HM-2-SSI-TSM

PROFIBUS DP

STRAIN GAGE INPUT MODULE

INSTRUCTION MANUAL

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Important User Information

Solid state equipment has operational characteristics differing from those of electromechanical equipment. "Safety Guidelines for the Application, Installation and Maintenance of Solid State Controls" describes some important differences between solid state equipment and hard-wired electromechanical devices. Because of this difference, and also because of the wide variety of uses for solid state equipment, all persons responsible for applying this equipment must satisfy themselves that each intended application of this equipment is acceptable.

In no event will the Helm Instrument Company be responsible or liable for indirect or consequential damages resulting from the use or application of this equipment.

The examples and diagrams in this manual are included solely for illustrative purposes. Because of the many variables and requirements associated with any particular installation, the Helm Instrument Company cannot assume responsibility or liability for actual use based on the examples and diagrams.

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Throughout this manual we use note to make you aware of safety considerations.

ATTENTION: Identifies information about practices or circumstances that can lead to property damage. Identifies information that is especially important for successful application and understanding of the product.

Attentions help you:

- identify a hazard
- avoid the hazard
- recognize the consequences

ATTENTION: Please check power supply ratings before proceeding! Each tonnage module consumes (+24, 173 mA +5, 220mA). Be sure to not overload the power supply.

TABLE OF CONTENTS

Preface 1
Who Should Use this Manual 1
Purpose of This Manual 1
Contents of this Manual 2
Terms and Abbreviations 3
Common Techniques Used in this Manual 5
Product Support 5
Your Questions or Comments on this Manual 5

Chapter 1 6
Overview 6
Strain Gain Transducer Operation 6
HM-2-SSI Features 7
Hardware Overview 8
Hardware Features 9

Chapter 2 12
Getting Started 12
Required Tools and Equipment 12
System Operation 13
Sensor Wiring 13

Chapter 3 14
Channel Configuration Data and Status 14
Output Image Block (DB131 for Ch1,2 DB137 for Ch3,4) 14
Input Image Block (DB130 for Ch1,2 DB 136 for CH3,4) 18

Chapter 4 21
Initial Hardware Setup Procedures 21
Menu Sequence 21
Install GSD File Procedures 24
Install Siemen's Ladder Logic Procedures 24
Add a New Module 25
System Troubleshooting Guide 26

Appendix A: Specifications: 32
Electrical Specifications: 32
Physical Specifications: 32
Environmental Specifications: 32
Input Specifications: 32

Appendix B: Module Diagrams: 33
HM2-SSI Load Module 33
Profibus Field Wiring Diagram 34
Strain Gage & I/O Connector Wiring 35
I/O Wiring Connection 36
Absolute Encoder Wire Connection 37

Appendix C: GSD File: 38

Appendix D: Address Values: 39
Input Image Block: DB130(Ch1,2) DB136(Ch3,4) 39
Output Image Block: DB131(Ch1,2) DB137(Ch3,4) 40
Signature Data Block: DB126(Ch1,2) DB133(Ch3,4) 41
Common Control Data Block: DB126(Ch1,2) DB133(Ch3,4) 42

Appendix E: Siemen's Ladder Logic: 44

Preface

Read this preface to familiarize yourself with the rest of this manual. This preface covers the following topics:

- who should use this manual
- the purpose of this manual
- terms and abbreviations
- conventions used in this manual

Who Should Use this Manual

Use this manual if you are responsible for the design, installation, programming, or maintenance of an automation control system.

You should have a basic understanding of a Profibus DP network. You should understand electronic process control and be able to interpret the ladder logic instructions required to generate the electronic signals that control your application.

Purpose of This Manual

This manual is a learning and reference guide for the Helm HM-2-SSI Module. It contains the information you need to install, wire, and use the module.

Contents of this Manual

Chapter	Title	Content
	Preface	Describes the purpose, background, and scope of this manual. Also specifies the audience for whom this manual is intended and defines key terms and abbreviations used throughout this book.
1	Overview	Provides a hardware and system overview. Explains and illustrates the components of the system.
2	Installation and Wiring	Provides installation information and wiring guidelines.
3	Channel Configuration, Data and Status	Examines the channel configuration and the channel status word, and explains how the module uses configuration data and generates status during operation.
4	Initial Setup Procedures	Gives setup instructions for initial setup. This includes the hardware setup, as well as installing the GSD file, and Siemen's ladder logic.
5	Troubleshooting	Explains how to interpret and correct problems that occur while using the load module.
A	Specifications	Provides physical, electrical, Environmental, and functional Specifications for the module.
B	Module Diagrams	Included diagrams are the load module layout, Profibus wiring, strain gage wiring module I/O wiring, master/slave config. Wiring, and encoder wiring.
C	GSD File	GSD files are used by Profibus configuration tools to enable a master Profibus scanner module - either in a PLC or PC - to know what slave devices are to be communicated to, their node address, what parameters can be read and written to and more.
D	Address Values	Provides Image Blocks
E	Siemen's Ladder Logic	Provides Siemen's Ladder Logic program

Terms and Abbreviations

The following terms and abbreviations are used throughout this manual.

Calibration - Procedure, performed by trained personnel, where machine or press is dynamically loaded to impact on load cells. This is the process of linearity measuring to determine the loading capacity of the machine.

Calibration Number - An amplification values established during machine calibration or pre-assigned on force load cells.

Channel - Refers to one of two, strain gage inputs available on the modules terminal block.

Configuration Word - Contains the channel configuration information needed by the module to configure and operate each channel. Information is written to the configuration word through the logic supplied in your ladder program.

HM-2-SSI - Helm monitoring module; provides processor input from up to two sensors.

Gain - Amplification of an input signal.

Load/Force - Measurement of impact during a machine cycle. Sensors provide the input for this measurement.

Look Window - Resolver or cam activated window which allows specific degrees in a machine cycle to be processed.

Low Alarm Inhibit - Number of consecutive machine cycles where low alarm is inhibited. Used in a process where machine cycles several times before running speed is established.

LSB - (Least Significant Bit) Refers to a data increment defined as the full scale range divided by the resolution. The LSB represents the smallest value within a string of bits.

Monitor Parts Mode - Status condition used during production run. Sample and compare logic is enabled. On resolver based systems, tracking alarm limits can be enabled.

Press Curve - Machine manufacturers provide this data table which defines limits on maximum load that should be exerted at a given degree of press stroke. This data is stored in EEPROM memory in the Helm processing unit.

Press Curve Alarm - Indication of resolver position and load when load at a given degree meets or exceeds press curve profile.

Resolution - The smallest detectable change in a measurement, typically expressed in engineering units (e.g. 0.15C) or as a number of bits. For example a 12-bit system has 4,096 possible output states. It can therefore measure 1 part in 4096.

Resolver - Sometimes called encoder. Device attached on a machine to determine stroke position. Sine/cosine based resolver required for Helm systems.

Reverse Load - Measurement of negative load/force being exerted on machine following the break-through of material, also referred to as snap through.

Sample - Load/force values established from a series of machine cycles, also defined as benchmark.

Sample Count - User input value used to specify how many machine cycles to base the sample on.

Sampling time - The time required by the A/D converter to sample an input channel.

Scale - Value used to describe the press/machine overall tonnage. Set for maximum value of one channel. For example, settings for a 150 ton press = 75.

Setup Mode - Status condition of monitor typically enables during die setup. Machine capacity alarms are enabled. On resolver based systems, press curve alarm can be enabled. This mode is also used during machine and resolver calibrations.

Status Word - Contains status information about the channel's current configuration and operational state. You can use this information in your ladder program to determine whether the channel data word is valid.

Target Load - A reference load established by the user. Used primarily during setup to improve setup time.

Tolerance /Trend Alarm - User defined upper and lower control limits established during the sample and compare process. These limits are established on the peak load and will activate the machine stop relay when exceeded.

Tracking Alarm - Requires resolver input. The sample and compare process is applied to the entire forming force based on user selected upper and lower control limits.

Trend Deviation - Percent of change, high and low, from sample value to current value.

TSM - Acronym for Through-the-Stroke load monitoring. Resolver input is required for monitoring the load being developed during machine cycle.

Common Techniques Used in this Manual

The following conventions are used throughout this manual:

- Bulleted lists such as this one provide information, not procedural steps.
- Numbered lists provide sequential steps or hierarchical information.

Product Support

Contact your Helm representative or call Helm direct at 419/893-4356:

- sales and order support
- product technical training
- warranty support
- support service agreements

Your Questions or Comments on this Manual

If you have any suggestions for how this manual could be made more useful to you, please send us your ideas.

Chapter 1

Overview

You have just purchased the most advanced strain monitoring solution available. HELM INSTRUMENT COMPANY, INC. manufactures a complete line of strain monitoring control solutions for use on metal stamping, forging, compaction and assembly presses; cold forming, cold heating, injection molding and die cast machines.

At HELM, quality is inherent not only in the design of our products but in the attitudes of our employees as well. We're working together to give you the best. After all, that's what our business is all about - providing innovative instrumentation to help make your manufacturing process more productive and your operation more effective.

The Helm HM-2-SSI combines machine and tooling monitoring with programmable limit switch function. User programmable high and low limits protect the machine and tooling to ensure part quality.

Strain Gain Transducer Operation

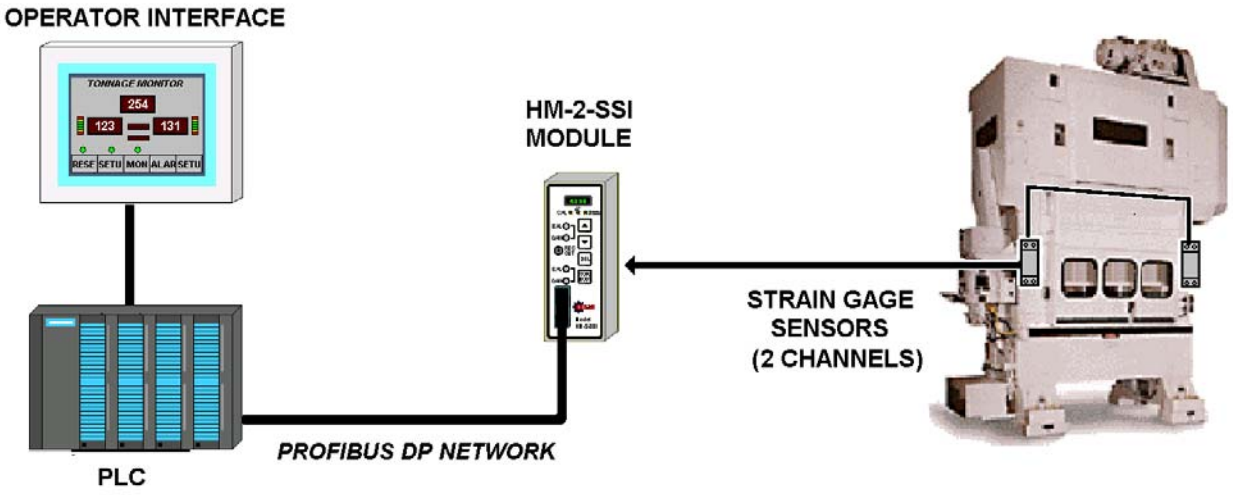
The primary part of the load monitoring system centers around the measurement. The basic function of the Helm Strain Gain sensor is to detect the amount of deflection imposed on the press or die as parts are being formed. All Strain Gain sensors are matched to within 1% and therefore can be replaced without recalibration of the machine.

The Helm Strain Gain sensors can be mounted to strategic high stress areas of the machine frame or strategically located in tooling or applied to stop blocks. Signals from these sensors are routed to the HM-2-SSI module for processing. The Helm Strain Gage is capable of measuring either a tension or compression signal.

CHAPTER 1

HM-2-SSI Features

- Two channel Strain Gage input with Auto Zero (350-700 ohm)
- PROFIBUS DP slave
- DIN rail mount
- Peak models
- Pre-programmed screens for Siemens HMI's
- Applications include Stamping, Forging, Die Cast, Injection Molding, Assembly and Weigh Scale

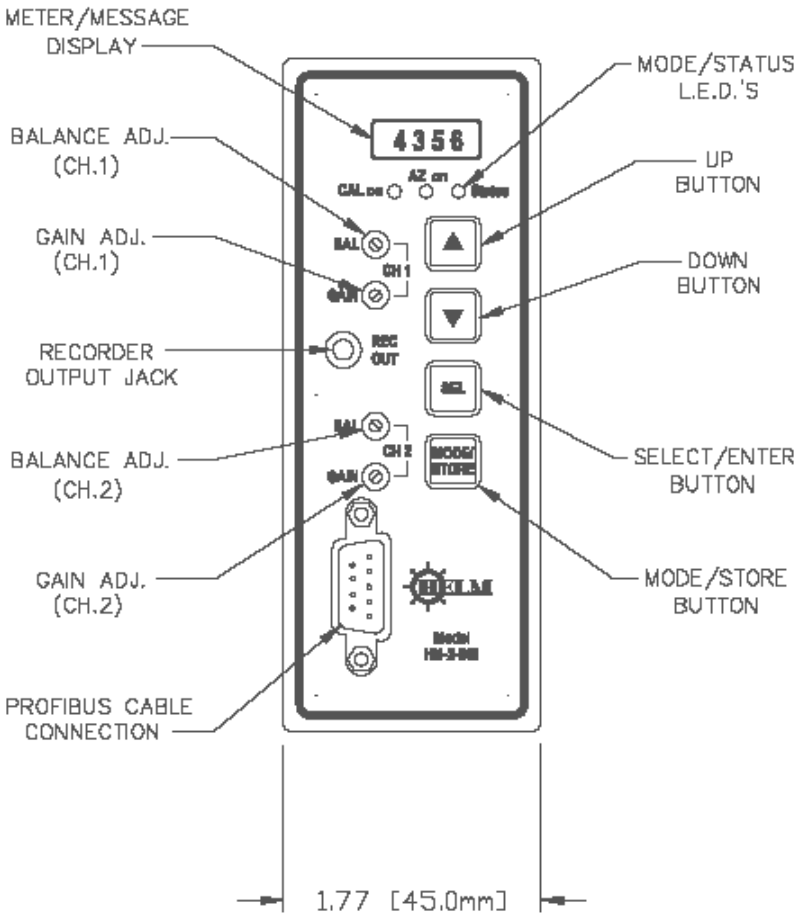


Hardware Overview

The force module uses Profibus communications. It interfaces to strain gage based transducers (350ohm or 700ohm).

The HM-2-SSI module receives and stores digitally converted analog data into its image table for retrieval on a Profibus network. The module supports connections from two strain gage sensors.

Hardware Features



METER/MESSAGE DISPLAY:

- The message display shows menu settings, and calibration values.

BALANCE ADJ. (CH. 1):

- Used to set CH. 1's amplifier to 0.

GAIN ADJ. (CH. 1):

- Used to adjust CH.1's calibration number or gain value.

RECORDER OUTPUT JACK:

- The recorder output jack outputs the analog signals of CH. 1 and CH. 2.

BALANCE ADJ. (CH. 2):

- Used to set CH. 2's amplifier to 0.

GAIN ADJ. (CH. 2):

- Used to adjust CH.2's calibration number or gain value.

PROFIBUS CABLE CONNECTION:

- Profibus communication jack

MODE STATUS LED'S:

- **Calibration LED**
  - This LED is lit if the module's calibration resistor is on.
- **AZ**
  - This LED is lit when Auto-Zero (AZ) is turned on.
- **Status**
  - Solid Green → Online Profibus Communications
  - Flashing Green → Offline Profibus Communications
  - Solid Red → ERROR: Profibus Communication Fault

UP/DOWN BUTTONS:

- The up/down buttons are used to change settings and values.

SELECT/ENTER BUTTON:

- This button allows the user to navigate through the menu.

MODE/STORE BUTTON:

- This button turns Calibration Mode on and off.
- When in other settings, this button is used to save the current values to the module's EEPROM.

Chapter 2

Getting Started

This chapter can help you to get started using the Helm HM-2-SSI module. The procedures included here assume that you have a basic understanding of Profibus communications. You should understand electronic process control and be able to interpret the ladder logic instructions required to generate the electronic signals that control your application.

Because it is a start-up guide, this chapter does not contain detailed explanations about the procedures listed. It does, however, reference other chapters in this book where you can get more information about applying the procedures described in each step.

If you have any questions or are unfamiliar with the terms used or concepts presented in the procedural steps, always read the referenced chapters and other recommended documentation before trying to apply the information.

This chapter will:

- tell you what equipment you need
- explain how to install and wire the module
- show you how to set channels for the sensor input

Required Tools and Equipment

Have the following tools and equipment ready:

- small blade screwdriver
- potentiometer trimmer (tweaker)
- appropriate strain gage cable

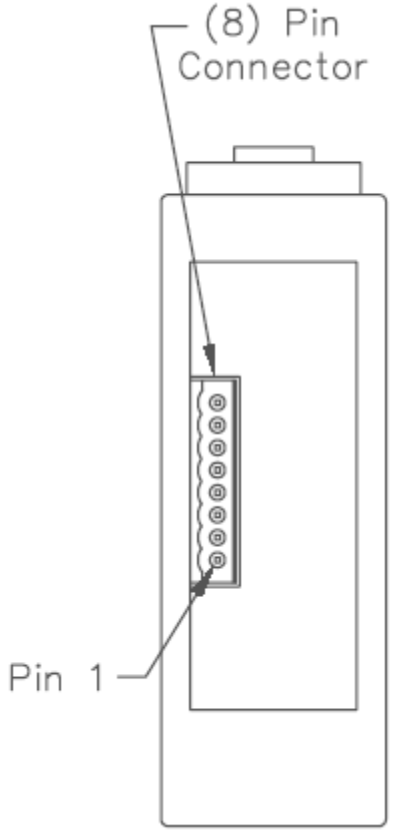
System Operation

The HM-2-SSI module communicates to a PLC through Profibus and receives+24Vdc power from an external power supply.

Each individual channel on the module can receive input signals from strain gage based sensors. The module converts the analog values directly into digital values.

Sensor Wiring

The module contains an 8-pin orange connector for wiring to the strain gages or load cells. The pin-out is shown below for both types used.



