Model iPM – Intelligent Power Monitor

Features

- Monitors Single Phase, 4 Wire Wye or Three Phase Delta
- User Specified Voltage Range, Frequency Range and Configuration
- Monitors Phase Sequence, Voltage, Frequency, THD and DC Component
- Designed to MIL-STD-810
- EMI Filtering per MIL-STD-461
- Transient Protection per MIL-STD-704 & MIL-STD-1399
- EIA RS485 Interface (Not required for basic operation; See NOTE)
- Background Self-Test
- 50 Milli-Seconds Holdup Time
- Hermetically Sealed

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NOTE: RS485 is a standard interface feature for this product but is not required for use in normal operation. Customers may utilize the iPM without the use of the RS485 interface feature and replace/substitute legacy monitors for standard operation.

General Description

The NAI iPM is an advanced, compact, DSP based system power monitor providing a precise instrument grade digital analysis of input power lines. The iPM monitors single phase, three phase 4-wire wye or three phase Delta power lines at various input voltage levels and frequencies. This monitor is equipped with an EIA RS485 compatible serial communications interface that permits additional control functions and readout of diagnostic data. Additionally, it features a background self-test that continuously monitors the health of unit hardware. This NAI power monitor is designed and qualified to the most stringent performance and environmental requirements.

Operation

When the voltage and frequency of the input signal are within prescribed high and low limits, and the phase sequence is ABC, the output relay will energize after the specified "pick-up" time delay. If the high or low voltage limits of any phase are exceeded for a time greater than the specified "drop-out" time delay, the relay de-energizes and remains de-energized until all phase voltages return within limits and remain at normal levels for longer than the specified "pick-up" time delay. If the input frequency exceeds the high or low frequency limits for a time exceeding the "drop-out" time delay, the relay de-energizes and remains de-energized until the frequency returns within limits and remains at normal levels for longer than the "pick-up" time delay. The output relay will not energize if the phase sequence is other than ABC or if any phase is disconnected. When the output relay is energized, loss of any phase or error in phase sequence will cause the relay to drop out within 750ms, overriding the time delay circuits.

Electrical Specifications

Input Characteristics:

Input	Single Phase …… 80Vrms – 283Vrms 4-Wire Wye ……. 80Vrms – 283Vrms (Line-to-Neutral) 3-Wire Delta …… 104Vrms – 490Vrms (Line-to-Line)
Frequency Range	47Hz to 800Hz
Input Transient Protection	Per MIL-STD-704, Type 1 (Three Phase and Single Phase)
Input Transient Protection (Optional)	Per MIL-STD-1399, Type 1 (Three Phase Delta) 440 & 115Vrm (Line-to-Line); 1000V Spike capability only (See Ordering Information; option codes)
EMI Filtering	Per MIL-STD-461 CE (Conducted Emissions)

Monitoring Characteristics:

Voltage Band	As Required; See Ordering Information
Frequency Band	As Required; See Ordering Information
Accuracy	1% Defined as maximum error of nominal full scale, including temperature drift and repetitive operations.
Peak Voltage (Crest Factor)	Default Trip Limit - Factory Set to 200%
Hold-Up Time	50ms
Distortion (THD)	Default Trip Limit - Factory Set to 10%
DC Component	Default Trip Limit - Factory Set to ±5Vdc
Phase Sequence	ABC
Phase Sequence Tolerance	Default Trip Limit - Factory Set to +/-30 degrees
Time Delay (Pick-up)	100ms – 9.99 sec; See Ordering Information
Time Delay (Drop-out)	100ms – 9.99 sec; See Ordering Information

Output Contacts:

Contact Form	DPDT or 3PDT
Contact Life	50,000 operations min.
Contact Resistance	15 milliohms max.
Dielectric Strength	1000Vdc (all terminals to case)
Insulation Resistance	100 Megohms@500Vdc (all terminals to case)
Dissipation	9 Watts max. @ 115Vrms; 11 Watts max. @ 230Vrms
Contact Rating	28Vdc: 10A resistive; *10A inductive* 115Vrms (47-65Hz): 2.5A resistive; *2.5A inductive* 115Vrms (360-800Hz): 10A resistive; *10A inductive*

