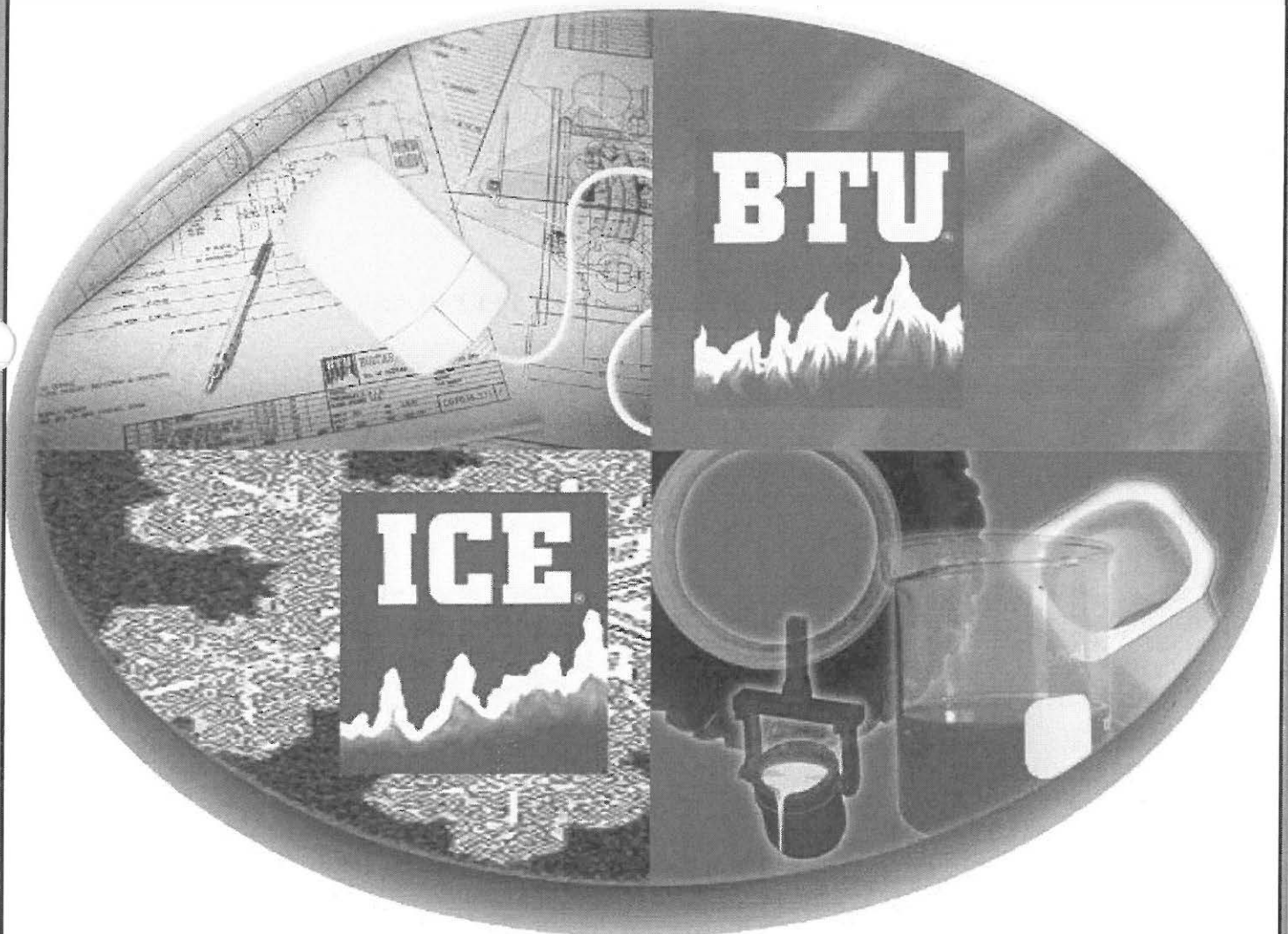




BUDZAR

INDUSTRIES, INC.



TERMS OF SALE

Our acknowledgement and acceptance are subject to the following conditions

1. **PRICE ADJUSTMENT:** Up to the time of formal order acknowledgment, all prices are subject to change without notice. Acknowledged sales price(s) of equipment is subject to adjustment, to reflect increases in Seller's costs in effect at the time of shipment. The price does not include any governmental taxes, such as sales, use or transaction, which are the responsibility of the Buyer. Prices are firm for thirty (30) days from date of proposal, and become subject to change without notice after that period. Additionally, the right is reserved to correct any stenographic or clerical errors, and we assume no responsibility beyond that usual in our course of business, except as defined in detail.

2. **TAXES:** In case of the imposition of any additional duty tax, or other governmental charge upon raw materials entering into production of the goods represented by the invoice, and order acknowledgement, or upon or measured by the production, sale or shipment of said goods by federal, state, or municipal authorities, which would be applicable to this sale, then the contract price may be increased by the amount of such additional cost or expense to the Seller, which is caused thereby. Unless specifically exempted, all sales, use and any other federal, state, municipal or governmental tax will be invoiced to the Buyer as a separate item in addition to the price of the equipment and are to be paid by the Buyer.

3. **TERMS:** For new customer orders of less than \$50,000 gross value, or for orders of less than \$100,000 gross value placed by customers with existing accounts, terms are net cash within the earlier of thirty (30) days after shipment or after notification that Seller's ready to ship. Discount of 1-1/2% for net cash within ten (10) days. For new customer orders greater than \$50,000 but less than \$100,000 gross value, thirty percent (30%) deposit is required with order and balance due within the earlier of thirty (30) days after shipment or after notification that Seller's ready to ship. For all orders of greater than \$100,000 gross value, twenty percent (20%) deposit is required with order and balance due within the earlier of thirty (30) days after shipment or after notification that Seller's ready to ship. These terms apply to partial as well as complete shipments. A service charge at the rate of 1-1/2% per month (18% per annum) or the maximum rate allowed by law, whichever is less, will be made on past due accounts. In the event Seller institutes legal proceedings for collection of past due accounts, Buyer shall pay all costs of collection including reasonable attorney's fees. Seller reserves the right to ship C.O.D. or refuse shipment or delivery of the goods referred to herein, or any part thereof, in the event that in its sole discretion decides that the outstanding indebtedness of the customer exceeds reasonable credit allowances.

4. **ACCEPTANCE:** All orders must be in writing and are not binding until acceptance by the Seller's office. All orders shall be deemed to be accepted if mailed and properly addressed and postage prepaid, when postmarked; if transmitted by telex, when transmitted; if transmitted by oral communication, when transmitted. Orders are accepted subject to strikes, accident, and other causes beyond Seller's control. Seller will not be liable for any delay in delivery or for any damage suffered by the Buyer for reason of such delay.

