Micro-Tech™ 3106
Impact Flowmeter Integrator
Operations & Service Manual

Analyze • Detect • Measure • Control™

Thermo
ELECTRON CORPORATION

Micro-Tech™ 3106 Impact Flow Meter Integrator

Revision History

Revision A	March 2004	ECO 232	First Release
Revision B	March 2004	ECO	Added CSA/CE certification symbols. Added Appendix with engineering drawings. Indicated Analog Input/Output board type (B) is optional.
Revision C	October 2006		Technical Specification Correction (Fusing)

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About this Manual

This manual provides installation, operation, troubleshooting, and repair information for the Micro-Tech™ 3106 Impact Flow Meter Integrator manufactured by Thermo. The Integrator is a microcomputer driven instrument used for deriving rate and quantity of flowing material from signals representing the impact force (lbs.) of moving material.

By suitable processing of this input signal, the Integrator delivers visible and electrical output representing the rate of material movement and visible and electrical output representing total amount of material which has passed through the flow meter.

For remote indicating, these options are available:

1. Remote totalization.

2. Remote flow rate - current or frequency.

3. Communications.

4. Field Bus

5. Many automatic and check functions are available to the operator for calibration and maintenance.

Who Should Use this Manual?

The *Micro-Tech 3106 Manual* is a learning resource and reference for anyone concerned with the operation of the Integrator.

Organization of the Manual

This manual is organized into 5 chapters and 3 appendices.

Chapter 1: Introduction - provides a functional overview of the system.

Chapter 2: Installation - provides the steps and instructions necessary to install the equipment

Chapter 3: Operations - provides information on the operation of the equipment.

Chapter 4: Maintenance and Troubleshooting – provides information on any maintenance of the equipment and troubleshooting if appropriate.

Chapter 5: Service, Repair, and Replacement Part - details the procedures and references for requesting service, repair, and replacement parts.

Appendix A: Digital Input/Output

Appendix B: Micro-Tech 3106 Menus

Appendix C: Engineering Drawings

Appendix D: Reader Comment Section

Documentation Conventions

The following conventions are used in this manual to help easily identify certain types of information:

- *Italic* is used to introduce new terms and for emphasis.

- *Italic/blue* type is used for references to other sections of the manual and serve as links in electronic documents.

- The names of setup, calibration displays, menu displays, and variables are shown in **CAPITALS**.

- The names of keys are shown in **BOLD CAPITALS.**

- **Note:** Provides information of special importance to the reader.

- ◉ This symbol indicates a **HINT** in the text that may be of value but not necessary for operation.

Safety Messages

Instructions in this manual may require special precautions to ensure the safety of the personnel performing the operations.

Please read the safety information before performing any operation preceded by this symbol. ⚠

There are two levels of safety messages: warnings and cautions. The distinction between the two is as follows:

⚠ WARNING

Failure to observe could result in death or serious injury.

⚠ CAUTION

Failure to observe may cause minor injury or damage the equipment
---

General Precaution

Do not install, operate, or perform any maintenance procedures until you have read the safety precautions presented.

⚠ **WARNING**

Users must follow all applicable safety procedures related to this product. High voltages and high temperatures are present within the system enclosure during normal operation.

Do not attempt to defeat safety interlocks provided with this product. There are no user serviceable parts inside the system enclosure. This product must be serviced only by authorized service Personnel.

Failure to comply with these warnings can result in exposure to high voltages or high temperatures, which can cause personal injury.

⚠ **WARNING**

Failure to follow safe installation and servicing procedures could result in death or serious injury.

- Make sure only qualified personnel perform installation and maintenance procedures in accordance with the instructions in this manual.
- Allow only qualified electricians to open and work in the electronics cabinet, power supply cabinet, control cabinet, or switch boxes.
- Covers over the electronics and rotating parts must always remain in place during normal operation. Remove only for maintenance, with the machine's power OFF. Replace all covers before resuming operation.
- During maintenance, a safety tag (not supplied by the factory) is to be displayed in the ON/OFF switch areas instructing others not to operate the unit (ANSI:B157.1).

⚠ **WARNING**

High voltage that may be present on leads could cause electrical shock.

- All switches must be OFF when checking input AC electrical connections, removing or inserting printed circuit boards, or attaching voltmeters to the system.
- Use extreme caution when testing in, on, or around the electronics cabinet, PC boards, or modules. There are voltages in excess of 115 V or 230 V in these areas.

⚠ **WARNING**

Use only the procedures and new parts specifically referenced in this manual to ensure specification performance and certification compliance. Unauthorized procedures or parts can render the instrument dangerous to life, limb, or property.

⚠ **WARNING**

This machine should not be operated at more than the production rate stated on your Equipment Specification sheet or used in applications other than those stated in the original order.

How to Get Help

⚠ **WARNING**

Unless you are directed to do so by an authorized service representative of *Thermo*, you should not attempt to perform any troubleshooting or maintenance procedures that are not described in this manual.

Failure to comply with these warnings can result in exposure to high voltages or high temperatures, which can cause personal injury.

CSA Certification – Certificate Numbers 1506639 and 1428908

The 'C' and 'US' indicators adjacent to the CSA Mark signify that the product has been evaluated to the applicable CSA and ANSI/UL Standards, for use in Canada and the U.S., respectively. This 'US' indicator includes products eligible to bear the 'NRTL' indicator. NRTL, i.e. National Recognized Testing Laboratory, is a designation granted by the U.S. Occupational Safety and Health Administration (OSHA) to laboratories, which have been recognized to perform certification to U.S. Standards.

Occupational Safety and Health Act (OSHA)

The *Occupational Safety and Health Act* clearly places the burden of compliance on the user of the equipment and the act is generalized to the extent that determination of compliance is a judgment decision on the part of the local inspection. Hence, *Thermo* will not be responsible for meeting the full requirements of OSHA in respect to the equipment supplied or for any penalty assessed for failure to meet the requirements, in respect to the equipment supplied, of the *Occupational Safety and Health Act*, as interpreted by an authorized inspector. *Thermo* will use their best efforts to remedy such violation at a reasonable cost to the buyer.

Thermo Warranty

The seller agrees, represents, and warrants that the equipment delivered hereunder shall be free from defects in material and workmanship. Such warranty shall not apply to accessories, parts, or material purchased by the seller unless they are manufactured pursuant to seller's design, but shall apply to the workmanship incorporated in the installation of such items in the complete equipment. To the extent purchased parts or accessories are covered by the manufacturer's warranty, seller shall extend such warranty to buyer.

Seller's obligation under said warranty is conditioned upon the return of the defective equipment, transportation charges prepaid, to the seller's factory in Minneapolis, Minnesota, and the submission of reasonable proof to seller prior to return of the equipment that the defect is due to a matter embraced within seller's warranty hereunder. Any such defect in material and workmanship shall be presented to seller as soon as such alleged errors or defects are discovered by purchaser and seller is given opportunity to investigate and correct alleged errors or defects and in all cases, buyer must have notified seller thereof within one (1) year after delivery, or one (1) year after installation if the installation was accomplished by the seller.

Said warranty shall not apply if the equipment shall not have been operated and maintained in accordance with seller's written instructions applicable to such equipment, or if such equipment shall have been repaired or altered or modified without seller's approval; provided, however, that the foregoing limitation of warranty insofar as it relates to repairs, alterations, or modifications, shall not be applicable to routine preventive and corrective maintenance which normally occur in the operation of the equipment.

"EXCEPT FOR THOSE WARRANTIES SPECIFICALLY CONTAINED HEREIN, SELLER DISCLAIMS ANY AND ALL WARRANTIES WITH RESPECT TO THE EQUIPMENT DELIVERED HEREUNDER, INCLUDING THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR USE. THE SOLE LIABILITY OF SELLER ARISING OUT OF THE WARRANTY CONTAINED HEREIN SHALL BE EXCLUSIVELY LIMITED TO BREACH OF THOSE WARRANTIES. THE SOLE AND EXCLUSIVE REMEDY FOR BREACH OF THE WARRANTIES SET OUT ABOVE SHALL BE LIMITED TO THE REPAIR OR REPLACEMENT OF ANY DEFECTIVE ACCESSORY, PART OR MATERIAL WITH A SIMILAR ITEM FREE FROM DEFECT, AND THE CORRECTION OF ANY DEFECT IN WORKMANSHIP. IN NO EVENT SHALL SELLER BE LIABLE FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES."

Purchaser agrees to underwrite the cost of any labor required for replacement; including time, travel, and living expenses of a *Thermo* Field Service Engineer at the closest factory base.

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Disclaimer

Though the information provided herein is believed to be accurate, be advised that the information contained herein is *not* a guarantee for satisfactory results. Specifically, this information is neither a warranty nor guarantee, expressed or implied, regarding performance, merchantability, fitness, or any other matter with respect to the products, and recommendation for use of the product/process information in conflict with any patent. Please note that *Thermo* reserves the right to change and/or improve the product design and specifications without notice.

Chapter 1
Introduction

This chapter provides information pertaining to the *Micro-Tech 3106 to* include system components, equipment inspection, site preparation, and installation. The Micro-Tech 3106 is designed for application on impact flow meters with LVDT measurement.

1.1 Inspection and Unpacking

The Micro-Tech 3106 Integrator has been properly packaged for shipment and storage, when necessary. Inspect all packages for damage before opening, as oftentimes the carrier may be responsible for shipping damage.

1.2 Storage

The Micro-Tech 3106 Integrator can be safely stored, with cover, latches secured and hole plugs installed, between -40° to +158° F (-40° to +70° C). The units should be protected against moisture.

1.3 Application

The Micro-Tech 3106 Filed Mount Integrator (Figure 1-1) or Panel Mount Integrator (Figure 1-2) is a microcomputer driven instrument used for deriving rate and quantity of flowing material from signals representing the impact force (lbs) of moving material.

By suitable processing of this input signal, the Integrator delivers visible and electrical output representing the rate of material movement and visible and electrical output representing total amount of material which has passed through the flow meter.

Figure 1-1: Micro-Tech 3106 Field Mount

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Figure 1-2: Micro-Tech 3106 Panel Mount

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For remote indicating, these options are available:

- Remote totalization

- Remote flow rate – current or frequency

- Communications

- Filed Bus

- Provisions for 4 programmable inputs, 4 programmable outputs, and 1 fault output

- An optional I/O board can be added

- Many automatic and check functions are available to the operator for calibration and maintenance

1.4   Micro-Tech 3106 Standard Features

The Model 3106 has many hardware and software features necessary for continuous weighing and outputting totalized weight and rate information. The main features are listed below.

- Menu driven scroll entries on a four line display

- Five LED status indicators

- Visible and electrical outputs representing total amount of material that has passed through the impact flow meter

- Automatic zero and span calibration

- Auto zero tracking

- Several software options that may be turned on by keyboard entry or by installing optional plug-in PC boards

- Optically coupled digital inputs and outputs

- Alarms and failure detection

- Communication standards: RS232C, RS485 networking multidrop, 20 mA current loop passive

- Allen-Bradley DF1, Modbus RTU

1.5   Integrator General Description

The Micro-Tech 3106 Integrator has been designed for impact sensors and is capable of performing all of the necessary measuring and control functions. All of the required functions are resident in the software of the microprocessor. Optional functions are automatically turned on when the relevant hardware is installed, or after the operator has selected them through the keypad.

Setup of the Micro-Tech 3106 is easy and is performed from the keypad on the front of the device. The setup parameters may be divided into the following categories:

- Measuring

- Monitoring

- Printing

- Communication

1.5.1   Measuring Functions

The Micro-Tech 3106 Integrator receives the force signal from the impact sensor and converts the force signal into a numeric value with very high accuracy and resolution (more than 2,000,000 counts at full scale).

Rate is calculated as decrement or increment of weight in time. Total is computed on three individual registers: total, reset total, operator total.

The Integrator can perform automatic zero and span calibrations.

Analog (current) output signals can be generated to transmit rate to other control devices.

Displayed variables and analog outputs can be smoothes via damping filters, individually programmable.

1.5.2 Monitoring Functions

The Integrator includes internal diagnostics that generate alarms in case of hardware failures or programming errors. The following process alarms are also provided:

- Alarms for high and low flow rate

Alarms are visible on the display and can be acknowledged and reset through the keypad, digital input, or serial line. Alarms can be delayed to avoid intervention in case of short time peaks. Each individual alarm can be programmed to operate as alarm, shut down, or none. Two LED's indicate the cumulative status of alarms and shut down. Digital outputs are also provided for the following:

- Hardware failure

- Alarm cumulative

- Shut down cumulative

1.5.3 Print Functions

Periodical and under command prints can be obtained by connecting a serial printer to the Comm output on the motherboard or an optional communication board. Time and date are permanently stored in the battery-backed memory. The entire set up of the instrument can also be printed out.

1.5.4 Communication Functions

There are two types of standard communication functions. Each is discussed below:

- Serial Communications – The communication protocol allows a remote intelligent device to read the contents of the registers and write to some registers.

During the communication activity, the Micro-Tech 3106 always acts as a Slave, meaning it responds to a request from a Master device on the line, but never attempts to send messages out.

One communication protocol may be selected and accessed through the communication terminals on the motherboard.

- Field Bus I/O – Allen-Bradley RIO or Profibus-DP I/O, or DeviceNet communication protocol board is typically used to transfer I/O images between a main PLC and the remote devices (normally remote I/O racks – rack adapters) or to transfer (read and write blocks of data with intelligent remote devices (node adapters), the Micro-Tech 3106 in this case.

The Remote I/O is a typical master/slave communication where the main PLC is the master or scanner and the remote devices are slaves or adapters.

1.6   Functional Description

This section describes technically, how the Micro-Tech 3106 performs each particular duty.

1.6.1   Measuring Functions

1.6.1.1   Instantaneous Flow Rate Calculation

The impact force measured by the DE10/DE20 over time is calculated to obtain instantaneous flow rate. This is multiplied by a suitable constant to obtain the value in engineering units (kg/h, ton/h, etc.). An adjustable damping filter is provided separately for displayed rate and current outputs.

1.6.1.2   Flow Totalization

Three totalizing memories are provided:

- The first memory (Master Total) is not re-settable to guarantee the data is not lost because of unwanted resets.

- The second and third memories (Reset and Operator Total) are re-settable by the operator and normally used for shift or daily Totalization.

1.6.1.3   Zero and Span Automatic Calibrations

The flow meter is first zeroed then spanned using material. Zero Calibration is done with all equipment such as screw conveyors, rotary airlock feeders, bucket elevators, dust collection, etc., in the area of the DE10/DE20 sensor on/running with no material flowing.

Span calibration must be done at maximum expected flow rate of the system Because all materials behave differently when they strike and then rebound off the impact plate, the Span Calibration must be done using a 'material test'. This test is done by running material through the flow meter for a period of time (at least 5 minutes). The longer the material test the better the result will be. All of the material should be pre-weighted or post-weighted on a high accuracy static scale to obtain the actual weight of the material.

1.6.1.4   Auto Zero Tracking (AZT)

Under a preset minimum flow rate when enabled, the instrument makes subsequent automatic zero corrections with the following sequence:

1. Waits for defined time until the next Zero Test (a solid "Z" displays)

2. Execution of a zero test (the "Z" flashes)

3. Performs automatic zero for the defined time

4. Continuously repeats above zero correction as long as feed rate remains below AZT preset value

The Zero Tracking function is limited to a maximum value of "**MAX DEVIATON'** that is set as a percentage in the **CAL DATA** scroll.

If the new zero that was calculated by the auto-zero tracking function exceeds that value, an alarm is generated, and the new correction is not installed. The reference value for zero is set every time an *Auto Zero* or *Manual Zero* is performed.

1.6.2   Current Output Signals

The standard Micro-Tech 3106 is equipped with one current output signal (0-20mA/4-20mA) on the motherboard. An optional dual channel current output/analog input board is available. The choice of the signal type is made through the keypad. Each current output may be programmed via the keypad to deliver one of the following:

- Flow rate

- Off

Each output has its own adjustable damping and programmable time or length delay.

1.6.3   Batch Control (Optional)

The Integrator, while calculating rate and totalization, may also do a batch control.

In this case, the Integrator operates during normal flow rate and activates the batch end output when the required quantity (set-point) is reached. A preset value may be entered to switch to a lower feed rate. When the totalized value equals the value of the quantity set minus preset, the controller switches to a lower rate set point (low rate set point) thus reducing the flow rate for a fine batching end.

The unit also allows the pre-ACT correction (or compensation of material before the flow meter) whose value has to be entered manually. The pre-feeder is stopped when the totalized value equals the batch set value minus the overflow correction value.

The batch START/STOP commands are provided either by the keypad or external signals (manual pushbutton or relay contact). The batch stop signal is used only as emergency to abort the batch cycle before its end. A delay time is provided between start command and actual start to compensate the difference in transport distance to the mixing point when several feeders are installed.

1.6.4   Indication System

The Integrator is equipped with an indication system. Indication can be in the form of one or all of the following:

- Status Indications

- Process Alarms

- Programming Errors

- Equipment Failures

If any of the controlled conditions takes place, it is signaled by the lighting of a LED on the front and by a digital output. Using the keyboard, you can view all the existing alarms and acknowledge them.

1.6.4.1   Status Indication

- Integrator ready to run material:
- "Ready" LED is on
- Power is on
- No calibration running
- Flow meter is calibrated
- No active alarm defined to shutdown

1.6.4.2   Process Alarms

The following process conditions are monitored and may produce an alarm or shutdown. A delay time after the abnormal condition is detected may be set for each individual alarm.

- High flow rate

- Low flow rate

- Overflow totalizer

- AZT over limit

- Batch Deviation (if Batch control is installed)

Each alarm can be defined as:

- NONE – Ignore abnormal condition

- ALARM - Warning, pre-feeder/process continues to run

- SHUTDOWN – Trip, pre-feeder/process stops, "READY" LED is off

1.6.4.3 Programming Errors

Programming errors may occur only during programming or calibration as a consequence of entering data above or below the operating range of the Integrator. If data above or below the limits are entered, the system displays a warning message and the minimum/maximum limits are shown.

1.6.4.4 Equipment Failures

The unit has an internal diagnostic system which detects the following instrument failures:

- Clock calendar circuit failure

- Bad weight signal

- RAM failure

- ROM failure

- Power on

- Default constants installed at power on

- Power down during calibration

- Calibration time expired

- General-purpose external alarms

- Communication error

- BCD error

- Mathematical error

1.6.5 Print Function

Available print functions are:

- Print on command

- Print at pre-selected times of day (up to four)

- Print at pre-selected intervals of time

- Print set-up

- Print alarm

1.7   Symbols

Symbols used in this manual are described in Table 1-1.

Table 1-1: Symbol Identification

Symbol	DESCRIPTION
	ALTERNATING CURRENT
	FRAME (GROUND) TERMINAL
	EARTH (GROUND) TERMINAL
	PROTECTIVE CONDUCTOR TERMINAL
	CAUTION, RISK OF ELECTRIC SHOCK
	CAUTION (REFER TO ACCOMPANYING DOCUMENTS)

1.8   Specifications

This section lists the specifications for the *Micro-Tech 3106.*

Field Mount

NEMA 4X (IP65), dust and watertight

Size: 17 x 13 x 7 inches

Material: Fiberglass reinforced polyester

2 position-mounting feet

Steel Chassis Providing EMI/RFI shielding

Panel Mount

Size: 12 x 4 x 7.5 inches

Material: Chromated mild steel

Environmental Conditions

Mounting

Should be mounted as close to the load cells as possible without being exposed to excessive heat or moisture

Field Mount suitable for outdoor mounting

Temperature (Ambient)

Storage: -40° to +158° F (-40° to +70° C)

Operating: +14° to +122° F (-10° to + 50°C)

Relative Humidity

Up to 95%, non-condensing

Pollution Degree

2

Altitude

Up to 6,561 ft (2000 m)

Power Requirements

Voltage Range

Nominal voltage +10%, -15%

Nominal Voltage

115/230 VAC, selectable

Nominal Frequency

50/60 Hz

Fusing

400mA Slo-Blo, 115 VAC, Type T

200mA Slo-Blo, 230 VAC, Type T

Power Consumption

50 VA max

Maximum Non-Destructive Input Voltage

150/300 VAC for 1 minute

Over Voltage Category

Category II

DC Power Supply

Auxiliary Power Supply Output (Alarm Contacts, etc.)

Output Voltage:	24 VDC
Isolation:	Yes – 500 volts
Output Ripple:	1.0 V peak to peak typical
Output Current:	600 mA Maximum
Short Circuit Protection	

AC Power Supply

EMI/RFI Protection

115/230 VAC, selectable (UL, CSA, VDE approved)

50/60 Hz transformer

Force Sensor

LVDT (Linear Variable Differential Transformer) with preamplifier.
The preamplifier is excited by an 11 – 15 VDC signal provided by the
Integrator.

The LVDT/preamplifier combination returns a frequency in the range of 100 to
2500 Hz

Maximum distance between the LVDT and the Integrator is 1000 feet (305 m)

Current Output

1 current output

Output Range: User selectable 0 –20 mA or 4 – 20 mA, representing 0 to 100% variable.

Resistive Load: 800-ohm max, Loop

Analog I/O Board (B)

(2) High level inputs

Type: Differential voltage input (0 – 20 mA or 4 – 20 mA with internal resistor, jumper selectable)

Range: 0 – 5 V, or ±V, programmable

Maximum usable input voltage: 106% of full scale

Non-isolated

Maximum non-destructive input voltage: 12V peak

(2) Current Outputs

Optically isolated

Isolated Power source

Voltage output by adding an internal dropping resistor

Output range: User selectable 0 – 20 mA or 4 – 20 mA, representing 0 to 100% variable

Resistive load: 800 ohms maximum

Capacitive load: no limit

Standard Communication

Serial Interface

Type:	Conforms to RS-232C, RS-485/422, and 20 mA standards; supports 2 and 4 wire multi-drop in RS-485. 20 mA loop is passive ONLY.
Interfacing:	RS-485 supports 2-wire or 4-wire multi-drop networking; RS 232 C provides support for modem
Data Rate:	300 to 19200, operator selectable from the keyboard
Data Format:	Asynchronous, bit-serial, selectable parity, data length, and stop bits
Optical Isolation:	250 VRMS max
Input Voltage:	±30 Vdc, max (RS-232C)
	± 15/-10 Vdc max (RS-485)
Cable Length:	50 feet max (RS-232C)
	4000 feet max (RS-485 and 20 mA)

Chapter 2
Installation

This chapter describes the Micro-Tech 3106 Impact Flow Meter Integrator installation procedure, hardware configuration, and initial programming. Initial programming is a machine directed procedure prompting the operator to enter required impact flow meter parameters. After all parameters have been entered, the Micro-Tech 3106 performs an unassisted zero and span calibration.

2.1   Safety Precautions

⚠ **CAUTION**
Do not install, operate, or perform any maintenance procedures until you have read the safety precautions that follow.

⚠ **CAUTION**
Do not connect power to the electronics or turn on the unit until you have read and understood this entire manual. The precautions and procedures presented in this manual must be followed carefully in order to prevent equipment damage and protect the operator.

⚠ **WARNING**
The instrument and door should always remain closed during operation, and only opened for maintenance procedures. Be sure to close the cover before resuming operation.

⚠ **WARNING**
All switches (such as control or power) must be off when checking input AC electrical connections, removing or inserting printed circuit boards, or attaching voltmeters to the system.
Incoming voltages must be checked with a voltmeter before being connected to the electronics.

⚠ **WARNING**

Extreme caution must be used in testing in, on, or around the electronics, PC boards, or modules. There are voltages in excess of 115 V or 230 V in these areas. Avoid high voltage and static electricity around the printed circuit boards.

⚠ **WARNING**

Maintenance procedures should be performed only by qualified service personnel and in accordance with procedures/instructions given in this manual.

⚠ **WARNING**

During maintenance, a safety tag (not supplied by Thermo Electron) should be displayed in the ON/OFF switch areas as a precaution instructing others not to operate the unit.

⚠ **WARNING**

Only qualified service technicians should be allowed to open and work in the electronics, power supply, control, or switch boxes.

⚠ **WARNING**

This equipment should not be operated or utilized in applications other than those stated in the original order.

To adapt production rates or applications consult Thermo Electron products Customer Service for recommendations.

⚠ **WARNING**

All panels covering the electronics must be in place and tight before wash down procedures. Damage to the electronics could result from water, moisture, or contamination in the electronics housing.

2.2   Incoming Power

> ⚠ **CAUTION**
>
> **Verify that the input voltage is correct with an AC voltmeter before you connect it to the instrument.**

> ⚠ **CAUTION**
>
> **Earth ground must be provided to the instrument. Do not use conduit to provide this ground.**

> ⚠ **CAUTION**
>
> **A readily accessible disconnect device shall be incorporated in the field wiring. This disconnect device should be in easy reach of the operator and it must be marked as the disconnecting device for the equipment.**

2.2.1   Critical Wiring Conditions

1. Ensure power is off at the mains
2. Do not route sensor and signal cables in the same conduit with power cables or any large source of electrical noise.
3. Earth ground all enclosures and conduits. A ground connection between all conduits is required.
4. Connect the shields ONLY where shown.
5. Check that all wires are tight in their connections.
6. Never use a "megger" to check the wiring.
7. A readily accessible disconnect device shall incorporated in the field wiring. This disconnect should be in easy reach of the operator and it must be marked as the disconnecting device for the equipment.
8. All conduits should enter the bottom of the enclosure. Do not run conduit through the top or sides of the enclosure.

2.3   Field Mount Installation

The Integrator should not be exposed to excessive vibration, heat, direct sunlight, or moisture. The ideal mounting location would be on a separate wall or beam in view of the DE10/DE20 sensor. Consult the factory in applications requiring a distance greater than 1000 feet between the sensor and the Integrator.

