Installation and User Manual

Tranberg 4900 Commander Control system

Version 3.1

R. STAHL TRANBERG AS

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Chapter I. Introduction

Section 1.01 General Information

The 4900 Commander is a control system developed by R. STAHL TRANBERG AS.

R. STAHL TRANBERG has a long history of designing and manufacturing navigation lights controllers for medium sized and large vessels. The traditional design principle has been a direct control of each channel, meaning that the cable for each individual lantern needs to be laid from the lantern to the actual controller. This is both a costly and challenging task.

The Commander has been developed with greater flexibility in mind, and in particular with the objective to avoid pulling each lantern cable into the bridge. The concept is therefore based upon the industry-proven RS-485 network with a number of nodes connected to this.

A node may in this respect be a control panel, a relay output module, the master CPU and more. Each node is given a unique address and the corresponding action between a single button and the panel is defined in the configuration of the system.

Chapter II. Technical overview

Section 2.01 Introduction

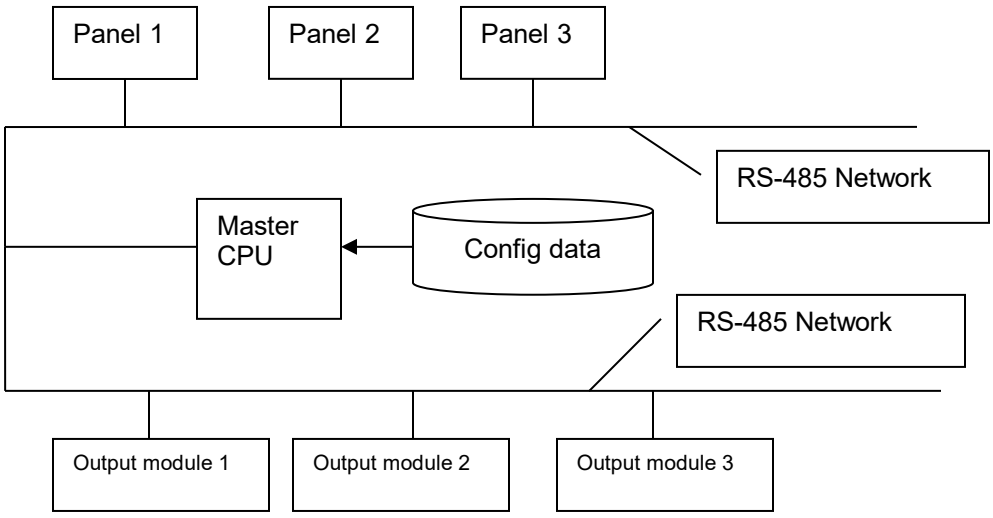
The TEF 4900 Commander system consists of three main components:

- Master CPU
- Panels
- Output modules

The three main components are interconnected via a RS-485 network. Each node has a unique address, and the Master CPU controls the network traffic by allowing one and only one node to 'talk' at any given time.

Section 2.02 System overview

Generic system diagram:



Chapter III. Functional description

Section 3.01 Introduction

The TEF 4900 Commander remote control system can have to up to 7 operator panels connected in one system.

Each operator panel consist of up to 64 buttons, each stacked up to 8 rows. The panels are backlit for easy reading of text and graphics, in daylight as well as at night. In addition, up to 16 relay output modules may be connected, providing a flexible control system with current sensing feedback from the outputs.

Application areas:

The Commander system is designed specifically for marine use and has a contemporary design with backlit front panels. The design concept allows customization of number of buttons, text and graphics, and is therefore useful for a wide range of customer-specific navigation and signal lights controllers.

Communications:

Robust, industry proven and noise immune RS-485 is used for communication between control panels, Master CPU and relay output modules. As an option, a communication interface to Voyage Data Recorder and/or vessel control system will be available, allowing data recording and external reset of alerts. The system supervises the integrity and issues an alert if a node fails to respond in the network.

Features at a glance:

- 24 VAC/VDC and 230 VAC versions
- With or without current sensing capabilities on outputs
- Optional compensation for voltage loss in long cable feeds
- Analog output module: Combined dimmer and flasher, triac-based, 230VAC
- Operator panels with dimmable backlight
- Audible and flashing LED alert, with potential free relay alert contacts
- RapidAction™ buttons: One touch turns on and off dedicated outputs
- GroupSelect™ buttons: Similar to radio buttons (select one buttons in a row)
- Optional functionalities include VDR (Voyage Data Recorder), CAM, BAMS and/or SCADA (Supervisory Control And Data Acquisition)

Section 3.02 Buttons and LEDs on panel

The TEF 4900 Commander is designed to be extensively configurable. This is in order to meet customer requirements with a minimum of production or engineering changes.

Configuration options:

- Text and graphics on panel
- Button quantity and panel size
- Button placement (installed or not installed in the grid pattern)
- Button functionality (ranging from one single channel to a group of output changes)
- Output module type (analogue, discrete relay or relay with current sensing)
- Manual or automatic changeover to spare outputs

Text and graphics on panel

The panels have backlight with manual dimming functionality. The text and graphics are laser engraved, providing the users with clear and precise information, readable in daylight as well as in the dark.

The construction consists of a machined, black aluminum frame with a recessed button surface made of Lexan. The Lexan film is painted on the reverse side as well as laser engraved on the same side. This ensures a very durable front.

Button quantity and panel size

The panels come in five different lengths, depending on the number of buttons. All panels have the same height.

The buttons are injection molded in black color. A Lexan film in various colors is inserted in a recess on top of the button. All button switch elements are of the metallic dome type.

Button placement

Buttons are placed in a grid with 8 positions vertically and from 3 to 8 horizontally. Buttons may be left out for clarity. This has no impact on software or any other settings.

Button functionality

Each button has two LEDs: One green and one amber[1]. Via software commands, these may light up in a number of combinations: Off, steady on or flashing.

A single press on a button may have several functions, depending on the on the configuration, button status, and the time the button has been pressed (short / long).

In general, there are four ‘normal’ states of a button:

- Off. No LEDs will light up.
- Rapid green flash: The panel awaits a confirmation from the output module that the corresponding output has turned on.
- Continuous green: The output module has confirmed that the corresponding output has been turned on.
- Slow green flash: The corresponding spare output has been turned on and is confirmed.

Failure combinations include:

- Flashing amber and green: The output channel (relay) reports a malfunction (broken fuse or lamp) on the main output (e.g. main lantern). The buzzer will sound. This is an unacknowledged alert. When pressed at this stage, the button will flash green and the spare output will be switched on.

[1] For legacy systems, this LED is red.

- Flashing amber: The output channel (relay) reports a malfunction (broken fuse or lamp) on the spare output (e.g. spare lantern). The buzzer will sound. This is an unacknowledged alert. When pressed at this stage, the button will light up with a continuous amber light.
- Continuous amber light: The spare output is defect. The panel must be turned off to reset this state.

Depending on the configuration, a single push on a button may turn on or off a number of outputs (and panel LEDs) to accommodate the needs. This yields a high density in functionality, while simplifying the tasks of the user. As an example, one press on a single button may 'remote' operate a selection of other buttons, as if the user pressed each and one of these. In any case the user will have control over each single button by turning this on or off.

See the two chapters Button and LED status and Button state diagram over the next two pages.

Button and LED status

With reference to the description on the previous page, this is a summary of the button functionality and the corresponding LED status, including alert buzzer.

State	Description	Effect	Led
0	Nothing (off). The default position of any button.	Outputs associated with this key will be turned off.	Green and amber LED off.
1	A normal press on a key (< 5 seconds). Not confirmed.	The output module will receive a message to turn on the respective (main) output.	Rapid green flash.
2	A long press on a key (> 5 seconds). Not confirmed.	The output module will receive a message to turn on the respective (spare) output.	Rapid green flash, each 4th blink is dark.
3	Main output is confirmed on.	The green LED will light up continuously.	Steady green light.
4	Spare output is confirmed on.	The green LED will flash slowly.	Slow green flash.
5	Main output reports a malfunction. Unacknowledged alert.	The buzzer will sound and both the green and amber LEDs on the button will flash.	Alternating amber and green flash.
6	Spare output reports a malfunction. Unacknowledged alert.	The buzzer will sound and the amber LED on the button will flash.	Rapid amber flash.
7	Spare output is defect and has been confirmed by the user.	The buzzer will stop and the amber LED will turn on continuously.	Steady amber light. Turn off panel to reset.

