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AMC7800
Advanced Mezzanine Card
PMC Carrier For MTCA.4

USERS MANUAL

PCB Issue 1

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Author: MRN

Revision History

The following table shows the revision history for this document.

Date	Version	Revision
05/03/2015	1.0	Initial release.
11/03/2015	1.1	Correct module size definition

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1. INTRODUCTION

The module has been developed primarily to allow the Micro Research Event Receiver (PMC-EVR) to be mounted in a MTCA.4 compliant PMC carrier. The module converts the LTTL trigger outputs from the PMC-EVR on Pn4 to LVDS using MAX9378 and then to the Zone 3 connector.
The MAX9378 are fully differential, high-speed, low-jitter, low propagation delay LVDS translators. Which are ideal for high speed triggering applications.

The AMC7800 is an AMC.1 PCI-Express four lane Micro-TCA specialised PMC carrier card that can accommodate one single-width PMC on a Double Mid-sized mTCA module.
The carrier is controlled and data downloaded via an XTCA interface which is AMC.1 (PCI-Express) compliant. The AMC7800 is an MCTA.4 compliant carrier card with Rear Transition Module (RTM) facility.

The AMC7800 provides an IPMI compliant Module Management Controller (MMC) with temperature monitoring, front panel status indicators and hot-swap support. There are three panel LED indicators, green to indicate power ok, red indicated fault and lastly blue for the hot-swap process. The AMC7800 card is also responsible for the control of the RTM it is connected to, therefore the IPMI has the added functionality to monitor and control the RTM plugged in.

A Tsi384 PCIe-to-PCI bridge is used to connect four PCIe lanes to the PMC slot. The bridge controls all PCI accesses and the frequency for the PMC access. PCI is supported up to 64-bit @66MHz.

The AMC7800 carrier card receives +12V and +3.3V power from the mTCA backplane. From the +12V the carrier produces +5V@2A volts +3.3V@2A and +12V@2A for the PMC module as well as all the required voltages to power the logic on the AMC7800 carrier card. The card also produces and monitors the 12V and management 3.3V supplies to the RTM. All voltage rails are protected by re-settable fuses.

Driver support is available for LINUX, RTEMS, Windows & EPICS environments.

2. SPECIFICATION

AMC7800 Specification				
Front Panel LEDs				
Carrier Card IPMI Indicators	**Carrier Status Indicators**			
Blue - Hot Swap	Green – AMC OK			
Green - Power on	Green – RTM Inserted			
Red - Fault/Error	Green – RTM OK			
AMC Module Connectors				
Zone1	AdvancedMC Plug Connector for µTCA, 170 pin to connect to the µTCA backplane as per AMC.0 definition			
Zone 3	2x 30 pair Advanced Differential Fabric (ADF) connectors to connect to the RTM			
Zone 3	Keying & Alignment, Safety key to indicate to the RTM the voltage levels present			
PMC Interface				
PMC	Can accommodate one PMC module			
Supported PCI Clock Frequency	33MHz / 66MHz (PCI)			
PMC I/O Access	Front panel I/O Rear I/O limited to 10 LDVS triggers from PMC-EVR via a compatible µRTM			
PCIe to PCI/PCI-X Bridge	Tsi384 from IDT			
Supported PCI Data Width	32-bit / 64-bit			
PCI I/O Signaling Voltage	3.3V and 5V			
Fabric Interface				
Signal standard	AMC.1 Type 1 compliant (4 x PCI-Express lane)			
Ports	Four lane on port 4, 5, 6 and 7 of the AMC connector, Zone 1			
IPMI	Version 1.5			
Mechanical				
Board Size	Double Module Mid-size Module 180.6mmx148.5mm			
Environment				
Operating Temperature	0 to 40 degrees C			

AMC7800 Specification Table

3. PMC I/O PIN OUTS on AMC7800 ZONE 3 CONNECTORS

There are two Advanced Differential Fabric (ADF) connectors (J30 and J31) that connect the AMC7800 carrier card to the RTM Rear Transition Module.
The connectors are ERmet ZD 3 pair female connector provides in the 10 wafer version 30 contact pairs (60 signal contacts and 30 ground contacts). Every contact pair is surrounded by an “L” shaped shield blade. The shielding contact is designated with the names of the corresponding signal pair (e.g. signal pin a and b is associated with shielding contact ab).

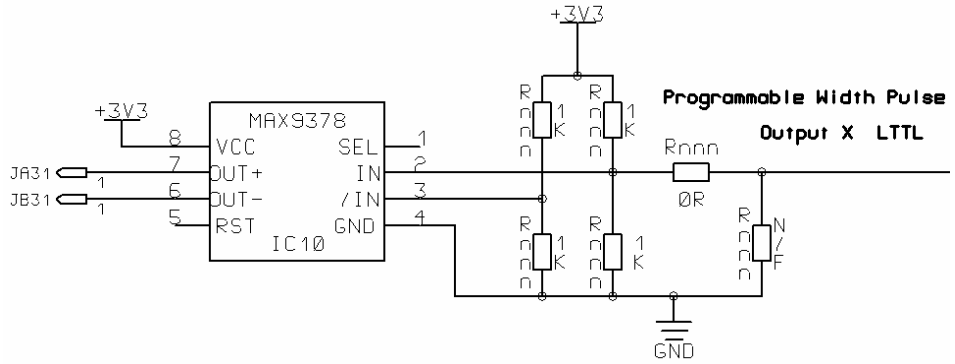
ZONE 3 J30

	A	B	C	D	E	F
1	PWRA1 +12V	PWRB1 +12V	PS#	SDA	TCK	TDO
2	PWRA2 +12V	PWRB2 +12V	MP +3v3	SCL	TDI	TMS
3						
4						
5						
6						
7						
8						
9						
10						

ZONE 3 J31
PWPO_x = Programmable Width Pulse

	A	B	C	D	E	F
1	PWPO_0 +	PWPO_0 -	PWPO_1 +	PWPO_1 -	PWPO_2 +	PWPO_2 -
2	PWPO_3 +	PWPO_3 -	PWPO_4 +	PWPO_4 -	PWPO_5 +	PWPO_5 -
3	PWPO_6 +	PWPO_6 -	PWPO_7 +	PWPO_7 -	PWPO_8 +	PWPO_8 -
4	PWPO_9 +	PWPO_9 -				
5						
6						
7						
8						
9						
10						

Programmable Width Pulse Output Circuitry



PMC connector 4 pins 23, 25, 27,29,31,33,35,37,39 and 41 shall be used for the Zone 3 triggers. Each trigger shall be converted to LVDS before it is distributed to the Zone 3 connector.

