INTRODUCTION

Quark Transition Board 3 (QTB-3) is a Megatel Quark compatible printed circuit board designed to ease OEM system development. It provides connection points for power, disk drives, video, keyboard, and other peripherals.

In one step it sorts the Quark's various signals into their respective groups and terminates them on the printed-circuit board in patterns that can accept industry standard connectors and cabling hardware. This speeds up the development process by simplifying the connections to peripherals and external circuitry, allowing the user to proceed to the more important task of prototyping the target system's hardware and software.

QTB-3 was developed because of the importance

of constructing a functional Quark prototype system quickly. It is available as a bare printed-circuit board or populated with standard hardware for connections to peripherals. The populated versions are based on different disk drive configurations and are factory tested.

This note covers all models of QTB-3, providing connector and cabling information, and explains the steps required to construct a Quark prototype system.

Other features provided on QTB-3 are:

- two 0.120 inch mounting holes
- pad-per-hole kluge area for additional user circuitry
- small size: 4.25" x 3.35" (108mm x 85mm)
- mixed disk drive capability
- suitable for prototyping or production runs



FIGURE 1. QTB-3 Populated (Typical)

QUARK TRANSITION BOARD QTB-3 USER'S MANUAL

HOW TO USE THIS MANUAL

- 1) "QTB-3 DESCRIPTION" outlines the characteristics of each model.
- "QTB-3 LAYOUT" is an "electrical roadmap" of the printed-circuit board, showing connector locations and pinouts.
 "QTB-3 ASSEMBLY" explains any assembly
- "QTB-3 ASSEMBLY" explains any assembly involved with each model. The populated models will require little or no assembly.
- assembly.
 4) "INITIAL SYSTEM ASSEMBLY" directs the construction of the initial Quark system step by step.
- 5) "ADDITIONAL INPUT/OUTPUT" covers the addition of extra peripherals and circuitry.

QTB-3 DESCRIPTION

QTB-3 is available as a bare printed-circuit board or with connectors for the various peripherals installed . The unpopulated model is suited for specific cabling requirments while the populated versions are better adapted to general applications. In any case, QTB-3 provides the fastest route to a functional Quark prototype system.

Five models of QTB-3 are available:

- BD-QTB35F is assembled for 5.25 inch floppy disk drives.
- BD-QTB35H is assembled for 5.25 inch floppy disk drives mixed with ST-506 hard disk.
- BD-QTB38F is assembled for 8 inch floppy disk drives.
- BD-QTB38H is assembled for 8 inch floppy disk drives mixed with ST-506 hard disk.
- BD-QTB300 is the bare printed-circuit board.

With the exception of their disk drive interfaces, the populated versions are identical.

Megatel can assist users in the development of custom versions of QTB-3 to meet their particular packaging needs.



FIGURE 2. Quark Prototype System Block Diagram

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QTB-3 LAYOUT

QTB-3 is provided with a layout silk screen so that signal groups can be quickly identified. This also ensures that connectors and cables are oriented correctly. Connector locations are indicated by a "J" number along with a white border surrounding the appropriate pad pattern.

Figure 3 is an enlarged photo of QTB-3's silk screened side. Pinout indicators appear clearly and additional information has been added for easier identification. Refer closely to this diagram, as well as Table 2 and Figure 4, for pinout information when constructing a prototype system.

QTB-3 ASSEMBLY

BD-QTB38F, BD-QTB35F

These models, which are configured for 8 inch and 5.25 inch floppy disk drives respectively, have connectors installed in the following locations:

LOC DESCRIPTION CONNECTOR TYPE

J1	Quark mate	96 pin female ESIC
J2	power	AMP Mate-n-lok #350211-1
J3	disk	17 position, 34 pin header
J4	RS-232C	13 position, 26 pin header
J5	RS-232C	DB-25S
J7	comp. vid.	RCA-type phono jack
J8	p. keyboard	11 pin header
J9	port 2	8 pin header
J10	port 3	5 pin header
J11	p. printer	10 position, 20 pin header
-	reset	normally-open, momentary-
		contact push button switch
-	ttl vid.	5-pin header

The power connector (J2) is the same type found on most standard 5.25 inch floppy disk drives. The mating connector is also supplied, with four color-coded wires attached to it. Connect the RED wire to +5V of the power supply and the ORANGE wire to +12V. The two BLACK wires should be connected to GND.

BD-QTB38H, BD-QTB35H

These models are configured for 8 inch and 5 inch floppy disk drives respectively with the addition of an ST-506 hard disk interface. They have the same features as BD-QTB38F and BD-QTB35F above, along with the following:

1) A 10 position, 20 pin header is installed in J12 for the hard disk data interface cable.

2) Tri-state buffer circuitry for the hard disk's read data lines is installed and is functional.

BD-QTB300

Connectors are not supplied with this model of QTB-3 consequently, some assembly will be required. This should be relatively straight forward providing sufficient attention is given to connector orientation and pinouts.

Any of the connectors required for the Quark prototype system should be installed at this point, paying close attention to Figures 3 and 4 and Table 2.

Each connector location will accept industry standard connectors and/or headers and/or wrap-posts, depending upon its purpose. A list of typical connectors is given in Table 1 below.

- 1) 96 pin female Quark mating ESIC (J1): Robinson Nugent #RNE-96CS-W-TG30 (wrap post tails) or equivalent.
- 2) Power (J2): AMP Mate-n-lok #350211-1 and mate or equivalent.
- 3) Dual Row Headers (J3, J4, J11, J12,): Ansley #609-xx27 (xx = number of positions) or equivalent.
- 4) Composite video: Switchcraft #3501FP or equivalent (RCA-type phono jack).
- 5) RS-232C interface (J5, J6): AMP #206584-2 DB-25S female receptacle or equivalent.
- 6) Single row headers (J8, J9, J10): AP #929834-01 or equivalent.

TABLE 1. Typical Connectors



- K CUT HERE TO USE 74LS126
- UO1 74LS126 TRI-STATE BUFFER LOCATION
- H ACCESS POINT FOR QUARK B17 (TRANSFER RATE)

FIGURE 3 B-3 LAYOUT

THE DRIVE

Listed below is the assembly procedure for BD-QTB300.

1) Only one connector MUST be mounted on the unlabeled surface of QTB-3 (the side without any silk screen markings). The 96 pin female ESIC, which is the Quark's mating connector, must be mounted in location J1 on the unlabeled side. A straight or right-angle connector may be used - mounting holes are provided for both types. Closely observe the row and column markings on QTB-3's silk screen and the connector to ensure correct orientation.

Installing an ESIC connector which has wrappost tails may present some difficulty - it should be soldered into place carefully. It is suggested that one of the outside rows (row A or C) be soldered first. The remaining outside row should then be carefully bent out so that row B can be soldered. The outside row can then be bent back into place and soldered as well.

Any other connectors can be mounted on either side of QTB-3. However, any locations conforming to an industry standard pinout should have their respective connectors mounted on the silk screened side of QTB-3 in order to preserve the correct pin-for-pin interface. This applies to J3, J5, J6, J11, and J12.

2) Power is applied to QTB-3 via J2. Four pads are provided on 0.200 inch centers for connections to +12V, +5V, and GND. These are clearly indicated on the silk screen. It is suggested that a polarized connector be used.

3) The disk data/control connector (J3) is universal and can be configured for 8 inch floppy disk, 5.25 inch floppy disk or ST-506 hard disk drives. It is designed to accept a 17 position, 34 pin male header or a 17 position dual readout edge connector (for 5.25 inch floppy disk only). In the latter case, QTB-3 can be used as a motherboard that attaches directly onto the logic card of a 5.25 inch disk drive.

Depending upon which pinout is required, the desired connector should be mounted in the rectangle indicating the drive type (8 = 8 inch floppy disk, 5 = 5.25 inch floppy disk, HD = hard disk). Pins 1 and 34 for each are indicated on Figure 3. Note that it is designed to accept only one connector as they

all share a common row of GND pads. Any connector to be installed in location J3 must utilize the row of GND pads.

A few simple modifications are required to configure J3 for 8 inch floppy disk drives (no modifications are needed for 5.25 inch floppy disk drives or hard disk drives). The steps to be performed are as follows:

- On the labeled side, cut the small traces joining each pad pair indicated by SIDE, INDEX, and SEL3. These locations are indicated by the letter "B" on Figure 3.
- From each of these areas, connect a strap from the pad closest to J1 to the corresponding single pad also indicated by SIDE, INDEX, and SEL 3.

Pins 1 through 34 on J3(8) correspond to pins 13 through 46 on an 8 inch floppy disk drive's card-edge connector.

4) Connecting a hard disk drive to the system (Quark/300 only) will require an additional 20 conductor cable for the drive's data interface. J12 on QTB-3 will accept a 10 position, 20 pin header for this purpose. Pins 1 and 20 are indicated on Figure 3.

The Quark/300 requires tri-stated READ DATA outputs on the hard disk drive. Many ST-506 hard disk drives do not have this feature therefore, space has been provided on QTB-3 for a tri-state buffer circuit. To utilize it, the following steps are required:

- Cut the two traces on the labelled side that are indicated by the letter "K" on Figure 3. These traces join pins 2 to 3 and 5 to 6 on the buffer.
- Install a 74LS126 TTL quad buffer in the location provided (which is U01 on on Figure 3). It must be mounted on the unlabeled side - pins 1 and 14 are indicated on Figure 3.
- Install 150 ohm resistors in the two places indicated by "R" on the silk screen and a 0.1 uF capacitor in the position indicated by "C". Do not confuse these with the indicators found on J12 - they are for a different purpose.

5) Location J7 is the composite video output. The pad marked "CV" is the composite video signal. The large 0.25 inch pad adjacent to it is GND and will accept an RCA-type phono jack. A short piece of wire is needed to connect the composite video signal (CV) to the other side of the jack. Alternatively, a 2 pin header can be installed in the pads marked "CV" and "GND".

6) A position for a reset switch is located just above J2. The upper pad is connected to pin C31 (RESET) on the Quark. Three pads on 0.200 inch centers allow a push-button switch to be mounted here. The switch should be a normally-open, momentary-contact type.

7) Mount any other connectors for other peripherals (keyboard, printer etc.) as required, paying close attention to Figures 3, and 4, and Table 2.

PROTOTYPE CONSTRUCTION USING QTB-3

REFER TO FIGURES 1 THROUGH 4 AS WELL AS TABLES 1 AND 2 FOR IMPORTANT INFORMATION REGARDING CONNECTOR LOCATIONS AND PINOUTS

This portion of the manual supports all models of QTB-3 and therefore has a more general nature.

A minimum set of peripherals is required for a Quark prototype system. This is: at least one 8 inch or 5.25 inch floppy disk drive; an RS-232C computer terminal or separate keyboard and monitor; and a reliable power supply providing +12V, +5V and GND.

The first section explains the initial system assembly procedure. A second section covers the addition of any extra peripherals and circuitry.

Connecting the Power Supply (J2)

Pin numbers are shown on Figure 3. Connect pin 1 to $\pm 12V$, pins 2 and 3 to GND, and pin 4 to $\pm 5V$.

CAUTION. Before connecting the Quark or any peripherals into QTB-3, verify that there are no short circuits between +5V, +12V or GND. Once this is established, apply power to the board and make sure that all voltages are correct. Failure to do so may result in severe damage to the Quark and/or the peripherals. Any such damage is not covered by warranty.

Connecting the Floppy Disk Drive(s) (J3)

Megatel CP/M operating systems are available on 8 inch or 5.25 inch floppy diskettes. It will be necessary to have at least one floppy disk drive of either type connected to the initial Quark system.

Connector J3 is the universal disk drive control/data interface. Depending upon which type of disk drive(s) are to be used, the required pinout is surrounded by a white type rectangle along with the drive indicator: 8 = 8 inch floppy disk; 5 = 5.25 inch floppy disk; HD = hard disk. J3 on indicates how Quark's Figure 4 the data/control signals are connected to each type of disk drive.

Pins 1 and 34 for each of the three possible configurations are shown on Figure 3. Odd numbered pins (1 thru 33) are GND while even numbered pins (2 thru 34) are control and data signals. A ribbon cable with a minimum of 34 conductors is all that is required to interface a floppy disk drive to the Quark. Alternatively, the connections to the disk drive can be made through individual wires. In this case, each signal wire should be placed with a ground wire to form a twisted pair.

If J3 is set for 5.25 inch floppy disk or for ST-506 hard disk pinout, pins 1 through 34 should be connected to the corresponding pins on the respective disk drive's card edge. However, if J3 is configured for 8 inch floppy disk pinout, pins 1 through 34 correspond to pins 13 through 46 respectively on the disk drive. Since 8 inch floppy disk drives have a 25 position, 50 pin card edge connector, the cabling will have to be constructed accordingly. The pattern for J3 on QTB-3 is designed to accept a 17 position, 34 pin header. If a 50 position ribbon cable is to be used, care must be taken in the orientation of the female socket. An alternative is to use a 34 conductor ribbon cable with a 34 pin socket at QTB-3 and a properly placed 25 position dual readout edge connector (using pins 13 through 46) at the drive.

The Quark can handle several disk drives of the same or different types depending upon the model. Although only one floppy disk drive is required for the initial sytsem, a second disk drive may be attaching desirable (or eventually required, as is the case with the Quark/300). All of the disk drives must be connected sequentially, as opposed to radially, along the cable. If different types of drives are to be used, the cable will have to be reconfigured accordingly. The drives can be connected in any order depending on the orientation of J3. Megatel can provide Drive Cable Adapter DCA-1, which is a small, universal printedcircuit board specially designed to convert standard disk drive ribbon cables so that different types of drives can be easily connected to the same cable.

The Quark's disk drive outputs must be terminated by 150 ohm resistors at the last drive on the cable. Any disk drives electrically between QTB-3 and the last drive should have their terminating resistors removed.

The operating system on the distribution diskettes will only recognize one physical disk drive, using SEL 0 to select the drive. The "first" (or only) drive in the prototype system should be set to acknowledge a drive select on SEL 0.

THE INITIAL CONSOLE DEVICE CAN BE AN RS-232C TERMINAL OR A SEPARATE PARALLEL KEYBOARD AND MONITOR. REFER TO THE SECTION CONCERNING SERIAL DEVICES FOR COMPLETE INFORMATION.

Connecting a Direct-drive Monitor (TTL VID)

Seperate horizontal sync (HS), vertical sync (VS), video (VID), +12V, and GND are available for connection to the monitor. These are clearly indicated on the board in the location marked "TTL VID".

Connecting a Composite Video Monitor (J6)

The pad marked CV is the composite video output. Shielded co-ax or a twisted pair of wires will provide the most reliable connection to the monitor. There should be a 150 ohm terminating impedence at the monitor. Connecting an ASCII Encoded Parallel Keyboard (J8)

Figure 3 indicates the pinout of this location. The strobe output from the keyboard should be connected to the pin marked "S" on QTB-3. The data outputs should be connected to "O" through "7" respectively. Power for the keyboard (+5V and GND) is also available from J8.

Plugging the Quark In (J1)

All of the Quark's signal lines enter QTB-3 via J1. ESIC connectors are polarized – as long as they are installed properly it is impossible to plug the Quark in incorrectly.

ONCE THESE DEVICES ARE CONNECTED PROPERLY THE INITIAL QUARK SYSTEM IS READY TO "BOOT-UP" USING THE QUARK SYSTEM SOFTWARE PACKAGE.

After the Quark prototype has sucessfully "booted-up", other peripherals and external hardware can be added as required.

Adding a Hard Disk Drive (J3, J12)

A seperate 20 conductor cable is required for the hard disk drive's data interface. This involves location J12 on QTB-3. Pins 1 through 20 (shown on Figure 3) should be connected to the corresponding pins on the drive's data interface. The +/- READ/WRITE signals are indicated on the silk screen.

The hard disk's READY output (pin 22 on the drive's control connector) must be connected to pin B17 (TRANSFER RATE) on QTB-3. If J3 is configured for a floppy disk drive (as it is on the factory populated models of QTB-3), with a hard disk drive connected further along the cable, one of the unused conductors on the floppy disk portion of the cable will be required to carry this signal. The corresponding pin on J3 that is used for this purpose should then be strapped by a wire to one of the pads connected to B17. These pads are indicated on Figure 3 by the letter "H" . The hard disk's READY output must not interfere with, or be affected by, the operation of the floppy disk drive. This may involve the removal of a jumper or performing

a simple modification on the floppy disk drive.

The Quark's SEL 2 output (C18) is connected to the hard disk's DRIVE SELECT 2 (pin 30) and also its HEAD SELECT 2 (pin 4). Some ST-506 hard disk drives may not operate properly because of this - it may result in an error due to the issuing of an incorrect head address. Should this problem surface, isolate HEAD SELECT 2/2 (pin 4) from the Quarks SEL 2 output.

Serial Terminal, Keyboard, and Printer Connection (J4, J5)

The pinout of J5 conforms to the standard RS-232C serial interface. J4 is also connected to the Quark's RS-232C interface however, its pinout is not the same as J5. It permits the use of a 13 position, 26-pin header as an alternative (or in addition to) the DB-25 arrangement. The connector orientations are indicated on Figure 3.

On the full duplex port, CTS (C4) should be connected to RTS (B3) and DTR (C3) should be connected to DSR (B4) if a seperate keyboard and monitor are to be the initial console devices. Two jumpers located on J4 of the populated models are for this purpose. These jumpers should not be present if a terminal that needs these signals is to be used.

The simplex serial port on the Quark is normally strapped at the factory for use as a serial output device. On connector J5, pin 14 is the simplex serial output and pin 16 is the simplex serial protocol input. If the simplex serial port is re-strapped on the Quark to act as an input, the functions of these two pins will be reversed accordingly.

Connector position J6 has the simplex serial output on pin 3 and the input on pin 16. Pin 7 is connected to GND. Installing a 25 pin D-shell connector in this position on the labeled side of QTB-3 will provide a common connection to a serial printer. Traces on the unlabeled side allow these connections to be removed or changed easily.

Once the prototype system has booted up, the desired console, list, and auxiliary devices for the target system can be specified during the software installation and the status of the full duplex and simplex port hardware can be dealt with accordingly.

Parallel Printer Connection (J11)

Connector location J11, which is Port 4 on the Quark, has a Centronics parallel printer interface. Pins 1 and 20 are indicated on Figure 3. The printer's STROBE input should be connected to pin 1 and its ACKNOWLEDGE output to pin 19. D0 through D7 are connected to odd numbered pins 3 through 17 respectively. This port has buffered outputs and can be used for other purposes if connection to a parallel printer is not required.

Parallel Input/Output Connection

The Quark has 2 undedicated I/O ports for use with external hardware and peripherals. Port 2 has 8 I/O positions and is indicated on QTB-3 as J9. Port 3 has 6 I/O lines and is marked as J10. The data pinout is indicated on Figure 3.

Reset

Momentarily depressing this switch will activate the power-on reset of the Quark, causing a cold boot to occur.

Peripheral Expansion Interface / Kluge Area

No particular connector location has been set aside for the Quark's Peripheral Expansion Interface. If access to it is desired, the kluge area of QTB-3 can be used for the installation of a specific connector. Short lengths of wire running from the connector to the appropriate pins on the female ESIC connector is one method of connection. Refer Table 2 and Figure 4 for to detailed information concerning the Peripheral Expansion Interface.

The kluge area, located in the upper portion of QTB-3, is a pad-per-hole matrix on 0.100 inch centers. There are over 200 pads available for extra circuitry and connectors. Several pads connected to +5V, +12V, and GND located near the power connector (J2), are provided for use with the kluge area and other general purposes.

QUARK PIN	GROUP	DESCR.	QTB-3 LOCATION (J#-PIN#)	QUARK PIN	GROUP	DESCR.	QTB-3 LOCATION (J#-PIN#)
A1 A2	CRT CRT	GND V-SYNC	TTL VID-GND TTL VID-VS	B17 B18	DISK DISK	T. RATE SEL3/HS1	J3(HD)-22 J3[(5)-6, (8)-20, (HD)-18,
AS A4 A5 A6	SIMP DUPL P3	D/P IN GND VIA PB1	J4-2, J5-3 J4-2, J5-14, J6-3 J4-13, J5-7, J6-7	B19 B20 B21	DISK DISK P1	SELO GND PAO	J3E(5)-10, (8)-14, (HD)-26] J3- 1 TO 33 ODD J8-D0
A7 A8	P3 P3 P4	VIA PB3 VIA PB5	J10-D3 J10-D5 J11-17	B22 B23 B24	P1 P1 FYP	PA7 STB	J8-D7 J8-S N/C
A10 A11 A12	P4 P4 P4	D5 D2 D0	J11-13 J11-7 J11-7	B25 B26 B27	EXP EXP EXP	P-O-R WR RD	N/C N/C N/C
A13 A14 A15	P4 EXP EXP	GND CS FCLK	J11-2 TO 20 N/C N/C	B28 B29 B30	EXP DISK		N/C J3E(5)-26, (8)-30, (HD)-10] J12-14,18, UD1-3,11
A16 A17 A18	DISK DISK DISK	GND STEP WG	J3-1 TO 33 ODD J3[(5)-20, (8)-24, (HD)-24] J3[(5)-24, (8)-28, (HD)-26]	B31 B32	PWR PWR	+5V +5V	J2-4, J8-+5 J2-4, J8-+5
A19 A20	DISK DISK	SIDE/HSO GND	U01-1,4,10,13 J3E(5)-32, (8)-2, (HD)-14] J3-1 TO 33 ODD	C1 C2 C3	CRT DUPL DUPL	H-SYNC RXD DTR	TTL VID-HS J4-3, J5-2 J4-11, J5-6
A21 A22 A23 A24	P1 P1 P1 FYP	PA2 PA4 PA6 GND	J8-D4 J8-D6 N/C	C5 C6 C7	CRT P3 P3	CIS C. VID PB2 PB0	J4-(, J)-4 J7-CV J10-D2 J10-D0
A25 A26 A27	EXP EXP EXP	D1 D7 D6	N/C N/C N/C	C8 C9 C10	P3 P4 P4	PB4 D4 D3	J10-D4 J11-11 J11-9
A28 A29 A30	EXP DISK DISK	D3 IND/SC GND	N/C J3E(5)-8, (8)-8, (HD)-8] J12-2,4,6,8,10,11,12,15,16,	C11 C12 C13	P4 P4 P4	D6 D1 STB	J11-15 J11-5 J11-1
A31 A32	pwr pwr	gnd GND	J2-2,3 J2-2,3	C14 C15 C16 C17	EXP EXP DISK DISK	A5 A5 RD/INDEX DIR	N/C N/C J3[(5)-30, (8)-34, (HD)-20] J3[(5)-18, (8)-22, (HD)-34]
B1 B2 B3	CRT SIMP DUPL	VID D/P OUT RTS	TTL VID-VID J4-6, J5-16 J4-9, J5-5	C18 C19	DISK DISK	SEL2/HS2 SEL1	J3E(5)-14, (8)-18, (HD)-4, 30] J3E(5)-12, (8)-16, (HD)-28]
B4 B5 B6	DUPL P2 P2	dsr Pa0 Pa1	J4-14, J5-20 J9-00 J9-01	C20 C21 C22	DISK P1 P1	WD PA1 PA3	J3[(5)-22, (8)-26] J8-D1 J8-D3
B7 B8 B9	P2 P2 P2	PA2 PA3 PA4	J9-02 J9-03 J9-04	CZ3 C24 C25	P1 EXP EXP	PA5 AD DO	J8-D5 N/C N/C
B10 B11 B12 D17	P2 P2 P2 P/	PAD PAG PA7	J9-D5 J9-D6 J9-D7 J11-19	C20 C27 C28 C20	EXP EXP EXP	02 04 05	N/C N/C N/C I3E(5)_28 (8)_32 (Un)_127
B14 B15 B16	EXP EXP DISK	A2 A4 GND	N/C N/C J3-1 TO 33 ODD	C30 C31 C32	DISK RES PWR	+R/+W RES +12V	J12-13,17, U01-6,8 RESET J2-1, TTL VID-+12

TABLE 2. Master Wire List

QUARK TRANSITION BOARD QTB-3 USER'S MANUAL



FIGURE 4. QTB-3 Schematic

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ADDITIONAL REFERENCES

1) THE MEGATEL QUARK MANUAL, for hardware and software. Order number MA-222302.

2) DRIVE CABLE ADAPTER DCA-1 MANUAL. Order number MA-DCA100.

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