THE KOSMOS SERIES

RS232C + RS485 OUTPUTS OPTION

RS6

Annexe to the Instructions Manual
Edition January 1996

RS6
English

DIGITAL PANEL INSTRUMENTS *KOSMOS SERIES*

RS232C + RS485 OUTPUTS OPTION

INDEX

1. RS232C + RS485 OUTPUTS OPTION

1.1. INTRODUCTION

The MICRA models can be extended with a communication outputs card that provides the RS232C and RS485 protocols, operating in half-duplex mode with selectable transmission rates between 1200 and 9600 baud.
Only one of the outputs installed can operate at a time as selected by the user via the instrument's keyboard.

The serial outputs permit to construct a communication line through which a master device can request to one or several MICRA the transmission of data such as display value, peak, valley, tare (or offset in case of the thermometers) or a setpoint value and allows to perform remote operations such as reset of peak, valley or tare (offset) memories and modification of setpoint values.

The outputs option is fully configurable via software ; output type selection (RS232C or RS485), transmission rate (1200, 2400, 4800 or 9600 baud), address number (programmable from 00 to 99) and protocole (DITEL or ISO 1745)..
The RS485 output provides impedance matching by an internal 120Ω resistance that is connected between the lines by placing an internal plug-in jumper.

The RS6 outputs option consists of an additional card that is easily installed in the instrument by means of a plug-in connector without need for previous configurations.
Once installed, the meter includes automatically a software routine that allows to select the output, the protocole type, configure the baud rate and program the address number.

The card incorporates two telephone sockets protruding out of the rear of the meter and two leds visible from the front that indicate the selected output.

The RS6 option is supplied with the RSKOSMOS program, for use under MS-DOS, that permits to control the transmission and reception of data on the screen of a PC.
This program provides a communications menu for sending commands, asking for data, changing parameters and viewing received data on the PC screen.

To use this program, the serial output of the meter has to be configured for ISO 1745 standard communication protocol.

1.2. DESCRIPTION OF OPERATION

The MICRA models can incorporate a half-duplex RS232C or RS485 serial communications output that are selectable via software from the meter's keyboard.

The RS232C standard permits only one instrument be connected to other master device equipped with RS232C output.

The RS485 standard allows connection of up to 31 instruments in the same bus along with other master device provided with RS485 output.

Anyway the serial channel does only function when the instrument is in the run mode and it normally stands in data reception mode until reception of a message.

A valid data transmission may cause the immediate execution of an action (erase the memories of peak, valley, tare/offset) or the transmission, after approx. 250ms, of a response from the requested instrument (display value or the contents of the peak, valley, tare/offset memories).

The input / output message format is the same for RS232 and RS485 but there are some significant differences in the way in which communication takes place.

With RS232, the transmission and the reception of messages between the instrument and the D.T.E. are made on different lines. Each data line has one driver connected permanently.

With RS485, the transmission and the reception of messages is realized on both directions over the same line.
All devices in the line remain normally in reception mode and only when they send a message, they connect the driver to the bus.

The data transmission does only take place upon request of the master device that identifies each instrument by its address number. The address 00 is common to all the units, that is, a command send to this direction is simultaneously received by all the units connected to the line.

When no driver is connected to the bus, the noise generated on the line may cause false data be received by some device. The instruments will reject data not conforming the valid format.

COMMUNICATION PROTOCOL

Two communication modes are provided ; The DITEL mode utilizes a ease to use protocol, compatible with several models of DITEL instruments. The ISO mode, conforming the ISO 1745 standard, permits a more safe comunication in noisy environments since the data transfer is verified at the transmission and the reception ends.

As it can be seen in the table of functions on page 6, the DITEL protocol uses 1 or 2 bytes depending of the command type while the ISO 1745 protocol forces the use of 2 bytes per command.

DITEL PROTOCOL

The character format is 1 START bit, 8 DATA bits and 1 STOP bit.

