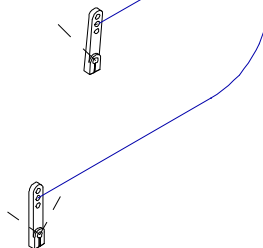
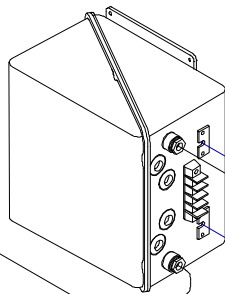


# MicroCommander 314 Actuator Installation Instructions



10260A

MMC-109 Rev. 10 7/98



**THIS PRODUCT IS INACTIVE!**  
**Please contact Mathers Controls for support information.**

## Table of Contents

SECTION	PAGE
<b>1. MICROCOMMANDER GENERAL .....</b>	<b>1</b>
<b>2. REQUIRED PARTS.....</b>	<b>1</b>
2.1 SUPPLIED BY MATHERS CONTROLS, INC. ....	1
2.1.1 Control Head .....	1
2.1.2 Actuator .....	2
2.1.3 Templates.....	2
2.1.4 Electric Cable.....	2
2.2 SUPPLIED BY INSTALLER.....	2
2.2.1 Required Tools.....	2
2.2.2 Push-Pull Cables.....	2
2.2.3 Push-Pull Cable Connection Kits.....	3
2.2.4 Control System Power 'ON' - 'OFF' .....	3
2.2.5 Station Lock-Out Switch 'STA 1' - 'NORMAL'.....	3
2.2.6 Engine 'STOP' Button.....	3
<b>3. PLAN THE INSTALLATION .....</b>	<b>3</b>
3.1 ACTUATOR LOCATION .....	3
3.2 CONTROL HEAD LOCATION .....	4
3.3 CONTROL SYSTEM POWER 'ON' - 'OFF' .....	4
3.4 STATION TRANSFER BUTTON LOCATION .....	4
<b>4. INSTALLATION.....</b>	<b>4</b>
4.1 MOUNT THE ACTUATOR .....	4
4.2 MOUNT THE CONTROL HEADS .....	5
4.3 MOUNT STATION TRANSFER BUTTON .....	5
4.4 MOUNT No. 1 STATION LOCK-OUT SWITCH.....	5
4.5 ENGINE 'START' SWITCH .....	6
4.6 ENGINE 'STOP' BUTTONS .....	6
4.7 INSTALL 8-CONDUCTOR CABLE .....	6
4.8 CONNECT 12 VOLT POWER TO ACTUATOR .....	8
4.9 INSTALL START INTERLOCK LEADS .....	8
4.10 IMPORTANT CHECKS .....	9
<b>5. CONTROL SET-UP .....</b>	<b>9</b>
5.1 ACTUATOR.....	9
5.2 CHECK REMOTE CONTROL HEADS AND STATION TRANSFER.....	10
5.3 PUSH-PULL CABLES .....	10

5.3.1 Reverse Gear Cable Adjustment .....	11
5.3.2 Throttle Cable Adjustment .....	12
5.4 STATION TRANSFER .....	12
5.5 START INTERLOCK .....	13
5.6 THROTTLE PAUSE .....	13
5.7 STATION 5 .....	13
5.8 FINAL CHECK .....	13
<b>6. SEA TRIALS AND OPERATOR INSTRUCTIONS .....</b>	<b>14</b>
6.1 TESTS BEFORE LEAVING THE DOCK .....	14
6.2 ADJUSTMENTS TO CHECK UNDERWAY .....	14
6.2.1 High Idle .....	14
6.2.2 Full Speed Setting .....	14
6.2.3 Proportional Pause On Direction Change .....	14
6.3 CONTROL HEAD TONES .....	15
<b>7. UPDATE INFORMATION.....</b>	<b>ERROR! BOOKMARK NOT DEFINED.</b>
<b>8. OPERATOR INSTRUCTIONS .....</b>	<b>16</b>
<b>9. MORSE CLUTCH AND THROTTLE KIT SELECTION .....</b>	<b>17</b>
9.1 PRE-ENGINEERED CLUTCH CONNECTION KITS .....	17
9.2 OUTBOARD AND I/O CABLE CONNECTION KITS .....	17
9.3 PRE-ENGINEERED THROTTLE CONNECTION KITS .....	17
<b>10. UNIVERSAL MOUNTING.....</b>	<b>18</b>
<b>11. REFERENCES .....</b>	<b>19</b>
11.1 AMERICAN BOAT AND YACHT COUNCIL (ABYC) .....	19
11.2 CODE OF FEDERAL REGULATIONS .....	19
11.3 SOCIETY OF AUTOMOTIVE ENGINEERS .....	19
11.4 NATIONAL MARINE MANUFACTURERS ASSOC. ....	19
11.5 UNDERWRITERS LABORATORIES .....	19
11.6 PARTS SOURCE.....	19
<b>12. SINGLE SCREW CIRCUIT .....</b>	<b>21</b>
<b>13. TWIN SCREW CIRCUIT .....</b>	<b>22</b>
<b>14. TEMPLATE.....</b>	<b>24</b>

## 1. MICROCOMMANDER GENERAL

The MicroCommander Control System provides single lever command of clutch and throttle from one to five remote stations. The control system operates from a 12 Volt DC negative ground power source and in a static condition draws only .4 amperes. The MicroCommander Control System will operate outboards, I/O's and inboards, either gas or diesel powered.

The connection to the engine throttle and clutch is through standard Morse Type 33C push-pull cable (refer to the References Section).

Requirements:

- Throttle or clutch selector lever load should not exceed 40 lbs.
- The MicroCommander Control System requires a supply voltage of 11 to 16 volts DC. A low voltage can cause a control circuit reset or erratic action. For this reason avoid using a starting battery if possible. Make sure battery's are properly charged.
- The 12 Volt DC power required is to be supplied through a 10 ampere, push button type, circuit breaker. (One for each Actuator) The circuit breaker is connected to the battery or battery isolator switch.

**NOTE: *The alternator MUST be connected directly to the battery or to an isolator switch that provides for an alternator field disconnect.***

**IMPORTANT - STATIC ELECTRICITY CAN DESTROY ELECTRONIC COMPONENTS. WHILE WORKING ON THE ACTUATOR WITH THE COVER REMOVED, GET RID OF ANY STATIC CHARGE YOU MAY HAVE ON YOUR PERSON BY MAINTAINING CONTACT WITH THE ACTUATOR FRAME USING A WRIST STRAP AND GROUND CONNECTOR.**

## 2. REQUIRED PARTS

### 2.1 SUPPLIED BY MATHERS CONTROLS, INC.

The following items are available from your local Mathers Controls dealer.

#### 2.1.1 Control Head

Single Control Head	(Single Screw)
Dual Control Head	(Twin Screw)

**NOTE: *Mathers Price List MMC-110 lists optional Control Head levers you may wish to order.***

**NOTE: *The station transfer button is included with each old style Control Head. The newer style Control Heads have the station transfer button enclosed within the Control Head. A twin screw station requires only one transfer button. This manual reflects the old style Control Head installation and usage.***

### **2.1.2 Actuator**

- One Actuator for each engine.
- Included are wire, terminals and tie wraps. Mounting screws are not included.

### **2.1.3 Templates**

The Template Section is intended as a tear out template to aid in mounting the Control Head, the transfer button, and the Actuator.

### **2.1.4 Electric Cable**

Pc.No. 180

Eight (8) Conductor Cable (Control Head to Actuator)  
Shielded 20 AWG, 300 V, PVC Insulated: -20EC to +80EC PVC Jacket.  
Color Coded UL VW-1.

Pc.No. 212

Two (2) Conductor Cable 12 V Supply  
14 AWG, 300 V, PVC Insulated: -20EC to +80EC PVC Jacket.  
Red with purple stripe and black UL VW-1.

Pc.No. 183

Two (2) Conductor Cable Start Interlock  
16 AWG, 300 V, PVC Insulated: -20EC to +80EC PVC Jacket.  
Yellow with red stripe UL VW-1.

