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Declaration of Conformity

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# Magic 485F25 & F9

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Datasheet Directory

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RS 232-485

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AUTOMATIC

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RS 485

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TRANSMITTER

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ENABLE

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This Instruction Manual is supplied with the Magic 485F Adapter to provide the user with sufficient information to utilise the purchased product in a proper and efficient manner. The information contained has been reviewed and is believed to be accurate and reliable, however **Amplicon Liveline Limited** accepts no responsibility for any problems caused by errors or omissions. Specifications and instructions are subject to change without notice.

**Magic 485F Instruction Manual Part N° 859 933 74 Issue A3**

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Approved for issue by A.S. Gorbald, Operations Director

## **DECLARATION OF CONFORMITY**

**AMPLICON LIVELINE LIMITED  
CENTENARY INDUSTRIAL ESTATE  
HOLLINGDEAN ROAD  
BRIGHTON BN2 4AW UK**

We declare that the product(s) described in this Instruction Manual perform in conformity with the following standards or standardisation documents:

**Electro Magnetic Compatibility (EMC):**

EN55022:1995	Emission Standard
BS EN50082-1:1992	Generic Immunity Standard
EMC Directive	89/336/EMC



**Jim Hicks, I. Eng, FIEIE  
Managing Director  
Amplicon Liveline Limited**

## MAGIC 485F

### 1 INTRODUCTION

#### 1.1 General Description

The Magic 485F 'MAGIC converter' transfers data between RS232 & RS485 networks. The unit is 'magic' in that, unlike conventional converters, it does not require the RTS signal to control RS485 transmitter turnaround. Instead the RS485 transmitter is enabled whenever a valid start bit is detected on the RS232 input. This feature can be very useful when connecting RS232 based modems, or other systems that do not support RTS handshaking to RS485 multidrop networks.

The data conversion process changes only electrical levels and the pin-out configuration is in accordance with the appropriate standards. As default the unit is supplied for the RS232 host device configured as Data Terminal Equipment (DTE) but can be changed by jumpers to a Data Communication Equipment (DCE).

RS485 multi-drop operation allows up to 32 devices to be connected in a simple network on a single serial bus. The transmitter has a tri-state output and is automatically disabled to allow reception over the same wire pair.

DC power for the Magic 485F Adapter must be applied from an external source. The DC power lines plus the RS422/485 data and control signals are connected through a pluggable 8 way screw terminal assembly at the free end of the Adapter.

#### 1.2 The Products Described in this Manual

The 485F range of boards share some common circuitry and features and are referred to in this manual either generically or individually:

485F	Refers to both boards
485F25	Refers to the 25 way D-type version only
485F9	Refers to the 9 way D-type version only

#### 1.3 Circuit Operation

The Magic 485F Adapter converts the electrical levels of signals from those specified for RS232 to the RS422/485 levels and vice versa. This conversion is done via intermediate TTL levels.

##### RS232 $\longleftrightarrow$ TTL

U2 is a MAX2322E (or equivalent) 5 V powered CMOS RS232 Driver/Receiver. A DC-DC converter is built into the chip to provide a typical  $\pm 9$  V output swing of the RS232 lines.

This receiver accepts signal at RS232 levels and converts these signals to TTL levels for internal use. The first receiver accepts the transmitted data (TxD) signal from the RS232 port and translates it to TTL levels for onward conversion by the RS422/485 driver.

This line is then fed to a FPGA device, U4, which monitors the data coming into the unit. If the unit detects a valid start bit, the device enables the transmitter and disables the receiver of the MAX491 transceiver chip U1. Once the packet of data is transmitted and the turnaround time has passed, as set by SW1, the unit reverts to receive mode.

### **RS422 / 485 $\longleftrightarrow$ TTL**

Conversion between the differential signal levels of RS422/485 and the internal TTL levels is performed by the MAX491 (or equivalent) transmitter and receiver U1. In normal operation the unit is in receive mode and data is transferred directly to the RS232 port.