(8) PIN CONNECTOR		
PIN	COLOR	FUNCTION
1	WHITE	+SIG. CH2
2	———	SHIELD
3	RED	−SIG. CH2
4	GREEN	+GAGE
5	BLACK	−GAGE
6	WHITE	+SIG. CH1
7	———	SHIELD
8	RED	−SIG. CH1

Chapter 3

Channel Configuration Data and Status

This chapter explains how the HM-2-SSI module communicates though the module's input and output image using Profibus. It lists the preliminary setup and operation required before the module can function.

Output Image Block (DB131 for Ch1,2 DB137 for Ch3,4)

This data block is the image of the output of the module. You can control the behavior of the module from this area such as setting the tonnage alarm limit values, changing the module's mode of operation, and etc.

Block:DB DB131	Data Type	Bit	Description
+0.0	Bit	0	
+0.1	Bit	1	Alarm Reset
+0.0	Bit	2	
+1.0	Bit	8	Set Calibrate mode
+1.1	Bit	9	Set Setup mode
+1.2	Bit	10	Set Monitor Mode
+1.3	Bit	11	
+2.0	INT	-	Look Window Start Degree (in Calibrate mode only)
+4.0	INT	-	Look Window Degree Step Value (1, 2, 4, 6, 8, 10,) (in Calibrate mode Only)
+6.0	INT	-	Set Ch1 High Capacity Alarm Value (in Calibrate mode)
+8.0	INT	-	Set Ch2 High Capacity Alarm Value (in Calibrate mode)
+10.0	-	-	-
+11.0	Bit	0	Press Curve Alarm On/Off
+11.1	Bit	1	Tracking Alarm On/Off
+11.2	Bit	2	Trend Alarm On/Off
+11.3	Bit	3	Delta Track On/Off
+11.4	Bit	4	Alarm Value type (1 = Tolerance in Ton, 0 = Tolerance in Percent)
+11.5	Bit	5	AMPTRACK On/Off
+11.6	Bit	6	
+11.7		7	8000 DP On/Off
+12.0	INT	-	Set Sample Count (2, 4, 8, or 16)
+14.0	INT	-	Set Low Alarm Inhibit Count
+16.0	INT	-	Alarm Start Degree Value (Tracking alarm only)
+18.0	INT	-	Alarm Stop Degree Value (Tracking alarm only)
+20.0	INT		Set Ch1 Low Tolerance value
+22.0	INT	-	Set Ch1 High Tolerance value
+24.0	INT		Set Ch2 Low Tolerance value
+26.0	INT	-	Set Ch2 High Tolerance value
+28.0	INT	-	Set Threshold for Tracking Alarm (In Percent)
+30.0	INT	-	Press Curve Input Value in 0 degree (in Calibrate mode)
+32.0	INT	-	Press Curve Input Value in 10 degree (in Calibrate mode)
+x.0	INT	-	Press Curve Input Data in y degree (in Calibrate mode)
+98.0	INT	-	Press Curve Input Value in 340 degree (in Calibrate mode)
+100.0	INT	-	Press Curve Input Value in 350 degree (in Calibrate mode)

Alarm Reset Bit
Set this bit On(1) for at least 50ms or longer to clear all present alarm condition of the module.

Set Calibrate Mode Bit
When set On (1), the module is in calibration mode. No alarms are active.
Note: all other mode bits must be off.

Set Peak Mode Bit
When set On (1), the module is in setup mode. Capacity alarms are active.
Note: all other mode bits must be off.

Set Monitor Parts Mode Bit
When set On (1), the module is in monitor parts (trend monitoring) mode. Capacity alarms and trend alarms, Tracking alarm are available.
Note: all other mode bits must be off.

Look Window Start Degree
Enter a press crank angle where you want the module to start monitoring /capturing peak load and load signature. For module to take effect of new setting, the module must be in Calibrate mode.

Look Window Degree Step Value (1, 2, 4, 6, 8, 10,)
This is an increment value to determine the stop look window angle. Once the Step value is entered, the Stop look window angle is calculated internally. In order to determine actual Stop look window angle for your reference, use the following formula:

Stop Look window Angle = Start Look Window Angle + (224 * Step Value) * 0.1

Set Ch1(2) High Capacity Alarm Value
Integer value of high capacity alarm setting. Range = 0 to 9999. A value of 0 disables alarm. The value entered will not be valid in the module until in Calibrate mode.
HIGH CAPACITY is the limit for the maximum peak tonnage allowed to operate the machine. Normally the value is set at or below the scale value which is the capacity of the machine divided by the number of frame sensor channels. HIGH CAPACITY alarm is available in all modes.

Function Switches

AMPTRACK On/Off - The AMPTRACK feature pertains to the filtering of tracking alarms, and helps to avoid “nuisance” type of alarms. The filtering occurs on the area where the load is constantly varies within the press stroke. AMPTRACK filtering can be seen in the wave screen, where constant variation area of the sample signature (along with the tracking bands) are filtered during relatively small portions of the stroke.

8000 DP On/Off Press - This option is used for double action press machine with dual bridge sensor for differential load monitoring application.

Curve Alarm On/Off – Press Curve alarms are valid in "setup" mode only, and provide press protection. Data points are retrieved from the press manufacture. These points represent tonnage limitations per angle of the press stroke. During the part process, if the tonnage exceeds the press curve limitation at any specific angle, a press curve alarm is triggered.

Tracking Alarm On/Off - Track alarms, are valid in "monitor-parts" mode only, and are based off the "sample curve" taken during the "learn cycle". Track alarms provide a thorough "parts quality" type of feature, because monitoring continues throughout the press stroke (based on the look window settings in the "Other Settings" screen).

Trend Alarm On/Off - Trend alarms, are valid in "monitor-parts" mode only, and are base off the "sample peak" taken during the "learn cycle". Trend alarms provide a "parts quality" type of feature, triggering alarms if the peak tonnage goes out of range of the tolerance.

Delta Track On/Off - The delta track feature pertains to the filtering of tracking alarms, and helps to avoid "nuisance" type of alarms. The filtering occurs during sudden force change within the press stroke. Delta track filtering can be seen in the wave screen, where high slopes of the sample signature (along with the tracking bands) are filtered during relatively small portions of the stroke.

Alarm Value type (1 = Tolerance in Ton, 0 = Tolerance in Percent)
Tolerance alarms run in either tons or percent, which is selected in the jobs screen. At loads less than peak (throughout the stroke), tolerance in the percent mode is less than tons mode. This can be seen in the "wave" screen when comparing tons to percent.

Set Sample Count
Enter one of the numbers (2, 4, 8,or 16). This is the number of cycles for the module to take to learn new sample(Target) tonnage for Trend alarm feature.

Set Low Alarm Inhibit Count
Enter a number of cycles for module to inhibit low trend alarm when sampling is done in Monitor mode. To disable this feature, enter '0'.

Alarm Start/Stop Degree Value
The user may choose to confine the track alarm "window" to avoid possible nuisance alarms. Start and Stop track angles must be within the look window.

Set Ch1(2) High/Low Tolerance Value
Integer values of high and low limit for trend alarm settings. Values are set in percent or in ton and represent the maximum and minimum percent/ton of change off the sample value. Range = 0 to 99% or 0 to 255ton. A value of 0 disables alarm.

Set Threshold for Tracking Alarm(in Percent)
This is to ignore the tracking alarm from monitoring the area of the load signature below the set percentage of the current peak tonnage. For example, if Tracking Low Inhibit is set to 10% and the current peak load is 90ton, then through out the load signature, tracking alarm will not monitor any tonnages below 9 ton.

Press Curve Input Values (36 words)
Enter 36 points of press Curve data for the press machine. These points represent tonnage limitations per angle of the press stroke. During the part process, if the tonnage exceeds the press curve limitation at any specific angle, a press curve alarm is triggered.
The 36 points of data are generated from the press curve charts provided by the press manufacture. Please contact Helm Instrument to get more information how to obtain the Press Curve data points for your machine.

Input Image Block (DB130 for Ch1,2 DB 136 for CH3,4)

This data block is an image of the Input of the module. You can monitor the status of the module's operation from this area such as current tonnage readings, tonnage alarm conditions, reverse load readings, etc.

Block:DB DB130	Data Type	Bit	Description
+0.0	INT	-	SPM Value
+2.0	INT	-	Scale Set Value
+4.0	INT	-	Ch1 Peak value in Ton (in PEAK or MONITOR Mode) Ch1 Calibrate number (in CALIBRATE Mode)
+6.0	INT	-	Ch2 Peak value in Ton (in PEAK or MONITOR Mode) Ch2 Calibrate number (in CALIBRATE Mode)
+8.0	INT	-	Ch1 Trend value in Percent or Ton
+10.0	INT	-	Ch2 Trend value in Percent or Ton
+12.0	INT	-	Ch1 Sample value in Ton
+14.0	INT	-	Ch2 Sample value in Ton
+16.0	INT	-	Ch1 Reverse Load in Ton
+18.0	INT	-	Ch2 Reverse Load in Ton
+20.0	Bit	0	Ch1 High Trend Alarm Indication Bit
+20.1		1	Ch1 Low Trend Alarm Indication Bit
+20.2		2	Ch2 High Trend Alarm Indication Bit
+20.3		3	Ch2 Low Trend Alarm Indication Bit
+20.4		4	Ch1Capacity Alarm Indication Bit
+20.5		5	Ch2 Capacity Alarm Indication Bit
+20.6		6	-
+20.7		7	-
+21.0		8	Ch1 Press Curve Alarm Indication Bit
+21.1		9	Ch2 Press Curve Alarm Indication Bit
+21.2		10	Ch1 High Tracking Alarm Indication Bit
+21.3		11	Ch1 Low Tracking Alarm Indication Bit
+21.4		12	Ch2 High Tracking Alarm Indication Bit
+21.5		13	Ch2 Low Tracking Alarm Indication Bit
+21.6		14	
+21.7		15	
+22.0	BIT	0	Ch1 Cal (-)Sign Bit
+22.1		1	Ch2 Cal (-)Sign Bit
+23.0		8	Module In Calibrate Mode Indication Bit
+23.1		9	Module In Peak Mode Indication Bit
+23.2		10	Module In Monitor Mode Indication Bit
+23.3		11	Sampling in progress Indication Bit
+23.4		12	Sample Ready Indication Bit (stay On until the mode changes)
+23.5		13	Alarm Rest in progress bit
+23.6		14	
+23.7		15	Low Alarm Inhibit Bit
+24.0	INT	-	Cycle Counter
+26.0	INT	-	Current Module report Angle (in Calibrate mode only)

SPM Value
This reports the current stroke per minute of the press cycle speed.

Scale Set Value
Reports current scale setting of the module .

Ch1(2) Peak value in Ton / Calibrate number
This integer word represents the peak load on channel 1(2) in Peak and Monitor Mode.
In Calibrate mode, this displays the sensor's balance reading or calibration(gain) readings.

Ch1(2)Trend Deviation in Percent or Ton
This integer word represents the difference between current peak load and sample peak load, in percentage or tonnage. This value can be used to control Trend deviation LED type display (Only valid in Monitor mode).

Ch1(2) Sample value in Ton
This integer word represents the average of the load values in Tons when learning(sampling) cycle is completed in Monitor mode.

Ch2 Reverse Load in Ton
Integer word represents the peak reverse load value in tons for the current machine cycle.

Capacity Alarm Indication Bit
When on (1), the current peak tonnage of the channel has met or exceeded the Capacity alarm set limit.

High/Low Trend Alarm Indication Bit
When on (1), the current peak tonnage has met or exceeded the high/low tolerance percentage or tonnage setting from the sample tonnage.

High/Low Tracking Alarm Indication Bit
When on (1), the some of the area of current tonnage signature has broken the high/low tolerance limit band around the sample tonnage signature within look window.

Press Curve Alarm Indication Bit
When on (1), the some of the area of current tonnage signature has broken the Press Curve limit within look window.

Module In Calibrate Mode Indication Bit
This bit is reported by the module that it is actually in Calibration mode when On(1).

Module In Peak Mode Indication Bit
This bit is reported by the module that it is actually in Peak mode when On(1).

Module In Monitor Mode Indication Bit
This bit is reported by the module that it is actually in Monitor mode when On(1).

Sampling in progress Indication Bit
This bit is reported by the module that it is currently in learning(sampling) mode when On(1).

Sample Ready Indication Bit (stay On until the mode changes)
This bit is reported by the module that it completed the learning cycle and established new sample tonnage when On(1).

Alarm Reset in Progress Bit
This bit is reported by the module that it is currently resetting all alarm conditions when On(1).

Current Module report Angle (in Calibrate mode only)
This reports the current crank angle read from Encoder attached to the module.

Chapter 4

Initial Hardware Setup Procedures

A complete listing of a sample Siemen's ladder logic program is included at the back of this manual. Examples shown here are for reference.

All values are 0 (default) on initial start-up. This means that all alarms are disabled. You must make the following adjustments for proper operation:

- set station number
- set hi/low
- set scale value
- set auto zero (az) control
- set channel 1 calibration
- set channel 2 calibration
- set encoder angle position
- set master/slave mode

Menu Sequence:

Sequence numbers 1-8 are for on-line settings
Sequence numbers 1-12 are for off-line settings

1. ch1 cal (default on power-up)
2. ch2 cal
3. set encoder angle
4. station
5. hi / lo
6. scale
7. az
8. module mode
9. a/d zero value (factory setting only)
10. a/d zero set (factory setting only)
11. master/slave mode setting*
12. aux/cam input check (not used) (factory check only)

*** master/slave mode setting is required for proper operation.**

Initial Setup Procedures:

Step 1. Set the Station Number

⇒ From the HM-2-SSI module, press SELECT until "station" scrolls across the display. From this menu you can change the station number by pressing the up/down buttons to coordinate with the Profibus communications.

Step 2. Set the Hi/Low Gain Range

⇒ Press SELECT until "hi/low" scrolls across the display. Change the module's hi/low alarm settings from here.
⇒ LOW = 140k CAL resistor range.
⇒ HI = 1M CAL resistor range.

Step 3. Set the Scale Value

⇒ Press SELECT until "scale" scrolls across the display. Use the up/down buttons to set the scale value to coordinate with the tonnage of the press the module is communicating with.

Step 4. Auto-Zero (AZ) Control

⇒ Press SELECT until "az" scrolls across the display. The auto-zero value is normally set to 'on'. Set to 'off' only on special circumstances.

Step 5. Click on Calibration Mode

⇒ Using the software operator interface, click on Calibration Mode to put the HM-2-SSI module into Cal Mode so calibration can be completed.

Step 6. Confirm that Profibus Communications are Online (Solid Green Status LED)

⇒ Using the software operator interface, click on Calibration Mode to put the HM-2-SSI module into Cal Mode so calibration can be completed.

Step 7. Calibrate Channel 1

⇒ Press SELECT until "ch1 cal" scrolls across the display. Under this menu, users can change three values: balance value, calibration value, and az value.

⇒ Balance Mode → using the balance potentiometer, you can manually adjust the balance to zero.

⇒ Calibration Mode → using the gain potentiometer, a user can manually adjust the setting to their desired calibration number.

⇒ Auto-Zero Mode → when AZ is turned on, this Mode will automatically zero this value.

Step 8. Calibrate Channel 2

⇒ Repeat Step 6 using ‘ch2 cal’.

Step 9. Set Encoder angle position

Move silde position to Top where reads “0” degree for crank angle.
Use “DOWN” button to clear any angle offset previsouly stored in the module.
Use “UP” button to zero the angle position.
Push “SAVE” button to save current offset.

Step 10. Set master/slave mode

Use “DOWN” button to set module for master mode.
Use “UP” button to set module for slave mode.
Push “SAVE” button to save current mode setting.

Install GSD File Procedures

Step 1. Begin by opening up SIMATIC Manager.

Step 2. In SIMATIC Manager, click File → New.

Step 3. Type gsdinstall for the project name, and click OK.

Step 4. From the menu toolbar, click Insert → Station → SIMATIC 300 Station.

Step 5. Double click SIMATIC 300 → Hardware.

Step 6. From the menu toolbar, click Options → Install GSD File.

Step 7. Browse to locate the .gsd file, and click install, then OK, and then Close.
- Can be located on the installation CD provided by Helm

Step 8. Keep SIMATIC Manager open, but close the current gsdinstall project.

Install Siemen's Ladder Logic Procedures

Step 1. In SIMATIC Manager, click File → Retrieve → Select File → Open.

Step 2. Accept the default directory, and click OK.

Step 3. Click OK, then click OK to the next dialog that appears as well.

Step 4. Double click SIMATIC 300 Station → Hardware.

Step 5. From here, you are able to view/edit the hardware configurations of the card, by double clicking the card's bitmap.

Add a New Module

Step 1. In SIMATIC Manager, click File → Open → [saved application]

Step 2. Double click the Simatic X00 Station
- X is the version number of the station that you are using

Step 3. From this screen, click on PROFIBUS DP master system
- The bottom part of your screen should say PROFIBUS DP master system
- If you do not click on this first, you will not be able to continue to add a new module.

Step 4. Now from the toolbar, click Insert → Insert Object

Step 5. From the pop-up, click Additional Field Devices → General → SGI 2 Channel
- If done properly, the properties window will appear.

Step 6. Document the Address that is displayed in the textbox.
- Notice that the address provided is incremented from the address of the previous module. This is done to avoid two modules obtaining the same address.
- This address number is actually the station number of the module.

Step 7. Click OK

Step 8. Click the new module, and document the I Address (PIW Address), as well as the Q Address (PQW Address) that can be found in the bottom display box.