5. **CANCELLATION:** Buyer expressly agrees to make a net cash payment to Seller for any cancellation of Buyer's order for specifically fabricated goods within thirty (30) days after any such cancellation by Buyer. The amount of such payment shall be calculated according to the following terms: Buyer expressly agrees to make a net cash payment to Seller in the amount of fifty percent (50%) of the acknowledged sale price of the equipment for a cancellation made between fourteen (14) and twenty-one (21) days after Seller's acceptance; seventy-five percent (75%) of the acknowledged sales price for a cancellation between twenty-two (22) and twenty-eight (28) days after Seller's acceptance; and one hundred percent (100%) of the acknowledged sale price of the equipment for a cancellation made twenty-nine (29) or more days after Seller's acceptance. Buyer unconditionally agrees to make such payments regardless of the events or circumstances which led to the cancellation.

6. **SPECIFICATIONS:** The Seller reserves the right to change specifications as conditions warrant.

7. **ROUTING:** Where prices include freight, the Seller determines the routing. If special routing is requested, a charge will be made for difference between such routing costs and normal minimum freight charges to same point.

8. **DELIVERY:** Agreement of delivery date constitutes a portion of the contract price. Any changes in or delays to the agreed upon shipment date which are imposed by the Buyer will be subject to amendment of the contract price in accordance with the service charges listed in item (3) above. Seller will endeavor to ship by promised delivery date, but failure to do so for any cause whatever will not give Buyer right to cancel or hold Seller responsible for any damages resulting from the failure to deliver within the time stated.

9. **APPROVAL OF SELLER'S DESIGN:** Where approval of the Seller's design is required by the Buyer prior to manufacture of the equipment, the Seller reserves the right to postpone purchase of materials or supplies to fill the order until after receipt of Buyer approved drawings. Any delays in shipment imposed by the Buyer due to failure to approve the Seller's design within the time period agreed upon in the contract are subject to amendment of the contract price in accordance with the service charges listed in item (3) above.

10. **SHIPPING:** All goods are shipped at Buyer's risk and are shipped F.O.B. Point of Manufacture with no allowance for freight. Freight charges will be billed by the selected carrier. If freight charges are required to be prepaid by the Seller, Seller will invoice the freight charges at cost of freight plus fifteen percent (15%) administrative handling fee. If material is received in damaged condition, Buyer should contact and immediately file claim against the carrier.

11. **WARRANTY:** Seller agrees that the apparatus manufactured will be free from defects in material and workmanship for a period of one (1) year from the date of original shipment, under normal use and service and when properly installed; and Seller's obligation under this agreement is limited solely to repair or replacement at Seller's option, at Seller's factories, or any part of parts thereof, which shall within one year from date of original shipment from factory to the original purchaser, be returned to Seller with transportation charges prepaid which Seller examination shall disclose to Seller satisfaction to have been defective. The sole purpose of the stipulated exclusive remedy shall be to provide the Buyer with free repair or replacement of defective goods in the manner provided herein. The exclusive remedy shall not be deemed to have failed its essential purpose so long as the Seller is willing and able to repair or replace defective goods in the prescribed manner. This agreement to repair or replace defective parts is expressly in lieu of and in disclaimer and exclusion of any implied warranties of merchantability and fitness for a particular purpose, as well as all other implied warranties, in law or equity, and of all other obligations or liabilities on Seller's part. There are no warranties which extend beyond the description hereof. No affirmation by Seller, by words or by action, other than as set forth in Paragraph 11 shall constitute a warranty. Seller neither assumes nor authorizes any person to assume for Seller any liability or obligation in connection with the sale of Seller's apparatus except said repair or replacement of the defective part as set forth above.

12. **LIMITATION OF LIABILITY AND DISCLAIMER OF CONSEQUENTIAL DAMAGES:** Seller's liability does not include any labor charges for replacement of parts, adjustments, repairs, or any other work done outside Seller's factories. Seller's liability does not include any consequential, incidental or resulting damage to person, property, equipment, goods, merchandise, profits, good will or reputations arising out of any defect in or failure of Seller's apparatus. Seller's obligation to repair or replace shall not apply to any apparatus which shall have been repaired or altered outside of Seller's factory in any way, or which has been or which has been subject to negligence, to misuse, or to pressure in excess of stated limits. On parts not manufactured by Seller such as motors, controls, etc., Seller extends only the same warranties given to the Seller. Seller's agreement hereunder runs only to the immediate purchasers and does not extend, expressly or by implication, to any other person. Nothing in the above warranty provisions, however, shall impose any liability or obligation of any type, nature or description upon Seller if Seller has received payment in full for the apparatus in question. This warranty does not cover refrigerant gas, nor does it cover any apparatus damaged from freezing of water or heat transfer fluid.

13. **SHORTAGES:** No claims for shortages will be considered unless same are made in writing to the Seller within ten (10) days of receipt of shipment.

14. **RETURNS:** Permission to return material plus shipping instructions and Returned Goods Tags must be secured from the factory offices of the Seller before returning any material. All returns must be unused, in new condition, and of standard manufacture. They are subject to a handling charge as stated by Seller. All authorized return shipments must be made as directed by Seller and with transportation charges prepaid to point of origin of our shipment unless instructed otherwise. Shipments of material returned without authorization or improperly tagged or not prepaid are subject to refusal and immediate return to shipper. Products which are obsolete or made to special order are not returnable.

15. **SOLE TERMS:** Failure of the Seller to object to provisions contained in Buyer's purchase orders or other communications shall not be deemed a waiver of the terms or conditions hereof nor acceptance of such provision. The printed terms hereon combined with the other writings entered into between the parties, are the entire contract and all the terms thereof. No oral statement, warranties, representations, stipulations or terms have any binding effect or be any part of the contract whatsoever. If any provision in this Acknowledgement and Acceptance or related writings shall for any reason be or become illegal, void or unenforceable, that illegality, voidness or unenforceability shall not effect any other provision.

16. Failure of the Buyer to object in writing within five (5) days of receipt thereof to Terms of Sale contained in the Seller's acceptance and/or acknowledgement, or other communications, shall be deemed an acceptance of such Terms of Sale by Buyer.

17. The Occupational Safety and Health Act (OSHA) imposes certain requirements on an "employer" including many relating to the use of machinery and equipment. These requirements are directly related to the conditions under which and the manner in which the machinery or equipment is used. Seller makes no warranty, expressed or implied, under OSHA, its interpretations and/or regulations. Further, the Seller makes no warranty of any kind other than the warranty set forth in Paragraph 11 of the Terms of Sale.

