Type KITZ 101, 102

Interface Unit

User Manual

R8521J

User Manual
Type KITZ 101, 102
Interface Unit

HANDLING OF ELECTRONIC EQUIPMENT

A person's normal movements can easily generate electrostatic potentials of several thousand volts. Discharge of these voltages into semiconductor devices when handling electronic circuits can cause serious damage, which often may not be immediately apparent but the reliability of the circuit will have been reduced.

The electronic circuits of AREVA T&D products are immune to the relevant levels of electrostatic discharge when housed in their cases. Do not expose them to the risk of damage by withdrawing modules unnecessarily.

Each module incorporates the highest practicable protection for its semiconductor devices. However, if it becomes necessary to withdraw a module, the following precautions should be taken to preserve the high reliability and long life for which the equipment has been designed and manufactured.

1. Before removing a module, ensure that you are at the same electrostatic potential as the equipment by touching the case.
2. Handle the module by its front-plate, frame, or edges of the printed circuit board. Avoid touching the electronic components, printed circuit track or connectors.
3. Do not pass the module to any person without first ensuring that you are both at the same electrostatic potential. Shaking hands achieves equipotential.
4. Place the module on an antistatic surface, or on a conducting surface which is at the same potential as yourself.
5. Store or transport the module in a conductive bag.

More information on safe working procedures for all electronic equipment can be found in BS5783 and IEC 147-0F.

If you are making measurements on the internal electronic circuitry of an equipment in service, it is preferable that you are earthed to the case with a conductive wrist strap.
Wrist straps should have a resistance to ground between 500k – 10M ohms. If a wrist strap is not available, you should maintain regular contact with the case to prevent the build up of static. Instrumentation which may be used for making measurements should be earthed to the case whenever possible.

AREVA T&D strongly recommends that detailed investigations on the electronic circuitry, or modification work, should be carried out in a Special Handling Area such as described in BS5783 or IEC 147-0F.

Contents

	SAFETY SECTION	7
1.	INTRODUCTION	11
2.	HANDLING AND INSTALLATION	11
2.1	General considerations	11
2.2.	Electrostatic discharge (ESD)	11
2.3.	Unpacking	12
2.4.	Storage	12
3.	KITZ FEATURES	12
4.	CONNECTION	13
4.1	RS232 (IEC-870) connection	17
4.2	K-Bus connection	18
5.	KITZ OPTION SWITCHES	19
5.1	Option switch settings	20
5.2	Data rate selection	20
5.3	RS232 (IEC-870) frame parity	20
5.4	Time tagging of K-Bus messages	21
5.5	Modem control	21
6.	KITZ LED INDICATIONS	22
7.	PROTOCOL CONVERSION	23
7.1	Message format	23
7.2	Message validation	23
7.3	Message time-out	24
7.4	Conversion sequences	24
7.5	Receive message buffering	24
8.	KITZ ADDITIONAL FEATURES	25
8.1	Real time clock (RTC) synchronisation	25
9.	TECHNICAL DATA	26
9.1	Ratings – auxiliary supply	26
9.2	Burden – auxiliary supply	26
9.3	Fuse Ratings	26
9.4	Accuracy	26
9.5	Operation indicator	26
9.6	Communication ports	27
9.7	Message buffers	28
9.8	High voltage withstand	28
9.9	Environmental	29
9.10	Mechanical tests	29
9.11	Enclosure protection IEC529 IP20	29
10.	COMMISSIONING	30
10.1	Commissioning preliminaries	30
10.2	Auxiliary supply tests	31
10.3	Settings	32

11.	PROBLEM SOLVING	32
11.1	Green supply indication led is off	32
11.2	Fuse blows on power-up (KITZ 101 only).	32
11.3	IEC 870 receive indication is off when communicating with a master station	32
11.4	K-Bus receive indication is off when communicating with a master station (and K relay)	32
11.5	Slow communications response (many retries)	33
11.6	Real time clock corruption	33

This Safety Section should be read before commencing any work on the equipment.

Health and safety

The information in the Safety Section of the product documentation is intended to ensure that products are properly installed and handled in order to maintain them in a safe condition. It is assumed that everyone who will be associated with the equipment will be familiar with the contents of the Safety Section.

Explanation of symbols and labels

The meaning of symbols and labels which may be used on the equipment or in the product documentation, is given below.

Caution: refer to product documentation

Caution: risk of electric shock

Protective/safety *earth terminal

Functional *earth terminal.
Note: this symbol may also be used for a protective/ safety earth terminal if that terminal is part of a terminal block or sub-assembly eg. power supply.

*Note: The term earth used throughout this manual is the direct equivalent of the North American term ground.

Installing, Commissioning and Servicing

Equipment connections

Personnel undertaking installation, commissioning or servicing work on this equipment should be aware of the correct working procedures to ensure safety. The product documentation should be consulted before installing, commissioning or servicing the equipment.

Terminals exposed during installation, commissioning and maintenance may present a hazardous voltage unless the equipment is electrically isolated.

If there is unlocked access to the rear of the equipment, care should be taken by all personnel to avoid electric shock or energy hazards.

Voltage and current connections should be made using insulated crimp terminations to ensure that terminal block insulation requirements are maintained for safety. To ensure that wires are correctly terminated, the correct crimp terminal and tool for the wire size should be used.

Before energising the equipment it must be earthed using the protective earth terminal, or the appropriate termination of the supply plug in the case of plug connected equipment. Omitting or disconnecting the equipment earth may cause a safety hazard.

The recommended minimum earth wire size is 2.5 mm^2, unless otherwise stated in the technical data section of the Service Manual.

Before energising the equipment, the following should be checked:

Voltage rating and polarity;

CT circuit rating and integrity of connections;

Protective fuse rating;

Integrity of earth connection (*where applicable*)

Equipment operating conditions

The equipment should be operated within the specified electrical and environmental limits.

Current transformer circuits

Do not open the secondary circuit of a live CT since the high voltage produced may be lethal to personnel and could damage insulation.

External resistors

Where external resistors are fitted to relays, these may present a risk of electric shock or burns, if touched.

Battery replacement

Where internal batteries are fitted they should be replaced with the recommended type and be installed with the correct polarity, to avoid possible damage to the equipment.

Insulation and dielectric strength testing

Insulation testing may leave capacitors charged up to a hazardous voltage. At the end of each part of the test, the voltage should be gradually reduced to zero, to discharge capacitors, before the test leads are disconnected.

Insertion of modules and pcb cards

These must not be inserted into or withdrawn from equipment whilst it is energised, since this may result in damage.

Fibre optic communication

Where fibre optic communication devices are fitted, these should not be viewed directly. Optical power meters should be used to determine the operation or signal level of the device.

Older products

Electrical adjustments

Equipments which require direct physical adjustments to their operating mechanism to change current or voltage settings, should have the electrical power removed before making the change, to avoid any risk of electric shock.

Mechanical adjustments

The electrical power to the relay contacts should be removed before checking any mechanical settings, to avoid any risk of electric shock.

Draw out case relays

Removal of the cover on equipment incorporating electromechanical operating elements, may expose hazardous live parts such as relay contacts.

Insertion and withdrawal of extender cards

When using an extender card, this should not be inserted or withdrawn from the equipment whilst it is energised. This is to avoid possible shock or damage hazards. Hazardous live voltages may be accessible on the extender card.

Insertion and withdrawal of heavy current test plugs

When using a heavy current test plug, CT shorting links must be in place before insertion or removal, to avoid potentially lethal voltages.

Decommissioning and Disposal

Decommissioning: The auxiliary supply circuit in the relay may include capacitors across the supply or to earth. To avoid electric shock or energy hazards, after completely isolating the supplies to the relay (both poles of any dc supply), the capacitors should be safely discharged via the external terminals prior to decommissioning.

Disposal: It is recommended that incineration and disposal to water courses is avoided. The product should be disposed of in a safe manner. Any products containing batteries should have them removed before disposal, taking precautions to avoid short circuits. Particular regulations within the country of operation, may apply to the disposal of lithium batteries.

