HSL-RT6-M45
Reynolds RT-6 Tester
Control (M4530 Based)
User's Manual

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Revised 30 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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APPENDICES

1.1 FEATURES

- Allows detection and rejection of leakers at speeds in excess of 2400CPM.

- Performs the following control functions:

    1) Detection of leakers (pin holes, split flanges, gross leakers, etc.). Does not reject good cans following a gross leaker or missing can.

    2) Auto photo multiplier tube (PMT) calibrate feature which continuously calibrates the PMT offset with machine running in normal operation.

    3) Static PMT gain calibration feature allows operator to calibrate the gain of the PMT at the push of a button using a calibrated leak can with the machine not running.

    4) Controls Odd and Even reject solenoids to reject cans at speeds greater than 2400CPM using the existing solenoids.

    5) Detects the following alarm conditions: Bad Pocket (excessive rejects from pocket), excessive good can rejection (light seals of machine compromised), timing signal failure, and PMT calibrate error.

    6) Data collection built-in including: total number of cans rejected count, number of cans rejected per pocket, and total number of good cans processed. (For both current shift and last shift).

- Halogen light source replaces both the existing fluorescent lamps and high frequency lamp driver for both increased test lumens and reliability.

- Optional Data/Set-up display (2 line X 40 character display with 24 key membrane keypad) allows local viewing of collected data (can count, total rejects, rejects per pocket) by the operator and set-up of all user variables (key switch enabled) by authorized personnel.

- Set-up and monitoring performed using "HSLRT6", an easy to use menu driven software package which runs on any IBM PC or compatible.

- Provided with resolver for machine mounting (replaces existing encoder) and built in programmable limit switch (PLS) with auto zero feature to simplify machine timing.

- Based on high performance M4530 PLC/PLS/PMT module which allows easy trouble-shooting and user customization using SYSdev (DOS-based) programming package.

SECTION 1
GENERAL DESCRIPTION

1.2 FUNCTIONAL DESCRIPTION

The HSL-RT6-M45 light tester package interfaces directly with the machine mounted photo multiplier tube (referred to hereafter as the PMT), machine mounted resolver, and the odd and even reject solenoids. The HSL-RT6-M45 detects defective cans (leakers), via the PMT, and rejects these cans by activating the respective odd or even reject solenoid at speeds up to 2400CPM. The photo multiplier tube (PMT) outputs a low level, high frequency analog value, which is proportional to the amount of light entering the tube. This output is input directly to the M4530 module and conditioned as necessary by the module to deduce the actual amount of

light the tube detected. The tube is extremely sensitive and easily capable of detecting a hole of .002 or less diameter in a can. The gain of the tube is adjustable by adjusting the voltage applied to the tube (0-1200 volts). The light tester package contains a 0 to 2000 volt variable power supply which supplies this voltage for the tube.

Two timing signals, provided by the PLS and machine mounted resolver, are used to generate the PMT sample timing and reject timing. These signals are a Marker pulse, generated once per 12 cans and used to specify pocket #1, and a Sync pulse, generated once per pocket and used for the PMT sample and reject timing. The PMT tube is gated "on" at both the leading and trailing edges of the sync pulse. The leading edge gate pulse is used to actually sample the can for leaks and occurs when the tube is aligned with the pocket. The trailing edge gate pulse occurs between pockets at the dark portion of the shutter. This is used as a base "dark" measurement for offset calibration.

Note: The tube is only gated "on" at these leading and trailing edge transitions for less than one millisecond and not just enabled continuously. This prevents the tube from saturating when a gross leaker or missing can is present at the pocket, allowing the following cans to be fully tested and not just rejected while the tube recovers from saturation.

Two parameters, set in the M4530 module, are used to calibrate the tube. They are: the PMT gain and PMT input offset. The PMT gain is a 0 to 6 volt analog output on the M4530 which is feed into the 0 to 2000 volt power supply which supplies power to the tube. This parameter is used to set the gain of the tube such that the desired minimum leak will be rejected. Adjusting this output between 0 and 6 volts adjusts the voltage applied to the PMT between 0 and 1200 volts, where 0 volts would result in no light detected (zero gain) and 1200 volts would result in the maximum sensitivity (maximum gain). The M4530 provides both manual and automatic modes of adjustment for the PMT gain (see sections 3.3 and 3.5).

The PMT input offset parameter is an internal M4530 adjustment, which adjusts the offset of the PMT output at the input to the M4530. This adjustment is used to set the proper balance between the PMT value of good cans and the PMT value of bad cans such that the good cans are not rejected while the bad (leak) cans are (this essentially gets the PMT value into the proper range). The M4530 provides both manual and automatic modes of adjustment for the offset (see sections 3.1 and 3.2).

In general, optimum performance is achieved when both automatic offset and gain adjustment is selected. The automatic offset adjustment allows the M4530 to compensate for PMT drift due to temperature, etc. continuously while the machine is running. The automatic gain or calibration mode provides the simplest method of calibrating the PMT gain, allowing the operator to calibrate the PMT using just a calibrated leak can and no other special equipment.

1.3 ALARM DETECTION

The package detects the following alarms:

BAD POCKET: If any pocket rejects more than a 4 cans per 10 revolutions of the tester, this alarm is generated for that pocket. This indicates that either the light seal for the respective pocket is bad, or that some other mechanical problem relating to that pocket is occurring.

EXCESSIVE GOOD CAN REJECTION: If ten consecutive cans are rejected, this alarm is generated. Once ten consecutive good cans are detected, the alarm is cleared. This generally indicates that a major light leakage has occurred either between the PMT shoe (gimbal) and the shutter wheel or in the pocket seals. This output can be used by the existing control system to stop the machine, preventing the rejection of excessive good cans.

TIMING SIGNAL FAILURE DETECTION: 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.

PMT CALIBRATE ERROR: If the M4530 is unable to calibrate the gain of the tube when a static calibration is performed, this alarm is set. This occurs either when the PMT does not detect enough light and the gain is maximized, or when the PMT detects too much light and the gain is minimized. In addition, this alarm occurs if the automatic offset adjustment routine adjusts the offset to the maximum or minimum offset but still cannot compensate for the offset of the PMT.

The above alarms can be mapped to discrete outputs on the M4530 to interface with the existing system if desired.

SECTION 1
GENERAL DESCRIPTION

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1.4 DATA COLLECTION

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

1) Total number of good cans tested
2) Total number of rejected cans
3) Total number of rejected cans for each pocket

This data can either be viewed locally on the display by the operator, viewed through the "HSLRT6" set-up program, or can be sent to the host PLC via RS-232 communications (MODBUS or Allen-Bradley DF1 protocols) using the optional S4516 communications board. This information is updated ("current" shift transferred to "Last" shift) based on the change of state of a discrete input. This input can be activated on an 8 or 12 hour shift basis or alternatively could be activated manually on a label run basis depending on the user's preference.

In addition to the shift data collection, a separate buffer is available to collect rejected cans per pocket counts as a diagnostics aid to the operator for trouble-shooting a bad seal problem for a specific pocket. Unlike the shift data, these counts can be reset manually by the operator at will. This allows the operator to note an abnormally high count on a specific pocket, attempt to correct the problem, reset the counts and then check the counts at a latter time to determine if the problem is corrected. This data is viewed on the HSL-RT6-DSP display.

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1.5 HALOGEN LIGHT SOURCE

The HSL-RT6-M45 package is provided with a halogen light source which replaces the existing fluorescent lamps and high frequency lamp driver. This provides light in the spectrum the PMT is optimized for but provides a number of additional benefits as well including:

1) Increased test lumens which allows for a greater degree of system sensitivity.

2) Elimination of the high frequency lamp driver and the failures associated with the driver. The halogen lamps are powered directly from 120VAC, 50/60HZ for the ultimate in lamp source simplification and reliability.

3) Reduction of light emitted in the UV spectrum (as compared to the use of black light fluorescent) for increased personnel safety.

The halogen light source is mounted on the existing lamp hood once the existing fluorescent lamps, ballast, and hood cover are removed.

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1.6 LED STATUS INDICATIONS

The following 4 status LEDs are located directly above the "CAL" port on the M4530:

PWR: "On" when +24VDC power is applied to the PMT section of the M4530 (this +24VDC also supplies power to the 2000 volt power supply of the PMT).

CAL: "On" after the calibrate procedure has been performed and the M4530 was able to calibrate the PMT gain successfully. "Off" if the PMT gain was not successfully calibrated. "Flashing" while the calibrate procedure is in process. See section 3.3 for details on the calibrate procedure.

MAINT: "On" when an offset error has occurred. See section 7.2 for details.

REJ: "On" when a leaker can is detected by the PMT. "Off" when a good can is detected by the PMT.

The following 3 status LEDs are located directly above the "PROG" port on the M4530:

PWR: "On" when +5VDC power is supplied from the P4500 power supply to the M4530.

RUN: "On" steady when the M4530 PLC section is running a valid user's program. "Off" when an internal fault is detected or when a valid user's program has not been loaded. The RUN LED will flash during program download as well.

FLT: "On" when an internally detected fault has occurred in the M4530 PLC section. See section 7.3 for details.

SECTION 1
GENERAL DESCRIPTION

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The standard HSL-RT6-M45 package is provided in a NEMA 12 enclosure for mounting on the machine directly.

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2.1 WHAT'S INCLUDED

Verify that the following items are included when unpacking the HSL-RT6-M45:

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2.1.1 HSL-RT6-M45 (STANDARD PACKAGE)

1ea.	HSL-RT6-M45 NEMA 12 enclosure including the following:
	1ea. M4530 PLC/PLS/PMT module
	1ea. P4500 Power Supply
	1ea. PS2000N1 High Voltage (2000 volts) Power Supply
1ea.	9956B-16 Photo Multiplier Tube
1ea.	B2F-RFI PMT Housing (with A1H PMT Preamp and GB1BH PMT Gating Circuit)
1ea.	PMT Mounting bracket set (15-002-1 and 15-002-2)
1ea.	PMT Cable Set (2ea. BNC Cables-4ft., 1ea. Lemo Cable-4ft)
1ea.	RSV34-MS1 Resolver
1ea.	RSV-RSCBLE-20 Resolver Cable
1ea.	Halogen Light Source Assembly
1ea.	HSL-RT6-M45 User's Manual
1ea.	M4530 User's Manual
1ea.	HSL-RT6-M45 Program Disk

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2.1.2 HSL-RT6-M45 OPTIONS (PURCHASED SEPARATELY)

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

1ea.	S4516 Data Communications Board (MODBUS and DF1 protocols)
1ea.	HSL-RT6-DSP Data/Set-up Display (D4591 2 Line X 40 character display with 24 key keypad mounted in a NEMA 12 mini-pedestal for direct mounting to the HSL-RT6-M45 enclosure).
1ea.	S4573 16-Point 10-30VDC Output to drive individual pocket reject indicators.

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SECTION 2
INSTALLATION

2.2 POWER REQUIRED

The HSL-RT6-M45 is powered from 115VAC, 50/60HZ and +24VDC. The 115VAC is used to power the M4530 module and the Halogen Light source while the +24VDC is used to power the PMT section, 2000 volt power supply, and +24VDC I/O (odd/even reject solenoids, etc.). The +24VDC current required by the HSL-RT6-M45 is approximately only 1.0 AMP more than the existing system's +24VDC current requirement, therefore the existing +24VDC power supply should be adequate.

Note: The +24VDC must be regulated (+/-10%).

2.3 MOUNTING THE HSL-RT6-M45 ENCLOSURE

The HSL-RT6-M45 enclosure should be mounted in the location that the high frequency lamp driver box was located. This is directly below the PMT location on the machine. To install the enclosure, first remove the wiring associated with the high frequency lamp driver and then remove the high frequency lamp driver box. Mount the HSL-RT6-M45 in the location the high frequency lamp driver box was mounted as conveniently close to the PMT as possible.

2.4 MOUNTING THE RSV34-MS1 RESOLVER

The HSL-RT6-M45 is designed to interface to a resolver (not encoder) for machine timing. To mount the resolver, perform the following:

1) Remove the existing encoder.

2) Mount the resolver in place of the encoder making sure the resolver shaft does not bind when the machine is rotated. Refer to the RSV34-MS1 data sheet for details on mounting the resolver.

3) Connect the supplied RSV-RSCBLE-20 cable to the MS connector on the resolver. Route the resolver cable in a separate conduit, away from all other high voltage (motor leads) and control wiring. Wire the cable directly to the 8-pin resolver connector on the M4530 (see section 2.7).

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2.5 MOUNTING THE PMT HOUSING

The HSL-RT6-M45 PMT replaces the entire existing Reynolds PMT assembly (with the exception of the shutter gimbal which is used) and is actually mounted in the same location. To mount the PMT, perform the following:

1) Remove the existing Reynolds PMT assembly.

2) Mount the supplied 15-002-2 PMT collet to the 15-002-1 mounting plate as shown in figure 1 on the drawing at the back of this manual, if not already done.

3) Carefully slide the 15-002 assembly over the PMT housing from the rear as shown in figure 1 and slide up until seated against the front lip of the PMT housing. Tighten the collet set screws against the PMT to hold the PMT in the collet.

4) Mount the entire PMT assembly to the machine frame, using the existing PMT mounting holes. When mounting the assembly, make sure the front of the PMT assembly is seated and sealed in the existing shutter gimbal.

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2.6 INSTALLING THE PMT TUBE INSIDE THE PMT HOUSING

These instructions are used to install the tube in the housing both at the initial installation of the HSL-RT6-M45 and when it is necessary to replace the tube. The 9956B-16 tube is installed inside the B2F-RFI housing once the housing is installed on the machine as follows:

IMPORTANT: For your safety, power to the PMT housing must be "off" prior to removing the Preamp/Gating Circuit assembly from the B2F-RFI housing. The Preamp/Gating Circuit and PMT are supplied with as much as 2000 volts DC. This power must be removed before any part of the B2F-RFI housing seal is broken. The housing is powered from the PS2000N1 which is powered from the +24VDC power supply. Therefore disconnecting the +24VDC power supply will power down the PS2000 power supply.

1) Disconnect the +24VDC power supply which powers the PMT section and PS2000N1 high voltage power supply.

2) Remove the Preamp/Gating circuit assembly from the B2F-RFI housing by unscrewing the connector plate from the housing and then removing the Preamp/Gating assembly. The Preamp/Gating assembly is attached to the connector plate and is removed from the housing with the plate.

3) Carefully install the 9956B-16 tube in the Preamp assembly connector. The tube is keyed (by a missing pin in the tube) and should fit in the Preamp connector only one way.

4) Carefully install the Tube/Preamp/Gating assembly back in the housing making sure the tube seats in the nose of the housing correctly and then screw the connector plate into the housing.

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2.7 WIRING THE HSL-RT6-M45

Perform the following to wire the HSL-RT6-M45:

1) Wire the odd/even reject solenoids and machine interlocks (main drive "on", sync timing output, leaker reject output, etc.) to the existing control system, referring to the electrical control schematic at the back of this manual, keeping all +24VDC wiring away from high voltage (motor leads) wiring.

2) Wire the machine mounted resolver directly to the 8-pin resolver input connector on the M4530 module using the supplied RSV-RSCBLE three pair, two conductor shielded cable. The shield of the resolver cable should be tied to SHLD terminal of the M4530 resolver input connector. Make sure the resolver cable shield is left floating at the resolver. Refer to the electrical control schematic at the back of this manual for details.

3) Wire +24VDC power from the user supplied +24VDC power supply to FU3 and wire #500 as shown.

4) Wire 115VAC, 50/60HZ power to fuses FU1 and FU2 as shown.

5) Connect the BNC cable marked "GATE" to the "GATE" connector on the B2F-RFI housing and then to the "GATE" connector on the side of the HSL-RT6-M45 enclosure. This signal "gates" the PMT "on" (applies the high voltage to the PMT) when the sample is taken.

6) Connect the BNC cable marked "SIG" to the "SIG" connector on the B2F-RFI housing and then to the "SIGNAL" connector on the side of the HSL-RT6-M45 enclosure. This is the output of the preamp from the PMT.

7) Connect the MHV connector on the end of the PS2000N1 cable to the "HV" connector on the B2F-RFI housing.

8) Connect the Lemo cable to the corresponding connectors on the B2F-RFI housing and the side of the HSL-RT6-M45 enclosure. This supplies +/-12VDC to the Preamp/Gating circuits of the B2F-RFI housing.

9) Keep the coax cables mounted in steps (5) through (8) above away from all other wiring. These signals are low level signals and should not be mixed with any other wiring.

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SECTION 2
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2.8 MOUNTING THE HALOGEN LIGHT SOURCE

The HSL-RT6-M45 package is provided with a halogen light source which replaces the existing fluorescent lamps and high frequency lamp driver. Mount the halogen light source assembly as follows:

1) Remove the cover from the existing fluorescent lamp hood.

2) Remove the existing fluorescent lamps, ballast, lamp brackets, and wiring (essentially "gut" the existing lamp hood).

3) The existing curved plexi-glass cover (mounted on the hood between the star wheel and hood) is retained. This prevents grease from being slung onto the halogen lamp glass covers. Clean the inside of the curved plexi-glass cover before mounting the halogen lamp assembly.

4) Mount the halogen light source assembly on top of the hood in the same fashion that the hood cover was mounted (the halogen lamp assembly replaces the hood cover).

5) Wire 115VAC power to the halogen lamps and fans of the assembly as shown in the schematic at the end of this manual.

6) This is also a good time to make sure the plexi-glass light windows at the pocket seals are clean and free of contaminates.

7) The hub of the starwheel is used as a reflector to illuminate the underside of the can to be tested. Verify that the hub is clean and well polished.

Due to the high radiated heat levels of halogen lamps, the lamps are turned "off" after a time delay when the machine stops. This prevents the halogens from baking the can that stops at the light test pocket. Once the machine starts again, the lamps are turned "on" immediately. This is controlled by CR1 in the HSL-RT6-M45 enclosure. In addition, a buck transformer is used to reduce the voltage on the lamps to about 80% of nominal line voltage. This reduces the radiated heat from the lamps without significantly reducing the lumens produced.

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2.9 HALOGEN BULB REPLACEMENT

Perform the following to replace either of the Halogen bulbs:

1) Disconnect power to the light source assembly and let the lamps and lamp housing glass covers cool.

2) Remove the lamp housing glass cover by removing the two wing nuts which secure the glass cover retainer with one hand and holding the glass cover with the other hand while the wing nuts are removed. Remove the glass cover from the assembly.

3) With a clean rag, remove the Halogen bulb from the fixture. One contact of the fixture is spring loaded, the bulb is removed by compressing the spring loaded contact and then removing the bulb.

4) Replace bulb with GE part number Q350T3/CL/HIR bulbs only. These are 350W, Halogen-IR lamps which produce approximately 50% more lumens per watt than ordinary Halogen lamps.

5) Install new bulb again using a clean rag to hold the bulb while it is being installed. Do not handle the quartz envelope directly as fingermarks or any type of grease may cause devitrification of the quartz resulting in reduced performance and possible breakage or shattering.

6) Once the bulb is re-installed, mount the glass cover back over the lamp housing, securing the cover with the retainer and wing nuts. Do not operate the light source assembly without the glass covers installed. The glass covers perform a number of functions including: preventing debris from being expelled inside the hood if the halogen lamp shatters, filtering the UV component of the light spectrum emitted from the lamp, and reflecting much of the heat generated from the halogen lamp out the top of the light source assembly instead of down into the machine.

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INSTALLATION

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2.10 MOUNTING THE KEYPAD/DISPLAY (OPTIONAL)

The D4591 HSL-RT6 Keypad/Display is mounted in a mini-pedestal which is mounted to the top of the HSL-RT6-M45 enclosure in the user's preferred location. To mount the display, perform the following:

1) Determine the desired location on top of the HSL-RT6-M45 enclosure to mount the HSL-RT6-DSP and punch a 2" hole at what will be the center of the pedestal. Drill 4ea. 9/32" holes around the 2" hole to match the pedestal mounting base.

2) Mount the HSL-RT6-DSP pedestal to the top of the HSL-RT6-M45 enclosure using the supplied gasket, bolts, and nuts.

3) Mount the Display enclosure to the top of the pedestal using the supplied gasket, bolts, and nuts.

4) Install the supplied 26-pin ribbon cable to the connector on the back bottom of the D4591 display (the cable connector is polarized and will only mate with the D4591 connector one way). Route the cable down the pedestal into the HSL-RT6-M45 enclosure.

5) Remove the four screws retaining the M4530 module to the back-panel and install the 26-pin ribbon cable to the display connector on the back of the M4530 module (the cable connector is polarized and will only mate with the M4530 connector one way). Install the M4530 back on the back-panel.

6) The HSL-RT6-DSP installation is now complete. Refer to section 4 for complete details on using the HSL-RT6 Keypad/Display.

2.11 HSL-RT6-M45 SOFTWARE INSTALLATION

Follow the steps below to install either the Windows or DOS based setup programs and PLC application program on a PC used to support the HSL-RT6-M45control system.

2.11.1 WINDOWS BASED SET-UP PROGRAM INSTALLATION

The HSLRT6 setup program is compatible with Windows 95/98/ME/2000/XP operating systems and is used to:
1) Setup (tune) the user adjustable variables.
2) Adjust the timing channel set-points.
3) Download the application program to the M4530 module.
4) Download (restore) or upload (save) the user setup variables from the M4530.
5) View "Rejects Per Pocket" and "Shift" data

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

1) Insert the HSLRT6 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 HSLRT6 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 HSLRT6 setup program can be executed from the "Systems" folder located in Programs from the Start menu.

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2.11.2 DOS BASED SET-UP PROGRAM INSTALLATION

The HSLRT6 DOS based set-up software is used to:
1) Setup (tune) the user adjustable variables.
2) Adjust the timing channel set-points.
3) Download the application program to the M4530 module.
4) Download (restore) or upload (save) the user setup variables from the M4530 to disk.
5) View "Shift" and "Rejects Per Pocket" data.

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

1) Create a directory off the root directory of the PC for the HSL-RT6-M45 called "HSLRT6". This will be used to store the "HSLRT6.EXE" setup program and HSLRT6 application program. Create this directory by typing the following at the DOS prompt:

   MD \HSLRT6<ENTER>

2) Install the disk labeled "HSL-RT6-M45 PROGRAMS" into the A: drive. Switch to the "HSLRT6" directory and install the "HSLRT6" set-up program by typing the following at the DOS prompt:

   CD \HSLRT6<ENTER>
   A:INSTALL<ENTER>

3) Add the HSLRT6 set-up program to your computer's menu software by creating a selection called "SET-UP HSL-RT6". The DOS commands executed for this selection should be:

   For the "SET-UP HSL-RT6" selection:
   CD \HSLRT6<ENTER>
   HSLRT6<ENTER>
   CD \<ENTER>

4) To execute the set-up program, simply select the "SET-UP HSL-RT6" selection from the menu software's menu.

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2.11.3 SYSdev PROGRAM DEVELOPMENT SOFTWARE INSTALLATION

The SYSdev Program Development software is used to perform on-line trouble-shooting and program modifications to the HSL-RT6-M45. If SYSdev was purchased with the HSL-RT6-M45 package and is not already installed on the your computer, install SYSdev onto the hard drive of your computer following the steps of the SYSdev Program Development manual.

2.11.4 APPLICATION PROGRAM INSTALLATION

The HSLRT6 application program is a SYSdev based program loaded into the M4530 module and performs the HSL-RT6-M45 logic. The HSLRT6 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 HSLRT6 program will have to be loaded onto the hard drive of the PC which is used to support the HSL-RT6. The SYSdev Program Development Software will also have to be loaded on the PC. To install this program perform the following:

1) Install the disk labeled "HSL-RT6-M45 PROGRAMS" into the drive.

2) For each of the " HSLRT6" directories (created in section 2.11.2), copy all the files from the disk to each of these subdirectories.

2.12 TUNING THE HSL-RT6-M45

The HSL-RT6-M45 is shipped from the factory with the PLC program "HSLRT6" loaded in the M4530 module (PLC section). This is the standard program used to implement the standard HSL-RT6-M45 light tester algorithms.

Once the HSL-RT6-M45 is installed and the control system is powered back up, perform the following to set-up and tune the HSL-RT6-M45. The set-up is performed using a PC running the "HSLRT6" set-up program or the optional Keypad/Display. See sections 5 or 6 for a description of the "HSLRT6" menus and variables and how to use the "HSLRT6" program. See section 4 for a description of the Keypad commands and menu displays of the HSL-RT6 Keypad/Display.

At the initial installation, prior to performing the set-up steps below, verify that the default user variables (see section 2.12.1) are set to the values listed.

