ViaSat

Model 8861A/8862
Antenna Position Controller

Installation, Operation and Maintenance Manual

551419D
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Notice

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This manual replaces technical manuals 42S054 and 42S121.

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SAFETY SUMMARY

Notice

Any service, adjustment, maintenance, or repair of this product must be performed only by authorized technical service personnel.

Prior to installation and use of this product review all safety markings and instructions. When safety precautions or important information is presented in this manual, the information will normally be presented just prior to the point where the hazard is likely to be encountered.

The following symbols are used throughout this manual to bring attention to practices, procedures, and conditions important to the safety of the operator and equipment or to obtaining desirable results from the equipment.

WARNING

This symbol warns of electrical shock hazards to personnel. Failure to comply with the instructions of such a warning may result in severe injury or death resulting from electrical shock.

WARNING

This symbol warns of non-electrical hazards to personnel. Failure to comply with the instructions of such a warning may result in severe injury or death.

CAUTION

This symbol warns of hazards to equipment. Failure to comply with the instructions of such a caution may result in damage or destruction of equipment.

GROUNDING REQUIRED

This symbol is used to bring attention to installation grounding requirements.

NOTE

Notes are used to provide clarification, or to alert the reader of possible erroneous results, which may occur if a procedure is not followed as written.

Chapter 1

General Information

1.1 Introduction

This manual contains information necessary for proper installation, operation, and maintenance of the Model 8861A Single-Speed Antenna Position Controller or the 8862 Variable-Speed Antenna Position Controller. Chapters 1 through 4 contain information pertaining to Model 8861A/8862 on a unit level. Chapter 5 contains information regarding maintenance. Chapter 6 provides parts list for the various assemblies. Chapter 7 contains various drawings and related manuals list.

The installer or user should review all warnings and cautions before performing any procedures. Failure to follow warnings and directions can result in injury to personnel or damage to equipment. ViaSat. has made every effort to ensure that this manual contains correct and complete information.

The following paragraphs will provide the user with a brief antenna control system description and a list of other technical manuals that contain information relative to the system. The 8861A and 8862 Antenna Position Controller units contain identical electronics and use the same firmware. They only differ in the type of motor drives that they operate. The 8861A implements control of motors using reversing contactors (1HP max). This only allows control of the motor direction of rotation, not the speed, so the motors turn at rated line speed. The 8862 uses variable speed AC drives to control motor speed from 10% of line speed to 150% of line speed. The motor turns at a rate proportional to the line frequency and the number of motor poles. ViaSat designed the 8861A and the 8862 for use with four pole motors (standard).

The 8861A Antenna Position Controller replaces the previous design, the 8861 Antenna Position Controller and still supports dual-motorized feeds (1-single phase, 1-three phase). Operating voltages are 208 VAC, 380/415 VAC 50/60 HZ. The 8861A Antenna Position Controller operates identically to the 8861 however, different printed circuit board assemblies are used internally. Contact ViaSat for information about upgrading to an 8861A Antenna Position Controller from an 8861 Antenna Position Controller.

The antenna control system design has a modular architecture capable of meeting a wide variety of antenna positioning and tracking requirements. The system consists of several components, not all required for any particular antenna installation.

- Model 8860 Antenna Tracking Controller
- Model 8861A Antenna Position Controller, Single Speed (1 horsepower)
- Model 8862 Antenna Position Controller, Variable Speed (2, 5, and 10 horsepower)
- Model 8861 Antenna Position Controller, Single Speed (1 hp max.), Replaced by 8861A
- Model 8864 Antenna Position Controller, Variable Speed (10 horsepower) Replaced by 8862
- Earth Station Controller, (ViaSat Skylinx™ or third part product typically)

The Models 8861A and 8862 provide basic positioning capability in response to commands sent from a host serial device. These units process the position feedback and limit signals and control the actuator motors. The single-speed controller provides a low-cost approach where fast antenna motion is not required and may be installed on all ViaSat antennas up to 11 meters in size. All antennas larger that 11 meters require the Model 8862 Controller configured for driving 10-horsepower motors.

The Model 8860 Antenna Tracking Controller (Figure 1-1) usually serves as the host serial device that provides an operator control panel containing a display and keypad. It also processes the beacon or carrier level inputs and commands the Antenna Position Controller for tracking motion. In older systems that did not require tracking and did not require a front panel, the Position Controller connected to the Model 7670 Series Earth Station Controller through the Model 7608 Line Interface Adapter (LIA). The LIA provided optical isolation and transient protection for the serial data link. If the system includes a Model 8860, the system does not require the Model 7608 since the Model 8860 also provides the same optical isolation and transient protection. ViaSat no longer manufactures the 7608 Line Interface Adapter and requires all systems to use the 8860 Antenna Tracking Controller.

Calibrate and test the Position Controller during antenna electrical system installation using an IBM compatible personal computer and special software. The computer running the calibration software can be connected to either the RS-232 connector on the Antenna Position Controller logic board or to the Modem connector on the rear panel of the 8860 Antenna Tracking Controller.

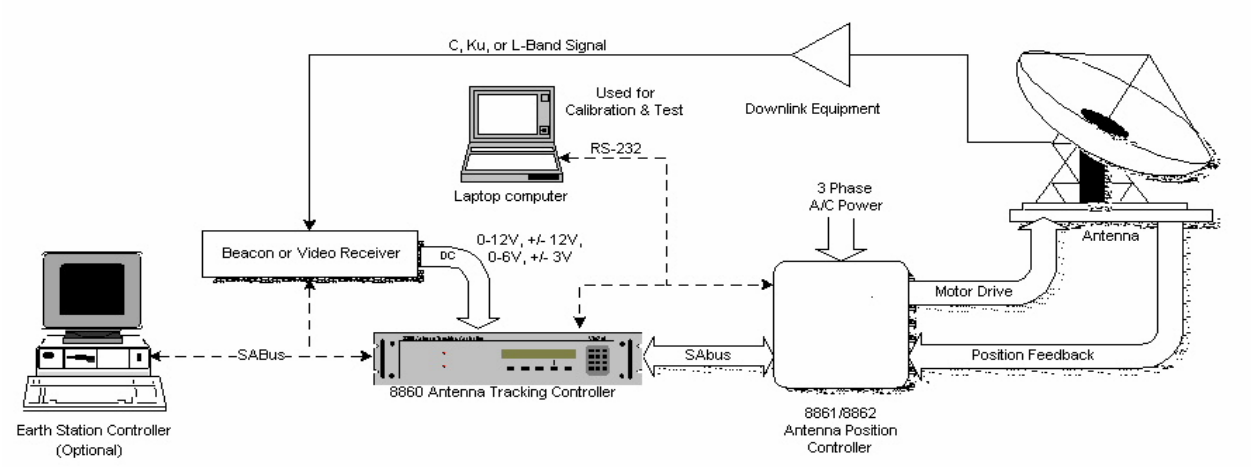


Figure 1-1. Antenna Control Components Simplified Block Diagram

1.2 Related Publications

The following related publications, of the issue and date in effect at the time of publication of this manual, are applicable. Equipment descriptions, maintenance, operation, and parts lists are contained in the individual equipment publications.

Manual Number	Description
557660	8860 Antenna Tracking Controller Operation Manual
551419	8861A/8862 Antenna Position Controller / Installation, Operation and Maintenance Manual
42S053	8860 Antenna Tracking Controller, Installation and Maintenance Manual
1008111	Windows Calibration Software Manual
42S057	8861 4.5-Meter Electrical Installation Manual
42S058	8861 6-Meter Electrical Installation Manual
42S059	8861 7-Meter Electrical Installation Manual
42S060	8861 9-/10-/11-Meter Electrical Installation Manual
42S157	8861 6-Meter (180^0) Electrical Installation Manual
42S278	8862 4.5-Meter Electrical Installation Manual
42S181	8862 6-Meter Electrical Installation Manual
42S179	8862 7-Meter Electrical Installation Manual
42S059	8862 7.3-Meter Electrical Installation Manual
42S178	8862 9-/10-/11-Meter Electrical Installation Manual
42S180	8862 6-Meter (180^0) Electrical Installation Manual.

Manual Number	Description
42S119	8862/64 16-/18-Meter Electrical Installation Manual
42S097	DOS Calibration Software Manual, (Obsolete document)
551410	Windows Calibration Software Manual, (Obsolete document)
42S054	8861 Position Controller Technical Manual, (Obsolete document)
42S121	8862/8864 Position Controller Technical Manual, (Obsolete document)

1.3 Unit Description

The following information applies to the 8861A Antenna Position Controller and also to the 8862 Antenna Position Controller.

The 8861A Antenna Position Controller can control antennas up to 11 meters in diameter and with azimuth and elevation motors up to 1 horsepower. The 8861A uses reversing contactors for controller the motor directions. Therefore, the motors move at a constant speed. ViaSat refers to the 8861A Antenna Position Controller as a single-speed motor controller.

The 8862 Antenna Position Controller can control antennas up to 18 meters in diameter and with azimuth and elevation motors of 2 horsepower, 5 horsepower or 10 horsepower. The 8862 uses variable speed AC motor drives (also called inverters) to vary the speed of the motors and to provide soft-starting of the motors. ViaSat refers to the 8862 Antenna Position Controller as a variable-speed motor controller.

The Antenna Position Controller provides the antenna interface for the antenna control system. The unit contains azimuth and elevation motor controllers to provide single-speed or variable speed control for the azimuth and elevation axes. A microprocessor (or micro-controller, an integrated microprocessor with additional I/O) provides control by processing feedback signals from the antenna and generating the drive commands for antenna movement. Depending on the antenna configuration, the unit can drive up to two motorized feeds.

The unit contains manual jog switches and axis condition indicators (see Figure 1-2 and Figure 1-3). The switches provide operator control of the antenna pointing angle at the antenna site, while the indicators provide a visual indication of antenna movement. The indicators also display faults. The unit does not have a display to show the pointing angles of the antenna. The unit has a connector that allows the user to connect a remote, Handheld Jog Controller.

With the Antenna Position Controller, the operator can control antenna movement either locally from the unit or remotely. In remote, another device (usually an 8860 Antenna Tracking Controller) sends position commands via the serial port using either the RS-422 connector or the RS-232 connector. If the 8860 serves as this host device, the system can also track on beacon signals from the satellite.

The Model 8861A and 8862 Antenna Position Controller has connections for a portable computer at the antenna for setup and calibration of the unit after installation.

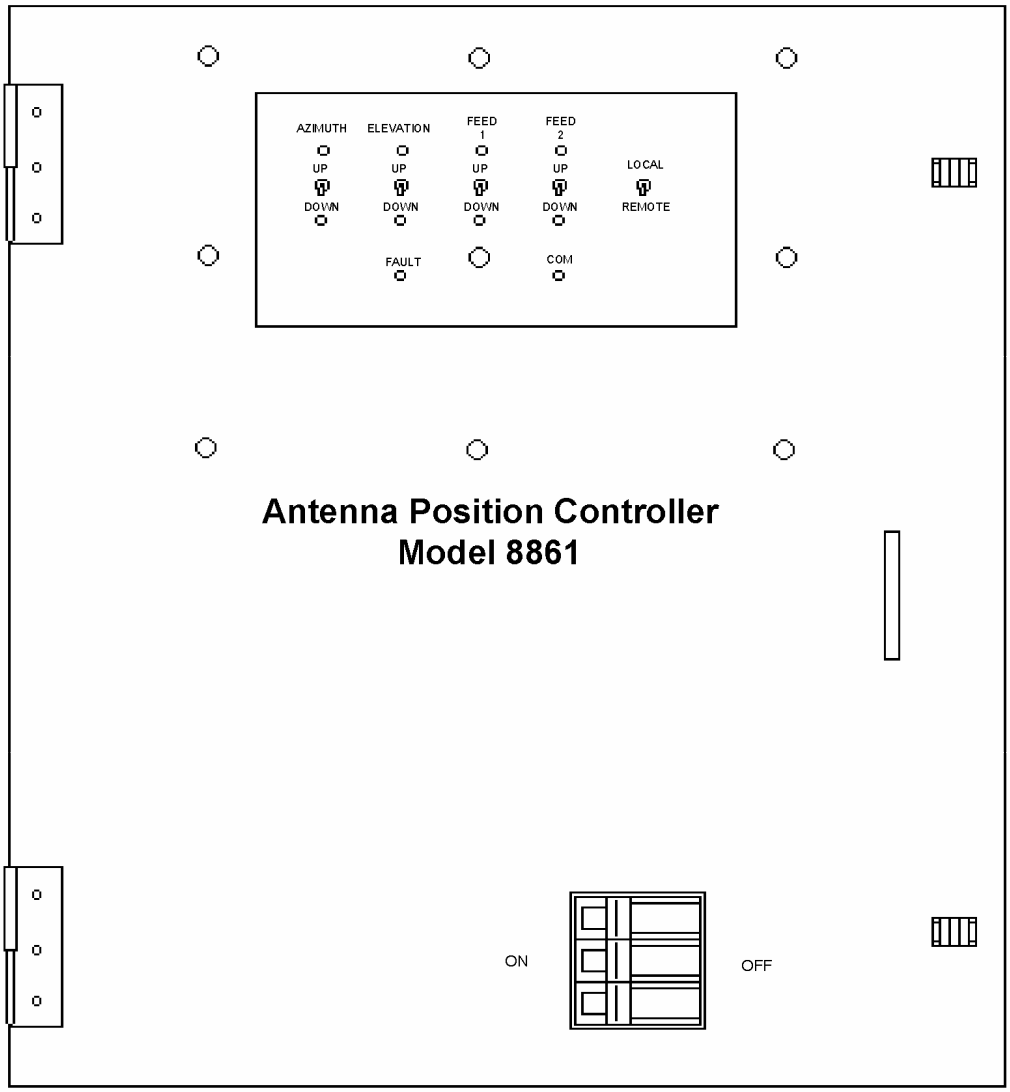


Figure 1-2. Model 8861A Internal Control Panel

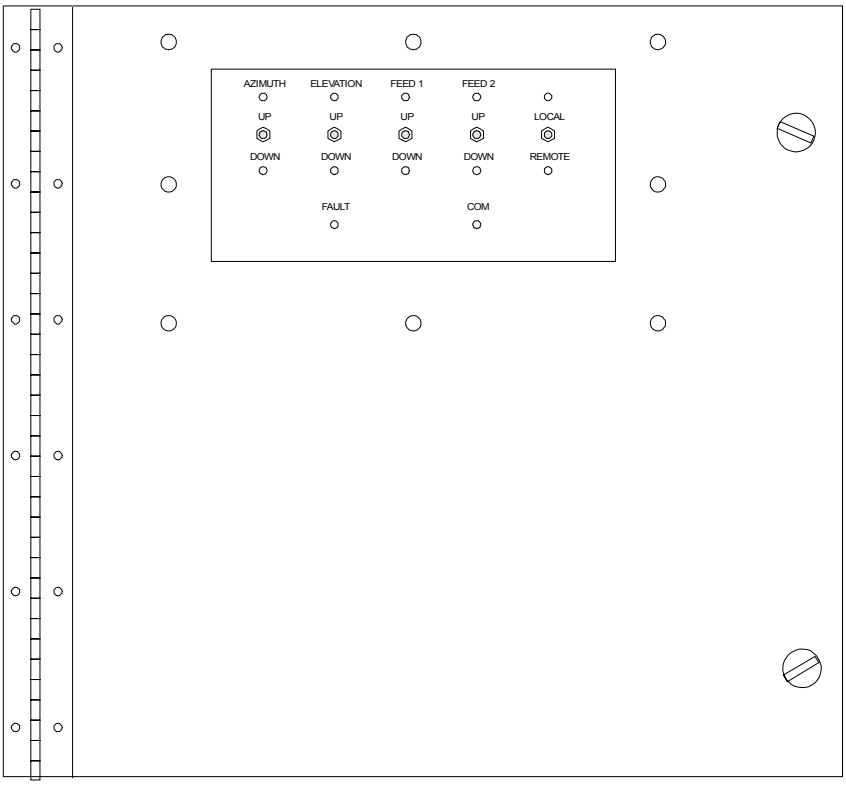


Figure 1-3. Model 8862 Internal Control Panel

1.4 Antenna Control Operation

The following information applies to the 8861A Antenna Position Controller and also to the 8862 Antenna Position Controller.

The microcontroller unit (MCU), located within the Logic Printed Wiring Board (PWB) Assembly mounted on the back of the inside door, controls the operation of the Model 8861A Antenna Position Controller. The logic assembly receives operating commands from the host control device or jog commands locally from the unit's antenna jog switches. These jog switches will move the antenna azimuth (AZ), elevation (EL), feed 1 (Fl), or feed 2 (F2) when the Loc/Remote switch is in the Local position. The jog switches have corresponding up and down status indicators that come on steady or blink to indicate axis status (axis in motion, limit reached, or axis limit switch failure detected). Refer to Chapter 3, INSIDE PANEL CONTROLS AND INDICATORS paragraph, for a complete list identifying possible indicator combinations.

The logic assembly also contains a FAULT LED indicator and a communications (COM) LED indicator. The FAULT indicator comes on when the unit detects a possible failure. The COM indicator comes on whenever the unit is communicating with the host control device.

The logic assembly processes local operator commands and transfers them to the Relay/Power Supply Assembly as digital up/down enable signals. In remote operation, the logic assembly communicates with the host control device that prompts the generation of the up/down enable signals. On the 8862, these signals also include accelerate and decelerate commands. The Relay/Power Supply Assembly applies these signals to the appropriate motor control circuits, which generates the individual axis drive signals. The drive signals energize relays that provide the power output signals to switch on the antenna motors.

Antenna resolvers/potentiometers provide analog antenna position information back to the logic assembly where it is converted to digital data. The MCU uses this digital information to properly move and stop the antenna. The logic assembly also transfers the data, via the RS-422 port (or RS-232), to the host control device where the operator can view the antenna position data.

If the antenna is driven into an electrical limit, the limit switch engages, breaking the relay coil circuit for the axis in limit. The limits apply directionally. That means the controller can command the axis back in the opposite direction from the limit switch. The unit senses both the normally closed (NC) and normally open (NO) contacts of each switch. The Relay/Power Supply Assembly conditions these signals and then sends them to the Logic Assembly for input to the MCU. Under normal or limit conditions, one of the contacts always has a logic low state and the other contact always has a logic high state, allowing the firmware to detect shorted or open limit switches. The limit switches help prevent mechanical damage to the antenna.

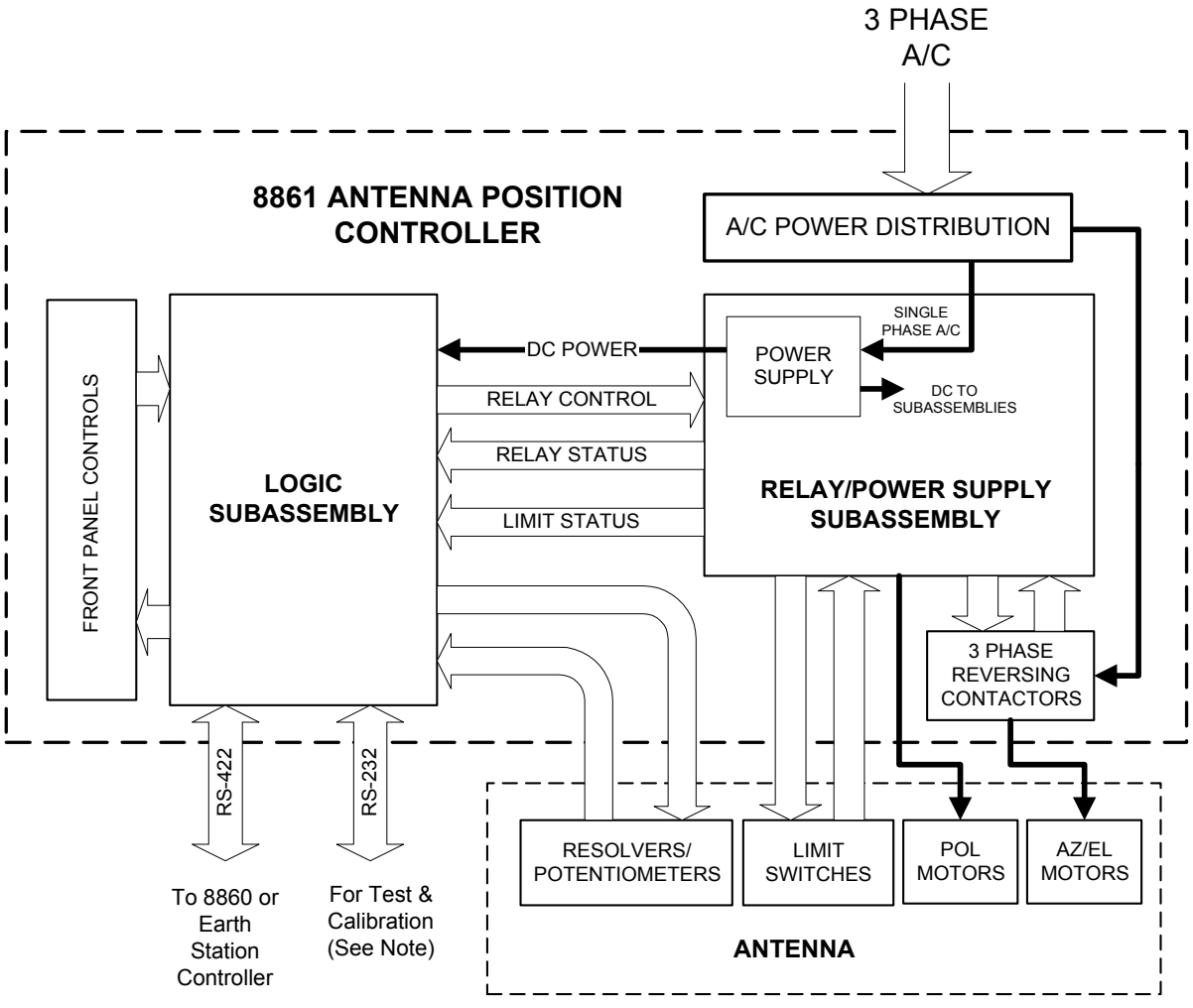
The emergency stop switch also stops all motor operation by removing control power from the main contactor on an 8862. The 8861A does not have a main contactor. The operator must manually reset the emergency stop prior to any further antenna movement. The 8862 has an emergency stop switch, while the 8861A does not. However, both units have identical internal connections for this function. ViaSat ships the 8861A with the emergency stop connector jumpered, but the user can remove this jumper and connect an external switch.

AC variable speed drives (inverters) or reversing contactors control azimuth and elevation speed and direction. Individual circuit breakers protect the variable speed drives. Depending on configuration, the variable speed motor controllers have ratings of 2 horsepower (208 VAC/380-415 VAC, 50-60 Hz), 5 horsepower (horsepower (208 VAC/380-415 VAC, 50-60 Hz), or 10 horsepower (380-415 VAC, 50-60 Hz). The single-speed reversing contactors have a rating of 1 horsepower maximum for all voltages. The units contain thermal overload relays to protect the motors. These overload relays have auxiliary contacts that allow the microcontroller to sense their status.

The logic assembly contains an RS-232 port for setup and calibration of the antenna control system. This serial I/O port allows the operator to input antenna specific information into the Antenna Position Controller.

The power service to the Model 8861A consists of five wires: three phase conductors, a neutral, and an equipment ground. The neutral conductor is used for powering single-phase loads. The Model 8861A is factory configured for a nominal line-to-line voltage of 208V or 380 to 415V ac. In the remainder of this manual, unless otherwise stated, all ac voltage designations shall refer to the nominal line-to-neutral voltage.

The control power supply is derived from phase 1 to neutral and operates at a nominal voltage of either 115V or 230V, depending on the system configuration.



Note: When RS-232 is Connected, RS-422 is deactivated

Figure 1-4. Model 8861A Simplified Block Diagram

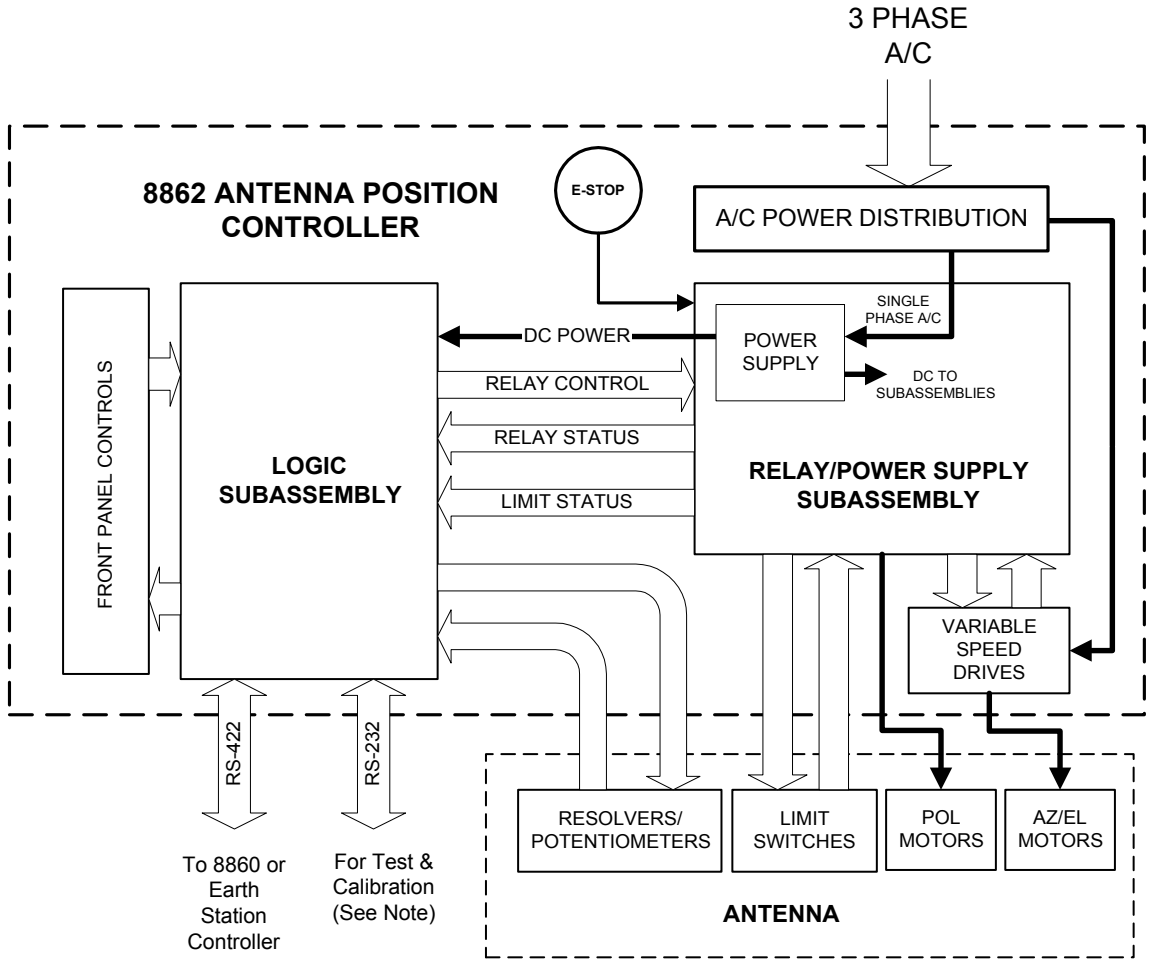


Figure 1-5. 8862A Simplified Block Diagram

1.5 Logic Printed Circuit Board Subassembly

The logic subassembly contains the MCU, memory, firmware, interface circuitry, indicators, and switches necessary to provide local control of the antenna position (see Figure 1-4 and Figure 1-5). Placing the LOCAL/REMOTE switch to the LOCAL position enables local control. Placing the LOCAL/REMOTE switch in the REMOTE position enables remote control. In remote, the units receive antenna position commands via the RS-422 (or RS-232) connector. The logic assembly is described in more detail in Chapter 4.

1.6 Relay/Power Supply Printed Circuit board Subassembly

The relay/power supply subassembly contains the control power supply, antenna interface, relay driver circuits, azimuth/elevation variable speed drive interface, feed motor control relays, auxiliary control, heater/fan control, emergency stop circuits, and master enable circuits. Azimuth and elevation motor control circuit controls the three-phase reversing contactors mounted on a DIN-rail located on the chassis of Model 8861A Antenna Position Controller, and also the variable speed drives of the Model 8862 Antenna Position Controller. The Relay/Power Supply board assembly is described in more detail in Chapter 4.

1.7 Motor Controllers

The 8861A Antenna Position Controller uses reversing contactors to control the azimuth and elevation motors. A three-phase induction motor reverses direction when any two phases swap positions. The 8861A also includes proper protective devices to prevent arcing when the unit changes the motor direction. The 8861A does not include any motor softstart devices.

1.8 Unit Specifications

1.8.1 8861A Antenna Position Controller Specifications

Table 1-1. 8861A Position Controller Specifications

Function/Item	Specification
Mechanical and Environmental	
NEMA 4 Enclosure	8 x 20 x 20-inch, mounted on antenna frame
Temperature range	-40° C to +55° C operational, motor control shut down on high temperature limit Note: Optional Low Temp Cable Kit required for use at temperatures below -20°C (-4°F)
Humidity	Enclosure automatically heated to prevent condensation
Electrical	
Input Service Configuration	Three phase power, ground, neutral (5-wire), "Y" configuration
Voltage, Frequency	180 VAC to 230 VAC, 50-60 Hz OR 380 VAC to 415 VAC, 50-60 Hz
Input (main) Circuit Protection	20 A minimum
Circuit Protection	Thermal/Magnetic breaker

Table 1-1. 8861A Position Controller Specifications

Function/Item	Specification
Communication Link	One serial port, RS-232 (DCE), RS-422 (modified SAbus)
Limit Switches	Dual contacts, logic interlocked
Az/El Control Life	500,000 cycles minimum
Az/El Motor Speeds	Single Speed
Az/El Motor Type	Three-phase AC, 0.5 HP to 1.0 HP (1.5 kW to 3.0 kW)
Az/El Protection	Thermal relay
Feed 1/Feed 2 Control Life	100,000 cycles minimum
Feed 1/Feed 2 Motor Speeds	Single-speed
Az/El Transducer Type	Brushless resolver
Converter Resolution	16 bit (0.005°)
Repeatability	±0.02° typical
Accuracy	±0.12° typical (Standard Resolution)
Feed 1/Feed 2 Transducer Type	Potentiometer or brushless resolver
Converter Resolution	10 bit (0.18° over 180°)
Repeatability	±0.35°
Operator Controls and Indicators	
Switches	Momentary contact
Az/El	JOG UP/OFF/JOG DOWN
Feed 1/Feed 2	JOG UP/OFF/JOG DOWN
Switch (toggle)	LOCAL/REMOTE
LEDs	AZ, EL, FEED 1, FEED 2 DOWN (green) AZ, EL, FEED 1, FEED 2 UP (green) COM (yellow) FAULT (red)
Mode of Operation	
Local	Front panel controls
Remote	Via SAbus command set
Setup/Calibration	Via RS-232 port using Earth Station Controller/PC or via RS-422 port using Earth Station Controller

Table 1-1. 8861A Position Controller Specifications	
Function/Item	Specification
Adjustments/Jumpers	
AC input voltage selection	
Relay/Power Supply Assembly 100-240 V 115 V/230 V	 Universal input power supply for board power Heater voltage
Auxiliary Inputs	
Number of Inputs	2
Type	Optical isolators, may be driven in several configurations
Auxiliary Outputs	
Contact Closure	Form C
Voltage	60 V DC/ 125 V AC, maximum
Current	1 Amp
Number of Outputs	2

1.8.2 8862 Position Controller Specifications

Table 1-2. 8862 Position Controller Specifications	
Function/Item	Specification
Mechanical and Environmental	
NEMA 3R Enclosure	47.5 inch H x 33.5 inch W x 13 inch D, mounted on platform near antenna
Certifications, Domestic USA Models: 2Hp/5Hp only, 180 - 230VAC 60Hz	ETL Listed Conforms to UL61010-1 2nd Edition FCC Part 15B

Table 1-2. 8862 Position Controller Specifications	
Function/Item	Specification
Certifications, International Models: 2hp/5hp only, 380-415VAC, 50Hz	CE
Temperature range	-40° C to +55° C operational, motor control shut down on high temperature limit. Unit has internal heating elements. Note: Optional Low Temp Cable Kit required for use at temperatures below -20°C (-4°F)
Humidity	Enclosure automatically heated to prevent condensation
Electrical	
Input Service Configuration	Three phase power, ground, neutral (5-wire), "Y" configuration
Voltage Frequency	187 V AC to 228 V AC, 50 to 60 Hz or 380 V AC to 415 V AC, 50 to 60 Hz
Input (main) Circuit Protection	32 A 2hp 8862 50 A 5hp/10hp
Circuit Protection	Thermal/Magnetic breaker
Communication Link	One serial port, RS-232 (DCE), RS-422 (modified SAbus)
Limit Switches	Dual contacts, logic interlocked
Az/El Control Life	500,000 cycles minimum
Az/El Motor Speeds	Single Speed
Az/El Motor Type	Three-phase AC, 0.5 HP to 10 HP (1.5 kW to 75 kW)
Az/El Protection	Thermal relay
Feed 1/Feed 2 Control Life	100,000 cycles minimum
Feed 1/Feed 2 Motor Speeds	Single-speed
Az/El Transducer Type	Brushless resolver
Converter Resolution	16 bit (0.005°)
Repeatability	±0.02° typical
Accuracy	±0.12° typical (Standard Resolution)
Feed 1/Feed 2 Transducer Type	Potentiometer or brushless resolver
Converter Resolution	10 bit (0.18° over 180°)

Table 1-2. 8862 Position Controller Specifications

Function/Item	Specification
Repeatability	±0.35°
Operator Controls and Indicators	
Switches	Momentary contact
Az/El	JOG UP/OFF/JOG DOWN
Feed 1/Feed 2	JOG UP/OFF/JOG DOWN
Switch (toggle)	LOCAL/REMOTE
LEDs	AZ, EL, FEED 1, FEED 2 DOWN (green) AZ, EL, FEED 1, FEED 2 UP (green) COM (yellow) FAULT (red)
Mode of Operation	
Local	Front panel controls
Remote	Via SAbus command set
Setup/Calibration	Via RS-232 port using Earth Station Controller/PC or via RS-422 port using Earth Station Controller
Adjustments/Jumpers	
AC input voltage selection	
Relay/Power Supply Assembly 115-230 V 115 V/ 230 V	 Universal input power supply for board power Heater voltage (plug selectable)
Auxiliary Inputs	
Number of Inputs	2
Type	Optical isolators, may be driven in several configurations
Auxiliary Outputs	
Contact Closure	Form C
Voltage	60 V DC/ 125 V AC, maximum
Current	1 Amp
Number of Outputs	2

Chapter 2

Installation

2.1 General

This chapter contains procedures for unpacking and installing the Model 8861A or 8862 Antenna Position Controller. General safety precautions and procedures are also described.

ViaSat thoroughly inspects and carefully packs all equipment before shipment. At the time of shipment, the carrier assumes responsibility for its safe delivery; therefore, do not return damaged units to ViaSat. Instead, file a claim with the carrier as noted in the paragraphs following the initial unpacking procedure given below:

1. Inspect shipping carton for visible damage.
2. Open the shipping carton.
3. Remove all packing material.
4. Inspect unit for visible damage.
5. Using packing list, check for missing items (see "How To Inventory Equipment Received" below).

2.2 What to do About Visible Loss or Damage

Make a note of any loss or evidence of external damage on the freight bill or receipt, and have it signed by the carrier's agent. Failure to adequately describe such external evidence of loss or damage may result in the carrier refusing to honor a damage claim. The form required to file such a claim will be supplied by the carrier.

2.3 What to do About Concealed Damage

Concealed damage means damage which does not become apparent until the unit has been unpacked. The contents may be damaged in transit due to rough handling, even though the carton may not show external damage. If you discover damage after unpacking the unit, make a written request for inspection by the carrier's agent within 15 days of the delivery date, then file a claim with the carrier since such damage is the carrier's responsibility. If you follow these instructions carefully, ViaSat guarantees its full support of your claims to protect you against loss from concealed damage.

2.4 How to Inventory Equipment Received

Check off each item received against that list on the packing slip included with the shipment, and verify that this list matches the purchase order. If any items are missing, please notify ViaSat immediately.

2.5 How To Return Equipment

ViaSat's Satellite Ground Systems division makes every reasonable effort to ensure that all items arrive safely and in working order. When equipment is received, which is not in working order, return the equipment to the factory for repair or replacement. Return the equipment according to the following procedure. This procedure will apply whenever equipment is returned for warranty or other services.

a) Notify ViaSat of the problem and request a Return Material Authorization (RMA) number and shipping instructions.

   For a current list of telephone and email contact information please refer to the Contact Information section of the ViaSat internet site (www.viasat.com/sgs/support/).

b) Tag or identify defective equipment and note defect and circumstances, if any. If known, reference sales order, purchase order, and date equipment was received.

c) Reship equipment in original shipping container or use a strong shipping container to protect equipment during shipment.

d) Package equipment using shock-absorbing material around all sides of equipment.

e) Seal container securely and mark outside of container FRAGILE. Also, place the RMA number on the outside of the container using a permanent marker.

WARNING

Electrical shock from voltages used in this system can cause injury or death. Prior to making any electrical connections or performing maintenance and repair, ensure power is removed. Electrical connections should be made only by qualified personnel in accordance with local regulation.

2.6 General Mechanical Safety Summary

These are general mechanical safety precautions that are not related to any specific procedure. They are recommended precautions that personnel must understand and apply.

WARNING

Installation or maintenance of antennas may require persons to work at elevated work stations. Whenever persons are working at eight or more feet above ground and not on a guarded platform, they should wear safety belts with at least one, and preferably two, lanyards, with the exception that trained and qualified persons may work up to 25 feet if on an approved ladder. In the sentence above, approved usually means that the ladder is tied off once the person has climbed but before work begins.

WARNING

Overhead hazards, either because items may fall or because a person may strike them unintentionally, are typical around construction sites or during installation of large antennas. It is prudent to adopt the following rules:

1. Never stand underneath anything while it is being hoisted.
2. Always wear a hard hat, especially if someone is above you.

2.6.1 Emergency Plan

Have an emergency plan. Know the procedures for obtaining first-aid and fire-fighting assistance. Plan your work and maintain good housekeeping; the safety and quality of the product are at stake.

2.7 General Electrical Safety Summary

These are general electrical safety precautions that are not related to any specific procedure. These are recommended precautions that personnel must understand and apply.

WARNING

Avoid shorting circuits when using metal tools. Some circuits have high current capability which, when shorted, will flash and may cause burns and/or eye injury.

Ensure that all electrical tools and equipment are properly grounded.

Remove all jewelry and exposed metal objects from body and clothing before performing maintenance, adjustments, and/or troubleshooting. Before working inside the equipment, remove all power, unless power is required to perform procedures. Do not replace parts with power on.

Replacement of fuses or other parts must be done using identical types and ratings. Substitution of non-identical parts may cause safety and fire hazards.

Servicing this equipment may require working with protective covers removed and ac power connected. Extreme caution must be exercised during these procedures.

Death or severe injury may result if personnel fail to observe safety precautions.

2.7.1 Resuscitation

Personnel working with or near hazardous chemicals or voltages should be familiar with modern methods of resuscitation.

2.8 Installation Procedures

The Model 8861A Antenna Position Controller mounts to the antenna structure; therefore, the installation procedure will change depending on the actual antenna structure. Because of the large number of antenna configurations, separate electrical installation manuals for each antenna configuration contain the Model 8861A Antenna Position Controller installation procedures. Refer to the appropriate electrical installation manual for the applicable antenna configuration.

NOTE

The electrical installation manual for the specific antenna contains procedure for installing Model 8861A Antenna Position Controller, azimuth and elevation limit switches, and data potentiometers/resolvers, and all associated hardware and cables.

The Model 8862 Antenna Position Controller mounts on the antenna pad. Anchor bolts hold the feet of the unit to the concrete pad. The installation kits includes drawings and a template for setting the position of these bolts.

2.8.1 Lifting and Moving Procedures

The Model 8862 enclosure weighs 190 lbs and therefore requires two persons to lift and move the product. Use a forklift, pallet jack or hand truck when moving or carrying the enclosure near to its final mounting location. Carefully remove the shipping crate and attach the mounting legs with supplied hardware. Locate two persons at the top end of the enclosure. Lift the unit to the vertical position but continue to hold on to it to prevent it from tipping over. Carefully lift one side at a time to maneuver the unit into place by slowly "walking" it to the desired position. Install anchor bolts into the foundation pad and attach bolts to enclosure legs.

NOTE

THE INSTALLER MUST CONNECT THE HEATER PLUG TO THE CORRECT CONNECTOR ON THE POWER SUPPLY/RELAY BOARD. USE J16 FOR 208 OPERATION OR J7 FOR 380/415 OPERATION (measured line-to-line.) If the installer fails to install the heater connection properly, damage to the antenna controller unit may occur; therefore, exercise caution and verify connection before applying power to the unit.

2.9 Setup and Calibration

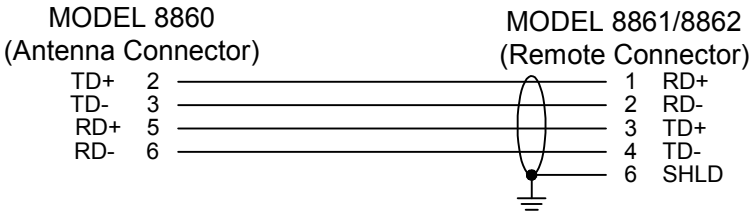
After installing the unit and associated equipment, proceed to the instructions contained in the Calibration Software Manual to complete setup and calibration procedures for Model 8861A or Model 8862 Antenna Position Controller. Refer to Figure 2-1 for signal interface cables required for remote operation and calibration.

WARNING

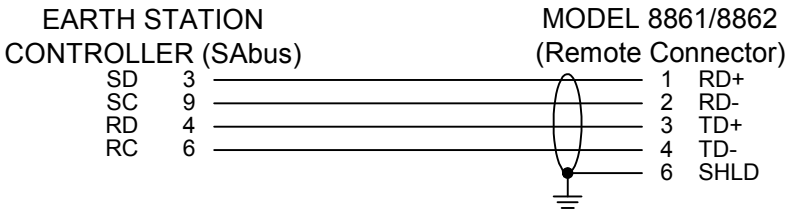
The A/C power that is supplied to the 8861A or 8862 is only for use by the antenna control system. Do not connect other electrical devices such as electrical receptacles, aircraft warning lights or other electrical appliances to the A/C power within the 8861A or 8862 enclosure. The user should provide a separate A/C power utility service at or near the base of the antenna if additional A/C power is required for other non-antenna control system related hardware such as aircraft warning lights or general-purpose utility receptacles.

