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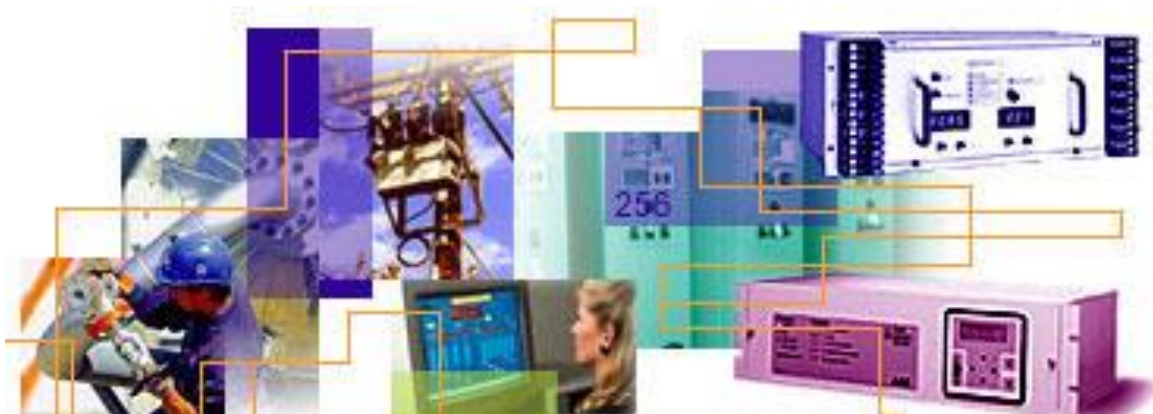
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Distribution Automation and Remote Control

COMTROLL 155

User's Manual



This document describes the COMTROLL 155 Remote Terminal Unit and Indicator Communication Unit. It provides all necessary information to set up and install the device in a COMTROLL Surveillance and Automation System. The document also gives a detailed hardware description.

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1. Introduction.

NORTROLL's system for distribution automation, called COMTROLL[®], is designed for remote control, surveillance and automation of secondary rural and urban distribution systems.

COMTROLL[®] is a modular system with different building blocks allowing the utilities to tailor a system to meet their own demands for functionality and complexity.

The COMTROLL[®] System consists of:

- * Fault passage indicators.
- * Software for remote control and surveillance of the network.
- * Outstations for remote operation of overhead line and underground cable switchgear.
- * Interface for easy integration of the ComTroll system with other SCADA systems.

The system consists of a wide range of RTU's for motorized switchgear and reclosers, as well as actuators for overhead line switches. ComTroll Surveillance and Automation System (S.A.S) can be configured as a stand-alone system or as an integrated part of a SCADA system. Fault Passage Indicators can be integrated in the system. Either as stand-alone or connected to a RTU for both overhead and underground fault locations.

This document covers the set up and operation of the ComTroll 155. The device comes in two different hardware versions. The RTU is used in applications where the intention is to drive an actuator and have local controls available.

The ICU is primary for use as a communication interface to Fault Indicators, but can also be used as a Remote Terminal Unit where local controls are not required.

For detailed descriptions of NetTroll Remote Control and Surveillance Software with automation plug-ins, see separate documentation.

