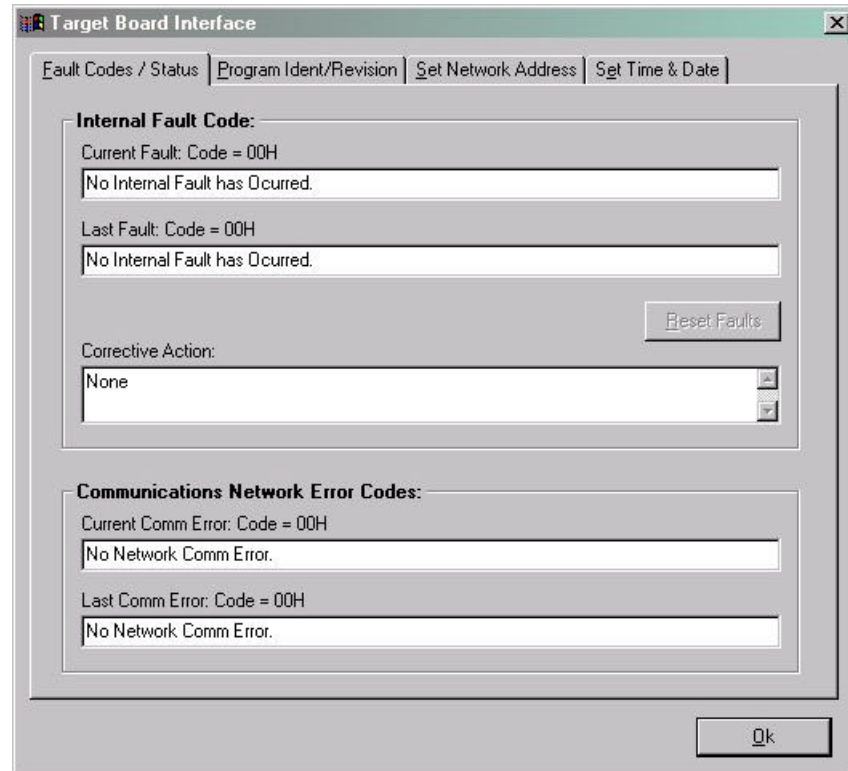- View "Online" Data
- View "Offline" Data

_____

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 still be displayed.

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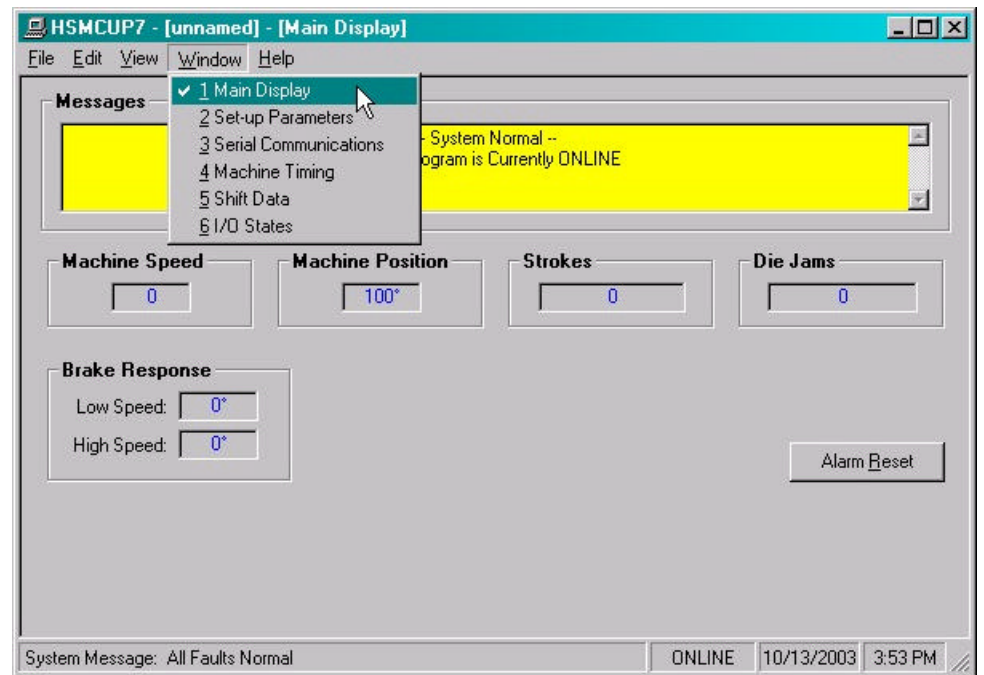
Once invoked, the set-up program will close the Comm port and cease communication with the M4500.

4.5 THE WINDOW MENU

The "Window" menu allows the user to select one of 6 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.

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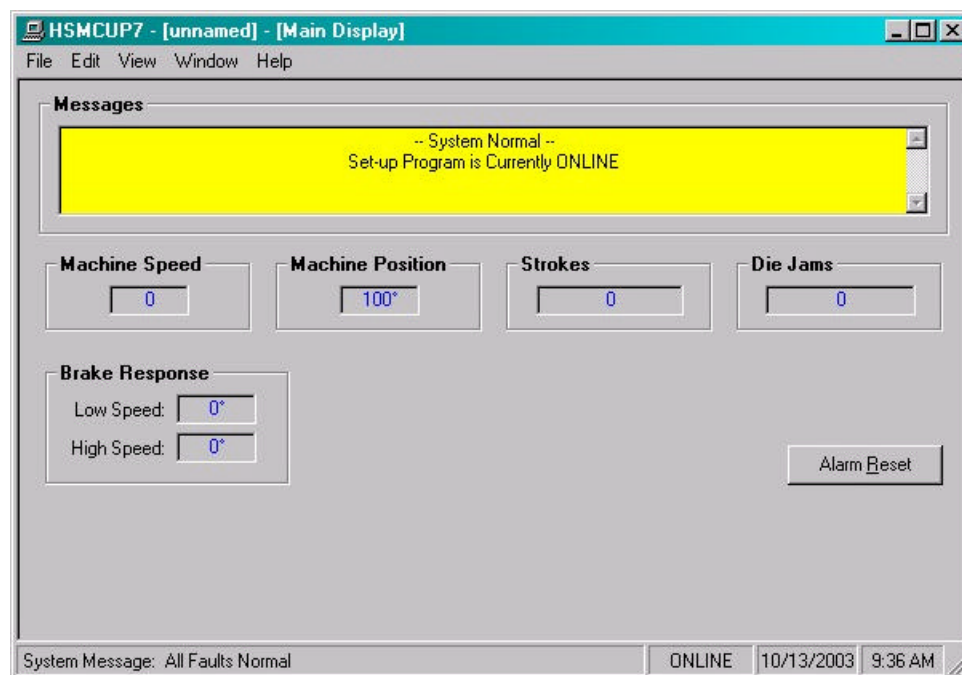
The following is a list of the functions of the "Main Display" window.

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 Speed: This display is only active while "Online" and displays the current speed of the machine in "Strokes Per Minute".

Position: This display is only active while "Online" and displays the current angular position of the cupper crankshaft.

**Strokes:** This display is the "Current Shift" total number of strokes into the current shift.

Die Jams: This display is the "Current Shift" total number of die jams or cup jams for all stations that the machine has had so far into the current shift

Brake Response: This is the brake response of both the low and high-speed stops. The response is the number of degrees it takes the press to stop from when the clutch is de-activated for a TDC stop to the position that the machine comes to rest.

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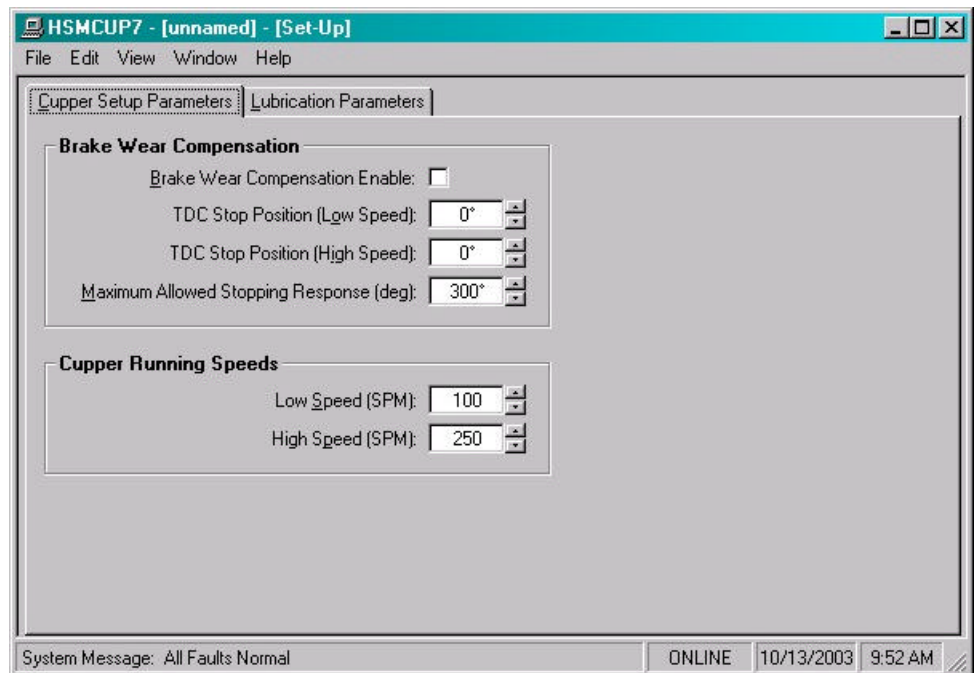
This window utilizes a "TAB" control to divide the set-up parameters into two categories, similar to that of the Keypad/Display.