Technical Specifications

Protective fuse rating

Refer to Section 9 Technical Data, item 9.3 Fuse ratings

Insulation class:	IEC 1010-1: 1990/A2: 1995 Class I EN 61010-1: 1993/A2: 1995 Class I	This equipment requires a protective (safety) earth connection to ensure user safety.
Installation Category (Overvoltage):	IEC 1010-1: 1990/A2: 1995 Category III EN 61010-1: 1993/A2: 1995 Category III	Distribution level, fixed installation. Equipment in this category is qualification tested at 5kV peak, 1.2/50µs, 500ý, 0.5J, between all supply circuits and earth and also between independent circuits.
Environment:	IEC 1010-1: 1990/A2: 1995 Pollution degree 2 EN 61010-1: 1993/A2: 1995 Pollution degree 2	Compliance is demonstrated by reference to generic safety standards.
Product safety: CE	73/23/EEC	Compliance with the European Commission Low Voltage Directive.
	EN 61010-1: 1993/A2: 1995 EN 60950: 1992/A3: 1995	Compliance is demonstrated by reference to generic safety standards.

Section 1. INTRODUCTION

The K-Bus communication system was developed to allow connection of remote K Range units (slaves) to a central point of access (a master control unit eg. a PC and a KITZ unit), thus allowing remote control and monitoring functions to be performed using an appropriate communication language. The system was initially developed for use in the electrical supply industry at distribution voltage levels, but can equally be applied to other voltage levels or indeed to other systems which would benefit from such a communication system.

This document details the KITZ interface unit used in conjunction with AREVA T&D K Range protection relays. It describes the operation and features of the unit in sufficient detail to allow users to interface this unit to other devices (PCs or MODEMS).

This guide should be used in conjunction with the service manual of the equipment with which the KITZ is to be interfaced.

The unit allows conversion between the K-Bus data format and IEC-870 - 5 FT 1.2. data format. This enables (for example) a PC based master station to communicate with K Range units (relays).

Section 2. HANDLING AND INSTALLATION

2.1 General considerations

2.1.1 Receipt of KITZ units

Although the KITZ interface unit is of a generally robust construction, the unit requires careful treatment prior to use on site. Upon receipt, the unit should be examined immediately, to ensure no damage has been sustained in transit. If damage has been sustained during transit, a claim should be made to the transport contractor, and an AREVA T&D representative should be promptly notified.

2.2. Electrostatic discharge (ESD)

The KITZ unit uses components that are sensitive to electrostatic discharges. The electronic circuits are well protected by the metal case and the internal components should not be exposed by removal of the top or front of the case. There are no user setting adjustments within the unit.

A person's normal movements can easily generate electrostatic potentials of several thousand volts. Discharge of these voltages into semiconductor devices when handling electronic circuits can cause serious damage, which often may not be immediately apparent but the reliability of the circuit will have been reduced.

When transporting the unit, care should be taken so that the RS232 port is not subjected to ESD. Touching the case will ensure you are at the same electrostatic potential as the unit.

If you are making measurements on the internal electronic circuitry of an equipment in service, it is preferable that you are earthed to the case with a conductive wrist strap. Wrist straps should have a resistance to ground between 500k-10M ohms. If a wrist strap is not available, you should maintain regular contact with the case to prevent a build-up of static. Instrumentation which may be used for making measurements should be earthed to the case whenever possible.

More information on safe working procedures for all electronic equipment can be found in BS 5783 and IEC 147-OF. It is strongly recommended that detailed investigations on electronic circuitry, or modification work, should be carried out in a Special Handling Area such as described in the above-mentioned BS and IEC documents.

2.3. Unpacking

Care must be taken when unpacking and installing the unit to prevent damage.

2.4. Storage

If the KITZ unit is not to be installed immediately upon receipt it should be stored in a place free from dust and moisture in the original carton. Where de-humidifier bags have been included in the packing they should be retained. The action of the de-humidifier crystals will be impaired if the bag has been exposed to ambient conditions and may be restored by gently heating the bag for about an hour, prior to replacing it in the carton.

Dust which collects on a carton may, on subsequent unpacking, find its way into the unit; in damp conditions the carton and packing may become impregnated with moisture and the de-humidifier will lose its efficiency.

Storage temperature –25°C to +70°C.

Section 3. KITZ FEATURES

The protocol converter features are as follows:

Choice of desktop (KITZ 101) or back of panel mounting (KITZ 102).

Wide range of auxiliary supply inputs.

Enables K-Bus to be interfaced with standard IEC 870-5 FT1.2 communication links.

Converts K-Bus messages to IEC-870 format.

Converts IEC-870 messages to K-Bus format.

Allows alternative data communication rates and frame format on the IEC-870 port.

Optionally adds a time tag to K Range reply messages.

Buffers incoming messages thus allowing transmission at lower speed.

Allows synchronisation of the real time clock via the communications.

Provides visual indication of communication operation.

A typical application connection arrangement for the KITZ 101 is shown below:

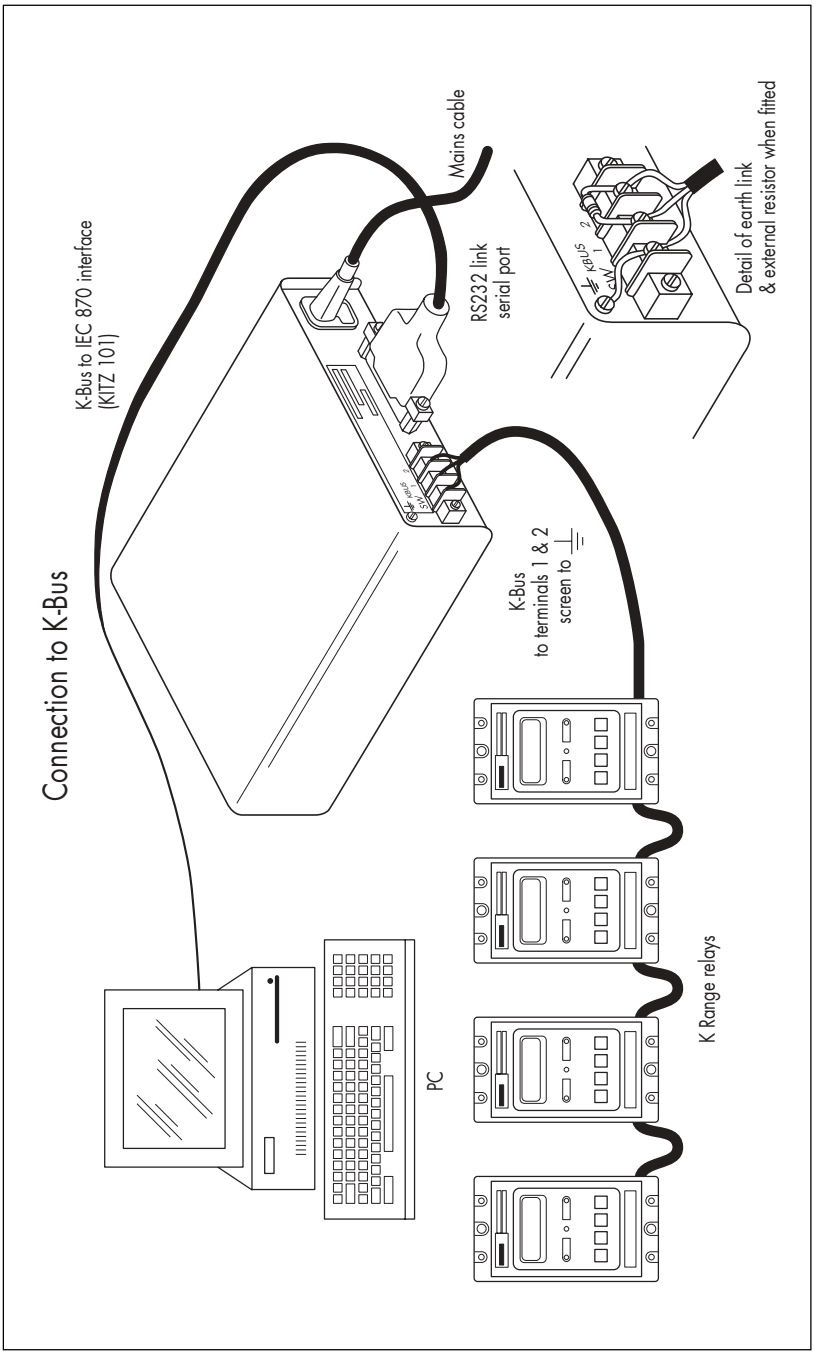


Figure 1a: Typical application of KITZ 101 interface unit.

