ComNav

INSTALLATION AND OPERATION MANUAL

121, 121B, 122, 122B, 221 & 222 REMOTE CONTROLS

ComNav Marine 121, 121B, 122, 122B, 221 and 222
Remote Controls

Part No.s 91257, 91261, 91275, 91289, 91140 and 91172

Operation and Installation Instructions

Revised January 18, 2000

IMPORTANT

Read these instructions thoroughly before installing any of these remote controls. These instructions assume you have read and understood the autopilot INSTALLATION AND OPERATION MANUAL, and all manuals supplied with the engine control system.

Introduction:

These remote controls combine autopilot and electronic engine control functions. The remote controls are designed for use with a ComNav® Marine autopilot and a compatible electronic engine control system.

*****The 121 Remote (Part No. 91257) combines the features of a 101 Remote plus a single lever control for one engine. The 121B Remote (Part No. 91261) adds a Bowthruster Interface which is compatible with most types of bowthrusters.

The 122 Remote (Part No. 91275) combines the features of a 101 Remote plus single lever controls for two engines. The 122B Remote (Part No. 91289) adds a Bowthruster Interface which is compatible with most types of bowthrusters.

The 221 Remote (Part No. 91140) combines the features of a 211 Remote plus a single lever control for one engine. The 222 Remote (Part No. 91172) combines the features of a 211 Remote plus single lever controls for two engines. The 221 and 222 Remotes can only be used with the ComNav® Marine 2001 autopilot.

*****Has been modified to include Bow and Sternthruster interfaces.

Warranty

The Limited Warranty printed in the autopilot Installation and Operation Manual applies to this remote control. This remote control is designed as watertight.

DO NOT disassemble this remote control. There are no user serviceable parts inside. The warranty **WILL BE VOID** if this remote control is disassembled.

SAFETY WARNING

THESE REMOTE CONTROLS PLACE A GREAT DEAL OF POWER AT YOUR FINGERTIPS. FAILURE TO OBSERVE THE FOLLOWING AND ANY OTHER SAFETY PRECAUTIONS WILL GREATLY INCREASE THE RISK OF SERIOUS OR FATAL INJURY WHILE USING THIS REMOTE CONTROL.

1) ENSURE THAT THE REMOTE IS OPERATED BY A QUALIFIED PERSON ONLY.

2) ALWAYS BE BRACED AGAINST ANY CHANGE IN VESSEL MOTION RESULTING FROM CHANGES IN THROTTLE, GEAR, RUDDER POSITION OR ANY COMBINATION OF THESE.

3) IF THE REMOTE CONTROL IS BEING OPERATED, ALWAYS WEAR THE SAFETY LANYARD. IN THE EVENT OF ANY SUDDEN VESSEL MOVEMENTS THAT COULD CAUSE YOU TO STUMBLE OR FALL, PERHAPS EVEN OVERBOARD, THE SAFETY LANYARD SHOULD CAUSE THE LANYARD KEY TO PULL OUT OF THE BACK OF THE REMOTE CONTROL, PUTTING THE ENGINE(S) INTO IDLE & THE GEARSHIFT INTO NEUTRAL. UNDER NO CIRCUMSTANCES SHOULD THE LANYARD KEY BE LEFT IN THE REMOTE CONTROL. THE LANYARD KEY MUST BE REMOVED AND REMAIN SEPARATE FROM THE REMOTE CONTROL WHILE IT IS NOT BEING USED.

4) DO NOT ATTEMPT TO OPERATE THE REMOTE AS A HANDHELD UNIT IN HEAVY WEATHER UNLESS YOU ARE SECURELY POSITIONED TO PREVENT ANY VESSEL MOTION FROM THROWING YOU OFF BALANCE OR OTHERWISE INTERFERING WITH THE SAFE OPERATION OF THE VESSEL CONTROLS.

5) THE REMOTE SHOULD NEVER BE OPERATED WHILE STANDING ON THE DOCK OR ANOTHER BOAT.

6) THE REMOTE SHOULD NEVER BE USED UNLESS A QUALIFIED PERSON REMAINS AT THE VESSEL'S MAIN CONTROLS AT ALL TIMES AND CAN CLEARLY SEE THE PERSON OPERATING THE REMOTE.

