GUIDANT

Smith Meter® AccuLoad® III-N4

Bulletin SS06041 Issue/Rev. 0.7 (3/19)

Electronic Preset Delivery System

The **Smith Meter® AccuLoad® III-N4** is a microprocessor-based instrument that can be configured to fit the application. It is capable of controlling two arms as either a blending or straight product instrument. The device has the flexibility of handling blending applications, straight ratio blending, up to three meters, side stream blending, and up to two arms of six-product sequential blending. The AccuLoad III has flash memory allowing for easy firmware upgrades and large storage capability.

Features

- Two-arm operation
- Up to 6 single pulse product meter inputs
- Up to 3 dual pulse product meter inputs
- Up to 4 additive meter inputs with local I/O
- Up to 24 additive meter inputs with remote I/O
- Each arm programmable for straight product, sequential
- Up to 50 recipes
- User-configurable inputs and outputs
- Block valve control and feedback (sequential blending)
- Block valve control and feedback (sequential blending)
- Additive control (metered, pulse out or communications)
- Four communication ports plus Ethernet port
- Meter factor calculation
- Programmable language/messages
- Turbine meter diagnostics
- Boolean/Algebraic processing
- Event logging/Audit trail
- Stand-alone operation
- Configurable load ticket/BOL emulation printing
- Continuous monitoring of critical functions
- Two-way data communications; built-in communication analyzer
- Automatic temperature and pressure compensation and density correction
- API tables from LPG to crude oil
- GPA Tables TP-15 and TP-16
- Five levels of security
- Automatic flow control with recovery
- Programmable valve control
- Stainless steel enclosure
- Transaction Data Archive (optional) also known as ComFlash Mass Storage Expansion Board
- Flash based memory
- Ethernet connectivity features (see page 3)
- Card Reader Interface
- Smith Meter®/Sening® Blue Tooth Connectivity

Applications

The AccuLoad III-N4 provides a unique solution for controlling the batch loading of products through multiple load arms. Two loading arms and three meters can be controlled with the AccuLoad III-N4. The unit is ideal for truck, barge, or rail car loading at loading racks, bulk plants, shipping docks, processing installations, and tank farms where straight products, as well as blended products, must be accurately loaded.

Standard Features

The following descriptions of straight product, sequentially-blended product, ratio-blended product, and side stream blended product loading are written as if all loading arms are programmed for that type of loading. In reality, all the following combinations of loading arm configurations are available in the AccuLoad III-N4.

Straight Product

The AccuLoad III-N4 is designed to handle two arms of straight products. Both arms can be loaded simultaneously.

Sequential Blending

The AccuLoad III-N4 is designed to sequentially control the loading of up to six petroleum or chemical products through each of two loading arms. Both of the loading arms can be loaded simultaneously.

Ratio Blending

The AccuLoad III-N4 is designed to control the blending of up to three petroleum products through a single loading arm. All products flow through a metering system, are co-mingled downstream of the metering system, and flow through a single loading arm into a transport or into storage. Since both of the loading arms are programmable, the unit could be programmed for two load arms, one of which could be programmed as a two-product blender and the other as a straight product arm.

Side Stream Blending

The AccuLoad III-N4 is designed to control the blending of a minor product and a major product. The minor product is metered and controlled by a valve and the main product is free flowing. A second meter and control valve is located down stream of the blending point and measures/controls the flow of the blended product. The second arm could be programmed as a straight product arm.

Wild Stream Blending

The AccuLoad also supports Wild Stream Blending, which allows for continuous (no preset entered) ratio blending of products. One of the products can be uncontrolled (wild stream). This option is also available with the hybrid arm configuration. Wild Stream Blending supports “on the fly” blend percent changes and also for changing meters to accommodate varying flow rates.