When the unit transmits data it is enabled by the FPGA and data flows out on to the RS485 bus. The unit is configured to echo data back to the receive port, however this can be disabled during transmission by the setting of Jumper J3.

### **DTR, DSR and DCD**

The RS232 port DSR and DCD inputs are linked to the DTR output to ensure that the RS232 operation does not lock up awaiting a handshake signal.

### **Power Regulator**

Q1 is a low dropout +5 volt regulator to supply the Magic 485F Adapter circuits. The limits of the input voltage to this regulator are  $>+5.0$  VDC and  $<+12.0$  VDC. Over this range, the output is between  $+4.8$  and  $+5.2$  VDC.

## **1.4 Technical Support**

Should the Magic 485F Adapter appear defective, please check the information in this manual to ensure that the product is being correctly applied.

If an application problem persists, please request Technical Support on one of the following numbers:

Telephone:	UK	01273 608 331
	International	+44 1273 608 331
Fax:	UK	01273 570 215
	International	+44 1273 570 215
E mail Internet		<a href="mailto:support@amplicon.co.uk">support@amplicon.co.uk</a> <a href="http://www.amplicon.co.uk">www.amplicon.co.uk</a>

## **1.5 Repairs**

If the Magic 485F Adapter requires repair then please return the goods enclosing a repair order detailing the nature of the fault. If the product is still under warranty, which is for a period of 12 months from the date of shipment, there will be no repair charge unless the fault has been caused by misuse.

For traceability when processing returned goods, a Returned Materials Authorisation (RMA) procedure is in operation. Before returning the goods, please request an individual RMA number by contacting Amplicon Technical Support by telephone or fax on the above numbers.

Give the reason for the return and, if the goods are still under warranty, the original invoice number and date. Repair turnaround time is normally five working days but the Service Engineers will always try to co-operate if there is a particular problem of time pressure.

Please mark the RMA number on the outside of the packaging to ensure that the package is accepted by the Goods Inwards Department.

Address repairs to:                    Customer Services Department  
    AMPLICON LIVELINE LIMITED  
    Centenary Industrial Estate  
    Brighton, East Sussex  
    BN2 4AW  
    England

## 2 INSTALLATION INSTRUCTIONS

### 2.1 Requirements of Host Equipment

The Magic 485F25 Adapter can be plugged into any device with an RS232 port terminating in a 25 way 'D' type male connector (DB-25). If the host device is equipped with a 25 way connector, it is normally male, and the Magic 485F25 Adapter can be directly plugged into this port.

The 485F9 Adapter can be plugged into any device with an RS232 port terminating in a 9 way 'D' type male connector (DB-9).

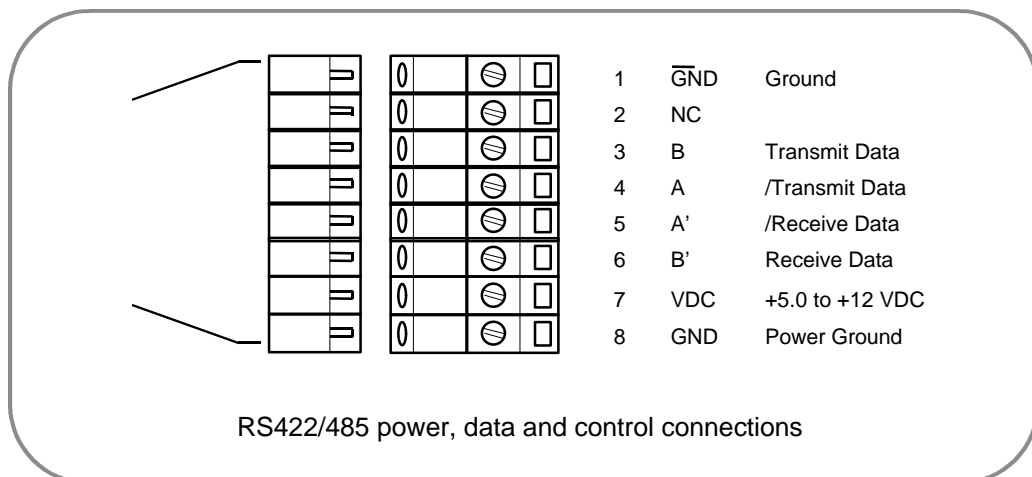
### 2.2 Connections to the Magic 485F Adapter

