ComNav®
marine ltd

CT7 Interface

for P Series Autopilot Systems

Installation & Operation Manual

ISO 9001
QMI REGISTERED

CE
COMPLIES WITH
CE REGULATIONS

PN 29010079

Welcome

Congratulations on your purchase of ComNav Marine's **CT7 Interface for P Series Autopilot Systems**!

At ComNav, we are proud of our prominence as a leader in the design and manufacture of marine autopilot systems. Developed by the same experienced design team that created the Commander P2 & Admiral P3 Autopilot Systems, the CT7 Interface extends the capabilities of those P Series Autopilot Systems to allow use with several additional types of vessel heading control systems

We are confident that our dedication to performance and reliability will ensure your satisfaction with the CT7 Interface.

ComNav Marine Ltd.

Warranty Notice

The Warranty for the CT7 Interface is contained within the Warranty of your P Series Autopilot System. Prior to the installation and/or operation of the CT7 Interface, ensure that you read, understand, and accept the conditions of the P Series Autopilot System warranties as detailed in the **Warranty Information** of that system, and the specific items in that Warranty which apply to Control Boxes.

Operator's Warning

The P Series Autopilot System (with or without the CT7 Interface) will steer your vessel. However it is only an aid to navigation. Its performance can be affected by many factors including equipment failure, environmental conditions, and improper handling or use. An autopilot system does not reduce your responsibility for the control of the vessel when underway. You must always be in a position to monitor the course, supervise the autopilot, and resume manual control if the need to do so arises.

Whenever underway, your vessel must be under the control of a qualified and alert person.

General Notice

This document, ComNav part number 29010079 Version 2 Revision 1, is the approved Installation and Operation Manual for use with CT7 Interface for P Series Autopilot Systems. Where versions of this manual exist in other languages, the English version shall be considered authoritative.

Document History

Revision	Date	By	Description
1R0	22 June 2006	DC	First Release
2R0	11 October 2007	DTO	- brand name change - added more info on Z-Drives & Electric Wheel - added new details in the Typical Wiring figures - updated General Specifications - updated information on SPU connectors & wiring - added more explanation of the various ways the CT7 can be wired
2R1	07 March 2008	DTO	- fix minor typos, control references, signal names - updated to latest manuals template

Table of Contents

Welcome **1**
Document History **2**
Table of Contents **3**
List of Figures **5**
List of Tables **6**
About this Manual **9**
Typefaces, Common Phrases & Terms 9
Manual Format 10
System Overview **13**
Installation **17**
Technical Requirements 17
Power Supply *17*
Special Tools *17*
Mounting 18
Wiring 18
Wire Gauge *18*
Wiring the System *19*
Connectors *19*
SPU ⇔ CT7 Cable *20*
Switched B+ & Rudder Follower *20*
ON/OFF Thrusters *21*
Electronic Thruster Controls *21*
Proportional (Analog) Thrusters *21*
Azimuth Drives *22*
Isolated Analog Power Supply *22*
4–20 mA Current-loop Outputs *22*
Electric Wheel Interface 23
ELECTRIC WHEEL Mode Enable *23*
Setup 24
Switch Settings *24*
Switch #1 – Setup 25
Switch #2 – Invert Channel A Output 25
Switch #3 – Bow Output Positive/Negative 25
Switch #4 – Stern Thruster Positive/Negative 25
Switch #5 – Channel A Control Source 25
Switch #6 – Channel B Control Source 25

Autopilot System Parameters 26
Dockside Menu 26
Thrust Type (Thruster Type) 26
Thrust MIN (Thruster Minimum) 26
Thrust MAX (Thruster Maximum) 26
Auto Menu 26
Thruster Assist 26
Thruster Gain 26
Electrical Adjustments 27
On/Off & Electronic Thrusters 27
Proportional Thrusters 27
Azimuth Drive Systems 27
Rudder Simulator Setup 27
Adjustment of Electric Wheel Gain 29
Final Steps 29
Care & Maintenance 33
Cleaning and Appearance 33
Protection of Wires and Cabling 33
Periodic Checks 33
Fuse Replacement 34
Appendices 37
Appendix 1 37
General Specifications 37
Appendix 2 38
Warning Messages 38
Appendix 3 39
Diagnostic LEDs 39
Appendix 3 41
Typical Wiring Diagrams 41
CE COMPLIANCE 51
Index 55
User Settings & Notes 59
User Settings 59
User Notes 60

List of Figures

Figure 1 – Exploded View Showing Removal of P Series SPU Wiring Cover 19
Figure 2 – CT7 Wiring Label 19
Figure 3 – SPU ⇔ CT7 Cable 20
Figure 4 – CT7 Switches & Trim-pots 24

List of Tables

Table 1 – Minimum Recommended Wire Gauges....18
Table 2 – Fuse Replacement Guide....34
Table 3 – General Specifications....37
Table 4 – Messages....38
Table 5 – Diagnostic LEDs....39
Table 6 – User Settings....59
Table 7 – User Notes....60

Introduction

About this Manual

This manual provides essential information for the safe and reliable operation of the ComNav CT7 Interface for P Series Autopilot Systems. You are urged to read this manual in its entirety before you use your CT7 Interface for the first time, and to keep it handy until you become thoroughly familiar with the operation of your system.

A number of steps in this manual require use of the setup menus and operational displays on the Control Head of the P Series Autopilot System. Please refer to your P Series *Installation and Operation manual* for instructions.

Typefaces, Common Phrases & Terms

Throughout this manual, you will see a number of different typefaces used, and several commonly-used words & phrases with very specific meanings, to describe concepts & actions that are fundamental to the operation of the autopilot. Please take a moment to become familiar with the following items:

Modes of Operation

Specific “modes of operation” are placed in bold uppercase lettering.
Example: **POWER STEER** mode.

Button

Buttons and controls on the P Series Control Head and the CT7 are placed in uppercase lettering.
Example: the TURN button.

System Component

Specific System Components are capitalized.
Example: The Control Head, or a Fluxgate Compass

LCD Display

Text that appears in the P Series Control head’s LCD display is in quotation marks.
Example: “Move Rudder to Port”

press or **momentary press**

Press and release the indicated button.

double-press

Press and release the indicated button twice in rapid succession.

press and hold

Press and hold the indicated button for a minimum of one-half of a second.

maintain

Hold the indicated button for as long as required to achieve a given result.
Example: To dodge an obstacle in the vessel’s path, press either the PORT ARROW or STARBOARD ARROW button, and maintain it in that position until the vessel has passed clear of the obstacle.

Manual Format

This manual has been formatted to be printed on both sides of the pages of the manual, on standard Letter-size paper (8.5" x 11").

If you have obtained this manual as a soft-copy, please note that it is in Adobe® Portable Document Format ("pdf"), and so may be viewed & printed with Adobe Reader®, or compatible pdf-format viewers.

When printing this manual, select "duplex printing" (or the equivalent term used by your printer's software driver), so that it will be printed double-sided on the paper. If your printer does not have built-in duplexing capability, you can still print this manual double-sided by following the instructions that came with your printer for doing "hand duplexing".

When printing this manual with Reader, you may wish to print the main body & the Typical Wiring Diagrams (between pages 43 to 50) on larger size paper (if your printer supports such).

Those diagrams are quite detailed – and so their original size, as drawn, is Tabloid-size paper (11" x 17"). The diagrams are most useable if they are printed on that size of paper. However, for publishing reasons, it was necessary to include them in this manual at Letter-size (in Landscape orientation).

To obtain them at a larger size, print just those pages with the printer/driver parameters set manually to "Tabloid" (or the appropriate equivalent term for your printer/driver).

You could also use the "enlarge" feature of a photocopier to make copies of the diagrams at a larger size, from prints done at Letter-size.

Lastly, a pdf document containing just the diagrams at "large size" is available, on special request. Please contact your ComNav Dealer if you would like to obtain a copy of that document.

System Overview

System Overview

This section gives a brief description of the CT7 Interface, and its major elements & their functions.

The CT7 is an optional extension to ComNav's P Series autopilot systems.

It is designed to be used when the vessel is equipped with Bow and/or Stern Thrusters, or when the vessel is equipped with an Azimuth drive (also known as "Z-Drive"). It is capable of operating a number of different types of thruster-control solenoid valves – including On/Off and Proportional types – and Azimuth Drive control systems. The CT7 has standard-voltage outputs, current loop outputs and optically-isolated analog outputs.

The CT7 also contains circuitry for interfacing an Electric Wheel to a P Series autopilot system, and a Rudder Simulator (which is typically needed when the CT7 is interfaced to Azimuth Drives).

The CT7 is specifically designed to be directly compatible with, and complementary to, ComNav's P Series autopilot systems, in features, operation, and appearance. It connects directly to the P Series Signal Processor Unit (SPU), via a dedicated cable that carries power to the CT7 main circuitry, and all control/data signals. There are two dedicated connectors on the CT7 for the power supply for the thruster(s) or Azimuth Drive.

The P Series SPU has built-in setup & operational firmware support for the CT7 Interface; the firmware is used whenever a CT7 is connected to the SPU, via the **J7 - THRUSTER INTERFACE** connector.

The major elements of the CT7 Interface are as follows:

- SPU Interface: this contains all the control & status circuits which connect to the P Series Signal Processor Unit.
- Power Supplies:
  - The main section of the CT7's circuitry is powered directly by the P Series SPU.
  - Two separate "drive" power supply circuits are provided. One is for On/Off Thrusters. The other for Proportional Thrusters or Azimuth Drives; this one is optically isolated from the main CT7 supply, and includes an optional splitter circuit, for use if the vessel only has a single-ended Proportional/Azimuth supply.
- On/Off Thruster Interface: this section contains digital logic circuits, controlled by the SPU, which drive high-power MOSFET output transistor pairs. There are a total of four pairs, for Bow & Stern and Port & Starboard On/Off solenoids, which can be wired either in common-positive or common-negative fashion.
- Proportional Thruster or Azimuth Drive Interface: this section is a mix of digital logic & analog circuits, controlled by the SPU. There are two sets of outputs from this section, each set having a pair of outputs, for interfacing two Bow & Stern Thrusters, or Port & Starboard Drives:
  - Voltage outputs: each output is optically isolated, and may be independently adjusted for output voltage range & polarity. An automatic change-over relay circuit, controlled by the SPU, allows the use of manual Thruster/Drive controls when the SPU is off or in **STANDBY** mode.
  - Current-loop outputs: these two non-isolated circuits have a nominal range of 4 to 20 mA.
- Electric Wheel Interface: this circuit allows most types of analog-output Electric Wheels to be used to "steer" the vessel when the P Series autopilot system is running in **POWER STEER** mode. An optional **WHEEL MODE** enable switch may also be connected to the CT7.
- Rudder Simulator: this circuit – primarily intended for use with Azimuth Drives – creates the Rudder Follower Unit (RFU) signal that the P Series SPU requires, in cases when it is not possible to use a regular RFU with the drive.

Installation

Installation

Technical Requirements

This subsection describes the technical requirements that should be met before installation of the CT7 Interface for P Series Autopilot Systems.