## **2.2 SUPPLIED BY INSTALLER**

### **2.2.1 Required Tools**

Anti-static wrist strap is included with Actuator.  
Wire cutter (Recommend Thomas & Betts WT-2000)  
Wire stripper (Recommend Thomas & Betts WT-2000)  
Wire crimper (Recommend Thomas & Betts WT-2000)  
7/16" Socket and medium extension  
3/8" Wrench  
7/16" Wrench  
Screwdriver - medium phillips head  
Screwdriver - medium straight slot  
Screwdriver - small straight slot  
Hole saw - 1"  
Drills - 9/32" and 7/32"

### **2.2.2 Push-Pull Cables**

(Two per engine) (Refer to the References Section)

Type 33C push-pull cables. The 33C cable offers 3" stroke. The cable length is measured from end of thread to end of thread. Cables are usually stocked in 1 foot increments.

### **2.2.3 Push-Pull Cable Connection Kits**

The kits connect the Type 33C cable to the engine throttle and reverse gear. Many engines and out drives are delivered with factory mounted kits. Morse standard connection kits are listed in Section 9. A universal connection kit listing parts and dimensional data is shown in Section 10.

### **2.2.4 Control System Power 'ON' - 'OFF'**

The recommended system is to use the engine key switch to turn the Control System 'ON' and 'OFF'. The key switch is to operate a relay. Use a Cole Hersee relay [P/N 24117-01] or equal. The relay can be ordered from Mathers Controls, Inc. as P/N 809. The 12 volt power is drawn from the battery through a circuit breaker, 10 ampere, manual reset, trip free, external ignition protected, and push button to reset. Use an E-T-A circuit breaker [P/N 41-2-S14-LN2-10] or equal. The circuit breaker can be ordered from Mathers Controls Inc. as P/N 810. (Refer to the References Section - Parts Source)

### **2.2.5 Station Lock-Out Switch 'STA 1' - 'NORMAL'**

Optional switch (1 only) SPST (single pole single throw). Locate at Primary Station. With Lock-out switch at the '**STA 1**' position, the switch is closed and transfer to other stations is prevented. '**NORMAL**' position, the switch is open and transfer between stations is allowed. Refer to Sections 12 and 13. Use a quality toggle switch with screw connected terminals.

### **2.2.6 Engine 'STOP' Button**

'**STOP**' buttons for engines **MUST** be located at **ALL** remote stations. **THIS IS AN ABSOLUTE REQUIREMENT AND WILL CANCEL WARRANTY IF NOT FOLLOWED.**

## **3. PLAN THE INSTALLATION**

### **3.1 ACTUATOR LOCATION**

Considerations:

- The Actuator is spray proof.
- Bulkhead mount is preferred for ease of access for wiring and adjustments, but the Actuator can be mounted in any attitude.
- Usually mounted in the engine area, however, consideration should be given to mounting just above or forward of the engine area.
- The MicroCommander Control System uses a micro processor and can be influenced by strong magnetic fields. Therefore, do not mount in close proximity to gas engine ignition systems, alternators, or electric motors. (Allow 4 feet of clearance or more.)
- Mount away from direct heat of the engine exhaust manifolds.
- Locate to be accessible for electric and push-pull cable connections.

- Locate such that push-pull cables make easy bends of 270 total degrees or less. Measure for Type 33C push-pull cables (cables come in 1 foot increments). Select engine brackets from those listed in Section 9. Many engines and out drives are delivered with factory mounted kits. Retrofits can often use the previous brackets on the engine.

### 3.2 CONTROL HEAD LOCATION

Considerations:

- The Control Head is watertight.
- The Control Head mounts flush to the panel. The only penetration of the panel is for wiring and mounting screws. The Control Head mounts with screws from the underside of the panel
- Retrofit applications will need to plan an adapter pad to cover the old Control Head cut-out and to mount the Control Head.

### 3.3 CONTROL SYSTEM POWER 'ON' - 'OFF'

The Control Head requires 12 Volt power (11 volts minimum to 16 volts maximum) protected by a 10 ampere switched circuit breaker.

**NOTE: Control system may require a separate supply if starter motor causes voltage to drop below 11 volts. Maximum run of 14 AWG power cable from 12 Volt DC source to Actuator is 70 feet. If distance is over 70 feet, use 12 AWG power cable. (See Figure 8, pg. 8)**

**NOTE: It is IMPORTANT that the wire size from the battery to the circuit breaker is large enough to prevent a voltage drop due to current draw. If you are picking up 12 volt power from a local source or bus instead of running an independent 14 AWG wire from the battery, make sure the wire size used is large enough to supply ALL current requirements without voltage drop.**

### 3.4 STATION TRANSFER BUTTON LOCATION

Locate in a position where it is convenient but will not be depressed inadvertently. No one but the operator needs to know the location of the station transfer button, therefore, you may want to consider an out of the way location.

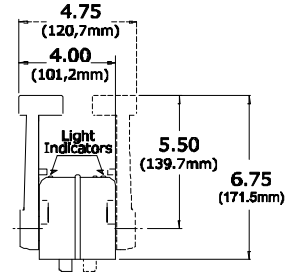
## 4. INSTALLATION

Before starting the actual installation of the MicroCommander Electronic Engine Control System, make sure you have the correct parts and tools on hand. Refer to Section 2 - REQUIRED PARTS. Read ALL the instructions pertinent to each part before beginning the installation of that part.

### 4.1 MOUNT THE ACTUATOR

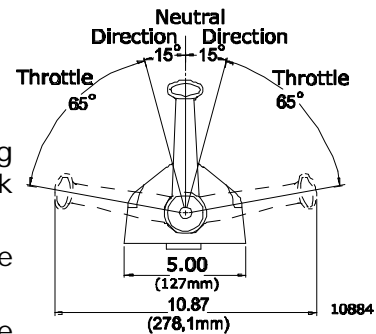
- A) Tear out the Actuator template and mark the mounting hole location. The preferred mounting uses 1/4" through bolts. No. 12 brass wood screws can be used.

B) Leave the Actuator cover on. To prevent static electricity damage to the electronic components, it is **IMPORTANT** to first connect the negative power lead to the Actuator. Connect the power source (-) negative cable (black) to the external Actuator (-) negative terminal. Reverse polarity (reversing connections) to the Actuator will damage the Actuator. Any time the Actuator cover is removed the installer must be wearing an anti-static wrist strap connected to the Actuator frame. Anti-static wrist strap, refer to Section 11.6 - Parts Source.



#### 4.2 MOUNT THE CONTROL HEADS

- Use the Control Head template to locate holes.
- Drill the screw holes. The #8-32 x 1" mounting screws will accommodate up to a 3/4" thick mounting surface.
- Check that the 4 mounting screws will start into the Control Head.
- Remove the Control Head and strip the adhesive cover from the gasket and apply the sticky side to the console.

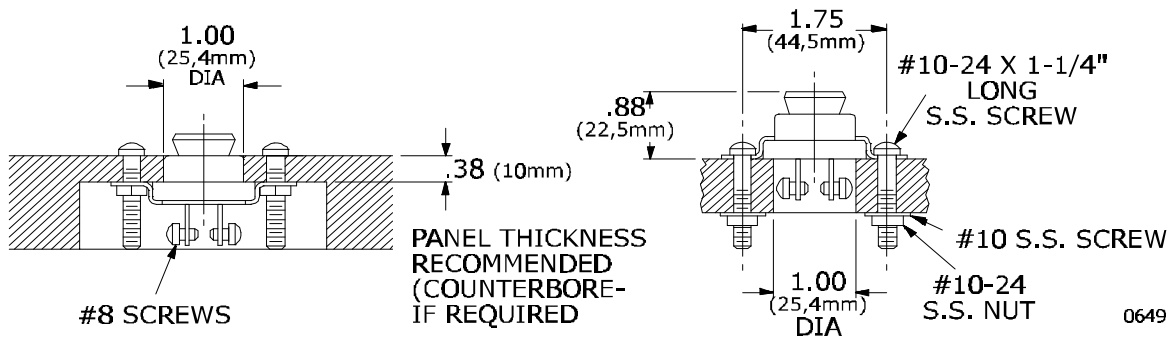


**Figure 1**  
**Control Head**

#### 4.3 MOUNT STATION TRANSFER BUTTON

A station transfer button is to be located at each remote station.

Use the hole template in Section 14. The station transfer button is waterproof. There are two methods of mounting - Surface Mount or Recessed Mount for this panels. See Figure 2, pg. 5.