Step 9. Create a database for the new module by opening and existing database and saving it as "DB(Address)".
- Example: Address = 4, so the database name is DB4

Step 10. Now open OB1 from your application

Step 11. In FC25 change:
- PIW address to the PIW address that was documented from step 8
- DB_ Num to the address that you documented from step 6

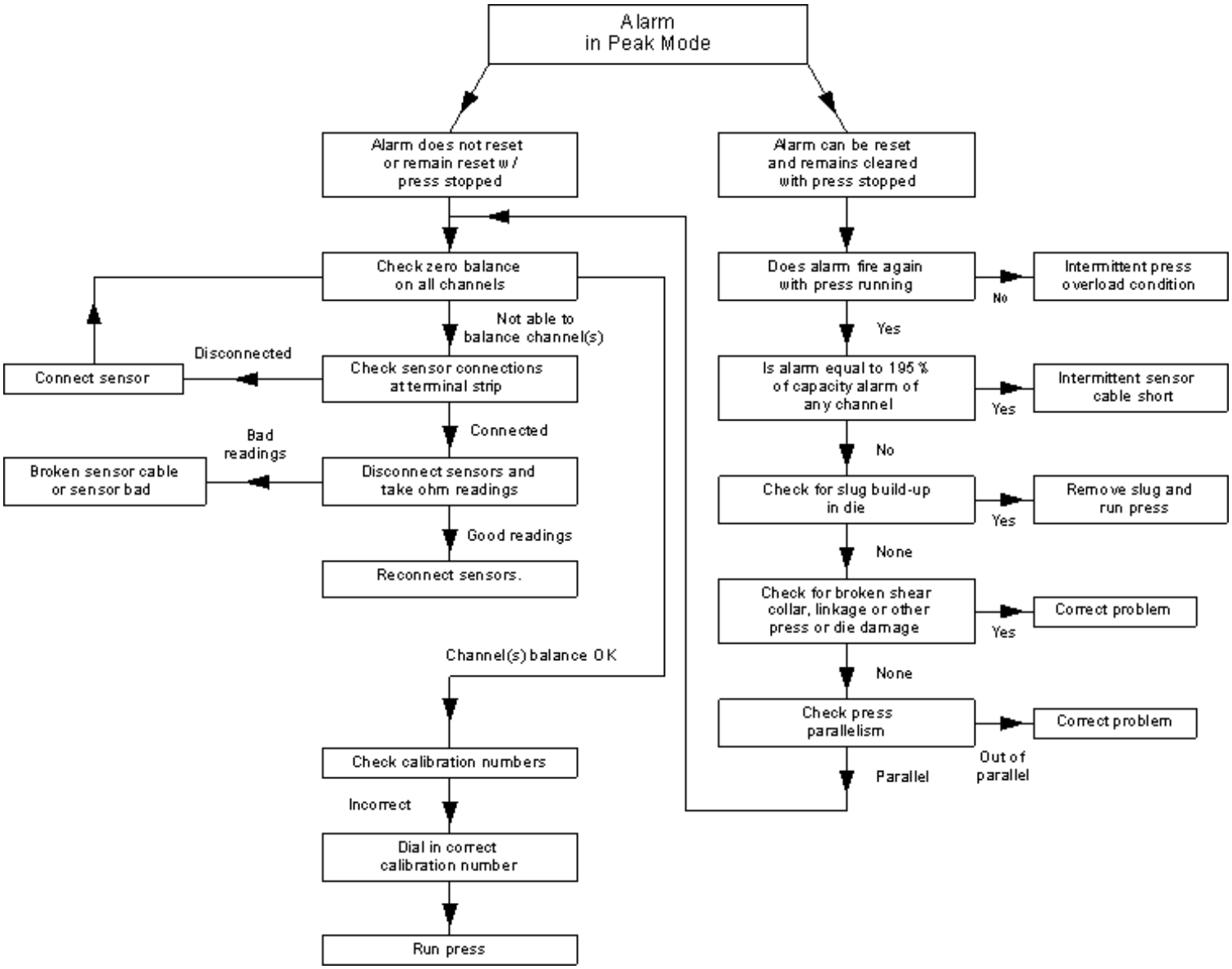
Step 12. In FC26 change:
- PQW address to the PQW address that was documented from step 8
- DB_ Num to the address that you documented from step 6

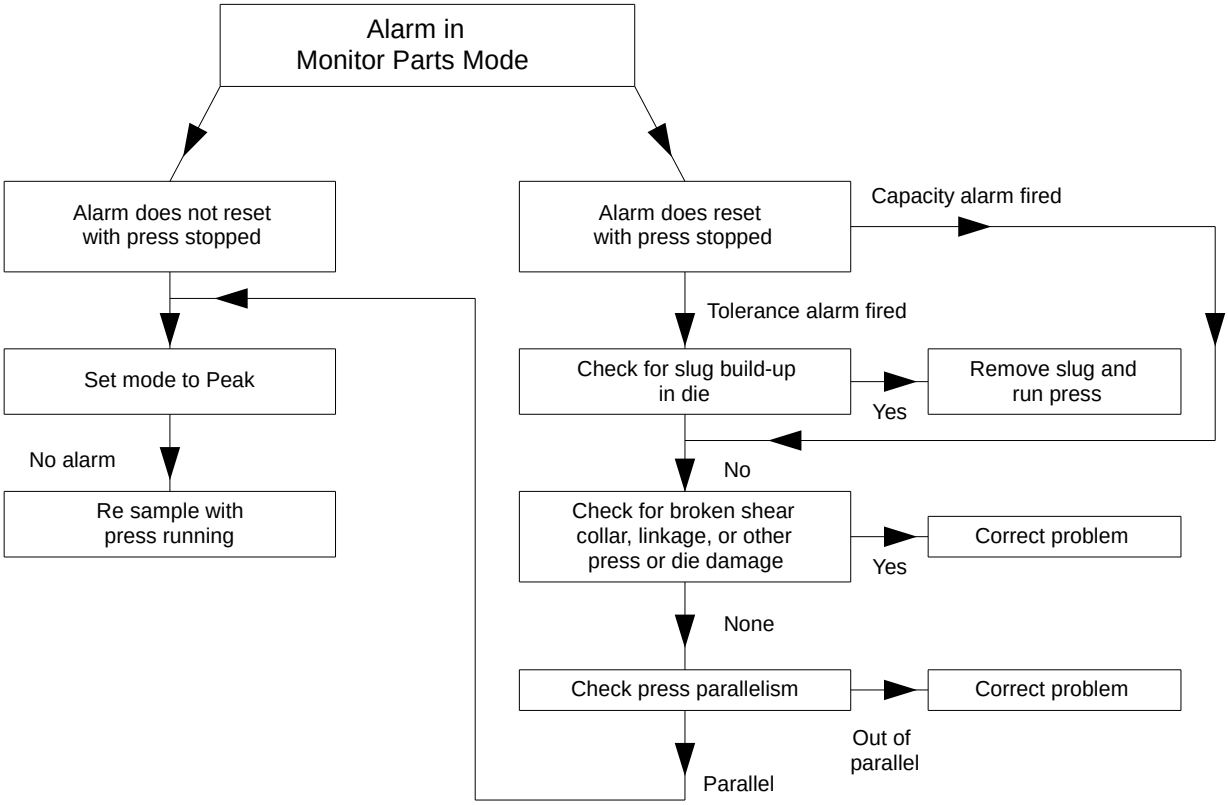
Chapter 5

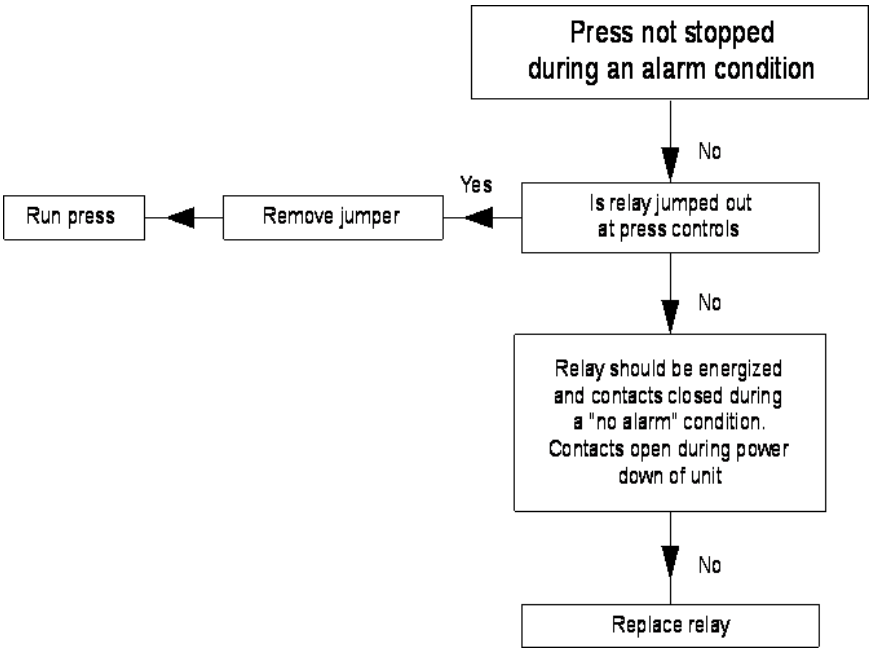
System Troubleshooting Guide

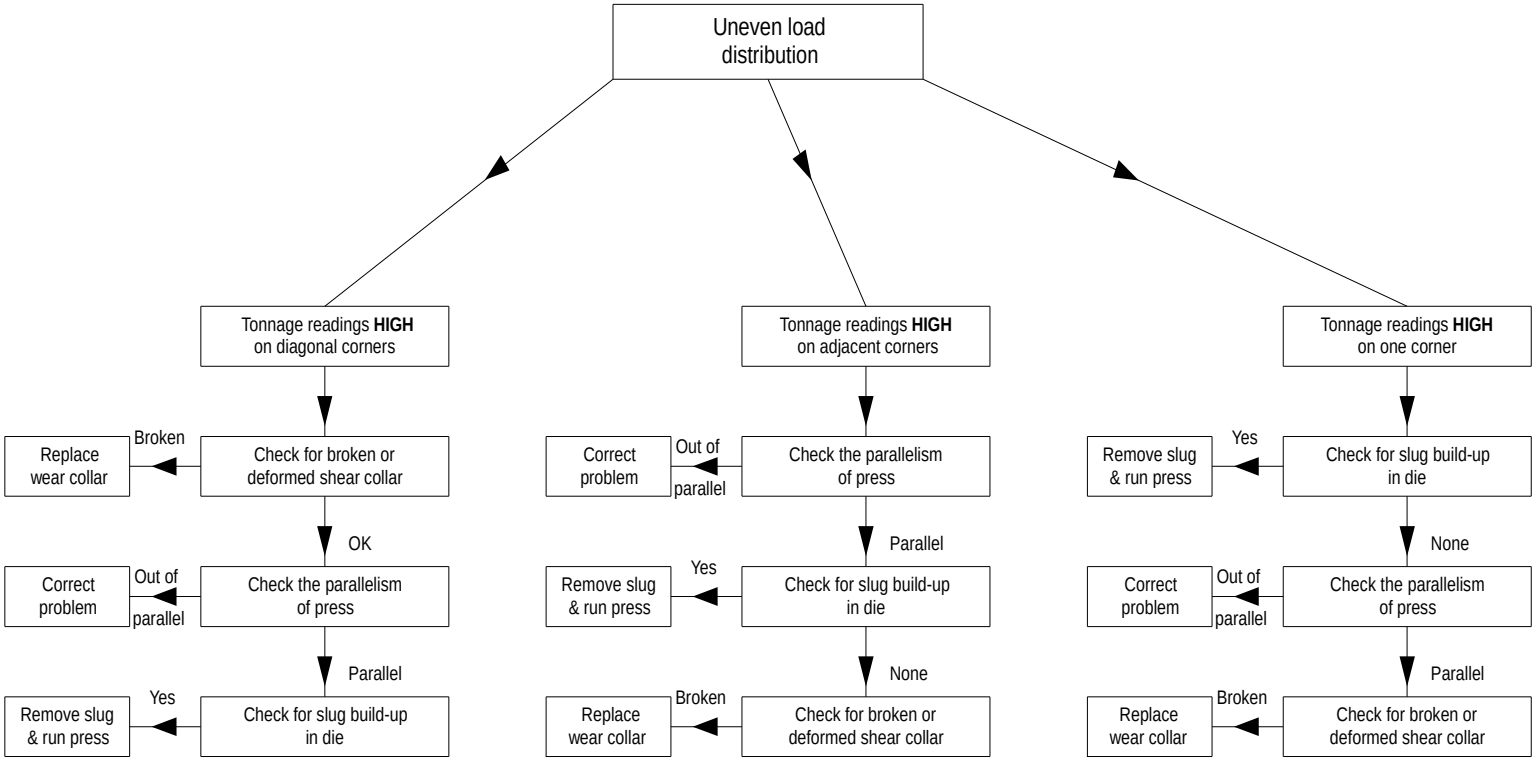
HT-400 Sensor Ohm Readings

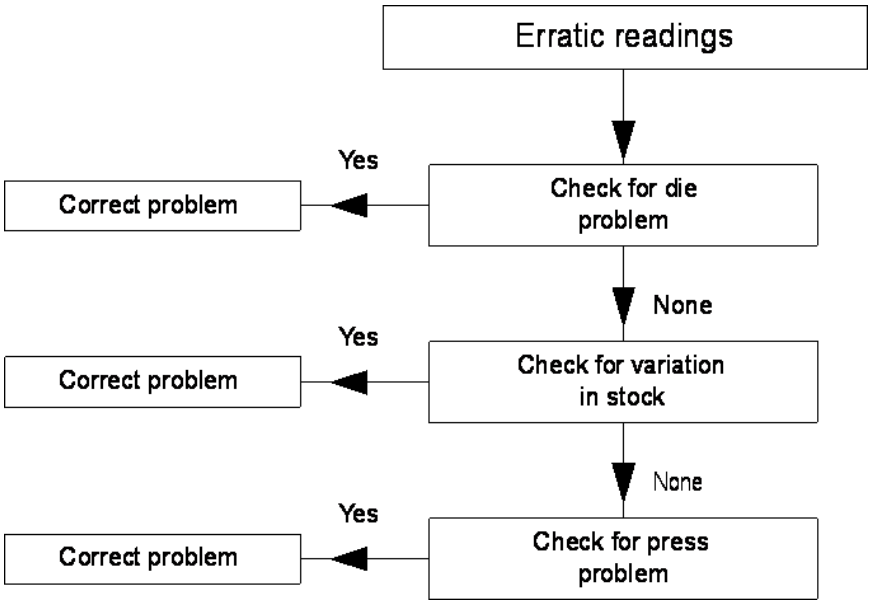
Green-Black……	350 ohms
Red-White……...	350 ohms
All other color combinations…..……	266 ohms
All colors to Ground...……	open
Shield to Ground.……	open











Appendix A: *Specifications:*

Electrical Specifications:

Power Consumption	146 MA at 24 vdc
Number of Channels	2 (isolated)
A/D Conversion Method	12 bit
Normal Mode Rejection (between + input and - input)	50 db at 2000 gain
AMP roll-off frequency	650 Hz at 3000 Gain
Calibration	Software Selectable

Physical Specifications:

Press Buttons	4 buttons for menu navigation and selection
LED Indicators	3 LEDs for Calibration, Auto-Zero, and Status
Recommended Cable	Strain Gage Cable (Helm part number 6117)
Terminal Strip	8-pin removable

Environmental Specifications:

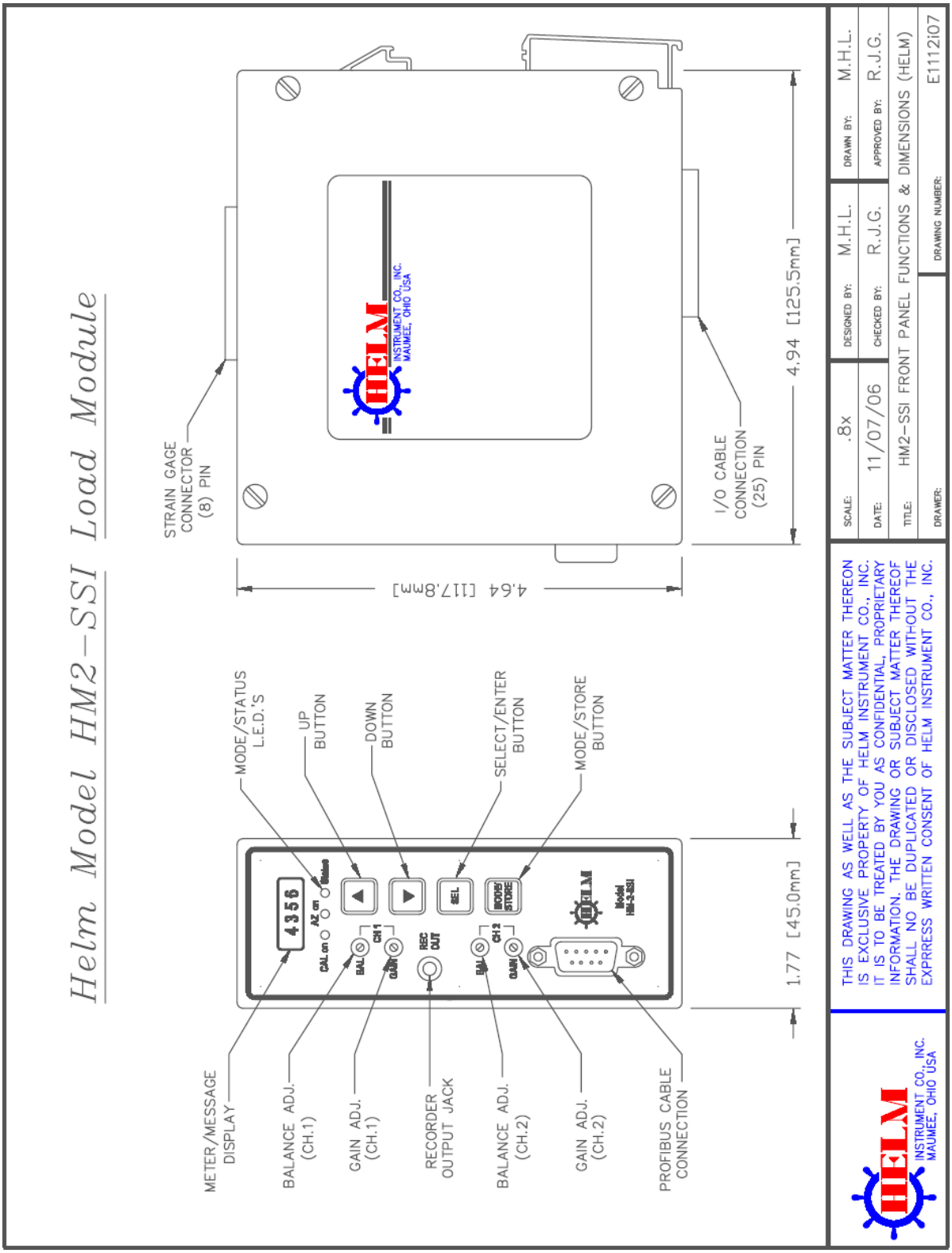
Operating Temperature	0°C to 60°C (32°F to 140°F)
Hazardous Environment Classification	Class 1 Division 2 Hazardous Environment

Input Specifications:

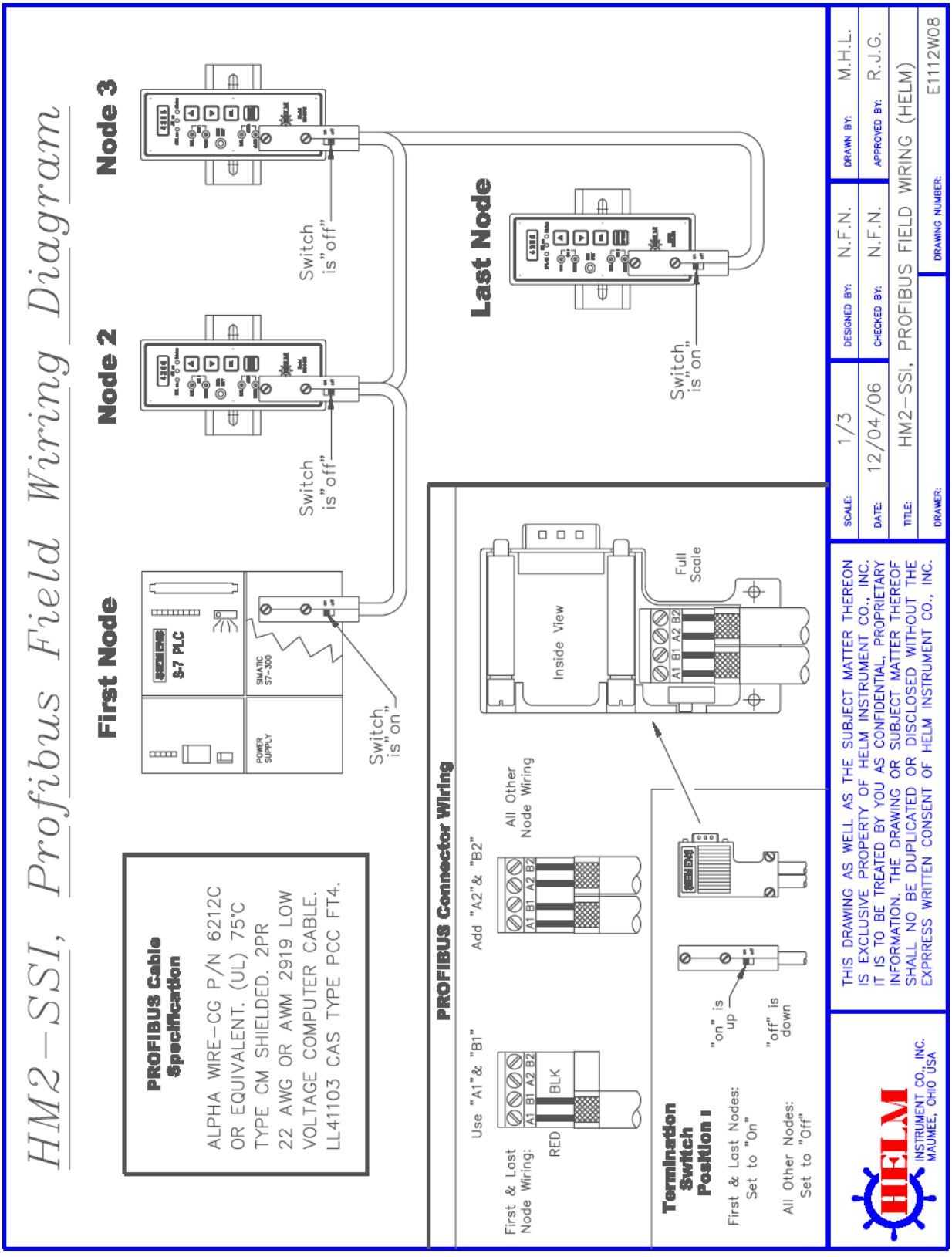
Type of Input	Strain Gage (350 ohm, 700 ohm)
Input Impedance	1K
Display Resolution	Up to 0.1% of full scale
Overall Module Accuracy	1% of full scale
Module Update Time	100 µsec

Appendix B: *Module Diagrams:*

HM2-SSI Load Module



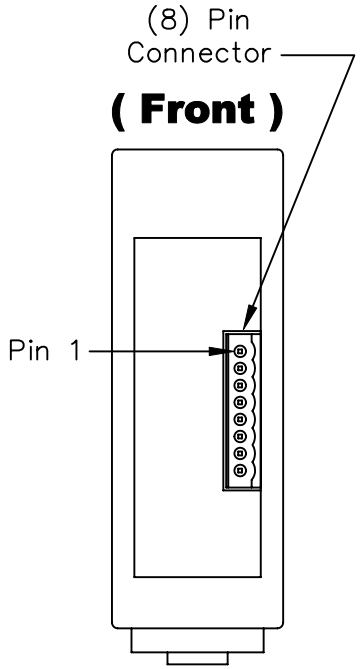
Profibus Field Wiring Diagram



Master Mode

HM2-SSI Thru-Stroke Strain Gage & I/O Connector Wiring

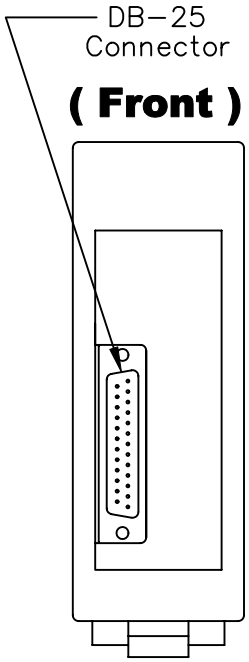
Strain Gage Connector



(8) PIN CONNECTOR		
PIN	COLOR	FUNCTION
1	WHITE	+SIG. CH2
2	———	SHIELD
3	RED	−SIG. CH2
4	GREEN	+GAGE
5	BLACK	−GAGE
6	WHITE	+SIG. CH1
7	———	SHIELD
8	RED	−SIG. CH1

Top View of Module

I / O Connector



Bottom View of Module

(25) PIN CONNECTOR		
PIN	COLOR	FUNCTION
1	RED	+24VDC
2	RED	+24VDC
3	NOT USED	
4	NOT USED	
5	NOT USED	
6	WHT/BLUE	−STOP
7	ORANGE	−AUX
8	NOT USED	
9	BLACK	DIG. GND
10	YELLOW	−CLOCK
11	GRAY	SHIELD
12	WHT/BRN	MSTR LATCH
13	BROWN	−DATA
14	BLACK	−24VDC
15	BLACK	−24VDC
16	NOT USED	
17	NOT USED	
18	GREEN	+STOP
19	BLUE	+AUX
20	NOT USED	
21	NOT USED	
22	PURPLE	+CLOCK
23	NOT USED	
24	NOT USED	
25	WHITE	+DATA

REV.	DESCRIPTION	BY	DATE
A	Color corrections.	N.F.N.	07/03/07
B	Added TSM designation.	N.F.N.	07/23/07
C	Ch. 1 & 2 was reversed.	Y.K.K.	02/29/08
D	Finish TSM wiring.	N.F.N.	05/10/11
E	Added Master Mode to Title.	N.F.N.	07/12/13

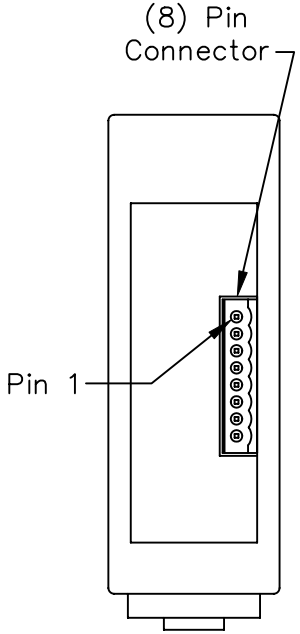
HELM INSTRUMENT CO., INC.
MAUMEE, OHIO USA

SCALE:	NONE	DESIGNED BY:	N.F.N.	DRAWN BY:	M.H.L.
DATE:	11/29/06	CHECKED BY:	N.F.N.	APPROVED BY:	R.J.G.
TITLE:	Master Mode, HM2−SSI Thru−Stroke Strain Gage & I/O Connector Wiring				
DRAWER:		DRAWING NUMBER:	E1112W09E		

Slave Mode

HM2-SSI, Thru-Stroke Strain Gage & I/O Connector Wiring

Strain Gage Connector

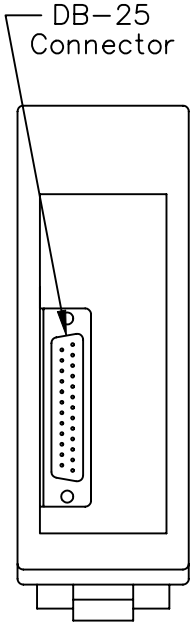


(8) PIN CONNECTOR		
PIN	COLOR	FUNCTION
1	WHITE	+SIG. CH2
2	———	SHIELD
3	RED	−SIG. CH2
4	GREEN	+GAGE
5	BLACK	−GAGE
6	WHITE	+SIG. CH1
7	———	SHIELD
8	RED	−SIG. CH1

(Rear)

Top View of Module

I / O Connector



(Rear)

Bottom View of Module

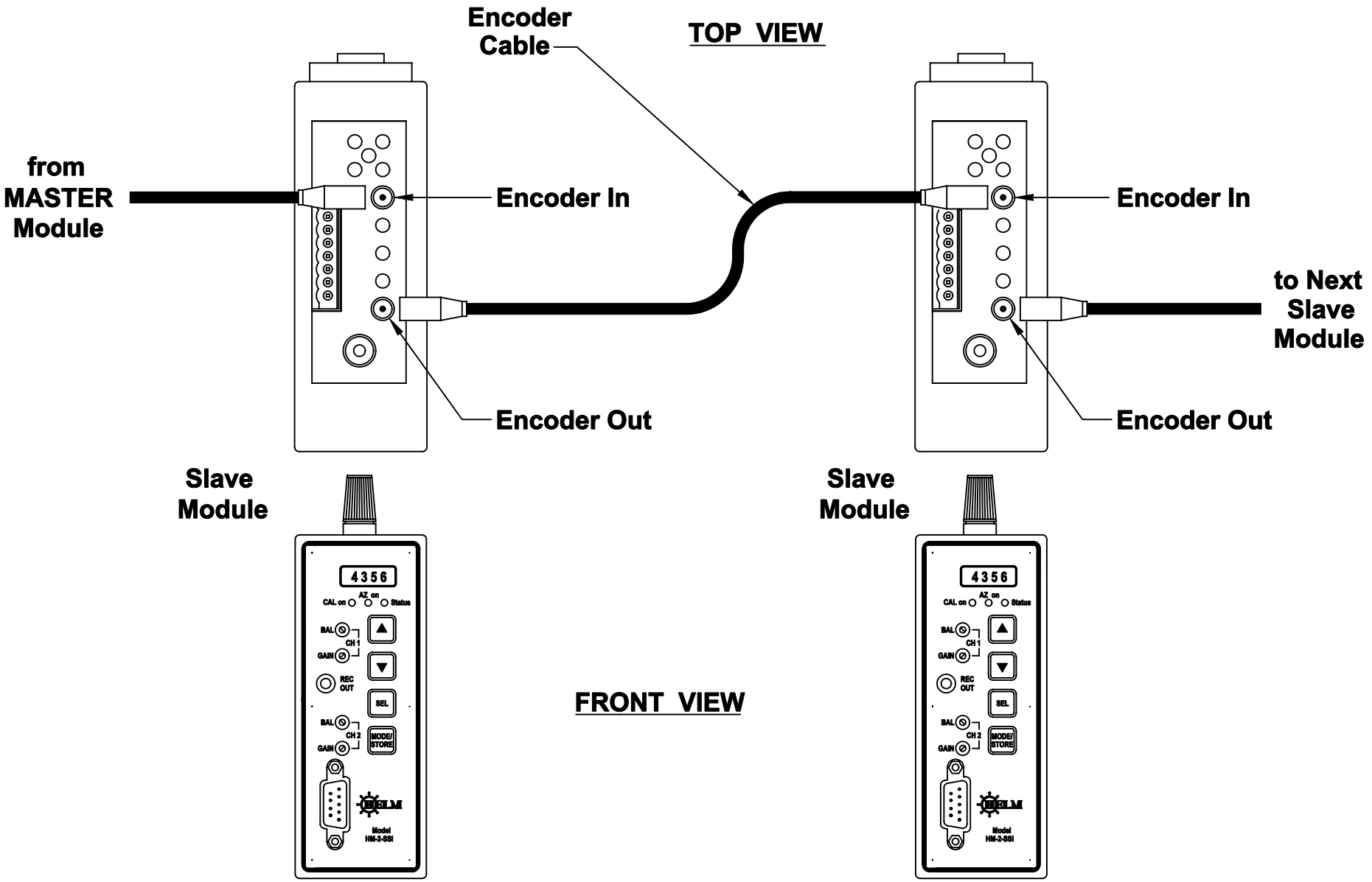
(25) PIN CONNECTOR		
PIN	COLOR	FUNCTION
1	RED	+24VDC
2	RED	+24VDC
3	NOT USED	
4	NOT USED	
5	NOT USED	
6	WHT/BLUE	−STOP
7	ORANGE	−CAM
8	NOT USED	
9	NOT USED	
10	NOT USED	
11	GRAY	SHIELD
12	NOT USED	
13	NOT USED	
14	BLACK	−24VDC
15	BLACK	−24VDC
16	NOT USED	
17	NOT USED	
18	GREEN	+STOP
19	BLUE	+CAM
20	NOT USED	
21	NOT USED	
22	NOT USED	
23	NOT USED	
24	NOT USED	
25	NOT USED	

REV.	DESCRIPTION	BY	DATE
A	Ch's 1 & 2 were reversed.	Y.K.K.	02/29/08
B	"CAM" was "AUX".	N.F.N.	06/24/09
C	Added Slave Mode to title, & thru−stroke was peak mode.	N.F.N.	07/12/13

HELM INSTRUMENT CO., INC.
MAUMEE, OHIO USA

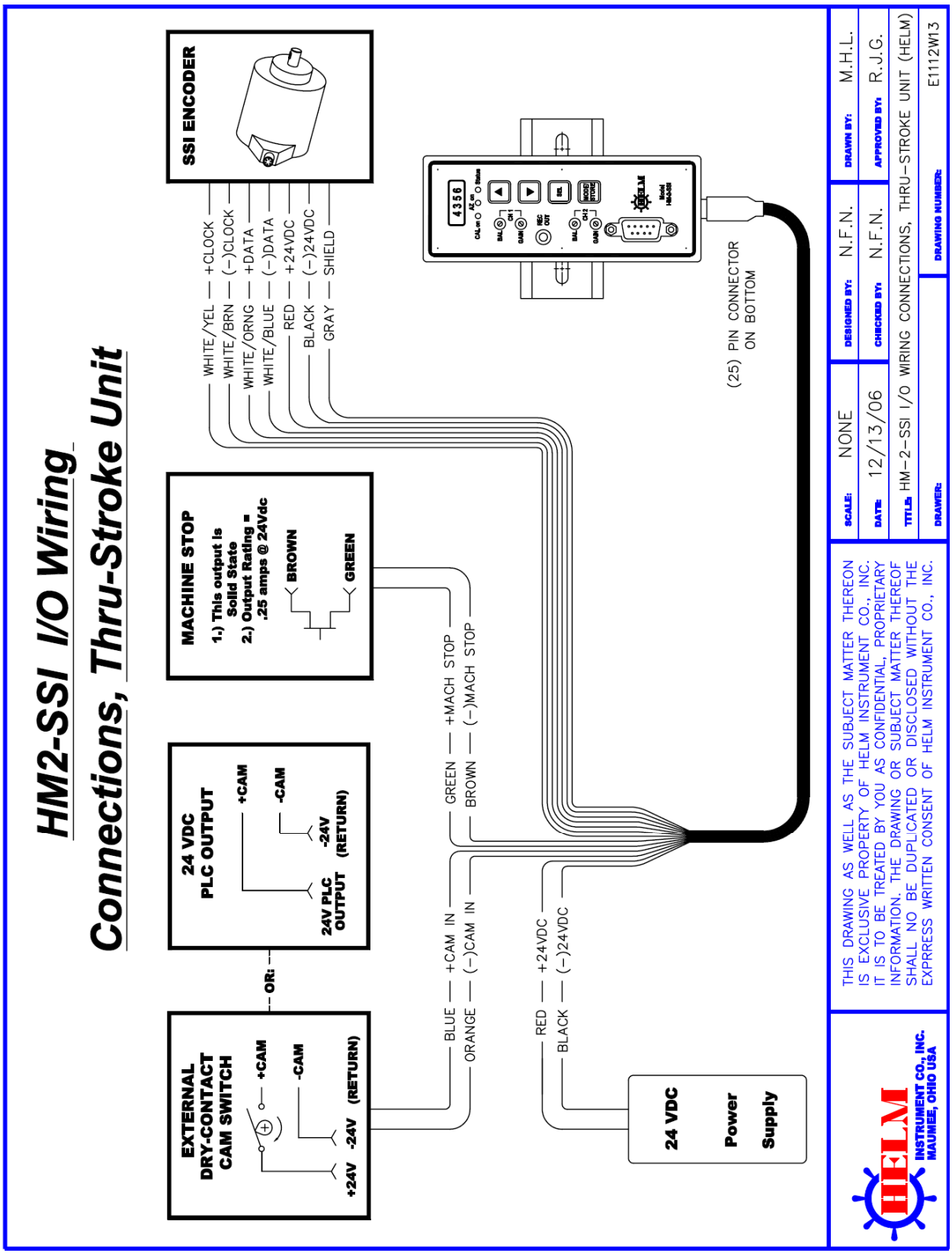
SCALE:	NONE	DESIGNED BY:	N.F.N.	DRAWN BY:	M.H.L.
DATE:	07/23/07	CHECKED BY:	N.F.N.	APPROVED BY:	R.J.G.
TITLE:	Slave Mode, HM2−SSI Thru Stroke Strain Gage & I/O Connector Wiring				
DRAWER:		DRAWING NUMBER:	E1112W14C		

