» User Guide «

HMITR-104

Driver Display System

-

Rugged Rail and Road Applications

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Caution, Electric Shock!

This symbol and title warn of hazards due to electrical shocks (> 60V) when touching products or parts of them. Failure to observe the precautions indicated and/or prescribed by the law may endanger your life/health and/or result in damage to your material.

Please refer also to the section “High Voltage Safety Instructions” on the following page.

Warning, ESD Sensitive Device!

This symbol and title inform that electronic boards and their components are sensitive to static electricity. Therefore, care must be taken during all handling operations and inspections of this product, in order to ensure product integrity at all times.

Please read also the section “Special Handling and Unpacking Instructions” on the following page.

Warning!

This symbol and title emphasize points which, if not fully understood and taken into consideration by the reader, may endanger your health and/or result in damage to your material.

Note ...

This symbol and title emphasize aspects the reader should read through carefully for his or her own advantage.

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Temperature and High Voltage Safety Instructions

Warning!

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

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Caution, Electric Shock!

Before installing your new Kontron product into a system always ensure that your mains power is switched off.

Serious electrical shock hazards can exist during all installation, repair and maintenance operations with this product. Therefore, always unplug the power cable and any other cables which provide external voltages before performing work.

Special Handling and Unpacking Instructions

ESD Sensitive Device!

Electronic boards and their components are sensitive to static electricity. Therefore, care must be taken during all handling operations and inspections of this product, in order to ensure product integrity at all times.

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In order to maintain Kontron's product warranty, this product must not be altered or modified in any way. Changes or modifications to the device, which are not explicitly approved by Kontron and described in this manual or received from Kontron's Technical Support as a special handling instruction, will void your warranty.

This device should only be installed in or connected to systems that fulfill all necessary technical and specific environmental requirements. This applies also to the operational temperature range of the specific board version, which must not be exceeded. If batteries are present, their temperature restrictions must be taken into account.

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

If the original packaging material is no longer available and it is necessary to store or ship the product, please re-pack it as nearly as possible in the manner in which it was delivered.

Special care is necessary when handling or unpacking the product. Please consult the special handling and unpacking instruction on the previous page of this manual.

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Kontron grants the original purchaser of Kontron's products a ***TWO YEAR LIMITED HARDWARE WARRANTY*** as described in the following. However, no other warranties that may be granted or implied by anyone on behalf of Kontron are valid unless the consumer has the express written consent of Kontron.

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Chapter 1

Introduction

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1. Introduction

The HMITR-104 Driver Display System is a process monitor and control system for rugged rail and road applications. As such, it is designed to provide visualization of application processes and process supervisory interaction.

It consists of a single display system for process visualization and capabilities for supervisory control inputs.

The display itself is a 10.4 inch (diagonal) color graphic display. Supervisory control inputs are either accomplished via:

- A UIC 612-01 compliant display bezel with “hard” keys located in the display bezel, or
- A touch screen for process context inputs (touch sensitive areas displayed according to application requirements)

The HMITR-104 is only available with one or the other of the control input possibilities.

The following interfaces are available with the HMITR-104:

On the front side:

- One TFT color display output interface
- Either one hard key input interface or one touch screen input interface
- Four status LEDs
- One ambient light sensing interface
- One buzzer (acoustical warning device)

On the back side:

- Two Fast Ethernet interfaces
- Two USB 2.0 interfaces
- Four serial interfaces
- Two 24VDC digital output channels
- Six digital input channels
- One CAN interface
- Audio interfacing for:
  - Mono loud speaker
  - Left and right microphone inputs
  - Line In (left and right)
  - Line Out (left and right)
- Input power interface
- Optionally, interfacing for:
  - WiFi antenna
  - GSM antenna
  - GPS antenna

1.1 Hardware Components

The HMITR-104 includes the following hardware sub-assemblies:

- System controller electronics
- TFT color display with backlighting and brightness control
- Either a display bezel with built-in hard keys, or a touch screen
- System casing consisting of:
  - a sheet metal case for housing the system electronics, IO connectors and mounting of the front panel
  - a front panel for mounting of the TFT display and protective glass plate, the touch screen (when installed), and the hard key bezel (when installed)
- Optional functional modules:
  - a WiFi LAN module including external antenna connector
  - a GSM PCIe Mini Card mobile telephone module including external antenna connector or a proprietary GSM or GSM-R mobile telephone module including external antenna connector
  - a GPS global positioning module including external antenna connector

  The above options must be specified at the time the HMITR-104 is ordered. They cannot be ordered or installed retroactively.

The HMITR-104 provides two PCIe Mini Card interfaces which are designed to support the above mentioned optional WiFi/LAN and GSM modules. These interfaces can, however, be used for expansion modules other than the WiFi/LAN or GSM modules. One interface is accessible only during the HMITR-104 assembly and if used the corresponding module must be installed at that time. The other interface is accessible via the back side System Access Panel 2 and the expansion module can be installed after the HMITR-104 is assembled.

If HMITR-104 external interfacing is required for usage of such modules, this must be specified when ordering the HMITR-104 so that the required interfacing can be made available. For example, there is a requirement for video input processing. In this case, a video frame grabber expansion module could be installed in the internal-only accessible interface and be provided with a video input interface connector on the back side of the HMITR-104.

1.2 Software Components

The HMITR-104 includes the following software elements:

- Board Support Package for the system controller electronics
- uEFI BIOS
- Linux or Windows XP Embedded Operating System (QNX on request)

1.3 HMITR-104 Mechanical and Functional Diagrams

The following figures illustrate mechanical and functional aspects of the HMITR-104.

Figure 1-1: HMITR-104 Perspective Front Views

Figure 1-2: Functional Block Diagram of the HMITR-104

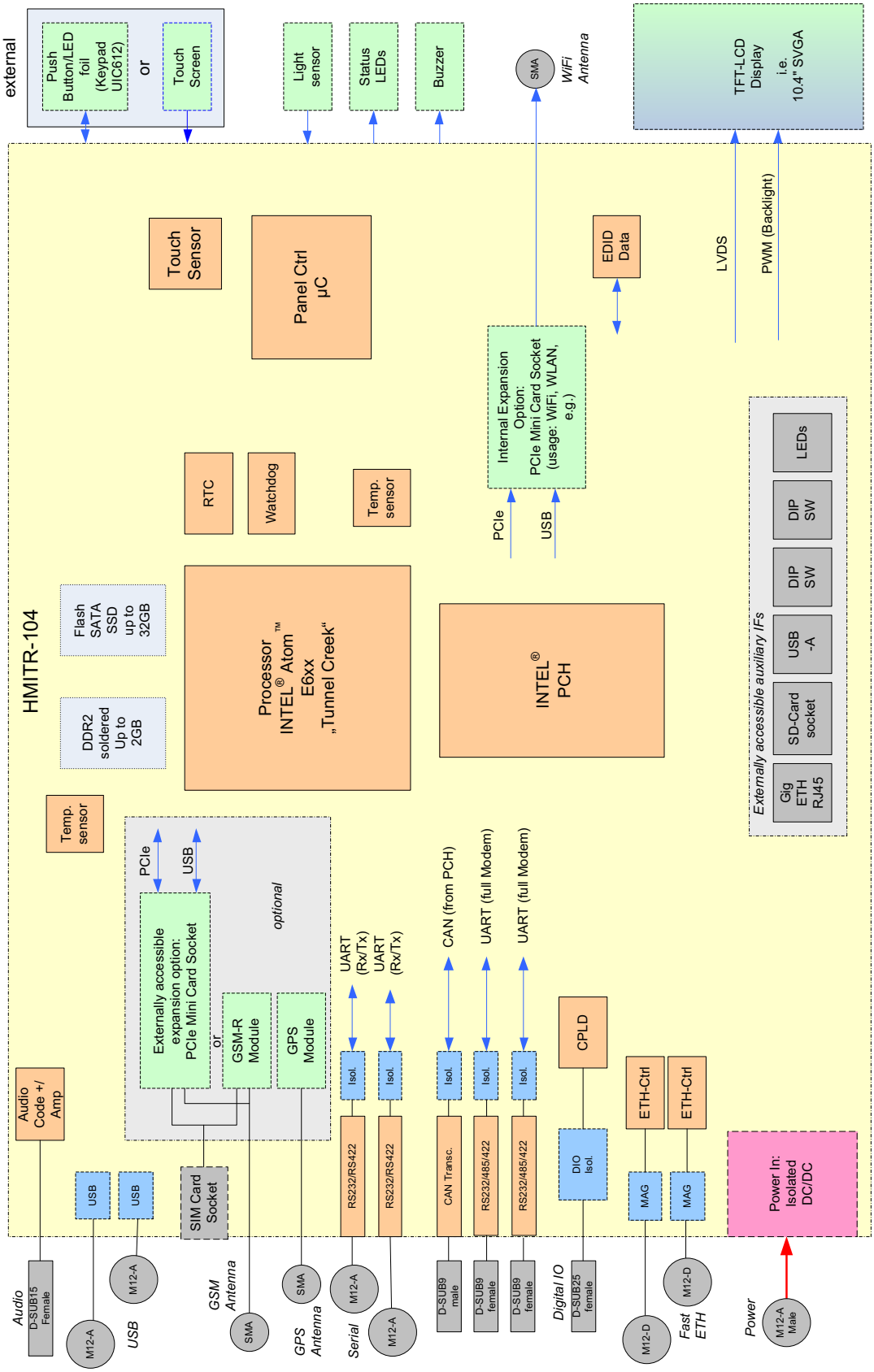


Figure 1-3: Assembly Drawing of the HMITR-104 Hard Key Version (Front)

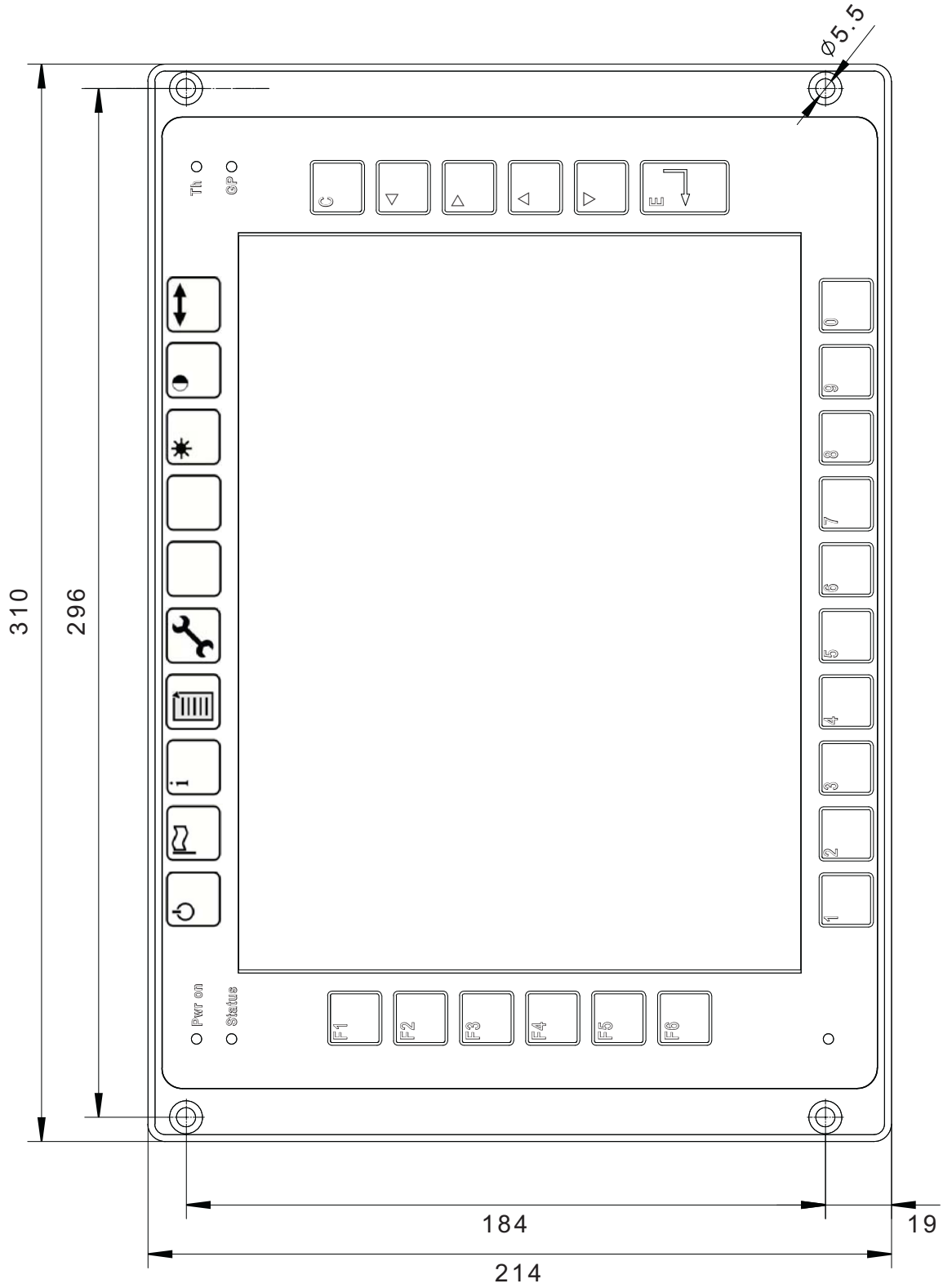


Figure 1-4: Assembly Drawing of the HMITR-104 Touch Screen Version (Front)

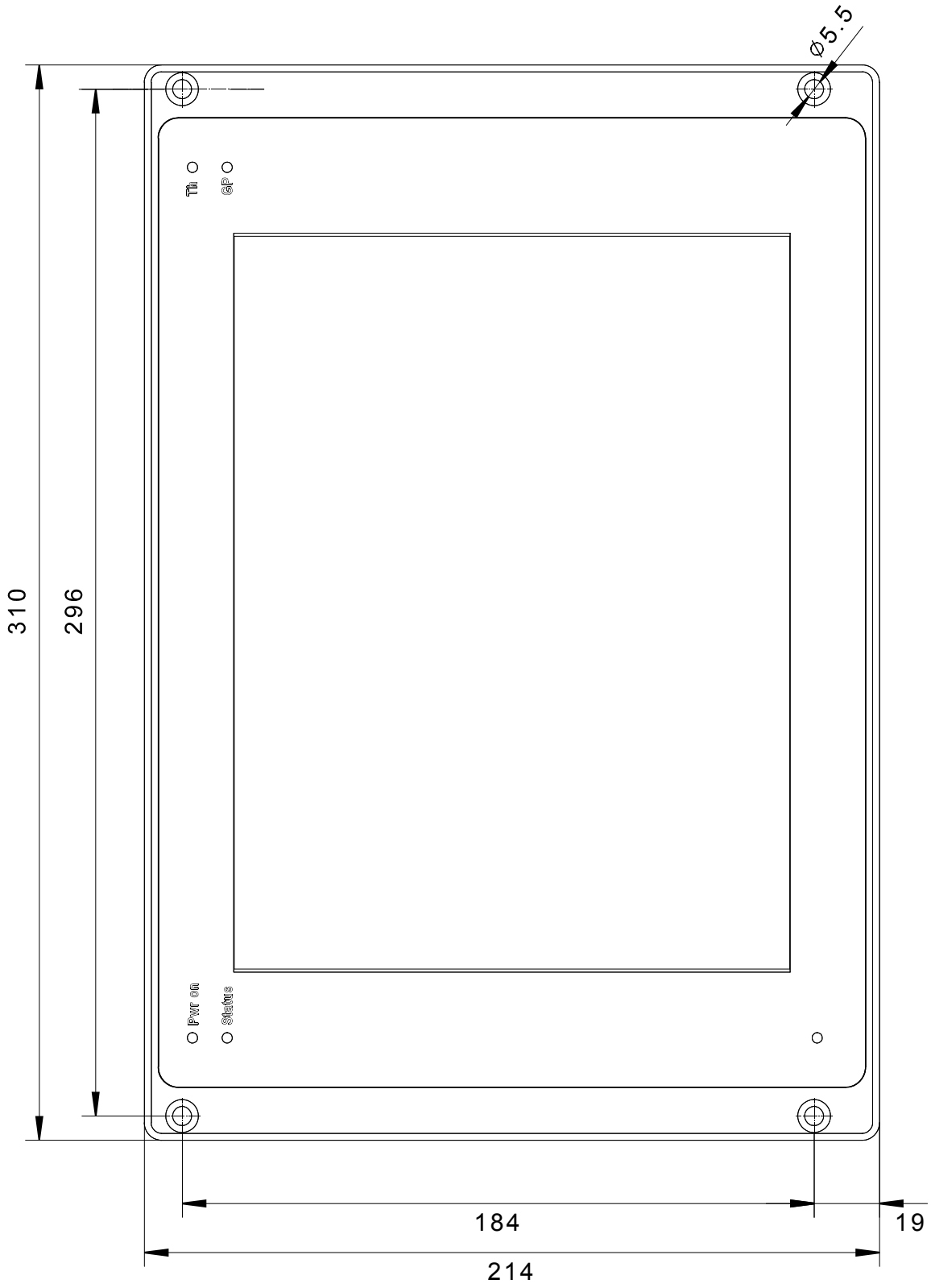


Figure 1-5: Assembly Drawing of the HMITR-104 Both Versions (Back)

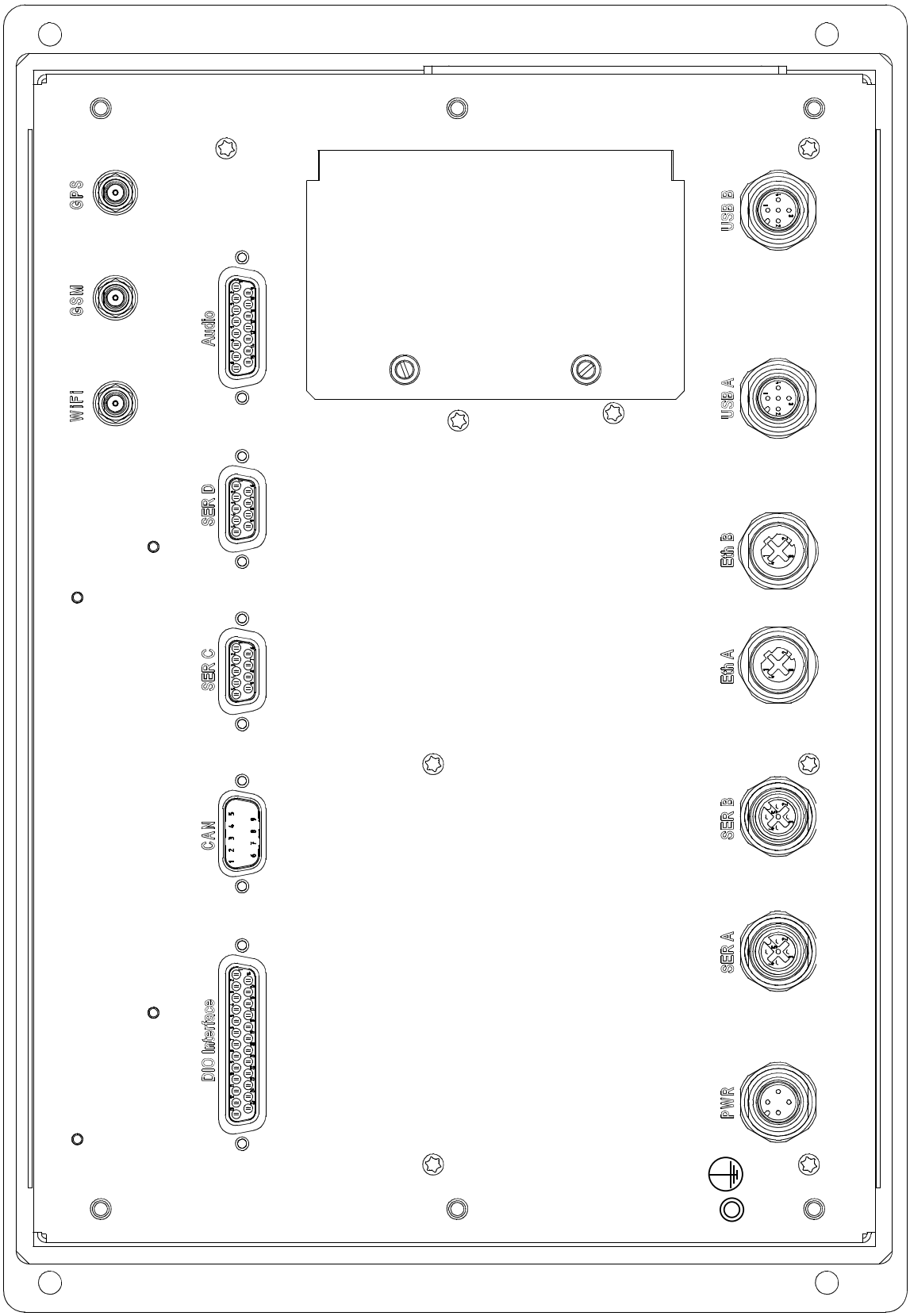


Figure 1-6: Assembly Drawing of the HMITR-104 Both Versions (Top)