Brake Wear Compensation: This section is used to set the brake wear compensation parameters in the M4500. This section contains the following selections:

1) **Brake Wear Compensation Enable:** This prompt is used to enable or disable the brake wear compensation. If the compensation is to be disabled, deselect the check box. If the compensation is to be enabled, select the check box.

   The HSL-CUP4 incorporates a brake wear compensation or automatic TDC timing feature, which stops the press at TDC regardless of the actual braking response of the clutch/brake. The stopping compensation is accomplished by automatically adjusting the TDC timing signal based on the previous stop. Any overrun is detected and a new TDC timing signal is computed such that the machine will stop at the desired location on the next stop. Three TDC signals are provided: one for low speed, one for mid speed, and one for high speed. The mid and high speed TDCs incorporate the break wear compensation feature. The appropriate TDC timing signal (mid or high) is adjusted based on the speed of the machine when the TDC stop was initiated.

2) **Desired TDC Stop Position (Low Speed):** This is the desired stopping location (in degrees) for a TDC stop at low speed when the brake wear compensation is enabled. This is typical set to 000 degrees (Back Dead Center).

3) **Desired TDC Stop Position (High Speed):** This is the desired stopping location (in degrees) for a TDC stop in high speed when the brake wear compensation is enabled. This is typical set to 000 degrees (Back Dead Center).

4) **Maximum Allowed Stopping Response (degrees):** This defines what the maximum allowed brake response is before the "Brake Response Too Long" alarm is generated. If the actual brake response (number of degrees from when the brake is activated to the position where the press ends up at rest) when a TDC stop is performed is longer than this number, the alarm is generated. If the actual brake response is less, the alarm is not generated. Set this parameter to the value where the brake response is considered too long and service to the brake should be performed (typically 270 to 300 degrees).
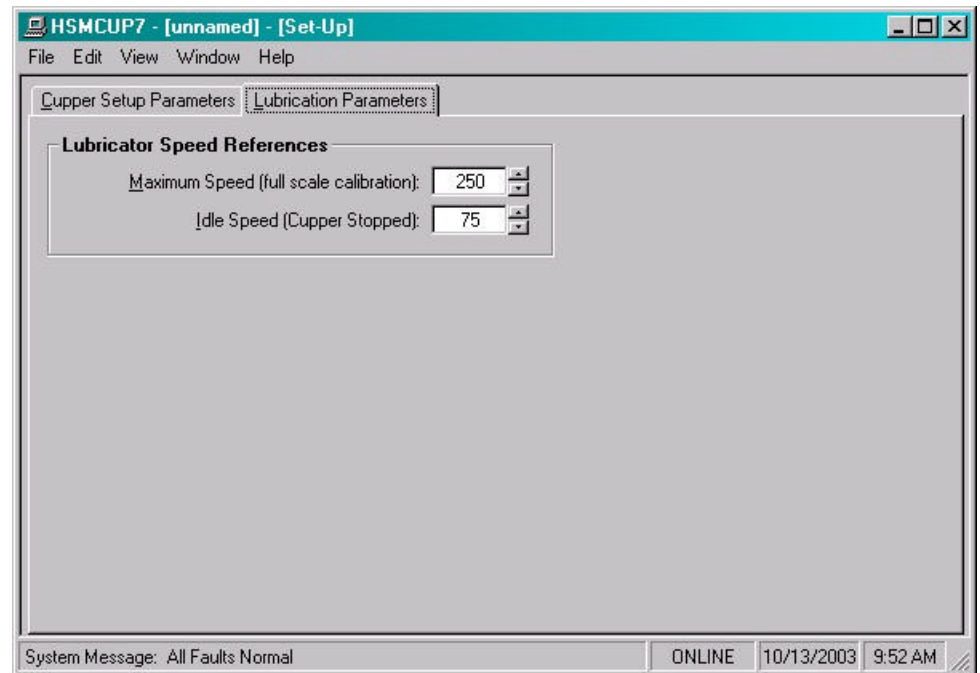
Cupper Running Speeds: This section is used to set the cupper running speeds in the M4500. This section contains the following selections:

1) **Running Cupper Low Speed (SPM):** This is the speed (in strokes per minute) the cupper will run when in low speed.

2) **Running Cupper High Speed (SPM):** This is the speed (in strokes per minute) the cupper will run when in high speed.

Lubricator Parameters: This section is used to set the lubricator speed references in the M4500. This section contains the following selections:

```
HSMCUP7 - [unnamed] - [Set-Up]                                    _ □ X
File  Edit  View  Window  Help

 Cupper Setup Parameters  | Lubrication Parameters |
 ┌─ Lubricator Speed References ──────────────────────┐
 │                                                    │
 │   Maximum Speed (full scale calibration):  [ 250 ]▲▼│
 │                                                    │
 │   Idle Speed (Cupper Stopped):             [  75 ]▲▼│
 │                                                    │
 └────────────────────────────────────────────────────┘




System Message:  All Faults Normal              ONLINE  10/13/2003  9:52 AM
```

1) **Lubricator Maximum Speed (SPM):** The "Lubricator Maximum Speed" parameter is used to scale the 0-10VDC analog output such that when the cupper is running at the speed entered in "Lubricator Maximum Speed", the analog output will be at 10 volts. This is typically set to the running high speed of the Cupper or slightly higher.

2) **Lubricator Idle Speed (SPM):** This parameter determines the speed the lubricator will run at when the cupper is stopped (de-clutched).

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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 with.
- View/Set the Allen-Bradley PLC destination node.
- Select the starting Allen-Bradley PLC destination file number.
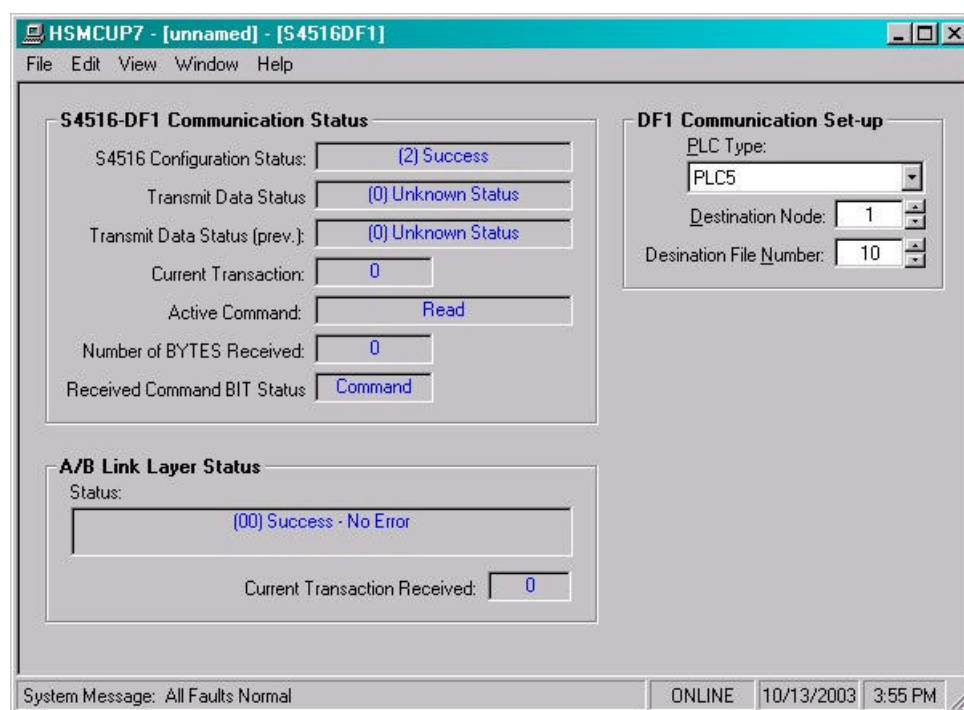
S4516 Configuration Status: This displays the current state of the configuration of the S4516 serial communications board. System function sfunc19(); (S4516 configuration) is used to set the S4516 configuration (network node address, network baud rate and USER port baud rate). This must be executed prior 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. This 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 sent 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.
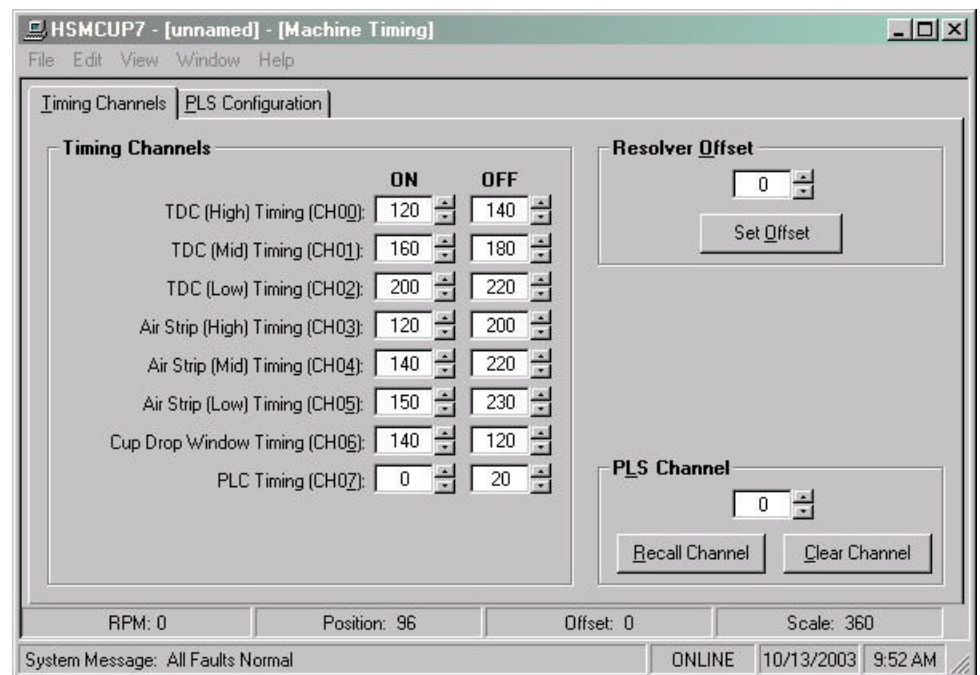
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4.5.4 THE MACHINE TIMING WINDOW

