HAWK-I™

Model 8630B
Hardware Manual

USER MANUAL

AMOT
CONTROLS

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CAUTION: Hazards which could result in equipment or property damage.
NOTE: Alerts user to pertinent facts and conditions.

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1. INTRODUCTION

The Hawk-I system is a unique, highly advanced, programmable controller combining the power of a PLC with the easy to use functionality of an embedded control system. This system allows safe, localized scanning of digital inputs, temperatures, pressures, flows, electrical currents and voltages, and fluid levels in machinery and industrial processes. Built-in communications make the Hawk-I a powerful and safe front end for hazardous-area data acquisition and alarm annunciation.

1.1 Easy and Flexible Programming

The graphical programming interface to the Hawk-I system allows the user to overcome the rigid constraints of conventional EPROM-based equipment. AMOT's innovative Ladder Logic lets even the novice programmer set up new system functions easily and quickly.

HawkWin, the Windows 95, 98, NT based configuration software used to program the Hawk-I system, was developed from AMOT's long experience in embedded controllers. The most critical problem with embedded controllers is the inability to make fast, on-site software changes, because the programming of a typical embedded controller is contained in an EPROM chip that cannot be altered. Software changes in such a system must be made at the factory, not in the field, taking up to several weeks to implement.

Hawk-I and HawkWin were created to overcome this limitation. Almost any safety shutdown, data monitoring, or alarm function can be rapidly programmed on-site using HawkWin. Then the function sequence is downloaded into Hawk-I through a standard RS232 Null Modem cable from the PC.

1.2 Other Key Features

The Hawk-I is based on an expandable platform. The basic system supports 16 discrete inputs, 4 power relay outputs, and a speed input to sense RPM. It can be expanded to include 8 or 16 thermocouples, 8 or 16 4-20 mA loop inputs, 2 PID 4-20 mA loop outputs, and 8 low power relays. (NOTE: Unit may be configured with no more than 24 analog inputs total and no more than 16 of one specific type).
A communications option allows connection to a modem or Distributed Control System (DCS) via Modbus/RTU protocol.
The Hawk-I module features a tactile keyboard (NEMA 4) and a large, high-contrast, 32-character display with backlight.

1.3 Scaling and Signal Processing

The Hawk-I contains scaling and linearizing circuits that provide individual channel readouts in software selectable units such as Centigrade and Fahrenheit temperatures, psig, psia, psid, feet and inches, meters and centimeters, inches of water, etc. Individually set alarm and shutdown setpoints are available for each channel, as well as multiple user-defined setpoints. Any channel can be configured to trip when the channel input is less than or greater than the setpoint. Timer class logic can also be associated with channels on an individual basis.

Input channels can be grouped together for signal averaging. The Hawk-I can generate an alarm or shutdown based on the deviation of any single channel from the average. Each input channel setpoint or averaging group setpoint can be assigned to any selected digital output.

1.4 RS-232C Communications Port

The RS232C serial data port and Modbus/RTU protocol allow easy interfacing to many types of PLCs and distributed control systems, including Modicon, Allen-Bradley, and Fisher Provox. Modbus supports one master and multiple slave units. Baud rate and Modbus ID number can be set from the Hawk-I keypad.

2. SPECIFICATIONS

The Hawk-I is an expandable-platform digital controller with many available options that allow the user to select a powerful yet economical control system.

2.1 Inputs

The sixteen discrete digital inputs used in the Hawk-I have volt-free contacts and are non-incendive; any kind of input switching device can be used. There is not enough energy in the circuit to ignite any gas mixture that may be present. The minimum loop resistance for an 'off' state is 15kΩ, the scan rate is 100 msec, and the response time is 100 msec.

The Hawk-I provides a speed input designed for use with an AMOT magnetic pickup, which senses gear teeth to determine RPM.

The optional J and/or K-type thermocouple inputs may be used with an expanded Hawk-I system. The available temperature range is -346º to 1940º F, or -210º to 1060º C. Accuracy is better than 1% of FSD with a 100 ms scan rate. The thermocouple input field connections are classified as non-incendive, since a thermocouple is a simple device that cannot store energy. The field wiring is 37-Way D Type through a DB-37 connector.

The Hawk-I can provide optional 4-20 mA/two-wire analog inputs. These inputs have an accuracy of ±0.5% of indicated parameter value with a scan rate of 100 ms. Loop power of 15 Vdc (open circuit) is provided. These analog inputs are designed for use with transmitters that are approved for use in a Class I, Division 2 area and are non-incendive. The field wiring is 25-Way D Type through a DB-25 connector. For hazardous area installations, if non-approved end devices are used, wiring must pass through an approved barrier.

2.2 Outputs

The basic Hawk-I system has four relay outputs. The outputs are solid-state (non-sparking) relays rated at 36Vdc, 1.75A. An external snubber network is required when switching inductive loads. These outputs are accessed through two-part Phoenix connectors on the back of the Hawk-I module. The connectors can accept wire as large as 12 AWG, allowing long wire runs without excessive signal loss.

WARNING

SINCE THESE RELAY CIRCUITS TRANSMIT POWER FROM AUXILIARY EQUIPMENT, THEY ARE CLASSED INCENDIVE. ALL ASSOCIATED WIRING MUST BE SEPARATED FROM NON-INCENDIVE WIRING BY AN APPROPRIATE DISTANCE.

A further option allows for eight low power, solid state relays. These outputs are rated at 100 mA/36 V. Connections are made through a 9-way, D type connector. One side of the relays is bussed common.

Two optional analog outputs can also be provided. These 4-20 mA outputs can be used to transmit selected data to a remote receiver. The accuracy is better than 0.75% of FSD with an update rate of 100 msec. These analog outputs are designed to be attached to a 4-20mA receiver that has been approved or recognized for use in a Class I, Division 2 area. If a non-approved receiver is used, the analog output wiring must pass through an approved barrier, when used in a hazardous area.

2.3 Communications

In addition to the I/O options, the Hawk-I has a 9-pin RS232C connector that can be used to connect the Hawk-I system with a modem, DCS, or a PC for programming and configuration changes. The protocol is Modbus/RTU. This additional programming capability is further discussed in a separate AMOT manual that describes the HawkWin computer program.

Signal levels on the RS232C port may be incendive. Any attached device within a hazardous area must be approved or recognized for use within that area.

2.4 Display

The Hawk-I controller has a large, high-contrast, backlit, 32-character display on a NEMA 4 faceplate. This LCD is 16 character by 2-line. System faults are identified in plain English, and display messages can be configured into the Hawk-I unit by the user.

2.5 Environment

The Hawk-I is suitable for use only in Class I, Division 2, Groups A, B, C and D, or non-hazardous locations. Wiring should be installed by qualified personnel in compliance with local electrical codes.

Electrical and RF interference immunity is designed into the Hawk-I, with RFI screening in the case. The unit has a high reliability due to conservative derating of electronic components. The internal printed circuit boards are conformally coated for extra environmental protection.

The Hawk-I can operate in temperatures between -20º and 65º Centigrade. The humidity limits are 5% to 95% non-condensing. The controller is weather and UV protected, and will withstand vibration up to 10G at 100 Hz. The protective case is sealed to NEMA 4 (IP65, dust tight and protected from water jets) from the front panel when properly installed.

2.6 Power Supply

The Hawk-I can be powered by either 12Vdc or 24Vdc. The 12-V input can accept DC ranging from 9V to 18V. The 24-V input can accept DC ranging from 18V to 36V. The supply should be capable of delivering 1A. Maximum ripple should be 1V P-P. Power is supplied through a terminal block on the rear of the Hawk-I.

Hazardous Approvals:

ETL: Class 1, Division 2
Groups A, B, C, & D
ETL FM 3810 CETL
FM 3611

CAN/CSA C22.2 No. 142

CAN/CSA C22.2 No. 2B

B.A.S.E.E.F.A.: Ex N II C

Power Requirements: Table A

Voltage: 24 Vdc (18-36 Vdc)
12 Vdc (9-18 Vdc)
Current: 500 mA max.(24V)
800 mA max. (12V)
Ripple: <1V pk-pk

Environment: *ETL* *B.A.S.E.E.F.A.*

Temperature: 0° to 150°F 0° to 122°F
(-18° to 65°C) (-18° to 50°C)

Vibration: 0-10g @ 100 Hz
Sealing: NEMA4 from Front Panel
EMC: IEC 801-2(ESD), 801-3(RF Immunity)

Display: Table E

Type: Backlit LCD
Characters: 16 Chars X 2 Lines
Char Size: 8.05 X 5.5mm

Digital Inputs (Non-Incendive):

Type: Volt-Free Contacts
Number: 16
Open Circuit: > 15 k ohms

Hawk-I™ Hardware Specifications

Speed Input (Non-Incendive):

Type: Magnetic Pickup
Number: 1
Signal: Zero Crossing >2V pk-pk

Analog Inputs (Optional): Table C

Type: 4-20mA, 2-wire Transmitter, (Non Incendive)
Number: 8 or 16
Accuracy: Better than 1% of FSD
Loop Power: 15 Vdc provided by the Hawk-I™

Thermocouple Inputs (Optional): Table C

Type: J and/or K, (Non Incendive)
Number: 8 or 16
Accuracy: Better than 1% of FSD

Relay Outputs: Table B

Type: DC Solid State Relay
Number: 4
Rating: 3-36 V at 1.75 A (Continuous)
Isolation: 4 kV

Digital Outputs (Optional): Table B

Type: Solid State Relay, Common Ground
Number: 8
Rating: 36 V at 100 mA
Isolation: 1.5 kV (min)

Analog Outputs (Optional): Table D

Type: 4-20 mA (2-wire)
Number: 1 or 2
Accuracy: Better than 0.75% of FSD

Communications: Table F

Standard: RS232C
Protocol: MODBUS-RTU
Baud Rates: 300-19,200 Baud

Model Code

8630B	1	1	0	0	0	0
Basic Model Number	Table A	Table B	Table C	Table D	Table E	Table F

Table A
Power Source

Code	Input Power Options
1	24 VDC (18-36)
5	12 VDC (9-18)

Table B
Relays

Code	Relay Options
1	4 DC Relays
3	4 DC Relays + 8 Aux. Outputs

Table C
Extended Board

Code	Extended Input Options
0	Extended Board not Fitted
1	16TC Inputs
2	8 (4-20mA) Inputs
3	16TC Inputs + 8 (4-20mA) Inputs
4	8TC Inputs
5	16 (4-20mA) Inputs
6	8TC + 16 (4-20mA) Inputs

Table D
Analog Output

Code	PID Options
0	PID Board not Fitted
1	Qty. 1 - PID for Grounded Load
2	Qty. 2 - PID for Grounded Load

Note: Extended Input Board must be Fitted for use with PID Options 1 & 2

Table E
LCD

Code	LCD Options
0	without Backlight
1	with Backlight

Table F
Communications

Code	Options
0	HawkWin
1	HawkWin + Data Out
2	HawkWin + MODBUS

Basic Unit

3. INSTALLATION

This chapter covers only the physical installation of the Hawk-I. The Hawk-I digital controller must be programmed with a set of user-selected functions before it can be put into service. The user first creates a customized program for the Hawk-I with AMOT's HawkWin software, which is installed in an IBM-type host computer. Then the customized program is downloaded from the PC into the Hawk-I. Once the Hawk-I is in service, the program can be updated using the built-in keypad.

For further information about programming your Hawk-I with HawkWin software, please consult AMOT's HawkWin Programming Manual.

3.1 Installation Overview

The Hawk-I is often installed in a conventional equipment cabinet of the enclosed type that can be used to hold a variety of electronic and pneumatic control equipment. Mounting brackets are provided to hold the unit in place. The environmental limitations listed on the Specifications Sheet should be observed. The Hawk-I is designed to be non-incendive for hazardous atmospheres, but retaining the non-incendive characteristics of the equipment depends critically on proper installation, good wiring practices, and the use of certified (or listed) end devices.

3.2 Recommended Environment

The Hawk-I is designed for continuous use (100% duty cycle) in an ambient temperature ranging from 0° F to 150° F (-18° C to 65° C) with a humidity of 5% to 95% (non-condensing). Site vibration must not exceed 10G at 100 Hz.

3.3 Mechanical Installation

The Hawk-I enclosure requires a ½ DIN cutout of 3.7 ± 0.1" by 7.3 ± 0.1", as dimensioned in Fig. 3-1.

To install the unit in a panel:

1. Insert the Hawk-I unit from the front of the panel.
2. Slide the two mounting brackets into the grooves along the sides of the enclosure.
3. Install the two socket-head screws into the grooves to clamp the unit in place. Note that to avoid stripping the threads, the screws must not be overtightened.
4. See Figs. 3-1 and 3-2 (AMOT Drawing No. 68630B-SD) and the following text for wiring connections.