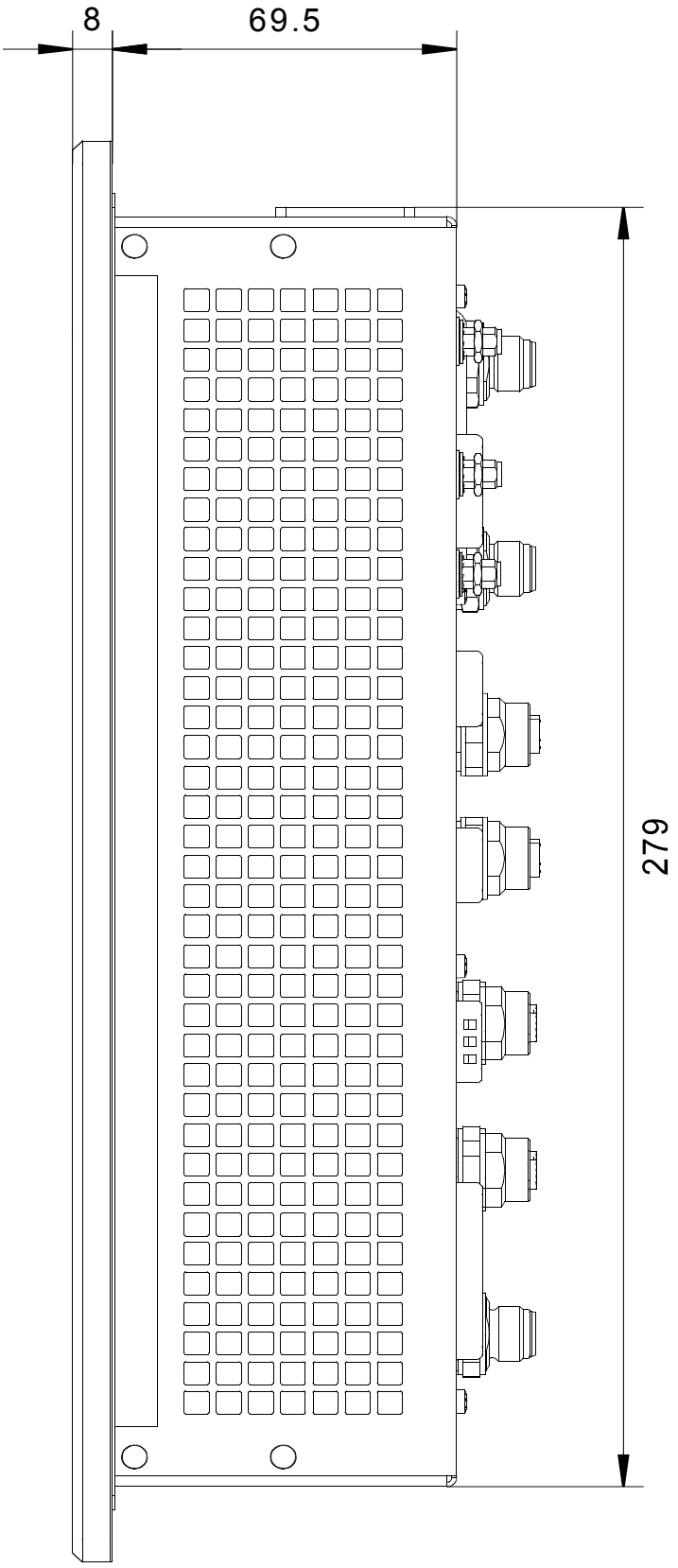
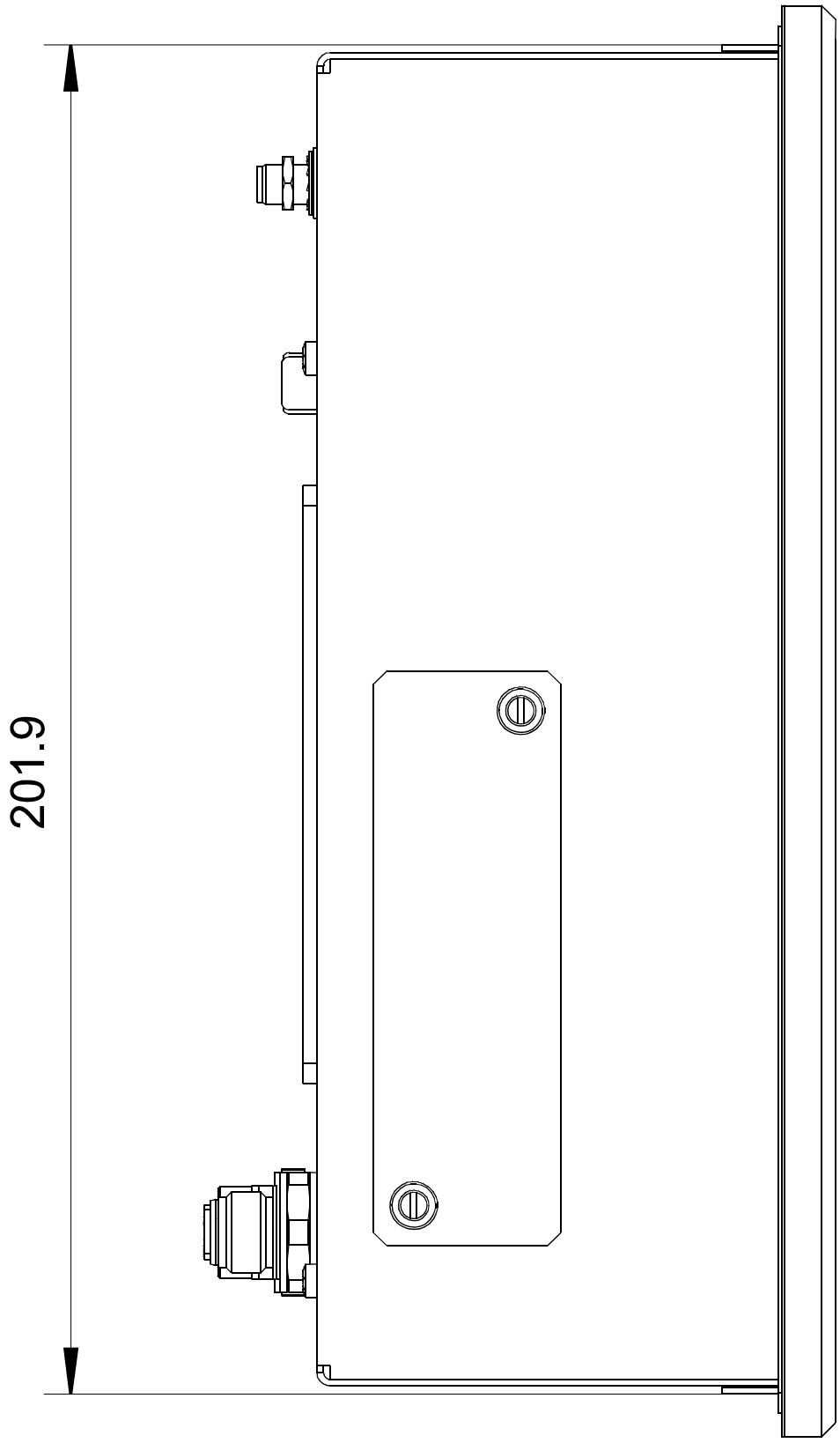


Figure 1-7: Assembly Drawing of the HMITR-104 Both Versions (Left)



1.4 Encasement

The HMITR-104 housing is comprised of:

- A sheet metal box for mounting of internal components, connectors for external interfacing including a case ground point, and mounting points for assembly with the front panel
- An aluminum front frame which acts as a mounting plate for the whole assembly, the TFT display, the touch screen or the hard key bezel with its protective glass plate for the TFT, and other internal components

Assembly drawings with the relevant information for mounting the HMITR-104 are provided by Figures 1-3 through 1-7.

As far as ingress protection is concerned, the sheet metal box is certified to IP code: IP20, standard. It provides protection against finger intrusion. In addition to IP20, it provides protection against intrusion of all smaller-sized foreign bodies with a diameter greater than 5 mm. This part of the assembly does not provide any protection against the infiltration of water. The front panel of both versions complies with IP65.

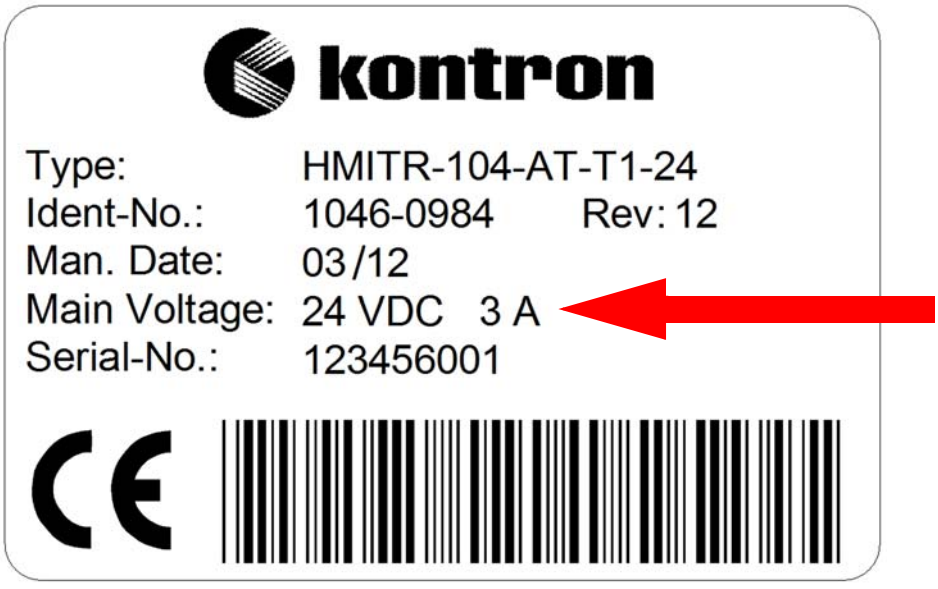
The HMITR-104 is designed for ambient air convection cooling. As the unit does not have a fan for forced air cooling, integrators must verify the application cooling design prior to integration in an application.

The case ground point as indicated by the ground symbol on the back side of the HMITR-104 is a threaded blind nut which accepts an M4 screw or bolt for attaching external ground cabling to the HMITR-104. Maximum permissible ingress of a screw into the blind nut is 8 mm. Refer to the Grounding Concept in Chapter 2.9 for further information concerning system grounding.

1.5 Identification Label

The HMITR-104 display unit has a type label on the backside of the unit which provides certain information about the unit. Important on the label is the “Main Voltage” required for operation. Always verify that the “Main Voltage” is that required by the application before installing a display unit.

Figure 1-8: Display Unit Identification Label Example



1.6 System Specifications

The following table provides the main specifications for the HMITR-104.

Table 1-1: Technical Specifications of the HMITR-104

HMITR-104	SPECIFICATION
System Controller	Intel® Atom™ E6xx Processor, up to 1.6 GHz, 512 kB L2 Intel® Platform Controller Hub EG20T
Memory	Main Memory: • Up to 2 GB DDR2 800 MT/s memory Flash Memory: • Two redundant SPI flashes (2 x 8 MB) for uEFI BIOS • Up to 32 GB NAND flash via an onboard Serial ATA Flash module (SSD) • bootable Serial EEPROM with 64 kbit SD/SDHC Card: • Up to 32 GB • bootable (Linux only)
Front Panel Interfaces	Display: • TFT-LCD • 10.4 inch • Backlighting dimmable LED's: • Pwr on (yellow): user programmable • Status (blue): user programmable • Th (yellow): user programmable • GP (blue): user programmable Touch Screen: (exclusive of the hard key bezel) • Capacitive Hard Key Bezel: (exclusive of the touch screen) • UIC 612-01 compliant • Keys for pre-defined functions • Key backlighting: dimmable • Hard glass: protection for the TFT-LCD Ambient Light Sensor: • for backlight control • for hard key backlighting Buzzer: • Acoustical warning device • Acoustical indication that key input recognized • 3.6 kHz • Sound Pressure Level: max 90 dB @ 10cm

Table 1-1: Technical Specifications of the HMITR-104

HMITR-104	SPECIFICATION
Rear Panel Interfaces	Power (PWR): • M12, A coded, 4-pin male connector Serial (SER A, SER B): • Two M12, A coded, 5-pin female connectors • RS232 (default) or configurable to RS422 Serial: SER C • One D-SUB, 9-pin female connector • RS232 (default) • RS422 (optional) • RS485 (optional) Serial: SER D • One D-SUB, 9-pin female connector • RS232 (optional) • RS422 (default) • RS485 (optional) Ethernet (Eth A, Eth B): • Two M12, D coded, 4-pin female connectors • 100BASE-T Fast Ethernet USB (USB A, USB B): • Two M12, A coded, 5-pin male connectors • USB 2.0 Digital IO: DIO Interface • One D-SUB, 25-pin female connector • 6 input channels • 2 output channels CAN: • One D-SUB, 9-pin male connector Audio: • One D-SUB, 15-pin female connector • Line IN (left and right) • Line OUT (left and right) • Micro (left and right) • Loud speaker (mono, 5 watt max.) • GSM handset (optional) Antennas (optional interfaces): • Three SMA female connectors e.g. GSM, GPS, and WiFi/WLAN

Table 1-1: Technical Specifications of the HMITR-104

HMITR-104	SPECIFICATION
Auxiliary Interfaces	Two standard PCIe Mini Card connectors: • One internal-only accessible connector, only full length PCIe Mini Cards can be used, no SIM card available • One externally accessible connector (access via the System Access Panel 2) If this interface is used, the proprietary interface described below cannot be used. In addition, only full length PCIe Mini Cards may be used with this interface. One proprietary interface for: • GSM/GSM-R modules externally accessible connector (access via the System Access Panel 2) for a Cinterion MC55i module or a Triorail TRM-3 module SIM Card: • externally accessible connector (access via the System Access Panel 2) • Usable with either a module in J15 or J16 (but not at the same time) DIP Switch SW2: • externally accessible eight position switch (access via the System Access Panel 1) • General purpose, application defined digital inputs DIP Switch SW3: • externally accessible two position switch (access via the System Access Panel 1) • Used for resetting uEFI BIOS settings and selecting SPI flash from which to boot (standard or recovery) USB: • externally accessible type A USB connector (access via the System Access Panel 1) Ethernet: • externally accessible RJ45 Gigabit Ethernet connector (access via the System Access Panel 1) SD/SDHC Card: • externally accessible SD/SDHC connector (access via the System Access Panel 1) • Supports up to 32GB • Bootable • Speed class 6 cards supported LED's: • Two general purpose three-state LEDs externally accessible (access via the System Access Panel 1) • Red, green and amber

Table 1-1: Technical Specifications of the HMITR-104

HMITR-104	SPECIFICATION
Operating Systems	Linux, Windows XP Embedded (QNX on request)
Power Supply	Mains Input (DC): • 24 V or 110 V (must be specified when ordering) • Input power supplied via M12, 4-pin male connector on rear panel • 10 ms hold up time (EN50155/S2)
Power Consumption	25W typical
Environmental Protection	IP20 (rear housing); IP65 (front panel)
Temperature Monitor and Control	Monitoring: • Internal temperature sensing device Control: • Function supervision • Front panel LED (Th) for indication of system over temperature; threshold temperature for lighting user programmable
Temperature Ranges	Operation: -25°C to +55°C (up to +70°C for 10 minutes max.; EN 50155 T1) Storage: -40°C to +85°C
Mechanical Characteristics	Dimensions: • 310.0mm (w) x 214mm (h) x 77,5mm (d) overall (see also figures showing assembly dimensions) Mounting (without forced air cooling): • Vertical and horizontal, thermal cooling concept must be verified before implementation (refer to chapters 3.3 and 3.5.1) Mounting clearance for cooling purposes: • top/bottom: 50 mm • left/right: 0 mm Mounting clearance required for assembly installation and interface cable connection: • back side: 270 mm (minimum) (70 mm for assembly; 200 mm for cables) Hard Key Bezel Front Plate: • Security glass plate, EN 50102, IK7
Weight	2,8 kg (weight approximate)
Battery (optional)	3.0V lithium battery for RTC with battery socket. Battery type: UL-approved CR2032 Temperature ranges: Operational: -30°C to +60°C typical (refer to the battery manufacturer's specifications for exact range) Storage: -55°C to +70°C typical (no discharge)

1.7 Standards

The HMITR-104 is designed to the following standards:

Table 1-2: Standards Applicable to the HMITR-104

REQUIREMENT	STANDARD	COMMENT
ITE Safety Europe	EN 60950-1	Safety Europe Directive 2006/95/EC
Railway Safety	EN 50155	Railway
Thermal Operating	EN 50155 IEC 60068-2-1 IEC 60068-2-2	Railway Class T1
Climatic Test Damp heat, cyclic	EN 50155 IEC 60068-2-30	Railway
Random Vibration Operating	EN 50155 EN 61373 IEC 60068-2-64	Railway Class 1B
Shock	EN 50155 EN 61373 IEC 60068-2-27	Railway Class 1B
EMC Emission	EN 50155 EN 50121-3-2 EN 55011	Railway Class A
EMC Immunity	EN 50155 EN 50121-3-2	Railway
Mechanical	UIC 612-01	Mechanical Dimensions
WEEE	Directive 2002/96/EC	Waste electrical and electronic equipment
RoHS	Directive 2002/95/EC	Restriction of the use of certain hazardous substances in electrical and electronic equipment

Note ...

Kontron performs comprehensive environmental testing of its products in accordance with applicable standards.

Customers desiring to perform further environmental testing of Kontron products must contact Kontron for assistance prior to performing any such testing. This is necessary, as it is possible that environmental testing can be destructive when not performed in accordance with the applicable specifications.

In particular, for example, boards **without conformal coating** must not be exposed to a change of temperature exceeding 1K/minute, averaged over a period of not more than five minutes. Otherwise, condensation may cause irreversible damage, especially when the board is powered up again.

Kontron does not accept any responsibility for damage to products resulting from destructive environmental testing.

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Chapter 2

Functional Description

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2. Functional Description

The following chapters present more detailed information about the HMITR-104 whereby the system interfaces and their functionality are discussed in general.

2.1 General Information

The are four versions of the HMITR-104 available based on the mains input voltage (24 or 110 VDC) and the operator input interfacing required (hard key bezel or touch screen). A single HMITR-104 may only have either a hard key bezel or a touch screen. A hard key bezel and touch screen together in one unit is physically not possible. All versions offer an extensive set of standard features.

In addition to the standard features, Kontron offers optional modules, serial interface configurations and a backup battery for the RTC which must be ordered with the HMITR-104. Please contact Kontron prior to ordering these options.

In the following chapters the standard as well as the optional features are described.

2.2 System Interfaces

The interfaces directly relevant to system implementation are grouped into three categories:

- Front side
- Back side
- Auxiliary

More detailled descriptions of these interfaces are provided in the ensuing chapters

2.2.1 Front Side Interfaces

The front side interfaces with the exception of the ambient light sensor provide for interaction with the vehicle operator. Operator interaction depends primarily on the input capability provided: touch screen or hard key bezel. Applications using a hard key bezel are limited by the functions assigned to the individual keys, whereas applications using a touch screen can be considerably more flexible.

In addition to the operator IO interfacing, there are LEDs and a warning buzzer available.

2.2.1.1 HMITR-104 Display

The HMITR-104 display is the same device for all versions of the HMITR-104. It is an SVGA backlighted color display, 4:3 format and has a diagonal of 10.4 inches. The HMITR-104 hard key versions have a protective glass plate for the display front whereas with the touch screen versions, the touch screen itself is the front plate of the display assembly. Display dimming is controlled via a light sensor built-in to the front panel of the HMITR-104. The following table provides specifications of the display unit.

