

COM-5101 SIGNAL/POWER CONDITIONING & RS422 INTERFACE

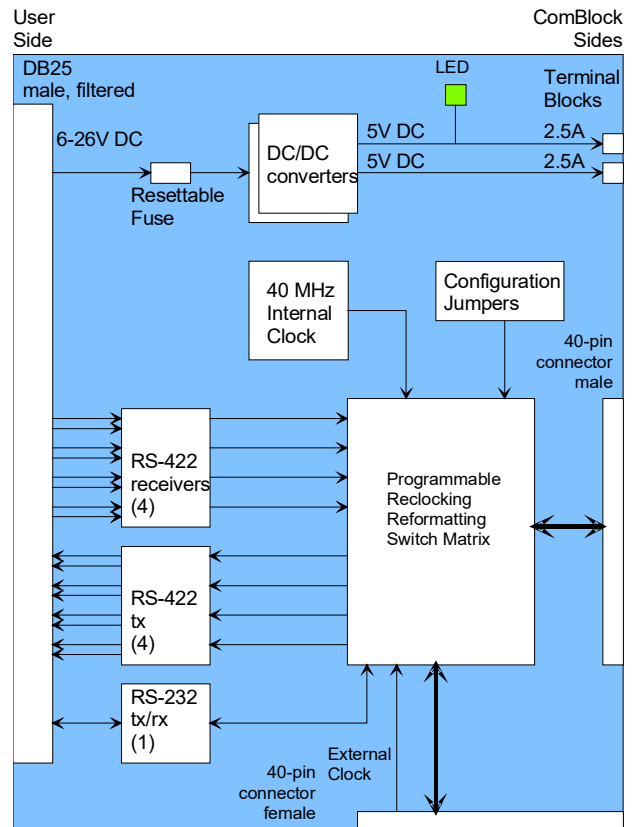
Key Features

- Support functions for Comblock assembly:
 - DC/DC converter for extended supply range.
 - RS422 interface for longer cable connections.
 - 40 MHz clock as reference processing clock for FPGAs.
 - Signal conditioning for easier interfacing with binary streams (data/clock).
- DC/DC converter:
 - Input supply: 6 – 26V.
 - Vcc1 output: 5V 2.5A max.
 - Vcc2 output: 5V 2.5A max.
 - Reverse voltage protection.
 - Resettable fuse.
- RS-422:
 - 4 differential input signals
 - 4 differential output signals
- RS-232:
 - 1 full duplex link for monitoring & control.
- Connectorized:
 - DB25 on user side
 - Two standard 40-pin 2mm dual row connectors on the ComBlock sides.

For the latest data sheet, please refer to the **ComBlock** web site: www.comblock.com/download/com5101.pdf. These specifications are subject to change without notice.

For an up-to-date list of **ComBlock** modules, please refer to www.comblock.com/product_list.htm.

Block Diagram



Electrical Interface

DB25 Module Interface (J1)	Definition
Pins 1,2,14	Ground
Pins 3,4,15,16	Input supply V _{IN} Range 6 – 26VDC
Pin 5	RS_232_TX RS-232C Transmit (O). Typically used for ComBlock monitoring and control: asynchronous serial, 115 Kbaud/s. 8-bit, no parity, one stop bit. No flow control. However, the actual signal definition may be different depending on the configuration option.
Pin 17	RS232_RX RS-232C Receive (I). Typically used for ComBlock monitoring and control: asynchronous serial, 115 Kbaud/s. 8-bit, no parity, one stop bit. No flow control. However, the actual signal definition may be different depending on the configuration option.
Pins 13,25	RS-422 differential receive pair 1 (I). Includes 100 Ohm termination and 1KOhm pullup/pulldown.
Pins 12,24	RS-422 differential receive pair 2 (I). Includes 100 Ohm termination and 1KOhm pullup/pulldown.
Pins 11,23	RS-422 differential receive pair 3 (I). Includes 100 Ohm termination and 1KOhm pullup/pulldown.
Pins 10,22	RS-422 differential receive pair 4 (I). Includes 100 Ohm termination and 1KOhm pullup/pulldown.
Pins 9,21	RS-422 differential transmit pair 1 (O).
Pins 8,20	RS-422 differential transmit pair 2 (O).
Pins 7,19	RS-422 differential transmit pair 3 (O).
Pins 6,18	RS-422 differential transmit pair 4 (O).
40-pin Male Connector (J6)	Definition
CLK	40 MHz reference clock (O) LVTTTL, 0-3.3V. Pin A1.
Programmable signal definition	LVTTTL, 0-3.3V. Interface compatible with most ComBlocks. Refer to connection matrix for details. Mostly used for output signals.
M&C_TX	Monitoring & Control chain (O) LVTTTL, 0-3.3V. Pin A18
M&C_RX	Monitoring & Control chain (I) LVTTTL, 0-3.3V. Pin B18

