



AVIDdirector-M2M™

Technical Reference Guide



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Overview

AVIDdirector-M2M is a dedicated wireless telemetry communication device that is capable of being installed in an industrial environment, to provide communications with a variety of equipment. AVIDdirector-M2M is designed to operate over any carrier's network through different replaceable radio cards. AVIDdirector-M2M is a ruggedized alternative to handheld wireless devices that can easily be broken, lost or stolen. AVIDdirector-M2M is capable of expanding your telemetry applications by assembling a collection of wireless modems, ruggedized computers and sensor input / output boards. To simplify the M2M communications and collection features, AVIDdirector-M2M uses M2MXML¹ to interface directly with backend systems and web portals. Each device is supplied with our M2M Application Framework software that allows a user to implement a wireless solution directly with your current machinery or sensors without writing embedded software applications on the device.



Figure 1. AVIDdirector-M2M

Features

The principle features of this device are:

1. Uses the Imsys Technologies² Cjip Java processor. This processor directly executes Java op-codes as its native machine instruction set without the need for an interpreter or Java to machine code compiler. This means the executable program size is very small (Java class files are often only 1-4K in size) and the performance is equivalent to desktop machines.
2. A Sun certified J2ME CLDC environment with extension for serial and parallel device I/O and control. It supports the connection framework along with PPP, javax.comm serial APIs, watchdog timers and other enhancements. Up to 128 different threads may be simultaneously executing.
3. It provides bi-directionally communication over any carrier's network using approved and commercially available modem modules.

¹ See Appendix 5 and <http://www.m2mxml.org> for further details and specifications.

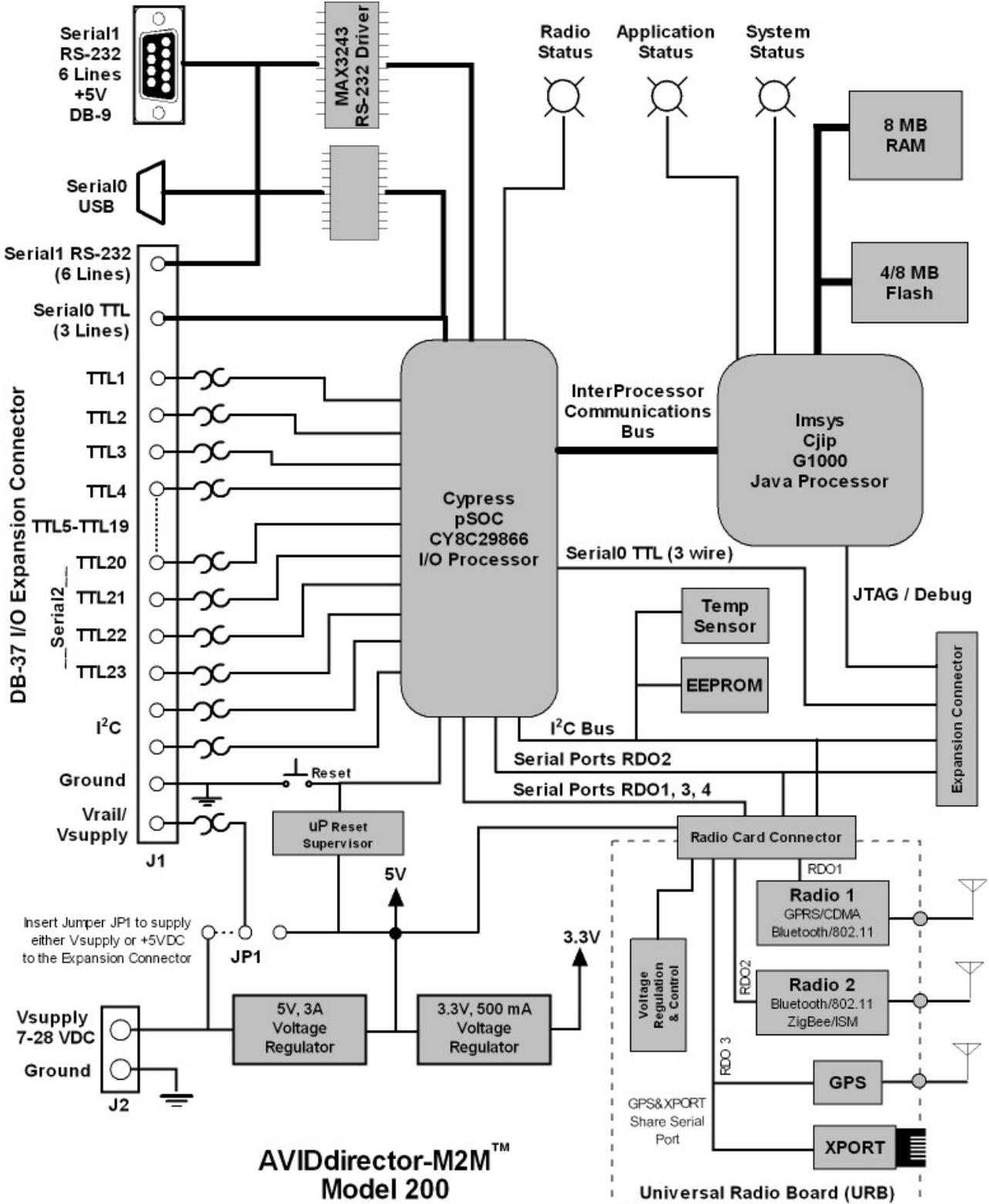
² See <http://www.imsystech.com> for further details on the Cjip and SNAP system