Rapid flash: 2 flashes per second.
Slow flash: 1 sec on, 1 sec off.

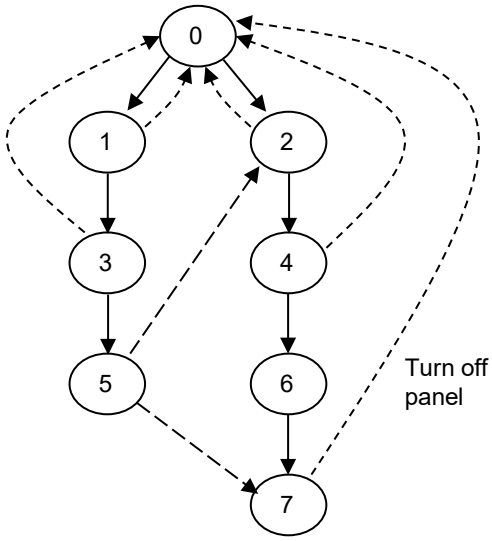
Button state diagram

With reference to the table above, the button states operate in a fixed state process. State 0 is the default state where both the green and amber LED on a button is turned off and associated outputs are in an off position.

The left branch on the diagram below shows the states when the user wants to turn on a main output, e.g. the main lantern. By pressing the button for less than 5 seconds, the button changes to state 1. In this state a message is sent to the corresponding output, and the LED flashes rapidly awaiting a confirmation from the output module. Another press on the key at this state will return to state 0 and a message to turn the output off.

All short dotted lines show states from where an output may be turned off.

The two long dotted lines indicate two options: Depending on whether an automatic switch-over to a spare lantern is present and configured the line from 5 to 2 indicates that it will turn on the spare lantern. If no spare lantern is present and configured, the line from 5 to 7 indicates that the amber LED will turn on steady to indicate that the corresponding lantern is defect and no spare is available.



Button configurations

Besides regular button functionality as described in the table above, the flexible configuration of the Commander allows buttons to be defined as RapidAction™ buttons or GroupSelect™ buttons.

RapidAction™ buttons: One touch on such a button turns on and/or off dedicated outputs and the corresponding buttons green LEDs, while no LED will lit up in the RapidAction™ button itself. The button merely acts as a hot key, simplifying standard operations, such as turning on sailing lanterns or anchor lanterns.

GroupSelect™ buttons: Similar to radio buttons on computer software. The user press one such button and the other buttons in the row will turn off all LEDs, while the green LED on the GroupSelect™ button that has been pressed will light up. This functionality may be used for setting a dimmer level, e.g. with four buttons that allows four settings/levels.

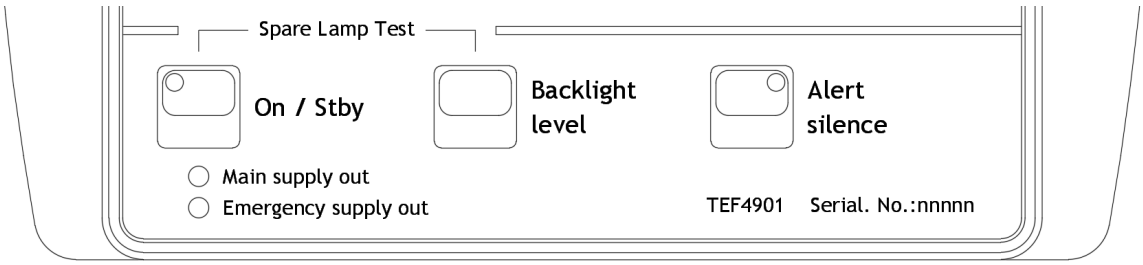
For navigation lights control system, the first button column at the panel is normally used for RapidAction™ functionality, named F-keys at the panel. The function of F-keys is software configurable and will switch on and off a predefined set of outputs.

The setup of F-keys is specific for each system; please refer to project drawings for details.

Spare lamp test

Test of individual spare lamp:	
1	Turn the respective circuit off.
2	Press and hold the respective button for min. 5 seconds.
3	Release button and spare lamp turns on.

Test of all spare lamps simultaneously:	
1	Panel in standby mode.
2	Press and hold “on/standby” button for min. 5 seconds and while still “on/standby” is pressed, press “backlight level” button. (Tip: While “on/standby” is pressed, press “backlight level” repeatedly till spare lamp test mode starts.)
3	All spare lamp outputs are switched on.
4	Press “On/Standby” to stop test.



Indicator lights, buttons:	
	Rapid green flashing: Circuit on, unconfirmed status.
	Green steady: Main lamp on.
	Slow green flashing: Spare lamp on.
	Amber flashing: Unacknowledged alert.
	Amber steady: Acknowledged alert.

Chapter IV. Master CPU

Section 4.01 Connections

Only one Master CPU shall be connected to the TEF4900 proprietary network.

Inputs

The master CPU has one digital input, 24VDC galvanic isolated. It is used as an alert silence input function, allowing external equipment to silence the panel buzzer. It is activated with a rising edge on the input (from 0 V to 24 V).

Outputs

The module has two single pole change-over relays. The alert output relay is energized in the inactive state, in order to signal a total power loss to an external system. The relay will activate when an alert condition is present, either power loss, output failure or communication errors on the bus (no messages from panel or modules). The alert conditions are indicated on the panel with flashing amber or steady amber LED indicators.

For faults which can be cleared by switching over to a spare or second power net, the alert output will be deactivated when the alert is acknowledged (This applies to outputs / lanterns with a spare, and for main (1) and emergency (2) power net). This makes it possible to indicate several alert conditions to the external system.

The second relay provides the alert silence signal. This relay gives a pulse of about 1 - 2 seconds when the alert silence button on the panel has been operated.

Power supply

The Master CPU can be connected to up to 4 power supplies (24 VDC), which are connected in parallel via a set of diodes. This combined power output supplies the panels and output modules. The power inputs are monitored by the Master CPU and their states are signaled to all connected nodes via the RS- 485 network.

LED indicators

The green Activity LED is flashing under normal conditions. This indicates that all nodes (relay modules and panel) are responding correctly.

For the 4900902 CPU Module (Legacy) the flash pattern is as following:

If this LED is constantly lit it indicates that minimum one node is not responding. This may be due to a broken communications cable, a faulty module or a combination of both. If this happens, the alert relay will be activated, the buzzer in the panel will sound and the indicator in the alert silence button will flash continuously (provided the connection towards the panel is OK). See also Chapter V Panel, Section 5.01 Overview, Power supply.

For the 4900903 CPU Module the flash pattern is as following:

The ‘Active* indicator on the TEF4900903 CPU mainboard flashes in different patterns indicating the different states of the system.

'Active' LED flash rate	Status
0.5 Hz (1s on, 1 s off)	Normal operation
2 Hz	Powerup (Duration 1s to 5 s, depending on system)
4 Hz	Internal fault (One or more modules or panel not responding)

In addition, the 'Active' LED will do an extra toggle (on-off-on or off-on-off) whenever a message (BAM or PTRA) is transmitted or received on the NMEA port. This may appear as an irregularity in the normal flash pattern.

On CPUs with the RCM3900 module on board, the user LEDs on the RCM3900 will make a short flash at the following events:
Green: a message (BAM or PTRA) is transmitted on the NMEA port
Red: a message (BAM or PTRA) is received on the NMEA port.

Section 4.02 VDR gateway

In order to send information to a VDR (Voyage Data Recorder) onboard the vessel, a VDR gateway module is installed in the Master CPU unit. This device passively listens to the network traffic and sends out information about the status of the system and the various output modules.

The VDR gateway sends out two types of messages, 1) system status messages according to a proprietary Tranberg protocol, and 2) alert messages according to IEC62923[2].

Electrical interface

- Baud rate: 38.400 bps
- Data bits: 8N1
- Electrical: Isolated RS-422, output only

System status messages

The output string is a proprietary NMEA-0183 structure with the following setup:

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
$PTRA	**1**	**2**	**1**	**1**	**1**	**1**	**C**	**5**	**0**	**1**	**1**	**1**	**4**	**4**	**4**	**4**	**1**	*	**7**	**E**
$PTRA	ComStatus	FailCode	Net 1	Net 2	Net 3	Net 4	Node type	Node number	Manual o'ride	Channel 8	Channel 7	Channel 6	Channel 5	Channel 4	Channel 3	Channel 2	Channel 1	*	Checksum MSB	Checksum LSB

[2] Legacy systems according to NMEA-0183 ALR and ACK messages.