2.3.1   Mounting

Mount the Integrator to a rigid, flat, vertical surface using four mounting tabs provided on the back of the enclosure see Figure 2-1.

A flat mounting surface will prevent twisting and/or warping of the fiberglass enclosure when tightening the mounting fasteners (¼" or 6 mm fasteners are required).

Figure 2-1: Typical Micro-Tech 3106 Field Mount Installation
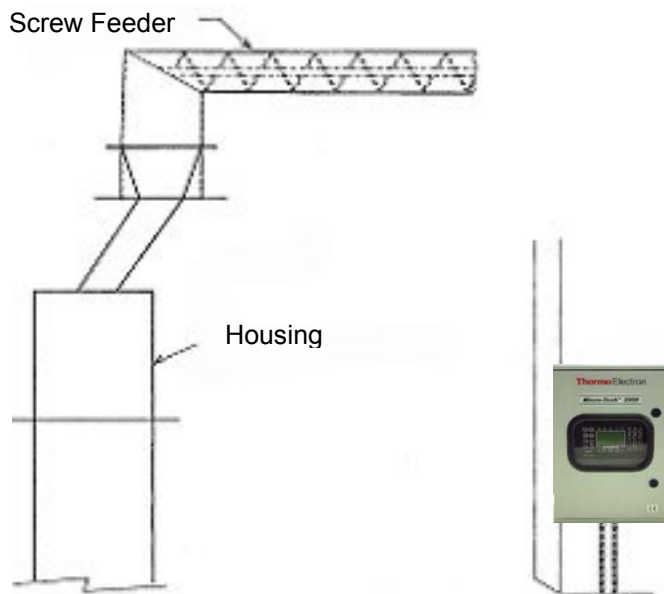
A95088

Figure 2-2: Electrical and Mounting Guidelines of the Micro-Tech 3106 (Field Mount)
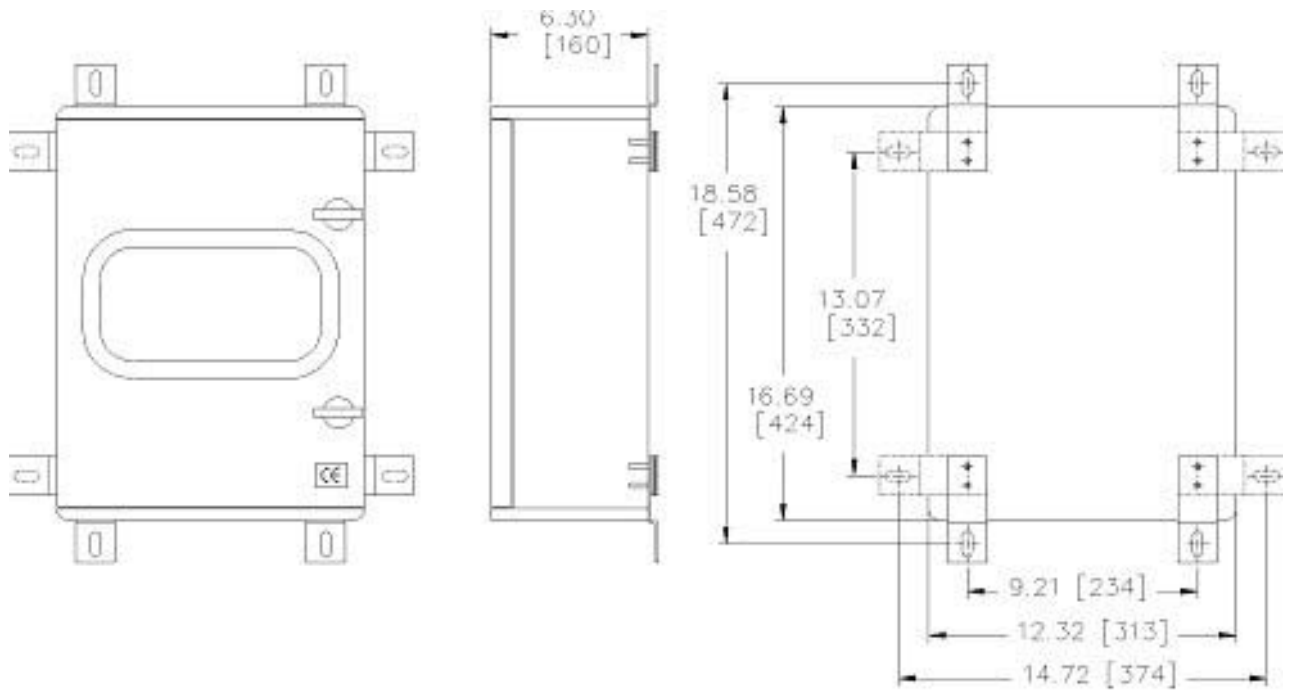
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⚠ **CAUTION**
Refer to the field-wiring diagram as a guide if you do not have a specific wiring diagram for your system. Follow your local electrical codes and regulations for minimum wire size and routing.

2.3.2   Connecting Incoming Power – Field Mount

To connect the incoming power, use the following procedure.

Note: All units shipped from the factory are configured for 115 VAC. If you desired 230 VAC, make sure the power selector switch is set to 230 VAC (Section 2.5.1).

1. Loosen the screw latch mounted on the front chassis. Open the door (see Figure 2-3).

2. Route incoming power wiring through a conduit hole at the bottom right of the enclosure. Leave ample loose wiring (typically 8") to facilitate removing the terminal connectors.

3. Wire safety ground terminal located on the side of the chassis.

4. Wire HOT to Terminal L on Power Input Terminal.

5. Wire NEUTRAL to Terminal N on Power Input Terminal.

6. If additional I/O is required at the line voltages, these wires should be routed through a conduit hole on the bottom right of the enclosure. Leave ample loose wiring (typically 8") to facilitate removing the terminal connectors.

7. All additional field wiring operation at voltages less then 30 V must be located on the left bottom of the enclosure. Leave ample loose wiring (typically 8") to facilitate removing the terminal connectors.

8. Close the inside panel and tighten the screw to secure the cover.

Figure 2-3: Field Mount Inside Front Panel

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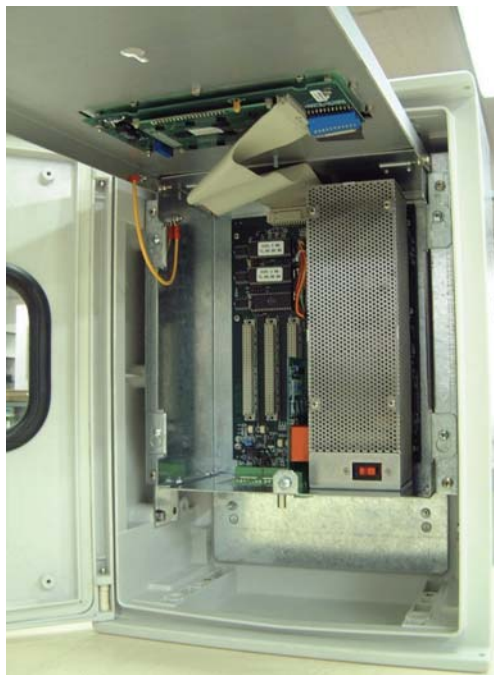
2.4   Panel Mount Installation

The panel-mounted Integrator is suitable for mounting in a control panel. The control panel should not be exposed to excessive heat, moisture, or vibration. The front bezel, when properly seated forms a dust seal.

A two (2) inch clearance around the top and bottom of the Integrator is required for convection cooling. Additional clearances may be required if equipment mounted directly below generates excessive heat. Clearance in the back is necessary for wiring access and fuse replacement. Clearance on the side is necessary for inserting the chassis holding brackets from the back after insertion of the Integrator.

2.4.1   Mounting

Provide a cutout in the panel and insert the Integrator after removing the holding brackets see Figure 2-4. From the back, insert the holding brackets on both sides of the Integrator. Tighten the holding brackets to support the Integrator and form the dust seal.

Figure 2-4: Electrical and Mounting Guidelines Micro-Tech 3106 (Panel Mount)
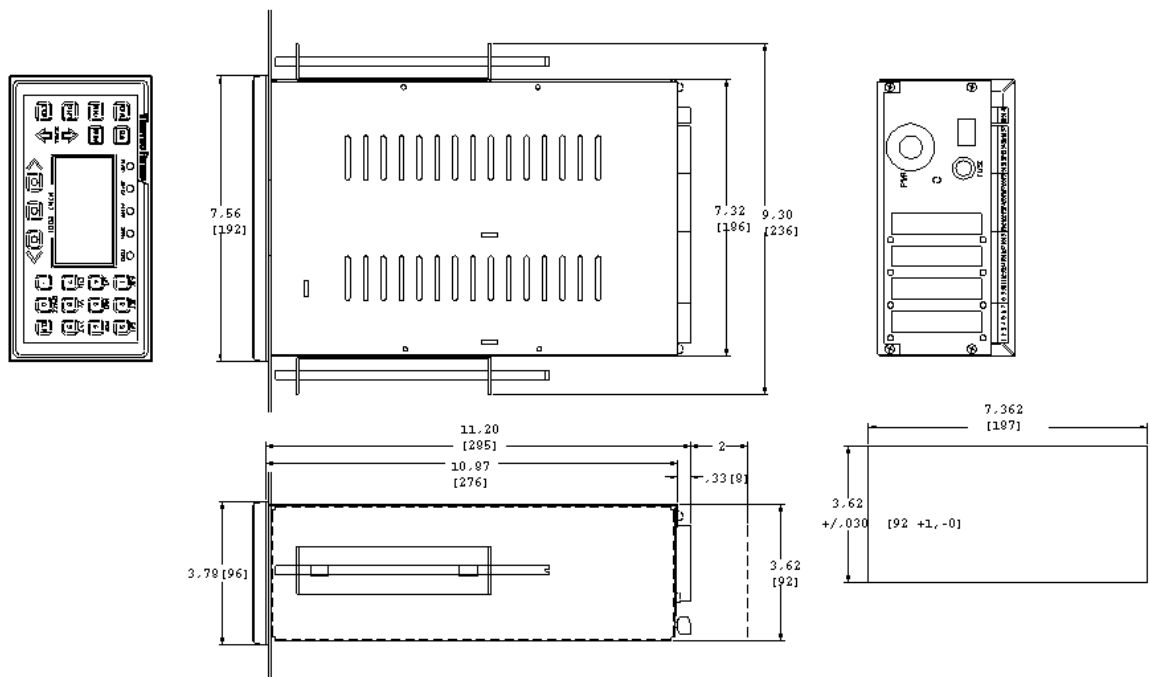
A90851

Figure 2-5: Installation Micro-Tech 3106 (Panel Mount)
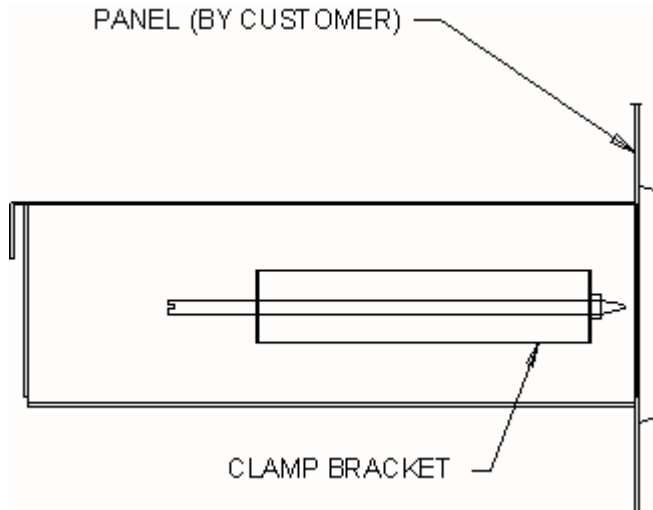
A00884.gif

- See Figure 2-5 for panel cutout, outline, and mounting dimensions.

- The large rubber band shipped with the unit can be used to hold clamp brackets in place during installation.

Remove clamp brackets and slide chassis assembly through front of cut-out. Re-install clamp brackets into chassis and tighten threaded rods against the back of the panel until the unit is secure.

2.4.2   Connecting Incoming Power – Panel Mount

To connect incoming power for panel mount installation, use the following procedure:

- For input power, use 14 AWG standard wire

- Wire the safety ground terminal located on the right backside of the enclosure.

- Wire the HOT to terminal labeled 1 of Terminal L on the Power Input Terminal.

- Wire the NEUTRAL to the terminal labeled 2 of Terminal N on the Power Input Terminal.

Note: All units shipped from the factory are configured for 115 VAC. If 230 VAC is required, refer to Section 2.5.1.

2.5   Impact Flow Meter Integrator Configuration

The *Micro-Tech 3106* is one of a family of products that is supported by a common hardware platform. Configuration of the hardware platform and additional circuit boards enable the hardware platform to be used for several discrete instruments.

Wire jumpers are installed at the factory for the instrument ordered and should not have to be reconfigured in the field.

Switches and removable jumpers are described in this section. The default position is noted in each description and, in most cases, is not changed.

2.5.1   Motherboard Configuration Jumpers and Switches

TO BE PERFORMED BY QUALIFIED SERVICE PERSONNEL ONLY

1. General Purpose Digital Inputs

Located on the motherboard are provisions for 5 programmable status inputs. The programmable inputs may be configured as normally open or normally closed. Inputs are *designed* for dry contacts. (Refer to Table 2-1 for configuration information.)

Figure 2-6: Micro-Tech Motherboard

OP 26

EPROM – U66

EPROM – U58

Lithium Battery

Audit Trail

Card Slots

Slot 3

Slot 2

Slot 1

Slot 4 – Relay
Output

Area of detail in
Figure 2-7
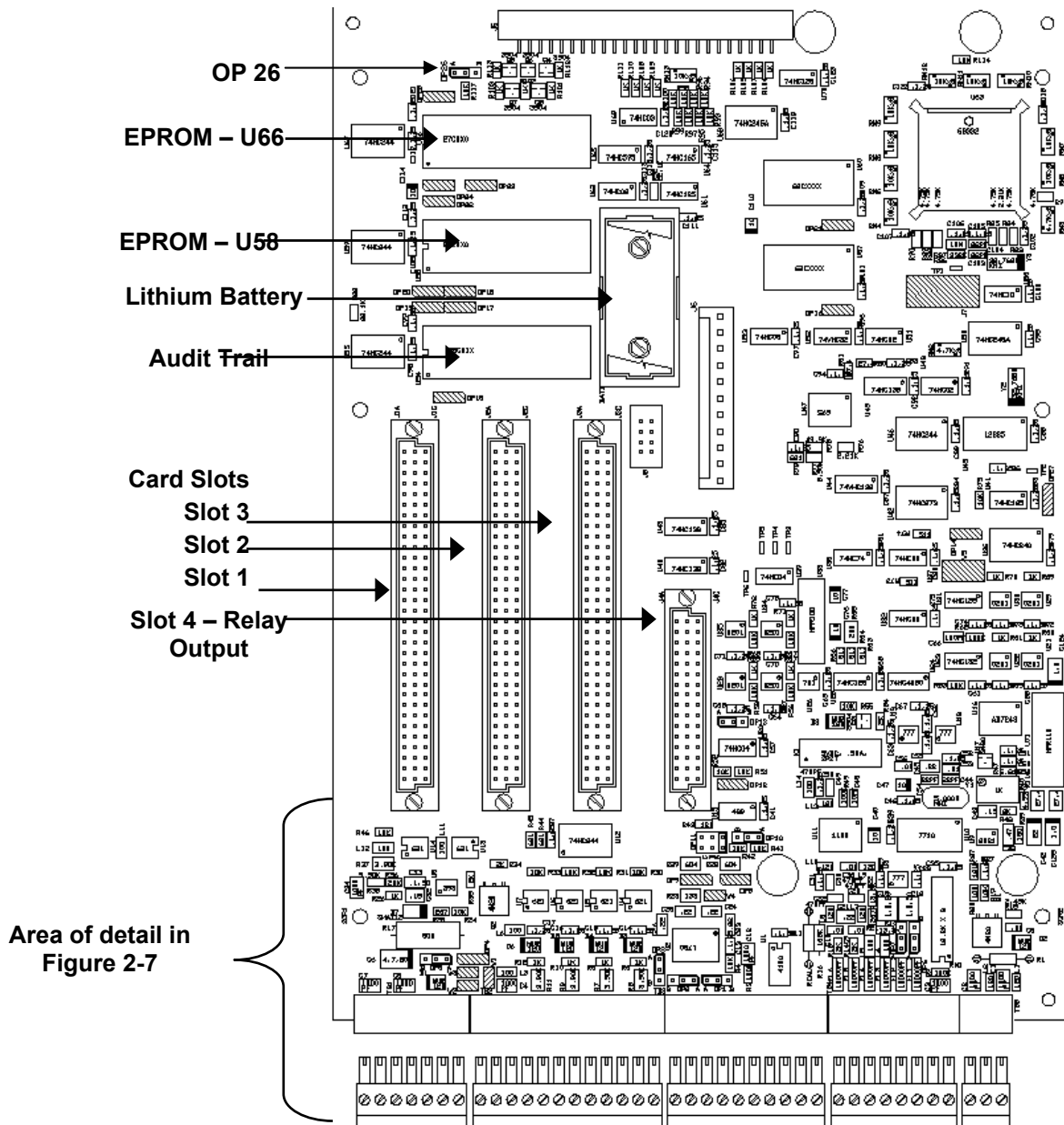
A90870

Table 2-1: Programmable Input Choice

General Purpose Alarm 1	Product # 4
General Purpose Alarm2	Product # 5
General Purpose Alarm 3	Product # 6
Print	Product # 7
Reset Total	Product # 8
Reset Alarm	Product # 9
Auto Zero	Product # 10
Product # 1	Batch Stop Command *
Product # 2	Batch Start-Up Command *
Product # 3	* Only with Loadout Option

2. *Digital Outputs*

A relay output board (all dry contacts) and is plugged into slot 4 of the motherboard. One of the relay outputs is permanently assigned as the fault output and cannot be programmed to any other function. The other 3 relays can be programmed to one of the choices shown below in either a normally open or normally closed position.

There is an additional solid-state output (located on the motherboard), which can also be programmed to one of the functions shown below.

The programmable output choices are listed in Table 2-2.

Table 2-2: Programmable Output Choices

Alarm Cumulative
Shutdown Cumulative
Ready
Low Rate
High Rate
Totalization Pulse (Remote Counter)
Batch Preset Reach
Batch End
Air Purge

If more than five digital inputs and four digital outputs are required, an optional digital I/O is necessary.

Figure 2-7: Area of Detail on Motherboard

OP 13
OP 11
OP 10
OP3   OP2   OP1
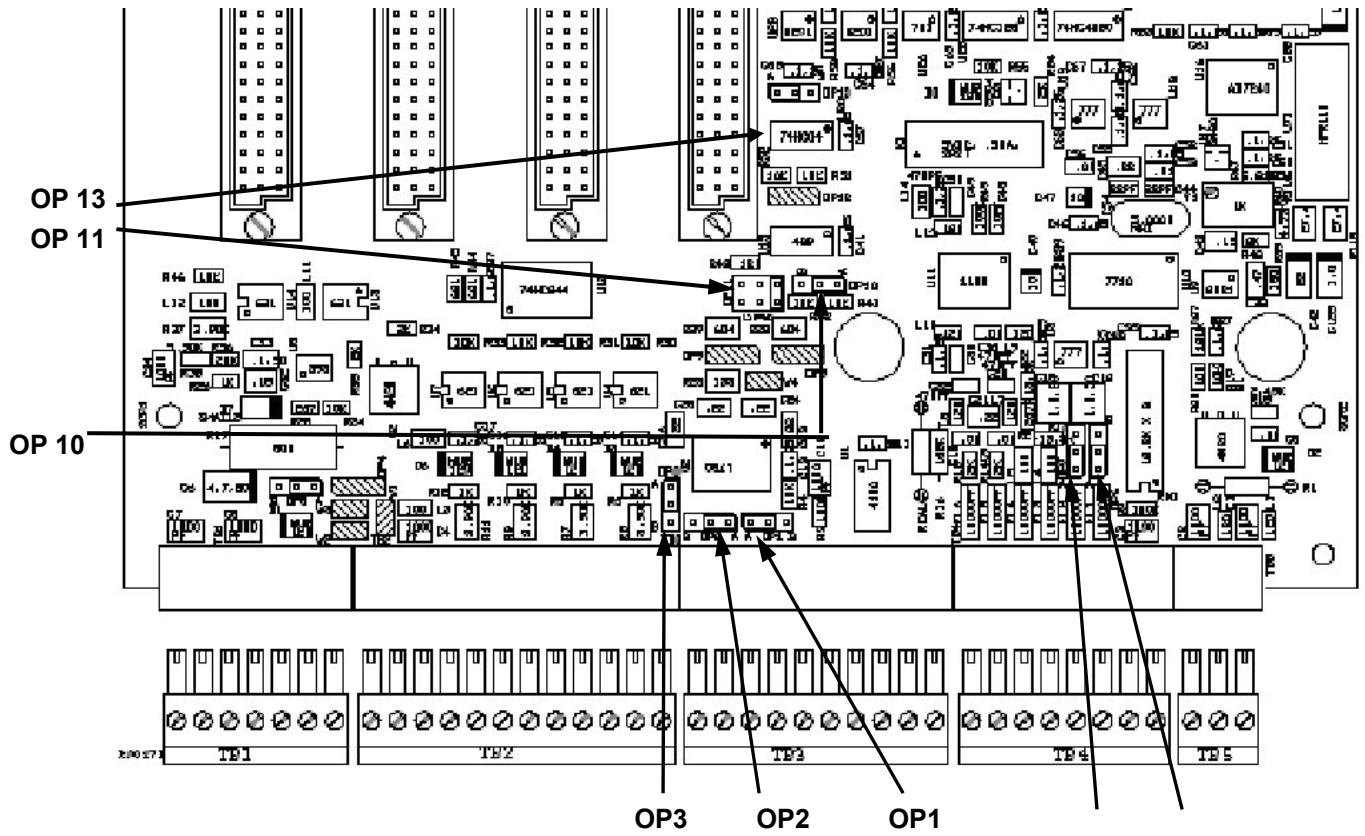
A95090

2.5.2   Pulse Frequency Modulation (PFM) Board

The PFM board is located on the motherboard (slot 1, 2, or3). This board accepts the unconditioned mass flow signal from the impact sensor. No configuration jumpers or switches are located on this board.

Figure 2-8: Pulse Frequency Modulation (PFM) Board
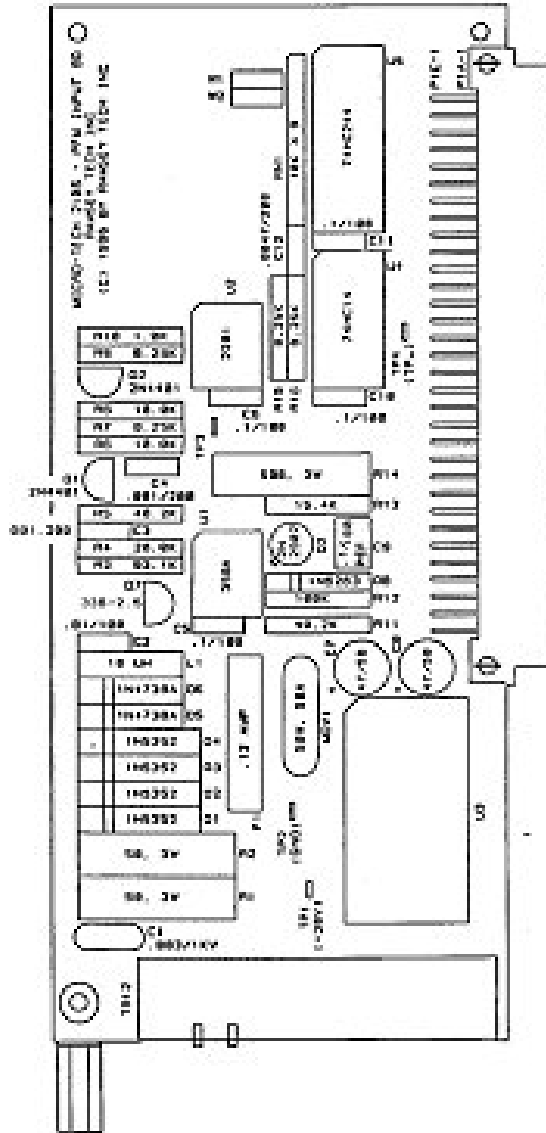
A95091

Table 2-3: Micro-Tech 3106 Motherboard Jumpers

Jumper Location	Foil/Jumper	Default Position	Description
OP1	Jumper	A	Comm A=RS-485/20mA B=RS-232
OP2	Jumper	A	Comm A=RS-485/20mA B=RS-232
OP3	Jumper	A	Comm A=RS-485/20mA B=RS-232
OP10	Jumper	A	Comm A = RS-485/232 B = 20 mA
OP11	Jumper	A	Comm A = Terminated B = Not Terminated C = 20 mA
OP13	Jumper	A	Comm A = Normal B = Multidrop
OP26	Jumper	A	OIML Calibration Jumper A = Allows Cal B = Restricts Cal

Table 2-4: Terminal Wiring Configurations

TB2 Digital Input				TB3 COMM	TB12 PFM Board		TB5 Analog Output	
8	+24 V			See	8	-	38	+
9				Table 2-7	7	+	39	-
10	Shield			Table 2-8	1	Shield	40	Shield
11				Table 2-9				
12	Sig	In2						
13	Com							
14	Sig	In3						
15	Com							
16	Sig	In4						
17	Com							
18	Sig	In5						
19	Com							

Analog I/O Board TB4 (Option)

4 +	Anal. In 1	
5 -		
8	Shield	
6 +	Anal. In 2	
7 -		
2 +	Anal Out 2	
3 -		
1	Shield	
9 +	Anal Out 3	
10 -		

Table 2-5: Relay Output Board

Micro-Tech 3000	
Relay Output Board	
1	NC
2	COM
3	NO
4	NC
5	COM
6	NO
7	COM
8	NO
9	COM
10	NO

Relay K1 Fault Output (terminals 1–3)
Relay K2 Output #1 (terminals 4–6)
Relay K3 Output #2 (terminals 7–8)
Relay K4 Output #3 (terminals 9–10)

*Relays Rated 33 VAC 0.5A - 70 VDC 0.5A

2.5.3   Analog Output (Motherboard)

A current output signal is available for customer use on motherboard Terminal Block 5. The rate, speed, or load parameters can be selected by the customer to be sent to a rate meter, recorder, or controller. The output range is adjustable from 0-20 mA, 4-20 mA, 20-0 mA, or 20-4 mA.