2. Hardware overview

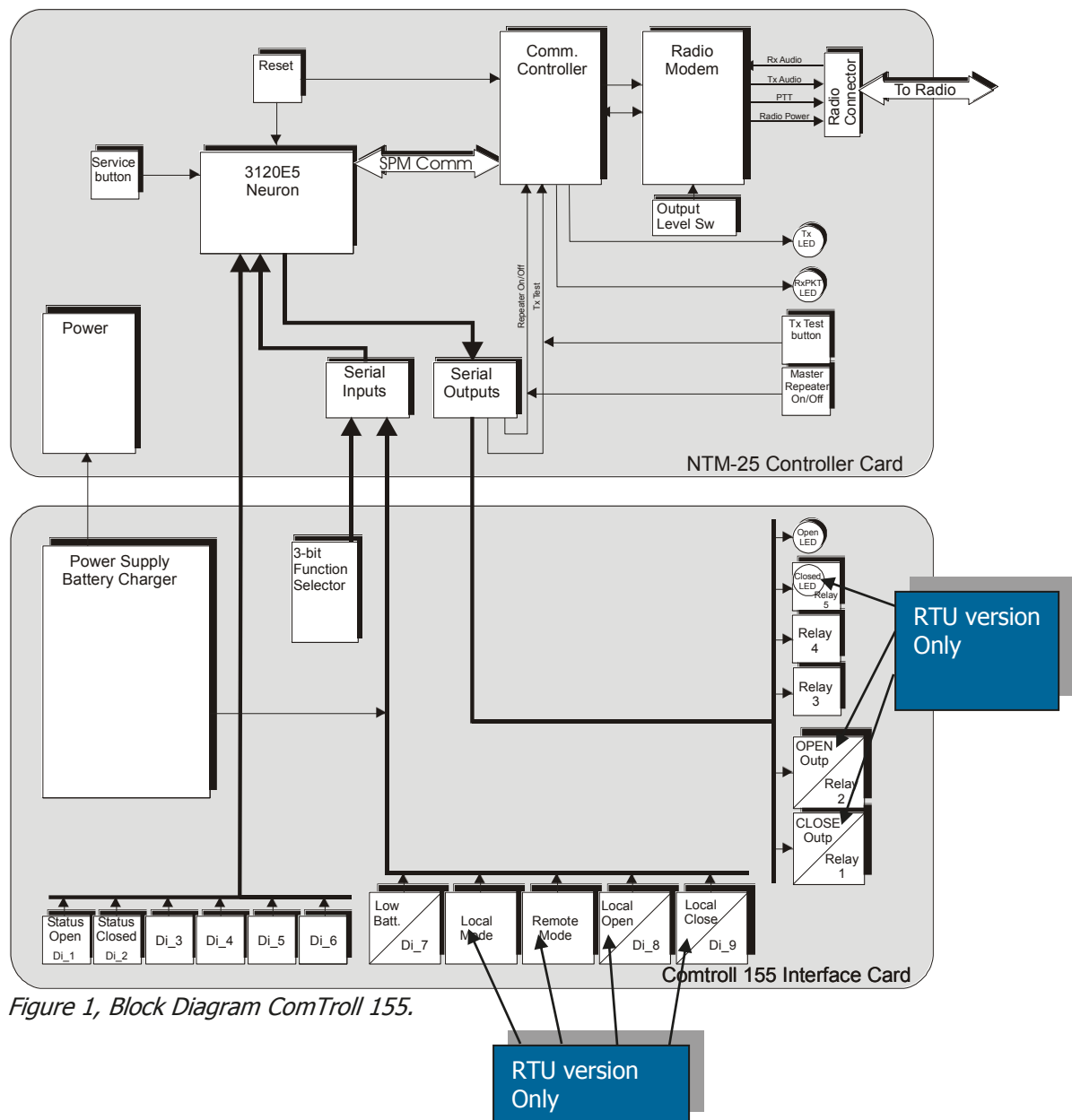
Block Diagram

ComTroll 155 is available in two different hardware versions.

- ComTroll 155 RTU
- ComTroll 155 ICU

Mode Switch and local command buttons on the front identify the RTU version. The ICU version has no controls or indications on the front panel.

See block diagram, applicable for both versions in figure 1.



Digital Inputs

There are two categories of digital inputs in ComTroll 155 RTU/ICU:

Parallel inputs:



Figure 2, Parallel Inputs.

When a change occurs on these inputs, the new status will be reported back to the Central Unit immediately.

The common input reference can be individually set for each input, or connected to GND by setting SW2 ON.

