Installation and Operation Instructions

Before attempting to connect or operate this product, please read these instructions completely.

QPT-50ICMS Universal Positioner

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1.0 INTRODUCTION

1.1 PURPOSE OF THIS MANUAL

The purpose of the Installation & Operation Manual is to provide a resource for users to gain knowledge in the installation & operation of the Moog QPT-50 ICMS Universal Positioner.

CAUTION	**READ THIS MANUAL COMPLETELY BEFORE CONNECTING POWER TO THE PAN & TILT UNIT. INJURY TO PERSONS, DAMAGE TO THE PAN & TILT UNIT, OR DAMAGE TO ITS ASSOCIATED EQUIPMENT, CAN OCCUR IF THE UNIT IS NOT PROPERLY OPERATED OR MAINTAINED!**

1.2 MANUAL CONTENTS

The Product Installation & Operation Manual contains the following chapters:

Chapter 1.0 Introduction
Chapter 2.0 General Information
Chapter 3.0 Unit Installation
Chapter 4.0 Unit Setup & Adjustment Procedures
Chapter 5.0 Maintenance & Repair
Chapter 6.0 General Troubleshooting
Appendix A Glossary of Terms
Appendix B Drawings
Appendix C Schematics
Appendix D IP / Serial Connection & Settings

1.3 PURPOSE OF EQUIPMENT

The purpose of the Moog QPT-50 ICMS Universal Positioner (referred to from this point forward as the Pan & Tilt Unit) is to remotely position a suitable payload (i.e., closed circuit television camera system, etc.), to any degree of azimuth and elevation. Models are available with electrical slip rings for continuous rotation applications, as well as limited rotation (435º of total rotation) where continuous rotation is not required. All models feature 180º of total tilt elevation, ±90° above or below the horizon.

Remote control for this unit is possible using the Remote Control Emulator Graphic User Interface (GUI) Software to control the Pan Axis, Tilt Axis, and various camera and lens functions. (See the Emulator/GUI software supplied with this unit.) A protocol manual is included for user designed applications.

1.4 SAFETY

The following safety recommendations do not supersede or replace any customer's in-house safety regulations or established practices. Its purpose is to remind users that care must be taken whenever working with or on the Moog QPT-50 ICMS Universal Positioner.

Product users can be exposed to serious personal injuries if safe operating practices are not observed. Your knowledge of this equipment could prevent an accident which otherwise might happen. Always ask supervisory personnel if there are any specific safety precautions you should follow before operating a Pan & Tilt Unit for the first time.

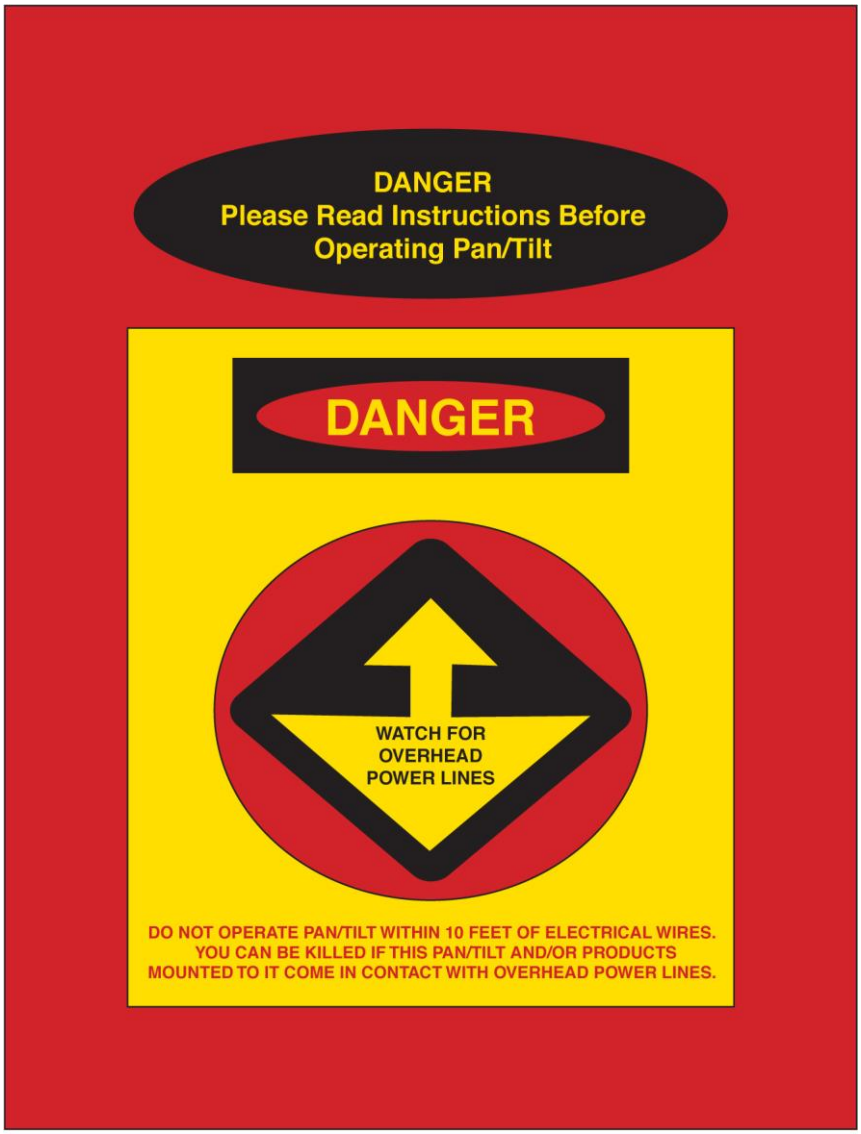


Figure 1: Overhead Power Line Warning

1.4 SAFETY (CONT)

Always follow these basic safety recommendations:

- Only authorized personnel familiar with operation should operate or maintain the Pan & Tilt Units.
- You should read and thoroughly understand the basic procedures for operating this unit and its software. Read this manual completely before operating the unit or its software.
- Make sure all access covers are in place and secured while the unit is operating. If you observe any covers not in place, inform supervisory personnel so the problem can be corrected.
- Stop the unit completely and remove powerbefore removing foreign objects that are near or obstructing the unit.
- Read, become familiar with, and follow the safety decals affixed to the unit.

Figure 2: Typical Pan & Tilt Unit Safety Decals

(Most units will contain some of the above or similar decals.)

2.0 GENERAL INFORMATION

2.1 DESCRIPTION OF EQUIPMENT

2.1.1 PAN & TILT DESCRIPTION

The Pan & Tilt Unit is constructed of aluminum with stainless steel hardware. Based on model, the outside dimensions vary between approximately 12.5" to 13" in height, (317.5mm to 330mm), 8.5" (216mm) deep, and 11.7" to 12.8" (297mm to 325mm) wide. The weight of the unit (minus payload) varies between approximately 32 lbs. and 35 lbs. (14.5 kg and 15.9 kg), depending on model.

The Pan & Tilt Housing (with Access Covers to provide access to the interior) encloses the Pan & Tilt Motors, Gear Drive Assemblies, Limit Rings (hard stops), position feedback encoders, and Control Circuit Boards.

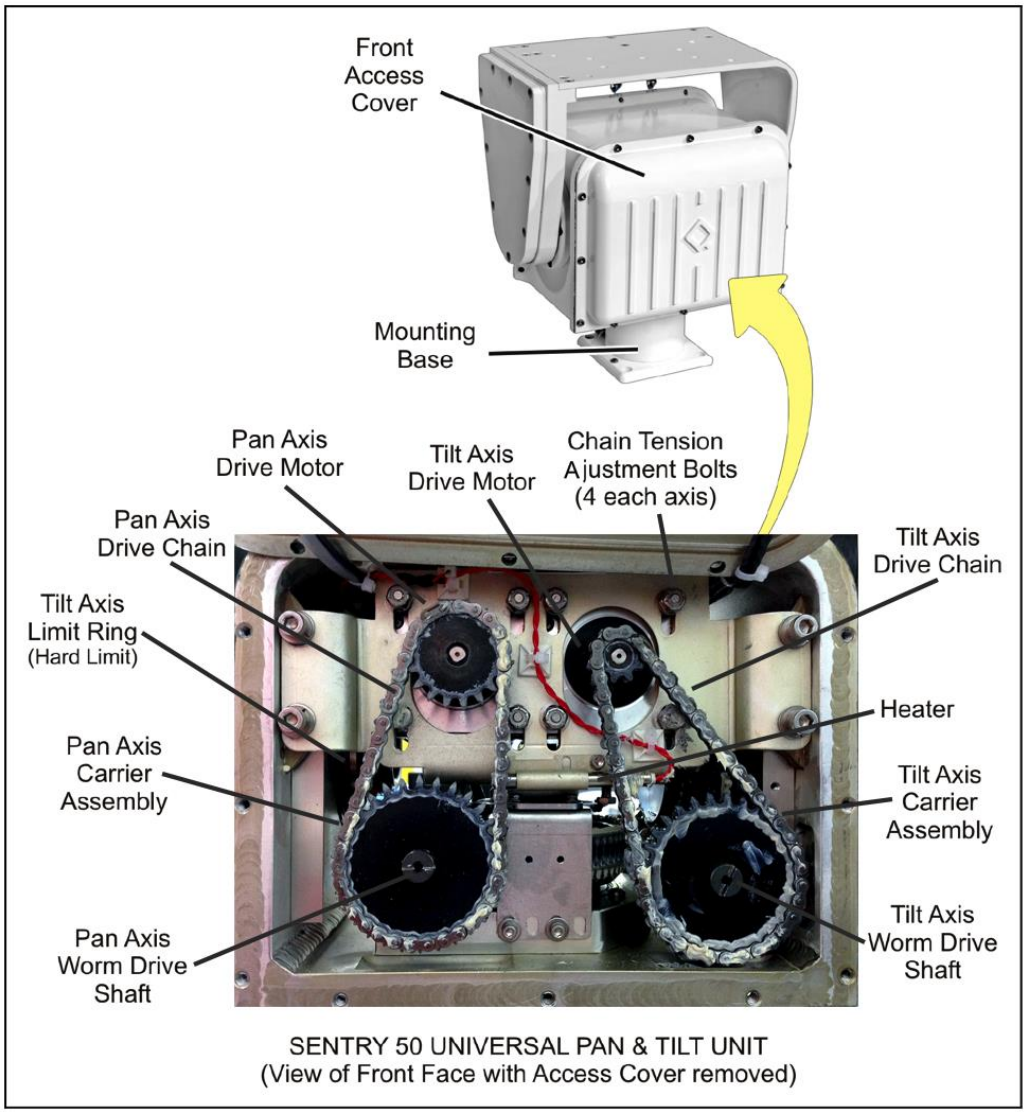


Figure 3: Pan & Tilt Unit Major Components – Front Face

2.1 DESCRIPTION OF EQUIPMENT (CONT)

2.1.1 PAN & TILT DESCRIPTION (CONT)

Power and control signal wiring enters the unit through a watertight connector (Base Connector) in the mounting base at the bottom of the unit. The Pan & Tilt Housing and Access Cover mating surfaces are sealed using O-rings to provide environmental protection. The Control Circuit Boards provide position control, camera control, and lens control.