SECTION 2
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2.12.1 DEFAULT SET-UP VARIABLES

As shipped, the user variables of the PMT section of the M4530 are set to the following defaults:

    PMT Gain (PMT Voltage 0-1200V) _____ : 1101
    Gain Calibrate PMT Input Average _____ : XXX
    M4530 PMT Input Sensitivity _____ : 7
    PMT Input Offset (-75 to 75) _____ : 000
    PMT Reject Can Threshold _____ : 075
    Automatic Offset Mode:
        Enabled (Y/N)_____ : YES
        Desired Good Can PMT Value _____ : 030
        Allowed Good Can Error _____ : 002
    PMT Gain Calibration Mode:
        Enabled (Y/N) _____ : YES
        Desired Calibrated Leaker Reject PMT value ___ : 120
        Allowed Calibrated Leaker Reject Error _____ : 005

Where "XXX" of the "Gain Calibrate PMT Input Average" can be any number. This will change when a calibrate cycle is performed.

2.12.2 SET MACHINE ZERO

Unlike the original encoder, the resolver shaft is not mechanically adjusted, to zero the timing, but instead is electronically adjusted in the PLS section. Position the machine with pocket #1 precisely aligned with the PMT, this is the machine zero location. Set the resolver offset per section 4.11 (HSL-RT6 Keypad/Display). Refer to section 5 (Windows based setup program reference) or section 6 (DOS based setup program reference) to set the resolver using the setup program.

Note: The M4530 PLS is automatically programmed with the Sync timing (CH00) and Marker timing (CH01). No other PLS timing channel programming is required by the user. The Sync timing goes "on" at the centerline of PMT tube to pocket alignment and goes "off" at the centerline in between pockets.

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2.12.3 VERIFY THE B2F-RFI PMT HOUSING OFFSET

The C634 A1H Preamp board inside the B2F/RFI housing contains an offset potentiometer, used to null any offset of both the PMT and amplifier circuitry. If this inherent offset of the PMT and amplifier is too great, this potentiometer may have to be adjusted to null the offset to zero. This is done by running cans through the machine and verifying the value the PMT offset automatically obtains. The PMT housing offset only needs to be set at the initial installation or any time the B2F-RFI PMT housing is replaced. All other offset variations due to temperature, etc. are automatically compensated for with the automatic offset adjustment feature of the M4530. This adjustment simply makes sure the offset potentiometer of the PMT housing is not set outside the normal range of operation. Verify the offset as follows:

1) Run the machine with cans at normal line speeds and verify that the offset is automatically adjusted until the "PMT Input Average" is equal to the "Desired Good Can PMT Value" within plus or minus 2. "Up Peak (Max)" and "Down Peak (Min)" should also be within plus or minus 5 of the "PMT Input Average".

2) If the offset exceeds + or -250 in an attempt to set the "PMT Input Average" equal to the "Desired Good Can PMT Value", the MAINT LED on the M4530 will be illuminated. This indicates that the PMT is detecting an excessive amount of light both when the cans are sampled and at the in-between pocket measurement. Verify that the machine is timed properly per section 2.12.2 and that no light leakage is occurring at any of the PMT seals (machine shutter to light seal plate, PMT to light seal plate, or at the PMT housing itself).

3) If the offset is greater then +/-20, disconnect the +24VDC power that powers the PS2000N1 high voltage power supply and remove the top of the B2F/RFI housing (side that contains connectors) and adjust the potentiometer on the A1H Preamp board (first board below connectors). Turning the pot clockwise will decrease the offset, turning it counter clockwise will increase the offset. One turn of the potentiometer changes the offset by about 40 to 50.

4) Re-install the top of the B2F/RFI housing, power up the +24VDC power supply that powers the PMT section of the M4530 and the PS2000N1 power supply and perform step 1 again. Repeat steps 1 thru 3 until the offset is less than +/-20 while the machine is running with good cans. The closer the offset is to zero, the better.

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2.12.4 CALIBRATE THE PMT GAIN

Stop the machine, install a calibrated leaker in the machine at the PMT and perform the gain calibration per section 3.4. If no calibration error occurred proceed to section 2.12.5.

If a calibration error did occur ("CAL" LED on front of M4530 "off" at completion of the calibration procedure), observe the value of the PMT gain, either on the "M4530 Set-up" menu of the "HSLRT6" set-up program or the "View PMT Data" menu of the HSL-RT6 Keypad/Display and verify the following:

1) If the "PMT Gain" is less than 500 volts and the "Gain Calibrate PMT Input Average" is greater than the "Desired Calibrated Leaker Reject PMT Value" by more than 5, the PMT detected too much light and was not able to reduce the gain of the PMT adequately to compensate for the amount of light detected. Verify that the calibrated leaker has a .0025 or less calibration hole in it and does not have any other areas of light leakage in the can. Verify that the seal at the pocket used for calibration is not leaking. Verify that no light leakage is occurring at any of the PMT seals (machine shutter to light seal plate, PMT to light seal plate, or at the PMT housing itself).

2) If the "PMT Gain" is at 1101 volts and the "Gain Calibrate PMT Input Average" is less than the "Desired Good Can PMT Value" by more than 5, then the PMT did not detect enough light and was not able to increase the gain enough to calibrate the M4530. Verify that the calibrated leaker has a .0025 calibration hole in it and also verify that the light source is generating an adequate supply of light (lamps are "on" when calibration is performed). If so, set the "Desired Calibrated Leaker Reject PMT Value" to a lower value (it can be set as low as 10 above the "Desired Good Can PMT Value") and try the calibration again. If the "Desired Calibrated Leaker Reject Value" is lowered, the "PMT Reject Can Threshold" should also be lowered (it should be between the "Desired Good Can PMT Value" and the "Desired Calibrated Leaker Reject Value").

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2.12.5 VERIFY CALIBRATED LEAKER REJECTION

Run the machine at normal production speeds and verify that calibrated leakers, when run through the machine, are rejected. Using the "HSLRT6" set-up program, observe both the Good Can Data and the Rejected Can Data. The "PMT Input Average" should be within plus or minus 2 of the "Desired Good Can PMT Value" set in the "M4530 Set-up Menu" (normally set to 30). The "Up Peak (Max)" and "Down Peak (Min)" should be within plus or minus 5 of the "PMT Input Average". As leaker cans are rejected, they will appear in the "Last Reject Value" through "8th to Last Reject Value" stack. When the calibrated leakers are run through the machine, the reject values of these cans will also appear in this stack.

If any of the calibrated leakers are not rejected when run through the machine, lower the "PMT Reject Can Threshold" and try again. This value can be lowered to within 5 above the "Desired Good Can PMT Value". If some of the calibrated leakers still are not rejected, increase the "PMT Gain" (this can be increased to a maximum of 1200 volts) and try again.

Note: Running the gain of the PMT above 1100 volts will shorten the life of the PMT. If some of the calibrated leakers are still not rejected, verify that the quality of light is adequate (both halogen lamps are "on" and hub of starwheel is polished).

If the machine seems to be rejecting an excessive amount of cans, select the "4: View Can/Reject Counts" selection from the Main Menu of the "HSLRT6" set-up program or the "Rejects Per Pocket" selection of the HSL-RT6-DSP display and observe the Per Pocket Reject Totals. If a particular pocket is rejecting a significantly higher number of cans than the other pockets, then that pocket most likely has a bad light seal (or some other mechanical problem). In general, this menu can be used to evaluate the reject performance of the machine.

SECTION 2
INSTALLATION

2.13 M4530/P4500/D4591 INSTALLATION

The following is provided only as a reference. These steps are performed by the factory prior to shipping the HSL-RT6-M45. These steps need only be performed in the event either the M4530 module, P4500 power supply, or D4591 display need to be replaced. Refer to the M4530 User's Manual for general details on installing the M4530, P4500, and D4591.

2.13.1 M4530 MODULE INSTALLATION

To install the M4530 module, perform the following:

1) Remove the cover from the M4530 chassis (retained with three captive screws on the lower front of the cover and two captive screws on each side of the M4530 chassis).

2) Install S4568 (SLOT0-0): This is the basic input/output board (reject solenoids, etc.). Set the slot address dip switches (SW1) on the S4568 to the following positions (slot0):

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

Install the S4568 in Slot0-0 (furthest left slot) of the M4530 chassis.

3) Install S4516 (SLOT0-1) (OPTIONAL): This is the optional communications (MODBUS or Allen-Bradley DF1) serial communications board. Set the slot address dip switches (SW2) on the S4516 to the following positions (slot1):

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

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

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

Install the S4516 in Slot0-1 (slot next to S4568) of the M4530 chassis.

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4) Install S4573 (SLOT0-2) (OPTIONAL): This is the optional pocket reject indicators output board. Set the slot address dip switches (SW1) on the S4573 to the following positions (slot2):

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

    Install the S4573 in Slot0-2 (slot next to S4516) of the M4530 chassis.

5) Install the cover back over the M4530, 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 M4530 chassis.

6) Connect the display ribbon cable to the connector on the back of the M4530 (the connector on the cable is polarized and should mate with the connector on the M4530 in only one way).

7) Mount the M4530 chassis to the HSL-RT6-M45 backpanel 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 M4530 (the connector on the cable is polarized and should mate with the connector on the M4530 only one way).

9) Install the respective field wiring arms on all the I/O boards of the M4530 (I/O slots 0 and 2, RS-232 connector on USER PORT, resolver connector, and PMT section connector). Make sure all the field wiring connectors are fully mated in the M4530.

10) Install the "GATE" and "SIG" coax cables to the respective BNC connectors of the M4530 PMT section (upper BNC connector is "GATE", lower BNC connector is "SIGNAL").

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2.13.2 P4500 POWER SUPPLY INSTALLATION

To install the P4500, perform the following steps:

1) Mount the P4500 to the HSL-RT6-M45 in the mounting holes next to the M4530 (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 M4530 (the connector on the cable is polarized and should mate with the connector on the M4530 only one way).

2.13.3 D4591 KEYPAD/DISPLAY INSTALLATION

To install the D4591 Keypad/Display, perform the following steps:

1) With the gasket installed on the mounting studs of the D4591, install the D4591 in the cut-out in the HSL-RT6-M45 display enclosure. Secure the display to the enclosure using 7ea. 8-32 nuts and external lock washers.

2) Connect the display ribbon cable to the connector on the lower back of the display (the connector on the cable is polarized and should mate with connector on the M4530 only one way).

2.13.4 DOWNLOAD "HSLRT6" PROGRAM TO M4530

Once the M4530/P4500/D4591 are installed, perform the following to download the HSLRT6 application program to the M4530:

1) Power up the M4530 and the PC used to interface with the HSL-RT6-M45.

2) Connect an RS-232 cable from the computer COM port to the "PROG" port on the M4530.

3) Execute the "HSLRT6" set-up program.

4) Download the HSLRT6 application program to the M4530 (refer to section 5.2.3 – Windows setup program reference or section 6.7 – DOS setup program reference)

5) Set the resolver zero as outlined in section 2.12.2.

6) Verify the PMT offset, calibrate the PMT Gain, and verify the calibrated leaker rejection as outlined in sections 2.12.3 thru 2.12.5.

7) The M4530 is now ready to run.

The following sections describe the different offset and gain modes as well as the calibration procedure in detail.

3.1 AUTOMATIC OFFSET ADJUSTMENT

Automatic PMT input offset mode is enabled by setting the "Automatic Offset Mode Enabled" to "YES" using the HSLRT6 set-up program. In addition, the user must set the value of the "Desired Good Can PMT value" as well as the "Allowed Good Can Error" (deviation) from the specified good can value. The "Desired Good Can PMT value" is typically set at 25 to 35. The "Allowed Good Can Error" (deviation) is typically set to 2 or 3. When the automatic offset feature is enabled, the M4530 averages the value of all good cans detected as well as the in-between pocket "dark" measurement over 36 consecutive pockets and automatically adjusts the PMT input offset until this average equals the "Desired Good Can PMT value" within the specified error (Allowed Good Can Error). This adjustment occurs continuously and compensates for any drift in the PMT due to temperature variations.

3.2 MANUAL OFFSET ADJUSTMENT

Manual PMT input offset mode is enabled by setting the "Automatic Offset Mode Enabled" to "NO" using the HSLRT6 set-up program. In this case, the user enters the absolute value of the offset after the automatic offset is disabled. The offset is set to a number between -250 and +250.

Perform the following to manually set the offset:

1) Using the HSLRT6 set-up program view the M4530 PMT data and monitor the "Average PMT Input". This is the average of all good cans and the in-between pocket "dark" measurement through 36 consecutive pockets.

2) Using the HSLRT6 set-up program select "No" to the "Enable Automatic Offset Mode". Then observe the "PMT Input" from the "View PMT Data" and adjust the "PMT Offset" as necessary until the "PMT Input" is between 25 and 30 (this assumes the reject threshold is set to 35 or above). This establishes the proper base value for good cans, such that bad (leaker) cans can be detected.

3) If the PMT gain is subsequently manually adjusted (see section 3.5), the PMT offset will then again have to be adjusted and so forth until both values are set properly.

Note: The automatic offset mode is strongly recommended for use over the manual offset mode. The automatic offset mode automatically compensates for PMT drift due to temperature, etc. The manual mode would require adjustment periodically as climate changes, etc. take place.

SECTION 3
OFFSET, GAIN AND CALIBRATION MODES

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3.3 AUTOMATIC GAIN ADJUSTMENT (CALIBRATION)

The automatic PMT gain adjustment mode is enabled by setting the "PMT Gain Calibration Mode Enabled" to "YES" using the HSLRT6 set-up program. In addition the user must set the "Desired Calibrated Leaker Reject PMT value" for calibrated leak cans as well as the "Allowed Calibrated Leaker Reject Error" (deviation) from the specified calibrated leak can value. The "Desired Calibrated Leaker Reject PMT value" is typically set between 50 and 200. The "Allowed Calibrated Leaker Reject Error" (deviation) is typically set to 5.

When the automatic gain feature is enabled, calibration is performed by stopping the machine and placing a calibrated leak can (a can with a .0025" calibrated leak hole) in the machine lined up exactly with the PMT. The calibration is initiated either from the "CALIBRATE" push-button inside the M4530 housing box or from the "CAL PMT GAIN" key on the HSL-RT6 Keypad/Display. The M4530 will now generate a series of sync pulses and take a series of samples from the PMT. During this sampling process, the M4530 will adjust the gain of the PMT until the samples read from the PMT are equal to the number entered in the "Desired Calibrated Leaker Reject PMT value", within the "Allowed Calibrated Leaker Reject Error". The "CAL" LED on the front of the M4530 will flash while the calibration is in progress. Once the calibrate process is complete, the "CAL" LED on the front of the M4530 will either illuminate continuously, indicating the calibration was successful, or will extinguish, indicating a calibration error occurred.

Note: When locating the calibrated leak can in front of the PMT, the can should be oriented with the .0025 hole in the least light intensive area. Generally this is with the hole facing the direction of movement of the can along the wheel. Thus when the M4530 is calibrated, it will be calibrated for the worst case lighting situation.

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3.4 CALIBRATION PROCEDURE

Perform the following to calibrate the gain of the PMT:

1) Stop the machine and place a calibrated leak can (a can with a .0025" hole) in the machine. With the can oriented with the .0025 hole facing the direction of movement of the can along the wheel, line the leak can up exactly with the PMT.

   Note: Orienting the can with .0025 facing the direction of movement along the wheel, places the hole at the least light intensive area of the PMT sampling station. This is done so that when the PMT is calibrated, it is calibrated for the worst case lighting situation.

2) With the calibrated leak can positioned in front of the PMT, initiate the calibration either by pressing the "CALIBRATE" push-button inside the M4530 housing box or, with the "Set-Up Enable" switch in the "Enable" position, by pressing the "CAL PMT GAIN" key on the HSL-RT6 Keypad/Display.

3) The "CAL" LED on the M4530 will flash while the PMT gain calibration is taking place. The "CAL" LED will illuminate solid if the calibration is successful. If the calibration is not successful, the "CAL" LED will extinguish after the calibration was attempted.

4) If a calibration error did occur ("CAL" LED on front of M4530 "off" at completion of the calibration procedure), observe the value of the PMT gain, either on the "M4530 Set-up" menu of the "HSLRT6" set-up program or the "View PMT Data" menu of the HSL-RT6 Keypad/Display and verify the following:

   a) If the "PMT Gain" is less than 500 volts and the "Gain Calibrate PMT Input Average" is greater than the "Desired Calibrated Leaker Reject PMT Value" by more than 5, the PMT detected too much light and was not able to reduce the gain of the PMT adequately to compensate for the amount of light detected. Verify that the calibrated leaker has a .0025 or less calibration hole in it and does not have any other areas of leakage in the can. Verify that the seal at the pocket used for calibration is not leaking. Verify that no light leakage is occurring at any of the PMT seals (machine shutter to light seal plate, PMT to light seal plate, or at the PMT housing itself).

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b) If the "PMT Gain" is at 1101 volts and the "Gain Calibrate PMT Input Average" is less than the "Desired Good Can PMT Value" by more than 5, then the PMT did not detect enough light and was not able to increase the gain enough to calibrate the M4530. Verify that the calibrated leaker has a .0025 calibration hole in it and verify that the light source is generating an adequate supply of light (lamps are "on" when calibration is performed). If so, set the "Desired Calibrated Leaker Reject PMT Value" to a lower value (it can be set as low as 10 above the "Desired Good Can PMT Value") and try the calibration again. If the "Desired Calibrated Leaker Reject Value" is lowered, the "PMT Reject Can Threshold" should also be lowered (it should be between the "Desired Good Can PMT Value" and the "Desired Calibrated Leaker Reject Value".

5) Remove the calibrated leak can and restart the machine. With the machine running at normal speeds, run calibrated leak cans through the machine and verify that all the calibrated leak cans are rejected. If any are not rejected, repeat steps 1 through 3 using the calibrated leak cans which were not rejected.

3.5 MANUAL GAIN ADJUSTMENT

Manual PMT gain mode is enabled by setting the "PMT Gain Calibration Mode Enabled" to "NO" using the HSLRT6 set-up program. In this case, the user enters the absolute value of the PMT Gain after the automatic gain is disabled. The PMT Gain is set to a number between 500 and 1200volts. This corresponds to the voltage applied to the PMT.

Note: The gain will round off to + or -5 volts of the value entered.

As an alternative, the gain can be increased or decreased by 5 from the "View PMT Data" of the HSLRT6 set-up program or using the "ADJUST GAIN (INC GAIN / DEC GAIN)" key on the HSL-RT6 Keypad/Display. In this case, the gain can be adjusted manually regardless of whether the PMT auto gain calibration mode is enabled or disabled.

Manually setting the PMT gain requires the user to run calibrated leakers through the machine to verify the PMT gain is set high enough to reject the calibrated cans. To set the gain, perform the following:

1) Using the HSLRT6 set-up program view the M4530 PMT data and monitor the "Average Reject Value" and the last 8 rejects ("Last Reject Value" through "8th to Last Reject Value"). The "Average Reject Value" is the average of the last 8 rejects.

2) Run some calibrated leak cans through the machine. The M4530 should reject all the cans. If the M4530 does not reject the cans, increase the "PMT Gain" (re-adjust the offset as well, if the manual offset mode is used - see section 3.2) and run the calibrated leakers through the machine again. Repeat this step until the M4530 always rejects the calibrated leakers.

3) Now observe the "Average Reject Value" and the last 8 rejects while running the calibrated leakers through the machine. The calibrated leakers should result in a reject value of approximately 100 to 200. If the value is just barely above the reject threshold, increase "PMT Gain" until the calibrated leakers result in reject values in the range of 100 to 200. If the calibrated reject value is always higher than 230, decrease "PMT Gain" until the calibrated leakers typically have a reject value around 100 to 200.

4) In general, the "PMT Gain" is set low enough where the calibrated leakers are easily detected but not so high that the M4530 becomes to sensitive and rejects good cans excessively. In addition, the higher the gain on the PMT, the shorter the life of the tube. As the tube ages, the sensitivity of the tube reduces, requiring the gain to be increased.

SECTION 3
OFFSET, GAIN AND CALIBRATION MODES

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The HSL-RT6 Keypad/Display contains 24 keys consisting of data display commands and set-up commands. The display 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 to view data as well as to adjust the PMT "Gain" and "Threshold" (key switch protected).
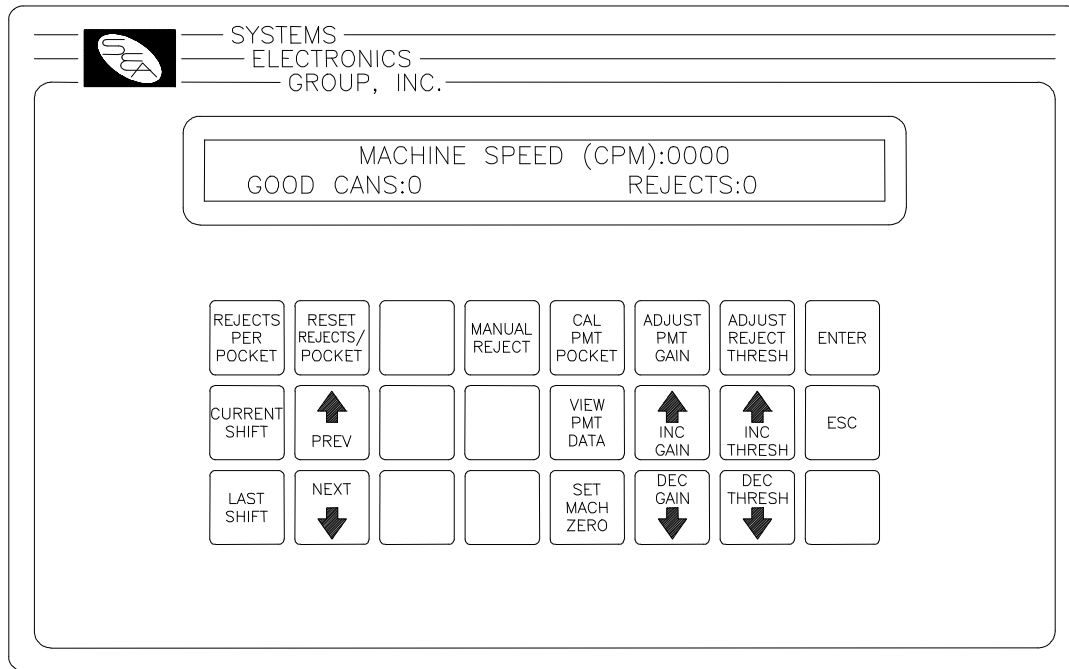
The display/keypad allows the following to be viewed or adjusted:

1) Calibrate the PMT gain
2) Increase/Decrease the PMT Gain
3) Increase/Decrease the Reject Threshold
4) View the PMT Set-up Data
5) Set Machine Zero
6) View the Number of Rejected Cans per Pocket
7) View the Current Shift Data
8) 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 return to the previous item on the menu.

SECTION 4
USING THE KEYPAD/DISPLAY

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4.1 DEFAULT SCREEN

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

MACHINE SPEED (CPM):xxxx
GOOD CANS:xxxxxxx   REJECTS:xxxxxx

Where the "Machine Speed" is the current speed of the tester, the "Good Cans" field is the total number of good cans tested so far into the current shift, and the "Rejects" field is the total number of rejected cans for all pockets so far into the current shift. This display effectively replaces a speed meter, and two can counters. This screen is always returned to when no commands are active.

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4.2 "REJECTS PER POCKET" KEY

The number of rejected cans per pocket menu is provided to aid in the trouble-shooting of a bad seal with a particular pocket. The total number of rejected cans for each pocket since the last reset or end of shift is displayed. The operator can reset these counts at any time to aid in the trouble-shooting process (see section 4.3). The data can be viewed simply be pressing this key. The display shows a series of screens each with four pockets from 1 through 12 as shown below:

-- REJECTED CANS PER POCKET --
1:xxxx   2:xxxx   3:xxxx   4:xxxx

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

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

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4.3 "RESET REJECTS PER POCKET" KEY

This key is used to reset the rejected cans per pocket counts that are displayed in the "Rejected Cans per Pocket" menu. When this key is pressed, the display will prompt "PRESS "ENTER" TO RESET THE REJECTS PER POCKET COUNTS OR "ESC" TO EXIT:". Press the "Enter" key to reset the rejects per pocket counts. Press the "ESC" to exit without resetting the counts. The rejects per pocket counts collected for the current shift will not be reset when this key is hit.

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4.4 "CURRENT SHIFT" KEY

The Current shift data menu displays the following information:

Good Cans:xxxxxx   Rejects:xxxxx
Rejected Cans per Pocket (1-12):xxxx

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

Note: The Current shift "Good Cans" and "Rejects" is displayed as part of the default.

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

Rejects: This is the total number of rejected cans for all pockets of the machine.

Rejected Cans per Pocket (1:-12:): This is the total rejected cans for each pocket. A disproportionately high count for a particular pocket indicates a bad pocket seal for that pocket.