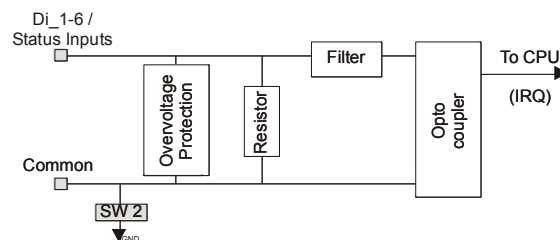


Figure 3, Parallel Input circuitry.

Serial Inputs:



Figure 4, Serial Inputs.

In the RTU version, Di_7 and Di_9 are used for the local controls (Close / open button in the front). In RTU versions where there are no local controls or indications, these inputs can be used as general digital inputs.

Low Battery Indication is given both for RTU and ICU. This indication can be switched off by SW1,1 and the input used for other purposes. (ON = Low Battery Indication activated).

The common input can be individually set for each input, or connected to GND by setting SW1 ON.

When the RTU is in Remote Mode, the controller reads these inputs every 4th second. This means that a pulse shorter than 3 seconds, will not be detected by the controller. In Off- or Local Mode, this time is set to 500 ms.

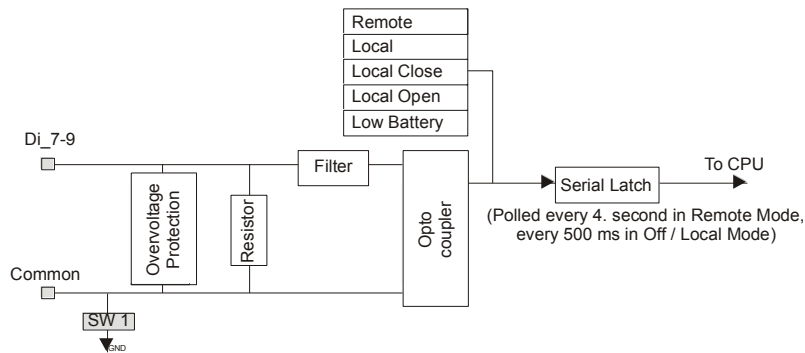


Figure 5, Serial Input circuitry.

Setting up the hardware prior to installation

There are some settings to be made before the installation can start in order to ensure correct operation. The DIP switch location is shown in the picture on page 9.

1. Radio Output Level.

The setting is dependant upon the radio model and frequency. The correct setting is made during final assembly & test in the factory, and it is normally not necessary to change this setting. The setting should however be checked before installation. Refer to NORTROLL AS for correct settings.

2. Master Repeater Switch

During installation, this switch must always be OFF. Setting this switch ON, enables the Repeater function. Before the repeater is switched ON, the addressing table must be set using NetLoad 3.

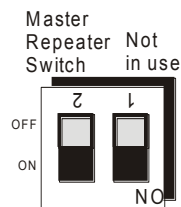


Figure 6, Master Repeater Switch.

3. Common Input Reference, Di_1 to Di_6.

The common inputs can be set individually or connected to Ground.

(Same as battery -). The setting is made by SW2 as follows:

When Switch is ON, the corresponding digital input common is set to GND.

When Switch is OFF, the common reference must be set externally on the connector block.

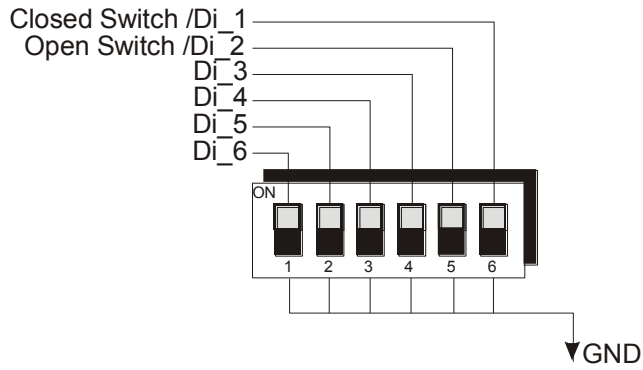


Figure 7, Setting the common input reference Di_1 to Di_6.