HM2SSi Slave Encoder Cable Connection



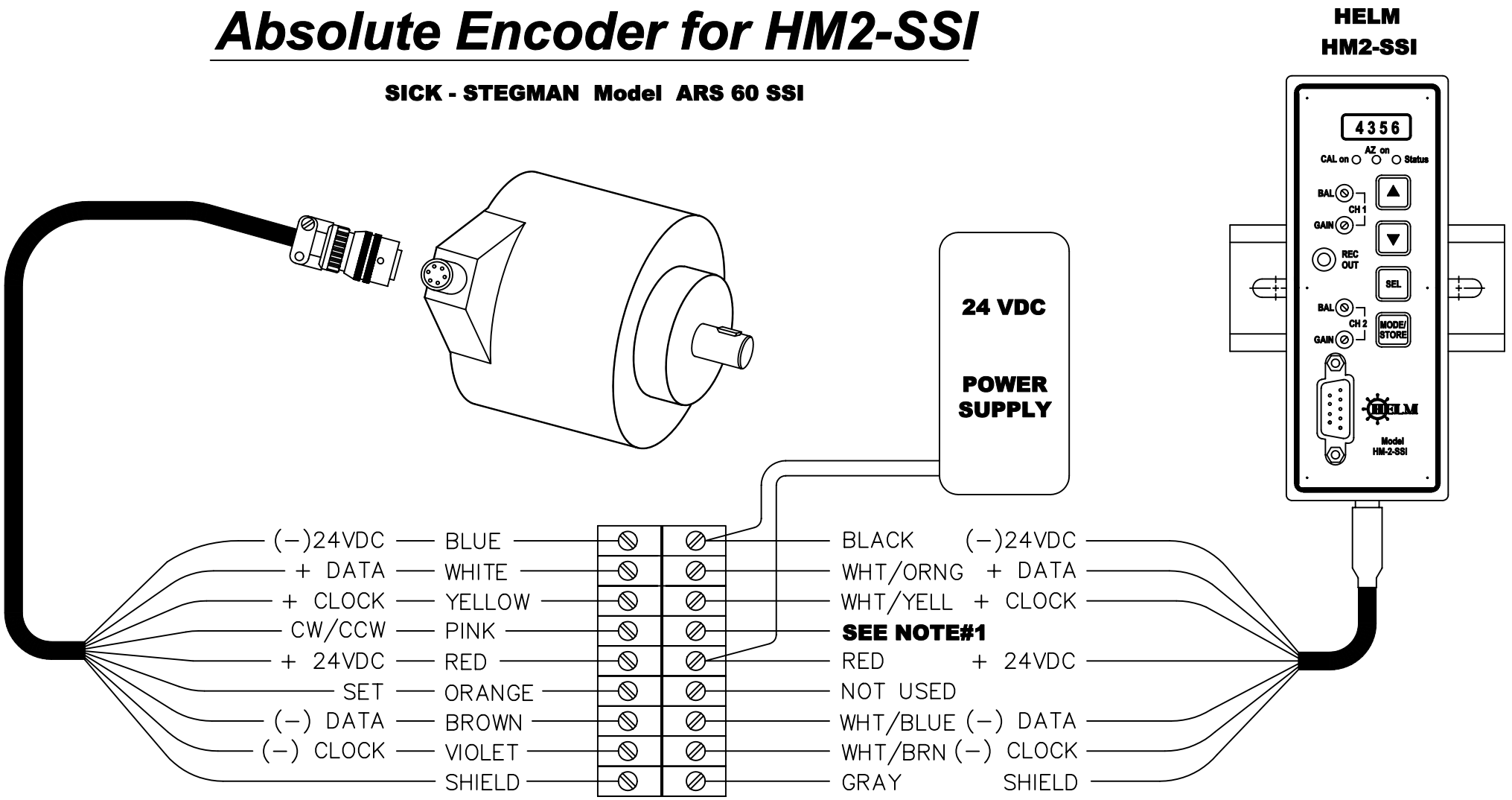
HELM INSTRUMENT CO., INC.
MAUMEE, OHIO USA

SCALE:	2X	DESIGNED BY:	N.F.N.	DRAWN BY:	M.H.L.
DATE:	07/18/13	CHECKED BY:	N.F.N.	APPROVED BY:	N.F.N.
TITLE:	ENCODER CABLE CONNECTIONS, HM2–SSi THRU–STROKE MODULE (HELM)				
DRAWER:		DRAWING NUMBER:	E1112M15		



Absolute Encoder for HM2-SSI

SICK - STEGMAN Model ARS 60 SSI



NOTES: 1.) CONNECT TO (−)24 TO REVERSE DIRECTION.
2.) CHECK SHIELD FOR CONTINUITY TO ENCODER CONNECTOR METAL SHELL.
IF CONTINUITY IS PRESENT, DO NOT ATTACH SHIELD AT MODULE CONNECTOR.
3.) HELM ENCODER STK# IS 87861.
4.) HELM CABLE STK# IS 87865−XX. XX= LENGTH IN METERS (STD. LENGTHS ARE 1.5, 3.0, 10.0, 20.0, 30.0)

REV.	DESCRIPTION	BY	DATE
A	UPDATED NOTES.	N.F.N.	7/18/13

HELM INSTRUMENT CO., INC.
MAUMEE, OHIO USA

SCALE:	NONE	DESIGNED BY:	M.H.L.	DRAWN BY:	M.H.L.
DATE:	11/28/06	CHECKED BY:	R.J.G.	APPROVED BY:	R.J.G.
TITLE:	ABSOLUTE ENCODER for HM2−SSI (HELM)				
DRAWER:		DRAWING NUMBER:	E1112W12A		

Appendix C: *GSD File:*

```
;-------------------------------------------------------------------------;
; GSD Multifunktionales Leistugsmessgeraet PROFIBUS DP                    ;
; Fa. GOSSEN-METRAWATT GMBH Thomas-Mann-Str. 16 - 20, D-90471 Nuernberg   ;
; Tel.: 0911/8602-0                                                       ;
; Stand: 21.09.99                                                         ;
;-------------------------------------------------------------------------;
#Profibus_DP
GSD_Revision=2
Vendor_Name         = "HELM INSTRUMENT"     ; Herstellername
Model_Name          = "SGI 2 CHANNEL  thru stroke"             ;
Herstellerbezeichnung
Revision            = "1.0"                       ; Ausgabestand des Geraets
Ident_Number        = 0x1235                      ; Ident-Nummer
Protocol_Ident      = 0                           ; PROFIBUS_DP Protokoll
Station_Type        = 0                           ; Slave-Station
Hardware_Release    = "02"                        ; Hardware-Stand
Software_Release    = "V3.00"                     ; Software-Stand
9.6_supp            = 1                           ; Baudrate 9.6kB unterstuetzt
19.2_supp           = 1                           ; Baudrate 19.2kB unterstuetzt
93.75_supp          = 1                           ; Baudrate 93.75kB unterstuetzt
187.5_supp          = 1                           ; Baudrate 187.5kB unterstuetzt
500_supp            = 1                           ; Baudrate 500kB unterstuetzt
1.5M_supp           = 1                           ; Baudrate 1.5MB unterstuetzt
3M_supp             = 1                           ; Baudrate 3MB unterstuetzt
6M_supp             = 1                           ; Baudrate 6MB unterstuetzt
12M_supp            = 1                           ; Baudrate 12MB unterstuetzt
MaxTsdr_9.6         = 60
MaxTsdr_19.2        = 60
MaxTsdr_93.75       = 60
MaxTsdr_187.5       = 60
MaxTsdr_500         = 100
MaxTsdr_1.5M        = 150
MaxTsdr_3M          = 250
MaxTsdr_6M          = 450
MaxTsdr_12M         = 800
Bitmap_Device       = "Helmn"
Implementation_Type = "SPC3"                      ; ASIC SPC3 wird verwendet
;----Slave spezifische Werte-----
;OrderNumber="A2000 L2"
Freeze_Mode_supp    = 0                           ; kein Freeze Mode
Sync_Mode_supp      = 0                           ; kein Sync Mode
Auto_Baud_supp      = 1                           ; automatische Baudratenerk.
Set_Slave_Add_supp  = 0                           ; Adressierung ueber BUS
Min_Slave_Intervall = 1                           ; min. Slave-Aufrufzeit
Modular_Station     = 0                           ; Produktbeschreibung 0=Kompaktger?,
1=Modular
Max_Diag_Data_Len   = 6                           ; keine User Diagnosen
;
;
Module= "96Words In, 64Words Out" 0x7f,0x7f,0x7f,0x7f,0x5f,0x5f
EndModule
;Slave_Family=3
Slave_Family=0
```

Appendix D: *Address Values:*

Input Image Block: DB130(Ch1,2) DB136(Ch3,4)

Block:DB DB130	Data Type	Bit	Description
+0.0	INT	-	SPM Value
+2.0	INT	-	Scale
+4.0	INT	-	Ch1 Peak value in Ton (in PEAK or MONITOR Mode) Ch1 Calibrate number (in CALIBRATE Mode)
+6.0	INT	-	Ch2 Peak value in Ton (in PEAK or MONITOR Mode) Ch2 Calibrate number (in CALIBRATE Mode)
+8.0	INT	-	Ch1 Trend value in Percent or Ton
+10.0	INT	-	Ch2 Trend value in Percent or Ton
+12.0	INT	-	Ch1 Sample value in Ton
+14.0	INT	-	Ch2 Sample value in Ton
+16.0	INT	-	Ch1 Reverse Load in Ton
+18.0	INT	-	Ch2 Reverse Load in Ton
+20.0	Bit	0	Ch1 High Trend Alarm Indication Bit
+20.1		1	Ch1 Low Trend Alarm Indication Bit
+20.2		2	Ch2 High Trend Alarm Indication Bit
+20.3		3	Ch2 Low Trend Alarm Indication Bit
+20.4		4	Ch1Capacity Alarm Indication Bit
+20.5		5	Ch2 Capacity Alarm Indication Bit
+20.6		6	-
+20.7		7	-
+21.0		8	Ch1 Press Curve Alarm Indication Bit
+21.1		9	Ch2 Press Curve Alarm Indication Bit
+21.2		10	Ch1 High Tracking Alarm Indication Bit
+21.3		11	Ch1 Low Tracking Alarm Indication Bit
+21.4		12	Ch2 High Tracking Alarm Indication Bit
+21.5		13	Ch2 Low Tracking Alarm Indication Bit
+21.6		14	
+21.7		15	
+22.0	BIT	0	Ch1 Cal (-)Sign Bit
+22.1		1	Ch2 Cal (-)Sign Bit
+23.0		8	Module In Calibrate Mode Indication Bit
+23.1		9	Module In Peak Mode Indication Bit
+23.2		10	Module In Monitor Mode Indication Bit
+23.3		11	Sampling in progress Indication Bit
+23.4		12	Sample Ready Indication Bit (stay On until the mode changes)
+23.5		13	Alarm Rest in progress bit
+23.6		14	
+23.7		15	Low Alarm Inhibit Bit
+24.0	INT	-	Cycle Counter
+26.0	INT	-	Current Module report Angle (in Calibrate mode only)

Output Image Block: DB131(Ch1,2) DB137(Ch3,4)

Block:DB DB131	Data Type	Bit	Description
+0.0	Bit	0	
+0.1	Bit	1	Alarm Reset
+0.0	Bit	2	
+1.0	Bit	8	Set Calibrate mode
+1.1	Bit	9	Set Setup mode
+1.2	Bit	10	Set Monitor Mode
+1.3	Bit	11	
+2.0	INT	-	Look Window Start Degree (in Calibrate mode only)
+4.0	INT	-	Look Window Degree Increment (1, 2, 4, 6, 8, 10,) (in Calibrate mode Only)
+6.0	INT	-	Set Ch1 High Capacity Alarm Value (in Calibrate mode)
+8.0	INT	-	Set Ch2 High Capacity Alarm Value (in Calibrate mode)
+10.0	-	-	-
+11.0	Bit	0	Press Curve Alarm On/Off
+11.1	Bit	1	Tracking Alarm On/Off
+11.2	Bit	2	Trend Alarm On/Off
+11.3	Bit	3	Delta Track On/Off
+11.4	Bit	4	Alarm Value type (1 = Tolerance in Ton, 0 = Tolerance in Percent)
+11.5	Bit	5	AMPTRACK On/Off
+11.6	Bit	6	
+11.7		7	8000 DP On/Off
+12.0	INT	-	Set Sample Count (2, 4, 8, or 16)
+14.0	INT	-	Set Low Alarm Inhibit Count
+16.0	INT	-	Alarm Start Degree Value (Tracking alarm only)
+18.0	INT	-	Alarm Stop Degree Value (Tracking alarm only)
+20.0	INT		Set Ch1 Low Tolerance value
+22.0	INT	-	Set Ch1 High Tolerance value
+24.0	INT		Set Ch2 Low Tolerance value
+26.0	INT	-	Set Ch2 High Tolerance value
+28.0	INT	-	Set Threshold for Tracking Alarm (In Percent)
+30.0	INT	-	Press Curve Input Value in 0 degree (in Calibrate mode)
+32.0	INT	-	Press Curve Input Value in 10 degree (in Calibrate mode)
+x.0	INT	-	Press Curve Input Data in y degree (in Calibrate mode)
+98.0	INT	-	Press Curve Input Value in 340 degree (in Calibrate mode)
+100.0	INT	-	Press Curve Input Value in 350 degree (in Calibrate mode)

Appendix D

Signature Data Block: DB126(Ch1,2) DB133(Ch3,4)

BLOCK DB DB126	Data Type	Bit	Description
+0.0	INT	-	Ch1 Wave Data - Index 1
+2.0	INT	-	Ch1 Wave Data - Index 2
+4.0	INT	-	Ch1 Wave Data - Index 3
+x.0	INT	-	Ch1 Wave Data - Index n (n = 1 - 224) (x = n * 2 + 4)
+444.0	INT	-	Ch1 Wave Data - Index 223
+446.0	INT	-	Ch1 Wave Data - Index 224
+448.0	INT	-	Ch2 Wave Data - Index 1
+450.0	INT	-	Ch2 Wave Data - Index 2
+452.0	INT	-	Ch2 Wave Data - Index 3
+x.0	INT	-	Ch2 Wave Data - Index n (n = 1 - 224) (x = n * 2 + 452)
+892.0	INT	-	Ch2 Wave Data - Index 223
+894.0	INT	-	Ch2 Wave Data - Index 224
+896.0	INT	-	Cycle Counter
+898.0	INT	-	Ch1 High AD
+900.0	INT	-	Ch1 Peak Value in Ton
+902.0	INT	-	Ch1 Low AD
+904.0	INT	-	Ch1 Alarm Angle
+906.0	INT	-	Ch1 Alarm Value in Ton at the Angle
+908.0	INT	-	Ch2 High AD
+910.0	INT	-	Ch2 Peak Value in Ton
+912.0	INT	-	Ch2 Low AD
+914.0	INT	-	Ch2 Alarm Angle
+916.0	INT	-	Ch2 Alarm Value in Ton at the Angle

Appendix D

Common Control Data Block: DB126(Ch1,2) DB133(Ch3,4)

Block:DB DB140	Data Type	Bit	Description
+0.0	INT	0 1 2	Set All Module to Calibrate Mode Set All Module to Setup Mode Set All Module to Monitor Parts Mode
+2.0	INT	-	Alarm Reset (0 = Normal. 1 = Reset)
+4.0	INT	- 0 1 2 3	Wave Xfer Bits Current Wave Xfer Bit Sample Wave Xfer Bit Pcurve Xfer Enable Bit Quick Data Xfer Enable Bit
+6.0	INT	-	
+8.0	INT	-	Current Mode Report from Module (1 = Cal, 2 = Setup, 4 = Monitor)
+10.0	INT	-	Current Encorder Angle
+12.0	INT		
+14.0	INT		
+16.0	INT		
+18.0	INT	-	External Software Status
		0	RSTMon Software Heartbeat (toggle between 1 and 0 every 3 seconds when the software is running)
+20.0	INT	-	Cycle Counter
+22.0	INT	- 0 1 2 3 4 5 6 7 8	ADC Command Bits (Used by RSTMon4C) ADC Job Download Bit Change Mode to Monitor Parts Bit Change Mode to Setup Bit ADC Command Complete Bit (Used by RSTMon4C)
+24.0	INT	-	ADC Job number (Used by RSTMon4C)
+26.0	INT	-	SAMPLING IN PROGRESS BITS
		0 1 2 3 4 5	Module 1 in Sampling Indication Bit Module 2 in Sampling Indication Bit Module 3 in Sampling Indication Bit Module 4 in Sampling Indication Bit Module 5 in Sampling Indication Bit Module 6 in Sampling Indication Bit
+28.0	INT	-	SAMPLE READY BITS (bits stays on until the mode change to setup or cal)
		0 1 2 3 4 5	Sample Ready for Module 1 Indication Bit Sample Ready for Module 2 Indication Bit Sample Ready for Module 3 Indication Bit Sample Ready for Module 4 Indication Bit Sample Ready for Module 5 Indication Bit Sample Ready for Module 6 Indication Bit
+30.0	INT	-	TONNAGE MODULE 1 ALARM BITS

		0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15	Ch1 High Trend Alarm Bit for Module 1 Indication Bit Ch1 Low Trend Alarm Bit for Module 1 Indication Bit Ch2 High Trend Alarm Bit for Module 1 Indication Bit Ch2 Low Trend Alarm Bit for Module 1 Indication Bit Ch1 Capacity Alarm Bit for Module 1 Indication Bit Ch2 Capacity Alarm Bit for Module 1 Indication Bit - - *Ch1 High Tracking Alarm Bit for Module 1 Indication Bit *Ch1 Low Tracking Alarm Bit for Module 1 Indication Bit *Ch2 High Tracking Alarm Bit for Module 1 Indication Bit *Ch2 Low Tracking Alarm Bit for Module 1 Indication Bit *Ch1 Press Curve Alarm Bit for Module 1 Indication Bit *Ch2 Press Curve Alarm Bit for Module 1 Indication Bit
+32.0	INT	-	TONNAGE MODULE 2 ALARM BITS (use index [15] for bit description)
+34.0	INT	-	TONNAGE MODULE 3 ALARM BITS (use index [15] for bit description)
+36.0	INT	-	TONNAGE MODULE 4 ALARM BITS (use index [15] for bit description)
+38.0	INT	-	
+40.0	INT	-	
+42.0	INT	-	
+44.0	INT	-	
+46.0	INT	-	
+48.0	INT	-	
+50.0	INT	-	
+52.0	INT	-	
+54.0	INT	-	Ch1 Peak tonnage value for Module 1
+56.0	INT	-	Ch2 Peak tonnage value for Module 1
+58.0	INT	-	Ch1 Peak tonnage value for Module 2
+60.0	INT	-	Ch3 Peak tonnage value for Module 2
+62.0	INT	-	Ch1 Peak tonnage value for Module 3
+64.0	INT	-	Ch2 Peak tonnage value for Module 3
+66.0	INT	-	Ch1 Peak tonnage value for Module 4
+68.0	INT	-	Ch2 Peak tonnage value for Module 4