7) IT IS VERY IMPORTANT TO NOTE THAT, WHEN YOU ARE USING THE REMOTE OR, IF YOU ARE MOVING IT AROUND, YOU MUST HOLD THE CABLE ITSELF IN ORDER TO PROVIDE STRAIN RELIEF. IF YOU DO NOT, THE REMOTE CABLE WILL BE DAMAGED AT THE ENTRY POINT TO THE REMOTE UNIT AND CAUSE REMOTE CONTROL FAILURE WHICH WILL ADVERSELY AFFECT VESSEL OPERATION.

8) IF THE LANYARD KEY IS PULLED OUT OF THE REMOTE CONTROL, RETURN THE SINGLE LEVER CONTROLS TO THE NEUTRAL POSITION. RE-INSERT THE LANYARD KEY & TAKE CONTROL AGAIN.

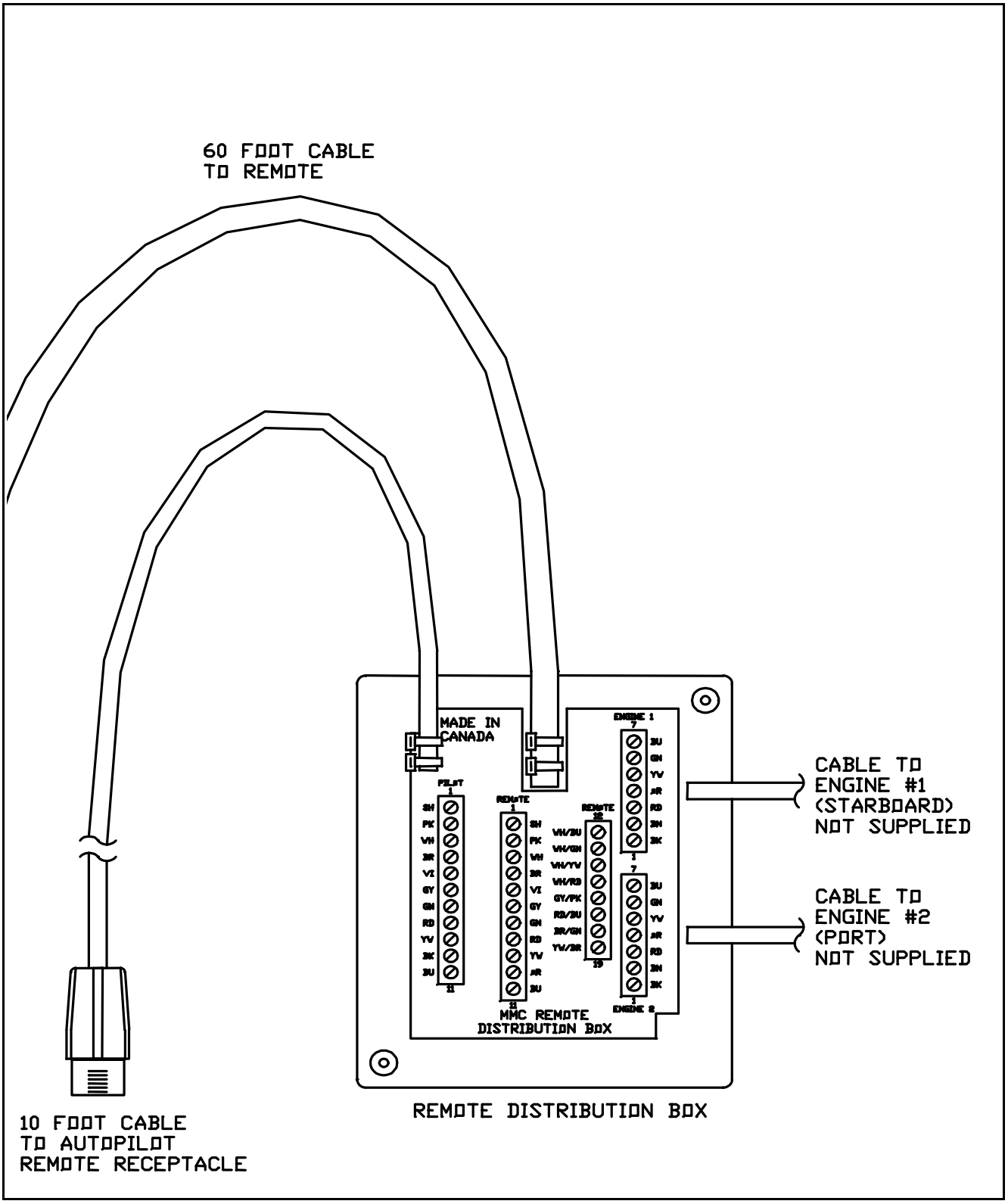

Figure 2 - INTERCONNECTION DIAGRAM

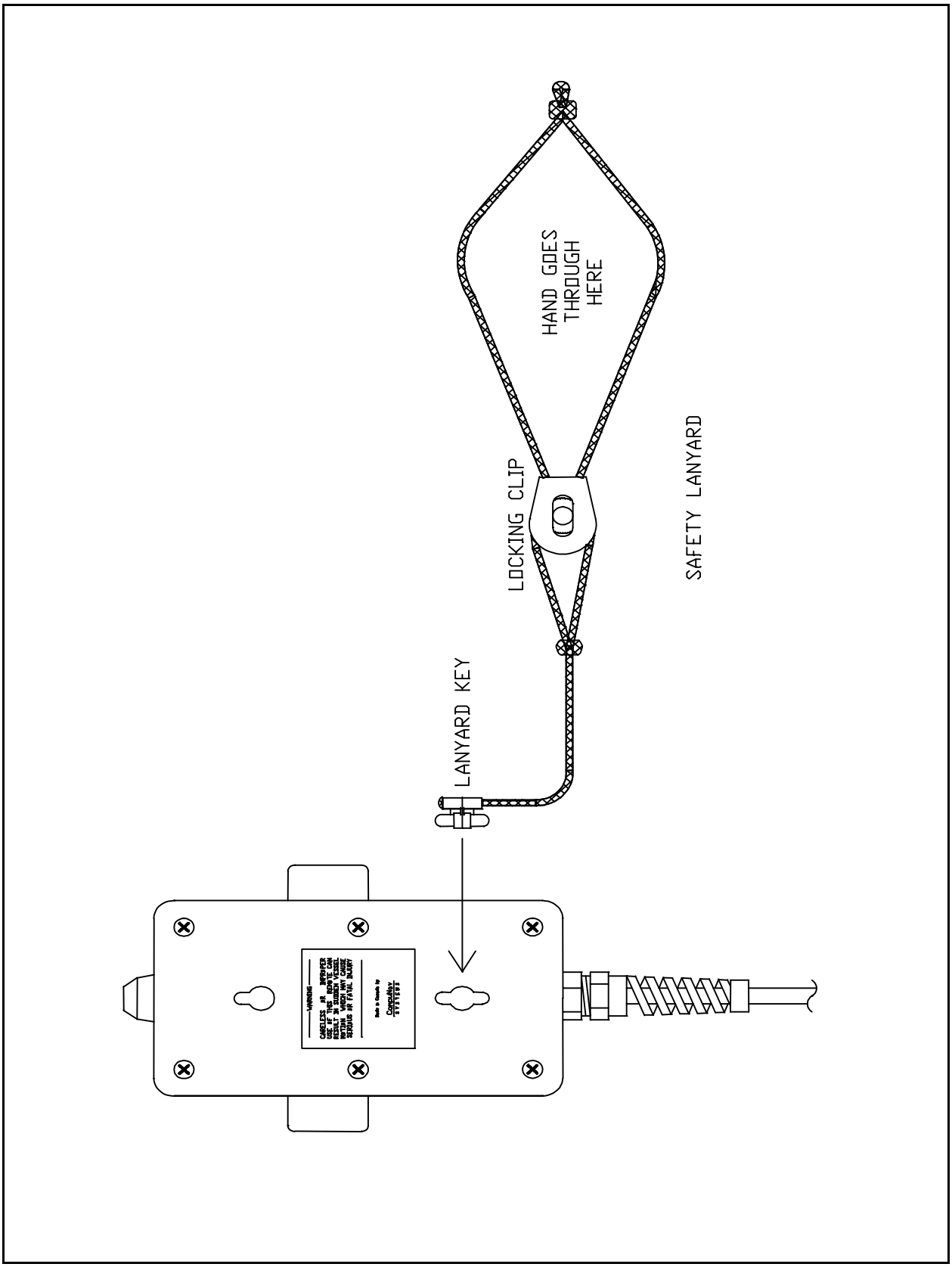

Figure 3 - SAFETY LANYARD INSERTION

OPERATION

1. Taking Control

Control can be transferred to the remote in one of two ways.

