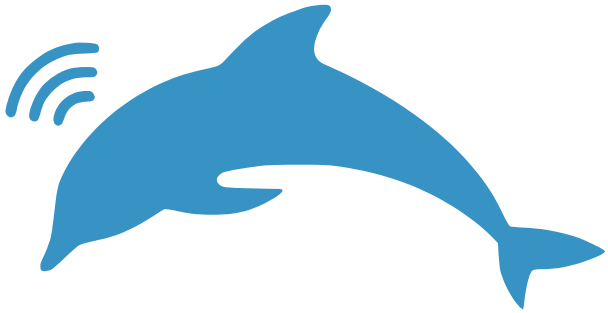

Popoto Modem

PMM5021 OEM Board Interface Control Document

delResearch LLC

Document Versions

Version	Purpose	Author	Sw Ver	Date
1.00	Initial draft	Jim DellaMorte		4/20/2021
1.01	Fixed Ducer Connector	Jim DellaMorte		6/18/2021

Contents

1 PMM5021 OEM Interface Description

1.1 Popoto Digital Interface

1.1.1 Overview

The Popoto Digital Interface (PDI) is a single connector which provides access to the most commonly used interfaces in the Popoto Modem system. These interfaces include RS-232, RS-422, 10/100 Ethernet, Board On/Off control, and PPS input signal.

1.1.2 PDI Hardware Components

PDI is connected to using a Molex Microfit connector (P/N 0430251400) or equivalent. This connector is sold as a shell plus discrete pins. While Molex produces many different pins for use with the MicroFit series, the best pins for use with Popoto Modems are Molex part number 0462355001. These pins are gold plated, rated for 250 mating cycles, and have a low insertion force. They are suitable for use with 20-24Ga wire. These pins can be crimped using one of Molex hand crimp tools such as the 0638190000. Alternately, if the expense of the crimp tool is cost-prohibitive for small prototype or limited production runs, pre-crimped wires are available from suppliers such as Digikey.

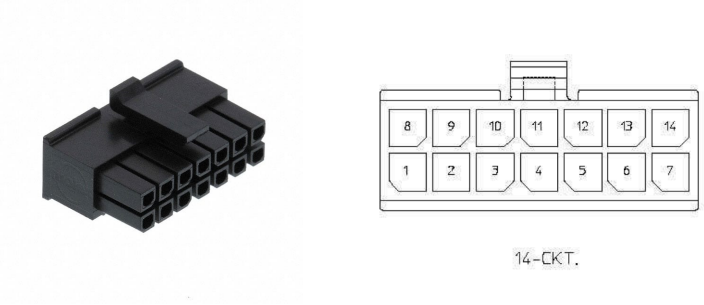

Figure 1.1: PDI User-Side Molex Connector. Interfacing to the PDI is accomplished with a Molex Microfit shell P/N 0430251400 and either Pre-pinned jumper wires, or Molex socket crimps.

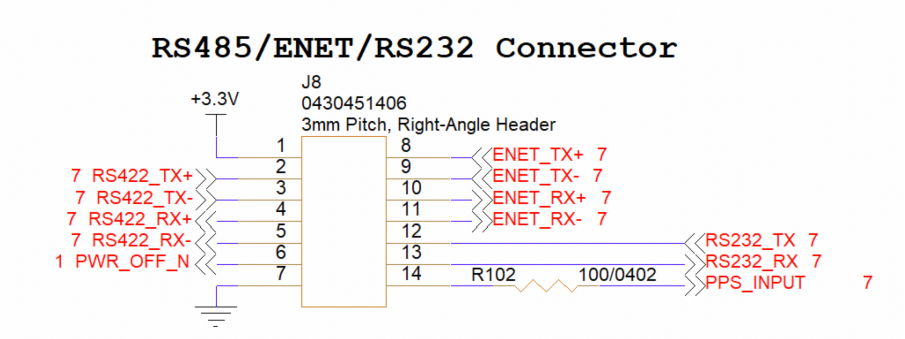

Figure 1.2: PDI Schematic connections.