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 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
resolver.

Position: This is the current "Position" in degrees of the 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 (inch the cupper to top dead center TDC).

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.

SECTION 4
HSMCUP7 WINDOWS BASED
SET-UP PROGRAM REFERENCE

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 General Timing Signal Locations section. Setpoints 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.

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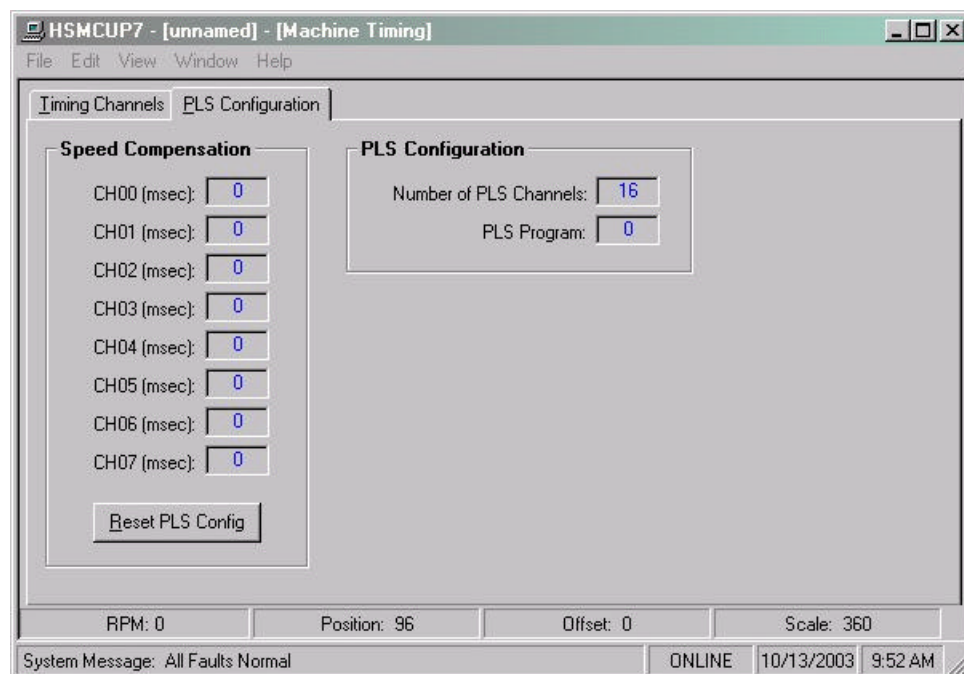
4.5.5 THE SHIFT DATA WINDOW

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 two categories, similar to that of the Keypad/Display. These
sections are as follows:

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) **Strokes:** This is the total number of strokes made for the shift.
   This is essentially a counter.

2) **Die Jams:** This is the total number of die jam or cup jam faults
   that occurred for all stations on the shift.

_____

3) **Die Jams/Cup Jams per Station:** This is the number of die jam or cup jam faults that occurred on each station on the shift.

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.
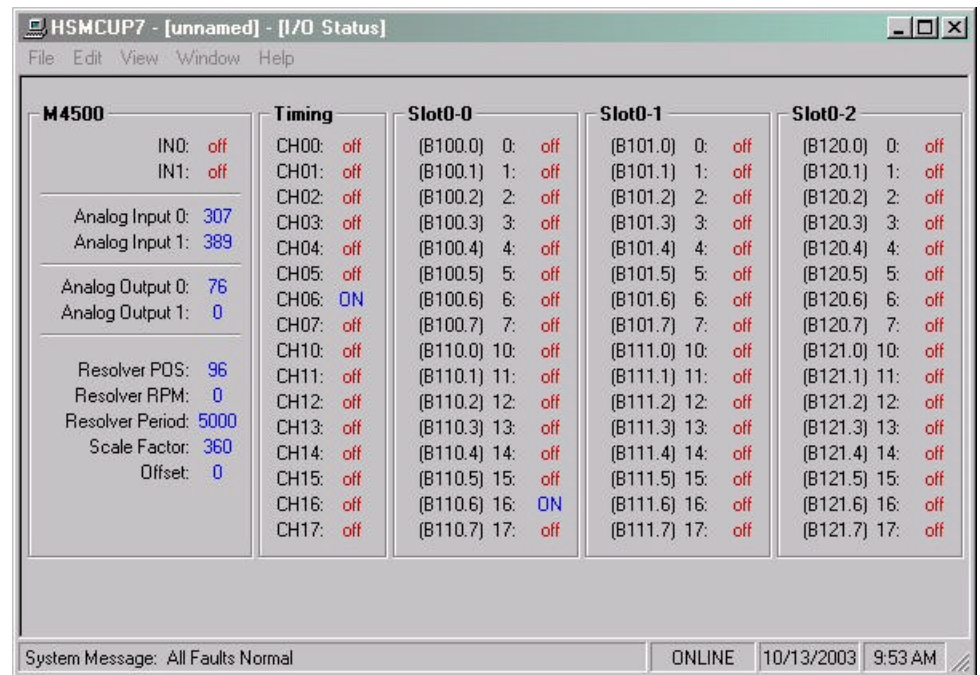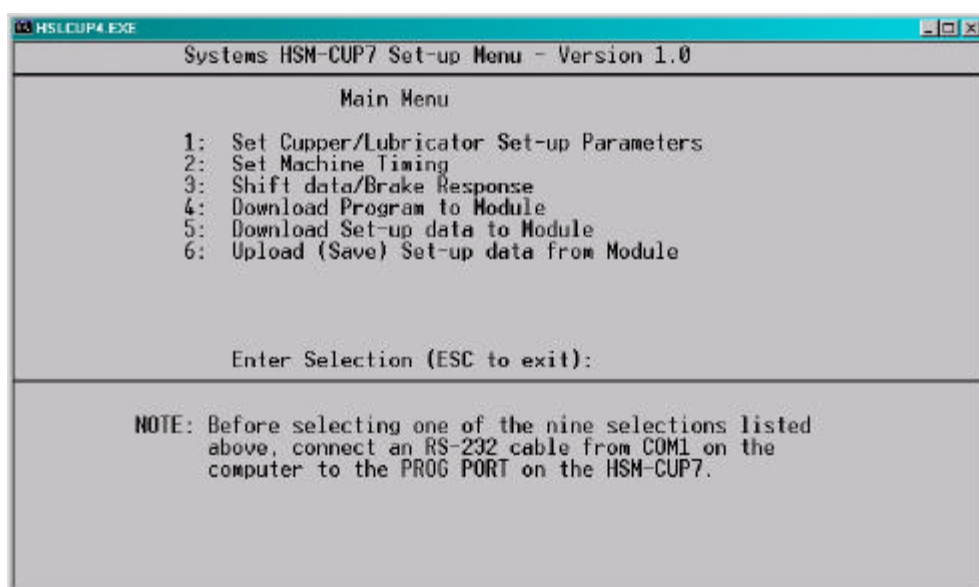
The DOS based "HSLCUP4" set-up program is menu driven program, allowing the user to easily view data or alter set-up variables using a laptop or personal computer. In addition to setting the set-up variables, it can be used to download the application program to the module as well as download and up-load the set-up data and save it to disk. The set-up variables are used to configure and tune the HSL-CUP4 to match the configuration and performance of the specific cupper (see section 2.8).

The main menu of the "HSLCUP4" set-up program incorporates the following menu selections:


```
HSLCUP4.EXE                                                    _ □ ×

          Systems HSM-CUP7 Set-up Menu - Version 1.0

                         Main Menu

          1:  Set Cupper/Lubricator Set-up Parameters
          2:  Set Machine Timing
          3:  Shift data/Brake Response
          4:  Download Program to Module
          5:  Download Set-up data to Module
          6:  Upload (Save) Set-up data from Module




               Enter Selection (ESC to exit):

     NOTE: Before selecting one of the nine selections listed
           above, connect an RS-232 cable from COM1 on the
           computer to the PROG PORT on the HSM-CUP7.
```

Note: The "HSLCUP4" 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 module. 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 "HSLCUP4" to the "PROG" port on the M4500.

