SUPERIOR BOILER WORKS, INC.

3524 East 4th St.
Hutchinson, KS 67501
Phone (620) 662-6693
Fax (620) 662-7586
www.superiorboiler.com

SUBMITTAL DATA FOR

SAMPLE SUBMITTAL

"Demand Superior Performance"

SUPERIOR BOILER WORKS, INC.

3524 East Fourth Street
Hutchinson, KS 67501
Ph. (620) 662-6693
Fax (620-662-7586
www.superiorboiler.com

HOLD FOR APPROVAL SUBMITTAL POLICY

Thank you for purchasing this fine Superior Boiler Works product. Our quality products are unmatched anywhere in the marketplace today and in an effort to maintain that leadership, we have put together this submittal for your review.

We ask that you review this document carefully and promptly as it will be come final after approval of this submittal and authorization to release. Any changes that are requested after that time will carry substantial rework, re-engineering and/or restocking charges.

If you have questions, or need to make changes to this unit, please contact your distributor as soon as possible.

Thank you for choosing Superior Boiler Works.

SUPERIOR BOILER WORKS, INC.

SPEC SHEET - **CREEK** PAGE 1 OF 1

S.O. NO. 15A90549 NAT.BOARD NO.

DATE RECEIVED: 7/2/14 SHIP WEEK OF

STATUS: WA&R [X] RELEASED [ ] DATE

SUBMITTALS REQ'D: 1 SETS PROPOSAL 15A90549

R&D SHEET [X] W.D. [X] SUBMITTAL NO.

BURNER [X] GAS PIPING [X] OIL PIPING [ ]

DATE REQ'D: MANUALS REQ'D: 2

JOB: NYC PS 50

LOCATION: NEW YORK, NY

SOLD TO: ALSTROM HEAT TRANSFER LLC

1408 SEABURY AVE

BRONX NY 10461

MODEL: **CR-XL-3000-W80-PF-G**

INPUT **3000** MBH OUTPUT **2880** MBH

SECTION **IV**

DESIGN PRESSURE **80** PSIG **210 °F** MAX. TEMP.

OPERATING PRESSURE **60** PSIG MAX.

NAMEPLATE: **SUPERIOR** PAINT RED/BLACK

SAFETY VALVE(S): **CONBRACO** [L]

[1] **10-616** SIZE **1.25" X 1.50"** SET @ **80** PSIG

PRIMARY L.W.C.O. **26NMB1A0A/3E1B** [L]

[1] OPERATOR **L4006A 1959** RANGE **40-180** [L]

[1] HIGH LIMIT **L4006E 1125** RANGE **100-200** [L]

[1] FIRING RATE **w/BURNER** RANGE [L]

[ ] LOW FIRE HOLD **N/S** RANGE [ ]

PRESSURE GAUGE **THERICE 600CB-45-02-L-A-130** [L]

DIAL **4 1/2"** RANGE **0-200** PSI

W/GAUGE/TEST COCK [X]

TEMPERATURE GAUGE **WEKSLER AF04-4-4-FS-X** [L]

DIAL **5.00"** STEM **4.00"** RANGE **50/400** °F

TRIDICATOR: **N/S** FIG. NO. [ ]

DIAL RANGE °F

DRAIN VALVE: **N/S** SIZE [ ]

CONDESATE DRAIN VALVE: **N/S** [ ]

FIG. NO. SIZE

INSTRUMENTATION SPOOL: NOT SUPPLIED

BURNER MFG. **POWER FLAME**

BURNER MODEL. **FDM 350**

VOLTAGE: **120** VOLT **60** HZ **1** PH

BLOWER MOTOR **1 1/2** HP

FLAME SAFEGUARD **HONEYWELL CONTROLLINKS**

BURNER OPERATION: **MODULATION**

CONTROL PANEL: MOUNTED BURNER X REMOTE

FUELS: GAS TYPE **NATURAL** OIL

FIRING RATE: GAS **3000** CFH OF **1000** BTU/CF

OIL GPH OF BTU/GAL

AVAILABLE GAS PRESSURE **7"-14" WC**

GAS TRAIN: SIZE MOUNTED LS X RS

PRESSURE ATOMIZING OIL PUMP: [ ]

BURNER CODES: UL X CSD-1 X IRI FM NFPA 85

SPECIAL INSTRUCTIONS:

MOUNT & WIRE BURNER & GAS TRAIN ONLY.

ALL CONTROLS FIELD INSTALLED AND WIRED.

COMPLETED BY: DATE

SALES: SH 7/9/14

ENG.: TLT 8/8/14

BOILER TO MEET THE FOLLOWING CODES:

CSD-1 [ ] UL LABEL [ ] [ ]

ELECTRICAL TEST ONLY [ ] FULL FIRETEST [ ]

[M] SHIPPED MOUNTED [N/A] NOT APPLICABLE

[L] SHIPPED LOOSE [N/S] NOT SUPPLIED

[P] PREPIPED/SHIPPED LOOSE [CF] CUSTOMER FURNISHED

REVISIONS

REV.	DATE	BY
A	8/20/14	SH
B	12/5/14	JB

3524 East 4th Avenue
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PH: (620) 662-6693
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CREEK CONDENSING BOILER WARRANTY

GENERAL WARRANTY:
Superior warrants all equipment manufactured by it and bearing its nameplate to be free from defects in workmanship and material, under normal use and service within sixty (60) months after shipment for the boiler body flue gas side and twelve (12) months for all other parts and accessories of the boiler. Thermal shock is covered for the lifetime of the boiler. Except where a different expressed written warranty has been issued, no warranty of any kind, express or implied, is extended by Superior to any person or persons other than its direct buyer.

Superior shall have no responsibility for the performance of any product sold by it under conditions varying materially from those under which such product is usually tested under existing industry standards, nor for any damage to the product from abrasion, erosion, corrosion, deterioration or the like due to abnormal temperatures or the influences of foreign matter or energy, nor for the design or operation of any system of which any such product may be made a part or for the suitability of any such product for any particular application. Superior shall not be liable for any cost or expense, including without limitation, labor expense, in connection with the removal or replacement of alleged defective equipment or any part or portion thereof, nor for incidental or consequential damages of any kind. Any substitution of parts not of Superior's manufacture or not authorized by Superior, or any modification, tampering, or manipulation of Superior's product shall void any and all warranties. Alteration of any parts without express written permission of Superior for a purpose other than that intended shall void any and all warranties.

GENERAL WARRANTY EXCLUSIONS:
Warranty will not cover the damaged, defective or not functioning parts due to:

- Normal wear and tear;
- Improper or inadequate use of the boiler;
- Installation or start up performed by unauthorized third parties;
- Failure to comply with the indication of Superior’s manual of use or improper modifications made by third parties;
- Tempering or improper adjustment of the boiler by third parties that are not included in the network of authorized representatives on behalf of Superior;
- Conditions of use not included in the instructions and warnings on the instruction manuals delivered with the boiler;
- Defects of elements of foreign origin;
- Incorrect electrical connections or input;
- Use of the product, after it has been taken out of service;

- Use of non-original spare parts;
- Faulty plant, installation errors or noncompliance with plant instructions, warnings, laws, regulations and applicable technical standards (i.e.: incorrect adjustment, boiler supply with specific fuel, use of the boiler outside of its certification range);
- Absence of a plate heat exchanger between primary and secondary circuit (when used in an open loop system)
- In case of improper installation, control and maintenance, that cause damage to the installed boiler, such as burner malfunction, absence of the safety parts provided by the Standards in force such as inadequate safety valves or expansion systems or improper chemical cleaning of the plant;
- Failure to remove the processing residues if the plant is new or deposits and subsequent cleaning of the pre-existing plant. In both cases the suggested operations must be performed before assembling the boiler;
- Events of force majeure (e.g.: lightning, floods, earthquakes) or vandalism;
- The warranty does not cover product maintenance;
- The warranty covers only the boiler body and excludes the accessories, electrical parts, and materials used for the construction of the plant; and not originally included with the boiler.

FLUE GAS SIDE WARRANTY EXCLUSIONS AND CONDITIONS:

- Any and all adjustments and inspections must be reported on a log with dates and signatures of the authorized technician.
- To make sure that there will be no cracks, the flame must be adjusted to prevent it from entering the heat exchanger passages. The adjustment of the burner must be checked every six (6) months of operation. Therefore, it is necessary to verify the content % of CO2 and NOx (Check the parameters according to the standards in force).
- The chimney draft must not impair the stability of the flame and should be checked before installation.
- Each component inside the combustion chamber should be checked before being ignited and at every heating season, as in the instructions given in the manual (e.g.; insulation between the burner nozzle and ceramic fiber door, deflector positioned correctly, visual inspection of the status of the internal boiler chamber and heat exchanger passages).
- The combustion chamber must be cleaned every year.
- Visual check of all the inner parts, and replacement if necessary.
- Cleaning of combustion chamber must not be performed using aggressive acidic or basic substances, but only the use of surfactants and water is permitted.
- The use of any fuel except natural gas (and/or LPG) is forbidden even for short periods of time, except for maximum five (5) days only in case of emergency backup fuel (light oil), with obligation of cleaning to be done by an authorized technician. Each type of gaseous fuel, although similar to natural gas and LPG, must be notified to and approved by the manufacturer.
- There must not be: aggressive gases, chemicals or halogens in the environment (combustion air).
- Any sealing operation, mechanical work, electrical engraving of any surface of the boiler is strictly forbidden.

WATER SIDE EXCLUSIONS AND CONDITIONS:
If any of the following occurs, the warranty shall not apply:

- Lack of water in the boiler;
- The supply water parameters must be in accordance with the limits indicated in the table annexed to the instruction manual;
- The plant and the boiler must be properly grounded;
- In case of limestone clogging, deposits and sludge, the presence of corrosion, overheating of the boiler body, corrosion caused by oxygen;
- Electrolysis caused by using dissimilar metals in the piping system;
- In a case where multiple boilers are connected in series which does not follow suggested piping diagrams in the manual;
- If the temperature goes below 41^0 F and the plant piping does not contain antifreeze, the boiler must be started and brought to the minimum temperature of 68^0 F, or the system must be completely drained;
- Use of improper product for water treatment inside the plant or incompatible antifreeze with system construction materials;
- The pressure must not exceed that indicated on the label;
- The boiler is used for direct production of domestic hot water; i.e. used in open system;
- The circulation inside the boiler exceeds the minimum and maximum range of the designed temperatures; 41^0 F minimum for hot water; 210^0 F maximum; maximum 100^0 F delta T;
- The boiler must be connected to the plant piping according to the standards in force and should not be isolated from the plant piping through isolation valves that interrupt the connection with the expansion vessel;
- The water flow must not exceed the maximum values indicated in the technical diagrams.

The foregoing warranties shall not apply to products or parts not manufactured by Superior.

There are no express or implied warranties which extend beyond those contained herein.

NOTE: All new boilers must be boiled out or Superior Boiler Technologies, Inc. will void the warranty.

NOTE: WARRANTY VALIDATION: Field start-up report must be completed, dated and signed then returned to Superior Boiler Technologies, Inc., 3524 East 4th Avenue, Hutchinson, KS 67501, ATTN: Sales Secretary, to validate warranty.

SUPERIOR
BOILER WORKS, INC.

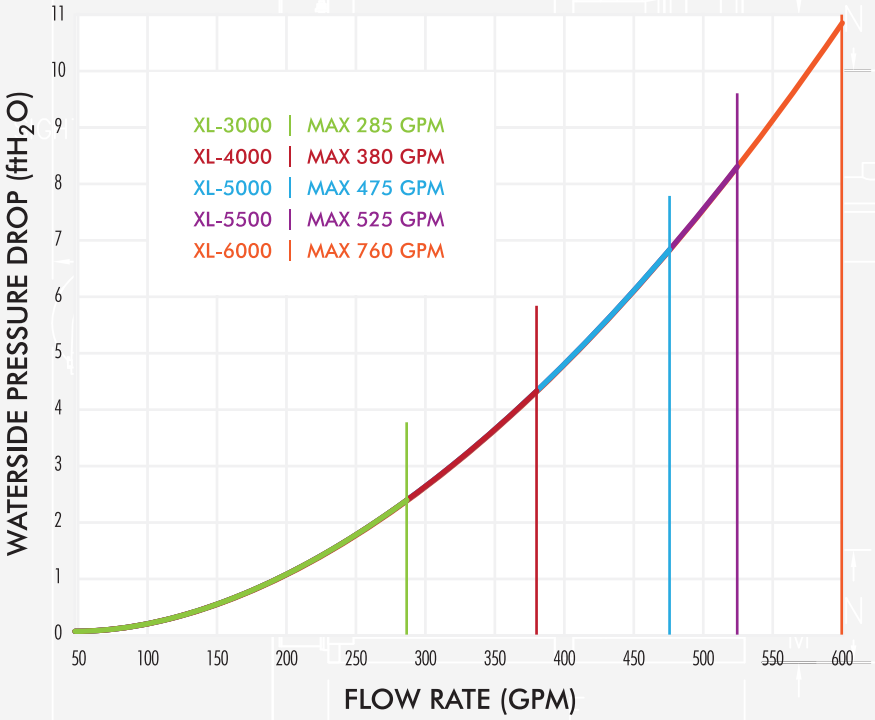
CREEK XL
CONDENSING BOILER

High Efficiency Condensing Boilers

	XL-3000	XL-4000	XL-5000	XL-5500	XL-6000
INPUT (btu/hr)	3,000,000	4,000,000	5,000,000	5,500,000	6,000,000
FUEL CONSUMPTION NG (ft^3/hr)	3,000	4,000	5,000	5,500	6,000
FUEL CONSUMPTION #2 OIL (GPH)*	21.4	28.6	35.7	39.3	42.9
OUTPUT (btu/hr)	2,850,000	3,800,000	4,750,000	5,225,000	5,700,000
WATER CONTENT (gal)	502	502	483	483	483
DRY WEIGHT (lbs)	4075	4165	4340	4375	4475
OPERATING WEIGHT (lbs)	8260	8350	8365	8400	8500
WIDTH (in)	52	52	55	55	55
HEIGHT (in)	82.75	82.75	88.625	88.625	88.625
DEPTH (in)	104	104	104	104	104
STACK CONNECTION O.D. (in)	14	14	16	16	16
WATER INLET/OUTLET DIAMETER (in)	4	4	4	4	4
MIN CLEARANCE TO CEILING (in)	20	20	20	20	20
MIN SIDE CLEARANCE (in)	4	4	4	4	4
SYSTEM FILLING/DRAINAGE (in)	3/4 NPT	3/4 NPT	3/4 NPT	3/4 NPT	3/4 NPT
BOILER CONDENSATION DRAIN (in)	1 NPT	1 NPT	1 NPT	1 NPT	1 NPT

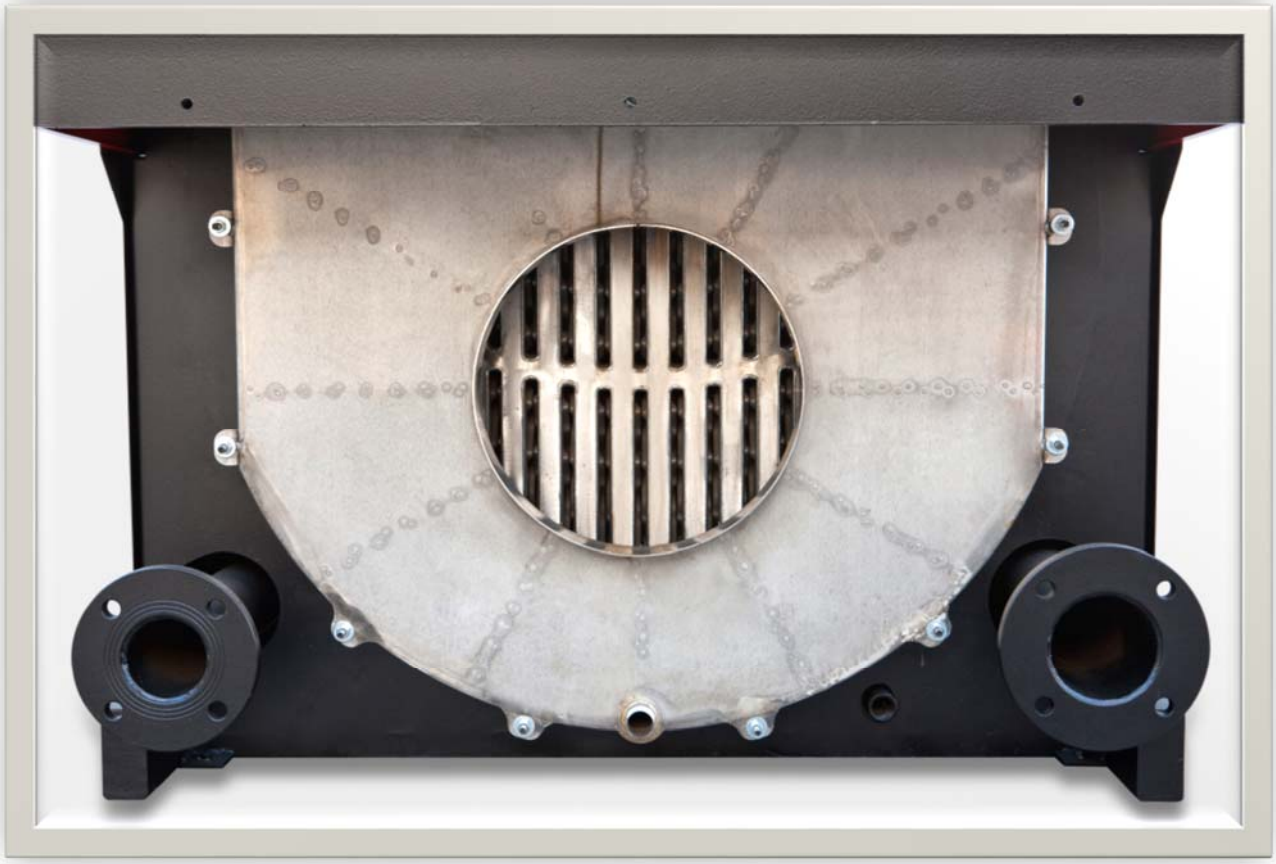
* oil is used as an emergency backup fuel

PRESSURE DROP vs GPM

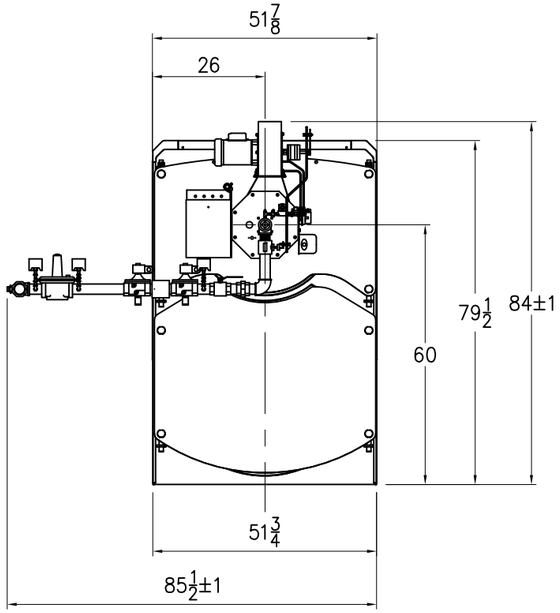


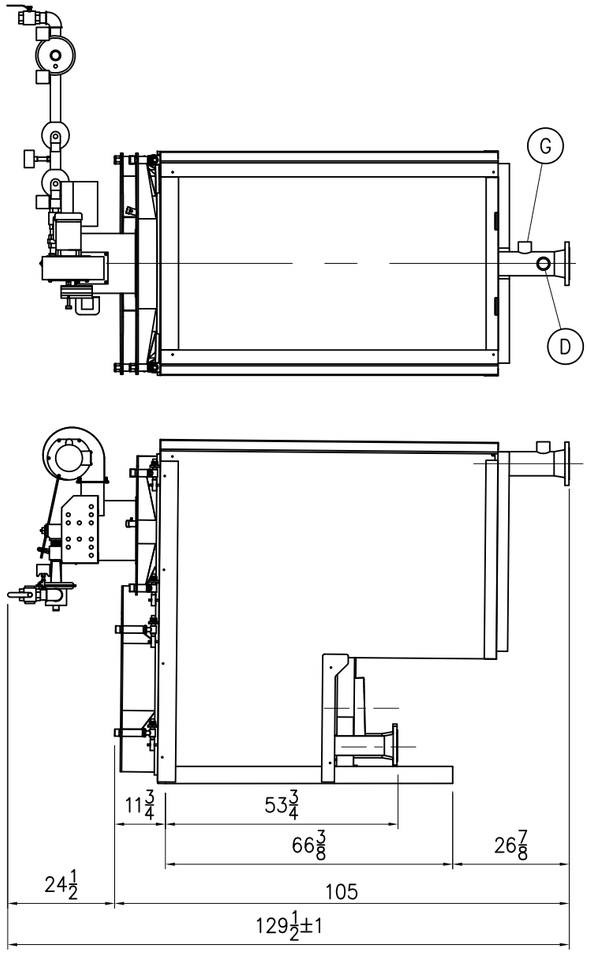
+ Sizes range from 3,000,000 - 6,000,000 btu/hr
+ High water volume w/ low waterside pressure drop reducing system pump HP
+ Twin water return for maximum efficiency
+ Heat exchanger made w/ 316Ti
+ Available w/ low and ultra low emissions on gas and #2 fuel oil
+ Simple to access and maintain

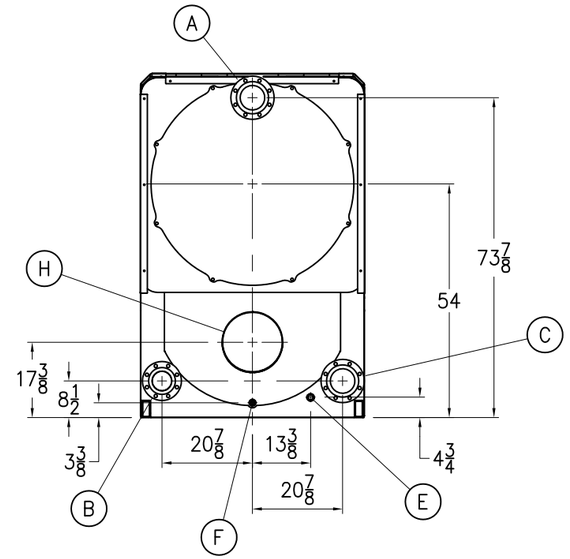
3524 E. 4th Avenue Hutchinson, KS 67501 • (620) 662-6693 • sales@superiorboiler.com • www.SuperiorBoiler.com



PRELIMINARY
NOT FOR CONSTRUCTION







BOILER CONNECTIONS

A.(1)	WATER OUTLET	5" 150# FLG
B.(1)	WATER RETURN HI TEMP	4" 150# FLG
C.(1)	WATER RETURN LOW TEMP	5" 150# FLG
D.(1)	SAFETY VALVE	2" NPT
E.(1)	BOILER FILL/DRAIN	3/4" NPT
F.(1)	CONDENSATION DRAIN	1" NPT
G.(1)	AUXILIARY	2" NPT
H.(1)	FLUE OUTLET	ø14"
J.( )		
K.( )		
L.( )		
M.( )		
N.( )		
P.( )		
Q.( )		
R.( )		
S.( )		

RATINGS & CAPACITIES

DESIGN PRESSURE	80 PSIG
DESIGN TEMPERATURE	210 °F
GROSS OUTPUT	2850 MBH
RATED INPUT	3000 MBH
HEATING SURFACE (ASME)	401.49 SqFt

WATER CAPACITY:
(FULL) 502 Gal @ 4,182 Lbs

SHIPPING WEIGHT: 4,350 Lbs

LTR	DATE	REVISION	BY

NOTES

1. ALL CONTROLS MOUNTED AS PER SPECIFICATION SHEET.
2. SPECIFICATION SHEET TAKES PRIORITY OVER R & D SHEET.
3. BOILER DESIGN CODE ASME SECTION IV.
4. ALL DIMENSIONS ARE ±1/2" UNLESS OTHERWISE NOTED.