1.1.3 Electrical Connections

Figure 1.2 shows the electrical connections for the the PDI interface. Pins labeled RS-422 are UART signals that comply with EIA-RS-422 interface standards. Default UART signaling parameters are 115200N81. Pins labeled with RS-232 are UART signals that comply with EIA-RS-232 electrical interface standards. UART signaling parameters for the RS-232 port default to 115200N81. PowerOFFN allows the unit to be powered off by connecting this signal to ground. ENET Signals are 10 100 Ethernet signals. As the Popoto board has on-board magnetics, these signals are standard 10 100 BaseT Ethernet signals. PpsInput is a 3.3V logic level input signal that is used for PPS input for clock discipline.

Table 1.1: PDI Components and Part Numbers

Part Number	Manufacturer	Description
0430251400	Molex	Microfit 14 position connector Receptacle 3.0MM
0462355001	Molex	Microfit 20-24Ga gold plated, lubricated sockets
0638190000	Molex	Microfit Hand Crimp tool
0797580010	Molex/Digikey	Precrimped Microfit leads

Table 1.2: PDI Electrical Pinout

Pin Number	I/O	Pin Name	Notes
1	O	3.3V	3.3V out when unit is powered up
2	O	RS 422 Tx +	Connect to Rx+ on Host
3	O	RS 422 Tx -	Connect to Rx- On Host
4	I	RS 422 Rx+	Connect Tx+ on Host
5	I	RS 422 Rx-	Connect to Tx- on Host
6	I	PowerSwitch	Short to ground to power down unit
7	-	Gnd	Digital Ground
8	O	Ethernet Tx+	T568A Green White T568B Orange White
9	O	Ethernet Tx-	T568A Green T568B Orange
10	I	Ethernet Rx+	T568A Orange & White T568B Green & White
11	I	Ethernet Rx-	T568A Orange T568B Green
12	O	RS-232 TX	Connect RX on Host
13	I	RS-232 RX	Connect to Tx On Host
14	I	PPS Interrupt	PPS interrupt for optional time Sync Max Voltage 3.3V for PMM3511 5V for PMM5021

1.1.4 Digital Interfaces

Popoto Modems have 3 additional digital interfaces beyond the PDI port. These interfaces are used to connect to external devices, or to provide alternate digital connection schemes for a host controller.

1.1.4.1 TTL Uart

The TTL UART port is used for connecting Popoto to a local controller over a short distance. The TTL UART port is a 5 pin Molex picoblade connector. Figure 1.3 shows the schematic connections on the TTL-UART port. In order to enable the 3.3V uart port, pins one and 2 of J6 must be shorted together. Doing this disables the RS-232 level translator, and thereby disables the RS232 port on the PDI connector.

Table 1.3: Popoto TTL UART Parts

Part Number	Manufacturer	Description
0510210500	Molex	Picoblade 5 position connector Receptacle
0500798000	Molex	Picoblade 26-28Ga sockets
2002181900	Molex	HAND TOOL FOR PICO-BLADE 26-32AW
2149202214	Molex	Precrimped Picoblade 150mm 26Ga

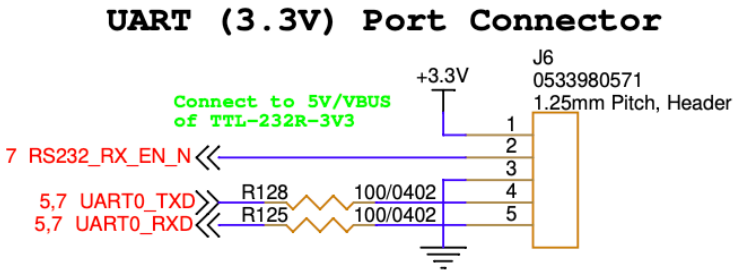

Figure 1.3: Popoto TTL Uart Plug. This port allows 3.3V Logic level uart connections