Table 2-6: Motherboard Current Output - TB 5

Motherboard Current Output #1 TB5	
38	+
39	-
40	Shield

2.5.4   Analog Input/Output Board (Option)

The analog input/output board is available in two configuration described below. (A) has one current output only; whereas, (B) has two voltage inputs and two current outputs. No configuration switches or jumpers exist on the analog boards.

Board type (A) One user definable 0-20/4-20 or 20-4/20-0 mA output.

The rate function can be selected by the customer to be sent to a rate meter, recorder, or controller.

Board type (B) Two +/- 5VDC differential inputs and two user definable 0-20/4-20 or 20-4/20-0 mA output

Inputs – The functions that can be selected for each input are: None, Set Point (SP), Moisture Compensation

Outputs – The functions that can be selected for each output are: Off and Rate

Table 2-7: Analog (TB4) Input/Output Board

Analog (TB4) In/Out Board	
2	+ Out –2
3	-
1	Shield
9	+ Out –3
10	-
4	+ In-1
5	-
8	Shield
6	+ In-2
7	-

2.5.5   Communications Configuration (Motherboard) COMM 1

This section describes the setup procedure and hardware configuration for the communications from the motherboard. Use the following steps to configure the communications:

Select the jumper positions for the desired communication standard. Refer to Table 2-3 for jumper locations.

1. Wire to the Terminal Block 3 on the motherboard for the communication standard selected, RS-485, RS-232c, 20 mA current loop.

2. Refer to *REC 3949, Chapter 3* for the remainder of the communication setup.

Table 2-7:   Motherboard COMM 1 Communications Wiring Configuration - TB3 – RS-485

Motherboard RS-485 Communications TB 3	
25	Shield
29	-RX
28	+Rx
24	Common
21	+TX
20	-TX

Maximum cable length 4000 ft
Use Beldon 9830 or equivalent

Table 2-8: Motherboard Wiring Configuration TB 3 – RS-232 Communications

Motherboard RS-232 Communications TB 3	
25	Shield
23	CTS
24	Common
22	RxD
21	TxD
20	RTS

Maximum cable length 50 ft
Use Beldon 9538 or equivalent

Table 2-9: Motherboard Wiring Configuration TB 3 – 20mA Serial Communications

Motherboard 20 mA Serial Communications TB 3	
25	Shield
26	+20 mA (out)
27	-20 mA (out)
28	+20 mA (in)
24	-20 mA (in)

Maximum cable length 4000 ft
Use Beldon 9829 or equivalent

Table 2-8: Mother Board Communication Jumper Settings

JUMPERS						
Mode	**OP1**	**OP2**	**OP3**	**OP10**	**OP13**	**OP11**	
RS-485	"A"	"A"	"A"	"A"	"A" Normal "B" Multi-drop	"A" Terminated 'B' Not Terminated	Default
RS-232	"B"	"B"	"B"	"A"	"A" Normal	"B" Not Terminated "A" Terminated	**Default**
20 mA	"A"	"A"	"A"	"B"	"A"	"C"	

2.6   Determining Installation Parameters

Following mechanical and electrical installation, it is necessary to record field data specific to your application into the *Micro-Tech 3106* memory. The following setup procedure should be completed before calibration of your belt scale system. Refer to Chapter 3 of this manual for more details or assistance.

Before applying power to the flow meter system, it is necessary to complete the following statements. Refer to your System Data Sheet in the front of your flow meter manual.

2.6.1   Flow Meter Capacity

Determine the flow meter's capacity in tons per hour and record the capacity below. (Example: 400.0)

_____(Tons Per Hour) Scale # 1

_____(Tons Per Hour) Scale # 2

2.7   Programming the *Micro-Tech 3106 (Initial Setup)*

When power is first applied to the instrument, the system steps the operator through menus and options that bring the system to a weighing state. Soft keys, numeric keys, and the scroll control keys are used to select choices. The **RUN** and **MENU** control keys are inactive during this procedure.

⚠ CAUTION
Verify 115/230 Volt selection is correct. Improper connection may result in damage to your *Integrator*.

The programming mode begins after cold start (See section 4.3.3). Information requested by the instructional screens should be entered before moving to the next screen. The flow meter is calibrated at the end of this procedure provided the correct information is entered. The alarm light flashes during the programming procedure and clears when calibration is complete.

The programming mode begins with the following instructional screens.

-- MEMORY ERASED --
Chose the language key to continue to
ESP   USA
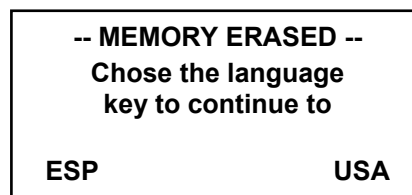
2.7.1   Language

The *Micro-Tech 3106* is a dual language instrument. USA is always the first language. The standard configuration provides *Spanish* (*ESP*) as the second language. Other languages, such as *German* (*GER*), are available upon request (consult factory). Press the desired language.

> **Initial scale setup
> and calibration
> Press down SCROLL.**

Press the **DOWN SCROLL** key.

> **Press key under HELP
> for more information.**
>
> **HELP**

"HELP" is flashing

Press the **HELP** soft key.

> **Key with dot (soft
> key) performs action of
> of word above it.**
> **MORE   RETURN**

When **RETURN** is pressed, the user is returned to the previous screen. Pressing **MORE** advances the system to the next screen.

Press **MORE**

> **Use down SCROLL key
> to advance through the menus**
>
> **MORE   RETURN**

Pressing **MORE** or **RETURN** reverts the screen back to previous screens in the series.

Press the **DOWN SCROLL** key.

2.7.2   Measure Units

Press **SCROLL DOWN** to accept the default unit, or **CHOICES** to scroll selections. Press **ENTER** to confirm your selection. Scroll down.

```
┌─────────────────────────────────┐
│       -- DISPLAY SCROLL 1 --     │
│           Measure units          │
│            >  English  <         │
│                                  │
│     CHOICE          ENTER        │
└─────────────────────────────────┘
```

Default: ENGLISH

Choices: ENGLISH, METRIC, MIXED
                    If English, all units in English
                    If Metric, all units Metric
                    If Mixed, units may be a combination of English
                    and Metric

Note: If the Measure units are changed from English to Metric (or vice versa) after the scale is calibrated, the span number changes but the calibration remains the same.

2.7.3   Totalization Units

The units to be used for Totalization are selected here. Press ENTER soft key to accept the default unit, or CHOICES soft key to scroll selections. Press ENTER to confirm your selection. Scroll down.

```
┌─────────────────────────────────┐
│       -- DISPLAY SCROLL 2 --     │
│          Totalization Units      │
│             >  Tons  <           │
│                                  │
│     CHOICE          ENTER        │
└─────────────────────────────────┘
```

English/Mixed	Metric	If Mixed
Default: Tons	**Default**: tones	**Default**: Tons
Choices: Tons, Ltons, Pounds	**Choices**: tones, kg	**Choices**: Tons, Ltons, kg, Pounds, tonnes

2.7.4 Rate Units

The rate is displayed according to the units selected here. Press **ENTER** soft key to accept the default unit, or **CHOICES** soft key to scroll selections. Press **ENTER** to confirm your selection. Scroll down.

```
-- DISPLAY SCROLL 3 --
        Rate Units
      >   TPH   <

  CHOICE        ENTER
```

English/Mixed	Metric	If Mixed
Default: Tph	**Default**: kg/h	**Default**: Tph
Choice: Tph, Ltph, Lb/mn, T/mn, LT/m, Percent %, Lb/h	**Choice**: t/h, kg/mn, t/mn Percentage %, kg/h	**Choice**: Tph, Ltph, kg/mn, t/mn, Lb/mn, t/mn, LT/mn, Percent kg/h, t/h

2.7.5 Max. Scale Capacity

The next entry is the scale capacity, which is the maximum rate at which the scale is allowed to work. This entry also defines the default number of decimal places that are used for displaying rate. Use numeric keys for entering the number, confirm with **ENTER**. Scroll down.

```
-- SC DATA SCROLL 1 --
    Max. scale capacity
    500.0          Tph
         ENTER
```

Default: 500.0
Min: 1
Max: 200000

2.7.6 Scale Divisions

When the Scale capacity is entered, the number of decimal places is also defined. If, for example, the User enters 500.0, this sets the "Scale Divisions" parameter to 0.1. Advancing to the next scroll, the User then sees first the Scale Division corresponding to the just entered Scale Capacity (in the example 0.1). If required, the User is able to alter the Scale Division to any of the available options.

The analog output is also defined by Max scale capacity. If the user enters 500.0 and the analog output is set for 4-20 mA, the analog output is 4 MA for 0 Tph flow rate and 20 mA for 500 Tph flow rate. Set the Max scale capacity 5% to 10% higher than the maximum expected flow rate.

If the Max scale capacity is changed after the Impact Flow Meter has been calibrated, the calibration will also be changed. A manual calibration change will be required to correct the calibration. See Section 3.9.2.2 Manual Span procedure.

Press the **ENTER** soft key to accept the default divisions, or the **CHOICES** soft key to scroll selections. Press **ENTER** to confirm your selection. Scroll down.

```
-- SC DATA SCROLL 2 --
     Scale Divisions
 >        0.1        <


 CHOICE          ENTER
```
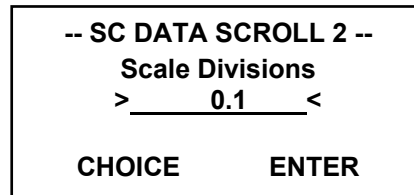
Default: 0.1
Choice: 0.1, 0.2, 0.5, 1, 2, 5, 10, 20, 50, 0.01, 0.02, 0.05, 0.001,
               0.002, 0.005

2.7.7   Quick Automatic Calibration of the Flow Meter

The flow meter is the first zeroed (3 seconds) and then calibrated using material.

```
-        ZERO CAL          -
  Stop material flow, then
        press START
           START
```

When START is pressed, the following screen is displayed for 7 seconds.

```
       AUTO ZEROING
       Please wait …
```
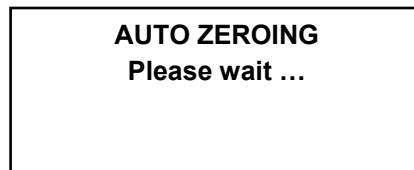
During Auto Zero, no material should be running through the flow meter.

When zero is reached, the system automatically displays the following screen:

```
AUTO ZERO COMPLETED
    Zero # changed
New Zero #   XXXXX
      CONTINUE
```

The word "COMPLETE" is flashing. Press CONTINUE to proceed to the Span Calibration Menu.

2.7.7.1 Initial Span Calibration

Because all materials be have differently when the strike and then rebound off the impact plate of the flow meter, the span calibration must be done using the actual material in a "material test". This test is done by running material through the flow meter for at least 5 minutes. The longer the test, the more accurate the result will be.

All of the material in the material test should be pre-weighed or post-weighed on a high accuracy static scale to obtain the actual weight of the test material. This actual weight is then entered into the integrator to complete the material test.

After initial Zero Calibrate is complete and CONTINUE has been pressed, the following screen displays:

```
   Press start soft key
    then run material..


  START        ABORT
```

If unable to run a material test at this point press **ABORT** and the **RUN** menu displays. The "Ready" light is off, the flow meter is not calibrated. An un-calibrated flow rate displays if product is run over the impact plate, all totalizers display –0- and do not function. Enabling the Totalizers is explained later in this chapter.

To continue with the material test press Start and immediately run material over the impact plate. The following screen displays.

```
    00000.0  Tons
     0000.0  Tph
  Press DONE to end
       DONE
```

During the Auto Span procedure, the resolution of totals is 10 times higher than normal.

Wait until all of the material has passed over the scale, then press DONE.

At the end of the test, the system prompts the operator for the reference weight of the material run during the test:

Pressing **DONE** advances to the following screen:

```
        00000.0  Tons
       Enter reference
     weight :  00.0  Tons
            ENTER
```

The operator must enter the actual weight of the material passed over the impact plate during the material test. Use the numeric keys to enter the actual weight and confirm with the **ENTER** key.

If either of the following – **SETTING ERROR** – screens display, a number has been entered or the actual/reference weight that the Integrator will not accept. One or more operating parameters of the Integrator are incorrect consult Thermo Electron.

```
      -SETTING ERROR –
       max     45000000
          min     500
             RETURN
```

```
      -SETTING ERROR –
   max     35000.00      Tons
   min         0.10      Tons
             RETURN
```

Press **RETURN** and the **ENTER REFERENCE WEIGHT SCREEN** displays again. A different number from the previous must be entered for the actual/reference weight and/or the operating parameter(s) must be corrected.

After the actual/reference weight has been successfully entered, the "Ready" light is on and the following screen is displayed:

```
      SPAN # CHANGED
   New span #     000000

          CONTINUE
```

Press Continue advances to the following screen:

```
SPAN CALIBRATION
Add reference
Weight to totals ?
YES                NO
```

If **YES** is pressed, the amount of material used for the test is added to the master, reset, and operator totals. If **NO** is pressed, the information is lost. The "Ready" light is on, the flow meter is only calibrated at the flow rate just run. Pressing **YES** or **NO** advances to the following screen.

```
SCALE CALIBRATED
Press RUN to start
or MENU for scrolls
```

NOTE: Moisture compensation is inhibited during material calibration.

This is done to make the check of the totalized quantity easier. The static scale provides the weight of the material including moisture. The weight of the water is removed immediately before adding to total at the end of the procedure so that the master, reset and operator's totals are still correct.

If the Impact sensor is not connected or a failure is detected, the message is the following:

```
SCALE NOT CALIBRATED
Press RUN to start or
MENU for scrolls
```

If the Flow Meter is not calibrated, the failure must be corrected and a repeat span calibration/material test must be done. See Section 3.9.2 and Section

After the Initial Zero and Span calibrations, the flow meter functions normally. Subsequent Zero and Span calibrations have slightly different processes. See Section 3.9.2 for details on subsequent calibration. If calibration is required for additional flow rates different than just run for Span, see Section 3.10.

If Abort was pressed before a Span Calibration/material test was done, the following steps will allow the totalizers to function and the "Ready" light will come on.

Press the **RUN** key for the run menu if not already there. Press the **MENU** key for **MAIN MENU 1**. Press the **SPAN CAL** key, then press the **MANUAL** key. The following screen displays:

```
┌─────────────────────────────────┐
│          - MANUAL -             │
│   Rate          000.00  Tph     │
│    Span#        0000000         │
│   ENTER         EXIT    RUN     │
│                                 │
└─────────────────────────────────┘
```

Write down the Span# in the display. Use the numeric keys to re-enter the same Span# and confirm with the enter key. Press the run key to return to the Run menu. The totalizers are now functioning; the "Ready" light is on. The displayed flow rate and totalizers are not yet calibrated. See Section 3.9.2.

Chapter 3
Operation

Your Thermo Impact Weighing System is capable of accurate weighing, provided it is installed, calibrated, operated, and maintained in complete accordance with the instructions contained in this manual and your DE10 or DE20 Impact Weigher Installation and Operation manual.

3.1   Overview

The Model 3106 Impact Flow Meter Integrator is a microcomputer-based instrument that accepts and conditions a weight signal and provides visual and electrical outputs for total weight and rate of flow. A stable sensor excitation voltage is produced by the Integrator.

Auto Zero Tracking enables the impact weighing system to automatically zero itself when material is not running over the impact plate. This is menu selectable. It is not recommended for most impact weighing applications and the factory default is "NO" Auto Zero Tracking. A flashing or constant "Z" will appear on the second line of the display to indicate this option is enabled.

Life expectancy of the RAM support battery is approximately ten years, if power is not applied. Under normal operation where power is on continuously, life expectancy will be much longer.

Errors may occur during initial calibration and their reason must be corrected during initial calibration. During normal operation, an alarm would most likely indicate a failure in the system or improper operation.

Figure 3-1: Impact Flow Meter Integrator
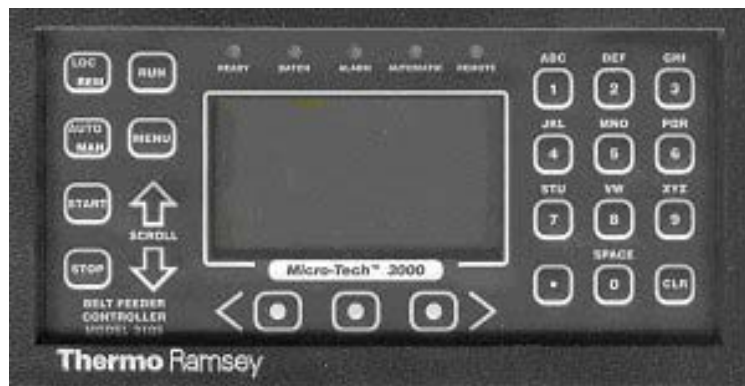
A95092

3.2   Front Panel

The front panel (Figure 3-1) contains the necessary indicators and keys to enable the operator to perform calibrations and required operations after the Integrator has been configured.

3.2.1   LED Indicators

The five red indicators show the status of the Integrator.

1. Zero Calibration in progress.
2. Span Calibration in progress.
3. Alarm pending.
4. Batch or Load Out running.
5. Ready (power on, no calibration running, flow meter is calibrated).

3.2.2   Keyboard

1. Run - Access the Run Menu and returns the Integrator to Run mode whenever pressed.
2. Menu - Permits entry to menus.
3. Up and Down arrow - scrolls up or down the selected menu.
4. Soft Keys - Select displayed function directly above the key. Moves cursor left and right during string editing.
5. Alpha/Numeric Keys 1 through 0 - Enter numerals and letters when string editing. Similar to telephone keys.
6. Decimal Point Key - Enters decimal point.
7. Clear Key - Removes wrong entries prior to pressing ENTER soft key.
8. Total - Displays Master total, Reset total and Operator total. Operator and Reset total may be reset.
9. Print - Starts printout. COMM option is required.
10. Start - Starts load out. Restart if interrupted.
11. Stop - Interrupts load out. Aborts load out if already interrupted.

Note: Start – Stop keys are only active with Load Out option.

3.2.3   Display

The four-line display indicates actual running information or displays menu entry information.

3.3   Menu Display

The Integrator is a menu driven machine that allows the operator to access all setup, text, and calibration parameters. Main Menu screens 1 through 6 can be accessed at any time by pressing the MENU key until the desired menu screen is displayed. Menu scrolls may be selected by pressing the soft key directly below the desired scroll, and then using the Up/Down scroll key.

If the Integrator is password protected, the appropriate password must be entered prior to making changes or calibrating. Menus may be viewed without entering a password, but no entries are allowed unless the password is entered.

Optional scrolls are only available if the available option has been installed. The following screens are activated by the MENU key.

```
      -  MAIN MENU 1  -
    Press MENU for more
    ZERO    SPAN    PROD
    CAL     CAL     SETUP
```

```
   -  MAIN MENU 2  -
Press MENU for more
        SCALE   CALIB
DISPLAY DATA    DATA

```

```
   -  MAIN MENU 3  -
Press MENU for more


PROT    DIAG     TEST

```

```
   -  MAIN MENU 4  -
Press MENU for more
I/O    ALARMS     LOAD
DEFINE  DEFINE    OUT

```

```
   -  MAIN MENU 5  -
Press MENU for more
 *        *
COMM A COMM B   PRINT
```

* Can be AB I/O or Pro DP

```
   -  MAIN MENU 6  -
Press MENU for more
AUDIT
TRAIL    LINEAR
```

3.4   Normal Power On

When the Integrator is powered on after initial programming, the RUN Menu is displayed unless the hardware configuration has been changed.

3.4.1   Hardware Configuration

If the hardware configuration detected at power on differs from the one recorded in memory, the following screen is displayed. This happens if a circuit board has been added or removed during power off, a circuit board has failed, or if a circuit board has come loose and is not pushed in all the way.

```
#1           000.00 Tons
Z            000.00 Tph


             PROD
```

```
-SLOT # n    CHANGED-
Acquire new
configuration ?
YES     NO
```

The screen displays after 10 seconds if the question is not answered. The Integrator assumes the answer is NO. "HW CONFIG. CHANGED" alarm is on and cannot be reset. The above screen displays each time the power is cycled.

If a circuit board is removed or added, and this is a permanent change in configuration, answer YES.

If a circuit board is removed and not replaced the Integrator cancels from memory the setup data of that board. If the same board is added again, the setup data has to be entered again.

If a circuit board is added, the Integrator acquires the new hardware configuration. Setup data for the new board must be entered.

Note: Check the setup configuration in the I/O DEFINE scroll if an I/O board is removed or added. I/O assignments change when the number of I/O boards change.

3.5 Run Menu

When the Integrator is normally powered on after initial programming, the Run Menu is displayed. The Run Menu can always be accessed by pressing the RUN key on the front panel at any time.

3.5.1 Main Menu

```
#1            000.00 Tons
Z             000.00 Tph


         PROD
```

The Run Menu is made up of several screens that can be scrolled using the scroll UP and DOWN keys.

The first line always displays the product number followed by the Master Total, which is the number of tons totalized by the Integrator Flow Meter since installation.

The second line always displays the rate of product flow. A "Z" displays on the left side if the "Auto Zero Tracking" option is enabled and product flow is stopped. Then, the "Z" stops flashing, indicating the Integrator is averaging the sensor signal to accurately re-zero the flow meter. The product flow must stay off during the entire cycle otherwise auto zero is aborted.

The third line is by default blank. It can be programmed to show either the product name, or the date and time (if the optional COMM board is installed). The selection is made in the Display Menu. The fourth line displays the soft keys.

Changing the product number can be done local from the Integrator keypad or remote using a digital input module. See Section 3.10.3 Product Setup Scroll. Up to 99 different products can be selected using local, up to 10 different products can be selected using remote. When Remote is enabled, digital input assignments for each product are made in Main Menu 4 - I/0 DEFINE. There are three general-purpose digital inputs available for use in selecting different products. Additional digital inputs are available by adding an optional DIO board. When the PROD key is pressed from the Run Menu, the following screen displays if the selection of the product is executed from remote.

```
In Remote Product
Selection Mode:


       RETURN
```

Pressing the RETURN key returns the display to the Run Menu.

If the selection of the product is executed from local, the following screen is displayed:

```
Change the product
number?


YES            NO
```

If NO is pressed the Run Menu is displayed.

If YES is pressed, the following screen displays:

```
Prod. Number       1
No Name


ENTER    NEXT     NAME
```

A different product number (1-99) can be entered by either typing in the product number followed by ENTER, or by using the NEXT key to scroll to the next product.

A product name can be entered by pressing the key below NAME. The following screen displays:

```
NO NAME         1

NO NAME
  <  ENTER  >
```

Type in the product name by pressing the appropriate alphanumeric keys. Example: To type a "C", press the "1" key four times. The keys under < and > may be used to scroll to the proper location of the product name. Press the ENTER key after the product name is typed. Then, press the RUN key to return to the Run Menu.

Note: The purpose of the different product numbers is to allow different products to be run through the flow meter. If different products have different bulk densities or size distribution the impact force on the impact plate will change thus changing calibration.

Each product can have it's own Span Calibration, Linearization, and Zero if required to make the flowmeter more accurate with these products. Each product must be initially calibrated when it is first run through the flow meter.

The Integrator then saves the calibration information. When the product number is selected again, the Integrator is already correctly calibrated. Max Scale Capacity is not affected by selecting a new/different product.

The Zero calibration should not change after selecting a new product. If Zero has changed, either the mechanical installation has changed or the electronic calibration has changed.

3.5.2   Reset Total

Press the scroll DOWN key to access the Reset Total Menu.

The Reset Total Menu is similar to the main Run Menu except Master Total has been replaced by Reset Total.

When the RESET key is pressed, the following screen is displayed:

```
RESET        000.00 Tons
Z            000.00 Tph


         RESET

```

```
Do you wish to clear
RESET total?


YES     NO

```

Press "YES" to clear the Reset total. Press "NO" to skip clearing. Pressing either YES or NO returns to the Reset Total Menu.

3.5.3   Alarm Pending

The message ALARM displays in the right soft key if an alarm is pending. The alarm LED also is flashing.

The following menu is displayed after pressing the ALARM soft key.

```
ALARM    NEW
xxxxxxxxxxxxxxxxxxxx
MM-DD-YYYY      HH:MM
RESET           NEXT
```

The keyword "NEW" indicates an alarm that has not been acknowledged yet. When the operator presses the RESET key to clear the alarm, the alarm displays only if the reason that caused the alarm to occur is corrected. If the alarm is still pending, the keyword "ACK" is displayed instead of "NEW".

The third line shows the date and time only if the optional COMM board is installed.

