M&V Plan for DG/CHP System

Ronald McDonald House

DRAFT - Revised may 25, 2017

Submitted to:

New York State Energy Research and Development Authority

17 Columbia Circle

Albany, NY 12203-6399

CDH ENERGY

Submitted by:

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Introduction

A 250 kW CHP system, consisting of a Intelligen Power Systems natural gas fired reciprocating has been installed at the Ronald McDonald House in New York, NY. Integrated Energy Concepts is providing a design-build installation of the system. The system includes both engine jacket and exhaust gas heat recovery systems and is capable of providing 1,500 MBtu/h of hot water at a maximum temperature of 205 °F. Heat recovered from the system will help meet space heating, DHW, and absorption chiller loads at the facility. The CHP system is fueled by natural gas at a rate of 27 therms/h. Based on the supplied energy balance, the system has a rated CHP efficiency of 87.1% (presumed LHV since cogen schedule in drawing set provides fuel input in therms/hr).

Based on the NYSERDA CHP Agreement, the system is expected to produce 893,295 kWh/year of electricity and provide a demand reduction (kWspc) of 130 kW. This performance equals 3,573 EFLH of CHP system operation. The projected performance incentive for the project is $186,830.

Outstanding Issues

- Parasitic power data (WPAR) not included in log files. Meter is installed but not powered up or commissioned. WPAR stipulated as 2.5 kW until meter is commissioned.

- Gas data (FG) not in log files. Waiting on utility provided pulse output and demarcation box.

- Total engine heat (QE) values in PCS does not match verified BTU meter values. RMC to set up new report (COGEN DATA GROUP 4) in PCS to trend BTU meter values (heat recovery, flow, temperatures).

- Rejected heat (QD) PCS values match verified BTU meter values. RMC to set up new report (COGEN DATA GROUP 5) in PCS to trend BTU meter values (heat recovery, flow, temperatures) for consistency for both BTU meters.

Instrumentation

In order to quantify the system performance fuel input, net electrical output, and useful thermal output must be measured. To capture these energy flows an instrumentation plan was developed by CDH Energy and reviewed with the developer Integrated Energy Systems. The instrumentation plan covers the location and type of sensors necessary to provide the appropriate measurements.

Integrated Energy Concepts supplied the instrumentation listed below for use in meeting the NYSERDA CHP program monitoring requirements. The table provides a description of the monitored data points and installed sensors.

Table 1. Instrumentation Supplied by Integrated Energy Concepts

No.	Data Point	Description	Units	Sensor	Figure in Document	Notes
1	WG	Generator Gross Electrical Output	kWh kW	ComAp Engine Controller	Figure 4	
2	WPAR	DMD-2 LVP-CHP Panel (Parasitic)	kWh kW	Square D Ion 7550		Square D meter not powered up or communicating with PCS.
3	WIMP	DMD-1 Utility Import	kWh kW	Square D CM4250	Figure 4	
4	FG	Generator Gas Use	CF	Utility Meter		No data provided - waiting pulse output
5	TPS	Cogen Primary Loop Temperature Leaving from Engine	deg F	Onicon System 10 BTU Meter	Figure 2	PCS values do not match BTU meter values. New report to be set up.
6	TPR	Cogen Primary Loop Temperature Return to Engine	deg F	Onicon System 10 BTU Meter	Figure 2	
7	FPL	Cogen Primary Loop Flow	gpm	Onicon System 10 BTU Meter	Figure 2	
8	QT	Total Engine Heat	Btu/h Btu	Onicon System 10 BTU Meter	Figure 2	
9	TDS	Cogen Dump Radiator Loop Supply Temperature	deg F	Onicon System 10 BTU Meter	Figure 2	Values are correct. New report to be set up for consistency.
10	TDR	Cogen Dump Radiator Loop Return Temperature	deg F	Onicon System 10 BTU Meter	Figure 2	
11	FDL	Cogen Dump Radiator Loop Flow	%	Onicon System 10 BTU Meter	Figure 2	
12	QD	Heat Rejected by Dump Radiator	Btu/h Btu	Onicon System 10 BTU Meter	Figure 2	
13	QU	Useful Heat Recovery	Btu/h Btu	Calculated by CDH		QU = QT - QD
14	TAO	Ambient Temperaure	deg F	TBD	Figure 2	
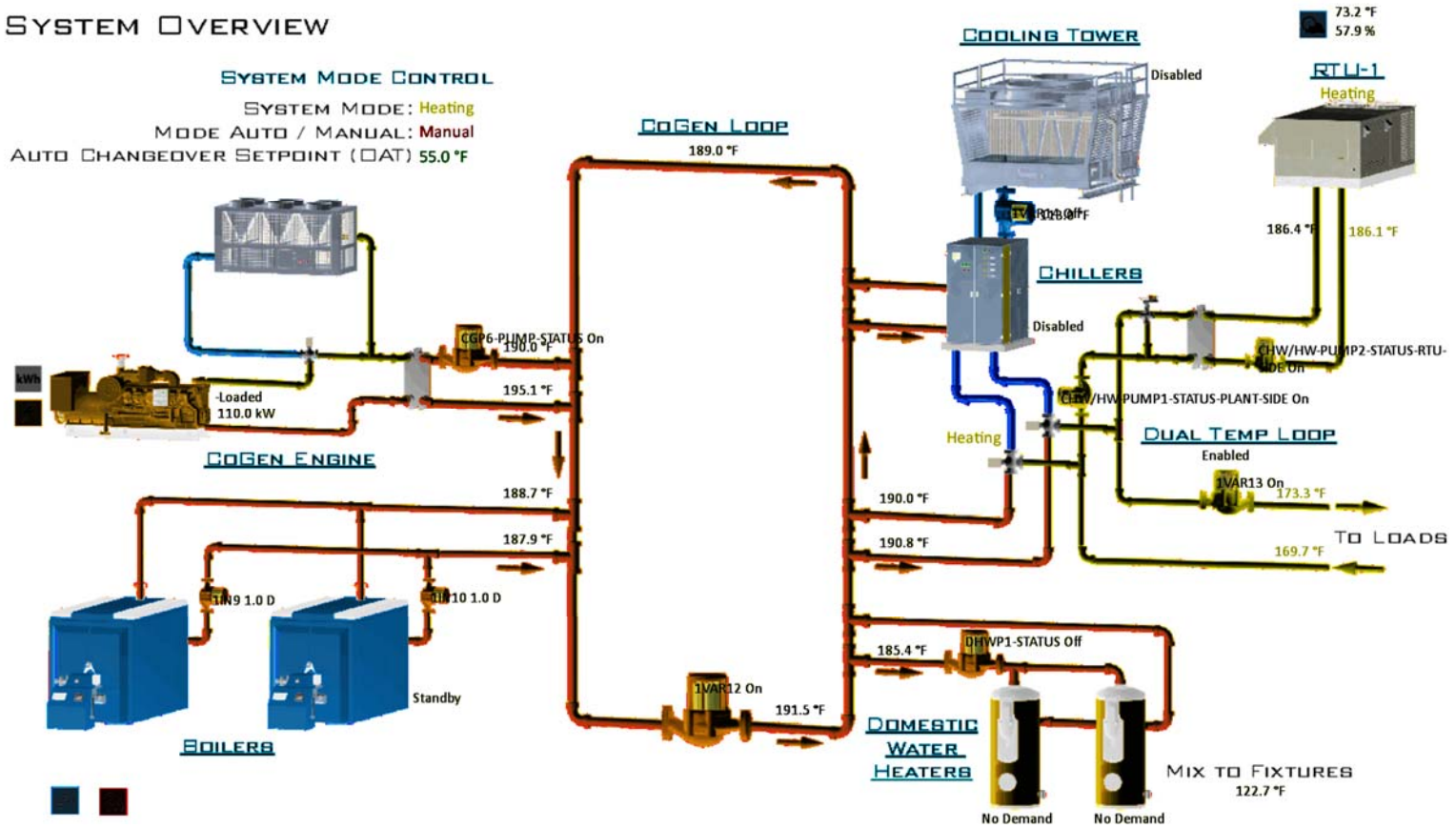
Figure 1. Control System Print Screen - System Overview
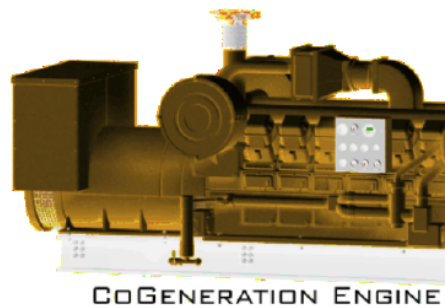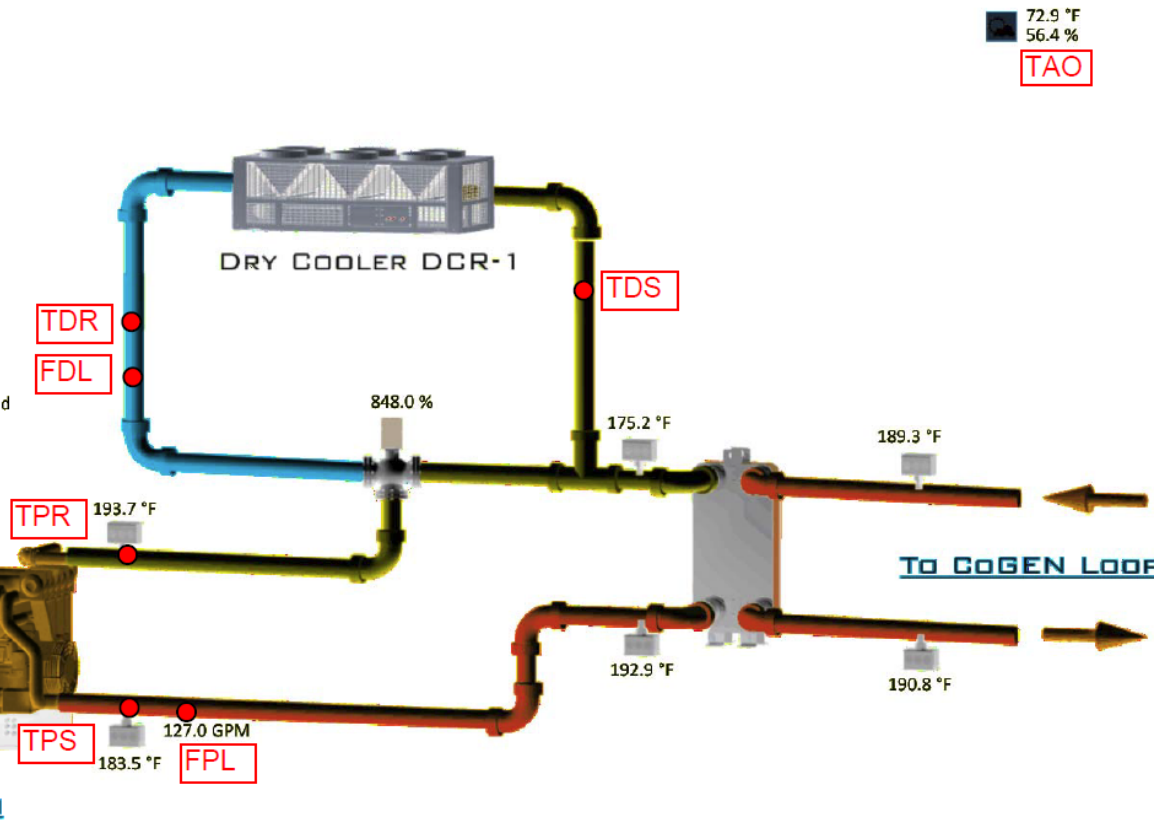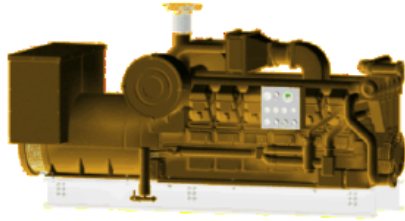
Figure 2. Control System Print Screen – Cogen Engine / Primary Loop

CoGeneration Electrical

72.6 °F
57.3 %

CoGeneration Engine
(Generator)

Import Power
(Utility)

Ronald McDonald House
(Electrical Load)

Produced Energy		**Imported Energy**		**ConsumedEnergy**	
A40296-GEN-ACT-PWR 98.0 kW		A40330-MAINS-PWR 17.0 kW		RMH-CONSUMED-PWR-CALC 115.0 kW	
Total Power	98.0 kW	Total Power	17.0 kW	Total Power	115.0 kW
WG Total Amps	356.4 Amps	Total Amps	80.8 Amps WIMP	Total Amps	437.2 Amps
Total Volts	275.0 Volts	Total Volts	210.3 Volts		

Detail By Phase			**Detail By Phase**	
Voltage L1-N	275.0 Volts	Current L1	180.0 Amps	Voltage L1-N	122.0 Volts
L2-N	274.0 Volts	L2	171.0 Amps	L2-N	122.0 Volts
L3-N	276.0 Volts	L3	175.0 Amps	L3-N	121.0 Volts
L1-L2	477.0 Volts	Power L1	33.0 kW	L1-L2	211.0 Volts
L2-L3	478.0 Volts	L2	32.0 kW	L2-L3	210.0 Volts
L1-L3	480.0 Volts	L3	32.0 kW	L1-L3	210.0 Volts

Figure 3. Control System Print Screen – Electrical

On Site Installation

No onsite installation work will be performed by CDH Energy.

Data Logger

No dedicated data logger is required. Values are logged at 15 minute intervals. The plant control system will collect information from each major component, assemble the data into a column oriented .CSV, .TXT, .XLS, or .XLSX report containing descriptive column headers and 96 records per day (for 15-minute interval data) for each data point. Data points should be averaged or sampled accordingly (rates such as gpm, temperatures, kW, MBtu/h, and cfh should be averaged, accumulated quantities should be sampled). The PCS has enough storage for a minimum of 8 months of logged data.

Communications

Internet connection and access to the PCS is provided by Ronald McDonald House. Data are downloaded to the NYSERDA verification server manually by CDH every 2-weeks from the (PCS). The data are then loaded into a database, checked for validity, and posted on the NYSERDA web site.

On Site Support

The site will be responsible for providing access to all areas necessary for verification of sensors.

Data Analysis

The collected data will be used to determine the net power output of the system as well as the fuel conversion efficiency (FCE).

Peak Demand or Peak kW

The peak electric output or demand for each power reading will be taken as the average kW in a fixed 15-minute interval (0:00, 0:15, 0:30, etc), or

$$kW = \sum_{15min} \frac{kWh}{\Delta t} = \sum_{15min} = \frac{kWh \text{ per interval}}{0.25\,h}$$

and the net power output from the CHP system is defined as:

$$WG_{net} = WG - WPAR$$

Where: WG_{net} - Net output from CHP unit (kWh or kW)

WG - CHP unit gross output (kWh or kW)

$WPAR$ - Stipulated as 2.5 kW based on on-site measurements until Square D Ion 7550 meter is commissioned. (kWh or kW)

Heat Recovery Rates

Heat recovery from the CHP system is achieved in the form of hot water. Useful heat recovery is used to meet space heating, domestic hot water, or absorption chiller loads. Heat can also be rejected by a roof mounted dump radiator. Heat recovery values (total, useful, and rejected) are calculated according to the following:

<u>Total Heat Recovery</u>

$$QT \ = \ 0.488 * FPL * (TPS - TPR)$$

Where: QT   -   Total heat produced by engine (MBtu or MBtu/h)

FPL   -   Cogen primary loop flow leaving engine (gpm)

TPS   -   Cogen primary loop temperature leaving engine (deg F)

TPR   -   Cogen primar loop temperature return to engine (deg F)

<u>Rejected Heat Recovery</u>

$$QD \ = \ 0.488 * FDL * (TDS - TDR)$$

Where: QD   -   Heat rejected by dump radiator (MBtu or MBtu/h)

FDL   -   Dump radiator loop flow (gpm)

TDS   -   Dump radiator loop supply temperature (deg F)

TDR   -   Dump radiator loop return temperature (deg F)

<u>Rejected Heat Recovery</u>

$$QU \ = \ QT - QD$$

The 0.488 value (k-factor) is the product of the density and specific heat of the heat transfer fluid, in units of $Btu/h \cdot gpm \cdot °F$.

Fuel Input

Fuel input to the CHP system is measured by the utility meter. It is a single, dedicated, pressure and temperature compensated gas meter having a pulse output and utility demarcation added.