The following sections are a complete description of the "HSLCUP4" selections and menus.
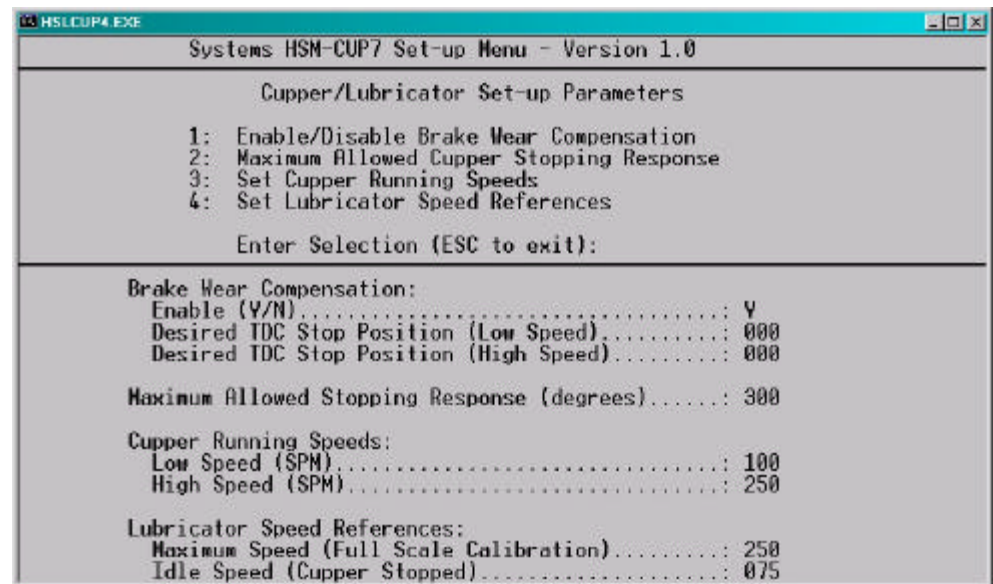
SECTION 5
HSLCUP4 DOS BASED
SET-UP PROGRAM REFERENCE

5.1 SET CUPPER/LUBRICATOR SET-UP PARAMETERS

This selection is used to set the various set-up parameters in the HSL-CUP4. When selected, the "Cupper/Lubricator Set-up Parameters" menu is invoked.

The "Cupper/Lubricator Set-up Parameters" menu contains the following selections:

```
HSLCUP4.EXE                                                    _ □ ×
          Systems HSM-CUP7 Set-up Menu - Version 1.0

               Cupper/Lubricator Set-up Parameters

          1:  Enable/Disable Brake Wear Compensation
          2:  Maximum Allowed Cupper Stopping Response
          3:  Set Cupper Running Speeds
          4:  Set Lubricator Speed References

               Enter Selection (ESC to exit):

   Brake Wear Compensation:
     Enable (Y/N).....................................: Y
     Desired TDC Stop Position (Low Speed)...........: 000
     Desired TDC Stop Position (High Speed).........: 000

   Maximum Allowed Stopping Response (degrees)......: 300

   Cupper Running Speeds:
     Low Speed (SPM).................................: 100
     High Speed (SPM)................................: 250

   Lubricator Speed References:
     Maximum Speed (Full Scale Calibration).........: 250
     Idle Speed (Cupper Stopped)....................: 075
```

The following selections set the corresponding parameters:

5.1.1 ENABLE/DISABLE BRAKE WEAR COMPENSATION

Brake Wear Compensation Enable? (0=No, 1=Yes): This prompt is used to enable or disable the brake wear compensation. If the compensation is to be disabled, enter "0" and press <ENTER>. If the compensation is to be enabled, enter "1" and press <ENTER>.

Desired TDC Stop Position (Mid Speed): This is the desired stopping location (in degrees) for a TDC stop in mid speed when the brake wear compensation is enabled. This is typical set to 000 degrees (Back Dead Center).

Desired TDC Stop Position (High Speed): This is the desired stopping location (in degrees) for a TDC stop in high speed when the brake wear compensation is enabled. This is typical set to 000 degrees (Back Dead Center).

_____

5.1.2 MAXIMUM ALLOWED STOPPING RESPONSE

Maximum Allowed Stopping Response (degrees): This defines what the maximum allowed brake response is before the "Brake Response Too Long" alarm is generated. If the actual brake response (number of degrees from when the brake is activated to the position where the press ends up at rest) when a TDC stop is performed is longer than this number, the alarm is generated. If the actual brake response is less, the alarm is not generated. Set this parameter to the value where the brake response is considered too long and service to the brake should be performed (typically 270 to 300 degrees).

_____

5.1.3 SET CUPPER RUNNING SPEEDS

Running Cupper Low Speed (SPM): This is the speed (in strokes per minute) that the cupper will run when in low speed.

Running Cupper High Speed (SPM): This is the speed (in strokes per minute) that the cupper will run when in high speed.

_____

5.1.4 SET LUBRICATOR SPEED REFERENCES

Lubricator Maximum Speed (SPM): The "Lubricator Maximum Speed" parameter is used to scale the 0-10VDC, analog output such that when the cupper is running at the speed entered in "Lubricator Maximum Speed", the analog output will be at 10 volts. This is typically set to the running high speed of the Cupper or slightly higher.

Lubricator Idle Speed (SPM): This parameter determines the speed the lubricator will run at when the cupper is stopped (de-clutched).
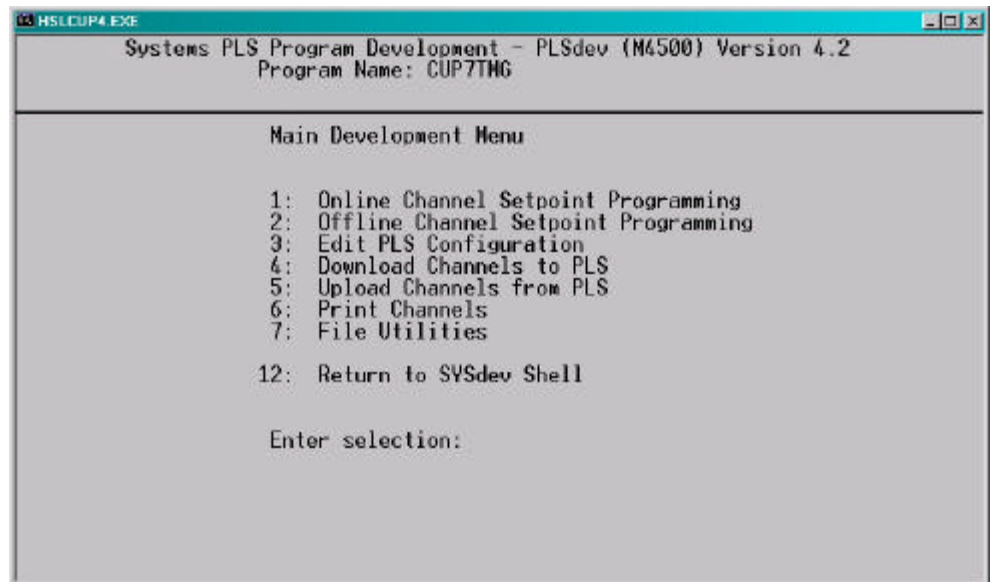
SECTION 5
HSLCUP4 DOS BASED
SET-UP PROGRAM REFERENCE

Note: When the cupper is running, the lubricator speed reference is proportional (as set by the "Lubricator Maximum Speed" scaling) to the speed of the cupper. This parameter is used to provide the speed reference when the cupper speed is zero.

5.2 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 HSL-CUP4). When selected, the PLS programming main development menu will be invoked using the default "CUP7TMG" channel set-point file.

From this menu, the user can zero the machine (set the resolver offset) and adjust the timing signal set-points. The following sections describe how to perform these functions. Section 6 provides a complete description of each timing signal.

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 PROG PORT on the HSL-CUP4.

5.2.1 ZERO THE MACHINE

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

1) Select the "2: Set Machine Timing" selection from the HSL-CUP4 set-up program main menu.

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

3) Select "F9: POS/RPM" and observe the "POS:" field. Verify that as the machine is rotated forward (either inching or barred) that the position increases linearly from 0 through 359. If not, swap the S1 and S3 leads of the resolver at the HSL-CUP4 resolver connector. Then verify that the position then indeed does increase with forward movement. Press <ESC> to exit the "POS/RPM" update.

4) Position the machine at Top Dead Center.

5) Auto zero the resolver by selecting "F10: Set Offset". Enter "0" in the offset field and press <ENTER>. The HSL-CUP4 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.

---

6) Exit back to the PLS Main Development menu by pressing <ESC>. Exit back to the "HSMCUP7" set-up main menu by pressing <ESC> again.

5.2.2 ADJUSTING THE TIMING CHANNEL SET-POINTS

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

1) Select the "2: Set Machine Timing" selection from the HSL-CUP4 set-up program main menu.