Table 2-1: HMITR-104 Display Specifications

FEATURE	SPECIFICATION
Display Area (mm)	211.2 (H) x 158.4 (V) (10.4 inch diagonal)
Resolution	800 (H) x 600 (V)
Pixel Pitch (mm)	0.264 (H) x 0.264 (V)
Display Mode	Normally white TN
Number of Color	16.7 M (8 bit/color)
Luminance	700 cd/m²
Contrast Ratio	700:1
Wide Viewing Angle Technology	Optical Compensation Film
Viewing Angle (CR ≥ 10)	Horizontal: -80° left ~ +80° right (H) Vertical: -60° lower ~ +80° upper (V) (angles measured at right angles to center of display)
Surface Treatment	Anti-glare and hard-coating 3H
Electrical Interface	LVDS
Optimum Viewing Angle (Contrast ratio)	6 o'clock
Backlight Unit	LED edge light

2.2.1.2 Hard Key Bezel

The hard key bezel versions of the HMITR-104 are designed in accordance with the UIC 612-01 specification. The operator keys are integrated into the outer perimeter of the bezel. These are "make" keys meaning as soon as they are pressed they are recognized as being pressed. The keys are backlighted for better viewing in dim light conditions.

The basic function of each key is determined by the UIC 612-01 specification. Applications can, however, provide "soft-keys" on top of the function assigned to certain keys. The ASCII key codes are provided in chapter 4. Refer to the UIC 612-01 specification for further information.

2.2.1.3 Touch Screen

The touch screen is in itself the front plate of the display unit. It is a glass plate with capacitive sensing to provide single touch or two finger motion recognition. In the case of touch screen versions of the HMITR-104, the application specifies the functionality of the touch screen.

The UIC 612-01 specification permits the application to simulate the "hard keys" of a hard key bezel on the display with the same functionality as a hard key bezel version.

In a single application, mixed versions should be avoided.

2.2.1.4 LEDS

All versions of the HMITR-104 have four LEDs on the front side of the unit. They are located at the top left (“Pwr on” and “Status”) and top right (“Th” and “GP”) side of the bezel (see figures 1-3 and 1-4 for their exact positions on the bezel). In spite of the naming convention of these LEDs they are general purpose freely programmable LEDs. They have no fixed assigned functions except if functions are defined by an application. Applications have access to these LEDs via an appropriate API.

The color of the LEDs is as follows:

Pwr on	yellow
Status	blue
Th	yellow
GP	blue

2.2.1.5 Buzzer

The HMITR-104 has an acoustical alarm device (piezoelectric buzzer) located directly behind the display. This device is application controlled via an appropriate API and can produce tones up to a maximum of approximately 90 dB sound pressure level.

2.2.1.6 Ambient Light Sensor

The HMITR-104 has an ambient light sensor located in the lower left corner of the display bezel. This light sensor is used to control both the brightness of the display (all versions of the HMITR-104) and the backlighting intensity of the hard keys of hard key versions of the HMITR-104.

Note ...

If this sensor is covered up or obstructed by objects placed in front of it, the brightness control of the display and, when applicable, the backlighting of the hard keys will not function properly.

2.2.2 Back Side Interfaces

The HMITR-104 provides the following system interfaces:

INTERFACE	CONNECTOR	DESCRIPTION
DIO Interface	J9	Digital Input and Output
CAN	J10	CAN
SER C	J11	Serial Interface: C
SER D	J12	Serial Interface: D
Audio	J13	Audio Input and Output
PWR	J18	System Input Power
SER A	J19	Serial Interface: A
SER B	J20	Serial Interface: B
Eth A	J21	Ethernet Channel: A
Eth B	J22	Ethernet Channel: B
USB A	J23	USB Channel: A
USB B	J24	USB Channel: B
WiFi	SMA	Antenna connector
GSM	SMA	Antenna connector
GSM-R	SMA	Antenna connector
GSM / PCIeMC	SMA / -	Antenna connector / -
GPS	SMA	Antenna connector

Descriptions of the connectors and their pinouts are provided in the following chapters.

2.2.2.1 DIO Interface - J9 - Digital Input and Output

This interface provides 6 digital input and 2 digital output channels and is realized using a 25-pin female D-Sub connector.

Figure 2-1: DIO Interface - J9 Connector

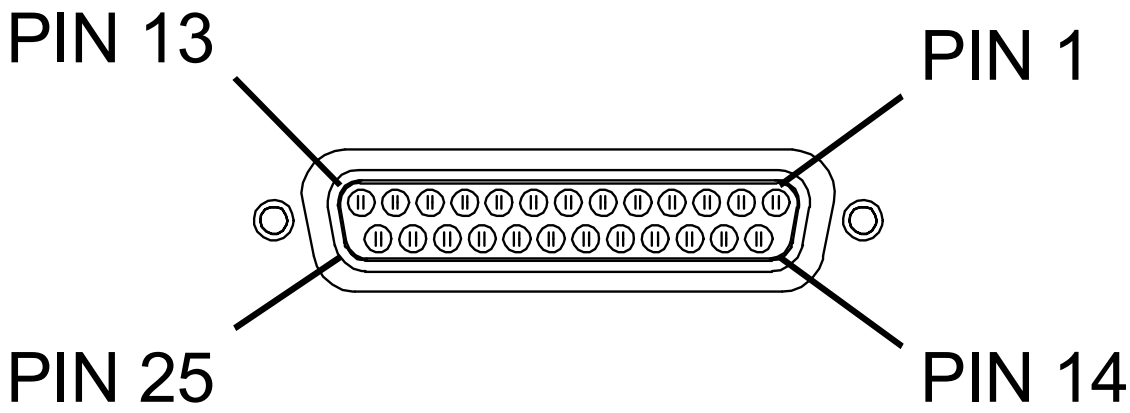


Table 2-2: DIO Interface - J9 Connector Pinout

FUNCTION	SIGNAL	PIN	PIN	SIGNAL	FUNCTION
Digital ground	GND_DOUT	1	14	GND_DOUT	Digital ground
Digital Output 0	DOUT[0]	2	15	DOUT[1]	Digital Output 1
	V_24_DOUT	3	16	V_24_DOUT	
Not connected	NC	4	17	NC	Not connected
Not connected	NC	5	18	NC	Not connected
Not connected	NC	6	19	NC	Not connected
Not connected	NC	7	20	DIN[0]+	Digital Input 0 +
Digital Input 0 -	DIN[0]-	8	21	DIN[1]+	Digital Input 1 +
Digital Input 1 -	DIN[1]-	9	22	DIN[2]+	Digital Input 2 +
Digital Input 2 -	DIN[2]-	10	23	DIN[3]+	Digital Input 3 +
Digital Input 3 -	DIN[3]-	11	24	DIN[4]+	Digital Input 4 +
Digital Input 4 -	DIN[4]-	12	25	DIN[5]+	Digital Input 5 +
Digital Input 5 -	DIN[5]-	13			

2.2.2.2 CAN Interface - J10

This is a standard CAN type interface. It uses a 9-pin male D-Sub connector.

Figure 2-2: CAN Interface - J10 Connector

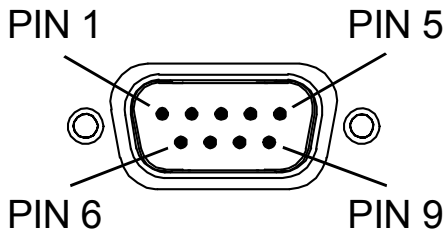


Table 2-3: CAN Interface - J10 Connector Pinout

PIN	SIGNAL	FUNCTION
1	NC	Not connected
2	CAN-	CAN negative
3	GND	Ground
4	NC	Not connected
5	NC	Not connected
6	NC	Not connected
7	CAN+	CAN positive
8	NC	Not connected
9	NC	Not connected

2.2.2.3 SER C/SER D Interfaces - J11/J12

These are serial interfaces configurable for RS232, and RS422/485 (half and full duplex). They use 9-pin, female, D-Sub connectors.

The default configuration for SER C is RS232. If either an RS422 or RS485 configuration is required, please contact Kontron prior to ordering the HMITR-104 as these configurations can only be set during assembly at the factory.

The default configuration for SER D is RS422. If either an RS232 or RS485 configuration is required, please contact Kontron prior to ordering the HMITR-104 as these configurations can only be set during assembly at the factory.

Figure 2-3: SER C/SER D Interfaces - J11/J12 Connectors

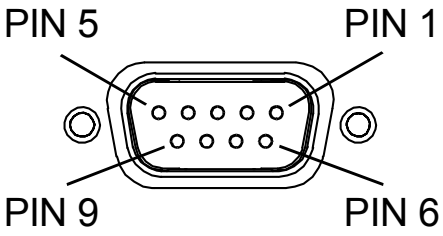


Table 2-4: SER C/SER D Interfaces - J11/J12 Connectors Pinout

PIN	Signal RS232	Signal RS422/485 full-duplex	Signal RS422/485 half-duplex
1	CD	NC	NC
2	RxD	Z	Z
3	TxD	B	NC
4	DTR	NC	NC
5	GND	GND	GND
6	DSR	NC	NC
7	RTS	A	NC
8	CTS	Y	Y
9	RI	NC	NC
HOUSING	Shield/GND	Shield/GND	Shield/GND

2.2.2.4 Audio Interface - J13

This interface provides LINE IN and OUT in stereo, microphone stereo input and mono speaker output. In addition, there are pins reserved for an operator telephone-like handset. The connector is a 15-pin female D-Sub connector.

Figure 2-4: Audio Interface - J13 Connector

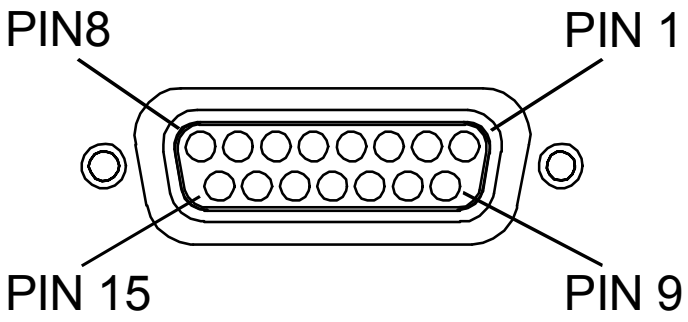


Table 2-5: Audio Interface - J13 Connector Pinout

SIGNAL	PIN	PIN	SIGNAL
Power Amplifier / Speaker +	1	9	Power Amplifier / Speaker -
GND_Audio	2	10	Microphone left
Microphone right	3	11	GND_Audio
Line In left	4	12	Line In right
Line Out left	5	13	Line Out right
GND_Audio	6	14	Reserved
Reserved	7	15	Reserved
Reserved	8		

2.2.2.5 Power Interface - J18

This interface provides input power to the HMITR-104. The connector is an M12, 4-pin, male, A-coded, panel feed through connector.

Figure 2-5: Power Interface - J18 Connector

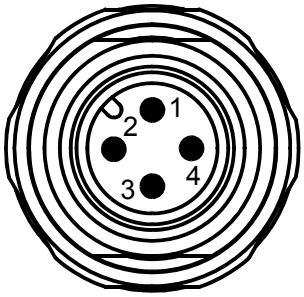


Table 2-6: Power Interface - J18 Connector Pinout

PIN	SIGNAL	FUNCTION
1	Vin+	Supply voltage plus
2	Active	Used to turn system on and off (refer to chapter 2.12 for further information on usage)
3	Vin-	Supply voltage negative
4	Vin-	Supply voltage negative
Housing	GND / Shield	Chassis ground

2.2.2.6 SER A/SER B Interfaces - J19/J20

These are serial interfaces configurable for RS232 (default) and RS422. They use M12, 5-pin, female, A-coded, panel feed through connectors.

Figure 2-5: SER A/SER B Interfaces - J19/J20 Connectors

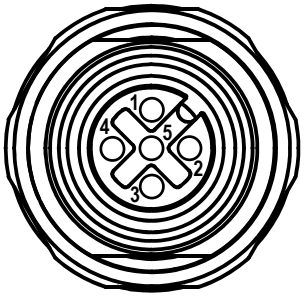


Table 2-6: SER A/SER B Interfaces - J19/J20 Connectors Pinout

PIN	Signal RS232	Signal RS422	Description
1	NC	RS422-Y	RS232: Not Connected RS422: Non-inverted UART Tx signal
2	RS232-TxD	RS422-Z	RS232: Non-inverted UART Tx signal; RS422: Inverted UART Tx signal
3	RS232-RxD	RS422-A	RS232: Inverted UART Rx signal; RS422: Non-Inverted UART Rx signal
4	GND_SER_A/B	GND	Ground isolated
5	NC	RS422-B	RS232: Not Connected RS422: Inverted UART Rx signal
HOUSING	Shield/GND	Shield/GND	Shield/GND

2.2.2.7 Eth A/Eth B Ethernet Interfaces - J21/J22

These are Fast Ethernet interfaces configured for 100BASE-T operation. These connectors are M12, 4-pin, female, D-coded, panel feed through connectors.

Figure 2-6: Eth A/Eth B Ethernet Interface - J21/J22 Connectors

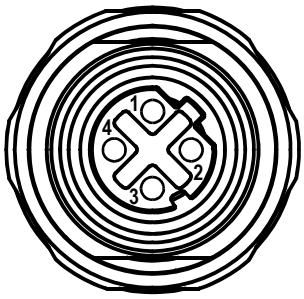


Table 2-7: Eth A/Eth B Ethernet Interface - J21/J22 Connectors Pinout

PIN	SIGNAL	FUNCTION
1	TD+	Transmit Data +
2	RD+	Receive Data +
3	TD-	Transmit Data -
4	RD-	Receive Data -
Housing	GND / Shield	Chassis ground

2.2.2.8 USB A/USB B Interfaces - J23/J24

These are USB 2.0 host interfaces and can be operated at high, full, and low speed. These connectors are M12, 5-pin, male, A-coded, panel feed through connectors.

Figure 2-7: USB A/USB B Interfaces - J23/J24 Connectors

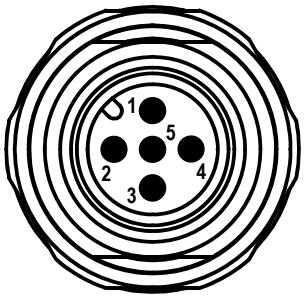


Table 2-8: USB A/USB B Interfaces - J23/J24 Connectors Pinout

PIN	SIGNAL	FUNCTION
1	D-	Data -
2	VBUS	Power supply for external USB devices (5V, max. 0.5A)
3	NC	Not connected
4	D+	Data +
5	GND	Ground
Housing	GND / Shield	Ground potential

2.2.2.9 WIFI/GSM/GPS Interfaces

These interfaces are the antenna connectors for the optional modules for the WiFi, GSM, and GPS functions. These connectors are SMA, female, panel feed through connectors.

Figure 2-8: WIFI/GSM/GPS Interface Connectors

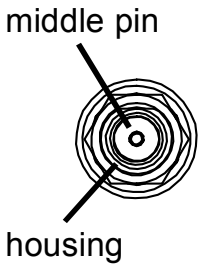


Table 2-9: WIFI/GSM/GPS Interface Connector Pinout

PIN	SIGNAL	FUNCTION
Middle	ANT_IO	Module RF input/output interface
Housing	GND / Shield	Ground potential

2.2.3 Auxiliary Interfaces

In addition to the front panel and back side interfaces, the HMITR-104 provides various auxiliary interfaces which are located behind the System Access Panels 1 and 2. To gain access to these interfaces, the corresponding metal cover plate must be removed. Normally in an application environment it is not necessary to have physical access to these interfaces and therefore the metal cover plates are installed. For maintenance or application development purposes, however, these plates may be removed allowing access as required.

These interfaces are:

(accessible via the System Access Panel 1 located on the chassis left side)

- GigaBit Ethernet, J9 (RJ45 connector)
- USB 2.0 highspeed serial interface, J5 (type A connector)
- SD/SDHC Secure Digital mass storage interface, J3
  (standard SD card holder/connector)
- One eight position DIP switch, SW2
- One two position DIP switch, SW3

(accessible via the System Access Panel 2 located on the chassis back side)

- GSM/GSM-R module: J15 (GSM/GSM-R interface)
- PCIe Mini Card: J16 (GSM module or any PCIe Mini Card compliant module)
- GSM SIM card: J17 (standard holder/connector)

Of the above mentioned interfaces the SW2, the SD/SDHC and the GSM/GSM-R or the PCIe Mini Card are available for use in an application.

The SW2 can be used to provide application relevant digital inputs.

The SD/SDHC can be used as a (bootable) mass storage device (R/W or R only).

The GSM/GSM-R interface can used for mobile communications. This is a special proprietary interface for two optionally available modules: one GSM module and one GSM-R module.

The PCIe Mini Card interface can used for mobile communications or other functions which have a PCEe Mini Card interface. This is a standardized interface which supports optionally available modules. Only full length PCIe Mini Cards may be used here.

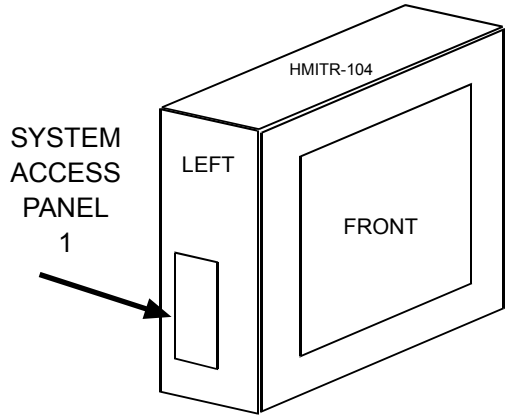
Any required optional modules must be ordered along with the HMITR-104. This is to ensure compatibility with the HMITR-104 and that any additional requirements are satisfied e.g. antenna or other cabling required.

The GSM/GSM-R and the PCEe Mini Card interfaces are mutually exclusive of one another due to physical restraints (only one module can be installed at a time). The GSM SIM card interface can be used with either of these interfaces.

If access to any of the auxiliary interfaces is required after the HMITR-104 is installed in an application, it may be possible, depending on the application situation, to gain access without removing any of the HMITR-104 interfacing cables. In any event, in this situation care must be exercised to prevent equipment damage or loss of components (screws, cover plates, cable wire breakage, etc).

The following figures illustrate the locations of the auxiliary interfaces. In the ensuing chapters more detailled information is provided concerning the auxiliary interfaces.

Figure 2-9: System Access Panel 1 Chassis Left Side



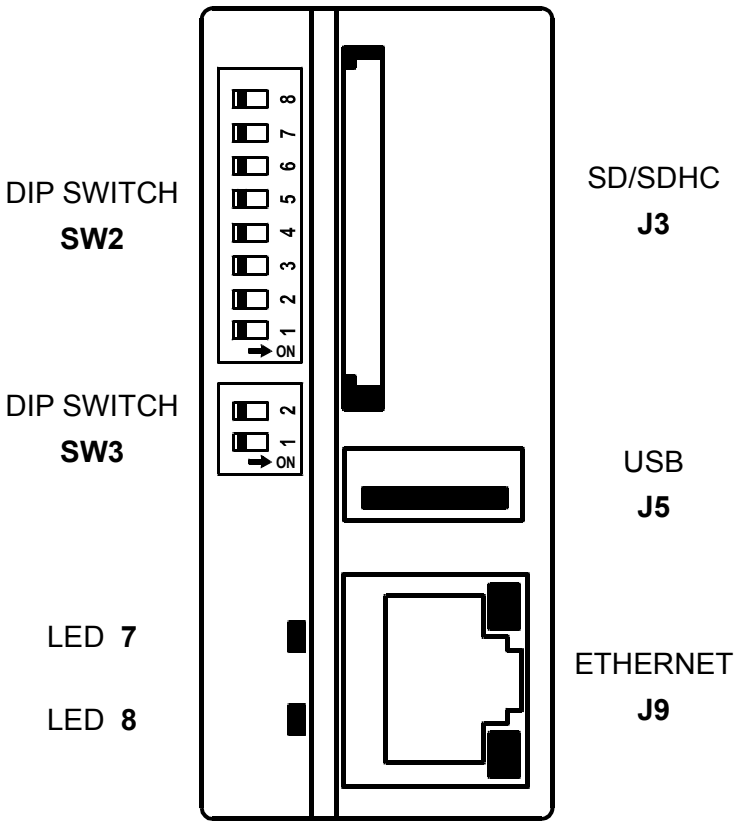
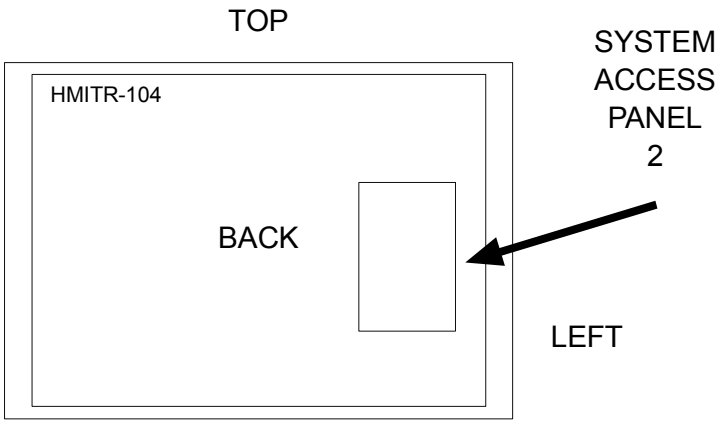
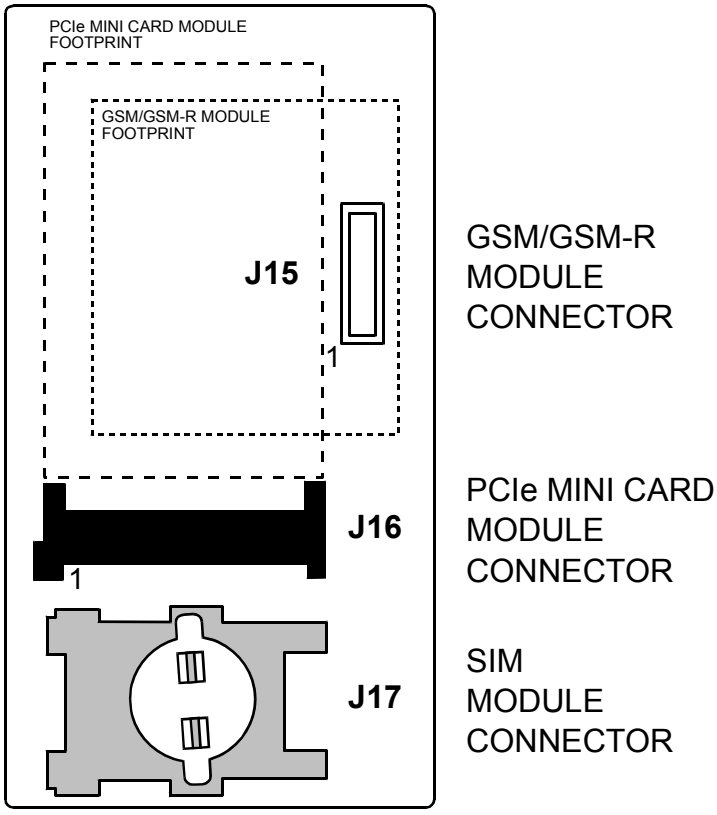


Figure 2-10: System Access Panel 2 Chassis Back Side





GSM/GSM-R
MODULE
CONNECTOR

PCIe MINI CARD
MODULE
CONNECTOR

SIM
MODULE
CONNECTOR

2.2.3.1 SD/SDHC Interface J3

The HMITR-104 auxiliary SD/SDHC card interface J3 is implemented as a standard SD/SDHC slot with the following pinout:.