4. 8 MB of Flash memory for program and persistent data storage, and 8 MB of DRAM memory. Of the 8 MB RAM, up to 6 MB is used for the Java heap, though up to 7 MB may be allocated. Java executables may be any size up to the amount of RAM or Flash installed.
5. Comes with the M2M Application Framework (M2MApp) preinstalled to implement on-terminal behaviors as configured by an M2MXML portal. This allows the user to configure each I/O pin and port's function and tie it to a device specified by a web portal or other M2MXML server. M2MApp has the concept of an M2Mlet for the user application and dynamically loadable device I/O drivers.
6. Internal debug / console connector. This allows connecting both an Imsys Developer hardware debugging pod and a serial terminal console port. The debugging pod provides single step execution, breakpoints (at either the Java statement or op-code level), data inspection and program download.
7. A "Unix-like" USB console terminal application for development and debugging. This supports most common Unix and DOS commands along with special command for program loading and transfer.
8. Four high voltage / current (HVC) digital input / output ports. These are designed to control relays and other industrial automation control systems. These ports will operate at up to 18 VDC at 250 mA or provide open collector outputs capable of sinking at least 400 mA. They are over voltage and current protected. Normal operation is 80-180 mA.
9. 22 TTL level (0 to 5 VDC) digital input / output ports. These are designed to control or interface with other electronic equipment. They can source 8 mA and sink 25 mA. Configurable as 8 Analog (4 Analog In/Out and 4 Analog In) all are capable of Digital In/Out.
10. Analog input capability to measure input voltages levels up to 10 readings per second. Two of the High Voltage/Current ports can measure input voltages up to 24 VDC with 12-bit accuracy and the TTL1 to TTL4 ports can measure input voltages up to 5 VDC with up to 14-bit accuracy, and TTL5, TTL6 can be configured for 12 bit readings. These may be programmed for higher speed and/or more precise readings if required.
11. 7 RS-232 lines on DB-9 and DB-37, supporting 1 or 2 serial connections
12. Two of the TTL (1 and 2 See Model 200 TTL Ports and DB-37 Expansion I/O Connector diagram for complete pin-out descriptions) pins can provide Analog output, driving 25 mA maximum.
13. The TTL5 and TTL6 lines may be switched to support connection with external I²C devices.
14. An external RS232 serial I/O port for bi-directional communication with the target equipment, including hardware flow control on CTS, RTS, DTR and DTE. +5V is available on this connector to directly power devices such as GPS, RFID, Barcode and Fingerprint readers.
15. An external TTL level (0 to 5 VDC) serial I/O port for bi-directional communication with target equipment, including hardware flow control on CTS and RTS. +5V is also supplies on this connector. These lines (RX2, TX2, CTS2, RTS2) many be directly controlled as four additional general purpose Digital I/O lines, or Analog input or output (RX2, TX2).
16. Supports extended operation on battery power by providing a low power or "sleep" mode where most terminal functions are powered off, but the low power mode can be terminated at a pre-set time or by pre-set activity on one of the two digital input ports.
17. Allows terminal software firmware upgrades by downloading new software over the serial port. A Windows client can be provided for this task.
18. Real-time clock and calendar with battery backup.
19. Packaged in a fully enclosed case 4.5" x 3.5" x 1.5" with standard industrial connectors for external antenna (SMA), externally provided 12 volt power, and serial/digital/analog I/O using standard connectors. The case will provide a mechanism for mounting using either extra mounting flanges or bolts.
20. Two status LEDs; one to indicate application behavior and the second for radio communications status.
21. 128 bytes of EEPROM storage for device configuration parameters.
22. Low noise linear regulators that do not to interfere with distant radio signals and are monitored by a temperature sensor to prevent overheating.