Temperature Compensation

The temperature compensation option provides the customer with the capability of compensating for the variance in temperature from a reference temperature. This option is used with an RTD input or a temperature transducer and, excluding the accuracy of the fluid temperature measurement, will exactly match the proper volume correction factor of ASTM-D-1250-04 and API MPMS CH 11.1 - 2004 over the fluid temperature range of -40°F to 572°F (-40°C to 300°C). The following API tables can be programmed in the AccuLoad III: 5A, 5B, 5D, 6, 6A, 6B, 6C, 6D, 23, 23A, 23B, 23D, 23E, 24, 24A, 24B, 24D, 24E, 53, 53A, 53B, 53D, 54, 54A, 54B, 54C, 54D, 59A, 59B, 59D, 60A, 60B, 60D, BR1A, BR1P, and BR2P.

Pressure Compensation

The pressure compensation option provides the customer with the capability of compensating the volume of product delivered at varying pressures per API Tables 11.2.1 and 11.2.2, using a 4-20 mA pressure transducer input per preset position. This option also contains real-time control functions for maintaining system pressures at the meter to a minimally-acceptable, user-definable level (pressure transducer not included). This option is particularly useful for light products, such as LPG, where the compressibility factor varies a great deal with different pressures.

Density Correction

The density correction option provides the customer with the capability of correcting the volume of product delivered at varying densities. This can be either a frequency input or a 4-20 mA input.

Metered Injectors, Piston Injectors and Smart Additives

The AccuLoad III has been designed to provide maximum flexibility when it comes to additive control. The unit is capable of handling metered injectors, piston injectors and smart additives simultaneously.

The AccuLoad is capable of controlling four additive injector metered systems. **(See Hardware Options for additional injector systems.)** The AccuLoad controls the additive solenoids to precisely inject the additive into the main product. It monitors the pulses of the additive meter and controls the amount of the additive, based on the incoming pulses from the additive meter and the main product meter.

Additive monitoring and smart additives provide the capability for the AccuLoad to monitor the feedback from the piston injectors of the additive products. The AccuLoad monitors

the injector feedback switches for a change of state and counts the errors and alarms if no change is detected within the cycle or a period of time, depending on how the unit is programmed. The AccuLoad will totalize the additive volume based on confirmation signals and a programmable volume per cycle. The totalized volume will print on the emulated load ticket printed on the shared printer output.

For Smart additives, the firmware has also been designed with a Master/Slave type of communications, with the AccuLoad being the master and the Additive Injector System being the slave. The AccuLoad constantly interrogates the Additive Injector System for a change in status. The AccuLoad can be operated with communications control over the Smart Additive Injector System or with communication/pulse control. When the AccuLoad has communication control over the Additive System, it will constantly monitor the Additive System for its status, poll the additive totals, and signal the system when to inject the additive -- all through the communications line.

The AccuLoad communications package has also been designed with a pass-through communications mode. In this mode of operation the supervisory computer can talk to the Additive Injector System through the communication lines that have been run to the AccuLoad and from the AccuLoad to the Additive Injector System(s).

Dual Pulse Security

This option provides continuous monitoring, error indication alarm, and correction of the pulse transmission for each preset position per API Petroleum Measurement Standard, Chapter 5.5, Level A, and Institute of Petroleum Standard, IP 252/76, Part XIII, Section 1, Level A (PPS High-Security Pulse Transmitter is not included). The PPS High-Security Transmitter provides four signals: “A,” “A inverted,” “B,” and “B inverted.” The “A” and “B” signals are 90 electrical degrees out-of-phase and used for dual-pulse security. The “A” and “A inverted,” and “B” and “B inverted” signals are 180 electrical degrees out-of-phase and are used for transmitter power sensing. If power sensing is not required, only “A” and “B” are used for dual-pulse security.

Automated Proving Mode

The AccuLoad III firmware provides an automated proving mode of operation. When the automated proving mode is activated the AccuLoad will calculate the meter factor for a proving run based on information that is obtained during the prove. The operator can select the flow rate and meter factor that is being proved through the keypad of the AccuLoad. After the prove is complete the operator enters the prover volume and prover temperature and the AccuLoad will calculate the new meter factor. The operator has the choice of downloading it to the program or ignoring it. The AccuLoad also has the capability of providing an average meter factor over a maximum of ten proves. This feature allows the operator to prove the meter on all four products, and four meter factors and associated flow rates for each product without having to enter the program mode for each product and meter factor.