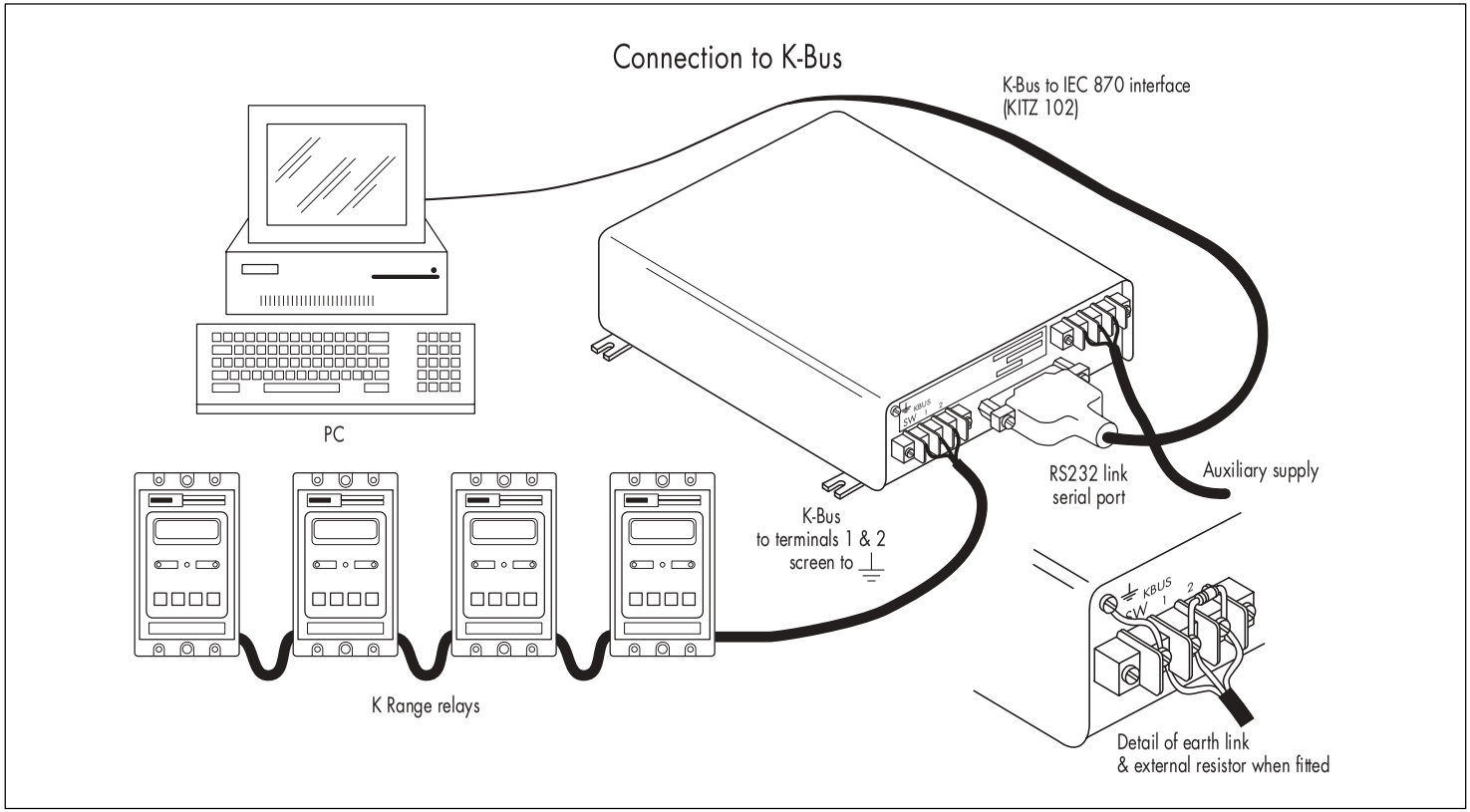


Figure 1b: Typical application of KITZ 102 interface unit.

A schematic representation of a typical application connection arrangement is shown below:

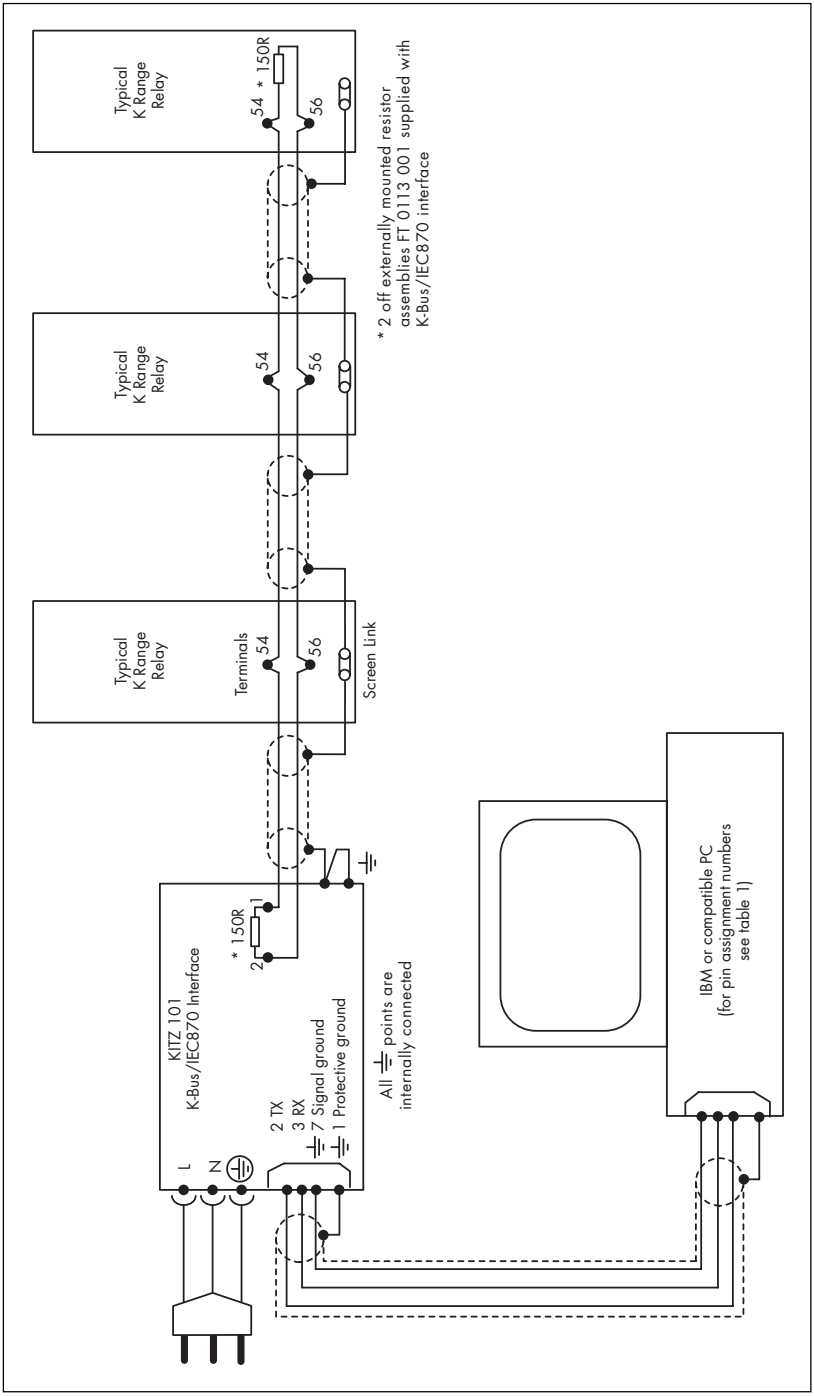


Figure 2a: KITZ 101 IEC-870 (RS232) port to PC serial port connections.