4.5 "LAST SHIFT" KEY

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

4.6 "MANUAL REJECT" KEY

The "MANUAL REJECT" key is used to manually reject cans from the tester either to test the reject solenoids or to reject cans for QC purposes. The tester will reject cans from either the odd or even solenoids as long as the "MANUAL REJECT" key is depressed.

SECTION 4
USING THE KEYPAD/DISPLAY

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4.7 "VIEW PMT DATA" KEY

The "View PMT Data" menu displays the following set-up variables:

PMT GAIN (VOLTS): XXXX   PMT OFFSET: +XXX
THRESHOLD: XXX   PMT AVERAGE: XXX   POS: XXX

The data is shown in real time and reflects any change in value that may occur for each set-up parameter. To exit this menu, simply press "ESC" to return to the default menu.

PMT Gain (Volts): This value adjusts the voltage applied to the tube, adjusting the gain. The value is set in 5-volt increments, from 498 to 1200. This parameter is adjusted when the PMT Gain calibration is performed (see section 4.8) or by adjusting the gain manually using the "ADJUST GAIN" key (see section 4.9).

PMT Offset: This is the input offset value (between -250 and +250) and adjusts the M4530 input offset proportionally. This parameter is adjusted automatically in response to variations of the PMT offset (see section 3.1).

Threshold: This value specifies the reject threshold. If the "PMT Input" value is below the threshold, the can is considered good and is not rejected. If the "PMT Input" value is above the threshold, the can is considered a leaker and is rejected. This parameter is typically set between 35 and 75. This parameter is adjusted using the "ADJUST THRES" key (see section 4.10).

PMT Average: This is the average of all good cans and the in-between pocket "dark" measurements for 36 consecutive cans.

POS: This is the current angular position of the resolver in degrees. The resolver makes one revolution for one revolution of the shutter wheel (one revolution per 12 pockets). Thus there are 30 degrees between pockets. This parameter is used to zero the machine (set the resolver zero, see section 4.11).

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4.8 "CALIBRATE GAIN" KEY

This selection is used to execute the PMT Gain calibration procedure. When selected, the display will prompt: "PLACE CALIBRATED LEAKER AT THE PMT AND PRESS "ENTER" OR "ESC" TO EXIT:".

To calibrate the PMT gain:
* Stop the tester
* Align a calibrated leak test can at the PMT and press the "ENTER" key

If the calibration is not to be performed, press the "ESC" key to return to the previous menu.

If the "ENTER" key is pressed, the calibration will be performed per section 3.3. Once the calibration is initiated, the current gain in volts is displayed. If the calibration is successful, the display will display: "CALIBRATION COMPLETE, PRESS "ESC"". If the calibration is not successful, the display will show either: "CALIBRATION ERROR - NO LIGHT DETECTED" or "CALIBRATION ERROR - EXCESS LIGHT DETECTED". See section 3.4 for details on the calibration error.

Note: This selection is only enabled when the "SET-UP ENABLE" key switch is in the "ENABLE" position.

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4.9 "ADJUST GAIN" KEY

This selection is used to manually increase or decrease the PMT Gain. Once activated, the "INC GAIN" or "DEC GAIN" key is used to adjust the gain up or down (respectively) by 5 volts each time the corresponding key is depressed. Increasing the gain increases the sensitivity of the system, decreasing the gain decreases the sensitivity of the system. Once the gain has been adjusted as desired, press "ESC" to return to the previous menu.

Note: This selection is only enabled when the "SET-UP ENABLE" key switch is in the "ENABLE" position.

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SECTION 4
USING THE KEYPAD/DISPLAY

4.10 "ADJUST THRESHOLD" KEY

This selection is used to increase or decrease the Reject Threshold. Once activated the "INC THRES" or "DEC THRES" key can be used to adjust the threshold up or down (respectively) by one each time the corresponding key is depressed. Increasing the threshold decreases the sensitivity of the system, decreasing the threshold increases the sensitivity of the system. Once the threshold has been adjusted as desired, press "ESC" to return to the previous menu.

Note: This selection is only enabled when the "SET-UP ENABLE" key switch is in the "ENABLE" position.

4.11 "SET MACHINE ZERO" (SET RESOLVER OFFSET) KEY

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

1) Select "VIEW PMT DATA" and observe the "POS:" field. Verify that as the machine is rotated forward that the position increases linearly from 0 through 359. If not, swap the S1 and S3 leads of the resolver at the M4530 resolver connector. Then verify that the position then indeed does increase with forward movement.

2) Position the machine with pocket #1 perfectly aligned with the PMT. This is the machine zero position.

3) Auto zero the resolver by pressing the "SET MACH ZERO" key. The display will prompt: "TO ZERO RESOLVER, ALIGN POCKET #1 WITH PMT AND PRESS "ENTER" OR "ESC" EXIT". Press the "ENTER" key to set the resolver offset. The M4530 will calculate the actual offset value required to make this the 000 position. The View PMT Data menu will be displayed, now showing the "POS:" at zero.

4) Press the "ESC" key to return to the default screen.

   Note: This selection is only enabled when the "SET-UP ENABLE" key switch is in the "ENABLE" position.

The Windows based set-up program is menu driven, allowing the user to easily view data, alter set-up variables or set machine timing (machine offset, timing signal locations, etc.), using a PC running the Windows (95/98/ME/2000/XP/NT) operating system. The set-up variables are used to configure and tune the M4530 to match the configuration and performance of the specific tester (see Tuning the HSL-RT6-M45, section 2.12).

Note: The set-up program is an on-line communications program used to interface with the M4530 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 M4530. The variables displayed while in the "Online" edit mode are read directly from the processor. Data is saved to a "Set-up Data" file (*.sdt) whenever changes are made to a parameter or if the data is uploaded from the processor.
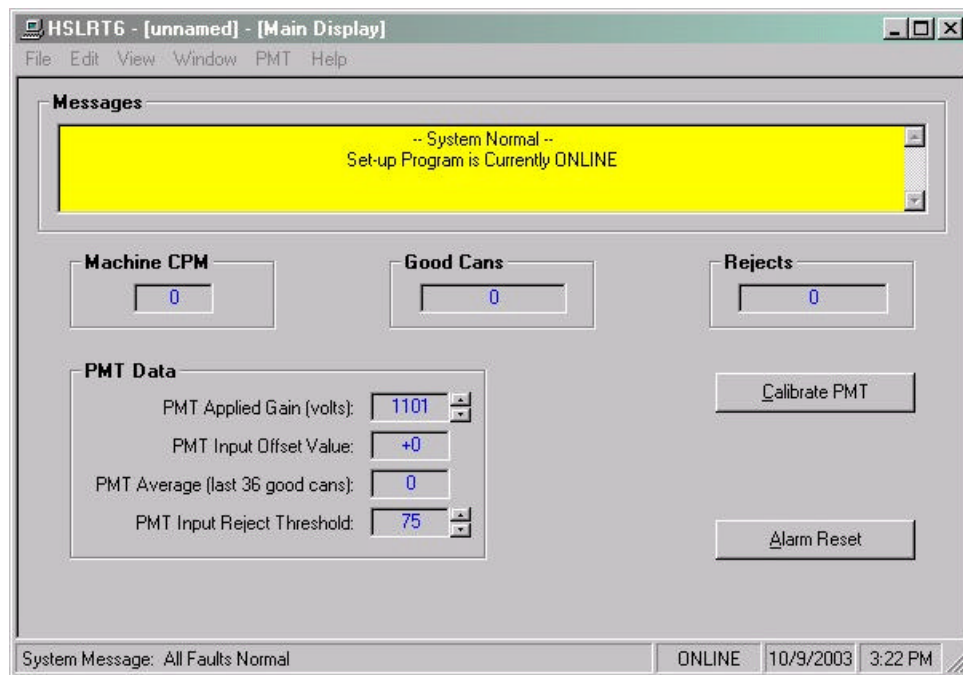
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5.1 GENERAL DESCRIPTION

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

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

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

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

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

Getting Help: The entire contents of the user's manual is contained within the help file. Pressing Ctrl+H will display the help file window. Pressing the F1 key will display the contents file. Hot spots allow jumps to other topics to display additional information as desired. Selecting About HSLRT6 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.

5.2 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
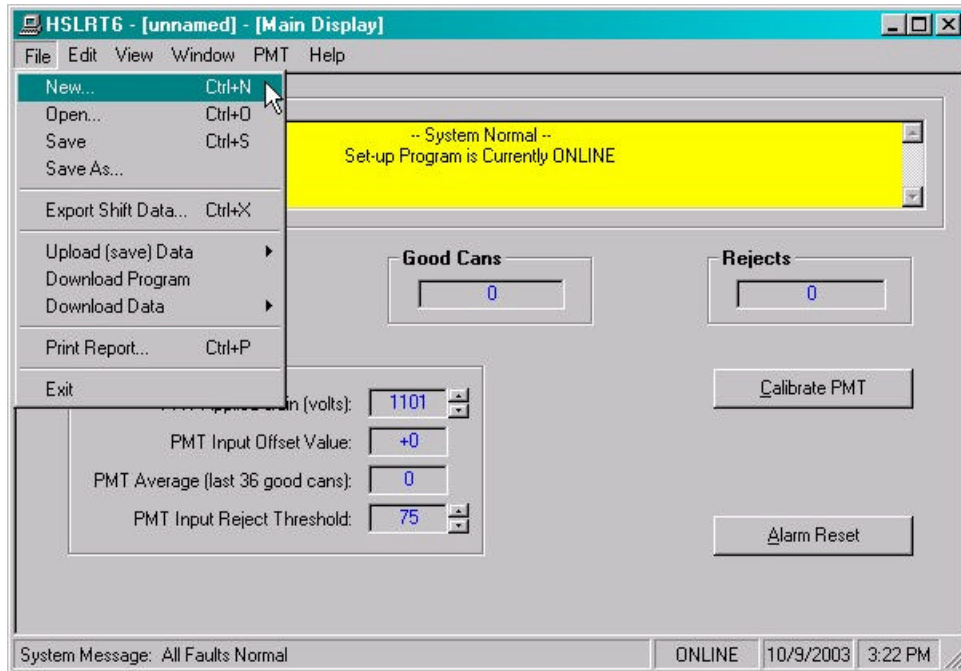
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5.2.1 THE SET-UP DATA FILE

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, the default parameters are loaded and the user is able to make changes as desired. The set-up program is unaware of the settings and parameters that exist within the M4530. 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 tester, 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" an 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. The name of the file will then be displayed in the title bar. If any changes are made to the parameters (including shift data), the user will be prompted to save any changes before terminating the program.

Save: To "Save" the data 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 exists. 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.

5.2.2 UPLOAD (SAVE) DATA

The "Set-up" program allows the user to upload set-up parameters, timing channel set-points and shift data from the M4530 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:
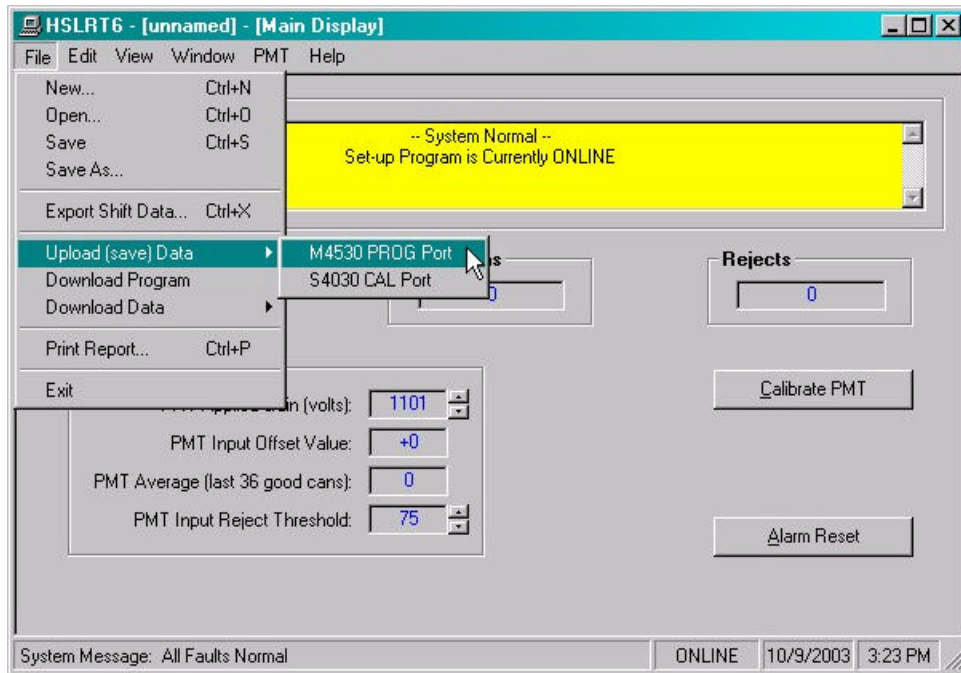
M4530 PROG Port: This option allows the user to upload set-up parameters, timing channel set-points and shift data from the M4530. If not connected to the M4530 PROG port, a message will be displayed alerting the user.

S4030 CAL Port: This option allows the user to upload PMT set-up parameters and data from the S4030 PMT processor board. If not connected to the S4030 CAL port, a message will be displayed alerting the user.

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5.2.3 DOWNLOAD PROGRAM

The "Set-up" program allows the user to "Download" the HSLRT6 SYSdev program to the M4530.
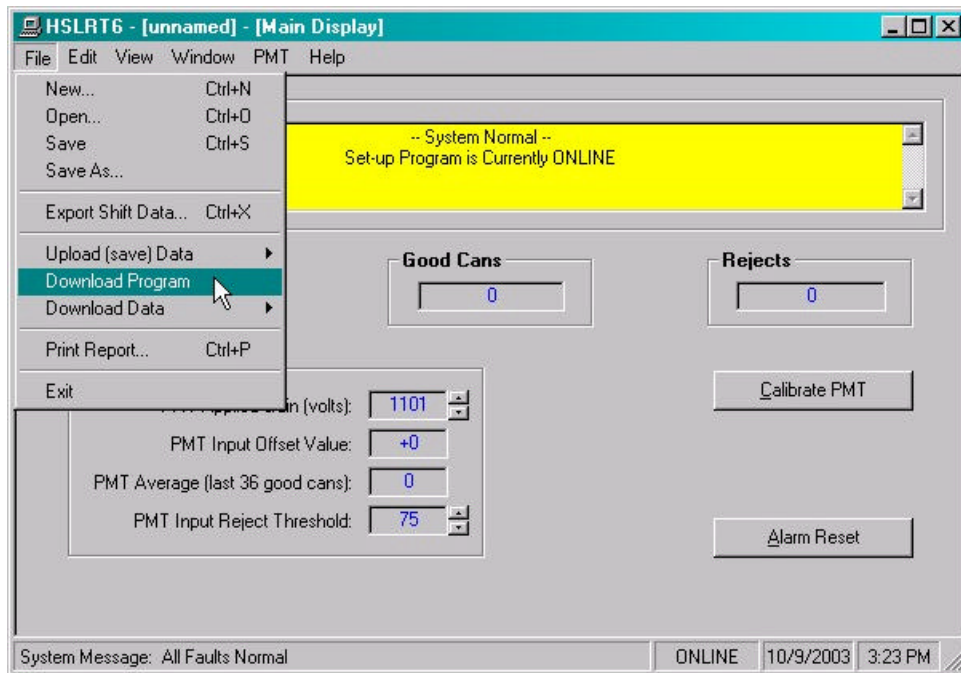
Note: To "Download" a SYSdev program to the processor, the program must be "Online". If "Online" mode cannot be achieved, program download will not be executed. If the program is currently "Offline", the user will be prompted to first go "Online".

Once selected, and "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 M4530 PLC SYSdev file can be downloaded with the set-up program. Care should be taken when selecting a program to download.

If not connected to the M4530 PROG port, a message will be displayed alerting the user.

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.

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5.2.4 DOWNLOAD (RESTORE) DATA

The set-up program allows the user to download "Set-up" parameters, timing channel set-points and shift data to the M4530 and S4030 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:
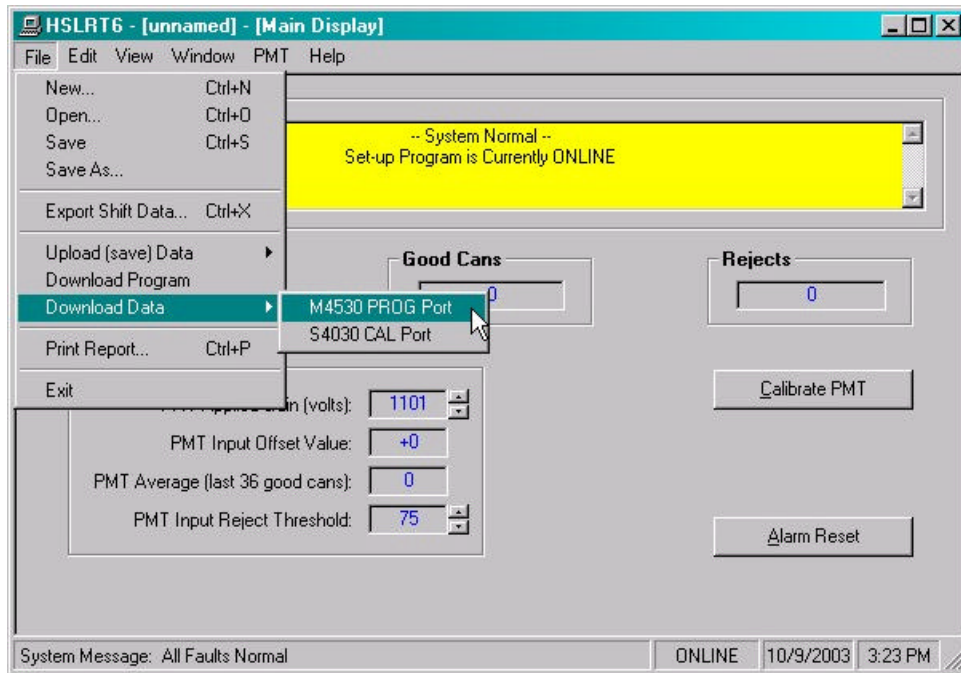
M4530 PROG Port: This option allows the user to download the set-up parameters, timing channel set-points and shift data to the M4530. If not connected to the M4530 PROG port, a message will be displayed alerting the user.

S4030 CAL Port: This option allows the user to download the PMT set-up parameters to the S4030 PMT Processor board. If not connected to the M4530 PROG port, a message will be displayed alerting the user.

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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5.2.5 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.

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5.3 THE EDIT MENU

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

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

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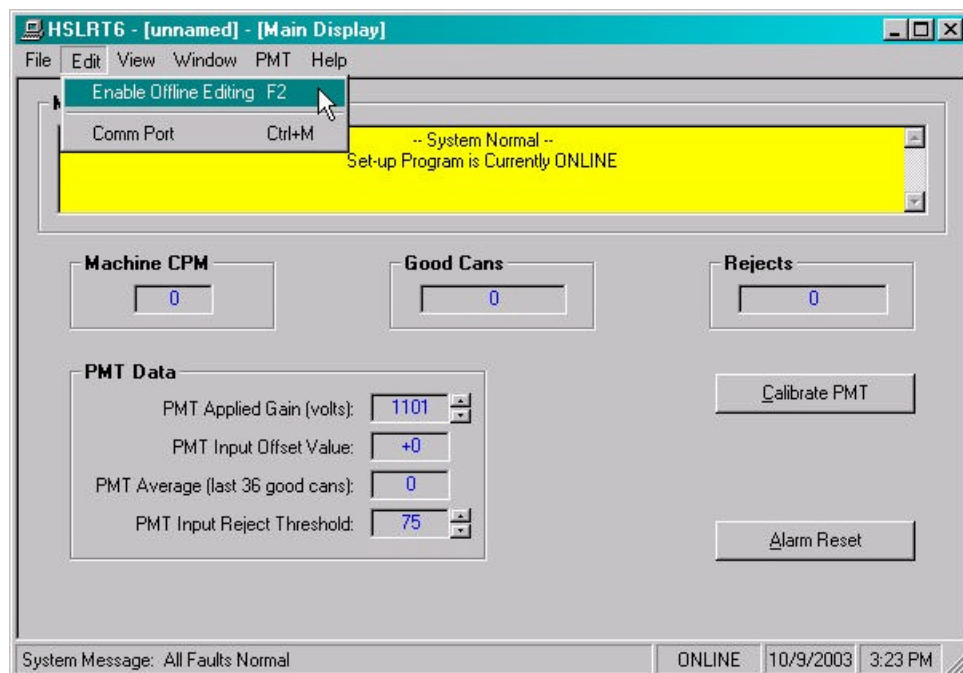
5.3.1 ENABLE OFFLINE EDITING

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 select "Enable Offline Editing" from the edit menu (or press function key F2) to enable/disable this feature.

5.3.2 SETUP COMM PORT

This function allows the user to specify the serial communications port and rate to talk to the M4530. The programming port of the M4530 is set to 9600 baud.
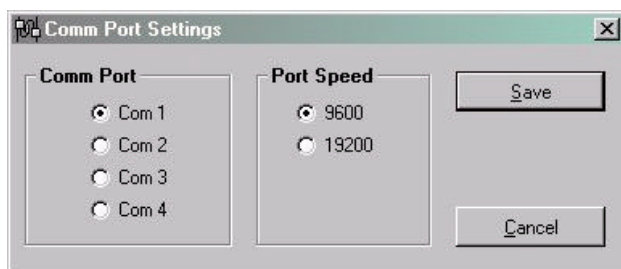
Once selected, a dialog box requesting the user to select a "Comm Port" and "Baud Rate" will be displayed. The default setting is COM1 at 9600 baud. The option to select the 19200 baud rate is to allow the user to communicate with the processor via the S4516 serial communications board.

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 Windows "Settings" folder.

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5.4 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

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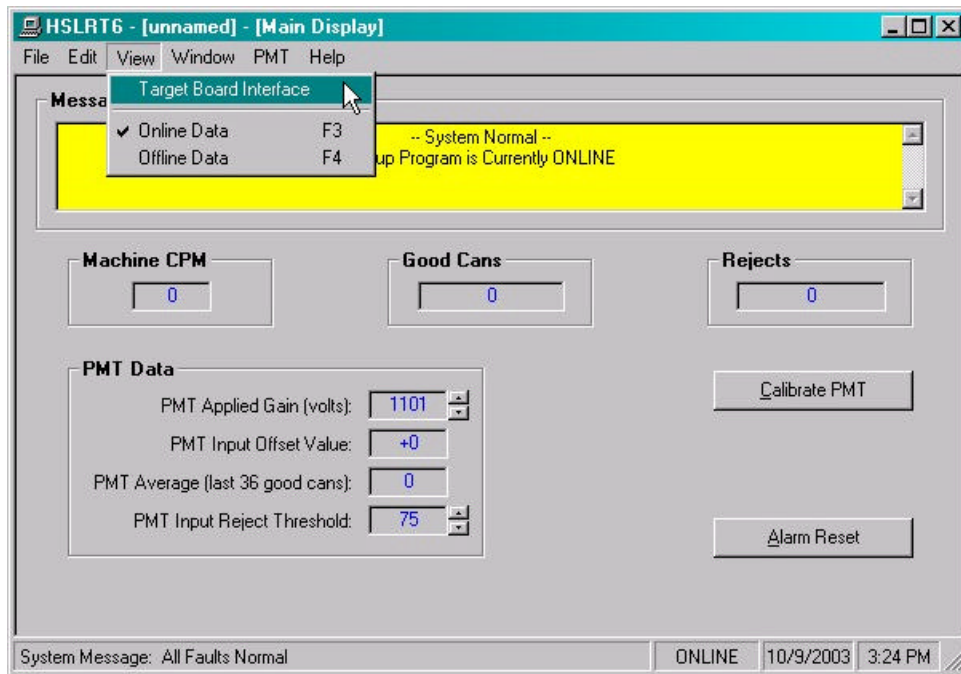
5.4.1 TARGET BOARD INTERFACE

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".
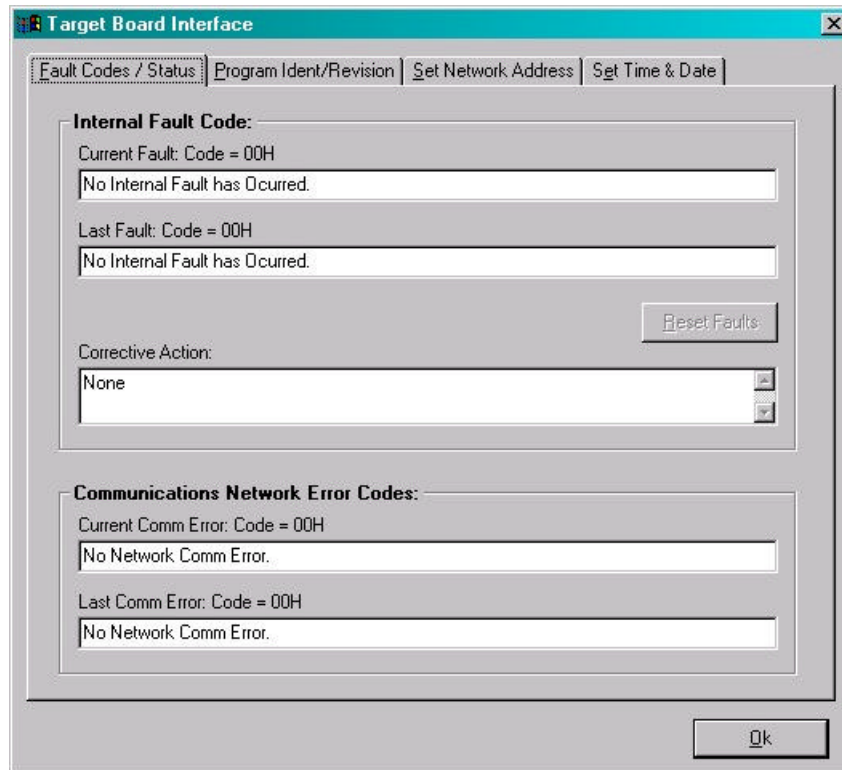
Once invoked, the set-up program will prompt the user to select a program to compare with the one existing in the processor. Whether a program is selected or the user cancels, the setup program will attempt to communicate with the M4530. If unsuccessful, a warning message will be displayed, prompting the user to either "Retry" or "Cancel" the operation. If the operation is canceled and communication with the processor cannot be established the system will be placed in an "Offline" mode, however the "Target Board Interface" window will be displayed.

