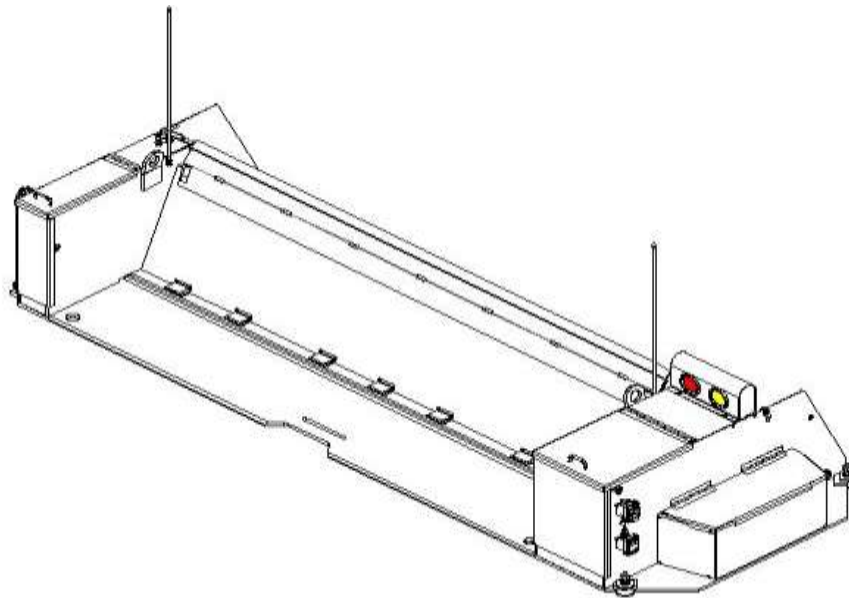


NASATKATM

S E C U R I T Y

Global Lines of DefenseSM

Kirtland Air Force Base – New Mexico
NMSB XV-PORTABLE USER MANUAL
NASATKA PROJECT# 2223



BY
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THE EQUIPMENT DESCRIBED AND ILLUSTRATED IN THIS MANUAL PRESENT:

ELECTRIC SHOCK HAZARDS & CRUSH AND PINCH HAZARDS

ALL SERVICE IS TO BE PERFORMED BY QUALIFIED AND TRAINED PERSONNEL ONLY.

ALL SAFETY PRECAUTIONS BY USACE EM385-1-1 AND OSHA 29 CFR 1910 ARE TO BE OBSERVED.

FAILURE TO FOLLOW PRESCRIBED WARNINGS MAY RESULT IN SERIOUS PERSONAL INJURY OR DEATH.

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DISCLAIMER

ALL BARRIER SYSTEMS SHOULD BE CAREFULLY PLANNED WITH SAFETY AS A PARAMOUNT CONCERN. THE PRODUCT IS DESIGNED TO CONTROL VEHICLE TRAFFIC; HOWEVER, NASATKA BARRIER INCORPORATED IS NOT A TRAFFIC SAFETY ENGINEERING FIRM AND RECOMMENDS THAT A SYSTEM BE REVIEWED BEFORE INSTALLATION. IT IS RECOMMENDED THAT ALL FORMS OF SAFETY EQUIPMENT BE UTILIZED TO THE MAXIMUM EXTENT POSSIBLE. SUCH SAFETY EQUIPMENT INCLUDES, BUT IS NOT LIMITED TO, PROPER LIGHTING, WRITTEN WARNING SIGNS, TRAFFIC SIGNALS, TRAFFIC ARMS AND/OR AUDIBLE ALARMS.

NOTE

FIGURES AND DESCRIPTIONS IN THIS MANUAL MAY REPRESENT OPTIONAL EQUIPMENT NOT SELECTED FOR THIS PROJECT. REFER TO EQUIPMENT SUPPLIED 1.3.

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REVISION HISTORY		
CHANGE	DATE	AFFECTED PAGES
Revision 00	27 JULY 2021	All – Initial Release

NOTE

FIGURES AND DESCRIPTIONS IN THIS MANUAL MAY REPRESENT OPTIONAL EQUIPMENT NOT SELECTED FOR THIS PROJECT. REFER TO EQUIPMENT SUPPLIED LIST IN 1.3.

Abbreviations and Acronyms

The abbreviations used in this manual are limited to standard (commonly used and accepted) scientific units of measure and therefore are NOT defined or listed. The acronyms used herein are defined in this listing in alphabetical order and are NOT defined within the text.

Acronyms

A/R	As Required
ACP	Access Control Point
ASTM	ASTM International (originally known as American Society for Testing and Materials)
AVB	Anti-ram Vehicle Barrier
BCU	Barrier Control Unit
CONOPS	Concept of Operations
DBA	Doing Business As
ECP	Entry Control Point
EFO	Emergency Fast Operation
ESL	Equipment Supplied List
F.O.B.	Faculty of Business
HPU	Hydraulic Power Unit
HMI	Human Machine Interface
IBD	Integrated Base Defense
LED	Light Emitting Diode
MCP	Master Control Panel
NMSB	Nasatka Maximum Security Barrier
PLC	Programmable Logic Controller
SDI	Serial Digital Interface
SoO	Sequence of Operations
UIP	User Interface Panel

1. GENERAL

This section contains general information including an introduction to the equipment, safety summary, an equipment supplied list, warranty, and a disclaimer.

1.1. Introduction

This document provides basic description, installation, operation, safety, and preventative/corrective maintenance for the Nasatka NMSB XV-P (portable steel plate barrier). It is NOT all encompassing and is based on typical installations. Integrators/Contractors are highly encouraged to review these guidelines and contact Nasatka to clarify any issues or to answer questions prior to excavation, installation, activation, operation, or maintenance. Nasatka is a barrier manufacturer; for questions related to civil issues specific to a jobsite, integrators/contractors should refer to the architectural firm that designed the project or a licensed Civil Engineer familiar with the local site conditions and requirements.

The NMSB XV-P plays a leading role in the vehicle access control industry. The patented mobile design greatly simplifies barrier installation and eliminates all major site excavation. By utilizing the latest technology in the design of the proprietary HPU and the microprocessor based electronic control system; the NMSB XV-P provides performance, reliability, safety and security unmatched in the industry.

Having been designed, manufactured, and approved to stop a 15,000-pound (6,800 kg) truck traveling at 30 mph (65 km/h), Nasatka provides the highest levels of perimeter security.

Each system is 100% factory tested and adjusted for normal installed operating conditions. The barrier, HPU, and the electronic control are interconnected and run in all operating modes. This insures that each component part of the NMSB XV-P is functioning in accordance with the customer operating parameters and the quality assurance standards of Nasatka.

In addition, our standard system documentation contains detailed, step-by-step, information pertaining to all aspects of installation, start up, trouble shooting, and maintenance.

1.2. Safety

WARNINGS or CAUTIONS that immediately precede a step apply directly to that step and all sub steps. WARNINGS or CAUTIONS that precede an entire procedure apply to the entire procedure. WARNINGS and CAUTIONS consist of three parts: a heading (WARNING, CAUTION, or NOTE); a statement of the hazard; minimum precautions and possible result if disregarded. NOTES are used to highlight operating or maintenance procedures, practices, conditions or statements that are not essential to protection of personnel or equipment. NOTES may precede or follow the step or procedure, depending upon the information and how it pertains to the procedure/step. The headings used and their definitions are as follows.

WARNING

HIGHLIGHTS AN ESSENTIAL OPERATING OR MAINTENANCE PROCEDURE, PRACTICE, CONDITION, OR STATEMENT WHICH IF NOT STRICTLY OBSERVED, COULD RESULT IN INJURY, DEATH, OR LONG TERM HEALTH HAZARDS.

CAUTION

HIGHLIGHTS AN ESSENTIAL OPERATING OR MAINTENANCE PROCEDURE, PRACTICE, CONDITION, OR STATEMENT WHICH IF NOT STRICTLY OBSERVED, COULD RESULT IN EQUIPMENT DAMAGE OR DESTRUCTION OR LOSS OF MISSION EFFECTIVENESS.

NOTE

HIGHLIGHTS AN ESSENTIAL ASPECT OF AN OPERATING OR MAINTENANCE PROCEDURE, CONDITION, OR STATEMENT AND/OR PROVIDES PERTINENT ANCILLARY INFORMATION.

1.2.1 Safety Instructions

Barrier operators SHALL comply with the following important safety instructions PRIOR TO and DURING the operation of the barrier.

- A. Read and comply with all safety rules in the technical manual(s) before operating the barrier(s).
- B. Only fully trained maintenance personnel may perform maintenance work.
- C. If the barrier is placed in a main traffic area place traffic safety cones and make every attempt to divert or stop traffic before maintenance is started.
- D. Do not put any objects under a raised barrier and keep all obstructions clear of the vicinity of the barrier.
- E. Do not operate or maintain the barrier when you are distracted or under the influence of drugs, alcohol, or medication causing diminished senses, judgments, or control.
- F. Prior to accessing any area beneath the gate plate assembly, the main electrical disconnect to the barrier shall be isolated and local lockout-tagout procedures shall be implemented and utilized.
- G. Never normally operate the barrier when a vehicle, person, or any obstruction is in the way, Emergency Procedures may differ.

1.2.2 Safety Summary

The following WARNINGS and CAUTIONS are provided at the point of use throughout this manual.

WARNING

THE WEIGHT/FORCE OF THE BARRIER (AND ITS LARGER MOVEABLE COMPONENTS) PRESENTS A CRUSH HAZARD. KEEP HANDS AND FEET OUT FROM UNDER THE BARRIER AND CLEAR OF ALL MOVING PARTS AT ALL TIMES. CRUSHING RESULTING FROM CONTACT WITH THIS WEIGHT/FORCE MAY RESULT IN SERIOUS INJURY OR DEATH.

WARNING

ENSURE THE AREA WHERE MOTION IS EXPECTED IS CLEAR OF PERSONS OR VEHICLES. UNEXPECTED MOVEMENT MAY CAUSE SERIOUS INJURY OR DEATH.

WARNING

THE GATE PLATE PRESENTS A CRUSH HAZARD AND OTHER MOVING PARTS PRESENT PINCH HAZARDS. KEEP HANDS AND FEET CLEAR FROM UNDER BARRIER AND ALL MOVING PARTS AT ALL TIMES. FAILURE TO REMAIN CLEAR OF CRUSH AND PINCH POINTS MAY RESULT IN SERIOUS INJURY OR DEATH.

WARNING

TWO PERSONS ARE REQUIRED TO MANUALLY OPERATE THE BARRIER. FAILURE TO USE TWO PEOPLE TO OPERATE THE BARRIER MAY PRESENT A CRUSHING HAZARD. BEING STRUCK BY THE BARRIER MAY RESULT IN SERIOUS INJURY OR DEATH.

WARNING

FAILURE TO LOCKOUT BARRIER POWER MAY ALLOW UNEXPECTED/INADVERTENT ACTIVATION OF THE BARRIER MOTOR DRIVE SYSTEM. UNEXPECTED/INADVERTENT ACTIVATION OF THE BARRIER MOTOR DRIVE SYSTEM MAY CAUSE SERIOUS INJURY OR DEATH.

WARNING

LOCK GATE PLATE TO PREVENT THE GATE PLATE FROM ACCIDENTALLY LOWERING WHILE PERSONNEL ARE WORKING. FAILURE TO LOCK THE GATE LOCK MAY RESULT IN SERIOUS INJURY OR DEATH.

1.3. Equipment Supplied List

Table 1 list the Nasatka Part Number, Nomenclature, and Quantity of the equipment supplied. The listing includes custom finishes, options, and major items, which are listed under the pertinent part number.

Table 1. Nasatka Equipment Supplied

PART NUMBER	NOMENCLATURE	QUANTITY
1152-1202-0000	NMSB XV-P Portable Barrier - Twelve foot clear opening. ASTM Rated M30/P3 (K4). Purchase price includes hot-dip Galvanizing: tool box items, dual traffic lights, and power outlet. Dual Buttress w/ Integrated Hydraulic Operator. Circuit Control Panel. Integrated Weather Resistant Operator Enclosure. Bio-degradable fluid. Tether controller. Limit Switch(s) and Springs for manual use in the event of power failure.	5
2230-0012-0051	Power Selection - 120/60/1 HPU - 12VDC Battery Unit for NMSB XV-P Includes HPU Battery Charger, Battery, and Barrier Control Unit, Wire Harness, and SDI Connector and Cover.	5
2221-0250-0050	Tether Controller – 250FT - Tether-cord push button open/close controls. Tether at maximum 250FT. Tether to be quick-disconnected to Barrier.	5
2221-0025-0050	Tether-cord push button open/close controls. Tether at maximum 25 ft. Tether to be quick-disconnected to Barrier.	5
2274-2036-1202	HPU Heater - Pad - 12VDC - 3" x 6" - 38W - XV - Solar – Assembly Includes: Heater, Thermostat, and Fuse	5
2265-2000-1001	Solar Charging Kit - NMSB XV and 12VDC - Top of Pole	5
2265-2900-0001	Solar Panel Stand - Pole - NMSB XV Bolt On	5

1.4. Warranty

NASATKA BARRIER, INC. (DBA: NASATKA SECURITY) [NASATKA]

PRODUCT EQUIPMENT WARRANTY TERMS AND CONDITIONS

Project Name: Kirtland Air Force Base – New Mexico

Nasatka Project No.: 2223

Equipment Warranty Period: One (1) Year

Period Start Date: TBD

Period End Date: TBD

NOTE

REFER TO APPENDIX A FOR PROJECT SPECIFIC WARRANTY.

1.4.1 Extended Warranty

NOTE

OPTIONAL LONGER WARRANTY PERIODS ARE AVAILABLE.

1.5. Disclaimer

All barrier systems should be carefully planned with safety as a paramount concern. The product is designed to control vehicle traffic; however, Nasatka Barrier Incorporated is not a traffic safety engineering firm and recommends that a system be reviewed before installation. It is recommended that all forms of safety equipment be utilized to the maximum extent possible. Such safety equipment includes, but is not limited to, proper lighting, written warning signs, traffic signals, traffic arms and/or audible alarms.

2. EQUIPMENT DESCRIPTIONS

The NMSB XV-P is manufactured for a 12 foot roadway opening. The major assemblies are the base plate assembly, gate plate assembly, and the housing assembly. Figure 1 shows these assemblies and components.

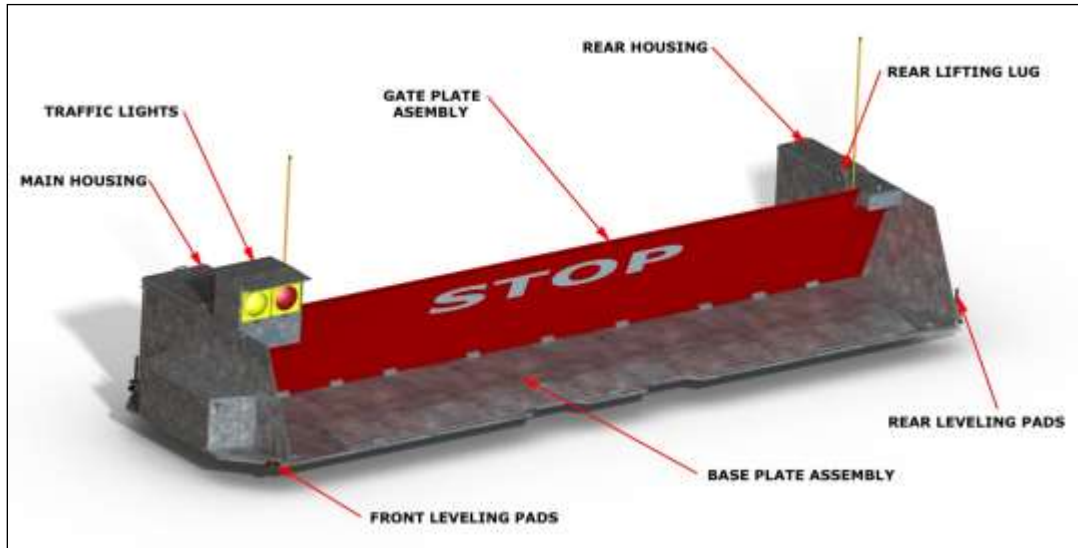


Figure 1. NMSB XV-P Major Components

NOTE

FIGURES AND DESCRIPTIONS IN THIS MANUAL MAY REPRESENT OPTIONAL EQUIPMENT NOT SELECTED FOR THIS PROJECT. REFER TO EQUIPMENT SUPPLIED LIST 1.3.

All steel components of the NMSB XV-P assembly are hot dip galvanized to prevent rust.

OPTIONAL Ballast may be added to the NMSB XV-P to increase its stopping capability. Ballast, totaling 18,000 lbs. (9,000 lbs. per side) placed on the safe side of the barrier, aligned and in contact with the two buttresses will increase the rating to an engineered rating of K12/L1. The concrete ballast is typically standard jersey barriers or poly type barriers filled with concrete, sand, water or an appropriate material.

2.1. Base Plate Assembly

The NMSB XV-P base plate assembly has two buttresses (housings), the main housing encloses the HPU, hydraulic cylinder, primary counter-balance spring, PLC, and the traffic signal, while the rear housing (the narrow housing at the opposite end of the gate plate) encloses a secondary counter-balance spring. The counter-balance springs allow the gate plate to be moved manually. The base plate assembly allows the housings and the gate plate to be mounted on a single mobile structure.

The dual directional (signals traffic on both the threat and safe side of the barrier), red/amber traffic signal is integrated into the front buttress. The front buttress also houses the batteries (which powers the entire system), and battery charger.

Additional base plate equipment includes the pushbutton pendent (which operates the barrier) and the tool box equipment.

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2.2. Gate Plate Assembly

The gate plate is an essential component for maintaining security with a NMSB XV-P barrier. With the gate plate in the nonsecure (open) position, it will allow a vehicle to pass through the ACP, and in the secure (closed) position traffic will not be able to pass the ACP.

2.3. Hydraulic Pump Unit

The HPU operates the gate plate. It consists of an electric motor, a hydraulic pump and multiple valves, a 2.5 gallon reservoir, and all other electrical/mechanical components used to provide gate plate movement and functions for the system.

The following paragraphs contain brief descriptions of HPU components. Refer to APPENDIX D and Figure 2 for additional HPU information.

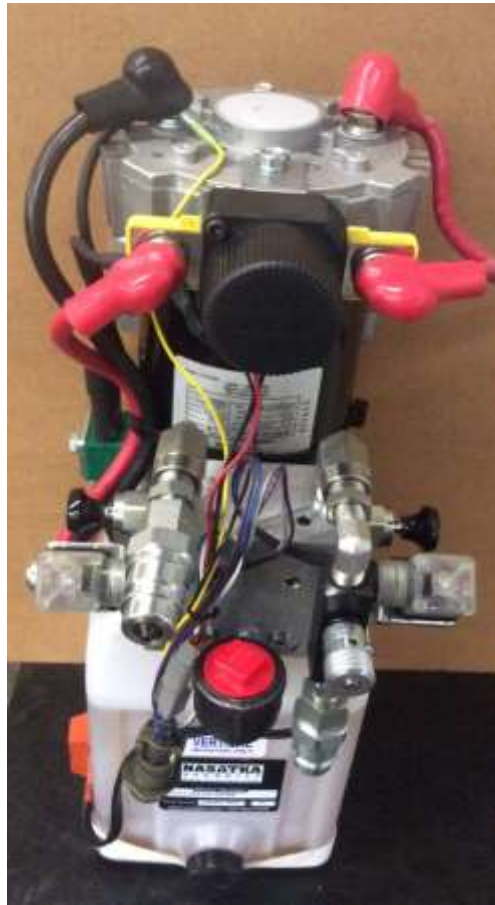


Figure 2. NMSB XV-P HPU

2.3.1 Hydraulic Pump And Valves

The pump is sized for a minimum of 200 cycles per hour. A cycle is defined as one up and down motion. The pump operates at a pressure range of 800 - 1200 PSI and controls a double-acting cylinder. One set of valves applies hydraulic pressure to one end of the cylinder to raise the gate plate and another set applies hydraulic pressure to the other end of the cylinder to lower the gate plate.

2.3.1.1 Motor

An electric motor drives the hydraulic pump. This motor is a 12 volt DC motor. The motor is powered by the system batteries which are charged by the system charger. Nasatka Security utilizes Scott DC Power products permanent magnet motor model type '4B2927' or equal. Refer to APPENDIX D for additional HPU motor data.


		Scott DC Power ProductsTM	
		A Klnetek Company[®]	
MFG. IN USA		PERMANENT MAGNET MOTOR	
MODEL	4BC2927	HP	1.0
RPM	3300	INS.CL.	H
VOLT.	12vdc	MOUNT	56B
AMP.	84	SHAFT	tang
DUTY	Int.	ENCL.	TENV
DATE	***	SER.NO.	*****

Figure 3. NMSB XV-P Motor Nameplate Data

2.3.2 Reservoir

The 2.5 gallon reservoir holds the hydraulic fluid required by the HPU. The amount of fluid used helps keep the hydraulic components cool and prevents pump starvation. Refer to Figure 4.

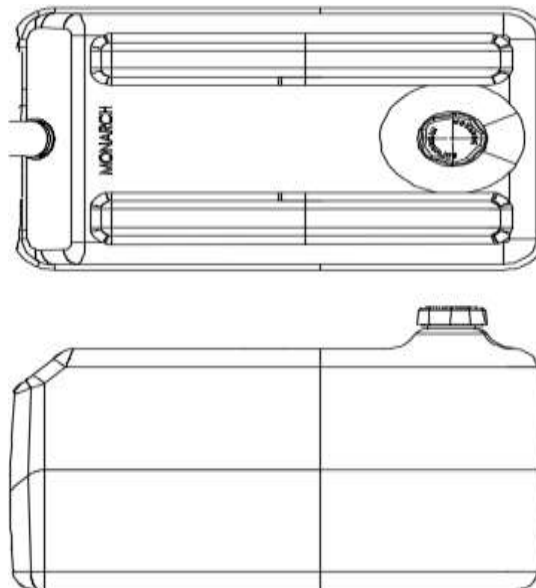


Figure 4. HPU Reservoir

2.3.3 Hydraulic Fluid

Nasatka utilizes RSC FUTERRA 32 hydraulic fluid that is a high performance, readily biodegradable, synthetic ISO 32 grade hydraulic fluid. It is intended for severe service, extreme high temperature (250°F / 121°C), low temperature (-40°F / -40°C), and high pressure (5000+psi) applications. It exhibits enhanced wear protection, cleanliness, and longer life than conventional petroleum hydraulic oils. RSC FUTERRA 32 can directly replace petroleum oil based hydraulic fluids of the same viscosity, yet has reduced environmental impact in the event of a leak or spill, as it is readily biodegradable and non-sheening. Refer to APPENDIX B for additional information.

2.3.4 HPU Heater

The HPU heater is 3 X 6 inch rectangular silicone rubber etched foil heater. The heater requires 12 VDC, 37.5W, 3.13A and features an embedded grounding plane. The heater utilizes a preset thermostat with an ON temperature of 32° F and an OFF temperature of 50° F. 6ft power cord set included. Refer to Figure 5 for additional information.

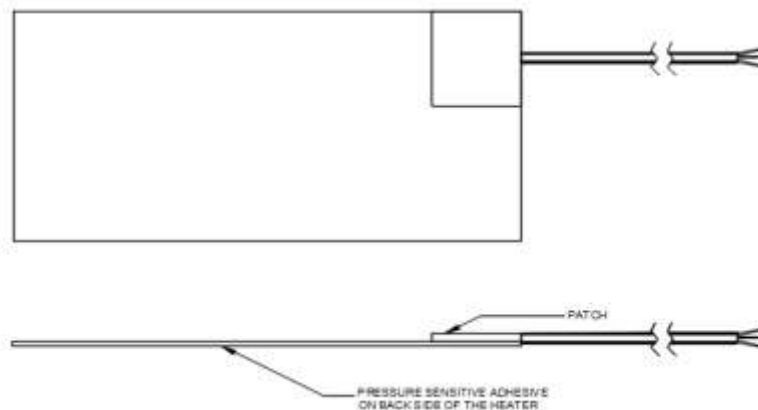


Figure 5. HPU Heater

2.3.5 HPU Heater Breaker

Bussmann Type '121B20-A2P-KA' Shortstop Circuit Breaker, Series 12X, 20A provided for circuit protection. Refer to APPENDIX D and Figure 6 for additional information.



Figure 6. HPU Heater Breaker

2.4. System Equipment

The system battery provides a 12 VDC mobile power source which is maintained by a charger. The battery powers the HPU electric motor, the PLC, traffic signals, and all other electrical/electronic components used to provide system functions. Refer to APPENDIX C for additional information.

2.4.1 Battery

The AGM deep cycle battery provides an ideal power source for heavy, renewable energy powered, portable, electric equipment requiring a deep discharge application. Ultra-deep discharging causes life-shortening plate shedding and accelerated positive grid corrosion, which can destroy a battery. Intimidator™ deep cycle batteries use the optimized amount of acid (no more, no less) ensuring the power in the acid is used before the power in the plates. This design, along with the enhanced durability in the glass mat and plate construction, protects the internal components from ultra-deep discharges. The battery is completely spill proof and maintenance-free to eliminate watering and typical maintenance. Refer to APPENDIX C for specifications and safety data information.



Figure 7. Battery

NOTE

ACTIVE VEHICLE BARRIER IS DELIVERED WITH BATTERY FUSE REMOVED TO ENSURE NO BATTERY DRAINAGE. FUSE MUST BE INSTALLED PRIOR TO OPERATION. REFER TO SHOP DRAWING SB-301 IN APPENDIX J FOR ADDITIONAL INFORMATION.

2.4.2 Battery Charger

The battery charger is provided based on 120 VAC, 1 Phase, and 60 Hz power. Completely encapsulated: waterproof, shockproof and ignition protected, water, oil or dirt will not damage the Blue Smart IP67 Charger. The casing is made of cast aluminum and the electronics are molded in resin. Setting a new industry standard: with 92% efficiency or better, these chargers waste three to four times less heat. And once the battery is fully charged, power consumption reduces to less than a Watt, some five to ten times better than the industry standard. The Blue Smart Charger features a microprocessor controlled 'adaptive' battery management. The 'adaptive' feature will automatically optimize the charging process relative to the way the battery is being used. The storage mode kicks in whenever the battery has not been subjected to discharge during 24 hours. In the storage mode float voltage is reduced to 2.2 V/cell (13.2 V for a 12 V battery) to minimize gassing and corrosion of the positive

plates. Once a week the voltage is raised back to the absorption level to 'equalize' the battery. Can be used in a hot environment such as a machine room. Output current will reduce as temperature increases up to 60°C, but the charger will not fail. Two LEDs for status indication; Yellow LED: bulk charge (blinking fast), absorption (blinking slow), float (solid), storage (off) Green LED: power on. Refer to APPENDIX C and Figure 8 for battery charger connection, specifications, operation, and maintenance information.



Figure 8. Battery Charger

2.5. Barrier Control Unit

The PLC is housed in the BCU system controller located on the front buttress. This system controller houses the PLC, necessary circuitry, and support components/connectors required to operate the system. Refer to APPENDIX E and Figure 9 for additional information.



Figure 9. System Controller And Power Selector Switch

2.5.1 Power Selector Switch

The power selector switch is used to tell the system controller from which end of the barrier to draw power. If the barrier is connected to power at the front location select “Front” or 1. If the barrier is connected to power at the rear location select “Rear” or 2. Refer to Figure 9.

2.5.2 PLC

Nasatka Security utilizes Crouzet Millenium 3 controller. The Millenium 3 is capable of retrieving information and triggering actions. Our controller can control, measure, manage, communicate, trigger actions, and can offer an operator dialog interface. It can also be adapted to suit the needs of diversified customer applications.



Figure 10. PLC

2.5.3 DC To DC Converter

The battery voltage (12 VDC) is converted to 24 VDC via the DC to DC converter to power the PLC. The 160 W, 12 V to 24 V step up DC/DC converter uses boost converter topology, and single direction current to provide a voltage regulator, current limiter, or voltage limiter application.



Figure 11. DC To DC Converter

2.6. Traffic Signal

The traffic signal (Figure 12) is mounted on the buttress and faces both directions to provide a visual indication of the barriers position. When the traffic signal is yellow, vehicles are to proceed with caution. When the traffic signal is red, vehicles are to stop at the designated point (pavement markings or traffic signs are typically provided for this purpose).



Figure 12. Traffic Signal

2.7. Tether Control Pendant

The tether control pendant (Figure 13) is used to control the position of the gate plate. The pendant can be connected to either side of the barrier at the connector marked for its use. The pendant houses two pushbuttons which indicate the direction the gate plate moves while the pushbutton is held down. Press and hold the pushbutton for the desired direction of gate plate movement (secure – raises the gate plate to close the ACP and nonsecure – lowers the gate plate to open the ACP) for the entire time that movement is required to change the gate plate position. Once the gate plate reaches the fully secure (closed) or nonsecure (open) position release the pushbutton. Refer to APPENDIX F for additional information.



Figure 13. Tether Control Pendant

2.8. Optional Equipment - Selected

Nasatka recognizes that our clients have different needs and therefore provides numerous optional equipment selections to enhance the performance and operation of the NMSB XV-P. These items must be specified when ordering. **Refer to the ESL** (Table 1. Nasatka Equipment Supplied) for the options specified for this project and the descriptions that follow.

2.8.1 Solar Panel

Available as an option for the NMSB XV is the solar panel charging system. The solar panel charging system includes a 130 W solar panels (wired in parallel) which provide enough power to maintain normal up/down cycle count without battery depletion. The panels are mounted on a removable pole at the front of the housing assembly and rotate to any direction.

There is a switch inside the front housing assembly that controls the battery charging source. One position of the switch will charge the system battery from a 115 VAC source while the other position charge from the solar panels. This switch must be in the appropriate position for the barrier to function properly. Refer to APPENDIX I for additional information.

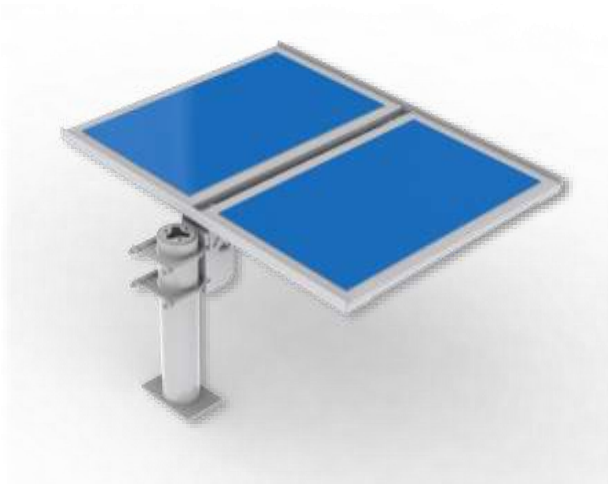


Figure 14. Solar Panel

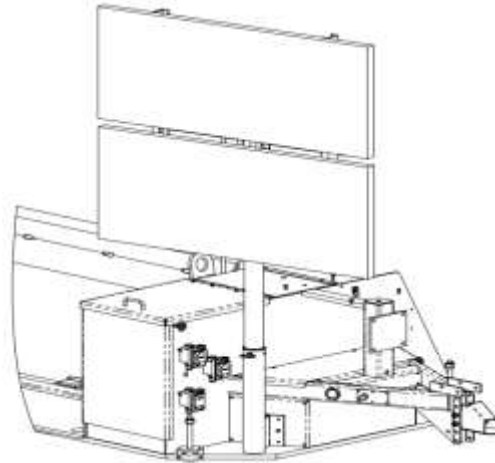


Figure 15. Solar Panel Mounting



WARNING

DO NOT CONNECT THE SOLAR PANELS IF THE BARRIER IS CONNECTED TO A 115 VAC SOURCE.

2.9. Optional Equipment - Not Selected

Nasatka recognizes that our clients have different needs and therefore provides numerous optional equipment selections to enhance the performance and operation of the NMSB XV-P. These items must be specified when ordering. **Refer to the ESL** (Table 1. Nasatka Equipment Supplied) for the options specified for this project and the descriptions that follow.

2.9.1 Master User Interface Panel

The Master UIP (also called, Master Control Panel or MCP), is designed to allow operator inputs to control a barrier. There are a series of pushbuttons on the UIP that operate the barrier. The pushbuttons on the UIP illuminate to provide visual indications as to the status of the barrier and the state of the UIP (enabled or disabled).



Figure 16. Master UIP

2.9.2 Remote User Interface Panel

The Remote UIP (also called, Remote Control Panel or RCP), is designed to allow operator inputs to control a barrier. There are a series of pushbuttons on the UIP that operate the barrier. The pushbuttons on the UIP illuminate to provide visual indications as to the status of the barrier and the state of the UIP (enabled or disabled).



Figure 17. Remote UIP

2.9.3 AIR-EAGLE® XLT RF Wireless System

The wireless remote control HMI is provided by a four button, 900 MHz, RF, hand-held transmitter (Model 44P-HH-4-005). The transmitter is designed to operate with the Model 44P-6-0002 transceiver. Transmitter buttons 1 and 2 operate relays 1 and 2 respectively in the transceiver. The AVB is placed in the Secure position when Relay 1 is activated and placed in the Nonsecure position when Relay 2 is activated. The transmitter receives confirmation feedback from the transceiver when the associated limit switch is closed. Input 1 on the 44P-6-0002 corresponds to the 'closed' limit switch and input 2 the 'open' limit switch. A 'closed' feedback will blink the RED LED quickly whereas the 'open' feedback will blink the GREEN LED quickly.



Figure 18. AIR-EAGLE RF Transmitter



Figure 19. AIR-EAGLE RF Transceiver

2.9.4 Generator

Nasatka utilizes the Generac Type 'GP5500' portable generator.



Figure 20. Generator

Below are some the features:

- A. Generac's OHV (overhead valve) engine with splash lubrication provides a long engine life.
- B. Large-capacity steel fuel tank with incorporated fuel gauge provides durability and extended run times.
- C. Low-oil level shutdown automatically safeguards engine from damage.
- D. Hour meter tracks maintenance intervals
- E. Hardened 1 1/4" steel tube cradle for added durability and strength.
- F. Fold-down, locking handle for sturdy portability and compact storage.
- G. Heavy-duty, never-flat wheels for reliable portability.

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- H. Environmentally Friendly CSA and CARB Certified.
- I. Heavy-duty, never flat wheels for reliable portability.
- J. Covered outlets provides added protection from the environment and rugged working conditions.

Below are the specifications of the generator:

- | | |
|---|--------------------------|
| A. AC Rated Output Running (Watts): | 5500 |
| B. AC Maximum Motor Starting (Watts): | 6875 |
| C. AC Frequency (Hz): | 60 |
| D. AC Voltage (VAC): | 120/240 |
| E. Rated Amperage (A): | 45.8/22.9 |
| F. Maximum Rated Amperage (A): | 57.3/28.6 |
| G. Engine Displacement (cc): | 398 |
| H. Engine Type: | OHV |
| I. Engine RPM: | 3600 |
| J. Recommended Oil: | 10W-30 / SAE30 |
| K. Lubrication Method: | Splash |
| L. Automatic Voltage Regulation (AVR): | Yes |
| M. Choke Location: | On engine |
| N. Fuel Shutoff: | On Fuel Tank |
| O. Starting Method: | Recoil Pull start |
| P. Low Oil Shutdown Method: | Low Level |
| Q. Neutral Bonded to Ground: | Yes |
| R. Start Switch Type: | On/Off Switch |
| S. Switch Location: | On engine |
| T. Fuel Gauge: | Built-in Tank |
| U. Fuel Tank Capacity Gal (Ltr): | 7.2 (27.3) |
| V. Run Time at 50% (Hours): | 10 |
| W. Handle Style: | Single Folding / Locking |
| X. Wheel Type: | 9.5 IN Solid Wheels |
| Y. Maintenance Kit: | Sold Separately |
| Z. Warranty – Residential / Commercial: | 2 year Ltd / 1 year Ltd |

Below are the dimensions and weights of the generator:

- | | |
|--------------------|-------------|
| A. Length in (mm): | 27.25 (692) |
|--------------------|-------------|

B. Width in (mm):	27 (687)
C. Height in (mm):	25 (638)
D. Extended Length in (mm):	44.5 (1129)
E. Carton Length in (mm):	31 (790)
F. Carton Width in (mm):	21.5 (550)
G. Carton Height in (mm):	23.25 (590)
H. Unit Weight lbs (kg):	170.9 (81.3)

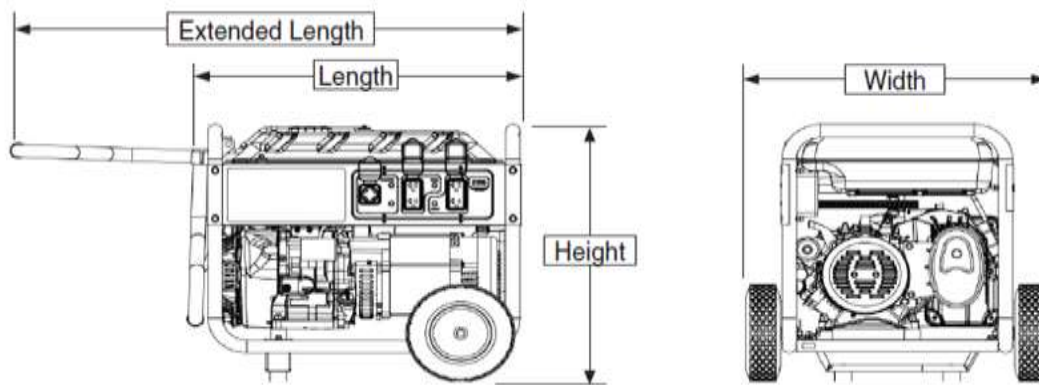


Figure 21. Generator Dimensions

2.9.5 Photoelectric Sensor

The new Enhanced versions of the Cutler-Hammer® 50 Series™ Photoelectric Sensors from Eaton's electrical business offer flexibility, durability and high optical performance, in a cost effective self-contained package.



Figure 22. Photoelectric Sensor

2.9.6 Battery Booster And Cable Kit

The NMSB XV uses a 12 VDC portable power source that can be connected when the battery has been depleted and short term power is required. The kit includes a 6FT extension cord, 12FT jumper cables, and the battery booster pack. Refer to Figure 23.

The battery booster data is the following:

- A. 1700 peak amperes.
- B. 425 cranking amperes to start passenger vehicles and light to medium duty trucks.
- C. 12 volts
- D. 46 inches #2 gauge cables plus automatic recharging for easy unit maintenance Industrial grade.
- E. Hot Jaw clamps for maximum energy transfer to the vehicle.



Figure 23. Battery Booster

2.9.7 Ballast

Provided layout and local authority permits, ballast may be placed on the safe side of the barrier. The ballast must be aligned with and in contact with the two buttress. The ballast must total 18,000 lbs. (9,000 lbs. per side) and is used to increase the crash rating of the barrier (to an engineered K12/L1 capable of stopping a 15,000-pound (6800 kg) truck traveling at 50 mph (80 km/h). The ballast can be standard concrete jersey barriers or poly type barriers filled with concrete, sand, water or an appropriate material so the weight requirement is obtained. The ballast does NOT require anchoring.

3. INSTALLATION DESCRIPTION

The NMSB XV-P is unique among the Nasatka Barrier line in that it is a mobile barrier. This barrier is intended to be placed into position and designed for setup in an expedited timeframe. Once in place, ballast can be added to the safe side of the barrier to increase its stopping capability. The following paragraphs describe the setup procedure.

3.1. Barrier Placement

Perform the following steps to place the NMSB XV-P in the desired location.

WARNING

THE BARRIER WEIGHS APPROXIMATELY 9,000 LBS. (4.08 MT).

WARNING

THE WEIGHT/FORCE OF THE BARRIER (AND ITS LARGER MOVEABLE COMPONENTS) PRESENTS A CRUSH HAZARD. KEEP HANDS AND FEET OUT FROM UNDER THE BARRIER AND CLEAR OF ALL MOVING PARTS AT ALL TIMES. CRUSHING RESULTING FROM CONTACT WITH THIS WEIGHT/FORCE MAY RESULT IN SERIOUS INJURY OR DEATH.

3.1.1 Portable Offloading from flatbed Delivery Truck Trailer

Below are the three options for offloading barrier.

- A. Utilizing two (2) forklifts, recommend minimum 15,000 lbs. Refer to Figure 24.



Figure 24. Utilizing Two Forklifts for offloading barrier

- B. Single (1) forklift, recommend minimum 30,000 lbs. forklift.
- C. Crane (with lift plan) properly sized for offloading Portable equipment. Refer to Figure 24 and APPENDIX H for more information.

3.1.2 Level Barrier On Roadway/Pavement

Perform the following steps to level the NMSB XV on the roadway/pavement.

- A. Level barrier if required.
 - 1. At threat side of barrier (located at bottom corners of barrier), locate barrier levelers. Refer to Figure 25.
 - 2. Loosen jam nut.
 - 3. Screw levelers up/down until barrier is level.
 - 4. Tighten jam nut.



Figure 25. Barrier Leveling On Roadway

NOTE

YOU MAY NEED TO ADJUST THE LEVELERS AGAIN AFTER THE FOLLOWING STEPS ARE COMPLETED.

3.1.3 Release gate plate locking pin.

- A. At rear buttress, locate gate plate locking pin. Refer to Figure 26.

NOTE

THIS PIN IS USED TO LOCK THE GATE PLATE IN THE UP POSITION FOR SHIPPING OR OTHER PURPOSES.

- 1. Release gate plate locking pin by removing padlock (or bolt and nut) which secures pin to lower hole in locking tab.



Figure 26. Unlock Plate Locking Pin

2. Turn gate plate locking pin counterclockwise and then lift pin. Refer to Figure 27.



Figure 27. Turning Plate Locking Pin

3. While holding gate plate locking pin up turn pin clockwise until pin rests against locking tab.
 - a) The gate plate locking pin should now be in line with the top hole of the locking tab. Refer to Figure 28.

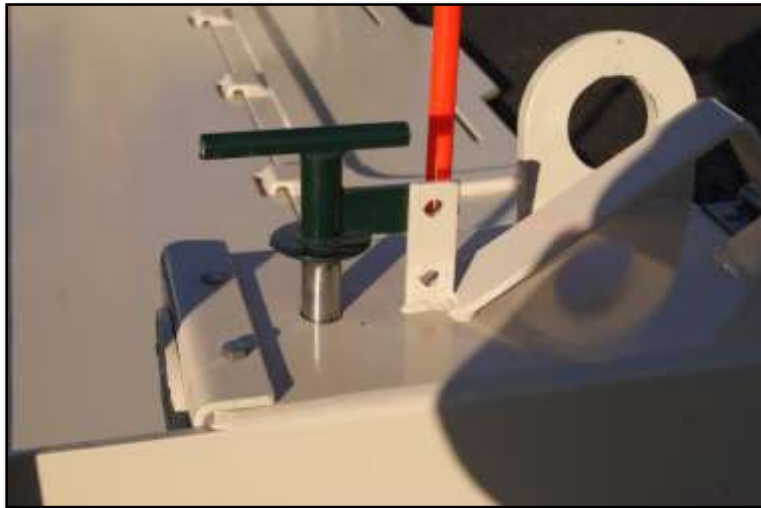


Figure 28. Secure Plate Locking Pin In Released Position

4. Secure gate plate locking pin into position at top hole on locking tab using either a padlock or a bolt and nut.

WARNING

KEEP HANDS AND FEET CLEAR FROM UNDER BARRIER AND ALL MOVING PARTS AT ALL TIMES.

NOTE

ENSURE THE GATE PLATE LOCKING PIN DOES NOT VIBRATE LOOSE AND MOVE INTO THE LOCKED POSITION DURING OPERATION OF THE BARRIER.

5. With the pendent plugged in (Figure 13), your HPU will operate by battery bank power.

NOTE

THE BARRIER IS NOW READY TO OPERATE.

4. OPERATING PRINCIPLES

This section provides complete instructions for operating the system.

4.1. Basic Barrier Operation

No matter what the operating conditions the basic operation of a barrier can be described as follows: the barrier can be in only one of the following positions at any time.

A. The barrier is Nonsecure.

Operator Input	Result
Secure	Barrier moves to the fully secure position in standard operating time
Nonsecure	No Action.

B. The barrier is Secure.

Operator Input	Result
Secure	No action.
Nonsecure	Barrier moves to the fully open position in standard operating time.

C. The barrier is moving toward Secure.

Operator Input	Result
Secure	Barrier continues toward the fully secure position.
Nonsecure	Barrier immediately reverses direction of travel and moves to the nonsecure position in normal operating time (slightly faster due to reduced travel).

D. The barrier is moving toward Nonsecure.

Operator Input	Result
Secure	Barrier immediately reverses direction of travel and moves to the secure position in normal operating time (slightly faster due to reduced travel).
Nonsecure	Barrier continues toward the fully nonsecure position.

4.2. Sequence Of Operation

The NMSB XV-P is very easy to operate and the SoO is very straight forward. Once the barrier is positioned and installed and all electrical connections are completed the barrier can be operated simply by pressing one of two buttons.

4.2.1 Operating The Barrier From The Tethered Pendant

The Tethered Pendant has two push buttons (open /close) controls which has a maximum of 25FT. The tether has a quick disconnect from barrier.

4.2.1.1 To Secure Barrier Using Tethered Control Pendant

Press and hold the up arrow (white pushbutton) on the pendant until the gate plate is in the fully raised position. Refer to Figure 13.

4.2.1.2 To Nonsecure Barrier Using Tethered Control Pendant

Press and hold the down arrow (black pushbutton) on the pendant until the gate plate is in the fully lowered position. Refer to Figure 13.

4.3. Traffic Light Sequence

The barrier is equipped with dual direction red/amber traffic signal to help inform vehicle operators of their status with regard to crossing the ACP and to provide an indication that gate plate movement is occurring. The amber light is ONLY on when the gate plate is in the fully nonsecure position while the red light is on any time the gate plate is moving or in any other position.

4.4. Modes Of Operation

The NMSB XV-P barriers operate in one of two modes: normal or manual. These modes utilize different operating conditions to move the gate plate assembly while maintaining safety and security. There are two sets of operating conditions under which the barriers must operate: normal and manual. These operating conditions and modes are described in detail in the following paragraphs.

4.4.1 Normal Operating Conditions

During normal mode, the basic human interfaced sequences are utilized as listed in Section 4.2, Sequence of Operations.

No matter what the source of the inputs, the results of the two inputs are given below for each of the four possible starting positions.

A. Barrier (Nonsecure)

Operator Input	Result
Secure	Barrier moves to the secure position in normal operating time provided no vehicle is within loop detector range.
Nonsecure	No action occurs.

B. Barrier (Secure)

Operator Input	Result
Secure	No action.
Nonsecure	Barrier moves to the nonsecure position in normal operating time.

C. Barrier Moving Toward Secure

Operator Input	Result
Secure	Barrier continues toward the secure position.
Nonsecure	Barrier immediately reverses direction of travel and moves to the nonsecure position in normal operating time (slightly faster due to reduce travel).

D. Barrier Moving Toward Nonsecure

Operator Input	Result
Secure	Barrier immediately reverses direction of travel and goes to the secure position in normal operating time (slightly faster due to reduced travel).
Nonsecure	Barrier continues toward the nonsecure position.

4.4.2 Manual Operating Conditions

The NMSB XV-P can be operated manually during installation or for maintenance purposes or during long term power outages when the batteries (or generator) power has been exhausted and other types of backup power are NOT available. Manual operating conditions allow the gate plate to be moved even if the power to the barrier has been lost, disabled, or turned off (maintenance purposes). The following instructions explain how to operate a NMSB XV-P barrier manually.

WARNING

TWO PERSONS ARE REQUIRED TO MANUALLY OPERATE THE BARRIER. FAILURE TO USE TWO PEOPLE TO OPERATE THE BARRIER MAY PRESENT A CRUSHING HAZARD. BEING STRUCK BY THE BARRIER MAY RESULT IN SERIOUS INJURY OR DEATH.

- A. Perform the following steps to manually operate the barrier.

WARNING

FAILURE TO LOCKOUT BARRIER POWER MAY ALLOW UNEXPECTED/INADVERTENT ACTIVATION OF THE BARRIER MOTOR DRIVE SYSTEM. UNEXPECTED/INADVERTENT ACTIVATION OF THE BARRIER MOTOR DRIVE SYSTEM MAY CAUSE SERIOUS INJURY OR DEATH.

1. Ensure power to barrier is disconnected.
2. Open front buttress lid.
3. Remove front buttress cover plate.

NOTE

INSIDE THE TOOLBOX IS THE MANUAL LIFT BAR.

4. Take out manual lift bars from storage compartment (2).
5. Place both manual lift bars in provided slots on gate plate. Refer to Figure 29.

WARNING

THE GATE PLATE PRESENTS A CRUSH HAZARD AND OTHER MOVING PARTS PRESENT PINCH HAZARDS. KEEP HANDS AND FEET CLEAR FROM UNDER BARRIER AND ALL MOVING PARTS AT ALL TIMES. FAILURE TO REMAIN CLEAR OF CRUSH AND PINCH POINTS MY RESULT IN SERIOUS INJURY OR DEATH.



Figure 29. Manual Lift Bars

WARNING

THE GATE PLATE PRESENTS A CRUSH HAZARD AND OTHER MOVING PARTS PRESENT PINCH HAZARDS. KEEP HANDS AND FEET CLEAR FROM UNDER BARRIER AND ALL MOVING PARTS AT ALL TIMES. FAILURE TO REMAIN CLEAR OF CRUSH AND PINCH POINTS MY RESULT IN SERIOUS INJURY OR DEATH.

6. One person needs to pull outward on both black check valves and hold. Refer to Figure 30.

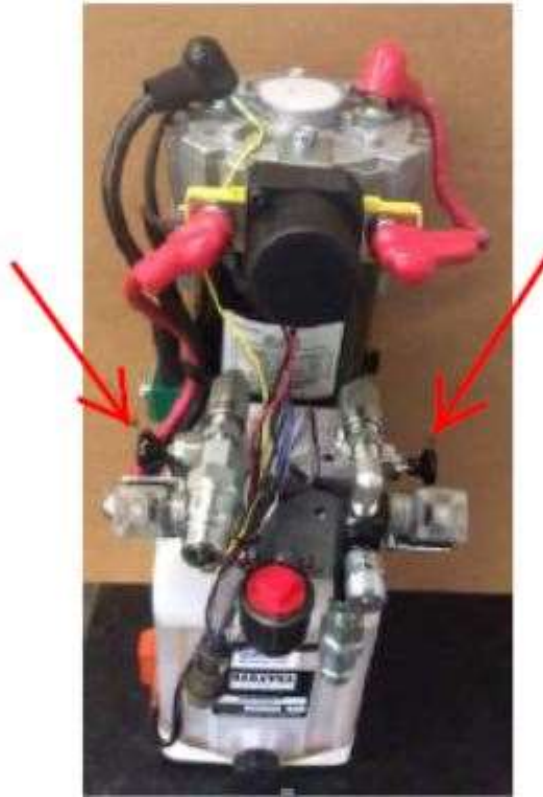


Figure 30. HPU Check Valves

7. Using two people, pull up to raise the gate or push down to lower the gate.

WARNING

LOCK GATE PLATE TO PREVENT THE GATE PLATE FROM ACCIDENTALLY LOWERING WHILE PERSONNEL ARE WORKING. FAILURE TO LOCK THE GATE LOCK MAY RESULT IN SERIOUS INJURY OR DEATH.

8. Once the gate is in the desired position the black check valves can be released.
9. If the gate plate was raised to the secure position, lock gate plate in place using both pins. Refer to Figure 31.

NOTE

THE BARRIER IS EQUIPPED WITH TWO LOCKING PINS ONE LOCATED ON TOP OF EACH HOUSING.



Figure 31. Gate Plate Locked In Place

4.5. Startup And Shutdown Procedures

The system startup occurs during power on, without operator interaction, as long as the power on sequence is performed in the order instructed.

NOTE

ACTIVE VEHICLE BARRIER IS DELIVERED WITH BATTERY FUSE REMOVED TO ENSURE NO BATTERY DRAINAGE. FUSE MUST BE INSTALLED PRIOR TO OPERATION. REFER TO SHOP DRAWING SB-301 IN APPENDIX J FOR ADDITIONAL INFORMATION.

4.5.1 Barrier Startup

WARNING

ENSURE THE AREA WHERE MOTION IS EXPECTED IS CLEAR OF PERSONS OR VEHICLES. UNEXPECTED MOVEMENT MAY CAUSE SERIOUS INJURY OR DEATH.

- A. At tool box, remove padlock (or bolt and nut) securing lid.
- B. Open lid and remove pushbutton control pendant. Refer to Figure 13.
- C. Determine which end of barrier you intend to operate from and connect pushbutton control pendant to connector at that end of barrier. Refer to Figure 32.

NOTE

THE PUSHBUTTON CONTROL PENDANT CAN ONLY BE CONNECTED TO THE CONTROL RECEPTACLES (THE RECEPTACLES ARE MARKED).



Figure 32. Tether Control Pendant Connection

- D. Connect barrier to a power source as follows.
1. If using facility power.
 - a) Turn facility power off.
 - b) Using power cord, connect facility power to barrier at power receptacle. Refer to Figure 32.
 - c) At front buttress, unsecure and open buttress lid.
 - d) Inside front buttress, turn power selector switch to correct feed position.
 - e) Close and secure buttress lid.
 - f) Turn facility power on.
 2. If using a generator. Refer to Figure 33.
 - a) Place generator where it will be out-of-the-way. Do NOT start generator until instructed.
 - b) Using power cord, connect generator to barrier at power receptacle.
 - c) At front buttress, unsecure and open buttress lid.
 - d) Inside front buttress, turn power selector switch to correct feed position.
 - e) Close and secure buttress lid.
 - f) Start the generator.



Figure 33. Connecting A Generator To The Barrier

4.5.2 System Shutdown

Perform the following to shut down the system.

- A. Remove external power as follows.
 1. If utilizing a generator, perform the following.
 - a) Stop the generator.
 - b) Disconnect power cord from barrier at power receptacle and then at generator.
 - c) Stow generator per manufactures instructions.
 - d) Stow power cord in barrier tool box.
 2. If utilizing facility power, perform the following.
 - a) Turn facility power source off.
 - b) Disconnect power cord from barrier at power receptacle and then facility power source.
 - c) Stow power cord in barrier tool box.
- B. Remove pushbutton control pendant and stow in barrier tool box.

4.6. Post-Shutdown Procedures

Perform the steps in the following subparagraphs for prolonged shutdown that may affect battery health.

4.6.1 Battery Maintenance During Extended Power Down

The system battery should be recharged at intervals of one month (or less) as failure to charge the battery will reduce its long term life. Perform the following steps to charge the system battery.

NOTE

THE BATTERY CHARGER PROVIDED WITH THE SYSTEM CANNOT BE USED TO CHARGE THE BATTERY IF THE BATTERY OUTPUT HAS BEEN DEPLETED TO 6 VDC OR LESS.

- A. Power on system and charge batteries as follows.
 - 1. Turn facility power off.
 - 2. Using power cord, connect facility power to barrier at power receptacle.
 - 3. At front buttress, unsecure and open buttress lid.
 - 4. Inside front buttress, turn power selector switch to correct feed position.
 - 5. Close and secure buttress lid.
 - 6. Turn facility power on.
 - 7. Wait a minimum of four (4) hours and a maximum of eight (8) hours.
- B. Turn off facility power and disconnect system.

4.6.2 Uninstalling The Barrier

- A. Perform the following steps to uninstalling a barrier and prepare it for relocation.

WARNING

THE GATE PLATE PRESENTS A CRUSH HAZARD AND OTHER MOVING PARTS PRESENT PINCH HAZARDS. KEEP HANDS AND FEET CLEAR FROM UNDER BARRIER AND ALL MOVING PARTS AT ALL TIMES. FAILURE TO REMAIN CLEAR OF CRUSH AND PINCH POINTS MY RESULT IN SERIOUS INJURY OR DEATH.

- 1. Raise gate plate. Refer to Figure 34.
- 2. At rear buttress, locate gate plate locking pin.
- 3. Remove either the padlock or the bolt and nut (securing the pin).



Figure 34. Raised Gate Plate

4. Turn gate plate locking pin clockwise until pin rests against the lower hole of locking tab.



Figure 35. Locking Pin Secured

5. Using a padlock (or a bolt and nut), secure gate plate with gate plate locking pin. Refer to Figure 36.

NOTE

THE GATE PLATE LOCKING PIN IS USED TO LOCK THE GATE PLATE IN THE UP POSITION FOR SHIPPING OR OTHER PURPOSES.



Figure 36. Secure Plate Locking Pin

6. Now the NMSB XV-P is ready to be removed from its current location.

5. PREVENTATIVE MAINTENANCE

Most normal routine inspection and maintenance will prevent the majority of problems that might occur with the system through normal wear and tear. It is essential that a preventative maintenance and inspection routine be established. It is very important that all personnel involved in any part of the installation, service, or operation of the barrier be familiar with how the equipment is properly used and the limitations of its components. Personnel should have good knowledge of the mechanical systems, safety, and maintenance procedures when servicing the system. This section covers all of the necessary procedures for taking care of your NMSB XV-P.

5.1. Storage

If the Barrier is not going to be installed immediately, it may be stored outdoors by covering the barrier with a plastic sheet. The barrier should be raised off of the ground to prevent rust and corrosion. If long term storage is expected (6 months or more), we recommend storing the components indoors and covering them with a ventilated plastic sheet to prevent condensation buildup.

5.2. Special Tools

All normal preventative maintenance and inspection can be accomplished with standard hand tools. No special tools are required.

5.3. Preventative Measures

In order for your barrier to operate with complete efficiency, there are several steps that need to be followed.

- A. Set up a regular schedule for checking the hydraulic oil temperature, appearance, smell, and feel.
- B. Be prompt about removing, repairing, or replacing any components of the hydraulic system that are running hot. Refer to APPENDIX B for hydraulic fluid information.
- C. If relief or flow-control valves are running hot, check and adjust their settings. Then clean the components off with a clean rag to ensure proper air flow.
- D. Break in new components gradually. New, close fitting parts expand at different rates, and are especially prone to seize up when they get too hot.
- E. Start a cold pump or motor on hot oil by jogging just enough to draw the hot oil into the component. Then wait a few minutes until the temperature on the outside of the pump is the same as that in the piping.
- F. Keep your equipment clean and dry. A thick layer of dirt acts as an insulator. This will prevent the hydraulic system from properly cooling eventually causing the system to malfunction.
- G. In warmer climates, be sure to check and change the oil more frequently. Make certain to use the oil recommended for hot-weather operation by the equipment manufacturer or oil supplier.

