

**Note: VOLTAGE LEVEL CONVERTER ONLY, INDEPENDENT OF PROTOCOL.**

## **Module Functionality:**

The unit is factory configured to interface to a standard IBM PC RS232 9 pin port with a “**straight through**” cable. The unit only uses 2 or 3 lines (plus ground) of the RS232 interface. Rx and Tx are always used. It is possible to permanently drive the RS485 transmitter (used in full duplex mode) or to allow a transmitted character to force the transmitter to be enabled and allow the reversion to a high impedance output after a fixed period (See **RS485 Transmitter Enable**). Some RS232 ports require the CTS and/or the DSR lines to be enabled. The RS232/485 converter provides 2 pull up resistors to 10V to allow this.

For full duplex operation the transmit line pair is A1/B1 and the receive line is A2/B2. For half duplex operation the active line pair is A1/B1.

## **Termination Resistors** (supplied already installed)

R18 is the termination resistor for A2/B2 - the receive line pair for full duplex communication

R19 is the termination resistor for A1/B1 - the transmit line pair for full duplex communication, and the line pair used for half duplex communication. The units use SFR16J resistors and are supplied with 120 ohm resistors. If the unit is not at either end of a line termination then the resistors should be removed.

## **Ground Reference Resistors** (supplied already installed)

In order to allow RS485 communications across multiple units without violating the common mode voltage restrictions of the RS485 drivers each unit needs to be referred to the same ground. (Refer to application note RS-485: A Primer. \*) The line pair A1/B1 shield S1 is referenced to ground through a 100 ohm MRS25F resistor, R11. R11 is mounted internally on sockets and may be removed if so desired. The line pair A2/B2 shield S2 is referenced to ground through a 100 ohm MRS25F resistor, R14. R14 is mounted internally on sockets and may be removed if so desired.

\*Available on request by email from [techsupport@weidmuller.ca](mailto:techsupport@weidmuller.ca) or visit [www.weidmuller.ca](http://www.weidmuller.ca) → Products → Signal Interface Products → Application Notes.

## **Failsafe Resistors** (not supplied)

Although the receivers on the RS232/485 Converter are failsafe, additional failsafe resistors (SFR16J) may be installed on sockets internal to the unit. Line pair A1/B1 has a pull up resistor R13 and a pull down resistor R12. Line pair A2/B2 has a pull up resistor R16 and a pull down resistor R15.

## **Failsafe Operation and the 991635/991676/991677**

When an input on the RS485 line is not connected to a low impedance source (all the drivers on the line are in high impedance or not connected) the floating signal may induce a spurious signal on the RS232 side of RS485 receiver which may in turn lead to spurious interrupts and erroneous messages received by the UART. Failsafe operation in RS485 means that the inputs have resistor biasing to prevent this condition. The devices used on the above Weidmuller products all include integral biasing resistors of a approximately 100K. Use of a termination resistor may defeat the inherent failsafe biasing. The user has two options: Remove the termination resistors which may not be required at lower transmission frequencies and shorter lengths or installation of additional failsafe resistors in locations internal to the above units.

It is possible to install these failsafe resistors in each module, but the number of modules on a network will affect the resistor value (since they are all in parallel) and it becomes tedious to install all the resistors. Since each module has default failsafe affected only by the termination resistor, if the module with the termination resistor is removed from the circuit this internal failsafe would come into operation. It is intuitive that the additional failsafe resistors should be included only in the two units with line termination resistors.

The calculation of the values for the resistors is based on maintaining 200mV across the line termination resistor. The network consists of a resistor (R13 or R16) to 5V connected to the "A" input of the RS485 and to one end of the line termination resistor. The other side of the line termination resistor is connected to the "B" input of the RS485 input and to a pull-down resistor (R12 or R15) to ground. These resistors are installed internal to the Weidmuller units and are mounted in resistor sockets. The voltage across a 120ohm line termination resistor is given by  $(120 * 5)/(2R+120)$  where R is the value of the pull-up or pull-down resistors, assuming identical values for the pull-up and pull-down resistors. This must be greater than 200mV

$$(120*5)/(2R+120) > 0.2$$

$$600 > 0.4R + 24$$

$$1440 > R$$

The lower the value of R, the greater the noise immunity, but the higher the current drawn by the system. The nearest standard value is 1K2. Since there are 2 resistors in parallel the effective value under normal circumstances is 600 ohms.

The user should install SFR16J 1K2 resistors in locations R12 and R13 for half-duplex operations and in R12, R13, R15 and R16 for full duplex operations. The user is required to remove a side plate of the module housing to access these locations.