(a) **To take control of both autopilot and engine functions,** first cinch the Safety Lanyard around your wrist and insert the Lanyard Key into the slot in the back of the remote. Push it firmly into place so it will not come out unintentionally. Set the engine control lever(s) to neutral and press the transfer pushbutton (black) on the end of the remote case for at least one second until the control indicator in the display moves to Rem.1 (or Rem.2) position and the red arrow(s) next to the single lever control(s) illuminate. Control the engines using the single levers as you would from any other station. If you attempt to take control of the engine without the Lanyard Key in place, the engine control will not allow it.

If the Lanyard Key is pulled out of the remote control, as in the event of a mishap, the engine control will sound an alarm, set the throttle to idle and the gear to neutral. It is of the utmost importance, therefore, that the Safety Lanyard be cinched around the operators wrist **before** operating the control. To re-establish control after the key has been pulled out, SET THE CONTROL(S) TO NEUTRAL, re-insert the Lanyard Key, and then press the transfer pushbutton for 1 second.

(b) **To take control of the autopilot functions only,** press the red and green pushbuttons simultaneously for at least one second until the control indicator in the display moves to the REM.1 or REM.2 position. This transfers only the autopilot functions to the remote. The red arrow(s) next to the single lever control(s) should not illuminate.

2. Engine Operation

Operation of the single lever control(s) on the remote control is identical to the operation of a standard electronic single lever control supplied with the electronic engine control system. Please refer to the manual supplied with the engine control system for exact operation of the engine control portion of the remote control.

3. Bowthruster or Sternthruster Operation

If the remote control is fitted with the optional bowthruster interface (121B and 122B models only), push the toggle switch to the right to move the bow of the boat to starboard. Push the toggle switch to the left to move the bow of the boat to port. Release the switch and the bowthruster will cease operation.

4. Autopilot Operation

NOTE: Also refer to the Operation Section of the autopilot Installation/Operation Manual

STANDBY - In this mode, the LCD display shows the vessel's actual compass heading. The electric clutch or lockup valve of a rotary drive or linear actuator is released, allowing use of the manual steering system. To select the type of special turn move the toggle switch to the U-TURN position release it, and press the RED or GREEN pushbutton until the desired type of turn is displayed.

TILLER (221 and 222 Remotes) - In this mode, the LCD display shows the vessel's actual compass heading. The electric clutch of a rotary drive or lockup valve of a linear actuator is now engaged. The rudder position is now controlled by the tiller.

POWER STEER (121(B) and 122(B) Remotes) - In this mode, the LCD display shows the vessel's actual compass heading. The electric clutch of a rotary drive or lockup valve of a linear actuator is now engaged. The rudder may be moved to port or starboard by pressing either the RED or GREEN pushbutton.

PILOT - In this mode, the LCD display shows the vessel's commanded heading. To alter the commanded heading, press and release either the RED (port) or GREEN (starboard) pushbutton. This action will alter the commanded heading in the chosen direction by one degree. Pressing and holding either pushbutton will initially change the commanded heading by one degree, and after a half second, by ten degrees per second. The vessel will turn to the new heading at the TURN RATE previously selected from the autopilot's front panel.

NAV - In this mode, the autopilot will take steering information from a navigation computer (LORAN, GPS, etc.).

5. Taking Control at Another Station

To transfer both the autopilot and engine control functions to another ComNav® 121(B)/122(B)/221/222 remote, insert the Lanyard Key in the back of the unit, ensure that the single lever control(s) are in the neutral position and press the transfer pushbutton (black) for at least one second.

To transfer the engine control function to another engine control station, follow the instructions in the manual provided by the engine control manufacturer.

