INSTALLATION AND USER INSTRUCTIONS

Electronic Control System

(ENG) **Installation and User Instructions.**
NB! Present these instructions to the owner following installation.

(GER) **Einbau- und Bedienungs-anleitung**
HINWEIS! Diese Anleitung ist nach dem Einbau der Anlage dem Bootseigentümer zu übergeben.

(FRE) **Instructions de montage et d'utilisation.**
NB! Ces instructions doivent être remises au propriétaire après le montage.

(SPA) **Instrucciones de instalación y de uso**
NOTA: Entregar estas instrucciones al propietario de la embarcación después de la instalación.

(ITA) **Istruzioni per l'installazione e l'uso**
NB! Sottoporre queste istruzioni al cliente, dopo l'installazione.

(SWE) **Bruks- och installationsanvisning.**
Obs! Efter installationen skall denna anvisning överlämnas till båtägaren.

⚠ IMPORTANT!

This batch with its accompanying instructions is produced for TFX Marine's service workshops, boat-builders, machine manufacturers and other authorized workshops which have personnel with qualified professional training.

The installation instructions are only produced for professional use and are not intended for non-professional use. TFX Marine will not assume any liability whatsoever for damage incurred, either damage to materials or personal injury, which may result if the installation instructions are not followed or if the work is carried out by non-professional personnel.

⚠ WICHTIG!

Dieser Satz mit vorliegender Einbauanleitung ist für TFX Marine Kundendienst-werkstätten, Werften, Maschinenbauer und für andere ermächtigte Werkstätten mit beruflich geschultem Personal vorgesehen.

Die Einbauanleitung ist nur für den berufsmäßigen Gebrauch vorgesehen und nicht für unprofessionelle Anwendung gedacht. TFX Marine übernimmt nicht die geringste Haftung für irgendwelchen Schäden an Personen oder Sachen, die als Folge einer Nichtbefolgung der Einbauanleitung oder wegen Ausführung der darin beschriebenen Arbeiten durch nicht beruflich geschulte Personen entstehen.

⚠ IMPORTANT!

Ce kit, avec instructions de montage, est destiné aux ateliers de service TFX Marine, aux constructeurs de bateaux et autres ateliers de construction agréés avec un personnel qualifié.

Les instructions de montage sont exclusivement conçues pour une utilisation professionnelle. TFX Marine se dégage de toute responsabilité pour d'éventuels endommagements, corporels ou matériels, résultant du non respect des instructions ou d'un travail effectué par un personnel non compétent.

⚠ IMPORTANTE!

El presente juego con las instrucciones de montaje se destina a los talleres de servicio TFX Marine, constructores de embarcaciones y máquinas y a otros talleres autorizados que cuentan con personal capacitado.

Las instrucciones de montaje están destinadas únicamente para uso profesional, por lo que TFX Marine no aceptará responsabilidad alguna por cualquier daño, tanto personal como material, resultado de no haber seguido las instrucciones de montaje o de haber sido efectuado el trabajo por personal que no está debidamente capacitado.

⚠ IMPORTANTE!

Questo kit e le relative istruzioni di montaggio sono stati realizzati per le officine di servizio TFX Marine, i cantieri, i fabbricanti di macchine e tutte le altre officine autorizzate il cui personale ha ricevuto un addestramento qualificato e specializzato.

Le istruzioni di montaggio sono state redatte esclusivamente per uso professionale e non sono adatte all'uso non professionale. La TFX Marine non si assume alcuna responsabilità per eventuali danni alle cose o alle persone, derivanti da trascuratezza nel seguire le istruzioni di montaggio oppure dall'esecuzione dei lavori da parte di personale non qualificato.

⚠ VIKTIGT!

Denna sats med föreliggande monteringsanvisning är framtagen för TFX Marines serviceverkstäder, båtbyggare, maskintillverkare och övriga auktoriserade verkstäder som har personal med kvalificerad fackutbildning.

Monteringsanvisningen är enbart framtagen för yrkesbruk och är inte avsedd för icke yrkesmässig användning. TFX Marines påtager sig inget som helst ansvar för eventuella skador, såväl materiella som personskador, som kan bli följden om monteringsanvisningen ej följs, eller om arbetet utförs av icke yrkeskunnig personal.

CONTENTS

User Instructions

Installation instructions

Safety information

Read this chapter thoroughly to ensure your safety. It contains information on safety.

Installation must be carried out by a TFX Marine authorised workshop.

Make sure you are in possession of the correct installation instructions before reading further. If not, please contact your TFX Marine dealer.

Incorrect installation or handling can cause personal injury and/or damage to the product and other property. Therefore, read the installation instructions thoroughly before starting the installation, starting the engine, performing maintenance or carrying out service work. If anything is still not clear or if you feel uncertain about something, please get in touch with your TFX Marine dealer for assistance.

⚠ This symbol is used in the installation and user instructions to call your attention to pints concerning safety information. Read all this information thoroughly.

Warnings used in the installation and user instructions have the following order of priority:

⚠ **WARNING!** Warns for risk of personal injury, extensive damage to products or property or serious functional disorders if the instructions are not followed.

⚠ **IMPORTANT!** Used to call your attention to matters that can cause damage or functional disorders to products or property.

NB! Used to call your attention to important information that can simplify working procedures or handling.

PRESENTATION

FUNCTIONS

The TFX Marine Electronic Control System is a single lever system for combined operation of the throttle and gear functions in marine engines. The system consists of an electronic unit, drive unit, control lever(s), control panel and cables.

A single system can be connected to up to three operating stations. One station is active at a time.

The system is dual voltage and automatically accepts either 12 or 24 V DC.

The system must be connected to two independent battery groups. This means that the system switches over to the Backup batteries if the power of the main battery group becomes insufficient.

The neutral-only start relay prevents engine start with the transmission engaged.

The electronic unit has a built-in information display, which is used for calibration and display of Error Codes should they arise (“Quick Troubleshooting”).

Individual adjustment of gear function and throttle stroke lengths.

Individual calibration/adjustment of control lever function.

Change stations underway. Program this function by pressing the button and executing a changeover to the new control.

Preprogram increased idle directly from the controls. A great benefit when the engine is cold, especially with petrol engines and when increased throttle is required for manoeuvring.

Throttle without transmission engaged by pressing a button and shifting the control lever to the desired rpm speed: permits engine throttling in neutral.

Programmable throttle delay makes it possible to delay throttle while shifting gears so that the reverse gear has the time to shift at low rpms, which prevents damage to the reverse gear. Program this directly on the electronic unit.

Progressive throttle feature offers 5 different “throttle curves” that can be set to match different engine types and driver preferences. Program this function directly on the electronic unit.

SYSTEM COMPONENTS

Control

Water resistant, stove-enamelled aluminium cover and stainless steel lever(s). One function button and two light-emitting diodes (LEDs) for each engine.

Drive unit

The drive unit is composed of stainless plate steel. Two electrical linear actuators: one for throttle and one for gear selection. Movement speed: 75 mm/second. Stroke length: max. 76 mm. Operating push or pull force: max. 11.5 kp (instantaneously higher).

The system can be connected to 12 V or 24 V DC operating voltage. Rated operating current is an average of 3 A and averages 0.1 A at rest.

Electronic unit

The electronic unit is mounted on the drive unit housing and controls the actuators. Under the electronic unit cover, there is an information display and buttons used for calibrating the system and viewing error codes. Electrical cables and the wiring harness connect easily with plug-in connectors on the rear side of the electronic unit.

Wiring harness

The drive unit comes complete with two cables (3x1.5 mm^2) one grey and one black. Length=6.5 m.

Mechanical control cables

Mechanical control cables must have UNF10/32 thread and be selected as short as possible for installation. Order TFX Marine cable type CC 313.

Signal cable between controls/electronic unit

Signal cable available in lengths from 5 m to 25 m.

Extension cable for calibration

A 4 m extension cable can be ordered as an optional accessory to facilitate system calibration. This means that the electronic unit can be disconnected from the drive unit and then used as a “Remote Control” when adjusting throttle and gear function.

Starting lock relay

Neutral-only start relay.

Relay for 12 V: 40 A, explosion proof.

Relay for 24 V: 20 A, **NB!** Not explosion proof.

Circuit breaker

An 8 A circuit breaker is to be fitted between the main switch and the electronic unit on the **Main positive** and **Backup positive**.