Figure 2-11: SD/SDHC I/F J3

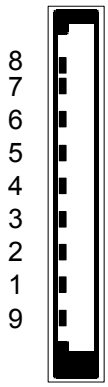


Table 2-10: SD/SDHC I/F J3 Pinout

PIN	SIGNAL	FUNCTION	I/O
1	DAT3	Data line 3	I/O
2	CMD	Command line	I/O
3	GND	Power ground	O
4	3.3V	Voltage supply	O
5	CLK	Clock	O
6	GND	Power ground	O
7	DAT0	Data line 0	I/O
8	DAT1	Data line 1	I/O
9	DAT2	Data line 2	I/O

2.2.3.2 USB Connector J5

The HMITR-104 auxiliary USB interface J5 is implemented as a 4-pin type A USB connector with the following pinout:

Figure 2-12: USB Con. J5

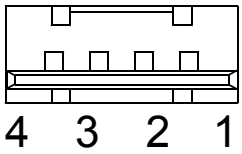


Table 2-11: USB Con. J5 Pinout

PIN	SIGNAL	FUNCTION	I/O
1	VCC	VCC	--
2	D-	Data -	I/O
3	D+	Data +	I/O
4	GND	GND	--
H	GND	GND/Shield (H = housing)	--

2.2.3.3 Gigabit Ethernet

The HMITR-104 auxiliary Ethernet interface J9 is implemented as an RJ-45 connector. This interface provides automatic detection and switching between 10Base-T, 100Base-TX and 1000Base-T data transmission (Auto-Negotiation). Auto-wire switching for crossed cables is also supported (Auto MDI-X).

Figure 2-13: GbE Connector J9

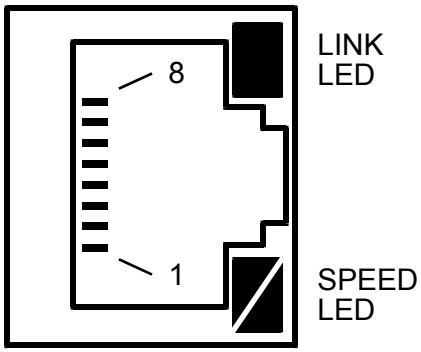


Table 2-12: Pinout of GbE Connector J9

PIN	MDI / STANDARD ETHERNET CABLE					
	10BASE-T		100BASE-TX		1000BASE-T	
	I/O	SIGNAL	I/O	SIGNAL	I/O	SIGNAL
1	O	TX+	O	TX+	I/O	BI_DA+
2	O	TX-	O	TX-	I/O	BI_DA-
3	I	RX+	I	RX+	I/O	BI_DB+
4	-	-	-	-	I/O	BI_DC+
5	-	-	-	-	I/O	BI_DC-
6	I	RX-	I	RX-	I/O	BI_DB-
7	-	-	-	-	I/O	BI_DD+
8	-	-	-	-	I/O	BI_DD-

Ethernet LED Status

LINK (green): This LED monitors network connection and activity. The LED lights up when a valid link (cable connection) has been established. The LED goes temporarily off if network packets are being sent or received through the RJ-45 port. When this LED remains off, a valid link has not been established.

SPEED (green/orange): This LED lights up to indicate a successful 100Base-TX or 1000BASE-T connection. When green it indicates a 100Base-TX connection and when orange it indicates a 1000Base-T connection. When not lit and the LINK LED is active, the connection is operating at 10Base-T.

2.2.3.4 DIP Switch SW2

This DIP switch SW2 is an eight position SPST switch which provides eight user configurable digital inputs. The eight individual switch states (on/off) are available via the Status Register 1 (STAT1, 0x281). It is recommended that switches not required for application usage be switched to the off position.

The following figure and table illustrate the switch positions and provide status information.

Figure 2-14: DIP Switch SW2

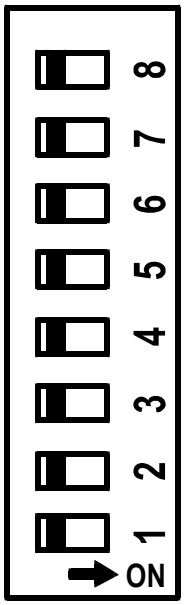


Table 2-13: DIP Switch SW2 Configuration

SW POS	STAT1 REGISTER NAME	SWITCH / BIT STATE	I/O
1	DIP2.1	off = 1 / on = 0	I
2	DIP2.2	off = 1 / on = 0	I
3	DIP2.3	off = 1 / on = 0	I
4	DIP2.4	off = 1 / on = 0	I
5	DIP2.5	off = 1 / on = 0	I
6	DIP2.6	off = 1 / on = 0	I
7	DIP2.7	off = 1 / on = 0	I
8	DIP2.8	off = 1 / on = 0	I

2.2.3.5 DIP Switch SW3

This DIP switch SW3 is a two position SPST switch which can be used to specify the uEFI BIOS settings to be used during system startup and which SPI flash is to be used to boot the system. Normally both of these switches are set to “OFF”.

The following figure and table illustrate the switch positions and provide function information.

Figure 2-15: DIP Switch SW3

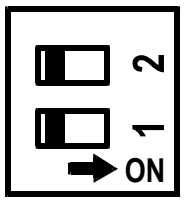


Table 2-14: DIP Switch SW3 Function

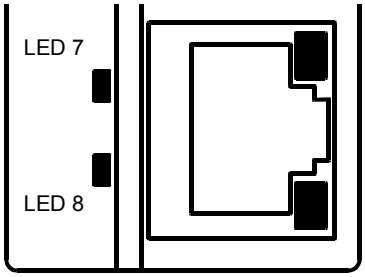
SWITCH	FUNCTION
1	Clear uEFI BIOS settings
2	SPI flash boot selection

2.2.3.6 LEDs 7 and 8

These are user general purpose LEDs which are configurable via the LED Control Register (LED, 0x28B). Their possible colors are red, green and amber (red + green).

The following figure illustrates the location of these LEDs.

Figure 2-16: LEDs 7 and 8



2.2.3.7 GSM/GSM-R Connector J15

This HMITR-104 auxiliary interface supports only the optional GSM/GSM-R modules. If such a module is populated, connector J16 cannot be used. Please contact Kontron for further assistance concerning use of this interface.

Figure 2-17: GSM/GSM-R Connector J15

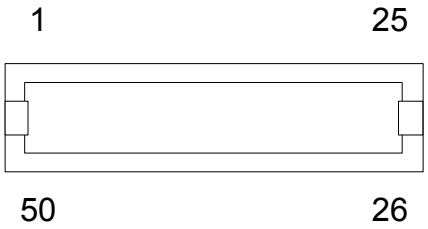


Table 2-15: GSM/GSM-R Connector J15

FUNCTION	SIGNAL	PIN	PIN	SIGNAL	FUNCTION
GND	GND	25	26	VBATT+	Power (Nom. 4.2V)
GND	GND	24	27	VBATT+	Power (Nom. 4.2V)
GND	GND	23	28	VBATT+	Power (Nom. 4.2V)
GND	GND	22	29	VBATT+	Power (Nom. 4.2V)
GND	GND	21	30	VBATT+	Power (Nom. 4.2V)
	NC	20	31	NC	
	NC	19	32	RING0	ASC0 Serial IF
	NC	18	33	DSR0	ASC0 Serial IF
ASC0 Serial IF	TxD0	17	34	RTS0	ASC0 Serial IF
ASC1 Serial IF	TxD1	16	35	DTR0	ASC0 Serial IF
ASC0 Serial IF	RxD0	15	36	RTS1	ASC1 Serial IF
ASC1 Serial IF	RxD1	14	37	CTS0	ASC0 Serial IF
	NC	13	38	CTS1	ASC1 Serial IF
	NC	12	39	DCD0	ASC0 Serial IF
	NC	11	40	NC	
	NC	10	41	IGT	Switch ON
	NC	9	42	NC	
	NC	8	43	MICN1	Handset MIC input
	NC	7	44	MICP1	Handset MIC input
SIM GND	CCGND	6	45	NC	
SIM-Card detection	CCIN	5	46	NC	
SIM-IF reset	CCRST	4	47	EPN1	Handset speaker
SIM-IF Data	CCIO	3	48	EPP1	Handset speaker
SIM-IF Pwr (2.75V to 2.95V)	CCVCC	2	49	NC	
SIM-IF Clk	CCCLK	1	50	NC	

2.2.3.8 PCIe Mini Card Connector J16

This HMITR-104 auxiliary interface supports optional modules that comply with the PCIe Mini Card specification. If such a module is populated, connector J15 cannot be used. Please contact Kontron for further assistance concerning use of this interface.

Figure 2-18: PCIe Mini Card Connector J16

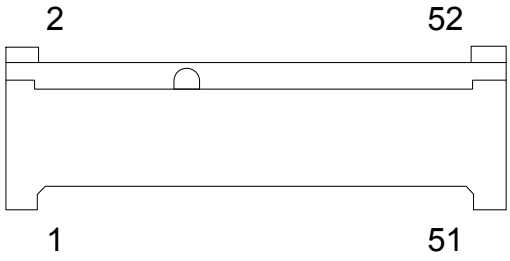


Table 2-16: PCIe Mini Card Connector J16

SIGNAL	PIN	PIN	SIGNAL
3.3V	52	51	NC
GND	50	49	NC
1.5V	48	47	NC
Reserved	46	45	NC
Reserved	44	43	NC
Reserved	42	41	NC
GND	40	39	NC
USB_D+	38	37	NC
USB_D-	36	35	GND
GND	34	33	PCIe Transmit +
Reserved	32	31	PCIe Transmit -
Reserved	30	29	GND
1.5V	28	27	GND
GND	26	25	PCIe Receive +
3.3V	24	23	PCIe Receive -
PCIe RST#	22	21	GND
Reserved	20	19	NC
GND	18	17	NC
UIM_VPP	16	15	GND
UIM_RESET	14	13	PCIe REFCLK +
UIM_CLK	12	11	PCIe REFCLK -
UIM_DATA	10	9	GND
UIM_PWR	8	7	Reserved
1.5V	6	5	NC
GND	4	3	NC
3.3V	2	1	Reserved

2.2.3.9 SIM Card Connector J17

This interface supports mini-SIM cards whereby only six card pins (C1, 2, 3, 5, 6 and 7) are contacted. S1 (C4) and S2 (C8) are only used for card insertion detection. If available, SIM card pins C4 and C8 are not contacted outside of the card.

Figure 2-19: SIM Card Con. J17

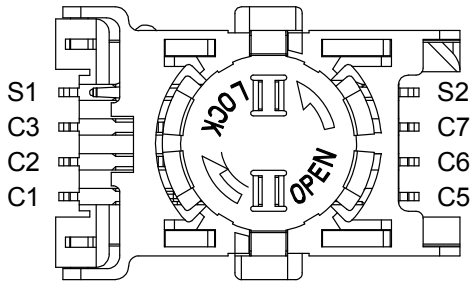


Table 2-17: SIM Card Con. J17 Pinout

PIN	SIGNAL	FUNCTION	I/O
C1	VCC	VCC	-
C2	NC	-	-
C3	CLK	Clock	O
S1	CD	Card detect	I
C5	GND	Ground	-
C6	NC	-	-
C7	I/O	Data I/O	I/O
S2	CD	Card detect	I

2.3 Optional Features

The HMITR-104 supports various optional features (i.e. add-on modules, serial interface configuration options and if required an RTC backup battery) which are described in the following chapters.

2.3.1 Add-On Modules

The following add-on modules are supported:

- Proprietary SATA mass storage module (MM-SATA)
- SD/SDHC mass storage module
- Proprietary GSM and GSM-R modules
- PCIe mini card modules
- SIM cards
- GPS module

These add-on modules are described in the following chapters.

2.3.1.1 SATA Mass Storage Module (MM-SATA)

The HMITR-104 has provision for a single optional Kontron proprietary SATA Flash module (MM-SATA) with either 16 GB or 32 GB NAND flash memory. Due to over-provisioning and other factors there is a considerable difference between the physical capacity of the flash memory and the logical capacity presented through the operating system (OS) as available for the user. As with all Flash memory, whenever possible unnecessary writing to the module should be avoided. If write protect for this module is required, please contact Kontron for further assistance.

This module must be ordered with the HMITR-104 as it must be installed at the factory. Please contact Kontron for further assistance before ordering the HMITR-104.

The following table provides specification information for the SATA module

Table 2-18: MM-SATA Flash Module Main Specifications

SATA FLASH MODULE		SPECIFICATIONS
Interface	Internal Board-to-Board Connector	One 34-pin, male, board-to-board connector
Memory	Memory	Up to 32 GB SLC-based NAND flash memory • Built-in full hard disk emulation • Up to 100 MB/s read rate • Up to 90 MB/s write rate
General	Power Consumption	typ. 0.5 W 3.3 V supply
	Climatic Humidity	93% RH at 40°C, non-condensing (acc. to IEC 60068-2-78)
	Dimensions	70 mm x 28 mm
	Board Weight	ca. 14 grams

2.3.1.2 SD/SDHC Mass Storage Module

The HMITR-104 provides support for a Secure Digital (SD) card or a Secure Digital High Capacity (SDHC) card with up to 32 GB for flexible flash-based memory expansion or system update. If required, the system can also be booted from this interface.

This interface is accessible in the field via the System Access Panel 1. Refer to Chapter 3 Installation for further assistance concerning installation and removal of SD/SDHC cards in the HMITR-104.

2.3.1.3 Proprietary GSM and GSM-R Modules

The HMITR-104 has a single proprietary interface (J15) based on the Cinterion MC55i module interface for use with the optional Cinterion MC55i GSM module or Triorail TRM-3 GSM-R module.

Kontron can provide either of these modules as required.

Initial installation including the antenna cable must be done at the factory. Module replacement can be done in the field. This interface is accessible in the field via the System Access Panel 2. Refer to Chapter 3 Installation for further assistance concerning installation and removal of GSM/GSM-R modules in the HMITR-104.

If one or the other of these modules is installed, J16 (PCIe Mini Card Interface) can not be used. This interface shares a SIM card interface with the PCIe Mini Card Interface.

This option must be ordered with the HMITR-104. Please contact Kontron for further assistance before ordering the HMITR-104.

2.3.1.4 PCIe Mini Card Modules

The HMITR-104 has a single PCIe Mini Card interface (J16) accessible via the System Access Panel 2. This interface can support a GSM module or other PCIe Mini Card compliant module (only full length modules are supported).

Kontron can provide a GSM PCIe Mini Card compliant module as required. Initial installation must be done at the factory if interfacing cabling is required (e.g. antenna cable). Module replacement can be done in the field. Refer to Chapter 3 Installation for further assistance concerning installation and removal of PCIe Mini Card modules in the HMITR-104.

If a PCIe Mini Card module is installed, J15 (Cinterion MC55i proprietary interface) can not be used. This interface shares a SIM card interface with the Cinterion MC55i proprietary interface.

This option must be ordered with the HMITR-104. Please contact Kontron for further assistance before ordering the HMITR-104.

2.3.1.5 SIM Card

SIM cards are supported by J17 (SIM card holder) accessible via the System Access Panel 2. This interface is shared by both the Cinterion MC55i proprietary interface and PCIe Mini Card interface. Only mini SIM cards with six pins are supported (the other two pins of this interface only support card detection). As Kontron does not supply SIM cards, users must purchase their own cards and install them in the field.

2.3.1.6 GPS Module

The HMITR-104 has an internal GPS interface which supports a single GPS device (Fastrax IT500) which can be supplied by Kontron.

Applications requiring use of this interface must have the GPS device and interfacing cabling installed at the factory. Therefore this option must be ordered with the HMITR-104. Please contact Kontron for further assistance before ordering the HMITR-104.

2.3.1.7 Internal PCIe Mini Card Modules

The HMITR-104 has a single internal PCIe Mini Card interface which can support either a WiFi module which can be supplied by Kontron or any other PCIe Mini Card compliant module which does not require a SIM card. Only full length modules are supported.

Applications requiring use of this interface must have the corresponding module (and any interfacing cabling) installed at the factory. Therefore this option must be ordered with the HMITR-104. Please contact Kontron for further assistance before ordering the HMITR-104.

2.3.2 Serial Interface Configuration Options

The HMITR-104 serial interfaces have various possible operational configurations. The table below illustrates these options. As these options must be set at the factory, they must be specified when the HMITR-104 is ordered. They cannot be changed in the field.

Table 2-19: Serial Interface Configurations

		INTERFACE TYPE		
		RS232	**RS422**	**RS485**
INTERFACE	**SER A**	**DEFAULT**	OPT	-
	SER B	**DEFAULT**	OPT	-
	SER C	**DEFAULT**	OPT	OPT
	SER D	OPT	**DEFAULT**	OPT

2.3.3 RTC Backup Battery

The standard backup power source for the RTC is a Gold Cap capacitor. The backup time is limited to approximately 17 days. If a longer backup time is required, a lithium coin cell battery is available as an option for the HMITR-104. If required, it must be ordered with the HMITR-104 as it is not possible to install it in the field. In addition, as the battery has a lifetime of 4 to 5 years, the HMITR-104 must be replaced and returned to the factory for battery replacement.

2.4 Watchdog Timer

The HMITR-104 provides a Watchdog timer that is programmable for a timeout period ranging from 125 ms to 4096 s in 16 steps. Failure to trigger the Watchdog timer in time results in a system reset or an interrupt. In dual-stage mode, it results in a combination of both interrupt and reset if the Watchdog is not serviced. A hardware status flag will be provided to determine if the Watchdog timer generated the reset.

Refer to chapter 4.11 for further information.

2.5 SPI Boot Flash for uEFI BIOS

The HMITR-104 provides two 8 MB SPI boot flashes for two separate uEFI BIOS images, a standard SPI boot flash and a recovery SPI boot flash. The fail-over mechanism for the uEFI BIOS recovery is controlled via the DIP switch SW3. If the standard SPI boot flash is corrupted, the recovery SPI boot flash can be selected to boot the system for resolution of the problem.

Location and switch position of SW3 can be found in this chapter. A description of DIP switch SW3 can be found in chapter 4.1.

The SPI flash includes a write protection option, which can be configured via the uEFI BIOS. If write protection is enabled, the SPI flash cannot be written to.

Note ...