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5.4.2 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 M4530. 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.

5.4.3 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 M4530.

5.5 THE WINDOW MENU

The "Window" menu allows the user to select one of five different Display/Set-up windows to modify set-up parameters, view shift data or receive feedback about the current status of the control system.
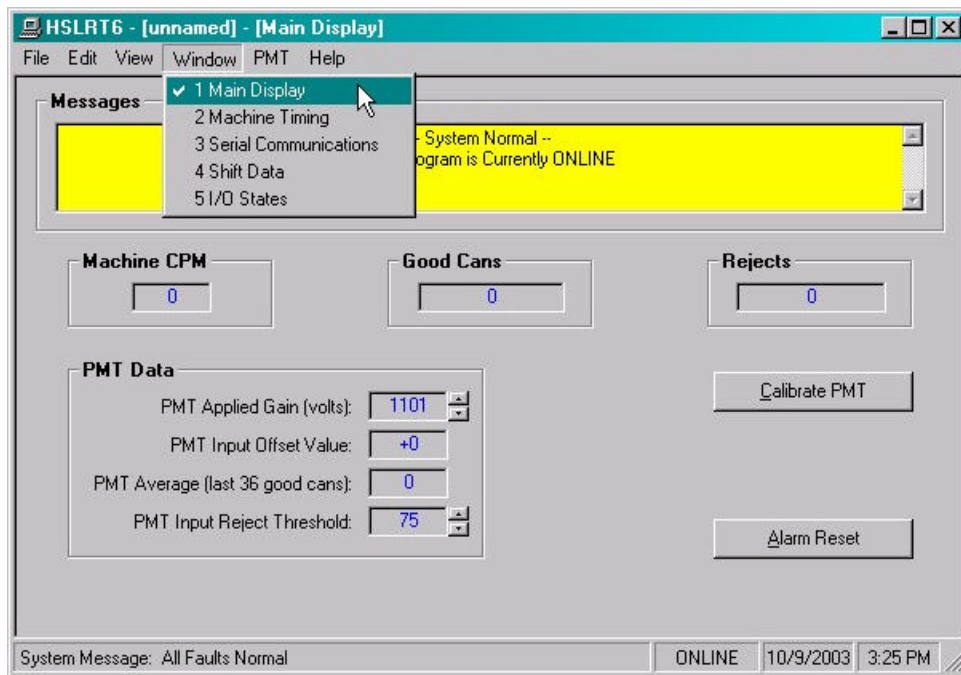
Once a window menu item is selected, a check mark is placed next to the selected item and the selected window is displayed with the name changed in the title bar of the main window.

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

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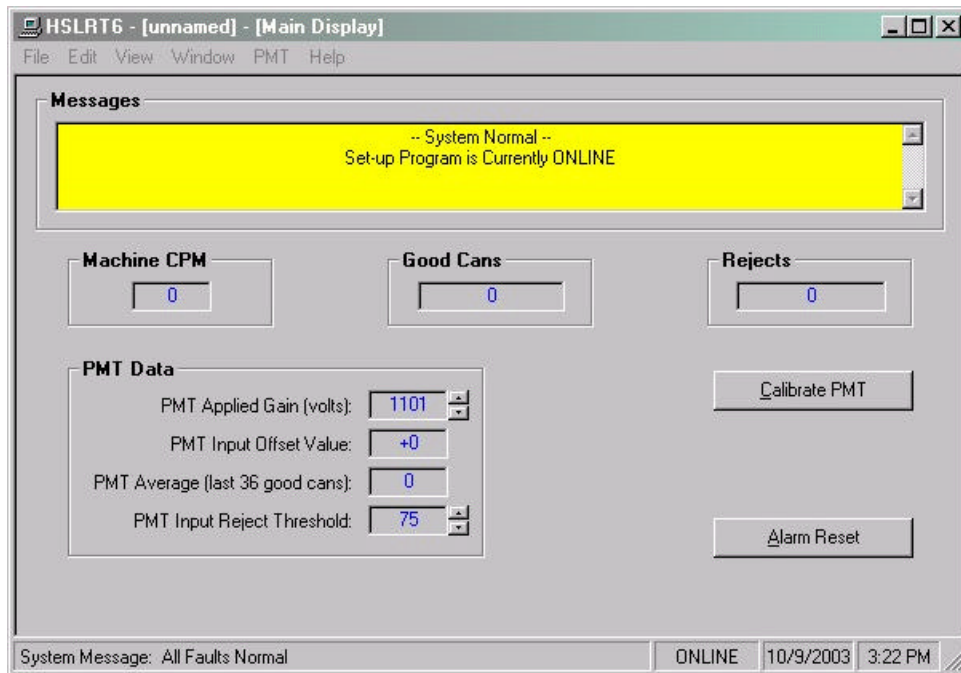
The following is a list of the functions of the "Main Display" window.

Messages: The "Messages" display is continuously updated. It displays alarm and status messages specific to the M4530, as well as, the current "Online" or "Offline" status of the set-up program By simply scrolling the display, the user is able to view all active alarm and status messages. If no alarm or status messages are active, a default message is displayed.

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

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

Rejects: This display is the "Current Shift" total reject count.

PMT Applied Gain (Volts): This is the voltage applied to the tube. The value is set in 5-volt increments, between 498 and 1200. This parameter is adjusted when the PMT Gain calibration is performed. It can also be adjusted manually using the up/down increment control. Adjusting this value adjusts the gain of the tube.

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Adjusting the PMT Gain: This selection is used to manually increase or decrease the PMT Gain. Once online with the M4530 through the PROG port, this control is active. The up/down increment control can be used to adjust the gain by 5 volts each time the corresponding key is depressed. Increasing the gain will increase the sensitivity of the system, decreasing the gain will decrease the sensitivity of the system.

PMT Offset: This is the input offset value (between -250 and +250) and adjusts the M4530 input offset proportionally. This parameter is adjusted automatically in response to variations of the PMT offset (see section 3.1 – Automatic Offset Adjustment).

Threshold: This value specifies the reject threshold. If the "PMT Input" value is below this threshold, the can is considered good and is not rejected. If the "PMT Input" value is above this threshold, the can is considered a leaker and is rejected. Typically, this parameter is set between 35 and 75. This parameter is adjusted using the up/down increment control

Adjusting the Threshold: This selection is used to increase or decrease the Reject Threshold. Once online with the M4530 through the PORG port this control is active. The up/down control can be used to adjust the threshold by one each time the corresponding key is depressed. Increasing the threshold will decrease the sensitivity of the system, decreasing the threshold will increase the sensitivity of the system.

PMT Average: This is the average of all good cans and the in-between pocket "dark" measurements for 36 consecutive cans.

Calibrate PMT: This selection is used to execute the PMT Gain calibration procedure. If the calibration is to be performed, stop the tester, align a calibrated leak test can at the PMT and select the "Calibrate PMT" button.

If the button is pressed, the calibration will be performed (see section 3.3 – Automatic Gain Adjustment, Calibration). Once the calibration is initiated, the message display will show "PMT Gain Calibration In Progress". The applied PMT gain will display the current gain in volts. If the calibration is not successful, the message display will show "Calibration Error". See section 3.4 – Calibration Procedure, for details on the calibration error.

Note: This function is only available while online with the processor through the PROG port and the tester is stopped.

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5.5.2 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.
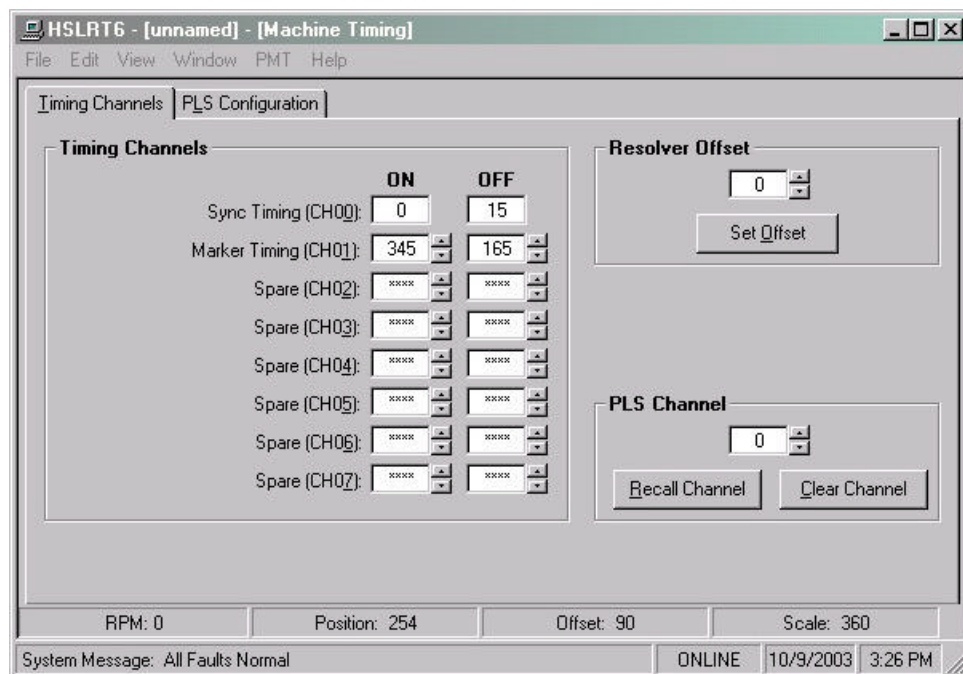
In addition, the following parameters are displayed at the bottom of this window:

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

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

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

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

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

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

1) Connect the RS-232 cable from the COM port on the computer to the "PROG" port on the M4530 and go online with the processor.

2) 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.

3) Observe the "POS:" field. Verify that as the machine is rotated forward that the position increases linearly from 0 through 359. If not, swap the S1 and S3 leads of the resolver at the M4530 resolver connector. Then verify that the position then indeed does increase with forward movement.

4) Position the machine with pocket #1 perfectly aligned with the PMT. This is the machine zero position.

5) Auto zero the resolver by entering "0" in the offset field and then "Click" the "Set Offset" button.

6) The M4530 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.

   Note: The offset can only be changed while online with the processor with the machine stopped.

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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 M4530.

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-points are entered for a particular channel simply by typing in the set-point.

   Note: CH00 (Sync timing) and CH01 (Marker timing) are automatically programmed at power-up and should not be modified by the user. Only CH02 thru CH07 can be programmed by the user if additional timing signals are required by the user (these channels are not used by the HSLRT6 program). Only one set-point is can be programmed 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.
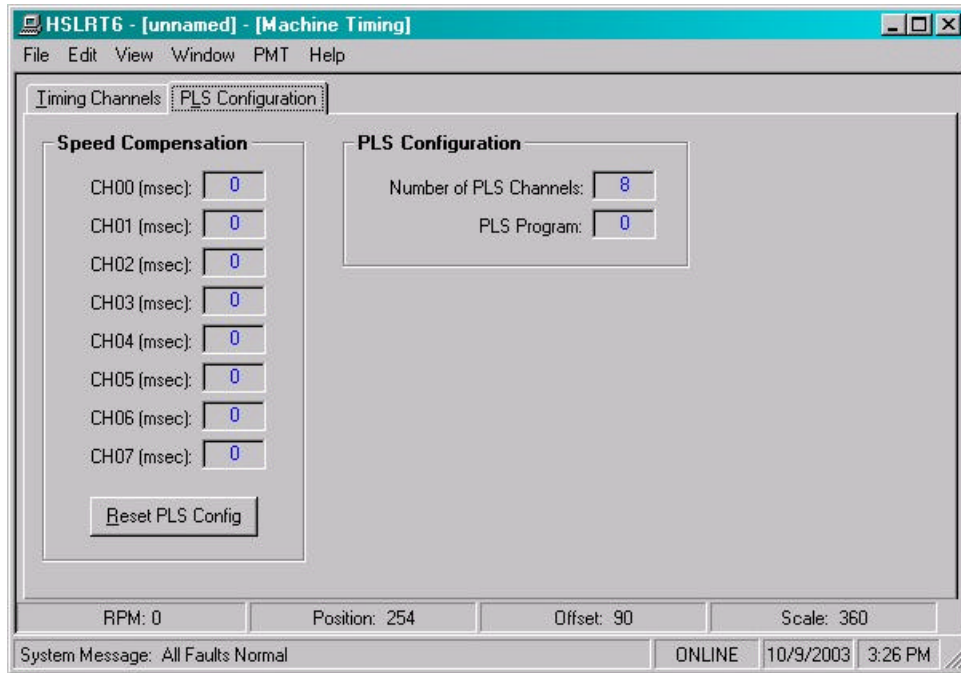
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5.5.3 THE SERIAL COMMUNICATIONS WINDOW

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

- View the S4516 configuration status.
- View the S4516-DF1 serial communication status.
- View the Allen-Bradley Link Layer serial communication status.
- Select the Allen-Bradley PLC type (PLC5 or SLC500) to communicate to.
- View/Set the Allen-Bradley PLC destination node.
- Select the starting Allen-Bradley PLC destination file number.
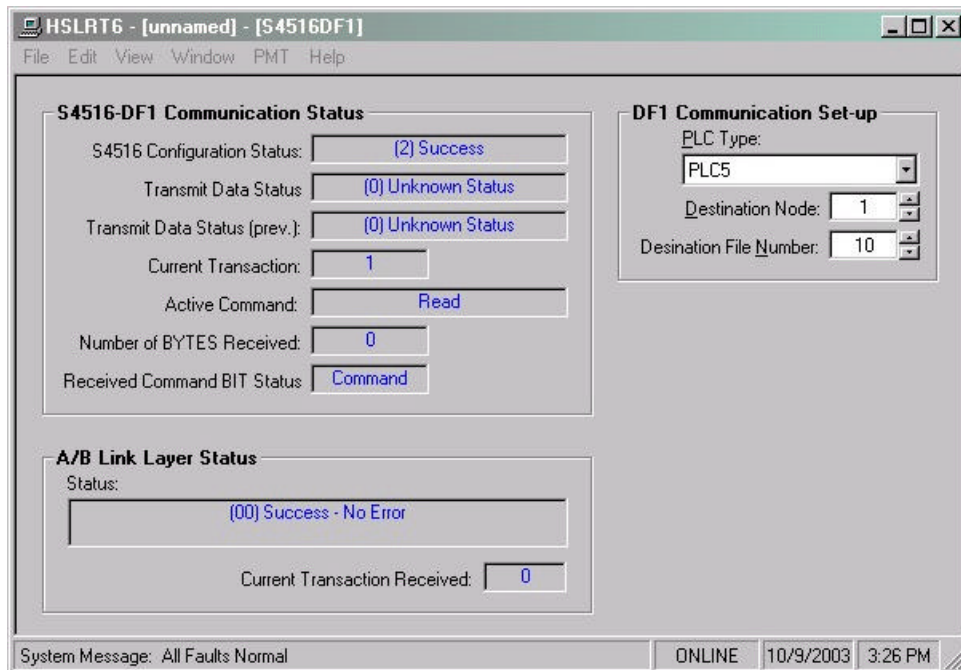
S4516 Configuration Status: This displays the current state of the configuration of the S4516 serial communications board. System function sfunc19(); (S4516 configuration) is used to set the S4516 configuration (network node address, network baud rate and USER port baud rate). This must be executed prior to executing ether system functions 10, 11 or 13. System function 19 is generally executed in the "Initialization" file of the user program.

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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 M4530. If this displays "Command", then a command action was received by the M4530.

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 M4530 will communicate to. The user can choose from "PLC5" or "SLC500".

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

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

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Destination File Number: This is the file number the M4530 will read and write data from. See Appendix B for a description of the data read from and written to an Allen-Bradley PLC.

5.5.4 THE SHIFT DATA WINDOW

The "Shift Data" window is used to view the shift data collected by the M4530. This window is selected from the "Window" menu.
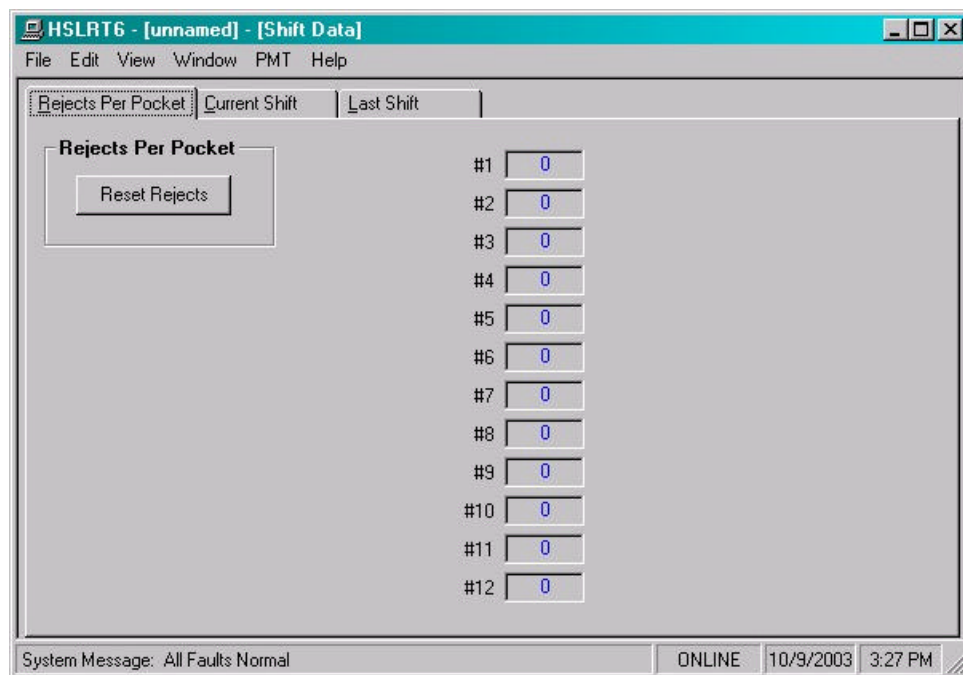
This window utilizes a "TAB" control to divide the set-up parameters into three categories, similar to that of the Keypad/Display. These sections are as follows:

Rejects Per Pocket: The number of rejects per pocket menu is provided to aid in the trouble-shooting of a bad seal with a particular pocket. The total number of rejects for each pocket since the last reset or end of shift is displayed. The user can reset these counts at any time to aid in the trouble-shooting process.

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. This data can be reset by the user from this section.

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

The Current shift data menu displays the following information:

1) Total Good Cans Processed:

2) Total Rejected Cans (for all pockets):

    Number of Rejected Cans (for each pocket):
    Pocket #1:
      thru
    Pocket #12:

This data is the totals so far into the shift. This data is transferred to the "Last shift" data when the end of shift input transfers from a "0" to a "1". This can be at the end of either an 8 or 12 hour shift or alternatively could be done at label changes such that the data collected would be for label runs rather than complete shifts.

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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.

5.5.5 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 M4530 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 M4530 processor.
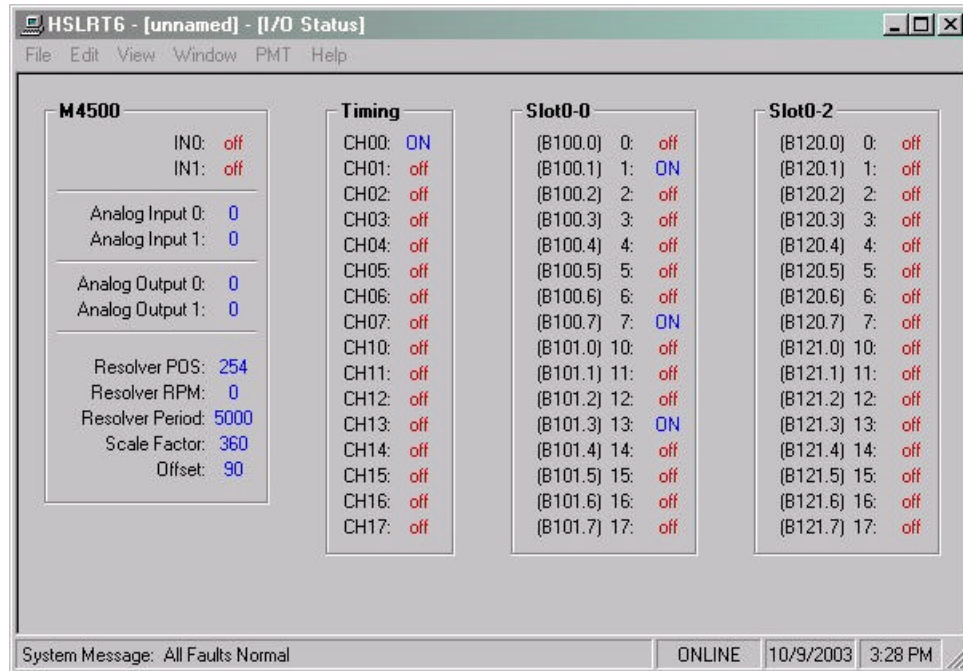
5.6 THE PMT WINDOW

The "PMT" window is used to view and adjust any of the PMT setup parameters.
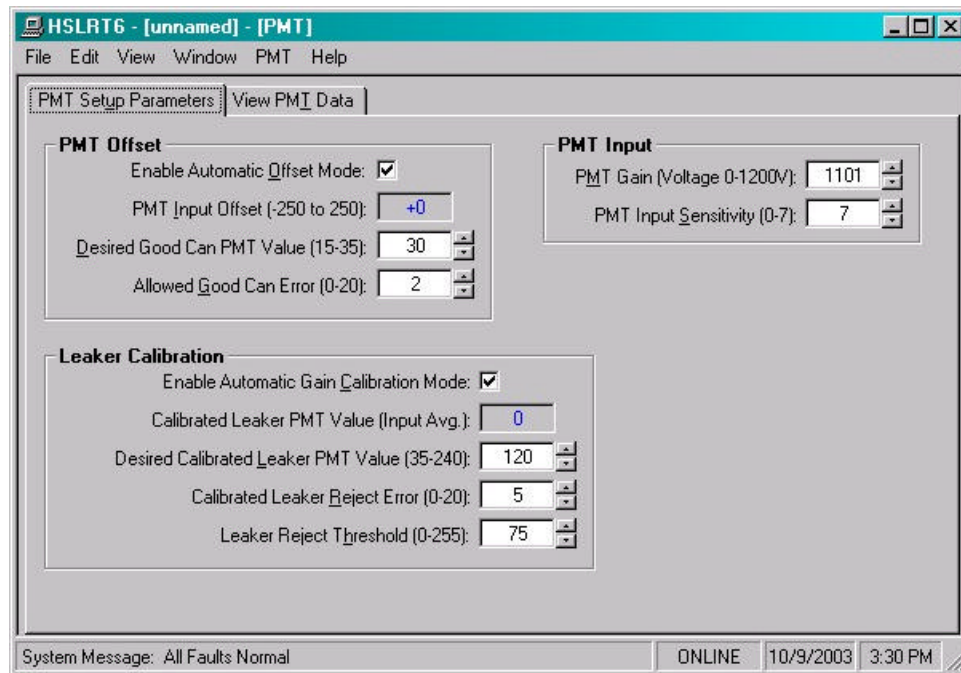
Note: Prior to selecting PMT window, make sure the RS-232 cable is connected from the COM1 port on the computer to the CAL PORT on the M4530.

