PREFERRED
UTILITIES MFG CORPORATION



BOILER CONTROLS RETROFIT AND SERVO INSTALLATION GUIDE

FOR USE ON BOILERS MADE BY THE CLEAVER-BROOKS COMPANY

BREAK FREE OF PROPRIETARY PARTS, PRICING, AND CONTROL.

FM APPROVED

Overview



While The Cleaver-Brooks Company makes a good low emissions boiler, adding a BurnerMate Universal retrofit control package makes it a great low emissions boiler. BurnerMate Universal offers a self-contained boiler control package that includes advanced flame safeguard control, parallel positioning fuel/air ratio control, oxygen trim draft control and drum level control. Up to ten high precision digital servos can be utilized for a variety of applications or in some cases you can reuse existing analog control devices.

The BMU continually monitors the flue gas oxygen and will use previously entered curve data to trim or fine tune the fuel/air ratio, maintaining peak operating efficiency. The safety of the boiler operation is also improved by monitoring the flue gas oxygen. This provides low excess air alarm and trip functions and has proven to be essential whenever Flue Gas Recirculation (FGR) is utilized to reduce emissions.

A Variable Speed Drive (VSD) controlled forced draft fan provides significant electrical savings compared to fixed speed fans with a damper. In many cases, the annual electrical cost savings due to the VSD are approximately the same as the annual fuel cost savings due to the Oxygen Trim. A BurnerMate Universal retrofit control package provides twice the annual savings, achievable with application of only a O2 Trim or only a VSD.

With energy savings as the main concern in today's world, a single point jackshaft control system does not allow for energy saving possibilities on many boilers. By converting to the BurnerMate Universal with an independent servo parallel positioning system, O2 trim and a VSD, annual energy costs will quickly plummet. Payback periods are frequently less than one and a half years.

Preferred Utilities, located in Danbury, Connecticut, manufactures microprocessor based controllers, instruments and electric actuators for combustion and process applications. A major component of the Instrument group sales is from control systems integration including personal computer based Supervisory Control and Data Acquisition systems.

Boiler EnergySaver Payback Analysis

Boiler EnergySaver Payback Analysis

Boiler / Burner Data:

Boiler Output:	600	(Bhp ▼	Burner does not fire:	109.5	days/yr
Fuel Type:	Natural Gas ▼		Fuel Cost:	5.00	($ / 1000 scf)
FD Fan Damper Type:	Non Vortex ▼		Electricity Cost:	10	(cents / kWh)
O2 Measurement:	%O2 Wet ▼				

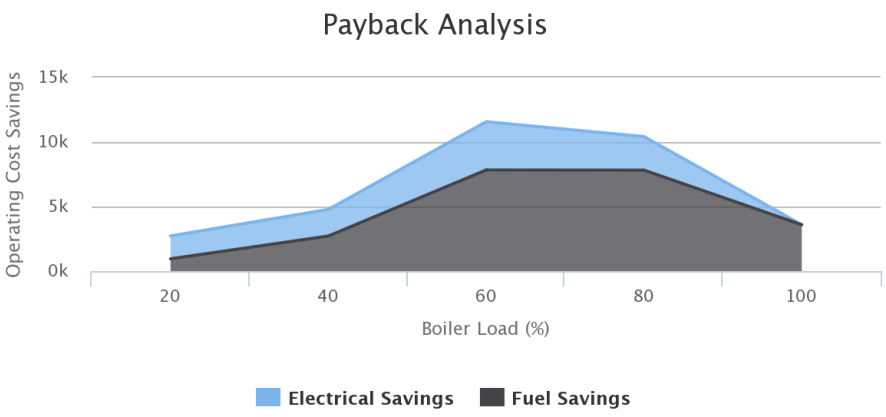
Existing: Full Speed FD Fan Motor			Proposed: VSD FD Fan Motor	
FD Fan Motor Hp Rating:	75 ▼		75 ▼	FD Fan Motor Hp Rating
Motor manufactured:	1997-2009 (EPA ▼		1997-2009 (EPA ▼	Motor manufactured
Typical motor efficiency:	91.7		91.7	Typical motor efficiency
Full Load Motor Efficiency:	91.7		91.7	Full Load Motor Efficiency
% of Motor Full Load Amps @ 100% Firing rate:	95.0	(80-100% typ)	95.0	VFD Full Load Efficiency (97-98% typ)

Firing Rate (%):	20%	40%	60%	80%	100%	Total	
Boiler Output:	120.0	240.0	360.0	480.0	600.0	(Bhp)	
% of Firing hours at this Output:	10	10	20	20	10	70	
Firing Hours at this Boiler Output:	613.2	613.2	1,226.4	1,226.4	613.2	6,132	
Existing Stack Oxygen:	8.0	8.0	7.0	6.0	5.0	%O2 Wet	
Proposed Stack Oxygen:	6.5	6.5	5.5	4.5	3.5	%O2 Wet	
Existing Stack Temperature:	450	450	475	480	500	(F)	
Projected Stack Temperature:	439.77	439.77	463.32	469.8	491.01	(F)	
Existing Combustion Efficiency:	77.7	77.7	77.8	78.5	78.6	(%)	
Projected Combustion Efficiency:	79.3	79.3	79.3	79.8	79.9	(%)	
Existing Fuel Usage:	3,202	6,403	19,184	25,358	15,815	69,962	(kscf)
Projected Fuel Usage:	3,136	6,272	18,811	24,931	15,574	68,724	(kscf)
Existing kWh Usage:	20,493	25,616	60,199	66,602	35,543	208,453	(kwh)
Projected kWh Usage:	2,758	4,988	22,804	40,620	37,414	108,584	(kwh)

Avg Annual Boiler Output:	185	(Bhp)	(fuel savings based) CO2 reduction:	72	(tons/yr)

	Existing -	Projected	= Savings		Total Savings/Year:
Annual Fuel Cost:	349,806	343,627	6,179	=	16,166
Annual Fan Electricity Cost:	20,845	10,858	9,987		

Total Cost:	45000	($)
Utility Rebate:	18000	($)
Cost (less rebate):	27000	(%)
Simple Payback:	1.67	(years)
Simple ROI:	59.87	(%)



Fuel and Electric Savings Per Year

Burner control upgrades and/or burner upgrades can provide significant fuel and electricity cost savings. How can an engineer, installer, or facility estimate realistic cost savings in order to evaluate the payback from an upgrade investment? Preferred has the answer. We built the Preferred Utilities EnergySaver Payback Analysis Web App to estimate savings based on site specific data.

Overview of Parts Required for Installation

BurnerMate Universal Control System

The following pictures and descriptions are based on a typical BurnerMate Universal retrofit package on a 250 HP The Cleaver-Brooks Company Boiler with Hawk controls.



Retrofit control package includes:

BurnerMate Universal 1ZN0 cabinet:
- BMU expanded chassis for draft control and O2 trim
- OIT Touchscreen

ZP Oxygen Analyzer

FD Fan Variable Speed Drive

Limit switches including:
- Low Gas Pressure Switch
- High Gas Pressure Switch
- Low Oil Pressure Switch
- High Oil Pressure Switch
- Low Oil Temperature Switch
- Combustion Air Pressure Switch

Draft Pressure Transmitter and High Draft Cutout Switch

Steam Drum Pressure Transmitter

Flue Gas Temperature Thermocouple

Parallel Positioning Combustion Control Servos:
- Gas Valve Servo Oil Valve Servo
- Forced Draft Damper Servo
- Flue Gas Recirculation (FGR) Damper Servo
- One additional servo for draft control
- (If there is an existing outlet damper)

All of the required brackets, couplings to adapt the new servos to the existing fuel and damper control devices.

Reused original equipment to BMU system:

The Cleaver- Brooks Company Oil Atomizing Air Pressure Switch

Gas and Oil Safety Shutoff Valves

Both High Steam Pressure Operating Limit Switches

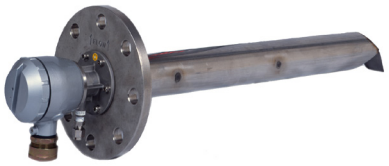
Existing Low Water and Auxiliary Low Water Cutoffs

Boiler Water Temperature Aquastat Switch





E-Link Draft Damper Assembly



In-Situ Oxygen Sensor



Servo with Quick Connect

Recommended Steps for Installation

Installation of the BurnerMate Universal control panel

Remove all field wiring to the original panel and unbolt it from the two angle supports on the boiler door. Build a uni-strut frame that will dimensionally fit the new panel and bolt it to the two angle supports as shown.

Original panel mounted to the angle supports.



New uni-strut frame bolted to the angle supports.



New BurnerMate Universal panel bolted to uni-strut frame.





New BurnerMate Universal panel powered up.



FD Motor wires routed behind the panel.



Mounting of the Field Devices

A Preferred ZP Zirconium-Oxide Oxygen Detector Probe (ZP-O2) is included as part of the new system. This gets wired in its own dedicated conduit directly back to the BMU panel. Calibration gas flow rate rotometers are supplied for installation at floor level and is connected to the Oxygen Detectors with ¼ inch copper. Reference Section 7 of the BurnerMate Universal Instruction Manual for details on installing the ZP-O2 probe and detector.

ZP-O2 Detector and Probe mounted in the stack.



Flow meter tubed to the O2 Detector





Shown are:

Low and High Oil Pressure Low Oil Temperature
Low Combustion Air Flow
Low Atomizing Air Pressure Switches

Low Gas Pressure Switch



High Gas Pressure Switch



Steam Pressure Transmitter



Variable Speed Drive (VSD)



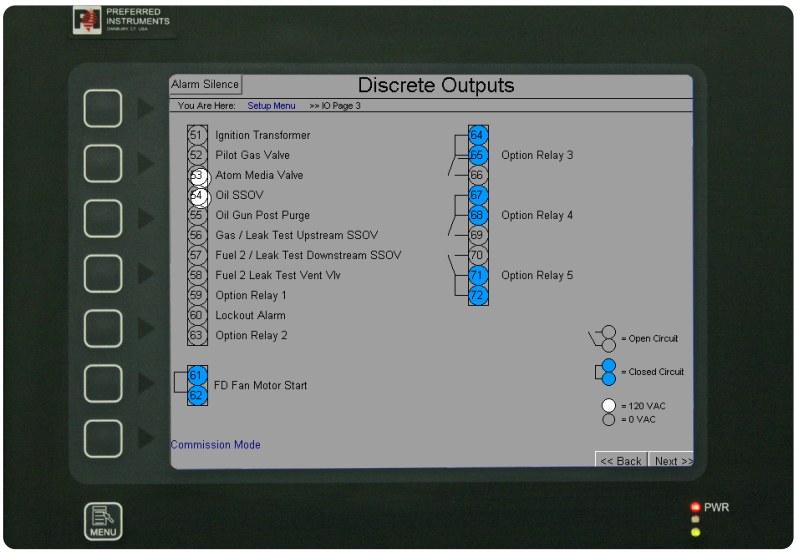
The original oil solenoid valve may be required to be replaced with new oil safety shut off valves with proof of closure switches.

