FST HO FAIL SAFE MEMORY and SB-TRIM CH2 0 Receiver Battery FAIL SAFE

Storage of Fail Safe data; only in PCM mode
(access via Set-Up Menu)

This function is only possible when in PCM mode and with receiver models mc-12, mc-18, mc-20 and DS 20 mc!

FAIL SAFE MEMORY

The higher working reliability of Pulse Code Modulation (PCM) in relation to the simple Pulse Position Modulation (PPM) results from the fact that the microprocessor built in the receiver recognizes, whether a received control signal was falsified or damaged by external interference. In these cases the receiver automatically replaces this disturbed signal by the last correctly received, which was stored in the receiver just in case. In this way brief interference, where the radio signal is weak or the like, is managed which would otherwise lead to the well-known "glitching".

When a longer lasting disturbance to the transmission between transmitters and receivers occurs, the mc-16/20 software offers two different options of FAIL SAFE programming. Using the INC / DEC keys, the "FST" (Fail Safe Time) can be selected:

1. HOLD program (display "HO"):
   In this case the Servos stops, in the case of a transmission disturbance to the receiver, in the position set by the last intact control signal. It remains in that position until a new, recognizable, control signal is detected by the receiver.
2. Variable programmable fail-safe with delay option (display: 0.3, 0.5 or 1.0):
   The servo moves to a pre-programmed set position, until the receiver receives an intact control signal. It is possible to set a delay time from the beginning of the interference to the operation of the fail safe program. This is settable in three steps (0.3s, 0.5s and 1.0s using the INC/DEC keys, taking into account different model speeds.

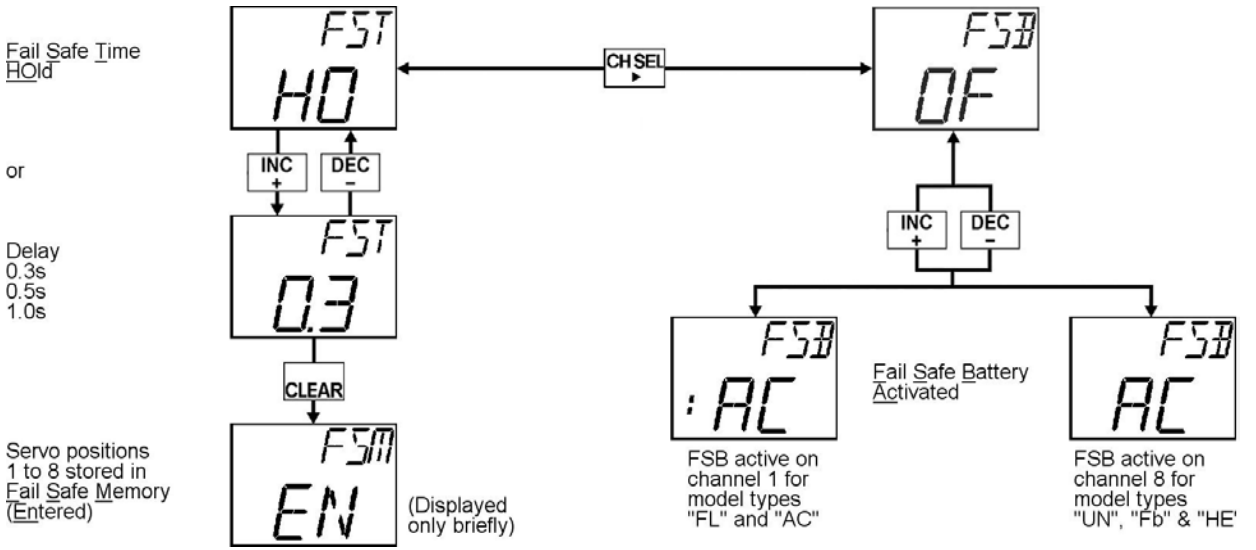
The desired positions of the servos on control functions 1 to 8, during the operation of fail safe, are simultaneously set at the transmitter and then the CLEAR key is pressed. These momentary positions are stored now as the fail safe positions. During operation these values are transferred to the receiver's memory, so that the receiver can fall back to them during interference. Storing is confirmed, in the display, by the brief display of "FSM EN", (Fail Safe Memory Entered). The fail-safe servo positions can be reset at any time, even in flight, by selecting the code and pressing CLEAR to be overwrite the existing settings.

This function is only possible when in PCM mode and with receiver models mc-12, mc-18, mc-20 and DS 20 mc!

Receiver Battery FAIL SAFE

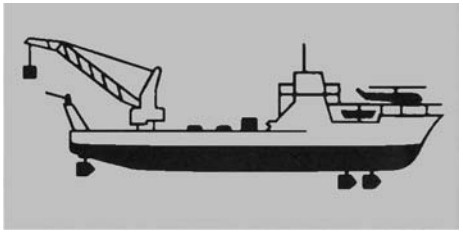
The output channel for the Receiver Battery FAIL SAFE is preset for model types "FL" and "AC" on channel 1 (throttle/spoiler), and for the types "UN", "Fb", "HE" on the channel 8.

As soon as the voltage of the receiver battery falls below a certain value, the associated servo goes to it's central position, to indicate the low battery voltage. By movement of control stick (1 or 8) the FAIL SAFE servo is release, so that servo again operates as desired by the pilot. The model must be landed immediately after the first FAIL SAFE message.