**Figure 2**

**Recessed Mount**

**Surface Mount**

#### 4.4 MOUNT NO. 1 STATION LOCK-OUT SWITCH

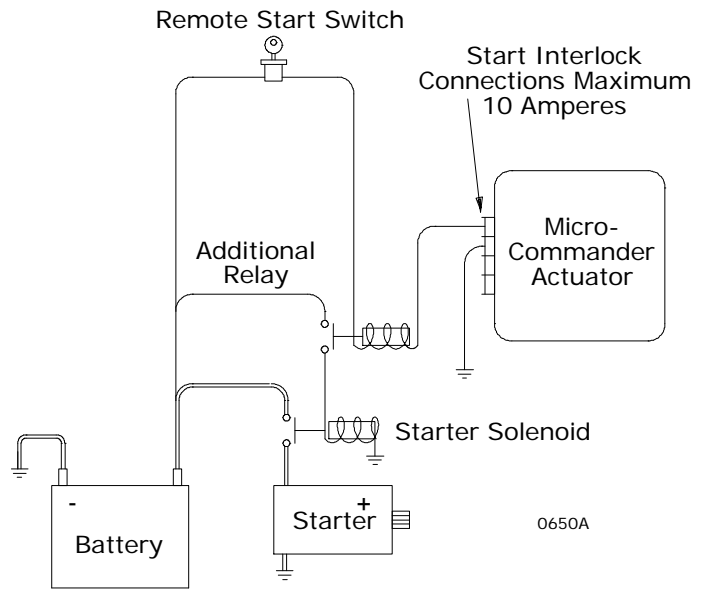
This is an optional switch that will lock command to the No. 1 or Primary station in the 'CLOSED' position. It will allow station transfer in the normal or 'OPEN'

position. Switch is supplied by others. Refer to the information supplied with the switch for installation.

#### 4.5 ENGINE 'START' SWITCH

The MicroCommander Control System is interlocked to prevent 'Start' until control system is turned 'ON' and reverse gear is in Neutral. The Engine 'START' signal MUST be connected through the Actuator to the starter solenoid or relay. The interlock will function with any start signal voltage. Refer to Sections 12 and 13.

**CAUTION:** *The circuit board is designed for a MAXIMUM of 10 amperes start signal current. More current will burn out the interlock circuit. A few engines are set-up to use more than 10 amperes. In that case a relay must be added as shown in Figure 3.*



**Figure 3**  
**Engine 'Start' Switch**

#### 4.6 ENGINE 'STOP' BUTTONS

Engine 'STOP' buttons are required at ALL remote stations. The 'STOP' buttons are installer supplied and are an ABSOLUTE requirement. Refer to the information supplied with the buttons for installation.

#### 4.7 INSTALL 8-CONDUCTOR CABLE

Run the 8-Conductor electric cable (2 cables if twin screw) from each Control Head to the appropriate Actuator. There can be as many as 5 remote stations. Mark each 8-Conductor cable at the Control Head and at the Actuator to indicate what station it connects and whether it is Port or Starboard engine command.

The 8-Conductors in the electric cable are color coded. The violet conductor is only used at Station 1 for the Station Lock-out Switch. If Station Lock-out Switch is not used, do not connect the violet conductor at the Actuator. Each conductor shall be installed so that it is protected from physical damage. Except for the first 3 feet of battery cables, conductors shall be supported by clamps or straps not more than 18 inches apart unless the conductor(s) is contained in a conduit. (Refer to the References Section)

At the Control Head, strip back the PVC cover on the cable approximately 2". Strip back the shielding and cut off the shielding and the drain wire flush with the end of the PVC cover. The cable shielding at the Control Head is **NOT** connected to ground. Strip 3/8" insulation off each wire. Twist the individual strands of the wires to minimize fraying. The orange wire must be lengthened to connect to the transfer button by using 16 AWG wire provided. The violet wire must also be lengthened when used at Station 1. Wire and connectors are provided with the Actuator.

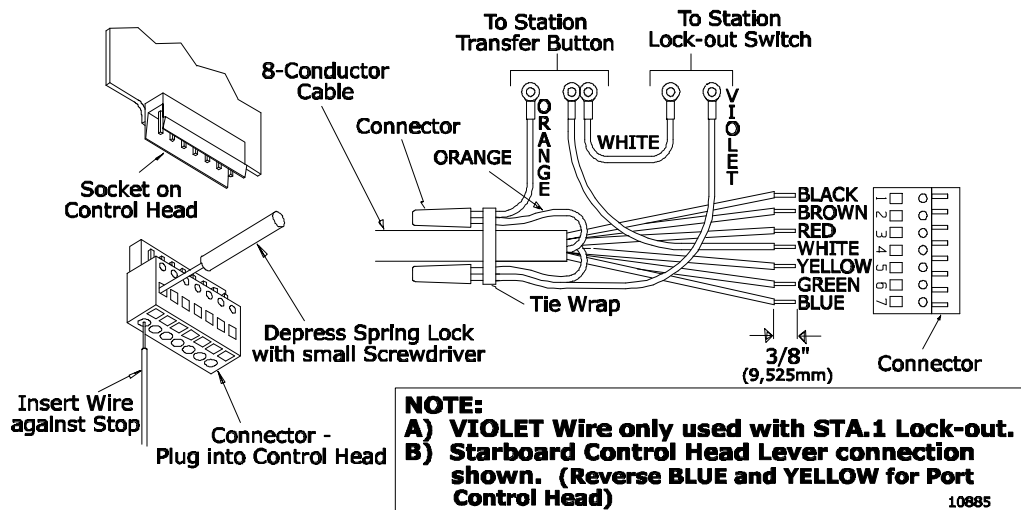


Figure 4  
Control Head Socket Connection

**NOTE: Wire color code is reversed to Control Head contacts 5 and 7, depending on the Control Head lever mounting to Starboard (right) or to Port (left) of the Control Head housing.**

Port side:	Starboard side:
Terminal 5 Blue	Terminal 5 Yellow
Terminal 7 Yellow	Terminal 7 Blue

Remove the Actuator cover and connect your anti-static wrist strap to the Actuator frame.

Remove the cable hole plugs as required. (Refer to Figure 5) Install the watertight cable grip that is included with the remote Control Head. (Refer to Figure 6) Station 1 will connect to TB8 (STA 1) as indicated on the drawing. Refer to Figure 7 and the appropriate Drawing in Section 12 or 13.

Strip the PVC cover shielding back approximately 2". The wire leads can be staggered for length to match the Station one terminal strip. Strip the wire 1/4" on each lead. Connect colors as indicated on the Single or Twin Screw Drawing.

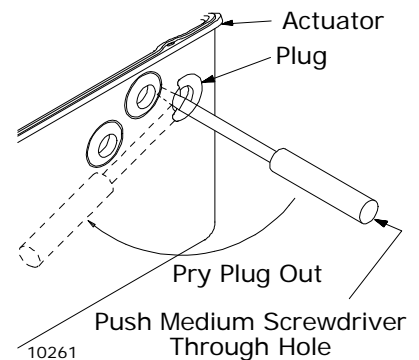
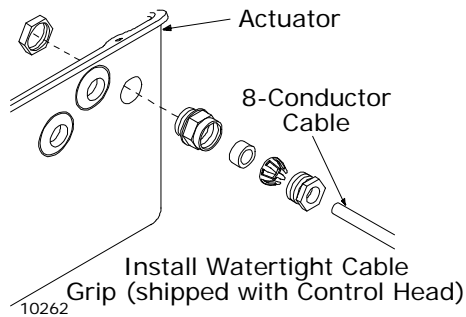


Figure 5



**Figure 6**

The shielding drain wire (bare wire) **must** be connected to ground at the board mounting screw. A wire terminal is provided.

Feed through a little slack cable and tighten the cable gripper on the 8-Conductor cable. The other station's 8-Conductor cables are brought in the same way and are connected to the appropriate terminal.

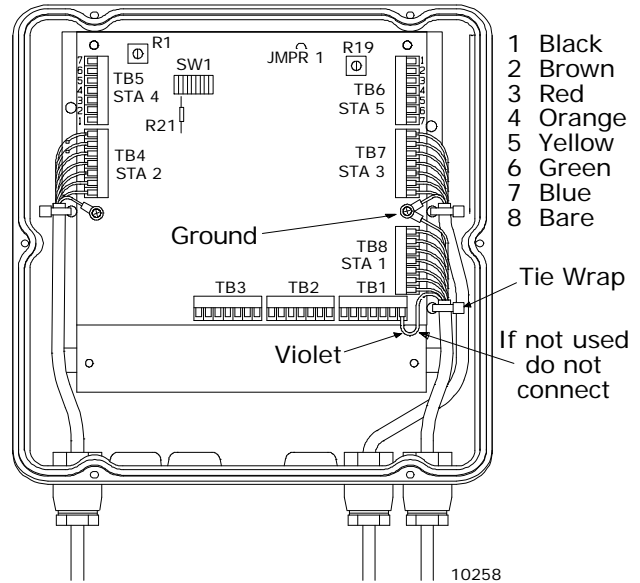
Secure the cable to the frame using tie wraps provided. The 5th remote station connects to TB6 (STA 5) and requires a little different procedure. See Station 5 installation in Section 5.7.

