KITZ 202 MODBUS

Communications Protocol Converter

Service Manual

R8566C

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 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 a 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 60147-0F.

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 60147-0F.

CONTENT

1.	SAFETY SECTION	3
1.1	Health and safety	3
1.2	Explanation of symbols and labels	3
2.	INSTALLING, COMMISSIONING AND SERVICING	3
3.	EQUIPMENT OPERATING CONDITIONS	4
3.1	Current transformer circuits	4
3.2	External resistors	4
3.3	Battery replacement	4
3.4	Insulation and dielectric strength testing	4
3.5	Insertion of modules and pcb cards	4
3.6	Fibre optic communication	5
4.	OLDER PRODUCTS	5
5.	DECOMMISSIONING AND DISPOSAL	5
6.	TECHNICAL SPECIFICATIONS	6

1. SAFETY SECTION

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

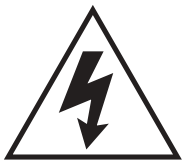
1.1 Health and safety

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.

1.2 Explanation of symbols and labels

The meaning of symbols and labels 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 e.g. power supply.

*NOTE: THE TERM EARTH USED THROUGHOUT THE PRODUCT DOCUMENTATION IS THE DIRECT EQUIVALENT OF THE NORTH AMERICAN TERM GROUND.

2. 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 electrical 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 $2.5mm^{2,}$ unless otherwise stated in the technical data section of the product documentation.

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)
- Remove front plate plastic film protection
- Remove insulating strip from battery compartment

3. EQUIPMENT OPERATING CONDITIONS

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

3.1 Current transformer circuits

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

3.2 External resistors

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

3.3 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.

3.4 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.

3.5 Insertion of modules and pcb cards

These must not be inserted into or withdrawn from equipment whist it is energised since this may result in damage.

3.6 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.

4. 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 electrical 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.

5. 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.

6. TECHNICAL SPECIFICATIONS

Protective fuse rating

The recommended maximum rating of the external protective fuse for this equipment is 16A, Red Spot type or equivalent, unless otherwise stated in the technical data section of the product documentation.

Insulation class:	IEC 601010-1 : 1990/A2 : 2001 Class I EN 61010-1: 2001 Class I	This equipment requires a protective (safety) earth connection to ensure user safety.
Insulation Category (Overvoltage):	IEC 601010-1 : 1990/A2 : 1995 Category III EN 61010-1: 2001 Category III	Distribution level, fixed insulation. Equipment in this category is qualification tested at 5kV peak, 1.2/50µs, 500Ω, 0.5J, between all supply circuits and earth and also between independent circuits.
Environment:	IEC 601010-1 : 1990/A2 : 1995 Pollution degree 2 EN 61010-1: 2001 Pollution degree 2	Compliance is demonstrated by reference to generic safety standards.
Product Safety:	72/23/EEC	Compliance with the European Commission Low Voltage Directive.
CE	EN 61010-1: 2001 EN 60950-1: 2002	Compliance is demonstrated by reference to generic safety standards.

CONTENTS

1.	**INTRODUCTION**	**8**
2.	**HANDLING AND INSTALLATION**	**9**
2.1	**Receipt of KITZ202 units**	**9**
2.2	**Electrostatic discharge (ESD)**	**9**
2.3	**Unpacking**	**9**
2.4	**Storage**	**9**
3.	**CONNECTION**	**10**
3.1	**Connection**	**10**
3.1.1	K-Bus connection	11
3.1.2	Rear RS232 connection	12
3.1.3	Rear RS485 connection	13
3.1.4	Rear optical fibre connection	14
3.1.5	Front RS232 (Courier) connection	14
4.	**ALARMS AND INDICATIONS**	**15**
4.1	**Communications indications operation**	**15**
4.2	**Unit Healthy LED**	**15**
4.3	**Unit Alarm LED**	**15**
4.4	**Alarm records**	**15**
4.5	**Testing LED indication operation**	**16**
4.6	**Watchdog contact operation**	**16**
4.7	**KITZ202 Courier events**	**16**
5.	**GETTING STARTED**	**17**
6.	**APPLICATION NOTES**	**18**
7.	**K-BUS COMMUNICATIONS (PORT 3)**	**19**
7.1	**Initialisation**	**19**
7.2	**Normal polling**	**19**
7.3	**Busy replies from downstream units**	**19**
7.4	**Retries to downstream units**	**19**
7.5	**Global requests**	**19**
8.	**COURIER MASTER COMMUNICATIONS (PORT 0 AND PORT 2)**	**21**
8.1	**KITZ202 Courier address**	**21**
8.2	**Downstream Unit Courier addresses**	**21**

8.3 Courier master software 21
8.4 KITZ202 Courier database 21
8.5 Courier passwords 22
8.6 Extended password protection 22
8.7 Data cells 22
8.8 Event extraction 22
8.9 Invalid settings 22
8.10 Request message processing 23
8.11 "Poll Status" and "Poll Buffer" 23
8.12 Block transfer from a Courier address 23
8.13 KITZ202 setting changes 23
8.14 Event/Alarm blocking 23

9. MODBUS MASTER COMMUNICATIONS (PORT 1) 24
9.1 KITZ202 MODBUS communications 24
9.2 Downstream MODBUS addresses 24
9.3 MODBUS implementation 24
9.3.1 Read Coil Status 24
9.3.2 Read Input Status 24
9.3.3 Read Holding Register 25
9.3.4 Read Input Register 25
9.3.5 Preset Single Register 25
9.3.6 Diagnostics 25
9.3.7 Functionality not supported 26
9.4 Mapping of relay Courier database cells to MODBUS registers 26
9.4.1 Mapping for KCGG/KCEG 28
9.4.2 Mapping for LFZR 30
9.4.3 Mapping for LGPG 32
9.4.4 Mapping for KBCH 34
9.4.5 Mapping for KMPC 36
9.4.6 Mapping for KAVR/KVTR/KAVS 38
9.4.7 Mapping for KVFG 40
9.4.8 Mapping for KVGC 42
9.4.9 Mapping for M300 44
9.4.10 Mapping for P123 46
9.4.11 Mapping for P220 48
9.4.12 Mapping for P143 50
9.4.13 Mapping for P241 52

9.4.14 Mapping for P343 54
9.4.15 Mapping for P444 56
9.4.16 Mapping for P545 58
9.4.17 Registers 31000 to 33999 60
9.5 MODBUS numeric types 61
9.6 Poll times (Min Scan Time) 62
9.7 Request message processing 62
9.8 Command message processing 62
9.9 Real time clock (RTC) time and date setting 62
10. TECHNICAL DATA 63
10.1 Ratings - auxiliary supply 63
10.2 Burden - auxiliary supply 63
10.3 Real time clock 63
10.4 Watchdog contact 63
10.5 Operation indications 63
10.6 Communications ports 64
10.6.1 Front RS232 Port 0 64
10.6.2 Rear Fibre Optic Port 64
10.6.3 Rear RS232 Port 64
10.6.4 Rear RS485 Port 65
10.6.5 Rear K-Bus Port 3 65
10.6.6 High voltage withstand 65
10.6.7 Electrical environment 66
10.6.8 Product safety 67
10.6.9 Atmospheric environment 67
10.6.10 Mechanical environment 67
10.7 User tests 67
11. COMMISSIONING, PROBLEM SOLVING AND MAINTENANCE 68
11.1 General 68
11.2 Commissioning instructions 68
11.2.1 Commissioning preliminaries 68
11.2.2 Auxiliary supply tests 69
11.2.3 Configuration 69
11.2.4 Testing communication port operation 69

11.3 Problem solving guide 70

11.3.1 All indications are Off 70

11.3.2 Green supply indication is Off and alarm indication is On 70

11.3.3 No communications 70

11.3.4 Slow communications response (many retries) 71

11.3.5 Cannot access one or more of the downstream units within the specified address range 71

11.3.6 Master station time out/MODBUS "busy" response received 71

11.3.7 Connected Courier downstream relay communications is slow when communicating via the KITZ202. 71

11.4 Maintenance 72

11.4.1 Battery replacement 72

12. Courier DATABASE 73

12.1 System DATA 73

12.1.1 Language 73

12.1.2 Password 73

12.1.3 Description 73

12.1.4 Plant reference 73

12.1.5 Model number 73

12.1.6 Serial number 73

12.1.7 Communications Level 73

12.1.8 Unit Address 74

12.1.9 Software Reference 74

12.1.10 Alarms 74

12.2 Unit settings 74

12.2.1 Extended Password protection 74

12.2.2 Menu Access 74

12.2.3 Password Timer 74

12.2.4 Port 1 Enable 74

12.2.5 Port 2 Enable 74

12.3 Port 0 settings 75

12.3.1 Port 0 Setting Timer 75

12.3.2 Port 0 Block Timer 75

12.3.3 Port 0 Reply Timer 75

12.3.4 Port 0 Reset Timer 75

12.3.5 Port 0 Add Time Tag 75

12.3.6 Port 0 Block Events 75

12.4 Port 1 settings (MODBUS) 76
12.4.1 Port 1 Mode 76
12.4.2 Port 1 Data Rate 76
12.4.3 Port 1 Frame Format 76
12.4.4 Port 1 Reply Timer 76
12.5 Port 2 settings (COURIER) 77
12.5.1 Port 2 Mode 77
12.5.2 Port 2 Data Rate 77
12.5.3 Port 2 Frame Format 77
12.5.4 Port 2 Setting Timer 78
12.5.5 Port 2 Block Timer 78
12.5.6 Port 2 Reply Timer 78
12.5.7 Port 2 Reset Timer 78
12.5.8 Port 2 Add Time Tag 78
12.6 Port 3 settings 79
12.6.1 Port 3 Reply Timer 79
12.6.2 Port 3 Retries 79
12.6.3 Port 3 Busy Replies 79
12.6.4 Port 3 Global Message Transmission Timer 79
12.6.5 Port 3 Message Transmission Delay Timer 79
12.7 Indications 80
12.7.1 Illuminate Indications on Power-Up test 80
12.7.2 Indications Test Illumination Time 80
12.7.3 Illuminate Indications Test 80
12.8 Real Time Clock 80
12.8.1 Date and Time 80
12.9 Communications statistics 81
12.9.1 Reset Communication Total Message statistics 81
12.9.2 Reset Communication Total Message Error statistics 81
12.9.3 Port 0 communication total messages received 81
12.9.4 Port 0 communication total error message received 81
12.9.5 Port 1 communication total messages received 81
12.9.6 Port 1 communication total error message received 81
12.9.7 Port 2 communication total messages received 82
12.9.8 Port 2 communication total error message received 82
12.9.9 Port 3 communication total messages received 82
12.9.10 Port 3 communication total error message received 82

12.10 Address range **83**
12.10.1 Base Address 83
12.10.2 No. of Units (Number of Downstream Units) 83
12.11 MODBUS Dev 1 - MODBUS Dev 20 **83**
12.12 Scan Time **83**
13. REFERENCES **83**
14. GLOSSARY **84**

BLANK PAGE

1. INTRODUCTION

This document details the MODBUS KITZ protocol converter. It describes the operation and features of the unit in sufficient detail to allow users to interface the unit to other equipment.

The MODBUS KITZ (KITZ202) will provide an interface between devices supporting K-Bus Courier communications, and a MODBUS RTU protocol based master station. MODBUS is a communications protocol, based on PLC architectures, which is commonly used in industry. It provides the ability to read and write analogue and digital values to 16-bit registers. The KITZ202 therefore allows integration of K-Bus communication devices into an existing substation control system supporting MODBUS RTU master station through one rear port. A second rear port allows a Courier master station to gain remote access to the connected K-Bus communication devices, and to the KITZ202 itself for configuration purposes. A front RS232 port allows a Courier master station to gain local access to the connected K-Bus communication devices, and to the KITZ202 itself for configuration purposes.

The KITZ202 will allow simultaneous communications to be performed from the MODBUS master, from the local Courier master, and from the remote Courier master, to any connected K-Bus communication devices. The unit performs conversion between the K-Bus Courier protocol and the MODBUS RTU protocol. The MODBUS ASCII protocol is not supported. The conversion performed by the unit is transparent to the equipment attached to the MODBUS RTU master station port.

2. HANDLING AND INSTALLATION

The user should be familiar with the contents of the Safety Section before commencing with any work on this equipment.

2.1 Receipt of KITZ202 units

Although the KITZ202 unit is of the standard MIDOS case type construction, it requires careful handling prior to use on site. Upon receipt, the unit should be examined immediately, to ensure that no damage has been sustained in transit.

If damage has been sustained during transit, a claim should be made to the transport contractor and a representative of AREVA T&D should be promptly notified.

2.2 Electrostatic discharge (ESD)

The KITZ202 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 the removal of the assembled boards from within the outer casing. It should be noted that there are no user setting adjustments or measurements to be carried out 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. Often, this is not immediately apparent, but the units reliability will have been reduced. When transporting the unit, care should be taken that the RS232 and RS485 ports are not subjected to ESD. Touching the case will ensure that the user is at the same electrostatic potential as the unit. 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 any 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 should be taken when unpacking and installing the unit to prevent damage.

2.4 Storage

If the KITZ202 unit is not installed immediately upon receipt, it should be stored in an environment free from dust and moisture in the original carton.

Where de-humidifier crystals will be impaired if the bag has been exposed to ambient conditions and may be restored by heating the bag gently for about half 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.

3. CONNECTION

3.1 Connection

The connection diagram for the KITZ202 is shown in the following figure:

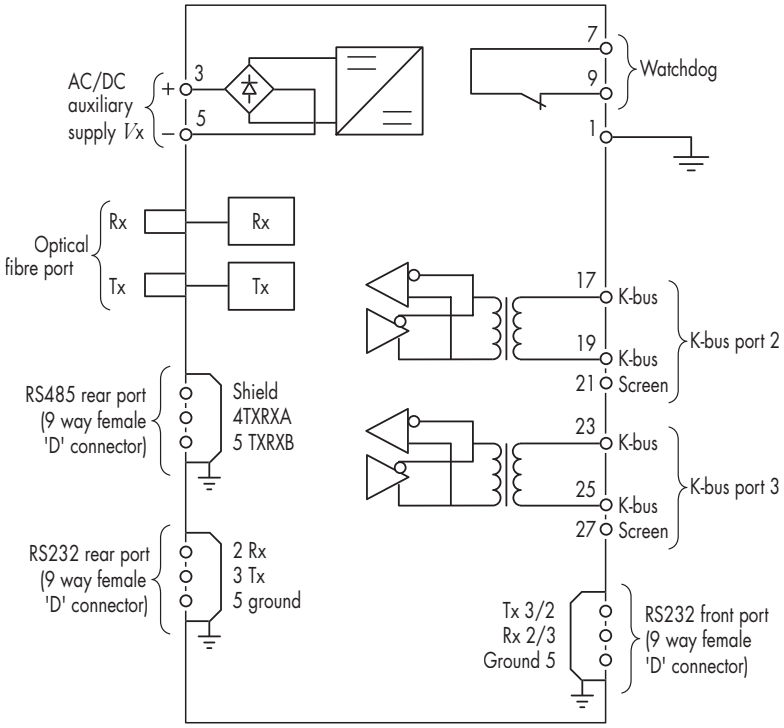


FIGURE 1 : CONNECTION DIAGRAM FOR KITZ202

The unit front panel is shown in the following figure:

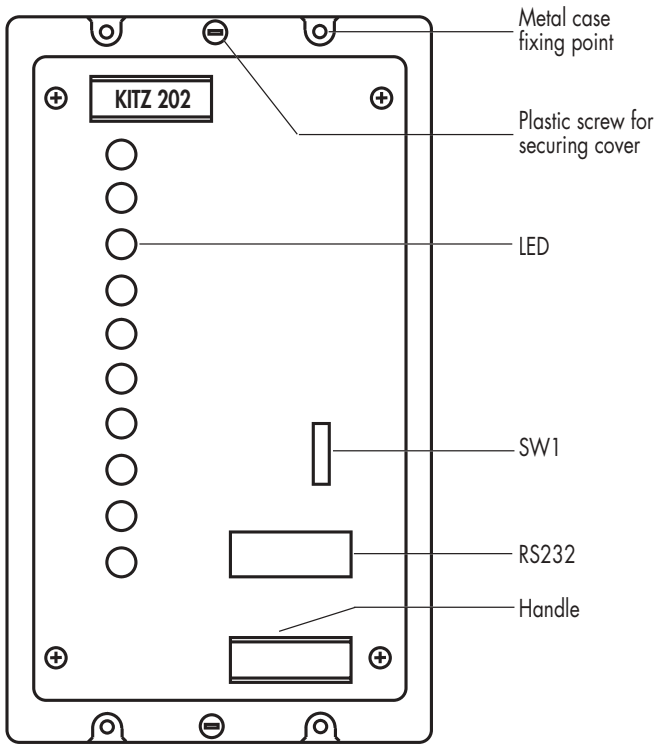


FIGURE 2 : KITZ202 FRONT PANEL LAYOUT

The unit consists of four communications ports. Port 0 is an RS232 connection which is designed for local access and is located on the front of the unit. A switch is provided for selecting DTE or DCE configuration (crossing over the transmit and receive signals). Port 1 is for the connection of the MODBUS master station. Port 2 is for the connection of a (remote) Courier master station.

The connection between the unit and the master station can either be 850nm multimode glass optical fibre or isolated RS485 or RS232. The connector associated with ports 1 and 2 is not fixed, so port1 (MODBUS) can be selected as either Optical Fibre or RS485 or RS232. Port 2 (Courier) can also be selected as either Optical fibre or RS485 or RS232 or K-Bus (master), but not the same as Port 1. Port 3 is for the connection of relays and is permanently configured for K-Bus.

The unit rear panel is shown in the following figure:

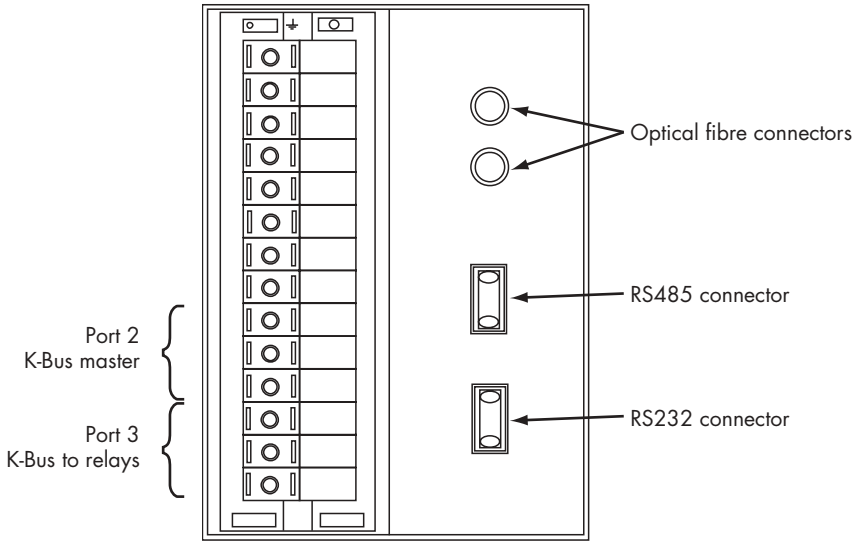


FIGURE 3 : KITZ202 REAR PANEL LAYOUT

3.1.1 K-Bus connection

K-Bus requires a twisted pair screened cable with resistor termination on the extreme ends.

3.1.1.1 Connection method

K-Bus is a multidrop standard. This means that a K-Bus connection can be made point to point or can be daisy-chained together with a number of devices. A chain of connected units is known as a spur and no branches may be made from the spur.