**Note:**

To determine proper jumper settings, user must refer to the pin out for the RS232 cable being used in conjunction with the pin out of the RS232 device. Once that is done, the relevant settings may be made by matching the PIN outs or flow of data using **Tables 1 & 5**.

**Jumper Settings & Functions**

Jumper #	Position 1-2	Position 2-3	Removed	Notes
<b>J1</b>	RS-485 transmitter always ON / Full Duplex	Auto Enable RS-485 transmitter / Half Duplex	RS-485 transmitter controlled by DTR or RTS / Half Duplex	See table 2 & 3 for more info.
<b>J2</b>	Host DTR Enables RS-485 transmitter / Half Duplex	Host RTS Enables RS-485 transmitter / Half Duplex	RS-485 transmitter auto enable or Full Duplex	See table 2 & 3 for more info.
<b>J3</b>	Data out of module through PIN 2	Data out of module through PIN 3	<b>Not Allowed</b>	See table 5 for more info
<b>J4</b>	Data In module through PIN 3	Data In module through PIN 2	<b>Not Allowed</b>	See table 5 for more info.
<b>J5</b>	Host DTR controls RS-485 transmitter through module PIN 4	Host DTR controls RS-485 transmitter through PIN 6	Non DTR controlled / Full Duplex	See table 2 & 3 for more info.
<b>J6</b>	Host DSR Enabled from module PIN 6	Host DSR Enabled from module PIN 4	Host DSR not Enabled	See table 5 for more info.
<b>J7</b>	Host RTS controls RS-485 transmitter through PIN 7	Host RTS controls RS-485 transmitter through PIN 8	Non RTS controlled / Full Duplex	See table 2 & 3 for more info.
<b>J8</b>	Host CTS Enabled from module PIN 8	Host CTS Enabled from module PIN 7	Host CTS not Enabled	See table 5 for more info.
<b>J9</b>	Echo Disabled (Half Duplex)	Full Duplex	Echo Enabled (Half Duplex)	See table 2 & 4 for more info.
<b>J10</b>	Full Duplex	Half Duplex	<b>Not Allowed</b>	See table 2 & 4 for more info.

Table 1 **PIN X (on DB9 Connector)**

**RS-485 Configurations**

**Full Duplex**

i.e. Transmitter always enabled.

Jumper #	Location
J10	1-2
J9	2-3
J1	1-2
J2	Removed
J5	Removed
J7	Removed

Table 2

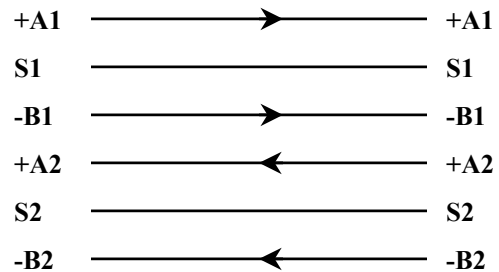


Fig 1. Data Flow in Full Duplex operation

## Half Duplex

Jumper #	RS-485 transmitter Auto enable		RS-485 Transmitter controlled by Host's DTR through WTL Pin 4	RS-485 Transmitter controlled by Host's DTR through WTL Pin 6	RS-485 Transmitter controlled by Host's RTS through WTL Pin 7	RS-485 Transmitter controlled by Host's RTS through WTL Pin 8
	Baud rate	R20 Value				
	1200	1.2M				
	2400	640K				
	4800	320K				
	9600 (default)	174K				
	19200	80K				
	115200	40K				
J1	2-3		Removed	Removed	Removed	Removed
J2	Removed		1-2	1-2	2-3	2-3
J5	Removed		1-2	2-3	Removed	Removed
J7	Removed		Removed	Removed	1-2	2-3

Table 3

Jumper #	Location	
J10	2-3	
J9	Echo Enable	Echo Disable
	Removed	1-2

Table 4

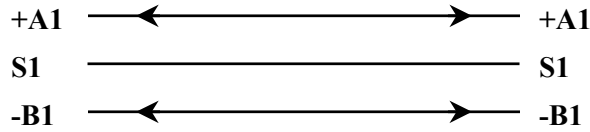


Fig.2 Information Flow for Half Duplex operation

## RS-232 Configurations

All references are to the DB9 connector on the Weidmuller module.

PIN functions are determined by the flow of data on PINs 2 & 3 on the Weidmuller RS232 module.