SUPERIOR BOILER WORKS, INC.
HUTCHINSON, KANSAS

CHECKED BY | DATE

DRAWN BY: T. THURSTON | DATE: 7-25-14

BOILER MODEL: CREEK XL
CR XL-3000-W80-PF-G

SCALE: 1/35

DRAWING No: 15A90549 & 15A90550

REPRESENTATIVE:
ALSTROM HEAT TRANSFER LLC

PROJECT:
NYC PS 50

SUPERIOR BOILER WORKS, INC.

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Hutchinson, KS 67501
PH: (620) 662-6693
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Terms and Conditions

DEFINITIONS

Where the context permits, the following words shall have the meanings indicated:

"Buyer" means the person, partnership, company, or corporation or entity procuring the Products from the Company.

"Company" means Superior Boiler Works, Inc., a Kansas corporation, or the subsidiaries, affiliates, or assigns thereof it may designate from time to time.

"Products" means all goods, materials, chattels, equipment, and machinery to be provided pursuant to this Proposal.

"Proposal" means the proposal in which these Terms and Conditions are incorporated by reference and in which specific Products, prices and other details are provided.

SALES TERMS

A. PAYMENT TERMS. The Company's normal payment terms are Net thirty (30) days from date of invoice. The Company may, in its sole judgment, require such other payment terms as it deems appropriate, including full or partial payment in advance of shipment or by letter of credit. Sales orders in excess of Seventy-five Thousand Dollars ($75,000) require a payment of seventy percent (70%) prior to shipment. International Buyers will provide Company an Irrevocable Letter of Credit acceptable to Company for payment of one hundred percent (100%) of the contract price in US funds at sight upon presentation of clean on board bill of lading.

B. PAST DUE ACCOUNTS. A finance charge of the lesser of one and one-half percent (1.5%) per month (eighteen percent (18%) APR) or the highest rate permitted by law will be assessed on all past due accounts. The parties intend to comply with all relevant usury laws. Should the finance charge paid exceed the legal limit, any excess will be deemed a payment of principal. An invoice is past due if the net amount is not paid within thirty (30) days from date of invoice. Interest charged on a past due invoice will be assessed from the date on which that invoice was due. The above charges will be billed on the date that the invoice becomes thirty (30) days past due and on each monthly period thereafter.

C. BREACH. In the event of failure of Buyer to make any payment to the Company when due, the Company shall be entitled, at its sole option, to suspend shipment of any or all goods to such defaulting Buyer, whether or not the contract covering said goods has been accepted by the Company; cancel any contracts then outstanding for the sale of goods to such defaulting Buyer; and to the extent permitted by law, receive all expenses incurred by it in the collection of said payment, including reasonable attorneys' fees.

D. PRICES. Prices quoted by the Company herein are firm for thirty (30) days from the date of quotation and are subject to adjustment as stated in the Company's Proposal. After thirty (30) days from the date of Proposal, all quoted prices are subject to change by the Company without prior notice to Buyer.

SALES CONDITIONS

A. OFFER. The Proposal and these Terms and Conditions constitute an offer by the Company to sell the Products specified upon the terms and conditions and at the price(s) and with the delivery date(s) stated herein and is not an acceptance of an offer by Buyer to buy Products. Buyer shall indicate its acceptance of this offer by written acceptance, confirmation or conforming Purchase Order, by making full or partial payment for the products, or by accepting delivery of part or all of the Products.

The Proposal, together with these Terms and Conditions and the documents attached thereto or incorporated therein by reference, shall constitute the entire agreement of the parties and may not be modified unless specifically agreed to by the Company in writing. No terms stated by Buyer in its proposal, request for proposal, bid, purchase order, acknowledgment or other form shall be binding upon the Company except as specifically approved in writing or expressly incorporated herein by the Company. Buyer is hereby notified of the Company's objection to and rejection of any additional or different or conflicting terms in Buyer's proposal, request for proposal, bid, purchase order, acknowledgment, or other forms. THE COMPANY'S PROPOSAL IS EXPRESSLY LIMITED TO ACCEPTANCE UPON THE TERMS AND CONDITIONS CONTAINED HEREIN.

B. EQUIPMENT SELECTION. The selection of sizes, types, capacities, and specifications of Equipment purchased by Buyer and the suitability thereof for Buyer's specific application shall be the sole responsibility of Buyer and/or Buyer's representative or consultant.

C. CANCELLATION AND MODIFICATION OF ORDERS. Orders are not subject to change or cancellation by Buyer. Orders may be canceled by Buyer only upon (1) written notice to the Company subsequently accepted in writing by the Company and (2) payment to the Company of reasonable cancellation charges for costs, losses and anticipated profits to be solely determined by the Company. Company shall have the right to cancel a contract for an order without any liability on its part.

D. CREDIT APPROVAL. All orders by Buyer are subject to credit investigation and approval prior to acceptance by the Company. Company reserves the right to withdraw credit and require full payment before production, shipment, delivery or installation if Company, within its sole discretion, determines Buyer's financial condition does not merit Company's extension of credit.

E. TAXES AND CHARGES. Federal, state and local taxes are not covered in the Company's price unless expressly stated on the Proposal and will be added to the purchase price, where applicable.

F. FREIGHT. Unless otherwise stated on the quotation form, prices are F.O.B. shipping point.

G. SHIPPING DATES. Shipment dates are approximate. All shipment dates are subject to strikes, accidents, shortages of material or labor, delays of carriers or causes that are unavoidable or beyond the control of Company.

H. TRANSPORTATION RISK. Title to Products and risk of loss passes to Buyer at the shipping point. Buyer assumes all risks of loss of damage upon the Company's delivery of the Products to the initial carrier. All Products are shipped at Buyer's risk.

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I. DELAYS IN DELIVERY. The Company has no obligation to deliver Products against any order by Buyer unless and until the order has been accepted by issuance of the Company's acknowledgement of order. In any event, the Company shall not be liable for any delay or failure in the delivery or shipment of Products against any accepted order, or for any damages suffered by reason thereof, in the event that such delay or failure is, or such damages are, directly or indirectly due to either accident in manufacture or otherwise, fire, flood, riot, war, embargo, labor stoppages, inadequate transportation facilities, shortage of materials or supplies, delay or default on the part of Company's vendors, regulation by any governmental authority, or any cause or causes beyond Company's control. The Company shall have no liability whatsoever for any direct, indirect, special, consequential, and incidental or liquidated damages or penalties. Buyer shall reimburse the Company for any additional cost to the Company resulting from delays caused by Buyer.

J. STORAGE. If shipment is delayed due to any cause within Buyer's control, the Products may be placed in storage by the Company for Buyer's account and risk and regular charges therefore and expenses in connection therewith shall be paid by Buyer. If, in the sole opinion of the Company, it is unable to obtain or continue such storage, Buyer will, on request, provide or arrange for suitable storage facilities and assume all cost and risk in connection therewith.

K. CLAIMS. The Company shall not be liable to Buyer for loss or damages to Products while in transit or after acceptance of delivery by Buyer. Shortages or damage of Products must be brought to the attention of the carrier at the time of delivery and stated in writing on the delivery papers in order to initiate a claim.

L. WARRANTIES AND LIMITATION OF LIABILITY. Superior warrants all equipment manufactured by it and bearing its nameplate to be free from defects in workmanship and material, under normal use and service within one (1) year from the date the equipment is first placed in use for any purpose, temporary or otherwise, or eighteen (18) months from the date of shipment, whichever shall be less. (See current warranty.) Buyer must provide written notice to Company within the warranty period of any defect in workmanship or material. Except where a different expressed written warranty has been issued, no warranty of any kind, express or implied, is extended by Superior to any person or persons other than its direct buyer.

Superior shall have no responsibility for the performance of any product sold by it under conditions varying materially from those under which such product is usually tested under existing industry standards, nor for any damage to the product from abrasion, erosion, corrosion, deterioration or the like due to abnormal temperatures or the influences of foreign matter or energy, nor for the design or operation of any system of which any such product may be made a part or for the suitability of any such product for any particular application. Superior shall not be liable for any cost or expense, including without limitation, labor expense, in connection with the removal or replacement of alleged defective equipment or any part or portion thereof, nor for incidental or consequential damages of any kind. Any substitution of parts not of Superior's manufactures or not authorized by Superior, or any modification, tampering, or manipulation of Superior's product shall void any and all warranties. Alteration of any parts without express written permission of Superior for a purpose other than that intended shall void any and all warranties.

The foregoing warranties shall not apply to products or parts not manufactured by Superior.

Warranty Validation: Superior Boiler Works, Inc. Field st art-up reports must be c ompleted, dated and signed then returned to Superior Boiler Works, Inc., P.O. Box 1527, Hutchinson, KS 67504-1527, ATTN: Sales Secretary to validate warranty.

M. DISCLAIMER OF IMPLIED WARRANTIES AND LIMITATION OF REMEDIES. The foregoing warranties are in lieu of all other warranties, expressed or implied, including but not limited to the implied warranties of merchantability and fitness for a particular purpose, and such implied warranties are expressly disclaimed. In no case shall Company be liable for any special, incidental, indirect or consequential damages, whether based upon breach of warranty, breach of contract, negligence, strict tort, or any other legal theory. In no event shall Company be liable for more than the purchase price of the Products in this contract.

N. SECURITY INTEREST. The Buyer hereby grants to the Company and the Company hereby retains a security interest in all Products furnished by the Company and the proceeds thereof, until the purchase price therefore is fully paid. Buyer appoints Company iota attorney in fact to execute any security agreement requested by Company and authorizes Company to file financing statements evidencing such security agreement.

O. RETURNS. Products may not be returned by Buyer for credit unless and until the company has agreed in writing to accept them. A minimum charge of twenty percent (20%) of the price of the returned Products shall be paid by Buyer for re-handling, restocking and/or reconditioning. All transportation costs for the returned Products must be paid by Buyer.

P. ASSIGNMENT. Any assignment of the rights accruing hereunder shall be void without the prior written consent of the Company.

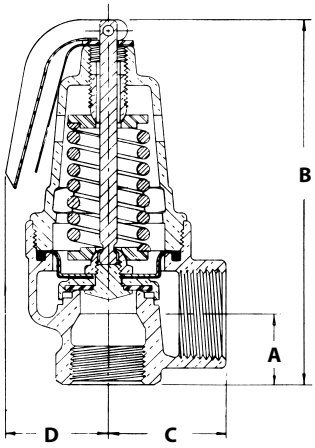
Q. WAIVER. The Company's waiver of any breach by Buyer of any of the provisions of these Terms and Conditions or the Proposal shall not constitute a waiver of any other breach of the same or any other provision. The Company's rights and remedies under any provision of these Terms and Conditions or the Proposal shall be in addition to and not in substitution of any other rights and remedies available to the Company under applicable law.

R. GOVERNING LAW AND ARBITRATION. This Proposal is to be interpreted in accordance with, and its administration and performance governed by, the laws of the State of Kansas. The parties hereto agree that Reno County, Kansas, shall be the exclusive forum for any cause of action filed in any court of law or equity arising out of the execution of or performance under this Proposal. Notwithstanding the foregoing, in the event Buyer is located outside the United States of America and purchases Products pursuant to the terms hereof for use outside the United States of America, any dispute between such Buyer and the Company respecting the Products shall be finally resolved by arbitration in the English language in Hutchinson, Kansas, Reno County, U.S.A. in accordance with the rules then obtaining of the American Arbitration Association, and judgment upon the award rendered may be entered in any court having jurisdiction thereof.

S. HEADINGS AND SEVERABILITY. Any headings preceding the text of the several articles hereof are inserted solely for convenience of reference, shall not constitute a part of the Terms and Conditions or the Proposal and shall not otherwise affect the meanings, content, effect or construction of these Terms and Conditions or the Proposal. In the event that any provision contained herein is held to be invalid or unlawful, such provision shall be severable from the remaining provisions of these Terms and Conditions or the Proposal which shall remain in full force and effect.

High Capacity Safety Relief Valves for Hot Water Heating Boilers

10-600 SERIES



High-capacity heating system valves with female inlet and standard or expanded female outlet. Elevated seat for drainage of water away from seat area. Entire pressure range is National Board capacity certified.

ASME Section IV
Inlet Sizes 3/4" to 2"
Factory set pressures from 15-160 psig
Maximum temperature service 250°F

HV
Section IV
Heating Boilers

APPLICATIONS:
Hot water heating boilers and hot water supply systems

FEATURES:
- High Btu capacity rating
- Silicone seat
- Fabric reinforced molded diaphragm isolates spring from water at all times
- Bronze body and spring cage
- Registered in Canadian provinces and territories CRN #0G8547.5C
- Protects against excessive water pressure due to failure of controls to regulate Btu input

DIMENSIONS AND WEIGHTS

Model Number	Size(in./mm.)		Certified Pressure Range psig	Wt./100 (lbs./kg.)	Dimensions (in./mm.)			
	Inlet NPT	Outlet NPT			A	B	C	D
10-604	3/4F	3/4F	15-160	232	1.03	5.25	1.62	1.56
	20	20		105.2	26	133	41	39
10-614	3/4F	1 F	15-160	226	1.03	5.25	1.72	1.56
	20	25		102.5	26	133	43	39
10-605	1F	1F	15-160	410	1.25	6.69	2.00	2.00
	25	25		185.9	31	169	50	50
10-615	1 F	1-1/4F	15-160	390	1.25	6.69	2.00	2.00
	25	32		176.9	31	169	50	50
10-606	1-1/4F	1-1/4F	15-160	795	1.25	8.37	2.47	2.62
	32	32		360.5	31	212	63	67
10-616	1-1/4F	1-1/2F	15-160	755	1.25	8.37	2.47	2.62
	32	40		342.4	31	212	63	67
10-607	1-1/2F	1-1/2F	15-160	1100	2.00	10.75	2.75	3.12
	40	40		498.9	50	273	69	79
10-617	1-1/2F	2F	15-160	1145	2.00	10.75	2.75	3.12
	40	50		519.3	50	273	69	79
10-608	2F	2F	15-160	2375	2.19	14.00	3.69	3.50
	50	50		1077.1	55	355	93	88
10-618	2F	2-1/2F	15-160	2315	2.19	14.00	3.66	3.50
	50	65		1049.9	55	355	92	88

P/N SUFFIX KEY

Set Pressure psig	Suffix	Set Pressure psig	Suffix
15	-01	85	-17
20	-02	90	-18
22	-03	95	-19
25	-04	100	-20
30	-05	105	-21
35	-06	110	-22
40	-07	115	-23
43	-08	120	-24
45	-09	125	-25
50	-10	130	-30
55	-11	135	-31
60	-12	140	-32
65	-13	145	-33
70	-14	150	-34
75	-15	155	-35
80	-16	160	-36

ORDERING CODE:
Use two-digit suffix number to indicate Inlet x Outlet size and set pressure.

EXAMPLES:
10-615-12
1"x 1-1/4" 10-610 set 60 psig
10-608-05
2"x 2" 10-600 set 30 psig

High Capacity Safety Relief Valves for Hot Water Heating Boilers

HV

10-610 SERIES

ASME SECTION IV HOT WATER

British thermal units per hour (Kilocalories per hour) at 10% overpressure. National Board Certified. Ratings are 90% of actual.

US Customary Units Btu/Hr.

Model No.	10-614 3/4 x 1	10-615 1 x 1-1/4	10-616 1-1/4 x 1-1/2	10-617 1-1/2 x 2	10-618 2 x 2-1/2
Set Pressure psig					
15	635,000	1,027,000	1,777,000	2,417,000	3,984,000
20	746,000	1,208,000	2,090,000	2,843,000	4,686,000
25	858,000	1,389,000	2,403,000	3,270,000	5,389,000
30	970,000	1,570,000	2,716,000	3,696,000	6,091,000
35	1,082,000	1,751,000	3,030,000	4,122,000	6,793,000
40	1,194,000	1,933,000	3,343,000	4,548,000	7,496,000
45	1,306,000	2,114,000	3,656,000	4,974,000	8,198,000
50	1,418,000	2,295,000	3,969,000	5,400,000	8,900,000
55	1,529,000	2,476,000	4,283,000	5,826,000	9,603,000
60	1,641,000	2,657,000	4,596,000	6,252,000	10,305,000
65	1,753,000	2,838,000	4,909,000	6,679,000	11,007,000
70	1,865,000	3,019,000	5,222,000	7,105,000	11,710,000
75	1,977,000	3,200,000	5,535,000	7,531,000	12,412,000
80	2,089,000	3,381,000	5,849,000	7,957,000	13,114,000
85	2,201,000	3,562,000	6,162,000	8,383,000	13,817,000
90	2,313,000	3,743,000	6,475,000	8,809,000	14,519,000
95	2,424,000	3,924,000	6,788,000	9,235,000	15,221,000
100	2,536,000	4,105,000	7,101,000	9,661,000	15,924,000
105	2,648,000	4,286,000	7,415,000	10,088,000	16,626,000
110	2,760,000	4,468,000	7,728,000	10,514,000	17,328,000
115	2,872,000	4,649,000	8,041,000	10,940,000	18,031,000
120	2,984,000	4,830,000	8,354,000	11,366,000	18,733,000
125	3,096,000	5,011,000	8,668,000	11,792,000	19,435,000
130	3,207,000	5,192,000	8,981,000	12,218,000	20,138,000
135	3,319,000	5,373,000	9,294,000	12,644,000	20,840,000
140	3,431,000	5,554,000	9,607,000	13,070,000	21,543,000
145	3,543,000	5,735,000	9,920,000	13,497,000	22,245,000
150	3,655,000	5,916,000	10,234,000	13,923,000	22,947,000
155	3,767,000	6,097,000	10,547,000	14,349,000	23,650,000
160	3,879,000	6,278,000	10,860,000	14,775,000	24,352,000

Metric Units Kcal/Hr.

Model No.	10-614 20 x 25	10-615 25 x 32	10-616 32 x 40	10-617 40 x 50	10-618 50 x 65
Set Pressure barg					
1.03	160	259	448	610	1,005
1.38	188	305	527	717	1,182
1.72	216	350	606	825	1,359
2.07	245	396	645	932	1,536
2.41	273	442	765	1,040	1,713
2.76	301	488	843	1,147	1,890
3.10	329	533	922	1,254	2,067
3.45	358	579	932	1,362	2,244
3.79	386	624	1,080	1,469	2,422
4.14	414	670	1,159	1,577	2,599
4.48	442	716	1,238	1,684	2,776
4.83	470	761	1,317	1,792	2,953
5.17	498	807	1,396	1,899	3,130
5.51	527	827	1,475	2,007	3,307
5.86	555	898	1,554	2,114	3,485
6.20	583	944	1,633	2,222	3,662
6.55	611	990	1,712	2,329	3,839
6.89	640	1,035	1,791	2,437	4,016
7.24	668	1,081	1,870	2,544	4,193
7.58	696	1,127	1,949	2,652	4,370
7.93	724	1,172	2,028	2,759	4,547
8.27	752	1,218	2,107	2,866	4,724
8.62	781	1,264	2,186	2,974	4,901
8.96	809	1,309	2,265	3,081	5,079
9.31	837	1,355	2,344	3,189	5,256
9.65	865	1,401	2,423	3,296	5,433
10.00	893	1,446	2,502	3,404	5,610
10.34	922	1,492	2,581	3,511	5,787
10.69	950	1,538	2,660	3,619	5,964
11.03	978	1,583	2,739	3,726	6,141

Form 266
Sheet P/N 100204-2
Rev. H

Warrick® Series 26NM Control

Installation and Operation Bulletin

This bulletin should be used by experienced personnel as a guide to the installation of the Series 26NM Control. Selection or installation of equipment should always be accompanied by competent technical assistance. We encourage you to contact Gems Sensors or a representative if further information is required.

Specifications

Control Design: Solid-state components enclosed in a clear Lexan plug-in style housing. Not NEMA Rated.
Contact Design: 1 SPST (1 form A), N.O. Non-powered contact.
Contact Ratings: 10A @120/240-VAC resistive (120°F), 1A @120/240VAC resistive (150°F), 1/3 Hp @ 120/240-VAC (120°F).
Contact Life: Mechanical - 5 million operations
Electrical - 100,000 operations minimum at rated load
Supply Voltage: Factory Configured: **24V, 120V, 220V, or 240V AC** +10%/-15% of nominal, 50/60 Hz. Factory Configured: **208V/240V Model**: 187V Min to 242V Max, VAC 50/60 Hz
Power Consumption: 24/120/220/240-VAC with relay energized ~ 4.4 VA.
Secondary Circuit: 2.3 VAC RMS voltage on probes, < 1 milliampere source capability.
Sensitivity: Factory programmed to 4.7K, 10K, 26K, 50K, or 100K Ohms
Operating Ambient Temperature Range: -40°F to +150°F (-40°C to +65°C)
Terminals: All connections made with screw-clamp terminals.
Time Delays: Standard LLCO, 0.5 sec. on rising level, 3 sec. on falling level. Optional 0-90 sec. time delays in 1-sec. increments for rising and falling.
Listings: Control carries U.L. Limit Control Listing (UL-353) for 24VAC and 120VAC Line Powered units only (220VAC, 240VAC, 208/240VAC units not rated).

Installation

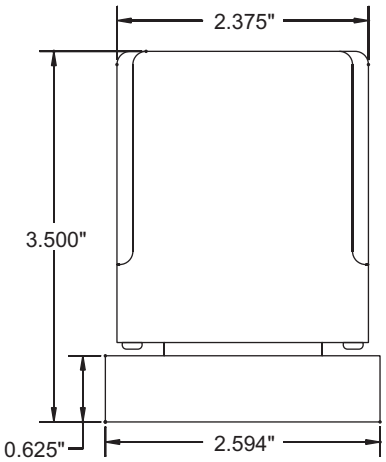
1. Install octal socket in appropriate enclosure using two #6 or #8 screws.
2. Install rail mount socket on appropriate rail (DIN mount) in appropriate enclosure if applicable.
3. Wire control per wiring diagram following N.E.C and local codes.
4. Install control module in socket.

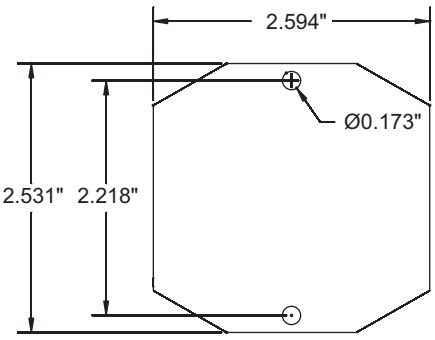
Sensitivity vs. Maximum Probe Wire Distance*

SENSITIVITY CHARACTER	SENSITIVITY (K-OHMS)	Distance (FT)
A	4.7	900
B	10	600
C	26	250
D	50	100
E	100	50

* Based on type MTW or THHN wire, #14 or #16 AWG

Dimensional Drawing

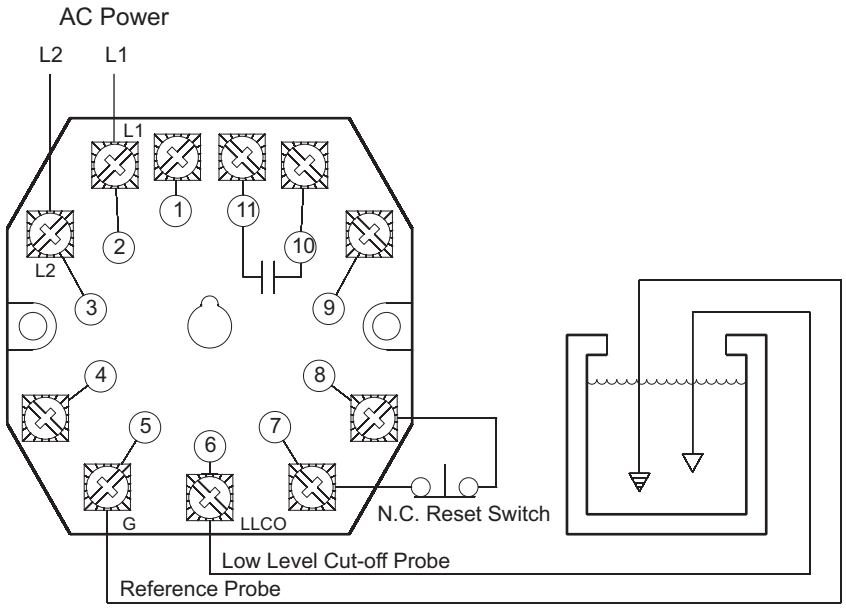




Mount the octal socket (base) on rigid vertical or horizontal surface using #6 or #8 screws. The control should be mounted within an enclosure of proper NEMA integrity.