FIG.1 THE TFX MARINE ELECTRONIC CONTROL SYSTEM,
(DIMENSION DRAWING)

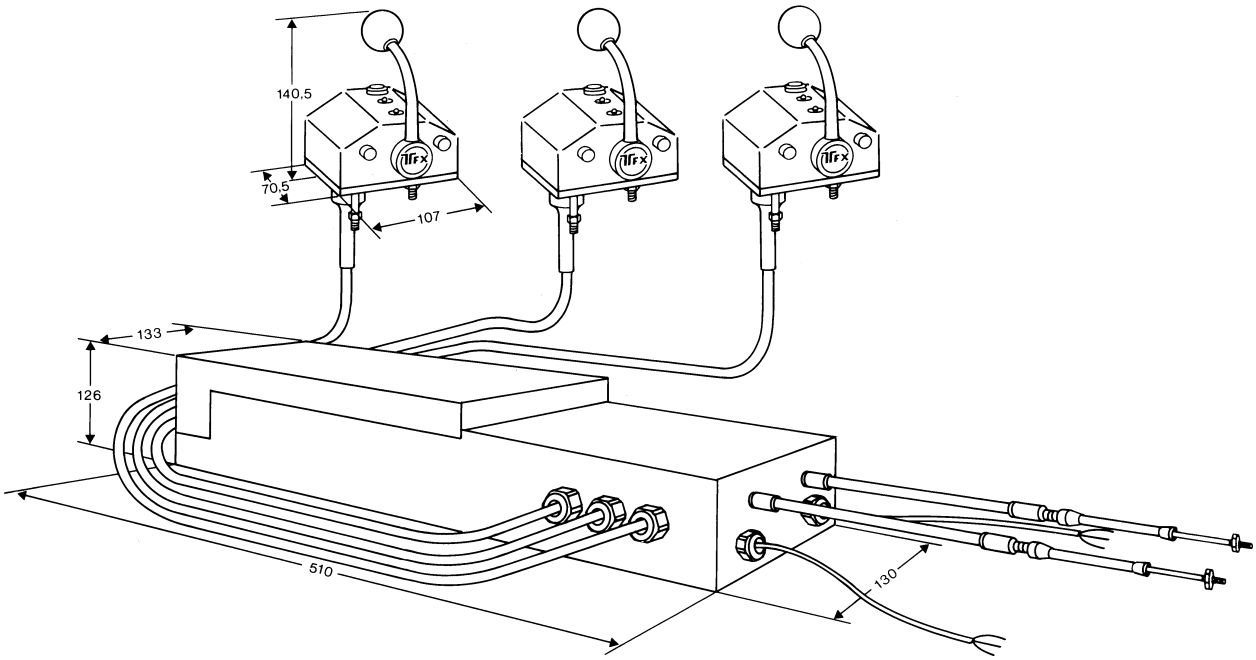
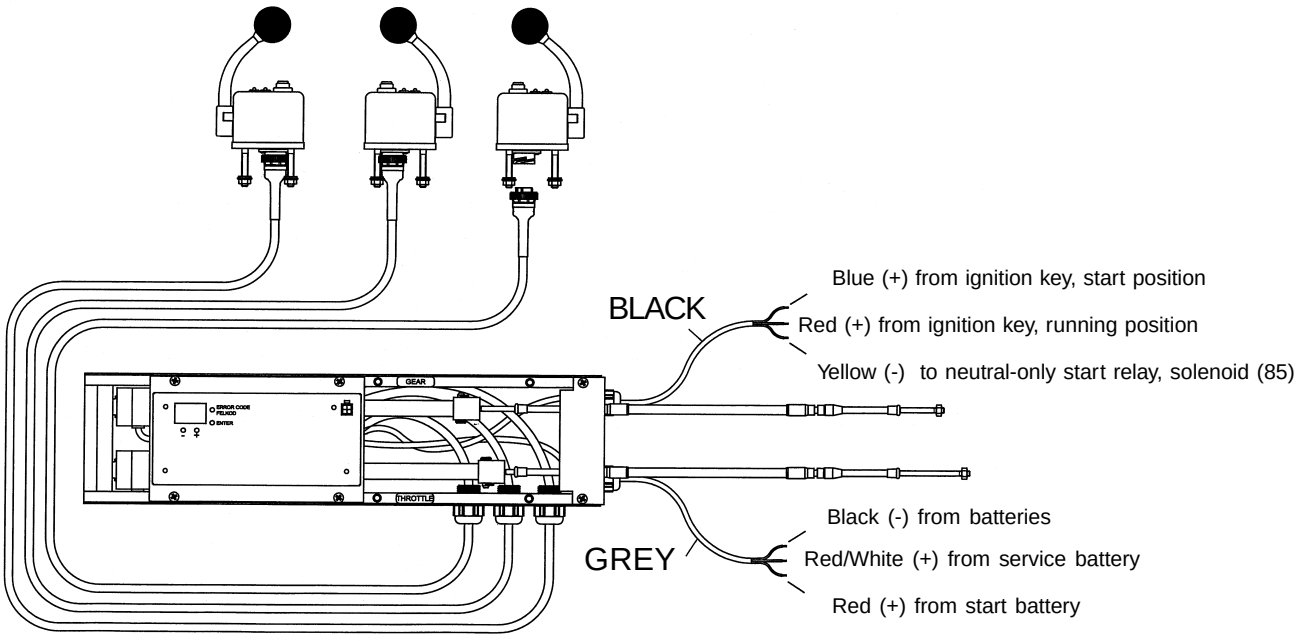


FIG. 2 DRIVE UNIT/ELECTRONIC UNIT AND CONTROLS WITH CABLES



OPERATING THE TFX MARINE ELECTRONIC CONTROL SYSTEM

IMPORTANT!

NB! It is incumbent upon the skipper to understand and be able to operate the TFX Marine Electronic Control System as described in this manual.

With several control stations

Always be observant regarding which is the preset alternative changeover control. See System Calibration, page 8, and Functional Testing, page 12.

Start

- Shift all control levers to neutral.
- Turn on the main switches.
- Turn on the ignition. (Start the engine.)
- All controls associated with the active engine should now be flashing green.
- Press the button on the control to be activated. The green LED will light solid.
- Gear and throttle can now be engaged (the green LED will go out after 5 seconds). After returning to neutral, the LED will light solid until the transmission is engaged again.

Throttle without transmission engaged

Press the button, hold it down and move the control lever forward to gear position. After 3 seconds, release the button. Now you can throttle (green LED flashes).

To engage the transmission, the lever must be moved back to neutral (green LED lights solid). The control then returns to normal function.

Programming increased throttle level (High idle)

The engine must be running. Press the button, keep it down and move the lever forward to gear position. After 3 seconds, release the button and increase the idle to the desired level, for instance 800 rpm. Press the button three times and move the lever back to neutral. The idle reverts to the original speed. To return to the 800 rpm idle, press the button three times. The idle then increases and remains at that level even when shifting gears. Too high idle can damage the transmission. After gear shifting and while running the boat, both the red and green LEDs blink simultaneously as a reminder that “high idle” is still set. To cancel the “high idle” function, return to neutral and press the button 3 times. The engine returns to normal idle speed.

To return to the preprogrammed idle speed, press the button tree times.

WARNING!

Changing operating positions at speed

Always pay attention to the current setting function (station changeover) for changing operating position. See System Calibration on page 8 and Function Testing on page 12.

WARNING!

When performing a changeover at speed, the active operating position must not be left unmanned.
Example: station change from the wheel house to the fly-bridge underway. The fly-bridge control lever must be in neutral. Press the button and move the lever forward until the green LED lights. Stop there and release the button while the green light is still lit. The fly-bridge control is now active.

Backup operating voltage

Should the Main voltage, **Main pos.(+)** fail or fall more than 2.0 V below that of the **Backup pos.(+)** while underway, the captain will be notified by the red LED blinking (1 blink). Investigate what is causing the voltage drop. The red LED stops flashing when everything is functioning normally.

If ignition is switched off while underway...

IMPORTANT!

This applies to diesel engines. Should the ignition mistakenly be switched off or should wire no. 4 to the system cut out underway, the green LED begins blinking very rapidly immediately and after 5 minutes the throttle slowly decreases to idle and the transmission shifts to neutral. Move the lever to neutral and press the button. You can now drive on. Also see page 15, Troubleshooting.

WARNING!

If the gear function locks while manoeuvring

If a gear movement locks, there are two ways of knowing: the first is the blinking red LED, one short and one long flash. The second is that the boat does not respond to forward or reverse manoeuvres.
Move the control lever to neutral, press the button once and continue normal operation. If it now functions normally, the red LED stops blinking and the Error Code on the electronic unit display disappears at the same time.

WARNING!

Never turn off the main switches while the engine is running.

THE LEDS	Flash pattern		Action
	Red LED	**Green LED**	
No active operating position selected		1 short flash, 2 sec. pause.	
Active control in neutral position		Solid light	
Control moved to driving position		Green LED goes out after 5 sec.	
Operating position cannot be activated (other position active)		5 rapid flashes. Green LED goes out after 5 sec.	
Throttle without transmission engaged		1 long flash, 2 sec. pause	
System failure	Rapid flash, 1 Hz		Switch off all power (10 sec) and then switch it on again (page 15).
Control calibration or system calibration is in progress	3 short flashes, pause for 2 sec.		
Error indication	2 short flashes, pause for 2 sec.		Move the lever to neutral, press the button once (page 15). Read Error Codes on the display (page 13).
Jammed gear actuator while underway	1 short+1 long flash, pause for 1.7 sec.		Move the lever to neutral, press the button once (page 15).
Driving on Backup pos.(+)	1 short flash, pause for 2 sec.		Investigate and remedy error manifestation.
Ignition switched off or ignition circuit, wire no. 4, is broken while underway		Very rapid flash, 3 Hz	See instructions on page 15.
Driving with “high idle”	1 long flash, pause for 2 sec. (red and green flash together)	1 long flash, pause for 2 sec. (red and green flash together)	

Unless otherwise stated, the flash sequences repeat until the condition is attended to or, if it is a fault, until the Error Code is read on the electronic unit display, the fault is remedied and the Error Code memory is emptied.