Example:

```
$PTRA,1,2,1,1,1,1,C,5,0,1,1,1,4,4,4,4,1*7E
```

Packet length: 25 characters (normal), plus commas, carriage return and new line. Total number of characters (including commas) sent are 42 characters, plus carriage return and new line. Packet lengths are shorter in case of irregularities (see later in this document).

Repetition rate: Packages are sent continuously at a rate of approx. 5-10 packets per second.

Explanations:

$PTRA: A fixed proprietary beginning of the telegram (Proprietary TRAnberg)

Comma: A comma sign (,), ASCII code 44 (0x2C)

Asterix: An asterix sign (*), ASCII code 42 (0x2A)

ComStatus: If minimum one node does not respond. 0 = Failure, 1 = Ok

FailCode: Common code for a fail on the module. 0 = Disregard, 1 = Ok, 2 = Net failure, 3 = Output failure, 4 = Net and output failure. If node is set to Manual override, the code is 3 or 4.

Net1 – Net4: Status of the (up to) 4 independent power supply networks. 1 = On, 0=Off.

Node type: B = Relay module (8 relays) without current sensing, C = Relay module (8 relays) with current sensing, D = combined dimmer and flasher module.

Node number: Address of the output module. This address corresponds to the address set on the particular output module, and is in the region of 1 – 77 (octal values).

Manual override: Indicates a manual override on the particular module (1 = Normal, 2 = Override)

Channel 8 – Channel 1: Status of relay setting: 0 = Disregard/testing, 1 = Off, 2 = On, no current, 3 = Not used, 4 = On, current ok, 5 = Manual override, no current, 6 = Manual override, current ok. (Current = current flows in circuit, meaning lamp and fuse is ok).

Checksum is a 2 digit ASCII hex checksum, MSB first.

Checksum MSB: The MSB of the checksum (e.g. 7 if the checksum is 7E).

Checksum LSB: The LSB of the checksum (e.g. E if the checksum is 7E).

Comments:

When calculating the checksum, the ASCII value of each character has been used. The checksum is the XOR-ing of all characters between the leading $-character and checksum delimiter *.

No spaces occur in any packet.

All packets are ended with a carriage return (CR) and new line (LF).

All characters referred to above are 7-bit ASCII and represented by the appropriate ASCII number (e.g. a ‘1’ is ASCII character 49, A is 65, B is 66, etc.).

Note on systems delivered prior November 1st 2017

NOTE: Due to a change in checksum calculation, systems delivered before November 1st 2017 will have the following format:

The output string is a proprietary NMEA-0183 structure with the following setup:

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
$PTRA	**1**	**2**	**1**	**1**	**1**	**1**	**C**	**5**	**0**	**1**	**1**	**1**	**4**	**4**	**4**	**4**	**1**	*****	**1**	**2**	**0**
$PTRA	ComStatus	FailCode	Net 1	Net 2	Net 3	Net 4	Node type	Node number	Manual o'ride	Channel 8	Channel 7	Channel 6	Channel 5	Channel 4	Channel 3	Channel 2	Channel 1	*	Checksum H	Checksum M	Checksum L

Example:

```
$PTRA,1,2,1,1,1,1,C,5,0,1,1,1,4,4,4,4,1,*,1,2,0
```

Packet length: 26 characters (normal), plus commas, carriage return and new line. Total number of characters (including commas) sent are 47 characters, plus carriage return and new line. Packet lengths are shorter in case of irregularities (see later in this document).

Fields are the same as for systems delivered after November 1st 2017, except the checksum calculation:

Checksum H: The 'hundreds' digit of the checksum (e.g. 1 if the checksum is 120).

Checksum M: The 'tens' digit of the checksum (e.g. 2 if the checksum is 120).

Checksum L: The 'ones' digit of the checksum (e.g. 0 if the checksum is 120).

When calculating the checksum, the ASCII value of each character has been used. The checksum is the XOR-ing of all characters sent, except the leading $-character, the commas and the final carriage return and new line characters.

Channel 8 – Channel 1 detailed information:

The data in the corresponding positions Channel 8 – Channel 1 depends on which type of module the message is sent from. See the table below for details.

Module type	Ch. 8	Ch. 7	Ch. 6	Ch. 5	Ch. 4	Ch. 3	Ch. 2	Ch. 1
Type B, without current sensing	Relay 8	Relay 7	Relay 6	Relay 5	Relay 4	Relay 3	Relay 2	Relay 1
	Output states, see table below							
Type C, with current sensing	Relay 8	Relay 7	Relay 6	Relay 5	Relay 4	Relay 3	Relay 2	Relay 1
	Output states, see table below							
Type D combined dimmer and flasher module	Output state, see table below	Dim or Flash value	0	0	0	0	0	0

Output state:

Value	Description	Applies to Type B	Applies to Type C	Applies to Type D
'0'	Disregard	Y	Y	Y
'1'	Off	Y	Y	Y
'2'	On, but no current	N	Y	Y
'3'	Not used, disregard	N	Y	Y
'4'	On, current ok	Y	Y	Y
'5'	Manual override, no current	N	Y	Y
'6'	Manual override, current ok	N	Y	Y

Dimmer and flasher value:

Value	Dimmer level (%)	Flasher rate (blink / min.)
'0'	0 (off)	0 (off)
'1'	15	30
'2'	30	60
'3'	45	90
'4'	60	120
'5'	75	260
'6'	90	180
'7'	100 (max)	200

Alert massages

Alert messages according to IEC62923, see annex I for alert list and interface.

Alarm messages, Legacy NMEA-0183 ALR and ACK messages

If specified, and for replacement components, the CPU may be delivered with legacy message structure.

The alarm messages are sent out at an interval of approx. 30 seconds, if no changes in alarm state have occurred. If there are any changes in alarm state, a message indicating the new state will be sent out immediately. If several alarms are active simultaneously, a list with all messages will be sent out (Note that alarm messages and VDR messages are mixed and appear randomly in relation to each other).

The system is able to report 3 different types of alarm: Output failure (lantern bulb failure, cable break or other), power failure (one or more power supplies are out), and communication failure (if the Master CPU do not get responses from modules or panel). If there are no alarms present, the 'No alarm' message will be sent out.

Errorno.	Message	Description
-	`$IIALR,,,V,V,*73`	No alarm
001	`$IIALR,,001,A,V,Output failure*2A`	unacknowledged
001	`$IIALR,,001,A,A,Output failure*3D`	acknowledged
002	`$IIALR,,002,A,V,Power failure*49`	unack.
002	`$IIALR,,002,A,A,Power failure*5E`	ack.
003	`$IIALR,,003,A,V,Comm. failure*15`	unack.
003	`$IIALR,,003,A,A,Comm. failure*02`	ack.

Section 4.03 SCADA Gateway

In order to receive commands from the outside of the Commander system, a SCADA gateway module is installed in the Master CPU unit. This unit will listen to incoming commands and issue these onto the internal network when queried by the Master CPU. This will allow for remote control of the system and panel.

The SCADA gateway accepts two types of input messages, 1) panel control messages according to a proprietary Tranberg protocol, and 2) alert message handling according to IEC62923[3].

Electrical interface

- Baud rate: 38.400 bps
- Data bits: 8N1
- Electrical: Isolated RS-422, input only

Panel control messages

The output string is a proprietary NMEA-0183 structure with the following setup:

1	2	3	4	5	6	7
$PTRA	)	5	1	*	1	6
$PTRA	Panel	Button	State	*	Checksum MSB	Checksum LSB

Example:

```
$PTRA,),5,1*16
```

Packet length: 10 characters (normal), plus commas, carriage return and new line.

Explanations:

$PTRA: A fixed start of the telegram (Proprietary TRAnberg)

Comma: A comma sign (,)

Asterix: An asterix sign (*)

Panel: Panel address

Button: Button number

[3] Legacy systems according to NMEA-0183 ALR and ACK messages.

State: Button state

Checksum is a 2 digit ASCII hex checksum, MSB first.