Torque all terminals and socket mounting screws to 7 in-lb max.

Wiring Diagram



Operation

AUTOMATIC RESET (Reset Switch terminals not wired) When the liquid rises to the electrode on terminal LLCO, the control energizes, changing state of the load contacts. (LED will be lit) The control remains energized until the liquid level recedes below electrode on terminal LLCO. The control then de-energizes, (LED will not be lit) returning load contacts to original state. Unless otherwise specified, there is a three second time delay on decreasing level. Liquid must be below probe on terminal LLCO for a full three seconds before control de-energizes.

MANUAL RESET (Normally closed pushbutton installed across reset terminals) When the liquid rises to the electrode on terminal LLCO, the control will remain de-energized until the pushbutton is depressed. Upon Reset Swtich activation, the control will energize, (LED will be lit) changing the state of the contacts. The control remains energized until the liquid level recedes below electrode on terminal LLCO. The control then de-energizes, (LED will not be lit) returning load contacts to their original state. Unless otherwise specified, there is a three second time delay on decreasing level. Liquid must be below probe on terminal LLCO for full three seconds before control de-energizes.

MANUAL RESET OPTIONAL POWER OUTAGE FEATURE (Normally closed pushbutton across reset terminals) Control will auto-recover from a power loss. With liquid present on LLCO electrode at a power outage event, the control will de-energize and will automatically re-energize upon return of power with liquid present on the probe at power-up. However, if loss of liquid is sensed on power-up, the control will remain de-energized until liquid again rises to electrode and pushbutton is depressed. The control will not attempt to auto-recover from a power outage if no liquid was present on the probe at power loss.

TEST FEATURE
Allows LLCO circuit to be tested without the need to drop the water level in the boiler to create a dry probe condition. Holding down the reset button for 3 seconds will allow the LLCO circuit to trip, simulating a dry probe. The controller will return to normal operation once the reset button is pressed a second time.

LED STATUS INDICATOR In normal operation, the LED on the control will either be on or off depending on the controller state. On-board microprocessors continuously monitor for fault conditions. In the event a fault is detected, the LED will blink a pattern indicating the fault type. If you experience an inoperable control and the LED is blinking, attempt to leave the control in the blinking state and contact the factory for assistance.

26NM XXXXX-XX-XX

- **Time Delay Increasing Level:** 0-90 seconds, Blank = 0 seconds.
- **Time Delay Decreasing Level**: 0-90 seconds, Blank = 3 seconds.
- **Optional Character:** see Chart
- **ENCLOSURE: 0-**None, **1-**NEMA 1, **2-**NEMA 4
- **Socket Style: A-**11 Pin Octal, **B-**Din Mount, **M-**NONE, Module Only
- **Supply Voltage: 1-**120VAC (+10%/-15%), **2**-240VAC (+10%/-15%), **3**-24VAC (+10%/-15%), **5**-220VAC (+10%/-15%), **8**-208/240VAC (187 to 242 VAC absolute range)
- **Mode/Sensitivity: A**-4.7K, **B**-10K, **C**-26K, **D**-50K, **E**-100K

	N.C. Pushbutton	Power Outage	Test Feature
A	X	X	X
B			X
C	X		
E		X	
F	X	X	
Y	X		X
Z		X	X
X	No Option		

Gems Sensors & Controls
Gems Sensors Inc.
One Cowles Road
Plainville, CT 06062-1198
Tel: 860.793.4579

Series 3E – Pipe Thread Attachment
Series 3N – Flat Surface Mounting

- Up to 7 Probes
- Threaded Attachment (3E)
- CSA Approved
- FM Approved (3E)
- Flat Mounting (3N)
- Available in Various Body Metals
- U.L. Recognized (3E)

Series 3E fittings are cast metal, pressure-tight assemblies capable of handling 1-7 probes. Attachment to vessels is accomplished with external pipe threading. 3E Fittings require the use of 3R rigid or 3W wire suspended electrodes.

Series 3N fittings accommodate 1-3 probes operating at atmospheric pressure. The assembly mounts on a flat surface atop open tanks or closed vessels. 3N Fittings require the use of 3R rigid or 3W wire suspended electrodes.

Series 3E

Series 3N

Specifications

Type of Connection	
Series 3E	Threaded
Series 3N	Flat Surface Mounting
Probes	
Series 3E	1 thru 7
Series 3N	1 thru 3
Terminal Housing	Die cast aluminum, epoxy coated
Body Material	
Series 3E	Cast iron, red brass, 316 stainless steel
Series 3N	PVC, red brass, 316 stainless steel
Pressure/Temperature	
Series 3E	125 psig @ 353°F (cast iron); 250 psig @ 406°F (brass, 316 s.s.)
Series 3N	0 psig @ 150°F (PVC); 0 psig @ 500°F (brass, 316 s.s.)
Approvals	
Series 3E	U.L. File # MP2489, Vol. 1, Sec. 2; CSA; FM
Series 3N	CSA File # LR11644

Dimensions

Series	No. of Probes	Attachment to Vessel	Conduit Boss Thread Size	Terminal Housing Size (W″ x D″ x H″)
3E	1	1″ NPT	1/2″ NPT	2-1/4 x 2-1/4 x 2-1/4
	2	2″ NPT	1/2″ NPT	3-1/4 x 3-1/4 x 2-3/8
	3	2″ NPT	1/2″ NPT	3-1/4 x 3-1/4 x 2-3/8
	4	2-1/2″ NPT	1/2″ NPT	3-1/4 x 3-1/4 x 2-3/8
	5	3″ NPT	3/4″ NPT	4 x 4 x 2-1/2
	6	3″ NPT	3/4″ NPT	4 x 4 x 2-1/2
	7	3″ NPT	3/4″ NPT	4 x 4 x 2-1/2
3N	1	2-1/4″ square flat pad, 1-1/2″ dia. hole in top of vessel secured with #10 machine screws at the corners of a 1-1/2″ square	1/2″ NPT	2-1/4 x 2-1/4 x 2-1/4
	2		1/2″ NPT	3-1/4 x 3-1/4 x 2-3/8
	3		1/2″ NPT	3-1/4 x 3-1/4 x 2-3/8

Applications

- Open Tanks
- Closed Vessels
- Water
- Diluted Corrosive Liquids

How to Order

Use the **Bold** characters from the chart below to construct a product code.

3E X X

Series
3E **3N**

Number of Probes[1]
1 – One **5** – Five
2 – Two **6** – Six
3 – Three **7** – Seven
4 – Four

Body Material
A – Cast Iron (3E) PVC (3N)
B – Red Brass
C – 316 Stainless Steel

Notes:
1. 3N features up to three probes only.
2. Special modifications available. Consult factory.

Honeywell

L4006A,B,E,H Aquastat® Controllers

INSTALLATION INSTRUCTIONS

APPLICATION

These boiler-mounted, immersion type controllers operate in response to temperature changes in hydronic heating systems.

L4006A breaks the circuit on a temperature rise to the control setting. It is used for high limit or low limit control. When used as a controller or as a low limit, a separate high limit must be used.

L4006B makes the circuit on a temperature rise. It is used as a circulator controller, delaying circulator operation when boiler water temperature is below the control setting.

L4006E,H includes a trip-free manual reset switch. These models are designed to break the control circuit whenever the temperature of the controlled medium reaches the high limit setting. A reset button on the front of the case must be pressed to re-establish the control circuit. L4006H also includes bracket and clamp for surface mounting on pipe or tank.

A plastic bag of heat-conductive compound is included with the L4006A,B,E Aquastat® Controllers for use when the sensing bulb is inserted into a well designed for a large bulb than the one used on the L4006A,B,E. A 124904 Well Adapter, for use on old wells that do not fit the L4006A,B,E immersion well clamp, can be ordered; see form 68-0040, Wells and Fittings for Temperature Controllers. A setting stop is included to prevent setting above a desired temperature on limit.

If a well adapter or other accessories are needed, refer to form 68-0040, Wells and Fittings for Temperature Controllers, for part numbers and ordering information.

INSTALLATION

When Installing This Product…

1. Read these instructions carefully. Failure to follow them could damage the product or cause a hazardous condition.
2. Check the ratings given in the instructions and on the product to make sure the product is suitable for your application.
3. Installer must be a trained, experienced service technician.
4. After installation is complete, check out product operation as provided in these instructions.

⚠ WARNING

Electrical Shock Hazard.
Can cause serious injury, death or equipment damage.
Disconnect the power supply before beginning installation to prevent electrical shock or equipment damage.

Installing Immersion Well Models (L4006A,B,E)

IMPORTANT

Obtain the best thermal response with a well that snugly fits the sensing bulb. The bulb should be inserted until it rests against the bottom of the well. Use a well of correct length and bend the tubing, if necessary, to provide enough force to hold the bulb against the bottom of the well. Do not make a sharp bend in the tubing. A sharp bend can produce a break in the tubing and cause a loss of fill. This condition will cause the high and low limit controls to be made continuously.

If the well is not a snug fit on the bulb, use the heat-conductive compound as follows. Fold the plastic bag of compound lengthwise and twist gently. Snip the end of the bag and insert into the well. Slowly pull out the bag while squeezing firmly to distribute the compound evenly in the well. Insert the bulb into the well. Bend the tubing, if necessary, to provide force to hold the bulb against the bottom of the well and to hold the out end of the bulb in firm contact with the side of the well. Wipe off any excess compound.

NOTE: Some models have an adjustable capillary tubing length to 3 inches (76 mm). In these models, pull out extra tubing from inside the case, if needed.

Follow the boiler manufacturer instructions, if available; otherwise, proceed as follows.

1. Remove the old control.
2. Refer to the cover insert of the old control to identify and tag each lead as it is disconnected.
3. Leave the old well in place if it is suitable.

If Well is Otherwise Suitable But Does Not Fit The L4006 Immersion Well Clamp

Use a 124904 Well Adapter (order separately, see form 68-0040) to secure the L4006 to the old well. The adapter has a flange at one end for fastening the L4066 adapter clamp.

1. Loosen, but do not remove, the two adapter clamp screws (see Fig. 1).
2. Slide the adapter onto the capillary and short tube; see Fig. 2 inset.
3. Make sure the flanged end of the adapter fits into the hole in the case. Position the adapter well clamp snugly over the flange on the adapter, then tighten the clamp screws.
4. Insert the bulb into the well, as shown in Fig. 2. If necessary, use the heat-conductive compound as instructed in the IMPORTANT statement on page 1.
5. Tighten the setscrew (if one is present in the old well spud) against the adapter.

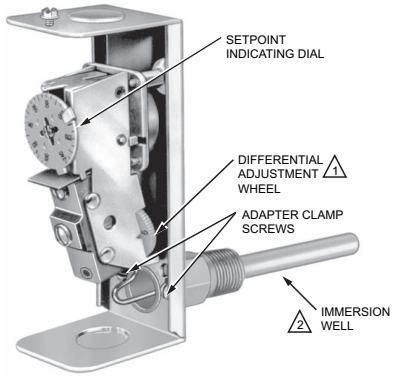


Fig. 1. Internal view of L4006A,B with horizontal well. L4006E is the same with reset button added.

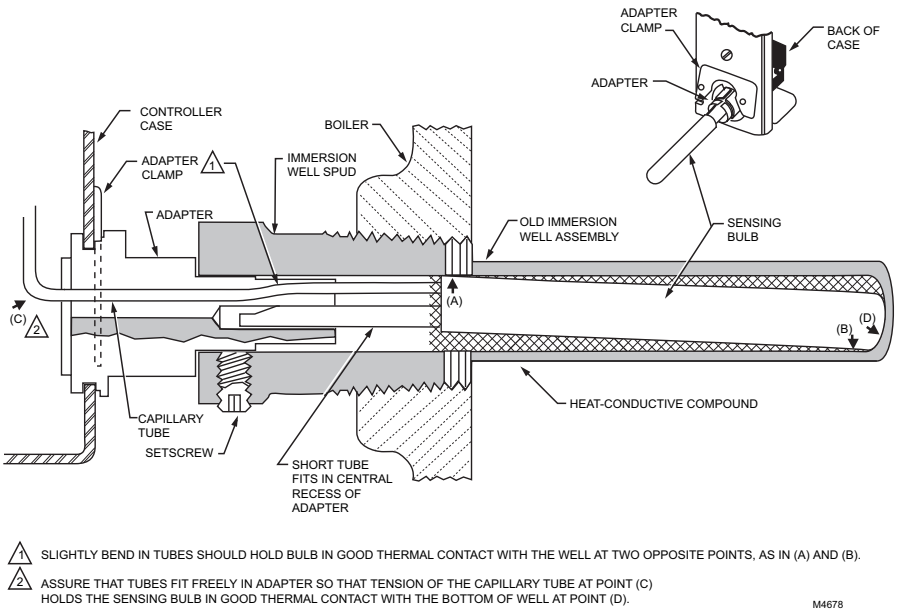


Fig. 2. Bulb in immersion well and use of adapter.

If the Old Well Is Unsuitable.

1. Drain the system and remove the well.
2. Select a new well from form 68-0040 (order well separately).
3. Install the new well, refill the system and check for leaks.
4. Loosen, but do not remove, the two adapter clamp screws (Fig. 1).
5. Insert the sensing bulb into the well until it bottoms as show in Fig. 2. Add heat-conductive compound, if necessary, as instructed in the IMPORTANT statement on page 1.

6. Make sure the end of the well fits into the hole in the case. Position the immersion well clamp snugly over the well flange and tighten the clamp screw securely.

Mounting Surface Mount Model (L4006H)

The L4006H is designed for surface mounting on piping or tank and can be mounted in any position.

When mounting the L4006H on piping, the pipe should be 1 in. (25 mm) diameter or larger for accurate temperature sensing.

1. Remove any insulation from the pipe.
2. Thoroughly scrape off all scale, rust or paint.
3. Mount controller as shown in Fig. 3 using adjustable 12 in. (294 mm) pipe strap furnished.

When mounting the L4006H on a tank, use a pipe strap of appropriate length, approximately 6-10 ft (17.6- 29.4m) for the tank (not provided). Fit the pipe strap through the slot in the mounting bracket. See Fig. 3.

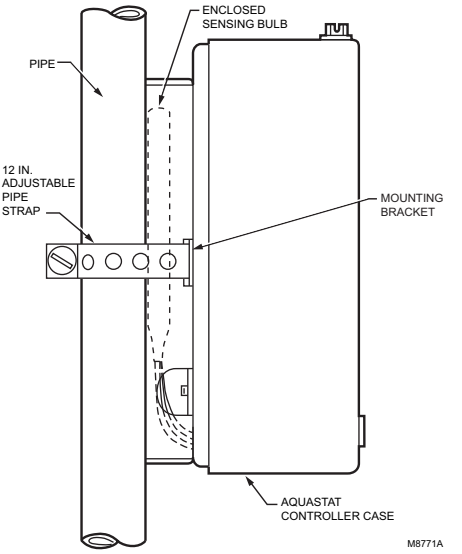


Fig. 3. Mount L4006H directly on surface.

Wiring

⚠ WARNING

Electrical Shock Hazard.
Can cause serious injury, death or equipment damage.
Disconnect power supply before connecting wiring to avoid electrical shock or equipment damage.

All wiring must comply with local codes and ordinances regarding wire size, insulation, enclosure, etc. See Fig. 4 and 5 for typical diagrams of Aquastat® Controllers used in heating systems.

Use these Aquastat Controllers with copper wire only.

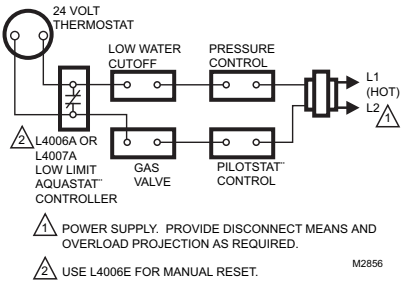


Fig. 4. Typical hookup for gas-fired system with domestic hot water.

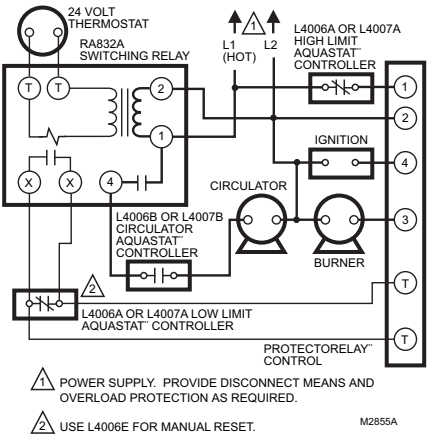


Fig. 5. Hookup for oil-fired, summer-winter, hydronic system with domestic hot water. This is typical where control for domestic hot water is added, or where each Aquastat Controller is mounted in a separate location.

OPERATION

For proper selections of settings, follow boiler manufacturer recommendations:

1. High limit controller: Shuts off burner when water temperature exceeds high limit setting. Burner restarts when temperature drops to high limit setting minus the temperature differential.

NOTE: If L4006E or H, see Manual Reset section.

2. Low limit controller: Maintains minimum boiler temperature for domestic hot water. Turns boiler on at temperature setting, less differential.
3. Circulator controller: Prevents circulation of water that is not hot enough. Breaks circulator circuit at temperature setting minus differential and remakes at setting.

ADJUSTMENT

Set the differential to correspond with the boiler manufacturer recommendations. To adjust models with adjustable differential, rotate the wheel on the back of the snap switch until the desired reading is aligned with the V notch in the frame. The wheel provides an adjustment from 5°F to 30°F (3°C to 17°C). Replace the cover on the Aquastat Controller.

Adjust the control point to correspond with the boiler manufacturer recommendations. To adjust, insert a screwdriver in the slotted screw type head located beneath the window in the cover. Turn the scale to the desired control point.

Manual Reset

When the device includes manual reset (L4006E and H), be sure to press the red reset button on the front of the case to make sure that the controller is not locked out on safety. When checking out the system, adjust the control point low enough so the temperature of the controlled medium reaches the high limit setting, the burner shuts off, and the Aquastat Controller locks out. When the temperature of the controlled medium drops to the high limit setting minus differential, push the manual reset button and the system should be operative again. Reset control to proper high limit setting.

CHECKOUT

Check to make certain that the Aquastat Controller has been installed and adjusted properly. Put the system into operation and observe the action of the device through several cycles to make certain that it provides proper control of the system as described in the Operations section. Further adjustments can be made to meet more exact comfort requirements.

MATERIAL SAFETY DATA SHEET

Section 1. Product And Company Identification

Product Name: Heat Conductive Compound

MSDS ID: DS9021

Synonyms: MS1699

Product Use: Heat conductive material used to enhance contact and heat transfer in temperature sensor applications.

Manufacturer: Honeywell Inc., 1985 Douglas Drive North, Minneapolis, MN 55422.

Date Released: October 8, 1999

Customer Response Center: 800-328-5111

Emergency Telephone Information: 888-809-3787

NFPA Ratings:

Health 0; Flammability 1; Reactivity 0; Personal Protection B

Section 2. Composition, Information on Ingredients

Ingredient	CAS Number	Percent	PEL	TVL
#2 Lithium Complex Grease (70%):				
Mineral Oil	64742-65-0	35-50	5 mg/m^3	5 mg/m^3
Mineral Oil	64742-62-7	20-25	5 mg/m^3	5 mg/m^3
Lithium Hydrostearate/Sebacate Complex	68815-49-6	4-9	—	—
Zinc Alkyldithiophosphate	68649-42-3	0-2	—	—
Aluminum Paste (30%):				
Aluminum, as Al	7429-90-5	20-25	15 mg/m^3	10 mg/m^3
Aliphatic Petroleum Distillates	8052-41-3	10-15	2900 mg/m^3	525 mg/m^3
Stearic Acid	57-11-4	1-2	—	—
Aromatic Petroleum Distillates	64742-95-6	1-2	5 mg/m^3	5 mg/m^3

Additional Information: Part No. 120650 (0.5 oz tube); Part No. 107408 (4 oz can); Part No. 197007 (5 gallon container). May also contain minute amounts of lithium and molybdenum lubricant compounds.

Section 3. Hazard Identification

Acute Health Effects:

Skin: Excessive contact may cause skin irritation and dermatitis.

Eye: Direct contact with eye will cause irritation.

Inhalation: No adverse effects are expected.

Ingestion: Ingestion of product may cause nausea, vomiting and diarrhea.

Chronic Health Effects:

Existing skin rash or dermatitis may be aggravated by repeated contact.

OSHA Hazard Classifications: None.

Carcinogenicity: Not considered to be a carcinogen by either OSHA, NTP, IARC, or ACGIH.

Section 4. First Aid Measures

Eye Contact: Flush eyes with water for 15 minutes. Remove any contact lenses and continue to flush. Obtain medical attention if irritation develops and persists.

Skin Contact: Remove excess with cloth or paper. Wash thoroughly with mild soap and water. Obtain medical attention if irritation develops and persists.

Ingestion: Contact physician or local poison control center *immediately.*

Inhalation: Remove patient to fresh air and obtain medical attention if symptoms develop.

Section 5. Fire Fighting Measures

Material Flash Point: > 383°F (195°C). Will burn if exposed to flame.

Extinguishing Media: Carbon dioxide, dry chemical or foam.

Special Fire Fighting Procedures: None.

Explosion Hazards: None. Aluminum powder can react with water to release flammable hydrogen gas. In the form of this product, this reaction is not expected.

Section 6. Accidental Release Measures

Scrape up and dispose of as solid waste in accordance with state and federal regulations.

Section 7. Handling and Storage

Store in dry place. Keep container closed when not in use.

Section 8. Exposure Controls and Personal Protection.

Ventilation: No special ventilation is required when working with this product.

Respiratory Protection: None required.

Eye Protection: Not normally required. However, use chemical safety goggles or faceshield if potential for eye contact exists, especially if material is heated.

Hand/Clothing Protection: Not normally required. Protective gloves and clothing are recommended, as material is difficult to remove from skin and clothing.

Other Protective Equipment: None required.

Section 9. Physical and Chemical Properties

Appearance/Odor: Aluminum color, semi-solid material, pleasant odor.

Solubility in Water: Negligible.

Specific Gravity: 0.86.

Section 10. Stability and Reactivity

Stability: Stable.

Reactivity: Hazardous polymerization will not occur.

Incompatibilities: Strong oxidizing agents and halogens.

Hazardous Decomposition Products: Carbon dioxide, carbon monoxide.

Section 11. Toxicology Information.

No data available.

Section 12. Ecological Information

Chemical Fate Information: Hydrocarbon components will biodegrade in soil; relatively persistent in water.

Section 13. Disposal Consideration

Dispose of as solid waste in accordance with local, state and federal regulations.

Section 14. Transportation Information

DOT Classification: Not classified as hazardous.