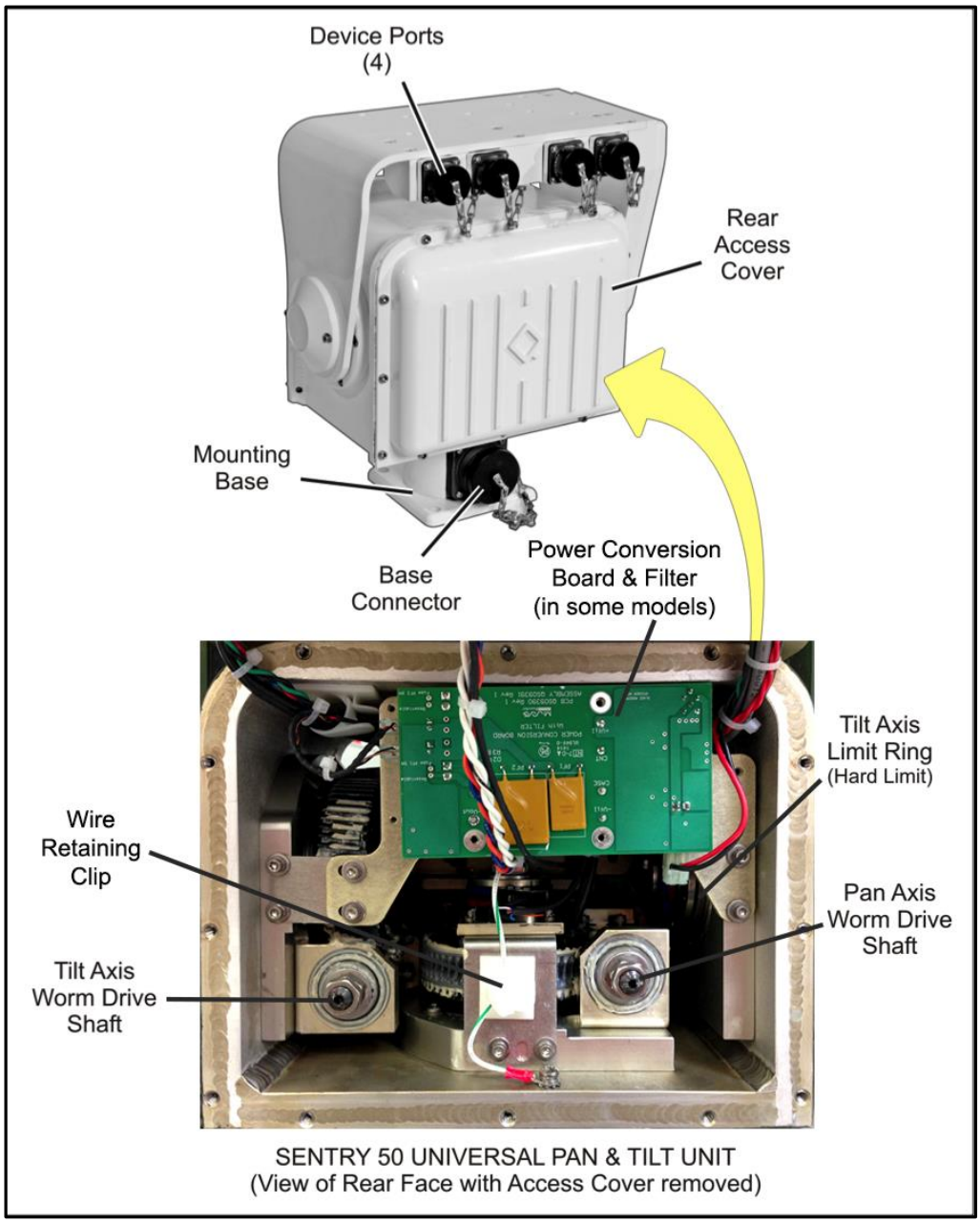


Figure 4: Pan & Tilt Unit Major Components – Rear Face

2.1 DESCRIPTION OF EQUIPMENT (CONT)

2.1.2 SYSTEM DESCRIPTION

The electronics in this positioner utilizes a “Distributed Architecture”. The electronics are divided into several separate modules. This allows locating them near the hardware to be controlled. The following modules are included:

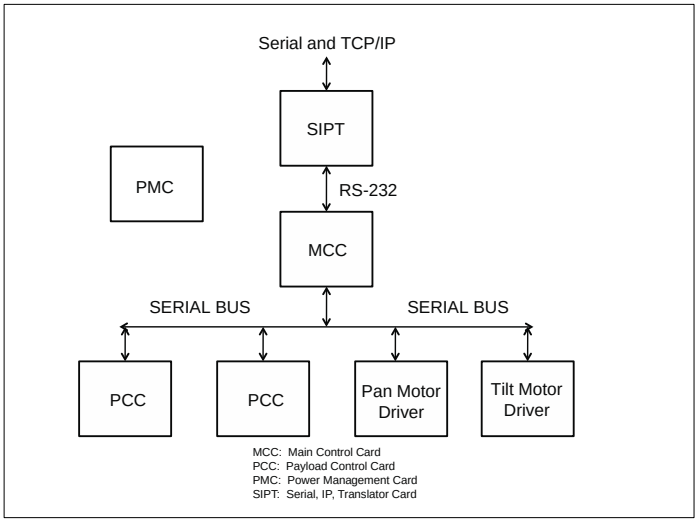
SIPT: Serial, IP, Translator Card
The SIPT (QS09100) handles serial and IP communications and performs data translation such as Pelco-D protocol. It connects to the MCC board.

MCC: Main Control Card
The MCC (QS09302) is the master or main control card for the system. It routes commands to other boards, such as the PCCs and the motor drivers. The MCC outputs messages to the system via a serial bus. The MCC protocols include: PTCR-96 and Pelco-D.

PCC: Payload Control Card (in some models)
The PCC (QS09317) is designed to interface with a variety of different payloads. The system allows control of 2 serial devices. This requires a PCC card for each payload and has analog drivers for most zoom, focus, and iris lenses. The PCC also has an on-board OSD (On Screen Display) which can be activated via the PTCR-96 protocol.

Motor Drivers:
There are two motor driver modules (QS09312) in each system: one for pan and one for tilt. The motor drivers control motor motion, and also store presets locally.

PMC: Power Management Card
The PMC (QS09304) is a power distribution card. It also performs transient and voltage protection. Some unitsoperate from a 70 vdc supply. If the unit operates from 70 vdc, there is aDC to DC converter board (QS09391) that converts the 70 v to 24 vdc (see Figure 4). Other units operate from a 24 vdc source. Refer to your model schematic and description.



DRIVE SYSTEM

The drive system consists of:

- Two 23 frame stepper motors, each driven by a micro step motor driver.
- Thesystem uses ball bearings, thrust bearings, worm drive, and drive chains.
- The stepper motor drive circuits divide each step of the motor into micro-steps, providing for very fine motion control. The QuickShift® technology introduces an additional division of speed, changing the speed range for pan and tilt independently. This allows a very wide dynamic range of speeds from fast to extremely slow movements.

COMMUNICATIONS & CONTROL BOARDS

All communication to the Positioner is through the SIPT module (Serial, IP, Translator Card)

The SIPT (QS09100) handles serial and IP communications and performs data translation such as Pelco-D protocol. It connects to the MCC board (Main Control Card).

The MCC (Main Control Card, QS09302) is the master or main control card for the system. It routes commands to other boards, such as the PCCs and the Motor Drivers. The MCC outputs messages to the system via a serial bus. The MCC protocols include: PTCR-96 and Pelco-D.

The MCC (Main Control Card, QS09302) and the SIPT (QS09100) are attached to the inside of the front cover, and can be accessed by removing the front cover (Figure 7). Also, the two motor drivers (QS09312) and thepower distribution board (QS09304) are attached to the rear cover Figure 8).CAUTION: When opening the rear cover, UN-HOOK the wire bundle from the wire retaining clip shown in Figure 4, 5, & 6.Connect wire bundle to the clip before closing the Rear Cover.

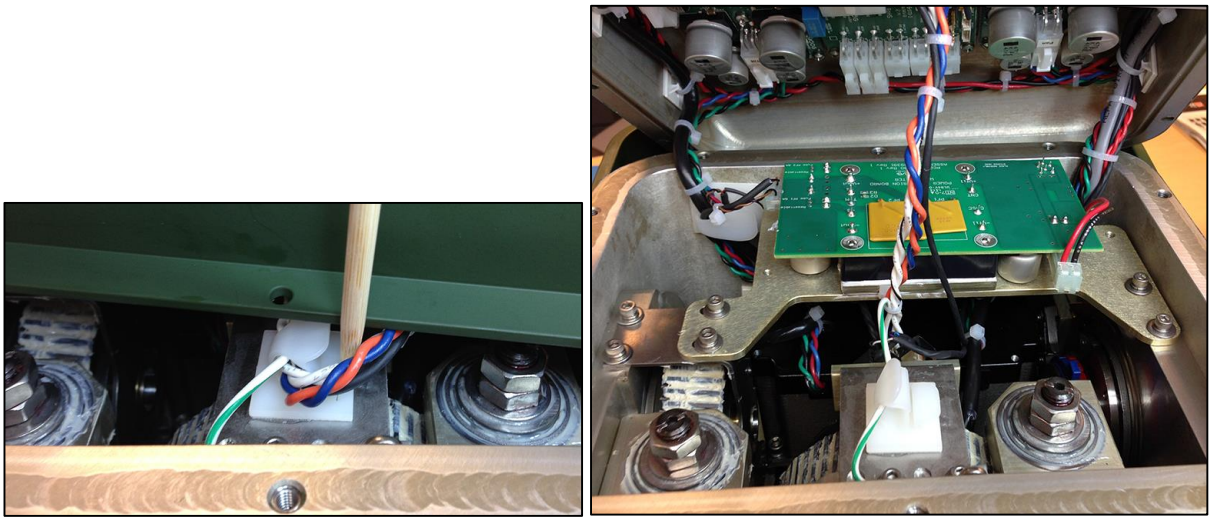


Figure 5 & 6: Rear Cover– Wire Retaining Clip

The Pan & Tilt Unit is connected to a DC power supply providing power to the MCC to control the two (2) Stepper Motors and Motor Drivers (1 each for Pan & Tilt axis of motion). Control communication is processed on the control circuit board providing control and status information on the buss.