5.4. Hydraulic System Maintenance And Inspection

Keeping a clean hydraulic system is essential in order to receive the maximum efficiency from your barrier. The hydraulic reservoir has been thoroughly cleaned and sprayed with a rust inhibitor prior to shipping. It has been our experience that most dirt infiltrates a hydraulic system during installation, so we recommend the following:

- A. All open ports on the power unit, cylinders, etc. must remain plugged with plastic plugs until the hydraulic connections are made to the system for usage.
- B. All interconnecting tubing, pipe, and hoses should be clean, and free of rust, scale and dirt.
- C. All openings in the reservoir system, such as the filter, breather, or access end cover holes, must remain closed during installation.
- D. If Teflon tape or pipe dope is used be sure it does not extend beyond the first thread of the pipe fitting.
- E. Check the hydraulic system for leaks at the power unit and at the cylinder on a weekly basis. Vibrations will loosen the fittings and create fluid leaks.
- F. Inspect the fluid level by taking off the fill cap located on the top of the reservoir and looking down into the reservoir of the hydraulic power unit. The oil level should be approximately 8" from the top of the reservoir. The oil level should be checked after the first 100 hours of operation to make certain that there are no leaks or problems with the hydraulic system. Change the hydraulic oil every 1000 to 2000 hours depending on the application and operation environment.
- G. The reservoir must be filled with clean fluid through the filler cap on the top of reservoir. This hydraulic unit holds approximately 2.5 gallons of hydraulic oil. The type of fluid must be compatible with the seals used on the power unit, and must comply with the recommendations of the manufacturers' of the component parts. Refer to APPENDIX B for hydraulic fluid information.
- H. Enforce a filter maintenance schedule and follow it closely. Replacing the filter extends the life of your hydraulic system.
- I. Inspect filter elements that have been removed from system for signs of failure. Looking at the filter may indicate that the service interval should be shortened, and internal components in the hydraulic system might be failing.
- J. Never return any fluid into the system which may have leaked out or and fluid that has been previously removed from the system. Always keep the supply of new hydraulic fluid sealed in a container.
- K. Use clean containers, hoses, and funnels when filling the reservoir. The use of a filter when adding oil is recommended to keep the amount of dust and dirt in the hydraulic system to a minimum.
- L. Make sure that all cleaned-out holes, filler caps, and filters on the reservoir are properly fastened after the hydraulic oil has been either changed or replaced.
- M. Do not run the system unless all filtration devices are in place.
- N. Before changing type of fluid, consult component and filter manufacturers for selection of the fluid and the filters that should be used. Refer to APPENDIX B for hydraulic fluid information. If the use of fire resistant fluid is required, consult the publication "RECOMMENDED PRACTICE FOR THE USE OF FIRE RESISTANT FLUIDS FOR FLUID POWER SYSTEMS", which is published by the National Fluid Power Association.

5.5. Monthly Maintenance Checklist

DESCRIPTION:	STATUS:	COMMENTS:
UP CYCLE		
DOWN CYCLE		
HYDRAULIC FLUID		
MOTOR RELAY		
HYDRAULIC MOTOR		
CONTROLLER		
UP LIMIT		
CYLINDER PINS		
HYDRAULIC HOSES		
HYDRAULIC CYLINDER		
TRAFFIC LIGHT		
RELAY SYSTEM		
SPRINGS		

NOTES: _____

SERVICED BY: _____ **DATE:** _____

SIGNATURE: _____

Refer to APPENDIX A for additional Maintenance Recommendations.

6. CORRECTIVE MAINTENANCE

This section provides descriptive information on maintaining/servicing the NMSB XV-P barrier, as well as the schedule of performance recommended by Nasatka Barrier, Incorporated

Power must be turned OFF and local lockout-tagout procedures performed at all times while maintaining the barrier unless otherwise stated within the procedure. Refer to WARNINGS, CAUTIONS, and Notes contained within this section regarding power and prop bar installation and removal.

WARNING

IT IS IMPERATIVE THAT PERSONNEL INVOLVED IN THE INSTALLATION, SERVICE, AND OPERATION OF THE BARRIER BE FAMILIAR WITH HOW THE EQUIPMENT IS TO BE USED, THE LIMITATIONS OF THE SYSTEM AND ITS COMPONENT PARTS. THE PERSONNEL SHALL ALSO HAVE KNOWLEDGE OF GOOD MECHANICAL PRACTICES IN TERMS OF SAFETY, INSTALLATION, AND MAINTENANCE OF THE BARRIER. FAILURE TO COMPLY COMPLETELY WITH SAFETY PRECAUTIONS AND PROCEDURES MAY RESULT IN SERIOUS INJURY OR DEATH.

WARNING

ALWAYS UTILIZE LOCKOUT-TAGOUT. FAILURE TO LOCKOUT-TAGOUT EQUIPMENT, POWER, OR SYSTEMS MAY RESULT IN SERIOUS INJURY OR DEATH.

WARNING

NEVER DEFEAT OR OVERRIDE AN EXISTING LOCKOUT-TAGOUT. DEFEATING OR OVERRIDING A LOCKOUT-TAGOUT MAY RESULT IN SERIOUS INJURY OR DEATH.

6.1. Troubleshooting

Three types of problems might occur with your NMSB XV-P; mechanical, electrical, or hydraulic. This section is devoted to assisting you in isolating a problem area and rectifying the problem.

6.2. Mechanical Problems

Mechanical problems can usually be diagnosed by close inspection of the various subassemblies and individual parts that make up the system. (i.e., a badly worn clevis pin in the cylinder will be obvious when the barrier reverses direction.) Routine inspection and preventative maintenance will avoid major problems. Refer to the Maintenance section of this manual for suggestions on routine preventative inspection and maintenance.

6.3. Electrical Problems

The heart of the NMSB XV-P is the electronic control system. The problem can be isolated to one of three possible causes:

1. The input device.
2. The connections between the device and the controller.
3. The controller itself.

A standard electrical test meter will confirm which of the three is causing the problem. If the contacts in the input device are functioning normally, the test meter will verify it quickly by checking the continuity at the input device itself. The next step is to check the signal at the control panel. Check the continuity at the appropriate terminals inside the panel. The final step to determine if the controller has malfunctioned is to check the signal at the terminals on the controller. If the inputs have been verified to be good, and the barrier still does not perform the desired action, the problem has been isolated to the output side.

6.3.1 Example Problem

The NMSB XV-P does not go to the secure position in response to the UP/CLOSE/SECURE button being pressed.

Solution:

- A. Verify the controller is receiving the signal from the button.
****Please note two things must happen for the gate plate to move.****
 - 1. The motor must run (to generate pump output).
 - 2. The solenoid valve must energize (to signal the gate plate to move to the secure or non-secure position).
- B. Check the output on the System Controller for the signals.
- C. Use the electrical test meter to verify the proper voltage (24 VDC, 110 VAC) is present at the terminals in the electrical control panel.
- D. Verify that the proper voltage is also present at the output device (motor, solenoid, light, etc.).
- E. Now check to see if the electric motor is running in the correct direction.
- F. Check the solenoid valve to see if it is shifting. Use an Allen wrench in the manual override of the solenoid to verify that the valve is operating.
- G. If all the above check out, the problem is isolated to the pump or the cylinder.
- H. Check the oil level in the reservoir.
- I. Verify there is hydraulic fluid flowing through the hoses. The hoses will "jump" in response to changes in pressure and flow. Visual and physical inspection will help determine whether or not there is fluid flow through the hoses.
- J. If there is flow in and out of the hydraulic cylinder, you have isolated the problem to possible leaking piston rings.

6.4. Hydraulic Problems

Nasatka Barrier takes pride in the quality of their systems. Normal routine preventative maintenance (as suggested) will prevent the majority of the problems with our system. All electrical and hydraulic components are available worldwide. Each component manufacturer has offices and distribution worldwide. These manufacturers are also committed to reliable service. You may contact Nasatka directly for additional assistance in trouble shooting and/ or for the names of local distributors in your area.

6.4.1 Maintaining Proper Oil Temperature

Hot oil in your hydraulic system is one of the primary causes of poor operation, component failure and downtime. The oil in your hydraulic system was designed for operation within a specified temperature range (120°F) is considered a normal operating temperature). You may be able to run it at hotter temperatures, intermittently, without adverse effects. If you run continuously with oil that is too hot, however, your equipment will operate poorly, and eventually key components will fail and halt your machine. Listed are some guidelines on maintaining proper oil temperature.

6.4.1.1 How Hot Is Too Hot

Hot oil is a relative term. Temperatures of 80°F up to 120°F, at the reservoir, are considered ideal operating temperature. Always take an oil temperature reading at the reservoir, not at a component or any of the piping. The hydraulic system is designed to operate up to 160°F. Do NOT exceed the maximum operating temperature for the equipment. Temperatures with as little as a 20 °F difference (180 °F) may result in UNSAFE operating conditions.

6.4.1.2 Isolating Trouble Spots

In order to determine which components are running hot and overheating the oil, feel the outlet fittings and lines at the valves, pumps, and motors. If the oil's temperature is normal going into a component, but hot coming out, that could be one of the troublemakers. If a sticking valve is set too low, part of the oil will be dumped across the valve with every cycle. This too generates excessive heat. Even when all valves are set properly, they may not be operating well because of worn orifices or seals. Always remove and check the hot components first, before taking apart any other components.

6.4.1.3 Check, Smell-And-Feel

Checking the hydraulic oil temperature periodically is good preventive maintenance. So too is the practice of periodically siphoning an oil sample from the reservoir, and comparing it with a sample of clean, new oil. Hydraulic oil that has been running too hot will look darker and feel thinner than new oil. It will also smell burned. Chances are it will contain more contaminants, because hot oil tends to accelerate the wear of component parts.

6.5. Limit Switch Adjustment

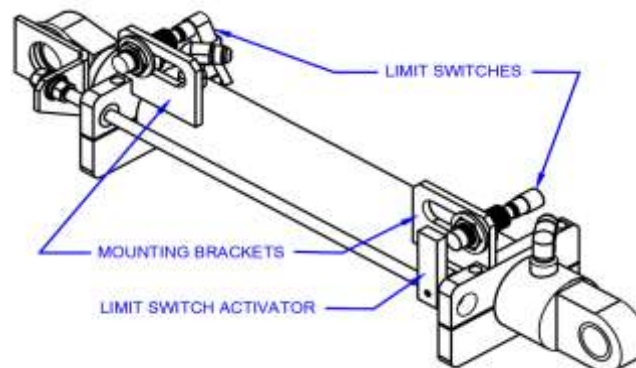


Figure 37. Limit Switch Adjustment

6.5.1 Adjusting Position of Limit Switch

- A. Perform the following procedure to adjust the position of the limit switch.

1. Place barrier in secure or nonsecure position.

NOTE

THE DISPLAY SCREEN ON THE PLC WILL READ "UP LIMIT" OR "DOWN LIMIT" AS SOON AS THE LIMIT SWITCH TRIPS.

NOTE

IF THE BARRIER IS IN THE SECURE POSITION AND "UP LIMIT" IS NOT DISPLAYED, TRY TO MANUALLY TRIGGER THE LIMIT SWITCH. IF THIS IS SUCCESSFUL THEN A SLIGHT ADJUST OF THE LIMIT SWITCH IS ALL THAT IS REQUIRED.

NOTE

IF THE BARRIER IS IN THE NONSECURE POSITION AND "DOWN LIMIT" IS NOT DISPLAYED, TRY TO MANUALLY TRIGGER THE LIMIT SWITCH. IF THIS IS SUCCESSFUL THEN A SLIGHT ADJUST OF THE LIMIT SWITCH IS ALL THAT IS REQUIRED.

2. Terminate power to barrier.
3. Loosen limit switch mounting nuts.

NOTE

SLIGHT ADJUSTMENTS (1/8 -INCH OR LESS) ARE ALL THAT SHOULD BE REQUIRED.

4. Slide limit switch down (See slotted bracket in Figure 37).

WARNING

HIGH VOLTAGE PRESENT WITH THE POWER ON. DO NOT REACH INSIDE THE HOUSING. CONTACTING A HIGH VOLTAGE CONDUCTOR/TERMINAL MAY RESULT IN ELECTRICAL BURNS, SERIOUS INJURY, OR DEATH.

5. Turn power on.

WARNING

CRUSH/PINCH/STRIKE HAZARDS PRESENT WHEN THE BARRIER IS MOVING. DO NOT REACH INSIDE THE HOUSING. BEING CAUGHT BETWEEN MOVING PARTS MAY RESULT IN SERIOUS INJURY OR DEATH.

6. Cycle barrier and verify limit switch is functioning correctly.
7. Repeat Step B through Step F as necessary to obtain proper placement of limit switch.

NOTE

IF A LIMIT SWITCH CAN NOT BE TRIGGERED MANUALLY, THE SENSOR MAY NEED TO BE REPLACED. CHECK SENSOR FUNCTIONALITY PRIOR TO REPLACING.

6.6. Troubleshooting Areas

This section list some of the problems that you might experience and how to fix them.

6.6.1 Dirty Oil

If you have dirty oil before expected please check the following:

- A. Components not properly cleaned after servicing.
- B. Inadequate screening in fill pipe.
- C. Air breather left off. No air breather provided; inadequate unit provided; insufficient protection of air breather.
- D. Gasket on the tank not properly affixed.
- E. Pipe lines not properly covered while servicing machine.
- F. Filter dirty or ruptured.

6.6.2 Foaming Oil

If you are having problems with the oil in your reservoir foaming, please check the following:

- A. Return of tank line not below fluid level. Broken pipe, line left out between a bulkhead coupling and the bottom of the tank after cleaning tank.
- B. Inadequate baffles in reservoir.
- C. Fluid contaminated with incompatible foreign matter.
- D. Suction leak to pump aerating oil.
- E. Lack of anti-foaming additives.

6.6.3 Moisture In Oil

If there are problems with moisture (such as condensation) in the oil please check the following:

- A. Cooling coils not below fluid level.
- B. Cold water lines fastened directly against hot tank causing condensation within tank.
- C. Soluble oil solution splashing into improperly sealed tank or fill pipes left open.
- D. Moisture in replacement fluid can.
- E. Extreme temperature differential in certain geographical locations.
- F. Drain not provided at lowest point in tank to remove water collected over possible long operating periods.

6.6.4 Overheating Of Hydraulic System

If you are having problems with your hydraulic system overheating, please check the following:

- A. Water shut off or heat exchanger clogged.
- B. Continuous operation at relief setting:
 - 1. Stalling under load, etc.
 - 2. Fluid viscosity too high or too low.
- C. Excessive slippage or internal leakage:
 - 1. Check stalls leakage past pump, motors, and cylinders.

- 2. Fluid viscosity too low.
- D. Reservoir sized too small.
- E. Reservoir assembled without baffling or sufficient baffling.
- F. Pipe, tube, or hose (diameter) too small, causing high velocity.
- G. Valve too small, causing high velocity.
- H. Improper air circulation around reservoir.
- I. System relief valve set too high.
- J. Power unit operating in direct sunlight or ambient temperature is too high.

6.6.5 Hydraulic System Foreign Substances

If there are signs of any foreign substances in the hydraulic oil please check the following:

- A. Pipe scale not properly moved.
- B. Sealing compound (pipe dope, Teflon tape) allowed getting inside fittings.
- C. Improperly screened fill pipes and air breathers.
- D. Burrs inside piping.
- E. Tag ends of packing coming loose.
- F. Seal extrusions from pressure higher than compatible with the seal or gasket.
- G. Human element not protecting components while being repaired and open lines left unprotected.
- H. Wipers or boots not provided on cylinders or rams where necessary.
- I. Repair parts and replacement components not properly protected while stored in repair depot (For example, rust and other contaminants).

6.6.6 Hydraulic Pump Makes Excessive Noise

If the hydraulic pump makes more noise than what is expected, please check the following:

- A. Check for vacuum leaks in the suction line (Such as a leak in fitting or damaged suction line).
- B. Check alignment with drive mechanism. Misalignment will cause wear and subsequent high noise level in operation.
- C. Check manufacturer's specifications relative to wear possibilities and identification or indications of wear at high operating noise level, etc.
- D. Check compatibility of fluid being pumped against manufacturer's recommendations.
- E. Relief of unloading valve set too high. Use reliable gauge to check operating pressure. Relief valve may have been set too high with a damaged pressure gauge. Check various unloading devices to see that they are properly controlling the pump delivery.
- F. Aeration of fluid in reservoir (return lines above fluid level).
- G. Worn or damaged gears and housing (gear type pump).
- H. Worn or faulty bearing.

- I. Reversed rotation.
- J. Plugged or restricted suction line or suction strainer.
- K. Plugged reservoir filter breather.
- L. Oil viscosity too high or operating temperature too low.
- M. Oil pour point too high.
- N. Air leak in suction line or fitting also causing irregular movement of control circuit.
- O. Loose or worn pump parts.
- P. Pump being driven in excess of rated speed.
- Q. Air bubbles in intake oil.
- R. Oil level too low and drawing air in through inlet pipe opening.
- S. Air leak at pump shaft seal.
- T. Suction filter too small or too dirty.
- U. Suction line too small or too long.
- V. Pump housing bolts loose or not properly torque.

6.6.7 Pump Failure To Deliver Fluid

If you are having problems with the hydraulic pump pumping the hydraulic fluid, please check the following:

- A. Fluid level in reservoir is low. (typically should be 2 gallons in a 2.5 gallon reservoir)
- B. Oil intake pipe suction strainer might be plugged.
- C. Air leak in suction line which prevents priming.
- D. Pump shaft is turning too slowly.
- E. Oil viscosity too high.
- F. Oil lift is too high.
- G. Wrong shaft rotation.
- H. Pump shaft or other parts are broken.
- I. Dirt or debris in the pump.

6.6.8 Oil Leakage Around Pump

If there is oil leaking from the pump, please check the following:

- A. Shaft seal worn.
- B. Head of oil on suction pipe connection - connection leaking.
- C. Pump housing bolts loose.

6.6.9 Excessive Pump Wear

If the pump is making excessive noises and not operating correctly, there may be an excessive wear issue. If this is the case please check the following:

- A. Abrasive dirt in the hydraulic oil being circulated through the system.
- B. Oil viscosity too low.
- C. System pressure exceeds pump rating.
- D. Pump misalignment or belt drive too tight.
- E. Air being drawn in through inlet of pump.

6.6.10 Pump Parts Inside Housing Broken

If you think there are broken parts inside your housing

- A. Your pump could have seized due to lack of oil.
- B. Excessive system pressure above maximum pump rating.
- C. Excessive torque on housing bolts.
- D. Solid matter being drawn in from reservoir and wedged in pump.

6.6.11 Troubleshooting Solenoid Valves

Below are a few steps for checking and troubleshooting the solenoid valves. Please check the following:

- A. Voltage is too low. If voltage will not complete the stroke of alternating current solenoid, it will burn out the coil.
- B. Signal to both solenoids of a double solenoid valve simultaneously. One or both of the solenoids will be unable to complete their stroke and will burn out (Make certain the electrical signal is interlocked so that this condition cannot exist).
- C. Mechanical damage to leads (For example, short circuit, open connections, etc.).
- D. Tight spool or other mechanical parts of the valve being actuated can prevent the solenoid from completing its stroke and subsequently burning out.
- E. Replacement springs too heavy in valve. It can overload solenoid and shorten life.
- F. Wrong voltage or frequency will either prevent operation because of inadequate capacity to handle the load with the lower voltage or burn out because of improper winding and excessive voltage.
- G. Dirty contacts may not supply sufficient current to solenoid to satisfy in-rush demands.
- H. Low voltage direct current solenoids may be affected by low battery capacity on cold mornings directly after starting cold engine.
- I. Long feed lines to low voltage solenoids may cause sufficient voltage drop to cause erratic operation.

6.6.12 Solenoid Valve Fails To Operate

If you are having problems with your solenoid valves, then please check the following:

- A. Is there an electrical signal to the solenoid or operating device? Is the voltage too low? (Check with voltmeter - test light in an emergency.)

- B. Has foreign matter jammed the main spool? (Remove end caps and see that the main spool is free in its movement. Remember there will be a quantity of fluid that escapes when the cap is removed and provide a container to catch it.)
- C. Are solenoids improperly interlocked so that a signal is provided to both units simultaneously? (Put test light on each solenoid lead in parallel and watch for simultaneous lighting. Check electrical interlock. This condition probably burns out more solenoids than any other factor.)
- D. Has mounting pad been warped from external heating? (Loosen mounting bolts slightly and see if valve functions. End caps can also be removed and checked for tight spool.)
- E. Is the fluid media excessively hot? (Check for localized heating which may indicate an internal leak, check reservoir temperature and see if it is within machine specifications.)
- F. Is there foreign matter in the fluid media causing gummy deposits? (Check for contamination, make certain seals and plumbing are compatible with the type of fluid being used.)
- G. Is an adequate supply of fluid being delivered to actuate the load? (Many times there is sufficient pressure to shift the valve but not enough to actuate the workload. Check pump supply pressure and volume if required - physical measurement of flow through relief valve with units blocked may be necessary.)
- H. Check circuit for possible interlocks on pressure sources to valve or to pilot.

7. RECOMMENDED SPARE PARTS

NOTE: PARTS NOT INCLUDED

This section provides identification for all components, assemblies, and subassemblies subject to replacement. There are no special hardware requirements. This section provides illustrations, drawings, and exploded views to enable easy identification of items. When illustrations omit the part numbers and description, both the illustrations and separate listing show the index, reference, or key number that cross-references the illustrated part to the listed part. Parts shown in the listings are grouped by components, assemblies, and subassemblies.

7.1. Spare Parts List

See Table 2 for the NMSB XV-P Optional Recommended spare parts listing.

Table 2. Spare Parts List

Nasatka Part Number	Description	Quantity
2120-1018-0050	18 Inch Spring	1
2120-1016-0050	16 Inch Spring	1
2121-5800-0000	Spring Eye Bolt 5/8-in	1
2121-5801-0000	Threaded Rod & Bolt Kit 5/8-in	1
2270-2018-1201	Sensor Inductive Proximity	2
2253-0013-0000	Cylinder 13"	1
2257-3800-1025	Hose - 3/8" MegaTuff - 25" with Fittings	1
2257-3800-1029	Hose - 3/8" MegaTuff - 29" with Fittings	1

7.2. Illustrated Parts Breakdown

Refer to APPENDIX J for an illustrated parts breakdown of the NMSB XV-P.

7.3. Contact Us

Additionally, Nasatka Security can be contacted at:

Nasatka Security
7427 Old Alexandria Ferry Road
Clinton, MD 20735 USA
Phone: (301) 868-0300
Fax: (301) 868-0524
www.nasatka.com

We will be glad to answer any questions that may arise in the use of the NMSB XV-P.

**APPENDIX A.
SPECIFICATIONS, WARRANTY, & SERVICE**

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Make and Model:	NMSB XV-P
Crash Rating:	15,000 LBS. (6804 kg) @ 30 mph (65 km/h), (M30/P3/K4) Engineered Rating: 15,000 LBS. (6804 kg) @ 50 mph (80 km/h), (K12/L1) with 9,000 lbs. ballast each side.
Clear Opening:	Nominal 12 foot (3.66 m) gate opening.
Barrier Material:	The NMSB XV-P major components are ASTM A36 steel.
Barrier Height:	In the fully secure position, the barrier gate plate height above the ground is 33 inches \pm 1-inch.
Barrier Dimensions:	See drawings in APPENDIX J.
Barrier Weight:	Approximately 9,000 LBS. (4.08 MT)
Response time:	The barrier will deploy to the secure position in approximately 3-5 seconds and to the nonsecure position in approximately 3-5 seconds using hydraulic power.
Cycling Time:	The hydraulic pump system is capable of completing five (5) cycles per minute. Half cycle (Nonsecure or Secure) time is approximately 3-4 seconds under normal operation, with a minimum of 100 full cycles on a fully charged system.
Normal Activation:	Electrically-driven hydraulic pump operating at a pressure of 800 PSI and a flow rate of 2.31 GPM (8.7 LPM) is used to operate a double-acting cylinder.
Position Selection:	The system shall be constructed such that the barrier remains in the position selected (open, closed) by the operator (i.e. no external hydraulic force shall be required to hold the barrier in the last commanded position).
Oil Containment:	The barrier shall meet Environmental Protection Agency standards for oil containment. Oil containment pits shall hold 1 gallon of oil for each 1/2 gallon of oil in the reservoir.
Galvanized:	All steel components of the barrier are hot dip galvanized.
Barrier Finish:	The entire barrier is hot dip galvanized – Impact side has a red reflective STOP affixed to the gate plate.
Operating Modes:	
	A) Manual: Bar/lever operation.
	B) Normal (Hydraulic): Raise and lower barrier per operator input.

HYDRAULIC PUMP UNIT:

Primary Voltage: The NMSB XV-P requires 120 VAC, Single Phase, 60 Hz, 20 Amp feed for the Battery Charger. The horsepower rating for the 12 VDC motor is 1 HP.

Hydraulic Fluid:

- Type: RSC FUTERRA HF32 Biodegradable Hydraulic Fluid
- Capacity: Two (2) gallon nominal

Hydraulic Pressure: (factory setting)

- Pump Maximum Output: 1000 PSI – Relief Valve Setting
- Barrier Requirements: 800 PSI

Operating temperature: The maximum ambient air operating temperature range of the barrier is -32° F to 135° F (-35° C to 57° C).

System Controller: Relays and timers synchronized to properly operate the barrier system. Controls operate on 24 VDC.

Traffic Signals: 24 VDC LED Bulbs

Control Pendant: A tether pendant control that can be connected at either side of the barrier. Nonsecure and Secure buttons are push to operation.

Charger Power Source: 120 VAC, 1 Phase, 60 Hz, 20 Amp, 3 Wire

SUMMARY TEST REPORT

Contract No.: P2011372
Summary Test Report No.: STR-400001-NBI3
Project Name: ASTM F2656-07 NMSBXV, NMSBXVI, and NMSBIII-D-8ft barriers
Sponsor Name: Nasatka Barriers, Inc.

DATE: July 22, 2011

TO: David Natelson
Nasatka Barriers Inc.

FROM: D. L. Bullard, Jr., Research Engineer, TTI Roadside Safety & Physical Security Division

PREPARED BY: Wanda L. Menges, Research Specialist, TTI Proving Ground

FOR MORE INFORMATION:

Name: D. L. Bullard, Jr.
Phone: 979-845-6153
E-mail: l-bullard@tamu.edu

SUMMARY TEST REPORT:

Disclaimer:

This report does not constitute a standard, specification, or regulation. Texas A&M University and Texas Transportation Institute assume no liability for its contents or use thereof. The names of specific products or manufacturers listed herein do not imply endorsement of those products or manufacturers. The results reported herein apply only to the security device being crash tested. The crash test was performed according to *ASTM F2656-07* standard specifications and TTI Proving Ground quality procedures.

Test Article Design and Construction

Drawings for the Nasatka NMSB XV Mobile Barrier are provided in Attachment A.

Assessment and Conclusions

On June 28, 2011, TTI Proving Ground performed *ASTM F2656-07* M30 test on the NMSB XV Mobile Barrier manufactured by Nasatka Barriers Inc. A 2000 International 4700 single-unit flatbed truck impacted the NMSB XV Mobile Barrier at 90.2 degrees, with the centerline of the vehicle aligned with the centerline of the NMSB XV Mobile Barrier. The

A better job done safer and sooner.

acceptable range for impact speed for this M30 test was 28.0-37.9 mi/h, and the actual impact speed was 30.4 mi/h. The NMSB XV Mobile Barrier brought the vehicle to a stop. The cargo remained onboard the vehicle, and the vehicle was not disabled. The leading edge of the cargo bed penetrated 60.9 ft beyond the inside edge of the NMSB XV Mobile Barrier.

ASTM F2656-07 provides a range of vehicle test designations and penetration levels that allow agencies to select perimeter security devices that satisfy their specific facility needs. The amount of vehicle penetration of the security device at the required impact velocity determines the dynamic penetration rating for each condition designation.

The leading edge of the cargo bed penetrated 60.9 ft beyond the inside edge of the NMSB XV Mobile Barrier. According to *ASTM F2656-07*, the NMSB XV Mobile Barrier meets Condition Designation/Penetration Rating M30/P3, which allows penetration of 23.1 to 98.4 ft when impacted by the medium duty truck at 30 mi/h.



United States Department of State

Washington, D.C. 20520

SEP 11 2000

Nasatka Barrier, Inc.
8405 Dangerfield Place
Clinton, MD 20735

Attention: Mr. Ralph Nasatka

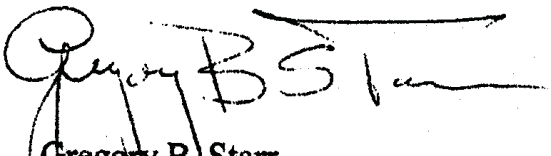
Dear Mr. Nasatka:

Based upon your request, the Department of State (DOS) technical representative witnessed the vehicle crash test on January 6, 2000 and has evaluated the Karco Engineering Test Report KAR99109-01 for the Nasatka Model XV Portable Barrier. The Model XV has been determined to meet the DOS certification standards for vehicle barriers. Under the provisions of SD-STD-02.01, *Specification For Vehicle Crash Test of Perimeter Barriers and Gates*, dated April 1985, the Model XV has been classified as a K4/L1 vehicle barrier: equivalent to a 15,000 lb vehicle at 30mph with maximum penetration of 20 to 50 feet.

The Nasatka Model XV will be placed on the DOS list of certified equipment which is available for use by architects and planners. Your product still has to compete with other bidding manufacturers who are certified with the same classification. We cannot guarantee that your product will be chosen by architects that design the facilities.

Thank you for your interest and endeavors in protecting our personnel and facilities overseas.

Sincerely yours,



Gregory B. Starr
Director
Physical Security Division
Bureau of Diplomatic Security



United States Department of State

Washington, D.C. 20520

Nasatka Barrier, Inc.
8405 Dangerfield Place
Clinton, MD 20735

Attention: Mr. Ralph Nasatka

Dear Mr. Nasatka:

I have reviewed your request to change the rating of the NMSB-XV anti-ram vehicle barrier from K4/L1 to a rating of K12/L1 based on the submitted TRC test report. The only difference I find between the two barriers is the addition of two Jersey barriers installed on each side of the higher rated barrier. Therefore, in order for me to approve your request the following stipulations are required: (1) the barrier rated K12/L1 must have its own unique model number; and (2) the barrier must contain, as part of its package, four Jersey barriers identical in size, weight, height, and width as those tested at TRC. You may even elect to provide pre-cast forms so that the concrete can be poured on site, thereby, reducing your shipping weight and cost. However, the final product must be identical to those used in your test.

As always, the new model number would be placed on the DOS list of certified equipment that is available for use by architects and planners. Your product would still have to compete with other bidding manufacturers who are certified with the same classification. We cannot guarantee that your product will be chosen by the architects that design the facilities.

Thank you for your interest and endeavors in protecting our personnel and facilities overseas.

Sincerely yours,

Dusty Rhodes
Physical Security Specialist
Physical Security Division
Bureau of Diplomatic Security



This document includes data that shall not be disclosed outside the Customer and shall not be duplicated, used, or disclosed—in whole or in part—for any purpose without first obtaining written permission and authorization by Nasatka.

**NASATKA BARRIER, INCORPORATED
(DBA: NASATKA SECURITY) [NASATKA]
PRODUCT EQUIPMENT WARRANTY
TERMS AND CONDITIONS
JANUARY 2019**

NASATKA BARRIER, INCORPORATED (dba: Nasatka Security)

CORPORATE INFORMATION:

Nasatka Company Address: 7427 Old Alexandria Ferry Road Clinton, MD. 20735

Nasatka Corporate Office: 1-301-868-0300

Nasatka Corporate Fax: 1-301-868-0524

Nasatka Business Classification: Small Business

Nasatka Corporate tax FEIN: 52-142 8080

Nasatka DUNS Number: 185057601

Nasatka CCR Registration Number: 1CEE3

NAICS Primary Code: 332999; 339999 (others applicable)

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1.0 Warranty

NASATKA BARRIER, INC. (DBA: NASATKA SECURITY) [NASATKA]

PRODUCT EQUIPMENT WARRANTY TERMS AND CONDITIONS

Project Name: Kirtland AFB NM

Project No.: 2223

Standard New Equipment Warranty Period: One (1) Year.

Period Start Date: TBD

Period End Date: TBD

Extended New Equipment Warranty Period: N/A

Extended Period Start Date: N/A

Extended Period End Date: N/A

Nasatka hereby guarantees all furnished material and installation (In the Event Nasatka is Contracted for labor and shall be limited to scope performed under contract) on the referenced project to be in compliance with the, Contract Documents, Specifications, Drawings, subsequent executed Change Order(s), Addendums, site condition confirmations, applicable codes, and approved Nasatka technical submittal documentation, as presented to and confirmed Accepted via written receipt by Nasatka.

Nasatka system(s) are warranted by LIMITATION FROM Nasatka (herein also referred to as “Nasatka” or “Supplier”), for a period as specified herein above, from date of Delivery to physical designation, from failure of operation in design of use against defects due to faulty material or workmanship.

Facility Assets Covered Under Nasatka Warranty Terms and Conditions

Quantity	Make/Model Description	Serial Number
Five (5)	NMSB XV Portable Barrier – 12ft Clear Opening ASTM Rated M30/P3 K4	TBD
Five (5)	120/60/1 HPU – 12VDC Battery Unit	TBD

Duration of Spare Part Component or Assembled Spare Part Goods limited warranty is ninety (90) Calendar days from date of shipment (F. O. B., NASATKA DESIGNATED SHIPMENT FACILITY) for any repair / replacement components, spare parts, gates, traffic safety items, guard booths, other ancillary equipment, primer, paint, and/or other surface coatings. THIRD PARTY MANUFACTURED PRODUCT SYSTEM(S) AND batteries are subject to warranty terms and conditions of the ORIGINAL manufacturer’s WARRANTY. Replacement of complete operator systems would be subject to warranty for One (1) Year period from date of shipment, F. O. B., NASATKA DESIGNATED SHIPMENT FACILITY.

Installation labor guarantee(s) may be incorporated herein by issuance of Purchase Order to Nasatka for Services' in which such Terms of Service(s) to be rendered are in advance, agreed upon in writing by Nasatka. Nasatka System(s) Installation is warranted by Nasatka for a period as specified herein above from date of Substantial Completion has been effectuated, from failure of operation in design of use against defects due to faulty material or workmanship per Nasatka Standard terms and Conditions. Substantial Completion is defined as the date of whichever event first takes place as stated herein below:

- Written acceptance by Customer (Customer is defined by Nasatka Purchase Order Customer, Owner, or End User).
- Customer occupancy including partial occupancy.
- Customer material usage start date
- Within fifteen (15) days of successful completion of Customer, Prime General Contractor Punch-list as demonstrated by NASATKA.

The following shall render the Nasatka Standard Warranty as stated herein, null and void, in which Supplier shall not have any liability under subject Project for which Warranty is to be furnished, including but not limited to; equipment material(s) and service(s) not furnished by Nasatka under Purchase Order Contract as accepted and executed by Nasatka; Shrouds; Paint Finishes; Non-Skid Surface; Plastic wear shims under knee braces; Hydraulic oil; Rubber materials; push-button contact block, solenoid motor contactor; circuit control panel relays; knee brace cover plate; knee brace bushings; knee brace pins; hinge clips; cylinder mount; cylinder bushings; LED lights; traffic lights; control panel indicator lights; battery(ies); any component/attachments not distributed by Nasatka have been added to the Nasatka furnished Product/System; in the event the Product has been altered, repaired, modified, misuse by or damages caused by Customer, Nasatka confirmation that warranty claim is invalid and unsubstantiated, normal operational wear and tear; unauthorized repairs and preventative maintenance (PM) by non-Nasatka Certified Personnel; improper installation; installation not performed by Nasatka authorized personnel; non-performance of preventative maintenance (PM) services; non-documented (written) performance of Supplier site specific recommended preventative maintenance (PM) program criteria; non-Supplier authorized (personnel, procedure, process, or component) alterations and modifications to Supplier furnished equipment; misuse; accidental or intentional impact; fire; neglect or abandonment by Customer; theft of Products; damage that reasonably could have been prevented by Customer or resulted from Customer's negligence in maintaining adequate protection for the Product/System, including the failure of Customer to provide and maintain a suitable operating environment for the Product/System; use of supplies or materials not meeting specifications for the Product/System; use of the Product/System for purposes other than those for which it was designed; damage caused by electrical work external to the Product or electrical service connected to the Product/System; at any time the power supplied to any part of the Nasatka Maximum Security Barrier system(s) falls short or exceeds the rate of tolerance for the equipment, discontinuation of services to Customer by any utility provider; any other cause not due to inherent defects or faulty workmanship by Nasatka; catastrophe; neglect; natural disaster; acts of God.

Any and all loss of or damage to all or any part of the Product/System under any circumstance(s) shall not be considered as "Preventative Maintenance" and such repairs shall be charged separately at current Nasatka rates or as mutually agreed in writing by both parties prior to execution of services.

Software – warranty against defects in media only. Includes telephone/email consultation and access to all software maintenance releases as stated herein. Annual Preventative Maintenance (PM) Service Agreements with Nasatka provides access to all software releases designated as maintenance releases. Major system releases introducing new capabilities will be available and priced separately from PM Service releases. Nasatka supports current Software release(s) and one previous release for 1 year after new release is offered. Customer will have Ninety (90) days from the date of a new release to upgrade from older releases before Supplier's support is discontinued.

Any defective equipment in the Nasatka Maximum Security Barrier system(s) shall be returned to the Nasatka designated approved service center, at Nasatka' S option, to review and inspect for repair or replacement. Subject to the limitation stated herein, warranty service (removal, repair, or replacement), equipment parts (repaired or replaced), and delivery (of removed parts or furnish of new parts, to and from Customer site), necessary to maintain the equipment as warranted shall be furnished by Supplier at no cost to Customer. Supplier shall be reimbursed by Customer for any Warranty claim in which such claim is proven invalid, unsubstantiated, or otherwise determined by Supplier to not be covered under the terms of Supplier Warranty conditions set forth herein. Installation of replacement parts shall be the responsibility of the customer. Troubleshooting of any kind, diagnosis, and/or replacement, and the associated cost thereof of installation and/or remedial services shall be the sole responsibility of the Customer.

NO CLAIM FOR SHORTAGE OF GOODS OR DAMAGE TO GOODS SHALL BE ALLOWED UNLESS CUSTOMER, WITHIN (10) CALENDAR DAYS AFTER RECEIPT OF WRITTEN CONFIRMATION OF SHIPMENT, GIVES SUPPLIER WRITTEN NOTICE OF THE CLAIM FOR SHORTAGE OR DAMAGE AND IN SUCH WRITTEN NOTICE, FULLY DESCRIBES THE SHORTAGE AND/OR DAMAGE ALLEGED.

FAILURE BY CUSTOMER TO MAKE TIMELY PAYMENT IN FULL FOR THE PRODUCTS, AND/OR FAILURE BY CUSTOMER TO PROPERLY AND TIMELY CONDUCT PREVENTIVE MAINTENANCE, FAILURE TO FOLLOW SUPPLIER'S INSTRUCTIONS FOR PROBLEM TROUBLESHOOTING AND/OR DIAGNOSIS, AND/OR FAILURE TO PROPERLY REMOVE AND/OR RE-INSTALL A PRODUCT OR PART THEREOF, MAY INVALIDATE THIS WARRANTY. IN THE EVENT A PRODUCT PROBLEM IS NOT THE RESULT OF A PRODUCT DEFECT, CUSTOMER SHALL BE RESPONSIBLE FOR MAINTENANCE CHARGES AT SUPPLIER'S STANDARD (MOST CURRENT) TIME AND MATERIALS RATES.

The Supplier's sole obligation under this Warranty shall be to repair (or at Supplier's option to replace) F.O.B. Supplier's nearest approved distributor service center, any defective product, without charge to Customer, Per following requirements expressed herein below and above:

- Customer presents to Supplier a written notice of any such claimed defect in material and workmanship within such LIMITED warranty period as stated.
- The Nasatka Maximum Security Barrier system(s) equipment was installed according to Supplier approved requirements and correctly. CUSTOMER COMPLETION CERTIFICATION DOCUMENTATION MUST BE SUBMITTED TO SUPPLIER UPON SUBSTANTIAL COMPLETION (OR BENEFICIAL USE).
- CUSTOMER SUBMITS TO SUPPLIER, documented written execution of proper and timely, site specific, supplier preventative maintenance (PM) program (AS SPECIFIED IN SUPPLIER OEM MANUAL), at a minimum, according to the Supplier's recommendations as qualified herein AND IN CONSIDERATION OF OPERATIONAL ENVIRONMENTAL CONDITIONS, CYCLE USAGE, COMPLEXITY OF INTEGRATED SEQUENCE OF OPERATION, ETC.
- VEHICLE STRIKES MUST BE REPORTED TO ENSURE CONTINUED MAINTENANCE COVERAGE ON REMAINING UNAFFECTED SYSTEM(S).
- The replaced Product(s) and/or Parts is/are properly removed and returned to Supplier, using the supplier return Material authorization (RMA) number & information provided by Nasatka.

THE EXCLUSIVE REMEDY FOR BREACH OF ANY WARRANTY BY SUPPLIER SHALL BE THE REPAIR OR REPLACEMENT AT SUPPLIER'S OPTION, OF ANY DEFECT(S) IN THE EQUIPMENT. IN NO EVENT SHALL THE SUPPLIER OF NASATKA MAXIMUM SECURITY BARRIER SYSTEM(S) BE LIABLE FOR CONSEQUENTIAL, INCIDENTAL, OR SPECIAL

DAMAGES OR ANY KIND AND OF DAMAGES TO ANYONE WHICH RESULT FROM THE USE BY CUSTOMER OR ANY OTHER PARTY, OF THE PRODUCTS, AND IN NO EVENT SHALL SUPPLIER LIABILITY EXCEED THE PRODUCT CONTRACT VALUE.

EXCEPT AS PROVIDED HEREIN, SUPPLIER MAKES NO WARRANTIES OR REPRESENTATIONS TO CUSTOMER OR TO ANYONE ELSE AND CUSTOMER HEREBY WAIVES ALL LIABILITY AGAINST SUPPLIER AS WELL AS ANY OTHER PERSON(S) FOR THE DESIGN, MANUFACTURE, SALE, INSTALLATION, USE, AND/OR SERVICING OF THE NASATKA MAXIMUM SECURITY BARRIER SYSTEM(S).

Extended Material Equipment Warranty periods are available for procurement and subject to Nasatka review of existing equipment conditions. Extended Warranty periods may be selected within ninety (90) calendar days of original Warranty term expiration date period.

Extended Material Equipment Warranty term(s) shall be considered in effect and valid only upon and contingent of advance payment of Extended Warranty start period.

Payment for selected Extended Material Equipment Warranty period is due, in full, within Thirty (30) Days of Extended Warranty execution date by Nasatka.

2.0 Preventative Maintenance (PM) & Service Information

Nasatka Reference(s):

1. Nasatka Service and Warranty Reporting Procedures.
2. Nasatka Standard Equipment and Installation Warranty Terms and Conditions.
 - Nasatka Corporate Headquarters is legally registered in the State of Maryland with U.S.A Conus (Domestic) Service Centers located in Clinton, MD., Tampa, FL., and Los Angeles, CA.
 - Nasatka provides an active 24/7 web-based portal for maintenance log and reports, and warranty reporting.
 - Nasatka manages an active 24/7 service call center for reporting warranty, services, and emergency responses. *Subject to Service Contract Terms and Conditions.

PM Service Program improvements are encouraged to be reviewed and modified accordingly per specific operational, safety, and functional requirements. The Nasatka provided PM Service Checklist and Inspection Schedules are recommendations only and shall be tailored for site specific PM requirements. Active Vehicle Barrier (AVB) systems that are seldom used are no different in service requirements than that of continuous cycled systems. Nasatka recommends the same Preventative Maintenance services be applied to all AVB systems, regardless of usage, with the same service schedule, to ensure operational function capability when required to deploy each system asset.

Design and implementation of a site specific consistent and detailed Preventative Maintenance (PM) Service Program is integral in maintaining the meantime and cycle rates and life cycle expectancy of Access Control Point (ACP) and Final Denial, Active Vehicle Barrier (AVB) security equipment. A site specific Preventative Maintenance Service Program should be designed, planned, and implemented to include but not limited to:

- Environmental Operating Conditions (weather, salt, dust, water tables, etc.);
- Hourly, Daily, Annual minimum and maximum operational cycle usage;
- Continuous operating cycle speeds (standard vs. emergency fast);
- Configured operating cycle speed open/close rate;
- Stagnation / Idle usage;
- Installation Conditions (slopes, depths, drainage, landscaping obstructions, etc.);
- AVB Clear Opening or other specified size(s);
- Power Distribution;
- Vehicular impacts (accidental or intentional);
- Material composition and design (hinges, etc.);
- Sequence of Operation (SOO) events of varying installation complexity of integrated components;
- Subject to daily or continuous traffic passage over and on certain barriers system(s);
- Weight loads passage over and on barrier system(s);
- Operator and/or System configuration;
- End User Standard Operating Procedures (SOP).;
- Complexity of integrated components requiring adjustments, calibration, & program enhancements.

Critical Access-Control or Final Denial Barrier Equipment utilized as maximum security measures shall require regular preventative checks both visual and physical, calibrations, and wear & tear repair service to prevent major failures and ensure optimal operation conditions as designed.

Nasatka recommends general servicing for ALL Active Vehicle Barrier (AVB) equipment at a minimum per the following:

- Nasatka recommends that at each time or period in which AVB Personnel Operator(s) and/or Maintenance Personnel Shift Change/Transfer, a minimum of visual equipment checks to evaluate

debris and obstructions, as well as function of each control mode sequence of operation, be performed for each barrier unit/set.

- Site specific periodic PM Service Programs are highly recommended for all daily and/or weekly cycled operating equipment whether automated or manual operable. Weekly, Monthly, Quarterly, Bi-Annual, and/or Annual major inspections and PM Service checks can be administered in support of specified periodic visual and function checks.
- Regardless of frequency of Preventative Maintenance intervals implemented, increased service intervals of visual, tightening of anchor bolts, snaking of drains, and/or other scope(s) of work shall be considered performed by Facility Management Personnel, or if Nasatka is 1st. or 2nd. Tier Sub-Contractor, the designated Prime General Contractor's authorized Representative, other trades, sub-contractors, etc. dependent on environmental conditions, site personnel visual inspection schedules, and/or age of equipment maintained.
- Continued Operations and Maintenance (O&M) Training is recommended on a minimum annual basis or when any site personnel are newly employed or scope of work roles are modified.
- End User shall incorporate Standard Operating Procedures (SOP) for each AVB Asset at each ACP Gate Location.
- To best respond to all Maintenance Services whether Preventative, Corrective, or Emergency type, it is recommended that the End User maintain a sufficient percentage of spare parts and/or spare operator systems as part of on-site inventory to ensure timely repair of non-operational equipment and prevent unnecessary or unreasonable downtime periods. A recommended spare parts/operator inventory list can be determined either upon conclusion of site assessment scope or as determined by each asset designated operation condition of cycle usage, integration device complexity, and operating environment, amongst other factors at any given location that may require special attention.



This document includes data that shall not be disclosed outside the Customer and shall not be duplicated, used, or disclosed—in whole or in part—for any purpose without first obtaining written permission and authorization by Nasatka.

NASATKA SERVICE INTRODUCTION & SERVICE AND WARRANTY REPORTING PROCEDURES

JANUARY 2019

Service / Warranty Report Link:

<https://nasatka.com/support>

NASATKA BARRIER INCORPORATED (dba: Nasatka Security)

CORPORATE INFORMATION:

Nasatka Company Address: 7427 Old Alexandria Ferry Road Clinton, MD. 20735

Nasatka Corporate Office: 1-301-868-0300

Nasatka Corporate Fax: 1-301-868-0524

Nasatka Business Classification: Small Business

Nasatka Corporate tax FEIN: 52-142 8080

Nasatka DUNS Number: 185057601

Nasatka CCR Registration Number: 1CEE3

NAICS Primary Code: 332999; 339999 (others applicable)



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1.0 About Nasatka

Company Name & Address	Business Information	Service Programs Point of Contact
Nasatka Barrier, Incorporated 7427 Old Alexandria Ferry Road Clinton, MD 27036 Office: 301-868-0300 Fax: 301-868-0524	DUNS #: 185057601 Cage Code: 1CEE3 EIN: 52-1428080 Small Business	Lisa Nasatka Director of Services Phone: 301.868.0300 e-mail: lisa.nasatka@nasatka.com Website: www.NASATKA.com Service Report Link: https://nasatka.com/support

For over 40 years, Nasatka Barrier, Incorporated (Dba: Nasatka Security) security solutions have met the challenging mandates of today and tomorrow's maximum-perimeter-vehicle-access-control security needs. Prior to the awakening events of 9/11 and the establishment of the Homeland Security Agency, Nasatka had been a leader in the innovation, manufacturing, installation, and services of vehicular access-control and perimeter security, maximum security system solutions, with a global presence, having corporate offices in Clinton, Maryland and sales and service locations the USA and in the Middle East. Having installed the first steel plate "wedge" barrier in the United States (J. Edgar Hoover Building in Washington, D.C.) and conducted the first DOS steel-plate barrier crash test in the United States, Nasatka's positive countermeasures consisting of active vehicle barriers (AVB) and/or passive vehicle barrier (PVB) systems to mitigate the potential damage from a vehicle-borne explosive device systems are deployed at the many of the most secured sites in the world. Nasatka solutions are designed primarily to control, detect and where necessary, stop unauthorized vehicle and pedestrian threats. Nasatka's business is a unique blend of physical and electronic security including; crash-tested active and passive vehicle and pedestrian barriers, crash-certified perimeter fencing, guard booths, and turnstiles. Nasatka provides design to sustainment services to include Custom Design Engineering, General Construction, and Contractual 24/7 Service and Maintenance programs for thousands of physical security assets throughout the Continental United States and Globally.

Nasatka system solutions comply with standard industry commercial and government security practices and/or to adopt practices and procedure guidelines to access-control / perimeter protection design including the USACE Army Standard UFGS (UFC 4-022-02), MIL-Handbook – 1013/14, Military Surface Deployment and Distribution Command Transportation Engineering Agency Pamphlet 55-15/17 (or other applicable) Traffic Safety Solutions, DOJ/USMS, and Department of State - Diplomatic Security (DOS) approved and authorized products and other



physical security requirements encompassing specific electrical, mechanical, structural, physical, and/or technical security directly related work.

Nasatka Security, incorporates engineering, design, manufacturing, construction, and service scope(s) with the proven ability to coordinate efforts in synchronization to meet the critical time and quality expectations of the end user customer for critical infrastructure facilities including Homeland Security, Commercial, Military, Energy, DOJ/USMS, OBO (DOS), and Data Centers amongst a few. Nasatka's multi-disciplinary Team provides guidance to an organization from initial needs assessment threat analysis through the implementation of customized security solutions that utilize both physical and electronic means to mitigate occurrences that will impede continuity through the use of Con-Ops (Concept of Operations).

- Design – Build turn-key integrated security solutions
- Manage risks and realize a higher return on your project investment
- Experienced Project Managers
- Project Supervision Services to 100% Turnkey Install
- Civil and Electrical Engineering Services
- Align project solutions with your operational and functional priorities
- Integrate multiple areas of expertise to arrive at a better site specific solution
- Custom Design and Construction
- Best-in-Class, Site Specific Solutions

INDUSTRY LEADERSHIP:

- Member of the ASTM F12 Committee Industry Group that is focused on the F 2656 07/15 and draft 19 Standard Test Method for Vehicle Crash Testing of Perimeter Barriers
- Member of the ASTM E54 Committee on Homeland Security
- Member of the ASTM E54.05.4 Subcommittee
*Currently working to move the USACE UFC 4-022-02 Guide into ASTM
- Member of the American Society of Industrial Security (ASIS)
- Member of the Society of Military Engineers (SAME)



2.0 Nationwide Service Capabilities

Nasatka Services provides for site specific Customer designed Preventative Maintenance and Repair Scope/Response perimeters.

Nasatka Services provides an active 24/7 web-based portal for maintenance log and reports and service request & warranty claim reporting.

Nasatka manages an active 24/7 service call center for reporting warranty, services, and emergency responses. *Subject to Service Contract Terms and Conditions.

Having installed the first steel plate wedge type active vehicle barrier in the United States (J. Edgar Hoover Building in Washington, D.C.) and conducted the first steel-plate barrier DOS certified crash test in the United States in 1985, Nasatka has designed, built, installed, and serviced products that are deployed at the most critical security sites in the world.

In 2008, Nasatka expanded its operations by opening a new office that includes a Call Center, Financial, Work Order, Asset Maintenance Service Database, and Customer Case System, staffed by service-focused personnel. Nasatka services' specializes in the Global Maintenance of Security Products including a wide range of physical and electronic security devices. Nasatka's experience includes logistical support to U. S. Bases worldwide, including furnishing and shipping of spare parts, performing repairs, and maintenance service recommendations. Nasatka currently provides contractual preventative maintenance (PM) and 24/7 repair services, as well as a wide range of perimeter and access-control services at critical sites throughout the world.

Nasatka Service contracts include varying requirements of Perimeter/Access-Control Preventative Maintenance (PM) and Service Programs, at multiple site locations with varying security requirements and priorities, which may include annual, bi-annual, quarterly, and monthly PM Programs in support of Regional, Nationwide (CONUS), and Global (OCONUS) contract obligations. Services often include continued asset inspection/assessments, educational operation & maintenance (O&M) classroom and/or field training sessions. Scope of Work (SOW) includes a variety of Access-Control Point (ACP) equipment brands with contractually-mandated response times. Nasatka's Service Program of Active Vehicle Barrier (AVB) includes access-control equipment manufactured by Delta Scientific, Ameristar/Assa Abloy (formerly ATG/Intertex), BB ARMOR, and Global Grab Technologies (formerly FutureNet, USR, and Smith Wesson Security Systems), Stanley, Hy-Security, Door King, Lift Master, APSG, RSSI, and SecureUSA, amongst other solution systems.



Nasatka's combined Global Service's Programs represent the largest active vehicle barrier maintenance contract programs awarded and performed by volume of assets to a single vendor. By far, Nasatka is the most knowledgeable and experienced Service Provider of the mechanical, structural, and electrical operation of AVB system and services.

Ability to provide a web-based portal for maintenance log and reports:

Nasatka has been a leader in the AVB industry in developing web-based interactive customer interfaces for sharing data and managing service projects and repairs. Nasatka can offer a solution that best fits the customer's preferences and technical capabilities, from simple online file sharing to access to Nasatka's Asset Management Database and Customer Case System.

One of the key return on investment (ROI) features of Nasatka Repair/Asset Management Portal is that Warranty start date information is tracked on per asset, per repair, per-serialized part level. This allows our customers to reduce expenditures as many older systems and contract data requirement do not track warranty information at this level of detail.

A login to Nasatka's Asset Management Database allows customers to view their own asset records, run reports on maintenance visits and repairs and track parts utilization. Customers can also view live data on ongoing repairs or projects, all tracked by Case Number.

Nasatka's **Asset Management Database** tags assets by country, region, state, owner and other key data points, allowing Nasatka to issue work orders and manage inventory by region. Nasatka's inventory system tracks inventory at each regional service center and supports management with programmable thresholds, triggering reorder below minimum quantities for specific part numbers. Nasatka establishes those thresholds based upon actuarial data acquired from its management of thousands of AVBs of virtually all brands.

Customers receive live e-mail updates each time a new entry is made in their case record. That means that customers can stay informed on the progress of a Case without having to call in to check that milestones have been met.

The Dashboard tab collates the data into the number and type of service provided to each specific AVB model under the contract. Nasatka can customize a report for whatever parameters are important to the customer and schedule the report to auto-email on a daily, weekly or monthly schedule, per customer preference.



Nasatka manages service calls and repair or upgrade projects through its state of the art **Customer Case System**. Customers are encouraged to enter their own cases on Nasatka's website and follow by contacting direct, Nasatka Service Department to enter their case. Subject to Service Contract Terms and Conditions an active 24/7 service call center for reporting warranty, services, and emergency responses is available. Upon entry of the case, customers are issued a case number that they may use to track the progress of their case. All updates are e-mailed to the customer and assigned Nasatka service personnel. The customer may update his own case by replying to any e-mail generated by the system. Cases are assigned a priority level ranging from Emergency to Low Priority, based upon the nature of the problem. Each priority level has a unique maximum response and resolution time.

Upon completion of a service call or preventative maintenance visit, technician site reports are entered into Nasatka's tracking system and tagged for type of visit (assessment, preventative maintenance or repair). If the visit was for preventative maintenance, Nasatka also tags the record as Monthly, Quarterly, Semi-Annual or Annual in order to track the specific requirements associated with those types of visits. For example, most Delta Scientific HPUs require quarterly replacement of hydraulic oil filters. Nasatka requires replacement of hydraulic fluid annually. Nasatka is able to track how many and which type of preventative maintenance visit has been completed each year for every asset under its management. This ensures that all preventative maintenance tasks for the year are completed for each and every asset.

Nasatka's **Customer Web Portal** allows customers to log into their accounts and view maintenance and service records online. Customers can look at live data of open and closed PM records, service call records and Customer Case Records. They can also run reports or request Nasatka to schedule an automated report, e-mailed to them on a designated schedule.

As an OEM, Nasatka maintains a large inventory of components for active vehicle barriers to support its own products. Many of these components are interchangeable with their counterparts on barrier systems of other brands. Nasatka has established relationships and regularly purchases components from active vehicle barrier OEMs as currently serviced by Nasatka.