Section 15. Regulatory Information

SARA Title III Supplier Notification: Include in Section 311/312 inventory reports if amounts exceed 10,000 pounds. Aluminum compounds are subject to the reporting requirements under Section 313 of Emergency Planning and Community Right-To-Know Act of 1986 (40 CFR 372). Ingredients listed in TSCA Inventory.

Section 16. Other Information

This information is furnished without warranty, expressed or implied, except that is is accurate to the best of our knowledge.

Prepared by: PROSAR, 1295 Bandana Boulevard, Suite 335, St. Paul, MN 55108 (651-917-6100).

600CB

Cast Aluminum Case

COMMERCIAL• CONTRACTOR GAUGES

600CB shown

- **3½" & 4½" Dial Sizes**
- **±1.0% Accuracy**
- **Cast Aluminum Case**
- **Adjustable Pointer**

The **600CB** Trerice Contractor Gauge is among the most frequently specified HVACR gauges within the construction industry. This gauge offers high reliability at a moderate price. The 600CB is furnished with a cast aluminum case and an adjustable pointer.

- Optional features and case style variations available: Please consult the Options & Accessories Section for details.
- For correct use and application of all pressure gauges, please refer to: Pressure Gauge Standard ASME B40.100.

Specifications

Model
600CB

Dial Sizes	3½", 4½"
Wetted Parts	3½" Dial Size: Bronze tube, brass socket 4½" Dial Size: Bronze tube, brass socket
Movement	Brass
Connection	Lower male, ¼ NPT
Case	Cast aluminum, black finished, stem-mounted flangeless
Ring	3½" Dial Size: Friction type, steel, black finished 4½" Dial Size: Friction type, 304 stainless steel
Window	Clear glass
Pointer	Adjustable, black finished
Dial Face	Aluminum, white background with black graduations and markings
Accuracy	±1.0% Full Scale, ASME B40.100 Grade 1A
Maximum Temperature	**212°F** (**100°C**)
Approximate Shipping Weight	3½" Dial Size: 0.7 lbs [0.32 kg] 4½" Dial Size: 1.1 lbs [0.50 kg]

HOW TO ORDER

Sample Order Number: **600CB 35 02 L A 090**

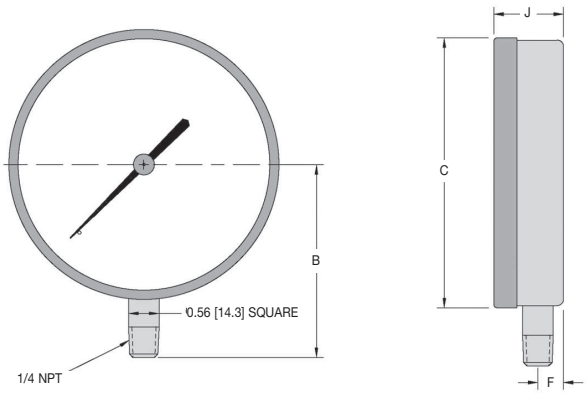
Model	Dial Size	Connection Size	Connection Location	Units of Measure	Range Code
600CB	**35** 3½" **45** 4½"	**02** ¼ NPT	**L** Lower	**A** psi **B** kPa **C** kg/cm² **D** psi/kPa **E** psi & kg/cm²	See Standard Ranges

12950 W. Eight Mile Road • Oak Park, MI 48237-3288 • TEL:248/399-8000 • FAX: 248/399-7246 • www.TRERICE.com

600CB

Cast Aluminum Case

All dimensions are nominal. Dimensions in [ ] are in millimeters.



Dial Size	B	C	F	J
3½"	3.06 [77.8]	3.88 [98.6]	0.44 [11.2]	1.22 [31]
4½"	3.54 [89.9]	4.96 [126]	0.47 [11.9]	1.28 [32.5]

Standard Ranges

psi Ranges (A)				kPa Ranges (B)				kg/cm² Ranges (C)			
Range Code	Specific Range (psi)	Figure Intervals	Minor Divisions	Range Code	Specific Range	Figure Intervals	Minor Divisions	Range Code	Specific Range	Figure Intervals	Minor Divisions
010	30" Hg to 0	5	0.5	010	–100 to 0 kPa	10	2	010	76 cm Hg to 0	10	1
020	30" Hg to 15 psi	10/5	1/0.5	020	–100 to 100 kPa	20	2	020	76 cm Hg to 1 kg/cm²	20/0.2	1/.02
030	30" Hg to 30 psi	10/5	1/–	030	–100 to 200 kPa	50	5	030	76 cm Hg to 2 kg/cm²	20/0.5	2/.02
040	30" Hg to 60 psi	10/10	2/1	040	–100 to 400 kPa	100	10	040	76 cm Hg to 4 kg/cm²	25/0.5	5/.05
050	30" Hg to 100 psi	30/20	2/2	050	–100 to 700 kPa	100	10	050	76 cm Hg to 7 kg/cm²	76/1	5/0.1
060	30" Hg to 150 psi	30/30	5/2	060	–100 to 1000 kPa	100	10	060	76 cm Hg to 10 kg/cm²	76/1	15/0.1
070	30" Hg to 300 psi	30/50	5/5	070	–100 to 2000 kPa	100/200	20	070	76 cm Hg to 21 kg/cm²	76/3	19/0.2
080	0 to 15 psi	3	0.2	080	0 to 100 kPa	10	1	080	0 to 1 kg/cm²	0.1	0.02
090	0 to 30 psi	5	0.5	090	0 to 200 kPa	20	2	090	0 to 2 kg/cm²	0.2	0.02
100	0 to 60 psi	10	1	100	0 to 400 kPa	50	5	100	0 to 4.2 kg/cm²	0.5	0.05
110	0 to 100 psi	10	1	110	0 to 700 kPa	100	10	110	0 to 7 kg/cm²	1	0.1
120	0 to 160 psi	20	2	120	0 to 1200 kPa	200	10	120	0 to 11 kg/cm²	1	0.1
130	0 to 200 psi	20	2	130	0 to 1500 kPa	300	20	130	0 to 14 kg/cm²	2	0.2
140	0 to 300 psi	50	5	140	0 to 2000 kPa	200	20	140	0 to 21 kg/cm²	3	0.2
150	0 to 400 psi	50	5	150	0 to 3000 kPa	500	50	150	0 to 28 kg/cm²	4	0.2
160	0 to 600 psi	100	10	160	0 to 4000 kPa	500	50	160	0 to 42 kg/cm²	6	0.5
180	0 to 1000 psi	100	20	180	0 to 7000 kPa	1000	100	180	0 to 70 kg/cm²	10	1

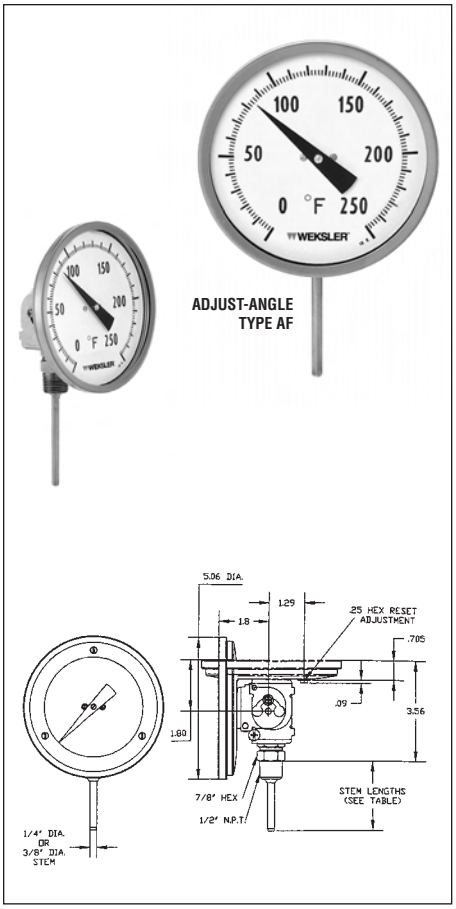
*For dual scale ranges, specify the appropriate **Units of Measure: D** (psi/kPa) or **E** (psi & kg/cm²) followed by the equivalent **A** (psi) **Range Code**. Other pressure ranges are also available including: Altitude, Ammonia, Refrigerant and Receiver. Consult Special Application Ranges section or factory for availability.*

WEKSLER®

Adjustable Angle Type
3″ and 5″ Dial Size

STANDARD RANGES

- All Stainless Steel Construction
- External Recalibration Adjustment
- White dial with black markings
- Accurate to ±1% of Scale Range
- Gasketed Glass Face
- Case is sealed to exclude dirt, dust and moisture
- 3″ and 5″ dial sizes
- Angularly adjustable frame permits positioning of dial to accommodate viewing requirements



3″ AND 5″ DIAL SIZE CATALOG NUMBERS				
STEM LENGTH	FIXED THREAD 3″	FIXED THREAD 5″	UNION CONNECTED 3″	UNION CONNECTED 5″
2½″	CF02	AF02	CU02	AU02
4″	CF04	AF04	CU04	AU04
6″	CF06	AF06	CU06	AU06
9″	CF09	AF09	CU09	AU09
12″	CF12	AF12	CU12	AU12
15″	CF15	AF15	CU15	AU15
18″	CF18	AF18	CU18	AU18
24″	CF24	AF24	CU24	AU24

NOTE: Union connected types must be used with thermowells, longer length available on special order.

STANDARD RANGES

CODE	Fahrenheit
FC	–80 to 120°F
FE	–40 to 120°F
FG	0 to 150°F
FJ	0 to 200°F
FL	0 to 250°F
FM	30 to 240°F
FN	30 to 130°F †
FR	50 to 300°F
FS	50 to 400°F
FT	50 to 550°F
FX	150 to 750°F†
FY	200 to 1000°F*†
	Celsius
CD	–50 to 50°C
CJ	0 to 100°C
CM	–10 to 110°C
CN	0 to 50°C †
CR	0 to 150°C
CS	0 to 200°C
CU	0 to 300°C
CX	50 to 450°C†
CY	100 to 550°C*†

	DUAL SCALE		
CODE	Fahrenheit (on outside	and	Celsius (on inside)
DE	-40/120°F	and	-40/50°C
DF	40/160°F	and	-40/70°C
DN	30/130°F	and	0/55°C †
DJ	0/200°F	and	-20/94°C
DL	0/250°F	and	-20/120°C
DR	50/300°F	and	10/150°C
DS	50/400°F	and	10/200°C
DT	50/550°F	and	10/290°C
DX	100/800°F*	and	40/430°C†
DY	200/1,000°F	and	100/550C*†

*Not recommended for continuous service above 800°F (425°C). For such temperatures see pg. 63.
†Minimum stem length for these ranges 4″.

OPTIONAL FEATURES	
CODE	Description
EL	Liquid Filling for Catalog No's AF, 3A, 5A only
PD	Plastic Window
SG	Shatter Proof Glass
NN	Paper Tag
NH	Stainless Steel Tag
DM	Dial Markings
C4	Calibration Certificate

SEPARABLE THERMOWELLS AVAILABLE SEE PAGES 59 - 63

HOW TO ORDER

A F 0 6 4 4 F M X

1. Basic 4-digit Catalog No. From Table Above
2. Stem Diameter: "4" = .250″O.D. (Standard); "5" = .375″O.D. (Extra Cost)
3. Thread Size: "4" = ½ NPT Male (AF Series); "U" = ½ NPT Male Swivel Nut (AU Series)
4. 2 Digit Range Code from Range Tables Above
5. Option(s): "X" = None Required; "9" = Option(s) Required (Extra Cost)

If option(s) are required specify: Plastic Face, Shatterproof Glass Face, Paper Tag, Stainless Steel Tag

Contact CG/MJK **Date** 01/23/2015

"Re-Submittal -2" Burner Specification Sheet

Job Number J083782-0 **Qty** 2 **Order Number** B060510 **Line Number** 1
Customer SUPERIOR BOILER WORKS **Purchase Order** 153002046
Job Name NYC PS 50

Burner Model	FDM350				
Burner Mode of Operation	MOD	**Serial Number**			
Code	UL, CSD-1				
UL Label					
Heat Exchanger Make	SUPERIOR BOILER	**Heat Exchanger Model**	CREEK XL3.0		
Heat Exchanger Type	Other				
Combustion Chamber Pressure	1.56				
Job Site Altitude	2000FT	**Clearance Checked By**	CG		
Clipped Circuit Board PN					
Gas High Fire Rate	3500 MBH				
Oil High Fire Rate	GPH	**PSIG Pump**			
Fuel Oil Grade					
UL Group - Gas	4D	**UL Group - Oil**			
Gas Type	NATURAL				
High Fire Manifold Pressure**	4.8 IN. WC	**Side Orifice Drill Size**	NONE		
Gas Regulator Outlet Pressure	6.4 IN. WC	**RPTD Job Pressure**	7/14.0	IN. WC	
Minimum Supply Pressure	7.0 IN. WC	**Max Design Pressure ***	14.0	IN. WC	
Wiring Diagram	G-J083782-2				
Gas Piping Diagram	PDGJ083782-1				
Oil Piping Diagram					
General Arrangement Drawing	FDM300_J085875	**Addl. Dwg.**			
Remote Panel Diagram		**Addl. Dwg.**			
Additional Drawings					

Control Voltage	115V	Single Phase	60	HZ	**Full Load Amps**	6.0
Blower Motor Voltage	115V	1 PH	60	HZ	**Full Load Amps**	18.4
Oil Pump Motor Voltage		PH		HZ	**Full Load Amps**	
Compressor Motor Voltage		PH		HZ	**Full Load Amps**	
Minimum Circuit Ampacity	29.00				**Gas Inlet Location**	
Ignition System	GAS PILOT SCANNER					
Diffuser Blade Setting	Blast Tube Flange Set					

Comments:
9X10 HOFFMAN & 24" WALL MOUNT REMOTE
LEAVE AS MUCH SPACE IN THE 9X10 AS POSSIBLE FOR CUST USE

****Approximate operating pressure at the Manifold Inlet for initial start-up. Final Pressure should be determined after checking actual flow with gas meter. Stack temperature, CO, CO2, O2, and Furnace Pressure will help in determining actual input when gas meter is not available for this unit.**

***All components are rated for the Max Design Pressure specified, that pressure must not be exceeded.**

BILL OF MATERIAL

Re-Submittal -2

Customer: SUPERIOR BOILER WORKS - 29875 Purchase Order: 153002046

Job Number: J083782 -0 Item: FDM350 Qty: 2.00 Order Number: B060510 - 1

PFI Part No.	U/M	Qty	Material Description	Ship Loose
054240	EA	1	1-1/2 HP 3450 RPM 115/208/230/1 ODP 56C 56B34D2025 OR 5KC49NN2140X MARATHON MOTOR	
081100	EA	1	7-5/8 X 3-1/2 X 5/8 D-HUB R762-350S 3450 CW SPEC. 1-0614 REVCOR WHEEL	
140020	EA	1	7990K10 4PDT CUTLER HAMMER GAS-OIL FUEL CHANGE-OVER SWITCH POSITIVE CENTER OFF	
140700	EA	2	CRTP1A9M9 OSLO SPST ROCKER SWITCH	
161000	EA	1	LGP-G 1-20 INCH ANTUNES LOW GAS PRESSURE SWITCH MANUAL RESET (VENTLESS)8103116202	L
161100	EA	1	HGP-G 2-20 INCH ANTUNES HIGH GAS PRESSURE SWITCH, MANUAL RESET (VENTLESS) 8101111202	L
171110	EA	1	SMD1206060 ANTUNES AIR SWITCH WITH COMPRESSION FITTINGS .17-12 INCH RANGE	
202450	EA	1	8040H007 1/4 INCH 120 VOLT 50/60 HZ. OR U-28-45-21-18 GAS PILOT VALVE	
203065	EA	2	V4295A-1155 HONEYWELL 2 INCH 5 PSI N.C. 120V NEMA 1 SOLENOID VALVE	L
273400	EA	1	501219-1 108BV 2 INCH ECLIPSE MANUAL BUTTERFLY VALVE	
300100	EA	1	RV-20VL 3/8 INCH 1/2 PSIG INLET PRESSURE 2.8-5.2 INCH SPRING REGULATOR	
300800	EA	1	RV-91 2 INCH MAXITROL REGULATOR WITH R9110-38 PINK 3-8" SPRING USE INLET PRESSURE 0.5 PSI	L
320001	EA	1	1092-PF-G 6000 VOLT 50/60 HZ. ALLANSON GAS IGNITION TRANSFORMER WITH GROUND WIRE	
332180	EA	1	AT140B-1206 40 VA 120/24 HONEYWELL FOOT MOUNT STEPDOWN TRANSFORMER	
391000	EA	2	ML7999A-2001/U HONEYWELL UNIVERSAL PARALLEL POSITION ACTUATOR (REV. 2)	
391010	EA	1	Q7999A-1006 HONEYWELL WIRING SUBBASE	
391020	EA	1	R7999A-1005/U HONEYWELL PARALLEL POSITIONING CONTROLLER	
391052	EA	1	S7999D-1048 HONEYWELL CONTROL LINKS TOUCH SCREEN 5.313 X 7.75 CUTOUT	
397521	EA	1	RM7840L-1075 HONEYWELL AUTOMATIC	

BILL OF MATERIAL

Re-Submittal -2

Customer: SUPERIOR BOILER WORKS - 29875 Purchase Order: 153002046

Job Number: J083782 -0 Item: FDM350 Qty: 2.00 Order Number: B060510 - 1

PFI Part No.	U/M	Qty	Material Description	Ship Loose
397521...	EA...	1...	PROGRAMMING CONTROL WITHOUT DISPLAY 50/60 HZ	...
400910	EA	1	Q7800B-1003/B HONEYWELL UNIVERSAL WIRING SUBBASE-METAL BURNER MOUNT	
403200	EA	1	C7027A-1023 CUSTOM PAK UV 1/2" NPT. MOUNTING 0-215DEG HONEYWELL FLAME SENSOR STD CNDT CNNCT	
406950	EA	1	R7849A-1023 HONEYWELL UV AMP 3 SECOND FLAME FAILURE RESPONSE TIME	
407710	EA	1	ST7800A-1039 HONEYWELL 30 SECOND PURGE TIMER	
440211	EA	1	T775M-2048 HONEYWELL MODULATING TEMPERATURE CONTROLLER, 2 RELAY OUTPUT, UNIVERSAL SELECTABLE ANALOG OUTPUTS	
480030	EA	1	RV4NAYSD502A CLAROSTAT 5K 1-TURN POTENTIOMETER	
480560	EA	1	MPKES90B1/4 APEM POTENTIOMETER KNOB 679-3545-ND	
576070	EA	1	CONTACTOR 7.5/10/20/25HP 28A IND 35A RES 120V COIL, SIEMENS 3RT1033-1AK60 & 3RH1921-1DA11	
610400	EA	2	SLU-35 ILSCO GROUNDING LUG	
611880	EA	1	1 POLE CC FUSE BLOCK KIT (CONSISTS OF 30321R, DFC3LP, DRM)	
612010	EA	30	019904225 ENTRELEC D6/8.ADO 14-16 GAUGE ADO, SCREW TERMINAL,BLOCK	
612130	EA	1	0199075.26 ENTRELEC D6/8.ADO 14-16 GAUGE AQO,TERMINAL RED (GAS VALVE)	
612200	EA	8	11511811 ENTRELEC M6/8 8MM TERMINAL BLOCK 50 AMP 8-22 GA. SCREW	
873420	EA	1	2 INCH STANDARD BLACK MALLEABLE IRON PIPE TEE	
910770	FT	5	3/8 INCH O.D. X .035 3003-0 ALUMINUM TUBE (5 FT. LENGTHS)	L
911530	EA	1	ORIFICE SPRING FOR 2 INCH PIPE TEE PER DWG NO. M-232S	
912796	EA	1	FDM LINKAGE ARRANGEMENT TAG, M390MC	
925020	EA	1	ATMR6 6 AMP 600V. CLASS CC NON-MOTOR RATED FERRAZ SHAWMUT FUSE	
931130	EA	1	AEBF (ANGLE EXTENDED BAKELITE FITTING)	
961174	EA	1	FD300 MOUNTING FLANGE GASKET	L
980030	EA	3	1/4 INCH MODEL 740 BALL VALVE WITH TEE	L

BILL OF MATERIAL

Re-Submittal -2

Customer: SUPERIOR BOILER WORKS - 29875 Purchase Order: 153002046

Job Number: J083782 -0 Item: FDM350 Qty: 2.00 Order Number: B060510 - 1

PFI Part No.	U/M	Qty	Material Description	Ship Loose
980030...	EA...	3...	HANDLE	L...
A26858	EA	1	15.5 X 24 DOOR S7999D AND VIEW WINDOW	
A27003	EA	1	FDM300 AIR INLET DAMPER	
C10651	EA	1	2 INCH SNAP IN SIGHT GLASS	
C10730	EA	1	C1 MOTOR PLATE	
C14004	EA	1	1/8 PIPE BRASS HEX ORIFICE 1/8" DRILL	
D10026	EA	1	FD75-FD350 IGNITION TRANSFORMER BRACKET	
D10028	EA	1	FD MOUNTING BRACKET 4.7 BOX & AIR SWITCH	
D10350	EA	1	FD300 SLIDING DAMPER	
D20025	EA	1	FD UV SCANNER ASSEMBLY	
D20028	EA	1	FD300 BURNER SHELL ASSEMBLY	
D20032	EA	1	FD350 INLET SCREEN ASSEMBLY	
D20302	EA	1	FDM300/350 AIR HSG 7.625 X 3 WHEEL	
D20322	EA	1	FD300 NAT GUN FR/UV ASSY "08"	
E10480	EA	1	10 X 9 COVER PLATE	
E10631	EA	2	WALL MOUNTED BOX BRACKET LEFT	
E10641	EA	2	WALL MOUNTED BOX BRACKET RIGHT	
E20020	EA	1	10 X 9 X 7.5 PANEL BOX ASSEMBLY	
E24002	EA	1	15.5 X 24 PANEL BOX ASSEMBLY "09"	
E24024	EA	1	24" PANEL TOP (9) RECT., POT., C/O "09"	
E80310	EA	1	15.5 X 24 CHASSIS "01" PC WHITE	
M10034	EA	2	FD SHIPPING BRACKET UNDERSLUNG GT	
M10041	EA	2	FD SHIPPING BRACKET TALL	
M10072	EA	1	ML7999A 10mm ADAPTOR	
M10073	EA	1	ML7999A 3/8" SHAFT ADAPTOR	
M15013	EA	1	2 INCH BLACK PIPE PLUG DRILLED & TAPPED	
M16073	EA	1	NP2 63-120 ML7999 AIR INLET DPR BRKT	
M16116	EA	1	ML7999 3/4" - 3" ECLIPSE BRACKET	
M20436	EA	2	2 INCH #68 BALL VALVE CSD-1	L
X02620	EA	1	1/8 BRASS HEX NIPPLE 122-2	
X02622	EA	1	1/4 BRASS HEX NIPPLE 122-4	L
X02623	EA	2	FD IGN/FR ELEC FTNG. 35B181C-1	
X02631	EA	1	3/8 X 3/8 TUBE TO MP STRAIGHT COMPRESSION FITTING 68-66	