The NEXT key is used to scroll between the pending alarms. The string "xxxxxxxxxxxxxxxxxx" stands for one of the following alarm conditions.

Table 3-1: Alarm Conditions

Clock Fail	External Alarm 1
Bad Weight Signal	External Alarm 2
RAM Fail	External Alarm 3
ROM Fail	Overflow Totalizer
High Rate	AZT over limit
Low Rate	Batch deviation
Warm Start	BCD Overflow
Bad Weight Signal	Math error
RAM Fail	Printer error
ROM Fail	Hardware Configuration Changed
High Rate	Allen-Bradley Remote I/O Error
Low Rate	PROFIBUS-DP Error
Warm Start	
Cold Start	
Power Down During Calibration	
Calibrate Time Elapsed	

3.6   Total Key

The TOTAL key accesses menus that contain detailed information for the three available totalizers: Reset, Operator, and Master.

Reset Total can be reset to -0- at will without a password. Operator Total can be reset to -0- at will, or may require a password depending if one is installed. Master Total cannot be reset to -0-.

NOTE: The Reset and Operator Totals are stored according to product number.

Press the TOTAL key for access and scroll up or down to find the Reset Total screen. Pressing RUN returns to the Run Menu.

```
RESET TOTAL      #1
SINCE      00-00-0000
          000.00  Tons
RESET
```

The first line shows the totalizer type followed by the product number.

The second line is only displayed if the optional COMM board is installed, and indicates the last date when the Reset or Operator Total was reset.

```
OPERATOR TOTAL    #1
SINCE      00-00-0000
          0000.00 Tons
RESET
```

The RESET key allows the operator to reset the desired total. When the RESET key is pressed, the following screen is displayed.

```
Do you wish to clear
xxxxxx total?

YES     NO
```

xxxxxx can be RESET or OPERATOR. Press "YES" to clear the total. Press "NO" to skip resetting.

The next screen is very similar to the previous ones; only the Master Total is displayed instead of the Reset or Operator Total. The RESET key is not displayed here since the Master Total cannot be reset to -0-.

```
MASTER TOTAL
SINCE      00-00-0000
            000.00 Tons


```

3.7   Print Key

See Serial COMM manual if COMM option is installed.

3.8   Start Stop Keys

Enabled only if Load Out option is installed. See REC 4030 for instructions and more information.

3.9   Calibration

Main Menu 1 contains the Calibration Menu and Product Selection Mode Menu. Main Menu 1 is selected by pressing the MENU key until Main Menu 1 displays. Desired calibration scrolls are selected by pressing the soft keys directly below the desired scroll.

```
-    MAIN MENU 1    -
Press MENU for more
ZERO     SPAN    PROD
CAL      CAL     SETUP

```

3.9.1   Zero Calibration

During any Zero Calibration all equipment such as screw conveyors, rotary airlock feeders, bucket elevators, dust collection, etc. in the area of the DE10/DE20 senor should be on/running with no material flowing.

1. The following screen displays when "ZERO CAL" is selected.

```
-       ZERO CAL      -
Stop material flow,
then press START.
START    EXIT   MANUAL

```
Password: Operator

Pressing the EXIT soft key returns the operator to Main Menu 1. Pressing MANUAL advances to Step 2 below. Pressing RUN at any time returns to the Run Menu.

When START is pressed, the following screen is displayed for 7 seconds.

```
AUTO ZEROING
Please wait
Rate:    000.0 Tph
Tot      000000 Tons
```

During Auto Zero, resolution of the total is ten times higher than normal.

The word "COMPLETED" is flashing. Pressing ADV changes from Error % to Accumulated Weight. The percentage of error is related to max scale capacity.

Pressing NO returns the screen to Main Menu 1 without changing the zero number.

```
AUTO ZERO COMPLETE
Error  0.00%
Change zero?
YES    NO    ADV
```

Pressing YES the zero number is changed and the next screen displays.

ADV changes from "Old zero" to "Rate, to "Total", and to "Error %".

Press MENU to repeat Auto Zero calibration. Press RUN to return to the Run Menu.

```
ZERO # CHANGED
New zero # 00000
Old zero # 00000
RUN      MENU   ADV
```

2. Manual Zero

The Manual Zero procedure shows the zero constant and allows direct entry if known. Use the numeric keys to enter the new Zero# and the ENTER key to confirm the new number.

```
-    MANUAL ZERO    -
Rate     000.0 Tph
Zero  # 00000
ENTER  EXIT     RUN
```

Password: Operator

Default: 40000
Min: 0
Max: 120000

3.9.2   Span Calibration Material Test

Span Calibration must be done at maximum expected flow rate of the system.

Because all materials behave differently when they strike, and then rebound off, the impact plate of the Flow Meter, the Span Calibration must be done using the actual material in a "material test". The test must conform to the following:

- The test must be at least 5 minutes long

- The flow rate must be constant/steady for the entire test.

- The test must be at least 200 counts o the 3106 Integrator.

A count is defined as 1 tenth of a unit of what is set in the Integrator totalizer. If the Integrator totalizer is set to pounds, one pound is .1 pound; if the totalizer is set to tons, one count is .1 ton, etc.

The longer the material test is run, the more accurate the flow meter will be. All of the material in the material test should be pre-weighed or post-weighed on a high accuracy static scale to obtain the actual weight of the test material. This actual weight is entered into the Integrator to complete the test.

Before any Span Calibration, Linearization in Main Menu 6 must be set to NO.

Go to Main Menu 6 using the MENU control key. Press the LINEAR key. Press the scroll DOWN key and the following screen displays.

```
-  LINEARIZATION  -
Linearization
>no<
CHOICE     ENTER
```

Default: NO

Selections: YES, NO

Use the CHOICE key to select NO if not already selected.

Press the RUN key to return to the Run Menu.

3.9.2.1   Automatic Span Calibration

1. Press the MENU key which brings up Main Menu 1.

2. Press the SPAN CAL key and the following screen displays.

```
SPAN CALIBRATION
Stop material flow,
then press START.
START   MENU   MANUAL
```

3. Pressing the MENU key returns the display to Main Menu 1.

4. Pressing the MANUAL key changes the display to the Manual Span procedure which is described in step 2.

5. Press START - totalization stops and the following screen displays.

```
Press START soft key
then run material

START
```

6. Press START and immediately run material over the impact plate. The following screen displays.

```
        000.00 Tons
        000.00 Tph
Press DONE to end
DONE    ABORT
```

During the Auto Span procedure, the resolution of total is 10 times higher than normal.

Pressing ABORT returns the display to Main Menu 1.

Wait until all material has passed over the impact plate, then press DONE. The following screen displays.

```
      0000.00 Tons

Ref. weight known?
YES      NO
```

When NO is selected, the system is notified that the reference (actual) weight of the material is not known. The Run Menu is displayed and MAT'L is flashing to remind the operator that the material test is incomplete.

```
#1          000.00 Tons
            000.00 Tph


MAT'L    PROD
```

7. Press MAT'L when actual material weight is known.

8. If YES was answered to Ref. weight known?, or if the MAT'L key has been pressed when flashing the following screen displays.

```
         000.00 Tons
Enter reference
weight:     0.00 Tons
ENTER     ABORT
```

If ABORT is pressed, the information acquired during the test is lost and the system goes back to Main Menu 1.

The operator must enter the actual weight of the material passed over the impact plate during the material test. Use the numeric keys to enter the actual weight and confirm with the ENTER key. If a number is entered for actual weight which the Integrator will not accept, the following screen is displayed.

```
-   SETTING ERROR   -
max     35000.00 Tons
min          0.10 Tons
RETURN
```

Press RETURN to return to the "Enter reference weight" screen. A number for actual weight between the min and max must be entered. After entering an actual weight between min and max, the following screen is displayed.

```
SPAN CAL COMPLETE
Error     000.00 %
Change span?
YES      NO    ADV
```

The word "COMPLETE" is flashing. Pressing ADV changes the screen from "Error %" to "Diff. X.XX Tons" to "XXXX.X PFM". The "XXXX.X PFM" shows the average PFM signal acquired from the DE10/DE20 sensor during the material test. If NO is pressed the test information is lost and the display moves to "Add reference weight to totals?".

If YES is pressed and the "SPAN # CHANGED" screen displays, the span constant has been updated and the test is finished.

If YES is pressed and the following - SETTING ERROR - screen displays, a number has been entered for the actual/reference weight that the Integrator will not accept. One or more operating parameters of the Integrator are incorrect consult Thermo Electron.

```
-   SETTING ERROR   -
max       45000000
min       500
RETURN
```

Press the RETURN soft key and return the display to the SPAN CAL. COMPLETE screen.

At the SPAN CAL. COMPLETE screen press NO. The test information is lost and the display moves to "Add reference weights to total?".

```
SPAN # CHANGED
New span   # 000000
Old span   # 000000
RUN    MENU
```

Pressing RUN or MENU from the SPAN # CHANGED screen advances to the following screen.

```
SPAN CALIBRATION
Add reference
weight to totals
YES     NO
```

If YES is pressed, the amount of material used for the test is added to the Master, Reset, and Operator totals. If NO is pressed, the information is lost. Pressing YES or NO advances to the Run Menu or Main Menu 1 depending on which selection was made on the "SPAN# CHANGED" screen.

Note: Moisture compensation is inhibited during material calibration. This is done to make the check of the totalized quantity easier. The static scale provides the weight of the material, including moisture. The weight of the water is removed immediately before adding to totals at the end of the test so the mater reset and operator's totals remain correct.

3.9.2.2 Manual Span

The Manual Span procedure can be used to adjust the Span Calibration without doing a material test. A correction factor is calculated by dividing the actual tons per hour by the displayed tons per hour on the Integrator. The correction factor is multiplied by the current Span number to calculate a new Span number. See the following example:

3.9.2.2.1 Existing Span # = New Span

In this example the existing 55 Tph calibration will change to 65 Tph.

Press the RUN key for the Run Menu if not already there. Press the MENU key for Main Menu 1. Press the SPAN CAL key, then press the MANUAL key. The following screen is displayed.

```
-  MANUAL SPAN   -
Rate      000.0   Tph
Span #   00000
ENTER    EXIT    RUN
```

Password: Operator

Default: 200000

Min: 500

Max: 45000000

The RUN key returns the display to the Run Menu; the EXIT key returns the display to Main Menu 1. Use the numeric keys to enter the new Span# and confirm with the ENTER key. If a number is entered for Span which the Integrator will not accept, the following screen is displayed. One or more operating parameters of the Integrator are incorrect consult Thermo Electron.

```
-  SETTING ERROR   -
max      45000000
min      500
RETURN
```

Press RETURN to return to the "Manual Span" screen. A number for Manual Span between the min and max must be entered and the operating parameter(s) must be corrected.

After the Manual Span number has been successfully entered, it displays in the "Manual Span" screen. Press the EXIT key for Main Menu 1 or the RUN key for the Run Menu.

3.9.3   Product Setup

Product Setup scroll consists of one screen for local or remote product selection.

1. Press the RUN key for the Run Menu unless already there. Press the MENU key for Main Menu 1. Press the PROD SETUP key and the following screen is displayed.

```
ENTER PRODUCT
SELECTION MODE:


EXIT    LOCAL
```
Password: Operator

2. Pressing the **EXIT** soft key returns the operator to Main Menu 1. Pressing the center soft key switches between Local and Remote. See Section 3.5.1 **Main Run** for more information on Product Selection.

3.10 Linearization

Linearization consists of determining and entering into the Integrator correction factors for various flow rates that may be expected. Accuracy of the flow meter will be improved using linearization especially if the flow rate varies downward from 100% for a significant amount of time during a material run. If the flow meter is expected to see multiple flow rates linearization is also recommended. One correction factor can be acquired or as many as five if necessary to improve accuracy. Correction factors can be acquired in ascending or descending flow rate order. The Integrator places them in correct order at the end of the linearization procedure. All correction factors are applied when Linearization is enabled in Main Menu 6.

Correction factors must be acquired at flow rates less than the Span flow rate.

Zero Calibration and Span Calibration at maximum expected flow rate must be done prior to Linearization. See Sections 3.10 and 3.9.2.

Because all materials behave differently when they strike, and then rebound off, the impact plate of the Flow Meter, the Span Calibration must be done using the actual material in a "material test". The test must conform to the following:

- The test must be at least 5 minutes long.

- The flow rate must be constant/steady for the entire test.

- The test must be at least 200 counts on the 2106 Integrator.

A count is defined as 1 tenth of a unit of what is set in the Integrator totalizer. If the Integrator totalizer is set to pounds, one pound is .1 pound; if the totalizer is set to tons, one count is .1 ton, etc.

The longer the material test is run, the more accurate the flow meter will be. All of the material in the material test should be pre-weighed or post-weighed on a high accuracy static scale to obtain the actual weight of the test material. This actual weight is entered into the Integrator to complete the test.

Two methods of Linearization are available, multi point automatic or multi point manual.

3.10.1 Multi-point Automatic Linearization

1. Press the **RUN** key for the Run Menu if not already there. Press the **MENU** key repeatedly until Main Menu 6 is displayed.

Press the LINEAR key to access Linearization. Scroll DOWN and the following screen displays.

```
  - MAIN MENU 6 -
Press MENU for more


LINEAR
```

Password: Service

```
- LINEARIZATION 1 -
Linearization
>no<
CHOICE   ENTER
```

Default: NO

Selections: YES, NO

Press **CHOICE** for selections, **ENTER** to confirm.

Select **YES** and press **ENTER** to confirm.

2. Press the **MENU** key repeatedly until Main Menu 1 is displayed.

```
  - MAIN MENU 1-
Press MENU for more
ZERO    SPAN  PROD
CAL     CAL   SETUP
```

Press SPAN CAL key and the following screen is displayed.

```
SPAN CALIBRATION
Multi point linear
>no<
CHOICE  ENTER  DELETE
```
Password: Service

Default: NO

Selections: YES, NO

Press CHOICE for selections and ENTER to confirm. Press DELETE to delete any previously acquired factors and the following screen is displayed.

```
DELETE LINEARIZATION
FACTOR
X
ALL    DELETE   ABORT
```
Password: Service

If Linearization was done previously, then old and unwanted correction factors must be deleted. If re-doing a calibration, you need not erase that factor since the new correction factor replaces the old one. The X represents factors 1 thru 5. Scroll UP or DOWN to select factor.

Press ALL to delete all factors that have been entered automatically or manually and the following screen is displayed for 3 seconds.

```
FACTORS DELETED
```

Press DELETE from the "DELETE LINEARIZATION" screen to only delete the displayed factor and the following screen displays for 3 seconds.

```
FACTORS   X   DELETED
```

After the 3 seconds, the display returns to the "DELETE LINEARIZATION" screen. Press ABORT and the display returns to the following screen.

```
SPAN CALIBRATION
Multi point linear
>no<
CHOICE   ENTER   DELETE
```

Password: Service

3. Press the CHOICE key to select YES, press the ENTER key to confirm. Scroll DOWN and the following screen is displayed.

```
FACTOR # 1
Prepare to run under
20% of full scale
CONT.    END    NEXT
```

Password: Service

Default: Factor: 1

Selections: 1 under 20%, 2 under 40%, 3 under 60%, 4 under 80%, 5 under 100%

4. Press NEXT to select the factor # and percent of full flow closest to the flow rate to be corrected. It is not necessary to acquire Factors in any specific order. The percents shown are only a guideline; Factors can be put in at any flow rate desired less than the Span flow rate - 100%. The minimum number of Factors to Linearize is 1.

5. Press END to return to Main Menu 1.

After selecting the desired Factor, press CONT. The following screen is displayed.

```
Press START soft key
then run material

START
```

Pressing START inhibits totalization and the following screen displays.

```
       000.00   Tons
       000.00   Tph
Press DONE to end
DONE    ABORT    ADV
```

During this procedure, display resolution of totals is 10 times higher than normal.

Pressing the ADV key will change the display from "XXX.XX Tph" to "XXXX.X PFM".

Pressing the ABORT key will abort the test and return to Main Menu 1.

Wait until all the material has passed over the impact plate, then press DONE. The following screen is displayed.

```
          0000.00   Tons
          XXXX.X    PFM
Ref. weight known?
YES     NO
```

If NO is pressed the reference (actual) weight of the material is unknown. The Run Menu is displayed where the MAT'L is flashing to remind the operator the material test is incomplete. Pressing the key below the flashing MAT'L or the YES key, the following screen is displayed.

```
000.00    Tons
Enter reference
weight    000.00   Tons
ENTER             ABORT
```

If the operator does not respond with Abort or Reference Weight, the display will time out and return to Main Menu 1. The information acquired during the test is lost. If the ABORT key is pressed the test is aborted, the information acquired during the test is lost, and Main Menu 1 is displayed. The operator must enter the actual weight of the material passed over the impact plate during the material test. Use the numeric keys to enter the actual weight and confirm with the ENTER key. If a number is entered for actual weight which the Integrator will not accept, the following screen is displayed.

```
   - SETTING ERROR -
max      35000.00   Tons
min           0.10  Tons
RETURN
```

Press RETURN to return to the "Enter reference weight" screen. A number for actual weight between the min and max must be entered. After entering an actual weight between min and max, the following screen is displayed.

```
FACTOR      # 1 DONE
Error    00.00%
Accept Factor?
YES     ABORT     ADV
```

Pressing the ADV key will change the display from "Error 00.00%" to "Diff. 00.00 Tons".

Pressing the ABORT key aborts the test and the "Add reference weight to totals?" screen is displayed.

If the YES key is pressed and the FACTOR # 1 ACQUIRED screen is displayed the correction factor is accepted (#1 in this case).

If the YES key is pressed and the following - SETTING ERROR - screen is displayed, a number has been entered for actual/reference weight that the Integrator will not accept. One or more operating parameters of the Integrator are incorrect consult Thermo Electron

```
   - SETTING ERROR -
max    1.500000
min    0.500000
RETURN
```

Press the RETURN soft key and return the display to the FACTOR # 1 DONE screen. At the FACTOR # 1 DONE screen press the ABORT soft key and the following screen is displayed.

```
SPAN CALIBRATION
Add reference
weight to totals?
YES    NO
```

Press YES if you want to add the material weight used for the test to the Master, Reset, and Operator totals. Press NO and the material weight is lost. Pressing YES or NO returns the display to Main Menu 1.

```
FACTOR # 1 ACQUIRED
 Go to next step?

YES    NO
```

Press YES if more factors are required. Repeat for all factors. Press NO if no more factors are required. Pressing NO returns to the "Add Reference Weight To Totals?" screen.

From Main Menu 1 press the SPAN CAL key and the following screen is displayed.

```
SPAN CALIBRATION
Multi point Linear
>yes<
CHOICE   ENTER   DELETE
```

Default: NO

Selections: YES, NO

Press the CHOICE key to select NO and confirm with ENTER. Press the RUN key to return to the Run Menu. The Impact Flow Meter is now Linearized and you can run material.

3.10.2   Multi-point Manual Linearization

If Linearization was done previously, then old and unwanted correction factors must be deleted. If re-doing a calibration, you need not erase that factor since the new correction factor replaces the old one. See section 3.11.1 on how to delete correction factors.

Stop all material flow to the impact plate. From the Run Menu scroll DOWN once to access the Reset Total Menu. Press the RESET key and clear the Reset total. Press the MENU repeatedly key until Main Menu 6 is displayed. Press the LINEAR key, scroll DOWN once, select YES and press the ENTER key to confirm. Scroll DOWN once and the following screen is displayed.

```
- LINEARIZATION 2A -
FREQ          FACTOR 1
 0.0          0.00000
ENTER    ACQ     FACT
```

Start material flow to the impact plate at the desired rate. Wait until material is flowing steady at that rate. Press the ACQ key and the ACQ displays from the display for 5 seconds while the Integrator acquires the average PFM frequency signal from the DE10/DE20. The average PFM frequency is then displayed. Press the RUN key to access the Reset Total Menu. Wait for all the material to pass over the impact plate. Record the total weight from the Integrator display. The correction factor is calculated using the reference (actual) weight and the displayed weight from the Integrator. See the following example:

Press the MENU key until Main Menu 6 is displayed. Press the LINEAR key, scroll DOWN once. YES should be selected if not, use the CHOICE key to select YES. Scroll DOWN to display the "FACTOR 1" screen which has the previously acquired frequency. Pressing the FACT/FREQ key enables the operator to toggle between Factor or PFM Frequency entry.

Press the FACT/FREQ key until FACT is displayed. Press the FACT key and FREQ is displayed, use the numeric keys to enter the correction factor and confirm with the ENTER key. The "FACTOR 1" screen should now have a PFM frequency and a correction factor displayed, see the following example:

```
- LINEARIZATION 2A -
FREQ         FACTOR 1
850.6        1.1818
ENTER    ACQ     FACT
```

After entering the correction factor number press the RUN key to return to the Reset Total Menu, scroll UP once to return to the Run Menu. The Flow Meter now will use the just entered correction factor(s) when Linearization is enabled in Main Menu 6.

If more correction factors are desired to get better accuracy from the Impact Flow Meter, follow the same procedure as above for factors 2-5.

Do not acquire PFM frequency or enter a correction number for FACTOR 6.

Notes about Zero and Span:

A stable Zero in essential to keeping the Flow Meter operating at its best possible accuracy for your installation. Once the DE10/DE20 has been zeroed, it should not shift by more than +/-.1%. If you suspect that the Zero has indeed shifted it can be checked for stability by running several Auto Zeros consecutively. Note each % change but do not change the Zero. If the % change is consistently under +/- .1% the Zero is good and should not be changed. If the Auto Zero shows a repeating change of +2% as an example, the Zero has shifted. If any repeating Zero shifts of more than +/-.1% are encountered, check the mechanical installation using the DE10 or DE20 INSTALLATION AND OPERATION MANUAL as a guide.

The Span Calibration can be checked occasionally with a "material test". It might be possible to get better accuracy from the Span Cal at 100% flow rate after initial calibration. After running several material tests record the error after each test but do not change any Span Cal information. Only update the Span Cal if you have a repeating error. Use the Manual Span procedure to change the Span number if needed.

If your maximum flow rate increases by more than 5% after the previous Span Cal was done, a Span Cal adjustment may be necessary to maintain accuracy. Use Auto Span Cal with material test.

If you have 2 or more completely different flow rates for the same material use Span Calibration, for the higher flow rate and put in a Linearization correction factor for the lower flow rate(s).

3.11 Permanent Scroll Record Setup Scrolls

MAIN MENU 1

ZERO SCROLL

Zero #

_____

SPAN SCROLL

Span #

MAIN MENU 2

DISPLAY SCROLL

1.   Measure Units

2.   Totalization Units   _____

3.   Rate Units   _____

4.   Language   _____

5.   Time   _____

6.   Date   _____

7.   Run Display, Line 3   _____

8.   Damping Display Rate   _____

SCALE DATA SCROLL

1.   Max. Scale Capacity

2.   Scale Divisions   _____

3.   Zero Dead Band Range   _____

CALIBRATION DATA SCROLL   _____

1.   Calibration Interval   Days

2.   Calibration Date   _____

3.   Auto Zero Tracking   • Yes   • No

3A.   Auto Zero Tracking Range   %

3B.   Auto Zero Tracking Max. Dev. _____

                                           %

3C.   Auto Zero Tracking Time   _____ secs

MAIN MENU 3

PROTECTION SCROLL

1.	Protection Level	• None	• Ltd	• Prot

DIAGNOSTICS SCROLL

1. PFM Gross

PFM Net _____

2A. PFM Output Zero _____

2B. PFM Output Max Rate _____

3. Service Password _____

4. Operator Password _____

5. Software Version _____

6. Date _____

7. Time _____

8. Board Type Slot #1 _____

9. Board Type Slot #2 _____

10. Board Type Slot #3 _____

11. Board Type Slot #4 _____

12. Board Type Slot #5 _____

13. Board Type Slot #6 _____

MAIN MENU 4

I/O DEFINE SCROLL

1. Current Output #1 Define

Current Output #2 Define _____

1A. Current Output #1 Range _____ mA

Current Output #2 Range _____ mA

1B. Current Output #1 Delay _____ sec

Current Output #2 Delay _____ sec

1C. Current Output #1 Damping _____ sec

Current Output #2 Damping _____ sec

2.	Analog Input #1 Definition	
2A.	Moisture Input Calibrate	% mA
2B.	Moisture Input Calibrate	% mA
3.	Analog Input #2 Definition	

4.	Digital Input Define	Physical Input	Status
External Alarm #1		/	
External Alarm #2		/	
External Alarm #3		/	
Print		/	
Reset Totals		/	
Reset Alarms		/	
Auto Zero		/	
Batch Start		/	
Batch Stop		/	
Batch Standby		/	
Product #1		/	
Product #2		/	
Product #3		/	
Product #4		/	
Product #5		/	
Product #6		/	
Product #7		/	
Product #8		/	
Product #9		/	
Product #10		/	

5.	Digital Output Define	Physical Output	Status
Alarm		/	
Shutdown		/	

Ready	/	
High Rate	/	
Low Rate	/	
Totalizer	/	
Batch Preset	/	
Batch End	/	
Air Purge	/	
6. Remote Counter Division		
7. Remote Counter Pulse		
8. Air Purge Interval		
9. Air Purge Duration		

ALARMS SCROLL

1. Rate Alarm	• Yes	• No	
1A. Low Rate Set	%	sec	
1B. High Rate Set	%	sec	
2. Alarm Set As	• Alarm	• Shutdown	• None

#1 Clock Fail

#2 Bad Weight Signal

#3 RAM Fail

#4 ROM Fail

#5 High Rate

#6 Low Rate

#7 Warm Start

#8 Cold Start

#9 P.D. During Calibration

#10 Time Elapsed Calibration

#11 Ext. Alarm #1

#12 Ext. Alarm #2

#13 Ext. Alarm #3

#14 Overflow Totalizer   _____

#15 AZT Limit   _____

#16 Batch Deviation   _____

#17 (Blank)   _____

#18 BCD Overflow   _____

#19 Math Error   _____

#20 Printer Error   _____

  #21/26 HW Conf. Change   _____

#27 AB R I/O Error   _____

#28 PROFIBUS-DP Error   _____

LOAD OUT SCROLL

1.   Preset Weight

2.   Pre Act Correction   _____

2A.   Pre Act Value   _____

3.   Start Delay   _____

4.   Coasting Time   _____

5.   Batch Deviation   _____

6.   Print Batch   _____

7.   Position Batch Num.   X = _____   Y = _____

8.   Position Batch Quant.   X = _____   Y = _____

9.   Position Batch Total   X = _____   Y = _____

MAIN MENU 5
COMM A SCROLL

1.	Baud Rate Port #1	
2.	Set Parity Port #1	_____
3.	Stop Bits Port #1	_____
4.	Word Length Port #1	_____
5.	Protocol Port #1	_____
5A.	Clear to Send #1	_____
6.	Address Port #1	_____
7.	Access Prot Port #1	_____
8.	Baud Rate Port #2	_____
9.	Set Parity Port #2	_____
10.	Stop Bits Port #2	_____
11.	Word Length Port #2	_____
12.	Protocol Port #2	_____
12A.	Clear to Send #2	_____
13.	Address Port #2	_____
14.	Access Prot Port #2	_____

PRINT SCROLL

1.	Handshaking	
2.	End of Line	_____
3.	Delay End of Line	_____
4.	Form Feed	_____
5.	Print Interval	_____
6.	Print Time #1	_____
7.	Print Alarms	_____
8.	Totals Report Format	_____
9A.	Number of Strings	_____

9B.   Contents String #1 _____

9C.   Position String Number #1 _____

9D.   Contents String #2 _____

9E.   Position String #2 _____

9F.   Contents String #3 _____

9G.   Position String #3 _____

9H.   Position Oper. Total _____

9I.   Position Reset Total _____

9J.   Position Master Total _____

9K.   Position Date _____

9L.   Position Time _____

9M.   Position Rate _____

9N.   Position Avg. Rate _____

9P.   Position Running _____

MAIN MENU 6

AUDIT TRAIL SCROLL

1.   Audit Trails   • Yes   • No

LINEARIZATION SCROLL

1.   Linearization   • Yes   • No

2A.   Factor 1

2B.   Factor 2 _____

2C.   Factor 3 _____

2D.   Factor 4 _____

2E.   Factor 5 _____

2F.   Factor 6 _____

_____

3.12 Calibration Report

Date				
By				
Scale Capacity				
Calib. Constant				
Zero - As Found				
- As Left				
Span - As Found				
- As Left				

3.13 Permanent Field Record

Flow Meter Location _____

Date _____

1. Flow Meter Capacity _____ (Tons Per Hour)

Chapter 4
Maintenance

The maintenance information in this manual should meet your service needs. If problems occur requiring technical assistance, contact Thermo Electron.