Table 1.4: Popoto 3.3V Uart Port

Pin Number	I/O	Pin Name	Notes
1	P	V+	+3.3V
2	I	V+	RS232_EN_N Tie this pin high (short to pin 1) to enable the 3.3V UART port
3	G	GND	Ground
4	O	UART0_TXD	Popoto UART Output
5	I	UART0_RXD	Popoto UART Input

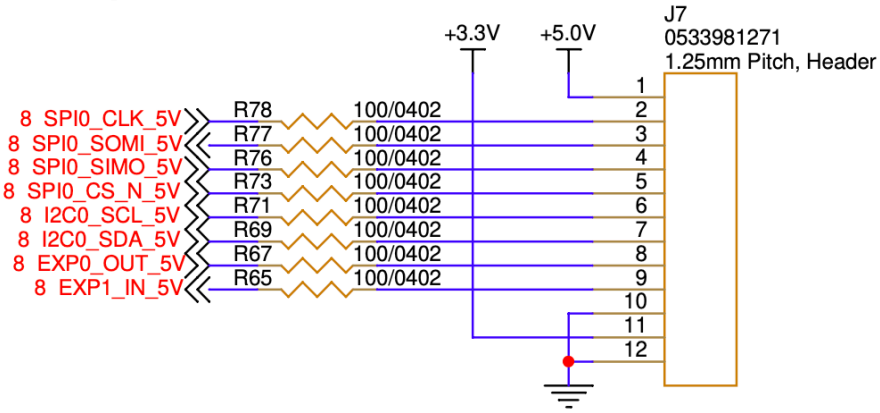

Figure 1.4: Popoto Expansion Header. This connector allows access to I2C, SPI and General purpose I/O from the Popoto Modem.

1.1.4.2 Expansion Header

Figure 1.4 shows the schematic diagram of the expansion header. This header is used to access peripherals from the Popoto Modem when running applications locally on the SOC. It supports a General Purpose input and General Purpose output pin, as well as SPI and I2C interfaces. Signals from this connector are used for PTT and volume control in SSB mode(PMM5021). This connector is a 12 Pin Picoblade connector, and the parts required for its use are listed in Table 1.5

Table 1.5: Popoto Expansion Header Parts

Part Number	Manufacturer	Description
0510211200	Molex	Picoblade 12 position connector Receptacle
0500798000	Molex	Picoblade 26-28Ga sockets
2002181900	Molex	HAND TOOL FOR PICO-BLADE 26-32AW
2149202214	Molex	Precrimped Picoblade 150mm 26Ga

1.1.4.3 MCU Expansion Header

The MCU Expansion header allows interface to the Popoto wake up processor. The Popoto wakeup processor is a mixed signal device. This device has Analog inputs, as well as digital I/O at 1.8V. This port is expecially useful for monitoring signals while the main processor is in Deep sleep mode. Use of this port requires special firmware support from Popoto Modem. If you require access to these signals for your application, please reach out to info@popotomodem.com.

1.1.4.4 Micro USB Port

The Micro USB port is a standard USB OTG port as configured by the Popoto Modem Linux Operating system. This port is extremely flexible, allowing both host and peripheral connections. If you have need for the Micro USB port, please contact Popoto Modem at info@popotomodem.com.

1.2 PMM5021 Specific Interfaces

1.2.1 Power

Power is provided to the PMM5021 OEM Boardset via connector J1 on the Digital Board. This connector is a 4 pin Molex MiniFit Jr connector, and has provisions for 2 V+ pins and 2 Ground pins. Acceptable input voltages are between 12 and 40 Volts. Table 1.7 and Figure 1.5 show the connections required for powering the PMM5021. Table 1.6 shows the parts required for attaching to the power connector on the PMM5021. Two option are given: Using sockets and a crimp tool for larger production runs, or ordering precrimped wires from Digikey for smaller prototype/production runs.