18. **GENERAL CONDITIONS:** The sales of goods pursuant to this order shall be governed by the laws of the State of Ohio. In addition to the rights and remedies conferred upon Seller by law, Seller shall not be required to proceed with the performance of any order or contract, if Buyer is in default in the performance of any order or contract with Seller, and in case of doubt as to Buyer's financial responsibility, shipments under this order may be suspended. This contract shall be binding upon and shall inure to the benefit of the successors and assigns of Buyer and Seller, provided, however, that Buyer may not assign or transfer this contract, in whole or in part, except upon written consent of Seller.



38241 Willoughby Pkwy., Willoughby, Ohio 44094-7582
Phone: (440) 918-0505 • FAX (440) 918-0606 / 918-0707

Warranty Policy & Procedures

Warranty is a manufacturer's means of protecting the end users of our products from defects in workmanship and materials which may not be detected at the time of manufacture. The following warranty policy is Budzar Industries, Inc. method to implement the corrections of such defects and track patterns of defects to aid in ongoing product improvement. We, at Budzar Industries Inc., are committed to ongoing product improvement and realize that customer satisfaction is of the utmost importance to insure the merchantability of our products as our future sales is built on the satisfaction of our past customers.

Consequently, to insure that our customers receive the product performance and service satisfaction expected of all Budzar Industries, Inc. products, we have produced the following warranty policy and procedures:

WARRANTY PARTS

Warranty Parts are defined as parts which were utilized in the manufacture of the original product. Only warranty parts which fall within one (1) year of the original equipment warranty period (See Terms of Sale) will be considered for warranty replacement. Budzar Industries, Inc. Service Department will, in conjunction with the manufacturer of the failed component(s), and in accordance with the conditions set forth in Term of Sale, determine on a case by case basis if the failed component is a warranty issue.

Component parts which fail within the original warranty period will be replaced with an exact duplicate part, if possible. In the event an exact replacement part cannot be provided within an equitable time period, Budzar Industries, Inc., at its option, may provide a like component equal to the failed component.

The component replaced shall be warranted for a period of ninety (90) days from the documented date of shipment from the factory or for the remainder of the original equipment warranty, whichever comes last.

THE WARRANTY REPLACEMENT PROCEDURE

Upon receipt of a confirmed customer purchase order, Budzar Industries, Inc. will enter a parts order for the perceived defective component and issue a Return Goods Authorization (RGA) for it's return. Upon receipt of the component from the customer, the component will be evaluated; it's warranty status determined, and the individual issuing the purchase order advised of the determination.

In the event that the component is determined to be defective, a credit will be issued to the customer's account to offset the customer's purchase order.

In the event that the component is found not to be defective, the customer will be contacted to determine the disposition of the customer's property. If, after being contacted, the customer does not advise Budzar Industries, Inc. within 20 working days of their chosen means of disposition, the component will be discarded.

Budzar Industries, Inc., in accordance with the Terms of Sale, cannot be liable for any additional warranty coverage either implied or extended by any individual other than those specified in the Terms of Sale. Further, the implication or use of Budzar Industries, Inc. name with any additional warranty or statement of coverage beyond the documented conditions within the Terms of Sale is specifically prohibited.

BUDZAR INDUSTRIES INC. TECHNICAL SERVICES

38241 Willoughby Pkwy.
Willoughby, Ohio 44094-7582
Tel 440-918-4954 FAX 440-918-0606/0707

DOMESTIC FIELD SERVICE LABOR RATES TERMS & CONDITIONS EFFECTIVE 1 JANUARY 2001

*DAYS WORKED	PER DIEM RATE USD	HOURLY RATE USD
Monday thru Friday	\$880.00	\$110.00
Weekdays exceeding 8 hrs or Saturday	\$880.00+\$165.00HR/\$1320.00	\$165.00
Sunday or Holiday	\$1540.00	\$192.50

*Normal working hours are considered as 8:00 Am to 4:30 PM with ½ hr for lunch.

*Weekends and holidays are on a limited basis and must scheduled one month in advance

TRAVEL: Travel is billed at one half (1/2) of the prevailing hourly rate.

The Purchaser shall issue a hard copy of their purchase order to Budzar Industries Inc. for the services to be performed. Upon receipt of the above purchase order, a Service Representative will be assigned to carry out the order and a Service Confirmation will be issued.

In the event that the Purchaser is ordering "Start-up" assistance, a "Start-up " questionnaire will be furnished to the Purchasers representative which must be addressed and returned to Budzar Industries, Inc. Service Department prior to and as a condition of field service.

The Purchaser agrees to pay Budzar Industries Inc. for the time, expenses, and materials required for each Service Representative to accomplish the work ordered by the Purchaser. Charges for time are made according to the above schedule of charges for each Service Representative.

Budzar Industries, Inc. will not be liable for damages to the customer's facility or losses of product, materials, damage to equipment or any consequential damages of any kind in execution of this service. By acceptance of service, the customer releases Budzar Industries, Inc. from any/all claims arising as a result of said service.

In addition to the above, charges will be made for the actual cost of living expenses (meals and hotels) and travel expenses (car rental, mileage, airfare) at cost plus a 10% Administrative fee. If it is necessary to travel by Company vehicle, the rate is \$.50 per mile and \$.80 per mile if a van or truck is required for service.

The minimum period of time charged for service is TWO (2) hours plus expenses.

Idle time during which the Service Representative cannot perform his duties because of the Purchasers or their representatives cause, request, or requirement shall be regarded as have been actually worked by him, even though his services have not, in fact, been used and will be billed accordingly.

Service billings are due and payable upon receipt of invoice

Signed: _____
Authorized Customer Representative

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UNIT SPECIFICATIONS

SERIAL NUMBER:	200502-9258 9253
MODEL NUMBER:	1SSOT-2420-NC-030-FCB-0-SP
P.O. NUMBER:	CE50001
SUPPLY VOLTAGE:	460-3-60
FULL LOAD AMPERAGE:	32.4
DESIGN TEMPERATURE RANGE:	100 TO 550°F
MAXIMUM OPERATING PRESSURE:	35 PSIG
DESIGN FLOW RATE:	20 GPM @ 30 PSIG
FLUID:	THERMINOL 66 OR EQUIVELANT
AREA CLASSIFICATION:	NEMA 1 (NEMA 12 ENCLOSURE)
SHIPMENT DATE:	NOVEMBER 2005

BUDZAR INDUSTRIES, INC.