*Please refer to the **Warranty Information** for your P Series Autopilot System before proceeding with installation.*

Hazard warning!

CAUTION!

Extreme caution is advised when using tools powered by alternating current (AC) from main AC supply circuits, regardless of whether the supply circuits are "indoor", "outdoor", "marine" or "industrial" rated. Water, especially sea water, is an **EXCELLENT** *conductor of electricity, and can complete a path to AC Ground through a person's body, causing injury or death, if a tool malfunctions or short-circuits.*

⇒ Battery powered tools are STRONGLY recommended ⇐

If AC tools are used, they **MUST** *be plugged into a circuit that is adequately protected against Ground Faults and other safety hazards, in accordance with local electrical codes.*

Power Supply

For reliable operation of the CT7 Interface, your P Series Autopilot System must be powered from a DC (direct current) power supply, with the correct nominal voltage. The power supply must be adequately breakered, or fused; if the circuits are fused, a separate "autopilot" switch should also be provided. Ensure that adequate wire sizes are used to handle the expected maximum currents – including those required by the CT7.

The main circuitry of the CT7 Interface is then powered (always at 12 VDC) from the P Series Autopilot System's Signal Processor Unit (SPU).

Depending on the type of thruster(s) &/or drive(s) on your vessel, a separate "drive" power supply may be used; this can be at a nominal voltage different than the P Series SPU supply voltage. The CT7 provides separate input connectors for the "drive" power supply – one connection for On/Off Thrusters, and one (optically isolated) for Proportional Thrusters or Azimuth Drives.

Special Tools

A slot screwdriver with a tip size of ~2.5 mm (0.1") is required, for tightening the small screws of the wire clamps in the plugs which mate with the CT7's pin-receptacle connectors; this screwdriver will also be used to flip the levers of the CT7's Configuration switches, and to adjust its trimming potentiometers.

An accurate voltage meter will be also be needed.

Finally, other general-purpose tools, such as a portable drill, pliers, wire cutters, screwdrivers, & wrenches, will be required.

Mounting

The CT7 Interface should be mounted in a clean and DRY area, away from heat, moisture, and water of any kind. The CT7 should be located reasonably close to the P Series SPU, and at least 1m (3') from any compass, in order to minimize any possible electrical interference to the compass.

It can be mounted vertically on a bulkhead or horizontally on a deck or shelf.

- If mounted vertically, it should be positioned so that all wires and cables will exit from the bottom of the CT7 (after running sideways, left &/or right as appropriate, from the connectors under the CT7's wiring cover).
- If mounted horizontally, all wires and cables should have a drip-loop formed in them.

Each CT7 is shipped from the factory with a package of four mounting feet and a separate instruction sheet that includes dimensions for drilling holes to fasten the feet to the vessel.

Wiring

Wire Gauge

Due to the relatively high current requirements of an autopilot system – as compared to many other types of electronic equipment – the size of wire used to connect the various components is very important.

Undersized wiring will result in power losses which can affect overall efficiency and performance. Refer to **Table 1 – Minimum Recommended Wire Gauges**. If in doubt, contact your ComNav Dealer for help.

Function / Use	Type / Gauge
Thrusters: 12/24/32 VDC Solenoid Valve	3 X 18 AWG
Azimuth Drives: Reversing Motor	2 X 14 AWG. *(refer to instructions supplied with the Drive Motor)*

Table 1 – Minimum Recommended Wire Gauges

Wiring the System

Once the CT7 Interface is securely mounted, begin wiring the system.

Start by removing the Wiring Covers from both the P Series SPU and the CT7. The covers are held in place by two knurled plastic nuts (see Figure 1).

Set the covers and nuts aside – the covers will be re-installed once all the wiring of the CT7 is complete.

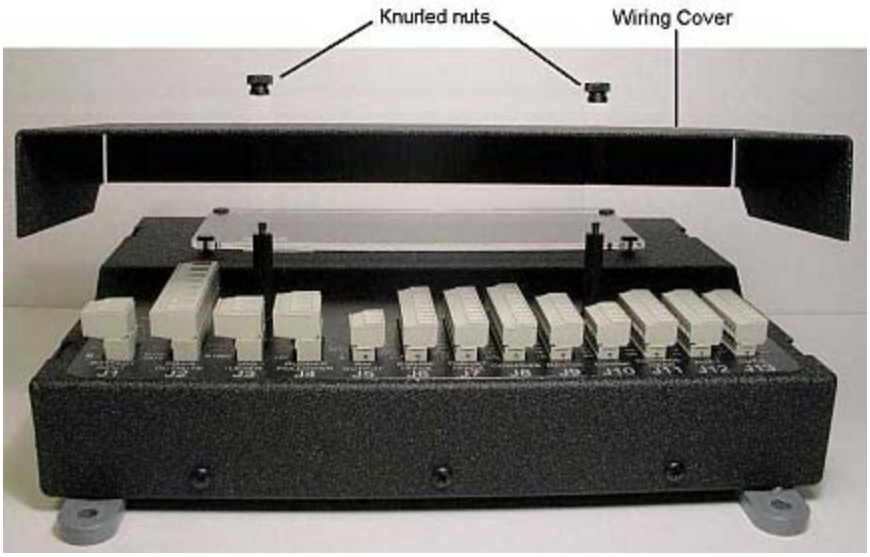


Figure 1 – Exploded View Showing Removal of P Series SPU Wiring Cover

Connectors

With the wiring covers off, all the connectors on the P Series SPU & the CT7 are visible.

The CT7's Wiring Label is shown below; please refer to your P Series Installation & Operation Manual for a picture of the SPU Wiring Label.

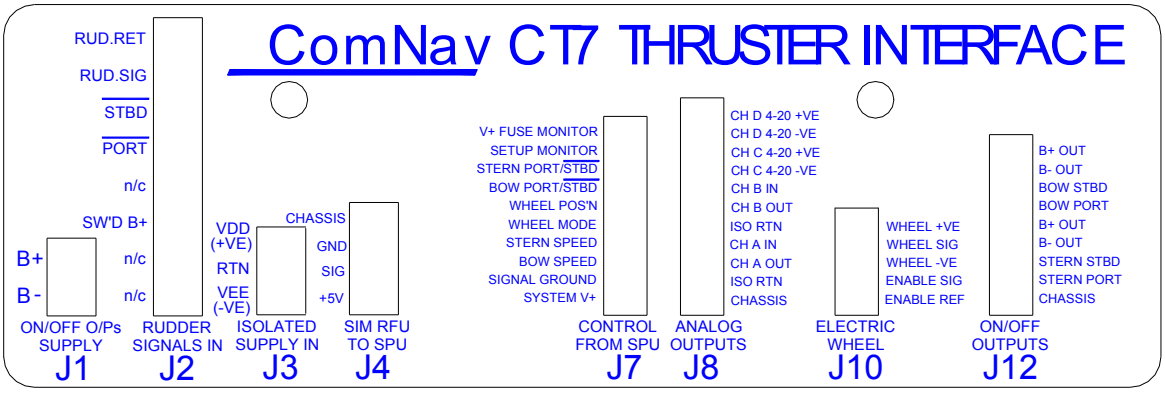


Figure 2 – CT7 Wiring Label

Each connector is a pin receptacle, with the pins sized according to how much current will be carried (bigger pins for higher current). Each pin has a signal name, rather than a number, to make it easier to match wires with pins (see the Typical Wiring Diagrams, page 43).

Each pin receptacle mates with a matching plug, which in turn has screw-clamp terminals, into which the wires from the external equipment & devices (battery, drive system, etc.) are inserted. The plugs allow quick installation & removal of system wiring, yet are fully secure, once the various cables are strain-relieved and the wiring cover is re-installed.

The CT7 Interface is shipped with all the plugs it requires, pre-installed on the connectors.

Note that the plug screws must be turned counter-clockwise several turns (using the small slotted screwdriver mentioned on page 17 – **Special Tools**) , to open up the plug's wire clamp, before a wire is inserted into that clamp; the screw must then be turned clockwise until the wire is tightly held in the clamp.

SPU ⇔ CT7 Cable

Because the CT7 Interface can be used for a variety of purposes, exact cable wiring depends on the intended use. Several diagrams showing typical wiring are included in a later section of this manual (starting on page 43.

One cable is always used, however: a CT7 must ***always*** be connected to a P Series SPU, via a 10 conductor cable. The cable supplies 12 VDC circuit power to the CT7 (but *not* the "drive power"), as well as carrying various control/status signals between the CT7 & the SPU.

A 2-meter cable is supplied with each CT7. This cable has a 10 position plug pre-wired onto both ends. The plugs mate with the J7 connectors on both the SPU & the CT7. The connections in this CT7 ⇔ SPU cable are as follows:

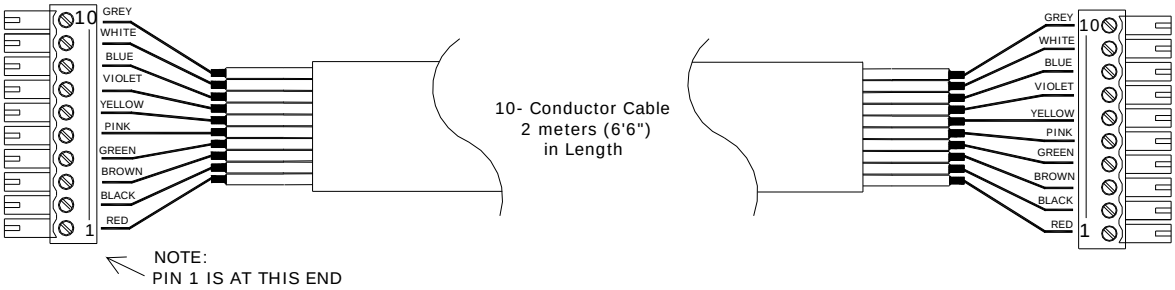


Figure 3 – SPU ⇔ CT7 Cable

Switched B+ & Rudder Follower

In some of the possible uses of the CT7 Interface, it is also necessary to connect the CT7 & the P Series SPU with additional wires:

- If the CT7 will be supplying power to Electronic Modules, Valves or Solenoids in Proportional Thrusters, or with Azimuth Drives, the Switched B+ output from the SPU must be wired to the CT7 (see diagrams **CT7 WIRING FIGS 3A/3B/3C/4/5**).
- If the CT7 is being used with Azimuth Drives, the Simulated Rudder Follower signals from the CT7 must be wired to the SPU (see diagrams **CT7 WIRING FIGS 4 & 5**).

At the CT7 end, these wires should be connected to the indicated pin(s) on the plugs supplied with the CT7. At the SPU end, the wire(s) should be added, at the indicated pins, to the plugs already in use on the SPU (more than one wire can be connected to each clamp in the SPU & CT7 plugs).

ON/OFF Thrusters

Both common–positive and common–negative thrusters can be accommodated with the CT7 Interface. It is even possible to have one thruster wired as common–positive, while the other is wired common–negative. See diagram **CT7 WIRING FIG 1**.