4.1 Frequent Checkpoints

The Micro-Tech™ 3106 Integrator is a solid-state device, and as such, should require very little maintenance. The front panel can be wiped clean with a damp cloth, and if necessary, a mild detergent (never use abrasive cleaners, especially on the display window). As a preventative measure, check that all wires, plugs, and integrated circuits are tight in their connectors. Also, keep the enclosure door tightly closed to prevent dirt infiltration.

More often than not, a quick visual inspection leads to the source of trouble. If a problem does develop, check the following before proceeding to more specific troubleshooting procedures.

1. Check Power
    - Check that the two (2) Line Voltage Selector Switches are set to the correct line voltage (see Section 2.4.1).
    - Check the fuses.
    - Check that the power switch is ON and that power is supplied to the unit.
    - Check Connections
    - Check that all terminations are secure
    - Check that the Display Module and Keyboard connectors are firmly seated in their connectors.
    - Check that the Remote Counter and optional input/output modules are secure in their sockets.
    - Check that all Jumpers are in their correct position.

4.2   Troubleshooting

This unit has built-in troubleshooting capabilities. A number of possible problems are automatically detected and screen messages are displayed. Also, refer to the Diagnostics Test Scrolls in Main Menu 3.

4.2.1   Alarm Message

The ALARM message is assigned to the right hand soft key when an alarm is pending. The ALARM message and its LED flash at the same time. The following screen is displayed when the right hand soft key is pressed.

```
ALARM     NEW

xxxxxxxxxxxxxxxxxxxx

MM-DD-YY     HH:MM

RESET     NEXT
```

The keyword "NEW" indicates an alarm that has not been acknowledged yet. When the operator presses the RESET key to clear the alarm, the alarm displays only if the reason that caused the alarm to occur is corrected. If the alarm is still pending, the keyword "ACK" is displayed instead of "NEW".

The third line shows the date and time only if the optional COMM board is installed.

The NEXT key is used to scroll between the pending alarms. The string "xxxxxxxxxxxxxxxxxxxxxxx" stands for one of the following alarm conditions.

4.2.2   Alarms List

1. Clock Fail

The system has detected a failure on the clock calendar circuit. This alarm only occurs if the optional COMM board is installed.

- Check the COMM board to see if it is properly inserted.
- Replace the COMM board.

2. Bad Weight Signal

The system has detected an error on the PFM signal.

- Check the sensor connections, both at the Integrator and at the DE10/DE20 sensor.
- Check the DE10/DE20 sensor.

3. RAM Fail

The system has detected an error on the RAM checksum during the internal periodical test. The RAM (Random Access Memory) is used to store variables and set up data.

- Replace the CPU board.

4. ROM Fail

The system has detected an error on the ROM checksum during the internal periodical test. The ROM (Read Only Memory) is used to store the program.

- Replace the CPU board.

5. High Rate

The rate has been detected to be higher than the maximum rate entered in the ALARM SET UP MENU.

6. Low Rate

The rate has been detected to be lower than the minimum rate entered in the ALARM SET UP MENU.

7. Warm Start

The Integrator has detected a power loss condition, or power was removed for an undefined period of time.

8. Cold Start

The Integrator has detected the loss of the set up data after power was removed. It needs to be set up and calibrated.

- Replace either the motherboard or the battery.

NOTE: The message COLD START never displays on the screen. This is because a Cold Start forces a start up procedure to be executed, and the alarm itself is cleared after the set up is completed. However, the alarm LED and the digital output will be showing an alarm during the initial set up procedure.

---

9. Power Down During Calibration

When the system is powered off while a calibration sequence is in progress, the flow meter may not be properly calibrated.

- Check calibration.

10. Calibration Time Elapsed

If a calibration check time period is entered and the time expires, this alarm occurs. The purpose is to remind the operator that the calibration has not been checked for a considerably long period of time.

- Check calibration.

11. External Alarm 1

Digital inputs can be programmed to detect external alarm conditions such as emergency switches, max level switches or other. This alarm is associated to the external alarm 1.

- Check external alarm #1.

12. External Alarm 2
   - Check external alarm #2.

13. External Alarm 3
   - Check external alarm #3.

14. Overflow Totalizer

This message indicates the output pulse generator for the remote mechanical totalizer has reached an overflow condition. The rate may be too high or the remote counter divider has been set too small.

   - Check the rate.
   - Check and eventually increase the remote counter divider.

This message is also displayed if the Master Totalizer rolls over.

15. AZT Over limit

The Auto Zero Tracking function has reached the maximum limit of tare allowed that will clear automatically. The zero may have shifted or the DE10/DE20 is not level.

   - Investigate and correct the zero shift.
   - Electronically level the DE10/DE20 sensor.

16. Batch Deviation

This alarm is only visible if the optional Load Out board is installed. It is generated when a batch is run and the error detected at the end of the batch is higher than specified.

   - Check the parameters of the load out.
   - Adjust the percent value.

17. BCD Overflow

This message is only displayed if the optional Digital or Load Out Digital (4 in/16 out) output board is installed. If the variable to be converted in the BCD format has more than 4 digits, the alarm is generated.

   - Check the size of variables and the BCD data setup.

18. Math Error

A divide by zero or overflow error is encountered during internal calculations. This message indicates some abnormal dimensional parameter is entered in setup.

   - Check setup data.

19. Printer Error

This message is displayed if the system has data to print and the printer is disconnected or the paper feed is empty.

20. Hardware Configuration Changed

When a new board is installed or a board removed, this message displays. Refer to Section 3.5.1.

21. Allen Bradley Remote I/O Error

This message is displayed if communication is interrupted. The green LED on the A B RI/O board will be flashing. The alarm does not come on if communication was never started.

22. PROFIBUS-DP Error

This message is only displayed if the optional PROFIBUS board is installed. The following two conditions activate the alarm.

A. If the Siemens SP 3 controller installed on the PROFIBUS interface board does not recognize any successful data transfer within the watchdog timer interval.

B. If the received data contains errors (value overlaps limits, register number does not exist, group number does not exist).

4.2.3   Micro-Tech Integrator Cold Start

It may sometimes be necessary to cold start the Micro Tech™ 2106 Integrator in event the software becomes corrupted. The option is available of installing the factory default constants or simply returning the Integrator to its previous running state. Steps required to cold start:

Press and hold in at the same time, the LEFT HAND ARROW key and the CLEAR key until the following screen displays:

```
      Install Factory
          Defaults?


NO        YES
```

Pressing NO returns the Integrator to the Run Menu.

If YES is pressed, the following screen displays

```
- MEMORY ERASED -
Choose the language
key to continue to
ITA        USA
```

When the above screen displays, all field entry data has been replaced by the factory default constants. Proceed to Initial Setup Procedure, Section 2.5.

NOTE: If the software corruption was catastrophic and the memory does not ease in the above steps, do the following:

Press and hold in the LEFT HAND ARROW key and CLEAR key. While holding in both keys, cycle line power. In the event the MEMORY ERASED screen does not appear, consult the factory.

4.2.4   Internal Test Procedure

From the Run Menu press the MENU key until Main Menu 3 displays. Press the TEST soft key then scroll DOWN twice and the following screen is displayed.

```
  - TEST SCROLL 2 -
Internal test of
microprocessor
START
```

Password: Service

When start is pressed, the following screens appear are displayed in sequence:

```
- TEST SCROLL 2A -
Testing ROM
TEST PASSED
```

```
- TEST SCROLL 2B -
Testing RAM
TEST PASSED
```

```
- TEST SCROLL 2C -
Testing E2PROM
TEST PASSED
```

**Only if Audit Trail
Option is installed**

The message "Test PASSED" is displayed if the test runs correctly. If something wrong is detected, then the message "Test FAILED" is displayed, and the soft key CONTINUE is shown. The operator has to press the key to go on to the next test.

Note: Test 2C requires a hardware jumper to be installed between serial in and serial out pins of the motherboard. Since the jumper is not normally in place, a "Test FAILED" message at the end of Test 2C is normally displayed.

If the internal test has failed, call Thermo Electron's Customer Service Department.

4.2.5   Sensor Excitation Signal

1. Measure DC volts across TB9, terminals 11 and 12 (or TB12, terminals 7 and 8 for panel mount unit). This voltage should be 11 to 15 volts.

2. To verify proper operation of the pre amplifier mounted on the DE10/DE20, measure DC volts across terminals 6 and 7. This voltage should be 0 2 volts, depending on where the LVDT core is located.

4.2.6   Resetting Master Total Procedure

Steps required to reset the master total or to reset remote counter overflow are given below:

1. If no password is installed

    A. Use the **MENU** key to select Main Menu 3

    B. Press the **DIAG** soft key and scroll down to the Service Password screen

    C. Type in a password (Example: 123) and press ENTER.

    D. Re enter the password and press ENTER.

    E. Select Main Menu 3.

    F. Press PROT scroll and press PROT soft key.

    G. Press the NONE soft key.

    H. Type in password 7832500 and press ENTER. The protection level should be Thermo Electron.

    I. Press the TOTAL key on the touch panel. Scroll UP or DOWN if needed to reach the Master Total screen.

    J. Press the RESET soft key and answer YES to REST MASTER TOTAL?

    K. Select Main Menu 3. Press the DIAG soft key and scroll DOWN to Service Password.

    L. Press ENTER twice, erasing the password installed in Step 3.

    M. Press the RUN key to return to normal operation.

2. If Password is already active

   A.   Select Main Menu 3.

   B.   Press the PROT scroll and press the PROT soft key.

   C.   Press the NONE soft key.

   D.   Type in password 7832500 and press ENTER. The protection level RAMSEY.

   E.   Press the TOTAL key on the touch panel. Scroll up or down if needed to reach the Master Total screen.

   F.   Press the RESET soft key and answer YES to Reset Master Total?

   G.   Select Main Menu 3.

   H.   Press the PROT scroll and choose the password level desired.

4.2.7   To Remove a Forgotten Password

1. Select Main Menu 3.

2. Press the PROTECT scroll and press the PROT soft key.

3. Press the NONE soft key.

4. Type in password 7832500 and press ENTER. The protection level should be RAMSEY.

5. Press NONE.

6. Select Main Menu 3.

7. Press the DIAG soft key and scroll down to Service Password.

8. Press ENTER twice. The display should respond with New Password Acquired.

9. Scroll down to Operator Password. Press ENTER twice. The display should respond with New Password Acquired.

10. Select main Menu 3. The PROT soft key should not appear, indicating all passwords have been erased. If PROT should appear, repeat Steps 1 through 9.

11. See Manual Section 3.11 for entering new passwords.

4.3 Cleaning Instructions

The Micro Tech™ 3106 Integrator is a solid-state device, and as such, should require very little maintenance. The front panel can be wiped clean with a damp cloth, and if necessary, a mild detergent (never use abrasive cleaners, especially on the display window). As a preventative measure, check that all wires, plugs, and integrated circuits are tight in their connectors. Also, keep the enclosure door tightly closed to prevent dirt infiltration.

Chapter 5
Service, Repair, and Replacement Parts

This chapter provides information about service, repair, and replacement parts for your *Thermo* product. It includes the telephone numbers for various departments at *Thermo*, the procedure for ordering replacement parts, a *Return Material Authorization Form*, and the parts list for the product are also included in this chapter.

The maintenance information in this manual is designed to meet your service needs. If you should encounter a problem that requires technical assistance, you may call *Thermo Product Service* at (763) 783-2605.

Thermo also provides on-site service technicians to assist customers with installation, setup, initial calibration, customer training, maintenance, and repair. Contact the *Thermo Field Service* department at the number given below for current rates and scheduling.

Thermo has repair centers located at the plant in Minneapolis, Minnesota. Products that need system checkout or repair can be returned to the plant with the *Return Material Authorization (RMA) Form*. Contact our Repair and Return department (763) 783-2728 to get an *RMA* number to use on the form.

Note: Have your machine model number and serial number available when you call.

Main Switchboard	(763) 783-2500
FAX	(763) 783-1537
Service	(763) 783-2605
	(763) 783-2605
Return Material Authorization & Repair	(763) 783-2728

5.1   Parts Ordering Information

For the fastest service when ordering parts, telephone or FAX the *Thermo Parts Department* at the numbers given below. Your regional field service representative can also assist you with parts orders.

The recommended procedure for ordering parts is:

1. Determine the broken or faulty part.

2. Locate the part in the Parts List.

3. Find the part number(s) for the item(s) you need.

4. Before you contact *Thermo* for your parts, make sure you have the following information:
    - Machine model and serial number
    - Purchase Order number
    - Date Required
    - Preferred shipping method
    - Part number(s), descripto9in, and quantity needed.
    - Telephone or FAX:

Thermo Electron Corporation
Customer Service Department
501 90th Ave. NW
Minneapolis, MN 55433

FAX: (763) 780-2525
Phone: (763) 783-2500
Return Material Authorization and Repair: (763) 783-2774

Thermo
ELECTRON CORPORATION

501 90th Avenue N.W.   Minneapolis MN
763-783-2500

Return Material Authorization
RMA   -

(This RMA Number Must Be Marked On All Paperwork And On Outside Of Package)

Req'd. By:

Date: _____

Customer

Contact: _____

Phone: (   ) _____

      Area Code

Bill To Customer # : _____

Return, Freight Prepaid To:
Thermo Electron Corporation
501 90th Avenue N.W.
Minneapolis, MN 55433

Ship _____

Returned From:

_____

_____

_____

Return To:

_____

_____

_____

Description Of Material Being Returned:

_____

_____

_____

Describe Equipment Malfunction Or Defect, If Any; Symptoms:

_____

_____

Minimum Charge

☐ Informed Customer of   ☐   Inspection Charge Per Item

Service Requested:

☐ Repair & Return   ☐   P.O. No.: _____

☐ Return for Credit   ☐ Original P.O. or Thermo Order _____

☐ Warranty Repair or Replacement   Serial _____

    Original P.O. # _____   Original _____

☐ Return Warranty/Exchange Unit   Shipped on Thermo Order No.: _____

☐ Other: _____

Disposition/Comments: (Thermo Electron Internal Use Only)

_____

REC 4187

5.2   Replacement Parts

MICRO-TECH™ 3000 Model 3106 Impact Flow Meter Integrator

Chassis Assembly, Panel Mount	049139
Chassis Assembly, Field Mount	050105
PCBA, Mother Board	051324
PCBA, PFM Input	050831
PCBA, Analog Output (1 out)	049004
PCBA, Analog Output (2 in/2 out)	049003
PCBA, DIO (4 in/16 out)	046841
PCBA, DIO (16 in/4 out)	046844
PCBA, Comm "A" Select one only	046853
RS-232C	
RS-485, std. (point to point)	
RS-485, multi-drop	
20 mA (digital) current loop	
PCBA, Allen-Bradley RI/O	055517
PCBA, PROFIBUS-DP	056713
PCBA, LED Assembly	046847
PCBA, Display Assembly	046860
PCBA, Touch Panel Model 2106	048422
PCBA, Field Terminal Entry (Field Mount Only)	047572
PCBA, Load Out DIO (4 in/16 out)	049475
PCBA, Load Out DIO (16 in/4 out)	049476
Fuse, Slo-Blo, 200mA (F1 220V) (Type T)	001366
Fuse, Slo-Blo, 400mA (F1 110V) (Type T)	002443
Fuse, Fast-Blo, 4.0 Amp (FT Board) (Type T)	037287
Battery, Lithium, 3.0 V, 1.2 AH, 2/3 A	037188
Transformer, Power	046863
Module, Power Input 180-240 VAC	047646
Module, Power Input 90-120 VAC	047575
Module, Power Input 10-32 VDC	048162
Module, Power Output 24-240 VAC	046814
Module, Power Output 5-60 VDC	046815

5.3   Disposal of Hazardous Waste

Disposal of lithium batteries and soldered printed circuit boards must be in accordance with your local *Hazardous Waste Policy*.

As an alternative product supplied by *Thermo* may be returned freight pre-paid, for disposal. Contact the Repair Department for a *Return Material Authorization Number* before shipping any product for disposal.

5.3.1   Replacement of Lithium Battery

The Integrator volatile memory backup battery can be replaced without any special tools.

1. Record all configuration, setup, and calibration data before removing the battery. All information is lost when the battery is removed.

2. Turn the Integrator power off at the main.

3. Remove the battery from its compression socket.

4. Observe the polarity markings on the battery socket base before inserting the new battery. Battery Type=Lithium, 3V, 1.2AH, 2/3A, Thermo Electron Part Number 037188.

5. Insert battery.

6. Restore power to the Integrator.

7. Cold start the Integrator. See cold start procedure in Section 4.3.3.

8. Re enter all data recorded in Step 1.

⚠ **CAUTION**
DANGER OF EXPLOSION IF BATTERY IS INCORRECTLY REPLACED.
Replace only with same or equivalent type recommended by Thermo Electron. Dispose of used battery according to manufacturers instructions on the battery or return to Thermo Electron. See 5.3.

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Appendix A
Digital Input/Output

The Micro-Tech 3106 has provisions for up to (24) total programmable digital inputs and (24) total programmable digital outputs.

Four programmable solid state inputs are accessed on the Motherboard (TB2). Three programmable isolated relay outputs and on non-programmable Micro-Tech hardware Fault isolated relay output are accessed on the Relay Output board. One programmable solid-state output is accessed on the Motherboard (TB1). Additional I/O up to the limit of (24) each can be added with optional Digital I/O board(s).

A.1. Mother Board Digital I/O

A.1.1.   Inputs

1. (4) Programmable solid state (DC) inputs (Appendix Figure A-1)
   - Optically isolated
   - Powered by internal +24 V DIO supply, 6 mA maximum
   - Cable Length: 150 ohm maximum. (7500 ft of 20 AWG)

Appendix Figure A-1: General Purpose Digital Inputs
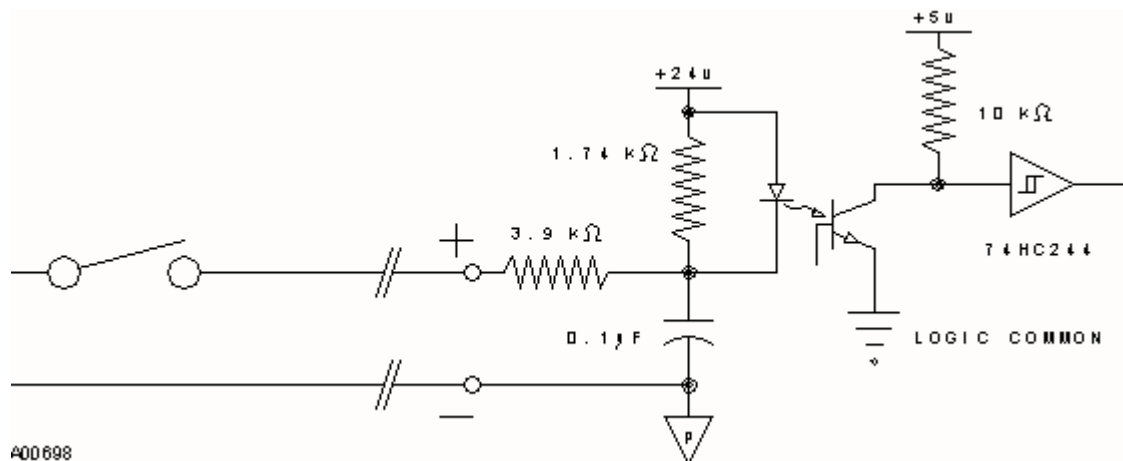
A.1.2.   Outputs

1. (3) Programmable isolated relay outputs, one non-programmable hardware Fault isolated relay output, one programmable solid-state output (Appendix Figure A-2 and Appendix Figure A-3).
   - Isolated Relay Outputs
   - Solid state Output

Appendix Figure A-2: Isolated Relay Outputs

A90752
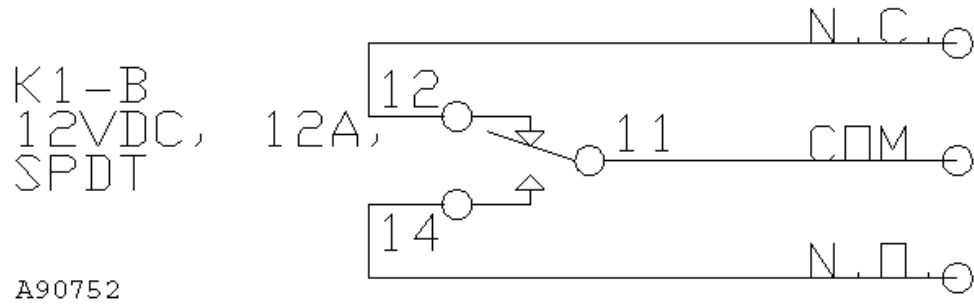
Appendix Figure A-3: Solid State Output

A90753
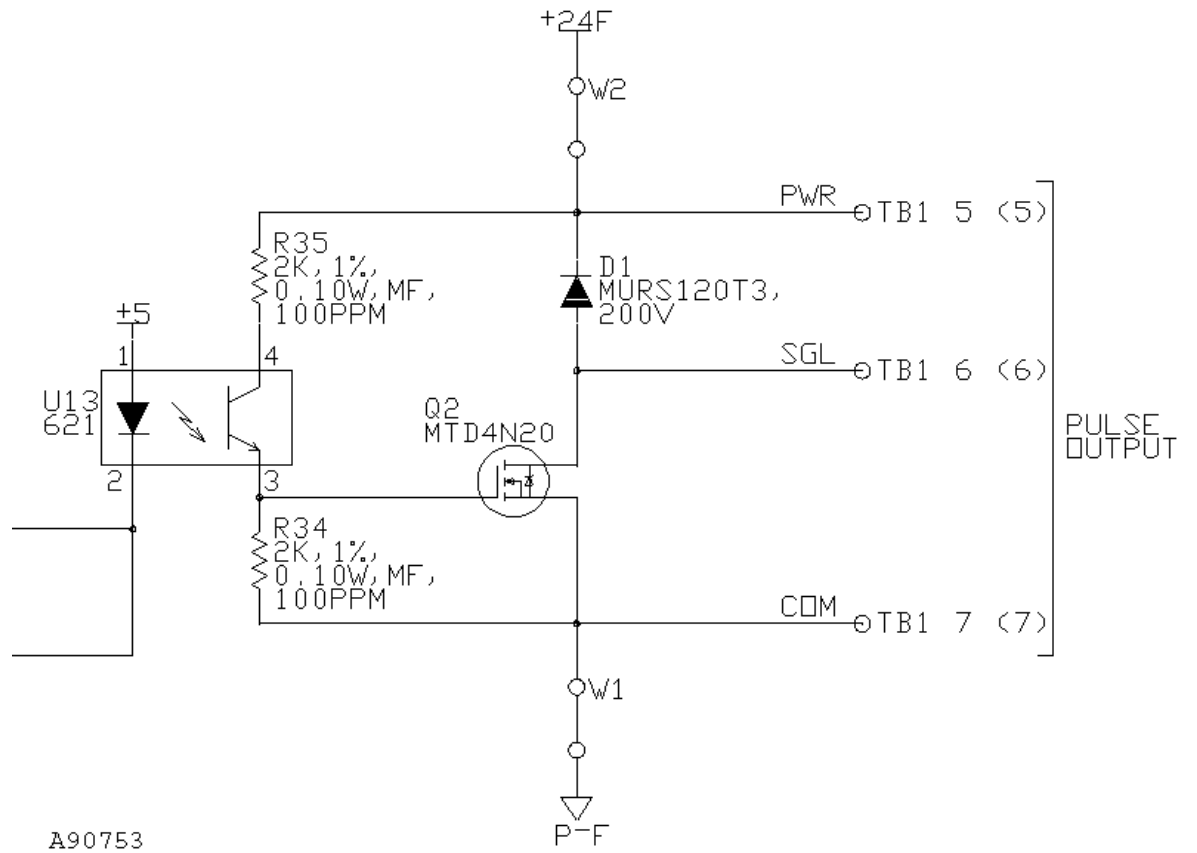
A.2. Digital Input/Output Board Configuration

In addition to the programmable digital inputs and outputs on the Mother board, optional Digital I/O (DIO) expansion boards can be added. Available boards are DIO input board 16 inputs/4 outputs, output board 16 outputs/4 inputs or 20 inputs/20 outputs by adding both boards.