NB! Driving the boat on Backup pos.(+) batteries (indicated by a red flash) is **not** considered a fault but permitted. An Error Code does therefore not appear on the display in such a case. For driving on Backup pos.(+) batteries, see “Backup operating voltage”.

Programmed “high idle” = red and green LEDs flash simultaneously. They blink only when the transmission is engaged. In neutral, the light is solid green.

Button function

All buttons in the system operate such that the function in question is activated when the button is released. Furthermore, all buttons have a “reaction time” of 0.2 seconds. The electronic unit will not register a faster button entry.

If a button is pressed for longer than 2 minutes, the electronic unit does not register the information either. See Error Codes, page 14.

NB! The aforementioned does not apply to the Error Code and Enter buttons on the electronic unit. They receive their value in the program. Otherwise, it would be impossible to read Error Codes.

SYSTEM CALIBRATION

System calibration must be carried out after installation and during the annual function test. Calibration means programming all data for the system's various settings into the electronic unit's memory.

WARNING!

Never calibrate while the engine is running.

Two separate calibrations must be performed: system calibration and control calibration.

System calibration

Use the buttons and display on the electronic unit to perform system calibration. Detach the drive unit cover.

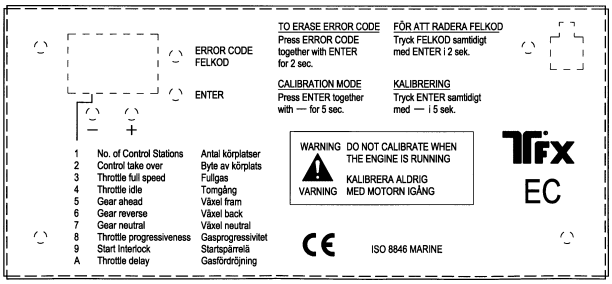


FIG. 6

The first figure on the display indicates which function is being set. See the figure above. The second states the current setting of the function in question.

Find out whether the engine's throttle is pulling or pushing and which is forward and reverse on the reverse gear before starting the calibration.

An optional 4 m extension cord can be ordered to facilitate system calibration. With the extension, the electronic unit can be detached from the drive unit and then employed as a "Remote control" when setting throttle and gear functions.

When setting the stroke length of the mechanical cables to match the movements of the throttle and gear arm, it can be adjusted using the (+) and (-) buttons on the electronic unit. (-) = actuator in, (+) = actuator out.

NB! When adjusting the actuators, take care so as not to set them too tightly against their respective mechanical stops. Should the actuators begin to make noise when set, they are too tight and will need to be "backed off" (within 10 seconds); otherwise, the actuator will jam. Should the actuators jam anyway, follow instructions on page 15.

Starting system calibration

a. Switch off all voltage to the system and ignition and wait 10 seconds.

b. Switch on the **Main pos. (+)** and ignition but not the **backup pos.(+)**.

c. Enter the program by holding down the Enter button and the (-) button at the same time for 5 seconds. Release, and the display lights up.

1. Setting the number of controls

The display now shows 1.1, which means that one control can be connected. To select two controls, press the (+) button once so that 1.2 appears on the display. For three controls, press the (+) button again so that 1.3 appears.

2. Setting "station changeover" options

Press Enter and 2.0 appears, which means that changeover is only possible in neutral. Press (+) so that 2.1 appears on the display = changeover underway is now programmed.

3. Setting full throttle position

Press Enter. A value between 3.3 and 3.7 will appear on the display.

3.3 = actuator fully retracted.
3.7 = actuator fully extended. Adjust the actuator position using the (+) and (-) buttons.

4. Setting idle position

Press Enter. A value between 4.3 and 4.7 will appear on the display.

4.3 = actuator fully retracted.
4.7 = actuator full extended. Adjust using the (+) and (-) buttons.

5. Setting forward gear position

Press Enter. A value between 5.3 and 5.7 will appear on the display.

5.3 = actuator fully retracted.
5.7 = actuator fully extended. Adjust using the (+) and (-) buttons.

6. Setting reverse gear position

Press Enter. A value between 6.3 and 6.7 will appear on the display.

6.3 = actuator fully retracted.
6.7 = actuator fully extended. Adjust using the (+) and (-) buttons.

7. Setting neutral gear position

Press Enter. A value between 7.3 and 7.7 will appear on the display.

7.3 = actuator fully retracted.
7.7= actuator fully extended. Adjust using the (+) and (-) buttons.

8. Setting throttle progression (5 different curves)

Press Enter. 8.0, 8.1, 8.2, 8.3 or 8.4 will appear on the display. Each figure combination indicates a specific throttle curve. **See diagram page 9**. Select throttle curve using the (+) and (-) buttons. Normal standard curve = 8.1.

9. Setting starting lock function

Press Enter. 9.0 or 9.1 will appear on the display. Using the (+) and (-) buttons, select 9.0 if no starting lock relay is fitted or 9.1 if a starting lock relay has been installed.

A. Setting gear-shifting throttle delay

Press Enter. (The display will show a figure between A.0 - A.9.) A.0 means no throttle delay.
By increasing the value, you can prolong the throttle delay by up to 5 seconds. See the table below.

Table, throttle delay when shifting gear

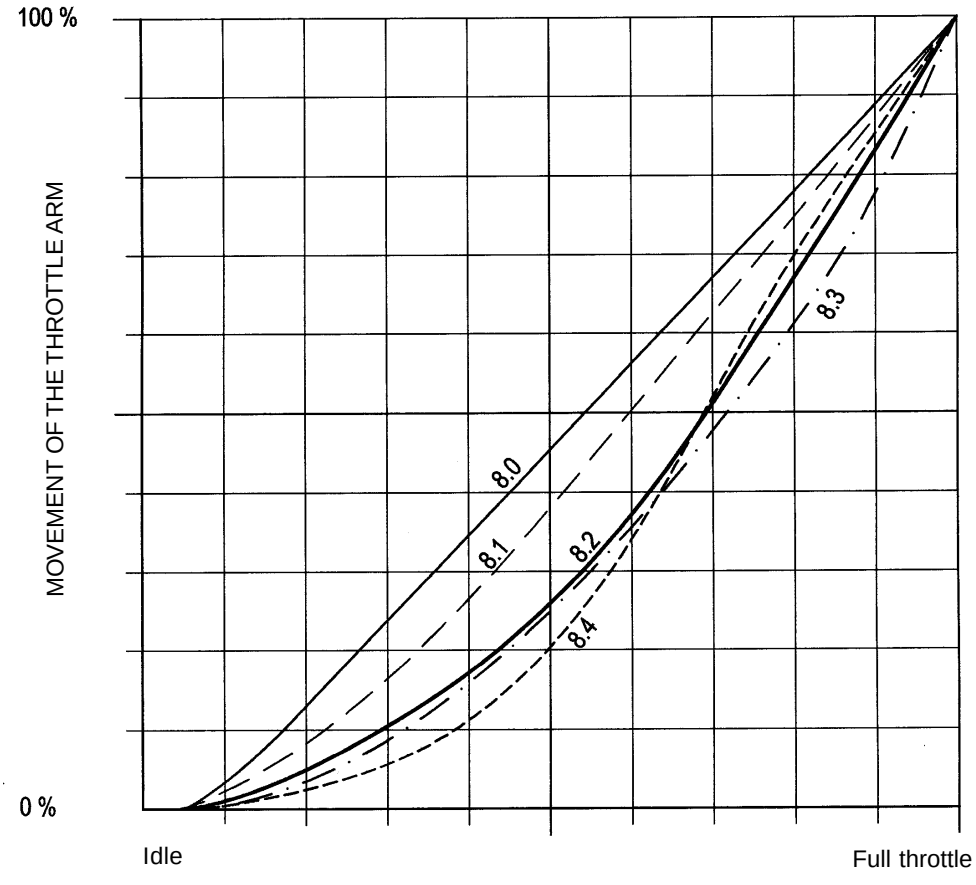
10. System calibration complete

Press Enter. The display shows no figures. Calibration is complete and all settings are stored. Now press Error Code. If the “00” appears on the display, everything is OK. Should any numbers appear, these are Error Codes. Press Error Code repeatedly until all figures have appeared. Make note of the figures and remedy as instructed in the Error Code tables at the back of the manual. Once any problems have been remedied, press Error Code and Enter at the same time for 2-3 seconds to empty the Error Code memory; otherwise, you cannot start the system. When you have pressed Error Code, “00” appears on the display when the system is functioning properly. The “00” disappears automatically after approx. 2 minutes.

Table, gear-shifting throttle delay

The display shows	A.0	A.1	A.2	A.3	A.4	A.5	A.6	A.7	A.8	A.9
Delay (seconds)	0.0	0.5	1.0	1.3	1.6	1.9	2.2	2.7	3.5	5.0

Throttle progression curves



CONTROL CALIBRATION

To calibrate the controls, you must shut off the main switches on both battery groups. The ignition key must be in the off position and the control levers in neutral.