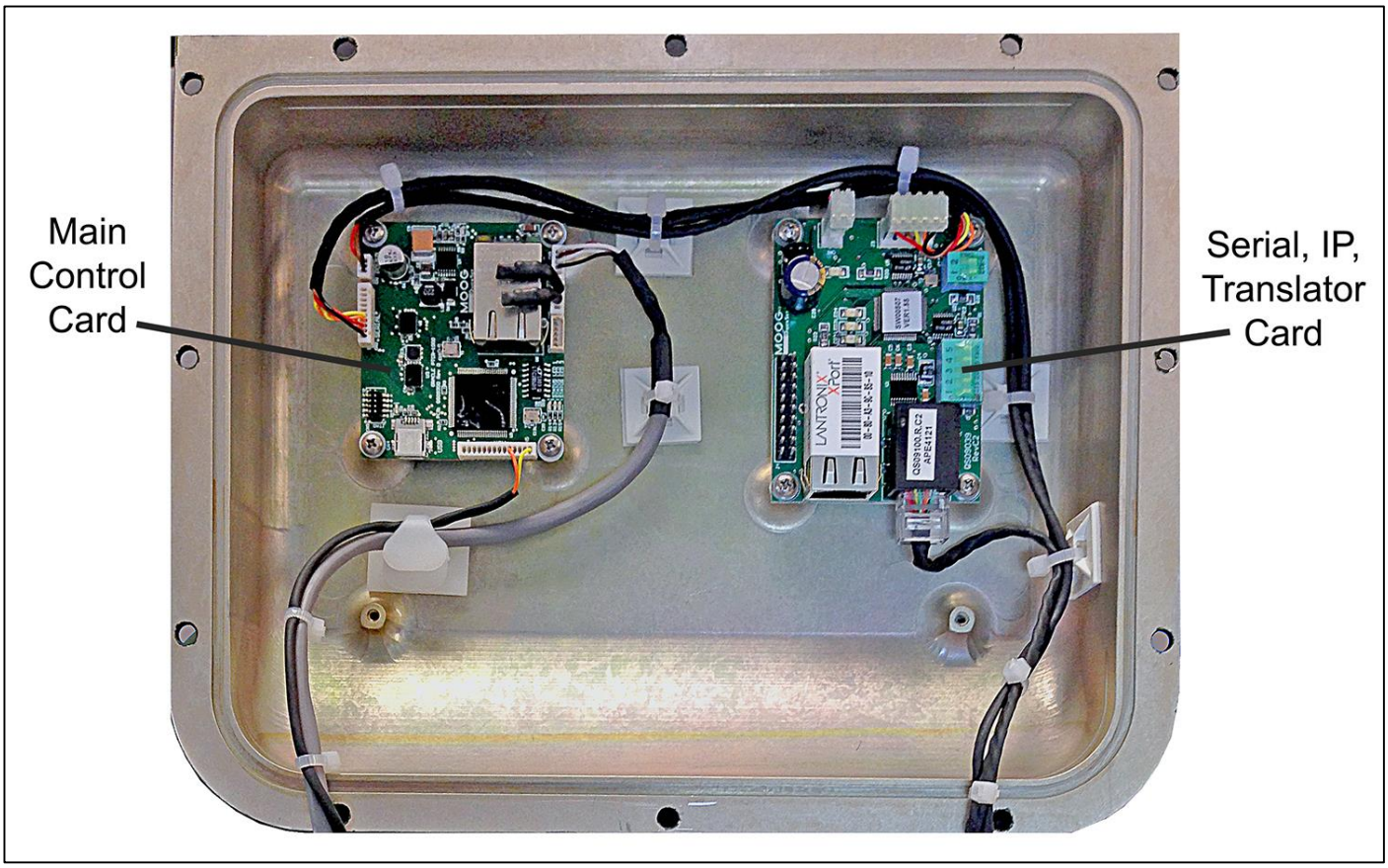


Figure 7: Front Cover- Main Control & SIPT Cards

2.1 DESCRIPTION OF EQUIPMENT (CONT)

2.1.2 CONTROL CIRCUIT BOARD & MOTOR DRIVERS DESCRIPTION (CONT)

Also connected to the motor driver cardsare the two (2) position Encoders which measure the relative position of the Pan and Tilt. Two (2) mechanical Limit Rings (Hard Limit Switches) providing a limit of travel for the up and down movement of the Tilt Axis. Non-continuous models have similar Limit Rings for limiting azimuth rotation. Two (2) Stepper Motor Drivers (Pan & Tilt) are mounted to the inside of the Rear Access Cover (Figure 8).

CAUTION	**WHEN REMOVING THE REAR ACCESS COVER, MAKE SURE TO MAINTAIN PHYSICAL CONTROL OF THE COVER. DAMAGE TO THE STEP DRIVE MOTOR DRIVERS AND ITS CONNECTORS MAY RESULT IF THE COVER DROPS AWAY BEFORE THE CONNECTORS ARE UNPLUGGED.**

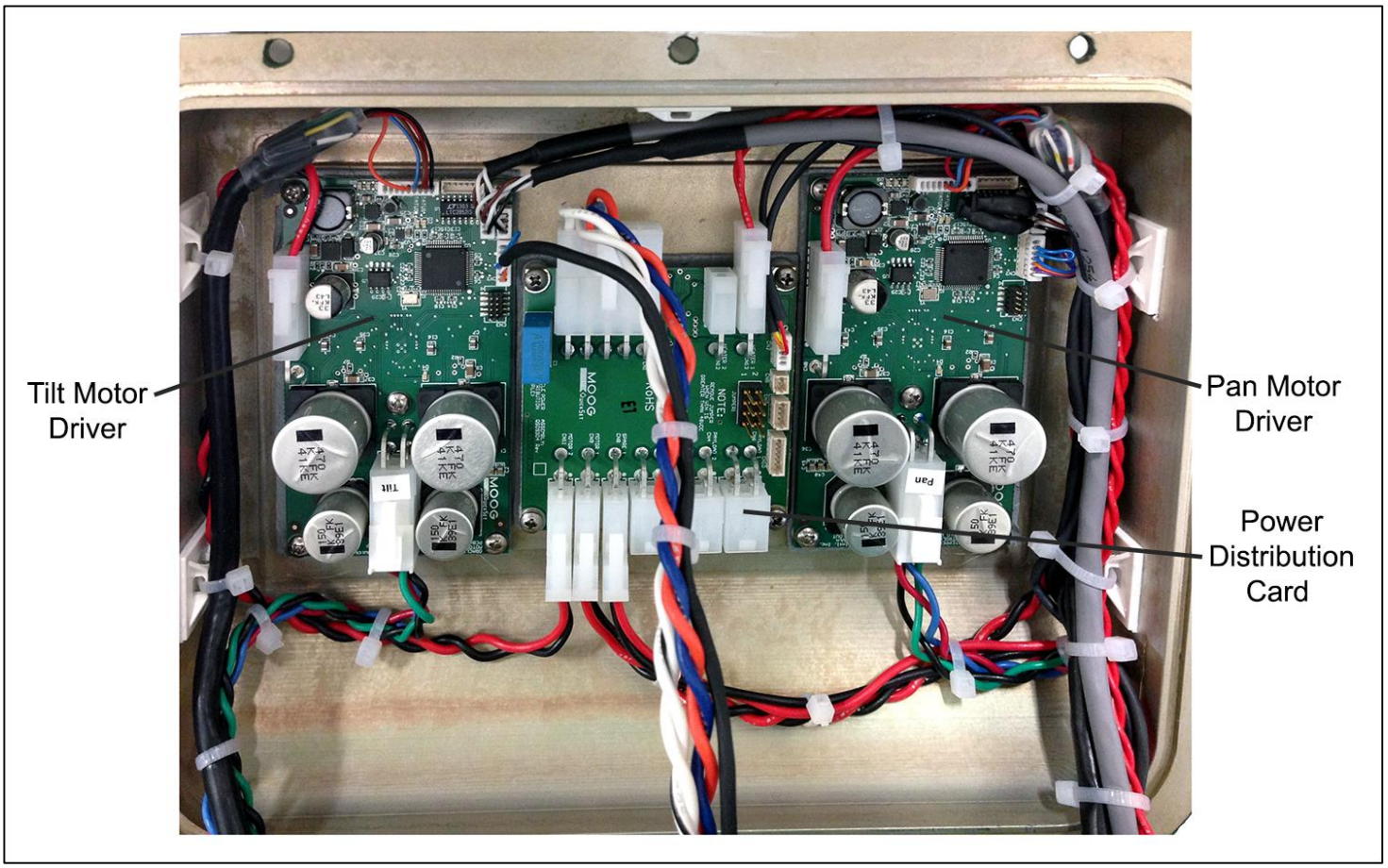


Figure 8: Rear Access Cover - Motor Drivers and Power Distribution Card

2.1 DESCRIPTION OF EQUIPMENT (CONT)

2.1.3 THEORY OF OPERATION

MECHANICAL

The Pan & Tilt sections move when the appropriate internal motors are energized driving the worm gear sets thereby rotating the shafts on which the Pan Section and the Tilt Section are mounted.

Both Pan & Tilt section gearing consists of a steel, helical gear meshed with a hardened steel single lead worm gear. Each axis is driven by its own stepper motor, connected via a chain to the worm. Although the worm can turn the helical gear, the helical cannot "back drive" and turn the worm, creating a passive braking system, eliminating unpowered motion.

Tripper arms driven by adjustable tabs activate mechanical switches that determine elevation (tilt) movement "hard" limits as set by the Limit Rings.Non-continuous rotation models have similar switches to limit azimuth rotation. These switches are connected to the microcontroller to signify when the unit has travelled to the limit of rotation in the respective axis.

ELECTRICAL

This model utilizes stepper motors and stepper motor driver modules, controlled by the main control card. Stepper motors, hard limit switches, and position feedback encoders are all connected to the motor driver cards (2). The Payload Control Card (PCC) (in some models) has provisions designed for camera systems including 12VDC power, a communication UART (configurable for RS232 or RS422), two pair of bi-directional PWM motor drivers designed as Zoom and Focus drivers for optical lenses, and two pair of analog feedback inputs also for Z&F lenses. By pairing the Z&F motor drivers with the position feedback, it is possible to include relative Z&F position as part of the P&T's preset positions. There are also two additional pairs of relay drivers designated as "Aux 1" and "Aux 2" for each of the two camera provisions.

"Soft" limits are set via the provided Emulator/GUI software. (See the GUI included on the supplied CD.) Soft limits should be the primary method of limiting rotation; soft limits should be set "inside" the envelop established by the hard limits, whereas hard limits are the absolute limit of rotation. Therefore, to set the hard limits the user must override the soft limits using the "SL Override" command. Soft limits are set in software, so the microcontroller knows their settings and will tailor automated moves accordingly, and will not allow programming of a move outside the soft limit setting. Hard limits (mechanical switches) cannot be anticipated by the microcontroller, and provide a limit to motion in a single direction. A "Down" limit will not stop "Up" travel, nor will a "Right" limit stop "Left" travel.

NOTE: Only non-continuous rotation models will have active "soft" limits available in the pan axis of rotation, or physical "hard" limit switches.

When the unit is commanded to move via the "jog" control, it is running "open loop" and will continue to run in the commanded direction and velocity until the command ceases, or the position approaches a soft limit. If the unit is jogged when the soft limits are overridden (not recommended), the unit will stop immediately without any gradual braking upon reaching the hard limit.Automated moves (Move To, Move Delta, Preset) are managed by the P&T's microcontroller; once the command is given, the P&T will initiate and manage the move until it reaches the commanded position.

POSITION FEEDBACK

This model incorporates two incremental encoders directly coupled to the pan and tilt (1 each) axis of motionused as position sensors.

The encoders are 9000 cycles (lines) per 360° rotation. Quadrature decoding provides 0.01º of resolution with no "rounding" of position reporting, as each transition equates to 0.01º of motion.