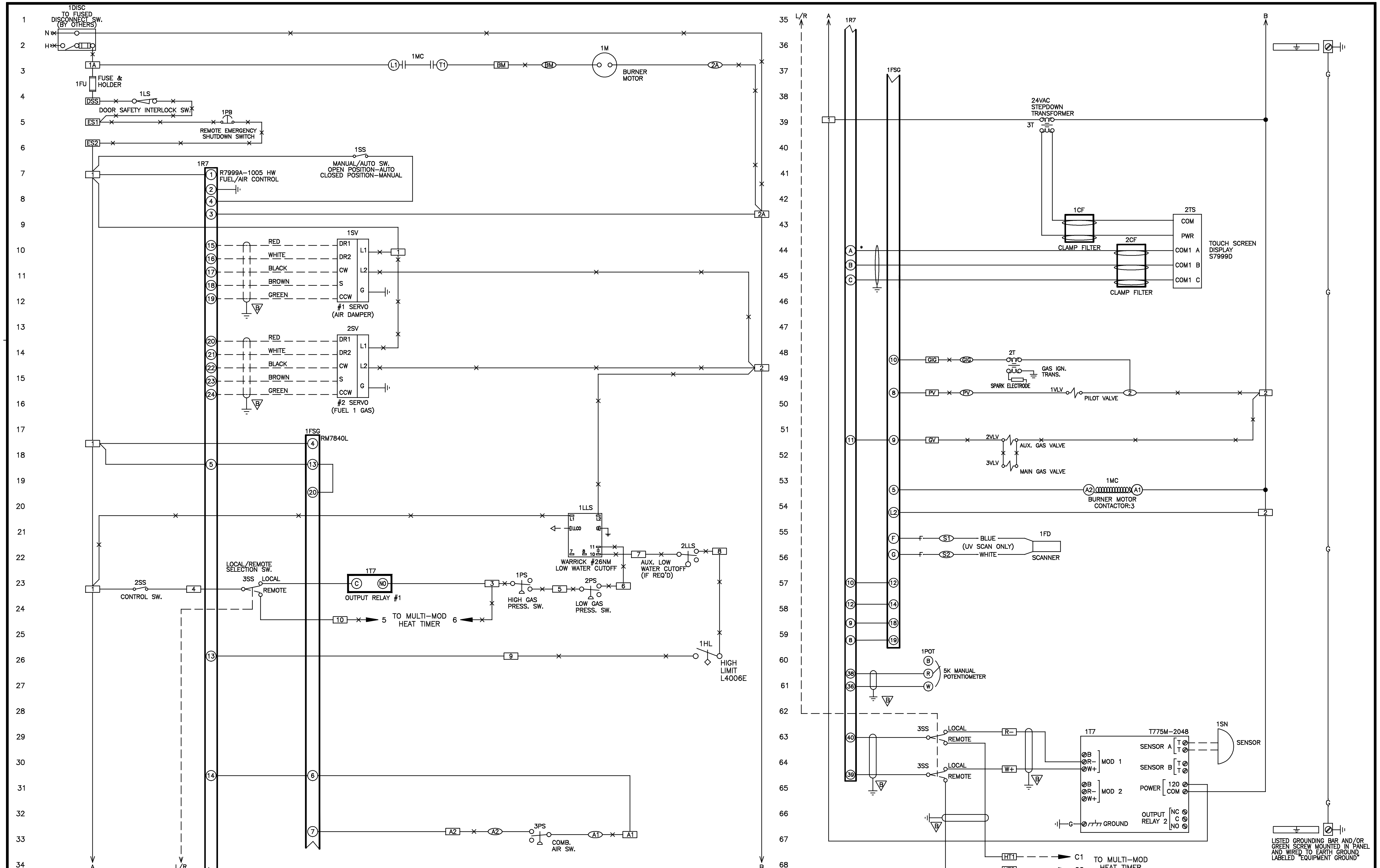
BILL OF MATERIAL

Re-Submittal -2

Customer: SUPERIOR BOILER WORKS - 29875 Purchase Order: 153002046

Job Number: J083782 -0 Item: FDM350 Qty: 2.00 Order Number: B060510 - 1

PFI Part No.	U/M	Qty	Material Description	Ship Loose
X02635	EA	1	1/4 X 1/8 BRS BUSHING 110-42	
X02640	EA	1	1/4 X 1/8 BRASS REDUCER MP-MP 123-42	
X02674	EA	1	1/4 BULKHEAD FITTING 62BH-4	
X02677	EA	1	3/8 X 1/4 COMP-MP STR 68-64	L
X04237	EA	1	FD300 IGN. ELECTRODE 90L201C-1	
X08504	EA	1	90L200C FD300 BACK PLATE GASKET	
X08681	EA	1	90L277C INLET RING (803 MODIFIED)	
X09410	EA	4	3/8-16 X 1 HEX HEAD CAP SCREW	
X09657	EA	12	5/16 MED. SPLIT LOCK WASHER	
X09795	IN	8	173220.05 PREPUNCHED DIN RAIL	
Y08000	FT	6	NO. 3GTO-15 15000 GTO IGNITION CABLE	



TERMINAL STRIP ARRANGEMENT:

REMOTE PANEL– DSS ES1 ES2 1 1 1 1 1A BM 2A 2 2 2 3 4 5 6 7 8 9 10 A1 A2 GIG PV GV R– W+ HT1 HT2

BURNER PANEL– BM 2A 2 A1 A2 GIG PV S1 S2

"USE COPPER CONDUCTORS ONLY."

CAUTION: THROW ALL DISCONNECTS TO OFF BEFORE SERVICING.

— G — EQUIPMENT GND. CONDUCTOR

— F — FLAME CIRCUIT: RUN IN SEPARATE CONDUIT OR SHIELDED CABLE

——— FACTORY WIRING

- - - 24V / —×— 115V / —●— 200–575V: FIELD WIRING "SEE SPEC. SHEET FOR VOLTAGE"

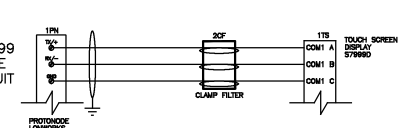
EQUIPMENT SHOWN ON DIAGRAM IS ONLY PROVIDED AND MOUNTED BY POWER FLAME IF SPECIFICALLY CALLED FOR ON BURNER SPEC. SHEET

NEUTRAL WIRING MAY NOT BE CONNECTED AS SHOWN, BUT MAY BE WIRED TO TERMINATE AT NEUTRAL TERMINALS SUCH AS 2, 2A, T2 OR L2.

CAUTION: ALL FIELD WIRING MUST BE WIRED AS SHOWN ON WIRING DIAGRAM.

ADD GREEN GROUND WIRE TO GROUNDING LUG FOR PILOT VALVES WITH GROUND WIRE.

* FOR BMS MODBUS COMMUNICATIONS – AFTER THE R7999 HAS BEEN COMMISSIONED, TERMINALS A, B & C OF THE R7999 NEED TO BE MOVED TO THE CONTROLBUS CIRCUIT ON THE S7810M (TERMINALS 1, 2 & 3). THEN THE BMS IS WIRED TO COM1 OF THE S7999D, SET "COM1 PORT INTERFACE" TO "GATEWAY FOR MODBUS MASTER".



2 ADD LOCAL/REMOTE SW. & HEAT TIMER CONNECTIONS	JG/CG	1/23/15
1 RESUBMIT– ADD CONTROL LINKS	EM/CG	12/17/14
REVISION	REV'D.	DATE

Power Flame Incorporated
2001 SOUTH 21st STREET PHONE (620) 421–0480
PARSONS, KANSAS 67357 FAX (620) 421–0948

DRAWN: EM | APPVD: CG | CODE: UL,CSD | PARENT:85875 | DATE:12/16/14 | DWG.: G–J083782–2

PARAMETERS: LLGX–RM7845A1001/U–API–PX–IX–RX–F2–WX–XX–X–XX–XX–XXX–XX–XXX–CSD–T775

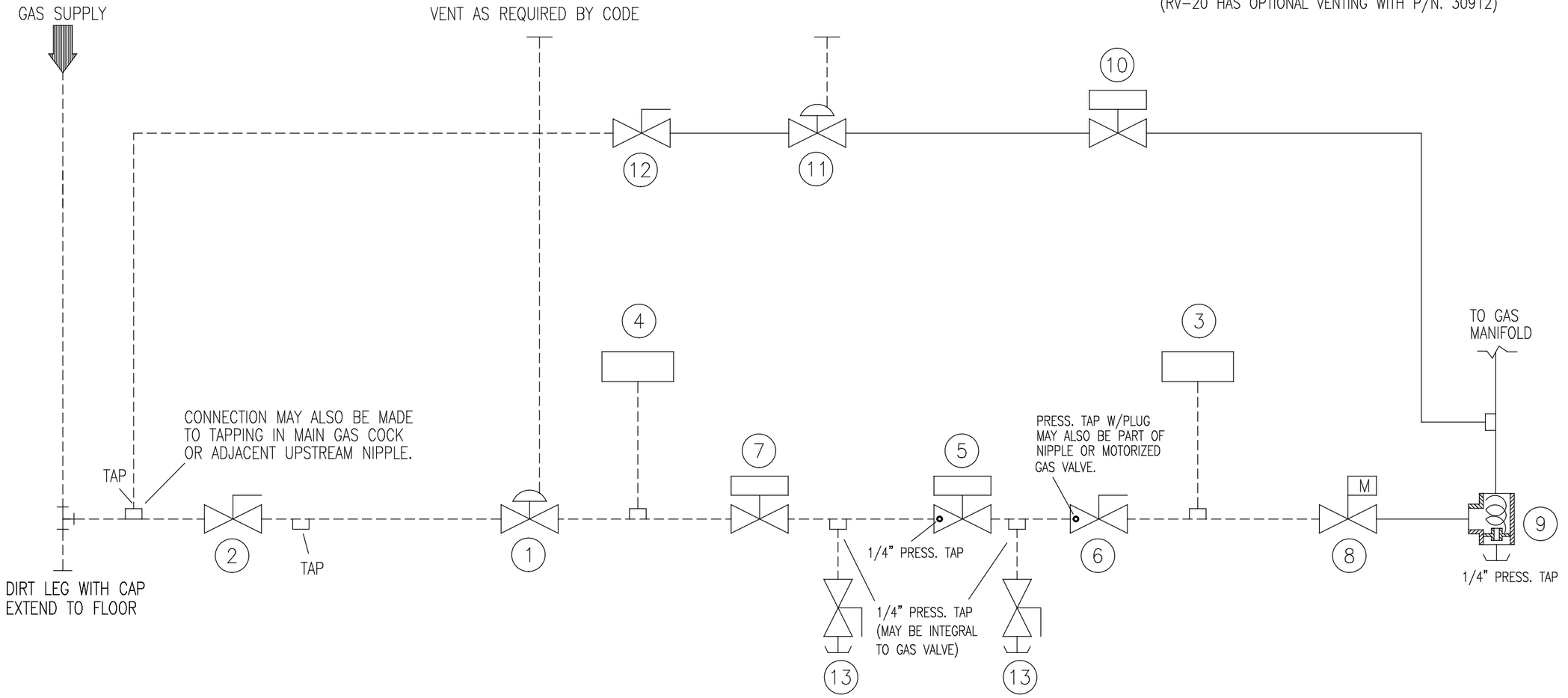
TITLE: GAS BURNER WITH RM7845A, MODULATION, 1PH. MOTOR AND SCANNER.

JOB NAME:

EQUIPMENT SHOWN ON DIAGRAM IS ONLY PROVIDED AND MOUNTED BY POWER FLAME IF SPECIFICALLY CALLED FOR ON BURNER SPEC. SHEET.

CAUTION: ALL FIELD PIPED COMPONENTS MUST BE MOUNTED IN THE PROPER LOCATION AND PROPER DIRECTION OF GAS FLOW.

NOTE: WHEN PILOT GAS PRESS. REG. IS AGA CERTIFIED DEVICE WITH INTEGRAL LEAK LIMITING ORIFICE; SUCH AS RV–20, RV–10 AND RV–12, VENT LINE FOR PILOT GAS PRESS. REG. MAY NOT BE REQ'D. UNLESS SPEC'D. BY OTHER CODES.
(NO PROVISION FOR EXTERNAL VENTING ON RV–10 & 12)
(RV–20 HAS OPTIONAL VENTING WITH P/N. 30912)



ITEM	PART NUMBER	DESCRIPTION
1	300800	MAIN GAS REGULATOR
2	M20436	MAIN GAS SHUTOFF COCK
3	161100	HIGH GAS PRESSURE SW.
4	161000	LOW GAS PRESSURE SW.
5	203065	MAIN GAS VALVE
6	M20436	MAIN GAS LEAK TEST COCK
7	203065	AUX. GAS VALVE
8	273400	BUTTERFLY VALVE
9	873420 & 911530	ORIFICE TEE & SPRING
10	202450	PILOT VALVE
11	300100	PILOT REGULATOR
12	980030	PILOT SHUTOFF COCK
13	980030	LEAK TEST COCK

REVISION	REV'D.	DATE
ADD CSD	CG	12/23/14

FACTORY PIPED
FIELD PIPED

REFER TO SPECIFIC REGULATOR LITERATURE FOR RECOMMENDED STRAIGHT RUN OF PIPING BEFORE/AFTER REGULATOR AND SENSING LINE (IF APPLIC.)

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PARSONS, KANSAS 67357
PHONE (620) 421–0480
FAX (620) 421–0948

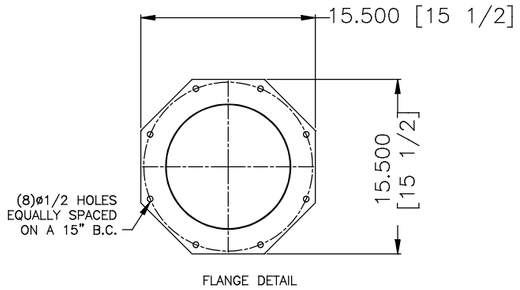
DRAWN: EM | APPVD: CG | DATE: 11/10/14 | PARENT: 83776 | DWG.: PDG–J083782–1

DRAWING PARAMETERS: N/A | CODE: UL,CSD–1

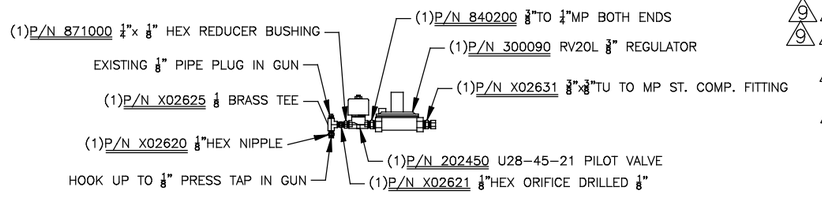
TITLE: GAS PIPING FOR MODULATION BURNER WITH INPUTS 400,000 TO 2,500,000 BTU'S.

JOB NAME:

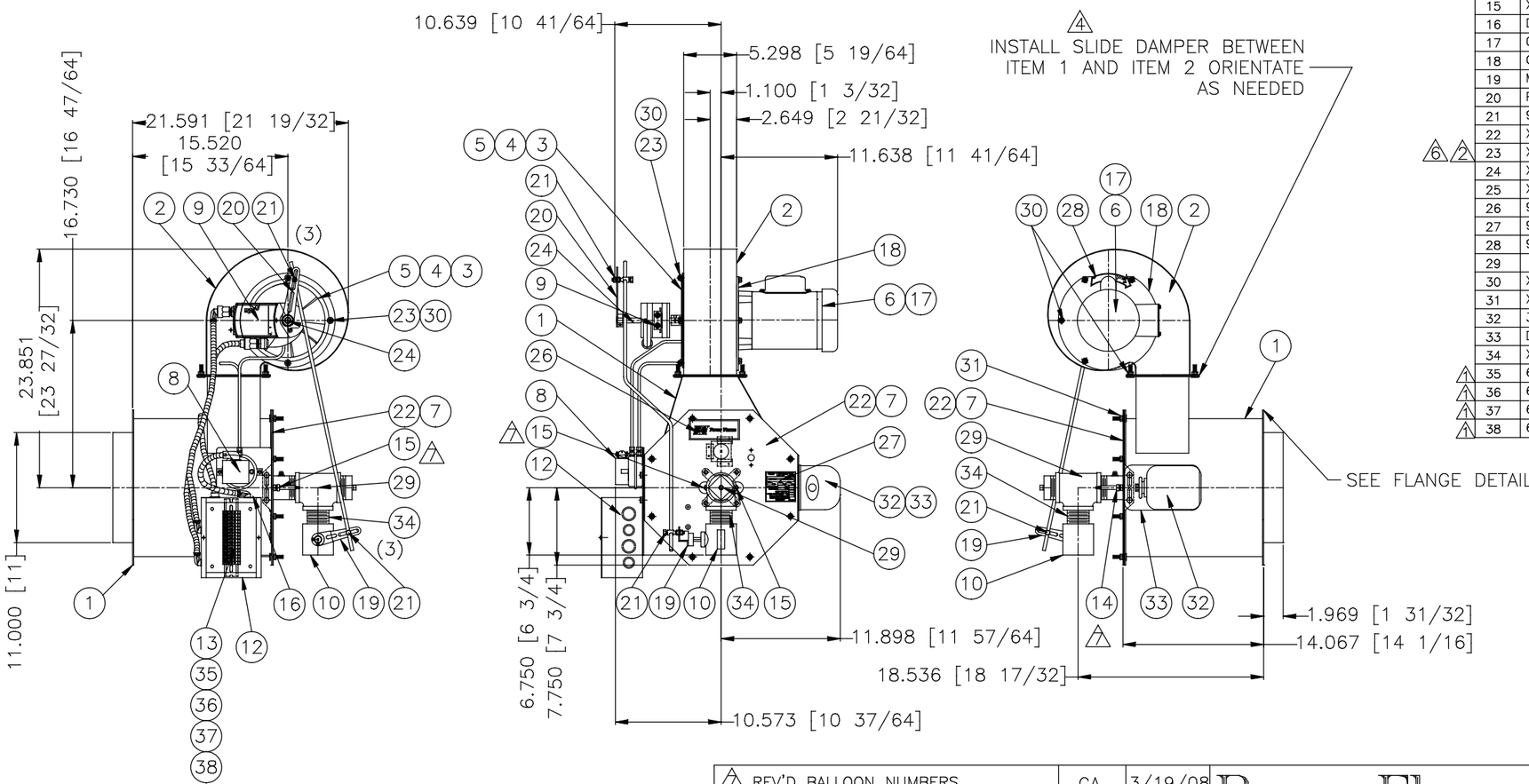
NOTES:
1) USE A PLASTIC FERRULE INSIDE IGNITION AND FLAME ROD ELCTRODE FITTINGS.
2) SHIP 5' OF FLAME ROD CABLE WITH BURNER.
(3) LINKAGE SHOWN IN LOW FIRE POSITION



FLANGE DETAIL



GAS PILOT OPTION ⚠



ITEM #	PART NO.	QTY. PER FDM300 D99084	QTY. PER FDM350 D99100	DESCRIPTION	DWG. NO.
1	D20028	1	1	FD 300 BURNER SHELL	35B204C
2	D20302	1	1	FDM300/350 AIR HSG ASSY	35A15C
⚠9⚠6 3	D10358	1	1	FDM300 HTD PIE DAMPER INNER PLT	35B392C
⚠9⚠6 4	D10359	1	1	FDM300 HTD PIE DAMPER MIDDLE PLT	35B394C
⚠9⚠6 5	D10360	1	1	FDM300 HTD PIE DAMPER OUTER PLATE	35B395C
6	050120	1		1 HP 56C FR BLOWER MOTOR	
⚠8 7	D20322	1	1	FD300 GUN/BACK PLATE ASSY.	35B352C
⚠10 8	171110	1	1	AIR SWITCH	
⚠5 9	060929	1	1	AM24-MFT-US BELIMO DIRECT DRIVE MOD MTR	
10	273400	1	1	2" ECLIPSE BUTTERFLY VALVE	
11	D10023	1	1	AM24-MFT BELIMO MOD. MOTOR BRACKET	35E57C
⚠1 12	X09950	1	1	6"x8"x4" JCT BOX	
⚠1 13	E11017	1	1	7.75" DIN RAIL	
14	X04237	1	1	IGNITION ELECTRODE	90L201C
15	X04238	1	1	FLAME ROD	90L202C
16	D10028	1	1	SIDE MOUNT PNL/AIR SW BRKT	35E48C
17	050370		1	1-1/2 HP 3450 RPM 56C MOTOR	
18	C10730	1	1	C1 MOTOR PLATE	30A9C
19	M90004	1	1	10mm OFFSET DAMPER ARM	90E270C
20	P82120	1	1	1/2"DAMPER ARM	70E25C
21	911000	2	2	5/16" LINKAGE SWIVELS	
22	X08504	1	1	FD300 BACK PLATE GASKET	90L200C
⚠6⚠2 23	X01478	4	4	X4 HTD MOD PIE DAMPER RETAINER	90L371C
24	X01470	1	1	X4 DAMPER AXLE	90L255C
25	X02390	1	1	5/8"x 1/2" BRONZE BUSHING	M283SC
26	912510	1	1	POWER FLAME LOGO	
27	912120	1	1	UL GAS RATE LABEL	M-308
28	912370	1	1	ROT ARROW	M-87SC
29		1	1	2" TEE WITH TAPPED PLUG	
30	X09745	20	20	10-32 KEP NUT	
31	X09566	8	8	5/16-18 WHIZ NUT	
32	320000	1	1	GAS IGNITION TRANSFORMER	
33	D10026	1	1	FD IGN. TRANSFORMER BRACKET	35E46C
34	X02337	1	1	2"x2-1/2" PIPE NIPPLE	
⚠1 35	612200	2	2	11511811 ENTRELEC M6/8 TERMINAL	
⚠1 36	612010	12	12	019904225 ENTRELEC D6/8 TERMINAL	
⚠1 37	612130	1	1	0199075.26 ENTRELEC D6/8 TERMINAL	
⚠1 38	612150	2	2	0199336.20 ADO/SCREW END SECTION	

NOTE:

FLAME ROD MAY BE REPLACED WITH SCANNER (OPTION)

IGNITION ELECTRODE WILL REMAIN ON BOTTOM PORTION OF GUN PLATE WHEN SCANNER (OPTION) IS USED

SCANNER (OPTION) TO BE LOCATED ON TOP PORTION OF GUN PLATE; ORIENTATE GUN PLATE AS NEEDED TO PREVENT INTERFERENCE BETWEEN SCANNER (OPTION) AND OTHER COMPONENTS

REVISION	REVD CHKD	DATE
⚠10 P/N 171110 WAS P/N 171100 EDC #1657	CA	7/25/13
⚠9 REV'D PIE DAMPER P/N'S	CA	2/20/09
⚠8 P/N D20322 WAS P/N D20305	CA	3/26/08

REVISION	REVD CHKD	DATE
⚠7 REV'D BALLOON NUMBERS	CA	3/19/08
⚠6 REV'D PIE DAMPER P/N'S	CA	2/28/07
⚠5 060929 WAS 060932 EDC #1555	CA	9/9/05
⚠4 ADDED SLIDE DAMPER NOTE	CA	9/6/05
⚠3 ADDED OPT GAS PILOT DETAIL	RAP CW	7/28/05
⚠2 X01473 WAS X01467	RAP CW	8/12/03
⚠1 X09950 W 937830/937900 ADD E11017,612010,612200,612150	RAP CW	7/10/03

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DWG. BY:	CHKD. BY:	APVD. BY:	SCALE:	DATE:
RAP	CW		1"=1"	6/2/03

DO NOT SCALE FROM THIS DRAWING | FILE LOC: NETWORK

TITLE: GENERAL ARRANGEMENT OF A FDM300/350
P/N D99084 & D99100

MED

DWG. NO. 35F39C-10

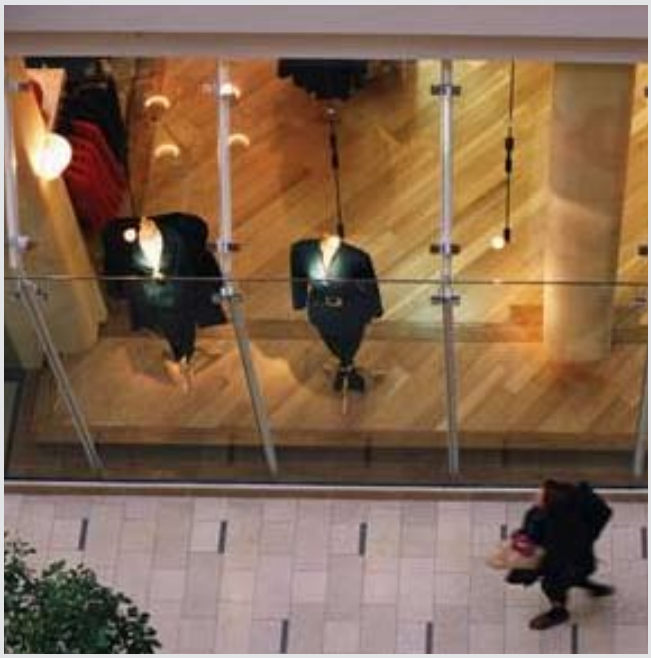
ControLinks™ Fuel Air Ratio

Commercial/Industrial Combustion Controls

Honeywell

Capable. Flexible. Efficient. Safe.

