METERING SOLUTIONS COOKBOOK NOTES
Measurement & Verification - Data Collection

GENERAL NOTES

1. REFER TO INSTALLATION INSTRUCTIONS FOR DEVICE SPECIFIC TERMINATIONS.
2. REFER TO DEVICE DATA SHEETS FOR DEVICE SPECIFIC DATA TRANSFER TYPES.
3. INSTALL CURRENT TRANSFORMERS (CT), VOLTAGE SENSORS, AND OTHER REQUIRED HARDWARE ASSOCIATED WITH THE PROPER OPERATION OF THE METERING EQUIPMENT PER NEC AND BEST PRACTICES.
4. CURRENT TRANSFORMERS AND VOLTAGE SENSORS NOT SHOWN FOR CLARITY.
5. MAXIMUM CURRENT TRANSFORMER LEAD RUN LENGTH DETERMINED BY CT TYPE. REFERENCE CT DOCUMENTATION PRIOR TO LAYING OUT EQUIPMENT.
6. LEVITON RECOMMENDS THE FOLLOWING USE OF ISOLATED PULSE OUTPUTS:
   A. TENANT BILLING
      • USE KWH (1000) OUTPUT IN MOST APPLICATIONS.
      • IF 15 MINUTE INTERVAL DEMAND DATA IS REQUIRED, USE 10 WATT-HOUR OUTPUT FOR HIGH ENERGY APPLICATIONS (METERS RATED 800A OR HIGHER), USE KWH PULSE OUTPUT.
   B. ENERGY MONITORING
      • USE 100W PULSE OUTPUT FOR MOST APPLICATIONS, THIS WILL PROVIDE BETTER DATA RESOLUTION WHEN USING PULSE ACCUMULATIONS TO TRACK 15 MINUTE INTERVAL DEMAND.
      • FOR HIGH ENERGY APPLICATIONS, (METERS RATED 800A OR HIGHER), USE KWH PULSE OUTPUT.
7. AN ENERGY MONITOR HUB AND SERIES 4000/4100 METERS MAY BE ON THE SAME MODBUS RTU LOOP. ONE TYPE PER LOOP SHOWN FOR SIMPLICITY.
8. MAXIMUM NUMBER OF CONNECTED DEVICES ON A MODBUS RTU LOOP IS 32.
9. BACNET MS/TP AS IT RELATES TO METERS SHOWN. MEDIA CONVERSION AND TRANSPORT ARE PART OF FACILITY BAS/SMS SYSTEM, NOT SHOWN FOR CLARITY.
10. FACILITY ETHERNET MAY INCLUDE MEDIA CONVERSION BETWEEN DEVICES. UTP SHOWN FOR SIMPLICITY. INDUSTRY STANDARD DISTANCES APPLY.
11. MODBUS IP AND BACNET IP ARE TRANSPORTED VIA ETHERNET.
12. REFER TO SPECIFIC METER DATA SHEETS FOR POLARITY REQUIREMENTS OF PULSE OUTPUT WIRE.

WIRE RUNS BY SYMBOL #

1. LINE: 15AMP, 120VAC, 2 WIRE PLUS GROUND, 60HZ DIRECT FROM SERVICE PANEL DO NOT SWITCH.
2. (1) ETHERNET CABLE EQUAL TO BELDEN 2412, LABELED PER DRAWING.
3. (1) MODBUS RTU CABLE EQUAL TO BELDEN 11204, LABELED PER DRAWING. MAXIMUM LENGTH 1200M (3935 FT).
4. (1) BACNET MS/TP CABLE ER-48S COMPLIANT CABLE, WIRING IN COMPLIANCE WITH ASHRAE 130-2004.
5. COMMUNICATION WIRE EQUAL TO (2) #18-22 AWG THHN PER METER. MAXIMUM LENGTH 200 FT.
6. CT WIRE HARNESS AS NOTED BY MANUFACTURER AND AS SCHEDULED. MAX RUN LENGTH PER CT DOCUMENTATION.
7. REFERENCE AND POWER CIRCUIT: (1) 3-PHASE, 4-WIRE, PLUS GROUND CIRCUIT AT THE METERED VOLTAGE. FEED FROM DEDICATED 10A 3-POLE BREAKER.
8. POWER WIRE BY FACTORY.
9. COMMUNICATION WIRE BY FACTORY