! RECEIVING MESSAGES

A message sent from the master device to the instrument must be composed of the following sequence of ASCII characters :

(	D	d	C	C	X X	CR

• Une "(" byte [ASCII 42] of start of message.
• Two address bytes (from 00 and 99).
• One or two ASCII characters corresponding to the desired command according to the table of functions (page 5).
• In case that the command request for a modification of parameters, the new value shall be transmitted with one byte of sign (+ [ASCII 43] or ! [ASCII 45]) or a blank space [ASCII 32] followed by a block of 4 numbers in ASCII including the decimal point.
• One "CR" character of end of message [ASCII 13].

! TRANSMISSION OF MESSAGES

The data sent from the instrument as a response to a data request type command from the master device is the following:

SP	X X	CR

• One byte of blank space [ASCII 32].
• One text (requested value) consisting of a byte of sign + [ASCII 43] or ! [ASCII 45] or a blank space [ASCII 32] followed by a block of 4 numbers in ASCII code including the decimal point.
• One "CR" byte [ASCII 13] of end of message.

If the command belongs to "orders" or "changing parameters", the instrument gives no response.

Table of functions

COMAND		FUNCTION	TYPE OF FUNCTION
DITEL	ISO		
V	0V	Transmission of the minimum reading (valley) stored in the memory	Data request
P	0P	Transmission of the maximum reading (peak) stored in the memory	
T	0T	Transmission of the tare value (offset in case of thermometers)	
D	0D	Transmission of the display reading	
L1	L1	Transmission of the setpoint 1	
L2	L2	Transmission of the setpoint 2	
v	0v	Reset the valley memory	Orders
p	0p	Reset the peak memory	
r	0r	Reset the tare memory	
t	0t	Tare the display	
M1	M1	Change the setpoint 1 value	Changing parameters
M2	M2	Change the setpoint 2 value	

ISO 1745 PROTOCOL

The transmission format is 1 START bit, 7 DATA bits, 1 PARITY (EVEN) bit and 1 STOP bit.

! RECEIVING MESSAGES

The message format, as sent from the master device, must consist of the following sequence of characters :

SOH	D	d	STX	C	C	X X	ETX	BCC

• One byte SOH of start of message [ASCII 01].
• Two bytes corresponding the first to the tens and the second to the units of the instrument address number.
• One byte STX of start of text [ASCII 02].
• Two command bytes according to the table of functions.
• In case of commands that change paramenters, a block o N bytes corresponding to the new value including sign and decimal point.
• One byte ETX of end of text [ASCII 03].
• One control byte BCC calculated in the following manner :
Perform an Exclusive-OR with all bytes comprised between the STX (not inclosed) and the ETX (enclosed).

- If the obtained byte (in ASCII format) is higher than 32, it can be taken as the BCC.
- If the result (in ASCII) is lower than 32, the BCC byte will be obtained by adding 32.

ISO 1745 PROTOCOL

! TRANSMISSION OF DATA

The format of messages as sent from the instrument in response to a command from the master device is the following :

1./ In case of commands that ask for the transmission of a value (data request type) :

SOH	D	d	STX	X X	ETX	BCC

• One byte SOH of start of message [ASCII 01].
• Two address bytes.
• One byte STX of start of text [ASCII 02].
• N bytes corresponding to the requested value (including the sign and the decimal point).
• One byte ETX of end of text [ASCII 03].
• One control byte BCC calculated with the method described in page 6.

2./ In case of commands that do not imply the return of a value (command type or changing parameters) :

The instrument sends a confirmation to the master device when it receives a message.

D	d	ACK	or	D	d	NAK

• If the message has been correctly received and interpreted, the response will consist of two address bytes and one "AKC" (acknowledged) byte [ASCII 06].
• If the received message has not been well interpreted or it has been detected as to have errors, the response will be two address bytes and a "NAK" byte [ASCII 21].

When the master device transmits a message to the address of 00, the command will be received by all the instruments on the bus and there will not be any response.