OT HOT OIL HEAT TRANSFER SYSTEM
INSTALLATION, OPERATION, & MAINTENANCE MANUAL

1. GENERAL

The Temperature Control Unit (TCU) is an engineered package designed to provide precise temperature control of your process equipment (process). It controls the temperature of the process by circulating a heat transfer fluid to and from the process. The TCU will heat or cool (if the cooling option was purchased) the process by adding or removing heat from the heat transfer fluid (fluid).

Extreme care must be used in installing this unit and double checks should be made at every step during installation. Installers and operators of the equipment must be thoroughly familiar with the instructions in this manual before commencing work. If the correct procedures are followed the unit should provide many years of trouble free service.

2. RECEIVING AND INSPECTION

1. Inspect unit for physical damage.
2. The recipient must file damage claims with carrier.
3. Check the supply voltage on unit data plate. Users supply voltage must be within 10% of voltage noted on data plate.
4. Before hooking up the unit, all pipe connections, flanges, unions and other Fittings including bolts, which hold bonnets to heat exchangers and all electrical connections, must be checked and tightened. Although each machine is operated at the factory before shipment, the constant vibration during shipment can loosen these items, and it is impossible for us to assure that they will be tight after the unit is hooked up. It is easy to check these items before attaching the machine to the load since it will be available from all sides to do this work.
5. Unauthorized alterations to factory supplied equipment voids warranty. Consult factory if modifications are required.

3. INSTALLATION AND COMMISSIONING

NOTE: Installation, commissioning and maintenance should only be performed by qualified individuals who are versed in local codes and regulations, and experienced with equipment of this type and nature.

CAUTION: Rotating equipment, hot surfaces and sliding valve stems are a potential injury hazard. Use caution when working on or around the equipment and avoid contact.

It cannot be stated strongly enough that a closed loop hot oil system must be purged of air and moisture prior to operation. Please follow the steps outlined on the next several pages and use good sense and caution for all procedures. Refer to Figure 1.0 and 2.0 as well as the drawings for the TCU located elsewhere in this manual.

4. SETTING

The TCU is designed to be placed on level flooring to evenly support the machine load. Shimming the unit may be required to correct for non-level field conditions. Excessive distortion of the framing may lead to premature pump failure.

Non-portable units have lagging holes so that the unit can be anchored to the flooring. Anchoring and foundation design is the responsibility of the installing contractor or the owner unless specifically contracted from Budzar Industries, Inc.

5. ELECTRICAL HOOK-UP

Follow all local and National Electric Codes. First check to see that all switches are in the off position. The electrical installation consists mainly of hooking-up the main supply power. The voltage and frequency of the TCU is indicated on the nameplate of the machine and must be matched within $\pm 10\%$. The electrical power taps should be fed to the machine from a fused disconnect switch. Fuses must be sized in accordance with the National Electric Code.

The incoming power is to be connected at the main power connections provided on the TCU. Budzar offers a variety of incoming power connections; non-fused disconnects, fused disconnects, circuit breakers and simple power terminals. A Licensed electrical contractor or electrician who is qualified for industrial equipment installation should handle the power wiring installation. CAUTION: NEC requires that a power disconnect, with lockout capability, be within sight of the equipment for maintenance purposes.

6. EXPANSION TANKS

Budzar offers several expansion tank options. If the expansion tank is a vented design it will need to be located at the highest point in the system. This location is required to prevent oil from overfilling the tank and leaking out the vent cap. If the tank was not ordered with remote mounting as an option it may be easy to remove the tank for remote mounting. Contact the Budzar Service Department if questions arise related to expansion tank location.

Even when the nitrogen purging option has been purchased, Budzar still recommends locating the tank at the highest point to simplify venting and moisture purging of the system. Further if piping is higher than the tank and the nitrogen pressure is lost the tank can flood and spill out.

7. PIPING

Proper piping connections must be made to the TCU. All piping connections are labeled and are shown on the drawings located elsewhere in this manual.

The connections are as follows:

1. Water supply (Cooling water to heat exchangers or pump seal cooling, if applicable)
2. Water Drain or return (Drain out of exchangers or seal cooling, if applicable)
3. Oil circulation connections to the process (Discharge and Return out to load's)
4. Expansion line to tank and discharge vent line to tank (when remote mounting tank)
5. Instrument Air, Nitrogen purge, tank off gas/vent (if applicable)

The successful operation of the Fluid Heat Transfer System is largely dependent upon proper design of the process equipment to be controlled, the sizing and capacity of the TCU and design of the interconnecting piping. Improperly designed piping or process equipment can cause failure of the electric heaters and circulating pumps. Undersized piping or passages in the process can make it impossible to obtain close temperature control. Interconnecting lines between the unit and process should be piped according to appropriate specification. It is essential to provide adequate means to relieve expansion and contraction stresses that occur because of the extreme temperature changes. Customers piping must not place any additional stress or loads on the TCU piping, framing and pump(s). External loads or piping stress can cause misalignment of the pump(s) and motor assembly, which can cause damage, excessive wear or premature failure.

The connecting pipes between the heat transfer machine and the process being controlled must be large enough to:

1. Handle all the heating or cooling necessary to accommodate the maximum load on the process being controlled without causing excessive temperature variation across the process.

2. Permit the machine to operate at or near design conditions to insure close temperature control and to protect the heater and pump.
3. Allow air and moisture to be evacuated from the piping, TCU and process.

As a guideline, the connecting piping or hose should be at least as large as the connection on the Hot Oil Unit. If it is absolutely necessary to reduce the connection size, reduce it by one (1) pipe size only, to keep the restriction to flow at a minimum. Preventing high resistance to flow in the piping system is critical. If rotary unions, check valves or quick disconnects are in the system piping, check these items for ability to handle the proper flow rates. The water feed lines must be free of restrictions that could cause expanding water to create excess pressure, such as a block valve. Service valves can be installed, or may have been supplied by Budzar, in the cooling water lines. The service valves must be open during operation.

CAUTION: If necessary, install safety pressure relief valves on the cooling water feed lines.

Typical cooling water sources are City Water, Well Water, River or Pond Water. When utilizing any of these sources, be sure that it is free of contaminants to prevent system and pump seal cooler fouling problems. An ideal source, when system-operating temperatures do not need to go below 95°F, is treated cooling tower water. Chilled water is required to run the unit at colder temperatures.

8. FLUSHING AND PRESSURE TESTING GUIDELINES

Flush the interconnecting piping to remove all weld slag, scale and other foreign material, which may have accumulated in the piping during installation. Budzar recommends the use of a flushing fluid such as Therminol® FF, MultiTherm® 100 or equal product for the piping loop and the hot oil unit.