Description	Information Flow	Pin #		Pin #		Comments
		Jumper settings		Jumper settings		
		J3/1-2	J4/1-2	J3/2-3	J4/2-3	
		1		1		Not Used
From RS-485 to RS-232	Data out of module (Tx)	2		3		
From RS-232 to RS-485	Data into module (Rx)	3		2		
Control of RS-485 transmitter by Host	Control Data into module (DTR)	4		6		See half duplex RS-485 configuration
GND		5		5		
Host Control	Control Data out of module	6		4		When Host requires DSR enabled (otherwise remove)
		DSR Enabled J6/1-2	DSR Not Enabled J6 removed	DSR Enabled J6/2-3	DSR Not Enabled J6 removed	
Control of RS-485 transmitter by Host	Control Data into module (RTS)	7		8		See half duplex RS-485 configuration
Host Control	Control Data out of module	8		7		When Host requires CTS enabled (otherwise remove)
		CTS Enabled J8/1-2	CTS Not Enabled J8 removed	CTS Enabled J8/2-3	CTS Not Enabled J8 removed	
		9		9		Not used

Table 5

### Default Settings:

J2 to J8 /1-2 (IBM PC with direct connection cable)  
DTR enabled, DSR and CTS enabled with pull up resistor.

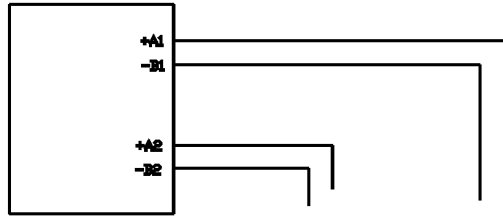
J9/2-3 Full Duplex

J10/1-2 Full Duplex

FULL DUPLEX

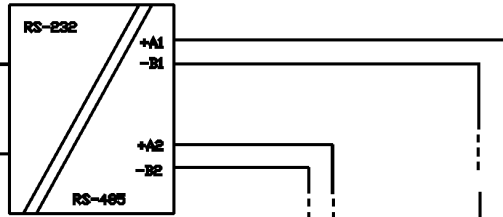
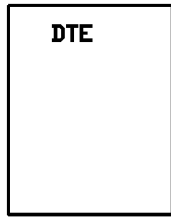
M  
A  
S  
T  
E  
R

HOST/  
CONTROLLER  
RS-485



OR

USER'S  
RS232  
DEVICE

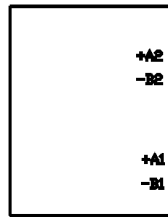


991635  
MASTER

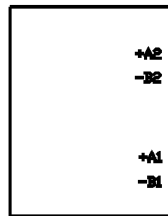


S  
L  
A  
V  
E  
S

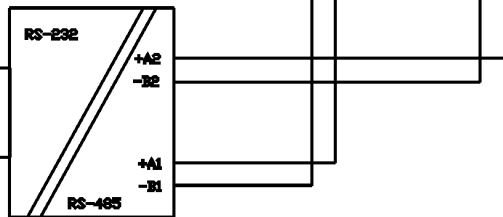
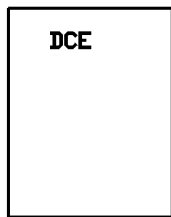
OTHER  
RS485  
DEVICE  
(SLAVE)