NOTE

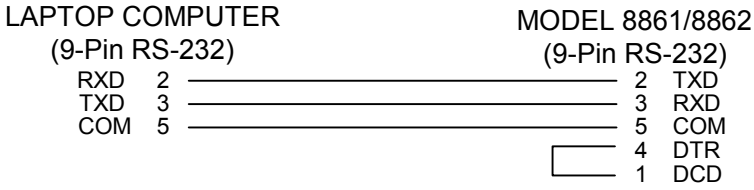
USE OF THIS EQUIPMENT IN A MANNER NOT SPECIFIED BY THE MANUFACTURER MAY IMPAIR THE PROTECTION PROVIDED BY THE EQUIPMENT.



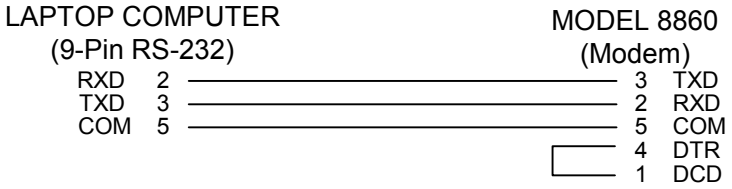
8860 TO 8861/8862



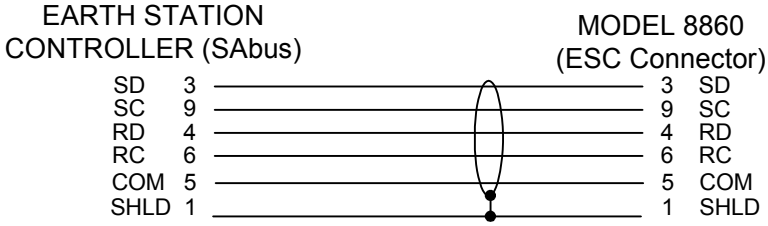
EARTH STATION CONTROLLER TO 8861/8862



LAPTOP COMPUTER TO 8861/8862



LAPTOP COMPUTER TO 8860



EARTH STATION CONTROLLER TO 8860

Figure 2-1. Interface Cables Used for Calibration

Chapter 3

Operation

3.1 General

This section contains information necessary to understand and operate the Model 8861A or Model 8862 Antenna Position Controller. This chapter includes an explanation of controls, indicators, and operating instructions.

Perform calibration before operating the Model 8861A or Model 8862. Refer to the Calibration Software Manual.

3.2 Inside Panel Controls and Indicators

The operator can control the antenna position directly from the panel inside the cover of the unit. The inside panel contains four momentary action switches and a two-position toggle switch. The inside panel also includes green light emitting diode (LED) indicators that indicate the status of each axis (axis in motion, limit reached or axis failure detected). A red FAULT indicator comes on when the unit detects a failure and the green communication (COM) indicator identifies that the unit has established communication with the host control device. Figure 3-1 shows the inside panel controls and indicators and Table 3-2 briefly describes their function.

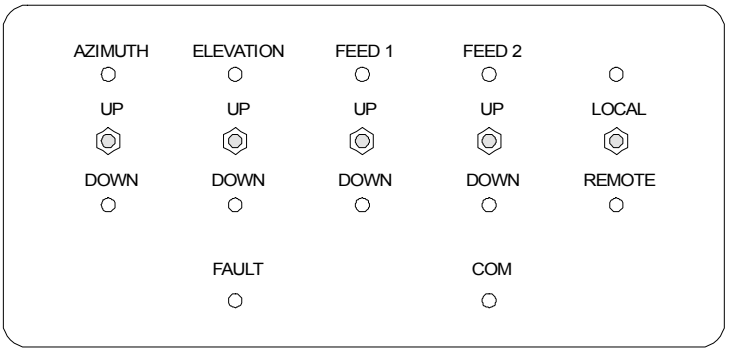


Figure 3-1. Inside Panel Controls and Indicators

Table 3-1. Description of Jog Switches

AZIMUTH	The azimuth momentary contact switch allows the user to jog the antenna azimuth up or down. The up position jogs the antenna in a clockwise direction and the down position jogs the antenna in the counterclockwise direction (as viewed looking down on the antenna from above). The spring-loaded switch will return to the OFF position when released.
ELEVATION	The elevation momentary contact switch allows the user to jog the antenna elevation up or down. The up position jogs the antenna in an upward direction and the down position jogs the antenna in the downward. The spring-loaded switch will return to the OFF position when released.
FEED 1	The feed 1 momentary contact switch allows the user to jog the antenna up or down. The up position jogs the feed in a clockwise direction and the down position jogs the feed in the counterclockwise direction (as viewed from the LNA side of the feed). The spring-loaded switch will return to the OFF position when released.
FEED 2	The feed 2 momentary contact switch allows the user to jog the feed up or down. The up position jogs the feed in a clockwise direction and the down position jogs the feed in the counterclockwise direction (as viewed from the LNA side of the feed). The spring-loaded switch will return to the OFF position when released.

Table 3-2. Description of the Indicator Functions

Indicator	Function		
Antenna Axis Status Indicators	The unit has eight antenna axis status indicators, two for each axis. Each axis has an up and down indicator. Each indicator can come on steady, blink, or fast blink depending on the status of the axis the indicator represents. The following list identifies the possible indicator combinations and the corresponding axis status.		
	Indicator		
	UP	DOWN	Status
	Off	Off	Idle
	On	Off	Up Motion
	Off	On	Down Motion
	Blink	Off	Up Limit
	Off	Blink	Down Limit
	Fast Blink	Off	Up Limit fault or Up Axis Stuck
	OFF	Fast Blink	Down Limit Fault or Down Axis Stuck
	Fast Blink	Fast Blink	Contactor/motor fault, axis overload, or backward operation

Table 3-2. Description of the Indicator Functions

Indicator	Function
AZIMUTH UP indicator	This indicator comes on steady when the antenna moves in the clockwise direction. The indicator blinks when the antenna reaches the clockwise electrical limit. The clockwise direction limit switch activates this signal. A fast blink indicates a fault.
AZIMUTH DOWN indicator	This indicator comes on steady when the antenna moves in the counter-clockwise direction. The indicator blinks when the antenna reaches the counter-clockwise electrical limit. The counter-clockwise direction limit switch activates this signal. A fast blink indicates a fault.
ELEVATION UP indicator	This indicator comes on steady when the antenna moves upward. The indicator blinks when the antenna reaches the clockwise electrical limit. The up direction limit switch activates this signal. A fast blink indicates a fault
ELEVATION DOWN indicator	This indicator comes on steady when the antenna moves downward. The indicator blinks when the antenna feed reaches the down electrical limit. The down direction limit switch activates this signal. A fast blink indicates a fault.
FEED 1 UP indicator	This indicator comes on steady when the antenna feed moves in the clockwise direction. The indicator blinks when the antenna feed reaches the clockwise electrical limit. The clockwise direction limit switch activates this signal. A fast blink indicates a fault
FEED 1 DOWN indicator	This indicator comes on steady when the antenna feed moves in the counter-clockwise direction. The indicator blinks when the antenna feed reaches the counter-clockwise electrical limit. The counter-clockwise direction limit switch activates this signal. A fast blink indicates a fault.
FEED 2 UP indicator	This indicator comes on steady when the antenna feed moves in the clockwise direction. The indicator blinks when the antenna feed reaches the clockwise electrical limit. The clockwise direction limit switch activates this signal. A fast blink indicates a fault.
FEED 2 DOWN indicator	This indicator comes on steady when the antenna feed moves in the counter-clockwise direction. The indicator blinks when the feed antenna reaches the counter-clockwise electrical limit. The counter-clockwise direction limit switch activates this signal. A fast blink indicates a fault.

Table 3-2. Description of the Indicator Functions

Indicator	Function
Advisory Indicators	
COM Indicator	The communications (COM) indicator comes on when the Antenna Position Controller communicates with the host control device.
Fault Indicator	The FAULT indicator comes on when the Antenna Position Controller detects a failure not related to a specific axis. ALARM Indicator — Possible Failure On Steady — Critical Fault, cannot reset Fast Blink — Fault, may be reset When the FAULT indicator blinks or fast blinks, reset the fault by placing the LOCAL/REMOTE switch to the REMOTE position and simultaneously place all four axis jog switches to the down position. This causes a manual reset. The operator can also reset the Antenna Position Controller from the 8860 or from the laptop computer using the Calibration Software. When the FAULT indicator remains lit steadily, the operator can only clear the fault by cycling power, if the fault does not indicate a hardware failure. See Chapter 4 for more details about these faults. With Version 2.1 or later firmware, the FAULT indicator also shows that the operator has placed the unit in Maintenance mode. While in this mode, the FAULT indicator briefly flashes once per 8 to 10 seconds, provided that no fault conditions exist. Paragraph 3.6, Operation, describes maintenance mode.
Active Indicator	The green LED behind the front panel blinks to indicate that the processor continues to run.

3.3 Operation

Normal operation of the Model 8861A or Model 8862 Antenna Position Controller uses either the 8860 Antenna Tracking Controller for remote control, or the internal jog switches described in INSIDE PANEL CONTROLS AND INDICATORS in section 3.2 for local control. Refer to the 8860 Operations Manual 557660 for information about using the 8860 Antenna Tracking Controller.

With version 2.1 or later firmware, the operator can place the Model 8861A or 8862 in maintenance mode. This mode disables some of the software safety features including position checkpoints, hard/soft limit position checking, and the communications watchdog timer. Use this mode only during system installation.

To place the Model 8861A in maintenance mode, hold the two feed switches in the UP position for at least five seconds with the LOCAL/REMOTE switch in the REMOTE position. While in this mode, if the unit detects no fault conditions, the FAULT indicator will flash briefly per 8 to 10 seconds. This mode will clear upon loss of power to the unit.

The operator can also enter this mode from the calibration software.

CAUTION

Maintenance mode allows the installer to move an antenna axis before installing or calibrating resolvers. Improper use of this mode can damage the antenna structure. Only qualified installation personnel should use maintenance mode. Always use extreme care while operating in this mode.

3.4 Setup and Calibration

The Model 8861A and the Model 8862 Antenna Position Controller contains an RS-232 port for setup and calibration of the antenna control system. The design of the RS-232 port allows it to interface with a laptop computer. The cable consists of all straight-though connections. The operator can obtain the correct cable (with proper connectors) at any computer store under the description "EGA Extender Cable." Using the Calibration Software, the operator can enter the required antenna specific data. Refer to the Calibration Software Manual for the setup and calibration procedures.

Chapter 4

Principles of Operation

4.1 Internal Printed Circuit Board Assemblies

The 8861A and the 8862 Antenna Positioner Controllers have two printed circuit board assemblies. The Logic Board has the microcontroller, memory, and signal interfaces. The Relay/Power Supply Board has the control power supply, power relays, isolated power control interfaces and isolated signal interfaces. Additionally, the 8861A has a snubber board to provide AC arc protection for the azimuth and elevation motor reversing contactors.

4.1.1 Logic Board Assembly

The 8861A and the 8862 Antenna Position Controllers use the same Logic Assembly and the same firmware. Previous versions of the 8861 (old drawing number 455300) used a different Logic Assembly, but also used the same firmware.

4.1.1.1 General

This section provides detailed information describing the Logic Assembly. This assembly consists of a microcontroller unit (MCU), firmware, switches, indicators, and the circuitry required to provide antenna motor interface and control for antenna positioning. The microcontroller unit controls the entire Model 8861A and 8862 Antenna Position Controller operations.

4.1.1.2 Description

In normal operation, the MCU (U36) receives antenna commands from the host control device. When the controller receives a command to change the antenna position, the processor provides the appropriate command signal to the antenna motor enable circuit. This circuit consists of U6, U7, U10, U12, and U13. This circuit supplies the individual command signal to the Relay/Power Supply Assembly. After generating the appropriate up or down command signal, the system routes the command through the normally closed contacts of the limit switch and applies the signal to a relay, which activates the correct motor. Activating a limit switch breaks the command path and prevents motion of the antenna.

4.1.1.3 Interface Operation

The RS-422 and RS232 interface circuits (U41 and U25) within the Logic Assembly provide the clock and data signals enabling the processor to communicate with the host control device. The data transfer clock signal generates data transfer rates of 1200, 2400, 9600, and 19200 bits per second.

The RS-232 output connector allows the connection of a straight-through cable from a laptop computer for setup and calibration of the unit. The unit defaults to the RS-422 link (connector J9) for communications. However, an active level on the data terminal ready (DTR, pin 4) input pin (connector J8), causes the assembly to select the RS-232 interface and deselect the RS-422 interface.

4.1.1.4 Signal Processing

A Motorola 68HC11 8-bit microcontroller, U36, provides the intelligence of the unit. It operates at a frequency of 8 MHz and it has a bus frequency of 2 MHz. It includes a watchdog timer internal to the processor. The Logic Printed Circuit Board Assembly stores the program in erasable programmed read-only memory (EPROM), U27, and it stores parameters specific to the antenna in the non-volatile memory (EEPROM) internal to the processor. The processor generates the appropriate changes in the antenna command position signals based on the program and the input signal monitored during operation.

The 8861A or 8862 reads azimuth and elevation data from the antenna using resolvers. The resolver circuit consists of the devices U1, U2, and U3. Under processor control via the resolver to digital latch U24, the processor selects the specific resolver signal required. One resolver input (consisting of a sine and cosine signal) exists for each of the possible four axes, including the two feed axes if they have resolvers. The system will allow use of 4X, multi-turn resolvers (high resolution) on the azimuth and elevation axes. To use this capability, the installer must configure the system for this operation during installation.

The resolver-to-digital converter (RDC) circuit (U9) reads each selected resolver input with a resolution of 16 bits. The RDC uses a preload of the previous value to reduce settling time. It also has four fixed test channels for self-test procedures. The processor reads the RDC data from a latch circuit on data bus lines D0 through D7. The processor reads all resolver channels.

When the resolver output corresponds to the commanded position, the processor terminates the antenna position change command. The unit communicates the position to the host device and the operator can view the position on the display. Note that resolver data has a much higher accuracy than potentiometer data.

The processor receives all eight-limit status outputs. Each limit status output consists of an active high signal and a complementary active low signal. The processor uses the paired signals to detect shorted or open limit switches. The active low inputs complete a portion of the motor control circuit and inhibit motion when high.

The Antenna Position Controller reads the position of motorized feeds using potentiometers, but it has the capability to support resolvers. See later in this section regarding the use of the Feed 1 and Feed 2 resolver inputs. The circuit that reads the potentiometer consists devices U6, U10, and U13.

4.1.1.5 Local Operation

Local operation allows control of the antenna position at the antenna site. Switches inside the Model 8861A and 8862 Antenna Position Controller cover provide local/remote selection and antenna axis jog switches. The inside panel also includes antenna movement, limit switch actuation, and alarm indicators. These allow the operator to monitor the control system operation at the antenna site during installation or maintenance operations. The local interface does not display the antenna position, however.

After the operator places the LOCAL/REMOTE switch, S1, in the local position, the processor enables the AZIMUTH, ELEVATION, FEED 1, and FEED 2 switches (S2 through S5, respectively). The operator can then jog each of the axes in the UP or DOWN direction.

4.1.1.6 Heating and Cooling

The 8861A and 8862 Antenna Position Controller include heating elements that activate when the temperature falls below the set point values. The units require these heaters to operator in low temperature regions of the world. The units also include the capability to support cooling fans. However, neither the 8861A nor 8862 Antenna Position Controller has fans. The obsolete 8864 Antenna Position Controller did include the fan option. If the temperature inside the 8861A or 8862 Antenna Position Controller rises above 65° C or falls below -20° C, the unit disables axis control to prevent damage. After the unit cools or warms, it will allow the operator to reset the fault. The user can adjust these values using the Calibration Software. If the temperature inside the unit falls below the temperature set point (5°C default), the processor activates the heater circuit, U22, which activates a control relay on the Relay/Power Supply Board to turn on the heating elements. The user can change the default temperature set point using the Calibration Software.

NOTE

THE INSTALLER MUST CONNECT THE HEATER PLUG TO THE CORRECT CONNECTOR ON THE POWER SUPPLY/RELAY BOARD. USE J16 FOR 208 OPERATION OR J7 FOR 380/415 OPERATION (measured line-to-line.)

4.1.2 Relay/Power Supply Board Assembly

4.1.2.1 General

This section provides detailed information pertaining to the Relay/Power Supply Board Assembly. The Relay/Power Supply Assembly consists of the power supply, azimuth and elevation motor control interface, feed motor control, and antenna interface. The board accepts a universal AC input of 115 V to 240 V (phase to neutral) with a frequency of 50-60 Hz. It does not require jumpers or any other user intervention. It does have both 115 V and 230 V plugs for the external heaters.

4.1.2.2 Description

The Logic Assembly interprets move commands into control voltages and outputs them to the Relay/Power Supply Assembly. At idle (no antenna movement commands issued), the control voltage lines remain at a logic high, +5 V. The Logic Assembly pulls the lines to ground to turn on the optical relay within the Relay/Power Supply Assembly when issuing a command. In addition to these individual signals, a master control enable signal must activate to engage the relays or variable speed drives. The master control enable signal controls a switch that activates the +24 V power for the relay coils.

After receiving an individual axis drive signal and the master control command signal, the Relay/Power Supply Assembly provides a closed circuit for the +24V power through the relay or inverter coil and the limit switch for that axis. Now the relay contacts can engage, applying power to the motor to move the antenna in the correct direction. If the antenna activates a limit switch, it breaks the circuit and kills power to the antenna while moving in that direction. The unit can still apply power to move in the opposite direction. The Logic Assembly will report the limit to the host device. This applies to all axes.

The Model 8861A uses reversing contactors to power the azimuth and elevation motors, while the Model 8862 uses variable speed drives, or inverters, to power the azimuth and elevation motors. The Relay/Power Supply Assembly design allows the same interface to control either reversing contactors or variables speed drives. Both units have identical feed motor control circuits consisting of ten relays arranged to perform like two small reversing contactors.

The Relay/Power Supply Assembly uses a network of optical switches to combine command signals, enable signals, and the limit switches. This network implements the logic to correctly and safely activate motors

4.1.2.3 Axis Fault Monitoring

During axis motion, the processor in the Logic Assembly monitors axis direction using potentiometer or resolver inputs. The processor determines if the axis moves in the wrong direction. It monitors both limits to determine if motion continues past a limit. If either fault occurs, the unit will display the fault on the front panel of the Positioner and also on the display of the host device.

4.1.2.4 Heater/Fan Operation

The 8861A and 8862 Antenna Position Controller include heating elements that activate when the temperature falls below the set point values. The units require these heaters to operator in low temperature regions of the world. The units also include the capability to support cooling fans. However, neither the 8861A nor 8862 Antenna Position Controller has fans. The obsolete 8864 Antenna Position Controller did include the fan option.

If the temperature inside the 8861A or 8862 Antenna Position Controller rises above 65° C or falls below -20° C, the unit disables axis control to prevent damage. After the unit cools or warms, it will allow the operator to reset the fault. The user can adjust these values using the Calibration Software.

If the temperature inside the unit falls below the temperature set point (5°C default), the processor activates the heater circuit, U22, which activates a control relay on the Relay/Power Supply Printed Circuit Board to turn on the heating elements. The user can change the default temperature set point using the Calibration Software.

4.1.2.5 Auxiliary Outputs

Relays K2 and K3 provide form-C contact closure outputs. The normally closed (NC), common (COM) and normally open (NO) outputs exit the board through connector J9. The relay contacts have a rating of 1 A at 240 V.

The 8860 Antenna Tracking Controller generates the signal to control these relays. The Relay/Power Supply Assembly has another auxiliary output on the antenna interface. This optically isolated output allows the user to add additional control signals if required.

4.1.2.6 Auxiliary Inputs

The Relay/Power Supply Assembly has one opto-isolated auxiliary input available for external control equipment via the auxiliary control circuit. The other auxiliary input serves as the phase loss relay. The user can monitor these inputs from the host control device.

The antenna interface circuit provides one additional opto-isolated input available for user defined purposes.

4.1.2.7 Power Supplies

The Relay/Power Supply Assembly has two universal switching power supply modules. The +24 V module, rated for 20 W, supplies all relay control power. The +5 V, ± 15 V module, rated for 30 W, supplies all logic and interface power.

4.1.3 Snubber Board Assembly

Only the 8861A Antenna Position Controller includes this printed circuit board. The 8862 does not require it. Older 8861 assemblies that use the old 8861 printed circuit boards also do not require this board. However, upgrades of an 8861 to an 8861A do require this board. Contact ViaSat for upgrade information. Because the old 8861 boards included many obsolete components, a repair to an 8861 may force an upgrade to an 8861A. ViaSat does not manufacture the older 8861 printed circuit boards.

4.1.3.1 General

A snubber consists of a resistor and capacitor in series that have a sufficiently high voltage rating to withstand electrical transients, such as those created by switching inductive loads. Common inductive loads include motors and solenoids. To suppress an arc created by switching contacts on a motor (such as reversing contactors used on the 8861A), the designer should place a snubber in parallel with the contactor. Design rules for selecting the snubber size also apply depending on the current and voltage.

4.1.3.2 Description

The Snubber Printed Wiring Board Assembly consists of ten snubbers. Each snubber contains a 39-ohm resistor and a 0.1 μF capacitor in series and encapsulated in an epoxy enclosure. The snubber has a rating of 600 VAC. The board has four ten-pin Wago style connectors (J1, J2, J3, and J4). J1 and J2 have the snubbers connected across each pair of pins, beginning with pins 1 and 2. J3 and J4 allow the 8861A to route power to the motors parallel to the snubber network. Using connectors J3 and J4 also allows the installer to connect external wiring to the 8861A without having to attach wires directly to the reversing contactors. The previous 8861 design required the installer to wire directly to the contactors.

4.1.4 Motor Drive Components

4.1.4.1 General

This section provides detailed information pertaining to Model 8861A and 8862 reversing contactors, variable speed drives, and other related information

4.1.4.2 Azimuth And Elevation Motor Drive

The Model 8861A runs motors only at line speed, so it uses reversing contactors for controller the motors. The Model 8862 runs motors at line and low speeds, neither normally equal to line speed. Therefore, the Model 8862 uses variable speed AC motor drives, or inverters. An AC motor runs at a speed proportional to the line frequency minus slip (about 6%). A standard four-pole motor should have an operating speed of approximately 1725 RPM at 60 Hz line frequency.

4.1.4.3 Reversing Contactors, 8861A

If any two phases of a three-phase AC induction motor swap positions, the motor will reverse directions. Special contactors exist, called reversing contactors that can energize contacts for motion in either direction. The Model 8861A uses two pairs of these contactors for controlling the motion of a three-phase AC motor. These contactors have a forward control line and a reverse control line. An auxiliary contact allows the system to verify contactor operation.

Reversing contactors provide the simplest method of controlling AC motors. For small motors, relays allow the creation of an equivalent device to reversing contactors. Because the contactors switch AC power into an inductive device, they require snubber devices to reduce arcing on the contacts. Arcing will damage the contacts over time and will create EMI inside the unit.

4.1.4.4 Variable Speed Drives, 8862

To satisfy the requirement to move quickly when changing between satellites (slewing) and to move slowly while tracking, the Model 8862 uses variable speed drives. ViaSat sets these drives at 150% of line frequency (90 Hz in the United States) for slewing and at 10% (6 Hz in the United States) for tracking.

The azimuth and elevation variable speed drives, or inverters, control power to the azimuth and elevation motors. These inverters convert the fixed voltage and frequency three-phase AC input into a variable voltage and variable frequency three-phase AC output. This variable output allows continuous adjustment of motor speed over a range of approximately 15:1. Figure 4-1 shows the relationship between voltage/frequency and speed/torque for a 380 V, 50 Hz system.

The azimuth and elevation actuators use four pole AC induction, or "squirrel cage," motors with a shaft speed roughly proportional to line frequency. As mentioned above, the actual shaft speed differs from the theoretical synchronous shaft speed by the motor slip, which varies depending on torque load and motor design. A four pole motor has an approximate speed of **30 x f**, with **f** equal to the applied frequency. A complete description of the "squirrel cage," synchronous motors, and slip greatly exceed the scope of this document.

The inverter must reduce line voltage as it lowers the frequency. It does this because the motor winding design assumed a specific voltage and frequency, with the ratio most critical. This constant voltage to frequency ratio allows the motor to operate at constant current, and therefore at constant torque. Below 10% to 20% of line frequency, resistive losses in the motor and motor leads become significant, causing reduction in torque. The inverter allows adjustment for this loss, using Voltage Boost.

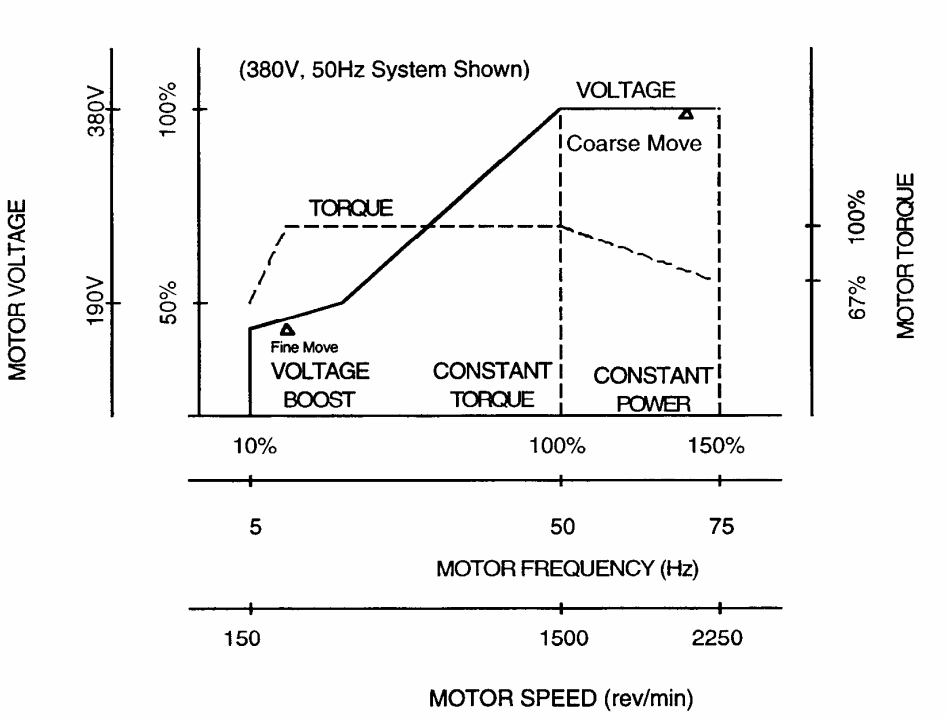


Figure 4-1. Motor Speed/Torque verses Inverter Voltage/Frequency

Consider a motor rated for 380 V, 50 Hz operation. With an output voltage of 380 V, 50 Hz (100% of line frequency), the motor runs at its nameplate speed and produces full torque. Since the voltage cannot increase above the line input, the driven above line frequency, the motor operates in a constant power region. In the constant power region the motor has torque inversely proportional to frequency. Doubling frequency reduces the available torque by one half.

The mode 8862 operates at either of two speeds, as noted above, for slewing and for tracking. The 8862 documentation will always show these values as percentages of line frequencies since the 8862 operates on both 50 Hz and 60 Hz systems. ViaSat uses 10% as the normal low speed setting and 150% as the normal high-speed setting. These speeds correspond to 5 Hz and 75 Hz respectively on a 50 Hz system, and 6 Hz and 90 Hz respectively on a 60 Hz system. The user can vary these speeds using the calibration software.

Figure 4-2 shows the inverter inputs and outputs. The AZ/EL REF signal from the Logic Assembly varies from 0 V DC to 10 V DC to control the frequency output of the inverter. The 8862 scales this voltage so that 5 V equal rated line frequency (50 Hz or 60 Hz).

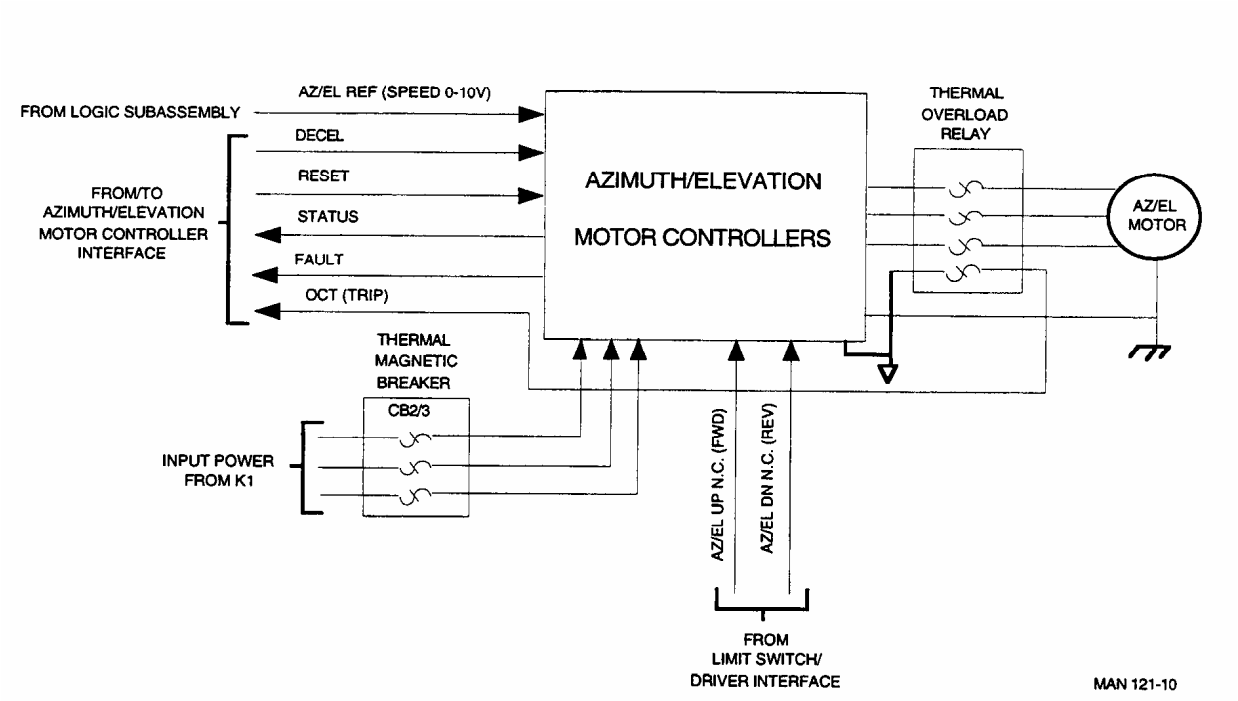


Figure 4-2. Motor Controller Inputs and Outputs

The inverter uses the DECEL signals to select one of two programmed acceleration or deceleration profiles. For high speeds, such as between satellite slewing moves, DECEL remains high and the inverter uses the ACCEL-1 and DECEL-1 settings. For low speeds, such as during tracking, DECEL remains low and the inverter uses the ACCEL-2 and DECEL-2.

Note the above information is relative to Polyspede Inverters only. Appendices C and D provide settings for several inverters used by ViaSat. Figure 4-3 shows a typical motion profile for a high-speed move.

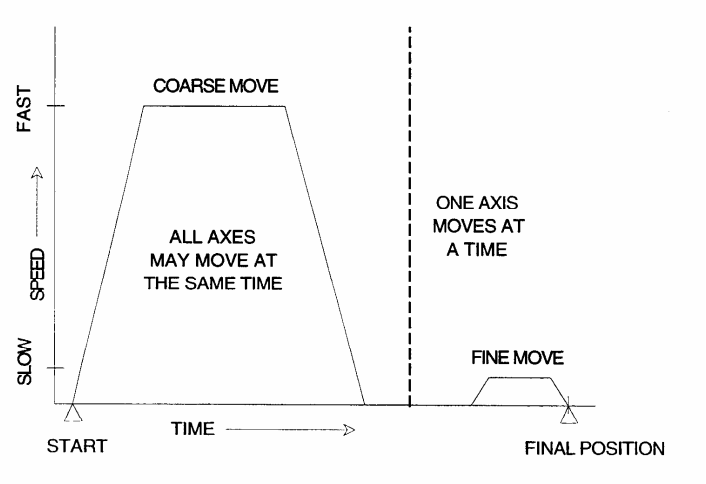


Figure 4-3. Azimuth/Elevation Move Profile

Currently, the 8862 uses variable speed drives (VSDs) by Mitsubishi. These drives do not use the ACCEL-2 and DECEL-2 control lines for speed control. Instead, a variable analog voltage from the logic card, converted to a variable frequency by the VSDs, controls the motor speed. Low speed input voltage to the VSD is approximately +0.5 to 1Vdc. High speed, (depending on the max speed setting) would produce about +5.0 to 7.4Vdc.

The AZ/EL FWD and AZ/EL REV signals enable the inverter output and determine the direction of motor rotation. These signals pass through the normally closed limit switch contacts. Therefore, the command will disappear when the motor moves into the limit in that direction. These signals match the control line of a reversing contactor, so that the same control circuit could control either device.

The inverter holds the AZ/EL UP/DN STATUS (RUN) signal low while running. The 8862 monitors these signals to determine system operational status.

The AZ/EL FAULT signals indicate, with a low level, that the inverter has sensed a failure or overload condition. The 8862 firmware monitors these signals and reports faults using the LED indicators on the front panel of the unit. It also reports the conditions to the host device. When the user executes a reset, the system resets these conditions. During a reset sequence, the firmware pulses the RESET line to both inverters low for approximately 50 msec, causing them to reset any internal fault conditions.

In addition to the overload protection provided by the inverters, the 8862 unit has thermal overload relays to protect the azimuth and elevation motor windings. These relays sense motor current and pull their respective over-current trip (OCT) signals low. The firmware monitors these signals and displays fault indications on the front of the unit in addition to reporting the condition to the host device. If the overload relays have the AUTO

configuration, the user may reset them from the front panel, but the relay will continue to trip until it cools. If the overload relays have the MAN configuration, the user must manually reset them before resetting the 8862. The 8861A also has thermal overload relays on its output.

Because they have many features, the variable speed drives require programming for proper operation. Refer to Appendices C and D for additional information about programming the drives.

4.1.4.5 Antenna Polarization Motor Drive

The polarization motors only move at constant speed and they do not exceed a maximum of 0.25 HP. Therefore, they do not require large contactors for reversing. The Relay/Power Supply Printed Circuit Board Assembly has a set of ten relays, five for Feed 1 and five for Feed 2, that implement the equivalent of a set of reversing contactors.

If the feed has a single-phase motor, it reverses by swapping the side where the unit supplies power. The motor has a Phase 1, Phase 2, Neutral, and Ground connection. Only one of Phase 1 or Phase 2 should have power, or the motor will not run. The motor changes direction depending on which phase has power. A single-phase motor can use a reversing contactor for direction control. The contactor will have power applied to only one of the two swapping phases and no power on the third phase. The polarization motors have overload relays in both the 8861A and 8862 units.

The above description of single-phase motors applies to all motors used by ViaSat in antenna feed. However, the description does not apply to all single-phase motors.

4.1.5 Emergency Stop Circuit

The emergency stop circuit consists of a normally closed switch that closes a circuit at connections J15-1 and J15-2 of the Relay/Power Supply Printed Circuit Board assembly inside the unit. Normally an 8862 has an emergency stop switch and an 8861A does not. ViaSat uses this standard arrangement because large antennas with more need for emergency stop buttons use the 8862 Antenna Position Controller. However, an emergency stop button can be added to the 8861A in the field.

The large, red button on the left side of the 8862 Antenna Position Controller is the emergency stop button. When pressed, the 8862 main contactor will shut off, the motors will turn off, and the unit will report an emergency stop. To resume operation, pull out the emergency stop switch (this requires the key shipped with the unit) and reset the unit by simultaneously pressing all jog switches down (Local/Remote switch in remote). Note that larger antennas may have several additional emergency stop switches wired in series with the main emergency stop switch.

4.1.5.1 Adding Additional Emergency Stop Switches, 8862

The installer or customer can add additional emergency stop switches at any point by placing them in series with existing emergency stop switch. The connections are located at TB3-1 and TB3-15 on the 8862.

4.1.5.1.1 Adding an Emergency Stop Switch to the 8861A

The 8861A has the connections J15-1 and J15-2, but it does not have the additional terminal block TB3 for wiring additional emergency stop switches. It also does not have a main contactor for shutting off power during a fault or emergency stop. However, the 8861A will halt operation, on either of those conditions when equipped with an emergency stop switch. If a customer desires an emergency stop switch, the installer must remove a jumper at J15-1 and J15-6 and install a normally closed, SPST emergency stop switch at the same connection locations. Then, the installer must go into the Calibration Software and clear the Emergency Stop Mask bit by "un-checking" the option in the General Setup Parameters window. After changing this field, shut down the calibration program and cycle power on the 8861A. Retest for proper operation. ViaSat sets this bit on all 8861A units during manufacture so that the unit does not require an emergency stop switch. The installer should test this system to verify operation of the switch. If the switch is mounted on the enclosure, the installer must seal the mounting location to prevent water entry inside the 8861A.

4.1.6 Phase Loss Relay

To prevent degradation of inverter performance, the Model 8862 uses a phase monitoring relay to monitor the voltage and sequencing in all three phases. This device indicates correct phase conditions by closing a contact monitored by the firmware. The connection points for this monitor exist on J15 of the Relay/Power Supply Printed Circuit Board (J15-5 Phase Loss Input, J15-6 Return). If a phase disappears or the sequence reverses, the contact opens and the 8862 reports the fault to the host device. Also the main contactor drops out and the unit reports an emergency stop condition.

The phase loss sensor (K2) shows a green and a red light during proper conditions. If a failure exists, the sensor turns off one or both lights. Wrong sequencing of the phases usually only occurs during installation. Correct it by attaching the power wires in the proper sequence. The local electrical contractors should have this information. A fault during operation usually indicates a serious problem.

The 8861A has the inputs for a phase loss sensor, but does not need or recognize them.

4.1.7 Handheld Jog Controller, (optional)

The Handheld Jog Controller (HJC) is a software application designed to operate on a personal data assistant (PDA) which provides the user the ability to manually jog a motorized, ViaSat Limited-Motion Antenna while moving about the pedestal area. The basic components of the product are 1) the PDA loaded with the HJC software, 2) sync/serial cable with A/C adaptor (provided by the manufacturer) and 3) a 50-foot RS-232 extension cable. The HJC is connected to the logic card located within the ViaSat Model 8861A or 8862 Antenna Position Controller utilizing the RS-232 interface provided on the PDA. Once the software program is started, all four axis of the antenna may be jogged from a maximum distance of 50 feet from the 8861A or 8862 Antenna Position Controller. The PDA touch screen provides jog buttons for all four axes, FAULT RESET, STOP, as well as angle indications for all four axis.

Chapter 5

Maintenance

5.1 Introduction

This chapter provides guidelines for general maintenance and troubleshooting of the Model 8861A and Model 8862 Antenna Position Controller. The design precludes any user repair other than replacing the internal modules. Limit user maintenance to specific level adjustments and subassembly or printed circuit board assembly replacement.

Table 5-1 provides common Model 8861A and Model 8862 Antenna Position Controller failure indications and the most probable remedy for the failure. Except for the non-resettable power-up faults, the 8860 Antenna Tracking Controller display also shows the condition of the position controller. The calibration software also displays the fault information in a more user-friendly format. Whenever possible, use the calibration software for interpreting faults rather than the descriptions given below.

Table 5-1. Failures and Remedies

Failure Indication		Comments/ Remedy
FAULT on Steady		If the FAULT indicator remains on steady and all axis indicators remain off, the processor watchdog timer has indicated a failure. Check the Logic Assembly. If an axis indicator comes on, proceed to the following list to determine the failure.
Azimuth Axis	Elevation Axis	
Up only on	Both off	EPROM checksum error, check Logic Assembly tested at power-up only
Down only on	Both off	RAM error, check Logic Assembly tested at power-up only
Up/Down on	Both off	Processor fault (EPROM) Check Logic Assembly tested at power-up only
Both off	Up only on	Reference frequency fault (resolver to digital) Check Logic Assembly tested at power-up only
Up only on	Up only on	Relay/Power Supply fault Check Relay/Power Supply Assembly tested during operation

Table 5-1. Failures and Remedies

Failure Indication		Comments/ Remedy
Down only on	Down only on	Logic board fault Check Logic Assembly tested during operation
FAULT Briefly Flashing		If no other fault conditions exist, the unit has entered Maintenance mode
FAULT Blinking		If the FAULT indicator blinks fast, the unit has a resetable fault. If no axis indicators blink, a resolver or analog test channel failure occurred, or a temperature fault occurred. Check the Logic Assembly and power supply voltages on the Relay/Power Supply Assembly
Azimuth Axis		
Up Indicator	Down Indicator	
Off	Off	Axis idle - normal operation
On	Off	Axis in up motion - normal operation
Off	On	Axis in down motion - normal operation
Blink	Off	Up limit reached. Drive antenna down to get out of limit. If indication continues, check movement of antenna in downward direction. If antenna moves, check limit switch. If not check the following: Check azimuth motor Check wiring and connections Check relay K1 on DIN rail Check relay/power supply
Off	Blink	Down limit reached. Drive antenna up to get out of limit. If indication continues, check movement of antenna in downward direction. If antenna moves, check limit switch. If not check the following: Check azimuth motor Check wiring and connections Check relay K1 on DIN rail Check relay/power supply
Blink	Blink	Check limit switch wiring. Check Relay/Power Supply board.
Fast Blink	Off	Up limit switch fault. Check limit switch wiring for a short or open.
Off	Fast Blink	Down limit switch fault. Check limit switch wiring for a short or open.

