1. PURPOSE & SCOPE:

This document is intended to give the reader an understanding of how to use the Tower Button Interface PCBA, PT00059154.

2. OWNER (Department): Research & Development, North Haven

3. REFERENCES:

The following internal documents/parts are references to this document:

Document / Part Number	Title
PT00059154	PCBA, Tower Button Interface
DC00059594	SCH, Tower Button Box Interface
PT00060097*	SUBASSY, CORE CONTROLLER SBC, KONTRON
PT00076545	SUBASSY, CORE CONTROLLER SBC, KONTRON
PT00042383*	SUBASSY, TOWER, BUTTON BOX
PT00076673	SUBASSY, TOWER, BUTTON BOX
PT00053639*	SUBASSY, TOWER, COMMON
PT00074950	SUBASSY, TOWER, COMMON

**This component is expected to be obsoleted and replaced by the item of the same name in this table but is still active at the time of this document's release.*

Table 1: Table of References

Specifics about individual components in the design should reference the current manufacturer datasheets, application notes, errata, etc. for each part number on the current bill of material as provided per the appropriate manufacturer.

4. DEFINITIONS:

Term / Abbreviation	Definition
SBC	Single Board Computer
TBI	Tower Button Interface PCBA
PWM	Pulse width modulation
LED	Light emitting diode
PCBA	Printed circuit board assembly
ESD	Electrostatic discharge

Table 2: Table of Definitions

5. DESIGN SUMMARY:

The Tower Button Interface PCBA is located inside the Core Controller in the Tower. It acts as an interface between the Button Box, which contains the System Pause and System Activate buttons, and the KTQ87 inside the Core Controller. The board's primary role is cleaning up the signals sent over the long cable connecting the Button Box to the Core Controller, but it also offers some useful features like a latching System Pause signal, and PWM control of the Button Box LEDs.

6. BUTTON BOX INTERFACE:

The Tower Button Interface PCBA communicates with the Button Box through a shielded RJ45 connector (J1). All connections on and off the board though this connector are filtered and have ESD protection.

Schematic Signal	Pin #	Description
GND	J1.1	Signal Ground
SysAct_L	J1.2	System Activation button signal. Active low.
LED_+12.0V	J1.3	Power source for the System Activate LED on the Button Box.
SysAct_LED_RTN	J1.4	Power return for the System Activate LED. PWM controllable.
SysPau_+3.3V	J1.5	System Pause signal voltage source.
SysPau	J1.6	System Pause button signal. Active high.
LED_+12.0V	J1.7	Power source for the System Pause LED on the Button Box.
SysPau_LED_RTN	J1.8	Power return for the System Pause LED. PWM controllable.

Table 3: Tower Button Interface PCBA Connector (J1) Pin Out

6.1. SYSTEM ACTIVATION

System Activate is located on pin J1.2. The signal is normally pulled high by a 10k ohm resistor. When the System Activate button on the Tower Button Box is pressed, pin J1.2 becomes connected to pin J1.1 through a 1k ohm resistor located inside the button. As a result the System Activation signal is pulled low.

6.2. SYSTEM PAUSE

System Pause is located on pin J1.6. The signal is normally pulled low by a 10k ohm resistor. When the System Pause button on the Tower Button Box is pressed, pin J1.6 becomes connected to pin J1.5 through a 1k ohm resistor located inside the button. As a result the System Pause signal is pulled high.

6.3. BUTTON BOX LEDS

A +12.0V source for the Button Box LEDs is available on pins J1.3 and J1.7. This source is provided by the KTQ87 and has a max load of 0.75A. The return path for the System Pause LED is on pin J1.8, and the return path for the System Activation LED is on pin J1.4. The KTQ87 can make the LEDs turn on/off, blink, or fade by toggling their return path's connectivity to GND at various frequencies. This is done via the Feature Panel Interface descried in Section 7.2 of this documentTable 5. Alternately, the System Activate and System Pause LEDs can be configured to be always on by placing a jumper across P1 or P2 respectively, or soldering a 0 ohm resistor on R2 or R5 respectively. The Button Box LEDs each draw about 12.5 mA of current.

7. KTQ87 INTERFACE:

The Tower Button Interface PCBA communicates with the KTQ87 though connectors P4 and P8. Connector P4 interfaces with the Front Panel Connector (J2) on the KTQ87. Connector P8 interfaces with the Feature Connector (J1) on the KTQ87.

7.1. FRONT PANEL INTERFACE

TBI Signal	TBI Pin	KTQ87 Signal	KTQ87 Pin	Description
+5.0V _IN	P4.2 P4.6	+5V	J2.11 J2.12	+5.0V to the Tower Button Interface PCBA.
SATA_LED	P4.3	SATA_LED#	J2.13	Input to the Tower Button Interface PCBA. Controls state of Core Controller chassis SATA Activity LED.
PWRBTN_IN	P4.7	PWRBTN_IN	J2.16	Input to the KTQ87 board. Toggle this signal low to start the ATX / BTX PSU and boot the board.*

**In order to power on the KTQ87 SCB using the System Activation button the jumper on connector P6 on the Tower Button Interface board must be configured as specified in Section 8 of this document.*

Table 4: Tower Button Interface PCBA to KTQ87 Front Panel Interface Map

7.2. FEATURE PANEL INTERFACE

TBI Signal	TBI Pin	KTQ87 Signal	KTQ87 Pin	Description
+3.3V_IN	P8.1	SB3.3	J1.9	+3.3V to the Tower Button Interface PCBA
SysPau_FLT	P8.3	GPIO0	J1.11	Filtered signal from the System Pause button on the Button Box.
SysAct_FLT_L	P8.4	GPIO1	J1.12	Filtered signal from the System Activation button on the Button Box. Active low.
SysPau_Latch	P8.5	GPIO2	J1.13	Latched signal from the System Pause button on the Button Box.
GPIO0	P8.6	GPIO3	J1.14	General purpose I/O
SysAct_LED	P8.7	GPIO4	J1.15	Signal for controlling System Activation LED
GPIO1	P8.8	GPIO5	J1.16	General purpose I/O
SysPau_LED	P8.9	GPIO6	J1.17	Signal for controlling System Pause LED
SysPau_Latch _CLR_L	P8.10	GPIO7	J1.18	Signal for clearing the System Pause latching circuit.* Active low.
SysAct_DB_L	P8.13	GPIO8	J1.21	Debounced signal from System Activation button on Button Box. Active low.
SysPau_DB	P8.14	GPIO9	J1.22	Debounced signal from System Pause button on Button Box.*
+12.0V_IN	P8.17	+12V	J1.37	+12.0V from the KTQ87.

**Denounced signals will have up to 80ms of delay.*

Table 5: Tower Button Interface PCBA to KTQ87 Feature Panel Interface Map

8. KTQ87 POWER-ON SIGNAL SOURCE CONFIGURATION

The KTQ87 inside the Core Controller SBC is configured to boot upon receiving power. However, if there is a desire to change the configuration of the Core Controller SBC so that it boots upon a user pressing either the Tower System Activation button or the power switch on the Core Controller SBC chassis itself, the Tower Button Interface board can be configured as follows to accommodate this. See the user manual for the KTQ87 to see details on configuring the boot up mode of the SBC.

When pulled low, the PWRBTN_IN signal (P4.7) starts the ATX / BTX PSU and boots the KTQ87 board. Connector P6 on the Tower Button Interface PCBA board allows for the source of PWRBTN_IN to be configured as either the System Activation button on the Tower Button Box, or the Chassis Power button on the Kontron computer chassis. This is done using a 2 pin jumper. Jumping pins P6.1 and P6.2 together will connect PWRBTN_IN to the System Activation button. Jumping pins P6.2 and P6.3 together will connect PWRBTN_IN to the Chassis Power switch.

Signal Source	Pin 6.1	Pin 6.2	Pin 6.3
Button Box System Activate Button	X	X	-
Chassis Power Switch	-	X	X

Table 6: P6 Configuration Table

9. LATCHING SYSTEM PAUSE SIGNAL

The Tower Button Interface PCBA board uses a Texas Instruments SN74LVC2G74DCUR, D-Type Flip Flop in order to generate a latching System Pause Signal, SysPau_Latch. The advantage to using SysPau_Latch is that once the signal goes high, it will remain high until the flip flop is cleared. This allows for the signal to be polled less frequently without the risk of missing a button push.

To use the flip flop, input signal SysPau_Latch_CLR_L (P8.10) must first be brought high. At this point output signal SysPau_Latch will be low. When the System Pause button is pressed the input signal SysPau_DB_R will be pulled high and the rising edge of this transition will cause output signal SysPau_Latch to go high. SysPau_Latch will remain high until the flip flop is cleared by bringing input signal SysPau_Latch_CLR_L low. So long as SysPau_Latch_CLR_L is low the output will remain low, regardless of whether or not the button is pressed. This logic is summarized in the table below.

Inputs		Outputs
SysPau_Latch_CLR_L	**SystPau_DB_R**	**SysPau_Latch**
0	X	0
1	0	X_0
1	↑	1

Table 7: Latching System Pause Logic Table

The flip flop is triggered by the output of the debouncer which can add up to 80ms of delay.

10. VOLTAGE AND POWER

All power used by the Tower I/O Interface Board is supplied by the KTQ87 inside the Core Controller. The KTQ87 provides +12.0V, +5.0V and +3.3V to the Tower Button Interface PCBA. The +12.0V and +3.3V rails each can supply a max load of 0.75A continuously, and up to 1.5A for periods lasting less than 1 second. The +5.0V rail can supply a max load of 2A continuous.

The +12.0V rail is used to power the two LEDs on the Button Box. The +5.0V rail is used to power the SATA and PWR LEDs on the front of the Core Controller. The +3.3V rail is used to power board logic.

11. DOCUMENT REVISIONS:

Revision	Description and Reason of Change	Author
A	Initial Release	Sean Casley