Electronic Thruster Controls

It is possible to wire the CT7 Interface in parallel to the Thruster Control circuits of a number of popular Thruster manufacturers.

Diagram **CT7 WIRING FIG 2** suggests one way that this may be accomplished.

The diodes shown in the circuit are required to provide a circuit path for powering the CT7 output circuit from the power supply of the Thruster Control module(s), while preventing the CT7 and P Series SPU circuitry from accidentally back-powering the Thruster module(s); the diodes also isolate the individual modules' power supplies from each other, if there are two such modules.

The diodes must be rated to handle at least the maximum current that Thruster Control module(s) require to drive their Port/Starboard signal lines. Because the modules are not supplied by ComNav, their current requirements are not known – and so the diodes must be chosen & supplied by the customer.

> ***Note:*** *the current required by the Thruster Control modules must not exceed the maximum current that the CT7's On/Off Outputs can handle. Also, the voltage across the V+ & -VE pins of the modules must not exceed the CT7's On/Off Drive Input Supply specifications. See General Specifications on page 37).*

Proportional (Analog) Thrusters

The CT7 Interface is equipped with two optically-isolated, high-power analog outputs that can drive a variety of proportional valves. The outputs are thermally protected and inherently short-circuit proof. The outputs are also routed through on-board change-over relays, controlled by the SPU, eliminating the need for additional relay boxes to switch between autopilot and manual control signals. The analog outputs are capable of driving voltages that swing both positive and negative, with respect to the ISO GND line.

There are several possible ways in which proportional Thrusters can be wired. See the diagrams **CT7 WIRING FIG 3A, 3B** & **3C** for some examples.

Certain proportional valves have two solenoid coils with a single common wire. See diagram **CT7 WIRING FIG 4**.

Note that the diodes in the diagram are required to direct positive-going (with respect to ISO GND) voltage to one of the two solenoids, and negative-going voltage to the other solenoid; the diodes must be rated for at least 1.5 Amps DC. In such cases, one coil is driven by the CT7's Analog Output Channel B, and the other is driven by an inverted signal from Channel A.

Because the solenoids are not supplied by ComNav, their current requirements are not known – and so the diodes must be chosen & supplied by the customer.

> ***Note:*** *the CT7's Analog outputs must be used either for Proportional Thrusters or Azimuth Drives. They can not be used simultaneously for both.*

Azimuth Drives

The same optically-isolated, high-power analog outputs used for Proportional Thrusters can instead be used for Azimuth Drives. The wiring is similar – see diagram **CT7 WIRING FIG 4**.

> ***Note:*** *the CT7's Analog outputs must be used either for Proportional Thrusters or Azimuth Drives. They can not be used simultaneously for both.*

For best Steering performance by a P Series autopilot system, it is always best to have a Rudder Follower Unit (RFU) connected to the vessel's Rudder – or, in the case of Azimuth Drives – to the "direction" mechanism of drive unit itself. Please contact your ComNav Dealer for further information on ComNav's RFUs which may suit your vessel's Azimuth Drives.

However, it is often not possible – or even if it is, it is usually not easy – to connect an RFU to Azimuth Drives.

Because of this, the CT7 Interface provides a Rudder Simulator feature, which generates an RFU signal – directly compatible with the P Series SPU – from the steering signals sent by the SPU to the CT7.

> ***Note:*** *the CT7's Rudder Simulator is designed & tested only for use with Azimuth Drives. Although the Rudder Simulator could in theory be used with normal drive types, to replace the RFU normally required for such drives, doing so is not supported or recommended by ComNav.*

Wiring of the CT7's RFU signals back to the SPU is via the J4 ⇔ J4 cable – see diagram **CT7 WIRING FIG 4**.

Isolated Analog Power Supply

The analog outputs of the CT7 Interface are optically isolated from the rest of the CT7 circuitry, and from the P Series SPU's circuitry, if an isolated supply is used as the power source for the analog outputs.

If the isolated supply is already split into positive and negative halves, it may be wired directly into **J3 – ISOLATED SUPPLY IN**.

However, the CT7 has available circuitry on board to split a single supply into positive and negative halves, if the isolated supply is not already split.

> ***Note****: if the supply-splitting circuit is used, the maximum positive and negative analog output voltages will be approximately ½ of the isolated supply voltage.*

Refer to diagrams **CT7 WIRING FIG 3A**, **3B**, **3C** & **4** for the Isolated Supply wiring.

> ***Important!*** *If the isolated supply used is already split, remove fuse F5 from the fuse holder on the CT7. This prevents current from flowing on the supply return line between the isolated supply and the on-board generated supply return line (ISO GND).*

4–20 mA Current-loop Outputs

The CT7 Interface provides two current-loop outputs that can be used to drive electronic steering modules. Typically the outputs will be 4 mA at 45° port rudder, and 20 mA at 45° starboard rudder; 12 mA signifies "mid-ship rudder". The outputs can drive loads between 10 and 500 Ohms. See **CT7 WIRING FIG 5** for wiring details of the Current-loop outputs.

> ***Note:*** *the CT7's Current-loop outputs are not optically isolated, nor do they have the change-over & range/polarity features of the analog voltage Proportional/Drive outputs.*

Electric Wheel Interface

The CT7 Interface will accept input from any Electric Wheel that provides an analog signal from zero to five volts DC, with the mid-ship position equal to 2.5 VDC.

In most cases, 5 VDC power can be supplied to the Electric Wheel from the CT7. However, if the Electric Wheel requires a different voltage, or if the current draw is greater than 20 mA, a separate power supply for the Wheel should be uses, and a common signal ground established between the external power supply and the CT7's J10 Wheel Ref pin.

Wire the Electric Wheel as per **CT7 WIRING FIG 6,** including a suitable On-Off switch (customer-supplied) – for Electric Wheel Enable – wired between J10's ENABLE SIG & ENABLE REF pins.

> ***Note:*** *that if the CT7 is only being used as an interface for an Electric Wheel, and you are not controlling Thrusters or an Azimuth Drive, the CT7 will draw all necessary power from the SPU via connector J7, and no additional battery connections to the CT7 are required.*

ELECTRIC WHEEL Mode Enable

Whenever the Electric Wheel Enable switch is ON (closed), the **ELECTRIC WHEEL** mode of the P Series Autopilot System is enabled.

In this condition, the **POWER STEER** mode of the P Series Autopilot System becomes **ELECTRIC WHEEL** mode instead: pressing the PWR STR button on the Control Head – which normally causes the autopilot to enter **POWER STEER** mode – will cause **ELECTRIC WHEEL** mode to be entered.

In this mode, the COURSE CHANGE knob and PORT/STARBOARD ARROW buttons on the autopilot Control Head will be disabled (you can still use them to view and change menu items, however).

If the autopilot is already in **POWER STEER** mode when the Electric Wheel Enable switch is turned ON, the autopilot will enter **ELECTRIC WHEEL** mode.

To exit **ELECTRIC WHEEL** mode, change to **STANDBY**, **AUTO**, or **NAV** modes by pressing the appropriate button.

While in **ELECTRIC WHEEL** mode, all autopilot Control Heads are forced into "Repeater" mode, and the Electric Wheel has sole control of the vessel's steering. Unlike regular "Repeater" mode though, you cannot "take control" away from the electric wheel by pressing the PORT and STARBOARD ARROW buttons on the Control Heads.

While this mode is active, a large letter "E" will be displayed in the upper left corner of the Control Head display, where the P Series operating mode indicator is normally shown.

Setup

Once the CT7 Interface is installed and wired, there are a few Setup steps that must be done, in order to use it with your P Series Autopilot System:

- Set the *configuration switches* on the CT7 to configure it for the type of drive on your vessel.
- Set the P Series Autopilot System's *Thruster parameter values* that control the CT7's operation.
- For analog voltage outputs to Proportional Thrusters or Azimuth Drives, adjust the range & polarity of the CT7's outputs to match with your drive system's requirements.
- For Azimuth Drives using the CT7's Rudder Simulator feature, adjust the Simulator to match with the drive's "steering" functions.

Switch Settings

Configuration of the CT7 Interface requires the correct setting of six switches that are located under the Access Window. To set the switches, first remove the window by prying it gently out of the chassis.

The six switches are all in one package, at the right of the window (see Figure 4). An individual switch is Closed when its lever is DOWN, and Open when the lever is UP.

> ***Important!*** *Correct settings of the CT7's switches are necessary for proper operation of the CT7. Incorrect settings may damage the CT7 circuitry and/or other equipment connected to the CT7.*

Figure 4 – CT7 Switches & Trim-pots

Switch #1 – Setup

When Switch #1 is in the DOWN position, and the P Series Autopilot System is turned on, the CT7 is placed in Rudder Simulator Setup Mode. This switch is only used when the CT7 is used to control Azimuth drives without a physical RFU, and then only during Dockside Setup of the P Series Autopilot System. It should be in the UP position at all other times.

> ***Note:*** *the CT7's LED lamp labelled "SETUP" will be lit whenever this switch is activated.*

Switch #2 – Invert Channel A Output

In order to invert the signal from the CT7's Analog Output Channel A with respect to Channel B, for use with certain types of twin or dual solenoid proportional valves, Switch #2 must be in the DOWN position. Otherwise, Channel A and B have the same voltage-swing polarity.

Switch #3 – Bow Output Positive/Negative

If the Bow Thrusters are On/Off types, and if they are to be activated by positive voltage on the signal line, Switch #3 should be in the DOWN position. If the Thrusters are to be activated by grounding the signal lines, this switch should be in the UP position.

Switch #4 – Stern Thruster Positive/Negative

This switch works exactly the same way as Switch #3, but affects the Stern Thruster On/Off outputs.

Switch #5 – Channel A Control Source

This switch selects the type of drive signal generated on the Channel A Analog Output. If the CT7 is to be used to control an Azimuth Drive or a Proportional Steering Valve with Channel A, this switch should be in the DOWN position. If the CT7 is to be used to control a proportional Bow thruster with Channel A, this switch should be in the UP position.

Switch #6 – Channel B Control Source

This switch works exactly the same way as Switch #5, but affects Analog Output Channel B.

Autopilot System Parameters

CT7-related parameters of the P Series Autopilot System are set up using the Control Head.

Dockside Menu

Thrust Type (Thruster Type)

Selects the type of thruster interface required: On/Off, Prop (Proportional), or None.

Select None if the CT7 Interface is to be used with an Azimuth drive, or as an Electric Wheel interface.

Thrust MIN (Thruster Minimum)

Selects the minimum voltage (percent of the supply voltage) at the CT7's Analog Output.

Proportional valves often have a minimum voltage/current that must be supplied before the valve's internal spool begins to move. By adjusting this item's setting, you can match the CT7's output voltage for the Bow thruster to the requirements of the valve.

> ***Note:*** *The output voltage for the Stern thruster will be slightly higher, as a function of the P Series Autopilot System's IST technology.*

If you are using On/Off valves, leave Thrust MIN set to the factory-default value of 30.

Thrust MAX (Thruster Maximum)

Selects the maximum voltage (percent of the supply voltage) at the CT7's Analog Output.