Calculated Quantities

The fuel conversion efficiency of the CHP system, based on the lower heating value of the fuel, will be defined as:

$$FCE = \frac{QU + 3,413 \cdot (WG)}{0.9 \cdot HHV_{gas} \cdot FG_{tot}}$$

Where: QU   =   Useful heat recovery (Btu)
            WG   =   Engine generator net output (kWh)
            FG   =   Generator gas consumption (Std CF)
            HHV_{gas}=   Higher heating value for natural gas (~1030 Btu per CF),
                            where 0.9 is the conversion factor between HHV and LHV.
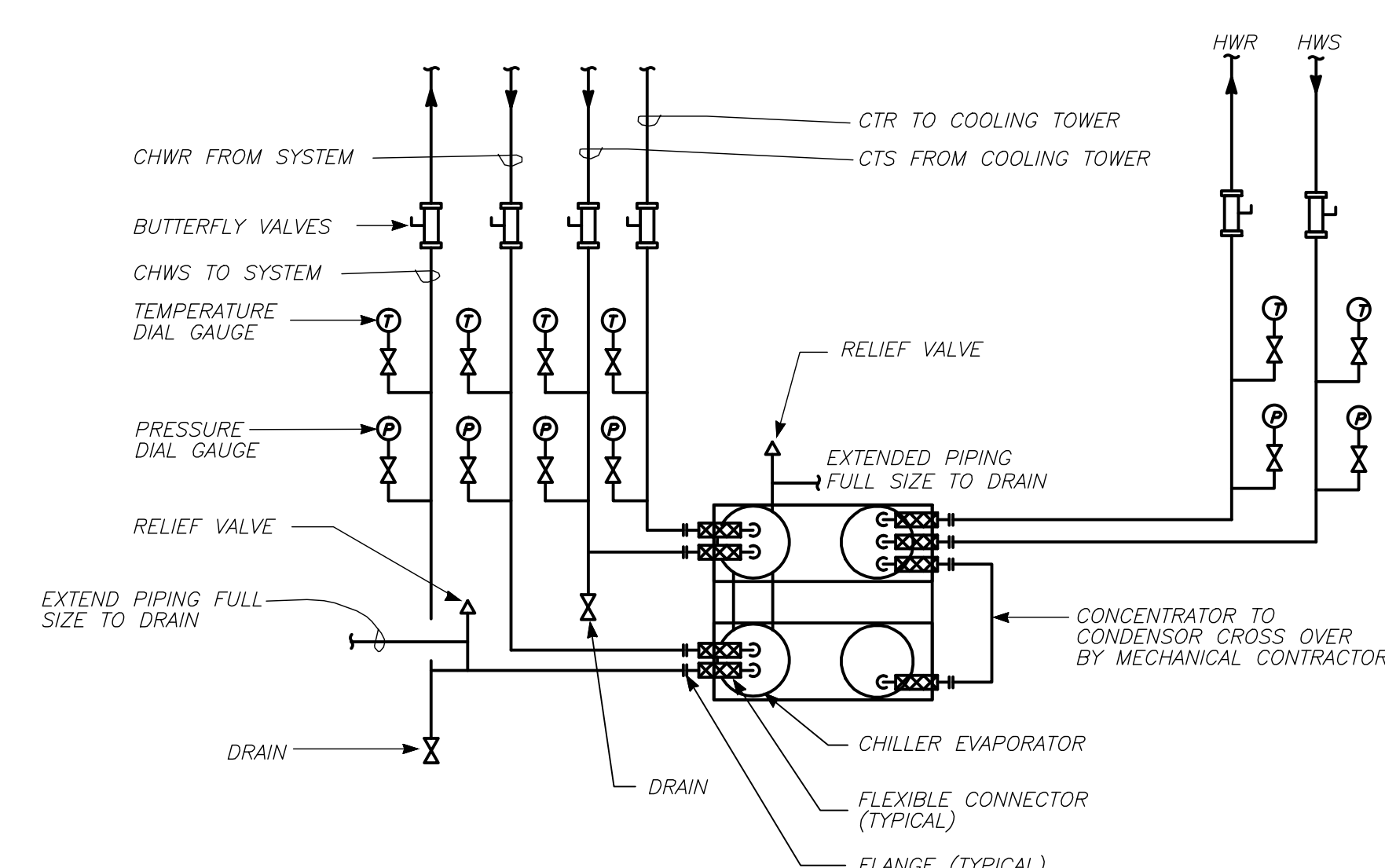
The FCE can be calculated for any time interval. When converting to daily, monthly, or annual values, each value is summed and then the formula is applied:

$$FCE = \frac{\sum^{N} QU + 3,413 \cdot \sum^{N} (WG)}{0.9 \cdot HHV_{gas} \cdot \sum^{N} FG}$$

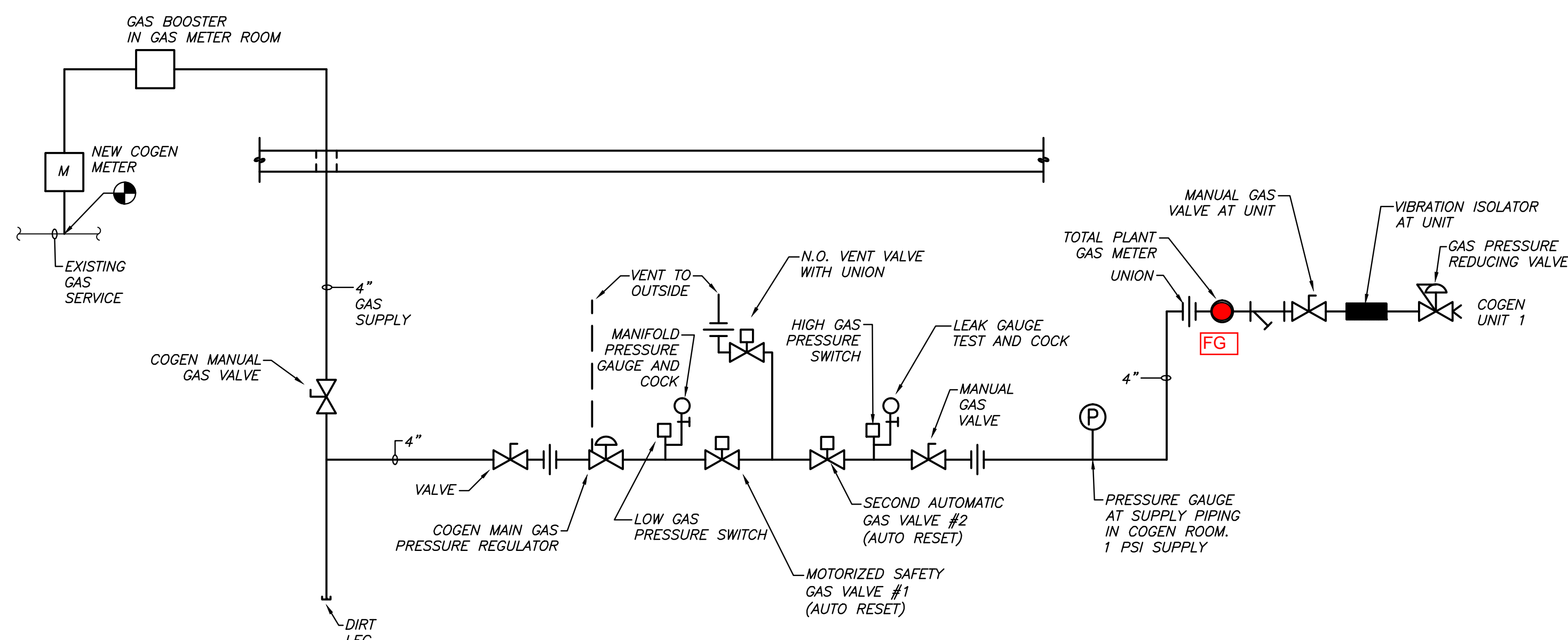Where N is equal to the number of intervals in the period of interest.

Appendix A

System Drawings

PIPING CONNECTIONS AT ABSORPTION CHILLER

1 / M-503   SCALE: NONE

CTR TO COOLING TOWER
CTS FROM COOLING TOWER
CHWR FROM SYSTEM
BUTTERFLY VALVES
CHWS TO SYSTEM
HWR HWS
TEMPERATURE
DIAL GAUGE
PRESSURE
DIAL GAUGE
RELIEF VALVE
RELIEF VALVE
EXTENDED PIPING
FULL SIZE TO DRAIN
EXTEND PIPING FULL
SIZE TO DRAIN
CONCENTRATOR TO
CONDENSOR CROSS OVER
BY MECHANICAL CONTRACTOR
DRAIN
DRAIN
CHILLER EVAPORATOR
FLEXIBLE CONNECTOR
(TYPICAL)
FLANGE (TYPICAL)

GAS TRAIN DETAIL – SYSTEM
NO SCALE

GAS BOOSTER
IN GAS METER ROOM
NEW COGEN
METER
EXISTING
GAS
SERVICE
COGEN MANUAL
GAS VALVE
4"
GAS
SUPPLY
DIRT
LEG
4"
VALVE
COGEN MAIN GAS
PRESSURE REGULATOR
MANIFOLD
PRESSURE
GAUGE AND
COCK
LOW GAS
PRESSURE SWITCH
VENT TO
OUTSIDE
MOTORIZED SAFETY
GAS VALVE #1
(AUTO RESET)
SECOND AUTOMATIC
GAS VALVE #2
(AUTO RESET)
N.O. VENT VALVE
WITH UNION
HIGH GAS
PRESSURE
SWITCH
MANUAL
GAS
VALVE
LEAK GAUGE
TEST AND COCK
4"
PRESSURE GAUGE
AT SUPPLY PIPING
IN COGEN ROOM.
1 PSI SUPPLY
TOTAL PLANT
GAS METER
UNION
FG
MANUAL GAS
VALVE AT UNIT
VIBRATION ISOLATOR
AT UNIT
GAS PRESSURE
REDUCING VALVE
COGEN
UNIT 1

GAS TRAIN DETAIL - COGEN. UNIT

2 / M-503   SCALE: NONE

GAS TRAIN COMPONENTS

1. MOTORIZED SAFETY VALVE – HYDRAMOTOR AH2D ACTUATOR WITH V710 VALVE BODY

2. GAS PRESSURE SWITCH – HONEYWELL C437D-H,J,K GAS/AIR PRESSURE SWITCH

3. GAS VENT VALVE – HONEYWELL S262 VENT VALVE

4. REGULATOR – EQUIMETER MODEL 122 INDUSTRIAL COMBUSTION REGULATOR

5. DIAPHRAGM GAUGES – WEISS SERIES DG 25

6. GAS METER – CTR-CPWS (CAPABLE TO 4000 CFH) WITH DIGITAL OUTPUT

7. COGEN UNIT GAS PRESSURE REGULATOR

CLIENT INFORMATION

RONALD McDONALD HSE OF NEW YORK
405 EAST 73rd STREET
NEW YORK, NY 10021

COMBINED HEAT
AND
POWER PLANT

PROJECT NAME

SCALE	PHASE

DETAILS - MECHANICAL

DRAWING TITLE

SEAL & SIGNATURE	DATE: 2-23-2011
	PROJECT No.: 12103
	DRAWING BY: CLK
	CHK BY: CPC
	DWG No:

M-503.00

SHEET 16 OF 18   CADO FILE No: 2   of

KEY INTERLOCK DESCRIPTION:

K1 89U FUSED DISCONNECT SWITCH TO BE EQUIPPED WITH AN INTEGRAL KEY INTERLOCK. WHEN THE KEY IS IN THE CAPTIVE POSITION. IT SHALL ONLY BE POSSIBLE TO REMOVE THE KEY IF THE 89U DISCONNECT IS IN THE OPEN POSITION AND WHILE THE KEY IS REMOVED THE 89U DISCONNECT WILL BE INHIBITED FROM CLOSING. THE SWITCHBOARD MANUFACTURER SHALL SUPPLY ONE (1) KEY SWITCH (SHIPPED LOOSE) FOR INSTALLATION IN THE UTILITY PROTECTION PANEL TO COMPLETE AN ELECTRIC INTERLOCK WITH THE G1 GENERATOR CONTACTOR. THE KEY SWITCH SHALL HAVE FOUR (4) FORM "C" CONTACTS.

REMOVAL NOTES:

1. DISCONNECT AND REMOVE EXISTING CT CABINET. COORDINATE ALL SHUTDOWNS WITH OWNER.
2. DISCONNECT EXISTING FEEDER. WIRE AND RACEWAY TO REMAIN TO BE REUSED.
3. DISCONNECT EXISTING CON EDISON SERVICE CONDUCTORS. WIRE AND RACEWAY SHALL REMAIN TO BE REUSED.
4. DISCONNECT AND REMOVE EXISTING CON EDISON REVENUE METER, METERING CT'S AND VOLTAGE SENSING CABLES. RETURN REVENUE METER AND METERING CT'S TO CON EDISON

FEEDER SCHEDULE (WIRE SIZE IN AWG)

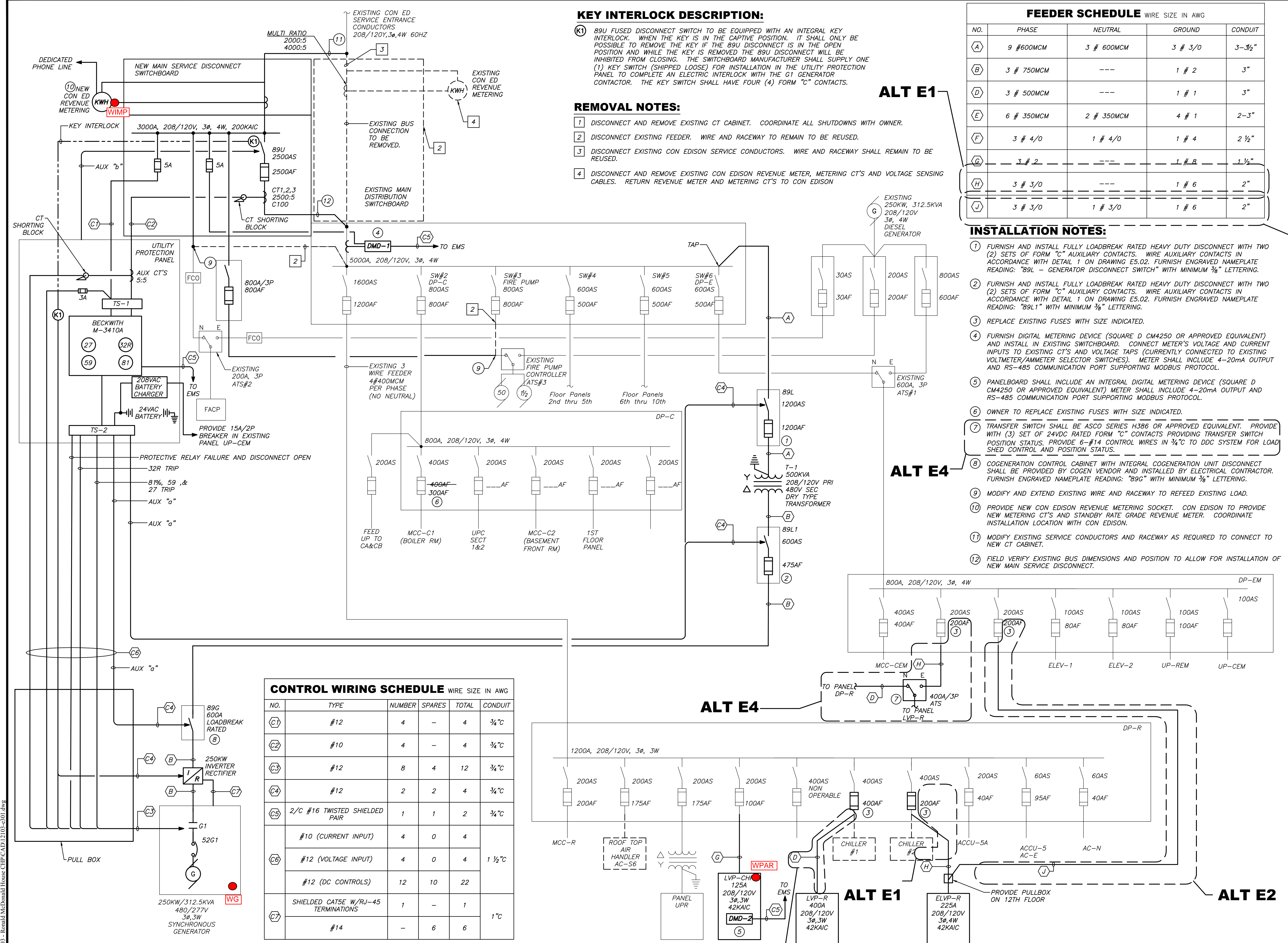| NO.	PHASE	NEUTRAL	GROUND	CONDUIT
A	9 #600MCM	3 # 600MCM	3 # 3/0	3–3½"
B	3 # 750MCM	---	1 # 2	3"
D	3 # 500MCM	---	1 # 1	3"
E	6 # 350MCM	2 # 350MCM	4 # 1	2–3"
F	3 # 4/0	1 # 4/0	1 # 4	2 ½"
G	3 # 2	---	1 # 8	1 ½"
H	3 # 3/0	---	1 # 6	2"
J	3 # 3/0	1 # 3/0	1 # 6	2"