Checksum MSB: The MSB of the checksum (e.g. 1 if the checksum is 16).

Checksum LSB: The LSB of the checksum (e.g. 6 if the checksum is 16).

Comments:

When calculating the checksum, the ASCII value of each character has been used. The checksum is the XOR-ing of all characters between the leading $-character and checksum delimiter *.

No spaces must occur in any packet.

All packets are ended with a carriage return (CR) and new line (LF).

All characters referred to above are 7-bit ASCII and represented by the appropriate ASCII number (e.g. a '1' is ASCII character 49, A is 65, B is 66, etc.).

The XOR-value of the initial 'PTRA' is 23.

Note on systems delivered prior November 1st 2017

NOTE: Due to a change in checksum calculation, systems delivered before November 1st 2017 will have the following format:

The output string is a proprietary NMEA-0183 structure with the following setup:

1	2	3	4	5	6	7	8
$PTRA	)	5	1	*	0	1	6
$PTRA	Panel	Button	State	*	Checksum H	Checksum M	Checksum L

Example:

```
$PTRA,),5,1,*,0,1,6
```

Packet length: 12 characters (normal), plus commas, carriage return and new line.

Fields are the same as for systems delivered after November 1st 2017, except the checksum calculation

Checksum H: The 'hundreds' digit of the checksum (e.g. 1 if the checksum is 120).

Checksum M: The 'tens' digit of the checksum (e.g. 2 if the checksum is 120).

Checksum L: The 'ones' digit of the checksum (e.g. 0 if the checksum is 120).

The checksum is the XOR-ing of all characters sent, except the leading $-character, the commas and the final carriage return and new line characters. When calculating the checksums, the ASCII value of each character shall been used.

Legal values

The following commands and data are allowed to remotely control a panel:

Item	From	To (including)
Panel	Panel 1 ASCII character 41 “)“	Panel 7 ASCII character 47 “/”
Button	Button 1 ASCII character 49 “1” *See tables on next two pages.*	Button 64 ASCII character 115 “s” *See tables on next two pages.*
	Notes on buttons: Buttons are indexed from top to bottom in each column. There are 8 buttons in each column. Continue to the top of next column when you have passed one column. Example: Top button in third column is button number 17. It’s address is 48 + 17 = 65, which is represented by the ASCII character ‘A’. *See tables on next two pages.*	
State	State 0 (Off), send ASCII character 48 “0” State 1 (Request main output on), send ASCII character 49 “1” State 2 (Request spare output on), send ASCII character 50 “2” Other States are not legal *States to be used when using special buttons:* Alert silence: Send ASCII character 49 “1” Power on panel: Send ASCII character 48 “0” for OFF. Send ASCII character 49 “1” for ON	

Panel address

Panel	ASCII char	ASCII code
1	)	41
2	*	42
3	+	43
4	,	44
5	-	45
6	.	46
7	/	47

Button numbers

Column	Row	Button	ASCII char	ASCII code	Comments
1	1	1	1	49	
	2	2	2	50	
	3	3	3	51	
	4	4	4	52	
	5	5	5	53	
	6	6	6	54	
	7	7	7	55	
	8	8	s	115	On/Off
2	1	9	9	57	
	2	10	:	58	
	3	11	;	59	
	4	12	<	60	
	5	13	=	61	
	6	14	>	62	
	7	15	?	63	
	8	16			Backlight dim
3	1	17	A	65	
	2	18	B	66	
	3	19	C	67	
	4	20	D	68	
	5	21	E	69	
	6	22	F	70	
	7	23	G	71	
	8	24	r	114	Alert silence
4	1	25	I	73	
	2	26	J	74	
	3	27	K	75	
	4	28	L	76	
	5	29	M	78	
	6	30	N	79	
	7	31	O	80	
	8	32	P	81	

Column	Row	Button	ASCII char	ASCII code
5	1	33	Q	81
	2	34	R	82
	3	35	S	83
	4	36	T	84
	5	37	U	85
	6	38	V	86
	7	39	W	87
	8	40	X	88
6	1	41	Y	89
	2	42	Z	90
	3	43	[	91
	4	44	\	92
	5	45	]	93
	6	46	^	94
	7	47	_	95
	8	48	‘	96
7	1	49	a	97
	2	50	b	98
	3	51	c	99
	4	52	d	100
	5	53	e	101
	6	54	f	102
	7	55	g	103
	8	56	h	104
8	1	57	i	105
	2	58	j	106
	3	59	k	107
	4	60	l	108
	5	61	m	109
	6	62	n	110
	7	63	o	111
	8	64	p	112

Note: The panel dim function cannot be remotely controlled.

Alert massages

Alert messages according to IEC62923, see annex I for alert list and interface.

Alarm silence messages, Legacy NMEA-0183 ALR and ACK messages

If specified, and for replacement components, the CPU may be delivered with legacy message structure.

The alarm silence messages are accepted as a response to the alarm messages sent out from the VDR gateway. Although 4 different messages are accepted, they all have the same function, to silence any (and all) audible alarm conditions present. Thus they have the same function as the alarm silence input (described in Section 3.02).

These messages works as an alarm acknowledge function for the power failure alarms (One or more power supplies are failing), and an audible alarm silence for the other alarms (output failure and communication failure). To acknowledge these alarms, the panel has to be operated.

Errorno.	Message	Description
-	$IIACK,000*55	General acknowledge
001	$IIACK,001*54	(General acknowledge)
002	$IIACK,002*57	(General acknowledge)
003	$IIACK,003*56	(General acknowledge)

Chapter V. Panel

Section 5.01 Overview

Up to 7 panels may be connected to the network. Each panel may have up to 64 buttons, of which three buttons have predefined functions:

- Power on/off (turn on or off the panel)
- Dimming of backlight
- Alert silence (turns off buzzer)

While the actions on each button may be configured, the actions of the three buttons listed above cannot be modified.

Hardware

The panel hardware consists of the following main parts: CPU, Watchdog reset circuitry, communications, as well as button and LED interface components.

CPU

All panels use a dedicated microcontroller with onboard memory.

Power supply

Up to 4 power feeds are possible to the Master CPU module, which are connected in parallel via a set of diodes. From this, a single 24VDC power supply is connected to the panels and output modules. This combination output forms a common power supply to all connected nodes. The power feed is supervised by the Master CPU and their states are signaled to all connected nodes via the RS- 485 network.

RS-485 circuitry

The communication circuitry has a built-in snubber circuit which eliminates the need of end resistor. The transceiver circuit is short circuit safe and is overvoltage protected.

Changes from NMEA-0183 to IEC62923

To be in compliance with IEC62923, there was a change in the panel hardware Q4 2023. The red LED indicators was changed to amber to comply with the priority of the alert. In NMEA-0183, all alerts was alarms, but from new approval according to IEC62923, the alerts was prioritized as warnings, thus requiring the red LED to be changed to amber.
Also, the amber led in the power button has been replaced with green for new panels.

Section 5.02 Buttons and indicator LEDs

The buttons are positioned in rows and columns. Each column is typically 8 elements high, where a button may be inserted in each element. A panel can have from 3 to 8 columns. Each button has two LEDs (green and amber).

As power is applied to the panel, the panel will be in the powered-up state. The backlight will turn on and the buttons will turn on main or spare according to the last known state (before power off).

User keys

Function: The function of the user keys depends on the configuration loaded into the main controller. It is typically used as a *control key* for a navigation light, showing the status of the navigation light and receiving operator commands such as on/off or alert acknowledge. It can also be used as an *F-key* which turns on and off various sets of navigation lights, preset in the configuration.
Indicators: There are two indicators for each user key, green and amber. These can light or flash in different patterns, indicating different states of the navigation light associated with that key.

State	Indication	Description
0	Off	Navigation light off
1	Fast flashing green	Short key press detected, awaiting confirmation from output
2	Fast flashing green (pause every 4th flash)	Long key press detected, awaiting confirmation from output
3	Steady green	Main (or single) navigation light on
4	Slow flashing green	Spare navigation light on
5	Fast flashing amber and green	Main navigation light has failed, Spare navigation light on
6	Fast flashing amber	Spare (or single) navigation light has failed, unacknowledged
7	Steady amber	Spare (or single) navigation light has failed, acknowledged

Table: User key indicator

On/off control: For the off state or states where the green indicator is active (states 0 to 3 in table), a short press on the button will turn the navigation light on or off, respectively. If the navigation light is off, a long press (>5 sec) on the key will turn on the spare navigation light (if there is one).