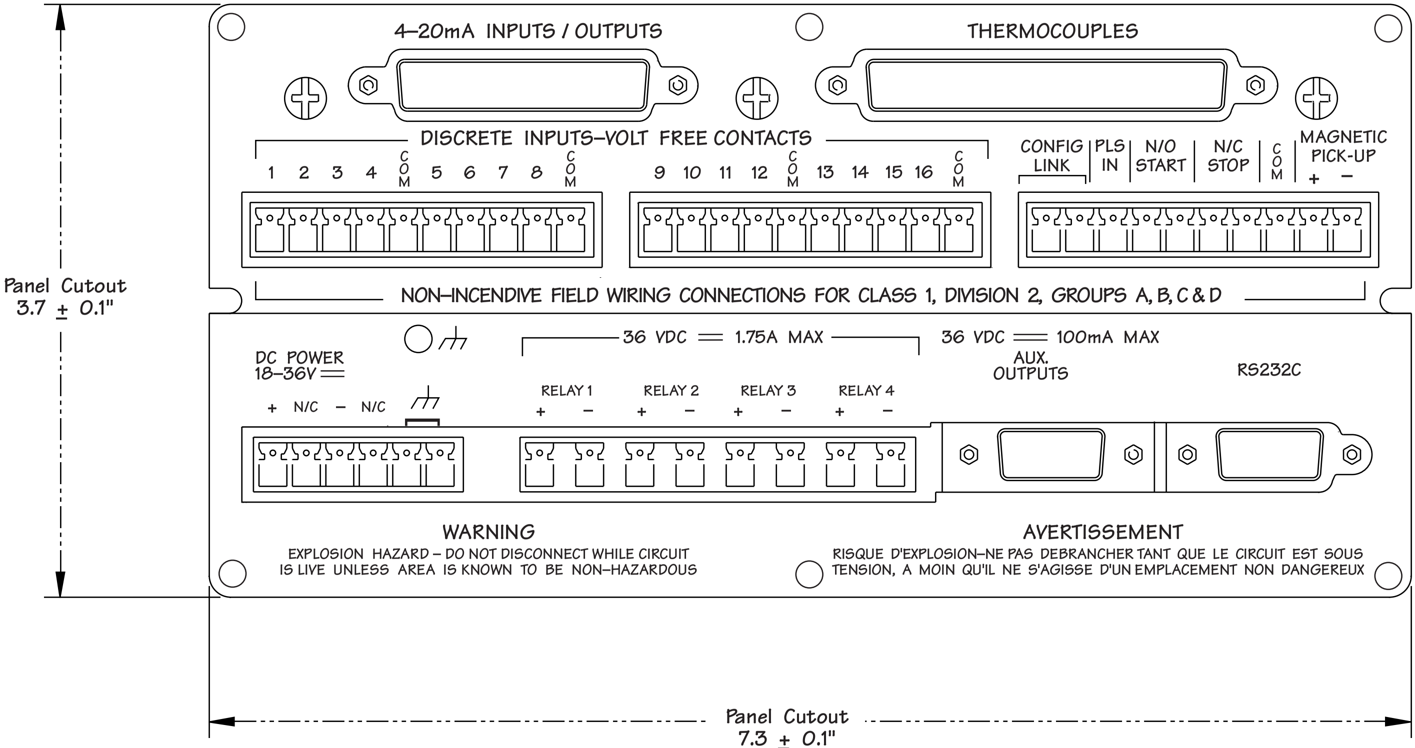


Figure 3-1. Back view of the HAWK-I, showing connection points and panel cutout dimensions for mounting.

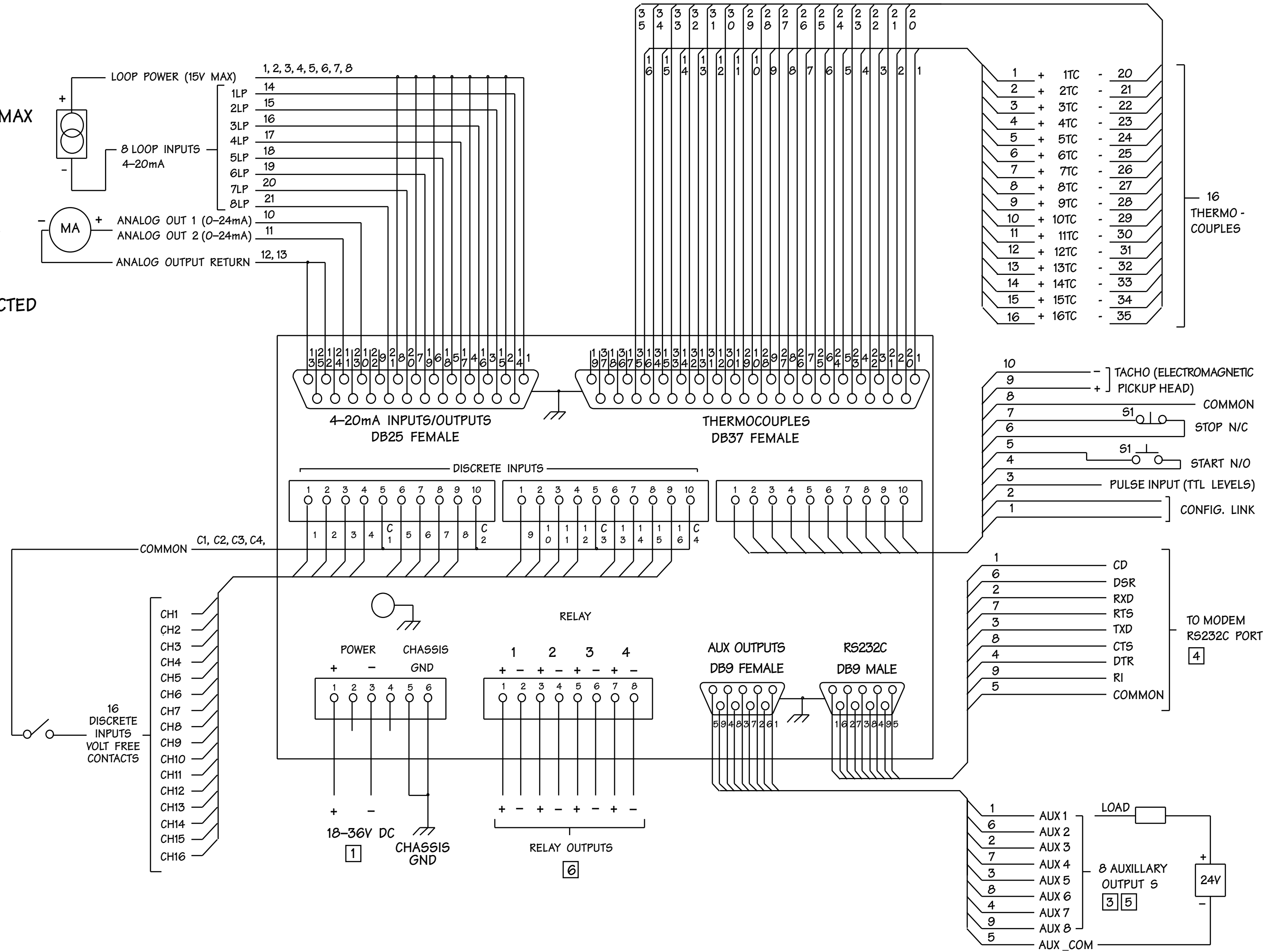
THIRD ANGLE PROJECTION

DWG NO. **68630B–SD** SHEET 1 OF 2

NOTES: UNLESS OTHERWISE SPECIFIED

1. DC INPUT POWER: 36V 500mA MAX (18V 800mA MAX 12V INPUT)
2. SOLID STATE RELAY OUTPUTS RATED 5–36V 1.75A MAX
3. AUXILLARY OUTPUTS– 36V 100mA MAX
4. NULL–MODEM TYPE CONNECTION REQUIRED FOR INTERFACE TO A COMPUTER
5. PIN 5 OF AUXILLARY OUTPUT CONNECTOR MUST BE CONNECTED TO AUX POWER GROUND
6. SNUBBER DIODE REQUIRED FOR INDUCTIVE LOADS
7. UNDOCUMENTED PINS SHOULD REMAIN DISCONNECTED

MODEL NO.	SHEET NO.
8630B_3___	1
8630B_6___	2



REV	REVISION RECORD	DATE	BY
4	REDRAWN/ADDED SHEET 2	09/09/98	DKH

TOLERANCES UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES [MILLIMETERS]
.XX ± ANGLES ±
.XXX ± FRACTIONS ±
.XXXX ±
DO NOT SCALE DRAWING
SURFACE ROUGHNESS
REMOVE ALL BURRS AND SHARP EDGES

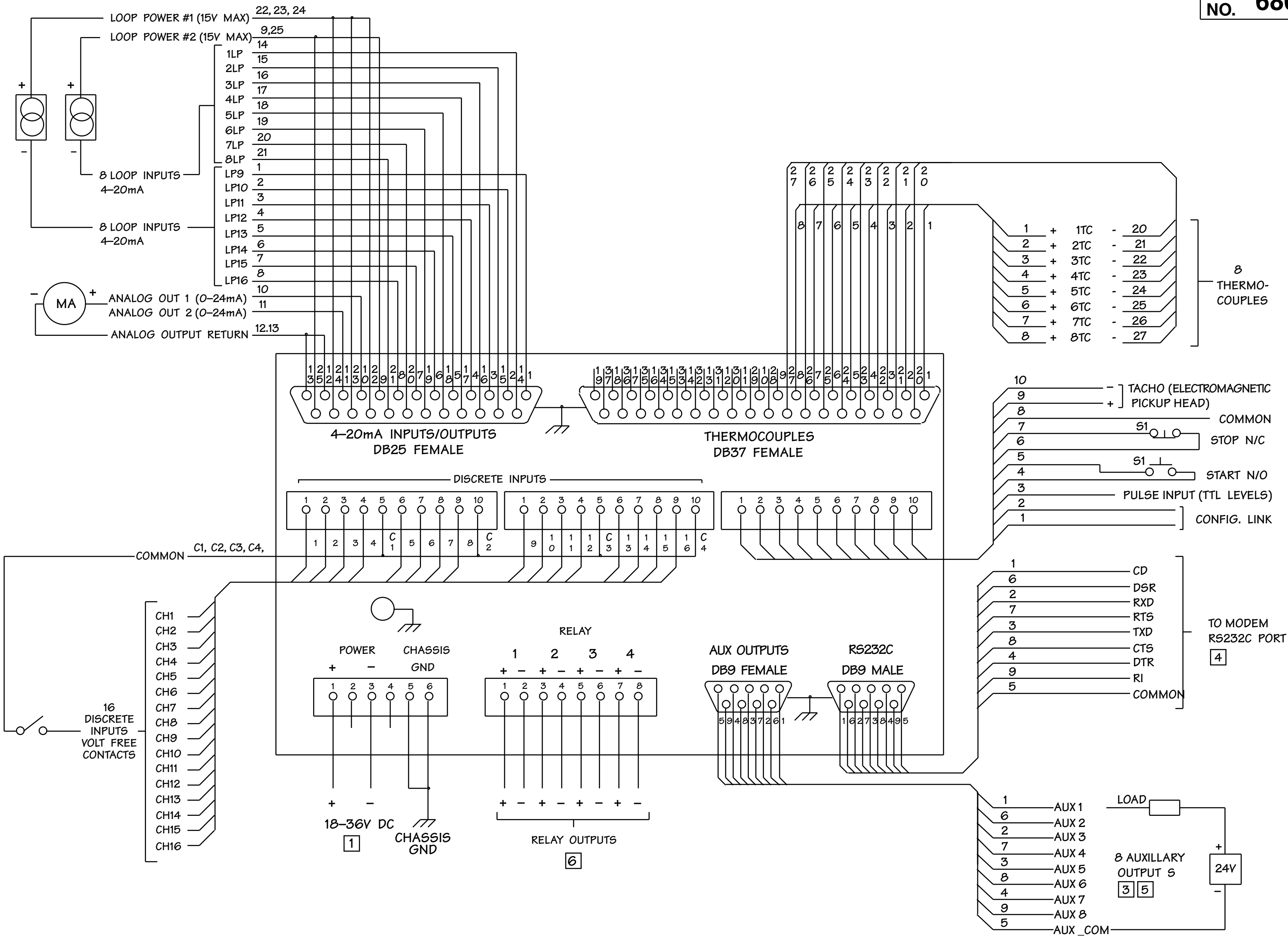
DWG CONTROL USA
DRAWN: EW
CHKD: SCALE:
APPROVAL:
DATE: 2 MAY 97
MODEL 8630B
FILE: 68630BSDS1r4.DWG

MATL:
FINISH:
TITLE:
HAWK - I SYSTEM DIAGRAM
AMOT CONTROLS
SIZE B
DWG NO 68630B - SD
SHEET 1 OF 2
RICHMOND, CA USA – BURY ST. EDMUNDS, SUFFOLK, ENGLAND

Figure 3-2, Sheet 1

THIRD ANGLE PROJECTION

DWG NO. **68630B–SD** SHEET 2 OF 2



				TOLERANCES UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES [MILLIMETERS]
				.XX ± ANGLES ±
				.XXX ± FRACTIONS ±
				.XXXX ±
				DO NOT SCALE DRAWING
4	REDRAWN/ADDED SHEET 2	09/09/98	DKH	SURFACE ROUGHNESS
REV	REVISION RECORD	DATE	BY	REMOVE ALL BURRS AND SHARP EDGES

DWG CONTROL USA	MATL:
DRAWN: EW	FINISH:
CHKD: SCALE:	TITLE:
APPROVAL:	HAWK - I SYSTEM DIAGRAM
DATE: 2 MAY 97	
MODEL 8630B	AMOT CONTROLS — SIZE B — DWG NO 68630B - SD SHEET 2 OF 2
FILE: 68630BSDS2r4.DWG	RICHMOND, CA USA – BURY ST. EDMUNDS, SUFFOLK, ENGLAND

Figure 3-2, Sheet 2

3.4 Wiring Requirements

The Hawk-I is Class I, Division 2 non-incendive equipment. The wiring to the fault and sensing switches does not require explosion proof conduit and housings. Such wiring cannot be the cause of a fire or an explosion.

The wiring must be kept separate from that of other electrical systems. If the Hawk-I wiring is in the same enclosure as other wiring, keep a minimum of two inches (2 in.) separation from the other wiring, and securely hold the wiring in place by tie wraps or other means. Even though explosion-proof conduit is unnecessary, give the wiring proper mechanical protection. Use wire of good quality and of an insulation type suitable for the environment.

> WARNING
> **POWER AND HAZARDOUS AREA WIRING SHOULD BE INSTALLED ONLY BY QUALIFIED PERSONNEL**

Because of the small currents and voltages used, keep the sensor wiring dry and keep splices to a minimum. If crimp-type wire terminations are installed, use a crimping tool rated for use with the wire size and the lug. Mismatch of a crimping tool to the wire and lug is a major source of poor connections. Inspect each lug for correct compression of the crimp on the cable conductor and the insulation.

Where conduit is used for protection of wiring, position it to avoid the collection of moisture. In junction boxes or sensor enclosures where open terminals are present, drain holes are recommended. The sensitivity of the system to wiring practices is very low, but the value of good wiring cannot be overestimated in the installation of electrical equipment.