INSTALLATION NOTES:

1. FURNISH AND INSTALL FULLY LOADBREAK RATED HEAVY DUTY DISCONNECT WITH TWO (2) SETS OF FORM "C" AUXILIARY CONTACTS. WIRE AUXILIARY CONTACTS IN ACCORDANCE WITH DETAIL 1 ON DRAWING E5.02. FURNISH ENGRAVED NAMEPLATE READING: "89L – GENERATOR DISCONNECT SWITCH" WITH MINIMUM ⅜" LETTERING.
2. FURNISH AND INSTALL FULLY LOADBREAK RATED HEAVY DUTY DISCONNECT WITH TWO (2) SETS OF FORM "C" AUXILIARY CONTACTS. WIRE AUXILIARY CONTACTS IN ACCORDANCE WITH DETAIL 1 ON DRAWING E5.02. FURNISH ENGRAVED NAMEPLATE READING: "89L1" WITH MINIMUM ⅜" LETTERING.
3. REPLACE EXISTING FUSES WITH SIZE INDICATED.
4. FURNISH DIGITAL METERING DEVICE (SQUARE D CM4250 OR APPROVED EQUIVALENT) AND INSTALL IN EXISTING SWITCHBOARD. CONNECT METER'S VOLTAGE AND CURRENT INPUTS TO EXISTING CT'S AND VOLTAGE TAPS (CURRENTLY CONNECTED TO EXISTING VOLTMETER/AMMETER SELECTOR SWITCHES). METER SHALL INCLUDE 4–20mA OUTPUT AND RS–485 COMMUNICATION PORT SUPPORTING MODBUS PROTOCOL.
5. PANELBOARD SHALL INCLUDE AN INTEGRAL DIGITAL METERING DEVICE (SQUARE D CM4250 OR APPROVED EQUIVALENT) METER SHALL INCLUDE 4–20mA OUTPUT AND RS–485 COMMUNICATION PORT SUPPORTING MODBUS PROTOCOL.
6. OWNER TO REPLACE EXISTING FUSES WITH SIZE INDICATED.
7. TRANSFER SWITCH SHALL BE ASCO SERIES H386 OR APPROVED EQUIVALENT. PROVIDE WITH (3) SET OF 24VDC RATED FORM "C" CONTACTS PROVIDING TRANSFER SWITCH POSITION STATUS. PROVIDE 6–#14 CONTROL WIRES IN ¾"C TO DDC SYSTEM FOR LOAD SHED CONTROL AND POSITION STATUS.
8. COGENERATION CONTROL CABINET WITH INTEGRAL COGENERATION UNIT DISCONNECT SHALL BE PROVIDED BY COGEN VENDOR AND INSTALLED BY ELECTRICAL CONTRACTOR. FURNISH ENGRAVED NAMEPLATE READING: "89G" WITH MINIMUM ⅜" LETTERING.
9. MODIFY AND EXTEND EXISTING WIRE AND RACEWAY TO REFEED EXISTING LOAD.
10. PROVIDE NEW CON EDISON REVENUE METERING SOCKET. CON EDISON TO PROVIDE NEW METERING CT'S AND STANDBY RATE GRADE REVENUE METER. COORDINATE INSTALLATION LOCATION WITH CON EDISON.
11. MODIFY EXISTING SERVICE CONDUCTORS AND RACEWAY AS REQUIRED TO CONNECT TO NEW CT CABINET.
12. FIELD VERIFY EXISTING BUS DIMENSIONS AND POSITION TO ALLOW FOR INSTALLATION OF NEW MAIN SERVICE DISCONNECT.

CONTROL WIRING SCHEDULE (WIRE SIZE IN AWG)

NO.	TYPE	NUMBER	SPARES	TOTAL	CONDUIT
C1	#12	4	–	4	¾"C
C2	#10	4	–	4	¾"C
C3	#12	8	4	12	¾"C
C4	#12	2	2	4	¾"C
C5	2/C #16 TWISTED SHIELDED PAIR	1	1	2	¾"C
C6	#10 (CURRENT INPUT)	4	0	4	
	#12 (VOLTAGE INPUT)	4	0	4	1 ½"C
	#12 (DC CONTROLS)	12	10	22	
C7	SHIELDED CAT5E W/RJ-45 TERMINATIONS	1	–	1	1"C
	#14	–	6	6	

REVISIONS

NO.	DATE	DESCRIPTION
1	6/1/2012	ISSUED FOR BID
2	12/7/2012	ISSUED FOR UTILITY REVIEW
3	03/11/2013	REVISED FOR INVERTER
4	7/10/2013	REVISED PER CON-ED
5	07/25/2013	REVISED PER FIELD
6	8/20/2013	REVISED FOR INDUCTION GEN
7	09/30/2013	REVISED PER RFI II
8	11/07/2013	REVISED PER IPS SUBMITTAL
9	4/28/2014	ISSUED FOR RE-PRICING

CLIENT INFORMATION

RONALD McDONALD HSE OF NEW YORK
405 EAST 73rd STREET
NEW YORK, NY 10021

COMBINED HEAT AND POWER PLANT

PROJECT NAME

SCALE | PHASE

ONE-LINE DIAGRAM

DRAWING TITLE

SEAL & SIGNATURE

DATE: 2-23-2011
PROJECT No.: 12103
DRAWING BY: CLK
CHK BY: CPC

DWG No:

E-301.00

CADO FILE No:

1 ONE-LINE DIAGRAM
E-301.00   SCALE: N/A

ALT E1 · ALT E2 · ALT E3 · ALT E4

CLIENT INFORMATION

REVISIONS		
NO.	DATE	DESCRIPTION
1	11/8/2013	ISSUED TO DOB

RONALD McDONALD HSE OF NEW YORK
405 EAST 73rd STREET
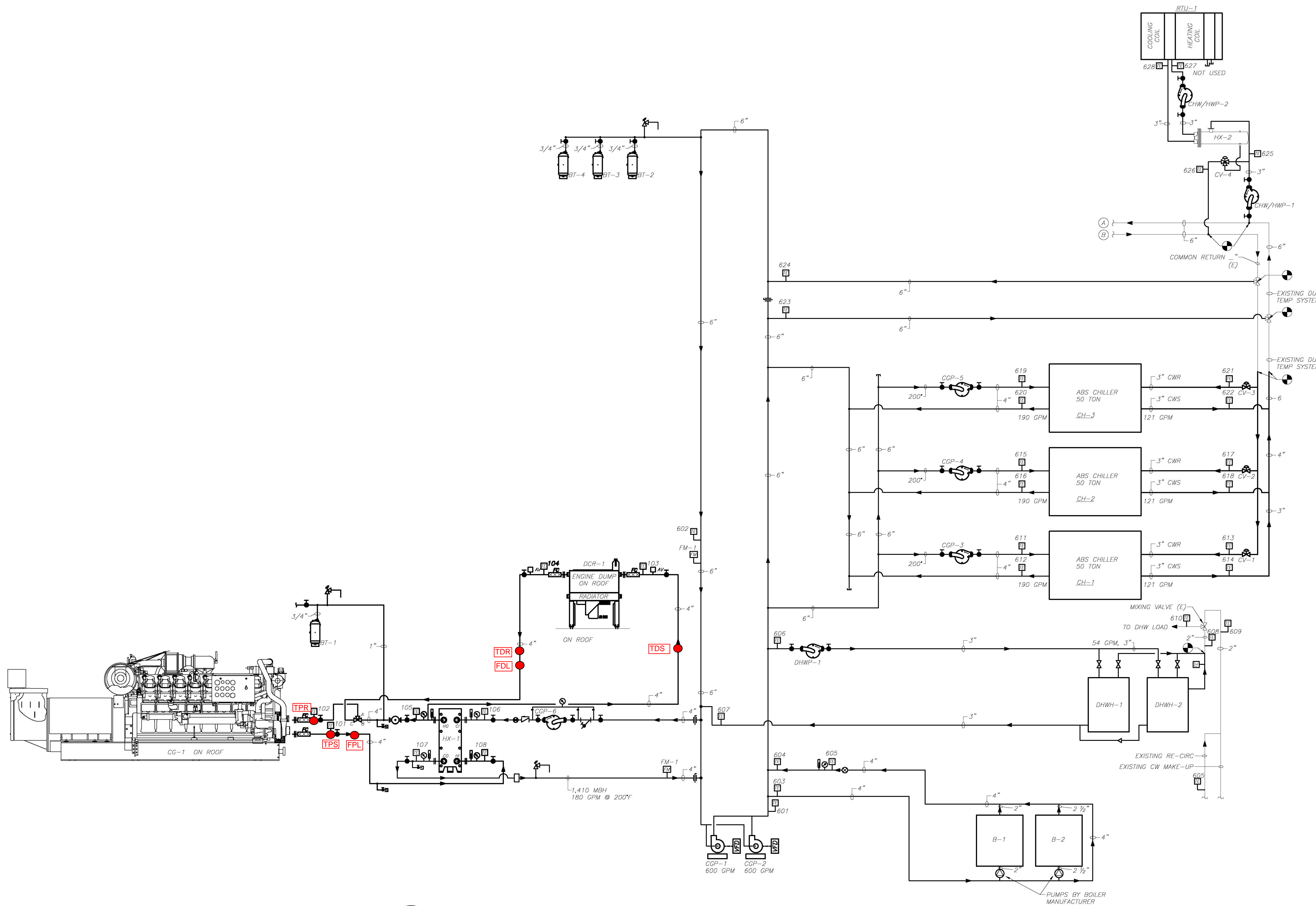NEW YORK, NY 10021

COMBINED HEAT
AND
POWER PLANT

PROJECT NAME

SCALE   PHASE

CHP PLANT HOT WATER
FLOW SCHEMATIC

DRAWING TITLE

SEAL & SIGNATURE

DATE: 2-23-2011
PROJECT No.: 12103
DRAWING BY: CLK
CHK BY: CPC
DWG No:
M-301.00

SHEET 10 OF 18

CADO FILE No:

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1 CHP PLANT HOT WATER FLOW SCHEMATIC
M-301.00

RTU-1
COOLING COIL
HEATING COIL
628   627   NOT USED
CHW/HWP-2
3"   3"
HX-2
625
626   CV-4   3"
CHW/HWP-1
A
B
6"   6"
COMMON RETURN
(E)
EXISTING DUAL TEMP SYSTEM

624
6"
623
6"   6"

3/4" 3/4" 3/4"
BT-4 BT-3 BT-2
6"

CGP-5   619   620   4"   ABS CHILLER 50 TON   CH-3   3" CWR   3" CWS   621   622   CV-3   6"
200'   190 GPM   121 GPM

CGP-4   615   616   4"   ABS CHILLER 50 TON   CH-2   3" CWR   3" CWS   617   618   CV-2   4"
200'   190 GPM   121 GPM

CGP-3   611   612   4"   ABS CHILLER 50 TON   CH-1   3" CWR   3" CWS   613   614   CV-1   3"
200'   190 GPM   121 GPM

602
FM-1
104   DCR-1   103
ENGINE DUMP ON ROOF
RADIATOR
ON ROOF
6"   4"
TDR   4"
FDL
TDS
4"

MIXING VALVE (E)
610
TO DHW LOAD   608   609
606   DHWP-1   3"   54 GPM, 3"   2"

3/4"   BT-1
TPR   102
101   105   106   CGP-6   607   6"   4"
TPS   FPL   4"   107   HX-2   108   4"   4"
CG-1 ON ROOF
1,410 MBH
180 GPM @ 200°F   FM-1   4"

DHWH-1   DHWH-2

EXISTING RE-CIRC
EXISTING CW MAKE-UP
605

604   605   4"
603   4"
601

CGP-1 600 GPM   CGP-2 600 GPM

B-1   B-2   4"
2"   2 1/2"
2"   2 1/2"
PUMPS BY BOILER MANUFACTURER

Appendix B

Cut Sheets for Key Sensors and Instruments

PowerLogic® ION7550/ION7650

Power and energy meters

Features

High visibility, multilingual, IEC/IEEE configureable display

Large, backlit LCD presents multiple simultaneous real-time and timestamped historical parameters as well as graphical trends and histograms.

High accuracy standards

Meets stringent IEC and ANSI measurement accuracy standards such as IEC 62053-22 Class 0.2S, ANSI C12.20 0.2 Class 10 & 20.

Digital fault recording

Simultaneously capture voltage and current channels for sub-cycle disturbance transients, as well as multi-cycle sags, swells and outages: 1024 samples/cycle waveform recording, 20/17 μs transient capture (50/60 Hz).

Power quality analysis and compliance monitoring

A choice of THD metering, individual current and voltage harmonics readings, waveform capture, EN50160 and flicker (PowerLogic ION7650 only) power quality compliance evaluation, and voltage and current disturbance (sag/swell) detection.

Complete communications

Fiber - Ethernet - Serial - Modem. Gateway functionality simplifies communications architecture and reduces leased line or connection costs. Concurrent, independent ports communicate with protocols such as ION®, DNP 3.0, Modbus® RTU, Modbus TCP, Modbus Master. 32 concurrent Modbus/TCP server connections. Dial-out capability when memory is near full. Data push capability through SMTP (email).

Patented ION® technology

Provides a modular, flexible architecture that offers extensive user programmability. Uniquely addresses complex monitoring and control applications. Adapts to changing needs, avoiding obsolescence.

Disturbance direction detection

Determine the location of a disturbance more quickly and accurately by determining the direction of the disturbance relative to the meter. Analysis results are captured in the event log, along with a timestamp and confidence level indicating level of certainty.

Alarm setpoint learning

Helps simplify alarming configurations by monitoring normal operating parameters and, over time, learning what constitutes a sag, swell, transient or high and low setpoint. Learning can be configured in either ION Setup or PowerLogic ION Enterprise software.

Trending and forecasting

Forecast values such as demand to better control demand charges and billing rates. View results via the meter's web pages. Analyse trends to support proactive maintenance schedules.

Transformer/line loss compensation

Automatically measure, compensate and correct for transformer or line losses when meter is physically separated from the point of billing or change of ownership.