Physical & Environmental Specifications

Temperature Range	Operating: -55°C to +100°C; Storage: -55°C to +125°C
Shock	Per MIL-STD-810C, Method 516.2, Procedure I, 50g's 11 ±1ms any axis
Vibration	Per MIL-STD-810C, Method 514.2, Procedure I, 10-2000Hz 20g's
Acceleration	Per MIL-STD-810C, Method 513.2, Procedure I & II, ±10g's
Humidity	Per MIL-STD-810C, Method 507.1 Procedure I
Altitude	70,000 feet per MIL-STD-810C, Method 504.1, Category 6 Equipment
MTBF	423,344 hrs. @ 40°C Ground Fixed per MIL-HDBK-217
Dimensions & Interface	Refer to "Mechanical Layout & Wiring Diagram"
Connector	MS 3113H-20-16PN; Mating Connector - MS3116F20-16S (NOT SUPPLIED)
Enclosure	Hermetically Sealed
Finish	Bright Tin Lead Hot Dip IAW MIL-F-14072M M258 or equivalent
Weight	12 oz. max (0.34kg)
Marking	Model number, Date code and Wiring Diagram

Communication

Description: Model iPM provides an EIA RS485 compatible serial data interface allowing enhanced control features, access to diagnostic data and real-time readout of measured parameters of the AC power input such as frequency, voltage, phase and others.
Since the iPM is designed with common hardware for all versions, the RS485 port is also used at the factory to customize all operating parameters to customer specification (see iPM Ordering Information).

Interface Settings

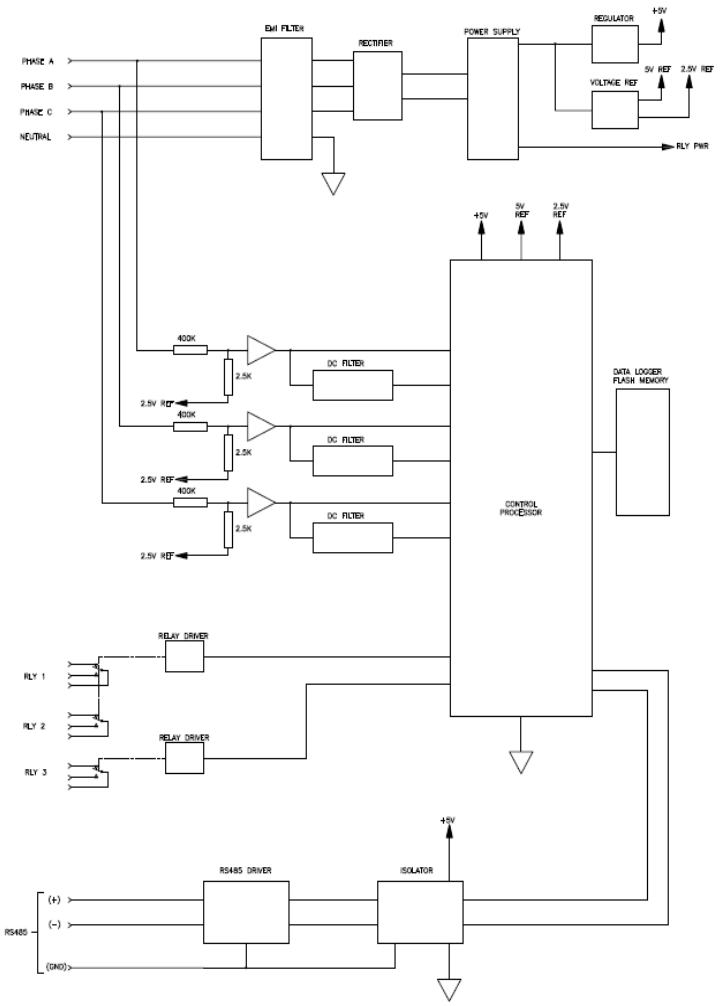
Baud Rate	115.2K*
Data Bits	8
Stop Bits	1
Parity	None
Protocol	None

*Baud rate is programmable 2400 to 115,200. Default value is 115,200.