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2.1 DESCRIPTION OF EQUIPMENT (CONT)

2.1.4 PAN & TILT UNIT SPECIFICATIONS/KEY FEATURES

PAN & TILT UNIT SPECIFICATIONS/KEY FEATURES	
Material	Housing (Aluminum), Hardware (Stainless Steel)
Weight	Between 32 & 35 lbs (14.5 & 15.9 kg) without payload (cameras, etc.)
Voltage/Power	24VDC (28 VDC Maximum 24VDC (+4 / - 0VDC) Total Power: 4.6A pk, <3A continuous at 24VDC (simultaneous pan and tilt move). Heaters: 2.7A at 24VDC; Thermostatically controlled (32°F on/35°F off) Current Surge: <16.5A for <3ms at 24VDC Standby: <0.8A at 24VDC (no heater current) Note: 70 VDC models are available
Load Capacity	Load Torque: 50lb-ft (67.79 Nm),Static Load Maximum: 228lbs, Static Torque Maximum: 150 lb.-ft.
Pan Range	Continuous Rotation or 435°(+/-217.5°)
Pan Speed Range	0.005° to 50°/s at 50 ft.-lbs.
Protocol	Quickset PTCR-96 or Pelco "D"
Tilt Range	180° (±90° max.)
Tilt Speed Range	0.005° to 25°/s up to 35 ft.-lbs. 0.005° to 12°/s up to 50 ft.-lbs.
Rotation Limits	Adjustable hard limits, adjustable soft limits on both axes.
Pan & Tilt Repeatability	0.05°Minimum incremental move: 0.01°
Feedback	9K Optical Encoders (0.01° readout)
Angular Position Resolution	0.01° (Encoders providing high resolution angular positioning)
Operating Temperature	Without heater: -15°C to 55°C (5°F to 131°F) With Heater: -30°C to 55°C (-22°F to 131°F)
Communication to Pan/Tilt	Communication: RS232 or RS422/4-wire 485 (full duplex only) Ethernet wiring is separate and independent. Default IP address 192.168.1.1
Embedded Controls	Electronic limits Pan & Tilt. 32 preset locations &3 programmable tours. Alignment to local or global coordinates
Communication to Sensors	Tilt Axis Payload Interface Port B (Std.): Mil-Spec 26-Soc, 16 Shell MS3112E16-26SW Payload pass through connectivity from base connector supplying Ethernet (CAT-6) 10/100/1000 baseT (Gigabit), video coax (75 ohm), internally generated 12VDC, external user supplied DC auxiliary power. Serial cable from payload for either control of payload thru Camera 2 of PTCR-96 board (default) or payload to pan/tilt serial control (IP or RS232/422), in lieu of other control interfaces. Power to Sensors 12Vdc @1.5A, on/off switchable under software control.
Test Software	Test software compatible with Windows-95 SP2, 98, ME, 2000 XP, and Windows 7. Not compatible with NT. Moog QuickSet control protocol documentation supplied. Virtual Joystick, Tours (3) can contain up to 63 Tour Steps of the 32 presets, Diagnostic communication and fault indicators, Protocol analyzer, Move Monitor allows logging of positions acquired.
Exterior Color/Finish	Powder coat paint over chemical film for corrosion resistance standard. Suffix on part number determines color: White (MWS), Desert Tan (BGP), and Black (FB). Other colors and CARC available upon request. External hardware all stainless steel
Environmental Enclosure	Gasket and sealed to withstand water and dust penetration. Meets IP66 / IP67 Standards.
Limit Switches	Internal and adjustable
Backlash	Adjustable
Test cable supplied	6 foot length test cable (6-SU243-6 or 6-20765-6) & mating connector

* Windows and Microsoft are registered trademarks of Microsoft Corporation.

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3.0 UNIT INSTALLATION

3.1 UNPACK & INSPECT

Carefully unpack the unit and examine it for signs of physical damage, particularly dented or broken parts, damage to wire harness, distortion of the tilt table or covers. If any signs of damage are observed, notify the freight carrier immediately for a claim. Retain all of the packaging material.

3.2 INCLUDED ITEMS

NOTE: See the "Read Me First / Included Items" sheet included in the contents of the shipping box.

Check the box contents for the following:

☐Read Me First / Included Items sheet

☐Pan & Tilt Unit

☐1 CD-ROM disc containing:

- Software with Emulator/Graphical User Interface (GUI)
- GUI Manual
- Operator/Service Manual
- Protocol Manual

☐1 Universal Translator CD-ROM disc (CD00545) containing:

- Universal Translator Software
- Universal Translator User's Guide, Model QS09100
- Universal Translator Configuration Tool Software Manual

☐Test Cable

☐Mating Connector

☐Schematic(s)

3.3 INSTALLATION PROCEDURES - MECHANICAL

3.3.1 SITE LOCATION

Select a mounting location that will provide the desired maximum movement of the Pan & Tilt angles without coming in contact with or striking any objects in their sweep paths.

NOTE: An arrow on the side of the Pan & Tilt indicates the direction the front of the unit is facing.

Limit Rings (Hard Limits) are provided to limit the degree of travel in the tilt path. The pan travel is continuous and the tilt travel can be narrowed from the maximum of 180° (±90° from horizon) to a lesser value.

NOTE: Non-continuous models with 435 degrees of Pan rotation have adjustable trip rings.

3.3.2 MOUNTING THE UNIT

The Mounting Base (4.0” [101.6mm] square) is drilled with four (4) 0.28” (7.11 mm) diameter mounting holes(see Appendix B Drawings).Using the mounting holes, fasten the base to a stable platform using (Moog recommended) ¼-20” high strength stainless steel bolts, washers, and nuts.

NOTE: Consideration of wind, ice load factors, and payload on the Pan & Tilt Unit are important when calculating how solid the mounting platform has to be and the strength required by the mounting bolts.

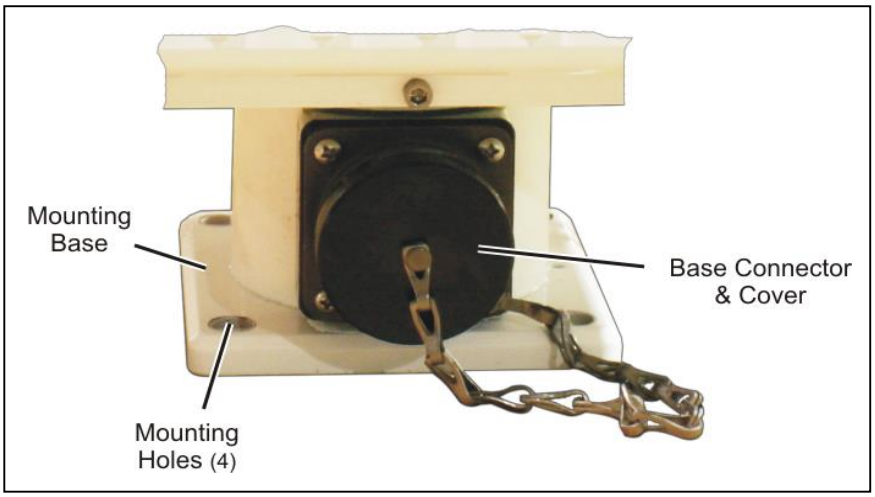

Figure 7: Mounting Base

3.4 INSTALLATION PROCEDURES - ELECTRICAL

3.4.1 GENERAL COMMENT

The interconnecting cable (Base Connector) between the controller and the Pan & Tilt Unit is vitally important to the reliable operation of any motorized instrument positioning system.

3.4.2 ASSEMBLE THE MATING RECEPTACLE CONNECTOR

Carefully solder the cable leads to the Mating Receptacle Connector that will be connected to the Pan & Tilt Base Connector. Refer to the appropriate Pan & Tilt Schematic for the connector pin function assignments for the Pan & Tilt Unit.

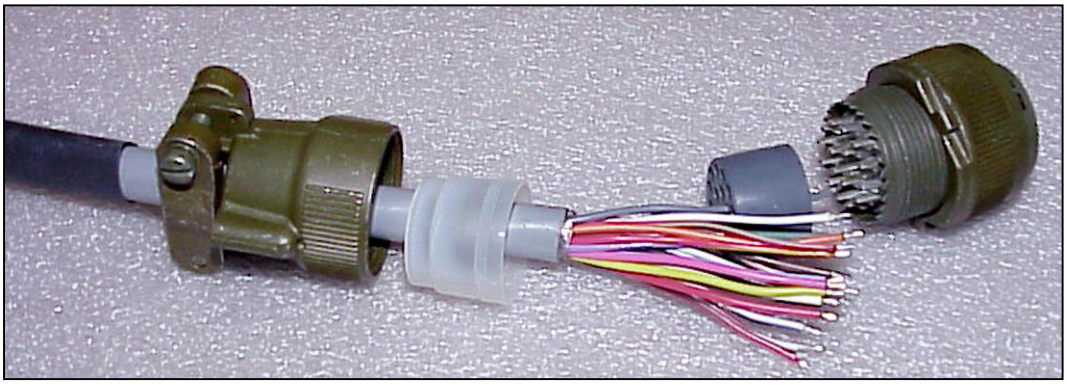

Figure 8: Base Connector Mating Receptacle Connector

Note: Typical Schematics follow, Refer to those supplied with your unit.

3.4.3 BASE MATING RECEPTACLE CONNECTOR WIRING

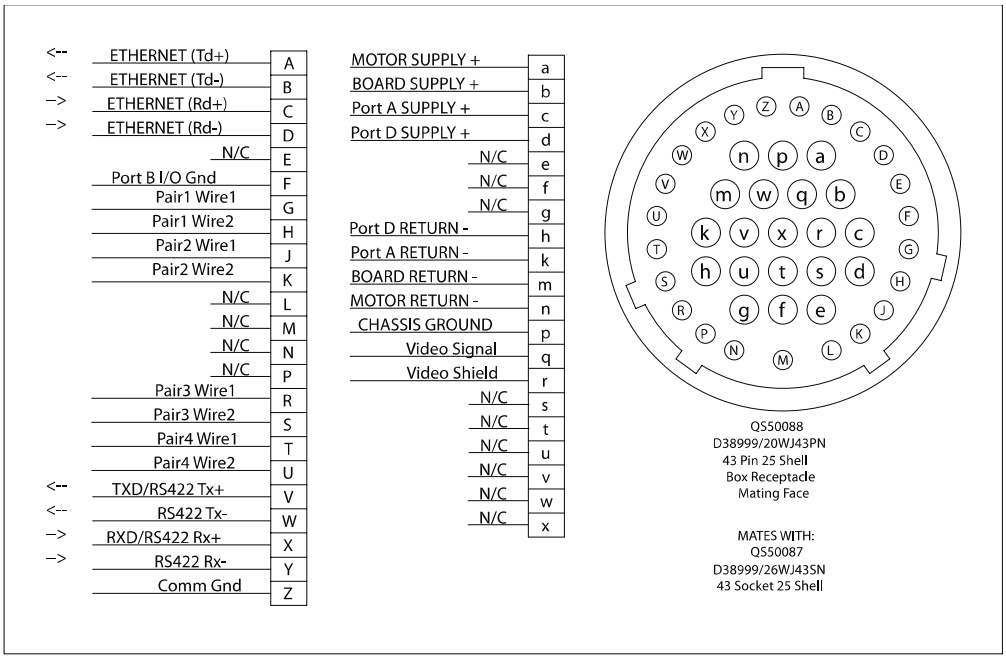

Figure 9: Mating Receptacle Connector Wiring

3.4.4 PORT B CONNECTOR WIRING

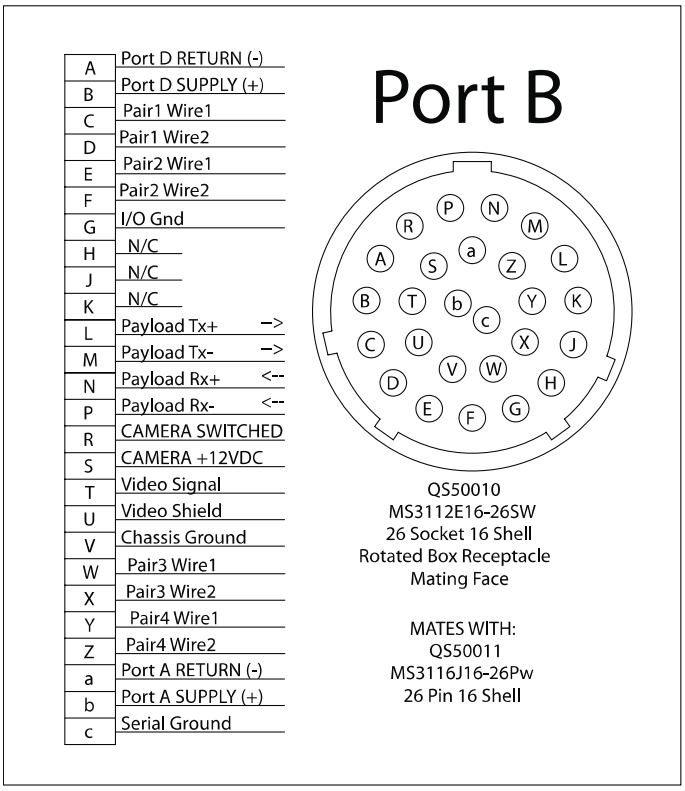

Figure 10: Port B Connector Wiring

4.0 UNIT SETUP & ADJUSTMENT PROCEDURES

4.1 INTRODUCTION

Prior to operating the Pan & Tilt Unit, perform the following Setup & Adjustment Procedures if necessary:

CAUTION	**PRIOR TO OPERATING THE PAN & TILT UNIT OR ACCESSING THE INTERIOR, READ AND BECOME FAMILIAR WITH ALL OF THE SAFETY RECOMMENDATIONS FOUND AT THE BEGINNING OF THIS MANUAL AND ON ANY SAFETY DECAL AFFIXED TO THE INSIDE OR OUTSIDE OF THE UNIT.**

4.2 INTERNAL ACCESS

(Refer to Figures 3, 4, 7, & 8 for Pan & Tilt Major Components)

With the Tilt Table in a horizontal (level) position, loosen the twelve (12) Cover Mounting Screws in each of the Front and Rear Access Covers. Remove the Front Access Cover for access to the Drive Motors/Drive Chains/Carrier Assemblies/Main Control Card/ Serial IP Translator Card, and remove the Rear Access Cover for access to the Motor Drivers and the Tilt Limit Rings.

4.2.1 MANUALLY ROTATING THE WORM DRIVE SHAFT (PAN OR TILT)

If the Tilt Table is not horizontal (level) and it interferes with removing one of the access covers, perform the following:

- Try adjusting the Tilt Table to a horizontal position by using the unit's power and the Emulator/GUI software.
- If positioning by power is not possible or practical, remove power from the unit, remove the unobstructed access cover, and using a large screwdriver, manually rotate the Tilt Axis Worm Drive Shaft until the Tilt Table is horizontal and clear of the obstructed access cover. Remove the screws and access cover. If necessary, the Pan Axis can be moved using the same procedure.

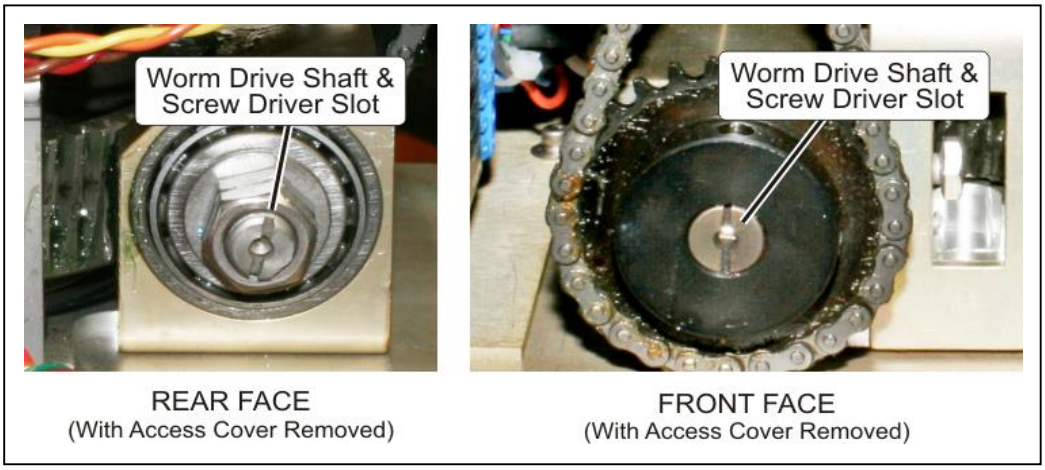

Figure 11: Worm Drive Shaft Manual Rotation

4.3 LIMIT RING (HARD LIMIT) ADJUSTMENT

NOTE: Limit Rings are factory set to the maximum allowable travel prior to delivery. If needed, roughly set the Limit Rings in your shop to fit your site and then make any final adjustments after the unit has been installed. Do not exceed factory settings (see IMPORTANT! below).

IMPORTANT!

- **MAXIMUM TILT MOVEMENT IS ± 90° FROM HORIZON (180° total travel)**
- **PAN MOVEMENT IS CONTINUOUS OR 435° IN NON-CONTINUOUS MODELS**
- **THE STANDARD UNIT IS FACTORY SET TO THE MAXIMUM TILT TRAVEL**
- **DO NOT ATTEMPT TO SET LIMITS GREATER THAN FACTORY SETTING OR DAMAGE WILL OCCUR TO THE PAN AND TILT UNIT!**

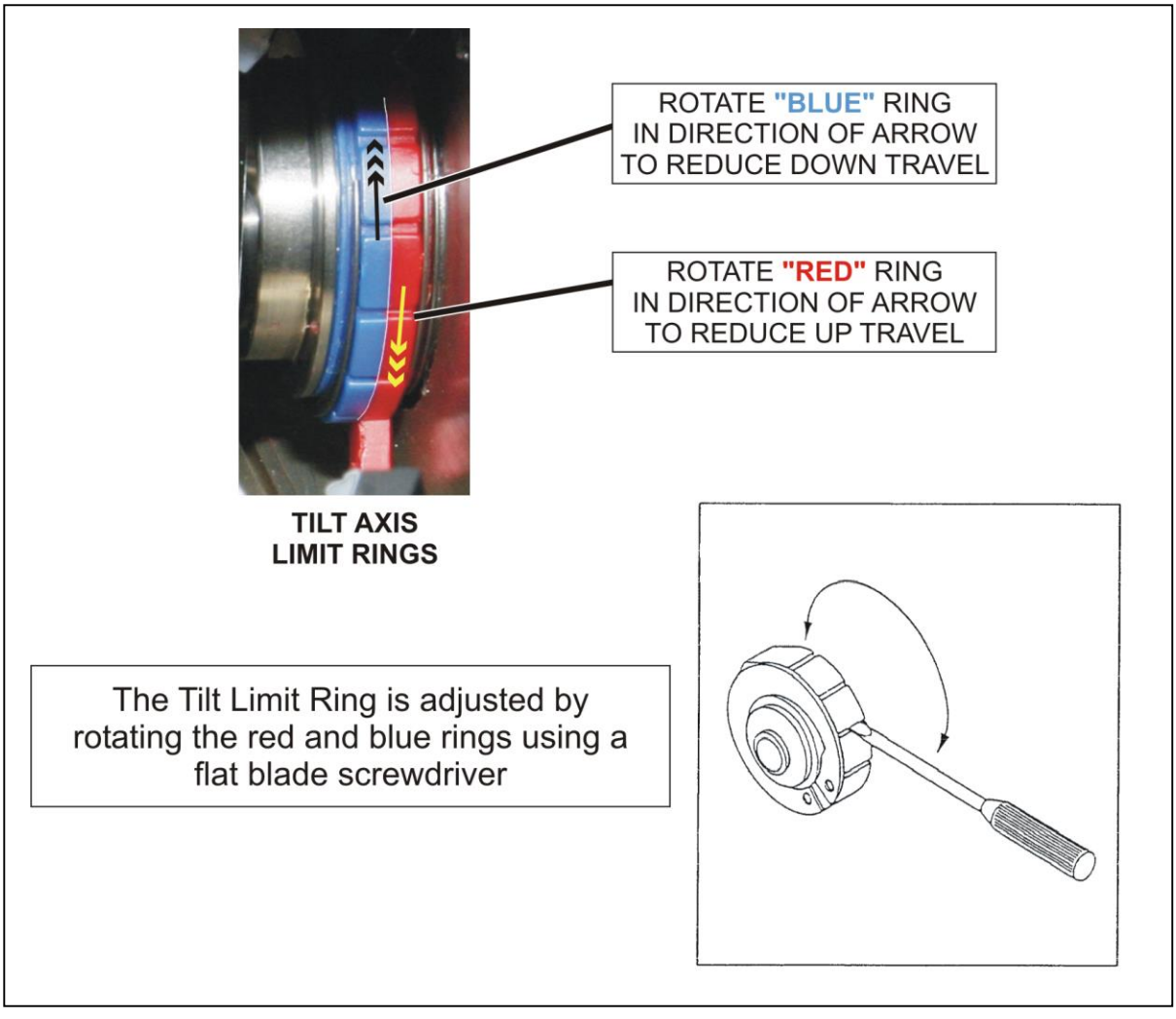

Figure 12: Tilt Limit Ring (Hard Limit) Adjustment

4.3 LIMIT RING (HARD LIMIT) ADJUSTMENT (cont)

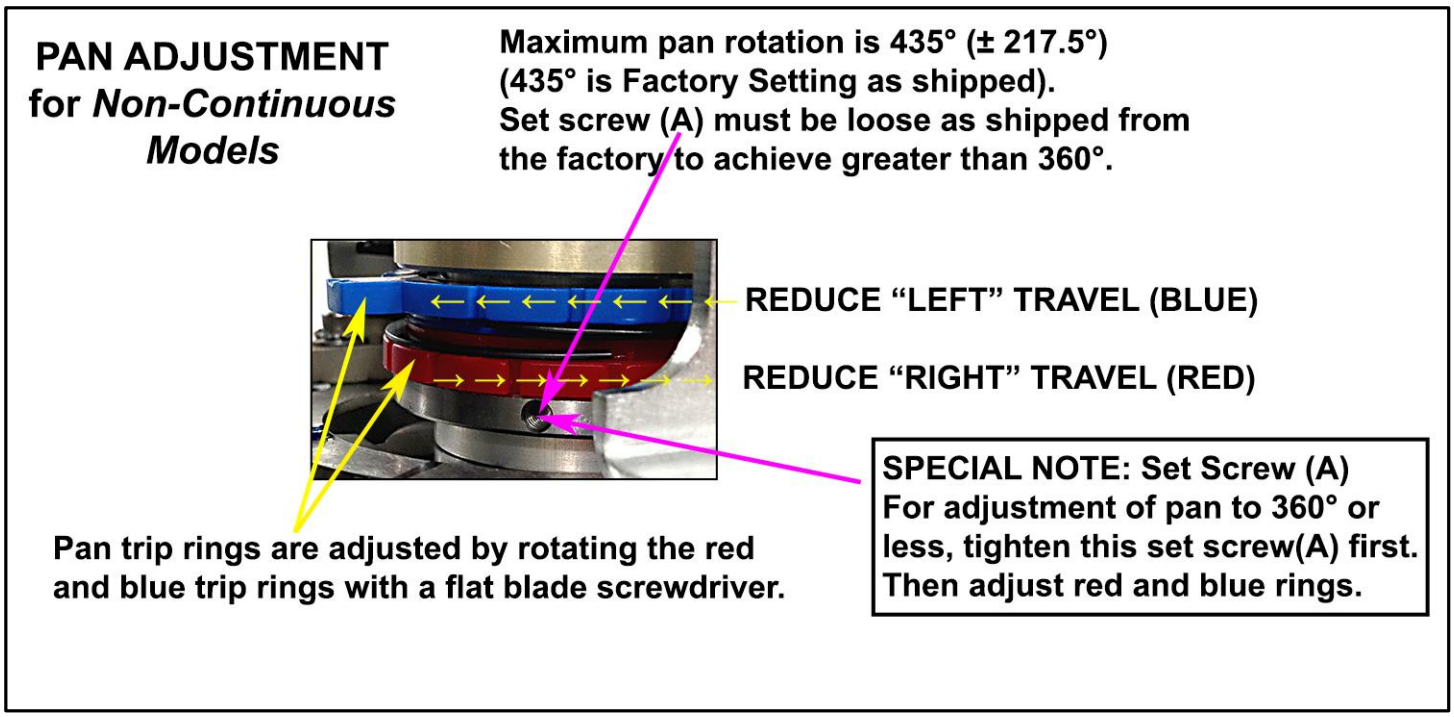

Figure 13: Pan Limit Ring (Hard Limit) Adjustment (Non-Continuous Models)