4. Digital Output Settings

In order to drive an actuator, the RTU version is fitted with two 16Amp relays. To activate these relays, all SW positions must be set ON. In the ICU version, all positions should be set to OFF. The connection is as shown in the figure below.

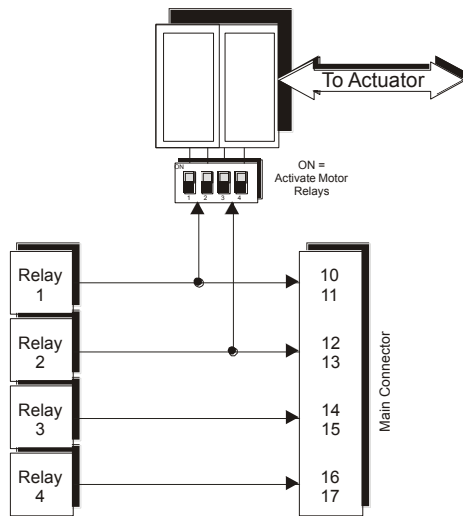


Figure 8, Digital outputs.

5. Common Input Reference, Di_7 to Di_9.

The meaning of each switch is as shown in figure KK.

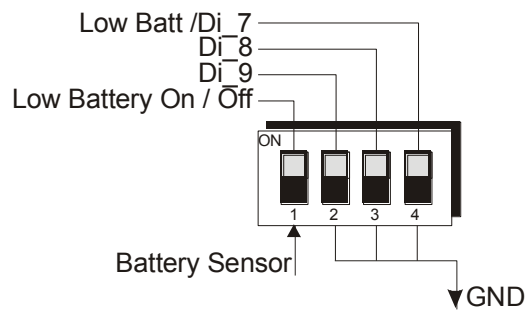
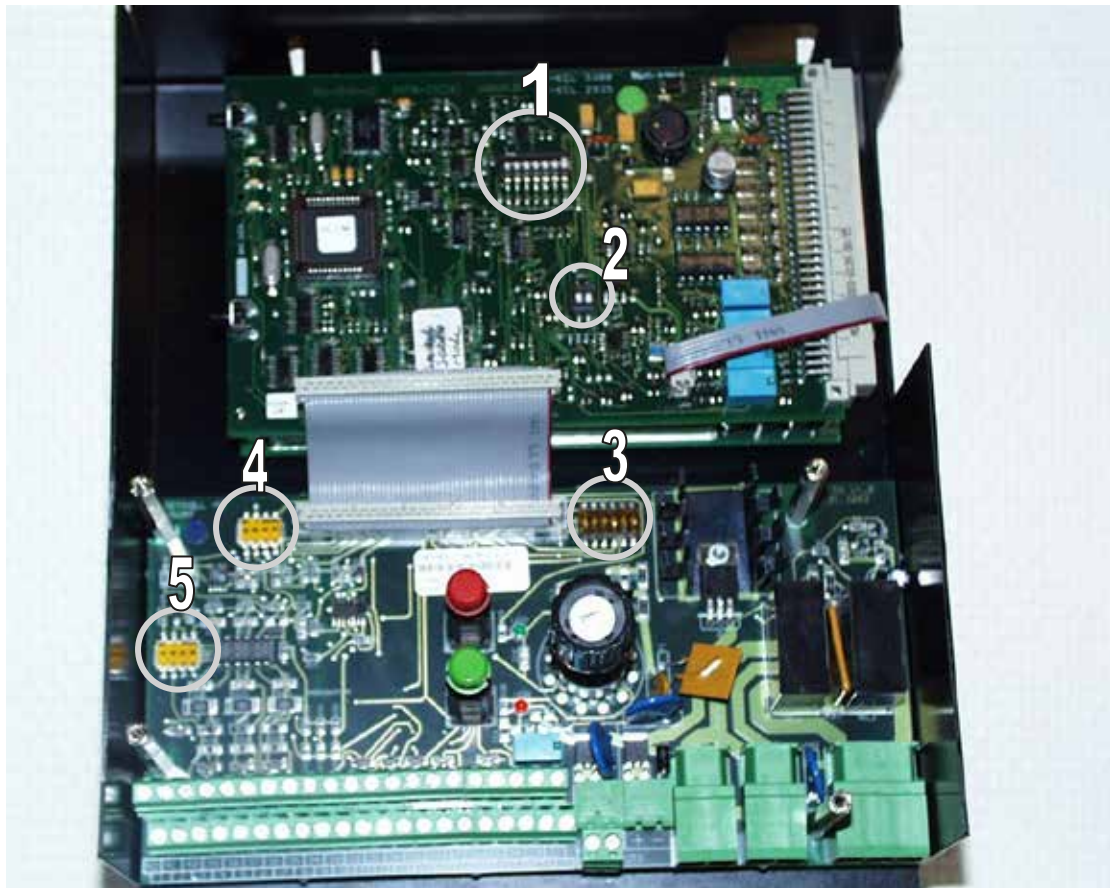