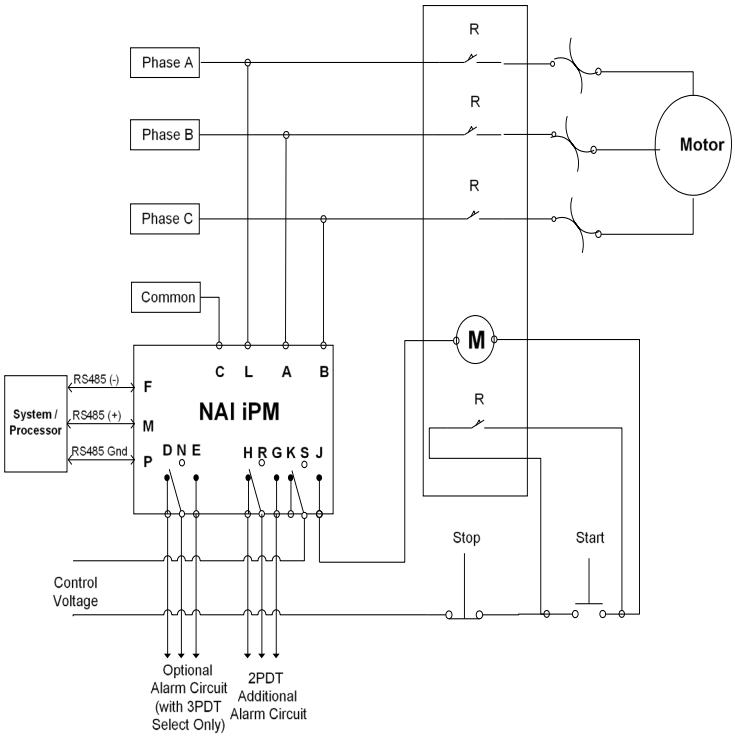
Command Format: Refer to North Atlantic document iPMA052 for detailed information on command format, syntax and content. All commands are sent via the RS485 serial interface as ASCII text. Each command is terminated with an ASCII Linefeed character (0x0A). Most commands will have a response message. Character string data responses will be terminated with an ASCII Linefeed character. Binary data response messages will not have a terminating character but will terminate when the specified number of bytes has been sent.