Inputs and outputs

Digital and analog inputs and outputs for pulse counting, demand metering for other WAGES utilities, equipment status/position monitoring, demand synchronization, triggering conditional energy metering, equipment control or interfacing.
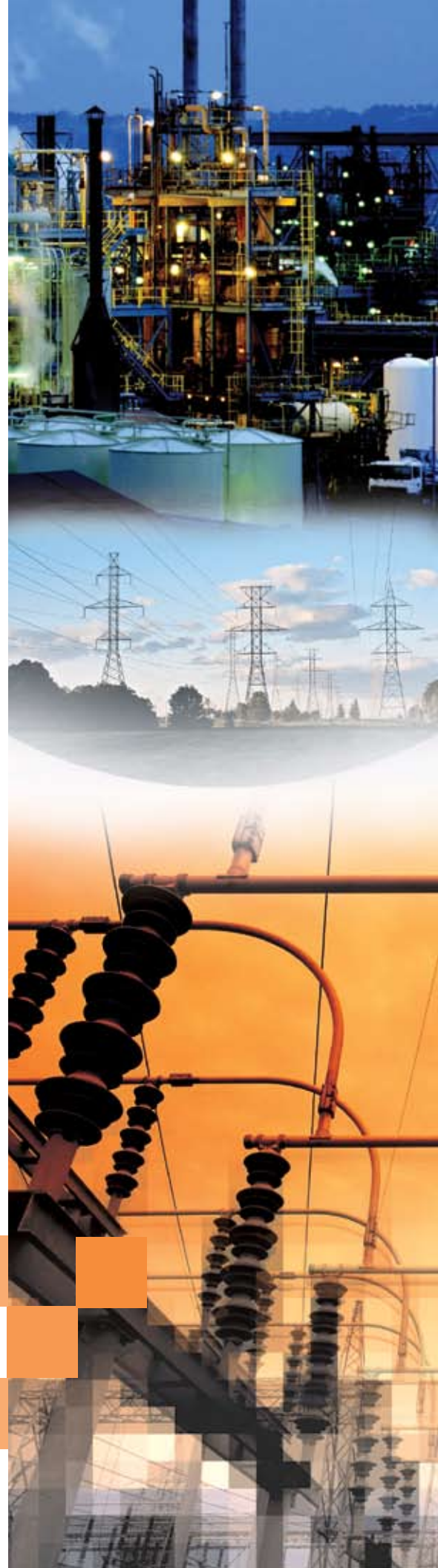
Intelligent metering and control devices

Used at key distribution points and sensitive loads, the PowerLogic ION7550 and ON7650 meters offer unmatched functionality including advanced power quality analysis coupled with revenue accuracy, multiple communications options, web compatibility, and control capabilities.

Integrate these meters with our PowerLogic® ION Enterprise® software or share operations data with existing SCADA systems through multiple communication channels and protocols.

Typical applications

For infrastructure, industrials and buildings

- Energy savings
    - Measure efficiency, reveal opportunities and verify savings
    - Reduce peak demand surcharges
    - Reduce power factor penalties
    - Strengthen rate negotiation with energy suppliers
    - Enable participation in load curtailment programs (e.g., demand response)
    - Identify billing discrepancies
    - Leverage existing infrastructure capacity and avoid over-building
    - Support proactive maintenance to prolong asset life
- Energy availability and reliability
    - Validate that power quality complies with the energy contract
    - Verify the reliable operation of equipment
    - Improve response to power quality-related problems

For electric utilities

- Energy availability and reliability
    - Improve T&D network reliability
    - Enhance substation automation to reduce field service time
    - Maximise the use of existing infrastructure
- Revenue metering and power quality
    - Install new high-accuracy metering at all interchange points
    - Improve or verify metering accuracy at existing interchange points
    - Verify compliance with new power quality standards
    - Analyse and isolate the source of power quality problems
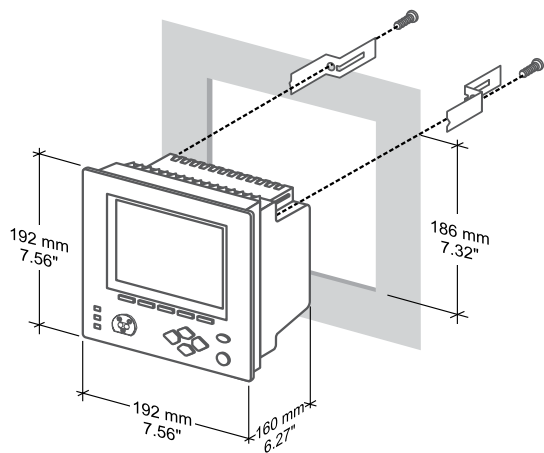
Installation

Designed to fit DIN standard 192 cutout (186 mm by 186 mm). Circuit and control power connections include 4-Wire Wye, 3-Wire Wye, 3-Wire Delta, Direct Delta and single phase systems. 4 voltage and 5 current inputs.


Input(s)	Specifications
Voltage inputs	
Nominal full scale:	347 direct V ac line-to-neutral, 600 V ac direct line-to-line, rms
Overload	1500 VAC rms continuous
Input impedance	5 M Ohms/phase (phase-Vref)
Fault capture	1200 Vpeak
Current inputs	
Nominal current	5 A, 10 A, and/or 20 A (1 A, 2 A, 5 A optional current range)
Max voltage	600 V rms (CAT III IEC 61010-1)
Withstand	2500 VAC, 60 Hz for 1 minute
Load/burden	0.05 VA per phase (at 5 A standard)
	0.015 VA per phase (at 1 A optional)
Impedance	0.002 Ohms/phase (phase-Vref)
	0.015 Ohms (optional current range)
Control power	
Operating range	Standard: AC: 85 to 240 V AC (+/-10%), 47 to 63 Hz; DC: 110 to 300 V DC (+/-10%); burden: typical 15 VA, max 35 VA
	Optional: low voltage DC power supply; rated inputs: DC 20 to 60 VDC (+/- 10%); burden: typical 12 VA, max 18 VA
Current probes with AC voltage output	
Rated inputs	1 V rms
Overload	5.5 V (CAT I IEC 61010-1)
Impedance	220 kOhms max.
Options	Current Probe Inputs for use with 0-1 VAC current probes. Probes sold separately. Accuracy depends on probe specs
	Current Probe Inputs with 3 calibrated Universal Technic 10A clamp-on CTs, meeting IEC 61036 accuracy

Front panel

Use for both display and configuration purposes. The large backlit LCD display screen and the numerous selection, navigation, and configuration softkeys allow quick, secure access to basic meter configuration screens. The front panel also provides access to many other meter functions such as meter resets and has multiple programmable screens for numeric and time-stamped values, frequency spectrum (harmonics), trend logs, and name plate data.


The large display automatically scrolls through displays screens that present at-a-glance volts, amps, power, energy and demand values. Screens are easily customised to suit user requirements. Set parameter measurements via front panel to comply with regional preferences. Modbus Master feature allows display of real-time parameters of any downstream modbus devices.
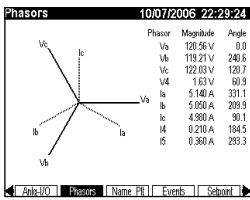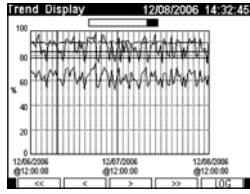
Phasors display
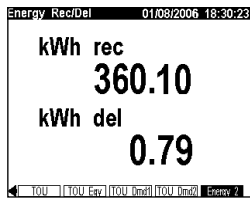
Energy received/delivered display
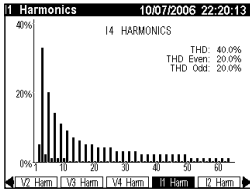
Harmonic current display

Trend display

Power and energy measurements

High-accuracy 4-quadrant energy metering in accordance with IEC 62053-22 class 0,2S for both 3- and 2-element systems. Real, bidirectional, reactive, and apparent values. Fully programmable integrating period (1, 5, 10, 15, 30, 60 minutes or other).

Supports block, rolling block, and predicted demand calculations such as: kW, kVAr and kVA demand, min/max; Volts and Amps demand, min/max; Cumulative demand; Demand on any instantaneous measurement.

Parameter	Accuracy ± (%reading)
Voltage (line-line, line-neutral): per phase, min/max, unbalance	0.1%
Frequency: present, min/max	±0.005 Hz
Current (I1, I2, I3)	0.1%
Current (I4, I5)	0.4%
Power: real (kW), reactive (kVAr), apparent (kVA), per-phase, total	IEC 62053-22 class 0,2S [2]
Energy: real (kWh), reactive (kVArh), apparent (kVAh), in/out	IEC 62053-22 class 0,2S [2]
kWA, kVA demand calculations	IEC 62053-22 class 0,2S [2]
Power Factor (at Unity PF)	0.2%

[1] Refer to User's Manual for valid measurement ranges
[2] Refer to Compliance section. Not applicable for NICT meters, contact factory for measurement specifications
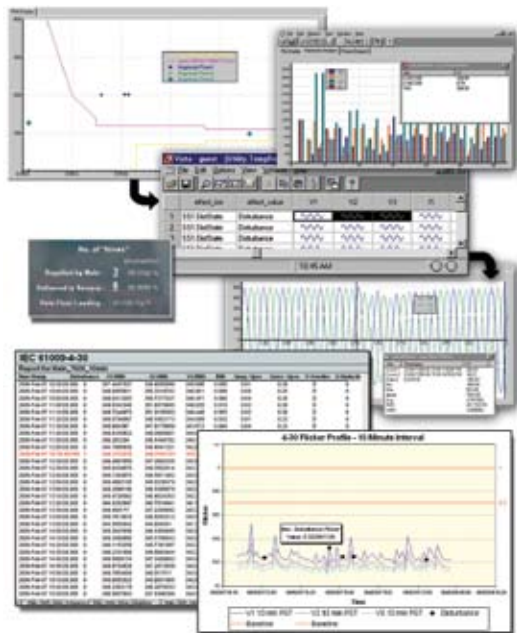

Example screen from PowerLogic ION Enterprise software showing continuous, wide-area monitoring, data capture and reporting for power quality and reliability conditions.

Power quality

Power quality compliance monitoring for international quality-of-supply standards plus specific data for localized and custom compliance agreements and network connection requirements.

☐ Harmonics (all models): individual harmonics up to the 63rd , K factor and Total Harmonics Distortion (THD).

☐ Sag/Swell (all models): voltage waveforms for sags and swells (i.e. ITI (CBEMA) Type 2 and Type 3 disturbances); report on each disturbance's magnitude and duration. Detect sub-disturbances during a sag/swell event.

☐ Disturbance direction detection (all models): analyze disturbance information to determine the direction of the disturbance relative to the meter. Results are provided in the event log, along with timestamp and the level of certainty of disturbance direction.

☐ EN50160 (ION7650 with EN50160 ordering option only): monitor compliance with EN50160 parameters.

☐ IEC 61000-4-30 (ION7650 only): monitor compliance of relevant 4-30 parameters such as power frequency, magnitude of supply voltage, flicker, supply voltage sags and swells, transients and voltage interruptions.

☐ Transient (ION7650 only): voltage waveforms of transient activity (i.e., ITI CBEMA Type 1 disturbances).
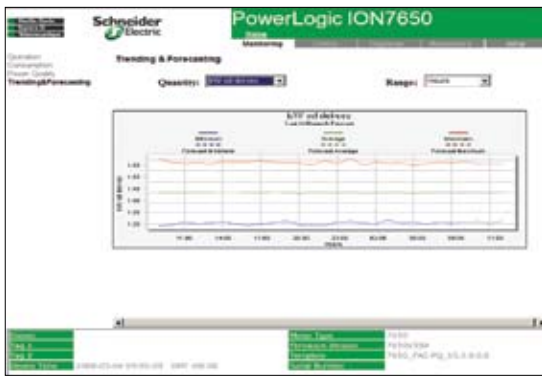
Trending and forecasting, as viewed from PowerLogic ION7650 web page.

Example Logging configurations

ION7550		ION7650	
	500 events	500 events	500 events	500 Events
Data[A]	1.5 years	3.1 years	1.3 years	2.9 years
Waveforms	180[B]	180[B]	360[C]	360[C]

A: 16 parameters recorded every 15 minutes

B: 30 waveforms on 6 channels at the maximum sampling rate

C: 30 waveforms on 12 channels with any selectable format (for example, 6 channels are 512 samples per cycle for 4 cycles, and 6 channels are 32 samples per cycle for 54 cycles)
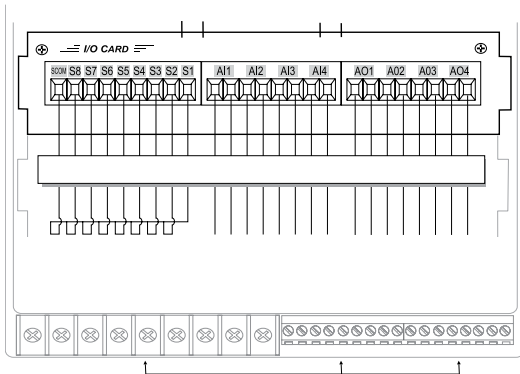
PowerLogic ION7650 I/O card.

Data and event logging

Ships with a comprehensive data-logging configuration. Data is prioritized and stored onboard in nonvolatile memory to eliminate data gaps in the event of outages or server downtime. Retrieved data is stored in an ODBC-compliant database when using ION Enterprise. Trending and forecasting capabilities track specified quantities over time and forecast the value of future quantities. View trending and forecasting data through the meter's web pages. Logging capacity is available in 5 MB or 10 MB configurations. Default depth and interval of logging is set at the factory, and depends upon onboard memory size.

☐ Revenue log: configured for use with UTS MV-90 billing software. Logs kWh del int, kWh rec int, kVARh del int, kVARh rec int values.

☐ Historic logs: record standard power system quantities, such as phase current, phase voltage and power factor.

☐ Report Generator log: configured to provide power system data for ION Enterprise software.

☐ Event log

☐ Trend display logs

Multiple tariffs and time-of-use (TOU) calculations

20-year calendar with automatic leap-year and seasonal time adjustments and clock synchronization over communications channel or GPS. TOU is configured four seasons, five daily profiles per season, four tariff periods per daily profile. Automatic mid-season rate change. Active, reactive, and apparent energy and demand; automatic recording of maximum (peak) demand during each tariff period.

Inputs and outputs

All models provide digital inputs as well as Form C (mechanical relays) and Form A (solid state relays) digital outputs. Optional digital and analog I/O is also available.

Digital output relays respond to internal alarms, external digital input status changes, or commands over communications. Use digital inputs to trigger alarms or logging, synchronize to a demand pulse or control conditional energy accumulation.
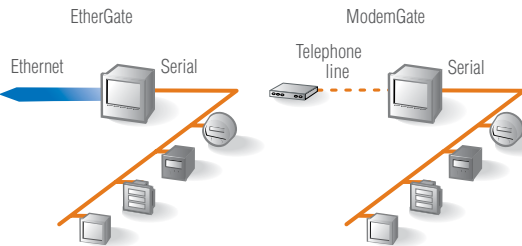
Type	Input / output	Specifications
Electromechanical relays	3 Form C relays: R1 - R3 Form C contacts: NO, K, NC	250 V AC / 30 V dc, max. voltage: 380 V AC / 125 V dc. Turn-on time: 15 ms max; Turn-off time: 5 ms max. Update rate: 1/2-cycle or 1 second
Solid state relays	4 Form A ditigal outputs: D1-D4[1]	Maximum voltage: 30 V dc; maximum current: 80 mA; isolation: optical; update rate: 1/2-cycle or 1 second
Analog (option)	4 inputs: AI 1 to AI 4	Signal type: dc current; range: 0 to 20 mA (scalable 4 to 20), or 0 to 1 mA; accuracy: +/-0.3% of full scale ; update rate: 1 second
	4 outputs: AO1 to AO4	Signal type: dc current; range: 0-20 mA (scalable 4-20) or -1-1 mA (scalable 0-1); update rate: 1/2-cycle or 1 second
Digital	8 inputs: S1 - S8	SCOM self-excited, dry contact sensing, no external voltage required. Min pulse width: 1 ms; max pulse rate: 20 pulses/sec. Timing resolution: 1 ms; update rate: 1/2 cycle (after timing resolution); isolation: 300 Vpeak; max rated voltage 120 VDC (external excitation)
	8 inputs (option): DI1 - DI8	Self excited (internal 30 VDC supply); dry contact sensing, or with external excitation 1.3 to 0.1 mm2 (16 to 28 AWG); min pulse width: 20 ms; max pulse rate: 25 pulses per second; updated ½ cycle (after timing resolution)

EtherGate   ModemGate

Ethernet   Serial   Telephone line   Serial

Communications

Multiple communication ports that operate simultaneously allow the meters to be used as part of a power and energy management system and to interface with other automation systems. Upload waveforms, alarms, billing data, and more to software for viewing and analysis.