Figure 9, Common input reference Di_7 to Di_9.

Electronics overview

The numbers shown on the picture refers to the section above.

1. Radio Output Level.
2. Master Repeater Switch.
3. Common Input Reference, Di_1 to Di_6.
4. Digital Output Settings.
5. Common Input Reference, Di_7 to Di_9.



Picture 1, Location of the DIP switches.

Connections

The figure below shows where to find the different connectors. The Table lists all connections on the input/output connector block.

Detailed connection diagrams are shown in separate documentation.

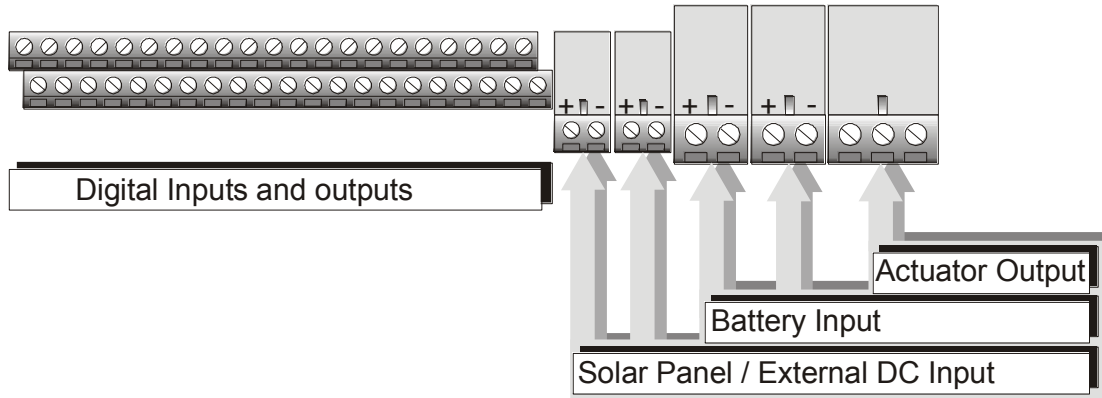


Figure 10, Connectors

Pin No	Meaning	Pin No	Meaning
1	12V Output	22	Relay Output 5 NO
2	Digital Input 9 / Local Close	23	Relay Output 5 NC
3	Di_9 Common	24	Digital input 6 COMMON
4	12V output	25	Digital input 6.
5	Digital Input 8 / Local Open	26	12 volt Output
6	Di_8 Common	27	Digital input 5 COMMON
7	12V output	28	Digital input 5.
8	Digital Input 7 / Low Battery	29	12 volt Output
9	Di_7 Common	30	Digital input 4 COMMON
10	Relay Output 1a	31	Digital input 4.
11	Relay Output 1b	32	12 volt Output
12	Relay Output 2a	33	Digital input 3 COMMON
13	Relay Output 2b	34	Digital input 3.
14	Relay Output 3a	35	12 volt Output
15	Relay Output 3b	36	Closed /Di_2 Input COMMON
16	Relay Output 4a	37	Closed / Di_2 input
17	Relay Output 4b	38	12 volt Output
18	12 Volt output	39	Open / Di_1 Input COMMON
19	GND	40	Open / Di_1 input
20	Relay Output 5 Common	41	12 volt Output
21	GND	42	Not Connected

3. Operation

ComTroll 155 RTU Commands

ComTroll 155 RTU has four relay outputs.

- ❑ Command Switch OPEN *Associated with Open and Close digital Inputs*
- ❑ Command Switch CLOSE *Associated with Open and Close digital Inputs*
- ❑ Auxiliary Relay 1
- ❑ Auxiliary Relay 2

The available commands implemented in ComTroll 155 RTU are listed below:

Executed when Mode Switch are in:	Command description	Additional information
Remote	Command Switch OPEN	This command will set the OPEN command relay and the actuator will start the operation. The relay resets and the actuator stops when the OPEN limit switch is activated. If the new status is not reached within 30 sec the command will timeout and reset the relay.
Remote	Command Switch CLOSE	This command will set the CLOSE command relay and the actuator will start the operation. The relay resets and the actuator stops when the CLOSED limit switch is activated. If the new status is not reached within 30 sec the command will timeout and reset the relay.
Remote	Set Auxiliary Relay 1	Receiving this command, the unit will set a 1 sec pulse on the auxiliary relay 1.