Boolean and Algebraic Processing

The AccuLoad III provides the customer the flexibility to set-up inputs and outputs for tasks that are not standard in the unit. Through Boolean processing, relays can be turned on and off through equations and events set up by the customer. For example, a relay is required to close at the first trip point of the load. This can be set up using Boolean processing and does not require special software from Smith.

Algebraic processing is also a feature that the customer can use to do simple mathematical calculations that are not in the unit. These calculations can then be used on the configurable reports for the current batch being run by the unit.

Hardware Options

AccuLoad Interface Control Board

The AccuLoad Remote Mounted Interface Control Board provides additional flexibility to the AccuLoad's standard features. The optional AICB Board provides either ten additional metered additive injector systems or twenty additional programmable outputs per board set. With the optional AICB Board, the AccuLoad III with firmware has the capability of handling up to twelve metered injectors, twelve meter inputs, twelve solenoid valve outputs, and twelve additive pump outputs. One of the four communication ports is required to communicate with the AICB Board.

ComFlash Mass Storage Expansion Board

The optional hardware module provides additional non-volatile memory to store transaction data. The module come with a 512 M SD card that has the capability of storing thousands of additional transactions. The module is only available on COM 4 and uses RS232 communications. The A3X also provides alarms for the expansion board to ensure proper operation. The Smith Meter® Proximity Card Reader can also operate on COM 4 in conjunction with the ComFlash board.

Card Reader

The Smith Meter® Card Reader can be added to the face of the AccuLoad III-N4. This option provides an integrally mounted RF-based proximity reader to the AccuLoad III. It is capable of interpreting multiple card formats and transmitting card data either to the AccuLoad III or directly to an automation system.

Ethernet Connectivity Features

- ARP/RARP and DHCP support
- PING echo diagnostics
- SLIP
- FTP file transfer
- Smith protocol and Modbus protocol support over TCP/IP
- Limited HTTP server functionality
- Dynamic name server lookups (DNS client)
- Simple Mail Transport Protocol (SMTP)
- Post Office Protocol V3 (POP3)
- A collection of HTML and XML pages and CGI scripts
- Web server – command line argument passing
- Support for network printers (LPR client)
- The addition of a Remote Display/TCP daemon to the AccuLoad III
- Compliance with TCP/IP standards

Specifications (AccuLoad III)

Accuracy

Calculated Accuracy: The gross at standard temperature to gross volume ratio, excluding the accuracy of fluid temperature measurement, will exactly match the proper volume correction factor of ASTM-D-1250-04 over the fluid temperature range of -40°F to 572°F (-40°C to 300°C).

Temperature Measurement Accuracy: Fluid temperature is measured to within ±0.72°F (±0.4°C) over the fluid temperature range of -148°F to 572°F (-100°C to 300°C). Fluid temperature is measured to within ±0.45°F (±0.25°C) over the fluid temperature range of 32°F to 572°F (0°C to 300°C).

Stability: 0.1°F (0.06°C)/year.

Flow Totalizing: Within one pulse of input frequency.

Electrical Inputs

AC Instrument Power:
Universal input 100 to 240 Vac, 58W maximum, 48 to 63 Hz. The AC circuitry is fuse-protected.

Surge Current: 28A maximum for less than 0.1 seconds.

Power Interruption Tolerance: Interruption of power greater than .05 seconds (typical) will cause an orderly shut-down of the AccuLoad and the control valve will be immediately signaled to close.

Note: A constant voltage transformer (CVT) is recommended if the available AC power is suspected not to comply with these specifications.

Pulse Input:
Type: High-speed, edge-triggered, optically isolated pulse transmitter input. The input pulse must rise above V (high min.) for a period of time and then fall below V (low) to be recognized as a pulse by AccuLoad III.

V (High): 5 Vdc minimum to 28 Vdc maximum.

V (Low): 1 Vdc maximum.