NAUTIC Multi-Prop Modules

Only available in PPM Mode



Optional Transmitter Module

NAUTIC Multi-Proportional Module
Part No. **4141**
Up to two modules are connectable,
(Described on page 92)

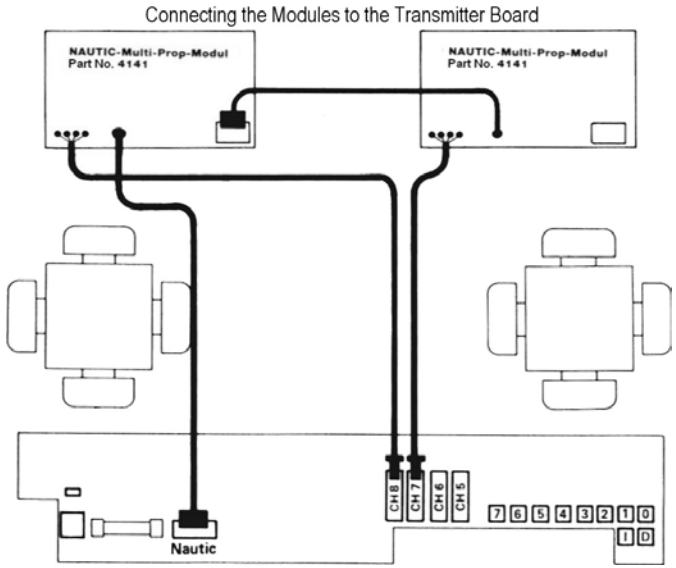
Function Notes
The NAUTIC Multi-Prop module allows two proportional function channels be split into eight proportional channels, i.e. at the receiver connections three additional servo connections are available per module. Two prop. module can transmitter lateral be inserted

Fitting and connection to the mc-16/20 transmitter.
The modules are installed as shown in the instructions on page 8/9 of this manual.
If the NAUTIC program in system menus "NA7" and/or. "NA8" are switched to "ON" (sees page 16), control paths 7 and/or 8 are automatically reserved for NAUTIC modules dependent on the model type.

Model Type	NAUTIC Channels
FL (Standard)	7 and 8
UN (Unifly)	7 and 8
Fb (F3B/Butterfly)	7 and 8
AC (Acrobatic)	7 only
HE (Helicopter)	7 only

The 5-pole connector of the module should to be inserted, e.g. into socket "CH7", and the 4-pole plug on the single-wire cable connected to the "NAUTIC" socket on the transmitter plate. If necessary a second module can be connected to "CH8". The 4-pole plug of the 2nd module is connected to the module already inserted.

Connecting the Modules to the Transmitter Board



Both model types "AC" and "HE" can additionally, if necessary, use channel 5 as well as channel 7 for the NAUTIC modules, under the following conditions:

1. Servo reverse (page 21) NORM
2. Servo Neutral Point (page 21) 0
3. Servo Travel (page 21) ±146%
   The setting is most easily done before inserting the proportional or switch modules (Part No. 4152 or 4151). During the servo travel setting when the NAUTIC modules are connected the display can flicker, which makes reading the exact value more difficult.
4. AC: Code “AUTOLANDING”
   if using ch 7 (page 57, 58) OFF
5. HE: Code “GYRO-CONTROL”
   if using ch 7 (page 78, 79) OFF
6. HE: Code “SWASHPLATE TYPE”
   if using ch 7 (page 66) Type 2 or 3

The transmitter set-up for the NAUTIC modules is now complete.