3.5 Grounding Requirements

The back of the Hawk-I has 5 circuit ground terminals (see Fig. 3-1) that are labeled COM (common), and 2 equipment ground terminals that are labeled with an earth ground symbol.

There is also a power supply return terminal labeled with a minus (-) sign. These terminals are not interchangeable, and if they are improperly connected, the Hawk-I may not function properly.

There are three basic purposes for a ground or common terminal. The first purpose is to ensure safety for operating personnel by providing electrical equipment with a direct connection or short circuit to the earth. The second purpose is to provide a direct connection to a circuit return point in a signal circuit, and the third purpose is to provide a return circuit for a power supply. These three different types of grounds must not be carelessly connected together, even though they are all referred to as grounds.

For example, on the back of the Hawk-I, the sixteen discrete digital switching inputs have four interconnected circuit return points labeled COM. The circuit returns for the digital inputs can be connected to any of these COM points. The COM terminals are input circuit grounds, and serve to complete the digital switching circuits. They are not power supply grounds or equipment safety grounds, and they must not be connected to the dc power supply or the protective or chassis earth ground connection.

The protective or chassis ground connection should be kept completely separate from the circuit ground. The protective ground is intended to keep the metal chassis of the Hawk-I at the same voltage as its surroundings, thus protecting the user from accidental electrical shock. This requires a separate grounding wire (minimum size 14 AWG) that is not connected to any other grounds. This protective ground wire should be connected to the earth-ground terminal bolt on the Hawk-I's back panel and then bonded to a good earth ground connection point.

The negative ground for the dc power supply connection is a power supply ground, and should be connected to the terminal labeled with a minus (-) sign just below the word POWER on the back panel.

If shielded cable is used to run input wires to the Hawk-I, the shields of the cables should be connected to the protective ground, not COM. Note also that cable shields should be grounded only at the Hawk-I and nowhere else. If a cable shield is grounded at more than one point, "ground loop" currents may flow through the shield, making it useless. Under normal conditions, shielded cable is recommended for the RS232C, thermocouple, and analog loop connections.

The user should follow these simple guidelines and avoid improper interconnections between circuit ground, protective ground, power supply ground, and cable shield ground. Many hard-to-diagnose equipment problems, including intermittent problems caused by transient electrical interference, can be prevented by careful and effective grounding.

If your installation has unusually high levels of electrical interference, special grounding arrangements may be required. Consult your AMOT service representative for further details.

3.6 Digital Inputs

The Hawk-I is provided with 16 discrete digital inputs. The exact configuration of these inputs is determined by the individual user's needs and the resulting HawkWin program. These digital switching inputs have volt-free contacts and the circuits are non-incendive. Any kind of volt-free, on-off sensor or sensing switch can be used with these digital inputs without the risk of igniting an explosive atmosphere under normal operating conditions.

3.6.1 Selecting Fault Sensing Switches

AMOT Controls manufactures many types of switches suitable for use with the Hawk-I. Various types of switches are actuated at preset values of pressure, temperature, vibration, etc.

The sensors selected should be of a type suitable for their mounting location. For example, if sensors are skid-mounted on an outdoor installation, they should be of NEMA 4 construction as a minimum requirement.

3.6.2 Dry Contacts

The Hawk-I accepts any type of dry contact switch as an input. The term "dry contact" means that during normal operation, the contacts are completely isolated from other electrical systems. Solid state relays and transistor outputs are not necessarily dry contacts unless specifically approved for use in hazardous area locations. For more information, refer to the relevant National Standard for non-incendive requirements.

The Hawk-I accepts the outputs of some active sensors such as smoke detectors and pyrometers as sensor inputs. The only requirement is that the device must have a dry contact output.

3.6.3 Sealed and Precious Metal Contacts

While environmentally or hermetically sealed switch contacts are desirable as inputs, they are not the only choice. The advantage of sealed contacts is that they cannot be corroded by the environment in which the equipment is installed. Another common method of reducing contact corrosion is the use of precious metal (e.g., gold) plating on the contact surface. This plating is less susceptible to corrosion than standard metals. AMOT can provide a full range of sensors.

3.6.4 Normally Open and Normally Closed

The digital fault sensors used by the Hawk-I can be of two forms, normally open (NO) or normally closed (NC). The two types of sensors are named according to their non-activated or healthy input state, which can be either NO or NC.

Normally open sensors close to register a fault. A NO sensor can be disabled if a wire is disconnected or broken, and the operator will not know that the circuit has failed until that switch is tested for correct operation. An NO sensor should be used only in non-safety applications or when the risk of physical damage to wiring is low.

Normally closed sensors (NC) require a closed loop to each fault sensing switch. They have the advantage of fail-safe operation. If a wire or sensor is broken or disconnected, the Hawk-I will show that the circuit is tripped, or in an open state.

Each of the 16 inputs of the Hawk-I can be individually configured for a normally open or normally closed digital sensor. This feature allows the use of both normally open and normally closed sensors in the same system.

3.6.5 Using Relay Contacts As Sensor Switches

There are two methods of using electromechanical relay contacts as fault sensors without invalidating the non-incendive rating of the Hawk-I. The first method permits the use of any standard relay, regardless of its design. In this case, a barrier must be placed between the relay contacts and the input wiring of the Hawk-I. The barrier must be mounted in a safe area or an explosion proof box, depending on the mounting location.

The second method requires a relay specifically designed to connect between incendive and non-incendive circuits. If this relay is mounted in a safe area or an explosion proof housing, no further precautions are necessary.

The wiring for a non-incendive system must be kept separate from the wiring of other electrical systems if the non-incendive status is to be maintained. If the non-incendive wiring is in the same enclosure with other wiring, it must be kept at least 2 inches from the other wiring. It should also be secured in place by cable ties or other appropriate means. The local non-incendive wiring code should always be followed.

Because of the small currents and voltages used in non-incendive circuits, wire splices and their associated problems must be kept to a minimum.

3.6.6 Connecting The Digital Inputs

See Fig. 3-2, Hawk-I System Diagram, which shows all the inputs for the Hawk-I. The discrete digital inputs are connected to the Hawk-I through two 10-pin, plug-in, screw terminal, male-type “Phoenix plug” connectors with a 5.08 mm pitch.

Shielding is usually not necessary for the digital inputs. These inputs are of low impedance and are not normally vulnerable to electrical interference.

Each digital input needs to have its own ground return, so for every digital input, two wires must be provided. For example, Digital Input 1 would have one side connected to Terminal 1 of the Phoenix connector. The other side is connected to the COM terminal next to Terminal 4. Up to 16 digital inputs may be connected to the Hawk-I.

3.7 The Thermocouple Inputs

The Hawk-I can be provided with optional thermocouple inputs of either the J or K type. Type J has a continuous range up to 850°C, and Type K goes up to 1100°C. The Hawk-I can monitor thermocouples as single devices, or it can be programmed to average a number of thermocouple temperatures and then respond to deviations from the average temperature.

Thermocouples are commonly installed, for example, on each cylinder of a large internal combustion engine. If any one cylinder gets significantly hotter than the others, the Hawk-I can trigger an alarm or a shutdown.

Selecting Fahrenheit or Centigrade is a simple point-and-click operation with AMOT's HawkWin software. The thermocouple type must also be selected. Type J and K thermocouples can be mixed and matched in any configuration that the user wants. The Hawk-I requires isolated (not grounded) thermocouples.

3.7.1 Connecting the Thermocouple Inputs

The thermocouple inputs are connected to the Hawk-I through a standard, 37-pin, female "D" type connector. When connecting a thermocouple to the Hawk-I, the (-) arm always runs to a connector pin that is numbered 20 or higher; the lower-numbered pins are reserved for the positive legs. For example, Thermocouple 1 should have its positive leg connected to Pin 1, and its negative leg connected to Pin 20. Refer to Fig. 3-2, AMOT Drawing No 68630B-SD, for connection details.

If the user prefers to have screw terminals available for field wiring, AMOT can provide interface boards to plug into the D-type connectors (see Fig. 3-1). The terminal strips on these modules provide a fast and easy way to connect input wires. Shielded cable must be used between the Hawk-I and the interface module.

Pins 17, 18, 19, 36, and 37 (see Fig. 3-2) should not be connected to any of the thermocouples. If shielded wire is used, terminate shields to the case of the Hawk-I or the ground termination of the interface module.

If both J and K type thermocouples are required, it is best to organize the connections in 2 blocks of 8 (1-8 and 9-16) where the majority of sensors within each group is of the same type. For example, if 7 J-type and 8 K-type sensors are used, put all the J-type sensors in one group and the K-type sensors in another. This practice greatly simplifies the calibration process as discussed later in this manual.

3.8 The 4-20 mA Sensor Inputs

The Hawk-I can be provided with optional analog inputs of the 4-20 mA 2-wire type. This is a popular configuration for industrial sensors of many different kinds. The sensor input, which may be temperature, pressure, flow, etc., is converted by a sensor circuit into an output current that varies between 4 mA and 20 mA. Any voltage drop in the connector wires becomes unimportant, since only the loop current is measured. The data transmission path is low impedance and relatively immune to noise pickup. The sensor circuitry is conveniently powered through the same two wires that carry the output signal. There is no chance of confusing a zero data reading with a broken wire, because at least 4 mA of current must always flow through the sensor. A load resistor network inside the Hawk-I converts the sensor output current into a precise voltage reading. The calibration of the circuit is programmed by the user with AMOT's HawkWin program.

A wide variety of popular 4-20 mA sensors are approved as non-incendive when connected to the Hawk-I. Your AMOT representative can provide further information concerning the sensors, transducers, and transmitters that are available for use with the Hawk-I's 4-20 mA inputs.

Once the Hawk-I has received its initial programming from the HawkWin software, the 4-20 mA inputs can be reconfigured as necessary from the Hawk-I's own key pad.

3.8.1 Connecting the 4-20 mA Sensor Inputs

The 4-20 mA sensors are two-terminal, polarity-sensitive devices. The positive or (+) terminals must be connected to the positive terminals of the 25-way D-type connector on the back of the Hawk-I. Likewise, the negative or (-) terminals must be connected to the negative terminals of the 25-way D-type connector on the back of the Hawk-I. Polarity is important because the internal circuitry of the sensors is powered by a +15 VDC power supply inside the Hawk-I. Please refer to Fig. 3-2 (Sheets 1 & 2) for the correct connection diagram.

Note: The 8-loop board is wired differently than the 16-loop board. Make sure that you refer to the correct wiring diagram for the version you have. For all Hawk-I's with an Extended Board model code of 1, 2, or 3, refer to Sheet 1 of Fig. 3-2. For all Hawk-I's with an Extended Board model code of 4, 5, or 6, refer to Sheet 2 of Fig. 3-2.

The 4-20 mA sensors will be operational only after their output settings are programmed by the HawkWin computer program. Alarm and shutdown points can also be specified with just a few key strokes.

25-way interface modules are also available for these connections. Shielded cable must be used between the Hawk-I and the breakout module.

3.9 The Tachometer Input

The tachometer is a standard feature. It is connected to the Hawk-I through a (10)-pin Phoenix connector that also handles several other inputs. The tachometer signal is generated by a magnetic device that acts as a gear-tooth counter. It is positioned close to a steel gear on the rotating machinery whose RPM is to be monitored. The number of gear teeth that pass the tachometer for each revolution of the machinery must be programmed into the Hawk-I. If, for example, the crankshaft of a gas engine has a gear with 208 teeth on it, then a tachometer mounted close to this gear will send 208 pulses per revolution of the engine. Once this information is entered into the Hawk-I, it handles the RPM calculation automatically.

3.9.1 Connecting the Tachometer Input

The tachometer wiring has (+) and (-) terminals. The magnetic pickup gap should be set in the range of 0.025” to 0.050” for best results.

The tachometer will not function until it is calibrated with the HawkWin program.

3.10 The Start and Stop Inputs

The normally-open (N/O) Remote Start and normally-closed (N/C) Remote Stop inputs are controlled by switches or push buttons that are connected to the Hawk-I by 2-conductor wires. The switch or push button contacts are non-incendive. These switches duplicate the start and stop buttons on the Hawk-I keypad, allowing remote operation or lock-out capability. The functions of the Start and Stop keys are completely programmable with the HawkWin computer program.

Until the Start and Stop keys are programmed with HawkWin, they have no pre-defined function.

3.10.1 Connecting the Start and Stop Inputs

The Remote Start and Remote Stop inputs are connected to the Hawk-I through the same 10-pin Phoenix connector that handles the tachometer input. **If these switches are not used, the Remote Stop inputs must be shorted for normal operation.** Connections may be made with any convenient kind of two-conductor wire, preferably 18 AWG or larger. These connections are non-incendive, so sealed switches are not required.

3.11 The Power Supply

The Hawk-I should be powered by a source of either nominal 24 Vdc or 12 Vdc at a minimum of 500 mA (see name plate on top of unit). Peak-to-peak (P-P) ripple should not exceed 1 V.

3.11.1 Connecting the Power Supply

The power supply wiring must meet all local regulations and should be at least 16 AWG or better. All power supply wiring must have insulation with a breakdown rating of at least 600 V, and be recognized, listed, or approved by a third party agency (UL, CSA, etc.). The insulation must be rated for at least 75° C above the surrounding ambient temperature.

The dc power is connected to the Hawk-I through an 6-pin Phoenix connector. Proper polarity must be observed.

AMOT recommends that a 1A, 24Vdc circuit breaker or power isolation switch be mounted close to the Hawk-I unit. This breaker will serve to remove power from the unit for servicing purposes. This circuit breaker is a high-energy device, and must conform to any safety requirements that are in force where it is located.

3.12 The RS232C Communications Port

The Hawk-I's RS232C connection is an input-output port that allows the Hawk-I to communicate with other equipment. When the CONFIG LINK contacts on the back of the Hawk-I are shorted, the Hawk-I goes into configuration mode. Then the RS232C input will act as a program loader to accept programming inputted from the HawkWin configuration program.