The uEFI BIOS code and settings are stored in the SPI boot flash. Changes made to the uEFI BIOS settings are available only in the currently selected SPI boot flash.Thus, switching over to the other SPI boot flash may result in operation with different uEFI BIOS code and settings.

2.6 Temperature Sensors

The HMITR-104 has two temperature sensors: one located near the CPU and one near the DDR memory. They are accessible via software to readout their temperatures.

The application must service these sensors and determine any action to be performed.

2.7 Audio Interfacing Specifications

The following tables define what audio interfaces are available with the HMITR-104 and their technical specifications.

Table 2-20: HMITR-104 Audio IO Interfaces

HMITR-104	INTERFACES
HD Audio	HD audio codec supporting the following ports: • Mic-In stereo port • Line-In stereo port • Line-Out stereo port • Mono speaker port

Table 2-21: HD Audio Interfacing Specifications

INTERFACE		PARAMETER	SPECIFICATIONS
Input	Mic-In (Stereo)	Sampling Rates	8 kHz, 11.025 kHz, 16 kHz, 22.05 kHz, 32 kHz, 44.1 kHz, 48 kHz, 88.2 kHz, 96 kHz, 176.4 kHz, 192 kHz
		Dynamic Range	85 dB
		Signal-to-Noise Ratio	85 dB
		ADC Resolution	24-bit
		Input Impedance	20 kΩ / unbalanced, Mic. Boost = 0 dB
		Input Sensitivity	typ. 1 Vrms, Mic Boost = 0 dB typ. 0.316 Vrms, Mic. Boost = 10 dB typ. 0.1 Vrms, Mic. Boost = 20 dB typ. 0.032 Vrms, Mic. Boost = 30 dB
		Input Gain/Attenuation Range: All Mixer Inputs	min. -34.5 dB max. +12 dB
		Total Harmonic Distortion (THD + N)	0.013%
		Input BIAS	3.3 V
	Line-In (Stereo)	Sampling Rates	8 kHz, 11.025 kHz, 16 kHz, 22.05 kHz, 32 kHz, 44.1 kHz, 48 kHz, 88.2 kHz, 96 kHz, 176.4 kHz, 192 kHz
		Dynamic Range	85 dB
		Signal-to-Noise Ratio	85 dB
		ADC Resolution	24-bit
		Input Impedance	20 kΩ / unbalanced
		Input Sensitivity	typ. 1 Vrms
		Total Harmonic Distortion (THD + N)	0.013%
Output	Line-Out (Stereo)	Dynamic Range	90 dB
		Signal-to-Noise Ratio	90 dB
		DAC	24-bit
		Sampling Rates	8 kHz, 11.025 kHz, 16 kHz, 22.05 kHz, 32 kHz, 44.1 kHz, 48 kHz, 88.2 kHz, 96 kHz, 176.4 kHz, 192 kHz
		Output Impedance	Line-Out mode: typ. 190 Ω Headphone mode: max. 0.5 Ω
		External Load Impedance	Line-Out mode: min. 10 kΩ Headphone mode: min. 32 Ω
		Output Level	min. 1 Vrms (full-scale output voltage)
		Total Harmonic Distortion (THD + N)	0.006%
	Speaker Mono	Impedance	4 Ω
		Output power	5 W

2.8 GPS Module Specifications

The following table provides the technical specifications of the optional HMITR-104 GPS module.

Table 2-22: GPS Module Specifications

FEATURE	SPECIFICATION
Receiver	GPS L1 C/A-code, SPS
Channels	22 tracking / 66 acquisition
Tracking sensitivity	-165 dBm typ.
Navigation sensitivity, cold acquisition	-148 dBm typ.
Update rate	1 Hz (configurable 10 Hz max)
Time to First Fix, cold acquisition	35 s typ.
Time to First Fix, hot acquisition	1 s typ.
Navigation accuracy	3 m Horizontal (RMS) (Note 1) 0.1 m/s Velocity 1 µs Time (1PPS), jitter 50 ns (RMS)
Acceleration range	4 g max (Note 1)
Velocity range	515 m/s max
Altitude range	18000 m max
Assisted GPS support	EPO 7 and 14 days
Differential GPS support	RTCM104, SBAS (WAAS, Egnos, MSAS)
Power consumption	75 mW typ
Storage temperature	-40°C…+85°C
Operating temperature	-40°C…+85°C
Serial port configuration	Port 0: NMEA
Serial port protocol	NMEA-0183
Serial data format (UART)	8 bits, no parity, 1 stop bit
Serial data speed (UART)	9600 baud (configurable)

Note 1: Live signal conditions, roof top antenna with good visibility

2.9 Grounding Concept

Externally the HMITR-104 is grounded via an M4 screw terminal point. From this terminal point a grounding wire must be connected to the vehicle's chassis or a central grounding point.

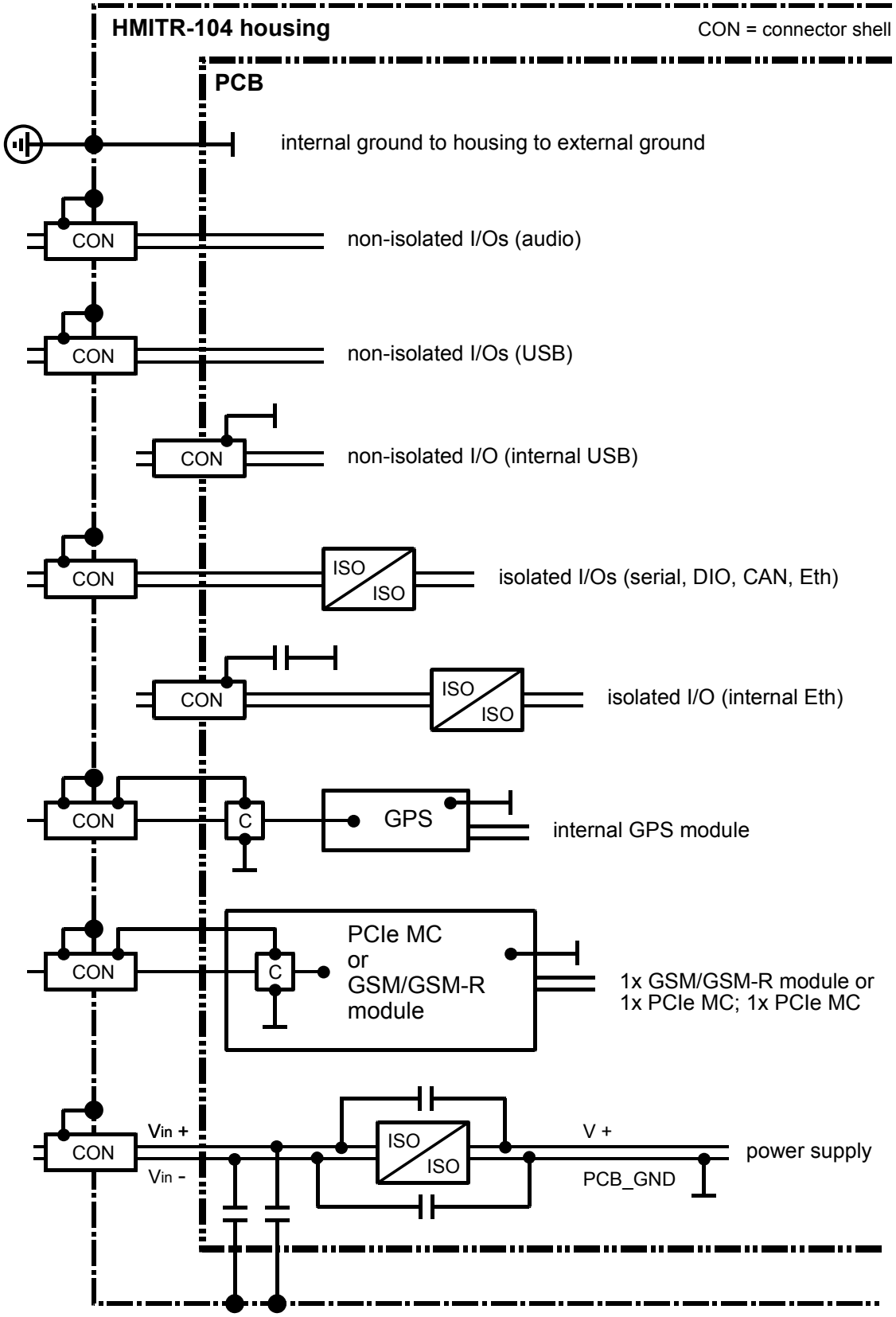
Inside the chassis, the HMITR-104 housing is connected to the ground plane of all internal PCBs. Interfaces which connect to external devices all have their external connector shells connected to the HMITR-104 housing. Only the two auxiliary interfaces (USB - J5 and ETH - J9) do not have their connectors connected directly to the HMITR-104 housing.

The following table and figure provide further information concerning HMITR-104 grounding.

Table 2-23: Grounding Concept

INTERFACE	CONNECTOR	CONNECTOR TYPE	CON. SHELL TO HOUSING	CONNECTION TO PCB GROUND	SIGNAL ISOLATION
DIO	J9 (DIO Interface)	DSUB	YES (0 ohm)	NO	YES
CAN	J10 (CAN)	DSUB	YES (0 ohm)	NO	YES
SERIAL	J11 (SER C)	DSUB	YES (0 ohm)	NO	YES
SERIAL	J12 (SER D)	DSUB	YES (0 ohm)	NO	YES
AUDIO	J13 (Audio)	DSUB	YES (0 ohm)	NO	NO
POWER	J18 (PWR)	M12	YES (0 ohm)	NO	YES (see figure 2-20)
SERIAL	J19 (SER A)	M12	YES (0 ohm)	NO	YES
SERIAL	J20 (SER B)	M12	YES (0 ohm)	NO	YES
ETH	J21 (Eth A)	M12	YES (0 ohm)	NO	YES
ETH	J22 (Eth B)	M12	YES (0 ohm)	NO	YES
USB	J23 (USB A)	M12	YES (0 ohm)	YES (0 ohm)	NO
USB	J24 (USB B)	M12	YES (0 ohm)	YES (0 ohm)	NO
GPS	(GPS)	SMA	YES (0 ohm)	YES (0 ohm)	NO
GSM/GSM-R or PCIe Mini Card	(GSM)	SMA	YES (0 ohm)	YES (0 ohm) (via GSM/GSM-R or PCIe Mini Card module)	NO
PCIe Mini Card	(WIFI)	SMA	YES (0 ohm)	YES (0 ohm) (via WiFi module)	NO
External Ground	GROUND	M4 screw (on back side of unit)	YES (0 ohm)	YES (0 ohm)	---
USB	J5 (internal)	USB type A	NO	YES (0 ohm)	NO
ETH	J9 (internal)	RJ45	NO	YES (capacitive)	YES

Figure 2-20: Grounding Concept



2.10 Power Consumption and Startup Currents

The power consumption table below lists the power specifications for the HMITR-104. The operating systems used were DOS, Linux and Windows® XP. All measurements were conducted at a temperature of 25°C, no optional modules installed (except for an MM-SATA module), all Ethernet interfaces in operation, and two USB interfaces in operation.

Note ...

The power consumption values indicated in the tables below can vary depending on the ambient temperature or the system performance. This can result in deviations of the power consumption values of up to 10%.

Further the values can vary according to the application configuration.

The power consumption was measured using Intel® Atom™ Processors E6XX and under the following testing conditions:

- DOS

  With this operating system only one thread was active. This operating system has no power management support and provides a very simple method to verify the measured power consumption values.
- Linux/Windows® XP, IDLE Mode
- HMITR-104 Thermal Design Power (TDP) at 70%

  These values represent the “typical” maximum power dissipation reached under OS-controlled applications.
- HMITR-104 Thermal Design Power (TDP) at 100%

  These values represent the maximum power dissipation achieved through the use of specific tools to heat up the processor core. 100% TDP is unlikely to be reached in real applications.
- Graphics Benchmarks

  These values represent an estimation of the power dissipation of a graphical working load.

The following table indicates the power consumption with 1 GB DDR2 SDRAM. For measurements made with the Linux and Windows® XP operating systems, the VGA resolution was 800 x 600 pixels.

Table 2-24: HMITR-104 Power Consumption

OS or OPERATING CONDITIONS	POWER
DOS	19.6 W
Linux / Win.® XP in IDLE Mode	19.8 W
TDP at 70%	20.6 W
TDP at 100%	21.2 W
Graphics Benchmarks	21.4 W

The following table indicates the peak start-up currents of the HMITR-104 when the power supply is switched on.

Table 2-25: Peak Start-Up Currents of the HMITR-104

HMITR-104 VERSIONS	STARTUP CURRENT
24 VDC	13.0 A
110 VDC	2.7 A

2.11 Digital Input and Output Signals

The HMITR-104 provides for six digital input and two digital output channels, all on one 25-pin D-Sub connector DIO Interface (J9). The two following tables provide the specifications for both types of signals. The ensuing chapters provide more detailled information concerning their implementation in an application.

Table 2-26: HMITR-104 Digital Input Specifications

TYPE	DESCRIPTION
Input Voltage Range	Low: -3V to +5V High: +11V to +30V
Channels	6 channels isolated from the system side. They do not share common GND or VCC.
Channel Connections	2 pins per channel; differential input
Input Filter (edge frequency)	10 kHz
Input Protection	8 kV ESD
Isolation	750 Vdc process to system
Input Impedance	Minimum: 1.5 k ohm Maximum: 6 k ohm at 30V

Table 2-27: HMITR-104 Digital Output Specifications

TYPE	DESCRIPTION
Output Voltage Range	Low state: =< +1.5 V High state: > +8.0 V and < +35 V Current per channel: max. 0.5 A Leakage current: 20 µA
Channels	2 channels The output channels are isolated from the system side and share common GND and VCC.
Channel Connections	1 pin per channel, single-ended
External Voltage (VCC)	+9.5 V to +35 V
Switch “On” Resistance	$R_{ds,on}$ = 1.8 ohm
Max. Output Frequency	2.5 kHz
System Switching Delay Time	$T_{d,on}$ = 4 µs, $T_{d,off}$ = 90 µs
Signal Output Overcurrent Protection	For output currents greater than 0.8 A, the output will be switched to a failure mode: square wave signal with a maximum current amplitude of 0.4A and an on/off time (t_{on}, t_{off}) of 100 µs.
Undervoltage Protection for external power supply	For the voltage source (EXTVCC) <= +8.5V, the outputs are switched off.
Overtemperature	If the case temperature of the High Side Driver switches exceeds 150°C, the outputs are switched off.
Isolation	750 Vdc process to system

2.11.1 Digital Input Signal Requirements

In addition to the input signal type and its range, which have been specified in the above tables, system integrators must be aware of certain input configuration requirements for the HMITR-104. The following chapters provide information regarding individual connection configuration requirements.

2.11.1.1 Channels

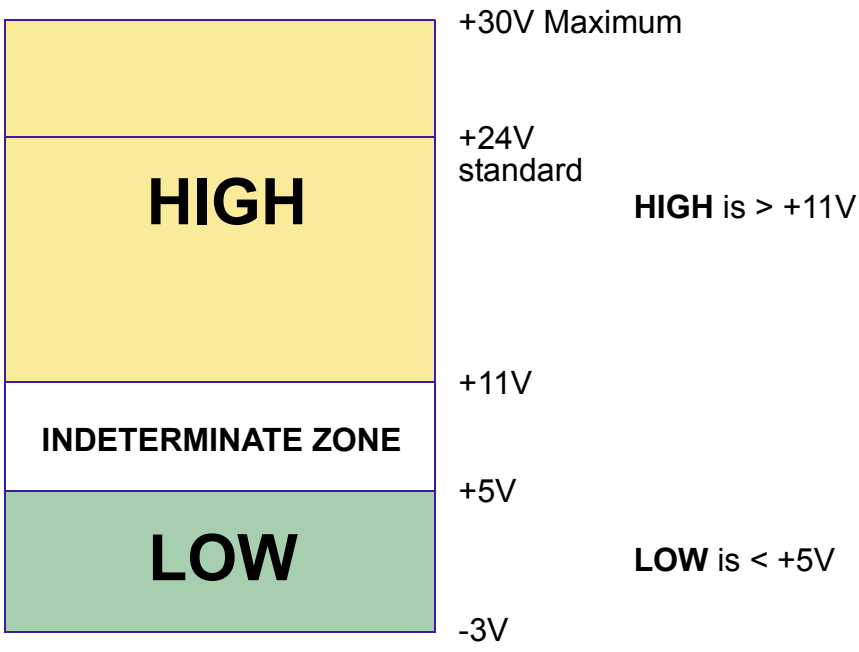
The DIO Interface connector (J9) of the HMITR-104 provides two input pins per channel. This allows each channel to be configured separately as required. This is illustrated in table 2-2, which shows the connector pinout.

The following chapters address the basic requirements.

2.11.1.2 Signal Characteristics

The digital inputs signals are differential whereby the specified voltage ranges illustrated in the following figure should be observed.

Figure 2-21: Digital Input Voltage Ranges



2.11.1.3 Channel Configuration

The following figures illustrate the typical configuration of input channels.

Figure 2-22: Input Configuration (Example for Channel 0)

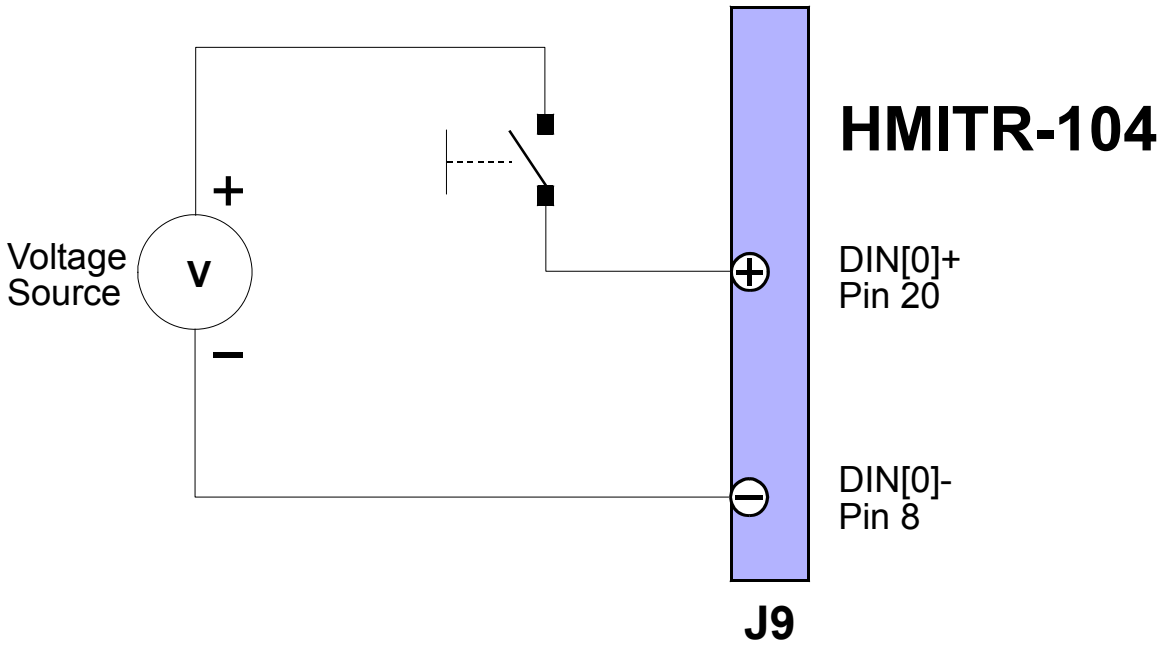
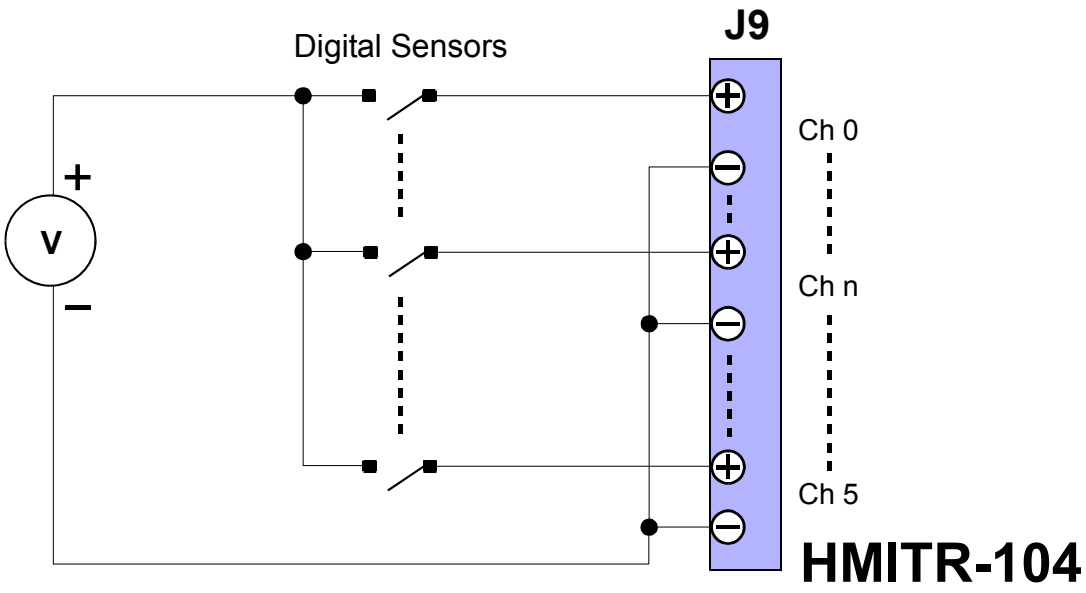


Figure 2-23: Configuration Diagram for All Input Channels



2.11.2 Digital Output Signal Properties

In addition to the output signal type and its range, which have been specified in table 2-27, system integrators must be aware of certain output configuration requirements for the HMITR-104. The following paragraphs provide some information regarding individual connection configuration requirements.

