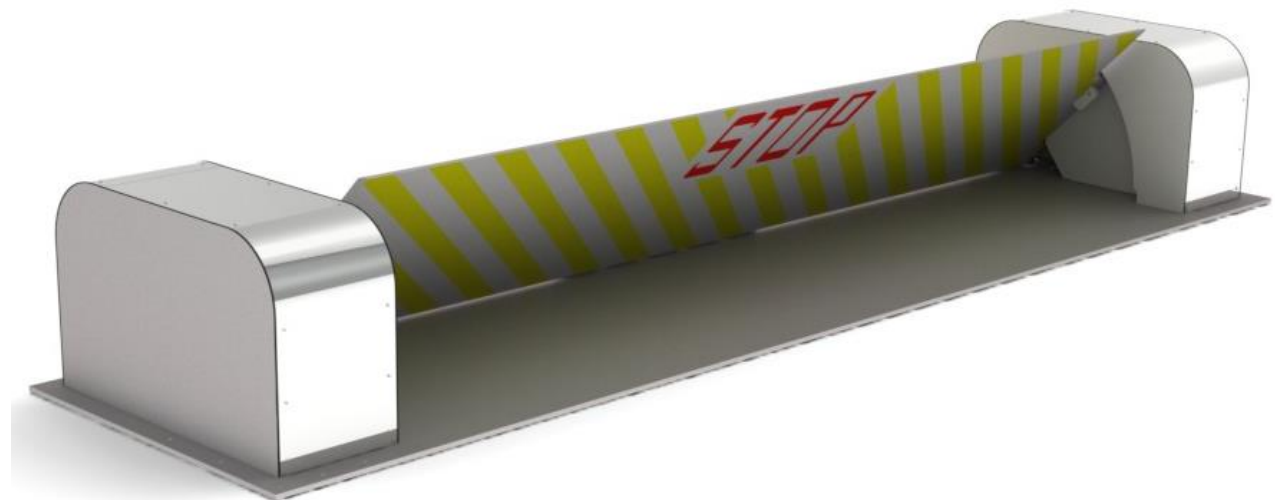


- ◆ **TERMS AND CONDITIONS / WARRANTY**
- ◆ **INSTALLATION**
- ◆ **HOOKUP**
- ◆ **MECHANICAL THEORY**
- ◆ **STARTUP**
- ◆ **HYDRAULIC TROUBLE SHOOTING**
- ◆ **ELECTRICAL TROUBLE SHOOTING**
- ◆ **MAINTENANCE**
- ◆ **DRAWINGS**



**JOB 10818 – NEW ORLEANS CONVENTION CENTER – NEW ORLEANS , LA**

---



**CORPORATE HEADQUARTERS**

40355 Delta Lane  
Palmdale, California 93551  
Phone: (661) 575-1100  
Fax: (661) 575-1109  
Email: [info@deltascientific.com](mailto:info@deltascientific.com)



## TERMS AND CONDITIONS OF PRODUCT SALE

THIS PURCHASE CONTRACT ("CONTRACT") SETS FORTH THE TERMS AND CONDITIONS FOR THE SALE BY DELTA SCIENTIFIC CORPORATION ("DELTA") TO THE BUYER SPECIFIED HEREIN ("BUYER") OF THE PRODUCTS SPECIFIED IN THE QUOTATION IDENTIFIED BELOW (THE "PRODUCTS"). THIS CONTRACT DOES NOT CONSTITUTE ACCEPTANCE OF ANY OFFER BY BUYER, WHETHER ORAL OR WRITTEN, INCLUDING BUT NOT LIMITED TO ANY PURCHASE ORDER, LETTER, E-MAIL, MEMO, OR ANY OTHER FORM. SALES OF THE PRODUCTS ARE LIMITED SOLELY TO THIS CONTRACT. DELTA RESERVES THE RIGHT TO MODIFY PRICES TO REFLECT MARKET CONDITIONS IF CUSTOMER ACTION OR INACTION IS THE CAUSE OF A DELAY GREATER THAN 30 DAYS IN LENGTH BETWEEN THE TIME CONTRACT TERMS ARE EXECUTED BY BUYER AND FABRICATION OF THE PRODUCT IS UNDERWAY.

**Acceptance.** Buyer accepts these terms and conditions when the first of the following occurs: Buyer (a) signs or makes a written acceptance of this Contract; (b) authorizes production or shipment of any part of the Products; or c) accepts Delta's Product submittals. Acceptance is expressly limited to all terms and conditions hereof without any addition, modification or exception, and Delta expressly rejects any additional or inconsistent terms, conditions, contingencies or covenants previously or hereafter proposed by Buyer. This Contract, when accepted by Delta at its corporate offices in California, constitutes the entire agreement between Delta and Buyer, superseding any prior agreement or understanding between the parties with respect to the subject matter hereof.

1. **Shipment and Delivery.** Buyer acknowledges that this Contract, and any additional Buyer orders accepted by Delta hereunder, are firm and non-cancelable. Deliveries of the Products will be made F.O.B. Delta's plant at Palmdale, California. Delta will arrange for shipment. Buyer will bear all costs of shipment and insurance and will reimburse all such costs incurred by Delta when invoiced. Upon Delta's delivery of the Products at Delta's plant to any carrier or Buyer's representative, Buyer assumes all risk of loss and damage with respect to the Products. Buyer shall promptly inspect each shipment upon receipt, and shall promptly inform Delta in the event all Products listed in Delta's shipping documents do not arrive as scheduled or are damaged or defective.
2. **Payment Terms.** If credit is approved in advance by Delta, payment terms are net thirty (30) days from the date of invoice. If credit is not approved in advance, Buyer shall make payment in full prior to delivery. Delta's invoice will be issued and dated upon date of shipment of Products. All payments shall be made at Palmdale, California. Unpaid invoices shall bear interest at the maximum lawful rate or 1.5% per month, whichever is less, commencing upon the date payment is due. Buyer shall be responsible for all costs of collection, including but not limited to reasonable attorneys' fees and expenses.
3. **Taxes and Similar Charges.** Buyer shall bear all applicable federal, state, municipal and other taxes (such as sales, use, excise, ad valorem and similar taxes), customs duties and charges. The lack of any such tax or charge on the invoice shall not affect Buyer's tax liability.
4. **Use and Permits.** Buyer will be responsible for operation of Products, including, but not limited to, obtaining all use and export permits, building permits, licenses, certificates and the like, required by any regulatory body for installation and use of the Products. If Buyer wishes for Delta to install any Products purchased hereunder, the terms and conditions of installation shall be set forth in a separate agreement.
5. **Limited Warranty; Limitation of Liability.** Delta warrants that during the warranty period applicable to the product, the Products will be free from defect in material and workmanship. Delta's sole obligation under this warranty shall be to repair (or at Delta's option, to replace), FOB Palmdale, California any defective product, without charge to Buyer, provided that: (a) Buyer gives Delta written notice of any claimed defect within the applicable limited warranty period; (b) the Products, if installed, were installed correctly and in accordance with any instructions provided by Delta, (c) the Products have not been altered, subjected to misuse, negligence or accident, or used with parts not authorized by Delta, (d) the Products have been properly and timely maintained by Buyer in accordance with the preventive maintenance instructions provided, and (e) the replaced Product(s) and or part(s) is/are properly removed and returned to Delta, using the Material Return Authorization (MRA) number and information provided by Delta. Product and Product part troubleshooting, diagnosis and/or replacement, and the cost of such replacement installation and/or related remedial services, are the sole responsibility of Buyer. The duration of the applicable Product warranty is ninety (90) days for guard booths, gates, traffic items and spare parts and one (1) year for Delta's Barricade/Barrier Systems, from date of shipment. Primer, paint and other surface coatings are excluded from warranty. FAILURE BY BUYER TO MAKE TIMELY PAYMENT IN FULL FOR THE PRODUCTS, AND/OR FAILURE BY BUYER TO PROPERLY AND TIMELY CONDUCT PREVENTIVE MAINTENANCE, FAILURE TO FOLLOW DELTA'S INSTRUCTIONS FOR PROBLEM TROUBLESHOOTING AND/OR DIAGNOSIS, AND/OR FAILURE TO PROPERLY INSTALL, REMOVE AND/OR RE-INSTALL A PRODUCT OR PART THEREOF, INVALIDATES THIS WARRANTY. IN THE EVENT A PRODUCT PROBLEM IS NOT THE RESULT OF A PRODUCT DEFECT, BUYER SHALL BE RESPONSIBLE FOR MAINTENANCE CHARGES AT DELTA'S STANDARD TIME AND MATERIALS RATES. NO OTHER WARRANTY IS EXPRESSED AND NONE SHALL BE IMPLIED, INCLUDING WITHOUT LIMITATION THE WARRANTY OF MERCHANTABILITY OR WARRANTY OF FITNESS FOR USE OR FOR A PARTICULAR PURPOSE. THE FOREGOING STATES DELTA'S ENTIRE LIABILITY WITH RESPECT TO THE PRODUCTS. IN NO EVENT SHALL DELTA BE LIABLE FOR ANY SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES WHICH RESULT FROM THE USE OF THE PRODUCTS BY BUYER OR ANY OTHER PARTY, AND IN NO EVENT SHALL DELTA'S LIABILITY EXCEED THE PRICE OF THE PARTICULAR PRODUCT UNIT(S) INVOLVED IN ANY CLAIM.
6. **Disclaimer and Indemnification.** Buyer acknowledges that the Products, designed for control of vehicular traffic, inherently involve a tradeoff of risk versus benefit. Buyer must devote careful consideration to the selection, placement and design of a barricade installation. To ensure approaching vehicles and pedestrians are fully aware of the Barricade/Barrier Systems and their operation, proper illumination, clearly worded warning signs, auxiliary devices such as semaphore gates, stop-go signal lights, audible warning devices, speed bumps, flashing lights, beacons, etc. should be considered. It is strongly recommended that the Buyer consult an architect and/or a traffic and/or safety engineer prior to installation of a Barricade/Barrier system. Delta does not purport to offer either architectural, traffic or safety engineering information. Buyer also concedes that, beyond its written installation, maintenance and operation instructions, Delta has no control as to how the Products will be utilized, or how persons in the vicinity of the Products, including but not limited to drivers, bicyclists and/or pedestrians, will act. Therefore, Buyer shall hold harmless, indemnify and defend Delta from and against all claims, demands, judgments and awards resulting from Buyer's installation, use or misuse of the Products, including, but not limited to, claims for personal injury, wrongful death and damage to real or personal property. However, in no event shall this indemnification provision apply where Delta's sole negligence resulted in the claim, judgment or award. Each party shall give the other party prompt written notice of any claim or suit for which such other party is responsible hereunder. The responsible party shall control the defense and/or settlement of such claim; provided that neither party has the authority to enter into a settlement, make an admission, or undertake any obligation or liability without the other party's written consent.
7. **General.** Delta shall not be liable for any delays or failure of performance, beyond the reasonable control of Delta, that affect Delta or any of Delta's suppliers; including, but not limited to, those caused by acts of God, acts of public enemy, acts or omissions of Buyer or its contractors and sub-contractors, fire, strike, riot, flood, governmental interference, unavailability or shortage of materials, labor, fuel or power through normal commercial channels, or failure or destruction of plant or equipment arising from any cause whatsoever. In the event of delay, the date of delivery shall be extended for a period equal to the time lost by such delay, and this Contract shall remain in full force and effect. This Contract may be modified only in writing. This Contract shall be governed by and construed in accordance with the laws of the state of California. Neither this Contract nor any rights or benefits hereunder are assignable by Buyer without prior written consent of Delta. Any such prohibited assignment shall be null and void. Notices shall be given in writing, via certified or overnight mail with proof of deliver, to an authorized representative or officer of a party.

ACCEPTED BY: \_\_\_\_\_  
NAME: \_\_\_\_\_  
DATE: \_\_\_\_\_

DELTA SCIENTIFIC CORP  
NAME: \_\_\_\_\_  
DATE: \_\_\_\_\_

QUOTE NO: \_\_\_\_\_  
REV / DATE: \_\_\_\_\_



### **WARRANTY AND LIMITATION OF LIABILITY**

Delta Scientific Corporation warrants that during the first one year (365) days from date of shipment, the Products will be free from defect in material and workmanship. Delta's sole obligation under this warranty shall be to repair (or at Delta's option, to replace), FOB: Palmdale, California, any defective product, without charge to Buyer, provided that, (a). Buyer gives Delta written notice of any such claimed defect within such period of one year (365) days, (b). The Products, if installed, were installed by a Delta authorized installer, (c). The Products have not been altered, subjected to misuse, negligence or accident, or used with parts not authorized by Delta, and (d). The Products have been maintained in accordance with the instructions provided. NO OTHER WARRANTY IS EXPRESSED AND NONE SHALL BE IMPLIED, INCLUDING WITHOUT LIMITATION THE WARRANTY OF MERCHANTABILITY OR WARRANTY OF FITNESS FOR USE OR FOR A PARTICULAR PURPOSE. THE FOREGOING STATES DELTA'S ENTIRE LIABILITY WITH RESPECT TO THE PRODUCTS. IN NO EVENT SHALL DELTA BE LIABLE FOR ANY SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES WHICH RESULT FROM THE USE BY BUYER OR ANY OTHER PARTY, OF THE PRODUCTS, AND IN NO EVENT SHALL DELTA'S LIABILITY EXCEED THE AMOUNTS PAID BY BUYER FOR THE PRODUCTS HEREUNDER.

### **DISCLAIMER**

Please note - careful consideration must be devoted to the selection, placement and design of a Barricade installation. Just as in the case of any Barricade system, perimeter security device or security gate that blocks a roadway or drive, care must be taken to ensure that approaching vehicles as well as pedestrians are fully aware of the Barricades and their operation. Proper illumination, clearly worded warning signs, auxiliary devices such as semaphore gates, stop-go signal lights, audible warning devices, speed bumps, flashing lights, beacons, etc. should be considered. Delta has information available on many such auxiliary safety equipment not specifically listed herein. It is strongly recommended that an architect and/or a traffic and/or safety engineer be consulted prior to installation of a Barricade system. Delta will offer all possible assistance in designing the operating equipment, controls and the overall system, but we are not qualified, nor do we purport to offer either traffic or safety engineering information.

### **INTELLECTUAL PROPERTY, DRAWINGS, SPECIFICATIONS AND TECHNICAL DATA**

The drawings and/or data included with this equipment unless otherwise noted remain the confidential property and trade secret of Delta Scientific Corporation. They shall not be disclosed, reproduced or used for manufacture, design or construction without the express authorization of Delta Scientific Corporation. The recipient by accepting these drawings and/or data, assumes custody thereof and under the above terms agrees not to allow the use of by unauthorized persons.



**MECHANICAL  
INSTALLATION INSTRUCTIONS  
VEHICLE ARREST SYSTEM**

COPYRIGHT 1991 DELTA SCIENTIFIC CORPORATION

ALL RIGHTS RESERVED

MFG. UNDER U.S. PATENT #4,097,170 4,158,514 4,318,079 4,354,771 4,490,068 4,576,508 4,715,742

U.K. PATENT # GB 2,127,893B 2,138,883B

40355 DELTA LANE • PALMDALE, CALIFORNIA 93551, USA • PHONE (661) 575-1100 • FAX (661) 575-1109

E-MAIL: [info@deltascientific.com](mailto:info@deltascientific.com)

## **MECHANICAL INSTALLATION INSTRUCTIONS**

### **DELTA BOLT DOWN SURFACE MOUNTED PHALANX BARRIERS**

#### **Safety Precautions**

Barrier systems are designed to stop high speed vehicles in very short distances. Because of this, accidental deployment of the Barrier on a vehicle traveling at speeds over 5 mph [8 kph] can produce critical or even fatal injuries. Keep traffic speeds to a safe level when transiting the Barrier area.

Remember: **SAFETY FIRST!**

At all times observe good safety practices when working on either the electrical or mechanical system. Particular attention should be paid to the danger of working on the Barrier when the power is on. Barriers are powerful hydraulic presses that can easily crush anything in their way. Keep hands free of the mechanism when the power is on or the HPU is up to pressure. Turn off the electric power and bleed the hydraulic pressure down to zero before working on any part of the system. Traffic should be controlled around the Barrier during any work so that vehicular accidents do not occur if the Barrier should happen to rise. After work is complete, do not allow traffic across the Barrier until all control and safety functions have been verified to be properly working. Please read the 'Summary of Safety Aspects Regarding Maintenance On or About the Barriers' in the Maintenance section of this manual.

#### **Foundation**

The Barrier foundation frame is to be bolted to the roadway. The area of the roadway that is to accommodate the Barrier can be prepared specifically for the installation or if sufficiently flat and strong, the existing surface may be utilized. The surface should be flat to within plus/minus 1/4" [6 mm].

Care should be taken to mount the Barrier in an area that is not subject to flooding. Additionally, the roadway should be raised in the area of the Barrier to prevent standing water from draining into the Barrier frame. It is not necessary for the Barrier to be level or plumb to operate. If the roadway is not level the Barrier may be placed to match the contour; however, be sure the appearance factor is considered. An installation where the equipment is not level even if it follows the terrain can be distracting.

**Bolt Recommendation, TT207S/FM** - Ten inch deep foundation (3,000 psi [20,68 MPa] concrete) which should extend a minimum of 18 inches on all sides of the Barrier. Use 1" diameter expansion bolts extending a minimum of four inches below grade. Quantity and location of anchor bolts per Barrier drawing.

**Bolt Recommendation, TT107S/FM** - Six inch deep foundation (3,000 psi [20,68 MPa] concrete) which should extend a minimum of 12 inches on all sides of the Barrier. Use 5/8" diameter expansion bolts extending a minimum of four inches below grade. Quantity and location of anchor bolts per Barrier drawing.

**Bolt Recommendation, TW2015** - Six inch deep foundation (3,000 psi [20,68 MPa] concrete) which should extend a minimum of 12 inches on all sides of the Barrier. Use 1/2" or 5/8" diameter expansion bolts extending a minimum of three inches below grade. Quantity and location of anchor bolts per Barrier drawing.

**Bolt Recommendation, TW4030** - Six inch deep foundation (3,000 psi [20,68 MPa] concrete) which should extend a minimum of 12 inches on all sides of the Barrier. Use 1/2" or 5/8" diameter expansion bolts extending a minimum of three inches below grade. Quantity and location of anchor bolts per Barrier drawing.

**Bolt Recommendation, DSC10MB** – Five inch deep foundation (3,000 psi [20,68 MPa] concrete). Use 5/8" adhesive anchors (Simpson ET Epoxy-Tie or equivalent) extending a minimum of four inches below grade. Quantity and location of anchor bolts per Barrier drawing.

**Bolt Recommendation, DSC1000** – Six inch deep foundation (3,000 psi [20,68 MPa] concrete). Use 5/8" adhesive anchors (Simpson ET Epoxy-Tie or equivalent) extending a minimum of four inches below grade. Quantity and location of anchor bolts per Barrier drawing.

**Bolt Recommendation, DSC1200** – Six inch deep foundation (*4,000 psi [27,58 MPa]* concrete). Use 5/8" adhesive anchors (Simpson ET Epoxy-Tie or equivalent) extending a minimum of four inches below grade. Quantity and location of anchor bolts per Barrier drawing.

**Bolt Recommendation, DSC1400** – Six inch deep foundation (3,000 psi [20,68 MPa] concrete). Use 5/8" adhesive anchors (Simpson ET Epoxy-Tie or equivalent) extending a minimum of four inches below grade. Quantity and location of anchor bolts per Barrier drawing.

**Note:** These are representative sizes of foundations and configurations for the listed Delta Barrier. The condition, age and reinforcement of existing concrete slabs must be considered. Expansion bolts are 'Red Head', 'Leibig' or equal 'wedge anchor', 'sleeve anchor' or 'stub anchor' bolts. For specific requirements, consult the factory or other qualified engineer. Delta offers complete design services.

## **Environmental Control**

Delta Scientific Corporation's vehicle Barrier systems can be used in all geographical areas. Since the early 1980's, Delta Barriers have been successfully installed in locations just south of the Arctic Circle (Oslo and Stockholm), in extremely cold areas of the United States such as Idaho Falls and Grand Forks, and in all the capital cities of Europe. Tropical installations include more than thirty locations within ten degrees latitude of the Equator. In between, installations run from temperate areas to Middle East desert sands.

## **Heating**

Cold climate installations require the use of heaters to maintain proper oil viscosity and to eliminate the possibility of snow or ice blocking the Barrier mechanism. Depending on the hydraulic power unit size and rating, Delta supplies heaters ranging from 60 to 500 watts @ 120/240 volts for the oil reservoirs. The hydraulic hoses to the Barriers are to be run below the frost line where temperatures are a relatively constant 45 to 55°F [7 to 13°C]. If desired, the ducts carrying these hoses can be heat traced at time of installation.

The Barriers themselves may require heaters, the ratings of which are determined by the length of the Barrier and available operating voltage. Ratings in the range of 1,000 to 2,000 watts are common.

Delta strongly recommends that the entire roadway in the immediate vicinity of the Barriers be heat traced. This is to minimize the chance that a vehicle could lose control or traction in front of the Barriers. Also, in many cases, guard and/or inspection personnel will need to work on a vehicle in front of the Barriers. The heat tracing will reduce the personnel dangers of working on snow and ice.

Roadways containing Barriers cannot be plowed. The snow plows will shear top plate bolts and damage inspection covers. Only hand clear snow around the Barriers. Snow removing chemicals such as salt should also not be used around the Barriers as the corrosion of the steel components will be greatly accelerated.

Drainage provisions in Barriers subject to freezing will also need some consideration. Heat tracing of the drain lines and/or sump well heaters may be needed to help remove the melted snow and ice from the Barrier foundations.

### **Cooling**

Barrier installations in areas where the temperatures are frequently above 100°F [38°C] should have the hydraulic power units located in temperature controlled equipment rooms or be equipped with oil coolers. The simplest but least effective method is an air cooled heat exchanger. Very large surface areas are required to cool oil to 160°F [71°C] when only 130°F [55°C] cooling air is available. A more compact installation can be realized if a water cooled heat exchanger is located in the reservoir tank. Typically, less than one gallon per minute [4 liters per minute] of water at 100°F [38°C] or less is required. If the water stream can be returned to a cooling tower or other closed loop system, no waste of water is incurred.

### **Sand and Dust**

Barrier locations in sand or dust areas require a few additional precautions. The hydraulic power units should be mounted in equipment rooms that can be pressurized to maintain positive air flow out of the room. This minimizes the accumulation of sand, dust and other abrasive materials on the hydraulic equipment where it could find its way into the oil and sensitive mechanical devices. Filter and fluid changes may be more frequent than at other installations.

Barriers in sand swept areas may need to have the foundation tubes cleaned frequently. This is usually accomplished by using an industrial type vacuum to sweep out the accumulated debris. Sand accumulation can be minimized by placement of suitable fences or walls around the Barrier area.

### **Drainage**

Water collected within the Barrier frame must be drained. Units without drainage holes provided at the frame will require that the concrete be scored (grooved) at the low points of the frame on either side of the Barrier. The holes or score marks should not be blocked by curbing or other structures adjacent the Barrier.

While the machine is designed for harsh environments, prolonged submersion will eventually cause both appearance and operating deterioration.

### **Interconnect**

Provisions for electrical and hydraulic feed can be either surface mounted or can be placed in excavations per the client's preference. (The hydraulic lines perform better when routed below the frost line in areas subject to freezing.) The feeds may be brought to either side of the Barrier end supports for double supported Barriers.

We recommend that 3" PVC pipe be run from the hydraulic power unit to the Barrier to provide a conduit through which hoses can be pulled. Alternately, rigid steel pipe can be run from the HPU to the Barrier directly buried in the ground or run on the surface. See the Hydraulic System section of this manual for a discussion of the various ways to interconnect the Barrier with the HPU.

The limit switch and/or Barrier heater conduits are located adjacent to the hydraulic connections. Rigid metallic conduit or equal is to be run to them. If the conduit is to be run underground, be sure that appropriate fittings are used that will allow wire to be pulled. It is too late to correct this error after the concrete is poured! Do not run the heater wires with the limit switches unless the insulation voltage rating of the wires are equal to the highest voltage anticipated.

### **Concrete Notes and Specifications (minimum requirements)**

The following notes are supplied as a general guide if new concrete is to be poured for the Barrier:

- 1) Contractor shall verify and be responsible for all dimensions and conditions at the job site.
- 2) Foundation concrete may be placed directly into neat excavations, provided the sides of the excavation are stable. Where caving occurs, provide shoring. Type and method of shoring shall be at the contractor's option.
- 3) The excavation shall be kept dry at all times. Groundwater, if encountered, shall be pumped from the excavation.
- 4) Concrete shall be laboratory designed, machine mixed, producing 3,000 psi [20,68 MPa] at 28 days. (Except for the DSC1200 which requires 4,000 psi [27,58 MPa])
- 5) Cement shall be tested Portland cement conforming to ASTM C150, Type I or II.
- 6) Aggregates shall conform to ASTM C33. Maximum size of aggregate shall be 1.5 inch [38 MM].
- 7) Reinforcing steel shall be deformed bars conforming to ASTM A615, Grade 60 [60,000 psi or 413,7 MPa].
- 8) Hooks and bends shall conform to AIC Standard 318, latest revision. Inside diameter of hooks and bends shall be at least 6 bar diameters.



- 9) Provide spacer bars, chairs, spreaders, blocks, etc, as required to positively hold the steel in place. All dowels shall be firmly wired in place before concrete is poured.
- 10) Concrete shall be conveyed from the mixer to final deposit by methods that will prevent separation or loss of materials. Troughs, buckets or the like may be used to convey concrete. In no case shall concrete be allowed to free drop more than 5 feet [1,5 M].
- 11) Concrete shall be thoroughly consolidated by suitable means during placement and shall be thoroughly worked around reinforcement and embedded fixtures and into corners of forms.
- 12) Concrete shall be maintained above 50°F [10°C] and in a moist condition for at least 7 days after placement. Adequate equipment shall be provided for heating concrete materials and protecting concrete during freezing or near freezing weather.
- 13) Where exterior wall face requires shoring and/or forming, the forms shall be substantial and sufficiently tight to prevent leakage. Forms shall not be removed until the concrete is 7 days old.
- 14) Backfilling shall be done by depositing and tamping into place clean sand or pouring lean concrete. Water jetting shall not be allowed.
- 15) Conduits and pipes of aluminum shall not be embedded in concrete unless effectively coated or covered to prevent aluminum/concrete reaction or electrolytic action between aluminum and steel.
- 16) Construction joints not indicated on the drawings shall not be allowed. Where a construction joint is to be made, the surface of concrete shall be thoroughly cleaned and all laitance and standing water removed.
- 17) Contractor shall be responsible for the protection of all adjacent areas against damage and shall repair or patch all damaged areas to match existing improvements.
- 18) Contractor shall keep the construction area clean at all times and at completion of work remove all surplus materials, equipment and debris and leave the premises in a clean condition acceptable to the owner or owner's representative.



**ELECTRICAL & CONTROLS  
INSTALLATION INSTRUCTIONS  
VEHICLE ARREST SYSTEM**

COPYRIGHT 1991 DELTA SCIENTIFIC CORPORATION

ALL RIGHTS RESERVED

MFG. UNDER U.S. PATENT #4,097,170 4,158,514 4,318,079 4,354,771 4,490,068 4,576,508 4,715,742

U.K. PATENT # GB 2,127,893B 2,138,883B

40355 DELTA LANE • PALMDALE, CALIFORNIA 93551, USA • PHONE (661) 575-1100 • FAX (661) 575-1109

E-MAIL: [info@deltascientific.com](mailto:info@deltascientific.com)

**DELTA SCIENTIFIC CORPORATION**

40355 DELTA LANE  
PALMDALE, CALIFORNIA 93551

PHONE 661-575-1100

FAX 661-575-1109

E-MAIL [info@deltascientific.com](mailto:info@deltascientific.com)

**ELECTRICAL CONNECTION CHART****NUMBER OF BARRICADES:**

TWO PHALANX SERIES BARRIERS

**CONTROL AND OPTIONS:**

STANDARD 24 VDC CONTROL

MASTER CONTROL PANEL (OPTIONAL)

SLAVE CONTROL PANEL (OPTIONAL)

EMERGENCY OPERATE CIRCUIT (OPTIONAL)

ANNUNCIATOR CIRCUIT (OPTIONAL)

SAFETY LOOP DETECTOR, MODEL 3546 (OPTIONAL)

STOP/GO SIGNAL LIGHTS, MODEL MPL-10 (OPTIONAL)

STOP/GO SIGNAL GATE, MODEL AG812 (OPTIONAL)

**REFERENCE CIRCUIT DRAWINGS:**

905xx	HYDRAULIC POWER UNIT, DUAL BARRIERS OR SETS
906xx-2	CONTROL CIRCUIT AND MOTOR STARTER, 120-240/24 VDC, DUAL
90605	MAIN BOARD LOGIC DIAGRAM
907xx	MASTER CONTROL PANEL, SINGLE BARRIER
908xx	SLAVE CONTROL PANEL, SINGLE BARRIER

The following charts have been prepared to assist in the ELECTRICAL INTERCONNECT of the HYDRAULIC POWER SYSTEM, THE SYSTEM CONTROL CIRCUITS, THE REMOTE CONTROL/STATUS PANELS (MASTER AND SLAVE), AND VARIOUS OPTIONS offered with DELTA BARRICADE SYSTEMS. These CHARTS are designed to supplement the detailed circuit drawings which are furnished with each system.

The voltage carried by each conductor, unless otherwise specified, is 24 VDC. These conductors are indicated by this symbol ">>>>>>>>". The maximum power at this voltage is 250 watts for hot/neutral wires, 1 watt for device wires. Where the voltage is other than 24 VDC, the conductor is indicated by this symbol ">>>>>> \* >>>>>>" and a footnote specifies the voltage and current requirement. Either multi-conductor cable or single conductor wire can be used at the option of the installer. The wire size should be selected based on the pull length, current and voltage requirements and local codes and specifications.

Terminals are designated by a PCB board number followed by two letters followed by the terminal number, i.e. 1 CB 11. The first number is PCB Board number, in this case Barrier # 1, the first letter is the strip location, in this case "control circuit", while the second letter defines the terminal voltage. 'A' and some 'C' codes are low voltage 24 VDC. Some 'B' & 'C' codes are the specified local control voltage.

PHONE 661-575-1100  
FAX 661-575-1109  
E-MAIL [info@deltascientific.com](mailto:info@deltascientific.com)

\*\*\*\*\*

## BARRIER CONTROL CIRCUIT

\* Load per limit switch is 0.6 watts.

\*\*\*\*\*

## LOOP SAFETY DEVICE CONTROL CIRCUIT

**Note:** Jumper terminal 1 CA 5 to terminal 1 CA 6 if no loop detector safety device is used.

**Note:** Jumper terminal 2 CA 5 to terminal 2 CA 6 if no loop detector safety device is used.

\* Load per loop detector safety device is 0.6 watts.

**DELTA SCIENTIFIC CORPORATION**  
40355 DELTA LANE  
PALMDALE, CALIFORNIA 93551

PHONE 661-575-1100  
FAX 661-575-1109  
E-MAIL [info@deltascientific.com](mailto:info@deltascientific.com)

## **ELECTRICAL CONNECTION CHART**

\*\*\*\*\*

### **STOP/GO SIGNAL LIGHTS**

CONNECTION POINTS BETWEEN THE CONTROL CIRCUIT (DRAWING NO. 906xx-2 & 90605) AND ONE OR MORE STOP/GO TRAFFIC LIGHTS.

This circuit synchronizes the stop/go lights with either of the Barriers. As soon as a Barrier starts to rise the red "stop" light comes on and stays on until the Barrier has been lowered and is fully down. The green "go" light comes on at this point.

### **STOP/GO SIGNAL LIGHTS**

### **CONTROL CIRCUIT**

#### **Signal Lights for Barrier # 1**

Supply Voltage	>>>> Note 2 >>>>	AC Control Voltage Hot
Supply Voltage	>>>> Note 2 >>>>	AC Control Voltage Neutral
Common Terminal	>>>> Note 2 >>>>	1 CB 3
Signal Green Light	>>>> Note 1 >>>>	1 CB 4
Signal Red Light	>>>> Note 1 >>>>	1 CB 5

#### **Signal Lights for Barrier # 2**

Supply Voltage	>>>> Note 2 >>>>	AC Control Voltage Hot
Supply Voltage	>>>> Note 2 >>>>	AC Control Voltage Neutral
Common Terminal	>>>> Note 2 >>>>	2 CB 3
Signal Green Light	>>>> Note 1 >>>>	2 CB 4
Signal Red Light	>>>> Note 1 >>>>	2 CB 5

Note 1: These lines must be sized to handle one 40 Watts (maximum) incandescent bulb operating at the AC Control Voltage. If back to back lights are used, twice the current must be handled.

Note 2: If the commons are combined, the total of all currents must be considered.

**DELTA SCIENTIFIC CORPORATION**  
40355 DELTA LANE  
PALMDALE, CALIFORNIA 93551

PHONE 661-575-1100  
FAX 661-575-1109  
E-MAIL [info@deltascientific.com](mailto:info@deltascientific.com)

## **ELECTRICAL CONNECTION CHART**

\*\*\*\*\*

### **STOP/GO SIGNAL GATE, MODEL AG812**

ADDITIONAL CONNECTION POINTS BETWEEN THE CONTROL CIRCUIT (DRAWING NO. 906x0-1 & 90605) AND THE STOP/GO SIGNAL GATE MODEL AG812.

The Stop/Go Signal Gate Model AG812 is designed to have its motion coordinated with its companion Barrier. Upon raising the Barrier, the Signal Gate will lower to provide visual indication to drivers to stop. The Signal Gate will remain in the down position until the Barrier is again lowered to the full down position at which point the Barrier's down limit switch will cause the Signal Gate to raise.

#### **STOP/GO SIGNAL GATE**

#### **CONTROL CIRCUIT**

##### Signal Gate for Barrier # 1

1 Terminal 12	>>>> Note 1 >>>>	1 CB 10
1 Terminal 14	>>>> Note 1 >>>>	1 CB 11

##### Signal Gate for Barrier # 2

2 Terminal 12	>>>> Note 1 >>>>	2 CB 10
2 Terminal 14	>>>> Note 1 >>>>	2 CB 11

Note 1: The Model AG812 Signal Gates have the local control voltage brought to terminals L1 and L2. Signal Gate jumpers are on terminals CA 3 and CA 5 (changed from terminals CA 4 and CA 5).