4.4 DRIVE CHAIN TENSION ADJUSTMENT

Adjust the tension on the Pan or Tilt Drive Chain as follows:

- Remove the Front Access Cover.
- Using a 3/8” socket, loosen the four (4) Chain Tension Adjustment Bolts (10-32 Nylon Locknuts) securing the Motor to the Motor Mounting Plate.
- Apply a slight amount of pressure to the side of the selected Motor thereby applying tension to the Chain.

NOTE: A small amount of slack in the chain is acceptable without affecting backlash. If the chain is too tight, it may cause binding and/or excessive chain and bearing wear. Do not apply excessive tension to the chains.

- Tighten the four (4) Chain Tension Adjustment Bolts.
- Replace the Front Access Cover.

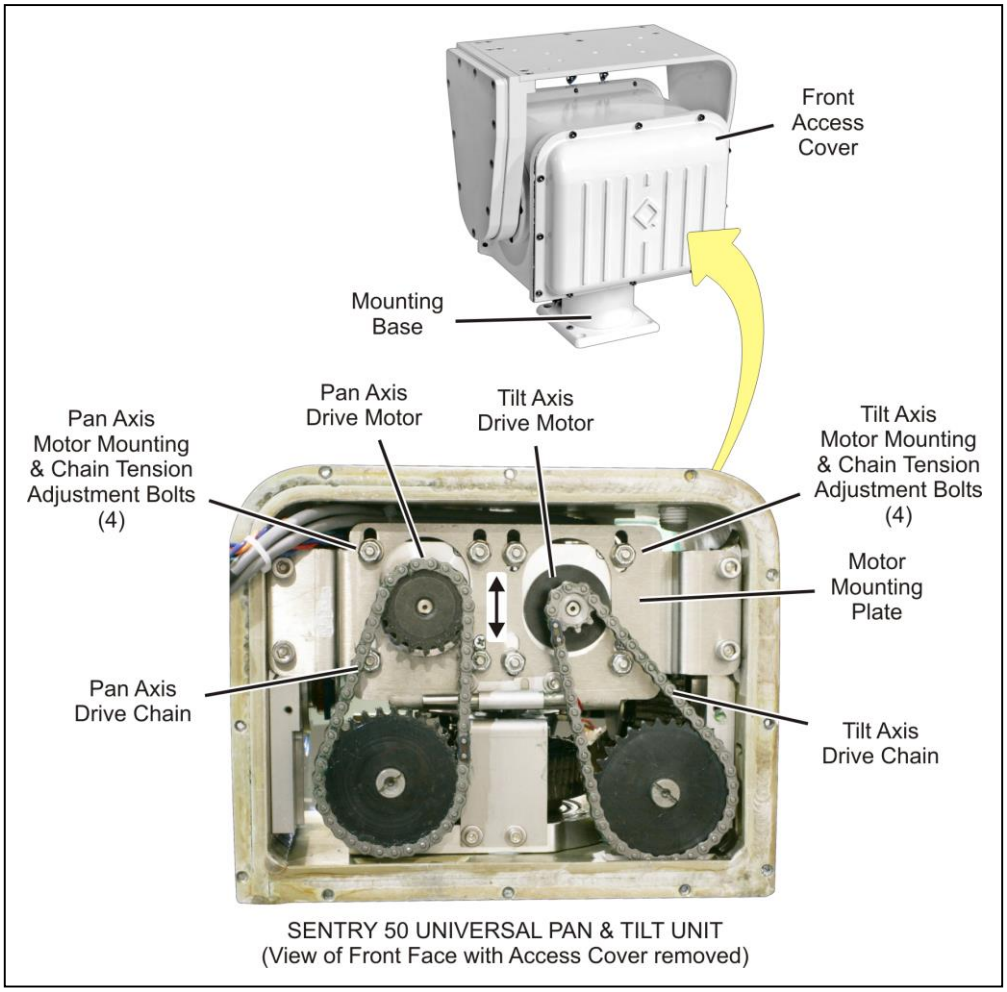

Figure 14: Drive Chain Tension Adjustment

4.5 PAN & TILT BEARINGS

The Pan & Tilt motions are carried on sealed, opposed ball bearings. The proper preload on these bearing pairs is factory adjusted and will not require field adjustment.

4.6 BACKLASH TEST & ADJUSTMENT PROCEDURE

Backlash is defined as unwanted movement in the Pan and/or Tilt section. Backlash can develop due to excessive center distance between Helical Gear and the Worm Gear or axial movement of the worm. Test and adjust the backlash on the Pan or Tilt axis as follows:

4.6.1 BACKLASH TEST PROCEDURE (PAN OR TILT)

- Stop the unit with the Tilt Table in the horizontal position. Remove power, grip the Tilt Table, and manually try to rotate it left and right. Free play should be between 0 and 1/64". If free play is excessive, adjust the backlash.
- To test for Tilt backlash, grip the Tilt Table and manually try to tilt the table forward and back. Free play should be between 0 and 1/64". If free play is excessive, adjust the backlash.

4.6.2 BACKLASH ADJUSTMENT PROCEDURE (PAN AND TILT)

- Loosen the four (4) Carrier Adjustment Screws.
- Adjust the Carrier Assembly to the tolerances shown in the Backlash Test Procedure.
- Tighten the four (4) Carrier Adjustment Screws.
- Perform the Backlash Test Procedure again.

NOTE: Repeat the test and adjustment procedures until the backlash is within tolerances.

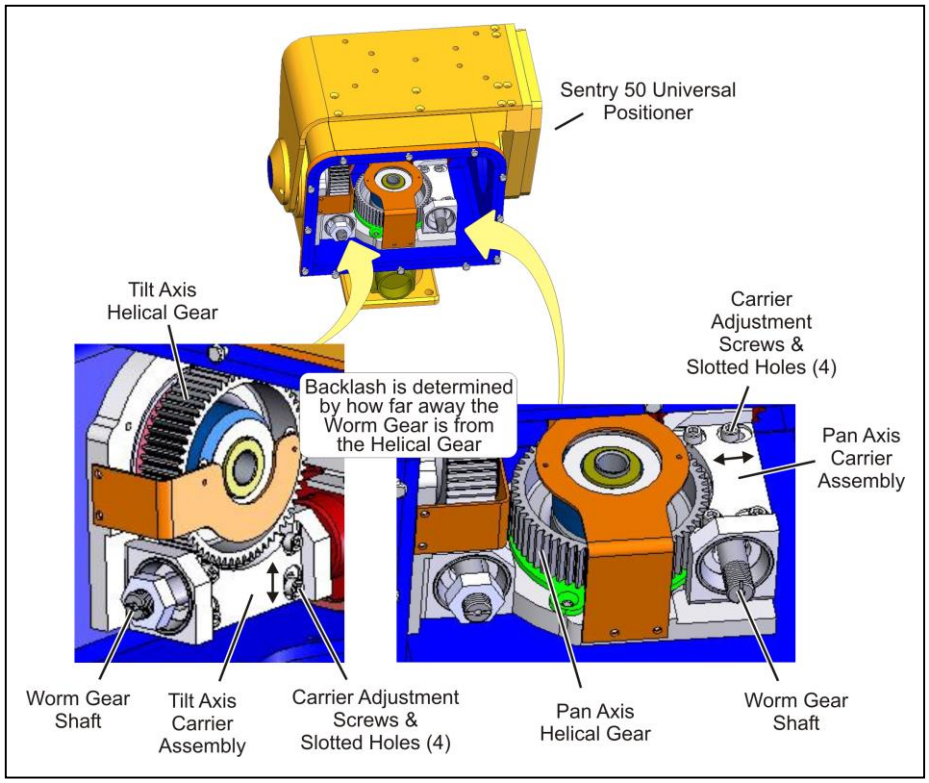

Figure 15: Pan & Tilt Axis Backlash Test & Adjustment Procedure

5.0 MAINTENANCE & REPAIR

5.1 ROUTINE MAINTENANCE

Inspect the unit on a regular basis to assure the early detection and correction of any minor problem before it becomes a major problem. The recommended inspection interval is dependent on the unit's location, severe weather conditions, or heavy use.

The following is a guideline to help establish a planned inspection program for this equipment. The user of this equipment should make the final determination on the inspection intervals.

5.1.1 FRESH WATER WASH

The exterior of the Pan & Tilt Unit should be sprayed down every 6 months to reduce damage due to salt spray and/or weather conditions.

5.1.2 INSPECTION INTERVALS

The following are the recommended inspection intervals for this equipment:

TYPE OF USE	INSPECTION INTERVAL
Intermittent	6 months
Heavy	User defined
Severe conditions	User defined

INSPECTION ITEMS

EXTERIOR INSPECTION	
INSPECTION ITEM	**DESCRIPTION**
Finish	Inspect the exterior finish for signs of damage or wear. Touchup damage if necessary.
Covers	Make sure the access covers are properly secured (i.e., all the bolts are in place and tightened, the cover seals are intact and not worn or damaged, etc.).
Wiring	Inspect the exterior wiring for signs of cracked insulation, frayed or pinched wires, and loose connections.
Mounting	Check that the mounting bolts are securely tightened and the required quantity are in place.
Other Hardware	Check that exterior hardware has not come loose. Tighten if necessary.
INTERIOR INSPECTION	
INSPECTION ITEM	**DESCRIPTION**
Wiring	Inspect the interior wiring for signs of cracked insulation, frayed or pinched wires, and loose connections.
Loose Hardware	Check that interior hardware has not come loose. Tighten if necessary.

