NIM351

**INTERFACE MODULE**

User Manual

Rev. 001

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Notation Conventions

Warning, ESD Sensitive Device!

This symbol draws your attention to the information related to electro static sensitivity of your product and its components. To keep product safety and operability it is necessary to handle it with care and follow the ESD safety directions.

Caution: Electric Shock!

This symbol warns about danger of electrical shock (> 60 V) when touching products or parts of them. Failure to observe the indicated precautions and directions may expose your life to danger and may lead to damage to your product.

Warning!

Information marked by this symbol is essential for human and equipment safety.
Read this information attentively, be watchful.

Note...

This symbol and title marks important information to be read attentively for your own benefit.

General Safety Precautions

This product was developed for fault-free operation. Its design provides conformance to all related safety requirements. However, the life of this product can be seriously shortened by improper handling and incorrect operation. That is why it is necessary to follow general safety and operational instructions below.

Warning!

All operations on this device must be carried out by sufficiently skilled personnel only.

Warning!

Please, keep in mind that any physical damage to this product is not covered under warranty. Also, be careful not to drop the product.

Note:

This product is guaranteed to operate within the published temperature ranges and relevant conditions. However, prolonged operation near the maximum temperature is not recommended by Fastwel or by electronic chip manufacturers due to thermal stress related failure mechanisms. These mechanisms are common to all silicon devices, they can reduce the MTBF of the product by increasing the failure probability. Prolonged operation at the lower limits of the temperature ranges has no limitations.

Caution, Electric Shock!

Before installing this product into a system and before installing other devices on it, always ensure that your mains power is switched off.

Always disconnect external power supply cables during all handling and maintenance operations with this module to avoid serious danger of electrical shock.

Unpacking, Inspection and Handling

Please read the manual carefully before unpacking the module or mounting the device into your system. Keep in mind the following:

ESD Sensitive Device!

Electronic modules and their components are sensitive to static electricity. Even a non-perceptible by human being static discharge can be sufficient to destroy or degrade a component's operation! Therefore, all handling operations and inspections of this product must be performed with due care, in order to keep product integrity and operability:

- Preferably, unpack or pack this product only at EOS/ESD safe workplaces. Otherwise, it is important to be electrically discharged before touching the product. This can be done by touching a metal part of your system case with your hand or tool. It is particularly important to observe anti-static precautions when setting jumpers or replacing components.
- If the product contains batteries for RTC or memory back-up, ensure that the module is not placed on conductive surfaces, including anti-static mats or sponges. This can cause short-circuit and result in damage to the battery and other components.
- Store this product in its protective packaging while it is not used for operational purposes.

Unpacking

The product is carefully packed in an antistatic bag and in a carton box to protect it against possible damage and harmful influence during shipping. Unpack the product indoors only at a temperature not less than +15°C and relative humidity not more than 70%. Please note, that if the product was exposed to the temperatures below 0°C for a long time, it is necessary to keep it at normal conditions for at least 24 hours before unpacking. Do not keep the product close to a heat source.

Following ESD precautions, carefully take the product out of the shipping carton box. Proper handling of the product is critical to ensure correct operation and long-term reliability. When unpacking the product, and whenever handling it thereafter, be sure to hold the module preferably by the front panel, card edges or ejector handles. Avoid touching the components and connectors.

Retain all original packaging at least until the warranty period is over. You may need it for shipments or for storage of the product.

Initial Inspection

Although the product is carefully packaged, it is still possible that shipping damages may occur. Careful inspection of the shipping carton can reveal evidence of damage or rough handling. Should you notice that the package is damaged, please notify the shipping service and the manufacturer as soon as possible. Retain the damaged packing material for inspection.

After unpacking the product, you should inspect it for visible damage that could have occurred during shipping or unpacking. If damage is observed (usually in the form of bent component leads or loose socketed components), contact Fastwel's official distributor from which you have purchased the product for additional instructions. Depending on the severity of the damage, the product may even need to be returned to the factory for repair. DO NOT apply power to the product if it has visible damage. Doing so may cause further, possibly irreparable damage, as well as result in a fire or electric shock hazard.

If the product contains socketed components, they should be inspected to make sure they are seated fully in their sockets.

Handling

In performing all necessary installation and application operations, please follow only the instructions supplied by the present manual.

In order to keep Fastwel's warranty, you must not change or modify this product in any way, other than specifically approved by Fastwel or described in this manual.

Technical characteristics of the systems in which this product is installed, such as operating temperature ranges and power supply parameters, should conform to the requirements stated by this document.

Retain all the original packaging, you will need it to pack the product for shipping in warranty cases or for safe storage. Please, pack the product for transportation in the way it was packed by the supplier.

When handling the product, please, remember that the module, its components and connectors require delicate care. Always keep in mind the ESD sensitivity of the product.

Three Year Warranty

Fastwel Co. Ltd. (Fastwel), warrants that its standard hardware products will be free from defects in materials and workmanship under normal use and service for the currently established warranty period. Fastwel's only responsibility under this warranty is, at its option, to replace or repair any defective component part of such products free of charge.

Fastwel neither assumes nor authorizes any other liability in connection with the sale, installation or use of its products. Fastwel shall have no liability for direct or consequential damages of any kind arising out of sale, delay in delivery, installation, or use of its products.

If a product should fail through Fastwel's fault during the warranty period, it will be repaired free of charge. For out of warranty repairs, the customer will be invoiced for repair charges at current standard labor and materials rates.

Warranty period for Fastwel products is 36 months since the date of purchase.

The warranty set forth above does not extend to and shall not apply to:

1. Products, including software, which have been repaired or altered by other than Fastwel personnel, unless Buyer has properly altered or repaired the products in accordance with procedures previously approved in writing by Fastwel.

2. Products, which have been subject to power, supply reversal, misuse, neglect, accident, or improper installation.

Returning a product for repair

1. Apply to Fastwel company or to any of the Fastwel's official representatives for the Product Return Authorization.

2. Attach a failure inspection report with a product to be returned in the form, accepted by customer, with a description of the failure circumstances and symptoms.

3. Carefully package the product in the antistatic bag, in which the product had been supplied. Failure to package in antistatic material will VOID all warranties. Then package the product in a safe container for shipping.

4. The customer pays for shipping the product to Fastwel or to an official Fastwel representative or dealer.

1   INTRODUCTION

1.1   PRODUCT PURPOSE

This user manual (hereinafter – "manual") contains information on the structure, operating principle as well as basic information related to commissioning, intended use and maintenance of the product "Interface module NIM351" (hereinafter – "module").

This module is designed for use in built-in systems with CAN networks and RS422/RS485 interfaces. The module contains two optically isolated serial ports RS422/RS485 and two CAN network channels.

The module is supplied together with drivers for operating systems QNX 6.3x, Windows XPe, and Linux 2.6.x.

> **ATTENTION:**
>
> THIS MODULE CONTAINS COMPONENTS SENSITIVE TO ELECTROSTATIC DISCHARGES!

1.2   HARDWARE VERSIONS, ORDERING INFORMATION AND SCOPE OF SUPPLY

1.2.1   Hardware versions and ordering information

Module hardware versions and their designations (ordering information) are listed in Table 1-1.

Table 1-1:   **Module content depending on hardware version**

Name	Ordering designation	Description
Interface module NIM351	NIM351-01	Interface module with channels 2xCAN and 2XRS422/RS485
	NIM351-02	Interface module with channels 2xCAN
	NIM351-03	Interface module with channels 2XRS422/RS485
	NIM351-01 / coated	Interface module with channels 2xCAN and 2XRS422/RS485, lacquer coated
	NIM351-02 / coated	Interface module with channels 2xCAN, lacquer coated
	NIM351-03 / coated	Interface module with channels 2XRS422/RS485, lacquer coated

1.2.2   Scope of supply

NIM351 module scope of supply is shown in Table 1-2.

Table 1-2:   **NIM351 module scope of supply**

Ordering designation	Decimal number	Designation
NIM351-xx	IMES.465635.003-xx	NIM351 interface module
	IMES-465961.001	Installation parts kit
	IMES.467369.024	CD

1.3   OPTIONAL ACCESSORIES

Peripheral devices may be connected to the module directly or via additional accessories and cables listed in Table 1-3.

Table 1-3:   **Optional accessories and cables for NIM351**

Code	Decimal number	Description	Note
—	ACS00005	Adaptor cable DB9M-IDC10	-

2   SPECIFICATIONS

2.1   COMMUNICATION CHANNELS

2.1.1   Serial ports

-    number of ports – 2;
-    interface type – RS422/RS485;
-    controller type – EXAR XR16C2850;
-    compatibility – 16C550; *)
-    data exchange rate – up to 3.686 Mbit/sec.;
-    supported interrupt levels – IRQ5, IRQ6, IRQ7, IRQ9, IRQ10, IRQ11;
-    connection – via IDC10 connector;
-    optical insulation – up to 500V.

*) – compatible by registers with 16C550, except for FIFO connector (128 bytes for receiving/ transmitting) and 32 times increasing reception/ transmission speed due to using 29491200 Hz reference frequency and operating in the mode of dividing reference frequency by 8 (rather than by 16 as in 16C550). More detailed registers description can be found in the technical description for XR16C2850 microcircuit.

2.1.2   CAN channels

-    number of channels – 2;
-    controller type – PHILIPS SJA 1000T;
-    protocol specification - 2.0A (standard-frame, 11-bit ID) and 2.0B (extended-frame, 29-bit ID);
-    clock frequency – 16 MHz;
-    transmission speed – up to 1 Mbit/sec.;
-    supported interrupt levels – IRQ5, IRQ6, IRQ7, IRQ9, IRQ10, IRQ11;
-    connection – via IDC10 connector directly or via adapter containing SUB-D connector with signals layout according to CiA recommendations, specifications DS 102-1;
-    optical insulation – up to 500V.

2.1.3   Module format

-    module format – PC/104+, 8 bit; "stack-through";
-    overall dimensions – according to PC/104-Plus Specification version 2.0;

Note:

Only power supply circuits are used in PCI bus of the module; the corresponding connector is installed in for design compatibility with PC/104+ format modules.

2.1.4   Controls and displays

- two 2-bit switching field, XP10 and XP11, are used to set up basic addresses for channels of CAN and COM-ports, respectively;
- green LEDs are used for CAN channels reception mode display;
- yellow LEDs are used for CAN channels transmission mode display;
- XP5, XP6 и XP3, XP4 switching fields are used for selecting interrupt levels for each channel of CAN and COM-ports.

2.2   MODULE POWER SUPPLY

- module power +5V is supplied via PC/104+ connectors;
- power consumption from the source 5V±5% for various hardware options, maximum:
  NIM351-01 – 0.3A;
  NIM351-02 – 0.2A;
  NIM351-03 – 0.2A;

2.3   SOFTWARE COMPATIBILITY TO OPERATING SYSTEMS

- FreeDOS;
- QNX 6.3x;
- Windows XPe;
- Linux 2.6.x.

2.4   OPERATING CONDITIONS

- operating temperature range – between -40 and +85°C;
- air relative humidity – between 5 and 95% at +25°C (without condensation);
- storage temperature range – between -55 and +90°C.

2.5   MECHANICAL SPECIFICATIONS

- vibration resistance, acceleration amplitude – 10g;
- resistance to single shocks, peak acceleration – 150g;
- resistance to multiple shocks, peak acceleration – 50g.

Note:

These mechanical specifications do not apply to connectors; connected external cables shall be fixed.

2.6   WEIGHTS AND DIMENSIONS

Module weight shall not exceed values listed in Table:

Table 2-1:   **Module weight**

Hardware version	Weight, kg, max.
NIM351-01 (-02, -03)	0.12

Module overall dimensions are 98.0 x 95.9 x 23.7 mm.

2.7   MEAN TIME BETWEEN FAILURES (MTBF)

MTBF value is 700 000 hours.

This MTBF value is calculated using Telecordia Issue 1 calculation model, calculation method – Method 1, Case 3, for continuous operation, ground-level installation, under conditions corresponding UKhL4 GOST 15150-69, at environment temperature +30°C.

—

3   PRODUCT USE

3.1   MODULE FLOW DIAGRAM

The module flow diagram is shown at fig. 3-1.

Figure 3-1:   **NIM351 module flow diagram**
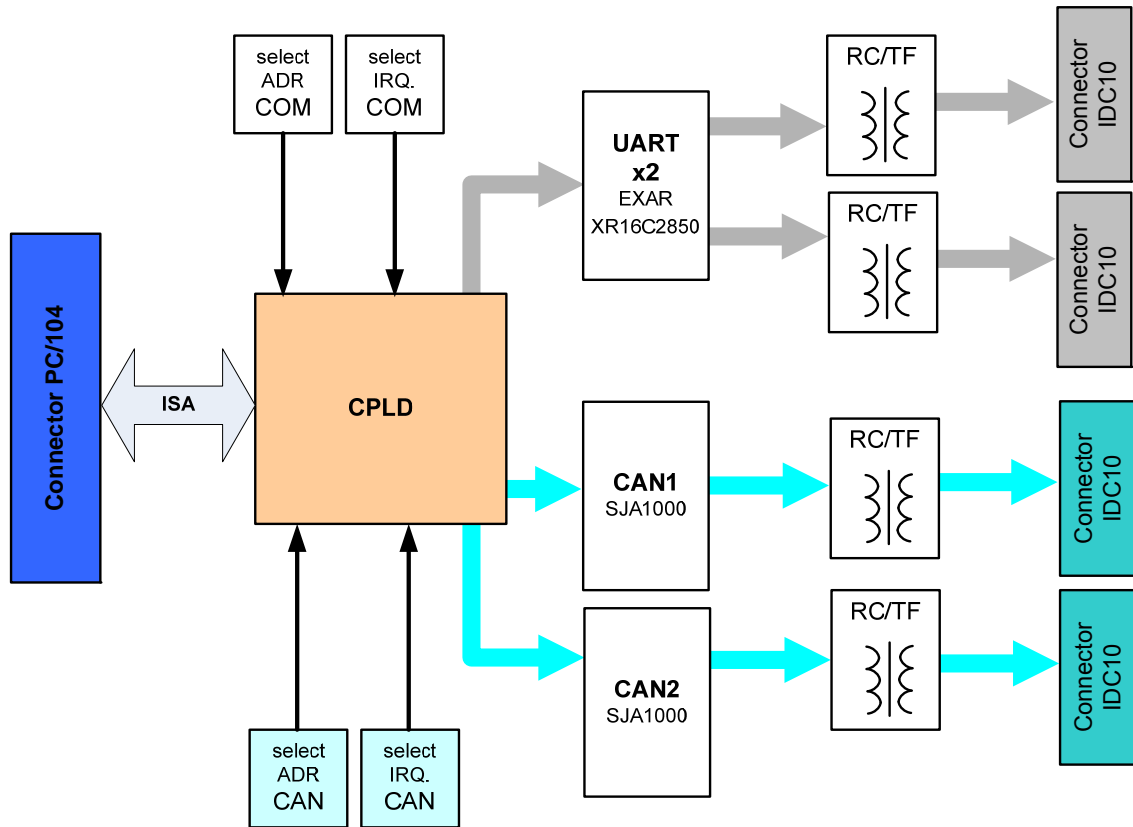
3.2   ADDRESSING SPACE ALLOTMENT

NIM351 module ports addressing space allotment is listed in Table 3-1.

Table 3-1:   **CAN and COM ports addressing space**

CAN	Addresses range			
	BA: CE00	BA: CF00	BA: DE00	BA: DF00
CAN1	CE000-CE1FF	CF000-CF1FF	DE000-DE1FF	DF000-DF1FF
CAN2	CE200-CE3FF	CF200-CF3FF	DE200-DE3FF	DF200-DF3FF
COM	Addresses range			
	BA: 100	BA: 180	BA: 200	BA: 280
COM1	0100-0107	0180-0187	0200-0207	0280-0287
COM2	0108-010F	0188-018F	0208-020F	0288-028F

3.3 COMPONENTS EXTERIOR AND LAYOUT

NIM351 module top side and switching components layout are shown at figure 3-2.

The module itself is a printed circuit board in PC/104+ format with connectors for channels CAN1, CAN2 (XP12, XP13) and for ports COM1 and COM2 (XP1, XP2) installed on it.

Basic addresses for COM-ports (within input/output addressing space) are set up using XP10 switching field. Options of COM1 and COM2 ports basic address selection are listed in Table 3-2.

Table 3-2: **COM1 and COM2 ports basic address selection**

XP10 (1-2)	XP10 (3-4)	Basic address
ON	ON	280H
OFF	ON	200H
ON	OFF	180H
OFF	OFF	100H

Note:

OFF – jumper is not installed, ON – jumper is installed.

Basic addresses for CAN communication channels (in memory addresses space) are set up using XP11 communication field. Options of CAN1 and CAN2 ports basic address selection are listed in Table 3-3.

Figure 3-2:   **NIM351 module top side and switching components layout**
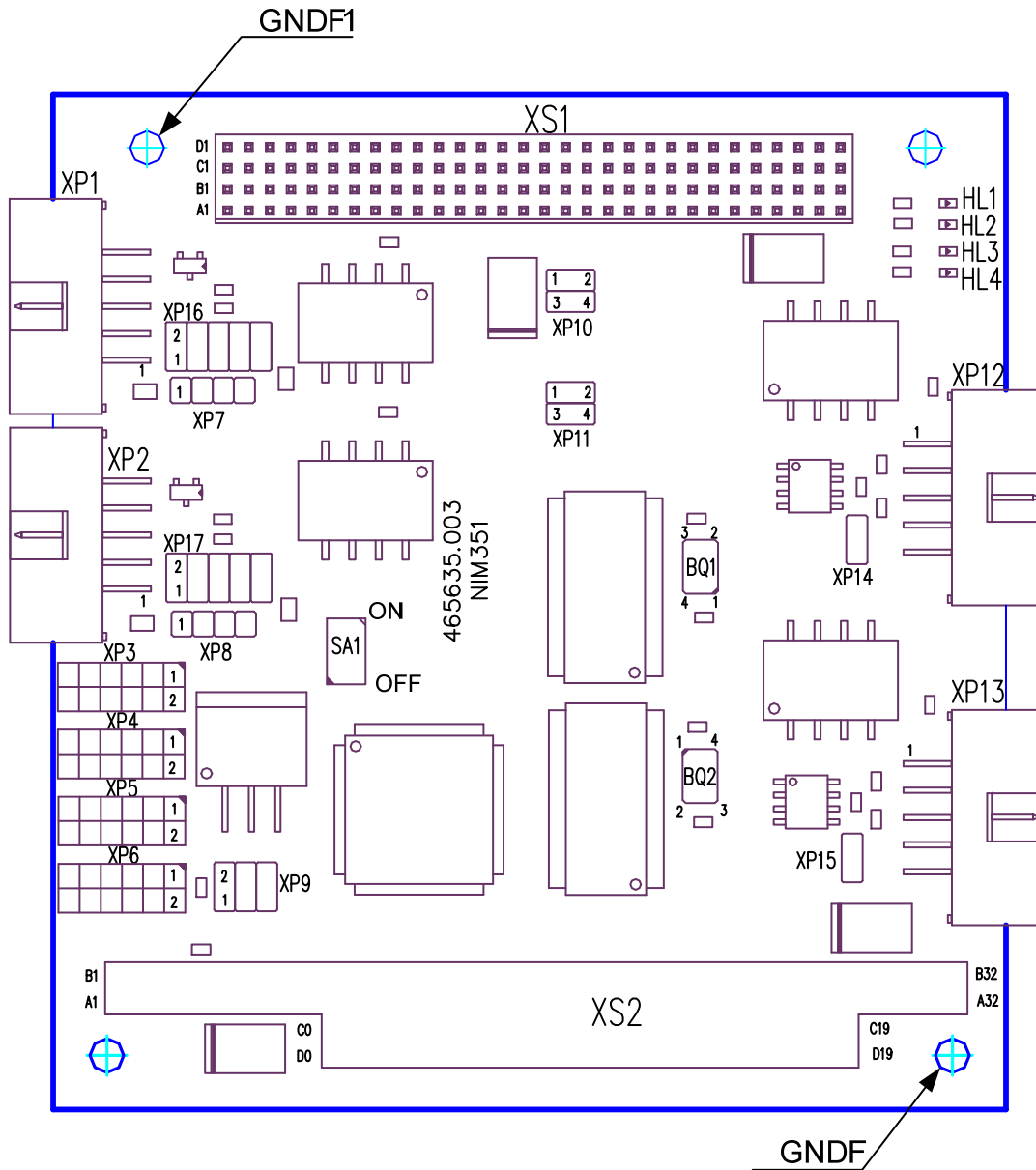
Table 3-3:   **CAN1 and CAN2 ports basic address selection**

XP10 (1-2)	XP10 (3-4)	Basic address
ON	ON	CE00H
OFF	ON	CF00H
ON	OFF	DE00H
OFF	OFF	DF00H

Note:

OFF – jumper is not installed, ON – jumper is installed.

Selection of interrupt levels for COM1, COM2 ports and for CAN1, CAN2 channels is shown in tables 3-4 and 3-5, respectively.

XP9 connector is used for microcircuit D3 programming.

Table 3-4:   **Interrupt level selection for COM1 and COM2 ports**

XP3 (COM1)	XP4 (COM2)	Interrupt level
1-2	1-2	IRQ5
3-4	3-4	IRQ6
5-6	5-6	IRQ7
7-8	7-8	IRQ9
9-10	9-10	IRQ10
11-12	11-12	IRQ11

ATTENTION:

OPERATION OF COM1 AND COM2 PORTS AT THE SAME INTERRUPT LEVEL IS NOT ALLOWED.

Terminal resistors of COM1 port are connected by installing jumpers XP7 (1-2)(3-4) (in RS422 mode) and XP7 (1-2) in RS485 mode. Jumpers XP16 (1-2)(3-4) shall also be installed for working by RS485 interface. Jumpers XP16 (5-6)(7-8) additionally defining levels in D+ and D- lines shall also be installed in edgecard modules for working by RS485 interface. The XP16 (9-10) jumper shall be installed for working in "no echo" mode.

Terminal resistors of COM2 port are connected by installing jumpers XP8 (1-2)(3-4) (in RS422 mode) and XP8 (1-2) in RS485 mode. Jumpers XP17 (1-2)(3-4) shall also be installed for working by RS485 interface. Jumpers XP17 (5-6)(7-8) additionally defining levels in D+ and D- lines shall also be installed in edgecard modules for working by RS485 interface. The XP17 (9-10) jumper shall be installed for working in "no echo" mode.

Terminal resistors of CAN channels are connected by installing XP14 (1-2) jumper for CAN1, and jumper XP15 (1-2) – for CAN2 channel.

Table 3-5:   **Interrupt level selection for CAN1 and CAN2 channels**

XP5 (CAN1)	XP6 (CAN2)	Interrupt level
1-2	1-2	IRQ5
3-4	3-4	IRQ6
5-6	5-6	IRQ7
7-8	7-8	IRQ9
9-10	9-10	IRQ10
11-12	11-12	IRQ11

To select operating mode with two CAN channels at the same interrupt level it is necessary to set the 1st SA1 switch into ON position and select the required interrupt level on the XP5 (CAN1) plugboard.

ATTENTION:

THE MODULE IS SUPPLIED WITH JUMPERS REMOVED!

4 CONNECTION

The module is connected to modules of PC/104-Plus format via XS1 and XS2 connectors.

4.1 PORTS COM1 AND COM2 RS422/RS485 (CONNECTORS XP1 AND XP2)

Connectors XP1 and XP2 (type IDC 10, step 2.54 mm) are provided for ports COM1 and COM2 connection. Contact pin assignment for XP1 and XP2 connectors is shown in Table 4-1.

Table 4-1: **Contact pin assignment for XP1 and XP2 connectors**

Out	Assignment (RS422)	Assignment (RS485)
1	TX-	D-
2	SHIELD	SHIELD
3	TX+	D+
4	-	-
5	RX-	-
6	-	-
7	RX+	-
8	-	-
9	GND	GND
10	-	-

Procedures for basic address, interrupt levels and terminal resistors setup are described in p. 3.3.

4.2 CAN1 AND CAN2 INTERFACES (CONNECTORS XP12, XP13)

Connectors XP12 and XP13 (type IDC 10, step 2.54 mm) are provided for CAN1 and CAN2 interfaces connection. Contact pin assignment for XP12 and XP13 connectors is shown in Table 4.2.

Light emitting diodes HL1, HL2 indicate reception/ transmission operating modes for CAN2 channel, LEDs HL3, HL4 – for CAN1 channel.

Procedures for basic address, interrupt levels and terminal resistors setup are described in p. 3.3.

Table 4-2: **Contact pin assignment for XP12 and XP13 connectors**

Out	Assignment
1	-
2	SHIELD
3	CAN L
4	CAN H
5	GND
6	-
7	-
8	-
9	-
10	-

Note:

A socket p/n 1-215919-0 Tyco Electronics or similar shall be used for making external connections to XP1, XP2, XP12, AND XP13 connectors.

Shielded twisted pair (e.g., FTP type) shall be used for connecting external cables routed outdoors.

Cable shields shall be connected to SHIELD signal on connectors XP1, XP2, XP12, AND XP13 of NIM351 module during cable termination. Metalized mounting holes GNDF, GNDF1 (see fig. 3.2) of NIM351 module shall be grounded. A shield at the opposite cable end shall be grounded.

5   TRANSPORTING AND STORAGE

5.1   TRANSPORTING

The module shall be transported in a separate manufacturer's package (tare) consisting of an individual antistatic pack and a cardboard box, in an enclosed transport vehicles (road, rail, air, in heated and hermetic compartments), in storage conditions 5 according to GOST 15150-69, or in storage conditions 3 for marine transport.

Modules may be transported in individual antistatic packs in common (group) manufacturer's tare.

Modules shall be transported according to cargo haulage rules and regulations applicable for a certain transport mode.

Packed modules shall not be exposed to knocks, falls, shocks and atmospheric precipitations during transport and handling. Method of laying packed modules onto a vehicle shall exclude their displacement.

5.2   STORAGE

Modules storage conditions shall meet the requirements of GOST 15150-69.

6 NOTES ON USE AND OPERATION

The module shall be used in modes and environment set for in this manual as well as in TU 4013-004-52415667-05.

The module shall be power supplied from an external DC power source with fixed voltage +5V±5%.

Do not connect/disconnect external devices and functional extension boards to/from the module when powered up.

Do not connect/disconnect the module to/from an external DC power source when turned on.

External devices and functional extension boards shall be connected to/from the module as described in this user manual.