PMC Pn4 pin VME P2 Pin Signal

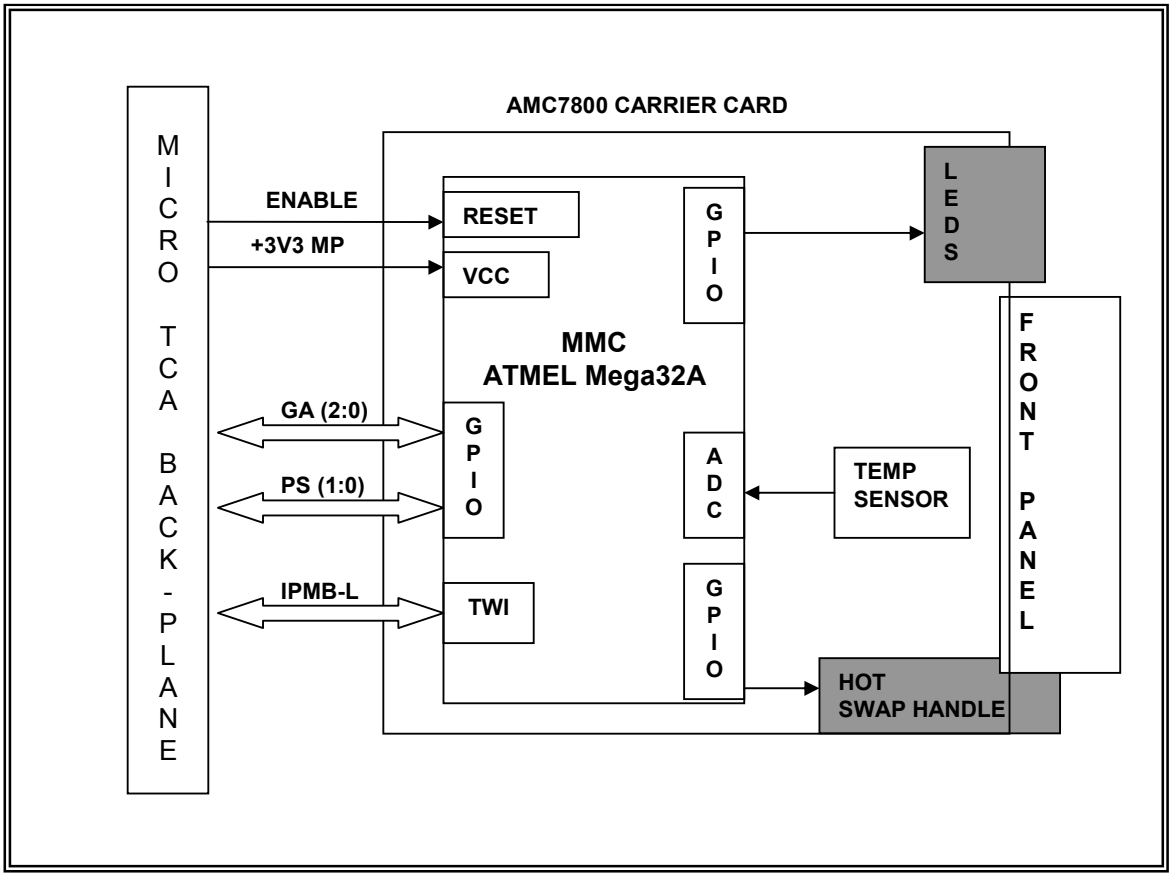
Signal Name On PMC-EVR-TREF	PMC Pn4 pin	Level From PMC	LTTL to LVDS Converter	Level To ZONE 3	ZONE 3 Cons
Transition board ID0	2				NC
Transition board ID1	4				NC
Ground	6, 8, …, 20				NC
Transition board ID2	22				NC
Transition board ID3	24				NC
Ground	26, 28, 30				NC
Transition board handle switch	32				NC
Ground	34, 36, …, 52				NC
+5V	54, 56, …, 62				NC
Power control for transition board	64				NC
NC	1, 3,…., 21				NC
prog width pulse output 0	23	LTTL	MAX9378	LVDS	J31.1a J31.1b
Prog width pulse output 1	25	LTTL	MAX9378	LVDS	J31.1c J31.1d
prog width pulse output 2	27	LTTL	MAX9378	LVDS	J31.1e J31.1f
prog width pulse output 3	29	LTTL	MAX9378	LVDS	J31.2a J31.2b
prog width pulse output 4	31	LTTL	MAX9378	LVDS	J31.2c J31.2d
prog width pulse output 5	33	LTTL	MAX9378	LVDS	J31.2e J31.2f
prog width pulse output 6	35	LTTL	MAX9378	LVDS	J31.3a J31.3b
prog width pulse output 7	37	LTTL	MAX9378	LVDS	J31.3c J31.3d
prog width pulse output 8	39	LTTL	MAX9378	LVDS	J31.3e J31.3f
prog width pulse output 9	41	LTTL	MAX9378	LVDS	J31.4a J31.4b
NC	43, 45…., 63				NC

4. Module Management Controller (MMC)

The MMC (Module Management Controller) passes information about the carrier card, using the IPMI interface, to the controller in the system. The controller in the system can then identify which card has been plugged in, the interface connections required on the back-plane and the power supply current details. If everything checks out ok then the controller will switch on the required power supply to the carrier and activate the PCIe bus.

The module management controller is based on the ATMEL Mega32A 8 bit microcontroller. The MMC has a number of operations to perform, as listed below:

- Monitoring of the hot-swap latch handle
- Controlling the front panel LED operation
- Generating the IMPI interface over the IMPB_L channel on the Micro TCA backplane connections, using a two wire I^2C interface
- Monitoring the board temperature of the AMC7800
- Determine and control of the RTM when inserted



Block Diagram of the Module Management Controller (MMC)

Shown in the block diagram above, are the connections to the MMC. The Atmel processor has a number of built-in functions to produce the required MMC operation.