To transfer the autopilot function to the autopilot front panel, press the RED and GREEN arrows on the autopilot front panel simultaneously for at least one second until the control indicator in the LCD display moves to the MASTER position.

To transfer the autopilot function to a ComNav® 101, 201, or 211 remote control, press the red and green pushbuttons on that remote control simultaneously for at least one second until the control indicator in the LCD display moves to the REM.1 or REM.2 position.

WARNING

Transfer of only the autopilot function still leaves control of the engine at the previous station. Transfer of only the engine control function still leaves control of the autopilot at the previous station.

INSTALLATION

DISTRIBUTION BOX - The Remote Distribution Box must be mounted so that the 10 foot cable supplied with it will reach the rear of the autopilot.

CONNECTING TO THE ENGINE CONTROLS - There is one terminal strip (121(B) and 221 Remotes) or two terminal strips (122(B) and 222 Remotes) on the right side of the distribution box which are to be connected to the engine actuator. In the distribution box supplied with 122(B) or 222 Remote, the upper terminal strip should be connected to the starboard engine and the lower terminal strip should be connected to the port engine. The wire colours shown adjacent to the terminals correspond to the colours of the cable used by the Mathers Microcommander engine controls. **The cable used to connect between the remote distribution box and the engine actuator must be obtained from the dealer where the engine control was purchased.**

WARNING

Follow the wire colour sequence corresponding to your engine control system exactly. Any incorrect connection could result in serious damage to the engine control or the remote control, or both.

NOTE: The 122(B) and 222 Remotes REQUIRE that the two engine controls be operated on a common ground. To ensure that this is the case, run a #14 gauge or larger wire between the common (or negative) terminals on each engine actuator. Failure to do this could result in serious damage to the remote control.

CONNECTING TO THE BOWTHRUSTER - If the bowthruster uses a standard electro-hydraulic four way valve, run a three conductor cable (installer supplied) from the bowthruster to the terminals on the relay circuit board as shown in Figure 4 (left side). The three wires can be wired in parallel with other devices used to control the valve.

If the bowthruster uses a proportional valve, then four wires are required, as well as an installer selected current setting resistor and a jumper on the relay circuit board.

To determine the correct value for the resistor you need to know how much current the valve requires; what the operating voltage is; and the coil resistance of the valve (measure with an ohmmeter). First determine the total resistance required by dividing the operating voltage by the current required by the valve. Then determine the resistance of the resistor by subtracting the coil resistance from the total resistance. Finally determine the resistor wattage by multiplying the current squared by the resistance of the resistor. Double this wattage to be conservative. See the circuit diagram on the right side of Figure 4 for further details.

The two wires to the proportional valve MUST be isolated by a double pole switch from any other devices used to control the valve.