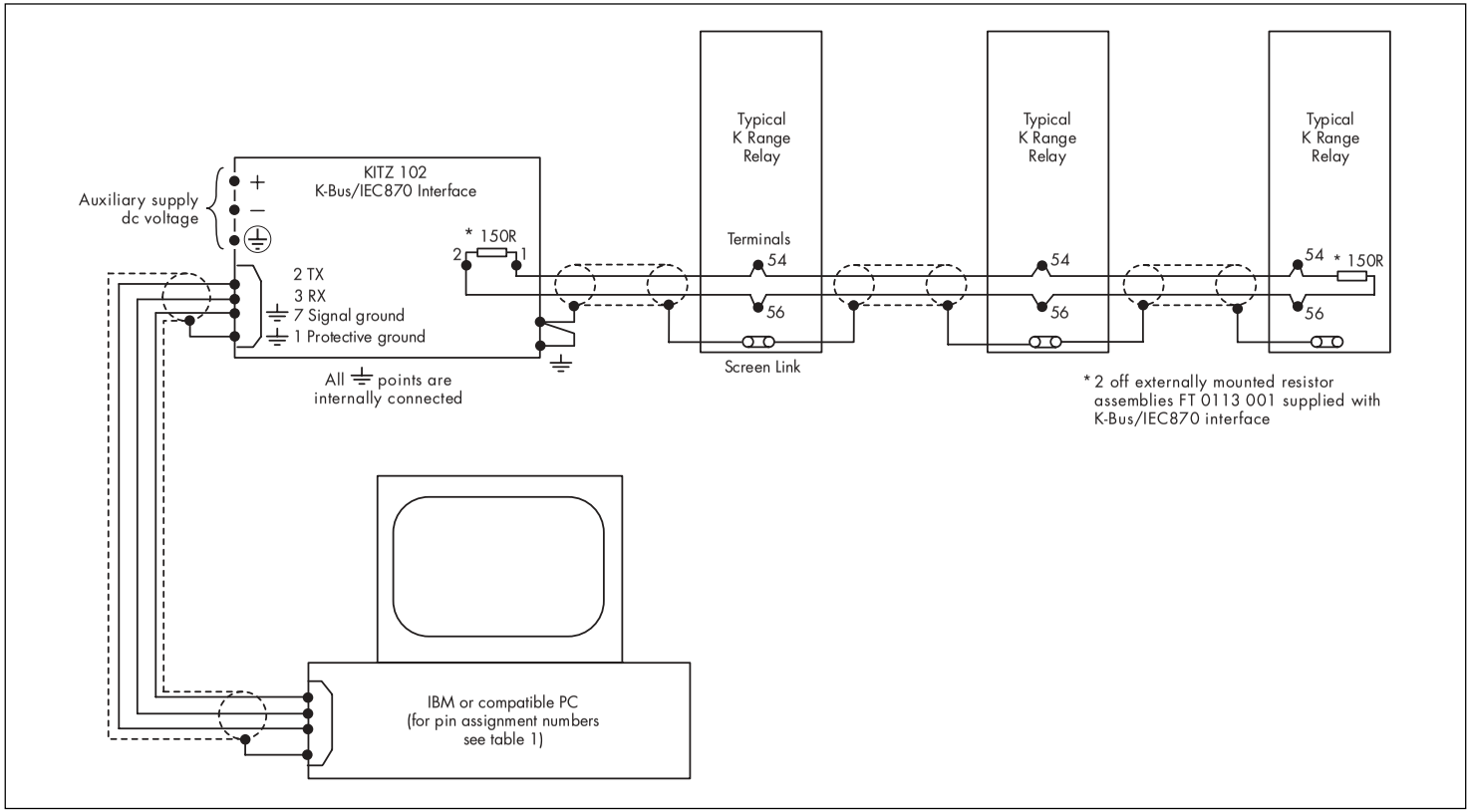


Figure 2b: KITZ 102 IEC-870 (RS232) port to PC serial port connections.

4.1 RS232 (IEC-870) connection

4.1.1 Recommended cable

A standard PC serial port interface cable (with the connections listed in Table 1) should be used. It is essential that the cable screen is earthed at one end to ensure adequate screening. The connectors should be screw-locked to the KITZ and the PC.

4.1.2 Cable length

The maximum recommended length of cable from the IEC-870 Communications port is 15 metres (50 feet) or 2500 pF total cable capacitance. For longer distance communication on the IEC-870 port an external RS485 interface may be required.

4.1.3 Data rates

The maximum data communication rate specified in the RS232-c standard is 20 kbits/s. The KITZ unit will support faster communication data rates (up to 115.2 kbits/s) for use with development tools such as K-Spy.

The following table shows the connections required to interface a KITZ to a user PC serial data port. These connections are for guidance only and reference should be made to the PC user manual.

Note that the terms "Receive Data" and "Transmit Data" (in Tables 1 and 2) refer to the named connector and not to a nominated end.

KITZ 25 Pin 'D' male connector (DTE)	PC-at laptop 9 Pin 'D' male connector (DTE)	PC or PS/2 Type 25 Pin 'D' male connector (DTE)
1 – Protective Ground	No Connection	1 – Protective Ground See note
2 – Transmit Data	2 – Receive Data	3 – Receive Data
3 – Receive Data	3 – Transmit Data	2 – Transmit Data
7 – Signal Common	5 – Signal Common	7 – Signal Common
Connector Shell to Cable Screen (see note)		

Table 1 KITZ/PC RS232 port inter-connections.

Note: The RS232 cable screen should be connected to earth at one end only, to prevent earth loops.
Pin 7 (Signal Common) or Pin 1 (Protective Ground) can be used as an alternative to the Connector Shell.

The following table lists the complete (Modem Control) pin functions of the KITZ and the PC:

Pin No	KITZ (DTE) Connector	PC AT LAPTOP 9 Pin female connector (DTE)	PC or PS/2 Type 25 Pin male connector (DTE)
1	Protective Ground	Carrier Detect (CD)	Protective Ground
2	Transmit Data (Tx)	Receive Data (Rx)	Transmit Data (Tx)
3	Receive Data (Rx)	Transmit Data (Tx)	Receive Data (Rx)
4	Request To Send (RTS)	Data Terminal Ready (DTR)	Request To Send (RTS)
5	Clear To Send (CTS)	Signal Common	Clear To Send (CTS)
6	Data Set Ready (DSR)	Data Set Ready (DSR)	Data Set Ready (DSR)
7	Signal Common	Request To Send (RTS)	Signal Common
8	Carrier Detect (CD)	Clear To Send (CTS)	Carrier Detect (CD)
9		Ring Indicator (RI)	
20	Data Terminal Ready (DTR)		Data Terminal Ready (DTR)
22			Ring Indicator (RI)

Table 2 KITZ and PC RS232 port modem control connections.

4.2 K-Bus connection

4.2.1 Recommended cable

Twisted pair of wires with outer screen, to DEF STANDARD 16-2-2c 16 Strands of 0.2mm diameter, 40mý per metre per core, 171pF per metre (core to core), 288pF per metre (core to screen).

4.2.2 Connection method

K-Bus is a multi-drop standard. The K-Bus cable extends from a KITZ interface unit and is daisy-chained from one slave device to the next in a radial fashion. The total K-Bus cable from the master control unit to the farthest slave device is known as a spur. No branches may be made from the spur.

4.2.3 Cable termination

Four millimetre looped screw termination or fast-on connection (as per MIDOS standard terminations). The outer screen should be earthed at one point of the cable only, preferably at the connection to the KITZ unit. The transmission wires should be terminated using a 150ý resistor at both extreme ends of the cable.