The Honeywell ControLinks™ Fuel Air Ratio Control System helps you realize real Energy Savings, Increased Turndown, Reduced Emissions and System Reliability all in an easy to install, powerful and cost effective package. With traditional mechanical linkage systems, compromised fuel and burner efficiency is the reality. So Go Linkageless with Honeywell's ControLinks and start reaping the benefits to your bottom line. You have Everything to Gain and Inefficiencies to Lose!



Go Linkageless with ControLinks and get Ahead of the Curve

Energy Savings

- Prevents burner short cycling
- Reduces fuel usage from 2 to 6% and beyond
- Many utility companies offer rebates if linkageless fuel air systems are installed

Maximize Burner Efficiency

- Match load to appliance firing rate
- Combustion efficiency maximized throughout the curve instead of at only 1 point
- Up to 24 points on the Fuel/Air Curve

Reduced Emissions and Reduced Excess Air

- Reduce Thermal NOx (Nitrous Oxide) by employing the Flue Gas Recirculation (FGR) damper function
- Reduce unburned fuel & products of combustion with 4th channel FGR

Increased Equipment Life

- Equipment cycles less frequently, reducing wear and tear and extending its useful life
- Integrated Thermal Shock Protection Algorithms offer advanced capability to extend equipment life

System Reliability

- No Fuel/Air Ratio curve erosion over time due to component wear and shifting as with mechanical linkage systems

Flexibility

- Flexible use 4th Channel, which may be used for FGR, Secondary Air Control or Secondary Modulating Fuel Valve
- Dual fuel flexibility, with two independent fuel curves, allowing maximum efficiency for both fuels

Safety

- Dynamic safety checks: Fail Safe Potentiometer Test, Anti-Swap of Actuators, Curve Tracking Verification & Safety Relay Test

Affordable

- Payback typically less than 1 year versus the expense of O_2 trim with marginal fuel efficiency gain over Linkageless Fuel Air Ratio Controls. Generally, O_2 trim provides some additional fuel savings, but is usually cost prohibitive.

ControLinks Fuel Air Control System:

The Linkageless Advantage

Typical Applications

Replaces traditional single point modulation of a mechanical cam and linkage assembly, which controls the relationship between fuel, airflow and flue gas recirculation (if used) on a power burner. Up to 4 independently controlled universal parallel positioning actuators (UPPAs) are commanded by the ControLinks™ Controller, which responds to load and firing rate demands. Honeywell's ControLinks linkageless fuel air ratio control provides more accuracy and efficiency in actuator positioning and burner firing, which equates to less service and downtime.

May be used on single or combination fuel single burner applications, including power burners, boilers, process furnaces, ovens, smelting, kilns, paint drying booths, VOC burn-off, ceramics, make-up air heaters or any full modulating burner as part of a retrofit or new burner application where increased efficiency is desired. Particularly suited for hospitals, schools, universities, office complexes, commercial retail complexes, multi-unit housing dwellings and industrial process production facilities.

Key Features

- Stand Alone Parallel Positioning Control System that is Designed for Easy Retrofit
- Dynamic Safety Checks including Fail Safe Potentiometer Checks, Anti Swap of Actuators & Curve Verification Algorithms
- Dynamic Safety Relay Test for LCI-LCO (Limit Control Input/Output) Contact Set
- Integrated Shock Protection Algorithms: Water or Stack Temperature Low Fire Hold, FGR Hold, FGR & Low Fire Hold
- Controller LEDs: Power, Alarm, Motor 1, 2, 3, 4 for Status and Fault Code Annunciation (60 Possible)
- 2 Independent Fuel Profiles with or without Flue Gas Recirculation (FGR)
- Programmable Positioning for Non-Selected Fuel Actuator, Standby, Purge, Light-Off, Minimum & Maximum Modulation
- Up to 4 Universal Parallel Positioning Actuators: Combustion Air, Fuel 1, Fuel 2, FGR/Flexible Usage
- 4th Channel Actuator Flexible Usage: FGR, Secondary Air Control, Secondary Modulating Fuel Valve
- 7 to 24 Points Per Profile Curve with Quick Set-up Feature Providing Minimum 3-Point Profile Curve
- Auto/Manual Firing Rate Input
- External Indication of Actuator Position via Large Arrow
- Actuator CW & CCW Switches for Manually Driving Hub — Useful for Installation & Service
- Actuator LED Annunciation for Unconfigured, Configured and On-Line or Faulty Actuator States
- Actuator Direct Coupled Output

Product Overview

The ControLinks Fuel Air Ratio Control System is a microprocessor-based control that simultaneously controls from two to four actuators associated with a full modulation power burner. Actuators control the position of primary and secondary fuel valves, the combustion air damper and the FGR (Flue Gas Return) damper, if used. The system consists of the R7999 master controller and its Q7999A wiring subbase and the ML7999A actuators.

Two controller models, 100 – 120Vac and 200 – 240Vac, cover global applications. Controller non-volatile memory stores operating history and current lockout and alarm status and has 6 LEDs for Power, Alarm and 4 Actuator Status Lights. Fault annunciation via blinking power light, with 60 possible fault codes. Floating control output to UPPAs, auto/manual firing rate input, remote reset capability, 4 – 20mA stack or water temperature input and dual fuel input. Control from 2 to 4 UPPAs. Password required for parameter adjustment to prevent unauthorized access.

UPPAs have universal power input of 100 to 240 Vac, providing flexibility in application with direct coupled output. A large arrow on the actuator face provides instant visual indication of actuator position. Floating control input with 950 possible actuator positions, output hub position accuracy of ±0.1 angular degrees and CW and CCW switches for manually driving hub. A mechanical stop with a magnetic coupling between stepper drive motor and the gear train assures gears will not strip or burn out the motor in an overload condition. Actuator LED Annunciation for Unconfigured, Configured and On-Line or Faulty Actuator States.

Go Linkageless and Say Goodbye to the Jackshaft Forever

Mechanical cam and linkage systems used to control the fuel-air ratio of a fully modulating power burner represent a great disadvantage to the equipment operator in regard to fuel usage, burner efficiency, dual fuel usage and burner turndown. Because mechanical linkage systems have one foot-mounted actuator to position both the combustion air and the fuel at the same time, the result is compromised fuel-air ratio and dual fuel efficiency to obtain reliable combustion throughout the fuel-air curve. Typically mechanically linked systems utilize the same point for light-off and low fire, which reduces fuel efficiency because many burners are capable of operating at a lower firing rate than light-off. As with any mechanical system, what happens over time is loss of precision due to component wear and shifting, equating to erosion of the fuel-air curve and non-optimal performance as well as unnecessary fuel costs.

With the ever increasing price of fuel and emphasis on emissions, achieving optimal burner efficiency has never been more critical and requires a cost-effective and enduring solution. Enter Honeywell's ControLinks Linkageless Fuel Air Control System, which provides consistent and reliable fuel-air ratio control thanks to precision microprocessor control and integral actuator position feedback potentiometers. Four separate Universal Parallel Positioning Actuators (UPPAs) replace the single actuator used with mechanical cam and linkage systems, providing independent control of the combustion air damper, the primary fuel, the secondary fuel and the FGR damper (if used). The UPPAs are commanded by the ControLinks Controller, which responds to load and firing rate demands. Further, ControLinks offers dual fuel flexibility, allowing two independent fuel curves, providing maximum efficiency for both fuels. Because the burner fuel to air ratio is adjusted independently, the result is maximized burner efficiency and reduced fuel consumption that typically pays for the ControLinks system within a year. See your ControLinks Authorized Representative to estimate your potential saving today!

One controller, four actuators and optimal burner efficiency. It all adds up to monumental savings you can't afford to ignore! So go linkageless with Honeywell's ControLinks and reap the benefits. You have everything to gain and inefficiencies to lose!

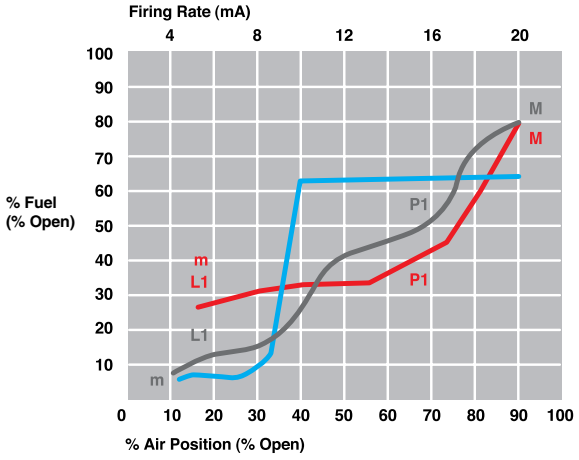
Reduced Emissions and FGR

Reducing emissions has become a spotlight issue for many facilities. Thermal NOx (Nitrous Oxide) is produced from the oxidation of nitrogen (N_2) at temperatures above 1500° F when burning natural gas and distillate oils.

Thermal NOx can be reduced by dropping the flame temperature, which can be accomplished by lowering the amount of oxygen in the combustion air. Such a task is achieved by utilizing Flue Gas Recirculation (FGR), in which a damper is placed in the flue gas piping, allowing recirculation of a portion of the flue gas.

FGR significantly reduces NOx emissions in industrial boilers by recirculating a portion of the flue gas into the main combustion chamber, thereby reducing the peak combustion temperature. The use of FGR also reduces emissions of unburned fuel and products of combustion.

Fuel/Air Profile Graph



One-fuel with FGR curve

m = minimum modulation
L1 = Light-off
P1 = Purge
M = Maximum modulation

ControLinks Curve
ControLinks FGR Curve
Mechanical Linkage Curve

Capable. Flexible. Efficient. Safe.

The ControLinks Fuel Air Ratio Control System provides value, flexibility and efficiency in an easy to install, capable package while ensuring equipment safety. It is compatible with competitive and legacy full modulation burner primary safety controls. A step-by-step menu driven commissioning process with step-size enforcement via the S7999B System Display or the ZM7999A Configuration Software provides quick and effective system commissioning.

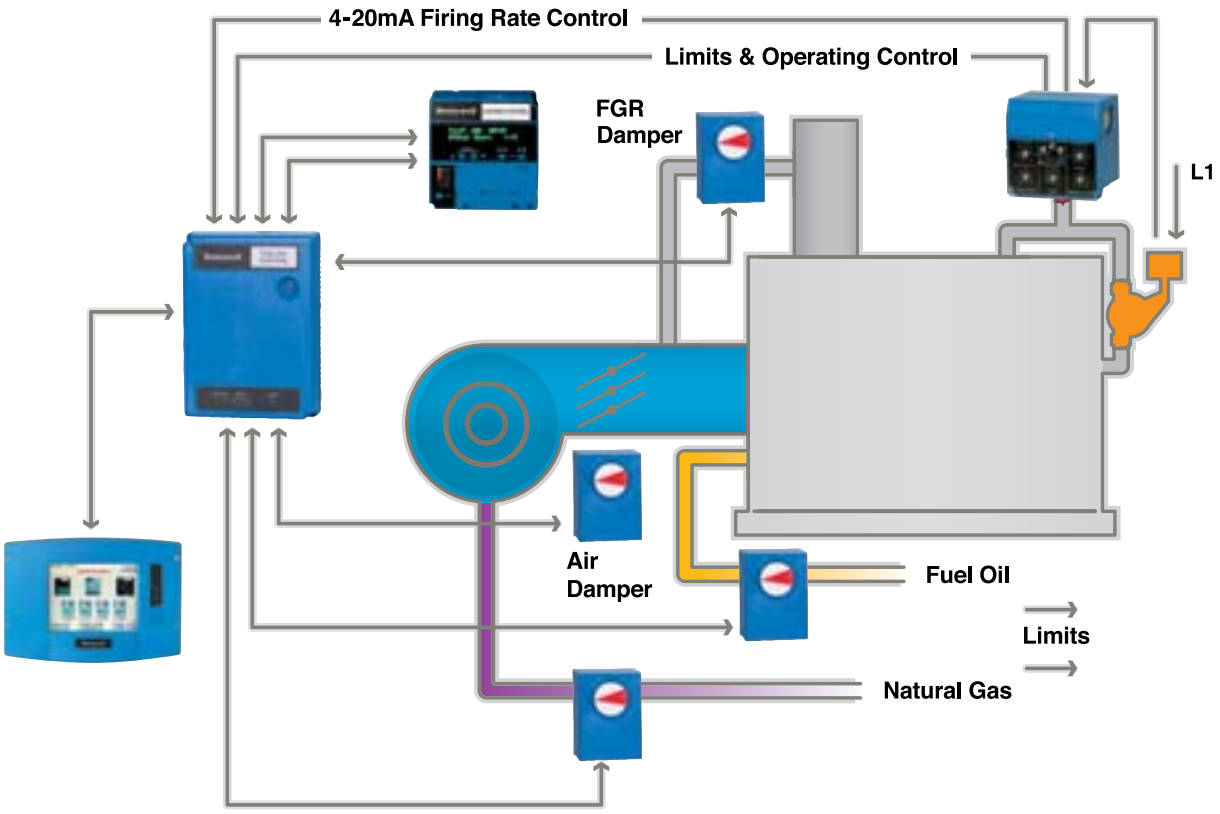
Capable of controlling from 2 to 4 UPPAs for Combustion Air, a Primary Fuel, a Secondary Fuel and a 4th Flexible Usage actuator. Allows two independent fuel air profiles with or without FGR. The ControLinks controller has the capability to prevent equipment thermal shock. The Integrated Thermal Shock Protection Algorithms include Water or Stack Temperature Low Fire Hold, FGR Hold or FGR and Low Fire Hold combined. Utilizing a scaleable 4-20mA stack/water temperature sensor input, the Water or Stack Temperature Low Fire Hold keeps the burner at light-off until the programmed temperature limit is exceeded. FGR Hold keeps the FGR damper closed until the stack temperature has reached its programmed threshold. FGR and Low Fire Hold combines both hold features, providing maximum equipment protection. The controller also has Fuel-Air-FGR profile download capability from a PC or the S7999B System Display via File Transfer Protocol (FTP). Other features include programmable behaviors for all actuators during Purge and Standby, a configurable Differential (reaction time) of 0.12 to 3.0mA and a configurable Dead Band of 0.1 to 0.5 angular degrees.

Flexible 4th channel Flexible Use Function, which may be used for Flue Gas Recirculation (FGR) damper actuation, Secondary Air Control or a Secondary Modulating Fuel Valve. The 4th channel operates in conjunction with the selected primary fuel and is hard programmed to drive fully closed at light-off, regardless of its selected function. The 4th channel may be programmed to follow the Fuel/Air curve or be configured flat or negative versus the Fuel/Air curve. Further 4th channel special operating functions can be selected via the System Parameters option during commissioning, invoking the Integrated Thermal Shock Protection Algorithms, which respond to the 4-20mA stack or water temperature sensor input.

Efficient operation is obtained by replacing old mechanical single point linkage systems with the ControLinks Fuel Air Ratio System, reducing fuel usage from 2% to 6% and beyond. By decoupling the fuel curves, maximum efficiency is achieved for both fuels. Further, there is no erosion over time of the Fuel Air Profile as with the inherent wear and tear of mechanical linkage systems, saving valuable fuel and maintenance costs. ControLinks allows optimization of the fuel/air mixture, which maximizes combustion efficiency throughout the curve. And with the ability to program up to 24 points per fuel/air curve, closer and more precise firing rate control is obtained over the entire firing rate of the burner for each fuel. Due to the inherent energy usage impact, many utility companies offer energy rebates if linkageless fuel air systems are installed. Inquire with your local utility.

Safe operation assured with built-in Self-Test and Safety Relay Circuits. Dynamic safety checks including Fail Safe Potentiometer Checks, Anti-Swap of Actuators and Curve Tracking Verification. At commissioning, the 8-digit hexadecimal actuator ID is entered for its respective channel and is tracked to ensure it is not swapped with an adjacent actuator, providing consistent operation. The curve tracking algorithm verifies the curve profile is within its programmed Dead Band of between 0.1 to 0.5 angular degrees and will lockout if the Dead Band is exceeded. Further safety is provided via the Dynamic Safety Relay Test for the LCI-LCO (Limit Control Input/Output) Contact Set, which verifies the contact integrity of devices installed in the limit string. Password protection for parameter changes, assuring no unauthorized re-adjustment of system occurs.

Boiler Application — ControLinks Fuel Air Ratio Control System



More Reasons to Go Linkageless with ControLinks	
Increased Turndown	• Increase turndown up to 6:1 vs. a typical mechanically linked optimal turndown of 3:1 • Separate points for light-off and low-fire vs. a mechanically linked system
Commissioning Time & Cost	• Burner commissioning time reduced by 30% to build the fuel/air curves • Fast burner setup via S7999B Display or PC/Laptop
Design Considerations	• Choose modulating component placement without consideration of common jackshaft linkage

Information/Options	Installation Instructions	Product Data	Guide Spec	Technical Brochure	Sell Sheet
R7999A, B Controller, Q7999A Subbase	—	65-0238/65-0240	65-0248	63-9489	63-9165
ML7999A Parallel Positioning Actuator	66-1121	65-0239	65-0248	63-9489	63-9165
S7999B System Display	65-0283	—	65-0293	63-9488	63-9165
V5197A Firing Rate Gas Valve, C6097 Pressure Switches, P7810C PressureTrol Controller, Flame Safeguard Controls					
Download from: http://customer.honeywell.com					
UDC2500/3200 Controls	http://content.honeywell.com/imc/pi/				

The Honeywell Solution

Get the 4-20mA control advantage by using Honeywell's V5197A Firing Rate Valve, the P7810C combination Firing Rate/Limit/On-Off Control and/or the UDC2500/3200 Control for Firing Rate or On/Off Control in conjunction with ControLinks for a powerful and accurate combination. ControLinks also accepts a scaled 4-20mA auxiliary sensor input as the tool to drive the Integrated Boiler Shock Protection Algorithms.

Component	Purpose	
R7999A, B ControLinks Controller 	Linkageless Fuel Air Controller, which controls 2 to 4 UPPAs for Combustion Air, Fuel 1, Fuel 2 & a 4th Channel Flexible Use. Directs UPPAs based on input from Firing Rate Control, Limit & Operating Controls, Primary Flame Safeguard Control and/or S7999B System Display. Maintains optimal burner Fuel Air Ratio to maximize burner efficiency and minimize fuel usage and emissions.	
ML7999A ControLinks Actuator 	Universal Parallel Positioning Actuator (UPPA) with direct coupled output and universal 100 to 240 Vac power input. Controls % open of Combustion Air Damper, Fuel 1 Valve, Fuel 2 Valve & FGR damper (if used). Floating control input with 950 possible actuator positions, output hub position accuracy of ±0.1 angular degrees.	
S7999B System Display 	Commission	• ControLinks Fuel/Air Ratio Control System. Password protected.
	Configure	• S7830 Expanded Annunciator Terminal Names (Global Feature) • Modbus Network (up to 99 nodes) & Assign Names
	Monitor	• Local Burner/Boiler System or up to 99 Systems/Nodes • Device status, fault codes & history, diagnostic information and key process variables for each 7800 SERIES & R7140 Burner Control, ControLinks Fuel/Air Ratio Control, Expanded Annunciator and/or UDC controller.
	Control	• Single (Local) Burner/Boiler System or up to 99 Systems/Nodes • Remote reset for each 7800 SERIES & R7140 Burner Control. UDC device security password, control, demand & alarm setpoints. Password protected.
V5197A Firing Rate Valve 	Modulating valve comes with ML7999 mounting bracket and direct couple drive stem to facilitate set-up. Driven by ML7999A, which responds to firing rate commands provided to the R7999 Controller, the valve expertly helps you match the appliance load. 15psi maximum rating, visual position indicator. Accepts C6097 flange mounted pressure switch. Several pipe adapters are available for valve train installation. Provides turndown of up to 40:1 via its flow limiting adjustment.	
C6097 Gas/Air Pressure Switch 	Diaphragm-actuated Gas Pressure Limit Switch. Available in 1/4 inch NPT or flange mount models, which mount directly to the V5197A Firing Rate Valve. IP54 enclosure standard. Other variations include additive or subtractive differential, operating pressure range, maximum pressure, manual reset and break on pressure fall or rise.	
P7810C PressureTrol® Controller 	Combination Firing Rate/Limit/On-Off Control. Two separate sensors for Limit and On/Off/Firing Rate Control. Provides 4-20mA Firing Rate commands based on pressure to the ControLinks Controller for effective load matching. For use with steam, air or noncombustible gases. Various operating pressure and differential ranges available. Break on pressure rise. LED indicators for power, call for heat and lockout status. Manual reset and electronic maximum fixed stop limit.	
RM7800 SERIES Primary Flame Safeguard Controls 	Primary flame safeguard control family. Several variations available for standing, intermittent or interrupted pilots, on/off or programming, modulation, pre purge, post purge, proof of closure, valve proving system (VPS), and lockout or recycle modulation as well as many other options.	
UDC2500 or UDC3200 Control 	For Firing Rate and/or On/Off operation based on pressure or temperature, the UDC2500 or UDC3200 Controls are just the ticket, providing accurate command for your burner application. For Firing Rate, controls provide a 4-20mA output for the ControLinks Controller.	

Condensed Specifications

Application	• Linkageless Fuel Air Ratio Control System • 4 Channel Output Control: Combustion Air, Fuel 1, Fuel 2, Flexible Usage • 4th Channel Usage: FGR, Secondary Air Control, Secondary Modulating Fuel Valve • Integrated Thermal Shock Protection Algorithms for Low Fire Hold and/or FGR Hold
LED Indicators	Power / Alarm / 4 Motor Channels for Status and Fault Codes (60 Possible)
Protection Category	R7999: NEMA 1 (IP40) ML7999: NEMA 2 (IP31) or NEMA 3 (IP54) with Optional Weatherproof Kit
Hysteresis and Dead Band	Configurable from 0.12 mA to 3.0 mA and 0.1 to 0.5 Angular Degrees
Required Components	ML7999A Universal Parallel Positioning Actuator (quantity 2 to 4), R7999A,B Controller, Q7999A Wiring Subbase and S7999B System Display or ZM7999A Configuration Software (for commissioning and/or monitoring)
Optional Components and Accessories	Weatherproof Kit (NEMA 3 / IP54) for ML7999A, Shaft Adapters, A7999A Portable Combustion Analyzer & Port Expander RS-232/RS-485 (for commissioning) & ControLinks Demo Tool: DSP3548
Honeywell Compatible Components	V5197A Firing Rate Valve, with ML7999 Actuator Mounting Bracket & Drive Stem P7810C PressureTrol® 4-20mA combination Firing Rate/Limit/On-Off Control UDC2500/3200 Control for Firing Rate/On-Off Control RM7800 SERIES, R7140, R4140 Legacy & Other Primary Flame Safeguard Controls
Electrical Ratings	R7999A: 100 to 120 Vac (+10%, -15%), 50/60 Hz (±10%), 10VA maximum R7999B: 200 to 240 Vac (+10%, -15%), 50/60 Hz (±10%), 10VA maximum ML7999A: 100 to 240 Vac (+10%, -15%), 50/60 Hz (±10%), 15VA maximum
Vibration	0.0 to 0.5 G continuous environment
Actuator Stroke	95˚ nominal ±3˚, mechanically limited
Actuator Timing	24 to 30 seconds for 90˚ Travel
Actuator Torque	100 lb-in (11.3 Nm) Lift and Hold Minimum, Breakaway Minimum, Stall Minimum
Actuator Accuracy	Output Hub Position Accuracy ±0.1 Angular Degrees.
Ambient Temperature Range	-40˚ F to +140˚ F (-40˚ C to +60˚ C)
Humidity Range	5% to 95% Relative Humidity, Non-condensing
Dimensions	R7999A,B: 5-3/16 in. W x 7-3/16 in. H x 3 in. D installed (131mm W x 182mm H x 76mm D) ML7999B: 4 in. W x 6 in. H x 3-1/2 in. D (102mm W x 153mm H x 89mm D)
Approvals	R7999A,B: UL/cUL Component Recognized (A only), CE Approved, CSD-1 & NFPA Acceptable, AGA Certified Product (Australian Gas Association) ML7999A: UL/cUL Listed, CE Approved, AGA Certified Product

To Learn More

For more information please contact your Honeywell Distributor. Or visit **http://customer.honeywell.com.**

Automation and Control Solutions

In the U.S.:
Honeywell
1985 Douglas Drive North
Golden Valley, MN 55422-3992

In Canada:
Honeywell Limited
35 Dynamic Drive
Toronto, Ontario M1V 4Z9
www.honeywell.com

Honeywell

63-9489
May 2007

ProtoNode
PROTOCOL GATEWAY
Instant Multiprotocol Deployment for OEM

FieldServer Technologies
A Sierra Monitor Company

ProtoNode is an external, high performance, low cost Building and Industrial Automation multi-protocol gateway providing OEMs instant multiprotocol deployment of field protocol, quickly enabling the OEM device to communicate to systems and devices using modern open protocols.