40-pin Female Connector (J2)	Definition
CLK_IN	40 MHz reference clock (I) LVTTTL, 0-3.3V. Pin A1.
Programmable signal definition	LVTTTL, 0-3.3V. Interface compatible with most ComBlocks. Refer to connection matrix for details. Mostly used for input signals.
M&C_RX	Monitoring & Control chain (I) LVTTTL, 0-3.3V. Pin A18
M&C_TX	Monitoring & Control chain (O) LVTTTL, 0-3.3V. Pin B18

The maximum peak throughput on each RS422 line is 10 MHz. (Maximum interface speed is 2 samples every 200 ns).

Operation

The COM-5101 can be configured in many ways by selecting a firmware configuration option and by setting the JP1 jumpers, as described below. The main features which can be configured by firmware are

- Internal versus external 40 MHz clock selection.
- Signal to pin assignment for 40-pin connectors J2/J6.
- RS422/RS232 transceivers signal assignment.
- Signal reclocking/reformatting types.

The firmware configuration option is to be selected at the time of order. However, with minimum Xilinx software and JTAG programming tools (not supplied), other options can be programmed in-circuit by users. All configuration files are available for download at www.comblock.com/download.htm

Each firmware option encompasses up to 16 different configurations, to be selected by the user by means of the four JP1 jumpers.

-A Firmware Option

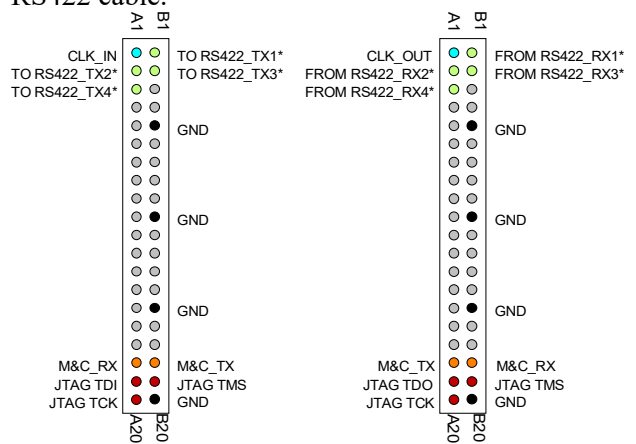
JP1 Jumper [1 2 3 4]	Configuration
0000	Connection Matrix A0
0001	Connection Matrix A1
0010	Connection Matrix A2
0011	Connection Matrix A3
0100	Connection Matrix A4
0101	Connection Matrix A5

Others	Future use
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Connection Matrix A0

Connection Matrix A0 Summary	
Signal Group	Signals
ComBlock (via J2) to RS422	1 clock 3 signals No flow control
RS422 to ComBlock (via J6)	1 clock 3 signals No flow control
40 MHz clock	Internal oscillator. Supplied to ComBlock assembly via J6
RS232 M&C	Connected to ComBlock via J6

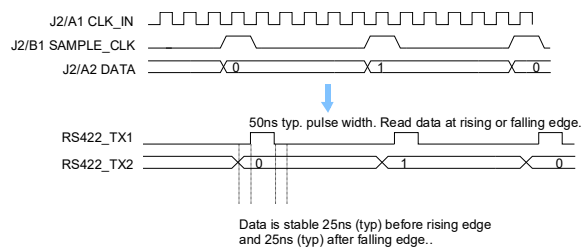
The primary use of this configuration is to simplify the interface to most ComBlocks by alleviating the need for a 40 MHz synchronous clock over the RS422 cable.