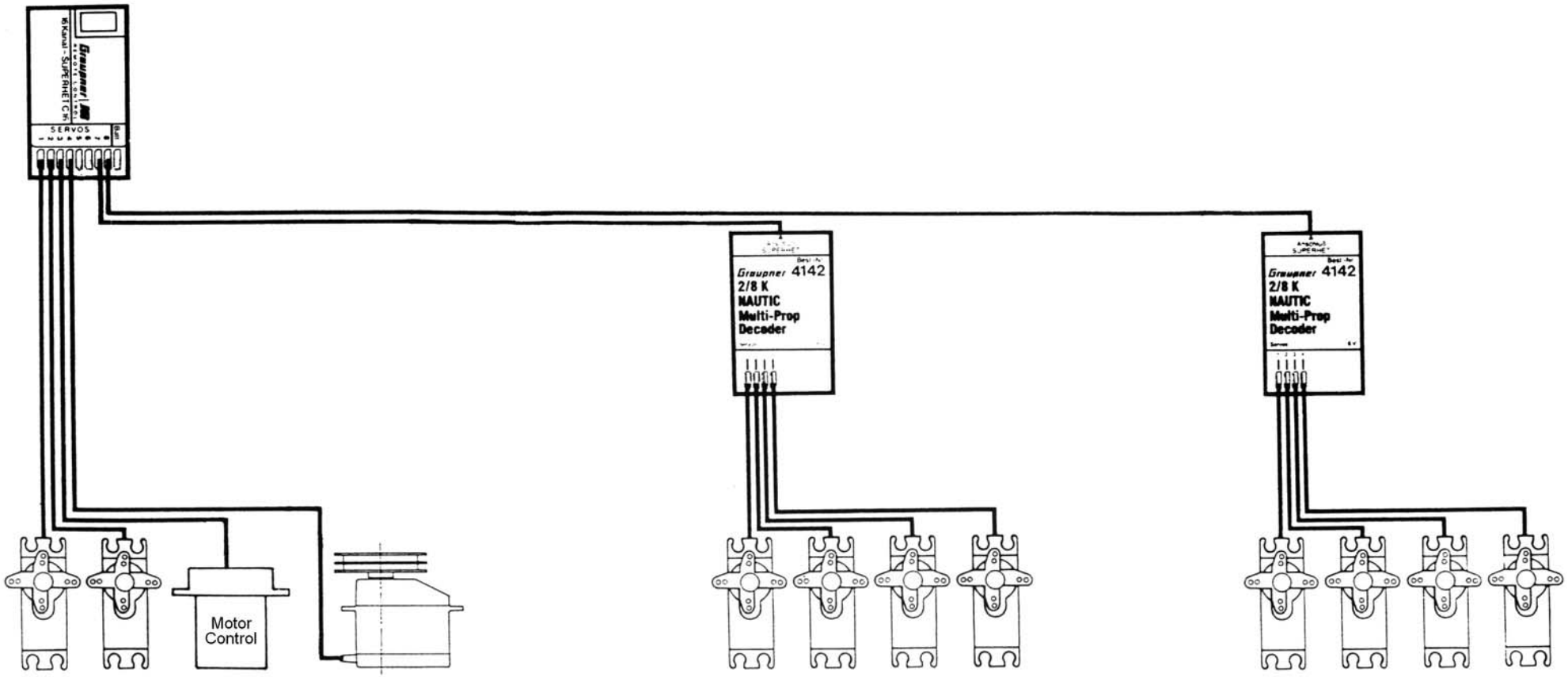
Receiver Requirements

NAUTIC Multi-Prop Decoder
Part No. **4142**
(Described on page 92)

Remark
For each NAUTIC Multi-Prop module a NAUTIC Multi-Prop decoder is necessary.

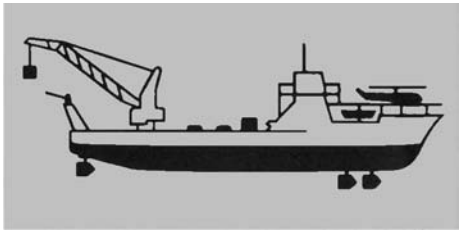
Note:
The NAUTIC Multi-Prop decoder extends two proportional channels (1 servo each), for a transmitter fitted with the NAUTIC Multi-Prop module, to eight proportional channels (4 servos each).

For a trouble free function at least three of the four possible servos should be attached to the NAUTIC Multi-Prop decoder.
An external power supply is not necessary. The servos are supplied via the receiver battery, which should be of sufficient capacity, e.g. 4.8V / 1.4Ah, Part No. 3448.

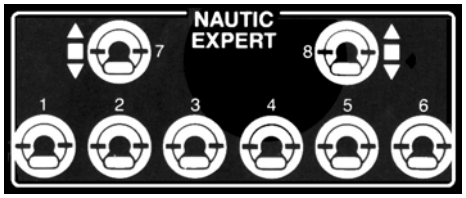


NAUTIC Expert Switch Function Modules

Only available in PPM Mode



Optional Transmitter Module



16 Channel NAUTIC Expert Module
Part No. **4108**
Up to two modules are connectable, (Described on page 92)

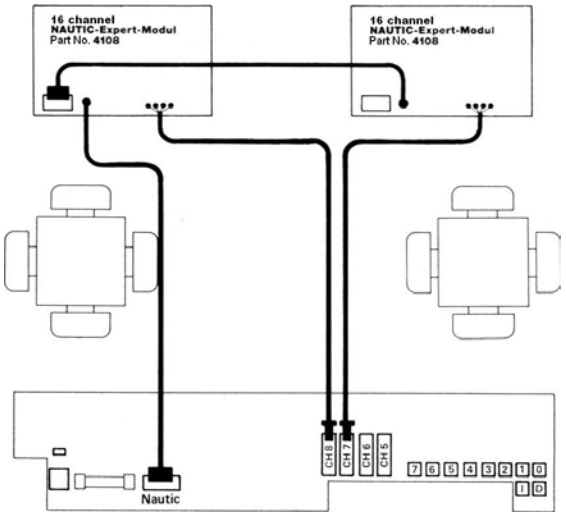
Function Notes

The NAUTIC Expert module extends two proportional channels to 16 signal paths. All eight switches have a central position, providing a genuine forwards–stop–backwards function, if at the receiver a switch module, Part No. 3754.1 or a Dual-Switch **module Part No. 3754.2 is used. Of the 8 switches, 3 switches are sprung-off and 2 are sprung-off in one direction. The remaining 3 switches are intended for forwards–stop–backwards functions and are not self-centring. Transmitter-laterally two modules with altogether 32 switching functions can be installed onto the module blow-out.**

Fitting and connection to the mc-16/20 transmitter.
The modules are installed as shown in the instructions on page 8/9 of this manual.
If the NAUTIC program in system menus "NA7" and/or. "NA8" are switched to "ON" (sees page 16), control paths 7 and/or 8 are automatically reserved for NAUTIC modules dependent on the model type.