Starting control calibration

1 Turn on the main switch **(Main pos.(+))** but not the Backup pos.(+).

2 Press and hold the button on the control panel and turn on the ignition key. The green LED on the control blinks. After 3 seconds, release the button and the red LED will now blink three times and the green LED will light solid. Wait for the green LED to go out then move on to point **3** below**.**

NB! The red LED flashes throughout the entire calibration process.

Setting forward gear

3 Move the lever to forward gear position, 0% throttle, and press the button. The green LED will light up. Wait until it goes out.

Setting full throttle forward

4 Move the lever to the desired position for forward, full throttle. This need not be all the way to the mechanical stop. Press the button; the green LED will light. Wait until it goes out.

Setting reverse gear position

5 Move the lever back to the reverse position, 0% throttle, and press the button. The green LED will light. Wait until it goes out.

Setting full throttle reverse

6 Move the lever to the required position for reverse, full throttle. This need not be all the way to the mechanical stop. Press the button, the green LED will light up, wait until it goes out.

Setting neutral position

7 Move the lever to neutral and press the button; the green LED will light solid and the red LED will stop triple blinking.

Calibration check

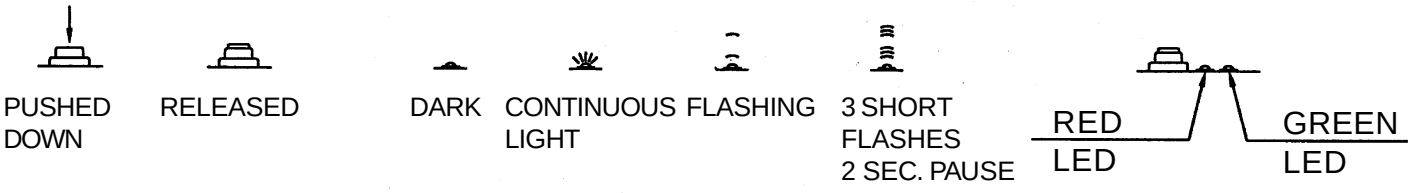
8 Press Error Code and Enter at the same time for 3 seconds to empty the Error Code memory.

9 Press Error Code. If “00” appears on the display, calibration was successful and the equipment can be used as normal.

NB! Apply the same procedure to each control unit.

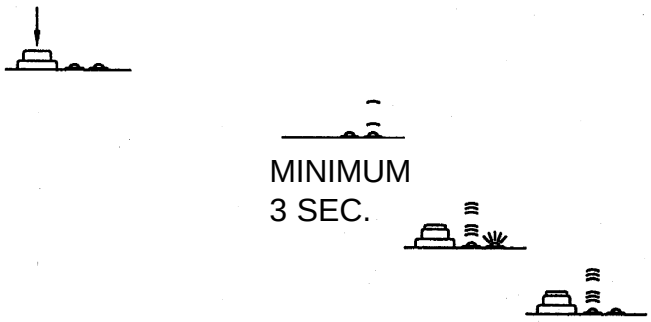
CONTROL CALIBRATION

BUTTON LED

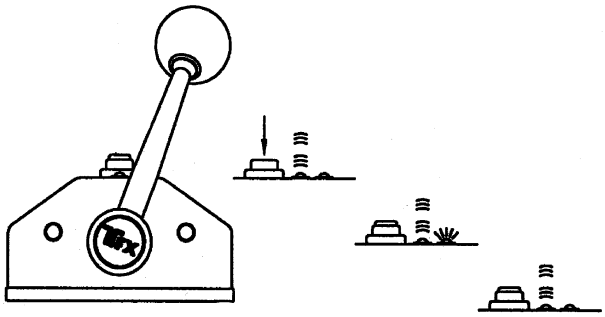


1. SWITCH ON MAIN SWITCH (MAIN POS.+)

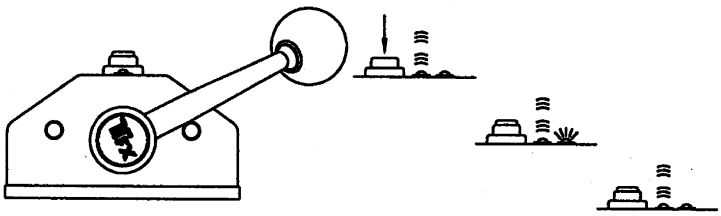
2. IGNITION KEY IN DRIVING POSITION



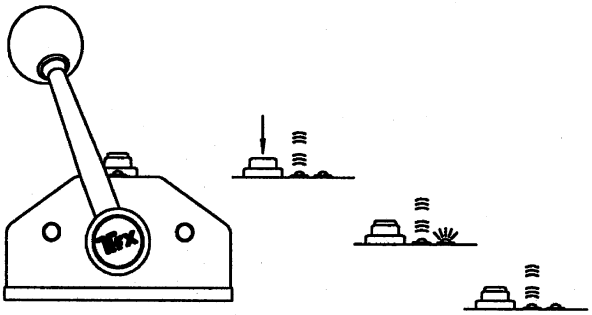
3. FORWARD, 0% THROTTLE



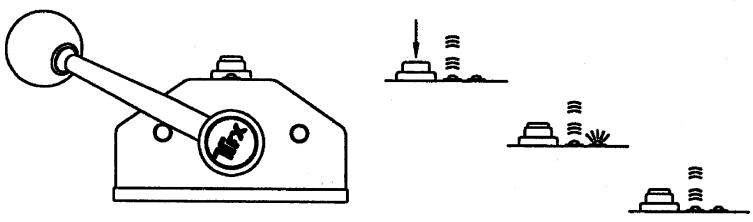
4. FORWARD, 100% THROTTLE



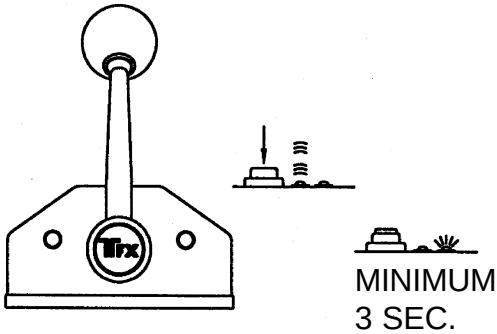
5. REVERSE, 0% THROTTLE



6. REVERSE, 100% THROTTLE



7. NEUTRAL



FUNCTION TESTING

When installation and calibration are complete, it's time to test the system while the engine is running.

Ensure that all control levers are in neutral. Switch on the Main pos.(+) and the Backup pos.(+). Start the engine. LEDs on all controls should now be flashing green. Push the button on the control to be activated. The green LED will light solid.

You now control the transmission and throttle. The green LED will go out approx. 5 seconds after the transmission is engaged. If you revert to neutral, the green LED will light solid as long as the control lever is in neutral.

Testing throttle without transmission engaged

Push the button and hold it down. Move the lever forward and release the button after 3 seconds. Now the engine can be throttled without the transmission engaged. (The green LED is flashing.) To engage the transmission again, return the control lever to neutral, whereafter the control returns to normal function.

Testing gear start block

Switch off the engine. Switch on the ignition. Activate the control. Move the lever to forward gear. Try to start the engine. This should not be possible, as the lever is in gear position and the safety relay has cut the voltage to the solenoid.

Testing operating station change underway (changeover underway) if it is programmed

Example: the boat is running at half speed and you want to move to a new operating station. With the lever in neutral at the new station, push the button and hold it down. Move the control lever slowly forward until the green LED lights. Stop there and release the button. This station is now operative.

Testing operating station change in neutral only

Put the lever in neutral on both controls. Press the button for the control you wish to change to. This station is now operative.

Setting throttle progression

There are 5 different throttle curves that can be selected on the electronic unit (see diagram on page 9), depending on boat or engine type or driver preferences. 8.0 is a direct and linear throttle movement; 8.1, 8.2, etc. have different characteristics. To obtain the best curve, test drive the boat to get the right feeling. The recommended curve is 8.1. Open the program by pressing Enter and (-) at the same time for 5 seconds. Then press Enter repeatedly until 8.0 appears on the display. Change the second figure by pressing (+) or (-) buttons until the correct curve and figures are selected. Press Enter **three times**. The setting is now stored.

Setting gear-shifting throttle delay

In principle, the control lever shifts from neutral immediately, without delay. If the reverse gear is slower, e.g. approx. 3 seconds from when the gear arm has reached its end position, A.7 is the correct value. A.7 means a 2.7-second delay before the throttle exceeds idle. This is standard practice on larger commercial ships where more than one captain is in command.

Should you want a throttle delay because the reverse gear transmission is slow, to thus prevent damage to the reverse gear, program the function as follows: open the program by pressing Enter and (-) at the same time for 5 seconds. Thereafter, press Enter until A.0 appears on the display. Adjust the second figure by pressing the (+) or (-) buttons until the correct figure and time are obtained. See the table on page 9. Press Enter **once**. The setting is now stored.