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

3) 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 cupper 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 PLS Main Development Menu. Press <ESC> again to exit back to the "HSMCUP7" set-up main menu. The new channels will be saved both in the module and in the "CUP7TMG" file on the hard drive.
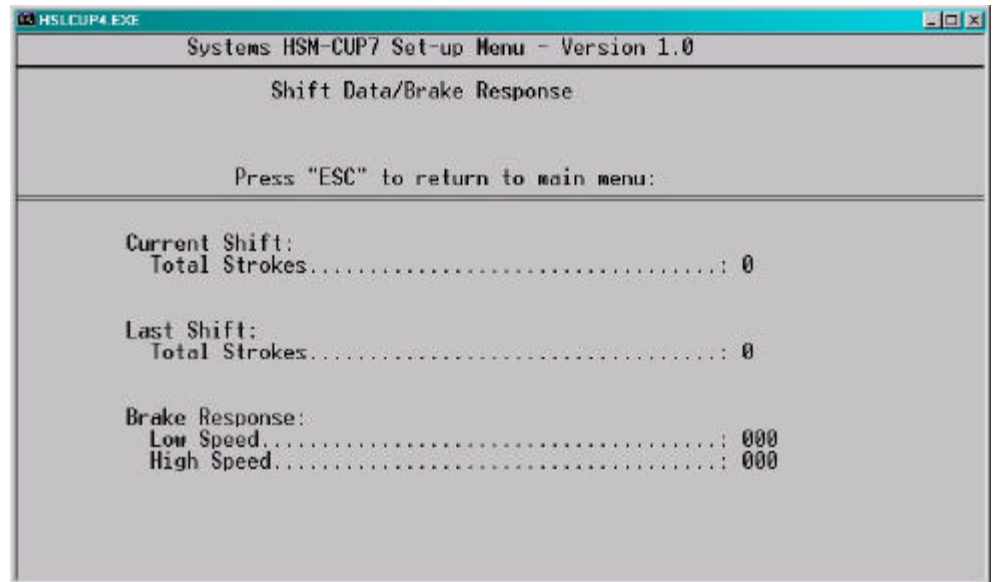

5.3 SHIFT DATA/BRAKE RESPONSE

This selection is used to view the Current Shift data, Last Shift data, and the Low and High Speed Brake Responses. When selected, the "Shift Data/Brake Response" menu is invoked.

The following data is displayed in the "Shift Data/Brake Response" menu:

```
HSLCUP4.EXE                                                    _□×

            Systems HSM-CUP7 Set-up Menu - Version 1.0

                      Shift Data/Brake Response


                   Press "ESC" to return to main menu:
_____

        Current Shift:
          Total Strokes...................................: 0


        Last Shift:
          Total Strokes...................................: 0


        Brake Response:
          Low Speed.......................................: 000
          High Speed......................................: 000
```

Current Shift - Total Strokes: This is the total number of strokes made so far into the current shift. This is essentially a stroke counter.

Last Shift - Total Strokes: This is the total number of strokes made in the last (previous) shift. This is essentially a stroke counter.

Note: The current shift 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. This data cannot be reset either from this menu or by the operator, only at the end of shift transition.

Mid Speed Brake Response (degrees): This is the number of degrees from the when the clutch was de-activated (at the TDC (Mid) timing) to where the cupper crankshaft came to rest when a TDC stop was performed at mid speed. This can be used to determine the general condition of the brake and whether servicing of the brake is required.

High Speed Brake Response (degrees): This is the number of degrees from the when the clutch was de-activated (at the TDC (hi) timing) to where the cupper crankshaft came to rest when a TDC stop was performed at high speed. This can be used to determine the general condition of the brake and whether servicing of the brake is required.

Note: The brake response of the brake for both high and mid speeds is updated after each TDC stop.

_____

5.4 DOWNLOAD PROGRAM TO MODULE

This selection is used to download the HSLCUP4 application program to the M4500 module. This should be performed when replacing the module or whenever the program has been changed. To download the program, perform the following:

Note: Program download cannot be performed while the cupper is running. All outputs on the HSL-CUP4 are turned "off" and no program execution is performed. The cupper should therefore be stopped before the download takes place.

1) Connect the RS-232 cable from the COM port on the computer to the "PROG" port on the HSL-CUP4.

2) Select "4: Download Program to Module" from the Main Menu. The current program ident, revision, and checksum for both the program on disk and already loaded in the module will be displayed. 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 "HSLCUP4" file could not be opened is displayed, then the "HSLCUP4" application program is not installed in the current directory.

3) Once program download is initiated, HSL-CUP4 program execution will cease, the current address being downloaded will be displayed, and the "RUN" LED on the module will flash continuously.

4) Once the download is complete, the "RUN" LED on the module will illuminate solid and program execution in the HSL-CUP4 will resume. Press any key to return to the "HSMCUP7" main menu.

5) This selection can also be used to verify the program ident, revision, and checksum without downloading the program. Perform steps 1 thru 3 above but instead of initiating the download in step 3, simply press the <ESC> key to abort the download once the ident, revision, and checksum have been displayed.

_____

SECTION 5
HSLCUP4 DOS BASED
SET-UP PROGRAM REFERENCE

5.5 DOWNLOAD SET-UP DATA TO MODULE

This selection is used to download the previously uploaded (saved) set-up variables to the HSL-CUP4 module. This should only be performed when replacing the module.

Note: The set-up data consists of the cupper and lubricator set-up parameters. Timing channel set-points are not stored as part of the set-up data, these are stored in the "CUP7TMG" file. 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 HSL-CUP4.

2) Select "5: Download Set-up data to Module". 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 download is complete, press any key to return to the main menu.

5.6 UPLOAD (SAVE) SET-UP DATA FROM MODULE

This selection is used to save the set-up variables from the HSL-CUP4 module 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 module, not on the file in the computer. By uploading (saving) the set-up variables to disk, they can be downloaded to the module in the event the module must be replaced.

The set-up data consists of the cupper and lubricator set-up parameters. Timing channel set-points are not stored as part of the set-up data, these are stored in the "CUP7TMG" file. 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 HSL-CUP4.

2) Select "6: Upload (Save) Set-up data from Module". 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 upload is complete, press any key to return to the main menu.

SECTION 5
HSLCUP4 DOS BASED
SET-UP PROGRAM REFERENCE

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

CH00: **TDC (High) Timing:** This signal is used to de-activate the clutch for a TDC stop at high speed.

> **Note:** The leading edge is used to de-activate the clutch, thus the width of the signal is not critical (generally set 20 degrees wide). When the brake wear compensation is enabled, this signal is adjusted automatically by the HSL-CUP4. If the brake wear compensation is disabled, this signal must be set manually. In this case, it should be set such that the press stops at top dead center for a TDC stop at high speed.

CH01: **TDC (Mid) Timing:** Same as the TDC (High) timing (CH00) except used when the machine is running in mid speed.

CH02: **TDC (Low) Timing:** Same as the TDC (High) timing (CH00) except used when the machine is running in low speed. The TDC (Low) timing does not incorporate the brake wear compensation feature and must therefore be set manually.

CH03: **Air Strip (High) Timing:** This signal is used to activate the air strip solenoid when the machine is running in high speed. The air strip is "on" for the entire window that CH03 is "on" while the machine is running. This signal is generally set "on" about 120 degrees and then set "off" at about 200.

CH04: **Air Strip (Mid) Timing:** Same as the Air Strip (High) timing (CH03) except used when the machine is running in mid speed. This is generally set "on" about 140 degrees and then "off" at about 220.

CH05: **Air Strip (Low) Timing:** Same as the Air Strip (High) timing (CH03) except used when the machine is running in low speed. This is generally set "on" about 150 degrees and then "off" at about 230.

SECTION 6
GENERAL TIMING
SIGNAL LOCATIONS

CH06: **Cup Drop Window Timing:** This signal is used to verify that the cups do drop correctly from the die. The cups must drop inside this window to avoid a die jam fault and the cups must not be detected outside this window in order to avoid a cup jam fault. The signal is generally set "on" at 140 degrees (or the point where the cups are first freed from the punches) and set "off" at 120 degrees (almost one stroke later to allow the maximum amount of time for the cups to drop).

CH07: **PLC Timing:** This is a general purpose timing signal provided as an output which can be input to the host PLC and used for whatever purpose desired by the host PLC. In addition this signal can be used to jumper out un-used die stations on machines that are less than 16-out. In this case this signal simulates the cup drop for the un-used stations in order to avoid a die jam.

CH10: **Motion Timing:** This is a pulse train set "on" for 30 degrees and then set "off" for 30 degrees through-out the entire channel.

The following are recommended spares for the HSL-CUP4. These parts are available through Systems Engineering Assoc. Inc.