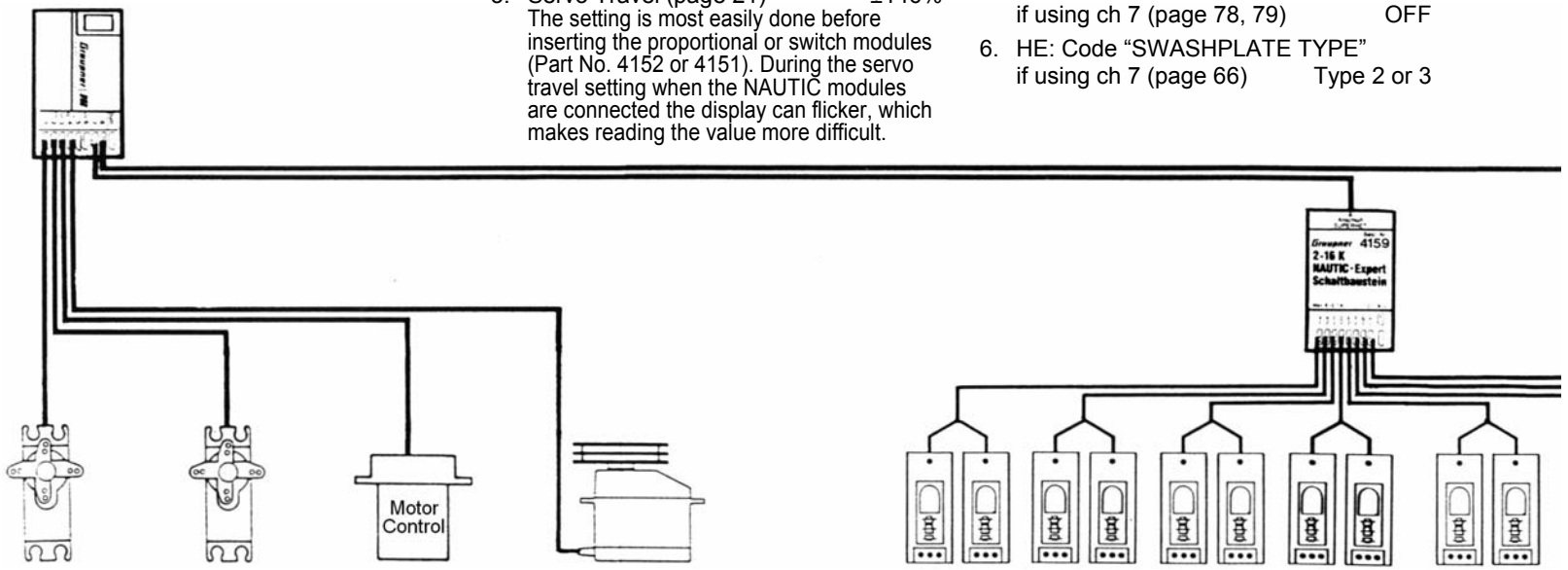
Model Type	NAUTIC Channels
FL (Standard)	7 and 8
UN (Unifly)	7 and 8
Fb (F3B/Butterfly)	7 and 8
AC (Acrobatic)	7 only
HE (Helicopter)	7 only

The 5-pole connector of the module should to be inserted, e.g. into socket "CH7", and the 4-pole plug on the single-wire cable connected to the "NAUTIC" socket on the transmitter plate. If necessary a second module can be connected to "CH8". The 4-pole plug of the 2nd module is connected to the module already inserted.



Both model types "AC" and "HE" can additionally, if necessary, use channel 5 as well as channel 7 for the NAUTIC modules, under the following conditions:

1. Servo reverse (page 21) NORM
2. Servo Neutral Point (page 21) 0
3. Servo Travel (page 21) ±146%
   The setting is most easily done before inserting the proportional or switch modules (Part No. 4152 or 4151). During the servo travel setting when the NAUTIC modules are connected the display can flicker, which makes reading the value more difficult.
4. AC: Code "AUTOLANDING" if using ch 7 (page 57, 58) OFF
5. HE: Code "GYRO-CONTROL" if using ch 7 (page 78, 79) OFF
6. HE: Code "SWASHPLATE TYPE" if using ch 7 (page 66) Type 2 or 3



Receiver Requirements

Part No.	Module	Comments
4159	2 / 16 channel NAUTIC Expert switch element (see page 92)	This module is required for the transmitter switch module to work
3941.6	Socket with 3-core lead	For connecting devices, max. 0.7A / channel
3936 or 3936.1	Y-lead 320 with 100mm cable length	For connecting NAUTIC Switch or Dual-Switch modules
3754.1	NAUTIC Switch Module	Direct link or 2 modules using a Y-lead
3754.2	NAUTIC Dual-Switch Module	Direct link to 2 channels or 1 channel using a Y-lead