Table 5-1. Failures and Remedies

Failure Indication		Comments/ Remedy
Fast Blink	Fast Blink	Both limit switches faulted. Check wiring for short or open. Check Relay/Power Supply Board.
Elevation Axis		
Up Indicator	Down Indicator	
Off	Off	Axis idle - normal operation
On	Off	Axis in up motion - normal operation
Off	On	Axis in down motion - normal operation
Blink	Off	Up limit reached. Drive antenna down to get out of limit. If indication continues, check movement of antenna in downward direction. If antenna moves, check limit switch. If not check the following: Check azimuth motor Check wiring and connections Check relay K1 on DIN rail Check relay/power supply
Off	Blink	Down limit reached. Drive antenna up to get out of limit. If indication continues, check movement of antenna in downward direction. If antenna moves, check limit switch. If not check the following: Check azimuth motor Check wiring and connections Check relay K1 on DIN rail Check relay/power supply
Blink	Blink	Check limit switch wiring. Check Relay/Power Supply board.
Fast Blink	Off	Up limit switch fault. Check limit switch wiring for a short or open.
Off	Fast Blink	Down limit switch fault. Check limit switch wiring for a short or open.
Fast Blink	Fast Blink	Both limit switches faulted. Check wiring for short or open. Check Relay/Power Supply Board.
Feed 1 Axis		
Up Indicator	Down Indicator	
Off	Off	
On	Off	Axis idle - normal operation
Off	On	Axis in up motion - normal operation
Blink	Off	Axis in down motion - normal operation

Table 5-1. Failures and Remedies

Failure Indication		Comments/ Remedy
Off	Blink	Up limit reached. Drive antenna down to get out of limit. If indication continues, check movement of antenna in downward direction. If antenna moves, check limit switch. If not check the following: Check azimuth motor Check wiring and connections Check relay K1 on DIN rail Check relay/power supply
Blink	Blink	Down limit reached. Drive antenna up to get out of limit. If indication continues, check movement of antenna in downward direction. If antenna moves, check limit switch. If not check the following: Check azimuth motor Check wiring and connections Check relay K1 on DIN rail Check relay/power supply
Fast Blink	Off	Check limit switch wiring. Check Relay/Power Supply board.
Off	Fast Blink	Up limit switch fault. Check limit switch wiring for a short or open.
Fast Blink	Fast Blink	Down limit switch fault. Check limit switch wiring for a short or open. Both limit switches faulted. Check wiring for short or open. Check Relay/Power Supply Board.

Table 5-1. Failures and Remedies

Failure Indication		Comments/ Remedy
Feed 2 Axis		
Up Indicator	Down Indicator	
Off	Off	Axis idle - normal operation
On	Off	Axis in up motion - normal operation
Off	On	Axis in down motion - normal operation
Blink	Off	Up limit reached. Drive antenna down to get out of limit. If indication continues, check movement of antenna in downward direction. If antenna moves, check limit switch. If not check the following: Check azimuth motor Check wiring and connections Check relay K1 on DIN rail Check relay/power supply
Off	Blink	Down limit reached. Drive antenna up to get out of limit. If indication continues, check movement of antenna in downward direction. If antenna moves, check limit switch. If not check the following: Check azimuth motor Check wiring and connections Check relay K1 on DIN rail Check relay/power supply
Blink	Blink	Check limit switch wiring. Check Relay/Power Supply board.
Fast Blink	Off	Up limit switch fault. Check limit switch wiring for a short or open.
Off	Fast Blink	Down limit switch fault. Check limit switch wiring for a short or open.
Fast Blink	Fast Blink	Both limit switches faulted. Check wiring for short or open. Check Relay/Power Supply Board.
Active Indicator		The active indicator (green LED behind the front panel) blinks while the processor runs. If this indicator does not blink, check axis indicators for faults. If the unit does not display a fault, check the active indicator DS9 on the Logic Subassembly

5.2 Circuit Breaker Trip Indications

Though they serve the same purpose, The 8861A and 8862 have different combinations of breakers

5.2.1 8861A Unit Assembly

Table 5-2 identifies all possible circuit breakers used in the Model 8861A. The table includes function, location, and trip indication of each circuit breaker. All 8861A units have the breaker arrangement and sizes. Refer to the assembly drawing in this section for a pictorial view of the circuit breaker location. Circuit breaker CB1 has a handle that protrudes though the front door, but all others have locations inside the inner door.

The thermal overload relays have adjustable current settings. Since the motor current ratings depend on the supply voltage and the antenna, the installer normally sets these during installation. If repeated overload tripping occurs, check that the overload relay adjustment matches the full load rating on the motor nameplate. If the motor has more than one voltage rating, use the rating closest to the local supply voltage. Some 380 VAC, 50 Hz antenna configurations actually use 460 VAC, 60 Hz motors. For these motors, use the 460 VAC rating.

Table 5-2. 8861A Antenna Position Controller Breakers

Circuit Breaker	Function	Location	Trip Indication
CB3	AC Input Main Breaker	Handle through front panel DIN rail mounted	Lever in off position - flip to reset
CB1	Azimuth Motor Thermal Overload	DIN rail mounted on K1-B	Factory set to automatically reset after cool down
CB2	Elevation Motor Thermal Overload	DIN rail mounted on K2-B	Factory set to automatically reset after cool down
CB5	Three-phase feed motor (Feed 2)	DIN rail mounted	Factory set to automatically reset after cool down
CB4	Single-phase feed motor (Feed 1)	Access through lower access door	Red button protruding - push to reset

5.2.2 8862 Unit Assembly

Table 5-3 identifies all possible circuit breakers used in the Model 8862. The table includes function, location, and trip indication of each circuit breaker. Because the circuit breakers differ between different 8862 configurations, a unit may not include all breakers. Refer to the assembly drawing for a pictorial view of the circuit breaker location. Circuit breaker CB1 has a handle that protrudes though the front door, but all others have locations inside the inner door.

The thermal overload relays have adjustable current settings. Since the motor current ratings depend on the supply voltage and the antenna, the installer normally sets these during installation. If repeated overload tripping occurs, check that the overload relay adjustment matches the full load rating on the motor nameplate. If the motor has more than one voltage rating, use the rating closest to the local supply voltage. Some 380 VAC, 50 Hz antenna configurations actually use 460 VAC, 60 Hz motors. For these motors, use the 460 VAC rating.

Table 5-3. 8862 Antenna Position Control Breakers

Circuit Breaker	Function	Location	Trip Indication
CB1	AC Input Main Breaker	Handle through front panel	Handle to off
CB2	Azimuth Motor	Access through lower access door	Handle down
CB3	Elevation Motor	Access through lower access door	Handle down
CB4	Control Power to electronics and heater/fan	Access through lower access door	Handle to right
K3	Azimuth Motor Thermal Overload	Access through lower access door	Factory set to automatically reset after cool
K4	Elevation Motor Thermal Overload	Access through lower access door	Factory set to automatically reset after cool
CB1-board	Control Power	Access through left access door	Red button protruding (push to reset)
CB2-board	Control Power	Access through left access door	Red button protruding (push to reset)

5.3 RMAs (for repair service)

For repair of failed equipment in the field, you need an RMA number before returning it to ViaSat. Do not ship any equipment without an RMA issued by ViaSat, Inc.

- Locate customer support contact info at www.viasat.com.
- Provide complete customer contact information: company, address, country, contact name/phone/email address
- Provide complete description of failure symptoms and conditions
- Provide product part number
- Provide product serial number
- Date that equipment was first received by customer
- All equipment returned for repair should be insured against loss or transit damage

Absence of any of this information will most likely cause a delay in issuing the RMA number. Upon receipt of the request, the RMA will be emailed to the customer with payment and shipping/address information.

Please pack the equipment properly. ViaSat is not responsible for equipment that arrives damaged as a result of improper packing or shipping/handling. These types of damages may result in higher repair fees.

Chapter 6

Parts List

6.1 Introduction

This chapter provides parts lists which support the assembly drawings located in Chapter 7 of this manual.

6.2 Parts List and Assembly Drawings

The parts lists in this chapter describe the parts referenced or illustrated by the assembly drawings. Use the information to identify and requisition parts, and as an aid in disassembly/assembly procedures. When a drawing has a parts list on the drawing, the parts list may not be repeated in this chapter.

6.2.1 Explanation of Title Block on Parts Listing

Each parts list starts at the top of the page with a title block. The title block contains the assembly part number, assembly description and the revision level of the assembly at the time this manual was published. Whenever a parts list is longer than one page the title block is repeated on the following page(s) until the list is complete.

6.2.2 Explanation of Parts Lists Column Headings

The parts list is separated into main groups or assemblies and keyed to associated assembly drawing(s) by item or find number and/or reference designation.

Ref Des This column contains the component Reference Designation used to identify the component on assembly drawings or as marked on the chassis or printed wiring boards.

Item Number This column contains the ViaSat part number.

Item Description This column contains a brief description of the part.

Rev This column indicates the revision level of the line item.

Qty This column contains the number of units of this part in the group or assembly.

U/M This column indicates the Unit Of Measure of the line item.

6.3 Ordering Parts

When ordering parts from ViaSat, always include the ViaSat part number, the part description, the unit name and unit serial number.

6.4 Parts List Index

Table 6-1. Parts List Index

BOM EXPLOSION REPORT

Part Number 477820
Part Revision Y
Part Description ENCLOSURE ASSY, 8862 ANTENNA POS. CONT.

Ref Des	Item Number	Item Description	Rev	Qty	U/M
	477820	ENCLOSURE ASSY, 8862 ANTENNA POS. CONT.			
000	476710	DOC PKG SFTWR-8861 V1.0 FAC TST	0	1	EAC
000	482496	TEST SPEC- 8862 ENCLOSURE	0	1	EAC
000	482499	WIRING DIAG- MOTOR & AC, 8862 & 8861A	G	1	EAC
000	482809	TEST PROCEDURE FOR THE 8862 ENCLOSURE	B	1	EAC
000	517111	INTERCONNECT DIAG - 8862	H	1	EAC
000	553348	WIRING DIAG-FEED, POTS, & LIMIT SWITCHES	B	1	EAC
000	CFOPT	CONFIGURED OPTION;SE	0	1	EAC
001	480468	ENCLOSURE, MODIFICATION-8862	B	1	EAC
002	521078	PANEL, MOUNTING-8862	B	1	EAC
003	480472	BRACKET, HORIZONTAL-8862	0	1	EAC
004	477808	SHIELD, VERTICAL-8864	B	1	EAC
005	480473	BRACKET, LEFT HAND SIDE-8862	0	1	EAC
006	480474	BRACKET, RIGHT HAND SIDE-8862	0	1	EAC
007	480475	BRACKET, BOTTOM-8862	0	1	EAC
008	480477	PLENUM-8862	C	1	EAC
009	480478	COVER, INTERNAL-8862	0	1	EAC
010	477814	HINGE, DOOR MTG	0	2	EAC
011	480476	HINGE, DOOR-8862	0	1	EAC
012	480470	DOOR, PWB MOUNTING-8862	A	1	EAC
013	480471	DOOR, BREAKER ACCESS-8862	0	1	EAC
014	477816	PANEL, DOOR-CIRCUIT BREAKERS	0	1	EAC
015	477819	PLATE-HINGE ADAPTER .090	0	2	EAC
016	480545	PLATE- HINGE ADAPTER, 8862	A	1	EAC
019	476716	LABEL-FRNT PNL IND LEGEND, 886X	A	1	EAC
020	480466	LABEL SET-ANTENNA CONT., 8862/4	0	1	EAC
021	132438	LABEL HIGH VOLTAGE 2-IN. X 4-IN.	B	7	EAC
022	480361	FERRULE-INSUL, WHITE, 22AWG	000	6	EAC
023	159472	NAMEPLATE METALPHOTO	0	1	EAC
024	281988	CIRCUIT BRKR ROTARY HANDLE ACT	A	1	EAC
025	281989	CIRCUIT BRKR ROT HAND ACT KNOB	A	1	EAC
027	89497	CONN RECT MASS TERM COVER FOR PN 89496	000	2	EAC
028	70423	CABLE GRIP .250-.375 CBL 1/2 IN. THD STR	0	2	EAC
029	86489	CONDUIT FITTING 1/2 CHASE CONN INSULATED	A	2	EAC
030	86771	CONDUIT FITTING 1 1/4 CHASE CONN INSUL	A	1	EAC
031	70422	CABLE GRIP .125-.250 CBL 1/2 IN. THD STR	0	1	EAC
032	281985	PLUG-KNOCKOUT SEAL 22MM PLAST	000	6	EAC
033	75452	LOCKNUT1/2-14 FOR CONDUIT 1/2 IPS ZN PL	A	3	EAC
034	73045	CABLE TIE - MINIATURE - 4 IN. LONG	A	35	EAC
035	83762	CLIP FLT CBL ADHSV BACK 1 X 1	96	3	EAC
036	78605	TERMINAL RECT INS 12-10AWG #10	96	18	EAC
037	267948	TERMINAL, CRIMP-INSULATED	0	24	EAC
038	71293	GROMMET 9/16 ID 3/4 HOLE 1/16PNL RUBBER	96	1	EAC
039	83566	GROMMET STRIP F/.085-.128 PNL THK NYLON	96	1.5	EAC
040	72327	SCREW 4-40 X 3/8 PAN HD, SST	A	8	EAC
041	72363	SCREW 6-32 X 3/8 PAN HD, SST	96	19	EAC
042	72401	SCREW 8-32 X 1/2 PAN HD, SST	0	35	EAC
043	180901	SCREW 8-32 X 1/2 SEELSKREW PAN HD SST	A	12	EAC
044	73272	WASHER-NO. 8- .188 .375 .049 AUS SST	96	7	EAC
045	173626	NUT 8-32 UNJC-3B HEX NYLON COLLAR SST	96	9	EAC

BOM EXPLOSION REPORT

Part Number 477820
Part Revision Y
Part Description ENCLOSURE ASSY, 8862 ANTENNA POS. CONT.

Ref Des	Item Number	Item Description	Rev	Qty	U/M
046	72317	SCREW 4-40 X 1/4 PAN HD, SST	96	12	EAC
050	75937	WASHER-NO. 4- .125 .312 .032 AUS SST	96	12	EAC
051	174554	WASHER NO. 4 LOCK, SPLIT, SST	A	12	EAC
052	173625	NUT 6-32 UNJC-3B HEX NYLON COLLAR SST	A	16	EAC
053	75939	WASHER-NO. 6- .156 .375 .049 AUS SST	96	35	EAC
054	174555	WASHER NO. 6 LOCK, SPLIT, SST	96	35	EAC
055	175193	CHEMICAL CORROSION INHIBITOR FR 10 CU FT	A	1	EAC
056	480601	SHIELD, PLEXIGLASS-RELAY & P.S. PWB	B	1	EAC
058	78679	TERM INS #6 SPADE FF 16-14AWG	96	3	EAC
060	85171	TERMINAL RING INS 22-18AWG #10 LP	96	2	EAC
061	75929	TUBING HEAT SHRINK .125ID SHRINKS TO.062	A	0.67	LFT
062	180808	STANDOFF 4-40 MALE/FEM 2.00L 1/4HEX SST	A	12	EAC
064	170474	TERMINAL RING INS 22-18AWG #8	96	2	EAC
065	87296	MOUNT, CABLE TIE, .75 SQ, 4 WAY, ADHESIVE BACKED, WHT	A	20	EAC
066	1033026	FERRULE, 6 AWG, WIRE END, W/PLASTIC COLLAR, GRN	000	20	EAC
067	1034276	FERRULE, 12 AWG, WIRE END, W/PLASTIC COLLAR, GRAY	000	3	EAC
A001	1032403	ASSY, PWB - P/S RELAY 8861/2, TESTED	002	1	EAC
A002	477789	PWB ASSY, LOGIC, 8862/4	P	1	EAC
A001P003, A001P015	89496	CONN RECT MASS TERM 8 POS 24AWG .100CTRS	0	2	EAC
A001P006	179175	CONN MISC HEADR TO WIRE 14-CON	A	1	EAC
A001P007	179169	CONN MISC HEADR TO WIRE 6-COND	A	1	EAC
CB004	480318	CIRCUIT BRKR 16A 480V 3P ULIEC	0	1	EAC
R001-R004	179706	RES, 130, 50W, WW, 1%, CHS MT	0	4	EAC
SP001	1029035	LIGHTNING, DIRECT, AC SURGE PROTECTOR MODULE, CLASS 1, 2-POLE, 300VAC	0	1	EAC
TB001	477821	TERM BLK ASSY-AC INPUT, 8862	C	1	EAC
TB002	477823	TERM BLK ASSY-AC DISTRIBUTION, 8862	B	1	EAC
TB003	517105	TERM. BLOCK ASSY-AZ/EL MOTORS	C	1	EAC
W001	455333	CABLE ASSY, POWER INTERFCE, 886X	B	1	EAC
W002	455334	ASSY, CABLE-LOGIC INTERFCE, 886X	B	1	EAC
W003	336825	ASSY, CABLE-TO CPU ANALOG I/O	B	1	EAC
W004, W013, W014	1030637	WIRE, 6 AWG BROWN, 600V -20/105C VW-1 UL1283/CSA	000	1.65	LFT
W005, W015, W016	1030638	WIRE, 6 AWG ORANGE, 600V -20/105C VW-1 UL1283/CSA	000	3.4	LFT
W006, W017, W018	1030639	WIRE, 6 AWG, YELLOW, 600V, -20/105C VW-1 UL1283/CSA	000	4	LFT
W007-W011	535239	WIRE 12 STRANDED GRN/YEL 600V -20/105C VW-1 UL/CSA	0	16	LFT
W012, W020, W039-W042	535245	WIRE 14 STRANDED BLUE 600V -20.105C VW-1 UL/CSA	0	6.8	LFT
W019	535241	WIRE 14 STRANDED BLACK 600V -20/105C VW-1 UL/CSA	0	2.6	LFT
W021, W034	70380	CABLE 2-22AWG COND FOIL SHIELD	96	12.45	LFT
W022-W024, W045, W046, W052, W055, W056, W062	535226	WIRE 12 STRANDED BRN 600V -20/105C VW-1 UL/CSA	0	24	LFT

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Part Number 477820
Part Revision Y
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Ref Des	Item Number	Item Description	Rev	Qty	U/M
W025-W027, W047, W048, W053, W057, W058, W063	535227	WIRE 12 STRANDED ORANGE 600V -20/105C VW-1 UL/CSA	0	27.65	LFT
W028-W030, W049, W050, W054, W059, W060, W064	535224	WIRE 12 STRANDED YELLOW 600V -20/105C VW-1 UL/CSA	00	27.25	LFT
W031, W035, W044	535246	WIRE 14 STRANDED BRN 600V -20.105C VW-1 UL/CSA	0	3.5	LFT
W032, W036, W043	535247	WIRE 14 STRANDED ORANGE 600V -20.105C VW-1 UL/CSA	0	3.5	LFT
W033, W037	535244	WIRE 14 STRANDED YELLOW 600V -20.105C VW-1 UL/CSA	0	2	LFT
W038	535259	WIRE 14 STRANDED GRN/YEL 600V -20.105C VW-1 UL/CSA	0	1.1	LFT
W066, W068, W071-W080, W087, W088	535321	WIRE 22 STRANDED BLACK 300V-40/80C VW-1	00	10.1	LFT
W069	535322	WIRE 22 STRANDED RED 300V -40/80C VW-1 UL/CSA	00	1.9	LFT
W070	535331	WIRE 22 STRANDED WHT/RED 300V -40/80C	0	1.35	LFT
W081, W082, W084, W085	535266	WIRE 16 STRANDED BROWN 600V -20/105C VW-1 UL/CSA	00	3.8	LFT
W083, W086	535265	WIRE 16 STRANDED BLUE 600V -20/105C VW-1 UL/CSA	00	2.9	LFT
W089	535225	WIRE 12 STRANDED BLUE 600V -20/105C VW-1 UL/CSA	0	1.5	LFT
068	1044902	FERRITE CORE, BROADBAND SPLIT SNAP-ON, FOR .5" DIA RND CABLE	000	2	EAC
069	75430	TERMINAL RECT UNINS 8AWG #7/32	97	4	EAC
W90, W91	535219	WIRE 10 STRANDED GRN/YEL 600V -20/105C	0	3	LFT
070	77937	TUBING HEAT SHRINK .250ID SHRINKS TO.125 BLK	96	1	LFT
071	87257	SCREW 1/4-20 X 1/2 CAP, HEX HD, AUS SST	96	2	EAC
072	1004835	LOCK NUT: 1/4 - 20 SERRATED FLANGE LOCK NUT ZINC PLT STL	0	2	EAC
73	187478	LABEL WARNING HIGH VOLTAGE 1.5" TRIANGLE	A	1	EAC
74	187479	LABEL WARNING DANGER 1.5" TRIANGLE	A	1	EAC
75	535617	LABEL CAUTION INTL SYM VINYL 1.5 X 1.5"	00	2	EAC
76	535616	LABEL HIGH VOLTAGE INTL VINYL 1.5 X 1.5"	00	2	EAC
77	1045716	LABEL, FCC PART 15, 8862, UL	001	1	EAC
78	1045719	LABEL, ELECTRICAL RATINGS, 8862, UL	002	1	EAC
Z001-Z003	180449	CKT MODULR R+C 1-39 OHM 1-.1MF 2L-SIP	0	3	EAC

BOM EXPLOSION REPORT

Part Number 517638
Part Revision J
Part Description ENCLOSURE ASSY,ANT.CONT,8861A

Ref Des	Item Number	Item Description	Rev	Qty	U/M
	517638	ENCLOSURE ASSY, ANT.CONT, 8861A			
29	70422	CABLE GRIP .125-.250 CBL 1/2 IN. THD STR	0	1	EAC
51	70423	CABLE GRIP .250-.375 CBL 1/2 IN. THD STR	0	2	EAC
47	71495	NUT 4-40 UNC-2B, SM PATT 3/16 HEX, SST	96	8	EAC
46	72321	SCREW 4-40 X 3/8 F HD, 82 DEG, SST	A	8	EAC
10	72329	SCREW 4-40 X 7/16 PAN HD, SST	96	2	EAC
5	72363	SCREW 6-32 X 3/8 PAN HD, SST	96	46	EAC
63	72350	SCREW 6-32 X 1/4 PAN HD, SST	A	6	EAC
7	72416	SCREW 10-32 X 3/8 PAN HD, SST	96	4	EAC
20	73045	CABLE TIE - MINIATURE - 4 IN. LONG	A	30	EAC
30	73266	WASHER-NO. 4- .125 .250 .022 AUS SST	A	8	EAC
8	73275	WASHER-NO.10- .219 .500 .049 AUS SST	96	4	EAC
W12, W23, W32, W43, W46, W48, W51, W53, W57, W58, W62, W65, W68	535246	WIRE 14 STRANDED BRN 600V -20.105C VW-1 UL/CSA	0	32.89	LFT
W13, W24, W44, W49, W54, W59, W63, W64, W66, W69	535247	WIRE 14 STRANDED ORANGE 600V -20.105C VW-1 UL/CSA	0	20.82	LFT
W14, W25, W45, W47, W50, W52, W55, W56, W60, W61, W67, W70	535244	WIRE 14 STRANDED YELLOW 600V -20.105C VW-1 UL/CSA	0	31.64	LFT
W35	535259	WIRE 14 STRANDED GRN/YEL 600V -20.105C VW-1 UL/CSA	0	1.25	LFT
W33, W34	535245	WIRE 14 STRANDED BLUE 600V -20.105C VW-1 UL/CSA	0	2.5	LFT
W15, W26	535326	WIRE 22 STRANDED BROWN 300V -40/40C VW-1 UL/CSA	00	6.66	LFT
W19, W30	535327	WIRE 22 STRANDED ORANGE 300V -40/80C VW-1 UL/CSA	00	6.66	LFT
W18, W29	535329	WIRE 22 STRANDED VIOLET 300V -40/80C VW-1 UL/CSA	00	6.66	LFT
W4, W6, W7, W9, W74	535328	WIRE 22 STRANDED GRAY 300V -40/80C VW-1 UL/CSA	0	6.763	LFT
W11, W22, W36, W38	723941-0001	WIRE 22 STRANDED PINK 300V -40/105C VW-1 UL/CSA	0	13.32	LFT
W16, W27	535335	WIRE 22 STRANDED WHT/BRN 300V -40/80C VW-1 UL/CSA	00	6.66	LFT
W20, W31	535336	WIRE 22 STRANDED WHT/ORG 300V -40/80C VW-1 UL/CSA	00	6.66	LFT
W17, W28	535338	WIRE 22 STRANDED WHT/VIO 300V -40/80C VW-1 UL/CSA	00	6.66	LFT
W5, W8	535337	WIRE 22 STRANDED WHT/GRY 300V -40/80C VW-1 UL/CSA	00	3.34	LFT
W10, W21, W37, W39	1030678	WIRE, 22 STRANDED WHT/PINK 300V -40/80C VW UL1007/CSA	000	13.32	LFT
14	75446	NUT 6-32 UNC-2B, PLAIN-HEX, SST	96	2	EAC
48	75452	LOCKNUT1/2-14 FOR CONDUIT 1/2 IPS ZN PL	A	3	EAC
W3	535224	WIRE 12 STRANDED YELLOW 600V -20/105C VW-1 UL/CSA	00	1.25	LFT
W1	535226	WIRE 12 STRANDED BRN 600V -20/105C VW-1 UL/CSA	0	1.25	LFT
19	86488	CONDUIT FITTING 1/2 STR LIQ TIGHT INSUL	A	2	EAC
28	88440	CONDUIT FITTING 3/4 STR LIQ TIGHT INSUL	A	1	EAC

BOM EXPLOSION REPORT

Part Number 517638
Part Revision J
Part Description ENCLOSURE ASSY,ANT.CONT,8861A

Ref Des	Item Number	Item Description	Rev	Qty	U/M
11	132438	LABEL HIGH VOLTAGE 2-IN. X 4-IN.	B	2	EAC
52	141784	DECAL, NO STEP	0	1	EAC
18	171621	HANDLE BLK ALUM 5/32 OD 1.25 CTRS 4-40TP	96	1	EAC
W2	535227	WIRE 12 STRANDED ORANGE 600V -20/105C VW-1 UL/CSA	0	1.25	LFT
A1P7	179169	CONN MISC HEADR TO WIRE 6-COND	A	1	EAC
15	173004	LATCH, 1/4 TURN NYLATCH WITH HANDLE	A	2	EAC
12	174554	WASHER NO. 4 LOCK, SPLIT, SST	A	10	EAC
6	174555	WASHER NO. 6 LOCK, SPLIT, SST	96	28	EAC
9	174557	WASHER NO. 10 LOCK, SPLIT, SST	96	4	EAC
A1P3, A1P15	89496	CONN RECT MASS TERM 8 POS 24AWG .100CTRS	0	2	EAC
58, 62	89497	CONN RECT MASS TERM COVER FOR PN 89496	000	2	EAC
21	175193	CHEMICAL CORROSION INHIBITOR FR 10 CU FT	A	1	EAC
CB4	1011482	RELAY THERMAL OVERLD .25- .40A	0	1	EAC
A3P1, A3P2	179171	CONN MISC HEADR TO WIRE 10-CON	A	2	EAC
A1P6	179175	CONN MISC HEADR TO WIRE 14-CON	A	1	EAC
A1P1, A1P2	179194	CONN RECT MASS TERM 16POS 22AW	A	2	EAC
44	179195	CONN RECT MASS TERM 16POS DUST COVER	A	2	EAC
59	1011487	KIT TERMINAL BLK MNTING	0	1	EAC
R1-R4	179706	RES, 130, 50W, WW, 1%, CHS MT	0	4	EAC
CB5	179734	CIRCUIT BRKR .5A 65VDC/250VAC	A	1	EAC
31	179738	TERMINAL BLOCK MODULR END STOP	0	2	EAC
17	180883	WASHER 3/8 LOCK, SPLIT, SST	A	4	EAC
W42	266311	ASSY, CABLE-SAFETY GROUND	0	1	EAC
2	282984	SUPPORT, PANEL-RIGHT SIDE	D	1	EAC
3	282985	SUPPORT, PANEL-LEFT SIDE	F	1	EAC
25	282990	PLUG, HOLE-NYL, TRS HD .875DI HL	0	5	EAC
13	362528	HINGE, PANEL, FRONT-8841B	0	2	EAC
1	455281	PANEL, RELAY-ANT CONTRLR, 8861	G	1	EAC
4	455284	PANEL, HINGED-ANT.CONTRLR, 8861	C	1	EAC
16	455295	BRACKET ASSY, MAIN BREAKER, 8861	B	1	EAC
A2	477789	PWB ASSY, LOGIC, 8862/4	P	1	EAC
W41	455333	CABLE ASSY, POWER INTERFCE, 886X	B	1	EAC
W40	455334	ASSY, CABLE-LOGIC INTERFCE, 886X	B	1	EAC
26	456043	DIN RAIL-MAIN BREAKER, 8861	A	1	EAC
TB1	456056	TERMINAL BLOCK ASSY, AC, 8861	B	1	EAC
A1	521425	ASSY, PWB - RELAY POWER SUPPLY	C	1	EAC
22	551676	ENCLOSURE- 8861 SST	98	1	EAC
54	476716	LABEL-FRNT PNL IND LEGEND, 886X	A	1	EAC
55	476717	LABEL-PWB CONN LEGEND, 8861	0	1	EAC
56	477467	LABEL-RELAY/PS CONN LEGND, 8861	0	1	EAC
57	480361	FERRULE-INSUL, WHITE, 22AWG	000	20	EAC
CB3	480382	CIRCUIT BRKR 20A 480V 3P ULIEC	0	1	EAC
W71, W72	70380	CABLE 2-22AWG COND FOIL SHIELD	96	3.34	LFT
W74	336825	ASSY, CABLE-TO CPU ANALOG I/O	B	1	EAC
A3	517636	ASSY, PWB- SNUBBER, 8861	A	1	EAC
	551411	INTERCONNECT DIAG. -8861A	B	1	EAC
60	538414	LABEL, CE MARK	D	1	EAC
	578825	CE COMPLIANCE DECLARATIONS(ANT PRODUCTS)	B	1	EAC
	455311	TEST SPEC-ANT.CONT., 8861	B	1	EAC
	482499	WIRING DIAG- MOTOR & AC, 8862 & 8861A	G	1	EAC

BOM EXPLOSION REPORT

Part Number 517638
Part Revision J
Part Description ENCLOSURE ASSY,ANT.CONT,8861A

Ref Des	Item Number	Item Description	Rev	Qty	U/M
	553348	WIRING DIAG-FEED, POTS, & LIMIT SWITCHES	B	1	EAC
	455312	TEST PROCEDURE-ANT.CONT., 8861A	C	1	EAC
	721773	LABEL KIT HIGH VOLTAGE WARNING (P/L ONLY	A	1	EAC
CB1, CB2	725229-0001	RELAY, THERMAL OVERLOAD, 2.5 - 4.0A	0	2	EAC
K1, K2	725226-0001	MOTOR CONTACTOR 3P RVRSING 12A, 24VDC COILS, AUX CONTACTS	0	2	EAC
CB 6	1029624	CKT BRKR, 1P-25A DIN MNT	000	1	EAC
SP 1	1029034	SURGE PROTECTOR, SINGLE PHASE, AC, MODULE, 400V	0	1	EAC

Chapter 7

Drawings and Manuals

7.1 Introduction

This chapter provides part numbers for assembly drawings, diagrams and manuals. Drawings are presented in hierarchical order with the highest order drawings shown first.

7.2 Drawing Index

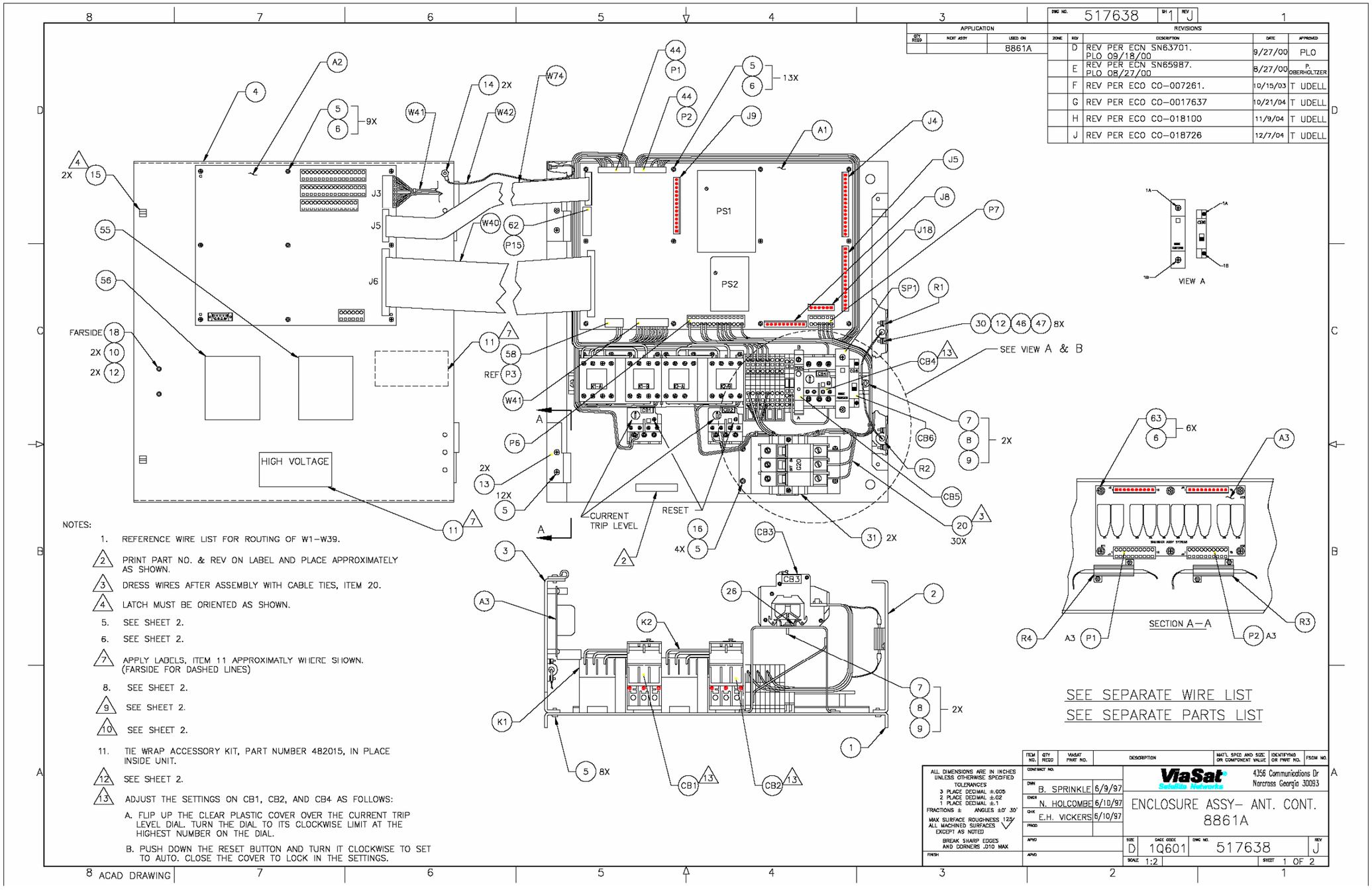
A drawing index is provided in Table 7-1. The drawing number, revision, drawing title and page location of each drawing is included in the table. A dash in the revision column indicates the original release of the drawing.

Table 7-1. Drawing Index

7.3 Manuals

Table 7-2. Manual Index

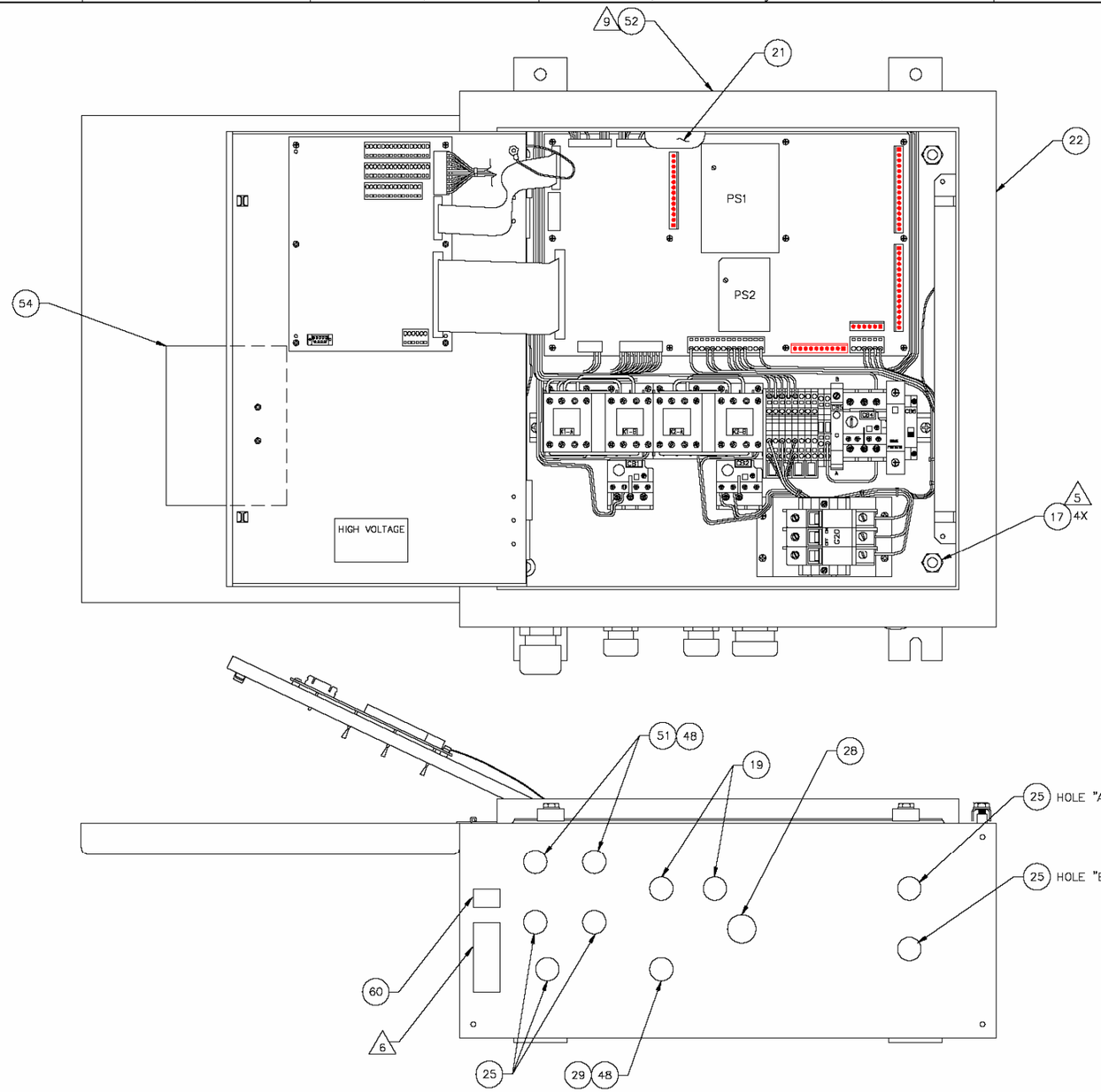
Manual Number	Description
557660	8860 Antenna Tracking Controller Operation Manual
551419	8861A/8862 Antenna Position Controller / Installation, Operation and Maintenance Manual
42S053	8860 Antenna Tracking Controller, Installation and Maintenance Manual
1008111	Windows Calibration Software Manual
42S057	8861 4.5-Meter Electrical Installation Manual
42S058	8861 6-Meter Electrical Installation Manual
42S059	8861 7-Meter Electrical Installation Manual
42S060	8861 9-/10-/11-Meter Electrical Installation Manual
42S157	8861 6-Meter (1800) Electrical Installation Manual.
42S278	8862 4.5-Meter Electrical Installation Manual
42S181	8862 6-Meter Electrical Installation Manual
42S179	8862 7-Meter Electrical Installation Manual
42S059	8862 7.3-Meter Electrical Installation Manual
42S178	8862 9-/10-/11- Meter Electrical Installation Manual
42S180	8862 6-Meter (1800) Electrical Installation Manual.
42S119	8862/64 16-/18-Meter Electrical Installation Manual
42S097	DOS Calibration Software Manual, (Obsolete document)
551410	Windows Calibration Software Manual, (Obsolete document)
42S054	8861 Position Controller Technical Manual, (Obsolete document)
42S121	8862/8864 Position Controller Technical Manual, (Obsolete document)


DWG NO. 517638 SH 1 REV J
APPLICATION
QTY REQD | NEXT ASSY | USED ON
8861A
REVISIONS
ZONE | REV | DESCRIPTION | DATE | APPROVED
D REV PER ECN SN63701. PLO 09/18/00 9/27/00 PLO
E REV PER ECN SN65987. PLO 08/27/00 8/27/00 P. OBERHOLTZER
F REV PER ECO CO-007261. 10/15/03 T UDELL
G REV PER ECO CO-0017637 10/21/04 T UDELL
H REV PER ECO CO-018100 11/9/04 T UDELL
J REV PER ECO CO-018726 12/7/04 T UDELL
HIGH VOLTAGE
PS1
PS2
J3
J5
J6
J4
J8
J9
J18
P7
P1
P2
P15
P3
P6
SP1
R1
R2
CB1
CB2
CB3
CB4
CB5
CB6
K1
K2
CURRENT TRIP LEVEL
RESET
SEE VIEW A & B
VIEW A
SECTION A—A
SEE SEPARATE WIRE LIST
SEE SEPARATE PARTS LIST
NOTES:
1. REFERENCE WIRE LIST FOR ROUTING OF W1-W39.
2 PRINT PART NO. & REV ON LABEL AND PLACE APPROXIMATELY AS SHOWN.
3 DRESS WIRES AFTER ASSEMBLY WITH CABLE TIES, ITEM 20.
4 LATCH MUST BE ORIENTED AS SHOWN.
5. SEE SHEET 2.
6. SEE SHEET 2.
7 APPLY LABELS, ITEM 11 APPROXIMATLY WHERE SHOWN. (FARSIDE FOR DASHED LINES)
8. SEE SHEET 2.
9 SEE SHEET 2.
10 SEE SHEET 2.
11. TIE WRAP ACCESSORY KIT, PART NUMBER 482015, IN PLACE INSIDE UNIT.
12 SEE SHEET 2.
13 ADJUST THE SETTINGS ON CB1, CB2, AND CB4 AS FOLLOWS:
A. FLIP UP THE CLEAR PLASTIC COVER OVER THE CURRENT TRIP LEVEL DIAL. TURN THE DIAL TO ITS CLOCKWISE LIMIT AT THE HIGHEST NUMBER ON THE DIAL.
B. PUSH DOWN THE RESET BUTTON AND TURN IT CLOCKWISE TO SET TO AUTO. CLOSE THE COVER TO LOCK IN THE SETTINGS.
ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED
TOLERANCES
3 PLACE DECIMAL ±.005
2 PLACE DECIMAL ±.02
1 PLACE DECIMAL ±.1
FRACTIONS ± ANGLES ±0° 30'
MAX SURFACE ROUGHNESS 125
ALL MACHINED SURFACES EXCEPT AS NOTED
BREAK SHARP EDGES AND CORNERS .010 MAX
FINISH
ITEM NO. | QTY REQD | VIASAT PART NO. | DESCRIPTION | MAT'L SPEC AND SIZE OR COMPONENT VALUE | IDENTIFYING OR PART NO. | FROM NO.
CONTRACT NO.
DWN B. SPRINKLE 6/9/97
ENGR N. HOLCOMBE 6/10/97
CHK E.H. VICKERS 6/10/97
PROD
APVD
APVD
ViaSat Satellite Networks
4356 Communications Dr Norcross Georgia 30093
ENCLOSURE ASSY- ANT. CONT. 8861A
SIZE D | CAGE CODE 1Q601 | DWG NO. 517638 | REV J
SCALE 1:2 | SHEET 1 OF 2
8 ACAD DRAWING

DWG NO.	517638	SH 2	REV J

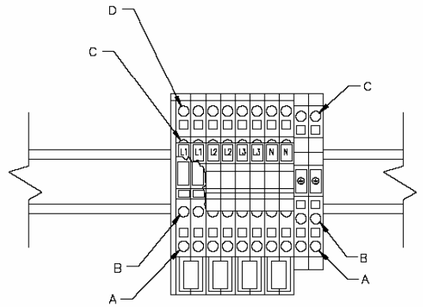
REVISIONS

ZONE	REV	DESCRIPTION	DATE	APPROVED
	J	SEE SHEET 1		



NOTES:

5. INSTALL LOCK WASHER, ITEM 17, IN ADDITION TO HARDWARE SUPPLIED WITH ENCLOSURE.
6. PLACE SERIAL DECAL WHERE SHOWN.
8. TB1-1 THRU TB1-10 APPEAR IN ORDER FROM LEFT TO RIGHT.
9. LABEL CIRCUIT BREAKERS AND CONTACTORS AS SHOWN.
10. CENTER DECAL (NO STEP) ON TOP OF SURFACE.
12. TERMINAL BLOCK JUMPERS MUST BE FIRMLY SEATED TO ENSURE RELIABLE ELECTRICAL CONNECTION.