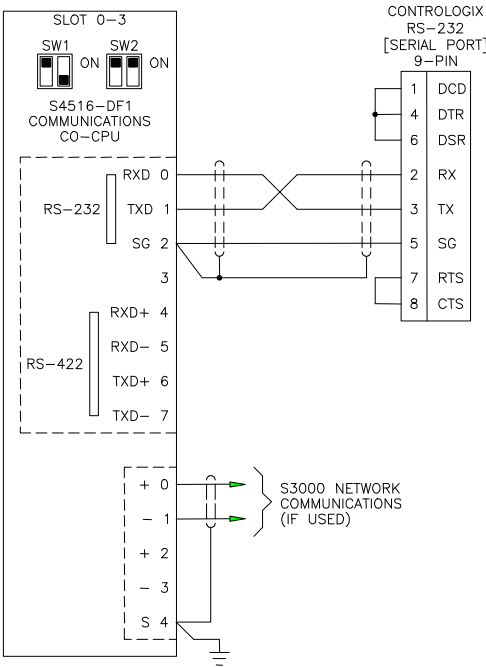| Quantity	Part Number	Description
1ea.	M4500	PLC/PLS Processor/Chassis – 4 Slot
1ea.	P4500	Power Supply
1ea.	S4563	16 Point 10-30VDC Input Board
1ea.	S4568	8 Input/8 Output 10-30VDC I/O Board
1ea.	D4591	Keypad/Display

SECTION 7
RECOMMENDED SPARE PARTS

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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 and should be set to:
POLE 1 = ON
POLE 2 = ON

APPENDIX A
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.
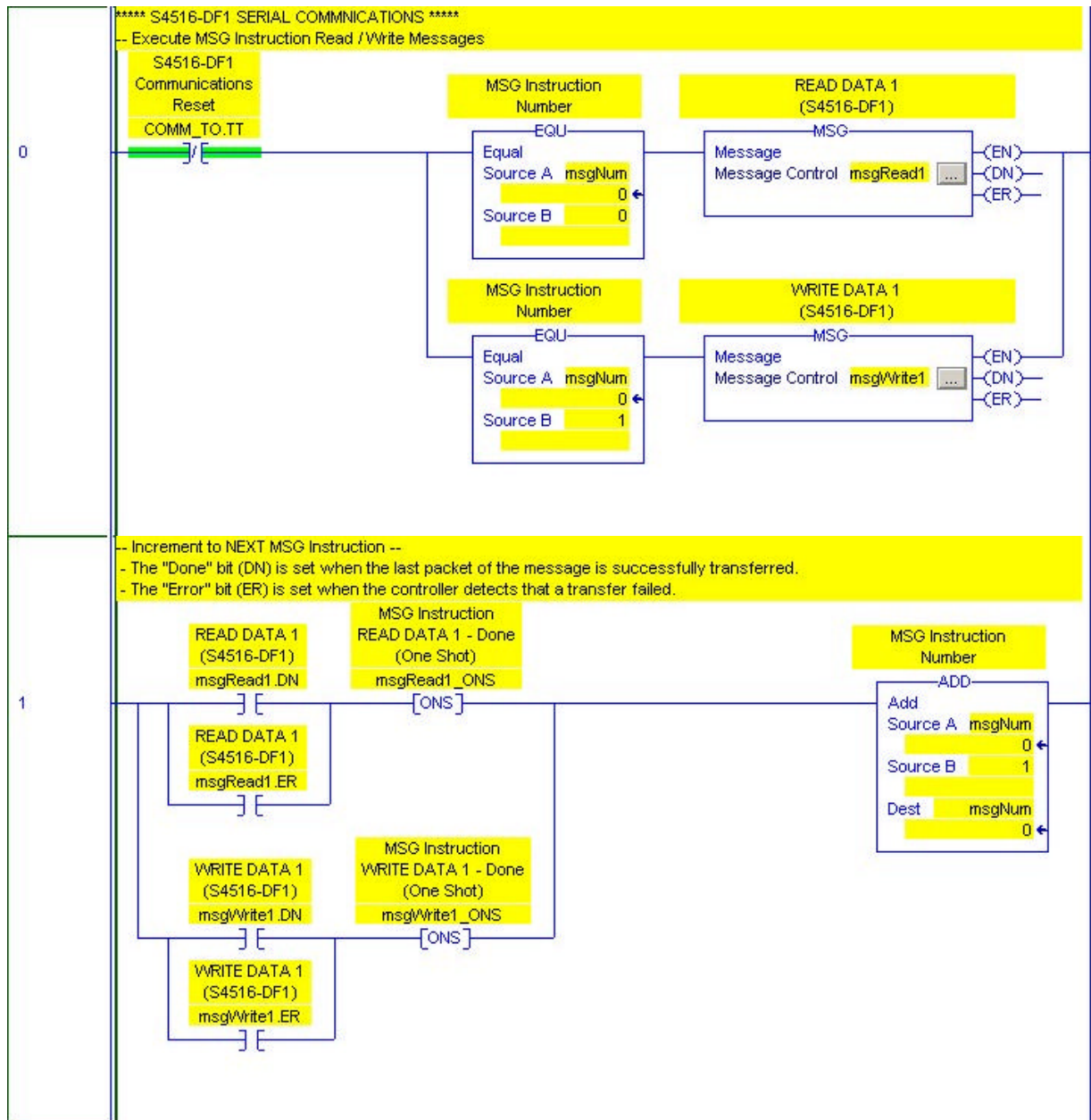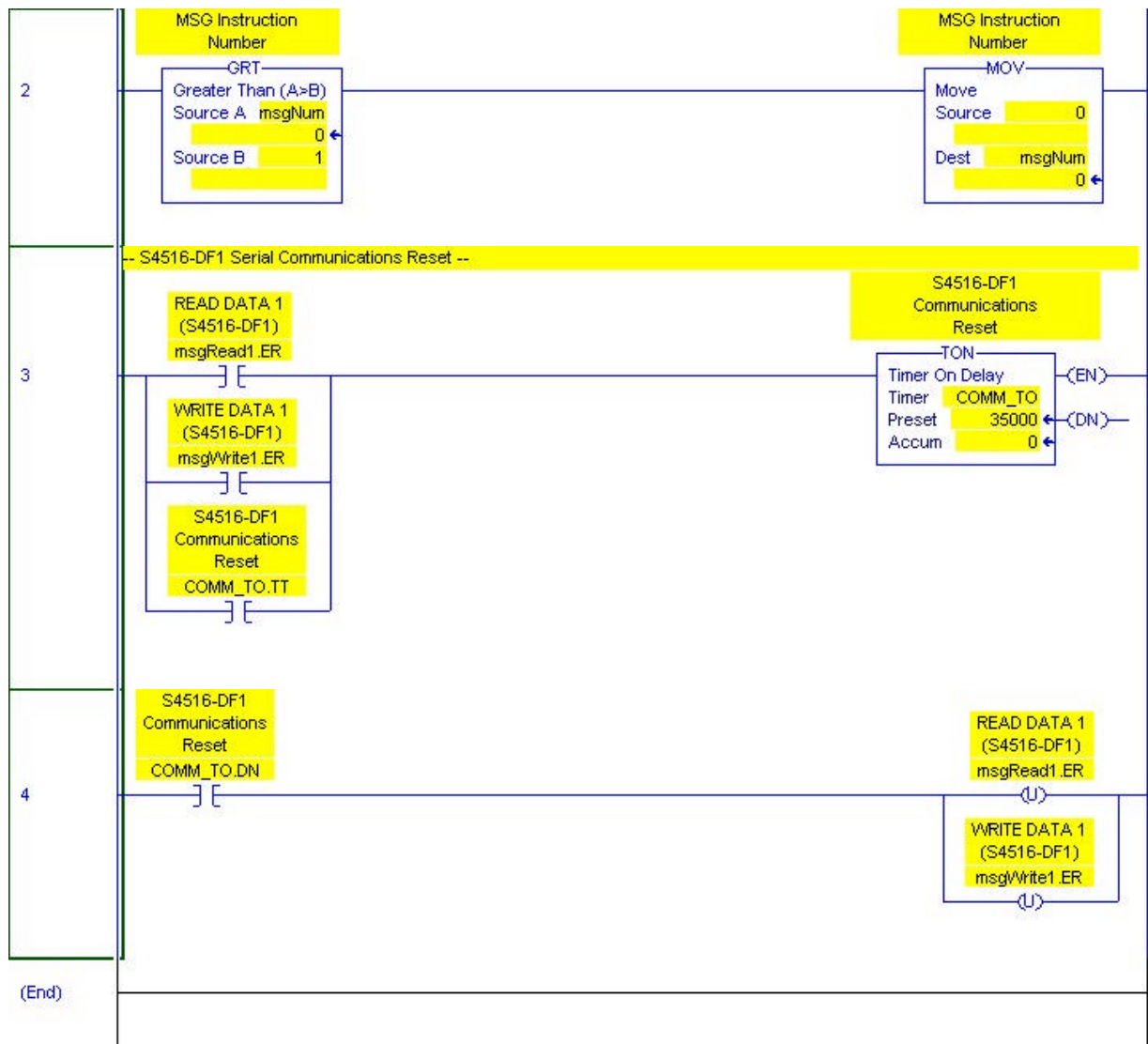
APPENDIX A
DF1 COMMUNICATIONS
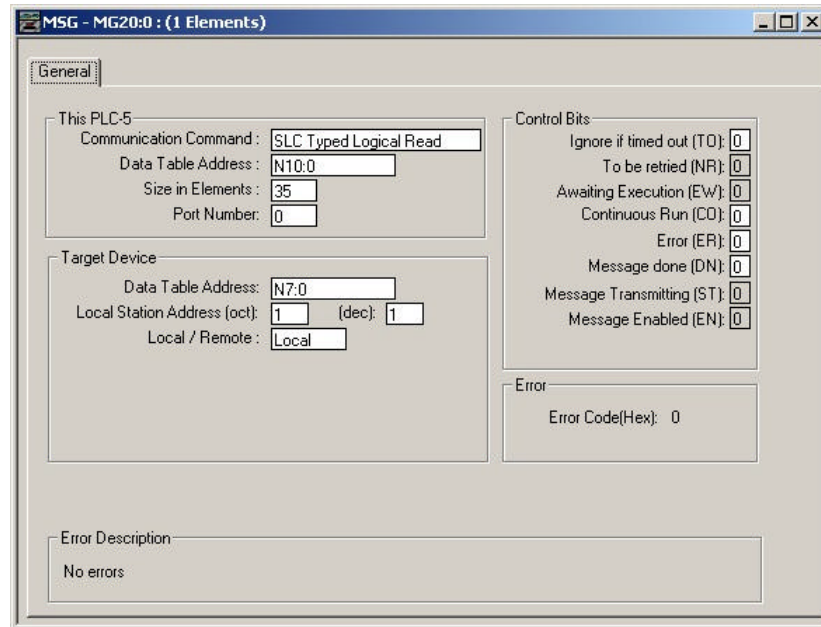
-- Roll-over MSG Instruction Number --

```
            MSG                                              MSG
            Instruction                                      Instruction
            Number                                           Number
              ┌─GRT──────────────────┐      ┌─MOV──────────────────┐
0002 ─────────┤ Greater Than (A>B)    ├──────┤ Move                  ├────
              │ Source A        N7:0  │      │ Source            0   │
              │                  0<   │      │                   0<  │
              │ Source B          1   │      │ Dest            N7:0  │
              │                   1<  │      │                   0<  │
              └──────────────────────┘      └──────────────────────┘
```