This window utilizes a "TAB" control to divide the set-up parameters into two categories. These sections are as follows:

PMT Setup Parameters:
1) **Automatic Offset Mode Enabled:** When "Checked", the automatic offset mode is enabled (see section 3.1 – Automatic Offset Adjustment). When "Unchecked", the manual offset mode is enabled (see section 3.2 – Manual Offset Adjustment).

2) **PMT Input Offset (-250 to 250):** This is the input offset value and adjusts the M4530 input offset proportionally. This parameter is set by the user in manual offset mode or is adjusted automatically when in the automatic offset mode.

3) **Desired Good Can PMT Value:** Used in the automatic offset mode. This value is set by the user to specify the desired good can average. The M4530 adjusts the input offset until the average good can input is within the specified error (see section 3.1 – Automatic Offset Adjustment).

---

4) **Allowed Good Can Error:** This parameter is used in conjunction with the "Desired Good Can PMT Value" to adjust the PMT input offset in the automatic offset mode. The M4530 will adjust the offset until the good can average is within the value entered in "Allowed Good Can Error" of the "Desired Good Can PMT Value".

5) **PMT Gain Calibration Mode Enabled:** When "Checked", the "Automatic Gain Calibration" mode is enabled (see section 3.3 – Automatic Gain Adjustment). When "Unchecked", the "Manual Gain" mode is enabled (see section 3.5 – Manual Gain Adjustment).

6) **Gain Calibrate PMT Input Average:** This is the average PMT input value of the last 6 samples taken while a calibration cycle is in process. The M4530 compares this value to the "Desired Calibrated Leaker Reject PMT Value" and adjusts the PMT gain accordingly while a calibrate cycle is in progress (see section 3.4 – Calibration Procedure).

7) **Desired Calibrated Leaker Reject PMT Value:** Used in the auto gain mode. This value is set by the user to specify the desired reject average. The M4530 adjusts the PMT gain until the average calibrate value is within the specified error.

8) **Allowed Calibrated Leaker Reject Error:** This parameter is used in conjunction with the "Desired Calibrated Leaker Reject PMT Value" to adjust the PMT gain in the auto gain mode. The M4530 will adjust the gain until the calibrate average is within the value entered in "Allowed Calibrated Leaker Reject Error" of the Desired Calibrated Leaker Reject PMT Value" (see section 3.3 – Automatic Gain Adjustment).

9) **PMT Reject Can Threshold:** This value specifies the reject threshold. If the "PMT Input" value is below this threshold, the can is considered good and is not rejected. If the "PMT Input" value is above this threshold, the can is considered a leaker and is rejected. Typically this parameter is set between 35 and 75.

10) **PMT Gain (PMT Voltage 0-1200V):** Adjusting this value adjusts the voltage applied to the tube, thus adjusting the gain of the tube. The value is set in 5 volt increments, thus when a number is entered, it will be rounded to the nearest 5 volt increment. This parameter is set by the user in manual gain mode (see section 3.5 – Manual Gain Adjustment) or is adjusted automatically when calibration is performed in the auto gain mode (see section 3.3 – Automatic Gain Adjustment).

11) **M4530 PMT Input Sensitivity:** This is a value, from 0 to 7, which adjusts how much the output from the PMT (input to the M4530) is amplified internally in the M4530. The higher the number, the higher the M4530 sensitivity will be. In general, this is set at the highest amplification and is only lowered if the PMT is too sensitive.

SECTION 5
HSLRT6 WINDOWS BASED
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View PMT Data: The "View PMT Data" selection is used to view the good can and reject data in real time as well as manually fine tune the PMT gain.

```
HSLRT6 - [unnamed] - [PMT]                                            _ □ X
File  Edit  View  Window  PMT  Help

 PMT Setup Parameters   View PMT Data

         PMT Gain (Voltage 0-1200V):  [ 1101 ] ▲▼        PMT Input Offset (-250 to 250):  [ +0 ]
 ┌Good Can Data──────────────────────┐   ┌Rejected Can Data──────────────────────┐
 │           PMT Input:  [ 0 ]        │   │      Average Reject Value:  [ 0 ]       │
 │   Average PMT Input:  [ 0 ]        │   │  Number of Rejects (last 36 cans):  [ 0 ]│
 │  PMT Deviation Up (avg):  [ 0 ]    │   │          Last Reject Value:  [ 0 ]     │
 │ PMT Deviation Down (avg):  [ 0 ]   │   │     2nd to Last Reject Value:  [ 0 ]   │
 │ Deviation Count Up (# cans):  [ 0 ]│   │     3rd to Last Reject Value:  [ 0 ]   │
 │Deviation Count Down (# cans):  [ 0 ]│  │     4th to Last Reject Value:  [ 0 ]   │
 │  Up Peak Max (PMT input):  [ 0 ]   │   │     5th to Last Reject Value:  [ 0 ]   │
 │ Down Peak Min (PMT input):  [ 0 ]  │   │     6th to Last Reject Value:  [ 0 ]   │
 │                                    │   │     7th to Last Reject Value:  [ 0 ]   │
 │                                    │   │     8th to Last Reject Value:  [ 0 ]   │
 └────────────────────────────────────┘   └────────────────────────────────────────┘

 System Message:  All Faults Normal                ONLINE   10/9/2003   3:30 PM
```

1) **PMT Gain:** This value adjusts the voltage applied to the tube, thus adjusting the gain of the tube. The value is set in 5 volt increments, thus when a number is entered, it will be rounded to the nearest 5 volt increment. This parameter is set by the user in manual gain mode or adjusted automatically when a calibration is preformed in the auto gain mode or is incremented or decremented by 5 from this menu.

2) **PMT Offset:** This is the input offset value and adjusts the M4530 input offset proportionally. This parameter is set by the user in manual offset mode or is adjusted automatically when in the automatic offset mode.

3) **PMT Input:** This is the value (0 to 255) of the last PMT sample and is proportional to the amount of light detected by the PMT where 0 equals no light detected and 255 equals maximum light detected.

4) **PMT Input Average:** This is the average of all good cans and the in-between pocket "dark" measurements for 36 consecutive cans.

5) **PMT Up Deviation:** This is the average up deviation from the good can "PMT Input Average" for 36 consecutive cans. The lower the number, the less deviation between all good cans, the higher the number, the more deviation.

6) **PMT Down Deviation:** This is the average down deviation from the good can "PMT Input Average" for 36 consecutive cans. The lower the number, the less deviation between all good cans, the higher the number, the more deviation.

7) **Up Deviation Count:** This is the number of good cans that deviated up from the good can "PMT Input Average" in the last 36 consecutive pockets.

8) **Down Deviation Count:** This is the number of good cans that deviated down from the good can "PMT Input Average" in the last 36 consecutive pockets.

9) **Up Peak (Max):** This is the highest PMT input value detected as a good can in the last 36 consecutive pockets.

10) **Down Peak (Min):** This is the lowest PMT input value detected as a good can in the last 36 consecutive pockets.

11) **Average Reject Value:** This is the average value of the PMT input for the last 8 rejects.

12) **# of Rejects (of Last 36 cans):** This is the number of leakers (rejects) detected in the last 36 consecutive pockets.

13) **Last Reject Value through 8th to Last Reject Value:** These 8 variables are a stack that contain the values of the last 8 rejects.

SECTION 5
HSLRT6 WINDOWS BASED
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The "HSLRT6" set-up program is a DOS based menu driven program which allows the user to easily view the HSL-RT6-M45 data or alter the HSL-RT6-M45 set-up variables using an IBM PC or compatible. In addition to setting the set-up variables, "HSLRT6" can be used to set the machine timing (machine offset, timing signal locations, etc.). The set-up variables are used to configure and tune the HSL-RT6-M45 to match the configuration and performance of the specific light tester (see section 2.12 – Tuning the HSL-RT6-M45).

The main menu of the "HSLRT6" set-up program incorporates the following menu selections:
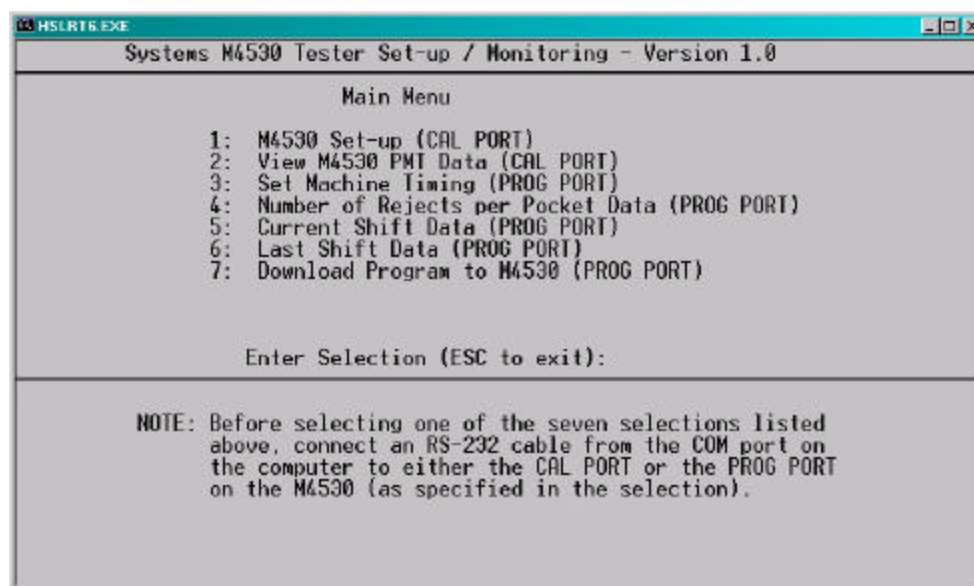
Note: The "HSLRT6" program is an on-line communications program used to interface with the M4530 module. The data displayed in the menus and set in the menus is communicated directly to the M4530. Therefore, prior to selecting any of the above selections, make sure an RS-232 cable is connected from the COM port on the computer running "HSLRT6" to the respective port ("CAL" or "PROG") on the M4530 as indicated in the selection.

The following sections are a complete description of the "HSLRT6" selections and menus.

SECTION 6
HSLRT6 DOS BASED
SETUP PROGRAM REFERENCE

6.1 M4530 SET-UP MENU (CAL PORT)

The M4530 Set-up Menu is used to set the offset and gain modes of the M4530 as well as the reject threshold. This menu is invoked by selecting "1: M4530 Set-up (CAL PORT)" from the Main Menu.

Note: Prior to selecting this selection, make sure the RS-232 cable is connected from the COM1 port on the computer to the CAL PORT on the M4530.
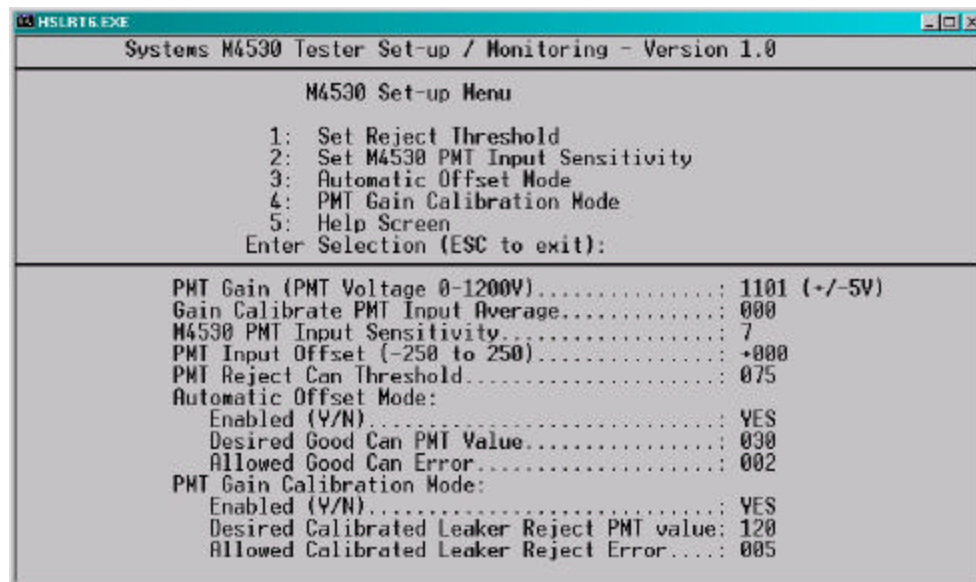
PMT Gain (PMT Voltage 0-1200V): This value adjusts the voltage applied to the tube, thus adjusting the gain of the tube. The value is set in 5 volt increments, thus when a number is entered, it will be rounded to the nearest 5 volt increment. This parameter is set by the user in manual gain mode (see section 3.5) or is adjusted automatically when calibration is performed in the auto gain mode (see section 3.3).

Gain Calibrate PMT Input Average: This is the average PMT input value of the last 6 samples taken while a calibration cycle is in process. The M4530 compares this value to the "Desired Calibrated Leaker Reject PMT Value" and adjusts the PMT gain accordingly while a calibrate cycle is in progress (see section 3.4).

M4530 PMT Input Sensitivity: This is a value, from 0 to 7, which adjusts how much the output from the PMT (input to the M4530) is amplified internally in the M4530. The higher the number, the higher the M4530 sensitivity will be. In general, this is set at the highest amplification and is only lowered if the PMT is too sensitive.

PMT Input Offset (-250 to 250): This is the input offset value and adjusts the M4530 input offset proportionally. This parameter is set by the user in manual offset mode (see section 3.2) or is adjusted automatically when in the auto offset mode (see section 3.1).

PMT Reject Can Threshold: This value specifies the reject threshold. If the "PMT Input" value is below this threshold, the can is considered good and is not rejected. If the "PMT Input" value is above this threshold, the can is considered a leaker and is rejected. Typically this parameter is set between 35 and 75.

Automatic Offset Mode Enabled: When set to "YES", the automatic offset mode is enabled (see section 3.1). When set to "NO", the manual offset mode is enabled (see section 3.2).

Desired Good Can PMT Value: Used in the auto offset mode. This value is set by the user to specify the desired good can average. The M4530 adjusts the input offset until the average good can input is within the specified error (see section 3.1).

Allowed Good Can Error: This parameter is used in conjunction with the "Desired Good Can PMT Value" to adjust the PMT input offset in the auto offset mode. The M4530 will adjust the offset until the good can average is within the value entered in "Allowed Good Can Error" of the "Desired Good Can PMT Value" (see section 3.1).

PMT Gain Calibration Mode Enabled: When set to "YES", the automatic gain calibration mode is enabled (see section 3.3). When set to "NO", the manual gain mode is enabled (see section 3.5).

Desired Calibrated Leaker Reject PMT Value: Used in the auto gain mode. This value is set by the user to specify the desired reject average. The M4530 adjusts the PMT gain until the average calibrate value is within the specified error (see section 3.3).

Allowed Calibrated Leaker Reject Error: This parameter is used in conjunction with the "Desired Calibrated Leaker Reject PMT Value" to adjust the PMT gain in the auto gain mode. The M4530 will adjust the gain until the calibrate average is within the value entered in "Allowed Calibrated Leaker Reject Error" of the Desired Calibrated Leaker Reject PMT Value" (see section 3.3).

SECTION 6
HSLRT6 DOS BASED
SETUP PROGRAM REFERENCE

6.2 VIEW M4530 PMT DATA (CAL PORT)

The View M4530 Data Menu is used to view the good can and reject data in real time as well as manually fine tune the PMT gain. This menu is invoked by selecting "2: View M4530 PMT Data (CAL PORT)" from the Main Menu.

Note: Prior to selecting this selection, make sure the RS-232 cable is connected from the COM1 port on the computer to the CAL PORT on the M4530.

```
HSLRT6.EXE                                                    _ □ ×
       Systems M4530 Tester Set-up / Monitoring - Version 1.0

                    View M4530 PMT Data Menu

               1:   Increase PMT gain (by 5volts)
               2:   Decrease PMT gain (by 5volts)
               3:   Reset MAINT alarm
               4:   Help Screen

                  Enter Selection (ESC to exit):

  PMT Gain..: 1101 (+/-5V)        PMT Input: 000
  PMT Offset: +000
  MAINT Alarm: NONE               Rejected Can Data:
                                    Average Reject Value..........: 000
  Good Can Data (averaged           # of Rejects (of last 36 cans): 000
  over last 36 cans):               Last Reject Value.............: 000
    PMT Input Average...: 000       2nd to Last Reject Value......: 000
    PMT Up Deviation....: 000       3rd to Last Reject Value......: 000
    PMT Down Deviation..: 000       4th to Last Reject Value......: 000
    Up Deviation Count..: 000       5th to Last Reject Value......: 000
    Down Deviation Count: 000       6th to Last Reject Value......: 000
    Up Peak (Max).......: 000       7th to Last Reject Value......: 000
    Down Peak (Min).....: 000       8th to Last Reject Value......: 000
```
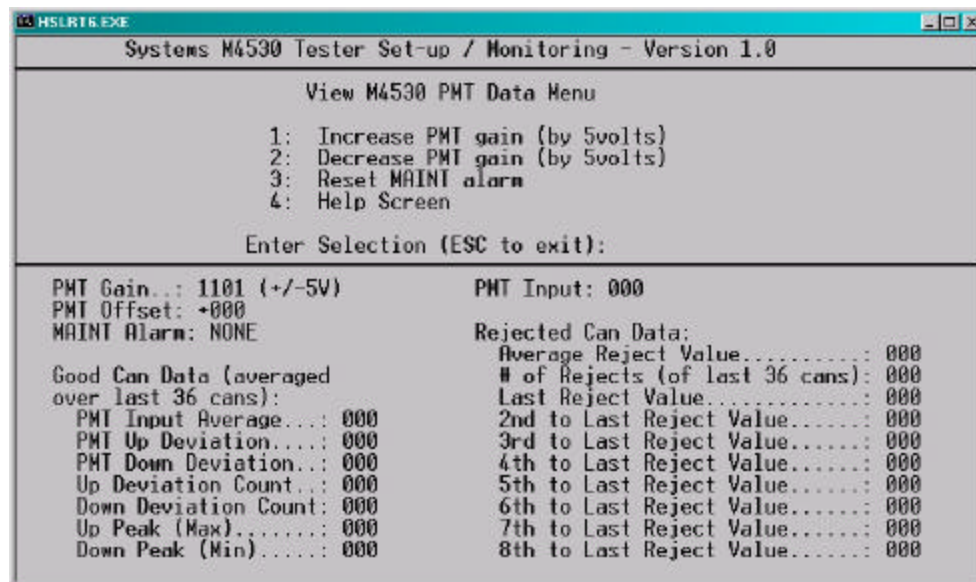
PMT Gain: This value adjusts the voltage applied to the tube, thus adjusting the gain of the tube. The value is set in 5 volt increments, thus when a number is entered, it will be rounded to the nearest 5 volt increment. This parameter is set by the user in manual gain mode (see section 3.5), is adjusted automatically when calibration is preformed in the auto gain mode (see section 3.3), or is incremented or decremented by 5 from this menu.

PMT Offset: This is the input offset value and adjusts the M4530 input offset proportionally. This parameter is set by the user in manual offset mode (see section 3.2) or is adjusted automatically when in the auto offset mode (see section 3.1).

PMT Input: This is the value (0 to 255) of the last PMT sample and is proportional to the amount of light detected by the PMT where 0 equals no light detected and 255 equals maximum light detected.

PMT Input Average: This is the average of all good cans and the in-between pocket "dark" measurements for 36 consecutive cans.

PMT Up Deviation: This is the average up deviation from the good can "PMT Input Average" for 36 consecutive cans. The lower the number, the less deviation between all good cans, the higher the number, the more deviation.

PMT Down Deviation: This is the average down deviation from the good can "PMT Input Average" for 36 consecutive cans. The lower the number, the less deviation between all good cans, the higher the number, the more deviation.

Up Deviation Count: This is the number of good cans that deviated up from the good can "PMT Input Average" in the last 36 consecutive pockets.

Down Deviation Count: This is the number of good cans that deviated down from the good can "PMT Input Average" in the last 36 consecutive pockets.

Up Peak (Max): This is the highest PMT input value detected as a good can in the last 36 consecutive pockets.

Down Peak (Min): This is the lowest PMT input value detected as a good can in the last 36 consecutive pockets.

Average Reject Value: This is the average value of the PMT input for the last 8 rejects.

# of Rejects (of Last 36 cans): This is the number of leakers (rejects) detected in the last 36 consecutive pockets.

Last Reject Value through 8th to Last Reject Value: These 8 variables are a stack that contain the values of the last 8 rejects.

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6.3 SET MACHINE TIMING (PROG PORT)

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 M4530). When selected, the PLS programming main development menu will be invoked using the default RT6TMG channel set-point file. From this menu, the user can zero the machine (set the resolver offset) and adjust the timing signal set-points of CH02 thru CH07 (additional user channels if used).

Note: CH00 (Sync timing) and CH01 (Marker timing) are automatically programmed at power-up and should not be modified by the user. The following sections describe how to perform these functions. Also, 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 M4530.
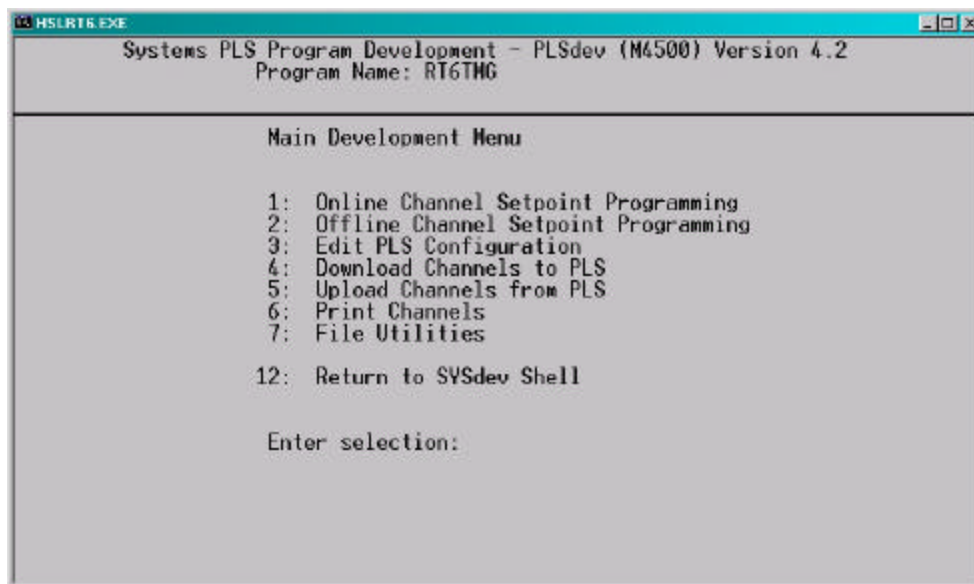
6.3.1 ZEROING THE MACHINE

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

1) From the HSLRT6 set-up program main menu, select "3: Set Machine Timing" selection.

2) Select "1: Online Channel Setpoint Programming".

3) Select "F9: POS/RPM" and observe the "POS:" field. Verify that as the machine is rotated forward that the position increases linearly from 0 through 359. If not, swap the S1 and S3 leads of the resolver at the M4530 resolver connector. Then verify that the position then indeed does increase with forward movement. Press "ESC" to exit the "POS/RPM" update.
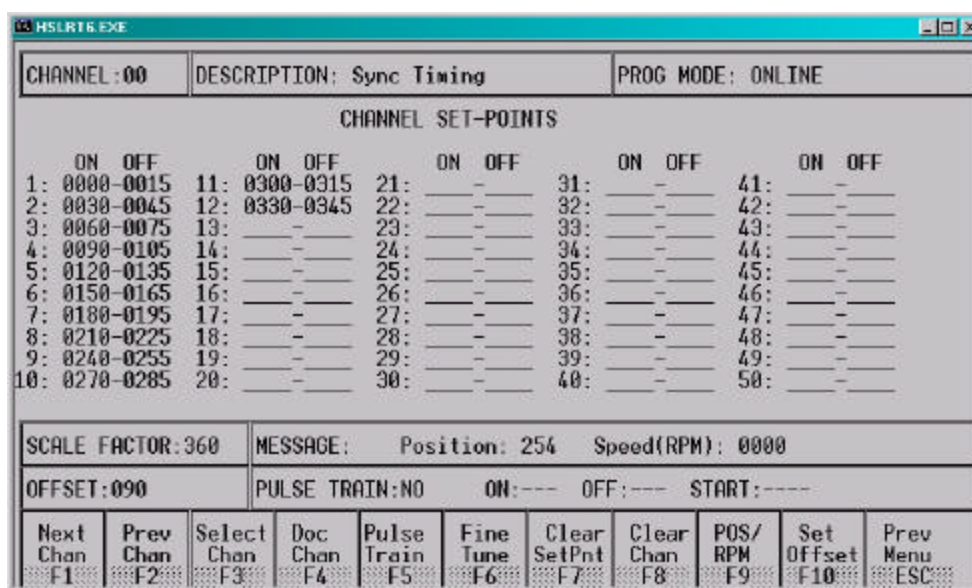
4) Position the machine with pocket #1 perfectly aligned with the PMT. This is the machine zero position.