If strainers were not purchased as part of the TCU, permanent or temporary strainers should be installed in the interconnecting piping to prevent debris from getting into the pump. Pipe and weld slag or other hard debris will damage the pump seal requiring premature replacement. Pump seals are not warranted. During the start-up of the unit the strainers will need to be cleaned frequently to remove accumulated debris. A drop in pump discharge pressure or cavitation of the pump may indicate that the strainer(s) are clogged. Refer to the trouble shooting section for strainer cleaning guidelines.

Pressure test the interconnecting piping according to the specifications to the required test pressure, see the steps below. Budzar recommends using the flushing fluid for the pressure testing of the hot oil unit and piping loop, so that the system will not be contaminated with excess water.

CAUTION: Protect all instruments, safeties and process equipment which could be damaged from excess pressure.

Even though the unit was pressure tested at the factory and should not require additional testing, flushing the TCU is a good idea.

Pressure test the piping as follows:

1. With the TCU and interconnecting piping filled connect a pressure boost source to a connections on the TCU or piping. A valve should be installed to allow for isolation of the pressure source. An accurate pressure gauge with the test pressure range should be installed to monitor the pressure. An excellent source is a Nitrogen bottle.
2. Allow the Nitrogen to raise the pressure in the piping system to the test pressure.
3. Isolate the source of pressure. Check for leaks and repair as necessary.
4. When the piping is free from leaks hold the pressure in the system for a minimum of one hour.
5. The pressure test must be conducted in a controlled and safe manner to check the integrity of the piping and to check for leaks. This is done to minimize the chance of a failure at operating conditions. A failure during operation may result in the loss of heat transfer fluid, unnecessary down time, product contamination, loss of property, or injury to personnel.

9. FILLING THE SYSTEM

Make certain that compatible heat transfer oil is being used to meet the system requirements. If any questions arise, contact our Service or Engineering Department for recommended oils.

Fill the system through the fill/drain valve (if provided), which should be located below the inlet line on the suction side of the pump or the fill vent port. Fill the system at the lowest point in the interconnecting piping when the TCU is installed higher than the process. Fill the piping loop and the hot oil unit and process with thermal fluid from new containers. Filling via a pump will speed the filling process, as will the use of "automatic" air vents, installed at highest points in the piping, these are available from Armstrong, Spirax Sarco and other manufacturers or can be purchased from Budzar. Continue to fill the system while venting the high points until the system is full. NOTE: The vent valve on the TCU to the expansion tank must be opened to allow air to vent from the piping. If Budzar did not provide the expansion tank this vent valve must be installed in the field. The manual bypass valve for the expansion tank

backpressure regulator, if so equipped, should be open to aid venting and filling. Fill the system until level on the expansion tank shows a level of 1/4 the tank capacity.

Now that the unit has oil in it, momentarily engage the start button on the unit and observe the pump rotation. Make certain that the belt or pump coupling (for long coupled pumps) has been removed before bumping to check rotation, the impeller can unthread itself from the motor shaft. For close coupled pumps the "bumping" must be very brief since the impeller can unthread itself from the motor shaft. NOTE: The alignment of the pump and motor should be checked prior to extended operation of the pump. The pumps were aligned prior to shipment but shipping and installation operations may have caused the pump to become misaligned. Final alignment is not within the scope of the Budzar supply and must be verified in the field by others. The correct rotation will be either stamped on the pump casing or indicated in the pump section of this manual. If the circulating pump is running backwards, reverse any two of the three-phase power input leads where they enter into the control box. The rotations of the pumps on multi-zone TCU's are tested prior to shipping from the factory. It is advisable to correct for improper phase (rotation) at the main input rather than on the individual pumps. After correct rotation is confirmed start the pump, the pressure gauge should indicate a positive pressure, which is a characteristic of the pump and system curves. If no pressure is indicated stop the pump immediately, there might be air entrapment starving the pump. If this is the case, the system will not operate until the air is released. Damage to the pump can occur if it is run without oil in the volute so the air must be purged from the pump volute. It may be possible to force the air out by running the fill pump while bleeding air from a piping high point. It may be necessary to loosen the top (2) pump bolts holding the volute together to release the air. Retighten bolts after oil seeps by. NOTE: The TCU has safeties that prevent the electric heaters from operating if sufficient flow cannot be maintained over the heating elements. An example is a pressure switch on the pump discharge, which is wired in the heater control circuit. Optional safeties include a bypass valve installed in the discharge piping and flow measuring devices other than a pressure switch. The bypass valve limits the backpressure in cases where excessive restrictions are encountered that could cause damage to the heater and oil. However, restricted flow to the process can cause erratic control of the process temperature.

10. AIR AND MOISTURE PURGING

Start the pump to circulate fluid throughout the piping and the process. Once the pump is running the temperature controller, usually mounted in the door of the electrical enclosure, should be set to a low value (50 °F/20 °C) so that heating will not occur. Vent the process equipment and the piping to remove air.

NOTE: The fill source must be available during this operation since as air is forced out of the piping system additional fluid will be needed to fill the space.

BE CAREFUL THAT THE LEVEL IN THE EXPANSION TANK DOES NOT DROP BELOW THE VISIBLE LEVEL.

Once the bulk of the air has been expelled the level in the expansion tank may need to be adjusted. Turn off the pump. Drain or add fluid to the hot oil unit until approximately 1/3 to 1/4 of the expansion tank is full or if applicable just above the low-level switch trip point.

Now that the system is completely filled and vented of as much air as possible ramp the setpoint of the hot oil unit up to the designed setpoint.

CAUTION: Do not exceed the maximum allowable ramp rate from the process equipment.

At each step hold the temperature constant and allow the process equipment and interconnecting piping to rise in temperature and check the level in the expansion tank. The manual vent valve on the hot oil unit to the expansion tank should be open to purge air and moisture from the system. If applicable the expansion tank backpressure vent valve manual bypass should also be opened to evacuate air and moisture. If applicable, the 3-way cooling control valve should be modulated through the full stroke several times at every other temperature step to allow for proper venting. Continue venting as in other steps using extreme caution once the temperature has exceeded 110 °F/45 °C. This is an important step that may take some time to complete due to the complex nature of the interconnected process piping.

Once the system has been vented and boiled out, the nitrogen blanket, if applicable, can be established. Close the manual vent and backpressure bypass valves and pressurize the expansion tank from the nitrogen supply system and verify the pressure settings on the nitrogen regulator and the back pressure regulator. The system is now ready to be brought to maximum operating temperature. Follow the process equipment manufacturer instructions for installation and start up of those pieces of equipment.