3.1.1.2 Recommended cable

Twisted pair with outer screen, to MOD DEF STANDARD 61-12 Part 5: 16 strand, 0.2mm diameter, 40 mΩ per metre per core, 171pF per metre (core to core), 288pF per metre (core to screen).

3.1.1.3 Cable termination

Termination is via three terminals on a standard MIDOS terminal block. Two terminals are for the twisted pair communications wires and the third is for the screen. The screen connection is not internally connected to the unit in any way, since the screen should be earthed at one point of the cable only - normally at the master end. The transmission wires should be terminated using a 150Ω resistor at both extreme ends of the cable. The MIDOS block terminal numbers, for connection of the K-Bus port, are given in table 1:

Port 3	Connection
23	K-Bus 1
25	K-Bus 2
27	Screen (N.C)

TABLE 1 : K-BUS CONNECTIONS

3.1.1.4 Cable polarity

Polarisation is not necessary for the twisted pair.

3.1.1.5 Maximum cable length

The maximum cable length for a spur is 1000m.

3.1.1.6 Maximum devices per spur

The maximum number of devices per KITZ202 is twenty.

3.1.2 Rear RS232 connection

3.1.2.1 Connection method

The rear RS232 port is suitable for direct point to point connection between the unit and a PC. It is isolated and designed for permanent connection. No modem control signals are available.

3.1.2.2 Recommended cable

A standard PC serial port interface cable should be used. It is essential that the cable screen be earthed at one end to ensure adequate screening. The connectors should be screw locked at each end. Reference should also be made to the PC user manual for the exact connection requirements.

3.1.2.3 Termination

The pinout of the rear port 9-way female 'D' connector is as shown in Table 2. It is configured as Data Terminal Equipment (DTE).

Pin Number	Function	Direction
SHELL	Protective ground	-
2	Received data RxD	In
3	Transmitted data TxD	Out
5	Signal ground GND	-

TABLE 2 : CONNECTION FOR THE REAR RS232 SERIAL CONNECTOR

The connection is:

KITZ202 – DTE				PC – DTE	
9-way				25-way	9-way
3	TXD	———	RXD	3	2
2	RXD	———	TXD	2	3
5	SG	———	SG	7	5

The earthing arrangement of the RS232 connection is for the protective ground to be connected to 0V via the case. This arrangement provides maximum screening of the RS232 signals. The signal ground of RS232 connection is not connected to the 0V of the unit. This ensures that no earth loop currents can flow between the KITZ202 and other connected equipments.

3.1.2.4 Cable length

The maximum cable length according to the RS232 specifications is 15m, or 2500pF total cable capacitance.

3.1.3 Rear RS485 connection

3.1.3.1 Connection method

The rear RS485 port is suitable for direct point to point or multidrop connection between the master and a (number of) unit(s). It is isolated and designed for permanent connection.

3.1.3.2 Recommended cable

The RS485 specification does not define connector type or pinout, so a cable suitable for connection between the KITZ202 connector, which is specified in section 3.1.3.3 below, and that provided by the RS485 master will be needed.

3.1.3.3 Termination

The pinout of the rear port 9-way female 'D' connector is as shown in Table 3.

Pin Number	Function	Direction
SHELL	Protective ground	-
1	Shield	-
5	Data signal TXRXB	In/Out
4	Data signal TXRXA	In/Out

TABLE 3 : CONNECTION FOR THE REAR RS485 SERIAL CONNECTOR

The screen of the RS485 cable should be earthed at one point of the cable only. When earthing at the KITZ202, the screen should be connected to the 'D' connector shell which forms the protective ground and is connected to 0V via the case.

The data signal lines, TXRXA and TXRXB should be terminated at both extreme ends of the cable with resistors. The value of each resistor must be close to the characteristic impedance of the cable, which is typically 100Ω - 120Ω.

3.1.3.4 Cable length

The maximum cable length according to the RS485 specification is 1000m.

3.1.4 Rear optical fibre connection

3.1.4.1 Connection method

The rear optical fibre port is suitable for direct point to point connection between the unit and a remote optical transmitter and receiver. The port consists of one Transmit fibre connection and one Receive fibre connection.

3.1.4.2 Recommended fibre

The optical fibre used should be 850nm multimode glass fibre (50/125µm and 62.5/125µm are suitable).

3.1.4.3 Termination

The BFOC/2.5 (ST®) connector type is used.

3.1.4.4 Fibre length

The transmitter and receiver capabilities allow a distance of 1 km of fibre between the KITZ202 and the master connection.

3.1.5 Front RS232 (Courier) connection

3.1.5.1 Connection method

The front port is designed only to be used for temporary connection and no modem control signals are available.

3.1.5.2 Recommended cable

A standard PC serial port interface cable should be used. It is essential that the cable screen be earthed at one end to ensure adequate screening.

The connectors should be screw locked at each end. Reference should also be made to the PC user manual for the exact connection requirements.

3.1.5.3 Termination

The pin out of the front port on the unit can be configured either as a Data Terminal Equipment (DTE) or a Data Circuit-terminating Equipment (DCE), using a crossover switch (SW1) on the front panel. The connections are listed in Table 4.

Pin Number	Function	Direction
SHELL	Protective ground	-
2/3	Received data RxD	In
3/2	Transmitted data TxD	Out
5		Signal ground GND

TABLE 4 : CONNECTION FOR THE FRONT RS232 SERIAL CONNECTOR

The earthing arrangement of the RS232 connection is for the protective ground to be connected to 0V via the case. This arrangement provides maximum screening of the RS232 signals. The signal ground is connected to 0V of the unit.

3.1.5.4 Cable length

The maximum cable length according to the RS232 specification is 15m, or 2500pF total cable capacitance.

4. ALARMS AND INDICATIONS

4.1 Communications indications operation

The operation indication of each communication port transmitter and receiver is listed in Table 5:

Indication LED name	Function
P0 Tx	Communication Port 0 (front Courier) is transmitting data
P0 Rx	Communication Port 0 (front Courier) is receiving data
P1 Tx	Communication Port 1 (rear MODBUS) is transmitting data
P1 Rx	Communication Port 1 (rear MODBUS) is receiving data
P2 Tx	Communication Port 2 (rear Courier) is transmitting data
P2 Rx	Communication Port 2 (rear Courier) is receiving data
P3 Tx	Communication Port 3 (rear K-Bus) is transmitting data
P3 Rx	Communication Port 3 (rear K-Bus) is receiving data

TABLE 5 : KITZ202 COMMUNICATION LED FUNCTIONS.

4.2 Unit Healthy LED

The unit healthy LED (when On) is used to indicate the following:

- The auxiliary supply is present.
- The unit software has been initiated.
- The settings are valid.
- The unit has a non-default serial number.

4.3 Unit Alarm LED

The alarm indication will reflect the alarm status ("SYS Alarms") of the unit.

These are:

- Invalid settings.
- Default settings loaded on initialisation, i.e. the unit has the default serial number (000000O).

The alarm indication will also flash to indicate that a valid password has been entered via the "SYSTEM DATA" menu column.

4.4 Alarm records

The alarm flags (in the "SYS Alarms" menu cell) indicate the set/reset state of the alarm.

Flag 0 indicates that the settings are invalid.

Flag 1 indicates that the default serial number (000000O) is being used.

An alarm condition will result in the Alarm indication being lit, the alarm bit will be set in the returned Courier status byte and the corresponding flag will be set in the "SYS Alarms" menu column.

4.5 Testing LED indication operation

Options are provided in the Courier datbase to allow the indications to be illuminated on power-up or via setting a menu cell. The duration for which the indications remain illuminated is controlled by the "IND Illum Time" setting in the Courier database. See section 12, Courier database settings, "INDICATIONS" menu column, for setting information details.

4.6 Watchdog contact operation

The watchdog relay contact (when open) indicates that the unit is healthy, as defined in section 4.2.

4.7 KITZ202 Courier events

The KITZ202 can generate the following time tagged events, available on either Port 0 or Port 2:

Invalid Settings in the non volatile memory

KITZ202 password entered via Port 0

KITZ202 setting changed via Port 0

KITZ202 password entered via Port 2

KITZ202 setting changed via Port 2

A total of 20 Courier events can be stored in the KITZ202 internal buffers. If the event buffer becomes full, the oldest event record will be overwritten by the next event. The events are time tagged using the real time clock and will have the form:

Milliseconds, Minutes, Hours, Day of week and day of month, Month, Year (tens and units).

This format is specified in IEC 870-5-4: 1993 "binary time 2a".

5. GETTING STARTED

The communication address of the unit will be set to 255 when it leaves the factory. This is the global address of all K-Bus slave units on the network and requires changing to a unique address in order to function as a slave device to the Courier master. This is accomplished using Courier master station software via the front port. Courier master station software may be "Courier Access Software", "Protection Access Software & Toolkit" or "MiCOM S1".

To change the relay's address from "Courier Access Software" or "Protection Access Software & Toolkit", select the "New Address" option from the "Units" menu. The serial number (including the suffix letter as a capital letter) of the relay must first be entered, followed by the current (old) address of the relay (enter 255 if this is not known). Finally enter the required new address of the KITZ202, in the range 1 to 254.

To change the relay's address from "MiCOM S1", select the "New Address by serial #" option from the "Device" menu, and proceed as described above.

6. APPLICATION NOTES

The following figure illustrates the application of the KITZ202 to integrate K, L and P Range protection devices into a system with an existing MODBUS master station.

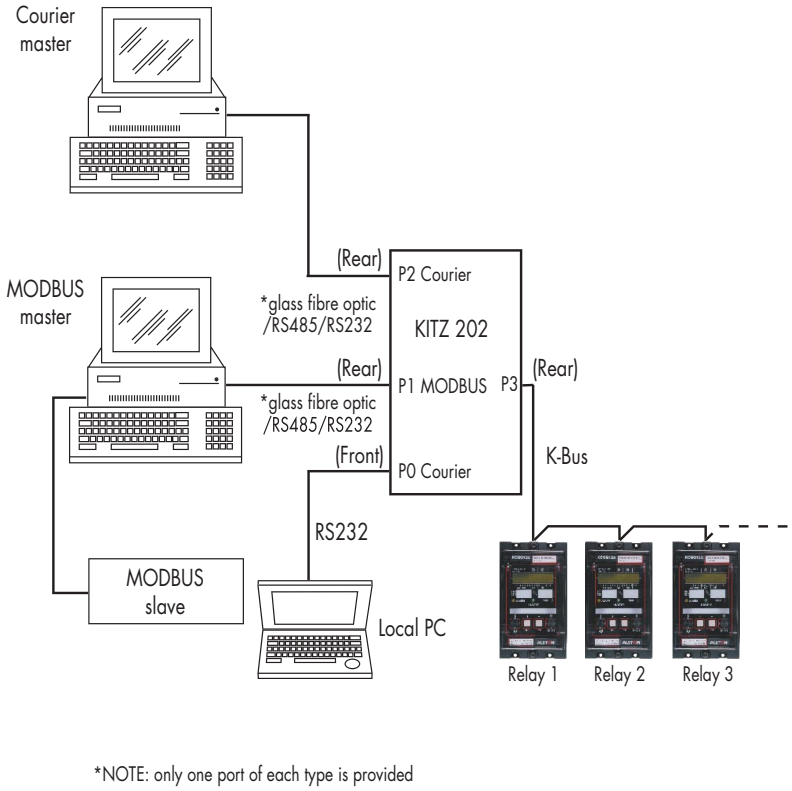


FIGURE 4 : EXAMPLE APPLICATION FOR KITZ202

Here up to twenty K, L and P Range relays can be interconnected on K-Bus, which terminates at Port 3 of the KITZ202. The KITZ202 unit is then connected to the existing MODBUS master station via either the optical fibre, the RS232 or the RS485 master port.

The MODBUS master station communicates with other MODBUS protocol-compatible devices at the same time as with the KITZ202. Other MODBUS protocol-compatible devices may include PLC's, instruments and relays already existing in the substation.

7. K-BUS COMMUNICATIONS (PORT 3)

7.1 Initialisation

On initialisation, the KITZ202 will send a Reset Remote Link command to each Courier address in the range "AR Base Address" to "AR Base Address"+"AR No. of Units"-1. The downstream unit will either respond with a valid acknowledge or not respond at all. If the addressed downstream unit responds with a valid acknowledge, the address will be added to the KITZ202 (internal) poll list, thus enabling data extraction. If the addressed downstream unit does not respond, "Reset Remote Link" will be sent to that address every poll cycle until that downstream unit does respond.

7.2 Normal polling

Downstream unit addresses are polled cyclically, from the lowest address to the highest. When request messages are not being received on master port 0, 1 or 2, the KITZ202 will poll all downstream unit addresses in the poll list with a message containing the "Poll Status" command. The current status of each downstream unit address (in the poll list) is buffered and can be extracted by a Courier master (or via MODBUS register 30001).

7.3 Busy replies from downstream units

If the reply from the downstream unit is busy, polling moves to the next address in the poll list, to which "Poll Status" will be issued. The "Poll Status" request for the pending downstream unit address is replaced by a "Poll Buffer" request in the next poll cycle.

"Poll Buffer" is used to determine if the KITZ202 has obtained the requested data from the addressed downsteam unit. All non busy message replies to master requests will contain the latest Courier status byte information (this information is extracted automatically via the KITZ202 internal polling). If a downstream unit sends more than a user specified number of busy replies ("P3 Busies") to the KITZ202, the KITZ will assume communication with the downstream unit has failed and send "Reset Remote Link" to that address every poll cycle until that downstream unit does respond. The polling of downstream unit addresses via the internal poll list allows "Poll Buffer"/"Poll Status" requests to be interleaved to all allowable addresses. This ensures that the average time for a non busy reply for all adresses is minimal and that the status for all addresses is updated as quickly as possible.

7.4 Retries to downstream units

After a request message has been transmitted to a downstream unit address, the KITZ202 will then wait for a response. If no response is received within a user specified time-out period ("P3 Reply Timer), a user specified number of retries ("P3 Retries") will be performed. If this fails to generate a response, the KITZ202 will send "Reset Remote Link" to that address every poll cycle until that downstream unit does respond.

7.5 Global requests

Global requests consist of two consecutive identical messages from a Courier master, or one message from a MODBUS master to MODBUS address 00. No reply messages are generated in response to global requests.

Once a valid global message (pair) has been received, these will be sent to the downstream units and KITZ202 itself when all other pending requests have been completed. The KITZ202 will respond with a busy reply to any other master non global requests (except the "Reset Remote Link" command) while a global message is being processed. "Reset Remote Link" commands received while a global message is being processed will return a valid response if the request address was present before

the global command was received (i.e. the downstream unit address was contained in the KITZ202 poll list), if not, a response will not be returned.

Global requests received at the KITZ202 while any relay is busy will be sent on to all relays as soon as all relays are non-busy. In order to improve communications reliability and security, the KITZ202 will transmit two global messages to the downstream units if the message is a "Set Real Time" command request, otherwise, three global messages will be transmitted. The time delay period between the consecutive global transmissions on Port 3 is specified by the setting "P3 Gtrans Timer" menu cell. Valid global request messages received by the KITZ202 will be re-transmitted on Port 3 even if no downstream units are connected to Port 3.

8. COURIER MASTER COMMUNICATIONS (PORT 0 AND PORT 2)

The front port (Port 0) communication parameters are fixed :

- IEC 60870 FTI.2 frame format = 11 bits (1 start bit, 8 data bits, 1 even parity bit, 1 stop bit)
- Data rate of 19200 bits per second

8.1 KITZ202 Courier address

The KITZ202 unit address is set to 255 (the global address) as a default condition. In order to allow initial entry to the unit settings, the Courier command "Change Device Address" should be used to give the unit an initial address (section 5). It can be set to any address (range 1 to 254).

The KITZ202 unit address should be different to any connected downstream units, otherwise the downstream unit with the same address as the KITZ202 will not be accessible by the Courier master. Global messages received by the KITZ unit will be passed on to the downstream units, and will also be processed by the KITZ itself.

8.2 Downstream Unit Courier addresses

The Courier address for each of the downstream units is settable in the range 1 to 254. The KITZ202 unit can communicate with up to 20 consecutive Courier addresses starting at a user specified Courier base address. The base address is specified by the setting "AR Base Address" and is used to define the lowest Courier address that will be accepted as valid. Communication with addresses 0 and the global address (255) are allowed at all times.

Master request messages with addresses that are not in the specified range will be ignored by the KITZ202 and will not be sent to the connected downstream units via Port 3. The maximum number of consecutive Courier addresses (starting at the Base Address) with which the KITZ202 can communicate is specified by the setting "AR No. of Units". This setting can be used as a filter to improve poll times if only a limited number of units with sequential addresses are required. Under normal circumstances, the connected master should not request information from non existent addresses via the KITZ202, but will send "Reset Remote Link" to each configured address each cycle. The addresses of all the attached downstream units should not be altered once communications are established.

8.3 Courier master software

The KITZ202 Courier interface is accessed via Port 0 or Port 2 by a PC installed with Courier based access software. This software polls all addresses connected to its system and allows the user to retrieve information from each address by extracting the contents of its database. It also allows authorised users to make setting changes to the relay. AREVA T&D can supply Courier master station software for use on a standard IBM compatible PC. This section of the manual describes the use of the KITZ202 menu to setup the relay.

8.4 KITZ202 Courier database

A reference to the structure of the Courier Database is given in section 12. The "SYSTEM DATA" column of the database is standard to all Courier devices and contains important information that is used to identify the unit to the access software. The remainder of the data base contains settings and data and can be browsed and modified by the user.

8.5 Courier passwords

The Courier interface utilises the password to prevent unauthorised access to some KITZ202 settings. To be able to modify the KITZ202 settings the user must correctly enter a four character Courier password. The KITZ202 settings are visable but not settable if the password has not been set. To set the password first select the "SYSTEM DATA" column using the Courier master software, the second item within the column is the KITZ202 password. The correct value of this cell is not visible and is instead represented as ****. The password protection is unlocked by setting this cell to the correct value using the access software. To change the password using the remote software the password unlock must first be removed using the method described above. Changing the setting of the password cell again allows a new password to be set. The password unlock can be removed by resetting the password cell. If no setting changes are made to the database for a set period of time the password unlock will self reset. This time period is specified by the "UNS Passwd Timer" setting (in the "UNIT SETTINGS" menu column). If this password is lost and access is required please contact your local AREVA T&D representative.

8.6 Extended password protection

The "Extended PWP" setting in the "UNIT SETTINGS" menu column is used to apply password protection to all communication settings within the unit. This can be used in conjunction with the remote access password protection to prevent the KITZ unit and downstream unit(s) settings from being changed remotely by unauthorised users.

8.7 Data cells

There are cells within the database which cannot be set, these contain the unit hardware and software configuration and stored information to be viewed. Some of these cells, such as those that relate to the unit configuration, will always contain the same data. Others, such as those used for accessing stored records, can be controlled using a settable cell to index the record being examined. There are other cells containing the current date, time and measurement values that are continually updated by the relay.

8.8 Event extraction

The KITZ202 supports the standard mechanism for event extraction. KITZ202 events can only be extracted by a Courier master (via Port 0 or Port 2). The events may be displayed on the PC and stored to a file.

8.9 Invalid settings

The invalid settings alarm ("SYS Alarms" - Flag 0) indicates that the settings for the KITZ202 are invalid. This alarm will be raised when the unit detects that the current settings contained in the unit's memory are invalid. Clearing the alarm will not copy the default settings to the non-volatile area. The default settings will only be loaded if the non-volatile settings are corrupted and the unit is re-energised. After the default settings have been loaded, "SYS Alarms" - Flag 1 will be set to indicate that the default serial number is being used. The default serial number cannot be changed by the user, and a representative of AREVA T&D should be contacted. The unit will still be operational. If new user settings have been entered to the unit, these will be stored within non-volatile memory and used by the KITZ202 unit. When the unit is powered-up with valid non-volatile settings, the invalid settings alarm will not be issued.