Input Impedance: 1.8 KΩ.

Pulse Resolution: 1 pulse/unit minimum, 9,999 pulses/unit maximum.

Frequency Range: 0 to 10.0 kHz.

Response: Within one pulse to a step change in flow rate.

Mode: Single, dual, dual with power sensing, density.

Duty Cycle: 35/65 to 65/35 (on/off).

Temperature Probe:
Type: four-wire, 100 Ω Platinum Resistance Temperature Detector (PRTD).

Temperature Coefficient: @ 32°F: 0.00214 Ω/Ω/°F (0.00385 Ω/Ω/°C).

Temperature Range: -148°F to 572°F (-100°C to 300°C).

Offset: Temperature probe offset is program-adjustable through the AccuLoad keypad in ±0.1 degree increments in the unit of temperature measurement used.

Self-calibrating: Lead length compensation that requires no resistance balancing of leads.

Analog (4-20 mA):
Type: Two-wire, 4-20 mA current loop receiver, isolated from ground, programmable as to function.

Span Adjustment: Program-adjustable through the AccuLoad keypad or communication in tenths of the unit used.

Input Burden: 50 Ω.

Accuracy: ±0.025% of range.

Resolution: One part in 65,536.

Voltage Drop: 2 Volts maximum.

Sampling Rate: One sample/300 mSec minimum.

Analog (1-5 Vdc):
Type: Two-wire, 1-5 Vdc voltage loop receiver, isolated from ground, programmable as to function.

Span Adjustment: Program-adjustable through the AccuLoad keypad or communications in tenths of the unit used.

Input Burden: 1 m Ω.

Accuracy: ±0.025% of range

Resolution: One part in 65,536.

Sampling Rate: One sample/300 mSec minimum.

AC Inputs:

Type: Optically-isolated, solid-state voltage sensor.

Input Voltage Range: 90 to 280 Vac.

Pickup Voltage: 90 Vac minimum.

Drop-out Voltage: 30 Vac maximum.

Current at Maximum Voltage: 20 mA maximum.

Input Resistance: 44,000 Ω typical.

DC Inputs:

Type: Optically-isolated solid state voltage sensors

Input Voltage Range: 5 to 28 Vdc.

Pickup Voltage: 5 Vdc minimum.

Drop-out Voltage: Less than 1 volt.

Current at Maximum Voltage: 20 mA maximum.

Input Level Duration: 120 mSec minimum.

Keypad:

Type: Metal encapsulated, one-piece, sealed, no moving parts, piezoelectric design. Protected against the environment.

Display:

The Graphics Display is a 240 by 64 pixel graphic Liquid Crystal Display (LCD) modules with LED backlighting.

Electrical Outputs

DC Power:

24 Vdc ±10%, 1 A maximum, short circuit protected.

AC Outputs:

Type: Optically-isolated, AC, solid-state relays. User-programmable as to function.

Load Voltage Range: 90 to 280 Vac (rms), 48 to 63 Hz.

Steady-State Load Current Range: 0.05A (rms) minimum to 1.0A (rms) maximum into an inductive load.

Leakage Current at Maximum Voltage Rating: 5.2 mA (rms) maximum @ 240 Vac.

On-State Voltage Drop: 2 Vac at maximum load.

DC Outputs:

Type: Optically-isolated solid state output. User-programmable as to function.

Polarity: Programmable (normally open or normally closed).*

Switch Blocking Voltage: 30 Vdc maximum.

Load Current: 150 mA maximum with 0.6 volt drop.

Note: *Power-down normally open.

Analog (4-20 mA):

Type: Two-wire, 4-20 mA current loop transmitter, isolated from ground, programmable as to function.

Span Adjustment: Program adjustable through the AccuLoad keypad or through communications.

Accuracy: ±0.025% of range.

Resolution: One part in 65,536.

Voltage Burden: 4 volts maximum.

Analog (1-5 Vdc):

Type: Two-wire, 1-5 Vdc voltage loop transmitter, isolated from ground, programmable as to function.