#### 4.8 CONNECT 12 VOLT POWER TO ACTUATOR

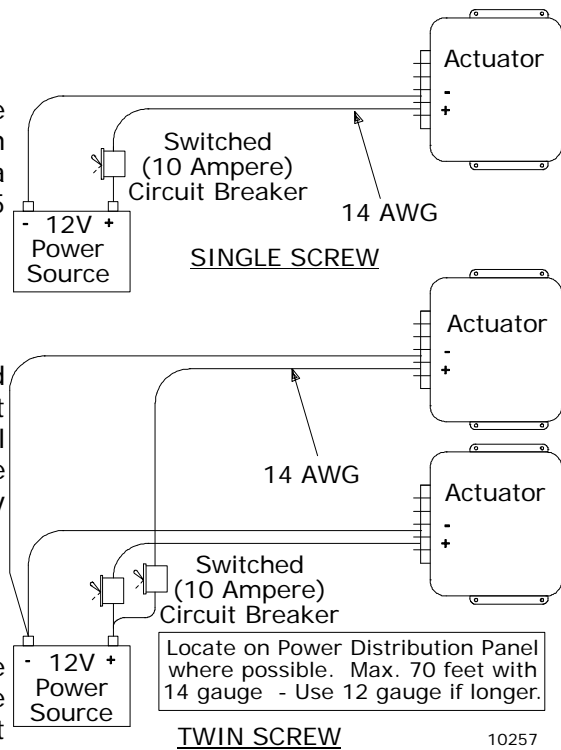
Connect the 12 volt positive cable (red w/purple stripe) from the switched circuit breaker to the (+) positive external Actuator terminal. Refer to Figure 8. The (-) negative cable (black) has previously been connected.

#### 4.9 INSTALL START INTERLOCK LEADS

The leads are yellow with a red stripe. Interrupt the start solenoid lead near the starter. Run the start leads to the Actuator external contracts. See circuit drawings in Section 12 and 13. The Actuator provides a start interlock for controls 'ON' and clutch in Neutral. The



**Figure 7**



**Figure 8**

'START' signal voltage can be 12, 24, or 32 volts as it only passes through a relay in the Actuator. **IMPORTANT: Maximum current 10 Amperes.**

#### 4.10 IMPORTANT CHECKS

The most common source of trouble is loose wiring connections. Make certain that wiring connectors are properly crimped and cannot be pulled out. Crimps and connections must be made to the wire, NOT to the wire insulation. All screwed wire connections must be checked to see they are secure.

### 5. CONTROL SET-UP

**CAUTION:**

- 1) *Keep hands and tools clear of the Actuator when power is 'ON'.*
- 2) *Turn 'OFF' the control system before disconnecting the 12 Volt batteries, particularly when the engine is running.*
- 3) *The push-pull cables are not yet connected.*

Turn 'ON' the control system.

The remote stations will beep.

Depress one station transfer button (Control Head levers in Neutral). The indicator light will tell you that you have command.

Move the Control Head levers full-ahead and full-astern. This will check that the Control Heads are operating normally.

#### 5.1 ACTUATOR

<b>Actuator Settings (as shipped)</b>		
High Idle	R19 Pot	Fully counterclockwise ↺ gives minimum High Idle.
Throttle Throw	R1 Pot	Fully counterclockwise ↺ gives minimum throttle.
<b>SW1 (Switch 1) Settings (as shipped)</b>		
Clutch Direction	(1) 'OFF' (2) 'ON'	Clutch Cable 'PULL' Ahead. 1/4" All switches 'ON' gives minimum throw
Clutch movement	(3) 'ON' (4) 'ON'	1/8" Switches to 'OFF' gives incremental increase. 1/16" Dimensions are each side of center.
Pause - Clutch engaged Ahead	(5) 'OFF' (6) 'OFF' (7) 'ON'	Provides a maximum pause from full-Ahead of 3-1/4 seconds. Refer to Section 6.2.3 for optional settings.
Throttle Pause	(8) 'OFF'	Throttle pause of 1/2 second following shift. Use when commanding hydraulic actuated clutches.
Throttle Direction	(9) 'OFF'	Throttle cable 'PUSH' for full.

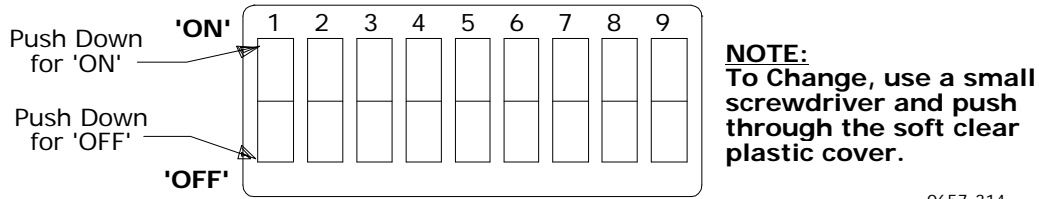


Figure 9

## 5.2 CHECK REMOTE CONTROL HEADS AND STATION TRANSFER

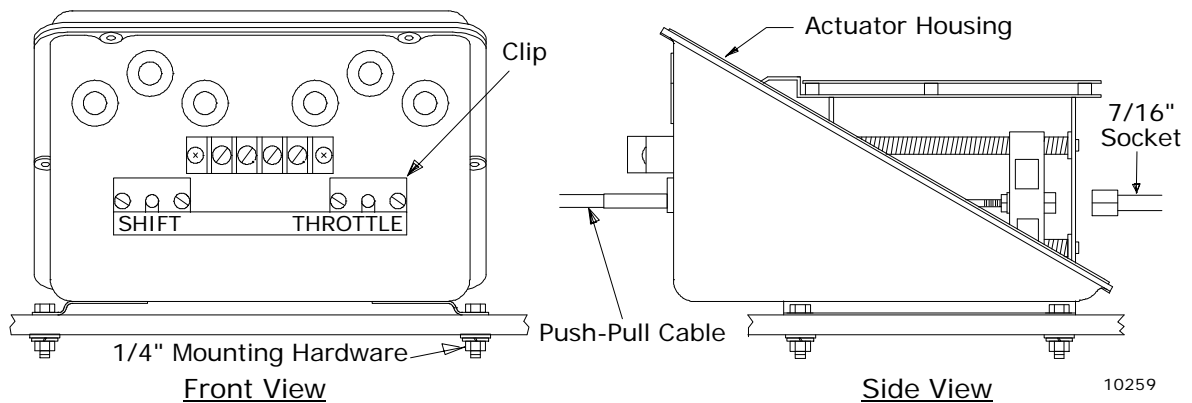
Move to each remote station and with the Control Head levers in the Neutral position push in the station transfer button. The indicator light on the Control Head will confirm that transfer has taken place and that you have command.

The Control Heads are direction sensitive. To prove that the Control Head wiring connections are correct, place the Control Head levers in the Neutral position, depress the station transfer button and then move the Control Head levers to the Ahead detent position. The red indicator light on the Control Head should blink. This indicates the clutch was left in Neutral and the Control Head lever will position the throttle in the Ahead direction. If the indicator light is steady in Ahead and blinks in Astern, then connections 5 and 7 on the Control Head connector must be reversed. (Section 4.7, pg. 6) The warm-up idle works only in the Ahead direction. There are no further adjustments to the remote Control Heads.