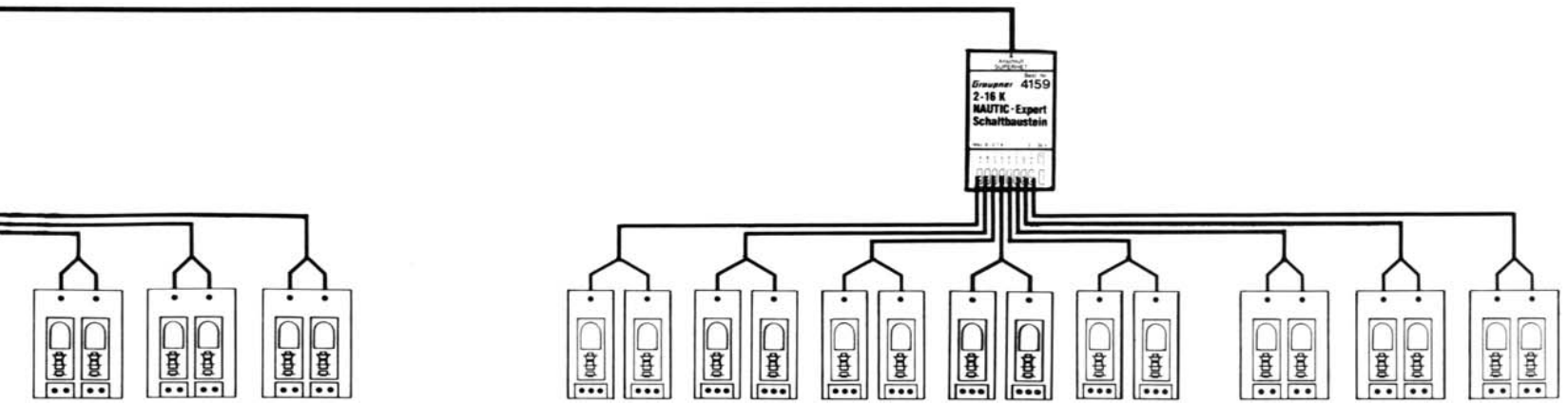
Connection

16 switching functions are available per switching component, and 8 devices, like lamps, LEDs, etc., (electrical motors excluded), with a power requirement of up to 0.7A for each can be directly attached. For each female connector there are two switching functions are possible via the three-core cable Part No. 3941.6 (fig. 2). For electric motors and devices with higher currents the NAUTIC switch or NAUTIC Dual-Switch module is available (fig. 3 + 4). In order to achieve the forward-stop-backwards function, the Dual-Switch module is connected to via a Y-lead. For correct operation one plug of the Dual-Switch module must be inserted in the opposite polarity (sand off the edges of this plug as necessary).

For directly attached consumers and for switching the relays an external power supply is necessary, e.g. a GRAUPNER receiver battery of sufficient capacity, see page 5. Other batteries to a maximum of 30V can be connected with a cable Part No. 3941.6.

Note:

When building your own switch modules, a protection diode is to be soldered across the terminals of the relay coil.



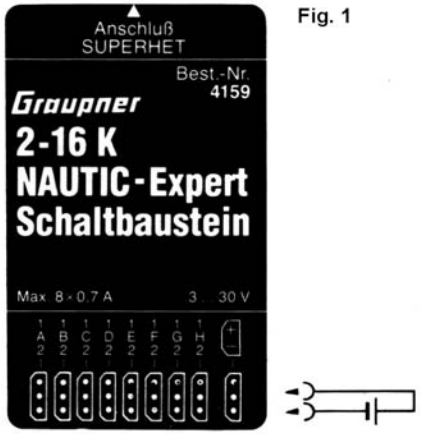
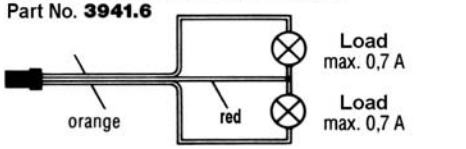
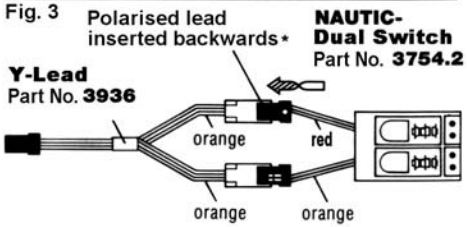
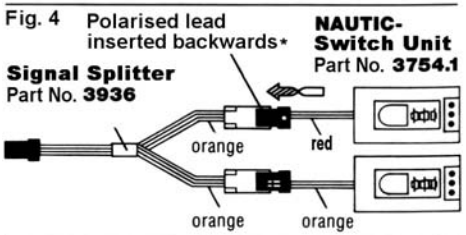


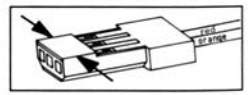
Fig. 1





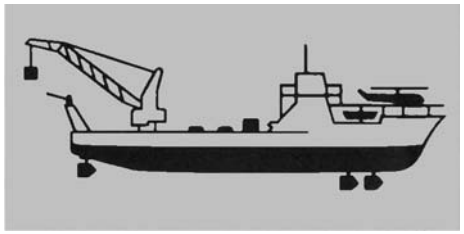


*Taper the other edges of the socket



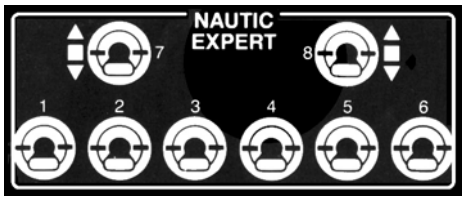
NAUTIC Multi-Prop and Expert Switch Modules

Only available in PPM Mode



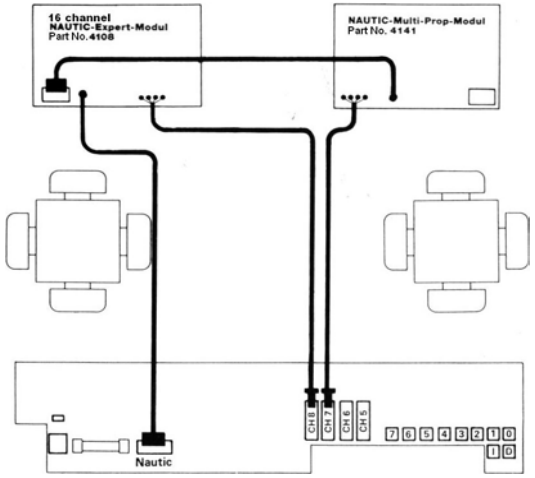
Optional Transmitter Module

NAUTIC Multi-Proportional Module
Part No. **4141**
(Described on page 92)



16 Channel NAUTIC Expert Module
Part No. **4108**
(Described on page 92)

Function Notes
In the case of using a combination of NAUTIC Expert and NAUTIC Multi-Prop modules, 2 channels (sockets CH7 and CH8 on the transmitter board) are extended to 16 switched outputs and 4 proportional channels (4 servos). The connection of both modules takes place as previous described on pages 84 and/or 86.