4.2.4 Cable polarity

Polarisation is not necessary for the 2 twisted wires.

4.2.5 Maximum cable (spur) length

The maximum cable length is 1000m.

4.2.6 Maximum slave devices per spur

The maximum number of devices per spur is 32.

Section 5. KITZ OPTION SWITCHES

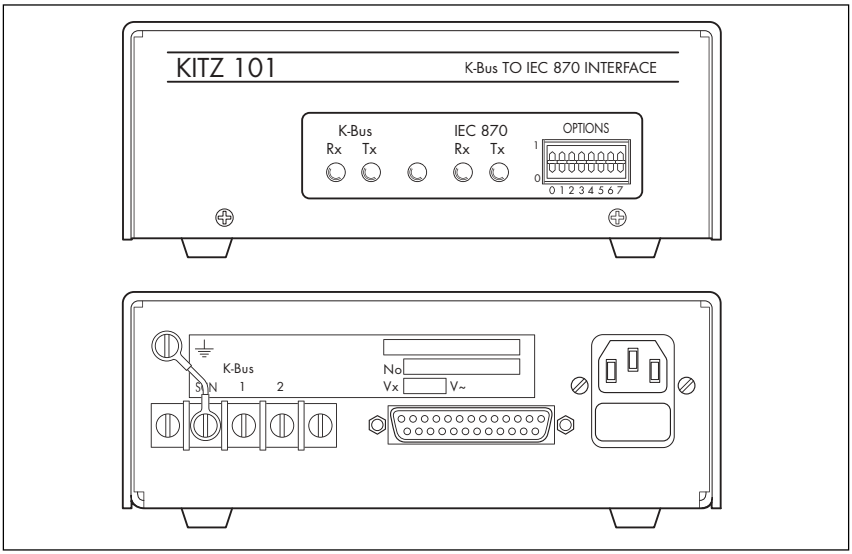


Figure 3a: KITZ 101 front plate layout and rear connections.

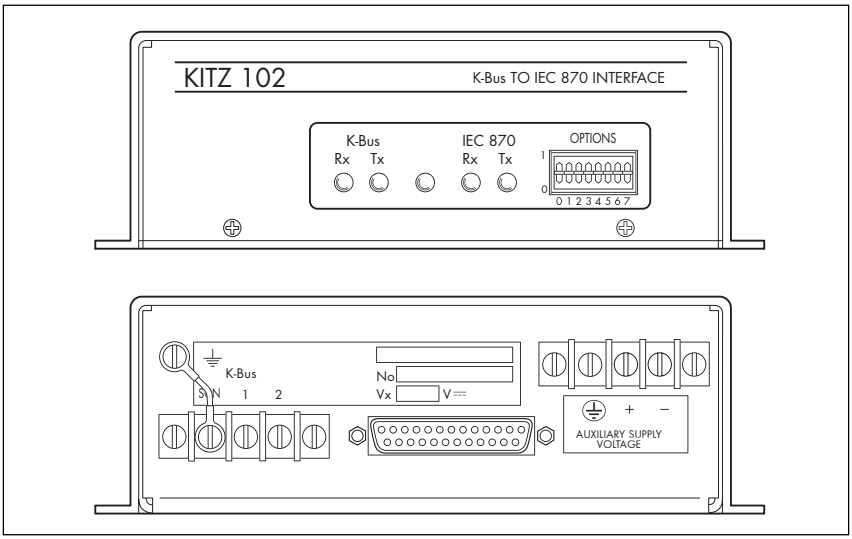


Figure 3b: KITZ 102 front plate layout and rear connections.

5.1 Option switch settings

The option switches on the KITZ front plate allow the user to configure the KITZ to suit the application requirements.

The following table lists the KITZ option switch functions.

Switch No.	Function
0 to 2	RS232 (IEC-870) data rate selection
3	RS232 (IEC-870) frame format
4	Add IEC time tag to K-Bus message
5	Modem present
6	Modem set-up
7	Reserved

Table 3. KITZ option switch functions.

A switch function is operational when in the UP position (marked 1). The switch position at power-up determines which features are enabled (or settings apply). Any changes made to the switch positions while the supply is present will not affect the operation.

5.2 Data rate selection

The three left-hand switches (switches 0 to 2) control the KITZ IEC-870 (RS232) port data communication rate setting.

The RS232 port is capable of supporting asynchronous serial communication at the data rates specified in Table 4. The corresponding switch settings are also shown in the table.

Data Rate	Switch 0	Switch 1	Switch 2
1200	Position 0	Position 0	Position 0
2400	Position 1	Position 0	Position 0
4800	Position 0	Position 1	Position 0
9600	Position 1	Position 1	Position 0
19200	Position 0	Position 0	Position 1
38400	Position 1	Position 0	Position 1
57600	Position 0	Position 1	Position 1
115200	Position 1	Position 1	Position 1

Table 4. KITZ IEC-870 (RS232) Port data rate selection.

5.3 RS232 (IEC-870) frame parity

The fourth switch (switch 3) allows the frame format of the RS232 (IEC-870) communications port to be set to the following modes:

Position 0 Asynchronous 11 bit (1 start bit, 8 data bits, 1 parity, 1 stop bit)

Position 1 Asynchronous 10 bit (1 start bit, 8 data bits, no parity, 1 stop bit)

The normal operational mode of the KITZ unit uses the 11 bit frame format. However, some equipment to which the KITZ unit is to be interfaced can only support the 10 bit frame format (eg. most modems).

The use of the 10 bit frame format will result in a less secure communications protocol which does not meet the IEC-870 - 5 FT 1.2 requirements.

5.4 Time tagging of K-Bus messages

The fifth switch (switch 4) appends an IEC-870 format time tag (using the KITZ RTC's current time) to a received K-Bus message.

The KITZ Interface unit will insert an IEC-870 format time tag into a converted IEC-870 courier message if all of the following conditions apply:

1) Switch 4 (fifth from left is set).
2) The message contains a millisecond timer count (DTL Type 38h - 3Bh).
3) The message contains a courier status byte (or bytes) (DTL Type 5Ch - 5Fh).
4) An IEC-870 time tag (DTL Type 3Ch - 3Fh) is not already contained before the status byte within the message.

The IEC-870 time tag will be added after the millisecond count.
The time tag format is shown below.

IEC TIME DTL (EXT)	Extended Length	ms.	Minutes	Hour	Day	Month	Year
3C	07	0 - 59999	0 - 59	0 - 23	1 - 31	1 - 12	0 - 99

The IEC-870 time tag value is the time of reception of the first byte of the K-Bus message.

If switch 4 is not set, the millisecond counter of the relay reply will be adjusted to take account of protocol conversion delays.

5.5 Modem control

The Modem Set-up and Modem Present switches control the KITZ unit mode of operation when connected to a modem. This is shown in the following table:

Modem Present (Switch 5)	Modem Set-Up (Switch 6)	Function
Position 0	Position 0	Normal operation - Modem control lines (CTS, DSR and DCD) ignored. DTR always active, RTS reflects Receive/Transmit state.
Position 1	Position 0	Modem control lines (CTS (Tx), DSR (Rx) and DCD (Rx)) must be active to START (see note) communication. DTR always active, RTS reflects Receive/Transmit state.
Position 0 or 1	Position 1	Communication disabled on RS232 and K-Bus ports.

Table 5. KITZ RS232 modem control.

Note: DSR and DCD are only required to be active at the start of message reception, while CTS is only required to be active at the start of message transmission.

Section 6. KITZ LED INDICATIONS

The KITZ unit has five led indications.

The green led indicates that the KITZ unit is in the powered-up state. The four yellow leds indicate the status of the K-Bus and IEC-870 communications.

The Receive K-Bus message led (K-Bus Rx) indicates that a message is being received on the K-Bus communications port.

The Transmit K-Bus message led (K-Bus Tx) indicates that a message is being transmitted on the K-Bus communications port.

The Receive IEC message led (IEC Rx) indicates that a message is being received on the IEC-870 communications port.

