

## Debug Port Design Guide for Target Systems Based on a Single Intel® Mobile Pentium® II Processor (MMC2 / EMC2)

*An Application Note*  
[www.arium.com](http://www.arium.com)

This design guide applies to target systems with the following processor characteristics. If your target system does not match the following chart, please contact American Arium for the appropriate design guide that matches your target system.

Processor Type	Number of Processors	Package Type
Pentium II	Single Processor	MMC2 / EMC2

### Debug Port Ground Pins

Signal	Pin	Description	Suggested Termination
GND	2, 4, 6, 13, 15, 17, 19, 21, 23, 25, & 27	Signal grounds.	Connect to ground

### Debug Port Output Signal Pins (Driven By Target)

Signal	Pin	Description	Suggested Termination
TDO	10	TAP Data Out (From last processor of scan chain to debug port)	150Ω to V <sub>CC</sub>
PRDY0#	18	Processor PRDY signal. From 1 <sup>st</sup> processor in single/multiprocessor system.	See below Note 1
PRDY1#	22	Processor PRDY signal. Not used. From 2 <sup>nd</sup> processor in a multiprocessor system.	1KΩ to V <sub>CC</sub>
PRDY2#	26	Processor PRDY signal. Not used. From 3 <sup>rd</sup> processor in a multiprocessor system.	1KΩ to V <sub>CC</sub>
PRDY3#	30	Processor PRDY signal. Not used. From 4 <sup>th</sup> processor in a multiprocessor system.	1KΩ to V <sub>CC</sub>
RESET#	1	Processor RESET signal. This allows the emulator to sense when the processor is being reset.	See below Note 2
V <sub>TT</sub>	9	Target V <sub>TT</sub> . The emulator uses V <sub>TT</sub> to detect target power and establish the GTL+ threshold.	1KΩ to V <sub>TT</sub>
BCLK	29	Private copy of BCLK. This allows the emulator to provide a TCK that is synchronous with BCLK.	

### Debug Port Input Signal Pins (Driven By Emulator)

Signal	Pin	Description	Suggested Termination
TDI	8	TAP Data In (From debug port to TDI of first processor in scan chain)	150Ω to V <sub>CC</sub>
TMS	7	TAP Mode Select	See below Note 3
TCK	5	TAP Clock. Of the debug port signals, this is the most critical signal.	See below Note 3
TRST#	12	TAP Reset	470Ω to ground
BSEN#	14	Boundary scan (TAP) enable. Emulator has access to TAP signals of CPU when low	See below Note 4
PREQ0#	16	Processor PREQ signal. To 1 <sup>st</sup> processor in a single/multiprocessor system.	See below Note 5
PREQ1#	20	Processor PREQ signal. Not Used. To 2 <sup>nd</sup> processor in a multiprocessor system.	No Connection
PREQ2#	24	Processor PREQ signal. Not Used. To 3 <sup>rd</sup> processor in a multiprocessor system.	No Connection
PREQ3#	28	Processor PREQ signal. Not Used. To 4 <sup>th</sup> processor in a multiprocessor system.	No Connection
DBRESET#	3	Target reset. When driven low, the target should reset the system and CPU.	See below Note 6
DBINST#	11	Emulator installed. Debug cable grounds this signal, allowing target to detect the emulator.	See below Note 4

The resistor values given are in ohms and are typical values. Actual values are dependent on the target layout. Resistors should have a 1%.

The Joint Test Action Group (JTAG) bus for on-module testing is defined in "Test Access Port and Boundary-Scan Architecture, IEEE 1149.1-1990, 21 May 1990."

The Debug Port connection is achieved by way of a 30-pin connector specified as AMP 104068-3. See the following pin numbering diagram.

2	4	6	8	10	12	14	16	18	20	22	24	26	28	30
1	3	5	7	9	11	13	15	17	19	21	23	25	27	29

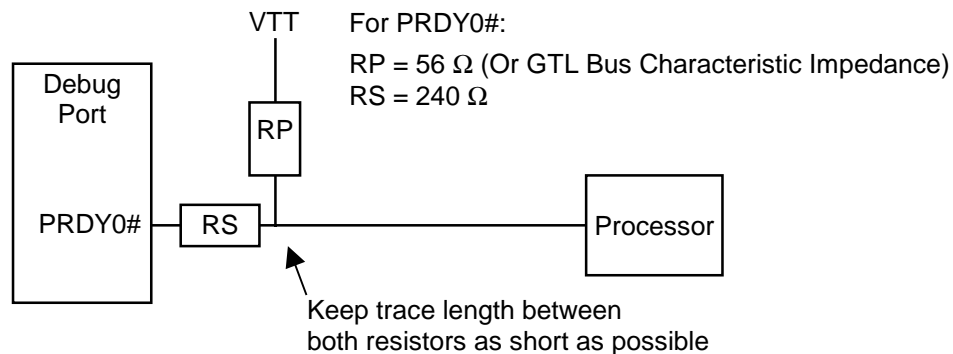
*Top View Of Connector With Pin Numbering*

### Voltage Definitions

V <sub>CC</sub>	Defined as the voltage level used to determine the processor CMOS logic high level (2.5V).
V <sub>TT</sub>	Defined as the voltage level used to determine the processor GTL+ logic high level.