PHONE 661-575-1100  
FAX 661-575-1109  
E-MAIL [info@deltascientific.com](mailto:info@deltascientific.com)

\*\*\*\*\*

## REMOTE CONTROL PANEL CONTROL CIRCUIT

Note 1: Size neutral and hot for 50 watts (maximum). All other lines are 1 watts each.

Note 2: The terminals 1 MA and 2 MA for these lines are jumpered at the factory; 1 MA 3 to 2 MA 3, 1 MA 18 to 2 MA 18, etc. A jumper will be required between the circuit boards in the control circuit.

PHONE 661-575-1100  
FAX 661-575-1109  
E-MAIL [info@deltascientific.com](mailto:info@deltascientific.com)

\*\*\*\*\*

[illegible]

Note 3: The terminals 1 SA and 2 SA for these lines can be commoned. A jumper will be required between the circuit boards in the control circuit.



**DELTA SCIENTIFIC CORPORATION**  
40355 DELTA LANE  
PALMDALE, CALIFORNIA 93551

PHONE 661-575-1100  
FAX 661-575-1109  
E-MAIL [info@deltascientific.com](mailto:info@deltascientific.com)

## **ELECTRICAL CONNECTION CHART**

\*\*\*\*\*

CONNECTION POINTS BETWEEN THE CONTROL CIRCUIT (DRAWING NO. 906xx-2 & 90605) AND THE HYDRAULIC POWER UNIT. NOTE: THESE CONNECTIONS HAVE BEEN MADE AT THE FACTORY BUT ARE SHOWN HERE AS AN AID TO TROUBLE SHOOTING.

### **CONTROL CIRCUIT**

#### **BARRIER # 1**

1 CB 17	>>>> Note 1 >>>>
1 CB 18	>>>> Note 1 >>>>
1 CB 19	>>>> Note 1 >>>>
1 CB 20	>>>> Note 1 >>>>
1 CB 21	>>>> Note 2 >>>>
1 CB 22	>>>> Note 2 >>>>

#### **BARRIER # 2**

2 CB 17	>>>> Note 1 >>>>
2 CB 18	>>>> Note 1 >>>>
2 CB 19	>>>> Note 1 >>>>
2 CB 20	>>>> Note 1 >>>>
2 CB 21	>>>> Note 2 >>>>
2 CB 22	>>>> Note 2 >>>>

### **MOTOR CONTROL CIRCUIT**

CC 18	>>>> Note 3 >>>>
CC 19	>>>> Note 3 >>>>
CC 20	>>>> Note 3 >>>>

### **HYDRAULIC POWER UNIT**

#### **VALVE SOLENOIDS**

# 1 UP
# 1 UP COMMON
# 1 DOWN
# 1 DOWN COMMON
#1 EMERGENCY OPERATE
# 1 EO COMMON

# 2 UP
# 2 UP COMMON
# 2 DOWN
# 2 DOWN COMMON
# 2 EMERGENCY OPERATE
# 2 EO COMMON

LEVEL SWITCH
LEVEL SWITCH/PRESSURE SWITCH
PRESSURE SWITCH

Note 1: These lines must be sized to carry 30 watts at 24 VDC.

Note 2: These lines must be sized to carry 20 watts at 24 VDC.

Note 3: Starter coil power consumption is less than 100 va inrush, and less than 10 va sealed.

**DELTA SCIENTIFIC CORPORATION**  
40355 DELTA LANE  
PALMDALE, CALIFORNIA 93551

PHONE 661-575-1100  
FAX 661-575-1109  
E-MAIL [info@deltascientific.com](mailto:info@deltascientific.com)

## **ELECTRICAL CONNECTION CHART**

\*\*\*\*\*

### **CONTROL CIRCUIT**

The Control Circuit is fed from the customer's local AC control voltage supply (either 100-120/1/50-60 or 200-240/1/50-60). Connection is to terminals CC 1(+) and CC 2(-). Supply should be adequate to provide a minimum of 250 Watts of power.

The control circuit contains a power supply, which reduces the local voltage to 24 VDC for use on the remote control panels. The feed out of the control circuit for these remotes is on terminal CA 1(+) and CA 2(-). Standard power capability is 150 watts. Battery back up power supply/charger and batteries are optionally available.

*Note:* Use caution when installing the field conduits and wiring to the control circuit enclosure. Shield metal chips and wire fragments from falling on to or in to components. Component failure can be caused by careless installation.

### **POWER UNIT MOTORS**

The motor has been ordered and supplied to the actual site voltage. Please confirm before hookup. The motor is factory wired to an automatic starter controlled by the hydraulic power unit pressure switch, oil level switch and (optional) three phase power monitor. Thermal overload protection is integrally provided.

The customer should provide branch circuit protection as required by national and local code. Care should be taken in arriving at the correct wire size for the length of cable provided.

### **HYDRAULIC POWER UNIT WIRING**

The three phase power is brought into the HPU terminal box to the line side of the door mounted disconnect switch at L1, L2 and L3.

Verify that the motor runs in the correct direction. Units with phase monitors (three phase only) are factory set to run in the correct direction. If motor does not run, or runs in the wrong direction, reverse any two incoming wires at L1, L2 or L3; motor should now run and in the correct direction.

Power for the starter contactor coil is the same as the primary voltage of the control circuit. Coil voltage legend plates are on the starter so that this can be confirmed. Connection points for the coil power are 'CC 1(+)' and 'CC 2(-)'. Starter coil power consumption is less than 100 va inrush, and less than 10 va sealed.

**DELTA SCIENTIFIC CORPORATION**  
40355 DELTA LANE  
PALMDALE, CALIFORNIA 93551

PHONE 661-575-1100  
FAX 661-575-1109  
E-MAIL [info@deltascientific.com](mailto:info@deltascientific.com)

## **ELECTRICAL CONNECTION CHART**

\*\*\*\*\*

### **SNOW MELTING HEATERS**

The system may be furnished with electric heaters for the purpose of melting snow and ice which may otherwise freeze the Barrier in either the up or down position.

The hydraulic oil reservoir may also be equipped with an immersion heater located within the oil level. It is equipped with a thermostat dial and should be set to a value between 60 to 75°F [15 to 25°C].

The electric feed to the heaters is fused in the control circuit. See appropriate wiring diagram for the connections.

Important: Before energizing the heater circuits at the start of each season, the elements must be megger tested. This is typically done with a megger capable of delivering 500 volts to the circuit. A value in excess of 50,000 ohms to ground is acceptable for energizing the heater circuits. Call the factory if a lower reading is found.

Failure of the elements will in no way cause the Barrier to malfunction unless there is an ice or snow build up inside the machine.



**MECHANICAL  
SYSTEM THEORY  
VEHICLE ARREST SYSTEM**

COPYRIGHT 1991 DELTA SCIENTIFIC CORPORATION

ALL RIGHTS RESERVED

MFG. UNDER U.S. PATENT #4,097,170 4,158,514 4,318,079 4,354,771 4,490,068 4,576,508 4,715,742

U.K. PATENT # GB 2,127,893B 2,138,883B

40355 DELTA LANE • PALMDALE, CALIFORNIA 93551, USA • PHONE (661) 575-1100 • FAX (661) 575-1109

E-MAIL: [info@deltascientific.com](mailto:info@deltascientific.com)

## **'OMEGA II' STYLE HYDRAULIC POWER UNITS**

### **THEORY OF OPERATION**

#### **Power Source**

This Delta Scientific Corporation Barrier system is powered by a hydraulic oil power unit (HPU). The unit is typically mounted remote from the Barrier and attached to it by hoses or steel pipes. The hydraulic power unit provides the tremendous lifting force necessary to raise the heavy steel weldments of the Barrier. The forces generated are in the range of several tons. An industrial grade electric motor drives the hydraulic gear pump to produce the HPU system pressure.

#### **Power Storage**

The HPU stores the pressurized hydraulic oil produced by the gear pump in an accumulator. The accumulator thus provides a high pressure reserve of oil available to move or maintain the position of the Barrier. The pressure of the oil in the accumulator is maintained by the automatic cycling of the pump motor on and off between the low and high settings of a pressure switch. It is important to note that the pump motor thus runs independently of any command from the Barrier control panel; if pressure is low the pump motor will run, if the pressure is within bounds (even with the Barrier moving) the pump motor will be off.

In addition to providing the high pressure oil to move the Barrier, the accumulator also acts as a hydraulic spring to cushion the various parts of the hydraulic system during normal operation and when the Barrier is performing its' designed task of arresting vehicles.

#### **Power Access**

To move the Barrier we must direct the pressurized oil in the HPU to the appropriate up or down side of a hydraulic cylinder in the Barrier. This is done by shifting a directional valve mounted on the HPU. The shifting is accomplished by energizing one of two electric solenoids on the valve. The valves used by Delta are known as 'two position, electrically actuated, spring detented'. The spring detent allows the valve to remain in the position it was last shifted to without being constantly energized. This saves energy and allows the Barrier to remain in its commanded position **even if power is interrupted** to the HPU.

### **GOOD HYDRAULIC PRACTICE**

#### **Safety Precautions**

At all times observe good safety practices when working on either the electrical or mechanical system. Particular attention should be paid to the danger of working on the Barrier when the power is on. The Barrier is a powerful hydraulic press that can easily crush anything in its way. Keep hands free of the mechanism when the power is on or the HPU is up to pressure. Turn off the electric power and bleed the hydraulic pressure down to zero before working on any part of the system. Traffic should be controlled around the Barrier during any work so that vehicular accidents do not occur if the Barrier should happen to unexpectedly move. After work is complete, do not allow traffic over the Barrier until all control and safety functions have been verified to be properly working.

## **Cleanliness**

To maintain system efficiency and reliability great care must be taken to prevent any form of dirt, sand or grit from entering the hydraulic system. Only new, clean **filtered** hydraulic oil should be used for charging the unit. Unless specifically ordered as filtered, new oil should be pumped through a 25 micron filter when charging. See [Commercial Hydraulic Oil Interchangeability Chart](#) for our recommended oils. The tests conducted at the factory on the system have been done with the HPU charged with Shell 'Tellus' 46. This grade is for moderate temperatures and is available in most of the worlds leading cities. Hydraulic oil is subject to degradation and contamination with age so follow the recommendations in the [Maintenance](#) section of this manual.

## **Location**

The hydraulic power unit should be mounted indoors in a clean, dry location away from excessive heat or cold. As an alternate the unit can be mounted outdoors as it is built standard to a NEMA 3R (IEC IP32) rating. The enclosure material is aluminum for corrosion resistance.

It is important that the hydraulic power unit be mounted at approximately the same or higher elevation as the Barrier(s). If the HPU is mounted lower than the Barrier(s), the oil in the lines may repeatedly drain back to tank and make the Barrier motion erratic. The power unit can be at elevation greater than the Barrier(s) if it is understood that breaking a line at the Barrier will cause oil to flow in that direction.

## **System Component Description**

The hydraulic power unit (HPU) is assembled in an aluminum enclosure, which supports the hydraulic oil reservoir and major components. Provision is made to permit bolting or lagging of the enclosure sub base to a suitable foundation. See the appropriate General Arrangement drawing for hole and interface dimensions. The enclosure proper bolts to the sub base. We suggest that the enclosure be gasketed or caulked to the foundation with an RTV adhesive to prevent water from entering the HPU from the underside.

The power unit has been pre-tested for function and leaks at the factory prior to shipment. Preparation for shipment calls for the draining of the test oil, however, approximately one inch [25 mm] may remain in the tank after draining.

## **Oil Reservoir Tank**

The oil reservoir is mounted on a frame above the pump/motor assembly. It forms a structure to which other components are attached. On the top is mounted the filler breather cap by which oil can be added to the tank. The capacity of the reservoir is nominally 5 gallons [20 liters]. This is also the approximately charge of oil that will be required to fill the lines and hydraulic cylinders of the Barriers.

A sight glass on tank's side indicates the tank's level. The reservoir should only be filled with the hydraulic system pressure at zero, otherwise overflowing can occur as a result of oil being displaced out of the accumulator. The proper oil level is within 1 inch [25 mm] of the sight glass top at zero system pressure.

The reservoir tank has connections for the pump feed (through a manual shut off valve and strainer) and tank return line from the valve manifold. A reservoir heater can be supplied if the ambient temperature so dictates.

### **Gear Pump/Check Valve**

The gear pump is mounted on a motor adapter and attached to the motor drive shaft by a flexible coupling. The set screws in the coupling halves should be checked for tightness on the pump and motor shafts prior to start up. The pump seals, as are all other HPU component seals, are Buna-N or Viton. A check valve is located at the pump. Its purpose is to prevent the pressurized oil in the high-pressure side of the unit from running back through the pump after the motor shuts off. If it were to fail you would likely see the fan on the pump motor run backwards and the system pressure fall until zero.

Do not start the pump/motor until oil has been put into the reservoir. The pump can only be run dry for a few seconds before damage to the gears and the housing occurs. The suction line to the pump is provided with a shutoff valve to facilitate maintenance. This valve must be fully open at all times except when replacing the pump. A closed pump shutoff valve can destroy the pump in seconds.

### **Motor**

The motor is mounted horizontally under the oil reservoir and is bolted to the HPU framework as well as to the other side of the pump/motor adapter. It is a totally enclosed fan cooled (TEFC) design, three phase AC as standard (alternate motors are furnished as optionally required). The motor voltage(s) and rating is shown on its name plate, its **as wired** voltage is shown on the Delta motor placard attached to the motor starter J'box.

Motor/pump direction of rotation is **critical**. A direction arrow decal is provided. The motor must run in this direction when site power is brought to the HPU enclosure, if not, see motor nameplate for the reverse wire connections.

### **Magnetic Motor Starter/Overload**

Site voltage is fed to the line side of the motor starter/thermal overload. See voltage placard attached to the starter enclosure for the **as wired** voltage and motor starter circuit drawing number. The feed to the HPU should be controlled from an appropriately sized circuit breaker/disconnect switch and the wires sized properly to prevent excessive voltage drop from the disconnect switch to the HPU skid. Motors should not be allowed to run at voltages exceeding +/- 10 percent of their ratings. This could lead to tripping of the thermal overloads or substantial damage to the motor and control circuit components.

The thermal overload is calibrated for the anticipated full load amperage of the motor at run voltage; this setting should be confirmed before start up (the amperage dial of the overload should be set for the full load amps labeled on the motor name plate). The overload should be in the **MANUAL** position; automatic reset could cause equipment failure if a fault is not corrected in a timely manner.

## **Accumulator**

The accumulator is a large cylindrical pressure vessel that provides the high pressure reserve of oil used to move the Barrier and keep it in position. In addition, the oil stored in the accumulator is available to move the Barrier even if the pump/motor should be inoperable. The amount of oil directed out to the Barrier is not limited by the displacement rate of the hydraulic gear pump but by the oil stored in the accumulator.

An accumulator is divided into two sides by a piston (piston accumulator). On the top side (the side with the precharge valve), the accumulator contains dry **nitrogen** gas pre-pressurized (precharged) at the factory to the pressure indicated on the Pressure Log of this Manual. The fittings and seals on the nitrogen fill connection should be kept tight to prevent loss of this precharge. A special tool is available from Delta Scientific to check the precharge pressure and facilitate recharging if that should become necessary. Precharge should be checked at least every six months (see Maintenance section of this manual). The pump/motor should not be run if there is no precharge; damage to the accumulator could result. Only dry nitrogen should be used for precharge, air or other gases **could cause the accumulator vessel to explode**. Precharge should only be done at zero hydraulic pressure or an incorrect precharge pressure will result.

The other side of the accumulator contains the system hydraulic oil. At zero hydraulic oil pressure there is little or no oil in the accumulator, the piston is down hard on the oil outlet. As the pump/motor runs, oil accumulates on the oil side at the pressure indicated by the system pressure gage (oil side). This pressure gage will read the precharge indirectly by jumping to the precharge value on motor startup then slowly running up to the shut off pressure. It is important to note that at shut off, only a portion of the accumulator contains oil, the piston has been pushed back to compress the nitrogen gas which is now also at the shutoff pressure. It is the compressed gas that provides the 'spring' to move oil out of the accumulator and to the cylinder(s) of the Barrier.

When performing accumulator maintenance it is necessary to bring the oil side pressure to zero. Large oil loss can occur if fittings are tampered with while under pressure. (See "System Bleed Down Valve" paragraph in this Manual section.)

## **Pressure Switch**

The pressure at which the oil side is maintained is determined by a pressure switch, mounted on the high pressure (accumulator) side of the system. The switch is factory set at 1350 psig [93 bar] and has a 500 psig [34 bar] 'dead-band'. This means that the pressure will fall 500 psi [34 bar] after shutoff before the switch closes to restart the pump motor. The settings should be noted in the pressure log in the Maintenance section. The electric side of the switch is terminated on a terminal strip in the motor starter enclosure.

## **Pressure Gage**

A pressure gage is provided to indicate the hydraulic oil pressure of the system. It does not indicate the accumulator precharge except as noted in the Accumulator paragraph of this section. The gage is liquid filled with glycol to eliminate needle bounce and a vent is thus provided to allow the case to breath, preventing case blow out. Upon receipt, remove vent seal plug/label if so equipped.



This gage must read zero when working on the HPU pressure lines and fittings or large oil loss can occur. A gentle tapping on the gage glass will provide the most accurate readings.

### **Pressure Relief Valve**

A pressure relief valve is provided should the pressure switch fail to shut off the pump/motor. It is typically set 200 to 250 psig [14-17 bar] higher than the pressure switch high setpoint. When the pressure relief valve opens, oil is allowed to circulate from the pressure side of the pump to the tank/pump suction. The motor horse power is thus being turned to heat across this valve which could cause component damage if allowed to operate uncorrected. A open pressure relief valve will cause a hissing sound and if the motor is turned off a falling pressure gage would be noted. If the relief valve does not reseal on pressure reduction see Trouble Shooting section.

The pressure relief valve should in no case be set higher than 1.1 times the pressure rating of the minimum rated component in the Barrier system. Please note that most components are designed with a 4 to 1 safety factor, thus the burst pressure of a 2500 psig [172 bar] rated hose would be 10,000 psig [690 bar].

### **Hand Pump (Optional)**

In the event power should be lost to the pump/motor, the Barrier can be raised by working an optional manual hand pump which is mounted adjacent to the pump/motor on the enclosure bottom. The hand pump has its' own internal check valve so no fluid is lost through the hand pump back to tank during normal motor driven pump operation. The suction line to the hand pump is located near the reservoir bottom. In use, the hand pump supplies oil to the pressure (P) side of the hydraulic system. The pump can be operated at anytime. To raise a Barrier with the hand pump when electricity is out:

- 1) Check sight gage for proper fluid level, add oil as necessary.
- 2) Make sure accumulator bypass (bleed down) valve is closed.
- 3) Shift directional valve spool of Barrier from left (Up) side.
- 4) Start pumping (each stroke should be productive). Pump until Barrier is fully up.
- 5) Continue pumping for 10 to 20 strokes after the Barrier is up. This will add some oil to the accumulator to provide for some internal leakage before the Barrier would start to drift down from low pressure.

### **Directional Control Valve**

A solenoid actuated directional control valve is provided to direct the high pressure oil to the up or down side of the Barrier cylinder. It is mounted on an aluminum manifold bolted to the back plate on the oil reservoir. When the 'up' side is energized, the valve connects the high pressure (P) side of the manifold to the (B) output port of the manifold. The tank return line (T) is simultaneously connected to the (A) output port. When the 'down' side is energized, the manifold (P) side is connected to the (A) port and the (T) side is connected to the (B) port.

The directional valve is equipped with pin extensions mounted on the solenoid ends so that the valve spool can be manually shifted by inserting a pin with a diameter of approximately 0.125 inch [3 mm]. As described above in the Power Access paragraph, the valve has spring detents so that it remains in the last commanded position until moved by the electric solenoids or the override pins. See the applicable 'Hydraulic Valve Connection' drawing.

The spool of the valve is designed to provide 'closed center ports' so that if the valve malfunctions and does not fully shift, the ports will be closed to one another. Note that the valve requires clearance between the spool and the valve body to properly function, thus some leakage from pressure to tank is to be expected. Excessive valve wear will eventually cause the pump/motor to cycle on and off several times per minute even when the Barrier is not moving. Replacement or rebuilding of the valve will then be required.

The valve is held to the manifold with high tensile cap screws. Buna-N or Viton O-rings are used to seal the valve port face to the manifold. It is imperative that the mating faces be clean and all 'O' rings in place and lightly lubricated with hydraulic oil before evenly torquing the cap screws.

The convention used on all Delta Barrier systems regarding the directional control solenoid valves is as follows:

<u>Side/Solenoid</u>	<u>Wire Color</u>	<u>Function</u>
Left/'B'	Black	UP
Right/'A'	Red	DOWN
---	White	COMMON
---	Green	GROUND

Valve mounting screw torque:

NFPA DO1/ISO 03 - 40 to 50 in-lbs [5 to 6 N-M]

### **Speed Control Valves**

The directional valve station has speed control valves to control the normal up and down speed of the Barrier. These are back to back mounted flow control valves in the 'B' hydraulic line. (A flow control valve is a needle valve with an integrally mounted check valve around the needle restriction.) The Delta convention on these valves is that the valve closest to the directional control valve controls the Barrier up speed, the valve closest to the Barrier controls the Barrier down speed. Clockwise turning of the adjustment knob is slower (valve closing); faster speed is gained by opening the valve (counter-clockwise). The valves should be locked with the set screw (lock nut) provided after adjustment.

See the Start Up section of this manual for recommendations on the normal up and down speeds of your Barrier. Speeds in excess of the recommendations may damage your system.

### **System Bleed Down Valve**

Prior to performing any work on the hydraulic power unit or Barrier it is necessary to bleed down the pressure stored in the accumulator. **Note:** It is especially necessary to bleed the power unit

down to zero hydraulic pressure before topping off the reservoir with fresh oil; large oil spillage can occur if the unit is not at zero pressure when the reservoir is topped off! This is accomplished with the accumulator bypass or bleed down needle valve located between the high pressure side of the system and the reservoir tank.

To bleed down the system:

- 1) Turn off electrical power to the pump/motor.
- 2) Release set screw. Crack open the bypass needle valve slightly until hissing sound is heard. Continue to open slowly until pressure on gage reads zero.
- 3) For added safety, leave valve open while performing maintenance.

To resume operation, close the bypass valve snugly and lock with set screw. Turn on system power.

### **Hydraulic Interconnect Lines**

Delta Scientific uses one of two systems to connect the hydraulic power unit to the Barrier. Applicable to both systems is a need to run the lines in the most direct route as possible, keeping bends to a minimum. Long runs will slow the Barrier rise time and must be compensated by increasing the flow diameter. In general, all runs over 50 feet [15 M] should first be cleared with the factory.

Cleanliness is the other important requirement for the hydraulic interconnect lines. Dirt or metal chips will find their way into the tight clearances of the components, scoring shafts and spools and wearing seals. Lack of cleanliness will shorten the service life of the system.

### **Flexible Hydraulic Hose**

This system conveys the hydraulic oil from the HPU to the Barrier through flexible hoses which in turn are run through a larger conduit, generally a 2 inch [50 mm] or 3 inch [75 mm] PVC tube per hose pair. The PVC conduit should be run to the Barrier in as direct a line as possible, all bends being a radius of at least 6 diameters of the conduit. The burial depth of the conduit should be deeper than the maximum permafrost level in areas subject to freeze. This will prevent excessive pressure drops in the hoses due to high viscosity from the cold. As the length of a hose changes under pressure, always provide some slack in the hose to allow for shrinkage or expansion.

All joints in the conduit system should be smooth and free from sharp edges and burrs to prevent scoring the hose outer sheathing during pulling and Barrier operation. A hose under pressure is very rigid and tends to bounce when the directional valves are shifted. Sharp edges will quickly cause a hose failure. Where the hose can not be clamped or fixed away from abrasive surfaces, a steel or plastic protective coil or sleeve should be placed over the hose.

If the hose run passes near an exhaust manifold or other heat source, it should be insulated by a heat resistant boot, fire- sleeve or a metal baffle.

Hoses received from the factory have caps on each end and are free from dirt and other contamination. Do not remove caps until hoses are pulled through the conduit and are ready for termination. If caps are not present, reclean the hoses by blowing out with clean compressed air. As an alternate, hose assemblies may be rinsed out with clean mineral spirits, being sure to flow the mineral spirits through from top to bottom without forming any low points which will tend to collect debris.

Before attempting to pull hoses through the conduit first inspect them. Lay the hose out straight and check that the layline of the assembly is not twisted. (Hoses pulled with a twist in them will tend to straighten, causing fitting nuts to loosen.) Check for scoring, cracks, bulging, kinks and dirt in the outer sheath. Check for proper gap between nut and socket or hex and socket; nuts should swivel freely. Be sure hose is capped securely.

If the hose must be stored for a prolonged period prior to installation it should be kept in a dark, dry atmosphere away from electrical equipment. The temperature should not exceed 90°F [32°C]. Storage in straight lengths is preferred. While stored, the hose should be wrapped as necessary with burlap or other suitable material to prevent damage.

Hoses should be inspected regularly when in operation, especially where the hose exits the conduit at the HPU or the Barrier. Worn or damaged hose assemblies should be replaced immediately.

Note: Hoses supplied by Delta Scientific are generally supplied in lengths of 25 feet [7.6 M] or 50 feet [15 M]. This is adequate for the majority of installations, however, there is generally some left over length. Coil the hose neatly in a circle approximately 20 inches [0.5 M] in diameter at the HPU. Secure the coil with loosely fitting cable ties or similar tie system. Do not allow the hose to rest on the ground or across sharp corners of equipment. If the hose is too short, extension pieces of the correct length can be ordered. As an alternate, hoses can be held back from your shipment and made to exact requirements after the length is determined.

'Reusable' or 'field' fittings may sometimes be supplied. These allow the hoses to be cut to the lengths required and re-terminated without having a hose swaging press at the job site. Do not swage fittings on Delta supplied hose unless done with hose, fittings and dies furnished of compatible make.

### **Steel Pipe Interconnect System**

As an alternate to the flexible hose system, steel pipe may be used for the run from the HPU to the Barrier. The same comments above about short, direct, runs to the Barrier apply. Typically the pipe run is made up above grade and dropped into a trench for direct burial (below frost level if applicable). If local conditions dictate, the outer portion of the pipe and fittings can be corrosion protected by coating or tape wrapping if desired. Short lengths of hose, typically 3 feet [1 M] long, can be supplied to attach the HPU and Barrier to the pipe system. Or the piping can be plumbed directly to the fittings on HPU or Barrier (for this a union will be required).

The pipe used should be ASTM A-106B seamless (carbon steel) as a minimum. Care should be taken when selecting wall thickness Vs pipe diameter for the system design pressure. (Delta can be consulted for proper line sizing, strength calculations and material selection.)

Fittings for the pipe run should be forged steel, ASTM A-105 or equal. Malleable iron is **not** acceptable. All pipe and fittings are to be furnished black, i.e. no galvanizing is permitted; the galvanize can flake off and block or damage hydraulic components.

If desired, stainless steel pipe and fittings can be used, however, do not mix stainless steel pipe with carbon steel fittings or severe corrosion of the carbon steel components could result. Copper and copper bearing alloys are generally unsuitable for hydraulic oil systems and should be avoided when possible.

### **Interconnect Convention**

So that the Barrier rises when the 'Raise' button is pressed it is necessary to coordinate the interconnect lines with the proper HPU and Barrier connections. The follow convention has been established by Delta:

<b><u>Color Tab</u></b>	<b><u>HPU Port</u></b>	<b><u>Barrier Cylinder</u></b>	<b><u>Function</u></b>
Red	'B'	Rod (Bottom) End	UP
Yellow	'A'	Cap (Top) End	DOWN

\* The rod end connection is frequently vented to air at the cylinder or on the tank top.

### **Fittings**

A variety of fittings are used on a Delta Barrier system; an understanding of how each style seals is important so that leak free operation can be maintained.

Pipe threads are of American National Taper Pipe Thread pattern. As the name implies they seal when the threads pull the tapers together to form a tight joint. These threaded fittings are the only style used by Delta on which Teflon tape or pipe dope may be used. Great care should be taken that pieces of tape or liquid sealant do not end up in the part being sealed as they will eventually find their way into valve seats or other critical parts. Start wrapping the tape one or two threads back from the front of the male fitting and only one or two times around is sufficient. More than twice around is detrimental to a tight joint. Fittings should be brought up snug but not too tight or the female part can be distorted. If orientation of the part is critical, stop on your mark as the part is getting snug instead of trying to force the fitting another complete turn.

SAE (Society of Automotive Engineers) straight threads are used on several fittings where the connection orientation is critical. The male fitting is oriented and a locking nut with washer and O-ring is tightened against the female part. Again, do not over tighten or distortion can occur.

The remaining fittings are SAE 37 degree flare fittings. These have a male nipple to which a compatible female hose or tube/nut can be attached. Most plumbing on the HPU is done with steel hydraulic tubing held to the SAE 37 degree male flare nipple with a ferrule and nut. The tube is not flared but cut square and deburred. The sealing pressure comes from the nut forcing the ferrule down onto the tube. These fittings can be broken and remade if necessary. Again snug is preferred to overtightened.

Most hoses supplied by Delta are terminated with SAE 37 degree female swivel ends. As the nut swivels on the hose, unions are not necessary. These screw directly onto a companion SAE 37 degree male nipple. To avoid confusion as to a fitting size, use the following table should ordering be necessary:

<u>Hose I.D.</u>	<u>Steel Tube OD</u>	<u>Thread Dimensions</u>
1/8"	1/8"	5/16-24
1/4"	1/4"	7/16-20
3/8"	3/8"	9/16-18
1/2"	1/2"	3/4-16
3/4"	3/4"	1-1/16-12
1"	1"	1-5/16-12

Note: Do not use Teflon tape or pipe dope on any straight thread fitting. Only taper pipe threads are to be so sealed.

### **Cylinders**

The Barriers are moved by double acting hydraulic cylinders. These are specified by the bore diameter and length of stroke, such as 2.5" by 8". When the Barrier is commanded to rise, oil from the 'B' hydraulic hose is forced into the 'rod' end of the cylinder, pushing the cylinder piston into the cylinder body. The rod end of the cylinder terminates in a clevis and the clevis pin pulls against the Barrier to move it in the up position. When lowering, the cylinder rod extends out of the cylinder body as the oil flows out of the rod end and back to the oil reservoir. The 'cap' end of the cylinder is either vented back to the reservoir tank top, or alternately, may have pressurized oil from the 'A' hose force the Barrier down.

The cylinders are pre-plumbed to connections at the Delta factory. The connections terminate in the Barrier access area where the customer ties the Barrier to whatever interconnect system is selected. The connection fittings are color coded as noted above in the Interconnection Convention paragraph.

## **Hydraulic Oil**

The hydraulic oil selected for the Barrier system is one of the most critical decisions to be made on your installation. The properties of the oil will affect the as new performance of the Barriers as well as the performance in years to come. Delta recommends the use of high grade, inhibited petroleum hydraulic oils for use in its systems. These oils inhibit or prevent rust, oxidation, foaming and wear. They are readily available just about everywhere in the world.

A viscosity compatible to the expected ambient temperature of the job site should be used. Heavy oil used in snow conditions will tend to slow the Barrier response time down, while light grade oils in desert conditions may not provide lubricity necessary to prevent component wear. Most brands of oils are manufactured in different grades for this purpose.

If required, the new fire-resistant or environmentally friendly fluids can be selected, please consult your fluid dealer for correct selection.

Delta does not recommend the general use of automatic transmission fluid in our systems. While compatible with the seal materials used in all the system components, ATF does not have sufficient viscosity at moderate temperatures and it is generally more expensive than the specially formulated general purpose hydraulic oils. **Under no circumstances** should brake fluid be used. It is not compatible with the seals and will swell and degrade them.

**Note:** The unit as received from the factory has been tested with Shell Oil Company 'Tellus' 46. Although the unit has been drained after test approximately 1 inch [25 mm] of fluid remains in the reservoir bottom. The hydraulic oils in the following tables should be compatible with this fluid.

## **Biodegradable Oils**

Environmentally friendly oils are also acceptable for use in these systems. These fluids are generally based on naturally occurring vegetable oils and are biodegradable by naturally occurring organisms when spilled or leaked in relatively small quantities. Larger spills will still need to be handled similarly to currently accepted methods for conventional mineral oil spills.

Contamination of these oils by other fluids may change the biodegradability, toxicity, or other performance characteristics. Systems should be cleaned as thoroughly as possible before introducing a biodegradable fluid.

Delta has reviewed the data on biodegradable oils manufactured by both Mobil and Texaco. These are summarized below. Other manufacturers' products are acceptable if equal to the performance of these oils or the standard mineral oils listed in the following pages. Consult your local fluid dealer for his recommendation.

### **Mobil Oil Corporation**

Light	EAL 224H
Medium	EAL 224H

### **Texaco Lubricants Company**

Code 1607 Biostar Hydraulic 32
Code 1616 Biostar Hydraulic 46

## Commercial Hydraulic Oil Interchangeability Chart

*	<b><u>AMOCO Oil Co.</u></b> <b><u>(Std. Oil Co)</u></b>		<b><u>AMSOIL</u></b>	<b><u>Ashland Oil Co.</u></b> <b><u>Valvoline Oil Co.</u></b>
	Light	Rycon Oil #15	AWH ISO 32	AW Oil #15
	Medium	Rycon Oil #21	AWI ISO 46	AW Oil #20
	Heavy	Rycon Oil #31	AWJ ISO 68	AW Oil #30
*	<b><u>Atlantic Richfield</u></b> <b><u>(ARCO)</u></b>		<b><u>Chevron USA Inc.</u></b>	<b><u>Continental Oil Co</u></b>
	Light	Duro AW S-150	EP Hyd Oil 32	Super Hyd 15
	Medium	Duro AW S-215	EP Hyd Oil 46	Super Hyd 21
	Heavy	Duro AW S-315	EP Hyd Oil 68	Super Hyd 31
	<b><u>Exxon USA Inc.</u></b>		<b><u>Getty Refining</u></b>	<b><u>Gulf Oil Co.</u></b>
	Light	Nuto H 32	Veedol Aturbrio AW 150	Harmony 43 AW
	Medium	Nuto H 46	Veedol Aturbrio AW 58	Harmony 48 AW
	Heavy	Nuto H 68	Veedol Aturbrio AW 61	Harmony 54 AW
	<b><u>Mobil Oil Corp.</u></b>		<b><u>Phillips Petroleum</u></b>	<b><u>Pennzoil Co.</u></b>
	Light	DTE 24	Magnus A 150	Hyd & GP Oil #1
	Medium	DTE 25	Magnus A 215	Hyd & GP Oil #2
	Heavy	DTE 26	Magnus A 315	Hyd & GP Oil #3
	<b><u>Shell Oil Company</u></b>		<b><u>Std Oil Co of Ohio</u></b>	<b><u>Texaco, Inc.</u></b>
	Light	Tellus 32	Industron 44	Rando Oil HD 32
	Medium	Tellus 46	Industron 48	Rando Oil HD 46
	Heavy	Tellus 68	Industron 53	Rando Oil HD 68
	<b><u>Union Carbide Corp</u></b>			
	Light	**		
	Medium	UCON Hyd Fluid WS34		
	Heavy	**		

\* Light oils are for cooler climates; medium for temperate zones; heavy for tropical or desert areas.