5.1 ROUTINE MAINTENANCE (CONT)

5.1.3 INSPECTION ITEMS (CONT)

INTERIOR INSPECTION (CONT)	
INSPECTION ITEM	**DESCRIPTION**
Cleanliness	Inspect the interior for foreign material/debris such as dust, dirt, or chips. These items can act as an abrasive in the gear lubricant and reduce gear life. Make sure to remove all foreign material. Clean the gears if necessary and reapply gear lubricant.
Worm/Helical Gear & Lubrication	Visually inspect the gears for worn teeth, poor alignment, and chips. Clean and lubricate the worms and worm gears every time the unit is opened (at least every 6 months). A special lubricant LUBRIPLATE SYNXTREME HD-1 is available from Moog Customer Service (# 9-54675) or it can be purchased locally.
Cover Seals	Replace if missing or damaged. Cover O'ring seals should be inspected every 6 months and replaced if needed. Lubricate the O'rings with O'Ring lubricant prior to reattaching an access cover.
Bearings	All bearings are sealed and lubricated for life.
Motors	Motors are lubricated for their design life and require no added lubricant.
Drive Chains	Drive Chains (Pan & Tilt) should be lubricated with LUBRIPLATE SYNXTREME HD-1, Quickset # 9-54675.

Figure 16: LUBRIPLATE SYNXTREME HD-1.

This is an extreme pressure lubricant, and we do not recommend a substitute.

This GREASE CANNOT BE MIXED WITH ANY OTHER GREASE.

6.0 GENERAL TROUBLESHOOTING

NOTE: The General Troubleshooting procedures listed here in the Installation & Operation Manual should be performed in conjunction with the Emulator/GUI software included on the CD supplied with this unit.

6.1 INTRODUCTION

A visual inspection of the Pan & Tilt Unit while its operating will usually reveal if a problem is mechanical or electrical. Users should become familiar with the equipment and report any unusual problems before small problems become major ones. Straightforward, common sense troubleshooting techniques will usually reveal the source of most problems encountered. Users should review the following general information to assist in troubleshooting the Pan & Tilt Unit:

 **CAUTION**	**REMOVE POWER PRIOR TO PERFORMING ANY "HANDS-ON" INTERNAL INSPECTION, ADJUSTMENT, OR DISASSEMBLY OF THE UNIT.**

6.2 DETERMINE IF THE PROBLEM IS MECHANICAL OR ELECTRICAL

- Remove the Access Covers.
- Actuate a movement using the Emulator/GUI software to determine if the Drive Motor is running. If the motor is running, the problem is most likely mechanical. If the motor is not running, the problem can be either mechanical or electrical.
- Remove power and mechanically uncouple the motor by removing the Drive Chain from the sprocket (see DRIVE CHAIN TENSION ADJUSTMENT).
- Reapply power and initiate a move of the selected axis. If the motor operates, the problem is most likely mechanical (i.e., binding Worm Drive Gears, Drive Chain tension is adjusted too strong, etc.).

6.3 MECHANICAL TROUBLESHOOTING

After troubleshooting the unit and the problem has been determined to be mechanical, check the following:

MECHANICAL TROUBLESHOOTING	
PROBLEM	**SOLUTION**
Loose sprockets caused by sheared drive pins or keys.	• Replace the sheared pin or key. • Re-install the sprocket. • Replace the Carrier Assembly. • Perform the Drive Chain Tension Adjustment procedure.
Drive Chain has slipped from sprocket.	• Loosen the Chain Tension Adjustment Bolts to loosen Drive Chain Tension. • Re-spool chain. • Perform the Drive Chain Tension Adjustment procedure.
Drive Chain is broken.	• Remove and replace the broken Drive Chain. • Perform the Drive Chain Tension Adjustment procedure.
Binding Gears	• Loosen the Chain Tension Adjustment Bolts to loosen Drive Chain Tension. • Inspect Worm Drive Shaft/Gears for proper lubrication. • Re-align gears. (See Backlash Test & Adjustment Procedure.) • Perform the Drive Chain Tension Adjustment procedure.

6.4 ELECTRICAL TROUBLESHOOTING

The electrical system consists of the controller, interface cable, and the Pan & Tilt Unit itself. A malfunction in any of these components will cause a system electrical failure. Troubleshooting the Electrical control system is accomplished by using the supplied Windows© -based test software. The test software is a Graphical User Interface (GUI) that allows the user to validate operation and hookup, perform initial setup, set operational parameters, store presets, and operate the unit. (See the Emulator/GUI software included on the CD supplied with this unit.)

ELECTRICAL TROUBLESHOOTING	
PROBLEM	**SOLUTION**
Drive Motor does not operate.	• Remove the Access Covers. • Check Red light on the motor driver module. If the Red light is off (no power at motor drive), check the wiring. If the wiring is OK, the motor driver may be defective. If the Red light is on, check for a square wave at pin 9 for step input to motor driver. A 5V step waveform should be present during jog, if not, check motor.
Drive Motor does not operate, motor voltage ok.	• Visually inspect the circuitry for any shorts. • Disconnect the motor. Use an ohmmeter to check the cabling. If no apparent problem is found, the motor could be defective.
The Pan/Tilt stalls at the Limit Ring activated limit switch.	• Check the limit switch.
The Tilt Axis does not stop at the Limit Ring actuated limit switch.	• Check the wiring for a short between the normally closed and common contacts of the tilt limit switch. • Check the limit switch.

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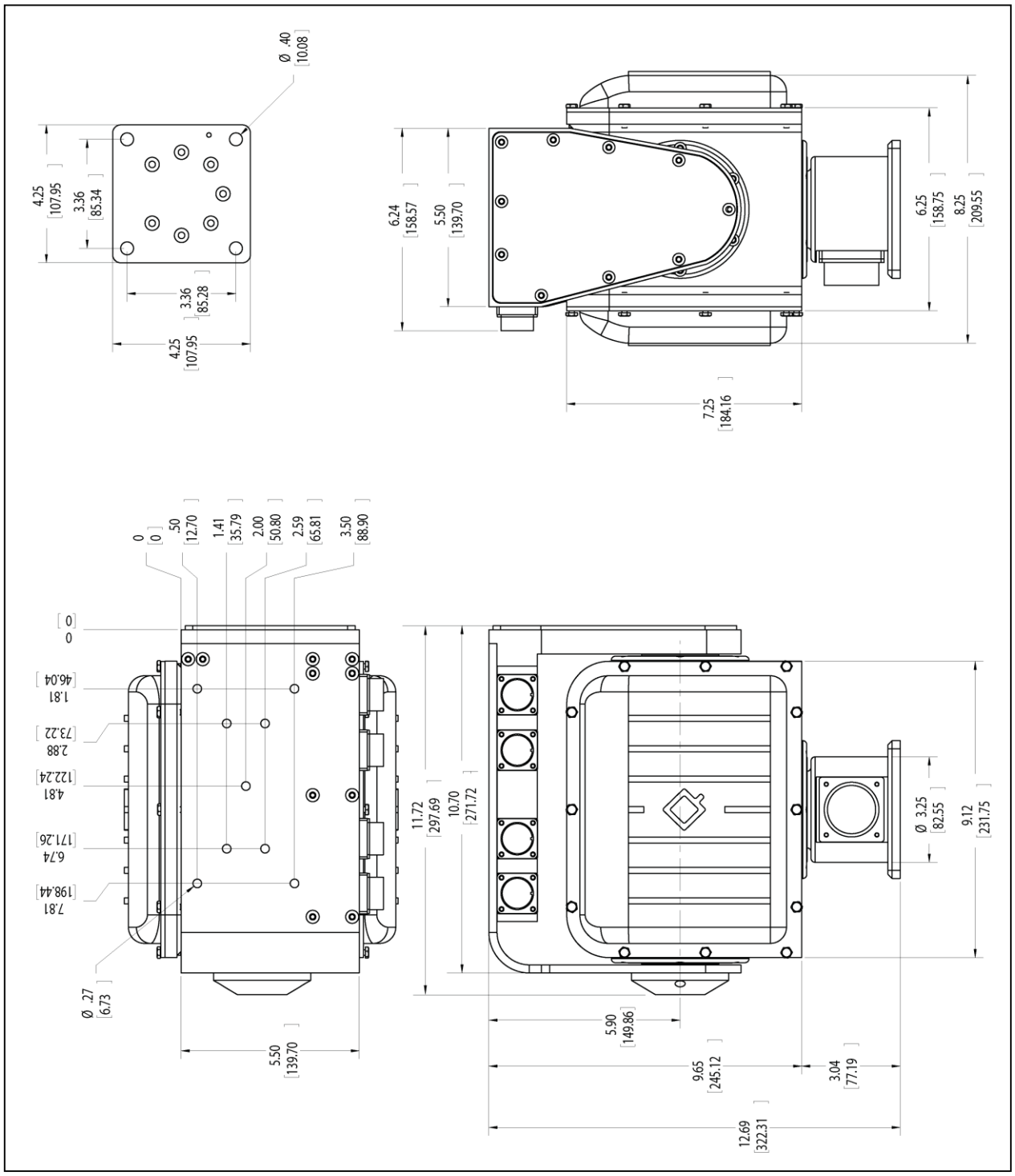
APPENDIX A – GLOSSARY OF TERMS

