2. Apollo Terminal Overview -- General Description

{***Apollo -- Official***}

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2. General Description of the Terminal

2.1 Hardware Description

This chapter provides an overview of the hardware that makes up Apollo.

2.1.1 Major Components of the Terminal

The guts of the Terminal consist of the following five main areas:

- **Main Processor**
- **Memory**
- **Audio Interface**
- **Battery and Power Management**
- **User Interface**

2.1.1.1 Main Processor

The main processor in Apollo is an Intel SA-1100 running at 190 MHz. The SA-1100 does all the task traversal, speech recognition, speech output, and communication management.

2.1.1.1.1 Memory Interface

The SA-1100 can store data in two different memory devices, DRAM and Flash. The DRAM is high speed, 32 bit wide memory that loses its data when power is removed. Flash is a slightly slower, 16 bit wide memory device that doesn't lose its data after power is removed.

2.1.1.1.2 PCMCIA Interface

The PCMCIA interface is used for expansion. This is where a radio or flash card could be connected. The slot can support either one Type II PCMCIA card or one Type III PCMCIA card. The slot is PCMCIA 2.1 compliant and can support 3 volt or 5 volt cards.

2.1.1.1.3 General Purpose Inputs and Outputs and Peripheral Pin Controller

The SA-1100 has 28 general purpose pins that can be configured as either inputs or outputs (*See Table 1 General Purpose Pins*). and a peripheral pin controller which can take control of unused peripheral pins and use them as general purpose I/O (*See Table 2 Peripheral Pins*). In Apollo, these pins are used to read pushbuttons, control power to different devices, and several are used to implement part of the PCMCIA interface. A more detailed description is given below.

Table 1: General Purpose Input and Output Pins

GPIO Bit	Signal Name	Function
0	ON_AIR_PB	Input, active high. Active when the on air pushbutton is pressed.
1	Follows SOFT_RESET	Input, active high. This signal is a delay of what the SOFT_RESET line does. The delay is created by the RC filter.
2	_PCD	Input, active low. Active when a PCMCIA card is placed in the slot. Part of the PCMCIA interface.
3	_PREADY	Input, active low. See PCMCIA spec for detailed description.
4	_BATT_LOW_1	Input, active low. Active when the battery voltage is below 5.5 volts.
5	BACKWARD_PB	Input, active high. Active when the minus or backward pushbutton is pressed.
6	FORWARD_PB	Input, active high. Active when the plus or forward pushbutton is pressed.
7	CHANGE_PB	Input, active high. Active when the change operator pushbutton is pressed.

8	UPDATE_PB	Input, active high. Active when the update training pushbutton is pressed.
9	SAMPLE_PB	Input, active high. Active when the sample noise pushbutton is pressed.
10	_PSTSCHG	Input, active low. See PCMCIA spec for detailed description.
11	_BATT_LOW_2	Input, active low. Active when the battery voltage is below 5.1 volts.
12	OFF_GPP	Output, active high. When set active, this line shuts off the 3.3 volt regulator and the terminal shuts off..
13	IN_CRADLE	Input, active high. Active when the terminal is in a cradle.
14	_RED_LED	Output, active low. When set active, this line turns on the red LED.
15	_GREEN_LED	Output, active low. When set active, this line turns on the green LED.
16	RTC_DATA	Input/Output. This is the data line for the 2 wire serial interface to the external RTC.
17	IRDA_SHUTDOWN	Output, active high. When set active, this line shuts off the IrDA transceiver.
18	PCMCIA_SHUTDOWN	Output, active high. When set active, this line powers down the PCMCIA slot.
19	RTC_SCLK	Output. This is the clock line for the 2 wire serial interface to the external RTC.
20	_SERIAL_SHUTDOWN	Output, active low. When set active, this line powers down the serial drivers.
21	VSERIAL_ENABLE	Output, active high. When set active, this line turns on 5 volts to the serial connectors.
22	LOW_TEMP_1	Input, active high. Active when the temperature drops below xxx degrees C.
23	CODEC_IRQ	Input, active high. Active when the codec wants to interrupt the processor.
24	_CODEC_RESET	Output, active low. When set active, this line places the codec in reset.
25	LOW_TEMP_2	Input, active high. Active when the temperature drops below xxx degrees C.
26	PRESET	Output, active high. See PCMCIA spec for detailed description.

27	_PSPKR	Input, active low. See PCMCIA spec for detailed description.