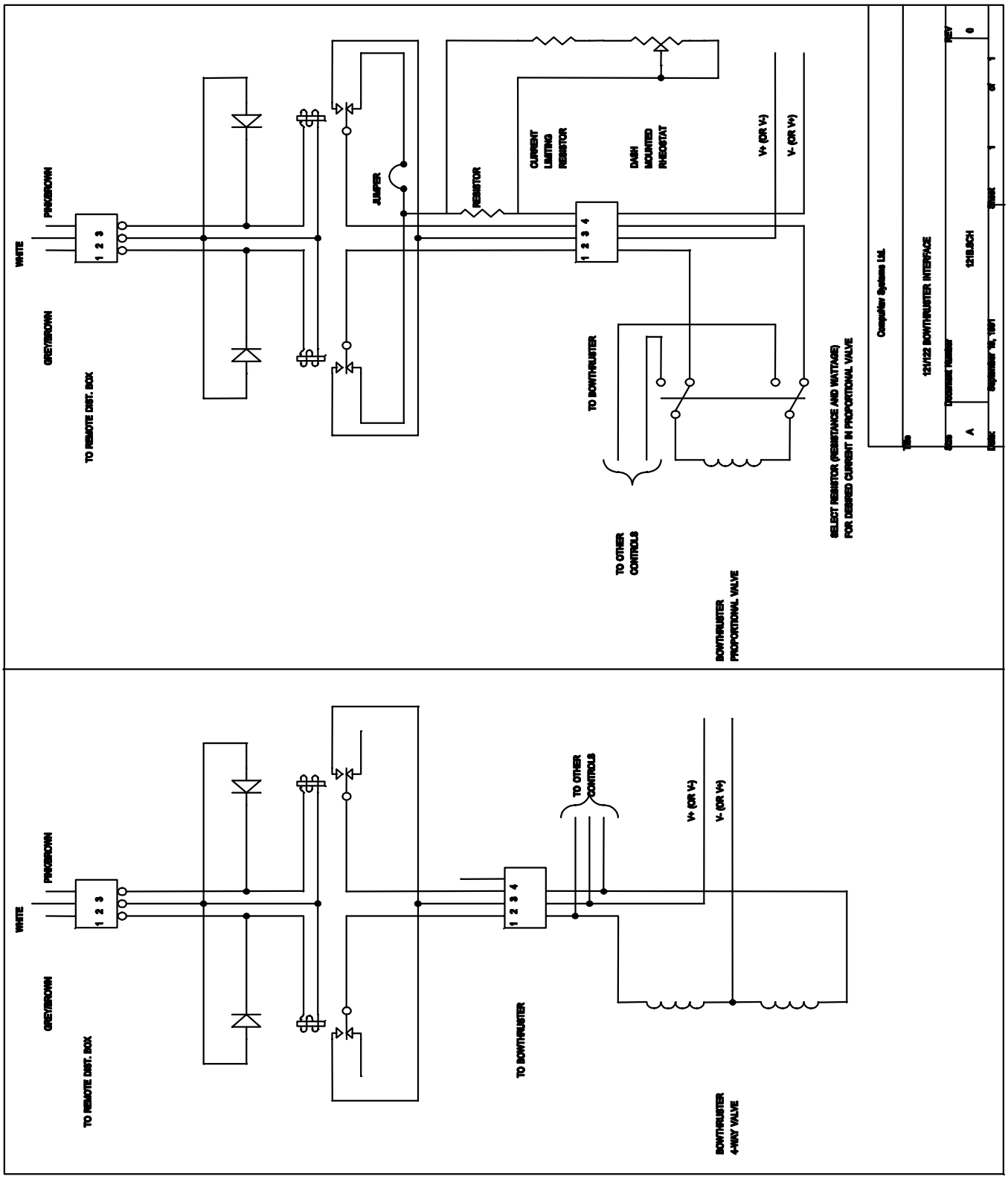

Figure 4 - BOWTHRUSTER INTERFACE SCHEMATIC

If the user wishes to make the speed of the proportional valve adjustable connect a dashboard mounted rheostat in series with a current limiting resistor to the solder pads for the resistor on the relay circuit board. The rheostat and the current limiting resistor should be equal in value, and their total resistance equal to the value calculated above. The wattage of each should be one half the value calculated above.

CONNECTING TO THE REMOTE - If the cable must pass through holes in decks or bulkheads it may be removed from the distribution box and run down to the distribution box from the remote mounting location. **EXTREME CARE** must be taken to ensure that each wire of the cable is re-inserted into the correct terminal as shown on the circuit board. After each wire has been re-inserted into its terminal and double checked, the cable **MUST** be re-secured with a pair of tie-wraps.

CABLE CHANGES - The wire colours marked on the distribution box circuit board refer to the original cable used with the 121, 122, 221 and 222 remote controls. The 121B and 122B remote controls with the bowthruster interface used a different cable. **BOTH** of these cables have been replaced by one new cable which is used for all. Table I cross references all three types of cable.

DIP SWITCHES - If the remote is connected to a 2001 autopilot, the dip switches on the CONTROL circuit board must be set correctly.

If a 221 or 222 remote is plugged into the REMOTE 1 receptacle on the rear of the autopilot, DIP SWITCH 5 on the CONTROL circuit board inside the autopilot should be 'CLOSED' or 'ON'. If the remote is connected to the REMOTE 2 receptacle on the rear of the autopilot, DIP SWITCH 6 on the CONTROL circuit board inside the autopilot should be 'CLOSED' or 'ON'.