The Transmit IEC message led (IEC Tx) indicates that a message is being transmitted on the IEC-870 communications port.

A detailed description of the led indication operation is shown below.

Indication	"On" State	"Off" State
Green led	Supply present	No supply
K-Bus Rx	When the first address character of the K-Bus message is received.	(1) When the end of message is received (Closing Flag 7Eh). (2) When a time-out error occurs. (3) When disabled (ie. when a valid IEC-870 message has been received on the other channel).
K-Bus Tx	When a K-Bus message is ready for transmission (loaded in transmit buffer).	(1) When all message characters have been transmitted including the Closing Flag. (2) When a time-out error occurs.
IEC 870 Rx	When the first IEC-870 Start character (68h) of the IEC-870 message is received.	(1) When the end of message is received (IEC-870 Stop character (16h)). (2) When a time-out error occurs. (3) When disabled (ie. when a valid K-Bus message has been received on the other channel)
IEC 870 Tx	When an IEC-870 message is ready for transmission (loaded in transmit buffer).	(1) When all message characters have been transmitted. (2) When a time-out error occurs.

Table 6. KITZ led indications.

Section 7. PROTOCOL CONVERSION

7.1 Message format

The KITZ interface unit main function is to convert K-Bus message data to IEC-870 - 5 FT1.2 format for communication with a PC.

The K-Bus message format is shown below:

PRE-AMBLE	START FLAG	A0-5	0	Message Length	DTL	Control	DTLs + Data	CRC	CLOSING FLAG
FFFFh	7Eh		0		61h				7Eh

The K-Bus frame is based upon the ISO High level Data Link Control (HDLC) protocol. This is a bit-oriented protocol and eliminates much of the control overhead associated with byte-oriented protocols. The information field of the HDLC frame is totally transparent and the information can take on any form and contain any binary bit combination.

The IEC-870 Message format as used by a PC-based K Range master station is shown below:

START FLAG	Message Length	Message Length	START FLAG	Control	A0-5	0	DTLs + Data	Check-sum	CLOSING FLAG
68h			68h			0			16h

For further details of the IEC-870 - 5 FT1.2 message format see the appropriate IEC specification.

7.2 Message validation

Message validation takes place during and after message reception.

7.2.1 K-Bus message validation

The framing of the K-Bus message must be correct (HDLC Start and Stop flags present).

At the end of a frame:

a) CRC (HDLC)
b) Data overrun
c) Residue (HDLC information field is an exact number of bytes)
d) Correct message length (matches received message data)

During a frame:

a) Character time-out
b) Receive Buffer overflow
c) Message is too long

7.2.2 IEC message validation

The framing of the message must be correct for IEC-870 - 5 FT1.2.

At the start of a frame:

a) A correct header frame must be present (2 Starts + matching lengths).

b) A time of greater than 33 bit transmissions (at current baud rate) must have elapsed since the last erroneous message

At the end of a frame:

a) Checksum is correct

b) A STOP character must be present.

During a frame:

a) Framing error
b) Overrun error
c) Character parity (if enabled)
d) Character time-out
e) Receive Buffer overflow
f) Message is too long

7.3 Message time-out

The KITZ unit uses timers to speed-up re-initialisation of message reception and transmission when a message timing error occurs (on the K-Bus or IEC-870 port).

7.3.1 K-Bus timers

The received K-Bus message is checked for character gaps. The timer value is 2ms between characters.

The transmitted K-Bus message cannot take greater than 500ms to transmit.

7.3.2 RS232 (IEC-870) timers

These timer values are dependent on the data rate used (the data rate switch position determines the timer value used).

The received IEC-870 message is checked for character gaps within the message. The maximum gap allowable is 33 bits (at current data rate).

The transmitted IEC-870 message is not allowed to take greater than a 5,500 bit time period (at current data rate) to transmit.

Note: IEC-870 - 5 FT1.2 states that data transmitted in this format should not have inter-character gaps. The KITZ unit transmits using this format, but the receiver allows gaps as mentioned above. The 3 byte (33 bit) delay after message error is adhered to.

7.4 Conversion sequences

When a valid message is received on one channel (either K-Bus or IEC-870), the following operation occurs:

(1) the other channels receiver is disabled.

(2) the message is converted (IEC-870 to K-Bus or K-Bus to IEC-870).

(3) the message is transmitted on the other channel.

(4) the other channels receiver is re-enabled.

7.5 Receive message buffering

Under normal operating conditions the KITZ unit will not need to buffer received messages because the master station will send a message and then wait for a

reply. However, if direct conversion is required message buffering will be inevitable. If the received message data rate is higher than the transmitted data rate, multiple message buffering (and eventual overflow) will occur. If the received message data rate is lower than (or equal to) the transmitted data, only one incoming message will have to be buffered while the previous message is being transmitted.

The KITZ unit is capable of buffering up to 2048 bytes of message data (but not exceeding 64 individual messages) on one channel while transmitting data on the other channel. After this limit has been reached, received messages will be ignored until space is available in the internal buffer (ie. a complete message has been transmitted).

When multiple buffering of received messages occurs, the messages will be converted and transmitted in the order in which they were received. The other channel's receiver will not be re-enabled until after all valid messages have been converted and transmitted.

Section 8. KITZ ADDITIONAL FEATURES

8.1 Real time clock (RTC) synchronisation

The K-Bus protocol converter real time clock (RTC) can only be synchronised over the IEC-870 communications link. A courier command allows setting of the RTC.

The command format is as follows:

Command DTL	Command Set IEC Time (RTC)	IEC TIME DTL (EXT)	Extended Length	Milli-seconds.	Minutes	Hour	Day	Month	Year
05	45	3C	07	0 - 59999	0 - 59	0 - 23	1 - 31	1 - 12	0 - 99

The protocol converter will check the incoming IEC-870 message for a synchronise RTC (real time clock) command sequence and if found sets the RTC to the specified time.

The 'Synchronise RTC' command must be the only command after the IEC control byte within the message, otherwise normal protocol conversion occurs.

The RTC setting value sent by the master station should correspond to the start of the transmitted message (to the KITZ unit).

If time-tagging of K-Bus messages is not required, the RTC need not be synchronised.

9.1 Ratings – auxiliary supply

Nominal	Operative
KITZ 101 110/240V ac	 87 – 265V ac 50/60Hz
KITZ 102 24/125V ac/dc 48/250V ac/dc	 19 –150V dc 50 –133V ac 50/60Hz 33 – 300V dc 87 – 265V ac 50/60Hz

9.2 Burden – auxiliary supply

KITZ 101 (ac) <3VA

KITZ 102 (ac) <5VA
(dc) <3W

9.3 Fuse Ratings

KITZ 101

Maximum recommended fuse rating (HRC or time lag type) is 6A.
Internal fuse rating is 1.6A/T 250V, 5x20mm.

KITZ 102

Maximum recommended fuse rating is 16A.

9.4 Accuracy

9.4.1 Real time clock (RTC)

RTC drift from setting at 20°C (over range –25°/+55°C) < 8s per 24 hours

Synchronisation Error: Time setting Error ±1.5ms*
Time Tagging Error: Current RTC Time Error +0 ms/–1ms

* If the RS232 (IEC-870) 10 bit frame format and a data rate of 1200 or 2400 bps are selected, synchronisation error is +2.0/–1.0ms.

9.4.2 Software communication timers

IEC data receive character gap timer: 33 bits +2.0/–0ms
IEC data receive error break timer: 33 bits +2.0/–0ms
IEC data transmit maximum transmit time: 5500 bits +2.0/–0ms
K-Bus data receive character gap timer: 2.0ms +0/–1.0ms
K-Bus data transmit maximum transmit time: 500ms +0/–1.0ms

9.5 Operation indicator

5 light emitting diodes - internally powered.