2. INSTALLING THE CARD

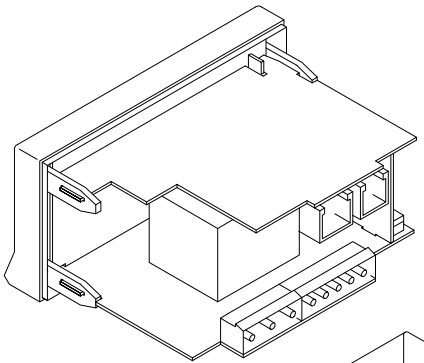


Fig. 1

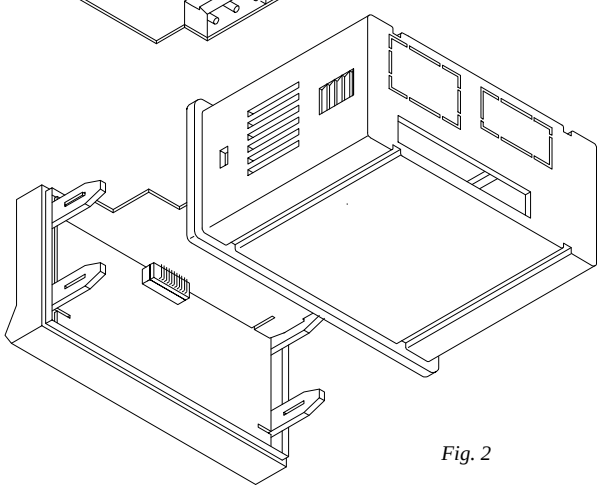


Fig. 2

2.1. INSTALLATION

The RS outputs option is installed horizontally, parallel to the main board with the component side looking downwards.
The card is attached to the meter by means of a connector that is plugged in to the rear side of the display board.
Two protrudings at each side of the front part of the circuit allows it to be installed between the slots of the upper tabs of the front cover in the same way as the main board is.
The figure 2 shows a perspective of the circuits installed (the main and the input boards have been removed for clarity) where it can be seen the connection to the display.

To install the outputs option, lift out the electronics assembly from the case and use a screwdriver to push on the junctions between the case and the grey-marked area to detach it from the case (see figure 2). The orifice will allow the RS connectors be brought out at the rear of the meter.

Install the card as indicated in the above parragraph taking care that the upper pin of the lateral circuit (input card) protrudes from the RS circuit slot as indicated in figure 1.
Insert back the instrument so that the main and the outputs boards slide over the inside tracks of the case.

2.2. CONNECTIONS

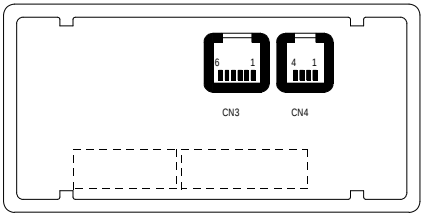


Fig. 1. Instrument rear view with RS6 option connectors

CN4 CONNECTION (RS232C)

PIN 1 = N/C
PIN 2 = TxD
PIN 3 = RxD
PIN 4 = GND

CN3 CONNECTION (RS485)

PIN 1 = -
PIN 2 = N/C
PIN 3 = B TxD/RxD
PIN 4 = A TxD/RxD
PIN 5 = GND
PIN 6 = -

Two cables of 2m, terminated with telephone plugs at one end, are supplied with each card ; one of them for the RS232C interface and one for the RS485.
It is also included a spliter for two cables that plugs in the 6-pin telephone socket, necessary in case of multiple hookup in the RS485 link.