3.0 Service Call Procedures

Nasatka's obligation to respond and fulfill Service and Warranty Support Requests are subject to specific Project Contractual Warranty Terms and Conditions and in the event of the absence of specific Project Contractual Warranty Terms and Conditions, Nasatka's Equipment and/or Labor (Installation/Supervision) Warranty Terms and Conditions shall govern. Service and Warranty Support Responses of any type are subject to Nasatka applicable material, travel, and labor rates per Nasatka's Equipment and/or Labor Warranty Terms and Conditions.

Despite conscientious preventative maintenance by the Customer and Contractor, active vehicle barrier (AVB) "System" will experience loss of functionality from time to time due to age, integration of third party devices, operator error, etc. This can range from minor malfunctioning of integrated options to complete failure of the System. Barrier system malfunction or failure raises many concerns, including, but not limited to:

1. Safety Hazards
2. Compromise of perimeter security
3. Traffic flow disruption
4. Disruption of normal security procedures (Ex. Card readers malfunction and barriers must be raised/lowered with push-button controls).

In the event of a malfunction, all Customer Personnel should be aware of the procedures to secure and/or unsecure the AVB manually. This allows the Customer to secure the perimeter or provide for emergency access in the event of escalated security alerts even if the hydraulic (HPU) or electric power unit (EPU) of the AVB is not functioning or in the event of mechanical or structural compromise of the System(s).

In the event of any barrier system malfunction, the Customer has the responsibility to:

1. Perform Complete System Re-set
2. Download and Review ALL Data logs from System, PLC, Microprocessor, Servo Drive, Rampart Server, and/or other device(s) that configure the System.
3. Identify major components troubles: Loop Detectors, Actuator, Servo Drive, PLC, Microprocessor, Power Supplies, batteries, surge suppressors, and/or other device(s) that configure the System.
4. Note the specifics of the reported problem. I.e. does the barrier motor run when attempting to operate? Does the operator hear a "click" in the CPU or nothing at all? Does the AVB raise partially or not at all? Are all safety loops clear of vehicles? Are there any "trouble" indicators lit or error messages displayed in the CPU?



5. Follow the procedures in the Nasatka Technical Troubleshooting Guide provided by Contractor at O & M training.

If the AVB system cannot be restored to good working order by following troubleshooting procedures, the Customer should place a service call to the Contractor. Customer should be prepared to answer detailed questions about the behavior of the equipment to the best of the Customer's ability.

Service Call Procedures (Example)

Nasatka Case System

The Contractor utilizes a state-of-the-art Case System to track Customer service calls and their resolutions. Service Call Cases can be opened by telephone or online. Contractor will provide each worksite location with a login to the Case System. This will enable Customer to log directly into the system, with much of their specific worksite information auto-filled into the case entry screen form.

Customers are encouraged to enter their own cases online whenever possible, but always have the option to call the Customer service department by phone and relate the details of their case to a Customer service agent. The customer may enter a case online and/or call the Contractor's Customer service phone number 24/7.

Customer Service Call Procedure

1. Gather details of barrier issue, including worksite location, gate or other interior location information, make/model/serial number of barrier, nature of problem.
2. Create a Case in System via this link: <https://nasatka.com/support> prior to receiving its site-specific login, Customers may also enter cases via the Nasatka Security website at www.nasatka.com. Once on the website, the case entry form can be found by following:
 - A. Place cursor over the Support menu option
 - B. Click "Support"
 - C. Enter all requested information.
 - D. Select the make and model of the barrier system from the "Support Item" picklist
 - E. Specify category of problem by selecting from the "Case Type" picklist
 - F. Select what this Case is related to from the "This Case is related to" picklist



- G. Give as detailed a description of the problem that you are able to give regarding the behavior of the equipment while the problem is occurring. Enter Date and Time of occurrence.
- H. After all information is entered click on "Submit"
- I. Once information is submitted a "Thank You" screen will come up.
- 3. An email will be sent to confirm your Support request.
- 4. Customer is encouraged to contact Nasatka Service Department to confirm receipt of on-line submission. To place a service call by phone, dial **301.868.0300** and **press the designated extension for Service.**
- 5. In the event internet is not accessible, to place a service call by phone, dial **301.868.0300** and **press the designated extension for Service.**
 - A. During Contractor's normal working hours (0730 EST – 1600 EST), a customer service agent will open a case for the Customer and enter details while the customer is on the phone.
 - B. Outside of normal business hours, the Contractor's after-hours call center will take a detailed message, including the name and contact information of the caller, along with a brief description of the problem. The call center will contact the on-call technician or service manager to call the customer back for more details. **Note:** The after-hours call center is instructed to only take messages from approved Representatives of the Customer. If the Customer or Customer Representative Name(s) are not contracted to be listed, the call center agent will instruct the caller to contact the primary contact on the Nasatka Service Call Contact List. A message will not be forwarded to Contractor Technician or service manager until an approved Customer Representative calls back.

Contractor Response to Service Call

- 1. Upon entry of a case in the Contractor's Case System, the Customer will receive an automated e-mail response indicating that a case has been created. The e-mail will contain a case number with which the Customer may track the progress of the case until resolution. The Customer may update the case online simply by responding to the automated e-mail, or to subsequent communications between Contractor and Customer in the e-mail chain. *All Case System entries shall be followed by placing a phone call to Contractor Service Department.



2. For standard regular unscheduled service calls, during Contractor standard normal business hours of 0730 EST– 1600 EST. (excluding weekend and holidays), the Customer will receive a call back within one (1) hour from a technician or service manager to discuss the problem and schedule a technician service visit, if necessary.
3. For Criticality 1 emergency service calls, during Contractor non-standard business hours of 1559 EST– 0729 EST. and weekend / holidays, the Customer will receive a call back within one (1) hour from a technician or service manager to discuss the problem and schedule a technician service visit, if necessary.
4. For all standard normal or emergency service calls in which confirmation of on-site requirement by Contractor is required, the Contractor shall arrive on-site within next available scheduled date or as required by the SOW after time of notification or if in phone / email contact with Contractor Technician or Service Manager, the conclusion of service contact by Customer. Responses shall include power outages that affect the equipment covered under this proposal. The Contractor will work on the repair to ensure completion within a reasonable period or as required by the SOW from the initial call for service, unless otherwise approved in writing by Customer designated Representative POC(s). *Any work for repair or replacement may be moved ahead to normal standard Contractor business hours as long as the specified completion period from the initial call for service is met, unless otherwise approved in writing by Customer designated Representative POC(s).
5. Upon contacting the Customer, the Technician or Service Manager will attempt to troubleshoot the problem over the phone with the Customer. This is to accomplish one of two objectives:
 - A. To resolve the problem over the phone, if possible.
 - B. To gather more detailed information about the nature of the problem. This increases the likelihood of a one-call resolution to the problem. **Note:** Whenever convenient for the Customer, the Contractor will attempt to set up a conference with the personnel actually operating the equipment. A live phone session with onsite personnel located at the equipment often results in successfully resolving minor issues over the phone.
6. If the problem cannot be resolved over the phone, the Technician or Service Manager will schedule and dispatch to visit the worksite to diagnose and repair the problem accordingly.



4.0 Preventative Maintenance (PM) & Service Information:

Nasatka Reference(s):

1. Nasatka Service and Warranty Reporting Procedures.
2. Nasatka Standard Equipment and Installation Warranty Terms and Conditions.
 - Nasatka Corporate Headquarters is legally registered in the State of Maryland with U.S.A Conus (Domestic) Service Centers located in Clinton, MD., Tampa, FL., and Los Angeles, CA.
 - Nasatka provides an active 24/7 web-based portal for maintenance log and reports, and warranty reporting.
 - Nasatka manages an active 24/7 service call center for reporting warranty, services, and emergency responses. *Subject to Service Contract Terms and Conditions.

PM Service Program improvements are encouraged to be reviewed and modified accordingly per specific operational, safety, and functional requirements. The Nasatka provided PM Service Checklist and Inspection Schedules are recommendations only and shall be tailored for site specific PM requirements. Active Vehicle Barrier (AVB) systems that are seldom used are no different in service requirements than that of continuous cycled systems. Nasatka recommends the same Preventative Maintenance services be applied to all AVB systems, regardless of usage, with the same service schedule, to ensure operational function capability when required to deploy each system asset.

Design and implementation of a site specific consistent and detailed Preventative Maintenance (PM) Service Program is integral in maintaining the meantime and cycle rates and life cycle expectancy of Access Control Point (ACP) and Final Denial, Active Vehicle Barrier (AVB) security equipment. A site specific Preventative Maintenance Service Program should be designed, planned, and implemented to include but not limited to:

- Environmental Operating Conditions (weather, salt, dust, water tables, etc.);
- Hourly, Daily, Annual minimum and maximum operational cycle usage;
- Continuous operating cycle speeds (standard vs. emergency fast);
- Configured operating cycle speed open/close rate;
- Stagnation / Idle usage;
- Installation Conditions (slopes, depths, drainage, landscaping obstructions, etc.);
- AVB Clear Opening or other specified size(s);
- Power Distribution;
- Vehicular impacts (accidental or intentional);
- Material composition and design (hinges, etc.);



- Sequence of Operation (SOO) events of varying installation complexity of integrated components;
- Subject to daily or continuous traffic passage over and on certain barriers system(s);
- Weight loads passage over and on barrier system(s);
- Operator and/or System configuration;
- End User Standard Operating Procedures (SOP),;
- Complexity of integrated components requiring adjustments, calibration, & program enhancements.

Critical Access-Control or Final Denial Barrier Equipment utilized as maximum security measures shall require regular preventative checks both visual and physical, calibrations, and wear & tear repair service to prevent major failures and ensure optimal operation conditions as designed.

Nasatka recommends general servicing for ALL Active Vehicle Barrier (AVB) equipment at a minimum per the following:

- Nasatka recommends that at each time or period in which AVB Personnel Operator(s) and/or Maintenance Personnel Shift Change/Transfer, a minimum of visual equipment checks to evaluate debris and obstructions, as well as function of each control mode sequence of operation, be performed for each barrier unit/set.
- Site specific periodic PM Service Programs are highly recommended for all daily and/or weekly cycled operating equipment whether automated or manual operable. Weekly, Monthly, Quarterly, Bi-Annual, and/or Annual major inspections and PM Service checks can be administered in support of specified periodic visual and function checks.
- Regardless of frequency of Preventative Maintenance intervals implemented, increased service intervals of visual, tightening of anchor bolts, snaking of drains, and/or other scope(s) of work shall be considered performed by Facility Management Personnel, or if Nasatka is 1st. or 2nd. Tier Sub-Contractor, the designated Prime General Contractor's authorized Representative, other trades, sub-contractors, etc. dependent on environmental conditions, site personnel visual inspection schedules, and/or age of equipment maintained.
- Continued Operations and Maintenance (O&M) Training is recommended on a minimum annual basis or when any site personnel are newly employed or scope of work roles are modified.
- End User shall incorporate Standard Operating Procedures (SOP) for each AVB Asset at each ACP Gate Location.



- To best respond to all Maintenance Services whether Preventative, Corrective, or Emergency type, it is recommended that the End User maintain a sufficient percentage of spare parts and/or spare operator systems as part of on-site inventory to ensure timely repair of non-operational equipment and prevent unnecessary or unreasonable downtime periods. A recommended spare parts/operator inventory list can be determined either upon conclusion of site assessment scope or as determined by each asset designated operation condition of cycle usage, integration device complexity, and operating environment, amongst other factors at any given location that may require special attention.

Preventative Maintenance Inspection (PMI) Site Assessment Prior to PM Service

Implementation: When AVB systems have been neglected, poorly maintained, and/or absent of a consistent, site specific Preventative Maintenance program per manufacturer recommendations and based on standard industry standards for access-control, active vehicle barrier systems, it is recommended that an initial on-site initial site assessment and component match check of each asset to first determine existing equipment conditions, operational function status', create a site specific PM Program, and assess what, if any, repairs or service of equipment is required to bring the systems to optimal operating condition. This site assessment would include the review of all presented past performance Preventative Maintenance and Corrective (Repair) Maintenance Service Records to adequately determine possible reoccurring operating, mechanical, or structural concerns of subject equipment assets. Detailed PMI Report would be issued within ten (10) calendar days of post assessment. Each individual PMI asset report would include material and labor cost with associated performance time frame to complete repair/replacement activities, as applicable.

Scheduled Preventive Maintenance (PM) Services: A site specific Preventative Maintenance Service Program should be designed, planned, and implemented per site environment operating conditions, operational sequence of operation, End User Standard Operating Procedures (SOP), security program modifications, cycle operation usage, and complexity of integrated components requiring adjustments, calibration, & program enhancements. When Preventative Maintenance Services are limited to specific PWS specified service intervals, additional PM Service checks may be required to be administered and supported by End User Customer Site Facility Personnel or other authorized designated Personnel for recommended periodic visual and function checks. Selected Nasatka Certified Technician(s) shall maintain the equipment detailed in the PWS, and in accordance with Nasatka OEM recommendations, standards, specifications, guidelines, codes, regulations, instructions, and schedules; established professional industry standards. Selected Nasatka Certified Technician(s) shall conduct site specific Preventive Maintenance Program (PM) and provide Corrective (Repair) Maintenance (CM) Service recommendations prevent



potential future service interruptions. System adjustments/calibrations will be completed as part of PM Program. Nasatka recommended CM Services' shall be performed to correct any deficiency identified on equipment assets between Scheduled Preventative Maintenance performance periods. Nasatka shall report to and provide written submission to Contracting Officer Representative (COR) of identified material and labor (time) requirements identified during the scheduled PM for written approval.

Corrective (Repair) Maintenance (CM) and Unscheduled Repair Service Request: Nasatka Certified Technician(s) shall perform Corrective (Repair) Maintenance (CM) Service including; repairs and/or replacement of part components and hardware required to correct any deficiency identified and restore AVB systems to optimum working conditions. In the event Corrective (Repair) Maintenance (CM) Service requires replacement of parts components not included in accordance with the PWS, Nasatka shall provide written submission to Contracting Officer Representative (COR) of identified materials and labor (time) estimate for written approval. Corrective (Repair) Maintenance (CM) Service is a labor (time as defined hourly or daily standard service rates based on door to door travel distances from PM Vendor nearest Service Center) and materials rate (based on Manufacturer recommended repair or replacement part component most current price list). Corrective (Repair) Maintenance (CM) Service and Unscheduled Service request to be performed during normal business work periods or as required by PWS. Corrective (Repair) Maintenance (CM) Service and Unscheduled Service request of normal standard work periods on-site response time for non-critical service requests would be responded to on-site within next available scheduled date after confirmed written receipt of service request and approval or as required by the PWS.

Nasatka recommends that Corrective (Repair) Maintenance (CM) Service mandatory minimum response times be given consideration of area traffic pattern, dispatch period, technician origination and preparation period, requested task which may require more than one Technician, etc. Corrective (Repair) Maintenance (CM) Service request of limited short response time period requirements may unintentionally compromise the safety of the responding Technician(s) and result in the Technician(s) arriving on-site less prepared to successfully address the specific repair requests to complete the service call.

Emergency Repair Service Request:

All Service requests outside of normal standard business hours in accordance with PWS or deemed critical by the COR shall be responded as an Emergency to respond on-site within specified time period after confirmed written receipt of service request and approval or as required by the PWS. Only the COR shall designate Emergency Service requests.



Emergency Repair Service is a labor (time as defined hourly or daily emergency response/unscheduled service rate based on door to door travel distances from PM Vendor nearest Service Center) and materials rate (based on Manufacturer recommended repair or replacement part component most current price list). Corrective (Repair) Maintenance (CM) Service and Unscheduled Service request to be performed during normal business work periods or as required by PWS.

Nasatka recommends that Emergency Repair Service mandatory minimum response times be given consideration of area traffic pattern, dispatch period, technician origination and preparation period, requested task which may require more than one Technician, etc. Emergency Repair request of limited short response time period requirements may unintentionally compromise the safety of the responding Technician(s) and result in the Technician(s) arriving on-site less prepared to successfully address the specific repair requests to complete the service call.

Standby Services:

Standby Service or Special Events Service requirements would typically require advanced scheduling of at least seven (7) business days. This service is a firm fixed price daily labor rate and materials.

Nasatka (OEM) Vendor Recommended Spare Parts/Attic Stock:

To best respond to all Maintenance Services whether Preventative, Corrective, or Emergency classified, it is recommended that the End User CUSTOMER maintain a sufficient percentage of spare parts and/or spare operator systems as part of on-site or Selected Nasatka Certified Vendor's inventory, to ensure timely repair of non-operational equipment and prevent unnecessary or unreasonable downtime/delay periods. A recommended spare parts/operator inventory list is best to be finalized upon conclusion of PMI Assessment, each asset existing escalation age conditions, and/or as by designated operation condition of cycle usage, integration device complexity, and operating environment. CUSTOMER may elect to inventory on or off-site (at Nasatka designated regional Certified Vendor facility) a select percentage of spare parts components based on OEM Vendor and Nasatka recommended inventory list. Replenishment of Spare Parts Inventory/Attic Stock shall be responsibility of End User CUSTOMER.

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Support

Nasatka Support Request Form

Please enter your case details online.

If this is an after hours support request and you are a customer with 24x7x365 onsite support,
please call our 24x7 call center at 1-301-868-0300.

* Subject/Title of Case
* Company Name
* First Name
* Last Name
* Email
* Phone Number
* Support Item
* Case Type
* This Case Related to ...
* Priority
* Description of Problem

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- Over 75 AMC in U.S.
- 5000 Global ACP Assets
- 24/7 Global Support
- Service on Any Make/Model
- Bollards, Crash Beams
- Sliding Gates

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Thank You

Someone will get back to you very shortly.

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Form PM601

NMSB XV-P Required Preventative Maintenance Service

Location of Site Visit:	Date and Time:
Barrier Serial #:	Base Contact Name:
Barrier Vin #:	Technician Name:

<ul style="list-style-type: none"> <input type="checkbox"/> Check all filters for cleanliness. Clean or replace as necessary <input type="checkbox"/> Check oil/hydraulic lines (hoses and straps) for cracking, seeping and/or defects <input type="checkbox"/> Check oil/hydraulic fluids. Drain and replace as necessary <input type="checkbox"/> Ensure oil/hydraulic fluid levels are adequate for the equipment and are maintained at the manufacturer's recommended levels. <input type="checkbox"/> Inspect hydraulic cylinder pins and locks <input type="checkbox"/> Inspection and operations check of barrier hydraulic system <ul style="list-style-type: none"> <input type="checkbox"/> Check barrier up cycle (3-5 seconds) <input type="checkbox"/> Check up speed adjustment <input type="checkbox"/> Check down speed adjustment <input type="checkbox"/> Check accumulator pressure <input type="checkbox"/> Check pressure switch (____-____psi) <input type="checkbox"/> Check relief valve (____psi) <input type="checkbox"/> Check down limit switch <input type="checkbox"/> Inspect manual operable counter-balance only open/close function and calibrate as may be required. <input type="checkbox"/> Inspect all hinges and pivot joints for wear, grease and/or lubricate to optimize operation and prevent rust <input type="checkbox"/> Inspection and operations check of manual deployment jacks systems, grease and/or lubricate to optimize operation and prevent rust <input type="checkbox"/> Check barrier springs <input type="checkbox"/> Check spring pins and washers <input type="checkbox"/> Check nut on spring tighten <input type="checkbox"/> Inspection and operations check of counter-balance spring systems and calibration, grease and/or lubricate to optimize operation and prevent rust <input type="checkbox"/> Inspection and operations check of independent gate arm system <ul style="list-style-type: none"> <input type="checkbox"/> Check gate arm boom <input type="checkbox"/> Remove all rust or corrosion from cylinder rams, and/or oil/lube to prevent rusting <input type="checkbox"/> Inspect cylinder seals <input type="checkbox"/> Inspect all steel components. Note all cracked, worn, distorted or warped components <input type="checkbox"/> Check all welds for cracking and fatigue <input type="checkbox"/> Check all heating units, as applicable, on all systems using heat strips and pumps <input type="checkbox"/> Check all towing equipment safety incl. emergency brake. <input type="checkbox"/> Check wheel axel assembly and tires for safety and wear. <input type="checkbox"/> Check wheel axel assembly for mobility, binding, or freeze of brakes. 	<ul style="list-style-type: none"> <input type="checkbox"/> Check all (red and yellow) traffic signal light function and bulb operation, replace bulb(s) as may be required <input type="checkbox"/> Inspection and operations check of PLC computer <ul style="list-style-type: none"> <input type="checkbox"/> Check the motor relay <input type="checkbox"/> Check the light relay <input type="checkbox"/> Clean the control panel <input type="checkbox"/> Inspection and operations check of the safety loop detector <ul style="list-style-type: none"> <input type="checkbox"/> Check the front loop <input type="checkbox"/> Check the rear loop <input type="checkbox"/> Inspection and operations check of the master panel <ul style="list-style-type: none"> <input type="checkbox"/> Check the power key <input type="checkbox"/> Check the up button <input type="checkbox"/> Check the down button <input type="checkbox"/> Check the power light <input type="checkbox"/> Check the red indicating light <input type="checkbox"/> Check the green indicating light <input type="checkbox"/> Inspection and operations check of the remote panel <ul style="list-style-type: none"> <input type="checkbox"/> Check the power key <input type="checkbox"/> Check the up button <input type="checkbox"/> Check the down button <input type="checkbox"/> Check the power light <input type="checkbox"/> Check the red indicating light <input type="checkbox"/> Check the green indicating light <input type="checkbox"/> Inspection and operations check of all power and control outlets <input type="checkbox"/> Inspection and operations check of all Tether control panels <input type="checkbox"/> Inspection and operations check of integrated photo eye beam <input type="checkbox"/> Inspection and operations check of integrated solar panel <input type="checkbox"/> Inspection and operations check of batteries <input type="checkbox"/> Inspection and operations check of integrated battery charger <input type="checkbox"/> Clean all equipment, power washing may be required <ul style="list-style-type: none"> <input type="checkbox"/> Clean all excess oil and debris from hydraulic pump units (HPU) to include HPU housing boxes <input type="checkbox"/> Raise barrier and clean/remove all water dirt, sand and debris from beneath barrier <input type="checkbox"/> Touch-up and reapply as necessary all safety reflective decals as originally applied to impact barrier plate <input type="checkbox"/> Inspect tool box for component match incl. wheel chocks, manual lift bar, jack drill adaptor, and document tool box parts. <input type="checkbox"/> Complete function check of entire system upon completion of Required Preventative Maintenance Service <p>• Please indicate N/A where Not Applicable.</p>
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Form PM601

NMSB XV-P Required Preventative Maintenance Service (cont.)

Location of Site Visit:	Date and Time:
Barrier Serial #:	Base Contact Name:
Barrier Vin #:	Technician Name:

Problems/Recommendations Identified: (associate each with numbered digital photo)		
Problem Description/Recommended Service Repair	Replacement Part #	Replacement Part Description

Technician Remarks:

Log (Date & Time)	Start of Service:	End of Service:
-------------------	-------------------	-----------------

Technician Signature:		Date:	
Base Contact Name:	Position:	Signature:	Date:
Phone:	Address:	E-Mail:	

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APPENDIX B. HYDRAULIC FLUID

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HIGH PERFORMANCE, ECOLABEL CERTIFIED ISO 32 HYDRAULIC FLUID

Description

RSC *FUTERRA* HF 32 is a synthetic, Ecolabel, ISO 32 grade hydraulic fluid formulated to withstand extreme conditions and corrosion while operating in severe outdoor environments. It is intended for severe service, extreme high temperature (250°F/121°C), low temperature (-40°F/-40°C) and high pressure (5000+psi/34,470 kPa) applications.

Its excellent oxidative and hydrolytic stability and near zero foaming tendency ensure that the fluids will last much longer than other EALs and conventional oils. RSC *FUTERRA* HF 32 offers greater flexibility and the ultimate system compatibility – offering drop-in replacement and broad seal compatibility. It was formulated for industrial applications where incidental environmental exposure of the lubricant is a cause for concern, as it is readily biodegradable and non-sheening*.

RSC *FUTERRA* HF series meets the requirements for a growing list of manufacturers. Visit our [website](#) or contact customer service for a full list of OEM approvals.

Property	Method	Requirements	Result
Kinematic Viscosity			
At 40°C, cSt	D445	28.8-35.2	32
At 100°C, cSt	D445	5.0 min	5.98
Viscosity Index	D2270	90 min	127
Density(60°F)	D1298	report	0.837
Pour Point, °C	D97	-15 max	-51
Flash Point (COC), °C	D92	185 min	226
Acid Number, mgKOH/g	D664	Report	0.89
Steel Pin Corrosion (3 hours, 100°C)	D665	Pass	
Deionized Water			Pass
Synthetic Salt Water			Pass
Foam Properties (after 10 minutes)	D892		
Sequence I, mL	Tendency/Stability	50-0 max	0-0
Sequence II, mL	Tendency/Stability	50-0 max	10-0
Sequence III, mL	Tendency/Stability	50-0 max	0-0
Demulse Properties (54°C)	D1401		
Oil / Water / Emulsion		40 / 37 / 3	40 / 40 / 0
Minutes		30	10
Copper Corrosion	D130		
3hrs @ 100 °C		2 max	1a

HIGH PERFORMANCE, ECOLABEL CERTIFIED ISO 32 HYDRAULIC FLUID

Property	Method	Requirements	Result
Oxidation Mins to 25 psi loss	D2272		1200
Oxidation	D943		>1000 hrs
Oxidation	D943M		>9000 hrs
FZG		10 min.	11
Hydrolytic Stability	D2619		
Copper Weight Loss, mg/cm ³			0.00
Change in Acid Number, mgKOH/g			<4.0
Appearance of Copper Panel			1b
Vickers 35VQ25 Vane Pump	35VQ25		Pass
Vickers V104C Vane Pump			
Total loss of ring and vane, mg			Pass
Denison T6H20C Pump (HF-1, HF-2, HF-6)			Pass
Biodegradability, % in 28 Days			>60
Ecotoxicity			
Fathead minnow, 96h LC50, ppm	OECD 201	>100	>10,000
Daphnia magna, 48h EC50, ppm	OECD 202	>100	>10,000
Algae, 72h EC50, ppm	OECD 203	>100	>1,000
Elastomer SRE-NBR-1 (80°C 1000 hours)	ISO 6072		Pass
Elastomer HNBR (100°C 1000 hours)	ISO 6072		Pass
Elastomer FKM (100°C 1000 hours)	ISO 6072		Pass

*CFR40 Part 435B

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Updated: 12/21/16

For more information about RSC Bio Solutions, visit us at rscbio.com or call +1 704.684.6100.



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800.661.3558
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1. Identification

Product identifier	RSC Futerra HF 32	
Other means of identification		
Part No.	FTHF32	
Recommended use	Hydraulic Fluid	
Recommended restrictions	None known.	
Manufacturer/Importer/Supplier/Distributor information		
Manufacturer		
Company name	RSC Bio Solutions	
Address	600 Radiator Road Indian Trail, NC 28079 United States	
Telephone	Phone:	704-684-6100
	Fax:	704-257-8996
Website	www.rscbio.com	
E-mail	Not available.	
Emergency phone number	EMERGENCY PH NO:	1-800-661-3558

2. Hazard(s) identification

Physical hazards	Not classified.
Health hazards	Not classified.
Environmental hazards	Not classified.
OSHA defined hazards	Not classified.
Label elements	
Hazard symbol	None.
Signal word	None.
Hazard statement	The mixture does not meet the criteria for classification.
Precautionary statement	
Prevention	Observe good industrial hygiene practices.
Response	Wash hands after handling.
Storage	Store away from incompatible materials.
Disposal	Dispose of waste and residues in accordance with local authority requirements.
Hazard(s) not otherwise classified (HNOC)	None known.
Supplemental information	None.

3. Composition/information on ingredients

Mixtures

The manufacturer lists no ingredients as hazardous according to OSHA 29 CFR 1910.1200.

*Designates that a specific chemical identity and/or percentage of composition has been withheld as a trade secret.

4. First-aid measures

Inhalation	Move to fresh air. Call a physician if symptoms develop or persist.
Skin contact	Wash off with soap and water. Get medical attention if irritation develops and persists.
Eye contact	Rinse with water. Get medical attention if irritation develops and persists.
Ingestion	Rinse mouth. Get medical attention if symptoms occur.
Most important symptoms/effects, acute and delayed	Direct contact with eyes may cause temporary irritation.

Indication of immediate medical attention and special treatment needed	Treat symptomatically.
General information	Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves.
5. Fire-fighting measures	
Suitable extinguishing media	Water fog. Foam. Dry chemical powder. Carbon dioxide (CO ₂).
Unsuitable extinguishing media	Do not use water jet as an extinguisher, as this will spread the fire.
Specific hazards arising from the chemical	During fire, gases hazardous to health may be formed.
Special protective equipment and precautions for firefighters	Self-contained breathing apparatus and full protective clothing must be worn in case of fire.
Fire fighting equipment/instructions	Move containers from fire area if you can do so without risk.
Specific methods	Use standard firefighting procedures and consider the hazards of other involved materials.
General fire hazards	No unusual fire or explosion hazards noted.
6. Accidental release measures	
Personal precautions, protective equipment and emergency procedures	Keep unnecessary personnel away. For personal protection, see section 8 of the SDS.
Methods and materials for containment and cleaning up	Large Spills: Stop the flow of material, if this is without risk. Dike the spilled material, where this is possible. Absorb in vermiculite, dry sand or earth and place into containers. Following product recovery, flush area with water.
	Small Spills: Wipe up with absorbent material (e.g. cloth, fleece). Clean surface thoroughly to remove residual contamination.
	Never return spills to original containers for re-use. For waste disposal, see section 13 of the SDS.
Environmental precautions	Avoid discharge into drains, water courses or onto the ground.
7. Handling and storage	
Precautions for safe handling	Avoid prolonged exposure. Observe good industrial hygiene practices.
Conditions for safe storage, including any incompatibilities	Store in original tightly closed container. Store away from incompatible materials (see Section 10 of the SDS).
8. Exposure controls/personal protection	
Biological limit values	No biological exposure limits noted for the ingredient(s).
Appropriate engineering controls	Good general ventilation (typically 10 air changes per hour) should be used. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level.
Individual protection measures, such as personal protective equipment	
Eye/face protection	Wear safety glasses with side shields (or goggles).
Skin protection	
Hand protection	Wear appropriate chemical resistant gloves. Suitable gloves can be recommended by the glove supplier.
Other	Wear suitable protective clothing.
Respiratory protection	Chemical respirator with organic vapor cartridge and full facepiece if threshold limits are exceeded. Dust mask.
Thermal hazards	Wear appropriate thermal protective clothing, when necessary.
General hygiene considerations	Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants.
9. Physical and chemical properties	
Appearance	Clear.

Physical state	Liquid.
Form	Liquid.
Color	Amber
Odor	Not available.
Odor threshold	Not available.
pH	Not available.
Melting point/freezing point	Not available.
Initial boiling point and boiling range	Not available.
Flash point	438.8 °F (226.0 °C) Cleveland Open Cup
Evaporation rate	Not available.
Flammability (solid, gas)	Not applicable.
Upper/lower flammability or explosive limits	
Flammability limit - lower (%)	Not available.
Flammability limit - upper (%)	Not available.
Explosive limit - lower (%)	Not available.
Explosive limit - upper (%)	Not available.
Vapor pressure	Not available.
Vapor density	Not available.
Relative density	Not available.
Solubility(ies)	
Solubility (water)	Not available.
Partition coefficient (n-octanol/water)	Not available.
Auto-ignition temperature	Not available.
Decomposition temperature	Not available.
Viscosity	32 cSt
Viscosity temperature	104 °F (40 °C)
Other information	
Density	6.97 lbs/gal
Explosive properties	Not explosive.
Flammability class	Combustible IIIB estimated
Oxidizing properties	Not oxidizing.
Pour point	-59.8 °F (-51 °C)
Specific gravity	0.84
VOC	0 %

10. Stability and reactivity

Reactivity	The product is stable and non-reactive under normal conditions of use, storage and transport.
Chemical stability	Material is stable under normal conditions.
Possibility of hazardous reactions	No dangerous reaction known under conditions of normal use.
Conditions to avoid	Contact with incompatible materials.
Incompatible materials	Strong oxidizing agents.
Hazardous decomposition products	No hazardous decomposition products are known.

11. Toxicological information

Information on likely routes of exposure

Inhalation	Prolonged inhalation may be harmful.
-------------------	--------------------------------------

Skin contact	No adverse effects due to skin contact are expected.
Eye contact	Direct contact with eyes may cause temporary irritation.
Ingestion	Expected to be a low ingestion hazard.
Symptoms related to the physical, chemical and toxicological characteristics	Direct contact with eyes may cause temporary irritation.
Information on toxicological effects	
Acute toxicity	Not available.
Skin corrosion/irritation	Prolonged skin contact may cause temporary irritation.
Serious eye damage/eye irritation	Direct contact with eyes may cause temporary irritation.
Respiratory or skin sensitization	
Respiratory sensitization	Not a respiratory sensitizer.
Skin sensitization	This product is not expected to cause skin sensitization.
Germ cell mutagenicity	No data available to indicate product or any components present at greater than 0.1% are mutagenic or genotoxic.
Carcinogenicity	This product is not considered to be a carcinogen by IARC, ACGIH, NTP, or OSHA.

IARC Monographs. Overall Evaluation of Carcinogenicity

Not listed.

OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)

Not regulated.

US. National Toxicology Program (NTP) Report on Carcinogens

Not listed.

Reproductive toxicity	This product is not expected to cause reproductive or developmental effects.
Specific target organ toxicity - single exposure	Not classified.
Specific target organ toxicity - repeated exposure	Not classified.
Aspiration hazard	Not an aspiration hazard.
Chronic effects	Prolonged inhalation may be harmful.

12. Ecological information

Ecotoxicity	The product is not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.
Persistence and degradability	No data is available on the degradability of this product.
Bioaccumulative potential	
Mobility in soil	No data available.
Other adverse effects	No other adverse environmental effects (e.g. ozone depletion, photochemical ozone creation potential, endocrine disruption, global warming potential) are expected from this component.

13. Disposal considerations

Disposal instructions	Collect and reclaim or dispose in sealed containers at licensed waste disposal site.
Local disposal regulations	Dispose in accordance with all applicable regulations.
Hazardous waste code	The waste code should be assigned in discussion between the user, the producer and the waste disposal company.
Waste from residues / unused products	Dispose of in accordance with local regulations. Empty containers or liners may retain some product residues. This material and its container must be disposed of in a safe manner (see: Disposal instructions).
Contaminated packaging	Since emptied containers may retain product residue, follow label warnings even after container is emptied. Empty containers should be taken to an approved waste handling site for recycling or disposal.

14. Transport information

DOT

Not regulated as dangerous goods.

IATA

Not regulated as dangerous goods.

IMDG

Not regulated as dangerous goods.

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code Not established.

15. Regulatory information

US federal regulations This product is not known to be a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

TSCA Section 12(b) Export Notification (40 CFR 707, Subpt. D)

Not regulated.

CERCLA Hazardous Substance List (40 CFR 302.4)

Not listed.

SARA 304 Emergency release notification

Not regulated.

OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)

Not regulated.

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Hazard categories Immediate Hazard - No
Delayed Hazard - No
Fire Hazard - No
Pressure Hazard - No
Reactivity Hazard - No

SARA 302 Extremely hazardous substance

Not listed.

SARA 311/312 Hazardous chemical No

SARA 313 (TRI reporting)

Not regulated.

Other federal regulations**Clean Air Act (CAA) Section 112 Hazardous Air Pollutants (HAPs) List**

Not regulated.

Clean Air Act (CAA) Section 112(r) Accidental Release Prevention (40 CFR 68.130)

Not regulated.

Safe Drinking Water Act (SDWA) Not regulated.

International Inventories

Country(s) or region	Inventory name	On inventory (yes/no)*
Australia	Australian Inventory of Chemical Substances (AICS)	Yes
United States & Puerto Rico	Toxic Substances Control Act (TSCA) Inventory	Yes

*A "Yes" indicates that all components of this product comply with the inventory requirements administered by the governing country(s)

A "No" indicates that one or more components of the product are not listed or exempt from listing on the inventory administered by the governing country(s).

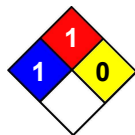
16. Other information, including date of preparation or last revision

Issue date 11-02-2016

Version # 01

HMIS® ratings Health: 1
Flammability: 1
Physical hazard: 0

NFPA ratings Health: 1
Flammability: 1
Instability: 0

NFPA ratings**Disclaimer**

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

Revision information

Product and Company Identification: Product and Company Identification
HazReg Data: International Inventories

APPENDIX C. BATTERY & BATTERY CHARGER

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DEEP CYCLE SERIES

INTIMIDATOR[®]

AGM

FEATURES AND BENEFITS

- Enhanced electrolyte suspension system absorbs more electrolyte, protects internal components
- Micro-porous glass separators prevents acid spills and terminal corrosion
- Premium maintenance-free deep cycle and starting service
- Lower internal resistance ensures higher discharge rates
- Extra deep discharge protection withstands damaging ultra-deep cycle service
- 2x the cycle life* of traditional batteries extends performance and life
- 20x more vibration protection* resists vibration and electrical loading damage
- Spillproof design enables flexible installation (upside-down not recommended)
- Requires less charging time for more optimized battery use

* Compared to conventional designs



The Intimidator AGM Deep Cycle Series provides an ideal solution for heavy marine house power, renewable energy powered equipment, portable power needs, golf cars and other types of electric vehicles.

Completely spillproof and maintenance-free AGM technology eliminates watering and unnecessary maintenance. Intimidator Deep Cycle batteries spend less time on the charger and more time in service by actually **recharging faster** than conventional batteries.

A **high deep discharge abuse tolerance** provides added resiliency for dependable deep cycle service.

Intimidator® AGM Solutions for Intimidating Battery Needs

Intimidator deep cycle batteries can be substituted in virtually any flooded lead-acid battery deep cycle application (in conjunction with voltage charging), as well as applications where traditional flooded batteries cannot be used. Because of their unique features and benefits, Intimidator deep cycle batteries are particularly well suited for:

COMMON DEEP CYCLE, DEEP DISCHARGE APPLICATIONS

- Marine Trolling • Electronics • Sailboats • Electric Vehicles • Wheelchairs • Golf Cars
- Portable Power • Floor Scrubbers • Personnel Carriers • Marine & RV House Power

STANDBY AND EMERGENCY BACKUP APPLICATIONS

- UPS (Uninterrupted Power Systems) • Cable TV • Emergency Lighting • Computer Backup
- Solar Power • Telephone Switching • Village Power

INTIMIDATOR AGM DEEP CYCLE SERIES HAS EXTRA PROTECTION AGAINST DEEP DISCHARGING

Ultra-deep discharging is what causes life-shortening plate shedding and accelerated positive grid corrosion, which can destroy a battery. Intimidator deep cycle batteries are designed to use the optimized amount of acid (no more, no less). This means that the power in the acid is used before the power in the plates. This design, along with the enhanced durability in the glass mat and plate construction, protects the internal components from ultra-deep discharges.



ENHANCED ELECTROLYTE SUSPENSION SYSTEM

- Absorbs more electrolyte, protects internal components
- Micro-porous glass separators prevent acid spills and terminal corrosion

DEEP CYCLE INTIMIDATOR® AGM BATTERIES

GROUP NO.	PART NO.	PERFORMANCE LEVEL				APPROX. WEIGHT (lbs.)	MAXIMUM OVERALL DIMENSIONS						FOOTNOTES
		CCA @ 0°F	RES. CAP.	REF. MCA	20 AH RATE		Length		Width		Height		
							inch	mm	inch	mm	inch	mm	
12 VOLT HEAVY-DUTY DEEP CYCLE ABSORBED GLASS MAT (AGM) VALVE REGULATED													
U1	8AU1	200	48	240	32	24	7 ¾	197	5 ½	130	7 ¼	184	2,38,39,Y
U1	8AU1H	200	48	240	32	24	8 ⅝	211	5 ½	130	7 ¼	184	2,17,38,39,Y
22NF	8A22NF	350	85	420	55	38.5	9 ¾	238	5 ½	140	9 ¼	235	2,38,39,G
24M	8A24M	525	135	800	79	53	10 ⅞	276	6 ¾	171	9 ¾	251	2,17,38,39,U
24	8A24	525	135	800	79	53	10 ⅞	276	6 ¾	171	9 ¾	251	2,17,38,39,G
24	8A24NH	525	135	800	79	53	10 ¼	260	6 ¾	171	9 ¾	251	2,38,39,G
27M	8A27M	580	175	900	92	63	12 ¾	324	6 ¾	171	9 ¾	251	2,17,38,39,U
27	8A27	580	175	900	92	63	12 ¾	324	6 ¾	171	9 ¾	251	2,17,38,39,G
31M	8A31DTM	800	200	1000	105	69	12 ⅞	329	6 ¾	171	9 ¾	238	2,16,17,38,39,U
4D	8A4D	1110	380	1420	198	129	20 ¾	527	8 ½	216	10	254	2,17
8D	8A8D	1450	480	1800	245	158	20 ¾	527	11	279	10	254	2,17
6 VOLT HEAVY-DUTY DEEP CYCLE ABSORBED GLASS MAT (AGM) VALVE REGULATED													
GC2	8AGC2	680	380	900	190	69.5	10 ¼	260	7 ½	181	10 ⅞	276	2,U

All batteries have SAE automotive posts unless noted

FOOTNOTES: 2. Black cover / Gray case 16. Dual terminal universal design 17. Includes handle 38. "Non-spillable" defined by DOT (Department of Transportation) definitions 39. "Non-spillable" defined by ICAO (International Commercial Airline Organization) and IATA (International Airline Transport Association) definitions G. Offset post w/ horizontal hole, stainless steel 5/16" bolt and hex nut (T881) U. Molded-in offset SAE post and vertical 5/16" NEG., 5/16" POS. stainless steel studs & hex nuts Y. Small L terminal with round holes

Experience Quality at its Core

East Penn's A³™ Advanced-Cubed precision-focused manufacturing approach ensures the process behind the technology delivers core quality at each stage of battery production. INTIMIDATOR batteries are supported by A³ manufacturing to optimize the life, power, and durability of the battery's design and performance.



EAST PENN manufacturing co., inc.

Lyon Station, PA 19536-0147 • Phone: 610-682-6361 • Fax: 610-682-4781
Order Department Hotline: 610-682-4231 • www.dekabatteries.com



Deka 8A24 (8A24M) AGM Battery

12 Volt - 79 Amp Hrs - Group 24

**Sealed Maintenance Free Deep Cycle Batteries for Marine, RV,
EV (Electric Vehicle), Golf Cart, UPS, Inverter, Solar Panel
(Photovoltaic), Telcom, CATV and Stand-by Applications**

The Deka 8A24 (8A24M) is an American made AGM (absorbed glass-mat) deep cycle battery. The AGM technology allows for a completely sealed maintenance-free battery with no sulfuric acid leaks, no acid clean up, and more power in the same space when compared to conventional batteries. It has an under 2% per month self discharge rate. These are manufactured by East Penn Manufacturing who also manufactures batteries under the name MK Battery.

The Deka 8A24 (8A24M) is a direct replacement for any group 24 lead-acid, GEL, or AGM batteries.

Warranty is for 1 year free replacement.

Deka 8A24 (8A24M) Specifications:

Nominal Voltage: 12V
Amp Hour Capacity @ 20 hr rate: 79 a/h
Reserve Capacity @ 25 amp discharge rate: 145 mins
BCI Group Size: 24
Marine Cranking Amps @ 32* F: 800 amps
Cold Cranking Amps @ 0* F: 525 amps
Weight: 53 lbs
Length: 10 7/8 in.
Width: 6 3/4 in.
Height: 9 7/8 in.



Terminal Type: dual terminals (autopost and stud)

[**Click Here To Download The Deka 8A24 \(8A24M\) Battery Specifications ****](#)

(** Click to download and save on your computer. PDF format. Adobe Acrobat viewer required for viewing.)

MATERIAL SAFETY DATA SHEET
VALVE REGULATED LEAD ACID
BATTERY,
NON-SPILLABLE
(US, CN, EU Version for International Trade)

SECTION 1: PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: Valve Regulated Lead Acid Battery
OTHER PRODUCT NAMES: Gel: Absorbed Electrolyte Sealed; Valve-Regulated Non-Spillable Battery; Battery Non-Spillable 49 CFR 173.159(d)

MANUFACTURER: East Penn Manufacturing Company, Inc.
DIVISION: Dekal Road
ADDRESS: Lyon Station, PA 19536 USA

EMERGENCY TELEPHONE NUMBERS: US: CHEMTREC 1-800-424-9300
CN: CHEMTREC 1-800-424-9300
Outside US: +1-202-483-7616

NON-EMERGENCY HEALTH/SAFETY INFORMATION: +1-610-682-6361

CHEMICAL FAMILY: This product is a gel/absorbed electrolyte type lead acid storage battery.

PRODUCT USE: Industrial/Commercial electrical storage batteries.

This product is considered a Hazardous Substance, Preparation or Article that is regulated under US-OSHA; CAN-WHMIS; IOSH; ISO; UK-CHIP; or EU Directives (67/548/EEC-Dangerous Substance Labeling, 98/24/EC-Chemical Agents at Work, 99/45/EC-Preparation Labeling, 2001/58/EC-MSDS Content, and 1907/2006/EC-REACH), and an MSDS/SDS is required for this product considering that when used as recommended or intended, or under ordinary conditions, it may present a health and safety exposure or other hazard.

Additional Information

This product may not be compatible with all environments, such as those containing liquid solvents or extreme temperature or pressure. Please request information if considering use under extreme conditions or use beyond current product labeling.

SECTION 2: HAZARDS IDENTIFICATION

GHS Classification:

Health	Environmental	Physical
Acute Toxicity – Not listed (NL) Eye Corrosion – Corrosive* Skin Corrosion – Corrosive* Skin Sensitization – NL Mutagenicity/Carcinogenicity – NL Reproductive/Developmental – NL Target Organ Toxicity (Repeated) – NL	Aquatic Toxicity – NL	NFPA – Flammable gas, hydrogen (during charging) CN - NL EU - NL

*as sulfuric acid

GHS Label: Valve Regulated Lead Acid Gel Battery, Non-Spillable

Symbols: C (Corrosive)



Hazard Statements

Contact with internal components may cause irritation or severe burns. Irritating to eyes, respiratory system, and skin.

Precautionary Statements

Keep out of reach of children. Keep containers tightly closed. Avoid heat, sparks, and open flame while charging batteries. Avoid contact with internal acid/ gel.

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EMERGENCY OVERVIEW: May form explosive air/gas mixture during charging. Contact with internal components may cause irritation of severe burns. Irritating to eyes, respiratory system, and skin. Prolonged inhalation or ingestion may result in serious damage to health. Pregnant women exposed to internal components may experience reproductive/developmental effects.

POTENTIAL HEALTH EFFECTS:

EYES: Direct contact of internal electrolyte gel with eyes may cause severe burns or blindness.

SKIN: Direct contact of internal electrolyte gel with the skin may cause skin irritation or damaging burns.

INGESTION: Swallowing this product may cause severe burns to the esophagus and digestive tract and harmful or fatal lead poisoning. Lead ingestion may cause nausea, vomiting, weight loss, abdominal spasms, fatigue, and pain in the arms, legs and joints.

INHALATION: Respiratory tract irritation and possible long term effects.

ACUTE HEALTH HAZARDS:

Repeated or prolonged contact may cause mild skin irritation.

CHRONIC HEALTH HAZARDS:

Lead poisoning if persons are exposed to internal components of the batteries. Lead absorption may cause nausea, vomiting, weight loss, abdominal spasms, fatigue, pain in the arms, legs and joints. Other effects may include central nervous system damage, kidney dysfunction, and potential reproductive effects. Chronic inhalation of sulfuric acid mist may increase the risk of lung cancer.

MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE:

Respiratory and skin diseases may predispose one to acute and chronic effects of sulfuric acid and/or lead. Children and pregnant women must be protected from lead exposure. Persons with kidney disease may be at increased risk of kidney failure.

Additional Information

No health effects are expected related to normal use of this product as sold.

SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

INGREDIENTS (Chemical/Common Names):	CAS No.:	% by Wt:	EC No.:
Lead, inorganic	7439-92-1	60-75 (average: 67)	231-100-4
Sulfuric acid	7664-93-9	5-15 (average: 10)	231-639-5
Antimony	7440-36-0	0-0.1 (average: <0.1)	231-146-5
Arsenic	7440-38-2	<0.1	231-148-6
Tin	7440-31-5	0-0.1 (average: <0.1)	231-141-8
Polypropylene	9003-07-0	2-10 (average: 4)	NA
NA – Not applicable/ND – Not determined			

Additional Information

These ingredients reflect components of the finished product related to performance of the product as distributed into commerce.

SECTION 4: FIRST AID MEASURES

EYE CONTACT: Flush eyes with large amounts of water for at least 15 minutes. Seek immediate medical attention if eyes have been exposed directly to acid gel.

SKIN CONTACT: Flush affected area(s) with large amounts of water using deluge emergency shower, if available, shower for at least 15 minutes. Remove contaminated clothing. If symptoms persist, seek medical attention.

INGESTION: If swallowed, give large amounts of water. Do NOT induce vomiting or aspiration into the lungs may occur and can cause permanent injury or death.

INHALATION: If breathing difficulties develop, remove person to fresh air. If symptoms persist, seek medical attention.

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SECTION 5: FIRE-FIGHTING MEASURES

SUITABLE/UNSUITABLE EXTINGUISHING MEDIA:

Dry chemical, carbon dioxide, water, foam. Do not use water on live electrical circuits.

SPECIAL FIRE FIGHTING PROCEDURES & PROTECTIVE EQUIPMENT:

Use appropriate media for surrounding fire. Do not use carbon dioxide directly on cells. Avoid breathing vapors. Use full protective equipment (bunker gear) and self-contained breathing apparatus.

UNUSUAL FIRE AND EXPLOSION HAZARDS:

Batteries evolve flammable hydrogen gas during charging and may increase fire risk in poorly ventilated areas near sparks excessive heat or open flames.

SPECIFIC HAZARDS IN CASE OF FIRE:

Thermal shock may cause battery case to crack open. Containers may explode when heated.

Additional Information

Firefighting water runoff and dilution water may be toxic and corrosive and may cause adverse environmental impacts.

SECTION 6: ACCIDENTAL RELEASE MEASURES

PERSONAL PRECAUTIONS:

Avoid Contact with Skin. Neutralize any spilled electrolyte with neutralizing agents, such as soda ash, sodium bicarbonate, or very dilute sodium hydroxide solutions.

ENVIRONMENTAL PRECATIONS:

Prevent spilled material from entering sewers and waterways.

SPILL CONTAINMENT & CLEANUP METHODS/MATERIALS:

Add neutralizer/absorbent to spill area. Sweep or shovel spilled material and absorbent and place in approved container. Dispose of any non-recyclable materials in accordance with local, state, provincial or federal regulations.

Additional Information

Lead acid batteries and their plastic cases are recyclable. Contact your East Penn representative for recycling information.

SECTION 7: HANDLING AND STORAGE

PRECAUTIONS FOR SAFE HANDLING AND STORAGE:

- Keep containers tightly closed when not in use.
- If battery case is broken, avoid contact with internal components.
- Do not handle near heat, sparks, or open flames.
- Protect containers from physical damage to avoid leaks and spills.
- Place cardboard between layers of stacked batteries to avoid damage and short circuits.
- Do not allow conductive material to touch the battery terminals. A dangerous short-circuit may occur and cause battery failure and fire.

OTHER PRECAUTIONS (e.g.; Incompatibilities):

Keep away from combustible materials, organic chemicals, reducing substances, metals, strong oxidizers and water.

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

ENGINEERING CONTROLS/SYSTEM DESIGN INFORMATION:

Charge in areas with adequate ventilation.

VENTILATION:

General dilution ventilation is acceptable.

RESPIRATORY PROTECTION:

Not required for normal conditions of use. See also special firefighting procedures (Section 5).

EYE PROTECTION:

Wear protective glasses with side shields or goggles.

SKIN PROTECTION:

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Wear chemical resistant gloves as a standard procedure to prevent skin contact.

OTHER PROTECTIVE CLOTHING OR EQUIPMENT: None required under normal use conditions for gel/absorbed electrolyte type batteries.

Wash hands after handling.

EXPOSURE GUIDELINES & LIMITS:

OSHA	Permissible Exposure Limit (PEL/TWA)	Lead, inorganic (as Pb)	0.05 mg/m ³
		Sulfuric acid	1 mg/m ³
		Antimony	0.5 mg/m ³
		Arsenic	0.01 mg/m ³
		Tin	2 mg/m ³
ACGIH	2007 Threshold Limit Value (TLV)	Lead, inorganic (as Pb)	0.05 mg/m ³
		Sulfuric acid	0.2 mg/m ³
		Antimony	0.5 mg/m ³
		Arsenic	0.01 mg/m ³
		Tin	2 mg/m ³
Quebec	Permissible Exposure Value (PEV)	Lead, inorganic (as Pb)	0.15 mg/m ³
		Sulfuric acid	1 mg/m ³ TWA
			3 mg/m ³ STEV
		Antimony	0.5 mg/m ³
		Arsenic	0.1 mg/m ³
		Tin	2 mg/m ³
Ontario	Occupational Exposure Level (OEL)	Lead (designated substance)	0.10 mg/m ³
		Sulfuric acid	1 mg/m ³ TWAEV
			3 mg/m ³ STEV
		Antimony	0.5 mg/m ³
		Arsenic (designated substance)	0.01 mg/m ³
		Tin	2 mg/m ³
Netherlands	Maximaal Aanvaarde Concentratie (MAC)	Lead, inorganic (as Pb)	0.15 mg/m ³
		Sulfuric acid	1 mg/m ³
Germany	Maximale Arbeitsplatzkonzentrationen (MAK)	Lead, inorganic (as Pb)	0.1 mg/m ³
		Sulfuric acid	1 mg/m ³ TWA
			2 mg/m ³ STEL
		Antimony	0.5 mg/m ³
United Kingdom	Occupational Exposure Standard (OES)	Lead	0.15 mg/m ³
		Antimony	0.5 mg/m ³
		Arsenic	0.1 mg/m ³
		Tin	2 mg/m ³

TWA – 8-Hour Time Weighted Average/ STE – Short Term Exposure / mg/m³ – milligrams per cubic meter of air/ NE – Not Established

Additional Information

- Batteries are housed in polypropylene cases which are regulated as total dust or respirable dust only when they are ground up during recycling. The OSHA PEL for dust is 15 mg/m³ as total dust or 5 mg/m³ as respirable dust.
- May be required to meet Domestic Requirements for a Specific Destination(s).

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE:	Industrial/commercial lead acid gel battery
ODOUR:	Odorless
ODOUR THRESHOLD:	NA
PHYSICAL STATE:	Sulfuric Acid, Gelatinous/ Lead, solid
pH:	<1
BOILING POINT:	235-240° F (as sulfuric acid)
MELTING POINT:	NA
FREEZING POINT:	NA
VAPOUR PRESSURE:	10 mmHg

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VAPOUR DENSITY (AIR = 1): > 1
SPECIFIC GRAVITY (H₂O = 1): 1.27–1.33
EVAPORATION RATE (n-BuAc=1): < 1
SOLUBILITY IN WATER: 100% (as sulfuric acid)
FLASH POINT: Below room temperature (as hydrogen gas)
AUTO-IGNITION TEMPERATURE: NA
LOWER EXPLOSIVE LIMIT (LEL): 4% (as hydrogen gas)
UPPER EXPLOSIVE LIMIT (UEL): 74% (as hydrogen gas)
PARTITION COEFFICIENT: NA
VISCOSITY (poise @ 25 °C): Not Available
DECOMPOSITION TEMPERATURE: Not Available

FLAMMABILITY/HMIS HAZARD CLASSIFICATIONS (US/CN/EU): As sulfuric acid
HEALTH: 3 FLAMMABILITY: 0 REACTIVITY: 2

SECTION 10: STABILITY AND REACTIVITY

STABILITY: This product is stable under normal conditions at ambient temperature.
INCOMPATIBILITY (MATERIAL TO AVOID): Strong bases, combustible organic materials, reducing agents, finely divided metals, strong oxidizers, and water.
HAZARDOUS DECOMPOSITION OR BY-PRODUCTS: Thermal decomposition will produce sulfur dioxide, sulfur trioxide, carbon monoxide, sulfuric acid mist, and hydrogen.
HAZARDOUS POLYMERIZATION: Will not occur
CONDITIONS TO AVOID: Overcharging, sources of ignition

SECTION 11: TOXICOLOGICAL INFORMATION

ACUTE TOXICITY (Test Results Basis and Comments):

Sulfuric acid: LD₅₀, Rat: 21409 mg/kg
LC₅₀, Guinea pig: 510 mg/m³

Lead: No data available for elemental lead

SUBCHRONIC/CHRONIC TOXICITY (Test Results and Comments):

Repeated exposure to lead and lead compounds in the workplace may result in nervous system toxicity. Some toxicologists report that abnormal conduction velocities in person with blood lead levels of 50 µg/100 ml or higher. Heavy lead exposure may result in central nervous system damage, encephalopathy and damage to the blood-forming (hematopoietic) tissues.

Additional Information

- Very little chronic toxicity data available for elemental lead.
- Lead is listed by IARC as a 2B carcinogen: possible carcinogen in humans. Arsenic is listed by IARC, ACGIH, and NTP as a carcinogen, based on studies with high doses over long periods of time. The other ingredients in this product, present at equal to or greater than 0.1% of the product, are not listed by OSHA, NTP, or IARC as suspect carcinogens.
- The 19th Amendment to EC Directive 67/548/EEC classified lead compounds, but not lead in metal form, as possibly toxic to reproduction. Risk phrase 61: May cause harm to the unborn child, applies to lead compounds, especially soluble forms.

SECTION 12: ECOLOGICAL INFORMATION

PERSISTENCE & DEGRADABILITY:

Lead is very persistent in soils and sediments. No data available on biodegradation.

BIO-ACCUMULATIVE POTENTIAL (Including Mobility):

Mobility of metallic lead between ecological compartments is low. Bioaccumulation of lead occurs in aquatic and terrestrial animals and plants, but very little bioaccumulation occurs through the food chain. Most studies have included lead compounds, not solid inorganic lead.