9.6 Communication ports

9.6.1 K-Bus port

Language:	COURIER
Transmission:	Synchronous - RS485 voltage levels
Transmission Coding:	Biphase space (Differential Manchester)
Frame Format:	HDLC
Baud Rate:	64k/bit per second
K-Bus Cable:	Screened twisted pair
K-Bus cable length:	1000m of cable (maximum)
K-Bus Loading:	32 units (multi-drop system)
Isolation:	2kV rms for one minute

Voltage signals

(Based on RS485 differential voltage level):

Unloaded driver differential output:	±5V
Receiver input sensitivity:	±200mV

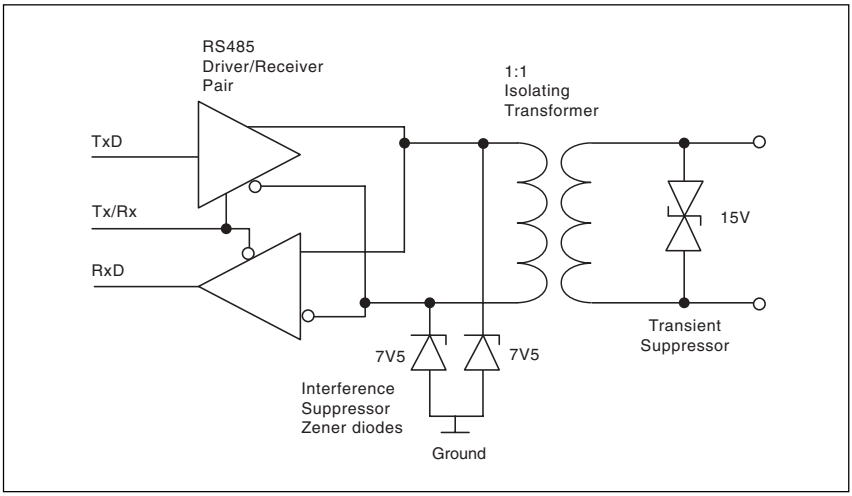


Figure 4: Circuit diagram of K-Bus electrical interface.

9.6.2 IEC-870 (RS232) port

Language:	COURIER
Transmission:	Asynchronous - RS232 voltage levels
Transmission coding:	NRZ
Frame format (switch 3 = position 0):	Asynchronous - 11 bit (1 start bit, 8 data bits, 1 parity (even) 1 stop bit)
Frame format (switch 3 = position 1):	Asynchronous - 10 bit (1 start bit, 8 data bits, no parity, 1 stop bit)
Baud rate:	1200 to 115200 bits per second
RS232 cable:	RS232 serial interface lead
RS232 cable length:	15m of cable (maximum) (or 2500pF total cable capacitance)
RS232 Loading:	2 units (point to point system)

9.7 Message buffers

K-Bus

Receive Data Buffer Size:	2048 bytes or 64 messages

IEC-870

Receive Data Buffer Size:	2048 bytes or 64 messages

9.8 High voltage withstand

The high voltage withstand tests can be performed on the following independent circuits:

Auxiliary supply
K-Bus communication port

The IEC 870 port is earthed locally and should not be tested for high voltage withstand. It is protected by the cable screen.

9.8.1 Dielectric test (Insulation) IEC 255-5, BS 5992-3

2.0kV rms for one minute between all terminals wired together and case earth.
2.0kV rms for one minute between terminals of independent circuits.

9.8.2 High voltage impulse IEC255-5, BS 5992-3

5kV peak, 1.2/50μs, 0.5J between all terminals of independent circuits, and terminals of independent circuits to case earth.

0kV peak on IEC-870 port

9.8.3 High frequency disturbance IEC255-22-1, BS 142-1.4.1

Class III 2.5kV peak between independent circuits, and independent circuits to case.

Class III 1.0kV between terminals of same circuit

0kV peak on IEC-870 port

9.8.4 Electrical fast transient IEC255-22-4, BS 142-1.4.4, IEC 801-4

Auxiliary supply	Class III 2kV
K-Bus communication port	Class III 2 kV – capacitive coupling
IEC-870 Port	None

9.8.5 Electrostatic discharge IEC 255-22-2, IEC 801-2

Class II 4kV – point contact discharge.

Note: The IEC-870 port will not withstand electrostatic discharges (air or contact).

9.9 Environmental

9.9.1 Temperature IEC 68-2-1, BS 2011 Part 2.1A & IEC 68-2-2, BS 2011 Part 2.1B

Storage and transit:	–25°C to +70°C
Operating:	–25°C to +55°C

9.9.2 Humidity IEC68-2-3, BS 2011 Part 2.1 Ca

56 days at 93% relative humidity and +40°C

9.10 Mechanical tests

9.10.1 Vibration IEC 255-21-1 Class I

9.10.2 Shock and bump IEC 255-21-2 Class I

9.10.3 Seismic IEC 255-21-3 Class I

9.11 Enclosure protection IEC529 IP20

9.12 Battery

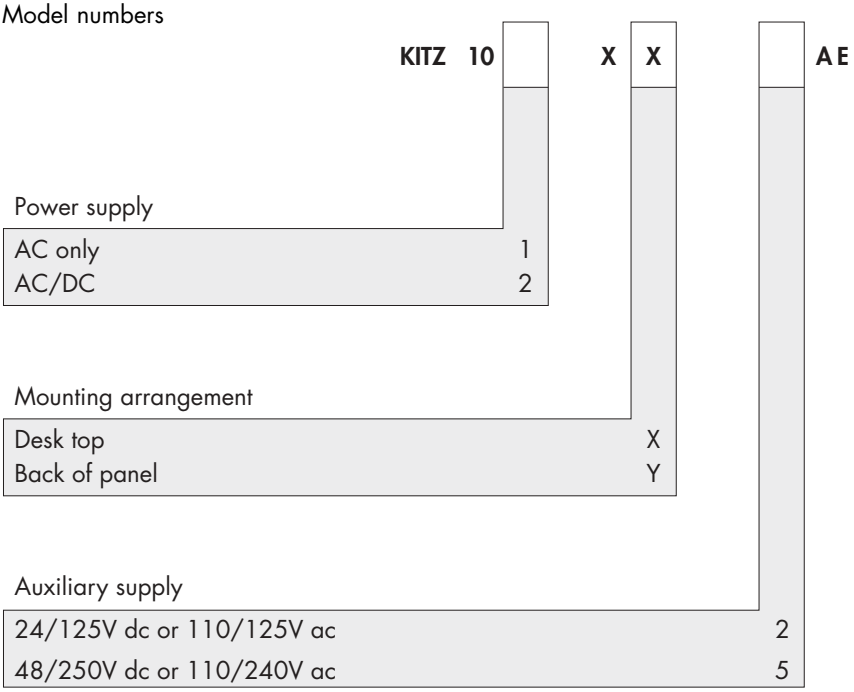
Replacement

See Section 11. Problem Solving.

Disposal

The battery should be removed from the unit and have any connection leads removed before disposal, taking precautions to avoid short circuits. Particular regulations within the country of operation may apply to the disposal of lithium batteries.

9.13 Model numbers



Section 10. COMMISSIONING

10.1 Commissioning preliminaries

The KITZ unit should be commissioned in conjunction with the K Range Protection Access Software & Toolkit (running on a PC) and (at least) one K Range relay.

See R8514 Protection Access Software & Toolkit or publication R8515 Courier Access Software which are provided with the software.

10.1.1 Module connection

Reference should be made to Section 3 of this manual and to the user manual of the computer (PC) on which the Protection Access Software & Toolkit is to be run.

10.1.2 Electrostatic discharge (ESD)

See recommendations in Section 2 of this user manual before handling the module.

10.1.3 Inspection

Carefully examine the unit and case to see that no damage has occurred since installation.

10.1.4 Earthing

10.1.4.1 Mains earthing

The KITZ unit must be earthed.

If the mains supply has no earth connection, the KITZ interface unit earthing connection on the rear of the case must be used to connect the unit to a local (mains) earth.

10.1.4.2 K-Bus earthing

The K-Bus cable screen should only be connected to earth at one point in the communication system. This will normally involve connecting the cable at the master station end to the KITZ interface unit earth connection and not at any other point.

10.1.5 Insulation

Insulation tests only need to be done when required.