Connections are made to the Magic 485F Adapter at each end. The RS232 connections are automatically made when the Adapter is plugged into the port, and the RS422/485 data, control and power connections must be made through a pluggable 8 way screw terminal connector assembly at the free end.

#### RS422/485 Connections on 8 way Pluggable Terminal Strip

The DC power input, RS485 transmission turnaround external control signal and RS422/485 data signal connections are made via an eight way screw terminal connector. The supplied connector can be unplugged from the Adapter for ease of making the cables without removing the Adapter from the port.

The connections are compatible with other RS485 Adapters in the Amplicon range, and are shown in Figure 2.2 below. The diagram shows the connector as viewed from the top face of the Magic 485F Adapter. The abbreviated function names are printed on the printed circuit board below the fixed part of the connector.



**FIGURE 2.2 RS422/485 CONNECTIONS**

## 2.3 Configuration of Magic 485F Adapter Options

Configuration of the options is undertaken by the setting of links and switches on the baseboard. For convenience, the plastic case is supplied in two parts and should only be clipped together when any configuration changes have been made. Operational tests can be performed before the case is fitted.

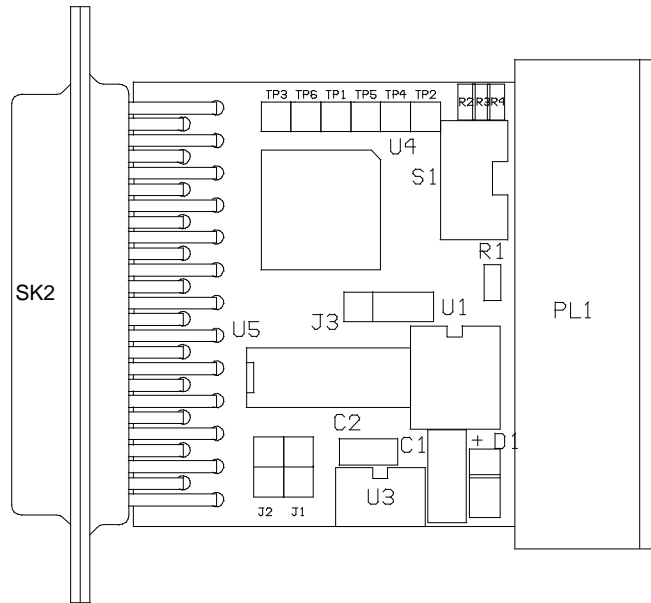


FIGURE 2.1 485F25 BOARD LAYOUT AND JUMPER POSITIONS

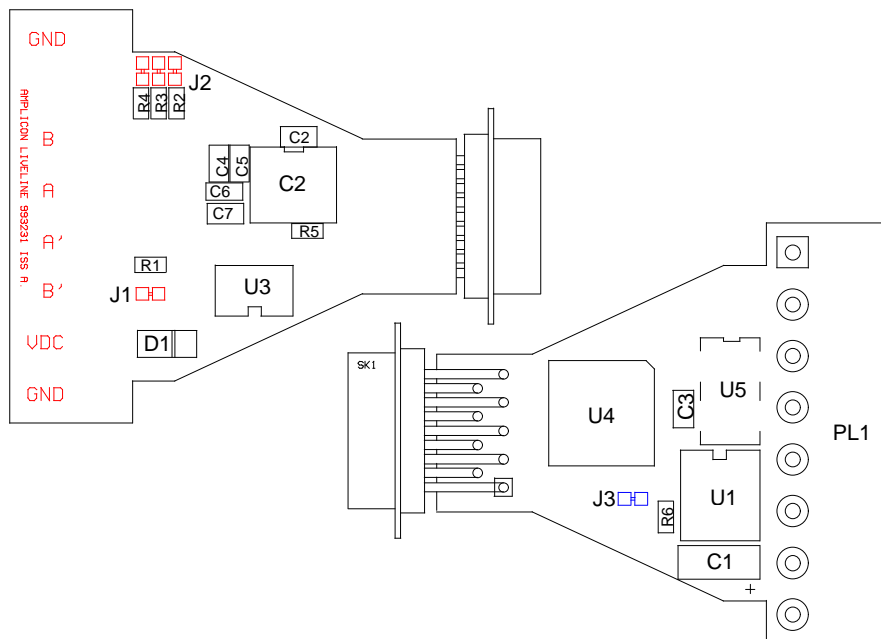


FIGURE 2.2 485F9 BOARD LAYOUT AND LINK POSITIONS

## 2.4 Configurable Options

### Selection of DCE or DTE (485F25 only)

The unit, as supplied from the factory, is configured to interface directly to a DTE i.e. a PC or dumb terminal . In the majority of applications this will be correct. This is set by the Jumpers J1 to J2. If required the unit can be converted to connect to a DCE e.g. a modem, by the repositioning of J1 and J2, as detailed below.

Link	Function
J1 1-2 & J2 1-2	RS232 connector wired as PC serial port (default factory setting)