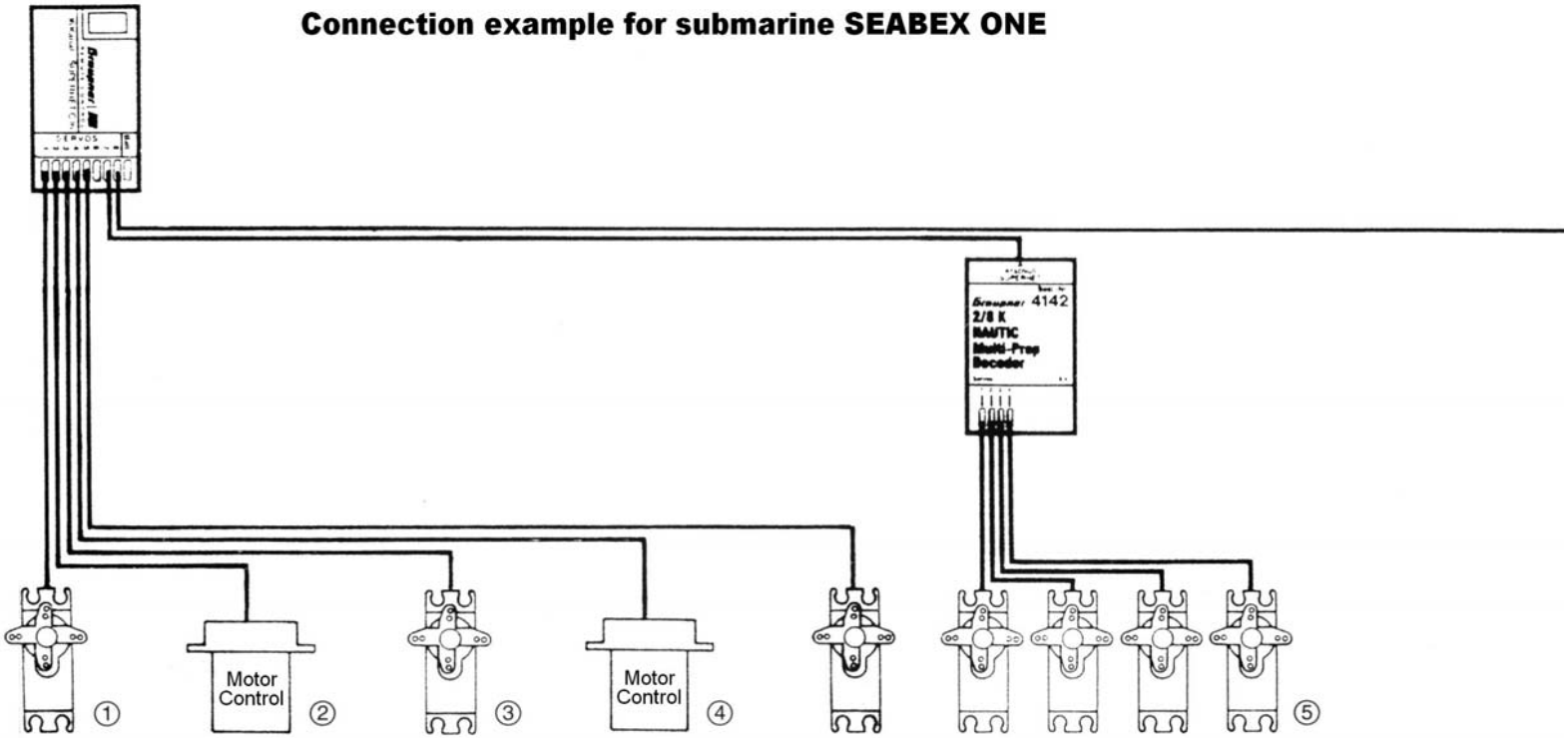


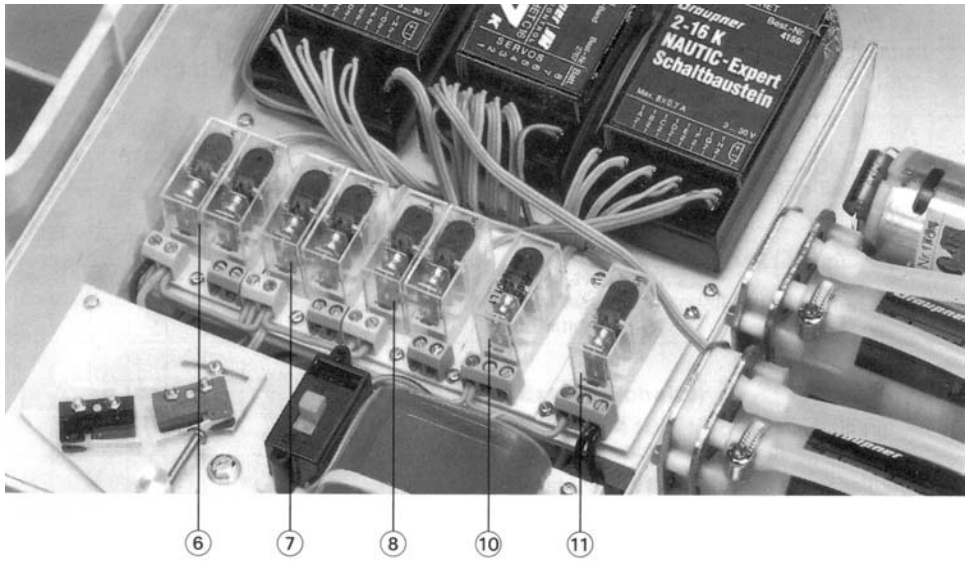
Receiver Requirements

Part No.	Module	Comments
4142	NAUTIC Multi-Prop Decoder	4 servos connected
4159	2-16 channel NAUTIC Expert Switch Module	For 16 switch functions
3941.6	Socket with 3-core lead	For connection of devices max. 0.7 A per signal path
3939 or	Y-Lead 320 with 100 mm	For connection of NAUTIC
3936.1	cable length	Switch or Dual-Switch modules
3754.1	NAUTIC Switch module	Direct connection or via a Y-Lead
3754.2	NUATIC Dual-Switch	Connection 2 channels via a Y-Lead

