# Application Note
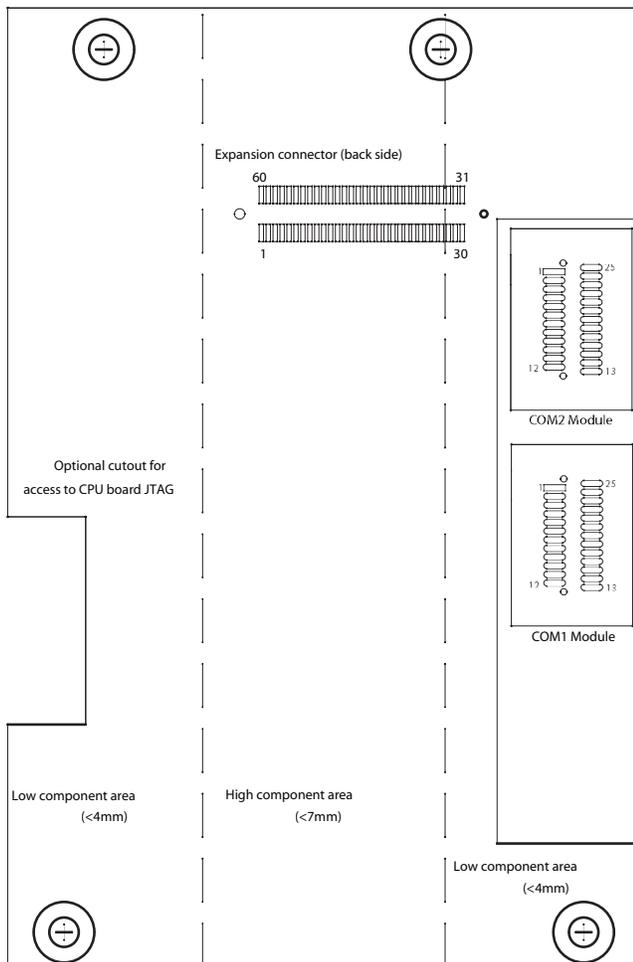
## Designing Custom Daughtercards for the QTERM- G55

## Introduction

This application note contains useful information for customers who wish to design their own custom daughtercard for the QTERM-G55 operator interface terminal.

## Mechanical Constraints

The image below shows the recommended outline and key features to consider in your board design. Dimensions are not shown; however, the figure is available as an AutoCad DXF file at the URL located at the end of this application note. Most modern EDA packages support DXF file import.



Expansion connector (back side)

60    31
1    30

COM2 Module

COM1 Module

Optional cutout for access to CPU board JTAG

Low component area (<4mm)

High component area (<7mm)

Low component area (<4mm)

View looking into back of unit

QSI recommends a board thickness of 1.6 mm. The 60-pin expansion port connector is located as shown in the figure and must be placed on the back side of the board (relative to the view in the figure). The cutout on the left allows access to the JTAG connector on the CPU board (for QSI use only) and is optional, but may facilitate support by QSI personnel.

The cutout on the right is required to provide room for cable connectors and the serial interface modules on the CPU board. These modules contain the transceiver circuits for the selected serial interface (EIA-232, EIA-422 or EIA-485). If daughtercard access to the COM1 or COM2 UARTs is desired, the board can be extended to cover the indicated regions. See "Electrical Interface" below for more details.

Component height on the front side of the board is limited to 4 mm, except for the indicated region down the middle of the board, where components should not exceed 7 mm in height.

Component height on the back side of the board (excluding the required connectors) should not exceed 1.8 mm. This restriction is a conservative limit based on the 6 mm board-to-board spacing and the highest component on the CPU board. Most of the CPU board components are much shorter than the worst case, but future CPU board revisions might move the high components or add additional parts. Violate this restriction at your own risk.

## Connectors

The manufacturers and part numbers for the connectors are:

Expansion Connector: FCI/Berg  61083-062000

Serial Module Interface:  FCI/Berg 91910-21125

## Electrical Interface

The daughtercard connects to the CPU board through the 60-pin expansion connector. This provides access to power supplies, the I²C bus and the COM3 UART of the system CPU. The connector also carries portions of the CPU memory bus and various digital control signals. These pins should be left unconnected.

The COM3 UART is directly accessible to the Qlarity application program. *If you wish to use this interface, you must request QSI to configure the terminal for 3 serial ports at assembly time.* The UART interface is the preferred method of communicating between the CPU and your electronics on the daughtercard. Note that the UART signals on the expansion connector are 3.3 volt logic level signals. (i.e. there is no transceiver).