8.10 Request message processing

If no messages are being processed by the KITZ202 (no buffered master requests or pending downstream unit replies), the first complete error free message received will either be processed by the KITZ202 itself or passed directly to a downstream unit depending on its address.

8.11 "Poll Status" and "Poll Buffer"

Master requests containing "Poll Status" or "Poll Buffer" are not passed through the KITZ202 to the downstream units. The reply is generated by the KITZ202 from its internal memory. No reply will be returned to a message containing "Poll Status" or "Poll Buffer" command which is sent to an address that is not present within the KITZ202 poll list.

8.12 Block transfer from a Courier address

The KITZ202 will only know of the existence of a Courier "Blocked" reply message when the downstream unit returns the block header. Once a block transfer has been initiated between the Courier master and one downstream unit, no further requests will be sent to the same downstream unit (a busy reply will be returned) until the block transfer is completed or terminated.

The block message transfer procedure will be terminated when the corresponding block footer is received from the downstream unit (or a communications failure occurs). In order to prevent one master station locking out access to a relay address from the other master station for excessive periods, a user specified block message time-out ("P0 Block Timer", or "P2 Block Timer") is used to terminate the block transfer procedure for the appropriate address.

8.13 KITZ202 setting changes

The settings of the KITZ202 unit can only be changed from a Courier master. When the system password of a connected downstream address is correctly entered, the password timer "UNS Passwd Timer" is enabled. If a setting change is in progress and the password timer expires before the associated setting timer ("P0 Set Timer", or "P2 Set Timer") expires, the setting will be aborted. This can be prevented by setting the password timer to a value greater than or equal to the highest setting timer value.

8.14 Event/Alarm blocking

Courier event records from the KITZ201 and connected Courier (downstream) units can be accessed from Port 0 or Port 2 via a Courier master station. The settings "P0 Block Events" and "P2 Block Events" prevent automatic event extraction via the specified port. This feature allows all events to be automatically extracted by one master only, which will allow a master to produce a complete centralised event list. A master can still extract events using the "Send Event"/"Accept Event" commands regardless of the status of the port Block Events settings. An event or alarm will result in the event flag/alarm flag being set in the returned Courier status byte. When the event/alarm blocking is in operation on a port, the event and alarm flags passed to that port remain set to zero.

9. MODBUS MASTER COMMUNICATIONS (PORT 1)

9.1 KITZ202 MODBUS communications

The KITZ202 is not a slave device to the MODBUS master station, and so it does not have a MODBUS address. The KITZ202 unit is transparent to the MODBUS master. Transparent, in this context, means that the MODBUS master sends each query as though it was sending it directly to the slave device. The KITZ202 traps the query, translates it into a Courier request, and passes it on to the Courier slave. The response from the slave is translated into a MODBUS response by the KITZ202 and passed on to the master.

To speed up the responsiveness of the system, data is cached within the KITZ202. The KITZ202 updates the cache by continuously polling the slave devices.

9.2 Downstream MODBUS addresses

The MODBUS address of each downstream unit is the same as its Courier address. The Courier addresses (1 to 254) that the KITZ202 will recognize are set by a 'Base Address' setting and a 'No. of Units' setting. See section 12.10.

9.3 MODBUS implementation

The nature of the MODBUS protocol is reading and writing to reference locations at a particular device address. The references are classified as input statuses, input registers, holding registers, etc. See Ref. 1 for an explanation of MODBUS.

The MODBUS RTU function codes supported by the KITZ202 are:

- 01 Read Coil Status (via MODBUS 0xxxx references)
- 02 Read Input Status (via MODBUS 1xxxx references)
- 03 Read Holding Register (via MODBUS 4xxxx references)
- 04 Read Input Register (via MODBUS 3xxxx references)
- 06 Preset Single Register (via MODBUS 4xxxx references)
- 08 Diagnostics

All other function codes will return a MODBUS exception response.

The following explanations should be read in conjunction with Ref. 1

9.3.1 Read Coil Status

There is one set of coil statuses accessible at references 00001 to 00032. The coil statuses are mapped to the same data that is mapped to Input Register 30193. The default mapping for register 30193 is to the Relay O/P Status cell of the Courier device. If this is changed then the mapping of coil statuses 00001 to 00032 will change with it.

9.3.2 Read Input Status

There is one set of input statuses accessible at references 10001 to 10032. The input statuses are mapped to the same data that is mapped to Input Register 30191. The default mapping for register 30191 is to the Input I/P Status cell of the Courier device. If this is changed then the mapping of input statuses 10001 to 10032 will change with it.

9.3.3 Read Holding Register

There is only one holding register that may be read. This is register 40400 that contains the value of the circuit breakers. The value returned will equate to the value read from cell 0010 of the attached Courier device.

9.3.4 Read Input Register

Two register areas are available, 30001 to 30599 and 31000 to 33999. See section 9.4 for how to map these registers to Courier data in slave devices.

9.3.5 Preset Single Register

Specific 4xxxx holding registers are provided to perform the various actions. This mapping is fixed and is not user configurable. The actions correspond to Courier Commands that the KITZ202 sends to the addressed slave device. All data sent to the these registers uses the numeric type K10 (see section 9.5).

Register	Courier Command	Preset Data
40400	Circuit Breaker Control	1 to Trip; 2 to Close
40401	Load Shed by Group	0 to 7
40402	Load Shed to Level	0 to 3
40403	Reset Trip indication	0 to 65535 *
40404	Select Setting Group	0 to Number of Setting Groups-1
40405 **	Set Courier Cell 0106	0 to 4 (Number of the required fault)

* The Preset Data for 40403 can be any value 0 to 65535. The data value is ignored because the Courier command requires no value.

** Register 40405 is only applicable to Px4x relays. This register should not be used with any other Courier device. Register 40405 only exists in a KITZ202 with a software reference of '18 KITZ 250 G' or later.

The Preset Data written to the registers must be the same as the Courier value that a normal Courier master station would send to the specific slave device to perform the required action.

Slave devices that do not support an action will return an error (excepting register 40405).

9.3.6 Diagnostics

The diagnostics subfunctions supported are,

- 00 Return Query Data
- 01 Restart Communications Option
- 04 Force Listen Only Mode
- 10 Clear Counters and Diagnostic Register
- 13 Return Bus Exception Error Count
- 14 Return Slave Message Count
- 17 Return Slave Busy Count

All other subfunctions will return a MODBUS exception response.

9.3.7 Functionality not supported

The following functionality is not supported via the MODBUS port of the KITZ202.

- Disturbance record extraction.
- Event extraction.
- Setting changes to the Courier slave devices.
- Time synchronization from the MODBUS master

All of the above are available via Port 0 and Port 2. See section 8 and Ref. 2.

9.4 Mapping of relay Courier database cells to MODBUS registers

The mapping of data from the Courier database cells of a relay to the MODBUS Input Registers in the KITZ202 is user-configurable. Any device using the Courier communication can be mapped.

The KITZ202 is pre-configured with default settings when it leaves the factory. This factory configuration of the KITZ202 is a suggested mapping for a selection of relay types. Suggested mapping for sixteen relay types are provide. The suggested mapping for each of these relay types is loaded into Input registers 30001 to 30599. These mappings are shown in sections 9.4.1 to 9.4.16.

The layout of registers 31000 to 33999 is shown in sections 9.4.17. The factory configuration for these registers, for all address, is for them to be set to cell 0000, i.e. disabled.

The factory configuration of the KITZ202 also includes suggested minimum scan times for each register. See section 9.6 and section 12.12.

The suggested mappings are allocated to MODBUS addresses (Dev *x*) as shown in Table 6 below. (Dev 1 ="AR Base Address", Dev 2 ="AR Base Address"+1, etc. For further details about Dev *x* see section 12.11.)

Address	Relay type
Dev 1	KCGG/KCEG
Dev 2	LFZR
Dev 3	LGPG
Dev 4	KBCH
Dev 5	KMPC
Dev 6	KAVR/KVTR/KAVS
Dev 7	KVFG
Dev 8	KVGC
Dev 9	M300
Dev 10	P123
Dev 11	P220
Dev 12	P143
Dev 13	P241
Dev 14	P343
Dev 15	P444
Dev 16	P545
Dev 17	Unused
Dev 18	Unused
Dev 19	Unused
Dev 20	Unused

TABLE 6 : RELAY TYPE ALLOCATION IN THE FACTORY CONFIGURATION

The setting used for the factory configuration are the same as the setting used in the default settings file included in "MiCOM S1" Courier master station software. Selecting a 'New' setting file for a KITZ202 in MiCOM S1 will provide these settings. It is recommended that "MiCOM S1" is used to modify the KITZ202 mapping to suit the application, due to the ease of using the Cut and Paste options.

The whole suggested mapping for a particular relay type can be easily Cut and Pasted to the appropriate address column. For example, if a P143 relay with Courier address 3 is to be connected, then the whole suggested mapping for a P143 can be selected and Cut from Dev 12 and then Pasted to Dev 3.

It is also recommended that only the data which is needed in the MODBUS master station is mapped. All other registers should be disabled, by mapping them to cell "0000" (this can be done using Cut and Paste in "MiCOM S1"). Disabling non-required cells will shorten the update cycle within the KITZ to provide a faster response to changed data values.

Where the mapping is going to be reduced from the suggested mapping, the final mapping should be configured, where possible, so that the registers used are contiguous (they all follow on). This will allow the MODBUS master station to read several values in one query, which will improve the efficiency of the system.

In the following MODBUS mapping tables the MODBUS numeric types are stated as codes K1 through K16. Each numeric type has a defined size and format. The definition of these MODBUS numeric types is given in the table in section 9.5.

Each type of data from the Courier relays is converted, according to its data type (Courier DTL code), into one of these MODBUS numeric types (K1 to K16). Data is requested in MODBUS protocol by specifying a starting register and the number of registers to be read. In the suggested mapping, starting registers are separated by the appropriate quantity of registers to fit the suggested data.

Although any Courier device can be mapped with the KITZ202, it is most commonly used with K series relays. Almost all numerical values in K relays are in the form of a Courier Number. These values will always be converted into the K8 numeric type defined in section 9.5. The cell location of these values can consequently be mapped to any starting register where 3 registers are available.

Input Registers 31000 to 33999 are fully user-definable. These registers are mapped as blocks of 125 registers. The start register of each block may be mapped to any required Courier data. The number of registers requested in the MODBUS query must match the MODBUS numeric type of the mapped data. Registers 31000 to 33999 are only supported in KITZ202 devices with a Software Reference of '18 KITZ 250 C' or later.

9.4.1 Mapping for KCGG/KCEG

Courier Row	Modbus Addr	No. Regs	Regs (max)	Format	Relay Cell	Cell description	Min Scan Time(s)
01	30001	1	1	K2	From replies	Courier Status Byte	0
02	30002	~	8	~	~	~	3600
03	30010	~	2	~	~	~	3600
04	30012	~	2	~	~	~	3600
05	30014	8	8	K11	0004	Description	3600
06	30022	8	8	K11	0005	Plant reference	3600
07	30030	8	8	K11	0006	Model Number	3600
08	30038	~	8	~	~	~	3600
09	30046	4	4	K11	0008	Serial Number	3600
0A	30050	1	1	K14	0009	System Frequency	3600
0B	30051	~	1	~	~	~	3600
0C	30052	1	1	K6	000C	Plant Status	0
0D	30053	~	1	~	~	~	0
0E	30054	1	1	K10	000E	Active Group	100
0F	30055	8	8	K11	000F	Load Shed Stage	0
10	30063	8	8	K11	0010	CB Control	0
11	30071	~	8	~	~	~	3600
12	30079	~	8	~	~	~	3600
13	30087	~	8	~	~	~	3600
14	30095	~	8	~	~	~	3600
15	30103	~	8	~	~	~	3600
16	30111	~	8	~	~	~	3600
17	30119	~	8	~	~	~	3600
18	30127	~	8	~	~	~	3600
19	30135	~	8	~	~	~	3600
1A	30143	~	8	~	~	~	3600
1B	30151	~	8	~	~	~	3600
1C	30159	~	8	~	~	~	3600
1D	30167	~	8	~	~	~	3600
1E	30175	~	8	~	~	~	3600
1F	30183	~	8	~	~	~	3600
20	30191	1 or 2	2	K6/7	0020	Logic I/P Status	0
21	30193	1 or 2	2	K6/7	0021	Relay O/P Status	0
22	30195	1 or 2	2	K6/7	0022	Alarm Status	0
23	30197	14	17	K11	0102	Protection Status (note 1)	0
24	30214	~	1	~	~	~	3600

Courier Row	Modbus Addr	No. Regs	Regs (max)	Format	Relay Cell	Cell description	Min Scan Time(s)
25	30215	~	1	~	~	~	3600
26	30216	~	2	~	~	~	3600
27	30218	~	2	~	~	~	3600
28	30300	~	1	~	~	~	0
2E	30500	3	3	K8	0201	IA Magnitude	0
2F	30503	3	3	K8	0404	IthA	0
30	30506	3	3	K8	0208	VA Magnitude	0
31	30509	3	3	K8	0311	Sum (Ia)2	0
32	30512	3	3	K8	040A	Peak IthA	0
33	30515	3	3	K8	0202	IB Magnitude	0
34	30518	3	3	K8	0405	IthB	0
35	30521	3	3	K8	0209	Vb Magnitude	0
36	30524	3	3	K8	0312	Sum (Ib)2	0
37	30527	3	3	K8	040B	Peak IthB	0
38	30530	3	3	K8	0203	IC Magnitude	0
39	30533	3	3	K8	0406	IthC	0
3A	30536	3	3	K8	020A	Vc Magnitude	0
3B	30539	3	3	K8	0313	Sum (Ic)2	0
3C	30542	3	3	K8	040C	Peak IthC	0
3D	30545	3	3	K8	0205	Vab Magnitude	0
3E	30548	3	3	K8	0206	Vbc Magnitude	0
3F	30551	3	3	K8	0207	Vca Magnitude	0
40	30554	3	3	K8	0301	3ph Active Power (W)	0
41	30557	3	3	K8	0302	3ph VA	0
42	30560	3	3	K8	0303	3ph Reactive Power (VAr)0	
43	30563	3	3	K8	0304	3ph Imax	0
44	30566	3	3	K8	030C	3ph Power Factor	0
45	30569	3	3	K8	0204	Residual Current/Io/IN	0
46	30572	3	3	K8	020B	Residual Voltage/Vo/VN	0
47	30575	3	3	K8	020C	Frequency	0
48	30578	3	3	K8	0310	Sum (OPS)	0
49	30581	3	3	K8	0407	Thermal state(%)	0
4A	30584	~	3	~	~	~	0
4B	30587	~	3	~	~	~	0
4C	30590	~	3	~	~	~	0
4D	30593	~	3	~	~	~	0
4E	30596	~	3	~	~	~	0

NOTE 1: Only available in Series 2 relays.

TABLE 7 : MAPPING FOR KCGG/KCEG

9.4.2 Mapping for LFZR

Courier Row	Modbus Addr	No. Regs	Regs (max)	Format	Relay Cell	Cell description	Min Scan Time(s)
01	30001	1	1	K2	From Replies	Courier Status Byte	0
02	30001	4	8	K11	0001	Language	3600
03	30010	~	2	~	~	~	3600
04	30012	~	2	~	~	~	3600
05	30014	8	8	K11	0004	Description	3600
06	30022	8	8	K11	0005	Plant Reference	3600
07	30030	8	8	K11	0006	Model Number	3600
08	30038	~	8	~	~	~	3600
09	30046	4	4	K11	0008	Serial Number	3600
0A	30050	1	1	K14	0009	System Frequency	3600
0B	30051	~	1	~	~	~	3600
0C	30052	~	1	~	~	~	0
0D	30053	~	1	~	~	~	0
0E	30054	1	1	K10	0F01	Active Group	100
0F	30055	~	8	~	~	~	0
10	30063	~	8	~	~	~	0
11	30071	~	8	~	~	~	3600
12	30079	~	8	~	~	~	3600
13	30087	~	8	~	~	~	3600
14	30095	~	8	~	~	~	3600
15	30103	~	8	~	~	~	3600
16	30111	~	8	~	~	~	3600
17	30119	~	8	~	~	~	3600
18	30127	~	8	~	~	~	3600
19	30135	~	8	~	~	~	3600
1A	30143	~	8	~	~	~	3600
1B	30151	~	8	~	~	~	3600
1C	30159	~	8	~	~	~	3600
1D	30167	~	8	~	~	~	3600
1E	30175	~	8	~	~	~	3600
1F	30183	~	8	~	~	~	3600
20	30191	~	2	~	~	~	0
21	30193	~	2	~	~	~	0
22	30195	~	2	~	~	~	0
23	30197	~	17	~	~	~	0
24	30214	~	1	~	~	~	3600

Courier Row	Modbus Addr	No. Regs	Regs (max)	Format	Relay Cell	Cell description	Min Scan Time(s)
25	30215	~	1	~	~	~	3600
26	30216	~	2	~	~	~	3600
27	30218	~	2	~	~	~	3600
28	30300	1	1	K6	0404	IRIGB Status	0
2E	30500	3	3	K8	0516	IA Magnitude	0
2F	30503	3	3	K8	0517	IA Phase Angle	0
30	30506	3	3	K8	0504	VA Magnitude	0
31	30509	3	3	K8	0505	VA Phase	0
32	30512	3	3	K8	0518	IB Magnitude	0
33	30515	3	3	K8	0519	IB Phase Angle	0
34	30518	3	3	K8	0506	Vb Magnitude	0
35	30521	3	3	K8	0507	Vb Phase	0
36	30524	3	3	K8	051A	IC Magnitude	0
37	30527	3	3	K8	051B	IC Phase Angle	0
38	30530	3	3	K8	0508	Vc Magnitude	0
39	30533	3	3	K8	0509	Vc Phase	0
3A	30536	3	3	K8	050A	Vab Magnitude	0
3B	30539	3	3	K8	050B	Vab Phase	0
3C	30542	3	3	K8	050C	Vbc Magnitude	0
3D	30545	3	3	K8	050D	Vbc Phase	0
3E	30548	3	3	K8	050E	Vca Magnitude	0
3F	30551	3	3	K8	050F	Vca Phase	0
40	30554	3	3	K8	0526	I0 Magnitude	0
41	30557	3	3	K8	0527	I0 Phase	0
42	30560	3	3	K8	0514	V0 Phase	0
43	30563	3	3	K8	0515	V0 Magnitude	0
44	30566	3	3	K8	0522	I1 Magnitude	0
45	30569	3	3	K8	0523	I1 Phase	0
46	30572	3	3	K8	0510	V1 Magnitude	0
47	30575	3	3	K8	0511	V1 Phase	0
48	30578	3	3	K8	0524	I2 Magnitude	0
49	30581	3	3	K8	0525	I2 Phase	0
4A	30584	3	3	K8	0512	V2 Magnitude	0
4B	30587	3	3	K8	0513	V2 Phase	0
4C	30590	3	3	K8	0501	3ph Active Power (W)	0
4D	30593	3	3	K8	0502	3ph Reactive Power (VAr)	0
4E	30596	3	3	K8	0503	Frequency	0