5) Auto zero the resolver by selecting "F10: Set Offset". Enter "0" in the offset field and press <ENTER>. The M4530 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 "HSLRT6" set-up main menu by pressing <ESC> again.

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6.3.2 ADJUSTING THE TIMING CHANNEL SET-POINTS

To set or alter any of the timing signal (CH02 thru CH07) set-points, perform the following:

1) From the HSLRT6 set-up program main menu, select the "3: Set Machine Timing" selection.

2) Select "1: Online Channel Setpoint Programming".

3) Set-points are entered for a particular channel by typing in the set-point in the form XXX-YYY<ENTER> in the first set-point of the given channel. 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 the desired channels are programmed, press <ESC> to exit back to the PLS Main Development Menu. Press <ESC> again to exit back to the "HSLRT6" set-up main menu. The new channels will be saved both in the M4530 and in the "RT6TMG" file on the hard drive.

   Note: CH00 (Sync timing) and CH01 (Marker timing) are automatically programmed at power-up and should not be modified by the user. Only CH02 thru CH07 can be programmed by the user if additional timing signals are required by the user (these channels are not used by the HSLRT6 program).

_____

6.4 NUMBER OF REJECTS PER POCKET DATA (PROG PORT)

The number of rejects per pocket menu is provided to aid in the trouble-shooting of a bad seal with a particular pocket. The total number of rejects for each pocket since the last reset or end of shift is displayed. The operator can reset these counts at any time to aid in the trouble-shooting process.

This menu is invoked by selecting "4: Number of Rejects per Pocket Data" from the Main Menu.
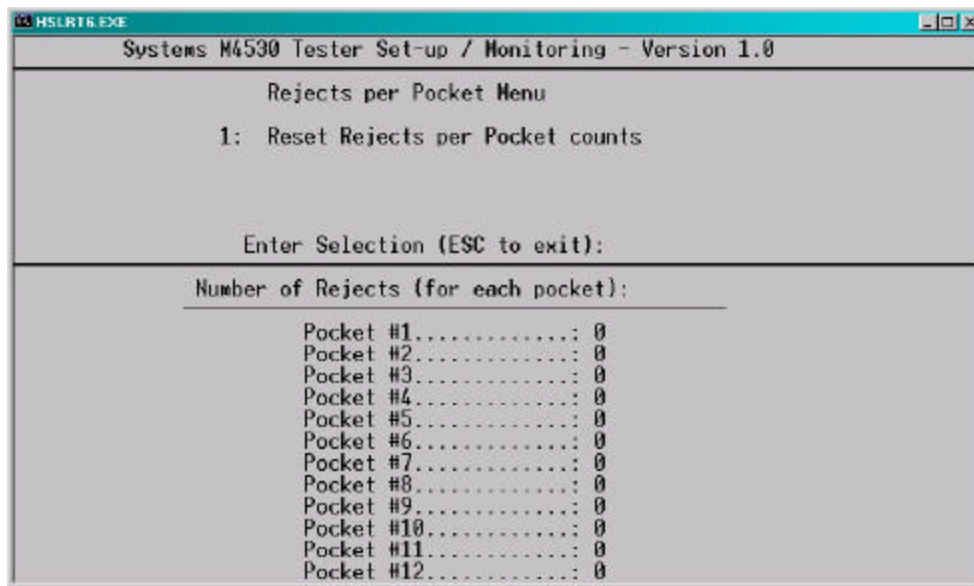
Note: Prior to selecting this selection, make sure the RS-232 cable is connected from the COM port on the computer to the "PROG" port on the M4530.

When selected from the main menu, the total rejects per pocket is displayed and updated continuously in fields that read "Pocket #xx...:". To exit back to the main menu, press <ESC>.

Note: A disproportionately high count for a particular pocket indicates a sealing problem for that pocket.

To reset the pocket reject counts, simply press "1". The counts will be reset in the M4530. To exit back to the main menu, press <ESC>.

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6.5 CURRENT SHIFT DATA (PROG PORT)

The Current shift data menu displays the following information:


```
HSLRT6.EXE                                                    _ □ x
       Systems M4530 Tester Set-up / Monitoring - Version 1.0

                   Current Shift (Totals so far)


              Press "ESC" to return to main menu:

       Total Good Cans Processed................: 0

       Total Rejected Cans (for all pockets)...: 0

       Number of Rejected Cans (for each pocket):
                      Pocket #1..............: 0
                      Pocket #2..............: 0
                      Pocket #3..............: 0
                      Pocket #4..............: 0
                      Pocket #5..............: 0
                      Pocket #6..............: 0
                      Pocket #7..............: 0
                      Pocket #8..............: 0
                      Pocket #9..............: 0
                      Pocket #10.............: 0
                      Pocket #11.............: 0
                      Pocket #12.............: 0
```
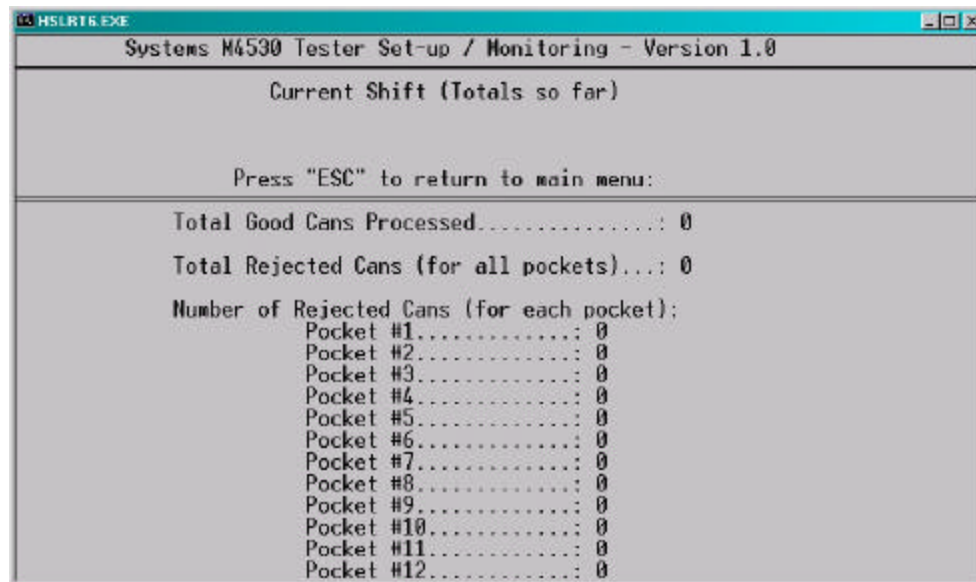
This data is the totals so far into the current shift. This data is transferred to the "Last shift" data when the end of shift input transfers from a "0" to a "1". This can be at the end of either an 8 or 12 hour shift or alternatively could be done at label changes such that the data collected would be for label runs rather than complete shifts. This data cannot be reset either from this menu or by the operator, only at the end of shift input transition. To exit back to the main menu, press <ESC>.

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

Total Rejected Cans: This is the total number of rejected cans for all pockets of the machine.

Pocket #01 rejects thru Pocket #12 rejects: This is the total rejected cans for each pocket. A disproportionately high count for a particular pocket indicates a sealing problem for that pocket.

6.6 LAST SHIFT DATA (PROG PORT)

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. Refer to section 6.5 for definitions of the data fields in the "Last Shift" data menu.

_____

6.7 DOWNLOAD PROGRAM TO M4530 (PROG PORT)

This selection is used to download the HSLRT6 application program to the M4530 module. This should only be performed when replacing the M4530 module (see section 2.13) or when the program has been changed. To download the program, perform the following:

Note: Program download cannot be performed while the tester is running. All outputs on the M4530 are turned "off" and no program execution is performed. Leak can detection would not take place such that if a bad can entered the machine, it would not be rejected. The tester should therefore be stopped while the download takes place (approximately 15 to 45 seconds depending on the computer used).

1) Connect the RS-232 cable from the COM port on the computer to the "PROG" port on the M4530.

2) Select "7: Download Program to M4530". 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 "HSLRT6.REV" file could not be opened is displayed, then the "HSLRT6" application program is not installed in the current directory. To install the program, perform the steps in section 2.11.4 to install the program.

3) Once program download is initiated, M4530 program execution will cease, the current address being downloaded will be displayed, and the "RUN" LED on the M4530 will flash continuously.

4) Once the download is complete, the "RUN" LED on the M4530 will illuminate solid and program execution in the M4530 will resume. Press any key to return back to the "HSLRT6" main menu.

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This section provides information for fault situations (Calibrate error, offset error (MAINT), and an M4530 fault) as well as set-up or tuning problems (excessive cans rejected, calibrated leakers not rejected). With the exception of the M4530 fault, all trouble shooting is performed with "HSLRT6".

7.1 GAIN CALIBRATE ERROR

PROBLEM:
"CAL" LED on M4530 "off" after calibration is performed and "CALIBRATION ERROR" message displayed on HSL-RT6-DSP.

SOLUTION:
Select the "M4530" Set-up" and verify the following:

1) Verify that the "PMT Calibration Mode Enabled" is set to YES. If the PMT calibration mode is disabled, the M4530 cannot adjust the gain and sensitivity when the calibration procedure is performed, and this will result in the calibrate error. Enable the "PMT Calibration Mode" per section 5 (Windows setup program reference) or section 6 (DOS setup program reference) and perform the calibration procedure again.

2) Verify that the "Desired Calibrated Leaker Reject PMT value" is at a reasonable value (40 to 200). If this value is outside this range (say 0 or 255), the M4530 cannot adjust the gain to achieve calibration. Set the "Desired Calibrate Leaker Reject PMT value" between 40 and 200 and try again.

   Note: The "Desired Calibrated Leaker Reject PMT value" must be greater than the "PMT Reject Can Threshold" (35 to 75), which in turn must be greater than the "Desired Good Can PMT Value" (20 to 30).

   Perform the calibration procedure again. If the problem persists, proceed to steps (3) and (4) below.

3) If, after calibration, the "PMT Gain" is less than 500 volts and the "Gain Calibrate PMT Input Average" is greater than the "Desired Calibrated Leaker Reject PMT value", the PMT detected too much light and was not able to reduce the gain of the PMT adequately to compensate for the amount of light detected. Verify that the calibrated leaker has a .0025 calibration hole in it and does not have any other areas of leakage in the can. Verify that the seal at the pocket used for calibration is not leaking. Verify that no light leakage is occurring at any of the PMT seals (machine shutter to light seal plate, PMT to light seal plate, or at the PMT housing itself). Perform the calibrate procedure (per section 3.4) and try again. Proceed to step (5) if the problem persists.

SECTION 7
TROUBLE-SHOOTING

4) If, after calibration, the "PMT Gain" is at 1101 volts and the "Gain Calibrate PMT Input Average" is less than the "Desired Good Can PMT Value" by more than 5, then the PMT did not detect enough light and was not able to increase the gain enough to calibrate the M4530. Verify that the calibrated leaker has a .0025 calibration hole in it and also verify that the light source is generating an adequate supply of light (lamps "on" during calibration). If so, set the "Desired Calibrated Leaker Reject PMT Value" to a lower value (it can be set as low as 10 above the "Desired Good Can PMT Value") and try the calibration again. If the "Desired Calibrated Leaker Reject Value" is lowered, the "PMT Reject Can Threshold" should also be lowered (it should be between the "Desired Good Can PMT Value" and the "Desired Calibrated Leaker Reject Value". Perform the calibrate procedure (per section 3.4) and try again.

5) If the solutions in (3) and (4) above do not correct the problem, verify all cables between the M4530 and the PMT and try again.

6) If the problem persists, verify that + and - 12VDC is present at the +12VDC, -12VDC, and AGND pins of the PMT of the M4530 and try again.

7) If the problem persists, verify that +24VDC is being supplied to the PS2000N1 power supply and try again.

8) If the problem persists, replace the 9956B-16 PMT tube and try again.

9) If the problem persists, replace the PMT housing, A1H Preamp, GB1BH Gating circuit and try again.

10) If the problem persists, replace the M4530 module. Set the module up per section 2.13 and try again.

_____

7.2 OFFSET ERROR

PROBLEM:
"MAINT" Led on M4530 is "on".

SOLUTION:
Select the "M4530" Set-up" and verify the following:

1) If the "MAINT Alarm" entry in the Set-up menu displays either "Offset Exceeded +250" or "Offset Exceeded -250", then the automatic offset routine attempted to adjust the offset outside the maximum + or - minus offset limits. If the offset exceeds + or -250 in an attempt to set the "PMT Input Average" equal to the "Desired Good Can PMT Value", the MAINT LED on the M4530 will be illuminated. This indicates that the PMT is detecting an excessive amount of light both when the cans are sampled and at the in-between pocket measurement or that the offset potentiometer in the PMT B2F-RFI housing is set incorrectly.

2) Verify that the "Desired Good Can PMT Value" is within a reasonable range (20 to 35). If this value is outside this range (say 0 or 255), the M4530 cannot adjust the offset enough to compensate for this unrealistic value. If the value was outside the range, set the "Desired Good Can PMT Value" between 20 and 35 and proceed to step (5).

   Note: The "Desired Calibrated Leaker Reject PMT value" must be greater than the "PMT Reject Can Threshold" (35 to 75) which in turn must be greater than the "Desired Good Can PMT Value" (20 to 30).

3) Verify that the B2F-RFI PMT housing offset potentiometer is set correctly (see section 2.12.3).

4) Verify that the machine is timed properly per section 2.12.2 and that no light leakage is occurring at any of the PMT seals (machine shutter to light seal plate, PMT to light seal plate, or at the PMT housing itself).

5) Reset the "MAINT Alarm" by selecting "3: Reset MAINT alarm". Run the machine with cans at normal line speeds and verify that the offset is automatically adjusted until the "PMT Input Average" is equal to the "Desired Good Can PMT Value" plus or minus 2. If the offset is again adjusted either up to the +250 max limit or down to the -250 max limit, perform step (6) below.

6) Verify all cables between the M4530 and the PMT and try again.

7) If the problem persists, verify that + and - 12VDC is present at the +12VDC, -12VDC, and AGND pins on the M4530 and try again.

_____

SECTION 7
TROUBLE-SHOOTING

8) If the problem persists, verify that +24VDC is being supplied to the PS2000N1 power supply and try again.

9) If the problem persists, replace the 9956B-16 PMT tube and try again.

10) If the problem persists, replace the PMT housing, A1H Preamp, GB1BH Gating circuit and try again.

11) If the problem persists, replace the M4530 module. Set the module up per section 2.13 and try again.

7.3 M4530 FAULT

PROBLEM:
"FLT" LED on M4530 module "on". M4530 none functional.

SOLUTION:
The "FLT" LED on the M4530 is illuminated when either the PMT Interface section of the M4530 or the PLC section of the M4530 incurs an internal fault. Perform the following to read the M4530 fault code:

1) Connect computer to "PROG" port of M4530.

2) Initiate "SYSdev" and select the "HSLRT6" program (or program which is normally downloaded to M4530).

3) From the "Main Development Menu", select "6: Target Board Interface".

4) From the Target Board Interface menu, select "4: Target Board Fault Codes/Status".

5) If the fault code displayed was "45H: User program system fault sfunc09 call", the PMT Interface section incurred the fault. All other fault codes pertain to the PLC section of the M4530.

6) Perform the corrective action described in the SYSdev fault menu and reset the fault code as prompted to by SYSdev. If the M4530 faults again, try cycling power to the M4530. If the M4530 faults again and will not run, replace the M4530, downloading the "HSLRT6" program (or other program if used) and perform the setup per section 2.13.

7.4 EXCESSIVE GOOD CANS REJECTED

PROBLEM:
Excessive good cans rejected from machine.

SOLUTION:
Excessive good cans are rejected from the machine either when a particular pocket or pockets has a bad light seal or when the M4530 is setup too sensitive. Perform the following to trouble shoot:

1) Select the "4: Number of Rejects per Pocket Data" selection from the "HSLRT6" main menu and observe the Per Pocket Reject Totals. If a particular pocket is rejecting a significantly higher number of cans than the other pockets, that pocket most likely has a bad light seal (or some other mechanical problem). Fix that pocket's seal and try again. If all pockets show high reject rates, continue to step (2).

2) Verify that all pocket seals are in good condition with no visible leaks. Verify pocket air pressure. Verify that no light leakage is occurring at any of the PMT seals (machine shutter to light seal plate, PMT to light seal plate, or at the PMT housing itself). If these all look good, proceed to step (3).

3) If the M4530 is setup too sensitive ("PMT Reject Can Threshold" too low, "Desired Calibrated Leaker Reject PMT Value" too high, or "PMT Gain" too high) excessive good cans will be rejected. Perform steps (4) through (7) to lower the sensitivity.

4) Select the "M4530 Set-up" menu and set the "Desired Calibrated Leaker Reject PMT Value" to a lower value (between 40 and 200).

    Note: The "Desired Calibrated Leaker Reject PMT value" must be greater than the "PMT Reject Can Threshold" (35 to 75) which in turn must be greater than the "Desired Good Can PMT Value" (20 to 30).

    Perform the calibration procedure and try again. If a calibrate error occurs at this point, trouble shoot per section 7.1.

5) If excessive cans are still being rejected, from the "M4530 Set-up" menu, increase the "PMT Reject Can Threshold" (normal range is 35 to 75).

    Note: If this is increased too high, calibrated leakers will not be rejected. Run calibrated leakers through the machine and verify they are still rejected.

6) If excessive cans are still being rejected, select the "View M4530 PMT Data" menu and manually lower the "PMT Gain". Again verify that the calibrated leakers are rejected at the lower gain settings.

SECTION 7
TROUBLE-SHOOTING

7) If the problem persists, perform steps (5) through (10) of section 7.1.

_____

7.5 CALIBRATED LEAKERS NOT REJECTED

PROBLEM:
Some or all of the calibrated leakers are not rejected when run through the machine.

SOLUTION:
In this case, either the sensitivity of the M4530 or PMT tube is too low. Other causes could be an inadequate light source (burned out tubes) or dirty shutter or starwheel. Perform the following:

1) Verify that the light source is adequate and that there are no burned out bulbs.

2) Verify that the machine is clean. The windows in the shutter must be free of dust and oil, and the plexi-glass starwheel should be clean. Verify that the PMT tube end window is also clean.

3) If the machine is clean and the light source adequate, select the "M4530 Set-up" menu and lower the "PMT Reject Can Threshold" and try again. This value can be lowered to within 5 above the "Desired Good Can PMT Value".

4) If the problem persists, increase the "PMT Gain" on the "View M4530 Data" menu and try again. This can be increased to a maximum of 1200 volts.

   Note: Running the "PMT Gain" above 1100 volts will shorten the life of the PMT.

5) If the problem still persists, perform steps (5) through (10) of section 7.1.

The following are the recommended spares for the HSL-RT6-M45. All parts are available through Systems Engineering.

Quantity	Part Number	Description
1ea.	M4530	PLC/PLS/PMT Module
1ea.	P4500	Power Supply
1ea.	S4568	8-IN/8-OUT 10-30VDC I/O BOARD
1ea.	S4516	Communications board (if used)
1ea.	S4573	16-Point 10-30VDC Output Board (if used)
1ea.	D4591	Display/Keypad
1ea.	RSV34-MS1	Resolver
1ea.	PS2000N1	2K Volt PMT Power Supply
1ea.	9956B-16	Photo Multiplier Tube
1ea.	B2F-RFI	PMT Housing with C634 PMT Preamp and C641 PMT Gating Circuit

SECTION 8
RECOMMENDED SPARES

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MODBUS PORT CONFIGURATION

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

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

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

_____

DATA WRITTEN TO THE MODICON PLC

The following data is written to the MODICON PLC:

MODICON Dest 4x Address	Data Definition	M4530 Source Address
401700	Speed (CPM)	W182
401701	Resolver Position	W180

Current Shift Data:

401702	Number of Good Cans (Lo-0 to 9,999)	W1100
401703	Number of Good Cans (Hi-10,000's)	W1102
401704	Total Rejects (Lo-0 to 9,999)	W1104
401705	Total Rejects (Hi-10,000's)	W1106
401706	Rejects Pocket #1 (current shift)	W1108
thru	thru	thru
401717	Rejects Pocket #12 (current shift)	W1130

Diagnostics Counts (resettable by the operator):

401718	Rejects Pocket #1 (diagnostic)	W1050
thru	thru	thru
401729	Rejects Pocket #12 (diagnostic)	W1072

_____

APPENDIX A
MODBUS COMMUNICATIONS

MODICON Dest 4x Address	Data Definition	M4530 Source Address
PMT Set-Up/Status Variables:		
401730	PMT Gain (in volts 498-to-1200)	W1000
401731	PMT Offset Magnitude (0-to-250)	B1002
401732	PMT Offset sign (0='+', 1='-')	B1003
401733	Reject Threshold (0-to-255)	B1004
401734	PMT Good Can Average Value	B1005
401735	Status (to MODICON)	W790

The bits of the Status register (to the MODICON from the M4530) are mapped as follows:

W790: Status to MODICON (4x address 401735 in MODICON)
B790.0:   Bad Seal Pocket #1
  thru   thru
B791.3:   Bad Seal Pocket #12
B791.4:   Excess Good Can Rejection Alarm
B791.5:   PMT Calibration in Progress
B791.6:   PMT Calibration Error
B791.7:   Timing Signal Fail Alarm

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

B790.0:   Bad Seal Pocket #1
  thru
B791.3:   Bad Seal Pocket #12
            The respective Bad Seal pocket alarm for pockets #1 thru #12 are activated when the corresponding pocket incurs over 4 rejects within 10 cans tested.

B791.4:   Excess Good Can Rejection Alarm - this bit is set to a "1" if 10 consecutive cans are rejected. The bit is cleared when 10 good consecutive cans are detected or when the machine stops. This generally indicates that a major compromise in the light seal (shutter plate to PMT gimbal or pocket seals) has occurred. In addition, this may also indicate an infeed track jam. This bit should be interlocked with the infeed low sensor to stop the machine if the infeed low sensor is covered and the bit is set to a "1".

B791.5:   PMT Calibration in Progress - this bit is set to a "1" when the PMT Gain calibration is in progress. When this bit goes back to a "0", bit6 of this byte should be tested to see if a calibration error occurred or not (see below).

B791.6:   PMT Calibration Error - this bit is set to a "1" if a calibration error occurred when the PMT Gain calibration is performed. If this bit is a "0" after the calibration is complete (bit5 above back "off"), then the calibration was successful. If it is "1", a calibration error occurred.

B791.7:   Timing Signal Fail Alarm - this bit is set to a "1" if either CH00 or CH01 fails to change state once the tester is running (drive on for a time delay).

APPENDIX A
MODBUS COMMUNICATIONS

_____

DATA READ FROM THE MODICON PLC

The following data is read from the MODICON PLC:

MODICON Dest 4x Address	Data Definition	M4530 Source Address
401760	Status/Control (from MODICON)	W792

The bits of the Status/Control register (from the MODICON to M4530) are mapped as follows:

Note: For all the following control bits, the corresponding action performed by the bit is activated at the leading edge ("off"-to-"on") transition of the bit. Once a bit is set "on", it must be set back to "off" some time latter, as if activated by a momentary PB contact.

W792: Status/Control from MODICON (4x address 401760 in MODICON)
- B792.0:   End of Shift
- B792.1:   Reset Rejects per pocket (diagnostics W1050-W1072)
- B792.2:   PMT Gain Calibrate Initiate
- B792.3:   PMT Gain Increase (by 5 volts)
- B792.4:   PMT Gain Decrease (by 5 volts)
- B792.5:   Reject Threshold Increase (by one)
- B792.6:   Reject Threshold Decrease (by one)
- B792.7:   Alarm Reset
- B793.0:   Set Resolver Zero (Auto Zero)
- B793.1:   Not Used
    thru
- B793.7:   Not Used

_____

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

B792.0:   End of Shift - Setting this bit to a "1" transfers the current shift data in the M4530 to the last shift data and clears the current shift data (to start data collection for the next shift). The current shift data in the MODICON should be saved to the last shift data stack prior to setting this bit.

B792.1:   Reset Rejects per pocket - Setting this bit to a "1" clears the rejects per pocket diagnostics data in M4530 words W1050-W1072 (MODICON words 401718-401729). This is usually done by the operator through out the shift to verify that one pocket is not rejecting at a higher rate than the other pockets.

B792.2:   PMT Gain Calibrate Initiate - Setting this initiates the gain calibration procedure just the same as the "CALIBRATE" button inside the panel does. The machine should be stopped with the calibrated leaker in front of the PMT prior to performing this.

B792.3:   PMT Gain Increase - Setting this bit to a "1" increases the gain of the PMT by 5 volts. This is used to manually increase the gain.