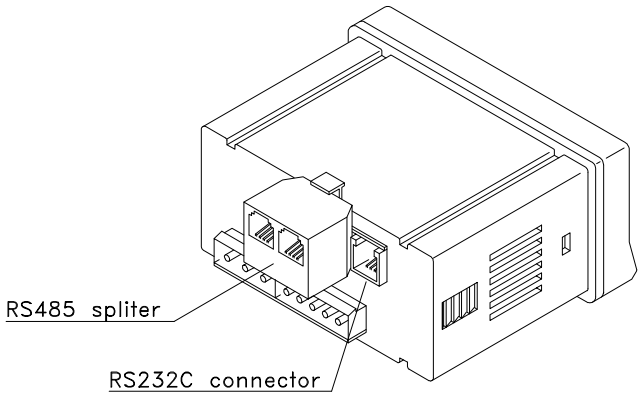
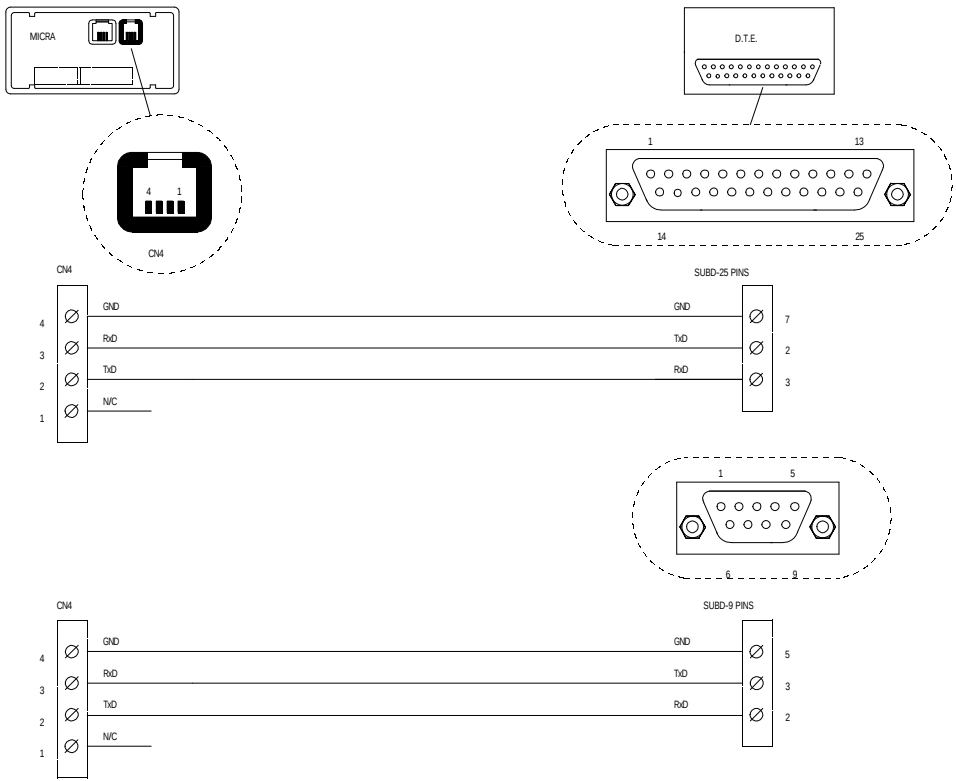
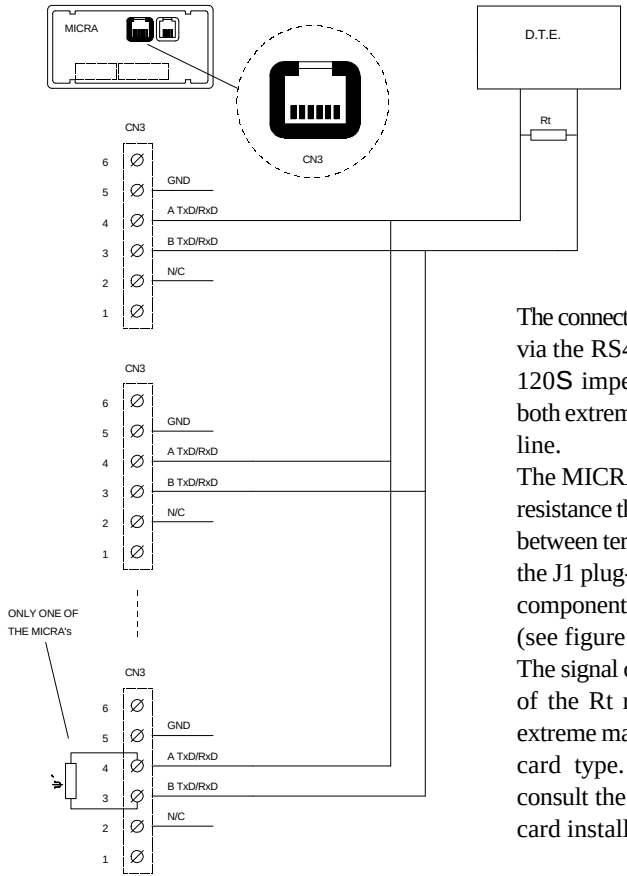


Fig. 2.