The I²C bus can also be accessed from Qlarity. This requires a custom build of the firmware and some minor modifications to your Qlarity application. NRE charges may apply. The bus is accessed via two Qlarity API functions: readi2c() and writei2c(). Documentation for these functions is not included in Qlarity Foundry. Please contact QSI for additional information.

The QTERM-G55 firmware contains GPIO drivers for Philips PCA9554A 8-bit I²C I/O port chips. Tie the I2C lines directly to the chip, and tie the chip address lines to ground. Use the 3.3 volt power supply. The GPIO chip is accessed from Qlarity by using the ReadGPIO(), SetGPIO() and SetGPIODirection() API functions.

As mentioned above, you can access the COM1 and/or COM2 UARTS on the CPU by extending the outline of the board to enclose the regions where the serial interface modules are located and placing a suitable connector as shown in the Figure. The connectors carry the UART signals, flow control lines and connections to pins on the circular connector (handheld) or DB9 connectors (panel mount). The daughtercard must provide any desired serial transceivers.

## Pinouts and Signal Descriptions

The following table shows the pin and signal descriptions for the 60-pin expansion connector:

| Pin Number | Signal Description |
|---|---|
| 1-16 | System data bus. Leave unconnected. |
| 17 | SCL: I²C bus serial clock. |
| 18 | SDA: I²C bus data signal. |
| 19-26, 35, 40-42, 46, 47 | System bus control signals. Leave unconnected. |
| 27, 34 | $V_{in}$: The fuse-protected DC input voltage to the terminal, typically 8-32 Volts DC. |
| 28, 29 | +3.3 Volts DC from the CPU board |
| 30, 31 | System ground. |
| 32, 33 | +5.0 Volts DC from the CPU board |
| 36 | Connects to pin 7 of the circular connector.* |
| 37 | Connects to pin 8 of the circular connector.* |
| 38 | Connects to pin 9 of the circular connector.* |
| 39 | Connects to pin 10 of the circular connector.* |
| 43 | COM3 receive to Qlarity CPU. |
| 44 | COM3 transmit from Qlarity CPU. |
| 45 | Active low system reset signal. |
| 48-60 | System address bus. Leave unconnected. |

*Available on handheld units only. You must request that QSI use the ser+eth version of the internal cable (P03-831) to use these connections, and the COM2 connections to the circular connector are lost.

The following table shows the pin and signal descriptions for the 25-pin expansion connectors:

| Pin Number | Signal Description |
|---|---|
| 1, 2, 5 | +3.3 Volts DC from the CPU board |
| 3 | UART transmit from Qlarity CPU. |
| 4 | UART receive to Qlarity CPU. |
| 7 | Hardware flow control line from Qlarity CPU. |
| 8 | Hardware flow control line to Qlarity CPU. |
| 13 | Connection to external connector:<br>Handheld COM1: circular pin 5<br>Handheld COM2:circular pin 9*<br>Panel Mount: DB9 pin 3 |
| 14, 23 | Connection to external connector:<br>Handheld COM1:circular pin 6<br>Handheld COM2:circular pin 10*<br>Panel Mount: DB9 pin 6 |
| 15 | Connection to external connector:<br>Handheld COM1: circular pin 3<br>Handheld COM2: circular pin 7*<br>Panel Mount: DB9 pin 2 |
| 16, 22 | Connection to external connector:<br>Handheld COM1: circular pin 4<br>Handheld COM2: circular pin 8*<br>Panel Mount: DB9 pin 1 |
| 17 | SCL: I²C bus serial clock. |
| 18 | SDA: I²C bus data signal. |
| 6, 19, 20, 23, 24 | System ground. |

*You must request that QSI use the 2 serial version of the internal cable (P03-830) to use these connections, and the connections from pins 36-39 on the expansion connector to the circular connector are lost.

All referenced digital signals use 3.3 Volt CMOS logic levels.

## Power Supply Constraints

The sum of the current drawn from the 3.3 Volt and 5 Volt power supplies should not exceed 400 mA.

## Attaching the Daughtercard

Your custom daughtercard should be assembled into the unit by removing the four M3 screws that correspond to the daughtercard mounting holes from the CPU board and replacing them with four M3 x 6 mm male-female standoffs (such as Lyn-Tron AL5171-06.0-00). The daughtercard is then aligned and inserted into the CPU board connectors. Finally, the four M3 screws are inserted through the mounting holes and fastened to the standoffs.

## References

The reference drawing showing the board outlines and key features can be downloaded at:

http://www.qsicorp.com/engfiles/\

The filename is G55Daughter.dxf. All units are metric.