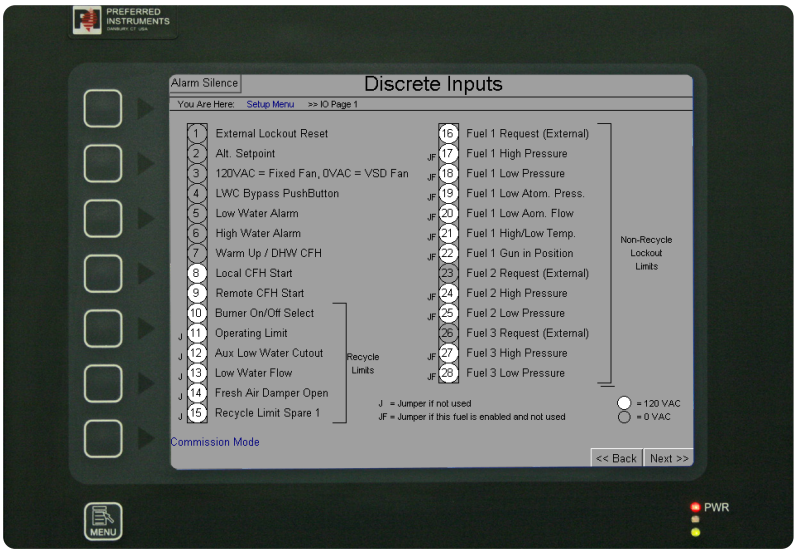


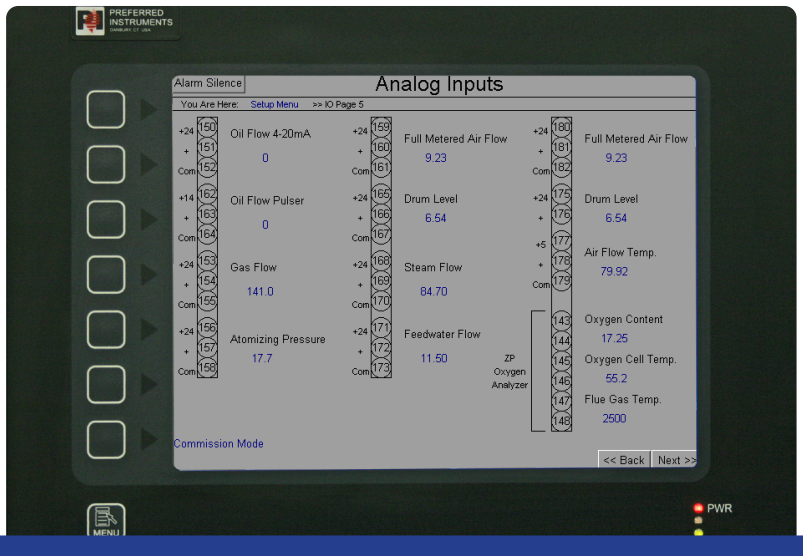


Wiring Field Devices

Wire the field devices as shown on the BurnerMate Universal electrical print and prove they are properly connected using the Touch Screen I/O reference view. All of the low voltage and high voltage circuits can be checked by viewing the touch screen.

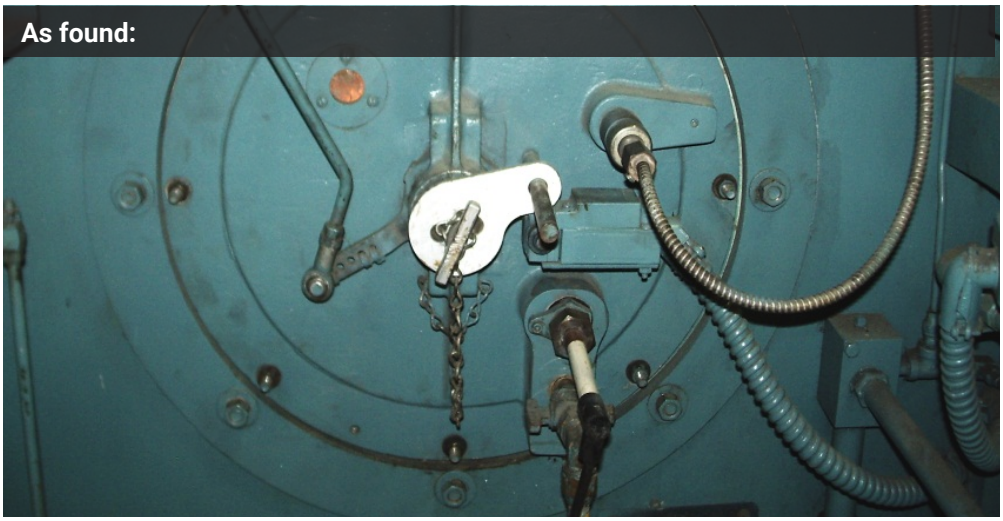






FD Damper BMU Servo Installation

As found:



Parts Required for Mounting the FD Damper Servo:

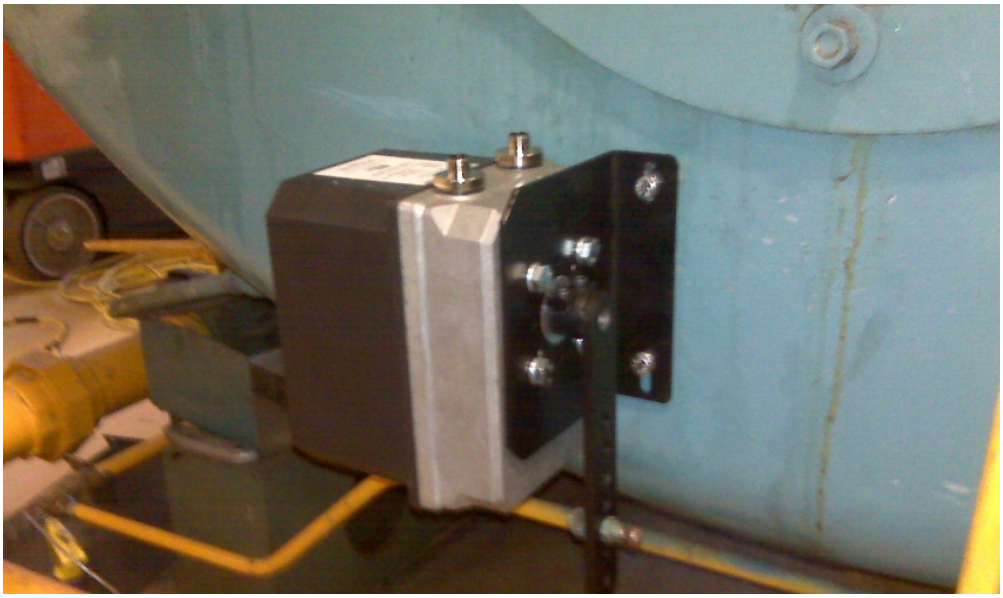
- One (1) BMU-SM-37-QD Servo
- One (1) Set servo bolts and washers
- One (1) 107371 Bracket
- One (1) 107366 Lever Arm
- Two (2) ¼-20 X 1 inch bolts, flat washers, lock washers

1 Remove the existing drive rod from the damper arm. Remove all the swivel hardware from the drive rod and the ball pin from the jackshaft drive arm for reuse. Discard the rod.

2 Remove the drive arm connecting the firing rate actuator to the jackshaft drive arm and remove the swivel hardware. Keep the drive rod for reuse and discard the swivel hardware.

3 Bolt the BMU-SM-37-QD Servo to the bracket supplied (107371) and loosely install the lever arm (107366) to the servo shaft as shown in the picture below.

4 With the FD damper in the fully closed position, hold the servo and bracket up to the boiler as shown in the picture below. Holding the servo so that the drive arm is approximately ¾ of an inch to the left of the last hole (outer most) in the FD drive arm, mark on the boiler the location of the bolt holes for the servo bracket.

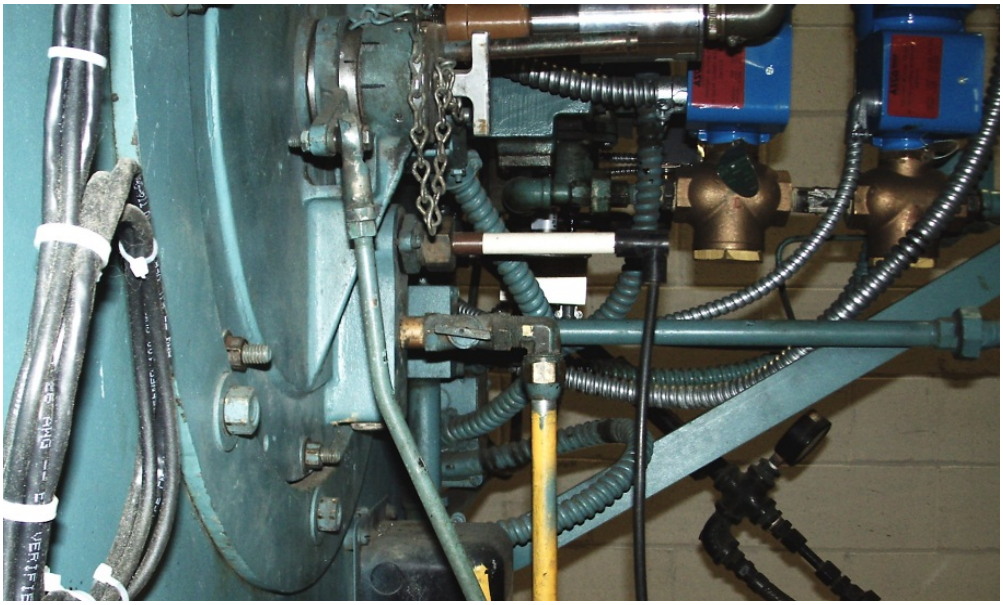


Hint: use a level to plumb a line from the last hole in the FD drive arm and make a pencil mark on the boiler adjacent to where the FD servo will be mounted. This will help facilitate the location of the servo bracket.

5 Drill and tap two ¼-20 holes and mount the servo bracket as shown above.

6 Using the drive arm from the firing rate actuator and the swivel fittings removed from the FD drive arm; assemble the drive arm as shown in the below pictures. The quick disconnect fitting should be on the servo drive arm.

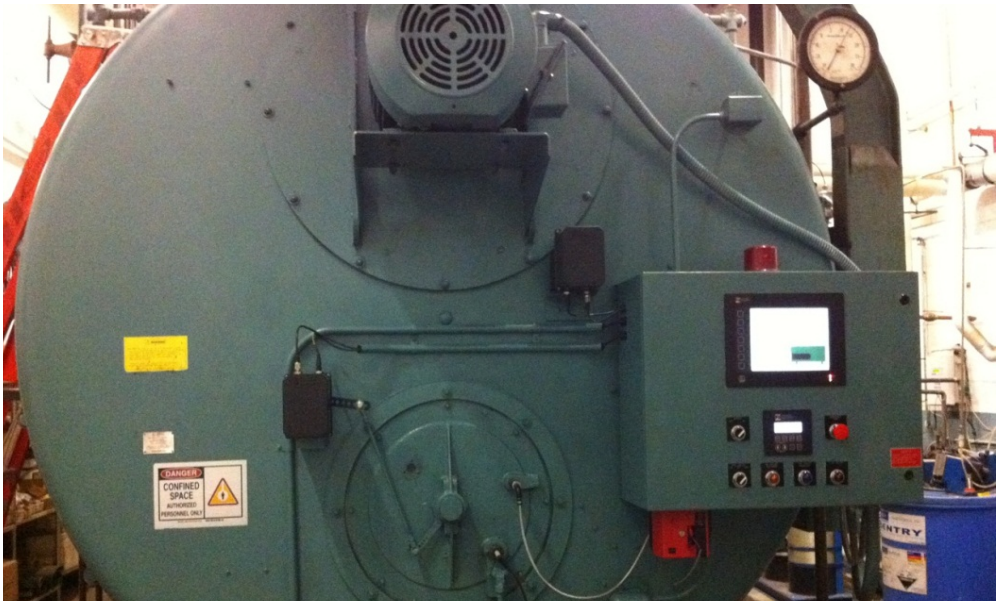
7 At 4 inches from the FD damper end of the drive arm, use a bench vise to bend the rod approximately 15 to 20 degrees as shown below. As a starting point, install the drive rod in the outer most hole on the damper drive arm and the 4th hole on the servo drive arm.



8 Remove the jumper J11 from the servo and stroke the servo manually to insure that the FD damper goes through a full stroke without binding. Adjust the drive rod position on the drive arms and the servo drive arm hub until a full damper stroke is achieved.