When the CONFIG LINK contacts are opened, the Hawk-I goes into its operational mode. Now the RS232C connection is not a program loader. Instead, it provides an optional input-output Modbus/RTU connection that supports remote monitoring and operation of the Hawk-I. Alternatively, the RS232 port may be connected to a printer.

Through the RS232C serial data port, all data available to the Hawk-I can be reported to a remote control center via the MODBUS for data logging, trending, and analysis. Faults and output relay operations can be reported through this data port,, including channel alarms, error messages, shutdowns, and power failures. A remote operator can monitor all data channels by a read-only operation that does not interfere with local use and control of the Hawk-I.

3.12.1 Connecting the RS232C Port for Programming

This input is connected by plugging the appropriate cable into the RS232C socket. For configuration and programming, a suitable cable will be connected to the HawkWin's host computer, or to a portable notebook computer that may be used to transfer the programming. During day-to-day operation, the Hawk-I is connected to a cable that runs to other monitoring and control equipment.

A null-Modem type connection is required for the programming connection. The Hawk-I port is configured as DTE for direct connection to a modem.

3.12.2 Connecting the RS232C Port for Monitoring

The Hawk-I's optional communications module uses the RS232C to transmit and receive information and commands from other monitoring and control equipment. This is a convenient way to use the Hawk-I's powerful and economical monitoring and control capabilities as an integrated part of a larger system.

All data collected by the Hawk-I can be transmitted to a remote control center for logging, trending, and analysis. Faults and output relay operations are also reported, including channel alarms and shutdowns, error messages, and power failures.

The Hawk-I can transmit channel profiles and setpoint data immediately upon request, giving a remote operator the ability to check the entire configuration of the Hawk-I. Data can be remotely accessed at any time via Modbus, and this does not interfere with the local operation. Both local and remote operators can monitor channels, acknowledge alarms, and start or stop the Hawk-I. However, only a local operator can change the Hawk-I's configuration or put the Hawk-I in test mode. All actions taken by a remote operator are immediately available to the control center.

The Hawk-I's internal communications module uses Modbus/RTU, which is a high-level, widely-supported communications protocol. The half-duplex, query/response program structure enables one remote master to query and control many slaves. Modem and radio link capability enable the Hawk-I to communicate over extremely long distances.

A number of software packages that support Modbus/RTU are now available, such as The Fix by Intellution, Heuristics by ONSPET and TOPDOC by Teledenken. These programs run on a variety of computer systems. Contact your AMOT representative for additional information concerning programs that can be used to interface other equipment with the Hawk-I.

3.13 The Configuration Link Input

The configuration link input is used to prepare the Hawk-I to receive its configuration programming from the HawkWin software, allowing local configuration and access to the diagnostics features. After the two configuration link contacts are connected, the Hawk-I is ready to accept programming. These two contacts may be shorted by running a wire jumper between the appropriate terminals on a plugged-in Phoenix connector. A small SPST toggle switch may also be used. A series of menus (discussed later in this document) allow local configuration and test.

3.13.1 Connecting the Configuration Link Input

This is done by shorting the two configuration link terminals. It may be useful to put a red tag on the jumper wire or toggle switch to remind the technician to open the link after programming is completed. The Hawk-I will not process its sequence instructions with the configuration link closed.

3.14 The Pulse Input

This input is not used in the current Hawk-I configuration.

3.14.1 Connecting the Pulse Input

No connection of any kind should be made to this input.

3.15 The Standard Relay Outputs

The basic Hawk-I system is equipped with 4 internal solid-state relays (Relays 1-4) that can control 5-36 Vdc with a maximum continuous current of 1.75 A each. These relays can be used for various control, alarm, and shutdown functions as programmed by the user. The relay outputs act as switches that are powered by auxiliary equipment, and as such are classed as incendive. Appropriate precautions should be taken if a hazardous atmosphere is present. These internal relays achieve a circuit isolation of 4 kV using optical isolation technology. Outboard snubbers are required for inductive loads.

3.15.1 Connecting the Standard Relay Outputs

The relay outputs are connected to external circuits through individual, two-terminal, Phoenix connectors, which can accept wire sizes as large as 12 AWG. Polarity must be observed on the DC connections.

3.16 The Optional Digital Outputs

The Hawk-I can be equipped with 8 optional, low-power, solid-state relays to control external relays or low-power circuits. They are capable of switching 36 Vdc at 100 mA. These outputs are potentially incendive, so appropriate wiring and relay housings must be provided for operation in hazardous atmospheres.

3.16.1 Connecting the Optional Digital Outputs

The optional outputs are connected through a 9-pin, D-type connector on the back of the Hawk-I. The pin numbers are shown in the Hawk-I System Diagram (see Fig. 3-2). All relay contacts are connected to a single negative (-) signal return wire. An interface module can be provided if the user requires screw terminal output connections.

3.17 The 4-20 mA Analog Outputs

The Hawk-I can be equipped with 1 or 2 optional 4-20 mA analog outputs. These analog outputs can transmit calibrated sensor data from the Hawk-I to other equipment. The accuracy of these outputs is better than 0.75% of FSD. These outputs are programmable from the HawkWin program and can provide PID-type control functions.

3.17.1 Connecting the 4-20 mA Analog Outputs

The signals from analog outputs 1 and 2 are transmitted through Pins 10 and 11 of the 25-pin, D-type socket on the Hawk-I (see Fig. 3-2). The signal return connections for these outputs are Pins 12 and 13 of the same 25-pin connector.

4. TEST AND OPERATION

After the necessary wiring has been completed and the Hawk-I is connected to all of the required inputs and outputs, the following procedures should be followed to check out the Hawk-I's installation.

WARNING: ALL WIRING SHOULD BE INSTALLED IN ACCORDANCE WITH LOCAL ELECTRICAL CODES

4.1 Pre-Operation Test Procedure

1. The wiring is complete and checked out to ensure the required continuity and freedom from inadvertent grounds.
2. The programming configuration is complete and checked for all channels, parameters, and options.
3. **ALL PERSONNEL ARE CLEAR OF ANY OPERATIONAL HAZARDS, ROTATING MACHINERY, WIRING, ETC.**
4. Apply power to the Hawk-I while watching its LCD. If the display remains blank, immediately remove power and check the wiring, especially the power wiring. During the power-up sequence, the Hawk-I should display:

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Amot Controls
   Hawk-I
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5. When power is on with the Hawk-I, the LCD should display a message. It should not be totally blank. The exact contents of the display are dependent on the user program and the status of the configuration link.
6. Check that each fault sensor operates correctly. Normally-open sensors can be closed with a wire jumper, and normally closed sensors can be opened by removing a wire from the appropriate terminal.
   The checkout is best performed one channel at a time. After each channel has been checked, the Hawk-I can be set to scan through all of the input channels to verify their function.
   If possible, each channel should be checked by exercising the actual fault switch that is being used. This will identify wiring problems that prevent a normally-closed circuit from opening when the circuit's sensor is activated. If it is difficult to exercise the actual sensor, the wiring can be opened and closed at the sensor itself to simulate sensor action.
7. Each start disable function should be individually checked by opening or shorting the wiring at the individual sensor.
8. All alarm horns and annunciators should be checked for proper function. All safety and emergency functions should be checked with great care.

WARNING

THE FRONT PANEL KEYS OF THE HAWK-I LABELED "START" AND "STOP" WILL HAVE NO FUNCTION UNLESS THEY ARE SPECIFICALLY PROGRAMMED USING HAWKWIN

4.2 Initial Check of Hawk-I Operation

The programmer who used HawkWin to setup the Hawk-I should provide a detailed operating procedure, possibly including a step-by-step checklist. After checking the Hawk-I's installation as described in Section 4.1 above, actual operation of the system can be verified.

The operation of the unit depends entirely on the programming sequence that is downloaded from the HawkWin software. A detailed review of the programming procedures for the Hawk-I is beyond the scope of this manual. Please refer to the Hawk-I Programming Manual, which is available from your AMOT representative.

WARNING

IF A VALID SEQUENCE IS NOT PRESENT IN THE HAWK-I AND THE UNIT GOES INTO RUN MODE:

IT WILL DE-ENERGIZE ALL RELAY OUTPUTS

IT WILL SET ALL ANALOG OUTPUTS TO 4 mA

THE SCREEN WILL DISPLAY THE MESSAGE "NO SEQUENCE"

4.2.1 Configure Mode and Run Mode

The Hawk-I must be in Run mode to be tested. Test personnel should ensure that the CONFIG LINK connections on the back of the Hawk-I are not shorted. When the CONFIG LINK connections are shorted, the Hawk-I will go into its Configure mode, and will be ready to download new sequence and analog diagrams from the HawkWin program. The unit must also be in the Configure mode to edit parameters such as analog set points and user display messages. However, if the programmer has inadvertently left the Hawk-I in Configure mode, functional testing cannot be carried out.

4.3 Troubleshooting the Installation

The Hawk-I's operation depends on the input sensors that are connected to the unit through wires and plug-in connectors. A wide variety of malfunctions can be caused by external wiring errors.

4.3.1 LED Status Indicator

The Hawk-I is equipped with a green status LED (lamp) that is visible in the opening between the power connector and the connector for relay output #1. This LED indicates three conditions:

OFF: No power to the Hawk-I, or complete failure of the system.

ON: Internal software functioning properly.

FLASHING: Off for a short period once every second. This indicates software failure or microprocessor failure.

The status indicator is helpful when trying to try and narrow down the cause of problems. It provides a quick way to check the condition of the fuse and power supply without opening the enclosure. It also helps to distinguish between a software failure and power related problems. During normal operation, the LED will always be illuminated.

4.4 Hawk-I Does Not Operate

NO POWER: Check status of dc power supply. Power must be supplied to the proper connections on the Hawk-I with correct dc polarity and voltage. The external circuit breaker must be ON. If the Hawk-I's LCD shows nothing at all and the backlight is not illuminated, the unit may not be receiving power.

FUSE BLOWN: The Hawk-I's internal protective fuse may be blown. In this case, it must be replaced. Check all wiring connections before reapplying power. See Section 5.1.3 for fuse replacement details. Replace only with a fuse of the same voltage and current ratings.

4.5 Digital Input Channel Does Not Function

This is probably caused by a problem in the external wiring. If most of the digital input channels function as programmed, then the problem is probably not in the Hawk-I. Use View Mode, or Configure Mode, to display all 16 digital input channels.

SUBSTITUTION TECHNIQUE: The technician will find it convenient to prepare a SPST switch with two wires attached. By substituting this switch for the two input wires of a digital channel, the function of that particular channel can be verified.

If the channel in question still does not function properly, then the programming of the Hawk-I should be checked. But if the Hawk-I responds correctly when the SPST switch is used to control the digital input channel in question, then the problem must be either in the wiring to the digital sensor for that input channel, or in the sensor itself.

The next step is to replace the sensor with a SPST switch and then check channel function. If the channel functions properly, then the problem is with the sensor. But if the channel still malfunctions, then the problem is with the wiring.

The technician will find that the most useful tool for finding wiring defects will be an ohmmeter. The digital contacts are volt-free, and the wiring that controls them is either shorted or open. If the technician uses a "buzzer" or some other ac signal source to "ring out" the wiring, care should be taken not to route such test signals into the Hawk-I.

4.5.1 Common Wiring Problems

BROKEN WIRE: This will cause the channel to be always open. Wires can be broken underneath the insulation, making the breakage invisible. An ohmmeter check will confirm this kind of problem.

BAD SPLICE OR CRIMP: Often a crimping connector is accidentally applied over unstripped wire. In this case, a new connector must be used to repair the splice. If solder connections are used, they may also be defective. A solder joint may look perfect but still be bad. If a continuity problem is found, all solder connections should be reflowed using new solder.

CONNECTOR PROBLEMS: The technician should separate all connectors in the circuit and look for broken parts, dirt and dust, or foreign material. Blow out the female connectors with compressed air. Check the wiring connections, either soldered or screw terminal, for breaks and unstripped wire. Wires are highly stressed at connectors, and breaks at connection points are quite common. The technician may decide to cut off a few inches of the cable in question and restrip all the wires. This will get rid of localized breaks that may be concealed by the insulation of the individual conductors.

SENSOR PROBLEMS: If the sensor has both normally open (NO) and normally closed (NC) contacts available, the wrong contacts may be wired. This difficulty can be easily fixed by changing the Hawk-I's program, or the technician may decide to switch the wiring at the sensor itself. The NO or NC status of a sensor's output can be checked with an ohmmeter. Be particularly suspicious of any riveted solder lugs on the sensor to which connections must be made. Rivets frequently come loose and cause continuity problems.

In industrial situations, mechanical failure seems to occur more frequently than electronic failure. The moving parts of any sensor should be examined carefully for freedom of movement and broken or jammed linkages. Linear, back-and-forth movements such as those used in limit switches seem to develop more problems than rotary movements.

All moving arms and levers associated with sensors should be examined for freedom of movement as well as the buildup of rust or other deposits. All springs used to control such linkages must be checked for weakness or breakage. Note that if a spring has broken, the pieces of the spring may have fallen off the linkage, so the absence of an essential spring may not be immediately obvious.

Another kind of mechanical problem is the clogging of a small pipe or tube that transmits pressure to a pressure sensor. All such tubes should have blow-off valves so they can be easily checked for clogging. If a sensor does not receive an accurate input, it cannot function properly.

Any sensor that appears to be corroded or damaged in any way should be replaced immediately. The installation of the Hawk-I provides a good opportunity for updating and modernizing sensors. Your AMOT representative can provide a wide selection of high-quality industrial sensors.

4.5.2 Intermittent Wiring Problems

If an input channel malfunctions only part of the time, this could also be a wiring problem. Some possible causes of intermittent wiring problems are:

POOR CONNECTOR CONTACT: The connector for the channel in question may not be making good mechanical contact. This problem may surface only when heat, vibration, or mechanical stress are applied. The technician may test for such a problem by wiggling the connector or pulling on it. If this causes the problem to occur, the solution is to replace the connector.

