

MODEL 0511/0512

PetroCount SMS SEQUENTIAL MANAGEMENT SYSTEM

DESCRIPTION

The PetroCount Sequential Management System (SMS) is a rugged yet compact electronic preset designed to sequentially blend up to 8 products in-line through a single loading arm. It provides precise batch delivery for custody transfer of petroleum, industrial and chemical products. Programming the PetroCount SMS is easily performed by selecting the desired options from built-in menus or through the PC based SMScom software. Available enclosures include Division 1 explosion proof and Division 2 hazardous area operation. The PetroCount SMS combines new and proven technology for high performance and reliability.

The PetroCount SMS Main Control Unit is equipped with a rugged operator interface with liquid crystal display and keypad. Delivered quantities are displayed on a large 8-character numeric display. Operator prompts and program menus are presented on a 32-character alphanumeric display. A sixteen pushbutton keypad provides pushbuttons 0-9, Start, Stop, Reset, Select, Repeat and Enter. The keypad is used for controlling the batch delivery sequence and for programming the user selectable data base parameters. An integral Weights and Measures security switch secures the data base against tampering.

Input/output capability of the main unit can be increased by adding the optional Remote Input/Output (RIO) Unit.

Additive meter pulse inputs are provided for total additive system control and monitoring. By controlling a solenoid valve and monitoring the pulse output from an additive meter, the PetroCount SMS will perform all those functions common to the most sophisticated additive systems. Additive totalizers, electronic calibration of the additive system, automatic additive rate adjustment and additive alarms are all integral functions of the SMS. Additive metering of up to ten individual metering streams is possible.



DESIGN FEATURES

- 50 Configurable Recipes with Optional Line Flush
- Additive Meter Pulse Inputs for Total Additive System Monitoring and Control
- 20 Solid State Relays for Control (with RIO)
- Integral Weights and Measures Security Switch
- 32 Bit high speed processor hardware with more memory for high speed measurement and control
- 4 Independent Permissive Sensing Circuits (2 AC and 2 DC)
- 4-Wire RTD Temperature Measurement for temperature compensation
- Digital Valve Control with Automatic High Flow Rate Recovery
- Independent temperature compensation methods for individual products
- User entered thermal expansion, linear equation or API tables for co-efficient temperature compensation
- Configurable Meter Ticket/BOL with Multidrop to Single Printer
- 2 Independent Isolated Data Communications Ports with Built in Communications Analyzer
- Archival Data Storage
- Non-Volatile Memory Retention (10 years)
- Ease in maintenance - All Plug-in Circuit Boards
- Multilingual user selectable operator prompts

WARNING

Do not operate this instrument in excess of the specifications listed. Failure to heed this warning could result in serious injury and/or damage to the equipment.

The PetroCount SMS is a sequential blending system offering a total solution for the metering and control requirements for most blending applications. Simply program the unit for the specific functions of your blending application via the keypad or the data communications interface. The user friendly display format prompts the operator through the entire loading sequence assuring a safe and reliable loading operation.

The PetroCount SMS loading sequence starts with the operator selecting a blend, entering a preset quantity and pressing "start". The SMS will automatically turn on the required product pumps, additive injection equipment and open the flow control valves. A low flow start sequence can be initiated to reduce static build up when delivering petroleum products. The SMS is designed to automatically maintain the highest possible flow rate that the system can deliver to keep loading time to a minimum.

Different control options for product selector valves ensure precise and optimum batch delivery regardless of the type of product selector valves used. Each recipe can define up to four different components which make up the final blend out of eight base products.

As the PetroCount SMS approaches the end of each component batch, the component stream will be slowed down to a low flow stop flow rate. The high speed digital valve control algorithm working in conjunction with the Brooks linear digital control valve ensures a smooth, repeatable low flow stop and final stop without line shock. Automatic operation of product pumps, based on the valve type and control option, optimizes batch duration and blending accuracy. Blend accounting is maintained for each product separately.

An automatic single product line flush sequence can be programmed at the end of the delivery to flush the loading arm with a single base product. This automatic sequence assures product quality as multiple blends are loaded through the same loading arm.

The PetroCount SMS is equipped with digital output circuits that can be configured for volume/pulse outputs for data acquisition type devices.

The PetroCount SMS can be configured to print a variety of reports to a serial printer. Up to 32 SMS units can be multidropped on 1 communications interface for report printing. The available reports include a configurable meter ticket/bill of lading, data log printout and inventory totals printout. The printing features allow the SMS to perform as a stand alone transaction accounting system or provide backup to an existing automation system.

The following instrument specifications apply to the Main Control Unit and the Remote Input/Output Unit. Instrument power is required for all Control Units.

ELECTRICAL

Instrument Power

115 Vac Configuration: 95 Vac to 135 Vac, 47 Hz to 63 Hz.
0.25 amp maximum without heaters operating
1.00 amp maximum with heaters operating
230 Vac Configuration: 190 Vac to 270 Vac, 47 Hz to 63 Hz.
0.125 amp maximum without heaters operating
0.500 amp maximum with heaters operating

INPUTS

Meter Pulse Inputs

12Vdc Source Mode (Intended for pulsers that generate a 12Vdc pulse)

Threshold: 6.3 Vdc \pm 0.5 Vdc
Input Resistance: 1.5 k ohms
Maximum Input Voltage: 30 Vdc
Maximum Input Frequency: 10 khz
Maximum Input Frequency for Additives: 5 khz

5Vdc Source Mode (Intended for pulsers that generate a 5Vdc pulse)

Threshold: 2.0 Vdc \pm 0.4 Vdc
Input Resistance: 2.0 k ohms
Maximum Input Voltage: 30 Vdc
Maximum Input Frequency: 10 kHz
Maximum Input Frequency for Additives: 5 khz

Sink Mode (Intended for pulsers with open collector or contact closure outputs.)

Nominal Applied Voltage: 12 Vdc
Nominal On Current: 8.0 mA
Maximum On Resistance: 700 ohms
Maximum On Voltage: 4.0 Vdc
Maximum Off Leakage: 1.0 mA
Maximum Input Frequency: 10 kHz

Digital Inputs (For use with open collector or contact closure outputs only.)