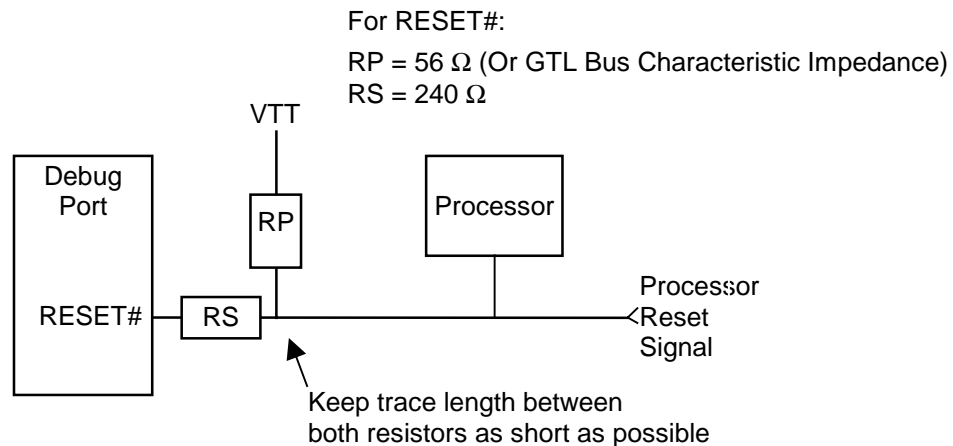
Note 1:

The PRDY0# signal is a GTL+ signal and should be end terminated to  $V_{TT}$  through a resistor equal to the characteristic impedance of the target's GTL bus. The signal supplied to the debug port should pass through a 240 $\Omega$  series resistor located as close as possible to the pull-up resistor. Do not add any stubs off of these traces. End termination resistor values for GTL signals vary according to the effective trace impedance and  $V_{TT}$  power dissipation issues.



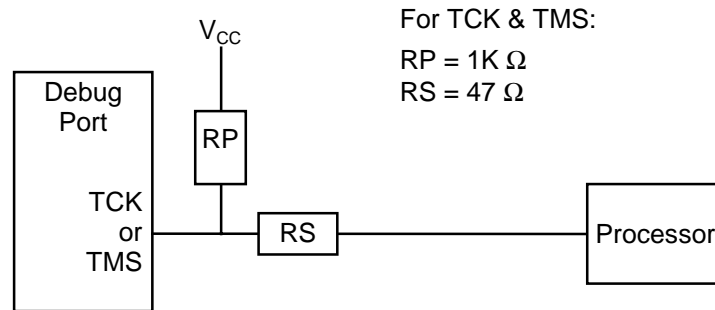
Note 2:

RESET# is a GTL+ signal and should be end terminated to  $V_{TT}$  through a resistor equal to the characteristic impedance of the target's GTL bus. The signal supplied to the debug port should pass through a 240 $\Omega$  series resistor located as close as possible to the nearest terminated end. Do not add any stubs off of this trace.



Note 3:

TCK is the most critical of the debug port signals. In the case of a single processor, TCK may be pulled up to  $V_{CC}$  through a  $1K\Omega$  resistor and then passed through a  $47\Omega$  series resistor before being routed to the processor as shown in the following figure. This note also applies to TMS and it should be terminated in the same manner.



Note 4:

BSEN# and DBINST# are driven by open drain devices. If these signals are used by the target, they should each be pulled up to their  $V_{CC}$  level through a resistor that will limit  $I_{OL}$  current to 48 mA. Intel recommends  $10K\Omega$ . If these signals are not used by the target, they may be left open.

Note 5:

PREQ0# should be pulled up to  $V_{CC}$  using a resistor in the range of  $270\Omega$  to  $10K\Omega$ .

Note 6:

DBRESET# is driven by an open drain device. It should be pulled up to  $V_{CC}$  through a resistor that will limit  $I_{OL}$  current to 48 mA. Intel recommends  $240\Omega$ .

**DISCLAIMER:**

In cases where the preceding guidelines differ from the current guidelines provided by Intel, the Intel guidelines will take precedence.