11. TYPICAL PRECAUTIONS

The liquid level in the expansion tank must be checked continually during the initial start-up procedure. The liquid level should not exceed the 1/4 mark nor drop below the 1/8 mark on the liquid level gauge. If abnormal expansion of fluid occurs, it is either because of air or steam (excess water) still present in the system. Review the air and moisture purging segment and repeat if necessary. If the problem continues shut the pump down and check the air vent valves, if provided, and pump / motor assembly.

12. OPERATING

Providing that the flushing, filling and purging sequences are complete the unit is now ready to be operated. CAUTION: Make certain that the vent valve from the TCU discharge to the expansion tank is closed before raising the unit temperature. Excessive heating of the expansion tank can cause oxidation of the fluid. Start the pump and set the temperature controller initially to operate at 50°F for approximately fifteen (15) minutes to establish that the system is functioning properly. The first time you start the TCU take amperage readings on the motor(s) and check all the safety controls and compare these to the copy of the test report. If all components are operating as required, begin to heat by setting the temperature controller at ambient plus 100°F, take amp. readings on heater and compare to the test report. If any problem is found with the Heat Transfer System, contact Budzar Industries. If everything is found to operate correctly proceed to heat-up the unit and allow fifteen (15) minutes of operating time at each step of 25°F before proceeding to the next setpoint change in temperature. Excessive water or air in the system can cause the heat transfer fluid to back-up into the expansion tank and thus evacuating the heating chamber. If this happens, return to the purging step. If this problem persists, drain the system and recharge with new moisture free heat transfer fluid. Keep in mind that oil that sits does accumulate moisture.

The TCU may now be operated until the maximum operational setpoint is attained. After the initial start-up sequence day to day start-up should just include turning on the pump and setting the temperature. A system, which has been purged and properly maintained, should start right up and operate with out incident. During heat up the only limitation to temperature ramp rate is the process and the available heat in the TCU. CAUTION: Some process equipment is susceptible to thermal shock, contact the process equipment manufacturer for ramp rate limitations.

13. TROUBLE SHOOTING

The following points have been noted during previous Installations and appeared to be the most common installation problems. Please read carefully so that you can either rectify or avoid them during the installation of your equipment.

1. Lack of circulation and/or temperature control. Readings that rise and fall over wide spread ranges.
 - A. Improper piping hook-ups, a condition which will cause an apparent lack of circulation, or lack of control, and can be due to nameplates being located incorrectly or being improperly interpreted. Trace the piping system

through the transfer system out to the load and back to make sure that the labels and piping are correct.

- B. Caused by lack of circulation due to either vapor binding of the system, restriction in the system or improper piping. Double check all points concerning air venting and pipe sizing.
 - C. Pump rotation incorrect. Note that a centrifugal pump will develop some flow regardless of its rotational direction. It will, however, develop proper flow only in the right direction. Check pump shafts and motor fans, where rotation can be observed for proper rotation, or use a discharge pressure gauge in conjunction with a suction pressure gauge to determine which direction provides the higher discharge pressure.
- 2. Wide temperature fluctuation around set point... control band too narrow on controller.
 - 3. Machine will not run properly, motor trips overload or blows fuses, electrical trouble suspected. This, in many cases, is due to the fact that one or more of the four wires compromising a three phase grounded neutral system has a loose connection to either terminals or lugs. Please check each wire following the wire through from source to final termination within the unit power box.
NOTE: Continuity tests are helpful in finding a loose connection.
 - 4. No temperature control at process - relief valve not seating properly letting fluid bypass the process.
 - 5. Tank overflow
 - A. Too much oil in system
 - 1. Check level at cold start. Tank should be no more than 1/4 full.
 - 2. Check total oil in system. Typically oil expands 10% for every 200°F rise in temperature.
 - B. Too much moisture in system (overflow occurs around 220-250°F)
 - 1. Check cooling tubes or jackets for leaks into oil
 - 2. Review procedure for filling system
 - C. Flow down stream of unit blocked
 - 1. Check for high discharge pressure readings or open vent valve.
 - 2. Install By-pass

6. High Discharge Pressure

- A. May be an indication of a clogged filter. Cool the unit down if possible and stop the pump or stop the pump and allow the unit to cool naturally. Isolate the filter and replace the filter element. Reinstall the screen and open the isolation valves, air will need to be purged. The procedure may need to be repeated several times before all the debris is eliminated. It may be possible to "blowdown" the strainer during hot operations when a strainer blowdown valve was purchased. CAUTION: Be careful when blowing down strainers in hot service.

7. Moisture or air entrained in heat transfer fluid. Return to the Air and Moisture Purging section and repeat.

14. INSULATION (APPENDIX A)

The system should be started up and allowed to operate at typical temperatures before final insulating steps are completed.

Selection of suitable insulation requires careful consideration because of the high operating temperatures and safety considerations involved. Heat transfer liquids can pose a fire hazard when they contact absorbent insulation materials at elevated temperatures. Laboratory tests have shown that synthetic heat transfer fluids have similar fire hazard characteristics of organic fluids when exposed to absorbent insulation at elevated temperatures. However, in some instances, synthetic heat transfer fluid was shown to present less of a hazard than some organic heat transfer fluids.

Nonabsorbent, closed cell insulation such as cellular glass is the preferred material for systems operating at high temperatures. Closed cell insulation, at a minimum, is recommended for installation at all flanges, valves and connections. Fiberglass insulation may be used provided that it is sealed to prevent saturation from dripping fluid. In addition metal jacketing with high temperature caulking is the minimum recommendation for sealing or install fiberglass insulation only were it is not exposed to dripping fluid.

Additional measures to eliminate liquid leakage into insulation from potential problem areas such as valve packing glands, flange gaskets and instrument connections include:

1. Eliminating the source of the leakage as soon as it occurs. This may require additional and proper tightening of flanged or screwed connections, replacement of leaking gaskets and repacking of valve stems with high temperature packing material.

2. Covering insulation in those areas where leaks are most likely to occur, using a hydraulic setting, oil-resistant cement or nonabsorbent shielding.
3. Establishing a system for regular inspection and maintenance of heat transfer equipment and piping to detect leaks at the earliest opportunity and replace any oil-soaked insulation.

15. FILTRATION (APPENDIX B)

Under proper use conditions, the heat transfer fluid generates no solid materials by itself. However, rust, mill scale and other contaminants can be present or can be accidentally introduced into a heat transfer system. Interconnecting piping design should include a filter or at a minimum, flanges and valves for future filter connections.