For Proportional Thrusters, you may wish to limit the maximum amount of thrust, in order to prevent excessive overshoot when the thrusters are used to maintain a course, or change onto a new course.

If you are using On/Off valves, leave Thrust MAX set to the factory-default value of 70.

Auto Menu

If Thrust Type in the Dockside menu is set to On/Off or Prop, then two additional items will appear in the Auto menu. They are:

Thruster Assist

Sets the maximum speed at which the CT7's Thruster Assistance feature will be active. This parameter can be varied in 0.5 Knot steps from 0.5 up to 7.0 Knots, or can be set to Off.

When Thruster Assist is set to some value other than Off, the CT7 will automatically use the thruster(s) to assist the vessel in maintaining a course, or turning onto a new course.

> ***Note:*** *this feature requires a speed sensor wired into the P Series SPU.*

When Off is selected, the P Series SPU will not use Automatic Thruster Assistance. You may still be able to activate the thrusters manually, depending on how you vessel is equipped and wired.

Thruster Gain

The options are Low, Medium, and High. Thruster Gain is used to adjust how aggressive you want the thrusters to be when using Automatic Thruster Assistance.

If On/Off thrusters are used, the Gain setting primarily affects how long the thruster is activated. If Proportional thrusters are used, the Gain setting primarily affects the minimum voltage of the Stern thruster output.

Electrical Adjustments

This step requires use of various menus and operational displays on the Control head of your P Series Autopilot System. It also requires use of an accurate Voltage meter, and a small slot-head screwdriver (see page 17 – **Special Tools**).

On/Off & Electronic Thrusters

The CT7 Interface can directly drive On/Off (Solenoid) & Electronic Thrusters without any electrical adjustments.

Proportional Thrusters

The CT7 Interface can directly drive some types of Proportional Thrusters without any electrical adjustments.

However, it will typically be necessary to adjust the maximum voltage that the CT7 outputs, to match with the input signal voltage requirements of your Thrusters (Electronic modules, valves, or solenoids). Refer to your Proportional Thruster manuals to determine those voltages.

Adjustments can be made to the CT7's "drive" output voltages by adjusting trim-pots CHA (for channel 'A' output) and CHB (for channel 'B' output). These trim-pots are factory set so that a rudder command of 45° results in approximately 10.0 Volts, but can be adjusted up or down (within the upper limit set by the Isolated Supply voltage), as desired.

> ***WARNING:*** *the CT7's Thruster output circuits are high-gain analog amplifiers. They were designed to work properly with most types of Proportional Thrusters; but, like all high-gain amplifiers, there is a potential for them to break into oscillation, when their gain trim-pots are set for maximum gain, if they are connected to wiring with high inductance and/or capacitance (typically, when long cable runs are required), or if the wiring is run close to strong sources of RFI or EMI. If this condition occurs, you should immediately reduce the gain settings (CHA/CHB trim-pots), and then contact your ComNav Dealer for assistance.*

Azimuth Drive Systems

The CT7 Interface can directly drive most Azimuth Drive systems without any electrical adjustments. Most Azimuth systems are equipped to accept ±10 VDC signals, with 0 VDC equating to the mid-ship position of the Azimuth unit.

> ***Note:*** *outputs are also available for Azimuth systems requiring 4 - 20mA input signals; these are described on page 22.*

However, adjustments can be made to the CT7's "drive" output voltages, as described above for Proportional Thrusters.

Rudder Simulator Setup

One adjustment unique to Azimuth Drives is for the CT7's Rudder Simulator feature.

Typically, it will be necessary to adjust the CT7's simulated RFU signal to match with your vessel's Azimuth drive's movements.

To adjust the CT7's simulated RFU:

1) Connect the appropriate Switched B+ & Rudder Feedback wires from the P Series SPU to the CT7's J2 and J4 connectors, as per "CT7 Wiring Fig 4". You may also wish to wire up the plugs for J3 and J8 – but DO NOT connect them to the CT7 at this time.

2) Remove the Access Window on the CT7. This is easily accomplished by gently prying the four corners of the window up from the chassis.
3) Turn on the P Series Autopilot System, and enter the Power Steer menu.
4) Select RAI Offset and ensure that it is set to 0 (zero).
5) Exit the Power Steer menu.
6) With the autopilot in STANDBY mode, gently adjust the VREF trim-pot on the CT7 (located immediately above the WHEEL GAIN trim-pot, see Figure 4), so that the RAI display at the bottom of the Control Head's screen reads 0 (zero) degrees.
7) Enter the Dockside menu. Referring to your P Series manual, follow all of the steps necessary to set up your autopilot.
8) When it comes time to do the Drive Setup, press the **Fn** button as usual.
9) When prompted to "Move Rudder to Max Starboard", move Switch #1 on the CT7 to the DOWN (closed) position, and note that the CT7's "SETUP" LED illuminates.
10) Press the STBD pushbutton on the CT7. You will see the Rudder Angle Indicator display on the Control Head begin to move. Do not be concerned if it moves in the opposite direction expected (the P Series SPU's firmware will automatically sort that out shortly).
11) Continue pressing the STBD button until the RAI reading is at maximum deflection. Then press the STBD ARROW button on the Control Head.
12) When prompted to "Move Rudder to Max Port", press the PORT button on the CT7 and note that the RAI will begin to swing to the other side.
13) Release the PORT button when the RAI reading is at maximum deflection. Then press the PORT ARROW button on the Control Head.
14) When prompted to "Center Rudder", use the STBD button on the CT7 once again to bring the RAI to the mid-ship position. Use the "PORT" and "STBD" buttons to fine-tune the position of the RAI if necessary.
15) Move Switch #1 to the UP (open) position.
16) Press the **Fn** button on the Control Head.
17) The autopilot will proceed with the testing of the drive. When prompted to bleed the system, simply press the **Fn** button to bypass that portion of the SPU's Drive Setup process. Once the autopilot has finished measuring the CT7 drive, you should bet a "Drive Test OK" message.
18) At this point, press the PORT ARROW button as usual, to return to the Dockside menu.
19) Exit the Dockside menu by selecting Exit from the menu (the autopilot will restart in STANDBY mode), or by turning the autopilot off and then on again.
20) Connect J3 to the azimuth supply.

    Note: *be sure to remove Fuse F5 if the azimuth supply provides an isolated return.*

21) Connect J8 to the appropriate connections on the azimuth drive.

22) Monitor the voltage at J8, pins Ch A Out & Ch B Out. Change the autopilot to POWER STEER mode, and use the PORT ARROW button to move the azimuth drive to 30° in the port direction.

    The 30° should not be taken from the autopilot display at this point – it should be determined by an independent RAI or physical means.

23) Now adjust the RFU GAIN trim-pot so that the autopilot RAI reads 30°.

24) Verify the RAI calibration by using the STARBOARD ARROW button to move the azimuth drive to 30° in the starboard direction and checking the autopilot display.

Adjustment of Electric Wheel Gain

1) Turn the WHEEL GAIN trim-pot on the CT7 all the way counter-clockwise if it is not already there.
2) Once the CT7 is wired to the autopilot SPU and the Electric Wheel, turn on the autopilot and enable the **ELECTRIC WHEEL** mode (by closing the Enable Wheel Enable switch), and then pressing the PWR STR button, to enter **ELECTRIC WHEEL** mode).
3) Move the wheel hard over in one direction.
4) Now slowly adjust the WHEEL GAIN trim-pot clockwise until the rudder stops just at the limits of its travel.
5) If the Wheel Gain is too high, the rudder will reach the limits of travel before the wheel reaches the limits of its travel, and you will not be able to steer as precisely.

Final Steps

Replace the access window cover on the CT7.

Re-check all cables & wires connected to the CT7 & the SPU:

- Are they secure?
- Are the plugs fully pushed into the CT7's & SPU's connectors?
- Is the polarity of all "drive power" wiring correct?
- If a split Isolated Analog Power Supply is used, is Fuse F5 removed? If a non-split supply is used, is F5 in?

Re-install the Wiring Covers on the CT7 & the SPU.

Care & Maintenance

Care & Maintenance

The CT7 Interface for P Series Autopilot Systems has been designed to provide many years of reliable service. The following periodic care and maintenance tips will help to ensure the longevity of your CT7.

Cleaning and Appearance

The CT7 Interface should be carefully cleaned on are regular basis with a damp cloth and mild soap.

Do not use abrasive cleaners or chemicals.

The CT7 is designed to be weatherproof and splash resistant, but it should not be immersed in water for a prolonged period of time.

Environments exceeding the maximum or minimum temperatures specified in General Specifications on page 37 MUST BE AVOIDED.

Exposure to prolonged direct sunlight should be avoided in order to prevent damage to the electronics and housing.

Protection of Wires and Cabling

After installation, ensure that the system components are securely mounted and will not shake loose due to the vibrations that can be expected in a marine vessel.

Ensure that the cabling and wiring to all system components is well secured with clamps or alternative fasteners.

Many potential problems can be avoided by ensuring that cabling and wiring do not cause strain on the connectors.

Periodic Checks

After the first six months of operation a thorough examination of the entire Autopilot system MUST BE UNDERTAKEN. All electrical connections, cables, clamps, mounting brackets, and mechanical connections must be secure.

An ANNUAL inspection should be undertaken thereafter.

Fuse Replacement

There are 3 types of fuses (5 fuses in total) used on the CT7 Interface. Should a fuse blow, determine the cause before replacing. Replace fuses only with the same type and rating as per the table below:

Designator	ComNav Part Number	Generic Description ***Manufacturer(s) & Part Number(s)***
F1	60810007	1 A Medium Time Delay, 125V or better, 5 x 20mm (DIN 41571, IEC 127)) *Bussman* ***GMC 1***
F2	60810024	*10A, Non-Time Delay, 125V, ¼"x 1-¼"* *Bussman* ***ABC-10***
F3, F4, F5	60810012	3.15 A Medium Time Delay, 125V or better, 5 x 20mm (DIN 41571, IEC 127)) *Bussman* ***GMC 3.15A***

Table 2 – Fuse Replacement Guide

Appendices

Appendices

Appendix 1

General Specifications

Parameter	Specification
Dimensions	257 x 184 x 76 mm (10.2 x 7.3 x 2.9”)
Operating Voltage	12 VDC *(nominal – supplied from the Commander/Admiral SPU via J7)*
Power Consumption	150 mADC typical (in idle sate)
On/Off Drive Input Supply (J1)	5 to 40 VDC
On/Off Drive Outputs	3 Amps (max.)
Analog (Proportional) Isolated Supply Input	+/- 28 VDC (max)
Analog (Proportional) Output	1.5 Amps (Max)
Current Loop Outputs	4–20 mA nominal, 12 mA @ mid-ship rudder 10 Ω to 500 Ω load impedance
Electric Wheel Input	0-5 VDC, 2.5VDC @ mid-ship rudder 200 Ω to 10 KΩ impedance
Rudder Follower Output	1.0–4.0 VDC centered at 2.5 VDC *(compatible with all ComNav autopilots)*
Electric Wheel Input	0-5 VDC, 2.5VDC @ mid-ship rudder 200 Ω to 10 KΩ impedance

Table 3 – General Specifications

Appendix 2

Warning Messages

There are two warning messages in the P Series Autopilot System that are specific to the CT7 Interface.