-- S4516-DF1 Serial Communications Reset --

```
                                                        S4516-DF1
          READ DATA 1                                   Communications
          (S4516-DF1)                                   Reset
            MG20:0                             ┌─TON──────────────────┐
0003 ────────┤ ┤──────┬────────────────────── │ Timer On Delay        ├──(EN)
             ER       │                        │ Timer            T4:0 │
                      │                        │ Time Base         1.0 │──(DN)
          WRITE DATA 1│                        │ Preset           35<  │
          (S4516-DF1) │                        │ Accum             0<  │
            MG20:2    │                        └──────────────────────┘
             ┤ ┤──────┤
             ER       │
                      │
          S4516-DF1   │
          Communications
          Reset       │
            T4:0      │
             ┤ ┤──────┘
             TT
```

-- Reset MSG Instruction Errors --

```
          S4516-DF1                                   READ DATA 1
          Communications                              (S4516-DF1)
          Reset                                        MG20:0
            T4:0                                          (U)
0004 ────────┤ ┤────────────────────────────┬───────────┤ ├──────
             DN                              │           ER
                                             │
                                             │      WRITE DATA 1
                                             │      (S4516-DF1)
                                             │       MG20:2
                                             │          (U)
                                             └───────────┤ ├──
                                                         ER
```

```
0005 ──────────────────────────────────────────────────(END)
```

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 --

MSG
Instruction
Number

MSG
Instruction
Number

0003

```
        GRT
        Greater Than (A>B)
        Source A      N7:0
                        0<
        Source B      1
                        1<
```

```
        MOV
        Move
        Source        0
                      0<
        Dest          N7:0
                      0<
```

-- S4516-DF1 Serial Communications Reset --

READ DATA 1
ERROR
(S4516-DF1)
N12:0

S4516-DF1
Communications
Reset

0004
```
        | |
        12
```

```
        TON
        Timer On Delay
        Timer         T4:0          (EN)
        Time Base     1.0
        Preset        35<           (DN)
        Accum         0<
```