◁ Connection of the modules to the transmitter board

Connection example for submarine SEABEX ONE





Connection example for submarine SEABEX ONE

Proportional Functions

① Tail propeller direction drive servo right/left

② Tail propeller motor drive forward–stop–backward

③ Tail propeller direction drive servo right/left

④ Tail propeller motor drive forward–stop–backward

⑤ Other proportional function as required

Dual-Switch Functions

(Connected via a Y-Lead, Part No. 3636)

⑥ Crane jib up/down

⑦ Crane rotate left/right

⑧ Crane hook up/down

⑨ Anchor chain up/down

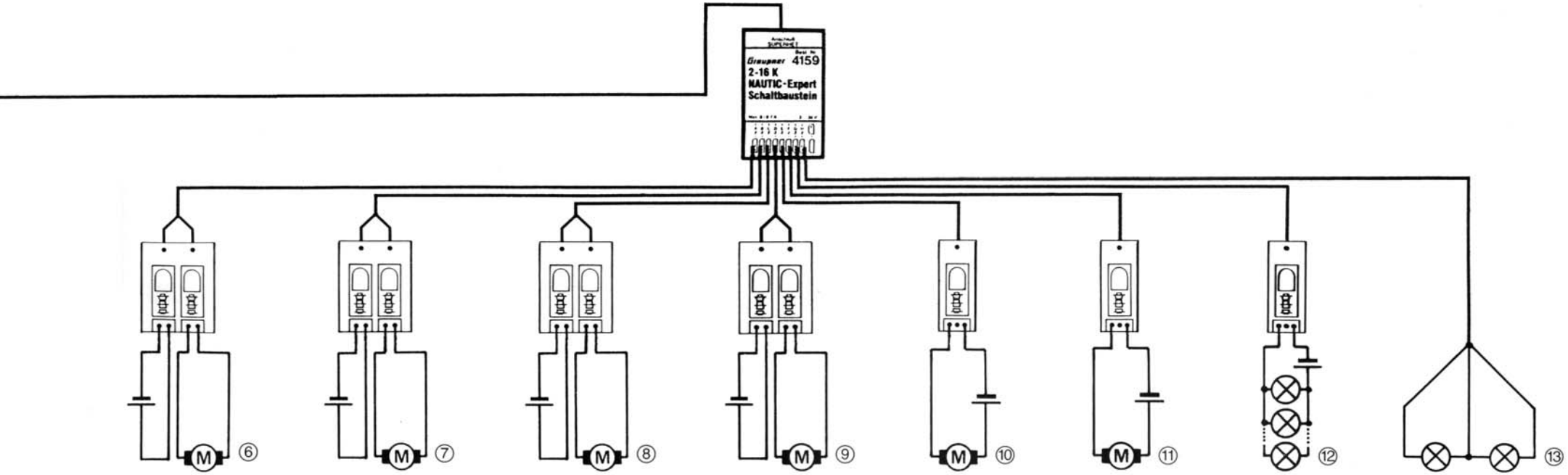
Switch Functions

⑩ Fire pump on/off

⑪ Helicopter rotor on/off

⑫ Ships lighting on/off

⑬ Low current application on/off (Connected by a 3-lead cable, Part No. 3641.6)



ERROR MESSAGE

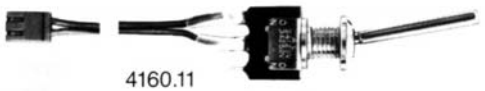
Storage Error

This message appears in the case of an error of the internal memory, i.e. all the entered data has been deleted and the memory contents reverted to the standard values!
The error can be caused by the complete discharge of the lithium battery on the transmitter plate. It has a duration of up to approx. 5 years and it ensures that the data stored in the memory remains, even when the transmitter remains switched off for a long period of time or excessive discharge of transmitter battery. As soon as the lithium battery voltage drops, the announcement appears after switching on.

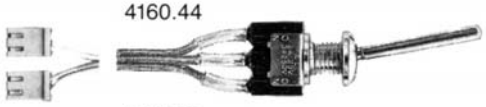
appears in the display, and an acoustic warning signal sounds. The error message is cleared by pressing any key.
When this error message appears your transmitter should be returned to a GRAUPNER Service Centre. To avoid damage, the changing of the lithium battery should be undertaken by a GRAUPNER Service Centre.

For You Notes

Switches & Modules


4160.11


4160.44


4160.22

Momentary Switch
Part No. **4160.11**
Sprung-off for momentary switching functions.

2-way Momentary Switch
Part No. **4160.44**
Used in place of INC/DEC for and required as a start/stop key for stopwatch

Differential Switch (3-way switch)
Part No. **4160.22**
For switching between 2 mixing functions.