Table 2: Peripheral Pin Controller

PPC Bit	Signal Name	Function
4	_RTC_RST	Output, active low. When set active, this pin resets the external real time clock.
5	DECODER_RESET	Output, active high. When set active, this pin resets the barcode decoder.
6	PVPP1	Output. This pin is used along with three others to enable and change the voltage supplied to the PCMCIA slot.
7	PVPP0	Output. This pin is used along with three others to enable and change the voltage supplied to the PCMCIA slot
8	_PVS2	Input. See PCMCIA spec for detailed description.
9	PVCC0	Output. This pin is used along with three others to enable and change the voltage supplied to the PCMCIA slot
10	PVCC1	Output. This pin is used along with three others to enable and change the voltage supplied to the PCMCIA slot
11	_PVS1	Input. See PCMCIA spec for detailed description.

Any of the GPIO pins can be configured to be interrupts.

2.1.1.1.4 Serial Channels

Apollo makes use of four of the five serial channels on the SA-1100. Channel 0 is not used. Two are used for the externally accessible serial ports, one is used for the IrDA port, and the fourth is used for communication to the codec. The following table shows the connections between ports and serial channels.

Table 3: Serial Channels and Terminal Ports

Serial Channel	Description	Configuration	Port
0	USB Device Controller	N/A	Not used
1	SDLC/UART	UART	Red port
2	Infrared Communications Port	IrDA	IrDA port
3	UART	UART	Blue port
4	MCP/SSP	MCP	Codec

2.1.1.1.5 Power Supply

The SA-1100 requires two different voltages to operate. The core of the processor is powered from 1.5 volts and the I/O is powered from 3.3 volts. When the 3.3 volt power is turned on, the processor can boot and run. If the 3.3 volt power is removed, the processor shuts off. The 1.5 volt power is not always on. It is enabled and disabled as needed by the SA-1100.

2.1.1.2 Memory

Apollo has two different memory devices to store data, DRAM and Flash memory.

2.1.1.2.1 DRAM

Apollo can support either 16 MB or 32 MB of DRAM. The DRAM is configured as either one or two banks of 4M x 32 bits.

Table 4: DRAM Integrated Circuit Specs:

Architecture:	**EDO**
Speed:	50 or 60nS
Refresh:	Self
Organization:	4M x 16 bit
Package:	TSOP

2.1.1.2.2 Flash Memory

Apollo can support either 4 MB or 8 MB of Intel Strataflash memory.

4MB IC: Intel E28F320J5-120

8MB IC: Intel G28F640J5-150.

2.1.1.3 Audio Interface

The Apollo audio interface consists of a differential speaker driver, a dynamic microphone input, an electret microphone input, a line level output, and a noise canceling electret microphone input. Here are the specifications for each part of the interface.

Electret Microphone Input

Bias Circuit: 2.2k ohms to 3.3 volts

Internal Gain: 1

Dynamic Microphone Input

Internal Gain: 5

Noise Canceling Electret Input

Internal Bias Circuit: 2.2k ohms to 3.3 volts

Internal Gain: 3.5

Speaker Driver:

Minimum Impedance: 16 ohms

Power:

Line Out

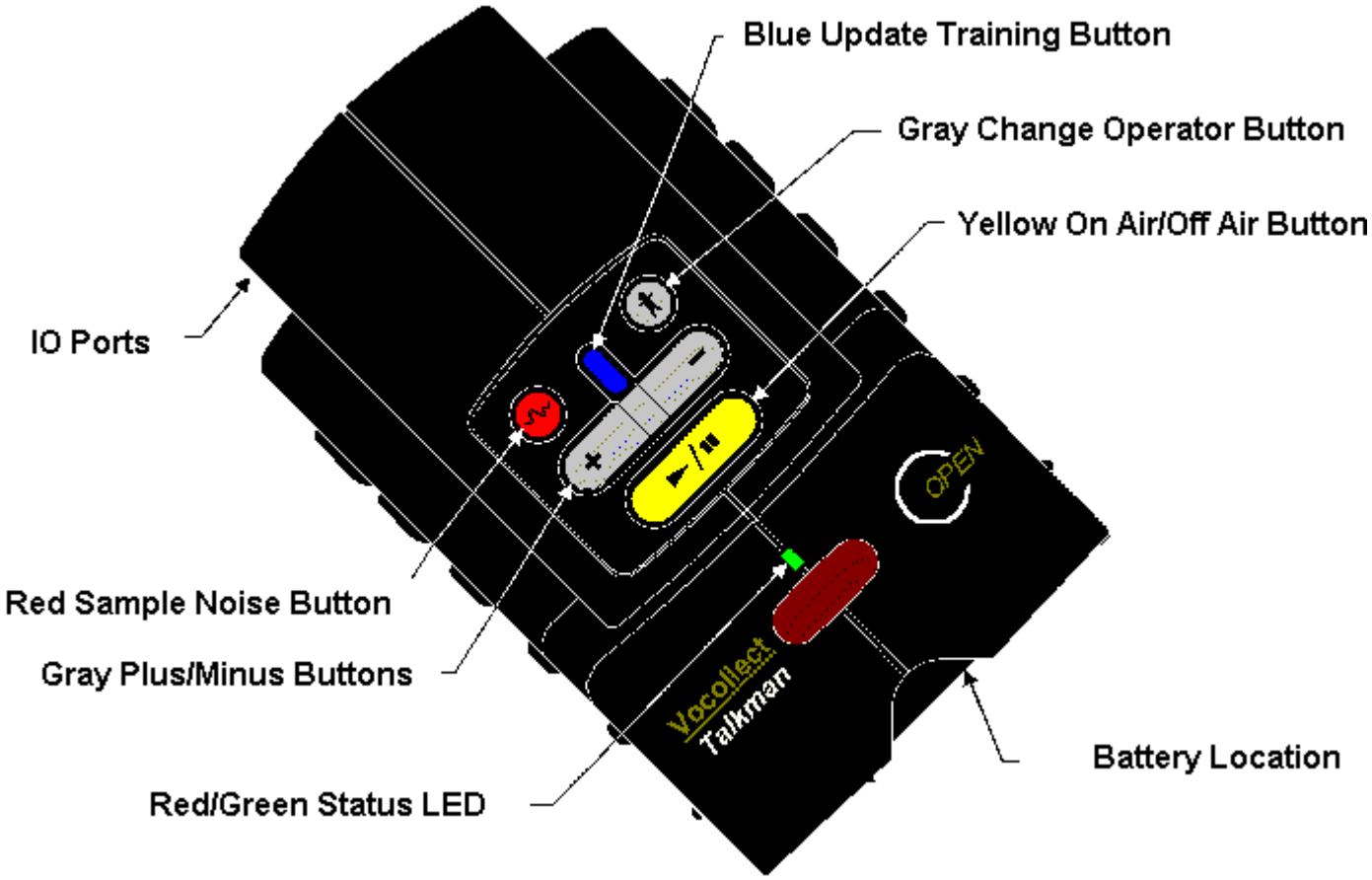
Minimum Impedance: 1k ohms

2.1.1.4 Battery and Power Management

The battery and power management section of Apollo is used to produce the proper regulated voltages for the different components to operate properly and to produce battery warnings and force the terminal into sleep when the battery voltage drops.

2.1.1.5 User Interface

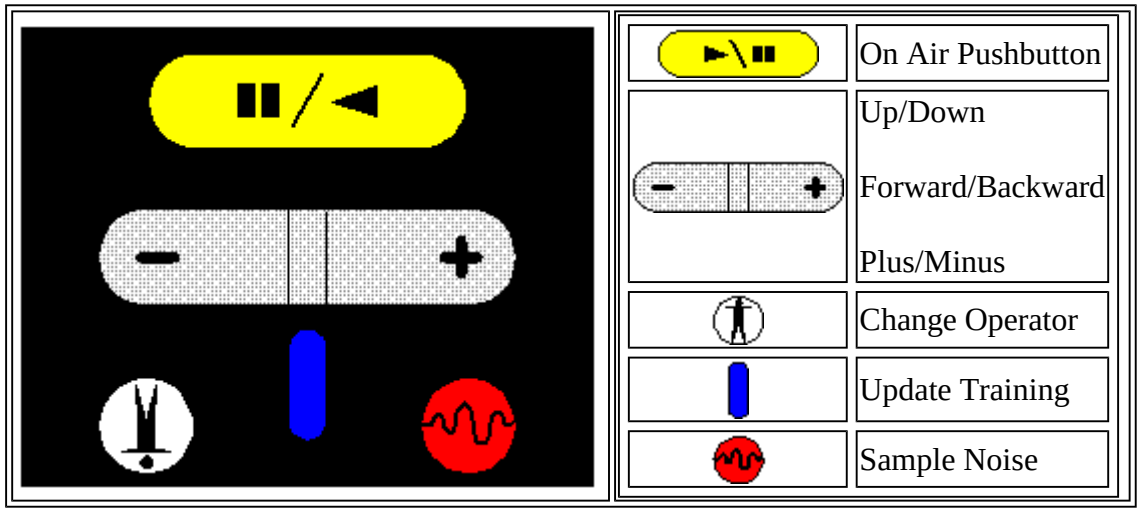
The user interface on Apollo consists of the pushbuttons, the LED, the serial ports, the line out jack, the headset port, and the IrDA port.