\*\* No recommendation





**START UP PROCEDURE  
VEHICLE ARREST SYSTEM**

COPYRIGHT 1991 DELTA SCIENTIFIC CORPORATION

ALL RIGHTS RESERVED

MFG. UNDER U.S. PATENT #4,097,170 4,158,514 4,318,079 4,354,771 4,490,068 4,576,508 4,715,742

U.K. PATENT # GB 2,127,893B 2,138,883B

40355 DELTA LANE • PALMDALE, CALIFORNIA 93551, USA • PHONE (661) 575-1100 • FAX (661) 575-1109

E-MAIL: [info@deltascientific.com](mailto:info@deltascientific.com)

**START UP INSTRUCTIONS**  
**BOLT DOWN STYLE PHALANX BARRIER OPERATED FROM OMEGA II HPU**

**Safety Precautions**

At all times observe good safety practices when working on either the electrical or mechanical system. Particular attention should be paid to the danger of working on the Barrier when the power is on. Barriers are powerful hydraulic presses that can easily crush anything in their way. Keep hands free of the mechanism when the power is on or the HPU is up to pressure. Turn off the electric power and bleed the hydraulic pressure down to zero before working on any part of the system. Traffic should be controlled around the Barrier during any work so that vehicular accidents do not occur if the Barrier should happen to rise. After work is complete, do not allow traffic over the Barrier until all control and safety functions have been verified to be properly working.

**YOUR SPECIAL ATTENTION IS CALLED TO THE FOLLOWING:**

**Special Safety Considerations**

Delta Barrier Systems are designed to deter, and as necessary stop unauthorized vehicle traffic by inserting a nearly immovable obstacle in a roadway. During normal servicing, maintenance and testing work, every effort must be made to protect pedestrian and vehicle traffic from entering traffic lanes where work is underway.

During work on either the Barrier(s), the control circuit, control logic, power unit, power feed or the control panel(s); traffic across or near the Barrier(s) should either be stopped or directed into a safe passage.

Prior to starting, restarting or restoring power to a Barrier system all remote input devices such as radio links, card readers, remote control panels, etc. should be checked to insure that they are properly set or are inactive. This is important to insure that a signal directing the Barrier to change status is not unexpectedly received at the time when the power is restored.

When a Barrier is powered up, whether at start-up, following a power outage or following the completion of service or maintenance work, these same precautions should be taken.

Consult the other sections of this manual for additional safety and security instructions and warnings.

**System Configuration**

Depending on the threat analysis and the specific layout of an installation site, Barrier systems can be configured to react differently to a variety of input signals or events. The selection of components and the configuration to meet these requirements are usually incorporated in the system at the time of manufacture. However some changes can be made in the field or by changing the nature of supplied input.

## **Default Status Quo**

In most locations, security considerations are such that a Barrier system can be configured to 'default status quo', that is the Barrier will not change status following a power outage or interruption. If a Barrier system so configured is in the open position when power is applied at initial start-up, following service or in the event of a local power outage, the Barrier will remain in the open position as when the power was removed or interrupted. Or if the Barrier is in the guard position it will return to the guard position upon resumption of power. An exception to this is the special situation as defined below in the 'power off' section.

## **Default Secure**

In certain high security areas Barrier systems may be configured so as to default to the Secure Status when power is applied to a system, whether following the system having been turned off or after unexpected power interruption. Thus a system on stand-by automatically goes to the guard position when the power is applied. That is, should the power be interrupted and then restored, while the Barrier is in the open position, it will return to the guard position.

If a Barrier is in the guard position when the power is interrupted it is normally designed to hold the guard position.

## **Power Off Operation**

A Barrier system with a battery back-up for the control circuit and the power off feature, can be operated a limited number of times during a power off condition. Once the power off reserve is exhausted, the last command the system receives will dictate the Barrier position when power is restored. Hence, if the Barrier is in the open position when the 'power off' reserve is spent, and the system then receives a close signal, the Barrier will remember that last signal and close when power once power is restored.

## **Additional Precautions**

Delta Barrier system controls are configured to meet site specific security conditions and the operating logic is most often defined at the time of procurement.

If the security or safety consideration of the site where the Barrier is installed or to be installed, dictates that the operation be altered from the original specification, contact the Engineering Department of Delta Scientific Corporation for assistance in making the desired revisions.

During routine maintenance and service work, or during thunder storms or other weather related disturbances, power interruptions can occur. For detailed service, maintenance and safety information refer to the specific sections of this manual provided with each system.

Before operating the system for the first time, make sure that all on the interconnections have been made between the Barrier, control panels and the hydraulic power system. After you are sure that everything is in order, make a visual inspection of the site to check that tools and construction debris are removed and clear of the equipment.

## **Power**

The electrical power that drives the system is typically supplied through a circuit breaker disconnect (customer furnished) that must be turned on before the system will operate. When the main power is turned on the pump motor will, in most cases, start and run until the system cut off pressure is reached. It is important on start up to **verify that the pump motor is turning in the proper direction** indicated by an arrow on the motor fan housing. Turning on the power without this check will destroy the pump in short order.

## **Control Buttons and Their Function**

### **Master Remote Control Panel On/Off Switch**

The master control panel has a main power indication light to show that the control circuit power is 'on'. Turning the master control panel main power On/Off key switch to the ON position will in turn illuminate the panel 'on' light.

### **Barrier Up/Down Controls**

There are two basic controls for the Barrier, one to raise and one to lower. The Barrier can be commanded to either raise or lower at any time whether it is moving or stationary. The Barrier will instantly reverse direction if so commanded at any point in its operation.

### **Barrier Position Indication (optional)**

The Barrier has position indication lights on the control panel. A green light indicates that the Barrier is fully down on the limit switch, any other position results in a red light indication.

### **Annunciator (optional)**

An annunciator feature is provided to alert the guards that the Barrier has been left in the down position for too long. The master remote control panel has an 'Annunciator Off/On' switch. With the switch in the 'Off' position, no alarm will sound. When placed in the 'On' position, the alarm will sound if the Barrier is left down longer than the preset value of the Annunciator Timer located in the control circuit. The alarm can be silenced by raising the Barrier or by turning the switch back to the 'Off' position. The timer is customer adjustable by accessing the control circuit.

### **Secondary, or Slave Panels (optional)**

Secondary panel(s) can be incorporated in the system, which allows for full operation of the Barrier from locations remote from the Master Control Panel. The slave control panel(s) are armed from the master control panel location. The slave panel(s) have main power indication lights to show that the panels are armed from the master control panel. Turning the slave control panel(s) main power On/Off key switches to the ON position will in turn illuminate the panel 'on' lights.

## Other Control Devices

Other control devices may be provided by Delta or by others. The Barrier can be raised or lowered by any normally opened, momentary closure type button or remote control device, such as radio, key pads, card readers, loops, etc.

## Start Up

### Safety Precautions

On initial start up, it is important to close off the roadway and clear the Barrier area of nonessential personnel. **Barrier movement may be very erratic at first.** In addition, each time the system is restarted or maintenance is performed the roadway should again be cleared to guard against unexpected Barrier movement.

### Start Up Sequence

1. Block all traffic during tests. Stay clear of Barrier.
2. Check that all electrical and hydraulic inter-connections are tight.
3. Fill system with **clean, filtered** oil to within 1" of the top of the sight glass. The oil reservoir capacity is approximately 4 gallons [15 liters].
4. Turn flow control valves fully clockwise to close, then open each two turns as a starting point. Confirm that pressure bleed down valve is closed.
5. Briefly apply power to the motor to confirm that the motor direction is per the direction arrow on the motor fan housing. Correct if necessary.
6. Apply power to the motor and allow the pump to bring the system up to the shutoff point of 1350 psig [93 bar] as shown on the motor starter drawing.
7. Check for any leaking fittings.
8. Operate each Barrier manually by pushing the override pins on the ends of the solenoid valves.
9. Check that when the **left** side solenoid pin is depressed, the Barrier **raises**. When the **right** side pin is depressed the Barrier **lowers**.
10. Cycle the system manually several times to remove air from the system. When the air is removed from the lines (no bleeding should be necessary) the Barrier motion should be smooth.
11. As the Barrier is manually moved, confirm that the pressure switch is turning the pump motor off at 1350 psig [93 bar] and on again at 1050 psig [71 bar].

12. Turn power to the pump 'Off'.
13. Bleed the system pressure down to zero by opening the bypass valve. This will help prime the hand pump.
14. **With the system at zero pressure**, top off the reservoir oil tank with **clean, filtered** oil to within 1" [25 mm] of the sight glass top.
15. Test hand pump operation by lifting one Barrier. The approximate number of strokes required per Barrier type:

Model TW2015 Phalanx is approximately 35  
Model TW4030 Phalanx is approximately 75  
Model DSC1000 Phalanx is approximately 35  
Model DSC1200 Phalanx is approximately 50  
Model DSC1400 Phalanx is approximately 50
16. Turn the motor/pump power back to 'On' to bring the system back to full pressure.
17. Apply power to the control circuit and turn control panel to 'On'.
18. Run each Barrier Up and Down several times allowing time for the HPU to recover pressure between each cycle. Check function of the indicator lights if so equipped.
19. If system includes one or more 'Slave' control panels, arm them and repeat test 17.
20. If system is equipped with the annunciator function, set the annunciator timer at the control circuit to the desired interval, arm the annunciator at the Master control panel, and lower the Barrier. Verify that the annunciator alarm sounds at all control panels at the desired interval.
21. Adjust the Barrier operating speed to the desired value. Delta suggests that both the up and down speeds be set to approximately 3 to 5 seconds. The type and adjustments of the valves are in the Drawings section of this manual. Normal operating speeds of 2 seconds or less are possible, but the increased wear and tear on the equipment should negate any considerations to so operate the Barriers. Excess noise also accompanies the faster speeds.
22. After final speed adjustment is made, lock the adjustment knob in position using the set screw provided.

## OPERATIONAL SUMMARY

### BARRIERS OPERATED FROM A NORMALLY UP POSITION

1. Barrier is to stay in the up and locked position and is to be lowered for the passage of one vehicle at a time.
2. During the normal hours of operation, the main power key switch shall be in the 'ON' position. The panel shall be turned 'OFF' and the key removed when no guard is present at the control station.
3. The control panel controls a Barrier in a particular lane. 'UP' and 'DOWN' control is provided for the Barrier. Before operating any Barrier:
  - A) Check that vehicles and pedestrians are clear.
  - B) Check that the controls for the correct Barrier will be pressed.
  - C) Press 'DOWN' to lower the Barrier to permit access.
  - D) After vehicle is clear of Barrier, press 'UP'.
4. **Do Not Place Items On The Control Panel.** The buttons are sensitive and the Barrier may move while not intended.
5. **Use The Barriers To Control Vehicles.** If a forced entry attempt occurs, use the 'UP' button to raise the Barrier. The Barrier is powerful and can block or lift most all vehicles.



**MECHANICAL TROUBLE SHOOTING  
VEHICLE ARREST SYSTEM**

COPYRIGHT 1991 DELTA SCIENTIFIC CORPORATION

ALL RIGHTS RESERVED

MFG. UNDER U.S. PATENT #4,097,170 4,158,514 4,318,079 4,354,771 4,490,068 4,576,508 4,715,742

U.K. PATENT # GB 2,127,893B 2,138,883B

40355 DELTA LANE • PALMDALE, CALIFORNIA 93551, USA • PHONE (661) 575-1100 • FAX (661) 575-1109

E-MAIL: [info@deltascientific.com](mailto:info@deltascientific.com)

Doc #100-35 P-5

TROUBLE  
SHOOTING  
MECHANICAL



## **HYDRAULIC TROUBLE SHOOTING**

### **DELTA PHALANX BARRIER SYSTEMS**

#### **Safety Precautions**

At all times observe good safety practices when working on either the electrical or mechanical system. Particular attention should be paid to the danger of working on the Barrier when the power is on. Barriers are powerful hydraulic presses that can easily crush anything in their way. Keep hands free of the mechanism when the power is on or the HPU is up to pressure. Turn off the electric power and bleed the hydraulic pressure down to zero before working on any part of the system. Traffic should be controlled around the Barrier during any work so that vehicular accidents do not occur if the Barrier should happen to rise. After work is complete, do not allow traffic over the Barrier until all control and safety functions have been verified to be properly working.

#### **Barrier Does Not Move**

Isolate the problem to either hydraulic or electrical:

- 1) Confirm power to the motor starter and control circuit is on. Are circuit breakers reset?
- 2) Check motor starter overload trip indication. Reset as necessary.
- 3) Check oil level in reservoir. The oil low level switch will open the starter circuit if the level is too low.
- 4) If the pump motor runs and the HPU maintains pressure, try operating the Barrier manually (see instructions in the Start Up section).
- 5) If the Barrier operates manually, run through the Electrical Trouble Shooting section.

#### **Hydraulic Problems - HPU Does Not Maintain Pressure**

Low pressure is usually caused by leakage, either internal or external, or low accumulator precharge.

##### **External Leakage**

External leaks are generally the result of loose or broken fittings or lines. As the path of leakage is away from the unit, the oil level falls and eventually the reservoir low oil level switch shuts down the pump motor. Look for spilled oil to locate the leak source. Correct as necessary. Bring pressure to zero before attempting repair.

##### **Internal Leakage**

Internal leakage is harder to locate than the above. Large internal leakage is generally accompanied by a hissing sound as oil flows over a valve seat or past a seal. An industrial

stethoscope or a length of tubing is handy for localizing the source of the noise. Small leaks are harder to find. Internal leakage can cause a component to become warm or hot as energy is dissipated across the leakage point. This temperature rise can also be utilized to locate the leakage source. Working through a list of the probable components may be your only alternative:

- 1) Bleed down needle valve. Check that valve is tight. Tighten set screw if valve is loosening. If valve will not seal due to a scored seat, replace valve.
- 2) Relief valve. Check that relief valve is closed at the pressure switch high setting. The valve should start to crack at approximately 2200 psig. Reset should be accomplished before 1900 psig (falling pressure). Adjust as necessary. Tighten lock nut after adjustment. If valve will not reseal, remove and clean or replace as necessary.

Adjustment of pressure relief valve: Use ½" and 9/16" open end wrenches. Use the 9/16" wrench to slack the lock nut on the valve adjustment spindle while the spindle is being held with the ½" wrench. The pressure relief valves are set at 1000 psig from the factory. Turn the adjustment spindle clockwise to increase pressure to the desired amount (one full turn being approximately 600 psi, or 100 psi for every 1/6<sup>th</sup> turn). When the desired value is reached, tighten lock nut while holding the spindle from moving.

- 3) Emergency Fast Operate valve. The EFO valve directly connects the pressure ('P') side of the system to the 'B' (Barrier 'UP') manifold. If the EFO valve opens without the main directional solenoid valve shifting to the 'B' solenoid, oil will short circuit thru the 'B' port back to tank. The EFO circuit requires that **both** the EFO and 'B' solenoids (left side) energize at the same time. Verify by energizing the EFO circuit. Place a metallic object (such as a screw driver blade) on the solenoid armatures of both the EFO and main directional solenoids; a slight magnetism should be felt. If not, see Electrical Trouble Shooting section to correct. If EFO valve leaks without being energized, disassemble and clean or replace as necessary.
- 4) Main directional control valve. The main directional control valve is of the spool type. This construction requires extremely close tolerances between the body and the spool of the valve for low internal leakage. However, even a new valve will leak oil from the high pressure side to the tank ports. This is most evident at pump shut off where the pressure gage is seen drifting down 50 or 100 psi or more. Older valves may cause the system to drop down to the point of motor turn on every 5 to 15 minutes (without Barrier being moved). At this point, valve replacement should be considered.
- 5) Check valve. The check valve (integral with the hydraulic pump, both motor driven and the handpump) keeps the oil in the high pressure side of the system from running back through the pumps to tank when the system is pressurized. Dirt or debris under the seat may allow oil to leak back through these routes. Disassemble and clean as necessary. If debris has scored the seat, seat renewal or replacement of the check valve will be necessary. (The motor driven pump check valve may be detected as being unseated by observing the motor fan slowly turning reverse of it's normal run direction. This is because the high pressure oil is reverse driving the gears of the pump.)

- 6) Hydraulic Pump. The gear pump performance depends upon close tolerances between the gears and the pump housing. Wear from old age or debris from dirty oil will allow oil to bypass around the gears back to the pump suction. Both the displacement and pressure capabilities of the pump will suffer. Eventually the pump will not be able to maintain pressure and will have to be rebuilt or replaced.
- 7) Hydraulic cylinders. Worn seals or scoring of the hydraulic cylinder walls may allow oil to bypass the cylinder piston. Seal renewal and cylinder honing may be required or the cylinder replaced. The cylinder rod seals are also a potential source of external leakage.

The leakages described above are all generally caused by debris contamination in the oil. Replacement of any of these components is an indication that the oil must be drained and replaced with clean **filtered** oil. A check of the filter and your filter changing procedures is also in order.

### **Zero or Low Accumulator Precharge**

Zero or low accumulator precharge is usually indicated by rapid cycling of the pump motor. This is due to the fact that very little or no oil is available in the accumulator under pressure; the slightest system pressure drop will cause the pressure switch to start the motor. Because very little oil has been displaced, the pressure will then raise very rapidly and cause the switch to stop the motor. This cycle will repeat again and again and will cause rapid deterioration of the hydraulic system.

If this occurs, stop the system and measure the accumulator precharge using the instructions in the **Maintenance** section of this manual. Recharge if necessary to the values indicated in the instructions and/or as written in the pressure log.

### **Barrier Moves Slowly**

The Barrier speed is controlled by the flow control valves located between the main directional control valve and the EFO tee connection. Adjust Barrier to the desired speed and tighten the lock nuts. If speed is still undesirably slow:

- 1) Check temperature. Low temperature raises the viscosity of the hydraulic oil increasing line pressure drop. If temperatures are severely low the power unit should be equipped with a oil reservoir heater. The Barrier's heaters also help (this is **not** their prime function however). Installation of the hydraulic lines in the frost zone will cause Barrier slowing (below the frost line, the ground is a fairly constant 55 degrees F [12 degrees C]).

Low temperature hydraulic oils can be selected for use during the cold months. See the selection chart in the Hydraulic Theory section of this manual. As an alternative, heaters and line tracing can be done at time of installation.

- 2) Accumulator pressure. Low accumulator precharge pressure causes less oil to be stored at high pressure. This reduces the maximum Barrier speed to that allowed by the amount of oil that can be displaced by the pump. The precharge pressure is indicated on a tag on the accumulator. Delta P/N 2469-31 Accumulator Charging Kit or similar device can be

used to check precharge. **Note:** On units with auxiliary EFO, the auxiliary accumulator EFO valve override must be in the 'out' position to relieve its' pressure before reading precharge.

- 3) Low system pressure. Low system pressure can be the result of an out of adjustment pressure switch or internal leakage as outlined above. If motor turns off below 1900 psig plus/minus 50 psi, replace switch. Otherwise, determine cause of internal leakage.

### **Barrier Does Not Fully Raise or Lower**

Failure of the Barrier to obtain full raised or lowered position usually indicates a mechanical difficulty at the Barrier. Check:

- 1) Debris buildup. Debris or other obstructions inside the Barrier foundation frame or along the rear hinge support may restrict Barrier movement. Remove top plates to inspect. Remove offending material.
- 2) Low pressure. If the HPU electrical power fails and the pump cannot return the unit to system pressure, the Barrier will slow and eventually stop when pressure is exhausted. Barrier may become stuck between position. Manually shift directional valve and hand pump the Barrier to the desired full up or full down position. Check low oil level is not the cause of pump shut off.

### **Pump Problems**

The heart of the hydraulic power unit is the pump. As it rotates at several thousand RPM, it is subject to more wear and tear than the other components. Pump problems to check are:

#### **Pump Fails to Rotate**

- 1) Check that the switches to the motor are properly set (see Electrical Trouble Shooting Section). Correct as necessary.
- 2) Check that the coupling between the motor and the pump rotates. Check condition of the resilient 'spider' between the coupling jaws. Replace coupling key(s), spider or entire coupling if necessary.
- 3) Check that the pump input shaft rotates by hand. If not, replacement or disassembly of pump will be required.

#### **Pump Delivery Abnormally Low**

- 1) Check that oil level in reservoir adequately covers the suction strainer.
- 2) Check for clogged suction strainer.
- 3) Check for suction line air leaks.

- 4) Check that the motor is running at rated speed; low voltage or single phasing of three phase motors are probable causes of low motor speed.
- 5) Check that pressure relief valve setting is not too low, thus flowing oil back into the reservoir tank.
- 6) Check that oil temperature is not too high (above 160 degree F). This can cause the viscosity to be lower than the recommended range of the pump. Also check that proper oil has been selected.

### **Excessive Pump Noise**

Hammer, gurgle or rattle noises are usually the result of a starved pump suction or air leakage in the suction lines. Causes and corrective action are:

- 1) Check that oil level in reservoir adequately covers the suction strainer.
- 2) Check for clogged suction strainer.
- 3) Check for suction line air leaks.
- 4) Check that oil temperature is not too high (above 160 degree F). This can cause the viscosity to be lower than the recommended range of the pump. Severely excessive oil temperature may cause the pump to cavitate. Also check that proper oil has been selected.
- 5) Check that the oil temperature is not too low. Excessive viscosity can cause pump suction starvation.
- 6) Check reservoir filler/breather. A clogged breather can prevent the tank from venting, causing vacuum inside reservoir. This will again starve the suction.



**ELECTRICAL TROUBLE SHOOTING  
VEHICLE ARREST SYSTEM**

COPYRIGHT 1991 DELTA SCIENTIFIC CORPORATION

ALL RIGHTS RESERVED

MFG. UNDER U.S. PATENT #4,097,170 4,158,514 4,318,079 4,354,771 4,490,068 4,576,508 4,715,742

U.K. PATENT # GB 2,127,893B 2,138,883B

40355 DELTA LANE • PALMDALE, CALIFORNIA 93551, USA • PHONE (661) 575-1100 • FAX (661) 575-1109

E-MAIL: [info@deltascientific.com](mailto:info@deltascientific.com)

Doc #100-35 P-6

TROUBLE  
SHOOTING  
ELECTRICAL

**ELECTRICAL TROUBLE SHOOTING**  
**PHALANX® STYLE BARRIERS OPERATING INDEPENDENTLY**

**Safety Precautions**

At all times observe good safety practices when working on either the electrical or mechanical system. Particular attention should be paid to the danger of working on the Barriers when the power is on. The Barriers are powerful hydraulic presses that can crush anything in their way. Keep hands free of the mechanism when the power is on or the HPU is up to pressure. Turn off the electric power and bleed the hydraulic pressure down to zero before working on any part of the system. Traffic should be controlled around the Barriers during any work so that vehicular accidents do not occur if the Barriers should happen to rise. After work is complete, do not allow traffic over the Barriers until all control and safety functions have been verified to be properly working.

**If the power unit will not run:**

- 1) Check the main power distribution feed to the power unit and the control circuit. Correct as necessary.
- 2) Check any disconnect before the hydraulic power unit motor starter. Turn on as necessary.
- 3) With the disconnect/main switch turned 'on', manually operate the armature of the motor starter. If the motor starts, check the solenoid coil of the starter for continuity. Next check that voltage is being applied to the coil. If no voltage is being applied, check the various switches in the starter circuit by directly applying power to the starter coil (CC2 and coil terminal A1). If direct application of power to the coil causes the starter to pull in and the system is not up to pressure, then try the starter circuit switches in this order:
  - A) Check hydraulic power unit for leaks or broken lines. Low oil level will cause reservoir level switch to open starter coil. Switch should be closed if oil is visible at least 1" from the bottom of the site gage glass.
  - B) Check pressure switch. High and low pressure settings are indicated on the starter circuit drawing. The pressure switch is factory set, if values are plus/minus more than 50 psig from the indicated values, consider replacing the switch.
  - C) Check voltage value to the starter. Values 15 percent low will cause the power monitor (if present) to interrupt power to the starter coil.
  - D) Check that the starter overload relay has not tripped. If so, determine the cause, i.e., high ambient, pump cavitation, failed pressure switch, etc. Be sure that overload relay is left with the reset in the 'manual' position. The 'automatic' reset feature can lead to failure of other parts in the hydraulic unit.

**If power unit runs and is up to pressure but the Barriers can't be opened or closed:**

- 4) Check control circuit voltage at terminals CC1 and CC2. Ordered voltage should be present (120/1/60 or 220/1/50 as applicable). Correct as necessary.
- 5) Jumpers (if furnished) on 1T transformer should be on the appropriate terminals for the voltage supplied in Step 4). Voltage on transformer secondary should be 25 to 30 VAC. Correct if necessary.
- 6) Check fuse 1FU before bridge rectifier for continuity. Replace if necessary.
- 7) Check fuse 2FU out of the bridge rectifier for continuity. Replace if necessary.
- 8) Check voltage at terminals xCA1 (+) and xCA2 (-) and at terminals xCB1 (+) and xCB2 (-). This should now be 24 VDC nominal (+/- 2 volts).
- 9) With the remote control panel key switch **ON**, check that the panel power indicator light is 'on'. If not, check the voltage across xMA3 and xMA18. It should be equal to the voltage found in step 8). If not, check the interconnect lines to xCA3 and xCA18. If voltage present, check the key switch for continuity. Replace if necessary.
- 10) Pressing the appropriate **OPEN/CLOSE** command button should cause the control relay in the control circuit to energize and in turn switch on power to the desired control valve solenoid. Voltage to xCA4 allows x1CR to pull in, in turn energizing the Barrier **up** (close) solenoid valve. Voltage to xCA8 allows the down relay x2CR to energize the Barrier **down** (open) solenoid.
  - A) Determine if command buttons and relays are functioning.
    1. Press Barrier **CLOSE** button. x1CR should pull in. The safety loop detector between terminal xCA5 and xCA6, if used, should be closed; jumper these terminals for this test. If x1CR fails to operate, jumper from xCA1 to xCA6. If relay still fails to energize, replace relay or PCB assembly.
    2. Repeat for Barrier **OPEN**. x2CR should pull in. If not, jumper xCA1 to xCA8. (The PCB has been factory assembled with a jumper between xCA9 and xCA10). Replace relay or PCB assembly as necessary.
  - B) If the **CLOSE/OPEN** relays (x1CR and x2CR) function and valve still does not shift, check:
    1. With appropriate relay energized, check that line voltage is applied between terminal xCB17 and xCB18 ('close' neutral) for 'Up' and xCB19 and xCB20 ('open' neutral) for 'Down' for the appropriate Barrier.



2. If voltage is present, check affected valve coil for continuity by directly applying line voltage (xCA1 and xCA2) to the valve coil. If coil fails this, replace the valve coil or entire valve as appropriate.

### **Emergency Operate Circuit** (optional)

- 11) When the emergency operate (EO) signal is given to the control circuit (by pressing the EO button), 24 VDC is applied to the EO relays x4CR which self hold as the up relays x1CR pull in and energize the directional control valves and the EO valves. The relays and valves remain energized until the reset button is actuated which releases x4CR and restores the system to normal operation.

**Note:** Reset should be pressed within 15 minutes of EO actuation to prevent heat damage to the solenoid valve coils.

- 12) If the EO system is not operating, first check that the x4CR's are pulling in. If not, place a jumper across xCA13 and xCA15. If the system now works, check the EO actuate switch (button) which is normally open and the reset button which is normally closed. Correct as necessary. If the relays x4CR pull in when the EO actuate switch (button) is pressed but the valves do not shift, check that the voltage between xCB21(+) and xCB22(-) is at 24 VDC. If voltage is present, check the valve coils for continuity. Replace relay(s) or valve coil(s) as necessary.

### **Barrier Position Indications**

- 13) The Barriers are equipped with limit switches which pilot relays to provide Barrier position indication. These indications are commonly used to run the Barrier **OPEN/CLOSE** (down/up) lights on the remote control panels and run traffic safety indications such as the stop/go signal lights.

If the indicator lights are not coordinated with the correct Barrier position, check:

- A) Limit Switch. The Barrier limit switch is a dry contact switch powered from the control circuit. xCA11 is common; xCA12 is the connection to the limit switch relay and auxiliary relay, x3CR and x3BCR, for the two Barriers. The limit switches should be 'opened' with the Barriers in the up position. The limit switches close when the Barriers are lowered to the full down position. Verify that the contacts behave accordingly, replace if necessary.
- B) If the switch is OK, jumper xCA11 to xCA12. Relays x3CR and x3BCR should pull in. Replace relay or entire PCB assembly as necessary.
- C) If relays appear OK, check bulbs by applying 24VAC xCA1/xCA2 (xMA3/xMA18 or xSA28/xSA18) directly to the suspected bulb.

**Delta Model AG812 Stop/Go Signal Gate** (optional)

- 14) The Barrier control circuit provides an independent output from the down limit switch that is used to Vend (raise) a Delta Model AG812 Series Stop/Go Signal Gate when the Barrier is fully lowered. The Signal Gate then simultaneously resets (lowers) as the Barrier is again raised off the down limit switch. Restating the above:

START - Barrier 'UP' -	AG812 Gate Arm 'DOWN'
'Lower' Command	Barrier Starts Down
Barrier Full Down	Arm Starts Up
Barrier Still Down	Arm Full Up
'Raise' Command	Barrier Starts Up/Arm Starts Down
FINISH - Barrier 'UP' -	AG812 Gate Arm 'DOWN'

- A) The AG812 Access Gate is installed per the instructions on Document A2021. Wire the 220 VAC power supply to L1 and L2 on the AG812 Terminal Strip.
- B) When the Barrier down button is pushed, the Barrier falls making the down limit switch auxiliary relay, 3BCR. The limit switch relay energizes and the Barrier/Signal Gate synchronization contact, 3BCR.1 closes, causing the Signal Gate to raise.
- C) Determine if the limit switch and limit switch relays are functioning (paragraph 13). If OK, check:
- D) When contact 3BCR.1 closes, Signal Gate should raise. If not, consult Signal Gate instructions, Document A2021 to trouble shoot the Signal Gate.



**MAINTENANCE  
VEHICLE ARREST SYSTEM**

COPYRIGHT 1991 DELTA SCIENTIFIC CORPORATION

ALL RIGHTS RESERVED

MFG. UNDER U.S. PATENT #4,097,170 4,158,514 4,318,079 4,354,771 4,490,068 4,576,508 4,715,742

U.K. PATENT # GB 2,127,893B 2,138,883B

40355 DELTA LANE • PALMDALE, CALIFORNIA 93551, USA • PHONE (661) 575-1100 • FAX (661) 575-1109

E-MAIL: [info@deltascientific.com](mailto:info@deltascientific.com)

Doc #100-35 P-7

MAINTENANCE

**MAINTENANCE**  
**DELTA DSC1200 PHALANX STYLE BARRIER SYSTEMS**

**Safety Precautions**

At all times observe good safety practices when working on either the electrical or mechanical system. Particular attention should be paid to the danger of working on the Barrier when the power is on. Barriers are powerful hydraulic presses that can easily crush anything in their way. Keep hands free of the mechanism when the power is on or the HPU is up to pressure. Turn off the electric power and bleed the hydraulic pressure down to zero before working on any part of the system. Traffic should be controlled around the Barrier during any work so that vehicular accidents do not occur if the Barrier should happen to rise.

**Barrier Disassembly, Service and Assembly**

The Barrier assembly is designed to facilitate easy repair and maintenance. Depending on the environmental conditions, we recommend at least a one month interval of inspection to conform that no debris, sand or dirt is accumulated inside the Barrier that would interfere with its operation. This can be easily checked by raising the road plate to its full up position; removing the inspection plates at the rear of the road plate and conducting a visual inspection. Remove any foreign debris found. During the inspection, grease the bearing blocks if equipped with grease fittings. Open the side doors to gain access to the hydraulic cylinder clevis pins and lubricate. Also examine the hydraulic cylinders to confirm that the seals are tight and that fittings are not leaking.

Should disassembly be necessary:

- 1) Lower the road plate fully.
- 2) Remove the 6 stainless steel buttress covers.
- 3) Remove the four (4) 1/2"-20 bearing block bolts from each of the two (2) bearing blocks located at the rear hinge area.
- 4) Remove the hydraulic cylinder rod end clevis pin. Using suitable wire, tie the cylinder up so that it does not interfere with the removal of the barrier plate.
- 5) Install two (2) lifting eyes (3/4"-10, minimum 6,000 pound rating). Using suitable rope, chain or sling through the lifting eyes, lift ram and move it forward then upward in order to clear the hinge retainers. The plate may then be moved rearward to fully remove it from the barrier, being careful not to damage the paint on the buttress sides or lower road plate surfaces. A forklift or other suitable lifting device can be utilized if a crane is not available. Note: The Model DSC1200 road plate weighs approximately 243 pounds per foot (362 Kg/M) of clear opening.
- 6) Place road plate on a suitable surface, such as 4 x 4" [100 x 100 mm] wooden blocking.

Full access to the hydraulic lines and the cylinders is made possible by opening the side panels. These devices can be inspected, repaired or replaced as required. Before reassembly, any rust or

other corrosion should be removed and the damaged finish coated with sealer or rust inhibiting paint. The foundation can be vacuumed of debris and the drain can be cleared as required.