2.11.2.1 Channels

The J9 connector of the HMITR-104 provides only one output pin per channel. This is illustrated in table 2-2, which shows the J9 connector pinout.

The following sections address the basic requirements.

2.11.2.2 Connection of External Supply

The HMITR-104 requires an external voltage for operation of the digital outputs.

The input connection for this voltage is realized via the 25-pin front panel connector DIO Interface connector (J9). The pinout of this connector is provided in table 2-2.

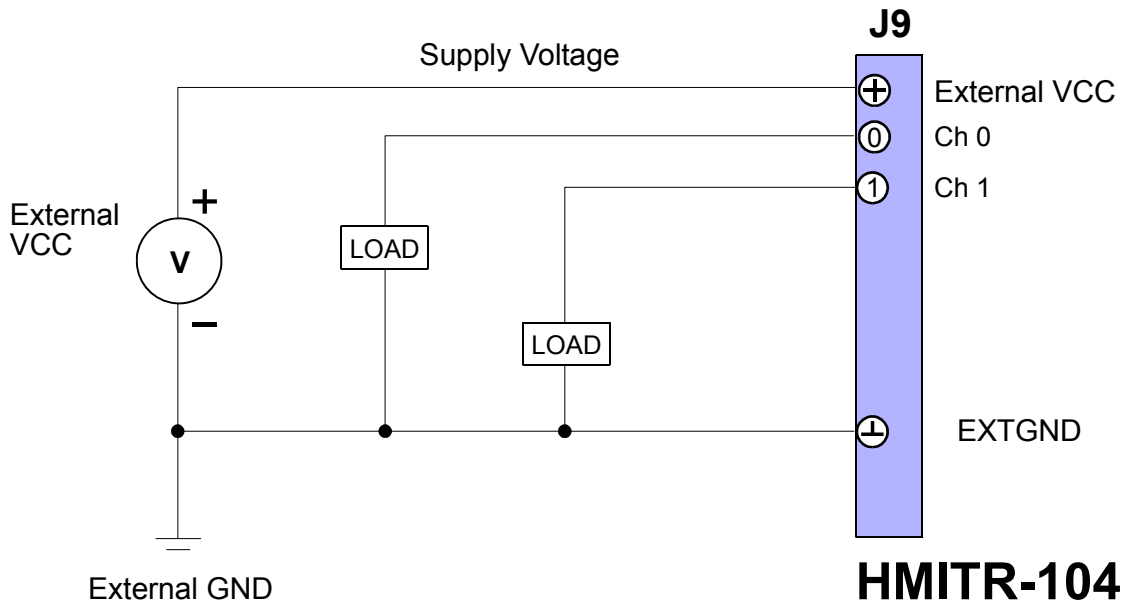
Note ...

Each channel has a maximum current of 0.5 A. In situations where many channels are carrying a high current, separate, larger gauge cables for the external power supply should be used.

2.11.2.3 Channel Connection

The following diagrams illustrate the external connection of the HMITR-104 to the application.

Figure 2-24: Digital Output Connection for Channels



Note ...

The voltage source for each channel is an external supply (in the range +9.5V to +35V DC). Therefore the GND reference for the digital output is the ground potential of this external voltage supply.

Note ...

Individual outputs should not be cascaded as it cannot be guaranteed that power sharing will be proportional, due to the transistor characteristics of each HSD switch.

2.11.2.4 Connection of Inductive Loads

The outputs have internal clamping diodes for each channel, which are able to demagnetize inductive loads.

The limitation is the peak power dissipation of the digital outputs at the front end. Where there are large loads or if there is the possibility that additional loads require demagnetization simultaneously, external demagnetization circuits are required.

2.12 System Startup and Shutdown

To perform a “cold” startup of the HMITR-104 first apply main input power (24 or 110 VDC depending on the variant). Then connect the “Active” signal (pin 2 of J18 “PWR” interface) to a voltage source equal to the main input power positive voltage. For example, if the main input power is 24 VDC then pin 2 must be connected to a voltage source of 24 VDC positive. When pin 2 is connected to an appropriate voltage source, powering up of the HMITR-104 will begin.

To properly shutdown down an operating HMITR-104, perform a normal shutdown as called for by the operating system or application as applicable. When the HMITR-104 is shutdown, power can be removed from the system and pin 2 of connector J18. If the system has been shutdown in this manner, the next startup will be a “cold” start as indicated above.

It is possible to force an immediate shutdown of the HMITR-104 by either removing the main input power or disconnecting pin 2 of J18 from its power source. In either of these cases, the system will not be properly shutdown.

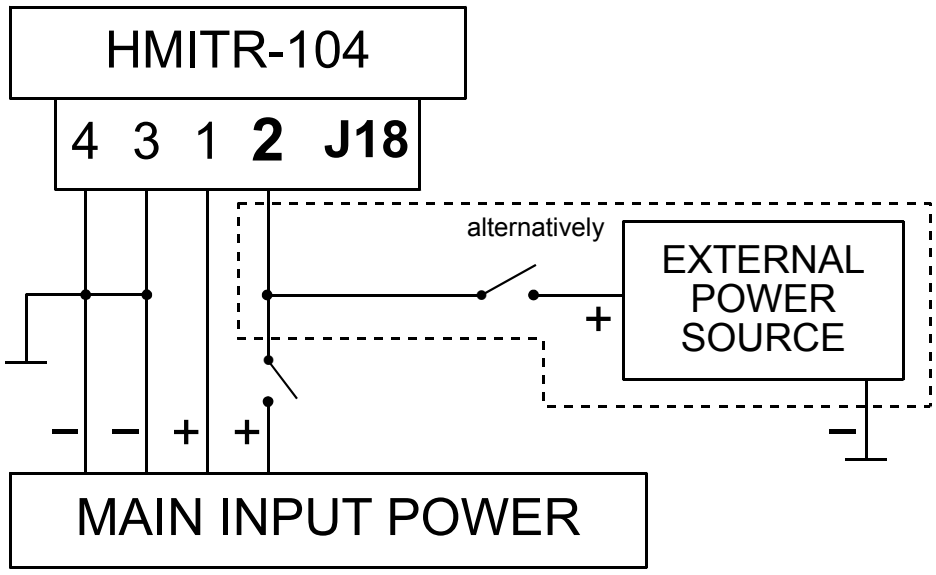
Warning

If the HMITR-104 is not properly shutdown as indicated above, this will in most cases lead to improper operation if not a total failure of the HMITR-104 at the next startup.

Kontron rejects all liability for any and all damages resulting from an improper shutdown of the HMITR-104.

If after a shutdown, power remains applied to pin 2 of J18, the HMITR-104 will not startup again even if the main input power is cycled off and on. In this case power must be removed from pin 2 and reapplied along with the main input power (if it was removed) for the HMITR-104 to be re-started. The following figure illustrates the power configuration required.

Figure 2-25: HMITR-104 Input Power Configuration



Chapter 3

Installation

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3. Installation

Integration of a HMITR-104 in an application is an involved process which requires a comprehensive and in-depth design concept as well as a thorough understanding of the functionality provided by the HMITR-104.

The previous chapters in this guide have dealt primarily with hardware aspects of the HMITR-104 providing extensive details of the interfacing available to an application. This chapter is intended to aid the integration process by providing information which must be considered prior to, during and after the integration of the HMITR-104 in an application.

Towards this goal the following subjects are addressed in this chapter:

- Safety
- Personnel requirements
- Thermal considerations
- Variant configurations
- Mounting pre-requisites
- Initial installation of a display unit
- Removal of a display unit
- (Re-) installation of a display unit
- System operation
- Optional module replacement
- SIM card installation/replacement
- Cleaning
- Maintenance
- Display unit disposal at end of life
- Software

3.1 Safety

The following safety issues are addressed in this chapter:

- Electrical shock hazard
- ESD protection
- Compromising the HMITR-104 Encasement
- Foreign Objects Inside the HMITR-104 Encasement

3.1.1 Electrical Shock Hazard

Some variants of the HMITR-104 Driver Display System are designed for operation with a nominal input voltage of 110 VDC (refer to the label on the back side of the HMITR-104 for the operational input power required by the unit). As this voltage is hazardous for personnel all applicable safety requirements regarding electrical shock must be observed when handling and operating an HMITR-104 with this input voltage. Refer to “Temperature and High Voltage Safety Instructions” in the Preface of this guide for further safety information.

Warning!

Serious electrical shock hazard can exist when handling the HMITR-104 in its operational environment. Ensure compliance with all applicable safety requirements before proceeding with any activities involving the HMITR-104.

Failure to comply with the above could endanger your life or health and may cause damage to the HMITR-104 or other system components including process-side signal conditioning equipment.

Kontron rejects any and all liability for damage resulting from failure to comply with all applicable safety requirements.

3.1.2 Electrostatic Discharge (ESD) Protection

Ensure that ESD protection requirements are observed when handling the HMITR-104.

Warning

Failure to comply with the above can lead to ESD damage to the HMITR-104

Kontron rejects all liability for any and all damages resulting from the failure to comply with ESD requirements.

3.1.3 Compromising the HMITR-104 Encasement

With the exception of the interfaces located behind the System Access Panels 1 and 2 there are no user serviceable elements in the HMITR-104. For this reason any compromising of (loosening of screws other than those of the SAP 1 and 2 cover plates) or opening of the HMITR-104 encasement will void the display unit warranty and automatically revoke the operation permit for this display unit.

In the event the encasement has been compromised, the display unit must be replaced and returned to the factory for repair.

Warning

Do not operate the HMITR-104 if its encasement has been compromised!

Kontron rejects all liability for any and all damages resulting from operation of the display unit if the encasement has been compromised.

3.1.4 Foreign Objects Inside the HMITR-104 Encasement

In the event any object should fall into the encasement and cannot be retrieved without opening it, the display unit must be replaced and returned to the factory for repair.

Be careful when using tweezers or other devices to retrieve objects that have fallen inside the HMITR-104 encasement as they can cause damage to internal components. Ensure that ESD protection requirements are observed when performing such retrieval activities.

Warning

Do not operate the HMITR-104 with any foreign objects inside the encasement!

Do not insert any retrieval device into the HMITR-104 with the power cable connected to the HMITR-104**.**

Kontron rejects all liability for any and all damages resulting from operation of the display unit with foreign objects inside of the HMITR-104 encasement.

3.2 Personnel Requirements

Personnel involved in the handling and operation of the HMITR-104 need to be aware of the requirements placed on them depending on the particular environment in which they are working. This user guide defines the following HMITR-104 environments:

- Development environment
- Implementation environment
- Application environment
- Maintenance environment

3.2.1 Development Environment

The development environment pertains to those activities related to application design and proof of design testing. These activities include but are not limited to application software development, interface functionality verification, and proof of application suitability.

It is assumed that all personnel involved in these activities are trained and experienced as well as being cognizant of all safety requirements for the environment in which they work.

In this environment, personnel have access to all externally available interfaces including those located behind the System Access Panels 1 and 2.

3.2.2 Implementation Environment

The implementation environment pertains to those activities dealing with the initial installation of the HMITR-104 at its final operational location within an application. These activities include but are not limited to the initial mounting of the display unit, application software installation, application interface functionality verification, and user operational acceptance of the display unit.

It is assumed that all personnel involved in these activities are trained and experienced as well as being cognizant of all safety requirements for the environment in which they work.

In this environment, personnel have access to all externally available interfaces including those located behind the System Access Panels 1 and 2.

3.2.3 Application Environment

The application environment pertains to those activities dealing with the operation of the display unit in the application for which it is intended. These activities include but are not limited to the operation of the display unit as called for by the application, assessment of the operational status of the display unit, application of work-around procedures for failed display functionality, and initiation of failure resolution actions.

It is assumed that all personnel involved in these activities are trained and experienced as well as being cognizant of all safety requirements for the environment in which they work.

In this environment, personnel only have access to the front panel interfaces.

3.2.4 Maintenance Environment

The maintenance environment pertains to those activities dealing with the resolution of unacceptable performance of the display unit during operation. These activities include but are not limited to determination of the operational status of the display unit, localization of the possible failure source, determination of action(s) to be taken to resolve the situation, and the resolution of the failure.

It is assumed that all personnel involved in these activities are trained and experienced as well as being cognizant of all safety requirements for the environment in which they work.

In this environment, personnel have access to all externally available interfaces including those located behind the System Access Panels 1 and 2.

3.3 Thermal Considerations

The HMITR-104 is designed for convection cooling within the specified ambient air temperature ranges. Therefore it is imperative that air flow to and from the display unit is guaranteed. In addition, implementers must empirically verify the cooling concept for the HMITR-104 prior to implementing the HMITR-104 in the intended application.

Warning

Do not operate the HMITR-104 if it is not properly cooled!

Kontron rejects all liability for any and all damages resulting from operation of the display unit at ambient temperatures outside the specified operating range.

3.4 HMITR-104 Variant Configurations

The HMITR-104 is currently available as four variants based on the desired mains input voltage and the operator input interface: hard key bezel or touch screen. The following table lists the possible configurations accordingly including optionally available features.

Legend: X = standard feature of variant; (X) = optionally available

Table 3-1: HMITR-104 Variant Configurations

FEATURES	V1	V2	V3	V4
INPUT POWER				
24 VDC	X		X	
110 VDC		X		X
CPU				
600 MHz Atom	(X)	(X)	(X)	(X)
1.00 GHz Atom	(X)	(X)	(X)	(X)
1.30 GHz Atom	X	X	X	X
1.60 GHz Atom	(X)	(X)	(X)	(X)
MEMORY				
1 GB	X	X	X	X
2 GB	(X)	(X)	(X)	(X)
FRONT SIDE INTERFACES				
DISPLAYS				
10.4 inch Mitsubishi	X	X	X	X
OPERATOR INPUT				
Hard key bezel (UIC 612-01 style)			X	X
Touch screen	X	X		
LEDS				
Pwr on, Status, Th, GP	X	X	X	X
OTHER				
Ambient light sensor	X	X	X	X
Buzzer	X	X	X	X

Table 3-1: HMITR-104 Variant Configurations

FEATURES	V1	V2	V3	V4
BACK SIDE INTERFACES				
SERIAL				
SER A, M12	X	X	X	X
SER B, M12	X	X	X	X
SER C, DSUB	X	X	X	X
SER D, DSUB	X	X	X	X
ETHERNET				
Eth A, M12	X	X	X	X
Eth B, M12	X	X	X	X
USB				
USB A, M12	X	X	X	X
USB B, M12	X	X	X	X
OTHER				
DIO Interface, DSUB, 25 pins	X	X	X	X
CAN, DSUB, 9 pins	X	X	X	X
Audio, DSUB, 15 pins	X	X	X	X
PWR, M12	X	X	X	X
Chassis grounding point, threaded hole	X	X	X	X
WIFI antenna cable, SMA	(X)	(X)	(X)	(X)
GSM antenna cable, SMA	(X)	(X)	(X)	(X)
GPS antenna cable, SMA	(X)	(X)	(X)	(X)

Table 3-1: HMITR-104 Variant Configurations

FEATURES	V1	V2	V3	V4
AUXILIARY INTERFACES				
SYSTEM ACCESS PANEL 1				
SD/SDHC card, 9-pin connector	X	X	X	X
USB2, type A connector, J5	X	X	X	X
Gigabit Ethernet, RJ-45 connector, J9	X	X	X	X
DIP switch, SW2, 8 positions	X	X	X	X
DIP switch, SW3, 2 positions	X	X	X	X
USB2, type A connector, J5	X	X	X	X
LEDs, D7 and D8	X	X	X	X
SYSTEM ACCESS PANEL 2				
GSM/GSM-R proprietary module, 50-pin connector, J15	X	X	X	X
PCIe Mini Card connector, 52-pin, J5	X	X	X	X
SIM card holder, 6-pin with card detect, J17	X	X	X	X
OTHER				
PCIe Mini Card connector, 52-pin, internal interface; no SIM card IF	X	X	X	X

Table 3-1: HMITR-104 Variant Configurations

FEATURES	V1	V2	V3	V4
OPTIONAL FEATURES				
ADD-ON MODULES				
SD/SDHC mass storage card: up to 32 GB	(X)	(X)	(X)	(X)
MM-SATA mass storage module: 8, 16 or 32 GB	(X)	(X)	(X)	(X)
GSM or GSM-R proprietary mobile communications module	(X) [1]	(X) [1]	(X) [1]	(X) [1]
PCIe mini card module: AUX_IF: GSM, other	(X) [1]	(X) [1]	(X) [1]	(X) [1]
PCIe mini card module: INT_IF: WLAN, other (no SIM card IF available)	(X)	(X)	(X)	(X)
GPS module, internal	(X)	(X)	(X)	(X)
INTERFACE CONFIGURATION OPTIONS				
SER A: RS232 to RS422	(X)	(X)	(X)	(X)
SER B: RS232 to RS422	(X)	(X)	(X)	(X)
SER C: RS232 to RS422 or RS485	(X)	(X)	(X)	(X)
SER D: RS422 to RS232 or RS485	(X)	(X)	(X)	(X)
OTHER				
Battery, RTC backup	(X)	(X)	(X)	(X)

1) Are mutually exclusive of one another (only one or the other module can be installed at a time)

3.5 Mounting Pre-requisites

The display unit mounting concept is an integral element of HMITR-104 applications. Not only the basic positioning of the display unit itself must be considered, it is necessary to fulfill various other requirements in order to achieve a successful implementation of the HMITR-104 in the intended application.

The following issues must be considered prior to physically attempting to integrate the HMITR-104:

- Physical orientation
- Physical Mounting
- Cabling
- Grounding Point Cabling

3.5.1 Physical Orientation

The display unit must be so positioned as to facilitate good visibility of the display screen. To a certain degree this may be limited by the possibilities presented by the driver's display console. In any event a satisfactory positioning must be achieved. Refer to table 2-1 for the specifications of the viewing angles of the display screen.

In addition to the viewing angle consideration, the display unit must not be installed so that the convection cooling is negated except that some form of forced cooling air circulation is available.

3.5.2 Physical Mounting

The front panel of the display unit is designed to be the mounting frame for installation in an driver's display console. It has four holes at the outer corners of the front panel which accept 5 mm flat head countersunk screws (either Torx or Allen screws are recommended). The console front panel must be stable enough to support the display unit as well as the interfacing cables connected to it. Further, the console front panel must provide a means of fixation for the mounting screws. Refer to chapter 1 for the physical dimensions of the display unit.

In addition to the cut-out for the display unit's encasement, there must be sufficient space behind the console wall for the unit encasement and to allow for cabling as well as air circulation within the unit.

3.5.3 Cabling

Where possible the external interfacing cables to the display unit should be of sufficient length as to allow the display unit to be extracted from the mounting cut-out and be placed flat on the driver's console desktop. This ensures a secure position to remove the cables as well as to gain access to the System Access Panels 1 and 2.

If this is not possible, the cables must be of sufficient length as to guarantee that the display unit can be safely installed or removed from its cut-out and have the cables be installed or removed without the possibility of the display unit falling or otherwise being damaged.