B792.4:   PMT Gain Decrease - Setting this bit to a "1" decreases the gain of the PMT by 5 volts. This is used to manually decrease the gain.

B792.5:   Reject Threshold Increase - Setting this bit to a "1" increases the "Reject Threshold" by one thus decreasing the system sensitivity.

B792.6:   Reject Threshold Decrease - Setting this bit to a "1" decreases the "Reject Threshold" by one thus increasing the system sensitivity.

B792.7:   Alarm Reset - Setting this bit to a "1" resets the bad pocket alarms for pockets 1-12 and the timing signal fail alarm.

B793.1:   Set Resolver Zero (Auto Zero) - Setting this bit sets the PLS offset such that the current position is "0". To set the resolver zero, stop the machine, align pocket #1 precisely wit the PMT and then set this bit to a "1". The Sync and Pocket #1 Marker timing are automatically set in the PLS section, no other action is required by the user to time the machine.

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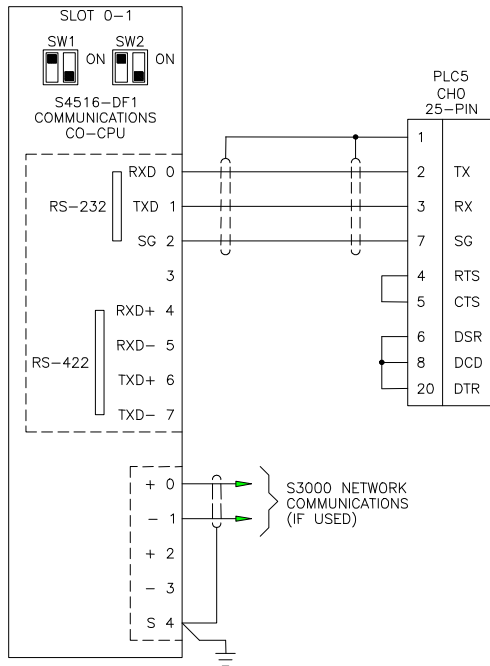
Internally, the PLC-5 should be set up for RS-232C communication. Refer to the dip-switch settings guide on the side of the processor.

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 M4530 rack and should be set to:
    POLE 1 = ON
    POLE 2 = OFF

APPENDIX B
DF1 COMMUNICATIONS

S4516-DF1 to SLC
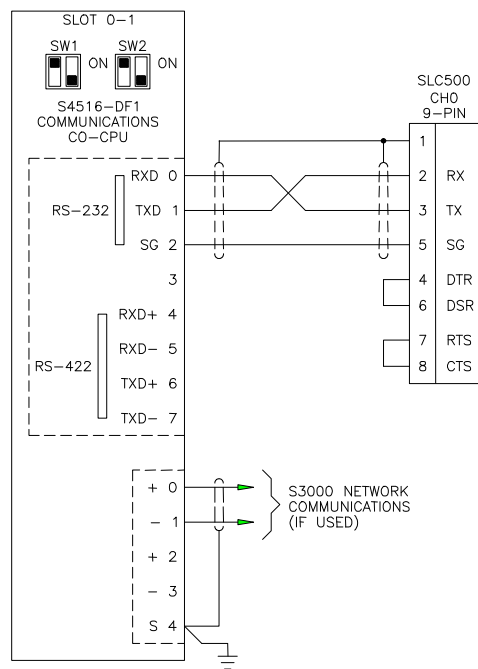
S4516-DF1 to ControLogix

SOFTWARE

PLC5

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

```
***** S4516-DF1 SERIAL COMMUNICATIONS *****
-- Execute MSG Instruction Read/Write Messages --

         S4516-DF1                      MSG                           READ DATA 1
         Communications                Instruction                   (S4516-DF1)
         Reset                         Number
         T4:0                          ---EQU---                     ---MSG---
0000     ---/---                       Equal                         Read/Write Message      (EN)
         TT                            Source A        N7:0          Control    MG20:0       (DN)
                                                         0<           Setup Screen      <    (ER)
                                       Source B        0
                                                         0<

                                       MSG                           WRITE DATA 1
                                       Instruction                   (S4516-DF1)
                                       Number
                                       ---EQU---                     ---MSG---
                                       Equal                         Read/Write Message      (EN)
                                       Source A        N7:0          Control    MG20:2       (DN)
                                                         0<           Setup Screen      <    (ER)
                                       Source B        1
                                                         1<
```

```
-- Increment to NEXT MSG Instruction --
 - The "Done" bit (DN) is set when the last packet of the message is successfully transferred.
 - The "Error" bit (ER) is set when the controller detects that a transfer failed.

                                       MSG Instrucion                MSG
         READ DATA 1                   READ DATA 1 - DONE            Instruction
         (S4516-DF1)                   (One Shot)                    Number
         MG20:0                        B3:0                          ---ADD---
0001     ---] [---                     ---[ ONS ]---                 Add
         DN                            0                             Source A        N7:0
                                                                                      0<
         READ DATA 1                                                 Source B        1
         (S4516-DF1)                                                                  1<
         MG20:0                                                      Dest            N7:0
         ---] [---                                                                    0<
         ER

                                       MSG Instrucion
         WRITE DATA 1                  WRITE DATA 1 - DONE
         (S4516-DF1)                   (One Shot)
         MG20:2                        B3:0
         ---] [---                     ---[ ONS ]---
         DN                            2

         WRITE DATA 1
         (S4516-DF1)
         MG20:2
         ---] [---
         ER
```

APPENDIX B
DF1 COMMUNICATIONS

-- Roll-over MSG Instruction Number --

```
0002
        MSG                                              MSG
        Instruction                                      Instruction
        Number                                           Number
            ┌─── GRT ──────────────┐                        ┌─── MOV ──────────────┐
            │ 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
        Communications                                   READ DATA 1
        Reset                                            (S4516-DF1)
        T4:0                                             MG20:0
0004     ┤ ├ ─────────────────────────────────────────────( U )
         └─ 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.

APPENDIX B
DF1 COMMUNICATIONS

-- Roll-over MSG Instruction Number --

	MSG Instruction Number		MSG Instruction Number

```
                  ┌─── GRT ──────────┐                          ┌─── MOV ──────────┐
                  │ Greater Than (A>B)│                          │ Move             │
0003 ──────────── │ Source A    N7:0  │ ──────────────────────── │ Source       0   │ ──────────
                  │              0<   │                          │              0<  │
                  │ Source B    1     │                          │ Dest      N7:0   │
                  │              1<   │                          │              0<  │
                  └───────────────────┘                          └──────────────────┘
```

-- S4516-DF1 Serial Communications Reset --

	READ DATA 1 ERROR (S4516-DF1)		S4516-DF1 Communications Reset

```
              N12:0                                            ┌─── TON ──────────┐
0004 ─────────┤ ├──────┬─────────────────────────────────────│ Timer On Delay   │──( EN )
               12      │                                       │ Timer      T4:0  │
                       │                                       │ Time Base   1.0  │──( DN )
          WRITE DATA 1 │                                       │ Preset      35<  │
          ERROR        │                                       │ Accum        0<  │
          (S4516-DF1)  │                                       └──────────────────┘
          N12:40       │
         ─┤ ├──────────┤
           12          │
                       │
          S4516-DF1    │
          Communications│
          Reset        │
          T4:0         │
         ─┤ ├──────────┘
           TT
```

-- Reset MSG Instruction Errors --

S4516-DF1 Communications Reset			READ DATA 1 ERROR (S4516-DF1)

```
          T4:0                                                 N12:0
0005 ─────┤ ├──────────────────────────────────────────────────( U )──────┐
           DN                                                     12        │
                                                                            │
                                                            WRITE DATA 1    │
                                                            ERROR           │
                                                            (S4516-DF1)     │
                                                            N12:40          │
                                                            ──( U )─────────┤
                                                               12

0006 ──────────────────────────────────────────────────────────( END )
```
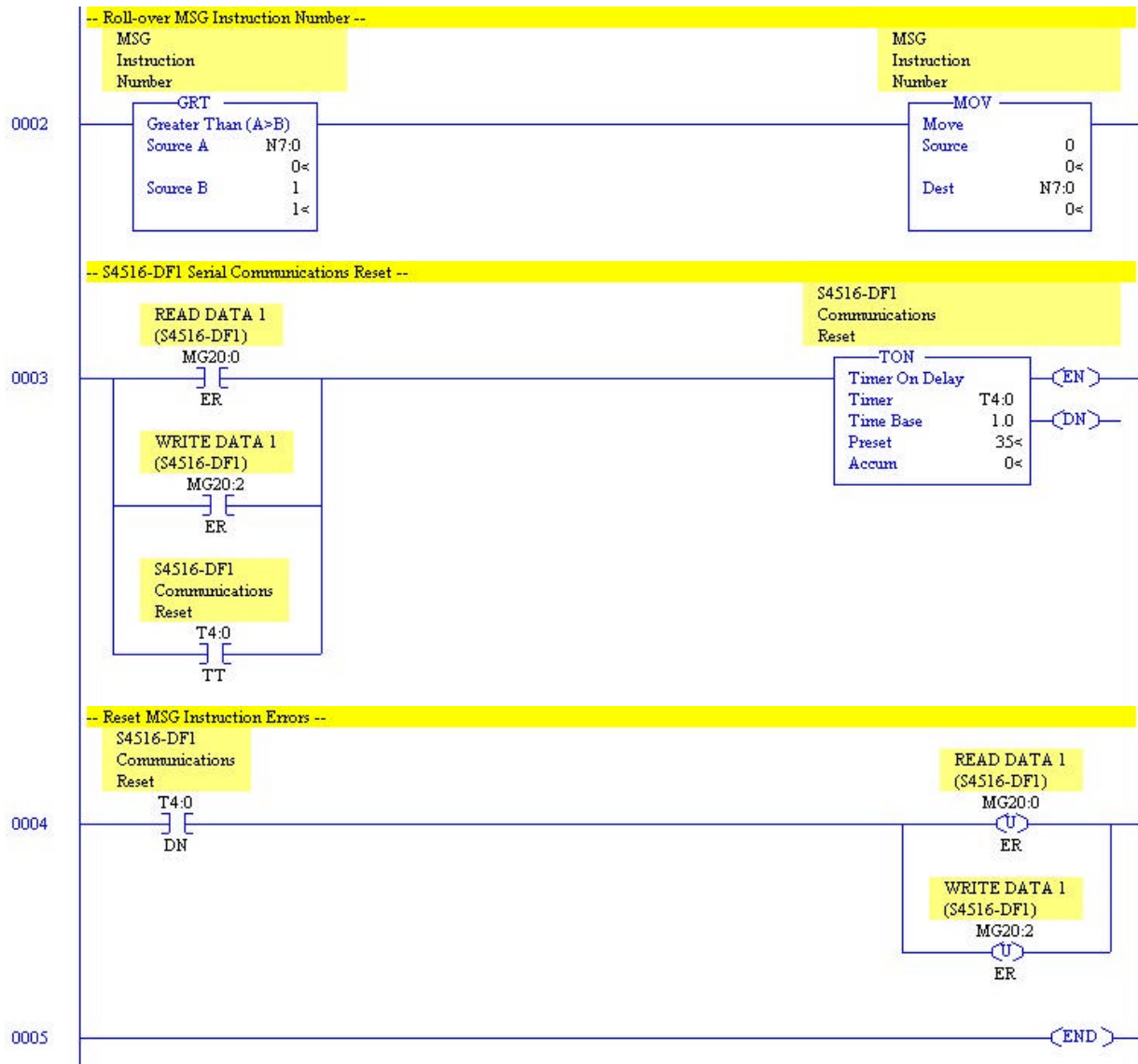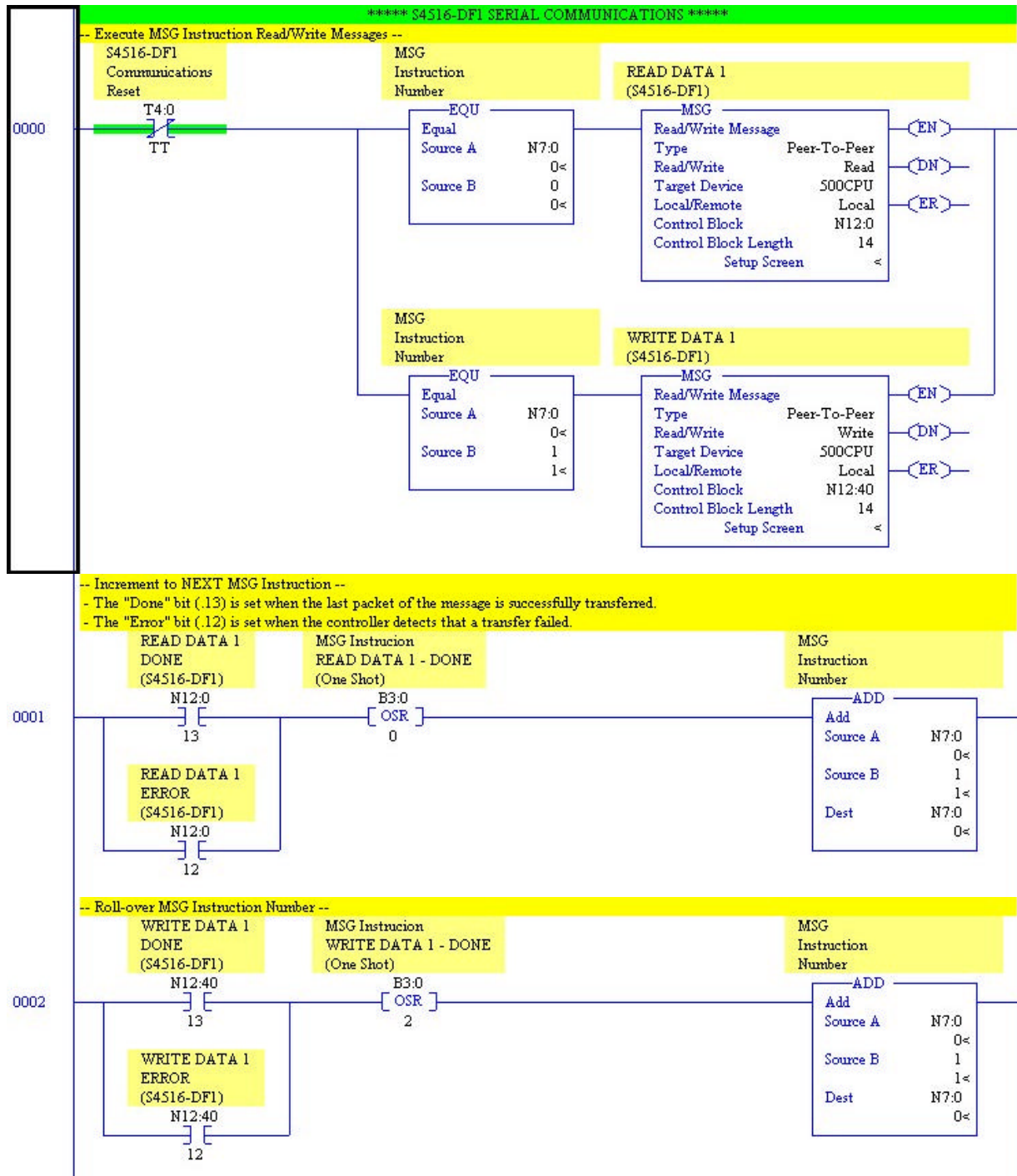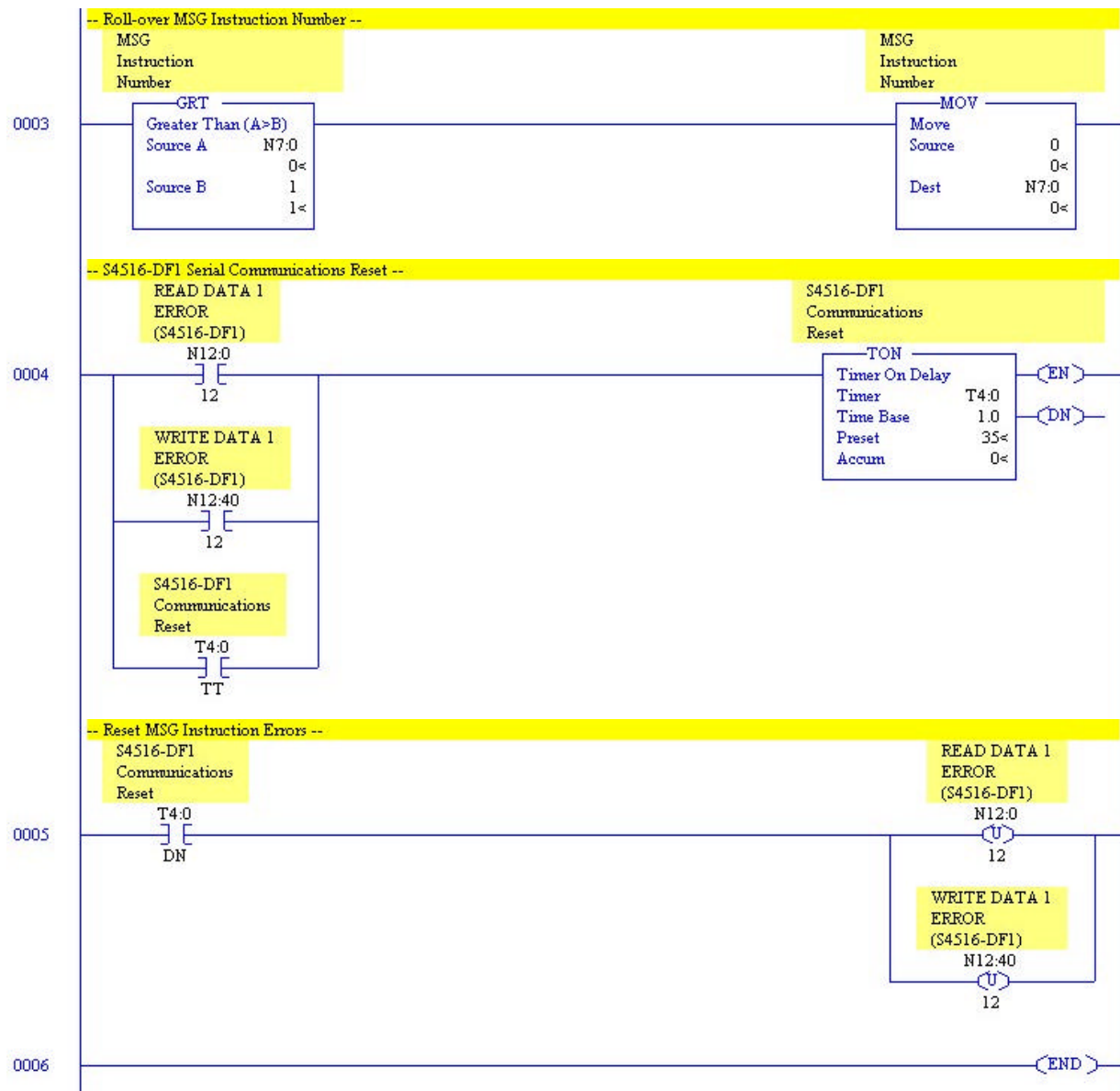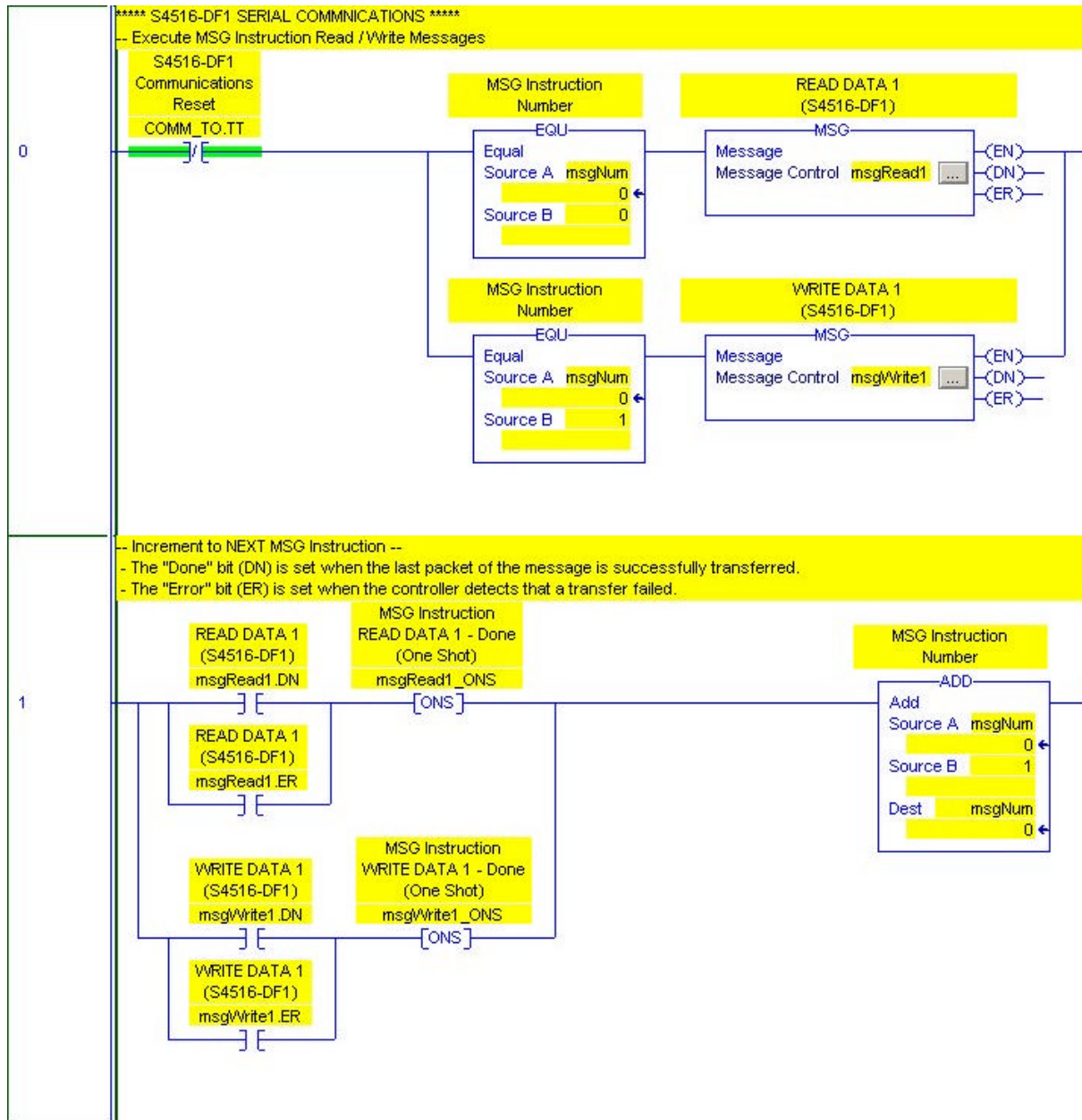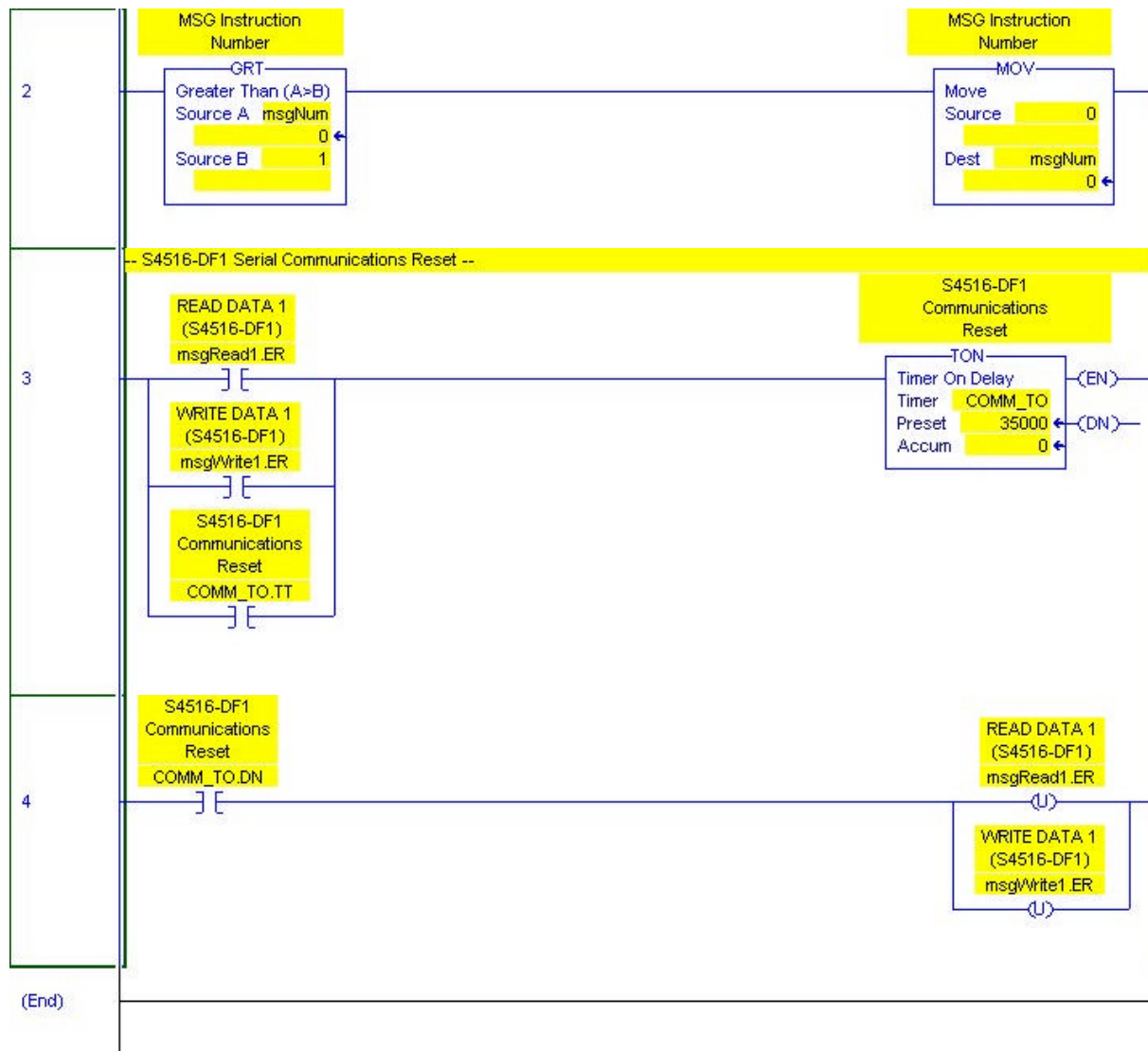
ControlLogix and CompactLogix

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

APPENDIX B
DF1 COMMUNICATIONS

2

MSG Instruction Number

GRT
Greater Than (A>B)
Source A msgNum
0
Source B 1

MSG Instruction Number

MOV
Move
Source 0
Dest msgNum
0

-- S4516-DF1 Serial Communications Reset --

3

READ DATA 1
(S4516-DF1)
msgRead1.ER
] [

WRITE DATA 1
(S4516-DF1)
msgWrite1.ER
] [

S4516-DF1
Communications
Reset
COMM_TO.TT
] [

S4516-DF1
Communications
Reset

TON
Timer On Delay (EN)
Timer COMM_TO
Preset 35000 (DN)
Accum 0

4

S4516-DF1
Communications
Reset
COMM_TO.DN
] [

READ DATA 1
(S4516-DF1)
msgRead1.ER
(U)

WRITE DATA 1
(S4516-DF1)
msgWrite1.ER
(U)

(End)

___

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 50 elements (total) read from the M4530 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 B
DF1 COMMUNICATIONS

WRITE INSTRUCTION – PLC5

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