Inspect and lubricate all bronze style bearings and pins. Graphite/fiberglass bearings should be inspected for any damage and replaced as necessary, lubrication of these style bearings is optional. Anti-seize compound has been used on the bearing block bolts at factory assembly, reapply if you remove the bolts. Check for sand and construction debris about the bearings and shafts and clean if necessary. Reassemble in reverse order. The proper torque value for the bearing bolts is 45 foot-lbs [60 N-M]

### **Hydraulic System Cleanliness**

The cleanliness of the hydraulic fluid directly affects the reliability of the hydraulic system and the longevity of the components. When contaminants are present, component wear and fatigue are accelerated, performance is degraded, valves, hydraulic motors and cylinders can malfunction and the hydraulic fluid may break down.

To maintain system efficiency and reliability great care must be taken to prevent any form of dirt, sand or grit from entering the hydraulic system. Only new, clean filtered hydraulic oil should be used for charging the unit. Unless specifically ordered as filtered, new oil should be pumped through a 25 micron filter when charging. See Commercial Hydraulic Oil Interchangeability Chart in the Mechanical Theory section of this manual for our recommended oils. The tests conducted at the factory on the system have been done with the HPU charged with Shell 'Tellus' 46. This grade is for moderate temperatures and is available in most of the worlds leading cities.

Hydraulic oil is subject to degradation and contamination with age or if subject to high temperatures (above 180°F [82°C]). The contamination can be from the following sources:

- 1) Particulate (dust, dirt, sand, rust, fibers, paint chips, etc.)
- 2) Wear metals, silicon and excessive oil additives.
- 3) Water.
- 4) Sealants (Teflon tape and pastes).
- 5) Sludge, oxidation and other corrosion products.
- 6) Acids and other chemicals.
- 7) Biological and microbes (for high water based fluids or other biodegradable fluids).

The hydraulic fluid should be sampled and tested periodically to ensure contamination and fluid properties are within acceptable levels. We suggest that the first test be done after one years operation. The frequency of testing will depend upon the results of that test. Most major cities will have hydraulic fluid testing commercially available.

## **Filters**

A filter element may be furnished to filter the oil as it is being returned to the oil reservoir. The oil filter housing is only rated at 150 psig [10 bar] or less as the oil in the return line has only to overcome the pressure drop through the filter itself. If the filter should become clogged with particulates from the system, a bypass check valve inside the filter will open and allow the dirty oil to circulate back to the reservoir. For this reason, frequent inspection of the filter is required.

A visual determination of the filter's degree of contamination should be made during filter change outs. Adjust the interval between changes if a high degree of particulates are found.

## **Pump Motor**

Electric motors are basically dependable machines and require little maintenance. Too much attention may be worse than none. The following should be helpful in reducing maintenance.

Wherever possible, prevent:

- 1) Dampness and dripping water.
- 2) Dirt, especially dust, which may block ventilation.
- 3) Inaccessible position, in case maintenance is necessary.
- 4) Excessive heat. Surrounding air (ambient) temperatures must not exceed 104°F [40°C]. Overloading a motor or operating it in an area where the temperature exceeds 104°F [40°C], may cause it to overheat. Frequent or prolonged starting periods or blocked ventilation are other causes of overheating.

The motor has front and rear ball bearings. The bearings have been given initial lubrication at the factory. Motors without regreasing capability are factory lubricated for normal bearing life. Motors having regreasing capability should be relubricated by the procedure noted below if they have been in storage for over one year and at the following service intervals:

- 1) Every five years based on 5,000 hours per year operation.
- 2) Every two years based on continuous operation.
- 3) Every six months for continuously high ambient temperature and or dirty or moist locations.

Greasing procedure:

- 1) Keep grease clean. Lubricate motors at standstill. Do not mix petroleum grease and silicone grease in motor bearings.
- 2) Use Shell Oil Company "Dolium R", Chevron "SRI No. 2" or Texaco Inc. "Premium RB".

- 3) Overgreasing bearings can cause premature bearing failure. If motor is equipped with an Alemite type fitting, clean tip of fitting and apply grease gun. Use only one to two full strokes.

### **Pump Replacement**

The following recommendations are given should replacement of the pump be required:

- 1) Damage to this component is generally caused by debris contamination in the oil. Replacement of the pump is an indication that the oil must be drained and replaced with clean **filtered** oil. A check of the filter and your filter changing procedures is also in order.
- 2) When changing out the pump, avoid contamination. Do not remove the plastic port plugs until just prior to installing the fittings and hoses. The pump mounting flange must make full contact with the pump/motor adapter. Do not use the pump mounting bolts to force the pump pilot into the pilot hole or to align the pump. To avoid damaging the pump seals and bearings, do not hammer on the pump or shaft to install or remove the pump/motor couplings.

## **SUMMARY OF SAFETY ASPECTS REGARDING MAINTENANCE ON OR ABOUT THE BARRIERS**

### **General**

At all times observe good safety practices when working on either the electrical or mechanical system. **Particular attention should be paid to the danger of working on the Barrier when the power is on.** Barriers are powerful hydraulic presses that can easily crush anything in their way. Keep hands free of the mechanism when the power is on or the HPU is up to pressure. Turn off the electric power and bleed the hydraulic pressure down to zero before working on any part of the system. Traffic should be controlled around the Barrier during any work so that vehicular accidents do not occur if the Barrier should happen to rise.

### **Maintenance Work In The Area About Barrier**

- 1) Select Barrier UP or DOWN position as desired from the control panel.
- 2) Turn control panel key switch to OFF position and remove key.
- 3) Turn system power OFF at the disconnect on the hydraulic power unit (HPU).
- 4) Proceed with maintenance. **DO NOT PERFORM ANY WORK UNDER THE BARRIER OR INSIDE THE BARRIER ACCESS AREAS!** Should work be required under the Barrier or inside the access areas, follow the procedures in the next section.
- 5) When all work is finished, turn HPU disconnect ON. Return panel key to the control panel.

### **Maintenance Work Under the Barrier or in the Barrier Access Areas**

- 1) Select Barrier UP or DOWN position as desired from the control panel.
- 2) Turn control panel key switch to OFF position and remove key.
- 3) Turn system power OFF at the disconnect on the hydraulic power unit.
- 4) If Barrier is in the UP position, securely block Barrier to prevent falling. Note: Lifting eyes secured in the tapped holes provided in the road plate can be used for chaining the Barrier in the UP position.
- 5) Bleed down the system:
  - A) Release set screw (or lock nut) on the system bleed down valve. Turn (anti-clockwise) the handle on the valve slightly until hissing sound is heard. Continue to open slowly until pressure on gage reads zero.
  - B) For added safety, leave valve open while performing maintenance.
- 6) Check that the Barrier is firmly held against movement.



- 7) Proceed with maintenance. Minimize any exposure to working under the Barrier by using when ever possible tools with handle extensions.
- 8) When all work is finished, turn HPU disconnect ON. Close any valves opened in the bleed down procedure. Return panel key to the control panel.

### **System Maintenance**

The following maintenance procedures and schedules should be adhered to in order to assure safe, long and trouble free service from your Delta Barrier System:

**REMEMBER: SAFETY FIRST !!!**

## **MAINTENANCE SCHEDULE**

### **FIRST WEEK**

Check operation of the Barrier at least once daily. Have the guards or operators report if Barrier fails to operate, or operates with a jerky motion. It is recommended that someone be on call who can explain the operation of the Barrier system to each new guard or operator.

#### **Daily Check**

- 1) Log pressure settings on sheet supplied in this section.
- 2) Check for leaks around all fittings. Tighten where necessary.
- 3) Check that hydraulic hoses (if used) are not rubbing on any hard or sharp surfaces. Especially check where hose enters conduit or where it may contact the ground.
- 4) Check oil level in the site glass after the pump/motor has run to full pressure and shutoff. If level appears to be falling, investigate the HPU and Barrier fittings and the hydraulic lines.
- 5) See appropriate Trouble Shooting section of the manual if any faults are observed.
- 6) Check all cylinder pins and bushings, apply a light even coating of grease.
- 7) Check all control functions for complete operation of all features.
- 8) Replace the oil filter at the end of the first week of operation.
- 9) At the start and end of the first week's operation, check the tightness of each of the eight hardened steel cap screws holding the two bearing blocks. Anti-seize compound has been used on the bolts, reapply if you remove the bolts. Check for sand and debris about the bearings and shafts and clean if necessary. Inspect and lubricate all bronze style bearings and pins. Graphite/fiberglass bearings should be inspected for any damage and replaced as necessary, lubrication of these style bearings is optional. The proper torque value for the eight hardened steel cap screws is 45 foot-lbs [60 N-M]
- 10) Check all top plate bolts for tightness. Note any tendencies for the top plate bolts to loosen.

## **MAINTENANCE SCHEDULE**

### **MONTHLY**

Check and service the following at monthly service intervals:

**Note: Block traffic during maintenance to prevent accidents.**

- 1) Shut system off and drop system pressure to zero.
- 2) Replace the oil filter (if present) at first monthly maintenance. For systems that are cycled less than 100 cycles per day, replace every third month there after. If system is cycled above this rate, or the location is in a high dust environment, replace filter monthly.
- 3) Check the accumulator pressure while the system is at zero pressure using Delta Charging Kit 2469-31 or equal. If tool is not available, observe the value that the pressure gage jumps to when power is again turned on. (See **Hydraulic Section** for details.) Log value and pressure setting on Log sheet provided.
- 4) Confirm that the Barrier operates smoothly during the raise and lower cycle. Adjust speeds as desired.
- 5) Observe Safety Precautions for working under the Barrier. Partial disassembly of the Barrier plate from the frame may be necessary for bearing block inspection and lubrication. Check for sand and debris about the bearings and shafts and clean if necessary. Inspect and lubricate all bronze style bearings and pins. Graphite/fiberglass bearings should be inspected for any damage and replaced as necessary, lubrication of these style bearings is optional. Check the tightness of each of the eight hardened steel cap screws holding the two bearing blocks. Anti-seize compound has been used on the bolts, reapply if you remove the bolts. The proper torque value for the eight hardened steel cap screws is 45 foot-lbs [60 N-M]
- 6) Check the operation of the Barrier heaters if so equipped. They should get warm approximately one minute after energizing.
- 7) Check all cylinder pins and bushings, apply a light even coating of grease.
- 8) Check all control functions for complete operation of all features.
- 9) Turn off pump/motor power, bleed system pressure to zero and add clean, filtered oil to the top of the site glass.
- 10) Clean dust and debris from around HPU tank and hydraulic lines. Wipe up any spilled oil.
- 11) Turn power on and bring system back to operation.

## **MAINTENANCE SCHEDULE**

### **YEARLY**

Check and service the following at yearly service intervals in addition to the monthly check:

**Note: Block traffic during maintenance to prevent accidents.**

- 1) Drain the oil from the reservoir and flush with mineral spirits or clean oil. After wiping down the tank sides and bottom to assure that no contamination remains, replace with clean filtered oil.
- 2) Check that the hydraulic cylinder(s) are not leaking internally (see **Hydraulic Trouble Shooting** section for details). Replace cylinder seals or cylinder as necessary.
- 3) Check cylinder clevis pins for wear, replace as necessary.
- 4) Examine the foundation frame for debris buildup, check drain lines and sump wells for drainage. Clean debris.
- 5) Tighten or replace any loose bolts securing access plates. Drill and tap to next size or use inserts if threads are stripped.
- 6) Check condition of the Barrier paint surface. Prepare, prime and touch up areas where the paint has been chipped or worn away. Apply new reflective tape as necessary.
- 7) Check hydraulic interconnect lines for kinks, contact wear or bulging. Replace or protect hoses as required.
- 8) Thoroughly clean the HPU, removing dust and spilled oil. Remove any rust build up on components. Touch up paint where necessary.
- 9) Check the accumulator pressure while the system is at zero pressure using Delta Charging Kit 2469-31 or equal. If tool is not available, observe the value that the pressure gage jumps to when power is again turned on. (See Hydraulic Section for details.) Log value and pressure setting on Log sheet provided.
- 10) Test motor starter overloads by pressing the test button. Replace if necessary or press reset. Auto/Manual switch should be in the **Manual** position.
- 11) Check the pressure relief valve by depressing the starter armature and allowing unit to run to the relief pressure value of 2,200 psig [152 bar]. Adjust as necessary.

## **ACCUMULATOR PRECHARGE PROCEDURE**

Use an inert gas such as Nitrogen for precharging accumulators. If oil pumped is not available, dry water pumped Nitrogen gas may be used. **Note: Do Not Use Air or Oxygen, the Accumulator Could Explode!**

Before precharging, make certain that the accumulator gas valve is screwed in tight. Check that the hydraulic pressure is a zero on the oil pressure gage. Precharging the accumulator while under pressure will result in an incorrect precharge pressure.

**Check the pre-charge value on the accumulator's label or on the HPU's Flysheet.** The following values are a guide only and may be modified in some instances to provide certain barrier performance. (See HPU Drawing or Drawing Fly Sheet for specific project precharge values.)

DSC800, TT203 & TT210 Bollards	500 PSIG
DSC701 & DSC720 Bollards	700 PSIG
TT205 & TT207 Phalanx	700 PSIG
DSC501, TT207S & TT207S/FM Phalanx	850 to 1100 PSIG
DSC1100	700 to 1000 PSIG
DSC1200	900 to 1000 PSIG
DSC1400	1000 PSIG
DSC2000	700 PSIG
DSC7000(H) & DSC7500(H)	900 PSIG
TT224, TW107, TW108, TW2015 and TW4030 Phalanx	700 PSIG
TT270 Hydraulic Gate Operator	800 PSIG
TT212H, TT212E(H) & BB10M Beam Barriers	600 to 700 PSIG
TT212EC(H) & (M), IP500(H) & (M)	600 to 1300 PSIG

### **CAUTIONS:**

1. Delta utilizes several types of gas valves on accumulators. All gas valves have a Schrader-style threaded connection (0.305"-32); some with a valve core and some with a jam nut or double lock nut, typically referred to as a "military- style" valve or a "strut" valve. Any valve with an internal valve core will require use of a charging assembly with a "T" handle gas cock in order to depress the valve core, allowing the entry or exhaust of nitrogen gas. The "T" handle of the gas cock also opens and closes the flow of gas through the gas cock. Turning the "T" handle clockwise opens the valve, turning counter-clockwise closes the valve.

**NOTE:** Many of the military style valves have O-ring seals at their base, sealing the valve to the accumulator. It is important to utilize two wrenches when opening this style – the first to hold the base nut stationary, the second to rotate the jam nut counter- clockwise, opening the valve. If the jam nut is loosened on an accumulator under pressure without holding the base stationary, the pressure may force the O-ring seal out of position, thereby losing the gas valve seal, causing the loss of nitrogen gas. If the O-ring seal is inadvertently displaced, re-tightening the valve base without relieving gas pressure may result in damage to the O-ring, necessitating replacement of the gas valve O-ring, prior to recharging the accumulator.

2. **DO NOT USE** automotive-type valve cores in high pressure accumulator gas valves
3. Do not reduce accumulator pre-charge pressure by depressing accumulator gas valve core (the high-pressure gas may rupture the rubber valve seat). Use the procedures outlined here to raise or lower the accumulator precharge.
4. Install a new gas valve O-ring each time the gas valve is removed.
5. Do not loop or twist the hose, as it will stiffen when gas pressure is released from the nitrogen gas bottle.
6. Never loosen swivel nut attached to the accumulator gas valve without first backing the Gas Chuck stem out all the way.
7. **NOTE:** Allow the accumulator to rest approx. 10-15 minutes after checking/adjustment of nitrogen gas pre-charge. This will allow gas temperature to adjust and equalize. Recheck gas pressure on gauge prior to disconnection. Check the accumulator gas valve for leaks with soapy water, if none observed, complete disconnection procedure and reassemble by re-installing the gas valve cap and protective gas guard.

**Determining the Current Pressure in the Accumulator** (During this procedure, refer to the diagrams on page 4.)

1. Remove the gas valve guard. Ensure that the valves are closed on the Nitrogen gas bottle and charge kit. Attach the accumulator charge kit's hose to the nitrogen bottle.
2. Attach the gauge assembly to the hose. Back out the Gas Chuck stem all the way by turning the T-handle (counter-clockwise) before attaching to accumulator.
3. Using a 3/4-inch wrench, hold the top hex on the accumulator's gas valve, and remove the yellow cap with 3/8-inch wrench.
4. Holding top hex on the accumulator's gas valve with a 3/4-inch wrench, attach the gas chuck on the gauge assembly to the gas valve on the accumulator. Secure the gauge assembly gas chuck to the accumulator gas valve with an 11/16-inch wrench. (Position of the tee handle on gas chuck should be fully turned counter-clockwise.)
5. Turn the T-handle on the gas chuck until the stem is all the way up (counter-clockwise).
6. Ensure that the bleeder valve on the gauge assembly is closed.
7. Turn the T-handle on the gas chuck until the stem is all the way down (clockwise) which will depress the accumulator gas valve core.
8. Be certain that the bleeder valve is closed.

9. Using a 3/4 inch wrench, hold bottom hex on accumulator gas valve, and slowly turn top hex on the gas valve counter-clockwise with second 3/4 inch wrench until the valve is open. The gauge will show pre-charge pressure.
10. Check the pressure on the gauge. If the gauge pressure matches the recommended pre-charge pressure for your barrier proceed to step 13.

#### **Adjusting the Pre-charge Pressure in the Accumulator:**

11. If the pre-charge pressure needs to be-increased, slightly crack open the valve on the Nitrogen gas bottle then the charge kit shutoff valve to slowly fill the accumulator. Close the shutoff valve when the gage indicates the desired precharge pressure.

**DANGER! NEVER EXCEED THE **MAXIMUM** ALLOWABLE WORKING PRESSURE OF THE PRESSURE VESSEL.**

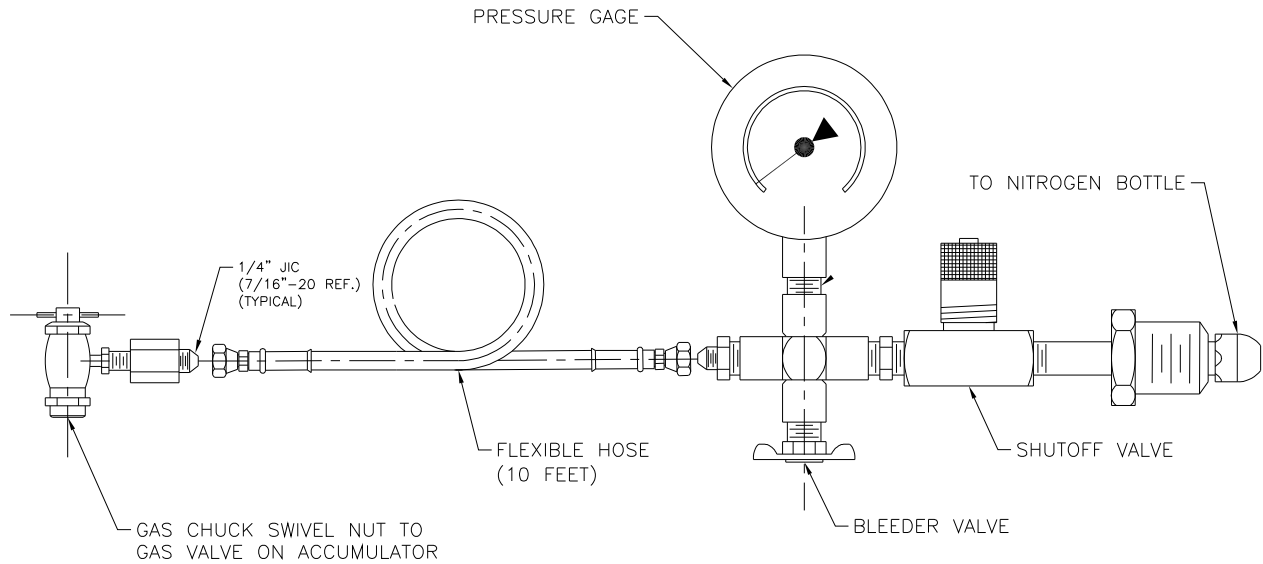
12. If the gauge pressure exceeds the desired pre-charge pressure is exceeded, ensure that the shutoff valve is closed and then open bleeder valve slightly to reduce pressure.

**Note:** Allow accumulator to rest 10-15 minutes after gas pre-charging. This will allow the gas temperature to adjust and equalize. Recheck gas pressure and adjust as necessary.

#### **Removing the Pre-charge Kit:**

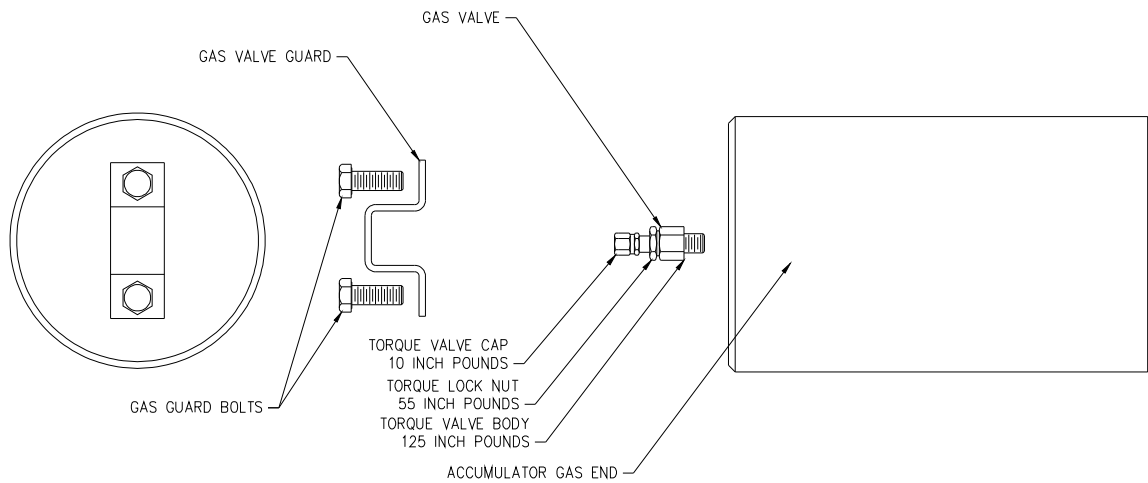
13. Using a 3/4 inch wrench, hold bottom hex on accumulator gas valve, and slowly turn top hex on the gas valve clockwise with second 3/4 inch wrench until the valve is closed.
14. Before loosening the gas valve swivel nut, turn the T-handle on the gas chuck until the stem out all the way (counter-clockwise)
15. Ensure that the valve on the Nitrogen bottle is closed and open the charge kit shutoff valve. Slowly open bleed valve on gauge assembly. Relieve pressure in the hose assembly until gauge reads zero.
16. Holding top hex on the accumulator's gas valve with a 3/4-inch wrench, remove the gas chuck on the gauge assembly to the gas valve on the accumulator with an 11/16-inch wrench.
17. Install yellow gas valve cap on accumulator.
18. Install spacer (optional) and the gas valve guard on accumulator with the supplied 3/8-inch hex bolts.

**DANGER! NEVER OPERATE ACCUMULATOR WITHOUT GAS VALVE GUARD INSTALLED.**



Delta Stock Number 2469-31 Accumulator Charge Kit

**Figure 1**



GAS VALVES WITH LOCKING NUTS

**Figure 2**



## HYDRAULIC POWER UNIT PRESSURE LOG

Pump Serial Number: \_\_\_\_\_

Use this log to provide a record of the key pressure values on the hydraulic system to facilitate trouble shooting and preventive maintenance:

As Shipped: \_\_\_\_\_ - \_\_\_\_\_ -

Reading Date	Low Pressure Reset	High Pressure Shutoff	Accumulator Precharge

Definitions:

**High Pressure Shutoff** - The gage reading where the pressure switch shuts the pump motor off. Compare against the as shipped value. Values can vary +/- 5 percent of the range; 1350 psig shutoff: +/- 68 psig, 1900 psig shutoff: +/- 95 psig, 2150 psig shutoff: +/- 107 psig.

**Low Pressure Reset** - The gage reading where the pressure switch turns the pump motor back on after pressure drops from being at the higher value. Compare against the as shipped value. Values are 350 psig +/- 50 psig less than the high pressure shut off pressure.

**Accumulator Precharge** - The nitrogen precharge pressure in the accumulator. Compare against the as shipped value. Values +/- 100 psig are generally OK. See the **Mechanical Theory** Section of this manual for a discussion of the accumulator. Can be directly checked at zero hydraulic system pressure with Delta Tool, Stock Number 2469-31 "Accumulator Charge Kit". See Document A2025 for the complete instructions of using this tool.

## **SPARE PARTS ORDERING INFORMATION**

Insurance or breakdown spares can be obtained locally or from Delta Scientific Corporation as desired. If parts are found locally, they should be of the same manufacture and pattern as the original part. On hydraulic systems, we do not recommend the replacement of the main directional valve by any other manufacturer than Vickers/Double A or Rexroth.

Please specify the model number of the Barriers and the serial number when ordering parts from the factory. If these are not known, the original order number and date of purchase of the system should be given.

(Serial numbers are located on the equipment nameplates on the HPU and in the Barrier access area. The Model number of the system is also shown on the nameplate. Electrical control panels and circuits reference the appropriate drawing number; please provide this number when ordering control components.)

Use the numbers on the attached spare parts list as well as the actual component's manufacturers' number. Give as complete a description of the part and its function as possible. If uncertain as to the parts name or function, digital photos of the part(s) can be emailed for identification or a sketch can be mailed or faxed with the order.

On requests for accumulators, parts and service, confirm accumulator manufacturer, manufacturer's part number and serial number before ordering accumulators, service manuals and/or seal kits.

Motor starters as supplied by Delta consist of a starter contactor paired with starter overload. These two components snap together to form the motor starter. Over the years, various manufacturers have been used, and even starters of the same manufacturer have sometimes had their design series changed. So unless the system is relatively recent, we recommend that both the starter and overload be replaced as a unit so that the assembly is compatible.

Most parts are maintained in stock and can be processed for shipment within one week of order. If parts are for breakdown replacement, please note on order so that we may expedite shipment. If parts are not in stock, we will confirm your order with an expected delivery date.

Prices shown are net each, FOB Palmdale, California. Prices are subject to change without notice.

Contact:

### **Delta Scientific Corporation**

40355 Delta Lane  
Palmdale, California 93551  
Phone (661)575-1100  
Fax (661)575-1109  
E-MAIL [info@deltascientific.com](mailto:info@deltascientific.com)

**DELTA SCIENTIFIC CORPORATION**  
40355 DELTA LANE  
PALMDALE, CALIFORNIA, 93551, USA

PHONE 661-575-1100  
FAX 661-575-1109  
EMAIL info@deltascientific.com

**SPARE PARTS LIST - JOB 10818**  
**DELTA MODEL DSC1200 SURFACE MOUNTED BARRIER SYSTEM**

EFFECTIVE: October 15, 2024

**ELECTRICAL PARTS**

<b><u>STK NO.</u></b>	<b><u>DESCRIPTION</u></b>
2459-12	FUSE, 250V, 7.5 AMP, 5/PKG,
2459-119	FUSE, 250 V, 3.5 AMP, 5/PKG,
2459-21	FUSE, 125 V, 1.0 AMP, 5/PKG,
2461-25	POWER SUPPLY, 150 WATTS,
2463-01	KEY SWITCH,
2463-01K	KEY, KEY SWITCH,
2463-02A	SELECTOR SWITCH,
2463-03A	EFO, HOODED TOGGLE TYPE,
2463-04A	EFO, LARGE GUARD TYPE,
2463-06	PUSHBUTTON, N.O. BLACK,
2463-07	PUSHBUTTON, N.C. RED,
2463-16	PILOT LIGHT, LED, RED,
2463-17	PILOT LIGHT, LED, GREEN,
2463-63	ANNUNCIATOR SIREN,
2471-70	PUMP/MTR, 1.5 HP @ 120/240/1/60,
2465-08	PRESSURE SWITCH, 1400/1900
2465-14	THERMOSTAT, FACTORY SET,
2465-55	BLANKET HEATER, 60W @ 120V,
2465-107	DIN HARNESS - BRN/BLU/GRN
2467-01	DIRECT. VALVE, DO3, 24 VDC,
2467-100	DIN HARNESS, BLK, WHT, GRN,
2467-101	DIN HARNESS, RED, WHT, GRN,
2531-11	MOTOR STARTER, 120 V COIL,
2531-66	STARTER OVERLOAD, 3.2-16 A,
2534-68	TIMER RELAY TRIM POT,
2534-69	TIMER RELAY, 24 VDC,
7195-FU1	FUSE, 2 AMPS, FAST ACTING
7195-V1	VOLTAGE REGULATOR, 12 V,
90605-00	BARRIER CONTROL CARD,
IN5404	DIODE,
1/4W1.2K	RESISTOR
MANUAL	OWNERS MANUAL

**PRICES ARE NET, FOB PALMDALE, CALIFORNIA, USA.**  
PRICES SUBJECT TO CHANGE WITHOUT NOTICE, CALL FOR CURRENT PRICES.  
**SEE ORDERING INSTRUCTIONS TO ASSURE THAT PROPER PARTS ARE ORDERED.**

**DELTA SCIENTIFIC CORPORATION**  
40355 DELTA LANE  
PALMDALE, CALIFORNIA, 93551, USA

PHONE 661-575-1100  
FAX 661-575-1109  
EMAIL info@deltascientific.com

**SPARE PARTS LIST - JOB 10818**  
**DELTA MODEL DSC1200 SURFACE MOUNTED BARRIER SYSTEM**

EFFECTIVE: October 15, 2024

**MECHANICAL PARTS**

<b><u>STK NO.</u></b>	<b><u>DESCRIPTION</u></b>
2465-05	PRESSURE RELIEF VALVE,
2465-21	PRESSURE GAGE, 0-3000 PSIG,
2465-23	GAGE SNUBBER,
2465-24	LEVEL GAGE, 5",
2466-02B	3/8" FLOW CONTROL VALVE,
2466-11B	1/4" NEEDLE VALVE,
2466-33B	1/2" BALL VALVE, BRONZE,
2467-71	MANIFOLD, DO3-1 STATION
2467-94	VALVE MOUNTING BOLT SET,
2468-10	HYD CYLINDER, 3" X 10",
2468-14	HYD CYLINDER SEAL KIT, 3",
2468-21	CYLINDER PIN, 1" DIA, TIE ROD,
2469-31	ACCUM CHARGE MANIFOLD,
2469-75	ACCUMULATOR, 2.5 GALLON,
2469-81	ACCUM REBUILD KIT, 6 INCH,
2470-41	SUCTION STRAINER,
2470-43	FILLER BREATHER,
2471-32	PUMP, BI DIREC 0.647 CU IN/REV,
2512-4-FT	HOSE ASSY, 1/4" X xx FT LG,
2512-6-FT	HOSE ASSY, 3/8" X xx FT LG,
2512-8-FT	HOSE ASSY, 1/2" X xx FT LG,
2512-45T	HOSE FIELD FITTING, JIC 04
2512-46T	HOSE FIELD FITTING, JIC 06
2512-47T	HOSE FIELD FITTING, JIC 08
7002-1	GASKET, OIL TANK COVER,

**PRICES ARE NET, FOB PALMDALE, CALIFORNIA, USA.**  
**PRICES SUBJECT TO CHANGE WITHOUT NOTICE, CALL FOR CURRENT PRICES.**  
**SEE ORDERING INSTRUCTIONS TO ASSURE THAT PROPER PARTS ARE ORDERED.**

**DELTA SCIENTIFIC CORPORATION**  
40355 DELTA LANE  
PALMDALE, CALIFORNIA, 93551, USA

PHONE 661-575-1100  
FAX 661-575-1109  
EMAIL info@deltascientific.com

**SPARE PARTS LIST - JOB 10818**  
**DELTA MODEL DSC1200 SURFACE MOUNTED BARRIER SYSTEM**

EFFECTIVE: October 15, 2024

**DSC1200 PARTS**

<b><u>STK NO.</u></b>	<b><u>DESCRIPTION</u></b>
1501-04	CAP SCREW, 1/2"-20 X 2"LG,
2465-184	PLASTIC TRIM (BLACK), SOLD BY THE FOOT
2739-010	BEARING BLOCK, 4 BOLT,
2739-02G	BEARING BLOCK BUSHING, GARMAX GM2428-32
2739-05G	CYLINDER HANGER BUSHING, GARMAX GM1620-16
12163-1	DSC1200 BUTTRESS CYLINDER COVER PANEL, LEFT HAND
12163-2	DSC1200 BUTTRESS CYLINDER COVER PANEL, RIGHT HAND
12164-1	DSC1200 BUTTRESS SIDE COVER PANEL, LEFT HAND
12164-2	DSC1200 BUTTRESS SIDE COVER PANEL, RIGHT HAND
11717-1-36	DSC1200 36" HPU BUTTRESS COVER, FRONT OR REAR, S.S.
11717-2-36	DSC1200 36" HPU BUTTRESS COVER, TOP, S.S.

**PRICES ARE NET, FOB PALMDALE, CALIFORNIA, USA.**  
**PRICES SUBJECT TO CHANGE WITHOUT NOTICE, CALL FOR CURRENT PRICES.**  
**SEE ORDERING INSTRUCTIONS TO ASSURE THAT PROPER PARTS ARE ORDERED.**



**DRAWINGS  
VEHICLE ARREST SYSTEM**

COPYRIGHT 1991 DELTA SCIENTIFIC CORPORATION

ALL RIGHTS RESERVED

MFG. UNDER U.S. PATENT #4,097,170 4,158,514 4,318,079 4,354,771 4,490,068 4,576,508 4,715,742

U.K. PATENT # GB 2,127,893B 2,138,883B

40355 DELTA LANE • PALMDALE, CALIFORNIA 93551, USA • PHONE (661) 575-1100 • FAX (661) 575-1109

E-MAIL: [info@deltascientific.com](mailto:info@deltascientific.com)

Doc #100-35 P-8

**DRAWING 90270R FLY-SHEET**

**DELTA JOB NUMBER:** 10818A

**CUSTOMER:** NEW ORLEANS CONVENTION CENTER  
ERNEST N. MORAL  
900 CONVENTION CENTER BLVD.  
NEW ORLEANS, LA 70130

**DATE:** October 15, 2024

THIS FLY-SHEET COVERS JOB SPECIFIC TABULATIONS TO DELTA DRAWING 90270.