J1,1- J2,1 & J1,2 - J2,2	RS232 connector wired as Modem serial port

### Selection of Local Echo On/Off in Half Duplex Operation

The factory default configuration of link (J3) fitted causes the transmitted data to be echoed to the receiver in half duplex operation. If this echo is not required, the link can be removed.

For full duplex operation, the link J3 must be in its default condition for the receiver to be continuously enabled. Echo back is not appropriate to full duplex operation.

Link		Function
<b>485F25</b>	<b>485F9</b>	
J3 1-2	J3 linked	RS485 local echo disabled (default factory setting)
J3 2-3	J3 cut	RS485 local echo enabled, transmitted character echoed back to receiver

### Transmission Line Termination

For proper operation of the RS422/485 bus in full or half duplex, multi-drop or point-to-point communication, it is recommended that termination be applied to the receiver end of the data lines. The simplest form of termination is line-to-line with typically a 120  $\Omega$  resistor across the differential input.

In a multi-drop system, the terminator resistor is only required at the device receiver located at the far end of the cable. If this is in half duplex operation, then both ends of the bus cable are equipped with receivers (transceivers) so termination is necessary at both ends. Although the Magic 485F Adapter will drive loads as low as 27  $\Omega$ , in general, RS485 transmitter circuits are specified as being capable of driving a minimum load resistance of 60  $\Omega$ , so no more than two terminator resistors should be connected to any one bus.

The Magic 485F Adapter is equipped with a terminator resistor for the receiver input pair. This resistor is connected into circuit by the setting of switch SW1 Bit 4 on the 485F25 or solder link J1 on the 485F9. Factory default settings are with the receiver input termination in circuit (SW1-4, on) for the 485F25, and (J1 solder link tracked) for the 485F9. It can be removed from the circuit by setting SW1-4 to off on the 485F25 or cutting the fine track connecting the pads of J1 on the 485F9.