CONNECTION OF ONE MICRA TO A D.T.E. VIA RS232C



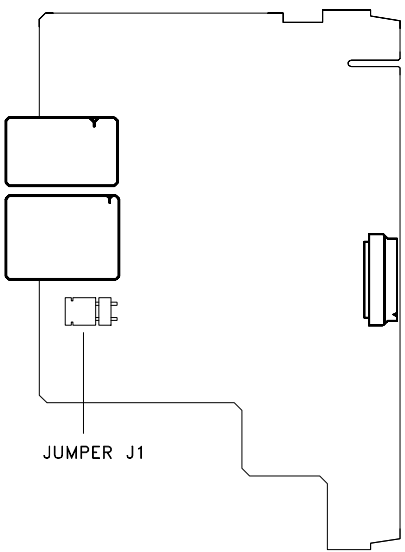
CONNECTION OF SEVERAL MICRA TO A D.T.E. VIA RS485



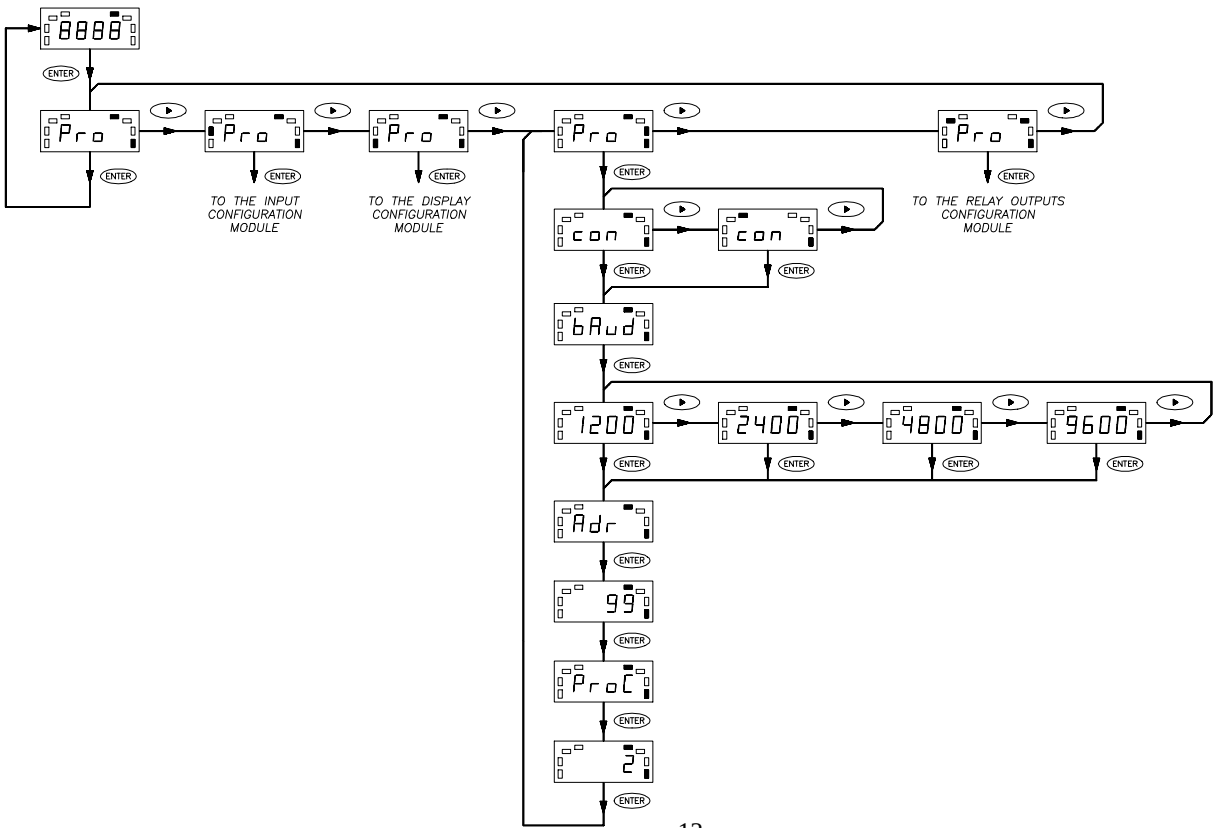
Up to 31 MICRA indicators can be connected to the D.T.E. Each instrument must have unique address between 01 and 99. All the MICRA's will also response to the address 00.
The master device then utilizes this address to send commands that have no response, such as to reset the memories of peak, valley or tare, to all the units simultaneously.