**S/N 10818A-1**  
**(ONE DSC1200(H) BARRIERS)**

**PHALANX CLEAR OPENING:** 17' (204") [518 cm]

**PHALANX 'A' LENGTH:** 206" [523 cm]

**PHALANX 'B' LENGTH:** 254" [645 cm]

**BARRIER HANDING:** AMBIDEXTROUS

**BARRIER WEIGHT:** 11,054 POUNDS [5,014 KG]

**'A' HEATER OPTION:** NO, HEATER

**HEATER STOCK NUMBER:** 2465-55

**'B' OPTION LIMIT SWITCH (FULLY DOWN):** YES, B2010

**'C' OPTION LIMIT SWITCH (FULLY UP):** YES, B2011

**BARRIER LIGHTS** NO BARRIER LIGHTS

**BARRIER FINISH:** STD PAINT

**PHALANX COLOR SCHEME:**

<b>BUTTRESSES:</b>	WHITE SIDES W/STAINLESS STEEL WRAP
<b>ROAD PLATE:</b>	WHITE W/ 6" RED STRIPES
<b>BARRIER FRAME:</b>	WHITE

**DRAWING 90270R FLY-SHEET**

**DELTA JOB NUMBER:** 10818B

**CUSTOMER:** NEW ORLEANS CONVENTION CENTER  
ERNEST N. MORAL  
900 CONVENTION CENTER BLVD.  
NEW ORLEANS, LA 70130

**DATE:** October 15, 2024

THIS FLY-SHEET COVERS JOB SPECIFIC TABULATIONS TO DELTA DRAWING 90270.

**S/N 10818B-1**  
**(ONE DSC1200(H) BARRIERS)**

**PHALANX CLEAR OPENING:** 13' (158") [518 cm]

**PHALANX 'A' LENGTH:** 158" [401 cm]

**PHALANX 'B' LENGTH:** 206" [523 cm]

**BARRIER HANDING:** AMBIDEXTROUS

**BARRIER WEIGHT:** 9,705 POUNDS [4,402 KG]

**'A' HEATER OPTION:** NO, HEATER

**HEATER STOCK NUMBER:** 2465-55

**'B' OPTION LIMIT SWITCH (FULLY DOWN):** YES, B2010

**'C' OPTION LIMIT SWITCH (FULLY UP):** YES, B2011

**BARRIER LIGHTS** NO BARRIER LIGHTS

**BARRIER FINISH:** STD PAINT

**PHALANX COLOR SCHEME:**

<b>BUTTRESSES:</b>	WHITE SIDES W/STAINLESS STEEL WRAP
<b>ROAD PLATE:</b>	WHITE W/ 6" RED STRIPES
<b>BARRIER FRAME:</b>	WHITE

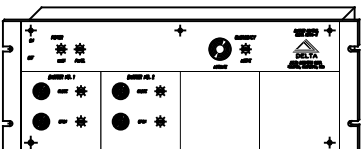
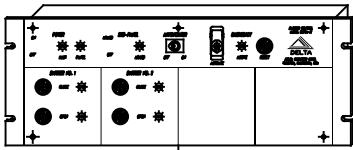


B1041 MASTER CONTROL PANEL  
(DWG 90732-2/-)  
N.T.S

B1091 SLAVE CONTROL PANEL  
(DWG 90832-2/-)  
N.T.S.

AG812-100W  
ACCESS GATE  
W/ AG812-14 12' WOOD ARM  
WHITE/W BLACK STRIPES

MPL-10LED120  
MOUNTED ON MPL-20 48" POST



13 WIRES MASTER/CONTROL CIRCUIT  
(2 AMP MAXIMUM CURRENT @ 24 VDC)

13 WIRES MASTER/SLAVE  
(2 AMP MAXIMUM CURRENT @ 24 VDC)

480/3/60, MOTOR POWER  
1.5 HP @ 480/3/60, 2.8 FLA  
120/1/60, CONTROL POWER

AG812-100W POWER:  
120/1/60, 5.5 AMP

2 WIRES, CONTROL CIRCUIT TO EACH SIGNAL GATE  
(0.0038 AMPS @ 24 VDC)

CONTROL WIRING VARIES  
DEPENDING ON SITE-SPECIFIC CONFIGURATION

3 WIRES CONTROL CIRCUIT TO EACH SIGNAL LIGHT  
(25 WATTS @ 120/1/60)

HYDRAULIC POWER UNIT  
(DWG 90567/G)  
B1325 HAND PUMP  
CONTROL CIRCUIT  
B1155 BATTERY BACKUP  
B1260 DISCONNECT  
(DWG 10818-30)

HYDRAULIC CYLINDER  
ENCLOSED IN BUTTRESS

(1 TWISTED PAIR)

LMA-1250-LV  
VEHICLE LOOPS

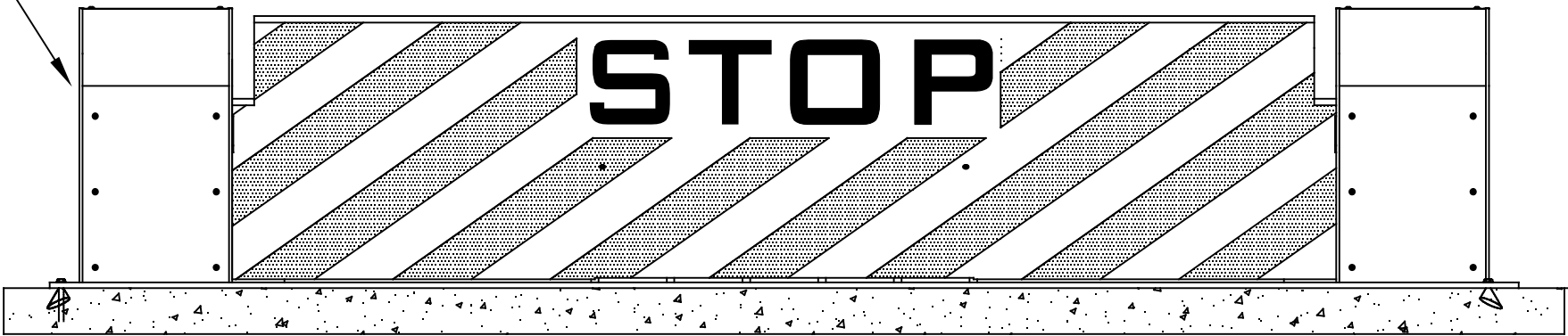
(1 TWISTED PAIR)

LMA-1250-LV  
VEHICLE LOOPS

(1 TWISTED PAIR)

LMA-1250-LV  
VEHICLE LOOPS

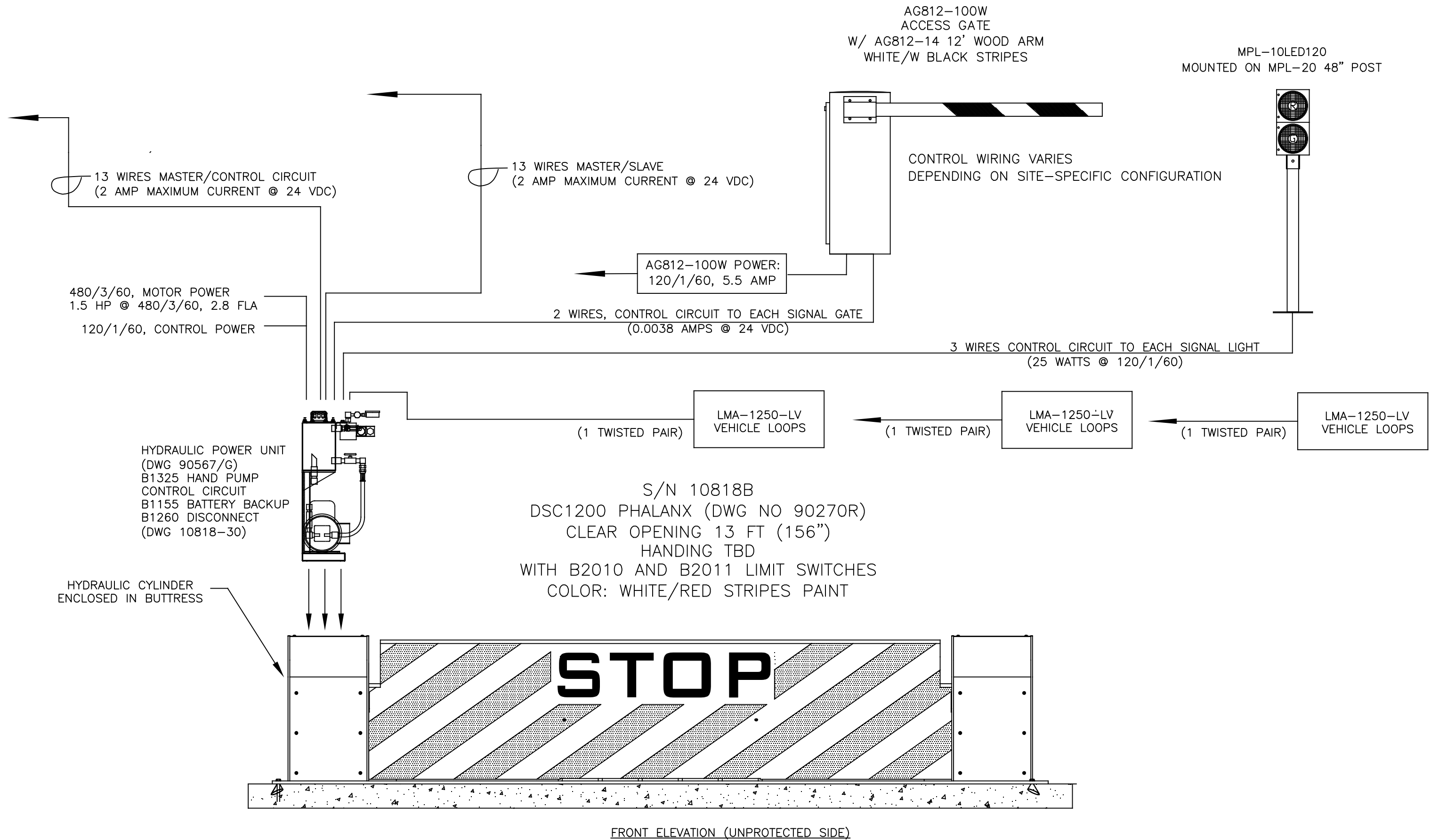
S/N 10818A  
DSC1200 PHALANX (DWG NO 90270R)  
CLEAR OPENING 17 FT (204")  
HANDING TBD  
WITH B2010 AND B2011 LIMIT SWITCHES  
COLOR: WHITE/RED STRIPES PAINT



FRONT ELEVATION (UNPROTECTED SIDE)

DUAL BARRIER SYSTEM

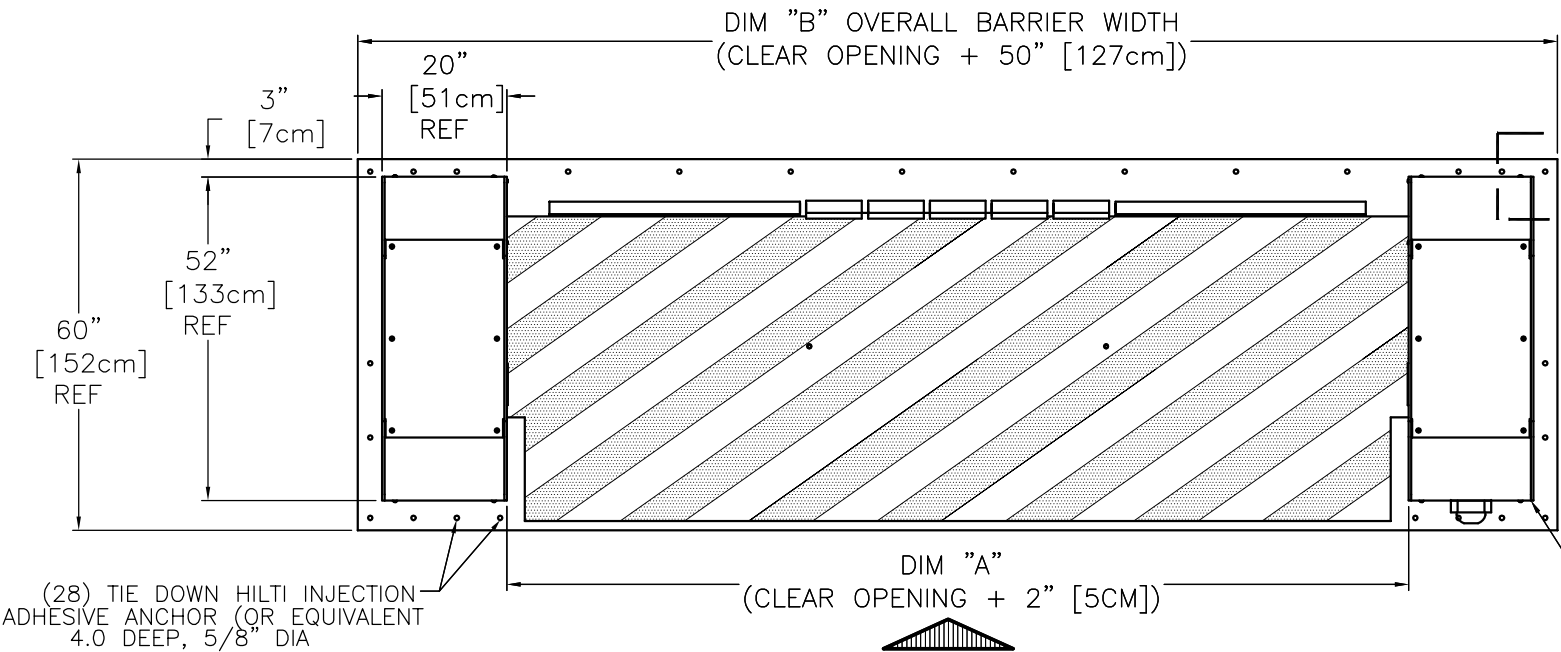
THIS DRAWING UNLESS OTHERWISE NOTED, REMAINS THE CONFIDENTIAL PROPERTY AND TRADE SECRET OF DELTA SCIENTIFIC CORPORATION. IT SHALL NOT BE DISCLOSED, REPRODUCED OR USED FOR MANUFACTURE, DESIGN OR CONSTRUCTION WITHOUT THE EXPRESS AUTHORIZATION OF DELTA SCIENTIFIC CORPORATION. THE HOLDER BY ACCEPTING THIS DRAWING, ASSUMES CUSTODY THEREOF AND UNDER THE ABOVE TERMS AGREES NOT TO ALLOW USE OF BY UNAUTHORIZED PERSONS.		UNLESS OTHERWISE NOTED DIMENSIONS ARE IN INCHES		TOLERANCES .X = ±.060 .XX = ±.030 .XXX = ±.010 ANGLES = ±.5°		SURFACE FINISH 125		REMOVE ALL BURRS & BREAK SHARP EDGES .02 MAX		DELTA SCIENTIFIC CORPORATION 40355 DELTA LANE PALMDALE, CA 93551 U.S.A. (861) 575-1100 FAX (861) 575-1109	
DSC1200 PHALANX BARRIER INTERCONNECT		DRAWN BY TMB		DATE 10/17/24		DRAWING NO. J10818A-1		REV.		SCALE: NTS	
CHKD BY		DATE		APPRD BY		DATE		SHEET		1 OF 1	
© 2019 ALL RIGHTS RESERVED											



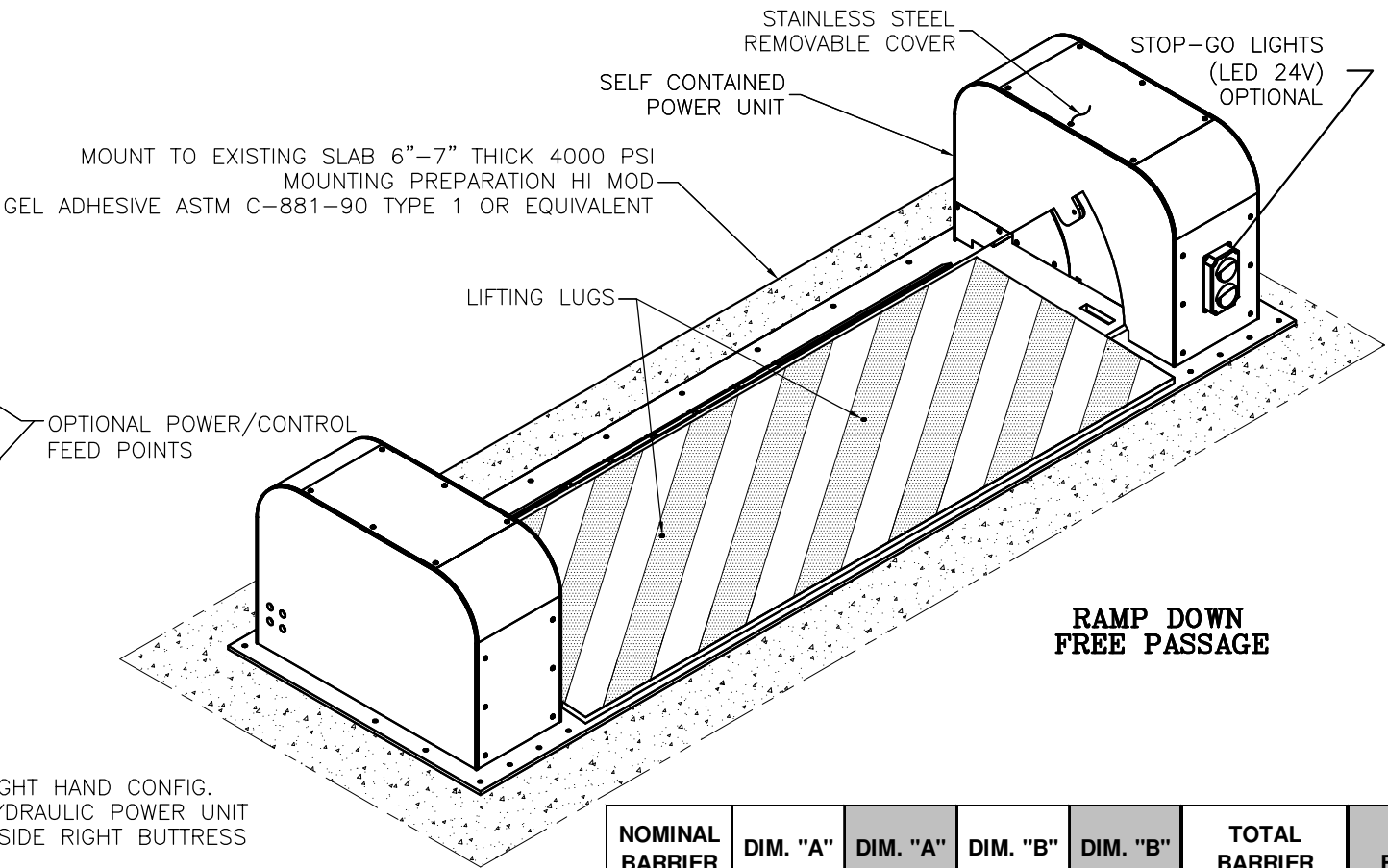
## DUAL BARRIER SYSTEM

<div>THIS DRAWING UNLESS OTHERWISE NOTED, REMAINS THE CONFIDENTIAL PROPERTY AND TRADE SECRET OF DELTA SCIENTIFIC CORPORATION. IT SHALL NOT BE DISCLOSED, REPRODUCED OR USED FOR MANUFACTURE, DESIGN OR CONSTRUCTION WITHOUT THE EXPRESS AUTHORIZATION OF DELTA SCIENTIFIC CORPORATION. THE PURPORT BY ADOPTING THIS DRAWING, ASSUMES CUSTODY THEREOF AND UNDER THE ABOVE TERMS AGREES NOT TO ALLOW USE OF BY UNAUTHORIZED PERSONS.</div> <div>© 2019 ALL RIGHTS RESERVED</div>	<div>UNLESS OTHERWISE NOTED DIMENSIONS ARE IN INCHES</div> <div>TOLERANCES .X = ±.060 .XX = ±.030 .XXX = ±.010 ANGLES = ±.5°</div> <div>SURFACE FINISH 125√</div> <div>REMOVE ALL BURRS &amp; BREAK SHARP EDGES .02 MAX</div>	<div><div><div><div></div><div>DELTA SCIENTIFIC CORPORATION</div></div><div>40355 DELTA LANE PALMDALE, CA 93551 U.S.A. (661) 575-1100 FAX (661) 575-1109</div></div><div>DSC1200 PHALANX BARRIER INTERCONNECT</div></div>				
		DRWN BY TMB	DATE 10/17/24	DRAWING NO. J10818B-1		REV.
		CHKD BY	DATE			
		APPRD BY	DATE	SCALE: NTS	SHEET 1 OF 1	

DSC1200 SURFACE MOUNTED  
SELF CONTAINED BARRIER SYSTEM  
U. S. DEPT. OF STATE CRASH  
CERTIFICATION K4, ZERO PENETRATION  
DELTA RATED K8



DIRECTION OF CONTROLLED TRAFFIC  
**PLAN VIEW**



NOMINAL BARRIER WIDTH (ft.)	DIM. "A" (in.)	DIM. "A" (cm)	DIM. "B" (in.)	DIM. "B" (cm)	TOTAL BARRIER WEIGHT (lbs.)	TOTAL BARRIER WEIGHT (kg)
8 ft	98 in	249 cm	146 in	371 cm	8,020 lbs	3,638 kg
9 ft	110 in	279 cm	158 in	401 cm	8,357 lbs	3,790 kg
10 ft	122 in	310 cm	170 in	432 cm	8,694 lbs	3,943 kg
11 ft	134 in	340 cm	182 in	462 cm	9,031 lbs	4,096 kg
12 ft	146 in	371 cm	194 in	493 cm	9,368 lbs	4,249 kg
13 ft	158 in	401 cm	206 in	523 cm	9,705 lbs	4,402 kg
14 ft	170 in	432 cm	218 in	554 cm	10,042 lbs	4,555 kg
15 ft	182 in	462 cm	230 in	584 cm	10,379 lbs	4,708 kg
16 ft	194 in	493 cm	242 in	615 cm	10,717 lbs	4,861 kg
17 ft	206 in	523 cm	254 in	645 cm	11,054 lbs	5,014 kg
18 ft	218 in	554 cm	266 in	676 cm	11,391 lbs	5,167 kg
19 ft	230 in	584 cm	278 in	706 cm	11,728 lbs	5,320 kg
20 ft	242 in	615 cm	290 in	737 cm	12,065 lbs	5,472 kg

DELTA SCIENTIFIC'S DSC1200  
SURFACE MOUNTED SELF CONTAINED  
CRASH RATED BARRIER

THE SYSTEM HAS BEEN TESTED IN FULL SCALE CONFIGURATION AT AN INDEPENDENT TESTING LABORATORY AND IS CRASH RATED TO K4, ZERO PENETRATION.

THIS BARRIER SYSTEM CAN BE SITED ON EXISTING CONCRETE OR ASPHALT ROADWAYS OR VERGES. NO EXCAVATION OR SUB-SURFACE PREPARATION IS REQUIRED.

THE DSC1200 IS A PHALANX TYPE SELF CONTAINED BARRIER WITH FREE PASSAGE BETWEEN BUTTRESSES OF 12 FT. (146IN.) OR SEE TABULATION.

POWER REQUIREMENTS:  
SEE CONTROL CIRCUIT DRAWING 906XX.

E	SEE ECO 2009-045	SWB	03/20/09		
D	SEE ECO 2008-161		12/15/08		
C	SEE ECO 2008-160	SWB	08/01/08		
B	SEE ECO 2008-065	JFW	6/10/08		
A	SEE ECO 2008-009	DCM	02/06/08		
REV.	DESCRIPTION	DRWN BY	DATE	APPVD BY	DATE

THIS DRAWING UNLESS OTHERWISE NOTED, REMAINS THE CONFIDENTIAL PROPERTY AND TRADE SECRET OF DELTA SCIENTIFIC CORPORATION. IT SHALL NOT BE DISCLOSED, REPRODUCED OR USED FOR MANUFACTURE, DESIGN OR CONSTRUCTION WITHOUT THE EXPRESS AUTHORIZATION OF DELTA SCIENTIFIC CORPORATION. THE RECIPIENT BY ACCEPTING THIS DRAWING, ASSUMES CUSTODY THEREOF AND UNDER THE ABOVE TERMS AGREES NOT TO ALLOW USE OF BY UNAUTHORIZED PERSONS.

© 2008  
ALL RIGHTS RESERVED

UNLESS OTHERWISE NOTED DIMENSIONS ARE IN INCHES

TOLERANCES  
.X = ±.060/FT  
.XX = ±.030/FT  
.XXX = ±.010/FT  
ANGLES = ±.5°

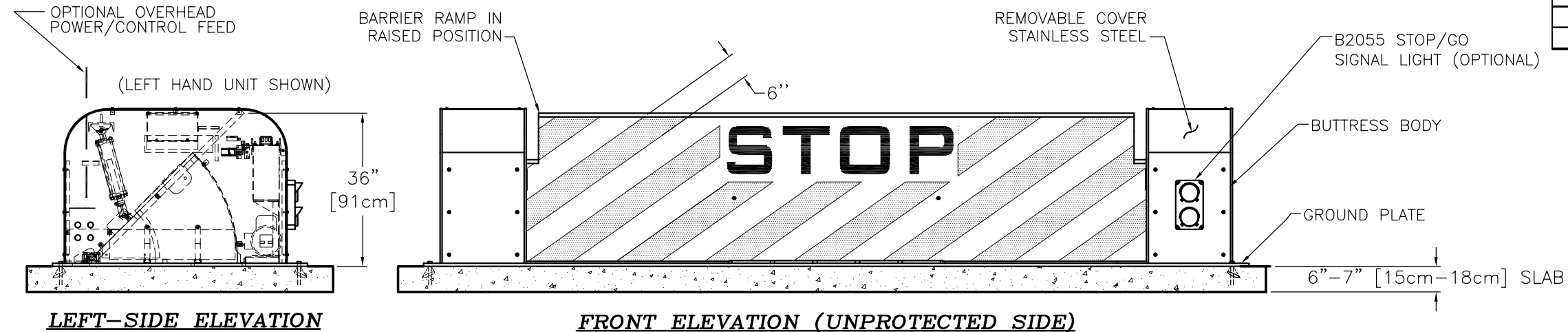
SURFACE FINISH  
125

REMOVE ALL BURRS & BREAK SHARP EDGES .02 MAX

**DELTA SCIENTIFIC CORPORATION**  
40355 DELTA LANE  
PALMDALE, CA 93551 U.S.A.  
(661) 575-1100 FAX (661) 575-1109

**MODEL DSC1200 SURFACE MOUNT 36"**  
**SELF CONTAINED BARRIER**

DRWN BY J. MANOR	DATE 9/18/07	DRAWING NO. <b>90270</b>	REV. <b>M</b>
CHKD BY	DATE	SCALE: 1:16 (D SIZE)	SHEET 1 OF 2
APPVD BY	DATE		



**LEFT-SIDE ELEVATION**

**FRONT ELEVATION (UNPROTECTED SIDE)**

NOTES:

1. OPTIONAL FEATURES INCLUDE

	PART NO.
A HEATER, 'W' WATTS @ 120 VOLTS	B3050
A HEATER, 'W' WATTS @ 240 VOLTS	B3051
B LIMIT SWITCH, FULLY DOWN	B2010
C LIMIT SWITCH, FULLY UP	B2011
D BUTTRESS MOUNTED STOP/GO SIGNAL LIGHT	B2055

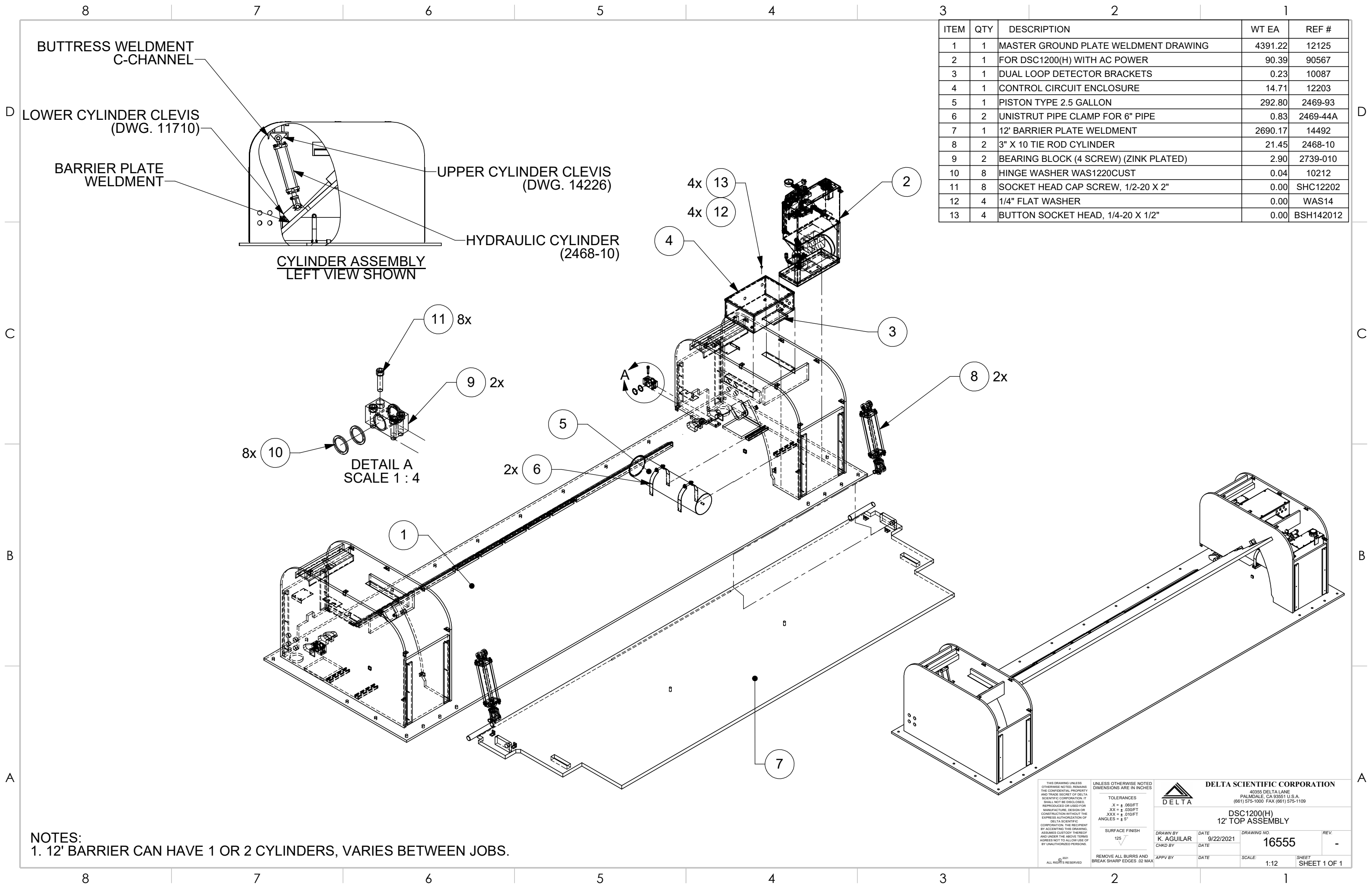
2. COLOR OPTIONS:

WHITE W/6" WIDE YELLOW STRIPES  
BLACK W/6" WIDE YELLOW STRIPES  
WHITE W/6" WIDE RED STRIPES

3. ALL STEEL MEMBERS PER AISC STANDARDS  
WELDING DESIGN CRITERIA AWS D1.1, LATEST REVISION.

4. ALL MILD STEEL COMPONENTS SANDBLASTED TO NEAR WHITE METAL AFTER FABRICATION AND PRIOR TO COATING.

M	SEE ECO 2015-080	M.R.C	09/09/15	JNF	9/23/15
L	SEE ECO 2015-009	M.J.S.	2/11/15		
K	SEE ECO 2012-049	M.C.	09/26/12	J.A.S.	09/26/12
J	SEE ECO 2012-002	M.C.	1/17/12	J.P.H	1/16/12
H	SEE ECO 2011-108	M.C.	9/16/11	D.M.	9/16/11
G	SEE ECO 2010-136	JTB	9/13/10		
F	SEE ECO 2010-021	J.M.	2/19/10		
REV.	DESCRIPTION	DRWN BY	DATE	APPVD BY	DATE



ITEM	QTY	DESCRIPTION	WT EA	REF #
1	1	MASTER GROUND PLATE WELDMENT DRAWING	4391.22	12125
2	1	FOR DSC1200(H) WITH AC POWER	90.39	90567
3	1	DUAL LOOP DETECTOR BRACKETS	0.23	10087
4	1	CONTROL CIRCUIT ENCLOSURE	14.71	12203
5	1	PISTON TYPE 2.5 GALLON	292.80	2469-93
6	2	UNISTRUT PIPE CLAMP FOR 6" PIPE	0.83	2469-44A
7	1	12' BARRIER PLATE WELDMENT	2690.17	14492
8	2	3" X 10 TIE ROD CYLINDER	21.45	2468-10
9	2	BEARING BLOCK (4 SCREW) (ZINK PLATED)	2.90	2739-010
10	8	HINGE WASHER WAS1220CUST	0.04	10212
11	8	SOCKET HEAD CAP SCREW, 1/2-20 X 2"	0.00	SHC12202
12	4	1/4" FLAT WASHER	0.00	WAS14
13	4	BUTTON SOCKET HEAD, 1/4-20 X 1/2"	0.00	BSH142012

NOTES:  
1. 12' BARRIER CAN HAVE 1 OR 2 CYLINDERS, VARIES BETWEEN JOBS.

THIS DRAWING UNLESS OTHERWISE NOTED, REMAINS THE CONFIDENTIAL PROPERTY AND TRADE SECRET OF DELTA SCIENTIFIC CORPORATION. IT SHALL NOT BE DISCLOSED, REPRODUCED OR USED FOR MANUFACTURE, DESIGN OR CONSTRUCTION WITHOUT THE EXPRESS AUTHORIZATION OF DELTA SCIENTIFIC CORPORATION. THE RECIPIENT BY ACCEPTING THIS DRAWING, ASSUMES CUSTODY THEREOF AND UNDER THE ABOVE TERMS AGREES NOT TO ALLOW USE OF BY UNAUTHORIZED PERSONS.

© 2021 ALL RIGHTS RESERVED

UNLESS OTHERWISE NOTED DIMENSIONS ARE IN INCHES

TOLERANCES  
X = ± .060/FT  
XX = ± .030/FT  
XXX = ± .010/FT  
ANGLES = ± 5°

SURFACE FINISH  
125

REMOVE ALL BURRS AND BREAK SHARP EDGES .02 MAX.