Nominal Applied Voltage: 12 Vdc
Nominal Operating Current: 6.0 mA
Maximum On Resistance: 1.5 k ohms
Maximum On Voltage: 4.0 Vdc
Maximum Off Leakage: 0.5 mA
Minimum Pulse Width: 15 ms

AC Permissive Power Detect Inputs

Input Voltage: 90 Vac to 270 Vac (47 Hz to 63 Hz)
Input Impedance: 56 k ohm Minimum

PRTD Inputs

Connection Type: 4 wire
Accuracy: \pm 0.25°F (\pm 0.139°C) over range of -50°F to 450°F (-45.6°C to 232°C)
Drive Current: 1 mA

Current Loop Inputs

Input Resistance: 110 ohms
Nominal Input Current: 4-20 mA
Maximum Input Current: 45 mA

OUTPUTS

AC Solid State Relays

Load Voltage: 24 Vac to 280 Vac (25 Hz to 79 Hz)
Maximum Current: 1.5 Amp
Maximum Off State Leakage: 6.0 mA
Maximum On State Voltage Drop: 1.6 Vac

DC Solid State Relays

Load Voltage: 3.0 Vdc to 60 Vdc
Load Current: 0.1 amps. dc to 1.5 Adc
Maximum Off State Leakage: 1.0 mA dc
Maximum On State Voltage Drop: 1.85 Vdc

Digital Outputs

Maximum Off State Voltage: 60 Vdc
Maximum On State Voltage: 1.0 Vdc (I=0.25 A)
Maximum On State Current: 1.0 A
Maximum Off State Leakage: 1 μ A
Maximum Output Frequency: 1 kHz

DC Power Sources (For use with Pulsers, Digital Outputs and Current Loop Transmitters.)

+12 Vdc Regulated at 300 mA, Fused at 750 mA
+24 Vdc Unregulated at 100 mA, 1% ripple maximum, fused at 250 mA

AC Power Sources for Use with Relays

See Table 1
Line Power Fused at 3 amps
Permissive Power Fused at 3 amps

ENVIRONMENTAL SPECIFICATIONS

Temperature

Operating: -40° to 122°F (-40° to 50°C)
Storage: -40° to 158°F (-40° to 79°C)

Thermal Shock

No harmful effect for:
Operating-Less than 1°C/min;
Storage-Less than 3°C/min

Humidity

0-95% Non-condensing

Vibration

S.A.M.A. Standard PMC 31.1 - 1980 Section 5.3
(Condition #2 - Field Mounted)

Shock

Drop and Tottle Test from a height of three feet when packaged in its normal shipping container

EMI/RFI

S.A.M.A. Standard PMC 33.1 - 1978, "Electromagnetic Susceptibility of Process Control Instrumentation", Classification 2-abc; No Error
CE Mark as per EMC directive 89/336/EEC
EN50081-1
EN50082-2

Salt Fog

NEMA 4X

Dimensions: See Figures 11 and 12.

AGENCY APPROVALS

Safety

UL/cUL Division 1 explosion proof enclosures are designed to UL and cUL specifications in NEC Class 1, Groups C & D, Division 1 or Class II, Groups E, F and G hazardous locations.

Division 2 hazardous locations enclosures are designed to UL and cUL specifications in NEC Class 1, Groups A, B, C & D, Division 2.

CENELEC Designed to CENELEC specifications per code EEx d IIB T6.

Table 1 Total Maximum Input/Outputs with PetroCount SMS (Includes Remote Input/Output Unit)

	Relay (K's)	Digital Outputs	Digital Inputs	Pulses		RTD	Analog Inputs
				Single	Dual		
Main Control Unit	10	2	4	4	1	3	2
Remote Input/Output Unit	10	2	4	6			
Digital Input/Output Card in RIO	0	5	8*	0	0	0	0
Total (Main plus RIO)	20	4	8	10	1	3	2
Total (with Digital Input/Output Card in RIO)	20	9	16*	10	1	3	2

* Three (3) of these Inputs can be configured as Outputs by hardware jumber setting.

Weights and Measures

- NIST/NTEP
- Dutch Weights and Measures (NMI) & OIML recommendations
- CCA - Canada

SEQUENTIAL MANAGEMENT SYSTEM FEATURES

Hardware Configuration

The Main Control Unit comes standard with an operator interface and is capable of multi-stream sequential blending. By adding the Remote Input/Output Unit the I/O capability of the main control unit is enhanced. See Table 1, Figures 2 and 3.

Additive Metering

Up to 10 additive meter pulse inputs are available for complete additive system monitoring and control. Simply install a small P.D. or Coriolis flowmeter with pulse output and solenoid valve in the additive line and the SMS will turn on the additive pump, control the injection of additive, totalize and print all additive information.

Additional features include the option to stop injecting additive during the low flow stop stage to flush the line of all additives in preparation for the next delivery. The SMS can selectively deliver additive only during certain portions of the load, yet still delivers the correct amount of additive for the entire quantity delivered. An additive alarm ensures that all additives are injected in the proper quantities. Individual selection of additive injector type provides optimal flexibility for additive injection.

The Additive Injection Rate can be assigned on a per recipe basis. Individual pump contact for each additive can be assigned. The additive alarms for metering applications are volume based (not percentage based).



Figure 1 CMF010 with RFT9739 transmitter

The efficient use of the Additive System can be achieved by configuring it in a Master-Slave configuration. This allows a single additive to be delivered from a group of additives using only one additive meter. Independent product totals are maintained by each additive and an Additive Flush feature is provided to purge the line. A typical Master-Slave Additive System is illustrated in Figure 3.

Blend Recipes

Fifty blend recipes are available in the memory of the PetroCount SMS unit. Each recipe has individual totalizers and is highly configurable providing maximum flexibility. Recipe configuration includes:

Recipe Name	
Recipe Additives Available	
Component 1-4 Base Product Selection	
Component 1-4 Ratio	
Component 1-4 Additive Selection	
Adjustment Factor	Flush Enable
Additive #1 Rate	Additive # 6
Additive #2 Rate	Additive #7
Additive #3 Rate	Additive #8
Additive #4 Rate	Additive #9
Additive #5 Rate	Additive #10
Recipe Totalizer	

Blend Control

A high speed blend control algorithm commands the Brooks Model 788 digital control valve or Brodie valves for precise control of all component batches. An "automatic high flow recovery" sequence will allow the system to recover to the high flow set point should the pumping system allow.