```
MSG - MG20:2 : (1 Elements)                                    _ □ X

 General

 ┌─This PLC-5──────────────────────────┐  ┌─Control Bits──────────────────────┐
 │  Communication Command : │SLC Typed Logical Write│  │   Ignore if timed out (TO): │0│ │
 │     Data Table Address : │N11:0│    │  │        To be retried (NR): │0│    │
 │      Size in Elements : │10│        │  │   Awaiting Execution (EW): │0│    │
 │        Port Number: │0│             │  │      Continuous Run (CO): │0│     │
 │                                      │  │              Error (ER): │0│     │
 ├─Target Device───────────────────────┤  │       Message done (DN): │0│     │
 │     Data Table Address: │N7:50│     │  │  Message Transmitting (ST): │0│   │
 │  Local Station Address (oct): │1│  (dec): │1│ │  Message Enabled (EN): │0│ │
 │        Local / Remote : │Local│     │  └───────────────────────────────────┘
 │                                      │  ┌─Error──────────────────────────────┐
 │                                      │  │    Error Code(Hex):  0              │
 │                                      │  └────────────────────────────────────┘
 └──────────────────────────────────────┘

 ┌─Error Description───────────────────────────────────────────┐
 │ No errors                                                    │
 └─────────────────────────────────────────────────────────────┘
```

Note: The Communication Command is "SLC Typed Logical Write". The Data Table Address can be any integer file address. The 10 elements written to the M4530 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 50 elements (total) read from the M4530 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 B
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 10 elements written to the M4530 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:

```
┌─ Message Configuration - msgRead1 ─────────────────────── ✕ ┐
│                                                              │
│ ┌ Configuration │ Communication │ Tag │ ─────────────────┐  │
│                                                              │
│   Message Type:        [SLC Typed Read          ▼]          │
│                                                              │
│   Source Element:      [N7:0                     ]          │
│                                                              │
│   Number Of Elements:  [50    ⬍]                            │
│                                                              │
│   Destination Element: [DF1_Read[0]         ▼]   [New Tag...] │
│                                                              │
│                                                              │
│                                                              │
│                                                              │
│                                                              │
│                                                              │
│  ○ Enable   ○ Enable Waiting   ○ Start   ○ Done   Done Length: 0  │
│                                                              │
│  ○ Error Code:       Extended Error Code:      □ Timed Out ← │
│  Error Path:                                                 │
│  Error Text:                                                 │
│              [  OK  ]  [ Cancel ]  [ Apply ]  [ Help ]       │
└──────────────────────────────────────────────────────────┘
```

Note: The "Message Type" is SLC Typed Read. The Destination Element can be any integer array. The 50 elements (total) read from the M4530 PLC are defined in the last section – Read/Write Data Definitions.

APPENDIX B
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 10 elements written to the M4530 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:
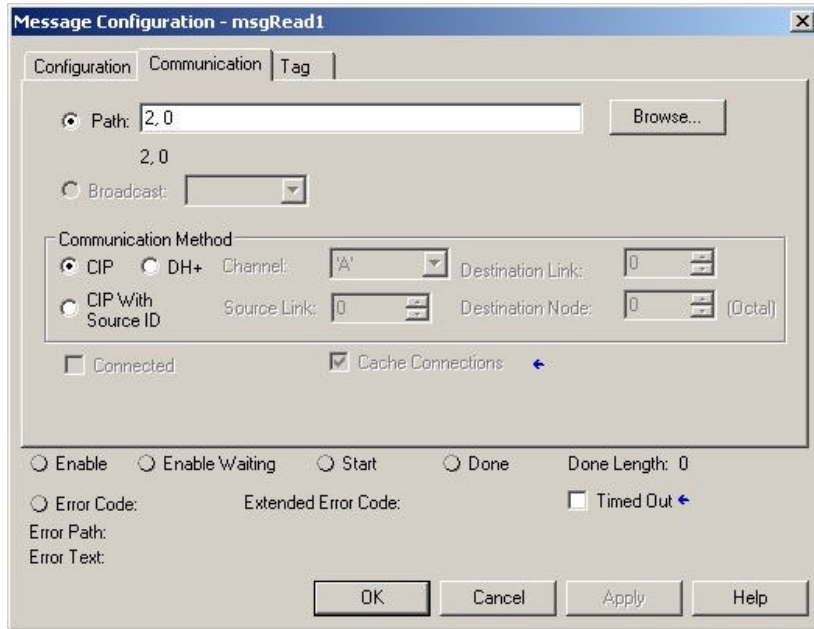
The "Path" describes the route the message takes to get to the destination. The format of the "Path" uses this format:

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 B
DF1 COMMUNICATIONS

TAG TAB - CONTROLOGIX
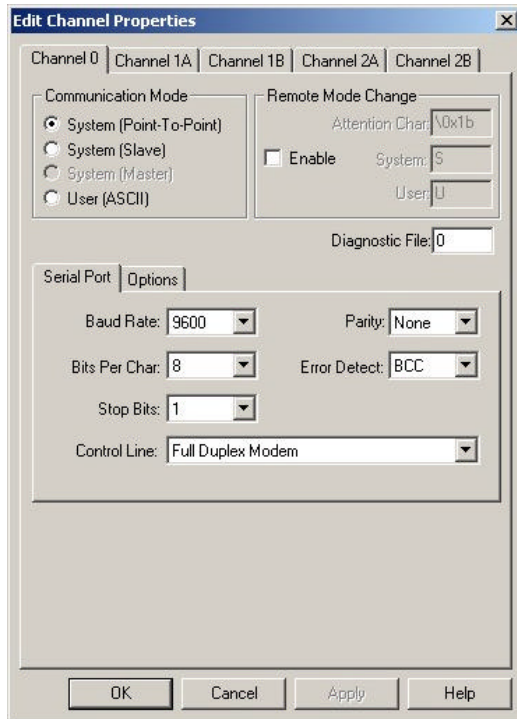The Tag configuration for a ControLogix PLC is setup as follows:
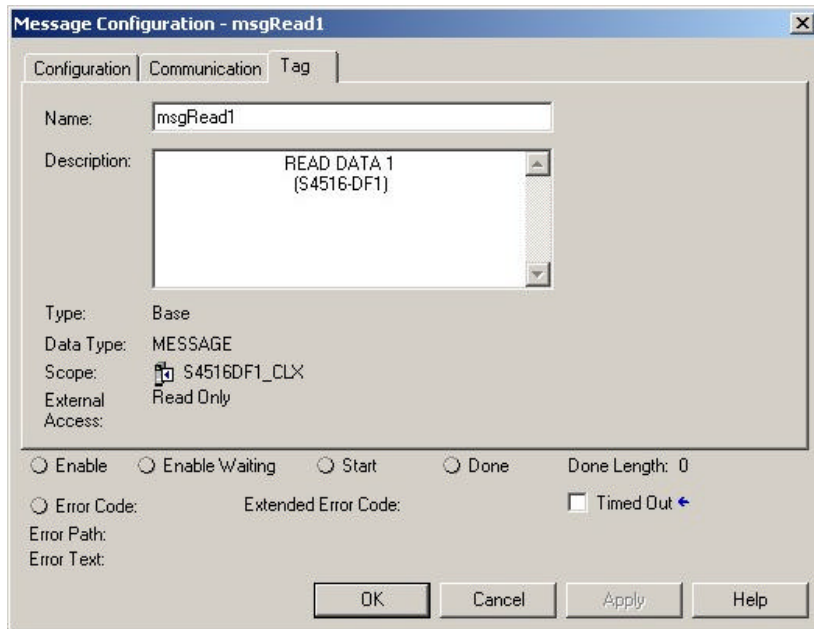
Note: The Tag "Data Type" must be MESSAGE and is defined at the "Controller" scope level.

CHANNEL 0 SETUP

PLC5

The Channel 0 Serial Port should be setup as follows:
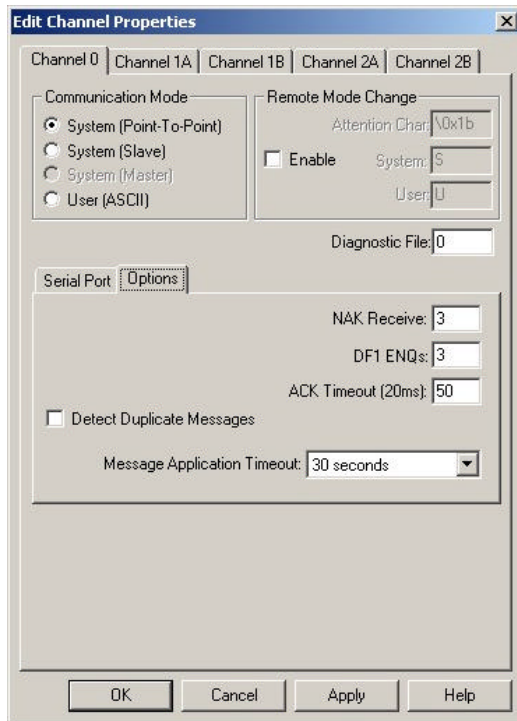

Note: The Communication Mode is setup for System (Point-to-Point).

APPENDIX B
DF1 COMMUNICATIONS

PLC5

The Channel 0 Options are setup as follows:

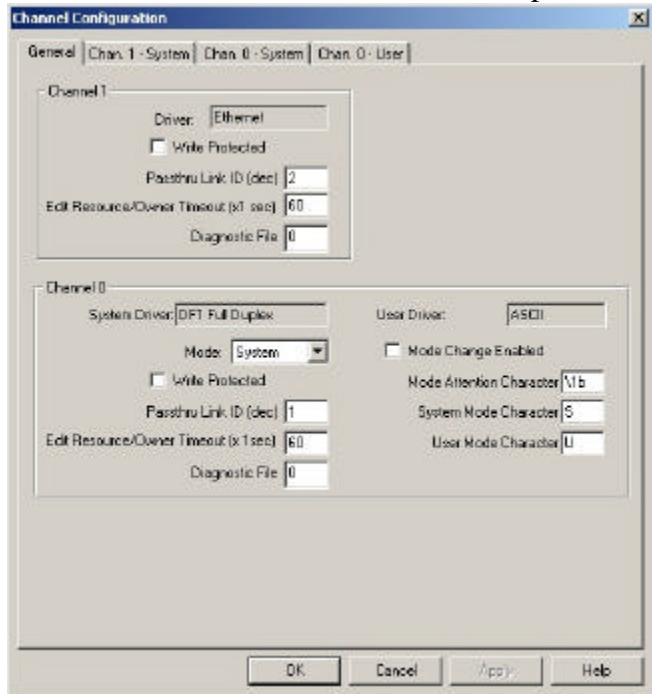
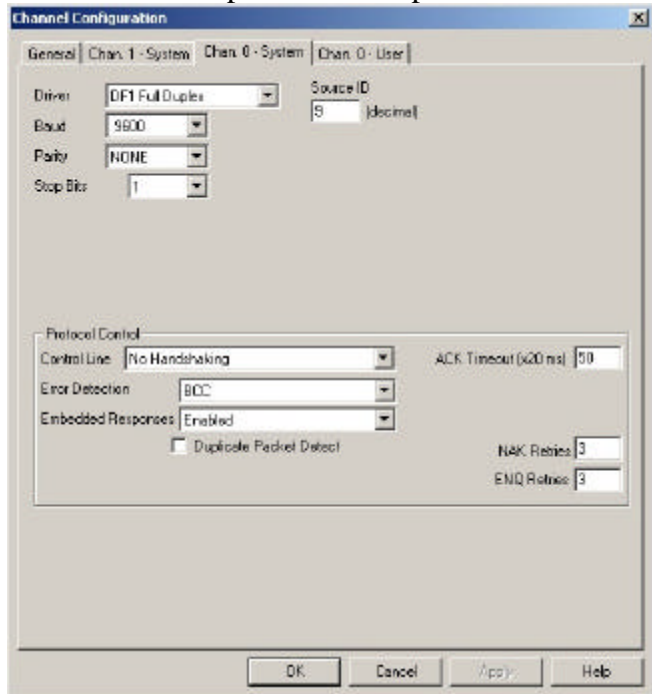**Note:** The "Detect Duplicate Messages" should be unchecked.

SLC500

The Channel 0 Serial Port should be setup as follows:
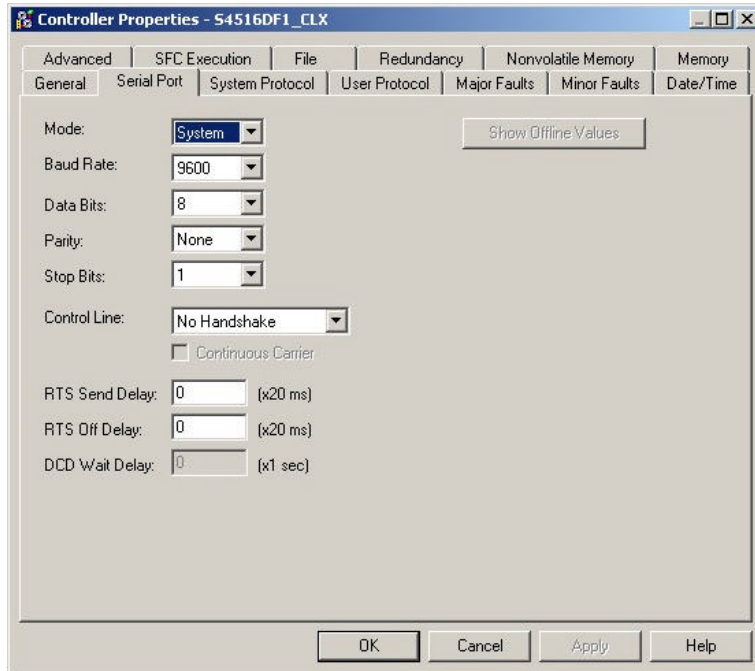

The Channel 0 Options are setup as follows:

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

APPENDIX B
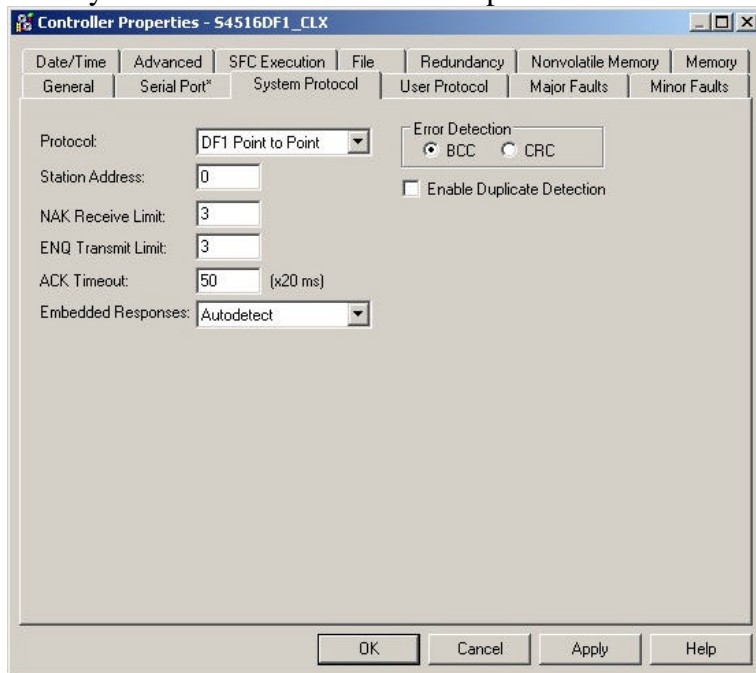# DF1 COMMUNICATIONS

CONTROLOGIX

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

The "System Protocol" should be setup as follows:

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

READ/WRITE DATA DEFINITIONS

Data Read From The M4530 (50 Elements) Is Defined As Follows:

Description	M4530 Add	Mapped Add	PLC Add	Function
General:				
M4530 Status Word 1 (to PLC)		W4600	N7:0	R/O
Bad Seal Pocket #1 (Bit 00)	B628.0	B4600.0	N7:0/0	
Bad Seal Pocket #2 (Bit 01)	B628.1	B4600.1	N7:0/1	
Bad Seal Pocket #3 (Bit 02)	B628.2	B4600.2	N7:0/2	
Bad Seal Pocket #4 (Bit 03)	B628.3	B4600.3	N7:0/3	
Bad Seal Pocket #5 (Bit 04)	B628.4	B4600.4	N7:0/4	
Bad Seal Pocket #6 (Bit 05)	B628.5	B4600.5	N7:0/5	
Bad Seal Pocket #7 (Bit 06)	B628.6	B4600.6	N7:0/6	
Bad Seal Pocket #8 (Bit 07)	B628.7	B4600.7	N7:0/7	
Bad Seal Pocket #9 (Bit 08)	B629.0	B4601.0	N7:0/8	
Bad Seal Pocket #10 (Bit 09)	B629.1	B4601.1	N7:0/9	
Bad Seal Pocket #11 (Bit 10)	B629.2	B4601.2	N7:0/10	
Bad Seal Pocket #12 (Bit 11)	B629.3	B4601.3	N7:0/11	
Spare (Bit 12)	B629.4	B4601.4	N7:0/12	
Spare (Bit 13)	B629.5	B4601.5	N7:0/13	
Spare (Bit 14)	B629.6	B4601.6	N7:0/14	
Spare (Bit 15)	B629.7	B4601.7	N7:0/15	
M4530 Status Word 2 (to PLC)		W4602	N7:1	R/O
Excessive Good Can Rejection (Bit 00)	B121.4	B4602.0	N7:1/0	
PMT Calibration in Process (Bit 01)	F34	B4602.1	N7:1/1	
PMT Calibration Error (Bit 02)	F38	B4602.2	N7:1/2	
Timing Signal Fail (Bit 03)	F18	B4602.3	N7:1/3	
Spare (Bit 04)		B4602.4	N7:1/4	
thru		thru	thru	
Spare (Bit 15)		B4603.7	N7:1/15	
Machine Speed (CPM)	W580	W4604	N7:2	R/O
Resolver Position	W180	W4606	N7:3	R/O
Shift Data (Current Shift):				
Good Cans (Lo)	W1100	W4608	N7:4	R/O
Good Cans (Hi)	W1102	W4610	N7:5	R/O
Total Rejects (Lo)	W1104	W4612	N7:6	R/O
Total Rejects (Hi)	W1106	W4614	N7:7	R/O
Pocket #1 Rejects	W1108	W4616	N7:8	R/O
thru	thru	thru	thru	R/O
Pocket #12 Rejects	W1130	W4638	N7:19	R/O

APPENDIX B
DF1 COMMUNICATIONS

Description	M4530 Add	Mapped Add	PLC Add	Function
Diagnostic Counts (resettable):				
Rejects - Pocket #1	W1050	W4640	N7:20	R/O
thru	thru	thru	thru	R/O
Rejects - Pocket #12	W1072	W4662	N7:31	R/O
PMT Settings:				
PMT Gain (in volts)	W1000	W4664	N7:32	R/O
PMT Offset Magnitude (0 to 250)	B1002	W4666	N7:33	R/O
PMT Offset sign (0="+", 1="-")	B1003	W4668	N7:34	R/O
Reject Threshold (0 to 255)	B1004	W4670	N7:35	R/O
PMT Good Can Average Value	B1005	W4672	N7:36	R/O
Spare Registers:				
Spare		W4674	N7:37	R/O
Spare		W4676	N7:38	R/O
Spare		W4678	N7:39	R/O
Spare		W4680	N7:40	R/O
Spare		W4682	N7:41	R/O
Spare		W4684	N7:42	R/O
Spare		W4686	N7:43	R/O
Spare		W4688	N7:44	R/O
Spare		W4690	N7:45	R/O
Spare		W4692	N7:46	R/O
Spare		W4694	N7:47	R/O
Spare		W4696	N7:48	R/O
Spare		W4698	N7:49	R/O

Data Written To The M4530 (10 Elements) Is Defined As Follows:

Description	M4530 Add	Mapped Add	PLC Add	Function
General:				
PLC Status Word 1 (from PLC)	W792	W4700	N7:50	W/O
End of Shift (1=Transfer Data) (Bit 00)	B792.0	B4700.0	N7:50/0	
Reset Rejects Per Pocket (Bit 01)	B792.1	B4700.1	N7:50/1	
PMT Gain Calibrate Initiate (Bit 02)	B792.2	B4700.2	N7:50/2	
PMT Gain Increase (by 5 volts) (Bit 03)	B792.3	B4700.3	N7:50/3	
PMT Gain Decrease (Bit 04)	B792.4	B4700.4	N7:50/4	
Reject Threshold Increase (Bit 05)	B792.5	B4700.5	N7:50/5	
Reject Threshold Decrease (Bit 06)	B792.6	B4700.6	N7:50/6	
Alarm Reset (Bit 07)	B792.7	B4700.7	N7:50/7	
Set Resolver Zero (Bit 08)	B793.0	B4701.0	N7:50/8	
Spare (Bit 09)	B793.1	B4701.1	N7:50/9	
Spare (Bit 10)	B793.2	B4701.2	N7:50/10	
Spare (Bit 11)	B793.3	B4701.3	N7:50/11	
Spare (Bit 12)	B793.4	B4701.4	N7:50/12	
Spare (Bit 13)	B793.5	B4701.5	N7:50/13	
Spare (Bit 14)	B793.6	B4701.6	N7:50/14	
Spare (Bit 15)	B793.7	B4701.7	N7:50/15	
PLC Status Word 2 (from PLC)		W4702	N7:51	W/O
Spare (Bit 00)		B4702.0	N7:51/0	
Thru		thru	thru	
Spare (Bit 15)		B4703.7	N7:51/15	
Spare		W4704	N7:52	W/O
Spare		W4706	N7:53	W/O
Spare		W4708	N7:54	W/O
Spare		W4710	N7:55	W/O
Spare		W4712	N7:56	W/O
Spare		W4714	N7:57	W/O
Spare		W4716	N7:58	W/O
Spare		W4718	N7:59	W/O

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