Error Code	Explanation
9	System error, or reset (e.g. due to low voltage when starting the engine = System error). Must be reset by switching off the entire system and restarting. This Error Code is displayed without pressing the Error Code button.
10	Red LED out, control no. 1 (breakdown/broken circuit). Cable harness failure. LED failure.
11	Green LED out, control no. 1 (breakdown/broken circuit). Cable harness failure. LED failure.
12	Potentiometer failure, no. 1 (<3% >97% of potentiometer's voltage feed). Cable harness failure.
13	Push button failure, control no. 1 (pressed down for > approx. 2 minutes). Cable harness failure.
14	Lever, control no. 1, not calibrated.
20	Red LED out, control no. 2 (breakdown/broken circuit). Cable harness failure. LED failure.
21	Green LED out, control no. 2 (breakdown/broken circuit). Cable harness failure. LED failure.
22	Potentiometer failure, no. 2 (< 3% >97% of potentiometer's voltage feed). Cable harness failure.
23	Push button failure, control no. 2 (pressed down for > approx. 2 minutes). Cable harness failure.
24	Lever, control no. 2, not calibrated.
30	Red LED out, control no. 3 (breakdown/broken circuit). Cable harness failure. LED failure.
31	Green LED out, control no. 3 (breakdown/broken circuit). Cable harness failure. LED failure.
32	Potentiometer failure, no. 3 (<3%, >97% of potentiometer's voltage feed). Cable harness failure.
33	Push button failure, control no. 3 (pressed down for > approx. 2 minutes). Cable harness failure.
34	Lever, control no. 3, not calibrated.
40	Throttle actuator motor, between the actuator and the electronic unit. Cable harness breakdown.
41	Throttle actuator motor, short circuit (cable harness short circuit).
42	Throttle actuator - not positioning. Jammed or mechanical failure, broken/short circuit. See page 15.
43	Throttle actuator - potentiometer signal outside max./min. limit. (Potentiometer broken/cable broken.)
44	Throttle actuator - distance too short between 0% throttle and 100% throttle when calibrating actuator positions (<10% of potentiometer's voltage feed).
50	Gear actuator motor, between the actuator and the electronic unit. Cable harness breakdown.
51	Gear actuator motor, short circuit (cable harness short circuit).
52	Gear actuator is not positioning. Jammed or mechanical failure, broken/short circuit. See page 15.
53	Gear actuator, potentiometer signal outside max./min. limit. (Potentiometer broken/cable broken.)
54	Gear actuator, distance too short between Reverse and Neutral, when calibrating the actuator positions (<10% of potentiometer's voltage feed).
55	Gear actuator, distance too short between Forward and Neutral, when calibrating the actuator positions (<10% of potentiometer's voltage feed).
56	Gear actuator, distance too short between Reverse and Forward when calibrating the actuator positions (<20% of potentiometer's voltage feed).
60	Too short distance between 0% throttle (neutral position) and 0% throttle (forward gear engaged) when calibrating the control lever (<2% of potentiometer's voltage feed).

Error Code	Description
61	Too short distance between 0% throttle (forward gear engaged) and 100% throttle (forward gear engaged) when calibrating the control lever (<10% of potentiometer's voltage feed).
62	Too short distance between 0% throttle (neutral position) and 0% throttle (reverse gear engaged) when calibrating the control lever (<2% of potentiometer's voltage feed).
63	Too short distance between 0% throttle (reverse gear engaged) and 100% throttle (reverse gear engaged) when calibrating the control lever (<10% of potentiometer's voltage feed).
64	Control incorrectly calibrated. Re-calibrate.
70	Yellow wire No. 6 to start relay coil, incorrectly connected, short circuit. (See pages 21 and 22.)
71	Starting lock relay, break in wire no. 6 or 7 to the coil. The wire no. 7 is not connected to continuous pos (+). (See pages 21 and 22.)
80	Enter button failure, as it has been pressed for too long (> approx. 2 minutes). (Breakdown).
81	The (+) button has been pressed for too long (> approx. 2 minutes). (Breakdown).
82	The (-) button has been pressed for too long (> approx. 2 minutes). (Breakdown).
83	The Error Code button has been pressed for too long (> approx. 2 minutes).
90	5 volt supply from electronic unit to control no.1 is outside permitted range (low voltage). Faulty cable harness.
91	5 volt supply from electronic unit to control no.2 and 3 is outside permitted range (low voltage). Faulty cable harness.
92	5 volt supply from electronic unit to throttle/gear actuators is outside permitted range (low voltage). Faulty cable harness.
93	Voltage supply to the electronic unit too low. (External fault.) < 6 V.
94	Intermediate voltage outside permitted range (low voltage). Internal fault in the electronic unit.
95	System calibration is not executed. Correct system calibration must be carried out before this "Error Code" can be erased.
96	Internal fault in the memory (in the electronic unit).

TROUBLESHOOTING

Error indication

If the red LED blinks with two short flashes and a 2-second pause, this means there is a system error. If this should occur, always first try moving the lever to neutral, pressing the button once and attempting to drive on. If this does not work, you must read the error display. Press Error Code on the electronic unit repeatedly until all the Error Codes have appeared on the display. Note the numbers and find out what the codes mean in the tables on pages 13 and 14.

NB! After attending to a fault, always empty and reset the Error Code memory. To do this, press Error Code once and then Error Code and Enter at the same time for 3 seconds. Press Error Code once more. If the display shows “00”, the system is functioning correctly.

System failure

Rapid red flashing = system failure. Switch off all voltage to the system, wait 10 seconds, switch on all voltage again. In this case, no. 9 has been on the display. The figure is erased by switching off and on the voltage. Everything should now be functioning normally again.

Ignition key switched off or break in ignition circuit, wire no. 4, while underway

A rapidly flashing green light will appear on the control panel and after 5 min the throttle will gradually drop to idling and neutral will be engaged. To continue driving, shift the lever to neutral, press the button once and drive on. The rapid green blinking continues while underway until such time as you turn on the ignition switch or repair the break in wire no. 4.

NB! If you do not press the button within 2 minutes of when the throttle falls off, the system shuts off. In that case, you must shut off the main switches to the system, wait 10 seconds, and start up again.

Jammed actuators during calibration

If the actuators become jammed, they may have been adjusted too tightly against the various stops on the throttle and/or gear arms during system setup and calibration.

NB! For functions 3-4-5-6 and 7 on the display, the second figure after the point **may not be lower than .3 or greater than .7**. This is because the maximum stroke length of the mechanical control cable is 76 mm (3 inches).

Proceed as follows:

1. Press the Enter and (-) buttons on the display at the same time for 5 seconds to open the program.
2. Which actuator is jammed? Is it the throttle actuator? Is it stuck on full throttle or idle? Example: The actuator is stuck on full throttle.
3. Press Enter until function no. 3, which controls full throttle, appears on the display. Adjust the second figure after the point on the display using the (+) or (-) buttons, depending on where the actuator is jammed.
4. Go through the entire program quickly by pressing Enter until the display does not show any figures.
5. Press Error Code and read the code that applies to the jam.
6. Press Error Code and Enter at the same time for 3 seconds. **The actuator should now be released**.
7. To obtain the correct position for the actuator, perform a new calibration of the throttle actuator settings only. No need to re-do all the others.
8. Open the program by pressing Enter and (-) at the same time for 5 seconds.
9. Press Enter twice to reach **function 3**. Adjust the second figure after the point on the display using (-) or (+) the buttons so that the throttle actuator moves to the appropriate position. Adjust the throttle actuator carefully to avoid getting it too tight again. The actuator is now adjusted and ready to use.
10. Press Enter quickly through the entire program until no figures appear on the display.
11. Press Error Code and Enter at the same time for 3 seconds to empty the Error Code memory.
12. Press Error Code once more. The display should now show **“00” which means that everything is functioning correctly.**

Jammed actuators while underway

Should the actuators become jammed while underway, due to too high momentary forces on the reverse gear, the red LED on the control will blink with one short and one long flash.

Move the control lever immediately to neutral and press the button once. The actuator should now move to neutral position and the red LED stop flashing. Now the control functions normally again and the Error Code memory is simultaneously emptied.

(Try to find out why gear shifting was sluggish, and adjust and rectify the fault to prevent its recurrence.)

MAINTENANCE OF THE TFX MARINE ELECTRONIC CONTROL SYSTEM

Check the mechanical cables and their fittings. See page 18.

Check all electrical connections and lubricate all contactors with a very thin layer of terminal grease, Volvo Penta part no. 1161417-9.

Check the actuators by forcing out the moving part as far as possible. Clean and apply a very thin layer of water-resistant grease.

Check that the circuit breakers are in good condition.

Check that the batteries' acid weight and voltage are satisfactory and that the cables to the drive unit are not damaged or otherwise in poor condition.

The maintenance work described above must be carried out once every season or at least once a year.

System calibration is performed once a year, see page 8.

Protect the controls against sun and water when the boat is not in use.

INSTALLATION

WARNING!