AQUATIC TOXICITY (Test Results & Comments):

Sulfuric acid: 24-hour LC₅₀, fresh water fish (*Brachydanio rerio*): 82 mg/l
96-hour LOEC, fresh water fish (*Cyprinus carpio*): 22 mg/l (lowest observable effect concentration)

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Lead (metal): No data available

Additional Information

- No known effects on stratospheric ozone depletion.
- Volatile organic compounds: 0% (by Volume)
- Water Endangering Class (WGK): NA

SECTION 13: DISPOSAL CONSIDERATIONS

WASTE DISPOSAL METHOD: Lead acid batteries are recyclable when sent to a secondary lead smelter. Follow local, State/Provincial, and Federal/National regulations applicable to as-used, end-of-life characteristics to be determined by end-user.

HAZARDOUS WASTE CLASS/CODE: US - Not applicable to finished product as manufactured for distribution into commerce.
CN – Not applicable to finished product as manufactured for distribution into commerce.
EWC – Not applicable to finished product as manufactured for distribution into commerce.

Additional Information

Not Included – **Recycle** or dispose as allowed by local jurisdiction for the end-of-life characteristics as-disposed.

SECTION 14: TRANSPORT INFORMATION

GROUND – US-DOT/CAN-TDG/EU-ADR/APEC-ADR:

Proper Shipping Name Not regulated as a Hazardous Material

AIRCRAFT – ICAO-IATA:

Proper Shipping Name Not regulated as a Hazardous Material

VESSEL – IMO-IMDG:

Proper Shipping Name Not regulated as a Hazardous Material

Additional Information

- Each battery and the outer packaging must be plainly and durably marked "Nonspillable" or "Nonspillable Battery"
- Non-Spillable Battery complies with the provisions listed in 49 CFR 173.159(d), therefore must not be marked with an identification number or hazardous label and is not subject to hazardous shipping paper requirements.
- Transport requires proper packaging and paperwork, including the Nature and Quantity of goods, per applicable origin/destination/customs points as-shipped.

SECTION 15: REGULATORY INFORMATION

INVENTORY STATUS:

All components are listed on the TSCA; EINECS/ELINCS; and DSL, unless noted otherwise below.

U.S. FEDERAL REGULATIONS:

TSCA Section 8b – Inventory Status: All chemicals comprising this product are either exempt or listed on the TSCA Inventory.

TSCA Section 12b – Export Notification: If the finished product contains chemicals subject to TSCA Section 12b export notification, they are listed below:

Chemical

CAS #

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None

NA

CERCLA (COMPREHENSIVE RESPONSE COMPENSATION, AND LIABILITY ACT)

Chemicals present in the product which could require reporting under the statute:

<u>Chemical</u>	<u>CAS #</u>
Lead	7439-92-1
Sulfuric acid	7664-93-9

SARA TITLE III (SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT)

The finished product contains chemicals subject to the reporting requirements of Section 313 of SARA Title III.

<u>Chemical</u>	<u>CAS #</u>	<u>% wt</u>
Lead	7439-92-1	67
Sulfuric acid	7664-93-9	10

CERCLA SECTION 311/312 HAZARD CATEGORIES: Note that the finished product is exempt from these regulations, but lead and sulfuric acid above the thresholds are reportable on Tier II reports.

Fire Hazard	No
Pressure Hazard	No
Reactivity Hazard	No
Immediate Hazard	Yes (Internal acid gel is Corrosive)
Delayed Hazard	No

Sulfuric Acid is regulated as an Extremely Hazardous Substance.

STATE REGULATIONS (US):

California Proposition 65

The following chemicals identified to exist in the finished product as distributed into commerce are known to the State of California to cause cancer, birth defects, or other reproductive harm:

<u>Chemical</u>	<u>CAS #</u>	<u>% Wt</u>
Arsenic (as arsenic oxides)	7440-38-2	<0.1
Strong inorganic acid mists including sulfuric acid	NA	10
Lead	7439-92-1	67

California Consumer Product Volatile Organic Compound Emissions

This Product is not regulated as a Consumer Product for purposes of CARB/OTC VOC Regulations, as-sold for the intended purpose and into the industrial/Commercial supply chain.

INTERNATIONAL REGULATIONS (Non-US):

Canadian Domestic Substance List (DSL)

All ingredients remaining in the finished product as distributed into commerce are included on the Domestic Substances List.

WHMIS Classifications

Class E: Corrosive materials present at greater than 1%

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the Controlled Products Regulations.

NPRI and Ontario Regulation 127/01

This product contains the following chemicals subject to the reporting requirements of Canada NPRI +/-or Ont. Reg. 127/01:

<u>Chemical</u>	<u>CAS #</u>	<u>% Wt</u>
Lead	7439-92-1	67
Sulfuric acid	7664-93-9	10

European Inventory of Existing Commercial Chemical Substances (EINECS)

All ingredients remaining in the finished product as distributed into commerce are exempt from, or included on, the European Inventory of Existing Commercial Chemical Substances.

European Communities (EC) Hazard Classification according to directives 67/548/EEC and 1999/45/EC.

<u>R-Phrases</u>	<u>S-Phrases</u>
35, 36, 38	1/2, 26, 30, 45

Additional Information

This product may be subject to Restriction of Hazardous Substances (RoHS) regulations in Europe and China, or may be

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regulated under additional regulations and laws not identified above, such as for uses other than described or as-designed/as-intended by the manufacturer, or for distribution into specific domestic destinations.
--

SECTION 16: OTHER INFORMATION

OTHER INFORMATION:

Distribution into Quebec to follow Canadian Controlled Product Regulations (CPR) 24(1) and 24(2).

Distribution into the EU to follow applicable Directives to the Use, Import/Export of the product as-sold.

SOURCES OF INFORMATION:

International Agency for Research on Cancer (1987), *IARC Monographs on the Evaluation of Carcinogenic Risks to Humans: Overall Evaluations of Carcinogenicity: An updating of IARC Monographs Volumes 1-42, Supplement 7*, Lyon, France.

Ontario Ministry of Labour Regulation 654/86. Regulations Respecting Exposure to Chemical or Biological Agents.

RTECS – Registry of Toxic Effects of Chemical Substances, National Institute for Occupational Safety and Health.

MSDS/SDS PREPARATION INFORMATION:

DATE OF ISSUE: **6 August 2007**

SUPERCEDES: **29 January 2007**

DISCLAIMER:

This Material Safety Data Sheet is based upon information and sources available at the time of preparation or revision date. The information in the MSDS was obtained from sources which we believe are reliable, but are beyond our direct supervision or control. We make no Warranty of Merchantability, Fitness for any particular purpose, or any other Warranty, Expressed or Implied, with respect to such information, and we assume no liability resulting from its use. For this and other reasons, we do not assume responsibility and expressly disclaim liability for loss, damage or expense arising out of or in any way connected with the handling, storage, use of, or disposal of the product. It is the obligation of each user of the product to determine the suitability of this product and comply with the requirements of all applicable laws regarding use and disposal of this product. For additional information concerning East Penn Manufacturing Co., Inc. products or questions concerning the content of this MSDS please contact your East Penn representative.

END

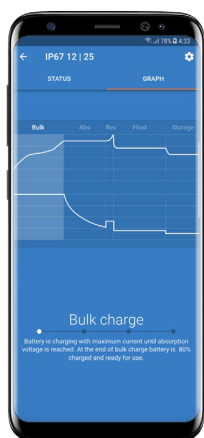
Blue Smart IP67 Charger

120 VAC

www.victronenergy.com



Blue Smart IP67 Charger 12/25



Bluetooth Smart enabled

The Blue Smart IP67 Charger is the wireless solution to monitor voltage and current, to change settings and to update the charger when new features become available.

With Bluetooth, the functionality of the IP67 charger is enhanced and is similar to that of our IP22 and IP65 chargers.

Completely encapsulated: waterproof, shockproof and ignition protected

Water, oil or dirt will not damage the Blue Smart IP67 Charger. The casing is made of cast aluminium and the electronics are moulded in resin.

The highest efficiency ever!

Setting a new industry standard: with 92% efficiency or better, these chargers waste three to four times less heat. And once the battery is fully charged, power consumption reduces to less than a Watt, some five to ten times better than the industry standard.

Adaptive 5-stage charge algorithm: bulk – absorption – recondition – float – storage

The Blue Smart Charger features a microprocessor controlled 'adaptive' battery management. The 'adaptive' feature will automatically optimise the charging process relative to the way the battery is being used.

Storage Mode: Less maintenance and aging when the battery is not in use

The storage mode kicks in whenever the battery has not been subjected to discharge during 24 hours. In the storage mode float voltage is reduced to 2,2 V/cell (13,2 V for a 12 V battery) to minimise gassing and corrosion of the positive plates. Once a week the voltage is raised back to the absorption level to 'equalize' the battery. This feature prevents stratification of the electrolyte and sulphation, a major cause of early battery failure.

Also charges Li-ion (LiFePO₄) batteries

LiFePO₄ batteries are charged with a simple bulk – absorption – float algorithm.

Protected against overheating

Can be used in a hot environment such as a machine room. Output current will reduce as temperature increases up to 60°C, but the charger will not fail.

Two LEDs for status indication

Yellow LED: bulk charge (blinking fast), absorption (blinking slow), float (solid), storage (off)

Green LED: power on

Blue Smart IP67 Charger	12/7	12/13	12/17	12/25	24/5	24/8	24/12	
Input voltage range and frequency	100-135 VAC 45-65 Hz							
Efficiency	93%	93%	95%	95%	94%	96%	96%	
No load power consumption	0.5W							
Charge voltage 'absorption'	Normal: 14,4V		High: 14,7V	Li-ion: 14,2V		Normal: 28,8V	High: 29,4V	Li-ion: 28,4V
Charge voltage 'float'	Normal: 13,8V		High: 13,8V	Li-ion: 13,5V		Normal: 27,6V	High: 27,6V	Li-ion: 27,0V
Charge voltage 'storage'	Normal: 13,2V		High: 13,2V	Li-ion: 13,5V		Normal: 26,4V	High: 26,4V	Li-ion: 27,0V
Charge current, normal mode	7A	13A	17A	25A	5A	8A	12A	
Charge current, LOW	2A	4A	6A	10A	2A	3A	4A	
Charge algorithm	5-stage adaptive							
Can be used as power supply	yes							
Protection	Battery reverse polarity (fuse)		Output short circuit		Over temperature			
Operating temp. range	-20 to +60°C (full rated output up to 40°C)				Derate 3% per °C above 40°C			
Humidity	Up to 100%							
Start interrupt option (Si)	Short circuit proof, current limit 0,5 A Output voltage: max one volt lower than main output							
ENCLOSURE								
Material & Colour	aluminium (blue RAL 5012)							
Battery-connection	Black and red cable of 1,5 meter							
120 V AC-connection	Cable of 1,5 meter with NEMA 5-15 plug							
Protection category	IP67							
Weight (kg)	1,8	1,8	2,4	2,4	1,8	2,4	2,4	
Dimensions (h x w x d in mm)	85 x 211 x 60	85 x 211 x 60	99 x 219 x 65	99 x 219 x 65	85 x 211 x 60	99 x 219 x 65	99 x 219 x 65	
STANDARDS								
Safety	UL 1236, CSA C22.2, EN 60335-1, EN 60335-2-29							
Emission Immunity	EN 55014-1, EN 61000-6-3, EN 61000-3-2							
Automotive Directive	EN 55014-2, EN 61000-6-1, EN 61000-6-2, EN 61000-3-3							

IMPORTANT SAFETY INSTRUCTIONS

1. **SAVE THESE INSTRUCTIONS** – This manual contains important safety and operating instructions for Blue Smart Charger models.
2. Use of an attachment not recommended or sold by Victron Energy may result in a risk of fire, electric shock, or injury to persons.
3. To reduce risk of damage to electric plug and cord, pull by plug rather than cord when disconnecting charger.
4. An extension cord should not be used unless absolutely necessary. Use of an improper extension cord could result in a risk of fire and electric shock. If extension cord must be used, make sure:
 - a) That pins on plug of extension cord are the same number, size, and shape as those of plug on charger;
 - b) that extension cord is properly wired and in good electrical condition; and
 - c) that wire size is large enough for ac ampère rating of charger as specified in “Technical Specifications”
5. Do not operate the charger with damaged cord or plug; contact your service agent or the manufacturer.
6. Do not operate the charger if it has received a sharp blow, been dropped, or otherwise damaged in any way; contact your service agent or the manufacturer.
7. Do not disassemble the charger; contact your service agent or the manufacturer when service or repair is required. Incorrect reassembly may result in a risk of electric shock or fire.
8. To reduce risk of electric shock, unplug charger from outlet before attempting any maintenance or cleaning. Turning off controls will not reduce this risk.
9. **WARNING – RISK OF EXPLOSIVE GASES.**
 - a) **BATTERIES GENERATE EXPLOSIVE GASES DURING NORMAL BATTERY OPERATION. FOR THIS REASON, IT IS OF UTMOST IMPORTANCE THAT EACH TIME BEFORE USING YOUR CHARGER, YOU READ THIS MANUAL AND FOLLOW THE INSTRUCTIONS EXACTLY.**

- b) Follow these instructions and those published by the battery manufacturer and manufacturer of any equipment you intend to use in vicinity of the battery.
10. PERSONAL PRECAUTIONS
- a) Consider having someone close enough by to your aid when you work near a lead-acid battery.
 - b) Have plenty of fresh water and soap nearby in case battery acid contacts skin, clothing, or eyes.
 - c) Wear complete eye protection and clothing protection. Avoid touching eyes while working near a battery.
 - d) If battery acid contacts skin or clothing, wash immediately with soap and water. If acid enters eye, immediately flood eye with running cold water for at least 10 minutes and get medical attention immediately.
 - e) NEVER smoke or allow a spark or flame in vicinity of a battery or engine.
 - f) Be extra cautious to reduce risk of dropping a metal tool onto battery. It might spark or short-circuit the battery or an other electrical part that may cause explosion.
 - g) Remove personal metal items such as rings, bracelets, necklaces, and watches when working with a lead-acid battery. A lead-acid battery can produce a short-circuit current high enough to weld a ring or the like to metal, causing a severe burn.
 - h) Do not use the battery charger for charging dry-cell batteries that are commonly used with home appliances. These batteries may burst and cause injury to persons and damage to property.
 - i) NEVER charge a frozen battery.
11. PREPARING TO CHARGE
- a) If it is necessary to remove the battery from a vehicle prior to charging, always remove the grounded terminal from the battery first. Make sure all accessories in the vehicle are off, so as not to cause an arc.
 - b) Be sure that the area around the battery is well ventilated while the battery is being charged.
 - c) Clean battery terminals. Be careful to keep corrosion from coming in contact with eyes.



- d) Add distilled water in each cell until battery acid reaches level specified by battery manufacturer. Do not overfill. For a battery without cell caps, such as valve regulated lead acid batteries, carefully follow the charging instructions of the manufacturer.
 - e) Study all battery manufacturer's specific precautions while charging and recommended rates of charge.
 - f) Determine the nominal voltage of the battery by referring to the owner's manual of the vehicle and make sure it matches the output rating of the battery charger.
12. **CHARGER LOCATION**
- a) Locate the charger as far away from the battery as DC cables permit.
 - b) Never place charger directly above battery being charged; gases from battery will corrode and damage the charger.
 - c) Never allow battery acid to drip on the charger when reading gravity or filling the battery.
 - d) Do not operate the charger in a closed-in area or restrict ventilation in any way.
 - e) Do not set a battery on top of the charger.
13. **DC CONNECTION PRECAUTIONS**
- a) Connect and disconnect the DC output terminals only after removing the AC cord from the electric outlet. Never allow terminals to touch each other.
 - b) Attach terminals to battery and chassis as indicated in 14(e), 14(f), 15(b), and 15(d).
14. **FOLLOW THE FOLLOWING STEPS WHEN THE BATTERY IS INSTALLED IN A VEHICLE. A SPARK NEAR THE BATTERY MAY CAUSE A BATTERY EXPLOSION. TO REDUCE RISK OF A SPARK NEAR BATTERY:**
- a) Position AC and DC cords to reduce risk of damage by hood, door, or moving engine part.
 - b) Stay clear of fan blades, belts, pulleys, and other parts that can cause injury to persons.
 - c) Check polarity of battery posts. POSITIVE (POS, P, +) battery post usually has larger diameter than NEGATIVE (NEG, N, -) post.
 - d) Determine which post of battery is grounded (connected) to the chassis. If the negative post is grounded to the chassis

(as in most vehicles), see (e). If the positive post is grounded to the chassis, see (f).

- e) In case of a negative-grounded vehicle, connect the POSITIVE (RED) terminal from the battery charger to the POSITIVE (POS, P, +) ungrounded post of the battery. Connect the NEGATIVE (BLACK) terminal to the chassis or engine block of the vehicle, away from battery. Do not connect the terminal to the carburetor, fuel lines, or sheet-metal body parts. Connect to a heavy gage metal part of the frame or the engine block. Connect the AC cord to the socket.
- f) In case of a positive-grounded vehicle, connect the NEGATIVE (BLACK) terminal from the battery charger to the NEGATIVE (NEG, N, -) ungrounded post of the battery. Connect the POSITIVE (RED) terminal to the chassis or engine block of the vehicle, away from the battery. Do not connect the terminal to the carburetor, fuel lines, or sheet-metal body parts. Connect to a heavy gage metal part of the frame or the engine block. Connect the AC cord to the socket.
- g) When disconnecting the charger, disconnect the AC cord, remove the terminal from the chassis of the vehicle, and finally remove the terminal from the battery terminal.
- h) See "charge algorithms" for length of charge information.

15. FOLLOW THESE STEPS WHEN THE BATTERY IS OUTSIDE OF THE VEHICLE. A SPARK NEAR THE BATTERY MAY CAUSE BATTERY EXPLOSION. TO REDUCE RISK OF A SPARK NEAR THE BATTERY:

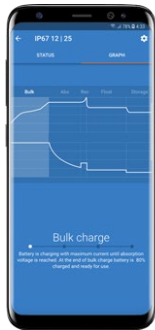
- a) Check the polarity of the battery posts. The POSITIVE (POS, P, +) battery post usually has a larger diameter than the NEGATIVE (NEG, N, -) post.
- b) Connect the POSITIVE (RED) charger terminal to the POSITIVE (POS, P, +) post of the battery.
- c) Do not face the battery when making the final connection.
- d) When disconnecting the charger, always do so in reverse sequence of the connecting procedure and break the first connection while as far away from battery as practical.



- e) A marine (boat) battery must be removed and charged on shore. To charge it on board requires equipment specially designed for marine use.

1. Quick user guide

The Blue Power IP67 chargers will charge and maintain lead-acid and Li-ion batteries, and supply users connected to the battery. In addition, the models with suffix (1+Si) feature a second current limited output which is always powered as long as 110 – 130 VAC is present on the input. This output can for example be used to prevent starting of a vehicle before unplugging the battery charger (start interrupt function).



Blue Smart version

Set-up, monitor and update the charger (add new features when they become available) using Apple and Android smartphones, tablets or other devices with the VictronConnect App.


VictronConnect is available to users of Windows PCs, macOS X, iOS and Android phones, as well as tablets.

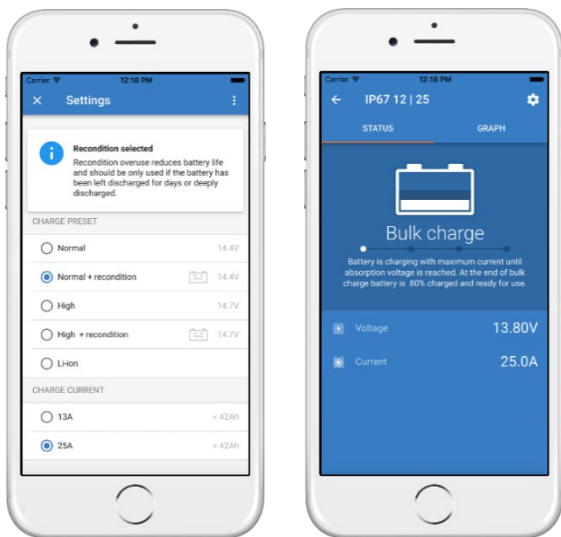
<https://www.victronenergy.com/support-and-downloads/software#victronconnect-app>

VictronConnect: Blue Smart IP67 charger pages

When the Blue Smart charger is powered-up it will be discoverable using the VictronConnect app on your device.

The 'home' page shows information about the battery voltage, charge current, and where your battery is in the charging-cycle.

To access the Settings button click on the cog icon  at the top right of the screen. From here you can choose a preset charge algorithm, you can select the charge current; and you can choose to employ the charge algorithm for a Li-ion battery when that is appropriate.



Installation and instructions for use

1. The battery charger must be installed in a well-ventilated area close to the battery (but, due to possible corrosive gasses not above the battery!)
2. Connect the ring terminals to the battery: the minus cable (black) to the minus (-) pole of the battery, the plus cable (red) to the plus (+) pole of the battery.
3. Plug the AC mains cable into the wall socket. The charge cycle will now start.

Two LEDs for status indication

Yellow LED: bulk charge (blinking fast), absorption (blinking slow), float (solid), storage (off)

Green LED: power on

Safety regulations and measures

1. Install the charger according to the stated instructions
2. Connections and safety features must be executed according to the locally applicable regulations.
3. Warning: do not attempt to charge non-rechargeable batteries.
4. Warning: a BMS (Battery Management System) may be required to charge a Li-ion battery.
5. This appliance is not intended for use by persons with reduced physical, sensory or mental capabilities, or lack of experience and knowledge, unless they have been given supervision or instruction concerning use of the appliance by a person responsible for their safety. Children should be supervised to ensure that they do not play with the appliance.
6. The charger is designed for lead-acid and Li-ion batteries 14-225Ah. Do not use for any other purpose.

2. 'Must know' features and facts

2.1 Ultra high efficiency "green" battery charger

With up to 95% efficiency, these chargers generate up to four times less heat when compared to the industry standard.

And once the battery is fully charged, power consumption reduces to 0.5 Watt, some five to ten times better than the industry standard.

2.2 Durable, safe and silent

- Low thermal stress on the electronic components.
- Protection against ingress of dust, water and chemicals.
- Protection against overheating: the output current will reduce as temperature increases up to 60°C (140°F), but the charger will not fail.
- The chargers are totally silent: no cooling fan or any other moving parts.

2.3 Reverse polarity protected

In case of wrong polarity connection, the external ATO blade fuse will blow. Check the polarity of the cable and check the correct value before replacing the fuse.

2.4 Recovery function for fully discharged batteries

Most reverse polarity protected chargers will not recognize, and therefore not recharge a battery which has been discharged to zero or nearly zero Volts. The *Blue Smart IP67 Charger* however will attempt to recharge a fully discharged battery with low current and resume normal charging once sufficient voltage has developed across the battery terminals.

2.5 Temperature compensated charging

The optimal charge voltage of a lead-acid battery varies inversely with temperature. The *Blue Smart IP67 Charger* measures ambient temperature during the test phase and compensates for temperature during the charge process. The temperature is measured again when the charger is in low current mode during float or storage. Special settings for a cold or hot environment are therefore not needed.

2.6 Adaptive Battery Management

Lead-acid batteries should be charged in three stages, which are [1] *bulk or constant-current charge*, [2] *absorption or topping charge* and [3] *float charge*.

Several hours of absorption charge are needed to fully charge the battery and prevent early failure to sulfation¹.

The relatively high voltage during absorption does however accelerate aging due to grid corrosion on the positive plates.

Adaptive Battery Management limits corrosion by reducing absorption time when possible, that is: when charging a battery that is already (nearly) fully charged.

2.7 Storage mode: less corrosion of the positive plates

Even the lower float charge voltage that follows the absorption period will cause grid corrosion. It is therefore essential to reduce the charge voltage even further when the battery remains connected to the charger during more than 48 hours.

2.8 Reconditioning

A lead-acid battery that has been insufficiently charged or has been left discharged during days or weeks will deteriorate due to sulfation¹. If caught in time, sulfation can sometimes be partially reversed by charging the battery with low current up to a higher voltage.

Remarks:

- Reconditioning should be applied only occasionally to flat plate VRLA (gel and AGM) batteries because the resulting gassing will dry out the electrolyte.
- Cylindrical cell VRLA batteries build more internal pressure before gassing and will therefore lose less water when subjected to reconditioning. Some manufacturers of cylindrical cell batteries therefore recommend the reconditioning setting in case of cyclic application.
- Reconditioning can be applied to flooded batteries to "equalise" the cells and to prevent acid stratification.
- Some battery charger manufactures recommend pulse charging to reverse sulfation. However, most battery experts agree that there is no conclusive proof that pulse charging works any better than constant voltage charging. This is confirmed by our own tests.

2.9 Lithium-ion (LiFePO₄) batteries

Li-ion batteries do not suffer from sulfation.

But Li-ion batteries are very sensitive to under voltage or over voltage².

Li-ion batteries therefore often have integrated cell balancing and under voltage protection (UVP) circuitry.

Some reverse polarity protected chargers will not recognize a battery when the UVP has tripped.

The *Blue Smart Charger* will however automatically reset the UVP and start charging.

Important note:

NEVER attempt to charge a Li-ion battery when its temperature is below 0°C (32°F).

2.10 Low current mode

Some lead acid batteries can overheat if charged with a current exceeding 0.3C (C is the capacity in Ah. A 12Ah battery for example should not be charged with a current exceeding $0.3 \times 12 = 4\text{A}$). The low current mode (charge current limited to 4A or less, see technical specifications) should therefore be used to charge low capacity lead-acid batteries.

¹ For more information about batteries, please refer to our book 'Energy Unlimited' (downloadable from www.victronenergy.com), or http://batteryuniversity.com/learn/article/sulfation_and_how_to_prevent_it

² For more information about Li-ion batteries please see <http://www.victronenergy.com/batteries/lithium-battery-12,8v/>

3. Charge algorithms

3.1 Smart charge algorithm with optional reconditioning for lead-acid batteries

Charge voltages at room temperature:

MODE	ABS V	FLOAT V	STORAGE V	RECONDITION Max V@% of Inom
NORMAL	14.4	13.8	13.2	16.2@8%, max 1h
HIGH	14.7	13.8	13.2	16.5@8%, max 1h
LI-ION	14.2	13.5	13.5	n. a.

For 24V chargers: multiply all voltage values by 2.

NORMAL (14.4V): recommended for flooded flat plate lead antimony batteries (starter batteries), flat plate gel and AGM batteries.

HIGH (14.7V): recommended for flooded lead calcium batteries, Optima spiral cell batteries and Odyssey batteries.

State of the art microprocessor controlled charge algorithm

Adaptive 5-stage charge characteristic: bulk – absorption – recondition - float – storage

The Blue Smart IP67 charger features a microprocessor controlled 'adaptive' battery management system. The 'adaptive' feature will automatically optimise the process relative to the way the battery is being used.

1. BULK

Charges the battery with maximum current until absorption voltage is reached. The battery will then be about 80% charged and is ready for use.

2. ABS - Absorption

Charges the battery at constant voltage and with decreasing current until it is fully charged.

See table above for absorption voltage at room temperature.

Adaptive battery management:

The absorption time is short (minimum 30 minutes) if the battery

was (nearly) fully charged and increases to 8 hours in case of a deeply discharged battery.

3. RECONDITION

Optional reconditioning for deeply discharged lead-acid batteries.

Reconditioning is applicable to the charge algorithms NORMAL and HIGH and can be selected with the App on your smartphone.

When in RECONDITION mode the battery will be charged with low current up to a higher voltage at the end of the absorption phase.

During reconditioning the maximum current is equal to 8% of the nominal current until the maximum voltage is reached.

Reconditioning is terminated after one hour or when the maximum voltage is reached, whichever comes first. See table.

Example:

For a 12/7 charger: the recondition current is

$$7 \times 0.08 = 0.56A$$

4. FLOAT

Keeps the battery at constant voltage and fully charged.

5. STORAGE

Keeps the battery at reduced constant voltage to limit gassing and corrosion of the positive plates.

Slow self-discharge is prevented by an automatic weekly refresh of the battery with a short absorption charge.

3.2 Lithium-ion (LiFePO₄) batteries

When charging a Lithium-ion battery, the *Blue Smart IP67 Charger* uses a specific charging algorithm for Lithium-ion batteries, to ensure optimum performance. *Select LI-ION with the app on your smart phone.*

3.3 When a load is connected to the battery

A load can be applied to the battery while charging, as long as the current draw is much lower than the rated output of the battery charger. Reconditioning is not possible when a load is connected to the battery.

Remarks:

- a) Disconnect all loads before attempting to recharge a very weak or fully discharged lead-acid battery. Loads may be reconnected once the bulk phase has started.
- b) Disconnect all loads before attempting to recharge a Li-ion battery when the under voltage protection (UVP) of the Li-ion battery has tripped. Loads may be reconnected once the bulk phase has started.

3.4 Triggering a new charge cycle

A new charge cycle will start when:

- a) The charger has reached float or storage, and, due to a load, current increases up to maximum current during more than four seconds.
- b) The AC supply has been disconnected and reconnected.

3.5 Estimating charge time

A lead-acid battery is about 80% charged at the beginning of the absorption period.

The time **T** to 80% charged can be calculated as follows:

$$T = Ah / I$$

Where:

I is the charge current (= charger output minus load current).

Ah is the amount of Ah to be charged.

A full absorption period of up to 8 hours is needed to charge the battery to 100%.

Example:

Charge time to 80% of a fully discharged 100Ah battery when charged with a 10A *Blue Power Charger*: $T = 100 / 10 = 10 \text{ hours}$

Charge time to 100%: $10 + 8 = 18 \text{ hours}$.

A Li-ion battery is more than 95% charged at the beginning of the absorption period, and reaches 100% charge after approximately 30 minutes absorption charge.

3.6 High internal resistance



When a battery reaches the end of its cycle- or float life, or when it dies prematurely due to sulfation or corrosion, capacity will dramatically drop and internal resistance will increase. The charger will not recognise such a battery during the test phase (it could as well be a nearly fully charged battery).

A very short bulk phase when charging a supposedly discharged battery does however indicate that the battery has reached the end of its useful life.

Remark: sulfation can sometimes be partially reversed by repeated application of the RECONDITION MODE.

3.7 Can be used as a power supply

The charger will supply DC loads when no battery is connected.

4. Technical specifications

Blue Smart IP67 Charger 120V	12V 7/13/17/25 A	24V 5/8/12 A
Input voltage range and frequency	100-130 VAC (2-6A) 45 -65Hz	
Standby power consumption	0.5W	
Charge voltage 'absorption'	Normal: 14.4 V, High: 14.7 V Lithium-ion: 14.2 V	Normal: 28,8 V, High: 29.4 V Lithium-ion: 28.4 V
Charge voltage 'float'	Normal: 13.8 V, High: 13.8 V Lithium-ion: 13.5 V	Normal: 27,6 V, High: 27.4 V Lithium-ion: 27.0 V
Charge voltage 'storage'	Normal: 13.2 V, High: 13.2 V Lithium-ion: 13.5 V	Normal: 26.4 V, High: 26.4 V Lithium-ion: 27.0 V
Charge current	7 / 13 / 17 / 25 A	5 / 8 / 12 A
Charge current in low current mode	2 / 4 / 6 / 10 A	2 / 3 / 4 A
Charge characteristic	5-stage adaptive	
Temperature compensation (lead-acid batteries only)	16 mV/°C (9mV/°F)	32 mV/°C (18mV/°F)
Can be used as power supply	Yes	
Protection	Reverse reverse polarity (fuse), Output short circuit	Over temperature
DC fuse, internal and not replaceable	n.a / n.a. / 25 / 35 A	n.a. / 15 / 20 A
DC fuse in DC cable – ATO blade (A)	20 A (12/25: no fuse)	20 / 10 / 15 A
Operating temp. range	-20 to +60°C (full rated output up to 40°C), 0 to + 140°F (full rated output up to 90°F)	
Humidity	Up to 100%	
Start interrupt option (Si)	Short circuit proof, current limit 0.5A, Output voltage: max one volt lower than main output	
ENCLOSURE		
Material & Colour	Aluminium (blue RAL 5012)	
Battery-connection	Black and red cable with M8 ring terminal 1.8 meter (6 feet) 12/7, 12/13, 24/5 -12 AWG 12/17, 12/25, 24/8, 24/12 - 9 AWG	
120 V AC-connection	Cable of 1.8 meter (6 feet) with US NEMA 5-15 plug	
Protection category	IP67	
Weight	12/7, 12/13, 24/5: 1.8kg (4lbs) 12/17, 12/25, 24/8, 24/12: 2.4kg (5.3lbs)	
Dimensions (h x w x d)	12/7, 12/13, 24/5: 85 x 211 x 60 mm 12/17, 12/25, 24/8, 24/12: 99 x 219 x 65 mm	3.4 x 8.3 x 2.4 inches 3.9 x 8.6 x 2.6 inches
STANDARDS		
Safety	EN 60335-1, EN 60335-2-29 (UL1236 / CSA C22.2)	
Emission	EN 55014-1, EN 61000-3-2	
Immunity	EN 55014-2, EN 61000-3-3	

Compliance Statement

This device complies with part 15 of the FCC rules. Operation is subject to the following two conditions.

- (1) This device may not cause harmful interference.
- (2) This device must accept any interference received, including interference that may cause undesired operation."

This device complies with Industry Canada license exempt RSS Standard(s). Operation is subject to the following two conditions.

- (1) This device may not cause harmful interference.
- (2) This device must accept any interference received, including interference that may cause undesired operation.

Contain FCC ID: SH6MDBT40
Contain IC ID: 8017A MDBT40
Frequency range: 2402 – 2480 MHz
Transmit power: -4dBm

Maintenance

The Blue Smart Charger is maintenance free.

When cleaning the charger remove the plug from the power socket. Then use a damp cloth to clean the exterior.

Five year limited warranty

This limited warranty covers defects in materials and workmanship in this product, and lasts for five years from the date of original purchase of this product. The customer must return the product together with the receipt of purchase to the point of purchase.

This limited warranty does not cover damage, deterioration or malfunction resulting from alteration, modification, improper or unreasonable use or misuse, neglect, exposure to excess moisture, fire, improper packing, lightning, power surges, or other acts of nature.

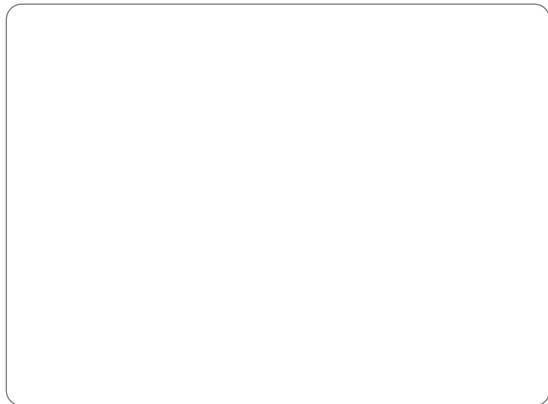
This limited warranty does not cover damage, deterioration or malfunction resulting from repairs attempted by anyone unauthorized by Victron Energy to make such repairs.

Victron Energy is not liable for any consequential damages arising from the use of this product.

The maximum liability of Victron Energy under this limited warranty shall not exceed the actual purchase price of the product.

Victron Energy Blue Power

Distributor:



Serial number:



Version : 00

Date : August 7th, 2020

Victron Energy B.V.

De Paal 35, 1351 JG Almere

PO Box 50016, 1305 AA Almere, The Netherlands

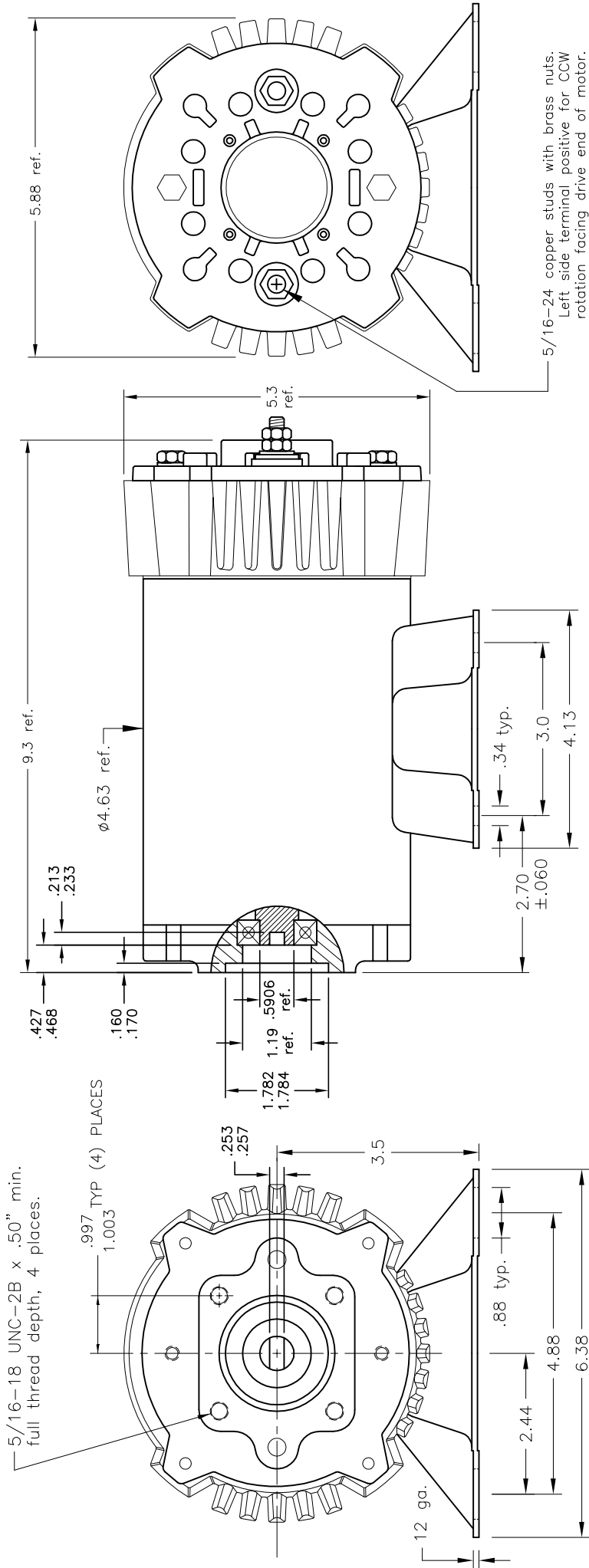
General Phone : +31 (0)36 535 97 00

E-mail : sales@victronenergy.com


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APPENDIX D. HYDRAULIC POWER UNIT

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Note:
1. Motor Enclosure type: TENV




Scott DC Power Products™
A Kinetek Company®

MFG. IN USA PERMANENT MAGNET MOTOR

MODEL	4BC2927	HP	1.0
RPM	3300	INS.CL.	H
VOLT.	12vac	MOUNT	56B
AMP.	84	SHAFT	tang
DUTY	Int	ENCL.	TENV
DATE	***	SER.NO.	****

1501 LAVELLE RD.
ALAMOGORDO, NEW MEXICO 88310
(575)434-0633



Scott DC Power Products™
A Kinetek Company®

1501 LaVelle Road
Alamogordo, NM 88310
Ph 575.434.0633
Fx 575.434.4895

Dr. By: *A. Bednory*
Date: 5/24/99
Primary Dimensions in Inches
Do Not Scale

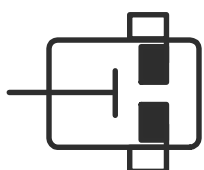
Motor Outline

4BC2927

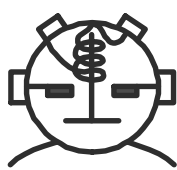
REV. ECO

6.11 Motor Start Switches for D.C. Power Systems

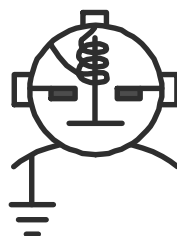
Wiring Diagrams



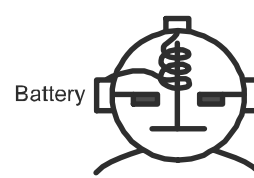
"A"



"B"



"C"



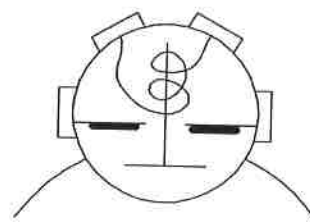
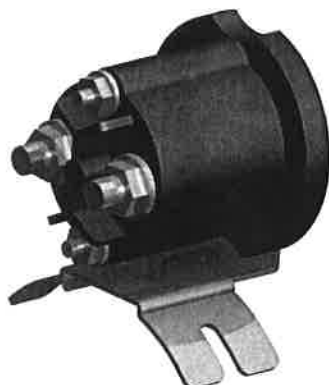
"D"

Part Number	Voltage	Wiring diagram	Coil Duty	Description
03336	12	D	Int.	Insulated Ground
17757	12	C	Int.	
17744	12	B	Int.	
17764	24	B	Int.	
03322	12/24	A	N.A.	Manual Start Only - M-3301, M-3313
04343	12/24	A	N.A.	Round Valve. Cam Start M-3310 Only
01349	N.A.	N.A.	N.A.	Bus Bar
13155	N.A.	N.A.	N.A.	Bus Bar for use with 17764, 17744 & 17757 Solenoids
01361	N.A.	N.A.	N.A.	Battery Cable, 5" Long
01628	N.A.	N.A.	N.A.	Battery Cable, 6" Long

Switches are available with curved mounting for direct attachment to power unit or with flat base for remote mounting. Other Motor Start Switches are also available. Contact Factory.

Key To Abbreviations: H.D. = Heavy Duty
Int. = Intermittent Duty

500208017764 24V

**500208017764 - 24 Volt 4 Post Start Switch**

Life and Electrical Data		
Property	Value	Test Procedures and Notes
Rated Minimum Life	100,000	Manufacturer's Rating
Minimum Test Life	891,000	Tested at 100 Amps, 21 VDC loaded, 24.0 VDC unloaded, 300 ms ON, 1300 ms CYCLE, repeated 24 hours/day until failure
Maximum Test Life	1,991,000	
Average Test Life	1,441,000	
Samples Averaged	2	
Rated Minimum S2	6 Minutes	Manufacturer's Rating
Rated Minimum S3	25%	
Operating Temperature	-40°F to 180°F (-40°C to 82°C)	Manufacturer's Rating
Ingress Protection	IP67	30 Minutes in water at 1.0 meter
Corrosion	ASTM B 117 96 hrs	Manufacturer's Rating
Rated Make Current	800 Amps	Manufacturer's Rating
Rated Break Current	250 Amps	
Rated Carry Current	150 Amps	
Tested Pull-In Voltage	9.4 VDC	Rising Voltage from 0.0 VDC
Tested Drop-Out Voltage	5.6 VDC	Falling Voltage from 24.0 VDC
Tested Coil Resistance	21 ohms	Measured with DMM
Tested Coil Current	1.1 Amps	Measured with DMM 24.0 VDC
Contact Resistance	400 μ ohms	Measured from voltage drop at 250 amps
Coil Heat	27.4 Watts	Calculated from resistance at 24.0 VDC
Contact Heat	9.0 Watts	Calculated from resistance at 150 amps
Total Heat	36.4 Watts	Calculated as sum of Coil and Contact Heat

CV

Check
Valves

SH

Shuttle
Valves

LM

Load/Motor
Controls

FC

Flow
Controls

PC

Pressure
Controls

LE

Logic
Elements

DC

Directional
Controls

MV

Manual
Valves

SV

Solenoid
Valves

PV

Proportional
Valves

CE

Coils &
Electronics

BC

Bodies &
Cavities

TD

Technical
Data

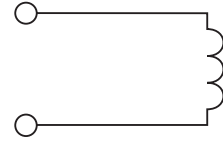
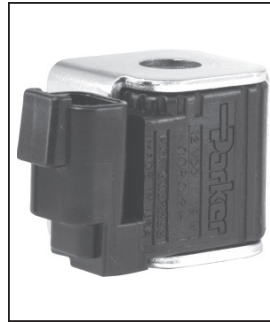
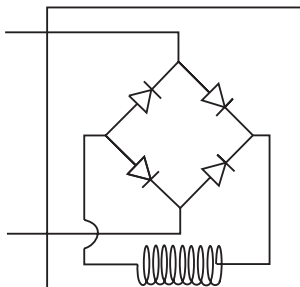
Features

- Integral Deutsch connector coil exceeds IP69K standards
- Integral Deutsch connector coil thermal shock dunk test rated
- Integral Amp Jr. coil exceeds IP67 standards for thermal shock, water resistance and "dunk capability"
- Universal 50/60 Hz operation
- Waterproof coil hermetically sealed, requires no O-rings or waterproofing kits
- External plated steel flux-carrying band (unlike encapsulated band) enables coil to withstand severe thermal shocks without cracking
- Symmetrical coil can be reversed without affecting performance

Specifications

Coil Type	S	Standard
	P	Puissant
Nominal Wattage (See Ordering Information For Exact Wattage)	S	14 Watts
	P	19 Watts
Duty Cycle	Continuous @ 100% voltage	
Magnetic Wire Insulation Class	'N' Rated at 200°C (392°F)	
Temperature Range	-40°C to +200°C (-40°F to +392°F)	
Temperature Rise At Nominal Voltage And Natural Ventilation	S	75°C (135°F)
	P	95°C (172°F)
Dielectric Strength Maximum Current Leakage (Amps)	.0005	In dry lab condition at 1000V AC for 30 seconds
	.001	After being immersed in 23°C (77°F) water with waterproof connector for 24 hours at 500V AC
Encapsulating Material	Glass filled rynite	
Color Identification On The Terminal Boss	S	Black Ring
	P	Red Ring
Weight	0.20 kg (0.44 lbs.)	

AC Coil Assembly



Ordering Information

CC	P	024	D
Super Coil 1/2" I.D.	Wattage	Voltage	Termination

Code	Wattage
S	Standard
P	Puissant

Code	Voltage	Watts		Amps		Ohms**	
	Volts	S	P	S	P	S	P
010	10 VDC	14	19	1.38	1.90	7.25	5.26
012*	12 VDC	14	19	1.15	1.58	10.43	7.58
018	18 VDC	14	19	0.77	1.06	23.48	17.05
024*	24 VDC	14	19	0.58	0.79	41.74	30.30
048	48 VDC	14	19	0.29	0.40	167.0	121.3
115*	115 VAC	16	19	0.17	0.20	680	576
230	230 VAC	17	22	0.09	0.12	2596	1919

*Standard Voltages

**Resistance ±10% at 68°F

Code	Termination
A	Amp Jr. (DC Only)
AD	Amp Jr. with 3 Amp Diode (DC Only)
C	Double Lead Wire with Conduit Connector (AC Only)
*D	DIN 43650 (AC or DC, Supplied without DIN Connector)
H	Integral Deutsch
HE	Integral Deutsch with 3 Amp Diode
*L	Double Lead (DC Only)
LS	Sealed Lead Wire IP69K Rated (Available January 1, 2011)
LD	Double Lead with Deutsch Connector DT04-2P-EP04 (DC Only) (Use 'H' series if possible)
LE	Double Lead with 3 Amp Diode (DC Only)
PF	Double Lead Wire with Packard Female Weather Pack Connector 1201 5792 (DC Only)
PM	Double Lead Wire with Packard Male Weather Pack Connector 1201 0973 (DC Only)
*S	Double Spade (DC Only)
*W	Double Screw (DC only)
WE	Double Screw with 3 Amp Diode (DC Only)
*Y	Single Screw (Internally Grounded, DC Only)

*UL listed 12/24/48 VDC only.

Note: Additional voltages and other terminals are available. Some coils are UL approved. For details please consult factory.

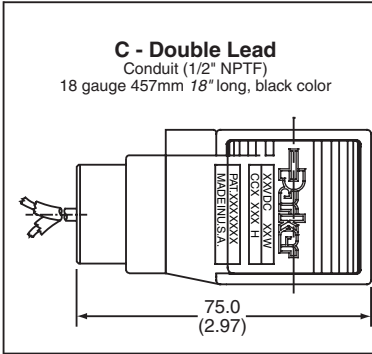
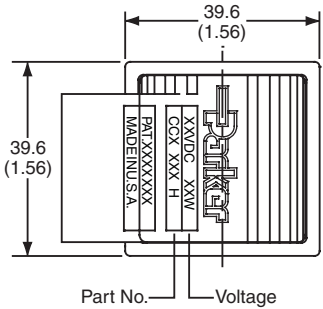
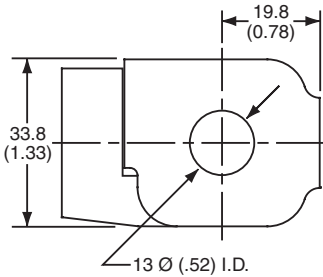
DIN Female Mating Connector: See page CE2

Deutsch Mating Connector: # DT06-2S

Packard Male Weather Pack Connector: 12010973

Packard Female Weather Pack Connector: 12015792

Terminal Styles and Dimensions



S - Double Spade 56.0 (2.21)	L - Double Lead 18 gauge 457mm 18" long black color 53.0 (2.07)	A - Amp Junior AD - Amp Junior with 3 Amp Diode (+ and - metered) 67.0 (2.62)
Y - Single Screw (Internal ground) 8-32 UNC screw & nut W - Double Screw 8-32 UNC screw & nut WE - Double Screw with 3 Amp Diode (+ and - metered) 57.0 (2.25)	LE - Double Lead with 3 Amp Diode 18 gauge 457mm (18") long Red wire positive, Black wire negative Diode protection from positive to negative 53.0 (2.07)	PF - Female Packard Connector PM - Male Packard Connector 177.0 (7.0) 53.0 (2.07)
C - Double Lead Conduit (1/2" NPTF) 18 gauge 457mm 18" long, black color 75.0 (2.97)	H - Integral Deutsch DT04 - 2P - EP04 HE - Integral Deutsch with 3 Amp Diode (+ and - metered) 62.74 (2.47)	D - DIN 43650 (ground wire on AC only) 64.0 (2.53)

- NOTES:**
1. The standard A.C. coil includes a molded-in full wave rectifier rated for 800 peak reverse voltage.
 2. All P Puissant (high wattage) coils use a red ring as an indication marker on the terminal boss.



718164 - Wire connector assembly with 36" leads for Super Coils with Integral Deutsch connectors.

- CV
- Check Valves
- SH
- Shuttle Valves
- LM
- Load/Motor Controls
- FC
- Flow Controls
- PC
- Pressure Controls
- LE
- Logic Elements
- DC
- Directional Controls
- MV
- Manual Valves
- SV
- Solenoid Valves
- PV
- Proportional Valves
- CE
- Coils & Electronics
- BC
- Bodies & Cavities
- TD
- Technical Data

SoliStat™ Temperature Controls

Tamper-Proof D.C. Temperature Controls for Harsh Environments

U.S. Patent 8,500,034



Overview

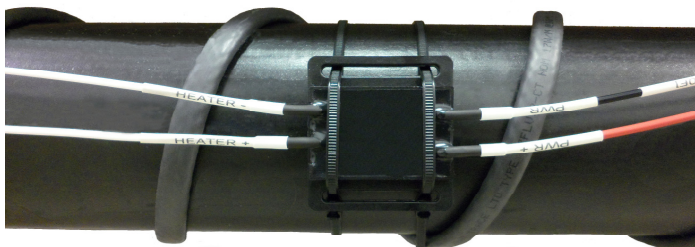
Ease of Use, Unequaled Performance

engenuity's SoliStat 2 is the basis for a family of reliable and easy to use temperature controlled switches for D.C. powered heating and cooling applications. Ranging from the original SoliStat 2-10—a self-contained, temperature control for loads up to 10A—to the SoliStat 2XD—a compact, dual loop temperature controller for loads up to 10A per channel—all members of the SoliStat family of temperature controls share the following design characteristics:

- Accurate, tamper-proof setpoints
- MTBF > 5M cycles
- Operating temperature range from -40°C to $+125^{\circ}\text{C}$
- Accurate trip point temperatures below 32°F
- Rugged, weather-proof housing

Solid-State Reliability

All SoliStat models utilize semiconductor output switches that are heavily protected against ESD. In addition, the outputs will withstand the counter-EMF generated at switch-off by many inductive loads. Because of this SoliStat will outlast any relay or contactor that may have been considered for your application.



*SoliStat 2 in a 12VDC heat tracing application
(insulation removed).*

Applications

The SoliStat line of temperature controls have been developed for D.C. powered applications that require on/off control in response to changing temperatures, such as:

- Turning on fans or compressors for cooling applications
- Controlling power to heaters or heat trace cable
- Switching on pumps for heating or cooling

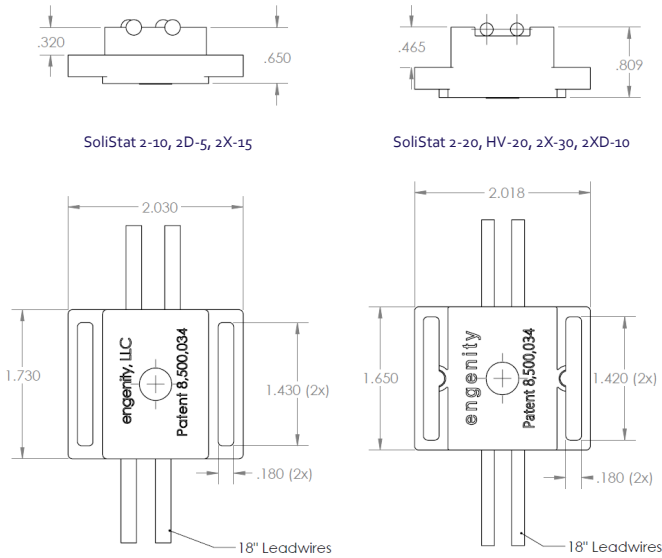
Specific applications of SoliStat controls include:

- Heating CCV filters in Tier IV diesel engines
- Condensate freeze prevention in CCV drain lines
- Freeze prevention of DEF lines in diesel locomotives
- Diesel fuel filter and fuel line warming
- Battery cabinet warming
- Vapor Recovery Unit freeze prevention
- Telemetry equipment cabinet warming and cooling
- Water line and water filter freeze prevention
- Seize-up prevention in pneumatic valves



SoliStat 2XD-10 with heaters for a CCV filter warming application

Standard Product Dimensions (inches)



Standard Features

- Operating Temperature: -40°C (-40°F) to $+125^{\circ}\text{C}$ ($+257^{\circ}\text{F}$)
- Storage Temperature: -65°C (-76°F) to $+150^{\circ}\text{C}$ ($+302^{\circ}\text{F}$)
- Set-point Tolerance: $\pm 1.1^{\circ}\text{C}$ ($\pm 2^{\circ}\text{F}$)
- Housing Material: Mineral Filled Nylon
- Sensor Heatsink: Anodized Aluminum
- Leads: stranded wire, ETFE insulation MIL-W-22759/16
- Lead Length: 18" standard, other lengths available
- Dust and Water Resistance: IP67
- RoHS Compliance: Yes
- All SoliStat configurations can be programmed for heating mode or cooling mode.
- SoliStat configurations with two output channels can be programmed for heat/cool mode.
- SoliStat can be programmed for either ON/OFF or fixed ON-time control. PID control available on request; consult the factory or your local representative for details.

SoliStat Configurations

Standard SoliStat temperature controls are available in the following configurations:

Product	Operating Voltage Range	Sensor Channels	Sensor	Output Channels	Maximum Output Current	Shutdown Mode Available
SoliStat 2-10	6—24V	1	Int. RTD	1	10A	Y
SoliStat 2-20	6—24V	1	Int. RTD	1	20A	Y
SoliStat 2D-5	6—24V	1	Int. RTD	2	5A/ch	Y
SoliStat HV-20	20—48V	1	Int. RTD	1	20A	N
SoliStat 2X-15	6—24V	1 or 2	Ext. RTD or K t/c	1	15A	Y
SoliStat 2X-30	6—24V	1 or 2	Ext. RTD or K t/c	1	30A	Y
SoliStat 2XD-10	6—24V	1 or 2	Ext. RTD or K t/c	2	10A/ch	Y

Other Temperature Controls

SoliStat's not quite right for your application? Give us a call; we can probably help you out. We have designed customer-specific controls for applications requiring more than two input channels, more than two output channels, sources up to 100VDC, and total system current to 100ADC.



SoliStat 2 is not protected against long-term accidental reverse polarity connection to the power supply. Please consult your local representative or the factory if you require reverse polarity protection!



www.engenity.com



Made in the U.S.A.



engenity, LLC
2306 Robbins Street
Saint Paul, Minnesota 55114-1142

+1 (651) 288-2590

SERIES 12X SHORTSTOP® CIRCUIT BREAKERS

AUTO, MANUAL & MODIFIED RESET CIRCUIT BREAKERS

SPECIFICATIONS

Single Pole Thermal Type Breakers

Applications: Battery chargers, trucks, buses, RV's, trolling motors, etc.

Rating: 5-50A, 14VDC; 28VDC (Series 123, 124, & 125).

Interrupt Rating: Main Circuit Protection: 1.5kA @ 12VDC (Series 193 w/plastic cover); Branch Circuit Protection: 2.5kA @ 12VDC (Series 121 & 124 -01 sealed & Series 123 w/plastic cover).

Operating Temperature Rating: -40°F (-40°C) to 185°F (85°C).

Storage Temperature Rating: -40°F (-40°C) to 260°F (125°C).

Materials: Black UL-Rated thermoplastic body (thermoset for Type II body & buttons); Cover is grey thermoplastic or steel-Type I gold, Type II silver.

Marking: Custom marking available. Consult factory for options.

Termination: #10-32 thread and quick-connect options available.

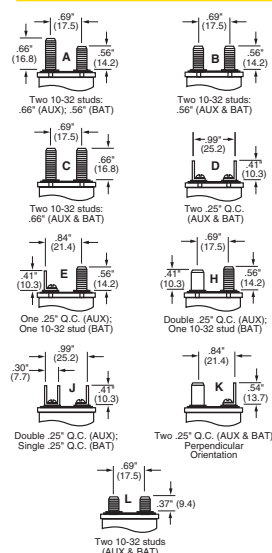
Torque Rating: 24in-lb (2.7Nm) max.

Mounting Torque Rating: Plastic cover - 15in-lb (1.7Nm); Metal cover - 30in-lb (3.4Nm).

