2.3 Display unit

The display unit is physically separate from the ventilator chassis (connected through a single cable running through the display arm). The display unit contains four circuit boards: COM Express Module, carrier board, touch screen controller, and alarm light. The COM Express Module contains the CPU and RAM. The carrier board is the main circuit board and provides connections between all subsystems within the DU. The touch screen controller manages the touch screen and communicates to the system with a serial connection. The alarm light provides a redundant visual alarm indicator.

The display unit communicates with the remainder of the system via the Motherboard using five digital channels. Settings and alarm annunciation information are directly relayed to the VMB and VCB from the display unit. The display is a 38 cm active matrix LCD with 8 bits per color and a LED background.

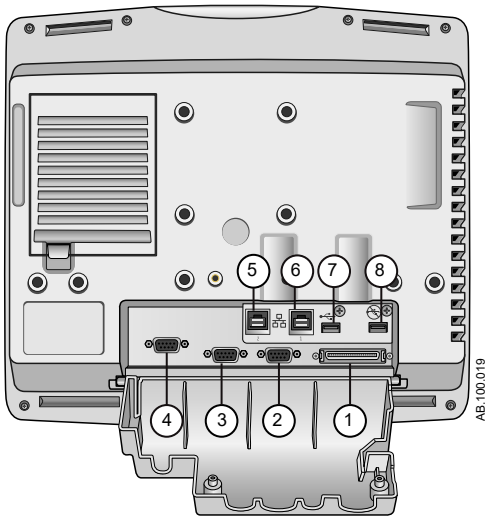
In the event of a display unit communications failure, the system will continue to ventilate at the current settings.

2.3.1 Display unit software requirements

The display unit uses USB media to manage software upgrades and to run the Service Application diagnostics.

2.3.2 Display unit connections

The display unit accommodates the following connections:



1. Display unit connection
2. VGA connection (not for clinical use)
3. Port 6 - RS232 serial communication
4. Port 5 - RS232 serial communication (service connection)
5. Ethernet connection (not supported)
6. Ethernet connection (not supported)
7. USB connection - standard USB 2.0 interface (not supported)
8. USB connection - standard USB 2.0 interface - system software download port (service use only)

2.3.3 Communication port connections

Datex-Ohmeda Com connection

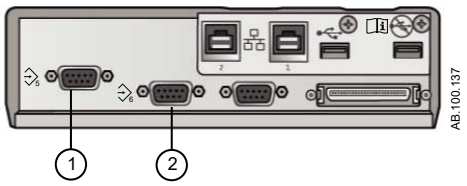
Port 5 (1) and 6 (2) interface cables must be shielded.

An authorized service representative is required to install the Datex-Ohmeda Com isolation cable prior to using the Ohmeda Com communication feature.

Note The delay time from the onset of an alarm condition to the signal leaving the Ohmeda Com port is up to two seconds. The facility is responsible for any additional delays introduced by equipment connected to the display ports.

Only the ventilator should be relied upon for alarm signal generation and information. Do not rely on the communication port connection for distribution and receipt of alarm signals.

The Port 5 (1) and Port 6 (2) connectors allow serial input/output of commands and data. The 9 pin connectors are located on the back of the display unit and are labelled Port 5 and Port 6. The output protocol is available at www.datex-ohmeda.com (under Products/Interfacing Commitment Products) or by contacting GE Healthcare at InterfaceCommitment@ge.com.



1. Port 5
2. Port 6

Figure 2-1 • Communication Port 5 and Port 6

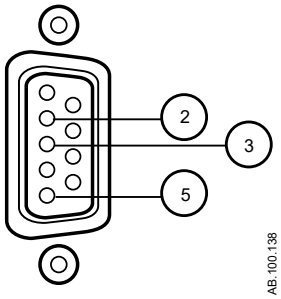


Figure 2-2 • Port 5 and Port 6 RS232 Serial communication port pin configuration

Isolation Cable (Datex-Ohmeda Com)	**Part Number - 2070435-001**
Pin 2	Receive
Pin 3	Transmit
Pin 5	ISO Ground
All other pins are not connected	

Nurse Call connection

Port 4 may be used to output alarm signals to a nurse call system. The ventilator will signal an alarm with a normally open or normally closed signal. The nurse call will be triggered by all medium and high priority alarms. When alarm audio is paused, the nurse call signal will be off.

Note The delay time from the onset of an alarm condition to the alarm signal leaving the nurse call port is up to two seconds. The facility is responsible for any additional delays introduced by equipment connected to the nurse call port.