If a 121(B) or 122(B) remote is plugged into the REMOTE 1 receptacle on the rear of the autopilot, DIP SWITCH 5 on the CONTROL circuit board inside the autopilot should be 'OPEN' or 'OFF'. If the remote is connected to the REMOTE 2 receptacle on the rear of the autopilot, DIP SWITCH 6 on the CONTROL circuit board inside the autopilot should be 'OPEN' or 'OFF'.

Table I - CABLE COMPARISON CHART

DISTRIBUTION BOX TERMINAL NUMBER	NEW CABLE FOR ALL	OLD STANDARD CABLE	OLD BOWTHRUSTER CABLE
1	SHIELD	SHIELD	SHIELD
2	PINK	PINK	RED/WHITE
3	WHITE	WHITE	WHITE
4	BROWN	BROWN	BLACK
5	PURPLE	PURPLE	RED/GREEN
6	GREY	GREY	BLACK/WHITE
7	GREEN	GREEN	GREEN
8	RED	RED	RED
9	YELLOW	YELLOW	BLACK/RED
10	BLACK	ORANGE	ORANGE
11	BLUE	BLUE	BLUE
12	WHITE/BLUE	WHITE/BLUE	BLUE/WHITE
13	WHITE/GREEN	WHITE/GREEN	GREEN/WHITE
14	WHITE/YELLOW	WHITE/YELLOW	WHITE/BLACK
15	WHITE/PINK	WHITE/RED	WHITE/RED
16	GREY/PINK	GREY/PINK	GREEN/BLACK
17	RED/BLUE	RED/BLUE	BLUE/RED
18	BROWN/GREEN	BLUE/GREEN	BLUE/BLACK
19	YELLOW/BROWN	YELLOW/BROWN	RED/BLACK
BOW PORT	PINK/BROWN		ORANGE/BLACK
BOW STBD	GREY/BROWN		ORANGE/RED
UNUSED	WHITE/GREY		

TESTING

AUTOPILOT - Turn the autopilot MASTER SELECT SWITCH to STANDBY (if the autopilot uses an engine driven pumpset, start the engine). The LCD display on the remote should be active. Press the RED and GREEN pushbuttons on the remote simultaneously for at least one second. The control indicator on the display should move to the REM.1 or REM.2 position. Rotate the remote MASTER SELECT SWITCH from STANDBY, to TILLER, to PILOT, and then NAV and make sure that the **function indicator**[1] on the right of the display changes appropriately.

Turn the remote MASTER SELECT SWITCH to the PILOT position. Briefly press the GREEN pushbutton and then the RED pushbutton and check t

Turn the remote MASTER SELECT SWITCH to the TILLER position (221 AND 222 remotes only). The rudder should move to the position indicated by the tiller. If the rudder is not correctly centred when the tiller is at zero degrees, loosen the two Allen head set screws which secure the tiller knob, remove it, center the rudder by turning the exposed shaft. Replace the tiller knob and press it down firmly while re-tightening the set screws. Check that the tiller does not drive the rudder into the mechanical stops on either side. If this happens, turn the remote MASTER SELECT SWITCH to PILOT and check the rudder travel in the DODGE mode. If the rudder still hits the mechanical stops, check the centering of the rudder follower and/or the adjustment of the RUDDER GAIN potentiometer as described in the DOCKSIDE SETUP section of the 2001 autopilot Installation and Operation manual. If the rudder does NOT hit the mechanical stops in the DODGE mode, return the remote MASTER SELECT SWITCH to the TILLER position and adjust the tiller travel using the potentiometer on the circuit board inside the remote control.

This completes the testing of the autopilot portion of the remote control.

[1] Function indicators are shown in the Controls Section of the autopilot Installation and Operation Manual.

ENGINE - Before testing the remote control for correct operation, the remainder of the engine control system should be tested and must be operating correctly according to the manufacturers instructions. This remote control will not correct an existing problem. **It is important during this testing procedure that the engine(s) be stopped.**

Turn the autopilot MASTER SELECT SWITCH to **STANDBY** and power up the engine controls. Insert the Lanyard Key, place the single lever control(s) on the remote in the neutral position, press the transfer pushbutton (black) on the end of the remote for at least one second. The light(s) adjacent to the engine controls should illuminate, and the control indicator on the LCD display should move to the REM.1 or REM.2 position. Check the operation of the engine controls according to the instructions provided by it's manufacturer.