Before starting installation, make sure the movement of the reverse gear is smooth and distinct and that the force required for shifting is not abnormally high for the current engine/ transmission combination during the operating and driving cycles that may occur. The need for abnormally high force may be due to worn or poorly adjusted transmission. Renew, repair or adjust the transmission as necessary.
Repeat the transmission function check at each annual maintenance inspection of the control system as well as whenever binding shifting movement is suspected and repair as necessary.

Wiring diagrams for single and twin engine installations can be found on pages 21 and 22.

IMPORTANT!

Read the manual thoroughly and install the equipment according to the instructions. Departing from the instructions can invalidate the warranty. Installation must be carried out by an authorised TFX Marine workshop.

IMPORTANT!

All electrical cables connected to the system must be disconnected when welding.

MECHANICAL INSTALLATION

Controls

The control apparatus must be positioned at least 50 cm from the magnetic compass to avoid interference. Position the controls for comfortable and secure operation of the lever and buttons. See the drilling template (page 23). The controls can be mounted with the lever on either port or starboard. Single control for one engine, and double control for twin engines.

WARNING!

It must be possible to kill the engine at each control unit, either by way of a key switch, kill button or stop cable.

IMPORTANT!

Drive and electronic unit

It is important to position the drive unit in a suitable location such that the mechanical cables are not too long (maximum about 3 m) and that the unit is easily accessible for reading the display and pressing the buttons when calibrating the system. It is equally important with regard to service access.

Do not install the drive unit in the underside of the deck in the motor compartment and especially not directly above the boat's motor and exhaust system where it would be very warm. Dimension drawings for installing the drive unit are provided on pages 5 and 23.

Ensure that the vessel operator is clearly aware of where and how the drive unit is installed.

IMPORTANT!

The fewer bends in the mechanical cables, the less resistance in the system. Minimum radius = 200 mm. Always match the cable length individually for each installation to the throttle and gears. Also make use of the adjustment possibilities afforded by the reversing gear and other equipment to ensure that the cable runs the shortest, most efficient route.

Position the drive unit to ensure the following:

- ambient temperature does not exceed 70° C.
- water cannot enter the unit because it is positioned too close to a hatch/floor opening, air intake or bilge (minimum distance 50 cm).
- the unit is not exposed unnecessarily to strong vibrations.

Protect the drive unit/electronic unit from direct or indirect contact with water, e.g. when cleaning or flushing the engine compartment.

Fitting the mechanical cables

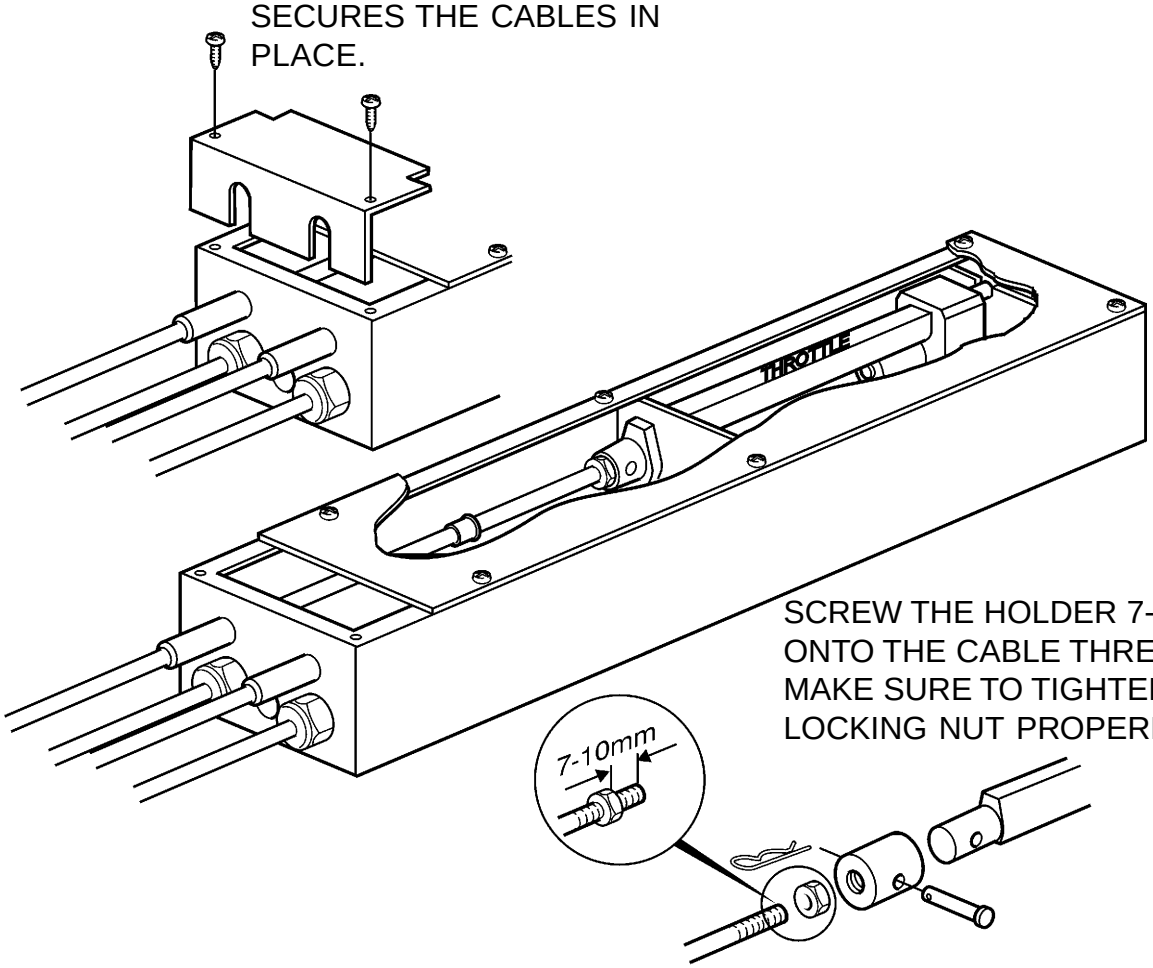
Connect the mechanical cables as per fig. 3 on page 18. The throttle actuator is marked THROTTLE and the gear actuator is marked GEAR. Make sure to screw the cable's threaded end 7-10 mm into the holder on the actuator and to tighten the locking nut properly. The cables are secured when the front plate is installed as illustrated.

The cable to the engine throttle arm must be secured with locking nuts on both sides. See fig. 3, page 18.

FIG. 3

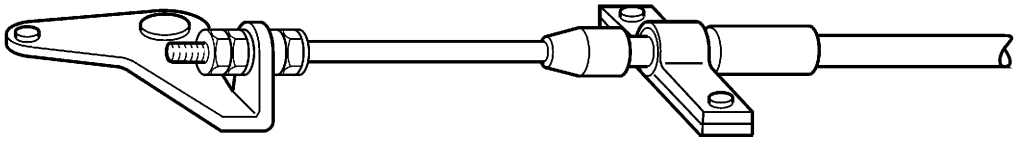
FITTING THE MECHANICAL CABLES

FASTENING THE FRONT PLATE SECURES THE CABLES IN PLACE.



SCREW THE HOLDER 7-10 MM ONTO THE CABLE THREAD. MAKE SURE TO TIGHTEN THE LOCKING NUT PROPERLY.

SECURE THE THROTTLE CABLE WITH LOCKING NUTS ON BOTH SIDES.



ELECTRICAL INSTALLATION

WARNING!

Carefully follow the wiring diagram for single and twin engine installation on pages 21 and 22, respectively.

Installation in sailboats or other special installations require different wiring depending on boat specifications. Get in touch with an authorised TFX Marine workshop.

The system must be installed as per the instructions. Deviations from the instructions may invalidate the warranty. Installation must be carried out by an authorised TFX Marine workshop.

Ensure all cables are properly clamped.

Batteries and switches

The TFX Marine Electronic Control System can be connected to 12 V or 24 V DC batteries.

The TFX Marine Electronic Control System must always be connected to two independent battery groups, such as start and service batteries.

Do not use any nonproprietary connectors, i.e. voltage regulators, or similar equipment when installing the system.

The battery groups must have a common neg. (-) connection but need not be of the same voltage: e.g. start batteries can be 24 V and service batteries 12 V. But prerequisite for using 12 V and 24 V at the same time is that Main pos. (+) and the ignition are always connected to the battery group that has the highest voltage during normal boat operation.

The boat's start batteries must be the main group, Main pos (+), which operates the electronic unit, provided they have higher voltage while running than the service batteries, which function as a backup should power from the start batteries diminish or fail.

Battery cable and manual reset circuit breaker

The grey three-lead cable (red, red/white and black wires) should be connected between the electronic unit and respective battery group.

There must be a main switch and circuit breaker between the electronic unit and the respective battery group.

TFX Marine circuit breakers are vibration-proof and designed for marine applications.

Install the circuit breakers where they are easily accessible.

The feed cable must be connected directly to its respective main switch in the boat's battery system and a circuit breaker installed between the main switch and the VPEC system.

If the feed cables must be longer, the cables must be thicker than that supplied.

The red wire no.1 Main pos. (+) is the main voltage supply to the system and must always be connected to the battery group with the highest operating voltage.

