



Installation and User Manual

TEF 4500 Commander Utility control system

Version 1.5

TRANBERG AS

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Chapter I. Introduction

Section 1.01 General information

The 4500 Commander Utility is a versatile control system, developed by TRANBERG AS.

TRANBERG has a long history of designing and manufacturing electronics for medium sized and large vessels. The traditional design principle of a control system has been a direct control of each channel, requiring pulling each individual cable into the bridge. This is both a costly and challenging task.

The Commander Utility has been developed with greater flexibility in mind, and in particular with the objective of reducing the number of cables. 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, a communications gateway, or other. Each node is given a unique address and the corresponding action between a single button in the panel and the corresponding action in an output module is predefined.

The system may be used for a number of applications, including:

- General lights
- Helideck landing lights
- Heating systems
- Pumps
- Windscreen wipers

Chapter II. Functional description

Section 2.01 Features

The TEF 4500 Commander Utility remote control system is extremely versatile and is comprised of three main components:

- Panels
- Output modules
- Serial Gateway

The components are interconnected via a RS-485 network (herein after called network). Each node has a unique address, and one relay output module controls the network traffic by allowing one and only one device to 'talk' at any given time. This network controller is selected with settings on the module.

The TEF 4500 Commander Utility system starts with a minimum of one panel and one relay output module, up to a maximum of 7 panels and 21 relay output modules.

Each operator panel consists of a minimum of 24 buttons, up to a maximum of 64 buttons. The buttons are stacked in columns of 8 buttons, and a maximum of 8 rows. The panels are backlit for easy reading of text and graphics, in daylight as well as at night. The required number of relay output modules may be connected, plus a 24VDC power supply, thus providing a compact and flexible control system.

One unique feature of the Commander Utility is the ability to divide the network into several domains, which act as individual networks. There must be a minimum of one domain in the network, and a maximum of 7.

Panels that are connected to the same network may have different sizes and different legends on the buttons. Thereby they will seamlessly act as different domains on the network along with the output modules they control. Another unique feature of the Commander Utility system allows identical panels to be connected to the network so that these may work in full parallel. The system allows from 2 and up to all 7 panels to be identical on a single network, where a single action on one panel is replicated on all other panels, including turning the system on or off.

Another feature is slave output modules. Slave mode can be used when two modules should react to the same button presses on a panel.

The Serial Gateway introduces a serial interface towards the Commander Utility network, and allows two-way communication between the Commander Utility network and a VDR/SCADA system.

No customer-specific software or configuration is required, no matter the size of a system.

Application areas:

The Commander Utility system is designed specifically for marine use and has a contemporary design with backlit front panels. The design is useful for a wide range of applications:

- Deck light control panel
- Floodlights
- Helideck lighting
- Heating systems
- Pump control panel
- Status panel for doors

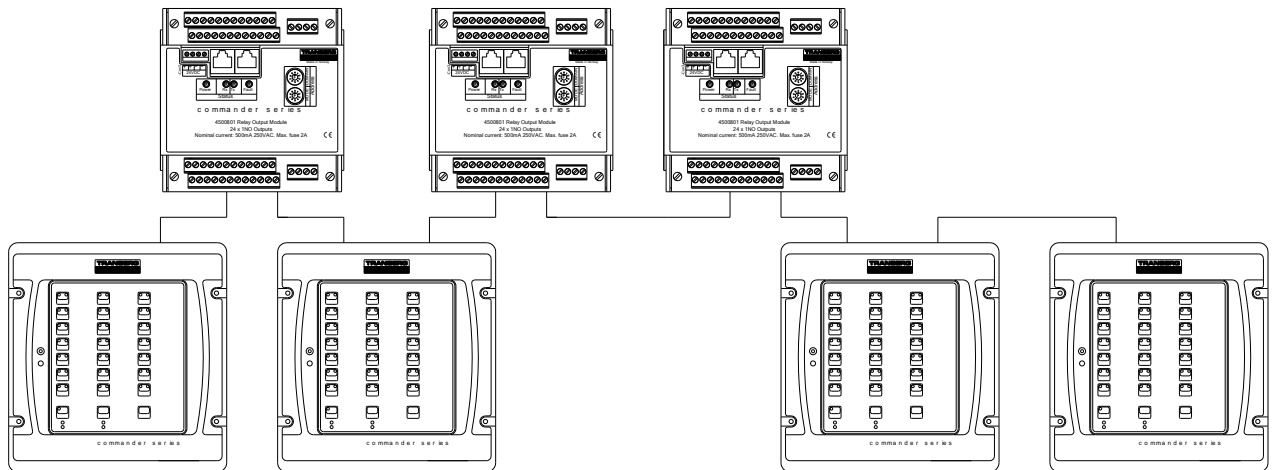
- General control panel

Features at a glance:

- Relay modules with 24 relays @ 500mA (only to be used as pilot relays)
- I/O modules with 24 inputs, 24 relay outputs @ 500mA (only to be used as pilot relays), and 3 alarm inputs.
- Backlit operator panels with dimming feature
- Optional Gateway that enables two-way communication (VDR/SCADA)
- Common alarm input
- External alarm reset
- Audible and flashing LED alarm
- NAUT-OSV compliant with dedicated alarm relay and bridge alarm reset relay
- Up to 7 panels may be connected to a single network
- The unique '*Twin panels*' function allows 2 or more panels to work in precise parallel, allowing the users to operate any of these panels to control the respective outputs.
- The '*Slave mode*' function allows two output modules to react to the same button actions.

Section 2.02 System Overview

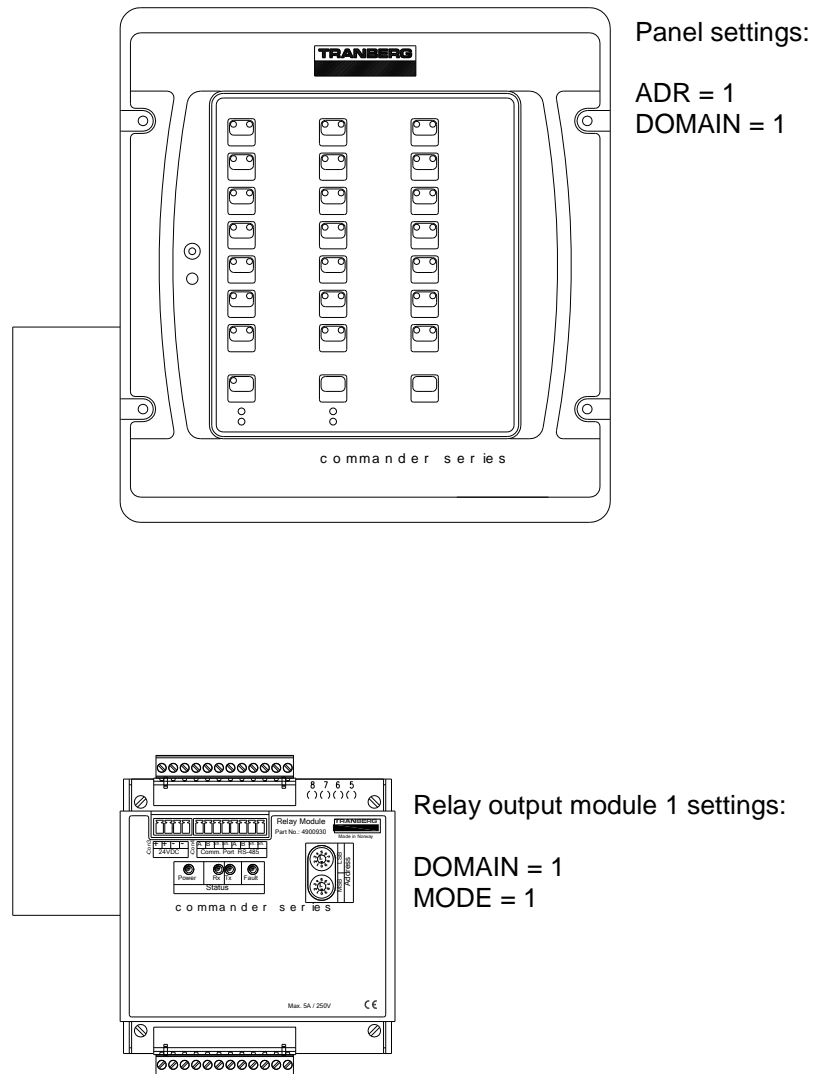
A generic diagram of a system setup is found below:



Section 2.03 Network and domains

A network may consist of 1 to 7 domains. Below are examples describing different configurations.