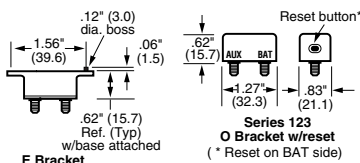
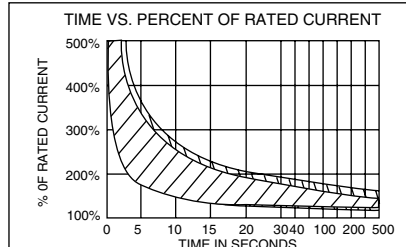
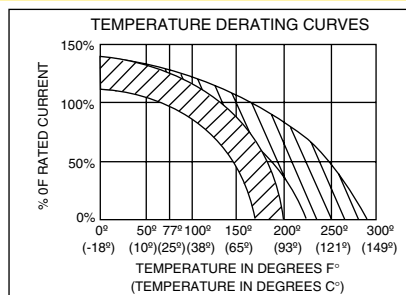
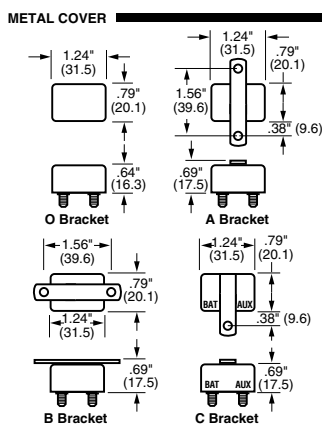
Ingress Protection Rating: IP66 on plastic cover version only (except for terminals).

Compliances: SAE J553; SAE J1171 (consult factory for Ignition Protection ratings).

TERMINAL OPTIONS



COVER & BRACKET OPTIONS (Dims. shown are for reference only. Consult factory for latest prints)



HARDWARE

WA / WB HA / HB KA / KB



Whiz Lock
#10-32



Hex Nut
#10-32



Keps Lock Nut
#10-32



Lock Washer

PART NUMBERING SYSTEM

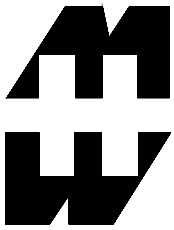
121B20-A2P-KA

Series	Terminal	Rating	Bracket	Mtg. Holes	Cover*	Options	Hardware
1 2							
121 - Type I, 14 VDC	A - Two 10-32 studs; .66 (Aux), .56 (Bat)	05 - 5 amps 08 - 8 amps	0 - No bracket A - Bracket	0 - No bracket 1 - .140 dia.	M - Metal* P - Plastic*	01 - Waterproof (metal covers only)	WA - Whiz-lock nut assembled
122 - Type II, 14 VDC	B - Two 10-32 studs; .56 (Aux & Bat)	10 - 10 amps 12 - 12 amps	B - Bracket C - Bracket	2 - .196 dia. 3 - .237 dia. (metal only)		02 - Splashproof (optional on metal covers - add 02 suffix; std. on plastic covers - omit 02 suffix.)	WB - Whiz-lock nut bulk
123 - Type III, 28 VDC	C - Two 10-32 studs; .66 (Aux & Bat)	15 - 15 amps 20 - 20 amps	E - Bracket (plastic only)	4 - .265 dia. (plastic only)			HA - Nut & lock washer assembled
124 - Type I, 28 VDC	***D - Two .250 QC; (Aux & Bat)	25 - 25 amps 30 - 30 amps		5 - .228 dia. (plastic only)			HB - Nut & lock washer bulk
125 - Type II, 28 VDC	**H - One 10-32 stud .56 (Bat), Double .250 QC (Aux)	35 - 35 amps 40 - 40 amps 50 - 50 amps		6 - .221 dia. (metal only)			KA - Keps lock nut assembled
	L - Two 10-32 studs; .37 (Aux & Bat)						KB - Keps lock nut bulk

*Series 123 available in plastic cover only. Series 122 & 125 available in metal cover only. **40A maximum ***30A maximum

APPENDIX E. BARRIER CONTROL UNIT

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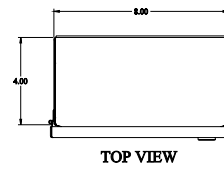


PART No. EJ1084

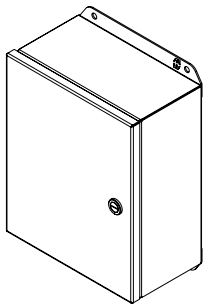
for more information visit
www.hammfg.com

Data subject to change without notice

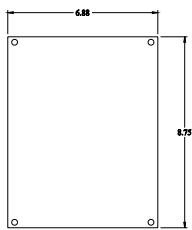
Isometric drawing Not to Scale



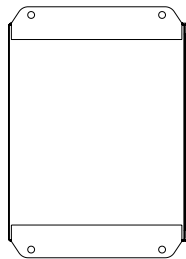
TOP VIEW



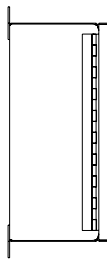
ISOMETRIC VIEW



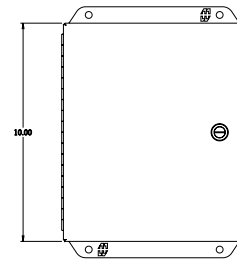
INNER PANEL



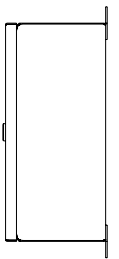
BACK VIEW



SIDE VIEW



FRONT VIEW



SIDE VIEW



BOTTOM VIEW

PRODUCT-DETAILS

OC25G02PNBN00NA2

OC25G02PNBN00NA2 Cam switch



General Information

Extended Product Type	OC25G02PNBN00NA2
Product ID	1SCA126440R1001
EAN	6417019564111
Catalog Description	OC25G02PNBN00NA2 Cam switch
Long Description	OC25 Cam switch, Ith=25A, ON-OFF, 2-contacts, Snap-on door mounting, Black Basic handle. Black handle and frontplate with standard text are included. Special engraved frontplates to be ordered as separate items.

Ordering

Minimum Order Quantity	10 piece
Customs Tariff Number	85365080
Last Ordering Date	2020-09-30 All Countries

Popular Downloads

Data Sheet, Technical Information	1SCC302009C0201
Instructions and Manuals	1SCC302013F0006
Wiring Diagram	1SCC302014M0201

Dimensions

Product Net Width	51 mm
Product Net Height	51 mm
Product Net Depth / Length	83 mm
Product Net Weight	0.09 kg

Technical

Rated Operational Current AC-22A (I_e)	(500 V) 20 A (690 V) 20 A
Rated Operational Current AC-23A (I_e)	(690 V) Three Phase 5.9 A (500 V) Three Phase 8.1 A (230 V) Three Phase 15 A (400 V) Three Phase 15 A
Rated Operational Power AC-23A (P_e)	(690 V) Three Phase 4.8 kW (500 V) Three Phase 4.8 kW (230 V) Three Phase 2.6 kW (400 V) Three Phase 7.5 kW
Conventional Free-air Thermal Current (I_{th})	q = 40 °C 25 A
Conventional Thermal Current (I_{the})	Fully Enclosed 25 A
Rated Continuous Thermal Current	25 A
Rated Impulse Withstand Voltage (U_{imp})	4 kV
Rated Insulation Voltage (U_i)	690 V
Rated Operational Voltage	690 V
Rated Short-time Withstand Current (I_{cw})	for 1 s 0.3 kA for 3 s 0.173 kA
Power Loss	1.8 W
Pollution Degree	3
Handle Type	Basic handle
Special Functions	ON - OFF switch: 0-position: 9 o'clock, step angle 90°, front plate 0-1
Color	Black
Mounting Type	Snap-on door mounting
Number of Contacts	2
Number of Poles	2
Enclosure Type	Not enclosed
Terminal Type	Screw Terminals

Technical UL/CSA

Ampere Rating UL/CSA	600 V AC 25 A
----------------------	---------------

Certificates and Declarations (Document Number)

Declaration of Conformity - CE	1SCC302005D0201
Instructions and Manuals	1SCC302013F0006

Container Information

Package Level 1 Units	1 piece
Package Level 1 Width	70 mm

Package Level 1 Depth / Length	122 mm
Package Level 1 Height	70 mm
Package Level 1 Gross Weight	0.09 kg
Package Level 1 EAN	6417019564111

Classifications

Object Classification Code	Q
ETIM 5	EC002611 - Control switch
ETIM 6	EC002611 - Control switch
ETIM 7	EC002611 - Control switch
UNSPSC	39122217
WEEE Category	5. Small Equipment (No External Dimension More Than 50 cm)
E-Number (Sweden)	3134293

Categories

Low Voltage Products and Systems → Switches → Cam Switches



"Compact" range with display CD12 Part number 88970041



- Green LCD with 4 lines of 18 characters and configurable backlighting
- More cost effective solution
- Industrial temperature range (-20 °C → +55 °C)
- Analogue inputs 0-10 VDC or 0-20 mA/Pt100 with converters
- Selective parameter setting : You can choose the parameters that can be adjusted on the front panel

Part numbers

	Type	Inputs	Outputs	Supply
88970041	CD12	8 digital (including 4 analogue)	4 relays 8 A	24 V DC

Specifications

General environment characteristics for CB, CD, XD, XB, XR and XE product types

Certifications	CE, UL, CSA, GL
Conformity to standards (with the low voltage directive and EMC directive)	IEC/EN 61131-2 (Open equipment) IEC/EN 61131-2 (Zone B) IEC/EN 61000-6-2, IEC/EN 61000-6-3 (*) IEC/EN 61000-6-4 (*) Except configuration (88 970 1.1 or 88 970 1.2) + (88 970 250 or 88 970 270) + 88 970 241 class A (class B in a metal enclosure)
Earthing	None
Protection rating	In accordance with IEC/EN 60529 : IP40 on front panel IP20 on terminal block
Overvoltage category	3 in accordance with IEC/EN 60664-1
Pollution	Degree : 2 in accordance with IEC/EN 61131-2
Max operating Altitude	Operation : 2000 m Transport : 3,048 m
Mechanical resistance	Immunity to vibrations IEC/EN 60068-2-6, Fc test Immunity to shock IEC/EN 60068-2-27, Fa test
Resistance to electrostatic discharge	Immunity to ESD IEC/EN 61000-4-2, level 3
Resistance to HF interference	Immunity to radiated electrostatic fields IEC/EN 61000-4-3, Immunity to fast transients (burst immunity) IEC/EN 61000-4-4, level 3 Immunity to shock waves IEC/EN 61000-4-5 Radio frequency in common mode IEC/EN 61000-4-6, level 3 Voltage dips and breaks (AC) IEC/EN 61000-4-11 Immunity to damped oscillatory waves IEC/EN 61000-4-12
Conducted and radiated emissions	Class B (*) in accordance with EN 55022, EN 55011 (CISPR22, CISPR11) group 1 (*) Except configuration (88 970 1.1 or 88 970 1.2) + (88 970 250 or 88 970 270) + 88 970 241 class A (class B in metallic cabinet)
Operating temperature	-20 → +55 °C (+40 °C in a non-ventilated enclosure) in accordance with IEC/EN 60068-2-1 and IEC/EN 60068-2-2
Storage temperature	-40 → +70 °C in accordance with IEC/EN 60068-2-1 and IEC/EN 60068-2-2
Relative humidity	95 % max. (no condensation or dripping water) in accordance with IEC/EN 60068-2-30
Mounting	On symmetrical DIN profile, 35 x 7.5 mm and 35 mm x 15 or panel (2 x 4 mm Ø)
Screw terminals connection capacity	Flexible wire with ferrule = 1 conductor : 0.25 to 2.5 mm ² (AWG 24...AWG 14) 2 conductors 0.25 to 0.75 mm ² (AWG 24...AWG 18) Semi-rigid wire = 1 conductor : 0.2 to 2.5 mm ² (AWG 25...AWG 14) Rigid wire = 1 conductor : 0.2 to 2.5 mm ² (AWG 25...AWG 14) 2 conductors 0.2 to 1.5 mm ² (AWG 25...AWG 16) Tightening torque = 0.5 N.m (4.5 lb-in) (tighten using screwdriver diam. 3.5 mm)

Processing characteristics of CB, CD, XD & XB product types

LCD display	CD, XD : Display with 4 lines of 18 characters
Programming method	Function blocks / SCF (Grafset) or Ladder
Program size	For CB, CD : 4 Ko : 64 macros max. 256 blocks max. per macro

	180 typical blocks For XB, XD : 8 Ko : 64 macro max. 256 blocks max. per macro 350 typical blocks Or for CB, CD, XB, XD : 120 lines in Ladder
Program memory	Flash EEPROM
Removable memory	EEPROM
Data memory	368 bit/200 words
Back-up time in the event of power failure	Program and settings in the controller : 10 years Program and settings in the plug-in memory : 10 years Data memory : 10 years
Cycle time	Function blocks : 6 → 90 ms (typically 20 ms) Ladder : typically 20 ms
Response time	Input acquisition time : 1 to 2 cycle times
Clock data retention	10 years (lithium battery) at 25 °C
Clock drift	Drift < 12 min/year (at 25 °C) 6 s/month (at 25 °C with user-definable correction of drift)
Timer block accuracy	1 % ± 2 cycle times
Start up time on power up	< 1,2 s

Characteristics of products with AC power supplied

Supply	24 V AC (88970..4)	100 → 240 V AC (88970..3)
Nominal voltage	24 V AC	100 → 240 V AC
Operating limits	-15 % / +20 % or 20.4 VAC → 28.8 VAC	-15 % / +10 % or 85 VAC → 264 VAC
Supply frequency range	50/60 Hz (+4 % / -6 %) or 47 → 53 Hz/57 < 63 Hz	50/60 Hz (+4 % / -6 %) or 47 → 53 Hz/57 < 63 Hz
Immunity from micro power cuts	10 ms (repetition 20 times)	10 ms (repetition 20 times)
Max. absorbed power	CB12-CD12-XD10-XB10 : 4 VA CB20-CD20 : 6 VA XD10-XB10 with extension : 7,5 VA XD26-XB26 : 7.5 VA XD26-XB26 with extension : 10 VA	CB12-CD12-XD10-XB10 : 7 VA CB20-CD20 : 11 VA XD10-XB10 with extension : 12 VA XD26-XB26 : 12 VA XD26-XB26 with extension : 17 VA
Isolation voltage	1780 V AC	1780 V AC
Inputs	24 V AC (88970..4)	100 → 240 V AC (88970..3)
Input voltage	24 V AC (-15 % / +20 %)	100 → 240 V AC (-15 % / +10 %)
Input current	4,4 mA @ 20,4 V AC 5,2 mA @ 24,0 V AC 6,3 mA @ 28,8 V AC	0,24 mA @ 85 V AC 0,75 mA @ 264 V AC
Input impedance	4.6 kΩ	350 kΩ
Logic 1 voltage threshold	≥ 14 V AC	≥ 79 V AC
Making current at logic state 1	>2 mA	>0.17 mA
Logic 0 voltage threshold	≤ 5 V AC	≤ 20 V AC (≤ 28 V AC : XE10, XR06, XR10, XR14)
Release current at logic state 0	<0.5 mA	<0.5 mA
Response time with LADDER programming	50 ms State 0 → 1 (50/60 Hz)	50 ms State 0 < 1 (50/60 Hz)
Response time with function blocks programming	Configurable in increments of 10 ms 50 ms min. up to 255 ms State 0 → 1 (50/60 Hz)	Configurable in increments of 10 ms 50 ms min. up to 255 ms State 0 → 1 (50/60 Hz)
Maximum counting frequency	In accordance with cycle time (Tc) and input response time (Tr) : 1/ ((2 x Tc) + Tr)	In accordance with cycle time (Tc) and input response time (Tr) : 1/ ((2 x Tc) + Tr)
Sensor type	Contact or 3-wire PNP	Contact or 3-wire PNP
Input type	Resistive	Resistive
Isolation between power supply and inputs	None	None
Isolation between inputs	None	None
Protection against polarity inversions	Yes	Yes
Status indicator	On LCD screen for CD and XD	On LCD screen for CD and XD

Characteristics of relay outputs common to the entire range

Max. breaking voltage	5 → 30 V DC 24 → 250 V AC
Breaking current	CB-CD-XB10-XD10-XR06-XR10 : 8 A XD26-XB26 : 8 x 8 A relays, 2 x 5 A relays XE10 : 4 x 5 A relays XR14 : 4 x 8 A relays, 2 x 5 A relays
Electrical durability for 500 000 operating cycles	Usage category DC-12 : 24 V, 1.5 A Usage category DC-13 : 24 V (L/R = 10 ms), 0.6 A Usage category AC-12 : 230 V, 1.5 A Usage category AC-15 : 230 V, 0.9 A
Max. Output Common Current	12A for O8,O9,OA
Minimum switching capacity	10 mA (at minimum voltage of 12 V)
Minimum load	12 V, 10 mA
Maximum rate	Off load : 10 Hz At operating current : 0.1 Hz
Mechanical life	10,000,000 operations (cycles)
Voltage for withstanding shocks	In accordance with IEC/EN 60947-1 and IEC/EN 60664-1 : 4 kV
Off-cycle response time	Make 10 ms Release 5 ms
Built-in protections	Against short-circuits : None Against overvoltages and overloads : None
Status indicator	On LCD screen for CD and XD

Characteristics of product with DC power supplied

Supply	12 V DC (88970..5 & 8970814 & 88970840)	24 V DC (88970..1 et 88970..2)
Nominal voltage	12 V DC	24 V DC
Operating limits	-13 % / +20 % or 10.4 V DC < 14.4 V DC (including ripple)	-20 % / +25 % or 19.2 V DC < 30 V DC (including ripple)
Immunity from micro power cuts	≤ 1 ms (repetition 20 times)	≤ 1 ms (repetition 20 times)
Max. absorbed power	CB12 with solid state outputs : 1.5 W CD12 : 1.5 W CD20 : 2.5 W XD26-XB26 : 3 W XD26-XB26 with extension : 5 W XD26 with solid state outputs : 2.5 W	CB12-CD12-CD20 with solid state outputs - XD10-XB10 with solid state outputs : 3 W XD10-XB10 with relay outputs : 4 W XD26-XB26 with solid state outputs : 5 W CB20-CD20 with relay outputs : 6 W XD26 with relay outputs : 6 W XD10-XB10 with extension : 8 W XD26-XB26 with extension : 10 W
Protection against polarity inversions	Yes	Yes
Digital inputs (I1 to IA and IH to IY)	12 V DC (88970..5 & 88970814 & 88970840)	24 V DC (88970..1 and 88970..2)
Input voltage	12 V DC (-13 % / +20 %)	24 V DC (-20 % / +25 %)
Input current	3,9 mA @ 10,44 V DC 4,4 mA @ 12,0 V DC 5,3 mA @ 14,4 VDC	2,6 mA @ 19,2 V DC 3,2 mA @ 24 V DC 4,0 mA @ 30,0 VDC
Input impedance	2.7 kΩ	7.4 kΩ
Logic 1 voltage threshold	≥ 7 V DC	≥ 15 V DC
Making current at logic state 1	≥2 mA	≥2.2 mA
Logic 0 voltage threshold	≤ 3 V DC	≤ 5 V DC
Release current at logic state 0	<0.9 mA	<0.75 mA
Response time	1 →2 cycle times + 6 ms	1 →2 cycle times + 6 ms
Maximum counting frequency	I1 & I2 : FBD (Up to 6 k Hz) & Ladder (1 k Hz) I3 to IA & IH to IY : in accordance with cycle time (Tc) and input response time (Tr) : 1/ ((2 x Tc) + Tr)	I1 & I2 : FBD (Up to 6 k Hz) & Ladder (1 k Hz) I3 to IA & IH to IY : in accordance with cycle time (Tc) and input response time (Tr) : 1/ ((2 x Tc) + Tr)
Sensor type	Contact or 3-wire PNP	Contact or 3-wire PNP
Conforming to IEC/EN 61131-2	Type 1	Type 1
Input type	Resistive	Resistive
Isolation between power supply and inputs	None	None
Isolation between inputs	None	None
Protection against polarity inversions	Yes	Yes
Status indicator	On LCD screen for CD and XD	On LCD screen for CD and XD
Analogue or digital inputs (IB to IG)	12 V DC (88970..5 & 88970814 & 88970840)	24 V DC (88970..1 and 88970..2)
CB12-CD12-XD10-XB10	4 inputs IB →IE	4 inputs IB →IE
CB20-CD20-XB26-XD26	6 inputs IB →IG	6 inputs IB →IG
Inputs used as analogue input only in FBD		
Measurement range	(0 →10 V) or (0 →V power supply)	(0 →10 V) or (0 →V power supply)
Input impedance	14 kΩ	12 kΩ
Input voltage	14.4 V DC max	30 V DC max
Value of LSB	14 mV	29 mV
Input type	Common mode	Common mode
Resolution	10 bit at maximum input voltage	10 bit at maximum input voltage
Conversion time	Controller cycle time	Controller cycle time
Accuracy at 25 °C	± 5 %	± 5 %
Accuracy at 55 °C	± 6.2 %	± 6.2 %
Repeat accuracy at 55 °C	± 2 %	± 2 %
Isolation between analogue channel and power supply	None	None
Cable length	10 m maximum, with shielded cable (sensor not isolated)	10 m maximum, with shielded cable (sensor not isolated)
Protection against polarity inversions	Yes	Yes
Potentiometer control	2.2 kΩ/0.5 W (recommended) 10 kΩ max.	2.2 kΩ/0.5 W (recommended) 10 kΩ max.
Inputs used as digital inputs		
Input voltage	12 V DC (-13 % / +20 %)	24 V DC (-20 % / +25 %)
Input current	0,7 mA @ 10,44 VDC 0,9 mA @ 12,0 VDC 1,0 mA @ 14,4VDC	1,6 mA @ 19,2 VDC 2,0 mA @ 24,0 V DC 2,5 mA @ 30,0 VDC
Input impedance	14 kΩ	12 kΩ
Logic 1 voltage threshold	≥ 7 V DC	≥ 15 VDC
Making current at logic state 1	≥0.5 mA	≥1.2 mA
Logic 0 voltage threshold	≤ 3 V DC	≤ 5 V DC
Release current at logic state 0	≤0.2 mA	≤0.5 mA
Response time	1 →2 cycle times	1 →2 cycle times
Maximum counting frequency in FBD	In accordance with cycle time (Tc) and input response time (Tr) : 1/ ((2 x Tc) + Tr)	In accordance with cycle time (Tc) and input response time (Tr) : 1/ ((2 x Tc) + Tr)
Sensor type	Contact or 3-wire PNP	Contact or 3-wire PNP
Conforming to IEC/EN 61131-2	Type 1	Type 1
Input type	Resistive	Resistive
Isolation between power supply and inputs	None	None
Isolation between inputs	None	None
Protection against polarity inversions	Yes	Yes
Status indicator	On LCD screen for CD and XD	On LCD screen for CD and XD
Characteristics of relay outputs common to the entire range		

Max. breaking voltage	5 →30 V DC 24 →250 V AC	
Max. Output Common Current	12A (10A UL) for O8,O9,OA	
Breaking current	CB-CD-XD10-XB10-XR06-XR10 : 8 A XD26-XB26 : 8 x 8 A relays, 2 x 5 A relays XE10 : 4 x 5 A relays XR14 : 4 x 8 A relays, 2 x 5 A relays	
Electrical durability for 500 000 operating cycles	Usage category DC-12 : 24 V, 1,5 A Usage category DC-13 : 24 V (L/R = 10 ms), 0,6 A Usage category AC-12 : 230 V, 1,5 A Usage category AC-15 : 230 V, 0,9 A	
Minimum switching capacity	10 mA (at minimum voltage of 12 V)	
Minimum load	12 V, 10 mA	
Maximum rate	Off load : 10 Hz At operating current : 0.1 Hz	
Mechanical life	10,000,000 operations (cycles)	
Voltage for withstanding shocks	In accordance with IEC/EN 60947-1 and IEC/EN 60664-1 : 4 kV	
Off-cycle response time	Make 10 ms Release 5 ms	
Built-in protections	Against short-circuits : None Against overvoltages and overloads : None	
Status indicator	On LCD screen for CD and XD	
Digital / PWM solid state output	12 V DC (88970814 & 88970840)	24 V DC (88970..2)
PWM solid state output*	CB12 : O4 XD26 : O4 →O7	CD12-XD10-XB10 : O4 CD20-XD26-XB26 : O4 →O7
* Only available with "FBD" programming language	* Only available with "FBD" programming language	
Breaking voltage	10.4 →30 VDC	19.2 →30 VDC
Nominal voltage	12-24 V DC	24 V DC
Nominal current	0.5 A	0.5 A
Max. breaking current	0,625 A	0,625 A
Voltage drop	≤ 2 V for I = 0.5 A (at state 1)	≤ 2 V for I = 0.5 A (at state 1)
Response time	Make ≤ 1 ms Release ≤ 1 ms	Make ≤ 1 ms Release ≤ 1 ms
Operating frequency	1 Maximum on inductive load	1 Maximum on inductive load
Built-in protections	Against overloads and short-circuits : Yes Against overvoltages (*) : Yes Against inversions of power supply : Yes (*) In the absence of a volt-free contact between the output of the logic controller and the load	Against overloads and short-circuits : Yes Against overvoltages (*) : Yes Against inversions of power supply : Yes (*) In the absence of a volt-free contact between the output of the logic controller and the load
Min. load	1 mA	1 mA
Maximum incandescent load	0,2 A / 12 V DC 0,1 A / 24 V DC	0,1 A / 24 V DC
Galvanic isolation	No	No
PWM frequency	14.11 Hz 56.45 Hz 112.90 Hz 225.80 Hz 451.59 Hz 1806.37 Hz	14.11 Hz 56.45 Hz 112.90 Hz 225.80 Hz 451.59 Hz 1806.37 Hz
PWM cyclic ratio	0 →100 % (256 steps for CD, XD and 1024 for XA)	0 →100 % (256 steps for CD, XD and 1024 for XA)
PWM accuracy at 120 Hz	< 5 % (20 % →80 %) load at 10 mA	< 5 % (20 % →80 %) load at 10 mA
Max. Breaking current PWM	50 mA	50 mA
Max. cable length PWM	20 m	20 m
PWM accuracy at 500 Hz	< 10 % (20 % →80 %) load at 10 mA	< 10 % (20 % →80 %) load at 10 mA
Status indicator	On LCD screen for CD and XD	On LCD screen for CD and XD

Accessories

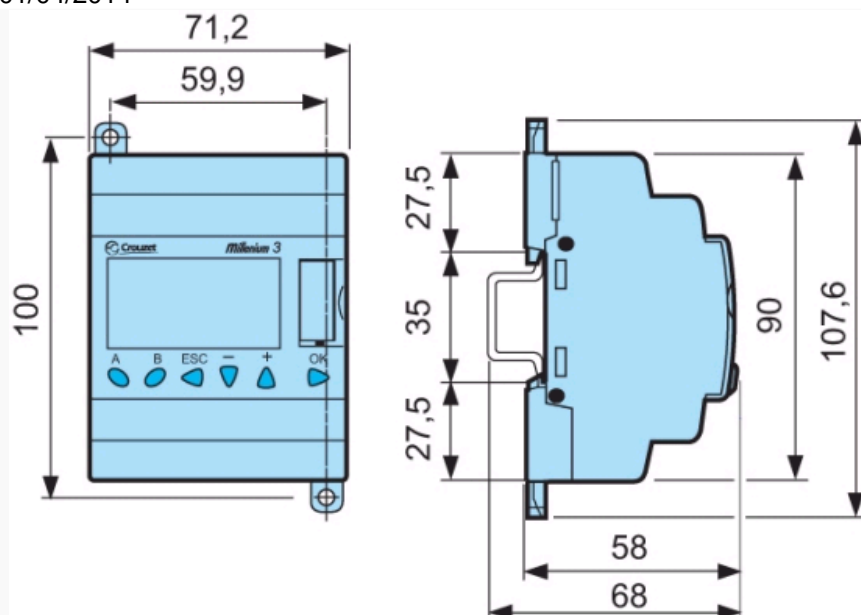
Type	Description	Code
M3 Soft	Multilingual programming software containing specific library functions (CD-ROM)	88970111
PA	EEPROM memory cartridge	88970108
PA	3 m serial link cable : PC →Millenium 3	88970102
PA	USB cable 3 m : PC →Millenium 3	88970109
PA	Millenium 3 interface →Bluetooth® (class A 10 m)	88970104

Comments

* to be marketed 1st quarter 2006

Dimensions (mm)

CD12



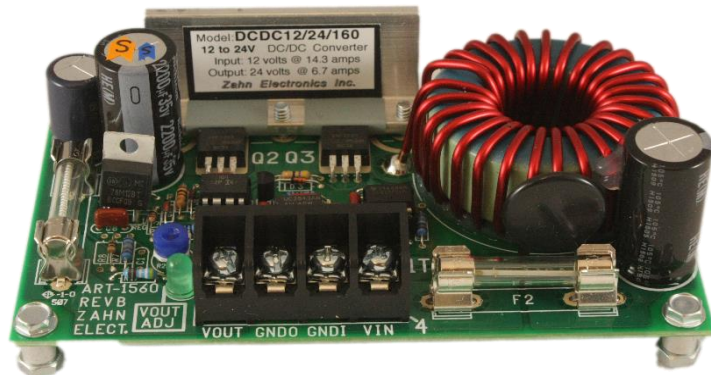
Technical Specification Sheet:

Model:

DCDC 12/24/160

Description:

160W, 12V to 24V DC-DC Step Up Converter



Zahn Electronics Inc.

4133 Courtney St., Unit #5
Franksville, WI 53126

Phone: (262) 835-9200

Web: www.zahnninc.com

Operating Temperature Range:

-20°C to +75°C

Efficiency:

93%

Recommended Input Voltage:

10V to 20V

Standby Current - No Load at 12V in:

140 mA

Input Current Internally Limited to:

16 Amps

Input Fuse:

30 Amps

Output Voltage Setpoint (adjustable):

20V to 28V

Output Power Rating:

160 Watts, 12v/24v

Output Current¹:

6.7 Amps, Vout=24V

Output Fuse:

10 Amps

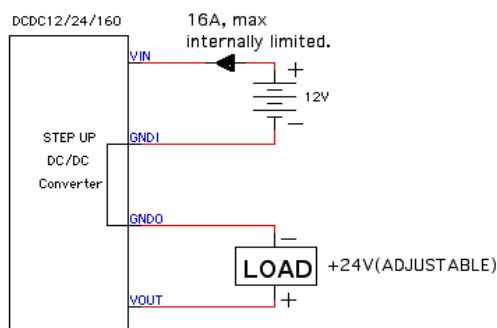
Max Output Ripple:

0.04 Volts, RMS

Switching Frequency:

20,000 Hz

INSTALLATION WIRING 12V TO 24V STEP UP DC/DC CONVERTER.



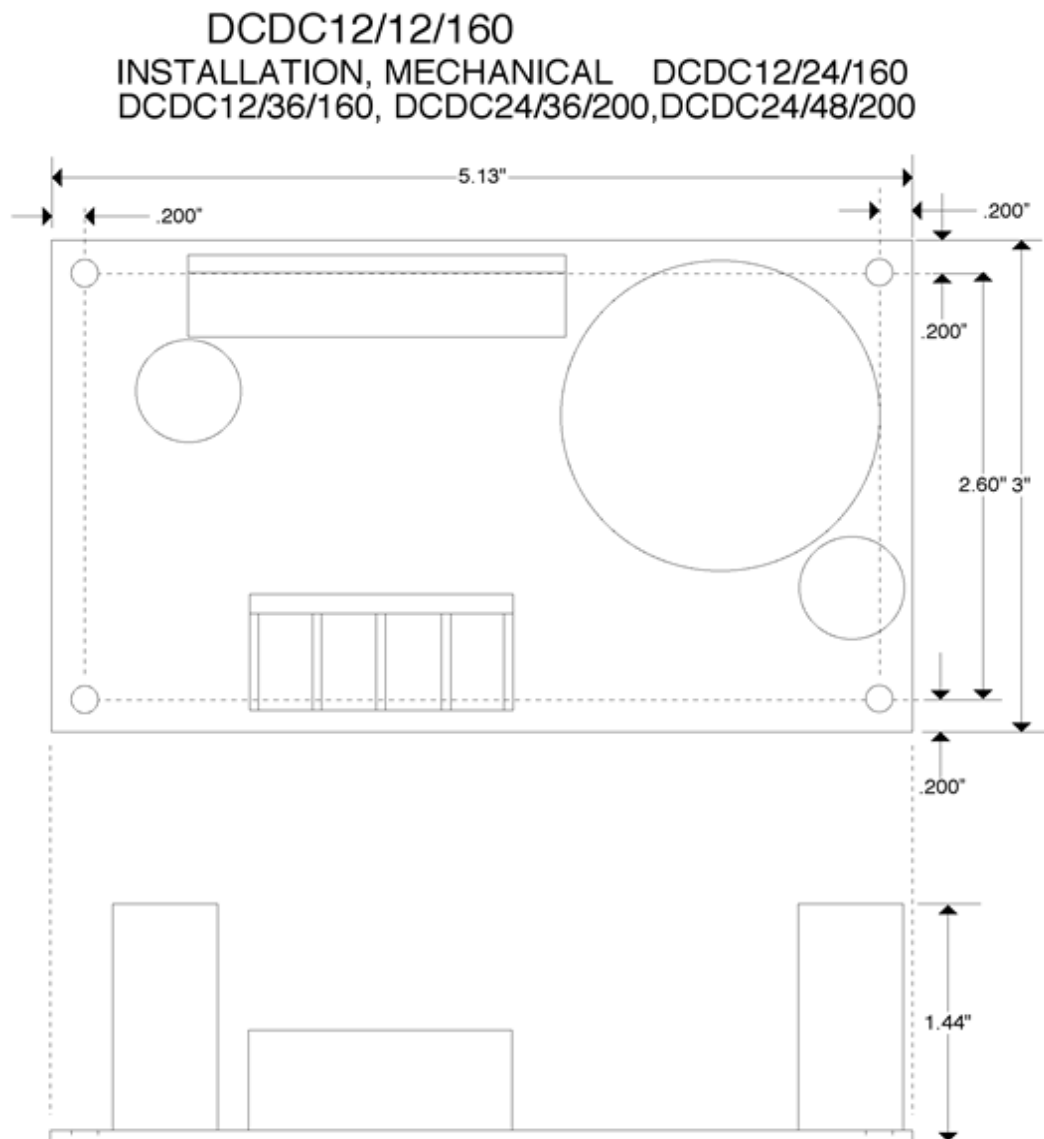
NOTES:

1 ADJUST "VOUT ADJ" POT FOR DESIRED LOAD VOLTAGE.

2 BATTERY CURRENT IS INTERNALLY LIMITED TO 16A.

su112

Mechanical Dimensions:



Zahn Electronics Inc.
4133 Courtney St. #5
Franksville, WI 53126

telephone: 262 835 9200
fax: 262 835 9201

inst 1564

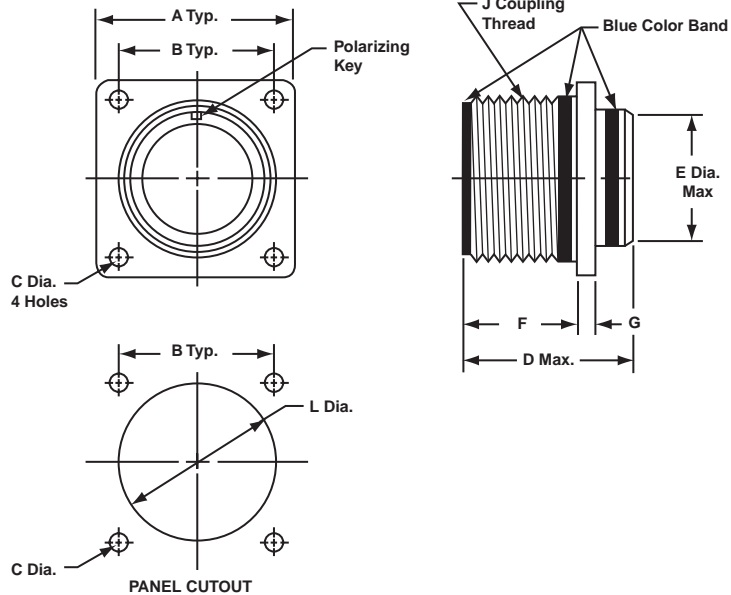
MS/Standard

MS3452

box mounting receptacle

Receptacle Shell, Flange Box Mount, Threaded Coupling

Military No. MS3452
Amphenol/Matrix No. 9442



To complete order number see how to order, page 29.

Shell Size*	A ±.031	B	C Dia.	D Max.		E Dia. ±.016	F	G ±.015	J Thread Class 2A	L Dia. ±.010
				Size 16 & 12 Contacts	Size 8, 4, 0 Contacts					
8S	.875	.594	.130/.115	1.662	—	.500	.578/.562	.083	.5000-28 UNEF	.562
10S	1.000	.719	.130/.115	1.662	—	.625	.578/.562	.083	.6250-24 UNEF	.688
10SL	1.000	.719	.130/.115	1.662	—	.625	.578/.562	.083	.6250-24 UNEF	.688
12	1.094	.812	.130/.115	1.662	—	.750	.765/.750	.083	.7500-20 UNEF	.812
12S	1.094	.812	.130/.115	1.662	—	.750	.578/.562	.083	.7500-20 UNEF	.812
14	1.188	.906	.130/.115	1.662	—	.875	.765/.750	.083	.8750-20 UNEF	.938
14S	1.188	.906	.130/.115	1.662	—	.875	.577/.562	.083	.8750-20 UNEF	.938
16	1.281	.969	.130/.115	1.662	1.937	1.000	.765/.750	.083	1.0000-20 UNEF	1.062
16S	1.281	.969	.130/.115	1.662	—	1.000	.577/.562	.083	1.0000-20 UNEF	1.062
18	1.375	1.062	.130/.115	1.662	1.937	1.062	.765/.750	.125	1.1250-18 UNEF	1.188
20	1.500	1.156	.130/.115	1.662	1.937	1.187	.765/.750	.125	1.2500-18 UNEF	1.312
22	1.625	1.250	.130/.115	1.662	1.937	1.312	.765/.750	.125	1.3750-18 UNEF	1.438
24	1.750	1.375	.157/.142	1.662	1.937	1.437	.827/.812	.125	1.5000-18 UNEF	1.562
28	2.000	1.562	.157/.142	1.662	1.937	1.750	.827/.812	.125	1.7500-18 UNS	1.812
32	2.250	1.750	.183/.168	1.662	1.937	2.000	.988/.875	.125	2.0000-18 UNS	2.062
36	2.500	1.938	.183/.168	1.662	1.937	2.250	.988/.875	.125	2.2500-16 UN	2.312
40	2.750	2.188	.183/.168	1.662	1.937	2.500	.988/.875	.125	2.5000-16 UN	2.562

* Consult Amphenol, Sidney, NY for availability of shell sizes 44 and 48.

97 series accessories

metal protection caps

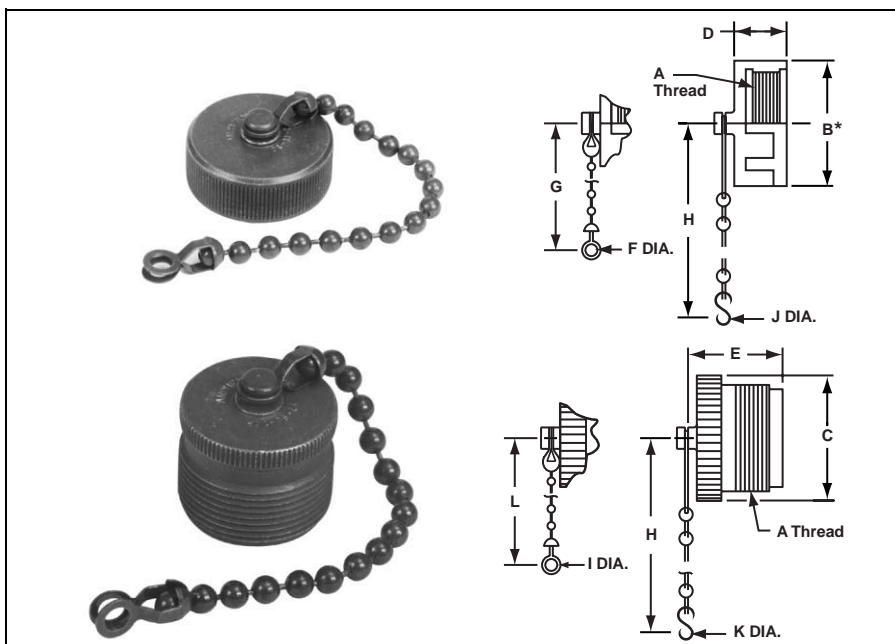
9760 Caps and Chain Assemblies

Fit MS and 97 type receptacles and plugs; provide protection against live circuits and keep out dirt and dust when connector is not in use.

Two styles are available: one with a stainless steel link chain, and one with a beaded chain. Both use the same caps and both have a cadmium olive drab finish.

Caps for receptacles have internal threads and are used on MS3102, MS3101, and MS3100 receptacles. A soft rubber disc seats on the connector shell, forming a water-tight joint.

Caps for plugs have external threads for use on all plugs where a coupling nut is provided (MS3106 and MS3108).



For Receptacles†		For Plugs†		For Connector Size	A Threads	B*		C		D*		E	
Link Chain	Bead Chain	Link Chain	Bead Chain			Inch	mm	Inch	mm	Inch	mm	Inch	mm
9760-908	9760-8	9760-808	9760-8P	8S	1/2-28	5/8	15.88	1/2	12.70	7/16	11.10	21/32	16.66
9760-910	9760-10	9760-810	9760-10P	10S, 10SL	5/8-24	13/16	20.62	5/8	15.88	7/16	11.10	21/32	16.66
9760-912	9760-12	9760-812	9760-12P	12, 12S, 12SL	3/4-20	15/16	23.80	3/4	19.05	7/16	11.10	27/32	21.41
9760-914	9760-14	9760-814	9760-14P	14, 14S	7/8-20	1-1/16	26.97	7/8	22.23	7/16	11.10	27/32	21.41
9760-916	9760-16	9760-816	9760-16P	16, 16S	1 -20	1-1/8	28.58	1	25.40	7/16	11.10	27/32	21.41
9760-918	9760-18	9760-818	9760-18P	18	1-1/8-18	1-5/16	33.32	1-1/8	28.58	7/16	11.10	27/32	21.41
9760-920	9760-20	9760-820	9760-20P	20	1-1/4-18	1-7/16	36.50	1-1/4	31.75	7/16	11.10	27/32	21.41
9760-922	9760-22	9760-822	9760-22P	22	1-3/8-18	1-9/16	39.67	1-3/8	34.93	7/16	11.10	27/32	21.41
9760-924	9760-24	9760-824	9760-24P	24	1-1/2-18	1-11/16	42.85	1-1/2	38.10	7/16	11.10	27/32	21.41
9760-928	9760-28	9760-828	9760-28P	28	1-3/4-18	1-59/64	48.79	1-3/4	44.45	1/2	12.70	27/32	21.41
9760-932	9760-32	9760-832	9760-32P	32	2 -18	2-3/16	55.55	2	50.80	1/2	12.70	27/32	21.41
9760-936	9760-36	9760-836	9760-36P	36	2-1/4-16	2-7/16	61.90	2-1/4	57.15	1/2	12.70	27/32	21.41

For Connector Size	F		G		H ± 1 Link		I		J		K		L	
	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm
8S	.125	3.18	2-9/16	65.07	4.0	101.60	.125	3.18	.140	3.56	.156	3.96	2-9/16	65.07
10S, 10SL	.125	3.18	2-9/16	65.07	4.0	101.60	.125	3.18	.140	3.56	.156	3.96	2-13/16	71.44
12, 12S, 12SL	.125	3.18	2-9/16	65.07	4.5	114.30	.125	3.18	.140	3.56	.156	3.96	3-13/16	96.84
14, 14S	.125	3.18	2-9/16	65.07	4.5	114.30	.125	3.18	.140	3.56	.156	3.96	3-13/16	96.84
16, 16S	.167	4.24	4-5/8	117.48	4.5	114.30	.167	4.24	.140	3.56	.156	3.96	4-5/8	117.48
18	.167	4.24	4-5/8	117.48	4.5	114.30	.167	4.24	.140	3.56	.156	3.96	4-5/8	117.48
20	.167	4.24	4-5/8	117.48	5.0	127.00	.167	4.24	.140	3.56	.187	4.75	4-5/8	117.48
22	.167	4.24	4-5/8	117.48	5.0	127.00	.167	4.24	.140	3.56	.187	4.75	4-5/8	117.48
24	.167	4.24	4-5/8	117.48	5.5	139.70	.167	4.24	.171	4.34	.187	4.75	4-5/8	117.48
28	.167	4.24	4-5/8	117.48	7.75	196.85	.167	4.24	.171	4.34	.187	4.75	4-5/8	117.48
32	.190	4.83	5-3/4	146.05	7.75	196.85	.260	6.60	.187	4.75	.218	5.54	5-3/4	146.05
36	.190	4.83	5-3/4	146.05	7.75	196.85	.260	6.60	.187	4.75	.218	5.54	5-3/4	146.05

* B dimension 1/16 inch less, and D dimension 1/64 inch less for screw machine parts, sizes 8 thru 22.

† Caps less chains are available. To order, add G to the part number; for example, 9760-908G.

Product Data Sheet

SJOOW



Product Description

Synthetic rubber insulation
Thermoset jacket
90 °C, 300 V

Applications

For use with portable appliances, small motors and tools. Also, for light-load general use in equipment exposed to oils, solvents, flame, grease.

Specifications

- CONDUCTOR: Bare, annealed copper per ASTM B-3, flexible, bunch stranded per UL 62, a separator can be applied over the conductor
- INSULATION: Synthetic rubber per UL 62
- COLOR CODE: Per ICEA Method 1, Table E-1 except 3/C which is black, white, green
- ASSEMBLY: Insulated conductors are cabled with fillers as necessary to make round, a separator is applied over the assembly
- OVERALL JACKET: Black, oil-resistant thermoset compound per UL 62
- STANDARDS: Meets UL and CSA requirements for Type SJOOW
- AMPACITY: Based on a 30 °C ambient temperature per 2008 NEC Table 400.5(A), Column A, the values are derated (where applicable) according to 2008 NEC Article 400.5
- TEMPERATURE: 90 °C
- VOLTAGE: 300 V

Product Data Sheet

Diameters and weights may vary among manufacturers. Other colors available: Yellow add -05 suffix to Part No. (e.g., 4B-1403-05). Orange add -08 suffix to Part No. (e.g., 4B-1404-08). For constantly flexing application, add "F" to Part No. (e.g., 4B-1804F).

Part No.	Conductor Size AWG	No. of Strands	No. of Conductors	Insulation Thickness (in.)	Overall Jacket Thickness (in.)	Nom. O.D. (in.)	Approx. Wt. lb./1,000 ft.	Amps per Conductor
4B-1802	18	16	2	0.030	0.030	0.280	41	7
4B-1803	18	16	3	0.030	0.030	0.300	54	7
4B-1804	18	16	4	0.030	0.030	0.325	67	5.6
4B-1602	16	26	2	0.030	0.030	0.305	51	10
4B-1603	16	26	3	0.030	0.030	0.325	69	10
4B-1604	16	26	4	0.030	0.030	0.350	84	8
4B-1402	14	41	2	0.030	0.030	0.335	66	15
4B-1403	14	41	3	0.030	0.030	0.360	88	15
4B-1404	14	41	4	0.030	0.030	0.390	111	12
4B-1202	12	65	2	0.030	0.030	0.405	100	20
4B-1203	12	65	3	0.030	0.030	0.425	129	20
4B-1204	12	65	4	0.030	0.030	0.465	164	16
4B-1002	10	104	2	0.045	0.045	0.540	169	25
4B-1003	10	104	3	0.045	0.045	0.565	218	25
4B-1004	10	104	4	0.045	0.045	0.625	281	20

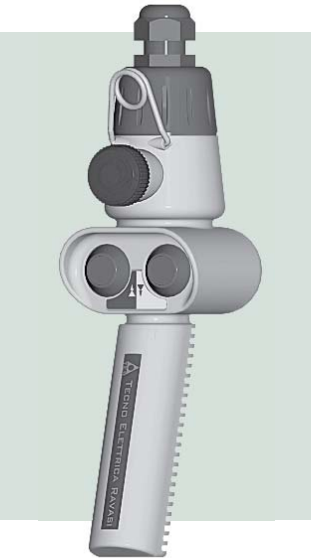
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APPENDIX F. TETHER CONTROL PENDANT

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CHARLIE PENDANT STATION

Charlie Pendant Control Station



The **Charlie Series Pendant Station** is a low cost, ergonomic design for one hand operation of up to three buttons. A patented unique clamshell design allows the installer the convenience of opening the unit without external screws, clamps, etc. Lightweight, easy to hold, provides one hand control of numerous equipment functions.

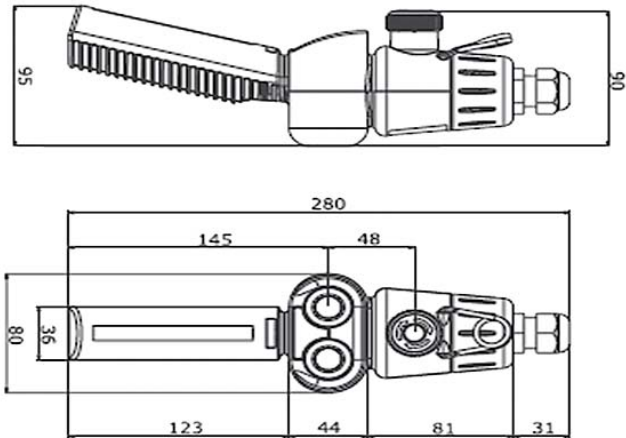
- Economical
- 2 to 3 button control
- 1, 2 speed switches
- IP65 rated

Charlie Pendant Control Station - Part No. & Pricing

No. Buttons	ASSEMBLY			Part No.
	E - Stop	1 Speed	2 Speed	
	1 N.C.	1 N.O. + 1 N.O. + com	1 N.O. + 1 N.O. + 1 N.O. + com	
2		2		PF39020001
			2	PF39020002
3	1	2		PF39030001
	1		2	PF39030002

* Custom Units available - Part Number assigned by factory; PF390 _ J _ _ _ .
See request form page M7

Charlie Pendant - Dimensions (mm)

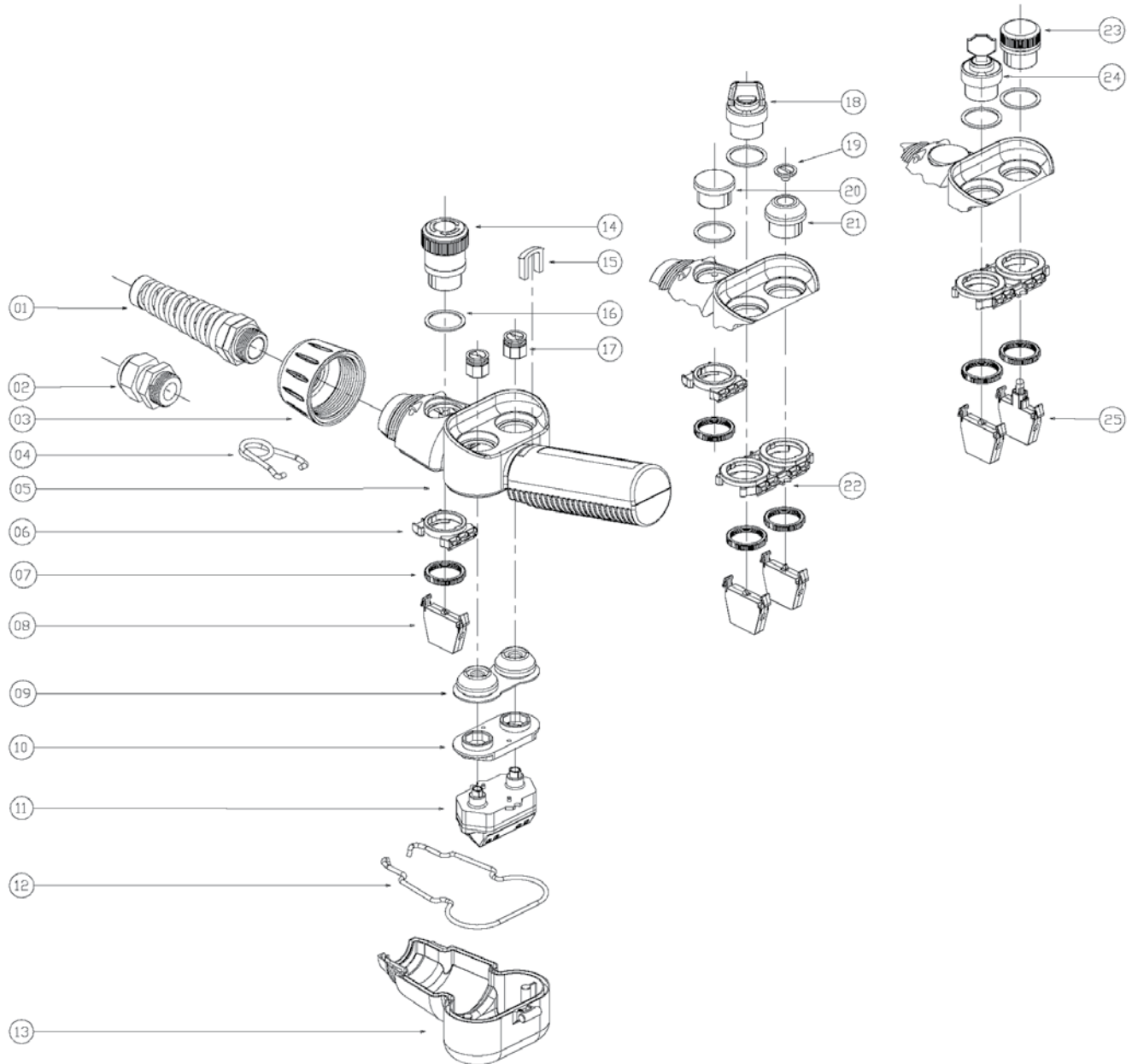


Discount Schedule SC-20

CHARLIE PENDANT - DIMENSIONS

M3



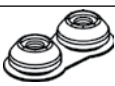










Charlie Pendant - Detailed Drawing *
















* See page M4 for spare part pricing

CHARLIE PENDANT - ACCESSORY PARTS

Spare Parts

Reference	Illustration	Description	Part No.
01		Spiral Cable Clamp	PRPS0025PE
08		1 N.O. Switch 1 N.C. Switch	PRSL1000PI PRSL1001PI
09		Rubber Boot for Double Push-Button (without buttons)	PRG0020PE
11		1-Speed Double Switch 2-Speed Double Switch	PRSL1002PI PRSL1003PI
14		Emergency Stop Mushroom Push-Button	PRSL1011PI
17		Button for Double Push-Button	PRTA2xxxPI*
18		Spring Return Selector Switch (on-off) Selector Switch (on-off)	PRSL1015PI PRSL1016PI
		Spring Return 3-Position Selector Switch 3-Position Selector Switch	PRSL1026PI PRSL1027PI
19		Button for Single Push-Button	PRTA1xxxPI*
20		Blanking Plug	PRSL1023PI
21		Single Push-Button (without button)	PRSL1023PI
23		Red Pilot Light Yellow Pilot Light Green Pilot Light	PRSL1012PI PRSL1013PI PRSL1014PI
24		Key Selector Switch (on-off)	PRSL1017PI
25		Lamp Holder (12V or 24V only)	PRSL1004PI

*Standard Buttons

						
PRTA1000PI PRTA2000PI	PRTA1001PI PRTA2001PI	PRTA1002PI PRTA2002PI	PRTA1003PI PRTA2003PI	PRTA1004PI PRTA2004PI	PRTA1005PI PRTA2005PI	PRTA1006PI PRTA2006PI
						
PRTA1007PI PRTA2007PI	PRTA1010PI PRTA2010PI	PRTA1011PI PRTA2011PI	PRTA1012PI PRTA2012PI	PRTA1013PI PRTA2013PI	PRTA1030PI PRTA2030PI	

Discount Schedule SC-20

CHARLIE PENDANT - TECHNICAL DATA
M5
Technical Specifications

Conformity to Community Directives	73/23/CEE	93/68/CEE		
Conformity to Standards	EN 60204-1 EN 60529	EN 60947-1 EN 418	EN 60947-5-1 EN 50013	IEC 536
Ambient Temperature	Storage Operational	-40°C / +70°C -25°C / +70°C		
Protection Degree	IP 65			
Insulation Category	Class II			
Cable Entry	Cable Clamp PG16			
Operating Positions	Any Position			
Weight	~ 320g			
Approvals	CE			

Technical Specifications of Contact Switches

Utilisation Category	AC 15
Rated Operational Current	3 A
Rated Operational Voltage	250V
Rated Thermal Current	10 A
Rated Insulation Voltage	500V ~
Mechanical Life	0,5 x 10 ⁶ operations
Terminal Referencing	According to EN 50013
Connections	Screw-Type Terminals
Approvals	CE - UL - cUL
Operating Force	2.0 - 2.4 lbs

Features of the Contact Switches

The single switches PRSL1000PI and PRSL1001PI have 1 N.C. contacts with 2 connecting terminals.

The double switch PRSL1002PI (1-speed)) has:

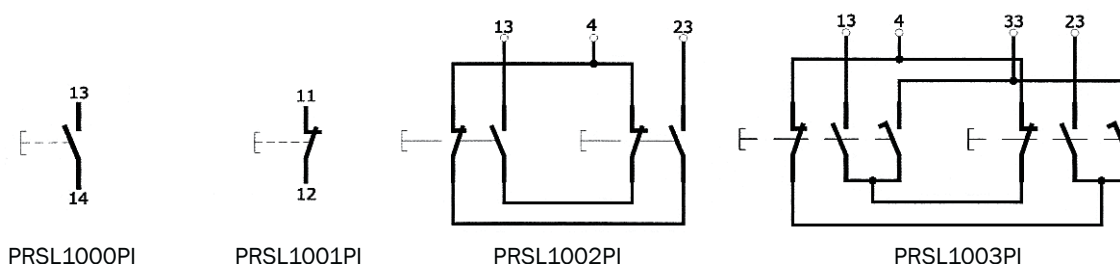
1 N.O. contact with 1 connecting terminal for the first speed for each opposite function - 1 single terminal for both functions

The double switch PRSL1003PI (2-speeds) has:

1 N.O. contact with 1 connecting terminal for the first speed for each opposite function - 1 N.O. contact with 1 connecting terminal for the second speed for both functions - 1 single terminal for both functions.