Line Flush

A single product line flush can be programmed in each recipe to assure product quality between blends. The flush product used is selectable.

Permissive Sense

Two AC (one permissive per tub) and two DC permissive inputs (assignable digital inputs) are provided for detecting the status of different permissive circuits.

Each input has a programmable prompt for telling the operator which circuit is inactive.

Relay Options

The Main Control Unit and Remote Input/Output Unit can each be ordered with 5ac, 10ac, 10dc or 5ac/5dc solid state relay cards.

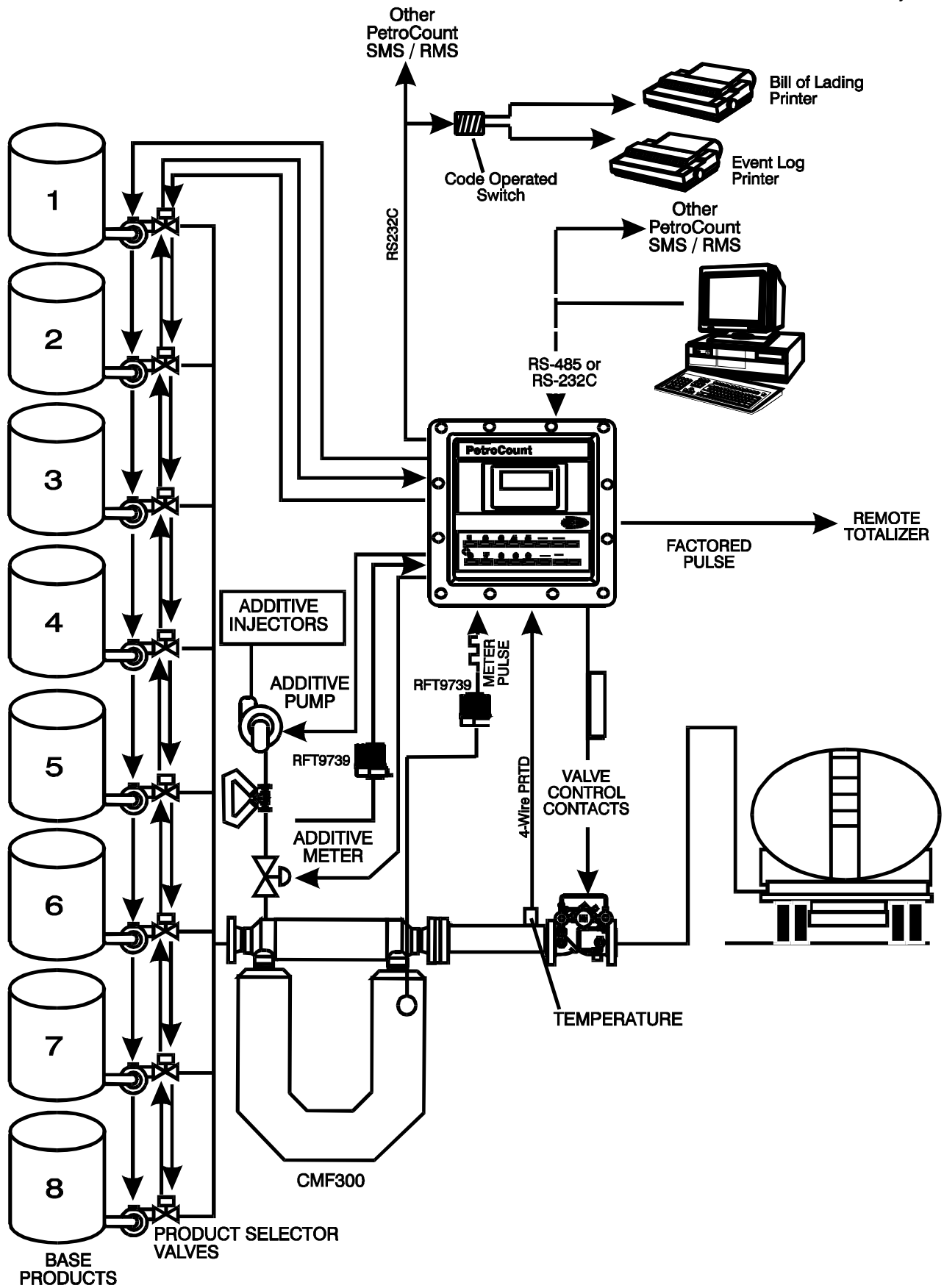


Figure 2 Loading Rack Applications-Additive Metering

Meter Factor Linearization

Flowmeter accuracy is maintained with programmable multi-point linearization. The PetroCount SMS automatically interpolates between the four meter factor set points assuring system accuracy over the required flow ranges as shown in Figure 4.

Operator View Screens

More than 125 separate data base variables are available for instantaneous operator viewing. These parameters may be viewed but not changed by the operator and include:

Flow Rate	Delivered Gross	Current Time
Temperature	Delivered Net	Meter Factor
Gross Totalizer	Additive Delivered	Additive Totalizer
Net Totalizer	Density	W & M Counter

Multi-lingual Operator Prompts

The operator (driver) prompts in the PetroCount are selectable from the following languages:

English	German (Deutsch)	French (Francais)
Spanish(Espanol)	Portuguese	Italian (Italiano)
Dutch (Nederlands)	Norwegian (Norsk)	Serb (Srpski)
Croatian (Hrvatski)	Danish (Dansk)	Swedish (Svensk)
Finnish (Suomi)	Polish (Polski)	Czech (Cesky)
Slovak (Slovensky)	Hungarian (Magyar)	Romanian
Latvian (Latvietis)	Lithuanian (Lietuviu)	Turkish (Turkce)
Indonesian (Bahasa)	Malaysian (Bahesa)	