NOTES BY SYMBOL #

1. CONFIGURE HIGH DENSITY PULSE MODULE TO ASSOCIATED DEVICE(S). MAXIMUM 23 METERS.
2. CONFIGURE METER TO ASSOCIATED LOADS. REFERENCE GENERAL NOTE 5 FOR RECOMMENDED USE AND PANEL SCHEDULES FOR MONITORED LOADS.
3. CONFIGURE ENERGY MONITORING HUB (EMH) OR EMBEDDED ENERGY MONITORING HUB (EMBH) AS REQUIRED. THE EMBH HAS EIGHT (8) ON-BOARD PULSE INPUT CHANNELS. EMBH HUB HAS NO PULSE INPUT CHANNELS.
4. POWER SUPPLY, CORD AND PLUG PROVIDED AS A COMPLETE ASSEMBLY.
5. CONFIGURE HUBITE AS REQUIRED. HUBITE HAS FOUR (4) ON-BOARD PULSE INPUT CHANNELS.
6. MANAGED ETHERNET SWITCH, 10/100/1000.
   A. PROVIDE MINIMUM TWO (2) SPARE PORTS. ASSUME AT LEAST ONE (1) BILLING COMPUTER PER SWITCH IN CALCULATIONS.
   B. SWITCH SHALL HAVE ALINK FEATURES.
   C. MULTIPLE SWITCHES SHALL BE LINKED TOGETHER.
7. CONFIGURE MODHOPPERS AS REQUIRED. MODHOPPER HAS (2) ON BOARD PULSE INPUT CHANNELS.
8. CONFIGURE EMH+ AS REQUIRED.
9. CONFIGURE DCAP AS REQUIRED.
10. CONFIGURE WIRELESS METERING DATA TRANSCEIVER TO ASSOCIATED DEVICE(S). MAXIMUM 1 OR 2 DEVICES DEPENDANT ON MODEL.

SYMBOLS

CONNECTOR BODY - FEMALE [CABLE MTG]
PLUG - MALE [CABLE MTG]
CROSSING WIRING, NO CONNECTION
CONNECTED WIRE
SEPARATE WIRE AS PART OF A BUNDLE
RECEPTACLE - FEMALE [PANEL MTG]
INLET - MALE [PANEL MTG]
WIRE RUNS NOT BY LEVITON
REFERENCE TO NOTES DOES NOT TRANSCEND DRAWINGS.
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MINI METER MMU TO HIGH DENSITY PULSE MODULE, MONITORING SYSTEM

MINI METER MMU

PULSE MODULE ASSEMBLY

HIGH DENSITY PULSE MODULE
A8911

9-30VDC

12-24VDC

POWER SUPPLY

120V IN

LINE (BLK)
NEU (WHIT)

CIRCUIT 1
LINE FEED
(120V)

EMBEDDED ENERGY MONITORING HUB
(EMB HUB)
A8810

24VDC 1A
CLASS 2 WALL BRICK XFMR

NEMA 5-15R
DUPLEX RECEPTACLE
(NOT BY LEVITON)

1-24VDC

TO ETHERNET SYSTEM

TO ETHERNET SYSTEM

CIRCUIT 1
LINE FEED
(120V)
INDIVIDUAL MINI METER TO ENERGY MONITORING HUB (EMH) OR ENERGY MONITORING HUBLITE (EMB HUBLITE), MONITORING SYSTEM

MINI METER

ENERGY MONITOR HUB (EMH)

24VDC 1A CLASS 2 WALL BRICK XFMR

NEMA 5-15R DUPLEX RECEPTACLE (NOT BY LEVITON)

CIRCUIT 1 LINE FEED (120V)

POWER SUPPLY

12-24VDC

CIRCUIT 1 LINE FEED (120V)

EMB HUBLITE ASSEMBLY

24VDC

TO ETHERNET SYSTEM

MINI METER

ENERGY MONITOR HUB (EMH)

24VDC 1A CLASS 2 WALL BRICK XFMR

NEMA 5-15R DUPLEX RECEPTACLE (NOT BY LEVITON)

CIRCUIT 1 LINE FEED (120V)

POWER SUPPLY

12-24VDC

CIRCUIT 1 LINE FEED (120V)

EMB HUBLITE ASSEMBLY

24VDC

TO ETHERNET SYSTEM
MINI METER MMU TO ENERGY MONITORING HUB (EMH) OR ENERGY MONITORING HUBLITE (EMB HUBLITE), MONITORING SYSTEM
INDIVIDUAL SERIES 1000/2000 METERS TO HIGH DENSITY PULSE MODULE, MONITORING SYSTEM
INDIVIDUAL SERIES 1000/2000 METERS TO ENERGY MONITORING HUB (EMH) OR ENERGY MONITORING HUBLITE (EMB HUBLITE), MONITORING SYSTEM
SERIES 2000 MMU TO ENERGY MONITORING HUB (EMH) OR ENERGY MONITORING HUBLITE (EMB HUBLITE), MONITORING SYSTEM