Budzar offers two basic filter options. A filter can be designed to operate at the highest expected temperature of the system and left on-line continuously. Or, a lower temperature filter can be installed that is by-passed when the system is hot. A lower temperature filter provides greater capacity, fewer leaks and smaller particle size retention at lower initial cost. Generally, filtration down to 10-micron is required to get contaminants and fine particulate out of the liquid.

16. HEAT TRANSFER SYSTEM CLEANOUT (APPENDIX C)

16.1 CAUSE OF SYSTEM FOULING

Even when proper heat transfer fluids are selected, improper or abnormal operating conditions can cause the heating system to develop fouling on the heat transfer surfaces, which may require a system cleanout.

The most common causes of system fouling are:

- overheating the heat transfer fluid
- contamination by process chemicals or other heat transfer fluids
- oxidation of the heat transfer fluid

Heat transfer fluids are affected by oxidizing conditions. Should extensive oxidation occur from air contacting hot fluid, a carbonaceous residue will form and adhere loosely to the system heating surfaces requiring cleanout of the system. Thermal breakdown of the fluid is less common than oxidation of these fluids, but can create carbonaceous deposits within the system. Contamination from process fluids or other heating media may contribute to fouling of a system.

Incompatibility of the fluid chemistries involved may dictate changing to fresh heat transfer fluid. This requires reclamation and or disposal of contaminated heat transfer fluid and refilling the system with new fluid.

16.2 CORRECTIVE ACTION

The decision to clean the system to remove troublesome solids that affect pump seal performance and foul the heating surfaces or to replace contaminated heat transfer fluid must be the judgment of the customer. The method of cleaning is dependent upon the degree of solids buildup and surface fouling.

16.3 HEAT TRANSFER SYSTEM CLEANERS

Today's fast paced production schedules don't always allow for timely oil changes and preventative maintenance. This situation over time can result in harmful deposits being created within your system, ultimately leading to equipment failure. Therefore, in our effort to truly service the heater transfer industry, Frontier has developed 4 unique and specific heat transfer system cleaners. Ranging from preventative maintenance system cleaners to emergency downtime system revivers, we have a cleaner that fits your needs and schedule.

DuraClean is part of our new line of premium heat transfer fluids. This product is a long life, preventative maintenance and light duty system cleaner, in addition to functioning as a long term heat transfer fluid.

DuraClean Concetrate is slightly more aggressive and is added to a system a few days prior to an oil change. It effectively cleans sludge and carbon deposits without shutting the system down and does not require subsequent flushing.

Carb-off is our original and most aggressive cleaner. Recommended by major equipment OEM's, the fast acting formulation makes it perfect for stripping fouled heat transfer systems of oxididated and thermally degraded oil deposits.

Once fluids are drained and replaced with Carb-off, the system must then be kept under 150°F while circulating. It will generally clean moderately to severely fouled systems in a few hours. Flushing the system prior to filling with heat transfer fluid is required. This product is compatible with all fluid types.

Thermosolution is a great preventative maintenance tool. It runs in systems at temperatures up to 575°F, which makes it perfect for cleaning moderately fouled systems. It is virtually odorless. After operation for 300 hours, the systems are just drained and refilled with heat transfer fluid. This product is compatible with petroleum and aromatic based fluids.

U-Clean Is another first for the industry. Finally a cleaning fluid compatible with Polyalkylene Glycol fluids such as Ucon 500, Which is safe and effective to use at temperature up to 500°F.

This product is ideal for either preventative maintenance of as a light to moderate system cleaner. Since U-Clean is compatible with Ucon 500 it does not require flushing after use.

Frontier
Service and Sales
www.heat-transfer-fluid.com
1-800-446-4910

RECOMMENDED SPARE PARTS LIST

SERIAL #: 200502-9253

MODEL#: 1SSOT-2420-NC-030-FCB-0-SP

<u>DESCRIPTION</u>	<u>PART NUMBER</u>	<u>PRICE</u>
EXPANSION TANK, 12 GAL	220-010-0174	\$324.00
SIGHT GAUGE	220-030-0063	\$81.00
PUMP	230-011-0102-P	Call for Pricing
PUMP SEAL	230-011-0102-S	Call for Pricing
PUMP MOTOR, 1 HP	240-100-0216	\$409.00
BELT, PUMP/MOTOR	340-020-0061	\$51.00
HEATER, 12 KW	270-030-0409	\$917.00
RELIEF VALVE, 1", SET @ 35 PSIG	290-030-0263	\$598.00
AIR VENT, 3/4"	300-035-0001	\$386.00
STRAINER, 1"	300-025-0097	\$199.00
PRESSURE GAUGE, 1/4", 0-100 PSIG	310-010-0521	\$51.00
LEVEL SWITCH, 3/4"	310-030-0154	\$76.00
FUSE, 4A	580-010-0190	\$28.00
FUSE, 20A	580-010-0036	\$28.00
FUSE, 1.4A	580-010-0237	\$10.00
FUSE, 0.6A	580-010-0235	\$24.00
PRESSURE SWITCH, 1/4", SET @ 4 PSIG	600-010-0085	\$85.00
SWITCH, START/STOP	640-030-0044	\$18.00
CONTACTOR, 9A	530-010-0014	\$61.00

CONTACTOR, 16A	540-010-0028	\$103.00
RELAY, 4PDT	590-010-0129	\$23.00
RELAY, TIME DELAY	590-010-0280	\$123.00
OVERLOAD, 1.6-5.0A	590-010-0201	\$116.00
THERMOCOUPLE, 10'	610-010-0104	\$117.00
TEMPERATURE SWITCH	560-010-0100	\$198.00
CONTROLLER	560-010-0648	\$561.00
SCR, 25A	550-010-0116	\$470.00

NOTE: PRICING VALID FOR ONE YEAR AFTER RECEIVING BUDZAR UNIT.