Block Diagram &Typical Application

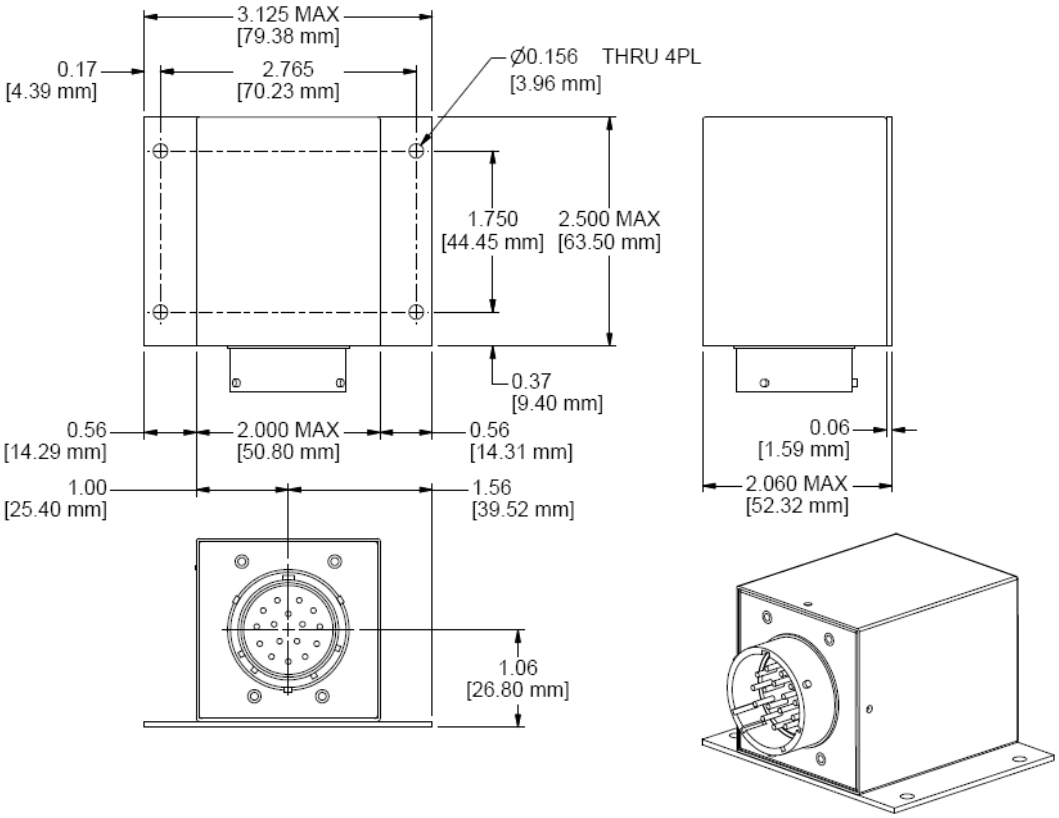
Block Diagram



Typical Application

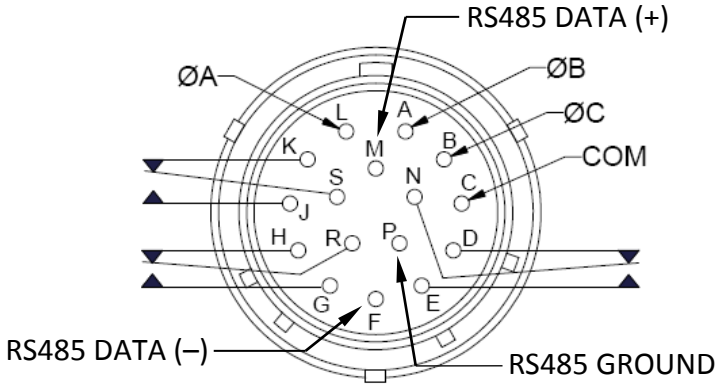


Mechanical Layout



TOLERANCES: .XX = ± .01″ [.25mm]
.XXX = ± .005″ [.13mm]

Wiring Diagram



Installation Information:

1. Wiring diagram shown above depicts the output contacts in the de-energized position.
2. For single phase operation, use Pins L & A.
3. For DPDT Operation, do not use pins D, E & N
4. ***CAUTION*** – PIN C (COM) IS NOT TIED INTERNALLY TO CHASSIS.
5. RS485 interface should be terminated with 120-ohm resistor between PIN M and PIN F for unit at end of bus only. Units built after 02/14/2017 do not have an internal termination resistor. Earlier revisions may contain a 120-ohm termination.

Ordering Information

TO ORDER, SPECIFY ALL PARAMETERS USING THE PART NUMBERING SYSTEM SHOWN BELOW:

Example Part Number: iPM 4 2 A 0 0 0 0 (048-062) (090-130) (010-999) 00

PHASE
1 = Single Phase
3 = 3-Wire Delta
4 = 4-Wire Wye

CONTACT FORMS
2 = DPDT
3 = 3PDT

RESERVED

PHASE SEQUENCE TOLERANCE
0 = Option Not Selected (Default 30° Phase Sequence Tolerance)
1 = Not Used
2 = 15° Phase Sequence Tolerance
3 = 30° Phase Sequence Tolerance
4 = 45° Phase Sequence Tolerance
5 = 30° Phase Sequence Tolerance, with phase dropout delay of 3.0 seconds
X = No phase checks

THD
0 = Option Not Selected
1 = Option Selected (Trip on THD)

DC
0 = Option Not Selected
1 = Option Selected (Trip on DC)

PEAK
0 = Option Not Selected
1 = Option Selected (Trip on PEAK)

FREQUENCY SENSE BAND
Specify (Low-High) frequency limits in hertz (Hz)
Enter XXX if Low or High limit not required

VOLTAGE SENSE BAND
Specify (Low-High) voltage limits in Vrms
Enter XXX if Low or High limit not required

PICK-UP & DROP-OUT TIME DELAY
Specify (Pick up - Drop out) time delay

OPTION CODES
00 = No Option; Enter "00"
02 = RESERVED
03 = Separate Relay Function – Similar to Type 109 power monitor (Contact Form option "3" required)
(J1 pins J, K and S) = Voltage Alarm
(J1 pins D, E and N) = Frequency Alarm
(J1 pins G, H and R) = Do Not Connect
04 = Maximum Voltage and/or Frequency with inverted relay logic (Non-Latching)
05 = RESERVED
06 = Emergency power and transient protection per MIL-STD-1399, Type 1 (Three Phase Delta), 440 & 115 VAC L-L, 1000V Spike Capability.
80 = Latch functionality. At initial turn on and after a trip condition, output is latched off until RS485 RESET command is received. Consult factory for availability of hardware reset discrete input.

Part Number Table for Special Orders

Part Number Special	Description
iPM42A-101	Complete “Set Point” part number: iPM42A1000(048-062) (190-220) (100-100)00
iPM42A-102	Complete “Set Point” part number: iPM42A0000(360-440) (100-XXX) (010-200)00
iPM42A-103	Complete “Set Point” part number: iPM42A0000(047-053) (191-242) (400-400)00
iPM33A-104	Complete “Set Point” part number: iPM33A0001(048-063) (175-228) (200-700)06
iPM33A-105	Complete “Set Point” part number: iPM33A0001(380-420) (175-228) (200-700)06
iPM32A-106	Complete “Set Point” part number: iPM32AX000(XXX-XXX) (104-144) (005-050)06