These messages will appear on the P Series Control Head when the associated conditions occur, if a CT7 is connected to the SPU and Thruster Type in the Dockside Menu is set to On/Off or Prop (see page 26).

Message	Description
CT7 VOLTAGE LOW	The CT7's main supply voltage at the J7 connector, SYSTEM V+ pin, is below ~8 Volts.
CT7 SETUP ON	Switch #1 on the CT7 is in the SETUP position (down). See page 25.

Table 4 – Messages

Appendix 3

Diagnostic LEDs

The CT7 Interface is equipped with a number of Light-Emitting Diode (LED) lamps that can assist in trouble-shooting should a problem arise with the CT7. Refer to the following table:

LED	Description
SYS PWR	This LED will be ON whenever the P Series SPU is powered up.
VCC	VCC is the voltage supplying the logic circuits on the CT7. The voltage is nominally 5.25 VDC, and can be measured at testpoint TP2 with respect to ground (GND, on TP1).
DRV PWR	This indicator will be ON whenever there is a supply voltage at the ON/OFF O/Ps SUPPLY connector, J1.
BOW PORT, STBD	One or the other of these indicators will be ON whenever the respective BOW On/Off outputs of the CT7 are On.
STERN PORT, STBD	One or the other of these indicators will be ON whenever the respective STERN On/Off outputs of the CT7 are On.
CH A POS, NEG	One or the other of these indicators will be ON whenever the CH A Proportional/Drive analog voltage outputs of the CT7 are Positive or Negative with respect to ISO GND (TP4).
CH B POS, NEG	One or the other of these indicators will be ON whenever the CH B Proportional/Drive analog voltage outputs of the CT7 are Positive or Negative with respect to ISO GND (TP4).
SETUP	This LED will be ON when the CT7 is in Rudder Simulator Setup mode.

Table 5 – Diagnostic LEDs

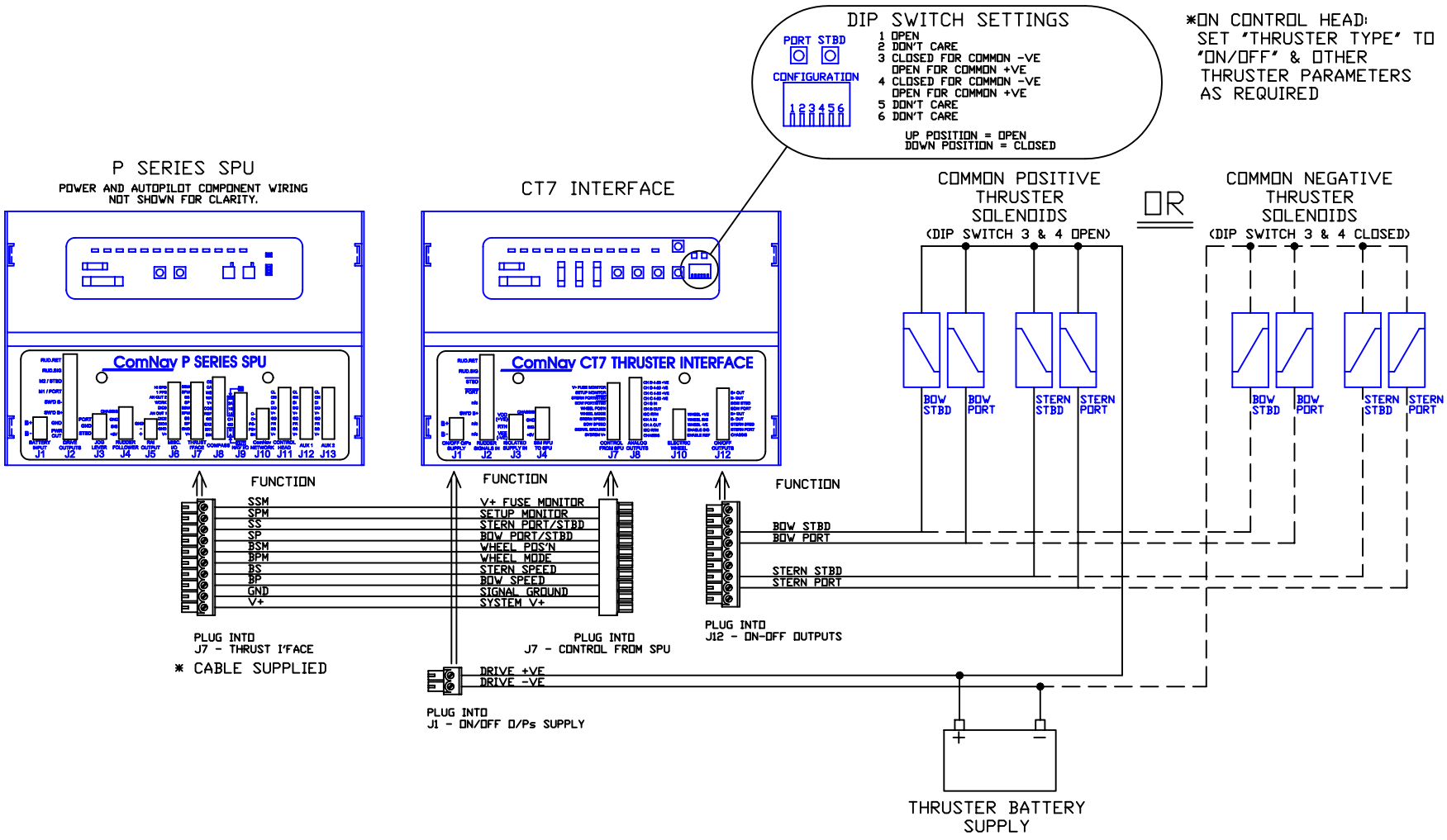
Appendix 3

Typical Wiring Diagrams

The following diagrams show the various ways in which the CT7 is wired.

DO NOT SCALE

IMPERIAL



PROJECTION

PROJECT TITLE: **CT7 INTERFACE**

SHEET TITLE: **COMMON POSITIVE/NEGATIVE THRUSTER WIRING**

ComNav® Marine Ltd.
#15-13511 Crestwood Place
Richmond, BC Canada V6V 2G1
Tel: 604.207.1600 Fax: 604.207.8008
www.comnavmarine.com

MATERIAL SPECIFICATION

FINISH

DOCUMENT ID. NO.: CT7 WIRING FIG 1

TOLERANCES UNLESS OTHERWISE SPECIFIED
FRACTIONAL DECIMALS ±1/16"
DECIMAL DIMENSIONS 0.0 ±0.020"
0.00 ±0.010"
0.000 ±0.002"
BREAK SHARP EDGES 0.02"
M/C SURFACES 125

DRAWN BY: DC/FW/DTO

DATE (YR MM DY): 07 10 05

PART NO.: N/A

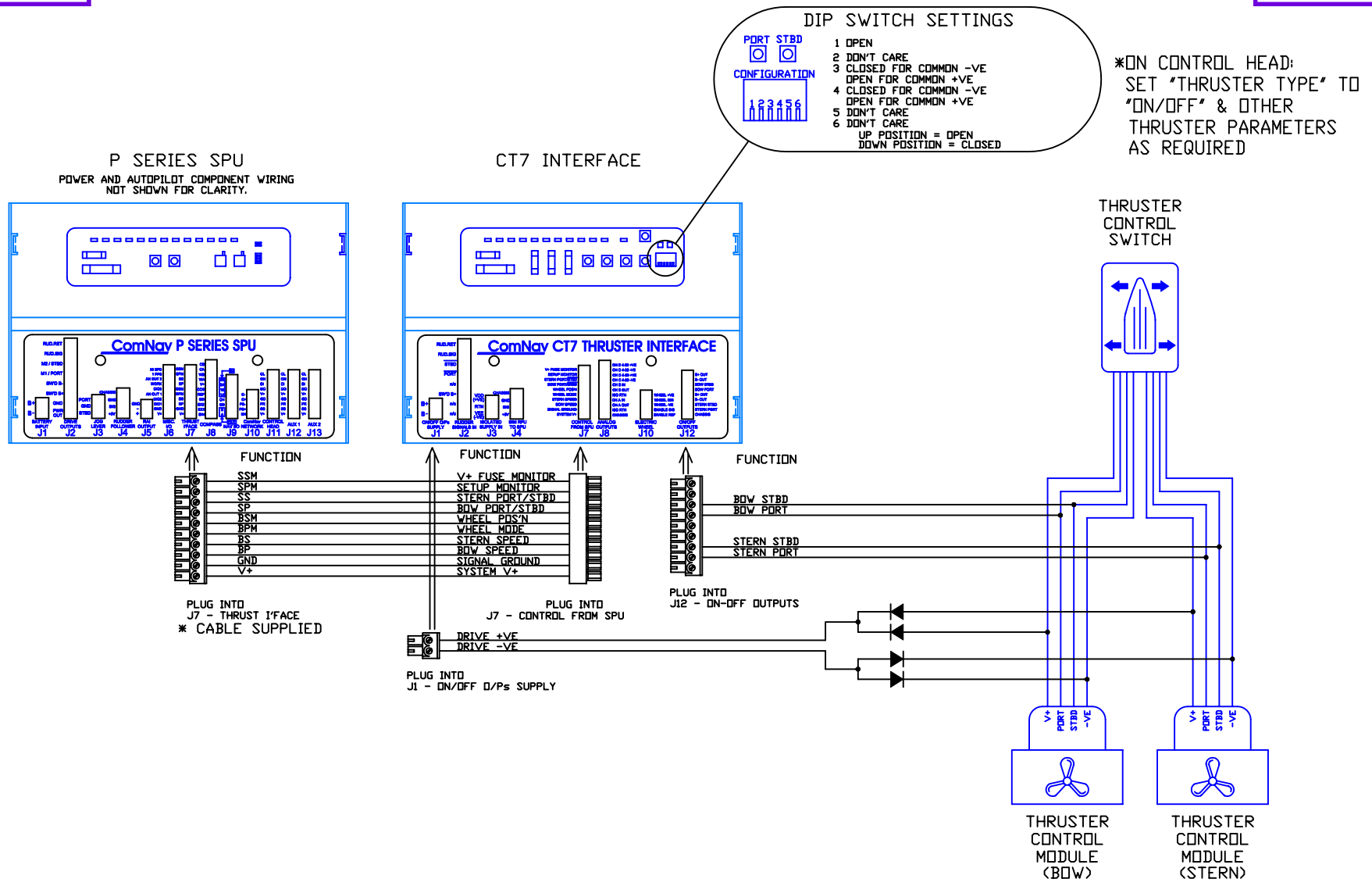
FILE NAME: 20350008WR1-2-0-1.DWG

SHEET NO.: **1 OF 1**

REV. NO.: **1-2**

DO NOT SCALE

IMPERIAL



PROJECTION

PROJECT TITLE: **CT7 INTERFACE**

SHEET TITLE: **ELECTRONIC THRUSTER WIRING**

ComNav® Marine Ltd.
#15-13511 Crestwood Place
Richmond, BC Canada V6V 2G1
Tel: 604.207.1600 Fax: 604.207.8008
www.comnavmarine.com