Alert acknowledge: If the indication is flashing amber (unacknowledged failure), a short press on the key will acknowledge the alert.

Special keys and indicators

On / Standby (power key)

The power key toggles the controller between active and standby mode. A short press will set the controller in active mode, press and hold for 1 sec to set the controller to standby mode.

When the panel is turned on, the backlight is turned on and the previous setting of lights will appear automatically and instantly.

A fast flashing LED and an activated buzzer in the panel indicate a communication error between the panel and the Master CPU.

There is only one green LED in this button.

State	Indication	Description
1	Slow flashing green	Controller is in standby mode
2	Steady green	Controller is active
3	Fast flashing green	Panel has lost communication with main controller

Table: Power key indicator

Spare navigation light test: If it is set in the configuration, it is possible to do a test of all spare navigation lights in the system at once.

Step	Description
1	Set system / panel in standby mode.
2	Press and hold power key for min. 5 seconds, and while still holding, press backlight level key shortly. (Tip: While power key is held, press backlight level key repeatedly until spare lamp test mode starts.)
3	Panel backlight turns on and all spare navigation lights outputs are switched on. Release power key and backlight level key. Panel buzzer makes a low-intensity sound approx. every 3rd sec.
4	Power key: press and hold for 1 sec to stop the test and return the system to standby.

Table: Spare lamp test procedure

Silence key

A short press on the silence key will silence an audible alert signal on the controller.

State	Indication	Description
0	Off	No audible alert signal
1	Fast flashing amber	Audible alert signal active
2	1.5s on, 0.5s off flashing amber	Internal fault in controller, lost communication with relay module

Table: Silence key indicator

Alert acknowledge: For power failure and internal failure, the first press on silence key will silence the audible alert signal, and the second press will acknowledge the alert.

Indicator test

When system is in active state and no audible signal alerts are present, a long press (>5 sec) on this key will start an indicator test on the panel. All indicators on panel will flash alternately to verify that the they are in working order. A short press on the silence key will revert to normal operation.

Backlight level key

A short press on this key will increase or decrease the backlight and indicator light intensity one step. The direction of intensity change (increase or decrease) will be same as the previous key press. Press and hold to change direction (increase/decrease) and to go to max or min intensity (It will stop at either end). There are no indicators in this key.

Power supply monitoring

Up to four power sources may be connected to the Master CPU. These sources are monitored by the Master CPU, and messages reporting the state for each supply are continuously sent to the panel. The power supply monitoring indicators will flash fast for an unacknowledged alert (even if the power supply has recovered), and light steady when the alert is acknowledged (if the supply net is still missing).

These indicators shows the status for the available power supplies, main and emergency.

State	Indication	Description
0	Off	Power supply OK
1	Fast flashing amber	Power supply has failed, unacknowledged
3	Two fast flashes, one second pause, repeated	Power supply is restored, rectified unacknowledged
3	Steady amber	Power supply has failed, acknowledged

Table: Power supply indicator flash pattern

Communication errors

If the Master CPU detects that a node is missing in the network, the indicator in the Alert silence button will flash while the alert buzzer will sound.

Audible signal

Alert: A buzzer in the panel will generate an audible signal when there is an unacknowledged alert present in the system.

State	Sound	Description
0	Off	No audible alert signal
1	2 short beeps (high intensity) approx. every 5th minute	Audible alert signal active: unacknowledged alert is present
2	1 short beep (low-intensity) approx. every 3rd sec	Spare navigation light test mode active

Table: Audible signal

All alerts in this system is of priority “Warning” and will signal with **2 audible beeps one time only**, when an alert is raised.

The alert silence action is temporary and will last for 30 sec. After 30 sec., a new audible alert signal is generated, and the silenced alerts changes state back to unsilenced. If a new alert is raised while the system is in a silence period, the system will generate a new audible signal.
It will be at least 15 seconds between two audible alert signals, even if the next alert occurs before that time has passed. If several alerts occur during the hold-off-time, only one audible signal will sound for these alerts combined. It is possible to silence this new alert, but the silence timer will not be set to a new period of 30 sec, it continues from the original silence trigger time.
An audible alert signal will be re-issued after approx. 5 min, if an alert remains unacknowledged.

Note for legacy systems

Older systems will for any alarm have 3 short beeps repeated every 15 sec until silenced. The panel/alarm will stay silenced forever or until a new alarm rises.

Section 5.03 Settings on the panel

Panel address

The address of the panel is set on the rear at the dial labeled ADR. This is preset by the factory, typically at address 1. See table below.

Address on panel	ADR switch setting	Comments / labelling
	0	Do not use
1	1 (default)	P1
2	2	P2
3	3	P3
4	4	P4
5	5	P5
6	6	P6
7	7	P7

Note: ADR-setting 0 should not be used. Setting 1 is default.

Number of columns on panel

The number of columns on the panel is set with the dial labeled COL. The default is 3, and maximum is 8. See table below.

Columns on panel	COL switch setting	Comments / labelling
	0	Data clearing of EEPROM
	1	Do not use
3	2	3 columns
4	3	4 columns
5	4	5 columns
6	5	6 columns
7	6	7 columns
8	7	8 columns

Note: COL-setting 0 is used to clear EEPROM memory. Col-setting 1 should not be used.

Non-volatile memory

Data storage

The CPU in the panel includes non-volatile memory. This is used to register the state of each button. Upon a complete power loss, this memory is read and the button statuses are set accordingly.

Data clearing

To clear all values in the panel, do the following:

- Remove power from the panel.
- Make a note of the setting of the dial COL at the rear side. Set it to position 0.
- Reconnect power to the panel again.
- Wait 15 seconds.
- Remove power from the panel.
- Set the dial COL back to its original position.
- Reconnect power to the panel again.

Data retention time

The non-volatile memory may be written to 100,000 times and will keep the data for 40 years.

Connections

Power

The 24VDC power is connected on the rear of the panels using regular screw terminals.

RS-485 network

The network is connected on the rear of the panels using RJ-45 terminals.

Chapter VI. Output modules

Section 6.01 Overview

The following output modules are available:

Part No.	Voltage	Monitoring of outputs	Description
4900 910	24V AC/DC	Yes	Fuses relay output module, 4 outputs. Max. 40W filament lamp load per output.
4900 911	24V AC/DC	Yes	Fuses relay output module, 8 outputs. Max. 40W filament lamp load per output.
4900 912	24V DC	Yes	Fuses relay output module, 4 outputs. Max. 20W LED lamp load per output. *See note below.*
4900 913	24V DC	Yes	Fuses relay output module, 8 outputs. Max. 20W LED lamp load per output. *See note below.*
4900 920	115/230V AC	Yes	Fuses relay output module, 4 outputs. Max. 85W filament lamp load per output.
4900 921	115/230V AC	Yes	Fuses relay output module, 8 outputs. Max. 85W filament lamp load per output.
4900 930	N/A	No	Relay output module, 8 potential free C/O outputs.
4900 935	N/A, 24VDC	No	Relay output / digital input module. 4 potential free C/O outputs. 4 digital (24VDC) inputs.
4900 940	115/230V AC	Yes	Fused relay output module, 1 output. Dimming output.
4900 950	115/230V AC	Yes	Fused relay output module, 1(2) output. Blinking output.

Note, output modules for LED navigation lights: alert threshold level: 34mA. Connected LED navigation lights shall be self-monitored and have built in life time control. In normal operation current consumption shall be >38mA. In "alert" state, current consumption shall be <31mA.

Common hardware

CPU

All modules use a dedicated microcontroller with onboard memory.

Power supply

The power feed is supervised by the Master CPU and signaled to the connected nodes via the RS-485 network. Up to 4 power feeds are possible, which are connected in parallel via a set of diodes. The combination output forms a common power supply for the connected nodes.

Address of modules

The address of the modules are preset at delivery. Two dials labeled ADR LSB and ADR MSB are used to set the address. Range is from 0 through 7 only on each dial, and the setting is in octal values. Never change the addresses, and if replacing a module, please ensure that the address of the new module is identical to the replaced module.

Modules are addressed from 1 and upwards. Do not use position 0.