TABLE 8 : MAPPING FOR LFZR

9.4.3 Mapping for LGPG

Courier Row	Modbus Addr	No. Regs	Regs (max)	Format	Relay Cell	Cell description	Min Scan Time(s)
01	30001	1	1	K2	From Replies	Courier Status Byte	0
02	30002	~	8	~	~	~	3600
03	30010	~	2	~	~	~	3600
04	30012	~	2	~	~	~	3600
05	30014	8	8	K11	0004	Description	3600
06	30022	8	8	K11	0005	Plant Reference	3600
07	30030	8	8	K11	0006	Model Number	3600
08	30038	~	8	~	~	~	3600
09	30046	4	4	K11	0008	Serial Number	3600
0A	30050	1	1	K14	0009	System Frequency	3600
0B	30051	~	1	~	~	~	3600
0C	30052	~	1	~	~	~	0
0D	30053	~	1	~	~	~	0
0E	30054	1	1	K10	000E	Active Group	100
0F	30055	~	8	~	~	~	0
10	30063	~	8	~	~	~	0
11	30071	~	8	~	~	~	3600
12	30079	~	8	~	~	~	3600
13	30087	~	8	K11	~	~	3600
14	30095	~	8	K11	~	~	3600
15	30103	~	8	K11	~	~	3600
16	30111	~	8	K11	~	~	3600
17	30119	~	8	K11	~	~	3600
18	30127	~	8	K11	~	~	3600
19	30135	~	8	K11	~	~	3600
1A	30143	~	8	K11	~	~	3600
1B	30151	~	8	K11	~	~	3600
1C	30159	~	8	K11	~	~	3600
1D	30167	~	8	K11	~	~	3600
1E	30175	~	8	K11	~	~	3600
1F	30183	~	8	K11	~	~	3600
20	30191	1 or 2	2	K6/7	0020	Logic I/P Status	0
21	30193	1 or 2	2	K6/7	0021	Relay O/P Status	0
22	30195	~	2	~	~	~	0
23	30197	~	17	~	~	~	0
24	30214	~	1	~	~	~	3600
25	30215	~	1	~	~	~	3600

Courier Row	Modbus Addr	No. Regs	Regs (max)	Format	Relay Cell	Cell description	Min Scan Time(s)
26	30216	~	2	~	~	~	3600
27	30218	~	2	~	~	~	3600
28	30300	~	1	~	~	~	0
2E	30500	3	3	K8	0C08	IA Magnitude	0
2F	30503	3	3	K8	1008	Ia Diff	0
30	30506	3	3	K8	1014	Ia Bias	0
31	30509	3	3	K8	1020	Ia Mean Bias	0
32	30512	3	3	K8	102C	Ia Sensitive	0
33	30515	3	3	K8	0C30	A Phase Watts	0
34	30518	3	3	K8	0C34	A Phase VAr	0
35	30521	3	3	K8	0C38	Phase Angle Aph	0
36	30524	3	3	K8	0C0C	IB Magnitude	0
37	30527	3	3	K8	100C	Ib Diff	0
38	30530	3	3	K8	1018	Ib Bias	0
39	30533	3	3	K8	1024	Ib Mean Bias	0
3A	30536	3	3	K8	0C10	IC Magnitude	0
3B	30539	3	3	K8	1010	Ic Diff	0
3C	30542	3	3	K8	101C	Ic Bias	0
3D	30545	3	3	K8	1028	Ic Mean Bias	0
3E	30548	3	3	K8	0C14	Vab Magnitude	0
3F	30551	3	3	K8	1030	Vab Comp	0
40	30554	3	3	K8	0C18	Vbc Magnitude	0
41	30557	3	3	K8	1034	Vbc Comp	0
42	30560	3	3	K8	0C1C	Vca Magnitude	0
43	30563	3	3	K8	0C28	Residual Current/ Io/ IN	0
44	30566	3	3	K8	0C20	Ie	0
45	30569	3	3	K8	0C24	Ve	0
46	30572	3	3	K8	0C3C	Frequency	0
47	30575	~	3	~	~	~	0
48	30578	~	3	~	~	~	0
49	30581	~	3	~	~	~	0
4A	30584	~	3	~	~	~	0
4B	30587	~	3	~	~	~	0
4C	30590	~	3	~	~	~	0
4D	30593	~	3	~	~	~	0
4E	30596	~	3	~	~	~	0

TABLE 9 : MAPPING FOR LGPG

9.4.4 Mapping for KBCH

Courier Row	Modbus Addr	No. Regs	Regs (max)	Format	Relay Cell	Cell description	Min Scan Time(s)
01	30001	1	1	K2	From Replies	Courier Status Byte	0
02	30002	~	8	~	~	~	3600
03	30010	~	2	~	~	~	3600
04	30012	~	2	~	~	~	3600
05	30014	8	8	K11	0004	Description	3600
06	30022	8	8	K11	0005	Plant Reference	3600
07	30030	8	8	K11	0006	Model Number	3600
08	30038	~	8	~	~	~	3600
09	30046	4	4	K11	0008	Serial Number	3600
0A	30050	1	1	K14	0009	System Frequency	3600
0B	30051	~	1	~	~	~	3600
0C	30052	~	1	~	~	~	0
0D	30053	~	1	~	~	~	0
0E	30054	1	1	K10	000E	Active Group	100
0F	30055	~	8	~	~	~	0
10	30063	~	8	~	~	~	0
11	30071	~	8	~	~	~	3600
12	30079	~	8	~	~	~	3600
13	30087	~	8	~	~	~	3600
14	30095	~	8	~	~	~	3600
15	30103	~	8	~	~	~	3600
16	30111	~	8	~	~	~	3600
17	30119	~	8	~	~	~	3600
18	30127	~	8	~	~	~	3600
19	30135	~	8	~	~	~	3600
1A	30143	~	8	~	~	~	3600
1B	30151	~	8	~	~	~	3600
1C	30159	~	8	~	~	~	3600
1D	30167	~	8	~	~	~	3600
1E	30175	~	8	~	~	~	3600
1F	30183	~	8	~	~	~	3600
20	30191	1 or 2	2	K6/7	0020	Logic I/P Status	0
21	30193	1 or 2	2	K6/7	0021	Relay O/P Status	0
22	30195	1 or 2	2	K6/7	0022	Alarm Status	0
23	30197	~	17	~	~	~	0
24	30214	~	1	~	~	~	3600
25	30215	~	1	~	~	~	3600

Courier Row	Modbus Addr	No. Regs	Regs (max)	Format	Relay Cell	Cell description	Min Scan Time(s)
26	30216	~	2	~	~	~	3600
27	30218	~	2	~	~	~	3600
28	30300	~	1	~	~	~	0
2E	30500	3	3	K8	0201	IA HV	0
2F	30503	3	3	K8	0205	IA LV1	0
30	30506	3	3	K8	0209	IA LV2	0
31	30509	3	3	K8	020D	Ia Diff	0
32	30512	3	3	K8	0210	Ia Bias	0
33	30515	3	3	K8	0202	IB HV	0
34	30518	3	3	K8	0206	IB LV1	0
35	30521	3	3	K8	020A	IB LV2	0
36	30524	3	3	K8	020E	Ib Diff	0
37	30527	3	3	K8	0211	Ib Bias	0
38	30530	3	3	K8	0203	IC HV	0
39	30533	3	3	K8	0207	IC LV1	0
3A	30536	3	3	K8	020B	IC LV2	0
3B	30539	3	3	K8	020F	Ic Diff	0
3C	30542	3	3	K8	0212	Ic Bias	0
3D	30545	3	3	K8	0213	Frequency	0
3E	30548	~	3	~	~	~	0
3F	30551	~	3	~	~	~	0
40	30554	~	3	~	~	~	0
41	30557	~	3	~	~	~	0
42	30560	~	3	~	~	~	0
43	30563	~	3	~	~	~	0
44	30566	~	3	~	~	~	0
45	30569	~	3	~	~	~	0
46	30572	~	3	~	~	~	0
47	30575	~	3	~	~	~	0
48	30578	~	3	~	~	~	0
49	30581	~	3	~	~	~	0
4A	30584	~	3	~	~	~	0
4B	30587	~	3	~	~	~	0
4C	30590	~	3	~	~	~	0
4D	30593	~	3	~	~	~	0
4E	30596	~	3	~	~	~	0

TABLE 10 : MAPPING FOR KBCH

9.4.5 Mapping for KMPC

Courier Row	Modbus Addr	No. Regs	Regs (max)	Format	Relay Cell	Cell description	Min Scan Time(s)
01	30001	1	1	K2	From replies	Courier Status Byte	0
02	30002	~	8	~	~	~	3600
03	30010	~	2	~	~	~	3600
04	30012	~	2	~	~	~	3600
05	30014	8	8	K11	0004	Description	3600
06	30022	8	8	K11	0005	Plant Reference	3600
07	30030	8	8	K11	0006	Model Number	3600
08	30038	~	8	~	~	~	3600
09	30046	4	4	K11	0008	Serial Number	3600
0A	30050	1	1	K14	0009	System Frequency	3600
0B	30051	~	1	~	~	~	3600
0C	30052	1	1	K6	000C	Plant Status	0
0D	30053	~	1	~	~	~	0
0E	30054	~	1	~	~	~	100
0F	30055	8	8	K11	000F	Load Shed Stage	0
10	30063	~	8	~	~	~	0
11	30071	~	~	~	~	~	3600
12	30079	~	8	~	~	~	3600
13	30087	~	8	~	~	~	3600
14	30095	~	8	~	~	~	3600
15	30103	~	8	~	~	~	3600
16	30111	~	8	~	~	~	3600
17	30119	~	8	~	~	~	3600
18	30127	~	8	~	~	~	3600
19	30135	~	8	~	~	~	3600
1A	30143	~	8	~	~	~	3600
1B	30151	~	8	~	~	~	3600
1C	30159	~	8	~	~	~	3600
1D	30167	~	8	~	~	~	3600
1E	30175	~	8	~	~	~	3600
1F	30183	~	8	~	~	~	3600
20	30191	1 or 2	2	K6/7	0020	Logic I/P Status	0
21	30193	1 or 2	2	K6/7	0021	Relay O/P Status	0
22	30195	1 or 2	2	K6/7	0022	Alarm Status	0
23	30197	~	17	~	~	~	0
24	30214	~	1	~	~	~	3600
25	30215	~	1	~	~	~	3600

Courier Row	Modbus Addr	No. Regs	Regs (max)	Format	Relay Cell	Cell description	Min Scan Time(s)
26	30216	~	2	~	~	~	3600
27	30218	~	2	~	~	~	3600
28	30300	~	1	~	~	~	0
2E	30500	3	3	K8	0201	IA Magnitude	0
2F	30503	3	3	K8	0208	VA Magnitude	0
30	30506	3	3	K8	0309	A Phase Watts	0
31	30509	3	3	K8	030D	A Phase VAr	0
32	30512	3	3	K8	040A	Peak Demand Phase A	0
33	30515	3	3	K8	0202	IB Magnitude	0
34	30518	3	3	K8	0209	Vb Magnitude	0
35	30521	3	3	K8	030A	B Phase Watts	0
36	30524	3	3	K8	030E	B Phase VAr	0
37	30527	3	3	K8	040B	Peak Demand Phase B	0
38	30530	3	3	K8	0203	IC Magnitude	0
39	30533	3	3	K8	020A	Vc Magnitude	0
3A	30536	3	3	K8	030B	C Phase Watts	0
3B	30539	3	3	K8	030F	C Phase VAr	0
3C	30542	3	3	K8	040C	Peak Demand Phase C	0
3D	30545	3	3	K8	0205	Vab Magnitude	0
3E	30548	3	3	K8	0206	Vbc Magnitude	0
3F	30551	3	3	K8	0207	Vca Magnitude	0
40	30554	3	3	K8	0301	3ph Active Power (W)	0
41	30557	3	3	K8	0411	Peak Demand +3ph W	0
42	30560	3	3	K8	0412	Peak Demand -3ph W	0
43	30563	3	3	K8	0302	3ph VA	0
44	30566	3	3	K8	0303	3ph Reactive Power (VAr)	0
45	30569	3	3	K8	0413	Peak Demand +3ph VAr	0
46	30572	3	3	K8	0414	Peak Demand -3ph VAr	0
47	30575	3	3	K8	030C	3ph Power Factor	0
48	30578	3	3	K8	0204	Residual Current/Io/IN	0
49	30581	3	3	K8	020C	Frequency	0
4A	30584	3	3	K8	0310	Sum (OPS)	0
4B	30587	3	3	K8	031A	Active energy (Wh)	0
4C	30590	3	3	K8	031B	Reactive energy (VARh)	0
4D	30593	~	3	~	~	~	0
4E	30596	~	3	~	~	~	0

TABLE 11 : MAPPING FOR KMPC

9.4.6 Mapping for KAVR/KVTR/KAVS

Courier Row	Modbus Addr	No. Regs	Regs (max)	Format	Relay Cell	Cell description	Min Scan Time(s)
01	30001	1	1	K2	From replies	Courier Status Byte	0
02	30002	~	8	~	~	~	3600
03	30010	~	2	~	~	~	3600
04	30012	~	2	~	~	~	3600
05	30014	8	8	K11	0004	Description	3600
06	30022	8	8	K11	0005	Plant Reference	3600
07	30030	8	8	K11	0006	Model Number	3600
08	30038	~	8	~	~	~	3600
09	30046	4	4	K11	0008	Serial Number	3600
0A	30050	1	1	K14	0009	System Frequency	3600
0B	30051	~	1	~	~	~	3600
0C	30052	1	1	K6	000C	Plant Status	0
0D	30053	1	1	K6	000D	Control Status	0
0E	30054	~	1	~	~	~	100
0F	30055	~	8	~	~	~	0
10	30063	~	8	~	~	~	0
11	30071	~	8	~	~	~	3600
12	30079	~	8	~	~	~	3600
13	30087	~	8	~	~	~	3600
14	30095	~	8	~	~	~	3600
15	30103	~	8	~	~	~	3600
16	30111	~	8	~	~	~	3600
17	30119	~	8	~	~	~	3600
18	30127	~	8	~	~	~	3600
19	30135	~	8	~	~	~	3600
1A	30143	~	8	~	~	~	3600
1B	30151	~	8	~	~	~	3600
1C	30159	~	8	~	~	~	3600
1D	30167	~	8	~	~	~	3600
1E	30175	~	8	~	~	~	3600
1F	30183	~	8	~	~	~	3600
20	30191	1 or 2	2	K6/7	0020	Logic I/P Status	0
21	30193	1 or 2	2	K6/7	0021	Relay O/P Status	0
22	30195	1 or 2	2	K6/7	0022	Alarm Status	0
23	30197	~	17	~	~	~	0
24	30214	~	1	~	~	~	3600
25	30215	~	1	~	~	~	3600
26	30216	~	2	~	~	~	3600
27	30218	~	2	~	~	~	3600

Courier Row	Modbus Addr	No. Regs	Regs (max)	Format	Relay Cell	Cell description	Min Scan Time(s)
28	30300	~	1	~	~	~	0
2E	30500	3	3	K8	0401	Line Voltage	0
2F	30503	3	3	K8	0402	Bus Voltage	0
30	30506	3	3	K8	0403	Vline/VBus Phase Angle	0
31	30509	3	3	K8	0405	Slip Freq	0
32	30512	3	3	K8	0404	Frequency	0
33	30515	~	3	~	~	~	0
34	30518	~	3	~	~	~	0
35	30521	~	3	~	~	~	0
36	30524	~	3	~	~	~	0
37	30527	~	3	~	~	~	0
38	30530	~	3	~	~	~	0
39	30533	~	3	~	~	~	0
3A	30536	~	3	~	~	~	0
3B	30539	~	3	~	~	~	0
3C	30542	~	3	~	~	~	0
3D	30545	~	3	~	~	~	0
3E	30548	~	3	~	~	~	0
3F	30551	~	3	~	~	~	0
40	30554	~	3	~	~	~	0
41	30557	~	3	~	~	~	0
42	30560	~	3	~	~	~	0
43	30563	~	3	~	~	~	0
44	30566	~	3	~	~	~	0
45	30569	~	3	~	~	~	0
46	30572	~	3	~	~	~	0
47	30575	~	3	~	~	~	0
48	30578	~	3	~	~	~	0
49	30581	~	3	~	~	~	0
4A	30584	~	3	~	~	~	0
4B	30587	~	3	~	~	~	0
4C	30590	~	3	~	~	~	0
4D	30593	~	3	~	~	~	0
4E	30596	~	3	~	~	~	0

TABLE 12 : MAPPING FOR KAVR/KVTR/KAVS

9.4.7 Mapping for KVFG

Courier Row	Modbus Addr	No. Regs	Regs (max)	Format	Relay Cell	Cell description	Min Scan Time(s)
01	30001	1	1	K2	From replies	Courier Status Byte	0
02	30002	~	8	~	~	~	3600
03	30010	~	2	~	~	~	3600
04	30012	~	2	~	~	~	3600
05	30014	8	8	K11	0004	Description	3600
06	30022	8	8	K11	0005	Plant Reference	3600
07	30030	8	8	K11	0006	Model Number	3600
08	30038	8	8	K11	0007	Firmware Number	3600
09	30046	4	4	K11	0008	Serial Number	3600
A	30050	1	1	K14	0009	System Frequency	3600
0B	30051	~	1	~	~	~	3600
0C	30052	1	1	K6	000C	Plant Status	0
0D	30053	1	1	K6	000D	Control Status	0
0E	30054	1	1	K10	000E	Active Group	100
0F	30055	8	8	K11	000F	Load Shed Stage	0
10	30063	8	8	K11	0010	CB Control	0
11	30071	~	8	~	~	~	3600
12	30079	~	8	~	~	~	3600
13	30087	~	8	~	~	~	3600
14	30095	~	8	~	~	~	3600
15	30103	~	8	~	~	~	3600
16	30111	~	8	~	~	~	3600
17	30119	~	8	~	~	~	3600
18	30127	~	8	~	~	~	3600
19	30135	~	8	~	~	~	3600
1A	30143	~	8	~	~	~	3600
1B	30151	~	8	~	~	~	3600
1C	30159	~	8	~	~	~	3600
1D	30167	~	8	~	~	~	3600
1E	30175	~	8	~	~	~	3600
1F	30183	~	8	~	~	~	3600
20	30191	1 or 2	2	K6/7	0020	Logic I/P Status	0
21	30193	1 or 2	2	K6/7	0021	Relay O/P Status	0
22	30195	1 or 2	2	K6/7	0022	Alarm Status	0
23	30197	17	17	K11	0102	Protection Status (note 1)	0
24	30214	~	1	~	~	~	3600
25	30215	~	1	~	~	~	3600
26	30216	~	2	~	~	~	3600

Courier Row	Modbus Addr	No. Regs	Regs (max)	Format	Relay Cell	Cell description	Min Scan Time(s)
27	30218	~	2	~	~	~	3600
28	30300	~	1	~	~	~	0
2E	30500	3	3	K8	0208	Va Magnitude	0
2F	30503	3	3	K8	0209	Vb Magnitude	0
30	30506	3	3	K8	020A	Vc Magnitude	0
31	30509	3	3	K8	0205	Vab Magnitude	0
32	30512	3	3	K8	0206	Vbc Magnitude	0
33	30515	3	3	K8	0207	Vca Magnitude	0
34	30518	3	3	K8	0305	V1 Magnitude	0
35	30521	3	3	K8	0306	V2 Magnitude	0
36	30524	3	3	K8	020B	Residual Voltage/Vo/VN	0
37	30527	3	3	K8	020C	Frequency	0
38	30530	3	3	K8	0310	Sum(OPS)	0
39	30533	~	3	~	~	~	0
3A	30536	~	3	~	~	~	0
3B	30539	~	3	~	~	~	0
3C	30542	~	3	~	~	~	0
3D	30545	~	3	~	~	~	0
3E	30548	~	3	~	~	~	0
3F	30551	~	3	~	~	~	0
40	30554	~	3	~	~	~	0
41	30557	~	3	~	~	~	0
42	30560	~	3	~	~	~	0
43	30563	~	3	~	~	~	0
44	30566	~	3	~	~	~	0
45	30569	~	3	~	~	~	0
46	30572	~	3	~	~	~	0
47	30575	~	3	~	~	~	0
48	30578	~	3	~	~	~	0
49	30581	~	3	~	~	~	0
4A	30584	~	3	~	~	~	0
4B	30587	~	3	~	~	~	0
4C	30590	~	3	~	~	~	0
4D	30593	~	3	~	~	~	0
4E	30596	~	3	~	~	~	0

NOTE 1: Only available in Series 2 relays.