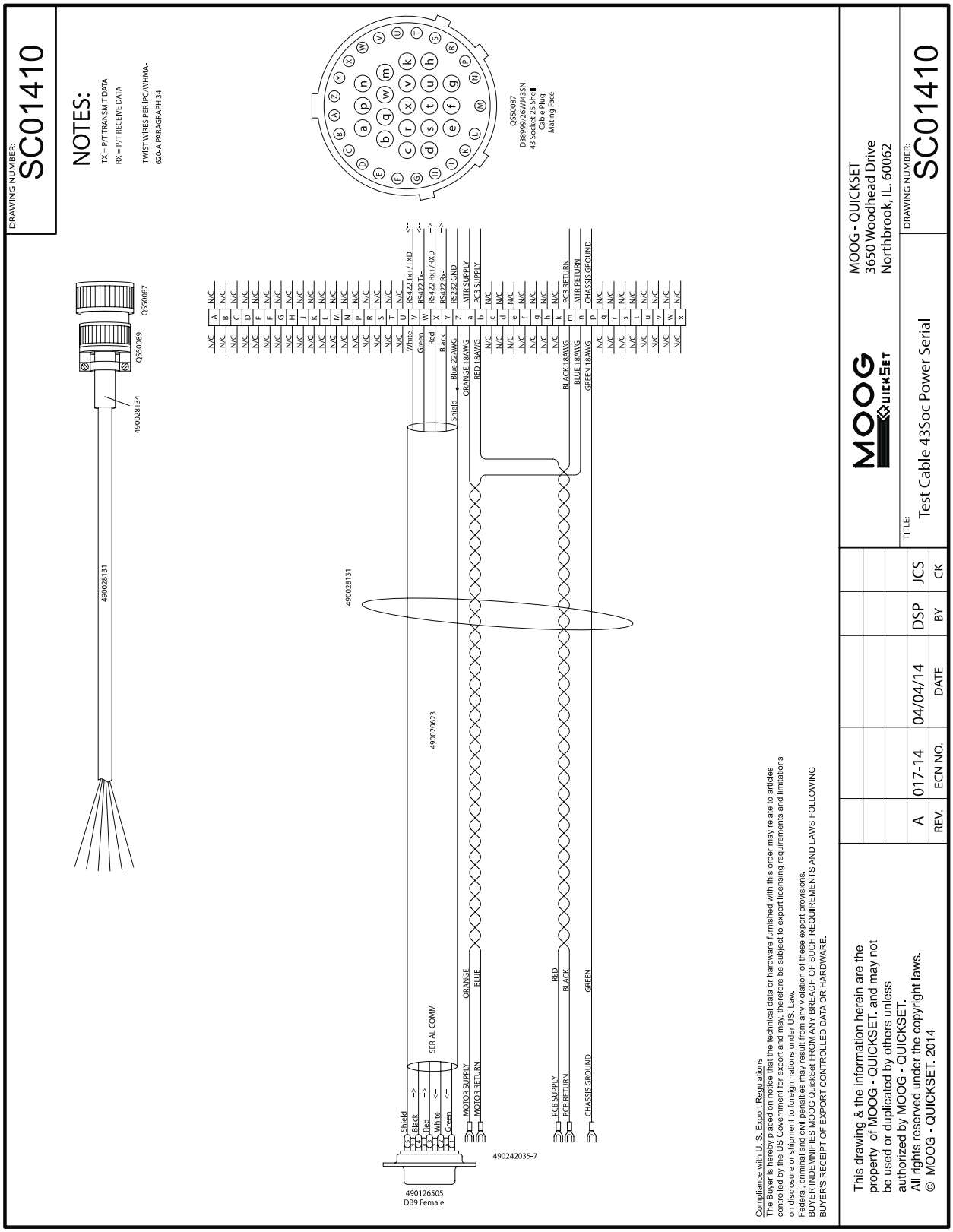
GLOSSARY OF TERMS	
TERM	**DESCRIPTION**
Carrier Assembly	Used to secure and house the Worm Drive Gear/Sprocket/Worm Drive Shaft.
Device Port	For Moog QPT-50 ICMS Universal Positioner, 4 Device Ports are mounted to the Tilt Table or 1 Port on the Tilt Axis to connect the Payload Control Card (PCCs) to the payload(s) on the Tilt Table.
Drive Chain	Used to connect a Drive Motor to a drive train to provide axis movement.
Drive Motor	A DC stepper type motor used to drive the axis drive train thereby supplying movement to the Pan & Tilt Unit.
Encoder	An electronic device attached to an axis of motion and used as a positioning sensor.
GUI	Graphical User Interface
Limit Ring	A mechanical device provided to limit the degree of travel (sweep path) for an axis. A tripper arm on each Limit Ring mechanically actuates an electrical limit switch when the axis reaches its far limits of travel. For this particular model of Pan & Tilt Unit, only the Tilt Axis has Limit Rings to limit the travel of the Tilt Axis. The Pan Axis is continuous and does not require Limit Rings or limit switches.
Control Board	Main Control Card(MCC)
Pan	The left or right movement (azimuth) of the Pan Axis.
Sweep Path	The extent of movement of the Tilt Axis from limit switch to limit switch. Pan Axis may be continuous or non-continuous.
Tilt	The up or down movement (elevation) of the Tilt Axis.
Tilt Table	Part of the Tilt Axis where the payload is attached.
Tripper Arm	Component attached to each Limit Ring to actuate a limit switch.
Universal Translator	A circuit board used to augment device communications abilities and offer a consistent and easy to use XML-style Universal Protocol for controlling all supported devices.

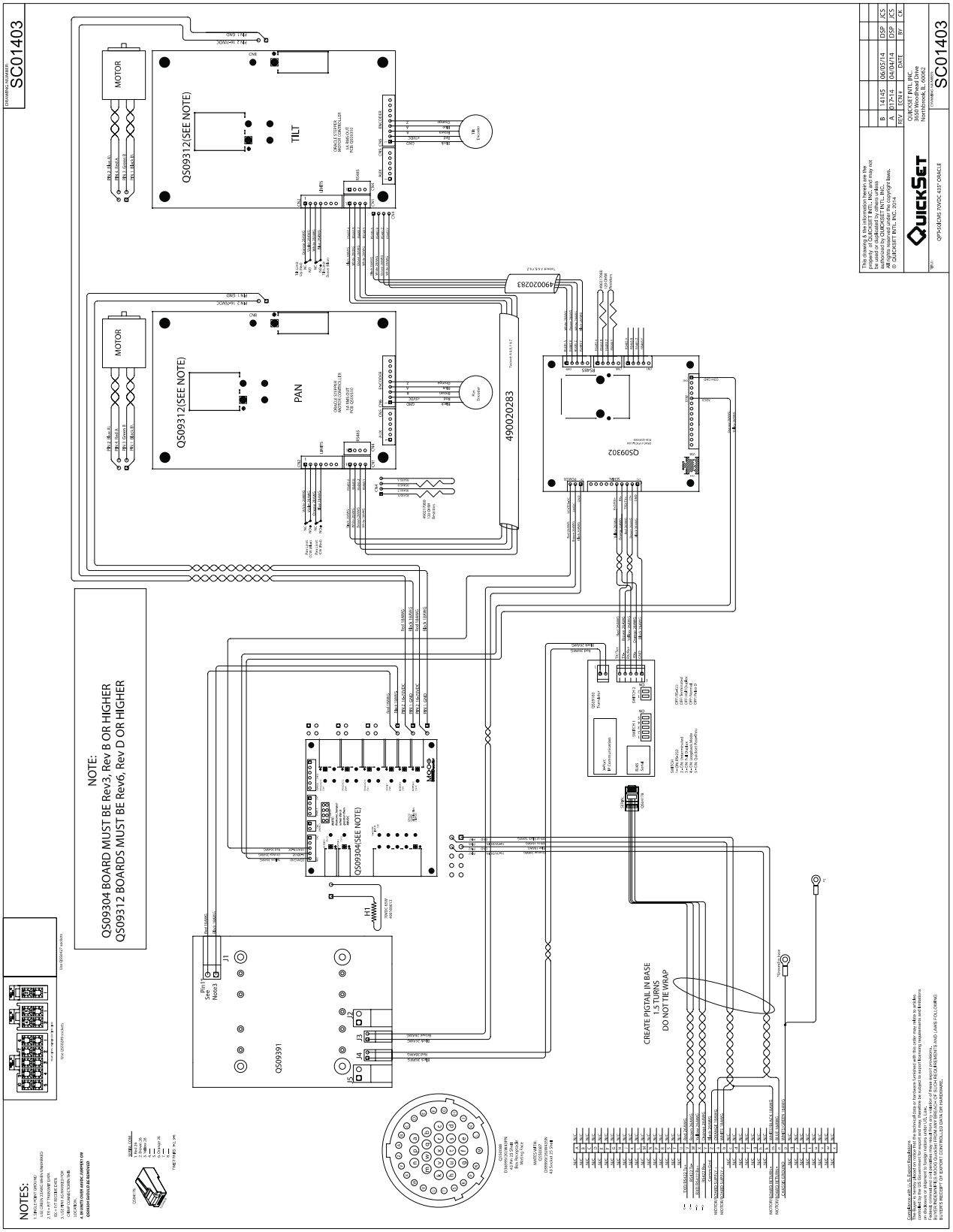
APPENDIX B – DRAWINGS



APPENDIX C – SCHEMATICS

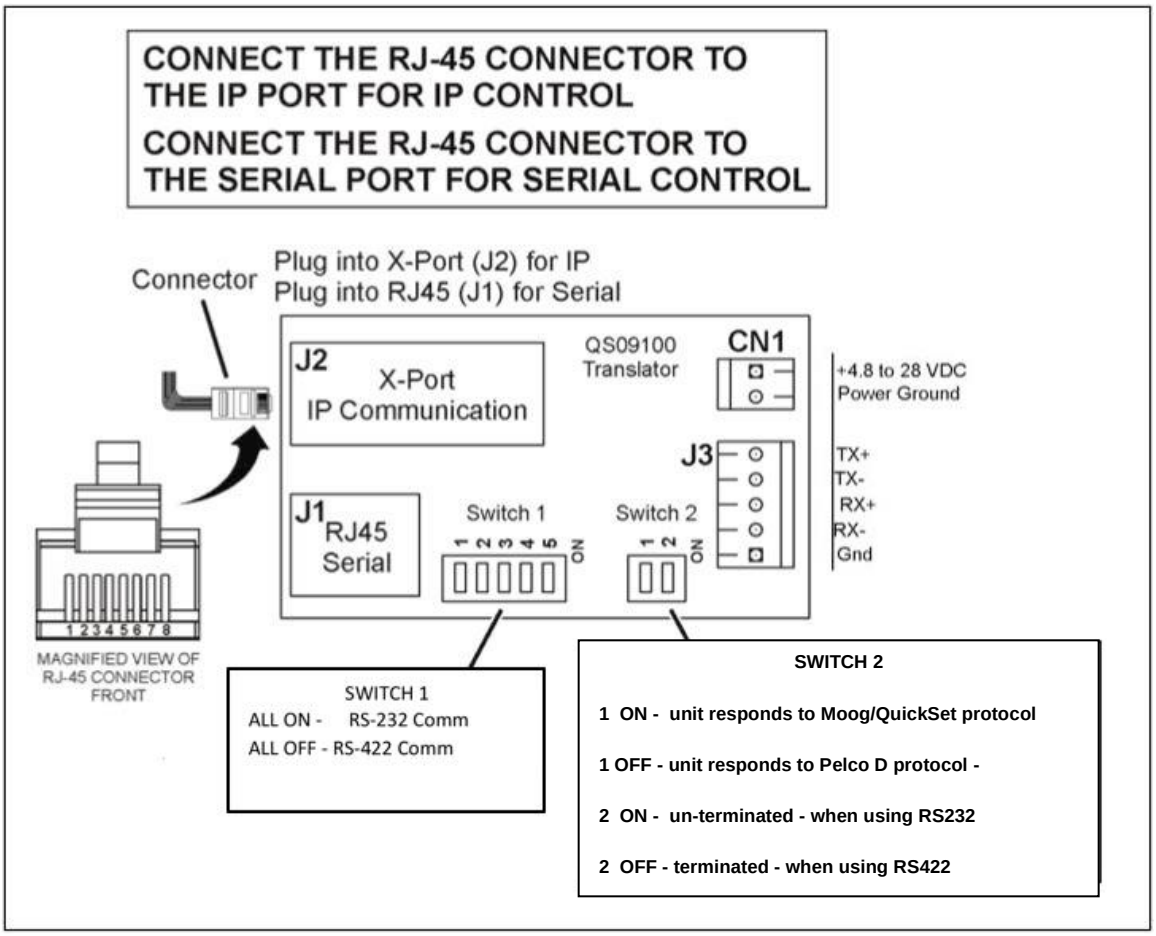
Note: Typical Schematics, Refer to those supplied with your unit.




SC01403
NOTE:
QS09304 BOARD MUST BE Rev3, Rev B OR HIGHER
QS09312 BOARDS MUST BE Rev6, Rev D OR HIGHER
QS09312(SEE NOTE)
TILT
PAN
MOTOR
490020283
QS09302
QS09304(SEE NOTE)
QS09391
CREATE PIGTAIL IN BASE
1.5 TURNS
DO NOT TIE WRAP
NOTES:
QUICKSET INTL. INC.
3650 Woodhead Drive
Northbrook IL 60062
SC01403

APPENDIX D – IP / SERIAL CONNECTION & SETTINGS

UNIVERSAL TRANSLATOR IP COMM & SERIAL PORT CONNECTIONS – INTERNAL



Universal Translator IP COMM & Serial Port Connections (Internal)

NOTE: Refer to the UNIVERSAL TRANSLATOR USER'S GUIDE and the UNIVERSAL TRANSLATOR CONFIGURATION TOOL SOFTWARE MANUAL (supplied separately on CD00545) for complete Universal Translator operation.