2.1.1.5.1 Pushbuttons

Apollo has a six button keypad -- the Plus/Minus button is one piece but each side acts like its own button. The keypad is used to control the operation of the Terminal. A picture of the keypad is shown below.

Table 5: Pushbuttons



	On Air Pushbutton
	Up/Down Forward/Backward Plus/Minus
	Change Operator
	Update Training
	Sample Noise

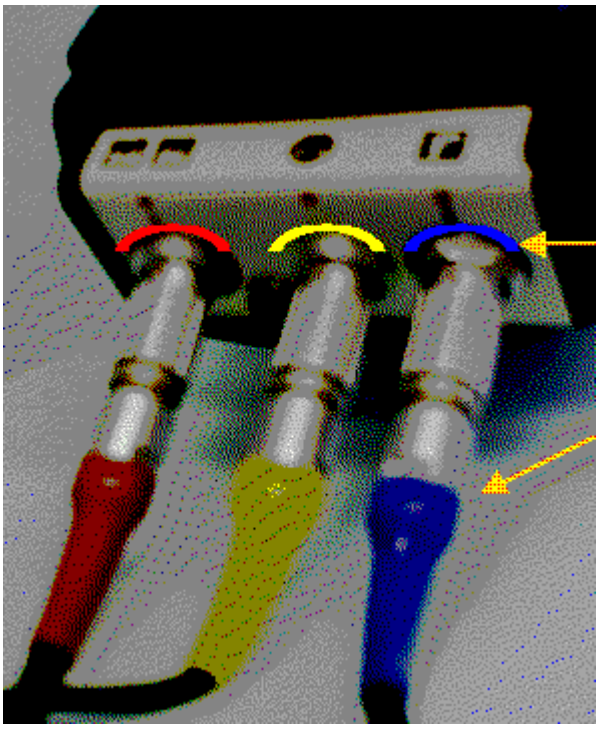
Key functions are discussed elsewhere.

2.1.1.5.2 LED

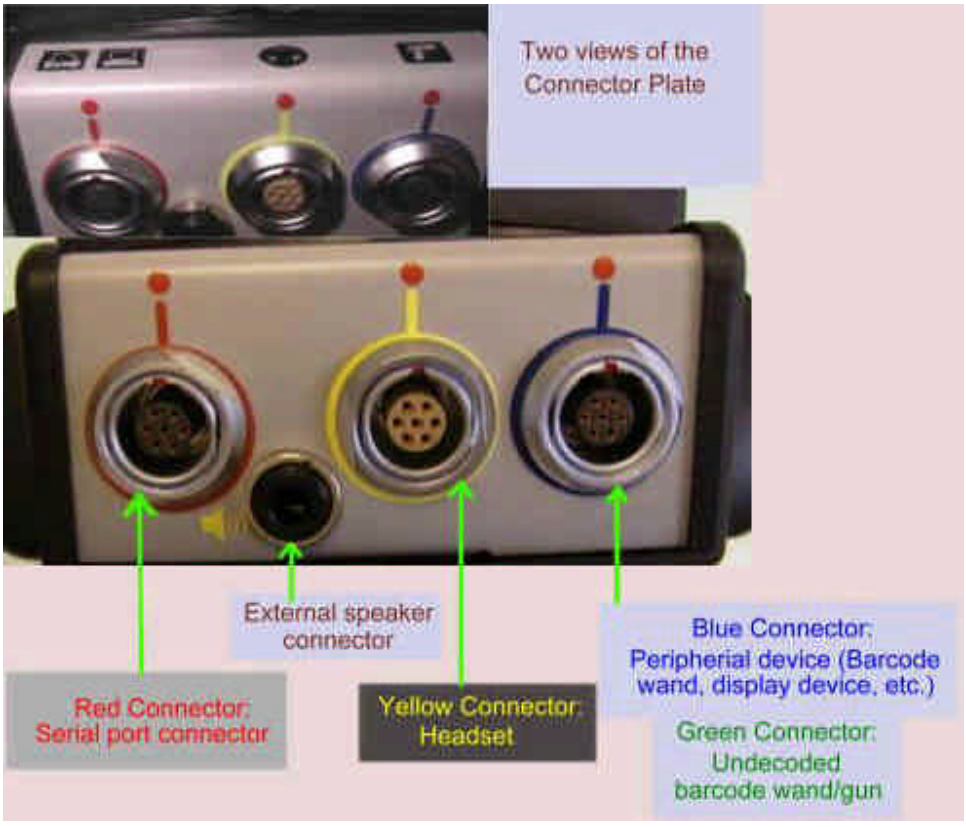
Apollo has a bi-color LED between the keypad and the IR lens. The LED can be red, green, orange, or off. See some other chapter for what the different colors mean.