TABLE 13 : MAPPING FOR KVFG

9.4.8 Mapping for KVGC

Courier Row	Modbus Addr	No. Regs	Regs (max)	Format	Relay Cell	Cell description	Min Scan Time(s)
01	30001	1	1	K2	From replies	Courier Status Byte	0
02	30002	~	8	~	~	~	3600
03	30010	~	2	~	~	~	3600
04	30012	~	2	~	~	~	3600
05	30014	8	8	K11	0004	Description	3600
06	30022	8	8	K11	0005	Plant Reference	3600
07	30030	8	8	K11	0006	Model Number	3600
08	30038	~	8	~	~	~	3600
09	30046	4	4	K11	0008	Serial Number	3600
0A	30050	1	1	K14	0009	System Frequency	3600
0B	30051	~	1	~	~	~	3600
0C	30052	1	1	K6	000C	Plant Status	0
0D	30053	1	1	K6	000D	Control Status	0
0E	30054	1	1	K10	000E	Active Group	100
0F	30055	8	8	K11	000F	Load Shed Stage	0
10	30063	~	8	~	~	~	0
11	30071	~	8	~	~	~	3600
12	30079	~	8	~	~	~	3600
13	30087	~	8	~	~	~	3600
14	30095	~	8	~	~	~	3600
15	30103	~	8	~	~	~	3600
16	30111	~	8	~	~	~	3600
17	30119	~	8	~	~	~	3600
18	30127	~	8	~	~	~	3600
19	30135	~	8	~	~	~	3600
1A	30143	~	8	~	~	~	3600
1B	30151	~	8	~	~	~	3600
1C	30159	~	8	~	~	~	3600
1D	30167	~	8	~	~	~	3600
1E	30175	~	8	~	~	~	3600
1F	30183	~	8	~	~	~	3600
20	30191	1 or 2	2	K6/7	0020	Logic I/P Status	0
21	30193	1 or 2	2	K6/7	0021	Relay O/P Status	0
22	30195	1 or 2	2	K6/7	0022	Alarm Status	0
23	30197	~	17	~	~	~	0
24	30214	~	1	~	~	~	3600
25	30215	~	1	~	~	~	3600

Courier Row	Modbus Addr	No. Regs	Regs (max)	Format	Relay Cell	Cell description	Min Scan Time(s)
26	30216	~	2	~	~	~	3600
27	30218	~	2	~	~	~	3600
28	30300	~	1	~	~	~	0
2E	30500	3	3	K8	0201	Vbc Magnitude	0
2F	30503	3	3	K8	0205	3ph Power Factor	0
30	30506	3	3	K8	0202	V reg	0
31	30509	3	3	K8	0203	Circulating Current	0
32	30512	3	3	K8	0204	Load Current	0
33	30515	3	3	K8	0207	Tap Position	0
34	30518	3	3	K8	0208	Highest Tap	0
35	30521	3	3	K8	0209	Lowest Tap	0
36	30524	3	3	K8	020A	Total Tap Change Ops	0
37	30527	3	3	K8	020B	Total Tap Change Frequent Ops	0
38	30530	3	3	K8	020C	T remain	0
39	30533	3	3	K8	0206	Frequency	0
3A	30536	~	3	~	~	~	0
3B	30539	~	3	~	~	~	0
3C	30542	~	3	~	~	~	0
3D	30545	~	3	~	~	~	0
3E	30548	~	3	~	~	~	0
3F	30551	~	3	~	~	~	0
40	30554	~	3	~	~	~	0
41	30557	~	3	~	~	~	0
42	30560	~	3	~	~	~	0
43	30563	~	3	~	~	~	0
44	30566	~	3	~	~	~	0
45	30569	~	3	~	~	~	0
46	30572	~	3	~	~	~	0
47	30575	~	3	~	~	~	0
48	30578	~	3	~	~	~	0
49	30581	~	3	~	~	~	0
4A	30584	~	3	~	~	~	0
4B	30587	~	3	~	~	~	0
4C	30590	~	3	~	~	~	0
4D	30593	~	3	~	~	~	0
4E	30596	~	3	~	~	~	0

TABLE 14 : MAPPING FOR KVGC

9.4.9 Mapping for M300

Courier Row	Modbus Addr	No. Regs	Regs (max)	Format	Relay Cell	Cell description	Min Scan Time(s)
01	30001	1	1	K2	From replies	Courier Status Byte	0
02	30002	~	8	~	~	~	3600
03	30010	~	2	~	~	~	3600
04	30012	~	2	~	~	~	3600
05	30014	8	8	K11	0004	Description	3600
06	30022	8	8	K11	0005	Plant reference	3600
07	30030	8	8	K11	0006	Model number	3600
08	30038	~	8	~	~	~	3600
09	30046	4	4	K11	0008	Serial Number	3600
0A	30050	~	1	~	~	~	3600
0B	30051	~	1	~	~	~	3600
0C	30052	~	1	~	~	~	0
0D	30053	~	1	~	~	~	0
0E	30054	~	1	~	~	~	100
0F	30055	~	8	~	~	~	0
10	30063	~	8	~	~	~	0
11	30071	~	8	~	~	~	3600
12	30079	~	8	~	~	~	3600
13	30087	~	8	~	~	~	3600
14	30095	~	8	~	~	~	3600
15	30103	~	8	~	~	~	3600
16	30111	~	8	~	~	~	3600
17	30119	~	8	~	~	~	3600
18	30128	~	8	~	~	~	3600
19	30135	~	8	~	~	~	3600
1A	30143	~	8	~	~	~	3600
1B	30151	~	8	~	~	~	3600
1C	30159	~	8	~	~	~	3600
1D	30167	~	8	~	~	~	3600
1E	30175	~	8	~	~	~	3600
1F	30183	~	8	~	~	~	3600
20	30191	1 or 2	2	K6/7	0020	Logic I/P Status	0
21	30193	1 or 2	2	K6/7	0021	Relay O/P Status	0
22	30195	1 or 2	2	K6/7	~	~	0
23	30197	~	17	~	~	~	0
24	30214	~	1	~	~	~	3600
25	30215	~	1	~	~	~	3600

Courier Row	Modbus Addr	No. Regs	Regs (max)	Format	Relay Cell	Cell description	Min Scan Time(s)
26	30216	~	2	~	~	~	3600
27	30218	~	2	~	~	~	3600
28	30300	~	1	~	~	~	0
2E	30500	3	3	K8	0401	V_A	0
2F	30503	3	3	K8	0402	V_B	0
30	30506	3	3	K8	0403	V_C	0
31	30509	3	3	K8	0407	I_A	0
32	30512	3	3	K8	0408	I_B	0
33	30515	3	3	K8	0409	I_C	0
34	30518	3	3	K8	040A	I_N	0
35	30521	3	3	K8	040B	Frequency	0
36	30524	3	3	K8	050D	3ph Active Power (W)	0
37	30527	3	3	K8	050E	3ph Reactive Power (VAr)	0
38	30530	3	3	K8	050F	3ph Apparent Power (VA)	0
39	30533	3	3	K8	0510	3ph Power Factor	0
3A	30536	3	3	K8	0511	Import Act Energy (Wh)	0
3B	30539	3	3	K8	0512	Export Act Energy (Wh)	0
3C	30542	3	3	K8	0513	Import React Energy (VARh)	0
3D	30545	3	3	K8	0514	Export React Energy (VARh)	0
3E	30548	~	3	~	~	~	0
3F	30551	~	3	~	~	~	0
40	30554	~	3	~	~	~	0
41	30557	~	3	~	~	~	0
42	30560	~	3	~	~	~	0
43	30563	~	3	~	~	~	0
44	30566	~	3	~	~	~	0
45	30569	~	3	~	~	~	0
46	30572	~	3	~	~	~	0
47	30575	~	3	~	~	~	0
48	30578	~	3	~	~	~	0
49	30581	~	3	~	~	~	0
4A	30584	~	3	~	~	~	0
4B	30587	~	3	~	~	~	0
4C	30590	~	3	~	~	~	0
4D	30593	~	3	~	~	~	0
4E	30596	~	3	~	~	~	0

TABLE 15 : MAPPING FOR M300

9.4.10 Mapping for P123

Courier Row	Modbus Addr	No. Regs	Regs (max)	Format	Relay Cell	Cell description	Min Scan Time(s)
01	30001	1	1	K2	From replies	Courier Status Byte	0
02	30002	~	8	~	~	~	3600
03	30010	~	2	~	~	~	3600
04	30012	~	2	~	~	~	3600
05	30014	8	8	K11	0004	Description	3600
06	30022	8	8	K11	0005	Plant reference	3600
07	30030	8	8	K11	0006	Model number	3600
08	30038	~	8	~	~	~	3600
09	30046	4	4	K11	0008	Serial Number	3600
0A	30050	1	1	K14	0009	System Frequency	3600
0B	30051	~	1	~	~	~	3600
0C	30052	~	1	~	~	~	0
0D	30053	~	1	~	~	~	0
0E	30054	1	1	K10	000E	Active Group	100
0F	30055	~	8	~	~	~	0
10	30063	~	8	~	~	~	0
11	30071	~	8	~	~	~	3600
12	30079	~	8	~	~	~	3600
13	30087	~	8	~	~	~	3600
14	30095	~	8	~	~	~	3600
15	30103	~	8	~	~	~	3600
16	30111	~	8	~	~	~	3600
17	30119	~	8	~	~	~	3600
18	30128	~	8	~	~	~	3600
19	30135	~	8	~	~	~	3600
1A	30143	~	8	~	~	~	3600
1B	30151	~	8	~	~	~	3600
1C	30159	~	8	~	~	~	3600
1D	30167	~	8	~	~	~	3600
1E	30175	~	8	~	~	~	3600
1F	30183	~	8	~	~	~	3600
20	30191	1 or 2	2	K6/7	0020	Logic I/P Status	0
21	30193	1 or 2	2	K6/7	0021	Relay O/P Status	0
22	30195	2	2	K7	0023	Pseudo Inputs Group 1	0
23	30197	2	17	K7	0024	Pseudo Inputs Group 2	0
24	30214	~	1	~	~	~	3600
25	30215	~	1	~	~	~	3600

Courier Row	Modbus Addr	No. Regs	Regs (max)	Format	Relay Cell	Cell description	Min Scan Time(s)
26	30216	~	2	~	~	~	3600
27	30218	~	2	~	~	~	3600
28	30300	~	1	~	~	~	0
2E	30500	3	3	K8	0301	I_A RMS	0
2F	30503	3	3	K8	0302	I_B RMS	0
30	30506	3	3	K8	0303	I_C RMS	0
31	30509	3	3	K8	0304	I_N RMS	0
32	30512	3	3	K8	0309	Frequency	0
33	30515	3	3	K8	0602	Total I_A Broken	0
34	30518	3	3	K8	0603	Total I_B Broken	0
35	30521	3	3	K8	0604	Total I_C Broken	0
36	30524	3	3	K8	0605	CB Operation	0
37	30527	~	3	~	~	~	0
38	30530	~	3	~	~	~	0
39	30533	~	3	~	~	~	0
3A	30536	~	3	~	~	~	0
3B	30539	~	3	~	~	~	0
3C	30542	~	3	~	~	~	0
3D	30545	~	3	~	~	~	0
3E	30548	~	3	~	~	~	0
3F	30551	~	3	~	~	~	0
40	30554	~	3	~	~	~	0
41	30557	~	3	~	~	~	0
42	30560	~	3	~	~	~	0
43	30563	~	3	~	~	~	0
44	30566	~	3	~	~	~	0
45	30569	~	3	~	~	~	0
46	30572	~	3	~	~	~	0
47	30575	~	3	~	~	~	0
48	30578	~	3	~	~	~	0
49	30581	~	3	~	~	~	0
4A	30584	~	3	~	~	~	0
4B	30587	~	3	~	~	~	0
4C	30590	~	3	~	~	~	0
4D	30593	~	3	~	~	~	0
4E	30596	~	3	~	~	~	0

TABLE 16 : MAPPING FOR P123

9.4.11 Mapping for P220

Courier Row	Modbus Addr	No. Regs	Regs (max)	Format	Relay Cell	Cell description	Min Scan Time(s)
01	30001	1	1	K2	From replies	Courier Status Byte	0
02	30002	~	8	~	~	~	3600
03	30010	~	2	~	~	~	3600
04	30012	~	2	~	~	~	3600
05	30014	8	8	K11	0004	Description	3600
06	30022	8	8	K11	0005	Plant reference	3600
07	30030	8	8	K11	0006	Model number	3600
08	30038	~	8	~	~	~	3600
09	30046	4	4	K11	0008	Serial Number	3600
0A	30050	1	1	K14	0009	System Frequency	3600
0B	30051	~	1	~	~	~	3600
0C	30052	~	1	~	~	~	0
0D	30053	~	1	~	~	~	0
0E	30054	1	1	K10	000E	Active Group	100
0F	30055	~	8	~	~	~	0
10	30063	~	8	~	~	~	0
11	30071	~	8	~	~	~	3600
12	30079	~	8	~	~	~	3600
13	30087	~	8	~	~	~	3600
14	30095	~	8	~	~	~	3600
15	30103	~	8	~	~	~	3600
16	30111	~	8	~	~	~	3600
17	30119	~	8	~	~	~	3600
18	30128	~	8	~	~	~	3600
19	30135	~	8	~	~	~	3600
1A	30143	~	8	~	~	~	3600
1B	30151	~	8	~	~	~	3600
1C	30159	~	8	~	~	~	3600
1D	30167	~	8	~	~	~	3600
1E	30175	~	8	~	~	~	3600
1F	30183	~	8	~	~	~	3600
20	30191	1 or 2	2	K6/7	0020	Logic I/P Status	0
21	30193	1 or 2	2	K6/7	0021	Relay O/P Status	0
22	30195	2	2	K7	0023	Pseudo Inputs Group 1	0
23	30197	2	17	K7	0024	Pseudo Inputs Group 2	0
24	30214	~	1	~	~	~	3600
25	30215	~	1	~	~	~	3600

Courier Row	Modbus Addr	No. Regs	Regs (max)	Format	Relay Cell	Cell description	Min Scan Time(s)
26	30216	~	2	~	~	~	3600
27	30218	~	2	~	~	~	3600
28	30300	~	1	~	~	~	0
2E	30500	3	3	K8	0301	I_A RMS	0
2F	30503	3	3	K8	0302	I_B RMS	0
30	30506	3	3	K8	0303	I_C RMS	0
31	30509	3	3	K8	0304	I_N RMS	0
32	30512	3	3	K8	0308	Frequency	0
33	30515	3	3	K8	0502	Thermal State	0
34	30518	3	3	K8	0503	Time Before Th Trip	0
35	30521	3	3	K8	050C	Permit Start N°	0
36	30524	3	3	K8	050D	Time Before Start	0
37	30527	3	3	K8	0512	Motor Operat Hours	0
38	30530	3	3	K8	0601	Total I_A Broken	0
39	30533	3	3	K8	0602	Total I_B Broken	0
3A	30536	3	3	K8	0603	Total I_C Broken	0
3B	30539	3	3	K8	0604	CB Operations	0
3C	30542	~	3	~	~	~	0
3D	30545	~	3	~	~	~	0
3E	30548	~	3	~	~	~	0
3F	30551	~	3	~	~	~	0
40	30554	~	3	~	~	~	0
41	30557	~	3	~	~	~	0
42	30560	~	3	~	~	~	0
43	30563	~	3	~	~	~	0
44	30566	~	3	~	~	~	0
45	30569	~	3	~	~	~	0
46	30572	~	3	~	~	~	0
47	30575	~	3	~	~	~	0
48	30578	~	3	~	~	~	0
49	30581	~	3	~	~	~	0
4A	30584	~	3	~	~	~	0
4B	30587	~	3	~	~	~	0
4C	30590	~	3	~	~	~	0
4D	30593	~	3	~	~	~	0
4E	30596	~	3	~	~	~	0

TABLE 17 : MAPPING FOR P220

9.4.12 Mapping for P143

Courier Row	Modbus Addr	No. Regs	Regs (max)	Format	Relay Cell	Cell description	Min Scan Time(s)
01	30001	1	1	K2	From replies	Courier Status Byte	0
02	30002	~	8	~	~	~	3600
03	30010	~	2	~	~	~	3600
04	30012	~	2	~	~	~	3600
05	30014	8	8	K11	0004	Description	3600
06	30022	8	8	K11	0005	Plant reference	3600
07	30030	8	8	K11	0006	Model number	3600
08	30038	~	8	~	~	~	3600
09	30046	4	4	K11	0008	Serial Number	3600
0A	30050	1	1	K14	0009	System Frequency	3600
0B	30051	~	1	~	~	~	3600
0C	30052	1	1	K6	000C	Plant Status	0
0D	30053	1	1	K6	000D	Control Status	0
0E	30054	1	1	K10	000E	Active Group	100
0F	30055	~	8	~	~	~	0
10	30063	~	8	~	~	~	0
11	30071	~	8	~	~	~	3600
12	30079	~	8	~	~	~	3600
13	30087	~	8	~	~	~	3600
14	30095	~	8	~	~	~	3600
15	30103	~	8	~	~	~	3600
16	30111	~	8	~	~	~	3600
17	30119	~	8	~	~	~	3600
18	30128	~	8	~	~	~	3600
19	30135	~	8	~	~	~	3600
1A	30143	~	8	~	~	~	3600
1B	30151	~	8	~	~	~	3600
1C	30159	~	8	~	~	~	3600
1D	30167	~	8	~	~	~	3600
1E	30175	~	8	~	~	~	3600
1F	30183	~	8	~	~	~	3600
20	30191	1 or 2	2	K6/7	0020	Logic I/P Status	0
21	30193	1 or 2	2	K6/7	0021	Relay O/P Status	0
22	30195	2	2	K7	010A	Trip Elements 1	0
23	30197	2	17	K7	010B	Trip Elements 2	0
24	30214	~	1	~	~	~	3600
25	30215	~	1	~	~	~	3600

Courier Row	Modbus Addr	No. Regs	Regs (max)	Format	Relay Cell	Cell description	Min Scan Time(s)
26	30216	~	2	~	~	~	3600
27	30218	~	2	~	~	~	3600
28	30300	~	1	~	~	~	0
2E	30500	3	3	K8	0210	I_A RMS	0
2F	30503	3	3	K8	0211	I_B RMS	0
30	30506	3	3	K8	0212	I_C RMS	0
31	30509	3	3	K8	0227	V_A RMS	0
32	30512	3	3	K8	0228	V_B RMS	0
33	30515	3	3	K8	0229	V_C RMS	0
34	30518	3	3	K8	022D	Frequency	0
35	30521	3	3	K8	030A	3ph Active Power (W)	0
36	30524	3	3	K8	030B	3ph Reactive Power (VAr)	0
37	30527	3	3	K8	030C	3ph Appar Power (VA)	0
38	30530	3	3	K8	030E	3ph Power Factor	0
39	30533	3	3	K8	0312	Import Act Energy (Wh)	0
3A	30536	3	3	K8	0313	Export Act Energy (Wh)	0
3B	30539	3	3	K8	0314	Import React Energy (VARh)	0
3C	30542	3	3	K8	0315	Export React Energy (VARh)	0
3D	30545	3	3	K8	0402	Thermal State	0
3E	30548	3	3	K8	0601	CB Operations	0
3F	30551	3	3	K8	0602	Total I_A Broken	0
40	30554	3	3	K8	0603	Total I_B Broken	0
41	30557	3	3	K8	0604	Total I_C Broken	0
42	30560	~	3	~	~	~	0
43	30563	~	3	~	~	~	0
44	30566	~	3	~	~	~	0
45	30569	~	3	~	~	~	0
46	30572	~	3	~	~	~	0
47	30575	~	3	~	~	~	0
48	30578	~	3	~	~	~	0
49	30581	~	3	~	~	~	0
4A	30584	~	3	~	~	~	0
4B	30587	~	3	~	~	~	0
4C	30590	~	3	~	~	~	0
4D	30593	~	3	~	~	~	0
4E	30596	~	3	~	~	~	0