(*) denotes reclocking and reformatting.

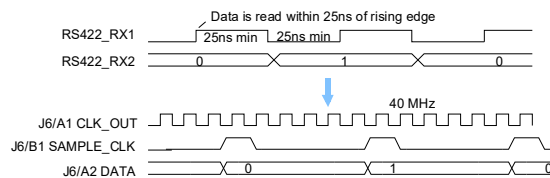
40-pin connectors J2 / J6

In the direction ComBlock to RS422, the signals are reformatted as shown below.



Reformatting from J2/LVTTL to RS-422 interface

In the direction RS422 to ComBlocks, the signals are reformatted as shown below:



Reformatting from RS-422 to J6/LVTTL interface

COM-1010 Convolutional encoder	COM-1009 Viterbi decoder
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Connection Matrix A0		
To Signal	From Signal(s)	Reformatting
RS422_TX1	J2/A1 & J2/B1	Converts the CLK_IN synchronous 'SAMPLE_CLK' signal found in most ComBlocks to a simple edge-trigger signal to indicate when to sample the three other RS422 data streams in RS422_TX2/3/4.
RS422_TX2	J2/A2	Converts the CLK_IN synchronous data streams to RS422 signals to be read at the rising edge of RS422_TX1.
RS422_TX3	J2/B2	
RS422_TX4	J2/A3	
J6/A1	Internal 40 MHz clock	
J6/B1	RS422_RX1 & Internal 40 MHz clock	Converts rising-edge of RS422 signal into a 25ns pulse synchronous with the internal 40 MHz clock. Creates the 'SAMPLE_CLK_IN' signal needed by most digital ComBlock inputs.
J6/A2	RS422_RX2 & Internal 40 MHz clock	Reclock to make signals synchronous with the internal 40 MHz clock. Creates the 'DATA_IN' signal needed by most digital ComBlock inputs.
J6/B2	RS422_RX3 & Internal 40 MHz clock	
J6/A3	RS422_RX4 & Internal 40 MHz clock	
J6/A18 M&C TX	RS232_RX	
J2/B18 M&C TX	RS232_RX	
RS232_TX	J6/B18 or J2/A18 M&C RX	

I/O Compatibility List and Limits

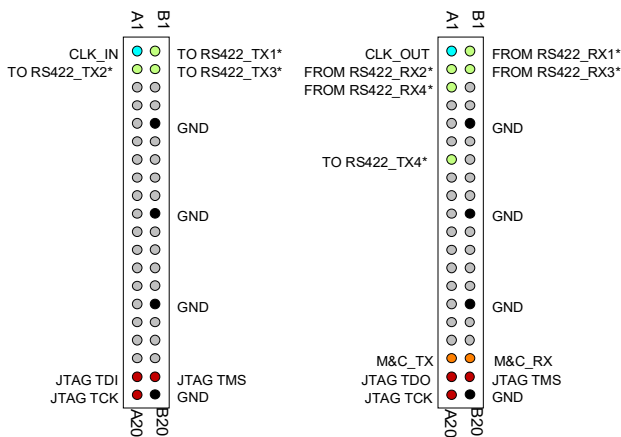
(not an exhaustive list)

Input (J2)	Output (J6)
COM-1001 BPSK/QPSK/OQPSK digital demodulator	
COM-1011 Direct Sequence Spread-Spectrum demodulator 10 Mchip/s	
COM-1019 Direct Sequence Spread-Spectrum demodulator 20 Mchip/s	
COM-1027 FSK/MSK/GFSK/GMSK demodulator	

Connection Matrix A1

Connection Matrix A1 Summary	
Signal Group	Signals
ComBlock (via J2) to RS422	1 clock 2 signals No flow control
RS422 to ComBlock (via J6)	1 clock 3 signals 1 flow control signal
40 MHz clock	Internal oscillator. Supplied to ComBlock assembly via J6
RS232 M&C	Connected to ComBlock via J6

The A1 connection matrix is similar to the A0 connection matrix, except for the provision of a flow control signal to regulate data throughput in the RS422 to ComBlock direction. This configuration is to be used in conjunction with ComBlock modulators. Indeed modulators typically require a flow control mechanism, as the modulation data rate is determined by the modulator at the end of the transmission chain. The flow control signal propagates upstream to control the source throughput.