## 5.3 PUSH-PULL CABLES

- CHECK that there are push-pull cable anchor brackets installed on the engine. If the brackets are not on the engine select from Section 9, and if necessary fabricate as indicated in Section 10.
- Actuator Shift Direction Setting. As shipped from the factory, Actuator dip switch (SW1) switch 1 is 'OFF', and therefore, the push-pull cable will PULL on the shift lever for Ahead. If this is correct leave it. If it is wrong change switch 1 to 'ON' and the push-pull cable will PUSH the shift lever for ahead.
- Actuator Throttle Direction Setting. As shipped from the factory, Actuator dip switch (SW1) switch 9 is 'OFF', and therefore, the push-pull cable will PUSH the throttle lever for full-speed. If this is correct leave it. If it is wrong change switch 9 to 'ON' and the push-pull cable will PULL on the throttle lever for full-speed.
- Connect the push-pull cables to the Actuator. Refer to Figure 10. Remove the 10-32 jam nut and the two rubber seals from the push-pull cable end that is to connect to the Actuator. Reinstall the 10-32 jam nut. Remove one cable anchor clip screw from the Actuator housing and swing the cable clip clear. Connect the shift cable and throttle cable to the proper hex nut. See label on the Actuator. Use a 7/16" socket to turn the hex nut onto the 10-32 cable rod end until there is 5/16" of thread showing beyond the jam nut.

Tighten the 10-32 jam nut to the hex nut. Install the cable anchor clips to secure the Type 33C cable to the Actuator housing.



**Figure 10**  
**33C Cable Connection**

### 5.3.1 Reverse Gear Cable Adjustment

**NOTE: Misadjusted clutch and throttle cables cause motors to burn out. Do it right by following these instructions.**

- A) Turn the Control System 'ON' and place the remote Control Head levers in Neutral.
- B) Adjust the clutch cable ball joint at the engine to match the clutch lever in Neutral. Leave the cable disconnected at this time.
- C) Move the Control Head levers to the Ahead detent. The Actuator can be adjusted for a total clutch movement of 2" to 3". The Actuators are shipped with switches set for minimum movement.
- D) Measure the clutch lever movement from Ahead to Astern detent. The clutch lever movement must fall in the adjustment range. Make the switch (SW1) selection.

SW1 will increase the push-pull clutch travel in each direction from Neutral by moving the switches from 'ON' to 'OFF'.


Switch 4 1/16"  
 Switch 3 1/8"  
 Switch 2 1/4"

**NOTE: Movement is minimum with switches 2, 3, and 4 in the 'ON' position. Total clutch travel change will be twice the increment listed above.**

- E) Match the required travel and then check the Astern direction. Recheck Ahead, Neutral, Astern with the clutch push-pull cable disconnected to see that the Actuator does not jam the clutch lever against its stops and that Neutral is correct.

F) Now connect the clutch cable.

### 5.3.2 Throttle Cable Adjustment

A) Check that potentiometers R1 and R19 are in the fully counterclockwise  position, as shipped from the factory.


B) Measure the throttle lever movement from Idle to full-speed. It must fit within the Actuator push-pull cable range of 1" to 2-4/5".

If the throttle lever movement is too little or too great the radius must be changed to fall within range. If possible, set throttle movement for 2-1/2" Idle to full.


Leave throttle cable disconnected at this time.

C) Place Control Head levers in Neutral, start engine and run at Idle.

Adjust ball joint on push-pull cable to match throttle lever Idle position.

D) Shut off the engine. Move the Control Head lever to full-speed. Move throttle lever to full-speed stop and gradually turn potentiometer R1 on the circuit board in a clockwise  direction until the ball joint can be connected with a slight amount of pressure against the full-speed throttle stop. Connect ball joint to throttle lever. The throttle is now set.


E) Place Control Heads in Neutral and start engine. Depress and hold station transfer button at Station-in-Command, move Control Head lever to Ahead detent position. The blinking indicator light at the Control Head will indicate you are in Warm-up Mode and in High Idle.

To make use of High Idle Mode, rotate potentiometer R19 clockwise  for the desired higher engine Idle RPM.

<p><b>CAUTION:</b> <i>When adjusting potentiometer R19 for High Idle, you must be sure you are in High Idle Mode. You must be in the AHEAD DETENT with the Control Head indicator light BLINKING. Otherwise, you may be trying to adjust High Idle when you are in Low Idle Mode.</i></p>
---

Check High Idle/Low Idle operation.

Move Control Head lever to Neutral, depress transfer button to return to Low Idle. Depress transfer button again for High Idle.

Diesel applications may want High Idle and Low Idle to be the same, to do this the potentiometer R19 is left in the fully counterclockwise  position. Shut off engine.

## 5.4 STATION TRANSFER

The operator can leave the Station-in-Command with the Control Head lever in any position from full-Ahead to full-Astern. To gain command at any other station the Control Head lever MUST be in the Neutral position. This is called NEUTRAL STATION TRANSFER. As soon as the Control Head indicator light shows red the operator can move the Control Head lever to any desired position.

## 5.5 START INTERLOCK

Check proper operation of start interlock:

- Turn off 12 Volt DC power to MicroCommander Control System, check that engines will not START.
- Turn on 12 Volt DC power to MicroCommander Control System, place Control Head levers to Ahead detent and check that engines will not START.
- Place Control Head levers in Neutral, engines should START in this position.

## 5.6 THROTTLE PAUSE

Hydraulic actuated clutches require 1/2 second or longer following clutch selector lever movement before there is clutch plate contact. SW1 switch 8 in the 'OFF' position allows 1/2 second throttle pause after clutch selector lever movement is complete. Dog clutches and cone clutches used on some I/O's and outboards do not require a throttle pause following clutch shift and SW1 switch 8 should be left 'ON'.

## 5.7 STATION 5

The 5th remote station is connected at terminal strip TB6 on the Actuator circuit board and requires the following alterations to the circuit board: (See Figure 7, pg. 8)

- Remove Jumper JP1.
- Remove Resistor R21.

The result is that all five stations operate as before, except that the High Idle feature has been eliminated at all remote stations.

## 5.8 FINAL CHECK

- A) Shut off the engine.
- B) Check that all engine connecting fasteners are tightened securely.
- C) Operate Control Heads Ahead and Astern and check clutch selector lever movement.

Operate Control Head levers from Idle to full-Ahead and check throttle lever movement.
- D) Transfer between all remote stations. Check that Control Heads will not transfer if receiving Control Head levers are not in Neutral.

Start engine and check that engine 'Stop' switches (normally push button) function correctly at all remote stations.
- E) If all of the above tests have performed correctly, only then should the vessel be sea trialed.

## 6. SEA TRIALS AND OPERATOR INSTRUCTIONS

### 6.1 TESTS BEFORE LEAVING THE DOCK

- A) Idle the engines and place one Control Head lever at a time in the Ahead detent and then the Astern detent.

Do this at each remote station to confirm direction command.

- B) Then use Warm-up Idle on EACH engine at EACH station, one engine at a time to confirm speed command.

**DO NOT ATTEMPT TO OPERATE THE CONTROLS AWAY FROM THE DOCK WITH ANY SYSTEM ABNORMALITY.**

**CAUTION:** *The MicroCommander is single lever command that provides finger-tip operation plus fast and accurate command. What you call for in Control Head lever position is what you get. Start out slowly and learn to appreciate a light touch and excellent command.*

### 6.2 ADJUSTMENTS TO CHECK UNDERWAY


#### 6.2.1 High Idle

Check that the High Idle setting is at the desired RPM. Check that both engines are the same RPM on a twin screw application. Adjustment are made at potentiometer R19 on the Actuator circuit board. Be sure you are in Warm-up Mode with the Control Head indicator light blinking and in the Ahead detent when adjusting R19.

#### 6.2.2 Full Speed Setting

Warm up the engine and in open water gradually move the Control Head lever to full-speed. The throttle throw has already been adjusted to place the throttle snug against the full-speed stop on the carburetor or governor when the Control Head lever is at full-speed.

If the top engine RPM is low, check that the throttle lever is against the full-speed stop. Other possibilities are the full-speed stops are set incorrectly or the propeller load is too great.

If full-speed should be lowered turn potentiometer R1 counterclockwise  to desired maximum RPM. For twin screw applications, check that Idle, High Idle, midrange, and full-speed all come up with approximately equal RPM with equal Control Head lever positions.

#### 6.2.3 Proportional Pause On Direction Change

This feature allows for engine deceleration and vessel speed to decrease on a straight through Full Speed Reversal. The throttle setting drops to Idle and the gear remains engaged Ahead.

The pause is in proportion to how much speed was called for and how long. The minimum pause is 2 seconds with SW1 switches 5, 6, and 7 in the 'OFF'

position. The maximum pause is 11 seconds with SW1 switches 5, 6, and 7 in the 'ON' position. Factory settings at the time of shipment are 3-1/4 seconds.