Table 1.6: PMM5021 Power Plug Components

Part Number	Manufacturer	Description
0039013042	Molex	MiniFit Jr 4 position connector Receptacle
0039000182	Molex	MiniFit Jr 18-24Ga gold plated, sockets
0638190901	Molex	Minifit Hand Crimp tool
0039000038-12-R9	Molex/Digikey	Precrimped MiniFit 12in 18Ga Red
0039000038-12-K9	Molex/Digikey	Precrimped MiniFit 12in 18Ga Black

Table 1.7: PMM5021 Power Connector Pinout

Pin Number	I/O	Pin Name	Notes
1	P	V+	12-40 Volts 150 Watts
2	P	V+	12-40 Volts 150 Watts
3	G	GND	Ground
4	G	GND	Ground

1.2.2 Analog Interfaces

The Analog interfaces to the PMM5021 can be found on the analog board. This board has the large round pot-core inductor, and can be seen in Figure 1.7

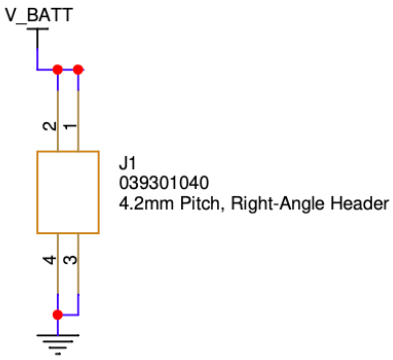

Figure 1.5: PMM5021 Power Schematic.

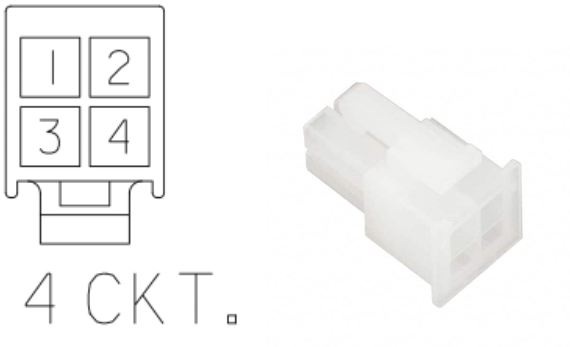

Figure 1.6: PMM5021 Power Connectors and pinout.

Figure 1.7: The PMM5021 Analog board

1.2.2.1 Transducer

The Transducer is connected to the Popoto Modem by a 6 pin Molex MiniFit Jr connection, labelled J9. This connector provides access to the TPA output and provides positions for series and parallel matching networks. In its default configuration with the Popoto 25-30Khz transducer, no additional matching networks are required. See Figures 1.8 and 1.9 for the pinout for this connector.

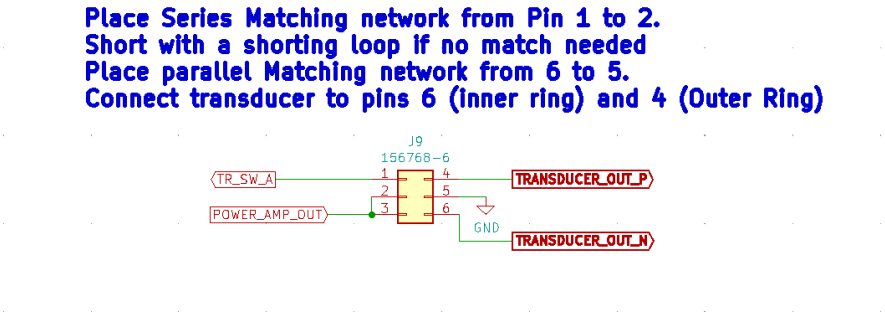

Figure 1.8: The PMM5021 Transducer connector schematic.

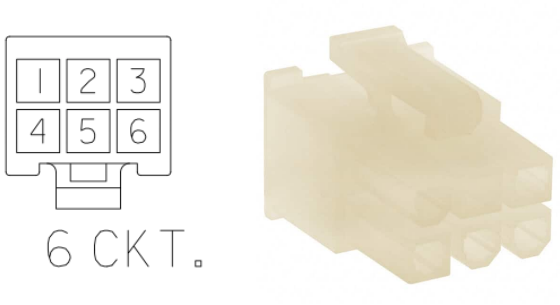

Figure 1.9: PMM5021 Transducer connector and pinout.