Alternate FD Damper Servo Installation for Larger Shells



Parts Required for Mounting the FD Damper Servo in the Alternate Location:

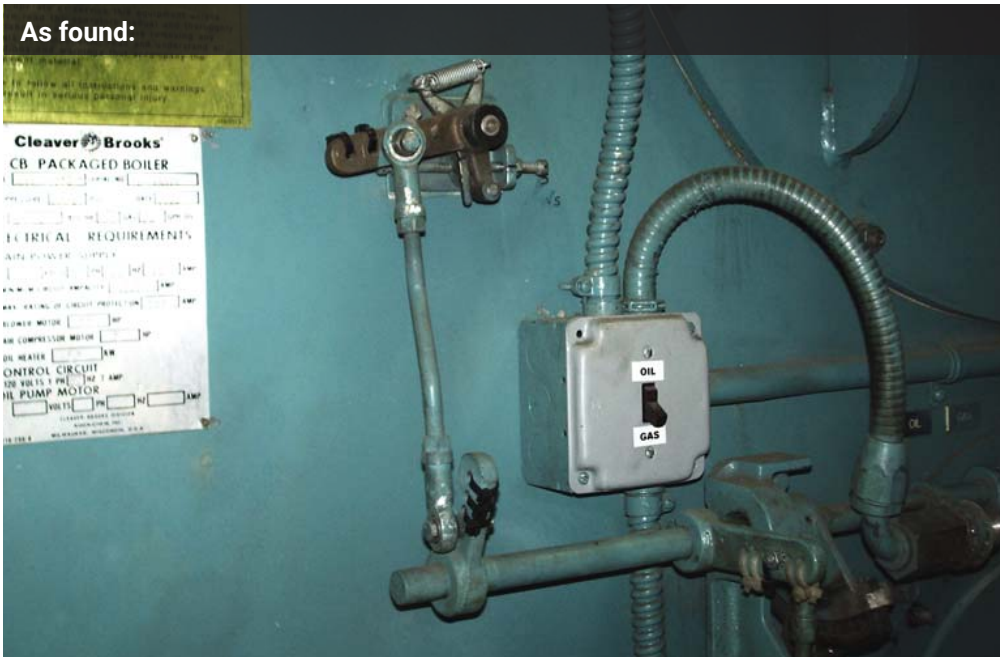
- One (1) BMU-SM-37-QD Servo
- One (1) Set servo bolts and washers
- One (1) 20174 Bracket
- One (1) 10736 Lever Arm

On larger diameter shells there is more room so that an alternate FD Servo bracket can be used as shown above and below. The bracket reuses the bolt holes that held the support bracket for the jackshaft. Reuse the bolts that held the jackshaft support bracket to the boiler front door.



FGR Damper Servo Installation

As found:



The following parts are required:

- One (1) BMU-SM-37-QD Servo
- One (1) Set servo bolts and washers
- One (1) 26177 Bracket
- One (1) A-26173-2A Coupling
- Four (4) ¼ 20 X 1 inch bolts
- Four (4) ¼ inch lock washers

Suggested Installation Instructions:

1. Remove the drive rod assembly and discard. Remove the outer portion of the FGR damper drive arm and over travel spring assembly but leave the inner portion fastened to the shaft. Also leave the bracket with the high and low fire stop screws.

2. Assemble the servo, coupling and bracket together and place it into position on the FGR damper shaft. Mark the center of the (4) holes for bolting the bracket to the front door.



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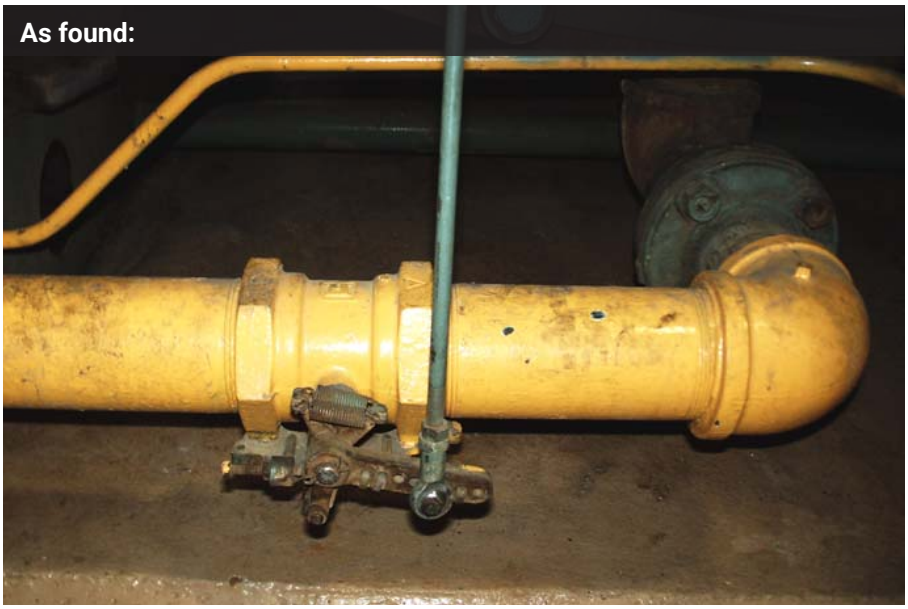
3 Remove the servo assembly and drill and tap the (4) ¼ 20 holes as required. Mount the servo assembly back onto the FGR damper shaft and install the (4) ¼ 20 bolts using the lock washers.

4 Do not tighten the set screws on the coupling to the shaft until the servo is powered up. The remove the J11 jumper and adjust the stroke of the servo to the required stroke of the FGR damper.

5 Move the servo and the damper to the closed position. Tighten the coupling set screws to the FGR damper shaft. Re-stroke the servo to insure smooth movement and that there is no binding.

Gas Valve Servo Installation

As found:



The following parts are required depending on gas valve:

HoneyWell LVL

- One (1) BMU-SM-37-QD Servo
- One (1) Set servo bolts and washers
- One (1) 26189 Bracket
- One (1) A-216173-2A Coupling

or

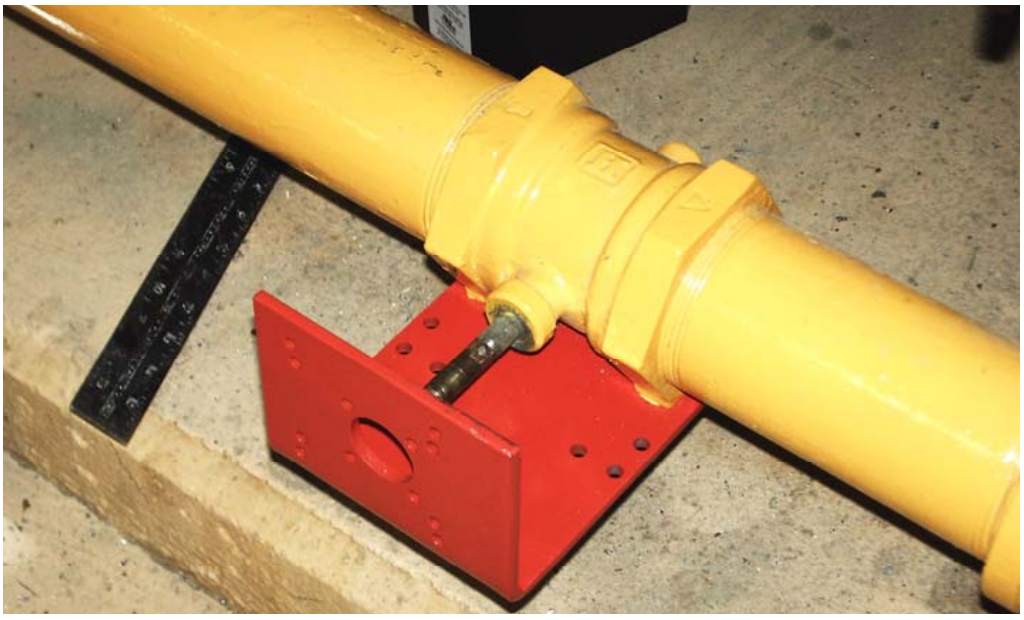
Other

- One (1) BMU-SM-37-QD Servo
- One (1) Set servo bolts and washers
- One (1) C-30009 Bracket
- One (1) B-20154 Coupling

Suggested Installation Instructions:

1. Before removing any of the linkage, use a file to mark the shaft to show the valve in the fully closed position. Remove the drive rod assembly. Remove the gas valve drive arm, over travel spring assembly and the bracket with the high and low fire stop screws. Save the bolts that held the stop screw bracket to the gas valve for reuse.

2. Bolt the bracket to the bottom of the gas valve as shown.



3 Install the servo and coupling as shown below. Do not tighten the coupling set screws to the valve shaft yet.



4 Once the servo is powered up, remove the J11 jumper and adjust the stroke of the servo to the required stroke of the gas valve.

5 Move the servo and the gas valve to the closed position (use the reference mark from #1 above). Tighten the coupling set screws to the gas valve shaft. Carefully stroke the servo to insure smooth movement and that there is no binding.



Oil Cam Servo Installation

As found:

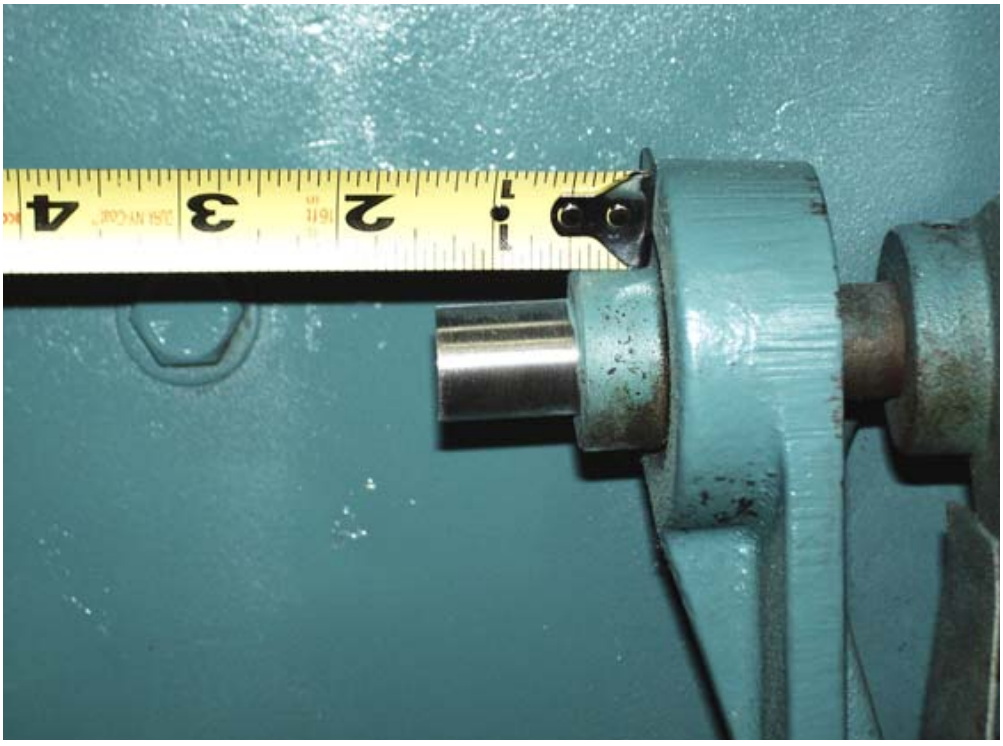


The following parts are required depending on gas valve:

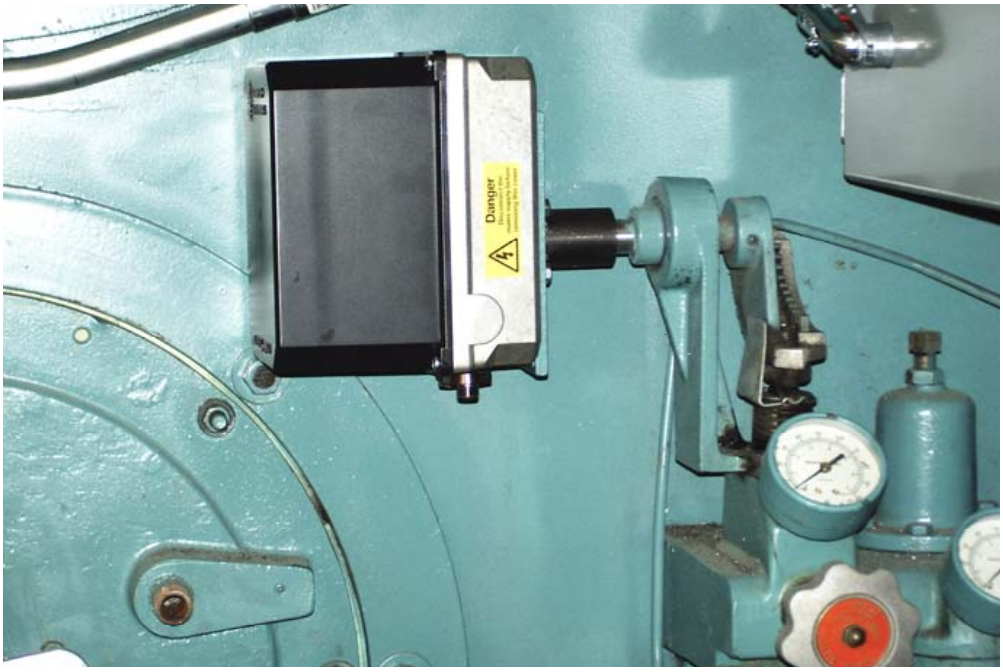
- One (1) BMU-SM-37-QD Servo
- One (1) Set servo bolts and washers
- One (1) 20173 Bracket
- One (1) A-26180-1 Coupling
- Three (3) ¼-20 x 1.25 inch bolts and lock washers

Suggested Installation Instructions:

1 Remove any linkage connected to the shaft in the vicinity of the oil valve assembly. Clean the shaft with emery cloth for 2 inches near the shaft bearing support. Cut the shaft at 1.375 inches from the bearing support bracket as shown below.