SW1 Switch: Full-Speed Pause

Switch 5	OFF	OFF	OFF	OFF	ON	ON	ON	ON
Switch 6	OFF	OFF	ON	ON	OFF	OFF	ON	ON
Switch 7	OFF	ON	OFF	ON	OFF	ON	OFF	ON
Seconds:	0	1.5	3.5	5	7	8.5	10.25	11.5

**NOTE:** *The pause in gear on a through shift is proportional to how much speed is called for and for how long. The times listed above are maximum. Shifting from Idle Ahead to Idle Astern the pause is ZERO. Half speed would give half the above listed pause. The time required to build to the maximum pause is 6 times the pause listed above. The pause from full-Astern to Ahead is half that listed above for full-Ahead to Astern.*

### 6.3 CONTROL HEAD TONES

There are THREE functions of the TONE:

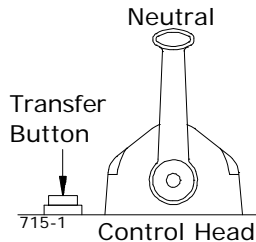
- **Low repetition rate tone** is normal when 12VDC power is first applied to the control system.
- **High repetition rate tone** is used to signal a warning of an abnormally high push-pull cable load of either the shift or throttle push-pull cable. The Actuator has stopped when this tone is heard. Moving the Control Head lever away from the position the tone was encountered will usually stop the signal. The cause of the high push-pull cable load **MUST** be determined. Disconnect the throttle and shift push-pull cables at the engine and check the engine and gear levers for heavy loads. Operate the Control Heads moving freely. Check Sections 5.3.1, pg. 11, and 5.3.2, pg. 12, to see that the push-pull set-up is adjusted correctly.
- **Steady tone.** This indicates a component failure or a voltage problem. Confirm the voltage is steady at 11 to 16 Volts DC. If the voltage is correct and the steady tone continues the Actuator should be replaced.

## 7. UPDATE INFORMATION

For more information regarding the following, please contact us directly or one of our MicroCommander Distributors or Factory Authorized Dealers.

- Our Actuators have progressed from the 314 Actuator to our current production the 585CE Actuator.
- A PROM set which updates the 314 Actuator with the program developments of the 580 Actuator is available.
- We have updated our Control Heads to incorporate the station transfer button within the Control Head housing.

## 8. OPERATOR INSTRUCTIONS



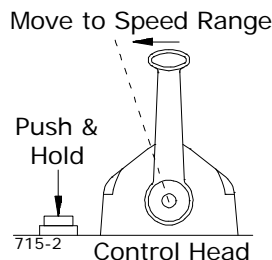
### Control System Start-up

When the control system is turned 'ON', the engine controls will automatically move to Neutral and Idle position. An intermittent tone will sound at all remote stations, as no station has command. The operator must depress the station transfer button to obtain command. The tone will stop at all remote stations and the indicator light will be steadily lit at the Station-in-Command. Only one remote station has command at a time.

### Engine Start

There are three control features related to main engine 'start'.

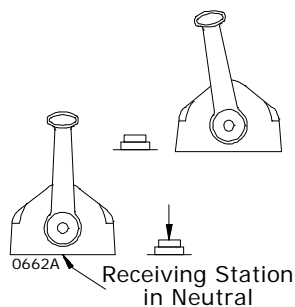
- 1) The control system is interlocked to block the engine 'START' signal if the control system has not been turned 'ON'.
- 2) The control system is interlocked to block the engine 'START' signal if the clutch selector lever is in the engaged position.
- 3) The control system allows engine speed adjustment without engaging the clutch to help starting and warming up a cold engine. This is called Warm-up Mode.



With the Control Head levers in the Neutral position, depress and hold down the station transfer button, move the Control Head levers to the Ahead detent position. Now release the station transfer button. The indicator light will blink, showing the clutch has stayed in Neutral. The operator can now move the Control Head levers through the speed range and 'start' and warm-up the engine. To reset the normal control function, the operator returns the Control Head levers to Neutral.

### Station Transfer

Only one remote station has command at a time. Command is transferred by a transfer push button. There is one push button at each remote station. To transfer, the Control Head levers of the remote station taking command must be in the Neutral position. The light on the Control Head is red when the station has command. The indicator lights at all other remote stations will be 'OFF'. Command remains unchanged for one second after the red light to allow the operator time to move the Control Head lever from Neutral to a position approximately matching the last speed setting.



## 9. MORSE CLUTCH AND THROTTLE KIT SELECTION

### 9.1 PRE-ENGINEERED CLUTCH CONNECTION KITS

GEAR MAKE	GEAR MODEL	KIT NO.
Allison	M & MH	41482
Borg Worner	70, 71, 72 In line w/red gear rear entry	301474
	71C & 72C Drop center front entry	35627
	AS2-73C-73C w/or w/out red gear front entry	43557
	1000 Series rear entry	202221
Capitol	12400	47070
	2, 3, & 4 HD & HE	42748
Caterpillar	7200 Series	NA
MerCruiser	Inboard w/o Warner red gear	62355
Paragon	P, PM, PL 8 PC-including V-Drives	44443
	HF-7	35790
Twin Disc	MG508, 509, 510, 510A, 512, 514C, 514CHP, 518, 521, 527, 530, 540 MG502, 506, 507, w/x9994, xA7022, A7048	42577
	Valves	63696

### 9.2 OUTBOARD AND I/O CABLE CONNECTION KITS

ENGINE MAKE	KIT NO.
Chrysler 1975 & later	300465
Evinrude/Johnson 55-235 H.P. 1978 to date	301729
Mercury 40-300 H.P.	301901
MerCruiser I/O	302123
OMC Sterndrive I/O	300557
Volvo I/O	Engine and out drive brackets are provided by Volvo

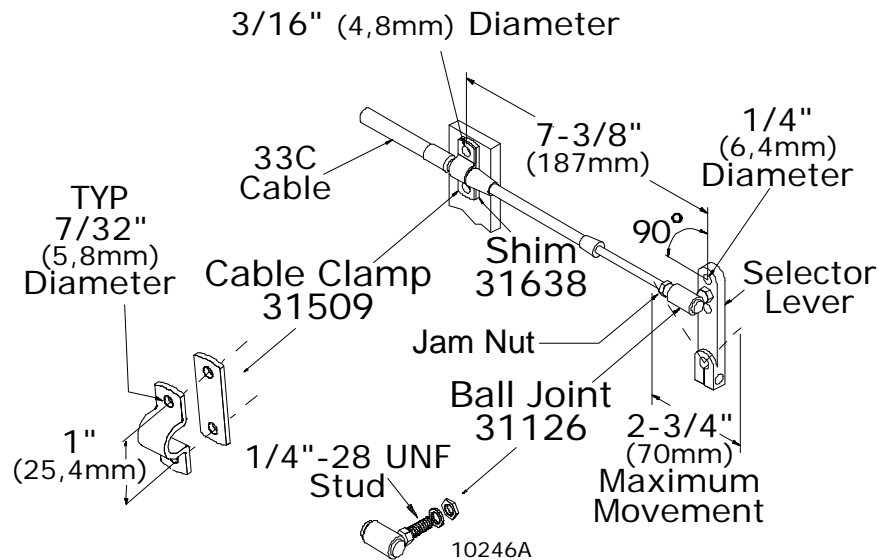
### 9.3 PRE-ENGINEERED THROTTLE CONNECTION KITS

ENGINE MAKE	ENGINE MODEL	KIT NO.
Caterpillar	3208 NA	300172
	334, 3304, 3306	300214
	3406, 343	300215
	3408	300213
Chevrolet	305 cu.in.	300003
	350 cu.in.	300003
Chris-Craft	305, 350 cu.in. all I/O's & inboards	300003
Chrysler	N1SSANM633	-----
Cummins	A11 w/MVSGOV	47471

ENGINE MAKE	ENGINE MODEL	KIT NO.
	AFC Fuel pump V504M, V555M, V903M, VT903M, VTA903M, NT855M, VT1710M, VTA1710M, KT & KTA 115M, KT & KTA 2300M, 1975 and later	
General Motors	3, 4, & 6-71 w/var.sp.gov. 6, 8, 12 V-71 & 6, 8 V-92 w/var.sp.gov. 6-71 inclined 2, 3, 4-53 w/left hand gov. Right hand gov. 6V-53 Rear entry 6V-53 Front entry 6, 8V-71 Front entry 12, 16V-149	41736 41489 68190 300822-001 300822-002 300823-001 300823-002 48410 301462
MerCruiser	302, 351, 460 cu.in. 305, 350 cu.in.	63746 300004
O.M.C.	OMC Ford eng. OMC Chev. eng.	63746 300004
Palmer	302, 351, 460 cu.in.	63746
Perkins	4, 236M 6, 3544M; T6, 3544M; ST6, 3544M; SST6, 3544M 4, 108 w/shut off 4, 154M	48931 302026 303878 304105