THERMAL FLUID TEMPERATURE CONTROL UNIT TEST REPORT

Serial Number: 200502-9253
 Model Number: 1SSOT-2420-NC-030-FCB-0-SP
 Date: 10/31/2005
 Tested By: KV
 Checked By: LG
 Run Time On Stand: 4 hrs.
 Design Pressure: 150 psi
 Thermal Fluid Used for Testing: Therminol 66
 P & I, Drawing Used: A

Voltage Used: 460/3/60
 Air regulator Tag: N/A Setting: N/A
 Water Regulator Tag: N/A Setting: N/A
 Strainer Cleaned (Y/N): Y
 Leak Test Pressure: 50 psi
 Leak Test Holding Time: 30 min.
 Max. Oil Test Temperature: 550 °F
 Upper 50F Range Temp. Rise (min.): N/A
 Electric Schematic Used: A

INSTRUMENTS:

Flow Switch Tag: N/A
 Flow Switch Tag: N/A
 Temperature Switch Tag: TSH-101
 Temperature Switch Tag: N/A
 Pressure Switch Tag: PSL-101
 Pressure Switch Tag: N/A
 Diff. Pressure Switch Tag: N/A
 Diff. Pressure Switch Tag: N/A
 Temperature Transmitter Tag: N/A
 Temperature Transmitter Tag: N/A
 Flow Transmitter Tag: N/A
 Flow Transmitter Tag: N/A
 Pressure Transmitter Tag: N/A
 Pressure Transmitter Tag: N/A

Setting (N/O @ GPM): N/A
 Setting (N/O @ GPM): N/A
 Setting (N/O @ F or C): 555 °F
 Setting (N/O @ F or C): N/A
 Setting (N/O @ PSIG): 4 psi
 Setting (N/O @ PSIG): N/A
 Setting (N/O @ PSIG): N/A
 Setting (N/O @ PSIG): N/A
 4 mA: N/A 20 mA: N/A
 4 mA: N/A 20 mA: N/A
 4 mA: N/A 20 mA: N/A
 4 mA: N/A 20 mA: N/A
 4 mA: N/A 20 mA: N/A
 4 mA: N/A 20 mA: N/A

TEMPERATURE CONTROLLER

Output 1 Type: Reverse Relay Time Prop.
 Low Temperature Limit: 50 °F
 Remote Setpoint: N/A
 Temperature Retransmission: N/A
 Deviation Alarm: N/A
 Rate of Change Limit Setting (F or C per hour): N/A

Output 2 Type: Low Alarm Set @ 294°F
 High Temperature Limit: 550 °F
 4 mA: N/A 20 mA: N/A
 4 mA: N/A 20 mA: N/A

MOTOR & HEATER DATA

Zone	Pressure		Motor				Heater	
	Suction	Discharge	HP	FLA	OL	AMPS	KW	AMPS
1	0	30 psi	1	1.85	1.85	1.71	12	15.9
1							12	16.0

CONTROL VALVE DATA

Valve Type (2 or 3 Way) and/or Tag	Heating or Cooling	Direct or Reverse	Fail Position	0.0% mA = or Volts	25% mA = or Volts	50% mA = or Volts	75% mA = or Volts	100% mA = or Volts
None				=	=	=	=	=

Other: Relief Valve Set @ 35 psi
 Evacuation enable set @ 140° F

Programming Record

Guide for Partlow 1160+

Customer:	Newbold				
Serial #:	200502-9253				
Model #:	1SSOT-2420-NC-030-FCB-0-SP				
Mode	Upper Display	Deflt. Unlock Codes	Configuration Mode:		
Operator	OPtr	None	Parameter	Lower Display	Setting
Set Up	setP	10	Bit rate	bAud	
Configuration	Conf	20	Comms Address	Addr	
Product Info	info	None	Comms Write	CoEn	
Auto Tuning	Atun	0	Dig. Input Usage	diGi	
			Config. Lock Code	Cloc	20
Configuration Mode:			Set Up Mode:		
Parameter	Lower Display	Setting	Parameter	Lower Display	Setting
Input Range/Type	inPt	JF	Input Filt. Time Const.	FiLt	2
Scale Range Up.Limit	rul	1402 °F	Proc. Var. Offset	OFFS	
Scale Range Lo.Limit	rll	32 °F	Primary (Heat) Power	PPLJ	Read Only
Dec. Pt. Position	dPoS	1	Sec. (Cool) Power	SPLJ	Read Only
Control Type	CtyP	dual	Primary Prop. Band	PB_P	2.0
Prim. Out.Control Act.	Ctrl	rEv	Sec. Prop. Band	PB_S	2.0
Alarm 1 Type	ALA1	P_Lo	Auto. Reset (Integral)	ArSt	0.40
High Alm. 1 Value	PhA1	140°F	Rate (Derivative)	rATE	0.20
Low Alm. 1 Value	PLA1		Overlap/Deadband	OL	0
Band Alm. 1 Value	bAL1		Manual reset (Bias)	biAS	0
Dev. Alm. 1 Value	dAL1		Prim. On/Off Diff.	diFF	
Alm. 1 Hysteresis	AHY1	1	Sec. On/Off Diff.	diFS	
Alarm 2 Type	ALA2	P-LO	Prim&Sec On/Off Diff	diFF	
High Alm. 2 Value	PhA2		Setpoint Upper Limit	SPuL	550°F
Low Alm. 2 Value	PLA2	294°F	Setpoint Lower Limit	SPLL	50 °F
Band Alm. 2 Value	bAL2		Prim. Out. Pwr. Limit	OPuL	100
Dev. Alm. 2 Value	dAL2		Out. 1 Cycle Time	Ct1	32
Alm. 2 Hysteresis	AHY2	1	Out. 2 Cycle Time	Ct2	32
Loop Alarm	LAEn	diSA	Out. 3 Cycle Time	Ct3	
Loop Alarm Time	Lati		High Alarm 1 Value	PhA1	140°F
Alarm Inhibit	Inhi	nonE	Low Alarm 1 Value	PIA1	
Output 1 Usage	USE1	Pri	Dev. Alarm 1 Value	dAL1	
Linear Out. 1 Range	tYP1		Band Alarm 1 Value	bAL1	
Ret. Out.1 Scale Max	ro1H		Alarm 1 Hyst.	AHY1	1
Ret. Out.1 Scale Min	ro1L		High Alarm 2 Value	PhA2	
Output 2 Usage	USE2	A2-d	Low Alarm 2 Value	PLA2	294°F
Lin. Out. 2 Range	tYP2		Dev. Alarm 2 Value	dAL2	
Ret. Out.2 Scale Max	ro2H		Band Alarm 2 Value	bAL2	
Ret. Out.2 Scale Min	ro2L		Alarm 2 Hyst.	AHY2	1
Output 3 Usage	USE3	AI-R	Loop Alarm Time	Lati	
Lin. Out. 3 Range	tYP3		Auto Pre-Tune	Apt	diSA
Ret. Out.3 Scale Max	ro3H		Auto/Man Cont Select	PoEn	diSA
Ret. Out.3 Scale Min	ro3L		Setpoint Ramp	SPr	diSA
Display Strategy	diSP	2	SP Ramp Value	rP	
Comms Protocol	comms		Setup Lock Code	Sloc	10