**DELTA**

**DELTA SCIENTIFIC CORPORATION**  
40355 DELTA LANE  
PALMDALE, CA 93551 U.S.A.  
(661) 575-1000 FAX (661) 575-1109

**DSC1200(H)  
12' TOP ASSEMBLY**

DRAWN BY <b>K. AGUILAR</b>	DATE 9/22/2021	DRAWING NO. <b>16555</b>	REV. -
CHKD BY	DATE	SCALE: 1:12	SHEET SHEET 1 OF 1
APPV BY	DATE		

**DRAWING 90567 FLY-SHEET**

**DELTA JOB NUMBER:** J10818A & J10818B

**CUSTOMER:** NEW ORLEANS CONVENTION CENTER  
ERNEST N. MORAL  
900 CONVENTION CENTER BLVD.  
NEW ORLEANS, LA 70130

**DATE:** October 15, 2024

THIS FLY-SHEET COVERS JOB SPECIFIC TABULATIONS TO DELTA DRAWING 90567/G.

**S/N 10818A & 10818B - HPU**  
**TWO HYDRAULIC POWER UNIT**

**'H' HORSEPOWER @'V' MOTOR VOLTAGE:** 1.5 HP @ 480/3/60

**PUMP/MOTOR SET STOCK NUMBER:** 2471-72

**PRESSURE SWITCH:** 1400 TO 1900 PSIG, STOCK NUMBER  
2465-08

**EFO VALVE:** NO, EFO

**B1192 TANK HEATER OPTION:** NO HEATER INSTALLED

**B1326 HAND PUMP OPTION:** YES, STOCK NUMBER 2471-32

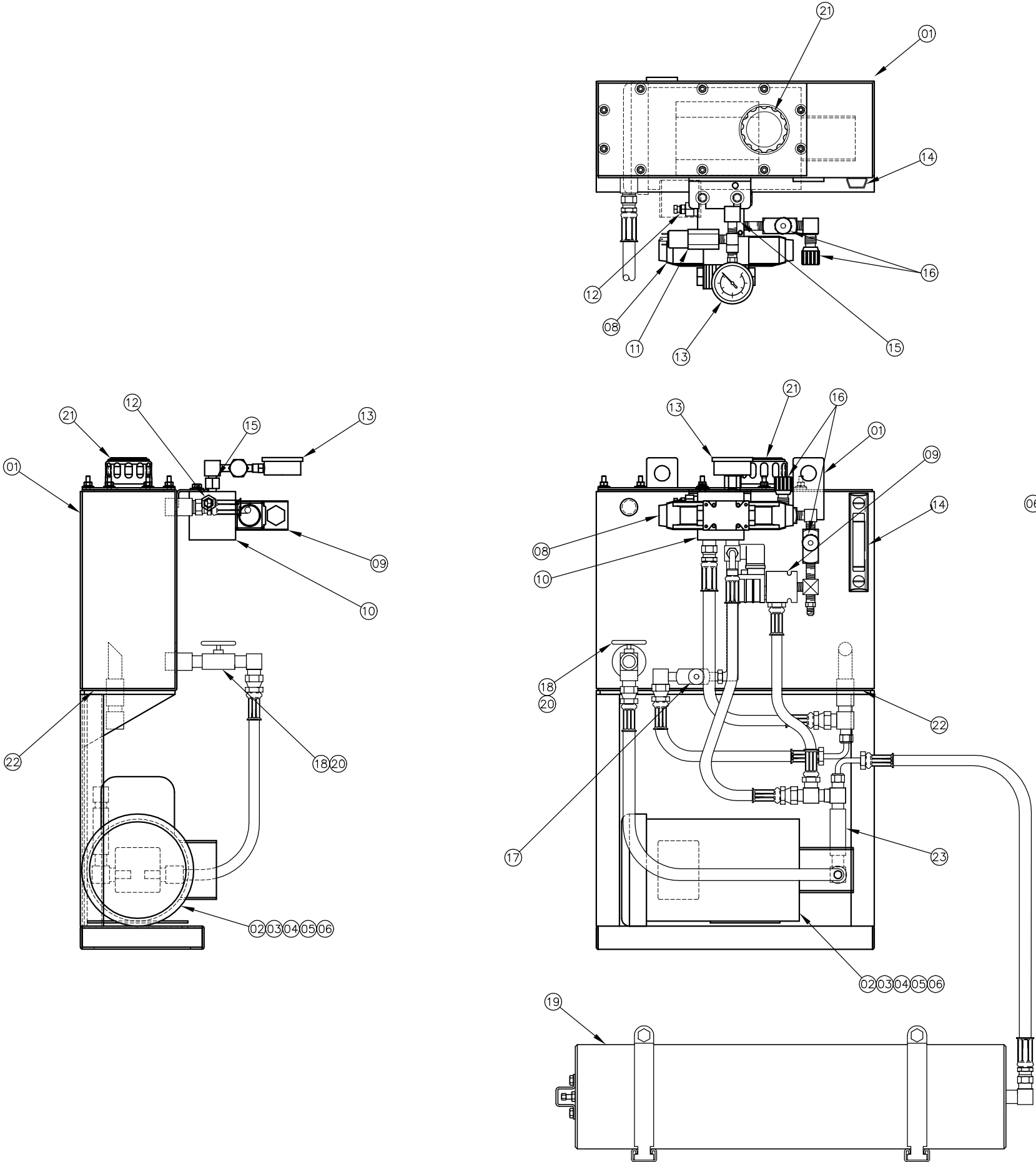
**FLOW CONTROL VALVES:** (2) 3/8" FNPT, STOCK NUMBER 2466-02

**ACCUMULATOR SIZE:** 2.5 GALLON, STOCK NUMBER 2469-93

**ACCUMULATOR PRE-CHARGE PRESSURE** 1000 PSIG DRY NITROGEN

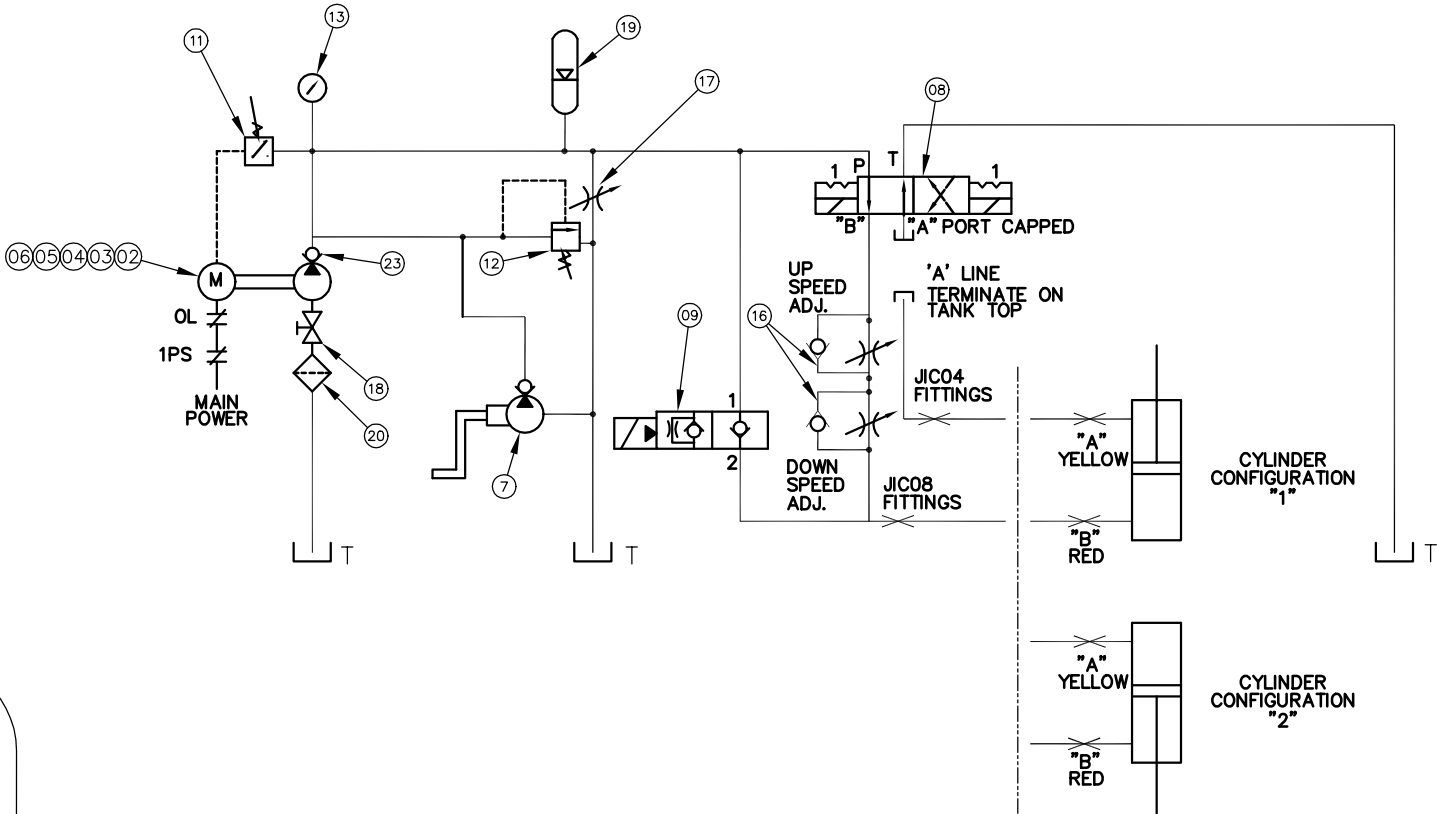
**MOTOR STARTER DRAWING NUMBER:** 10818-30

**WEIGHT, POUNDS [KG]:** 198 POUNDS [90 KG]



ITEM	REQ'D	MATERIAL DESCRIPTION	STK. NO.
01	1	HPU, TANK AND FRAME,	12226
02	0 or 1	PUMP/MOTOR SET, VAC115/230, 1.5 HP, 1 PH, 1.17 GPM, 60 Hz, 1550 PSI	2471-70
03	0 or 1	PUMP/MOTOR SET, VAC208/220, 1.5 HP, 1 PH, 1.17 GPM, 50/60 Hz	2471-71
04	0 or 1	PUMP/MOTOR SET, VAC208/220/440, 1.5 HP, 3PH, 1.17 GPM, 50/60 Hz	2471-72
05	0 or 1	PUMP/MOTOR SET, VAC208/220/440, 1.5 HP, 3 PH, .58 GPM, 50/60 Hz	2471-73
06	0 or 1	PUMP/MOTOR SET, VAC115/230, 1.5 HP, 1 PH, .58 GPM, 60 Hz, 1800 PSI	2471-74
07	0 or 1	HANDPUMP, B1326 OPTION	2471-32
08	1	VALVE,SOLENOID, D03, 24 VDC, SPRING DETENTED,	2467-01
09	0 or 1	VALVE, EFO, 24 VDC,	2467-31
10	1	MANIFOLD, ISO 03, SINGLE STATION	2467-71
11	1	PRESSURE SWITCH, OFF @ xxxx PSIG/RESET xxxx PSIG	2465-xx
12	1	PRESSURE RELIEF VALVE,	2465-05
13	1	PRESSURE GUAGE, 0-3000 PSIG,	2465-21
14	1	LEVEL GAUGE, 5",	2465-24
15	1	GAUGE SNUBBER, DELTROL GS20S	2465-23
16	2	VALVE, FLOW CONTROL, 3/8" NPT,	2466-02
17	1	VALVE, NEEDLE, 1/4" NPT,	2466-11
18	1	VALVE, BALL, 1/2" NPT, BRONZE,	2466-33B
19	1	ACCUMULATOR, PISTON TYPE, 2.5 GALLON,	2469-93
20	1	SUCTION STRAINER,	2470-41
21	1	FILLER BREATHER,	2470-43
22	0 or 1	TANK HEATER, B1192 or B1193 OPTION	2465-xx
23	1	PRESSURE RELIEF VALVE, 1/4" NPT	2466-61B

TOTAL WEIGHT = 198 POUNDS [90 KG]



TYPICAL HYDRAULIC FLOW SCHEMATIC

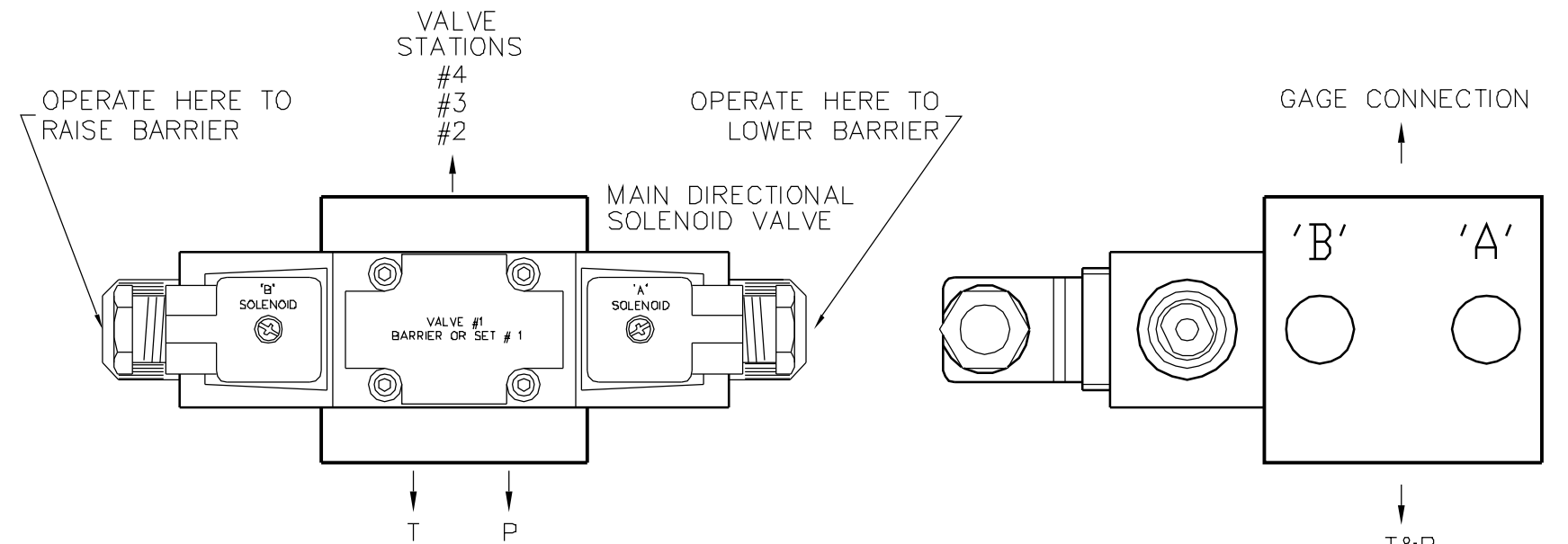
TYPICAL CYLINDER INSTALLATIONS

G	ECO 2014-006	J.P.H.	01/21/14										
F	ECO 2013-024	JNF	06/04/13										
E	ADDED CYLINDER CONFIGURATIONS 1 & 2	J.P.H.	04/03/13										
D	ECO 2012-049	M.C.	09/24/12	J.A.S.	09/24/12								
C	ECO 2010-140	JTB	9/14/10										
B	ECO 2009-022	JFW	2/18/09										
A	ECO 2008-112	JFW	9/29/08										
REV.	DESCRIPTION	DRWN BY	DATE	APPVD BY	DATE								
<div><div><p>THIS DRAWING UNLESS OTHERWISE NOTED, REMAINS THE CONFIDENTIAL PROPERTY AND TRADE SECRET OF DELTA SCIENTIFIC CORPORATION. IT SHALL NOT BE DISCLOSED, REPRODUCED OR USED FOR MANUFACTURE, DESIGN OR CONSTRUCTION WITHOUT THE EXPRESS AUTHORIZATION OF DELTA SCIENTIFIC CORPORATION. THE RECIPIENT BY ACCEPTING THIS DRAWING, ASSUMES CUSTODY THEREOF AND UNDER THE ABOVE TERMS AGREES NOT TO ALLOW USE OF BY UNAUTHORIZED PERSONS.</p><p>© 2008 ALL RIGHTS RESERVED</p></div><div><p>UNLESS OTHERWISE NOTED DIMENSIONS ARE IN INCHES</p><p>TOLERANCES .X = ±.060/FT .XX = ±.030/FT .XXX = ±.010/FT ANGLES = ±.5°</p><p>SURFACE FINISH 125</p><p>REMOVE ALL BURRS &amp; BREAK SHARP EDGES .02 MAX</p></div><div><p><b>DELTA SCIENTIFIC CORPORATION</b> 40355 DELTA LANE PALMDALE, CA 93551 U.S.A. (661) 575-1100 FAX (661) 575-1109</p><p><b>INTEGRATED HYDRAULIC POWER UNIT FOR DSC1200 WITH AC POWER</b></p><table><tr><td>DRWN BY S.BRESSLER</td><td>DATE 02/28/08</td><td>DRAWING NO. <b>90567</b></td><td>REV. <b>G</b></td></tr><tr><td>CHKD BY</td><td>DATE</td><td>SCALE: 1:4 (D SIZE)</td><td>SHEET 1 OF 1</td></tr></table></div></div>						DRWN BY S.BRESSLER	DATE 02/28/08	DRAWING NO. <b>90567</b>	REV. <b>G</b>	CHKD BY	DATE	SCALE: 1:4 (D SIZE)	SHEET 1 OF 1
DRWN BY S.BRESSLER	DATE 02/28/08	DRAWING NO. <b>90567</b>	REV. <b>G</b>										
CHKD BY	DATE	SCALE: 1:4 (D SIZE)	SHEET 1 OF 1										

# MAIN DIRECTION CONTROL VALVES (ON MANIFOLD)

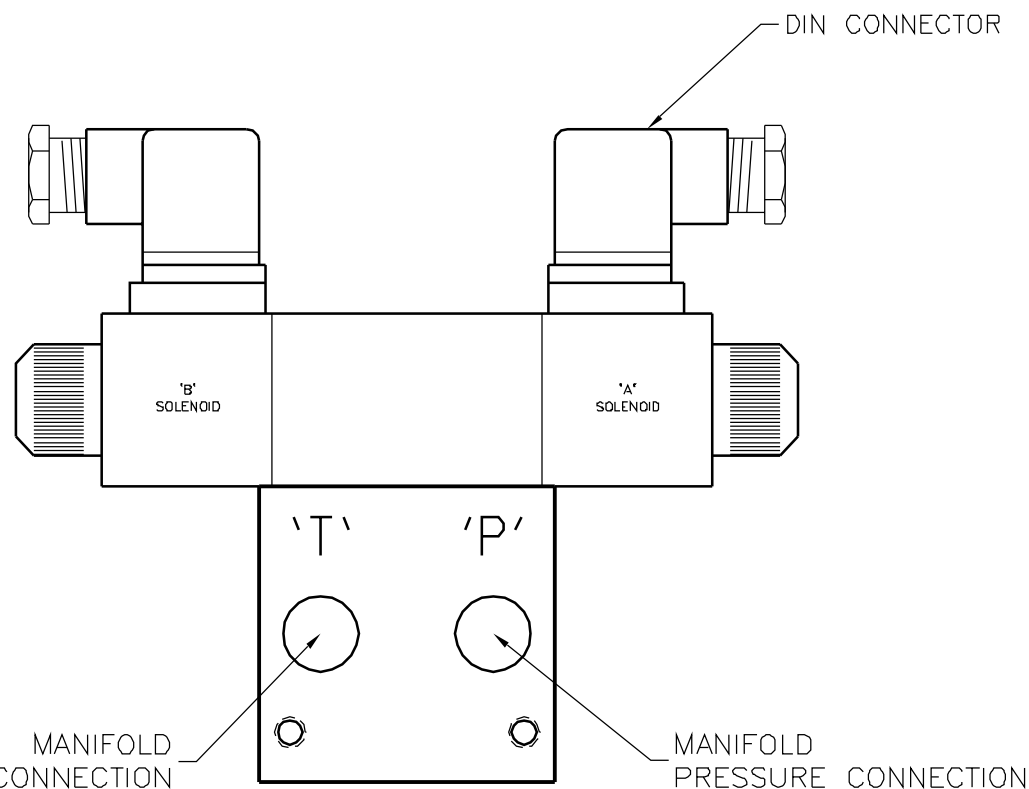
5-B

## SINGLE ACTING SURFACE MOUNTED BARRIERS

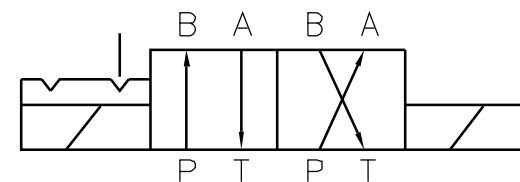


ELEVATION

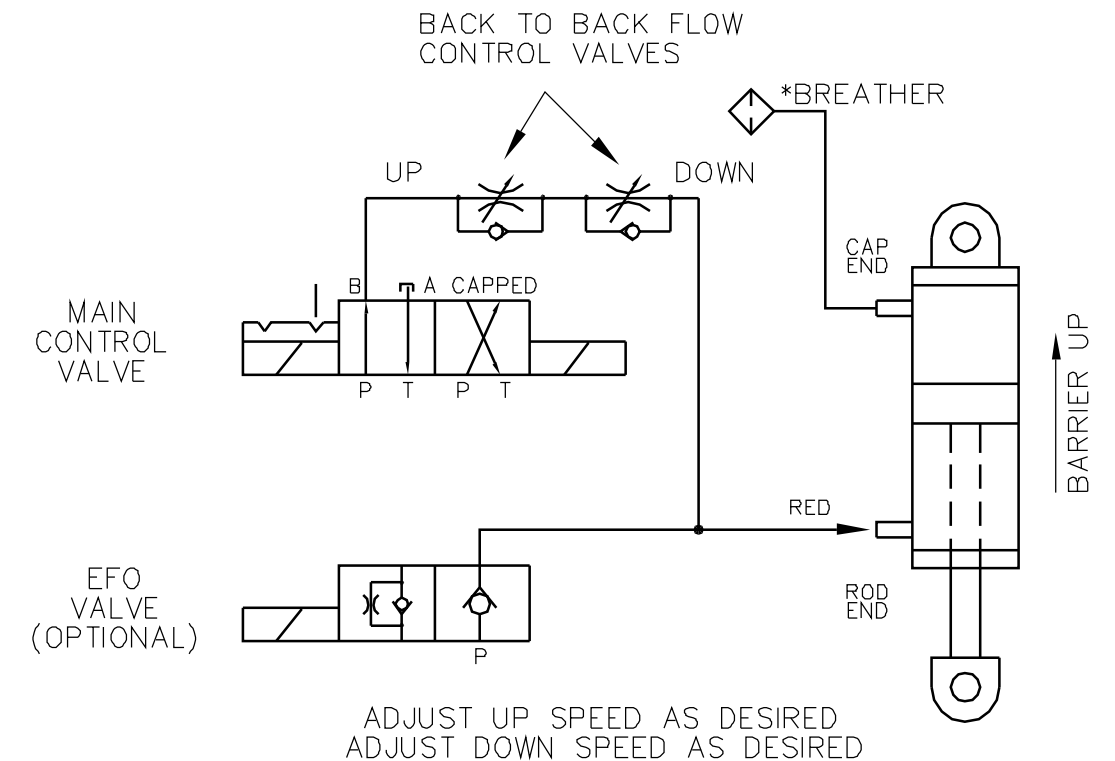
RIGHT ELEVATION



BOTTOM VIEW SHOWING  
PRESSURE AND TANK CONNECTIONS

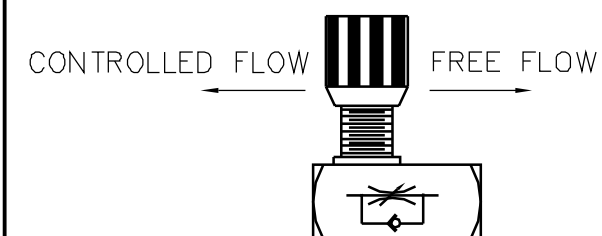


VALVE SYMBOL



\* BREATHER OR ALTERNATELY CONNECTED  
TO HPU TANK TOP

## SPEED CONTROL VALVE



FLOW CONTROL VALVE

CLOCKWISE IS SLOWER  
COUNTER CLOCKWISE  
IS FASTER

<small>THIS DRAWING UNLESS OTHERWISE NOTED, REMAINS THE CONFIDENTIAL PROPERTY AND TRADE SECRET OF DELTA SCIENTIFIC CORPORATION. IT SHALL NOT BE DISCLOSED, REPRODUCED OR USED FOR MANUFACTURE, DESIGN OR CONSTRUCTION WITHOUT THE EXPRESS AUTHORIZATION OF DELTA SCIENTIFIC CORPORATION. THE RECIPIENT BY ACCEPTING THIS DRAWING, ASSUMES CUSTODY THEREOF AND UNDER THE ABOVE TERMS, AGREES NOT TO ALLOW USE OF IT BY UNAUTHORIZED PERSONS.</small>				<small>UNLESS OTHERWISE NOTED DIMENSIONS ARE IN INCHES</small>				<b>DELTA SCIENTIFIC CORPORATION</b> 24901 WEST AVE. STANFORD VALENCIA, CA 91355 U.S.A. (805) 257-1800 FAX (805) 257-0617			
<b>TOLERANCES</b> .X = ±.060/FT .XX = ±.030/FT .XXX = ±.010/FT ANGLES = ±.5°				<b>SURFACE FINISH</b> 125				<b>VALVE CONNECTION DIAGRAM BACK TO BACK FLOW CONTROLS/S.A.</b>			
DRWN BY J.FRIEND				DATE 06/06/97				DRAWING NO. 90416			
CHKD BY				DATE				SCALE FULL (D SIZE)			
APPVD BY				DATE				SHEET SHEET 1 OF 1			

**DRAWING J10818-30 FLY-SHEET**

**DELTA JOB NUMBER:** J10818A & J10818B

**CUSTOMER:** NEW ORLEANS CONVENTION CENTER  
ERNEST N. MORAL  
900 CONVENTION CENTER BLVD.  
NEW ORLEANS, LA 70130

**DATE:** October 15, 2024

THIS FLY-SHEET COVERS JOB SPECIFIC TABULATIONS TO DELTA DRAWING 90663-1/-.

**S/N 10818A & 10818B - CC**  
**TWO CONTROL CIRCUIT(S)**

**'H' HORSEPOWER @ 'R' MOTOR RPM:** 1.5 HP @ 1725 RPM

**'V' MOTOR VOLTAGE:** 480/3/60

**'FL' MOTOR FULL LOAD AMPS:** 8.6 AMPS

**'CV' CONTROL CIRCUIT VOLTAGE:** 120/1/60

**'W' POWER SUPPLY WATTAGE:** 150 WATTS, STOCK NUMBER 2461-25

**'1FU' FUSE AND STOCK NUMBER:** 1.5 AMPS, STOCK NUMBER 2459-15

**'2FU' FUSE AND STOCK NUMBER:** 7.5 AMPS, STOCK NUMBER 2459-12

**'3FU'/'RHA' FUSE AND STOCK NUMBER:** NO OIL HEATER

**'RW' OIL HEATER WATTS:** NO HEATER

**'4FU-5FU'/'BHA' FUSE AND STOCK NUMBER:** 2.5 AMPS, STOCK NUMBER 2459-10

**'HW' BARRIER HEATER WATTS:** (2) 60 WATTS

**WIRE COLOR CODE:** USA

**B1255 POWER MONITOR OPTION:** NO POWER MONITOR

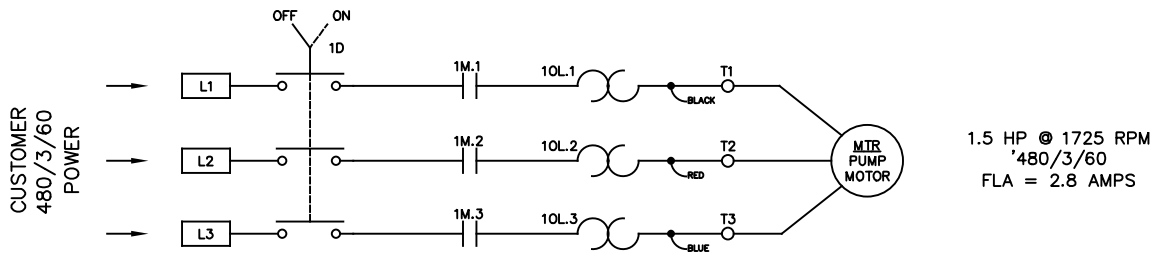
**B1260 DISCONNECT OPTION:** YES, B1260 DISCONNECT INSTALLED

**STARTER STOCK NUMBER:** 2531-107

**OVERLOAD STOCK NUMBER:** 2531-67



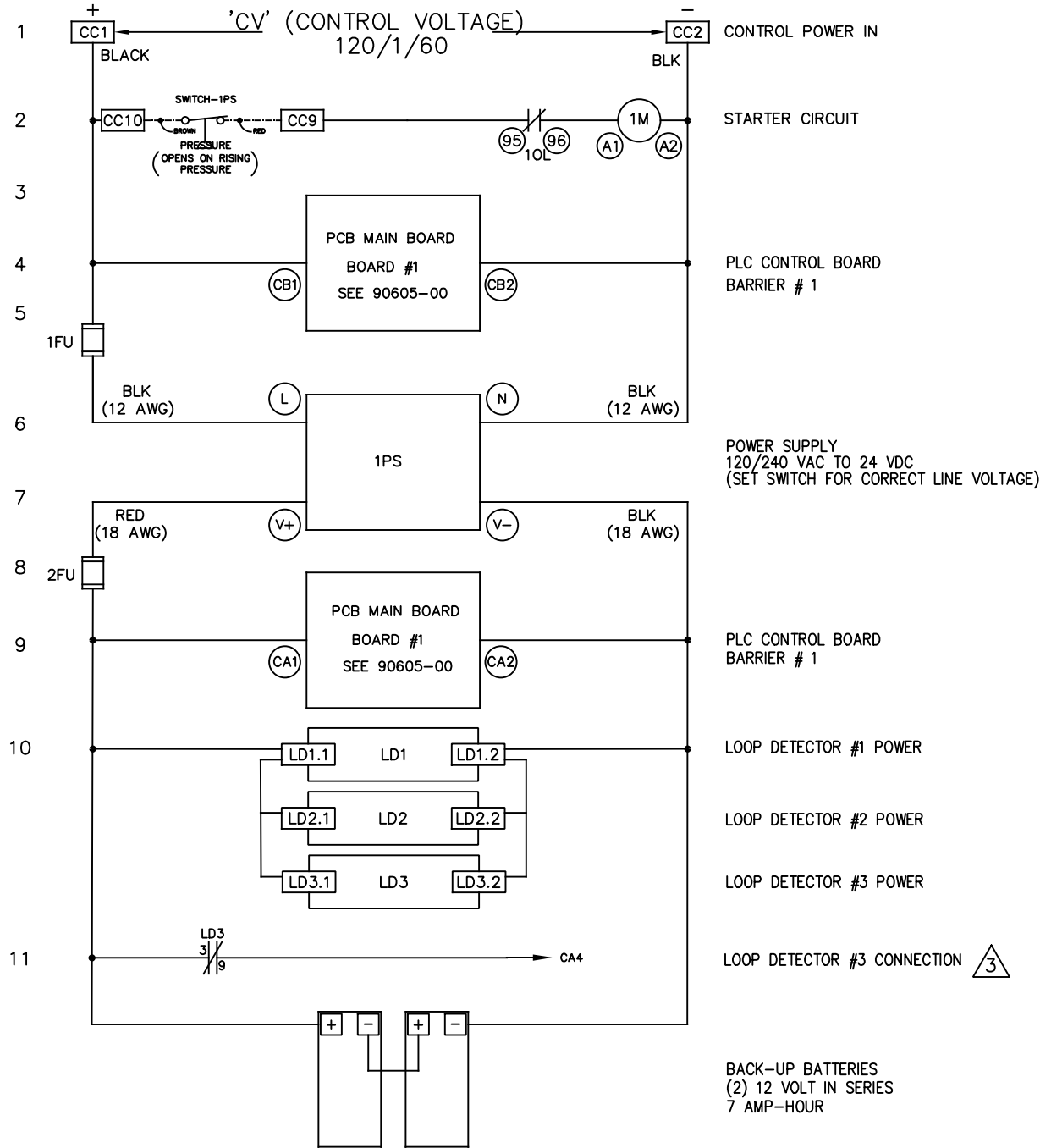
MOTOR WIRING



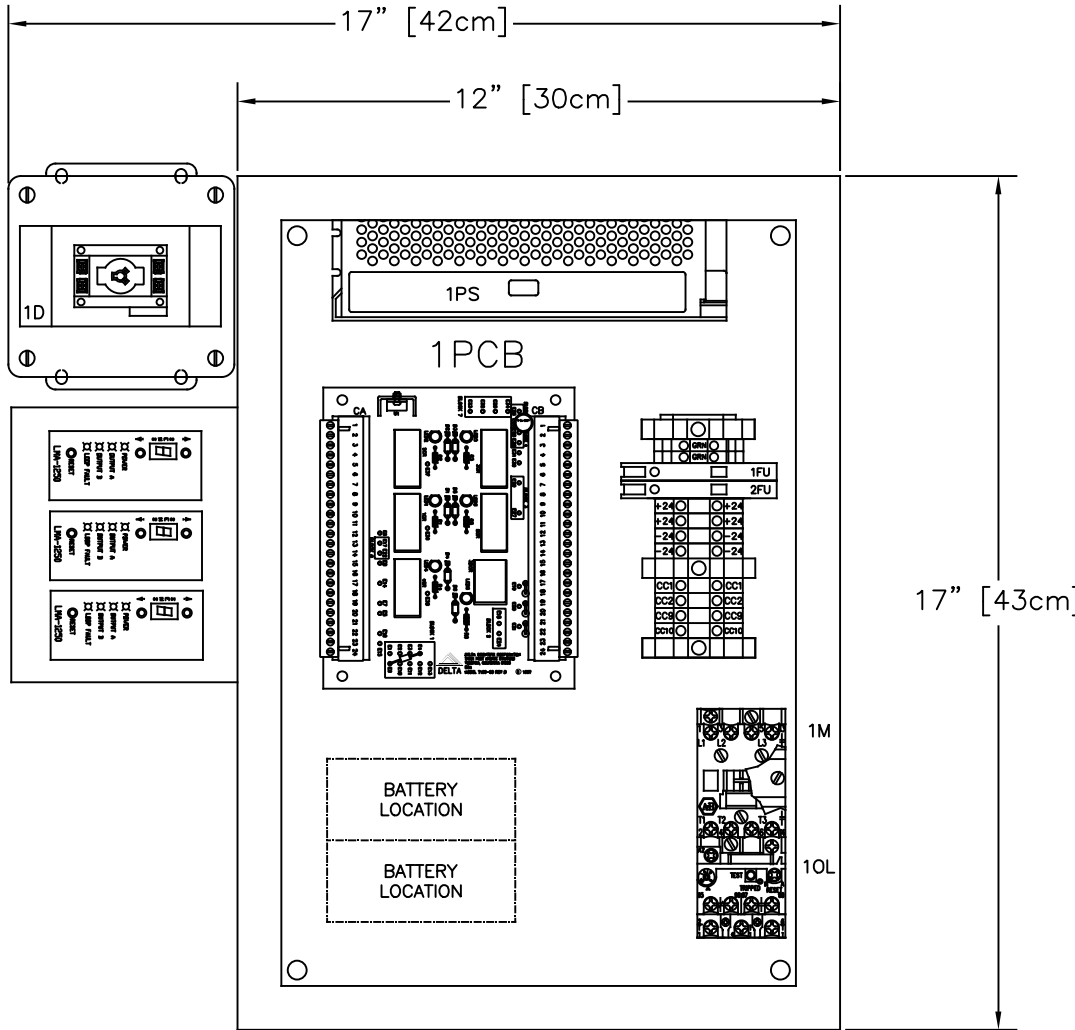
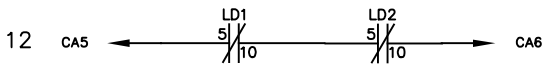
LOCATION	L1	L2	L3	NEUTRAL	GROUND
USA - 200-250 VAC	BLACK	RED	BLUE	WHITE	GREEN *
USA - 400-500 VAC	BROWN	ORANGE	YELLOW	WHITE	GREEN *
CANADA	RED	BLACK	BLUE	WHITE	GREEN *
EUROPE	BROWN	BLACK	GREY	BLUE	GRN/YEL