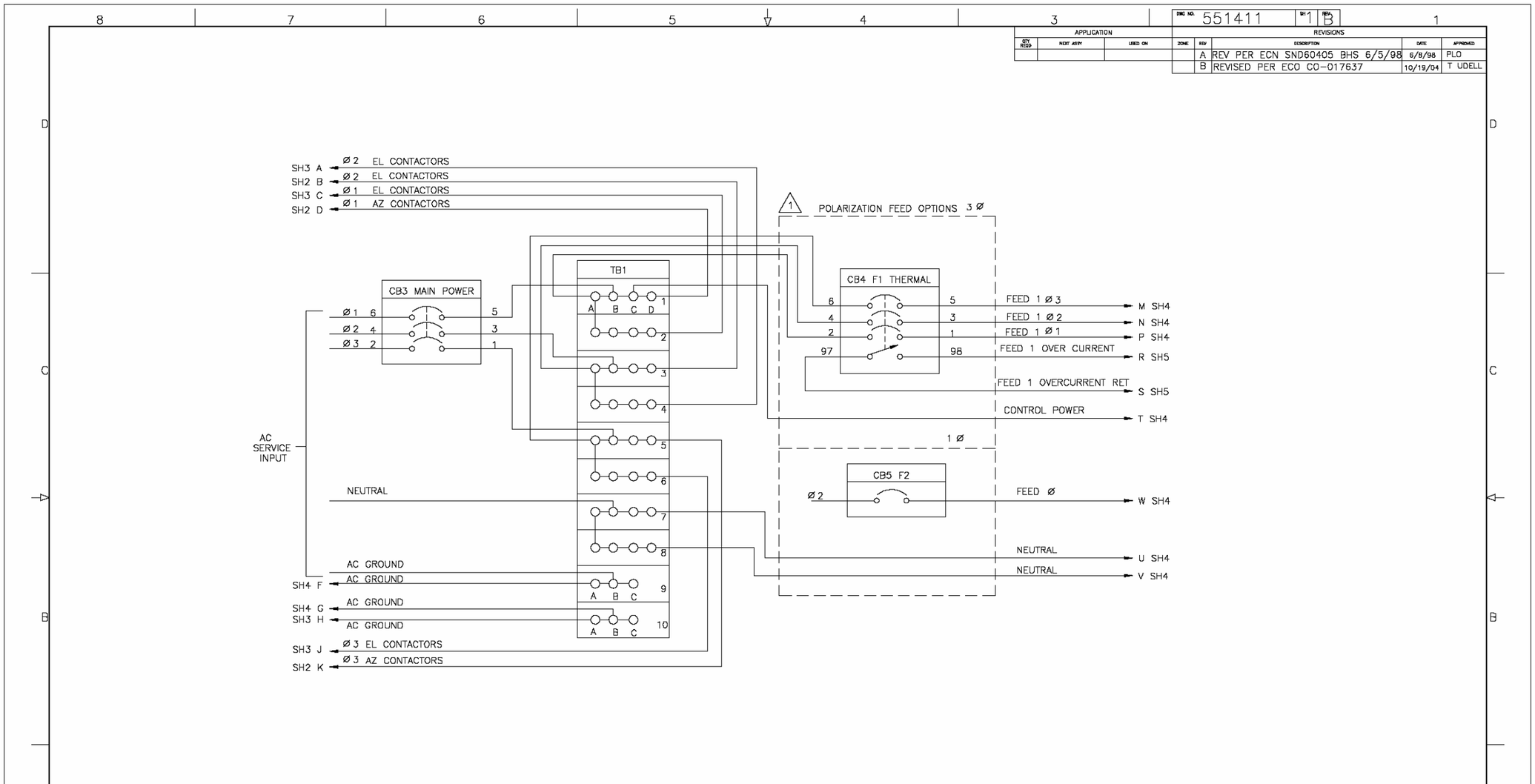
VIEW B (K2 REMOVED)
(TB1-1 THRU TB1-10)
8 12

DRAWN B. SPRINKLE 6/9/97	SIZE D	CAGE CODE 1Q601	DWG NO. 517638	REV J
CHK EDWARD H. VICKERS 6/10/97	SCALE 1:2		SHEET 2 OF 2	

8 ACAD DRAWING

DWG NO. 551411 SH 1 REV. B

APPLICATION			REVISIONS				
QTY REQD	NEXT ASSY	USED ON	ZONE	REV	DESCRIPTION	DATE	APPROVED
				A	REV PER ECN SND60405 BHS 6/5/98	6/8/98	PLO
				B	REVISED PER ECO CO-017637	10/19/04	T UDELL



NOTES:

1. NORMAL SCIENTIFIC ATLANTA POLARIZATION MOTOR CONFIGURATION USES A 3 PHASE MOTOR IN POSITION F1 AND/OR A SINGLE PHASE MOTOR IN F2 POSITION.
2. SEE SHEET 4
3. SEE SHEET 7

ITEM NO.	QTY REQD	SA PART NO.	DESCRIPTION	MAT'L SPEC AND SIZE OR COMPONENT VALUE	IDENTIFYING OR PART NO.	FSCM NO.

ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED
TOLERANCES
3 PLACE DECIMAL ±.005
2 PLACE DECIMAL ±.02
1 PLACE DECIMAL ±.1
FRACTIONS ± ANGLES ±0° 30'
MAX SURFACE ROUGHNESS 125 ALL MACHINED SURFACES EXCEPT AS NOTED
BREAK SHARP EDGES AND CORNERS .010 MAX
FINISH

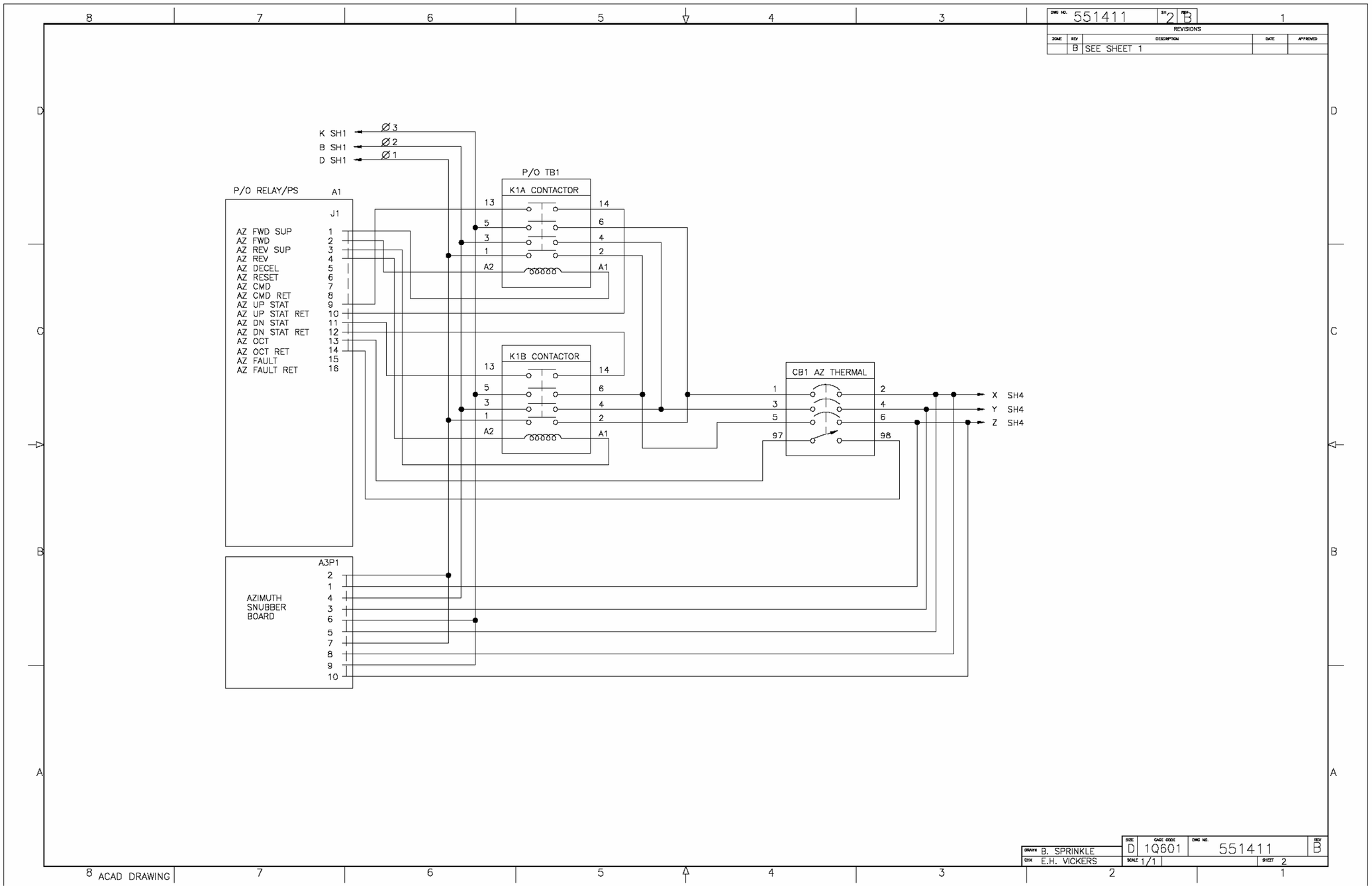
CONTRACT NO.
DWN B. SPRINKLE 6/10/97
ENGR N. HOLCOMBE 6/11/97
CHK E.H. VICKERS 6/11/97
PROD
APVD
APVD

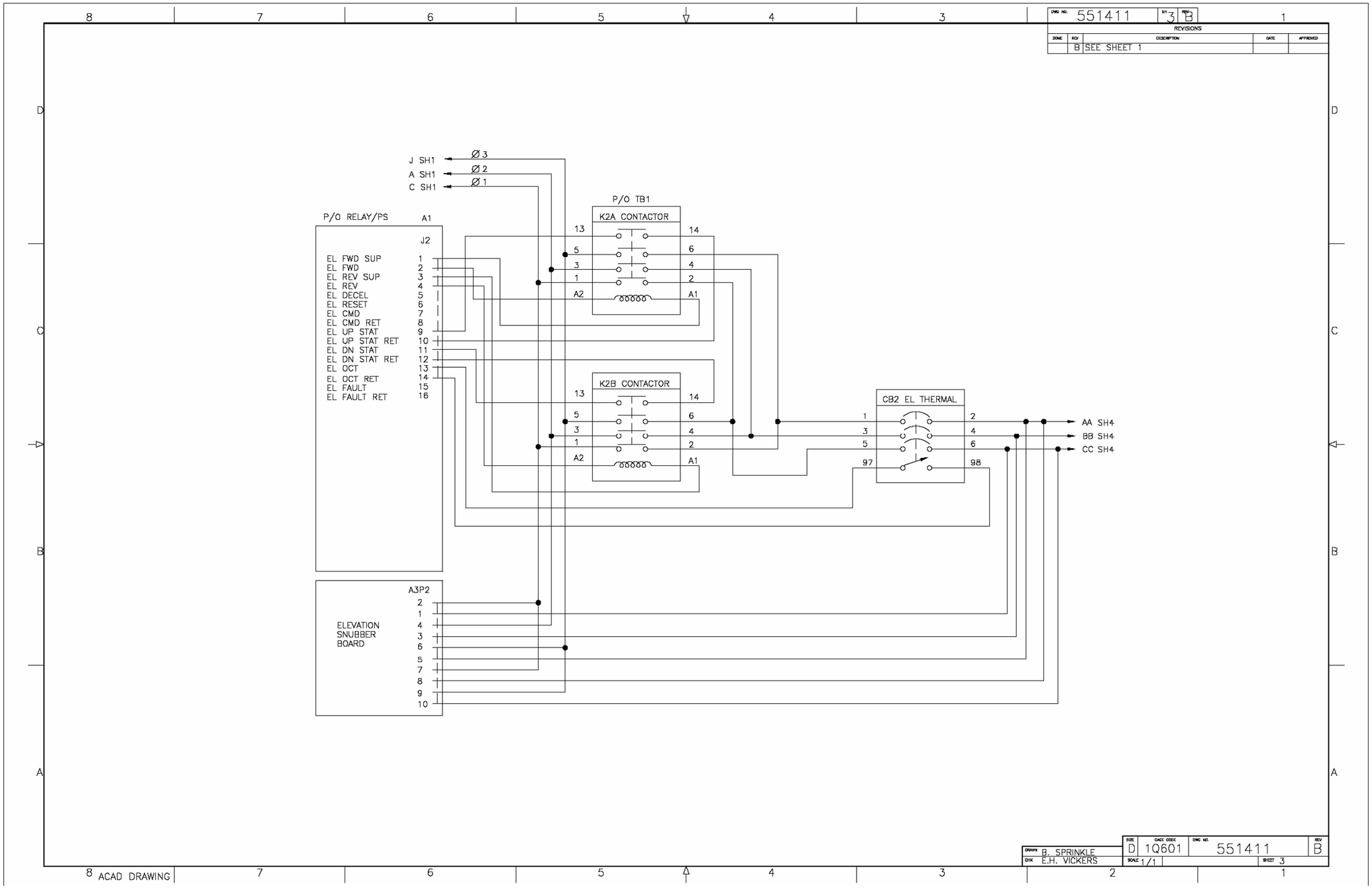
ViaSat® 4356 Communications Dr Norcross Georgia 30093

INTERCONNECT DIAGRAM— 8861A

SIZE D | CAGE CODE 1Q601 | DWG NO. 551411 | REV B
SCALE 1/1 | SHEET 1 OF 7

8 ACAD DRAWING

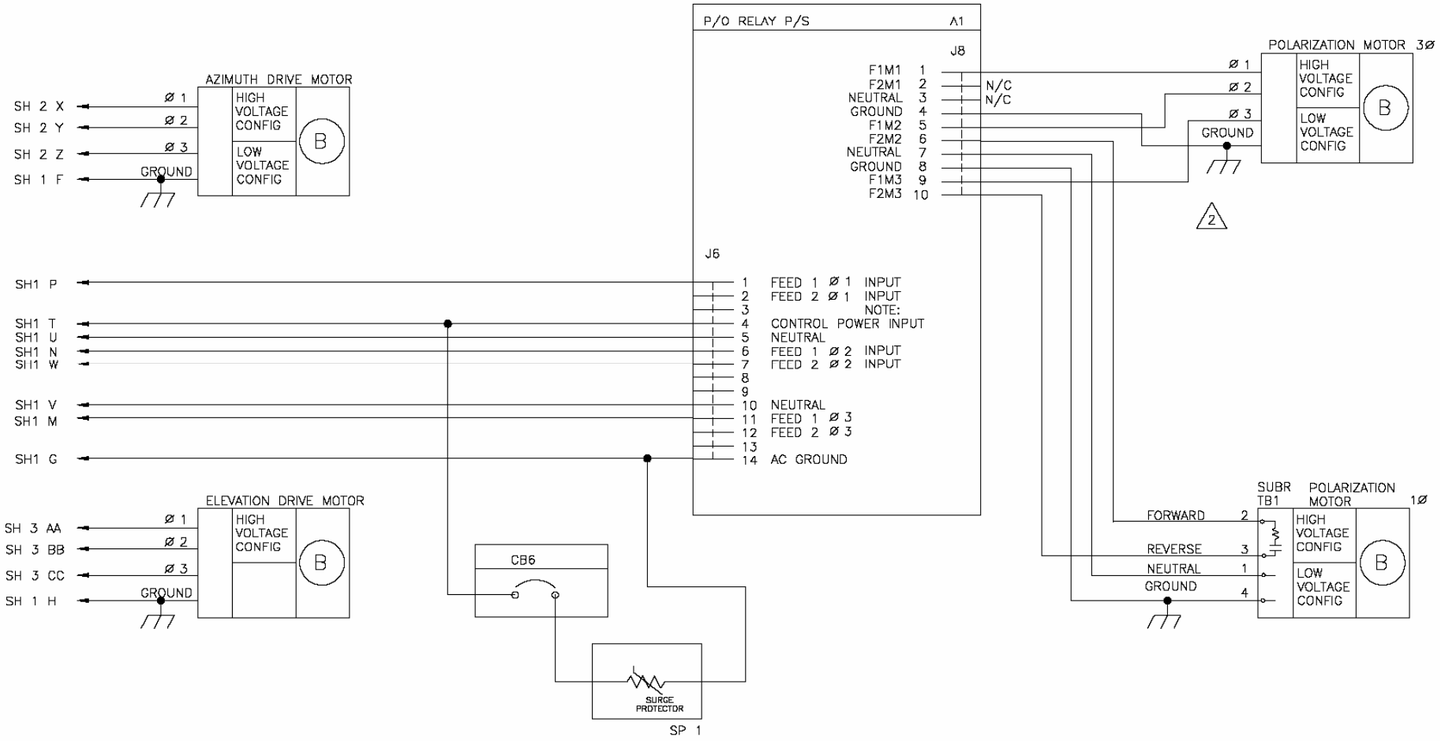

DWG NO. 551411 SH 2 REV B
REVISIONS
ZONE REV DESCRIPTION DATE APPROVED
B SEE SHEET 1
K SH1
B SH1
D SH1
Ø3
Ø2
Ø1
P/O RELAY/PS
A1
J1
AZ FWD SUP 1
AZ FWD 2
AZ REV SUP 3
AZ REV 4
AZ DECEL 5
AZ RESET 6
AZ CMD 7
AZ CMD RET 8
AZ UP STAT 9
AZ UP STAT RET 10
AZ DN STAT 11
AZ DN STAT RET 12
AZ OCT 13
AZ OCT RET 14
AZ FAULT 15
AZ FAULT RET 16
P/O TB1
K1A CONTACTOR
K1B CONTACTOR
13
14
5
6
3
4
1
2
A2
A1
CB1 AZ THERMAL
1
2
3
4
5
6
97
98
X SH4
Y SH4
Z SH4
A3P1
AZIMUTH SNUBBER BOARD
2
1
4
3
6
5
7
8
9
10
8 ACAD DRAWING
7
6
5
4
3
2
1
DRAWN B. SPRINKLE
CHK E.H. VICKERS
SIZE D
CAGE CODE 1Q601
DWG NO. 551411
REV B
SCALE 1/1
SHEET 2


DWG NO. 551411 SH 3 REV B
REVISIONS
ZONE REV DESCRIPTION DATE APPROVED
B SEE SHEET 1
J SH1 Ø 3
A SH1 Ø 2
C SH1 Ø 1
P/O RELAY/PS
A1
J2
EL FWD SUP 1
EL FWD 2
EL REV SUP 3
EL REV 4
EL DECEL 5
EL RESET 6
EL CMD 7
EL CMD RET 8
EL UP STAT 9
EL UP STAT RET 10
EL DN STAT 11
EL DN STAT RET 12
EL OCT 13
EL OCT RET 14
EL FAULT 15
EL FAULT RET 16
P/O TB1
K2A CONTACTOR
13 14
5 6
3 4
1 2
A2 A1
K2B CONTACTOR
13 14
5 6
3 4
1 2
A2 A1
CB2 EL THERMAL
1 2
3 4
5 6
97 98
AA SH4
BB SH4
CC SH4
A3P2
ELEVATION SNUBBER BOARD
2
1
4
3
6
5
7
8
9
10
8 ACAD DRAWING
DRAWN B. SPRINKLE
CHK E.H. VICKERS
SIZE D CAGE CODE 1Q601 DWG NO. 551411 REV B
SCALE 1/1 SHEET 3

DWG NO. 551411 SH 4 REV B

REVISIONS

ZONE	REV	DESCRIPTION	DATE	APPROVED
	B	SEE SHEET 1		



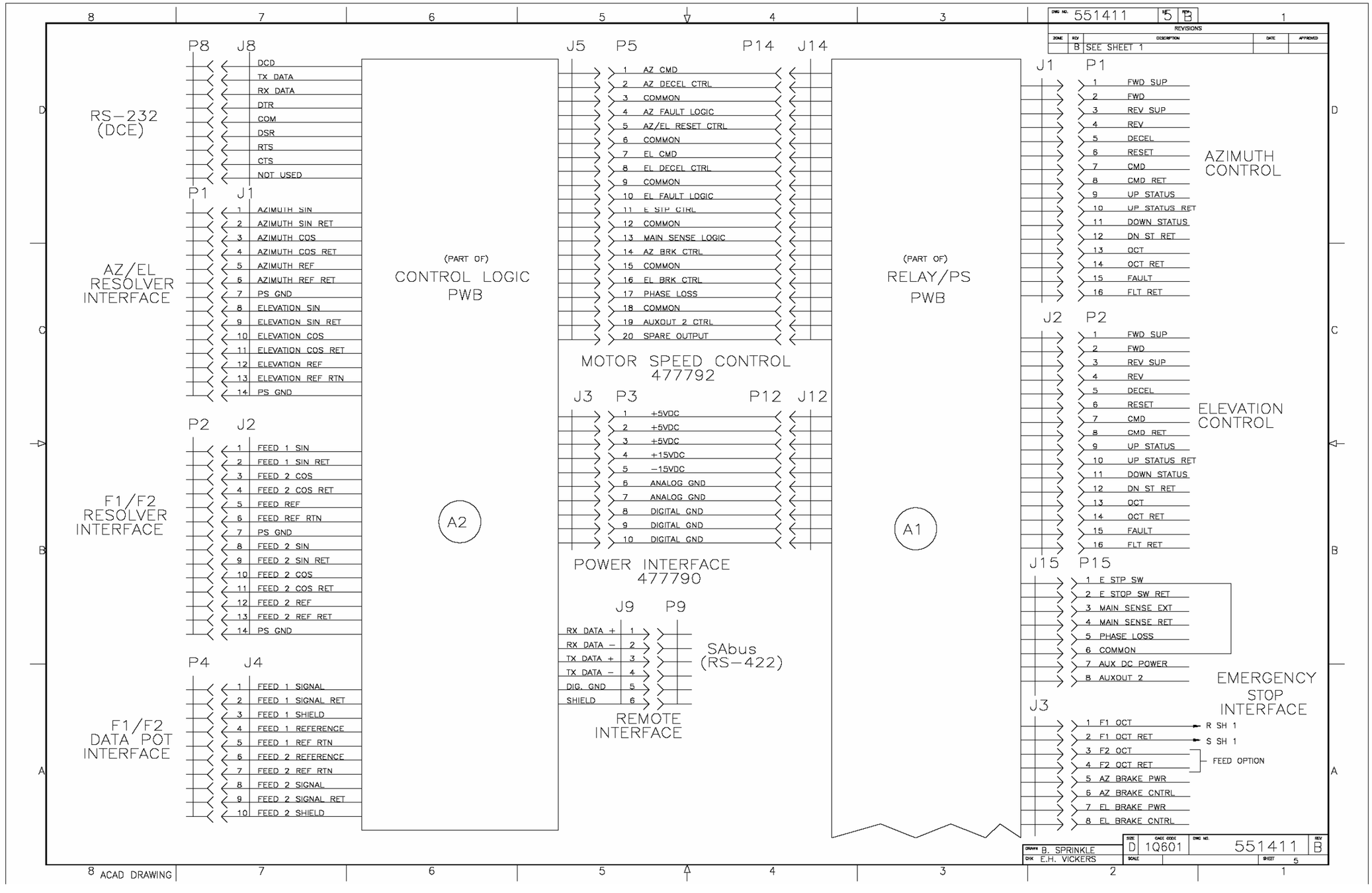
NOTE:

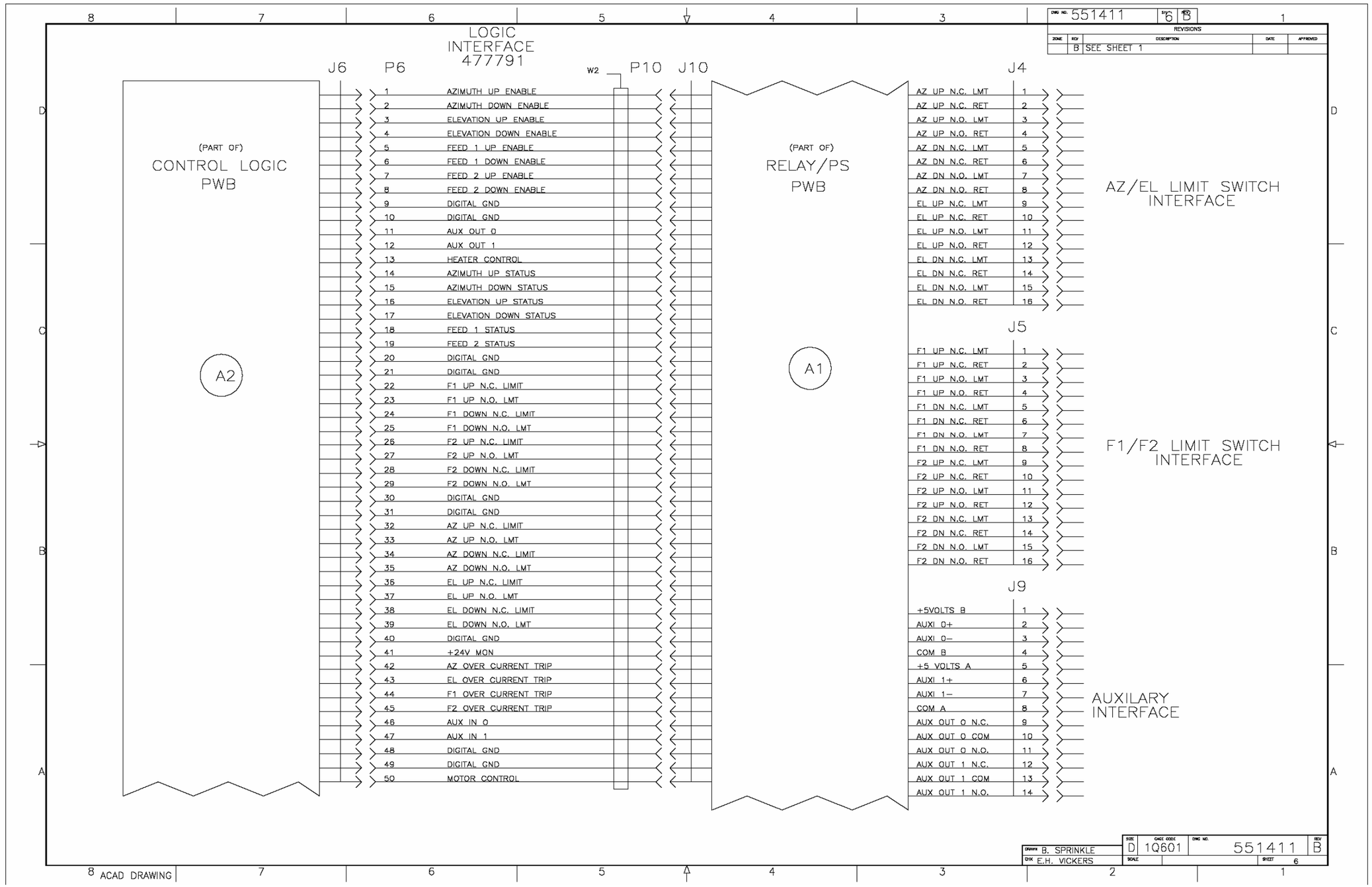
2 SOME 380/415 VAC SYSTEMS USE AN AUTOTRANSFORMER TO STEP DOWN THE SINGLE PHASE MOTOR VOLTAGE TO 115 VAC. SEE VIASAT DRAWING 482499 FOR MOTOR WIRING.

DRAWN B. SPRINKLE
CHK E.H. VICKERS

SIZE D | CAGE CODE 1Q601 | DWG NO. 551411 | REV B
SCALE 1/1 | SHEET 4

8 ACAD DRAWING 7 6 5 4 3 2 1

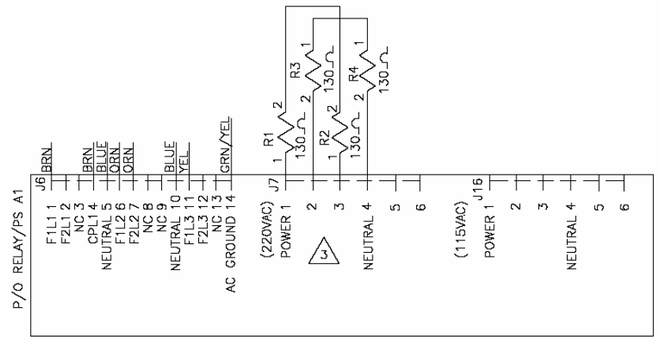

DWG NO. 551411 SIZE D REV B
REVISIONS
ZONE REV DESCRIPTION DATE APPROVED
B SEE SHEET 1
RS-232 (DCE)
P8 J8
DCD
TX DATA
RX DATA
DTR
COM
DSR
RTS
CTS
NOT USED
AZ/EL RESOLVER INTERFACE
P1 J1
1 AZIMUTH SIN
2 AZIMUTH SIN RET
3 AZIMUTH COS
4 AZIMUTH COS RET
5 AZIMUTH REF
6 AZIMUTH REF RET
7 PS GND
8 ELEVATION SIN
9 ELEVATION SIN RET
10 ELEVATION COS
11 ELEVATION COS RET
12 ELEVATION REF
13 ELEVATION REF RTN
14 PS GND
F1/F2 RESOLVER INTERFACE
P2 J2
1 FEED 1 SIN
2 FEED 1 SIN RET
3 FEED 2 COS
4 FEED 2 COS RET
5 FEED REF
6 FEED REF RTN
7 PS GND
8 FEED 2 SIN
9 FEED 2 SIN RET
10 FEED 2 COS
11 FEED 2 COS RET
12 FEED 2 REF
13 FEED 2 REF RET
14 PS GND
F1/F2 DATA POT INTERFACE
P4 J4
1 FEED 1 SIGNAL
2 FEED 1 SIGNAL RET
3 FEED 1 SHIELD
4 FEED 1 REFERENCE
5 FEED 1 REF RTN
6 FEED 2 REFERENCE
7 FEED 2 REF RTN
8 FEED 2 SIGNAL
9 FEED 2 SIGNAL RET
10 FEED 2 SHIELD
(PART OF) CONTROL LOGIC PWB
A2
J5 P5 P14 J14
1 AZ CMD
2 AZ DECEL CTRL
3 COMMON
4 AZ FAULT LOGIC
5 AZ/EL RESET CTRL
6 COMMON
7 EL CMD
8 EL DECEL CTRL
9 COMMON
10 EL FAULT LOGIC
11 E STP CTRL
12 COMMON
13 MAIN SENSE LOGIC
14 AZ BRK CTRL
15 COMMON
16 EL BRK CTRL
17 PHASE LOSS
18 COMMON
19 AUXOUT 2 CTRL
20 SPARE OUTPUT
MOTOR SPEED CONTROL 477792
J3 P3 P12 J12
1 +5VDC
2 +5VDC
3 +5VDC
4 +15VDC
5 -15VDC
6 ANALOG GND
7 ANALOG GND
8 DIGITAL GND
9 DIGITAL GND
10 DIGITAL GND
POWER INTERFACE 477790
J9 P9
RX DATA + 1
RX DATA - 2
TX DATA + 3
TX DATA - 4
DIG. GND 5
SHIELD 6
SAbus (RS-422)
REMOTE INTERFACE
(PART OF) RELAY/PS PWB
A1
J1 P1
1 FWD SUP
2 FWD
3 REV SUP
4 REV
5 DECEL
6 RESET
7 CMD
8 CMD RET
9 UP STATUS
10 UP STATUS RET
11 DOWN STATUS
12 DN ST RET
13 OCT
14 OCT RET
15 FAULT
16 FLT RET
AZIMUTH CONTROL
J2 P2
1 FWD SUP
2 FWD
3 REV SUP
4 REV
5 DECEL
6 RESET
7 CMD
8 CMD RET
9 UP STATUS
10 UP STATUS RET
11 DOWN STATUS
12 DN ST RET
13 OCT
14 OCT RET
15 FAULT
16 FLT RET
ELEVATION CONTROL
J15 P15
1 E STP SW
2 E STOP SW RET
3 MAIN SENSE EXT
4 MAIN SENSE RET
5 PHASE LOSS
6 COMMON
7 AUX DC POWER
8 AUXOUT 2
EMERGENCY STOP INTERFACE
J3
1 F1 OCT
2 F1 OCT RET
3 F2 OCT
4 F2 OCT RET
5 AZ BRAKE PWR
6 AZ BRAKE CNTRL
7 EL BRAKE PWR
8 EL BRAKE CNTRL
R SH 1
S SH 1
FEED OPTION
DRAWN B. SPRINKLE
CHK E.H. VICKERS
SIZE D CAGE CODE 1Q601 DWG NO. 551411 REV B
SCALE SHEET 5
8 ACAD DRAWING 7 6 5 4 3 2 1
D C B A


DWG NO. 551411
SIZE D
REV B
REVISIONS
ZONE | REV | DESCRIPTION | DATE | APPROVED
B | SEE SHEET 1
LOGIC INTERFACE 477791
J6 P6 W2 P10 J10
(PART OF) CONTROL LOGIC PWB
A2
1 AZIMUTH UP ENABLE
2 AZIMUTH DOWN ENABLE
3 ELEVATION UP ENABLE
4 ELEVATION DOWN ENABLE
5 FEED 1 UP ENABLE
6 FEED 1 DOWN ENABLE
7 FEED 2 UP ENABLE
8 FEED 2 DOWN ENABLE
9 DIGITAL GND
10 DIGITAL GND
11 AUX OUT 0
12 AUX OUT 1
13 HEATER CONTROL
14 AZIMUTH UP STATUS
15 AZIMUTH DOWN STATUS
16 ELEVATION UP STATUS
17 ELEVATION DOWN STATUS
18 FEED 1 STATUS
19 FEED 2 STATUS
20 DIGITAL GND
21 DIGITAL GND
22 F1 UP N.C. LIMIT
23 F1 UP N.O. LMT
24 F1 DOWN N.C. LIMIT
25 F1 DOWN N.O. LMT
26 F2 UP N.C. LIMIT
27 F2 UP N.O. LMT
28 F2 DOWN N.C. LIMIT
29 F2 DOWN N.O. LMT
30 DIGITAL GND
31 DIGITAL GND
32 AZ UP N.C. LIMIT
33 AZ UP N.O. LMT
34 AZ DOWN N.C. LIMIT
35 AZ DOWN N.O. LMT
36 EL UP N.C. LIMIT
37 EL UP N.O. LMT
38 EL DOWN N.C. LIMIT
39 EL DOWN N.O. LMT
40 DIGITAL GND
41 +24V MON
42 AZ OVER CURRENT TRIP
43 EL OVER CURRENT TRIP
44 F1 OVER CURRENT TRIP
45 F2 OVER CURRENT TRIP
46 AUX IN 0
47 AUX IN 1
48 DIGITAL GND
49 DIGITAL GND
50 MOTOR CONTROL
(PART OF) RELAY/PS PWB
A1
J4
AZ UP N.C. LMT 1
AZ UP N.C. RET 2
AZ UP N.O. LMT 3
AZ UP N.O. RET 4
AZ DN N.C. LMT 5
AZ DN N.C. RET 6
AZ DN N.O. LMT 7
AZ DN N.O. RET 8
EL UP N.C. LMT 9
EL UP N.C. RET 10
EL UP N.O. LMT 11
EL UP N.O. RET 12
EL DN N.C. LMT 13
EL DN N.C. RET 14
EL DN N.O. LMT 15
EL DN N.O. RET 16
AZ/EL LIMIT SWITCH INTERFACE
J5
F1 UP N.C. LMT 1
F1 UP N.C. RET 2
F1 UP N.O. LMT 3
F1 UP N.O. RET 4
F1 DN N.C. LMT 5
F1 DN N.C. RET 6
F1 DN N.O. LMT 7
F1 DN N.O. RET 8
F2 UP N.C. LMT 9
F2 UP N.C. RET 10
F2 UP N.O. LMT 11
F2 UP N.O. RET 12
F2 DN N.C. LMT 13
F2 DN N.C. RET 14
F2 DN N.O. LMT 15
F2 DN N.O. RET 16
F1/F2 LIMIT SWITCH INTERFACE
J9
+5VOLTS B 1
AUXI 0+ 2
AUXI 0– 3
COM B 4
+5 VOLTS A 5
AUXI 1+ 6
AUXI 1– 7
COM A 8
AUX OUT 0 N.C. 9
AUX OUT 0 COM 10
AUX OUT 0 N.O. 11
AUX OUT 1 N.C. 12
AUX OUT 1 COM 13
AUX OUT 1 N.O. 14
AUXILARY INTERFACE
DRAWN B. SPRINKLE
CHK E.H. VICKERS
SIZE D CAGE CODE 1Q601 DWG NO. 551411 REV B
SCALE SHEET 6
8 ACAD DRAWING 7 6 5 4 3 2 1

DWG NO.	SH	REV
551411	7	B

REVISIONS

ZONE	REV	DESCRIPTION	DATE	APPROVED
	B	SEE SHEET 1		



3 THE UNIT WILL HAVE R1, R2, R3, AND R4 EITHER CONNECTED TO J7 OR J16 DEPENDING UPON POWER SPECIFICATIONS.

A) CONNECTED TO J7 IF UNIT IS OPERATING OFF 380/415VAC.

B) CONNECTED TO J16 IF UNIT IS OPERATING OFF 208VAC.

DRAWN	B. SPRINKLE
CHK	E.H. VICKERS

SIZE	CAGE CODE	DWG NO.	REV
D	1Q601	551411	B

SCALE 1/1 SHEET 7

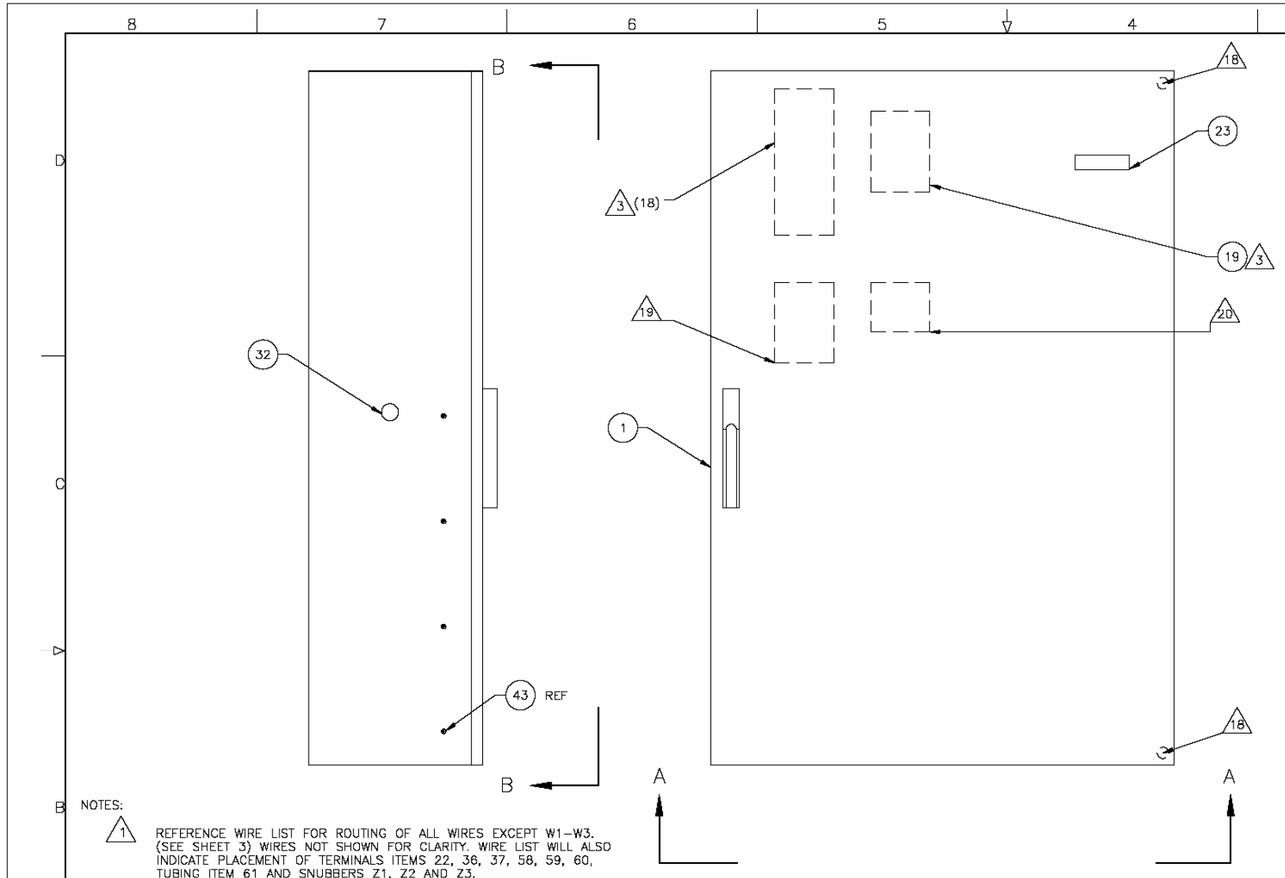
8 ACAD DRAWING 7 6 5 4 3 2 1

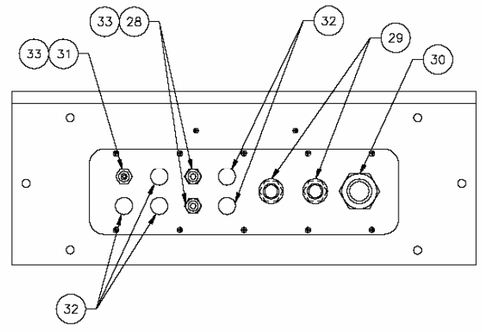
DWG NO. 477820 SH 1 REV Y

APPLICATION		
QTY REQD	NEXT ASSY	USED ON
		8862

REVISIONS

ZONE	REV	DESCRIPTION	DATE	APPROVED
	L	REV PER ECN SND63092 PLO 9/14/00	9/15/00	P.L.O.
	N	REV PER ECN SND65626-01	2/4/02	B. JOHNSON
	P	REV PER ECO CO-000678	3/28/03	B. JOHNSON
	R	REV PER ECO CO-006154	10/9/03	B. JOHNSON
	S	REV PER ECO CO-009943	3/23/04	T. UDELL
	T	REV PER ECO CO-016535	9/29/04	T. UDELL
	U	REV PER ECO CO-018372	12/7/04	T. UDELL
	V	REV PER ECO CO-019971	2/4/05	T. UDELL
	W	REV PER ECO CO-021396	4/14/05	M.L.SMITH
	Y	REV PER ECO CO-025255	2/12/06	T. UDELL





VIEW A-A

NOTES:

1. REFERENCE WIRE LIST FOR ROUTING OF ALL WIRES EXCEPT W1-W3. (SEE SHEET 3) WIRES NOT SHOWN FOR CLARITY. WIRE LIST WILL ALSO INDICATE PLACEMENT OF TERMINALS ITEMS 22, 36, 37, 58, 59, 60, TUBING ITEM 61 AND SNUBBERS Z1, Z2 AND Z3.
2. PLACE ACCESSORY KIT (ITEM 17), E-STOP KIT (ITEM 57), MANUAL, AND CALIBRATION KIT INSIDE UNIT FOR SHIPMENT.
3. APPLY LABELS, ITEM 18, AND 19. APPROXIMATELY WHERE SHOWN. (INSIDE DOOR) (ALSO SEE SHEET 3). ITEM 18 WILL BE ISSUED WITH AZ/EL KIT.
5. SEE SHEET 2.
6. SEE SHEET 2.
7. SEE SHEET 4.
8. SEE SHEET 2
9. SEE SHEET 3
10. SEE SHEET 3
11. SEE SHEET 2
12. TIE THE KEY FOR HANDLE, SUPPLIED WITH UNIT, INSIDE THE UNIT WITH A CABLE TIE FOR SHIPMENT.
13. SEE SHEET 2
14. INSTALL PLASTIC PLUGS, PROVIDED WITH ENCLOSURE, INTO UNUSED HOLES ON BOTTOM AND BACK OF ENCLOSURE.
15. SEE SHEET 2
16. SEE SHEET 4
17. SEE SHEET 2
18. ASSEMBLE TWO DOOR GROUND WIRES APPROXIMATE 20-INCHES LENGTH. USE TERMINAL LUGS ITEM NO 69 AND 8AWG GRN/YEL WIRE ITEM W90, W91. USE 1/4-20 X 1/2-INCH SCREW AND NUT SUPPLIED. ATTACH EACH GND WIRE TO TOP AND BOTTOM HOLE ON INSIDE OF ENCLOSURE DOOR. TOP GROUND WIRE ATTACH TO VSD PLATE. BOTTOM GND WIRE TO NEAREST SCREW ON INTERNAL COVER ITEM 9.
19. ATTACH ELECTRICAL RATINGS LABEL PN 1045719.
20. ATTACH FCC PART 15 LABEL PN 1045716.
22. SLIDE FERRITE CORE OVER WIRE CONNECTIONS AT L1, L2, L3 AND NEUTRLAL. RUN THE WIRE BACK THROUGH THE FERRITE TWICE MAKING TWO COMPLETE, TIGHT LOOPS. FINAL POSITION OF THE FERRITE CORE SHOULD BE APPROX. 2-INCHES FROM TERMINAL LUGS.

SEE SEPARATE PARTS LIST

1. SEE SEPARATE WIRE LIST

ITEM NO.	QTY. REQD	VASAT PART NO.	DESCRIPTION	MAT'L SPEC AND SIZE OR COMPONENT VALUE	IDENTIFYING OR PART NO.	FSCM NO.

ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED
TOLERANCES
3 PLACE DECIMAL ±.005
2 PLACE DECIMAL ±.02
1 PLACE DECIMAL ±.1
FRACTIONS ± ANGLES ±0° 30'
MAX SURFACE ROUGHNESS 125
ALL MACHINED SURFACES EXCEPT AS NOTED
BREAK SHARP EDGES AND CORNERS .010 MAX
FINISH NONE

CONTRACT NO.
DRN TED SMITH 10/27/92
ENGR PHIL C. LEWIS 10/29/92
CHK KEVIN P. MELVIN 10/29/92
PROD
APVD
APVD

ViaSat® 1725 Breckinridge Plaza Duluth, Georgia 30096

ENCLOSURE ASSY-ANTENNA POSITION CONTROLLER

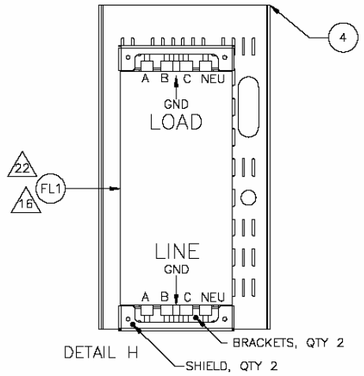
SIZE D | CAGE CODE 1Q601 | DWG NO. 477820 | REV Y
SCALE 1/4 | SHEET 1 OF 4

8 ACAD DRAWING 7 6 5 4 3 2 1

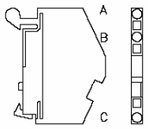
DWG NO.	SH	REV
477820	2	Y

REVISIONS

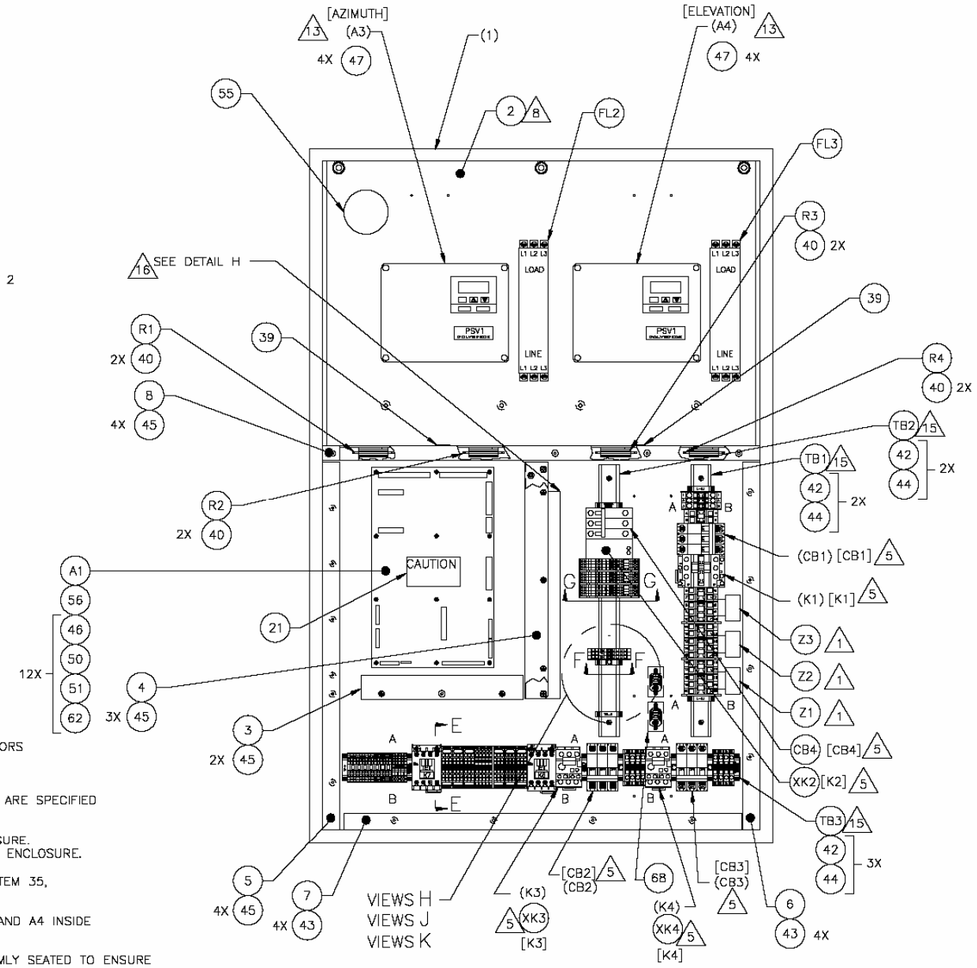
ZONE	REV	DESCRIPTION	DATE	APPROVED
	Y	SEE SHEET 1.		

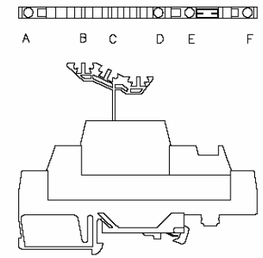


DETAIL H

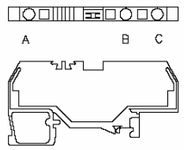


VIEW E–E
SCALE: 1/1





VIEW G–G
SCALE: 1/1



VIEW F–F
SCALE: 1/1

NOTES:

5. LABEL COMPONENTS WITH REFERENCE DESIGNATORS AS SHOWN IN BRACKETS.

6. COMPONENTS A3, A4, CB1, CB2, CB3, K1, K2, K3, K4, AND ITEM 1B SHOWN IN PARENTHESES ARE SPECIFIED IN THE AZ/EL KITS.

8. DISCARD BOTTOM PLATE SUPPLIED WITH ENCLOSURE. ATTACH ITEM 2 WITH HARDWARE SUPPLIED WITH ENCLOSURE.

11. PLACE CABLE TIES, ITEM 34, & CABLE CLIPS, ITEM 35, WHERE NEEDED FOR DRESSING & ROUTING.

13. PLACE INVERTER MANUALS, SUPPLIED WITH A3 AND A4 INSIDE THE UNIT FOR SHIPMENT.

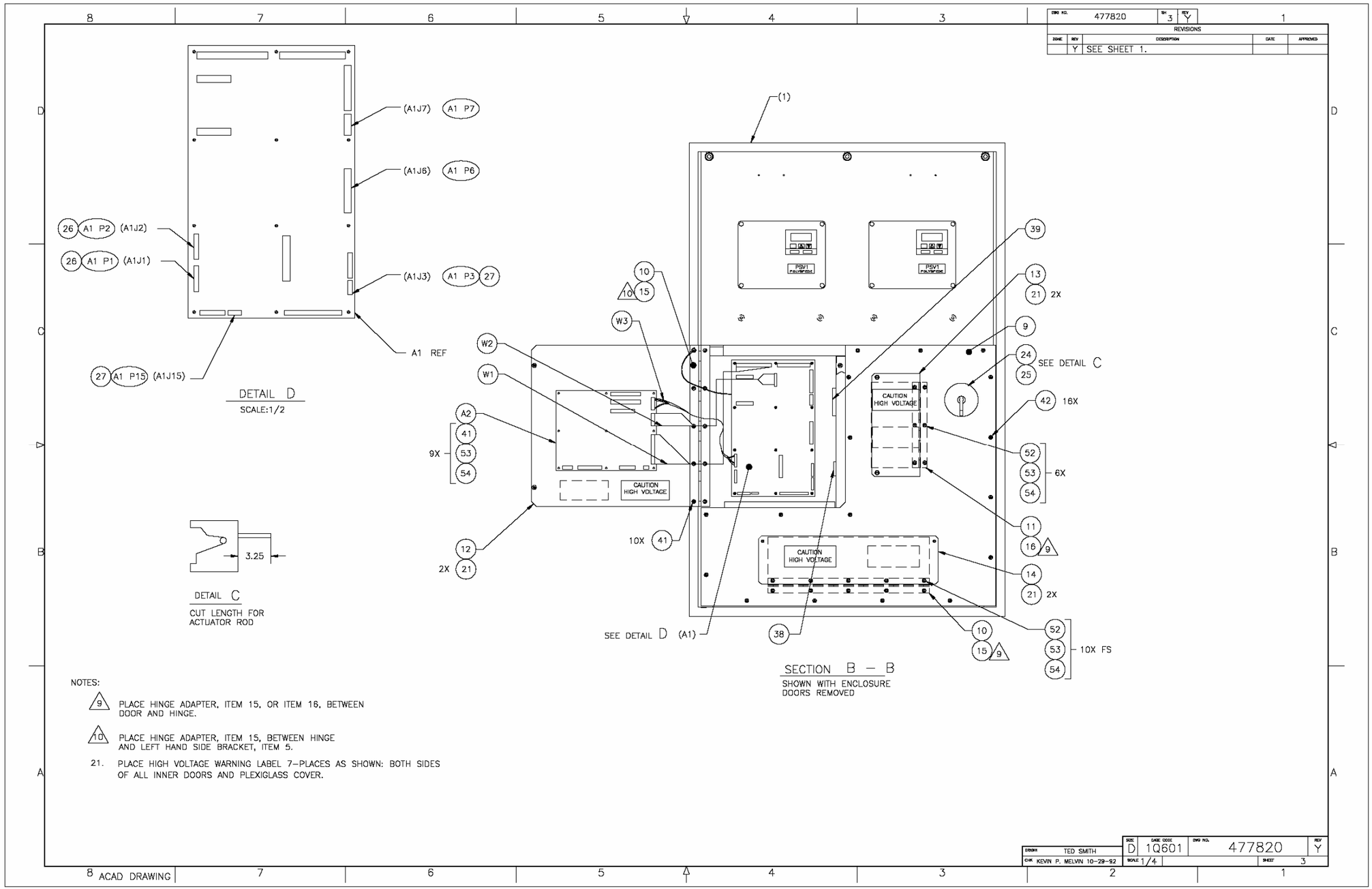
15. TERMINAL STRIP JUMPER BLOCKS MUST BE FIRMLY SEATED TO ENSURE RELIABLE ELECTRICAL CONNECTION.

17. ATTACH BRACKET TO FILTER USING 8–32 FLANGE NUT, QTY 8 PROVIDED IN KIT 1045447. ATTACH FILTER W/BRACKETS TO ITEM 4 USING 10–32 HEX SCREW, #10 NUT AND WAHER. PLACE #10 WASHER UNDER SCREW HEAD AND NUT. 2 #10 WAHSERS PER #10 SCREW. ATTACH COVER TO BRACKET USING 4–40 SCREW, #4 WASHER AND #4 NUT, QTY 4 EA, PROVIDED IN KIT 1045477. TERMINAL LUGS FOR CONNECTIONS FROM FL1 OUTPUT TO CB1 INPUT ARE PROVIDED IN KIT 1045447. SECURE LUGS TO FILTER USING HARWARE PROVIDED WITH FILTER. LOCATE FL1 ON SHIELD ITEM 4 AS SHOWN. ATTACH 5 UNUSED LUGS TO FLI INPUT FOR FIELD INSTALLATION.

VIEW B – B
SHOWN WITH ALL DOORS REMOVED AND WITHOUT INTERNAL COVER.

DRAWN	TED SMITH	SIZE	CAGE CODE	DWG NO.	REV
CHK	KEVIN P. MELVIN 10-29-92	D	1Q601	477820	Y
		SCALE	1/4	SHEET	2 OF 4

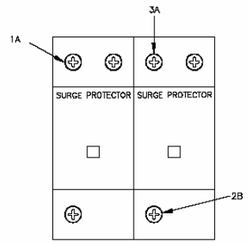
8 ACAD DRAWING


DWG NO. 477820 SH 3 REV Y
REVISIONS
ZONE REV DESCRIPTION DATE APPROVED
Y SEE SHEET 1.
(A1J7) A1 P7
(A1J6) A1 P6
26 A1 P2 (A1J2)
26 A1 P1 (A1J1)
(A1J3) A1 P3 27
A1 REF
27 A1 P15 (A1J15)
DETAIL D
SCALE:1/2
(1)
PSV1
PSV1
CAUTION HIGH VOLTAGE
CAUTION HIGH VOLTAGE
CAUTION HIGH VOLTAGE
W1
W2
W3
A2
41
53
54
9X
10
15
12
21
2X
10X 41
SEE DETAIL D (A1)
38
39
13
21 2X
9
24
25
SEE DETAIL C
42 16X
52
53
54 6X
11
16 9
14
21 2X
10
15 9
52
53
54 10X FS
3.25
DETAIL C
CUT LENGTH FOR
ACTUATOR ROD
SECTION B – B
SHOWN WITH ENCLOSURE
DOORS REMOVED
NOTES:
9 PLACE HINGE ADAPTER, ITEM 15, OR ITEM 16, BETWEEN DOOR AND HINGE.
10 PLACE HINGE ADAPTER, ITEM 15, BETWEEN HINGE AND LEFT HAND SIDE BRACKET, ITEM 5.
21. PLACE HIGH VOLTAGE WARNING LABEL 7–PLACES AS SHOWN: BOTH SIDES OF ALL INNER DOORS AND PLEXIGLASS COVER.
DRAWN TED SMITH
CHK KEVIN P. MELVIN 10-29-92
SIZE D CAGE CODE 1Q601 DWG NO. 477820 REV Y
SCALE 1/4 SHEET 3
8 ACAD DRAWING

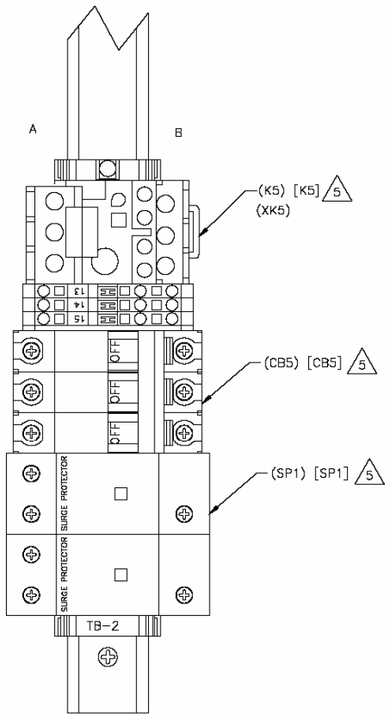
DWG NO.	477820	SH 4	REV Y

REVISIONS

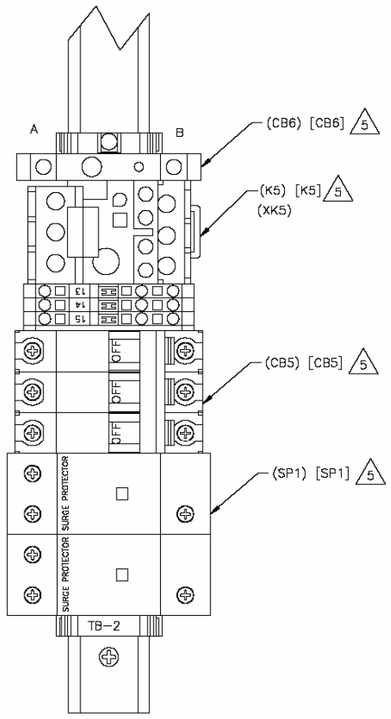
ZONE	REV	DESCRIPTION	DATE	APPROVED
	Y	SEE SHEET 1.		



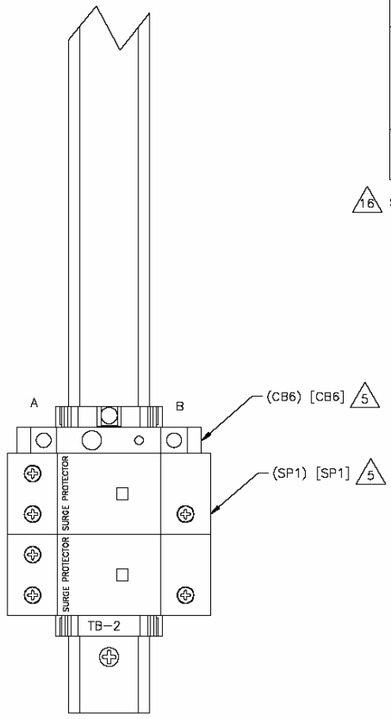
16 SP1 TERMINAL DESIGNATIONS



VIEW H



VIEW J

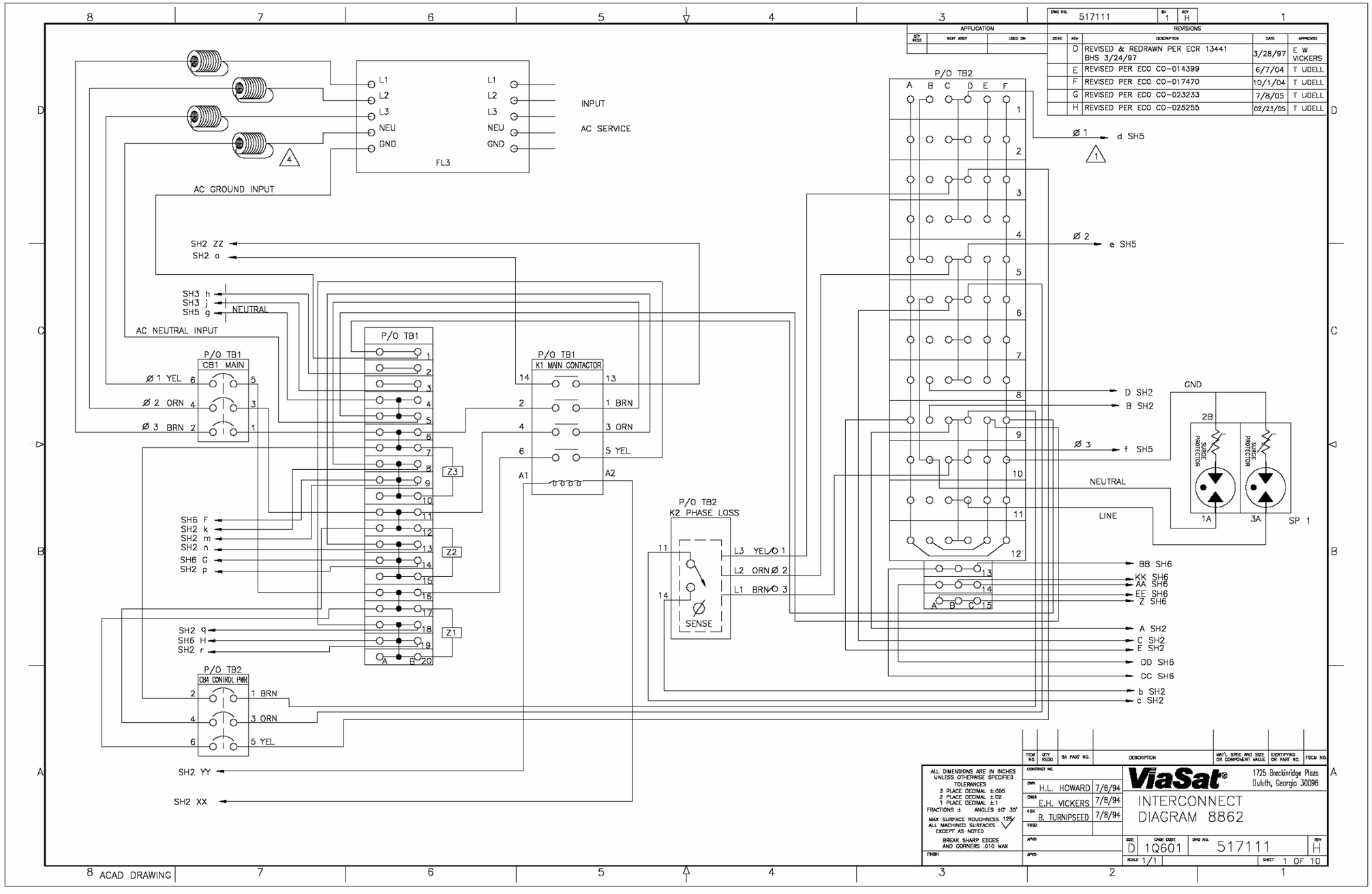


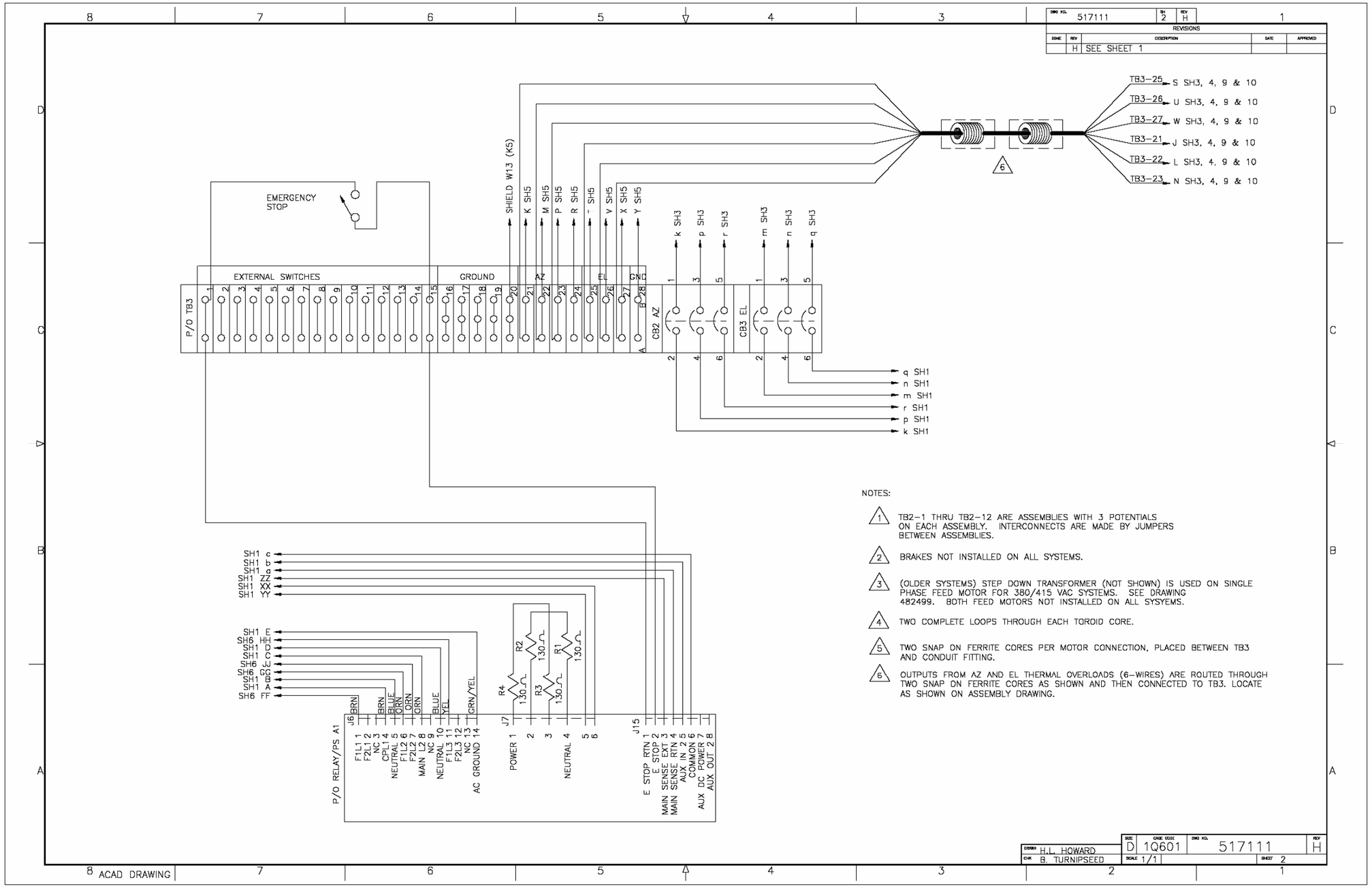
VIEW K

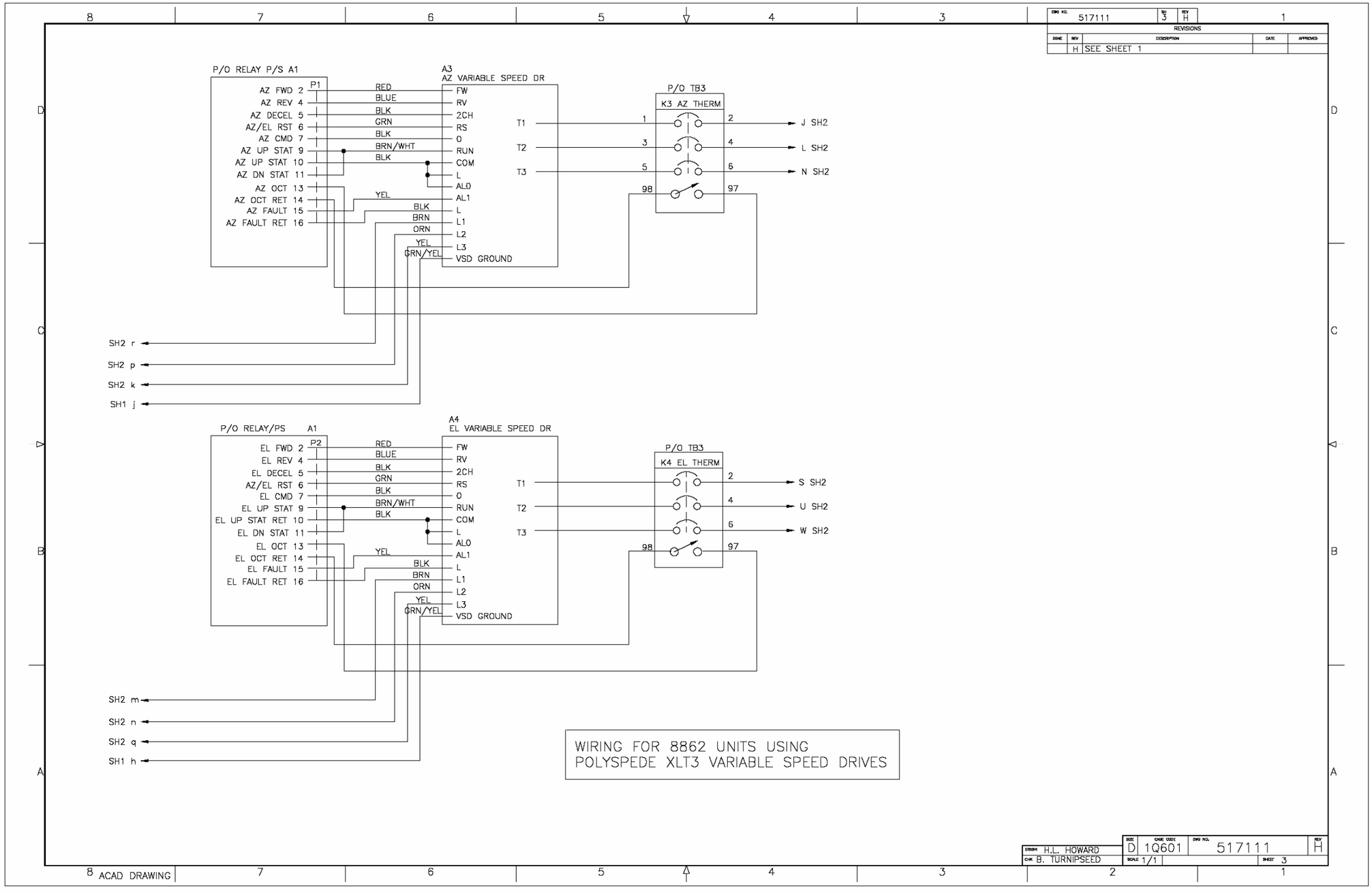
NOTES:
7. COMPOENTS K5, XK5, CB5, AND CB6 SHOWN IN PARENTHESSES ARE SPECIFIED IN THE FEED KITS.

DRAWN	TED SMITH	SIZE	CAGE CODE	DWG NO.	REV
CHK	KEVIN P. MELVIN 10-29-92	D	1Q601	477820	Y
		SCALE	1/1	SHEET	4

8 ACAD DRAWING


DWG NO. 517111
SH 1
REV H
REVISIONS
D REVISED & REDRAWN PER ECR 13441 BHS 3/24/97 3/28/97 E W VICKERS
E REVISED PER ECO CO-014399 6/7/04 T UDELL
F REVISED PER ECO CO-017470 10/1/04 T UDELL
G REVISED PER ECO CO-023233 7/8/05 T UDELL
H REVISED PER ECO CO-025255 02/23/05 T UDELL
APPLICATION
L1
L2
L3
NEU
GND
FL3
INPUT
AC SERVICE
AC GROUND INPUT
AC NEUTRAL INPUT
NEUTRAL
SH2 ZZ
SH2 a
SH3 h
SH3 j
SH5 g
P/O TB1
CB1 MAIN
Ø 1 YEL
Ø 2 ORN
Ø 3 BRN
P/O TB1
K1 MAIN CONTACTOR
1 BRN
3 ORN
5 YEL
A1
A2
Z3
Z2
Z1
SH6 F
SH2 k
SH2 m
SH2 n
SH6 G
SH2 p
SH2 q
SH6 H
SH2 r
P/O TB2
CB4 CONTROL PWR
SH2 YY
SH2 XX
P/O TB2
K2 PHASE LOSS
SENSE
L3 YEL Ø 1
L2 ORN Ø 2
L1 BRN Ø 3
P/O TB2
Ø 1
d SH5
Ø 2
e SH5
Ø 3
f SH5
D SH2
B SH2
GND
NEUTRAL
LINE
SURGE PROTECTOR
SP 1
BB SH6
KK SH6
AA SH6
EE SH6
Z SH6
A SH2
C SH2
E SH2
DD SH6
CC SH6
b SH2
c SH2
ALL DIMENSIONS ARE IN INCHES
UNLESS OTHERWISE SPECIFIED
TOLERANCES
.3 PLACE DECIMAL ±.005
2 PLACE DECIMAL ±.02
1 PLACE DECIMAL ±.1
FRACTIONS ± ANGLES ±0° 30'
MAX SURFACE ROUGHNESS 125
ALL MACHINED SURFACES EXCEPT AS NOTED
BREAK SHARP EDGES AND CORNERS .010 MAX
FINISH
DRN H.L. HOWARD 7/8/94
ENGR E.H. VICKERS 7/8/94
CHK B. TURNIPSEED 7/8/94
PROD
APVD
APVD
ViaSat
1725 Breckinridge Plaza
Duluth, Georgia 30096
INTERCONNECT DIAGRAM 8862
SIZE D
CAGE CODE 1Q601
DWG NO. 517111
REV H
SCALE 1/1
SHEET 1 OF 10
8 ACAD DRAWING

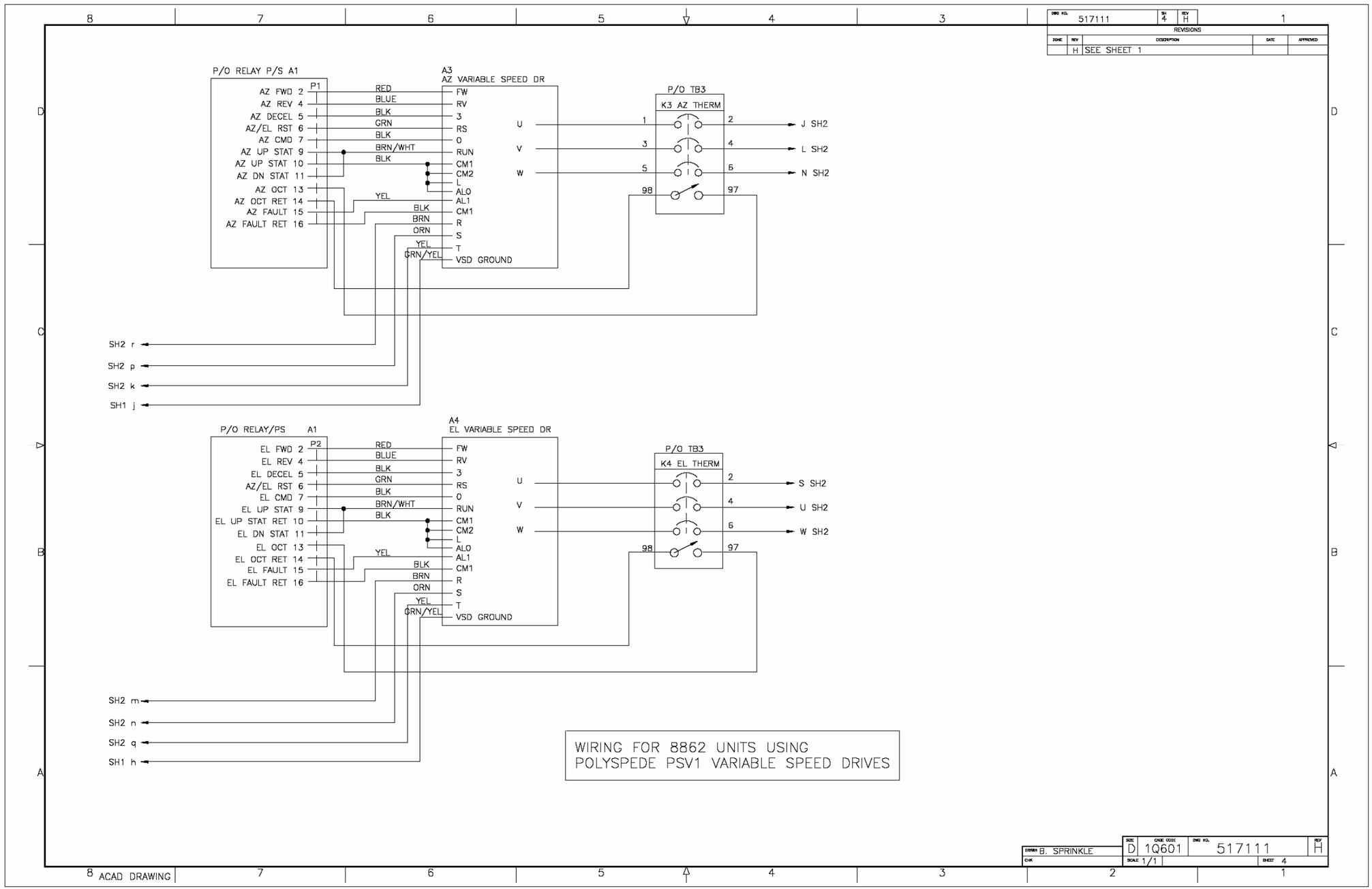

DWG NO. 517111
SH. 2
REV H
REVISIONS
ZONE | REV | DESCRIPTION | DATE | APPROVED
H SEE SHEET 1
TB3–25 S SH3, 4, 9 & 10
TB3–26 U SH3, 4, 9 & 10
TB3–27 W SH3, 4, 9 & 10
TB3–21 J SH3, 4, 9 & 10
TB3–22 L SH3, 4, 9 & 10
TB3–23 N SH3, 4, 9 & 10
SHIELD W13 (K5)
K SH5
M SH5
P SH5
R SH5
SH5
V SH5
X SH5
Y SH5
EMERGENCY STOP
EXTERNAL SWITCHES
GROUND
AZ
EL
P/O TB3
CB2 AZ
CB3 EL
k SH3
p SH3
r SH3
m SH3
n SH3
q SH3
q SH1
n SH1
m SH1
r SH1
p SH1
k SH1
SH1 c
SH1 b
SH1 a
SH1 ZZ
SH1 XX
SH1 YY
SH1 E
SH6 HH
SH1 D
SH1 C
SH6 EE
SH6 GG
SH1 B
SH1 A
SH6 FF
R4 130Ω
R3 130Ω
R2 130Ω
R1 130Ω
J6
J7
J15
P/O RELAY/PS A1
F1L1 1
F2L1 2
NC 3
CPL1 4
NEUTRAL 5
F1L2 6
F2L2 7
MAIN L2 8
NC 9
NEUTRAL 10
F1L3 11
F2L3 12
NC 13
AC GROUND 14
POWER 1
2
3
NEUTRAL 4
5
6
E STOP RTN 1
E STOP 2
MAIN SENSE EXT 3
MAIN SENSE RTN 4
AUX IN 2 5
COMMON 6
AUX DC POWER 7
AUX OUT 2 8
NOTES:
1 TB2–1 THRU TB2–12 ARE ASSEMBLIES WITH 3 POTENTIALS ON EACH ASSEMBLY. INTERCONNECTS ARE MADE BY JUMPERS BETWEEN ASSEMBLIES.
2 BRAKES NOT INSTALLED ON ALL SYSTEMS.
3 (OLDER SYSTEMS) STEP DOWN TRANSFORMER (NOT SHOWN) IS USED ON SINGLE PHASE FEED MOTOR FOR 380/415 VAC SYSTEMS. SEE DRAWING 482499. BOTH FEED MOTORS NOT INSTALLED ON ALL SYSYEMS.
4 TWO COMPLETE LOOPS THROUGH EACH TOROID CORE.
5 TWO SNAP ON FERRITE CORES PER MOTOR CONNECTION, PLACED BETWEEN TB3 AND CONDUIT FITTING.
6 OUTPUTS FROM AZ AND EL THERMAL OVERLOADS (6–WIRES) ARE ROUTED THROUGH TWO SNAP ON FERRITE CORES AS SHOWN AND THEN CONNECTED TO TB3. LOCATE AS SHOWN ON ASSEMBLY DRAWING.
DRAWN H.L. HOWARD
CHK B. TURNIPSEED
SIZE D
CAGE CODE 1Q601
DWG NO. 517111
REV H
SCALE 1/1
SHEET 2
8 ACAD DRAWING

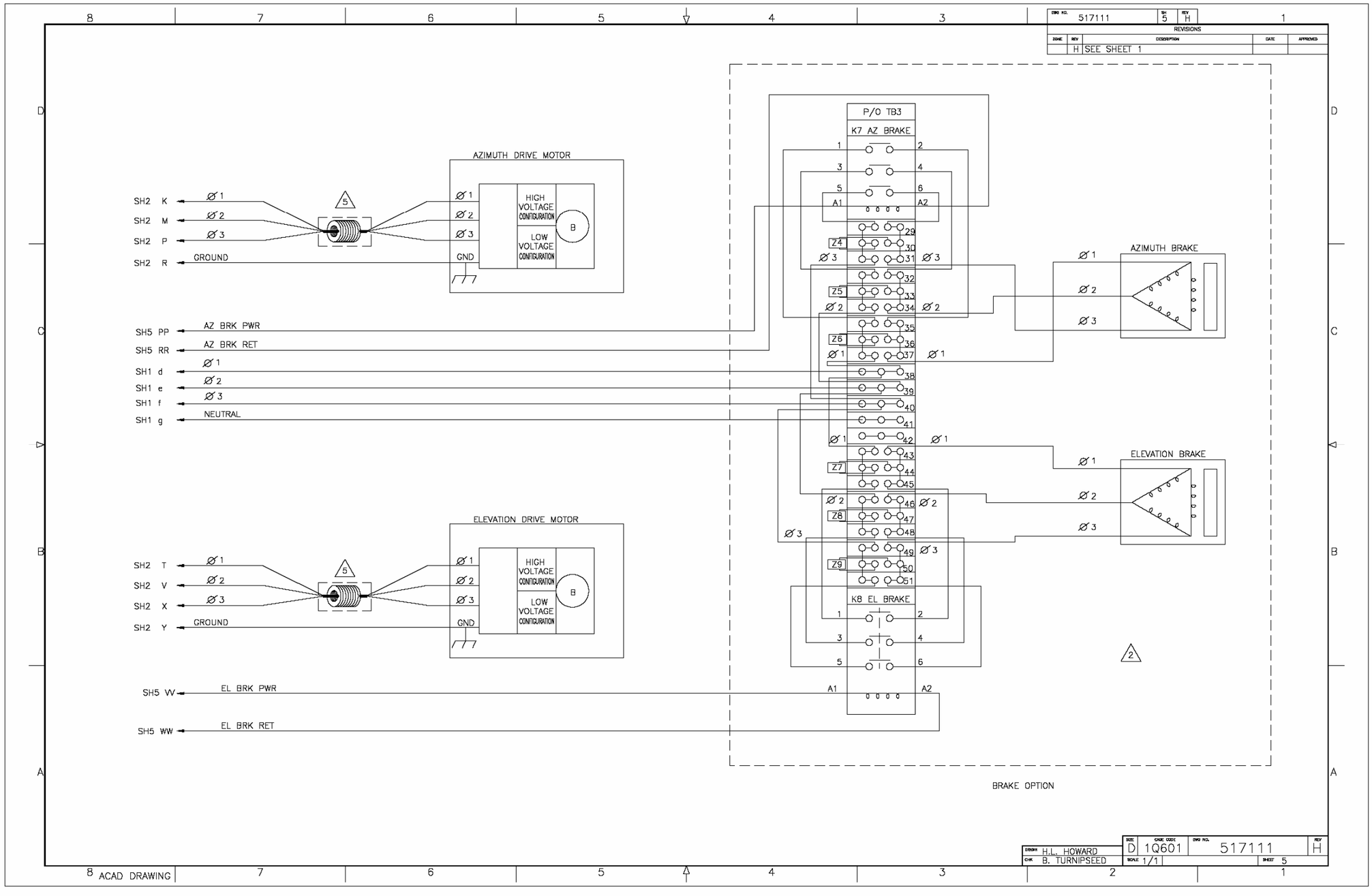

DWG NO. 517111
SZ D
REV H
REVISIONS
ZONE | REV | DESCRIPTION | DATE | APPROVED
H SEE SHEET 1
P/O RELAY P/S A1
P1
AZ FWD 2
AZ REV 4
AZ DECEL 5
AZ/EL RST 6
AZ CMD 7
AZ UP STAT 9
AZ UP STAT 10
AZ DN STAT 11
AZ OCT 13
AZ OCT RET 14
AZ FAULT 15
AZ FAULT RET 16
A3
AZ VARIABLE SPEED DR
RED
BLUE
BLK
GRN
BLK
BRN/WHT
BLK
YEL
BLK
BRN
ORN
YEL
GRN/YEL
FW
RV
2CH
RS
0
RUN
COM
L
ALO
AL1
L
L1
L2
L3
VSD GROUND
T1
T2
T3
P/O TB3
K3 AZ THERM
1
2
3
4
5
6
98
97
J SH2
L SH2
N SH2
SH2 r
SH2 p
SH2 k
SH1 j
P/O RELAY/PS A1
P2
EL FWD 2
EL REV 4
EL DECEL 5
AZ/EL RST 6
EL CMD 7
EL UP STAT 9
EL UP STAT RET 10
EL DN STAT 11
EL OCT 13
EL OCT RET 14
EL FAULT 15
EL FAULT RET 16
A4
EL VARIABLE SPEED DR
RED
BLUE
BLK
GRN
BLK
BRN/WHT
BLK
YEL
BLK
BRN
ORN
YEL
GRN/YEL
FW
RV
2CH
RS
0
RUN
COM
L
ALO
AL1
L
L1
L2
L3
VSD GROUND
T1
T2
T3
P/O TB3
K4 EL THERM
2
4
6
98
97
S SH2
U SH2
W SH2
SH2 m
SH2 n
SH2 q
SH1 h
WIRING FOR 8862 UNITS USING
POLYSPEDE XLT3 VARIABLE SPEED DRIVES
DRAWN H.L. HOWARD
CHK B. TURNIPSEED
SIZE D
CAGE CODE 1Q601
DWG NO. 517111
REV H
SCALE 1/1
SHEET 3
8 ACAD DRAWING
7
6
5
4
3
2
1

DWG NO.	SH	REV
517111	4	H

REVISIONS

ZONE	REV	DESCRIPTION	DATE	APPROVED
	H	SEE SHEET 1		




DWG NO. 517111
SH 5
REV H
REVISIONS
ZONE | REV | DESCRIPTION | DATE | APPROVED
H SEE SHEET 1
AZIMUTH DRIVE MOTOR
SH2 K
SH2 M
SH2 P
SH2 R
GROUND
HIGH VOLTAGE CONFIGURATION
LOW VOLTAGE CONFIGURATION
GND
B
P/O TB3
K7 AZ BRAKE
A1
AZ
Z4
Z5
Z6
Z7
Z8
Z9
AZIMUTH BRAKE
SH5 PP
AZ BRK PWR
SH5 RR
AZ BRK RET
SH1 d
SH1 e
SH1 f
SH1 g
NEUTRAL
ELEVATION BRAKE
ELEVATION DRIVE MOTOR
SH2 T
SH2 V
SH2 X
SH2 Y
GROUND
K8 EL BRAKE
A2
SH5 VV
EL BRK PWR
SH5 WW
EL BRK RET
BRAKE OPTION
DRAWN H.L. HOWARD
CHK B. TURNIPSEED
SIZE D
CAGE CODE 1Q601
DWG NO. 517111
REV H
SCALE 1/1
SHEET 5
8 ACAD DRAWING

DWG NO.	SH	REV
517111	6	H

REVISIONS

ZONE	REV	DESCRIPTION	DATE	APPROVED
	H	SEE SHEET 1		

SH5 WW
SH5 VV
SH5 RR
SH5 PP
SH1 BB
SH1 AA
SH1 Z

P/O TB2

CB5 F1

SH1 F — F1Ø — 2 — 1
SH1 G — F1Ø — 4 — 3
SH1 H — F1Ø — 6 — 5

K5 F1 THERM

SH1 EE — 2 — 1
SH1 DD — 4 — 3
SH1 CC — 6 — 5
98 — 97

CB6 F2

SH2 JJ — A — B
SH1 KK
SH2 FF
SH2 GG
SH2 HH

P/O RELAY/PS A1

JB

F1 M1	1
F2 M1	2
NEUTRAL	3
GROUND	4
F1 M2	5
F2 M2	6
NEUTRAL	7
GROUND	8
F1 M3	9
F2 M3	10

J3

F1 OCT	1
F1 OCT RET	2
F2 OCT	3
F2 OCT RET	4
+24 AZ BRK PWR	5
AZ BRK RET	6
+24 EL BRK PWR	7
EL BRK RET	8

CASSEGRAIN THREE PHASE (POL MOTOR)

Ø 1
Ø 2
Ø 3
GROUND

HIGH VOLTAGE CONFIGURATION
LOW VOLTAGE CONFIGURATION
B

SUBR TB1

PRIME FOCUS ONE PHASE (SUBREFLECTOR MOTOR)

FORWARD 2
REVERSE 3
NEUTRAL 1
GROUND

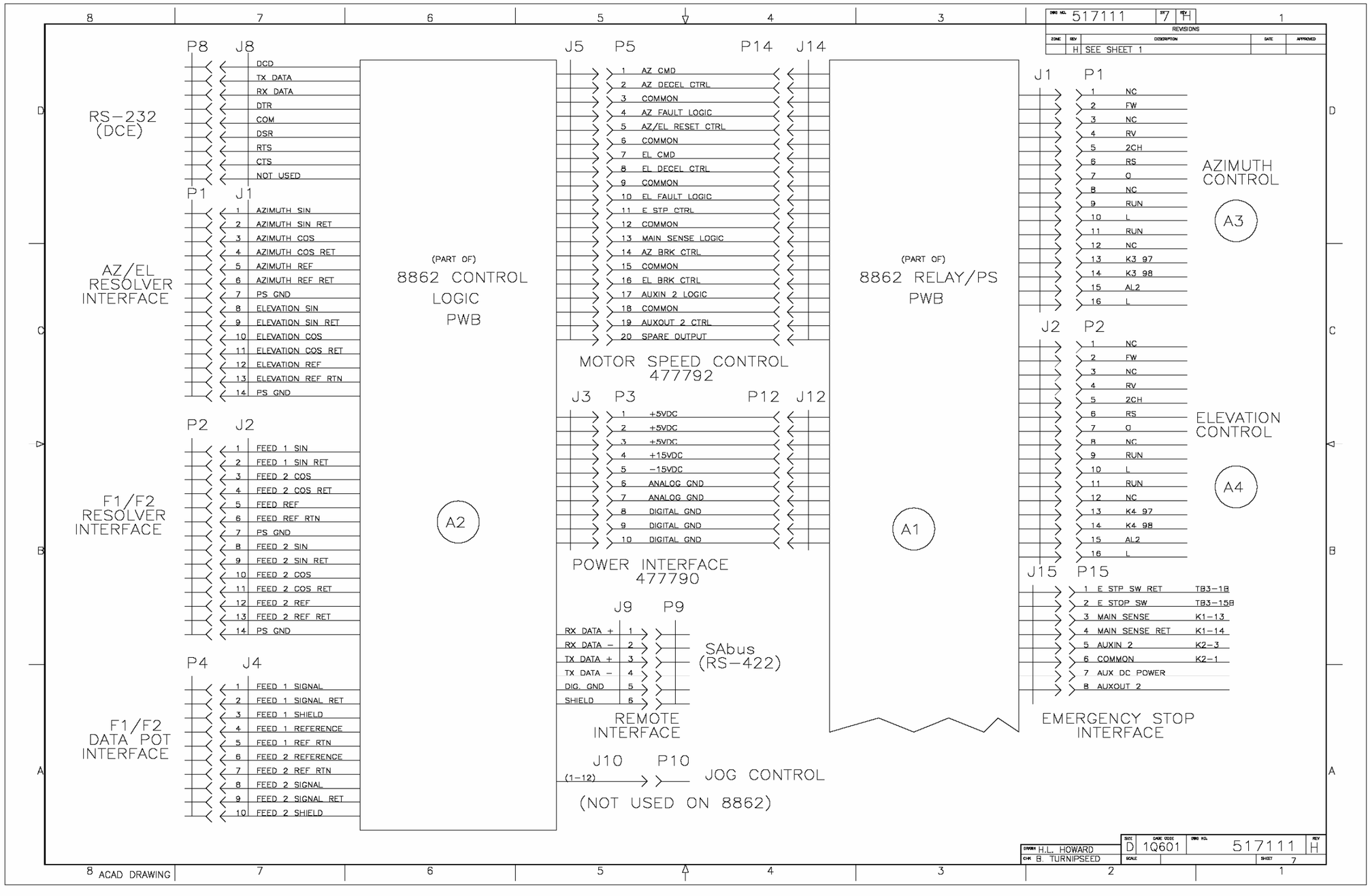
HIGH VOLTAGE CONFIGURATION
LOW VOLTAGE CONFIGURATION
B

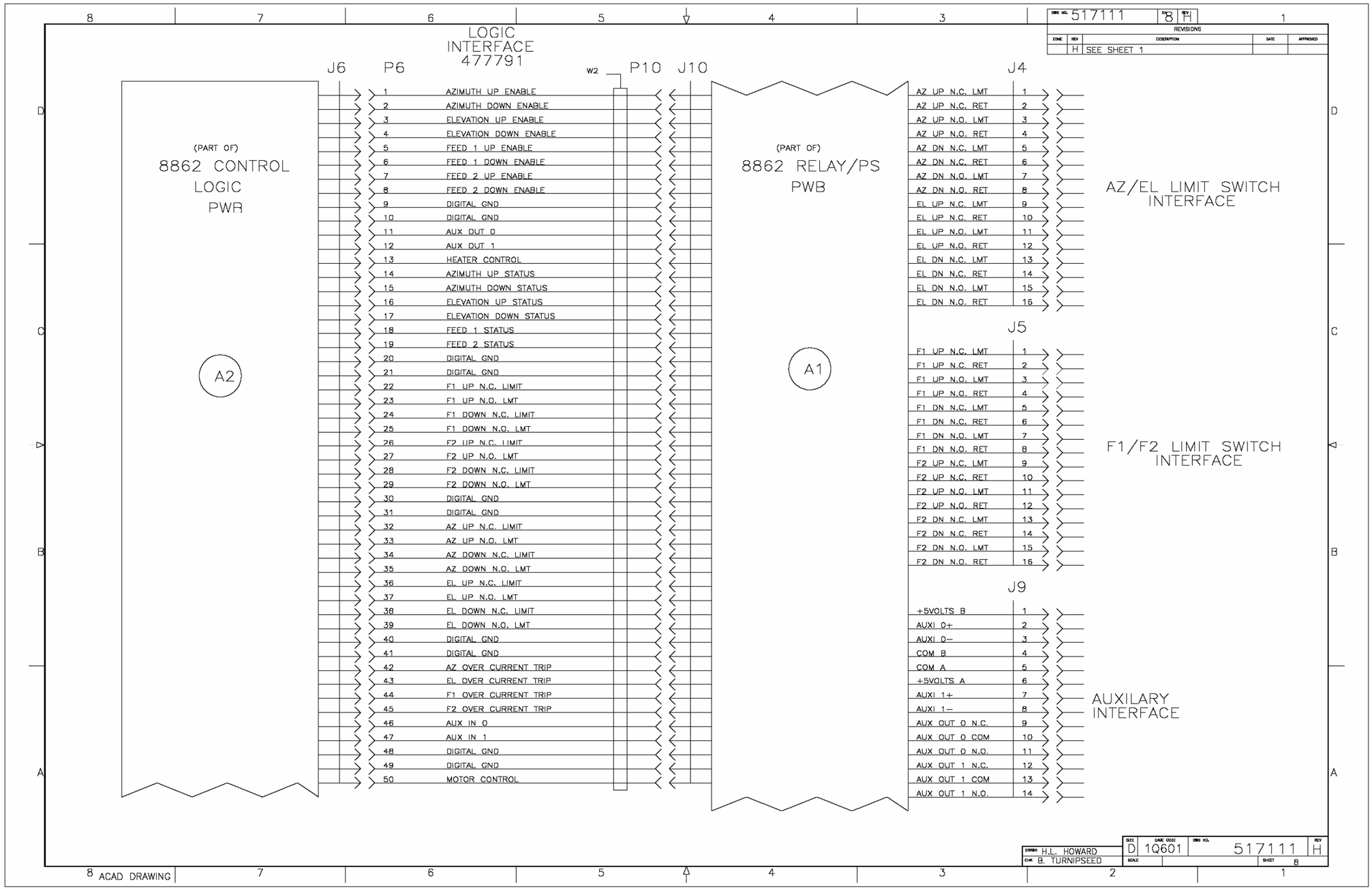
3

FEED OPTIONS

DRAWN H.L. HOWARD	SIZE D	CAGE CODE 1Q601	DWG NO. 517111	REV H
CHK B. TURNIPSEED	SCALE 1/1		SHEET 6	

8 ACAD DRAWING


DWG NO. 517111 SIZ D REV H
REVISIONS
ZONE REV DESCRIPTION DATE APPROVED
H SEE SHEET 1
RS-232 (DCE)
P8 J8
DCD
TX DATA
RX DATA
DTR
COM
DSR
RTS
CTS
NOT USED
AZ/EL RESOLVER INTERFACE
P1 J1
1 AZIMUTH SIN
2 AZIMUTH SIN RET
3 AZIMUTH COS
4 AZIMUTH COS RET
5 AZIMUTH REF
6 AZIMUTH REF RET
7 PS GND
8 ELEVATION SIN
9 ELEVATION SIN RET
10 ELEVATION COS
11 ELEVATION COS RET
12 ELEVATION REF
13 ELEVATION REF RTN
14 PS GND
F1/F2 RESOLVER INTERFACE
P2 J2
1 FEED 1 SIN
2 FEED 1 SIN RET
3 FEED 2 COS
4 FEED 2 COS RET
5 FEED REF
6 FEED REF RTN
7 PS GND
8 FEED 2 SIN
9 FEED 2 SIN RET
10 FEED 2 COS
11 FEED 2 COS RET
12 FEED 2 REF
13 FEED 2 REF RET
14 PS GND
F1/F2 DATA POT INTERFACE
P4 J4
1 FEED 1 SIGNAL
2 FEED 1 SIGNAL RET
3 FEED 1 SHIELD
4 FEED 1 REFERENCE
5 FEED 1 REF RTN
6 FEED 2 REFERENCE
7 FEED 2 REF RTN
8 FEED 2 SIGNAL
9 FEED 2 SIGNAL RET
10 FEED 2 SHIELD
(PART OF) 8862 CONTROL LOGIC PWB
A2
J5 P5 P14 J14
1 AZ CMD
2 AZ DECEL CTRL
3 COMMON
4 AZ FAULT LOGIC
5 AZ/EL RESET CTRL
6 COMMON
7 EL CMD
8 EL DECEL CTRL
9 COMMON
10 EL FAULT LOGIC
11 E STP CTRL
12 COMMON
13 MAIN SENSE LOGIC
14 AZ BRK CTRL
15 COMMON
16 EL BRK CTRL
17 AUXIN 2 LOGIC
18 COMMON
19 AUXOUT 2 CTRL
20 SPARE OUTPUT
MOTOR SPEED CONTROL 477792
J3 P3 P12 J12
1 +5VDC
2 +5VDC
3 +5VDC
4 +15VDC
5 -15VDC
6 ANALOG GND
7 ANALOG GND
8 DIGITAL GND
9 DIGITAL GND
10 DIGITAL GND
POWER INTERFACE 477790
J9 P9
RX DATA + 1
RX DATA - 2
TX DATA + 3
TX DATA - 4
DIG. GND 5
SHIELD 6
SAbus (RS-422)
REMOTE INTERFACE
J10 P10
(1-12)
JOG CONTROL
(NOT USED ON 8862)
(PART OF) 8862 RELAY/PS PWB
A1
J1 P1
1 NC
2 FW
3 NC
4 RV
5 2CH
6 RS
7 Q
8 NC
9 RUN
10 L
11 RUN
12 NC
13 K3 97
14 K3 98
15 AL2
16 L
AZIMUTH CONTROL
A3
J2 P2
1 NC
2 FW
3 NC
4 RV
5 2CH
6 RS
7 Q
8 NC
9 RUN
10 L
11 RUN
12 NC
13 K4 97
14 K4 98
15 AL2
16 L
ELEVATION CONTROL
A4
J15 P15
1 E STP SW RET TB3-1B
2 E STOP SW TB3-15B
3 MAIN SENSE K1-13
4 MAIN SENSE RET K1-14
5 AUXIN 2 K2-3
6 COMMON K2-1
7 AUX DC POWER
8 AUXOUT 2
EMERGENCY STOP INTERFACE
DRAWN H.L. HOWARD
CHK B. TURNIPSEED
SIZE D CAGE CODE 1Q601 DWG NO. 517111 REV H
SCALE SHEET 7
8 ACAD DRAWING


DWG NO. 517111
SIZE D
REV H
REVISIONS
ZONE | REV | DESCRIPTION | DATE | APPROVED
H | SEE SHEET 1
LOGIC INTERFACE 477791
J6 P6 W2 P10 J10
(PART OF) 8862 CONTROL LOGIC PWR
A2
1 AZIMUTH UP ENABLE
2 AZIMUTH DOWN ENABLE
3 ELEVATION UP ENABLE
4 ELEVATION DOWN ENABLE
5 FEED 1 UP ENABLE
6 FEED 1 DOWN ENABLE
7 FEED 2 UP ENABLE
8 FEED 2 DOWN ENABLE
9 DIGITAL GND
10 DIGITAL GND
11 AUX OUT 0
12 AUX OUT 1
13 HEATER CONTROL
14 AZIMUTH UP STATUS
15 AZIMUTH DOWN STATUS
16 ELEVATION UP STATUS
17 ELEVATION DOWN STATUS
18 FEED 1 STATUS
19 FEED 2 STATUS
20 DIGITAL GND
21 DIGITAL GND
22 F1 UP N.C. LIMIT
23 F1 UP N.O. LMT
24 F1 DOWN N.C. LIMIT
25 F1 DOWN N.O. LMT
26 F2 UP N.C. LIMIT
27 F2 UP N.O. LMT
28 F2 DOWN N.C. LIMIT
29 F2 DOWN N.O. LMT
30 DIGITAL GND
31 DIGITAL GND
32 AZ UP N.C. LIMIT
33 AZ UP N.O. LMT
34 AZ DOWN N.C. LIMIT
35 AZ DOWN N.O. LMT
36 EL UP N.C. LIMIT
37 EL UP N.O. LMT
38 EL DOWN N.C. LIMIT
39 EL DOWN N.O. LMT
40 DIGITAL GND
41 DIGITAL GND
42 AZ OVER CURRENT TRIP
43 EL OVER CURRENT TRIP
44 F1 OVER CURRENT TRIP
45 F2 OVER CURRENT TRIP
46 AUX IN 0
47 AUX IN 1
48 DIGITAL GND
49 DIGITAL GND
50 MOTOR CONTROL
(PART OF) 8862 RELAY/PS PWB
A1
J4
AZ UP N.C. LMT 1
AZ UP N.C. RET 2
AZ UP N.O. LMT 3
AZ UP N.O. RET 4
AZ DN N.C. LMT 5
AZ DN N.C. RET 6
AZ DN N.O. LMT 7
AZ DN N.O. RET 8
EL UP N.C. LMT 9
EL UP N.C. RET 10
EL UP N.O. LMT 11
EL UP N.O. RET 12
EL DN N.C. LMT 13
EL DN N.C. RET 14
EL DN N.O. LMT 15
EL DN N.O. RET 16
AZ/EL LIMIT SWITCH INTERFACE
J5
F1 UP N.C. LMT 1
F1 UP N.C. RET 2
F1 UP N.O. LMT 3
F1 UP N.O. RET 4
F1 DN N.C. LMT 5
F1 DN N.C. RET 6
F1 DN N.O. LMT 7
F1 DN N.O. RET 8
F2 UP N.C. LMT 9
F2 UP N.C. RET 10
F2 UP N.O. LMT 11
F2 UP N.O. RET 12
F2 DN N.C. LMT 13
F2 DN N.C. RET 14
F2 DN N.O. LMT 15
F2 DN N.O. RET 16
F1/F2 LIMIT SWITCH INTERFACE
J9
+5VOLTS B 1
AUXI 0+ 2
AUXI 0– 3
COM B 4
COM A 5
+5VOLTS A 6
AUXI 1+ 7
AUXI 1– 8
AUX OUT 0 N.C. 9
AUX OUT 0 COM 10
AUX OUT 0 N.O. 11
AUX OUT 1 N.C. 12
AUX OUT 1 COM 13
AUX OUT 1 N.O. 14
AUXILARY INTERFACE
DRAWN H.L. HOWARD
CHK B. TURNIPSEED
SIZE D CAGE CODE 1Q601 DWG NO. 517111 REV H
SCALE SHEET 8
8 ACAD DRAWING 7 6 5 4 3 2 1

DWG NO.	SIZE	REV
517111	D	H

REVISIONS

ZONE	REV	DESCRIPTION	DATE	APPROVED
	H	SEE SHEET 1		

P/O RELAY P/S A1 — P1

AZ FWD 2	RED	STF
AZ REV 4	BLK	STR
AZ DECEL 5	WHT	RH & RM
AZ/EL RST 6	BLK	RES
AZ CMD 7	GRN	2
AZ CMD RET 8	BLK	5
AZ UP STAT 9	BLU	RUN
AZ UP STAT RET 10	BLK	SD
AZ DN STAT 11	YELLOW	
AZ DN STRET 12	BLK	SE
AZ OCT 13	BRN	B
AZ OCT RET 14	BLK	C
AZ FAULT 15	BRN	R
AZ FAULT RET 16	ORN	S
	YEL	T
	GRN/YEL	VSD GROUND

A3 AZ VARIABLE SPEED DR

U, V, W

P/O TB3 K3 AZ THERM

1 → 2 → J SH2
3 → 4 → L SH2
5 → 6 → N SH2
98 → 97 → RED → BLK

SH2 r
SH2 p
SH2 k
SH1 j

WIRING FOR 8862 UNITS USING
MITSUBISHI E500 SERIES VARIABLE SPEED DRIVES

P/O RELAY/PS A1 — P2

EL FWD 2	RED	STF
EL REV 4	BLK	STR
EL DECEL 5	WHT	RH & RM
AZ/EL RST 6	BLK	RES
EL CMD 7	GRN	2
EL CMD RET 8	BLK	5
EL UP STAT 9	BLU	RUN
EL UP STAT RET 10	BLK	SD
EL DN STAT 11	YELLOW	
EL DN STRET 12	BLK	SE
EL OCT 13	BRN	B
EL OCT RET 14	BLK	C
EL FAULT 15	BRN	R
EL FAULT RET 16	ORN	S
	YEL	T
	GRN/YEL	VSD GROUND

A4 EL VARIABLE SPEED DR

U, V, W

P/O TB3 K4 EL THERM

1 → 2 → S SH2
3 → 4 → U SH2
5 → 6 → W SH2
98 → 97 → RED → BLK

SH2 m
SH2 n
SH2 q
SH1 h

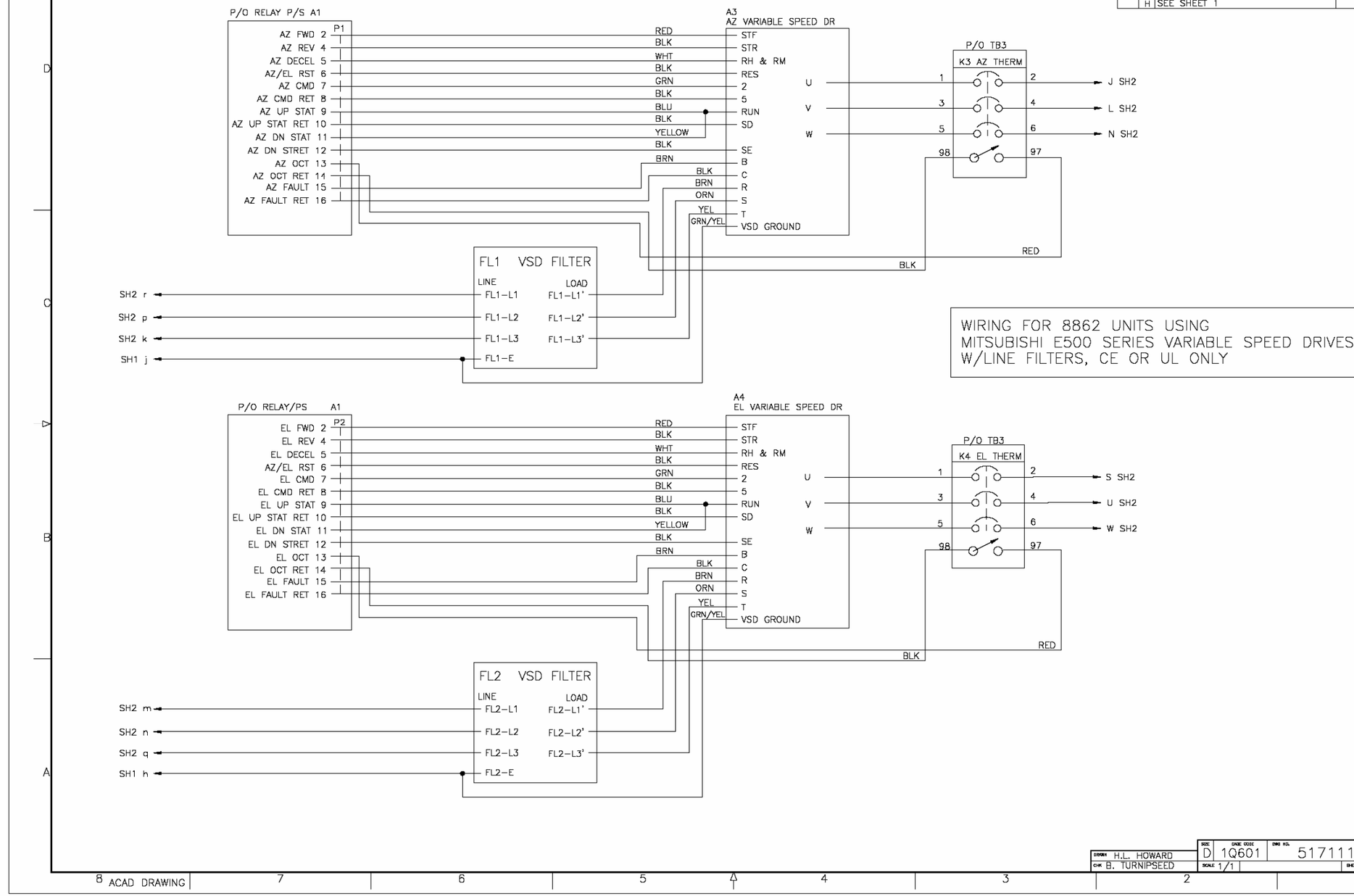
DRAWN	H.L. HOWARD	SIZE D	CAGE CODE 1Q601	DWG NO. 517111	REV H
CHK	B. TURNIPSEED	SCALE 1/1		SHEET 9	

8 ACAD DRAWING

DWG NO. 517111 | SH 10 | REV H

REVISIONS

ZONE	REV	DESCRIPTION	DATE	APPROVED
	H	SEE SHEET 1		



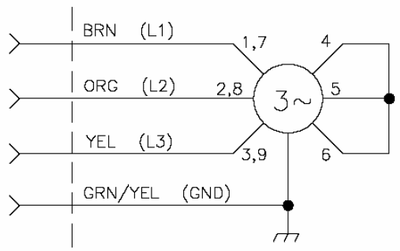
DRAWN H.L. HOWARD
CHK B. TURNIPSEED
SIZE D | CAGE CODE 1Q601 | DWG NO. 517111 | REV H
SCALE 1/1 | SHEET 10

8 ACAD DRAWING

APPLICATION			ZONE	REVISIONS			
QTY REQD	NEXT ASSY	USED ON		REV	DESCRIPTION	DATE	APPROVED
				E	REVISED AND REDRAWN PER ECN SN63693 PLO 09/21/00	9/27/00	PLO
				F	REVISED AND REDRAWN PER ECO CO-006709	9/25/03	T UDELL
				G	REVISED AND REDRAWN PER ECO CO-018926	12/14/04	T UDELL

TB3	P3
8862	8861A
21B-L1	P3-7 L1
22B-L2	P3-4 L2
23B-L3	P3-1 L3
24B-GND	P3-10 GND

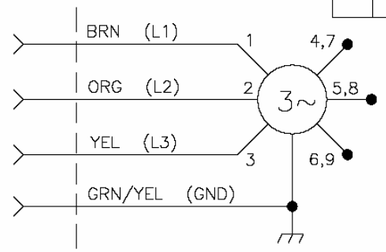
TABLE 2



208 VAC

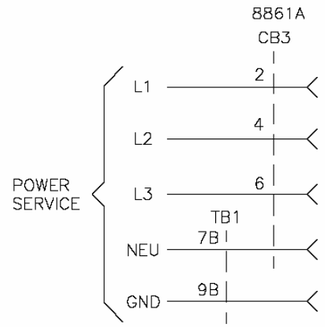
TB3	P3
8862	8861A
21B-L1	P3-7 L1
22B-L2	P3-4 L2
23B-L3	P3-1 L3
24B-GND	P3-10 GND

TABLE 1



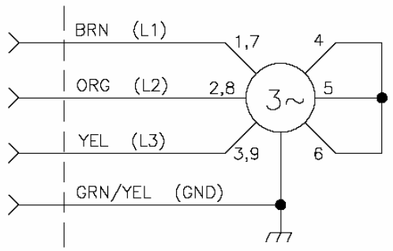
380/415 VAC

AZIMUTH



TB3	P4
8862	8861A
25B-L1	P4-7 L1
26B-L2	P4-4 L2
27B-L3	P4-1 L3
28B-GND	P4-10 GND

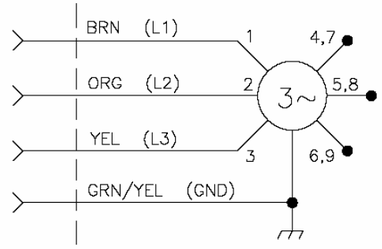
TABLE 4



208 VAC

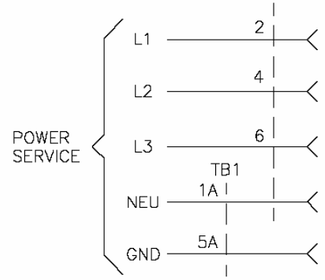
TB3	P4
8862	8861A
25B-L1	P4-7 L1
26B-L2	P4-4 L2
27B-L3	P4-1 L3
28B-GND	P4-10 GND

TABLE 3



380/415 VAC

ELEVATION



AC POWER INPUT

REVERSE PHASING AS NECESSARY TO SATISFY PHASE SEQUENCE RELAY

AZIMUTH AND ELEVATION MOTORS

(BALDOR-DUAL VOLTAGE)

TO REVERSE MOTOR ROTATION, SWAP ORANGE AND YELLOW WIRES.
WIRE MOTOR PER NAME PLATE DIAGRAM.

ITEM NO.	QTY REQD	VASAT PART NO.	DESCRIPTION	MAT'L SPEC AND SIZE OR COMPONENT VALUE	IDENTIFYING OR PART NO.	FSCM NO.

ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED
TOLERANCES
3 PLACE DECIMAL ± .005
2 PLACE DECIMAL ± .02
1 PLACE DECIMAL ± .1
FRACTIONS ± ANGLES ±0° 30'
MAX SURFACE ROUGHNESS 125 ALL MACHINED SURFACES EXCEPT AS NOTED
BREAK SHARP EDGES AND CORNERS .010 MAX
FINISH

CONTRACT NO.

DWN.	JAMIE KING	4/13/93
ENGR	PHIL C. LEWIS	4/14/93
CHK	J. HARDMAN	4/14/93
PROD		
APVD		
APVD		

ViaSat 4356 Communications Dr Norcross Georgia 30093

MOTOR & AC POWER WIRING DIAGRAM-8862 & 8861A

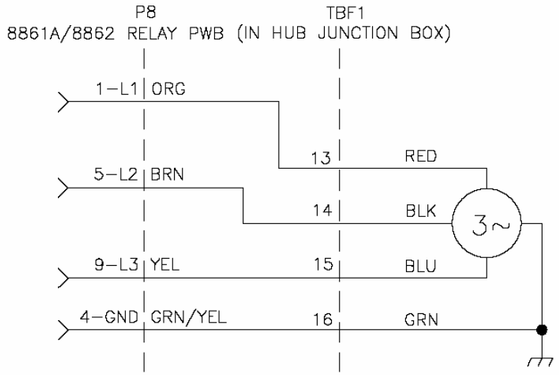
SIZE	CAGE CODE	DWG NO.	REV
C	1Q601	482499	G

SCALE NONE SHEET 1 OF 3

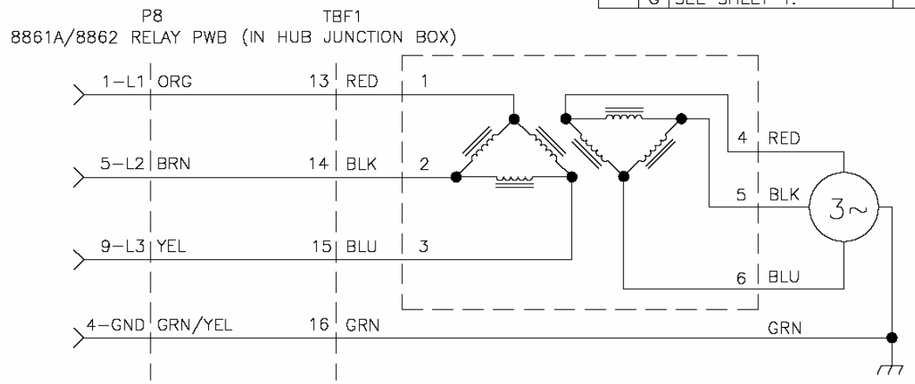
DWG NO. 482499 SH 1 REV G

ACAD DRAWING

REVISIONS				
ZONE	REV	DESCRIPTION	DATE	APPROVED
	G	SEE SHEET 1.		



208 VAC

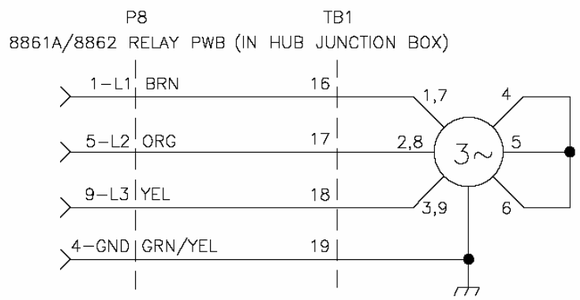


380/415 VAC

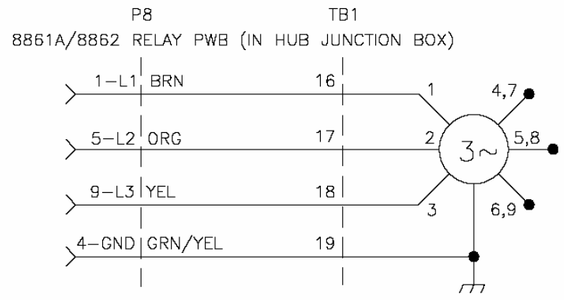
6, 7, 9 & 11 METER CASSEGRAIN FEED MOTOR (F1)

(ROBBINS AND MEYERS OR RELIANCE ELECTRIC) OBSOLETE

FOR 415 VAC OPERATION, TRANSFORMER IS P/N 478031
FOR 380 VAC OPERATION, TRANSFORMER IS P/N 364938
TRANSFORMER IS MOUNTED INSIDE HUB.
TO REVERSE MOTOR ROTATION, SWAP ORANGE AND YELLOW WIRES.



208 VAC



380/415 VAC

10, 11 & 18 METER CASSEGRAIN FEED MOTOR (F1)

(BALDOR .25 HP–DUAL VOLTAGE)

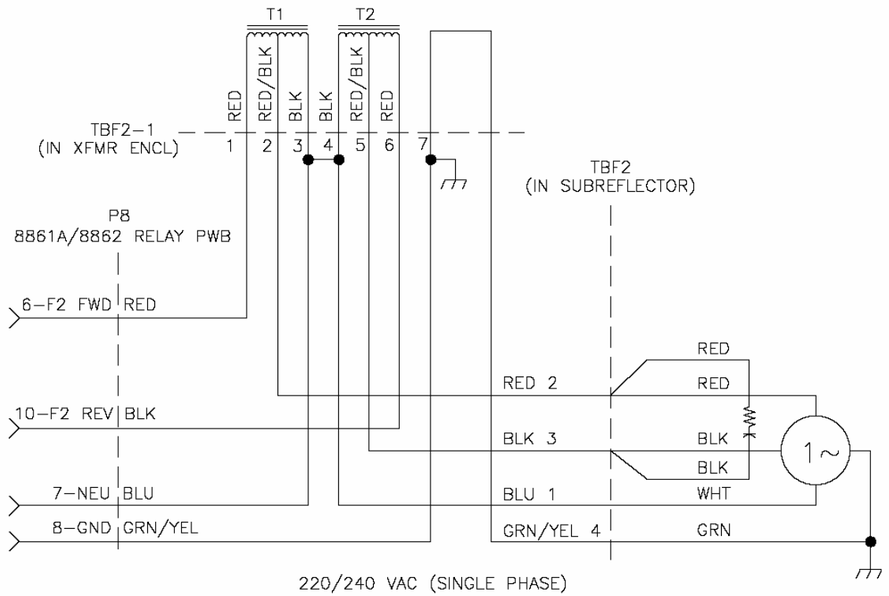
TO REVERSE MOTOR ROTATION, SWAP ORANGE AND YELLOW WIRES.
WIRE MOTOR PER NAME PLATE DIAGRAM.