1. TERMINAL STRIP (COM) METER
2. TERMINAL STRIP (COM) METER
3. TERMINAL STRIP (COM) METER

4. 9

5. ENERGY MONITOR HUB (EMH) ABB12

6. TO ETHERNET SYSTEM

7. 24VDC 1A WALL BRICK XFMR

8. NEMA 5-15P DUPLEX RECEPTACLE
   (NOT BY LEVITON)

9. CIRCUIT 1 LINE FEED (120V)

10. HUBLITE ASSEMBLY

11. EMB HUBLITE A1B10

12. 24VDC

13. METER (COM) (PULSED)

14. METER (COM) (PULSED)

15. METER (COM) (PULSED)

16. METER (COM) (PULSED)

17. POWER SUPPLY

18. 12-24VDC

19. 120V IN

20. CIRCUIT 1 LINE FEED (120V)

21. TO ETHERNET SYSTEM
INDIVIDUAL SERIES 3500 METER TO MODBUS TCP/IP

INDIVIDUAL SERIES 3500 METER TO BACNET IP
INDIVIDUAL SERIES 4X00 METER TO HIGH DENSITY PULSE MODULE, MONITORING SYSTEM

SERIES 4x00 METER

PULSE MODULE ASSEMBLY

HIGH DENSITY PULSE MODULE
A8911
9–30VDC

1

12–24VDC
POWER SUPPLY
120V IN

LINE (BLK)
NEU (WHI)
CIRCUIT 1
LINE FEED
(120V)

EMBEDDED ENERGY
MONITORING HUB
(EMB HUB)
A8810

24VDC 1A
CLASS 2
WALL BRICK
XFMR

NEMA 5–15R
DUPLEX RECEPTACLE
(NOT BY LEVITON)

2 TO ETHERNET SYSTEM

CIRCUIT 1
LINE FEED
(120V)
INDIVIDUAL SERIES 4000/4100 METER TO MODBUS RTU

ENERGY MONITOR HUB (EMH) OR EMBEDDED ENERGY MONITORING HUB (EMB HUB)

A8812 OR A8810

24VDC 1A CLASS 2 WALL BRICK XFMR

NEMA 5–15R DUPLEX RECEPTACLE (NOT BY LEVITON)

LINE FEED (120V)

INDIVIDUAL SERIES 4000/4100 METER TO BACNET MS/TP

TO BACNET SYSTEM (MAXIMUM ALLOWABLE DEVICES ON BACNET MS/TP – RS485 NETWORK IS 32.)
INDIVIDUAL SERIES 4X00 METER TO ENERGY MONITORING HUB (EMH) OR ENERGY MONITORING HUBLITE (EMB HUBLITE), MONITORING SYSTEM

1. SERIES 4x00 METER (P1)
2. ENERGY MONITOR HUB (EMH) (A8812)
3. 24VDC 1A CLASS 2 WALL BRICK XFMR
4. NEMA 5–15R DUPLEX RECEPTACLE (NOT BY LEVITON)
5. TO ETHERNET SYSTEM

CIRCUIT 1 LINE FEED (120V)
SERIES 8000 METER — MODBUS RTU OPTION

SERIES 8000 METER — MODBUS TCP/IP OPTION

SERIES 8000 METER — BACNET IP OPTION

NOTE: NO MORE THAN 16 SERIES 8000 METERS PER ENERGY MONITOR HUB.
SERIES 7000/7100 METER — MODBUS RTU OPTION

SERIES 7000/7100 METER — MODBUS TCP/IP OPTION

SERIES 7000/7100 METER — BACNET MS/TP OPTION

SERIES 7000/7100 METER — BACNET IP OPTION

NOTE: NO MORE THAN 4 SERIES 7000/7100 METERS PER ENERGY MONITORING HUB. CONSULT FACTORY FOR ADDITIONAL DESIGN INFORMATION.

TO ETHERNET SYSTEM

TO ETHERNET SYSTEM

TO BACNET SYSTEM

(MAXIMUM ALLOWABLE DEVICES ON BACNET MS/TP - RS485 NETWORK IS 4.)