Application example 1: Single panel and relay output module



Comments:

- Relay output module 1 (with settings DOMAIN = 1 and MODE = 1), acts as the network controller.
- The alarm input and alarm reset input is active on this module.
- Relay 8 is automatically defined to activate as long as the systems is turned on.
- Relay 16 is automatically defined to activate as long as an alarm is present.
- Relay 24 will activate for a period of 1 second after a potential alarm has been acknowledged.

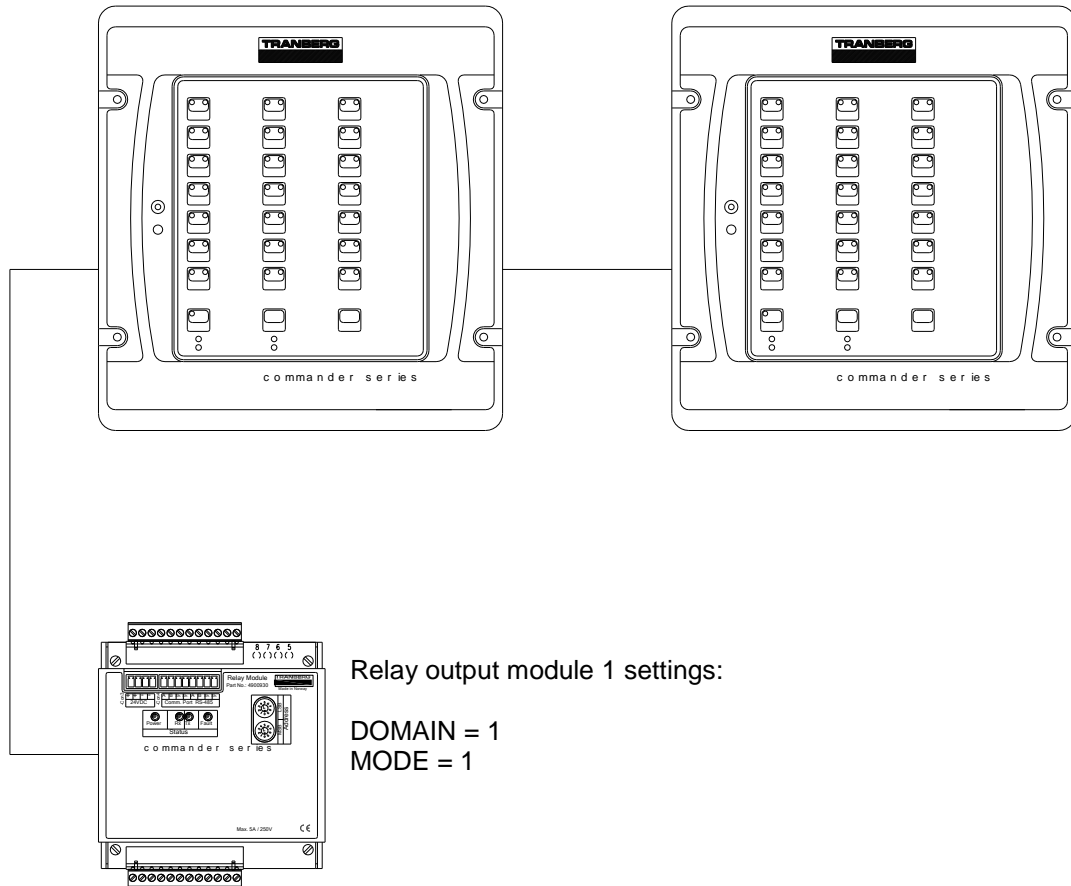
Application example 2: Twin panels and a common relay output module

Panel 1 settings:

ADR = 1
DOMAIN = 1

Panel 2 settings:

ADR = 2
DOMAIN = 1



Relay output module 1 settings:

DOMAIN = 1
MODE = 1

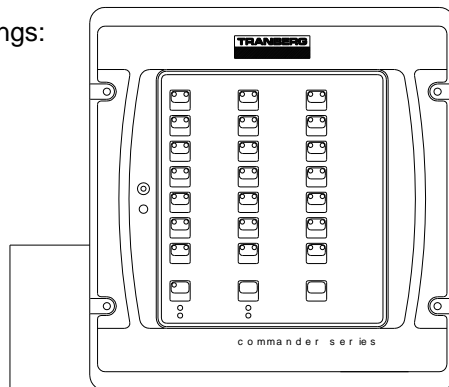
Comments:

- Relay output module 1 (with settings DOMAIN = 1 and MODE = 1), acts as the network controller.
- The alarm input and alarm reset input is active on this module.
- Relay 8 is automatically defined to activate as long as the system is turned on.
- Relay 16 is automatically defined to activate as long as an alarm is present.
- Relay 24 will activate for a period of 1 second after a potential alarm has been acknowledged.
- Both panels work in parallel together with the relay output module. Thus, both will reflect the current state of the outputs, and both panels operate identically. This unique feature is called Twin Panels. More on this in the *Panels* chapter.

Application example 3: Two individual panels and two relay output modules

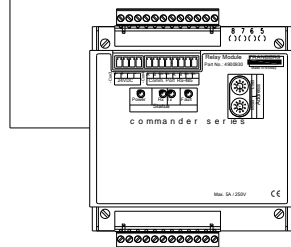
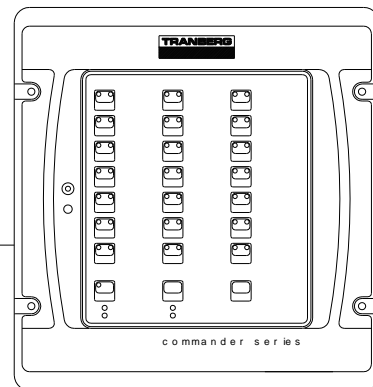
Panel 1 settings:

ADR = 1
DOMAIN = 1



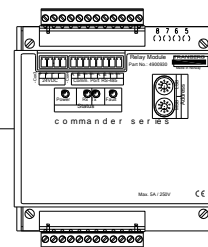
Panel 2 settings:

ADR = 2
DOMAIN = 2



Relay output module 1 settings:

DOMAIN = 1
MODE = 1



Relay output module 2 settings:

DOMAIN = 2
MODE = 1

Comments:

- Relay output module 1 (with settings DOMAIN = 1 and MODE = 1), acts as the network controller.
- Both relay output modules communicates with their respective panels/domains.
- The alarm input and alarm reset input is active on each module, and corresponds to each panel.
- Relay 8 is automatically defined to activate as long as the corresponding domain is turned on.
- Relay 16 is automatically defined to activate as long as an alarm is present in the corresponding domain.
- Relay 24 will activate for a period of 1 second after a potential alarm has been acknowledged for the corresponding domain.
- The two domains will appear independent of each other.