Port	Specifications
Serial RS-232/RS-485 port (COM 1)	Protocols include ION, Modbus RTU, Modbus Master, DNP 3.0, GPS, EtherGate, ModemGate. Data rates: 300 – 115,200 bps (RS-485 limited to 57,600 bps). Connectors: male DB9 (RS-232 DTE) or captured wire (RS-485). Duplex: Full (RS-232), Half (RS-485).
Serial RS-485 port (COM 2)	Protocols include ION, Modbus RTU, Modbus Master, DNP 3.0, GPS, EtherGate, ModemGate. Data rates: 300 – 57,600 bps 2400 to 38400. Duplex: Half
Internal modem (COM 3)	Data rates: 300 bps - 33.6 kbps (V.3.4, V.32 bis, V.32, V.22 bis, V.22 A/B, V.23, V.21, Bell 212A, Bell 103). Supports automatic data rate detection. RJ11 interface. Approvals: FCC P68 (USA), Industry Canada CS-03. Also approved for use in: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, UK.
ANSI Type 2 optical port (COM 4)	Protocols include ION, DNP 3.0, Modbus RTU Data rates: 1200 - 19,200 bps. Half duplex.
Ethernet port	Protocols: TCP/IP, Telnet, ION, Modbus TCP, SNMP Interface: IEEE 802.3-1993, ISO/IEC 8802-31993 (Ethernet). Data rates:10 Mbps, half duplex. 10BASE-T, 100BASE-TX: Connectors: RJ45, cabling: unshielded twisted-pair cable,0.5 mm (24 AWG), max. length 100 meters (109 yards). Isolation: Transformer isolated to 1500 volts rms. 100BASE-FX (fibre) Connectors: ST; Cabling: Fibre optic cable, 62.5/125 μm nominal, wavelength 820 nm, max. length 2000 meters

Software integration

Integrate within PowerLogic facility-level or enterprise-wide power and energy management systems. Real-time data and data logs stored onboard can be automatically retrieved on a scheduled basis for analysis at the system level. Compatible with PowerLogic ION Enterprise and PowerLogic ION Setup. Modbus compatibility and register-based logged data supports integration and data access by building automation, SCADA and other third-party systems.

Special features

Flash-based firmware allows upgrades via communications without removing the meter from the site. Simply download the latest firmware from www. powerlogic.com. Real time data, data logs and waveforms stored on board.

General specifications

Description	Specifications
Accuracy	IEC 62053-22 0,2S, 1 A and 5 A tested by KEMA; Complies with ANSI C12.20, Class 10 & Class 20
Safety/construction	IEC 1010-1 (EN61010-1); CSA C22.2 No 1010-1; UL 61010B-1 Electromagnetic Immunity; IEEE C.37-90.1-1989;EN50082-2
Electromagnetic compatibility	IEC 61000-4-2 (EN61000-4-2/IEC 8012); IEC 61000-4-3 (EN61000-4-3/IEC 801-3) Radiated EM Field Immunity
	IEC 61000-4-4 (EN61000-4-4/IEC 801-4) Electric Fast Transient; IEC 61000-4-5 (EN61000-4-5/IEC 801-5) Surge Immunity
	IEC 61000-4-6 (EN61000-4-6/IEC 801-6) Conducted Immunity; IEC 61000-3-2 (EN61000-3-2); IEC 61000-3-3 (EN61000-3-3)
	FCC Part 15 Subpart B, Class A Digital Device; EN55011 (CISPR 11); EN55022 (CISPR 22); EN61000-6-4 (EN50081-2)
Environmental conditions	Operating temperature: -20° C to +70° C (no formation of ice) (-4° F to 158° F)
	Low Voltage DC Power Supply: -20° C to 50° C (-4° F 122° F)
	Storage: -40° C to +85° C (-40° F to 185° F)
	Humidity: 5% to 95% non-condensing

Features	ION7550	ION7650
Metering		
Power, energy & demand	■	■
Power quality		
Sag/swell, harmonics monitoring	■	■
Harmonics: individual, even, odd, up to	63rd	63rd
Harmonics: magnitude, phase and inter-harmonics		50th
Symmetrical components: zero, positive, negative	■	■
Recording compliant with IEC 61000-4-30 Class A		■
IEC61000-4-15 flicker		■
EN50160 compliance checking		■
Transient detection, microseconds (20μs for 50Hz, 17μs for 60Hz)		20/17
Sampling rate, maximum samples per cycle	256	1024
Disturbance direction detection	■	■
Logging and recording		
Memory standard/optional	5 MB/10 MB	5 MB/10 MB
Min/max, historical, waveform logging	■	■
Timestamp resolution in seconds	0.001	0.001
Historical trend information via front panel display	■	■
GPS time synchronization	■	■
Communications and I/O		
RS-232/485; RS-485; Ethernet; Optical	■	■
Internal modem	1	1
3-port DNP 3.0 via serial, modem, Ethernet, I/R ports	■	■
Modbus RTU slave/master; Modbus TCP	■	■
EtherGate, ModemGate, MeterM@il, WebMeter	■	■
Analog inputs/outputs (optional)	4/4	4/4
Digital status inputs/outputs	16/4	16/4
Relay outputs (standard)	3	3
Setpoints, alarming, and control		
Setpoints, number/minimum response time	65/$^{1/2}$-cycle	65/$^{1/2}$-cycle
Math, logic, trig, log, linearization formulas	■	■
Call-out on single & multi-condition alarms	■	■
Alarm setpoint learning	■	■

Software integration

PowerLogic® ION Enterprise® Software
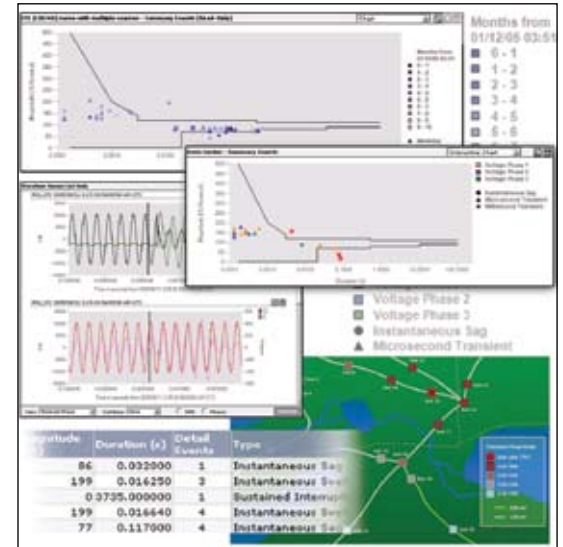
ION® Setup Software

Modbus® Master

Internet Connectivity

XML Compatibility

Flash-based firmware

Perform upgrades via communications without removing the meter from the site.

Certificate No. 002188

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a brand of
Schneider Electric

SQUARE D

InteliVision 5
InteliVision 5 RD

CONTROLLER COLOUR DISPLAY UNIT

ComAp

InteliVision 5

Plug and play interface	Front IP65	ScreenEditor	Short distance	Tier 4	Configurable soft keys

InteliVision 5 RD

Galvanically separated RS-485 interface	Plug and play interface	Front IP65	ScreenEditor	Long distance	Tier 4
Configurable soft keys	Backlit dimming analog input	Binary output	Internal buzzer	Backlit	

Description

InteliVision 5 and InteliVision 5 RD – new generation colour display panels compatible with the following product line of controllers:

▷ InteliGen^{NT}
▷ InteliSys^{NT}
▷ InteliMains^{NT}

There are two versions available:
▷ InteliVision 5 – for localized visualisation and intended for shorter distances (up to 2 meters) from the controller
▷ InteliVision 5 RD – for remote visualisation and intended for longer distances (up to 1000 meters) from the controller

They are designed as a simple, easy to use Plug and play solution.

Order codes

Product	Order code
InteliVision 5	INTELIVISION 5
InteliVision 5 RD	INTELIVISION 5 RD

Benefits

▷ Plug and play operation (auto configuration based on controller application)
▷ Simple, fast and intuitive control
▷ Easy drag and drop screen configuration in graphical editor
▷ Fast access to important data
▷ Five configurable soft keys:
  • Fast skip to any screen
  • Binary signal activation – S/R button / toggle button / pulse generator
  • Association to various Genset commands
▷ Support of Tier 4 icons
▷ Mounting screw available at the rear face of InteliVision 5 to mount a compatible controller
▷ Same language support as the controller including graphic languages

Features

▷ 5,7" Colour TFT display with resolution 320 × 240 pixels
▷ Local display intended for shorter distances (up to 2 meters)[1]
▷ Remote display intended for longer distances (up to 1000 meters)[2]
▷ Direct connection to the controller (converters are not needed)
▷ Communication connection via RS-485[1]
▷ Communication connection via galvanic separation of RS-485[2]
▷ Same cut out as InteliGen[NT]
▷ Backlit buttons[2]
▷ Equipped with internal buzzer[2]
▷ Binary output for external horn/buzzer control[2]
▷ Analog input to control backlit intensity[2]
▷ Operating temperature: –40 to +70°C
▷ Face is sealed to IP65
▷ EMC, climatic and mechanical tests
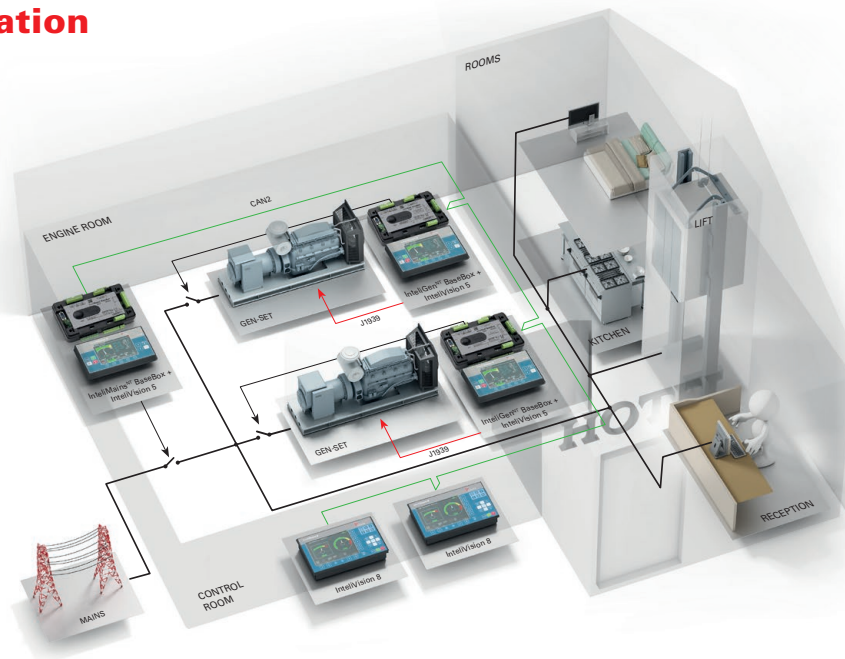▷ CE, UL certification

KEY
[1] Only for InteliVison 5
[2] Only for InteliVison 5 RD

Function Overview of InteliVision 5 and InteliVision 5 RD

	RS-485 isolated	Distance [m]	Binary output	Analog input	Backlit (display buttons)	Protected IP	Internal buzzer
InteliVision 5	No	2	No	No	No	IP-65 (face)	No
InteliVision 5 RD	Yes	1000	Yes	Yes	Yes	IP-65 (face)	Yes

Typical application

MANUFACTURER:

ComAp a.s.

Czech Republic
Phone: + 420 246 012 111
Fax: + 420 266 316 647
E-mail: info@comap.cz
Internet: www.comap.cz

LOCAL DISTRIBUTOR / PARTNER:

Customer satisfaction is our mission. We continuously develop our people to be the best to succeed in our mission.

InteliGen^NTC BaseBox

GENERAL PURPOSE GEN-SET CONTROLLER WITH DETACHABLE COLOUR DISPLAY

1)

Description

InteliGen^NTC BaseBox is a comprehensive controller for both single and multiple gen-sets operating in standby or parallel modes. The detachable modular construction allows easy installation with the potential for many different extension modules designed to suit individual customer requirements.

A built-in synchronizer and digital isochronous load sharer allow a total integrated solution for gen-sets in standby, island parallel or mains parallel with native cooperation of up to 32 gen-sets.

InteliGen^NTC BaseBox supports many standard ECU types and is specially designed to easily integrate new versions.

New ethernet connections together with AirGate make remote internet connection to new InteliGen^NTC BaseBox easy.

After registration of InteliGen^NTC BaseBox on our website you can simply monitor the site on the internet using WebSupervisor.

The controller is available in two models: InteliGen^NT BaseBox and InteliGen^NTC BaseBox

InteliGen^NTC BaseBox or InteliGen^NT BaseBox can be connected with InteliVision 5 and/or other ComAp displays.

Benefits

▷ Support of engines with ECU (Electronic Control Unit)
▷ Excellent configurability to match customers' needs exactly
▷ Complete integrated gen-set solution and signal sharing via CAN bus – minimum external components needed
▷ Many communication options – easy remote supervising and servicing
▷ Gen-set performance log for easy problem tracing
▷ Built-in PLC functions
▷ 5,7" colour TFT display [1]
▷ Active buttons – fast access to important data [1]
▷ Backlit buttons [2]

1) It is concerned in connection with InteliVision 5
2) It is concerned in connection with InteliVision 5 RD

WebSupervisor
The WebSupervisor system, a secure web based remote monitoring system which allows equipment fitted with various types ComAp units to be monitored via the internet from a remote PC or other web enabled device such as smartphone, webbook, etc. It operates in any internet browser and needs no special software to be installed. User can view recorded data from their equipment, receive Email alerts on alarms and control the remote units. Dedicated App's for iPhone and Android provide a truly mobile constant connection with the monitored equipment.

LOCATE
ComAp's LOCATE system uses the power of cellular communications technology to provide users and peace of mind that the monitored asset is where it should be. Locate provides location data to the WebSupervisor system without the need for costly GPS positioning equipment and works anywhere there is a cellphone signal, even indoors. Not only will WebSupervisor show the position of the monitored equipment, it will also maintain a track history and show route of the movement on a map. LOCATE – Simply Here!

AirGate
Modern communications made simple. ComAp's powerful AirGate technology is provided in a range of our controllers and makes remote internet connection to the ComAp controller easy. Just register the AirGate enabled controller on our website and from then on let ComAp's unique system locate and maintain contact with the controller, no need to worry about VPN's, Static IP addresses or corporate firewalls, simple! "AirGate – Simply connected."

ComAp is a member of AMPS (The Association of Manufacturers of Power generating Systems).

ComAp products meet the highest standards, with every stage of production undertaken in accordance with the ISO certification obtained in 1998.