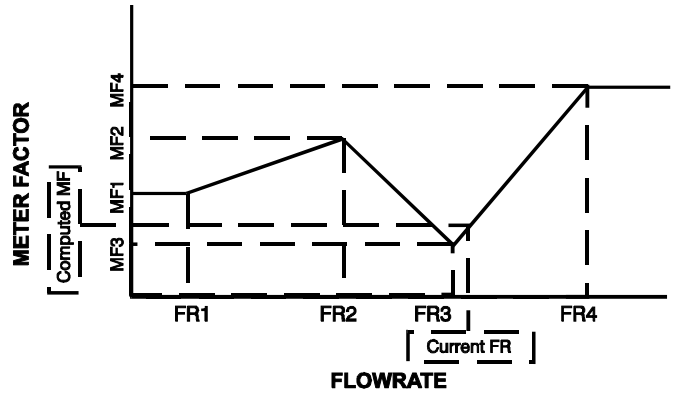


Figure 4 Meter Factor Linearization



Figure 5 Retrofit Kit for Existing PetroCount IMS Housings

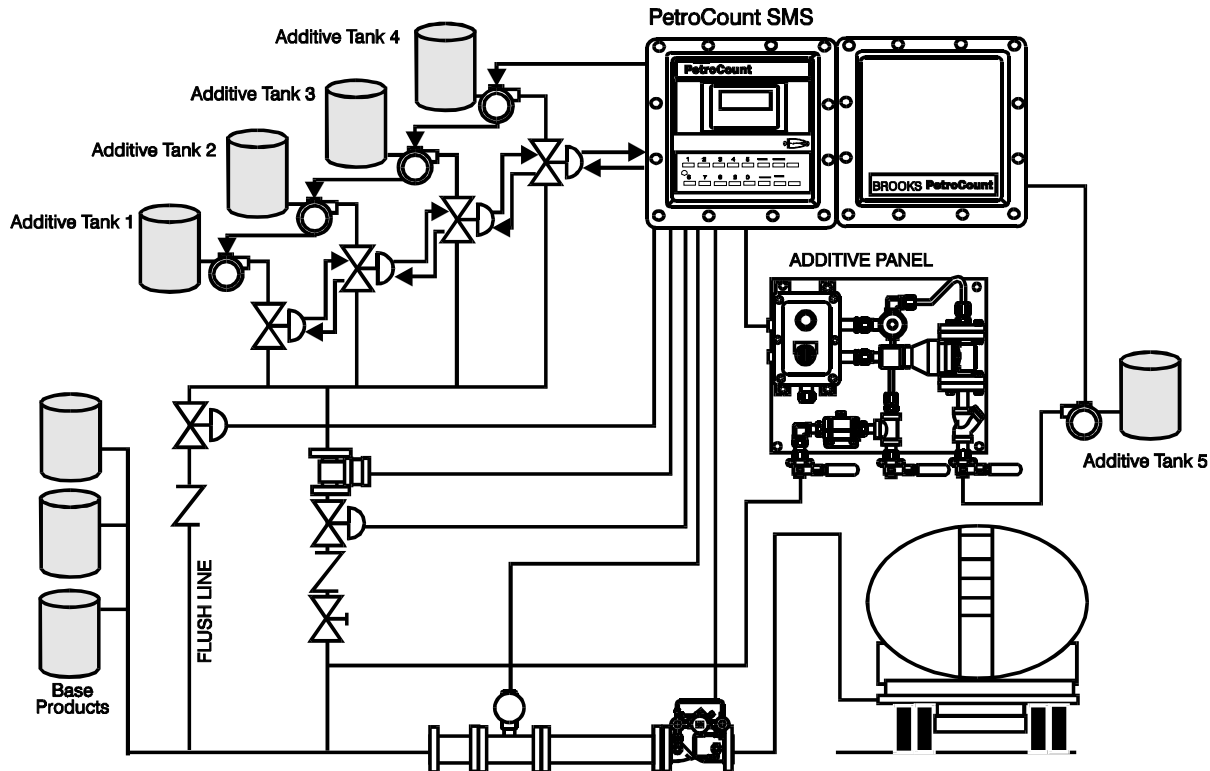


Figure 3 PetroCount SMS Additives Sub-system

Alarms

The PetroCount SMS offers comprehensive alarms for blending systems. Each alarm action is user programmable for no action, display only, close relay contact, stop loading process or lock the unit. Built in programmable alarm conditions are user-selectable and may be programmed to monitor one or more of the following conditions:

Low Flow Rate	Blend Abort
High Flow Rate	Blend Out of Spec.
Preset Over Delivery	Pulse Security
Preset Under Delivery	Pulser Failure
Valve Failure	Additive Failure
Diagnostic	Temperature Out of Range
Data Comm	Power Failure

Pulse Security

Dual pulse signals, 90° out-of-phase, can be monitored for error conditions which can occur because of electrical noise or faulty pulse generating components. The PetroCount performs the pulse security function in accordance with API Petroleum Measurement Standard, Chapter 5.5, level B, and Institute of Petroleum Standard, IP 252/76, Part XIII, Section 1, Level B.

Temperature Compensation

PetroCount RMS and SMS computes CTL (Temperature Correction factor) through user entered constant, linear equations or API tables. Besides API tables for generalized refined products. SMS firmware also includes compensation tables for Crude and Lube Oils. All API tables are standard in the firmware. The reference base temperature for compensation is also configurable.

Density Referencing

PetroCount SMS calculates the reference density from the observed density via live or user entered inputs. This is used for density correction in odd API tables. With even API tables, the user entered base product reference-density is used.

Recipe Selection

The PetroCount SMS can be configured to prompt the operator with a scrolling menu of recipe names or by entering a 2-digit recipe number. If only one recipe is required a default recipe can be selected eliminating the recipe selection process. A terminal automation system can select any recipe via digital communications.

Data Communications

Two independent data communications ports are provided for remote access and control using either computer mode or terminal mode. Communications port #1 is jumper configurable for RS232 or RS485 multidrop.