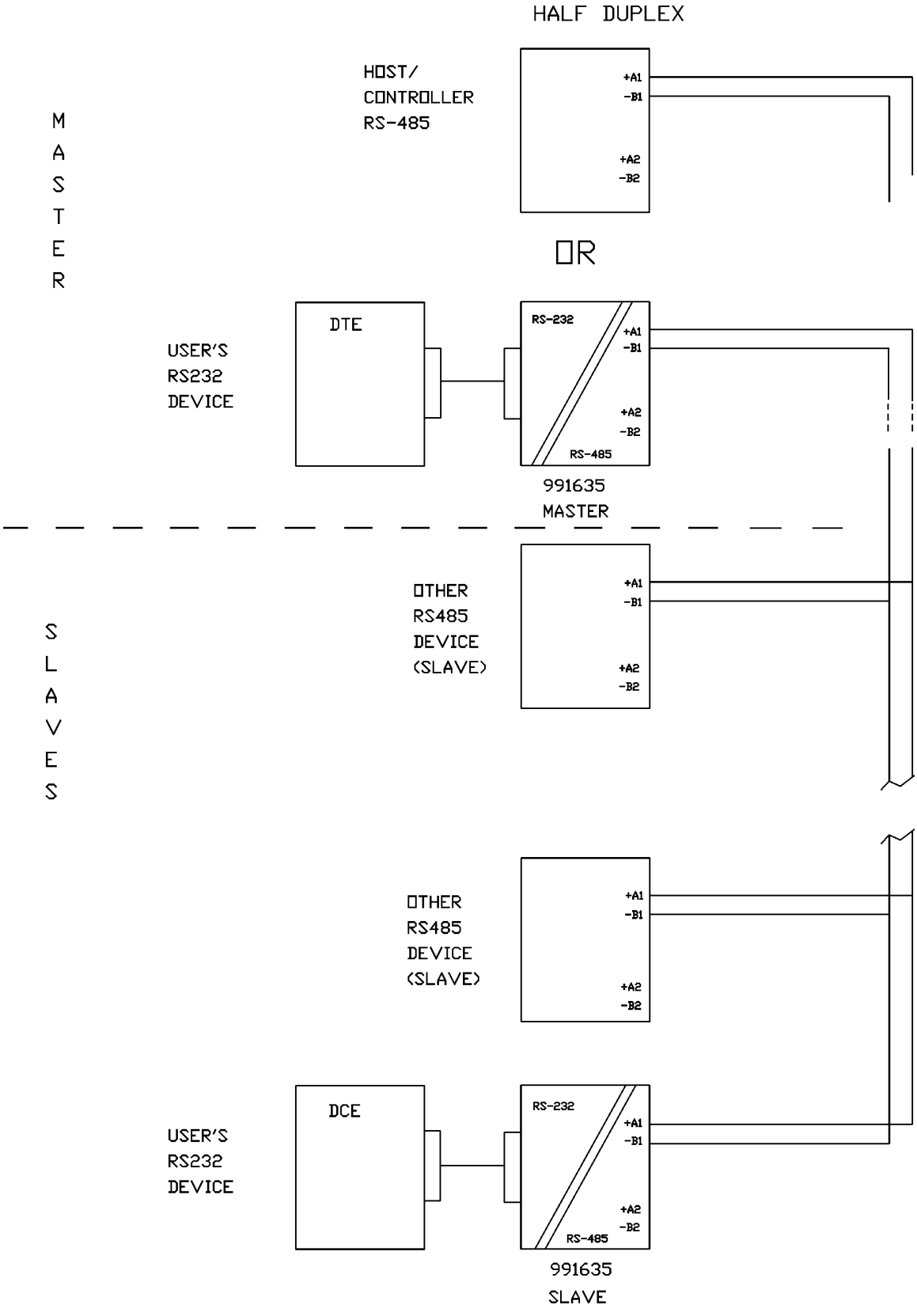
OTHER  
RS485  
DEVICE  
(SLAVE)



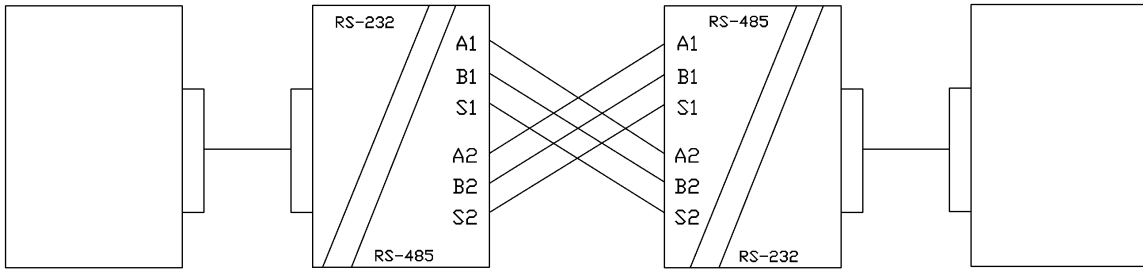
USER'S  
RS232  
DEVICE



991635  
SLAVE

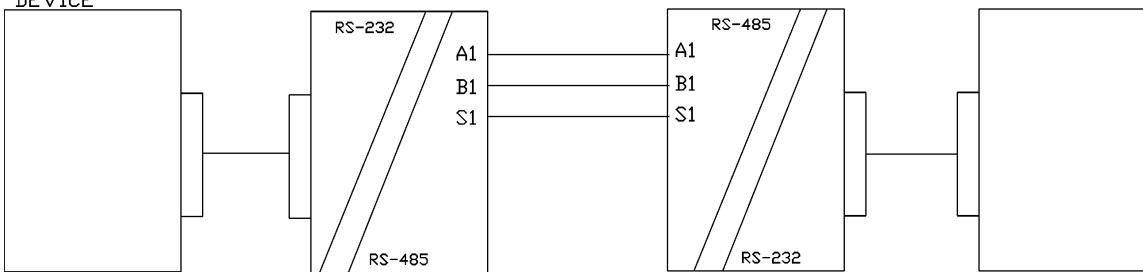


USER'S  
RS-232  
DEVICE



USER'S  
RS-232  
DEVICE

Full Duplex



Half Duplex