MATERIAL SPECIFICATION

FINISH

DOCUMENT ID. NO.: CT7 WIRING FIG 2

TOLERANCES UNLESS OTHERWISE SPECIFIED
FRACTIONAL DECIMALS ±1/16"
DECIMAL DIMENSIONS 0.0 ±0.020"
0.00 ±0.010"
0.000 ±0.002"
BREAK SHARP EDGES 0.02"
M/C SURFACES 125

DRAWN BY: DC/FW/DTO

DATE (YR MM DY): 07 10 05

PART NO.: N/A

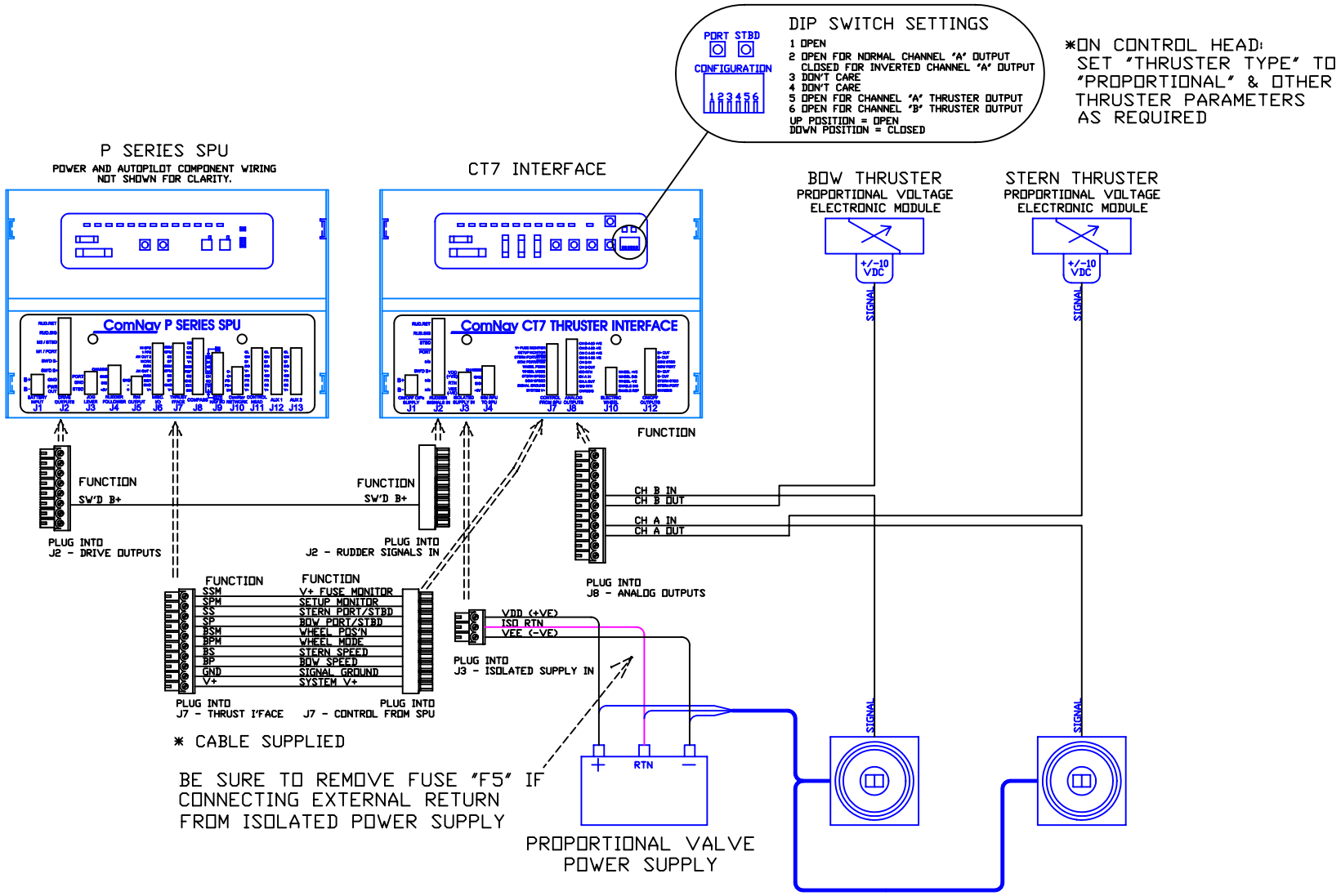
FILE NAME: 20350008WR1-2-0-2.DWG

SHEET NO.: **1 OF 1**

REV. NO.: **1-2**

DO NOT SCALE

IMPERIAL



PROJECTION

PROJECT TITLE: **CT7 INTERFACE**

SHEET TITLE: **PROPORTIONAL THRUSTER WIRING**

ComNav® Marine Ltd.

#15-13511 Crestwood Place
Richmond, BC Canada V6V 2G1
Tel: 604.207.1600 Fax: 604.207.8008
www.comnavmarine.com

MATERIAL SPECIFICATION

FINISH

DOCUMENT ID. NO.: CT7 WIRING FIG 3A

TOLERANCES UNLESS OTHERWISE SPECIFIED
FRACTIONAL DECIMALS ±1/16"
DECIMAL DIMENSIONS 0.0 ±0.020"
0.00 ±0.010"
0.000 ±0.002"
BREAK SHARP EDGES 0.02"
M/C SURFACES 125