FieldServer Technologies pre-programs the ProtoNode solution to provide a virtual plug-and-play, easy, complete protocol package for the OEM including: BACnet MS/TP, BACnet/IP, Metasys N2 by JCI, Modbus TCP, KNX, M-Bus, Allen Bradley EtherNet/IP, LonWorks and many others. There are no configuration files to download in the field and all configurations are available to the user/installer simply by selecting the proper DIP switches. ProtoNode OEM users have access to the extensive FieldServer driver library.

ProtoNode is the instant answer to a manufacturer's needs to meet customer demands. As an example, a manufacturer might have five different devices, each requiring a variety of protocols to meet their customer's interoperability needs. They desire a single source solution, with multiprotocol, multi-configuration capability, and they need it now! A single ProtoNode Solution can be provided by FieldServer Technologies that has all pretested configuration choices preloaded.

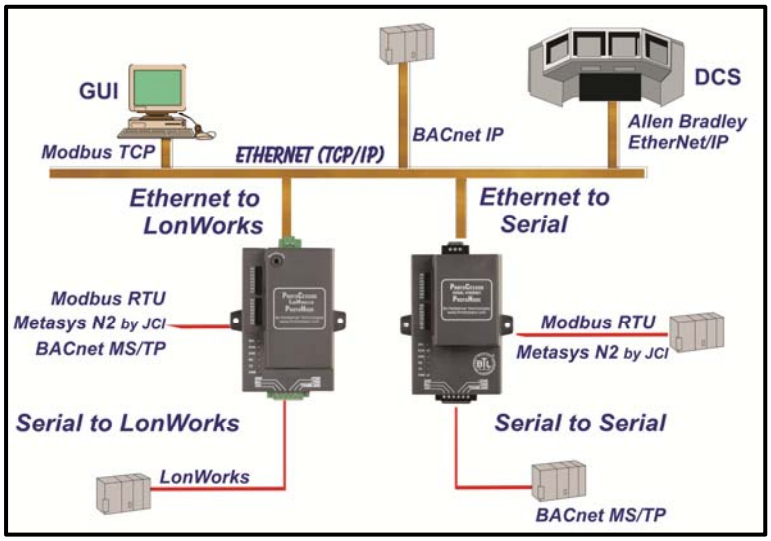
ProtoNode RER

ProtoNode LER

A key benefit for the OEM is minimal engineering costs, minimized stocking costs and simplified training and start-up operations!

ProtoNode Solution:

- ✓ Ability to automatically support multiple known controller profiles.
- ✓ Designed to be full featured, field programmable, and with multiple protocol support for any protocol translation between Serial, Ethernet, or LonWorks environments.
- ✓ Three methods of configuration:
  - Configuration Auto-Selector (via DIP switches)
  - Auto-Discover known devices
  - Profile selection via Web Configurator to load multiple configurations
- ✓ Multiple hardware solutions available interfacing with RS-232, RS-485, RS-422, KNX, M-Bus, Ethernet or LonWorks.
- ✓ Support one or multiple field protocols in single ProtoNode.
- ✓ Supports up to 10,000 Host and Field Protocol memory points depending upon model selected.
- ✓ Options available include USB2 port, Bluetooth, SD Card for data logging and collection, higher point counts.
- ✓ BACnet COV support provides fast data communication while reducing the traffic over a BACnet network.
- ✓ Supports virtual nodes allowing multiple OEM controllers to connect to a single ProtoNode and seen as separate controllers on the various field networks.
- ✓ Easily supports OEM's custom proprietary host serial or Ethernet protocols.
- ✓ Multi-Client and Multi-Server support ensures interoperability between any Industrial and or Building Automation protocols.
- ✓ BTL Marked and LonMark Certified.



FieldServer Technologies, 1991 Tarob Court, Milpitas, California 95035 USA **Web:** www.protocessor.com
Tel: 408-964-4433, **FAX:** 408-262-9042, **Toll-Free**: 800-317-8319 **Email:** sales@protocessor.com

Specifications:

ProtoNode	Interface Connections							Point Count			Certifications		
	RS-232	RS-485	RS-422	Ethernet	LonWorks	KNX	M-Bus	Level I	Level II	Level III	BTL	LonMark	KNX
FPC-N34		2		1				1500	5000	10000	Yes		
FPC-N35		1		1	1			1500	5000	10000	Yes	Yes	
FPC-N36		1	1	1				1500	5000	10000	Yes		
FPC-N37			1	1	1			1500	5000	10000	Yes	Yes	
FPC-N38	1	1		1				1500	5000	10000	Yes		
FPC-N39	1			1	1			1500	5000	10000	Yes	Yes	
FPC-N40		1		1		1		1500	5000	10000	Yes		Pending
FPC-N41				1	1	1		1500	5000	10000	Yes	Yes	Pending
FPC-N42		1		1			1	1500	5000	10000	Yes		
FPC-N43				1	1		1	1500	5000	10000	Yes	Yes	

Power Requirements

Power: 9-30 VDC or 12-24 VAC
(RS-422 = 15-30 VDC or 12-24 VAC)

Current draw @ 12V

- RER @ 12V = 240 mA
- LER @ 12V = 250 mA
- FPC-N36 @ 15V = 200 mA
- FPC-N37 @ 15V = 210 mA

M-Bus

- Slave: 550 mA @ 12V
- Master (1 Slave): 580 mA @ 12V
- Master (64 Slave): 980 mA @ 12V

Environmental

Operating Temp.: -40°F to 167°F (-40°C to 75°C)
Relative Humidity: 5-90% RH, non-condensing

Enclosure

Dimensions: 4.5 x 3.2 x 1.6 in. (L x W x H)
(11.5 x 8.2 x 4.0 cm)

Warranty

Warranty: Two years return to factory

Approvals

- BACnet Testing Labs (BTL) B-ASC
- LonMark 3.4 Certified - ProtoNode LER Series
- TUV approved to UL 916 EN 60950-1, EN 50491-3 and CSA C22-2 standards
- RoHS Compliant
- DNP3 Conformance Tested
- CE & FCC Approved

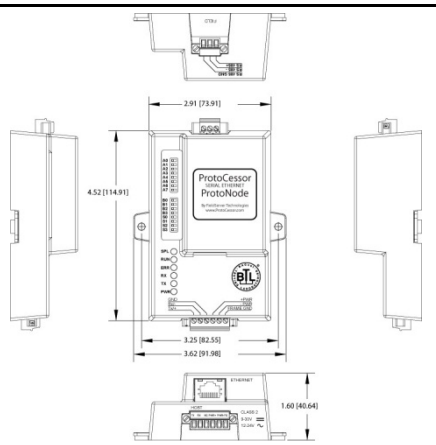
BACnet Support

- Alarm & Event notification read properties multiples, and more (see PICS)
- BACnet COV's, 20,000
- Support up to 20,000 Host & Field points
- DIP switches are for setting MAC Address, Node-ID, Baud Rate on the RS-485 Field protocol

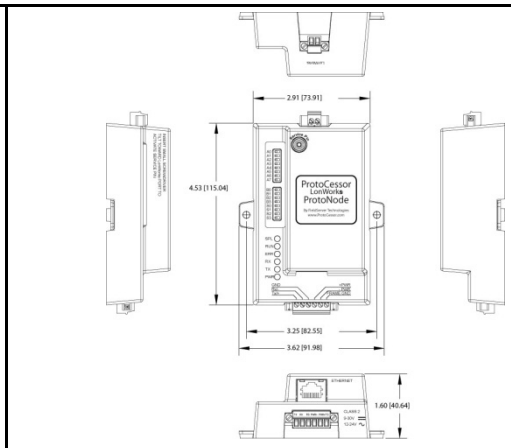
LonMark Certification on the ProtoNode LER

- SPID: 80:00:95:46:00:84:04:07
- Profiles: 0000 - Node object (1)
  0001 - Open Loop Sensor Object (5)
  0003 - Open Loop Actuator Object (5)

FieldServer Technologies has a library of over 100 drivers so check with ProtoCessor sales to determine what additional protocols are available to meet specific application needs.



ProtoNode RER Outline Dimensions



ProtoNode LER Outline Dimensions

Rev. 4/14

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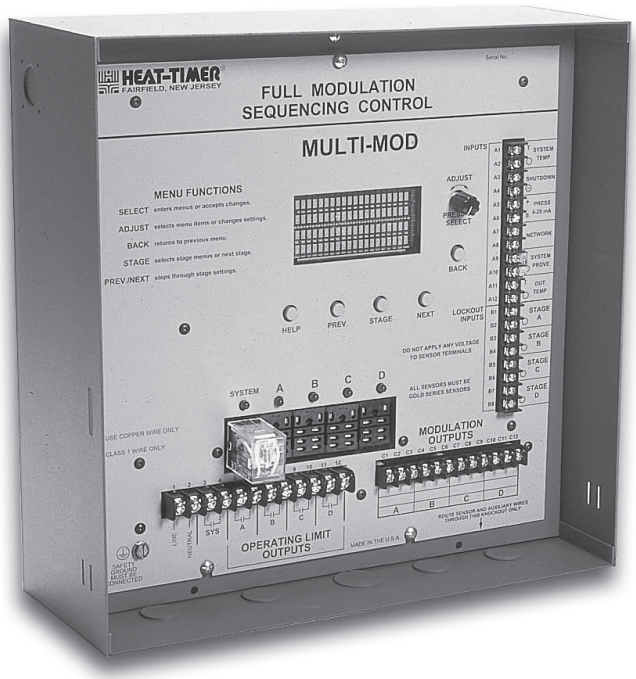
MODULATING SET POINT CONTROL

With • Lead Lag Modulating Boiler Control
• Internet, BACnet, or Modbus Communication options

Multi-MOD Platinum

Description:

- Sequences up to 4 Fully Modulating Stages for Temperature or Pressure Systems. The Multi-MOD Platinum is the perfect control whenever multiple fully modulating stages are required for heating or cooling applications. The Multi-MOD Platinum controls the on/off and the modulation of each stage to maintain precise set point control using PID type control logic.
- Controls 0-5V, 0-10V, 4-20mA, or 135Ω modulating motors. The Multi-MOD Platinum is designed to accurately control the output from 0 to 100% of modulation for each of these different types of motors. One Multi-MOD Platinum can even control two different types of motors.
- Digital Display of all System Settings. The Multi-MOD Platinum's 80 character alphanumeric digital display names each system parameter in plain English and shows its precise value. The easy to follow menu system allows users to quickly make changes to any system setting without having to learn any specialized codes or keyboard commands. Password protection is available to prevent unauthorized users from making adjustments to control settings.
- Automatic Rotation among Stages. Rotating the first stage to be activated on a call for output promotes even wear on each stage. The Multi-MOD Platinum has three modes of rotation: Manual, First ON/First OFF, or automatically every selected time period from every hour to every 7 days.
- Outdoor Reset Capability. The Multi-MOD Platinum can be connected to existing or new Heat-Timer outdoor reset controls (HWR for hot water heat, or MPC for steam heat). The Multi-MOD Platinum also has built in hot water reset with adjustable reset ratios, offsets and outdoor cutoff.
- Connects to Energy Management Systems. All Multi-MOD Platinums can be disabled by an Energy Management System (EMS) or other controller when there is no output requirement. The Multi-MOD Platinum can also accept a 4-20 mA input signal from an EMS to adjust the set point according to outdoor temperature or other factors.
- Monitors Stage Status. The Multi-MOD Platinum is designed to accept Lockout inputs from each stage. If any stage is in Lockout, the Multi-MOD Platinum will automatically skip it when adding more capacity. If a stage goes into Lockout during normal operation, the next stage will be activated immediately to maintain the desired output capacity.



- Optional BACnet or Modbus Communication. With the BACnet or Modbus options, a Multi-MOD Platinum can act as node in a BMS network. A proprietary communication EMS/BMS can use their BACnet IP, MST/TP, or Modbus integration to place the Multi-MOD Platinum on their network.
- Optional Internet Remote Communication Add-On. Imagine being able to not just control your building heat from anywhere, but to be able to see boiler status, and temperature and pressure logs. In addition, you will be able to set and monitor wireless and hard wired sensors, configure and receive alarms and lockout status, configure and view histories, and more. Well, imagine no more. The Multi-MOD Platinum can be ordered with the Internet communication packages that fit your needs. With that you can configure, set alarms and monitor a variety of sensors ranging from wireless, water meter, oil level, temperature, pressure, switch, and stack sensors.
- Additional features include: A purge timer, a low fire adjustment, a firing point setting for the next stage based on the firing rate of the current stage, a lag stage timer, a last stage hold adjustment, and many others.

Ask About the Internet, BACnet, and Modbus Communication Options

HT# 056160-00 D

HEAT-TIMER® CORPORATION
20 New Dutch Lane, Fairfield, NJ 07004 973-575-4004 • Fax 973-575-4052 • http://www.heat-timer.com

Features:

- All the following stage signal outputs are available: - 0-5 V or 0-10 V - 4-20 mA - 135 Ω
- The following are field selectable
- Rotation type: Manual, first on/first off, or automatic every adjustable time period from every hour to every 41 days
- Input type: Temperature, pressure, 4-20mA, or interface to outdoor reset controls HWR or MPC
- Temperature display: ºFahrenheit or ºCelsius
- Lockout inputs for each stage allow the Multi-MOD Platinum to automatically begin activating the next stage if a stage goes into Lockout
- Capability of connecting to Heat-Timer network sensors or Mini-MIG boxes to monitor temperatures, pressures, oil tank levels, water meters, etc.
- A System output relay is provided and is energized when output is required. It will remain on for an adjustable time delay after the last stage turns off
- System Prove input must be made before stages are activated
- Adjustable PID type logic or throttling range controls stage loading/unloading
- Parallel loading mode–used when boiler recommends higher efficiencies at lower firing points
- Remote enable/disable function
- Remote set back feature
- Adjustable purge, lag stage delay, system run-on delay, and standby timers
- Adjustable ignition and modulation start points
- Lead stage will not turn off until the system temperature or pressure exceeds an adjustable range from the set point value, preventing short cycling of the lead stage
- The Multi-MOD Platinum can be configured to accept a 4-20mA signal to remotely change the set point
- System sensor can be located up to 500' from the control module
- System sensor reading, set point, and stage information are constantly shown on the 80 character display
- Menu system provides digital display and precise adjustment of all settings
- Built-in password protection
- LEDs show status of each output relay
- Plug in field replaceable relays are rated at 6A resistive 1/3HP
- All settings and operating modes are stored permanently in EE-Prom even if power is lost
- Remote communication packages are available either at the time of order or as a field upgrade (Internet, BACnet, or Modbus)
- Hot water reset operation

Benefits:

Easy to order, stock, or field upgrade

- The base Multi-MOD Platinum unit can accommodate temperature, pressure, or 4-20mA inputs, and 0-5V, 0-10V, 4-20mA and 135Ω modulating motors.
- When ordering, you only need to specify the input sensor type and the output modulating motor type.
- If the system changes in the future, both sensors and output modules can be upgraded in the field.

Easy to install

A single 13" x 13" enclosure contains all Multi-MOD Platinum hardware and software.

- Only one sensor is required and it can be installed in any convenient location up to 500' from the Multi-MOD Platinum panel.
- Large, clearly marked 3/8" terminals facilitate wiring with standard screwdrivers.
- The 80 character display and easy to use menu system will guide you through all necessary settings.
- Every setting is displayed, eliminating guesswork about the precise value.

Easy to use

- After initial configuration, the Multi-MOD Platinum needs no further adjustment.
- Glancing at the 80-character display provides you with all the necessary operating information —system sensor value, setting, and output stage status.
- The PID algorithm will adjust for changes in load based on ambient conditions, outdoor conditions, or process demands.
- Lockout and System Prove inputs allow the Multi-MOD Platinum to quickly adjust to output stage or other system problems.
- The remote enable/disable function turns the Multi-MOD Platinum off automatically when no output is needed.

Fuel saving

- The Multi-MOD Platinum is unique among lead-lag systems in that is PID algorithm controls to precisely the desired set point. Unlike other systems, it does not bring all stages up to high modulation and then back them down until the desired set point is obtained. The Multi-MOD Platinum does not waste energy by activating unneeded stages and running them in the inefficient high modulation mode.
- The Multi-MOD Platinum has a built in Setback capability that lowers the set point when less output is required. This can be enabled from an EMS, a remote controller, or a manual switch.

HT# 056160-00 D

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- The remote enable/disable function allows an external control to shut the Multi-MOD Platinum down when no output is required, instead of relying on personnel to remember. For example, when the outdoor temperature rises above a desired point, a temperature controller output can disable the Multi-MOD Platinum.
- A Multi-MOD Platinum operating in heat mode can realize the fuel saving benefits of outdoor reset. A Multi-MOD Platinum can be controlled by Heat-Timer's outdoor reset control for hot water (HWR), for steam heat (MPC), or for a vacuum steam system (SRC). A Multi-MOD Platinum can also accept remote 4 20 mA set point.

Prolong output stage life

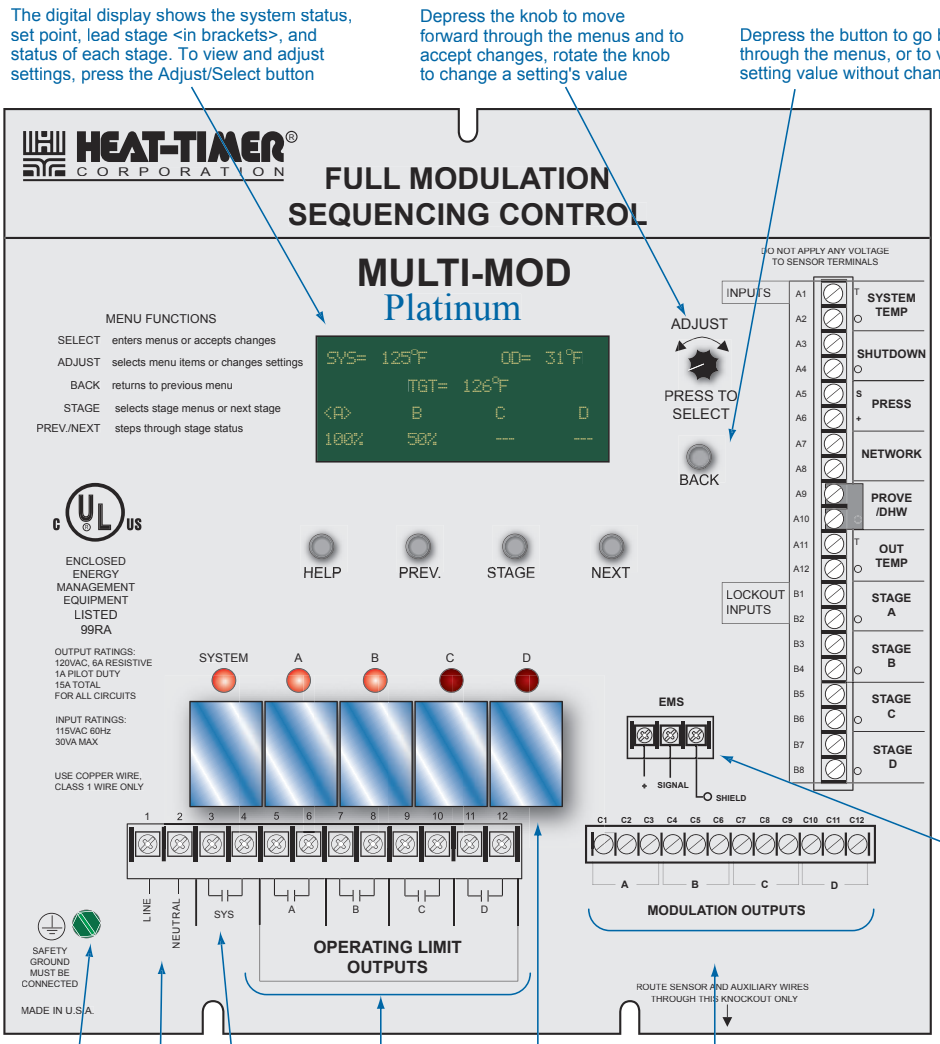
- The automatic lead stage rotation evenly distributes the wear on all available stages.
- The available rotation options allow you to pick the optimum schedule for your output stages.
- The purge time sets the minimum run time for any stage, preventing harmful short cycling.
- Short cycling prevention tools are built into the Multi-MOD Platinum software. As described in the previous section, on a cold start, the Multi-MOD Platinum does not bring all stages up to high modulation and then back them down. Stages are only enabled when they are required.
- The Multi-MOD reduces Short cycling of the lead stage during low load conditions using the Last Stage Hold setting. It allows the system temperature or pressure to vary from the set point before turning the last stage off.
- Stages are never turned off in high modulation, which can be very harmful. The Multi-MOD Platinum backs the modulation down to low before stages are turned off.