Both DIO boards provide isolated contact closure inputs and 24 volt current sinking (default) or current sourcing (consult Factory) isolated outputs. The DIO input board connector J16 is a male 25 pin sub-miniature D connector and the DIO output board connector J15 is a female connector.

Internal or external 24 VDC power for the DIO boards is controlled by selectable jumpers OP1 and OP2 located on the lower right hand side of the DIO boards (Figure A/1-3). All inputs and outputs use the same selected power supply. See table below for jumper positions.

JUMPERS			
POWER SOURCE	OP1	OP2	
Internal	"A"	"A"	[Default]
External	"B"	"B"	

The isolated contact closure inputs are activated by completing the circuit from the input to the negative side of the 24 VDC supply. Approximately 6 mA of current flows out of each input during contact closure.

The outputs of the DIO boards use 2803 current sinking (default) type IC's. The output IC's are installed in sockets to allow replacing the output IC only, rather than the board if the IC is damaged.

The output IC's can be replaced with 2981 type IC's for current sourcing applications. Wire jumpers W1 thru W4 must be relocated for current sourcing (see Figure A/1-3). In most cases, it is recommended that the boards be returned to the factory for converting from current sinking (default) to current sourcing. See table below for jumper positions.

JUMPERS					
CURRENT	W1	W2	W3	W4	
Sinking	"Yes"	"No"	"Yes"	"No"	[Default]
Sourcing	"No"	"Yes"	"No"	"Yes"	

Appendix Figure A-4: Digital Input/Output Boards

P/N 046841

OP1 & 2

W1 THRU W4

J15 FEMALE
D-CONNECTOR

END VIEW

OUTPUT
IC'S

16OUT / 4IN

A01277
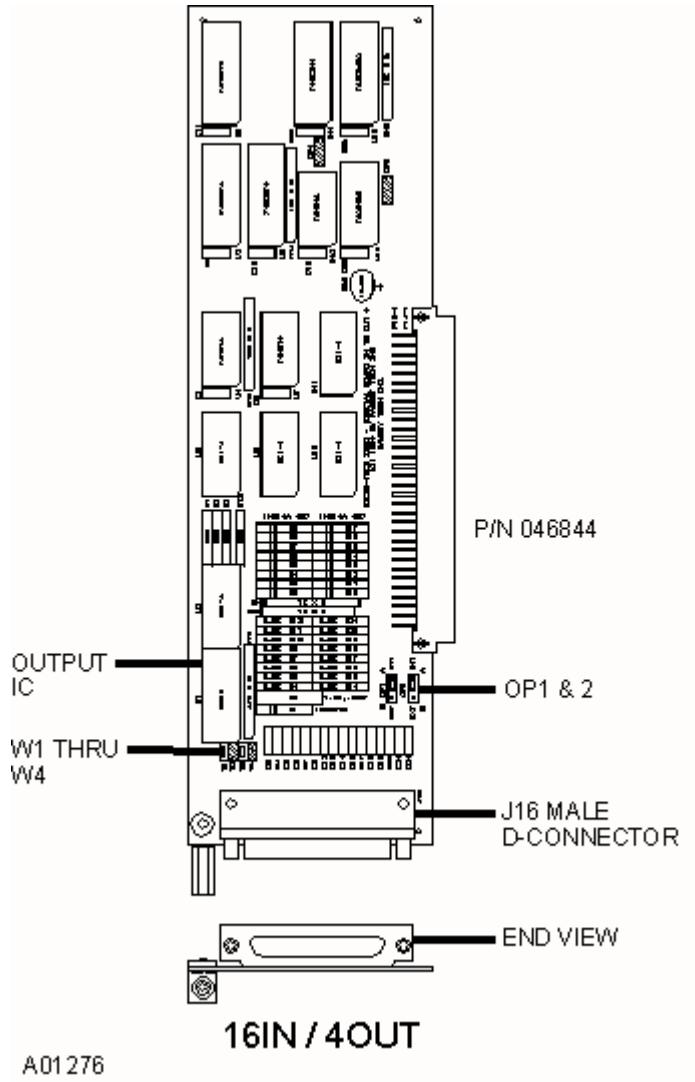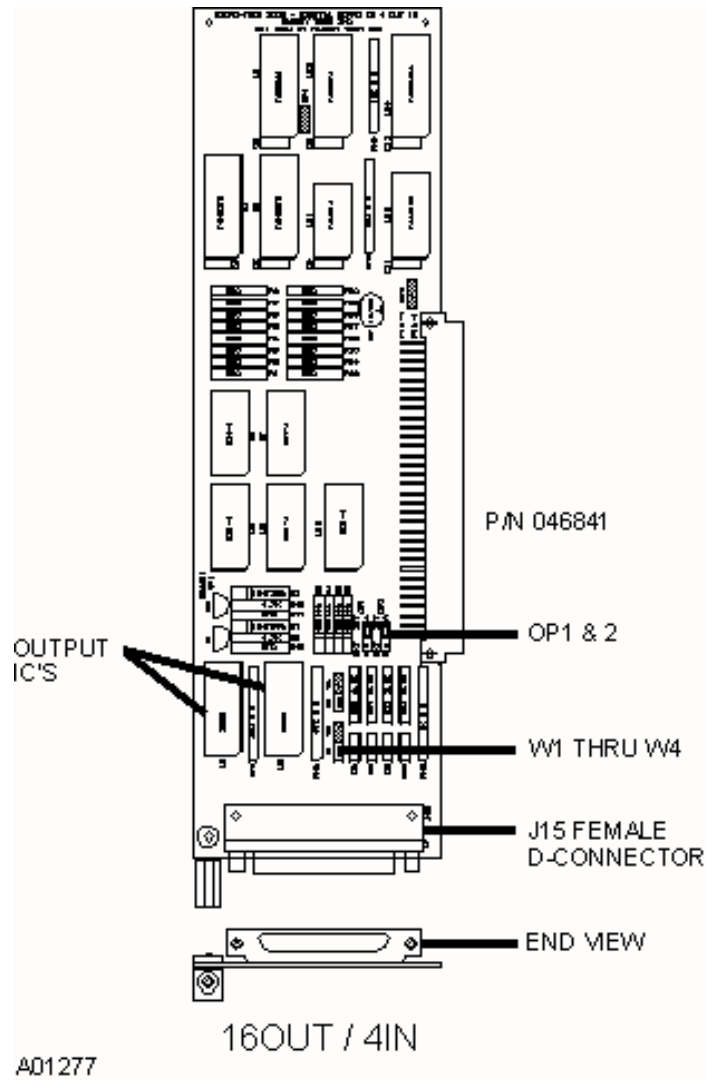
A.2.1.   16 In/4 Out DIO Board Specification (Figure A/1-4)

1.   (16) Programmable inputs

See Section 1.1.1 specifications.

2.   (4) Programmable outputs

See Section 1.1.2 specifications.

3.   Connector

25 pin D connector (male). Connector is interchangeable with a 20 or 22 pin subminiature D connector dimensionally complying with MIL-C-24308.

A.2.2. 4 In/16 Out DIO Board Specification (Figure A/1-4)

1. (4) Programmable inputs

See Section 1.1.1 specifications.

2. (16) Programmable outputs

See Section 1.1.2 specifications.

3. Connector

25 pin D connector (female). Connector is interchangeable with a 20 or 22 pin subminiature D connector dimensionally complying with MIL-C-24308.

Figure 5-1: Digital Input/Output
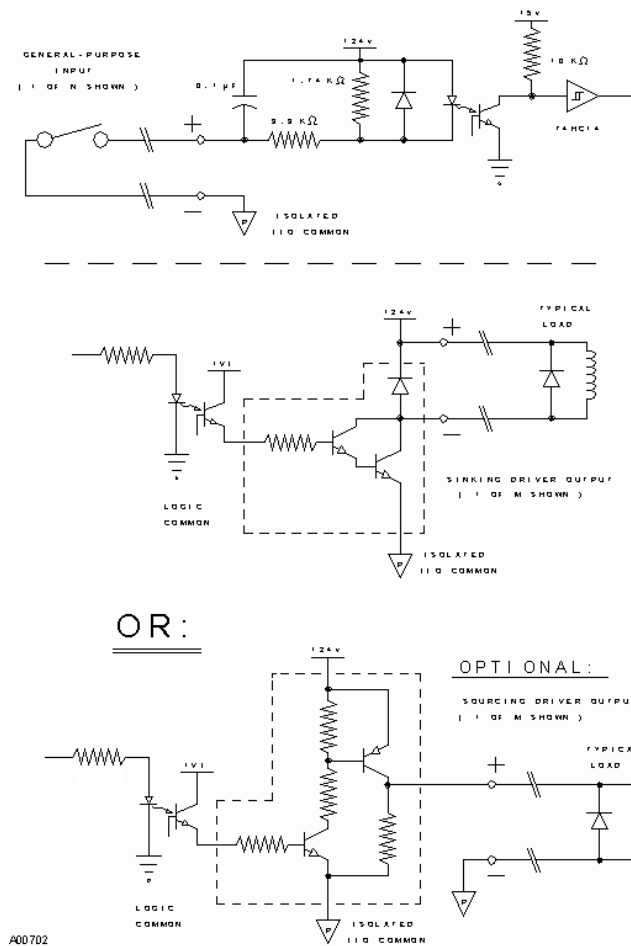
A.1. BCD Input Option

Load sizes for load out or batching applications can be remotely entered by BCD. An optional Load Out input output board is required.

See Figure A/1-5 for wiring.

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Appendix B
Micro-Tech 3106 Menus

The Integrator is a menu driven machine that allows the operator to access all setup, test, and calibration parameters. Main Menu screens 1 through 6 can be accessed at anytime by pressing the MENU key until the desired menu screen is displayed. Menu scrolls may be selected by pressing the soft key directly below the desired scroll, and then using the Up/Down scroll key.

If the Integrator is password protected, the appropriate password must be entered prior to making changes or per forming routine calibration. Menus may be viewed without entering a password, but no entries are allowed unless the password is entered.

Optional menu scrolls are only available if the available option has been installed. The following screens are activated by the MENU key.

```
-  MAIN MENU 1  -
Press MENU for more
ZERO  SPAN  PROD
CAL   CAL   SETUP
```

```
-  MAIN MENU 2  -
Press MENU for more
     SCALE CALIB
DISPLY     DATA DATA
```

```
-  MAIN MENU 3  -
Press MENU for more


PROT  DIAG  TEST
```

```
-  MAIN MENU 4  -
Press MENU for more
I/O   ALARMS     LOAD
DEFINE     DEFINE
     OUT
```

```
-  MAIN MENU 5  -
Press MENU for more
    *         *
COMM A      COMM B
      PRINT
```

* Can be AB I/O or Pro DP

```
-  MAIN MENU 6  -
Press MENU for more
AUDIT
TRAIL LINEAR
```

B.1. Main Menu 1

Main Menu 1 contains the Calibration Menu and Product Selection Mode Menu. Menu 1 is selected by pressing the MENU key until Main Menu 1 displays. Desired calibration scrolls are selected by pressing the soft keys directly below the desired scroll.

```
-  MAIN MENU 1  -
Press MENU for more
ZERO  SPAN  PROD
CAL   CAL   SETUP
```

B.1.1.   Zero Calibration

See Section 3.9.1

B.1.2.   Span Calibration

See Section 3.9.2

B.1.3.   Product Setup

See Section 3.9.3

B.2. Main Menu 2

Main Menu 2 contains the setup and configuration menus. Main Menu 2 is selected by pressing the MENU key until Main Menu 2 displays. Setup scrolls are selected by pressing the key directly below the desired scroll.

```
  -   MAIN MENU 2   -
Press MENU for more
         SCALE
CALIB
DISPLY    DATA
DATA
```

B.2.1.   Display

Press the DISPLY soft key and the following screen displays.

```
- START OF SCROLL -
Use SCROLL keys to
view selections.

```

Press the SCROLL DOWN key and the following screen displays

```
- DISPLAY SCROLL 1 -
Measure Units
> English <                    Password: Service
CHOICE     ENTER

```

1. Define Measure Units. Press the CHOICE soft key to scroll selections. Press ENTER to confirm your selection

Default: ENGLISH

Selections: ENGLISH, METRIC, MIXED

                   If ENGLISH, all units in USA

                   If Metric, all units in Metric

                   If Mixed, units can be a combination of USA and Metric

Scroll DOWN and the following screen displays.

```
- DISPLAY SCROLL 2 -
Totalization Units
> Tons <
CHOICE     ENTER
```

Password: Service

The units to be used for totalization are selected here. Press the CHOICE soft key to scroll selections. Press ENTER to confirm your selection.

If ENGLISH: **Default:** Tons
             Selections: Tons, LTons, Pounds

If METRIC: **Default:** tonnes

             Selections: tonnes, kg

If MIXED: **Default:** tonnes

             Selections: tonnes, Pounds, Tons, LTons, kg

Scroll DOWN and the following screen displays.

The units to be used for rate are selected here. Press the CHOICE soft key to scroll selections. Press ENTER to confirm your selection.

```
DISPLAY SCROLL 3 -
Rate Units
>Tph<
CHOICE     ENTER
```

Password: Service

If ENGLISH: **Default:** Tph
             Selections: Tph, LTph, Lb/m, T/m, LT/m, percent %, Lb/h

If METRIC: **Default:** t/h

             Selections: t/h, kg/m, t/m, percent %, kg/h

If MIXED: **Default**: t/h

             Selections: Lb/h, Tph, LTph, kg/m, t/m, Lb/m, T/m, LT/m, percent %, kg/h, t/h

2. Defining the Language

The Micro-Tech™ 3106 is capable of displaying one of two different languages. English or (USA) and Italian (ITA) are the standard languages provided. Other languages, such as German (GER) and Spanish (ESP) are available upon request (consult factory).

Scroll DOWN and the following screen displays.

Press the CHOICE soft key to scroll selections. Press ENTER to confirm your selection.

```
- DISPLAY SCROLL 5 -
Language
>USA<
CHOICE    ENTER
```

Default: USA
Selections: USA, ITA (Italian)

3. Setting Time and Date

This section applies only if the COMM board is installed. The user has to define the format for displaying and printing time and date.

Scroll DOWN and the following screen displays.

Press the CHOICE soft key to scroll selections. Press ENTER to confirm your selection.

```
- DISPLAY SCROLL 6 -
Time
>am/pm<
CHOICE    ENTER
```

Default: am/pm
                    am/pm, 24h

Scroll DOWN and the following screen displays.

Press the CHOICE soft key to scroll selections. Press ENTER to confirm your selection.

```
- DISPLAY SCROLL 7 -
Date
>MM-DD-YYYY<
CHOICE   ENTER
```
If language is USA

Default: MM-DD-YYYY

 If language other than USA
Default: DD-MM-YYYY

Selections: DD-MM-YYYY, MM-DD-YYYY, YYYY-MM-DD

4. Setting Line 3 of the Run Menu

The Run Menu can be configured to display any of the following on Line 3:

*   Product (if COMM is installed)

*   Date (if COMM is installed)

*   Time (if COMM is installed)

*   No Display (the default selection).

Scroll DOWN and the following screen displays.

Press the CHOICE soft key to scroll selections. Press ENTER to confirm your selection.

```
- DISPLAY SCROLL 8 -
Run display line 3
>No display<
CHOICE   ENTER
```
Password: Operator

Default: NO DISPLAY
Selections: NO DISPLAY, PRODUCT, DATE/TIME (only if COMM is installed)

5. Setting Damping for the Display Rate

The material flow displayed rate on the screen can be damped by a entering an averaging time. This will average out/dampen variations in the flow rate making the display easier to read. This damping of the display rate does not affect the current out variable. The current out variable has a separate damping setting available thru Main Menu 4, I/O define.

Scroll DOWN and the following screen displays.

Use the numeric keys to enter the averaging/damping time in seconds, and confirm with the ENTER key.

```
- DISPLAY SCROLL 9 -
Damping Display RATE
Damping = 2 sec
ENTER
```

Password: Operator

Default:	2 sec
Min:	0 sec
Max:	400 sec

Press the **MENU** key to return to Main Menu 2.

B.2.2.   Scale Data

Press the **SCALE DATA** soft key and the following screen displays:

```
-  MAIN MENU 2   -
Press MENU for more
     SCALE CALIB
DISPLY    DATA DATA
```

Press the scroll down key until each of the following screens display:

```
      - START OF
SCROLL -
Use SCROLL keys to
view selections.
```

```
- SC DATA SCROLL 1 -
Max scale capacity
       10 Tph
ENTER
```

Password: Service

```
- SC DATA SCROLL 2 -
Scale Divisions
>0.1<
CHOICE      ENTER
```

Password: Service

1. Scale Capacity and Divisions

Scroll down and the following screen displays:

```
- SC DATA SCROLL 6 -
Zero Dead-Band Range
    2.0%
ENTER
```

Password: Service

2. Setting the Dead Band

The dead band is a percentage of the Max Scale Capacity (rate) below which the flow rate is ignored (if any) and a zero rate is forced. All totalizers except remote pulse totalizer are disabled when the flow rate is below the dead band threshold. Use the numeric keys to enter the dead band percentage and confirm with the ENTER key.

Default: 2%
Min: 0%
Max: 5%

Dead band is useful when the installation has severe vibrations and the zero is unstable. Zero unstable means zero repeats sometimes but drifts. Increasing the dead band percentage can make for a more accurate flow meter installation with the above conditions by ignoring the insignificant impact plate movements caused by vibrations.

Press **MENU** to return to Main Menu 2.

B.2.3.   Calibration Data

```
-  MAIN MENU 2  -
Press MENU for more
     SCALE CALIB
DISPLY    DATA  DATA
```

The Cal Data scroll allows the operator to enter or set parameters which relate to the calibration of the Flow Meter.

Press the CALIB DATA soft key and the following screen displays.

Scroll **DOWN** and the following screen displays:

```
- START OF SCROLL -
Use SCROLL keys to
view selections.
```

1.   Entering Calibration Interval

If an optional COMM board is installed, the system can be programmed to prompt the operator when the next calibration is due. If this option is not desired, confirm the default 0 days interval, otherwise enter the number of days using the numeric keys. The calibration date displayed in Scroll 9 is automatically updated whenever a calibration is done. If a non-zero number is entered, an alarm displays after the time is elapsed. The alarm can only be cleared after a calibration check is done. Use the numeric keys to enter the calibration interval and confirm with the ENTER key.

```
     - CAL DATA
SCROLL 1 -
Calibration interval
   0 days
ENTER
```

Password: Operator

Default: 0 Days
Min: 0 Days

Max: 365 Days

Scroll DOWN and the following screen displays.

```
- CAL DATA SCROLL 2 -
Calibration date
Last  MM-DD-YYYY
Next  MM-DD-YYYY
```

2.   Defining Auto Zero Tracking

A periodic auto zero procedure can be automatically executed by the system if the Auto Zero Tracking option is set to YES. If YES is selected, Auto Zero Tracking is enabled anytime the product flow has stopped and the rate falls below the range setting selected with CAL DATA SCROLL 3A.

```
- CAL DATA SCROLL 3 -
Auto zero tracking
>no<
CHOICE      ENTER
```

Password: Operator

Default: NO
Selections: NO, YES

Auto Zero Tracking is not recommended for most impact weighing applications.

If you are going to use Auto Zero Tracking, contact Thermo Electron field service first.

The following scrolls are only visible if Auto Zero Tracking is enabled - set to YES on CAL DATA SCROLL 3.

Set AZT to YES and scroll DOWN the following screen displays. Define the range of action of the AZT with reference to Max. Scale Capacity (rate) using the numeric keys and confirm with the ENTER key. A flow rate greater than the range setting deactivates AZT.

```
-CAL DATA SCROLL 3A-
Auto zero tracking
range +/-  4.0 %
ENTER
```

Password: Operator

Default: +/-4%
Min: +/-0%

Max: +/-10%

Scroll DOWN and the following screen displays

```
-CAL DATA SCROLL 3B-
Auto zero tracking
max dev  +/-   4.0 %
ENTER
```

Password: Service

Define the maximum amount of zero error (with reference to Max. Scale Capacity) that AZT can automatically compensate. Use the numeric keys to enter the max dev and confirm with the ENTER key.

Default: +/- 4%
Min: +/- 0%

Max: +/- 10%

Scroll DOWN and the following screen displays.

```
-CAL DATA SCROLL 3C-
Auto zero tracking
time :      10  sec
ENTER
```

Password: Service

Default: 10 sec
Min: 1 sec

Max: 60 sec

Define the time used for averaging the impact plate position in determining zero. The system zeros the flow meter averaging the impact plate position for the time defined, only after the flow rate has been permanently lower than the defined range for the same amount of time. Use numeric keys to enter auto zero tracking time and confirm with the ENTER key.

B.3. Main Menu 3

Main Menu 3 is used for protecting and un-protecting the system using passwords, and to perform diagnostic and test functions. The diagnostic functions can only be operated after removing all password protections and should only be used by experienced technical personnel. Most test functions are not password protected. Main Menu 3 is selected by pressing the MENU key until Main Menu 3 displays.

```
- MAIN MENU 3 -
Press MENU for more


PROT  DIAG  TEST
```
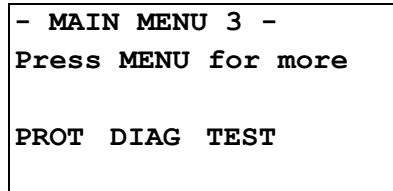
The PROTection menu only becomes visible after passwords have been defined (see the DIAGnostics menu)

B.3.1.   Changing the Protection Level

The Micro-Tech™ 3106 has three protection levels to which specific passwords are related.

The protection levels and the passwords are defined using the following scheme:

PROTECTION	*PASSWORD*	*STATUS*
NONE	SERVICE	The system is totally un-protected; all data can be read or changed.
LIMITED	OPERATOR	Operator functions and data are unprotected. All setup and calibration data are protected except zero calibrate.
PROTECTED		The system is totally protected, process data can be read, no change allowed.

A SERVICE password is required to access the NONE level. An OPERATOR or a SERVICE password is required to access the LIMITED level.

Press the PROT soft key and the following screen displays.

Use the NONE key to access the NONE protection level. If the current level is not already NONE, the SERVICE password it required.

Use the LTD key to access the limited protection level. If the system is in level NONE, change is immediate. If it is in PROT level, the SERVICE or OPERATOR password is required. Use the PROT key to access the protected level. No password is required.

```
         - PROTECTION
LEVEL -
         > NONE <


NONE  LTD   PROT
```

Default: NONE

Selections: NONE, LIMITED, PROTECTED

Password: from NONE to LTD or PROT: not required

                from LTD to PROT: not required

                from LTD to NONE: SERVICE

                from PROT to NONE: SERVICE

                from PROT to LTD: OPERATOR or SERVICE

Pressing the soft key gives entry into desired level. Going from a low level to a higher level forces the password entry.

1.   On Line Procedure for Changing Protection Level

The protection level can be temporarily changed by entering a password "on the fly" during normal operation. When the operator tries to enter a variable or select a function which is password protected, and the password is installed, the following screen is displayed.

```
- SYSTEM PROTECTED -
PLEASE ENTER
PASSWORD _____
ENTER
```

The operator can enter either the OPERATOR or the SERVICE passwords. However, if the operator enters the OPERATOR password and the variable or function requires the SERVICE password instead, the access is denied and the following screen is displayed.

```
- SYSTEM PROTECTED -
PLEASE ENTER SERVICE
PASSWORD_____
ENTER
```

If the operator fails to enter the correct password, the following screen displays.

```
- SYSTEM PROTECTED -
INVALID PASSWORD
ACCESS DENIED
RETURN
```

Pressing RETURN returns the program to the previous function. If the operator enters the correct password, the previous screen displays and access is allowed.

When the protection level is changed using the on line procedure, the system automatically returns to protected status if no keyboard entries are made within 60 seconds.

B.3.2. Diagnostics

Press the DIAG key from Main Menu 3 and the following screen displays.

```
- START OF SCROLL -
Use SCROLL keys to
view selections.
```

Scroll DOWN and the following screen displays.

```
-DIAGNOST. SCROLL 1-

PFM gross  0000.0
PFM net    0000.0
```

1. PFM Raw Data

Diagnostic Scroll 1 shows the raw data from the sensor and the net value after the zero constant has been subtracted. The allowable range of the PFM gross signal is from 70 to 2500 Hz.