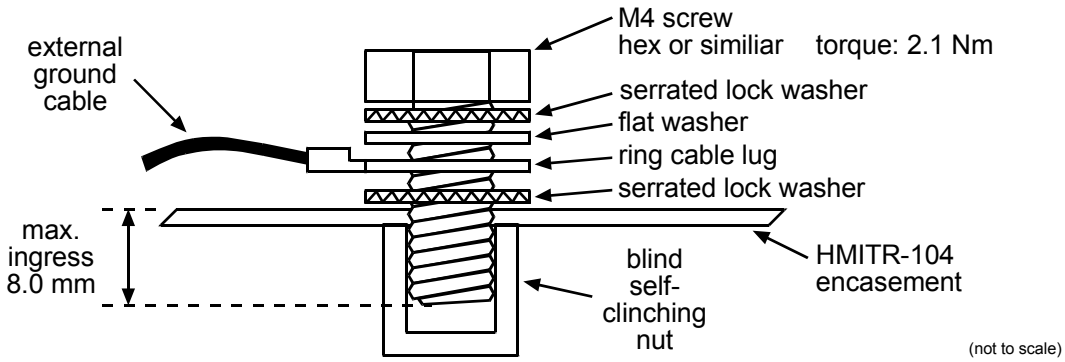
All cables must be clearly marked to ensure that they are connected to the correct connectors on the display unit. In addition, the cables must have some form of support so as to minimize the strain on the display unit's connectors.

The mains DC input power cable must also have an indication as to the power source voltage: 24 VDC or 110 VDC.

3.5.4 Grounding Point Cabling

As the operational grounding concept of the HMITR-104 calls for a ground point connection of the encasement to external ground, there must always be a ground connection to the encasement. This is accomplished via an M4 screw with an external ground wire attached installed in the ground point blind nut. The ingress of the M4 screw must not be more than 8 mm. This is necessary to avoid damage to the ground point. Refer to the figure below for an example of assembly details.

Figure 3-1: Assembly of the Grounding Point Connection



3.6 Installation and Removal in an Application Environment

The following chapters provide basic instructions and information necessary to:

- Initially install a HMITR-104 Driver Display System in a driver's display console
- Remove a previously installed display unit
- (Re-)install a display unit in a previously prepared driver's display console

3.6.1 Initial Installation of a Display Unit

The initial installation of a display unit assumes that all required preparatory work has been accomplished, that the display unit to be installed has been configured for application operation and accepted as operable, that proper mounting screws and appropriate washers are available, and that the available mains DC input voltage is the same as that required by the display unit.

Personnel who perform this procedure must have read and familiarized themselves with the procedure prior to executing it.

All discrepancies encountered during the execution of this procedure must be resolved before proceeding with the next step indicated. If necessary, begin again with step 1 of the procedure. Do not leave out any steps.

To initially install a display unit perform the following procedure:

1. Ensure that at all times during the execution of this procedure that all safety requirements are fulfilled.

   Refer to chapter 3.1 for safety information. If the mains DC input voltage is 110 VDC for this installation, pay particular attention to the electrical shock hazard warning in chapter 3.1.1.

2. Ensure that the available mains DC input power is the same as required for the display unit to be installed.

   There is a label on the HMITR-104 display unit which indicates the input voltage required by the display unit. Compare this with the source voltage indicated on the input power cable. If they are not the same, do not install this display unit.

3. Before attaching any cables, ensure that the display console cut-out and mounting holes fit to the display unit being installed.

   To do this, carefully insert the display unit into the cut-out and verify that the front panel mounting holes fit to the console mounting holes.

   Resolve any discrepancies before proceeding. Criteria: 1. Display unit must fit in the console cut-out; 2. All holes must fit; 3. All four mounting screws must be installable.

4. Connect the external ground wire to the grounding point of the display unit.

   Refer to chapter 3.5.4 for the display unit grounding point connection assembly requirements.

5. Except for the power cable, connect all external interfacing cables.

6. Ensure that for the remainder of this procedure that no contact with the touch screen or the hard keys is made.

7. Verify that it is safe to connect the power cable.

   The reason for this being is that depending on the application and configuration of the mains DC input power, the system may start to operate. If this is not desirable, ensure that the system will not start to operate when the power cable is connected.

   Refer to the documentation of the driver’s display console for further assistance regarding this issue.

8. Connect the power cable.

9. Insert the display unit into the designated display console cut-out and align it with the mounting holes.

10. Insert and tighten the display unit mounting screws.

The torque requirements for tightening of the display unit screws is a function of the driver's display console front panel and its associated fasteners. Refer to the documentation of the driver's display console for torque requirements.

11. Initial physical installation of the HMITR-104 display unit is now completed.

Verification or operation of the application functionality is not within the scope of this user guide.

3.6.2 Removal of a Display Unit

The following procedure assumes that the HMITR-104 display unit has been properly shut-down, that all required tools are available (e.g. appropriate screw drivers), and that the documentation of the driver's display console for performing the display unit shutdown is available

Personnel who perform this procedure must have read and familiarized themselves with the procedure prior to executing it.

All discrepancies encountered during the execution of this procedure must be resolved before proceeding with the next step indicated. If necessary, begin again with step 1 of the procedure. Do not leave out any steps.

To remove a display unit perform the following procedure:

1. Ensure that at all times during the execution of this procedure that all safety requirements are fulfilled.

Refer to chapter 3.1 for safety information. If the mains DC input voltage is 110 VDC for this installation, pay particular attention to the electrical shock hazard warning in chapter 3.1.1.

2. Ensure that for the remainder of this procedure that no contact with the touch screen or the hard keys is made except as required to perform a proper display unit shutdown.

3. If the display unit is operating, perform a proper display unit shutdown.

Refer to the documentation of the driver's display console for performing the display unit shutdown.

4. Remove the display unit mounting screws and retain them for future use.

   Refer to the documentation of the driver's display console for tool requirements.

   Once the display unit has been removed, the mounting screws may be reinstalled in the display console mounting fasteners if required.

5. Carefully remove the display unit from the display console so as to gain access to the external cables for removal.

   During the remainder of this procedure it is necessary to ensure that the display unit is properly supported to preclude damage to either the unit itself or the external cabling.

6. Verify that it is safe to disconnect the power cable.

   If for some reason the system is operating, a proper system shutdown must be performed before proceeding.

   Refer to the documentation of the driver's display console for performing the display unit shutdown.

7. Disconnect the power cable.

8. Disconnect all external interfacing cables.

9. Disconnect the external ground wire from the grounding point of the display unit.

   Retain the screw and washers for future use.

10. Physical removal of the HMITR-104 display unit is now completed.

    Dispose of the display unit as required.

3.6.3 (Re-)installation of a Display Unit

The (re-) installation of a display unit assumes that the display unit to be installed has been configured for application operation and accepted as operable, that proper mounting screws and appropriate washers are available, and that the available mains DC input voltage is the same as that required by the display unit.

Personnel who perform this procedure must have read and familiarized themselves with the procedure prior to executing it.

All discrepancies encountered during the execution of this procedure must be resolved before proceeding with the next step indicated. If necessary, begin again with step 1 of the procedure. Do not leave out any steps.

To install a display unit perform the following procedure:

1. Ensure that at all times during the execution of this procedure that all safety requirements are fulfilled.

   Refer to chapter 3.1 for safety information. If the mains DC input voltage is 110 VDC for this installation, pay particular attention to the electrical shock hazard warning in chapter 3.1.1.

2. Ensure that the available mains DC input power is the same as required for the display unit to be installed.

   There is a label on the HMITR-104 display unit which indicates the input voltage required by the display unit. Compare this with the source voltage indicated on the input power cable. If they are not the same, do not install this display unit.

3. Before attaching any cables, ensure that the display console cut-out and mounting holes fit to the display unit being installed.

   To do this, carefully insert the display unit into the cut-out and verify that the front panel mounting holes fit to the console mounting holes.

   Resolve any discrepancies before proceeding. Criteria: 1. Display unit must fit in the console cut-out; 2. All holes must fit; 3. All four mounting screws must be installable.

4. Connect the external ground wire to the grounding point of the display unit.

   Refer to chapter 3.5.4 for the display unit grounding point connection assembly requirements.

5. Except for the power cable, connect all external interfacing cables.

6. Ensure that for the remainder of this procedure that no contact with the touch screen or the hard keys is made.

7. Verify that it is safe to connect the power cable.

   The reason for this being is that depending on the application and configuration of the mains DC input power, the system may start to operate. If this is not desirable, ensure that the system will not start to operate when the power cable is connected.

   Refer to the documentation of the driver’s display console for further assistance regarding this issue.

8. Connect the power cable.
9. Insert the display unit into the designated display console cut-out and align it with the mounting holes.
10. Insert and tighten the display unit mounting screws.

The torque requirements for tightening of the display unit screws is a function of the driver's display console front panel and its associated fasteners. Refer to the documentation of the driver's display console for torque requirements.

11. Physical installation of the HMITR-104 display unit is now completed.

Verification or operation of the application functionality is not within the scope of this user guide.

3.7 System Operation

The basic power up/down scheme of the HMITR-104 display unit is described in chapter 2.12.

As system operation is a function of the operating system and the application it is not within the scope of this user guide.

Implementers, however, must still be aware that they are responsible for ensuring that for a given application all necessary functions are available to ensure proper operation of the system including the safety of the system as well as personnel (e.g. operators, installers, maintainers).

For this reason, some required application functions may or must be external to the HMITR-104 display unit (e.g. power on/off switching, "Active" signal on/off switching (J18 "PWR" connector), digital input signalling for display unit shutdown).

3.8 Optional Module Replacement

The following interfaces support user replaceable modules:

- J3: SD/SDHC memory card
- J15: GSM/GSM-R proprietary modules
- J16: PCIe mini card modules
- J17: mini-SIM card

Replacement of these modules requires that the display unit and the modules (new and old) be in a "safe" state prior to performing replacement actions:

- Safety and ESD protection requirements must be observed throughout the replacement procedure (refer to chapter 3.1 for requirements)
- If the display unit involved is installed in a driver's display console and an SD/SDHC module is to be replaced, execute the removal procedure as far as necessary to gain safe access to the J3 interface. Otherwise, perform a complete removal of the display unit. (refer to chapter 3.6.2 for removal procedures)
- Properly shutdown
- No power applied (power cable must be disconnected)

- Display unit supported (to preclude falling or be otherwise damaged or cable damage)

Personnel who perform module replacements must have read and familiarized themselves with the requirements set forth in this chapter prior to replacing modules.

All discrepancies encountered during the replacement activities must be resolved before proceeding with the next action indicated. If necessary, start over again from the beginning of the module replacement. Do not leave out any actions required.

3.8.1 SD/SDHC Memory Card Handling

To install, remove or replace an SD/SDHC memory card requires removal of the System Access Panel 1. If required, refer to chapter 3.6.2 for removal procedures of the display unit.

Once the access panel is removed, the memory card holder, J3, is accessible. To install a card simply push it in until it “locks” itself (i.e. push all the way in; then release; if the card remains in the holder it is installed, if not repeat until the card “locks” itself in the holder).

To remove a card simply push it in all the way and then let it “push” itself out (there is a spring loaded mechanism in the holder which does this). Once the card is released grasp the protruding part of the card and remove it from the holder.

To replace a card first remove the old card, then install the replacement card. Dispose of removed or replaced cards as required. Reinstall the System Access Panel 1 and, if required, reinstall the display unit in the driver’s display console. Refer to chapter 3.6.3 for installation procedures of the display unit.

3.8.2 GSM/GSM-R Proprietary Module Handling

To install, remove or replace a GSM/GSM-R proprietary module requires removal of the System Access Panel 2. If required, refer to chapter 3.6.2 for removal procedures of the display unit. In this case the display unit must be completely removed before performing any further actions.

Operation of a display unit in an application environment with a removed module is not a defined operational mode. Therefore do not operate display units which normally must have a module installed in an application environment.

Usage of this interface requires that the module including the antenna cable has been initially installed at the factory. This being the case, the first possible action is to remove the module.

To gain access to the module remove the System Access Panel 2. Once the access panel is removed, remove both of the module retaining screws. Retain these screws for future use.

As the antenna cable is fixed to the back side of the module, be careful when removing the module. Do not pull on the antenna cable.

Now remove the module by gently rocking it and at the same time pulling up on the module.

When the module is free, remove the antenna cable. To remove the antenna cable apply perpendicular force to the cable connector being careful not to pull on the cable. Secure the antenna cable end before proceeding (do not allow it to slip away inside the encasement).

To install or replace a module, first remove the “old” module if required, then install the “new” module. To install the “new” module, first connect the antenna cable. To do this, align the antenna cable connector with the module’s antenna connector, then apply perpendicular force as required to the antenna cable connector until it “snaps” into the module’s connector.

Now align the module’s interfacing connector with the auxiliary interface connector J15. Apply perpendicular force as required to the module until it is seated in the J15 connector. Then install both of the previously removed module retaining screws (torque: 0.35 Nm).

Dispose of a removed or replaced module as required. Reinstall the System Access Panel 2 and, if required, reinstall the display unit in the driver’s display console. Refer to chapter 3.6.3 for installation procedures of the display unit.

3.8.3 PCIe Mini Card Module Handling

To install, remove or replace a PCIe Mini Card module requires removal of the System Access Panel 2. If required, refer to chapter 3.6.2 for removal procedures of the display unit. In this case the display unit must be completely removed before performing any further actions.

Operation of a display unit in an application environment with a removed module is not a defined operational mode. Therefore do not operate display units which normally must have a module installed in an application environment.

Usage of this interface requires that the module including any external interfacing has been initially installed at the factory. This being the case, the first possible action is to remove the module.

To gain access to the module remove the System Access Panel 2. As the module may have external interfacing, be careful when removing the module. Do not pull on any external interfacing cabling.

Remove any interfacing cable(s) and secure them. If an antenna cable is present, remove the antenna cable by applying perpendicular force to the cable connector being careful not to pull on the cable. Secure the antenna cable end before proceeding (do not allow it to slip away inside the encasement).

To remove the module, release the two retaining springs on the module end opposite the module’s auxiliary interface connector J16 and pull the module out of the connector.

When the module is free, if required, remove any remaining interfacing cable(s).

To install or replace a module, first remove the “old” module if required, then install the “new” module. To install the “new” module, first connect any interfacing cable(s) which may be routed to connector(s) on the bottom side of the module.

Now insert the module’s interfacing connector into the auxiliary interface connector J16. Apply perpendicular force as required to the module’s opposite end until it “snaps” into the module’s retaining mechanism. Then install any remaining interfacing cable(s).

Dispose of a removed or replaced module as required. Reinstall the System Access Panel 2 and, if required, reinstall the display unit in the driver’s display console. Refer to chapter 3.6.3 for installation procedures of the display unit.

3.8.4 SIM Card Handling

Operation of a GSM or GSM-R module requires the use of a SIM card. The HMITR-104 provides a SIM card interface (J17 - holder with contacts) for mini-SIM cards.

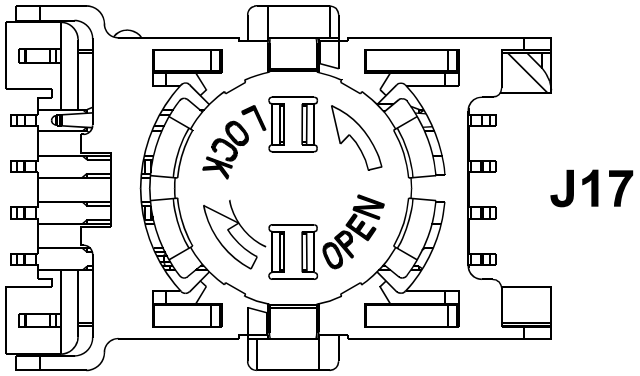
To install, remove or replace a SIM card requires removal of the System Access Panel 2. If required, refer to chapter 3.6.2 for removal procedures of the display unit. In this case the display unit must be completely removed before performing any further actions.

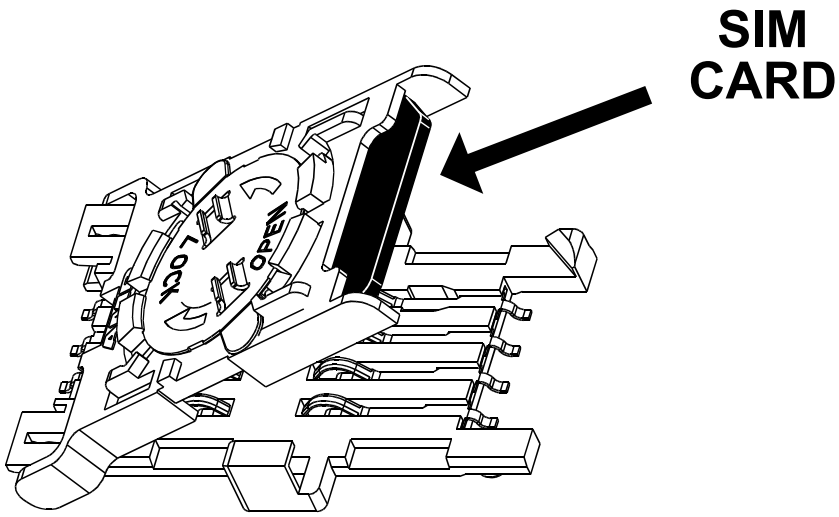
Operation of a display unit in an application environment with a removed SIM card is not a defined operational mode. Therefore do not operate display units which normally must have a SIM card installed in an application environment.

To install a SIM card, first remove the access panel, then turn the retaining cover of the SIM card holder to the open position and lift up the holder cover. Either insert the new card or remove and then insert the replacement card (card contacts to J17's contacts). Ensure that the SIM card is properly installed in the holder cover slot. Press down on the holder cover, turn the retaining cover to the locked position, and then re-install the access panel.

The following figures show the card holder in the closed position and in the open position for inserting a SIM card.

Figure 3-2: SIM Card Holder J17





3.9 Auxiliary Interfaces J3, J5, J9, SW2 and 3, LEDs 7 and 8

These interfaces provide functionality to support various application development, implementation, operational and maintenance requirements.

Use of these interfaces is either restricted to non-application environments or must be configured at the latest prior to implementation of the HMITR-104 in an application.

3.9.1 Interface J3: SD/SDHC Memory Card

The primary mass storage device for the HMITR-104 is the MM-SATA. The SD/SDHC memory card interface, however, offers flexibility and, depending on the circumstances in which it is used, additional storage capacity. If used in an application environment, it must be installed at the latest prior to implementation of the HMITR-104 in the application environment.

As the system can be booted from this interface, it is very suitable for application development, implementation and maintenance functions. In the application environment it can be used for user defined functions or additional data storage.

3.9.2 Interface J5: USB 2.0

This is a standard USB 2.0 interface designed principally for use with a keyboard and mouse. It can, however, be used with any other standard USB 2.0 compatible device (e.g. external hard disk drive, DVD/CD disk drive, etc.).

As there are no provisions for accessing this interface in the application environment, it can only be used when the HMITR-104 is not installed in a driver's display console.

3.9.3 Interface J9: Gigabit Ethernet

This is a standard Gigabit Ethernet interface designed principally for use in non-application environments.

As there are no provisions for accessing this interface in the application environment, it can only be used when the HMITR-104 is not installed in a driver's display console.

3.9.4 Interface SW2: DIP Switch, General Purpose Digital Input

This is an eight-position, single-pole, single-throw DIP switch block which provides user defined general purpose digital input capability.

As there are no provisions for accessing this interface in the application environment, it must be configured when the HMITR-104 is not installed in a driver's display console.

3.9.5 Interface SW3: Special Function

This is an two-position, single-pole, single-throw DIP switch block which provides special functions for use in non-application environments.

Refer to chapters 2.2.3.5 and 4.2.1 for further information.

As there are no provisions for accessing this interface in the application environment, it must be configured when the HMITR-104 is not installed in a driver's display console.

3.9.6 Interface LEDs: 7 and 8 General Purpose

These LEDs can be used to provide user defined general purpose visual status information.

Refer to chapters 2.2.3.6 and 4.4.9 for further information.

As there are no provisions for accessing this interface in the application environment, it can only be observed when the HMITR-104 is not installed in a driver's display console and the System Access Panel 1 is removed.

3.10 Cleaning

To clean the HMITR-104 front panel, apply a small amount of cleaning agent to a clean, soft, lint free cloth and lightly wipe the screen from left to right, right to left, top to bottom. Using a clean, soft, dry, lint free cloth wipe the screen dry. Repeat as necessary until all smudges, streaking and other soiling have been removed.

Do not apply the cleaning agent directly to the screen, always use a clean soft cloth. Do not use any form of abrasive sponges, paper towels or the such like. Do not soak the cleaning cloth with the cleaning agent. Apply only a small amount of the cleaning agent at one time to the cloth.

Recommended cleaning and desinfection agents are:

- Nepurin Uni Top (Gerhard Ruff GmbH, D-Memmingen)
- Nepurin VitroGlanz (Gerhard Ruff GmbH, D-Memmingen)
- Mucocit-A (Merz GmbH & Co KG, D-Frankfurt)

3.11 Maintenance

With the exceptions of replacing GSM/GSM-R or PCIe mini card modules or re-installing or configuring of the operating system and application software the HMITR-104 cannot be repaired in the field. If repair of the display unit is necessary it must be returned to Kontron.