ViaSat	4356 Communications Dr Norcross, Georgia 30093	SIZE C	CAGE CODE 1Q601	DWG NO. 482499	REV G
DWN JAMIE KING	CHK J. HARDMAN	SCALE NONE		SHEET 2	

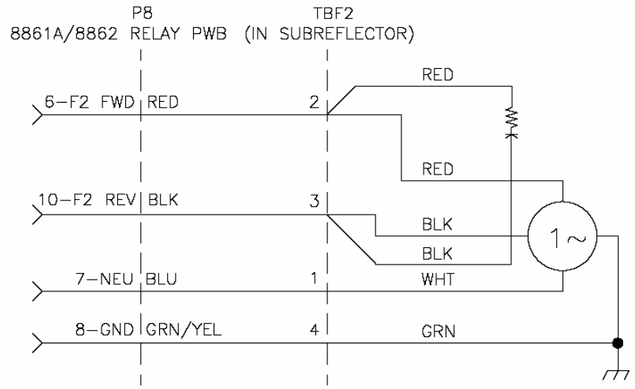
DWG NO. 482499 SH 2 REV G

ACAD DRAWING

REVISIONS				
ZONE	REV	DESCRIPTION	DATE	APPROVED
	G	SEE SHEET 1.		



220/240 VAC (SINGLE PHASE)



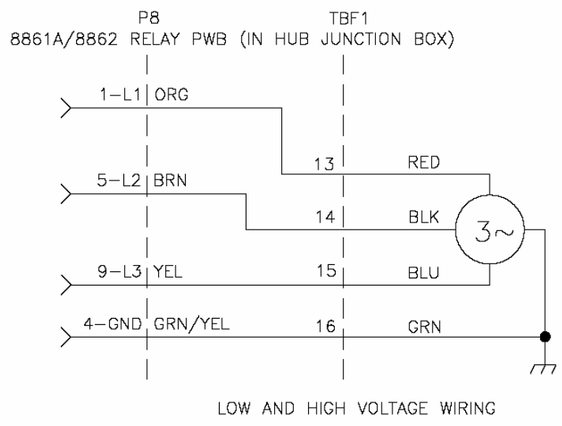
115 VAC (SINGLE PHASE)

3.6, 4.5 & 6 METER PRIME FOCUS FEED MOTOR (F2)

(BODINE)

TRANSFORMERS, PART NUMBER 180884 AND TB1
ARE PHYSICALLY LOCATED IN SEPARATE ENCLOSURE ASSEMBLY,
MOUNTED ON ANTENNA.

TO REVERSE MOTOR ROTATION SWAP RED AND BLACK WIRES AT P8.



LOW AND HIGH VOLTAGE WIRING

6, 7.3, 9 & 11 METER CASSEGRAIN FEED MOTOR (F1)

(BISON)

FOR 208-240 VAC, USE LOW VOLTAGE DELTA WIRING AT MOTOR JUNCTION BOX
CONNECT: W2 TO U1 (PHASE 1), U2 TO V1 (PHASE 2), V2 TO W1 (PHASE 3)

FOR 380-460 VAC, USE HIGH VOLTAGE WYE WIRING AT MOTOR JUNCTION BOX
CONNECT: JUMPER W2, U2 AND V2 TOGETHER, U1 (PHASE 1), V1 (PHASE 2), W1 (PHASE 3)

TO REVERSE MOTOR ROTATION, SWAP ORANGE AND YELLOW WIRES.

ViaSat	4356 Communications Dr Norcross, Georgia 30093	SIZE C	CAGE CODE 1Q601	DWG NO. 482499	REV G
DWN JAMIE KING	CHK J. HARDMAN	SCALE NONE		SHEET 3	

DWG NO. 482499 SH 3 REV G

ACAD DRAWING

REVISIONS				
ZONE	REV	DESCRIPTION	DATE	APPROVED
	A	REVISED AND REDRAWN PER ECN 50056. RHU 12/8/97	12/8/97	E BRAGG
	B	REVISED PER ECO CC-021767	4/29/05	T UDELL

APPLICATION

QTY REQD	NEXT ASSY	USED ON

553348 REV 1 SHT B

F1 DATA POT

CW

S

CCW

JUNCTION BOX INSIDE HUB

TBF1

BLK	1	WHT	F1 REF	P4 LOGIC PWB 4
WHT	2	BLK	F1 REF RTN	5
RED	3	RED	F1 SIG	1
GRN	4	BLK	F1 SIG RTN	2
	5			3
	6			
2-20	7	YEL	F1 UP NC LIM	P5 RELAY PWB 1
1-20	8	BLK	F1 UP NC RET	2
3-20	9	BRN	F1 UP NO LIM	3
2-20	10	BLK	F1 DN NC LIM	5
1-20	11	GRN	F1 DN NC RET	6
3-20	12	BLK	F1 DN NO LIM	7
RED	13	ORG	PHASE 1	P6 RELAY PWB 1 1
BLK	14	BRN	PHASE 2	5
BLUE	15	YEL	PHASE 3	9
GRN	18	GRN/YEL	GROUND	4

F1 UP LIMIT SWITCH

F1 DOWN LIMIT SWITCH

(NC)

(NC)

F1 MOTOR CONNECTION

M

PHASE 1

PHASE 2

PHASE 3

GROUND

NOTES:

1. POWER WIRING VALID ONLY FOR UNITS USING RELAY BOARD ASSEMBLIES 477604 OR 521425. THIS INCLUDES ALL 8862 UNITS, BUT ONLY 8861A ASSEMBLY 517638, BUILT BEGINNING IN FEBRUARY 1997.
2. REMOVED
3. REMOVED
4. VIEW ORIENTATION ESTABLISHED FROM LNA SIDE.
5. POTENTIOMETER IS WIRED SO THAT CLOCKWISE FEED ROTATION VIEWED FROM LNA SIDE OF FEED RESULTS IN INCREASING SIGNAL VOLTAGE WITH RESPECT TO RETURN. POTENTIOMETER SHAFT ROTATES CLOCKWISE VIEWED FROM ITS SHAFT END.
6. SHIELDS AND DRAIN WIRES ARE CUT OFF AT POT END OF CABLE AND NOT CONNECTED TOGETHER. UNSHIELDED PORTION OF CABLE SHOULD BE KEPT AS SHORT AS POSSIBLE, 2-3 IN. MAX.
7. AT PWB END, REMOVE APPROXIMATELY 3 IN. OF SHIELDS AND TWIST DRAIN WIRES TOGETHER WITH ONE END OF A 3 IN. GREEN WIRE. INSULATE EXPOSED SHIELDS WITH LARGE HEATSHRINK TUBING TO PREVENT SHORTING. ATTACH OTHER END OF 3 IN. GREEN WIRE TO NEAREST PWB MOUNTING SCREW WITH SPADE LUG.
8. REMOVED

6, 7, 9, 11 METER CASSEGRAIN (FEED 1)

VALID FOR 208, 380-415 VAC, 50-60 Hz SYSTEMS

ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED
TOLERANCES
3 PLACE DECIMAL ±.005
2 PLACE DECIMAL ±.02
1 PLACE DECIMAL ±.1
FRACTIONS ± ANGLES ±0 30'
MAX SURFACE ROUGHNESS 125 ALL MACHINED SURFACES EXCEPT AS NOTED
BREAK SHARP EDGES AND CORNERS .010 MAX
FINISH NONE

ITEM NO.	QTY REQD	SA PART NO.	DESCRIPTION	MATL SPEC AND SIZE OR COMPONENT VALUE	IDENTIFYING SA PART NO.	FINISH NO.

CONTRACT NO.

DRAWN	R.UNDERWOOD	1/9/97
ENGR	E.H.VICKERS	1/10/97
CHK	J.COOPER	1/24/97
APVD		
APVD		

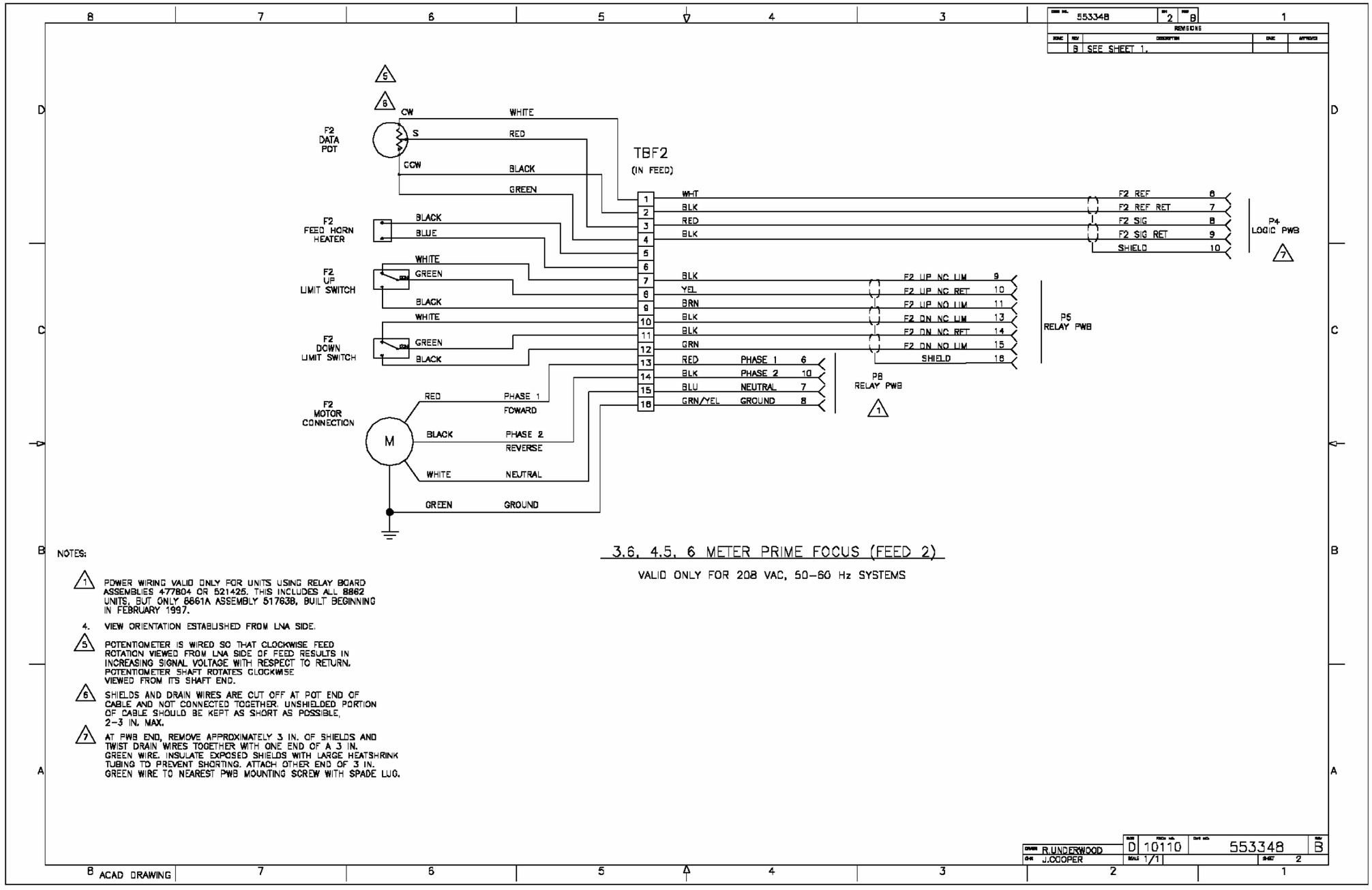
ViaSat 4356 Communications Dr Norcross Georgia 30093

WIRING DIAGRAM FEED, POTS AND LIMIT SWITCHES 8861A/8862

SIZE D | FSCM NO. 10110 | DWG NO. 553348 | REV B

SCALE 1/1 SHEET 1 OF 4

B ACAD DRAWING


553348
REVISIONS
B SEE SHEET 1.
F2 DATA POT
CW
S
CCW
WHITE
RED
BLACK
GREEN
F2 FEED HORN HEATER
BLACK
BLUE
F2 UP LIMIT SWITCH
WHITE
GREEN
BLACK
F2 DOWN LIMIT SWITCH
WHITE
GREEN
BLACK
F2 MOTOR CONNECTION
M
RED
PHASE 1
FOWARD
BLACK
PHASE 2
REVERSE
WHITE
NEUTRAL
GREEN
GROUND
TBF2
(IN FEED)
1 WHT
2 BLK
3 RED
4 BLK
5
6
7 BLK
8 YEL
9 BRN
10 BLK
11 BLK
12 GRN
13 RED PHASE 1 6
14 BLK PHASE 2 10
15 BLU NEUTRAL 7
16 GRN/YEL GROUND 8
F2 REF 6
F2 REF RET 7
F2 SIG 8
F2 SIG RET 9
SHIELD 10
P4 LOGIC PWB
F2 UP NC LIM 9
F2 UP NC RET 10
F2 UP NO LIM 11
F2 DN NC LIM 13
F2 DN NC RET 14
F2 DN NO LIM 15
SHIELD 16
P5 RELAY PWB
P8 RELAY PWB
3.6, 4.5, 6 METER PRIME FOCUS (FEED 2)
VALID ONLY FOR 208 VAC, 50-60 Hz SYSTEMS
NOTES:
1. POWER WIRING VALID ONLY FOR UNITS USING RELAY BOARD ASSEMBLIES 477804 OR 521425. THIS INCLUDES ALL 8862 UNITS, BUT ONLY 8661A ASSEMBLY 517638, BUILT BEGINNING IN FEBRUARY 1997.
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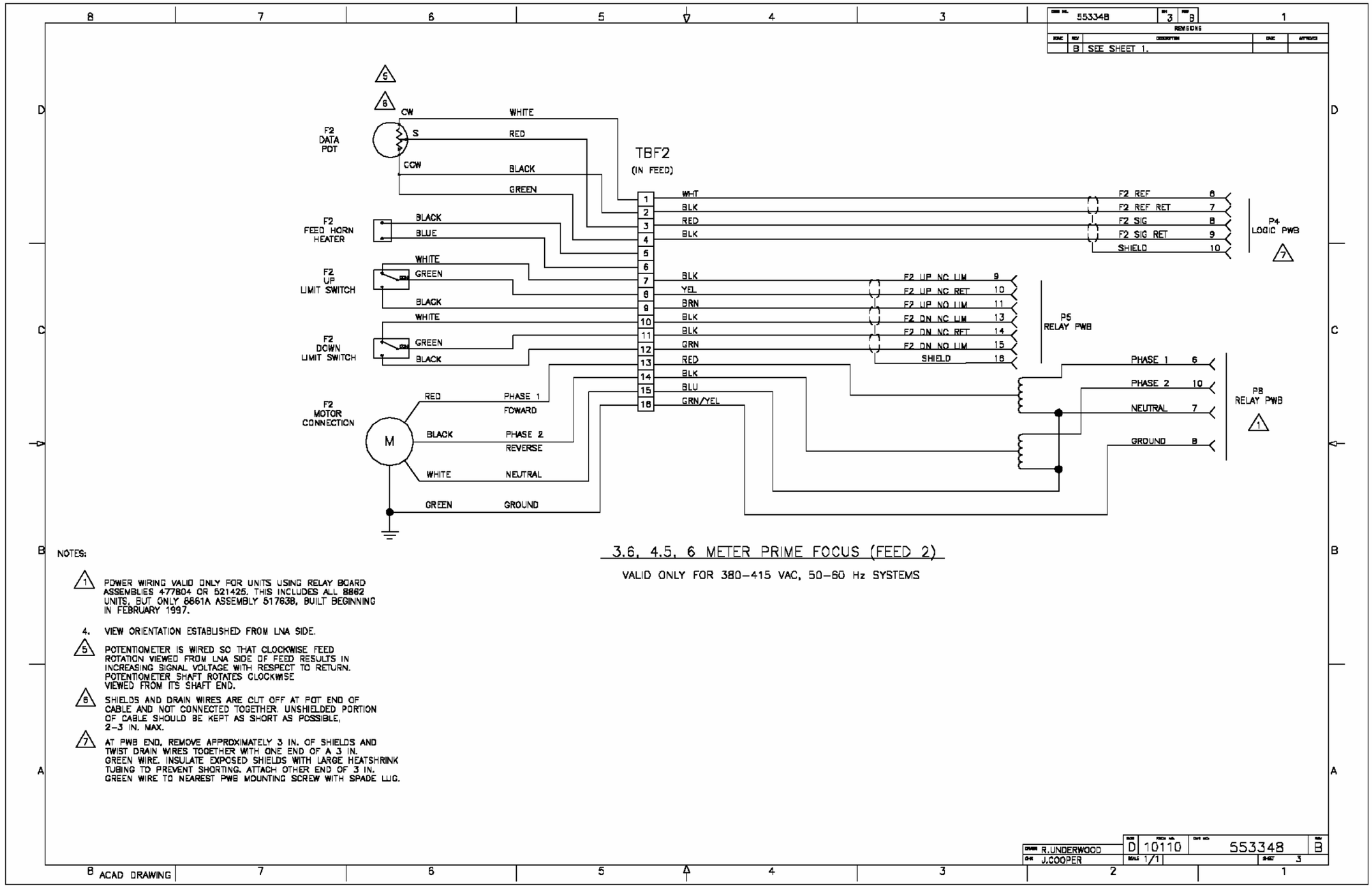
R.UNDERWOOD
J.COOPER
D 10110 553348 B
SCALE 1/1
B ACAD DRAWING


553348
REVISIONS
B SEE SHEET 1.
TBF2
(IN FEED)
F2 DATA POT
CW
S
CCW
WHITE
RED
BLACK
GREEN
F2 FEED HORN HEATER
BLACK
BLUE
F2 UP LIMIT SWITCH
WHITE
GREEN
BLACK
F2 DOWN LIMIT SWITCH
WHITE
GREEN
BLACK
F2 MOTOR CONNECTION
M
RED
PHASE 1
FOWARD
BLACK
PHASE 2
REVERSE
WHITE
NEUTRAL
GREEN
GROUND
WHT
BLK
RED
BLK
BLK
YEL
BRN
BLK
BLK
GRN
RED
BLK
BLU
GRN/YEL
F2 REF 6
F2 REF RET 7
F2 SIG 8
F2 SIG RET 9
SHIELD 10
P4 LOGIC PWB
F2 UP NC LIM 9
F2 UP NC RET 10
F2 UP NO LIM 11
F2 DN NC LIM 13
F2 DN NC RET 14
F2 DN NO LIM 15
SHIELD 16
P5 RELAY PWB
PHASE 1 6
PHASE 2 10
NEUTRAL 7
GROUND 8
P8 RELAY PWB
3.6, 4.5, 6 METER PRIME FOCUS (FEED 2)
VALID ONLY FOR 380–415 VAC, 50–60 Hz SYSTEMS
NOTES:
1. POWER WIRING VALID ONLY FOR UNITS USING RELAY BOARD ASSEMBLIES 477804 OR 521425. THIS INCLUDES ALL 8862 UNITS, BUT ONLY 8661A ASSEMBLY 517638, BUILT BEGINNING IN FEBRUARY 1997.
4. VIEW ORIENTATION ESTABLISHED FROM LNA SIDE.
5. POTENTIOMETER IS WIRED SO THAT CLOCKWISE FEED ROTATION VIEWED FROM LNA SIDE OF FEED RESULTS IN INCREASING SIGNAL VOLTAGE WITH RESPECT TO RETURN. POTENTIOMETER SHAFT ROTATES CLOCKWISE VIEWED FROM ITS SHAFT END.
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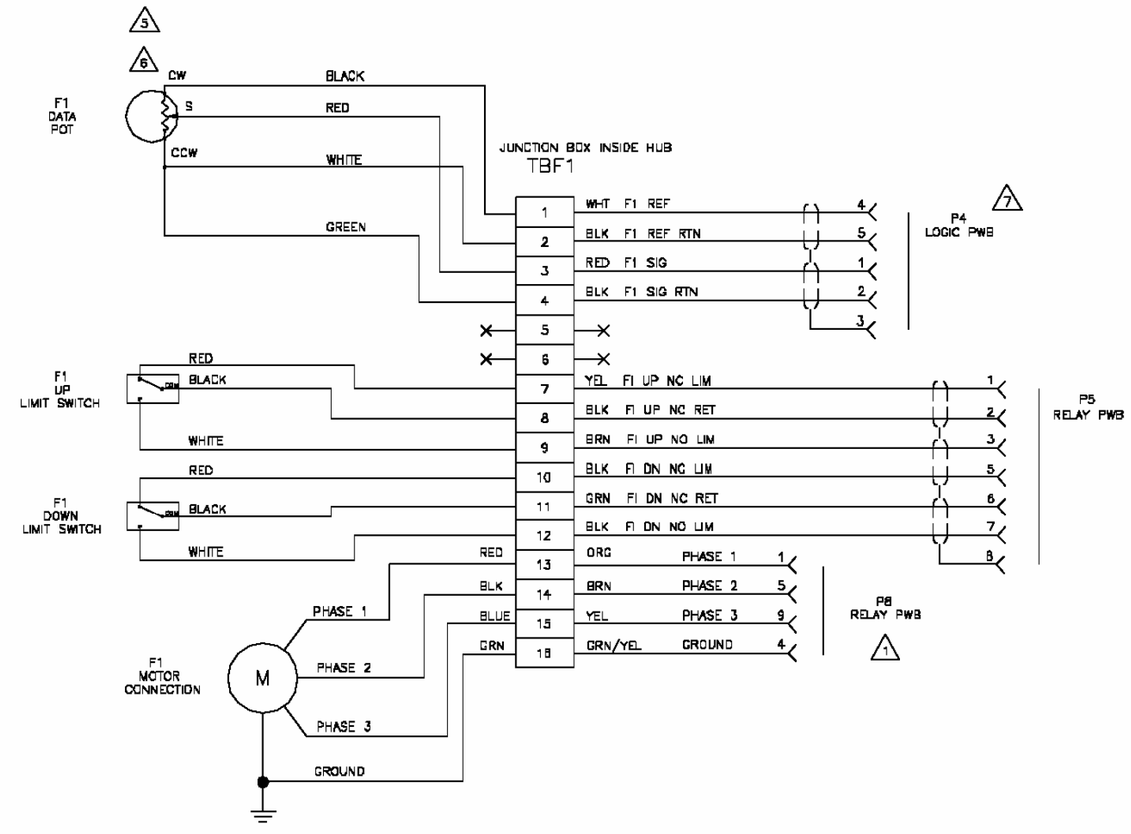
R.UNDERWOOD
J.COOPER
D 10110 553348 B
SCALE 1/1
B ACAD DRAWING

DWG NO.	REV	SHT
553348	4	B

ZONE	REV	DESCRIPTION	DATE	APPROVED
	B	SEE SHEET 1.		



NOTES:

1. POWER WIRING VALID ONLY FOR UNITS USING RELAY BOARD ASSEMBLIES 477804 OR 521425.
4. VIEW ORIENTATION ESTABLISHED FROM LNA SIDE.
5. POTENTIOMETER IS WIRED SO THAT CLOCKWISE FEED ROTATION VIEWED FROM LNA SIDE OF FEED RESULTS IN INCREASING SIGNAL VOLTAGE WITH RESPECT TO RETURN. POTENTIOMETER SHAFT ROTATES CLOCKWISE VIEWED FROM ITS SHAFT END.
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16, 18 METER CASSEGRAIN (FEED 1)

VALID FOR 208, 380-415 VAC, 50-60 Hz SYSTEMS

DRAWN	SIZE	MFG NO.	DWG NO.	REV
R.UNDERWOOD	D	10110	553348	B
CHK J.COOPER	SCALE 1/1		SHEET 4	

B ACAD DRAWING

Appendix A

Firmware Upgrade Procedure

A.1 Introduction

Perform the following procedure to upgrade the firmware contained in the Model 8861A or 8862. Both units use the same firmware.

1. Deactivate tracking, if necessary, by pressing STOP on the main screen of the 8860 Antenna Tracking Controller.

2. Disconnect the device connected to the RS-232 or RS-422 port on the Logic Printed Circuit Board Assembly. Only one of these ports will have a connection.

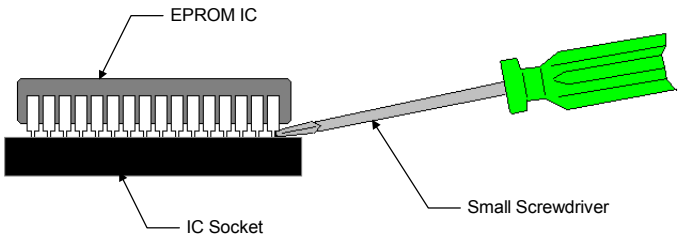
3. Connect a laptop computer or an Earth Station Controller to the 8861A/8862. The laptop computer will connect to the RS-232 port.

4. ALTERNATIVE: If the system includes an 8860 Antenna Tracking Controller, let it remain connected to the RS-422 port on the 8861A/8862 logic card. Then the operator can connect an RS-232 cable to Modem connector on the rear of the 8860 (or an SAbus cable from an Earth Station Controller to the Earth Station connector) and the operator can complete the next task from inside the shelter.

5. Save configuration data on a disk file, using the computer and the Calibration Software. This precaution will allow the operator to restore the previous configuration if the upgrade fails.

6. Turn off power to the 8861A/8862 and open the inner door to allow access to the Logic Printed Wiring Board Assembly.

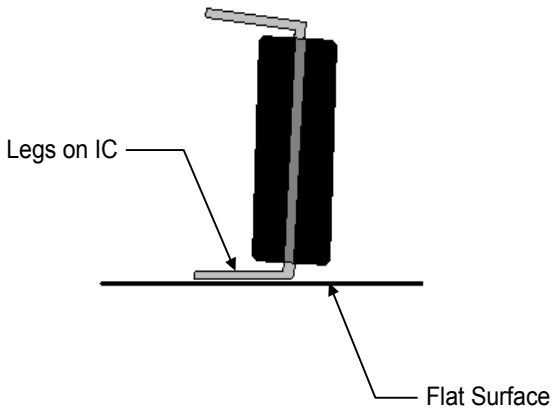
7. Wear a ground strap attached to the enclosure chassis ground to remove any static charge (if the operator has no strap, touch the metal enclosure to remove any static charge), then use a small flat screwdriver to remove EPROM U27. Note the orientation of the EPROM.



Removing EPROM IC

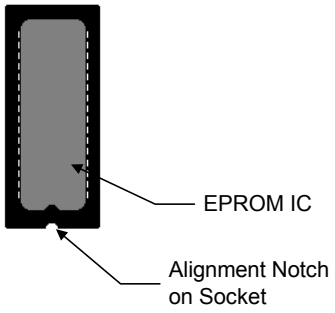
8. Use care when inserting the EPROM. Applying power to the device while installed upside down will destroy the EPROM. New EPROMS usually come with the legs bent slightly away from the body of the IC. This can make it difficult to line up the pins with the IC socket. Bending the legs of the device too far may cause them to break. To straighten the legs on the IC you can do the following:

   - Turn the IC on one side and place the legs so they are flat on a tabletop or other flat surface.
   - Hold the body of the IC firmly and gently push the IC forward to bend the legs so they are perpendicular to the body of the IC.
   - Repeat steps 1 to 2 for the other set of legs.



Bending Legs on New ICs

9. Install the new EPROM into socket U27 in the same orientation as the previous EPROM. The notch on the end of the EPROM should match the notch on the end of the socket.



Aligning IC to Socket

10. Close the inner door.

11. Apply power to the Model 8861A/8862.

12. Normal power-up LED sequence will occur and the main contactor should energize

    a. If connected to a Model 8860, communications should resume within 20-40 seconds.

    b. If the operator observes the correct position data, proceed to Step 13. Otherwise, the operator may need to restore the configuration data from the disk file that was saved in step 5 of this procedure.

13. The operator can command the system to resume tracking, if desired. This upgrade does not require any changes to the Model 8860 configuration.

Some firmware upgrades of older 8862 units may require a wiring modification before upgrading to Version 2.4 or later firmware. Contact ViaSat for the technical bulletins describing this change.

Appendix B

8861A/8862 SAbus Command Set Version 3.0

REVISION HISTORY

January 10, 2002 plo V3.0

- Added command 44 Hex to read the high resolution (20-bit) Azimuth and Elevation values.

March 10, 1994 pcl V2.2-V2.4 (Document Change Only)

- Added note to command 64 for V2.4 firmware.
- Corrected message description for command 68-6F.
- Added note to command 59.

April 5, 1993 pcl V2.2

- Added command 43, Enable/Disable comm guard mode, which forces a controller restart approximately one minute after the last valid message is received.
- Added command PAL output state reporting to command 65.

January 24, 1993 pcl V2.1

- Split the position reporting differential and minimum move distance into two separate parameters. The position reporting differential is now axis parameter 0x0d. The minimum move distance remains parameter 0x10.
- Added parameter 0x16 - position retry pulse width, in clock ticks.
- Added parameter 0x17 - maximum number of position retries.
- Added command 42 - enter/exit maintenance mode - allows installer to bypass position checkpointing.

April 24, 1992 pcl V2.0

- Revised description of operating modes to include discussion of variable-speed controllers. Added speed comment to all move commands.
- Command 31 - power-up-flag is now configuration-change-flag and is asserted after the change speed command as well as after exit from setup mode.
- Command 34 - added byte 6 containing e-stop, phase-loss, and drive fault bits.
- Changed command 3C from auxiliary inputs and outputs 1 and 2 to 0 and 1 respectively. On variable-speed controllers, there are also auxiliary input 2 and auxiliary output 2.
- Added command 41 - change axis speed.
- Added southern hemisphere note to command 51.
- Changed command 62 to include bits for e-stop sense and aux. input 2.
- Command 65 - added byte 3 containing bits for drive reset, e-stop control, and AZ, EL deceleration control.
- Added command 6A for testing analog speed outputs.

October 16, 1991 pcl V1.3

- Initial Release

OPERATIONAL COMMANDS

ASCII	HEX	FUNCTION
'0'	30	Device ID Query
'1'	31	Status Query
'2'	32	Extended Query
'3'	33	Axis Position Query
'4'	34	Fault Query
'5'	35	Hard Limit Query
'6'	36	Soft Limit Query
'7'	37	Move All Axes
'8'	38	Move Axis
'9'	39	Move by Time
':'	3A	Clear Status Change Flag
';'	3B	Set Remote Lockout
'<'	3C	Aux I/O
'='	3D	Stop
'>'	3E	Reset Fault
'?	3F	Restart APC
'@'	40	Reserved for Firmware Development
'A'	41	Change/Read Current AZ, EL Speed
'B'	42	Enter/Exit Maintenance Mode
'C'	43	Enable/Disable Comm Guard Mode
'D	44	Read High Resolution (20-Bit) values for Azimuth and Elevation
'E'-'O'	45-4F	Not Used
'~'	7E	Comm Status Query/Clear

SETUP/CALIBRATION COMMANDS

ASCII	HEX	FUNCTION
'P'	50	Setup Mode Entry/Exit
'Q'	51	Read Axis - Uncalibrated
'R'	52	Move Axis - Uncorrected
'S'	53	Move by Time - Uncorrected
'T'	54	Read Stopping Distance
'U'	55	Set Axis Parameter
'V'	56	Get Axis Parameter
'W'	57	Set General Parameter
'X'	58	Get General Parameter
'Y'	59	Set Communications Parameters
'Z'	5A	Get Communications Parameters
'['-'_'	5B-5F	Not used

FACTORY TEST COMMANDS

ASCII	HEX	FUNCTION
'`'	60	Test Mode Entry/Exit
'a'	61	Test LEDs
'b'	62	Read Switches
'c'	63	Read Limits
'd'	64	Read Status
'e'	65	Test Relays
'f'	66	Read Channel
'g'	67	Test RDC
'h'	68	Test Reference
'i'	69	Test PWM (8862/64 only)
'j'	6A	Reserved
'k'	6B	Initialize EEPROM
'l'	6C	Reserved
'm'	6D	Reserved
'n'	6E	Reserved
'o'	6F	Test COP Timer, same as restart APC
'p'	70	Reserved for exclusive use by 8860
'q'-'|'	71-7D	Not used

DESCRIPTION OF 8861/62/64 OPERATING MODES

IDLE All axis relays/drives are released and the antenna is not moving. While idle, the firmware monitors all installed axes for changes in position greater than the reporting differential and sets the summary change flag if this condition occurs. Also, the relay supply is turned off, and all installed limit switches are monitored for limit, shorted or open conditions, and reported accordingly. Several other resolver and analog test channels are also monitored for correct values.

JOG The Jog mode is initiated via the controller front panel switches and allows multiple axes to move at the same time. Each axis is sampled and controlled every 32 ms. The termination is time-based. Holding a switch in the on position presets a counter, which is allowed to count down when the switch is released. No stopping correction is applied to the turn-off time. For variable-speed controllers, each axis starts at low speed, then ramps up to high speed after about four seconds.

SLEW The Slew mode is initiated via the SAbus Move All command and allows multiple axes to move at the same time. Each axis is sampled and controlled every 32 ms. The termination is position-based. Each axis is driven to a position close to the commanded position and stopped. After all axes have reached the coarse stopping position, each axis is individually moved into commanded position using the peak mode. For variable-speed controllers, the coarse moves are made at high speed, followed by the fine moves at low speed.

PEAK The Peak mode is initiated following the slew mode to move a single axis into final commanded position. The selected axis is sampled and controlled every 4 ms. The termination is based on a linear interpolation of previously stored stopping distance correction values. The peak mode may also be initiated via the SAbus Move Axis command. For variable-speed controllers, the move is made at low speed.

TIME The Time mode is initiated via the SAbus Move by Time command and moves a single axis for a specified number of clock ticks, plus the time required for the axis relays to drop out. The selected axis is sampled and controlled every 4 ms. A command of zero causes the relays to be turned off immediately after turn-on has been detected. For variable-speed controllers, the move is made at low speed.

MOVE-UNC The Slew-Uncorrected mode is initiated via the SAbus Move-Axis Uncorrected command and moves a single axis to the specified coarse position. The move is not followed by a peaking cycle and is not corrected for stopping distance. For variable-speed controllers, the move is made at the high speed. The stopping distance is measured in preparation for a subsequent Get Stopping Distance command. This mode is intended to be used for dynamic calibration of the antenna and control system.

TIME-UNC The Time-Uncorrected mode is initiated via the SAbus Move by Time - Uncorrected command and is identical to the Time mode except that the stopping distance is measured in preparation for a subsequent Get Stopping Distance command. For variable-speed controllers, the move is made at the low speed. This mode is intended to be used for dynamic calibration of the antenna and control system.

NOTE: Due to hardware limitations, only the active transducer channels and limit switches are monitored while the antenna is moving in any of the modes (except idle) described above.

Function '0' 30 Device ID Query

Command [addr]['0']

Response [addr]['0'][mmmmvv] where mmmm is the device model number 'controller' and vv is the software revision level with decimal point assumed 1 place right of the first digit.

Function '1' 31 Status Query

Command [addr]['1']

Response [addr]['1'][n] where n is a single byte formatted as follows:

b6: always 1

b5: EEPROM initialized (>V1.1)

A value of 1 indicates that the EEPROM data was found to be invalid and was initialized to factory default values on power-up.

b4: Power-Up Fault (>V1.1)

This bit is set after a fault has been detected which forced an internal restart. (COP timer)

b3: Configuration Change Flag

This flag is set after the configuration (such as current azimuth or elevation speed) has changed. It is also set the first time this status is read after controller power-up, also set after a restart command.

b2: Motion Flag

A value of 1 indicates that the antenna is moving.

b1: Status Change Flag

A value of 1 indicates a change in status or position. This flag is cleared by the Clear Change Flag Command (3A).

b0: Summary Fault

A value of 1 indicates that a control or axis fault has been detected. This bit remains set as long as the fault condition exists or until cleared by the Reset Fault command (3E).

Function '2' 32 Extended Query

Command [addr]['2']

Response [addr]['2'][n...][x...x] where n...n and x...x represent the limit data and axis position data, respectively, formatted as follows:.

byte 1: System Summary

b6-b4: always 011

b3: Remote Lockout Flag

A value of 1 indicates that remote positioning of the antenna is inhibited.

b2: Local Mode Flag

A value of 1 indicates that the controller Remote/Local switch is in the Local position.

b1: Motion Inhibited (if enabled)

b0: External Fault Input (if enabled)

byte 2: AZ Limit Status
byte 3: EL Limit Status
byte 4: F1 Limit Status
byte 5: F2 Limit Status

where each byte is formatted as follows:

b6-b4: always 011
b3: Soft Limit Down
b2: Soft Limit Up
b1: Hard Limit Down
b0: Hard Limit Up

bytes 6-9: AZ angle
bytes 10-13: EL angle
bytes 14-17: F1 angle
bytes 18-21: F2 angle

All positions are reported as left-justified unsigned 16-bit integers. For example: 14adh --> 31h, 34h, 3ah,3dh.

The position values have calibration factors applied and represent 16-bit binary fractions of a circle. (i.e. 360 degrees divided into 65536 parts) If an axis is not installed, its value is returned as zero.

Function '3' 33 Axis Position Query

Command

[addr]['3'][a] Returns the position of the specified axis, a, formatted as follows:

byte 1: axis select
b6-b2 always 01100
b1-b0: axis select where
00 = AZ
01 = EL
10 = F1
11 = F2

Response

[addr]['3'][x...x] where x...x is the position of the specified axis formatted as follows:

bytes 1-4: axis angle.

The position is reported as a left-justified unsigned 16-bit integer. For example: 14adh --> 31h, 34h, 3ah,3dh.

The position value has calibration factors applied and represents a 16-bit binary fraction of a circle. (i.e. 360 degrees divided into 65536 parts) If an axis is not installed, its value is returned as zero.

Function '4' 34 Fault Query

Command [addr]['4']

Response [addr]['4'][f...f] where f...f is fault data formatted as follows:

byte 1: Control faults
b6: always 1
b5: eeprom power-up fault (> V1.1)
b4: over temperature *
b3: under temperature *
b2: A/D converter fault
b1: R/D converter fault
b0: relay/power supply fault

byte 2: AZ Axis Faults
byte 3: EL Axis Faults
byte 4: F1 Axis Faults
byte 5: F2 Axis Faults

where each byte is formatted as follows:

b6: always 1
b5: Axis relay fault * (> V1.1)
b4: Axis motion fault *
b3: Axis upper limit failure *
b2: Axis lower limit failure *
b1: Axis backward operation *
b0: Axis overload trip *

byte 6: Variable speed drive faults
b6-b4: always 100
b3: Emergency stop condition **
b2: Phase loss or reversal fault
b1: EL VSD fault *
b0: AZ VSD fault *

* Indicates faults that are cleared by the Reset Fault command (3E).

** The E-Stop condition must first be corrected by closing the relay circuit, followed by a Reset Fault command (3E).

Function '5' 35 Hard Limits Query

Command [addr]['5]

Response [addr]['5'][x..x]
where x...x is the hard position limit data formatted as follows:

bytes 1-4:	AZ lower hard limit
bytes 5-8:	AZ upper hard limit
bytes 9-12:	EL lower hard limit
bytes 13-16:	EL upper hard limit
bytes 17-20:	F1 lower hard limit
bytes 21-24:	F1 upper hard limit
bytes 25-28:	F2 lower hard limit
bytes 29-32:	F2 upper hard limit

All angles are sent as left-justified unsigned 16-bit integers. For example: 14adh --> 31h, 34h, 3ah,3dh.

The position values have calibration factors applied and represent 16-bit binary fractions of a circle. (i.e. 360 degrees divided into 65536 parts) If an axis is not installed, its value is returned as zero.

Function '6' 36 Soft Limits Query

Command [addr]['6']

Response [addr]['6'][x...x]
where x...x is the soft position limit data formatted as follows:

bytes 1-4:	AZ lower soft limit
bytes 5-8:	AZ upper soft limit
bytes 9-12:	EL lower soft limit
bytes 13-16:	EL upper soft limit
bytes 17-20:	F1 lower soft limit
bytes 21-24:	F1 upper soft limit
bytes 25-28:	F2 lower soft limit
bytes 29-32:	F2 upper soft limit

All axes are sent as left-justified unsigned 16-bit integers. For example: 14adh --> 31h, 34h, 3ah,3dh.

The position values have calibration factors applied and represent 16-bit binary fractions of a circle. (i.e. 360 degrees divided into 65536 parts) If an axis is not installed, its value is returned as zero.

Function '7' 37 Move All Axes

Command [addr]['7'][x...x] where x...x is the commanded absolute position formatted as follows.

bytes 1-4:	AZ angle
bytes 5-8:	EL angle
bytes 9-12:	F1 angle
bytes 13-16:	F2 angle

All angles are sent as left-justified unsigned 16-bit integers. For example: 14adh --> 31h, 34h, 3ah,3dh.

The position values have calibration factors applied and represent 16-bit binary fractions of a circle. (i.e. 360 degrees divided into 65536 parts. For the variable-speed controllers, the azimuth and elevation axes are operated at their current fast speed values during the coarse move, and their slow speed values during the fine move.

Response [addr]['7']

Note: The command will be NAK'd under the following conditions:
1. Any of the coordinates are out-of-range.
2. The controller is in local mode.
3. The Remote Lockout flag is set.
4. The controller is in setup mode.
5. The controller is in test mode.

6. The inhibit input is enabled and active.
7. The antenna is already moving.

If an axis is not installed, its value is ignored.

Function '8' 38 Move Axis

Command

[addr]['8'][a][x...x] moves the axis a to the commanded absolute position x...x, where a and x...x are formatted as follows:

byte 1: axis select
b6-b2 always 01100
b1-b0: axis select where
00 = AZ
01 = EL
10 = F1
11 = F2
bytes 2-5: angle data

The axis data is sent as a left-justified unsigned 16-bit integer. For example: 14adh --> 31h, 34h, 3ah,3dh.

The position value has calibration factors applied and represents an unsigned 16-bit binary fraction of a circle (i.e. 360 degrees divided into 65536 parts). For the variable-speed controllers, the azimuth and elevation axes are operated at their current slow speed values.

Response

[addr]['8']

Note:

The command will be NAK'd under the following conditions:
1. The commanded position is out-of-range.
2. The controller is in local mode.
3. The Remote Lockout flag is set.
4. The controller is in setup mode.
5. The controller is in test mode.
6. The inhibit input is enabled and active.
7. The antenna is already moving.

If the axis is not installed, its value is ignored.