2 Mount the servo and coupling to the bracket and place it on the shaft as shown. When the coupling appears to be properly aligned, mark the front door for the bracket location.

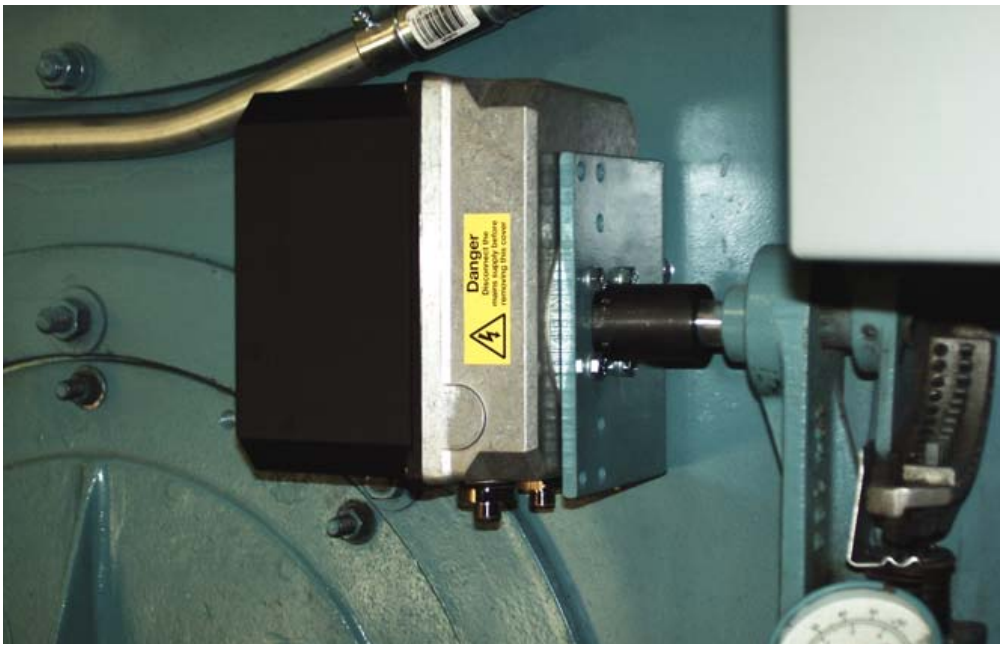




3 Re-install the servo and coupling to the mounted bracket. Tighten the servo end of the coupling but do not tighten the coupling set screws to the shaft yet.

4 Once the servo is powered up, remove the J11 jumper and adjust the stroke of the servo to the required stroke of the oil valve cam.

5 Move the servo and the oil valve cam to the closed position. Tighten the coupling set screws to the shaft. Carefully stroke the servo to insure smooth movement of the cam and that there is no binding.





Outlet Damper Servo Installation

Introduction:

It is quite common to find Firetube Boilers made by The Cleaver-Brooks Company to have a outlet damper or any type of draft control installed.. A stub stack arrangement usually doesn't produce draft issues that will affect the boiler. On the other hand there are many cases where the boiler was part of a retrofit package in an existing older boiler room. This older boiler room probably has an existing chimney and common breaching design that was reused for venting the new boilers. In this case it is very common to find draft dampers and control systems that are in use.

The Firetube Boiler manufactured by The Cleaver-Brooks Company is normally very tolerant of variations in the outlet draft because the level of the draft (or pressure) is very small compared to the resistance of the Boiler and Burner and the resulting FD Fan discharge static pressure. The allowable draft range variation is normally specified by The Cleaver-Brooks Company to be -0.5 to +0.5" in. wc.

However, with the introduction of the "LE" (Low Emissions) model the outlet draft has becomes a significantly more important condition because it has a direct influence on the quantity of flue gas directed to recirculate and blend with the combustion air. Variations in the amount of recirculated flue gas (FGR) not only impacts on the level of NOx emissions but also will affect the burner's overall operation. For this reason, The Cleaver-Brooks Company has specified an outlet draft range for "LE" Boiler applications be limited to -.25 to +.25 in. wc.

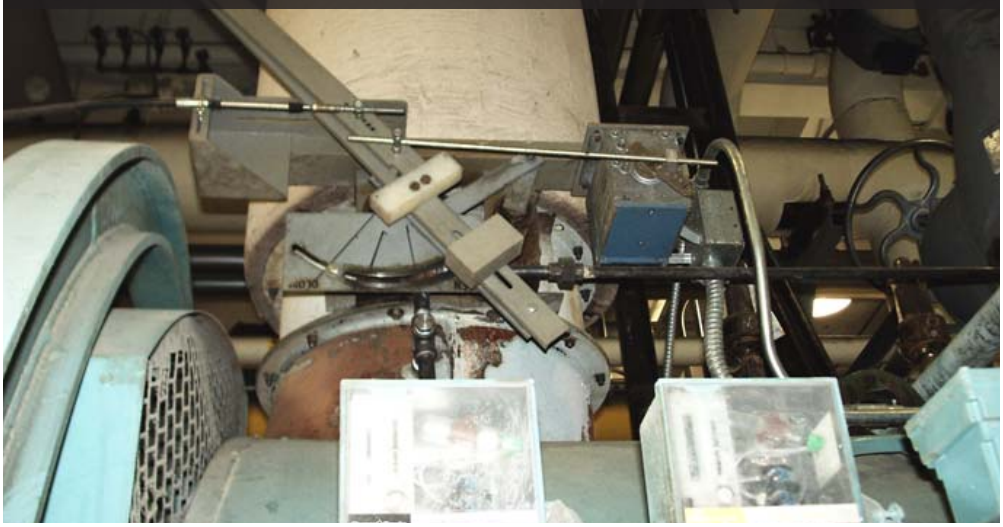
Preferred Utilities has supplied hundreds of draft control systems for use on boilers made by The Cleaver-Brooks Company. The mechanical feed-forward RapidLink System was originally designed for operation with The Cleaver-Brooks Company LE Boilers. The RapidLink was later updated with our current ELink Draft Control System. In both cases the same damper design was utilized.

The following drawings illustrate the RapidLink design and the newer ELink design. The conversion of the ELink to a new BMU servo is quite easy and only requires a servo change out and set up. The RapidLink however is more involved.

The following instructions are based on the retrofit of a RapidLink system with a new BMU servo and reusing the existing outlet damper assembly.

Outlet Damper Servo Installation

As found:



The following parts are required:

- One (1) BMU-SM-37-QD Servo
- One (1) A-26180-1 Coupling
- One (1) Set servo bolts and washers
- One (1) 90377 Bracket
- Two (2) 90378 Spacers
- Two (2) ¼-20 x 2.5 inch bolts, washers, flat washers and nuts (supplied by others)
- One (1) 107371 Bracket

Suggested Installation Instructions:

1 Remove the RapidLink linkage assembly, draft actuator, main support bracket (save the mounting bolts, nuts and washers) and the flex cable that connects to the firing rate jackshaft. Reference the next two photos.





Secure the damper drive arm thumbscrew so that the damper cannot be accidentally locked in place.

2 Loosely mount the 107371 bracket to the 90377 bracket using the two 90378 spacers. Then slide the coupling onto the servo and mount the servo to the 107371 bracket as shown in the following pictures. Note that the 90377 bracket will mount to the damper assembly in the same location and faction as the RapidLink mounting bracket.

Front View:



Top View:



Mounting Plate Connection:



Servo Arm Connection:



3 With all bolts hand tight and the servo and damper shaft lined up, mark the location of the two required bolts holes on the damper bracket. Remove the 90377 bracket and drill the holes large enough so that the original mounting bolts, nuts and washers can be reused.



4 Reassemble the parts noted in step 2 and tighten the nuts and bolts as required. Tighten the coupling on the servo shaft only and leave the damper shaft end loose. Move the damper using the damper drive arm and insure that the damper moves freely.

5 Once the servo is powered up, remove the J11 jumper and adjust the stroke of the servo to the required stroke of the damper.

6 Move both the servo and the damper to the closed position. Tighten the coupling set screws to the damper shaft. Carefully stroke the servo to insure smooth movement and that there is no binding.

7 As shown in some of the above pictures, the top of the 90377 serves as a convenient location for the new JC-22XMTR-HPCO Draft Transmitter and High Pressure Cutout Switch.

Quick Connect QD1 Cable Method

Preferred Utilities developed a simple and efficient method of wiring the servos. The QD1 Quick connect sockets are pre-installed in the servos from the factory. Each servo has a female and male socket. Each QD1 cable transfers power and comunication to the servo. Up to ten servos can be connected in a row.

Important things to remember when using the QD1 Quick Connect cables:

- QD1 Cables MUST be protected by a 3 Amp fuse (or smaller) in the burner panel.
- Cables are ITC-ER (Exposed Run) and do not need to be run in conduit, if the following are true:
  - Cable is protected from physical damage by being supported and secured to cable trays, struts, angles, channels, cold pipes, conduits, etc.
  - Cable must be supported and be secured at intervals not exceeding 6 ft.
  - Cable must NOT contact, or be secured to, surfaces exceeding 185 F (85 C)
- Connectors are Nema 4 rated when Hand Tight. Do NOT over tighten.
- Maximum combined cable length is 250 ft. Max QD-JB servo stub Length is 20 ft.
- Connections to a QD1-JB must start at “A”, and not skip outputs. The output following the last servo can be connected to the “IN” of another QD1-JB, or to a servo Daisy Chain.
- Servo addresses must follow the Daisy Chain (or QD1-JB) sequence, and not skip any values. In the first example below, the servo connected to QD1-Cable-F-xx is Address 0. In the second example, QD1-JB “A” is address 0. In the third example, QD1-JB “A” is Address 3.

Reference to Part Numbers

QD1 Servos:

BMU-SM-03-QD1MF	AC Motor 3 ft-lb.
BMU-SM-15-QD1MF	AC motor 15 ft-lb.
BMU-SM-37-QD1MF	AC Motor 37 ft-lb.
BMU-SM-03DC-QD1MF	DC motor 3 ft-lb.
BMU-UM-072-QD1MF	AC Motor 72 ft-lb.
BMU-UM-140-QD1MF	AC motor 140 ft-lb.
BMU-UM-280-QD1MF	AC Motor 280 ft-lb.
BMU-UM-430-QD1MF	AC motor 430 ft-lb.
BMU-UM-720-QD1MF	AC Motor 720 ft-lb.