## 10. UNIVERSAL MOUNTING

Fabricate Bracket to match  
dimensions shown



## **11. REFERENCES**

### **11.1 AMERICAN BOAT AND YACHT COUNCIL (ABYC)**

P.O. Box 806  
Amityville, NY 11701  
E-1 Bonding of Direct Current Systems  
E-3 Wiring Identification on Boats  
E-9 DC Electrical Systems on Boats

### **11.2 CODE OF FEDERAL REGULATIONS**

33 CFR 183 Subpart I - Electrical Systems  
183, 410 Ignition protection  
183, 415 Grounding  
183, 425 Conductors: General  
183, 430 Conductors in circuit of less than 50 Volts  
183, 445 Conductors: Protection  
183, 455 Overcurrent and Protection: General

### **11.3 SOCIETY OF AUTOMOTIVE ENGINEERS**

400 Commonwealth Drive  
Warrendale, PA 15096  
J917 Marine Push-Pull Cables  
J1171 External Ignition Protection  
J1428 Marine Circuit Breakers  
J378 Marine Engine Wiring

### **11.4 NATIONAL MARINE MANUFACTURERS ASSOC.**

401 North Michigan Avenue  
Chicago, IL 60611

### **11.5 UNDERWRITERS LABORATORIES**

### **11.6 PARTS SOURCE**

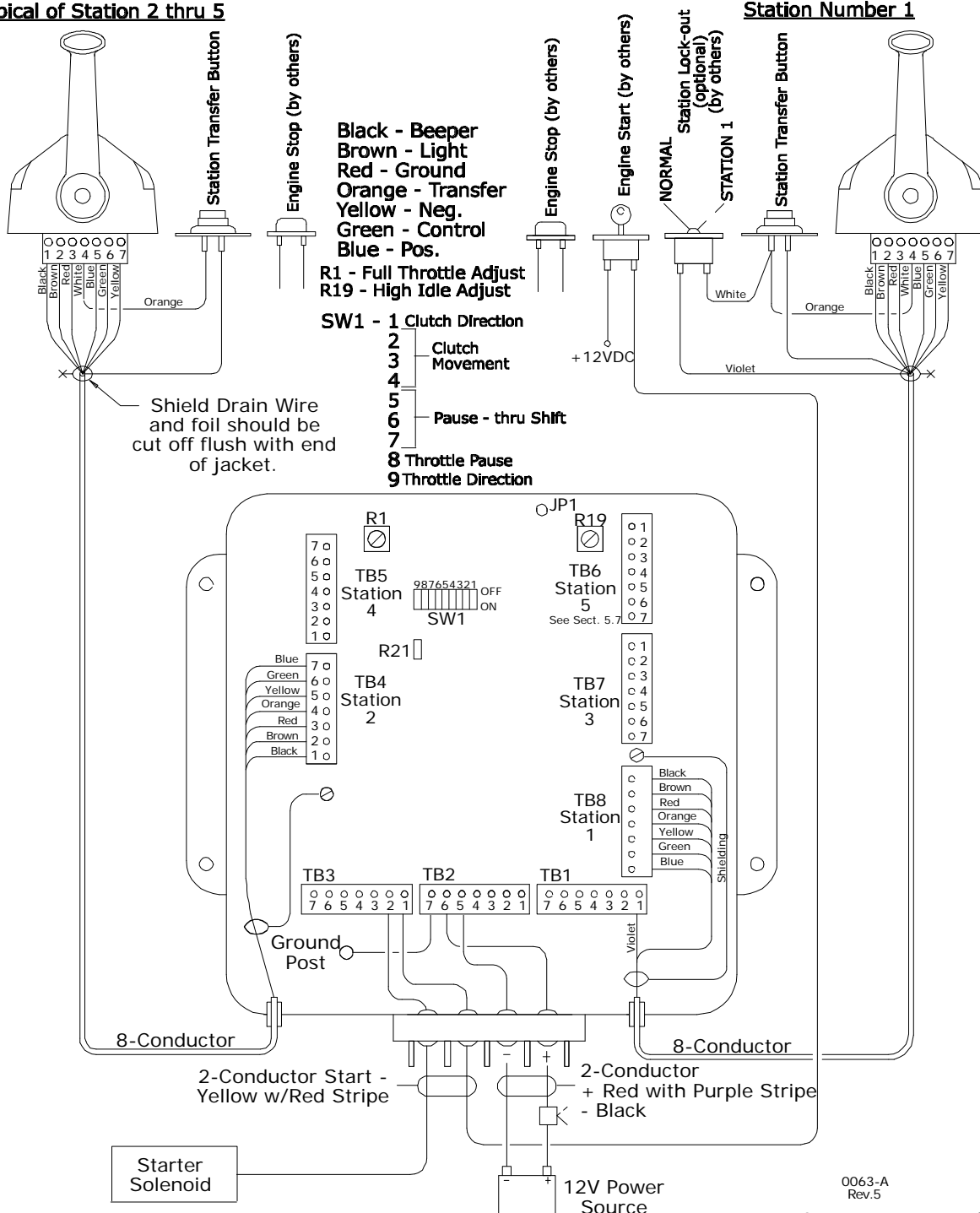
ANTI-STATIC WRIST STRAP Thomas & Betts P/N AWCC	P/N 517
CIRCUIT BREAKER E-T-A Manufacturer P/N 41-2-514-LN2-10 UL Approved	P/N 810
RELAY Cole Hersee P/N 24 117-01 UL Approved	P/N 809