All N.C. contacts are of the positive opening operation type.

The switches have the following reference for internal wiring.



CHARLIE PENDANT - MAINTENANCE INSTRUCTIONS

M 6

Use & Maintenance Instructions

The **Charlie Pendant Control Station** is an electromechanical device for low voltage control circuits (EN 60947-1, EN60947-5-1) to be used as electrical equipment on machines (EN 60204-1) in compliance with the fundamental requirements of the Low Voltage Directive 73/23/CEE and of the Machine Directive 89/392/CEE.

The pendant station is designed for industrial use and also for use under particularly severe climactic conditions (operational temperature -25°C to +70°C, suitable for use in tropical environment). The equipment is not suitable for use in environments with potentially explosive atmosphere, corrosive agents or a high percentage of sodium chloride (saline fog). Oils, acids or solvents may damage the equipment.

The switches (08, 11) are designed for auxiliary control of contactors or electromagnetic loads (utilisation category AC-15 according to EN 60947-5-1). Do not connect more than one phase to each switch (08, 11). Do not oil or grease the control elements (14, 17, 18, 21, 24) or the switches (08, 11).

The installation of the pendant station shall be carried out by an expert and trained personnel. Wiring shall be properly done according to current instructions.

Prior to installation and the maintenance of the pendant station, the main power of the machinery shall be turned off.

Steps for the proper installation of the pendant station

- unscrew and remove the front ring (03) and the cable clamp (02)
 - open the lower cover (13)
 - insert the cable into the cable clamp (02) to a length suitable for wiring the switches
 - strip the cable to a length suitable for wiring the switches (08, 11)
 - tape the stripped part of the cable
- connect all the switches (08, 11) according to the contact scheme printed on the switches (tighten the wires into the terminals with a torque equal to 0.6 Nm; insertability of wires into the switch terminals equal to 2 x 1.5mm² - 1 x 2.5mm²).
- screw the front ring (03) to close enclosure and lower cover (13) (check the proper positioning of the coupling pin of the lower cover (13) and of the rubber (12))
 - tighten the cable clamp (02) on the cable tight enough to guarantee protection against water and/or dust

Periodic Maintenance Steps

- check the proper tightening of the front ring (03)
- check the proper tightening of the cable clamp (02)
- check the proper tightening of the switch (08, 11) terminal screws
- check all wiring (in particular where wires clamp into the switches)
- check the conditions of the rubber (12) fit into the lower cover (13) and of the rubber of the control elements (09,21)
- check that the plastic enclosure (03, 05, 13) of the pendant station is not broken

In case any component of the pendant station is modified, the validity of the markings and the guarantee on the equipment are annulled. Should any component need replacement, use original spare parts only.

Springer Controls declines all responsibility for damages caused by the improper use or installation of the equipment.

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APPENDIX G. LIMIT SWITCH

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AK Series Inductive Proximity Sensors



M18 (18 mm) metal – DC

- 24 models available
- Standard and extended distance models available
- 2-wire and 3-wire models
- Axial cable or M12 quick-disconnect models available
- Complete overload protection
- IP67 rated
- LED status indicators are visible 360° around the cylinder
- Lifetime warranty



AK Series M18 DC Inductive Prox Selection Chart

Part Number	Price	Sensing Range	Housing	Output State	Logic	Connection	Wiring	Dimensions
Standard Distance								
AK1-AN-1A	\$22.00	5 mm (0.197 in)	Shielded	N.O.	NPN	2 m (6.5') axial cable	Diagram 1	Figure 1
AK1-AP-1A	\$22.00				PNP	2 m (6.5') axial cable	Diagram 1	Figure 1
AK1-A0-1A	\$23.00				Sink/source	2 m (6.5') axial cable	Diagram 2	Figure 1
AK1-AN-1H	\$22.00				NPN	M12 (12 mm) connector	Diagram 1	Figure 2
AK1-AP-1H	\$22.00				PNP	M12 (12 mm) connector	Diagram 1	Figure 2
AK1-A0-1H	\$23.00				Sink/source	M12 (12 mm) connector	Diagram 2	Figure 2
AK1-AN-2A	\$22.00	8 mm (0.315 in)	Unshielded	N.O.	NPN	2 m (6.5') axial cable	Diagram 1	Figure 1
AK1-AP-2A	\$22.00				PNP	2 m (6.5') axial cable	Diagram 1	Figure 1
AK1-A0-2A	\$23.00				Sink/source	2 m (6.5') axial cable	Diagram 2	Figure 1
AK1-AN-2H	\$22.00				NPN	M12 (12 mm) connector	Diagram 1	Figure 2
AK1-AP-2H	\$22.00				PNP	M12 (12 mm) connector	Diagram 1	Figure 2
AK1-A0-2H	\$23.00				Sink/source	M12 (12 mm) connector	Diagram 2	Figure 2
Extended Distance								
AK1-AN-3A	\$26.50	8 mm (0.315 in)	Shielded	N.O.	NPN	2 m (6.5') axial cable	Diagram 1	Figure 1
AK1-AP-3A	\$26.50				PNP	2 m (6.5') axial cable	Diagram 1	Figure 1
AK1-A0-3A	\$29.50				Sink/source	2 m (6.5') axial cable	Diagram 2	Figure 1
AK1-AN-3H	\$26.50				NPN	M12 (12 mm) connector	Diagram 1	Figure 2
AK1-AP-3H	\$26.50				PNP	M12 (12 mm) connector	Diagram 1	Figure 2
AK1-A0-3H	\$29.50				Sink/source	M12 (12 mm) connector	Diagram 2	Figure 2
AK1-AN-4A	\$26.50	12 mm (0.472 in)	Unshielded	N.O.	NPN	2 m (6.5') axial cable	Diagram 1	Figure 1
AK1-AP-4A	\$26.50				PNP	2 m (6.5') axial cable	Diagram 1	Figure 1
AK1-A0-4A	\$29.50				Sink/source	2 m (6.5') axial cable	Diagram 2	Figure 1
AK1-AN-4H	\$26.50				NPN	M12 (12 mm) connector	Diagram 1	Figure 2
AK1-AP-4H	\$26.50				PNP	M12 (12 mm) connector	Diagram 1	Figure 2
AK1-A0-4H	\$29.50				Sink/source	M12 (12 mm) connector	Diagram 2	Figure 2

Dimensions

mm [inches]

Figure 1

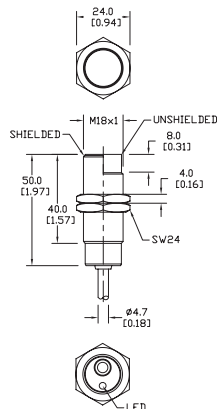
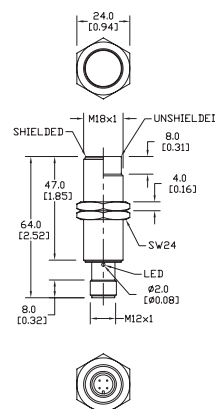


Figure 2



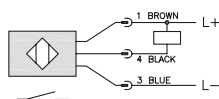
AK Series Inductive Proximity Sensors

AK Series Specifications				
Mounting Type	Standard Distance		Extended Distance	
	Shielded	Unshielded	Shielded	Unshielded
Nominal Sensing Distance	5 mm (0.197 in)	8 mm (0.315 in)	8 mm (0.315 in)	12 mm (0.472 in)
Operating Distance	N/A			
Material Influence Factors	See Material Influence table #1 later in this section			
Output Type	3- wire: NPN or PNP/N.O. (normally open) / 2-wire: sink/source, N.O. only			
Operating Voltage	10 to 30 VDC			
No-load Supply Current	≤ 20 mA for 3 mins			
Operating (Load) Current	3-wire: ≤400mA / 2-wire: 3-100mA			
Off-state (Leakage) Current	3-wire: ≤10µA / 2-wire: ≤0.8mA max			
Voltage Drop	3-wire: 1 volt max. / 2-wire: ≤2.8V max.			
Switching Frequency	600 Hz	300 Hz		
Differential Travel (% of Nominal Distance)	2 to ≤10%		2 to ≤15%	
Repeat Accuracy	≤2%		≤5%	
Ripple	≤10%			
Time Delay Before Availability (tv)	3-wire: 100ms / 2-wire: 50ms			
Reverse Polarity Protection	Yes			
Short-Circuit Protection	Yes (switch auto-resets after overload is removed)			
Operating Temperature	-25° to +70°C (-13° to 158°F)			
Protection Degree (DIN 40050)	IEC IP67			
Indication/Switch Status	Yellow (N.O. output energized)			
Housing Material	Nickel-plated brass			
Sensing Face Material	Polybutylene Terephthalate (PBT)			
Shock/Vibration	See terminology section.			
Tightening Torque	25 Nm (18.44 lbs.-ft.)			
Weight	A type (w/ cable): 130 g (4.59 oz) H type: 55 g (1.94 oz)			
Connection	2 meter PVC axial cable / M12 connector			
Agency Approvals	N/A			

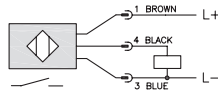
Wiring diagrams

Diagram 1

NPN Output



PNP Output



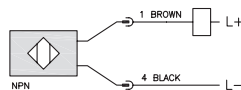
Connector

M12 connector



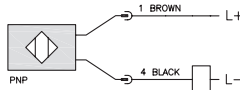
Diagram 2

Sink/Source Output



Wiring diagram when sensor is wired in sinking mode used with a sourcing module.

Sink/Source Output



Wiring diagram when sensor is wired in sourcing mode used with a sinking module.

Note: Negative (-) lead is Black on M12 quick disconnect cables and Blue on axial cables.

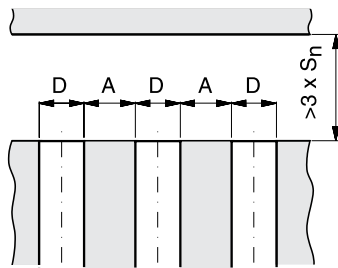
Proximity Sensor Terminology

The following descriptions refer to the European standard EN 60947-5-2. of 2007.

The specifications given here are intended to be minimum performance values described by the standard.

Alignment

Proximity switches must not be mutually influenced. For this reason, a minimum distance between them (referred to as alignment) must be provided. Where not explicitly listed on product datasheet or installation instructions, follow these general guidelines.



Size D	Flush A (mm)	Non-flush A (mm)
Ø3	0	--
M4	0	--
Ø4	0	--
M5	0	--
5X5	0	--
M8	2/3*	8
8X8	2/3*	--
M12	6/10*	12
M18	12/20*	30
M30	30	60

*Extended distance models

Break function (NC, normally closed)

A break function causes load current to flow only when a target is not detected.

Protection degree

If not otherwise specified, proximity switches (when installed in accordance with manufacturer's instructions) have minimum IP65 protection against dust and water jets.

Differential travel (Hysteresis)

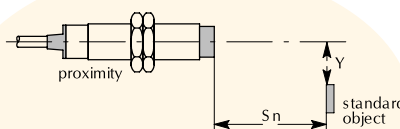
The differential travel is given as a percentage of the nominal sensing distance (S_n) and is the maximum difference between the switching distances. The differential is intentionally introduced to guarantee the stability of the output state in case the target is positioned near the switching points.

Electrical connections

Keep sensor cables and power cables separated to avoid electrical interference.

The power supply voltage must not exceed the specified limits U_b .

If a non-stabilized supply voltage is used for DC sensors, the maximum voltage peak under minimum power consumption conditions and minimum voltage peak under maximum power consumption must not exceed U_b limits.



Detection Area

If the power supply of the sensor is also used to switch inductive loads, a suppression device must be provided. A fuse to protect the power supply line is also recommended.

Installation notes

Select a sensor compatible with the operating environment: verify the compatibility between building materials, the presence of chemicals, temperature range, protection degree, vibrations, shocks, EMC, supply voltage available, load type, etc.

Select the sensor by referring to the size and type of material to be detected.

Check the minimum distances between sensor and damping materials or another sensor.

Check that the number of operations does not exceed the maximum switching frequency. If the phase of the output signal is important, check the turn on and turn off time.

Metallic chips or dust must not accumulate on the sensing face. The distance between the sensor and the object to detect must not exceed the assured operating distance S_a ; the best sensing range is $S_n/2$.

Check the effect of vibrations.

Install the sensor using the installation accessories and do not exceed the maximum tightening torque.

Indication/switch status

Proximity switches may incorporate one or more color indicators. The meaning of the colors vary by part. Please see part specifications for meaning.

Make function (NO, normally open)

A make function causes load current to flow only when a target is detected.

Proximity Sensor Terminology

Material influence

The nominal sensing distance (Sn) is defined using precisely defined measuring conditions (See Operating Distance). Other conditions may result in a reduction of the operating distance. The table below shows the influence different target materials have on the operating distances of the sensors.

Material Influence					
Sensor Series	Target Material Value				
	Steel	Copper	Aluminum	Brass	Stainless Steel
AC1-**-1*	1.00	0.28	0.21	0.32	0.63
AC1-**-3*	1.00	0.29	0.23	0.31	0.66
AE*-A*-1*	1.00	0.29	0.38	0.49	0.78
AE*-A*-2*	1.00	0.43	0.51	0.59	0.83
AE*-A*-3*	1.00	0.35	0.43	0.52	0.78
AE*-A*-4*	1.00	0.47	0.52	0.58	0.79
AE*-A*-5*	1.00	0.27	0.33	0.41	0.72
AE9-10-1*	1.00	0.25	0.28	0.40	0.68
AES-**-1*	1.00	0.15	0.10	0.15	0.55
AES-**-3*	1.00	0.15	0.15	0.21	0.56
AHS-**-1*	1.00	0.10	0.05	0.13	0.54
AHS-**-3*	1.00	0.05	0.05	0.10	0.50
AK1-A*-1*	1.00	0.40	0.48	0.72	0.86
AK1-A*-2*	1.00	0.45	0.53	0.56	0.77
AK1-A*-3*	1.00	0.40	0.45	0.50	0.75
AK1-A*-4*	1.00	0.45	0.53	0.56	0.77
AK9-**-1*	1.00	0.15	0.18	0.28	0.60
AM*-A*-1*	1.00	0.22	0.31	0.41	0.77
AM*-A*-2*	1.00	0.41	0.47	0.56	0.86
AM*-A*-3*	1.00	0.33	0.40	0.50	0.82
AM*-A*-4*	1.00	0.41	0.46	0.52	0.71
AM1-A0-1*	1.00	0.30	0.35	0.50	0.80
AM1-A0-2*	1.00	0.52	0.57	0.62	0.87
AM1-A0-3*	1.00	0.42	0.47	0.55	0.80
AM1-A0-4*	1.00	0.51	0.56	0.62	0.78
AM*/0-5H	1.00	0.25	0.30	0.40	0.70
AM9-**-1*	1.00	0.20	0.28	0.35	0.47
APS4-12*-E*-D	1.00	0.35	0.45	0.55	0.70
APS25-8*-E-D	1.00	0.40	0.50	0.50	0.75
AT1-A*-1*	1.00	0.35	0.45	0.50	0.75
AT1-A*-2*	1.00	0.45	0.50	0.55	0.80
AT1-A*-3*	1.00	0.35	0.45	0.50	0.70
AT1-A*-4*	1.00	0.45	0.50	0.55	0.75
AT9-**-1*	1.00	0.17	0.20	0.30	0.65
CR5-A*-**	1.00	0.60	0.60	0.70	0.85
CR8-A*-1*	1.00	0.40	0.45	0.55	0.80
CR8-A*-2*	1.00	0.45	0.50	0.60	0.80
CR8-A*-3*	1.00	0.27	0.36	0.45	0.77
DR10-A*-1*	1.00	0.25	0.28	0.37	0.63
DR10-A*-2*	1.00	0.41	0.50	0.55	0.75
DW-A*-50*-04	1.00	0.25	0.28	0.36	0.60
DW-A*-50*-M5	1.00	0.30	0.33	0.42	0.67
DW-A*-50*-M8-001	1.00	0.27	0.33	0.41	0.72

Proximity Sensor Terminology

Material influence

The nominal sensing distance (Sn) is defined using precisely defined measuring conditions (See Operating Distance). Other conditions may result in a reduction of the operating distance. The table below shows the influence different target materials have on the operating distances of the sensors.

Material Influence					
Sensor Series	Target Material Value				
	Steel	Copper	Aluminum	Brass	Stainless Steel
DW-A*-50*-M8	1.00	0.27	0.33	0.41	0.72
DW-A*-51*-M8	1.00	0.44	0.47	0.55	0.77
DW-A*-51*-M8-001	1.00	0.44	0.47	0.55	0.77
DW-Ax-52x-M8	1.00	0.22	0.25	0.33	0.63
DW-A*-50*-M12	1.00	0.25	0.30	0.40	0.70
DW-Ax-52x-M12	1.00	0.23	0.27	0.36	0.67
DW-A*-50*-M18	1.00	0.26	0.30	0.40	0.67
DW-A*-50*-M18-002	1.00	0.26	0.30	0.40	0.67
DW-A*-51*-M18	1.00	0.42	0.44	0.50	0.69
DW-A*-51*-M18-002	1.00	0.42	0.44	0.50	0.69
DW-A*-50*-M30	1.00	0.35	0.40	0.45	0.66
DW-A*-50*-M30-002	1.00	0.35	0.40	0.45	0.66
DW-A*-51*-M30	1.00	0.37	0.42	0.47	0.78
DW-A*-51*-M30-002	1.00	0.37	0.42	0.47	0.78
DW-A*-62*-03-96*	1.00	0.45	0.50	0.60	0.80
DW-A*-62*-03	1.00	0.45	0.50	0.60	0.80
DW-A*-62*-M4-96*	1.00	0.45	0.50	0.60	0.80
DW-A*-62*-M4	1.00	0.45	0.50	0.60	0.80
DW-A*-70*-C23	1.00	0.80	1.00	1.20	0.85
DW-A*-70*-C23-276	1.00	0.80	1.00	1.20	0.85
DW-Ax-71x-04	1.00	0.95	1.00	1.35	0.40
DW-Ax-71x-M5	1.00	0.95	1.00	1.35	0.40
DW-A*-71*-M8	1.00	0.85	1.00	1.40	0.90
DW-A*-71*-M8-001	1.00	0.85	1.00	1.40	0.90
DW-A*-71*-M12	1.00	0.80	1.00	1.40	0.65
DW-A*-71*-M18-002	1.00	0.90	1.00	1.35	0.70
DW-A*-71*-M18	1.00	0.90	1.00	1.35	0.70
DW-A*-71*-M18-002	1.00	0.90	1.00	1.35	0.70
DW-A*-71*-M30	1.00	0.90	1.00	1.20	0.25
DW-A*-71*-M30-002	1.00	0.90	1.00	1.20	0.25
LF40-**-*H	1.00	0.30	0.40	0.40	0.70
PBK-A**-*H	1.00	0.00	0.10	0.20	0.50
PBM-A**-*H	1.00	0.10	0.30	0.30	0.60
PBT-A**-*H	1.00	0.30	0.40	0.40	0.70
PD1-A*-1*	1.00	0.45	0.50	0.55	0.80
PD1-A*-3*	1.00	0.40	0.40	0.50	0.75
PEW-A*-1*	1.00	0.30	0.40	0.50	0.70
PFK1-B*-1H	1.00	0.25	0.35	0.40	0.70
PFK1-B*-2H	1.00	0.27	0.35	0.42	0.70
PFK1-**-3H	1.00	0.20	0.30	0.40	0.65
PFK1-**-4H	1.00	0.30	0.38	0.42	0.65
PFM1-B*-1H	1.00	0.25	0.30	0.40	0.75

Proximity Sensor Terminology

Material influence

The nominal sensing distance (Sn) is defined using precisely defined measuring conditions (See Operating Distance). Other conditions may result in a reduction of the operating distance. The table below shows the influence different target materials have on the operating distances of the sensors.

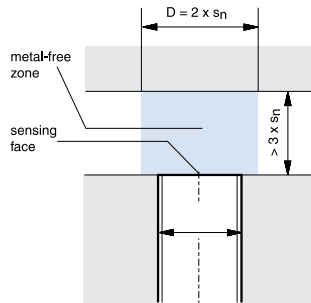
Material Influence					
Sensor Series	Target Material Value				
	Steel	Copper	Aluminum	Brass	Stainless Steel
PFM1-B*-2H	1.00	0.33	0.40	0.50	0.80
PFM1-**-3H	1.00	0.30	0.35	0.40	0.75
PFM1-**-4H	1.00	0.33	0.40	0.45	0.75
PFT1*-AP-*H	1.00	0.30	0.40	0.40	0.70
PKW-**-1H	1.00	0.12	0.20	0.26	0.62
PKW-**-2H	1.00	0.30	0.37	0.46	0.78
PKW-A*-5*	1.00	0.80	1.00	1.20	0.50
PKW-A*-5* (if Embedded)	0.75	-	0.90	0.75	0.80
PMW-**-1H	1.00	0.02	0.08	0.20	0.68
PMW-**-2H	1.00	0.34	0.41	0.51	0.88
PMW-A*-5*	1.00	0.85	1.00	1.30	0.50
PMW-A*-5* (if Embedded)	0.70	-	1.15	1.05	0.80
PN-m SERIES	1.00	0.30	0.40	0.50	0.70
PN-m6 SERIES	1.00	0.30	0.40	0.50	0.70
PNK SERIES	1.00	0.30	0.40	0.50	0.70
PNK6 SERIES	1.00	0.30	0.40	0.50	0.70
PNT SERIES	1.00	0.30	0.40	0.50	0.70
PNT6 SERIES	1.00	0.30	0.40	0.50	0.70
PTW-A*-**	1.00	0.30	0.40	0.40	0.70
PY3-A*-1A	1.00	0.50	0.55	0.65	0.80
PY3-A*-3A	1.00	0.45	0.50	0.60	0.80
PY4-A*-1A	1.00	0.50	0.55	0.65	0.80
PY4-A*-3A	1.00	0.45	0.50	0.60	0.80
VFK1-A0-*M	1.00	0.30	0.40	0.50	0.70
VFT1-A0-*M	1.00	0.30	0.40	0.40	0.70
V3E1/**-3*	1.00	0.51	0.48	0.56	0.83
V3E1/**-4*	1.00	0.47	0.52	0.57	0.79
V3K1/**-3*	1.00	0.39	0.46	0.52	0.81
V3K1/**-4*	1.00	0.47	0.51	0.55	0.77
VK1-A0-1*	1.00	0.35	0.40	0.50	0.80
VK1-A0-2*	1.00	0.40	0.45	0.55	0.95
V3M1/**-3*	1.00	0.48	0.54	0.60	0.86
V3M1/**-4*	1.00	0.49	0.54	0.58	0.79
VM1-A0-1*	1.00	0.40	0.50	0.55	0.75
VM1-A0-2*	1.00	0.45	0.50	0.60	0.80
V3T1/**-3*	1.00	0.42	0.48	0.53	0.83
V3T1/**-4*	1.00	0.55	0.51	0.46	0.81
VT1-A0-1B	1.00	0.40	0.45	0.50	0.82
VT1-A0-2B	1.00	0.45	0.50	0.55	0.82

Proximity Sensor Terminology

Mounting type

Flush (shielded/embeddable) proximity switches

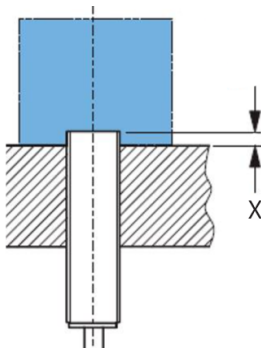
These proximity switches may be flush mounted regardless of the metal being used. For reliable operation, it is necessary to observe the minimum distances from adjacent metal targets.



S_n = Nominal sensing distance (see Rated operating distance)

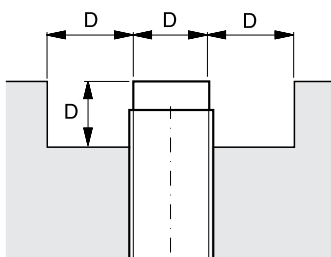
Semi-flush (quasi-embeddable) proximity switches

When mounting semi-flush proximity switches in conducting materials (metals), the unit can be almost flush, with a minimal protrusion (X = roughly 20% of the housing diameter) above the surface. See specific sensor for exact value.



Non-flush (unshielded/non-embeddable) proximity switches

When mounting non-flush proximity switches in conducting materials (metals), it is necessary to observe the minimum distances from adjacent metal targets. Flush mounting in non-conducting materials is permitted.



Off-state (leakage) current

This is the current that flows through the load circuit of the proximity switch in the OFF state at the maximum supply voltage.

Open collector

The output transistor is not internally connected to a pull-up or pull-down load. It is therefore possible to connect an external load supplied by an external voltage.

Operating distance (assured sensing range) (S_a)

The operating distance is the distance at which a standard target approaching the active face of the sensor causes a sensor output state change.

Output type and load connections – 3-wire NPN

There are two power wires and one output wire. The switching element is connected between the output wire and the negative terminal, and the load is connected between the output wire and the positive terminal. In the ON state, the current sinks from the load into the switching element.

Output type and load connections – 3-wire PNP

There are two power wires and one output wire. The switching element is connected between the output wire and the positive terminal, and the load is connected between the output wire and the negative terminal. In the ON state, the current flows from the switching element into the load.

Overvoltage protection

No damage will occur in the presence of surge pulses exceeding U_b and energy less than 0.5J.

Polarity reversing protection

No damage will occur to proximity switches if the supply wires are reversed.

Protection against inductive loads

Unless otherwise specified, DC sensors are protected against inductive overvoltage by use of a surge diode or a zener diode.

Unshielded proximity switches

The sensor housing does not cover the side of the sensing head. This type of sensor has a higher sensing range than the shielded type.

Rated insulation voltage (U_i)

Unless specified differently, all of the sensors with a supply voltage of up to 50 VAC and 75 VDC are tested at 500 VAC.

Sensors with a supply voltage up to 250 VAC are tested as follows:

- Class 1 (with earth terminal) at 1500 VAC
- Class 2 (with double insulation, without earth terminal) at 3000 VAC.

Nominal sensing distance — (Rated operating distance) (S_n)

This distance does not take into account manufacturing tolerances ($\pm 10\%$) or variations due to external conditions, such as voltages and temperatures not falling within the rated values.

Repeat accuracy (R)

The repeat accuracy of the effective operating distance (S_r) is measured over an eight hour period at an ambient temperature of 73°F ($\pm 9^\circ$) [23°C ($\pm 5^\circ$)] at a specified humidity and with a specified supply voltage. The difference between the measurements shall not exceed the specified value, or if not specified, 10% of S_n .

Ripple

This is given as a percentage of the mean supply voltage. It is the maximum peak-to-peak value of the admitted ripple voltage. A ripple voltage of $< 10\% U_b$ is desirable.

Proximity Sensor Terminology

Shocks

In accordance with IEC 60068-2-27

Pulse shape: half-sine

Peak acceleration: 30g

Pulse duration: 11 ms

Short-circuit protection

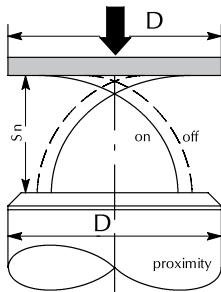
All DC sensors have integrated short-circuit protection. AC sensors should be protected externally by such devices as fuses.

No load supply (current consumption)

Amount of current consumed by sensor when output is not energized.

Standard target

A standard target is square, 1 mm thick, and made from type FE360 carbon steel. The length of the side of the square is equal to the diameter of the sensor's active surface, or three times the rated operating distance (S_n), whichever is greater.



Nominal Sensing Distance

Switching frequency (f)

Switching frequency is the maximum output switching frequency performed by the output circuit when standard targets cross the sensing field at a distance of $S_n/2$. The targets are spaced $2d$.

- For DC sensors, the minimum output pulse width must not fall below $50 \mu\text{s}$.
- For AC sensors, the minimum output pulse must not fall below half a sine period (ie. for 60 Hz, $1/60 \div 2 = 8.33 \text{ ms}$.)

Temperature range

Unless otherwise specified, the minimum temperature range is -13 to $+158^\circ\text{F}$ (-25 to $+70^\circ\text{C}$).

Turn-on time

Turn-on time is the elapsed time from when the target enters the sensing range until the output switches.

Turn-off time

Turn-off time is the elapsed time from when the target is removed until the output switches.

Operating voltage (U_b)

Supply voltage range for safe and correct sensor operation.

Operating (load) Current

Maximum current the sensor output is capable of switching.

Voltage drop (U_d)

This is the voltage measured across the active output of the proximity switch when the rated operational current (I_e) flows in the load at the rated supply voltage and the temperature is at 73°F ($\pm 9^\circ$) [$(23^\circ\text{C} (\pm 5^\circ))$]. Unless specified differently, the following values are guaranteed:

- Two-wire DC models $< 8 \text{ VDC}$
- Three-wire DC models $< 3.5 \text{ VDC}$
- Two-wire AC models $< 10 \text{ VAC}$

Vibration

In accordance with IEC 60868-2-6

Frequency range: 10-55 Hz

Amplitude: 1 mm

Sweep cycle duration: 5 min.

Duration of endurance at 55 Hz: 30 min. in each of the three axis directions

4-wire NPN or PNP (complementary outputs)

There are two power wires: one normally open output wire and one normally closed output wire.

4-wire NPN and PNP

There are two power wires, and the output type is wiring programmable. An NPN output is available by connecting the PNP terminal to the negative power supply line. A PNP output is available by connecting the NPN terminal to the positive power supply line.

Time delay before availability (t_v)

The time delay before availability is the time between the switching on of the supply voltage and the instant at which the sensor becomes ready to operate correctly.

During the reset the output circuit is in OFF-state; false signal may be present but the duration shall not exceed 2 ms. If not specified otherwise, the reset duration doesn't exceed 300 ms.

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APPENDIX H. OFFLOADING BARRIER

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Mobile Active Vehicle Barrier – Crane Hoisting For XV-P



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Revisions:
Revision 00 initial release

1.1. Loads and Lift Points

1.1.1. Loads

See Table 1 for manufacturer provided weight chart.

Table 1. Manufacturer Weight Chart

ITEM	APPROX.WEIGHT LB
NMSB XV – Portable Barrier	9,000

See Table 2 for manufacturer provided dimensions.

Table 2. Manufacturer Size Chart

ITEM	LENGTH INCH	WIDTH INCH	HEIGHT INCH
NMSB XV – Portable Barrier	195	72	41

1.1.2. Lift Points

1.1.2.1. NMSB XV-P

Lift a NMSB XV-P USING LIFTING EYES.

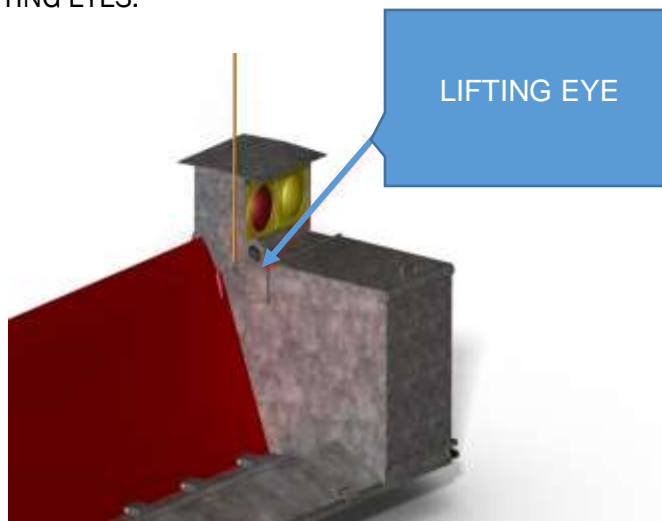


Figure 1. NMSB XV-P Front Lift Point

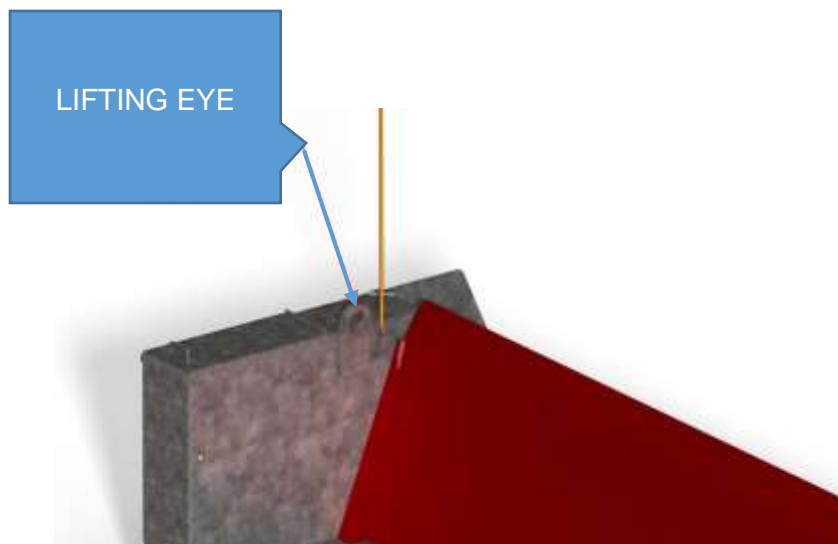


Figure 2. NMSB XV-P Rear Lift Point

NOTE

THE FOLLOWING FIGURES DEPICT THE NMSB XVX BEING HOISTED.
THE SAME LIFT POINTS AND METHOD APPLY TO THE NMSB XV-P.



Figure 3. Hoisting Strap Locations



Figure 4. Crane Hoisting



Figure 5. Crane Hoisting & Barrier Unloading

1.2. Site Documentation

1.2.1. Inspections

Provide completed Hoisting Notification Form no less than three days prior to scheduled lift.
Complete Lift Plan & Checklist just prior to scheduled lift.

A. The following daily inspections are required:

1. Daily pre-shift crane inspections will be made by the qualified operator according to the manufacturer's specifications and site inspection logs. The inspection logbook will remain within the crane operators cab.
2. All rigging shall be inspected daily by the qualified rigger prior to use.

1.2.2. Contact Information

- Nasatka Site Rep
- **IN CASE OF EMERGENCY 911**

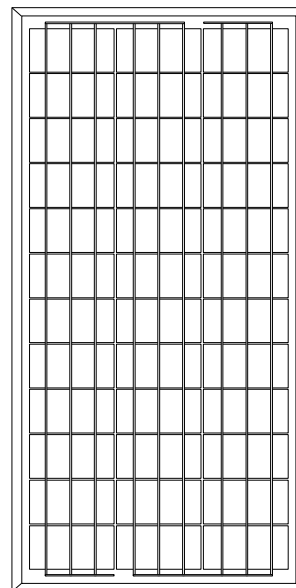
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APPENDIX I. SOLAR

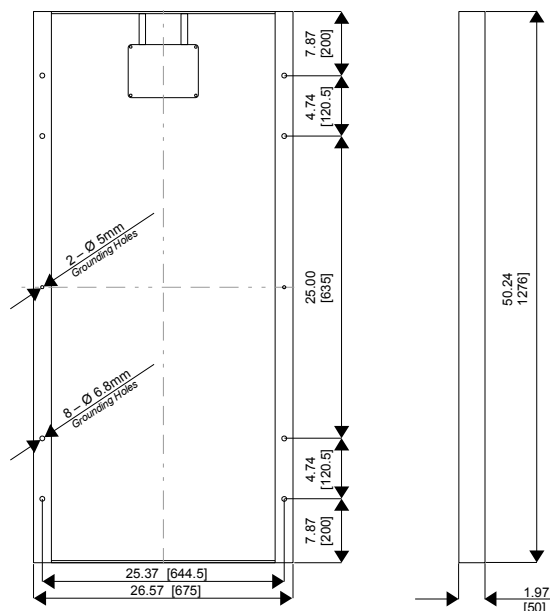
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Electrical Performance

Specs	130W, 12V
Maximum Power (Pmax)	130W
Voltage at Pmax (Vmp)	17.4V
Current at Pmax (Imp)	7.5A
Open-circuit voltage (Voc)	22.0V
Short-circuit current (Isc)	8.2A
Temperature coefficient of Voc	-(80±10)mV/°C
Temperature coefficient Isc	(0.065±0.015)%/ °C
NOCT (Air 20°C; Sun 0.8kW/m ² wind 1m/s)	47±2°C
Operating Temperature	-40°C to 85°C
Maximum system voltage	1000V DC
Power tolerance	+10% / -5%
*STC: Irradiance 1000W/m, AM1.5 spectrum, 25°C	



Dimensions



Weight: 26.51Lbs [12.00kg]

Features

- Nominal 12V DC for standard output.
- Outstanding low-light performance.
- Heavy-duty anodized frames.
- High transparent low-iron, tempered glass.
- Cells are laminated with TPT and EVA ensuring longer life and maximum performance.
- Rugged design to withstand high wind pressure, hail and snow load.
- Aesthetic appearance.
- 25 years limited power output warranty.
- Custom design capabilities allow us to meet unique customer demands.

Product shown with optional meter.



Morningstar's **ProStar** is the world's leading mid-range solar controller for both professional and consumer applications. This second generation ProStar:

- Adds new features and protections using highly advanced technology
- Provides longer battery life and improved system performance
- Sets new standards for reliability and self-diagnostics

Standard Features:

- Versions available: 15 or 30 amp
12 / 24 or 48 volt
negative or positive ground
- Estimated 15 year life
- PWM series battery charging (not shunt)
- 3-position battery select: gel, sealed or flooded
- Very accurate control and measurement
- Jumper to eliminate telecom noise
- Parallel for up to 300 amps
- Temperature compensation

- Tropicalization: conformal coating, stainless-steel fasteners & anodized aluminum heat sink
- No switching or measurement in the grounded leg
- 100% solid state
- Very low voltage drops
- Current compensated low voltage disconnect (LVD)
- LED's indicate battery status and faults
- Capable of 25% overloads
- Remote battery voltage sense terminals

Electronic Protections:

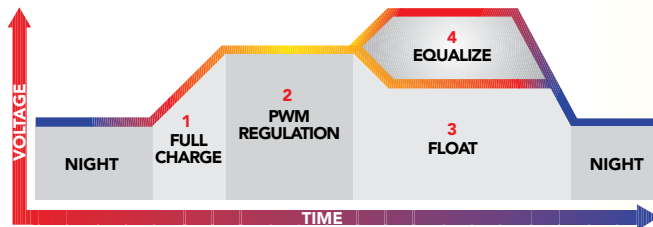
- Short-circuit — solar and load
- Overload — solar and load
- Reverse polarity
- Reverse current at night
- High voltage disconnect
- High temperature disconnect
- Lightning and transient surge protection
- Loads protected from voltage spikes
- Automatic recovery with all protections

ProStar Options:

- Digital meter
 - Highly accurate voltage and current display
 - Low self-consumption (1 mA)
 - Includes manual disconnect button
 - Displays 5 different protection functions and disconnect conditions
 - Self-diagnostics (self-test) provides a comprehensive test of the ProStar —
 - Displays 9 different controller status parameters, including temperature
 - Displays detected faults
- Positive ground
- Remote temperature probe

Optimized Battery Charging:

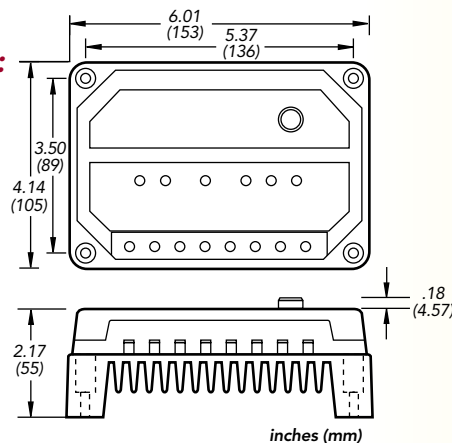
The ProStar has 4 stages of charging to provide increased battery capacity and life.



Mechanical Specifications:

Weight:
12 oz
(0.34 kg)

Wire Size:
#6 AWG
(16 mm²)



ProStar Versions:

	PS-15	PS-30	PS15M-48V
Rated Solar Current	15A	30A	15A
Rated Load Current	15A	30A	15A
System Voltage	12/24V	12/24V	48V
Options:			
Digital Meter	yes	yes	standard
Positive Ground	no	yes	yes
Remote Temp. Probe	yes	yes	yes

Battery Voltage Setpoints*

	Gel	Sealed	Flooded
Regulation Voltage	14.0	14.15	14.4
Float	13.7	13.7	13.7
Equalization	n/a	14.35	14.9/15.1
Load Disconnect	11.4	11.4	11.4
Load Reconnect	12.6	12.6	12.6

Note: values are for 12V. Use 2X for 24V and 4X for 48V.

Electrical Specifications:

	12V	24V	48V
Temp. Comp. (mV/°C)*	– 30mV	– 60mV	– 120mV
Accuracy	40mV	60mV	80mV
Min. voltage to operate	8V	8V	15V
Self-consumption	22mA	25mA	28mA
LVD current coefficient**	– 20mV	– 40mV	– 80mV
Charge algorithm	PWM, constant voltage		
Operating temperature	– 40°C to + 60°C		
Digital Display:			
Operating temperature	– 30°C to + 85°C		
Voltage accuracy	0.5%		
Current accuracy	2.0%		
Self-consumption	1 mA		

* 25°C reference

** per amp of load

WARRANTY: Five year warranty period. Contact Morningstar or your authorized distributor for complete terms.

AUTHORIZED MORNINGSTAR DISTRIBUTOR:



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Newtown, PA 18940 USA
Tel: +1 215-321-4457 Fax: +1 215-321-4458
E-mail: info@morningstarcorp.com
Website: www.morningstarcorp.com

PROSTAR

SOLAR CONTROLLERS

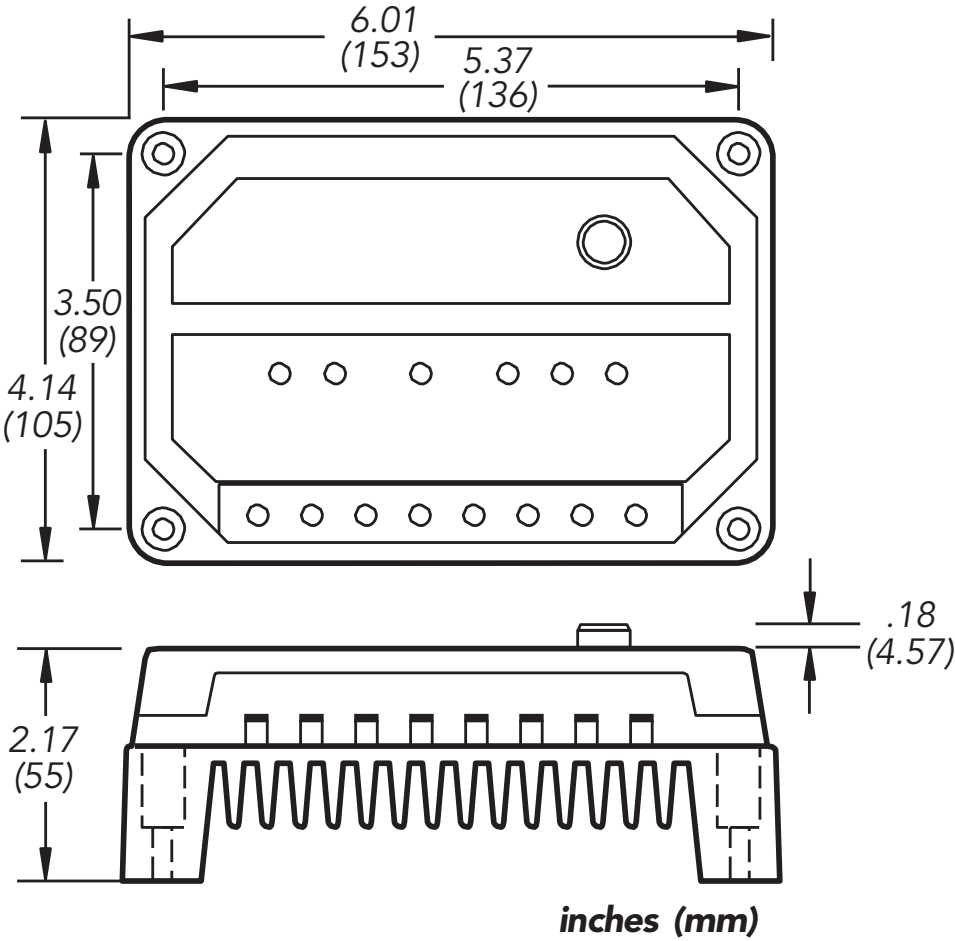
OPERATOR'S MANUAL

PROSTAR VERSIONS INCLUDED IN THIS MANUAL

	PS-15	PS-30	PS-15M-48V
Rated Solar Current	15A	30A	15A
Rated Load Current	15A	30A	15A
Max. Solar Input Voltage	30/60V	30/60V	120V
System Voltage	12/24V	12/24V	48V
Digital Meter Option	yes	yes	standard
Positive Ground Option	no	yes	yes

8 Pheasant Run
Newtown, PA 18940 USA
phone: 215 321 4457
fax: 215 321 4458
email: info@morningstarcorp.com

PROSTAR DIMENSIONS



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1.0 GENERAL INFORMATION

Thank you for selecting the ProStar solar controller. This second generation ProStar adds new features and protections using highly advanced technology. Morningstar's patented PWM battery charging algorithm has also been further optimized for longer battery life and improved system performance.

Many functions of the ProStar are unique. Although the ProStar is very simple to use, please take the time to read this operator's manual and become familiar with the controller. This will help you to make full use of the many advantages the ProStar can provide for your solar system.

2.0 IMPORTANT SAFETY INFORMATION

"Always Put Safety First"

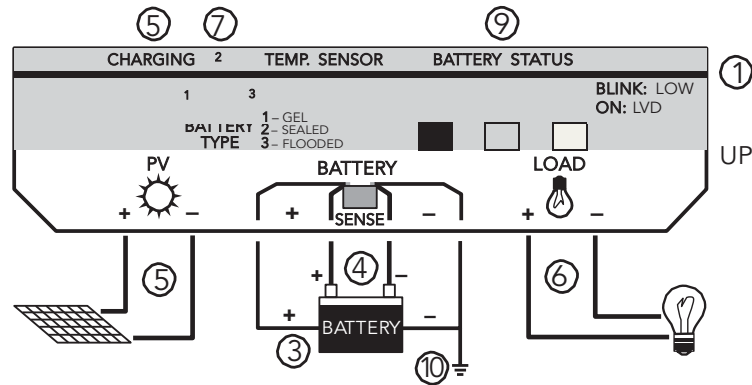
- Be very careful when working with batteries. Wear eye protection. Have fresh water available to wash and clean any contact with battery acid.
- Charge only lead-acid batteries that are properly sized for the system.
- Explosive battery gasses can be present during charging. Be certain there is enough ventilation to release the gasses.
- Use insulated tools and avoid metal objects near the batteries.
- Carefully read the battery manuals and other equipment manuals before installing the solar system. Observe ALL precautions when working with batteries and power electronics.
- Fuses or DC disconnects may be required in the system. These protective devices are not part of the ProStar controller.
- Avoid large voltage drops in the battery wires. Use the Battery Sense connection for best battery charging and system performance.
- Do not allow water to enter the controller.
- Avoid touching the controller heat sink. Under certain operating conditions, the heat sink can become hot.
- Install the controller in a vertical position with adequate space for ventilation.
- Ensure that the system is properly grounded.
- SAVE these instructions for future reference.

3.0 QUICK START INSTRUCTIONS

This section provides a brief overview of how to get started using the ProStar controller. However, please review the entire manual to ensure best performance and years of trouble-free service.

1. Verify that the nominal array voltage matches the nominal battery voltage.
2. Verify that the solar and load currents will not exceed the ratings of the ProStar version being installed.
3. Verify that the solar input voltage (temperature compensated Voc) will not exceed the rating for the applicable system voltage

4. Mount the ProStar to a vertical surface. Allow space above and below the controller for air flow. The heat sink MUST be in a vertical (up & down) position.
3. Connect the Battery first. Observe that the Battery Status LEDs blink in sequence one time. Torque all the ProStar terminals tightly, but do not exceed 35 in-lb.
4. Connect the battery Sense. This is recommended, but not required, if the battery is located more than 5 meters from the controller.
5. Connect the **Solar**. With sunlight, the green Charging LED will light.
6. Connect the Load. If there is a fault, the LEDs will begin blinking. Refer to section 4.0 of this manual to identify the fault.



7. Select the proper charging for the battery being used. Turn the rotary switch with a screwdriver to the Battery Type printed on the label. The Battery Status LEDs will blink 1, 2 or 3 times depending on the Battery Type selected.
8. For 12 or 24 volt systems, the ProStar will automatically select the system voltage. If the system is 24 volts, first confirm that the battery is above 15.5 volts. The controller selects 12 or 24 volts at start-up.
9. Observe the LEDs and digital meter (if provided) to confirm normal operation.
10. It is recommended that the system be properly grounded.

4.0 LED INDICATORS

The 4 LEDs in the lower label indicate system status and various faults. These functions are described below.

CHARGING (LED 1 – green)

- ON: battery charging during sunlight (always on during sunlight)
- OFF: normal during night (off during sunlight indicates solar reverse polarity or overcurrent)

BATTERY STATUS (LEDs 2 – 4)

- GREEN: ON indicates battery is near full charge
BLINKING indicates PWM charging (regulation)
- YELLOW: ON indicates battery at middle capacity
- RED: BLINKING indicates a low charge state and low voltage disconnect (LVD) warning ; SOLID indicates that the load has been disconnected (LVD)

FAULT INDICATIONS (G = green; Y = yellow; R = red)

G/Y/R blinking together	– battery select fault
R – Y sequencing	– high temperature disconnect
R – G sequencing	– high voltage disconnect
R/G – Y sequencing	– load short circuit or overload

5.0 DIGITAL METER & MANUAL DISCONNECT

A digital meter is available with the ProStar controller as an option. If your version includes the meter display, this section will describe the information that can be displayed with the meter, and the added capabilities that are enabled by the push button switch.

5.1 DIGITAL METER

A precision 3-digit digital meter will continuously display battery voltage, solar current, and the load current. The meter automatically scrolls through these 3 displays. The 3 red LEDs will indicate which parameter is being displayed.

The digital meter will operate from -30°C to $+85^{\circ}\text{C}$. The values displayed are calibrated electronically in production and are accurate to within a few percent. Please note, however, that if the Battery Sense is not connected, the voltage displayed will be in error by the voltage drops in the battery wires.

5.2 MANUAL DISCONNECT

The push button next to the digital display can disconnect the Load or both Load and Solar. A second push of the button will return the controller back to normal operation.

LOAD OFF: A brief push of the button (less than 2 seconds) will disconnect the Load. The Solar remains on and charging.

LOAD AND SOLAR OFF: If the button is held down for 2 seconds, the Solar will also be disconnected.

When the button is pushed, the red LED inside the cap will light. In addition, the Load or both Load and Solar will display "OFF" in the digital meter to indicate the disconnected state.

5.3 DISPLAY DISCONNECTS & PROTECTIONS

The following protection functions and disconnect conditions will be displayed in the digital meter when they occur:

<i>Lvd</i>	LVD – low voltage load disconnect (load only)
<i>Hvd</i>	high voltage disconnect (both solar and load)
<i>Hot</i>	high temperature disconnect (both solar and load)
<i>OCP</i>	overcurrent and short circuit protection (load, solar overcurrent)
<i>SC</i>	short circuit protection (solar only)

5.4 SELF-DIAGNOSTICS (SELF-TEST)

If the push button is held down for 4 seconds, the ProStar will go into automatic self-diagnostics. Note that the button must be released to start the self-test.

NOTE: The push button can be used to toggle through the displays faster. The entire self-test takes 30 to 45 seconds. The load will be turned on for 0.1 second and may flash during the test. A short or overload condition could cause a controller restart.

The following displays will occur (examples are used):

<i>8.8.8</i>	self-test started, checking the digital meter segments
<i>12u</i>	the system voltage (12/24/48)
<i>15A</i>	ProStar current rating
<i>r1.5</i>	software version installed
<i>E04</i>	a fault has been detected (see list below)
<i>---</i>	display if no fault is found
<i>25c</i>	temperature measured at the controller remote
<i>rP</i>	temp probe is detected (if connected)
<i>25c</i>	temperature at the remote probe (if connected)
<i>SEn</i>	battery sense detected (if connected)
<i>S-1</i>	battery select position (1,2, or 3)
<i>J-1</i>	telecom noise jumper cut (change to on-off regulation)
<i>End</i>	end of the self-test
<i>End---End</i>	display continues if no error was detected.
<i>End End</i>	display continues if an error has been detected.

To terminate the self-test, push the button.

The self-test can be repeated to confirm the result.

Error List:

E01	Rotary switch battery selection failure
E03	Voltage reference test failed (circuit, malfunctions)
E04	Solar array current fault (circuit, FETs)
E07	Load FETs off test (load connection, FETs shorted)
E08	Load current fault (circuit, FETs)
E09	Load FETs on test (load circuit, FETs open)
E10	Internal temp sensor out of range high
E11	Internal temp sensor out of range low
E12	Remote temp probe out of range
E13	Battery sense fault (battery V drop over 5V, no Sense negative connection)

NOTE: In addition to the self-test, observe the solar and load currents displayed in the meter. The self-diagnostics plus the currents displayed in the meter will provide a comprehensive test of the ProStar. Some faults may exist that are not detected by the self-test, but the large majority of potential faults will be tested and reported in this self-diagnostic test.

Refer to section 9.0 for more information.

6.0 INSTALLATION INSTRUCTIONS

The ProStar is installed in 10 steps. Follow the procedure in section 6.2 for a proper installation and best performance.

6.1 GENERAL INSTALLATION NOTES

- The ProStar uses stainless steel fasteners, an anodized heat sink, and conformal coating to protect from harsh conditions. However, for acceptable service life extreme temperatures and marine environments should be avoided.
- The ProStar prevents reverse current leakage at night, so a blocking diode is not required in the system.
- The ProStar is designed to regulate ONLY solar (photovoltaic) power. Do not connect it to any other type of power generator. Do not attempt to regulate a wind turbine. However, other power sources can be connected directly to the battery.
- The connector terminals will accept a maximum wire size of AWG #6 / 16 mm² (solid/multistrand) or AWG #8 / 10 mm² (fine strand). Use a flathead insulated screwdriver, and torque tightly up to 35 in-lb.
- Fuses or DC disconnects may be required in the system. These protection devices are not part of the ProStar controller.

NOTE: Carefully observe the LEDs at each connection. The LEDs will indicate proper polarity and a good connection.

6.2 INSTALLATION STEPS

Refer to the wiring connection diagram in section 3.0.

STEP 1: Mounting

Inspect the controller for shipping damage. Mount the ProStar to a vertical surface (4 stainless steel #8 self-tapping screws are included). Tighten the mounting screws using care not to crack the plastic case. Do not install directly over an easily combustible surface since the heat sink may get hot under certain operating conditions.

NOTE: Heat sink must be in a vertical position (fins up and down).

Allow at least 15 cm (6 inches) space above and below the controller for air flow. Install in an area protected from direct rain and direct sun.

If the controller is installed in an enclosure, some ventilation is recommended. Do not locate in an enclosure where battery gasses can accumulate.

STEP 2: Ratings

Confirm that the solar array and loads will not exceed the current rating of the ProStar version being installed.

Multiple ProStar units can be paralleled at the system battery to increase the solar capacity, but do not parallel loads.

NOTE: The battery should be connected first. This will activate the controller protection features, and will power the LEDs to guide installation and start-up.

STEP 3: Battery

Before connecting the battery, measure the battery's open-circuit voltage. It must be over 8 volts to operate the controller. For 24 volt systems, the battery must be over 15.5 volts or the ProStar will regulate for 12V. The 12/24V auto selection is only done at start-up.

Connect the battery and confirm that the 3 Battery Status LEDs blink in sequence. If they do not light, check the battery polarity (+/-) and battery voltage.

CAUTION: The ProStar is protected against all faults EXCEPT a reversed battery connection together with a polarized or short circuited load. CONFIRM that the battery + and – wires are correctly connected before proceeding. Check the wires and the LEDs.

The green, yellow or red LED will light depending on the battery charge state. Confirm one of these LEDs is on before going to the next step.

STEP 4: Sense

Battery sense connections are recommended if the controller is more than 5 meters from the battery. The Sense, connected directly to the battery, will improve the battery charging and control.

Both Sense wires (+/-) must be connected. A small wire size (18 AWG or larger) can be used for the Sense because the current is very low. Note that the middle 2 terminals are for sense (with the smaller wire slots in the case).

NOTE: If the Battery input voltage is more than 5 volts different than the Sense due to voltage drops or faulty connections, the Sense input will not be recognized by the ProStar.

STEP 5: Solar

These terminals are used to connect the Solar (PV) array. First confirm that the solar modules are wired for the same voltage as the battery.

Use caution, since the solar array will produce power whenever in sunlight. If the solar is connected while in sunlight, the Charging LED indicator will light. Confirm proper connection with the Charging LED.

STEP 6: Load

Turn the load off, and connect the load wires to the Load terminals. Turn the load on to confirm a proper connection.

If the load does not turn on, it could be for various reasons:

- the ProStar is in LVD (red LED on)
- there is a short circuit in the load (LEDs blinking R/G – Y)
- there is an overload condition (LEDs blinking R/G – Y)
- the load is not connected, not working, or turned off

Confirm the load is working properly before going to Step 7.

STEP 7: Battery Type Selection

Using a small screwdriver, turn the rotary switch to select the Battery Type. There are 3 choices (see section 8.2):

1 = Gel battery

2 = Sealed battery

3 = Flooded battery

A proper selection will flash the 3 Status LEDs together: 1 time for Gel, 2 times for Sealed, and 3 times for Flooded.

If the rotary switch does not make a good contact with one of the 3 selections, the 3 LEDs will start flashing together and continue until a good contact is made.

STEP 8: Confirm Installation

After the connections are completed, observe the LEDs to make sure the controller is operating normally for system conditions. If the optional digital meter is provided, observe that the display is scrolling with proper voltage and amperage values. A self-test can be performed with the digital meter (see section 5.4).