LISTED
E465230

Features

▷ Support of engines with ECU (J1939, Modbus and other proprietary interfaces); alarm codes displayed in text form
▷ AMF function
▷ Automatic synchronizing and power control (via speed governor or ECU)
▷ Baseload, Import / Export
▷ Peak shaving
▷ Voltage and PF control (AVR)
▷ Generator measurement: U, I, Hz, kW, kVAr, kVA, PF, kWh, kVAhr
▷ Mains measurement: U, I, Hz, kW, kVAr, PF
▷ Selectable measurement ranges for AC voltages and currents – 120 / 277 V, 0–1 / 0–5 A [1]
▷ Inputs and outputs configurable for various customer needs
▷ Bipolar binary outputs – possibility to use BO as High or Low side switch
▷ RS232 / RS485 interface with Modbus support; Analog / GSM / ISDN / CDMA modem support; SMS messages; ECU Modbus interface
▷ Secondary isolated RS485 interface [1]
▷ Ethernet connection (RJ45) [1]
▷ USB 2.0 slave interface [1]
▷ Controller redundancy
▷ Event-based history (up to 1000 records) with customer-selectable list of stored values; RTC; statistic values
▷ Integrated PLC programmable functions
▷ Interface to remote display unit (InteliVision 5 RD)
▷ DIN-Rail mount

1) Available only for InteliGen^NTC BaseBox model

Order codes

| Product	Order code
InteliGen^NT BaseBox	IG-NT-BB
InteliGen^NTC BaseBox	IG-NTC-BB

Integrated fixed and configurable protections

▷ 3 phase integrated generator protections (U + f)
▷ IDMT overcurrent + Shortcurrent protection
▷ Overload protection
▷ Reverse power protection
▷ Instantaneous and IDMT earth fault current
▷ 3 phase integrated mains protections (U + f)
▷ Vector shift and ROCOF protection
▷ All binary / analog inputs free configurable for various protection types: HistRecOnly / Alarm Only / Alarm + History indication / Warning / Off load / Slow stop / BreakerOpen&Cooldown / Shutdown / Shutdown override / Mains protect / Sensor fail
▷ Phase rotation and phase sequence protection
▷ Additional 160 programmable protections configurable for any measured value to create customer-specific protections
▷ Application security

ANSI CODES

ANSI code	Protection	ANSI code	Protection
25	Synchronism check	50N+64	Earth fault current*
27	Undervoltage	51	Generator overcurrent, IDMT
32	Overload		
32P	Load shedding	51N+64	Earth fault current, IDMT
32R	Reverse power	55	Power factor*
37	Undercurrent*	59	Overvoltage
40	Excitation loss	71	Gas (fuel) level
46	Generator current unbalance	78	Vectorshift
47	Voltage asymmetry and phase sequence	79	AC Reclosing
		81H	Generator overfrequency
49T	Temperature monitoring*	81L	Generator underfrequency
50	Generator short current	81R	ROCOF

* can be created using universal protections

Schematic diagram

InteliGen^NTC BaseBox

ComAp
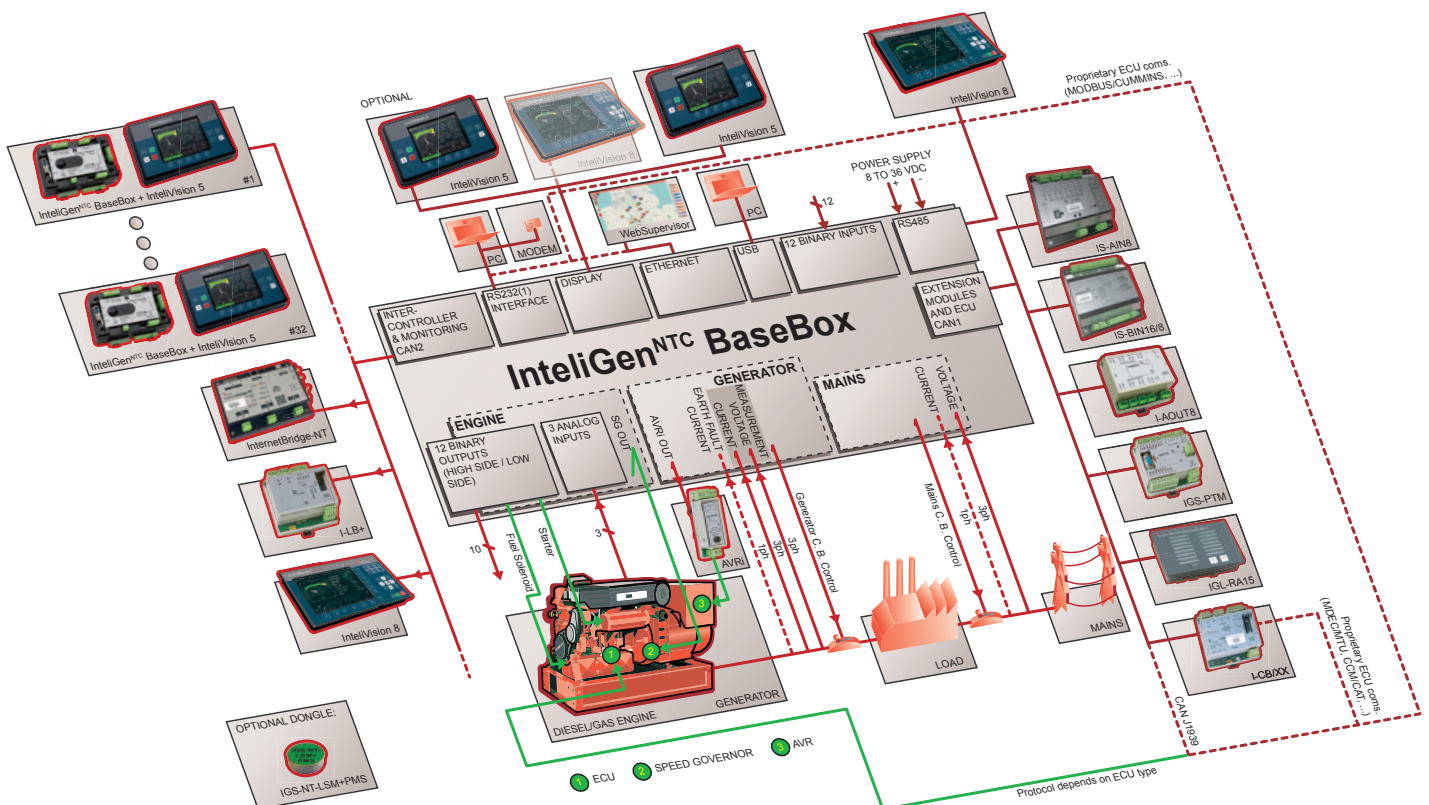
Upgrade kits

▷ **IGS-NT-LSM + PMS dongle:**
  - Enables Multiple isolated parallel or multiple parallel with mains
  - Optimizing number of running engines: Power management; kW, kVA or % load based
  - Digital Load Sharing
  - Digital VAr Sharing

Extension modules

▷ up to 4× **I-AOUT8** – Analog output extension module
▷ up to 2× **IGL-RA15** – Remote annunciator
▷ up to 4× **IGS-PTM** – Analog/binary input/output module
▷ up to 10× **IS-AIN8** – Analog input module
▷ up to 6× **IS-BIN16/8** – Binary input/output module
▷ up to 10× **IS-AIN8TC** – Module for thermocouple measurement

Communication modules and PC tools

▷ **InternetBridge-NT** – Communication module with cellular/ethernet connection
▷ **I-LB+** – Local bridge supporting USB communication
▷ **I-CB** – ECU communication bridge
▷ **WinScope** – Special graphical controllers´ monitoring software
▷ **WebSupervisor** – Cloud-based system for monitoring and controlling of ComAp controllers
▷ **GenConfig** – PC configuration tool
▷ **InteliMonitor** – PC monitoring tool

Remote displays

▷ up to 2× **InteliVision 5** – New generation 5,7´´ colour display unit
▷ up to 2× **InteliVision 5 RD** – New generation 5,7´´ remote colour display unit
▷ up to 6× **InteliVision 8** – 8´´ colour detachable display unit
▷ **InteliVision 17Touch** – Colour touch 17´´ display

Typical application

STANDBY SYSTEM WITH LOAD SHEDDING – ADVANCED DISPLAYS

Description:

▷ Containerized rental gen-sets are deployed as temporary and mobile power generation units providing essential energy for subsystems and construction machinery on building projects or civil engineering applications where mains power is not available or has been manually disconnected.

▷ The application shows rental gen-sets fitted with the latest remote communication module InternetBridge-NT which enables the central control facility and mobile service engineers to efficiently monitor, control and supervise equipment wherever it is located. By using the supportive web based software applications such as WebSupervisor, rental operators can significantly improve operational control.

▷ Each gen-set can be used in Stand-by, Single parallel to mains and Multiple parallel modes according to the position of Mode selector switch.

▷ Load sharing and VAr sharing can be conditionally switched from isochronous regulation to droop. It ensures reliable operation in case of cut off the CAN intercontroller communication line or cooperation with the gen-sets equipped with third-party control system.
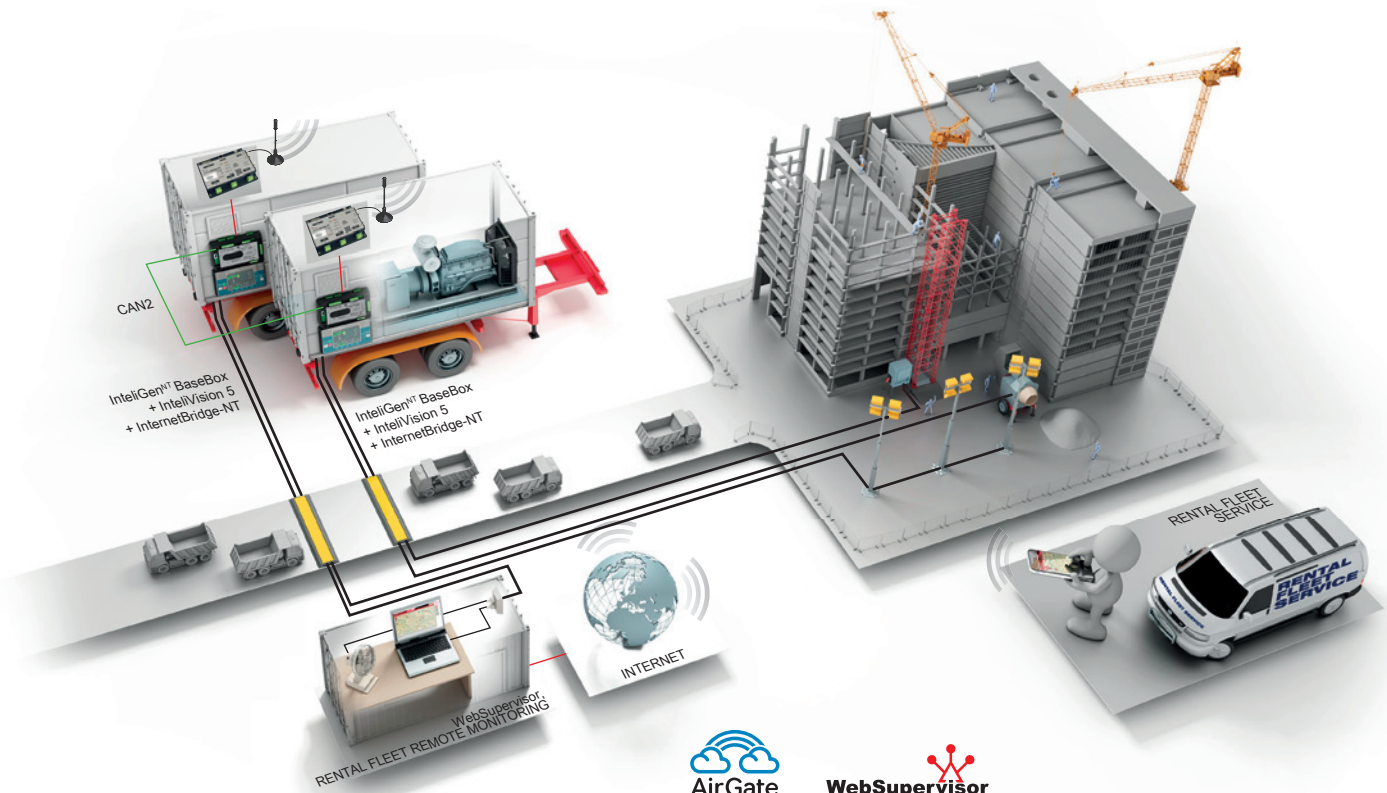
Scope of supply:

▷ 2× InteliGen^{NT} BaseBox
▷ 2× InteliVision 5
▷ 2× InternetBridge-NT

CAN2

InteliGen^{NT} BaseBox + InteliVision 5 + InternetBridge-NT

InteliGen^{NT} BaseBox + InteliVision 5 + InternetBridge-NT

RENTAL FLEET REMOTE MONITORING

INTERNET

RENTAL FLEET SERVICE

AirGate

WebSupervisor

ComAp

InteliGen^{NTC} BaseBox

Functions chart

Product	InteliGen^{NT}	InteliGen^{NT} BaseBox	InteliGen^{NTC} BaseBox	InteliSys^{NTC} BaseBox
Order code	IG-NT	IG-NT-BB	IG-NTC-BB	IS-NTC-BB
Binary Inputs / Outputs	12/12 (108/108) [1]	12/12 (108/108) [1]	12/12 (108/108) [1]	16/16 (112/112) [1]
Analog Inputs/Outputs	3/0 (83/32) [1] (configurable as tristate)	3/0 (83/32) [1] (configurable as tristate)	3/0 (83/32) [1] (configurable as tristate)	4/1 (84/33) [1] (configurable as tristate)
AMF function	●	●	●	●
GCB control with feedback	●	●	●	●
Integrated PLC	Standard	Standard	Standard	Extended
Input configuration	●	●	●	●
Output configuration	●	●	●	●
Voltage measurement Gen / Mains (bus)	3 ph / 3 ph 277V	3 ph / 3 ph 277V	3 ph / 3 ph 120V / 277V	3 ph / 3 ph 120V / 277V
Current measurement	3ph + 1 / 6w IDMT overcurrent 5A	3ph + 1 / 6w IDMT overcurrent 5A	3ph + 1 / 6w IDMT overcurrent 1A / 5A	3ph + 1 / 6w IDMT overcurrent 1A / 5A
kW / kWh / kVA measurement	● / ● / ●	● / ● / ●	● / ● / ●	● / ● / ●
Communication interfaces	CAN1, CAN2, RS232, RS485, Ethernet [2], Modbus	CAN1, CAN2, RS232, RS485, Ethernet [2], Modbus	CAN1, CAN2, RS232, 2× RS485, USB, Ethernet, Modbus, Modbus TCP, AirGate, Web server	CAN1, CAN2, RS232, 2× RS485, USB, Ethernet, Modbus, Modbus TCP, AirGate, Web server
ECU support	●	●	●	●
Active call / SMS support	●	●	●	●
Forward / Reverse synchronizing / Mains parallel operation	● / ● / ●	● / ● / ●	● / ● / ●	● / ● / ●
Multiple operation / Power Management System	● [3]	● [3]	● [3]	● [3]
Display	LCD 128×64	External	External	External
History (max records) [4]	500	1000	1000	4000

KEY

●	included
CAN1	for peripheral modules and ECU (J1939)
CAN2	intercontroller can; monitoring

[1] with IS-AIN8, IS-AIN8TC, IS-BIN16/8, I-OUT8 or IGS-PTM
[2] with communication modules
[3] with IGS-NT-LSM+PMS dongle
[4] depends on number of values in history record

References   Singapore

F1 Singapore Grand Prix

The race was illuminated by twenty-four individual 500 kVA generators, powering 1500 special lighting rigs. To control all this power the experienced team carefully considered all available systems on the market and chose ComAp's InteliGen^{NTC} BaseBox and InteliVision 8 combination. An event of this magnitude doesn't just need lighting. Beyond the track 12 further 50 kVA, InteliLite NT AMF 25 controlled generators were used to supply the monitoring system along the track.

MANUFACTURER:

ComAp a.s.
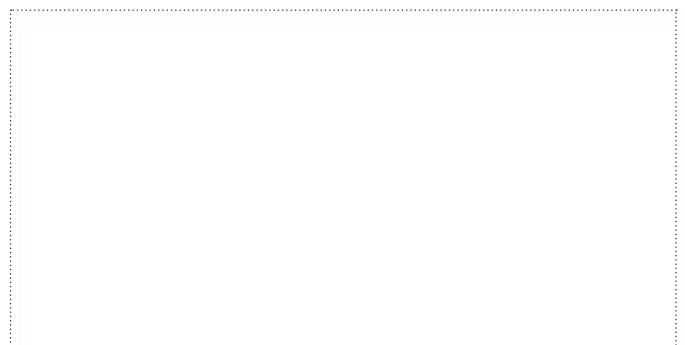
Czech Republic
Phone: + 420 246 012 111
Fax: + 420 266 316 647
E-mail: info@comap.cz
Internet: www.comap.cz

LOCAL DISTRIBUTOR / PARTNER:

Customer satisfaction is our mission. We continuously develop our people to be the best to succeed in our mission.