Table 1.8: PMM5021 Transducer Connector Pinout

Pin Number	I/O	Pin Name	Notes
1	I	TR_SW_A	Input to the TR Switch. Connect to Pin 2 with series matching network
2	O	POWER_AMP_OUT	Connect to Pin 1 with series Matching network
3	O	POWER_AMP_OUT	Same signal as Pin 2
4	O	TRANSDUCER_OUT_P	Positive transducer connection. Connect to Pin 5 with parallel matching network if needed
5	G	GND	Ground
6	O	TRANSDUCER_OUT_N	Negative transducer connection.

Table 1.9: PM5021 Transducer Plug Parts

Part Number	Manufacturer	Description
0039012060	Molex	MiniFit Jr 6 position connector Receptacle
0039000182	Molex	MiniFit Jr 18-24Ga gold plated, sockets
0638190901	Molex	Minifit Hand Crimp tool
0039000038-12-R9	Molex/Digikey	Precrimped MiniFit 12in 18Ga Red
0039000038-12-K9	Molex/Digikey	Precrimped MiniFit 12in 18Ga Black

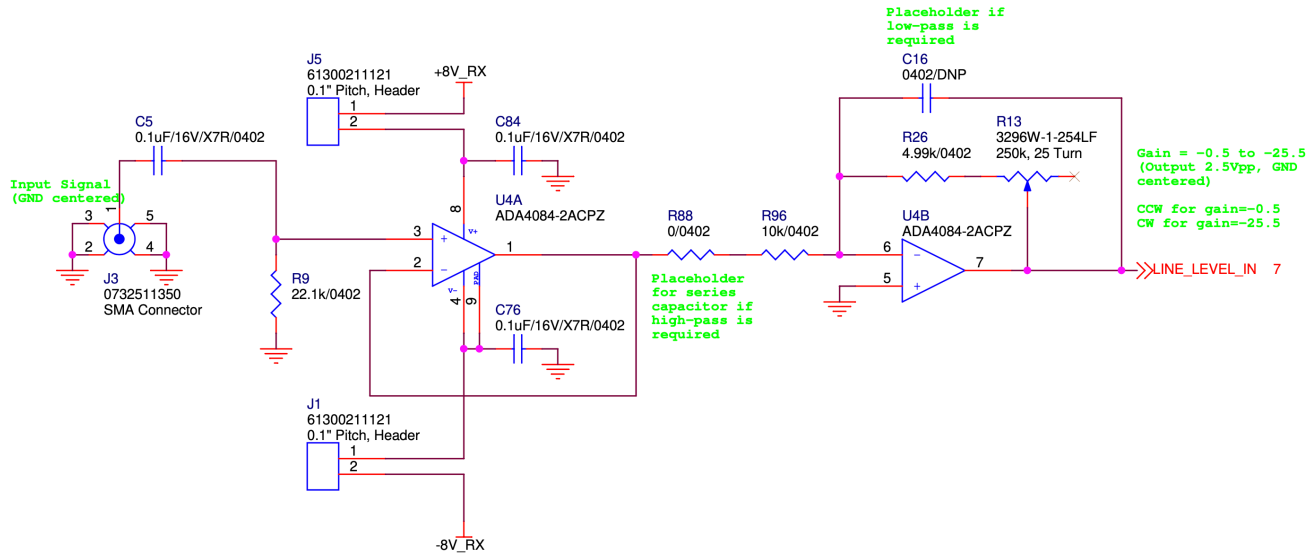

Figure 1.10: PMM5021 Analog input schematic excerpt. This circuit conditions the input signal and is used for SSB voice input or for applications providing line level analog input.