STEP 9: Grounding

For safety and effective lightning protection, the negative conductor of the solar system should be properly grounded (see the NOTE below). In addition, the heat sink can be grounded with a #8-32 UNC or M4 screw (0.136 hole provided).

The Solar, Battery, and Load negative terminals are all connected together inside the ProStar per UL recommendations. No switching or measurement is done in the negative current path.

NOTE: For positive ground versions, the Solar, Battery and Load POSITIVE terminals are connected together inside the ProStar. The positive system conductor must be properly grounded. Make sure the upper label of the ProStar indicates "Positive Ground" above the version number to confirm this is a positive ground ProStar controller.

7.0 OPERATION

7.1 OPERATOR'S TASKS

The ProStar is a fully automatic solar system controller that includes many electronic functions to protect both the controller and the solar system. Battery charging is also fully automated (see section 8.0).

The only manual tasks performed by the operator are:

- a. Installation (see section 6.2)
- b. Battery type selection (see section 6.2, Step 7)
- c. Disconnect button / Self-test (see section 5.2 and 5.4)
- d. Reset if a load short circuit does not automatically clear (see section 7.3)
- e. Maintenance (see section 7.4)

7.2 OPERATIONS & FUNCTIONS

The solar system operator should become familiar with the following operating functions of the ProStar controller. Refer to the Technical Specifications (section 10.0) for actual setpoints and other parameter values.

- 100% Solid State: All power switching is done with FETs. No mechanical relays are used in the controller.
- Battery Charge Regulation: The ProStar is a PWM battery charger. See the next section (8.0) for a description of battery charging.
- Low Voltage Load Disconnect (LVD): An automatic load disconnect protects the battery from deep discharge. The load automatically reconnects when the battery recovers. A 4-minute delay prevents false LVD disconnects.
- Low Voltage Warning: The red status LED will blink at low battery capacity to warn of a possible LVD.
- Parallel Controllers: ProStar controllers work very well in parallel configurations. No blocking diodes are required. Each controller must have an independent and separate solar subarray and a load that does not exceed the controller's rating.
- Auxiliary Generators: Engine generators and other sources of power may be connected directly to the battery for charging. It is not necessary to disconnect the ProStar from the battery. However, do not use the ProStar to regulate these other sources of power.

Noise: The ProStar circuit minimizes switching noise and filters noise output. A properly grounded system will also minimize noise. If noise is present in a telecom or radio load, refer to section 7.5 below.

7.3 PROTECTIONS

The ProStar is fully protected against system faults listed below. Recovery is automatic except where noted below. Refer to sections 4.0 and 5.0 for fault indications.

- Solar short circuit and overload – fully automatic recovery
- Load short circuit and overload – after 3 automatic load reconnect attempts (10 seconds between each attempt), the fault must be cleared and the load must be turned off or disconnected for 10 seconds or longer to restore power to the load terminals.
- Reverse polarity – fully protected except per Caution below
- Battery disconnected – the load is protected from voltage spikes
- High temperature – first the solar is disconnected, then the load will be disconnected; auto reconnects
- High battery voltage – first the solar is disconnected, then the load will be disconnected; auto reconnects
- Very low battery voltage – brownout protection, auto recovery into LVD state
- Battery select error – defaults to gel battery setting, flashes LEDs
- Temperature sensor failure – a remote probe failure defaults to the internal temperature sensor, which defaults to a fixed 25°C if it fails

CAUTION: One source of potential damage to the controller is a reversed battery polarity (+/-) together with a polarized or short-circuited load.

7.4 INSPECTION & MAINTENANCE

The following inspections and maintenance tasks are recommended at least two times per year for best controller performance.

1. Confirm that the correct battery type is selected. Turn the rotary switch to another setting and then back to the setting desired, and count the LED flashes.
2. Confirm that the maximum current of the solar array and load does not exceed the ProStar ratings.
3. Tighten all the terminals. Inspect for loose or broken wire connections.
4. Check that the controller is securely mounted in a clean, protected environment.
5. Check that the air flow and the ventilation holes are not blocked.
6. Inspect for dirt, insects, nests, and corrosion.
7. Check that the controller functions and LED indicators are correct for the system conditions at that time.

7.5 SPECIAL FEATURES

Two specialized capabilities will apply to some ProStar owners.

A) Remote Temperature Probe

An optional remote temperature probe can be soldered to the ProStar assembly at any time. The standard cable length is 25 ft (7.6 m), and this can easily be extended to 100 ft (30 m) or longer. The 2 probe wires are soldered to the main board assembly between the temperature sensor and the green LED, at "J12".

Instructions are provided with the remote probe. The ProStar will automatically select the remote probe for battery temperature compensation if it is installed.

B) Telecom Noise Jumper

Some telecom equipment will produce noise when the ProStar begins PWM regulation. If this occurs, a jumper can be cut to eliminate the noise. Instructions follow:

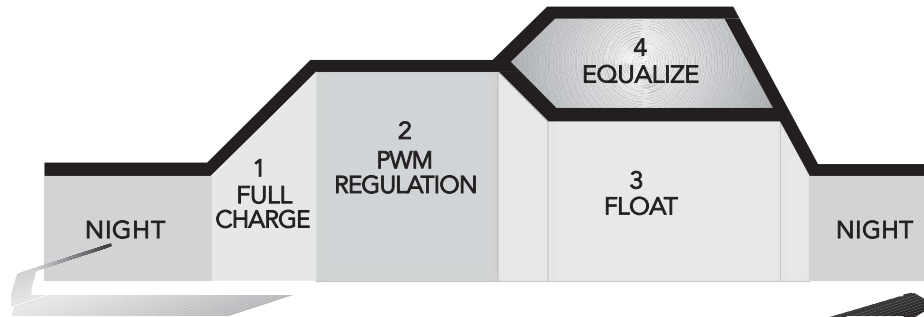
- First, try to improve the system grounding which often eliminates the noise. The PWM battery charging provides a significant benefit to the battery, and it is worth trying to preserve the PWM charging.
- If the noise continues, disconnect the controller and remove the ProStar assembly from its plastic case.
- Locate a vertical resistor in the upper right hand corner of the board, near the microcontroller. This is identified as "J11" on the board.
- Cut one leg of the resistor and separate the leads.

This will convert the battery charging to a typical "on-off" regulation of the solar energy. The switching is very slow, so the noise will not be noticeable. The equalization and float features of the battery charging algorithm are preserved in the "on-off" mode.

In the future, this can be reversed back to PWM if the cut jumper leg is soldered back together.

8.0 BATTERY CHARGING INFORMATION

The ProStar is an advanced, fully automatic solar battery charger. No adjustments are required except to select the battery type at installation (see section 8.2 below).



8.1 PROSTAR CHARGING METHOD

The ProStar uses 4 stages of charging for rapid, efficient and safe battery charging. These are shown in the diagram below:

1. Recharging with 100% of available solar energy.
2. PWM constant-voltage regulation to prevent heating and excessive battery gassing. Pulse charging to restore full battery capacity.
3. Float: After battery is fully recharged, ProStar reduces to a float or trickle charge. The transition depends on battery history. A load that exceeds available solar output will return ProStar to the PWM mode.
4. Equalize: A boost charge that depends on elapsed time and battery history. Flooded cells receive a vigorous equalization, sealed batteries a smaller boost to bring uneven cells into balance and extend the battery life. Gel cells are not equalized.

8.2 SELECT BATTERY TYPE

The Battery Type rotary switch allows selection of 1 of 3 charging algorithms. These are broadly defined as the following battery types as noted on the lower label:

1. Gel: Some gel and other battery types recommend lower regulation voltages and no equalization. This setting regulates to 14.0V (for a 12V battery).
2. Sealed: AGM, "maintenance free" and some types of gel batteries. Regulates to 14.15V (12V battery) with 14.35V boost charging.
3. Flooded: Vented cells that require water to be added. Regulates to 14.4V with 14.9V and 15.1V equalizations (12V battery).

The above values are 2 times for 24V, and 4 times for 48V.

The battery type selection can be changed at any time.

8.3 PROSTAR CHARGING FEATURES

Other ProStar capabilities for best battery life follow:

- Night Disconnect: The solar array automatically disconnects at night to prevent reverse current leakage from the battery.

- **Battery Sense:** Good battery performance requires accurate charging. Voltage drops in the battery power cables can distort the battery charging. The Sense wires eliminate the voltage drops for optimized charging.
- **Temperature Compensation:** Four control setpoints (25°C reference) are compensated for temperature (PWM regulation, float, equalization, high voltage disconnect). The charging is compensated by $-5 \text{ mV/}^\circ\text{C}$ /cell ($-30\text{mV/}^\circ\text{C}$ for a 12V battery). Compensation is limited to minus 30°C.
- **Remote Temperature Probe:** An optional probe is available to measure temperature at a location away from the controller. This requires soldering 2 wires to the ProStar PCB. See section 7.5.
- **Battery Equalization:**

	Sealed	Flooded
Calendar – 25 days		
Equalization voltage	14.35	14.9
Cumulative time	1 hour	1 hour
Time starts above (V)	14.3	14.6
Battery History (flooded only)		
Battery voltage falls below (V)	N/A	11.7
Equalize voltage		15.1
Cumulative time		2 hours
Time starts above (V)		14.6
Reset 25-day calendar		yes

The above battery setpoints are 2 times for 24V, and 4 times for 48V.

9.0 TESTING AND TROUBLESHOOTING

9.1 SELF-DIAGNOSTICS

If your ProStar includes the optional digital meter, refer to section 5.4 for how to perform a self-test of the ProStar. This will test for almost all failure modes of the ProStar and display any faults that are found.

If the self-diagnostic test indicates that no failures were found, it is very likely that the problem is with the solar system or battery.

9.2 TECHNICAL SUPPORT

Additional technical information and support can be found at Morningstar's Website:
www.morningstarcorp.com

9.3 TESTING WITH A POWER SUPPLY

The ProStar can be tested with a power supply used in place of either the solar array input or the battery. To avoid damage to the ProStar, observe the following cautions:

- Current limit the power supply to no more than half the ProStar rating.
- Set the power supply to 15 volts DC or less for 12V systems (30V for 24V systems and 60V for 48V systems).
- Connect only one power supply to the controller.

Failure to follow these precautions may void the warranty.

9.4 TROUBLESHOOTING

The ProStar is assembled with automated equipment, tested with computers, and is protected from faults. It is usually worthwhile to troubleshoot the entire solar system for faults, since the ProStar will generally not be the cause of a problem. Most problems will be caused by wiring connections, batteries unable to hold a charge, or faulty loads.

CAUTIONS:

1. Troubleshooting should be done by qualified personnel.
2. A battery can cause serious damage if shorted.
3. There are no user serviceable parts, fuses or circuit breakers inside the ProStar.
4. Observe all normal precautions when working with energized circuitry.

NOTE: If soldering is required, simply solder-through the conformal coating. The coating is acrylic and does not affect soldering.

1. BATTERY IS NOT CHARGING

- Check the green CHARGING LED above the Solar input. With sunlight on the solar array, this LED should be on.
- Check that the proper BATTERY TYPE has been selected.
- Check that all wire connections in the system are correct and tight. Check the polarity (+/-) of the connections.
- Measure the solar array open-circuit voltage (disconnected from the controller) and confirm it is normal. If the array voltage is low or zero, repair the fault in the array.
- Confirm that the load is not drawing more energy than the solar array can provide.
- If the BATTERY SENSE terminals are not used, there may be excessive voltage drops between the ProStar and the battery. This is a common cause of undercharging batteries. See section 6.2 to connect the Battery Sense.
- Check the condition of the battery. Determine if the battery voltage falls at night with no load. If the battery is unable to maintain its voltage, it may be failing
- Measure the solar input voltage (during daytime) and battery voltage at the ProStar terminals. If the voltages at the terminals are the same (within about 0.5 volts), the solar array is charging the battery. If the solar voltage is close to open-circuit (about 20V), and the battery voltage is low, the controller is not charging the battery and may be defective. Make sure the ProStar is not in regulation (PWM) for this test (see section 4.0).

NOTE: If the battery is not being fully recharged, measure the voltage at the battery terminals on the ProStar, and then at the terminals on the battery. This should be done at midday with full charging from the solar array (and not in PWM regulation). If the ProStar terminals are 1 volt higher than the battery terminals, for example, this voltage drop will cause the battery to regulate 1 volt below its desired regulation (PWM) voltage, and it will take longer to recharge. In this case, the SENSE terminals should be connected to the battery for accurate charging.

2. BATTERY VOLTAGE IS TOO HIGH

- First check the operating conditions to account for temperature compensation (a 15°C / 59°F temperature will increase PWM regulation by 0.3V for a 12V battery) and automatic equalizations.

- Check that the proper battery type has been selected.
- Disconnect the solar array, and remove the battery wire from the ProStar battery positive (+) terminal. Wait a few seconds and reconnect the battery positive terminal (leaving the solar array disconnected). After start-up, the green CHARGING LED should not be on. Measure the voltage at the SOLAR terminals (with the array still disconnected). If battery voltage is measured at the SOLAR terminals and the green LED is on, the controller may be defective.

CAUTION: If your ProStar is a positive ground version, references above to Battery (+) terminals should be Battery (–) negative terminals.

3. LOAD IS NOT OPERATING PROPERLY

- Check that the load is connected and turned on. Confirm that no fuses or circuit breakers in the system are tripped (there are no fuses or circuit breakers inside the ProStar).
- Check all connections to the load, and battery connections. Make sure voltage drops in the system are not too high (a voltage drop to the load will reduce the voltage at the load).
- Check the LED indications on the ProStar. If the red status LED is on, the load has been disconnected due to low battery voltage (LVD). This is a normal protection function of the ProStar, and the load will be automatically reconnected when the battery is charged by the solar array.
- If the LEDs are blinking, the load may have been disconnected for protection from one of the following faults:
 - short circuit or overload (R/G–Y sequencing)

NOTE: After 3 automatic retries, the fault must be cleared and the load must be switched off or disconnected for 10 seconds or longer to restore power to the load terminals

- high temperature (R–Y sequencing)
 - high voltage (R–G sequencing)
- Measure the voltage at the BATTERY terminals. If above LVD and no faults are present, the load should have power. Then measure the voltage at the LOAD terminals, and if there is no voltage present the controller may be defective.

NOTE: For more technical and testing information, visit Morningstar's Website: www.morningstarcorp.com

10.0 TECHNICAL SPECIFICATIONS

Note: Values are for 12V versions. 24V versions are 2 times (48V are 4 times) the 12V values unless noted otherwise.

• Accuracy		
	12V	40 mV
	24V	60 mV
	48V	80 mV
• Min. voltage to operate		
	12/24V	8 V
	48 V	15 V
• Self-consumption		
	12/24V	22 / 25 mA
	48V	28 mA
• LVD current coefficient		
	-20 mV/amp load	
	24 V / 48 V	-40 mV / -80 mV
• High temp shutdown		
	70°C disconnect solar	
	80°C disconnect load	
	60°C reconnect load	
	50°C reconnect solar	
• Voltage drops (max.)		
	solar / battery	0.2 V
	battery / load	0.12 V
• Operating life		
	15 years	
• Transient surge protect		
	pulse power rating	1500 watts
	response	< 5 nanosec

METER DISPLAY

• Type	LCD
• Temp rating	-30 to +85°C
• Voltage accuracy	0.5%
• Current accuracy	2.0%
• Self-consumption	1 mA

BATTERY STATUS LEDS

	Falling V	Rising V	
G to Y	12.1	13.1	Y to G
Y to Blink R	11.7	12.6	Blink R to Y
Blink R to R	11.4	12.6	R to Y

BATTERY SETPOINTS (@ 25°C)

	Gel	Sealed	Flooded
• LVD	11.4	11.4	11.4
• LVD reconnect	12.6	12.6	12.6
• PWM regulation	14.0	14.15	14.4
• Float	13.7	13.7	13.7
• Equalization	N/A	14.35	14.9 / 15.1
• HVD (solar)	15.2	15.2	15.2
• HVD (load)	15.3	15.3	15.3

BATTERY CHARGING

• Charge algorithm	PWM, constant voltage
• Temp comp. coefficient	-5mV/°C/cell (25°C ref)
• Temp comp. range	-30°C to +80°C
• Temp comp. setpoints	PWM, float, equalize, HVD
• Equalization	see section 8.3

MECHANICAL

• Dimensions: (inch)	6.01 x 4.14 x 2.17 153 x 105 x 55
• Weight	12 oz (0.34 kg)
• Wire terminals	Euro-style
	solid #6 AWG / 16 mm ²
	multistrand #6 AWG / 16 mm ²
	fine strand #8 AWG / 10 mm ²
• Terminal diameter	0.210 in / 5.4 mm
• Torque terminals	up to 35 in-lb

ENVIRONMENTAL

• Ambient temperature	-40 to +60°C
• Storage temperature	-55 to +85°C
• Humidity	100% (NC)

Specifications subject to change without notice.
Designed in the U.S.A.
Assembled in Singapore.



MS-ZMAN-PS02 (May 2013)

APPENDIX J. SHOP DRAWINGS

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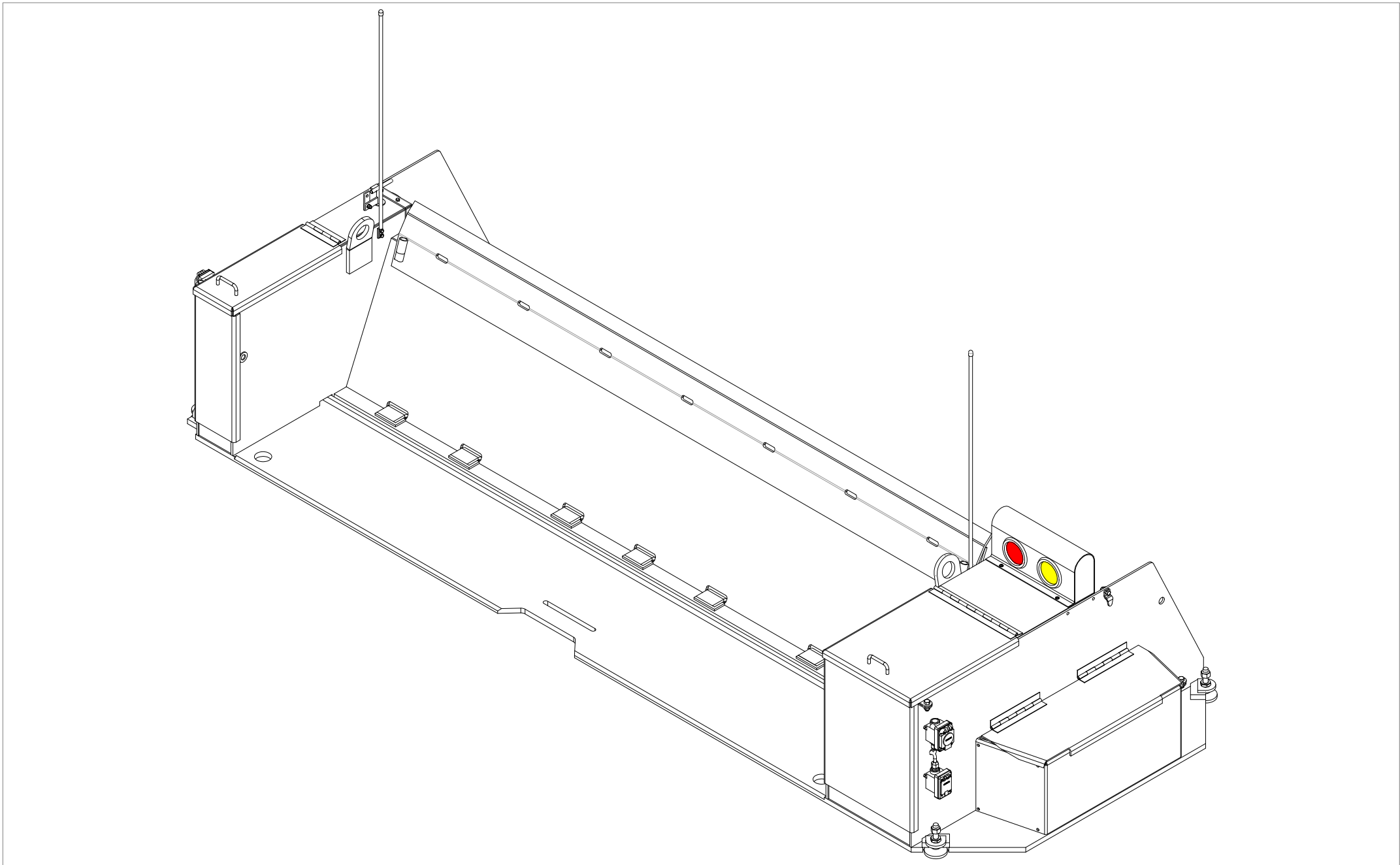
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KIRTLAND AIR FORCE BASE - NEW MEXICO

GENERAL NOTES:

A. FULL BARRIER WILL BE HOT-DIP GALVANIZED.



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REV.	DATE	DESCRIPTION

DESCRIPTION:	KIRTLAND AIR FORCE BASE NM				CHK BY:	HBH
	COVER PAGE				DATE:	07/27/21
PROJECT NO:	2223		DRAWN BY:	DAC	SCALE:	NTS

SHEET:
SB-000

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CONTRACTOR INSTALLATION NOTES:

1. CONTRACTOR SHALL PROVIDE FOR AND ACQUIRE ALL NECESSARY PERMIT(S) AND INSPECTIONS AS MAY BE REQUIRED BY THE AUTHORITY(IES) HAVING JURISDICTION.

2. INSTALLATION SHALL MEET OR EXCEED THE MINIMUM REQUIREMENTS OF THE APPLICABLE CODES IN FORCE OR ADOPTED BY THE AUTHORITIES HAVING JURISDICTION.

3. THE CONTRACTOR SHALL FURNISH ALL MATERIALS AND LABOR NECESSARY FOR THE INSTALLATION OF A COMPLETE AND FUNCTIONAL SYSTEM MEETING THE INTENDED PURPOSE OF THE PROJECT.

4. THE CONTRACTOR SHALL MAKE A THOROUGH EXAMINATION OF THE SITE CONDITIONS AND CONTRACT DOCUMENTS.

5. PRIOR TO COMMENCING WORK, THE CONTRACTOR SHALL COORDINATE WITH THE APPROPRIATE UTILITIES FOR METERING, TRANSFORMER AND SERVICE CONNECTION REQUIREMENTS.

6. CONDUIT SHALL BE INSTALLED CONCEALED OR RECESSED IN A NEAT AND WORKMANLIKE MANNER. ALL CONDUIT SHALL BE INSTALLED PARALLEL OR PERPENDICULAR TO ANY BUILDING OR STRUCTURE UNLESS OTHERWISE APPROVED BY OWNER. EXPOSED CONDUIT ON EXTERIOR WALLS OR FINISHED WALLS IS PROHIBITED UNLESS OTHERWISE REVIEWED AND APPROVED BY OWNER.

7. FOR UNDERGROUND AND UNDER SLAB INSTALLATIONS, CONDUIT SHALL BE PVC OR IMC W/AN ASPHALTIC OR OTHER APPROVED CORROSION INHIBITING COATING. OR AS PER CURRENT NEC.

8. TO LIMIT WATER INTRUSION, SEAL ALL CONDUITS WHERE THE CONDUIT CONNECTS TO AN INTERIOR CONDUIT BODY OR TO AN EXTERIOR EXTERIOR JUNCTION BOX.

9. PROVIDE AN INDEPENDENT MEANS OF SUPPORT FOR CONDUIT INSTALLED ABOVE A CEILING WHERE THEY ARE DISTINGUISHABLE BY COLOR, TAGGING OR OTHER EFFECTIVE MEANS. THE CEILING SUPPORT SYSTEM SHALL BE PERMITTED TO SUPPORT BRANCH CIRCUIT WIRING WHERE INSTALLED IN ACCORDANCE WITH THE CEILING MANUFACTURER'S INSTRUCTIONS.

10. PROVIDE AN INSULATED THROAT FITTING OR PLASTIC BUSHING FOR ALL 1" AND LARGER CONDUIT TERMINATIONS IN PANEL BOARDS, LOAD CENTERS, WIREWAYS AND DISCONNECT SWITCHES.

11. PROVIDE GROUNDING BUSHINGS FOR ANY CONDUIT TERMINATIONS AT ECCENTRIC AND CONCENTRIC KNOCKOUTS IN DISCONNECTS, PANELBOARDS AND LOAD CENTERS OR WHEN REDUCING WASHERS ARE USED. BOND ALL JUNCTION AND PULL BOXES TO GROUND.

12. PROVIDE AN UPDATED TYPED PANEL SCHEDULE REFLECTING INSTALLED CONDITIONS FOR ALL PANEL BOARDS WITH "SPACE" OR "SPARE" PERMANENTLY WRITTEN IF APPLICABLE.

13. SUPPORT WIRES FOR ELECTRICAL EQUIPMENT SHALL BE FASTENED AT BOTH ENDS SO AS TO BE TAUT. INSTALLATION OF ELECTRICAL CABLES AND CONDUIT SHALL BE SUCH THAT UNDULATIONS ARE KEPT TO A MINIMUM.

14. PERMANENTLY LABEL ALL JUNCTION BOX COVERS WITH CIRCUITS DESIGNATION (SOURCE, PHASE, ETC.) CONTAINED WITHIN.

15. AT CONCLUSION OF PROJECT, PROVIDE OPERATING, INSTALLATION INSTRUCTIONS, AND WARRANTY DOCUMENTS TO THE OWNER FOR ALL INSTALLED EQUIPMENT. OPERATING, INSTALLATION, AND WARRANTY DOCUMENTS SHALL BE BOUND TOGETHER WITH INDEX INDICATING WHERE TO FIND INFORMATION ON THE VARIOUS EQUIPMENT.

16. PROVIDE THE APPROPRIATE FIRE STOP SYSTEM AND/OR FIRE CAULK AT ANY PENETRATION BETWEEN RATED ASSEMBLIES.

17. CONDUIT TERMINATION AT NEMA 3R ENCLOSURES SHALL BE WITH MYERS HUBS FOR TOP PENETRATIONS AND LIQUID TIGHT SEALING RINGS OR SEALING LOCKNUTS FOR SIDE PENETRATIONS.

ABBREVIATION LIST

A	AMPERE
AR	AS REQUIRED
ASTM	AMERICAN SOCIETY FOR TESTING AND MATERIALS
AWG	AMERICAN WIRE GAUGE
BCU	BARRIER CONTROL UNIT
C	CONDUIT
CAT	CATEGORY
CB	CIRCUIT BREAKER
CKT	CIRCUIT
CL	CENTER LINE
CU	COPPER
DEG	DEGREE
DS	DISCONNECT SWITCH
EG	EQUIPMENT GROUND
EC	ELECTRICAL CONTRACTOR
ECO	EMERGENCY CLOSE OPERATION
EFO	EMERGENCY FAST OPERATION
EM	EMERGENCY
EMT	ELECTRICAL METALLIC TUBING
EPU	ELECTRICAL POWER UNIT
EX	EXISTING
FBO	FURNISHED BY OTHERS
FO	FIBER OPTIC
G	GROUND
HP	HORSEPOWER
HPU	HYDRAULIC POWER UNIT
JB	JUNCTION BOX
kVA	KILOVOLT AMPERE
kW	KILOWATT
LH	LEFT HANDED
MM	MULTIMODE
NA	NOT APPLICABLE
NEC	NATIONAL ELECTRICAL CODE
NEMA	NATIONAL ELECTRICAL MANUFACTURING ASSOCIATION
NMSB	NASATKA MAXIMUM SECURITY BARRIER
NFPA	NATIONAL FIRE PROTECTION ASSOCIATION
NIC	NOT IN CONTRACT
Ø	PHASE
P&I	PROMDE AND INSTALL
PNL	PANEL
PVC	POLY VINYL CHLORIDE
R	RELOCATED (EXISTING TO BE RELOCATED)
RH	RIGHT HANDED
RMC	RIGID METAL CONDUIT
TYP	TYPICAL
UG	UNDERGROUND
UON	UNLESS OTHERWSE NOTED
V	VOLT
WP	WEATHERPROOF

SOURCE: 10/2018

SYMBOL LEGEND

	EQUIPMENT - AS NOTED		KEYED NOTES
	NMSB XV-PORTABLE BARRIER		PARTS NOTES

LINETYPE LEGEND

—————	AS NOTED
- - - - -	EXISTING TO REMAIN / BY OTHERS
—————	NASATKA SUPPLIED

DRAWING INDEX

NUMBER	TITLE	REV
SB-000	COVER PAGE	0
SB-001	DRAWING INDEX, SYMBOL LEGEND, & ABBREVIATION LIST	0
SB-100	CONTROL PANEL DIAGRAM	0
SB-200	PARTS IDENTIFICATION TABLE	0
SB-201	PARTS IDENTIFICATION	0
SB-202	GENERAL LAYOUT	0
SB-203	CONTROL & POWER RECEPTACLES	0
SB-204	OPTIONAL - RECOMMENDED SPARE PARTS	0
SB-205	OPTIONAL EQUIPMENT - SELECTED	0
SB-206	OPTIONAL EQUIPMENT - NOT SELECTED	0
SB-300	HPU - DETAILS	0
SB-301	HPU BATTERY WIRING	0
SB-302	PIPING & INSTRUMENTATION DIAGRAM	0
SB-303	PROXIMITY SWITCH ASSEMBLY	0
SB-304	HAND PUMP - DETAILS	0
SB-305	LED TRAFFIC LIGHT - DETAILS	0
SB-400	HPU HEATER PAD - DETAILS	0
SB-401	SOLAR SYSTEM WIRING	0

DISCLAIMER:
SOME SYMBOLS, AND ABBREVIATIONS SHOWN
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DESCRIPTION:

KIRTLAND AIR FORCE BASE NM

DRAWING INDEX, SYMBOL LEGEND, & ABBREVIATION LIST

PROJECT NO: 2223

REV.

DATE

DESCRIPTION

REV.

DATE

DESCRIPTION

REV.

DATE

DESCRIPTION

DRAWN BY: DAC

SCALE: NTS

CHK BY: HBH

DATE: 07/27/21

SHEET:

SB-001

J-4

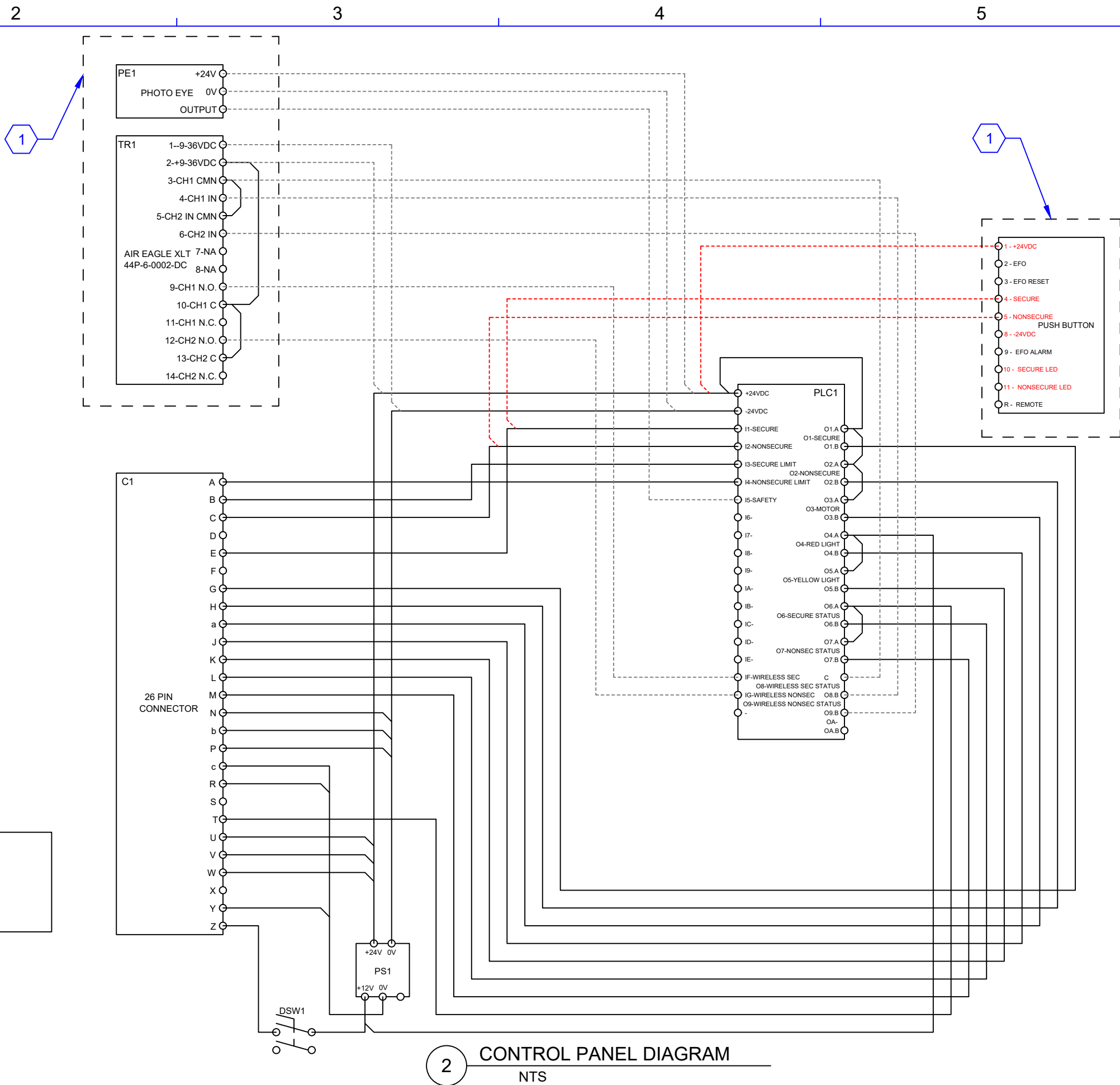
C:\Users\Deborah.Livesey\Box Sync\Documents\AutoCAD Sheet Sets\Projects\2223 Kirtland AFB NM - XV-P\CAD Drawings\SB-001 DRAWING INDEX, SYMBOL LEGEND, & ABBREVIATION LIST.dwg, July 27, 2021 11:30 AM, DEBORAH LIVESEY,

CONNECTOR PIN OUT			
PIN	CONNECTION	DESCRIPTION	WIRE COLOR
A	I4	DOWN LIMIT	ORANGE
B	I3	UP LIMIT	GRAY
C	I2	TETHER DOWN	VIOLET
D	I2	SDI DOWN	GREEN
E	I1	TETHER UP	BLACK
F	I1	SDI UP	WHITE
G	O1	UP SOL	BROWN
H	O2	DOWN SOL	VIOLET
J	O4	RED LIGHT	RED
K	O5	YELLOW LIGHT	YELLOW
L	O6	SDI UP STATUS	BLUE
M	O7	SDI DOWN STATUS	YELLOW
N	-24	UP SOL CMN	BLUE
P	-24	MOTOR RELAY CMN	GREEN
R	-12	YELLOW LIGHT CMN	BLACK
S	-24	SDI -24 VDC OUT	ORANGE
T	O6 & O7	SDI FEEDBACK CMN	BROWN
U	+24	UP LIMIT CMN	WHITE
V	+24	DOWN LIMIT CMN	RED
W	+24	TETHER CMN	GREEN
X	+24	SDI +24 VDC OUT	RED
Y	PS 12V GND	-12 VDC IN	YELLOW
Z	PS 12V IN	+12 VDC IN	BLACK
a	O3	MOTOR RELAY +	WHITE
b	-24	DOWN SOL CMN	GRAY
c	-12	RED LIGHT CMN	VIOLET

1 IDENTIFICATION TABLE

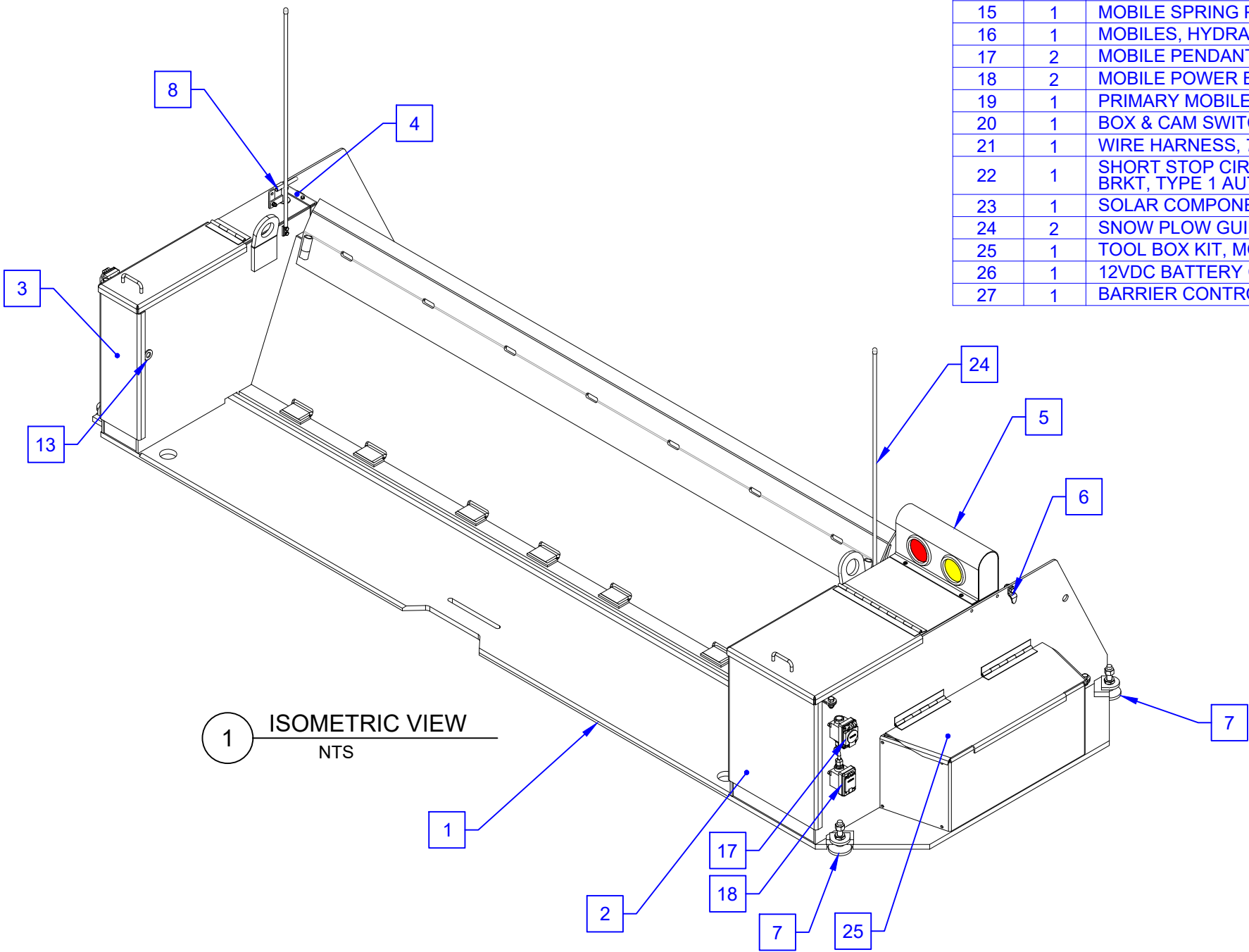
KEYED NOTES:

1. OPTIONAL EQUIPMENT NOT SELECTED - PHOTO-EYE, WIRELESS TRANSCEIVER, & PUSH BUTTON MASTER.



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1 ISOMETRIC VIEW
NTS

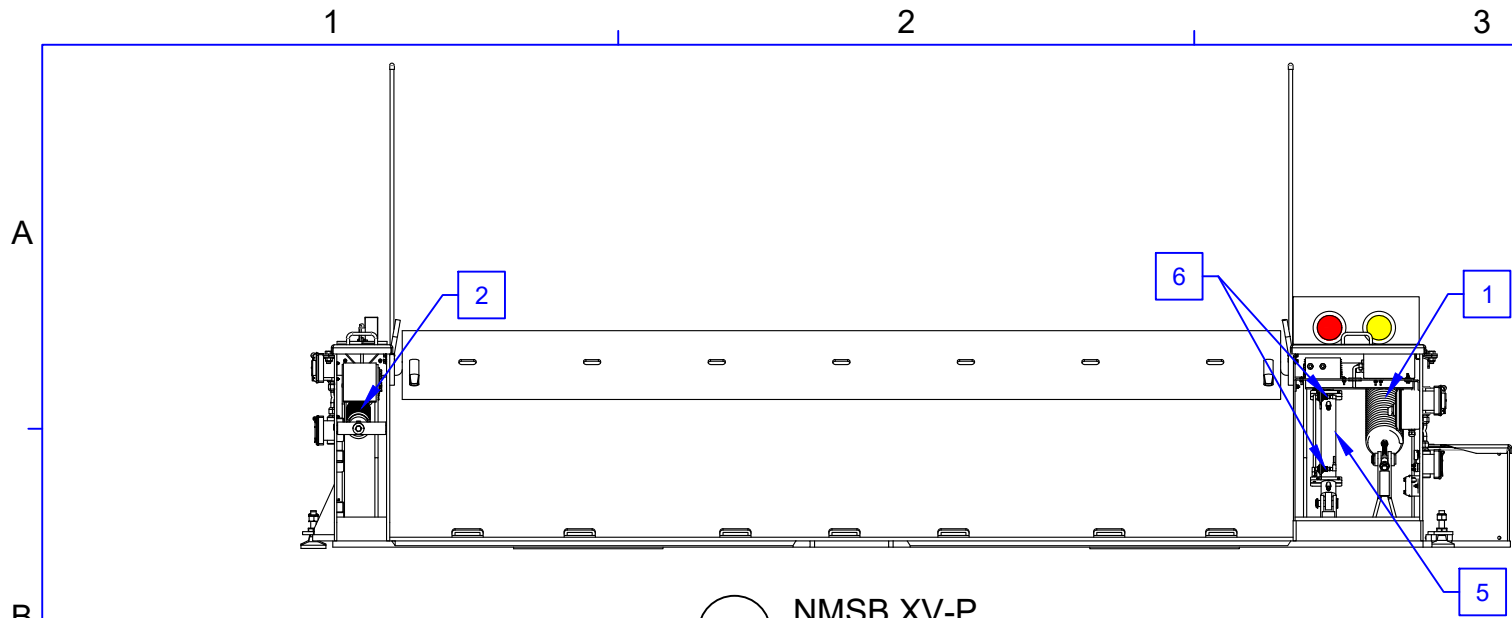
ITEM #	QTY	DESCRIPTION	MATERIAL
1	1	PRE GALVANIZED FRAME PARTS ASSEMBLY MODEL XV	N/A
2	1	COMPONENTS, REAR HOUSING DOOR ASSEMBLY	N/A
3	1	COMPONENTS, NARROW HOUSING REAR DOOR ASSEMBLY	N/A
4	1	NARROW HOUSING FRONT COVER ASSEMBLY - RH	N/A
5	1	MODEL 15 - 4" X 4" LED TRAFFIC LIGHT ASSEMBLY	N/A
6	1	TOOL BOX LID LATCH ASSEMBLY	N/A
7	2	8" LEVELING FOOT ASSEMBLY	N/A
8	1	LOCKING PIN	N/A
9	1	HPU AND BATTERY MOUNTING PLATE	N/A
10	1	SPRING PIN ASSEMBLY	N/A
11	2	CYLINDER PIN, 1" DIA. X 3" USABLE LENGTH	N/A
12	1	SECONDARY MOBILE SPRING ASSEMBLY	N/A
13	1	SMALL SPRING PIN ASSEMBLY	N/A
14	2	BEARINGS, SLEEVE, 1 1/8" ID X 1/8" WALL	GARMAX
15	1	MOBILE SPRING PIN ASSEMBLY, (FOR 5/8" BOLT)	N/A
16	1	MOBILES, HYDRAULIC CYLINDER W/ PROX SWITCH ASSEMBLY	N/A
17	2	MOBILE PENDANT BOX ASSEMBLY	N/A
18	2	MOBILE POWER BOX ASSEMBLY	N/A
19	1	PRIMARY MOBILE SPRING ASSEMBLY	N/A
20	1	BOX & CAM SWITCH FOR MOBILE CHANGEOVER ASSEMBLY	N/A
21	1	WIRE HARNESS, 7 PIN JUNCTION BOX ASSEMBLY	N/A
22	1	SHORT STOP CIRCUIT BREAKER, SERIES 12X, 20A, 12V, PLASTIC, RT AND BRKT, TYPE 1 AUTOMATIC RESET ASSEMBLY	N/A
23	1	SOLAR COMPONENTS, CHARGER MOUNTING BRACKET	N/A
24	2	SNOW PLOW GUIDE KIT (PART OF TOOLBOX KIT)	N/A
25	1	TOOL BOX KIT, MODEL 15M STANDARD	N/A
26	1	12VDC BATTERY CHARGER 120VAC - 20A	N/A
27	1	BARRIER CONTROL UNIT	N/A

2 IDENTIFICATION TABLE

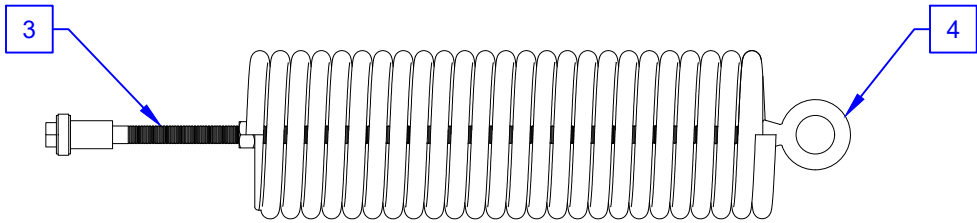
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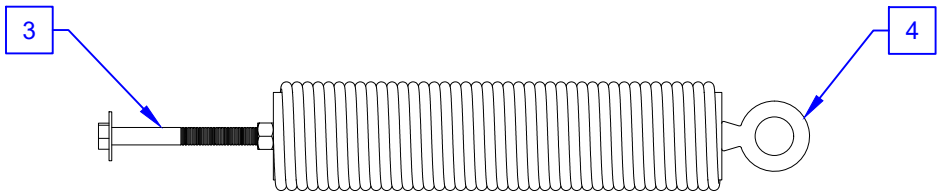
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PROJECT NO:	2223	DRAWN BY:	DAC	CHK BY:	HBH	
SHEET:	SB-200		SCALE:	NTS	DATE:	07/27/21



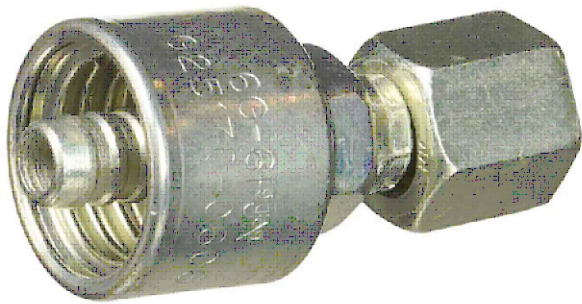
1 NMSB XV-P
NTS



3 PRIMARY SPRING
NTS



5 SECONDARY SPRING
NTS



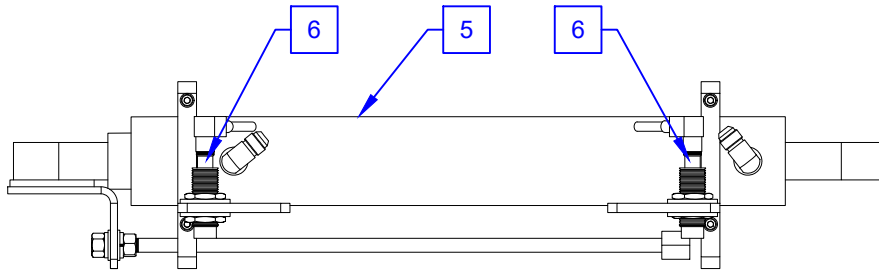
7 HOSE FITTING
NTS



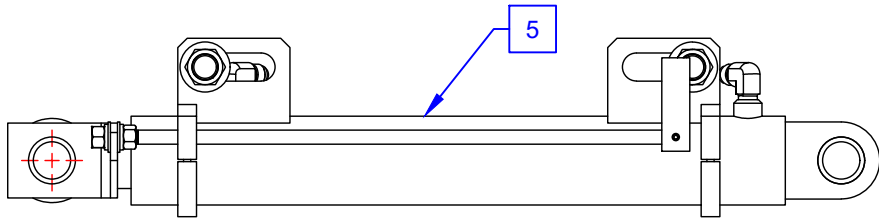
8 HOSE
NTS

ITEM #	PART #	DESCRIPTION
1	2120-1018-0050	PRIMARY MOBILE SPRING ASSEMBLY - 18 INCH
2	2120-1016-0050	SECONDARY MOBILE SPRING ASSEMBLY - 16 INCH
3	2121-5801-0000	THREADED ROD & BOLT KIT
4	2121-5800-0000	SPRING EYE BOLT - 5/8 INCH
5	2253-0013-0000	HYDRAULIC CYLINDER - 2 INCH BORE - 13 INCH STROKE
6	2270-2018-1201	CYLINDER PROXIMITY SENSOR
7	2257-3800-1025	HYDRAULIC HOSE - 25 INCH WITH FITTINGS
8	2257-3800-1029	HYDRAULIC HOSE - 29 INCH WITH FITTINGS

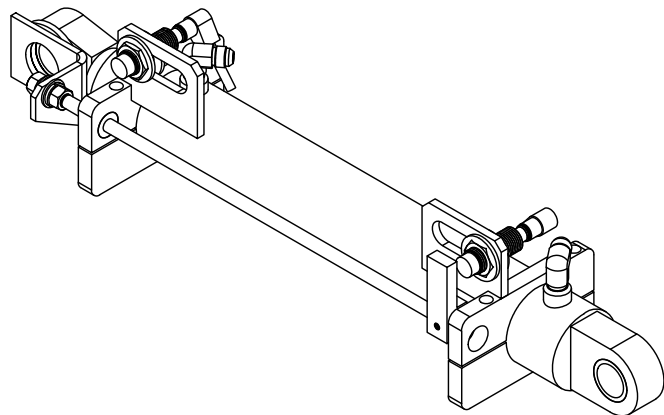
2 RECOMMENDED SPARE PARTS TABLE



4 CYLINDER AND SENSOR ASSEMBLY - TOP VIEW
NTS



6 CYLINDER AND SENSOR ASSEMBLY - SIDE VIEW
NTS



9 CYLINDER AND SENSOR ASSEMBLY - ISOMETRIC
NTS

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DESCRIPTION:

KIRTLAND AIR FORCE BASE NM

OPTIONAL - RECOMMENDED SPARE PARTS

PROJECT NO:

2223

REV.