Isolate all wiring from the earth and test the insulation with an electronic or brushless insulation tester at a DC voltage not exceeding 1000V. Terminals of the same circuits should be temporarily strapped together.

The main groups on the relays are given below:

Auxiliary voltage supply
K-Bus Communication port
Case earth

This test should not be performed on the IEC870 (RS232) communications port.

10.1.6 Equipment required

The KITZ units require the following:

AC/DC voltmeter 0–300V

A portable PC, with Protection Access Software & Toolkit and a K Range relay are essential for commissioning the KITZ K-Bus/IEC 870 interface unit.

10.2 Auxiliary supply tests

The unit will operate from either a 110V/120V or 220/240V ac auxiliary supply, or a 24/125V or 48/250V dc auxiliary supply depending on the version. The incoming voltage must be within the operating range specified in Table 7.

Nominal	Operative
KITZ 101 110/240V ac	 87 – 265V ac 50/60Hz
KITZ 102 24/125V ac/dc 48/250V ac/dc	 19 –150V dc 50 –133V ac 50/60Hz 33 – 300V dc 87 – 265V ac 50/60Hz

Table 7. KITZ auxiliary supply rating.

The green supply indication should be on when the auxiliary supply voltage is greater than the minimum specified level.

10.3 Settings

When the KITZ interface unit is used to allow a PC (running master station software) to communicate with K Range relays (ie. normal operation), the following applies:

Check baud rate (option switches 0-2) setting on the IEC-870 (RS232) port corresponds to the data communication rate of the master station. The standard setting is 9600 bps and the following option switch position apply:

Option Switch 0 is set to 1 (Up)

Option Switch 1 is set to 1 (Up)

Option Switch 2 is set to 0 (Down)

Option Switch 3 (RS232 (IEC870) frame format) should be set to the 0 (Down) position.

Option Switch 4 (Add IEC time-tag) should be set to the 1 (Up) position.

Option Switches 5 and 6 (Modem Present and Modem Set-up) should be set to the 0 (Down) position.

Option Switch 7 (reserved) should be set to the 0 (Down) position.

The option switch settings are applied at power-up.

If changes are made to the settings, the auxiliary supply must be switched off. The unit is re-energised after at least 5 seconds.

Section 11. PROBLEM SOLVING

Common operational faults are listed in this section. The solutions offered are for guidance only.

11.1 Green supply indication led is off

Check correct auxiliary supply is present (ie. no supply).

Check fuse.

11.2 Fuse blows on power-up (KITZ 101 only).

Check that excessive auxiliary supply voltage is not being used.

11.3 IEC 870 receive indication is off when communicating with a master station

Check data rate selection for IEC-870 (RS232) port is identical to that of the master station.

Power-down the unit and then power-up the unit to guarrantee the switch settings.

Check master station is polling for data.

11.4 K-Bus receive indication is off when communicating with a master station (and K relay)

Relay is not communicating (incorrect address/not configured etc.): refer to the appropriate K Range service manual.

Incorrect connection and/or termination resistor fitted to K-Bus of wrong value or missing altogether.

11.5 Slow communications response (many retries)

No termination resistor fitted to K-Bus, or incorrect value.

11.6 Real time clock corruption

The battery within the KITZ 101, 102 is provided to maintain the real time clock to the correct time following an interruption of the ac/dc voltage supply to the unit. Corruption of the real time clock can occur if the voltage across the battery drops below the accepted minimum level and an interruption in power supply takes place. This may be evident by invalid real time clock data within the Courier response message of the slave devices connected to the unit. The voltage across the battery should be measured with the supply voltage removed and if found to be less than 3.5V, the unit should be returned to AREVA T&D for replacement of the battery.

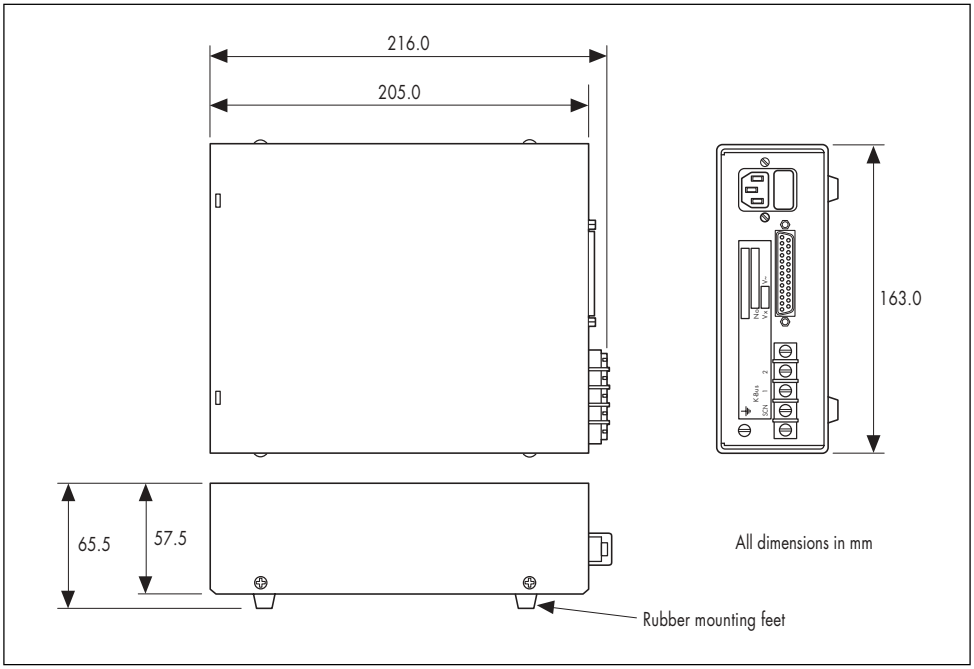


Figure 5a: Outline drawing for KITZ 101

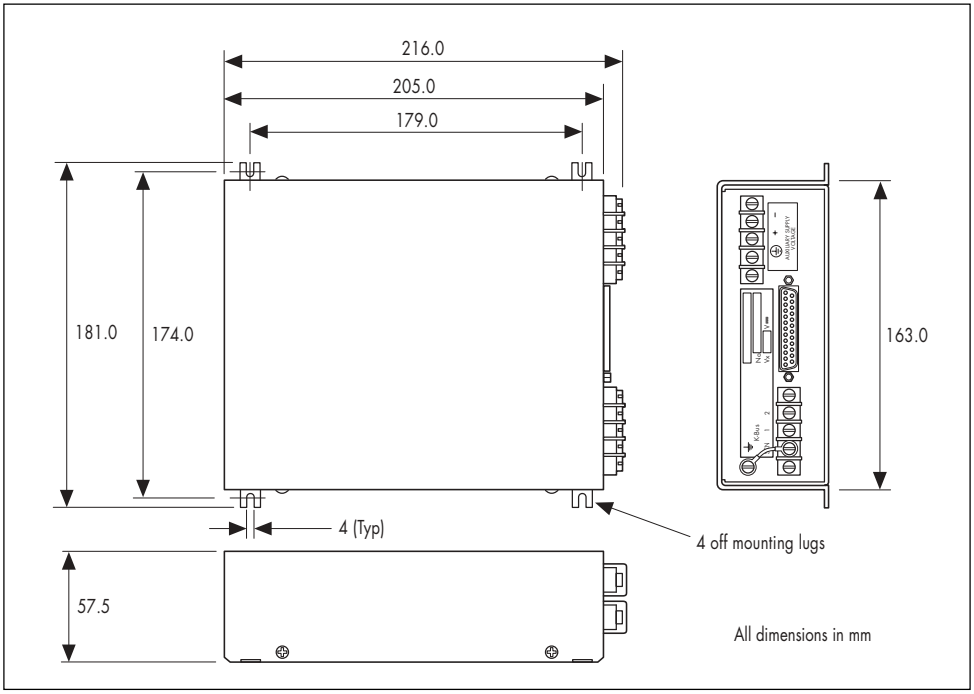


Figure 5b: Outline drawing for KITZ 102

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