(*) denotes reclocking and reformatting.

40-pin connectors J2 / J6

Connection Matrix A1		
To Signal	From Signal(s)	Reformatting
RS422_TX1	J2/A1 & J2/B1	Converts the CLK_IN synchronous 'SAMPLE_CLK' signal found in most ComBlocks to a simple edge-trigger signal to indicate when to sample the three other

		RS422 data streams in RS422 TX2/3/4.
RS422_TX2	J2/A2	Converts the CLK synchronous data streams to RS422 signals to be read at the rising edge of RS422 TX1.
RS422_TX3	J2/B2	
J6/A1	Internal 40 MHz clock	
J6/B1	RS422_RX1 & Internal 40 MHz clock	Converts rising-edge of RS422 signal into a 25ns pulse synchronous with the internal 40 MHz clock. Creates the 'SAMPLE_CLK_IN' signal needed by most digital ComBlock inputs.
J6/A2	RS422_RX2 & Internal 40 MHz clock	Reclock to make signals synchronous with the internal 40 MHz clock.
J6/B2	RS422_RX3 & Internal 40 MHz clock	Creates the 'DATA_IN' signal needed by most digital ComBlock inputs.
J6/A3	RS422_RX4 & Internal 40 MHz clock	
RS422_TX4	J6/A7	Converts the CLK synchronous data streams to RS422 signals to be read at the rising edge of RS422 RX1.
J6/A18 M&C_TX	RS232_RX	
RS232_TX	J6/B18 M&C_RX	

I/O Compatibility List and Limits

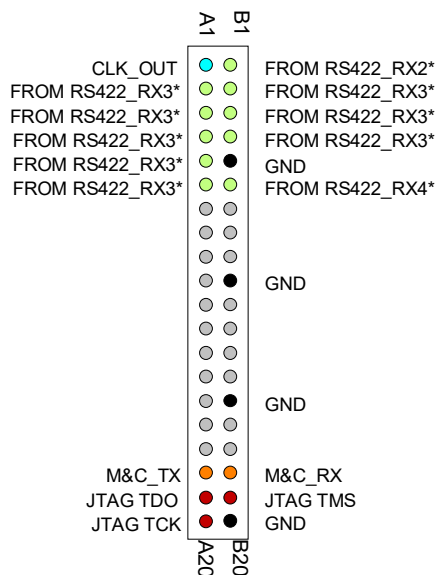
(not an exhaustive list)

Input (J2)	Output (J6)
COM-1001 BPSK/QPSK/OQPSK digital demodulator	COM-1002 BPSK/QPSK/OQPSK digital modulator.
COM-1011 Direct Sequence Spread-Spectrum demodulator 10 Mchip/s	COM-1012 Direct Sequence Spread-Spectrum digital modulator.
COM-1019 Direct Sequence Spread-Spectrum demodulator 20 Mchip/s	COM-1018 Direct Sequence Spread-Spectrum digital modulator.
COM-1027 FSK demodulator	COM-1028 FSK/MSK/GFSK/GMSK digital modulator

Connection Matrix A2

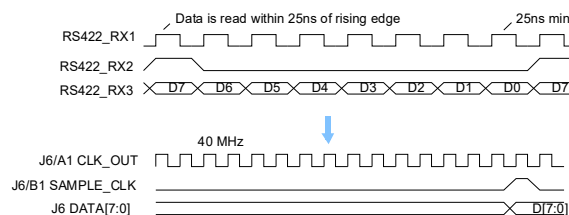
Connection Matrix A2 Summary	
Signal Group	Signals
ComBlock (via J2) to RS422	unused
RS422 to ComBlock (via J6)	1 bit clock 1 byte clock 1 serial data stream to be converted to 8-bit parallel. 1 trigger signal
40 MHz clock	Internal oscillator. Supplied to ComBlock assembly via J6
RS232 M&C	Connected to ComBlock via J6