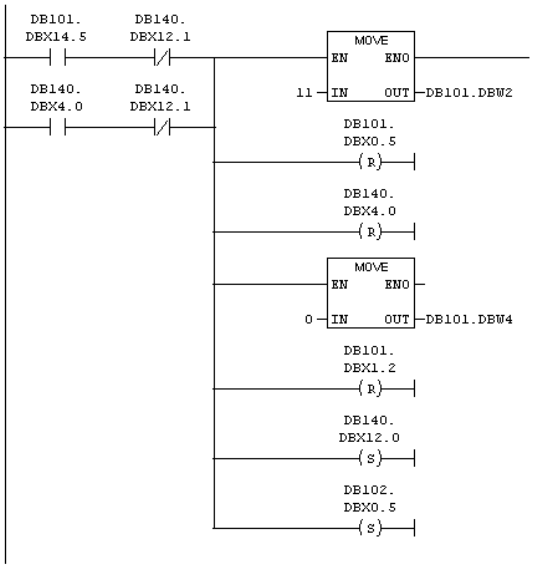
Appendix E: *Siemen's Ladder Logic:*

OB1 : "Main Program Sweep (Cycle)"

Comment:

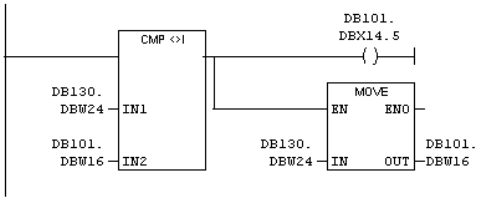
Network 1: SET COMMAND OUTPUT WORD TO 11

ch1 ch2 startwave bit sets ch3 ch4 startbit for tests only remove later
set module xfer command register to 11
reset xfer block counter to zero



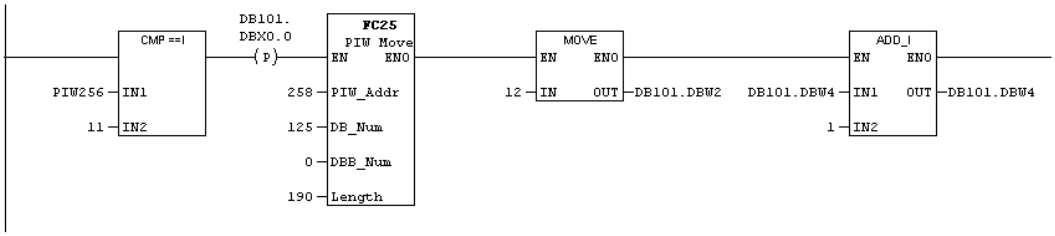
Network 2 : Title:

sets bit when cycle counter changes



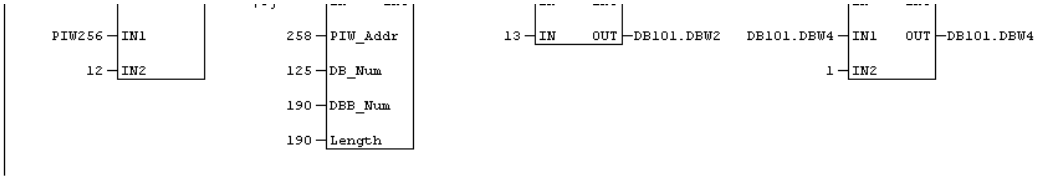
Network 3 : WHEN STATUS WORD EQUALS 11, MOVE DATA TO HOLDING REGISTERS

1. FC25 LENGTH VALUE MUST BE EVEN
2. FC25 WILL NOT WORK CORRECTLY WITHOUT ONE-SHOT BIT
3. move first 190 bytes into DB125
4. add 1 to xfer block counter



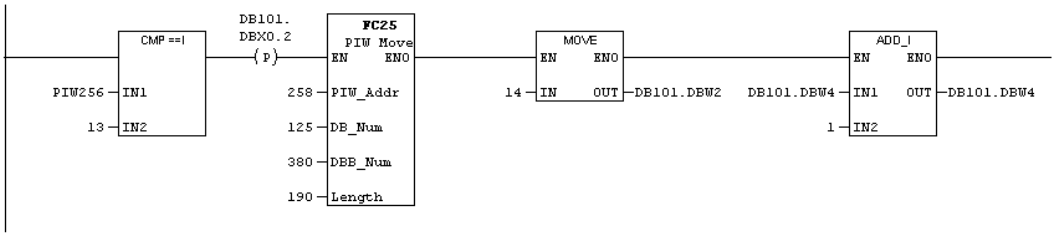
Network 4 : WHEN STATUS WORD EQUALS 12, MOVE DATA TO HOLDING REGISTERS

move next 190 bytes into DB125
add 1 to xfer block counter



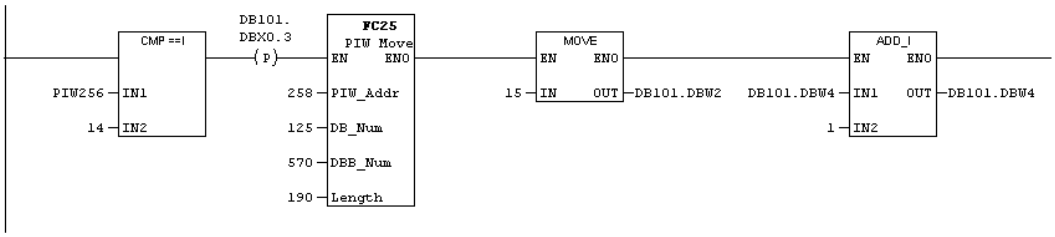
Network 5 : WHEN STATUS WORD EQUALS 13, MOVE DATA TO HOLDING REGISTERS

```
move next 190 bytes into DB125
add 1 to xfer block counter
```



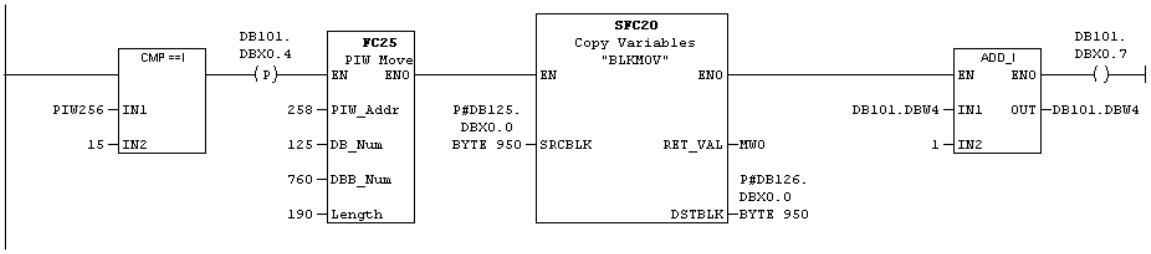
Network 6 : WHEN STATUS WORD EQUALS 14, MOVE DATA TO HOLDING REGISTERS

```
move next 190 bytes into DB125
add 1 to xfer block counter
```



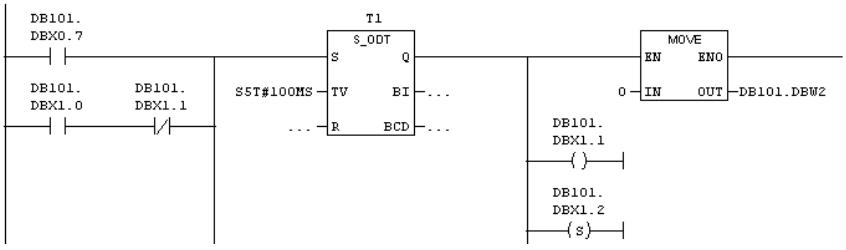
Network 7 : WHEN STATUS WORD EQUALS 15, MOVE DATA TO HOLDING REGISTERS

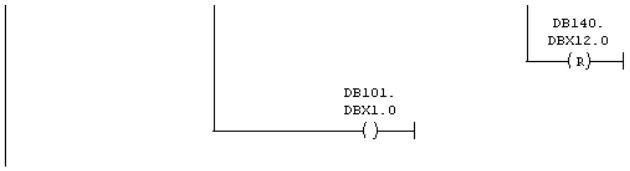
```
1. mov next 190 bytes into DB125,DB125 is now full
2. mov DB1025 actual waveform data for 2 channels into DB126
3. add 1 to xfer block counter
4. start delay timer to allow for proper timing between module block xfers
```



Network 8 : Title:

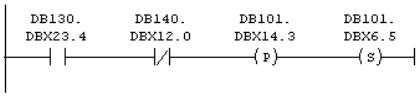
```
1. after delay, move zero into module block control register
2. turn off test output for white wave xfer time
3. set quickdata xfer bit (normal data mode, no waveform)
```





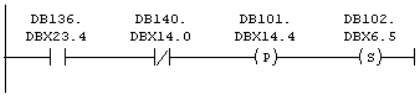
Network 9 : when sample is ready, initiate sample wave xfer

Comment:



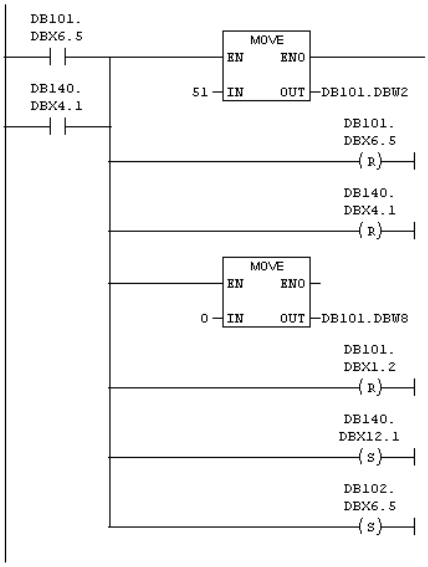
Network 10 : when ch3,ch4 sample is ready, intiate green wave xfer

Comment:



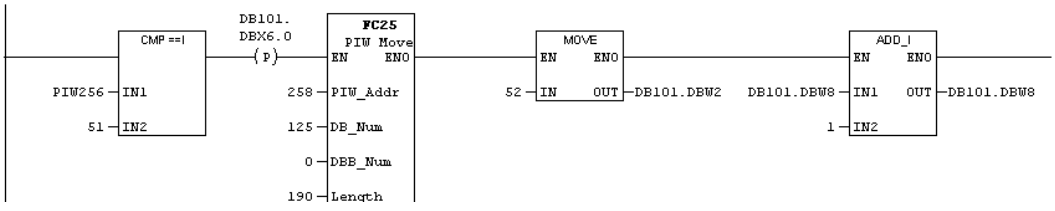
Network 11 : set bit to initiate green wave xfer

```
ch1 ch2 startbit sets ch3 ch4 startbit for tests remove later
initiate sample wave data xfer from module
set module xfer command register to 51
reset xfer block counter to zero
turn on green wave test output
delete last rung after initial test is done (ch3/ch4 sample wave xfer)
```



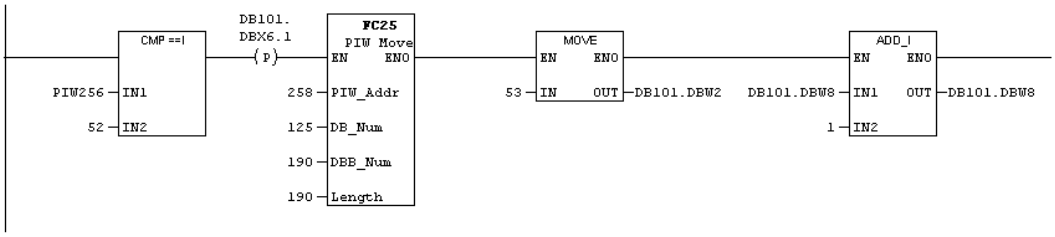
Network 12 : Title:

```
move first 190 bytes into DB125
add 1 to xfer block counter
```



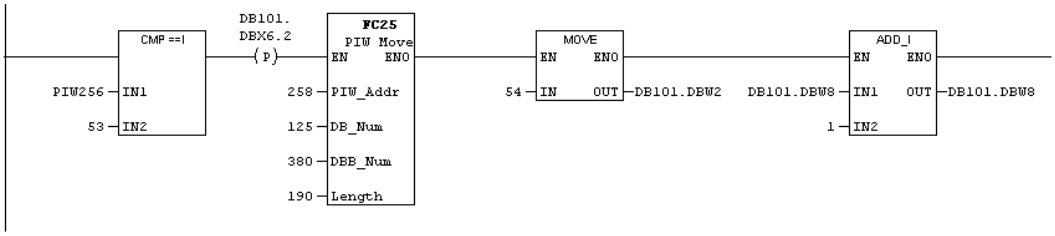
Network 13 : Title:

```
move next 190 bytes into DB125
add 1 to xfer block counter
```



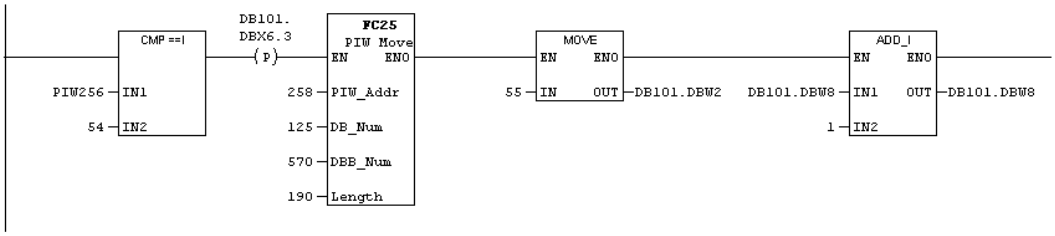
Network 14 : Title:

```
move next 190 bytes into DB125
add 1 to xfer block counter
```



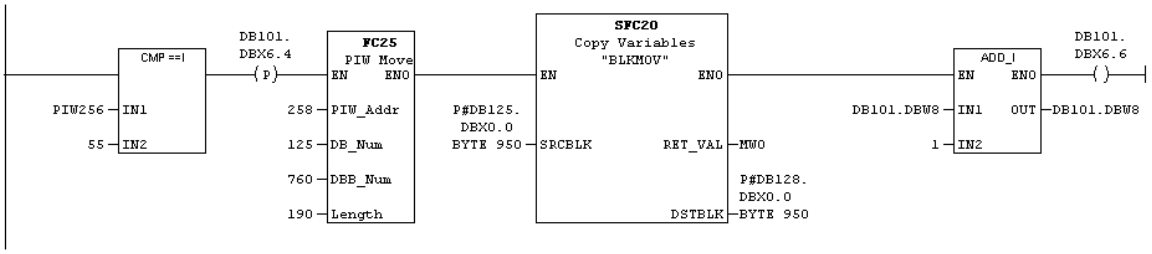
Network 15 : Title:

```
move next 190 bytes into DB125
add 1 to xfer block counter
```



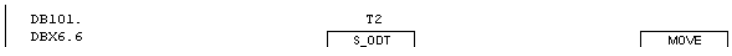
Network 16 : Title:

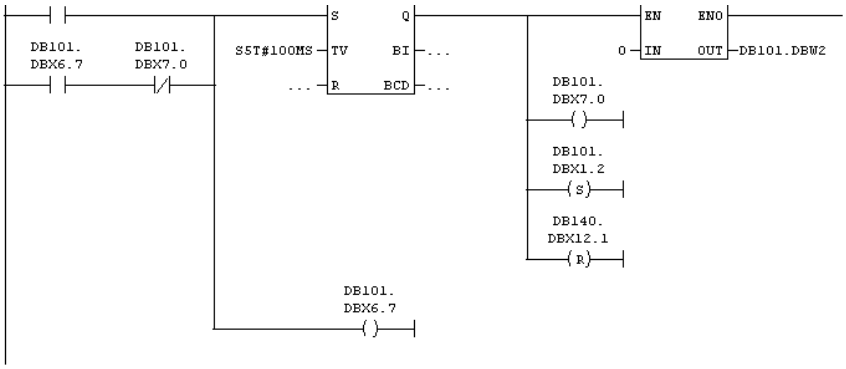
```
move next 190 bytes into DB125
d25 full, move DB125 into DB128
add 1 to xfer block counter
start delay timer to allow proper timing between module xfers
```



Network 17 : Title:

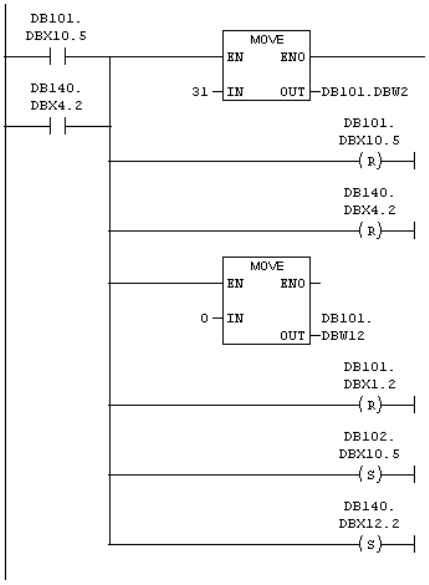
```
after time delay mov 0 to module xfer command register
set quikdata bit for normal data ( no waveform data
turn xfer green data test output off
```





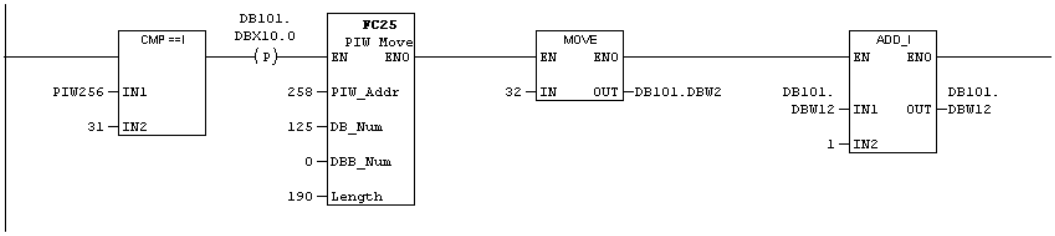
Network 18 : set bit to initiate red wave xfer

```
ch1 ch2 startbit sets ch3 ch4 startbit for tests remove later
initiate presscurve wave data xfer
set control xfer register to 31
reset red wave block xfer counter to zero
turn on red wave xfer test output
```