Span Adjustment: Program adjustable through the AccuLoad keypad or through communications.

Accuracy: ±0.025% of range.

Resolution: One part in 65,536.

Pulse Output 1 & 2:

Type: Optically-isolated solid state output. Pulser output units are program-selectable through the AccuLoad keypad or communications.

Polarity: Programmable (normally open or normally closed).

Switch Blocking Voltage (Switch Off): 30 Vdc maximum.

Load Current (Switch On): 10 mA with 0.6 volts drop.

Frequency Range: 0 to 3000 Hz.

Duty Cycle: 50/50 (on/off).

Pulse Output 3, 4 & 5:

Type: Solid state relay digital output switch

Load Current: 110mA max.

Frequency Range: 0-125Hz

Duty Cycle: 50/50 (on/off)

Programmable maximum frequency output. All intended pulses will be eventually transmitted, the total period may increase to ensure all pulses are output.

Note: When used, these outputs use the DC output points on the KDC (DC output 1-3 respectively and also the 3 digital inputs 1-3 respectively).

Environment

Ambient Operating Temperature

-40°F to 140°F (-40°C to 60°C).

Humidity:

5 to 95% with condensation.

Enclosure:

Industrial type 4X.

Electrical Safety Approvals

UL/CUL

Class I, Division 2, Groups C & D; UNL-UL Enclosure 4X, CNL-CSA Enclosure 4.

Class I, Zone 2, Group IIB.

UL/CUL File E23545.

Weights & Measures Certifications

United States NTEP Certificate of Conformance issued by the National Conference on Weights and Measures CC 99-141

Canadian Notice of Approval, issued by Measurement Canada AV-2361

For other please consult factory.

AccuLoad III-N4 Weight: Approximately 35 lb (15.90 kg).

Communications

General

Number of Ports: Four, plus Ethernet port.

Configuration: Multi-drop network. Standard IT practices should be followed when connecting multiple AccuLoad IIIs via an Ethernet hub, router, or switch.

Data Rate: Keypad-selectable to asynchronous data rates of 1,200, 2,400, 3,600, 4,800, 7,200, 9,600, 19,200, or 38,400 bps (serial comm).

Data Format: Programmable one start bit, programmable seven or eight data bits - even, odd, or no parity, one stop bit.

Line Protocol: Half-duplex, full-duplex, no character echo.

Data Structure: ASCII character-oriented, modeled after ISO Standard 1155.

Protocol: Smith ASCII LRC, Smith ASCII CR, Smith ASCII binary, Modicon Modbus (PI-MBUS-300 Rev. D).

AccuLoad II Style: Terminal Mode, Minicomputer Mode.

Ethernet: 10/100 Base TRJ-45 8 or 10 pin UTP (unshielded twisted pair) connector.

EIA-232 (1 dedicated, 2 selectable)

Type: Interfaceable with EIA-232 data communication standards. Data transmitters are tri-state design.

Typical Applications: Product receipt ticket printing (used with a stand-alone ASCII printer or as a backup in the standby mode with automation for BOL emulation) or communications with Product Management Automation Systems. Up to 16 AccuLoads can be connected onto the same transmit and receive data lines.

EIA-485 (1 dedicated, 2 selectable)

Type: Interfaceable with EIA-485 data communication standards.

Typical Application: Communications with Product Management Automation Systems.

Number of Units per Communication Line: Up to 32 AccuLoads can be connected onto the same transmit and receive data lines.

Specifications (Red and Green Indicating Light Units – Optional)

Electrical Ratings

Bulbs:
LED Lamp, 120V AC in Red or Green

Terminals:
Saddle clamp type for 1 x 22 AWG

Specifications (Stop Button – Optional)

Electrical Ratings

Contact Block:

A600 (AC): 120V maximum

Make and Emergency Interrupting Capacity (Amps): 60 (120V); 30 (240V)

Normal Load Break (Amps): 6 (120V); 3 (240V)

Thermal Current (Amp): 10

Voltamperes: Maximum Make 7200; Maximum Break 720

Contact Type:
1N0-1NC (Momentary)