BROKEN WIRES: The broken ends of a wire may stay in contact part of the time, and lose continuity only intermittently. Moving the wire around and pulling on it may help to confirm this problem. Note that a digital ohmmeter may be too slow in its response to show any change if the loss of contact is momentary. The technician should check along the entire length of the wiring in question for signs of stress such as a dented conduit or a damaged cable shield or covering. In severe cases, the entire wiring run may have to be replaced.

DAMAGED INSULATION: If insulation has been damaged, this may permit intermittent contact between different conductors of a cable, or between a conductor and the external shielding or conduit. In such cases, the damaged section of wire must be replaced. There may be damage in more than one location, so the safest procedure is to replace the entire run of cable.

4.5.3 Swapping Channels

Your Hawk-I unit was carefully checked before it was shipped. Even so, there is a possibility that one of the digital input channels may be defective. If wiring checks have not isolated the problem in a particular digital input channel, then the programmer can reprogram the function of that channel to another digital input, if an unused input is available.

If this procedure restores function, then the Hawk-I can be put back in service at once without waiting for repairs, and considerable time can be saved.

4.6 Electromagnetic Interference (EMI)

Electromagnetic interference (EMI) can be described as an accidental and undesirable form of radio broadcasting. The high-powered equipment commonly found in industrial environments will frequently produce strong magnetic, electrostatic, or electromagnetic fields. These fields will then create undesirable voltages in nearby equipment.

To prevent these undesirable voltages, equipment designers can use shielding, which is simply a method of screening out the strong ambient fields. However, shielding is not as simple as it might appear. A shield that will block radio-type or electromagnetic waves will not have the slightest effect on a strong magnetic field from a nearby motor-generator set. The following information will provide the technician with some helpful guidelines for operation in environments with strong EMI.

4.6.1 Symptoms of EMI

The Hawk-I is housed in a metal case that is designed to keep out EMI. However, if EMI gets into the external wiring of the Hawk-I, it can penetrate the case and possibly cause problems.

What effect can powerful EMI signals have on the Hawk-I? The Hawk-I's digital circuitry can be upset or even damaged by high levels of EMI.

The result could be intermittent problems such as unintended system reset or loss of memory that might be associated with the operation of nearby, high-powered electrical equipment such as welders, motor controllers, and radio transmitters.

4.6.2 Grounding

Proper grounding is imperative to maintain the Hawk-I's electrical safety and immunity to EMI. Grounding requirements are discussed in Section 3.5 of this manual, and should be carefully followed. Special care should be taken with the so-called earth ground.

The purpose of the earth ground is to maintain the chassis of the Hawk-I at the same potential as the earth itself and provide a low impedance path for RF noise away from the Hawk-I. This is usually done by connecting the earth ground to a water or other metal pipe that has extensive contact with the earth. A copper pipe is the best. Iron or steel pipes are not as good.

4.6.3 Ground Loops

If a large current of any kind flows through a grounding wire, the finite resistance of the wire will cause a voltage difference between the ground point and the far end of the wire. Any equipment "grounded" by that wire will thus be raised above ground by the induced voltage, and the "ground" will be of inferior quality.

The same effect can occur when the shielding of a cable is "grounded" at several different points. The shield can then be driven above ground potential by the large circulating currents. In such a case, the shielding loses its effectiveness. It is clear that the technician must try to keep accidental "ground loop" currents out of the Hawk-I's wiring.

In difficult situations, the technician may have to try several grounding points before an effective grounding connection is found.

4.7 Before Contacting AMOT

It may be necessary for a customer to contact AMOT about problems with a Hawk-I installation. Before the customer picks up the phone, the following information should be available:

1. When did the problem first appear? Please be ready to give the date and the time of day.

2. What was happening just before the problem occurred? What was the equipment doing, and what was the operator doing? Did the operator observe anything unusual just before the problem occurred? Was there any loud noise or unusual vibration? Was the operator attempting to stop or restart the equipment? Any unusual event may be of interest.

3. Did the technician who is contacting AMOT actually witness the problem in person? This may be very important. Your AMOT representative may ask for information that only an eyewitness can provide.

4. Any unusual environmental situation should also be reported. Was there a nearby lightning strike or a power outage? A power surge? An earthquake that might have damaged wiring? Excessive heat or cold?

5. Is there any printout or other record of equipment status or function at the time that the problem occurred?
6. Has this problem or a similar one ever occurred before? How many times, and on what dates? What was the outcome? How was the situation resolved?
7. Describe the most recent maintenance, repair, or reprogramming that was done on the Hawk-I. When was it performed? And by whom?
8. After the specific problem in question occurred, what steps were taken to correct it?
9. Does the on-site technician have any suggestions or recommendations to make about the problem?

   Giving accurate and complete information to your AMOT representative will help to resolve system problems in a timely and effective fashion.

5. MAINTENANCE AND REPAIR

5.1 Maintenance

The only maintenance required for the Hawk-I other than periodic battery replacement is keeping the faceplate clean. Use a cloth dampened with water to clean the faceplate. Do not use solvents; they could damage the plastic membrane.

WARNING
EXPLOSION HAZARD
DO NOT DISCONNECT EQUIPMENT UNLESS POWER HAS BEEN SWITCHED OFF OR THE AREA IS KNOWN TO BE NON-HAZARDOUS

5.1.1 Cleaning

If the Hawk-I keypad or enclosure requires cleaning, wipe the surfaces with a damp cloth. Do not use solvents or abrasive cleaners on the Hawk-I.

5.1.2 Battery Replacement

WARNING
EXPLOSION HAZARD
BATTERY MUST BE REPLACED ONLY IN AN AREA KNOWN TO BE NON-HAZARDOUS

A small internal battery is used to back up the Hawk-I's active memory. This battery should have a useful life of at least 3 years with the unit unpowered. The drain on the battery is so low that the battery's life will be nearly equal to its shelf life. All parameters for the program are stored in non-volatile memory that does not require battery backup. AMOT recommends that the battery should be replaced every 36 months.

TO REPLACE THE BATTERY:

1. Switch off power to the Hawk-I.
2. Disconnect all wiring from the rear of the Hawk-I.
3. At the sides of the unit, remove the two socket-head screws and slide out the two mounting brackets.
4. Remove the Hawk-I from the mounting panel and take it to a safe area.
5. At the back of the faceplate, remove six screws attaching the bezel. Then remove the bezel.
6. At the front of the faceplate, remove six screws attaching the faceplate to the unit housing.
7. Carefully tilt the faceplate outward to gain access to the cable connectors.
8. Carefully disconnect the cables and remove the faceplate.

9. Note the location of the slots holding the three circuit boards. Counting down from the top of the unit, the boards are installed in slots 3, 7, and 13. To simplify reassembly, you may want to mark the housing at the front ends of these slots with a pencil or marker.
10. Carefully slide out all three circuit boards as a group. Support the boards so as not to stress the connections between them.
11. The internal battery is located at the left end of the CPU/Digital input (middle) board. Carefully slide the battery out from its holder. Replace the battery only with a unit of similar rating. See the Spare Parts List or contact your AMOT representative for suitable spare parts.
12. Carefully align the three circuit boards with their correct slots in the housing.
13. Slide the boards into place so that the rear connectors fit through their openings in the housing.
14. Position the faceplate next to the front of the housing and carefully connect the cables.
15. At the front of the faceplate, install six screws to attach it to the housing.
16. Align the bezel with the front of the faceplate. Be sure not to pinch the cables when installing the faceplate.
17. At the back of the faceplate, install six screws to attach the bezel.
18. Insert the Hawk-I unit from the front of the panel.
19. Slide the two mounting brackets into the grooves along the sides of the enclosure.
20. Install the two socket-head screws to clamp the unit in place. DO NOT OVERTIGHTEN THE SCREWS; THE THREADS WILL STRIP.
21. At the rear panel, connect all wiring.
22. Power up the Hawk-I and test its operation. After battery replacement, the Hawk-I will need to have its internal time and date set via the CONFIG DIAGNOSTICS menu.

5.1.3 Fuse Replacement

The Hawk-I has an internal fast-blow fuse, 5 X 20 mm, 500mA, 250V (800mA, 250V for 12V versions). See the Spare Parts List or contact your local AMOT representative for suitable spare parts.

In order not to compromise the non-incendive classification of the equipment, there is no externally-accessible fuse holder.

WARNING

EXPLOSION HAZARD

FUSE MUST BE REPLACED ONLY IN AN AREA KNOWN TO BE NON-HAZARDOUS

TO REPLACE THE FUSE:

1. Follow the steps indicated for replacing the battery, with the exception of Step 11.
2. The fuse is located near the power connector on the bottom board (Power Supply).

5.2 Repair

With the exception of the internal battery and fuse, there are no field-serviceable parts in the Hawk-I. If the unit malfunctions, it must be returned to AMOT Controls or a factory-authorized repair center for test and evaluation.

Any attempt by a customer to repair any part of the Hawk-I will void all warranties. All repairs of the Hawk-I must be performed at an AMOT-certified repair facility.

WARNING

EXPLOSION HAZARD SUBSTITUTION OF COMPONENTS MAY IMPAIR SUITABILITY FOR CLASS I, DIVISION 2

5.2.1 Returning Equipment For Repairs

If a Hawk-I unit or any Hawk-I circuit boards or other components are being returned to AMOT for diagnosis and repair, the customer must first contact an AMOT representative and obtain a Return Goods Authorization (RGA). At that time, the customer will be given a specific Return Goods Authorization (RGA) Number for that particular shipment.

AMOT will not accept any equipment for repair unless the RGA procedure is followed. Any equipment sent to AMOT without the RGA Number conspicuously displayed on the packaging will be returned to the sender. Equipment should be shipped promptly after obtaining the RGA Number, since all RGA Numbers automatically expire after 30 calendar days. Consult your AMOT representative for further details concerning repairs.

Spare Parts List - Model 8630B

ITEM	AMOT Part Number
Battery, 3V, 48mAh, BR1632	60364
Fuse, 250V, 500mA, 5 X 20 mm, Fast-Acting	51019L050
Fuse, 250V, 800mA, 5 X 20 mm, Fast Acting	51019L080
8 pos Phoenix MSTB	50576L008
6 pos Phoenix MSTB	50446L106
10 pos Phoenix MSTB	50446L110
Keypad	60361L001

6. CHANGING THE HAWK-I's CONFIGURATION

The Hawk-I is programmed with AMOT's HawkWin software, which enables the user to set up the sequence and analog ladder logic diagrams that determine the basic functionality of the unit. However, after the program is downloaded into the Hawk-I, everyday operation of the unit is controlled by the built-in keypad.

6.1 The Hawk-I Keypad

The right side of the Hawk-I's keypad contains five green keys, arranged like a plus sign or +. The key in the middle of the + sign is labeled ENTER, and the four remaining keys are placed at the ends of the plus sign's four arms.

The buttons above and below the ENTER button are called the UP and DOWN buttons. The buttons to the left and right of the ENTER button are called the LEFT and RIGHT buttons. These designations give only a general idea of the many functions that these buttons can perform while accessing and updating the configuration settings.

> WARNING: The front panel keys of the Hawk-I labeled START and STOP will have no function unless they are specifically programmed using HawkWin.

The keypad enables the user to navigate a configuration matrix that allows the details of the programming to be updated and changed whenever necessary. Figures 5-1 and 6-1 (Sheets 1-2) show the details of this configuration matrix in the form of a flow chart. The Hawk-I user will first scroll up or down in the matrix to find the particular menu that is needed. Then the user can move to the right along the selected menu to gain access to the menu box or boxes that must be changed.

6.2 Gaining Access to the Configuration Menus

1. Apply power to the Hawk-I through the connections on the rear panel.
2. The LCD should first say Amot Controls HAWK-I. After a few seconds, the display will change either to the programmed display (if in Run Mode), or indicate CONFIGURE MENU CONTROLLERS (if in Configure Mode). The CONFIG LINK contacts must be connected before the configuration procedure can be performed.
   Note that if the unit is in View Mode, it will not go into Configure Mode and the reconfiguration cannot be performed. There is also a lockout coil (Configure Disable) that may be included in the Sequence Diagram. Activating this coil will prevent the Hawk-I from entering Configure Mode. If the configure link is present on power-up, the Hawk-I will enter Configure Mode regardless of its programmed

sequence. This is a safety feature intended to prevent damage to equipment controlled by the Hawk-I.

If the lockout coil is not used, be sure to stop any machinery controlled by the Hawk-I. The Hawk-I will not respond to alarms or shutdowns while in Configure Mode.

3. After the CONFIG LINK contacts are shorted, the LCD should say CONFIGURE MENU CONTROLLERS. If these words are displayed, you are in the configuration matrix. Note that CONFIGURE MENU CONTROLLERS identifies the menu box at the left end of the first row of the Configuration Mode Flow Chart.

6.3 Moving Up and Down Between Menus

To step up and down from menu to menu in the configuration matrix, use the UP and DOWN buttons. Note that if you press the UP button immediately after accessing the matrix, the display will change from CONFIGURE MENU CONTROLLERS to CONFIGURE MENU LOCK/UNLOCK, which is the last menu in Sheet 2 of the Configuration Mode Flow Chart. If you press the DOWN button right after getting into the matrix, the LCD should say CONFIGURE MENU ANALOG USER IN. Stepping up and down in this way will enable the user to access any menu in the matrix.

6.4 Moving From Side to Side in a Menu

When you have reached the menu where configuration changes must be made, press ENTER. You will now be inside the row. Whenever you want to exit the row, simply press the gray RESET button. If there is no existing programming to be edited in a particular row, the LCD will indicate 'No instances of this type loaded.' If any programming of that kind is needed, it will have to be set up with AMOT's HawkWin software and then downloaded into the Hawk-I.

However, if there is existing programming in the selected row, then the programming information will appear on the LCD. Program reconfiguration can now begin.

6.5 Revising Data Within a Menu Box

To change anything that you see on the LCD, it must first be selected. The blinking or on-off activity of a word, letter, or number within a particular menu box indicates that this is the part of the box that will change when the editing commands are used.