Scroll DOWN and the following screen displays.

2. Change Passwords

```
       -DIAGNOST.
SCROLL 3-
Enter SERVICE
password  ********
ENTER
```

Password: Service

Default: **No password**

The password can be changed by entering a new one. The user can enter up to eight characters (numeric keys entries). The entered numbers are not echoed on the screen. Pressing just the ENTER key removes the password.

After the password has been entered, the system asks for confirmation. This prevents losing access control due to a typing mistake while entering passwords.

If the password entered the second time matches the first, the following screen confirms the entry.

```
-DIAGNOST. SCROLL 3-
Reenter SERVICE
password  ********
ENTER
```

If the two passwords do not match, the system does not accept the new password, and the following screen displays:

```
-DIAGNOST. SCROLL 3-
    NEW PASSWORD
       ACQUIRED
RETURN
```

Scroll **DOWN** and the **OPERATOR** password screen displays:

```
-DIAGNOST. SCROLL 3-
INVALID PASSWORD

RETURN
```

The **OPERATOR** password is double checked similarly to the **SERVICE** password.

It is strongly suggested to write down the password and preserve a copy in a safe place. If the password is forgotten, refer to Section 4.2.7.

```
-DIAGNOST. SCROLL 4-
Enter OPERATOR
password  ********
ENTER
```

Password: Operator

Default: No password

Scroll down and the Software Version screen displays.

3. Display Software Version

```
        -DIAGNOST.
SCROLL 5-
   Software version:
      00.00.00.00.
```

The software version is displayed for reference only.

Scroll down and the date screen displays:

4. Setup Date and Time

```
        -DIAGNOST.
SCROLL 6-
Date  DD-MM-YYYY
DAY   DD
ENTER
```

Password: Service

Default: 00-00-0000
Min: 01-01-0000

Max: 12-31-2096

This section only applies if a COMM board is installed. The user can set the current date and time. A battery operated clock calendar then maintains time and date even if power is removed. Day, Month, and Year are entered in sequence using the numeric keys and confirm with ENTER

Scroll **DOWN** and the time screen displays:

```
       - DIAGNOST
SCROLL 7 -
Time        9:50a
HOURS:      9 am
ENTER       AM/PM
```

	24 hour	**a m/pm**
Default:	00:00	01:00
Min:	00:00	01:00
Max:	23.59	12:59

Time is entered in a similar way. The AM/PM key is used when time is in the English mode. Hours and minutes are entered in sequence using the numeric keys and confirm with ENTER. See Display Scroll 7 in Main Menu 2.

Scroll DOWN and the hardware configuration screens appear as follows.

5. Check Hardware Configuration

The system automatically recognizes when optional boards are installed. The following scrolls are used to show the configuration. Remember that when a board is acknowledged, the related information stays in memory even if the board is removed, until the operator deletes it by responding YES to the message shown at power on.

The following screen is displayed for each board installed is each slot.

```
-DIAGNOST. SCROLL 8-
Board type slot #1
BOARD TYPE

```

```
-DIAGNOST. SCROLL 9-
Board type slot #2
BOARD TYPE

```

```
-DIAGNOST. SCROLL 10-
Board type slot #3
BOARD TYPE

```

```
-DIAGNOST. SCROLL 11-
Board type slot #4
BOARD TYPE

```

```
-DIAGNOST. SCROLL 12-
Board type slot #5
BOARD TYPE

```

```
-DIAGNOST. SCROLL 13-
Board type slot #6
BOARD TYPE
```

BOARD TYPE can be:

- PFM BOARD   Standard board which reads/excites LVDT

- Dig I/O 16in/4out   Optional digital input output board.

                     - #16 Optocoupled digital Inputs

                     - #4 Optocoupled digital outputs

- Dig I/O 4in/16out   Optional digital input output board.

                     - #4 Optocoupled digital inputs

                     - #16 Optocoupled digital outputs

- Load Out 16in/4out   Optional digital input output board dedicated to the Load Out.
                     - #16 Optocoupled digital Inputs

                     - #4 Optocoupled digital outputs

- Load Out 4in/16out   Optional digital input output board dedicated to the Load Out.
                     - #4 Optocoupled digital inputs

                     - #16 Optocoupled digital outputs

- Analog I/O   Optional analog input output board.

                     - #2 Current outputs

                     - #2 Voltage inputs

- Current Out   Optional current output board.

                     - #1 Current output

- Communication A   Serial communication board (RS232, RS485)
- Communication B   AB RI/O board

                     PROFIBUS-DP

Scroll **DOWN** and the Last Span PFM screen displays:

```
        -DIAGNOST.
SCROLL 14-
LAST SPAN PFM
0000.0
```

This screen displays the last PFM acquired for the LAST span calibration.

B.3.3.   Tests

```
- START OF SCROLL -
Use SCROLL keys to
view selections.
```

1.   Lamp Test

From Main Menu 3 press the TEST soft key and the following screen displays.

```
- TEST SCROLL 1 -
LAMP TEST


START
```

Press START to begin Lamp Test of the Integrator. All LED's and digits of the display blink for a number of seconds.

2.   Self Test of the Integrator

Scroll DOWN and the internal test screen displays.

```
        - TEST SCROLL 2
-
Internal test of
microprocessor
START
```

Password: Service

The system can perform some internal test functions, which can be used to detect malfunctions to the hardware devices.

After START is pressed, the following screens are displayed in sequence.

```
- TEST SCROLL 2A -
Testing ROM
TEST PASSED
```

```
- TEST SCROLL 2B -
Testing ROM
TEST PASSED
```

The message "Test PASSED" is displayed if the test runs correctly. If something wrong is detected, then the message "Test FAILED" is displayed, and the soft key CONTINUE is shown. The operator has to press CONTINUE to go on the next test.

NOTE: Test 2C requires a hardware jumper to be installed between serial in and serial out pins of the motherboard. Since the jumper is not normally in place, a "Test FAILED" message at the end of Test 2C is normally displayed.

3. Test Digital Inputs

The next screen is used to check the digital input circuitry. The display shows a 1 if the specific input is closed, 0 if open. If more digital I/O boards are installed, the NEXT soft key displays, allowing the operator to scroll between boards.

Scroll DOWN and the digital input test screen displays.

```
- TEST SCROLL 3 -
Dig input test
Slot #0: - - - - 0000
                  NEXT
```

Slots are numbered 1 to 6; slot 0 is the motherboard. Inputs are shown from right to left. If a board has 16 inputs, two screens are used to show the first and the second half, the lower half is shown first.

4. Test Digital Outputs

This test shows the status of each digital output and allows the operator to force the output for testing purposes. The output, when forced, stays on until the CLEAR soft key is pressed or the Run Menu is entered. If an output is forced and the scroll key is used for reaching some other menu, the output stays in the forced status until RUN is pressed. This allows the operator to check inputs while outputs are still in the forced status.

Scroll DOWN and the digital output test screen displays.

```
- TEST SCROLL 4 -
Dig output test
Output  #1:  ON/OFF
ENTER ON/OFF
```

To force an output, enter the desired number followed by ENTER. Then use the ON/OFF key to force it to the ON or OFF STATUS. After the output has been forced, the CLEAR soft key displays in the middle position. Slots are numbered 1 to 6; slot 0 is the motherboard.

⚠ **WARNING**

FORCING THE DIGITAL OUTPUTS MAY CAUSE MACHINERY TO START. AFTER THE USER TRIES TO FORCE AN OUTPUT, THE FOLLOWING MESSAGE WILL BE DISPLAYED.

⚠ **WARNING**

IF THE USER PRESSES CONTINUE, BE AWARE THE ACTION MAY CAUSE DAMAGE OR INJURY. IF THE USER PRESSES ABORT, THE SYSTEM WILL RETURN TO THE PREVIOUS SCROLL.

```
        WARNING
EQUIPMENT MAY START


CONTINUE    ABORT
```

5. Test Current Outputs

This section only applies if a current output board is detected. The board can have one or two current output channels. Scroll down and the digital output test screen displays.

```
- TEST SCROLL 5 -
Current output #1
should be      4.0 mA
ENTER CLEAR
```

Default: 4.0 mA
Min: 0.0 mA
Max: 20.0 mA

To force the output, use the numeric keypad to enter the desired number of milliamps and press **ENTER**.

If the board has two channels, the following screen is shown.

```
- TEST SCROLL 6 -
Current output #2
should be      4.0 mA
ENTER CLEAR
```

Password: Service

Default: 4.0 mA
Min: 0.0 mA
Max: 20.0 mA

The factory default for Current Out Define in I/O DEFINE is set to >Rate<. The factory default for Current Out Range in I/O DEFINE is set to >4 20 mA<. If the Current Out Range is set to >0 20 mA< the Current Output default would be 0.0. If the Current Out Range is set to >20 4 mA< or >20 0 mA< the Current Output default would be 20.0 mA. With Current Out Define set to >Rate< the CLEAR key resets the Current Output to the default.

6. Test Current Inputs

Scroll DOWN and the following screen is displayed only if an analog input board is detected, and shows the status of each analog input channel.

```
        - TEST SCROLL 7
-
Voltage input
#1 00.0 V
#2 00.0 V
```

7. Test Communications A

Scroll DOWN. If a communication board is detected, the following screen is shown. The Port 2 soft key is only shown if two boards are detected.

```
- TEST SCROLL 8 -

Test communication A


PORT1 PORT2
```

Password: Service

By pressing the PORT1 or the PORT2 soft key, the test is initiated. A test pattern is sent out on the TX output and read on the RX input. If the test fails, the message "Test Failed is shown; otherwise, the message "Test Passed" is displayed.

Note: This test requires a hardwire jumper to be installed between terminals TB5-8 (RX) and TB 5-9 (TX) on the communication board.

8. Test Communications B

This test is similar to the previous one but works for the field bus version of the communication board.

Scroll DOWN and the Test Communication B screen displays.

```
        - TEST SCROLL 9
-
Test communication B


START
```

9. Test BCD Input Board

If an optional load out board is detected, the following screen displays. The test is similar to the digital input test.

Scroll DOWN and the Test BCD Input Board screen displays.

```
- TEST SCROLL 10 -
BCD  Input test
             0000
ENTER CLEAR
```

10. Test BCD Output Board

The following test screen is displayed if an optional load out board is detected.

Scroll DOWN and the BCD Output Test screen displays.

```
        - TEST SCROLL 11
-
BCD Output test
              0000
ENTER CLEAR
```

Password: Service

Default: 0
Min: 0

Max: 9999 or 7999 if parity check enabled

11. Test the CPU Serial Line

Scroll DOWN and the Test CPU Serial Line screen displays.

```
        - TEST SCROLL 12
-
Test CPU serial line

START
```

Password: Service

If START is pressed, the Integrator performs a test of the serial line of the CPU board.

Note: The CPU serial line is not implemented in the current hardware; therefore, the normal response is TEST FAILED.

12. Test the Keyboard and Switches

Scroll DOWN and the Keyboard + Switches screen displays.

```
- TEST SCROLL 13 -
Keyboard + switches
Key
Switches    00000000
```

Press the RUN key twice to exit. All other keys including MENU are displayed but not executed.

B.4. Main Menu 4

Main Menu 4 is dedicated to the definition of the input output (I/O), alarms and, if the optional hardware exists, the load out controller (batch).

```
-    MAIN MENU 4    -
   Press MENU for more
I/O   ALARMS      LOAD
DEFINE      DEFINE
        OUT
```

B.4.1.   I/O Definitions

The input output section of the system is fully configurable. All inputs and outputs are conventionally numbered and can be assigned to physical input and output terminals depending on the needs. The following section explains how to configure I/O. However, the standard configuration as provided by the factory is normally satisfactory.

1.   Define Current Output

Press the I/O DEFINE soft key and the following screen displays.

```
- START OF SCROLL -
Use SCROLL keys to
view selections.
```

Scroll DOWN and the I/O DEF SCROLL 1 screen displays.

```
- I/O DEF SCROLL 1 -
Current output define
#1:  > Rate <
CHOICE      ENTER NEXT
```

The standard factory supply is for one current output only, no current inputs. The following menu screens are shown to define it. Press the CHOICE soft key to scroll selections. Press ENTER to confirm your selection. The NEXT key only displays if the optional 2-inputs/2 outputs board is installed and allows the operator to set up either of the outputs.

```
- I/O DEF SCROLL 1 -
Current output define
#1:  > Rate <
CHOICE     ENTER NEXT
```

Password: Service

Default: **RATE**
Selections: **RATE, OFF**

If the selection of the previous screen is RATE, the operator can set up the range, delay and damping of the current output. The range is selectable between the standard 0 to 20 mA and 4 to 20 mA both in direct and reverse mode. Select 0 20 or 4 20 if an increase in current is desired for any increase in the process material flow. Select 20 0 or 20 4 if a decrease of current is desired for any increase of the variable. Press the CHOICE soft key to scroll selections. Press ENTER to confirm your selection.

Scroll DOWN and the I/O DEF SCROLL 1A screen displays.

```
- I/O DEF SCROLL 1A -
Current out range
#1:  > 4-20 mA <
CHOICE     ENTER NEXT
```

Password: Service

Default: **4-20 ma**
Selections: **0-20 mA, 4-20 mA, 20-0 ma, 20-4 mA**

Each current output can be delayed. This is typically needed in blending systems, to correct transport time differences. The delay is set in seconds.

Scroll DOWN and the I/O DEF SCROLL 1B screen displays.

```
- I/O DEF SCROLL 1B -
Current out delay
#1:   10 sec
ENTER NEXT
```

Password: Service

Default: **10 sec**
Min: **0 sec**

Max: **300 sec**

A damping factor can also be selected for each current channel. This damping only affects the current output, not the displayed flow rate, which has a separate damping factor, selectable in Main Menu 2, Display.

Scroll DOWN and the I/O DEF SCROLL 1C screen displays.

```
- I/O DEF SCROLL 1C -
Current out damping
#1:   2 sec
ENTER NEXT
```

Password: Operator

Default: **2 sec**
Min: **0 sec**

Max: **400 sec**

2.   Define Analog Inputs

If the 2-inputs/2 outputs analog board is installed, the following screens are displayed. Analog inputs can be used for measuring the moisture of the material.

Moisture compensation is performed on the process material flow, and affects both rate and totals. Only during material calibration with material is moisture compensation suspended, so that the totalized quantity can be directly compared to the weight obtained on a static scale. The moisture compensation is executed before adding to totals. Press the CHOICE soft key to scroll selections. Press ENTER to confirm your selection.

Scroll DOWN and the I/O DEF SCROLL 2 screen displays.

```
- I/O DEF SCROLL 2 -
Analog input #1 def.
#1: > Off <
CHOICE      ENTER CALIB
```

Password: Service

Default: **OFF**
Selections: **OFF, MOISTURE**

Scroll DOWN and the I/O DEF SCROLL 3 screen displays.

```
- I/O DEF SCROLL 3 -
Analog input #2 def.
#2: > Off <
CHOICE      ENTER CALIB
```

Password: Service

Default: **OFF**
Selections: **OFF, MOISTURE**

A. Setup Moisture Compensation Input

If an analog input has been programmed for reading the moisture signal and CALIB key is pressed, the following screens appear. The user can calibrate the input signal by entering the equivalence between percent of moisture and mA on two points. Use the %Moist key to enter the percent of moisture, use the mA key to enter the corresponding number of mA, and confirm with ENTER.

```
- I/O DEF SCROLL 2A -
Moisture input calib.
  0.0 %    =     0.0
mA
ENTER %MOIST      mA
```

Password: Service

Default:	**0.0 %**	**0.0 mA**
Min:	**0.0 %**	**0.0 mA**
Max:	**20.0 %**	**10.0 mA**

Do the same with the second input.

```
- I/O DEF SCROLL 2B -
Moisture input calib.
20.0 %     =     10.0
mA
ENTER %MOIST      mA
```

Password: Service

Default:	**10.0 %**	**20.0 mA**
Min:	**1.0 %**	**5.0 mA**
Max:	**20.0 %**	**20.0 mA**

3. Define Digital Inputs

```
- I/O DEF SCROLL 4 -
Dig.  input def.
Ext alarm 1      0 NO
ENTER NC/NO NEXT
```

Password: Service

Digital inputs can be programmed. The following screen shows one logical function per time, and allows the user to assign it to a physical input. The NEXT key scrolls between the logical functions. The NC/NO key selects the Normally Open (NO) or Normally Closed (NC) status of the input. Normally Open means the input is inactive when disconnected. To program a function, scroll with NEXT until the function is displayed, then enter the physical input number and confirm with ENTER. Scroll with NC/NO until the desired mode is displayed. By assigning a function to 0, the function is disabled.

The following table shows the available logical selections that can be assigned to any available physical input. Default inputs may be reassigned to any physical output if desired. External alarms 1, 2, and 3 can be assigned to logical functions not on the list.

Logical selections should not be reassigned after the physical inputs have been terminated.

⚠ **CAUTION**
Logical inputs return to the default if the Integrator is cold started.

Selections:	Default:	
External alarm 1	0 NO	0 = function disabled
External alarm 2	0 NO	
External alarm 3	0 NO	
Print	0 NO	(Only if COMM installed)
Reset Totals	0 NO	
Reset Alarms	0 NO	
Product #1	0 NO	(Only if Product Select is Remote)
Product #2	0 NO	(Only if Product Select is Remote)
Product #3	0 NO	(Only if Product Select is Remote)
Product #4	0 NO	(Only if Product Select is Remote)
Product #5	0 NO	(Only if Product Select is Remote)
Product #6	0 NO	(Only if Product Select is Remote)
Product #7	0 NO	(Only if Product Select is Remote)
Product #8	0 NO	(Only if Product Select is Remote)
Product #9	0 NO	(Only if Product Select is Remote)
Product #10	0 NO	(Only if Product Select is Remote)
Auto Zero	0 NO	(Only if AZT enabled)
Batch Start	0 NO	(Only if Load Out installed)
Batch Stop	0 NO	(Only if Load Out installed)
Batch Standby	0 NO	(Only if Load Out installed)

Three assignable inputs are standard on the motherboard.

MOTHER BOARD INPUTS			
PHYSICAL INPUT NUMBER	**ASSIGNED FUNCTION**	**FIELD MOUNT**	**PANEL MOUNT**
1		**TB8 13 & 14**	**TB2 5 & 7**
2		**TB8 11 & 12**	**TB2 8 & 10**
3		**TB8 9 & 10**	**TB2 9 & 10**

Additional assignable logical inputs from the above table can be selected by adding optional I/O boards. Available options are 4in/16out, 16in/4out, or 20in/20out by adding both boards.

DIGITAL INPUT/OUTPUT BOARD INPUTS				
			INSTALLED OPTIONS	
PHYSICAL INPUT NUMBER	ASSIGNED FUNCTION	4IN/16OUT ONLY	16IN/4OUT ONLY	4IN/16OUT AND 16IN/4OUT
4		J15 - 2	J16 - 17	J15-2
5		J15 - 15	J16 - 5	J15-15
6		J15 - 3	J16 - 18	J15-3
7		J15 - 16	J16 - 6	J15-16
8			J16 - 19	J16-17
9			J16 - 7	J16-5
10			J16 - 20	J16-18
11			J16 - 8	J16-6
12			J16 - 21	J16-19
13			J16 - 9	J16-7
14			J16 - 22	J16-20
15			J16 - 10	J16-8
16			J16 - 23	J16-21
17			J16 - 11	J16-9
18			J16 - 24	J16-22
19			J16 - 12	J16-10
20				J16-23
21				J16-11
22				J16-24
23				J16-12

⚠ **WARNING**
Changing the definition of the digital inputs may cause machinery to start. After the user tries to change a definition, the following message is displayed.

⚠ **WARNING**
If the use presses continue, be aware the action may cause damage or injury. If the user presses abort, the system returns to the previous scroll.

4.   Define Digital Outputs

Digital outputs can be programmed. The following screen shows one logical function per time, and allows the user to assign it to a physical output. The NEXT key scrolls between the logical functions. The NC/NO key selects the Normally Open (NO) or Normally Closed (NC) status of the output. Normally Open means the output is not energized in normal conditions. To program a function, scroll with NEXT until the function is displayed, then enter the number of the physical output and confirm with ENTER. Finally, scroll with NC/NO until the desired mode is displayed. By assigning a function to 0, the function is disabled.

```
- I/O DEF SCROLL 5 -
Dig. output def.
Alarms      0 NO
ENTER NC/NO NEXT
```

Password: Service

The following table shows the available logical selections that may be assigned to any available physical output. Typical field wiring drawings and customer specific field wiring drawings show Ready defaulted to #1 NC, Alarm defaulted to #2 NC, and Totalizer (remote counter) defaulted to #3 NO. Default selections may be reassigned to any physical output if desired.

Logical selections should not be reassigned after the physical inputs have been terminated.

⚠ **CAUTION**
Logical outputs return to the default if the Integrator is cold started.

Selections	Default	
Alarm	2 NC	
Shut down	0 NO	
Ready	1 NC	
High Rate	0 NO	(Only if Rate Alarm enabled)
Low Rate	0 NO	(Only if Rate Alarm enabled)
Totalizer	3 NO	
Batch Preset	0 NO	(Only if Load Out installed)
Batch End	0 NO	(Only if Load Out installed)
Air Purge	0 NO	

One non-assignable Fault output and three assignable outputs are standard on the motherboard.

MOTHER BOARD OUTPUTS			
PHYSICAL OUTPUT NUMBER	ASSIGNED FUNCTION	FIELD MOUNT	PANEL MOUNT
	Fault Output	TB8 1 & 2	TB2 15 & 16
1		TB8 7 & 8	TB2 12 & 16
2		TB8 5 & 6	TB2 13 & 16
3		TB8 3 & 4	TB2 14 & 16

Additional assignable logical outputs from the above table can be selected by adding optional I/O boards. Available options are 4in/16out, 16 in/4 out, or 20in/20out by adding both boards.

DIGITAL INPUT/OUTPUT BOARD OUTPUTS				
		INSTALLED OPTIONS		
PHYSICAL OUTPUT NUMBER	ASSIGNED FUNCTION	4IN/16OUT ONLY	16IN/4OUT ONLY	4IN/16OUT AND 16IN/4OUT
4		J15-17	J16 - 2	J16-2
5	_____	J15 - 5	J16 - 15	J16-15
6	_____	J15 - 18	J16 - 3	J16-3
7	_____	J15 - 6	J16 - 16	J16-16
8	_____	J15 - 19		J15-17
9	_____	J15 - 7		J15-5
10	_____	J15 - 20		J15-18
11	_____	J15 - 8		J15-6
12	_____	J15 - 21		J15-19
13	_____	J15 - 9		J15-7
14	_____	J15 - 22		J15-20
15	_____	J15 - 10		J15-8
16	_____	J15 - 23		J15-21
17	_____	J15 - 11		J15-9
18	_____	J15 - 24		J15-22
19	_____	J15 - 12		J15-10
20	_____			J15-23
21	_____			J15-11
22	_____			J15-24
23	_____			J15-12

> ⚠️ **WARNING**
>
> **Changing the definition of the digital outputs may cause machinery to start. After the user tries to change a definition, the following message is displayed.**

```
        WARNING
   EQUIPMENT MAY START


CONTINUE    ABORT
```

> ⚠️ **WARNING**
>
> **If the user presses continue, be aware the action may cause damage or injury. If the user presses abort, the system returns to the previous scroll.**

5.   Define Remote Totalizer Output

If the TOTALIZER output function is assigned to an output, the following screens allow the user to set up related parameters. Set the divider according to the maximum rate the flow meter will run. Use the numeric keys to enter the divider in totalization units and confirm with ENTER. One pulse is generated for each unit specified by the divider. The pulse frequency generated in normal conditions should not exceed 6 pulses per second. Higher frequencies are possible, however they do not improve accuracy.

```
- I/O DEF SCROLL 6 -
Remote counter div.
       1.0   Tons
ENTER
```

Password: Service

Default: **1**
Min: **0.01**

Max: **100**

Use the numeric keys to enter the pulse width in seconds of the totalizer and confirm with ENTER. A higher pulse width limits the maximum frequency. The default 0.1 sec is recommended for pulse frequencies exceeding 12 pulses per second.

```
- I/O DEF SCROLL 7 -
Remote counter pulse
width  0.100 sec
ENTER
```

Password: Service

Default: **0.1 sec**
Min: **0.005 sec**
Max: **1 sec**

6. Define Air Purge Timing

If an output is assigned to the Air Purge function, then a time interval has to be defined here. Use the numeric keys to enter Air Purge Interval and Duration and confirm with ENTER.

```
- I/O DEF SCROLL 8 -
Air purge interval
        120 sec
ENTER
```

Password: Operator

Default: **120 sec**
Min: **0 sec**
Max: **3600 sec**

```
- I/O DEF SCROLL 9 -
Air purge duration
          2 sec
ENTER
```

Password: Operator

Default: **2 sec**
Min: **0 sec**
Max: **30 sec**

7. Define Load Out Output Data

If the optional Load Out output board (4 in/16 out) is installed, the operator can select the related variable. Press the CHOICE key to scroll selections. Press enter to confirm your selection.

```
- I/O DEF SCROLL 10 -
BCD output variable
> Off <
CHOICE     ENTER
```

Password: Service

Default: **OFF**
Selections: **OFF, RATE**

```
-I/O DEF SCROLL 10A-
BCD output polarity
> Negative <
CHOICE     ENTER
```

Password: Service

Default: **NEGATIVE**
Selections: **NEGATIVE, POSITIVE**

If the selection is Rate, the following screens allow the operator to define the polarity and the parity check of the BCD output. The polarity selection reverses the signals from NO to NC and vice versa. If a parity criterion is selected, the most significant bit of the BCD output is used for parity check. Press the CHOICE soft key to scroll selections. Press ENTER to confirm your selection.