CIRCUIT 1 LINE FEED (120V)

24VDC 1A CLASS 2 WALL BRICK XFMR

NEMA 5-15R DUPLEX RECEPTACLE (NOT BY LEVITON)

ENERGY MONITOR HUB (EMH) OR EMBEDDED ENERGY MONITORING HUB (EMB HUB) A8812 OR A8810

SERIES 7000/7100 — MODBUS TCP/IP OPTION

SERIES 7000/7100 — MODBUS RTU OPTION

SERIES 7000/7100 — BACNET MS/TP OPTION

SERIES 7000/7100 — BACNET IP OPTION
INDIVIDUAL EMH+ TO MONITORING SYSTEM VIA ETHERNET

DISTRIBUTION PANEL

NOT BY LEVITON

EMH+ A8814

TO ETHERNET SYSTEM

INDIVIDUAL EMH+ PLUS MODBUS RTU DEVICES TO MONITORING SYSTEM VIA ETHERNET

DISTRIBUTION PANEL

NOT BY LEVITON

EMH+ A8814

TO ETHERNET SYSTEM

TO MODBUS RTU DEVICES
PULSE METERS — SYSTEM BACKBONE — MODBUS RTU TO ETHERNET

Typical Riser Distribution:

- Pulse Modules
- High Density Pulse Module AB911
- MINI METER MMU
- LEVEL THREE
- Energy Monitor Hub (EMH) or Embedded Energy Monitoring Hub (EMB Hub)
- A8812 or A8810
- Maximum number AB911'S per MODBUS RTU network is 32.

From Water Meter Pulse Outputs:

- SERIES 4X00 / SERIES 8000 METER
- LEVEL TWO
- Facility Ethernet System
- Facility Billing System
- MAXIMUM NUMBER OF DEVICES PER MODBUS RTU NETWORK IS 32.

From Gas Meter Pulse Outputs:

- SERIES 4X00 / SERIES 8000 METER
- LEVEL TWO
- ENX
- Facility Ethernet System
- Facility Billing System
- MAXIMUM NUMBER OF DEVICES PER MODBUS RTU NETWORK IS 32.

To Internet Based Billing System:

- SERIES 4X00 / SERIES 8000 METER
- LEVEL THREE
- MAXIMUM NUMBER OF DEVICES PER MODBUS RTU NETWORK IS 32.

Internet Based Billing System

- SERIES 4X00 / SERIES 8000 METER
- LEVEL THREE
- ENX
- Facility Ethernet System
- Facility Billing System
- MAXIMUM NUMBER OF DEVICES PER MODBUS RTU NETWORK IS 32.
BACNET MS/TP METERS — SYSTEM BACKBONE — BACNET MS/TP

RISER 1

SERIES 4100 / 7000/7100 METER

2

BN

4

BN

4

BN

4

SERIES 4100 / 7000/7100 METER

2

TO FACILITY BAS/BMS

RISER 2

SERIES 4100 / 7000/7100 METER

2

BN

4

BN

4

SERIES 4100 / 7000/7100 METER

2

TO FACILITY BAS/BMS

RISER 3

SERIES 4100 / 7000/7100 METER

2

BN

4

BN

4

SERIES 4100 / 7000/7100 METER

2

MAXIMUM NUMBER OF S7000/S7100 METERS PER BACNET MS/TP RS-458 NETWORK IS 4.
METERS — SYSTEM BACKBONE — ENERGY MONITORING HUBS (EMH) / EMH+ (METER AND HUB) TO ETHERNET

BUILDING "A"

RISER 3
EMH / EMH+

RISER 2
EMH / EMH+

RISER 1
EMH / EMH+

BUILDING "B"

RISER 3
EMH / EMH+

RISER 2
EMH / EMH+

RISER 1
EMH / EMH+

BUILDING "C"

RISER 3
EMH / EMH+

RISER 2
EMH / EMH+

RISER 1
EMH / EMH+

BUILDING "D"

RISER 3
EMH / EMH+

RISER 2
EMH / EMH+

RISER 1
EMH / EMH+

FACILITY ETHERNET SYSTEM

FACILITY ETHERNET SYSTEM
METERS — SYSTEM BACKBONE — SERIES 3500 METER/ SERIES 8000 METER/
SERIES 7000/7100 METER/EMH+ METER AND HUB TO MODBUS TCP/IP
METERS — SYSTEM BACKBONE — SERIES 3500 METER/ SERIES 8000 METER/ SERIES 7000-7100 METER/EMH+ METER AND HUB TO BACNET IP
MINI METER PULSE OUTPUT TO HIGH DENSITY PULSE MODULE, MODBUS TO MODHOPPER