Communications port #2 is dedicated RS485. Each port can be configured with unique data rates up to 19,200 baud, word size (8 or 7), stop bits (1 or 2) and parity (none, odd or even). Both communications ports are electrically isolated from all I/O circuits providing for superior noise immunity and performance. A communications analyzer and communication port alarms are provided to aid in system diagnostics.

Archive Memory Storage

Archival memory storage of all transaction information is maintained even after a power outage. The archive function can be configured to stop all loading should the memory storage become full. Some available archive parameters include:

Transaction Index	Product Weighted Avg. Temp.
AlarmHistory	Recipe Number
Time/Date	

Volume Weighted Density

PetroCount SMS is capable of accepting 'live' density input through a 4 to 20 mA Analog input channel. Volumetric batch weighted average density is calculated by the PetroCount SMS using this live density values will be available for printing on the Bill of Lading to comply with Weights & Measures requirements.

Printing Options

Up to 32 PetroCount SMS Control Units can be multidropped to a serial printer for printing the following reports for recording transaction details and data base maintenance:

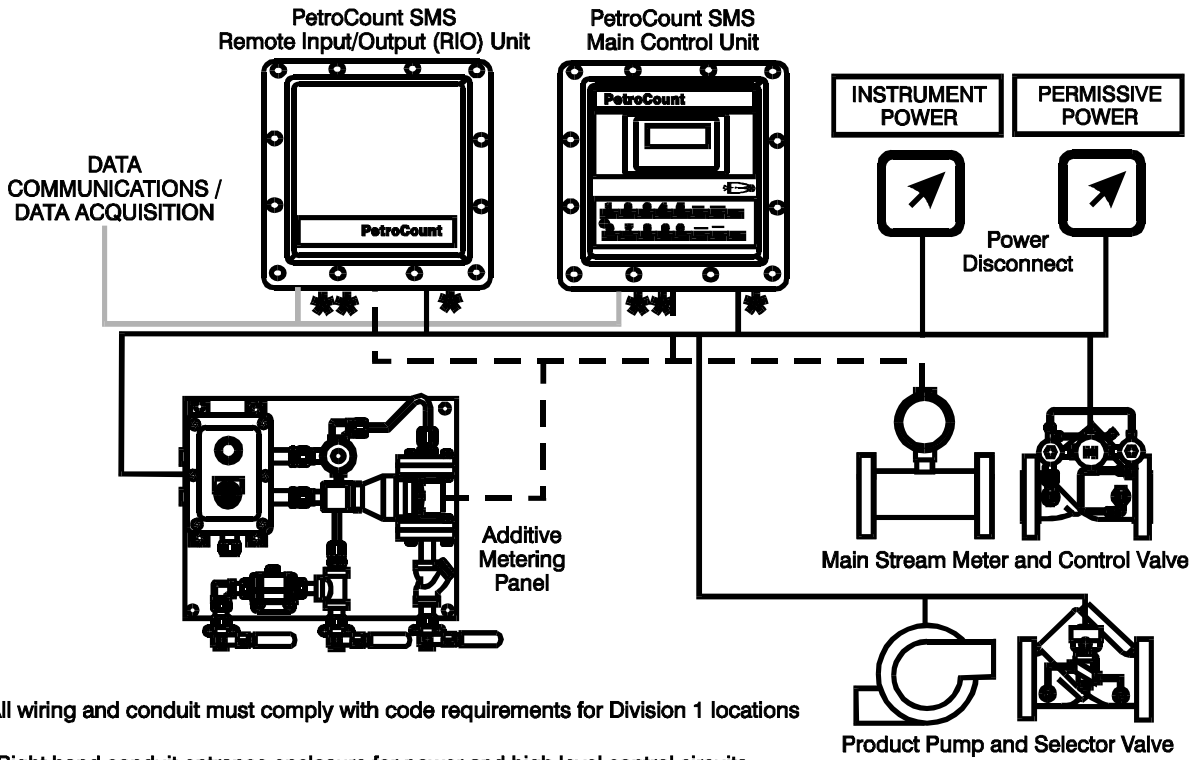
Data Log
Bill of Lading/Meter Ticket (Configurable)
Inventory Totals Printout

By incorporating an external data splitter unit or "code operated switch", a single serial communication port can be used to support two separate printers for printing Bill of Lading & Event Log information.

The printer interface supports PTB (German Weights & Measures) protocol also supports special characters required by PTB such as the display of variables (raw vs. calculated), date format, special punctuation (*and #), decimal points, etc.

Retrofit Kit

A retrofit kit is available to upgrade previous generation PetroCount IMS Control Units. Retrofit kits are also



All wiring and conduit must comply with code requirements for Division 1 locations

*Right hand conduit entrance enclosure for power and high level control circuits.

** Center and left hand conduit entrances on each enclosure for low level I/O circuits.

NOTE: Maximum cable length for communications cable between Main and Remote Input/Output Unit is 25 feet.