The Two-Wire-Interface (TWI) is used to implement the I^2C interface for the IPMB_L (Intelligent Platform Management Bus). This bus carries information about the AMC7800 module and messages to the Controller.

There are 3 Geographic Address GA (2-0) lines used to assign the address of the AMC module on the IPMB_L. Each of these lines has 3 different states, grounded (G),

unconnected (U) or pulled-up (P). The MMC has the functionality to determine these states and then knows if the controller is trying to address the module.

The PS0 & PS1 pins are used to detect the presence of the AMC module to the controller. The PS0 & PS1 are connections at either end on the AMC connector. When inserted into the back-plane these connections produce a diode drop voltage, indicating to the controller that a module has been plugged-in.

The Atmel processor has an ADC (Analogue to Digital Converter) which monitors the board temperature, the 5V IP card supply and the on-board 3.3V supply. If these voltages are not present or the temperature is too high/low an error will be reported and the light red LED on the front panel illuminated.

There are 3 IPMI status LEDs on the front panel, controlled by the MMC. These are the blue LED used for the hot-swap operation, Green LED to indicate power ok to the module and Red LED to indicate an error or fault.

The module handle is used to indicate the insertion or extraction of the module to the MMC. Then the MMC sends an event message across the IPMI to the controller to indicate that the module has been inserted or removed. This allows the module to be inserted or removed with the power still supplied, hot-swap operation.

4.1 FRU Information

The MMC stores information about the card which it can pass on to the MCH controller. The following tables indicate the different types of field information.

4.1.1 Common Header Format

Field Length	Value (Hex)	Field Type
1	1	Common Header Format Version
1	0	No Internal Use Area
1	0	No Chassis Info Area
1	1	Board Area start offset (8 bytes)
1	8	Product Area start offset (64 bytes)
1	F	Multi-Record area start offset (164 bytes)
1	0	PAD set to 0
1	*	Common header checksum (calculate)

Print out from MCH common header records for the AMC7800

```
FRU Info for device 8:
----------------------------------------
Common Header    : 0x01 0x00 0x00 0x01 0x08 0x0f 0x00 0xe7
----------------------------------------
```

4.1.2 Board Info Area Format

Field Length	Value (Hex)	Field Type
1	1	Board Area Format Version
1	7	Board Area Length (in multiples of 8 bytes)
1	19	Language code English
3	xx	Mfg. Date /Time
1	D5	Board Manufacturer type/length byte
21	xx	Board Manufacturer HYTEC Electronics Ltd
1	C7	Board Product Name type/length byte
7	xx	Board Product Name AMC7800
1	C3	Board Serial Number type/length byte
3	xx	Board Serial Number 0000xx
1	C7	Board Part Number type/length byte
7	xx	Board Part Number AMC7800
1	C0	FRU File ID (No File ID)
1	C1	Indicates no more fields
5	00	00hex unused space
1	*	Checksum (Calculated)

Board Info Area Format

Example print out from MCH board Info Area records for the AMC7800

```
---------------------------------------------------------
Board Info Area          : at offs=8, len=56
Manufacturer (21)        : Hytec Electronics Ltd
Board Name (07)          : AMC7800
Serial Number (03)       : 001
Part Number (07)         : AMC7800
---------------------------------------------------------
```

4.1.3 Product Info Area Format

Field Length	Value (Hex)	Field Type
1	1	Product Area Format Version
1	7	Product Area Length (in multiples of 8 bytes)
1	19	Language code English
1	D5	Manufacturer Name type/length byte
21	xx	Manufacturer HYTEC Electronics Ltd
1	C7	Product Name type/length byte
7	xx	Product Name AMC7800
1	C7	Product Part Number type/length byte
7	xx	Product Part Number AMC7800
1	C2	Product Version type/length byte
2	xx	Product Version 0001
1	C3	Product Serial Number type/length byte
3	xx	Product Serial Number 0000xx
1	C0	Asset Tag type/length (length 0)
1	C0	FRU File ID (No File ID) (length 0)
1	C1	Indicates no more fields
9	00	00hex unused space
1	*	Checksum (Calculated)

Product Info Area Format

Example print out from MCH Product Info Area records for the AMC7800

```
----------------------------------------------------------------
Product Info Area          : at offs=64, len=56
Manufacturer (21)          : Hytec Electronics Ltd
Product Name (07)          : AMC7800
Product Number (02)        : 00
Part Version (02)          : 01
Product Serial Number (03) : 001
Asset Tag (00)             :  -
FRU file ID (00)           :  -
----------------------------------------------------------------
```

4.2 Multi-record Area

The MMC passes status and information about the Carrier Card to the system controller MMC. The system controller then decides if to power-up the carrier card and allocate the appropriate interface connections on the back-plane or to disable the carrier module. The information about the Carrier module is held in a number of records in the MMC and is passed to the controller when requested to. This information is called E-Keying information

4.2.1 AMC7800 Module Current Requirements Record

One of these records is called the current requirement record. This details the AMC7800 module current requirements

Field Description	Size, in bytes	Default Value
Record Type	1	0xC0, OEM type
End of list /Version	1	0x02,
Data length of record	1	0x06
Record Checksum	1	Calculated
Header Checksum	1	Calculated
Manufacturer ID, least significant byte first	3	0x5A, 0x31, 0x00 (PICMG ID 12634)
PCIMG Record ID	1	0x16, (Power Record) Module power descriptor value 0x16 is required
Record Format version	1	0x00, For this spec 0 must be used
Current Draw	1	25 (2.5A) Current requirement in units of 100mA at 12V
Total	11	Total number of bytes required for the current record

AMC7800 Module Current Requirements Record

Example print out from MCH Multi-record 1 current requirements record for the AMC7800

```
----------------------------------------------------------------
Record (0): Type ID=0xc0, PICMG Record ID=0x16, offset=0x000, len=11
Module Current Requirements Record:
  Current Draw: 2.5 A
----------------------------------------------------------------
```

4.2.2 AMC7800 Point-to-Point Connectivity Record

Another E-Keying record is the connectivity record. This record details the required interface connections to the back-plane. For example the type of connection, PCIe, Ethernet, Serial RapidIO, to which lanes 0,1,2 etc and the number of connections required 1 or more.