QD1 Cables:

QD1-Cable-MF-3.3	Male/Female 3.3ft
QD1-Cable-MF-6.2	Male/Female 6.2ft
QD1-Cable-MF-12.1	Male/Female 12.1ft
QD1-Cable-MF-24	Male/Female 24ft
QD1-Cable-MF-48	Male/Female 48ft
QD1-Cable-F-13	Female 13ft
QD1-Cable-F-26	Female 26ft
QD1-Cable-F-65	Female 65ft

QD1 Cable

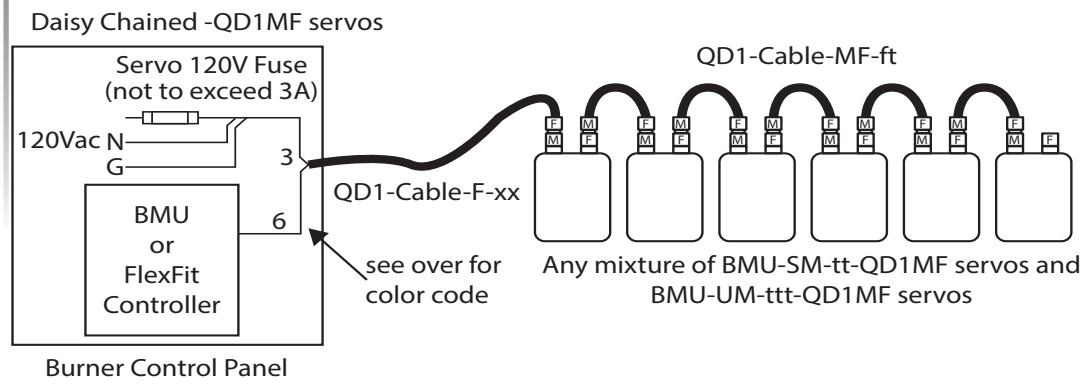


QD1 Servo

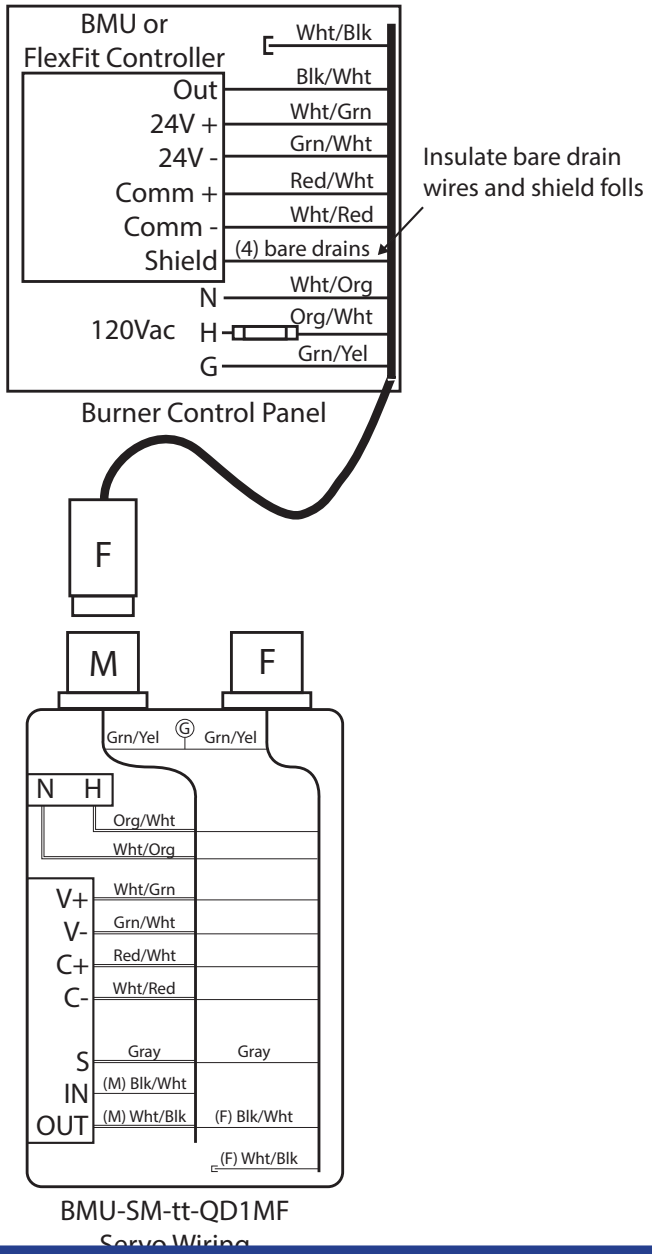


Quick Reference for QD1 Cables and Servos

Typical QD1 Installation



Extend Cables by using multi Cables and plug together



Internal QD1 Cable Wiring

Quick Reference for Parts Required for Installation

FD Damper:

- One (1) BMU-SM-37-QD Servo
- One (1) Set servo bolts and washers
- One (1) 107371 Bracket
- One (1) 107366 Lever Arm
- Two (2) ¼-20 X 1 inch bolts, flat washers and lock washers

FD Damper Servo (Alternate Location):

- One (1) BMU-SM-37-QD Servo
- One (1) Set servo bolts and washers
- One (1) 20174 Bracket
- One (1) 10736 Lever Arm

FGR Damper:

- One (1) BMU-SM-37-QD Servo
- One (1) Set servo bolts and washers
- One (1) 26177 Bracket
- One (1) A- 26173-2A Coupling
- Four (4) ¼ 20 X 1 inch bolts
- Four (4) ¼ inch lock washers

Gas Valve:

HoneyWell LVL

- One (1) BMU-SM-37-QD Servo
- One (1) Set servo bolts and washers
- One (1) C-30009 Bracket
- One (1) B-20154 Coupling

Other

- One (1) BMU-SM-37-QD Servo
- One (1) Set servo bolts and washers
- One (1) 26189 Bracket
- One (1) A-26173-2A Coupling

Oil Valve:

- One (1) BMU-SM-37-QD Servo
- One (1) Set servo bolts and washers
- One (1) 20173 Bracket
- One (1) A-26180-1 Coupling
- Three (3) ¼-20 x 1.25 inch bolts and lock washers

Outlet Damper - Converted from a RapidLink:

- One (1) BMU-SM-37-QD Servo
- One (1) A-26180-1 Coupling
- One (1) Set servo bolts and washers
- One (1) 90377 Bracket
- Two (2) 90378 Spacers
- Two (2) ¼-20 x 2.5 inch bolts, washers, flat washers and nuts (supplied by others)
- One (1) 107371 Bracket

Commissioning the BurnerMate Universal

The following are the basic steps recommended for a complete and successful start-up of the **BurnerMate Universal**, including the tuning and final commissioning functions. A detailed step by step procedure is outlined in Section 5 of the Instruction Manual.

Caution: The commissioning engineer must read the Instruction Manual carefully and be certain that they fully understand the requirements of the BurnerMate Universal and its application as it applies to the specific fired equipment being retrofitted. Failure to follow the instructions in the manual could result in damage to the product and/or a hazardous condition. Check the ratings given in the manual to insure tha this product is suitable for the intended application. After installation and commissioning is complete, check that the actual operation of this product is as it is described in the manual.

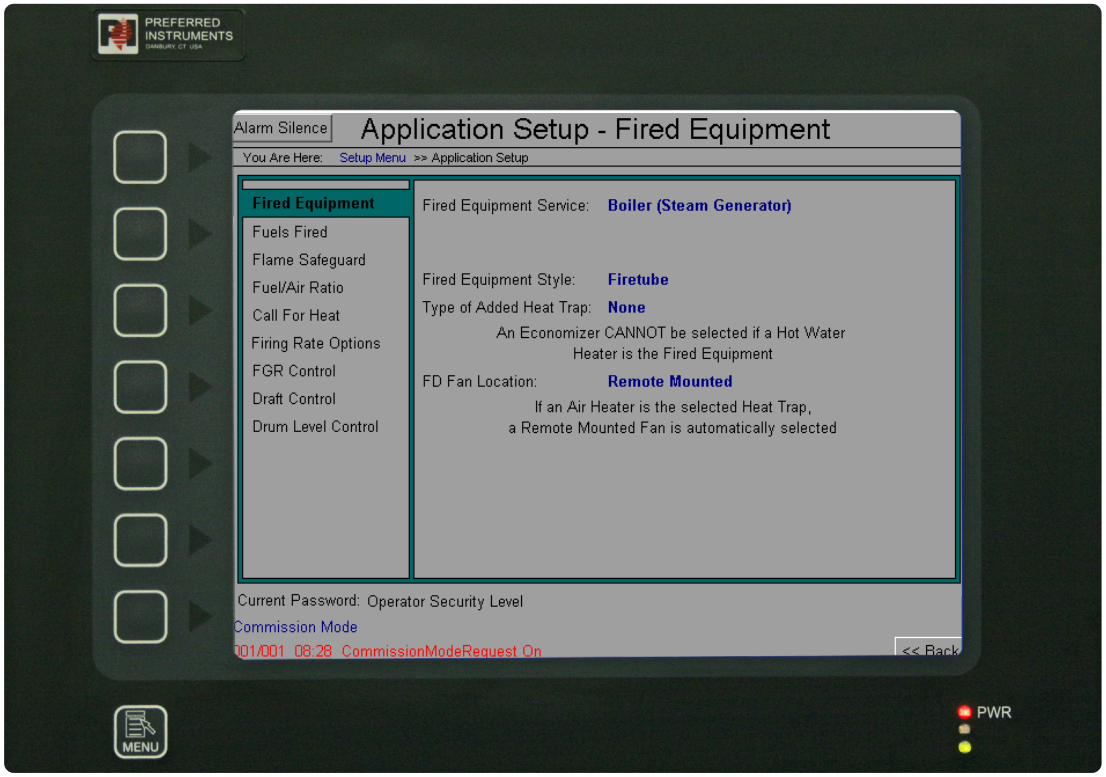
Steps to commission a BurnerMate Universal

1. Obtain a Temporary Password.
2. Review the application and configure the appropriate Parameters as they apply to this installation. See Section 3 in the Instruction Manual.
3. Set up and calibrate all of the BurnerMate Universal servos.
4. Place the BurnerMate Universal in the “Commission Mode”.
5. Pre-program the Standby, Purge and Ignition positions.
6. Start the burner sequence and confirm the operation of all safety non-recycle and operating recycle limits.
7. Verify the Purge and Ignition positions and fire the burner.
8. Enter the curve points. Repeat for all fuels.
9. Verify all curve points.
10. Operate in automatic and perform the final PID tuning.
11. Document all the Parameter settings, limit switch settings and combustion and servo data.