TABLE 18 : MAPPING FOR P143

9.4.13 Mapping for P241

Courier Row	Modbus Addr	No. Regs	Regs (max)	Format	Relay Cell	Cell description	Min Scan Time(s)
01	30001	1	1	K2	From replies	Courier Status Byte	0
02	30002	~	8	~	~	~	3600
03	30010	~	2	~	~	~	3600
04	30012	~	2	~	~	~	3600
05	30014	8	8	K11	0004	Description	3600
06	30022	8	8	K11	0005	Plant reference	3600
07	30030	8	8	K11	0006	Model number	3600
08	30038	~	8	~	~	~	3600
09	30046	4	4	K11	0008	Serial Number	3600
0A	30050	1	1	K14	0009	System Frequency	3600
0B	30051	~	1	~	~	~	3600
0C	30052	1	1	K6	000C	Plant Status	100
0D	30053	1	1	K6	000D	Control Status	0
0E	30054	1	1	K10	000E	Active Group	0
0F	30055	~	8	~	~	~	0
10	30063	~	8	~	~	~	0
11	30071	~	8	~	~	~	3600
12	30079	~	8	~	~	~	3600
13	30087	~	8	~	~	~	3600
14	30095	~	8	~	~	~	3600
15	30103	~	8	~	~	~	3600
16	30111	~	8	~	~	~	3600
17	30119	~	8	~	~	~	3600
18	30128	~	8	~	~	~	3600
19	30135	~	8	~	~	~	3600
1A	30143	~	8	~	~	~	3600
1B	30151	~	8	~	~	~	3600
1C	30159	~	8	~	~	~	3600
1D	30167	~	8	~	~	~	3600
1E	30175	~	8	~	~	~	3600
1F	30183	~	8	~	~	~	3600
20	30191	1 or 2	2	K6/7	0020	Logic I/P Status	0
21	30193	1 or 2	2	K6/7	0021	Relay O/P Status	0
22	30195	2	2	K7	0108	Trip Elements 1	0
23	30197	2	17	K7	0109	Trip Elements 2	0
24	30214	~	1	~	~	~	3600
25	30215	~	1	~	~	~	3600

Courier Row	Modbus Addr	No. Regs	Regs (max)	Format	Relay Cell	Cell description	Min Scan Time(s)
26	30216	~	2	~	~	~	3600
27	30218	~	2	~	~	~	3600
28	30300	~	1	~	~	~	0
2E	30500	3	3	K8	0210	I_A RMS	0
2F	30503	3	3	K8	0211	I_B RMS	0
30	30506	3	3	K8	0212	I_C RMS	0
31	30509	3	3	K8	0213	I_N RMS	0
32	30512	3	3	K8	0227	V_A RMS	0
33	30515	3	3	K8	0228	V_B RMS	0
34	30518	3	3	K8	0229	V_C RMS	0
35	30521	3	3	K8	022D	Frequency	0
36	30524	3	3	K8	030A	3ph Active Power (W)	0
37	30527	3	3	K8	030B	3ph Reactive Power (VAr)	0
38	30530	3	3	K8	030C	3ph Appar Power (VA)	0
39	30533	3	3	K8	030E	3ph Power Factor	0
3A	30536	3	3	K8	0312	Import Act Energy (Wh)	0
3B	30539	3	3	K8	0313	Export Act Energy (Wh)	0
3C	30542	3	3	K8	0314	Import React Energy (VARh)	0
3D	30545	3	3	K8	0315	Export React Energy (VARh)	0
3E	30548	3	3	K8	0402	Thermal State	0
3F	30551	3	3	K8	0403	Time To O/L Trip	0
40	30554	3	3	K8	0411	Time To Next Start	0
41	30557	3	3	K8	041B	Motor Running Hours	0
42	30560	3	3	K8	0601	CB Operations	0
43	30563	3	3	K8	0602	Total I_A Broken	0
44	30566	3	3	K8	0603	Total I_B Broken	0
45	30569	3	3	K8	0604	Total I_C Broken	0
46	30572	~	3	~	~	~	0
47	30575	~	3	~	~	~	0
48	30578	~	3	~	~	~	0
49	30581	~	3	~	~	~	0
4A	30584	~	3	~	~	~	0
4B	30587	~	3	~	~	~	0
4C	30590	~	3	~	~	~	0
4D	30593	~	3	~	~	~	0
4E	30596	~	3	~	~	~	0

TABLE 19 : MAPPING FOR P241

9.4.14 Mapping for P343

Courier Row	Modbus Addr	No. Regs	Regs (max)	Format	Relay Cell	Cell description	Min Scan Time(s)
01	30001	1	1	K2	From replies	Courier Status Byte	0
02	30002	~	8	~	~	~	3600
03	30010	~	2	~	~	~	3600
04	30012	~	2	~	~	~	3600
05	30014	8	8	K11	0004	Description	3600
06	30022	8	8	K11	0005	Plant reference	3600
07	30030	8	8	K11	0006	Model number	3600
08	30038	~	8	~	~	~	3600
09	30046	4	4	K11	0008	Serial Number	3600
0A	30050	1	1	K14	0009	System Frequency	3600
0B	30051	~	1	~	~	~	3600
0C	30052	1	1	K6	000C	Plant Status	100
0D	30053	1	1	K6	000D	Control Status	0
0E	30054	1	1	K10	000E	Active Group	0
0F	30055	~	8	~	~	~	0
10	30063	~	8	~	~	~	0
11	30071	~	8	~	~	~	3600
12	30079	~	8	~	~	~	3600
13	30087	~	8	~	~	~	3600
14	30095	~	8	~	~	~	3600
15	30103	~	8	~	~	~	3600
16	30111	~	8	~	~	~	3600
17	30119	~	8	~	~	~	3600
18	30128	~	8	~	~	~	3600
19	30135	~	8	~	~	~	3600
1A	30143	~	8	~	~	~	3600
1B	30151	~	8	~	~	~	3600
1C	30159	~	8	~	~	~	3600
1D	30167	~	8	~	~	~	3600
1E	30175	~	8	~	~	~	3600
1F	30183	~	8	~	~	~	3600
20	30191	1 or 2	2	K6/7	0020	Logic I/P Status	0
21	30193	1 or 2	2	K6/7	0021	Relay O/P Status	0
22	30195	2	2	K7	010A	Trip Elements 1	0
23	30197	2	17	K7	010B	Trip Elements 2	0
24	30214	~	1	~	~	~	3600
25	30215	~	1	~	~	~	3600

Courier Row	Modbus Addr	No. Regs	Regs (max)	Format	Relay Cell	Cell description	Min Scan Time(s)
26	30216	~	2	~	~	~	3600
27	30218	~	2	~	~	~	3600
28	30300	~	1	~	~	~	0
2E	30500	3	3	K8	0210	I_A RMS	0
2F	30503	3	3	K8	0211	I_B RMS	0
30	30506	3	3	K8	0212	I_C RMS	0
31	30509	3	3	K8	0227	V_A RMS	0
32	30512	3	3	K8	0228	V_B RMS	0
33	30515	3	3	K8	0229	V_C RMS	0
34	30518	3	3	K8	022D	Frequency	0
35	30521	3	3	K8	030A	3ph Active Power (W)	0
36	30524	3	3	K8	030B	3ph Reactive Power (VAr)	0
37	30527	3	3	K8	030C	3ph Appar Power (VA)	0
38	30530	3	3	K8	030E	3ph Power Factor	0
39	30533	3	3	K8	0312	Import Act Energy (Wh)	0
3A	30536	3	3	K8	0313	Export Act Energy (Wh)	0
3B	30539	3	3	K8	0314	Import React Energy (VARh)	0
3C	30542	3	3	K8	0315	Export React Energy (VARh)	0
3D	30545	3	3	K8	0401	IA2 Magnitude	0
3E	30548	3	3	K8	0403	IB2 Magnitude	0
3F	30551	3	3	K8	0405	IC2 Magnitude	0
40	30554	3	3	K8	040F	V_N 3rd Harmonic	0
41	30557	3	3	K8	0601	CB Operations	0
42	30560	3	3	K8	0602	Total I_A Broken	0
43	30563	3	3	K8	0603	Total I_B Broken	0
44	30566	3	3	K8	0604	Total I_C Broken	0
45	30569	~	3	~			0
46	30572	~	3	~	~	~	0
47	30575	~	3	~	~	~	0
48	30578	~	3	~	~	~	0
49	30581	~	3	~	~	~	0
4A	30584	~	3	~	~	~	0
4B	30587	~	3	~	~	~	0
4C	30590	~	3	~	~	~	0
4D	30593	~	3	~	~	~	0
4E	30596	~	3	~	~	~	0

TABLE 20 : MAPPING FOR P343

9.4.15 Mapping for P444

Courier Row	Modbus Addr	No. Regs	Regs (max)	Format	Relay Cell	Cell description	Min Scan Time(s)
01	30001	1	1	K2	From replies	Courier Status Byte	0
02	30002	~	8	~	~	~	3600
03	30010	~	2	~	~	~	3600
04	30012	~	2	~	~	~	3600
05	30014	8	8	K11	0004	Description	3600
06	30022	8	8	K11	0005	Plant reference	3600
07	30030	8	8	K11	0006	Model number	3600
08	30038	~	8	~	~	~	3600
09	30046	4	4	K11	0008	Serial Number	3600
0A	30050	1	1	K14	0009	System Frequency	3600
0B	30051	~	1	~	~	~	3600
0C	30052	1	1	K6	000C	Plant Status	0
0D	30053	1	1	K6	000D	Control Status	0
0E	30054	1	1	K10	000E	Active Group	100
0F	30055	~	8	~	~	~	0
10	30063	~	8	~	~	~	0
11	30071	~	8	~	~	~	3600
12	30079	~	8	~	~	~	3600
13	30087	~	8	~	~	~	3600
14	30095	~	8	~	~	~	3600
15	30103	~	8	~	~	~	3600
16	30111	~	8	~	~	~	3600
17	30119	~	8	~	~	~	3600
18	30128	~	8	~	~	~	3600
19	30135	~	8	~	~	~	3600
1A	30143	~	8	~	~	~	3600
1B	30151	~	8	~	~	~	3600
1C	30159	~	8	~	~	~	3600
1D	30167	~	8	~	~	~	3600
1E	30175	~	8	~	~	~	3600
1F	30183	~	8	~	~	~	3600
20	30191	1 or 2	2	K6/7	0020	Logic I/P Status	0
21	30193	1 or 2	2	K6/7	0021	Relay O/P Status	0
22	30195	2	2	K7	010A	Trip Elements	0
23	30197	~	17	~	~	~	0
24	30214	~	1	~	~	~	3600
25	30215	~	1	~	~	~	3600

Courier Row	Modbus Addr	No. Regs	Regs (max)	Format	Relay Cell	Cell description	Min Scan Time(s)
26	30216	~	2	~	~	~	3600
27	30218	~	2	~	~	~	3600
28	30300	~	1	~	~	~	0
2E	30500	3	3	K8	0201	I_A Magnitude	0
2F	30503	3	3	K8	0203	I_B Magnitude	0
30	30506	3	3	K8	0205	I_C Magnitude	0
31	30509	3	3	K8	021A	V_{AN} Magnitude	0
32	30512	3	3	K8	021C	V_{BN} Magnitude	0
33	30515	3	3	K8	021E	V_{CN} Magnitude	0
34	30518	3	3	K8	022A	Frequency	0
35	30521	3	3	K8	030A	3ph Active Power (W)	0
36	30524	3	3	K8	030B	3ph Reactive Power (VAr)	0
37	30527	3	3	K8	030C	3ph Appar Power (VA)	0
38	30530	3	3	K8	030E	3ph Power Factor	0
39	30533	3	3	K8	0601	CB A Operations	0
3A	30536	3	3	K8	0602	CB B Operations	0
3B	30539	3	3	K8	0603	CB C Operations	0
3C	30542	3	3	K8	0604	Total I_A Broken	0
3D	30545	3	3	K8	0605	Total I_B Broken	0
3E	30548	3	3	K8	0606	Total I_C Broken	0
3F	30551	~	3	~	~	~	0
40	30554	~	3	~	~	~	0
41	30557	~	3	~	~	~	0
42	30560	~	3	~	~	~	0
43	30563	~	3	~	~	~	0
44	30566	~	3	~	~	~	0
45	30569	~	3	~	~	~	0
46	30572	~	3	~	~	~	0
47	30575	~	3	~	~	~	0
48	30578	~	3	~	~	~	0
49	30581	~	3	~	~	~	0
4A	30584	~	3	~	~	~	0
4B	30587	~	3	~	~	~	0
4C	30590	~	3	~	~	~	0
4D	30593	~	3	~	~	~	0
4E	30596	~	3	~	~	~	0

TABLE 21 : MAPPING FOR P444

9.4.16 Mapping for P545

Courier Row	Modbus Addr	No. Regs	Regs (max)	Format	Relay Cell	Cell description	Min Scan Time(s)
01	30001	1	1	K2	From replies	Courier Status Byte	0
02	30002	~	8	~	~	~	3600
03	30010	~	2	~	~	~	3600
04	30012	~	2	~	~	~	3600
05	30014	8	8	K11	0004	Description	3600
06	30022	8	8	K11	0005	Plant reference	3600
07	30030	8	8	K11	0006	Model number	3600
08	30038	~	8	~	~	~	3600
09	30046	4	4	K11	0008	Serial Number	3600
0A	30050	1	1	K14	0009	System Frequency	3600
0B	30051	~	1	~	~	~	3600
0C	30052	1	1	K6	000C	Plant Status	0
0D	30053	1	1	K6	000D	Control Status	0
0E	30054	1	1	K10	000E	Active Group	100
0F	30055	~	8	~	~	~	0
10	30063	~	8	~	~	~	0
11	30071	~	8	~	~	~	3600
12	30079	~	8	~	~	~	3600
13	30087	~	8	~	~	~	3600
14	30095	~	8	~	~	~	3600
15	30103	~	8	~	~	~	3600
16	30111	~	8	~	~	~	3600
17	30119	~	8	~	~	~	3600
18	30128	~	8	~	~	~	3600
19	30135	~	8	~	~	~	3600
1A	30143	~	8	~	~	~	3600
1B	30151	~	8	~	~	~	3600
1C	30159	~	8	~	~	~	3600
1D	30167	~	8	~	~	~	3600
1E	30175	~	8	~	~	~	3600
1F	30183	~	8	~	~	~	3600
20	30191	1 or 2	2	K6/7	0020	Logic I/P Status	0
21	30193	1 or 2	2	K6/7	0021	Relay O/P Status	0
22	30195	2	2	K7	010A	Trip Elements 1	0
23	30197	2	17	K7	010B	Trip Elements 2	0
24	30214	~	1	~	~	~	3600
25	30215	~	1	~	~	~	3600

Courier Row	Modbus Addr	No. Regs	Regs (max)	Format	Relay Cell	Cell description	Min Scan Time(s)
26	30216	~	2	~	~	~	3600
27	30218	~	2	~	~	~	3600
28	30300	~	1	~	~	~	0
2E	30500	3	3	K8	0210	I_A RMS	0
2F	30503	3	3	K8	0211	I_B RMS	0
30	30506	3	3	K8	0212	I_C RMS	0
31	30509	3	3	K8	0227	V_{AN} RMS	0
32	30512	3	3	K8	0228	V_{BN} RMS	0
33	30515	3	3	K8	0229	V_{CN} RMS	0
34	30518	3	3	K8	022D	Frequency	0
35	30521	3	3	K8	030A	3ph Active Power (W)	0
36	30524	3	3	K8	030B	3ph Reactive Power (VAr)	0
37	30527	3	3	K8	030C	3ph Appar Power (VA)	0
38	30530	3	3	K8	030E	3ph Power Factor	0
39	30533	3	3	K8	0312	Import Act Energy (Wh)	0
3A	30536	3	3	K8	0313	Export Act Energy (Wh)	0
3B	30539	3	3	K8	0314	Import React Energy (VARh)	0
3C	30542	3	3	K8	0315	Export React Energy (VARh)	0
3D	30545	3	3	K8	0419	I_A Diff	0
3E	30548	3	3	K8	041A	I_B Diff	0
3F	30551	3	3	K8	041B	I_C Diff	0
40	30554	3	3	K8	0420	Thermal State	0
41	30557	3	3	K8	0511	Ch1 Rx Prop Delay	0
42	30560	3	3	K8	0512	Ch1 Tx Prop Delay	0
43	30563	3	3	K8	0513	Ch2 Rx Prop Delay	0
44	30566	3	3	K8	0514	Ch2 Tx Prop Delay	0
45	30569	3	3	K8	0602	CB A Operations	0
46	30572	3	3	K8	0603	CB B Operations	0
47	30575	3	3	K8	0604	CB C Operations	0
48	30578	3	3	K8	0605	Total I_A Broken	0
49	30581	3	3	K8	0606	Total I_B Broken	0
4A	30584	3	3	K8	0607	Total I_C Broken	0
4B	30587	~	3	~	~	~	0
4C	30590	~	3	~	~	~	0
4D	30593	~	3	~	~	~	0
4E	30596	~	3	~	~	~	0

TABLE 22 : MAPPING FOR P545

9.4.17 Registers 31000 to 33999

There are 23 starting registers in the second set of starting registers mentioned above, for user-defined mapping, as detailed in Table 23:

Courier Row	Modbus Addr	No. Regs	Regs (max)	Format	Relay Cell	Cell description	Min Scan Time(s)
4F	31000	125	125	*	User defined		0
50	31125	125	125	*	User defined		0
51	31250	125	125	*	User defined		0
52	31375	125	125	*	User defined		0
53	31500	125	125	*	User defined		0
54	31625	125	125	*	User defined		0
55	31750	125	125	*	User defined		0
56	31875	125	125	*	User defined		0
57	32000	125	125	*	User defined		0
58	32125	125	125	*	User defined		0
59	32250	125	125	*	User defined		0
5A	32375	125	125	*	User defined		0
5B	32500	125	125	*	User defined		0
5C	32625	125	125	*	User defined		0
5D	32750	125	125	*	User defined		0
5E	32875	125	125	*	User defined		0
5F	33000	125	125	*	User defined		0
60	33125	125	125	*	User defined		0
61	33250	125	125	*	User defined		0
62	33375	125	125	*	User defined		0
63	33500	125	125	*	User defined		0
64	33625	125	125	*	User defined		0
65	33750	125	125	*	User defined		0

*= dependent on Courier menu cell

TABLE 23 : USER DEFINABLE MAPPING

9.5 MODBUS numeric types

Table 24 below shows the format of the MODBUS numeric types, referenced as codes K1 through K16, so that the user can configure the MODBUS master to read and decode the data.