2.1.1.5.3 Audio and Serial Connectors

The following image shows Lemo connectors on a Terminal.

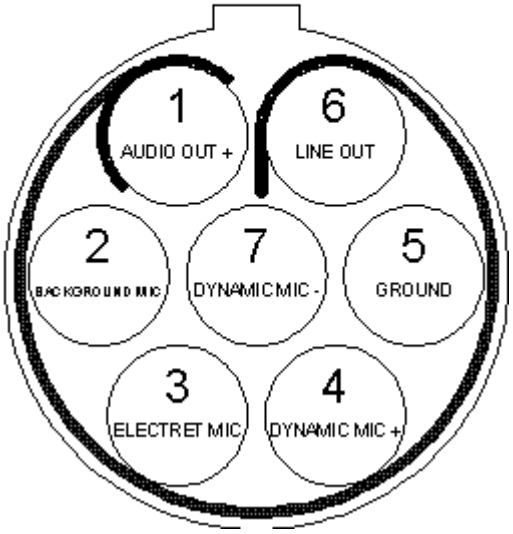


Below is an image of the connectors:

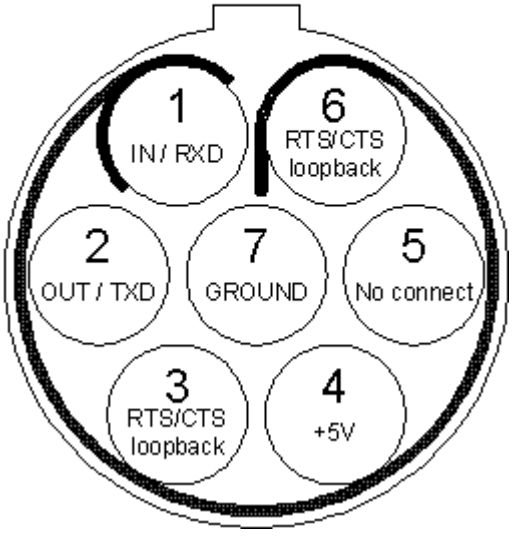


Below are pin outs for the three Lemo connectors.

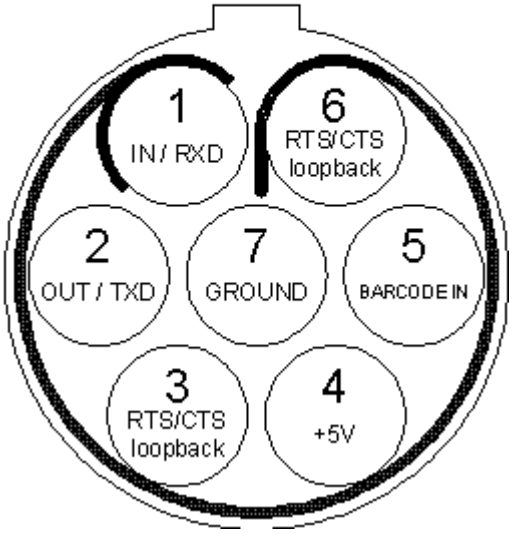
Apollo Headset Connector
Yellow, Single Key
Viewed from back / solder side



Apollo Serial Connector, Com 1
Red, Double Key (30 degrees)
Viewed from back / crimp side



Apollo Serial Connector, Com 2
Blue, Double Key (60 degrees)
Viewed from back / crimp side



2.1.1.5.4. IrDA

The Infra Red port is not implemented on Apollo.