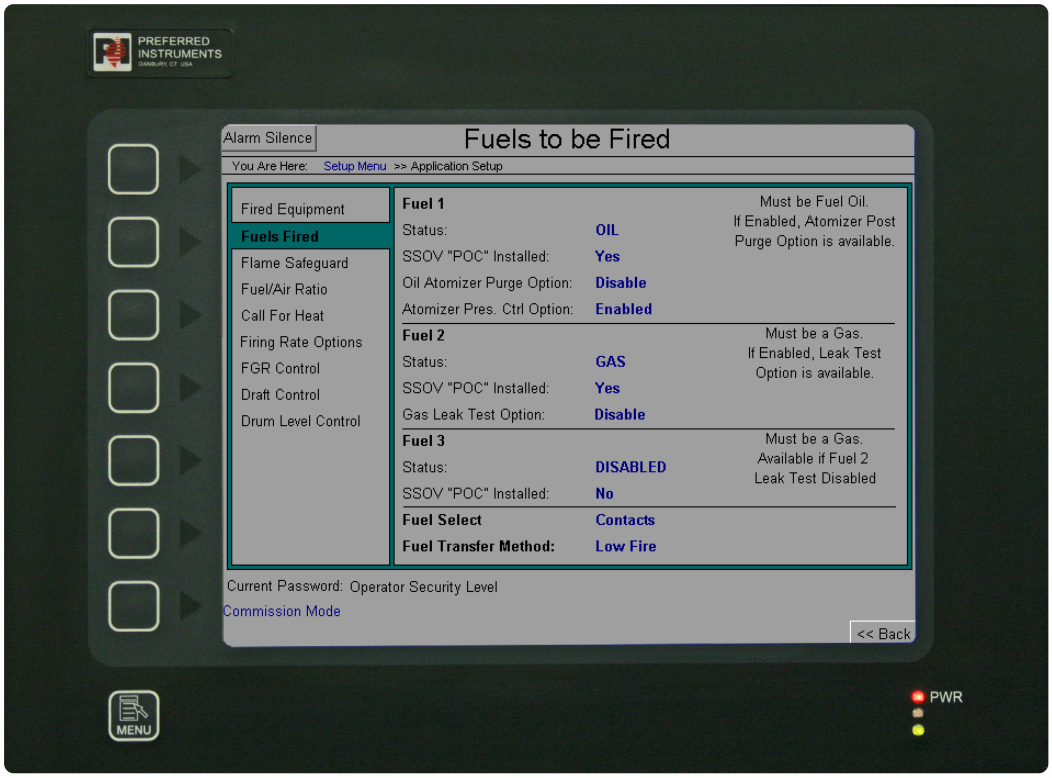
Commissioning the BurnerMate Universal

1 To get started you must obtain a temporary password for the BurnerMate Universal. On the LCD screen, access the Utilities menu from the Main menu. Record the current Date, Time and Serial Number. Contact Preferred Instruments in Danbury, CT during normal working hours and ask for Technical Support. A temporary password, good for 6 hours, will be issued to you.

2 Application setup pages in the OIT Touch Screen are designed to make the initial parameter setting a snap. By answering a few questions up front about your installation, you will customize the Main Screen view and basically eliminating all unused options and parameters leaving behind only the parameters that pertain to this application.

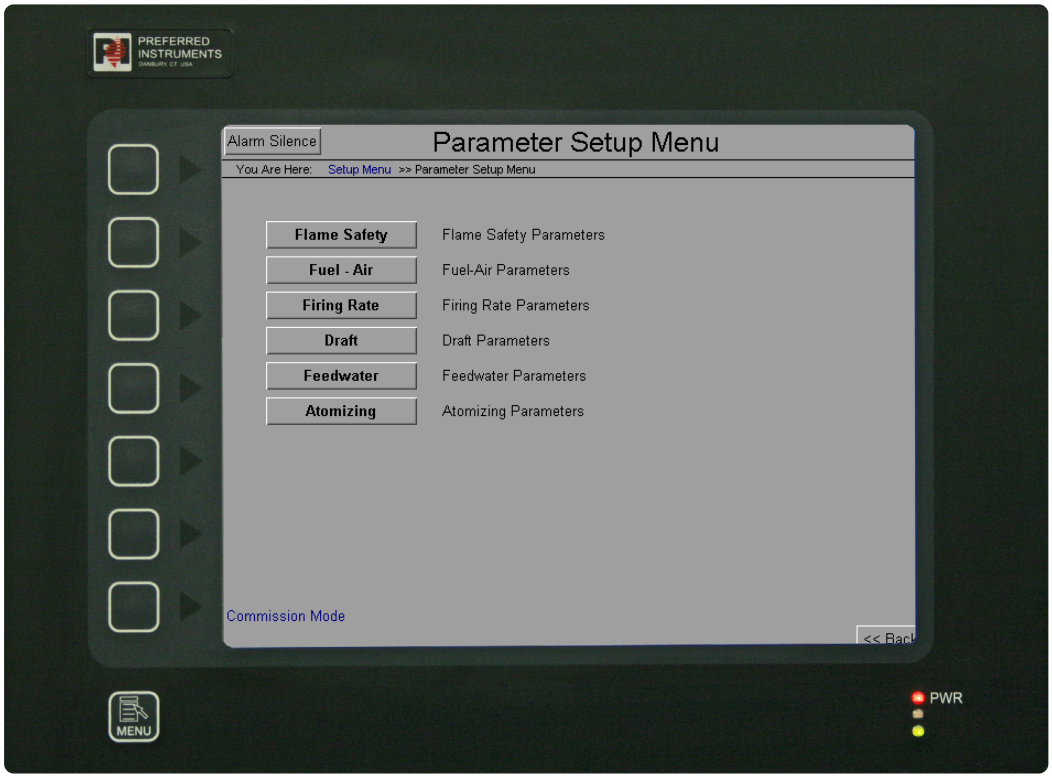


OIT Application Screen

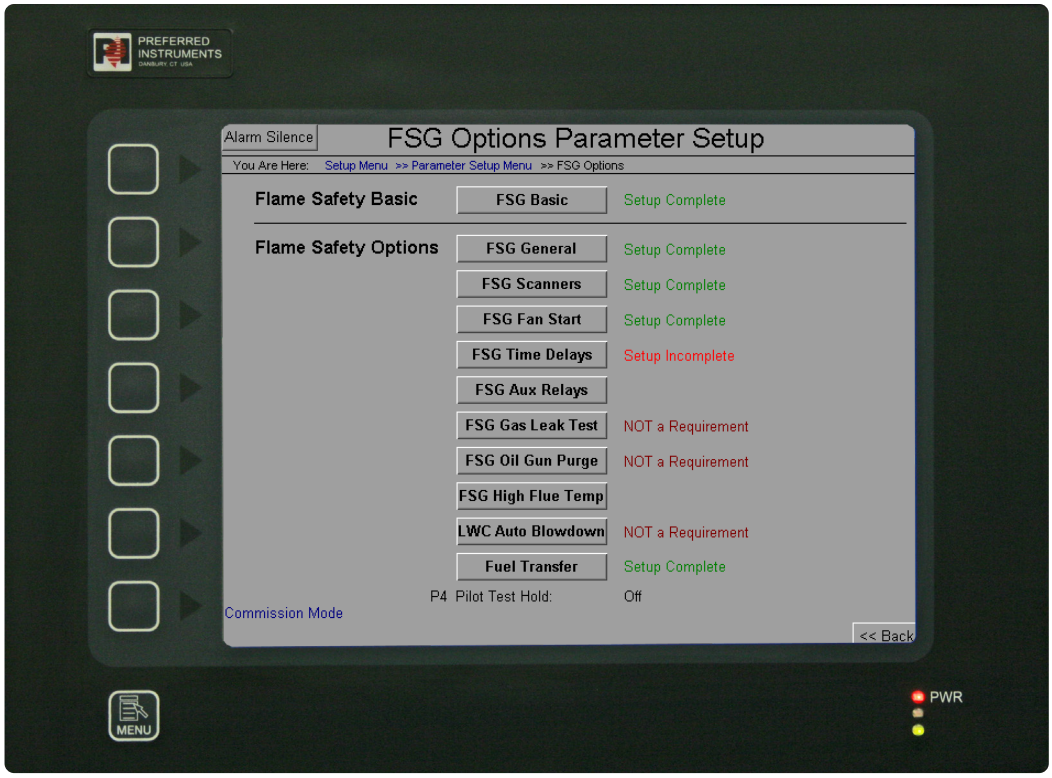


OIT Application Screen

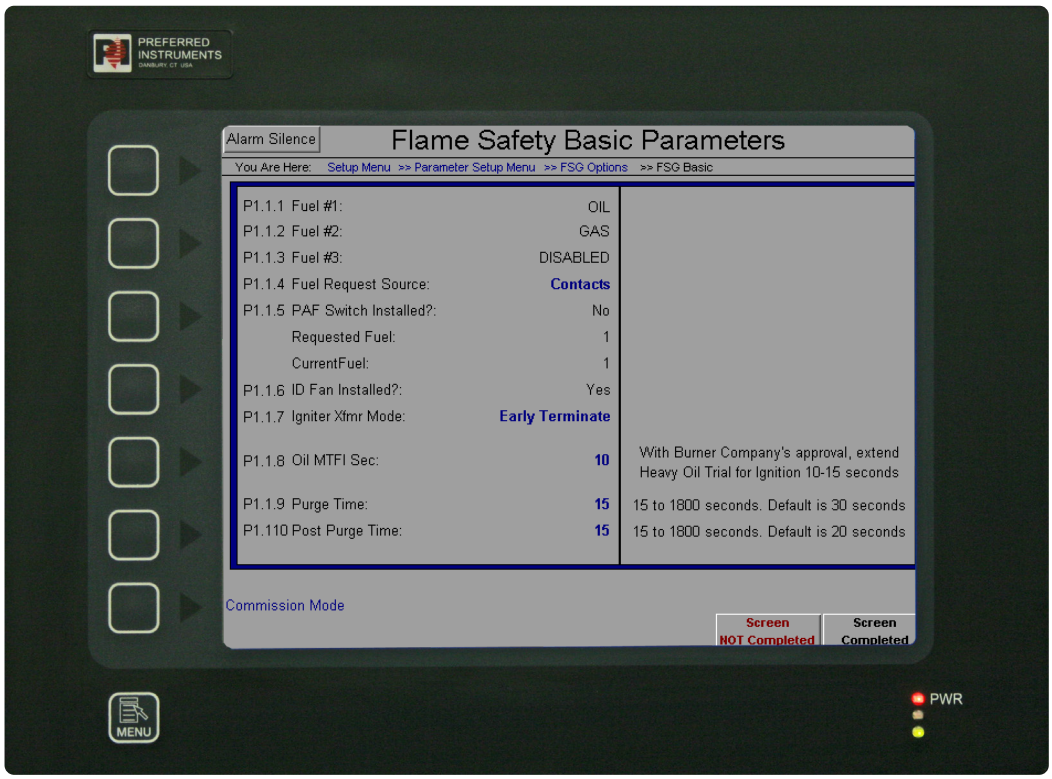
From the Application screen, proceed to the Parameter Setup screens.



Parameters are divided into six basic groups.

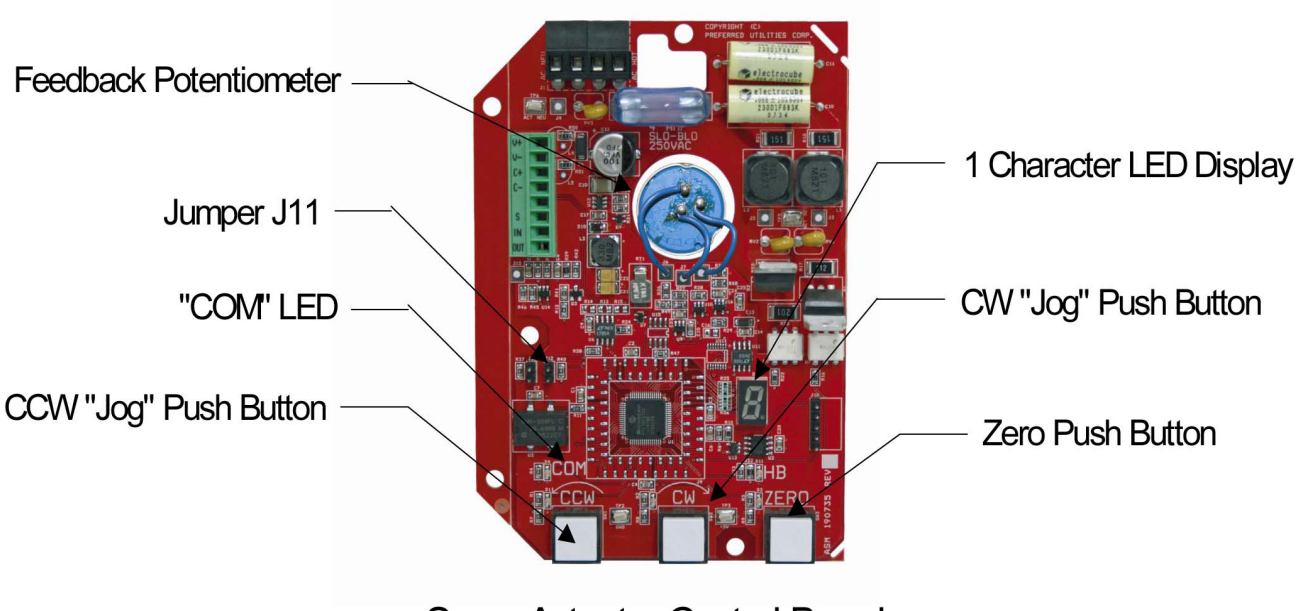


Each Parameter group is further divided into sub-groups so it's easy to stay organized.



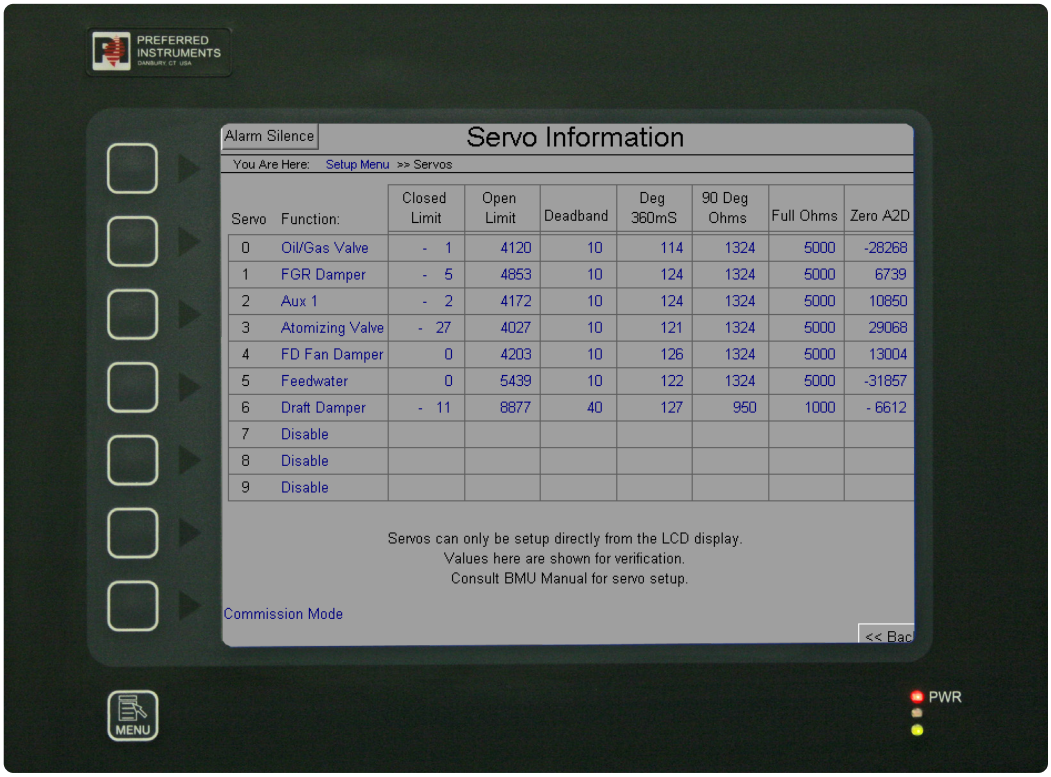
OIT Parameter Screen

3 Configure and calibrate the servos.
Follow the simple step by step instructions in section 6 of the BMU instruction manual.



Servo-Actuator Control Board

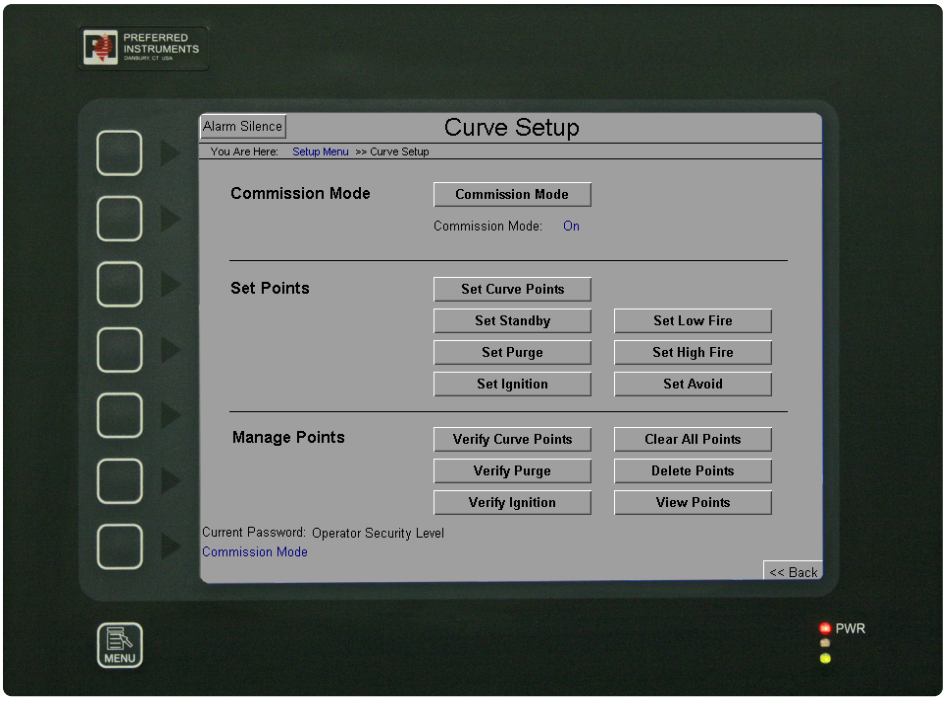
View of the servo control board.



OIT screen showing the final servo set up data.

4 From the LCD keypad, enable the “Commission Mode”.

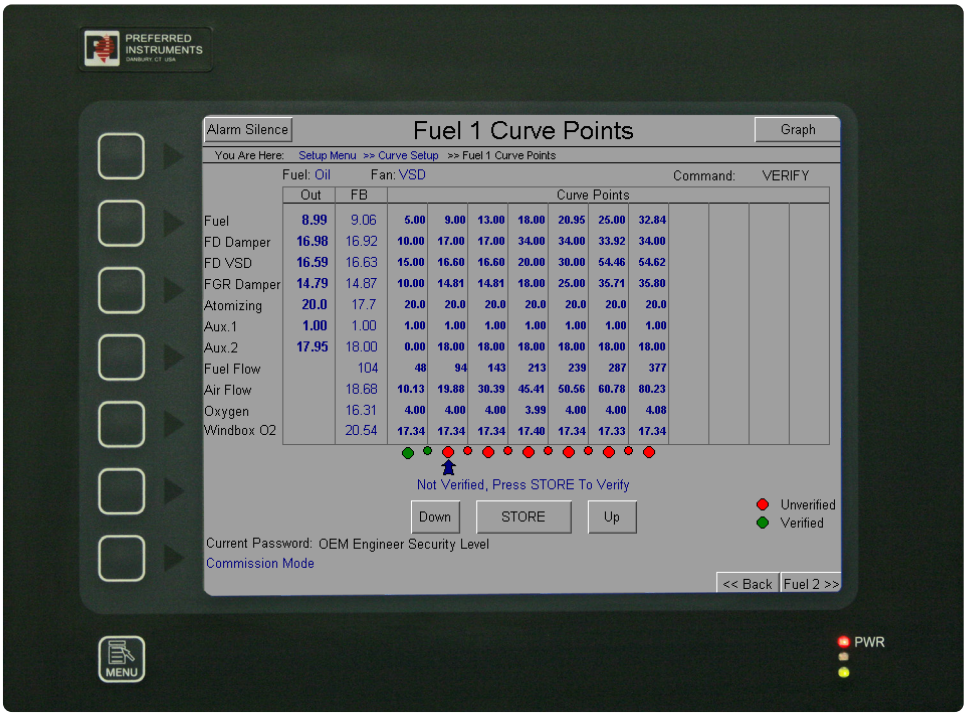
5 Pre-program the Standby, Purge and Ignition positions and curve points.

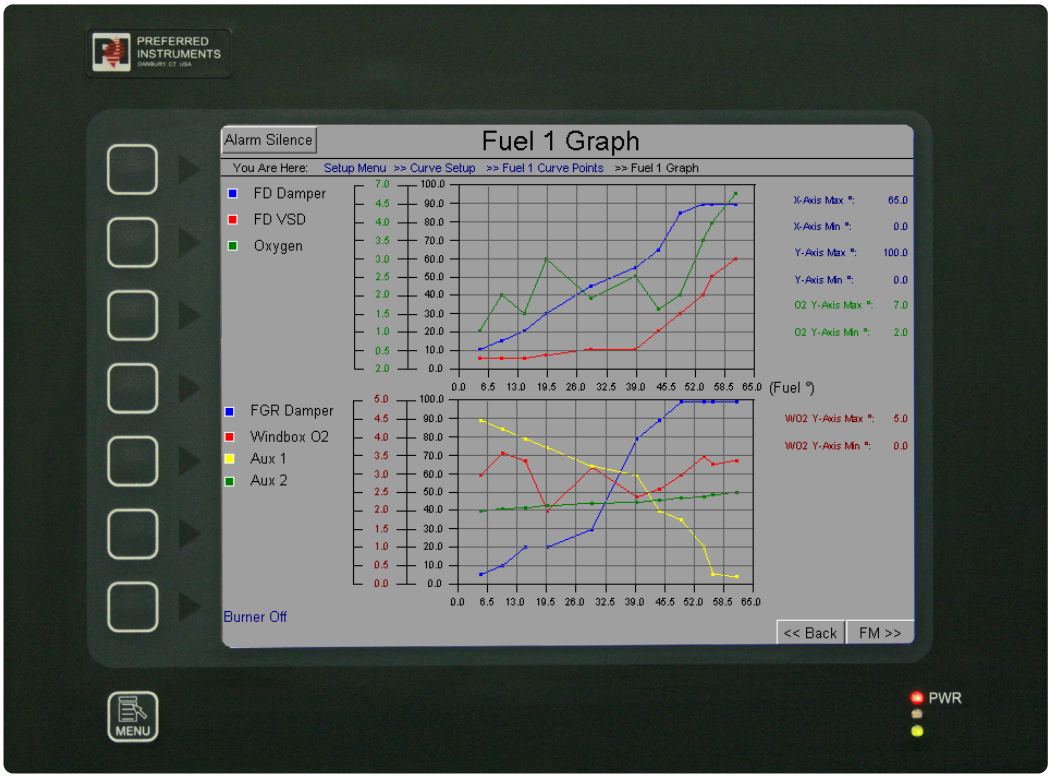


6 Start the burner sequence and verify that all safety and operating limits are functioning properly.

7 Verify the Purge and Ignition positions and fire the burner.

8 Set up the fuel/air ratio curves for each fuel. The curve set up screen will provide access to all locations to enter setting up data and verification of points.

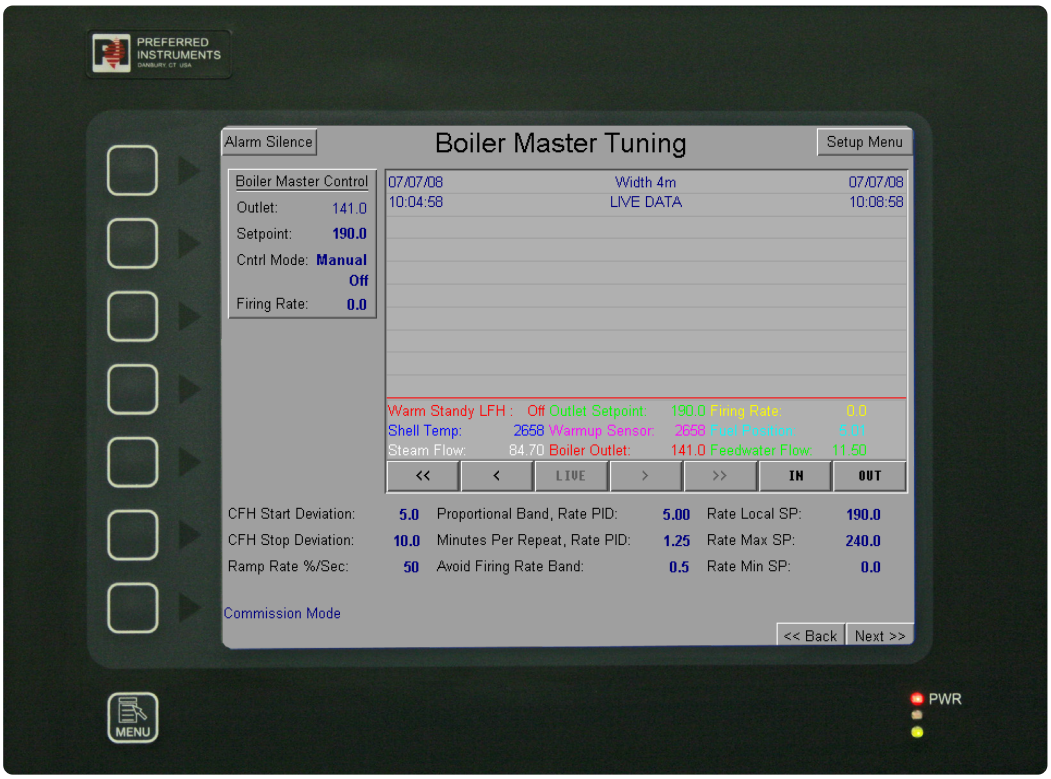




Typical fuel curve

All curve points can be graphically viewed for fine tuning.

10 Perform the final tuning of the control loops.



PID loop tuning is made easy with tuning parameters and a trending graph.

Completed Installation





New Quick-Disconect Servo Cables

A Simpler Way to Retrofit



New QD1 style

One cable per servo (all 120V, Communications, and 24Vdc wires into are in a single cable)

A QD1-JB Junction Box is NOT required (more cost savings), but can be used if desired.

Cables are rated ITC-ER (Instrument Tray Cable – Exposed Run), which means these cables do NOT have to be run in conduits per the National Electric Code.

QD1 cables and -QD1xx servos are UL Recognized for Exposed Run installation on Burners and Boilers.

QD1 cabling costs less than the existing QD cables and is more rugged.

Cable length can be extended by connecting two cables together, see attached instructions for lengths in stock.

The -QD1MF (Male & Female) servos can be used for: Daisy Chain, QD1-JB, or mixed Daisy Chain/QD1-JB systems.

The QD1-CABLE-F-xx replaces the “Green Cable” (that used to run to the BMU-JBOX), see attached instructions.

The QD1-JB can connect to up to 6 servos (the old BMU-JBOX could only connect to 4 servos)

Old QD style

Two cables were required per servo (a 120V cable plus a communications cable)

Requires a BMU-JBOX

Is NOT UL Listed

Is more expensive than -QD1 cabling

Is not as rugged as -QD1 cabling



Part No. BMU-SM-37-QD1MF

Appendix A

Wiring the BurnerMate Universal Servos

The wiring of the BurnerMate Servos is relatively easy if the following instructions have been read and are understood by the installing electrician.

There are two methods of connecting the required power and communication wires to the servos. The first is to directly wire to the internal circuit boards of the servos and the second is to use the factory supplied and pre-wired quick connect cables made specifically for these servos. The following covers both of these methods in detail.

Direct Wiring Method

You will need the following parts:

- Three (3) #16 ga. THHN wires
- One (1) Green BMU Cable

The servos are always wired in a series, daisy chain arrangement where the wires will run from the BurnerMate Universal chassis to the first servo (address 0) and then from the first servo to the next servo (address 1) and then to the next (address 2) and then to the next and the next until all the servos have been connected. The address of the servo is always in the same sequence as they are wired; first servo is address 0, the second is address 1, etc. As each servo can be assigned to any of the available tasks it makes no difference what sequence you use to connect the servos. Take the easiest route.

To wire the servos directly you will need three #16 gauge THHN wires and the green BMU-CABLE. These wires can be run in the same conduit because the 120 VAC power is isolated for powering the servos only. No other devices can be powered from this circuit.

Prepare the shielded cable ends before pulling the cables into the servo.

1 Pull the BMU-CABLE along with (3) 16 ga. THHN wires through a ½" flex conduit with enough slack for servicing.

2 Install (2) conduits for daisy chain wiring, one BMU-CABLE & three 16 ga. wires in each conduit. Reference the terminal wiring diagrams on page 25.

Caution: Do not attempt to pull two of the green shielded cables through one servo conduit connection! It will never fit and damage to the shielded cable will result.

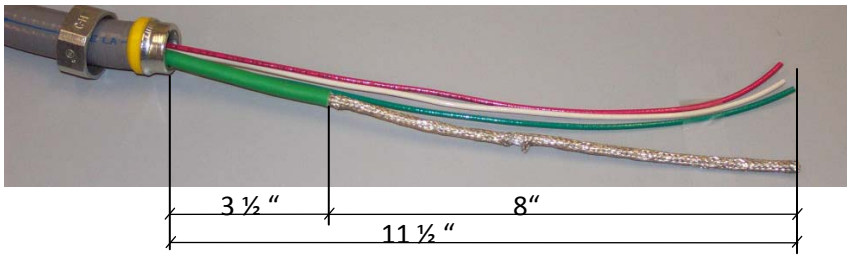
Supplied with a BMU Servo Wiring Kit (190778) Each kit includes the following:

(2) pieces of 1/16 inch diameter heat shrink tubing 7 ¾ inch long (10625)

(2) pieces 3/8 inch diameter shrink tubing 1 ½ inch long (10651)

(4) small wire ties (92036)

3



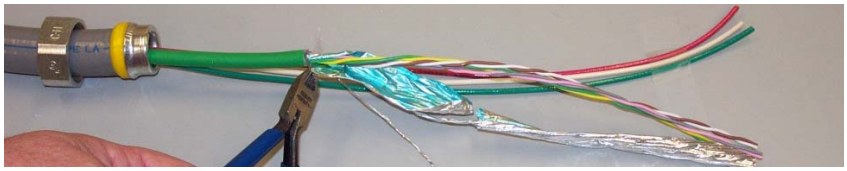
Cut to the length shown.
Remove 8" of green cable insulation.

4



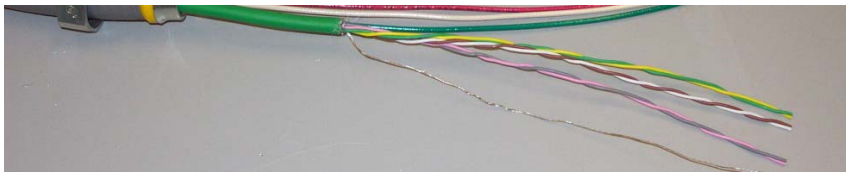
Push back the braided shield and cut it off.

5



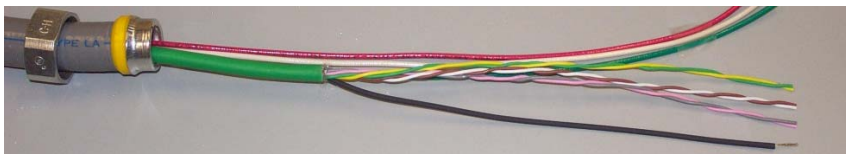
Caution: Do not cut off the bare 'drain' wire.
Remove the foil shield.

6



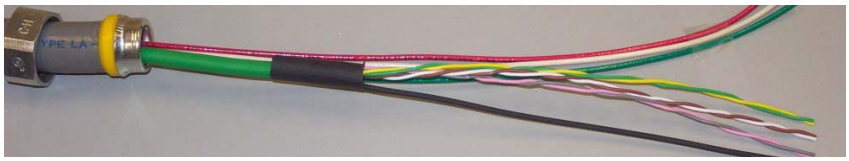
Keep the wire pairs twisted together.
Separate the bare 'drain' wire.

7



Use the 1/16" shrink tubing to insulate the drain. For Daisy chaining servos, mark the in & out grey/pink wires on the respective wire sides. If the servo is the last in the chain there is no need for this step.

8



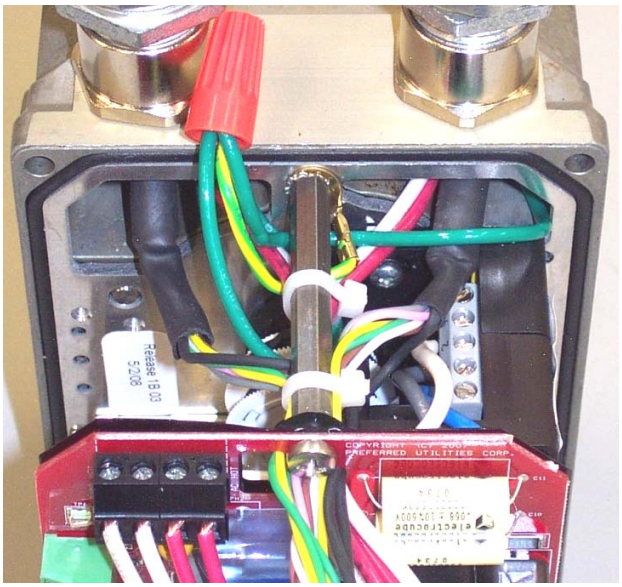
Slide the 3/8 inch shrink tubing over the twisted pairs and drain wire and heat shrink it.

Attention: All following steps must be completed before moving forward.

Caution: All shielded cable braid, foil, and bare drain wire must be insulated. If any of these touch the conduit, servo metal, ground, or any other exposed wires; electrical noise will be increased!

9 After preparing the shielded cable ends, pull the shielded cables and the 120 VAC wires through the conduit connections and into the servo, and connect the flex conduit to the servo.

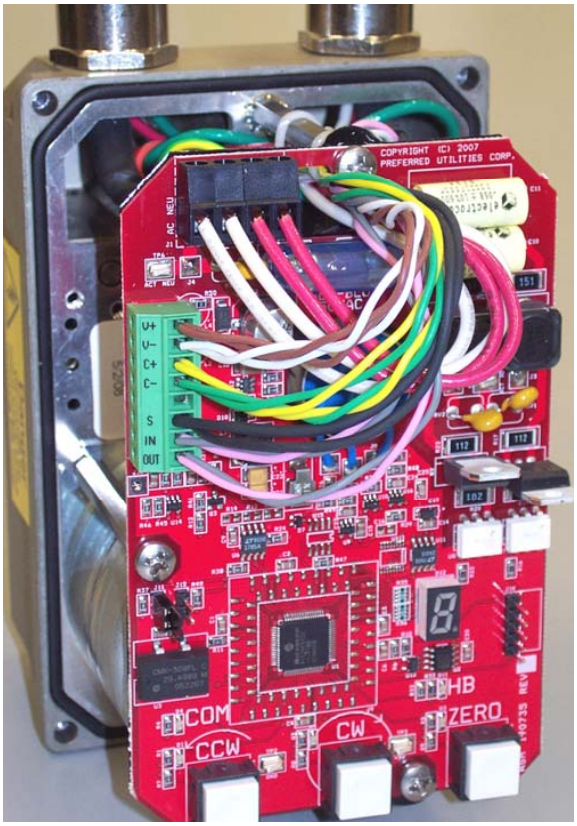
Appendix

10 

Use wire ties to route the wires as shown. Keep the wires on the back side of the stand-off to provide clearance for the cover.

11 Keep the wires away from the white limit switch cam adjustment wheels.

12 Wire servo via Terminal Wiring.



Terminal Wiring

Horizontal AC Terminal Strip:

Left two terminals: Neutral
Right two terminals: 120 VAC Hot

(Terminal pairs are connected internally)

Vertical DC shielded cable terminal strip:

V+	Brown	(+ 24 VDC)
V-	White	(24 VDC Common)
C+	Yellow	(Communications +)
C-	Green	(Communications -)
Blank	not used	
S	Shield drain wire	(Heat shrink covered)
IN	Pink/gray pair	(from the BMU or the previous servo)
OUT	Pink/gray pair	(to the next servo in the 'daisy chain')

13 Wire nut the field wiring ground wires to the green/yellow servo ground wire.

14 Very firmly tighten all terminal block screws.

15 Tug on each individual wire in each terminal to ensure that there is a good connection.

Notes

Notes





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