Figure 6 Installation Considerations

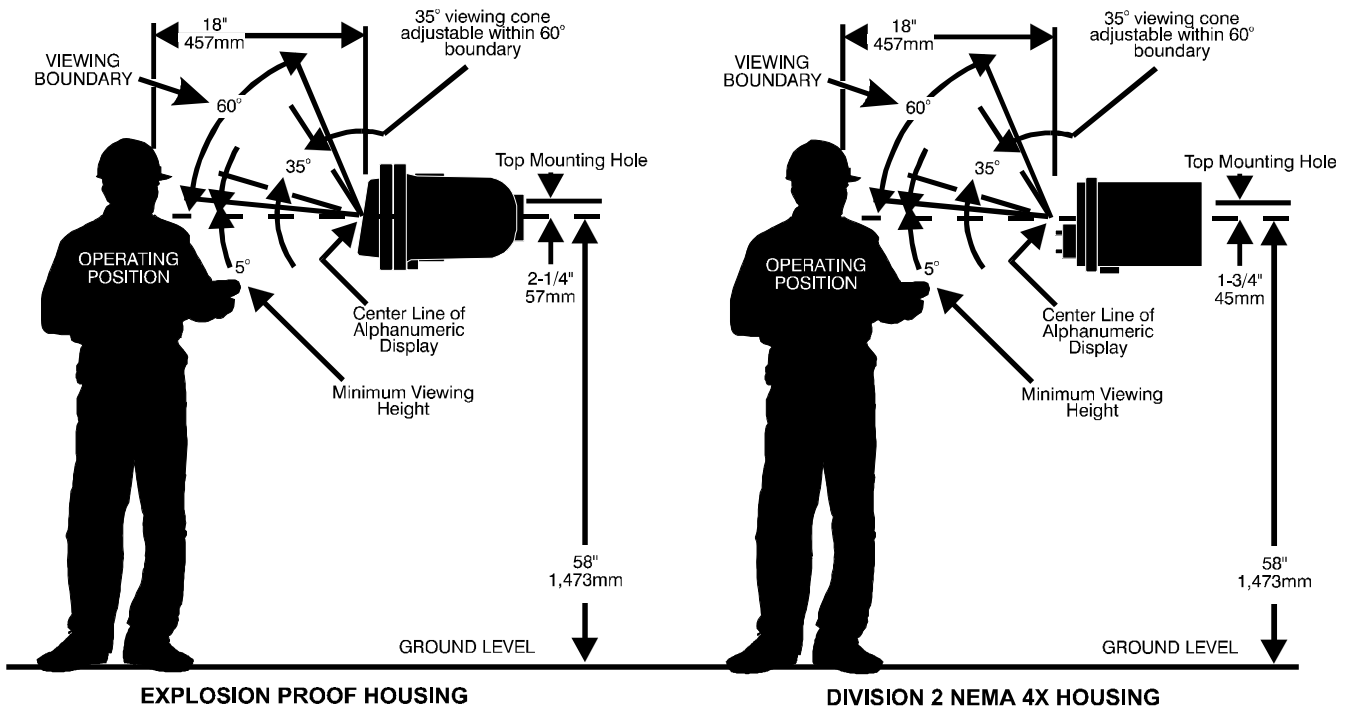


Figure 7 Mounting Considerations

Deliver To:

Charge To:

Driver ID Number: 5836479
Order Number: 2345

Date: 04/12/95

Time In: 08:14:42
Time Out: 08:21:27

<u>Product</u>	<u>Meter ID</u>	<u>Gallons Gross Qty</u>	<u>Gallons Net Qty</u>	<u>F° Temp</u>	<u>API Density</u>	<u>Additives</u>	<u>cc's Quantity</u>
89 OCT	3C	1000.05	993.25	----			
--Regular		599.92	595.96	72.5	46.3	add 1	3985.2
--Premium		400.13	397.29	73.6	47.2	add 2	2375.8

Figure 8 Typical Printed Ticket (Reduced from Original Size)

<u>Driver I.D.</u>	<u>Unit Addr</u>	<u>Recipe</u>	<u>Gross Del.</u>	<u>Net Del.</u>	<u>Gross Total</u>	<u>Net Total</u>	<u>Avg Temp</u>	<u>Time In</u>	<u>Time Out</u>
0003872	203	MidGrade	2000.07	1978.88	2924092	2924092	-----	16:35	16:40
		Super	600.02	594.14	836513	828984	78.5		
		Regular	1199.97	1188.45	1988294	1970396	77.9		
		MTBE	200.08	198.48	99285	98496	80.3		
		prod #4	0.00	0.00	0	0	0.0		
		prod #5	0.00	0.00	0	0	0.0		
		prod #6	0.00	0.00	0	0	0.0		
		prod #7	0.00	0.00	0	0	0.0		
		prod #8	0.00	0.00	0	0	0.0		
		Add 1 =		7645.3cc					
		Add 2 =		325.0cc					
		add #3 =		0.0cc					
		add #4 =		0.0cc					
		add #5 =		0.0cc					
		add #6 =		0.0cc					
		add #7 =		0.0cc					
		add #8 =		0.0cc					
		add #9 =		0.0cc					
		add #10 =		0.0cc					
00882651	605	Hi Test	2999.96	2974.46	3809914	3579002	-----	16:37	16.42
		Super	2999.96	2974.46	3809914	3579002	78.7		
		prod #2	0.00	0.00	0	0	0.0		
		prod #3	0.00	0.00	0	0	0.0		
		prod #4	0.00	0.00	0	0	0.0		
		prod #5	0.00	0.00	0	0	0.0		
		prod #6	0.00	0.00	0	0	0.0		
		prod #7	0.00	0.00	0	0	0.0		
		prod #8	0.00	0.00	0	0	0.0		
		add #1 =		0.0cc					
		add #2 =		0.0cc					
		Add 3 =		11358.4cc					
		add #4 =		0.0cc					
		add #5 =		0.0cc					
		add #6 =		0.0cc					
		add #7 =		0.0cc					
		add #8 =		0.0cc					
		add #9 =		0.0cc					
		add #10 =		0.0cc					

Figure 9 Typical Data Log Printout

INVENTORY TOTALS

PetroCount: SMS #204
 Date: 04/18/95

Unit Address: 215
 Time: 09:38:24

Gross Totalizers

Product	Previous Reading	Current Reading	Change
Regular	754833.54	785582.23	30748.69
Super	97884.46	138835.87	40951.41
MTBE	48331.13	58229.32	9898.19
Alcohol	42004.56	49893.12	7888.56
prod #5	0.00	0.00	0.00
prod #6	0.00	0.00	0.00
prod #7	0.00	0.00	0.00
prod #8	0.00	0.00	0.00

Net Totalizers

Product	Previous Reading	Current Reading	Change
Regular	759549.70	780082.92	30533.22
Super	97149.87	137793.73	40643.86
MTBE	48089.34	57937.85	9848.51
Alcohol	41709.97	49543.74	7833.77
prod #5	0.00	0.00	0.00
prod #6	0.00	0.00	0.00
prod #7	0.00	0.00	0.00
prod #8	0.00	0.00	0.00

Additives

Product	Previous Reading	Current Reading	Change
Add 1	4839.29	4892.19	52.90
Add 2	2883.20	2945.56	62.36
Add 3	3363.00	3363.00	79.61
Add 4	18226.39	18332.79	106.40
add #5	0.00	0.00	0.00
add #6	0.00	0.00	0.00
add #7	0.00	0.00	0.00
add #8	0.00	0.00	0.00
add #9	0.00	0.00	0.00
add #10	0.00	0.00	0.00