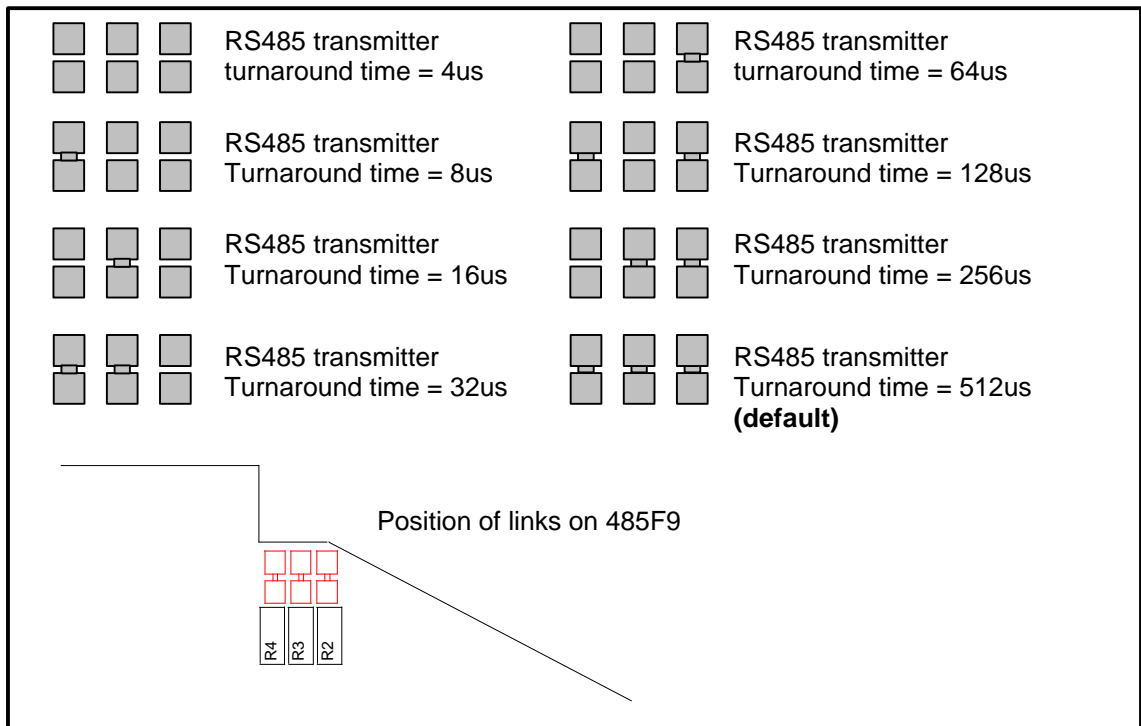


## 2.5 Transmitter Turnaround Delay

By the nature of the operation of the unit there will be a time delay in the switching of the unit from transmit to receive. This time can be fine tuned to the particular installation and the length of the cable run, resulting in quicker operation. This operation can only be tested on a trial basis and is accomplished by the setting of SW1 Bits 1-3 on the 485F25 as described in Table 2.1, and cutting or resoldering the tracks between the pads of J2 on the 485F9 as shown in Figure 2.3.

1	2	3	4	Function
X	X	X	ON	RS485 termination on, termination resistor fitted
X	X	X	OFF	RS485 termination off, termination resistor not fitted
OFF	OFF	OFF	X	RS485 transmitter turnaround time = 4 us.
ON	OFF	OFF	X	RS485 transmitter turnaround time = 8 us.
OFF	ON	OFF	X	RS485 transmitter turnaround time = 16 us.
ON	ON	OFF	X	RS485 transmitter turnaround time = 32 us.
OFF	OFF	ON	X	RS485 transmitter turnaround time = 64 us.
ON	OFF	ON	X	RS485 transmitter turnaround time = 128 us.
OFF	ON	ON	X	RS485 transmitter turnaround time = 256 us.
ON	ON	ON	X	RS485 transmitter turnaround time = 512 us. <b>(default)</b>

**TABLE 2.1 485F25 BIT SWITCH SETTINGS AND FUNCTION**



**FIGURE 2.3 485F9 LINK SETTINGS AND FUNCTION**

### **2.6 Power Requirements**

The Magic 485F Adapter must be powered from an external power supply providing a positive output of between +5.0 VDC and +12.0 VDC. This auxiliary power supply unit should be capable of sourcing at least 100 mA for each 485 Adapter that it supplies. Within this constraint, as many 485 Adapters as are required can be fed from a single supply. The Amplicon Mains adapter meets this requirement and the U.K. version is available under order code 919 135 69. See paragraph 2.4.1 for information on connecting this mains adapter to the Magic 485F terminals.