Color: Black

Terminals:

Stainless steel saddle clamp type for 1 x 18 - 14 AWG (0.75 - 2.5 sq. mm) solid or stranded copper conductor

Specifications (AICB Board – Optional) (Remote Mount)

Electrical Inputs

DC Instrument Power:
24 Vdc ±10%, 1 watt maximum

Pulse Input:
Type: High-speed, edge-triggered, optically isolated, compatible with contact closure, open collector or voltage sink/source pulse transmitter input. The input pulse must rise above V (high min.) for a period of time and then fall below V (low) to be recognized as a pulse.

V (High): 10 Vdc minimum to 24 Vdc maximum.

V (Low): 8 Vdc maximum.

Pulse Resolution: 1 pulse/unit minimum, 9,999 pulses/unit maximum.

Frequency Range: 0 to 5 kHz.

Response: Within one pulse to a step change in flow rate.

Minimum Pulse Width: 50 uS.

Electrical Outputs

AC Outputs:
Type: Optically-isolated, AC, solid-state relays. User-programmable by the host as to function.

Load Voltage Range: 90 to 275 Vac (rms), 48 to 63 Hz.

Steady-State Load Current Range: 0.05A (rms) minimum to 0.5A (rms) maximum into an inductive load.

Leakage Current at Maximum Voltage Rating: 0.1mA (rms) maximum at 240 Vac.

On-State Voltage Drop: 1.5 Vac at maximum load.

Environment

Ambient Operating Temperature
-40°F to 140°F (-40°C to 60°C).

Humidity:
5 to 95% with condensation.

Remote Enclosure:
Explosion-proof (NEMA 7, Class I, Groups C and D) and watertight (NEMA 4X), IP65

Electrical Safety Approvals (Remote Enclosure)
UL/CUL:
Class I, Division 1, Groups C and D; Class II, Groups E, F and G, UNL-UL Enclosure 4X, CNL-CSA Enclosure 4
Class I, Zone 1, AEx d IIB T6, IP65
UL File E23545
ATEX / IEC Ex:
DEMKO 11 ATEX 1103869X IEC Ex UL 11.0029X
Ex d IIB T6 IP65 Tamb = -40°C to +60°C

Programmable Inputs/Outputs

Digital Inputs	AC	DC	Total
Standard	5	6	11
Optional (One Remote AICB)	5	16	21
Digital Outputs	**AC**	**DC**	**Total**
Standard	11	3	14
Optional (One Remote AICB)	31	13	44
Analog Inputs/Outputs - Up to 6			

Modeling[1]

ALIII-N4 — ALX2 — 1 — 1 — 1 — A00000 — 10

Hardware Model Designation
N4 - NEMA IV

Firmware
ALX1 - 1 Arm Operation
ALX2 - 2 Arm Operation

Stop Button
0 - None
1 - 120 / 230 Volt

Indicator Lights
0 - None
1 - 120 Volt (Red, Green)
2 - 240 Volt (Red, Green)
3 - 120 Volt (Green, Green)

Hardware Options
0 - None
1 - Card Reader

Analog Modules[2]
Digit 1 - Number of RTDs
Digit 2 - Number of 4-20 mA inputs
Digit 3 - Number of 4-20 mA outputs
Digit 4 - Number of 1-5 Vdc inputs
Digit 5 - Number of 1-5 Vdc outputs

Number of Fuse Holders
(0 - 10)