IMPORTANT!

The red/white wire no. 2 is the Backup pos. (+) of the system, which automatically takes over should the Main battery voltage diminish or fail.

The red wire no.1, Main pos.(+), and the red/white wire no.2, Backup pos.(+), wires may not be connected to the same battery group.

The black wire no. 3 (neg.-) connects to the battery neg.(-).

Neg.(-) must be common from both battery groups.

Cable to ignition key

The black three-lead cable (with red, blue and yellow wires) connects to the ignition key. (Yellow wire to relay; see terminal diagram, pages 21 and 22).

Red wire no. 4 connects to the ignition key's output pos. (+) in running position, which then supplies operating voltage to the electronic unit.

Blue wire no. 5 connects to the ignition key's output pos. (+) in starting position to supply operating voltage to the electronic unit while starting the boat engine. This works as compensation for the red wire which, at the starting moment, can be dead, depending on what type of ignition key and/or engine is fitted.

These two wires, red and blue, must always run individually and may *not* be attached to the same connection. The blue wire may never supply voltage while the boat is running.

Red and blue wires must always be connected to the same battery group to which the battery system **Main pos. (+)** is connected, usually the engine's start battery group.

Installation in sailboats or other types of special installation require different wiring depending on individual boat specifications. Get in touch with an authorised TFX Marine workshop.

Neutral-only start relay

A relay connected as per the wiring diagram prevents starting while the engine is in gear.

IMPORTANT!

Should you for any reason not wish to use the start lock function, forfeiting the extra security the system offers, isolate and insulate the yellow wire no. 6 in the black cable.

Yellow wire no. 6 shall be attached to terminal **no. 85** on the relay. When the gear lever is in neutral position, there is neg.(-) voltage in **yellow wire no. 6**, the relay switches on, and the engine can be started.

From the ignition key input pos.(+) (coming from the engine's cable harness), run a new **wire no. 7** to the relay terminal **no. 86**, which always has positive voltage as long as the engine's main switch is on.

Cut **wire no. 8** (in the engine's cable harness), which runs from the engine's ignition key to the engine and controls the start signal to the solenoid, and connect one end to terminal **no. 87** on the relay and the other to **no. 30** on the relay.

Do not use the boat engine relay in this connection.

When the boat has several operating stations with start function, the relay should be connected to the engine's cable harness (after the engine and before the harness branches off to the various stations, e.g. wheelhouse, fly bridge, etc.). In this way, **one** relay ensures that the start lock function works for all operation stations.

There are two types of starting lock relay: one for 12 V, 40 A, which is approved for installation in areas where there may be flammable gases, and one that is not explosion proof, i.e. a 24 V, 20 A relay. **NB! Other relays with built-in diodes and other functions may interfere with or damage the TFX Marine System. Do not use other relays.**

Remaining wires

Wire no. 9 is the pos.(+) lead from the boat engine to the ignition key.

Wire no. 10 is the main lead from the start battery group and the main switch to the start motor.

Wire no. 11 is the neg.(-) cable between the batteries.

Detach the electronic unit (four screws) from the drive unit, and connect the contact cables to the rear of the electronic unit. See fig. 5. Connect the cables as appropriate from wheel house to Control 1, from the fly bridge to Control 2 and from any further operating position to Control 3.

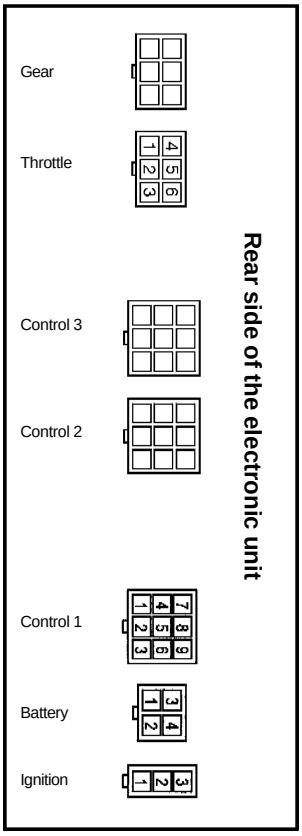
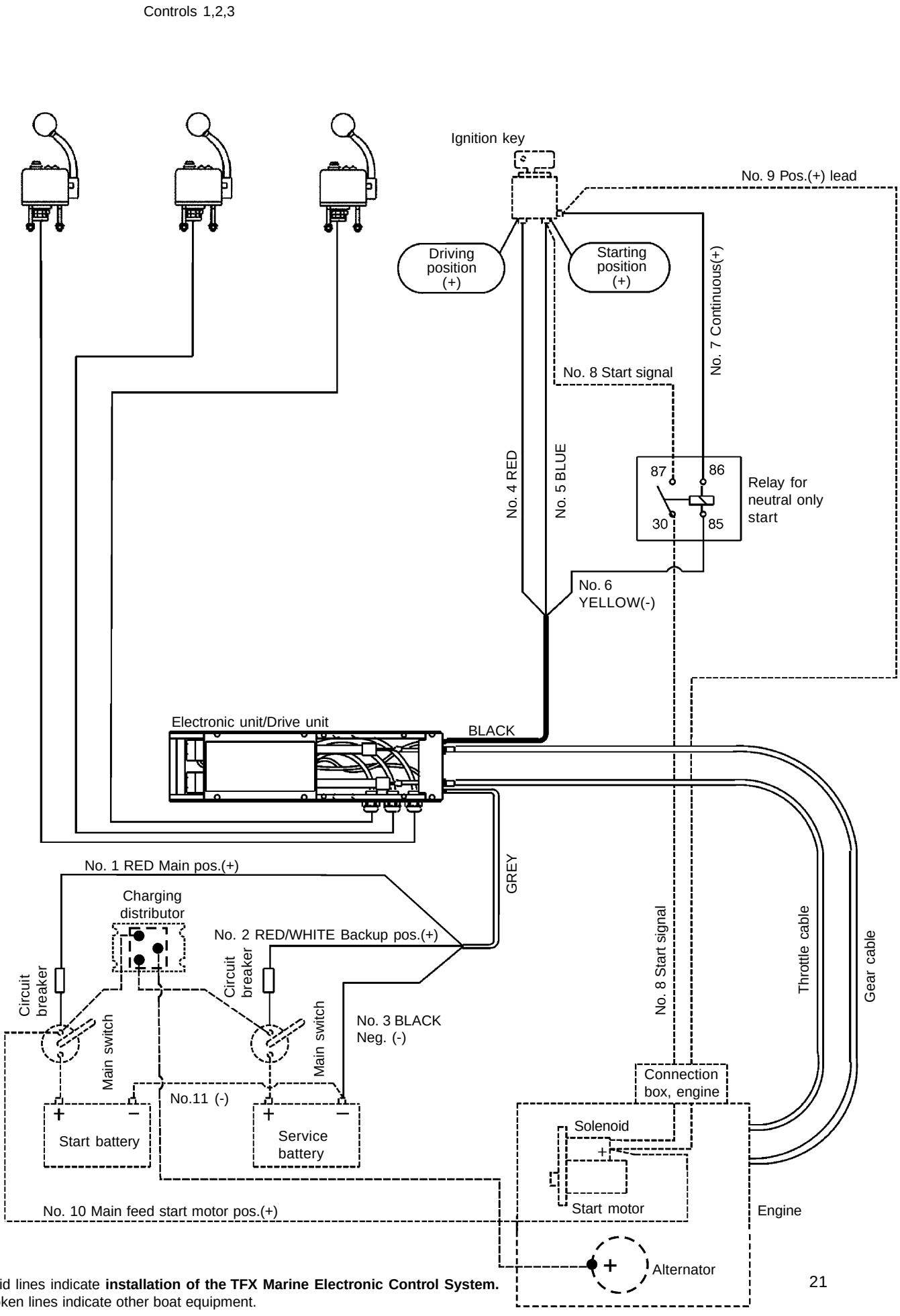