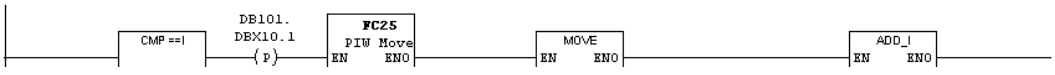
Network 19 : Title:

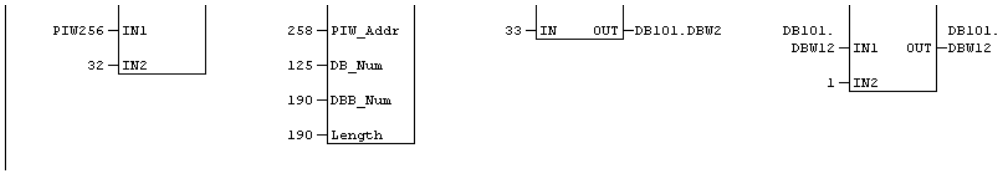
```
move first 190 bytes into DB125
add 1 to xfer block counter
```



Network 20 : Title:

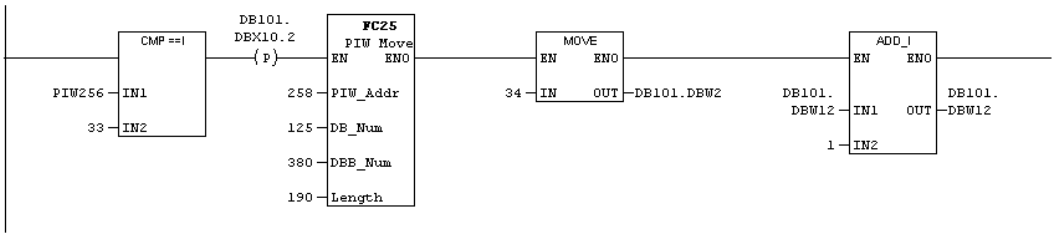
```
move next 190 bytes into DB125
add 1 to xfer block counter
```





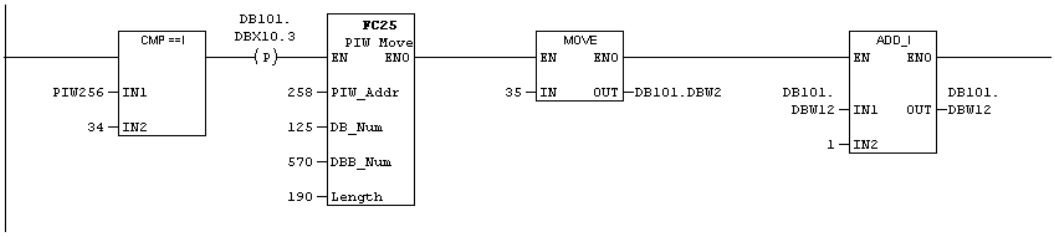
Network 21 : Title:

move next 190 bytes into DB125
add 1 to xfer block counter



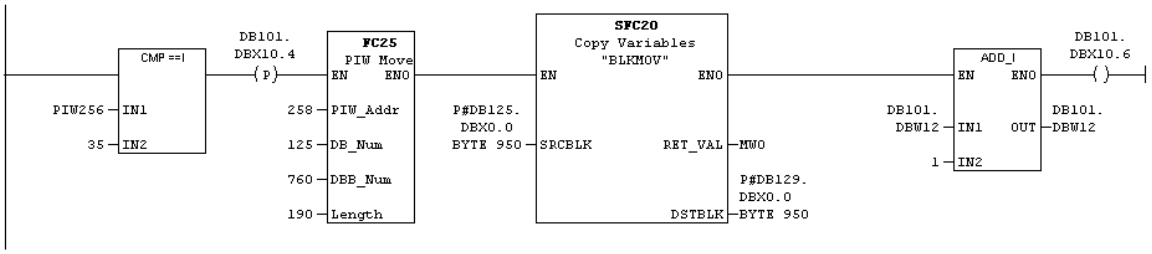
Network 22 : Title:

move next 190 bytes into DB125
add 1 to xfer block counter



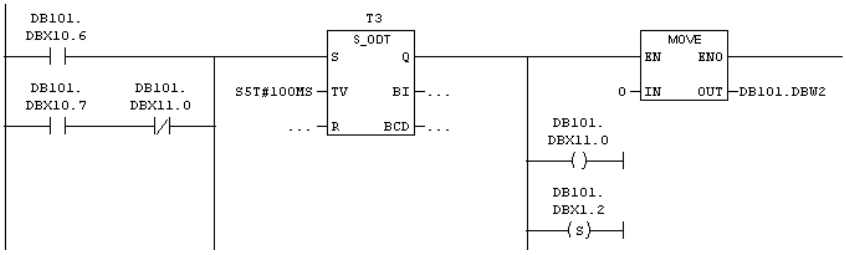
Network 23 : Title:

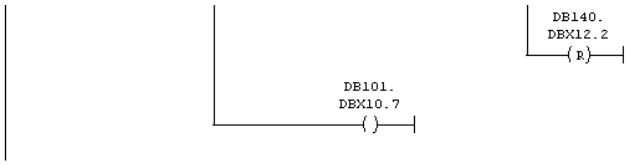
move next 190 bytes into DB125
DB125 full, xfer DB125 into DB129
add 1 to xfer block counter
start delay to allow proper timing between module xfers



Network 24 : Title:

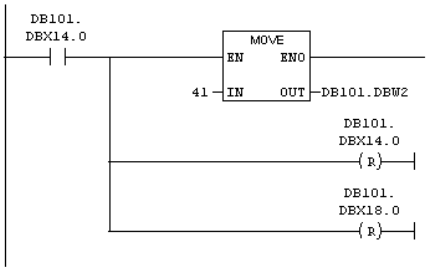
after time delay set module xfer block command to zero
turn off red wave xfer test output
set quickdata bit (no waveform data xfer)





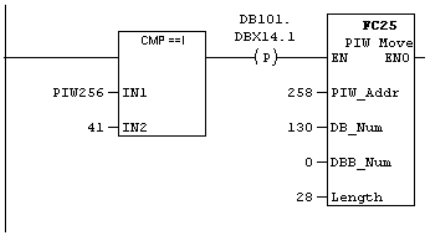
Network 25 : Title:

```
set module xfer command register to 41,quickdata mode
```



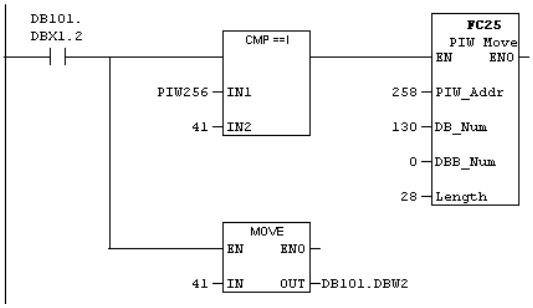
Network 26 : Title:

```
normal quick data request ladder logic
move 28 bytes into DB130
xfer DB130 to db138
db138 to be read by operater interface
set module xfer command register to zero
this rung is needed to refresh normal input image when waveform data xfer is
done
control register for module should be set to 41 (quick data mode)
change db31.dbx102.0 to different table
DB130 bytes 0 to 28 is ch1,ch2 input image
db131 bytes 0 to 102 is ch1,ch2 output image
small proface display reads only one data table,combine DB130 and db131 to
db138
delete db138 on final version ladder logic,helm test only
```



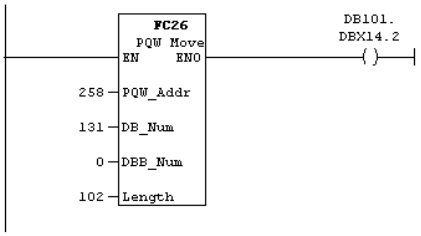
Network 27 : Title:

```
quick data request test ladder logic
this rung of ladder logic is used to put module into constant quickdata mode
no waveform xfer data takes place when this bit is set
turn on quickdata mode test output
also move DB130 to db31 when done 28 bytes
quickdatatestbit is set after waveform data is xfer is done,but may need to be
set initially on power up (no waveform data xfer)
this rung of ladder logic is not setup right,can cause bad data to be xfered
delete db138 on final version ladder logic
```



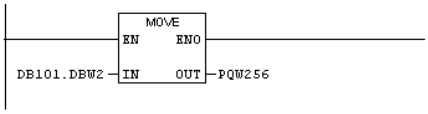
Network 28 : Title:

```
move presscurve points in here 36 total points
move db131 102 bytes total to ch1,ch2 output image
fill up rest of hmi data table
```



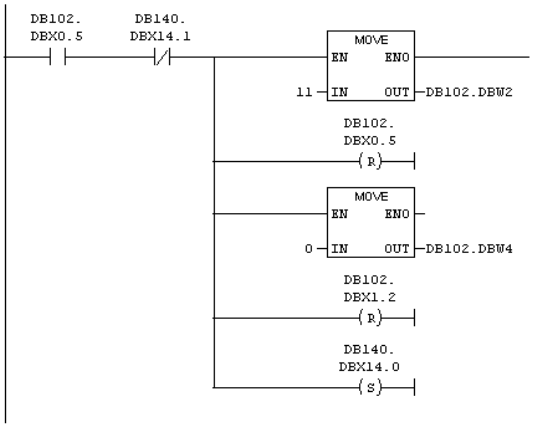
Network 29 : Title:

```
Comment:
```



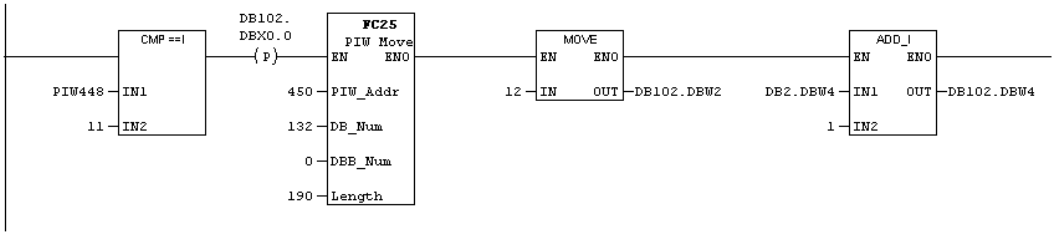
Network 30 : SET COMMAND OUTPUT WORD TO 11

```
start of channels 3 and 4
move 11 into xfer command register ch3,ch3
reset xfer block counter to zero
turn on test output 4
```



Network 31 : WHEN STATUS WORD EQUALS 11, MOVE DATA TO HOLDING REGISTERS

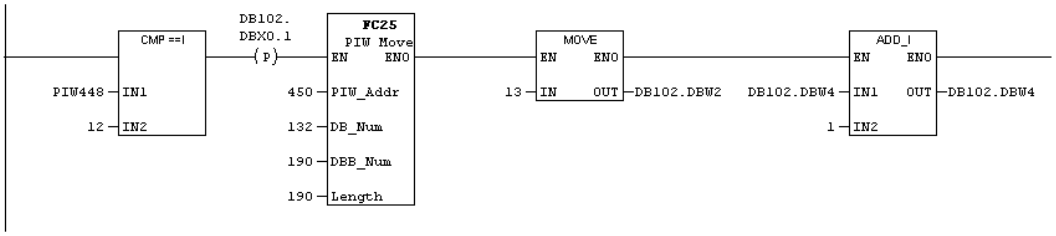
```
1. FC25 LENGTH VALUE MUST BE EVEN
2. FC25 WILL NOT WORK CORRECTLY WITHOUT ONE-SHOT BIT
3. move first 190 bytes of waveform into db32
4. add 1 to xfer block counter
```



Network 32 : WHEN STATUS WORD EQUALS 12, MOVE DATA TO HOLDING REGISTERS

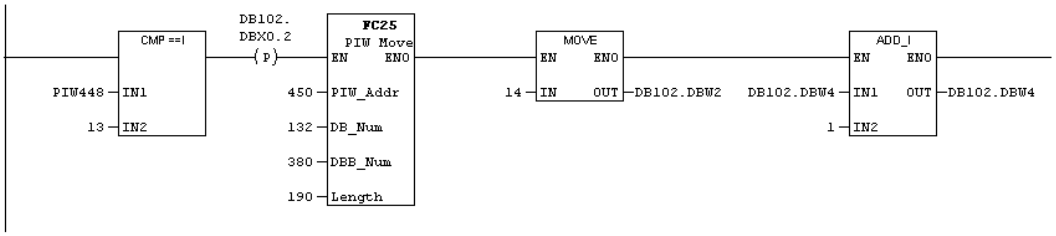
```
move next 190 bytes into db132
```

add 1 to xfer block counter



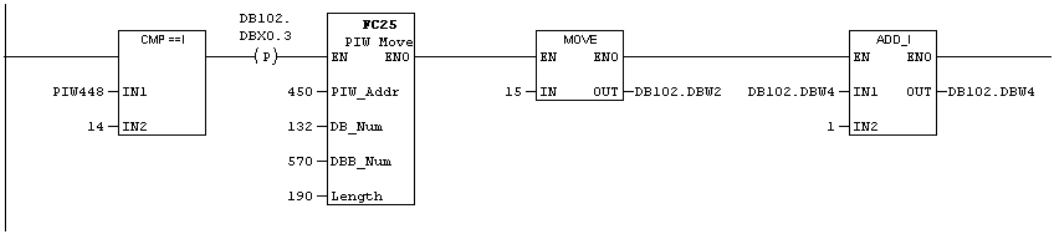
Network 33 : WHEN STATUS WORD EQUALS 13, MOVE DATA TO HOLDING REGISTERS

move next 190 bytes into db132
add 1 to xfer counter



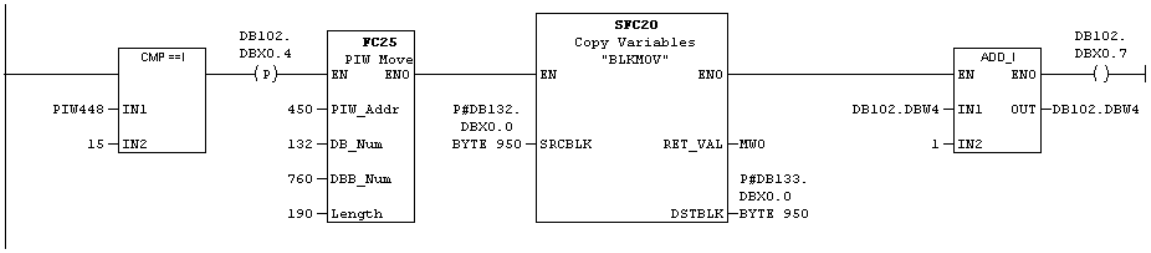
Network 34 : WHEN STATUS WORD EQUALS 14, MOVE DATA TO HOLDING REGISTERS

move next 190 bytes into db132
add 1 to xfer block counter



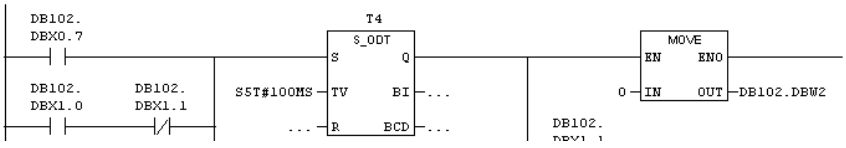
Network 35 : WHEN STATUS WORD EQUALS 15, MOVE DATA TO HOLDING REGISTERS

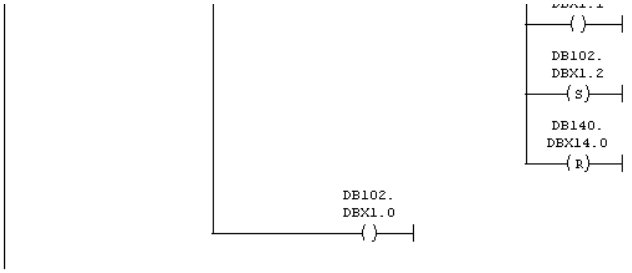
move next 190 bytes into db132
db132 full, move db132 into db133
add 1 to xfer block counter
set bit to intiate timer delay to allow for proper timing for more data xfers



Network 36 : Title:

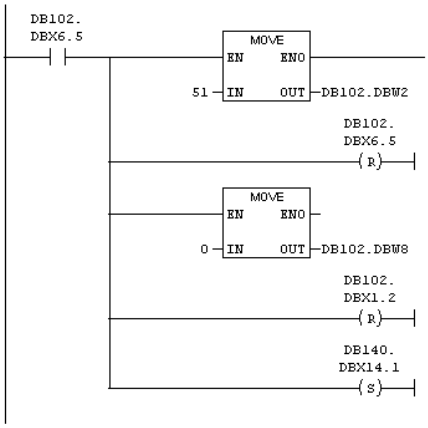
when delay is finished,move zero into module xfer control register
turn off test output 4
set normal data bit for module input image





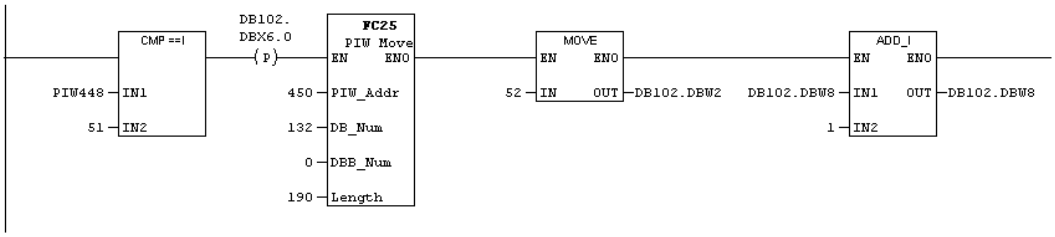
Network 37 : set bit to intiate green wave xfer

```
move 51 into module xfer control register
reset xfer block counter to zero
turn on test output 5
```