The Magic 485F Adapter is fitted with an eight way pluggable terminal strip at its free end, and the power supply should be connected to terminals 7 and 8. Terminal 8 is Ground or negative, terminal 7 is the positive supply. **OBSERVE POLARITY** when powering the adapter. If the polarity is incorrect, the Magic 485F Adapter will not operate, but is protected against damage.

### **2.7 Connecting the Amplicon Mains Adapter**

The optional mains adapter plugs directly into a 3 pin, 13 A mains socket (U.K. version), or must be fitted with a suitable plug (International version). The mains supply voltage must be 230 VAC  $\pm 10\%$ , 50 Hz. The DC output is by a two-wire cable approximately 2 m in length. This cable is terminated in a moulded connector which must be cut off and discarded. The two wires can then be parted and stripped back about 6 mm. The black wire is negative and goes to terminal 8 (GND) of the Magic 485F Adapter, and the black wire with a white stripe is positive and goes to terminal 7 (VDC). Section 2.8 gives the Amplicon order codes for the above adapters.

### **2.8 Optional Accessories**

#### **U.K. Mains Adapter Power Supply**

<b>Amplicon Order Code</b>	<b>Description</b>	<b>Function</b>
919 135 69	Plug-in mains Adapter	Provides +9 VDC at 200 mA to power one or two Magic 485F Adapters. Mains operated 230/240 VAC. Integral 3 pin, 13 A, UK style plug. Two wire output cable of 2 m length. Moulded connector to be removed for screw terminal connection to Magic 485F Adapter. Wire with white stripe is positive.

The U.K. Mains Adapter complies with the requirements of British Standard BS415

#### **International Mains Adapter Power Supply**

919 448 69	Wired-in mains Adapter	Provides +9 VDC at 200 mA to power one or two Magic 485F Adapters. Mains operated 220/230 VAC. Two wire (Brown - live, blue - neutral), 1.5 m length mains input cable. Two wire output cable of 2 m length. Moulded power connector to be removed for screw terminal connection to Magic 485F Adapter. Wire with white stripe is positive.
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### 3 TECHNICAL SPECIFICATION

The technical characteristics of the Magic 485F Adapter are in accordance with the following electrical and physical specifications.

**Except where otherwise noted, all specifications are typical at 25° C**

#### Electrical Specification

Supply Voltage	+5.0 VDC to +12.0 VDC from external supply via terminal strip
Supply Current	50 mA plus current drawn by output loads 100 mA fully loaded
RS232 'High' signal input	+2.4 to +30 V
RS232 'Low' signal input	-30 to +0.8 V
RS232 Input Resistance	5 k $\Omega$
RS232 'High' signal output	+9 V
RS232 'Low' signal output	-9 V
RS232 Output Resistance	300 $\Omega$
RS422/485 Input sensitivity	0.2 V
RS422/485 Input Hysteresis	70 mV
RS422/485 Output drive	1.5 V minimum, fully loaded
RS422/485 Output load	27 $\Omega$ minimum
RS422/485 Receiver I/P Termination	120 $\Omega$ resistor across differential input terminals. Can be disconnected by switching SW1-4
Data Rate	120 kBd max
RS232 Connector	25 way DB-25 female connector with screw-locks
RS422/485 Connector	8 way pluggable screw terminal assembly

#### Physical/Environmental Specification

	<u>Module with connector</u>	<u>Packed</u>
Size	67 x 53 x 20 mm	215 x180 x 80 mm
Weight	60 gm	250 gm
Temperature Range	<u>Operating</u> 0° C to +60° C	<u>Storage</u> -20 to +70° C