AICB Modeling

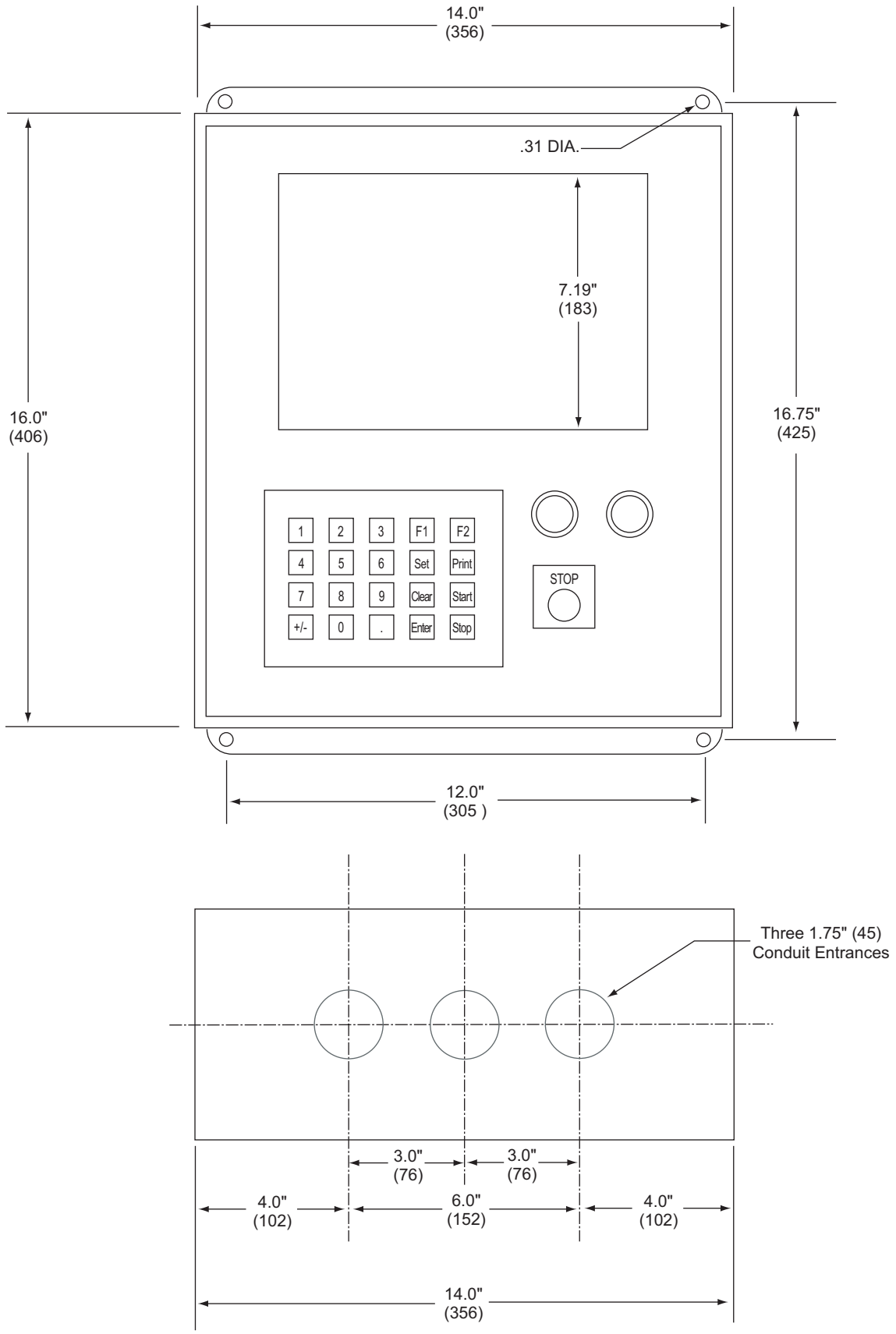
REM — XP — A

Model Designation

Housing
XP - Explosion Proof

Hardware Option
A = AICB Board

1 A complete model number is required when ordering the AccuLoad III.
2 Maximum of 6 Analog Modules per AccuLoad III.



Note: Dimensions — Inches to the nearest tenth (millimetres to the nearest whole mm), each independently dimensioned from respective engineering drawings.