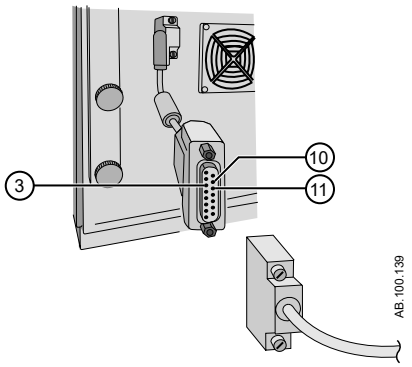


Figure 2-3 • Port 4 nurse call shown with isolation cables

Isolation Cable (Datex-Ohmeda Com)	Part Number - 2070436-001
Pin 3	Relay common
Pin 10	Normally open
Pin 11	Normally closed

Load current:

- Minimum: 100 uA at 100 mVdc
- Maximum: 1 A at 30 Vdc
- Relay isolated

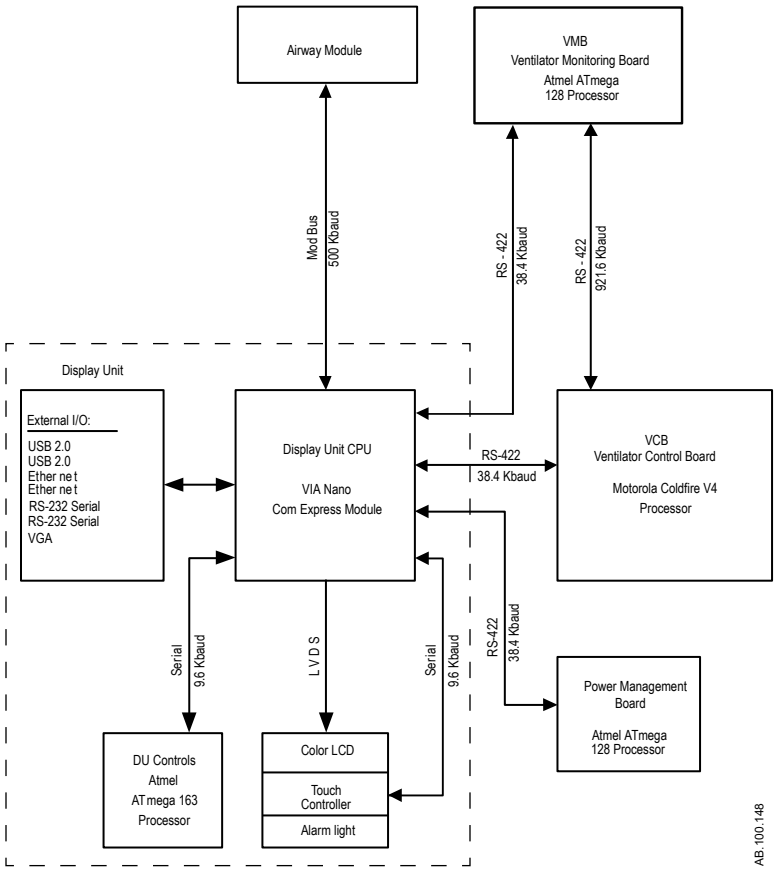


Figure 2-4 • Communication Channels

2.4 Main Enclosure

2.4.1 Ventilator Control Board

The ventilator control board (VCB) is a Motorola Coldfire V4 CPU powered assembly that collects information from all ventilator system sensors (some indirectly from the VMB), and controls all actuators necessary to affect ventilation delivery.

The VCB computes and supplies all ventilation sensor monitoring data for display on the display unit. If there are alarms to be generated based on this monitoring data, the VCB notifies the display unit to post the appropriate alarm message and audio sequence. The VCB observes the display unit's response to ensure that the alarm is adequately presented.

To control ventilation, the VCB accepts ventilation parameters from the display unit. Measured data (waveform and numeric) is also sent to the display unit from the VCB. This data flow occurs on the 38.4 Kbaud, RS-422 communications link (VCB - display unit Data I/O).

The VCB also communicates directly with the VMB every 2 ms, receiving expiratory flow, expiratory pressure and O2 sensor data on the 921.6 Kbaud, RS-422 interface (VMB Sensor Data I/O). Barometric pressure data is also received from the VMB, but at a lower data rate.

The following sensor information is acquired directly by the VCB:

- Air Flow/Temp sensor through the 1^2C interface at 250 Hz
- O2 Flow/Temp sensor through the 1^2C interface at 250 Hz
- Total Flow/Temp sensor through the 1^2C interface at 250 Hz
- Inspiratory Pressure sensor via a differential analog signal – 12 bits at 1000 Hz
- Auxiliary Pressure sensor via a differential analog signal – 12 bits at 1000 Hz
- Proximal flow sensor via differential analog signal - 12 bits at 500 Hz

The VCB contains actuator drive circuits for the following:

- Air and O2 Flow Valves
- Exhalation Valve
- Inspiratory Pressure Sensor zeroing valve
- Auxiliary Pressure Sensor purge flow valve

The Flow Valve and Exhalation valve actuators are driven using current drive circuits and feedback controlled using current sense resistors. The VCB contains digital control signals for activating the inspiratory effort and safety relief valves (through the VMB) and the Piezo-Electric Nebulizer.

The VCB receives 12.5 Vdc from the PMB, which it regulates down to various voltages for use by the board's digital circuits and analog drivers. These voltage levels are self-tested on the VCB. An additional power line is separately connected to an auxiliary buzzer on the VCB that provides a backup audio alarm source. The buzzer is normally on and must be kept silent by both the VCB and through a dedicated digital line coming from the VMB. A reset or