DRAWN BY: DC/FW/DTO

DATE (YR MM DY): 07 10 05

PART NO.: N/A

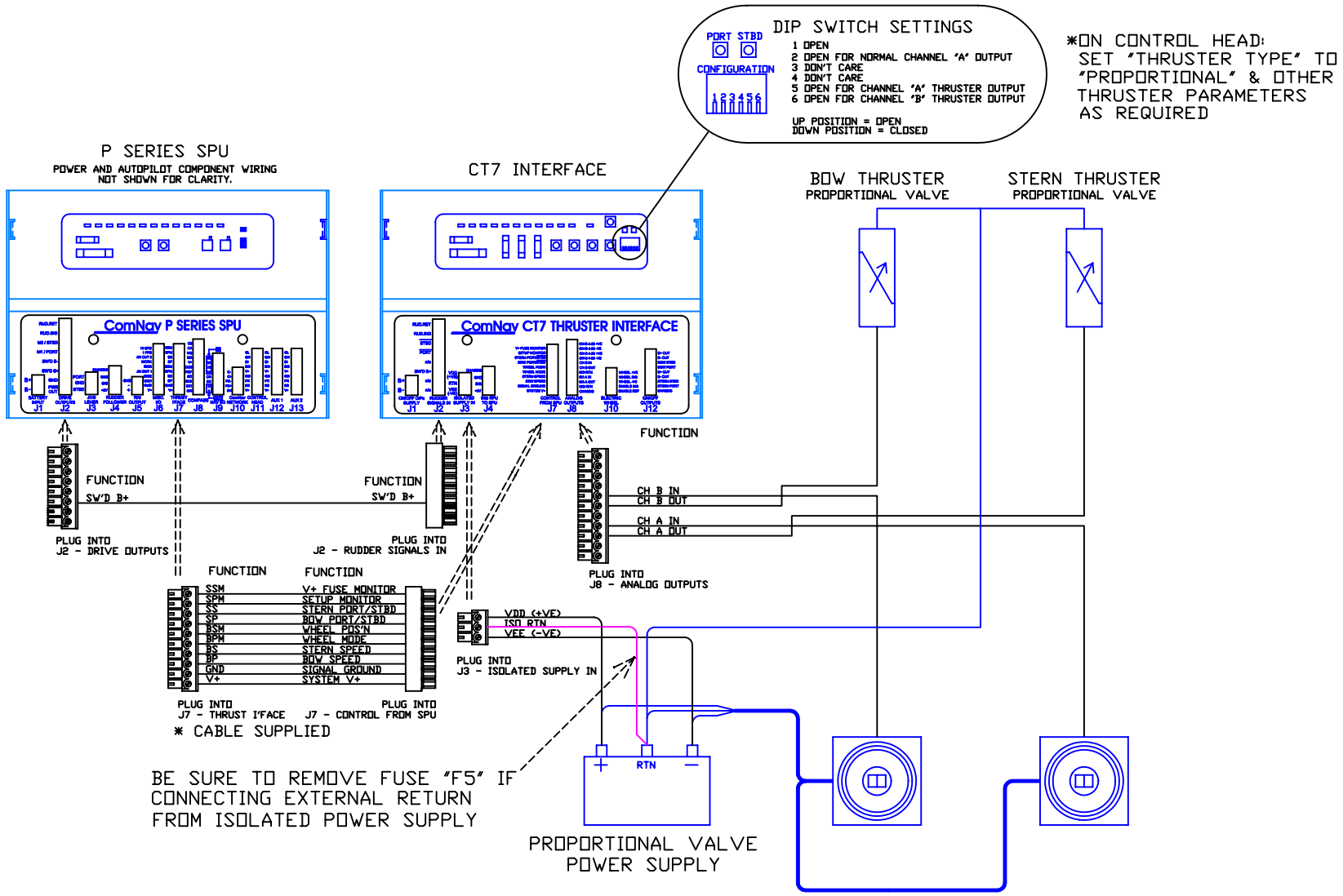
FILE NAME: 20350008WR1-2-0-3A.DWG

SHEET NO.: **1 OF 1**

REV. NO.: **1-2**

DO NOT SCALE

IMPERIAL



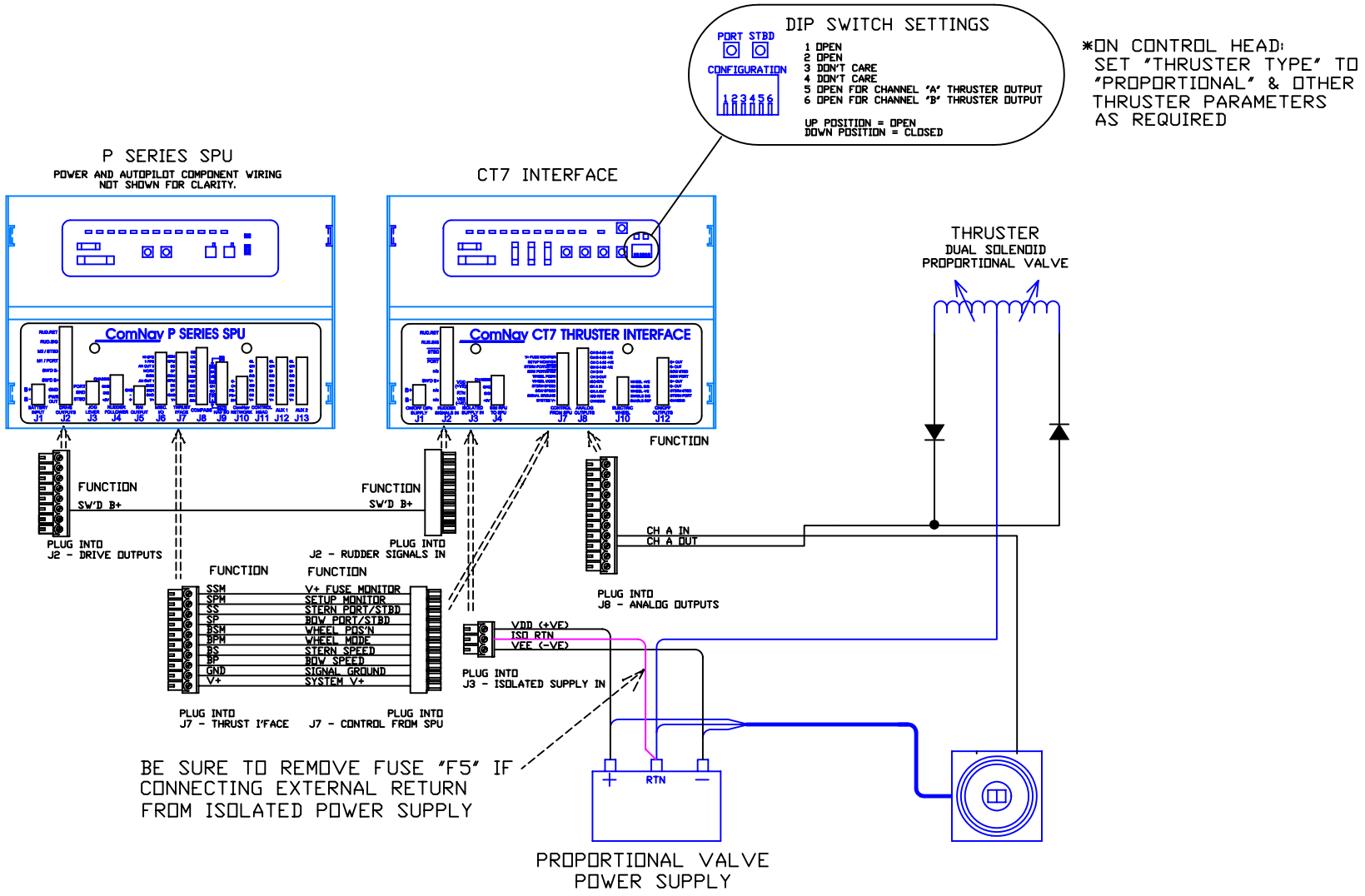
PROJECTION	PROJECT TITLE: **CT7 INTERFACE**	SHEET TITLE: **PROPORTIONAL THRUSTER WIRING**

ComNav® Marine Ltd.
#15-13511 Crestwood Place
Richmond, BC Canada V6V 2G1
Tel: 604.207.1600 Fax: 604.207.8008
www.comnavmarine.com

MATERIAL SPECIFICATION	FINISH		DOCUMENT ID. NO.: CT7 WIRING FIG 3B
TOLERANCES UNLESS OTHERWISE SPECIFIED FRACTIONAL DECIMALS ±1/16" DECIMAL DIMENSIONS 0.0 ±0.020", 0.00 ±0.010", 0.000 ±0.002" BREAK SHARP EDGES 0.02" M/C SURFACES 125	DRAWN BY: DC/FW/DTO	DATE (YR MM DY): 07 10 05	PART NO.: N/A
	FILE NAME: 20350008WR1-2-0-3B.DWG		SHEET NO.: **1 OF 1** / REV. NO.: **1-2**

DO NOT SCALE

IMPERIAL



PROJECTION

PROJECT TITLE: **CT7 INTERFACE**

SHEET TITLE: **PROPORTIONAL THRUSTER WIRING**

ComNav® Marine Ltd.
#15-13511 Crestwood Place
Richmond, BC Canada V6V 2G1
Tel: 604.207.1600 Fax: 604.207.8008
www.comnavmarine.com

MATERIAL SPECIFICATION

FINISH

DOCUMENT ID. NO.: CT7 WIRING FIG 3C

TOLERANCES UNLESS OTHERWISE SPECIFIED
FRACTIONAL DECIMALS ±1/16"
DECIMAL DIMENSIONS 0.0 ±0.020"
0.00 ±0.010"
0.000 ±0.002"
BREAK SHARP EDGES 0.02"
M/C SURFACES 125

DRAWN BY: DC/FW/DTO

DATE (YR MM DY): 07 10 05

PART NO.: N/A

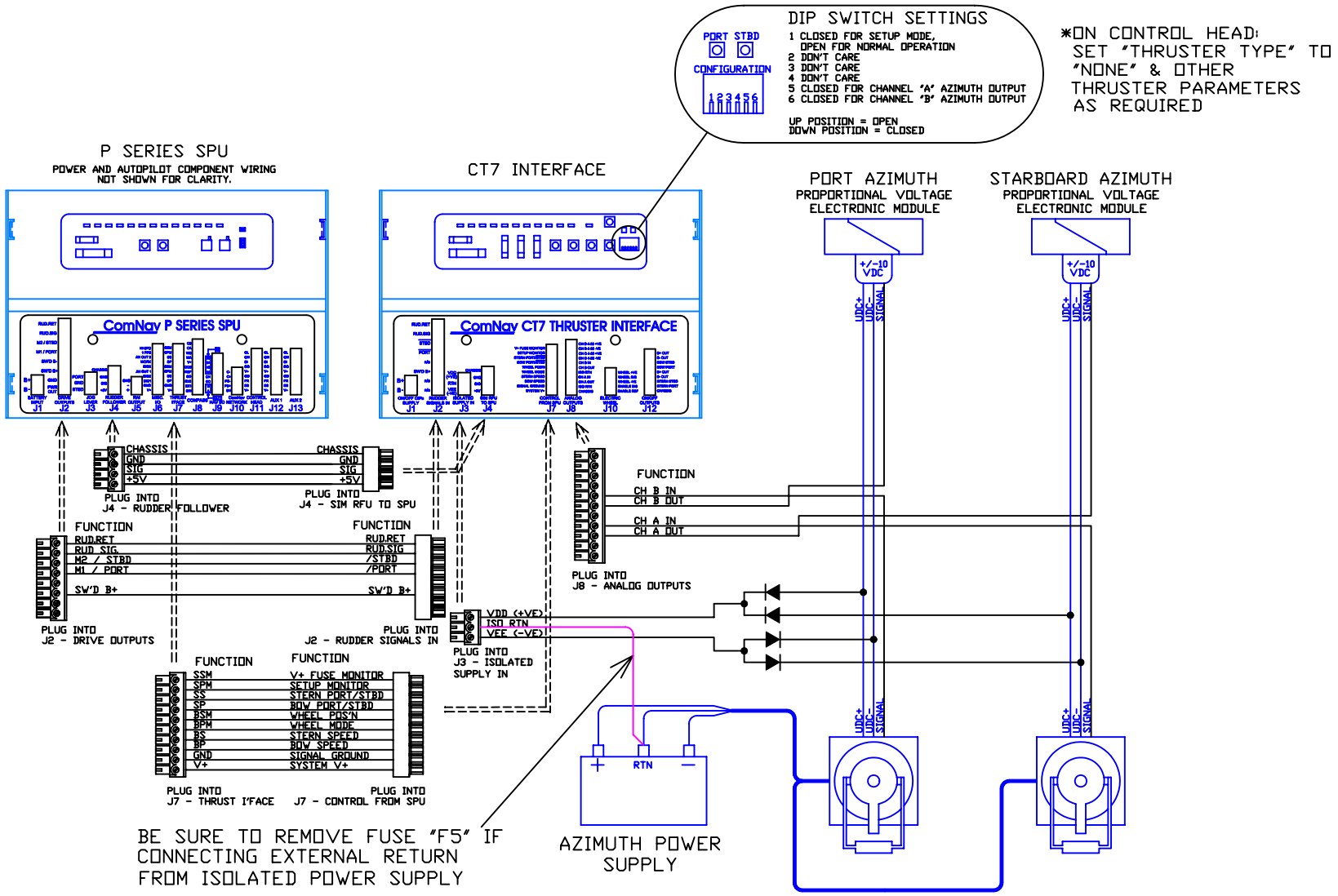
FILE NAME: 20350008WR1-2-0-3C.DWG

SHEET NO.: **1 OF 1**

REV. NO.: **1-2**

DO NOT SCALE

IMPERIAL



PROJECTION

PROJECT TITLE: **CT7 INTERFACE**

SHEET TITLE: **AZIMUTH STEERING WIRING**

ComNav® Marine Ltd.
#15-13511 Crestwood Place
Richmond, BC Canada V6V 2G1
Tel: 604.207.1600 Fax: 604.207.8008
www.comnavmarine.com

MATERIAL SPECIFICATION

FINISH

DOCUMENT ID. NO.: CT7 WIRING FIG 4

TOLERANCES UNLESS OTHERWISE SPECIFIED
FRACTIONAL DECIMALS ±1/16"
DECIMAL DIMENSIONS 0.0 ±0.020" | 0.00 ±0.010" | 0.000 ±0.002"
BREAK SHARP EDGES 0.02"
M/C SURFACES 125