Hardware Design

The device contains two processors: an Imsys Cjip Java processor and a Cypress Microsystems PSoC (System On a Chip). The Cjip handles the application and network functions and the PSoC the hardware interfacing.

A block diagram of the system is as shown:



**AVIDdirector-M2M™
Model 200**

Figure 2 AVIDdirector-M2M Architecture

The Imsys Cjip processor is unique in that it implements the Java instruction set as its native machine code, avoiding the performance penalty normally associated with Java interpreters and allowing real-time, deterministic behavior needed by embedded applications. The processor includes IEEE 454 floating-point acceleration. The Cjip processor offers far more functionality than traditional J2ME based devices by allowing:

- a. Direct execution of Java op-codes without the overhead or performance penalty of an interpreter.
- b. 8 MB of RAM for application heap and data storage and 8 MB Flash persistent storage for programs and data (this could be expanded in a custom design)
- c. Simultaneous execution of multiple applications, each with multiple threads
- d. Support for multiple network connections.
- e. Support for both the J2ME CLDC and a subset of the J2SE APIs. This includes support for javax.comm, network and direct hardware I/O.
- f. An internal debug connector to allow setting breakpoints, viewing registers and single stepping through code execution on the device.

The Cjip is responsible for running the M2MApplication Framework, communicating over the wireless network, telemetry data storage and management, system startup, logging and monitoring. From the developer's perspective it is the perfect processor for this device.

The Cypress PSoC is designed to handle all hardware interfacing, including digital, analog or serial data. Its unique architecture includes reconfigurable digital and analog hardware blocks that can be internally connected to perform functions and logic normally requiring many external hardware devices. For example, it can be configured to provide DTMF tone dialing, infrared signaling, motor control and magnetic card strip reading. It provides the ideal I/O processor for an M2M device since it can be adapted to almost any sensor or control application.

Tech Notes:

The two processor on the main CPU board: the Imsys Java application processor and the Cypress PSoC I/O processor. The power (current) needs of the AVIDdirector main CPU board itself are:

- Normal mode, executing code, reading from Flash, Green System and Radio LEDs ON around **145ma** (could peak **160ma**).
- Normal mode, processing: **85ma to 130 ma**.
- Idling (no active processing): about **65 ma**.
- Imsys in Sleep mode, all LEDs and RS-232 off: **41ma**.
- Imsys and PSoC in Sleep mode, all LEDs and RS-232 off: **22ma**.
- Deep sleep mode. Imsys turned off (3.3V turned off) and PSoC in timed sleep mode (30 second increments). **5ma**.

This is the power consumption of just the main CPU board. The radio board, when turned off, adds about 1-3 ma due to leakage current in the power control FETs. When the radios are turned on their power needs are around (average values):

- **GPRS (MultiTech MTSMC-G):** Idle **15ma**, Data active .5W **280ma** (average) 2W **420ma** (average) TX **1.2A** (peak)
- **EDGE (MultiTech MTSMC-E):** Idle **28ma**, Data active 1W **280ma** (average) 2W **400ma** (average), TX **1.5A** (peak)
- **CDMA (MultiTech MTSMC-C):** Idle **20ma**, Data active **445ma** (average) Full power **770 ma**
- **iDEN (Motorola iO270):** Idle **20ma**, RX Slot **85ma**, TX Slot **1.2A** GPS **50ma**
- **Iridium (Quake Q9612):** Idle/Receive **50ma**, TX **400-650ma**
- **WiFi (MultiTech MT800SWM):** Idle **80ma**, Active **240ma**
- **BlueTooth (MultiTech MTS2BTSMI):** Idle **2ma**, Active **7ma**, Discovery **70ma**, Data Transmission **45ma**
- **XPORT:** Ethernet **240ma**

- **GPS:** Sony **85ma**, US GlobalSat **75ma**

We have seen with the GPRS and CDMA radios connected and turned on but without an active data connection they add an average of **40 to 60 ma** to the normal standby current drain of the AVIDdirector (i.e. Idling current is about **105-125 ma** for a GPRS radio with a data connection but no data transfer).