MINI METER MMU

PULSE MODULE ASSEMBLY

HIGH DENSITY PULSE MODULE

MINI METER PULSE OUTPUT TO HIGH DENSITY PULSE MODULE, MODBUS TO MODHOPPER

MINI METER TO MODHOPPER ONBOARD PULSE INPUT TERMINALS

POWER SUPPLY

120V IN

12–24VDC

CIRCUIT 1 LINE FEED (120V)

MINI METER TO MODHOPPER ONBOARD PULSE INPUT TERMINALS

MINI METER

COM

PULSE

(1)

MODHOPPER

R9120–500

COM

PULSE

(1)

24VDC 1A
CLASS 2 WALL BRICK XFMR

NEMA 5–15R DUPLEX RECEPTACLE
(NOT BY LEVITON)

24VDC 1A
CLASS 2 WALL BRICK XFMR

CIRCUIT 1 LINE FEED (120V)
SERIES 2000 METER MMU PULSE OUTPUT TO HIGH DENSITY PULSE MODULE, MODBUS TO MODHOPPER

SERIES 1000/2000 METERS TO MODHOPPER ONBOARD PULSE INPUT TERMINALS
SERIES 4X00 METER PULSE OUTPUT TO MODHOPPER ONBOARD PULSE INPUT TERMINALS

SERIES 4X00 METER MODBUS TO MODHOPPER
SERIES 8000 METERS TO MODHOPPER, MONITORING SYSTEM

Note: No more than 4 S8000 meters per MOD hopper. Consult factory for additional design information.

EMH+ TO MODHOPPER

Circuit 1 line feed (120V)
METERS — SYSTEM BACKBONE — MODHOPPER

TYPICAL RISER

LEVEL THREE

LEVEL TWO

ENERGY MONITOR HUB (EMH) OR EMBEDDED ENERGY MONITORING HUB (EMB HUB)

ABB12 OR ABB10

MODHOPPER R9120—500

TO INTERNET BASED BILLING SYSTEM

OR

FACILITY ETHERNET SWITCH

FACILITY BILLING SYSTEM
NOTE: MAXIMUM OF 4 7000/7100 METERS PER MODHOPPER. CONSULT FACTORY FOR ADDITIONAL DESIGN INFORMATION.
PULSE METERS — INDIVIDUAL MINI METERS, SERIES 1000/2000, GAS, WATER TO ENERGY MONITORING HUB (EMH) OR ENERGY MONITORING HUBLITE (EMB HUBLITE), MONITORING SYSTEM
WIRELESS METERING DATA TRANSCEIVERS, DCAP AND REPEATER

NOTE: PLEASE REFER TO SPECIFIC DATA SHEETS FOR POLARITY REQUIREMENTS FOR PULSE OUTPUT WIRING.

WIRELESS METERING DATA TRANSCEIVER
1P (WITHOUT LCD)
T70MB-Sx0

WIRELESS METERING DATA TRANSCEIVER
2P (WITHOUT LCD)
T70MB-Dx0

WIRELESS METERING DATA TRANSCEIVER
1P (WITH LCD)
T75MB-Sx0

WIRELESS METERING DATA TRANSCEIVER
2P (WITH LCD)
T75MB-Dx0

WIRELESS REPEATER
T95RX-000

WIRELESS DCAP
T25DX-xxx

FACILITY BILLING SYSTEM

24VDC 1A CLASS 2 WALL BRICK XFMR

NEMA 5–15R DUPLEX RECEPTACLE (NOT BY LEVITON)

CIRCUIT 1 LINE FEED (120V)

LINE (ENX)
LINE (LF1)
LINE (LF2)
LINE (LF3)
LINE (LF4)

24VDC 1A CLASS 2 WALL BRICK XFMR

NEMA 5–15R DUPLEX RECEPTACLE (NOT BY LEVITON)

CIRCUIT 1 LINE FEED (120V)

LINE (ENX)
LINE (LF1)
LINE (LF2)
LINE (LF3)
LINE (LF4)
INDIVIDUAL MINI METER TO SINGLE PULSE METERING DATA TRANSCEIVER (MDT)

NOTE: PULSE IN CONNECTS TO 1000Wh, 100Wh OR 10Wh APPLICATION DEPENDENT.

WATER AND GAS METER TO DUAL PULSE METERING DATA TRANSCEIVER (MDT)

NOTE: PULSE IN CONNECTS TO 1000Wh, 100Wh OR 10Wh APPLICATION DEPENDENT.

NOTE: PLEASE REFER TO SPECIFIC DATA SHEETS FOR POLARITY REQUIREMENTS FOR PULSE OUTPUT WIRING.