DRAWN BY: DC/FW/DTO

DATE (YR MM DY): 07 10 05

PART NO.: N/A

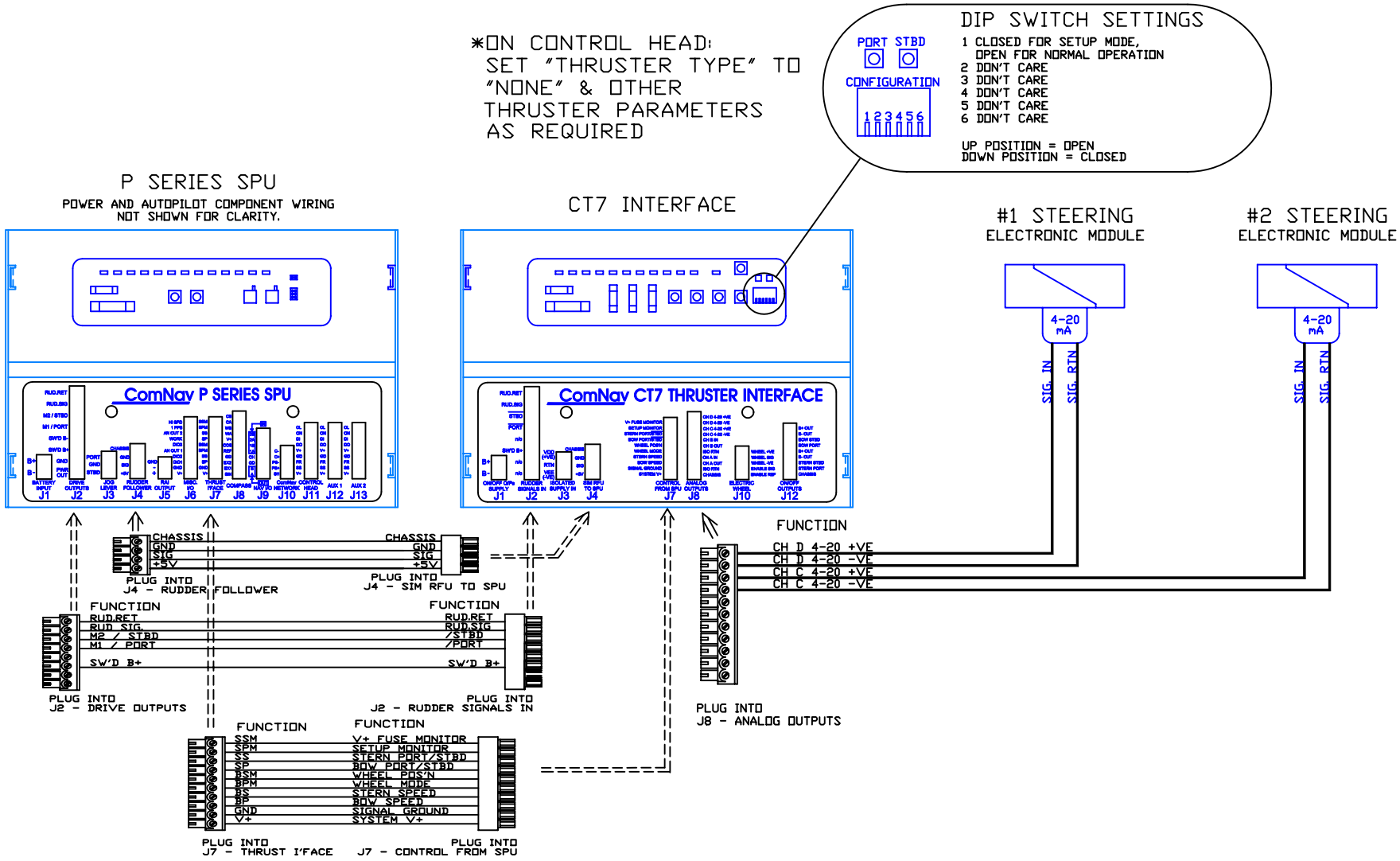
FILE NAME: 20350008WR1-2-0-4.DWG

SHEET NO.: **1 OF 1**

REV. NO.: **1-2**

DO NOT SCALE

IMPERIAL



PROJECTION

PROJECT TITLE: **CT7 INTERFACE**

SHEET TITLE: **4-20 mA CURRENT LOOP WIRING**

ComNav® Marine Ltd.

#15-13511 Crestwood Place
Richmond, BC Canada V6V 2G1
Tel: 604.207.1600 Fax: 604.207.8008
www.comnavmarine.com

MATERIAL SPECIFICATION

FINISH

DOCUMENT ID. NO.: CT7 WIRING FIG 5

TOLERANCES UNLESS OTHERWISE SPECIFIED
FRACTIONAL DECIMALS ±1/16"
DECIMAL DIMENSIONS 0.0 ±0.020"
0.00 ±0.010"
0.000 ±0.002"
BREAK SHARP EDGES 0.02"
M/C SURFACES 125

DRAWN BY: DC/FW/DTO

DATE (YR MM DY): 07 10 05

PART NO.: N/A

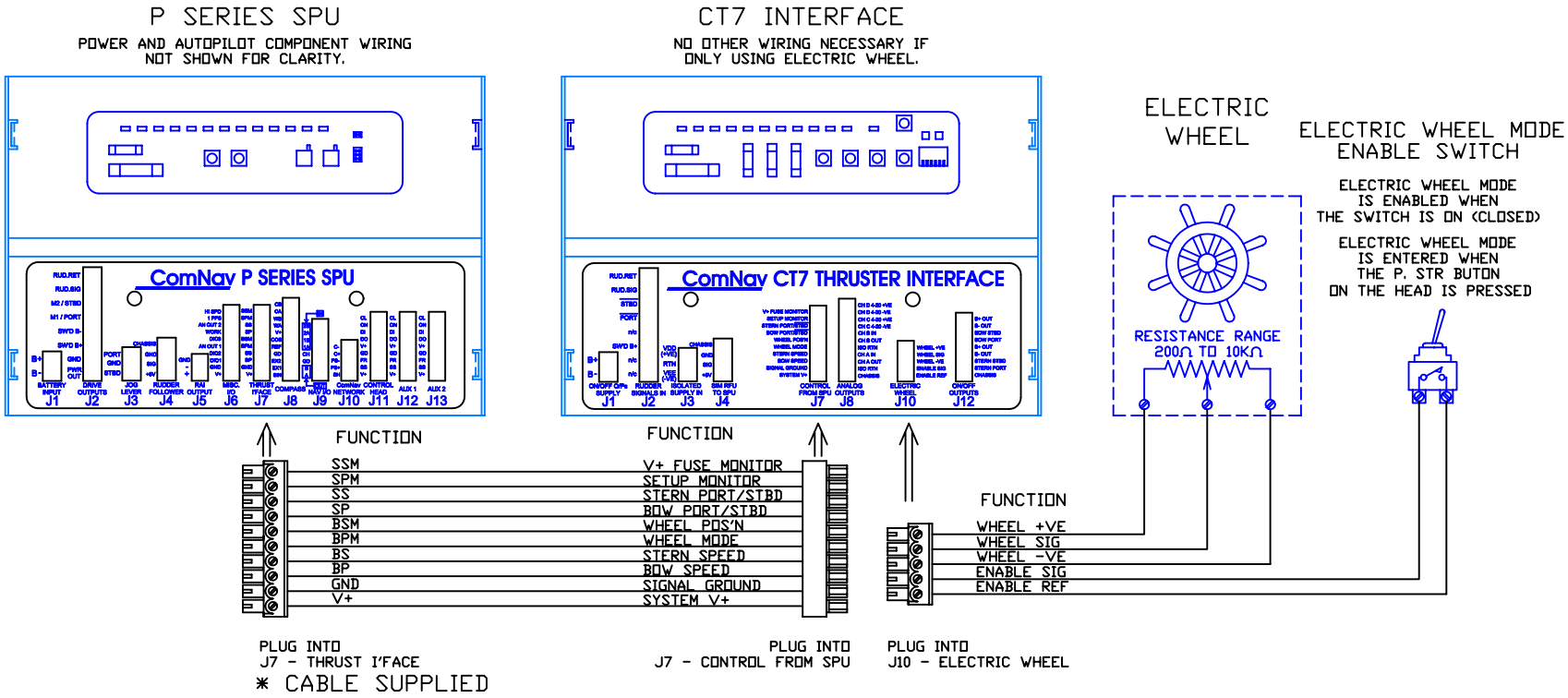
FILE NAME: 20350008WR1-2-0-5.DWG

SHEET NO.: **1 OF 1**

REV. NO.: **1-2**

DO NOT SCALE

IMPERIAL



PROJECTION

PROJECT TITLE: **CT7 INTERFACE**

SHEET TITLE: **ELECTRIC WHEEL WIRING**

ComNav® Marine Ltd.
#15-13511 Crestwood Place
Richmond, BC Canada V6V 2G1
Tel: 604.207.1600 Fax: 604.207.8008
www.comnavmarine.com

MATERIAL SPECIFICATION

FINISH

DOCUMENT ID. NO.: CT7 WIRING FIG 6

TOLERANCES UNLESS OTHERWISE SPECIFIED
FRACTIONAL DECIMALS ±1/16"
DECIMAL DIMENSIONS 0.0 ±0.020"
0.00 ±0.010"
0.000 ±0.002"
BREAK SHARP EDGES 0.02"
M/C SURFACES 125

DRAWN BY: DC/FW/DTO

DATE (YR MM DY): 07 10 05

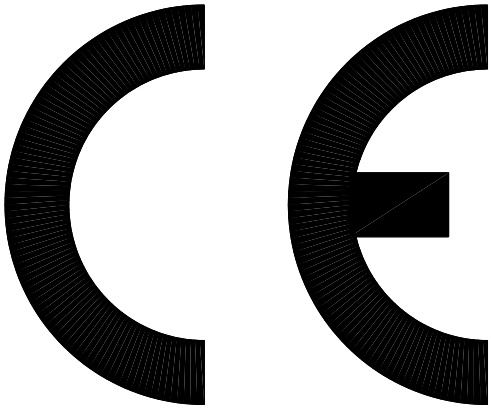
PART NO.: N/A

FILE NAME: 20350008WR1-2-0-6.DWG

SHEET NO.: 1 OF 1

REV. NO.: 1-2

CE COMPLIANCE



This product has been tested and is in compliance with the Electro-Magnetic Compatibility (EMC) standards of the European Community, and bears the CE label. It has been tested according to the applicable sections outlined under:

Technical standard #IEC945/EN60945,
Marine Navigation Equipment,
General Requirements

Applicable sections for methods of testing and required test results are:

Section 4.5.4:	**Radiated Interference**
Section 4.5.4:	**Immunity to Electro-Magnetic Environment**
Annex A, Section A.3:	**Immunity to Conducted Audio Frequencies**
Annex A, Section A.4:	**Immunity to Earth Lead Coupling**
Annex A, Section A.6:	**Immunity to Radiated Interference**

Test results and a declaration of conformity are on file at the ComNav Head Office.

ComNav Marine Ltd.
#15 - 13511 Crestwood Place
Richmond, BC V6V 2G1
Canada

Index

Index

Azimuth Drives 13, 18, 20, 22, 24, 25, 26, 27
Care & Maintenance 33
CE Compliance 51
Checks – Periodic 33
Current-loop outputs 13, 22, 27
Diagnostic LEDs 39
Double-press 9
Electric Wheel 13, 23, 26, 29
Fuse Replacement 34
Installation 17
LEDs, Diagnostic 39
Maintain 9
Minimum Recommended Wire Gauges 18
Momentary press 9
On/Off Thrusters 13, 21, 25, 27
Power Supply 17
Press 9
Press and hold 9
Proportional Thrusters 13, 20, 21, 24, 25, 27
RFU Simulator 13, 20, 24, 25, 27, 37, 38, 39
Special Tools 17, 20
Specifications 37
Technical Requirements 17
Thruster Parameters 24, 26, 38
Typical Wiring Diagrams 41
User Notes 60
User Settings 59
Warning Messages 38
Warranty 1, 17
Wire Gauges 18
Z-Drives 13

User Notes & Settings

User Settings & Notes

User Settings

Once your CT7 Interface system has been installed and set up correctly, make a record of all the settings for future reference, in the tables below

Parameter	Range	Default Value	User Settings
Dockside Menu			
Thrust Type	None, On/Off, Prop.	None	
Thrust MIN	0-70%	30	
Thrust MAX	100% - Thrust MIN	70	
Auto Menu			
Thrust Assist *(If Thruster Type is not "None")*	Off, 0.5 – 7.0 (Knots)	Off	
Thruster Gain	Low, Medium, High	Low	

Table 6 – User Settings

User Notes

Table 7 – User Notes