\* GROUND CONDUCTOR MAY BE BARE COPPER WIRE

CONTROL CIRCUIT WIRING




LOOP DETECTOR #1-2 CONNECTIONS

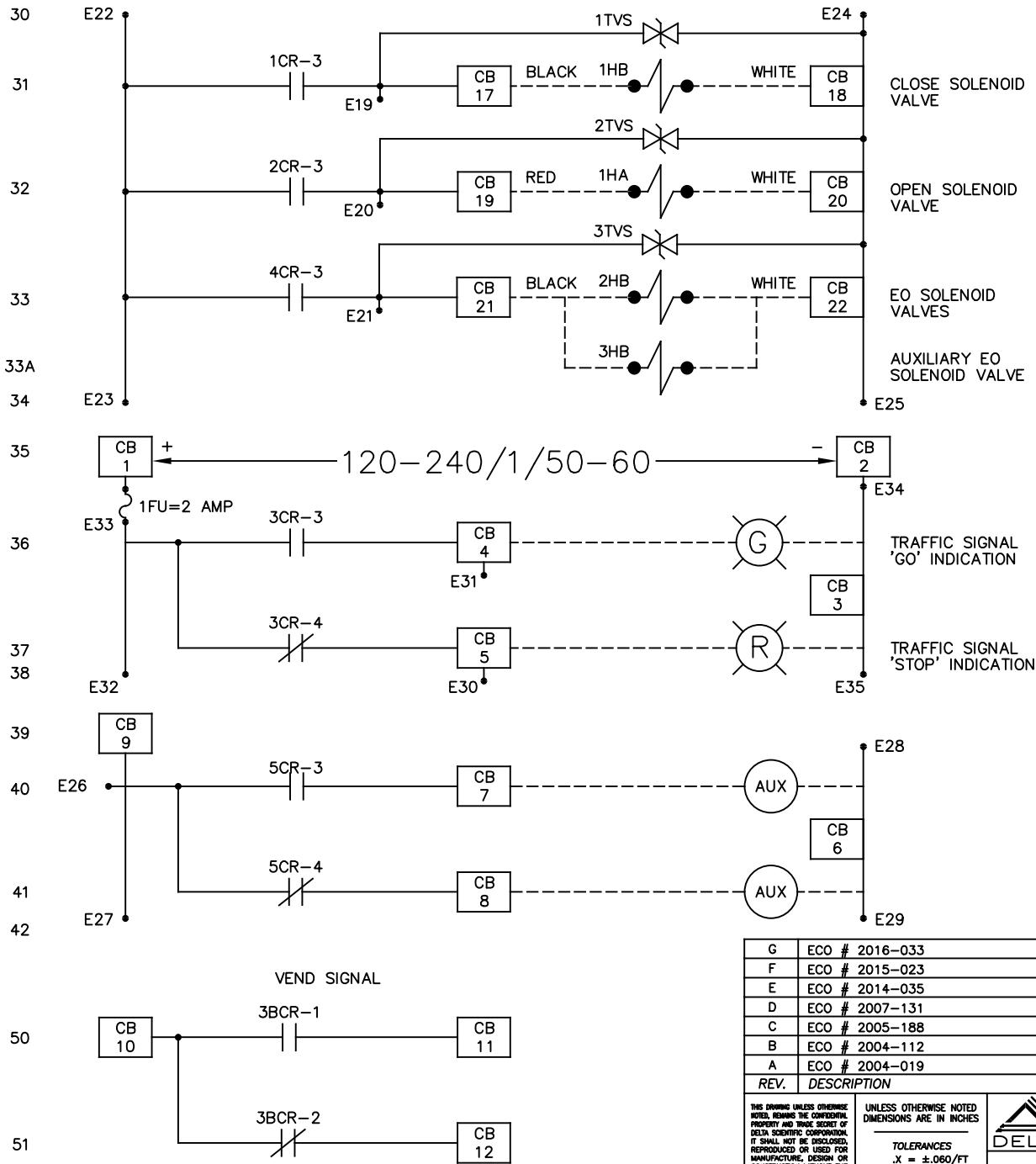
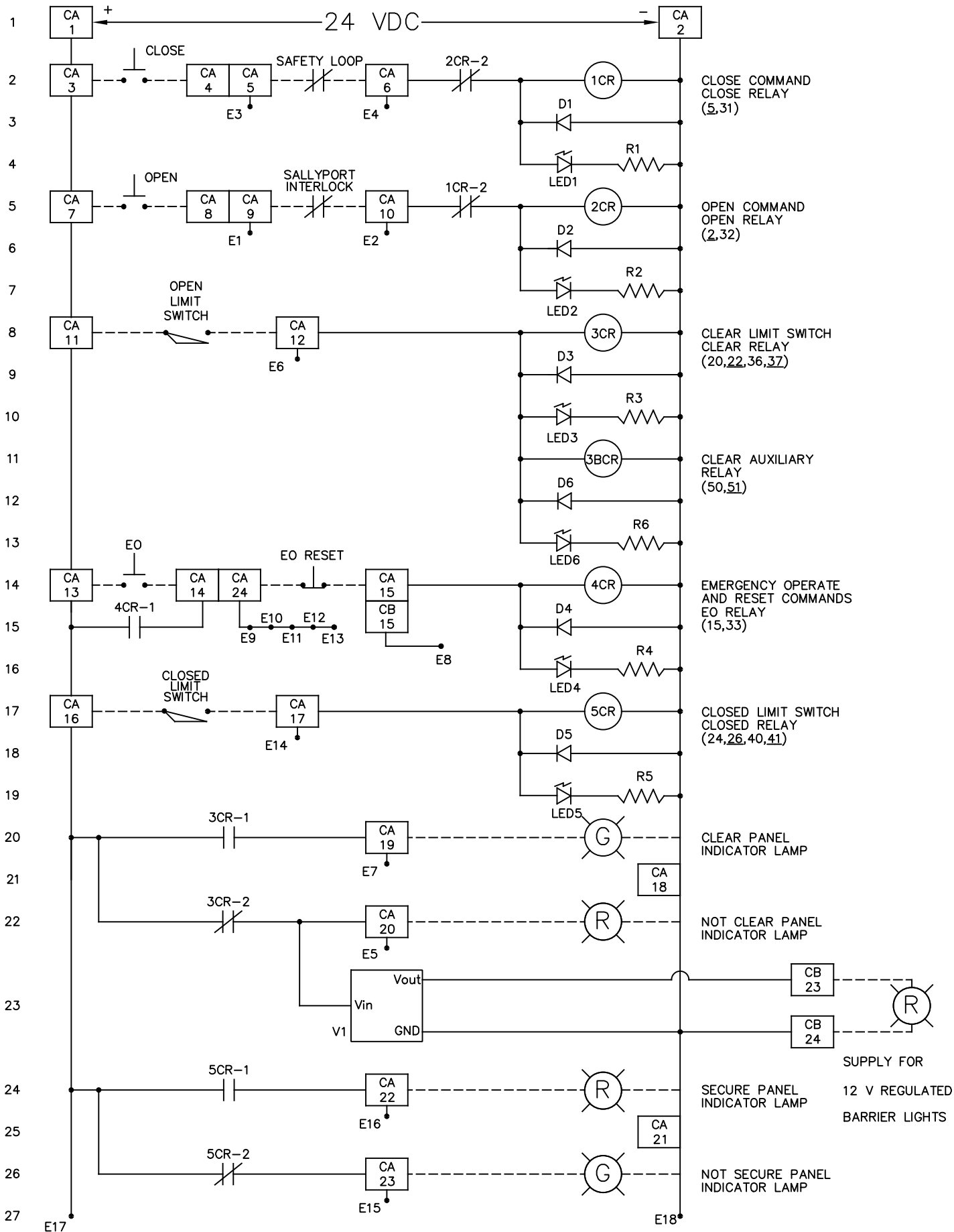


APPROXIMATE PARTS LOCATION ON CHASSIS PAN  
ENCLOSURE CLASSIFICATION NEMA 1

- 1 MOUNTED NEXT TO CC BOX  
INSIDE BUTRESS
- 2 MOUNTED NEXT TO CC BOX  
INSIDE BUTRESS USING LMH4-11
- 3 PULSE ON EXIT (AUTOCLOSE)  
REFERENCE B2100

ITEM	REQ'D.	DESCRIPTION	STK. NO.
1PLC	1	DELTA PRINTED CIRCUIT BOARD ASSEMBLY, P/N 7314-00	90605-00
1M	1	MOTOR STARTER, 120 VOLT	2531-107
10L	1	STARTER OVERLOAD,	2531-67
1D	1	DISCONNECT, B1260	2531-95
1PS	1	POWER SUPPLY, 120/240 V, 50/60 HZ/24 VDC, 150 WATTS	2461-25
1FU	1	FUSE, 250 VOLTS, 1.5 AMP, DUAL ELEMENT,	2459-15
2FU	1	FUSE, 250 VOLTS, 7.5 AMP, DUAL ELEMENT,	2459-12
LD1-LD3	3	LOOP DETECTOR, 24 VDC, DUAL OUTPUT	LMA-1250-LV
1BAT-2BAT	2	BATTERY, 12 VOLT, 1.2 AMP-HOUR, YUASA NP1.2-12 OR EQ	2461-42
01	8	TERMINALS, 30 AMP, A-D DN-T10	2460-60
02	2	FUSE BLOCK, A-D DN-F6	2460-63
03	2	TERMINAL, GROUNDING BLOCK, A-D DN-G10	2460-61
04	3	TERMINALS, END ANCHOR, A-D DN-EB35	2460-62
05	A/R	DIN RAIL, 35mm X 'L' A/R	STOCK
06	1	ENCLOSURE, NEMA 1, 4" x 4" x 4",	2462-44
07	1	ENCLOSURE, NEMA 1, 17" x 12" x 6",	2462-104
08	1	CHASSIS PAN, 15.25" x 10.25"	2462-105

<p>THIS DRAWING UNLESS OTHERWISE NOTED, REMAINS THE CONFIDENTIAL PROPERTY AND TRADE SECRET OF DELTA SCIENTIFIC CORPORATION. IT SHALL NOT BE DISCLOSED, REPRODUCED OR USED FOR MANUFACTURE, DESIGN OR CONSTRUCTION WITHOUT THE EXPRESS AUTHORIZATION OF DELTA SCIENTIFIC CORPORATION. THE REPORT BY ADAPTING THIS DRAWING, ASSUMES CUSTODY THEREOF AND UNDER THE ABOVE TERMS AGREES NOT TO ALLOW USE OF BY UNAUTHORIZED PERSONS.</p> <p>© 2023 ALL RIGHTS RESERVED</p>	<p>UNLESS OTHERWISE NOTED DIMENSIONS ARE IN INCHES</p>	 <p>DELTA</p>	<p>DELTA SCIENTIFIC CORPORATION 40355 DELTA LANE PALMDALE, CA 93551 U.S.A. (661) 575-1100 FAX (661) 575-1109</p>				
	<p>TOLERANCES .XX = ±.060/FT .X = ±.030/FT .XXX = ±.010/FT ANGLES = ±.5°</p>	<p>CONTROL CIRCUIT/MOTOR STARTER DSC1200 (OMEGA II), SINGLE BARRIER</p>					
	<p>SURFACE FINISH 125</p>	<p>DRAWN BY SEAN RIEDEL</p>	<p>DATE 10/15/24</p>	<p>DRAWING NO. 10818-30</p>	<p>REV. -</p>		
	<p>REMOVE ALL BURRS &amp; BREAK SHARP EDGES .02 MAX</p>	<p>CHKD BY</p>	<p>DATE</p>	<p>SCALE: N.T.S.</p>	<p>SHEET 1 OF 1</p>		
	<p>APPROV BY</p>	<p>DATE</p>					



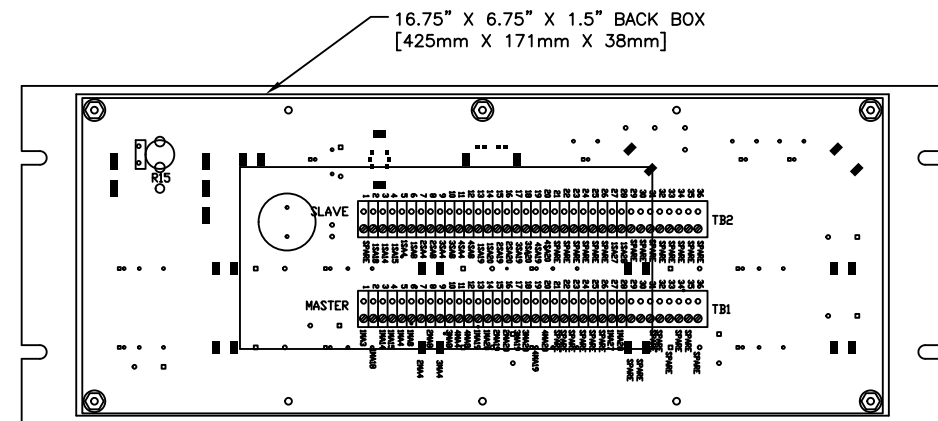
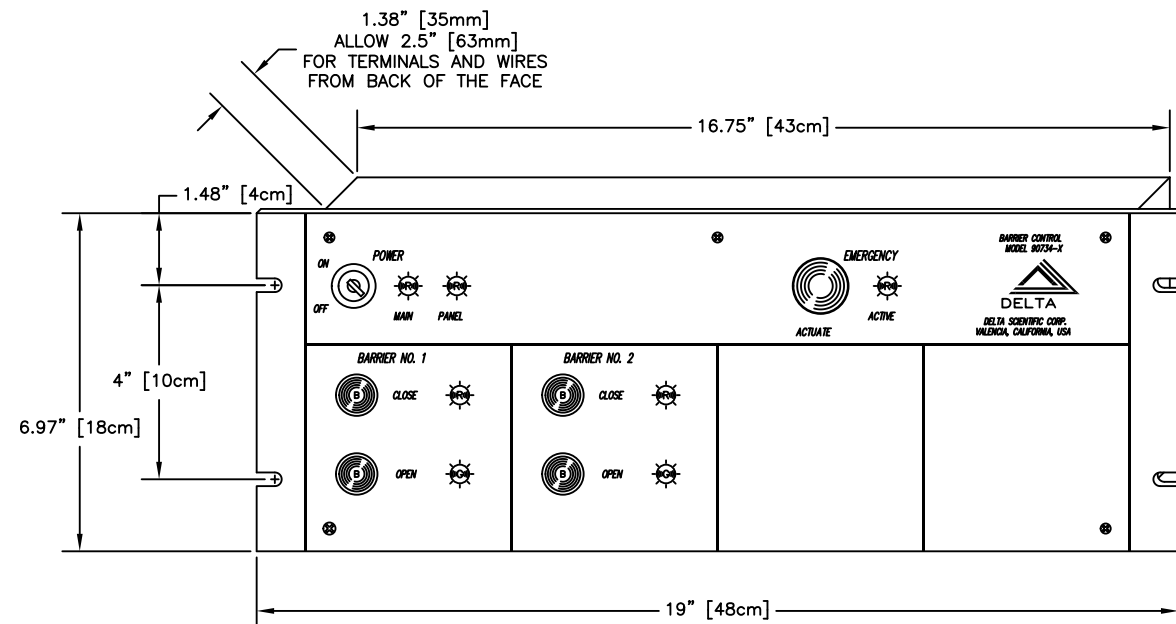
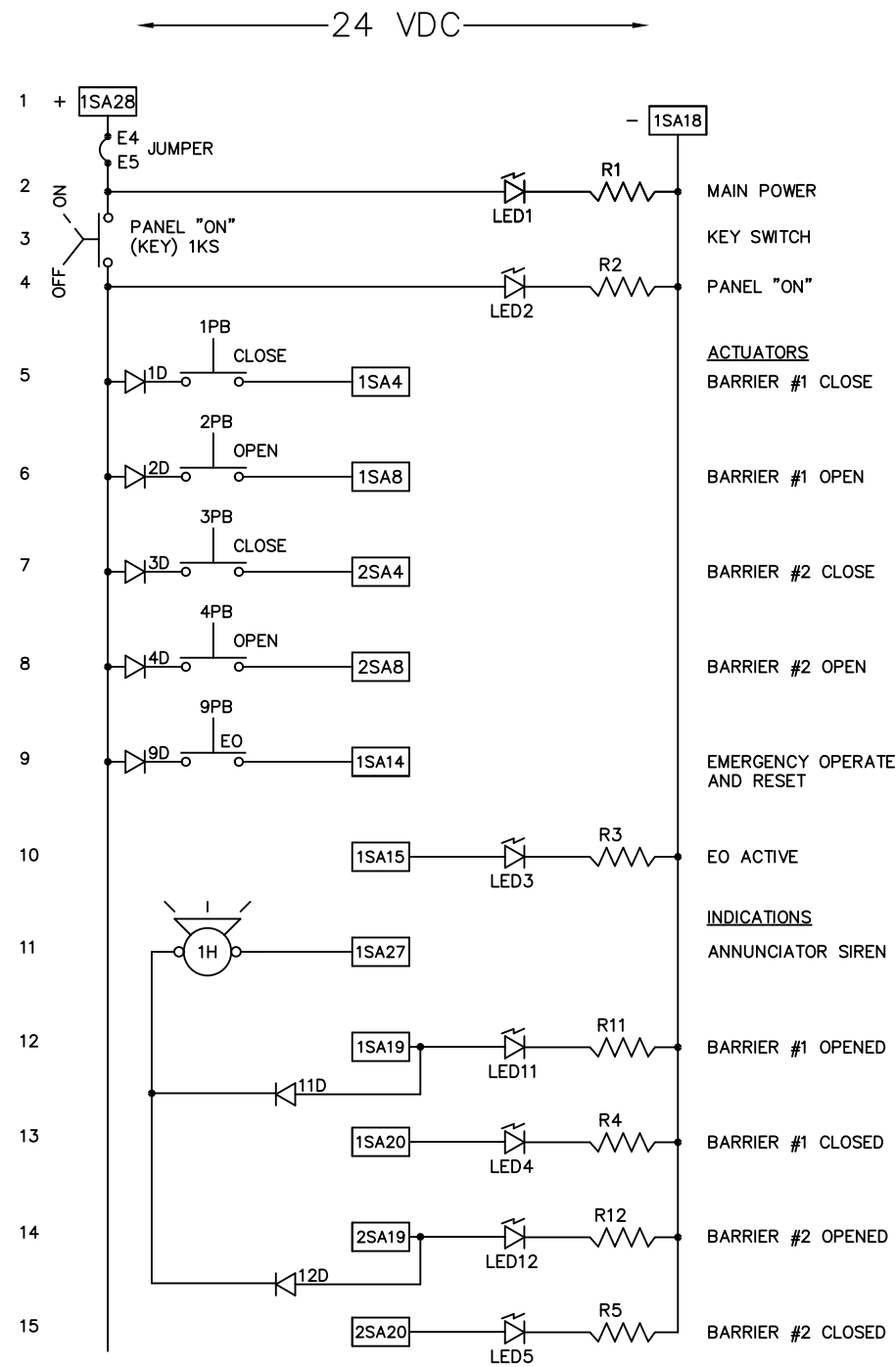
ITEM	QUAN.	DESCRIPTION	STOCK NO.
1PCB	1	MAIN BOARD, DELTA PART	90605/G
D1-D6	6	DIODE, 1N4007	3546-D1
R1-R6	6	RESISTOR, 2.2K OHMS, 1/8 WATT	3546-R1
LED1-LED6	6	LED, H-P # HLMP-3750	3546-LED
1CR-5CR	5	RELAY, DPDT, 24 VDC, OMRON G2R-24-24VDC	2457-91
3BCR	1	RELAY, SPDT, 24 VDC, OMRON G5L-114P-PS-24VDC	2457-92
1TVS-3TVS	3	TRANSIENT SUPPRESSOR, P6KE62CA	7195-TVS
1FU	1	FUSE, TIME DELAY, 2 A, 507-1114-ND (MFG 3721200041)	7195-FU1
V1	1	VOLTAGE REGULATOR, 7812CT, 12 VOLT	7195-V1
01	1	TERMINAL STRIP HEADER, 24 PT, 5EHDR-24, 1-24	2460-92
02	1	TERMINAL BLOCK, 24 PT, 5ESDV-24, 1-24	2460-93
03	1	TERMINAL STRIP HEADER, 24 PT, 5EHDR-24, 24-1	2460-94
04	1	TERMINAL BLOCK, 24 PT, 5ESDV-24, 24-1	2460-95
05	1	HEAT SINK, THERMALLOY #60738	7195-05
06	1	6-32 X 0.3125 LG SCREW, NUT & LOCK WASHER	-----
07	1	FUSEHOLDER, MICROFUSE, 5mm PIN TYPE, D-K#486-1249-ND	7195-FH1

JUMPER CHART			
E1	TO	E2	
E4	TO	E9	
E17	TO	E22	
E18	TO	E24	

\* WITH DIODE

G	ECO # 2016-033	ZTW	03/16/16																
F	ECO # 2015-023	FRP	03/20/15	JNF	03/20/15														
E	ECO # 2014-035	FRP	04/09/14																
D	ECO # 2007-131	JNF	10/24/07																
C	ECO # 2005-188	JNF	12/14/05																
B	ECO # 2004-112	JNF	06/11/04																
A	ECO # 2004-019	JNF	01/29/04																
REV.	DESCRIPTION	DRWN BY	DATE	APPVD BY	DATE														
<div><div><div>THIS DRAWING UNLESS OTHERWISE NOTED, REMAINS THE CONFIDENTIAL PROPERTY AND TRADE SECRET OF DELTA SCIENTIFIC CORPORATION. IT SHALL NOT BE DISCLOSED, REPRODUCED OR USED FOR MANUFACTURE, DESIGN OR CONSTRUCTION WITHOUT THE EXPRESS AUTHORIZATION OF DELTA SCIENTIFIC CORPORATION. THE PURPORT BY ADAPTING THIS DRAWING, ASSUMES CUSTODY THEREOF AND UNDER THE ABOVE TERMS, AGREES NOT TO ALLOW USE OF BY UNAUTHORIZED PERSONS.</div><div>UNLESS OTHERWISE NOTED DIMENSIONS ARE IN INCHES</div><div><div>TOLERANCES</div><div>.X = ±.060/FT .XX = ±.030/FT .XXX = ±.010/FT ANGLES = ±.5°</div><div><div>SURFACE FINISH</div><div>125</div></div></div><div><div>DELTA</div><div>DELTA SCIENTIFIC CORPORATION 40355 DELTA LANE PALMDALE, CA 93551 U.S.A. (661) 575-1100 FAX (661) 575-1109</div><div>DELTA BARRIER CONTROL CIRCUIT PRINTED CIRCUIT BOARD</div></div><div><div>DRWN BY J.FRIEND</div><div>DATE 11/18/98</div><div>CHKD BY</div><div>DATE</div><div>APPVD BY</div><div>DATE</div></div><div><div>DRAWING NO. 90605</div><div>SCALE: N.T.S.</div><div>REV. G</div><div>SHEET 1 OF 1</div></div></div><tr><td colspan="4">© 2015 ALL RIGHTS RESERVED</td><td colspan="2">REMOVE ALL BURRS &amp; BREAK SHARP EDGES .02 MAX</td></tr><tr><td colspan="6"></td></tr><tr><td colspan="6"></td></tr></div>		© 2015 ALL RIGHTS RESERVED				REMOVE ALL BURRS & BREAK SHARP EDGES .02 MAX													
		© 2015 ALL RIGHTS RESERVED				REMOVE ALL BURRS & BREAK SHARP EDGES .02 MAX													

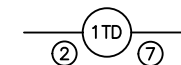




PANEL BACK – WIRING CONNECTIONS

ITEM	REQ'D	DESCRIPTION	STK. NO.
1KS	1	KEY SWITCH,	2463-01
1PB-4PB	4	PUSH BUTTON, N.O.,	2463-06
9PB	1	LARGE PUSH BUTTON,	2463-04A
1LT-5LT	5	PILOT LIGHT, RED, LED, 24 VDC,	2463-16
11LT-12LT	2	PILOT LIGHT, GREEN, LED, 24 VDC,	2463-17
1H	1	ANNUNCIATOR SIREN,	2463-63
1D-12D	7	DIODE, 1N5404	1N5404
1R-12R	7	RESISTOR, 1.2K OHM, 0.25 WATT,	----
01	1	BOARD, PCB,	90734-X
02	1	PANEL FACE, 6.97" X 19" X 0.125" (90833-3)	1893-XX
03	1	ENCLOSURE, 6.75" X 16.75" X 1.5"	2462-58
04	1	TERMINAL STRIP, 28 POINT, FEMALE	2460-02
05	1	TERMINAL STRIP, 28 POINT, MALE	2460-03

LEGEND

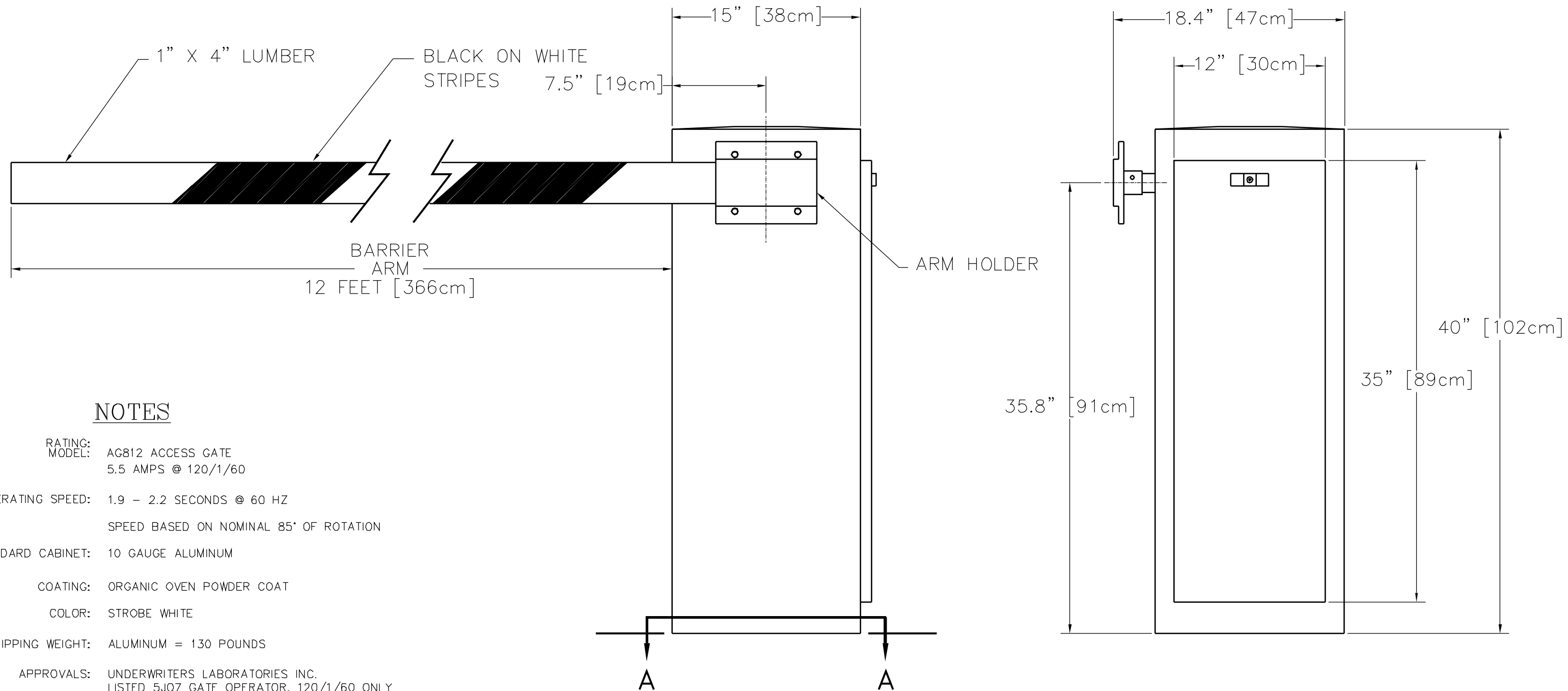


DEVICE WITH DEVICE'S PIN CALLOUTS

2MA28

TERMINAL LOCATION

THIS DRAWING UNLESS OTHERWISE NOTED, REMAINS THE CONFIDENTIAL PROPERTY AND TRADE SECRET OF DELTA SCIENTIFIC CORPORATION. IT SHALL NOT BE REPRODUCED, REPRODUCED OR USED FOR MANUFACTURING, DESIGN OR CONSTRUCTION WITHOUT THE EXPRESS AUTHORIZATION OF DELTA SCIENTIFIC CORPORATION. THE REPRODUCER BY ACCEPTING THIS DRAWING, ASSUMES CUSTOMER THEREBY AND UNDER THE ABOVE TERMS AGREES NOT TO ALLOW USE OF BY UNAUTHORIZED PERSONS.				UNLESS OTHERWISE NOTED DIMENSIONS ARE IN INCHES				TOLERANCES .X = ±.060/FT .XX = ±.030/FT .XXX = ±.010/FT ANGLES = ±.5°				SURFACE FINISH 125				REMOVE ALL BURRS & BREAK SHARP EDGES .02 MAX			
DELTA SCIENTIFIC CORPORATION 40355 DELTA LANE PALMDALE, CA 93551 U.S.A. (661) 575-1100 FAX (661) 575-1109				DRAWN BY J.FRIEND				DATE 04/16/03				DRAWING NO. 90832-2				REV. -			
B1091 SLAVE CONTROL PANEL W/INDICATING LIGHTS, EFO, AND ANNUNCIATOR, TWO BARRIER				CHKD BY				DATE				APPROV BY				DATE			
SCALE: 1:2 (D SIZE)				SHEET 1 OF 1															



## NOTES

RATING:  
MODEL: AG812 ACCESS GATE  
5.5 AMPS @ 120/1/60

OPERATING SPEED: 1.9 - 2.2 SECONDS @ 60 HZ  
SPEED BASED ON NOMINAL 85° OF ROTATION

STANDARD CABINET: 10 GAUGE ALUMINUM

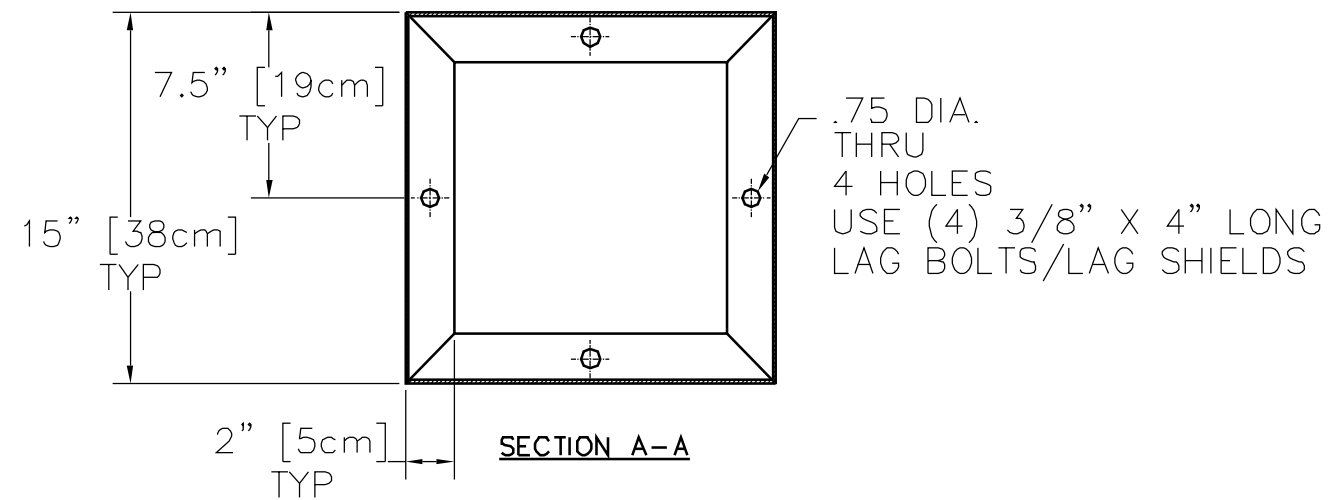
COATING: ORGANIC OVEN POWDER COAT

COLOR: STROBE WHITE

SHIPPING WEIGHT: ALUMINUM = 130 POUNDS

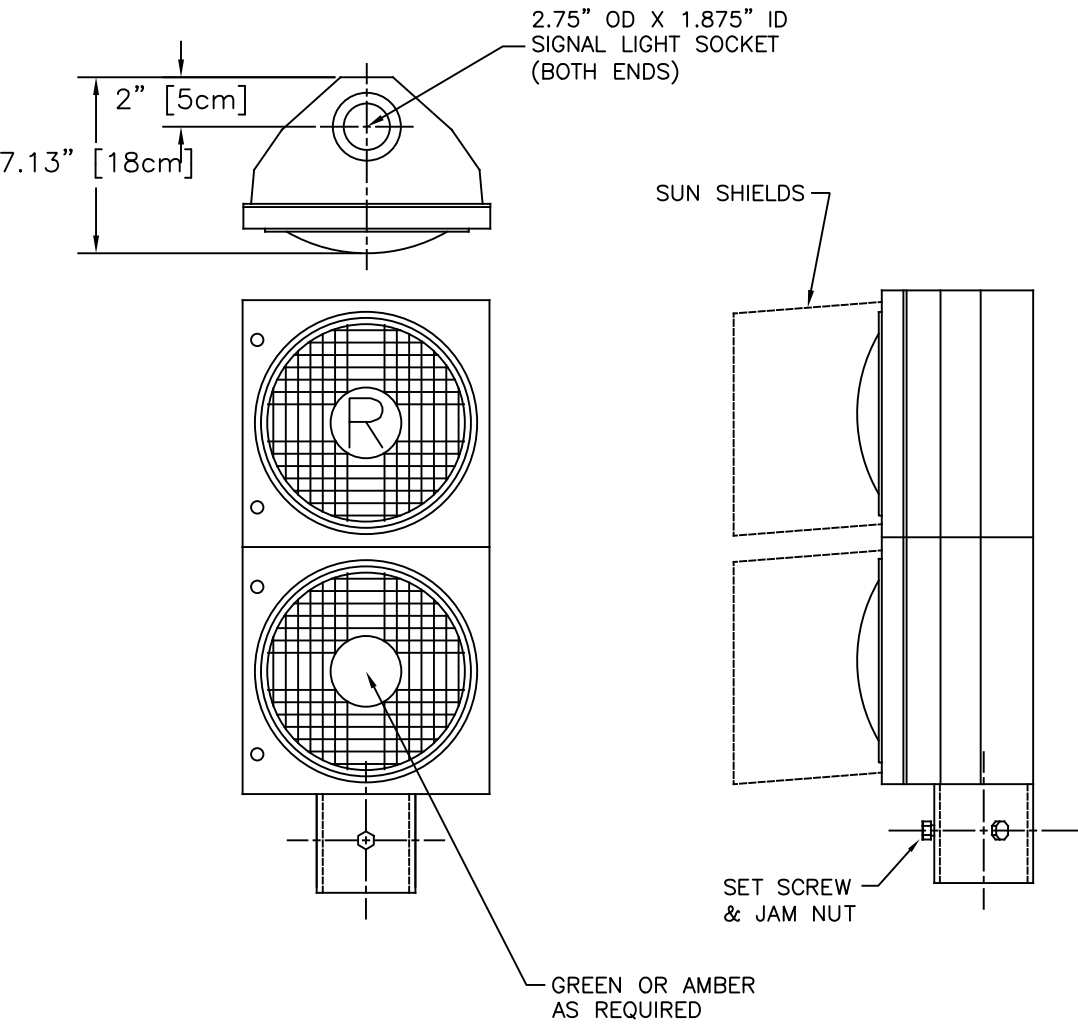
APPROVALS: UNDERWRITERS LABORATORIES INC.  
LISTED 5J07 GATE OPERATOR, 120/1/60 ONLY

ACCESSORIES: 120 VOLT UNITS ONLY, TWO 125V, 60HZ, 15AMP  
RECEPTACLES, 10AMPS MAXIMUM.