# 12. SINGLE SCREW CIRCUIT

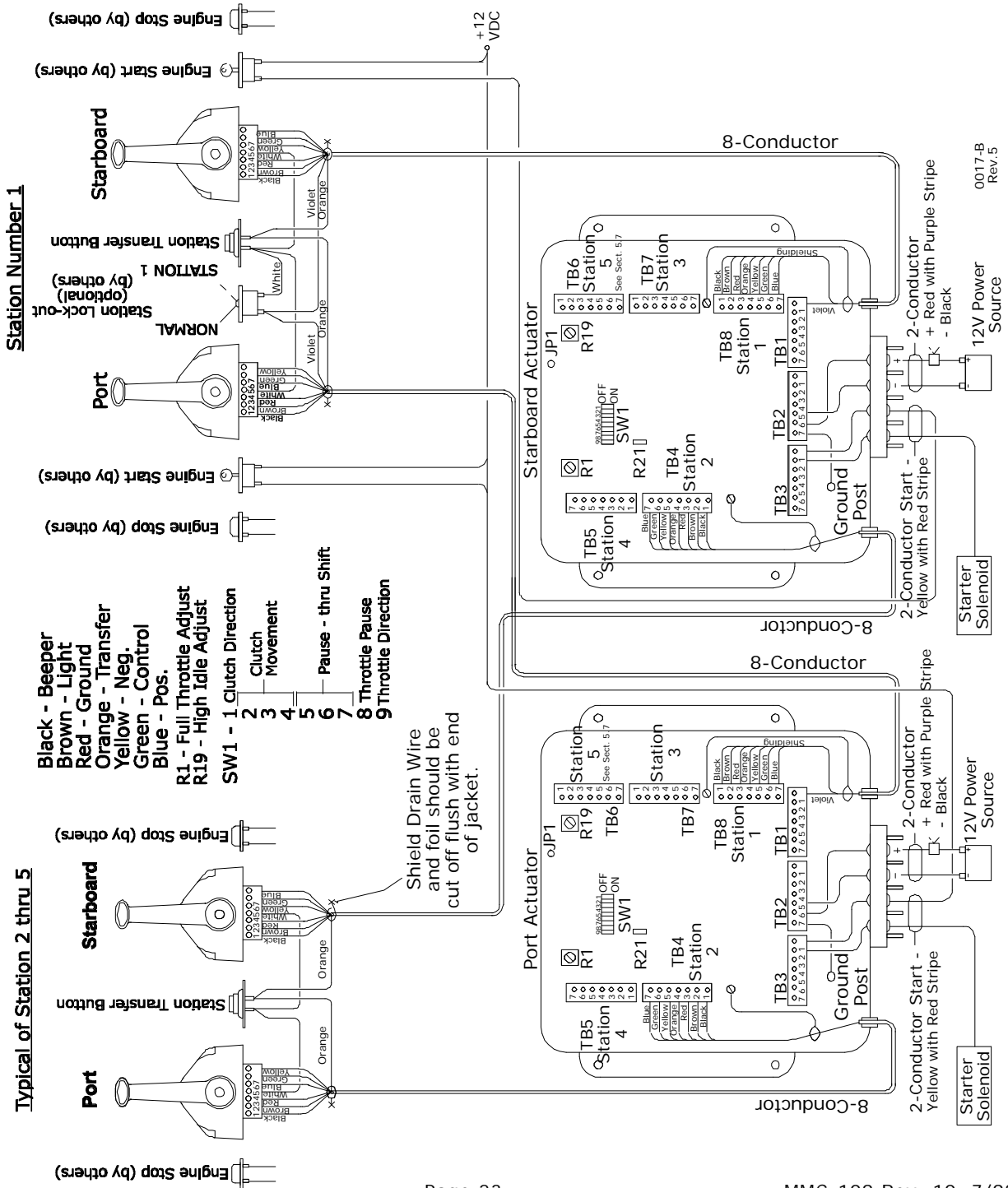
Typical of Station 2 thru 5

Station Number 1



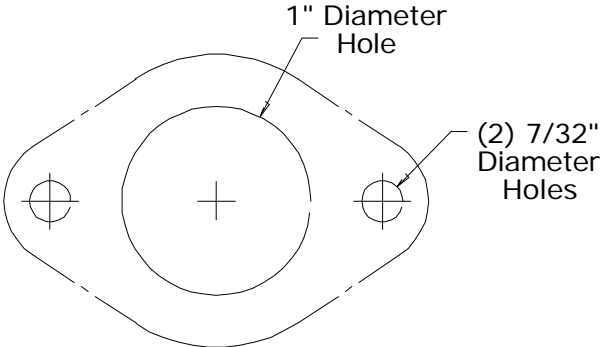


# 13. TWIN SCREW CIRCUIT

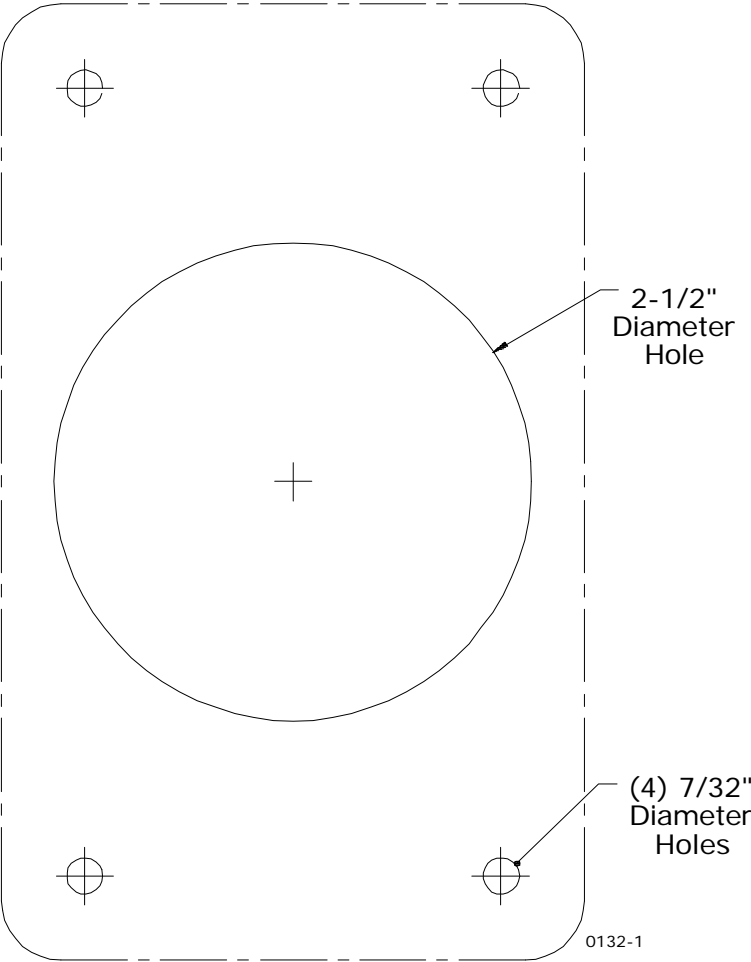




# 14. TEMPLATE

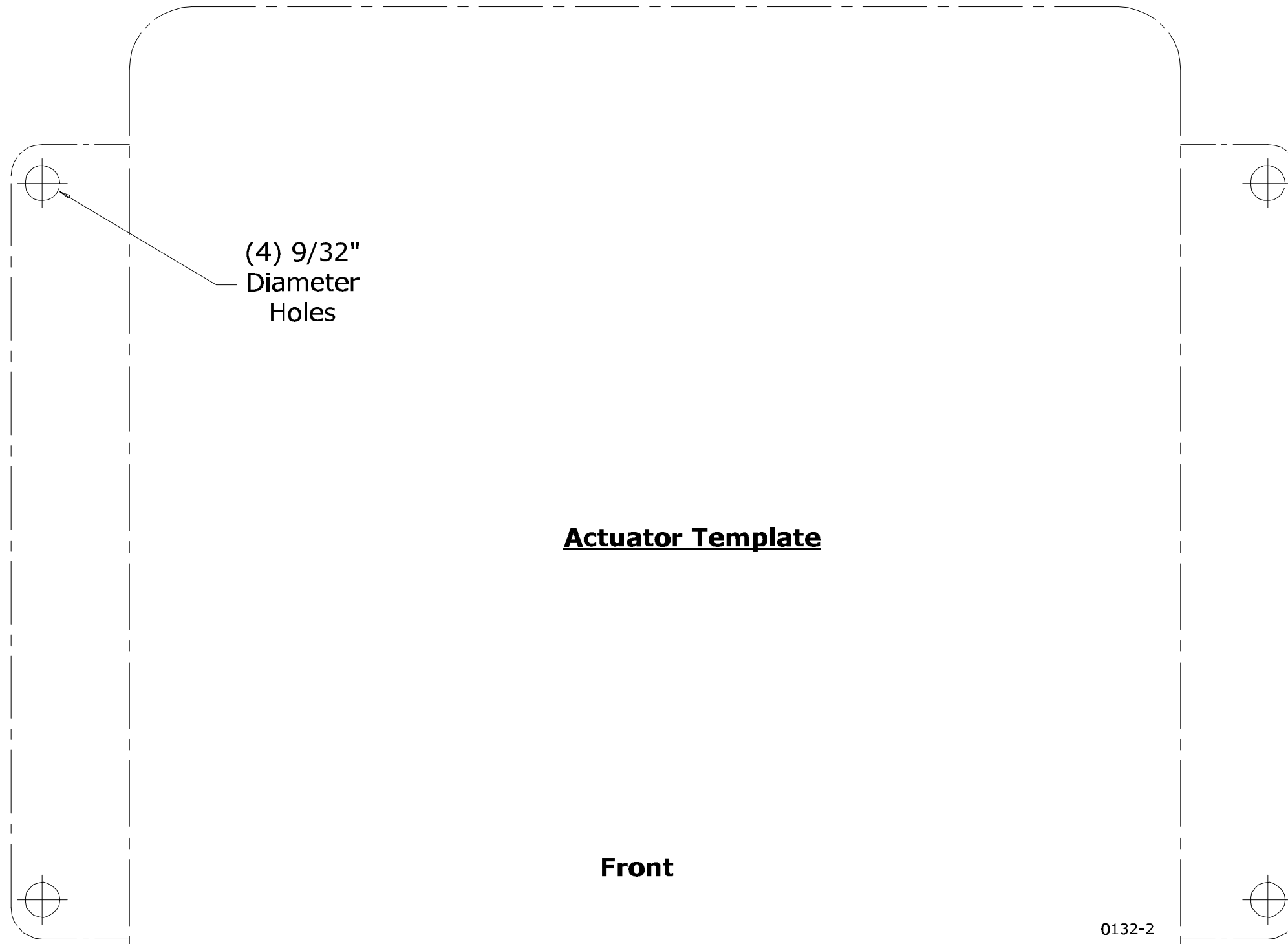


**Transfer Button**



**Control Head**





(4) 9/32"  
Diameter  
Holes

**Actuator Template**

**Front**

0132-2