4160


4160.1


4160.2


4160.3

External Switches

Part No. **4160** for switching one function – long arm

Part No. **4160.1** for switching one function – short arm

Part No. **4160.2** for simultaneous switching of 2 functions – short arm

Part No. **4160.3** for simultaneous switching of 3 functions – short arm

On/Off switching of special functions, e.g. Mixers


4147.1


4147.2


4147.3

Locking External Switches

Part No. **4147.1** for switching of one function

Part No. **4147.2** for simultaneous switching of 2 functions

Part No. **4147.3** for simultaneous switching of 3 functions

Locking switches have a mechanical locking device, which prevents unplanned operation during use. Only by simultaneous lifting and moving the lever can the switch operated.
Important mixing functions, which inadvertent use could lead to the crash of the flight model, should be secured with locking switches.

4151

4152

2 channel Switch Module
Part No. **4151** with long arm
Part No. **4151.1** with short arm

The switch has 3 positions, so that for example electric motors can be switched forward-stop-backwards. Also for suitable on/off functions, like switching loads, lamps, etc.

2 channel Switch Module
Part No. **4151.2** with short arm
Part No. **4151.3** with long arm

Self-centring on/off switch module. Suitable for switching electric motors, other loads, lamps, etc.

2 channel Proportional Module
Part No. **4152**

Linear control channel, or can be used as proportional control, e.g. with mixers.


4111

Rotary Proportional Control
Part No. **4111**

Rotary control channel, or can be used as proportional control, e.g. with mixers.

4158

External Multiple Switch Module
Part No. **4158**

Three toggle switches without central position, for the operation of Exponential / Dual-rate options or other switching functions. For further auxiliary functions, e.g. mixers, it can be retrofitted with other external switch (Part Nos. 4160, 4160.1, 4160,2 or 4160.3).

NAUTIC Modules

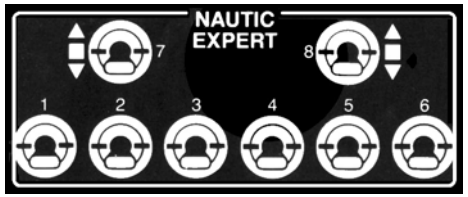
NAUTIC Multi-Prop Module
Part No. **4141**

The module extends proportional functions by using 2 channels to make 8 channels. This module can be inserted at the module places of the transmitter. Thus the ship modeller has a large number of proportional functions available for multi-function ships. At the receiver the NAUTIC Multi-Prop decoder (Part No. 4142) is necessary.

NAUTIC Multi-Prop Decoder
Part No. 4142

The NAUTIC Multi-Prop Decoder allows 2 proportional channels, when using the transmitter Multi-Prop module (Part NO 4141), to become 8 proportional channels. Thus an extension to the Multi-System of 3 servos is possible per Multi-Prop Decoders connected to the servo socket of the receiver.

Power Required, ca.	**10 mA**
Dimensions, ca.	**69 x 42 x 20 mm**
Weight, ca.	**27g**



16 Ch NAUTIC Expert Switch Module
Part No. **4108**

This module extends 2 channels to 16 switch outlets. All 8 switches have a central position, which makes it possible to switch a function forward-stop-backwards where required.

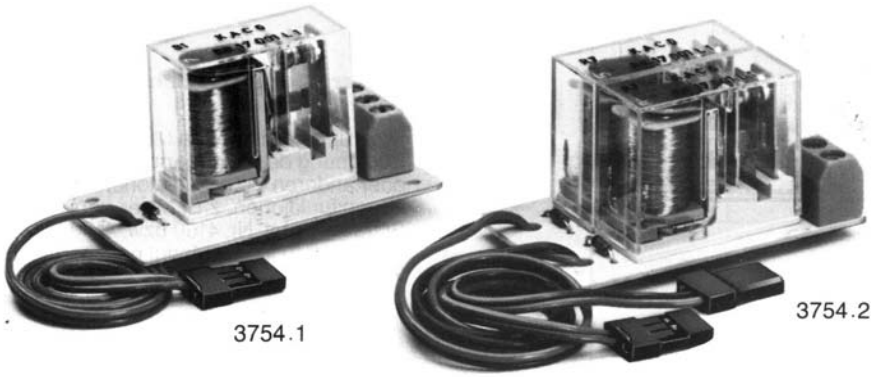
3 switches are sprung-off and 2 are sprung-off in one direction. 2 models can be mounted in the transmitter, and together providing 32 switch functions.

For each module, the receiver requires a 2-16K NAUTIC Expert Switch module (part No. 4159).

2-16K NAUTIC Switch Block
Part No. **4159**

With the retrofitting of the transmitter with the NAUTIC Expert module, Part No. 4108, and the receiver connected to 2 NAUTIC Expert switch blocks it is possible to extend to 32 switch outlets.

The devices can be supplied from a common power source or, if using the appropriate wiring leads, by several power sources.



NAUTIC Switch Module
Part No. **3754.4**

NAUTIC Dual-Switch Module
Part No. 3754.2

The modules are attached via their leads to the 2-16K NAUTIC Expert Switch Block, Part No. 4159.
The high-quality, durable relays permit the switching of devices of high power, e.g. electric motors, lamps, pumps etc. The 2 relays of the Dual-Switch Module, Part No. 3754.2, are wired in such a way that an attached electric motor can be operated forward-stop-backwards. The loads are attached using the screw terminal strips.

Technical Data

	Switch Module 3754.1	Dual-Switch Module 3754.2
Receiver Voltage	4.8 – 12V	4.8 – 12V
Max. Current	16A	16A
Switching Voltage	24V	24V
Dimensions, ca.	50 x 27 x 26 mm	50 x 30 x 26 mm
Weight, ca.	25g	45g