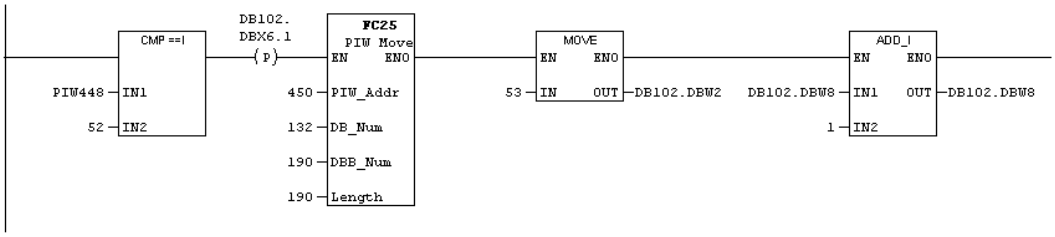
Network 38 : Title:

```
move first 190 bytes into db132
add 1 to xfer block counter
```



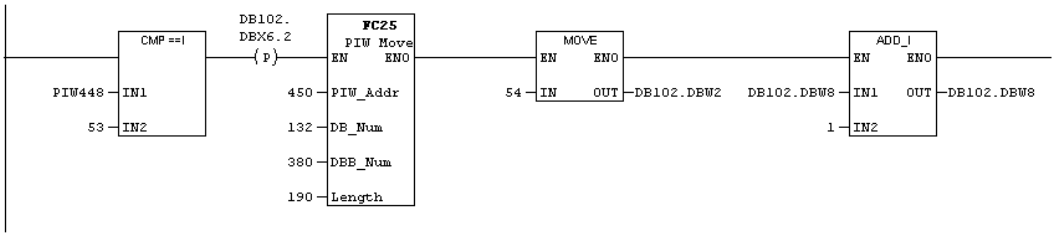
Network 39 : Title:

```
move next 190 bytes into db132
add 1 to xfer block counter
```



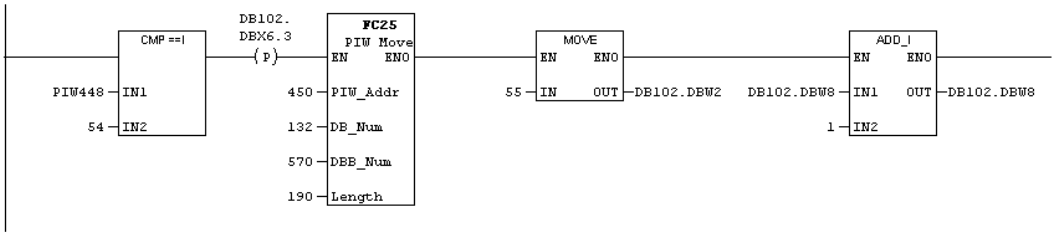
Network 40 : Title:

```
move next 190 bytes into db132
add 1 to xfer block counter
```



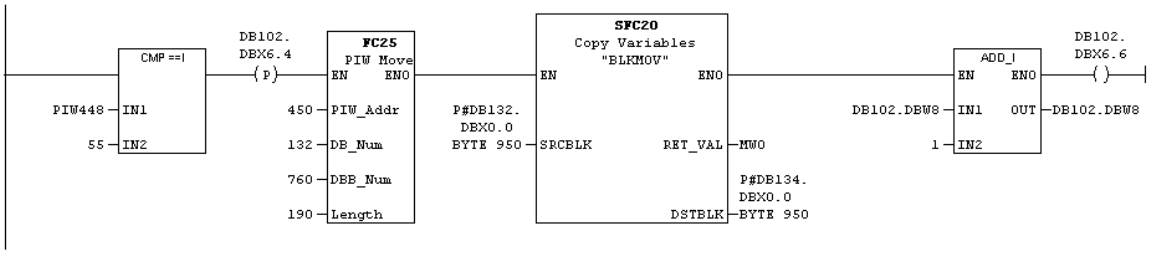
Network 41 : Title:

```
move next 190 bytes into db132
add 1 to xfer block counter
```



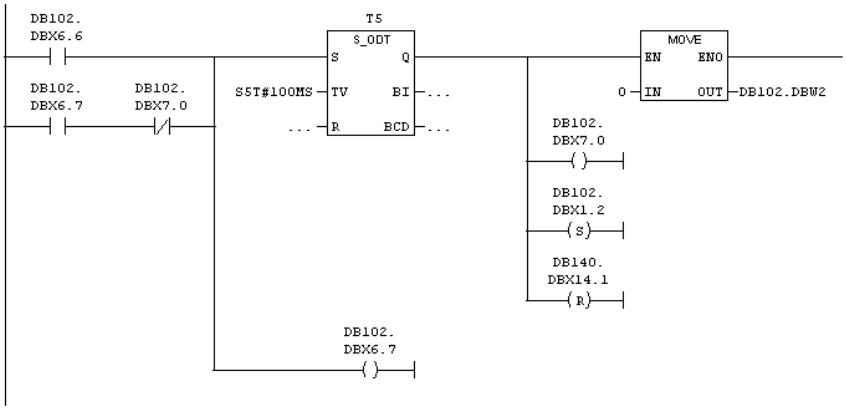
Network 42 : Title:

```
move next 190 bytes into db132
d132 full, move db132 to db134
add 1 to xfer block counter
set bit to iniate time delay to allow for proper timing for next xfer
```



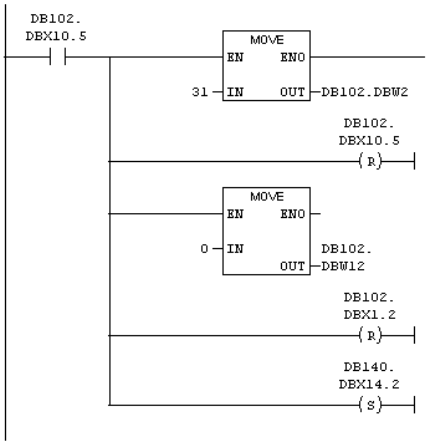
Network 43 : Title:

```
after delay time set module xfer command to zero
turn off output test 5
set normal input image bit xfer (no waveform data)
```



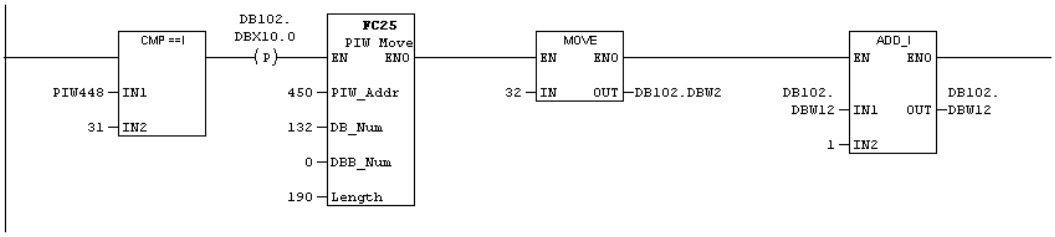
Network 44 : set bit to intiate red wave xfer

```
move 31 into module xfer command ch3,ch4
reset xfer block counter to zero
turn on test output 6
```



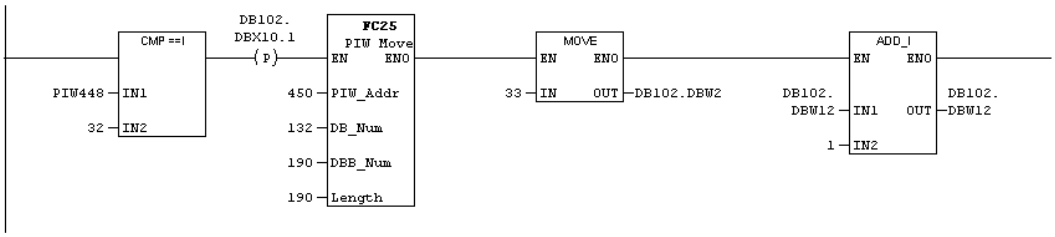
Network 45 : Title:

move first 190 bytes into db132
add 1 to xfer block counter



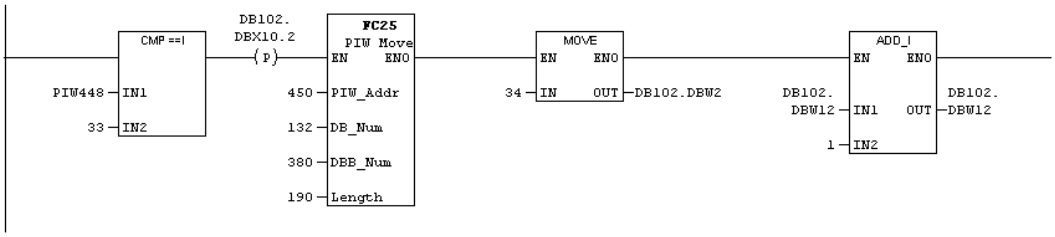
Network 46 : Title:

move next 190 bytes into db132
add 1 to xfer block counter



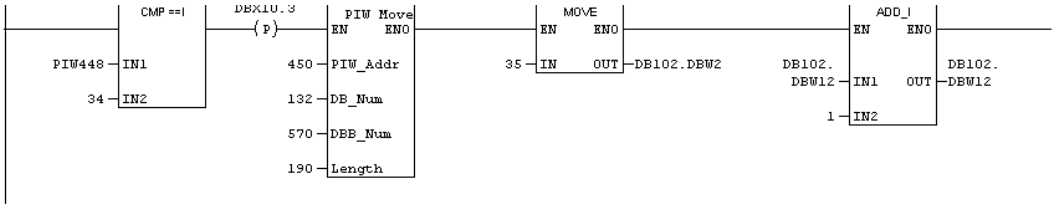
Network 47 : Title:

move 190 bytes into db132
add 1 to xfer block couter



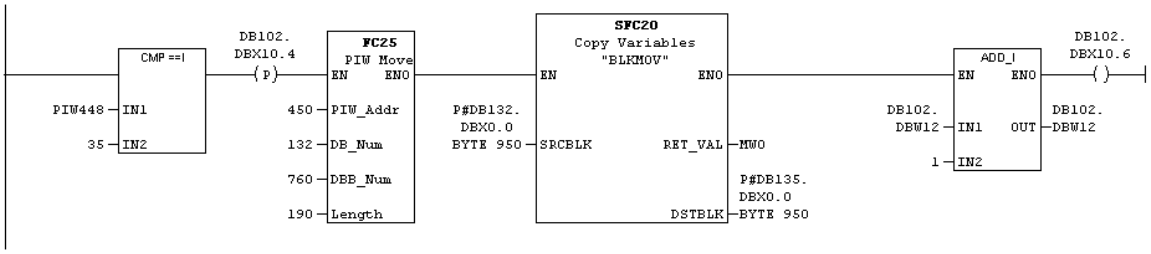
Network 48 : Title:

move next 190 bytes into db132
add 1 to xfer block counter



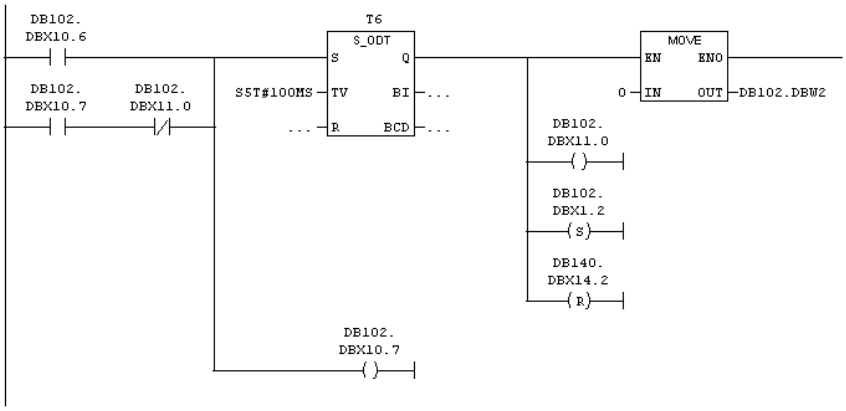
Network 49 : Title:

```
move next 190 bytes into db132
db132 full, move db132 to db135
add 1 to xfer block counter
set bit to initiate time delay to allow for proper time between module xfers
```



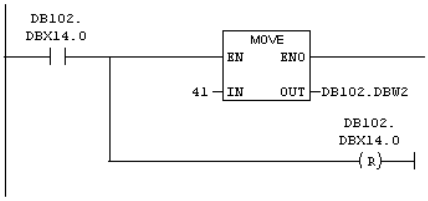
Network 50 : Title:

```
after time delay, set xfer module block command to zero
set normal input image bit (no waveform xfer mode)
turn off output test 6
```



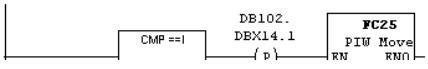
Network 51 : Title:

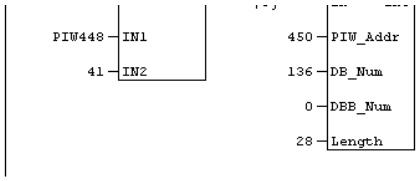
```
move 41 into module xfer command register (normal input image mode)
```



Network 52 : Title:

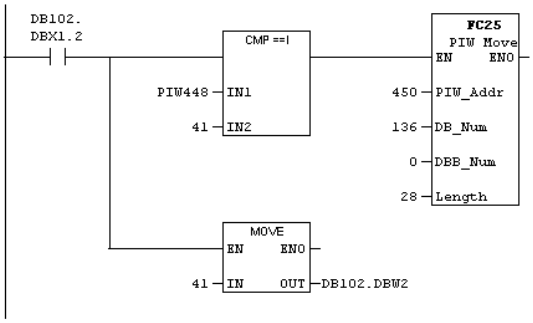
```
normal quick data request ladder logic
this rung is needed to refresh input image ch3,ch4 data after waveform data
xfer
```





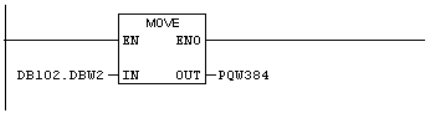
Network 53 : Title:

quick data request test ladder logic
sets module to constant input image normal mode (no waveform xfer)



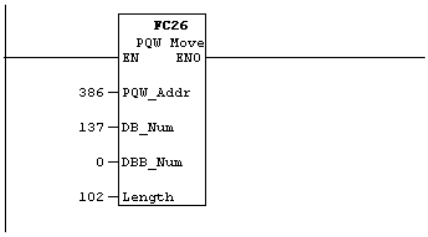
Network 54 : Title:

move xfer control register to output image ch3,ch4



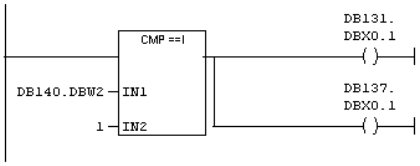
Network 55 : Title:

move presscurve points in here 36 total points
xfer from DB137



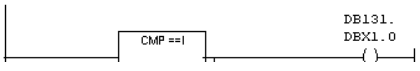
Network 56 : ALARM RESET

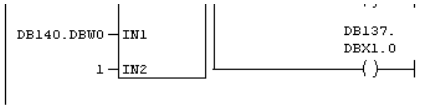
normal alarm reset



Network 57 : CALIBRATE MODE

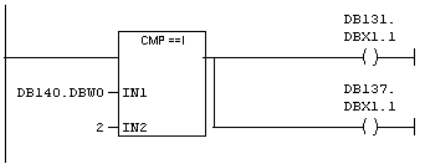
Comment:





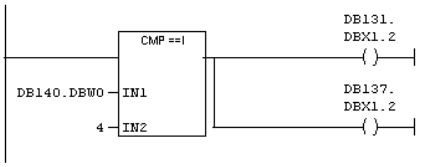
Network 58 : SETUP MODE

Comment:



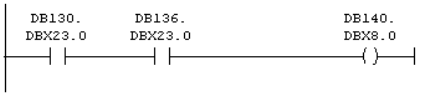
Network 59 : SET MODULE TO MONITOR PARTS MODE

Comment:



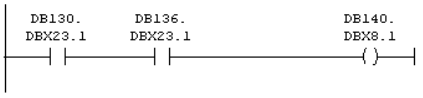
Network 60 : CURRENT MODE - CALIBRATE

Comment:



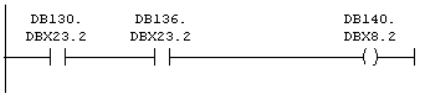
Network 61 : CURRENT MODE - PEAK

Comment:



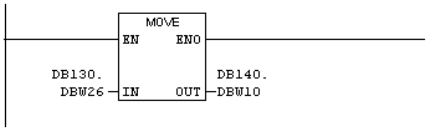
Network 62 : CURRENT MODE - MONITOR

Comment:



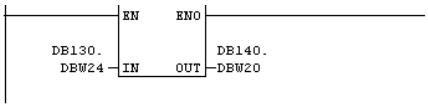
Network 63 : CURRENT RESOLVER ANGLE

Comment:



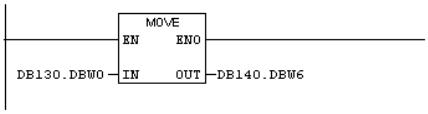
Network 64 : STROKE COUNTER

Comment:



Network 65 : Title:

Comment:



Network 66 : MODULE 1 SAMPLING

Comment:

Network 67 : MODULE 2 SAMPLING

Comment:

Network 68 : MODULE 1 SAMPLE READY

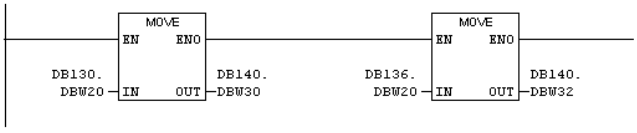
Comment:

Network 69 : MODULE 2 SAMPLE READY

Comment:

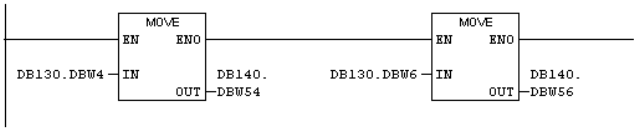
Network 70 : ALARM BITS - MODULE 1 AND 2

Comment:



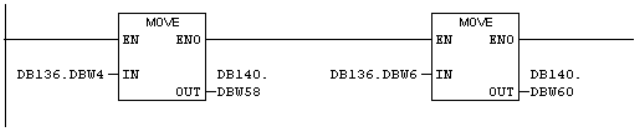
Network 71 : MODULE 1 PEAK TONNAGE - CHANNELS 1 AND 2

Comment:



Network 72 : MODULE 2 PEAK TONNAGE - CHANNELS 1 AND 2

Comment:



Network 73 : Title:

Comment: