

they will end up in the boiler.

SYSTEM CLEANING PROCEDURE

For steam systems, the boiler will need to be connected to the header utilizing steam to purge the piping and thus push the debris out of the system. However, at this time all condensate must be wasted until it runs clear and water analysis of the condensate indicates that it is free of contaminants. Steam trap strainers must be periodically opened and cleaned of any debris which accumulates.

During this system clean out, the boiler make-up water must be properly softened and treated. At the conclusion of the system clean out, the condensate must be reconnected.

For old or existing steam systems, the installation process may have jarred debris loose. Following the boil out of the new boiler, the condensate should be wasted until it is within proper guidelines. Check all steam trap strainers to assure their cleanliness. Refer to the succeeding section on replacement boiler installations.

3.4 REPLACEMENT BOILER INSTALLATIONS: PROTECTION AGAINST CORROSION & SEDIMENT

BOILER MUST CONTROL FEED WATER

The water feed to the boiler must be controlled by the boiler-mounted water level control. It is unacceptable to use gravity return or to let the water feed be controlled by a condensate/ receiver/ condensate pump system. The water feed to the boiler must be controlled:

- by a feed pump control which is mounted on the boiler. This control is to activate the feed pump on a boiler feed system. It will be necessary to supply such a system if not already installed. - OR -
- by an automatic water feeder mounted on the boiler. This is used only on systems requiring 100% make-up, such as humidification, steam process, etc.

NOTE

It is not recommended to provide the make-up for a closed steam heating system to the boiler by means of a water feeder. It is preferred that system make-up be connected to the condensate return tank of a boiler feed system.

A boiler feed system may be used in conjunction with an existing condensate receiver system by allowing the receiver system to pump condensate into the boiler feed system tank.

CLEAN OR REPLACE ALL SYSTEM PIPING AND HEATING UNITS

Arrange for chemical and mechanical cleaning of

the entire system. A chemical treatment company should be consulted for the proper means of this chemical cleaning.

Replace any piping considered to be deteriorated beyond safe or cleanable condition. Flush the system clean, being certain to isolate the boiler.

DO NOT FLUSH THE SYSTEM THROUGH THE BOILER

NOTE: For some old systems, there is a reluctance to clean the piping because of the possibility of leaks occurring in badly corroded lines. Should the customer refuse cleaning, it is necessary to install filtration equipment. Install either a fibrous filter or a centrifugal filter in the boiler return piping. This will collect and remove sediment from the system. A booster pump may have to be installed as well to overcome the additional pressure drop introduced in the line by the filter. When filling the system, provide chemical treatment as outlined in Section 3.5.

CAUTION

Failure to properly clean the system or to install mechanical sediment removal equipment can result in tube blockage and severe corrosion plus damage to pumps, controls, and air removal devices.

3.5 BOILER WATER TREATMENT

PURPOSE OF WATER TREATMENT

Water treatment is required for satisfactory operation of the boiler. It must be devised to prevent depositing of scale and to prevent corrosion from acids, oxygen and other such harmful elements that may be in the water supply. A qualified water treatment chemist should be consulted and the water systematically treated.

OBJECTIVES

The basic objectives of water treatment are:

1. Prevent the accumulation of scale and deposits in the boiler.
2. Remove dissolved gases from the water.
3. Protect the boiler against corrosion.
4. Maintain the highest possible boiler fuel efficiency.
5. Decrease the amount of boiler down time from cleaning.

WATER SOFTENER

It is highly recommended that a zeolite water softener be used for all make-up to the boiler. It is intended that this be used in addition to the chemical treatment of the boiler. Water softening removes calcium and magnesium, the primary causes of hard boiler scale.

CONTINUOUS MONITORING REQUIRED

Water treatment should be checked and maintained whenever the boiler is operating. The boiler operator should be sure that the boiler is not operating for long periods without proper water treatment. Water treatment may vary from season to season or over a period of time. Therefore, the water treatment procedure should be checked not less than four times a year, and possibly more frequently as the local water conditions may indicate.

3.6 EXTERNAL "FIRE-SIDE" CLEANING

PURPOSE

Carbon (soot) is an insulator and is corrosive. The heating surface of a boiler must be kept free from soot accumulation to keep the boiler operating at its highest efficiency and to avoid damage from corrosion.

SOOT REMOVAL

If the yearly inspection of the boiler tube surfaces reveals a build-up of either soot or rust (usually due to condensation), the tubes should be thoroughly brushed. (Tube cleaning brushes are available from Bryan Steam) To inspect and, if necessary, clean the tube surfaces and flue collector, first remove the tube access panels. Examine the exterior of the tubes for evidence of soot or rust. Using a flashlight, carefully look between the tubes. There should be an unobstructed opening between all tubes, and the top surfaces of the tube must be free from soot accumulation. Also inspect the interior of the flue collector. Brush or vacuum the soot from all surfaces. Be sure to cover atmospheric burners with a protective cover during cleaning to prevent soot from falling into them.

If the buildup of soot is appreciable, the flue gas venting system must be thoroughly inspected internally as well, and cleaned as necessary.

IMPORTANT

If either soot or condensation is apparent, a boiler service technician should be consulted. The presence of soot indicates poor combustion and possibly hazardous boiler operation. Failure to do so may result in fire, explosion potential, or asphyxiation. A combustion test and burner adjustments should be undertaken at once.

Rust on the tubes indicates that boiler operating temperatures are too low. The set point of the boiler operating control must be no less than 130°F for natural gas or propane firing, and 170°F for oil fired boilers. Boilers equipped with outdoor reset control must also follow these limits.

3.7 SUGGESTED MAINTENANCE SCHEDULE

DAILY

1. Make visual inspection of gauges, monitors, and indicators and record readings in boiler log.
2. Make visual check of instrument and equipment settings against factory recommended specifications.
3. Check operation of float type low water cutoffs to ensure control is functioning. The lower piping connections of float type level controls should have a suitable blowdown valve piped into a proper drain. This valve should be opened periodically to allow any sludge accumulated in the control to be flushed out. On closed loop water heating systems this should not be often required. Consult manufacturer's instructions.

WEEKLY

1. On units equipped with firing rate control, verify that it is functioning correctly by adjusting control and observing if input changes accordingly.
2. Make visual inspection of igniter and pilot flame. For an atmospheric unit, confirm pilot flame is as shown in this manual (Section 1.9) and that the main burners light off correctly (smoothly) and that the flame is clean and normal. For units with a power burner, check pilot flame signal strength as specified in burner manual.
3. Check pilot and main fuel valves for correct operation. Open limit switch - make audible and visual check - check valve position indicators and check fuel meters, if supplied.
4. Confirm boiler area is free of combustible materials and that there is nothing obstructing air openings, draft hood relief openings, etc.
5. Check combustion safety controls for flame failure and flame signal strength as specified in manufacturer's instructions located at the back of this manual for atmospheric units or in the burner manual for units equipped with a power burner.
6. Check all limit controls as specified in manufacturer's manual.
7. Check float low water cutoff as described above.

MONTHLY

1. Make visual inspection of linkage and proper operation of flue, vent, stack, or outlet dampers. Check draft as specified in Section 2 of this manual.
2. Check float low water cutoff as described above.
3. For those units equipped with a power burner, check low draft, fan, air pressure and damper position interlocks as specified in burner manual.
4. Check high and low gas pressure interlocks. Refer to manufacturers instructions for correct procedure.
5. Check high and low oil pressure interlocks. Refer to manufacturers instructions for correct procedure.

ANNUALLY

1. Perform leakage tests on pilot and main gas or main oil fuel valves as specified in manufacturers instructions.
2. Check operating control, high limit, low fire start control, and low water cutoff as specified in manufacturers instructions.
3. For units equipped with power burners, check air atomizing interlock, fuel valve interlock switch, purge switch, burner position interlock, and fuel changeover control, as specified in burner manual.
4. The boiler should be checked at least yearly by the local gas utility company. Particular attention should be paid to the pilot burner safety devices. The pilot burner should be checked to ensure that prompt ignition of all burners occurs as the gas valve opens. Refer to Section 1.9.
5. The flue gas passages and the exterior surfaces of the boiler tubes should be inspected at least annually. Any accumulation of soot or debris should be thoroughly cleaned out.
6. If the yearly inspection of the boiler tube surfaces reveals a build-up of soot (carbon) or rust, the tubes surfaces should be thoroughly brushed. Failure to do so may result in fire or asphyxiation hazards.

7. The boiler pressure vessel and piping should be checked annually.

8. Check combustion safety control for pilot turndown and refractory hold-in as specified in manufacturer's instructions.

3.8 FLOAT-ACTUATED WATER LEVEL CONTROLS

Inspect float type water level controls for proper operation. Visually inspect sight glasses for evidence of scale forming residues. Refer to section 3.9 for gauge glass maintenance.

On closed steam heating systems, the float low water cutoff should be blown down by means of opening a blowdown valve on the lower connection of the cutoff once per day.

On humidification or process systems, the blowdown schedule should be based on recommendation from a water treatment and maintenance program specifically designed for the boiler.

At the annual inspection, all float type level controls should be disassembled, cleaned and inspected thoroughly. When re-installed these controls must be given an operational test.

3.9 WATER GAUGE GLASSES

INSTALLATION

Check with the maintenance supervisor and engineering for the proper glass to be used. Compare the box and the glass label or marking to ascertain that the gauge glass ratings or temperature and pressure are suitable for use on the boiler. Use new gaskets when replacing glass. The gaskets used should be the same type as those originally supplied with the boiler. Make certain that the gauge glass valves are properly aligned.

All bolts and nuts must be free-running and well lubricated, preferably with a graphite type lubricant. Washers under nuts and bolt heads are desirable. DO NOT tighten while equipment is in operation.

MAINTENANCE

Inspect the gauge glass regularly for any signs of clouding or scratching. In new processes, the gauge glass should be inspected daily until the need for replacement becomes apparent. This will help establish the routine inspection cycle.

The gauge glass should be blown down daily so as to remove accumulated sediment from the valves.

INSPECTION

To examine for scratches, shine a bright concentrated light at about a 45° angle. Anything which glistens brightly should be inspected closely. Any scratch which glistens and will catch a fingernail, or crescent-shaped or star-shaped mark is cause for replacement. This is because scratches, corrosion, chips and surface damage weaken the glass. If inner surface appears cloudy or roughened, and will not respond to cleaning procedures, this is evidence of chemical attack. If severe, this is cause for replacement.

REPLACEMENT OF GLASS

Any glass that has been removed from its mounting in process boilers, regardless of the reason for removal, should be discarded and replaced with a new glass and gaskets. Used glasses may contain hidden damage and represent a safety hazard.

Be sure that the replacement glass is suitable for service conditions.

Protective shields to keep cold air, water, or falling objects from glass must be replaced.

4.0 IDLE BOILER CARE AND LAY-UP

GENERAL

Corrosion damage to boilers is often the result of improper lay-up during non-operating periods. Substantial damage can occur in only a few days in

proper precautions are not taken. This damage is irreversible and will reduce boiler reliability, increase maintenance costs and eventually shorten the useful life of the boiler tubes.

Idle boilers are vulnerable to attack when air contacts untreated wet metal surfaces. To prevent corrosion, the boiler metal must be protected by either keeping the surfaces completely dry or excluding air from the boiler. Air exclusion is accomplished either by keeping the boiler completely full of water (short term lay-up) or filling the boiler with nitrogen gas (long-term lay-up). The nitrogen gas prevents air infiltration and does not react with the metal.

In addition to the corrosion damage that occurs, the metal particles that are released will form an insulating scale on the tubes when the boiler is returned to service. These corrosion products will accumulate on critical heat transfer areas of the boiler, increasing the potential for localized corrosion and over heating.

PRE-OPERATIONAL CLEANING AND LAY-UP

Proper lay-up techniques must be used on an idle boiler even if it has never been in operation. Before pre-operational lay-up, the boiler must be chemically cleaned as outlined in Section 3.2 of this manual. This is required, as noted in this section, to remove preservatives, oil and grease from the tube surfaces. Follow the short term or long term lay-up procedure as appropriate.

TAKING BOILERS OFF LINE

In operation, boiler water contains suspended solids which are held in suspension due to water circulation and the action of treatment chemicals. Unless care is exercised when draining the boiler, these suspended solids settle on the tube surfaces and will air dry to an adherent deposit, sometimes requiring chemical cleaning to remove. In addition, these deposits may be misleading regarding the effectiveness of the chemical treatment program.

PRE-SHUTDOWN PRECAUTIONS

For a period of three to seven days prior to shutdown, manual blowdown frequency should be increased. During this period, the lower conductivity limit should be below 3500 micro-mohs per centimeter. The feed of internal treatment must be increased to maintain a specific residual concentration. Continuous blowdown (when used) should be kept to a minimum so the reduction of solids is achieved by the increased manual blowdown.

WASHDOWN

As the boiler cannot be washed immediately, the

heat in the boiler may cause baking of residual sludge. The boiler should not be drained until cooled enough to prevent this. However, never leave the boiler filled with water for any extended period of time without taking measures to prevent corrosion.

LAY-UP CONSIDERATIONS

There are two basic methods of steam boiler lay-up: Wet lay up or Dry lay-up. The choice of which method should be used depends on:

- The possibility that the boiler may need to be placed in operation on short notice.
- Disposal of lay-up solutions
- Freezing potential

Wet Lay-up is recommended for relatively short outages, such as seasonal lay-up. This method has the advantage of allowing the boiler to be brought on line with short notice. But it can pose problems if there is any likelihood of freezing.

Dry Lay-up is recommended for longer periods of boiler shut-down or storage. But it is practical only if boiler can be drained hot (120°F to 170°F) or if external drying can be provided.

WET LAY-UP OF STEAM BOILERS - SHORT TERM

In the wet lay-up procedure, the boiler is to be filled with chemically treated water and sealed to prevent air in-leakage. Nitrogen gas under slight pressure can also be used to displace air and protect the boiler surfaces from corrosion. The following steps should be taken for wet lay-up of a boiler:

1a. Procedure for operational boiler:

At least thirty minutes before the boiler comes off line, add the following chemicals:

Sodium Sulfitite - 0.5 lbs. per 100 gallons water

Polymeric Sludge Dispersant - 0.1 lbs. per 100 gallons water

Caustic Soda - 0.3 lbs. per 100 gallons water

1b. Procedure for idle boiler:

If the boiler has never been on line or has been out of service for cleaning - Select the highest quality water available to fill the boiler. Steam condensate, softened water, filtered fresh water, and boiler feedwater are generally acceptable for lay-up. Raw city water is not recommended and should not be used.

Prepare the chemical solution described in (1a) in

a separate tank. Adhere to the safety precautions described in Section 3.2 of this manual. Add the concentrated lay-up solution to the boiler during the time it is being filled.

After the boiler is filled and the lay-up solution has been added, the boiler is to be operated for thirty minutes at low fire to circulate and mix the chemicals.

2. After filling, the boiler must be closed or blanked tightly. The power supply to the boiler must be cut off. Vent all air from the top of the boiler to allow complete fill with the required solution. Nitrogen gas at 5 psig may be introduced through a suitable opening to prevent air in-leakage during the lay-up period. An alternative to the nitrogen gas (see safety precautions under dry lay-up) is to install a 55 gallon drum or auxiliary vessel as shown in Figure 3.11A. This is to be fitted with a cover and filled with properly treated water. This vessel or drum should be connected to an available opening in the top of the vessel. Its purpose is to create a hydrostatic head and to allow a ready visual check of water level loss or in-leakage during the lay-up period.

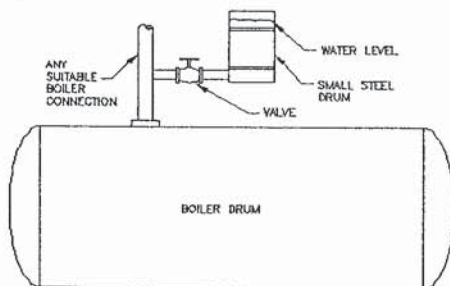


Figure 3.11A: WET LAY-UP STATIC HEAD DRUM

3. During lay-up, test the boiler weekly to assure the proper levels of sulfite and alkalinity. To do this, take a sample of the boiler water from the surface blowdown line or other high point. The test results should be:

- Sodium Sulfite 200 ppm minimum
- Phenolphthalein Alkalinity (as CaCO₃)

400 ppm minimum

If the tests indicate chemical concentration has decreased, chemical may be introduced to the boiler by putting it in the drum shown in Fig. 3.11A. Then lower the boiler water level to introduced it into the boiler. Then operate the boiler at low fire to

circulate the water and mix the chemical. Then repeat Step. 2. Pay attention to the maintenance of the valves being used to isolate the boiler to prevent leakage and resultant dilution of the lay-up solution.

ALTERNATE METHOD

An alternate wet lay-up method is to pipe clean continuous blowdown water from a properly treated boiler into any convenient bottom connection on the idle boiler, allowing the water to flow through the boiler and out the top (through any convenient top opening) to the sewer. This method will insure a continuous, complete fill with warm, properly treated water. It also prevents in-leakage of air by keeping the boiler slightly pressurized. It may also provide enough heat to keep the fireside of the boiler dry and possibly produce adequate freeze protection.

DRY LAY-UP OF STEAM BOILERS - LONG TERM

The dry lay-up method recommended requires that the boiler be drained, dried as completely as is possible, all opening and valves closed. Nitrogen gas at 5 psig is introduced to the boiler to pressurize it and prevent air in-leakage. The success of the procedure depends on the thorough drying of the boiler metal surfaces after draining and the exclusion of air during the lay-up.

CAUTION

The use of nitrogen for blanketing is recommended in both the wet and dry lay-up procedures. Even though nitrogen in dilute quantities is non-toxic, it will not support life. Precautions must be taken before entering equipment filled with nitrogen for inspections or any other purposes. These precautions shall be as follows:

- disconnection of nitrogen supply line
- complete purging and venting of the equipment with fresh air
- testing oxygen levels inside before any attempt to enter
- all confined entry guidelines applicable to site must be followed

Appropriate caution signs shall be posted around the equipment to alert personal that nitrogen blanketing is in use. A boiler laid up dry must be tagged with information that the unit is not to be operated until the boiler is properly refilled.

1. Drain the boiler before the steam pressure falls to zero. Then pressurize with 5 psig nitrogen gas through a suitable top opening during draining. The nitrogen pressure is to be maintained through draining and subsequent storage.

An alternate method is to completely dry a clean boil (by blowing hot dry air through the boiler) and then purge the air from the boiler and pressurize with 5 psig nitrogen. Be aware that all metal surfaces which are not completely dry are vulnerable to corrosion, particularly if oxygen is present.

2. If a boiler has been down for repairs and is to be laid up, it should be operated to pressurize with steam and then drained and pressurized with nitrogen as in step 1.

3. All connections must be blanked or tightly closed.

Note: Operating boilers must be removed from service to minimize adherence of boiler water suspended solids on boiler metal surfaces. Refer to previous instructions for boiler washdown.

RETURNING IDLE BOILER TO SERVICE

After wet lay-up

To start an idle boiler after wet lay-up, use the following procedure:

1. If the boiler was pressurized with nitrogen, disconnect the nitrogen supply source and vent the boiler.

2. Using the blowdown valve, drain the boiler partially and make up with feedwater so as to dilute the chemical residuals to operating concentration levels.

3. After the boiler water concentrations and the water level are returned to proper operating conditions, the boiler can be started in the normal manner.

After Dry Lay-Up

To start an idle boiler after dry lay-up, use the following procedure:

1. Disconnect the nitrogen supply source and vent the boiler in a safe manner - external to the building and away from air intakes. Then thoroughly purge the boiler of nitrogen with dry air.

2. The boiler was to have been cleaned before the lay up procedure. So it is necessary only to fill the boiler with properly treated water. Then proceed with start-up.



Bryan Boilers

Removal and Replacement of Flexible Water Tubes

Instruction 34

(1/97)

Follow this easy step-by-step procedure to remove or replace the flexible water tubes in Bryan Boilers. This process requires no rolling or welding. Follow the steps as outlined for the most efficient and least time consuming procedure.

CAUTION: GOGGLES OR SAFETY GLASSES SHOULD BE WORN TO PREVENT INJURY. Before removing tube(s), boiler must be completely drained of water. If boiler outlet and return are equipped with shutoff valves, close both to avoid draining the entire system.

TOOLS REQUIRED

Hammer

- A. For 3/4" and 1" tubes, two pound hammer
- B. For all 1 1/2" tubes, four pound hammer

Tube Puller (Available from Bryan)

- A. For 3/4" tubes, number 4 puller
- B. For 1" tubes, number 2 puller
- C. For 1 1/2" tubes, number 3 puller

Tube Driver (Available from Bryan)

- A. For 3/4" and 1" tubes, number 1 driver
- B. For 1-1/2" tubes, number 2 driver

Nut Wrench - 3/8"

TUBE ORDERING INFORMATION

For Bryan Boiler Series

Order tubes by configuration

F, D and HED Series

Tubes are long or short. Outside is long, inside is short.

L Series

Tubes are right hand or left hand. (facing burner end)

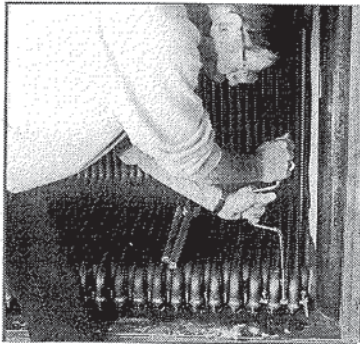
LM, AB, RV and RW Series

Tubes are inside or outside

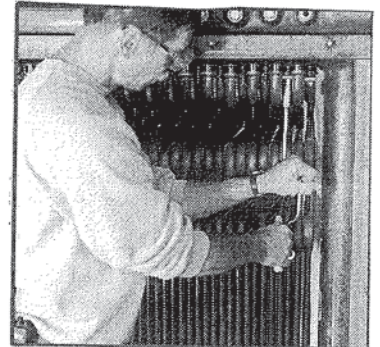
PREPARATION

Begin by removing the insulated jacket side panels or doors, exposing the inner tube access panels. On some models (L, LM and RW Series) tube access is from both sides. On each end of every tube is a welded steel tapered ferrule which is driven into tapered holes in the upper and lower steel headers.

REMOVAL OF TUBES



1. Remove lower tube clamps. On most models a stud and clamp are required over the steel ferrule. Remove the retaining nut and clamp before attempting to remove the tube(s). To facilitate removal, you may need to soak with good penetrating fluid.



2. Remove upper tube clamps. Follow the same procedure as step one.



3. Loosen tube ferrules. Strike the side of the tube ferrule two or three times with a hammer to help loosen the tube ferrule in the upper and lower header.



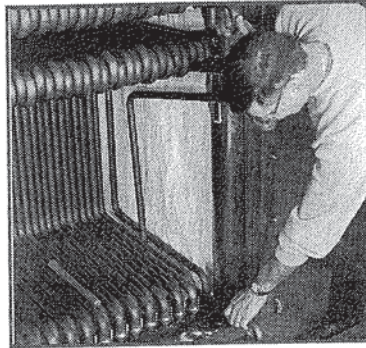
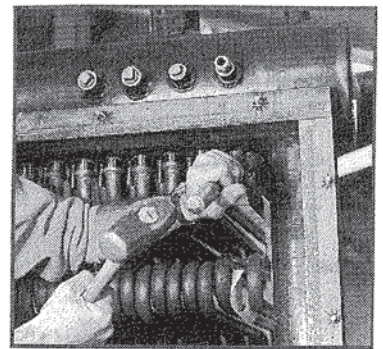
4. Pull lower tube ferrule (outer row of tubes). Drive the tube puller wedges under the lip of the tube ferrule with several blows of the hammer on the end of the handle. Alternate with downward blows to lift the tube ferrule. Hold the leverage and repeat to drive the wedge further.





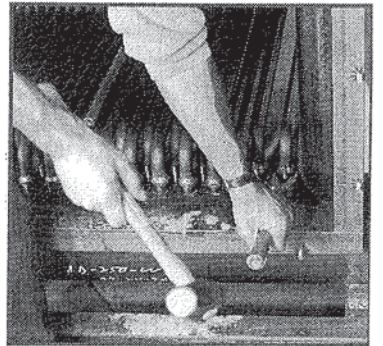
5. Clear tube Ferrule from the header. Continue driving wedge under and leveraging fitting up until it pops the end of the tube free from the hole in the header. ←

6. Pull upper tube ferrule. Repeat the procedure to pull the tube ferrule of the same tube from the upper header. →



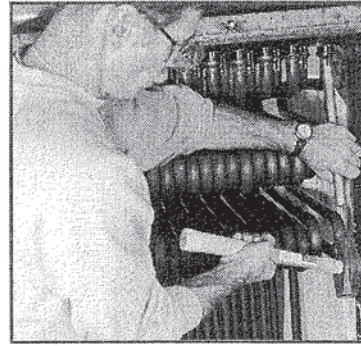
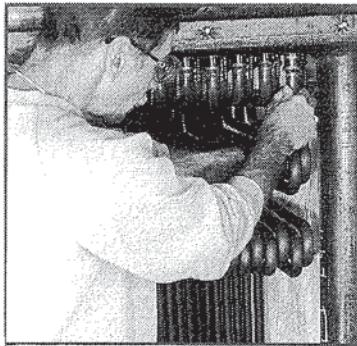
7. Remove outer row tube. Remove the tube and repeat with other outer row tubes to gain access to rear tubes. If a tube leak occurs in an inner tube, two adjacent outer tubes must be removed to access the inner tube for removal. ←

8. Pull inner row tube ferrules. Repeat the procedure in steps four through seven to remove inner tube or tubes. →



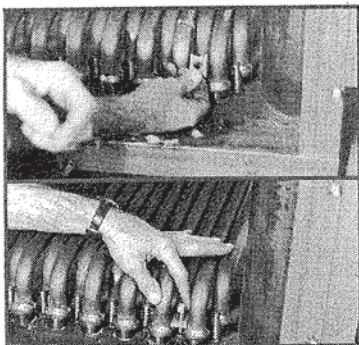
REPLACEMENT OF TUBES

Before placing a new tube into the headers, clean the holes by wiping gently with emery cloth to be sure there are no burrs. If replacement tube has been sitting for a long period of time and shows rust, repeat the cleaning procedure on the tube ferrule. With a small brush, apply a thin coating of gray pipe dope around the inside of the hole and all around the tube ferrule.



9. To replace tubes, start with the inner tube. Insert the lower tube ferrule in the bottom header first then the top tube ferrule in the top header. Replace all tubes before driving.

10 & 11. Drive the tube ferrules until they seat. With the driver tool positioned on the ring, strike the end of the driver with the hammer three or four blows. **DO NOT DRIVE THE FERRULE DOWN TO THE RING.** Before the ring reaches the header, after three or four good hits, you will hear a solid hit. This indicates the tube is seated.



12. Replace tube clamps. If your unit is equipped with studs and clamps, reinstall the tube clamps and secure them with nuts. Tighten the nut only until snug. Do not try to compress the ferrule into the holes with the clamps, because the clamps might break or the studs might shear.

REFILL THE BOILER

Refill the boiler with water. Fill until pressure is slightly under the relief valve set pressure. Inspect all tube ferrules for leaks. If the tube(s) you replaced leaks, reduce the pressure in the boiler to zero, then strike the fitting once or twice with the driver and hammer as shown in steps ten and eleven above. After inspection, replace the tube access panels and jacket access doors.

 **Bryan Boilers**
 Installation and Operating Service Manual Supplement

Bryan Boilers is currently supplying boilers with product enhancements to our flexible tubes. Most flexible tubes will no longer have a separate ferrule welded to each end. We have developed a way to form the ferrule from the tube material directly on the bent tube see figure 1. We will identify these tubes as “**End-Formed**”. Patent Pending

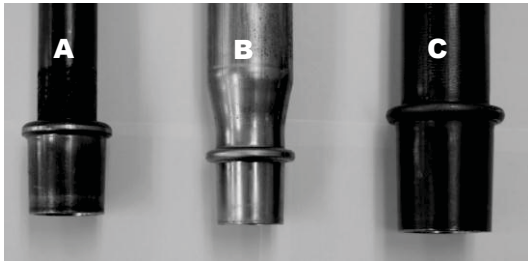


Figure 1

- A. 1” End-Formed Tube.
- B. Triple-Flex End-Formed Tube.
- C. 1-1/2” End-Formed Tube.

These tubes will require a specific driver to install the tubes into the boiler vessel. The tube driver required is shown in Figure 2.



Figure 2

This driver is required to drive all end-formed tubes. The driver (see Figure 3) previously used to drive 1” tubes will adequately drive 1” end-formed tubes only.

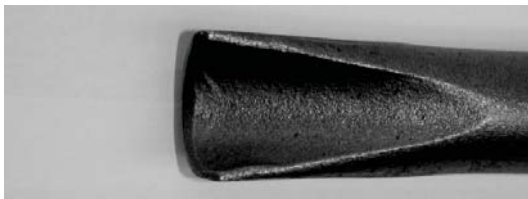


Figure 3

If you have a driver that looks like Figure 4 – B, your driver will need to be modified by grinding to match Figure 4 – A.

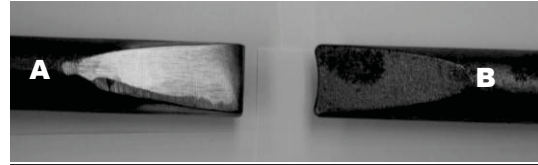


Figure 4

The new driver and current tube pullers will work for all tubes regardless if end-formed or welded ferrule.

We have changed to end-formed tubes for the following boilers, DR, AB, RV, and RW. The Triple-Flex boiler has shipped with end-formed tubes since introduction.

The table below is provided as a cross-reference until the parts list can be revised with the new numbers.

NOTE:

If you order tubes with old part number, you will receive end-formed tube replacements.

End-Formed Tube Cross Reference		
Boiler Series Outside or Inside	With Fittings (Old Part#)	End-Formed (New Part#)
DR Outside	400004	301442
DR Inside	400003	301443
CLM	400176	N/A
CL	400131	N/A
AB Outside	77120	301446
AB Inside	77121	301447
RV Outside	38100	301448
RV Inside	38101	301449
RW Outside	50101	301450
RW Inside	50100	301451
K Outside	32124	N/A
K Inside	32125	N/A
Tube Driver	28906.1	

TERMS AND CONDITIONS OF SALE

BRYAN BOILERS

("Seller")

PRICES AND TERMS OF PAYMENT

- A. Prices quoted are firm for no more than 30 days from the date of quotation, subject to any conditions stated in Seller's quotation or in an order submitted by Buyer and expressly accepted in writing by Seller. Seller will not be bound by any price sheet or quote other than a price quote signed by an authorized representative of Seller.
- B. Prices on orders accepted by Seller are firm, to the extent stated in the accepted order, subject to the following:
1. The purchase order must provide for shipment within six months of the date of the purchase order.
 2. Any shipment made more than six months after such date is subject to a price adjustment, at Seller's sole discretion, to the Seller's price in effect at the time of shipment, which will not exceed 125% of the price on the acknowledged purchase order
 3. Any shipment more than 12 months after the date of the purchase order will be invoiced at Seller's price in effect at the time of shipment.
- C. On orders having a total price of less than \$100,000 payment will be due "net 30 days" from date of shipment with approved credit, unless otherwise specifically agreed to by Seller. On orders having a total purchase price of \$100,000 or more, terms are 10% with order, 40% upon Seller's receipt of Buyer's approval of drawings, 45% within 30 days after shipment with approved credit and 5% at start-up of the products or within 90 days after shipment, whichever occurs sooner.
- D. The price of parts, components, and other items not manufactured by Seller is subject to adjustment by Seller to reflect price changes by Seller's suppliers.
- E. Orders accepted by seller are subject to credit investigation and approval. If Buyer's financial condition at any time does not justify the terms specified, Seller may require full or partial payment as a condition to commence or continue to manufacture, or in advance of shipment or, if shipment has been made, recover shipment from the carrier. A service charge of 1-1/2% per month will be added to all accounts 30 days past due.
- F. Any tax or government charge now or hereafter leveled upon the production, sale, use, or shipment of products ordered or sold will be charged to and paid by the Buyer, unless the Buyer has provided Seller with a tax exemption certification acceptable to the applicable taxing authorities. Such taxes are not covered in the selling price unless expressly stated on the quotation form.

SECURITY INTEREST

Notwithstanding transfer of title to Buyer, the Seller retains and the Buyer hereby grants to the Seller a purchase money security interest in all products sold, and Buyer hereby irrevocably appoints Seller as its attorney-in-fact to execute and deliver, in Buyer's name, any such financing statements or other documents as may be necessary under the Uniform Commercial Code or other applicable laws governing the items sold herein to perfect Seller's interest therein.

Buyer will obtain and maintain insurance against loss or damage naming Seller as an additional insured in an amount sufficient to protect Seller's interest in all products until the purchase price has been paid in full.

CHANGES, ORDERS, AND CANCELLATION

Seller may adjust the selling price to cover any requested change in specifications or other terms after receipt of the Buyer's order. Orders accepted by Bryan Boilers shall not be canceled by the Buyer except at Bryan's sole discretion. In the event of any cancellation, Bryan reserves the right to impose a cancellation charge sufficient to cover all losses

and out-of-pocket cost incurred by Seller in connection with such order, including materials and labor charges and cancellation charges from vendors, plus a cancellation charge of 20% of the original face amount of the order to compensate Seller for its lost profits.

RETURNED GOODS

Products may not be returned for refund or credit after Buyer has agreed to accept them. Inspection by a Seller representative may be required before return authorization is granted. A minimum restocking and handling charge of 25% (plus the cost of any missing parts or components and inbound freight) will apply to all such returned products. All transportation charges for returned products must be paid by Buyer.

TRANSPORTATION TERMS AND CLAIMS

Unless otherwise stated on Seller's quotation form, all prices are F.O.B. Seller's shipping point. Delivery to the initial carrier shall constitute delivery to the Buyer. Seller's responsibility ceases and title to the goods passes, subject to Seller's security interest, upon delivery in good order to such carrier, and all products are shipped at the Buyer's risk. The Buyer agrees to examine all deliveries carefully before signing transportation receipts. If products are visibly damaged, the Buyer shall require that written confirmation of the damage be noted on the carrier's delivery receipt and confirmed by the driver for the carrier. If damage is discovered after unpacking, the carrier shall be notified at once so that an inspection can be made and the claimed damage substantiated by the carrier

FORCE MAJEURE AND STORAGE

- A. Seller shall not be liable for any delay or delivery of shipment of products or for any damages failure in the suffered by reason of such delay or failure if, directly or indirectly, due to fire, flood, other weather conditions, accidents, riots, war, embargo, labor stoppages, inadequate transportation facilities, shortages of material or suppliers, regulation by government authority, or any cause beyond Seller's control.
- B. Seller reserves the right to allocate available production among its customers in any fair and reasonable manner that it determines is necessary or desirable.
- C. If delivery is delayed due to any cause beyond Seller's control, Buyer shall reimburse Seller for any added costs. Without limiting the foregoing, product on which manufacture or delivery is delayed due to any cause may be placed in storage by Seller, for the Buyer's account and risk, and regular charges therefore and expenses in connection therewith shall be paid by the Buyer. If, in Seller's opinion, it is unable to obtain or continue such storage, the Buyer will, on request, provide or arrange for suitable storage facilities and assume all costs and risks in connection therewith.

SHORTAGES, VARIANCES, AND WEIGHTS

No claims for variance from or shortages in orders will be considered unless presented within 30 days after receipt of products. Any shipping weights given or estimated are approximate, for the Buyer's convenience only, and not guaranteed by Seller.

LIMITS OF LIABILITY

Any action by Buyer on this contract must be commenced within one year after the cause of action accrues. Actions on Seller's Warranties shall be limited as provided therein. Seller shall in no event have any liability for any liquidated damages, consequential damages or penalties, whether on account of lost profits, or otherwise, unless specifically agreed to in writing signed by an authorized representative of Seller.

PRODUCT CHANGES

Seller reserves the right to make changes in products of any kind without prior notice, and to deliver revised designs or models of products against

any order. Seller shall have no responsibility whatsoever with respect to changes made by the manufacturer of products sold but not manufactured by it.

PATENTS

Products manufactured and sold by Seller may be used by the Buyer pursuant to such patent rights as Seller may own or enjoy. Seller shall not be liable for any use to which any such products may be put as part of any system, mechanism or process covered by patent rights of others.

TESTS

Any tests requested by the Buyer to determine the performance of products covered by Seller's quotation, must utilize procedures acceptable to Seller and the Buyer is responsible for the costs thereof. Whenever an order includes start-up or service agreements, Seller shall not be obliged to provide any start-up or other service as long as any payment to Seller is in default.

CONFLICTING PROVISIONS OFFERED BY BUYER

Any terms and conditions of Buyer's purchase order which are different from, in addition to or inconsistent with the terms and conditions expressed herein, are hereby objected to, and will not be binding on Seller in any manner whatsoever unless accepted by Seller in writing.

Seller shall ship the products referred to in this document only on the condition that the terms and conditions of sales set forth hereon shall be binding on the Buyer.

APPLICABLE LAW

Any orders or contracts received by Seller from Buyer shall be governed by, consulted and enforced by the laws of the state of Indiana.

COMPLETE AGREEMENT

The complete agreement between Seller and Buyer is contained herein and in any specifications signed by the Seller, and no additional or different terms or conditions stated by Buyer shall be binding unless agreed to by Seller in writing. Neither course of dealings, nor usage of trade, shall be relevant to supplement or explain any terms used in this Agreement, and this Agreement may be modified only by a writing signed by both Seller and Buyer. The failure of Seller to insist upon strict performance of any of the terms and conditions stated herein shall not be considered as a continuing waiver of any such terms or conditions or any of Seller's other rights.

CHANGES IN TERMS

These terms and conditions of sale are subject to change by Seller from time to time without prior notice.

LIMITED WARRANTY

BRYAN BOILERS

("Seller")

LIMITED WARRANTY

Subject to the terms and conditions herein, Seller warrants to the original owner at the original installation site that products manufactured by Seller ("Products") comply, at the time of manufacture, with recognized hydronics industry regulatory agency standards and requirements then in effect and will be free from defects in materials and workmanship for a period of 12 months after the date of start-up or 18 months after the date of shipment, whichever shall be less (the "Warranty Period").

REMEDY

- A. The sole remedy for breach of this warranty is expressly limited to the repair or replacement of any part found to be defective under conditions of normal use within the Warranty Period. Installation is not included.
- B. Warranty - The owner must notify the original installer of the Product and Seller, in writing, within the Warranty Period, providing a detailed description of all claimed defects. Transportation to a factory or other designated facility for repairs of any products or items alleged defective shall, in all events, be the responsibility and at the cost of the owner.

EXCLUSIONS

Seller shall have no liability for:

- A. Incidental, special, or consequential damages, such as loss of the use of products, facilities, or production, inconvenience, loss of time or labor expense involved in repairing or replacing the alleged defective Product.
- B. The performance of any Product under conditions varying materially from those under which such Product is usually tested under industry standards as of the time of shipment.
- C. Any damages to the Product due to abrasion, erosion, corrosion, deterioration, abnormal temperature, or the influence of foreign matter or energy.

- D. The design or operation of owner's plant or equipment or of any facility or system of which any Product may be made a part.
- E. The suitability of any product for any particular application.
- F. Any failure resulting from misuse, modification not authorized by Seller in writing, improper installation, or lack of proper maintenance.
- G. Equipment furnished by the owner, either mounted or unmounted, or when contracted for by the owner to be installed or handled.

Seller's liability under this warranty shall not in any case exceed the amount paid for the Product found to be defective.

THIRD-PARTY WARRANTIES

For goods or components not manufactured by Seller, the warranty obligations of Seller shall, in all respects, conform and be limited to the warranty actually extended to Seller by its vendors.

SEVERABILITY

To the extent that any provision of this warranty would be void or prohibited under applicable law, such provisions shall be limited in effect to the minimum extent necessary to render the remaining provisions hereof enforceable.

NO OTHER WARRANTIES

Seller makes no implied warranty of merchantability or fitness for a particular purpose, or other warranties with respect to any products or services except as expressly set forth in this limited warranty.

**25-YEAR
NON-PRO-RATED
WARRANTY
AGAINST
THERMAL SHOCK**

In addition to our standard one-year warranty against defective parts and workmanship, Bryan Steam LLC warrants the boiler pressure vessel for twenty-five (25) years, non-pro-rated, from the date of shipment from Peru, Indiana. This warranty is only valid if the boiler is installed and operated in accordance with our Installation and Operation Manual.

This warranty shall cover leaks in boiler tubes, upper and lower drums, and downcomers, when upon inspection by us, such damage is attributed to unequal expansion, often described as “thermal shock.”

This warranty does not cover damages or failures that can be attributed to corrosion, scale, dirt or sludge accumulation in the boiler, low water conditions, failure of any safety devices or any other improper service, operation or neglect.

Bryan Steam LLC liability is hereunder limited to solely repairing or supplying a replacement pressure vessel or component parts as determined necessary by our inspection. Bryan Steam LLC is not responsible for shipping, handling, installation and other costs, including all costs associated with the removal and disposal of the old pressure vessel or component parts. In no event shall Bryan Steam LLC be responsible for any incidental, consequential, or other damages, including any damages resulting from loss of use of the boiler.

 **BRYAN STEAM**® *Bryan Steam LLC — Leaders Since 1916*
783 N. Chili Ave., Peru, Indiana 46970 U.S.A.
Phone: 765-473-6651 • Internet: www.bryanboilers.com
Fax: 765-473-3074 • E-mail: inquiry@bryansteam.com

1/4" Dia. x 1 1/4" length time-delay ferrule fuses

MDL-V (axial leads)

MDL

Specifications
Description: Time-delay fuse.

Dimensions: 1/4" x 1 1/4"
(6.4 x 31.7mm).

Construction: Glass tube with nickel-plated brass endcaps.

Ratings:

- Volts — 250Vac (1/6-8A)
- 32Vac (9-30A)
- Amps — 1/6-30A
- IR* — 35A (1/6-1A @ 250Vac)
- 100A (1 1/4-3A @ 250Vac)
- 200A (4-8A @ 250Vac)
- 1000A (9-30A @ 32Vac)

*Interrupting ratings were measured at 70% – 80% power factor on ac, and at a time constant described in UL 198L.

Agency Information: CE, Std. 248-14, UL Listed, Guide JDYX, File E19180; 1/6-8A CSA Certification Class 1422-01, File 53787, 1/6-8A, UL Recognized, Guide JDYX2, File E19180, 8.1-30A.

Features and Benefits

- Time-delay allows close sizing on inductive circuits.
- Broad amp size range allows improved compatibility between fuse and circuit operating characteristics.

Typical Applications

- Electronic Circuits

Catalog Numbers (Amps)

With Axial Leads

MDL-V-1/6	MDL-V-1	MDL-V-7
MDL-V-1/10	MDL-V-1 1/4	MDL-V-8
MDL-V-1/6	MDL-V-1 1/2	MDL-V-9
MDL-V-7/10	MDL-V-2	MDL-V-10
MDL-V-3/4	MDL-V-2 1/4	MDL-V-12
MDL-V-1/4	MDL-V-2 1/2	MDL-V-15
MDL-V-7/10	MDL-V-3	MDL-V-20
MDL-V-3/6	MDL-V-4	MDL-V-25
MDL-V-1/2	MDL-V-5	MDL-V-30
MDL-V-3/4	MDL-V-6	

Without Axial Leads

MDL-1/6	MDL-1	MDL-7
MDL-1/10	MDL-1 1/4	MDL-8
MDL-1/6	MDL-1 1/2	MDL-9
MDL-7/10	MDL-2	MDL-10
MDL-3/4	MDL-2 1/4	MDL-12
MDL-1/4	MDL-2 1/2	MDL-15
MDL-7/10	MDL-3	MDL-20
MDL-3/6	MDL-4	MDL-25
MDL-1/2	MDL-5	MDL-30
MDL-3/4	MDL-6	

Data Sheet:2004

MDQ-V (axial leads)

MDQ

Specifications
Description: Dual-element, time-delay fuse.

Dimensions: 1/4" x 1 1/4"
(6.4 x 31.7mm).

Construction: Glass tube with nickel-plated brass endcaps.

Ratings:

- Volts — 250Vac (1/100-7A)
- 32Vac (7 1/2-7A)
- Amps — 1/100-15A
- IR — 35A (1/100-1A @ 250Vac)
- 100A (1 1/4-3A @ 250Vac)
- 200A (4-7A @ 25Vac)
- 1000A (7 1/2-12A @ 32Vac)

Agency Information: CE, Std. 248-14, UL Listed, File E19180; Guide JDYX, 1/6-7A CSA Certification, File 47233, Class 1422-01, 1/6-7A, UL Recognized, Guide JDYX2, File E19180, 7.1-30A.

Features and Benefits

- Dual-element design allows closer sizing to inductive circuits than any other fuses.

Typical Applications

- Electronic Relay and Control Circuits

Catalog Numbers (Amps)

With Axial Leads

MDQ-V-1/100	MDQ-V-7/10	MDQ-V-1 1/2	MDQ-V-5
MDQ-V-1/52	MDQ-V-3/6	MDQ-V-1 3/10	MDQ-V-6
MDQ-V-1/6	MDQ-V-7/10	MDQ-V-1 9/10	MDQ-V-6 1/4
MDQ-V-7/10	MDQ-V-1/2	MDQ-V-2	MDQ-V-7
MDQ-V-1/6	MDQ-V-7/10	MDQ-V-2 1/4	MDQ-V-7 1/2
MDQ-V-15/100	MDQ-V-3/4	MDQ-V-2 1/2	MDQ-V-8
MDQ-V-175/1000	MDQ-V-7/10	MDQ-V-2 3/10	MDQ-V-9
MDQ-V-3/6	MDQ-V-1	MDQ-V-3	MDQ-V-10
MDQ-V-7/10	MDQ-V-1 7/10	MDQ-V-3 3/10	MDQ-V-12
MDQ-V-3/4	MDQ-V-1 1/4	MDQ-V-4	MDQ-15

Without Axial Leads

MDQ-7/100	MDQ-3/10	MDQ-1 1/2	MDQ-5
MDQ-1/52	MDQ-3/6	MDQ-1 9/10	MDQ-6
MDQ-7/6	MDQ-7/10	MDQ-1 9/10	MDQ-6 1/4
MDQ-7/10	MDQ-1/2	MDQ-2	MDQ-7
MDQ-1/6	MDQ-7/10	MDQ-2 1/4	MDQ-7 1/2
MDQ-15/100	MDQ-3/4	MDQ-2 1/2	MDQ-8
MDQ-175/1000	MDQ-7/10	MDQ-2 3/10	MDQ-9
MDQ-3/6	MDQ-1	MDQ-3	MDQ-10
MDQ-7/10	MDQ-1 7/10	MDQ-3 3/10	MDQ-12
MDQ-3/4	MDQ-1 1/4	MDQ-4	MDQ-15

Data Sheet: 2044

MDA-V (axial leads)

MDA

Specifications
Description: Time-delay fuse.

Dimensions: 1/4" x 1 1/4"
(6.4 x 31.7mm).

Construction: Ceramic tube with nickel-plated brass endcaps.

Ratings:

- Volts — 250Vac (or less)
- 125Vdc (20A- 30A)
- Amps — 1/10-30A
- IR** — 35A (1/10-1A @ 250Vac)
- 100A (2 1/2-3A @ 250Vac)
- 200A (4-10A @ 250Vac)
- 1500A (15-30A @ 250Vac)
- 10,000A (20-30A @ 125Vdc)

**Interrupting ratings were measured at 70% – 80% power factor on ac, and at a time constant described in UL 248.

Agency Information: CE, Std. 248-14, UL Listed, Guide JDYX, File E19180, 0-15A CSA Certification, Class 1422-01, File 53787, 0-15A.

Features and Benefits

- Ceramic body allows for higher amp/volt rating combinations.
- Inventory consolidation by replacing MDL fuses allows for reduced SKU investment and minimizing potential for misapplying fuse.

Typical Applications

- Electronic Circuits

Catalog Numbers (Amps)

With Axial Leads

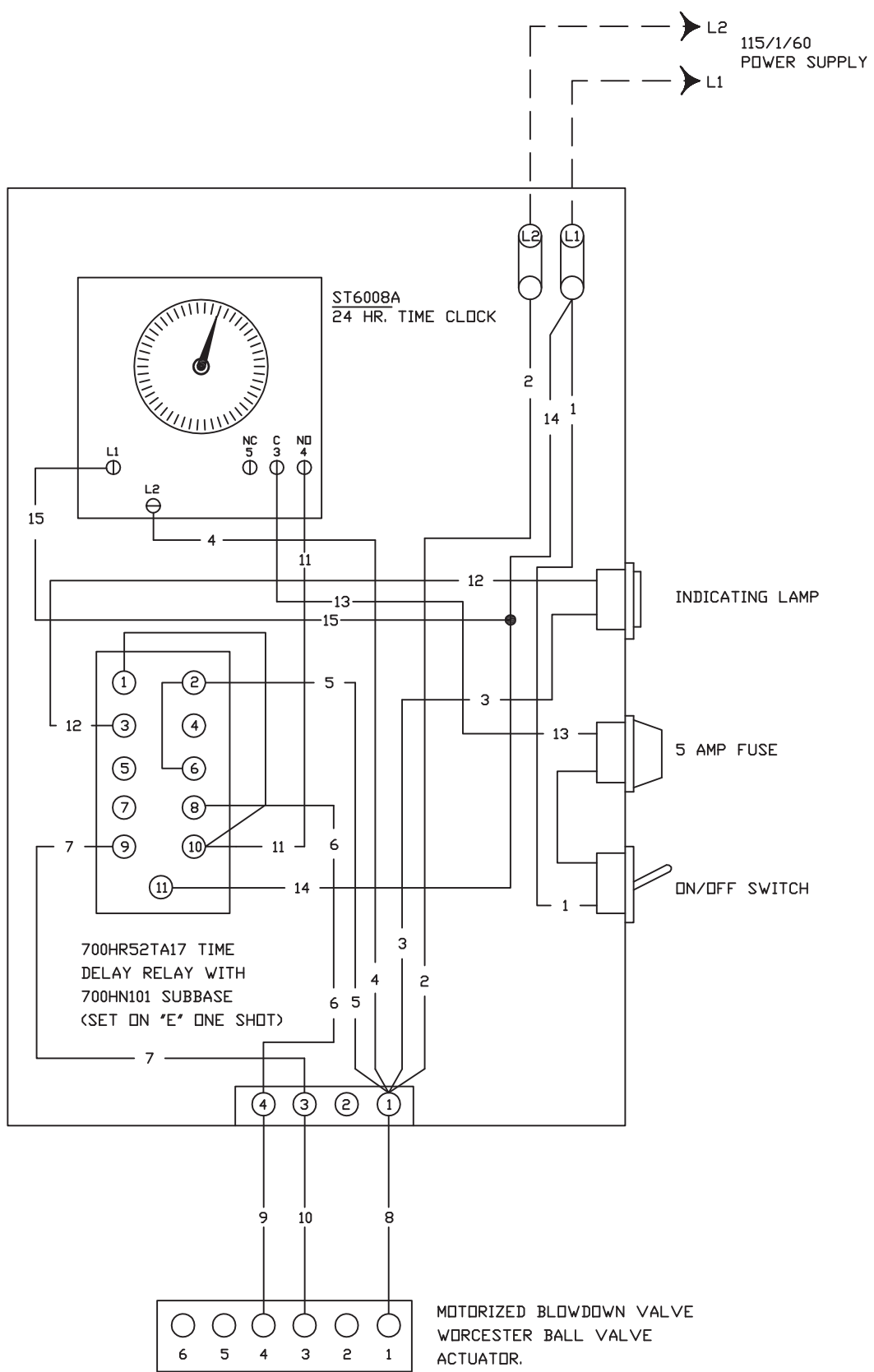
MDA-V-7/10	MDA-V-2 1/2	MDA-V-10
MDA-V-1/4	MDA-V-3	MDA-V-12
MDA-V-1/2	MDA-V-4	MDA-V-15
MDA-V-3/6	MDA-V-5	MDA-V-20
MDA-V-1	MDA-V-6	MDA-V-25
MDA-V-1 1/2	MDA-V-7	MDA-V-30
MDA-V-2	MDA-V-8	

Without Axial Leads

MDA-3/10	MDA-2 1/2	MDA-10
MDA-1/4	MDA-3	MDA-12
MDA-1/2	MDA-4	MDA-15
MDA-3/6	MDA-5	MDA-20
MDA-1	MDA-6	MDA-25A
MDA-1 1/2	MDA-7	MDA-30A
MDA-2	MDA-8	

Data Sheet: 2002

Electronic Fuses



REVISION	# 13
APPROVED BY	DATE
INITIAL	
ENGINEERING MANAGER	







BRYAN STEAM LLC

783 North Chili Avenue Peru, IN 46970

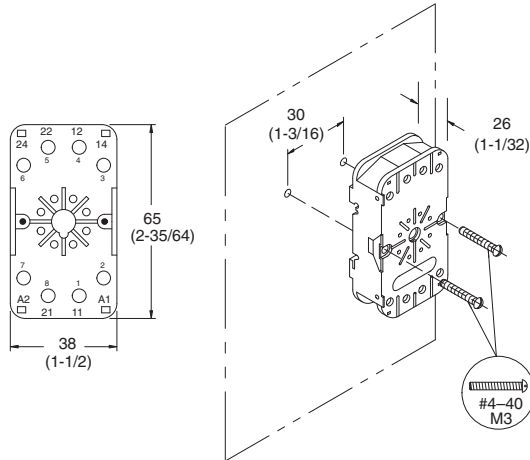
DWG. TITLE: AUTOMATIC SURFACE BLOWDOWN SYSTEM
W/ 24 HR TIME CLOCK
AND TIME DELAY RELAY

DRAWN BY:	DATE:	SCALE:	DISK:	DWG. NO.:
BHG	9/28/06	NONE	FS	WD-336-1

Bulletin 700-HA
General Purpose Relays
Accessories

	Description	Pkg. Qty.	Cat. No.	Factory-stocked Item
 Cat. No. 700-HN100	Screw Terminal Tube Base Sockets – Panel or DIN Rail Mounting. Guarded Terminal Construction 8-pin for use with DPDT Bulletin 700-HA relays, -HX digital timing relays, -HT (ON-Delay) and -HRM, -HRC and -HV (Repeat Cycle) timing relays. Order must be for 10 sockets or multiples of 10.	10	700-HN100	✓
 Cat. No. 700-HN125	Screw Terminal Tube Base Sockets – Panel or DIN Rail Mounting Open Style Construction 8-pin for use with DPDT Bulletin 700-HA relays, -HT (ON-Delay) and -HRM, -HRC and -HV (Repeat Cycle) timing relays. Order must be for 10 sockets or multiples of 10. No retainer clip required.	10	700-HN125	✓
 Cat. No. 700-HN101	Screw Terminal Tube Base Sockets – Panel or DIN Rail Mounting. Guarded Terminal Construction 11-pin for use with 3PDT Bulletin 700-HA relays, -HR and -HT (OFF-Delay) timing relays. Order must be for 10 sockets or multiples of 10.	10	700-HN101	✓
 Cat. No. 700-HN126	Screw Terminal Tube Base Sockets – Panel or DIN Rail Mounting. Guarded Terminal Construction 11-pin for use with 3PDT Bulletin 700-HA relays, -HR and -HT (OFF-Delay) timing relays. Order must be for 10 sockets or multiples of 10.	10	700-HN126	✓
 Cat. No. 700-HN203	8-Pin Socket – Can Be Used With or Without Timing Attachment or Surge Suppressor Screw Terminal Tube Base Sockets – panel or DIN Rail mounting. Guarded terminal construction. Used with DPDT Bulletin 700-HA relays. Order must be for 10 sockets or multiples of 10.	10	700-HN202	✓
	11-Pin Socket – Can Be Used With or Without Timing Attachment or Surge Suppressor Screw Terminal Tube Base Sockets – panel or DIN Rail mounting. Guarded terminal construction. Used with 3PDT Bulletin 700-HA relays. Order must be for 10 sockets or multiples of 10.	10	700-HN203	✓
 Cat. No. 199-DR1	DIN Rail Mounting Pack Standard 35 x 7.5 mm DIN Rail, 1 meter long, 10 rails per package. Order must be for 10 rails or multiples of 10.	10	199-DR1	✓

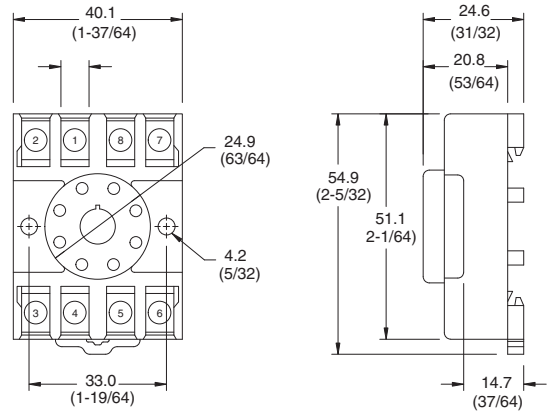
Dimensions are shown in millimeters (inches). Dimensions are not intended to be used for manufacturing purposes.



Cat. No. 700-HN100

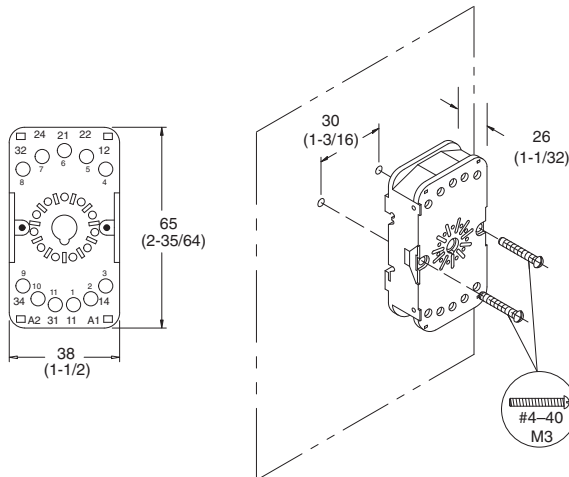
Panel Mounting

Wire Size: $2 \times 2.5 \text{ mm}^2$
 Single Wire – Up to #12 AWG
 Double Wire – $2 \times 2.5 \text{ mm}^2$ (#2–14 AWG... #2–20 AWG)
 (Either Solid or Stranded)
 Strip Length: 9 mm (3/8") – Torque: 0.8 Nm (7 lb.-in.)



Cat. No. 700-HN125 ①

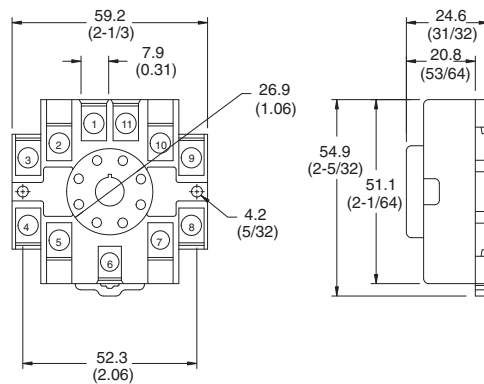
Wire Size: $2 \times 2.5 \text{ mm}^2$
 Single Wire – Up to 12 AWG
 Double Wire – $2 \times 2.5 \text{ mm}^2$ (#2–#4 AWG... #2–20 AWG)
 (Either Solid or Stranded)
 Strip Length: 9 mm (3/8") – Torque: 0.8 Nm (7 lb.-in.)



Cat. No. 700-HN101

Panel Mounting

Wire Size: $2 \times 2.5 \text{ mm}^2$
 Single Wire – Up to #12 AWG
 Double Wire – $2 \times 2.5 \text{ mm}^2$ (#2–14 AWG... #2–20 AWG)
 (Either Solid or Stranded)
 Strip Length: 9 mm (3/8 in.) – Torque: 0.8 Nm (7 lb.-in.)



Cat. No. 700-HN126 ①

Wire Size: $2 \times 2.5 \text{ mm}^2$
 Single Wire – Up to #12 AWG
 Double Wire – $2 \times 2.5 \text{ mm}^2$ (#2–#14 AWG... #2–20 AWG)
 (Either Solid or Stranded)
 Strip Length: 9 mm (3/8 in.) – Torque: 0.8 Nm (7 lb.-in.)

① Cat. No. 199-FSM Surge Suppressors fit on the coil terminals. See page 195.

EFF. DATE 1/1/02
REPL. 7/1/98

ILLUSTRATED PARTS LIST

FORM 2347
Page: AB-BT-S-1

FOR AB – SERIES, FORCED DRAFT, STEAM BOILERS AB90 THRU AB300

ORDERING INSTRUCTIONS

WHEN ORDERING PARTS FOR YOUR BRYAN BOILER OR HEATER,
BE SURE TO INCLUDE THE FOLLOWING INFORMATION:

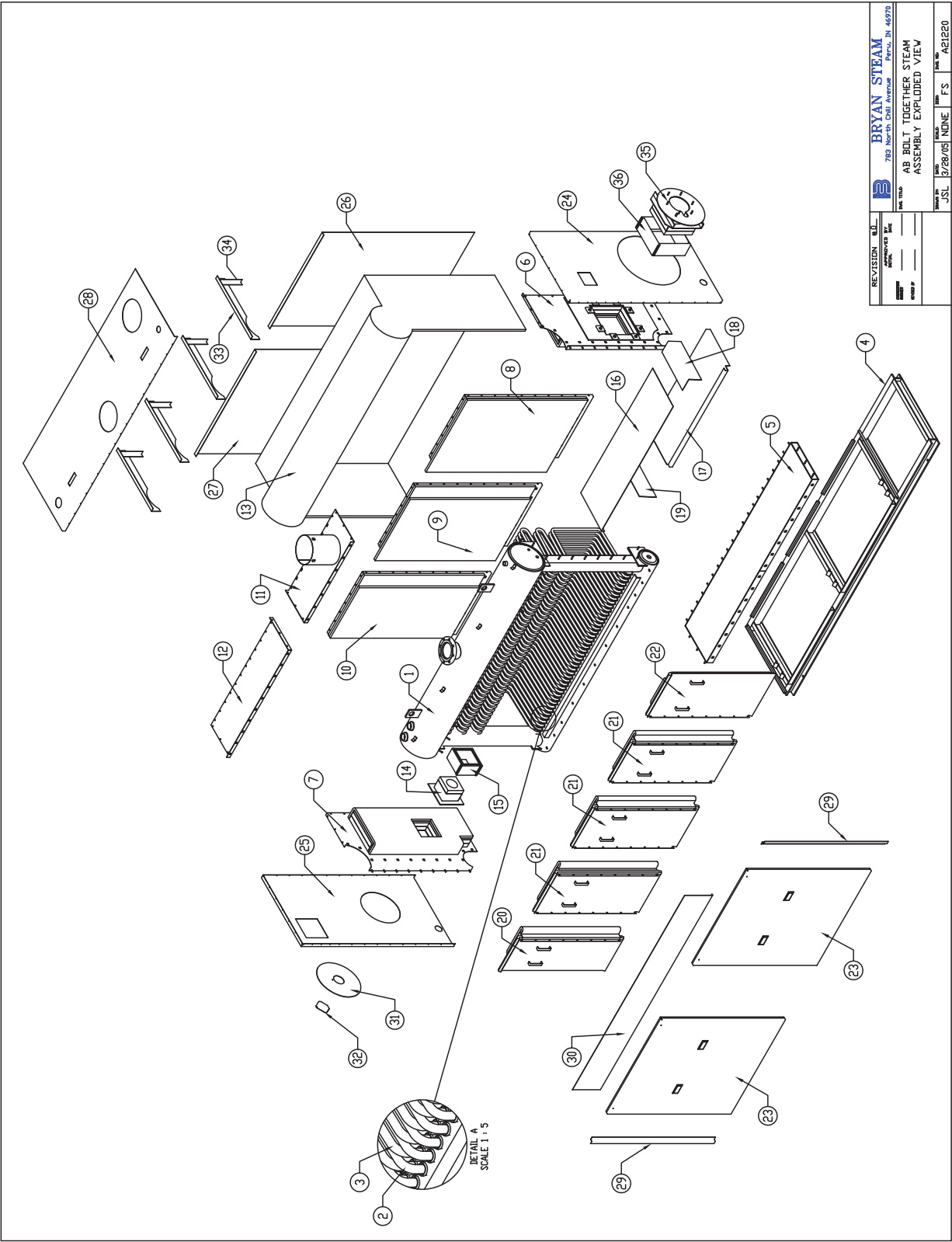
1. QUANTITY OF ITEMS REQUIRED
2. PART NUMBER FROM THIS PARTS LIST (IF LISTED)
3. DESCRIPTION OF PART
4. BOILER MODEL NUMBER
5. BOILER SERIAL NUMBER
6. SHIPPING INSTRUCTIONS

EXAMPLE

PLEASE FORWARD TO US:

<u>QTY.</u>	<u>PART NO.</u>	<u>DESCRIPTION</u>	<u>FOR MODEL</u>	<u>BOILER SERIAL NO.</u>	<u>SHIP VIA</u>
5	77120	Boiler Tubes	AB150	12345	Freight Truck

BRYAN STEAM LLC
783 N. CHILI AVE. * PERU * INDIANA * 46970
PHONE: 765-473-6651 * FAX: 765-473-3074
E-MAIL: inquiry@bryansteam.com * INTERNET: <http://www.bryanboilers.com>



REVISION	NO.	DATE	BY	CHKD.	APP'D.
 BRYAN STEAM 782 North Chili Avenue Peru, IN 46870					
AB BOLT TOGETHER STEAM ASSEMBLY EXPLODED VIEW					
PROJECT	NO.	DATE	BY	CHKD.	APP'D.
JSL	2/28/05	NDNE	F.S.		A21220

EFF.DATE: 3/26/05
 REPL.: NEW

**AB BOLT TOGETHER
 FORCED DRAFT - STEAM
 PARTS LIST**

FORM: 2347
 PAGE: AB - BT - FD - S - 2

ITEM	DESCRIPTION	AB90-S		AB120-S		AB150-S		AB200-S		AB250-S		AB300-S	
		QTY	PART NO.	QTY	PART NO.	QTY	PART NO.	QTY	PART NO.	QTY	PART NO.	QTY	PART NO.
23	JACKET DOOR												
	Jacket Access Door Assembly (#1)	--	--	--	--	--	--	1	400177.34	--	--	--	--
	Jacket Access Door Assembly (#2)	1	400177.41	--	--	--	--	1	400177.41	1	400177.41	--	--
	Jacket Access Door Assembly (#3)	--	--	--	--	--	--	--	--	1	400177.50	--	--
	Jacket Access Door Assembly (#4)	--	--	1	400177.51	--	--	--	--	--	--	--	--
	Jacket Access Door Assembly (#5)	--	--	--	--	2	400177.30	--	--	--	--	--	--
	Jacket Access Door Assembly (#6)	--	--	--	--	--	--	--	--	--	--	2	400177.53
	JACKET PANELS												
24	Jacket Front (Burner End)	1	78334	1	78334	1	78334	1	78334	1	78334	1	78334
25	Jacket Rear (Peep Site End)	1	78330	1	78330	1	78330	1	78330	1	78330	1	78330
26	Jacket Side (First Panel)	1	78340		78341	1	78342	1	78343	1	78343	1	78343
27	Jacket Side (Second Panel)	--	--	--	--	1	78341	1	78341	1	78340	1	78344
28	Jacket Top	1	78350	1	78351	1	78352	1	78353	1	78354	1	300398
29	Jacket Door Filler Strip	2	38274	2	38274	2	38274	2	38274	2	38274	2	38274
30	Jacket Door Bar	1	300546.45	1	300546.54	1	300546.63	1	300546.79	1	300546.94	1	300546.108
31	Jacket Peep Site Overlay	1	38486	1	38486	1	38486	1	38486	1	38486	1	38486
32	Jacket Peep Site Observation Port Overlay	1	38485	1	38485	1	38485	1	38485	1	38485	1	38485
33	Jacket Support	2	300332	2	300332	2	300332	4	300332	4	300332	4	300332
34	Jacket Support Bracket	2	300118.11	2	300118.11	2	300118.11	4	300118.11	4	300118.11	4	300118.11
	BURNER ASSEMBLY												
	BURNER - See Burner Parts Data Sheet												
35	Burner Plug (Gordon Piatt Burner)	1	400252	1	400252	1	400252	1	400252	1	400252	1	400252
36	Burner Plug Filler Insulation	4	300529	4	300529	4	300529	4	300529	4	300529	4	300529
	Rope Gasket (Ft.)	10	24621	10	24621	10	24621	10	24621	10	24621	10	24621
	STEAM TRIM												
	Control Panel												
	Terminal Strip *												
	Gauge Glass												
	Gauge Glass Valves												
	Pressuretrol - Operator												
	Pressuretrol - High Limit												
	Low Water Cut Off & Pump Control												
	Auxiliary Low Water Cut Off												
	Try Cocks												
	Pressure Gauge												

REFER TO EQUIPMENT LIST

EFF. DATE: 3/26/05

REPL.: NEW

**AB BOLT TOGETHER
FORCED DRAFT - STEAM
PARTS LIST**

FORM: 2347

PAGE: AB - BT - FD - S - 3

ITEM	DESCRIPTION	AB90-S		AB120-S		AB150-S		AB200-S		AB250-S		AB300-S	
		QTY	PART NO.	QTY	PART NO.	QTY	PART NO.	QTY	PART NO.	QTY	PART NO.	QTY	PART NO.
	STEAM TRIM	REFER TO EQUIPMENT LIST											
	Pressure Shutoff Cock												
	Blowdown Valves (Optional)												
	Pressure Relief Valve												
	SERVICE TOOLS												
	Tube Puller **	1	28905	1	28905	1	28905	1	28905	1	28905	1	28905
	Tube Driver **	1	28901	1	28901	1	28901	1	28901	1	28901	1	28901
	Tube Brush ***	1	28917	1	28917	1	28917	1	28917	1	28917	1	28917

* Depends on Number of Terminals Required

** Furnished as Standard on High Pressure Steam Only

*** Not Standard. Available Upon Request.

BOILER PRE START UP INSPECTION & CHECK LIST

An inspection of the boiler and burner unit is strongly suggested prior to notifying any start-up personnel. An incomplete or inadequate installation will require additional time and effort by start up personnel, causing untimely delays and additional start up costs.

GENERAL

1. Are boiler and burner installed in accordance with applicable installation instructions?
2. Has the proper electrical voltage been connected to the boiler and burner control cabinets as shown on the respective material lists?
3. Has the jobsite wiring been checked for completeness and accuracy? Have 3-phase motors been properly wired and checked for correct rotation?
4. Are the boiler mounted limit controls such as low water cutoffs, high limit controls, operating controls, modulation controls, etc., properly installed, wired, and adjusted to the proper settings?
5. Are the boiler controls the right type and range for the installation?
6. Is the boiler water supply, including feed pumps, properly connected and is boiler filled with water?
7. Is sufficient load connected to the boiler so that it can be fired continuously at full rating?
8. If boiler load is not connected, can steam be wasted so that boiler can be fired continuously at full rating without endangering personnel or equipment?
9. If the installation is a hot water boiler, have the circulating pumps been completely installed, wired, and tested to assure proper operation so that the burner can be fired continuously at full rating?
10. Have the boiler breeching connections to the stack been completed and are they open and unobstructed?
11. Is draft control equipment required, and, if so, installed?
12. Have adequate provisions for combustion air been installed?

GAS FIRING

1. Have properly sized vent lines been installed on all gas train components which require venting? This includes such items as pressure regulators, normally open vent valves, diaphragm valves, low and high gas pressure switches, etc.
2. Have gas train piping and components been tested and proven gas tight?
3. Is the proper gas pressure available at the inlet to the controls which meets the requirement shown on the boiler and burner material list.

OIL FIRING

1. Is the oil tank installed and filled with the proper type and grade of fuel oil, as required by the boiler and burner material lists? There absolutely must be no water in the tank!
2. Have oil supply and return lines been properly sized to meet the maximum pumping capacity of the pump and has the system been purged and proven leak proof?
3. Is the oil system piped for two-pipe operation as required and is the oil pump set-up for two-pipe operation?
4. Is all specified auxiliary equipment mounted and wired? This may include outdoor temperature controls, oil flow switches, space thermostats, water flow switches, motorized combustion air louvers, etc.
5. Have the persons listed below been notified of the burner start-up date?
 - Owner's Representative
 - Mechanical Contractor's Representative
 - Electrical Contractor's Representative
 - Service Organization's Representative
 - Boiler Manufactures' Representative

BRYAN BOILERS / BRYAN STEAM, LLC

REQUEST FOR START-UP OR SERVICE

FORM: 2048
Date 01/01/00

Origin of Call: _____ Date: _____
 Service P.O.: _____ Job Location: _____
 BOILER Model #: _____ Bryan #: _____ Serial #: _____
 Rated Input: _____ MBH: _____ GPH#: _____ Oil @ _____ " W.C. Overfire
 BURNER Model #: _____ Serial #: _____
 ML #: _____ S.O. #: _____
 Appointment Date: _____ With Whom: _____ Phone #: _____
 Copies To: _____
 Job Name: _____ Invoice To: _____

STACK - Height _____ Size _____
 BREECHING - Size _____ Length _____ #ELs _____
 UNIT OUTLET DAMPER - % Open _____
 BAROMETRIC DAMPER - Size _____ Mfgr _____
 SEQUENCE DAMPER CONTROL:
 Mfgr. _____ Model _____
 COMBUSTION AIR INLET - Size _____
 OIL TANK - Above Burner Below Burner
 Distance from tank _____ Vertical Lift _____
 Suction Line Size _____ Pipe Tubing

SAFETY CONTROL CHECK

1. Lo-Water Cut-Off _____
2. Second Lo-Water Cut-Off _____
3. Limit Control _____ Setting _____
4. Operating Control _____ Setting _____
5. Firing Rate Control _____ Setting _____
6. Pilot Turn Down Test _____
7. Flame Failure Test _____
8. Lo Gas Press. Switch _____ Setting _____
9. Hi Gas Press. Switch _____ Setting _____
10. Lo Oil Press. Switch _____ Setting _____
11. Lo Air Atomizing Press. Switch _____
Setting _____
12. Lo Oil Temp. Switch _____ Setting _____

TIME INCURRED

Job Hrs. | + Travel Hrs. | x No. Persons | = Total Hrs.

INSTRUCTIONS TO SERVICEMAN

BURNER READINGS	GAS		OIL	
	LO	HI	LO	HI
INPUT: MBH/GPH				
FUEL PRESSURE:				
Orifices-"WC/Nozzle-PSIG				
Oil Return/Air-PSIG				
OIL TEMPERATURE -°F:				
Inlet				
Outlet				
PUMP DATA:				
Vacuum-"Hg				
Discharge-PSIG				
COMBUSTION TESTS:				
CO2 - %				
O2 - %				
CO - %/Smoke No.				
DRAFT:				
Overfire - "WC				
Outlet - "WC				
Temp. of Room Outlet				
Air Inlet Louver - "Open				
Primary Air Adj. Pos.				
Drawer Position				
Flame Signal - MA/DC				

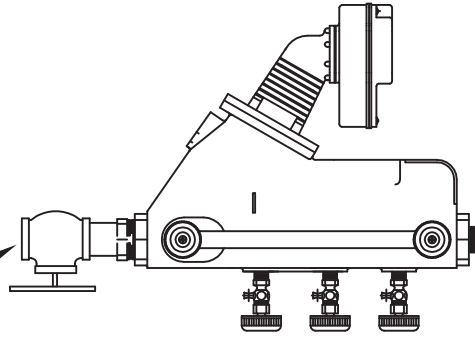
Motor Data @ Hi-Fire						
	L1		L2		L3	
	V	A	V	A	V	A
Blower						
Oil Pump						
Air Comp.						

**ALL SAFETY
CONTROLS MUST
BE TESTED**

REMARKS _____

 TEST MANUAL REC'D BY _____
 STARTUP BY _____
 APPROVED BY _____
 DATE _____

FEEDWATER CONTROL



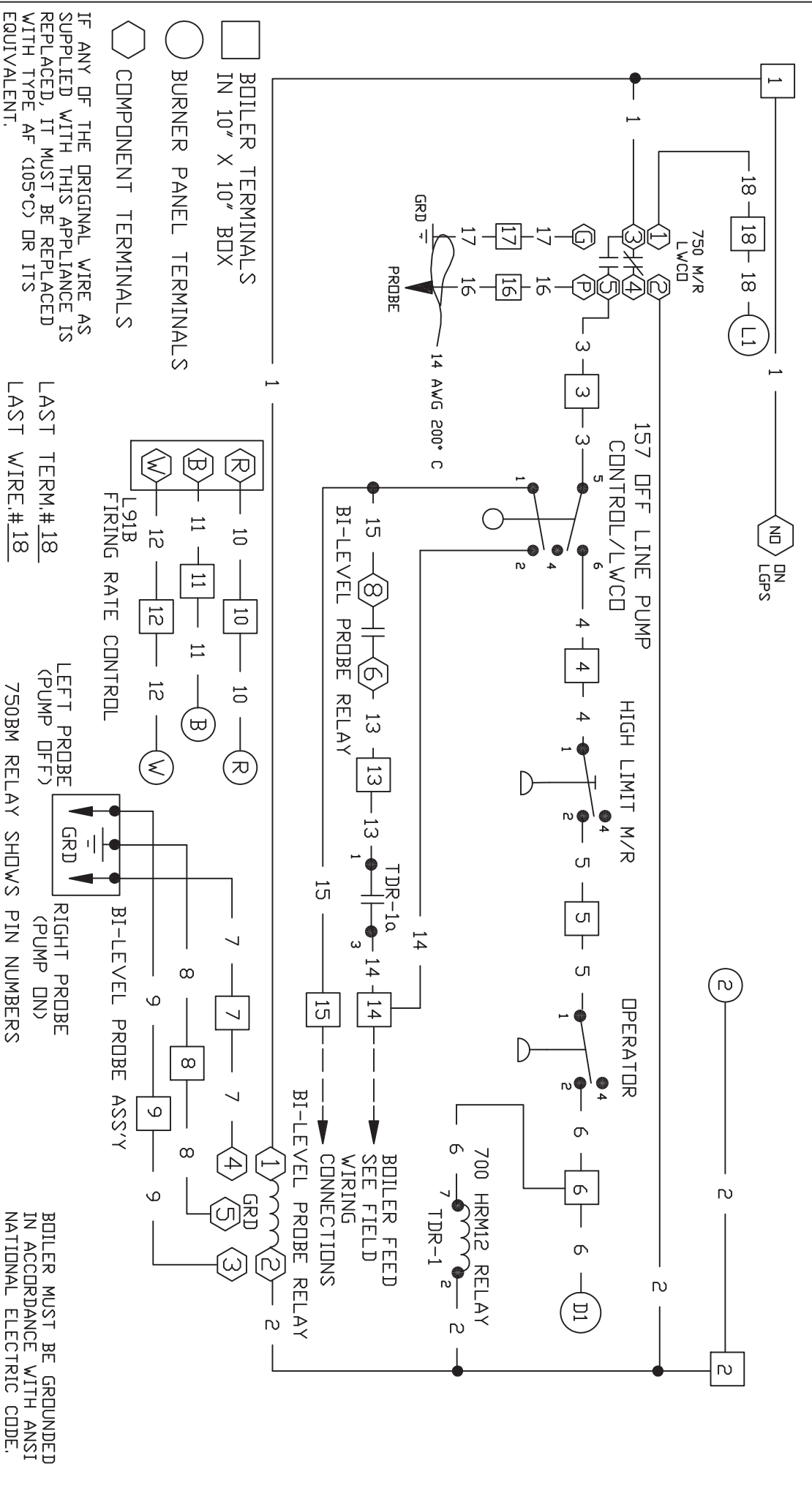
3/4"
CONTROL
BLOWDOWN
VALVE



BRYAN STEAM LLC
783 N CHILI AVE PERU IN 46970

DWG. TITLE: TYPICAL PIPING FOR
INSTALLING CONTROL BLOWDOWN
VALVE

DRAWN BY: BHG	DATE: 9/15/06	SCALE: NONE	DISK:	DWG. NO.:
				A20899-1



IF ANY OF THE ORIGINAL WIRE AS SUPPLIED WITH THIS APPLIANCE IS REPLACED, IT MUST BE REPLACED WITH TYPE AF (105°C) OR ITS EQUIVALENT.

FIELD WIRING CONNECTIONS

BOILER TERMINALS IN 10" X 10" BDX

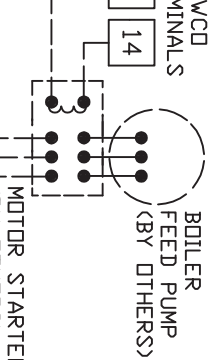
BURNER PANEL TERMINALS

COMPONENT TERMINALS



CONNECT TO 115/1/60 POWER SUPPLY

CONNECT TO 115/1/60 POWER SUPPLY



BI-LEVEL PROBE ASS'Y

RIGHT PROBE (PUMP DN)

LEFT PROBE (PUMP DFF)

BOILER MUST BE GROUNDED IN ACCORDANCE WITH ANSI NATIONAL ELECTRIC CODE.

DRAWN BY:	DATE:	REF. #	ORDER NO.:
RWJ	9/5/14	W-906	5140273W

BRYAN STEAM LLC
 783 NDRTH CHILI PERU, INDIANA 46970

WIRING FOR FORCED DRAFT STEAM BOILERS USING PWR. FLM. BURNERS MODULATION