WRITE DATA 1
ERROR
(S4516-DF1)
N12:40
```
        | |
        12
```

S4516-DF1
Communications
Reset
T4:0
```
        | |
        TT
```

-- Reset MSG Instruction Errors --

S4516-DF1
Communications
Reset
T4:0

READ DATA 1
ERROR
(S4516-DF1)
N12:0

0005
```
        | |
        DN
```
```
        (U)
        12
```

WRITE DATA 1
ERROR
(S4516-DF1)
N12:40
```
        (U)
        12
```

0006
```
                                    (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.

_____

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 35
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).

_____
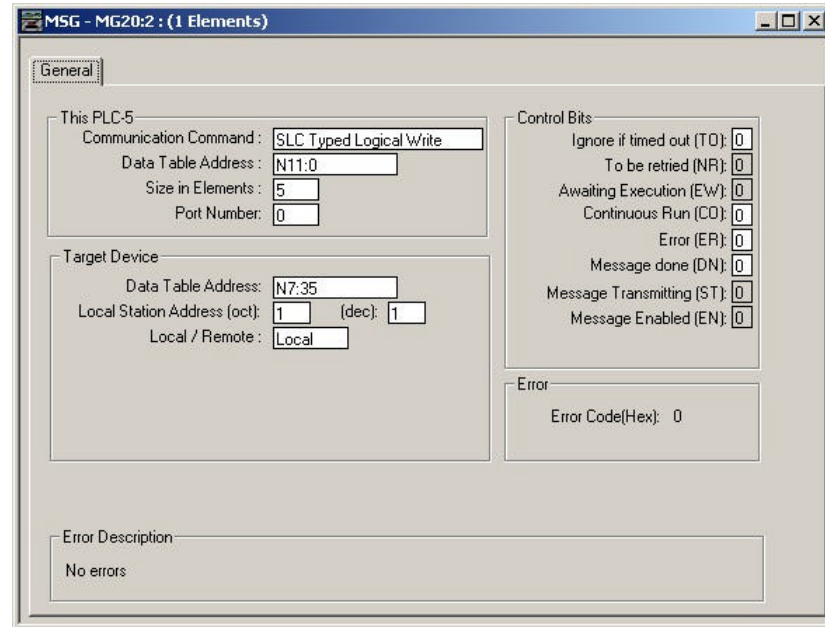
APPENDIX A
DF1 COMMUNICATIONS

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 5 elements written to the M4500 PLC are defined in the last section – Read/Write Data Definitions.

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 35 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).

APPENDIX A
DF1 COMMUNICATIONS

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 5
elements written to the M4500 PLC are defined in the last section –
Read/Write Data Definitions.

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 35 elements (total) read from the M4500 PLC are defined in the last section – Read/Write Data Definitions.

APPENDIX A
DF1 COMMUNICATIONS

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 5 elements written to the M4500 PLC are defined in the last section – Read/Write Data Definitions.

COMMUNICATION TAB - CONTROLOGIX

The communication configuration for a ControLogix PLC is setup as follows:
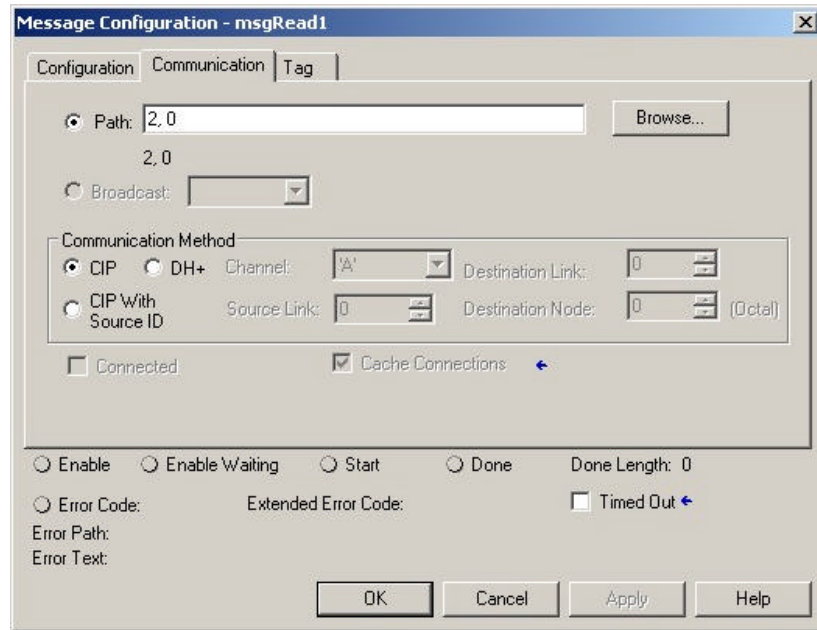
The "Path" describes the route the message takes to get to the destination. The format of the "Path" uses this format:
port, next_address

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.

APPENDIX A
DF1 COMMUNICATIONS

TAG TAB - CONTROLOGIX
The Tag configuration for a ControLogix PLC is setup as follows:

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

CHANNEL 0 SETUP

PLC5

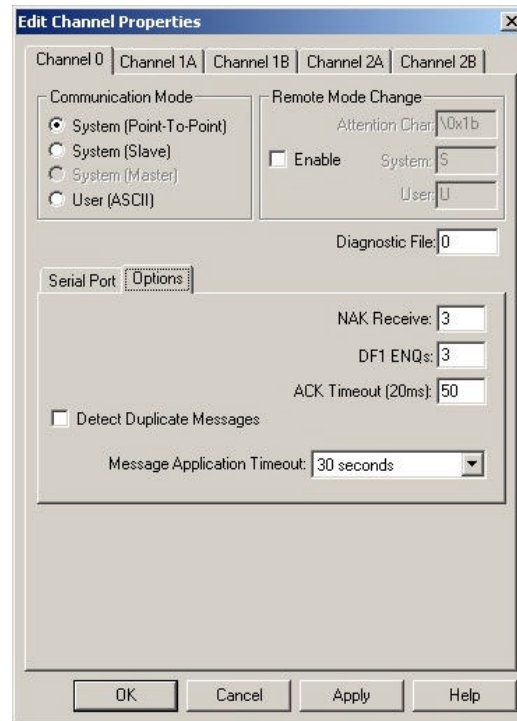The Channel 0 Serial Port should be setup as follows:
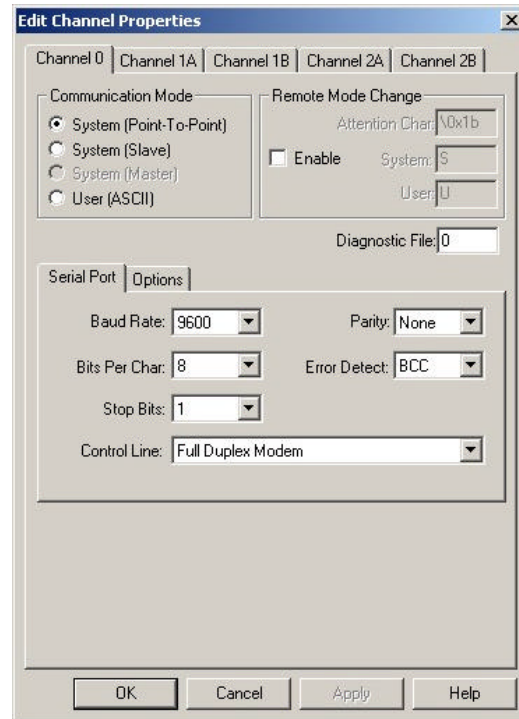
Note: The Communication Mode is setup for System (Point-to-Point).

PLC5

The Channel 0 Options are setup as follows:

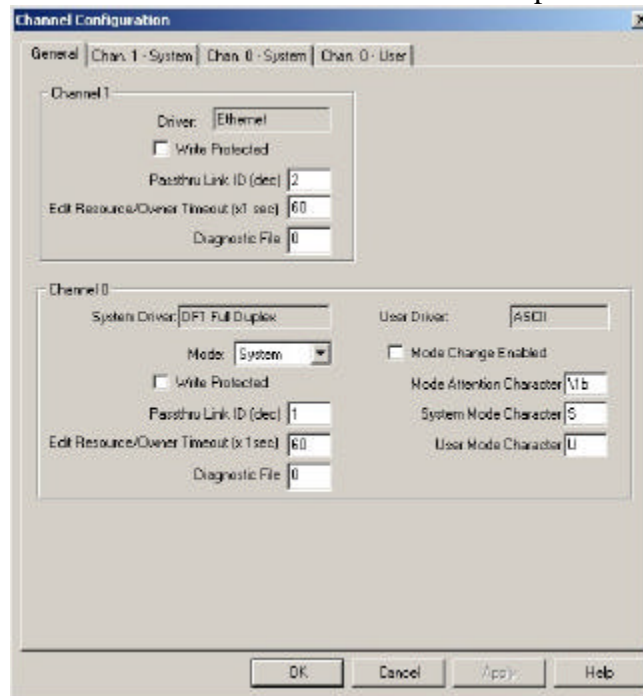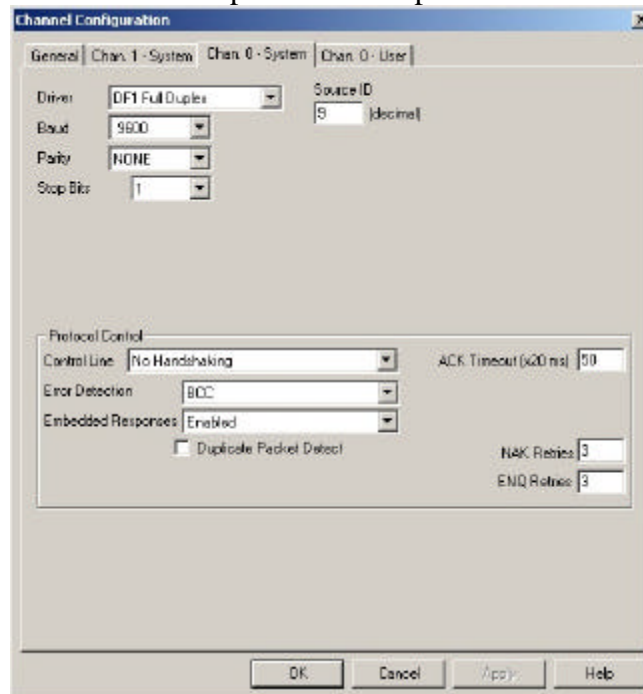**Note:** The "Detect Duplicate Messages" should be unchecked.

SLC500

The Channel 0 Serial Port should be setup as follows:

The Channel 0 Options are setup as follows:

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

APPENDIX A
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 (35 Elements) Is Defined As Follows:

Description	M4500 Add	Mapped Add	PLC Add	Function
General:				
Speed, CPM (Resolver RPM)	W182	W800	N7:0	R/O
Resolver Pos.	W180	W802	N7:1	R/O
Number of Strokes (Lo, 0-9,999)	W1100	W804	N7:2	R/O
Number of Strokes (Hi, 10,000's)	W1102	W806	N7:3	R/O
Total Die Jams (Lo, 0-9,999)	W1104	W808	N7:4	R/O
Spare	-	W810	N7:5	R/O
Die Jams Station #1	W1108	W812	N7:6	R/O
Die Jams Station #2	W1110	W814	N7:7	R/O
Die Jams Station #3	W1112	W816	N7:8	R/O
Die Jams Station #4	W1114	W818	N7:9	R/O
Die Jams Station #5	W1116	W820	N7:10	R/O
Die Jams Station #6	W1118	W822	N7:11	R/O
Die Jams Station #7	W1120	W824	N7:12	R/O
Die Jams Station #8	W1122	W826	N7:13	R/O
Die Jams Station #9	W1124	W828	N7:14	R/O
Die Jams Station #10	W1126	W830	N7:15	R/O
Die Jams Station #11	W1128	W832	N7:16	R/O
Die Jams Station #12	W1130	W834	N7:17	R/O
Die Jams Station #13	W1132	W836	N7:18	R/O
Die Jams Station #14	W1134	W838	N7:19	R/O
Die Jams Station #15	W1136	W840	N7:20	R/O
Die Jams Station #16	W1138	W842	N7:21	R/O

APPENDIX A
DF1 COMMUNICATIONS

Description	M4500 Add	Mapped Add	PLC Add	Function
Alarm Status:	-	W844	N7:22	R/O
Spare (Bit 00)	-	B844.0	N7:22/0	R/O
Timing Signal Fail (Bit 01)	F8	B844.1	N7:22/1	R/O
Clutch Output #1 Fail (Bit 02)	F48	B844.2	N7:22/2	R/O
Clutch Output #2 Fail (Bit 03)	F49	B844.3	N7:22/3	R/O
No Motion Alarm (Bit 04)	F42	B844.4	N7:22/4	R/O
Resolver Fail Alarm (Bit 05)	F43	B844.5	N7:22/5	R/O
Coil Stock O'Ride Mode Fault (Bit 06)	F56	B844.6	N7:22/6	R/O
Spare (Bit 07)	-	B844.7	N7:22/7	R/O
Spare (Bit 08)	-	B845.0	N7:22/8	R/O
Spare (Bit 09)	-	B845.1	N7:22/9	R/O
Spare (Bit 10)	-	B845.2	N7:22/10	R/O
Spare (Bit 11)	-	B845.3	N7:22/11	R/O
Spare (Bit 12)	-	B845.4	N7:22/12	R/O
Spare (Bit 13)	-	B845.5	N7:22/13	R/O
Spare (Bit 14)	-	B845.6	N7:22/14	R/O
Spare (Bit 15)	-	B845.7	N7:22/15	R/O
Die Jam Alarm Bits (station 1 to 16)	W104	W846	N7:23	R/O
Cup Jam Alarm Bits (station 1 to 16)	W106	W848	N7:24	R/O
Spare	-	W850	N7:25	R/O
Spare	-	W852	N7:26	R/O
Spare	-	W854	N7:27	R/O
Spare	-	W856	N7:28	R/O
Spare	-	W858	N7:29	R/O
Spare	-	W860	N7:30	R/O
Spare	-	W862	N7:31	R/O
Spare	-	W864	N7:32	R/O
Spare	-	W866	N7:33	R/O
Spare	-	W868	N7:34	R/O

Data Written To The M4500 (5 Elements) Is Defined As Follows:

Description	M4500 Add	Mapped Add	PLC Add	Function
General:				
Spare	-	W870	N7:35	R/W
Spare	-	W872	N7:36	R/W
Spare	-	W874	N7:37	R/W
Spare	-	W876	N7:38	R/W
Spare	-	W878	N7:39	R/W