Remote	Set Auxiliary Relay 2	Receiving this command, the unit will set a 1 sec pulse on the auxiliary relay 2.
ALL	Set Tx Test ON	The unit sends a 5 second test tone. Used for radio signal measurements.
ALL	Set Repeating Tx Test ON	The unit sends a 5 second test tone followed by a 20 second pause. This sequence is repeated until "Set Repeating Tx Test OFF" is received, or device is reset.
ALL	Set Repeating Tx Test OFF	Turns the repeating Tx Test tone OFF. Note! This command must be sent when the Tx Test tone is in its 20 sec pause. If not, the command will not be executed.
ALL	Set Repeater ON	Enables the unit to be used as a repeater.

		Note! The Domain and Subnet Filter in the repeater must be set prior to this command. Use NetLoad 3 to set the Domain and Subnet that shall be repeated. The Repeater Master Switch must be set to ENABLED for this command to be executed. IMPORTANT! The unit itself must not be installed in a subnet repeated by the repeater!
ALL	Set Repeater OFF	Turns the repeater function OFF. If Master Repeater Switch is set to ON, the repeater will be enabled after a reset / power-up.
ALL	Communication Test	The unit will send an Acknowledge Message upon reception of this message. No digital status is sent back from the unit. Not applicable when UNACKED Message Service is used.
ALL	Status Check	The unit will read all digital inputs and transfer the status back to the Central Unit.

For detailed description of how to assign user defined message texts for the above commands, please refer to the NetTroll User Guide.

ComTroll 155 RTU Indications

When a digital input event is detected (transition on any of the digital inputs including the Mode Switch), the unit will send a Network Variable to report the new status. The Network Variable contains status information on all digital inputs.

This means, if e.g. the operator set the Mode Switch from Remote to Local, all digital inputs are scanned and the actual status on all digital inputs is sent at the same time, in the same Network Variable.

The Open (Di_8) and Close (Di_9) digital inputs are in parallel to the buttons on front panel.

See Nortroll Network Protocol Description (NNP) for further details regarding Network Variable structures.

ComTroll 155 RTU Local Controls and Indications

With the Mode Switch in REMOTE, only commands sent from the Central Unit are executed. In the LOCAL mode, OPEN and CLOSE commands can be issued from buttons on the front of the unit. In OFF, no commands are executed.

It is not possible to operate the Auxiliary relays locally.

The two LED's, indicating the Switch Status (Open or Closed) are OFF when the unit is in REMOTE mode. The LED corresponding to the actual switch state is switched ON, and a Network Variable Update is sent, approximately 3 sec after the Mode Switch is set to LOCAL mode.

The LED's will stay ON when Mode Switch is set to OFF.

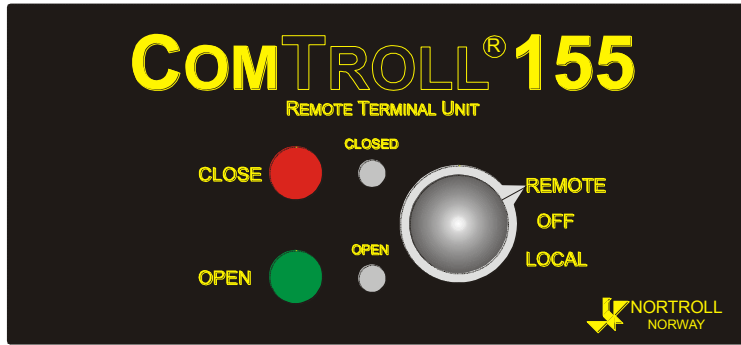


Figure 11, Local controls and indications.

ComTroll 155 ICU Commands

ComTroll 155 ICU has five relay outputs.

- Relay 1
- Relay 2
- Relay 3
- Relay 4
- Relay 5

The available commands implemented in ComTroll 155 ICU are listed below:

Executed when Mode Switch are in:	Command description	Additional information
N/A	Set Relay 1	The relay output is normally open. This command will give closed contacts on the outputs of Relay 1 for 1 second.
N/A	Set Relay 2	The relay output is normally open. This command will give closed contacts on the outputs of Relay 2 for 1 second.
N/A	Set Relay 3	The relay output is normally open. This command will give closed contacts on the outputs of Relay 3 for 1 second.
N/A	Set Relay 4	The relay output is normally open. This command will give closed contacts on the outputs of Relay 4 for 1 second.
N/A	Set Relay 5	The relay output is has both the NC and NO contacts available. The contacts will change status for 1 second receiving this command.
N/A	Set Repeating Tx Test ON	The unit sends a 5 second test tone followed by a 20 second pause. This sequence is repeated until "Set Repeating Tx Test OFF" is received.

N/A	Set Repeating Tx Test OFF	Turns the repeating Tx Test tone OFF. Note! This command must be sent when the Tx Test tone is in its 20 sec pause. If not, the command will not be executed.
N/A	Set Repeater ON	Enables the unit to be used as a repeater. Note! The Domain and Subnet Filter in the repeater must be set prior to this command. Use NetLoad 3 to set the Domain and Subnet that shall be repeated. The Repeater Master Switch must be set to ENABLED for this command to be executed. IMPORTANT! The unit itself must not be installed in a subnet repeated by the repeater!
N/A	Set Repeater OFF	Turns the repeater function OFF.
N/A	Communication Test	The unit will send an Acknowledge Message upon reception of this message. No digital status is sent back from the unit. Not applicable when UNACKED Message Service is used
N/A	Status Check	The unit will read all digital inputs and transfer the status back to the Central Unit.

For detailed description of how to assign user defined message texts for the above commands, please refer to the NetTroll User Guide.

ComTroll 155 ICU Indications

When a digital input event is detected (transition on any of the digital inputs including the Mode Switch), the unit will send a Network Variable to report the new status. The Network Variable contains status information on all digital inputs.