Figure 1 – Enclosure Dimensions

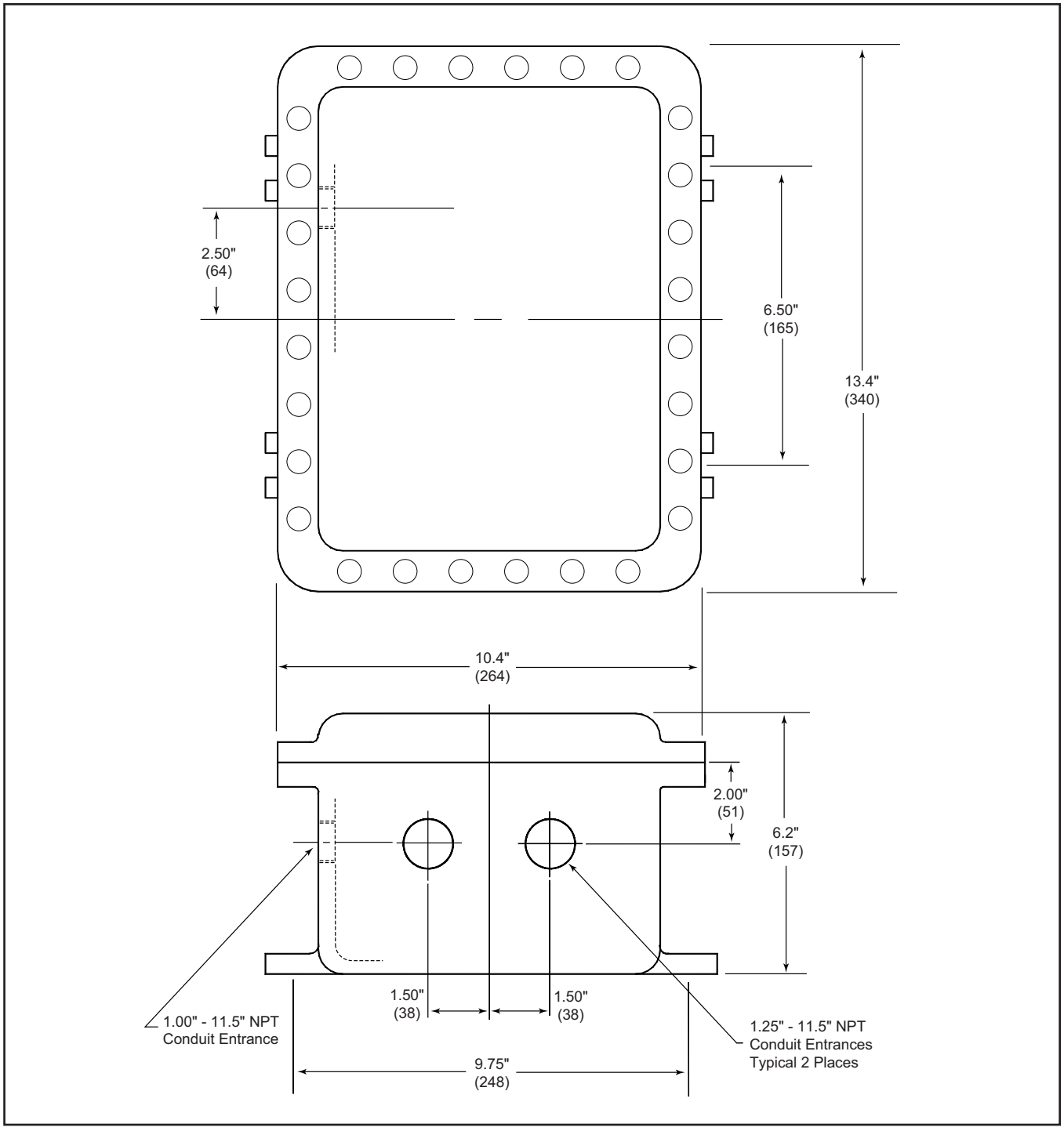


Figure 2 – Remote Housing (Optional AICB)

Revisions included in SS06041 Issue/Rev. 0.7 (3/19):
Weights & Measures added; Approvals sections updated.

The specifications contained herein are subject to change without notice and any user of said specifications should verify from the manufacturer that the specifications are currently in effect. Otherwise, the manufacturer assumes no responsibility for the use of specifications which may have been changed and are no longer in effect.

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