InteliGen^{NTC} BaseBox

Gen-set controller

Datasheet

Product description

- Comprehensive paralleling gen-set controller
- Parallel operation up to 32 gen-sets
- High level control for complex systems

Key features

- Load sharing and VAr sharing via CAN
- Virtual shared inputs and outputs via CAN
- Support of wide range of applications
  - ○ Single or multiple gen-sets in parallel to mains operation with automatic back up function, multiple island operation
- Advanced power management function
- Customizable load control in parallel to mains
- Wide range of ECU support
- Extended communication capabilities
  - ○ Built-in web server
  - ○ Full Modbus slave support
  - ○ GPS and AirGate support and more
- Highly configurable
  - ○ Timers,Internal PLC , Force values and more
- Compatible with ComAp's InteliVision displays
- Active e-mail messaging and SMS
- Extensive built-in protection functions
  - ○ Standard protections
  - ○ User configurable protection
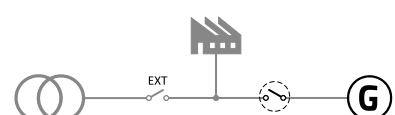- Extendable with ComAp's extension modules

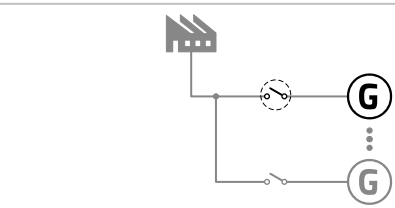## Application overview

SPtM
Mains & Generator Circuit Breaker
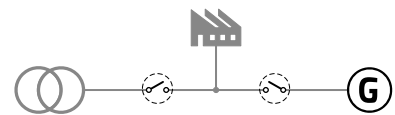
SPI
Generator Circuit Breaker

MINT
Generator Circuit Breaker

Technical data

Power supply

Power supply range	8-36 VDC
Power consumption	0.4A / 8VDC 0.15A / 24VDC 0.1A / 36VDC
RTC battery	10 years (replacable by official service)
Fusing	2A (without BOUT consumption)

Operating conditions

Operating temperature	-40°C to +70°C
Storage temperature	-40°C to +80°C
Operating humidity	95% w/o condensation
Vibration	5-25Hz, ±1.6mm 25-100Hz, a=4g
Shocks	$a=200m/s^2$

Voltage measurement

Measurement inputs	3ph-n Gen voltage 3ph-n Mains/Bus voltage
Measurement range	110V/277V
Max allowed voltage	125%
Accuracy	1% of 110V/277V
Frequency range	40-70Hz (at accy 0.1Hz)
Input impedance	0.6MΩ ph-ph 0.3MΩ ph-n

Current measurement

Measurement inputs	3ph Gen current 1ph Mains current
Measurement range	1A/5A
Max allowed current	1000%/200%
Accuracy	2% of 1A/5A
Input impedance	<0.1Ω

Binary inputs

Number	12 non-isolated
Input resistance	4.7kΩ
Close/Open indication	0-2VDC close contact >4VDC open contact

Binary outputs

Number	12 non-isolated
Max current	0.5A (2A per group)
Switching to	negative/positive supply terminal

Analog inputs

Number	3 non-isolated
Type	Switchable (Voltage, Resistance, Current)
Resolution	10bits, max 4 decimals
Range	0-5VDC/0-2500Ω/0-20mA
Input impedance	>100kΩ/>100kΩ/180Ω
Accuracy	±1% of meas value ±1mV ±2% of meas value ±2Ω ±1% of meas value ±0.5mA

Magnetic pick-up

Voltage input range	2 Vpk-pk to 50Veff
Frequency input range	4Hz to 15 kHz
Frequency measurement tolerance	0.2 %

Voltage regulator output

Type	5 V TTL PWM / ± 10 VDC with IG-AVRi interface

Speed governor outputoutput

|	
Voltage output	± 10 VDC / max.15 mA
Voltage output via resistor	± 10 VDC via 10 kΩ resistor / max . 1 mA
PWM	500÷3000 Hz / 5V / max. 10mA

Communications

|	
RS232	Direct/Modbus, non-isolated
RS485	Direct/Modbus, isolated
Display port	non-isolated RS485, only terminal connection
USB port	Direct, isolated
Ethernet port	LAN/Internet, Modbus TCP, SNMP, WebServer, Airgate
CAN1	External modules 250kbps, max 200m, Isolated
CAN2	Intercontroller and comm extensions 250/50kbps, max 200/1000m, Isolated

Dimensions, terminals and mounting
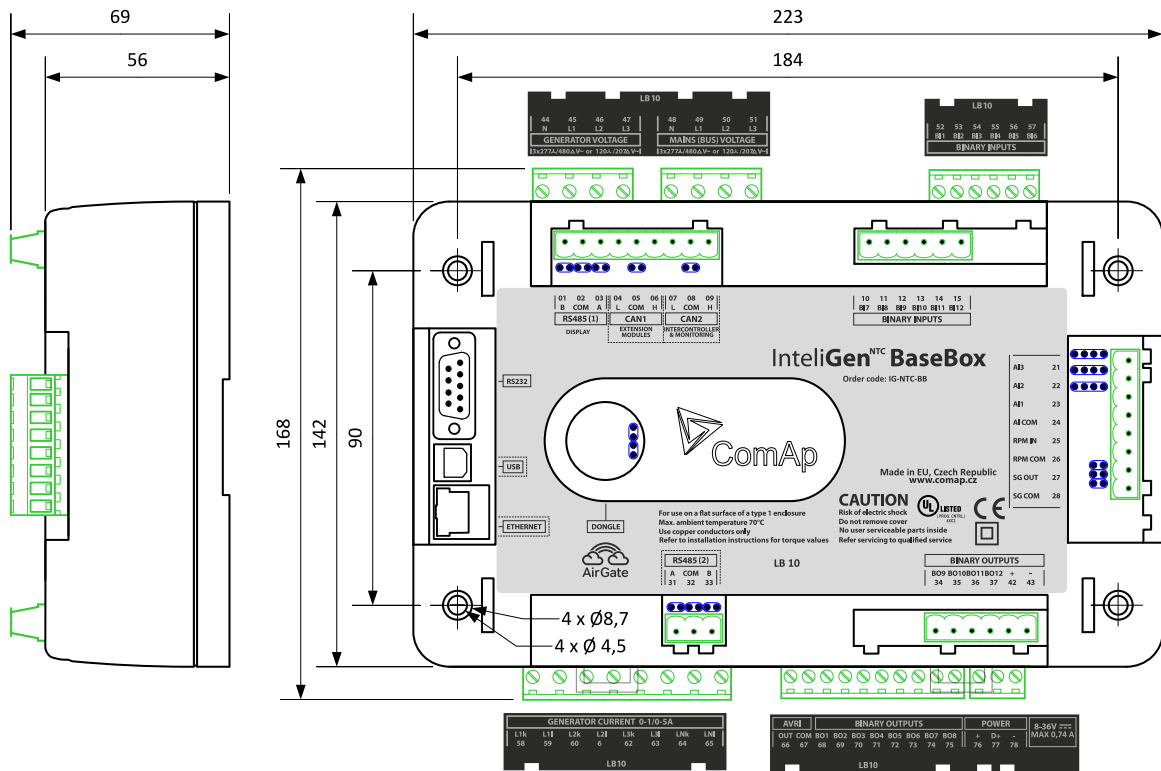
Panel door mounting with InteliVision 5
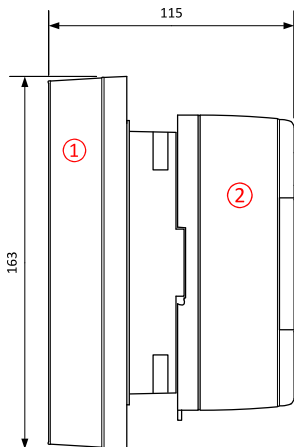
DIN-rail mounting
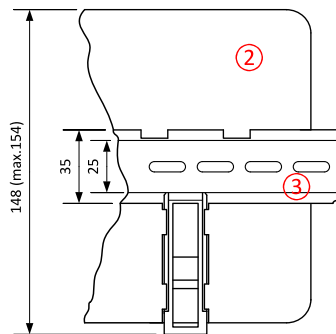
① InteliVision5

② InteliGen^NTC BaseBox

③ DIN-rail

④ InteliVision 8

Panel door mounting with InteliVision 8
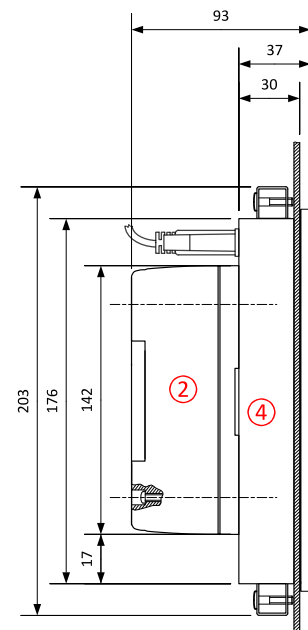
Note: InteliGen^NTC BaseBox can be mounted on a standard DIN rail or, in combination with InteliVision 5 or InteliVision 8, it can be door mounted. InteliVision 5 features mounting rail for direct mounting. Mounting in combination with InteliVision 8 uses four screws provided in the InteliGen^NTC BaseBox package.

Available extension modules

Product	Description	Order code
Inteli IO8/8	8 Binary inputs and 8 Binary outputs packed in a small unit (HW switchable to IO16/0)	I-IO8/8
Inteli IO16/0	16 Binary inputs packed in a small unit (HW switchable to IO8/8)	I-IO8/8
Inteli AIN8	8 Analog inputs and 1 pulse/frequency input in a small unit	I-AIN8
InteliAIN8TC	8 Thermocouple Analog inputs in a small unit	I-AIN8TC
IS-AIN8	8 Analog inputs packed in a rugged metal unit	IS-AIN8
IGS-PTM	8 Binary inputs, 8 Binary outputs, 4 Analog inputs and 1 Analog output in a unit	IGS-PTM
IGL-RA15	15 Binary LED output (3 colors) packed in a rugged metal unit	IGL-RA15
I-AOUT8	8 Analog outputs packed in a rugged metal unit	I-AOUT8
InternetBridge-NT	Multiple Internet connections (PC and Modbus) to all controllers on CAN2 or RS485	IB-NT
I-LB+	Direct connection (PC) to all controllers on CAN2 or RS485	I-LB+

Related products

Product	Description	Order code
InteliVision 5	Color 5.6" display for monitoring and control	INTELIVISION 5
InteliVision 5 RD	Color 5.6" display for monitoring and control (RS485 isolated and backlit buttons)	INTELIVISION 5 RD
InteliVision 8	Color 8" display for advanced monitoring, control & trending, USB capable	INTELIVISION 8

Functions and protections

The described product fully supports the following functions and protections as defined by ANSI (American National Standards Institute):

Description	ANSI code	Descritption	ANSI code
Synchronism check	25	Earth fault current	50N+64
Undevoltage	27	Overcurrent (IDMT)	51
Overload	32	Earth fault current IDMT	51N+64
Load shedding	32P	Power factor	55
Reverse power	32R	Overvoltage	59
Undercurrent	37	Gas (fuel) level	71
Excitation loss	40	Vector shift	78
Current unbalance	46	AC reclosing	79
Voltage asymmetry and phase sequence	47	Overfrequency	81H
Temperature monitoring	49T	Underfrequency	81L
Generator overcurrent	50	ROCOF	81R

Certificates and standards

This product is CE compliant.
- EN 60068-2-6 ed.2:2008
- EN 60068-2-27 ed.2:2010
- EN 60068-2-30, May 2000
- EN 60068-2-64
- EN 61010-1:2003

CE

• SYSTEM-10 BTU METER •

ONICON
FLOW AND ENERGY MEASUREMENT

UL LISTED

PROCESS CONTROL EQUIPMENT
3GF5

DESCRIPTION

The System-10 BTU Meter provides highly accurate thermal energy measurement in chilled water, hot water and condenser water systems based on signal inputs from two matched temperature sensors (included) and any of ONICON's insertion or inline flow meters (ordered separately). The basic model provides a local indication of energy, flow and temperature data through an alphanumeric display. An isolated solid state dry contact is provided for energy total. Optional analog outputs and network communications are also available.

APPLICATIONS

Chilled water, hot water and condenser water systems for:
- Commercial office tenant billing
- Central plant monitoring
- University campus monitoring
- Institutional energy cost allocation
- Performance/efficiency evaluations
- Performance contracting energy monitoring

ORDERING INFORMATION

The System-10 BTU Meter is sold complete with temperature sensors. Thermowell installation kits and flow meters are purchased separately.

FEATURES

Simple Installation and Commissioning - Factory programmed and ready for use upon delivery. All process data and programming functions are accessible via front panel display and keypad.

Single Source Responsibility - One manufacturer is responsible for every aspect of the energy measurement process ensuring component compatibility and overall system accuracy.

N.I.S.T. Traceable Calibration with Certification - Each Btu measurement system is individually calibrated using application specific flow and temperature data and is provided with calibration certificates.

Precision Solid State Temperature Sensors - Custom calibrated and matched to an accuracy better than ±0.15° F over calibrated range.

Highly Accurate Flow Meters - ONICON offers a wide variety of insertion and inline type flow measurement technologies including turbine, electromagnetic and vortex sensing. Each type offers unique advantages depending on the application. All ONICON flow meters are individually wet calibrated and designed to operate over a wide flow velocity range with accuracies ranging from ±0.2% to ±2.0% of rate depending on the model.

Complete Installation Package - All mechanical installation hardware, color coded interconnecting cabling and installation instructions are provided to ensure error-free installation and accurate system performance.

Serial Communications - Optional communications card provides complete energy, flow and temperature data to the control system through a single network connection, reducing installation costs.

ITEM #	DESCRIPTION
SYSTEM-10	System-10 BTU Meter
SYSTEM-10-OPT8	High temperature sensors (over 200° F)
SYSTEM-10-OPT9	Add one analog output
SYSTEM-10-OPT10	Add four analog outputs
Choose from the following commonly used thermowell installation kits:	
SYSTEM-10-OPT4	Upgrade to outdoor thermowells (pair)
BTU-ST-INSTL32	Brass kit for welded steel pipe (¾" - 5")
BTU-ST-INSTL52	Brass kit for threaded steel pipe (¾" - 2½")
BTU-ST-INSTL34	SS kit for welded steel pipe (¾" and up)
BTU-ST-INSTL36	Brass kit for copper tube (¾" - 2")
BTU-ST-INSTL37	Brass kit for copper tube (2½" - 3")
Choose from the following flow meters:	
F-1100 / F-1200	Insertion Turbine Flow Meter (1¼" - 72")
F-1300	Inline Turbine Flow Meter (¾" - 1")
F-3100 / F-3200	Inline Electromagnetic Flow Meter (¼" - 48")
F-3500	Insertion Electromagnetic Flow Meter (3"- 72")
F-4200	Clamp-on Ultrasonic Flow Meter (½" - 48")
F-2000 Series	Inline Vortex Flow Meter (½" - 12")
Refer to catalog for flow meter installation kits. Consult with ONICON for additional thermowell installation kit and flow meter options.	

SYSTEM-10 BTU METER SPECIFICATIONS

CALIBRATION
Flow meters and temperature sensors are individually calibrated followed by a complete system calibration.
Field commissioning is also available.

ACCURACY

TEMPERATURE
Overall differential temperature measurement uncertainty of ≤ ± 0.15° F over the stated range
(Includes uncertainty associated with the sensors, transmitters, cabling and calculator input circuitry)
Temperature sensors meet EN1434 / CSA C900.1 accuracy requirements for 1K sensors for cooling applications, 32° F - 77° F
Temperature sensors meet EN1434 / CSA C900.1 accuracy requirements for 2K sensors for heating applications, 140° F - 212° F

CALCULATOR
Computing nonlinearity within ±0.05%
Calculator meets EN1434 / CSA C900.1 class 1 accuracy requirements for 2K sensors for all applications

PROGRAMMING
Factory programmed for specific application
Field programmable via front panel interface

MEMORY
Non-volatile EEPROM memory retains all program parameters and totalized values in the event of power loss.

DISPLAY
Alphanumeric LCD displays total energy, total flow, energy rate, flow rate, supply temperature, return temperature, serial number and alarm status
Alpha: 16 character, 0.2" high
Numeric: 8 digit, 0.4" high
Rate Display Range: 0 - 9,999,999
Total Display Range: 0 - 9,999,999
The totals will roll over to zero when the maximum count is exceeded.

OUTPUT SIGNALS
Standard:
    Isolated solid state dry contact for energy total:
        Contact rating: 100 mA, 50 V
        Contact duration: 0.5, 1, 2, or 6 sec
Optional:
    Analog Output(s) (4-20 mA, 0-10 V or 0-5 V):
        One or four analog output(s) available for flow rate, energy rate, supply/return temps, or delta-T.
Serial Communications:

BACnet IP or MS/TP	LONWORKS - TP/FT-10F
Siemens Apogee - P1	Johnson Controls Metasys - N2
MODBUS RTU RS485 or TCP/IP	

TEMPERATURE SENSORS
Solid state sensors are custom calibrated using N.I.S.T. traceable temperature standards.
Current based signal (mA) is unaffected by wire length.

TEMPERATURE RANGE
Standard liquid temperature range: 32° F to 200° F
    Optional extended temperature ranges available
Ambient temperature range: -20° F to 140° F

LIQUID FLOW SIGNAL INPUT
0-15 V pulse output from any ONICON flow meter

MECHANICAL
Electronics Enclosure:
    Standard: Steel NEMA 13, wall mount, 8"x 10"x 4"
    Optional: NEMA 4 (Not UL listed)
    Approximate weight: 12 lbs
Temperature Sensor Thermowell Kits:
    Thermowells and other kit components vary by fluid type, fluid temperature, pipe material and pipe size. Commonly used kits are listed on the previous page. Contact ONICON for additional thermowell kit options, including hot tap installation kits for retrofit installations.