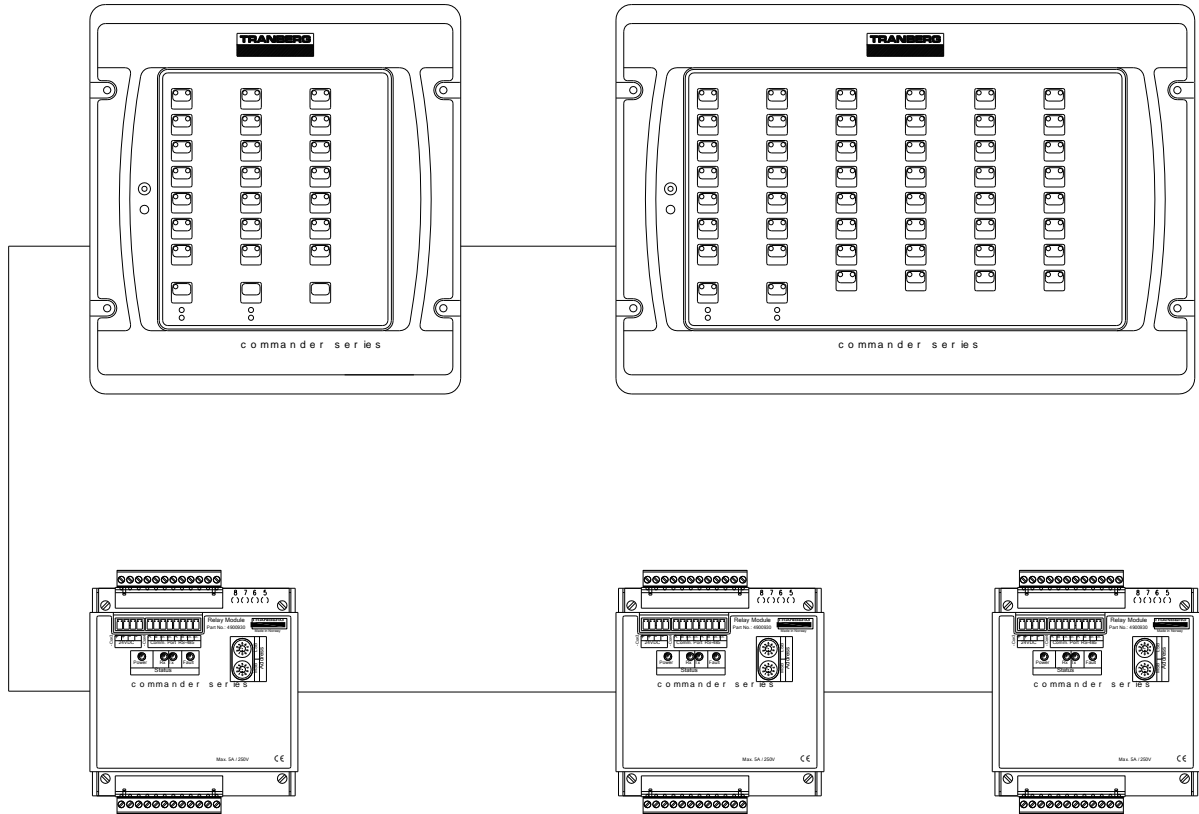
Application example 4: Two panels and three relay output modules

Panel 1 settings:

ADR = 1
DOMAIN = 1

Panel 2 settings:

ADR = 2
DOMAIN = 2



Relay output module 1 settings:

DOMAIN = 1
MODE = 1

Relay output module 2 settings:

DOMAIN = 2
MODE = 1

Relay output module 3 settings:

DOMAIN = 2
MODE = 2

Comments:

- Relay output module 1 (with settings DOMAIN = 1 and MODE = 1), acts as the network controller.
- Relay module 1 communicates with panel 1, while the other two relay output modules communicate with panel 2. Hence, there are two domains in operation in this configuration.
- The alarm input and alarm reset input is active on relay output module 1 and 2.
- Relay 8 is automatically defined to activate as long as the corresponding domains are turned on.
- Relay 16 is automatically defined to activate as long as an alarm is present in the corresponding domain.
- Relay 24 will activate for a period of 1 second after a potential alarm has been acknowledged for the corresponding domains.
- The two domains will appear independent of each other.

Chapter III. Panels

Section 3.01 Overview

The panels come in five different lengths, depending on the number of buttons, but they all share the same height.

Buttons are placed in a grid with 8 positions vertically and from 3 to 8 horizontally. All buttons are present in a panel, regardless of being used or not. Please observe that each button will be functional in any case.

The button tops are injection molded in black color. In recesses on top of the buttons, Lexan films in various colors and with or without openings for LEDs are inserted.

Text and graphics are laser engraved, enabling us to provide 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 and laser engraved on the reverse side. This ensures a very durable front.

Engraving may be done upon order or later in a project. A Lexan foil may be shipped to the customer at any time and inserted in the panel without any disassembly.

Panel	Buttons	Available Buttons	Available Full-Size Buttons
TEF4901000	3 x 8 = 24	21	21
TEF4902000	5 x 8 = 40	37	29
TEF4903000	6 x 8 = 48	45	37
TEF4904000	7 x 8 = 56	53	45
TEF4905000	8 x 8 = 64	61	53

Section 3.02 Buttons and LEDs

Each button on a panel is given a unique definition, such as C3R4. C3 means Column 3, and R4 means Row 4. Obviously, the first button then becomes C1R1, and the last available button will be C7R8.

The TEF 4500 Commander Utility is by design pre-arranged when it comes to buttons and relay actions.

The first three columns of buttons in a panel consist of 24 buttons (8 times 3). The lowest buttons in these three columns are by default the following:

- Power on/off (C1R8)
- Backlight dimming (C2R8)
- Alarm acknowledge (C3R8)

These buttons cannot have any other functions.

The three columns with buttons are reflected in a single relay output module, which have 24 relays. Relay number 1 reflects the status of button number 1 (C1R1), relay number 2 is reflected in the button below this (C1R2), and so forth.

Power button

Power on/off. A short press will turn the system on, while a longer press (approx. 1 second) is needed to turn the system off. When off, all output modules will turn off all relays. When turned on again, all those outputs that were turned on previously, will be turned on again. Relay number 8 in the bus master will be

activated as long as the system/domain is turned on. The definition of the bus master is explained in the *Output modules* chapter.

The LED in the Power button will flash slowly when the panel is off, and will turn off when the panel is on.

Note that a yellow, fast flashing Power button LED and an activated buzzer in the panel indicates a communications error between the panel and the rest of the network.

Backlight level button

The panel background is illuminated by means of side-emitting LEDs inside the panel. These illuminate text and graphics. Press and hold the Backlight level button to regulate the light intensity upwards or downwards.

Alarm acknowledge button

Once an alarm is given, relay number 16 in the primary relay output module will activate, and will stay activated as long as the alarm is present. A single press on the Alarm Acknowledge button, or an external signal to the Alarm Silence Input on the associated primary output module, will turn off the buzzer in the panel and acknowledge the alarm given. As an alarm is acknowledged, relay number 24 will activate for a period of 1 second, and the contacts on this relay may be used as an interface with the Bridge Alarm System. No relays will be activated if it is a network error alarm.

Button LEDs

Each button has one green LED in the upper left corner. This normally indicates whether the corresponding relay output is on or off. There is also a red LED in the upper right corner of each button. The LEDs may have different meanings depending on the settings on the output module.

Alarm LEDs

Depending on what type of output module a panel controls, it comes with two or four alarm LEDs.

- The Network error LED will flash upon a network error.
- The Alarm 1 LED will flash when a signal is provided onto the Alarm 1 Input on the relay output module.

Only on panels with four alarm LEDs:

- The Wakeup LED will flash when a signal is provided onto the Wakeup Input on the relay output module.
- The Alarm 2 LED will flash when a signal is provided onto the Alarm 2 Input on the relay output module.

The audible alarm will sound on all alarms. The alarm is silenced by pressing the Alarm Acknowledge button (or via an external signal to the Alarm Silence input on the relay output module), at which time the LED will light continuously until the error has disappeared.

The alarm LEDs will light up in different patterns, depending on the state of the alarm:

Pattern	State
Fast flash	Unacknowledged alarm
Steady on	Acknowledged alarm present
Two fast flashes, then 1 sec. pause	Unacknowledged alarm, not present anymore
Off	No alarm

If the panel is turned off and on again while there are alarms present, the audible alarm will sound and the corresponding alarm LED will flash yet again.

LED testing

By pressing the Acknowledge button for more than 5 seconds, a LED test procedure is invoked: All green LEDs will flash on for almost one second, and then the red LEDs will flash similarly. This procedure will repeat until the button is pressed a second time, and has no effect on the original LED status.

Section 3.03 Settings

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.

Panel numbers	ADR switch setting	Comments / labelling
	0	DO NOT USE
1	1	P1
2	2	P2
3	3	P3
4	4	P4
5	5	P5
6	6	P6
7	7	P7

The ADR setting should always be a unique number. There must not be two panels on the same network with the same number, as that will lead to data packet collisions on the network.

Domain

Select the DOMAIN setting as required. Up to 7 DOMAINS may be defined, which in practice acts as independent 'systems' on the single network.