To make a particular number or word group blink, use the RIGHT and LEFT buttons to step forward and backward through the current menu box. When a particular word group is blinking, use ENTER to make the first letter in the group blink. To move the blinking from one letter in the group to the next, press the RIGHT and LEFT buttons. Note that the keypad will select only words that can be edited. It will skip past formatting and label-type words such as CLASS and NORMALLY that cannot be changed.

To enter the desired changes, use the UP and DOWN buttons to step the display through all the options that are available. When the desired information is displayed, press ENTER to change the Hawk-I's configuration. To move back and forth to adjoining menu boxes, use the RIGHT and LEFT keys until the desired box appears on the LCD.

When all of the changes within a row are completed, use RESET to return to the main menu structure. If changes have been made, the display will prompt the user to press ENTER to confirm or RESET to cancel. Pressing ENTER will save the changes to the Hawk-I's non-volatile memory. If RESET is pressed, the Hawk-I will ignore any changes made in that menu.

Note that the Hawk-I contains a backup copy of the active, non-volatile memory. The contents of active memory can be backed up by using the 'Load Active Mem.' option from the Diagnostics Menu. The backup memory is also updated when a new sequence is downloaded to the Hawk-I, or if the Hawk-I senses that it has been corrupted.

6.6 Exiting Configuration Mode

Configure Mode will exit only from the root configure menu. If the configuration link is broken and the user is in a sub-menu, the Hawk-I will remain in configure until the sub-menu is exited.

6.7 Precautions

> WARNING: The functionality of the Hawk-I can be seriously altered in Configure Mode. Use extreme care when making changes to the Hawk-I's configuration. Be sure to thoroughly test and document any modifications.

> DANGER: When in Diagnostics Mode, the Hawk-I outputs can be manually toggled (or ramped). This is useful for system troubleshooting, but can be extremely dangerous. Be sure that all personnel are clear of hazards before activating outputs.

6.8 Descriptions of Individual Menu Boxes

The menu boxes in the Hawk-I's configuration matrix allow the user to modify characteristics of the objects that are used in the Hawk-I's ladder logic without the requirement for a computer. A brief description of the Configure Menu options follow. For complete information regarding the objects that these menus control, see the HawkWin programming manual.

6.8.1 Controllers

This menu allows configuration of the PID blocks. Users can modify the action (direct/reverse), gain, integral, derivative, filter, and deadband parameters for each PID in their analog diagram.

6.8.2 Analog User Input

This menu is used to set the value and descriptive text of any configured analog user inputs.

6.8.3 Hours Run / Power Down

The contents of each run meter is displayed and can be set or reset. This menu also shows the last power on time/date, and the last power down time/date logged by the Hawk-I. The power on/off information can be useful when tracking system failures or unannunciated shutdowns.

6.8.4 Fault Logging

This menu allows the viewing of the Hawk-I's fault log. Each fault is time and date stamped.

6.8.5 Digital Inputs

Changes can be made to the class (A, B, b, C), descriptive text, alarm/ shutdown classification, and normal status (open/closed) for all of the 16 digital inputs.

6.8.6 Analog Inputs

Changes can be made to the class (A, B, b, or C), descriptive text, low/ high shutdown setpoints, low/high shutdown enable/disable, low/high alarm setpoints, and low/high alarm enable/disable for all of the analog inputs. This menu allows the user to view the current input type and units, i.e., a J type thermocouple displaying in °C or a 4-20mA loop displaying PSIG. The user can also view the calibration of loop transmitters, i.e., 4mA = 0 PSI, 20mA = 500 PSIG. These settings cannot be altered from configure mode.

6.8.7 Digital Outputs

This menu allows the user to view and change the descriptive text associated with each of the digital outputs.

6.8.8 Analog Outputs

This menu allows the user to view and change the descriptive text associated with each of the analog outputs.

6.8.9 Timers

This menu allows the user to view and change the value and text for each of the timers.

6.8.10 Tachometer

Changes can be made to the Pulses Per Revolution (PPR) of the tachometer, the descriptive text, overspeed setpoint, underspeed setpoint, Crank Termination Speed (CTS), and Purge Permit Speed (PPS) from this menu.

6.8.11 Time of Day

This menu allows the user to view and change predefined software "Time of Day" functions.

6.8.12 User Switches

This menu allows the user to view and change predefined software "switches". These switches give the user the capability of defining alternate routines within the same program.

6.8.13 Average Groups

From this menu, the user can configure the descriptive text, group A high/low deviations, and group B high/low deviations for each of the average groups.

6.8.14 Split Ranges

This menu is used to modify the descriptive text, range for output A, and range for output B for each of the split range controls.

6.8.15 User Setpoints

Use this menu to set the descriptive text, setpoint, hysteresis, and control action (rising or falling) for each of the user setpoints.

6.8.16 Communications

From this menu, the user can select the Modbus access and communication speed. Some communications packages (FIX, for example) subtract 1 from the Modbus address before they transmit a request. The Hawk-I can easily accommodate this by adding 1 to every incoming message address. This adjustment (+1) is selected to be either yes or no.

6.8.17 Test Mode Timer

This menu selects the duration of the test mode timer. The test mode timer is used in conjunction with View Mode when testing sensors on an active machine. Alarm and shutdown conditions will not trip output for the duration of the timer. This value can range from 30 to 300 seconds.

6.8.18 Diagnostics

The diagnostics menu provides test functions for the inputs and outputs, allows the system clock time and date to be set, and allows the active memory to be loaded or saved, as well as analog input calibrations, firmware version, date of last download, and number of downloads.
When toggling or ramping outputs, only one output at a time is active. All others are off, or set to their minimum value.
Press RESET to exit a test menu and return to the Diagnostics Menu. Pressing RESET a second time will return to the Configure Menu.

6.8.18.1 Key Test

This menu allows the user to test the functionality of the keypad as well as the Remote Stop and Remote Start switches.

6.8.18.2 Digital Inputs

Allows the user to verify the operation of the 16 digital inputs.

6.8.18.3 Digital Outputs

Allows the user to verify the operation of the 4-12 digital outputs.

6.8.18.4 Analog Inputs

This menu allows the user to verify the operation of all Analog Inputs without setting off alarms or sensor failures.

6.8.18.5 Analog Outputs

This menu allows the user to verify the operation of 1-2 Analog Outputs by manually ramping each output from 0% to 100%.

6.8.18.6 Hrs Run / Pwr Dn

Same as Section 6.8.3

6.8.18.7 System Clock

Allows the user to set the time and day.

6.8.18.8 Load Active Mem

Allows the user to load settings from ROM.

6.8.18.9 Save Active Mem

Allows the user to save changes to ROM.

6.8.18.10 Calibrate Inputs

Allows the user to calibrate analog inputs.

To calibrate an analog input(s):

- Select the input or group of inputs to be calibrated (T/C 1-8, T/C 9-16, individual T/C's, or individual loops)
- With the calibration source set at the defined value, apply the signal to the input(s) in question.
- Following the LCD prompt, set the first calibration point.
- Press the RIGHT button to accept the calibration source signal.
- Adjust the calibration source signal to reflect the second set point and apply the signal as before.
- Following the LCD prompt, set the second calibration point.
- Press the RIGHT button to accept the second calibration source signal.

After calibration, a message will appear indicating success or failure. A failure indicates that the difference between the calibration source signal and the corresponding calibration setpoint was too large for compensation. This can happen if the calibration source signal is not changed when entering the second calibration setpoint; or if one of the calibration setpoint values is incorrectly entered.

6.8.18.11 Firmware

Provides Firmware version and checksum

6.8.18.12 Sequence

Provides last sequence download date and time.

6.8.18.13 Accesses

Provides current download count.

6.8.18.14 Clr Calibration

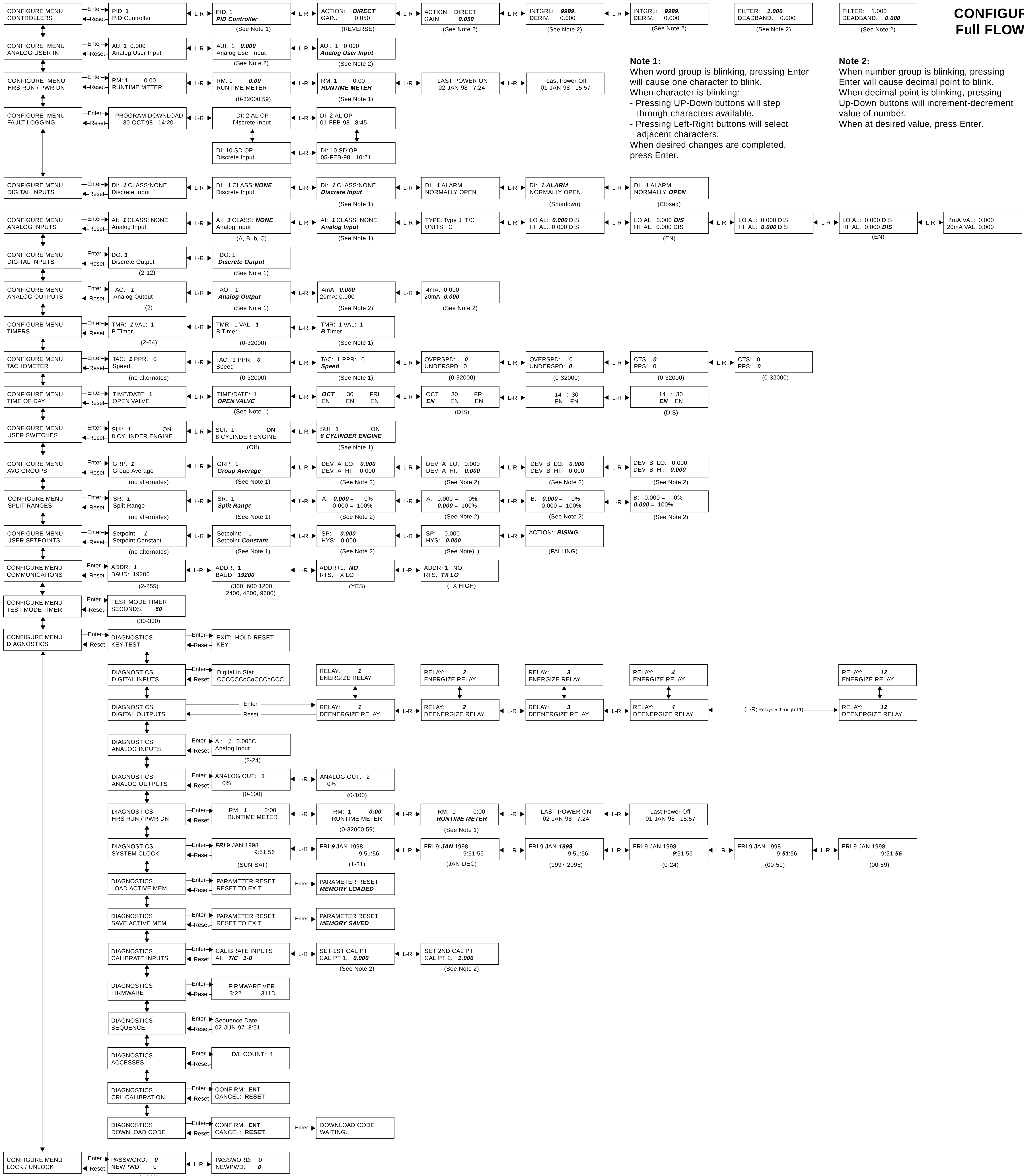
Allows the user to reset all calibration settings.

6.8.18.15 Download Code

Allows the user to download new firmware via the serial port.

6.8.19 Lock / Unlock

This is the security section of the Hawk-I. If the entered password does not match the stored password, the Hawk-I will not allow configuration changes from the keypad. The default password is 0, which allows open access. Valid passwords range from 0 to 999.



CONFIGURATION MODE Full FLOWCHART fig. 6

Note 1:
When word group is blinking, pressing Enter will cause one character to blink.
When character is blinking:
- Pressing UP-Down buttons will step through characters available.
- Pressing Left-Right buttons will select adjacent characters.

When desired changes are completed, press Enter.

Note 2:
When number group is blinking, pressing Enter will cause decimal point to blink.
When decimal point is blinking, pressing Up-Down buttons will increment-decrement value of number.
When at desired value, press Enter.

