Unicont SPb Ltd

NMEA Data Combiner
NC-117

Operation Manual
(117-2-250215)

St. Petersburg
2015

V.1.0

TABLE OF CONTENTS

1.   GENERAL INFORMATION

The NC-117 Data Combiner is designed to receive messages from NMEA0183 - compatible sources over 8 RS-232/422 inputs and 1 USB port, combine acquired messages in various combinations according to user settings and transmit them from 4 RS-232/422 outputs or one USB port to receivers compatible with NMEA 0183 protocol.

In addition, the combiner understands NMEA, beginning with a $ or ! or # and and coming to end CR и LF and , provides the capability to receive and combine messages compatible with other applicable standards (of serial communication links) provided that these messages include such symbols as "Carriage Return" and/or «Line Feed» (CR and LF, correspondingly).

2.   SET OF DELIVERY

Data Combiner NMEA type NC-1171	1 pc
Operation Manual	1 copy
CD with drivers (the unit may be connected to PC's USB port)	1 pc

3. SPECIFICATION

Electrical parameters:

Supply voltage	9 to 36 VDC
Power consumption	max 7 W
Galvanic isolation between combiner and power supply	yes
Overvoltage protection	- overvoltage - supply voltage polarity doesn't matter

Operating parameters:

Weight	max 0.7 kg
Overall dimensions	194 x 117 x 29 mm
Protection class	IP 22
Operating temperature	-15 to +55 °C
Storage temperature	-60 to +70 °C

I/O characteristics:

Number of inputs	8xRS-232/422 + USB
Number of outputs	4xRS-232/422 + USB
Baud rate (input/output)	individually selectable from 2400 bit/s to 115200 bit/s for each port
Signal data format	NMEA 0183 versions 1 to 3 (IEC 61162-1, 61162-2) or other serial data transmission signals
Opto-isolation (inputs)	yes
Galvanic isolation (outputs)	yes
Message combining	selectable for each output port
Input ports polling priority	selectable for each output port
Delay of input port polling	selectable for each output port
NMEA option	selectable for each output port
NMEA header setting	for each output port
Number of polled input ports	selectable for each output port

4.   PRINCIPLE OF OPERATION

The NC-117 Data Combiner receives NMEA messages over In1 to In8 inputs and USB (refer to p. 5), then combines acquired messages according to user settings and output them through Out1 to Out3 ports and USB-port. Baudrate settings and message combining settings are selectable by user on the built-in keyboard and LCD display, see Figure 1.
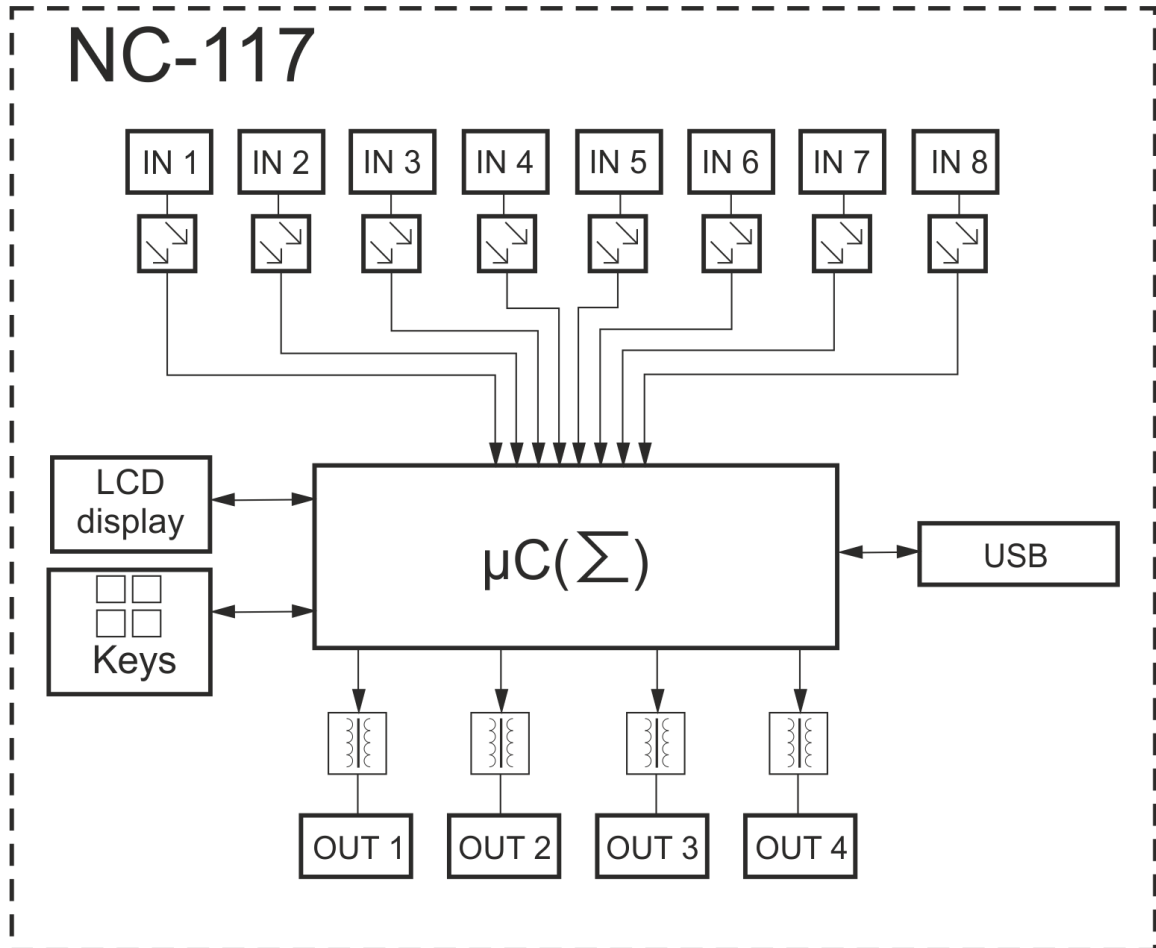
Figure 1 For examples of settings and corresponding data receive/transfer methods