DOMAIN for a panel	DOMAIN switch setting	Comments / labelling
	0	DO NOT USE
1	1	D1
2	2	D2
3	3	D3
4	4	D4
5	5	D5
6	6	D6
7	7	D7

Normally the DOMAIN setting is identical to the ADDRESS setting on the same panel (same number).

Twin panel

However, when using two or more panels, setting the DOMAIN number equal to another panel's DOMAIN setting, provides you with the possibility of having twin panels (two or more panels working identically and in parallel). Examples are given in the table below:

ADR switch setting	DOMAIN switch setting	Comments
0	0	DO NOT USE
1	1	Panel 1 is normally set
2	1	Panel 2 is twin to panel 1
3	1	Panel 3 is also twin to panel 1
4	4	Panel 4 is normally set
5	4	Panel 5 is twin to panel 4

Status LEDs

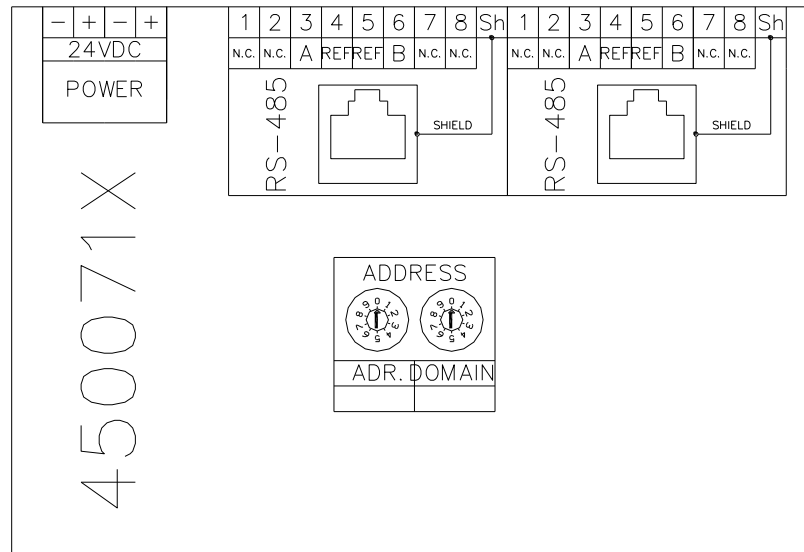
These LEDs are located on the back of the panel.

LED	Color	Status	Description
Pwr	Green	Steady on	24VDC is present.
Rx	Yellow	Flicker	The module receives messages from the bus
Tx	Yellow	Flicker	The module sends messages on the bus
Fault	Red	Steady on	Functional error
		Fast blink	Network error: No messages received
		Slow blink	Network error: The module receives messages on the bus, but none to its own address
		Off	Module and outputs OK

Slow blink: 1 sec. on, 1 sec. off.

Fast blink: 2 blinks per second.

Section 3.04 Connection diagram



Chapter IV. Output modules

Section 4.01 Overview

The different output modules available are:

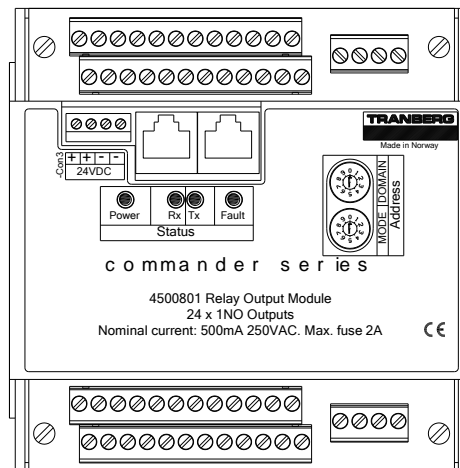
- **4500801**
Relay output module with 24 relays
- **4500802**
Relay input/output module with 24 optically isolated inputs and 24 relay outputs

Section 4.02 Bus master

The network needs a network controller. Depending on the settings on an output module, it can be set as a bus master. The bus master acts as a network controller, and coordinates the bus activity. There must be one, and only one, bus master on the network. For selecting the bus master, see the settings tables for each module.

Section 4.03 4500801

Relay output module with 24 relays. The relays are only to be used as pilot relays for larger relays/contactors that should do the actual circuit breaking. All relays are single pole, potential free, 'Normally Open' (NO) and rated at 500mA / 250VAC continuous.



Special Inputs / Outputs

Input	Function	Comment
Ext. Alarm Input	Alarm 1	Activates alarm relay and indicator 'Alarm 1' on panel. Available as both a 24VDC optically isolated input, or as a set of open contacts that upon closing will activate the alarm input.
Alarm Silence	Alarm silence	Silences the alarm. Available as both a 24VDC optically isolated input, or as a set of open contacts that upon closing will deactivate the alarm state.

Output no.	Terminals no.	Function	Comment
8	15 – 16	Power on	Active when system power is on.
16	31 – 32	Alarm	Active when the alarm input is activated.
24	47 – 48	Alarm ack.	Pulsed for 1 sec. after alarm silence input or silence button on panel has been activated.

Settings

The addresses of the modules are required to ensure proper operation. There are two dials labeled DOMAIN and MODE that set the address on each module. DOMAIN should be set to match that of the DOMAIN setting on the corresponding panel, while MODE should be set according to the table below.

Note that each module must have its own unique address on the network!

Do not change the addresses. If replacing a module, please ensure that the address of the new module is identical to the address of the old module.

Address settings:

Address	DOMAIN	MODE	Comments / labeling
	0	0	Do not use
1	1	1	Domain 1, columns 1, 2, and 3 in panel. Acts as a network controller / bus master
2	1	2	Domain 1, columns 4, 5, and 6 in panel.
3	1	3	Domain 1, column 7 in panel.
4	2	1	Domain 2, columns 1, 2, and 3 in panel.
5	2	2	Domain 2, columns 4, 5, and 6 in panel.
6	2	3	Domain 2, column 7 in panel.
7	3	1	Domain 3, columns 1, 2, and 3 in panel.
8	3	2	Domain 3, columns 4, 5, and 6 in panel.
9	3	3	Domain 3, column 7 in panel.
10	4	1	Domain 4, columns 1, 2, and 3 in panel.
11	4	2	Domain 4, columns 4, 5, and 6 in panel.
12	4	3	Domain 4, column 7 in panel.
13	5	1	Domain 5, columns 1, 2, and 3 in panel.
14	5	2	Domain 5, columns 4, 5, and 6 in panel.
15	5	3	Domain 5, column 7 in panel.
16	6	1	Domain 6, columns 1, 2, and 3 in panel.
17	6	2	Domain 6, columns 4, 5, and 6 in panel.
18	6	3	Domain 6, column 7 in panel.
19	7	1	Domain 7, columns 1, 2, and 3 in panel.
20	7	2	Domain 7, columns 4, 5, and 6 in panel.
21	7	3	Domain 7, column 7 in panel.

Slave mode

Slave mode can be used when two modules should react to the same button presses on a panel. Both modules' outputs will be equal, but the slave does not react to alarm input or alarm silence signals. The slave module does not send any feedback to the panel, and the status LEDs in the panel will therefore only reflect the Main Module's status.

To put a module in slave mode, follow these settings:

Mode (Main Module)	Mode (Slave Module)
1	4
2	5
3	6

Note: DOMAIN setting must be equal on both modules!

Status LEDs

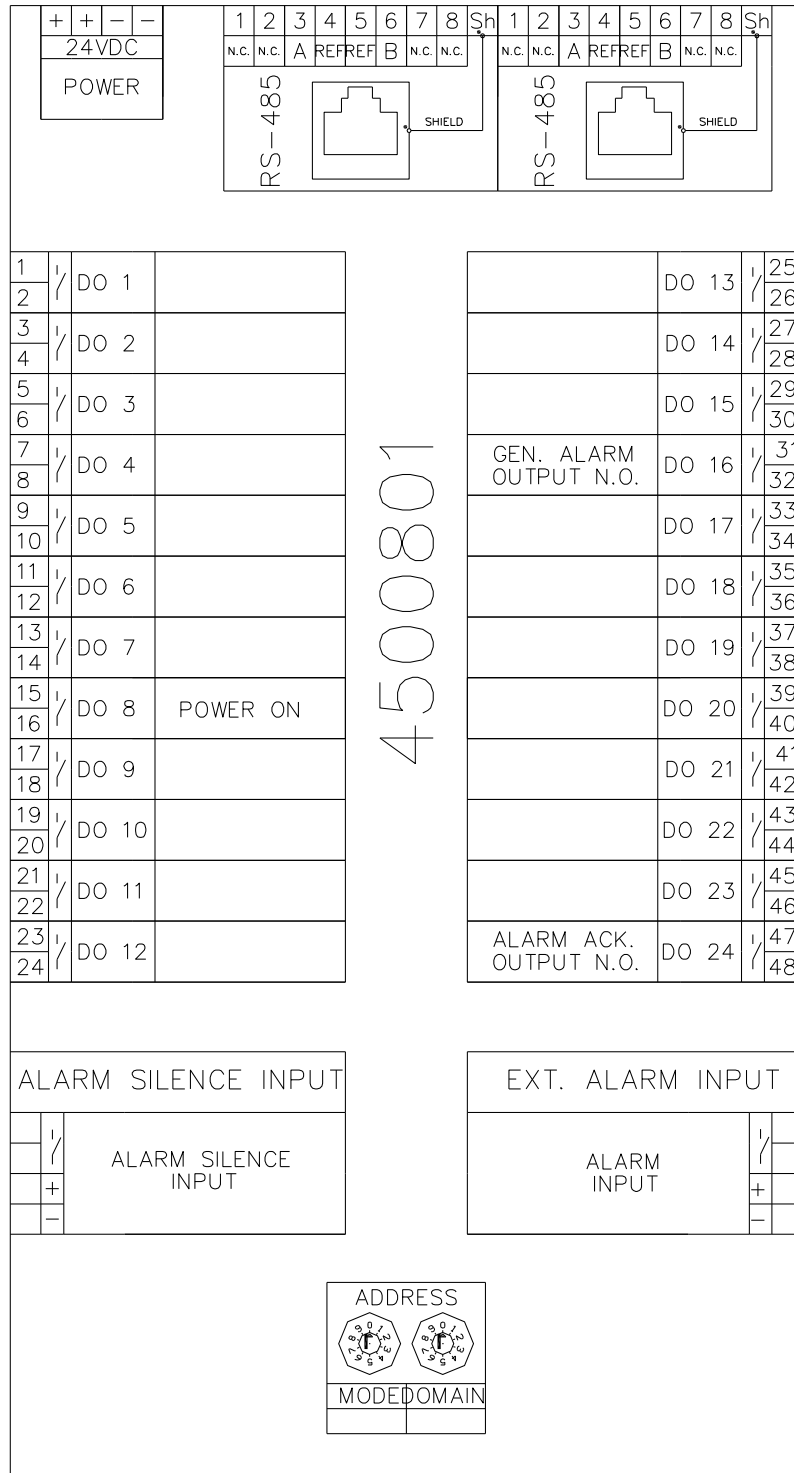
These LEDs are located on the top of the module.

LED	Color	Status	Description
Pwr	Green	Steady on	24VDC is present.
Rx	Yellow	Flicker	The module receives messages from the bus
Tx	Yellow	Flicker	The module sends messages on the bus
Fault	Red	Steady on	Functional error
		Fast blink	Network error: No messages received
		Slow blink	Network error: The module receives messages on the bus, but none to its own address
		Off	Module and outputs OK

Slow blink: 1 sec. on, 1 sec. off.

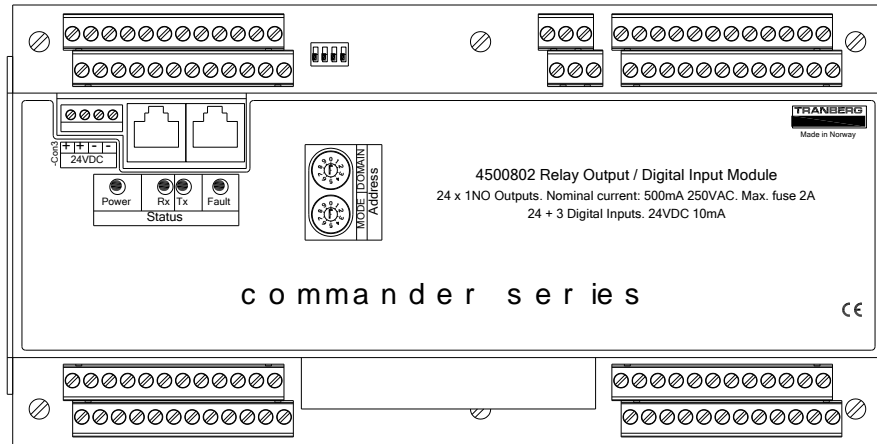
Fast blink: 2 blinks per second.

Connection diagram



Section 4.04 4500802

Relay input/output module with 24 optically isolated inputs, 24 relay outputs and 3 optically isolated alarm inputs. The relays are only to be used as pilot relays for larger relays/contactors that should do the actual circuit breaking. All relays are single pole, potential free, 'Normally Open' (NO) and rated at 500mA / 250VAC continuous.



Special Inputs / Outputs

Input no.	Terminals no. X3:	Function	Comment
25 / AL1	1 – 2	Alarm 1	Activates alarm relay and indicator 'Alarm 1' on panel.
26 / AL2	3 – 4	Alarm 2	Activates alarm relay and indicator 'Alarm 2' on panel.
27 / AL3	5 – 6	Wakeup alarm	Activates alarm relay and indicator 'Wakeup' on panel. Turns on power.

Input no.	Terminals no. X2:	Function	Comment
8	15 – 16	Power on	Falling edge toggles on or off.
16	31 – 32	Force power on	System is always on as long as this input is high.
24	47 – 48	Alarm silence	Rising edge silences the alarm

Output no.	Terminals no. X1:	Function	Comment
8	15 – 16	Power on	Active when system power is on.
16	31 – 32	Alarm	Active when the alarm input is activated.
24	47 – 48	Alarm ack.	Pulsed for 1 sec. after alarm silence input or silence button on panel has been activated.

Settings

The addresses of the modules are required to ensure proper operation. There are two dials labeled DOMAIN and MODE that set the address on each module. DOMAIN should be set to match that of the DOMAIN setting on the corresponding panel, while MODE should be set according to the tables below.

Note that each module must have its own unique address on the network!

Do not change the addresses. If replacing a module, please ensure that the address of the new module is identical to the address of the old module.

Address settings:

Address	DOMAIN	MODE	Comments / labeling
	0	0	Do not use
1	1	1 / 7	Domain 1, columns 1, 2, and 3 in panel. Acts as a network controller / bus master
2	1	2 / 8	Domain 1, columns 4, 5, and 6 in panel.
3	1	3 / 9	Domain 1, column 7 in panel.
4	2	1 / 7	Domain 2, columns 1, 2, and 3 in panel.
5	2	2 / 8	Domain 2, columns 4, 5, and 6 in panel.
6	2	3 / 9	Domain 2, column 7 in panel.
7	3	1 / 7	Domain 3, columns 1, 2, and 3 in panel.
8	3	2 / 8	Domain 3, columns 4, 5, and 6 in panel.
9	3	3 / 9	Domain 3, column 7 in panel.
10	4	1 / 7	Domain 4, columns 1, 2, and 3 in panel.
11	4	2 / 8	Domain 4, columns 4, 5, and 6 in panel.
12	4	3 / 9	Domain 4, column 7 in panel.
13	5	1 / 7	Domain 5, columns 1, 2, and 3 in panel.
14	5	2 / 8	Domain 5, columns 4, 5, and 6 in panel.
15	5	3 / 9	Domain 5, column 7 in panel.
16	6	1 / 7	Domain 6, columns 1, 2, and 3 in panel.
17	6	2 / 8	Domain 6, columns 4, 5, and 6 in panel.
18	6	3 / 9	Domain 6, column 7 in panel.
19	7	1 / 7	Domain 7, columns 1, 2, and 3 in panel.
20	7	2 / 8	Domain 7, columns 4, 5, and 6 in panel.
21	7	3 / 9	Domain 7, column 7 in panel.

The different modes of operation:

Domain	Mode	sw4	sw3	sw2	Description
0	0	x	x	x	Self test
1-7	1-3	off	off	off	Standard
1-7	1	off	off	ON	Power supply monitor
1-7	1-3	off	ON	off	Radio remote
1-7		off	ON	ON	-
1-7		ON	off	off	-
1-7		ON	off	ON	-
1-7		ON	ON	off	-
1-7		ON	ON	ON	-
1-7					-
1-7		off	off	off	-
1-7	7	off	off	ON	Motor protection

1-7		off	ON	off	-
1-7		off	ON	ON	-
1-7	7-9	ON	off	off	Monitor
1-7	7	ON	off	ON	Earth fault
1-7		ON	ON	off	-
1-7		ON	ON	ON	-

This switch can be used to invert the inputs, i.e. a high input will be treated as a low input and vice versa.

sw1	Input
Off	NOT Inverted
On	Inverted

Modes of operation

- **Self test**
This mode can be used to test each output relay. Each output is turned on in sequence, and then off again, before it starts over again.
- **Standard**
In this mode the outputs, in addition to be controlled by the panel, are controlled by the inputs. The inputs control the outputs in a toggle fashion, i.e. one pulse on the input turns the corresponding output on, while the next pulse turns it off. It is the negative going edge on the input that triggers the change in output. In this way, a simple pushbutton can be connected to an input to control the output. It also allows for the panel and inputs to function in parallel, i.e. a pulse on the input or a key press on the panel will both change the output.
- **Power supply monitor**
This mode monitors two inputs, 9 and 10. This can be used to control which power supply to be used under certain conditions. The inputs monitor supply 1 and 2. If one of them drops out, a signal can be given to switch supply.

Outputs 9 and 10 are mutually exclusive, 1 sec. switchover pause (break before make)

Input 9	Input 10	Output 9	Output 10
High	High	On	Off
Low	High	Off	On
High	Low	On	Off
Low	Low	On	Off

Input	Output	Description
9	9	Supply 1
10	10	Supply 2

If one of the inputs goes low, the Alarm acknowledge button will flash red, and the alarm buzzer will sound. When the Alarm acknowledge button is pressed, the buzzer will stop and the red LED will turn off.

- **Radio remote**
The radio remote mode is to be used with a 10 buttons / relays radio remote control. It will control the first 24 keys / outputs on a panel / module. The 10 relay outputs from the radio control are connected to the corresponding 10 first inputs on the I/O module. Inputs 1 – 8 functions the same way as the 8

first keys on the panel (first column), and key 9 and 10 on the radio control functions as shift keys selecting the next two key columns / outputs on the module, respectively.

- **Motor protection mode:**
When a button is pressed, the corresponding output is turned on, and the button starts flashing its green LED. After a delay of 3 seconds, the corresponding input is read. If the input is high, the button LED turns steady green. To turn the output off, press the button once more.

If the input is low, the button LED starts flashing red, and the buzzer will sound. The acknowledge/silence button needs to be pressed to silence the alarm, and all flashing LEDs will turn on steady. The outputs are not affected by an alarm, and pressing a button with a red LED will turn the output off (and silence the alarm).

A button with a steady green LED will start flashing red and the buzzer will sound if its input goes low.

- **Monitor**
In this mode, each button controls the corresponding output in a toggle fashion. The button LED is steady green when the corresponding input is low and steady red when the input is high.
- **Earth fault mode:**
Buttons control outputs as usual, with green LED indicating output is on. A high input indicates an error in that channel, and is indicated on the panel by the red LED. If the output is on when the error occur, the output will be turned off, the red LED in the button will flash and the buzzer will sound. The acknowledge/silence button needs to be pressed to silence the alarm. Then the red LED will turn on steady. If the output is off, the red LED will go directly to the steady on state, and no buzzer will sound. When the red LED is on or flashing, the output is not allowed to turn on. The red LED is controlled only by the input, it is not possible to turn it off by the button.

Status LEDs

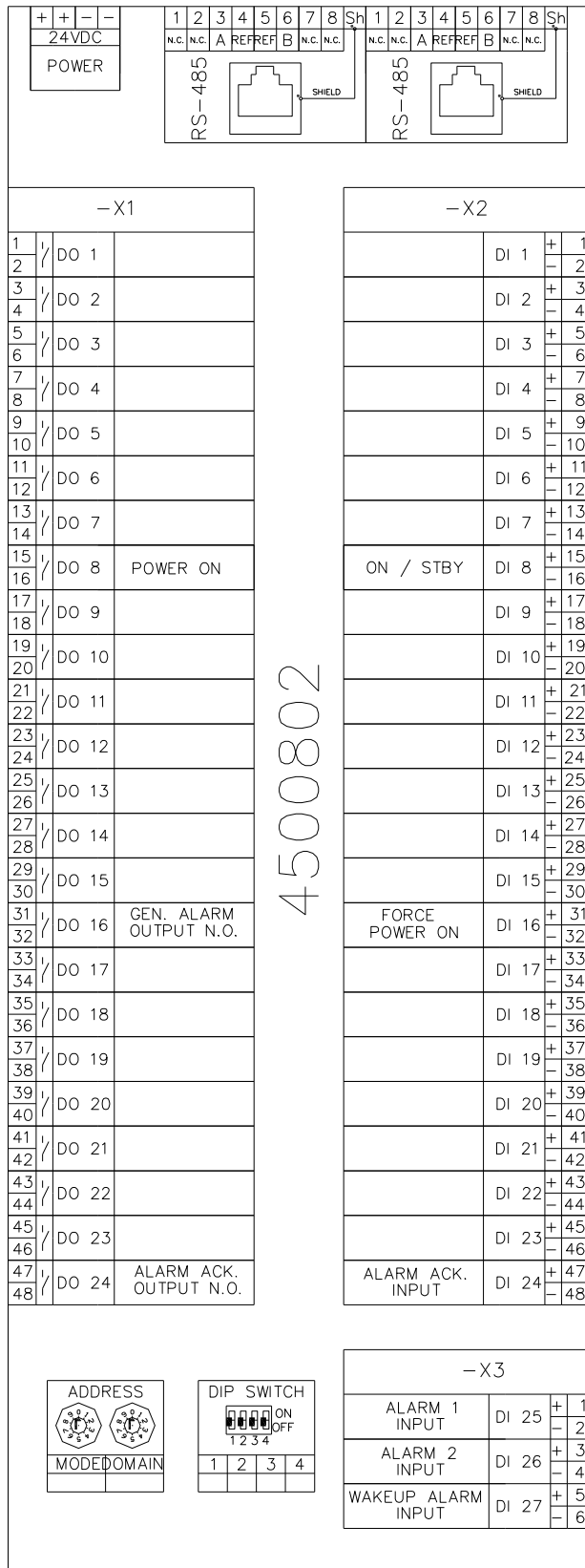
These LEDs are located on the top of the module.

LED	Color	Status	Description
Pwr	Green	Steady on	24VDC is present.
Rx	Yellow	Flicker	The module receives messages from the bus
Tx	Yellow	Flicker	The module sends messages on the bus
Fault	Red	Steady on	Functional error
		Fast blink	Network error: No messages received
		Slow blink	Network error: The module receives messages on the bus, but none to its own address
		Off	Module and outputs OK

Slow blink: 1 sec. on, 1 sec. off.

Fast blink: 2 blinks per second.

Connection diagram



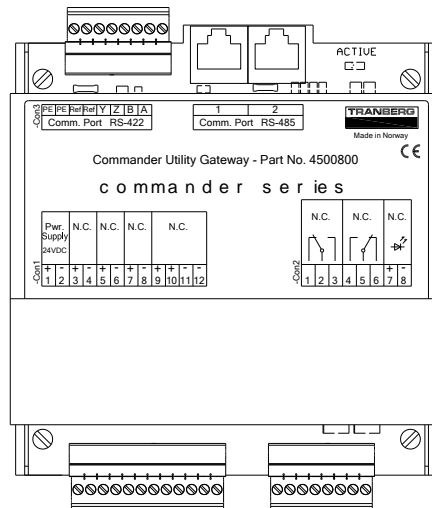
Chapter V. Serial Gateway

Section 5.01 Overview

The Commander Utility Gateway introduces a serial interface towards the Commander Utility network, and may be used together with a VDR/SCADA system. The gateway consists of two unidirectional interfaces, one in each direction. These communication channels operate independent of each other, and directly towards the internal bus communication and bus master.

It uses the RS-422 standard at 38400 baud with 8 data bits, no parity and 1 stop bit (8N1).

The Gateway has a predefined address on the bus, and therefore it doesn't need any settings setup.



Section 5.02 RS-422 Serial Interface

The gateway communicates with external equipment through its RS-422 interface at 38400 baud with 8 data bits, no parity and 1 stop bit (8N1).

A: TXD+
B: TXD-

Y: RXD+
Z: RXD-

Section 5.03 Node addressing

Maximum number of panels: 7

Maximum number of output modules: 21

Gateway node has a predefined address.

Each (main) panels address also gives the domain address for the panels and relay modules that are logically connected. An unused address is used as a broadcast address that every node on the network listens to.

Address	ASCII	Dec	Description
scada	'('	40	The scada node
broadcast	0	48	Broadcast domain
panel1	1	49	Domains
panel2	2	50	
panel3	3	51	
panel4	4	52	
panel5	5	53	
panel6	6	54	
panel7	7	55	
module01	A	65	1 + 0
module02	B	66	1 + 1
module03	C	67	1 + 2
module04	D	68	2 + 0
module05	E	69	2 + 1
module06	F	70	2 + 2
module07	G	71	3 + 0
module08	H	72	3 + 1
module09	I	73	3 + 2
module10	J	74	4 + 0
module11	K	75	4 + 1
module12	L	76	4 + 2
module13	M	77	5 + 0
module14	N	78	5 + 1
module15	O	79	5 + 2
module16	P	80	6 + 0
module17	Q	81	6 + 1
module18	R	82	6 + 2
module19	S	83	7 + 0
module20	T	84	7 + 1
module21	U	85	7 + 2

Section 5.04 Messages from gateway / system (VDR)

Typical message (ASCII):

```
$PTRA,E,1,0,#,1,FFFFFF*CC<CR><LF>
```

Where CC is a 2 digit ASCII hex checksum, MSB first.

Message format (comma separated fields):

No	Field	Bytes	Value	Comment
1	Header	1	'\$PTRA'	Always the same
2	Message command	1	'A' to 'H'	
3	Domain no.	1	'1' – '7'	

4	Domain status/request	1		
5	Channel no.	1		
6	Channel state/data	1		
7	Channels applicable	0, 2, 4, 6	ASCII hex	Optional (1, 8, 16, 24 channels, dependent on channel no.)
8	Checksum	2	ASCII hex	XOR of all characters between '\$' and '*', excluding '\$', '*' and comma delimiter ','.
9	Footer	2	<CR><LF>	
	Sum bytes:	8, 10, 12, 14		

2. Message commands:

Value	ASCII	Name	Comment
65	A	button	From panel
66	B	level input	Not used
67	C	current-sense	Not used
68	D	error-input	Not used
69	E	output-status	From relay module 4500801, state of relay outputs
70	F	helideck	Only used in 24 I/O module 4500802
71	G	multistate	Only used in 24 I/O module 4500802
72	H	sync	Only used in 24 I/O module 4500802

3. Domain number:

Possible domains are '1' to '7', '1' is normally used. Use '2' and more when connecting several systems on the same bus.

4. Domain status/request:

Status is sent out from relay-module no. 0 (for buttons 1 – 21) in each domain. Status req. (request) is sent out from the other modules in the system (for each domain). The relay module 0 determines the status after receiving the status request from the other modules in the domain. This is to avoid any ambiguities about the status.

No.	Status	Status req.	Power	Sound	Wake up	Alarm2	Alarm1	Comment
0	'/'	'O'	0	x	x	x	x	
1	'0'	'P'	1	0	0	0	0	
2	'1'	'Q'	1	0	0	0	1	
3	'2'	'R'	1	0	0	1	0	
4	'3'	'S'	1	0	0	1	1	
5	'4'	'T'	1	0	1	0	0	
6	'5'	'U'	1	0	1	0	1	
7	'6'	'V'	1	0	1	1	0	
8	'7'	'W'	1	0	1	1	1	
9	'8'	'X'	1	1	0	0	0	
10	'9'	'Y'	1	1	0	0	1	
11	':'	'Z'	1	1	0	1	0	
12	';'	'['	1	1	0	1	1	
13	'<'	'\'	1	1	1	0	0	
14	'='	']'	1	1	1	0	1	
15	'>'	'^'	1	1	1	1	0	
16	'?'	'_'	1	1	1	1	1	

5. Channel numbering:

The system can use up to 64 channels (input, output etc.) in one domain. These channels can be addressed in 4 different ways/group sizes: 24, 16, 8 and 1, depending on the value of the numbering byte:

Value	ASCII	Size	Bytes	Channels	Comment
33	'!'	24	6	0 – 23	
34	'"'	24	6	24 – 47	
35	'#'	24	6	48 – 71	64 – 71 is not used
36	'\$'	16	4	0 – 15	
37	'%'	16	4	16 – 31	
38	'&'	16	4	32 – 47	
39	' ''	16	4	48 – 63	
40	' ('	8	2	0 – 7	
41	')'	8	2	8 – 15	
42	'*'	8	2	16 – 23	
43	'+'	8	2	24 – 31	
44	','	8	2	32 – 39	
45	'-'	8	2	40 – 47	
46	'.'	8	2	48 – 55	
47	'/'	8	2	56 – 63	
49 - 112	'1' – 'p'	1	0	0, 1, 2, ..., 61, 62, 63	Consecutive values

The size used depends on the type of message and module. A button message from a panel uses size 1 identifying the channel relating to only that particular button, while a relay module with 24 output relays, uses a message with the status of all 24 outputs in one message.

6. Channel data:

The channel data shows the data (level or state) of the channel(s) indicated by the channel numbering byte.

7. Channel applicable:

This can be regarded as a bit mask showing the channels in the group for which the data is valid (high), and for which the data is not valid (low). The mask is represented as an ASCII hexadecimal value, MSB to the left. It can also be a data value, depending on the command.

Ex.: \$PTRAE,1,0,!1,0000A0*32 :

0000A0 (hex) = 0000 0000 0000 0000 1010 0000 (binary). The channel data ('1') in this message is valid only for channel 5 and 7 (channel 0 = least significant bit, to the right). '!' indicates channel numbers are 0 – 23.

(Note that outputs 7, 15 and 23 have special functions on relay module 4500801: 7 = power on/off, 15 = alarm on/off, 23 = alarm reset. See also the Commander utility user manual)

Section 5.05 Messages to system (SCADA)

The input port to the gateway must be recognized by the bus master (relay module with address set to 1) at power up. Therefore it is important that the gateway is power up before or at least at the same time as the bus master.

The 'ACTIVE' LED on the gateway will light up when the output port is online and ready to receive external commands. After receiving a command, it will switch off to indicate that the command is now processed. No further commands can be received in this period.

The typical use of the input port is to imitate a panel, sending buttons commands into the system.

Typical message (ASCII):

\$PTRA,A1053*CC

- button command (A)
- domain 1
- no change in status (0)
- button no. 5 has recently been released (3).

Message format:

No	Field	Bytes	Value	Comment
1	Header	1	'\$PTRA'	Always the same
2	NMEA comma	1	','	
3	Command message	5 or more	See below	Sent out on the internal bus
4	NMEA separator	1	'*'	
5	Checksum	2	ASCII hex	XOR of all characters between '\$' and '*', excluding '\$', '*' and comma delimiter ','.

Command message format:

No	Field	Bytes	Value	Comment
1	Message command	1	'A' to 'H'	
2	Domain	1	'1' – '7'	
3	Status / status request	1		'0' when no change
4	Channel no.	1		Button no.
5	Channel state	1		Depressed or released
6	Channels data	0, 2, 4, 6	ASCII hex	optional (1, 8, 16, 24 channels)

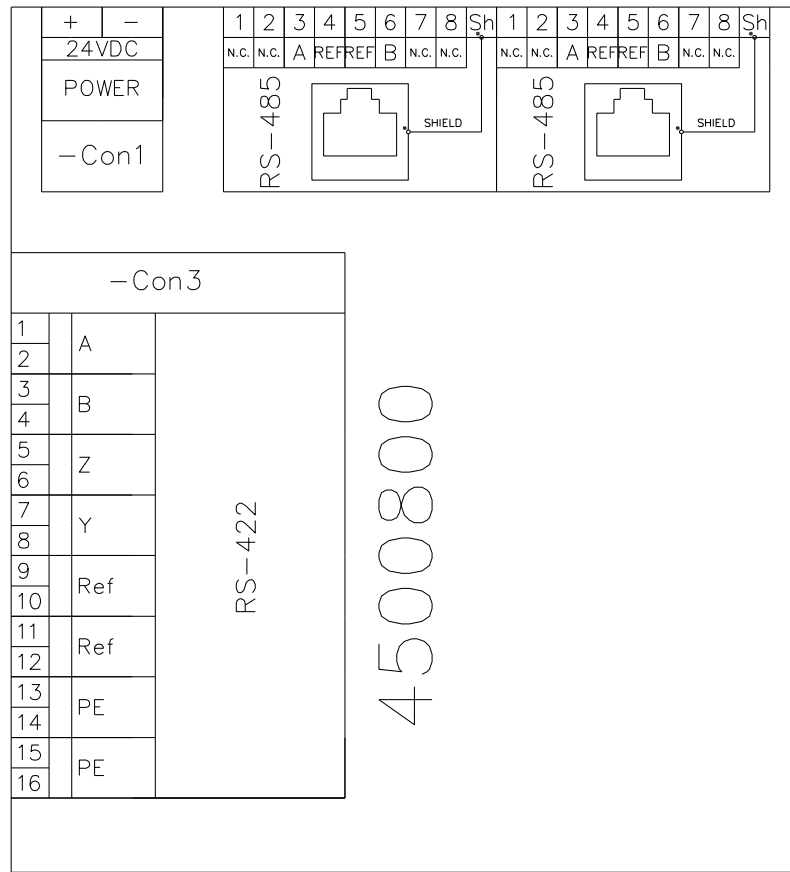
For commands and formatting, see previous chapter on output port (VDR).

The panel sends out the different states of the buttons. The relay module responds to a button release, a falling edge on the button. This will toggle the corresponding output relay.

ASCII	Level	Comment
'0'	low level	
'1'	high level	
'2'	rising edge	
'3'	falling edge	Button released

(When no buttons are operated, the panel sends a dummy message with '0' in channel and in state.)

Section 5.06 Connection diagram



Chapter VI. Installation

Section 6.01 Physical Placement

The panels 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.

Panels should be fixed to the bridge or similar place by means of four screws.

Modules should be mounted on a 35mm DIN-rail by using the spring-loaded clamp on the rear side of the module.

Section 6.02 Power cables

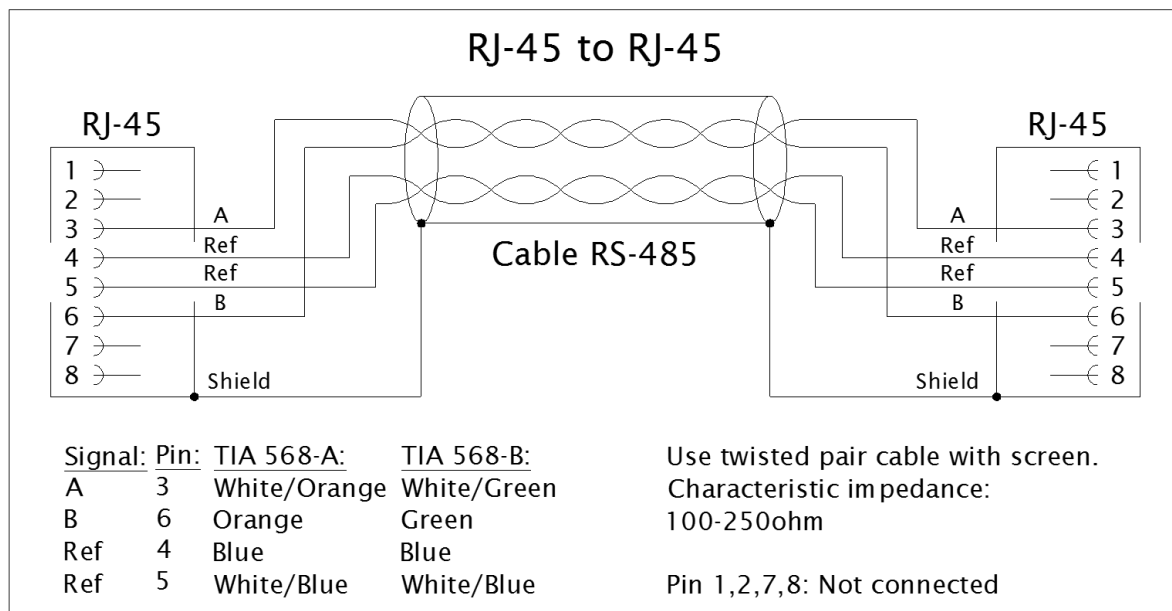
All modules should be powered from the same 24VDC supply. All modules have dual terminals, so they may be terminated in a daisy chain from module to module.

Use 0.5 – 1.0 mm² wires.

Section 6.03 Communication cables

All modules should be connected to the same physical network. All modules have dual RJ-45 terminals, and must be connected in a daisy chain from module to module. The communication cable must not be connected in a loop; it should always be end to end.

The communication cables should be shielded and have a minimum of 2 twisted pairs. Characteristic impedance: 100-250 ohm. Suitable cable types can be cables made for Profibus, Interbus, Ethernet, Cat5, Cat6, or similar.



Never use an end-of-line resistor in the network. The communication circuitry has built-in serial resistors in the A and B lines to avoid damage occurring from a short or similar.

Note: Keep communication cables away from power lines.

Section 6.04 Applying power for the first time

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

- Ensure all termination is correct and properly done.
- Ensure that all panels and output modules have the correct settings.
- Apply power to the power sources that feed the network. If supplied by different power supplies – power up the bus master last!

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

- All connected modules should light up a green LED (Power) indicating power is present.
- Each connected module is queried by the network controller, and as each module replies, a yellow LED (Tx) is lit up for a fraction of a second.

Section 6.05 Testing the system

Start the system testing:

- Turn the panel off by pressing the power button in the lower left corner for a couple of seconds. The backlit display will turn off and the yellow LED inside the power button will flash. When a panel is turned off, all corresponding outputs will be turned off on that DOMAIN. Even though the panel is turned off, all communication in the system continues. If there are more than one DOMAIN active on the network, turn off the other panels as well.
- Turn the panel(s) back on. The yellow LED in the power button will turn off, 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 according to the settings on the output module. If there is any unexpected behavior, check the wiring or configuration settings.
- Always refer to the system configuration and/or termination drawings when testing a system.

Section 6.06 Troubleshooting

If a failure is detected:

- Ensure that the settings on all panels and output modules are correct.
- Ensure that the output is terminated correctly.
- Check whether the corresponding output module responds to the action. It does so by flashing the Rx LED (yellow) rapidly, but it should also flash the Tx LED (yellow) 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. If supplied by different power supplies – power up the bus master last! Then start testing over again.

Network failures:

- If the yellow LED in the Power button in the panel is flashing fast, 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 red LED in an output module lights up, it is an indication that this particular module have no connection to the network. Possible reasons may be that the A and B lines are not connected or switched. If so, reconnect and try again.

LEDs in the panel turn on and off randomly:

- Ensure that there is only one master on the bus.
- If two or more masters are found, change settings and restart the system.

One or more columns on a panel are not functional:

- Remove power from the panel
- Write down the positions of both 'ADR' and 'DOMAIN' on the back of the panel before setting both of them to '0'.
- Reapply power
- Press a button in the rightmost column
- Remove power and set 'ADR' and 'DOMAIN' to the previous settings before reapplying power.

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

- Disconnect main power.
- Disconnect the terminal plugs to the module
- Disconnect the wires from the output module to the external power relays.
- 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 *Applying power for the first time* and *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 VII. Additional Information

Section 7.01 Technical Clarifications

Please contact TRANBERG AS regarding clarifications:

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