The connection of multiple instruments via the RS485 inter-face requires a 120S impedance matching (Rt) at both extremes of the communication line.
The MICRA indicators provide a Rt resistance that is internally connected between terminals 3 and 4 by placing the J1 plug-in jumper located on the component side of the outputs card (see figure at right).
The signal connections and the value of the Rt resistance at the D.T.E. extreme may vary depen-ding on the card type. It is recommended to consult the technical manual of the card installed in the equipment.

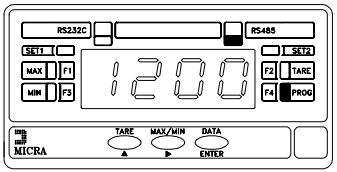
Output Option Circuit REF. 408A
(Component side)



3. OUTPUTS PROGRAMMING

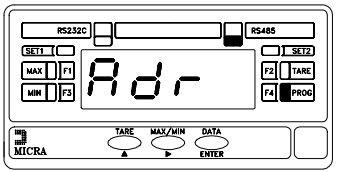


[14.1]



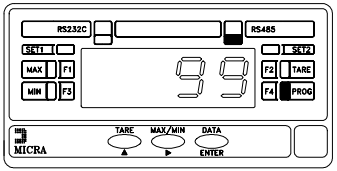
After, the display reads the previously programmed transmission rate. Available options are : **1200**, **2400**, **4800** and **9600** baud.
Press repeatedly the ▶ key to rotate around the different choices and select the baud rate that matchs the rate at which operates the existing equipment. Press ENTER to validate the entry and go to the next programming phase (fig. 14.2).

[14.2]



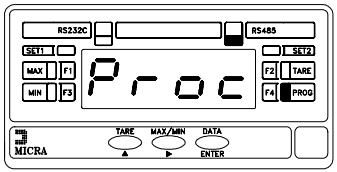
The indication given by figure 14.2 is viewed for 2 seconds before the instrument's address is allowed to be programmed on next step.
In case of multiple hookup in the same communication link, each instrument must be assigned different address numbers so that each one can be individually addressed.
After 2s or by a press of ENTER, the meter automatically enters in the phase of the address programming.

[14.3]



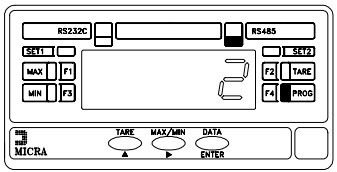
At this point the display shows a number of two digits corresponding to the previously programmed address, with the first digit in flash.
If it is wanted to change the number, press repeatedly the ▲ key to make the flashing digit rotate from 0 to 9 and once it has taken the desired value, press ▶ to advance to the next digit to be modified. Repeat this operation until the desired address appears on the display.
It can be assigned address numbers between 00 and 99. It is recommended not to give the address 00 since it is common to all indicators, that is, a command sent with address of 0 will be implemented by all the indicators connected on the bus.
Once the instrument's indentification number has been composed on the display, press ENTER to store data in the memory and go to the next programming phase (figure 15.1).

[15.1]



The figure 15.1 shows the indication previous to the next phase which, after 2s, gives access to the selection of the communications protocol between the D.T.E. and the instrument.
The instrument provides two dialogue formats ; the DITEL protocol and the ISO 1745 standard protocol. See pages 5, 6 and 7 to have a functional description of each type.

[15.2]



After 2s or by a push of "ENTER", the display shows a number (1 or 2 depending on previous selection) corresponding to the present communications protocol [**1** = DITEL protocol, **2** = ISO 1745].
If desired to change the protocol type, press ▶ to pass from one to other number. When the desired option appears on display, press ENTER to validate the selection and automatically go to the **Pro** level shown in figure 13.1.