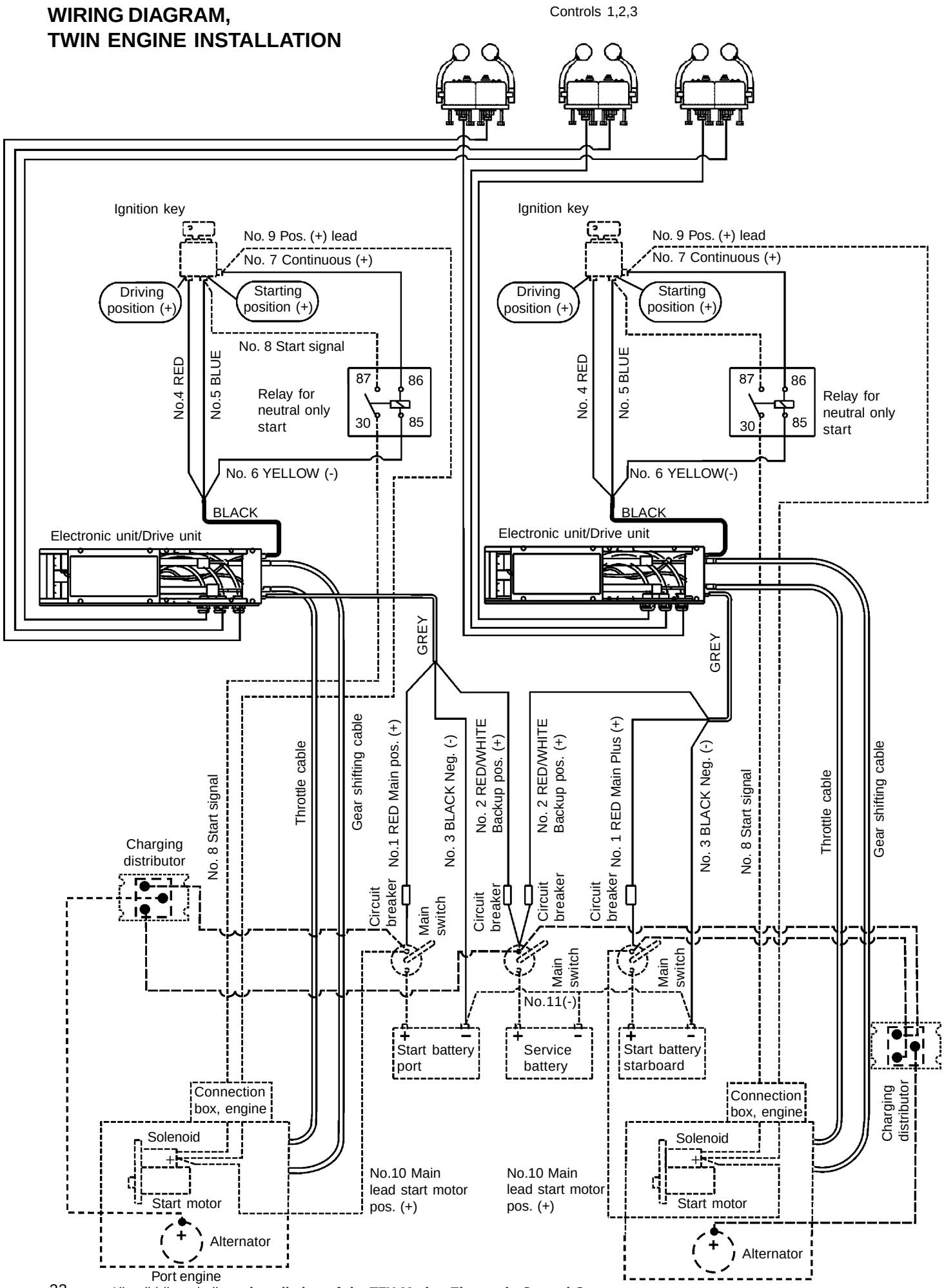
FIG. 5 REAR SIDE OF THE ELECTRONIC UNIT

WIRING DIAGRAM, SINGLE ENGINE INSTALLATION



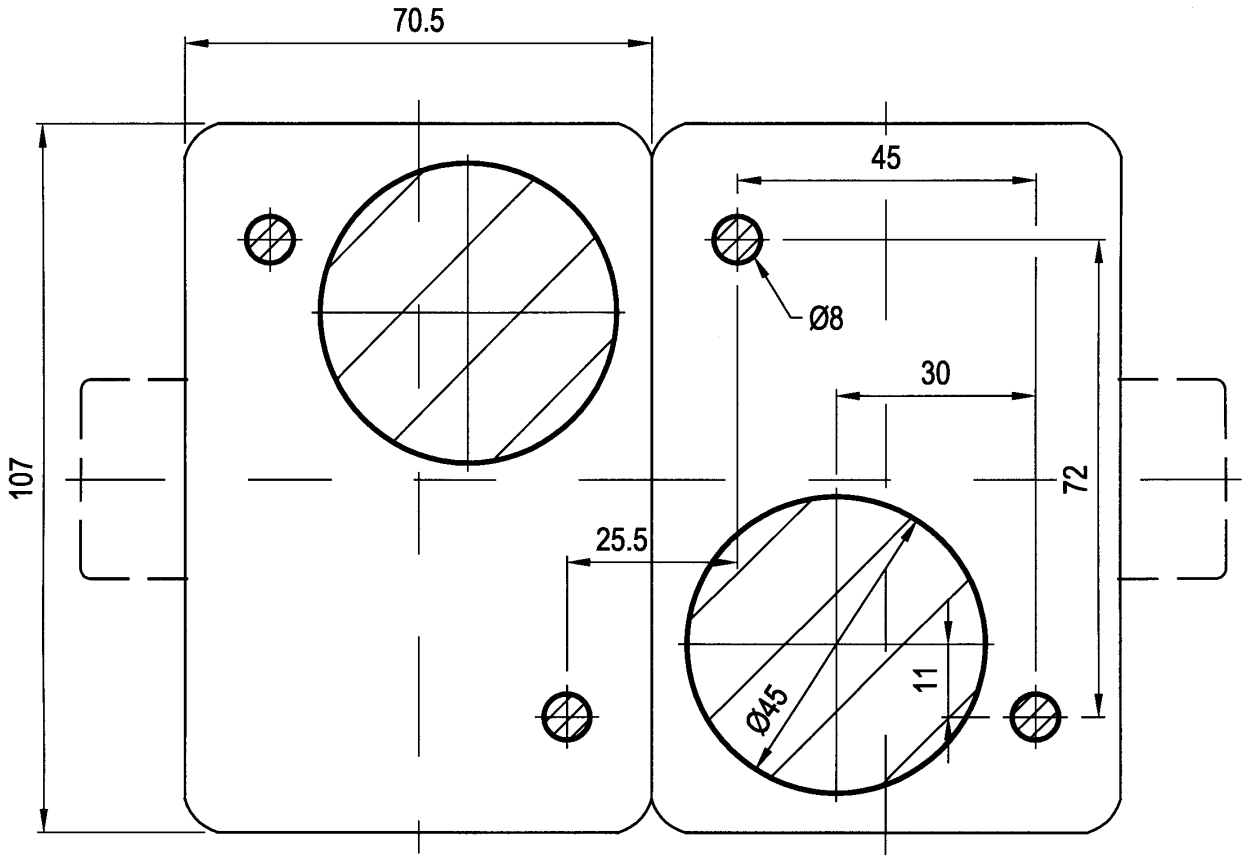
All solid lines indicate **installation of the TFX Marine Electronic Control System.**
All broken lines indicate other boat equipment.

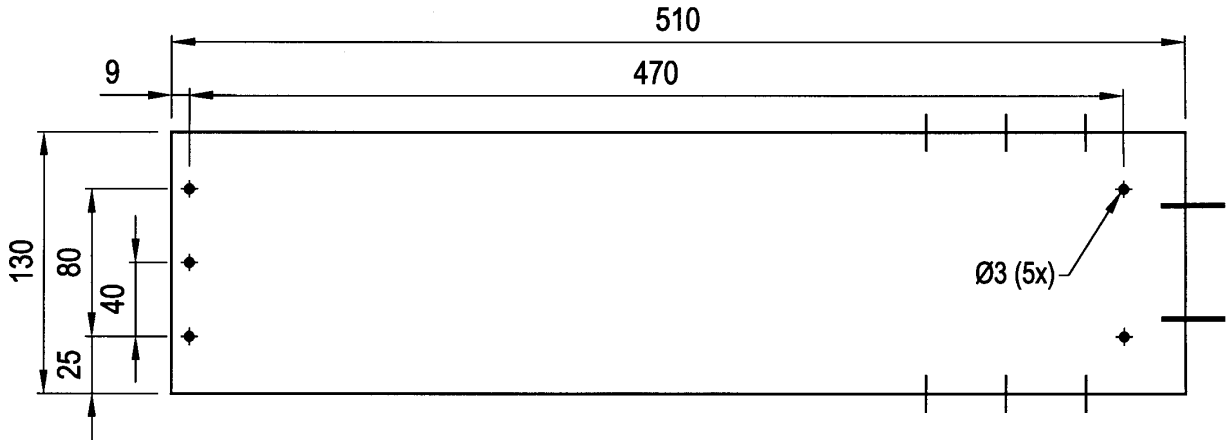
WIRING DIAGRAM, TWIN ENGINE INSTALLATION



All solid lines indicate **installation of the TFX Marine Electronic Control System**.
All broken lines indicate other boat equipment.

Dimension drawing, controls, control panel, drive unit





CE APPROVAL

CE

THE TFX MARINE ELECTRONIC CONTROL SYSTEM COMPLIES WITH REQUIREMENTS IN THE FOLLOWING CE STANDARDS:

ELECTROMAGNETIC COMPATIBILITY DIRECTIVE 89/336EEC

EN 55 022, CLASS A, RADIO INTERFERENCE

EN 61 000-4-3 ELECTROMAGNETIC COMPATIBILITY (EMC), IMMUNITY

EN 61 000-4-2 ELECTROMAGNETIC DISCHARGE IMMUNITY (ESD)

ISO 8846 SMALL CRAFT - ELECTRICAL DEVICES - PROTECTION AGAINST IGNITION OF SURROUNDING FLAMMABLE GASES

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