Multi-MOD Platinum Specifications

Input Voltage 120VAC
Power Consumption 30VA
Operating Mode . . . . . Heating/Cooling
Lead Stage Rotation
  Manual
  First On/First Off
  Automatically. . . . . Every hour to every 41 days
Output Types 0-5V, 0-10V, 420mA, 135Ω
Stage Modes . . . . . Off, Auto, On, Standby, Manual
Output Contacts . . . . . .5 SPST
Output Rating . . . . . .6A resistive, 1/3HP
Operating Ambient Temperature . . . . . .20 to 120°F
Enclosure. . . . . NEMA -1
Dimensions. . . . . .13" x 13" x 5-1/2"
Weight . . . . . 14 Lbs
Sensor Accuracy
  Temperature . . . . . +1°F (1°C)
  Pressure 1%FS
Temperature display . . . . . Field select °F or °C
Sensor Ranges
  Temperature . . . . . -30 to 250°F (-35 to 120°)
  Pressure . . . . . 0 to 15, 30, 100, 200, or 300psi
Ignition Start Point . . . . . 1 to 50%
Modulation Start Point . . . . . 0% to 100%
Operating Mode . . . . . .Normal or Process
Modulating Mode. . . . . Normal or Parallel
Purge Delay . . . . . .1.0 to 10.0 minutes
Lag Stage Delay . . . . . .0 to 60 minutes
System Run On Delay . . . . . .0 to 30 minutes
Standby Time . . . . . .0 to 60 minutes
Setback
  Temperature. . . . . .0 to 75°F (0 to 42°C)
  Pressure (0-15 or 0-30) . . . . . 0-7.5 psi
  Pressure (0-100) 0-75psi
  Pressure (0-200) 0-150psi
  Pressure (0-300) 0-200psi
Last Stage Hold
  Temperature . . . . . .0 to 30°F (0 to 30°C)
  Pressure (0-15 or 0-30) 0-3psi
  Pressure (0-100, 200, or 300) . . . . . .0-10% of range
Shutdown Input . . . . . .Dry Contact Only
System Prove Input . . . . . .Dry Contact Only
Lockout Inputs . . . . . .Dry Contact Only
4-20mA External Input . . . . . .Pressure or temperature
Reset Ratio. 1-4, 4-1
Reset Offset . . . . . (+40°F) (-40°F)
Remote Communication Options
  Internet (RINET) through www.htcontrols.com
  BACnet IP or MSTP (BAC)
  MODBUS RTU (BUS)

HT# 056160-00 D

Multi-MOD Platinum Control



* DRY CONTACTS ONLY
** Only available with the Remote Communications package

Item Description	Part #
Multi-MOD Platinum (0-135Ω)	926650-135
Multi-MOD Platinum (Current or Voltage)	926650-C/V
Multi-MOD Platinum - Internet	926650-135-RINet♦
Multi-MOD Platinum - BACnet IP or MSTP	926650-135-BAC♦
Multi-MOD Platinum - Modbus RTU	926650-135-BUS♦
Extension Panel (8 Stages with Lockout) ♦♦	926650-EXT

Item Description	Part #
3-in-1 Temperature Sensor	904220-00
0-30 PSI Transducer	904310-00
0-100 PSI Transducer	904312-00
0-200 PSI Transducer	904311-00
0-300 PSI Transducer	904313-00
Current/Voltage Output Card (2 stages)	900201-C/V
0-135Ω Output Card (2 stages)	900201-135
Plug-in Relay 24VDC	500054-00

♦ All Multi-MODs can have either C/V or 135Ω modulating signal based on the output cards installed. Change the 135 in the Part # to C/V for Current or Voltage modulation option.

♦♦ Extension panels DO NOT come with Output cards or relays. They must be purchased separately.

HT# 056160-00 D

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HEAT-TIMER CORPORATION 20 New Dutch Lane, Fairfield, NJ 07004 973-575-4004 • Fax 973-575-4052 http://www.heat-timer.com

CSI SPECIFICATION: *MULTI-MOD PLATINUM*

SECTION: 230913 Instrumentation and Control devices for HVAC

PART 1 GENERAL

1.1 Summary

A. Section Includes:

1. Multiple modulating boiler Heating Control.

B. Related Sections:

2. Conforms to applicable building code requirements of all authorities having jurisdiction.

1.2 References

A. International Organization for Standardization (ISO)

1. Manufacturer shall be ISO 9001:2000 Quality Management Systems Certified.

B. Underwriters Laboratories, Inc. (UL):

1. Tested per standard 916, Temperature Indicating and Regulating Equipment.

C. The City of New York, Department of Environmental Protection (DEP).

1. The control shall be approved for installation in New York City by DEP.

1.3 Quality Assurance

A. Manufacturer's Quality System:

1. Registered to ISO 9001:2000 Quality Standard, including in-house engineering for product design activities.
2. The control must be UL tested and certified per standard 916, Temperature Indicating and regulating Equipment.

1.4 Control Operation

A. **Description:** The control shall operate on 120VAC, with a maximum power of 30 watts. The control shall be pre-engineered and programmed exclusively for the operation of multiple modulating steam/hydronic heating systems based on a PID logic. It shall be capable of controlling four modulating boilers without any additional extra modules. However, it shall be modular and capable of controlling a total of 20 modulating boilers using a maximum of two external modulating extension controls.

B. **Modulating Outputs:** The control shall have four normally open relay contacts that can be used to start/stop each burner. These relays shall be field replaceable. The control shall have four modulating outputs. Every two modulating outputs shall have the same modulating signal and be controlled by the same modulating output card. The control shall have the capability to operate modules having 0 – 5 volts, 1 - 5volts, 0 – 10 volts, 2 - 10 volts, 4 – 20 ma, and 135-ohm outputs. The control shall be capable of identifying the output module types and adjusting control output accordingly. Where practical, the output modules shall be protected from accidental incorrect connection. Should damage occur, where practical, damage shall be confined to the output module.

C. **Sequence of Operation:** When heat is required, the control PID shall activate the lead boiler and start its pre-purge cycle followed by the initiation of modulation at the Fire Start Percent. When additional heat is needed, the control shall start to increase modulation until the Modulation Start percent has been reached. That shall be followed by the lag boiler pre-purge cycle. Then, the lag boiler shall remain at the Fire Start percent and the lead boiler shall resume its modulation until it reaches full fire (100% modulation). Any additional requirements for heat shall trigger the control to increase the lag boiler. When the control PID requires reduced output, the control shall reduce the modulation of the lag boiler until it reaches its Fire Start percent. That shall be followed by the reduction of modulation of the lead boiler until it reaches 40% percent of its Modulation Start percent. This shall trigger the control to turn off the lag boiler.

D. Features:

1. **Outdoor Reset or Set Point:** The control shall provide an integral sensor set point adjustment. The set point shall be adjustable either through the control menu or remotely using a 4-20mA input signal. In addition, when in temperature mode and equipped with an outdoor sensor, the control shall be capable of varying the set point based on an outdoor reset curve. The outdoor reset curve parameters shall be field adjustable.
2. **Fire Start Percent:** Adjustable from 1 to 100%. This setting shall set the firing percent at which the burner shall start at when energized or de-energized. There shall be an independent adjustment of this setting for each burner.
3. **Modulation Start Percent**: Adjustable from 0 to 100%. This setting shall set the percent of modulation the lead boiler must achieve before the lag boiler is activated. There shall be an independent adjustment of this setting for each burner.
4. **Gain:** Adjustable from -10 to +10. This setting shall increase or decrease the amount of modulation based on the rate of change in system sensor reading and the set point.
5. **Purge Time:** Adjustable from 0- 10.0 minutes. This setting shall set the delay time between a boiler being energized and the beginning of modulation.
6. **Last Stage Hold:** Adjustable from 0 to 30 minutes. The last stage hold shall keep the last boiler at low fire for an additional degrees/lbs of pressure to reduce short cycling of the lead boiler.
7. **Lag delay:** Adjustable from 0 to 60 minutes. The lag boiler in the rotation shall not be fired until the lead boiler has remained in high fire for the period of time set by the Lag Stage delay.
8. **Rotation:** The control shall be capable of rotating the boilers either based on an adjustable time period, Last-On/last-Off, or manually.
9. **Parallel Modulation:** The control shall have an option for parallel modulation where multiple boilers can modulate upward or downward together with increase or decrease modulation.
10. **Memory:** The control shall store all configuration and settings on EE-Prom. In case of power failure the control should be able to retrieve all of its latest settings.
11. **Display:** The control shall have a four line by eighty-character alphanumeric display capable of displaying both numbers and characters. The display shall be visible with no ambient light. All control operation information shall be available for display. During times of inactivity, or 10 minutes after last user entry, the display shall enter a lower power mode. In this mode the control should display date and time of day, cycle status, outdoor temperature, system temperature, and valve opening percentage. In this mode, the display shall reduce visible light output. The control shall exit this mode whenever button or digital encoder activity is sensed.
12. **Boiler Lockout Input:** The control shall have a dry contact input for boiler failure. The control shall not include failed boilers in its modulation sequence.

E. Input Points:

1. **Outdoor Temperature:** This shall be the value read from the outdoor sensor placed on the north side of the building at least 10 Ft. above the ground.
2. **System Temperature (Hydronic Systems):** This shall be the value read from the system sensor placed on the hot water system pipe to measure hot water circulating temperature.
3. **System Pressure (Steam Systems):** This shall be the value read from the system pressure sensor placed on the main header.
4. **External Shutdown:** The control shall be capable of accepting a dry closure type shutdown input. This shall prevent any boilers or pumps from activating when the contact is closed.
5. **Prove Input:** The control shall be capable of accepting a dry contact closure type for system prove input. This shall prevent any boilers from activating until the contact is closed.
6. **Lockout Input:** The control shall be capable of accepting dry contact closure for boiler failure.

7. **System Set Point (4-20mA Signal):** The control shall be capable of accepting a 4-20mA remote signal as a set point.

F. Output Points/Relays:

1. Burner relay output
2. Burner modulation output: 135 Ohm, 4-20mA, 0-5V, 1-5V, 0-1V, 2-10V
3. System relay output

G. Data Points:

1. **Burner Modulation Percent:** This shall indicate the percent of modulation status each boiler has.
2. Fire Start Percent: This shall be the percent at which a boiler will start its modulation. Each boiler shall have a separate configurable value.
3. **Last Stage Hold:** Adjustable from 0 to 30 minutes. The last stage hold shall keep the last boiler at low fire for an additional degrees/lbs of pressure to reduce short cycling of the lead boiler.
4. **Lag Delay:** Adjustable from 0 to 60 minutes. The lag boiler in the rotation shall not be fired until the lead boiler has remained in high fire for the period of time set by the Lag Stage delay.
5. **Modulation Speed** (for process applications only) This shall be adjusted the burner modulation motor speed for the control logic to match.
6. **Modulation Start Percent**: Adjustable from 0 to 100%. This setting shall set the percent of modulation the lead boiler must achieve before the lag boiler is activated. There shall be an independent adjustment of this setting for each burner.
7. **Rotation Mode**: Auto, Manual, Last-On/Last-Off
8. **Setback:** The control shall have a dry contact input to initiate a setback.
9. **Standby Delay:** This shall be the set to the amount of time for all automatically controlled boilers to be at high fire before starting boilers set to standby.
10. **System Run-On:** This shall be the value at which the system relay shall remain energized for after all boilers have turned off.
11. **System Set Point/Target.** This shall be either set to the desired system design temperature / pressure. If the control is set to outdoor temperature reset, this value should change dynamically based on the outdoor temperature and other reset ratio parameters.

1.5 Regulatory Approvals

A. Underwriters Laboratories, Inc. (UL):

1. The control shall be tested per standard 916, Temperature Indicating and Regulating Equipment.

B. The City of New York, Department of Environmental Protection (DEP).

1. The control shall be approved for installation in New York City by DEP.

1.6 Included Items

A. Control Relays. Control relays shall be plug-in type, UL listed, and shall have dust cover and LED "energized" indicator. Contact rating, configuration, and coil voltage shall be suitable for application. Only one relay is included for the system output. Additional relays are required for each boiler and must be ordered separately.

1.7 Optional Items

A. Outdoor Temperature Sensor shall be of the Thermistor type capable of measuring between –30°F to 250°F. It shall have a weather shield to protect it from moisture and direct sun.

B. System Temperature Sensor shall be of the Thermistor type capable of measuring between –30°F to 250°F

C. System Pressure Sensor shall be of the Transducer type capable of measuring between 0-30PSI, 0-100PSI, 0-200PSI, 300PSI.

1.8 Communication (Select one of these Options)

A. **Internet Communication:** The control shall be capable of communicating to the Internet using a high-speed Internet connection to communicate to the manufacturer or manufacturer representative web servers to send or receive its information. Remote users of the control shall have the capability of the control remotely using an Internet Browser with built-in Java when provided with security logging

information. The user shall be capable of viewing and changing control settings remotely. In addition, the web server shall offer customizable history reporting and graphing of all control and sensor data. The control and web system shall be capable of sending alarms to web viewers, several E-mails, and several cellular phones as text messages.

B. **BACnet IP Communication:** The control shall be BACnet IP capable. It shall provide the user with BACnet IP communication Interface to an Energy Management System (EMS) or Building Management System (BMS) on the same BACnet network. The control shall be designed to be BACnet Application Specific Controller (B-ASC). The control shall manage the boilers and their modulation and the system pump through direct wiring to the equipment and not through the BACnet network.

C. **BACnet MSTP Communication:** The control shall be BACnet IP capable. It shall provide the user with BACnet MSTP communication Interface to an Energy Management System (EMS) or Building Management System (BMS) on the same BACnet network. The control shall be designed to be BACnet Application Specific Controller (B-ASC). The control shall manage the boilers and their modulation and the system pump through direct wiring to the equipment and not through the BACnet network.

D. **MODBUS (RTU):** The control shall be MODBUS RTU capable. It shall provide the user with RS485 communication Interface to an Energy Management System (EMS) or Building Management System (BMS) on the same BACnet network. The control shall be designed to be BACnet Application Specific Controller (B-ASC). The control shall manage the boilers and their modulation and the system pump through direct wiring to the equipment and not through the MODBUS network.

B. **Johnson Metasys, Johnson N2, LonWorks, Honeywell, Tridium, and other protocol communications:** The control shall be BACnet IP capable. However, will communicate to the other proprietary protocol through a BACnet IP or BACnet MSTP to the specified proprietary protocol through a gateway that is supplied by the control manufacturer at additional cost. It shall provide the user with proprietary protocol communication Interface to an Energy Management System (EMS) or Building Management System (BMS). The control shall be designed to be BACnet Application Specific Controller (B-ASC). The control shall manage the boilers and their modulation and the system pump through direct wiring to the equipment and not through the BACnet network.

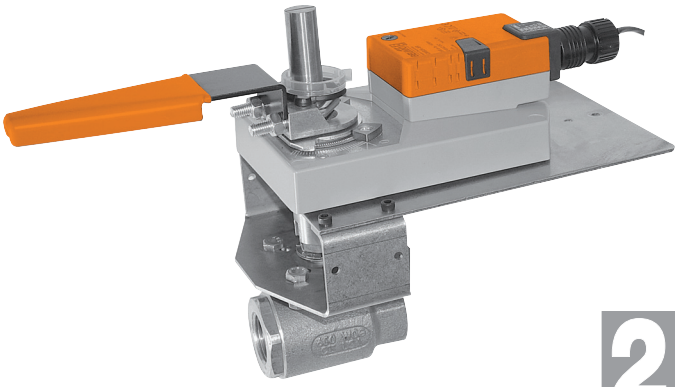
1.9 Security

A. Control Local Security:

1. The control shall have a secure password to deter unauthorized users. The password shall be optionally activated.
2. The control shall have a key-locked enclosure.

B. Control Remote Internet Security

1. To access an Internet communication control remotely, the control, web server, or proprietary software shall deter unauthorized users by requiring a secure password for logging to the control interface.



2 YEAR WARRANTY

CE LISTED 94 05 TEMP.IND. & REG.EQUIP. c UL us BRUSHLESS dc motor

Models

GMB24-3-X1
2*GMB24-3-X1

Technical Data	
Control	On/Off, Floating Point
Power supply	24 VAC ± 20% 50/60 Hz 24 VDC ± 10%
Power consumption running	4 W
holding	2 W
Transformer sizing	6 VA (Class 2 power source)
Electrical connection	❑ 3 ft [1m] 18 GA plenum rated cable ½" conduit connector
Overload protection	electronic throughout stroke
Angle of rotation	95°
Direction of rotation	reversible with ↷/↶ switch
Position indication	reflective visual indicator (snap-on)
Running time	150 seconds, constant independent of load
Humidity	5 to 95% RH non-condensing
Ambient temperature	-22°F to 122°F [-30°C to 50°C]
Housing	NEMA 2/IP54 with cable entry down
Housing material	UL94-5V (flammability rating)
Agency listings	cULus acc. to UL 60730-1A/-2-14, CAN/CSA E60730-1, CSA C22.2 No. 24-93, CE acc. to 89/336/EEC
Noise level	<45 dB(A)
Quality standard	ISO 9001

Dimensions with 2-Way Valve

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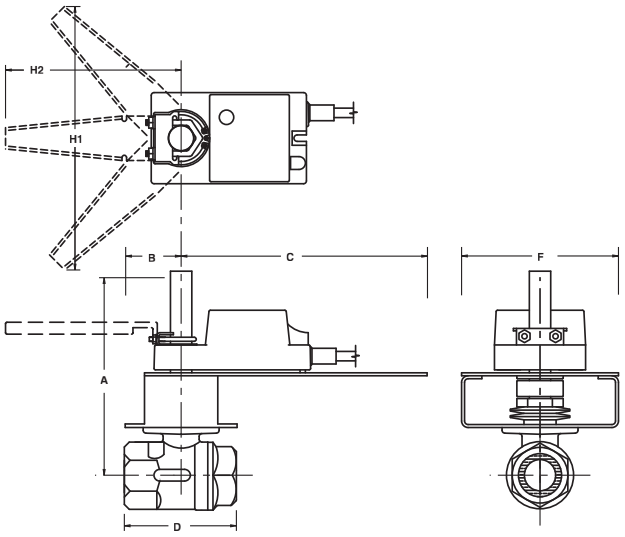

Valve Nominal Size — Dimensions (Inches)

Valve Body	COP	Inches	DN [mm]	A	B	C	D	F	H1	H2
B239VS	400	1½	40	7.50	3.00	8.00	4.37	6.25	9.75	8.50
B249VS	200	2	50	7.50	3.00	8.00	4.68	6.25	9.75	8.50
B239VSS	1000	1½	40	7.50	3.00	8.00	4.37	6.25	9.75	8.50
B249VSS	400	2	50	7.50	3.00	8.00	4.68	6.25	9.75	8.50

Dimensions with 3-Way Valve

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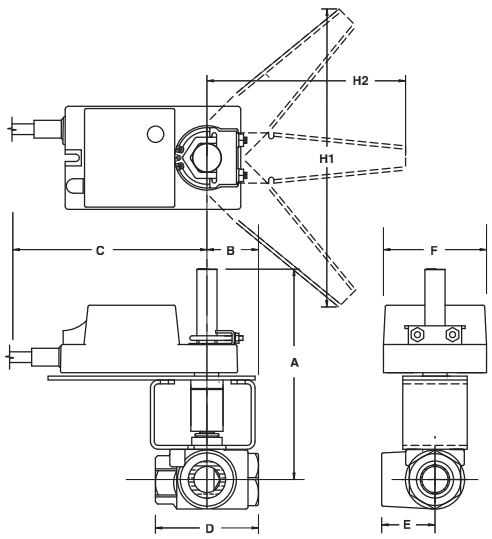

Valve Nominal Size — Dimensions (Inches)

Valve Body	COP	Inches	DN [mm]	A	B	C	D	E	F	H1	H2
B340VS	75	1½	40	7.00	2.00	8.00	4.44	2.25	6.25	9.75	8.50
B350VS	75	2	50	15.00	8.00	8.00	5.38	2.75	6.25	9.25	8.50

Dimensions with 2*GM… and 2-Way Valve

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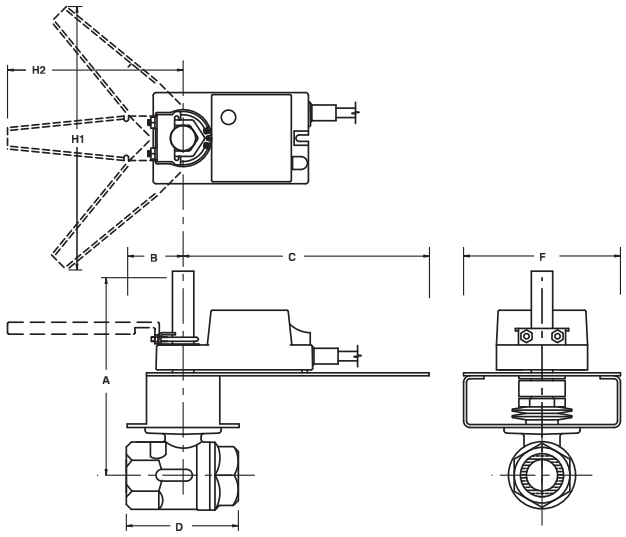

Valve Nominal Size				Dimensions (Inches)						
Valve Body	COP	Inches	DN [mm]	A	B	C	D	F	H1*	H2*
B240VS	400	1½	40	7.50	3.00	8.00	4.75	6.25	9.75	8.50
B250VS	200	2	50	15.00	3.00	8.00	5.37	6.25	9.75	8.50
B265VS	100	2½	65	15.00	3.00	8.00	6.25	6.25	9.75	8.50
B280VS	50	3	80	15.00	3.00	8.00	6.75	6.25	9.75	8.50
B249VSS	1000	2	50	7.50	3.00	8.00	4.68	6.25	9.75	8.50
B265VSS	200	2½	65	15.00	3.00	8.00	6.25	6.25	9.75	8.50

*Handles not available on spring return series or dual mounted actuators

Dimensions with 2*GM… and 3-Way Valve

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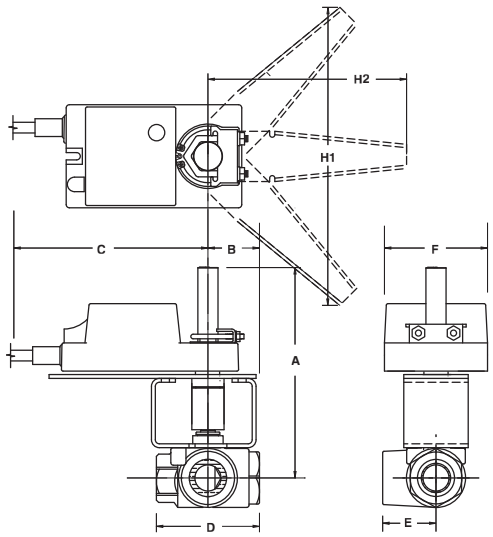
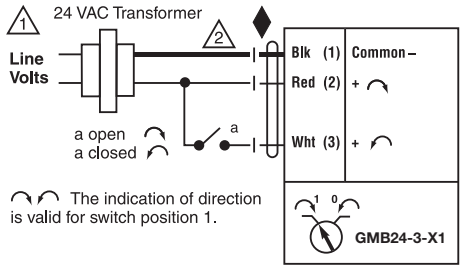


Valve Nominal Size				Dimensions (Inches)								
Valve Body	COP	Inches	DN [mm]	A	B	C	D	E	F	H1*	H2*
B350VS	200	2	50	15.00	8.00	8.00	5.38	2.75	6.25	9.75	8.50

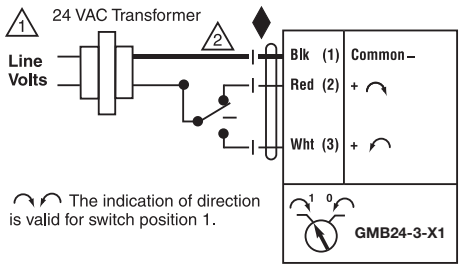
*Handles not available on spring return series or dual mounted actuators

Wiring Diagrams

1. Provide overload protection and disconnect as required.
2. Actuators may be connected in parallel if not mechanically mounted to the same shaft. Power consumption and input impedance must be observed.
3. Actuators may also be powered by 24 VDC.
4. Position feedback cannot be used with Triac sink controller. The actuator internal common reference is not compatible.
5. Control signal may be pulsed from either the Hot (source) or the Common (sink) 24 VAC line.
7. Contact closures A & B also can be triacs. A& B should both be closed for triac source and open for triac sink.
8. For triac sink the common connection from the actuator must be connected to the hot connection of the controller.



On/Off control



Floating Point or On/Off control

Piping

The valve should be mounted in a weather-protected area in a location that is within the ambient limits of the actuator. Allow sufficient room for valve with actuator and for service. Allow 6" for cover removal and 12" for complete actuator removal. The assembly can be mounted with the actuator vertical or horizontal in relation to the pipe. The actuators should never be mounted underneath the valve, as condensation can build up and result in a failure of the actuators. Do not reverse flow direction.