DATE

DESCRIPTION

DRAWN BY:

DAC

SCALE:

NTS

CHK BY:

HBH

DATE:

07/27/21

SHEET:

SB-204

NASATKA

SECURITY

C:\Users\Deborah.Livesey\Box Sync\Documents\AutoCAD Sheet Sets\Projects\2223 Kirtland AFB NM - XV-P\CAD Drawings\SB-204 OPTIONAL - RECOMMENDED SPARE PARTS.dwg, July 27, 2021 11:31 AM, DEBORAH LIVESEY,

J-10

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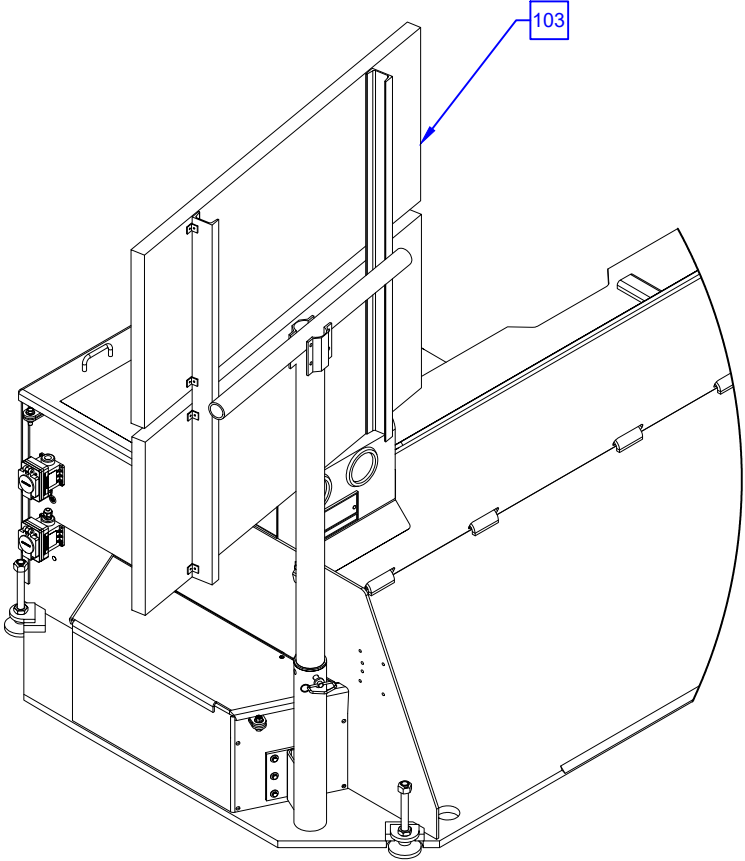
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GENERAL NOTES:

A. REFER TO SB-401 FOR SOLAR SYSTEM WIRING INFORMATION.

ITEM #	DESCRIPTION
101	PHOTO-EYE, SENSOR, ASSEMBLY
102	GENERATOR
103	SOLAR KIT ASSEMBLY



1 SOLAR KIT ASSEMBLY
NTS

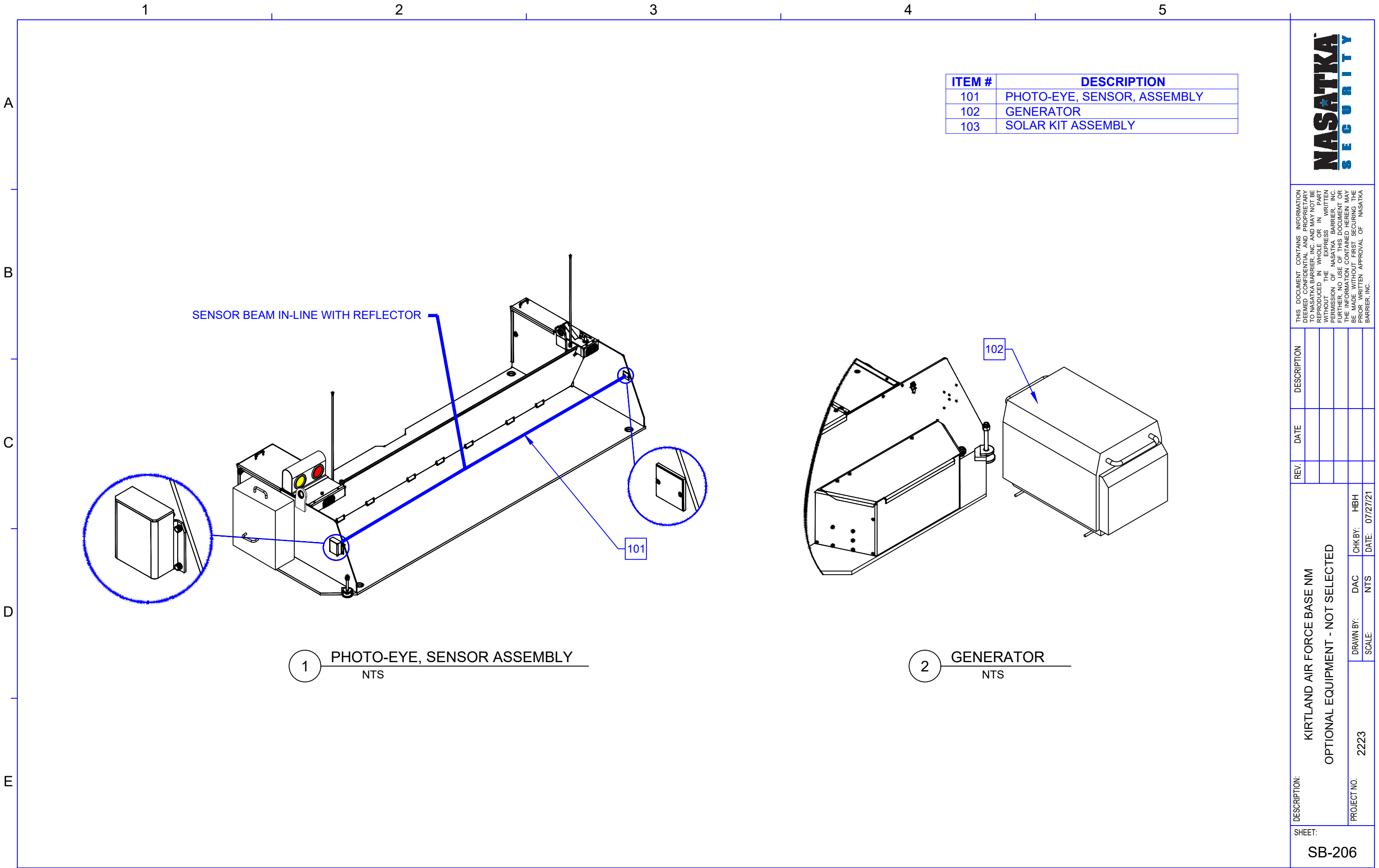


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REV.	DATE	DESCRIPTION

DESCRIPTION: KIRTLAND AIR FORCE BASE NM OPTIONAL EQUIPMENT - SELECTED	DRAWN BY: DAC	CHK BY: HBH
	SCALE: NTS	DATE: 07/27/21
PROJECT NO: 2223		

SHEET:
SB-205



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REV.	DATE	DESCRIPTION

DESCRIPTION: KIRTLAND AIR FORCE BASE NM
OPTIONAL EQUIPMENT - NOT SELECTED

PROJECT NO. 2223

DRAWN BY: DAC
SCALE: NTS

CHK BY: HBH
DATE: 07/27/21

SHEET: SB-206

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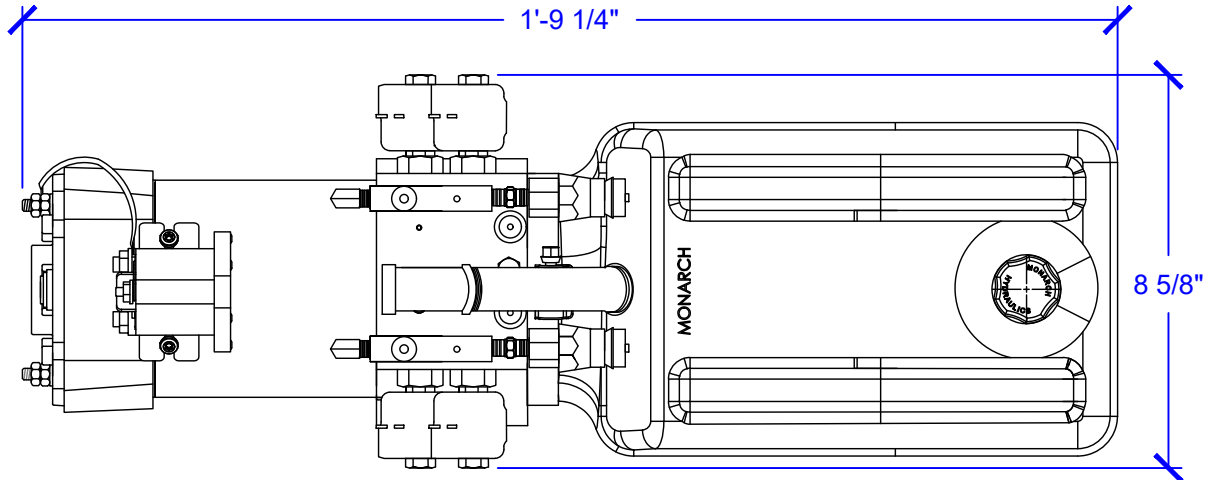
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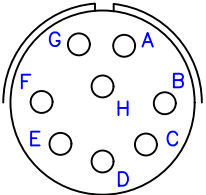
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1	1	08072	MOTOR,DC,12V,1 HP,3/4 FACE MT
2	1	12345	BASE ASSY,M3598,STD M/M W/C.V.
3	1	17764	SWITCH,SOL.,24 VOLT, 4-POST
4	1	14185	RESV,PLSTC,6.75X6.75X11,V/MT
5	1	MAS-1165	DBL PO 4W STACK MANIFOLD MHI INTRFC
6	2	CCP024-D	24VDC COIL, 19W, DIN CONN, 1/2 STEM
7	2	DSL083B	3W/2P SIDE CYL PORT #8 CAVITY SPOOL
8	2	DSL081CRTS	VALVE, 2W/2P NORMALLY CLOSED
9	1	PF400S	1/4" FLOW CONTROL
10	2	NV-12-SAE-M	1/2 QUICK DISCONN MAL COUPLER #8 ORB
11	2	N/A	VALVE, PRESSURE RELIEF
12	2	6405-08-04	#8 ORB M X 1/4 NPTF
13	2	5406-06-04	3/8 NPTM X 1/4 NPTF REDUCER
14	2	6805-06-06	FRGD 90° ELOW - #6 ORBM X 3/8 NPTF
15	1	5500-04-04	90° ELBOW - 1/4" NPTM x 1/4" NPTM
16	1	5404-06-04	3/8 NPTM X 1/4 NPTM HEX NIPPLE
17	1	5404-04-04	1/4 NPTM HEX NIPPLE
18	2	6409-03	#03 ORBM PLUG
19	1	380007060	3/4"x6" BLACK PIPE
20	1	330025007	3/4" 45° BLACK PIPE
21	1	01143	PLUG,RESEV,BREATH-FILLER, 3/4"
22	1	07900	CLAMP,HOSE,WORM GEAR,RSV,M-SER
23	1	6896	MOTOR, STRAP
24	1	10BC	10" BATTERY CABLE
25	1	07550-07.00	WIRE ASSY,CNTRL,16AWG,HS,RING 7"

1 HPU - IDENTIFICATION TABLE

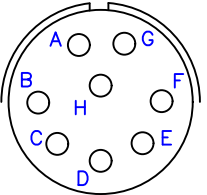


2 HPU - TOP VIEW
NTS

HPU CONNECTOR - PT01SE12-8S-SR			
PIN	HPU CONNECTION	DESCRIPTION	WIRE COLOR
A	MR+	MOTOR RELAY +	WHITE
B	MR-	MOTOR RELAY -	GREEN
C	US+	UP SOLENOID +	BROWN
D	US-	UP SOLENOID -	BLUE
E	DS+	DN SOLENOID +	VIOLET
F	DS-	DN SOLENOID -	GRAY
G	+12	+12 VDC IN	YELLOW
H	-12	-12 VDC IN	BLACK

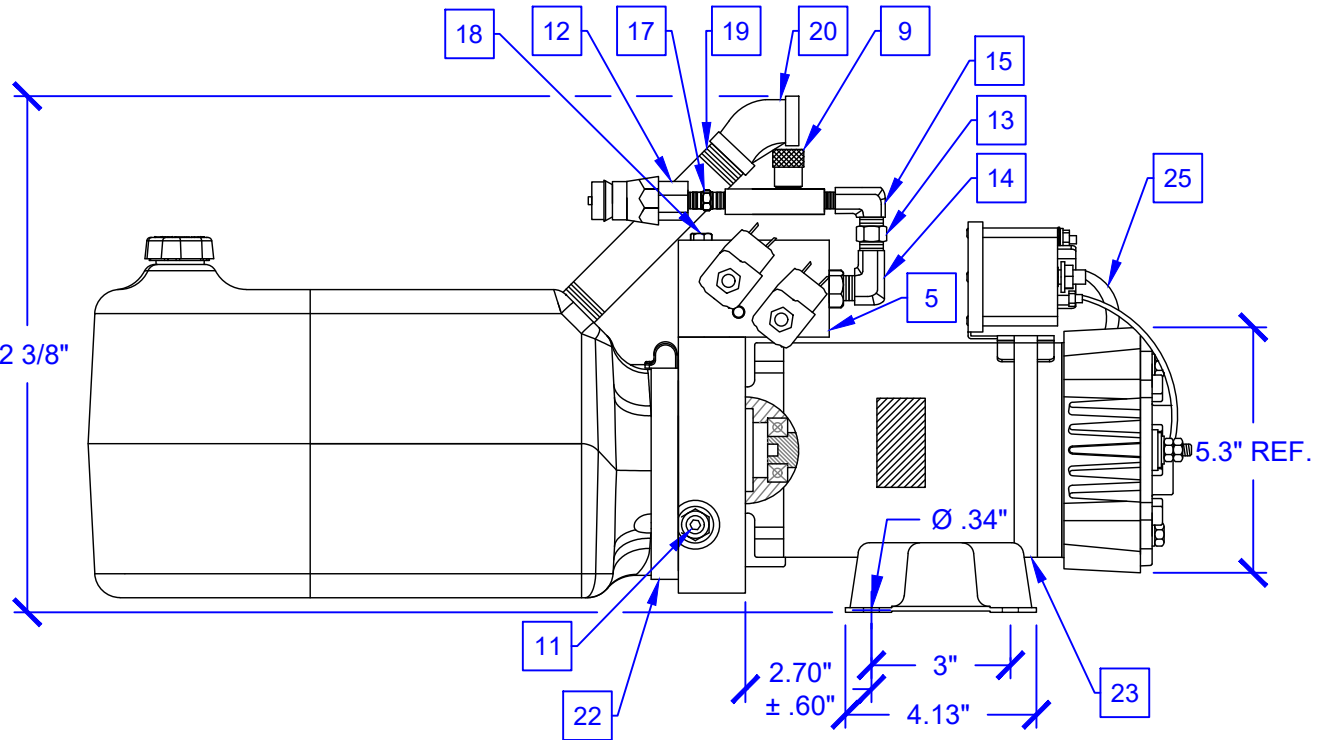


HPU CONNECTOR - FRONT

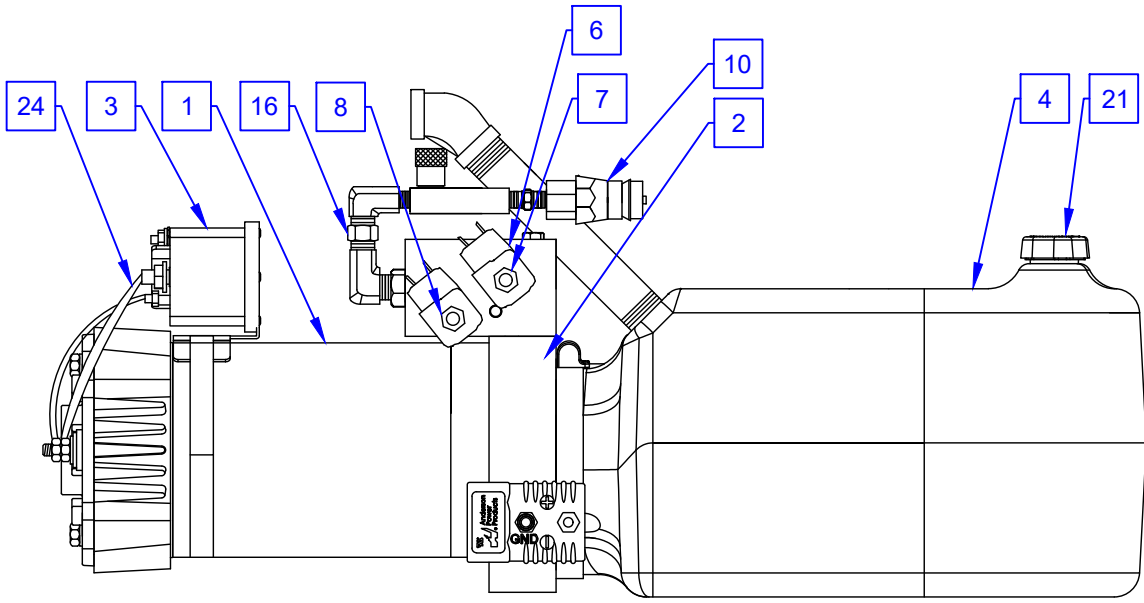


HPU CONNECTOR - REAR

3 HPU - CONNECTORS
NTS



4 HPU - RIGHT SIDE VIEW
NTS



5 HPU - LEFT SIDE VIEW
NTS

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REV.	DATE	DESCRIPTION

DESCRIPTION: KIRTLAND AIR FORCE BASE NM

PROJECT NO: 2223

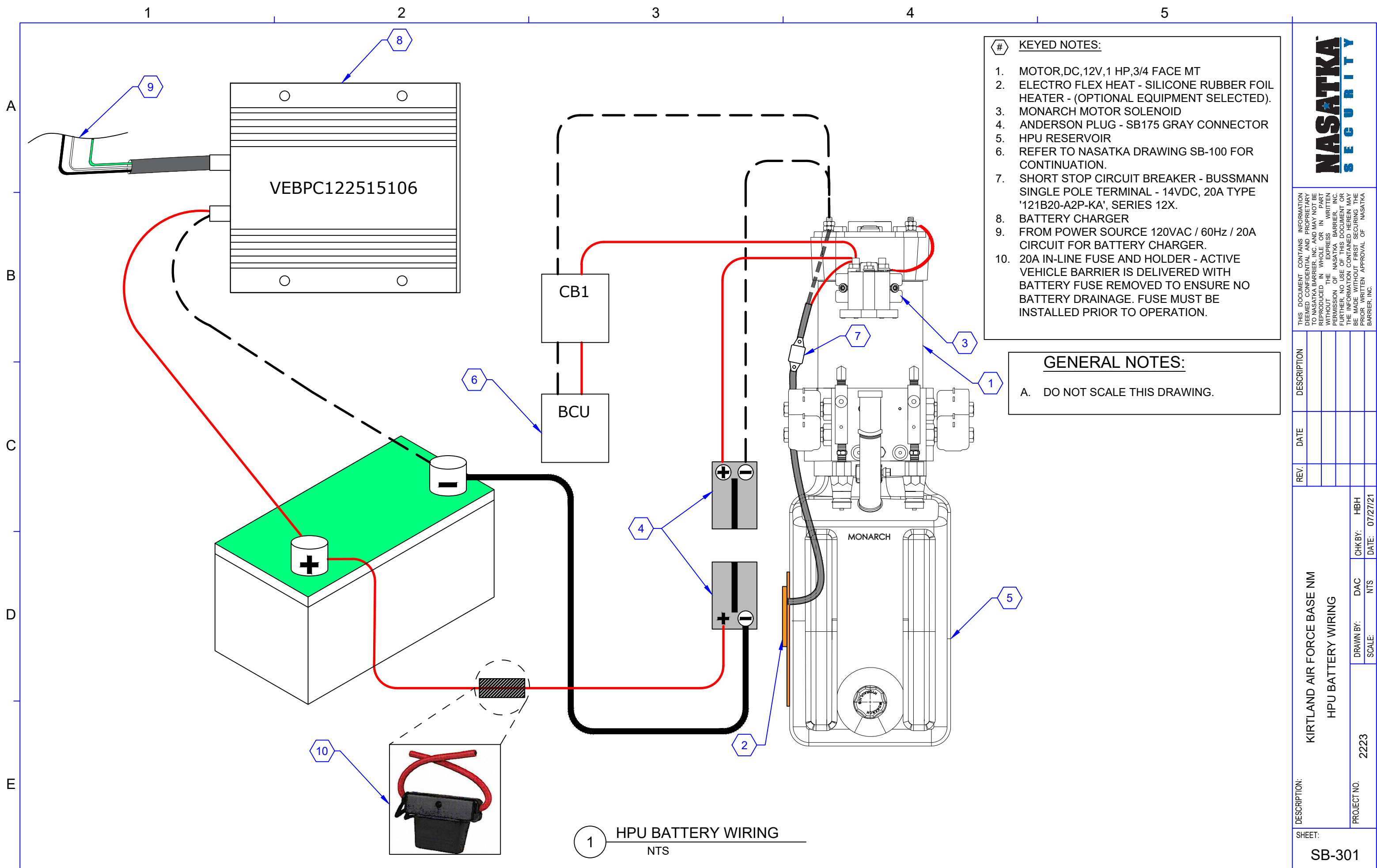
SHEET: SB-300

DRAWN BY: DAC

CHK BY: HBH

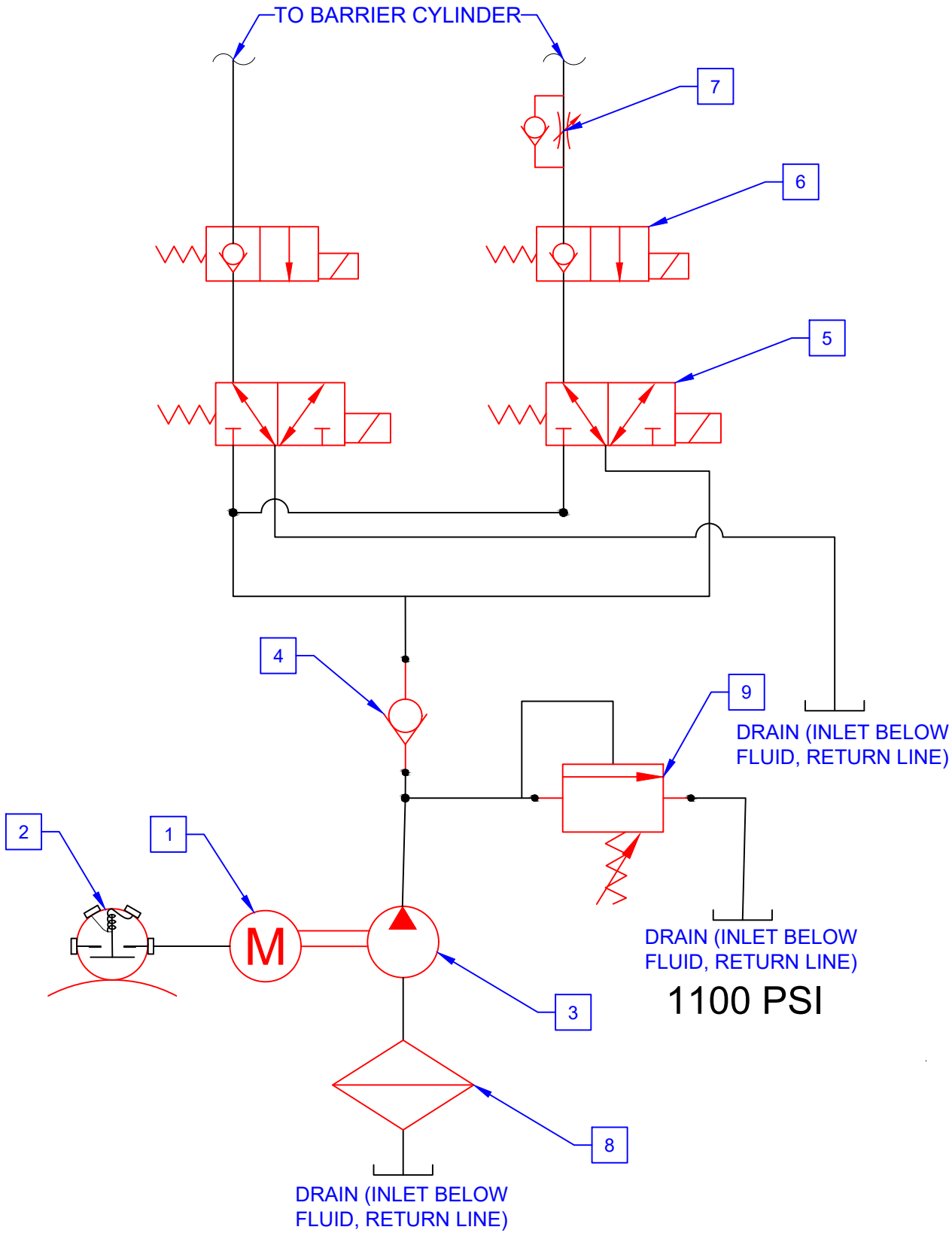
DATE: 07/27/21

SCALE: NTS



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12345



1 PIPING & INSTRUMENTATION DIAGRAM
NTS

ITEM #	QTY	DESCRIPTION
1	1	MOTOR, DC, 12V, 1 HP, 3/4 FACE MT
2	1	SWITCH, SOL., 24 VOLT, 4-POST
3	1	ADAPTER, DC, MOTOR TO PUMP, M-SER
4	1	CHECK VALVE
5	2	3W/2P SIDE CYL PORT #8 CAVITY SPOOL
6	2	VAVLE, 2W/2P NORMALLY CLOSED
7	1	1/4" FLOW CONTROL
8	1	FILTER SUCTION, (M-PUMP)
9	1	VALVE, PRESSURE RELIEF

2 IDENTIFICATION TABLE

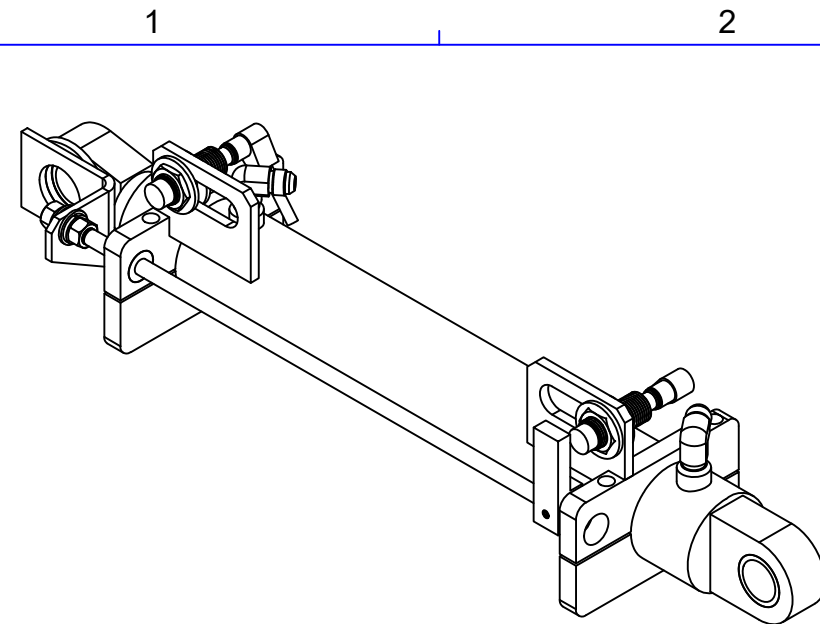


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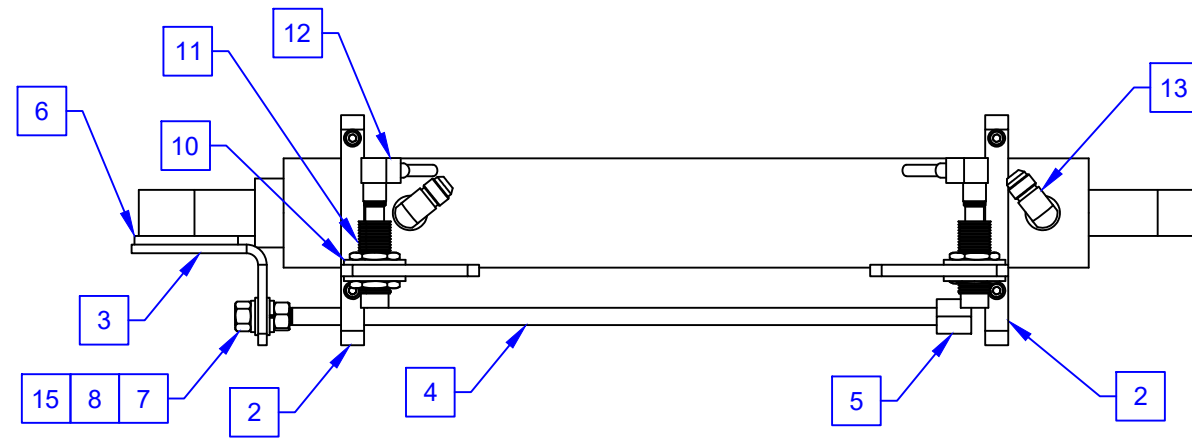
REV.	DATE	DESCRIPTION

DESCRIPTION:		KIRTLAND AIR FORCE BASE NM			
		PIPING & INSTRUMENTATION DIAGRAM			
PROJECT NO.	2223	DRAWN BY:		DAC	
		SCALE:		NTS	
		CHK BY:		HBH	
		DATE:		07/27/24	

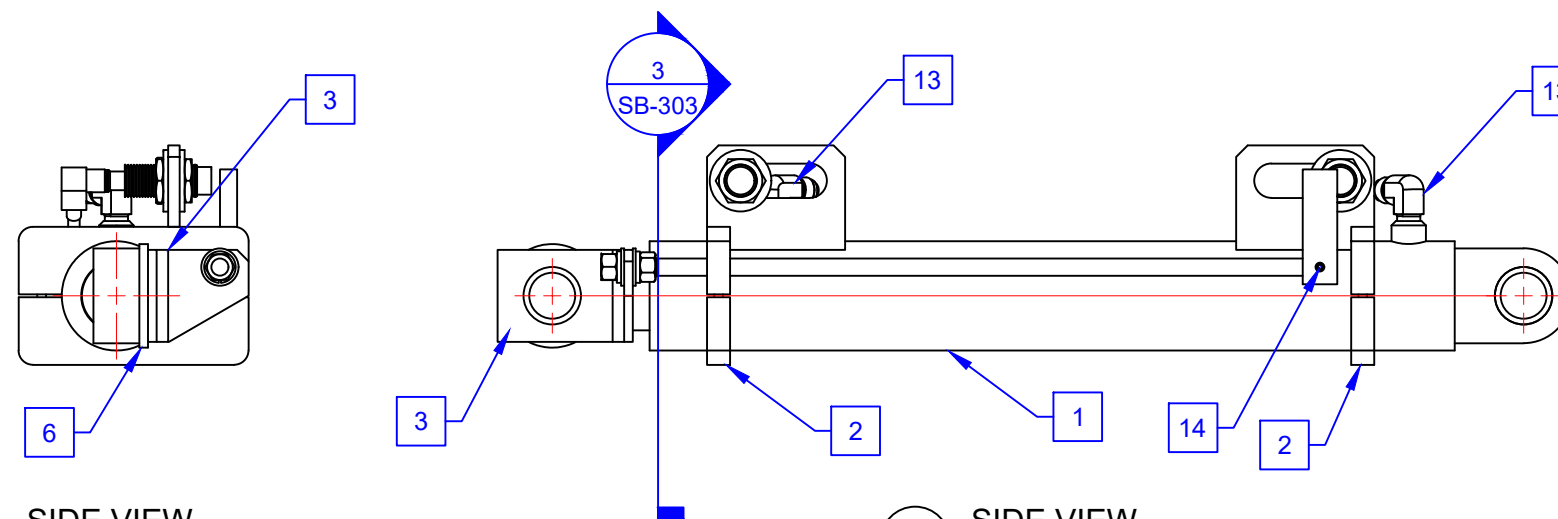
SHEET:
SB-302



1 ISOMETRIC VIEW
NTS

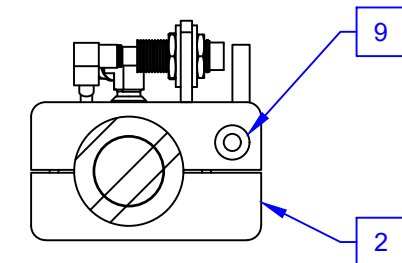


2 TOP VIEW
NTS



4 SIDE VIEW
NTS

5 SIDE VIEW
NTS



3 SECTION VIEW
NTS

ITEM #	QTY	DESCRIPTION	MATERIAL
1	1	HYDRAULIC CYLINDER 2" BORE 13" STROKE	--
2	2	PROXIMITY SWITCH MOUNTING BLOCK, 2" BORE	N/A
3	1	PROXIMITY SWITCH TRIGGER BRACKET	A36
4	1	PROXIMITY SWITCH TRIGGER ROD	304SS
5	1	PROXIMITY SWITCH, TRIGGER FLAG	6061
6	1	FLAT WASHER, 1 1/4" X 2 1/2" OD	ZINC PLATED
7	2	HEX NUT, 3/8"-16	ZINC PLATED GR5
8	2	FLAT WASHER, 3/8"	ZINC PLATED
9	1	BEARING, LINEAR, 3/8" ID X 3/16" WALL X 1/2" LG	UHMW
10	4	FLAT WASHER, M18, DIN 125	ZINC PLATED
11	2	PROXIMITY SWITCH, 18MM QUICK DISCONNECT	N/A
12	2	CABLE, QUICK DISCONNECT, 18MM PROXIMITY SWITCH	N/A
13	2	FITTINGS, 90 ELBOW, 6MJ (MALE JIC 9/16) - (MALE NTP 1/4)	N/A
14	1	SOCKET HEAD SET SCREW, 10-32 X 1/4" LG	ZINC PLATED GR5
15	2	SPLIT LOCK WASHER, 3/8"	ZINC PLATED

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PROJECT NO.	2223	DRAWN BY:		DAC	CHK BY:	HBH
		SCALE:		NTS	DATE:	07/07/24

SHEET:
SB-303

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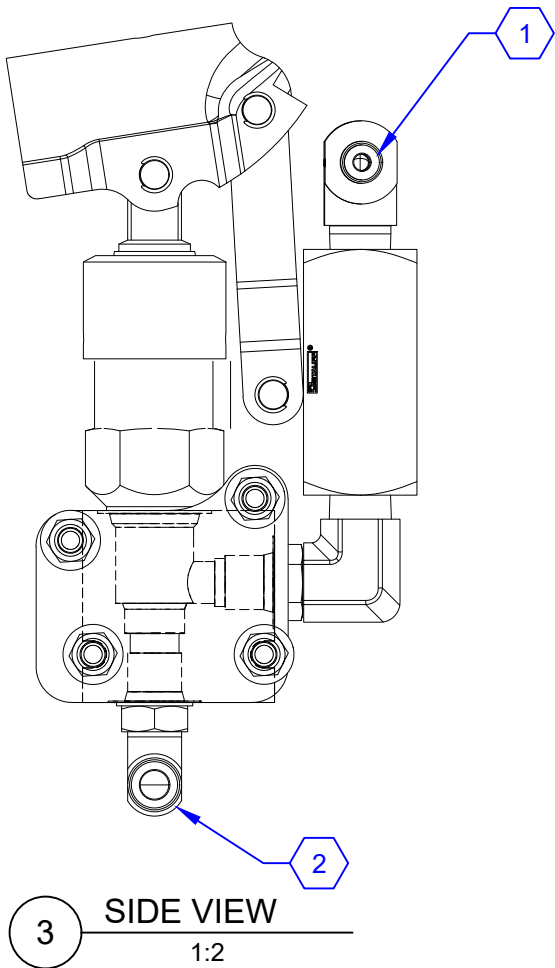
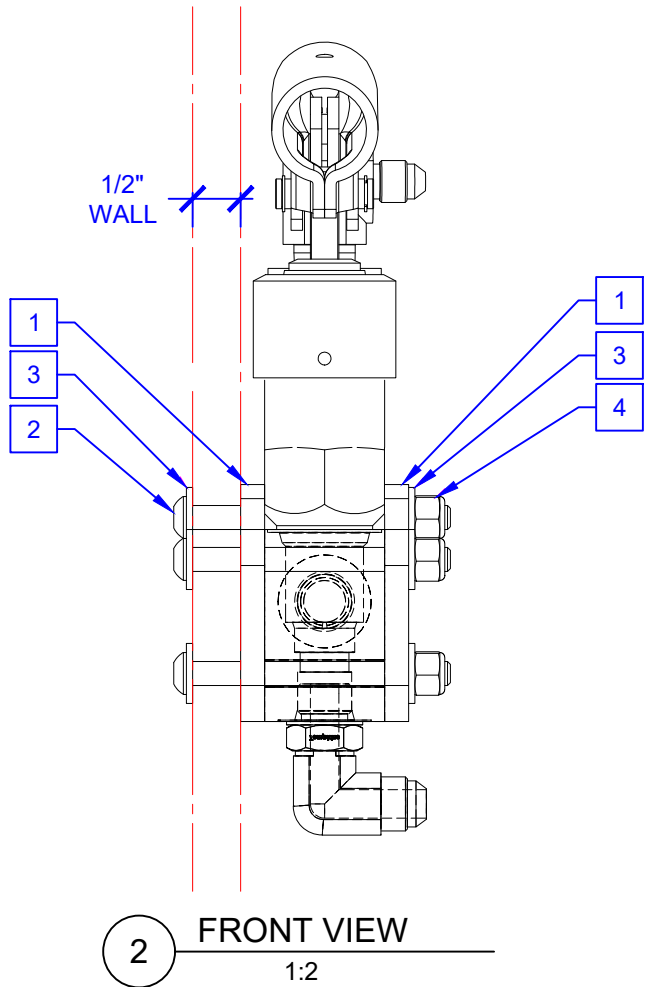
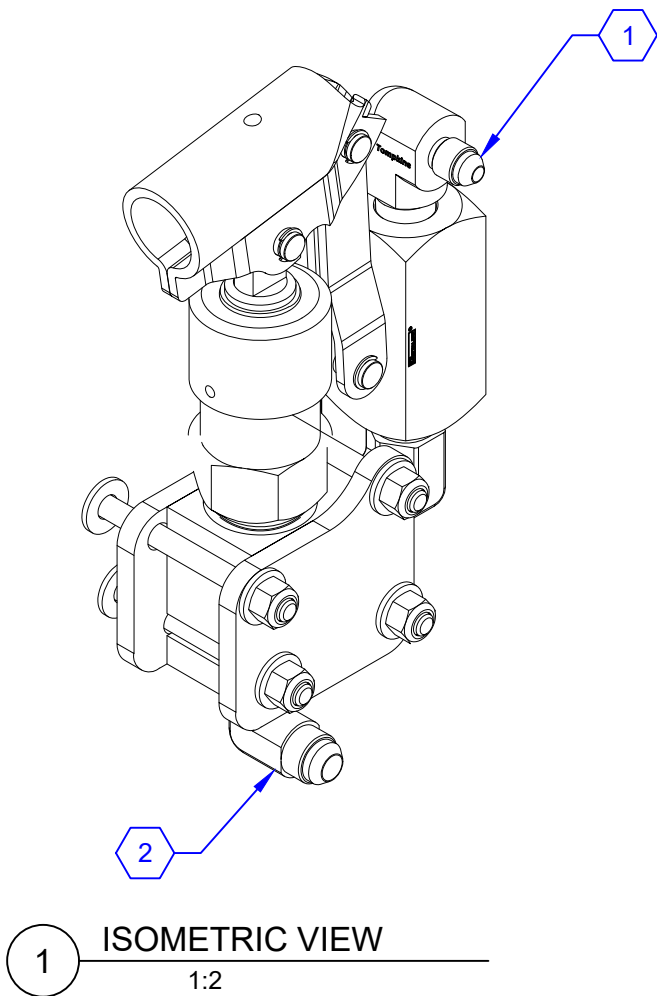
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ITEM #	QTY	DESCRIPTION	MATERIAL
1	2	PLATE, 1/4" X 2 5/8" X 5 3/4" LG, BURN TO SHAPE	ASTM A36
2	4	BHSCCHCS, 1/4"-20 X 2 3/4" LG	316 SS
3	8	FLAT WASHER, 1/4"	316 SS
4	4	NYLON LOCK NUT, 1/4"-20	316 SS

KEYED NOTES:

1. PRESSURE PORT
2. TANK PORT

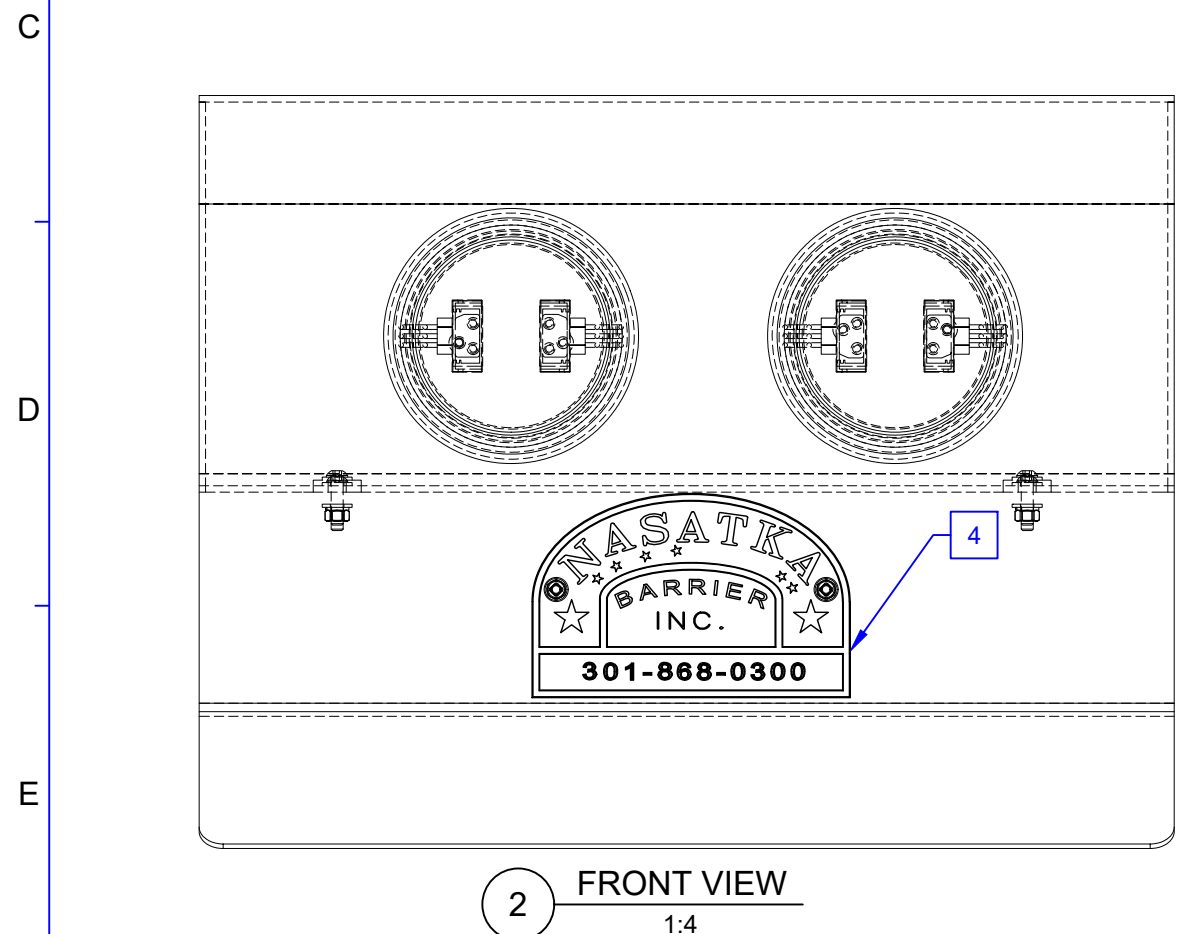
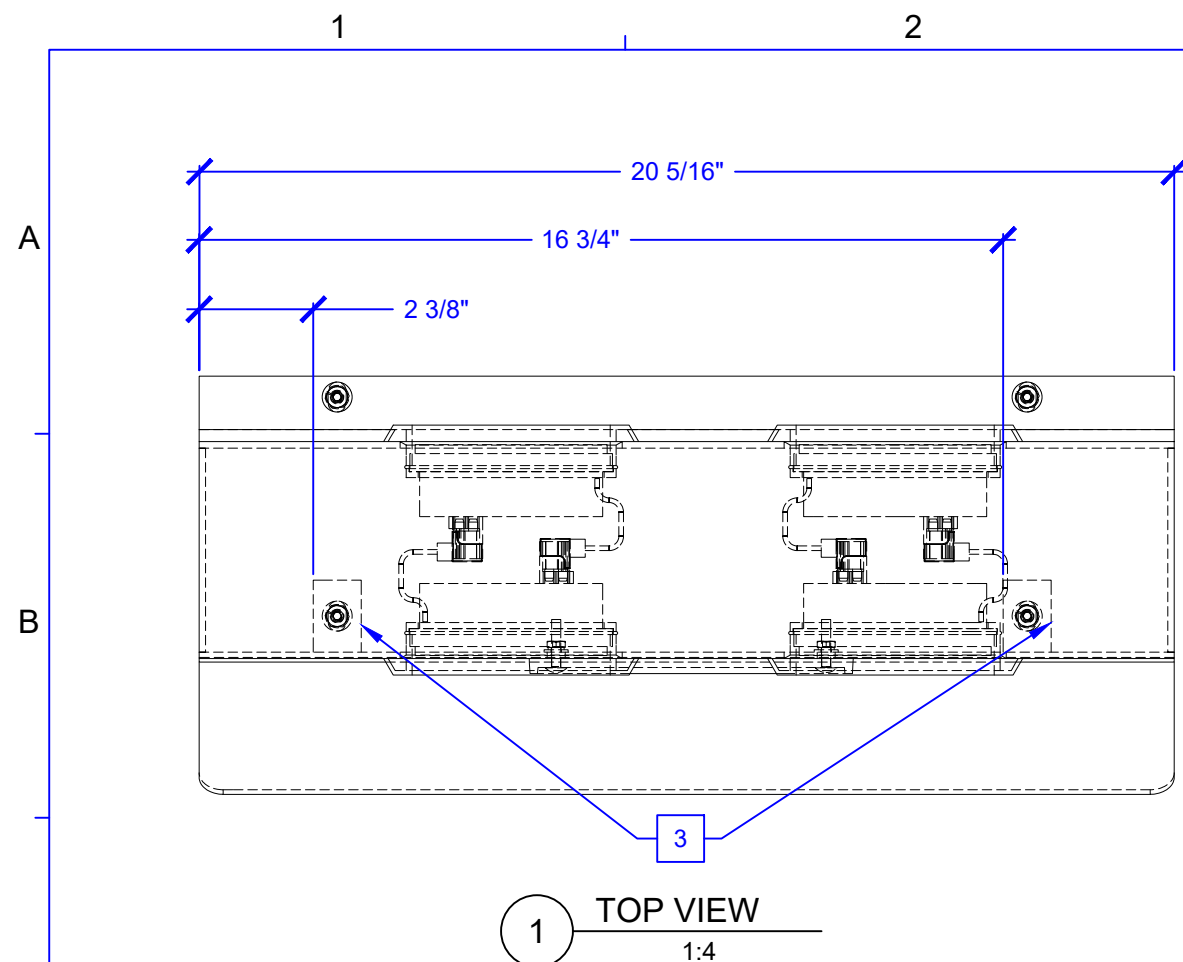
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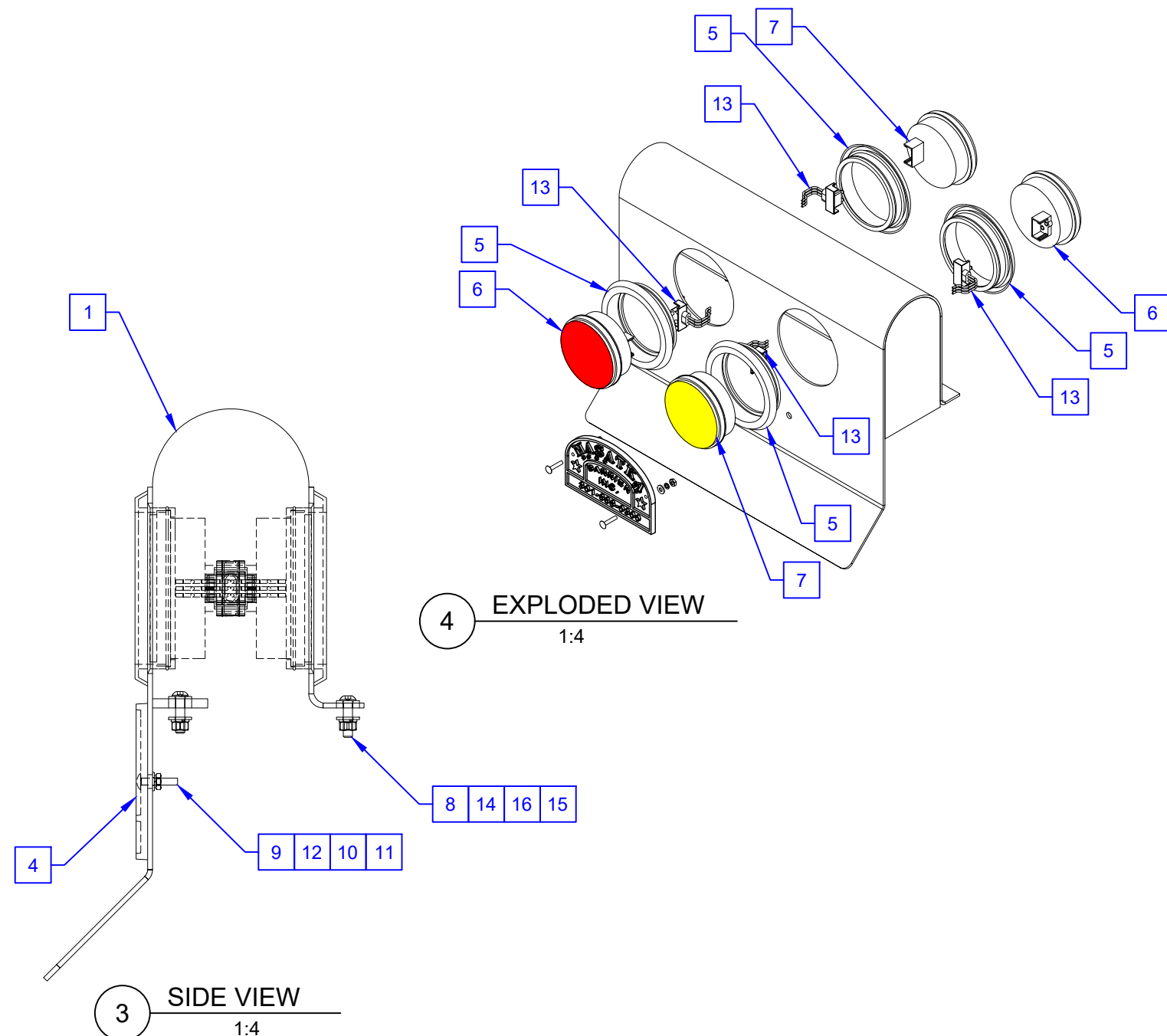
REV.	DATE	DESCRIPTION

DESCRIPTION:	KIRTLAND AIR FORCE BASE NM				CHK BY:	HBH
	HAND PUMP - DETAILS				DATE:	07/27/21
PROJECT NO:	2223		DRAWN BY:	DAC	SCALE:	1:2

SHEET:
SB-304



ITEM #	QTY	DESCRIPTION	MATERIAL
1	1	PLATE, 10 GA X 20 5/16" X 28 11/16" LG, BURN TO SHAPE	ASTM A36
2	2	PLATE, 10 GA X 4 1/4" X 8 1/8" LG, BURN TO SHAPE	ASTM A36
3	2	FLAT BAR, 1/4" X 1 1/2" X 1" LG	ASTM A36
4	1	NASATKA NAME PLATE	6061 ALUM
5	4	TRAFFIC LIGHT 4.00" RUBBER GROMMET	SILICON RUBBER
6	2	RED LED WITH RED LENS, 12 LED, 4IN, S-T-T WITH REFLECTOR 12V PE	HIGH DENSITY
7	2	AMBER LED WITH AMBER LENS, 12 LED, 4IN, S-T-T WITH REFLECTOR 12V PE	HIGH DENSITY
8	4	BHSCS, 1/4-20 X 1" LG	316 SS
9	2	CARRIAGE BOLT, 10-24 X 1" LG	316 SS
10	2	FLAT WASHER, #10	316 SS
11	2	SPLIT LOCK WASHER, #10	316 SS
12	2	HEX NUT, 10-24	316 SS
13	4	WIRE HARNESS, 3 WIRE PLUG RIGHT ANGLE	N/A
14	8	FLAT WASHER, 1/4"	316 SS
15	4	HEX NUT, 1/4-20	316 SS
16	4	SPLIT LOCK WASHER, 1/4"	316 SS



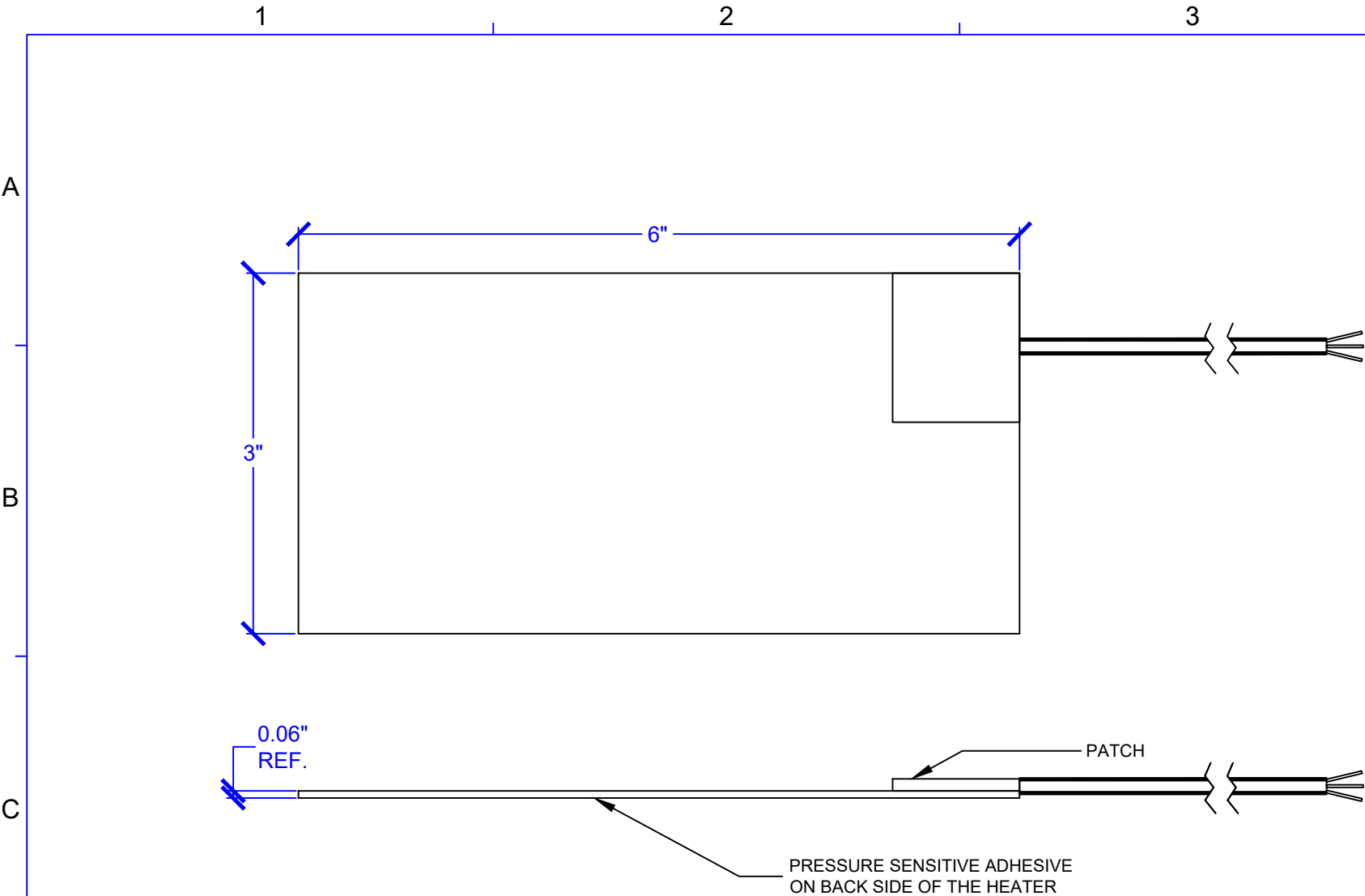
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DESCRIPTION:	KIRTLAND AIR FORCE BASE NM LED TRAFFIC LIGHT - DETAILS			
PROJECT NO.	2223	DRAWN BY:	DAC	CHK BY: HBH
		SCALE:	1/4	DATE: 07/27/21

SHEET:
SB-305



1 HPU HEATER PAD - DETAILS
NTS

GENERAL NOTES:

- A. EXACT CONFIGURATION IS SUBJECT TO CHANGE.
- B. ALL DIMENSIONS ARE IN INCHES.
- C. HEATER INSULATION: SILICONE RUBBER.
- D. HEATER ELEMENT: FOIL
- E. ELECTRICAL: 12 VOLTS, 37.5 WATTS, 3.83 OHMS ($\pm 10\%$), 3.13 AMPS.
- F. GROUNDING PLANE EMBEDDED IN HEATER
- G. HEAT PAD CORDSET: 18/3 AWG. HPN, BLACK, 4 FT LONG, NO PLUG.
- H. BRISKHEAT SRL HEATING BLANKET NTK16S001
- I. THERMOSTAT - 6-24 VDC - SOLISTAT2-20OHP35P45
- J. RATED: 20 AMPS
- K. SURFACE MOUNT
- L. THERMOSTAT POWER LEADS: 18 INCHES LONG
- M. SETTINGS: ON AT 35°F (2°C) - OFF AT 45° F (7°C)



2 THERMOSTAT - DETAILS
NTS

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REV.	DATE	DESCRIPTION

DESCRIPTION:	KIRTLAND AIR FORCE BASE NM			
	HPU HEATER PAD - DETAILS			
PROJECT NO:	2223		CHK BY:	HBH
			DATE:	07/27/21
DRAWN BY:		DAC	NTS	
SCALE:				

SHEET:
SB-400

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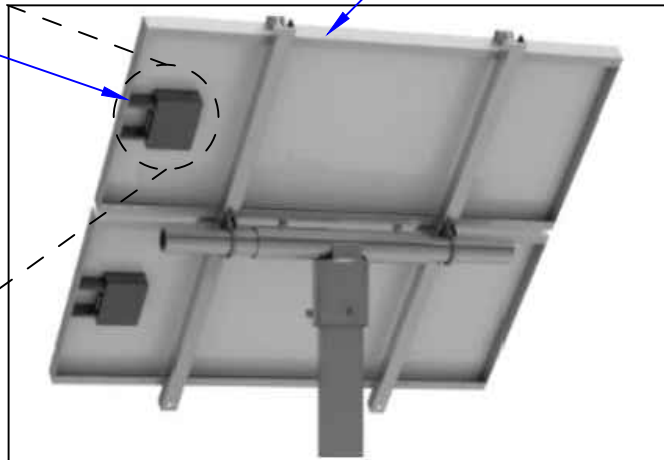
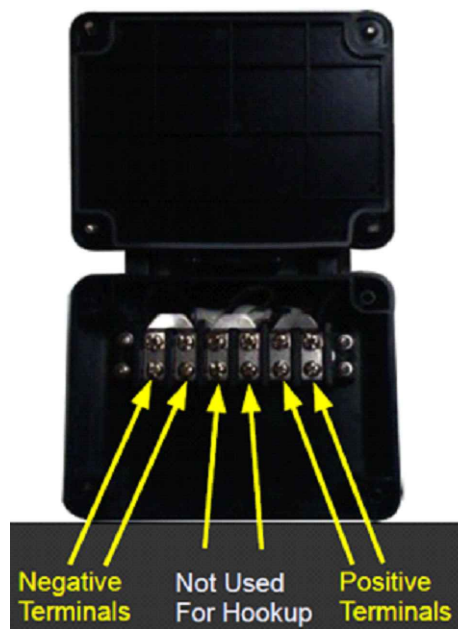
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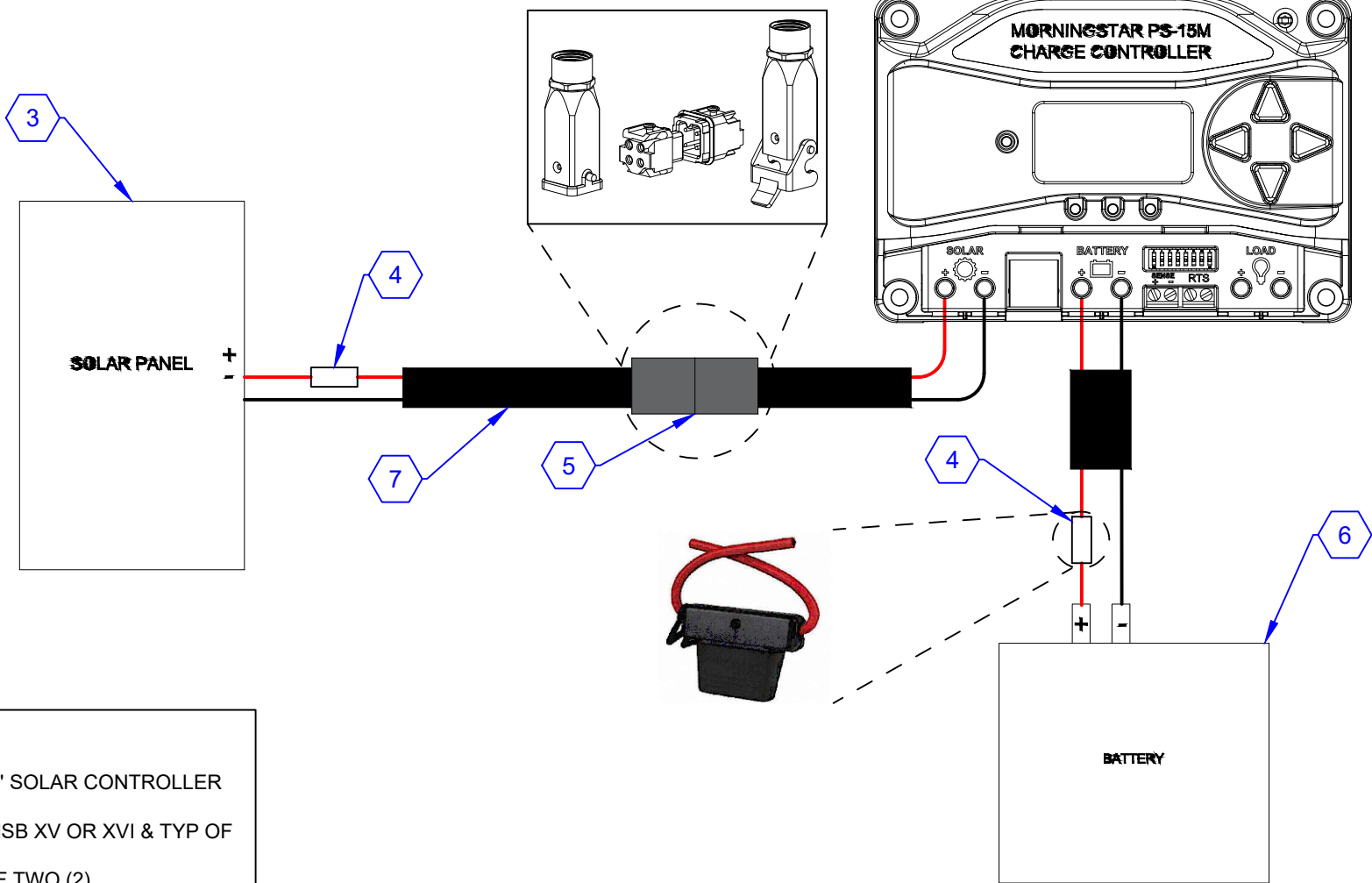
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1 SOLAR PANEL JUNCTION BOX FOR CONNECTIONS
NTS



- # KEYED NOTES:
1. MORNINGSTAR TYPE PROSTAR 'PS-15M' SOLAR CONTROLLER
 2. SOLAR PANEL WIRING JUNCTION BOX
 3. SOLAR PANEL - TYP OF ONE (1) FOR NMSB XV OR XVI & TYP OF TWO (2) FOR NMSB XVX.
 4. 20A IN-LINE FUSE AND HOLDER - TYP OF TWO (2)
 5. QUICK CONNECTOR
 6. 12VDC BATTERY
 7. BUNDLED TWO CONDUCTOR CABLE - TYP

2 SOLAR SYSTEM WIRING DIAGRAM
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REV.	DATE	DESCRIPTION

DESCRIPTION: KIRTLAND AIR FORCE BASE NM SOLAR SYSTEM WIRING	DRAWN BY: DAC	CHK BY: HBH
	SCALE: NTS	DATE: 07/27/21
PROJECT NO: 2223		

SHEET:
SB-401