Address setting of modules:

Address	MSB	LSB	Comments / labelling
	0	0	Do not use
1	0	1	M2
2	0	2	M3
3	0	3	M4
4	0	4	M5
5	0	5	M6
6	0	6	M7
7	0	7	M8
8	1	0	M9
9	1	1	M10
10	1	2	M11
11	1	3	M12
12	1	4	M13
13	1	5	M14
14	1	6	M15
15	1	7	M16
16	2	0	M17
17	2	1	M18
18	2	2	M19
19	2	3	M20
20	2	4	M21
21	2	5	M22
22	2	6	M23
23	2	7	M24
24	3	0	M25
25	3	1	M26
26	3	2	M27
27	3	3	M28
28	3	4	M29
29	3	5	M30
30	3	6	M31
31	3	7	M32

RS-485 circuitry

The communication circuitry has a built-in snubber circuit which eliminates the need of end resistor. The transceiver circuit is short circuit safe and is overvoltage protected.

Network cables

Minimum requirements for communication cables: Characteristic impedance 100-250 Ohm, 2x twisted pair and outer screen. Cable terminated in a RJ-45 plug. Signal ‘A’ – Pin 3, signal ‘B’ – Pin 6, signal ‘Ref’ – Pin 4 and 5.

LEDs

There are four LEDs on each output module: Power indicates that logic power supply (24VDC) is present to the module, Rx indicates messages received to the module, Tx indicate messages sent out from the module, while Fault indicate a failure in the module or the main supply net is missing.

Fault LED	Error	Description
Steady on	Functional	Can be several causes: No current drawn on output channels, a switchover to emergency power supply net, etc.
Rapid flash	Network	No messages received. Check network connection.
Slow flash	Network	The module receives messages on the network, but none to itself. Check address setting.
Off	None	Module and outputs OK.

Relay output modules

Capacity

Double-pole relay contacts rated at 8A / 250 VAC. The outputs are fuses in both poles. 2.5A for 230V modules, 4A for 24V modules and 1.25A for modules dedicated for LED lights. The printed circuit board is designed to fulfill the demands of both max. current and max. voltage.

On the relay module with current sensing, four relays are grouped together on one printed circuit board. This means they typically will be used as the relays for main and spare lanterns. The four relays have a common power supply, selectable out of two available power supplies.

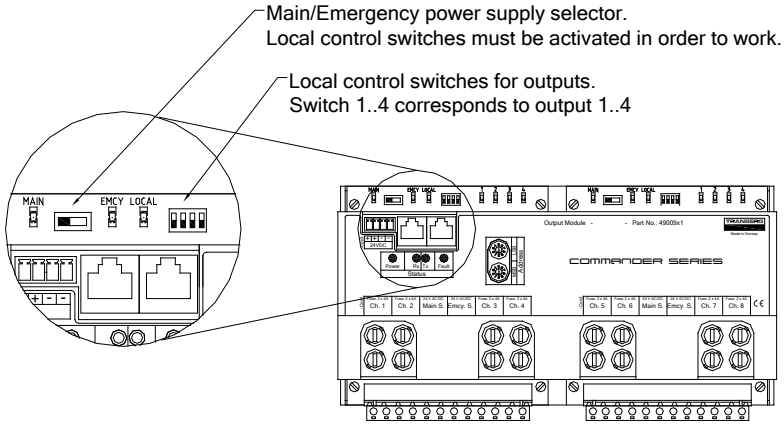
On the relay module without current sensing, all 8 relays are stand-alone. The 8 relays have a common, single power feed.

Manual operation

Each output may be individually turned on. This is used in the event of a system failure and where it is imperative that the outputs are correctly set.

As soon as one output is set, the hardware will turn all outputs off. This ensures full control of the outputs in On or Off state.

The relay module without current sensing does not have the option of manual operation. This is because this particular module is not intended to be used with critical outputs, such as navigational lanterns.



Current supervision

Relay modules with current supervision will detect that current is present or missing, while the output is turned on. This may be due to a broken fuse or lamp, and a message will be sent to the Master CPU for further actions.

Current is measured using a in-line resistor for low-voltage applications (<30VDC) and two diodes in antiparallel for high voltage applications (230VAC)

Analog output modules

Outputs

The analog output module is a combined dimmer and flasher unit. It can operate in both modes, depending on setting and commands sent to it from the Master CPU.

Manual operation

Outputs can be set manually. Before changing any settings, make a note of the original setting of the MSB and LSB rotary switches. Incorrect setting at a later stage may impair the system.

- For dimmer function, set the MSB rotary (address) switch on the module to 6.
- For flasher function, set the MSB rotary (address) switch on the module to 7.
- Disconnect power to the module for a few seconds, and then reconnect.
- Set the LSB rotary (address) switch on the module according to this table:

LSB:	Dimmer level (%)	Flasher rate (blink / min.)
0	0 (off)	0 (off)
1	15	30
2	30	60
3	45	90
4	60	120
5	75	260
6	90	180
7	100 (max)	200

Note, LSB=0: Depending on load, dimmer level may not be completely off.

To reset modules back to normal operation, set MSB and LSB switches as they were initially.

Current supervision

Current supervision is available on all versions. The current supervision may also be switched off if needed. Prior to such operations, remove the label that is positioned across the MSB and LSB rotary switches on the module, and make a note of the original setting. Incorrect setting at a later stage may impair the system.

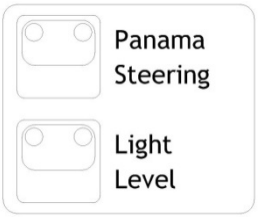
Do as follows:

- If the MSB rotary (address) switch on the module was set at 0, set it to 4.
- If the MSB rotary (address) switch on the module was set at 1, set it to 5.
- Disconnect power to the module for a few seconds, and then reconnect. The module will work as before but the current supervision will be turned off.
- Do not change the setting on the LSB rotary (address) switch on the module.

To reset modules back to normal operation, set MSB and LSB switches as they were initially.

Example of use

The analog output module can for example be used to power a Panama Canal Steering Light. The button setup on the control panel may look like the figure below.



In this group of two buttons, the upper button (Panama steering) will turn the output on and off.

The lower button (Light level) will increase the output level in steps according to the table above, resetting to lowest level when maximum is reached.

Connections and fuses

Power

There are two terminations for power; module power (24VDC) and power for the outputs:

- The 24VDC module power is connected on the module using regular screw terminals. These are clearly marked and have double terminals for further termination to other modules.
- The powers for the outputs are split in two on the termination plug: Main power supply and spare power supply. These shall only be fed from a common power distribution terminal rail.

Fuses

Each output has two fuses, one for each wire. These are located adjacent to the respective terminals on the output modules. Fuses must be as follows:

- 24V output modules: 4A Ceramic, Quick, 5*20mm, IEC-60127.
- 230V output modules: 2.5A Ceramic, Quick, 5*20mm, IEC-60127.
- LED light output modules: 1.25AT, 5*20mm, IEC-60127.

RS-485 network

The network is connected on the top of the modules using RJ-45 terminals.

LEDs

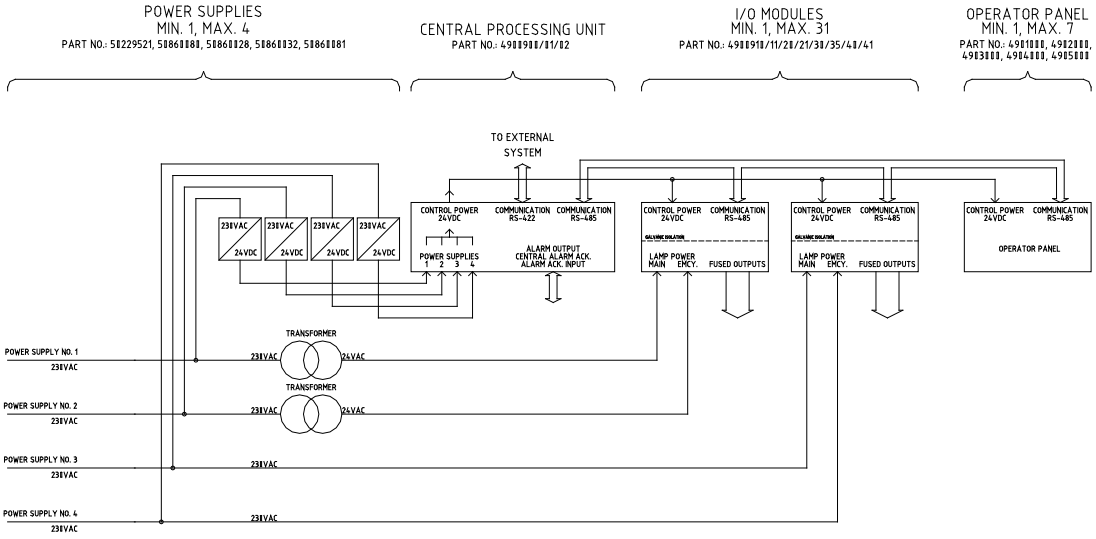
There are four LEDs on each output module: Power indicates that logic power supply (24VDC) is present to the module, Rx indicates messages received to the module, Tx indicate messages sent out from the module, while Fault indicate a failure in the module or the main supply net is missing.