Previous Reading 04/17/95 13:36:58

Figure 10 Inventory Totals Printout

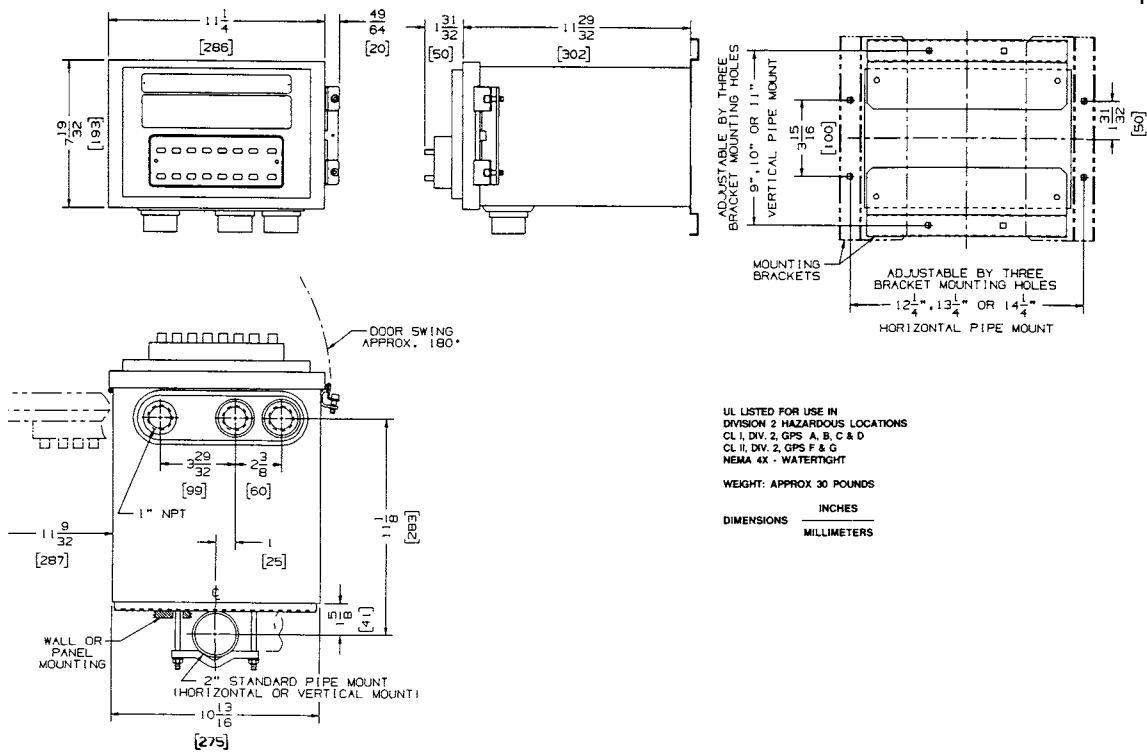


Figure 11 Dimensions PetroCount SMS Division 2, NEMA 4X Housing

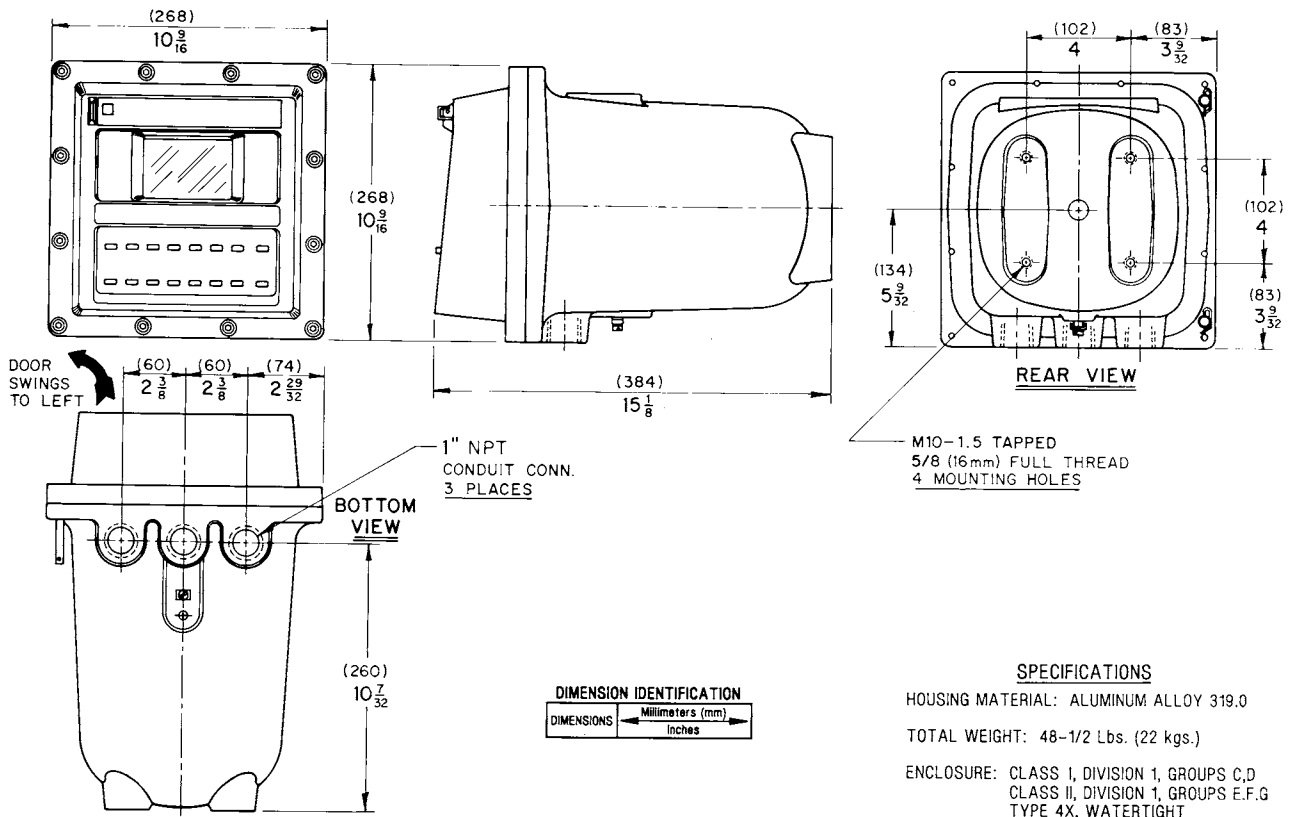


Figure 12 Dimensions PetroCount SMS Explosion Proof Housing

Table 2 Main Control Unit Model Number Breakdown

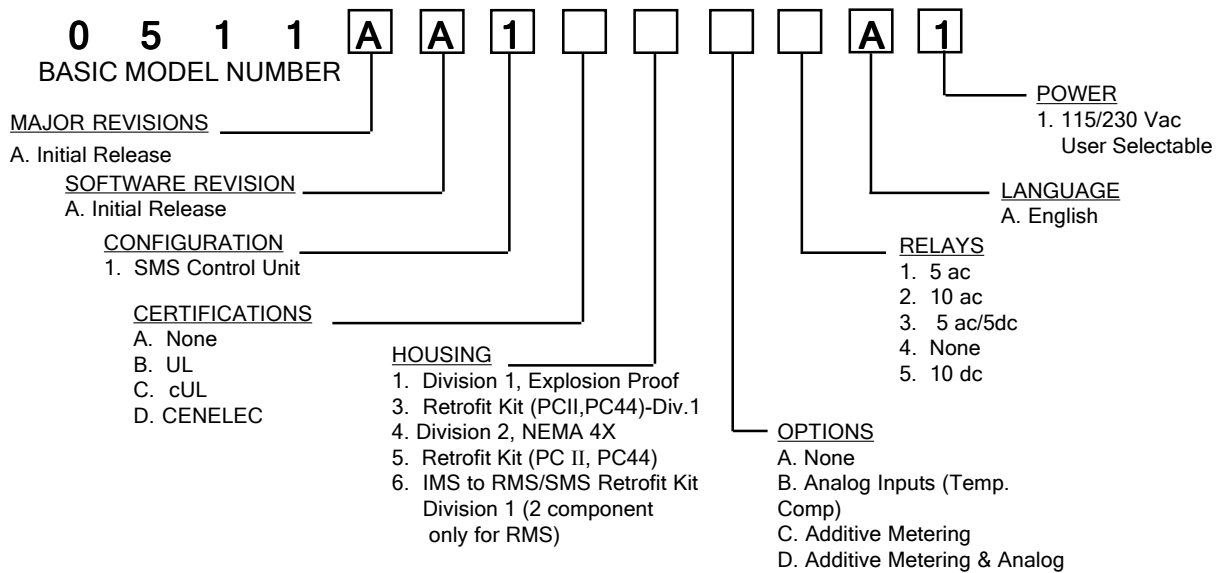
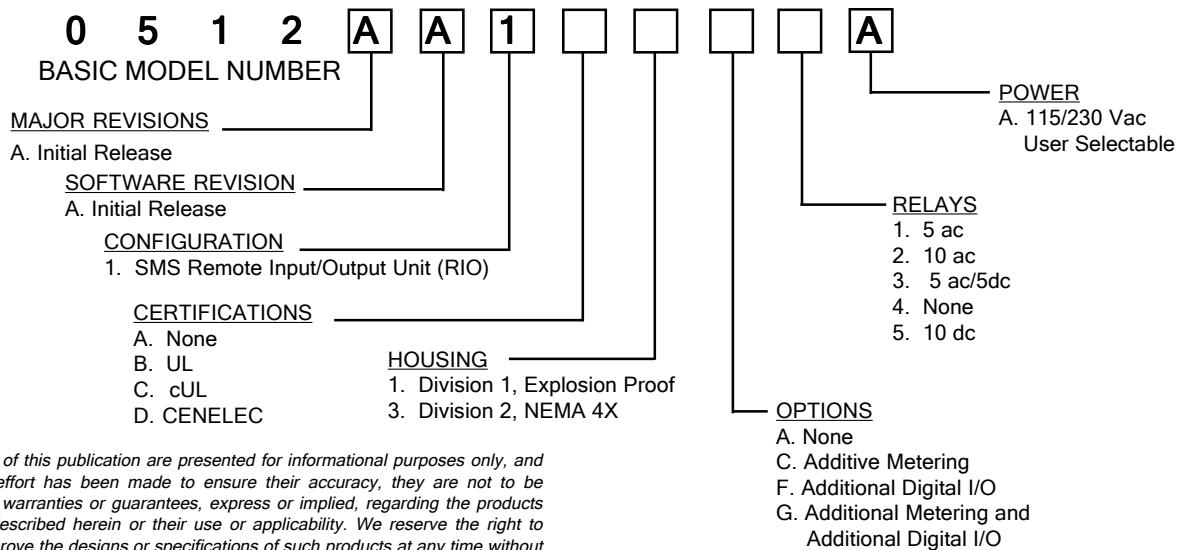


Table 3 Remote Input/Output Unit Model Number Breakdown



The contents of this publication are presented for informational purposes only, and while every effort has been made to ensure their accuracy, they are not to be construed as warranties or guarantees, express or implied, regarding the products or services described herein or their use or applicability. We reserve the right to modify or improve the designs or specifications of such products at any time without notice.



Daniel Division Headquarters - Houston, Texas, USA, Tel: (713) 467-6000, Fax: (713) 827-3880
USA Toll Free 1-888-FLOW-001
 Calgary, Alberta, Canada, Tel: (403) 279-1879, Fax: (403) 236-1337
 Stirling, Scotland - UK, Mid-East & Africa, Tel: +44 1653-638300, Fax: +44 1653-600425
 Singapore - Asia Pacific Tel: +65- 777-8211, Fax: +65 -770-8001

www.daniel.com

Daniel is a wholly owned subsidiary of Emerson, and a division of Emerson Process Management.