The A2 connection matrix is primarily intended for use in conjunction with the COM-8001 arbitrary waveform generator. It allows one to load a file from a host computer into the COM-8001 SDRAM memory at speed up to 10 Mbit/s over a RS422 connection. The data stream is transmitted serially over the RS422 connection and converted into an 8-bit byte for interface compatibility with the COM-8001 input. As this configuration does not support flow-control, the sender is responsible for maintaining the serial throughput below the 10 Mbit/s limit.



(*) denotes reclocking and reformatting.

40-pin connector J6



Reformatting from RS-422 to J6/LVTTL interface

Connection Matrix A2		
To Signal	From Signal(s)	Reformatting
J6/A1 CLK_OUT	Internal 40 MHz clock	
J6/B1 SAMPLE_CLK_OUT	RS422_RX1 (serial bit clock) and RS422_RX2 (byte clock) & Internal 40 MHz clock	Creates a SAMPLE_CLK_OUT pulse indicating that the DATA_OUT byte is ready to be read. The pulse is generated upon receiving the last serial bit (LSB).
J6/A2 DATA_OUT(0)	RS422_RX3 (serial bit), RS422_RX1 (serial bit clock), RS422_RX2 (byte clock) & Internal 40 MHz clock	The serial data stream conveyed by RS422_RX3 is converted into a 8-bit byte. Bit 7 (most significant bit) is transmitted first. Bit 7 is identified in the serial data stream by RS422_RX2 (byte clock) = '1'. For all other serial bits, the RS422_RX2 byte clock is '0'.
J6/B2 DATA_OUT(1)		
J6/A3 DATA_OUT(2)		
J6/B3 DATA_OUT(3)		
J6/A4 DATA_OUT(4)		
J6/B4 DATA_OUT(5)		
J6/A5 DATA_OUT(6)		
J6/A6 DATA_OUT(7)		
J6/B6 TRIGGER_OUT	RS422_RX4 (trigger out), RS422_RX1 (serial bit clock) & Internal 40 MHz clock	Reclock to make signals synchronous with 40 MHz clock. Creates the 'TRIGGER_OUT' signal needed by the COM-8001.
J6/A18 M&C_TX	RS232_RX	
RS232_TX	J6/B18 M&C_RX	

I/O Compatibility List and Limits

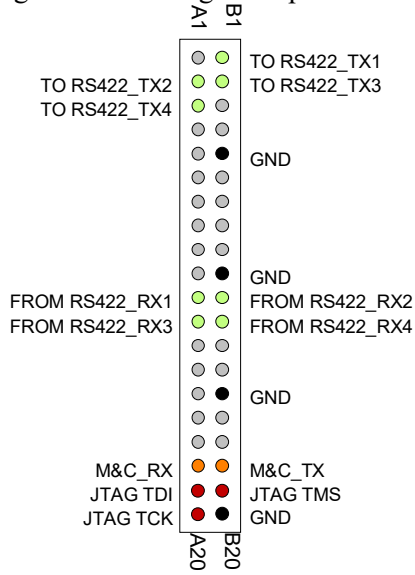
(not an exhaustive list)

Input (J2)	Output (J6)
	COM-8001 Arbitrary waveform generator.
	256MB/1GB, 40 Msamples/s.

Connection Matrix A3

Connection Matrix A3 Summary	
Signal Group	Signals
RS422 to ComBlock (via J2)	4 signals
ComBlock (via J2) to RS422	4 signals
ComBlock (via J6) to/from RS422	Unused.
40 MHz clock	Unused.
RS232 M&C	Connected to ComBlock assembly via J2

The primary use of this configuration is to convey four signals in each direction between a ComBlock assembly and a user over the RS422 cable. No reclocking or reformatting takes place.



No reclocking and reformatting.
40-pin connector J2

Connection Matrix A0		
To Signal	From Signal(s)	Reformatting
RS422_TX1	J2/B1	None
RS422_TX2	J2/A2	
RS422_TX3	J2/B2	
RS422_TX4	J2/A3	
J2/A11	RS422_RX1	None
J2/B11	RS422_RX2	
J2/A12	RS422_RX3	
J2/B12	RS422_RX4	
J6/A18 M&C_TX	RS232_RX	
J2/B18 M&C_TX	RS232_RX	
RS232_TX	J6/B18 or J2/A18 M&C_RX	

I/O Compatibility List and Limits

(not an exhaustive list)

Input (J2)	Output (J6)
COM-7001-B Turbo Code Encoder / Decoder	

Connection Matrix A4

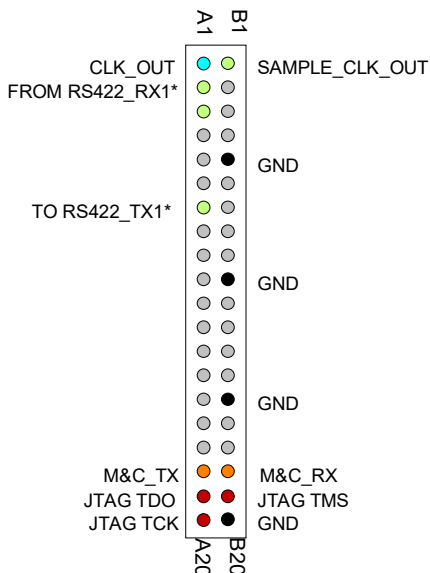
Connection Matrix A4 Summary	
Signal Group	Signals
RS422 to ComBlock (via J6)	1 serial data
ComBlock to RS422 (via J6)	1 data clock, rising edge
40 MHz clock	Internal oscillator. Supplied to ComBlock assembly via J6
RS232 M&C	Connected to ComBlock via J6

The A4 connection matrix can be used to connect an external data source to a ComBlock transmit assembly. Two signals are conveyed over the RS422 cable:

- a serial data stream from the data source to the ComBlock assembly.
- a data clock from the ComBlock assembly to the data source.

The data source is expected to generate one data bit at each [rising edge](#) of the data clock. Conversely, the ComBlock assembly reads the serial data shortly after the falling edge of the data clock. For falling edge trigger, see connection Matrix A5.

There is no need for flow-control signals as the ComBlock only generate a data clock when it can accept serial input data.



(*) denotes reclocking and reformatting.

40-pin connector J6

Note: The data clock signal requesting data from the external data source does not have a 50% duty

cycle. It consists of 50ns positive pulses, irrespective of the actual data throughput.

Connection Matrix A4		
To Signal	From Signal(s)	Reformatting
RS422_TX1	J6/A7	Data clock. The flow control signal from the transmit ComBlock module is converted into a 50ns data clock pulse requesting (pulling) a serial data bit from the external data source. The maximum response time for the external data source is 50ns after the rising edge of the data clock RS422_TX1.
J6/A1	Internal 40 MHz clock	
J6/B1	J6/A7 & Internal 40 MHz clock	Generate the SAMPLE_CLK_IN signal needed by most transmit ComBlock modules.
J6/A2	RS422_RX1	Serial data from the external data source.
J6/A18 M&C_TX	RS232_RX	
RS232_TX	J6/B18 M&C_RX	

I/O Compatibility List and Limits

(not an exhaustive list)

Input (J2)	Output (J6)
	COM-1002 BPSK/QPSK/OQPSK digital modulator.
	COM-1012 Direct Sequence Spread-Spectrum digital modulator.
	COM-1018 Direct Sequence Spread-Spectrum digital modulator.
	COM-1028 FSK/MSK/GFSK/GMSK digital modulator
	COM-1010 Convolutional encoder