Scroll DOWN and the I/O DEF SCROLL 10B screen displays. Press the CHOICE soft key to scroll selections. Press ENTER to confirm your selection.

```
-I/O DEF SCROLL 10B-
BCD output parity
> no <
CHOICE     ENTER
```

Password: Service

Default: **NO**
Selections: **NO, YES**

8. Define BCD Input Data

If the optional Load Out input board (16 in/4 out) is installed, the following screens allow the operator to define the related variable and the polarity of the signals. Press the CHOICE soft key to scroll selections. Press ENTER to confirm your selection.

```
- I/O DEF SCROLL 11 -
BCD input variable
> Batch set point <
CHOICE      ENTER
```

Password: Service

Default: **NONE**
Selections: **BATCH SET POINT, BATCH PRE-ACT**

The next screen displays if the BCD input variable is set to Batch Set Point or Batch Pre Act. Scroll DOWN. Press the CHOICE soft key to scroll selections. Press ENTER to confirm your selection.

```
-I/O DEF SCROLL 11A-
BCD input polarity
> Negative <
CHOICE     ENTER
```

Password: Service

Default: **NEGATIVE**
Selections: **NEGATIVE, POSITIVE**

B.4.2. Alarms Definitions

The alarms of the Micro Tech™ 2106 can be programmed. Process alarms such as low and high rate can be set to the desired range. In addition, all alarms can be defined to be:

ALARM   Generate a warning message when active.

SHUT DOWN   Generate a warning message and turn off the READY LED and output when active.

NONE   No action.

1. Define Rate Alarm

From Main Menu 4 press the ALARMS DEFINE soft key and the following screen displays.

```
- START OF SCROLL -
Use SCROLL keys to
view selections.
```

Scroll DOWN and the ALARM SCROLL 1 screen displays. Press the CHOICE soft key to scroll selections. Press ENTER to confirm your selection.

```
- ALARM SCROLL 1 -
Rate alarm
> no <
CHOICE     ENTER
```
                                                              Password: Operator

Default: **NO**
Selections: **NO, YES**

Scroll DOWN and the ALARM SCROLL 1A screen appear.

```
- ALARM SCROLL 1 A-
Low rate set
10.0%     10 Tph   10 Sec
```
                                                              Password: Operator

If the selection in the previous screen was YES, enter the low and high set points for the alarm. Also, enter the desired delay time before the alarm is monitored. The UNITS key allows the user to specify the set points in engineering units. The % key selects set points in percent. The SET/DELAY switches between the set point and the delay time.

The SET/DELAY switches between the set point and the delay time.

```
ENTER SET/DELAY
UNITS/%
```

Password: Operator

Default:	**10 %**	**10 sec**
Min:	**0 %**	**0 sec**
Max:	**103 %**	**90 sec**

Scroll DOWN and the ALARM SCROLL 1B screen displays.

```
- ALARM SCROLL 1B -
High rate set
10.0% / 10 Tph   10
Sec
ENTER SET/DELAY
UNITS/%
```

Password: Operator

Default:	**10 %**	**10 sec**
Min:	**0 %**	**0 sec**
Max:	**103 %**	**90 sec**

B.4.3.   Setup Alarms Modes

Scroll DOWN and the following message is displayed for three seconds:

```
- ALARM SCROLL 2 -
 - ALARM DEFINITION -
Use NEXT key or
enter alarm number
```

After three seconds, the following screen is displayed. The user can use the
CHOICE soft key to select the desired mode between ALARM (just a warning
message), SHUT DOWN (warning plus fault output) and NONE (no action).
Confirm with ENTER. Use the NEXT key to scroll between alarms, or enter the
alarm number.

```
ALARM NUMBER     # 1
Clock Fail
set as   > ALARM <
CHOICE   ENTER   NEXT
```

B.4.4.   Load Out

The LOAD OUT menu only displays if the optional load out board is installed.
Load out is described in REC 4030, Load Out.

B.5. Main Menu 5

Main Menu 5 is dedicated to the serial options. COMM A is used to set up the
serial line of the optional COMM A board. PRINT is used for setting up the
printer output. Main Menu 5 does not appear unless an optional COMM A board
is installed.

```
-  MAIN MENU 5  -
 Press MENU for more

COMM A      PRINT
```

B.5.1.   Communications A Scroll

The communication board A has one serial channel, which can be configured
using jumpers as an RS232 or an RS485 channel. The serial channel can be used
for printing or for a serial communication with an intelligent device such as a
PLC or a PC. Two boards can be installed and programmed, typically one for
the printer and one for the supervisor.

The following screens define the communication parameters for the first and the
second channel. Press the COMM A soft key and the following screen displays.

```
- START OF SCROLL -
Use SCROLL keys to
view selections.
```

Scroll DOWN and the COMM A SCROLL 1 screen displays.

```
- COMM  A SCROLL 1 -
Baud  Rate  port  #1
> 9600 <
CHOICE     ENTER
```

Password: Service

Default: **9600**
Selections   **110, 150, 300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600**

Scroll DOWN and the COMM A SCROLL 2 screen displays.

```
- COMM  A SCROLL 2 -
Set  parity  port  #1
> no parity <
CHOICE     ENTER
```

Password: Service

Default: **NO PARITY**
Selections: **EVEN PARITY, ODD PARITY, NO PARITY**

Scroll DOWN and the COMM A SCROLL 3 screen displays.

```
- COMM  A SCROLL 3 -
Stop  bits  port  #1
> 1 <
CHOICE     ENTER
```

Password: Service

Default: **1 STOP BIT**
Selections: **STOP BIT, 2 STOP BITS**

Scroll **DOWN** and the COMM A SCROLL 4 screen displays.

```
- COMM  A SCROLL 4 -
Wordlength  port  #1
> 8 <
CHOICE     ENTER
```

Password: Service

Default: **8 BITS**
Selections: **7 BITS, 8 BITS**

Some commonly used protocols are implemented in the system. See Communication Protocols (REC 3913) for the details. Possible selections are:

PC-MASTER	Thermo Electron proprietary protocol: Multi Drop, Master Slave.
SIEMENS 3964R	A proprietary protocol of Siemens. Point to point, Multi Master.
ALLEN-BRADLEY DF1	A proprietary protocol of Allen-Bradley. Multi Drop, Master Slave
MODBUS	A proprietary protocol of AEG. Multi Drop, Master Slave.
PRINTER	Not a protocol, selects printer output.

Scroll DOWN and the COMM A SCROLL 5 screen displays.

```
- COMM  A SCROLL 5 -
Protocol  port  #1
      > Printer <
CHOICE     ENTER
```

Password: Service

Default: **PRINTER**
Selections: **PC-MASTER, SIEMENS 3964R, ALLEN-BRADLEY DF1, MODBUS, PRINTER**

If the selected protocol is not PRINTER, the following screens define the ADDRESS of the device in the multi drop line, and the access permission from the remote supervisor. If the password protection level is NONE, the supervisor has full access to the Integrator. If the password protection level is LIMITED, the supervisor will only access those variables that are accessible with the OPERATOR password. If the password protection level is PROTECTED, the Integrator is read only to the supervisor.

Scroll DOWN and the COMM A SCROLL 5A screen displays.

```
- COMM  A SCROLL 5A -
Clear to send  #1
> Disabled <
CHOICE     ENTER
```

Password: Service

Default: **DISABLED**
Selections: **DISABLED, ENABLED**

Scroll DOWN and the COMM A SCROLL 6 screen displays.

```
- COMM  A SCROLL 6 -
Address port  #1
    1
ENTER
```

Password: Service

Default: **1**

Min: **1**

Max: **255**

Scroll DOWN and the COMM A SCROLL 7 screen displays.

```
- COMM  A SCROLL 7 -
Acces prot port  #1
> none <
CHOICE     ENTER
```

Password: Service

 Default: **NONE**

 Selections: **NONE, LIMITED, PROTECTED**

If a second communication board is installed, the following screen displays.
These screens operate exactly as the ones dedicated to the communication board
1.

Scroll DOWN and the COMM A SCROLL 8 screen displays.

```
COMM  A SCROLL 8 -
Baud  Rate  port  #2
> 9600 <
CHOICE     ENTER
```

Password: Service

Default: **9600**

Selections: **110, 150, 300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600**

Scroll **DOWN** and the COMM A SCROLL 9 screen displays.

```
- COMM  A SCROLL 9 -
Set  parity  port  #2
> no parity <
CHOICE     ENTER
```
Password: Service

Default: **NO PARITY**
Selections: **EVEN PARITY, ODD PARITY, NO PARITY**

Scroll DOWN and the COMM A SCROLL 10 screen displays.

```
- COMM  A SCROLL 10 -
Stop  bits  port  #2
> 1 <
CHOICE     ENTER
```
Password: Service

Default: **1 STOP BIT**
Selections: **STOP BIT, 2 STOP BITS**

Scroll DOWN and the COMM A SCROLL 11 screen displays.

```
- COMM  A SCROLL 11 -
Wordlength  port  #2
> 8 <
CHOICE     ENTER
```
Password: Service

Default: **8 BITS**
Selections: **7 BITS, 8 BITS**

Scroll **DOWN** and the COMM A SCROLL 12 screen displays.

```
- COMM  A SCROLL 12 -
Protocol  port  #2
       > Printer <
CHOICE     ENTER
```

Password: Service

Default: **PRINTER**
Selections: **PC-MASTER, SIEMENS 3964R, ALLEN-BRADLEY DF1, MODBUS, PRINTER**

Scroll DOWN and the COMM A SCROLL 12A screen displays.

```
-COMM  A SCROLL 12A-
Clear to send  #2
> Disabled <
CHOICE     ENTER
```

Password: Service

Default: **DISABLED**
Selections: **DISABLED, ENABLED**

B.5.2. Communication B (Field Bus)

Refer to Field Bus manual if this option is installed.

B.5.3. Print

The Micro Tech™ 3106 has a fully programmable printer format. The following section explains how to program it according to the specific needs.

1. Define Handshaking

The system can be configured to operate without any handshake (NONE), or using the Clear to Send signal (CTS) or the XON XOFF sequence. Refer to the instruction manual of the printer to define which selection is required. The selection NONE is only used for testing purposes. It is not recommended for normal use. If NONE is selected, the system is not able to recognize if the printer is on line or not, or if paper is empty.

The most commonly used protocol is the CTS, which is a signal generated by the printer to indicate whether it is ready to receive data or not.

```
- PRINTER SCROLL 1 -
Handshaking
> none <
CHOICE      ENTER
```

Password: Service

Default: **NONE**
Selections: **NONE, CTS, XON-XOFF**

Different printers use different end of line patterns. Select the one your need for your printer.

Scroll DOWN and the PRINTER SCROLL 2 screen displays.

```
- PRINTER SCROLL 2 -
End of line
> CR <
CHOICE      ENTER
```

Default: **CR**
Selections: **CR, LF, CR+LF**

Some simple printers cannot accept characters while they are printing. In some cases, the handshake is not well controlled by the printer, so a delay at end of line is helpful.

Scroll DOWN and the PRINTER SCROLL 3 screen displays.

```
- PRINTER SCROLL 3 -
Delay end of line
 0 sec
ENTER
```

Password: Service

Default: **0 sec**
Min: **0 sec**
Max: **5 sec**

A form feed character can be sent to the printer after each report to force the printer to eject the paper. If NO is selected, a normal END OF LINE character(s) is printed at the end of the report.

Scroll DOWN and the PRINTER SCROLL 4 screen displays.

```
- PRINTER SCROLL 4 -
Form feed
 > no <
CHOICE      ENTER
```

Password: Service

Default:　　NO
　　　　　　　　NO, YES

2.　Periodical Printing

If you want to generate periodical printing, enter the number of minutes, hours, or days in the following screen. By entering 0, the periodical printing is prevented. Use the INTV key to switch from minutes to hours to days.

Scroll DOWN and the PRINTER SCROLL 5 screen displays.

```
- PRINTER SCROLL 5 -
Print interval
                0  min
ENTER INTV
```

Password: Service

Default:　　　0 min
Min:　　　　**0 min, 0 hours, 0 days**
Max:　　　　**59 min, 23 hours, 365 days**

The system can print at specific times during the day. Enter the time you want to obtain the printing. Use the NEXT key to scroll between the print times (maximum 4). The ON/OFF key enables or disables the displayed print time.

Scroll DOWN and the PRINTER SCROLL 6 screen displays.

```
- PRINTER SCROLL 6 -
Print time #1
 time:   HH:MM
ENTER ON/OFF    NEXT
```

Password: Service

	If 24 hours	If am/pm
Default:	OFF	OFF
Min:	00:00	01:00
Max:	23:59	12:59

Scroll **DOWN** and the PRINTER SCROLL 7 screen displays.

```
- PRINTER SCROLL 7 -
Print alarms
> no <
CHOICE     ENTER
```

Password: Service

Default: **NO**
Selections: **NO, YES**

Scroll DOWN and the PRINTER SCROLL 8 screen displays.

```
- PRINTER SCROLL 8 -
Total report format
> Default 1 <
CHOICE     ENTER
```

Password: Service

Default: **DEFAULT 1**
Selections: **DEFAULT 1, DEFAULT 2**

B.6. Main Menu 6

Main Menu 6 is dedicated to Audit Trail and Linearization.

```
        - MAIN MENU 6 -
Press MENU for more
AUDIT
TRAIL LINEAR
```

B.6.1.   Audit Trail

This menu is only displayed if the Audit Trails option is installed.

The Audit Trail function is a method for recording all changes in setup and calibration data. Any time the operator changes a value which affects weighing, the new parameter is recorded with time and date. All changes can be printed when required. Press the AUDIT TRAIL key and the AUDIT TRAILS 1 screen displays.

```
- AUDIT TRAILS 1 -
Audit trails
> no <
CHOICE     ENTER
```

Password: Service

Default: **NO**
Selections: **NO, YES**

If the AUDIT TRAILS is YES, following screen displays for 3 seconds.

```
      - AUDIT TRAILS -
Use scroll keys
enter trail number
```

After 3 seconds, the next screen displays.

```
      -TRAIL EVENT No.
000-
hh:mm mm-dd-yyyy
nnnnnn = vvvvvv/old
nnnnnn = vvvvvv/new
```

hh:mm	**Time of change**
mm-d-yyyy	**Date of change (the format may vary depending on the country)**
nnnnnn	**Parameter's name**
vvvvvv	**Parameter's values, before change (old) and after change (new)**

Time and date are shown only if an optional Communication board is installed. The user can scroll between events which are displayed in order of date and time. The user can also enter a number to display a specific event.

B.6.2. Linearization

Linearization is explained in Chapter 3, section 3.11 LINEARIZATION.

B.7. Print Key

If the optional COMM board is installed, the PRINT key enables the printer to print data. The following screen is displayed.

```
- PRINTER SCROLL  -
Com #1 no data
Start print TOTALS
PRINT
```

The second line gives the status of the printer.

NO DATA **Indicates the printer is idle, no data is being sent to the printer.**

IS RUNNING **The Integrator is sending data to the printer.**

The third line indicates what kind of data is printed if the PRINT key is pressed. The UP and DOWN keys select between the following:

TOTALS **Print totals.**

BATCH **Only if load out option is active, print load out information.**

SETUP **Print the setup data of the Integrator.**

TRAILS **If audit trails option is active, print audit trails data.**

Print starts after the **PRINT** key is pressed.

The COM key allows the operator to select the printer incase more than one is installed.

Examples of data that can be printed:

Printed TOTALS:

TOTALS REPORT

DATE: 12-10-1999

TIME: 8:21a

MASTER TOTAL: 0.00 Tons

RESET TOTAL #1:   0.00 Tons

RESET TOTAL #2:   0.00 Tons

RESET TOTAL... RATE: 0.00 Tph

Print BATCH:

BATCH REPORT

DATE: 12-10-1999

TIME: 8:21a

PRODUCT NR: XXXXXXXXXXXXX

BATCH NR: XX

SET POINT: 0.00 Tons

TOTAL: 0.00 Tons

Print ALARM:

12-10-1999   8:21a

Clock fail

Print SETUP:

INTEGRATOR SETUP

The Integrator prints out all data and setups.

Print AUDIT TRAILS: Optional

TRAIL RECORD NR:	1
DATE 12-10-1999	TIME 11:59p
VARIABLE	Scale capacity
NEW	400.0
OLD	500.0

TRAIL RECORD NR:	2
DATE 12-10-1999	TIME 11:31p
VARIABLE	Span
NEW	250000
OLD	300000

TRAIL RECORD NR:	3
DATE 12-10-1999	TIME 11:53p
VARIABLE	Div(3)
NEW	0.05
OLD	0.1

Appendix C
Engineering Drawings

This appendix contains a list of the engineering drawings associated with the Micro-Tech 3106

➢ Field Wiring Diagram – 07361H-E001

➢ Serial Communication Specifications – 07361B-E0008

➢ Outline & Mounting, Field Mounting 3000 Series Integrator – 07361B-0001

➢ Outline & Mounting, Panel Mounting 3000 Series Integrator - 07361B-0002

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Appendix D
Reader Comment Section

As the user of this document, you are important to us. Your comments and suggestions are always welcome and encouraged. Please make a copy of the comment form, and then take a moment to fill out the requested information. Finally, send the form to us by mail or FAX using the information shown on the form. Your input can help Thermo improve its documentation. Thank you!

Reader Comment Form

Micro-Tech™ 3106 Manual   REC 4187, Rev. A

Please mail the completed form to: Or FAX the completed form to:

Manager, Education and   Manager, Education and
Documentation   Documentation
Thermo Electron, Corporation   Thermo Electron, Corporation
501 9th Ave. NW   1-763-783-2525
Minneapolis, MN   55433
United States of America

1. Does this manual meet your needs? Please explain.

_____
_____
_____
_____
_____

2. Did you find any incorrect or incomplete information? Please provide as much detail as possible.

_____
_____
_____
_____
_____

3. Do you have any other suggestions for improvement of this manual?

_____
_____
_____
_____
_____

4. OPTIONAL: Please describe your job, position, responsibilities, and plant location. Include your name and address, if you wish.

_____
_____
_____
_____
_____

Your response is very important to us. THANK YOU!
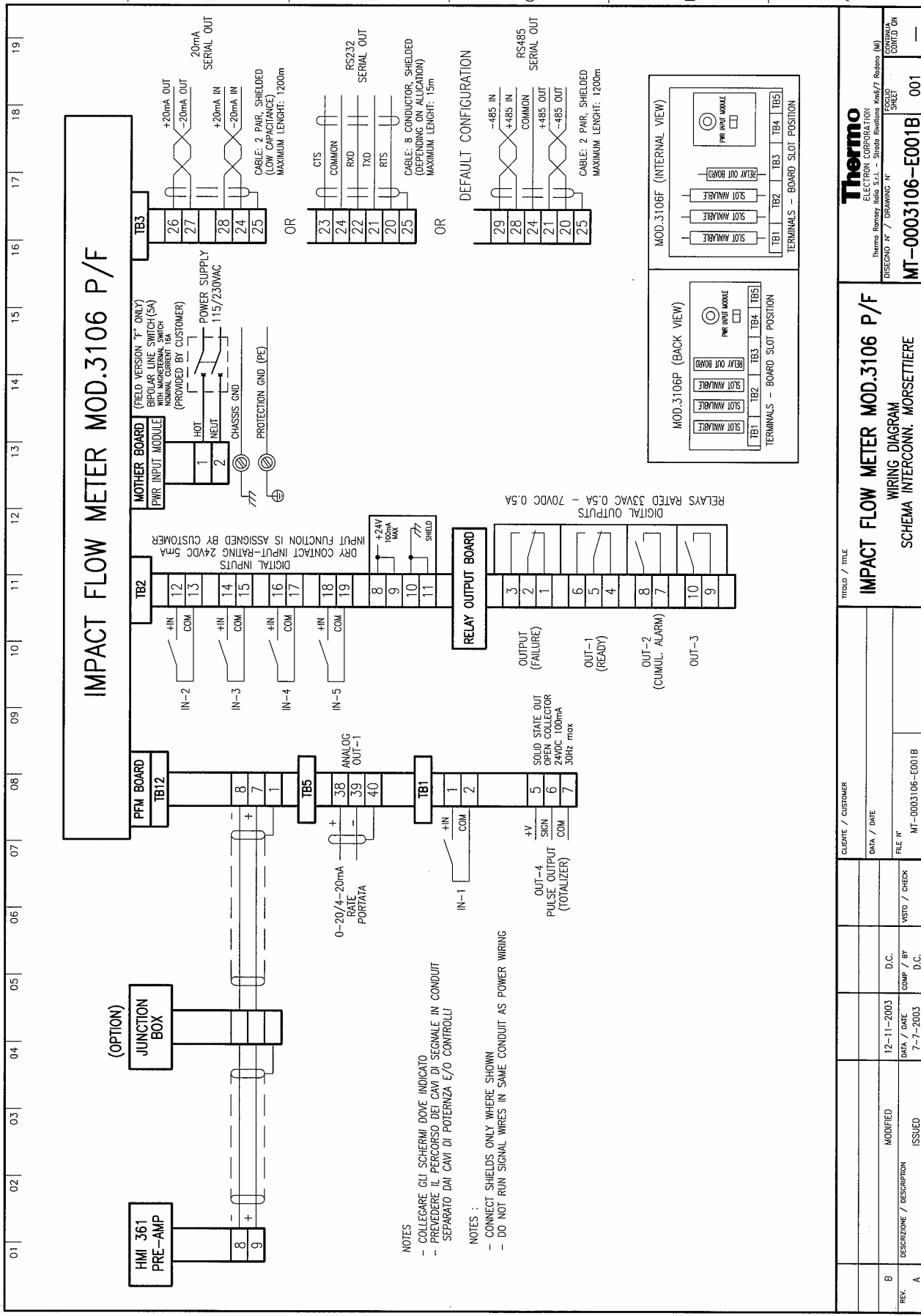
IMPACT FLOW METER MOD.3106 P/F

MOTHER BOARD

PWR INPUT MODULE

(FIELD VERSION "F" ONLY)
BIPOLAR LINE SWITCH (5A)
WITH MAGNETOTERMAL SWITCH
NOMINAL CURRENT 16A
(PROVIDED BY CUSTOMER)

POWER SUPPLY
115/230VAC

HOT — 1
NEUT — 2
CHASSIS GND

PROTECTION GND (PE)

TB3

20mA SERIAL OUT
+20mA OUT — 26
−20mA OUT — 27
+20mA IN — 28
−20mA IN — 24
25

CABLE: 2 PAIR, SHIELDED
(LOW CAPACITANCE)
MAXIMUM LENGHT: 1200m

OR

RS232 SERIAL OUT
CTS — 23
COMMON — 24
RXD — 22
TXD — 21
RTS — 20
25

CABLE: 8 CONDUCTOR, SHIELDED
(DEPENDING ON APPLICATION)
MAXIMUM LENGHT: 15m

OR

DEFAULT CONFIGURATION

RS485 SERIAL OUT
−485 IN — 29
+485 IN — 28
COMMON — 24
+485 OUT — 21
−485 OUT — 20
25

CABLE: 2 PAIR, SHIELDED
MAXIMUM LENGHT: 1200m

TB2

DIGITAL INPUTS
DRY CONTACT INPUT—RATING 24VDC 5mA
INPUT FUNCTION IS ASSIGNED BY CUSTOMER

IN−2   +IN 12 / COM 13
IN−3   +IN 14 / COM 15
IN−4   +IN 16 / COM 17
IN−5   +IN 18 / COM 19

+24V 100mA MAX — 8
9
/// SHIELD — 10
11

RELAY OUTPUT BOARD

DIGITAL OUTPUTS
RELAYS RATED 33VAC 0.5A − 70VDC 0.5A

OUTPUT (FAILURE) — 3, 2, 1
OUT−1 (READY) — 6, 5, 4
OUT−2 (CUMUL. ALARM) — 8, 7
OUT−3 — 10, 9

PFM BOARD

TB12
− 8
+ 7
1

TB5
ANALOG OUT−1
+ 38
− 39
40

0−20/4−20mA
RATE
PORTATA

TB1
+IN 1
COM 2

IN−1

SOLID STATE OUT
OPEN COLLECTOR
24VDC 100mA
30Hz max

OUT−4
PULSE OUTPUT
(TOTALIZER)
+V 5
SIGN 6
COM 7

(OPTION)
JUNCTION BOX

HMI 361 PRE−AMP
− 8
+ 9

MOD.3106F (INTERNAL VIEW)

PWR INPUT MODULE

RELAY OUT BOARD
SLOT AVAILABLE
SLOT AVAILABLE
SLOT AVAILABLE

TB1 TB2 TB3 TB4 TB5
TERMINALS − BOARD SLOT POSITION

MOD.3106P (BACK VIEW)

PWR INPUT MODULE

RELAY OUT BOARD
SLOT AVAILABLE
SLOT AVAILABLE
SLOT AVAILABLE

TB1 TB2 TB3 TB4 TB5
TERMINALS − BOARD SLOT POSITION

NOTES
− COLLEGARE GLI SCHERMI DOVE INDICATO
− PREVEDERE IL PERCORSO DEI CAVI DI SEGNALE IN CONDUIT
  SEPARATO DAI CAVI DI POTERNZA E/O CONTROLLI

NOTES :
− CONNECT SHIELDS ONLY WHERE SHOWN
− DO NOT RUN SIGNAL WIRES IN SAME CONDUIT AS POWER WIRING