Chapter VII. Installation

Section 7.01 Introduction

The panel and the other components may be physically installed with a distance of theoretically up to hundreds of meters. However, we recommend that all output modules and the master controller are physically located near each other.

All systems are custom made. Refer to drawings for the specific system for connection diagram.



General block diagram.

Section 7.02 Power cables to modules

All modules should be powered from the same 24VDC supply which comes from the Master CPU. All modules have dual terminals, so they may be terminated in a daisy chain from module to module.

Use minimum 0.5 mm² wires.

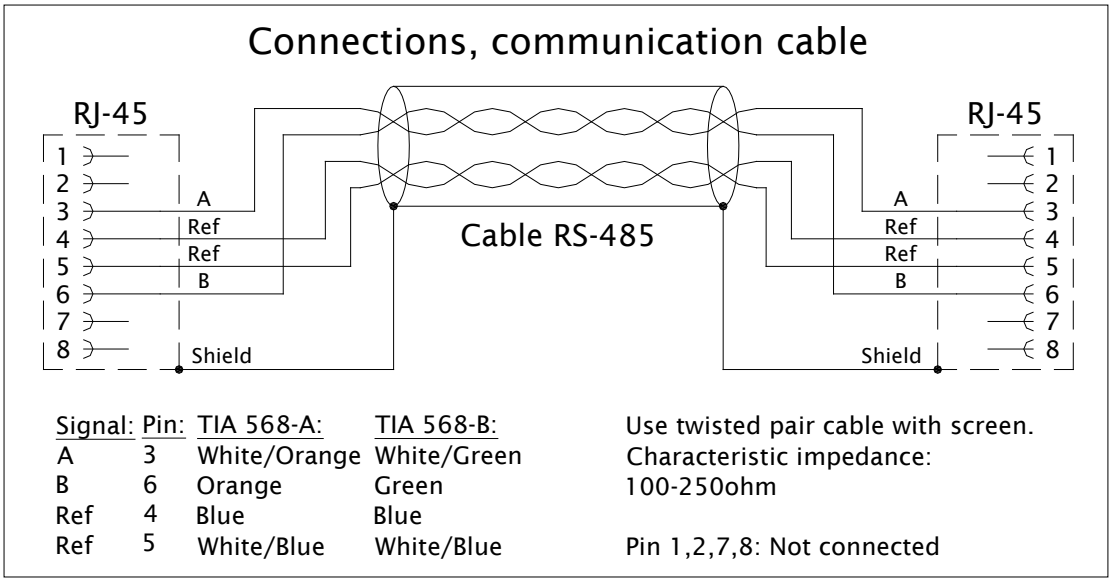
Section 7.03 Communication cables to modules

All modules should be connected to the same network cables which starts at the Master CPU and ends up in the panel. All modules have dual terminals, so they may be terminated in a daisy chain from module to module.

Communication cable should be a twisted pair, 100 - 250 Ohm characteristic impedance (Cat. 5 is ok). The cable should also provide wires for a common reference and shield.

Never use a end-of line resistor in the network. The communication cable should not be connected in a loop; it should always be end to end.

Each module has been factory set with correct node addresses and labeled accordingly. Do not make any changes.



Signal:	Pin:	TIA 568-A:	TIA 568-B:	Use twisted pair cable with screen.
A	3	White/Orange	White/Green	Characteristic impedance:
B	6	Orange	Green	100-250ohm
Ref	4	Blue	Blue	
Ref	5	White/Blue	White/Blue	Pin 1,2,7,8: Not connected

Section 7.04 Main power supplies

The Master CPU has terminals for incoming 24VDC power. Up to four power supplies may be connected, which inside the module are wired in parallel by means of high capacity diodes. The resulting common 24VDC power is then made available as a power source to all other modules that are a part of the system.

Each of the up to four power supplies are monitored by the Master CPU.

Section 7.05 Termination of system

The system must be terminated correctly to ensure that all nodes are powered and that they communicate properly.

Panel:

- The panel should be fixed to the bridge or similar place by means of four screws.
- Connect 24VDC power and the communication cable.

Output modules:

- The output modules should be clamped onto a 35 mm rail using the clip on the rear side of the modules.
- Connect 24VDC power and the communication cable.

Master CPU:

- The module should be clamped onto a 35mm rail using the clip on the rear side of the modules.
- Connect the various power sources (up to four) as described in the provided system data sheets.
- Connect 24VDC power to other modules and panel.
- Connect the communication cable.

Ensure that all modules are earthed to the same potential. Modules are earthed through the DIN rail mounting foots. No wire termination.

Section 7.06 Termination of outputs

All outputs must be terminated correctly to ensure a proper installation. Ensure that wires do not apply a load to the output modules or terminals.

Terminate the power sources for the outputs themselves:

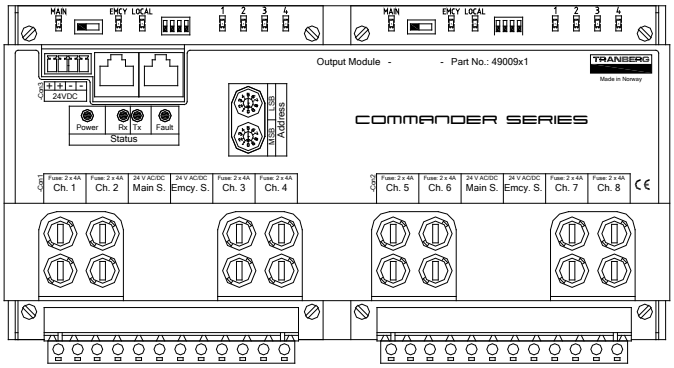
- Main power source
- Spare power source

Max. wire size: 2.5mm^2

Terminate each output on the modules:

- Two separate wires to each output.
- Check that appropriate fuses are installed in the fuse holders.

Use wires dimension suitable for the load. Max. 2.5 mm^2.



Output module with 8 outgoing circuits.

Section 7.07 Applying power for the first time

Before applying power for the first time, do the following:

- Ensure all termination is correct and properly done.
- Then apply power to the power sources that feed the Master CPU.

All connected modules as well as the panel should now be powered:

- All connected modules should lit up a green LED (Power) indicating power is present.
- The Master CPU starts communicating within seconds, which is visible as a amber flashing LED (Rx) on all connected modules.
- Each connected module is queried by the Master CPU repeatedly, and as each module replies, a amber LED (Tx) is lit up for a fraction of a second.

Section 7.08 Testing the system

Start the system testing:

- Turn the panel off by pressing the power button in the lower left corner. The backlit display will turn off and the green LED inside the power button will flash. When a panel is turned off, all corresponding outputs will be turned off. Even though the panel is turned off, all communication in the system continues.
- Turn the panel back on. The green LED in the power button light steady, and the panel backlight will turn on again.
- Test the various functions by pressing each button and verify that its intended operation is carried out:
    - Press a button and verify that the green LED starts flashing rapidly. As the corresponding output is turned on and is verified by the output module, the green LED in the button will switch to a steady green light. Note that depending on the configuration of the system, it may be that the LEDs in a button is not intended to light up. See chapter 3.02 Buttons and LEDs on panel for a description of the possibilities.
    - A faulty lamp or fuse will be detected by the output module, which in turn relays that message to the Master CPU. As a response to this, the buttons green and amber LED on the panel will flash to announce a fault. See chapter 3.02 Buttons and LEDs on panel for a definition of what the LED statuses mean.
- Always refer to the system configuration and/or termination drawings when testing a system.