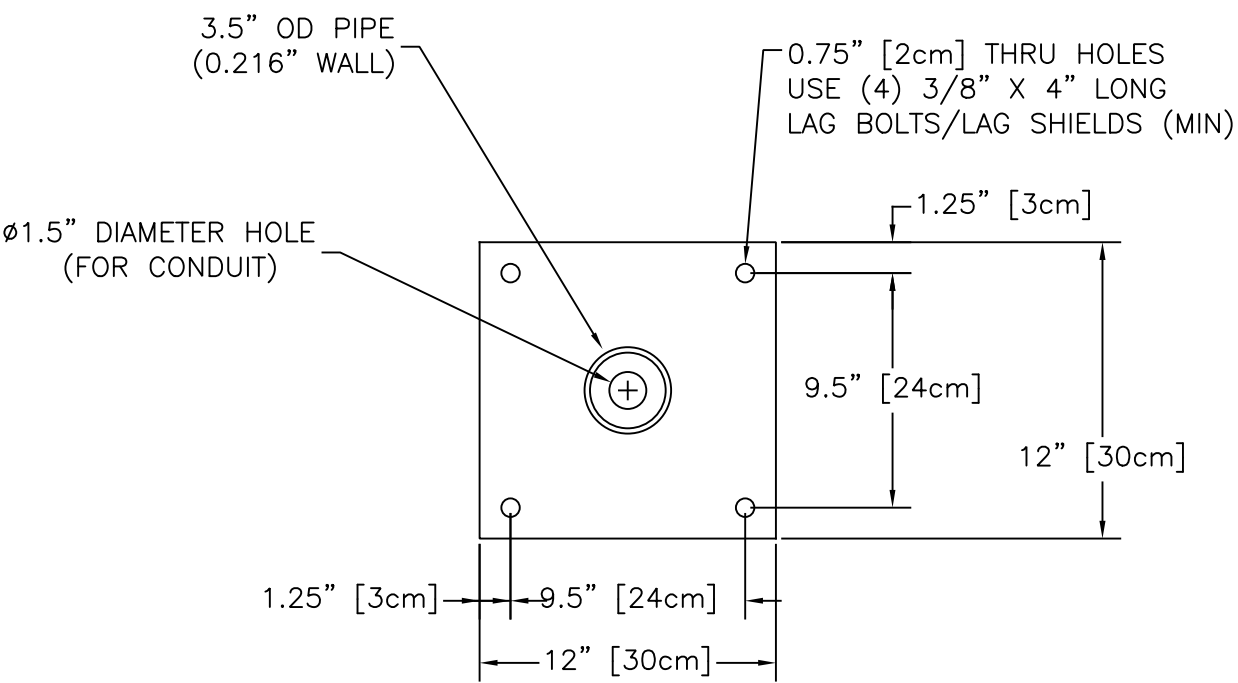
<small>THIS DRAWING UNLESS OTHERWISE NOTED, REMAINS THE CONFIDENTIAL PROPERTY AND TRADE SECRET OF DELTA SCIENTIFIC CORPORATION. IT SHALL NOT BE DISCLOSED, REPRODUCED OR USED FOR MANUFACTURE, DESIGN OR CONSTRUCTION WITHOUT THE EXPRESS AUTHORIZATION OF DELTA SCIENTIFIC CORPORATION. THE RECIPIENT BY ACCEPTING THIS DRAWING, ASSUMES FULL RESPONSIBILITY AND UNDER THE ABOVE TERMS AGREES NOT TO ALLOW USE OF IT BY UNAUTHORIZED PERSONS.</small>		<small>UNLESS OTHERWISE NOTED, DIMENSIONS ARE IN INCHES</small>		<b>DELTA SCIENTIFIC CORPORATION</b> 24901 WEST AVE. STANFORD VALENCIA, CA 91355 U.S.A. (805) 257-1800 FAX (805) 257-0617	
				<b>MODEL AG812 ACCESS GATE</b> <b>GENERAL ARRANGEMENT</b>	
<small>TOLERANCES</small> .X = ±.060/FT .XX = ±.030/FT .XXX = ±.010/FT ANGLES = ±.5°	<small>SURFACE FINISH</small> 125	<small>DRWN BY</small> J.FRIEND	<small>DATE</small> 10/14/05	<small>DRAWING NO.</small> AG812-100W	<small>REV.</small> -
<small>REMOVE ALL BURRS &amp; BREAK SHARP EDGES .02 MAX</small>	<small>APPRVD BY</small>	<small>DATE</small>	<small>SCALE:</small> 1:4 (D SIZE)	<small>SHEET</small> 1 OF 1	

ALL POSTS FURNISHED WITH STANDARD WHITE PAINTED FINISH (MPL-20W)  
RED (MPL-20R) AND YELLOW (MPL-20Y) AVAILABLE AS AN OPTION



MODEL MPL-10LED

MPL-10LED230RFA	RED/FLASHING AMBER	200-250	50/60	B	2534-113
MPL-10LED120RFA	RED/FLASHING AMBER	100-125	50/60	A	2534-56
MPL-10LED24VDCRA	RED/AMBER	9-33	VDC		
MPL-10LED230RA	RED/AMBER	200-250	50/60	-	-
MPL-10LED120RA	RED/AMBER	100-125	50/60	-	-
MPL-10LED24VDC	RED/GREEN	9-33	VDC		
MPL-10LED230	RED/GREEN	200-250	50/60	-	-
MPL-10LED120	RED/GREEN	100-125	50/60	-	-
MODEL NO.	LED LAMP COLORS	VOLTAGE	HERTZ	DIAGRAM	FL STK.NO.



BASE FLANGE (TYPICAL)

FLASHER DIAGRAMS

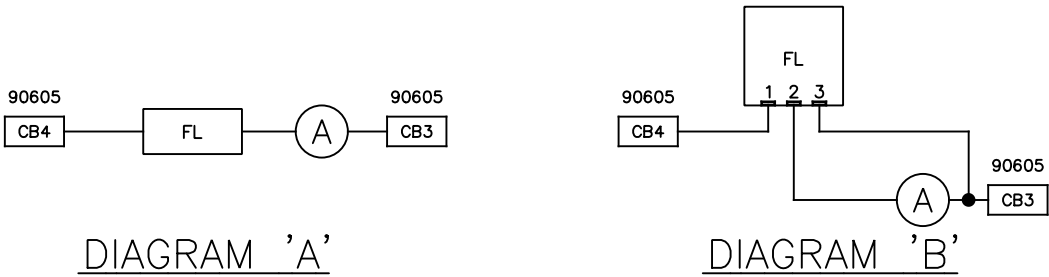
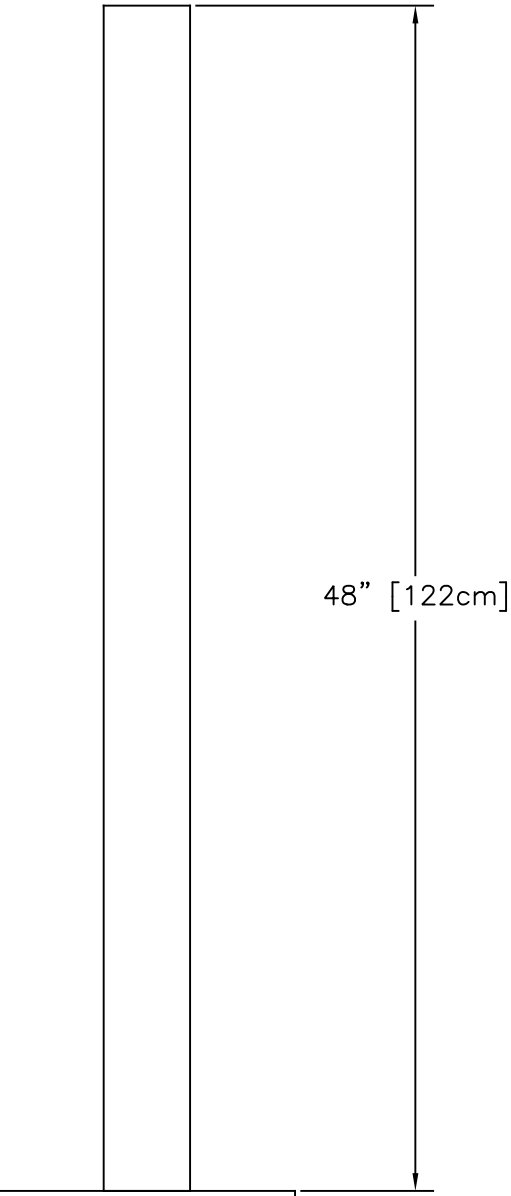
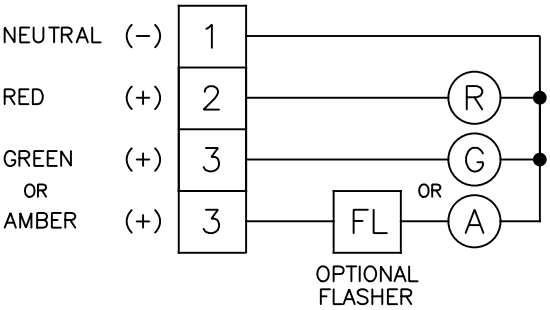


DIAGRAM 'A'

DIAGRAM 'B'

TERMINAL DIAGRAM

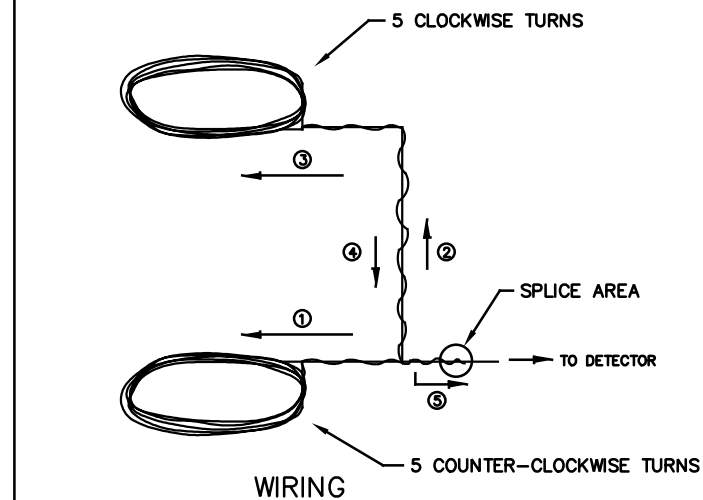
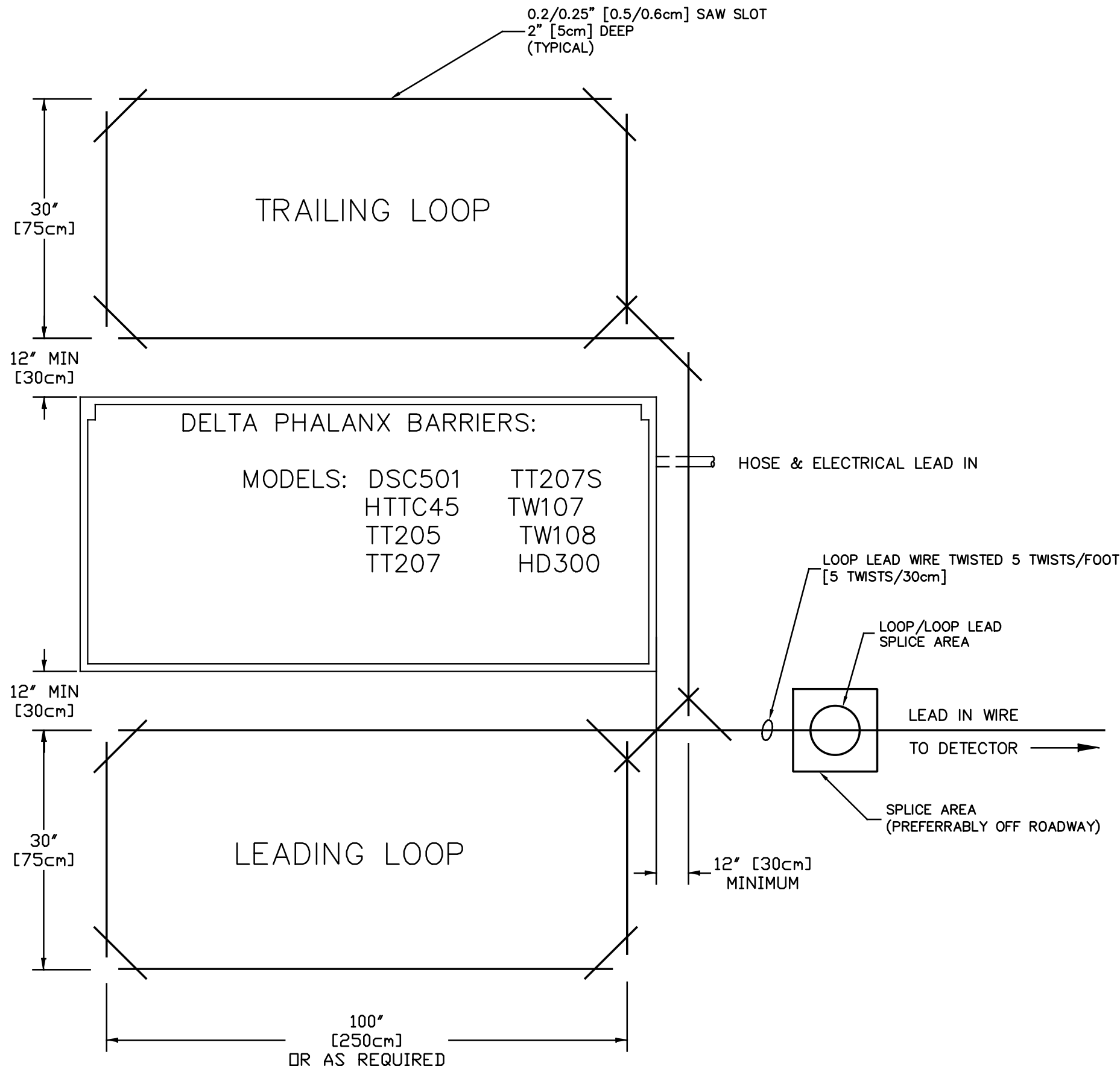


MODEL MPL-20

48" FLANGED POST

A	ECO 2020-90	AWL	07/31/20		
REV.	DESCRIPTION	DRWN BY	DATE	APPVD BY	DATE
THIS DRAWING UNLESS OTHERWISE NOTED, REMAINS THE CONFIDENTIAL PROPERTY AND TRADE SECRET OF DELTA SCIENTIFIC CORPORATION. IT SHALL NOT BE DISCLOSED, REPRODUCED OR USED FOR MANUFACTURE, DESIGN OR CONSTRUCTION WITHOUT THE EXPRESS AUTHORIZATION OF DELTA SCIENTIFIC CORPORATION. THE RECIPIENT BY ACCEPTING THIS DRAWING, ASSUMES CUSTODY THEREOF AND UNDER THE ABOVE TERMS AGREES NOT TO ALLOW USE OF BY UNAUTHORIZED PERSONS.					
UNLESS OTHERWISE NOTED, DIMENSIONS ARE IN INCHES					
TOLERANCES .X = ±.060/FT .XX = ±.030/FT XXX = ±.010/FT ANGLES = ±.5°					
SURFACE FINISH 125					
REMOVE ALL BURRS & BREAK SHARP EDGES .02 MAX					
DELTA SCIENTIFIC CORPORATION 40355 DELTA LANE PALMDALE, CA 93551 U.S.A. (661) 575-1100 FAX (661) 575-1109					
MPL-10, MPL-20 COMBO LIGHT WITH POST					
DRWN BY	MILL	DATE	4/25/2018	DRAWING NO.	REV.
CHKD BY		DATE		MPL-10/20	A
APPVD BY		DATE		SCALE:	SHEET
				1:4 (D SIZE)	1 OF 1





NOTES:

1) FOR LOOP INSTALLATION, REFER TO DSC LA2075.

2) PREFERRED LOOP MATERIAL IS 7 STRAND, #16 AWG COPPER W/0.045" CROSS LINKED POLYETHYLENE INSULATION.

ALTERNATE MATERIAL, #14 OR #16 AWG STRANDED COPPER, TYPE THHN OR BETTER INSULATION.

3) PREFERRED LOOP LEAD-IN CONDUCTOR IS 2 CONDUCTOR #16 AWG COPPER, 19-29 STRAND, TWISTED 5 TURNS PER FOOT, INNER INSULATION 20 MIL HI-DENSITY POLYETHYLENE, 1 MIL ALUMINUM SHIELD W/0.5 MIL POLYESTER FILM, #20 AWG TINNED COPPER DRAIN WIRE, OUTER JACKET 35 MIL HI-DENSITY POLYETHYLENE.

ALTERNATE LEAD-IN MATERIAL, #14 OR #16 AWG STRANDED COPPER PAIR, THHN OR BETTER INSULATION, TWISTED 5 TURNS PER FOOT MINIMUM.

4) LEAD-IN CONDUCTOR CAN BE RUN IN SAW CUT OR CONDUIT.



C	ECO #2014-062	TDP	6/20/14		
B	ECO #2004-239	JNF	11/22/04		
A	REVISED LOOP NOTES	JNF	01/23/02		
REV.	DESCRIPTION	DRWN BY	DATE	APPVD BY	DATE
<small>THIS DRAWING UNLESS OTHERWISE NOTED, REMAINS THE CONFIDENTIAL PROPERTY AND TRADE SECRET OF DELTA SCIENTIFIC CORPORATION. IT SHALL NOT BE DISCLOSED, REPRODUCED OR USED FOR MANUFACTURE, DESIGN OR CONSTRUCTION WITHOUT THE EXPRESS AUTHORIZATION OF DELTA SCIENTIFIC CORPORATION. THE REPERT BY ACCEPTING THIS DRAWING, ASSUMES CUSTODY THEREOF AND UNDER THE ABOVE TERMS AGREES NOT TO ALLOW USE OF BY UNAUTHORIZED PERSONS.</small>		<b>DELTA SCIENTIFIC CORPORATION</b> 40355 DELTA LANE PALMDALE, CA 93551 U.S.A. (661) 575-1100 FAX (661) 575-1109			
		<b>SUGGESTED SAFETY LOOP INSTALLATION - PHALANX BARRIERS</b>			
		DRWN BY D.G.	DATE 01/23/90	DRAWING NO. <b>90420</b>	REV. <b>C</b>
		CHKD BY	DATE	SCALE: N.T.S.	SHEET 1 OF 1
© 2001 ALL RIGHTS RESERVED		REMOVE ALL BURRS & BREAK SHARP EDGES .02 MAX		APPVD BY	



# LMA-1250 "DEFLECTOMETER" Series Operating Instructions

## Single Channel / Dual Output Inductive Loop Vehicle Detector

### 1. Connect to proper source voltage

Verify the source voltage before applying power. The "Pin Assignment" side label on the unit indicates the input power required for each model and indicates either Fail Safe operation or Fail Secure operation.

MODELS	10-40 VDC or 14-35 VAC	95 VAC to 250 VAC	Fail Safe	Fail Secure
LMA-1250-LV	●		●	
LMA-1250-HV		●	●	
LMA-1250S-LV	●			●
LMA-1250S-HV		●		●

OUTPUT RELAY	FAIL SAFE OPERATION		FAIL SECURE OPERATION	
	POWER FAILURE	LOOP FAILURE	POWER FAILURE	LOOP FAILURE
A	CALL Output	CALL Output	No Output	No Output
B	No Output	See "Output B Mode" Table	No Output	See "Output B Mode" Table

### 2. DEFLECTOMETER Indications

STATUS	DEFLECTOMETER
0	No Call
1, 2, 3, 4, 5, 6, 7, 8, 9	Sensitivity Meter (4, 5 & 6 = Optimum Sensitivity Setting for Loop & Lead-in Network)
d	2-Second Delay Timing
E	2, 5 or 10 Second Extension Timing
F	Current "Real Time" Loop Failure

### 3. LED Indications

STATUS	FRONT PANEL INDICATORS			
	POWER	OUTPUT	LOOP FAULT	DEFLECTOMETER
Normal, No Call	ON	OFF	OFF	0
Normal, Call	ON	ON	OFF	1 thru 9
Output Delay Mode	ON	2 Hz Flash	OFF	d
Output Extension Mode	ON	4 Hz Flash	OFF	E
Current Fault: Open Loop	ON	Single Flash	Single Flash	F1
Current Fault: Shorted Loop	ON	Double Flash	Double Flash	F2
Current Fault: 25% Inductance Change	ON	Triple Flash	Triple Flash	F3
Previous Fault: Open Loop	ON	Normal	Single Flash	Normal
Previous Fault: Shorted Loop	ON	Normal	Double Flash	Normal
Previous Fault: 25% Inductance Change	ON	Normal	Triple Flash	Normal
Low Supply Voltage	Short Flash every 2 seconds	OFF	OFF	OFF

### 4. Setting Sensitivity - Front Panel Sensitivity Push Buttons

The DEFLECTOMETER (front panel 7-segment LED) aids in setting the LMA-1250 quickly and easily to the most optimum sensitivity level to ensure the trouble-free detection of all vehicles, including motorcycles and high bed vehicles. For typical vehicles (mid-size vehicle / small pick up) utilizing properly installed roadway loops, a value of 5 displayed on the DEFLECTOMETER during the DETECT output period indicates an optimum sensitivity setting. For high profile vehicles (commercial trucks, 4x4's, etc...), a DEFLECTOMETER reading of 4 will be optimum. For low profile vehicles (sports cars, etc...), a DEFLECTOMETER reading of 6 will be optimum.

#### Adjusting sensitivity using the DEFLECTOMETER (recommended):

The DEFLECTOMETER should read zero (0) with no vehicle over the roadway loop. When the typical vehicle is completely in the detection zone (OUTPUT indicator On), the sensitivity should be adjusted up or down until the DEFLECTOMETER displays the desired optimum value of 5 (or 4 or 6 as described above).

If a typical vehicle located over the roadway loop causes the number "7" to be displayed on the DEFLECTOMETER, the sensitivity should be decreased two levels. This can be done by pressing the front panel SENS↓ button two times.

If a typical vehicle located over the roadway loop causes the number "2" to be displayed on the DEFLECTOMETER, the sensitivity should be increased three levels. This can be done by pressing the front panel SENS↑ button three times.

**NOTE: THE DEFLECTOMETER DYNAMICALLY UPDATES AFTER EACH SENSITIVITY LEVEL CHANGE, ALLOWING YOU TO CHANGE SENSITIVITY SETTINGS WHILE A VEHICLE REMAINS IN THE LOOP DETECTION ZONE.**

#### Adjusting sensitivity without using the DEFLECTOMETER (manually setting sensitivity):

The LMA-1250 offers 10 levels of sensitivity (0 to 9). Level 9 is the highest sensitivity. Sensitivity can be manually set to any desired level by pressing the front panel SENS buttons (↑ or ↓) when a vehicle is NOT over the roadway loop. The first time a SENS button (↑ or ↓) is pressed, the current sensitivity level is displayed on the DEFLECTOMETER for 5 seconds. If either SENS button (↑ or ↓) is pressed again before the 5 second period ends, the sensitivity setting will increase (SENS ↑) or decrease (SENS ↓). The new sensitivity value will then be displayed on the DEFLECTOMETER display for 5 seconds. The factory default Sensitivity setting is level 4.

### 5. Rear Panel DIP Switches

#### Loop Frequency – Two Position DIP Switch

SWITCH	LOW	MEDIUM – LOW	MEDIUM – HIGH	HIGH	FACTORY DEFAULT
1	ON	OFF	ON	OFF	OFF
2	ON	ON	OFF	OFF	OFF

**Loop Frequency** is controlled by the rear panel 2-Position DIP switch. On occasion, loops are placed in close proximity and it is necessary to select a different frequency level for each loop to avoid interference (crosstalk). Four frequencies are selectable, HIGH being the factory default.

**Measuring Loop Frequency:** With no vehicle in the detection zone, press RESET and review the two or three digits (in Kilohertz) that quickly flash before the DEFLECTOMETER changes back to zero. The most significant digit of the frequency is flashed first in the sequence. This unique feature allows you to read and reliably separate the frequency of each detector loop. The LMA-1250 frequency should be adjusted such that there is a minimum of 5 Kilohertz of separation between all adjacent loops. Loop frequency is also displayed at power-up.

# LMA-1250 "DEFLECTOMETER" Series Operating Instructions

## Single Channel / Dual Output Inductive Loop Vehicle Detector

### LMA-1250 Parameter Options – Eight Position DIP Switch

SWITCH	ON	OFF	FACTORY DEFAULT
1	Sensitivity Boost	No Sensitivity Boost	OFF
2	Limited Presence	Infinite Presence	OFF
3	2-Second Delay Timing	No 2-Second Delay Timing	OFF
4	See "Extension Timing" Table Below (Switches 4 & 5)		OFF
5			OFF
6	See "Output B Mode" Table Below (Switches 6 & 7)		OFF
7			OFF
8	Reserved		N/A

#### Extension Timing (Switches 4 & 5)

SWITCH	0 Seconds	2 Seconds	5 Seconds	10 Seconds
4	OFF	ON	OFF	ON
5	OFF	OFF	ON	ON

#### Output B Mode (Switches 6 & 7)

SWITCH	Pulse On Entry	Pulse On Exit	Duplicate Output A	ON During Loop Fault
6	OFF	OFF	ON	ON
7	OFF	ON	OFF	ON

**Sensitivity Boost (DIP 1):** When ON, sensitivity will increase only during the CALL Output period without changing the sensitivity of a vacant loop. When a vehicle enters the loop, the LMA-1250 sensitivity is boosted to a higher level than the vacant loop setting. The boosted sensitivity remains throughout the CALL Output period. When the vehicle leaves the loop, the sensitivity returns to the vacant loop setting. This feature helps prevent dropouts during the passage of high bed vehicles and is exceptionally useful in sliding gate situations.

**Presence Output Modes (DIP 2):** When ON (Limited Presence Mode), the presence CALL Output A hold time is between 5 minutes minimum and 3 hours maximum. Hold time depends on loop geometry; number of wire turns in the loop, vehicle size, and position of the vehicle in the loop zone. When OFF (Infinite Presence Mode), the presence CALL Output A hold time will always be maintained as long as a vehicle is located over the loop zone and power is not removed from the LMA-1250.

**Two Second Output Delay (DIP 3):** When ON, the CALL Outputs A & B will be delayed for a period of 2 seconds after a vehicle has entered the loop zone. If the vehicle does not remain in the loop zone for the full 2 seconds the delay timer will terminate and no CALL Output A or B will be produced.

**Output Extension (DIPS 4 & 5):** Utilizing the settings shown in the "Extension Timing" DIP switch table above, or the label located on the side of the LMA-1250, the Output A can be selected to hold a CALL output for either 2, 5 or 10 seconds after the vehicle has left the loop zone. This feature does not affect Output Pulse modes or Output B.

**Output B Mode (DIPS 6 & 7):** Utilizing the settings shown in the "Output B Mode" DIP switch table above, or the label located on the side of the LMA-1250, four output modes of operation are selectable for Output B. Output A always operates in Presence mode.

In the **Pulse on Entry Mode**, the Output B provides a 250-millisecond pulse when a vehicle enters the loop zone.

In the **Pulse on Exit Mode**, the Output B provides a 250-millisecond pulse when a vehicle exits the loop zone.

In the **Duplicate Output A Mode**, the Output B operates in presence mode and follows the operation of Output A.

In the **ON During Loop Fault Mode**, the Output B is On during a current loop fault condition.

## 6. Additional Features & Benefits

**Reset:** The LMA-1250 can be manually cleared and retuned by pressing the front panel RESET button or by interrupting power. The current loop frequency is displayed immediately after pressing RESET (flashing digits). See "Measuring Loop Frequency" in section 5.

**Output "CALL" Memory:** A power loss of 4 seconds or less will not drop the vehicle CALL Output.

**Loop Fault Diagnostics:** The LOOP FAULT indicator and 7-Segment DEFLECTOMETER indicate if the LMA-1250 is within the specified loop inductance range. The LMA-1250 is able to detect Open Loops, Shorted Loops, or sudden changes in loop inductance exceeding 25% of the nominal inductance. If a Loop Fault is detected, the OUTPUT and LOOP FAULT indicators continuously emit a sequence of flashes (See the "LED Indications" table in section 3). Additionally, the 7-Segment DEFLECTOMETER displays the code "F1", "F2", or "F3" indicating a current loop fault condition.

If a fault condition self-heals, the OUTPUT indicators and the 7-Segment DEFLECTOMETER will return to normal operation. The LOOP FAULT indicator will continue to flash with the sequence signifying the type of loop fault that was last detected. In the case of the excessive inductance change fault, the unit will retune to the new inductance after a period of two seconds and continue operation. Pressing the RESET button will clear the flash sequence from the LOOP FAULT indicator.

**Loop Fault Memory:** Previous loop faults are stored in non-volatile internal memory. If power is interrupted for any length of time, the LMA-1250 will not lose the last loop condition status. After power is restored to the LMA-1250, the yellow LOOP FAULT indicator will automatically indicate the last loop status condition (Open Loop, Shorted Loop, 25% Change In Inductance, or No Loop Problem. See the "LED Indications" table in section 3. Momentarily pressing the front panel RESET button will clear the LOOP FAULT indicator and retune the LMA-1250. Should you want to review the last loop condition after the LMA-1250 has been reset, simply PRESS and HOLD the RESET button and after 2 seconds the LOOP FAULT indicator will indicate the last loop fault condition.

**Operating Temperature:** -30°F to 165°F (-34°C to +74°C).

## 7. Connector Pin Assignments:

Model LMA-1250-LV	
PIN	FUNCTION
1	12 VDC to 24 VDC / 24 VAC (+)
2	DC Ground / 24 VAC (-)
3	Output Relay B, Normally Open (Closes for DETECT)
4	No Connection
5	Output Relay A, Common
6	Output Relay A, Normally Open (Closes for DETECT)
7	Loop Input
8	Loop Input
9	Output Relay B, Common
10	Output Relay A, Normally Closed (Opens for DETECT)
11	Output Relay B, Normally Closed (Opens for DETECT)

Model LMA-1250-HV	
PIN	FUNCTION
1	AC Line (89 VAC to 270 VAC)
2	AC Neutral
3	Output Relay B, Normally Open (Closes for DETECT)
4	No Connection
5	Output Relay A, Common
6	Output Relay A, Normally Open (Closes for DETECT)
7	Loop Input
8	Loop Input
9	Output Relay B, Common
10	Output Relay A, Normally Closed (Opens for DETECT)
11	Output Relay B, Normally Closed (Opens for DETECT)