Figure 2. Layout of inputs/outputs, controls and indicators.

4.1 Input port setup

User menu allows setup of input/output ports of the data combiner. Press "Menu" button to display status of channel activity. Once the button is pressed, the data combiner opens port selection screen (inputs/outputs).

```
INPUTs
OUTPUTs
```

Press "Menu" button.

```
INPUTs
```

Press "Set"» («↵»).

4.2 . Choice of a selected port.

Use the buttons «▼» and «▲» to select the desired port.

```
IN 1   CRCoff
9600,1,NONE
```

Press "Set" button.

Press buttons «▼» and «▲» to select desired setting (Baud rate setting enables to specify data transfer rate in both directions, Stop-bit setting enables to specify number of stop-bits, Parity setting enables to specify parity check, CRC chk setting enables to specify checksum function parameter and Get from setting enables to specify message combining function parameters), then press «Set» button. Next actions depend on selection made in this point.

Note: when required to return to port selection screen, press «Menu» button. If required to exit from port selection screen to inputs/outputs status indication screen, press "Menu" button.

4.3 Baud rate setting

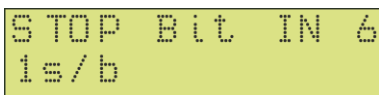When baud rate settings are selected, the LCD display shows the following:

```
BAUDRATE  IN  1
2400
```

Use «▼» or «▲» button to select the desired value for baudrate setting from available: 2400, 4800, 9600, 14400, 19200, 28800, 38400, 57600, 76800, 115200. Press "Set" button. The data combiner saves selected baud rate in non-volatile memory, then it switches to selection screen.

Note: If required to cancel the selection (without saving selected value), press «Menu» button to return to selection screen.

4.4 Stop-bit Setting

When stop-bit setting is selected, the LCD display shows:
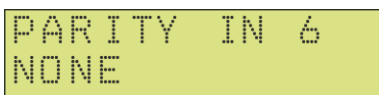
```
STOP  Bit  IN  6
1s/b
```

Using «▼» or «▲» button, s

elect the desired number of stop-bits, than press "Set" button to save the setting. After that, the data combiner switches to selection screen.

Note: If required to cancel the selection (without saving selected value), press «Menu» button to return to selection screen.

4.5 Parity Setting

When parity setting is selected, the LCD display shows the following:

```
PARITY  IN  6
NONE
```

Use «▼» or «▲» button to select the desired value for parity check (No – function disabled, Even – even, Odd – odd), then press «Set» button to save the setting. After that, the data combiner switches to selection screen.

Note: If required to cancel the selection (without saving selected value), press «Menu» button to return to selection screen.

4.6 CRC check setting

When CRC check setting is selected, the LCD display shows the following:

```
CHECK SUM IN 6
OFF
```

Use «▼» or «▲» button to select the desired setting (ON – function enabled, OFF – disabled), then press «Set» button to save the setting. After that, the data combiner switches to selection screen.

Note: If required to cancel the selection (without saving selected value), press «Menu» button to return to selection screen.

Attention! When enabled, checksum function provides validity check for data and NMEA messages and ensures no errors. However, for signals compliant with standard NMEA0183 ver. 1 or any other signals that differs from NMEA 0183 ver. 2, the NC-117 combiner will ignore any received messages, if checksum function is enabled.

4.7 Get from function setting

When Get from setting is selected, LCD display shows the following:
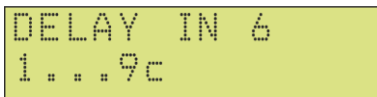
```
PRIORITY IN 6
PRIORITY Lv
```

When required to select the desired priority, press «▼» or «▲» button. Press «Set» button to save the selected priority. After that, the data combiner switches to selection screen.

4.8 Port Polling Delay Setting according to priority

When polling delay is selected, LCD display shows the following:

```
DELAY IN 6
1...9c
```

When required to select the desired delay time, press «▼» or «▲» button. Press «Set» button to save the selected delay time. After that, the data combiner switches to selection screen.

4.9 Output port setting

Select settings of output ports using the same procedure as for input ports, see p.p. 4.1-4.7.

4.10   Get from setting

The combiner NC-117 operation algorithm provides flexibility of data acquisition setting for subsequent data transmission using output channels. A specific data acquisition procedure can be selected for each of channels: Out1, Out2, Out3, Out4 and USB.

This setting (Get from) can be selected only for outputs (Out1 - Out4 and USB).

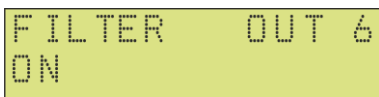When Get from setting is selected, LCD display shows the following:

```
GET FROM OUT 6
1 _ 3 _ 5 6 7 _ 9
```

The lower line on LCD display shows numbers of those inputs which will be used to receive data. Data acquired over these channels will be sent from current output. Non-active input channels (i.e. channels that will not be used by combiner for data acquisition) are indicated by "_".

4.11   Data Filtering Setting

When data filtering setting is selected, LCD display shows the following:
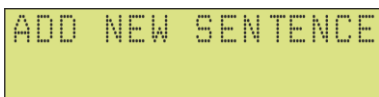
```
FILTER    OUT 6
ON
```

When required to select ON or OFF for the desired port filter, press «▼» or «▲» button. Press «Set» button to save the selected port filter. If setting "Filter OFF" is selected, the further settings are not active. Press "Menu" button to return to selection screen.
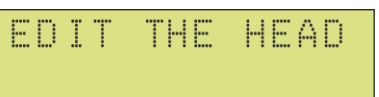
4.12   NMEA sentence adding

When NMEA sentence adding setting is selected, LCD display shows the following:

```
ADD NEW SENTENCE
```

Press "Set" button. LCD display shows the following:
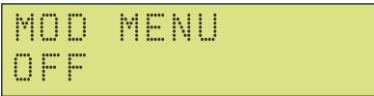
```
EDIT THE HEAD
```

When required to ON or OFF for the desired function, press «▼» or «▲» button, to add or not to add sentence heads transmitted to output port or not be transmitted in dependence on data filter setting.
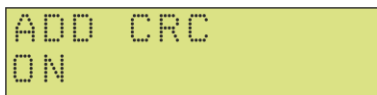
4.13   "Mod menu" setting

When "Mod menu" setting is selected, LCD display shows the following:
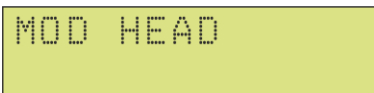
```
MOD MENU
OFF
```

When required to select ON or OFF "Mod menu" setting, press «▼» or «▲» button. When "Mod menu" setting is ON (or OFF), switch to NMEA CRC, then select ON or OFF to add CRC to NMEA sentence.

```
ADD CRC
ON
```

If CRC setting is of no importance, use «▼» or «▲» buttons to enter the setting "Mod head". This setting may be used, when the combiner is connected to the units that use different NMEA header versions:

```
MOD HEAD
```

Use buttons «▼» or «▲», to change NMEA header for the desired header, suitable for your unit.

Press "Set" button .

5. USER MENU FREE

INPUTs

IN1	IN8	USB
Baud rate IN1	**Baud rate IN8**	**Baud rate USB**
2400	2400	2400
4800	4800	4800
9600	9600	9600
14400	14400	14400
19200	19200	19200
28800	28800	28800
38400	38400	38400
57600	57600	57600
115200	115200	115200
Stop Bit IN1	**Stop Bit IN8**	**Stop Bit USB**
1 stop bit	1 stop bit	1 stop bit
2 stop bits	2 stop bits	2 stop bits
Parity IN1	**Parity IN8**	**Parity USB**
None	None	None
Even	Even	Even
Odd	Odd	Odd
Check Sum IN1	**Check Sum IN8**	**Check Sum USB**
CRC On	CRC On	CRC On
CRC Off	CRC Off	CRC Off
Priority IN1	**Priority IN8**	**Priority USB**
Priority lv.	Priority lv.	Priority lv.
Primary	Primary	Primary
Secondary	Secondary	Secondary
Priority Off	Priority Off	Priority Off
Delay	Delay	Delay
1…9 sec	1…9 sec	1…9 sec

```
                                    OUTPUTs

        OUT1                          OUT4                          USB

   Baud rate OUT1               Baud rate OUT4               Baud rate USB

        2400                         2400                         2400
        4800                         4800                         4800
        9600                         9600                         9600
       14400                        14400                        14400
       19200                        19200                        19200
       28800                        28800                        28800
       38400                        38400                        38400
       57600                        57600                        57600
      115200                       115200                       115200

   Stop Bit OUT1                Stop Bit OUT4                Stop Bit USB

      1 stop bit                   1 stop bit                   1 stop bit
      2 stop bits                  2 stop bits                  2 stop bits

   Parity OUT1                  Parity OUT4                  Parity USB

        None                         None                         None
        Even                         Even                         Even
        Odd                          Odd                          Odd

   Get From OUT1                Get From OUT4                Get From USB

   Filter OUT1                  Filter OUT4                  Filter USB

     Filter ON|OFF                Filter ON|OFF                Filter ON|OFF

       Get From                     Get From                     Get From

     Fil. OUT1 IN1                Fil. OUT4 IN1                Fil. USB IN1

       Add new                      Add new                      Add new
       sentence                     sentence                     sentence

      Edit the head                Edit the head                Edit the head

       Mod menu                     Mod menu                     Mod menu

        Mod on/off                   Mod on/off                   Mod on/off
        Add CRC on/off               Add CRC on/off               Add CRC on/off
        Mod Head                     Mod Head                     Mod Head

     Fil. OUT1 IN9                Fil. OUT4 IN9                Fil. USB IN9

       Add new                      Add new                      Add new
       sentence                     sentence                     sentence

      Edit the head                Edit the head                Edit the head

       Mod menu                     Mod menu                     Mod menu

        Mod on/off                   Mod on/off                   Mod on/off
        Add CRC on/off               Add CRC on/off               Add CRC on/off
        Mod Head                     Mod Head                     Mod Head
```

6. INSTALLATION AND CONNECTION

For recommended combiner installation procedure, please refer below:

1. Select the combiner installation place. Please ensure, that installation place allows both for easy access to the combiner and wires termination. It is recommended to consider the vertical inner bulkhead of the ship or mounting panel as suitable installation place;

2. Securely install the combiner body to vertical wall, then check the installation tightness with hand (for mounting dimensions, please refer to the figure below);

3. Remove the combiner cover;

4. Attach the connecting wires from power sources and devices to combiner terminals, then secure the wires in special bracket using collars;

5. Apply the voltage supply to the combiner.

6. Check the settings of output and input ports according to instructions specified in p. 4.1

7. Check the data combiner performance.
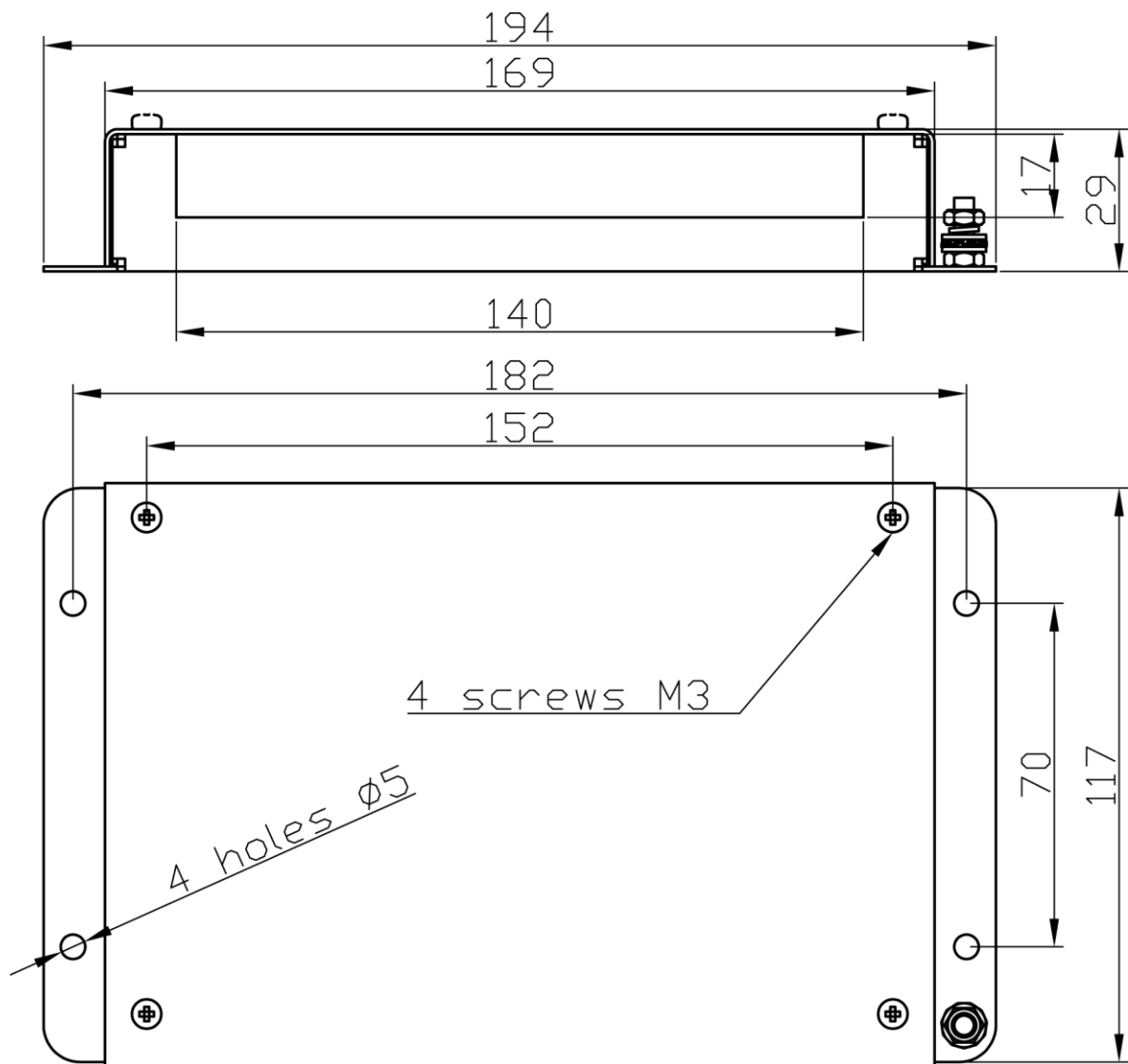
Figure 3 Dimensional drawing of NC-117 data combiner

Using USB interface for communication with PC

Attention! Please remember, that when the combiner is connected to PC using USB interface, corresponding drivers must be installed!

Connecting signal sources compliant with NMEA

Each input port of NC-117 enables signal sources connecting both with RS-232 output interface and RS-422/485. For connection diagram of each interface, please refer below Figure 4.
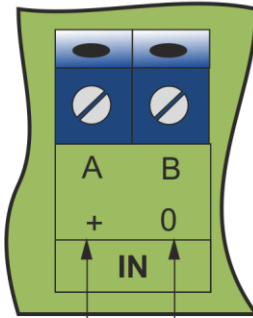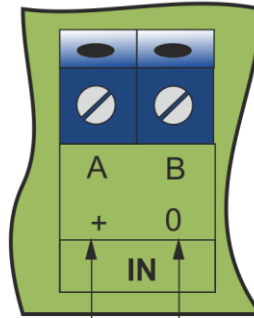
Figure 4 Connecting NMEA signal sources to input ports

Connecting NMEA signal receivers

Output ports of NC-117 enables connecting NMEA signal receivers both with RS-232 input interface and RS-422/485. For connection diagrams of each interface, please refer below Figure 5.
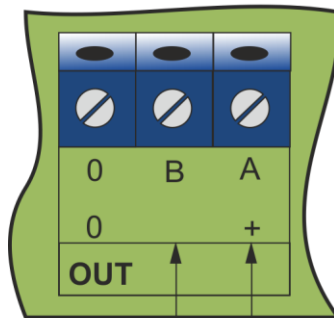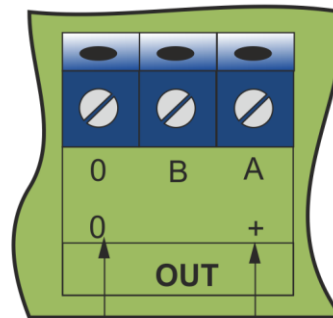

Figure 5 Connecting NMEA signal receivers to output ports

Connecting NC-117 to PC using USB interface

The NC-117 combiner can be connected to PC interface using standard USBA-USBB connection cable. The USB-B connector is provided on combiner PCB.

When NC-117 is connected to USB located on PC, the operating system which supports Plug-n-Play feature detects the new device automatically. For correct communication over USB interface, please install drivers contained on CD disc supplied. Once drivers are successfully

installed, virtual COM port appears in OS devices list and it can be used as standard PC COM-port.

Recommendations on output port baud rate settings

The output interface capacity must meet the following requirement: sum of output data streams per time unit must be less than channel capacity.

So, output baud rate setting must exceed:

$$E = \sum_n (C_n \cdot f_n)$$

where n is input channel number, Cn is number of bytes in single message over n-channel, fn is message transfer rate over n-channel. E is necessary capacity of output channel expressed in bytes/s.

As different methods of data encoding are available for serial data transfer, following channel capacity (expressed in bits/s) is required for following conditions:

Number of stop-bytes	Parity check	Channel capacity
1	No	E * 9
1	Even or Odd	E * 10
2	No	E * 10
2	Even or Odd	E * 11

Пример расчета необходимой пропускной способности выходного канала

It is required to sum up data over 3 input channels with following parameters:

Channel No.	Message size (bytes)	Messages transfer rate (Hz)
1	50	10
2	30	5
3	100	1

So, necessary output channel capacity must be:

E = (50*10) + (30*5) + (100 * 1) = 750 byte/s.

Parity check function for output port is disabled («No») and number of stop-bits is set to 1. In this case output channel capacity must be at least:

E = 750 * 9 = 6750 bit/s.

Therefore, output port baudrate setting must be selected at least 9600 bits/s (baudrate setting for output port can be selected from available values in the combiner menu).

7. COMBINER DEFAULT SETTING

The NC-117 data combiner is supplied by Manufacturer with the following default settings:

Port	Baud rate	Setting description			
		Stop-bit	Parity	CRC check	Get from
In1	4800	1	No	OFF	-
In2	4800	1	No	OFF	-
In3	4800	1	No	OFF	-
In4	4800	1	No	OFF	-
In5	4800	1	No	OFF	-
In6	4800	1	No	OFF	-
In7	4800	1	No	OFF	-
In8	4800	1	No	OFF	12345678
In5/Out1	4800	1	No	OFF	12345678
In6/Out2	4800	1	No	OFF	12345678
In7/Out3	4800	1	No	OFF	12345678
In8/USB	4800	1	No	OFF	12345678

8. TRANSPORANTION AND STORAGE

The data combiner shall be stored in a heated room at ambient temperature +5°C to +35°C (rated values: -55°C to +75°C), at relative humidity not more than 95% at +25°C, with content of dust, moisture and aggressive admixtures not exceeding the rated values specified in GOST 12.1.005-88 for operating areas of production facilities.

The data combiner shall be transported in transport package of the Manufacturer in covered trucks.

The data combiners can be shipped:

by trucks and rail in covered vehicles (covered railroad cars, universal containers),

by air (in pressurized and heated spaces of planes),

by sea (in dry service spaces),

The combiner shall be transported according to transportation rules valid for each transport.

During loading/unloading works and transportation, requirements of warning markings on packages and cases shall be strictly observed; shocks and impacts, that can damage the unit performance, shall be avoided.

All packages shall be surely fastened during transportation.

Unpacking the units after their storage in storehouses or transportation at temperature lower than +10°C shall be performed only after their storage during 12 h under normal ambient conditions.

9. **DISPOSAL**

Packaging elements of a new product, its parts damaged during its operation, and a worn product shall not be disposed as usual waste, because they contain row materials and materials that can be reused.

Written off parts and components that are out of use, shall be delivered to a special area for collection of waste licensed by local authorities. Besides, you may send worn parts to Manufacturer's factory for subsequent disposal.

Proper waste disposal provides to avoid possible negative consequences for environment and human health, as well as to recover some parts or product components thus ensuring energy and resource savings.

During its operation period and after its termination, the product does not pose a threat to life and health of people and environment.

This product shall be recycled according to standards used for electronic equipment. (Federal Law of 24.06.98 No. 89-F3 "On Production and Consumption Waste" as amended of 30.12.2008 No. 309-F3)

The products marked with crossed recycle bin shall be discarded separately from consumption waste.

10. **WARRANTY**

The manufacturer guarantees the unit NC-117 complies with this manual provided that the operation, transportation and storage conditions are adhered to during the warranty period.

The unit's warranty period expires 24 months from the date of its shipping from the manufacturer's storehouse.

Within the warranty period, the owner is entitled for a free repair, or a replacement of a separate part, provided that the malfunction occurred through the manufacturer's fault.

Warranty repair is provided if the unit is submitted with the manufacturer's label and a legible serial number available on it, as well as this operation manual.

The manufacturer is not responsible and cannot guarantee the unit's operation:

1. After the warranty period is over;
2. In case of failure to observe the unit's operation, transportation, storage and installation rules and conditions;
3. If the unit is in an unmarketable condition or has a damaged body and other causes beyond the manufacturer's control;
4. If self-made electrical devices were used;
5. If there was an attempt to repair the unit by a person who is not an authorized representative of the manufacturer.

If the owner loses this operating manual or the manufacturer's label with a serial number, the manufacturer shall not provide their copies, and the owner shall be divested of the right for a free repair during the warranty period.

Upon the warranty expiry, the manufacturer shall facilitate the repair of the unit at the owner's expense.

Note: in case of warranty repair, the unit's disassembling from the installation site and its delivery to the manufacturer's service center are done at the owner's expense.

Visit the manufacturer's website (www.unicont.com) to find in section "support/warranty":
- forms to fill in claims,
- full warranty description,
- detailed description of the warranty service rendering procedure.
The manufacturer service center's address and contact details:

Unicont SPb Ltd
Kibalchicha st., 26E, St. Petersburg, 192174 , Russia
Phone: +7 (812) 622 23 10
Fax: +7 (812) 362 76 36
e-mail: service@unicont.com

11. DATE OF PACKING

Data Combiner	NC-217	№
name of article	designation	serial number

Packed _____ *Unicont SPb Ltd, Russia.* _____
Manufacturer

according to the requirements of the current technical documentation.

_____   _____   _____
post   signature   clarification of signature

_____
year, month, day

12. ACCEPTANCE DETAILS

Data Combiner	NC-217	№
name of article	designation	serial number

was manufactured and accepted in accordance with the regulatory requirements of the state standards and applicable technical documentation, and is suitable for operation.

Quality control representative

Stamp _____   _____
here   signature   clarification of signature

_____
year, month, day

13. DATE OF COMMISSIONING

Data Combiner	NC-217	№
name of article	designation	serial number

The unit has been put into operation.

Date of installation: _____

Place of installation: _____

Person in charge of installation: _____