Section 7.09 **Failures**

If a failure is detected:

- Ensure the output is terminated correctly and that the fuse and lamp is ok. Use only fuses of correct type, refer to chapter VI Output modules.
- Check whether the corresponding output module responds to the action. It does so by flashing the Rx LED (amber) rapidly, but it should also flash the Tx LED (amber) about once per second or more often. Missing the Tx signal may indicate bad communications termination, mix-up of the A and B-lines or similar.
- Turn all power off and reapply power. Then start testing over again.

Network failures:

- If the Activity LED in the Master CPU flashes, it indicates a correct network.
- If the green LED in the Power button in the panel flashes, it may indicate a faulty connection towards the panel. If the other modules in the system work properly (flashing RX and TX) LEDs, the fault is somewhere between the panel and the rest of the system. Check the communications cable and connections. Possible reasons may be that the A and B lines are switched, if so, reconnect and try again.
- If the Activity LED in the Master CPU is constantly on, it indicates a failure somewhere in the network. Check the above; if the amber LED in the power button in the panel is not flashing, the fault is found in one of the output modules.
- If the Activity LED in the Master CPU is constantly on, the system may still be operable, provided that the panel is functional. If the reason for the fault is an output module, only that module is defect, while the rest of the system will work.

The outputs may be turned on manually using the small switches located on each relay output module. See chapter VI. Output modules, Section 6.01 Overview, Relay output modules, Manual operation.

If a module needs to be replaced, ensure the following:

- Disconnect main power feeds to the Master CPU
- Disconnect the main and spare power feeds to the output modules
- Disconnect the terminal plugs to the module
- Remove the module by tilting it towards its rear side (opposite/reverse of text on module top).
- Check the address setting on the faulty module, and set the exact same address on the new module.
- Insert a new module, and then connect the various plugs.
- Reapply power and test according to chapters 7.07 Applying power for the first time and 7.08 Testing the system.
- If the failure has been corrected, label the new module in the same way as the faulty module, e.g. M3, and set a sticker on top of the address dial switch to avoid anyone altering this.

Chapter VIII. Approvals

Section 8.01 Approvals

Type approved by DNV.

Chapter IX. Additional Information

Section 9.01 Contact information

Please contact R. STAHL TRANBERG AS regarding clarifications:

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Annex I - TEF4900 BAM implementation details

Chapter I. Introduction

Section 1.01 Definitions, acronyms and abbreviations

BAM	Bridge Alert Management
CAM	Central Alert Management
Emcy	Emergency
EUT	Equipment Under Test
I/F	Interface
IO	Input / Output
NLC	Navigation Light Controller
NL	Navigation Light
NMEA	National Marine Electronics Association.
system	Navigation Light Control system
panel	NLC user interface

In this document the 'NMEA' acronym is used as a short form for referring to the NMEA 0183 standard - which is the basis for the IEC 61162 standard - and the electrical interface used for this communication.

Chapter II. BAM Implementation

Section 2.01 Function type

Tranberg TEF4900 Commander NLC is function type: **P** (BAM compliant equipment) acc.: IEC 62923-1:2018.

Section 2.02 Alert List

Event	Cat.	Prio.	ID	Short text	Decription
Output failure	A	W	3008	Lost Navlight	A Navigation Light is not working
Power supply fail main or emcy	A	W	3022	Power Fail	Navigation Lights power supply failure, main or emcy
NLC internal fault	A	W	3062	Internal Fault	Navigation Light Controller internal fault

Alert priority: W - Warning

Category
TEF4900 uses category A alerts for all alert types. This means that the operator must go to the NLC panel to see which NL is failing, and to acknowledge the alert..

Alert ID
TEF4900 uses standard identifiers according to IEC62923-2 [6], table A.1.

Alert instance
Alert instance not used in TEF4900 NLC.

Alert short text
TEF4900 uses short text adapted from IEC62923-2 [6], table A.1.

Section 2.03 **Talker identifier**

Talker device	Identifier	Comment
Navigation light controller	NL---	
Proprietary code	P---	Used in existing Tranberg products for the proprietary sentence PTRA

Section 2.04 **Supported alert handling sentences**

Sentences ACN, AGL, ALC, ALF, ARC and HBT are used for alert handling. Table below shows what sentences the Tranberg NLC supports.

Mne-monic	Name	Trn smt	Rc v	Comment
ACN	Alert command		X	For receiving change in alert state
AGL	Alert group list			Tranberg NLC does not support grouping of alerts
ALC	Cyclic alert list	X		Transmitted regularly, at least every 30 s.
ALF	Alert message	X		Information on new alerts and if requested for existing alerts
ARC	Alert command refused	X		Tranberg NLC does not support responsibility transfer
HBT	Heartbeat			Tranberg NLC does not support responsibility transfer

NOTE: Regarding ARC and Responsibility Transfer: Category A alerts are not allowed to transfer responsibility (Ref. IEC62923-1, chapter 6.2.2.2 and MSC.302(87))

Functions not supported in TEF4900 NLC:

- Long alert description text (ALF sentence)
- Alert Aggregation
- Alert Escalation
- Alert Grouping
- Alerts of priority Alarm or Emergency Alarm

Section 2.05 **Fields used in sentences**

This list refer to the ALF sentence, since it uses all relevant fields.

No.	Field Name	Use in NLC
1	Total number of ALF sentences for this message, 1 to 2	Used as appropriate for the relevant sentence
2	Sentence number, 1 to 2	Used as appropriate for the relevant sentence
3	Sequential message identifier, 0 to 9	Used as appropriate for the relevant sentence / message
4	Time of last change	Not used in Tranberg NLC. Null field
5	Alert category, A, B or C	See alert list
6	Alert priority, E, A, W or C	See alert list
7	Alert state, A, S, N, O, U or V	Used as appropriate for the relevant alert and alert state
8	Manufacturer mnemonic code	Not used in Tranberg NLC. Null field

9	Alert identifier	See alert list
10	Alert instance	Not used in Tranberg NLC. Null field
11	Revision counter, 1 to 99	Used as appropriate for the relevant alert and alert state
12	Escalation counter, 0 to 9	Escalation is not used in Tranberg NLC. Set to 0.
13	Alert text (Max 16 characters)	See alert list

General Sentence Format:
(See IEC 61162-1 for detailed description)

```
$--ACN,hhmmss.ss,aaa,x,x,x,x,c,a*hh<CR><LF>
$--ALC,xx,xx,x.x,aaa,x.x,x.x,x.x,...,aaa,x.x,x.x,x.x*hh<CR><LF>
$--ALF,x,x,x,hhmmss.ss,a,a,a,aaa,x.x,x.x,x.x,x,c---c*hh<CR><LF>
$--ARC,hhmmss.ss,aaa,x.x,x.x,c*hh<CR><LF>
```

Section 2.06 **States for Warning**

Warning states:

State	Fault present	Code	Flashing	Audio
W1: Normal		N		
W2: Active Unacknowledged	X	V	X	X
W3: Rectified Unacknowledged		U	X	
W4: Active Silenced	X	S	X	
W5: Active Acknowledged	X	A		
W6: Active Resp. Transferred	X	O		

ADDITIONAL: Terminating (when equipment is turned off or set to standby), set to Normal

Section 2.07 **Actions**

Outgoing msgs:

1. Send **ALC** regularly (max 30 s interval)
2. Any change of alert state (E.g. when alerts become silenced, rectified, etc) for all alert instances, send a a new **ALF** with new info (new state and revision counter).
3. If a request for responsibility transfer (O) has been sent, then a refusal **ARC** must be replied back.

Incoming msgs:

1. If **ACN**: Check for:
   a) acknowledge (A). There are only cat. A alerts here, so send an **ARC** (refuse responsibility transfer) as response.
   b) request / repeat information (Q). send **ALF** sentence for the requested alert instance. As long as the alert ID and instance are correct, an **ALF** will be sent out for the requested alert, also if the state is Normal.
   c) responsibility transfer (O). There are only cat. A alerts here, so send an **ARC** (refuse responsibility transfer) as response.
   d) silence (S). Silence the panel buzzer. Change alert state and send new **ALF** sentence. If alert state is already 'S', ignore.

Note that alert state may change as a result of change in internal conditions (from the source itself), or as a result of an incoming **ACN** sentence.