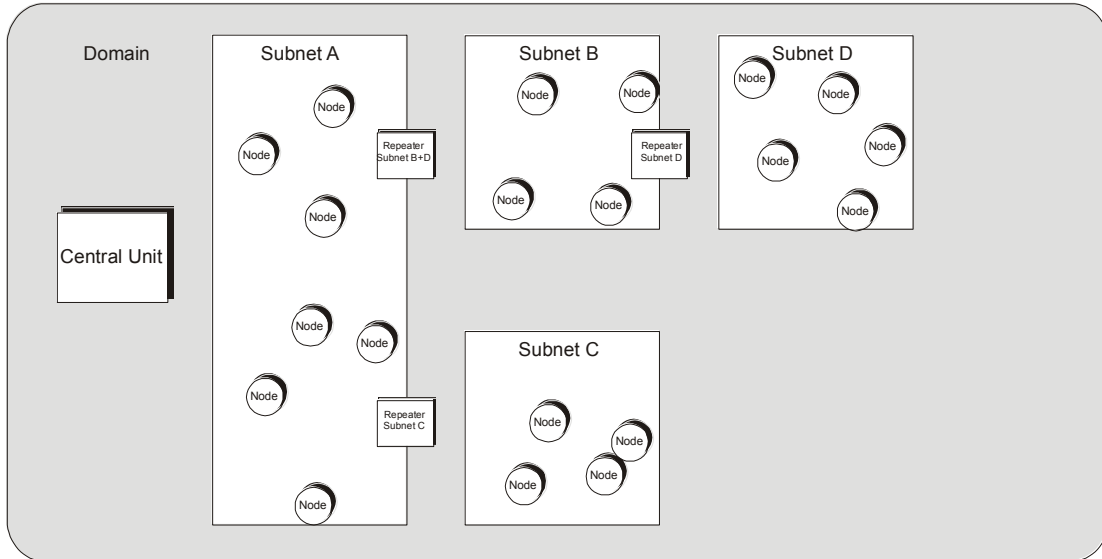
This means, if e.g. Di_2 is changed, all digital inputs are scanned and the actual status on all digital inputs is sent at the same time, in the same Network Variable.

See Nortroll Network Protocol Description (NNP) for further details regarding Network Variable structures.

ComTroll 155 Repeater

All ComTroll 155 versions can be programmed as store-and-forward repeaters. The RTU/ICU functionality is unaffected by the repeater settings.

The repeater filters messages on Domain- and Subnet (or groups of subnets) address. The address setting in the repeater is programmed in the communication setup in the Neuron.



IMPORTANT! **The unit itself must not be installed in a subnet repeated by the repeater!**

The Master Repeater Switch must be set to ENABLED to set the unit as repeater. (See picture 1).

When the Master Repeater Switch is OFF (Disabled), it is not possible to turn the repeater function ON by sending a command from the Central Unit.

When the Master Repeater Switch is ON (Enabled), the repeater is set to ON during power-up. It is not necessary to set it ON from the Central Unit.

When Network Management commands are sent, repeaters not involved in the communication path can be switched OFF from the Central Unit.

E.g., if a Replace command is executed on subnet C, the repeater for subnet B and D should be switched OFF during the operation.

The repeater can be switched ON again by sending a command from the Central Unit. It is also set ON after a reset.

When the ComTroll 155 Repeater is installed in NetTroll, a separate device type should be created for each device.

4. Technical Specifications

Solar Panel Input /Ext. DC Input:	14 – 24 Vdc.
Relay output maximum rating:	0,5A@1200Vac, 1,0A@24Vdc.
Supply Voltage /Battery Input:	Min 12 Vdc, Max 15 Vdc
Power Consumption (@12Vdc Input):	15 mA excl. radio. 37 mA incl. NTR-10 radio.
Maximum charging current:	3A.
Design Standard:	Nortroll QA Handbook.
Mechanical outline:	300x201x65 [mm] (H x W x D).
Temperature, operational:	- 40 °C to +70 °C.
Temperature, storage:	- 55 °C to + 125 °C.

For radio details, see separate documentation.