ELECTRICAL
Input Power: Based on Btu meters configured for network connection without the optional analog outputs
    Standard: 24 VAC, 50/60 Hz, 500 mA
    Optional: 120 VAC, 50/60 Hz, 200 mA
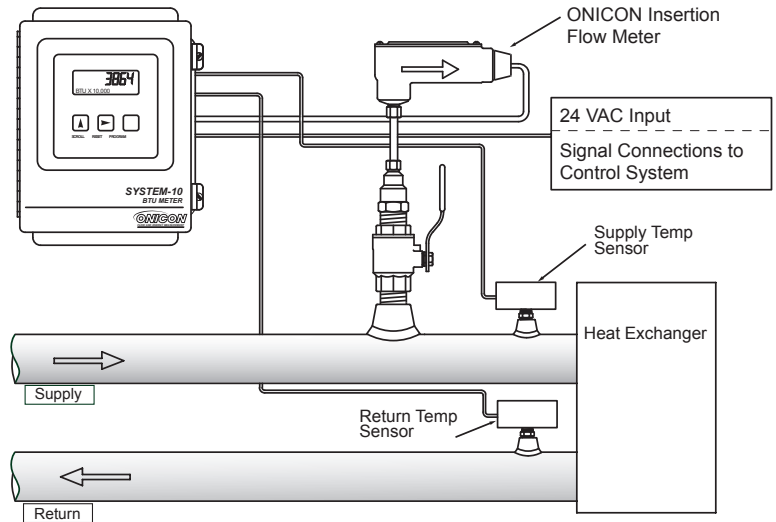   230 VAC, 50 Hz, 150 mA
Internal Supply:
    Provides 24 VDC at 200 mA to electronics and flow meter
Wiring:
   Temperature signals: Use 18-22 ga twisted shielded pair
    Flow signals: Use 18-22 ga - see flow meter specification sheet for number of conductors.

Note: Specifications are subject to change without notice.

TYPICAL SYSTEM-10 INSTALLATION

Insertion turbine flow meter shown. Any ONICON flow meter may be used with the System-10 BTU Meter. Consult with ONICON for additional flow meter types.
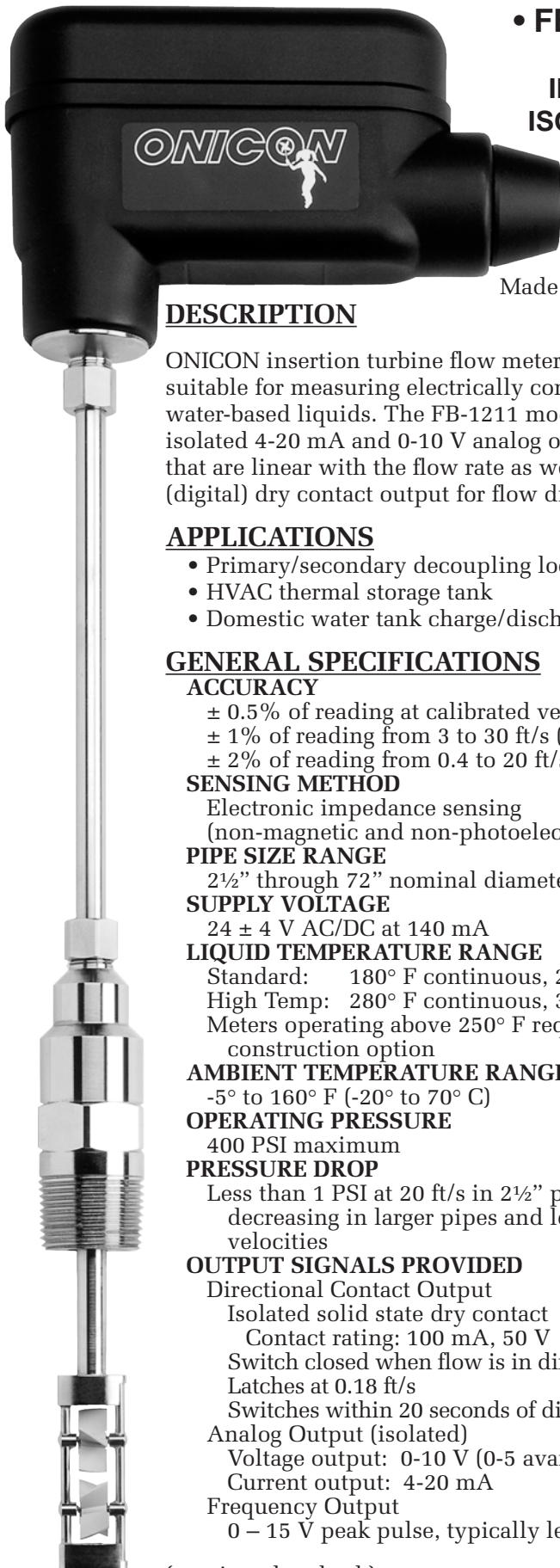
• FB-1211 DUAL TURBINE •
BI-DIRECTIONAL
INSERTION FLOW METER
ISOLATED ANALOG OUTPUT

ONICON INCORPORATED

Made in the USA

DESCRIPTION

ONICON insertion turbine flow meters are suitable for measuring electrically conductive water-based liquids. The FB-1211 model provides isolated 4-20 mA and 0-10 V analog output signals that are linear with the flow rate as well as a binary (digital) dry contact output for flow direction.

APPLICATIONS

- Primary/secondary decoupling loop (bypass)
- HVAC thermal storage tank
- Domestic water tank charge/discharge

GENERAL SPECIFICATIONS

ACCURACY
± 0.5% of reading at calibrated velocity
± 1% of reading from 3 to 30 ft/s (10:1 range)
± 2% of reading from 0.4 to 20 ft/s (50:1 range)

SENSING METHOD
Electronic impedance sensing
(non-magnetic and non-photoelectric)

PIPE SIZE RANGE
2½" through 72" nominal diameter

SUPPLY VOLTAGE
24 ± 4 V AC/DC at 140 mA

LIQUID TEMPERATURE RANGE
Standard: 180° F continuous, 200° F peak
High Temp: 280° F continuous, 300° F peak
Meters operating above 250° F require 316 SS construction option

AMBIENT TEMPERATURE RANGE
-5° to 160° F (-20° to 70° C)

OPERATING PRESSURE
400 PSI maximum

PRESSURE DROP
Less than 1 PSI at 20 ft/s in 2½" pipe, decreasing in larger pipes and lower velocities

OUTPUT SIGNALS PROVIDED
Directional Contact Output
  Isolated solid state dry contact
    Contact rating: 100 mA, 50 V
  Switch closed when flow is in direction of arrow
  Latches at 0.18 ft/s
  Switches within 20 seconds of direction change
Analog Output (isolated)
  Voltage output: 0-10 V (0-5 available)
  Current output: 4-20 mA
Frequency Output
  0 – 15 V peak pulse, typically less than 300 Hz

(continued on back)

CALIBRATION

Every ONICON flow meter is wet calibrated in a flow laboratory against primary volumetric standards that are directly traceable to N.I.S.T. A certificate of calibration accompanies every meter.

FEATURES

Unmatched Price vs Performance - Custom calibrated, highly accurate instrumentation at very competitive prices.

Excellent Long-term Reliability - Patented electronic sensing is resistant to scale and particulate matter. Low mass turbines with engineered jewel bearing systems provide a mechanical system that virtually does not wear.

Industry Leading Two-year "No-fault" Warranty - Reduces start-up costs with extended coverage to include accidental installation damage (miswiring, etc.) Certain exclusions apply. See our complete warranty statement for details.

Installation Flexibility - Patented dual turbine models deliver outstanding accuracy in short pipe runs.

Simplified Hot Tap Insertion Design - Standard on every insertion flow meter. Allows for insertion and removal by hand without system shutdown.

OPERATING RANGE FOR COMMON PIPE SIZES
0.17 TO 20 ft/s
±2% accuracy begins at 0.4 ft/s

Pipe Size (Inches)	Flow Rate (GPM)
2½	2.5 - 230
3	4 - 460
4	8 - 800
6	15 - 1,800
8	26 - 3,100
10	42 - 4,900
12	60 - 7,050
14	72 - 8,600
16	98 - 11,400
18	120 - 14,600
20	150 - 18,100
24	230 - 26,500
30	360 - 41,900
36	510 - 60,900

11451 Belcher Road South, Largo, FL 33773 • USA • Tel +1 (727) 447-6140 • Fax (727) 442-5699
www.onicon.com • sales @onicon.com

0224-2

05-14

FB-1211 SPECIFICATIONS cont.

MATERIAL
Wetted metal components:
    Standard: Electroless nickel plated brass
    Optional: 316 stainless steel

ELECTRONICS ENCLOSURE
Standard: Weathertight aluminum enclosure
Optional: Submersible enclosure
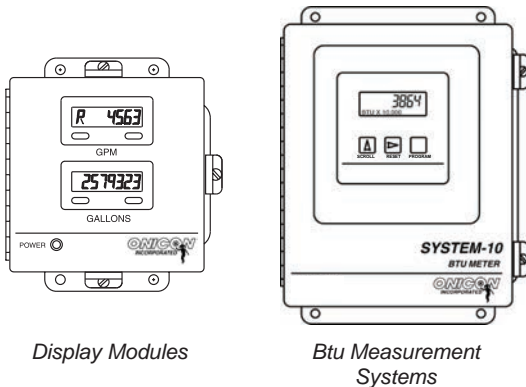
ELECTRICAL CONNECTIONS
6-wire for minimum for directional switch and
    either 4-20 mA or 0-10 V output
Second analog output and/or frequency output
    requires additional wires.
Standard: 10' of cable with ½" NPT
              conduit connection
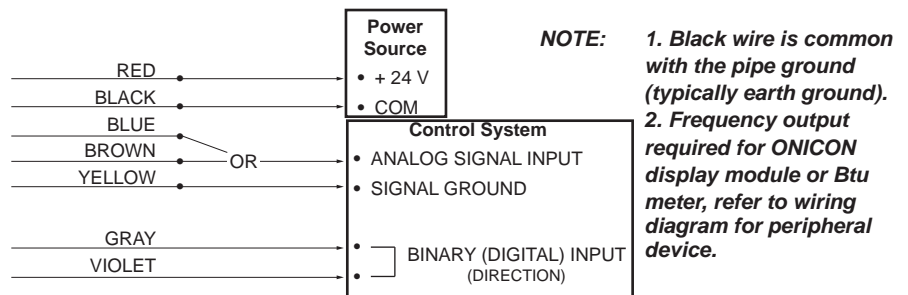Optional: plenum rated cable

ALSO AVAILABLE

Display Modules

Btu Measurement Systems

FB-1211 WIRING INFORMATION

WIRE COLOR	DESCRIPTION	NOTES
RED	(+) 24 V AC/DC supply voltage, 140 mA	Connect to power supply positive
BLACK	(-) Common ground (Common with pipe ground)	Connect to power supply negative
GREEN	(+) Frequency output signal: 0-15 V peak pulse	Required when meter is connected to local display or Btu meter
BLUE	(+) Analog signal: 4-20 mA (non-isolated)	Both signals may be used independently
BROWN	(+) Analog signal: 0-10 V (non-isolated)	
YELLOW	(-) Isolated ground	Use for analog signals only
GRAY	Dry contact directional output - indicates flow direction	Contact closed when flow is in direction of arrow on meter
VIOLET		
DIAGNOSTIC SIGNALS		
ORANGE	Bottom turbine frequency	These signals are for diagnostic purposes - connect to local display or Btu meter
WHITE	Top turbine frequency	

FB-1211 WIRING DIAGRAM

Flow meter into control system (no display or Btu meter)

NOTE:

1. Black wire is common with the pipe ground (typically earth ground).
2. Frequency output required for ONICON display module or Btu meter, refer to wiring diagram for peripheral device.
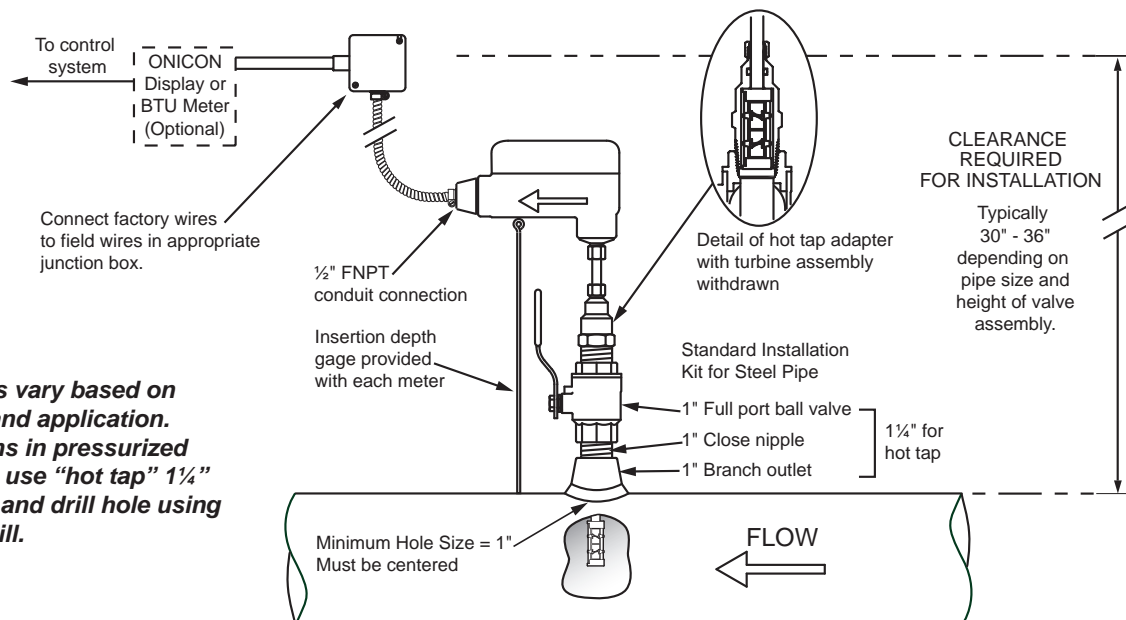

TYPICAL METER INSTALLATION
(New construction or scheduled shutdown)

- Acceptable to install in vertical pipe
- Position meter anywhere in upper 240° for horizontal pipe

THIS AREA ACCEPTABLE

Horizontal Run Pipe

To control system

ONICON Display or BTU Meter (Optional)

Connect factory wires to field wires in appropriate junction box.

½" FNPT conduit connection

Insertion depth gage provided with each meter

Detail of hot tap adapter with turbine assembly withdrawn

Standard Installation Kit for Steel Pipe

1" Full port ball valve
1" Close nipple
1" Branch outlet
1¼" for hot tap

CLEARANCE REQUIRED FOR INSTALLATION

Typically 30" - 36" depending on pipe size and height of valve assembly.

Minimum Hole Size = 1" Must be centered

FLOW

NOTE:
Installation kits vary based on pipe material and application. For installations in pressurized (live) systems, use "hot tap" 1¼" installation kit and drill hole using a 1" wet tap drill.

Appendix C

Site Photos

Intelligen 250 kW CHP unit.

Dump radiator.

ComAp engine controller, and gross power meter.
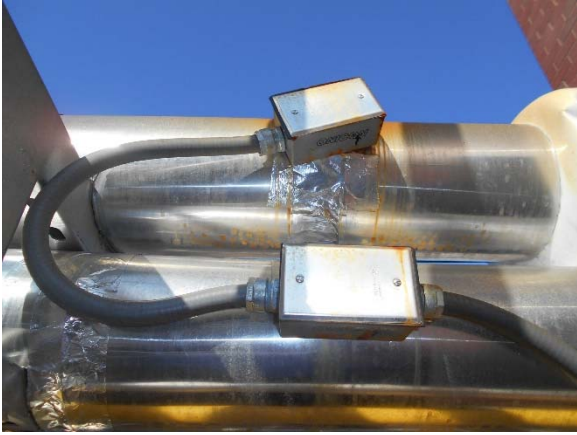

Un-commissioned Square D Ion 7550 parasitic power meter.

Onicon System 10 BTU meter (typ).

Onicon F-1xxx flowmeter (typ).

Onicon System 10 BTU meter temperature sensors (typ).