Ensure the engines are stopped. Place the engine lever controls at approximately one half throttle ahead. Pull the Lanyard Key from the back of the remote. Check that the throttles have returned to idle and the gear shifts to neutral. **Return the levers to the neutral position** and re-insert the Lanyard Key. Press the transfer pushbutton (black) on the end of the remote for at least one second. Check that the normal operation of the remote is restored.

BOWTHRUSTER - Energize the bowthruster, and push the bowthruster control to the right. If the bow of the vessel moves to port, reverse the Port and Stbd wires to the valve. Push the bowthruster control to the left to confirm correct operation in that direction also.

STERNTHRUSTER - Energize the sternthruster, and push the sternthruster control to the right. If the bow of the vessel moves to port, reverse the Port and Stbd wires to the valve. Push the sternthruster control to the left to confirm correct operation in that direction also.

NOTE: This remote has been modified to suit customer's requirement. The dodge/turn function is disabled. The NAV cross track error sense and type of turn selection function is also disabled. Instead the unit is equipped with the Bowthruster interface.

TROUBLESHOOTING

In troubleshooting the operation of the remote control, it is important to distinguish whether the problem is in the engine control portion, or the autopilot portion, or both.

1. **Problems with both the autopilot and engine control portions of the remote.** The most likely problem is the wiring of the remote, particularly if the cable from the remote to its distribution box has been removed from and later re-inserted into the distribution box. Recheck that all the wires are connected to the correct terminals, and are tight. Correct any improper connections.

2. **Problems with the engine control portion of the remote.** Connect the remote to another input in the engine actuator. If the problem disappears, the problem is most likely in the engine actuator. Contact the engine control dealer or manufacturer for advice. If the problem remains, the problem is most likely in the remote. MAKE SURE THE LANYARD KEY IS CORRECTLY INSERTED INTO THE REMOTE CONTROL (see Figure 3). Recheck all of the wiring in the Remote distribution box, particularly if the cable connecting the remote to the distribution box has been removed and reinserted into that distribution box. Contact your dealer or ComNav Marine for advice.

3. Problems with the autopilot portion of the remote. Try plugging the cable from the Remote distribution box to the rear of the autopilot into the other remote receptacle on the rear of the autopilot (2001 only). **Make sure that the dip switch for that receptacle is set correctly (2001 autopilot only)**. If normal operations are restored, the problem is in the autopilot. If the problem remains, recheck the wiring in the Remote distribution box, particularly if the cable from the remote to its distribution box was removed and reinserted. Correct any improper connections. If the problem still remains, contact your dealer or ComNav Marine for assistance.

COMPATIBILITY

The ComNav Marine 121(B), 122(B), 221 and 222 remotes are compatible with the following engine controls.

1) **Mathers Microcommander**. Operation of the engine control portion of the remote is identical to standard MMC controls. Electrical travel of the controls is 87% of the travel of a standard MMC control, so a slightly slower maximum engine speed may be observed.

Table II - MMC INTERCONNECTION CHART

REMOTE DISTRIBUTION BOX TERMINAL	WIRE COLOUR	MATHERS ACTUATOR TERMINAL
1	BLACK	1
2	BROWN	2
3	RED	3
4	ORANGE	4
5	YELLOW	5
6	GREEN	6
7	BLUE	7
N/C	SHIELD	8 (580 ACTUATOR ONLY)

NOTE 1 - **Engine kill pushbuttons or kill switches must be mounted in an area close to where the remote is to be used as specified in Mather's instructions.** Failure to do this may invalidate their warranty.

NOTE 2 - Interconnect the ground terminals of both MMC Actuators using a #14 gauge wire if using the ComNav® 122(B) or 222 Remote Control.

NOTE 3 - The manual supplied with the MMC Actuator says to reverse the YELLOW and BLUE wires on the Control Head for the Port Engine. This has already been done inside the ComNav Remote Control. Connect the cable from the Remote distribution box to the MMC Actuator exactly as shown above. **Do Not** reverse the Yellow and Blue wires as mentioned in the MMC manual. Serious damage to the engine control, or the remote control, or both **will** result.