Determination of the operational status of the HMITR-104 and actions to be performed to resolve unacceptable performance issues is not within the scope of this user guide. Application developers and implementers are responsible for providing guidance and assistance to operations and maintenance personnel for accomplishing these functions.

If a display unit is to be returned to Kontron and the original packaging is not available for returning the unit, the packaging used must comply with the IEC standard 1131-2.

3.12 System Disposal

The HMITR-104 system may be disposed of as electronic waste. The chassis itself is made up of steel and aluminum. The metal parts can be disposed of as scrap metal provided the electronic components are removed prior to disposal.

3.13 Software

For software provided by Kontron with the HMITR-104 refer to the online documentation provided with the software packages for installation and usage.

Application software including any diagnostic software must be provided by the user.

Chapter 4

Configuration

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4. Configuration

4.1 Front Panel Hard Key ASCII Codes

The following table provides information regarding the ASCII codes generated when hard keys on the front panel are actuated.

Table 4-1: Front Panel Hard Key ASCII Codes

SYMBOL	FUNCTION	KEY CODE ASCII
⏻	On / Off	alt / ctrl / A
Flag	Open dialog: Change Language	alt / ctrl / B
i	information	alt / ctrl / C
List	'fault overview' display mask	alt / ctrl / D
Tool	Display remedies for a fault	alt / ctrl / J
Blank		alt / ctrl / E
Blank		alt / ctrl / F
✷	Brightness control	alt / ctrl / G
◑	Day / Night mode	alt / ctrl / H
⇔	Change display	alt / ctrl / I
C	Up to higher level of mask hierarchy	Backspace
◁	Cursor	Cursor left
▷	Cursor	Cursor right
△	Cursor	Cursor up
▽	Cursor	Cursor down
E	Enter	Enter
0	0	0
1	1	1
2 ABC	2	2
3 DEF	3	3
4 GHI	4	4
5 JKL	5	5
6 MNO	6	6
7 PQRS	7	7
8 TUV	8	8
9 WXYZ	9	9
F1	Function key	F1
F2	Function key	F2
F3	Function key	F3
F4	Function key	F4
F5	Function key	F5
F6	Function key	F6

4.2 DIP Switches

The HMITR-104 is equipped with two blocks of DIP switches (SW2 and SW3) which provide system control capability. They are both located behind the System Access Panel 1 (on the chassis left side).

When the HMITR-104 is installed in an application these switches are not normally physically accessible as the HMITR-104 would have to be demounted and the metal access plate be removed. For this reason they must be configured for operation prior to installation of the HMITR-104.

4.2.1 DIP Switch SW3

This is a two position DIP switch which can be used to specify the uEFI BIOS settings to be used during system startup and which SPI flash is to be used to boot the system. Normally both of these switches are set to “OFF”.

Table 4-2: DIP Switch SW3 Configuration

SWITCH	SETTING	DESCRIPTION
1	OFF	Boot using the currently saved uEFI BIOS settings
	ON	Clear the uEFI BIOS settings and use the default values
2	OFF	Boot from the standard SPI boot flash
	ON	Boot from the recovery SPI boot flash

To clear the uEFI BIOS settings, proceed as follows:

1. Set the DIP Switch SW3, switch 1, to the ON position.
2. Apply power to the system.
3. After 30 seconds, remove power from the system.
   During this time period of approx. 30 seconds, no messages are displayed.
4. Set the DIP Switch SW3, switch 1 to the OFF position.

4.2.2 DIP Switch SW2

This is an eight position DIP switch which can be used to provide digital inputs which can be accessed via the Status Register 1 (STAT1). These are user general purpose inputs the meanings of which are defined by software. Switch positions which are not required should be set to “OFF”. The reason for this is that the switch position “OFF” sets the corresponding register bit to “1” which indicates that the switch is in any event operating properly.

Table 4-3: DIP Switch SW3 for Boot Configuration

SWITCH	SETTING	DESCRIPTION
1 - 8	OFF	Sets the corresponding register bit to “1”
	ON	Sets the corresponding register bit to “0”

4.3 I/O Address Map

The following table indicates the HMITR-104 specific registers.

Table 4-4: I/O Address Map

ADDRESS	DEVICE
0x280	Status Register 0 (STAT0)
0x281	Status Register 1 (STAT1)
0x282	Control Register 0 (CTRL0)
0x283	Control Register 1 (CTRL1)
0x284	Device Protection Register (DPROT)
0x285	Reset Status Register (RSTAT)
0x286	Board Interrupt Configuration Register (BICFG)
0x289	Board and PLD Revision Register (BREV)
0x28B	LED Control Register (LCTRL)
0x28C	Watchdog Timer Register (WTIM)
0x290	HMO01A Logic Revision Number (REV)
0x295	Digital Input Data Register (DIN)
0x296	Digital Output Data Register (DOUT)
0x297	Digital Output Fail Register (FAIL)
0x298	Digital Output Reset Register (DRST)

4.4 Registers

4.4.1 Status Register 0 (STAT0)

This register provides operational configuration/status information.

Table 4-5: Status Register 0 (STAT0)

REGISTER NAME		STATUS REGISTER 0 (STAT0)		
ADDRESS		0x280		
BIT	NAME	DESCRIPTION	RESET VALUE	ACCESS
7	Res.	Reserved	0	R
6	BBEI	uEFI BIOS boot end indication 0 = uEFI BIOS is booting 1 = uEFI BIOS boot is finished	0	R
5 - 4	BFSS	SPI boot flash selection status 00 = Standard SPI boot flash active 01 = Recovery SPI boot flash active 10 = External SPI boot flash active 11 = Reserved	N/A	R
3	DIP1.2	DIP switch SW3, switch 2 Clear uEFI BIOS settings 0 = Switch on (Clear the uEFI BIOS settings and use the default values) 1 = Switch off (Boot using the currently saved uEFI BIOS settings)	N/A	R
2	Res.	Reserved	0	R
1	DIP1.1	DIP switch SW3, switch 1 BIOS Flash boot select 0 = Switch on (Boot from the recovery SPI boot flash) 1 = Switch off (Boot from the standard SPI boot flash)	N/A	R
0	Res.	Reserved	0	R

4.4.2 Status Register 1 (STAT1)

This register provides the operational configuration of DIP switch SW2, switches 1 to 8. Logically it can be used to provide general purpose user configurable digital inputs for application control functionality.

Table 4-6: Status Register 1 (STAT1)

REGISTER NAME		STATUS REGISTER 1 (STAT1)		
ADDRESS		0x281		
BIT	NAME	DESCRIPTION	RESET VALUE	ACCESS
7	DIP2.8	System DIP switch SW2, switch 8 0 = Switch on 1 = Switch off	N/A	R
6	DIP2.7	System DIP switch SW2, switch 7 0 = Switch on 1 = Switch off	N/A	R
5	DIP2.6	System DIP switch SW2, switch 6 0 = Switch on 1 = Switch off	N/A	R
4	DIP2.5	System DIP switch SW2, switch 5 0 = Switch on 1 = Switch off	N/A	R
3	DIP2.4	System DIP switch SW2, switch 4 0 = Switch on 1 = Switch off	N/A	R
2	DIP2.3	System DIP switch SW2, switch 3 0 = Switch on 1 = Switch off	N/A	R
1	DIP2.2	System DIP switch SW2, switch 2 0 = Switch on 1 = Switch off	N/A	R
0	DIP2.1	System DIP switch SW2, switch 1 0 = Switch on 1 = Switch off	N/A	R

If not required, these switches should be set to OFF.

4.4.3 Control Register 0 (CTRL0)

This register provides boot flash update selection monitor and control capability.

Table 4-7: Control Register 0 (CTRL0)

REGISTER NAME		CONTROL REGISTER 0 (CTRL0)		
ADDRESS		0x282		
BIT	NAME	DESCRIPTION	RESET VALUE	ACCESS
7 - 6	Res.	Reserved	00	R
5	BFUS	Boot flash update selection 0 = Select standard SPI boot flash for update 1 = Select recovery SPI boot flash for update	0	R/W
4 - 0	Res.	Reserved	00000	R

4.4.4 Control Register 1 (CTRL1)

This register provides the capability to monitor the reset status or force the resetting of various system elements.

Table 4-8: Control Register 1 (CTRL1)

REGISTER NAME		CONTROL REGISTER 1 (CTRL1)		
ADDRESS		0x283		
BIT	NAME	DESCRIPTION	RESET VALUE	ACCESS
7	SRST	SATA Flash module reset 0 = Reset of SATA Flash module 1 = SATA Flash module is in operation	1	R/W
6	IORST	Reset of IO Controller Board 0 = IO controller components are reset / disabled 1 = IO controller components are released / enabled	1	R/W
5	PCIe_RST	Reset of PCIe Components 0 = Disable / reset PCIe components 1 = Enable / release PCIe components	1	R/W
4	ETH_ PHY_ RST	Reset of ETH-PHY 0 = Disable Ethernet PHY 1 = Enable Ethernet PHY	1	R/W
3	USB_RST	Reset of USB HUB 0 = Disable USB HUB 1 = Enable USB HUB	1	R/W
2 - 0	Res.	Reserved	000	R

4.4.5 Device Protection Register (DPROT)

This register provides monitor and control capability for write protection of various data storage devices.

Table 4-9: Device Protection Register (DPROT)

REGISTER NAME		DEVICE PROTECTION REGISTER (DPROT)		
ADDRESS		0x284		
BIT	NAME	DESCRIPTION	RESET VALUE	ACCESS
7 - 2	Res.	Reserved	000000	R
1	EEWP	EEPROM write protection 0 = System EEPROM on SMB not write protected 1 = System EEPROM on SMB write protected Writing a '1' to this bit sets the bit. If the bit is set it cannot be cleared.	0	R/W
0	BFWP	Boot Flash write protection 0 = both SPI Boot Flashes are not write protected 1 = both SPI Boot Flashes are write protected Writing a '1' to this bit sets the bit. If the bit is set it cannot be cleared.	0	R/W

4.4.6 Reset Status Register (RSTAT)

This register provides the ability to determine the possible source of a host reset.

Table 4-10: Reset Status Register (RSTAT)

REGISTER NAME		RESET STATUS REGISTER (RSTAT)		
ADDRESS		0x285		
BIT	NAME	DESCRIPTION	RESET VALUE	ACCESS
7	PORS	Power-on reset status 0 = System reset generated by software (warm reset) 1 = System reset generated by power-on (cold reset) Writing a '1' to this bit clears the bit.	N/A	R/W
6 - 5	Res.	Reserved	0	R
4	Res.	Reserved	0	R
3	DCRS	Display controller reset status 0 = System reset not generated by Display Controller (e.g. Display Watchdog) 1 = System reset generated by Display controller (e.g. Display Watchdog) Writing a '1' to this bit clears the bit.	0	R/W
2 - 1	Res.	Reserved	0	R
0	WTRS	Watchdog timer reset status 0 = System reset not generated by the Watchdog timer 1 = System reset generated by the Watchdog timer Writing a '1' to this bit clears the bit.	0	R/W

Note ...

The Reset Status Register is set to the default values by power-on reset, not by a warm reset.

4.4.7 Board Interrupt Configuration Register (BICFG)

This register provides a bit for specifying an interrupt (IRQ5) if required in the event that a Watchdog timeout occurs.

Table 4-11: Board Interrupt Configuration Register (BICFG)

REGISTER NAME		BOARD INTERRUPT CONFIGURATION REGISTER (BICFG)		
ADDRESS		0x286		
BIT	NAME	DESCRIPTION	RESET VALUE	ACCESS
7 - 1	Res.	Reserved	0000000	R
0	WICF	Watchdog interrupt configuration: 0 = Disabled 1 = IRQ5	0	R/W

4.4.8 Board and PLD Revision Register (BREV)

This register provides the revision index for the CPU board itself and the board's PLD logic. Based on this information the software can determine which logical elements to use for proper operation of the system. These indexes begin with the value 0x00 and will be incremented accordingly with each change in the hardware or the PLD logic as product development continues.

Table 4-12: Board and PLD Revision Register (BREV)

REGISTER NAME		BOARD AND PLD REVISION REGISTER (BREV)		
ADDRESS		0x289		
BIT	NAME	DESCRIPTION	RESET VALUE	ACCESS
7 - 4	BREV	Board revision index	N/A	R
3 - 0	PREV	PLD revision index	N/A	R

4.4.9 LED Control Register (LED)

This register provides bits for monitoring and controlling of two internal general purpose LEDs. These LEDs can be used to provide application, software development or test status information. These LEDs are located behind the access panel on the left side of the chassis.

Table 4-13: LED Control Register (LED)

REGISTER NAME		LED CONTROL REGISTER (LED)		
ADDRESS		0x28B		
BIT	NAME	DESCRIPTION	RESET VALUE	ACCESS
7 - 4	LCMD	LED command 0000 = Get LED 0 (LED D8) 0001 = Get LED 1 (LED D7) 0010 - 0111 = Reserved 1000 = Set LED 0 (LED D8) 1001 = Set LED 1 (LED D7) 1010 – 1111 = Reserved	0000	R/W
3 - 0	LCOL	LED color 0000 = Off 0001 = Green 0010 = Red 0011 = Amber (Red + Green) 0100 – 0111 = Reserved	0000	R/W

4.4.10 Watchdog Timer Control Register (WTIM)

The HMITR-104 has one Watchdog timer provided with a programmable timeout ranging from 125 msec to 4096 sec. Failure to strobe the Watchdog timer within a set time period results in a system reset or an interrupt. The interrupt mode can be configured via the Board Interrupt Configuration Register (0x286).

There are four possible modes of operation involving the Watchdog timer:

- Timer only mode
- Reset mode
- Interrupt mode
- Dual stage mode

At power on the Watchdog is not enabled. If not required, it is not necessary to enable it. If required, the bits of the Watchdog Timer Control Register must be set according to the application requirements. To operate the Watchdog, the mode and time period required must first be set and then the Watchdog enabled. Once enabled, the Watchdog can only be disabled or the mode changed by powering down and then up again. To prevent a Watchdog timeout, the Watchdog must be retriggered before timing out. This is done by writing a ’1’ to the WTR bit. In the event a Watchdog timeout does occur, the WTE bit is set to ’1’. What transpires after this depends on the mode selected.

The four operational Watchdog timer modes can be configured by the WMD[1:0] bits, and are described as follows:

Timer only mode - In this mode the Watchdog is enabled using the required timeout period. Normally, the Watchdog is retriggered by writing a ’1’ to the WTR bit. In the event a timeout occurs, the WTE bit is set to ’1’. This bit can then be polled by the application and handled accordingly. To continue using the Watchdog, write a ’1’ to the WTE bit, and then retrigger the Watchdog using WTR. The WTE bit retains its setting as long as no power down-up is done. Therefore, this bit may be used to verify the status of the Watchdog.

Reset mode - This mode is used to force a hard reset in the event of a Watchdog timeout. In addition, the WTE bit is not reset by the hard reset, which makes it available if necessary to determine the status of the Watchdog prior to the reset.

Interrupt mode - This mode causes the generation of an interrupt in the event of a Watchdog timeout. The interrupt handling is a function of the application. If required, the WTE bit can be used to determine if a Watchdog timeout has occurred.

Dual stage mode - This is a complex mode where in the event of a timeout two things occur: 1) an interrupt is generated, and 2) the Watchdog is retriggered automatically. In the event a second timeout occurs immediately following the first timeout, a hard reset will be generated. The second timeout period is the same as the first. If the Watchdog is retriggered normally, operation continues. The interrupt generated at the first timeout is available to the application to handle the first timeout if required. As with all of the other modes, the WTE bit is available for application use.

Table 4-14: Watchdog Timer Control Register (WTIM)

REGISTER NAME		WATCHDOG TIMER CONTROL REGISTER (WTIM)		
ADDRESS		0x28C		
BIT	NAME	DESCRIPTION	RESET VALUE	ACCESS
7	WTE	Watchdog timer expired status bit 0 = Watchdog timer has not expired 1 = Watchdog timer has expired. Writing a '1' to this bit resets it to 0.	0	R/W
6 - 5	WMD	Watchdog mode 00 = Timer only mode 01 = Reset mode 10 = Interrupt mode 11 = Cascaded mode (dual-stage mode)	00	R/W
4	WEN/WTR	Watchdog enable / Watchdog trigger control bit 0 = Watchdog timer not enabled Prior to the Watchdog being enabled, this bit is known as WEN. After the Watchdog is enabled, it is known as WTR. Once the Watchdog timer has been enabled, this bit cannot be reset to 0. As long as the Watchdog timer is enabled, it will indicate a '1'. 1 = Watchdog timer enabled Writing a '1' to this bit causes the Watchdog to be retriggered to the timer value indicated by bits WTM[3:0].	0	R/W
3 - 0	WTM	Watchdog timeout settings 0000 = 0.125 s 0001 = 0.25 s 0010 = 0.5 s 0011 = 1 s 0100 = 2 s 0101 = 4 s 0110 = 8 s 0111 = 16 s 1000 = 32 s 1001 = 64 s 1010 = 128 s 1011 = 256 s 1100 = 512 s 1101 = 1024 s 1110 = 2048 s 1111 = 4096 s	0000	R/W

4.4.11 HMO01A Logic Revision Number Register (REV)

This register provides the revision index for the I/O board's PLD logic. Based on this information the software can determine which logical elements to use for proper operation of the system. This index begins with the value 0x00 and will be incremented accordingly with each change in board's PLD logic as product development continues.

Table 4-15: HMO01A Logic Revision Number Register (REV)

REGISTER NAME		HMO01A LOGIC REVISION NUMBER REGISTER (REV)		
ADDRESS		0x290		
BIT	NAME	DESCRIPTION	RESET VALUE	ACCESS
7 - 4	Res.	Reserved	0000	R
3 - 0	PREV	HMO01A: PLD logic index	N/A	R

4.4.12 Digital Input Data Register (DIN)

This register is used to monitor the status of the general purpose digital input signals on the rear I/O Interface connector (J9).

Table 4-16: Digital Input Data Register (DIN)

REGISTER NAME		DIGITAL INPUT DATA REGISTER (DIN)		
ADDRESS		0x295		
BIT	NAME	DESCRIPTION	RESET VALUE	ACCESS
7-6	Res.	Reserved	0000	R
5	DIN[5]	General Purpose Input: HMO01A: DIN[5] 0 = Input low 1 = Input high	0	R
4	DIN[4]	General Purpose Input: HMO01A: DIN[4] 0 = Input low 1 = Input high	0	R
3	DIN[3]	General Purpose Input: HMO01A: DIN[3] 0 = Input low 1 = Input high	0	R
2	DIN[2]	General Purpose Input: HMO01A: DIN[2] 0 = Input low 1 = Input high	0	R
1	DIN[1]	General Purpose Input: HMO01A: DIN[1] 0 = Input low 1 = Input high	0	R
0	DIN[0]	General Purpose Input: HMO01A: DIN[0] 0 = Input low 1 = Input high	0	R

4.4.13 Digital Output Data Register (DOUT)

This register is used to control the general purpose output signals on the rear I/O Interface connector (J9).

Table 4-17: Digital Output Data Register (DOUT)

REGISTER NAME		DIGITAL OUTPUT DATA REGISTER (DOUT)		
ADDRESS		0x296		
BIT	NAME	DESCRIPTION	RESET VALUE	ACCESS
7 - 2	Res.	Reserved	000000	R
1	DOUT[1]	General Purpose Output 1: HMO01A: DOUT[1] 0 = Output low 1 = Output high	0	R/W
0	DOUT[0]	General Purpose Output 0: HMO01A: DOUT[0] 0 = Output low 1 = Output high	0	R/W

4.4.14 Digital Output Fail Register (FAIL)

This register provides the operational status of the fail-signal from the HighSideDriver of the two digital outputs.

Table 4-18: Digital Output Fail Register (FAIL)

REGISTER NAME		DIGITAL OUTPUT FAIL REGISTER (FAIL)		
ADDRESS		0x297		
BIT	NAME	DESCRIPTION	RESET VALUE	ACCESS
7 - 1	Res.	Reserved	0000000	R
0	FAIL	HMO01A: FAIL 0 = not failed 1 = failed	0	R

4.4.15 Digital Output Reset Register (DRST)

This register provides the capability to monitor and control the functionality of the reset signal for the two digital outputs (HSD-Driver reset).

Table 4-19: Digital Output Reset Register (DRST)

REGISTER NAME		Digital Output Reset Register (DRST)		
ADDRESS		0x298		
BIT	NAME	DESCRIPTION	RESET VALUE	ACCESS
7 - 1	Res.	Reserved	0000000	R
0	DRST	HMO01A: DOUT reset 0 = High Side Driver is in the reset state (outputs are disabled) 1 = High Side Driver is in the active state (outputs are enabled)	0	R/W

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