Detailed below is the connectivity record for the AMC7800 Carrier Module. There is a single PCIe connection connected physically connected to port 4 connected to channel 0 of the back-plane

Field Description	Size, in bytes	Default Value
Record Type	1	0xC0, OEM type
End of list /Version	1	0x82, last record
Data length of record	1	0x10
Record Checksum	1	Calculated
Header Checksum	1	Calculated
Manufacturer ID, least significant byte first	3	0x5A, 0x31, 0x00 (PICMG ID 12634)
PCIMG Record ID	1	0x19, (Point-to-Point Record) Connectivity descriptor value 0x19 is required
Record Format version	1	0x00, For this spec 0 must be used
OEM GUID Count	1	0x00,
Record Type	1	0x80, AMC module
Channel descriptor count	1	0x01
AMC Channel Descriptors, LSB first (Channel ID =0)	3	0xa4, 0x98, 0xf3, (PCI Express on fabric A ports, 4,5,6,7) See Table AMC Channel Descriptor
AMC Link Descriptors, LSB first	5	0x00, 0x2f, 0x00, 0x00, 0xfd (Channel0, PCIe lanes 0,1,2,3 are included, AMC Asy Match = 01, Type Extension 0, no grouping See Table AMC Link Descriptor
Total	21	Total number of bytes required for the Point-to-Point Connectivity record

AMC7800 Point-to-Point Connectivity Record

The AMC Channel Descriptor and AMC Link Descriptor are broken down into more detail in the following tables.

4.2.3 AMC Channel Descriptor

Bits	Setting					Description
23:20		1	1	1	1	Reserved. Must be 11111b
19:15	0	0	1	1	1	Lane 3 Port no.7
14:10	0	0	1	1	0	Lane 2 Port no.6
9:5	0	0	1	0	1	Lane 1 Port no.5
4:0	0	0	1	0	0	Lane 0 Port no.4

AMC Channel Descriptor

In connectivity record (23:0) = F3, 98, A4

4.2.4 AMC Link Descriptor

Bits	Setting								Description
39:34			1	1	1	1	1	1	Reserved. Must be 111111b
33:32							0	1	AMC Asy Match. 01b
31:24	0	0	0	0	0	0	0	0	Link Grouping ID. Single channel link
23:20					0	0	0	0	AMC link Type Extension. 0
19:12	0	0	0	0	0	0	1	0	AMC link Type. 2 AMC 1 PCI Express
11:8					1	1	1	1	AMC link designator , Lane3,2,1 & 0 included
7:0	0	0	0	0	0	0	0	0	AMC Channel ID 0 Fabric A connection

AMC Link Descriptor

In connectivity record (39:0) = FD, 00, 00, 2F, 00

Example print out from MCH Multi-record 2 Point to point record for the AMC7800

```
-----------------------------------------------------------------
Record(1): Type ID=0xc0, PICMG Record ID=0x19, offset=0x00b, len=21
AMC Point-to-Point record:
AMC Slot 4, OEM GUID Count = 0
   Record Type = AMC, len=21
   Channel Descriptor count = 1
   Channel (0): Port[4 5 6 7]
   Link Descriptors: size=5
   Link 0 of Channel 0: lanes [0..3]=[1111], PCIe,  Gen 1, no SSC, Grp=0x0, Match=0x1
```

4.2.5 Zone 3 Interface Compatibility Record

The finial multi-record is the compatibility record for the RTM. If the RTM matches this record then the AMC7800 and the RTM are compatible. The 12V will be enabled to the RTM and the RTM with move into state M4, normal operation.

Supported Zone 3 Identifier records (Interface Identifier OEM)

IANA PEN (Private Enterprise Number)	Zone 3 OEM Record	Description
0x009F81 Hex (40833) Hytec No	0x78000001 Hex	AMC7800 Zone 3 Compatibility

Zone 3 Interface Compatibility Record

Field Description	Size, in bytes	Default Value
Record Type	1	0xC0, OEM type
End of list /Version	1	0x82, (end of multi-record list)
Data length of record	1	0x0d
Record Checksum	1	Calculated
Header Checksum	1	Calculated
Manufacturer ID, least significant byte first	3	0x5A, 0x31, 0x00 (PICMG ID 12634)
PCIMG Record ID	1	0x30, (Zone 3 interface compatibility record)
Record Format version	1	0x01,Record format version 01
Type of interface identifier	1	0x03 (OEM interface identifier)
Manufacturer IANA	3	0x81, 0x9F, 0x00 (IANA PEN number)
OEM interface designator	4	0x01, 0x00, 0x03, 0x70 (AMC7800 compatibility)
Total	18	Total number of bytes required for the current record

AMC7800 Zone 3 Compatibility Record

Example print out from MCH Multi-record 3 Zone 3 compatibility record for the AMC7800

```
---------------------------------------------------------------------
Record (2): Type ID=0xc0, PICMG Record ID=0x30, offset=0x00b, len=18
Zone 3 Interface Compatibility record:
Manufacturer ID (IANA):         0x009f81OEM-defined interface designator: 0x01009f81
---------------------------------------------------------------------
```

4.2.6 Zone 3 Mechanical Keying & Alignment

As an added safety arrangement there is a mechanical keying arrangement between the AMC7800 carrier and the RTM. On the AMC there is a female keyed guide module and on the RTM there is a compatible male version.

The orientation of the key alignment determines the data signals in volts on the ADF connectors.

N	Orientation In Degrees	Data signal in Volts On ADF connectors
1	0	LVDS
2	45	0 -+/-1V
3	90	>+/-1 - +/-3.3V
4	135	>+/-3.3 - +/-10V
5	180	>+/-10V
6	225	Reserved
7	270	Reserved
8	315	Reserved

Safety Key Orientation

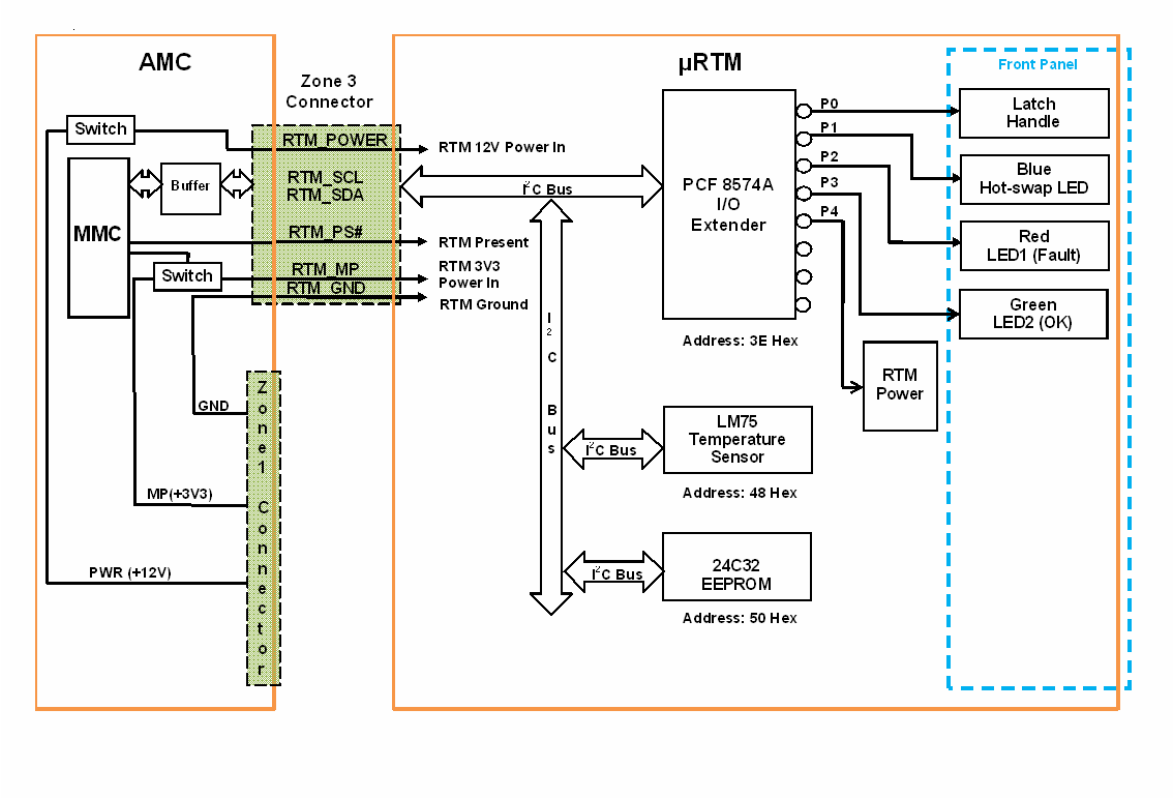
The orientation of the key guide is set to 0^0 LVDS.

5. Rear Transition Module (RTM) Management

The AMC7800 also supplies and monitors the power to the Rear Transition Module (RTM). This is done via the MMC which has the added functionality to control and monitor if an RTM is inserted. On insertion of an RTM the MMC allows a low current 3.3V supply to enable and the I^2C management interface used to check the RTM for compatibility with the AMC7800. If everything is ok then the main higher current 12V payload is applied to the RTM. The current draw is monitored and if it exceeds the limit, shuts down the supply, and notifies the AMC via the IPMI protocols.

The MMC also uses the an I^2C interface to control the LEDs, monitor the latch handle & temperature sensor as well as read the records from the RTM.

The RTM management is compliant to the PICMG MicroTCA.4 Specification. Shown in the block diagram below are the devices used:-



Block Diagram of the RTM IPMI

5.1 IPMI Sensors

There are a number of sensors on the AMC7800 carrier card as listed below:-

Sensor No	Name	Sensor Type	Sensor	Normal Value	Fault Value
0	HYTEC AMC-7800	0x12 Device locator		AMC name HYTEC AMC-7800	
2	Temp Board	0x01 Full sensor	0x01 =Temp	Temperature in degrees C	
3	FRU HOT_SWAP	0x01 Full sensor	0xf2= Hot Swap	0x01 = Latch handle CLOSED	0x02 = Latch handle OPEN
4	POWER 3.3V OK	0x02 Compact sensor	0x08= Power	0x01 = 3.3V power OK	0x00 =3.3V power not present
5	POWER 5V OK	0x02 Compact sensor	0x08= Power	0x01 = 5V power OK	0x00 = 5V power not present
9	RTM_PG3V3	0x02 Compact sensor	0x08= Power	0x00 = RTM 3.3V power good OK	0x01 = RTM 3.3V power good FAIL
10	RTM_PG12V	0x02 Compact sensor	0x08= Power	0x00 = RTM 12V power good OK	0x01 = RTM 12V power good FAULT
11	RTM_FLT3V3	0x02 Compact sensor	0x08= Power	0x01 = RTM 3.3V NO FAULT	0x00 = RTM 3.3V FAULT
12	RTM_FLT12V	0x02 Compact sensor	0x08= Power	0x01 = RTM 12V NO FAULT	0x00 = RTM 12V FAULT

IPMI Sensors

- Temp Board: On-board LM75 temperature sensor fed to the ADC on the ATMEL flash device
- FRU-HOT-SWAP: Indicates if the latch handle on the AMC7800is open or closed
- POWER 3.3V OK: Indicates if the on-board 3.3V supply is present or not, 0x01 = valid, 0x00= not present
- POWER 5V OK: Indicates if the on-board 5V supply is present or not, 0x01 = valid, 0x00= not present
- RTM_PG3V3: This is only valid when a RTM is present. Active low power good indicator for the 3V3 on the RTM
- RTM_PG12V: This is only valid when a RTM is present. Active low power good indicator for the 12V on the RTM
- RTM_FLT3V3: This is only valid when a RTM is present. Active low fault indicator for the 3V3 on the RTM. 0x01 = no fault, 0x00 = fault condition
- RTM_FLT12V: This is only valid when a RTM is present. Active low fault indicator for the 12V on the RTM. 0x01 = no fault, 0x00 = fault condition

Example Print out of the sensor data records from the MCH console:-

```
==================================================================
 #  SDRType   Sensor      Entity      Inst        Value       State      Name
------------------------------------------------------------------------------------------------------------
 0  MDevLoc               0xc1        0x64                               HYTEC AMC-7833
 2  Full      Temp        0xc1        0x64        37          ok         Temp Board
 3  Full      0xf2        0xc1        0x64        0x01                   FRU HOT_SWAP
 4  Compact   0x08        0xc1        0x64        0x01                   POWER 3.3V OK
 5  Compact   0x08        0xc1        0x64        0x01                   POWER 5V OK
 9  Compact   0x08        0xc1        0x64        0x00                   RTM_PG3V3
10  Compact   0x08        0xc1        0x64        0x00                   RTM_PG12V
11  Compact   0x08        0xc1        0x64        0x01                   RTM_FLT3V3
12  Compact   0x08        0xc1        0x64        0x01                   RTM_FLT12V
------------------------------------------------------------------------------------------------------------
```

5.2 I/O Extender

The PCF8574A I/O expander has the following connections to its ports

Pin	Description	0	1
P0	Hot swap handle	Closed	Open
P1	Blue LED	On	Off
P2	LED1 Red	On	Off
P3	LED2 Green	On	Off
P4	Power Good	Fail	OK

For normal operation the hot-swap handle will be closed ‘0’, the blue and red LEDs would be off ‘1’ and the green ok LED will be on ‘0’. However these settings are governed by the front AMC module the µRTM is plugged into.

The address on the I^2C bus is 0x3E Hex.

5.3 EEPROM (FRU Records)

The 24C32 EEPROM hold the Field Replaceable Unit (FRU) records about the RTM module. Stored on the EEPROM are the board area information, product area information, and multi-record area information. The address on the I^2C bus is 0x50 Hex.

5.3.1 Compatibility Check

The front AMC MMC (Module Management Controller) performs a compatibility check by reading the records stored in the RTM. If the records match and the AMC and RTM are considered to be compatible, the AMC will enable the main 12V payload to the RTM and move the state to state M4, normal operation.

5.3.2 RTM Zone 3 Interface Compatibility Record

Supported Zone 3 Identifier records (Interface Identifier OEM Example)

IANA PEN (Private Enterprise Number)	Zone 3 OEM Record	Description
0x009F81 Hex (40833) Hytec No	0x78000001 Hex	AMC7800 Zone 3 Compatibility

5.4 Temperature Sensor

The LM75B is a temperature to digital converter using an on-chip band gap temperature sensor and Sigma-Delta A to D converter. The device is controlled via the 2 wire I^2C bus and has the address set to 0x48 Hex.

The device has an 11 bit ADC that offers a temperature resolution of 0.125^{o}C, with a temperature accuracy of +/-2^{0}C from -25^{0}C to +100^{0}C.

5.5 Compatible RTM

The AMC7800 is designed to be implemented with SLAC. The AMC7800 passes all the Trigger signals to the RTM.

6. AMC Fabric Interfaces

Detailed below are the connections between the Micro TCA backplane and the AMC 7800 carrier card

	Description	Port No	Function
Basic Connector	Clock	TCLKA	Not Used
	Clock	TCLKB	Not Used
	PCI Express Gen 1 Clock Receiver 100 MHz nom. Straight connected	FCLKA	AMC FCLKA (CLK3) is used as the PCI Express Reference Clock.
	Common Options Region	0	Not Used
		1	
		2	
		3	
	Fat Pipes Region	4	PCIe connection 1
		5	PCIe connection 2
		6	PCIe connection 3
		7	PCIe connection 4
		8	Not Used
		9	
		10	
		11	
Extended Connector	Extended Options Region	12	
		13	
		14	
		15	
		TCLKC/TCLKD	
		17	
		18	
		19	
		20	

AMC Fabric Interfaces

The Fat Pipe region supports data path connections such as PCIe, advanced Switching, Ethernet and Serial RapidIO. A ‘Fat Pipe’ is a data transmission circuit or network capable of carrying large amounts of data.

There are a total of 8 ports on the fat pipe using ports 4-11. Ports 4-7 are defined on the Basic side and ports 8-11 defined for the Extended Side of the connector.

On the AMC7800 Carrier Card ports 4, 5, 6 and 7 are connected to the PCIe interface, all the other ports are not connected/used.

6.1 Connections to 170pin AMC Edge connector

Basic Side (Component Side 1)					Extended Side (Component Side 2)				
Pin No	Signal	Driven By	Mating	Pin Function on the AMC	Pin No	Signal	Driven By	Mating	Pin Function on the AMC
85	GND		First	Logic Ground	86	GND		First	Logic Ground
84	PWR	Carrier	First	Payload Power	87	Rx8-	Carrier	Third	Port 8 Receiver-
83	PS0#		Last	Presence 0	88	Rx8+		Third	Port 8 Receiver+
82	GND		First	Logic Ground	89	GND		First	Logic Ground
81	FCLKA-	FCLKA Driver	Third	Fabric Clock A-	90	Tx8-	AMC	Third	Port 8 Transmitter-
80	FCLKA+		Third	Fabric Clock A+	91	Tx8+		Third	Port 8 Transmitter+
79	GND		First	Logic Ground	92	GND		First	Logic Ground
78	TCLKB-	TCLKB Driver	Third	Telecom Clock B-	93	Rx9-	Carrier	Third	Port 9 Receiver-
77	TCLKB+		Third	Telecom Clock B+	94	Rx9+		Third	Port 9 Receiver+
76	GND		First	Logic Ground	95	GND		First	Logic Ground
75	TCLKA-	TCLKA Driver	Third	Telecom Clock A-	96	Tx9-	AMC	Third	Port 9 Transmitter-
74	TCLKA+		Third	Telecom Clock A+	97	Tx9+		Third	Port 9 Transmitter+
73	GND		First	Logic Ground	98	GND		First	Logic Ground
72	PWR		First	Payload Power	99	Rx10-	Carrier	Third	Port 10 Receiver-
71	SDA_L	IPMI Agent	Second	IPMB-L Data	100	Rx10+		Third	Port 10 Receiver+
70	GND		First	Logic Ground	101	GND		First	Logic Ground
69	Rx7-	Carrier	Third	Port 7 Receiver-	102	Tx10-	AMC	Third	Port 10 Transmitter-
68	Rx7+		Third	Port 7 Receiver+	103	Tx10+		Third	Port 10 Transmitter+
67	GND		First	Logic Ground	104	GND		First	Logic Ground
66	Tx7-	AMC	Third	Port 7 Transmitter-	105	Rx11-	Carrier	Third	Port 11 Receiver-
65	Tx7+		Third	Port 7 Transmitter+	106	Rx11+		Third	Port 11 Receiver+
64	GND		First	Logic Ground	107	GND		First	Logic Ground
63	Rx6-	Carrier	Third	Port 6 Receiver-	108	Tx11-	AMC	Third	Port 11 Transmitter-
62	Rx6+		Third	Port 6 Receiver+	109	Tx11+		Third	Port 11 Transmitter+
61	GND		First	Logic Ground	110	GND		First	Logic Ground
60	Tx6-	AMC	Third	Port 6 Transmitter-	111	Rx12-	Carrier	Third	Port 12 Receiver-
59	Tx6+		Third	Port 6 Transmitter+	112	Rx12+		Third	Port 12 Receiver+
58	GND		First	Logic Ground	113	GND		First	Logic Ground
57	PWR		First	Payload Power	114	Tx12-	AMC	Third	Port 12 Transmitter-
56	SCL_L	IPMI Agent	Second	IPMB-L Clock	115	Tx12+		Third	Port 12 Transmitter+
55	GND		First	Logic Ground	116	GND		First	Logic Ground
54	Rx5-	Carrier	Third	Port 5 Receiver-	117	Rx13-	Carrier	Third	Port 13 Receiver-
53	Rx5+		Third	Port 5 Receiver+	118	Rx13+		Third	Port 13 Receiver+
52	GND		First	Logic Ground	119	GND		First	Logic Ground
51	Tx5-	AMC	Third	Port 5 Transmitter-	120	Tx13-	AMC	Third	Port 13 Transmitter-
50	Tx5+		Third	Port 5 Transmitter+	121	Tx13+		Third	Port 13 Transmitter+
49	GND		First	Logic Ground	122	GND		First	Logic Ground
48	Rx4-	Carrier	Third	Port 4 Receiver-	123	Rx14-	Carrier	Third	Port 14 Receiver-
47	Rx4+		Third	Port 4 Receiver+	124	Rx14+		Third	Port 14 Receiver+
46	GND		First	Logic Ground	125	GND		First	Logic Ground
45	Tx4-	AMC	Third	Port 4 Transmitter-	126	Tx14-	AMC	Third	Port 14 Transmitter-
44	Tx4+		Third	Port 4 Transmitter+	127	Tx14+		Third	Port 14 Transmitter+
43	GND		First	Logic Ground	128	GND		First	Logic Ground
42	PWR	Carrier	First	Payload Power	129	Rx15-	Carrier	Third	Port 15 Receiver-
41	ENABLE#	Carrier	Second	AMC Enable	130	Rx15+		Third	Port 15 Receiver+
40	GND		First	Logic Ground	131	GND		First	Logic Ground
39	Rx3-	Carrier	Third	Port 3 Receiver-	132	Tx15-	AMC	Third	Port 15 Transmitter-
38	Rx3+		Third	Port 3 Receiver+	133	Tx15+		Third	Port 15 Transmitter+

Connections to AMC Edge Connector (pins 38-133)

Basic Side (Component Side 1 continued)					Extended Side (Component Side 2 continued)				
Pin No	Signal	Driven By	Mating	Pin Function on the AMC	Pin No	Signal	Driven By	Mating	Pin Function on the AMC
37	GND		First	Logic Ground	134	GND		First	Logic Ground
36	Tx3-	AMC	Third	Port 3 Transmitter-	135	TCLKC-	TCLKC Driver	Third	Telecom Clock C-
35	Tx3+		Third	Port 3 Transmitter+	136	TCLKC+		Third	Telecom Clock C+
34	GND		First	Logic Ground	137	GND		First	Logic Ground
33	Rx2-	Carrier	Third	Port 2 Receiver-	138	TCLKD-	TCLKD Driver	Third	Telecom Clock D-
32	Rx2+		Third	Port 2 Receiver+	139	TCLKD+		Third	Telecom Clock D+
31	GND		First	Logic Ground	140	GND		First	Logic Ground
30	Tx2-	AMC	Third	Port 2 Transmitter-	141	Rx17-	Carrier	Third	Port 17 Receiver-
29	Tx2+		Third	Port 2 Transmitter+	142	Rx17+		Third	Port 17 Receiver+
28	GND		First	Logic Ground	143	GND		First	Logic Ground
27	PWR	Carrier	First	Payload Power	144	Tx17-	AMC	Third	Port 17 Transmitter-
26	GA2	Carrier	Second	Geographic Addrs 2	145	Tx17+		Third	Port 17 Transmitter+
25	GND		First	Logic Ground	146	GND		First	Logic Ground
24	Rx1-	Carrier	Third	Port 1 Receiver-	147	Rx18-	Carrier	Third	Port 18 Receiver-
23	Rx1+		Third	Port 1 Receiver+	148	Rx18+		Third	Port 18 Receiver+
22	GND		First	Logic Ground	149	GND		First	Logic Ground
21	Tx1-	AMC	Third	Port 1 Transmitter-	150	Tx18-	AMC	Third	Port 18 Transmitter-
20	Tx1+		Third	Port 1 Transmitter+	151	Tx18+		Third	Port 18 Transmitter+
19	GND		First	Logic Ground	152	GND		First	Logic Ground
18	PWR	Carrier	First	Payload Power	153	Rx19-	Carrier	Third	Port 19 Receiver-
17	GA1	Carrier	Second	Geographic Addrs 1	154	Rx19+		Third	Port 19 Receiver+
16	GND		First	Logic Ground	155	GND		First	Logic Ground
15	Rx0-	Carrier	Third	Port 0 Receiver-	156	Tx19-	AMC	Third	Port 19 Transmitter-
14	Rx0+		Third	Port 0 Receiver+	157	Tx19+		Third	Port 19 Transmitter+
13	GND		First	Logic Ground	158	GND		First	Logic Ground
12	Tx0-	AMC	Third	Port 0 Transmitter-	159	Rx20-	Carrier	Third	Port 20 Receiver-
11	Tx0+		Third	Port 0 Transmitter+	160	Rx20+		Third	Port 20 Receiver+
10	GND		First	Logic Ground	161	GND		First	Logic Ground
9	PWR	Carrier	First	Payload Power	162	Tx20-	AMC	Third	Port 20 Transmitter-
8	RSRVD8		Second	Reserved, not connected	163	Tx20+		Third	Port 20 Transmitter+
7	GND		First	Logic Ground	164	GND		First	Logic Ground
6	RSRVD6		Second	Reserved, not connected	165	TCK	Carrier	Second	JTAG Test Clock Input
5	GA0	Carrier	Second	Geographic Addrs 0	166	TMS	Carrier	Second	JTAG Test Mode Select in
4	MP	Carrier	First	Management Power	167	TRST#	Carrier	Second	JTAG Test Reset Input
3	PS1#	AMC	Last	Presence 1	168	TDO	AMC	Second	JTAG Test Data Output
2	PWR	Carrier	First	Payload Power	169	TDI	Carrier	Second	JTAG Test Data Input
1	GND		First	Logic Ground	170	GND		First	Logic Ground

Connections to AMC Edge Connector cont (pins 1-33 & 134-170)

Listed in the table above are the standard connections to the 170 pin AMC back-plane.

Please not only one port is connected to the PCIe communications link and that is port4. All of the other ports are not connected on the AMC7800 module itself.

7. AMC LED Indicators

The AMC7800 has 3 LED indicators to represent the IPMI function on the front panel

Colour	Description
Blue	This LED function is according to the AMC.0 specification. It is the hot-swap indicator.
Red	Fault has been generated (Also extraction sequence)
Green	Indicates the AMC7800 card has powered up ok

7.1 Blue LED

The BLUE LED indicates the hot swap state of the AMC7800 module.

Insertion Sequence:

- Blue LED off: The AMC7800 module is inserted into the crate, but no power has been applied. M0 state, unit installed but no power
- Blue LED is on: The management power is applied to the unit, but the insertion handle is pulled out. M1 state, power but module inactive
- Blue LED long blink: The handle has been closed and the unit is being activated. M2 state, activation request
- Blue LED off: Activation in progress and then activation complete. M3 state (activation in progress) to M4 state, green LED on, all ok.

Extraction Sequence:

- Blue LED off: The AMC7800 module is in the normal active state. M4 state active
- Blue LED short blink: The insertion handle has been pulled out, deactivation request. M5 state, deactivation request state. Then deactivation in progress state, M6 state.
- Blue LED on: Deactivation complete, now save to remove the AMC7800 module from the crate. Red LED also on, M1 state, module inactive.
- Blue LED off: Module not installed or the power has been turned off. M0 state, module not installed.

7.2 Red LED

The RED LED indicates when a fault has been generated by the AMC7800 Card. Also on when in the extraction sequence and the Blue LED is on and M1 state.

7.3 Green LED

The GREEN LED indicates that the module has move into the active normal running state and the power to the unit is ok

7.4 AMC Status LED Indicators

Colour	Description
Green	Left Hand Status LED The RTM is compatible with the AMC and the RTM is in State M4, normal operation
Green	Middle Status LED Indicates the AMC card is OK
Green	Right Hand Status LED Indicates the RTM is present and the RTM has been plugged into the AMC

7.5 On-Board LED Indicators

There are 9 on-board LED indicators for various power supply rails and PCIe lanes.

LD No	Description	Colour
LD1	Indicates 12Vpayload is ok	Green
LD2	Indicates 5V voltage is ok	Green
LD3	Indicates RTM 12V voltage Fail	Red
LD4	Indicates 3.3V FPGA voltage is ok	Green
LD5	Indicates RTM 3.3V voltage Fail	Red
LD9	Indicates PCIe Lane 1 Good	Green
LD10	Indicates PCIe Lane 2 Good	Green
LD11	Indicates PCIe Lane 3 Good	Green
LD13	Indicates PCIe Lane 4 Good	Green

7.6 On-board Plugs

PL1:- PMC Connector.

PL2:- Used to program the ATMEL Mega32 flash microcontroller device. Connect to a suitable AMTEL programmer adaptor

PL3:- Test purposes

PL4:- Test purposes

7.7 PCB LINK and Jumper settings

There are a number of link and Jumper settings. The following tables detail their function and default factory settings.

On-board Link Settings

Jumpers	Function	Default setting
J1	Used for test only Jumper must be in.	IN
J2	Used for test only Jumper must be out.	OUT
J3	Used for test only Jumper must be out.	OUT
J4	Used for test only Jumper must be out.	OUT
J5	Used for test only Jumper must be out.	OUT
J6	Used for test only Jumper must be in.	IN
J7	Sets PMC PCI speed IN 33MHz Out 66MHz	IN
Links		
LK1 & LK12	For test purposes. Enable 12V to the RTM. With LK12 made and LK1 not, 12V to the RMT always enabled. Under normal operation, 12V RTM enabled controlled by MMC. LK1 made & LK12 not.	Factory Setting LK1 made & LK12 not. Normal operation, 12V RTM enabled controlled by AMC
LK6 & LK11	For test purposes. Enable 3V3 to the RTM. With LK11 made and LK6 not, 3V3 to the RMT always enabled. Under normal operation, 3V3 RTM enabled controlled by MMC. LK6 made & LK11 not.	Factory Setting LK6 made & LK11 not. Normal operation, 3V3 RTM enabled controlled by AMC
LK7	For test purposes. When made disables the on-board power supplies. Disables 5V& 3.3V.	Factory Setting Link not made

List of On-Board Link Settings