Connection Matrix A5

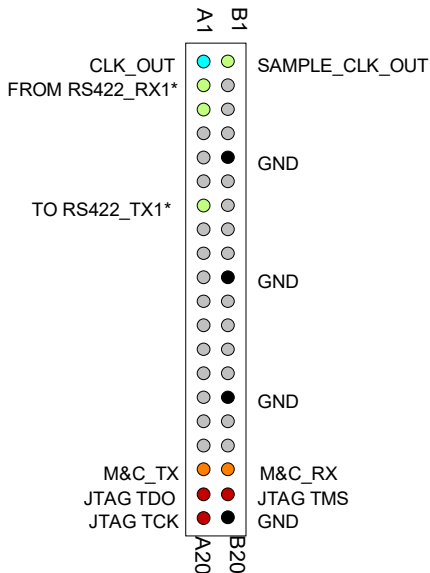
Connection Matrix A5 Summary	
Signal Group	Signals
RS422 to ComBlock (via J6)	1 serial data
ComBlock to RS422 (via J6)	1 data clock, falling edge
40 MHz clock	Internal oscillator. Supplied to ComBlock assembly via J6
RS232 M&C	Connected to ComBlock via J6

The A5 connection matrix can be used to connect an external data source to a ComBlock transmit assembly. Two signals are conveyed over the RS422 cable:

- a serial data stream from from the data source to the ComBlock assembly.
- a data clock from the ComBlock assembly to the data source.

The data source is expected to generate one data bit at each [falling edge](#) of the data clock. Conversely, the ComBlock assembly reads the serial data shortly after the falling edge of the data clock. For rising edge trigger, see connection Matrix A4.

There is no need for flow-control signals as the ComBlock only generate a data clock when it can accept serial input data.



(*) denotes reclocking and reformatting.

40-pin connector J6

Note: The data clock signal requesting data from the external data source does not have a 50% duty

cycle. It consists of 50ns inverted pulses, irrespective of the actual data throughput.

RS-422 Line Termination

All RS422 receivers include a 100 Ohm line termination resistor. Pull up/down resistors ensure that the RS422 receiver will be in a determined state when the line is not connected.

RS-422 Twisted Pairs

When assembling the harness to be connected to the DB-25 connector, please make sure that the differential RS-422 signals are conveyed over twisted pairs.

For example the RS422_RX1P/RS422_RX1N signals are conveyed over a twisted pair. It would be unwise to twist two wires which are not part of the same pair.

Supply LED

A green LED indicates that output supply voltage is present. It does not mean, however, that the voltage is correct as the LED may turn on even in undervoltage conditions.

Fuse

The V_IN supply voltage through the DB-25 is protected by a resettable fuse. The fuse acts like an ordinary fuse to open a circuit in the event of overcurrent caused by a short circuit condition, for example, but resets after the fault is cleared and the power is removed. The fuse ratings vary with temperature as follows:

	Temperature	
Hold current	0C	2.88A
Hold current	20C	2.5A
Hold current	60C	1.5A
Trip current	0C	5.76A
Trip current	20C	5.0A
Trip current	60C	3.0A
Time to trip	20C, 12.5A	10.3s max

Output Short-Circuit Protection

The COM-5101 is protected against ground short-circuit fault on the regulated output as long as the input voltage is less than 21VDC.

Chassis / Circuit Ground

The chassis ground (outer shell of the DB-25 connector) can be connected or disconnected to the circuit ground by means of a 0 Ohm 0603 surface mount resistor (R30). This allows the user to avoid ground loops by selecting a single connection between chassis ground and circuit ground when integrating the ComBlock modules within a metal chassis. R30 is installed by default. Please refer to the COM-5101 schematics for details:

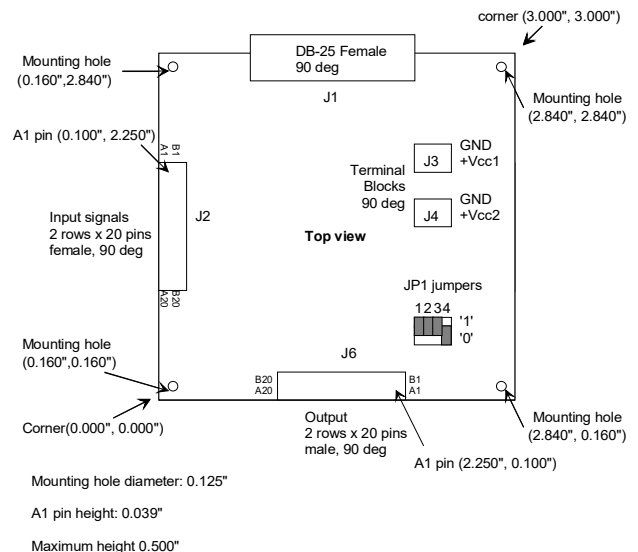
www.comblock.com/download/com_5101schematics.pdf