1.2.2.2 Analog In

The PMM5021 Analog board has provisions for analog input via an SMA connector mounted on the analog board. This connector is used for SSB voice input, as well as for applications that have line level outputs of transducer signals. The Analog input port drives an adjustable gain amplifier to allow for level matching between different equipment. An excerpt of the schematic, showing the input amplifier topology is shown in Figure 1.10. Note that for the analog input to operate, the J5 and J1 jumpers must be installed and J2 should be installed in the 2-3 position to connect the input to SMA. The input impedance of the SMA connection is 22.1 K. The input gain is adjustable by R13 yield a gain spanning from 1/2 to 25. The A/D input spans +/- 2.5 volts.

1.2.2.3 Analog Out

The PMM5021 Analog board has provisions for analog output via an SMA connector mounted on the analog board. This connector is used for SSB voice output, as well as for applications that utilize offboard power amplifiers. The Analog output port drives a fixed gain amplifier to provide buffering and level setting of the output to +/-5V. An excerpt of the schematic, showing the input amplifier topology is shown in Figure 1.11. The full scale output voltage on the SMA is +/- 2.0 Vpp. The maximum output current is 145mA and is ground centered.

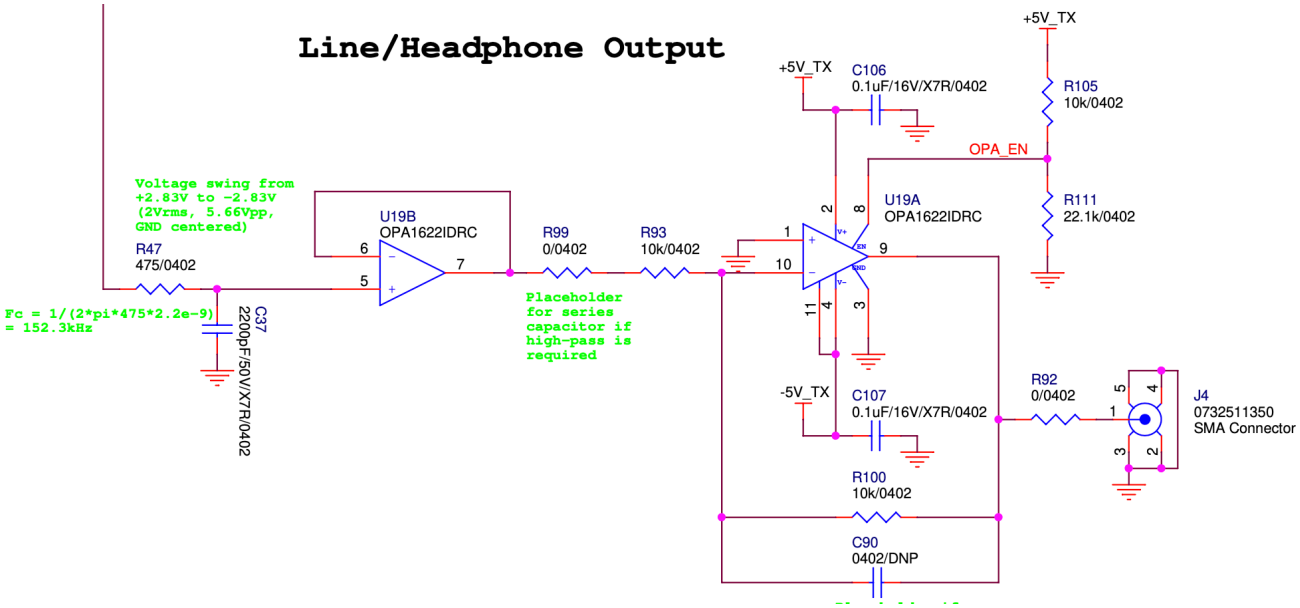

Figure 1.11: PMM5021 Analog output schematic excerpt. This circuit provides a +/- 5V signal to the SMA output port. This signal is used for the headphones output during SMA voice mode, or for a diagnostic port or to drive an external power amplifier if needed.