CONFIGURATION MODE FLOWCHART 1 OF 2

CONFIGURE MENU CONTROLLERS (Enter / Reset)
- PID: **1** / PID Controller
- L-R: PID: 1 / ***PID Controller*** (See Note 1)
- L-R: ACTION: ***DIRECT*** / GAIN: 0.050 (REVERSE)
- L-R: ACTION: DIRECT / GAIN: ***0.050*** (See Note 2)
- L-R: INTGRL: ***9999.*** / DERIV: 0.000 (See Note 2)
- L-R: INTGRL: ***9999.*** / DERIV: 0.000 (See Note 2)
- L-R: FILTER: ***1.000*** / DEADBAND: 0.000 (See Note 2)
- L-R: FILTER: 1.000 / DEADBAND: ***0.000*** (See Note 2)

CONFIGURE MENU ANALOG USER IN (Enter / Reset)
- AU: **1** 0.000 / Analog User Input
- L-R: AUI: 1 ***0.000*** / Analog User Input (See Note 2)
- L-R: AUI: 1 0.000 / ***Analog User Input*** (See Note 2)

CONFIGURE MENU HRS RUN / PWR DN (Enter / Reset)
- RM: **1** 0.00 / RUNTIME METER
- L-R: RM: 1 ***0.00*** / RUNTIME METER (0-32000:59)
- L-R: RM: 1 0.00 / ***RUNTIME METER*** (See Note 1)
- L-R: LAST POWER ON / 02-JAN-98 7:24
- L-R: Last Power Off / 01-JAN-98 15:57

CONFIGURE MENU FAULT LOGGING (Enter / Reset)
- PROGRAM DOWNLOAD / 30-OCT-98 14:20
- L-R: DI: 2 AL OP / Discrete Input
- L-R: DI: 2 AL OP / 01-FEB-98 8:45
- DI: 10 SD OP / Discrete Input
- L-R: DI: 10 SD OP / 05-FEB-98 10:21

CONFIGURE MENU DIGITAL INPUTS (Enter / Reset)
- DI: ***1*** CLASS:NONE / Discrete Input
- L-R: DI: ***1*** CLASS:***NONE*** / Discrete Input
- L-R: DI: ***1*** CLASS:NONE / ***Discrete Input*** (See Note 1)
- L-R: DI: ***1*** ALARM / NORMALLY OPEN
- L-R: DI: ***1 ALARM*** / NORMALLY OPEN (Shutdown)
- L-R: DI: ***1*** ALARM / NORMALLY ***OPEN*** (Closed)

CONFIGURE MENU ANALOG INPUTS (Enter / Reset)
- AI: ***1*** CLASS: NONE / Analog Input
- L-R: AI: ***1*** CLASS: ***NONE*** / Analog Input (A, B, b, C)
- L-R: AI: ***1*** CLASS: NONE / ***Analog Input*** (See Note 1)
- L-R: TYPE: Type J T/C / UNITS: C
- L-R: LO AL: ***0.000*** DIS / HI AL: 0.000 DIS
- L-R: LO AL: 0.000 ***DIS*** / HI AL: 0.000 DIS (EN)
- L-R: LO AL: 0.000 DIS / HI AL: ***0.000*** DIS
- L-R: LO AL: 0.000 DIS / HI AL: 0.000 ***DIS*** (EN)
- L-R: 4mA VAL: 0.000 / 20mA VAL: 0.000

CONFIGURE MENU DIGITAL OUTPUTS (Enter / Reset)
- DO: ***1*** / Discrete Output (2-12)
- L-R: DO: 1 / ***Discrete Output*** (See Note 1)

CONFIGURE MENU ANALOG OUTPUTS (Enter / Reset)
- AO: ***1*** / Analog Output (2)
- L-R: AO: 1 / ***Analog Output*** (See Note 1)
- L-R: 4mA: ***0.000*** / 20mA: 0.000 (See Note 2)
- L-R: 4mA: 0.000 / 20mA: ***0.000*** (See Note 2)

CONFIGURE MENU TIMERS (Enter / Reset)
- TMR: ***1*** VAL: 1 / B Timer (2-64)
- L-R: TMR: 1 VAL: ***1*** / B Timer (0-32000)
- L-R: TMR: 1 VAL: 1 / ***B*** Timer (See Note 1)

CONFIGURE MENU TACHOMETER (Enter / Reset)
- TAC: ***1*** PPR: 0 / Speed (no alternates)
- L-R: TAC: 1 PPR: ***0*** / Speed (0-32000)
- L-R: TAC: 1 PPR: 0 / ***Speed*** (See Note 1)
- L-R: OVERSPD: ***0*** / UNDERSPD: 0 (0-32000)
- L-R: OVERSPD: 0 / UNDERSPD: ***0*** (0-32000)
- L-R: CTS: ***0*** / PPS: 0 (0-32000)
- L-R: CTS: 0 / PPS: ***0*** (0-32000)

CONFIGURE MENU TIME OF DAY (Enter / Reset)
- TIME/DATE: **1** / OPEN VALVE
- L-R: TIME/DATE: 1 / ***OPEN VALVE*** (See Note 1)
- L-R: ***OCT*** 30 FRI / EN EN EN
- L-R: OCT 30 FRI / ***EN*** EN EN (DIS)
- L-R: ***14*** : 30 / EN EN
- L-R: 14 : 30 / ***EN*** EN (DIS)

CONFIGURE MENU USER SWITCHES (Enter / Reset)
- SUI: ***1*** ON / 8 CYLINDER ENGINE
- L-R: SUI: 1 ***ON*** / 8 CYLINDER ENGINE (Off)
- L-R: SUI: 1 ON / ***8 CYLINDER ENGINE*** (See Note 1)

CONFIGURE MENU AVG GROUPS (Enter / Reset)
- GRP: ***1*** / Group Average (no alternates)
- L-R: GRP: 1 / ***Group Average*** (See Note 1)
- L-R: DEV A LO: ***0.000*** / DEV A HI: 0.000 (See Note 2)
- L-R: DEV A LO: 0.000 / DEV A HI: ***0.000*** (See Note 2)
- L-R: DEV B LO: ***0.000*** / DEV B HI: 0.000 (See Note 2)
- L-R: DEV B LO: 0.000 / DEV B HI: ***0.000*** (See Note 2)

CONFIGURE MENU SPLIT RANGES (Enter / Reset)
- SR: ***1*** / Split Range (no alternates)
- L-R: SR: 1 / ***Split Range*** (See Note 1)
- L-R: A: ***0.000*** = 0% / 0.000 = 100% (See Note 2)
- L-R: A: 0.000 = 0% / ***0.000*** = 100% (See Note 2)
- L-R: B: ***0.000*** = 0% / 0.000 = 100% (See Note 2)
- L-R: B: 0.000 = 0% / ***0.000*** = 100% (See Note 2)

CONFIGURE MENU USER SETPOINTS (Enter / Reset)
- Setpoint: ***1*** / Setpoint Constant (no alternates)
- L-R: Setpoint: 1 / ***Setpoint Constant*** (See Note 1)
- L-R: SP: ***0.000*** / HYS: 0.000 (See Note 2)
- L-R: SP: 0.000 / HYS: ***0.000*** (See Note 2)
- L-R: ACTION: ***RISING*** (FALLING)

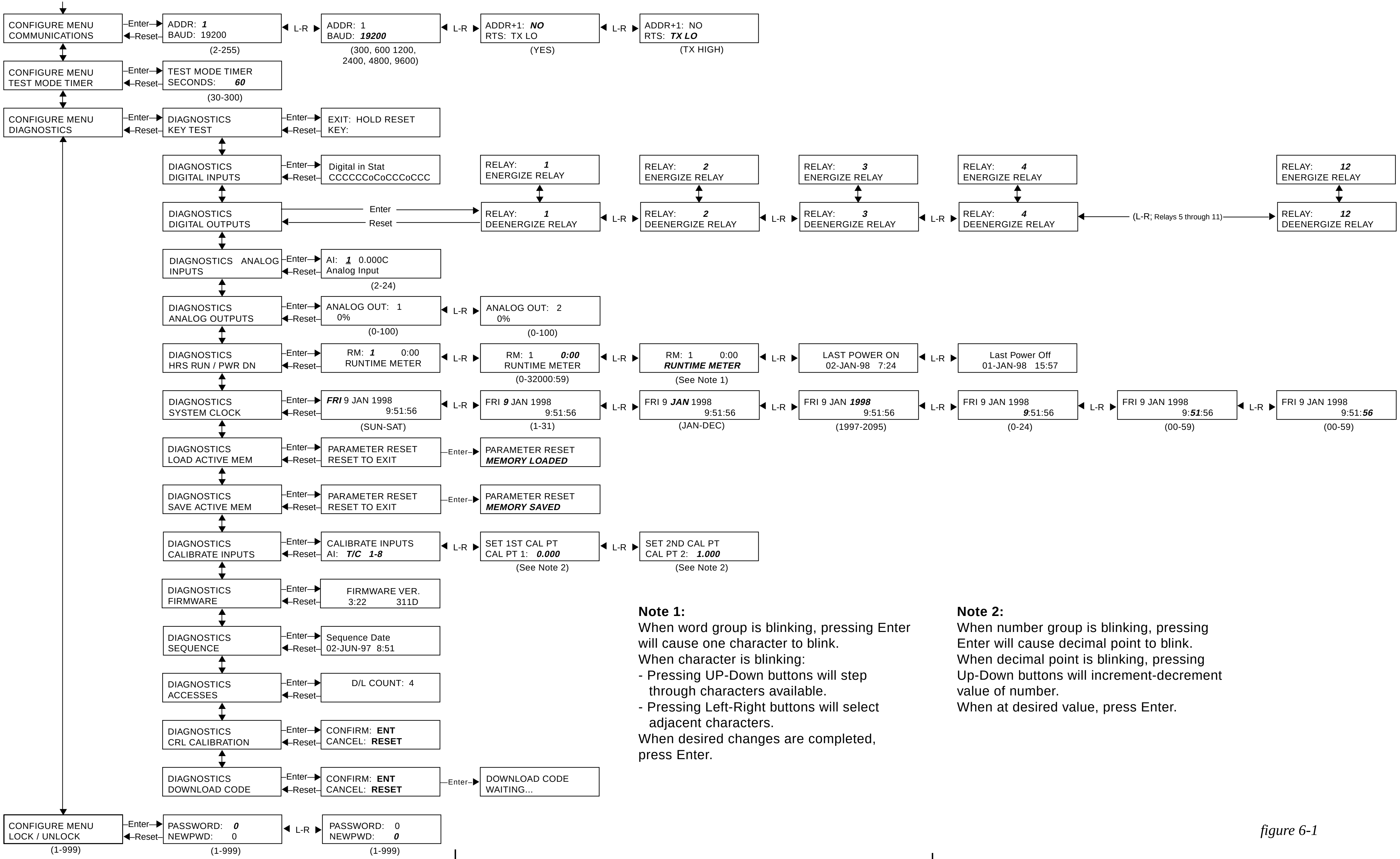
Note 1:
When word group is blinking, pressing Enter will cause one character to blink.
When character is blinking:
- Pressing UP-Down buttons will step through characters available.
- Pressing Left-Right buttons will select adjacent characters.

When desired changes are completed, press Enter.

Note 2:
When number group is blinking, pressing Enter will cause decimal point to blink.
When decimal point is blinking, pressing Up-Down buttons will increment-decrement value of number.
When at desired value, press Enter.

figure 6-1

CONFIGURATION MODE FLOWCHART 2 OF 2



Note 1:
When word group is blinking, pressing Enter will cause one character to blink.
When character is blinking:
- Pressing UP-Down buttons will step through characters available.
- Pressing Left-Right buttons will select adjacent characters.

When desired changes are completed, press Enter.

Note 2:
When number group is blinking, pressing Enter will cause decimal point to blink.
When decimal point is blinking, pressing Up-Down buttons will increment-decrement value of number.
When at desired value, press Enter.

figure 6-1

7. Accessing the Hawk-I's View Mode

After the system has been configured and is running a sequence, it may be necessary to view the status of inputs, outputs, or other settings. In addition, the user may want to change certain parameters without having to stop the sequence and put the Hawk-I in Configure mode. The number of parameters available to be modified in this mode is limited. The user should refer to Section 7.1 to determine which parameters may be modified in this mode.

View Mode may be accessed by pressing the ENTER button while the Hawk-I is in Run Mode. Navigation of the View Mode menu is identical to navigation within the Configure Mode menu (See Section 6). Keypad functions are also identical and are defined in Sections 6.1, 6.3, 6.4, 6.5.

For a detailed view of the View Mode menu in flowchart form, refer to Figure 7-1, Sheets 1 and 2.

7.1 Descriptions of Individual Menu Boxes

7.1.1 Controllers

This menu shows the current configuration of the PID blocks. Users can modify the gain, integral, derivative, filter, and deadband parameters for each PID in their analog diagram.

7.1.2 Analog User In

This menu shows the value and descriptive text of any configured analog user inputs. Users can only modify the value for each analog user input from this menu.

7.1.3 Unhealthy Channels

This menu shows any analog or discrete inputs that have gone unhealthy.

7.1.4 Hours Run / Power Down

This menu shows the status of all runtime meters as well as the last power on time/date and the last power off time/date. No user modification is possible from this menu

7.1.5 Fault Logging

This menu allows the viewing of the Hawk-I's fault log. Each fault is time and date stamped.

7.1.6 Digital Inputs

This menu shows the status, class, alarm/shutdown classification, and descriptive text for all 16 digital inputs. No user modification is possible from this menu.

7.1.7 Analog Inputs

This menu shows the class, type, units, alarm points, shutdown points, and descriptive text for all analog inputs. The user may only modify the low and high alarm setpoints.

7.1.8 Digital Outputs

This menu shows the descriptive text for all digital outputs. No user modification is possible from this menu

7.1.9 Analog Outputs

This menu shows the descriptive text and range for all analog outputs. No user modification is possible from this menu.

7.1.10 Timers

This menu shows the value and descriptive text for all timers. No user modification is possible from this menu.

7.1.11 Tachometer

This menu shows the descriptive text, Pulses Per Revolution (PPR), overspeed/underspeed setpoint, Crank Termination Speed (CTS), and Purge Permit Speed (PPS) for the tachometer. The user may only modify the PPR.

7.1.12 Time of Day

This menu allows the user to view and change predefined software "Time of Day" functions.

7.1.13 User Switches

This menu allows the user to view the status of all predefined software "switches". The user may only modify the on/off status of the switch from this menu.

7.1.14 Average Groups

This menu shows the descriptive text, group A high/low deviations, and group B high/low deviations. The user may modify the group A & B high/low deviations from this menu.

7.1.15 Split Range

This menu shows the descriptive text, output A range, and output B range. The user may modify the output A & B ranges from this menu.

7.1.16 User Setpoints

This menu shows the descriptive text, setpoints, hysteresis, and control action for all user setpoints. The user may modify the setpoints, hysteresis, and control action from this menu.

7.1.17 Run Diagnostics

The Run Diagnostics menu allows the user to view the status of individual channels (digital and analog inputs/outputs), adjust the system clock, view communications settings, and view system parameters (firmware, sequence, accesses, etc.) while the Hawk-I is in Run mode. The user may only modify the system clock settings while in this mode. To perform more detailed diagnostics, refer to Section 6.8.18.

7.1.17.1 Digital Inputs

Shows the status (Open/Closed) of all 16 Digital inputs

7.1.17.2 Analog Inputs

Shows the status of all Analog inputs

7.1.17.3 Analog Outputs

Shows the status of all Analog outputs

7.1.17.4 Digital Outputs

Shows the status of all Digital outputs

7.1.17.5 System Clock

Shows the current time/date settings for the Hawk-I. The user may modify these settings from this menu.

7.1.17.6 Communications

Shows the current settings for the serial port.