Code	No of registers	Description	Range
K1	125	Courier data (packed from left, text padded with 20 (spaces))	0 to 255 for each byte
K2	1	Courier Status Byte (LSB = Status byte, MSB = 0)	n/a
K3	1	Menu cell reference (col - high byte, row - low byte)	00,00 to 255,255
K4	2	Millisecond count	0 to 4294967295
K5	1	Courier Group ID (LSB = Group ID, MSB = 00)	0 to 255
K6	1	1 register for 1 or 2 byte binary flags (high byte padded with 00)	n/a
K7	2	2 registers for 1, 2, 3 or 4 byte binary flags (high byte padded with 00)	n/a
K8	3	Software Issue 18 KITZ 250 G and earlier	
		Signed floating point numbers xx yy . zz xx yy - signed 4 byte value zz - unsigned 2 byte value	-2147483648.9999 to 2147483647.9999 (highest bit of zz set to signify overflow)
		Software Issue 18 KITZ 250 H and later	
		Signed floating point numbers xx yy . zz xx yy - signed 31 bit value in the form: Value in the 31 least significant bits. Sign bit in the most significant bit. 0=positive, 1=negative. zz - unsigned 2 byte value	-2147483647.9999 to 2147483647.9999 (highest bit of zz set to signify overflow)
K9	2	4 byte signed integer	-2147483648 to 2147483647
K10	1	Unsigned Integer 16 bit	0-65535
K11	1	ASCII text, two characters per register, MSB contains first character. The number of registers used to represent a string will be the maximum register size (packed from left, padded with 20 (spaces))	32 to 163 for each byte
K12	2	Password, 2 registers are used to encode the 4 character password using the same format as K11	65 to 90 for each byte
K13	2	Unsigned long integer, high order word first in register	0 to 4294967295
K14	1	Signed integer	-32768 to 32767
K15	4	Time and date using IEC format: Register 1: Years (high byte reserved) Register 2: Month/Day/Week Register 3: Hours/Minutes Register 4: Milliseconds	n/a
K16	2	Copy of IEEE data (1st register contains MSB, 2nd register contains LSB)	As for IEEE float

TABLE 24 : MODBUS NUMERIC TYPES

9.6 Poll times (Min Scan Time)

The KITZ202 periodically polls specific information and measurement data from the downstream units and stores this in its internal memory, ready for extraction by a master which is polling for MODBUS data. The interval at which the KITZ202 polls the measurement data is set on a per MODBUS register location basis (i.e. it is common for the same MODBUS register location across all device addresses, irrespective of what that the register location is mapped to in the relay Courier database).

The "MinScanTime" values shown in the MODBUS mapping tables are the default values.These values could even be changed to '0' so that the MODBUS register location is polled every loop by the KITZ202. Changing the contents of a Courier cell would almost immediately change the contents of the respective MODBUS register in KITZ202.

In this way the KITZ202 is configured to update unimportant cells less frequently and therefore provide a faster update for more important cells (such as power system measurements).

9.7 Request message processing

If no messages are being processed by the KITZ202 (no buffered master requests or pending downstream unit replies), the first complete error free message received on the MODBUS port will be processed by the KITZ202.

9.8 Command message processing

If no messages are being processed by the KITZ202 (no buffered master requests or pending downstream unit replies), the first complete error free message received on the MODBUS port will be processed by the KITZ202. The KITZ202 will forward the equivalent Courier command to the appropriate device address immediately (and await the reply), before continuing with polling.

9.9 Real time clock (RTC) time and date setting

The current RTC time and date can be set from the Courier master only. There is no external time synchronisation (e.g. IRIG-B) input. Values polled by the MODBUS master will not have a timestamp associated with them.

10. TECHNICAL DATA

10.1 Ratings - auxiliary supply

Range	Nominal (V)	Operative range (V)
Low voltage (LV)	24/125V DC 110V AC 50/60Hz	19 - 150V DC 50 - 133V AC
High voltage (HV)	48/250V DC 110/230V AC 50/60Hz	33 - 300V DC 87 - 265V AC

10.2 Burden - auxiliary supply

AC <7VA
DC <6W

10.3 Real time clock

RTC drift from setting at 20°C
< 1 second per 24 hours

Synchronisation error
Time setting error ±1.0ms*

Time tagging error
Current time error +0ms/-10.0ms

*Where time setting error is the accuracy of the external clock input data.

10.4 Watchdog contact

Watchdog relay
1 make (open when healthy)

Make
10A and carry for 0.2s

Carry
5A continuous

Break
DC 30W resistive

15W inductive(L/R=0.04s)

Rated load
DC 5A at 30V

AC 5A at 250V

10.5 Operation indications

Ten light emitting diodes.

10.6 Communications ports

10.6.1 Front RS232 Port 0

Language	Courier	
Transmission	Asynchronous - RS232 voltage levels	
Transmission coding	NRZ	
Frame format		
Asynchronous	11 bits	8 Even 1
Data rate	19200 bits per second	
Cable type	RS232 serial interface lead	
Cable Length	15m max. or 2500pF cable capacitance	
Loading	2 units (point to point system)	
Isolation	Earthed SELV circuit	
Connection	9-way female 'D' connector	

10.6.2 Rear Fibre Optic Port

Language	MODBUS/Courier	
Transmission	Asynchronous - fibre optic	
Transmission coding	On/Off signalling	
Idle mode	Light On/Light Off (selectable)	
Wavelength	(820 - 870) nm	
Frame format		
MODBUS: Asynchronous	10/11 bits	8 None 2, 8 None 1, 8 Even 1, 8 Odd 1
Courier: Asynchronous	10/11 bits	8 None1, 8 Even 1
Data rate	1200 to 115,200 bits per second	
Cable type	Glass fibre multimode	
Cable length	1000m max.	
Loading	2 units (point to point system)	
Connection	BFOC/2.5 (ST®) connector	

10.6.3 Rear RS232 Port

Language	MODBUS/Courier	
Transmission	Asynchronous - RS232 voltage levels	
Transmission coding	NRZ	
Frame format		
MODBUS: Asynchronous	10/11 bits	8 None 2, 8 None 1, 8 Even 1, 8 Odd 1
Courier: Asynchronous	10/11 bits	8 None1, 8 Even 1
Data rate	1200 to 115,200 bits per second	
Cable type	RS232 serial interface lead	
Cable length	15m max. or 2500pF cable capacitance (up to 19,200 bits per second)	
Loading	2 units (point to point system)	
Isolation	SELV	
Connection	9-way female 'D' connector	

10.6.4 Rear RS485 Port

Language	MODBUS/Courier
Transmission	Asynchronous - RS485 voltage levels
Transmission coding	NRZ
Frame format	
MODBUS: Asynchronous 10/11 bits	8 None 2, 8 None 1, 8 Even 1, 8 Odd 1
Courier: Asynchronous 10/11 bits	8 None 1, 8 Even 1
Data rate	1200 to 115200 bits per second
Cable type	RS485 serial interface lead
Cable length	1000m max.
Loading	Multidrop system
Isolation	SELV
Connection	9-way female 'D' connector

10.6.5 Rear K-Bus Port 3

Language	Courier
Transmission	Synchronous - RS485 voltage levels
Transmission coding	Biphase space (differential Manchester)
Frame format	HDLC
Language	Courier
Data rate	64k bits per second
Cable type	Screened twisted pair
Cable length	1000m (maximum)
Loading	20 units (multidrop system)
Isolation	2kV RMS for one minute
Voltage levels based on RS485 differential voltage level	
Unloaded driver differential output	±5V
Receiver input sensitivity	±200mV

10.6.6 High voltage withstand

Dielectric withstand

IEC 60255-5: 1977

2kV rms for 1 minute between case earth and the following independent circuits: the auxiliary supply, K-Bus port and relay contacts, with the terminations of each circuit wired together.

2kV rms for 1 minute between any of the following independent circuits: the auxiliary supply, K-Bus port and relay contacts, with the terminations of each circuit wired together.

2kV rms for 1 minute between any of the following independent circuits: rear RS232 SELV port, RS485 SELV port, with the terminations of each circuit wired together.

1kV rms for 1 minute between the auxiliary suply and the following independent circuits: rear RS232 SELV port, RS485 SELV port, with the terminations of each circuit wired together.

1kV rms for 1 minute between case earth and the following independent circuits: rear RS232 SELV port, RS485 SELV port, with the terminations of each circuit wired together.

High voltage impulse
IEC 60255-5:1977 Three positive and three negative impulses of 5kV peak, 1.2/50ms, 0.5J between terminals of the same circuit (except relay contacts, RS232 and RS485 ports), between independent circuits (except RS232 and RS485 ports), and between all terminals connected together and case earth (except RS232 and RS485 ports). Three positive and three negative impulses of 1kV peak, 1.2/50ms, 0.5J applied between the auxiliary supply and rear RS232 and RS485 ports, and between rear RS232 and RS485 ports wired together and case earth.

Insulation resistance
IEC 60255-5: 1977 >100W

10.6.7 Electrical environment

DC supply interruptions
IEC 60255-11: 1979 The unit will withstand a 10ms interruption in the auxiliary supply, under normal operating conditions, without de-energising.

AC ripple on DC supply
IEC 60255-11: 1979 The unit will withstand 12% ripple on the DC supply.

AC supply voltage dips and interruptions
EN 61000-4-11:1994 The unit will withstand voltage dips of 100%, 60% and 30%, in the auxiliary power supply for a duration of 10ms, under normal operating conditions, without de-energising. The unit will withstand a 10ms interruption in the auxiliary power supply, under normal operating conditions, without de-energising.

High frequency disturbance
IEC 60255-22-1: 1988 Class III
2.5kV peak between auxiliary supply, watchdog contacts, K-Bus ports, port and case earth.
2.5kV peak between the cable screen of the rear RS232, RS485, K-Bus ports and case earth.
2.5kV peak between the cable screen of the rear RS232, RS485, K-Bus ports and case earth.
2.5kV peak between auxiliary supply and the watchdog contacts.
1.0kV peak across the supply terminals.

Surge immunity
EN 61000-4-5: 1995
Level IV and Level III
4kV peak, 1.2/50ms appplied between the auxiliary supply, K-Bus port, RS485 port and case earth 2kV peak, 1.2/50ms appllied between the terminals of the auxiliary supply.
2kV peak, 1.2/50ms applied between the RS232 port and case earth.

Fast transient disturbance
IEC 60255-22-4: 1992 Level IV
4kV, 2.5kHz applied directly between the auxiliary supply, watchdog relay contacts and case earth.
4kV, 2.5Hz applied via a capacitance clamp to the rear RS232, RS485 and K-Bus ports.

Electrostatic discharge
EN 61000-4-2: 1995 Level 3
8kV discharge in air with cover in place and cover removed.
6kV point contact discharge with cover in place and cover removed.

EMC compliance
CE 89/336/EEC — Compliance with the European Commission Directive on EMC is claimed via the Technical Construction File route.

EN 50081-2: 1994
EN 50082-2: 1995 — Generic Standards were used to establish conformity.

10.6.8 Product safety

CE 73/23/EEC — Compliance with European Commission Low Voltage Directive.

EN61010-1: 1993/A2: 1995
Compliance is demonstrated by reference to generic safety standards.

EN60950: 1992/A11: 1997

10.6.9 Atmospheric environment

Temperature
IEC 60255-6: 1998 — Storage and transit - 25°C to + 70°C
Operating -25°C to + 55°C
IEC 60068-2-1: 1990/A2: 1994 — Cold
IEC 60068-2-2: 1974/A2: 1994 — Dry heat

Humidity
IEC 60068-2-3: 1969 — 56 days at 93% RH and +40°C

Enclosure protection
IEC 60529: 19989 — IP50 (dust protected)

10.6.10 Mechanical environment

Vibration
IEC 60255-21-2: 1988 — Response Class 2
Endurance Class 2

Shock and bump
IEC 60255-21-2: 1988 — Shock response Class 2
Shock withstand Class 1
Bump Class 1

Seismic
IEC 60255-21-3: 1993 — Class 2

10.7 User tests

To avoid possible degradation of insulation by repeated type testing, it is recommended that insulation tests, if required, are performed at 500V dc. The insulation resistance should be greater than 100Ω.

11. COMMISSIONING, PROBLEM SOLVING AND MAINTENANCE

11.1 General

The user should be familiar with the contents of the Safety Section before commencing with any work on this equipment.

11.2 Commissioning instructions

11.2.1 Commissioning preliminaries

The KITZ202 unit should be commissioned with the aid of "Courier Access Software" (CAS), "Protection Access Software & Toolkit" (PAS&T) or "MiCOM S1" running on a PC and at least one Courier based device.

11.2.1.1 Module connection

Reference should be made to sections 3 and 5 of this manual and to the user manual of the computer (PC) on which the Courier master software is to be run.

11.2.1.2 Electrostatic discharge (ESD)

See recommendations in section 2.2 of this manual before handling the module.

11.2.1.3 Inspection

Carefully examine the unit and case to verify if no damage has occurred since installation.

11.2.1.4 Earthing

Mains earthing.

The KITZ202 unit must be earthed

If the mains supply is not earthed, the KITZ202 unit earthing connection on the rear of the case must be used to connect the unit to a local (mains) earth.

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 end (i.e. at the KITZ202) and not at any other point.

11.2.1.5 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 circuit should be temporarily strapped together. The main groups on the unit are given below:

- Auxiliary supply voltage
- K-Bus Port 3
- Watchdog relay contacts
- Case earth

This test should not be performed on the RS232 port at the front of the unit as this is not isolated.

11.2.1.6 Equipment required

- The KITZ202 unit requires the following:
- AC/DC voltmeter 0 - 300V
- A portable PC running PAS&T
- Any supported Courier compatible (K-Bus) device.

11.2.2 Auxiliary supply tests

The unit will operate from either a 110V or 110/230V AC supply or a 24/125V DC or 48/250V DC battery supply, depending on the KITZ202 version. The incoming voltage must be within the operating range specified in the table below:

Range	Nominal (V)	Operative range (V)
Low voltage (LV)	24/125V DC 110V AC 50/60Hz	19 - 150V DC 50 - 133V AC
High voltage (HV)	48/250V DC 110/230V AC 50/60Hz	33 - 300V DC 87 - 265V AC

11.2.3 Configuration

The KITZ202 does not have any external switches for setting its parameters (other than the Port 0 DTE/DCE switch). The unit can only be configured by running "Courier Access Software", "Protection Access Software & Toolkit" or "MiCOM S1" on a PC connected to the RS232 front port (Port 0) of the KITZ202.

The communication parameters of the front port are fixed:

- IEC 60870 FT1.2 frame format = 11 bit frame format (1 Start bit, 8 Data bits, 1 Even parity bit, 1 Stop bit)
- Data rate of 19200 bits per second.

The pin out of the front port on the unit can be configured either as Data Terminal Equipment (DTE) or a Data Circuit-terminating Equipment (DCE), using the crossover switch (SW1) on the front panel. The very first time the unit is powered up, a PC running the software must be connected to the front port to set up its address (as detailed in section 5) and to configure its settings. The full Courier database is presented in Section 12. After configuration, the new settings will be held in the unit's non volatile memory.

11.2.4 Testing communication port operation

After the KITZ202 settings have been configured as required, connect the MODBUS master to Port 1 (use the appropriate RS232 or RS485 or Optical Fibre connections).

Request measurements and data for the attached downstream unit from the MODBUS master and confirm that the requested data is returned.

11.3 Problem solving guide

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

11.3.1 All indications are Off

- Check correct auxiliary supply is present.
- Check external fuse (if present).

11.3.2 Green supply indication is Off and alarm indication is On

- An error in the setting data has been detected.
- Default serial number has been loaded.

If the unit is de-energised then re-energised after a non-recoverable setting error has occurred, the default settings will be loaded (these are listed in Section 12).

If this occurs, the unit will have the default serial number 000000O and a Unit Address of 255 (global), the address will have to be changed to a unique address (see section 5).

After the address has been changed, the password protected settings can be accessed by using the default password "AAAA" (this can also be changed if required).

11.3.3 No communications

Indication status: Port 0, 1 or 2 receive indication is Off when communicating with a master station.

- Check master station is polling for data.
- Check fibre or cable connections are correct.

Indication status: Port 3 transmit indication is On and Port 3 receive indication is Off when communicating with a master station (and Relay):

- Relay is not communicating (incorrect address/not configured etc.):
  refer to the Service Manual of the Relay.
- Two relays are using the same address, all addresses must be unique.
- No termination resistors fitted to K-Bus, or incorrect value.
- K-Bus is not a single spur (no branches are allowed)

Indication status: Port 0, 1 or 2 receive indication is On, Port 3 transmit indication is On, Port 3 receive indication is On and the corresponding Port 0, 1 or 2 transmit indication is Off when communicating with a master station (and relay):

- The master station is completing a transfer sequence that has been interrupted when the KITZ202 unit was de-energised then re-energised.

11.3.4 Slow communications response (many retries)

- "P3 Trans Delay " timer setting is too long. Decrease the value.
- No termination resistor fitted to K-Bus, or incorrect value.
- K-Bus exceeds 1000m.
- K-Bus cable specification not as recommended in section 3.1.1.2.
- Frequent or large amount of data transfer is being performed from a master connected to another input port.
- Setting change sequence in progress on another port (Check "P0 Set Timer" or "P2 Set Timer" value is not too long).

11.3.5 Cannot access one or more of the downstream units within the specified address range

- Check that the "AR Base Address" and "AR No. of Units" settings (in the "ADDRESS RANGE" menu column) correspond to the addresses of the downstream units polled by the master.
- Check that the address setting of the downstream unit is correct.
- Check that the KITZ202 "SYS Unit Address" is not set to the same value as one of the Downstream address.
- Check that two or more of the downstream units do not have the same address setting.

11.3.6 Master station time out/MODBUS "busy" response received

- Increase the Max Busies setting of the master (see the relevant publication).
- Increase the KITZ202 "P0 Reply Timer", "P1 Reply Timer" or "P2 Reply Timer" as applicable.
- Increase the KITZ202 "P3 Busies" setting.
- Increase the KITZ202 "P3 Trans Delay" timer setting.

11.3.7 Connected Courier downstream relay communications is slow when communicating via the KITZ202.

- Decrease the KITZ202 "P3 Trans Delay" timer setting.

11.4 Maintenance

11.4.1 Battery replacement

The battery within the KITZ202 is provided to maintain the Real Time Clock to the correct time, following an interruption of the auxiliary input supply.

If the battery is removed from its socket the time and date will start from 00:00:00: 1996 Jan 01. No warning will be given to reset time and date.

11.4.1.1 Instructions for replacing the battery

For personal safety, ensure that auxiliary DC/AC supplies are isolated from the unit. Take off the front cover and pull the unit out of its case. As viewed from the front, the right hand side screen plate should be removed by unscrewing the four attaching screws. After undoing the two screws securing the power supply board (ZJ0358), use the tip of a screwdriver to prize the board off from the end connector. Place the board on a conductive surface, with the electronic components facing upwards, taking care to place a non- conductive spacer such as a piece of cardboard underneath the battery (see warning below). Gently extract the battery from its socket, using a small screwdriver to prize the battery free.

WARNING: TO AVOID DISCHARGING A BATTERY, IT SHOULD NOT BE PLACED ON A CONDUCTIVE SURFACE WITH ITS LEGS IN CONTACT WITH THE SURFACE. THE REPLACEMENT BATTERY SHOULD BE REMOVED FROM ITS PACKAGING AND PLACED INTO THE BATTERY HOLDER. THE FLAT AREA ON THE HOLDER SHOULD BE ALIGNED WITH THE FLAT AREA ON THE BATTERY. AFTER REPLACING THE BATTERY, THE UNIT SHOULD BE RE-BUILT BY FOLLOWING THE PROCEDURE DESCRIBED ABOVE IN REVERSE ORDER.

11.4.1.2 Post modification tests

Energise the KITZ202 and verify that it is functioning normally. Set it to the correct time and date. Power the unit down for at least 10 seconds and back on. Check that the correct time has been maintained.