Function '9' 39 Move by Time

Command

[addr]['9'][a][t...t] where a is the direction and axis select and t...t is the commanded run time formatted as follows:

byte 1: axis select
b6-b3: always 0110
b2: direction select (1 = up)
b1-b0: axis select where
00 = AZ
01 = EL
10 = F1
11 = F2

bytes 2-5: length of time to move the selected axis, in multiples of 4 ms. For the variable-speed controllers, the azimuth and elevation axes are operated at their current slow speed values.

Response [addr]['9']

Note: The command will be NAK'd under the following conditions:
1. The controller is in local mode.
2. The Remote Lockout flag is set.
3. The controller is in setup mode.
4. The controller is in test mode.
5. The inhibit input is enabled and active.
6. The antenna is already moving.

If the axis is not installed, its value is ignored.

Function ':' 3A Clear Status Change Flag

Command [addr][':']

Response [addr][':']

This command clears the status change flag reported in command 31.

Function ';' 3B Set Remote Lockout

Command [addr][';']

Response [addr][';']

This command sets (r = 1), or clears (r = 0), the Remote Lockout Flag. When the RL Flag is set, the controller will NAK commands that cause the controller to move the antenna.

Function '<' 3C Aux Out/In

Command [addr]['<'][d] where d indicates the following:
b6-b4: always 011
b3: auxiliary output 1 mask
b2: auxiliary output 0 mask
b1: auxiliary output 1 data
b0: auxiliary output 0 data

Response [addr]['<'][d][t] where d indicates the following:
b6-b5: always 01
b4: enclosure heater on
b3: auxiliary input 1
b2: auxiliary input 0
b1: auxiliary output 1 data
b0: auxiliary output 0 data

and t is the controller internal temperature in Celsius, sent as a left-justified signed 16-bit integer. For example: 14adh --> 31h, 34h, 3ah,3dh.

Note: The auxiliary outputs will only change if they have not been mapped to summary fault or antenna moving function. Refer to the discussion of setup parameters for more information.

Function '=' 3D Stop Motion

Command [addr]['=']

Response [addr]['=']

This command stops antenna motion. It does not drop out the main contactor in variable-speed controllers (8862/64).

Function '>' 3E Reset Fault

Command [addr]['>']

Response [addr]['>']

Comment This command causes the controller to attempt to reset any reported faults. Note that some faults such as limit switch failures will not reset until the fault condition is corrected.

Function '?' 3F Restart controller

Command [addr]['?']['8861']

Response None

Comment This command causes the controller to perform a reset, i.e. the unit starts operation from the power-up state.

Function '@' 40 Firmware Debug Query

Command [addr]['@']

Response response varies with configuration

Comment This command is reserved for firmware development use.

Function 'A' 41 Change/Read Axis Speed

Command [addr]['A'][a][r][ss][ff]

This command sets the current slow speed, represented by ss, and the current fast speed, represented by ff, for axis a, where a is 0 for azimuth and 1 for elevation. Each speed value is formatted as an 8-bit integer representing percentage of base motor frequency (100 % = 50 Hz, for a 50 Hz system). For example: 14h --> 31h, 34h.

Each value can range from the minimum to the maximum values stored in EEPROM. Speed values of zero , or values outside the EEPROM range, are ignored.

If r is 1, the ss and ff values are ignored, and the slow and fast speeds are restored to the default minimum and maximum EEPROM values, respectively.

Response [addr]['A'][ss]ff] The response reports the current slow and fast speeds for the selected axis. Any changes just made are reflected in the response.

Comment — This command is ignored for the single-speed controller (8861) and is NAK'd if the antenna is in motion. Note that it is possible to operate at a speed greater than 100 %, subject to motor torque limitations. On power-up or reset, the slow and fast speeds are restored to the EEPROM values.

Function 'B' 42 Enter/Exit Maintenance Mode

Command — [addr]['B'][d] Where d is a single byte formatted as follows:

b6-b2: 01100
b1: maintenance mode mask
b0: maintenance mode flag

With d set to 3, the controller is placed in the maintenance mode in which limit, axis motion, and backward operation faults are ignored. Also, the communication watchdog timer is disabled. With d set to 2, or on power-up, the controller is returned to normal operation. Other values of d are ignored. Changing this mode flag causes the configuration change bit in command #31 to be set.

Response — [addr]['B'][d] where d is the maintenance mode flag (bit 0 only) as above.

This command will be NAK'd if the antenna is moving, or if the controller is in setup or test modes.

CAUTION: This command disables software safety features, and if used improperly, can result in damage to the antenna or to nearby structures. It is intended to allow the installer to move an axis before the resolvers have been installed or calibrated, and as such, should only be used with extreme care by qualified installation personnel.

Function 'C' 43 Enable/Disable Comm Guard Mode

Command — [addr]['B'][d] Where d is a single byte formatted as follows:

b6-b2: 01100
b1: comm guard mode mask
b0: comm guard mode flag

With d set to 3, the controller is placed in the comm guard mode which forces a restart of the controller firmware approximately one minute after the last valid message is received. With d set to 2, or on power-up, the controller is returned to normal operation. Other values of d are ignored. Changing this mode flag causes the configuration change bit in command #31 to be set.

Response — [addr]['B'][d] where d is the comm guard mode flag (bit 0 only) as above.

This command will be NAK'd if the antenna is moving, or if the controller is in setup or test modes.

Function 'D' 44 Read High Resolution AZ EL

Command — [addr]['D']

Response — [addr]['D'][x...x]

where x...x is the high resolution position data formatted as follows:

bytes 1-5: AZ High resolution (20-bit) data
bytes 6-10: EL High Resolution (20-bit) data

All axes are sent as left-justified unsigned 20-bit integers. For example: 1e4adh --> 31h, 3eh, 34h, 3ah,3dh.

The position values have calibration factors applied and represent 20-bit binary fractions of a circle. (i.e. 360 degrees divided into 1048576 parts)

Function 'P' 50 Setup Mode

Command [addr]['P'][d] With d set to 1, the controller is placed in the setup mode. With d set to 0, the controller is returned to normal operation. This command may be addressed to either device '0'or to the current SAbus address.

Response [addr]['P']

This command will be NAK'd if the antenna is moving, or if the controller is in test mode. Also, the controller will NAK the command to exit setup mode if any EEPROM writes are currently in progress.

Caution: Address '0' should not be used unless the 8861/2/4 is the only device on the SAbus.

Function 'Q' 51 Read Axis - Uncalibrated

Command [addr]['Q'][a] Reads the specified axis, a, where a is 0 for AZ, 1 for EL, 2 for F1, and 3 for F2.

Response [addr]['Q'][x..x] Where x..x is the position data formatted as follows:
bytes 1-4: angle data

The axis data is sent as a left-justified 16-bit integer. For example: 14adh --> 31h, 34h, 3ah,3dh.

The position value has no calibration factors applied and represent a 16-bit binary fraction of a circle (i.e. 360 degrees divided into 65536 parts). If the axis is not installed, its value is returned as zero. The azimuth position is not corrected for southern hemisphere operation.

Comment This command will be NAK'd if the specified axis is not installed.

Function 'R' 52 Move Axis - Uncorrected

Command

[addr]['R'][a][x...x] where a is the axis and x...x is the commanded absolute position formatted as follows.

byte 1: axis select
b6-b3: always 01100
b1-b0: axis select where
00 = AZ
01 = EL
10 = F1
11 = F2
bytes 2-5: angle data

The angle is sent as a left-justified unsigned 16-bit integer. For example: 14adh --> 31h, 34h, 3ah,3dh.

The position value has calibration factors applied and represents an unsigned 16-bit binary fraction of a circle. (i.e. 360 degrees divided into 65536 parts)
This command functions the same as Move Absolute except that it operates on a single axis and the controller does not correct for stopping distance. In preparation for a subsequent Read Stop Time Command, the stopping distance is measured when the axis is stopped. This command is intended for coarse positioning only - it does not peak the antenna into final position. For the variable-speed controllers, the azimuth and elevation axes are operated at their current fast speed values.

Response

[addr]['R']

Note:

The command will be NAK'd under the following conditions:
1. The commanded position is out-of-range.
2. The controller is in local mode.
3. The Remote Lockout flag is set.
4. The controller is in test mode.
5. The inhibit input is enabled and active.
6. The antenna is already moving.

If the axis is not installed, its value is ignored.

Function 'S' 53 Move by Time - Uncorrected

Command

[addr]['S'][a][t...t] where a is the direction and axis select and t...t is the commanded run time formatted as follows:

byte 1: axis select
b6-b3: always 0110
b2: direction select (1 = up)
b1-b0: axis select where
00 = AZ
01 = EL
10 = F1
11 = F2

bytes 2-5: length of time to move the selected axis, in multiples of 4 ms.

Response [addr]['S']

In preparation for a subsequent Read Stop Time Command, the stopping distance is measured when the axis is stopped. This command is the same as the Move by Time command except that the controller does not measure the stopping distance. For the variable-speed controllers, the azimuth and elevation axes are operated at their current slow speed values.

Note: The command will be NAK'd under the following conditions:
1. The controller is in local mode.
2. The Remote Lockout flag is set.
3. The controller is in test mode.
4. The controller is in setup mode.
5. The inhibit input is enabled and active.
6. The antenna is already moving.

If the axis is not installed, its value is ignored.

Function 'T' 54 Read Stop Distance

Command [addr]['T'][a][u] Where a is the axis command as follows: 0 is AZ, 1 is EL, 2 is F1, 3 is F2. U is 1 for up, 0 for down.

Response [addr]['T'][rrdd] Returns the relay drop-out time, rr, and stopping distance, dd, each as two ASCII-encoded digits for the specified axis and direction, a. If the previous move command was not move axis - uncorrected (52) or move by time - uncorrected (53), values of zero are returned.

Note: The command will be NAK'd under the following conditions:
1. The controller is in test mode.
2. The controller is in setup mode.

Function 'U' 55 Set Axis Parameters

Command [addr]['U'][a][pp][s][dddd] Sets an axis parameter in non-volatile memory where a is the axis, pp is the parameter no., s is the size ('1'=bit, '8'=byte, '?'=word), and dddd is the parameter, always sent as four ASCII-encoded digits.
Refer to the **DESCRIPTION OF AXIS SETUP PARAMETERS.**

Response [addr]['U'] This command will be NAK'd if the controller is not in setup mode, or if an illegal combination of parameters is received. Also, this command will be NAK'd if the EEPROM write queue is full.

Function 'V' 56 Get Axis Parameters

Command [addr]['V'][a][pp] Gets the axis parameter pp.

Response [addr]['V'][a][pp][s][dddd] Returns the parameter formatted as in command 55 above. If the requested parameter number is reserved, but not yet defined, the length and data are returned as zero.

Function 'W' 57 Set General Parameters

Command [addr]['W'][pp][s][dddd] Sets a general parameter in non-volatile memory where pp is the parameter no., s is the size ('1'=bit, '8'=byte, '?'=word), and dddd is the parameter, always sent as four ASCII-encoded digits. Refer to the **DESCRIPTION OF GENERAL SETUP PARAMETERS.**

Response [addr]['W'] This command will be NAK'd if the controller is not in setup mode, or if an illegal combination of parameters is received. Also, this command will be NAK'd if the EEPROM write queue is full.

Function 'X' 58 Get General Parameters

Command [addr]['X'][pp] Gets the general parameter pp.

Response [addr]['X'][pp][s][dddd] Returns the parameter formatted as in command 57 above. If the requested parameter number is reserved, but not yet defined, the length and data are returned as zero.

Function 'Y' 59 Set Communications Parameters

Command [addr]['Y'][paddr][b] Sets the EEPROM Sabus address and baud rate where paddr is a standard SAbus address and b is the baud rate as follows:
0 - current value is unchanged
1 - 1200
2 - 2400
3 - 4800
4 - 9600
5 - 19200
6 - reserved
7 - reserved

Response [addr]['Y'] This command may be addressed to either device '0'or to the current SAbus address, and will be NAK'd if the controller is not in setup mode, or if an illegal combination of parameters is received. Also, this command will be NAK'd if the EEPROM write queue is full.

Caution: Address '0' should not be used unless the 8861/2/4 is the only device on the SAbus.

Note: **Changes made by this command will not take affect until the 8861/2/4 is restarted by cycling power, or by command 3F.**

Function 'Z' 5A Get Communications Parameters

Command [addr]['Z'] Gets the SAbus and baud rate.

Response [addr]['Z'][paddr][b] Returns the EEPROM Sabus address, paddr, and baud rate formatted as in command 59 above. This command may be addressed to either device '0' or to the current SAbus address.

Caution: Address '0' should not be used unless the 8861/2/4 is the only device on the SAbus.

Function '`' 60 Test Mode

Command [addr]['`']['8861'd]With d set to 1, places the controller in factory test mode. With d set to 0, returns the controller to normal operating mode.

Response [addr]['`'] This command will be NAK'd if the antenna is moving or if the controller is in setup mode.

Function 'a' 61 Test LEDs

Command [addr]['a'][ppp] Lights the front panel LEDs as follows:

byte 0:
b6-b4: always 011
b3: EL Down LED
b2: EL Up LED
b1: AZ Down LED
b0: AZ Up LED

byte 1:
b6-b4: always 011
b3: F2 Down LED
b2: F2 Up LED
b1: F1 Down LED
b0: F1 up LED

byte 2:
b6-b4: always 011
b3: reserved
b2: reserved
b1: FAULT LED
b0: COMM LED

Response [addr]['a'] This command will be NAK'd if the controller is not in test mode.

Function 'b' 62 Read Switches

Command [addr]['b'] Reads the front panel switches.

Response [addr]['b'][ppp]

byte 0:
b6-b4: always 011
b3: F2 Down Switch
b2: F2 Up Switch
b1: F1 Down Switch
b0: F1 Up Switch

byte 1:
b6-b4: always 011
b3: EL Down Switch
b2: EL Up Switch
b1: AZ Down Switch
b0: AZ Up Switch

byte 2:
b6-b5: always 10
b4: E-stop sense (if equipped)
b3: Auxiliary input 2 (if equipped)
b2: auxiliary input 1
b1: auxiliary input 0
b0: Local Switch

Function 'c' 63 Read Limit Switch Inputs

Command [addr]['c'] Reads the limit switch inputs.

Response [addr]['c'][ppp]

byte 0:
b6-b4: always 011
b3: EL Down Limit (NO)
b2: EL Down Limit (NC)
b1: EL Up Limit (NO)
b0: EL Up Limit (NC)

byte 1:
b6-b4: always 011
b3: AZ Down Limit (NO)
b2: AZ Down Limit (NC)
b1: AZ Up Limit (NO)
b0: AZ Up Limit (NC)

byte 2:
b6-b4: always 011
b3: F2 Down Limit (NO)
b2: F2 Down Limit (NC)
b1: F2 Up Limit (NO)
b0: F2 Up Limit (NC)

byte 3:
b6-b4: always 011
b3: F1 Down Limit (NO)
b2: F1 Down Limit (NC)
b1: F1 Up Limit (NO)
b0: F1 Up Limit (NC)

Note: This command disables the axis relays and will be NAK'd if the controller is not in test mode.

The appropriate relay driver for the axis and direction must be enabled using command 65 before the limit inputs may be read.

Function 'd' 64 Read Status Inputs

Command [addr]['d'] Reads the axis status inputs.

Response [addr]['d'][ppp]

byte 0:
b6-b4: always 011
b3: EL Drive Fault (8862/64 only)*

b2: AZ Drive Fault (8862/64 only)*
b1: F2 Status
b0: F1 Status

byte 1:
b6-b4: always 011
b3: EL Down Status
b2: EL Up Status
b1: AZ Down Status
b0: AZ Up Status

byte 2:
b6-b4: always 011
b3: F2 Overload trip
b2: F1 Overload trip
b1: EL Overload trip
b0: AZ Overload trip

* Drive Fault bits - in firmware version 2.4 ONLY:
0 = Fault, 1 = Normal
These bits will be corrected in V2.5.

Function 'e' 65 Test Relays/Drives

Command [addr]['e'][pppp] Tests the axis relays, where pppp is four bytes formatted as follows:

byte 0:
b6-b4: always 011
b3: EL Down Relay
b2: EL Up Relay
b1: AZ Down Relay
b0: AZ Up Relay

byte 1:
b6-b4: always 011
b3: F2 Down Relay
b2: F2 Up Relay
b1: F1 Down Relay
b0: F1 Up Relay

byte 2:
b6-b4: always 011
b3: Master enable
b2: Heater relay
b1: Aux Out 2 Relay
b0: Aux Out 1 Relay

byte 3:
b6-b4: always 011
b3: EL decel control
b2: AZ decel control
b1: VSD reset
b0: E-Stop control

Response [addr]['e']rr where rr is two bytes containing the command PAL output state, formatted as in bytes 0 and 1 above.

Note: This command will be NAK'd if the controller is not in test mode.

Note that the up and down outputs for each axis are hardware interlocked; that is, attempting to set the up output while the down output is already set will result in both outputs being cleared.

Function 'f' 66 Read Channel

Command [addr]['f'][dd] Reads the specified channel, dd, where dd ranges from 0 to 23 (17 hex) and is formatted as follows:

byte 0:
b6-b1: always 011000
b0: channel MS bit

byte 1:
b6-b4: always 011
b3: channel LS+3 bit
b2: channel LS+2 bit
b1: channel LS+1 bit
b0: channel LS bit

Channel numbers are defined as follows:

00	Azimuth resolver	0C	Temperature sensor
01	RDC test angle 1	0D	Azimuth speed signal
02	Elevation resolver	0E	Relay supply voltage
03	RDC test angle 2	0F	Elevation speed signal
04	Feed 1 resolver 10	ADC input - not used	
05	RDC test angle 3	11	ADC input - not used
06	Feed 2 resolver 12	ADC input - not used	
07	RDC test angle 4	13	ADC half-scale test
08	Feed 1 pot signal	14	ADC zero test
09	Feed 1 pot supply	15	ADC full scale test
0A	Feed 2 pot signal	16	not used
0B	Feed 2 pot supply	17	not used

Response [addr]['f'][x..x] Where x..x is the channel data formatted as follows:

bytes 1-4: angle data

The axis data is sent as a left-justified 16-bit integer. For example: 14adh --> 31h, 34h, 3ah,3dh.

The position value has no calibration factors applied and represent a 16-bit binary fraction of a circle (i.e. 360 degrees divided into 65536 parts). If the axis is not installed, its value is returned as zero.

Note: This command changes the internal channel scheduler and will be NAK'd if the controller is not in test mode.

Function 'g' 67 Test R/D Converter

Command [addr]['g'] Selects resolver mux channel T1R, and writes its previous value minus 90 counts to the R/D converter.

Response [addr]['g'][f] Waits one clock tick, reads the selected channel, and compares the reading to the previous value. If the difference between the two readings is within two RDC counts, f is returned as FALSE, 30h, otherwise it is returned as TRUE, 3fh.

Note: This command changes the internal channel scheduler and will be NAK'd if the controller is not in test mode.

Function 'h' 68 Test Reference Frequency

Command [addr]['h'] Measures the period of the 7500 Hz resolver reference.

Response [addr]['h'][dddd] Returns the period of the signal in internal timer units.

Function 'i' 69 Test PWM Outputs

Command [addr]['i'[aa][ee] Sets the azimuth and elevation speed reference outputs to aa and ee respectively, where aa and ee are formatted as 8-bit integers representing the percentage of base motor frequency (100 % = 50 Hz, for a 50 Hz system). For example: 14h --> 31h, 34h.

Response [addr]['i']

Function 'j' 6A Reserved

reserved for internal use.

Function 'k' 6B Initialize EEPROM

Command [addr]['k']['8861'] Initializes the contents of the internal EEPROM to a default (factory) state then resets the controller. Further communication is inhibited until the initialization and reset is complete.

Response none (unless NAK'd)

This command will be NAK'd if the controller is not in test mode.

Caution: This command causes all setup parameters to be lost.

Function 'j' 6C Reserved
Function 'k' 6D Reserved
Function 'l' 6E Reserved

reserved for internal use.

Function 'o' 6F Test COP Timer

Command [addr]['o']['8861]

Response None

Comment — If the COP timer has been enabled and is operating properly, this command forces a timeout followed by a restart. This command is the same as command 3F, Restart Controller.

Function 'p' 70 Reserved for 8860 Passthru Mode

reserved for exclusive use by 8860.

Function '~' 7E Comm Status Query

Command — [addr]['~'][d]

Response — [addr]['~'][n...n] Where n...n is the number of errors, reported as a left-justified unsigned 16-bit integer.

This query returns the number of communication errors since the counter was last reset. With d set to 1, the counter is reset.

DESCRIPTION OF AXIS SETUP PARAMETERS

In the descriptions that follow, the default values are shown in the form [1, 2, 3, 4] where the values refer to the azimuth, elevation, feed 1, and feed 2 axes respectively. Unless noted otherwise, all binary parameters are positive logic (0 = FALSE, 1 = TRUE).

parameter	description	size	default
00h	**axis installed**	**bit**	**[1,1,0,0]**
	This parameter indicates that the axis hardware is present on the antenna. For example a system with only one motorized feed will have the feed 2 installed parameter set to 0.		
01h	**axis calibrated**	**bit**	**[0,0,0,0]**
	This parameter is not currently used by the controller.		
02h	**axis data pot**	**bit**	**[0,0,1,1]**
	This parameter indicates that the axis position transducer is a potentiometer instead of a resolver. This parameter is only valid for feed 1 and feed 2.		
03h	**alternate dir**	**bit**	**[0,0,0,0]**
	This parameter is used to correct for a transducer indicating backwards rotation. Note that setting this parameter does not correct for backward motor rotation or swapped limit switches as these items are hardwired.		
04h	**axis trip mask**	**bit**	**[0,0,0,0]**
	This parameter is set to mask the overload trip input for an axis whose overload device is not equipped with an auxiliary contact. Note that setting this bit does not prevent the device from tripping.		
05h	**axis fault mask**	**bit**	**[0,0,0,0]**
	This parameter is not currently implemented.		
06h	**soft limit pos up**	**word**	**0xffff [all]**
07h	**soft limit pos down**	**word**	**0 [all]**
	These limits may be set to restrict motion of the antenna to a specified range. They should not be used to prevent the antenna from hitting an obstruction - the mechanical limits must be adjusted for this purpose.		
08h	**hard limit pos up**	**word**	**0xffff [all]**
09h	**hard limit pos down**	**word**	**[0,0,0,0]**
	These parameters indicate the positions to which the physical limit switches are adjusted.		
0ah	**axis offset**	**word**	**[0,0,0,0]**
0bh	**axis scale numerator**	**word**	**0x4000 [all]**
0ch	**axis scale denominator**	**word**	**0x4000 [all]**
	These parameters are used to scale the position transducer reading to the correct value. The scaling is in the form:		
	Y = X * (numerator/denominator) + offset		

parameter	description	size	default

The numerator and denominator are not used for azimuth and elevation as these transducers are always directly coupled to the mount pivots with no gearing, ie. 90☜ mechanical rotation results in 90☜ electrical travel.

0dh **axis position report differential** **byte** **0x02 [all]**
This parameter controls position change reporting - a change in position larger than this parameter causes the status change flag to be set.

0eh **axis minimum slew distance** **word** **0x0008 [all]**
This parameter determines the minimum coarse move that may be made. If the difference between commanded and present position is less than this parameter, the coarse move is skipped, otherwise the coarse move takes place. The correct value for this parameter is dependent on antenna speed.

0fh **axis minimum peak distance** **word** **0x0004 [all]**
This parameter determines the minimum fine move that may be made. If the difference between commanded and present position is less than this parameter, the axis is backed out during the coarse move. The correct value for this parameter is dependent on antenna speed.

10h **axis minimum move distance** **word** **0x0002 [all]**
This parameter determines the minimum move distance. If the difference between commanded and present position is less than this parameter, the move for this axis is not performed.

11h **axis checkpoint position** **word** **4 [all]**
12h **axis checkpoint time** **byte** **4 [all] (>V1.2)**
Periodically, during antenna motion, each axis position is checked to see if it is actually changing. The time parameter determines how often the position is checked, in 250 ms increments. The position parameter determines the minimum change, in position (in converter counts) required for normal operation. If the change in position is less than this parameter, it is reported as a motion fault and indicates a possible stuck actuator or motor failure. The direction of motion is also checked and, if reversed, is reported as a backward operation fault. The correct values for these parameters are dependent on antenna speed.

13h **axis minimum speed** **byte** **[10]**
14h **axis maximum speed** **byte** **[200]**
These parameters specify the minimum and maximum speed for the axis and represent the percentage of base motor frequency (e.g. 200 % = 100 Hz, for a 50 Hz system). They are only applicable for the variable-speed controllers (8862/64).

15h **checkpoint enable** **bit** **[1,1,1,1]**
This parameter, if set to 1, enables the checkpoint feature as described above.

16 **retry pulse width** **byte** **0 [all]**
This parameter determines the on time, in 4 ms clock ticks for a position retry pulse. This number represents the time that the contactors are driven on and does not include the contactor release time.

parameter	description	size	default
17	**retry maximum count**	**byte**	**0 [all]**
	This parameter determines the maximum number of position retrys that will be made. Setting this paramter to zero prevents any position retrys from being made.		
18h-1fh	**reserved**		
20h-27h	**axis stop distance up**	**byte**	
28h-2fh	**axis stop distance down**	**byte**	
	These parameters are used to correct for overtravel when stopping the antenna at the desired position.		
30h-37h	**axis speed up**	**byte**	
38h-3fh	**axis speed down**	**byte**	
	These parameters are not currently implemented.		

C. DESCRIPTION OF GENERAL SETUP PARAMETERS

parameter	description	size	default
00h	**EEPROM configuration number**	**word**	**0x0002**
	This parameter reports the version number of the internal EEPROM data structure and is read only. It is intended to be used to prevent incompatibility between different version of firmware and test/calibration software.		
01h	**special power mode**	**bit**	**0**
	Setting this parameter to 1 forces sequential operation of the axes during the coarse move cycle. This mode of operation is used for special applications where the available input power is limited.		
02h	**variable speed mode**	**bit**	**0 (8862/64 only)**
	Setting this parameter to 1 indicates that variable-speed control is available for the azimuth and elevation axes.		
03h	**temp fault mask**	**bit**	**0**
	Setting this parameter to 1 causes the controller to mask enclosure low and high temperature alarms.		
04h	**summary fault output enable**	**bit**	**0**
	Setting this parameter to 1 designates auxiliary output 0 as a summary fault output function. Otherwise this output may be turned on or off via command 3C.		
05h	**antenna moving output enable**	**bit**	**0**
	Setting this parameter to 1 designates auxiliary output 1 as an antenna motion output function. Otherwise this output may be turned on or off via command 3C.		
06h	**external fault input enable**	**bit**	**0**
	Setting this parameter to 1 designates auxiliary input 0 as an external fault input.		
07h	**inhibit motion input enable**	**bit**	**0**
	Setting this parameter to 1 designates auxiliary input 1 as a motion inhibit input.		
08h	**communication watchdog enable**	**bit**	**1**
	Setting this parameter to 1 causes remote-commanded antenna motion to be stopped in the event that communication with the host device is lost (Approx. 1 sec. timeout).		
09h	**temperature control enable**	**bit**	**1**
	Setting this parameter to 1 enables enclosure temperature control.		
0ah	**temp scale numerator**	**word**	**0x01f0**
0bh	**temp scale denominator**	**word**	**0xfde8**
0ch	**temperature offset**	**word**	**0xfef5**
	These parameters are used to scale the enclosure temperature sensor reading to the correct value in degrees Celsius. The scaling is in the form:		

parameter	description	size	default
	Y = X * (numerator/denominator) + offset		
0dh	**temperature setpoint** This parameter determines the temperature at which the heater (8861/62) or fan (8864) is turned on.	**word**	**0**
0eh	**temperature lower limit**	**word**	**0xffd8**
0fh	**temperature upper limit** These parameters determine the limits for enclosure temperature fault reporting.	**word**	**0x0041**
10h	**southern hemisphere flag** Setting this parameter to 1 allows the controller to properly handle the azimuth position discontinuity (359.99 -> 0.00 deg.) in the southern hemisphere.	**bit**	**0 (V1.2)**
11h	**high resolution AZ, EL** Setting this parameter to 1 indicates that the installation is equipped with 1X-4X coarse/fine resolvers for improved position accuracy (8864). In this configuration, the F1 and F2 resolver inputs are used for the AZ and EL fine inputs respectively.	**bit**	**0 (8864 only)**
12h	**fan cooling mode** Setting this parameter to 1 causes the temperature control logic to be reversed, turning on the heater/fan relay when the temperature exceeds the setpoint.	**bit**	**0 (8864 only)**
13h	**e-stop mask (for V1.0 H/W)** This parameter is set to 1 to indicate that the controller is not equipped with an emergency stop relay.	**bit**	**1 (8861 only)**

Function 'K' 4B Get Axis Statistics

Command [addr]['K'][a] Where a is the axis('0'-'3').

Response [addr]['K'][m][s][g] Where m is the number of commanded moves since power-on, s is the number of axis starts since power-on, and g is the number of position glitches (bad readings) since power-on. Note that a Move All Axes command (#37) may result in two commanded moves for each affected axis.

The m, s, and g fields are sent as left-justified unsigned 16-bit integers, each encoded as four ascii-hex digits. For example: 14adh --> 31h, 34h, 3ah,3dh.

Function 'L' 4C Setup Position Analyzer

Command [addr]['L'][m][a][f][ss] Where m is the change mask ('0' or '1'), and a is the axis to be monitored ('0'-'3'). The ss field is the number of samples to skip during monitoring, encoded as 2 ascii-hex digits. The f field is a single byte formatted as follows:

b6-b3: 0110	
b2:	circular buffer mode flag
b1:	automatic start/stop mode flag
b0:	position analyzer enable flag

Response [addr]['L'][a][f][ss] Where a, f, amd ss are formatted as above.

Function 'M' 4D Get Position Analyzer Status

Command [addr]['M']

Response [addr]['M'][f][i][c][s] Where f is the active flag ('0' or '1'), i is the current buffer index, c is the number of samples collected, and s is the buffer position where axis motion stopped.

The i, c, and s fields are sent as left-justified unsigned 16-bit integers, each encoded as four ascii-hex digits. For example: 14adh --> 31h, 34h, 3ah,3dh.

Function 'N' 4E Get Next Position Data Record

Command [addr]['N'][s] Where s is the buffer selector:

'0' = averaged position data (default)
'1' = raw position data
'2' = time stamp data

Response [addr]['N'][i][d..d] Where i is the buffer index for the first data value and d..d is the next eight data values.

The index and data values are sent as left-justified unsigned 16-bit integers, encoded as four ascii-hex digits. For example: 14adh --> 31h, 34h, 3ah,3dh.

Function	**'O'**	**4F**	**Set/Get Position Data Index**

Command [addr]['O'][f][i] Where f is the new index flag and i is the new buffer index. With f set to 1, if i is in range the buffer index is changed to i, otherwise, the buffer index is set to zero.

Response [addr]['O'][i] Where i is the buffer index.

The index is sent as a left-justified unsigned 16-bit integer, encoded as four ascii-hex digits. For example: 14adh --> 31h, 34h, 3ah,3dh.

Appendix C

Polyspede Variable Speed Drives

The 8862 Antenna Position Controller uses variable speed drives, or inverters, to supply variable frequency AC power to the azimuth and elevation motors. In units manufactured prior to 1996, the antenna controller used the Polyspede XLT-3 series for all two, five, and ten (8864 only) variable speed drives. The XLT-3 had a larger body than the later models and a simpler programming procedure. Internally, the drive used power Darlington pair transistors for the output stage.

The variable speed drive functions as an electric power inverter. It has a three-phase rectifier on the input that converts the incoming power to high voltage DC. On the output, it has a computer controlled three-phase switching bridge that converts the DC power into AC power of the desired frequency. Electrical engineers call an electric power device that converts DC power to AC power an inverter. The switching sequence on the output sets the operating frequency of the output. The device may have an actual switching frequency much higher that the line frequency to reduce electrical noise (the higher frequency filters out easier). An inverter has variable speed control of an AC motor as a secondary effect. The inverters used for motor control have features optimized for this function.

After 1996, the Polyspede PSV-1 drive was used for two and five horsepower units only. In 1997, Polyspede introduced a variation of the PSV-1 drive with the designation PSV-1-U2. The PSV-1-U2 has a very different programming procedure from the previous drives. Because of this complexity, please refer the PSV-1-U2 manual for programming information.

Hitachi manufactures these variable speed drives and Polyspede markets them under their name. Hitachi also markets these drives though other sources in the Unites States under the model number J100.

The next pages give the programming instructions for the XLT-3 and PSV-1 variable speed drives. Units shipped with the XLT-3 drives for several years so, many of these units still remain in the field. Units shipped after 1995 will have the PSV-1 drives. Stock of the XLT-3 drives no longer exists, so any failed unit requires replacement with a PSV-1 drive. An adapter kit for this replacement task is available. Because the high operating frequency of the PSV-1 interferes with the XLT-3, replace both drives if one drive fails. Polyspede can repair some failures in XLT-3 drives and return them to service.

Because many units in the field have the XLT-3 drives, the chart below gives the programming for that family of drives.

Function	Parameter	Model 8862 208 V, 60 Hz	Model 8862 380/415 V, 50 Hz	Model 8864 380/415 V, 50 Hz	Notes
00	VFE	VFG-VC	VFG-VC	VFG-VC	
01	ACCEL-1	8	8	8	(1)
02	DECEL-1	3	3	3	(1)
03	Fmax	0	0	0	
04	Fmin	1	1	1	
05	H-LIM-F	120	120	120	
06	L-LIM-F	1	1	1	
07	JUMP-F1	0	0	0	N/A
08	JUMP-F2	0	0	0	N/A
09	JUMP-F3	0	0	0	N/A
10	CF	(N)	(N)	(N)	
11	Fstop-T	0	0	0	(1)
12	Speed-1	0	0	0	
13	Speed-2	90	75	75	
14	Speed-3	6	5	5	
18	ACCEL-2	1	1	1	(1)
19	DECEL-2	0.5	0.5	0.5	(1)
20	F-DCB	1	1	1	
21	V-DCB	20	20	20	
22	T-DCB	0.1	0.1	0.1	
23	E-therm	100	100	100	
24	ACCLine	Linear	Linear	Linear	
25	DECLine	Linear	Linear	Linear	
26	F-START	0	0	0	
27	F-END	120	120	120	
28	SWITCH1	00000111	00000111	00000111	
30	LM.CONS	4	4	4	
31	OLalarm	110	110	110	(1)
32	V-auto	0	0	0	(1)
33	IPS-T	1	1	1	
36	IPS-RT	1	1	1	

Function	Parameter	Model 8862 208 V, 60 Hz	Model 8862 380/415 V, 50 Hz	Model 8864 380/415 V, 50 Hz	Notes
MONITOR SETTINGS					
03	F-SET-M	Terminal	Terminal	Terminal	
04	F/R-SW	Terminal	Terminal	Terminal	
07	V-Boost	28	28	28	(1)
Notes: (1)Parameters may need adjustment in the field for antenna or site specific requirements.					

The PSV-1 variable speed drive has a completely different programming scheme, as shown below. The PSV-1 also has a limited-function operator keypad used during normal operation. The user cannot access all of the parameters below with the local keypad and must attach a remote keypad to fully program the drive. The operator must remove the remote keypad during normal operation. The operator can change some parameters accessible to the local keypad, but then cannot change them back without using the remote keypad.

Monitor	Parameter	Model 8862 208 V, 60 Hz	Model 8862 380/415 V, 50 Hz	Notes
2	Accel-1	8.0 sec	8.0 sec	(1)
3	Accel-2	3.0 sec	3.0 sec	(1)
4	Decel-1	1.0 sec	1.0 sec	(1)
5	Decel-2	0.5 sec	0.5 sec	(1)
6	F-Set-M	Terminal	Terminal	
7	F/R-SW	Terminal	Terminal	
11	V-Boost	28	28	
Function				
00	Control V/F	VF-VC 060-120	VF-VC 050-100	
01	+Fmax	0.0 Hz	0.0 Hz	
02	Fmin	0.5 Hz	0.5 Hz	
03	H-LIM-F	0.0 Hz	0.0 Hz	
04	L-LIM-F	0.0 Hz	0.0 Hz	
05	Speed-1	12.0 Hz	12.0 Hz	
06	Speed-2	12.0 Hz	12.0 Hz	
07	Speed-3	40.0 Hz	40.0 Hz	
08	Speed-4	0.0 Hz	0.0 Hz	

Monitor	Parameter	Model 8862 208 V, 60 Hz	Model 8862 380/415 V, 50 Hz	Notes
09	Speed-5	0.0 Hz	0.0 Hz	
10	Speed-6	0.0 Hz	0.0 Hz	
11	Speed-7	0.0 Hz	0.0 Hz	
12	F-DCB	0.5 Hz	0.5 Hz	
13	V-DCB	010	010	
14	T-DCB	1.0 sec	1.0 sec	
15	E-therm	120%	120%	
16	ACCLine	Linear	Linear	
17	DECLine	Linear	Linear	
18	F-Start	0.0 Hz	0.0 Hz	
19	F-End	90 Hz	75 Hz	
20	SWITCH1	Factory Default	Factory Defaut	
21	SWITCH2	AIN 10V	AIN 10V	
22	SWITCH3	TLOK OFF	TLOK OFF	
23	SWTICH4	TER6 Run	TER6 Run	
24	SWITCH5	Factory Default	Factory Default	
25	LM.CONS	150% 01.0	150% 01.0	
26	IPS-T	1.0 sec	1.0 sec	
27	IPS-R-T	10.0 sec	10.0 sec	
28	BRD-%ED	5.0%	5.0%	
29	SPD-ARV	ACC 100%	ACC 100%	
30	CARRIER	16 kHz	16 kHz	
31	V-SET	200 V	400 V	
32	DEC-V	200 V	400 V	
33	APLACT	00	22	

Notes:

(1) Parameters may need adjustment in the field for antenna or site specific requirements.

(2) Functions 20 through 24 (SWITCH1 through SWITCH5) have submenus beneath them. Only change the values shown. Do not change any value in any submenu of functions 20 through 24.

(3) Verify the setting of Function 33 according to the VSD rating. This value executes a block reprogram function. When changes, it will change many different parameters.

(4) Avoid making changes from the local digital operator. Changes made on this keypad will override some changes that require the remote keypad to restore. See the Polyspede manual for additional information.

(5) Shorting FW and RV to CM1 erase the programming and returns the drive to factory default settings.

The PSV-1-U2 uses the same basic programming scheme as the PSV-1. However, some of the definitions of switch settings and the block reprogram function have changes. The PSV-1-U2 also includes a complex method for accessing all parameters from the local keypad. Refer to the Polyspede manual for more information about programming this drive.

Appendix D

Mitsubishi Variable Speed Drives

Variable Speed Drives (VSDs) are used to control the speed of the motors on the Viasat limited motion antennae. They are located within the 8862 Antenna Position Controller (APC) and are sometimes referred to as 'inverters'. There are three different types of 8862 APCs that support three different motor horsepower ratings: 2hp, 5hp and 10hp. All the 8862 units use Mitsubishi inverters. The 2hp unit is a Mitsubishi Model FR-E520-1.5k inverter and the 5hp unit is a FR-E520-3.7k inverter.

The ten horsepower version of the 8862/8864 uses the Mitsubishi A200E variable speed drive. This drive has the same inputs and outputs as the Polyspede family of variable speed drives. When programming it, the operator should configure it with the same first and second acceleration and deceleration settings as those used on the Polyspede drives. However, the A200E has many more features and a different programming scheme. Please refer to the manual that comes with the Mitsubishi A200E for more information.

The 8862 Antenna Position Controllers shipped since 1995 and before the termination of the product also use the Mitsubishi A200E variable speed drive.

All of the Mitsubishi inverters (as well as older Polyspede units) require unique programming before they can be used in the 8862 APC. All necessary programming is performed in the factory before the unit is shipped. Only in very unique and rare situations will the programming change after the unit is installed. Note that these units have non-volatile memory so even if power is removed, they will retain the programmed settings. In the event that a failure occurs to a VSD after the 8862 has been installed, the replacement will have to be programmed before it can be used. The 8862 will not function correctly with the factory default programming from Mitsubishi. Once the replacement inverter is installed, it can be powered-up and programmed.

Viasat provides optional spares kits for the 8862 APC. There are unique kits to the 2hp, 5hp and 10hp 8862 APCs. A special keypad (parameter unit) is provided in the kit (along with a VSD, pwbs, etc) for programming the inverter. On the inside of the enclosure door, there is a label defining the specific parameters that were programmed at the Viasat factory. The following pages provide instructions on using the keypad to read and write values to the parameters in the VSD.

Reading VSD Parameters

1) Disable power to 8862.

2) Remove top cover on inverter.

3) Plug RJ-45 connector from Parameter Unit into mating connector on inverter.

4) Enable power to 8862. After power-up sequence is complete, you'll hear main A/C contactor energize.

5) Parameter Unit will power up and the display will show **0.00Hz** and **Stop Ext**.

6) Press **Green PU** button on keypad of Parameter Unit. Display should show **Directly** and **Set 0.00Hz**.

7) To read a parameter value: press **Set**, enter the parameter **number** followed by pressing the **Read** button.

8) After reading all desired parameter values, press the **Mon** button. Display should show **0.00Hz** and **Stop PU**.

9) Press Ext button. Display should show **0.00Hz** and **Stop Ext**.

10) Disable power to 8862, remove cable from inverter and enable power to 8862.

Writing VSD Parameters

1) Disable power to the 8862.

2) Remove top cover on inverter.

3) Plug RJ-45 connector from Parameter Unit into mating connector on inverter.

4) Enable power to 8862.

5) Parameter Unit will power up and the display will show **0.00Hz** and **Stop Ext**.

6) Press **Green PU** button on keypad of Parameter Unit. Display should show **Directly** and **Set 0.00Hz**.

7) Press **Set**, enter parameter **77** followed by pressing the **Read** button. Change this parameter to a **0** and press **Write**. This puts the Parameter unit in **Write** mode. Enter the desired parameter and new value followed by pressing the **Write** button. When finished, re-enter parameter **77** and set value to a **1** to return to **Read** mode.

8) After writing all desired parameter values, press the **Mon** button. Display should show **0.00Hz** and **Stop PU**.

9) Press **Ext** button. Display should show **0.00Hz** and **Stop Ext**.

10) Disable power to the 8862, remove cable from inverter and enable power to 8862.

Blank