7.1.17.7 System Info

Show the total number of rungs in a sequence (**R**:) and the total number of sequence overruns (**O**:)

7.1.17.8 Firmware

Shows the current firmware version and checksum.

7.1.17.9 Sequence

Shows the download date and time of the current sequence.

7.1.17.10 Accesses

Shows the total number of downloads.

7.1.18 Lock / Unlock

This menu allows the user to password protect the unit to prevent unauthorized access to system parameters. If the system is locked, parameters may only be viewed.

7.1.19 Test Mode

This menu allows the user to test digital, analog, and tachometer inputs while the system is in Run mode. The Test Mode function is controlled by a timer whose value is defined in CONFIGURE/TEST MODE TIMER (Sec. 6.8.17). While the timer is running, the selected input can be manipulated without setting off any sensor fails or alarms. When the timer stops, the system will return to the sequence display. All temporarily disabled sensor fails and alarms will be restored.

7.1.19.1 Digital Inputs

Allows the user to test all 16 Digital inputs (one at a time).

7.1.19.2 Analog Inputs

Allows the user to test all Analog inputs (one at a time).

7.1.19.3 Tachometer

Allows the user to test the Tachometer input.

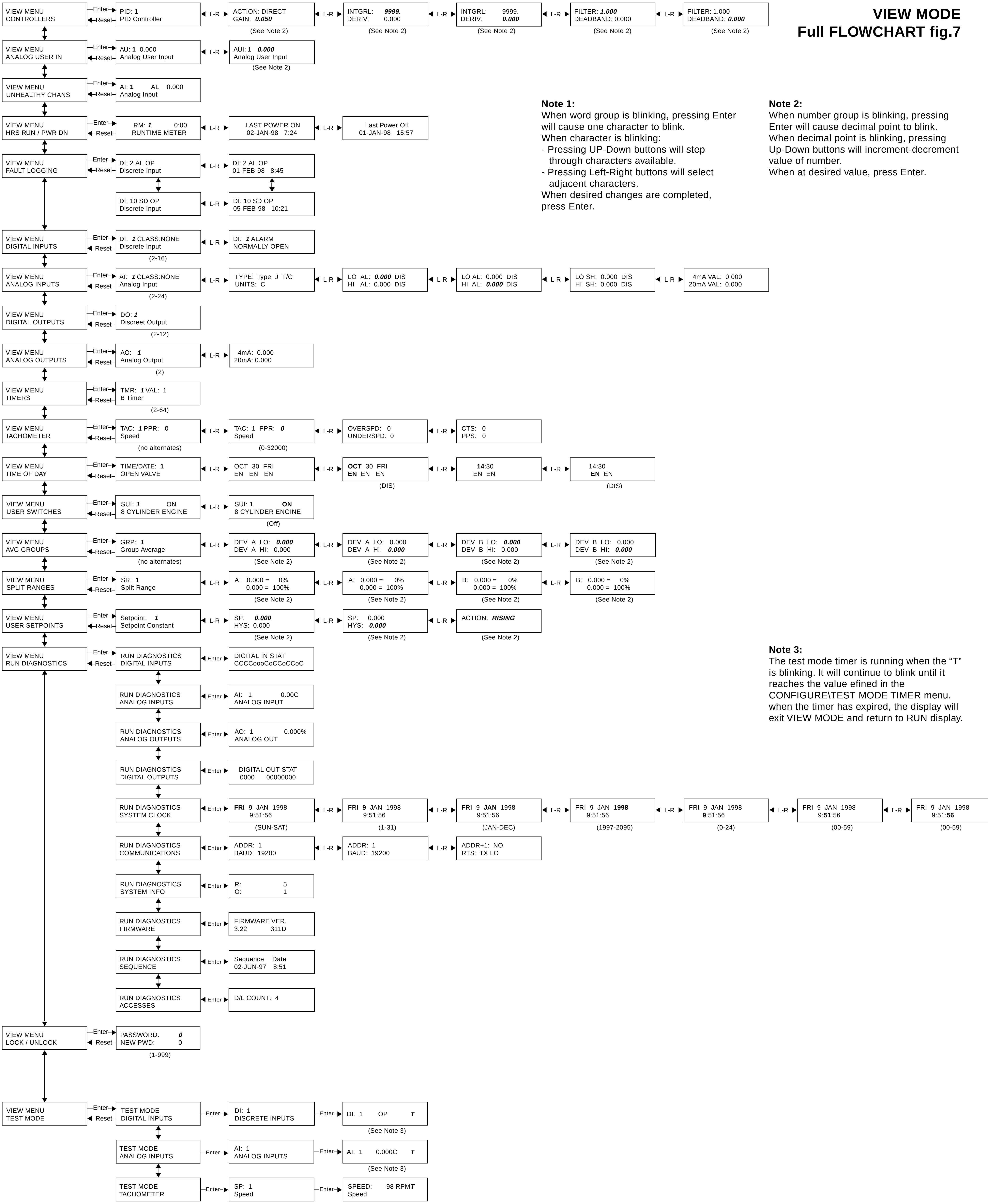
VIEW MODE
Full FLOWCHART fig.7

Note 1:
When word group is blinking, pressing Enter will cause one character to blink.
When character is blinking:
- Pressing UP-Down buttons will step through characters available.
- Pressing Left-Right buttons will select adjacent characters.

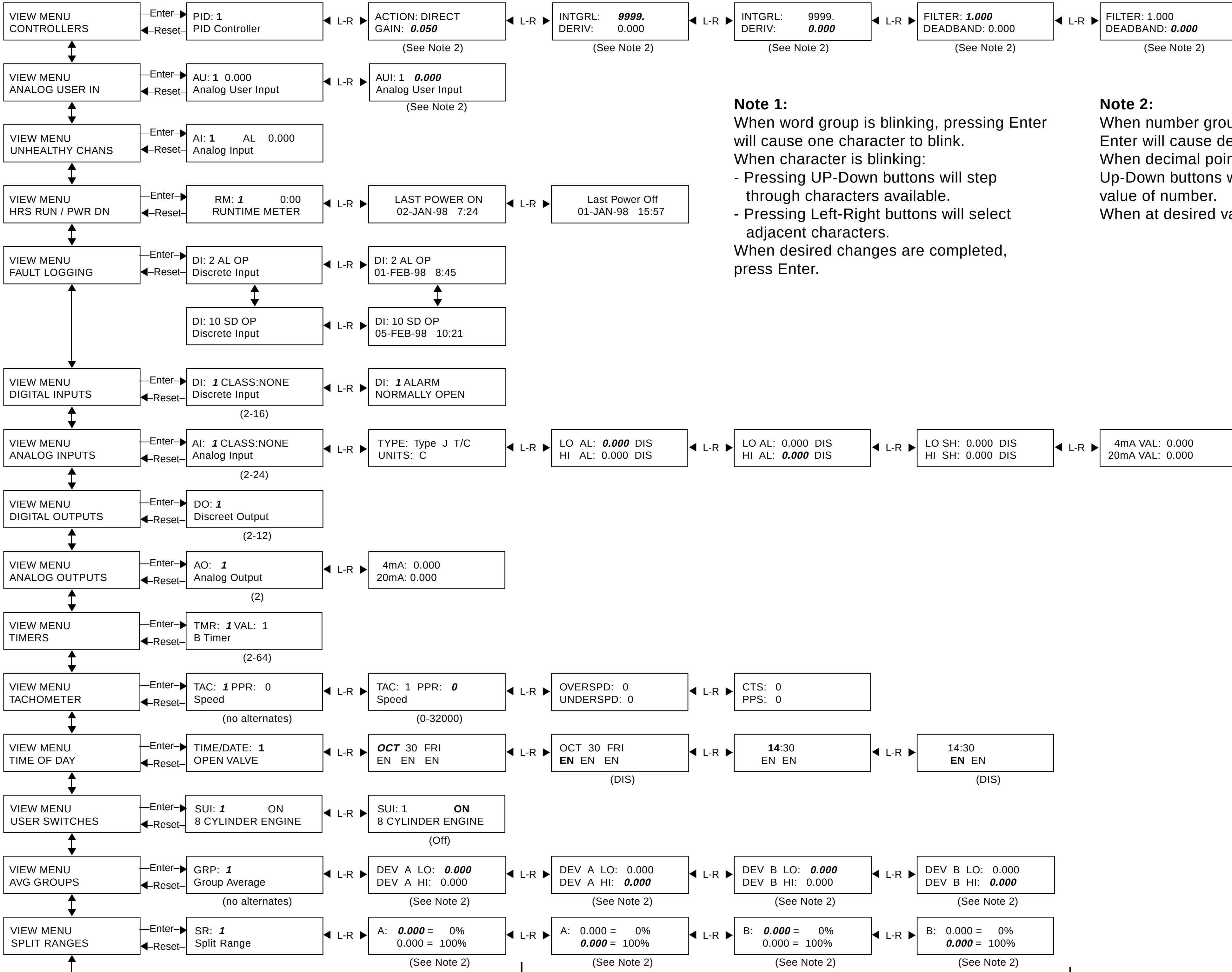
When desired changes are completed, press Enter.

Note 2:
When number group is blinking, pressing Enter will cause decimal point to blink.
When decimal point is blinking, pressing Up-Down buttons will increment-decrement value of number.
When at desired value, press Enter.

Note 3:
The test mode timer is running when the "T" is blinking. It will continue to blink until it reaches the value efined in the CONFIGURE\TEST MODE TIMER menu. when the timer has expired, the display will exit VIEW MODE and return to RUN display.



VIEW MODE FLOWCHART 1 OF 2



Note 1:
When word group is blinking, pressing Enter will cause one character to blink.
When character is blinking:
- Pressing UP-Down buttons will step through characters available.
- Pressing Left-Right buttons will select adjacent characters.

When desired changes are completed, press Enter.

Note 2:
When number group is blinking, pressing Enter will cause decimal point to blink.
When decimal point is blinking, pressing Up-Down buttons will increment-decrement value of number.
When at desired value, press Enter.

figure 7-1

VIEW MODE
FLOWCHART 2 OF 2

Note 3:
The test mode timer is running when the "T" is blinking. It will continue to blink until it reaches the value defined in the CONFIGURE\TEST MODE TIMER menu. When the timer has expired, the display will exit VIEW MODE and return to RUN display.

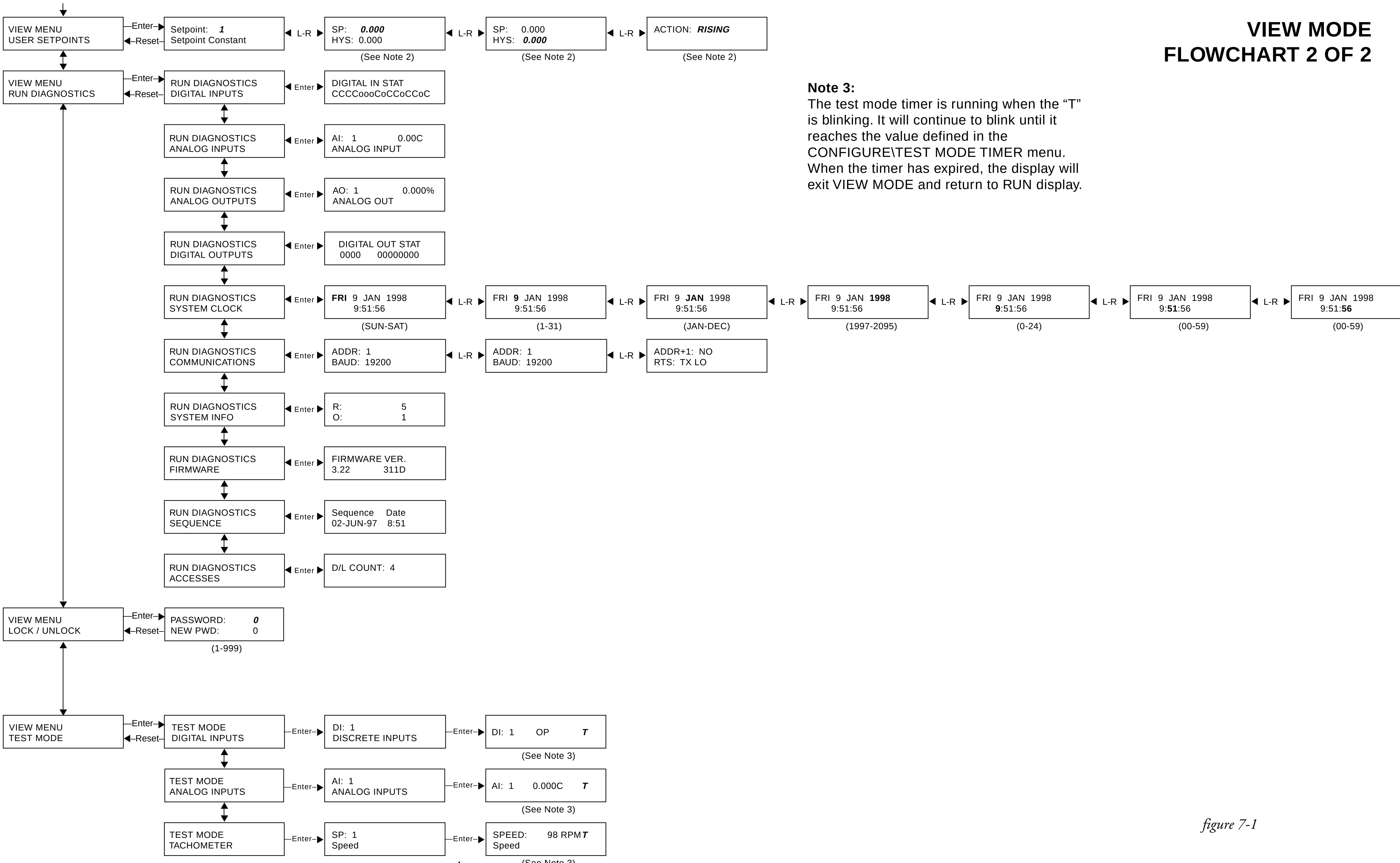


figure 7-1