11.4.1.3 Battery replacement type

The correct replacement battery type is: FB2325H2 from Rayovac, rated at nominal parameters of 3V and 360mAh.

11.4.1.4 Battery shelf life and replacement interval

Under normal storage conditions, the expected shelf life of the battery is 10 years. Under normal operating conditions, the battery should be replaced after 10 years.

11.4.1.5 Battery disposal

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

12. Courier DATABASE

12.1 System DATA

Col	Row	Menu Text	Example Values	Cell Type	Min	Max	Step	Default	Password Protected
00	01	SYS Language	English	Setting	0	3	1	0	No
			French						
			German						
			Spanish						
00	02	SYS Password		Setting	65	90	1	AAAA	Yes
00	04	SYS Description	********	Setting	32	159	1	16 Chars	Yes
00	05	SYS Plant Ref.	********	Setting	32	159	1	16 Chars	Yes
00	06	SYS Model No.	KITZ20201L15CEA	Data Cell					No
00	08	SYS Serial No.	123456A	Data Cell				000000O	No
00	0A	SYS Comms Level		Data Cell				1	No
00	0B	SYS Unit Address	1	Data Cell				255	No
00	11	SYS Soft Ref	18KITZ250E	Data Cell					
00	22	SYS Alarms		Data Cell					
	(Flag 0)		Invalid Settings						
	(Flag 1)		Def Serial Id						

12.1.1 Language

For model numbers KITZ20201L12CE and KITZ20201L15CE menu is available in English language only.

12.1.2 Password

Password protection is provided for menu access. This four character password must be entered to allow protected menu cells to be accessed.

12.1.3 Description

This alphanumeric value is for a textual description (eg. Line reference of associated protection relays).

12.1.4 Plant reference

This alphanumeric value should be used to refer to the location (eg. Substation).

12.1.5 Model number

This character string is fixed and contains the full unit model number.

12.1.6 Serial number

This seven character string (six numbers and an alpha character) is fixed and contains the relay serial number.

12.1.7 Communications Level

This data cell identifies the level of the Courier language supported by the unit.

12.1.8 Unit Address

This refers to the Courier address of the unit on the communications network.

12.1.9 Software Reference

This contains the reference number of component parts of the software contained within the unit.

12.1.10 Alarms

This cell indicates the status of the unit alarms.

12.2 Unit settings

Col	Row	Menu Text	Values	Cell Type	Min	Max	Step	Default	Password Protected
04	04	UNS Extended PWP	Disabled	Setting	0	1	1	0	Yes
			Enabled						
04	08	UNS Menu Access	Normal	Setting	0	1	1	0	Yes
			Advanced						
04	10	UNS Passwd Timer	min	Setting	1	30	1	2	Yes
04	1C	UNS P1 Enable	Disabled	Setting	0	1	1	1	Yes
			Enabled						
04	20	UNS P2 Enable	Disabled	Setting	0	1	1	1	Yes
			Enabled						

12.2.1 Extended Password protection

Enables additional password protection for communications port settings. These settings are marked as “Optional” Password Protection.

12.2.2 Menu Access

This setting hides advanced communications port settings.

12.2.3 Password Timer

This is the time period for which the System Password remains active (after being entered or the last setting change).

12.2.4 Port 1 Enable

This setting allows the MODBUS master port to be enabled.

12.2.5 Port 2 Enable

This setting allows the Courier master port to be enabled.

12.3 Port 0 settings

Col	Row	Menu Text	Values	Cell Type	Min	Max	Step	Default	Password Protected
08	08	P0 Setting Timer	min	Setting	1	30	1	2	PWP if 0404=1
08	0C	P0 Block Timer	min	Setting	1	30	1	2	PWP if 0404=1
08	10	P0 Reply Timer	ms	Setting	5	100	5	5	PWP if 0404=1
08	14	P0 Reset Timer	ms	Setting	5	100	5	5	PWP if 0404=1
08	1C	P0 Add Time Tag	Disabled	Setting	0	1	1	0	PWP if 0404=1
			Enabled						
08	20	P0 Block events	Disabled	Setting	0	1	1	1	PWP if 0404=1
			Enabled						

12.3.1 Port 0 Setting Timer

This setting is the time-out value applied to setting changes and setting change message interleaving when access is made via the front port.

Menu cell is visible if cell 0408 = “Advanced”.

12.3.2 Port 0 Block Timer

This setting is the time-out value applied to “Blocked” message transfer interleaving when access is made via the front port.

Menu cell is visible if cell 0408 = “Advanced”.

12.3.3 Port 0 Reply Timer

This setting is the maximum time delay before a reply is generated after a valid request is received on the front port of the unit (Excluding globally addressed requests and the reset remote link request). The reply may be “busy”. No reply is generated if the address is not valid or communications has not already been established with the address.

Menu cell is visible if cell 0408 = “Advanced”.

12.3.4 Port 0 Reset Timer

This setting is the maximum time delay before a reply is generated after a valid reset remote link request is received on the front port of the unit. No reply is generated if the address is not valid or communications has not already been established with the address.

Menu cell is visible if cell 0408 = “Advanced”.

12.3.5 Port 0 Add Time Tag

This setting appends a real time tag to the front port response messages.

Menu cell is visible if cell 0408 = “Advanced”.

12.3.6 Port 0 Block Events

This setting prevents automatic event extraction via the front port.

Menu cell is visible if cell 0408 = “Advanced”.

12.4 Port 1 settings (MODBUS)

Col	Row	Menu Text	Values	Cell Type	Min	Max	Step	Default	Password Protected
0C	08	P1 Mode	RS232 (no CTRL lines)	Setting	0	5	1	1	PWP if 0404=1
			RS485						
			O/F Light on						
			O/F Light off						
0C	0C	P1 Data rate	1200 Baud	Setting	0	11	1	7	PWP if 0404=1
			2400 Baud						
			3600 Baud						
			4800 Baud						
			7200 Baud						
			9600 Baud						
			14400 Baud						
			19200 Baud						
			28800 Baud						
			38400 Baud						
			57600 Baud						
			115200 Baud						
0C	10	P1 Frame Format	8 even 1	Setting	0	3	1	0	PWP if 0404=1
			8 odd 1						
			8 none 1						
0C	1C	P1 Reply Timer	ms	Data Cell	5	2000	5	50	PWP if 0404=1

12.4.1 Port 1 Mode

This setting selects the Port 1 mode of transmission: Light On when line idle, or Light Off when line idle, RS232, or RS485.

Menu cell is visible if cell 041C = “Enabled”.

12.4.2 Port 1 Data Rate

This setting selects the data rate used for MODBUS communications. The above data rates only are supported.

Menu cell is visible if cell 041C = “Enabled”.

12.4.3 Port 1 Frame Format

This setting selects the frame format used for MODBUS communications: the number of data bits, parity, and stop bits.

Menu cell is visible if cell 041C = “Enabled”.

12.4.4 Port 1 Reply Timer

This setting is the maximum time delay before a reply is generated after a valid request is received on rear port 1 of the unit. No reply is generated if the address is not valid or communications has not already been established with the address.

Menu cell is visible if cell 0408 = “Advanced” and cell 041C = “Enabled”.

12.5 Port 2 settings (COURIER)

Col	Row	Menu Text	Values	Cell Type	Min	Max	Step	Default	Password Protected
10	08	P2 Mode	RS232 (no CTRL lines)	Setting	0	5	1	2	PWP if 0404=1
			K-Bus						
			RS485						
			O/F Light on						
			O/F Light off						
10	0C	P2 Data Rate	1200 Baud	Setting	0	11	1	7	PWP if 0404=1
			2400 Baud						
			3600 Baud						
			4800 Baud						
			7200 Baud						
			9600 Baud						
			14400 Baud						
			19200 Baud						
			28800 Baud						
			38400 Baud						
			57600 Baud						
			115200 Baud						
10	10	P2 Frame Format	11 Bit Frame	Setting	0	1	1	0	PWP if 0404=1
			10 Bit Frame						
10	14	P2 Setting Timer	min	Setting	1	30	1	10	PWP if 0404=1
10	18	P2 Block Timer	min	Setting	1	30	1	2	PWP if 0404=1
10	1C	P2 Reply Timer	ms	Setting	5	2000	5	50	PWP if 0404=1
10	20	P2 Reset Timer	ms	Setting	5	2000	5	5	PWP if 0404=1
10	28	P2 Add Time Tag	Disabled	Setting	0	1	1	0	PWP if 0404=1
			Enabled						

12.5.1 Port 2 Mode

This setting selects the Port 2 mode of transmission: Light On when line idle, or Light Off when line idle, RS232, RS485, or K-Bus.

Menu cell is visible if cell 0420 = “Enabled”.

12.5.2 Port 2 Data Rate

This setting selects the data rate used for COURIER communications. The above data rates only are supported.

Menu cell is visible if cell 0420 = “Enabled” and 1008 ≠ "K-Bus".

12.5.3 Port 2 Frame Format

This setting selects the frame format used for COURIER communications: the number of data bits, parity, and stop bits.

Menu cell is visible if cell 0420 = “Enabled” and 1008 ≠ "K-Bus".

12.5.4 Port 2 Setting Timer

This setting is the time-out value applied to setting changes and setting change message interleaving when access is made via Port 2.

Menu Cell is Visible if cell 0408 = “Advanced” and cell 0420 = “Enabled”.

12.5.5 Port 2 Block Timer

This setting is the time-out value applied to “Blocked” message transfer interleaving when access is made via the rear port 2.

Menu cell is visible if cell 0408 = “Advanced” and cell 0420 = “Enabled”.

12.5.6 Port 2 Reply Timer

This setting is the maximum time delay before a reply is generated after a valid request is received on rear port 2 of the unit. No reply is generated if the address is not valid or communications has not already been established with the address.

Menu cell is visible if cell 0408 = “Advanced” and cell 0420 = “Enabled”.

12.5.7 Port 2 Reset Timer

This setting is the maximum time delay before a reply is generated after a valid reset remote link request is received on the rear port 2 of the unit. No reply is generated if the address is not valid or communications has not already been established with the address.

Menu cell is visible if cell 0408 = “Advanced” and cell 0420 = “Enabled”.

12.5.8 Port 2 Add Time Tag

This setting appends an IEC870 real time tag to the port 2 response messages.

Menu cell is visible if cell 0408 = “Advanced” and cell 0420 = “Enabled”.

12.6 Port 3 settings

Col	Row	Menu Text	Values	Cell Type	Min	Max	Step	Default	Password Protected
14	04	P3 Reply Timer	ms	Setting	5	100	5	15	PWP if 0404=1
14	08	P3 Retries		Setting	0	99	1	10	PWP if 0404=1
14	0C	P3 Busies		Setting	0	999	1	99	PWP if 0404=1
14	10	P3 GTrans Timer	ms	Setting	5	1000	5	10	PWP if 0404=1
14	14	P3 Trans Delay	ms	Setting	0	1000	10	10	PWP if 0404=1

12.6.1 Port 3 Reply Timer

This setting is the maximum time delay that the KITZ202 will wait for a response from a downstream unit before performing a retry.

12.6.2 Port 3 Retries

This setting is the maximum number of retries (of the same request) that will be performed by the KITZ202 when a response from a downstream unit is not received within the Port 3 Reply Time duration. If no reply is received and the maximum number of retries have been sent, the KITZ202 issues a "Reset Remote Link" request to that address.

12.6.3 Port 3 Busy Replies

This setting is the maximum number of busy reply responses from a downstream unit (to a request for data) that will be accepted by the KITZ202. If the maximum number of busy responses has been exceeded, the KITZ202 issues a "Reset Remote Link" request to that address.

12.6.4 Port 3 Global Message Transmission Timer

This is the time delay period for transmission of globally addressed (address 255) Courier request messages. A valid global message consists of two or three identical messages sent sequentially with this time delay between the individual messages.

12.6.5 Port 3 Message Transmission Delay Timer

This is the time delay period between transmission of successive messages on Port 3. This can be used to decrease the number of messages sent to a downstream unit over a given time period and will reduce the number of busy replies received when a low number of downstream units are connected to port 3.

This setting can also be used to reduce the downstream transmission bandwidth to simplify downstream message interrogation.

12.7 Indications

Col	Row	Menu Text	Values	Cell Type	Min	Max	Step	Default	Password Protected
1C	08	IND Pwr Up Enab	Disabled	Setting	0	1	1	1	
			Enabled						
1C	0C	IND Illum Time	s	Setting	1	60	1	2	No
1C	10	IND Illuminate	Disabled	Setting	0	1	1	0	No
			Enabled						

12.7.1 Illuminate Indications on Power-Up test

This setting enables the power-up indications test.

12.7.2 Indications Test Illumination Time

This setting controls the duration that the indications will remain illuminated during the power-up and menu activated indication tests.

12.7.3 Illuminate Indications Test

This menu cell allows the indications to be tested “on the fly”.

12.8 Real Time Clock

Col	Row	Menu Text	Values	Cell Type	Min	Max	Step	Default	Password Protected
20	04	RTC Time/Date	YY:MM:DD hh:mm:ss	Data Cell				96:01:01: 00:00:00	No

12.8.1 Date and Time

This setting allows the user to read the current date and time.

12.9 Communications statistics

Col	Row	Menu Text	Values	Cell Type	Min	Max	Step	Default	Password Protected
24	04	CS Reset Totals	No	Setting	0	1	1	0	PWP if 0404=1
24	08	CS Reset Errors	No	Setting	0	1	1	0	PWP if 0404=1
24	0C	CS P0 Total Mesg		Data Cell				0	No
24	10	CS P0 Error Mesg		Data Cell				0	No
24	14	CS P1 Total Mesg		Data Cell				0	No
24	18	CS P1 Error Mesg		Data Cell				0	No
24	1C	CS P2 Total Mesg		Data Cell				0	No
24	20	CS P2 Error Mesg		Data Cell				0	No
24	24	CS P3 Total Mesg		Data Cell				0	No
24	28	CS P3 Error Mesg		Data Cell				0	No

12.9.1 Reset Communication Total Message statistics

This setting resets the total received message statistics for all communication ports.

Menu cell is visible if cell 0408 = “Advanced”.

12.9.2 Reset Communication Total Message Error statistics

This setting resets the total received error message statistics for all communication ports.

Menu cell is visible if cell 0408 = “Advanced”.

12.9.3 Port 0 communication total messages received

This data cell displays the total number of messages received on the front communication port.

Menu cell is visible if cell 0408 = “Advanced”.

12.9.4 Port 0 communication total error message received

This data cell displays the total number of messages received with errors on the front communication port.

Menu cell is visible if cell 0408 = “Advanced”.

12.9.5 Port 1 communication total messages received

This data cell displays the total number of messages received on the rear communication port 1.

Menu cell is visible if cell 0408 = “Advanced”.

12.9.6 Port 1 communication total error message received

This data cell displays the total number of messages received with errors on the rear communication port 1.

Menu cell is visible if cell 0408 = “Advanced”.

12.9.7 Port 2 communication total messages received

This data cell displays the total number of messages received on the rear communication port 2.

Menu cell is visible if cell 0408 = “Advanced”.

12.9.8 Port 2 communication total error message received

This data cell displays the total number of messages received with errors on the rear communication port 2.

Menu cell is visible if cell 0408 = “Advanced”.

12.9.9 Port 3 communication total messages received

This data cell displays the total number of messages received on the rear communication port 3.

Menu cell is visible if cell 0408 = “Advanced”.

12.9.10 Port 3 communication total error message received

This data cell displays the total number of messages received with errors on the rear communication port 3.

Menu cell is visible if cell 0408 = “Advanced”.

12.10 Address range

Col	Row	Menu Text	Cell Type	Min	Max	Step	Default	Password Protected
28	04	AR Base Address	Setting	1	254	1	1	PWP if 0404=1
28	08	AR No. of Units	Setting	0	20	1	20	PWP if 0404=1

12.10.1 Base Address

This is the base reference Courier address and is used to define the lowest Courier address that will be used (Dev 1). The unit can communicate with up to 20 consecutive Courier addresses starting at the Base Address.

12.10.2 No. of Units (Number of Downstream Units)

This is the number of consecutive Courier addresses (starting at the Base Address) with which the KITZ202 is required to communicate, the maximum being twenty. This setting can be used as a filter to improve efficiency if only a limited number of units are required.

12.11 MODBUS Dev 1 - MODBUS Dev 20

The columns 31(hexadecimal) through to 44(hexadecimal) inclusive hold the MODBUS mapping for each device address. Column 31, i.e. Device 1, corresponds to the Base address, and so on up to column 44, i.e. Device 20. Refer to section 9.4 for details of the MODBUS mapping.

12.12 Scan Time

The Minimum Scan Time (MST) is defined for each register. The value defined for a register applies to all devices, Dev 1 to Dev 20. Refer to section 9.6 for further details.

13. REFERENCES

The following documents should be considered in addition to this manual.

1. Modicon Modbus Protocol Reference Guide PI-MBUS-300 Rev D. March 1992.

2. Courier User Guide - R6512 Rev E (published by AREVA T&D)

14. GLOSSARY

Courier	A communications language developed to provide generic control, monitoring, data extraction and setting changes on remote devices (primarily on protective relays) within the substation environment.
DCE	'Data Circuit-terminating Equipment'. A device providing a communication path for use by a DTE. DCE is the standard port available on a modem.
DTE	'Data Terminal Equipment'. A device acting as a source or destination (or both) for data during a communication session. DTE is the standard port available on a PC.
IEC 60870-5 FT1.2	The communication standard which is used to transfer Courier data over RS232 connections.
K-Bus	The 64 kbps twisted pair cable used to connect Courier compatible devices and transfer Courier data.
KITZ	Interface unit for Courier slave devices, including KITZ101, KITZ102, KITZ201, KITZ202 and KITZ204.
M.O.D.	UK Ministry of Defence
MODBUS RTU	A byte-based protocol originating from Modicon company. See reference 1 in Section 13.
PC	Personal computer.
PLC	Programmable Logic Controller
RTC	Real Time Clock. Holds the device date and time
SELV circuit	A secondary circuit which is so designed and protected that, under normal and single fault conditions, its voltages do not exceed a safe value. Safe voltages are defined as less than 42.4V peak or 60V dc. (EN 60950: 1992/A5: 1998).

REPAIR FORM

Please complete this form and return it to AREVA T&D with the equipment to be repaired. This form may also be used in the case of application queries.

AREVA T&D
St. Leonards Works
Stafford
ST17 4LX
England

For : After Sales Service Department

Customer Ref: _____ Model No: _____

AREVA Contract Ref: _____ Serial No: _____

Date: _____

1. What parameters were in use at the time the fault occurred?

   AC Volts _____ Main VT/Test set

   DC Volts _____ Battery/Power supply

   AC current _____ Main CT/Test set

   Frequency _____

2. Which type of test was being used? _____
3. Were all the external components fitted where required? Yes / No
   (Delete as appropriate)
4. List the relay settings being used

   _____

   _____

   _____

5. What did you expect to happen?

   _____

   _____

   _____

   _____

continued overleaf

6. What did happen?

_____

_____

_____

7. When did the fault occur?

Instant	Yes / No	Intermittent	Yes / No
Time delayed	Yes / No	(Delete as appropriate)	
By how long?	_____		

8. What indications if any did the relay show?

_____

_____

_____

_____

9. Was there any visual damage?

_____

_____

_____

10. Any other remarks which may be useful:

_____

_____

_____

_____	_____
Signature	Title
_____	_____
Name (in capitals)	Company name

Publication: R8566C

AREVA T&D's Automation & Information Systems Business www.areva-td.com
T&D Worldwide Contact Centre online 24 hours a day: +44 (0) 1785 25 00 70 http://www.areva-td.com/contactcentre/