Bypassing the DC/DC Converters

The COM-5101 is equipped with up to two DC/DC converters accepting input voltages in the range 6-26VDC. In applications where the user can only supply +5V, a provision is made to bypass the DC/DC converters. 0 Ohm 0603 surface-mount resistor pads are located around the DC/DC converters to enable/disable bypass. Please refer to the COM-5101 schematics for details:

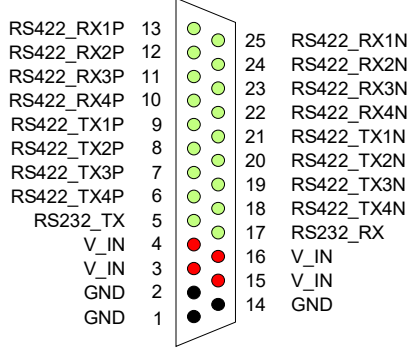
www.comblock.com/download/com_5101schematics.pdf

Mechanical Interface

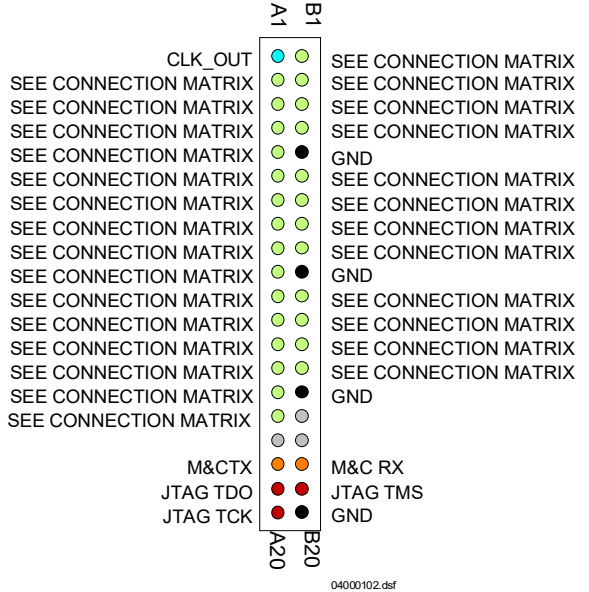


Pinout

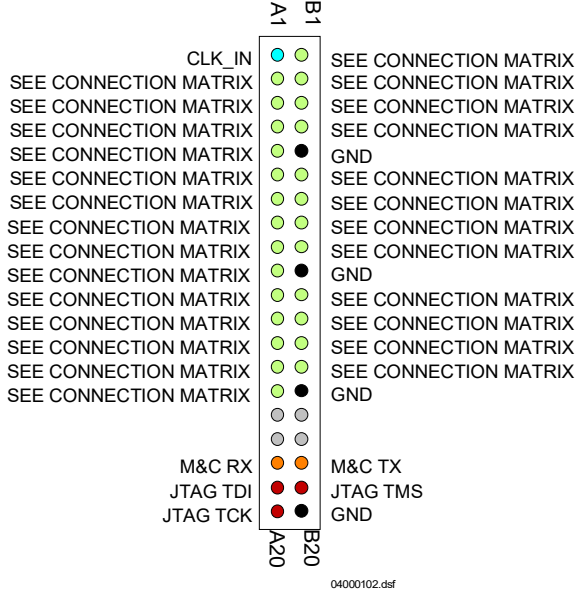
DB25 Connector J1



Output Connector J6



Input Connector J2 (Capabilities)



ComBlock Ordering Information

COM-5101-A
Signal/Power conditioning & RS422 interface, -A configuration

ECCN: 5A991.b.12

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