The Cypress CY8C29866 is the top model in the Cypress product line, operating at 24 Mhz. with 32K of Flash and 2K of RAM. It supports:

§ 16 digital PSoC blocks provide:

- 8- to 32-Bit Timers, Counters, and PWMs
- CRC and PRS Modules
- 8 Communications Blocks to provide up to 4 Full-Duplex UARTs. Each block may be either a serial receiver or transmitter. The 8 blocks are used to provide 4 full duplex serial channels. These serial channels may be assigned to almost any digital I/O pin as required; for example, TTL3 and TTL4 may be used for Serial2.
- Multiple SPI™ Masters or Slaves
- 25 mA Sink on all GPIO, Pull up, Pull down, High Z, Strong, or Open Drain Drive Modes on all GPIO

§ 12 Rail-to-Rail Analog PSoC Blocks Provide:

- Up to 12 analog inputs on GPIO
- Four 40 mA analog outputs on GPIO
- Up to 14-Bit ADCs
- Up to 9-Bit DACs
- Programmable Gain Amplifiers
- Programmable Filters and Comparators

Complex peripherals may be constructed in software by combining blocks together. The Cypress Microsystems web site has designs featuring modems, magnetic strip readers, 1-wire communicators and other complex mixed mode devices largely implemented in the PSoC's software. The AVIDdirector-M2M API provides the ability to download partial Flash updates to the PSoC for implementation of user written peripherals.

The processors communicate over a high-speed 8-bit data bus. The M2M application developer never interfaces directly with the PSoC processor; all its hardware interfacing is controlled via a Java API on the Cjip processor. The PSoC is connected to the Cjip's interrupt system allowing it to notify the Java processor of a particular hardware event, such as a new data or a change in a reading level. The PSoC can be programmed by either the Cjip (allowing for firmware updates in the field for added capability) or by the debug header on the board. This device is designed to support all common interface needs because M2M devices need to operate with a wide range of interfaces. Specifically:

- a. Parallel digital input and output, such as used for relays, switches, sensors, trip points, motors and other hardware devices

These are used both to turn a device on and off and to sense if the device/sensor is on or off. The device supports 6 TTL (0-5V) level lines and 4 high voltage/current (HVC) (20 VDC, 200 mA) ports. The user connects to the device using commonly available Phoenix connectors that plug into the telemetry device. Phoenix supplies connectors with a variety of contact types, including screw down, wire displacement, spring latch and crimp connectors. This flexibility will allow the user to choose which connector best suits their application and to easily reuse the device for other applications.

TTL levels are used in newer devices or interfacing with other electronic circuitry, along with custom electronic devices. These lines are protected by re-settable fuses to prevent over current and can withstand a minimum of 2KV static discharge (ESD).

The high current interface section is designed for industrial automation control of relays, motors and other electromechanical devices. It includes protection against damage due to the higher power levels

involved and transient voltages from motors or relays. The PSoC processor allows the outputs to be configured as either active source/active sink, or having the source and sink operate independently.

HVC devices are powered by either the main device supply voltage, ($V_{supply} - 16 \text{ VDC max}$) or external voltage (V_{rail}) of no more than 30 VDC. This determines the maximum voltage, which can be supplied or controlled (synced). An internal jumper (JP1) is normally installed to supply V_{supply} power to pin 12 of the I/O connector and the HVC devices. Removing it allows a higher voltage to be connected to pin 12 and supply V_{rail} to the HVC components.

It is very important that Jumper settings are correct before an external voltage is supplied to Vrail (Pin 12) Please review Jumper settings in Appendix 10 before proceeding!

- b. Analog input to measure voltage levels on a particular line

Where the digital inputs have only two values (on(1) and off(0)) this allows reading the level in 4096 steps (12 bits). On the TTL1 to TTL4 and RX2, TX2, CTS2, RTS2 inputs this allows reading a signal from 0 to +5VDC in 1.2mV steps, and on the HVC1, HVC2 inputs, up to 24VDC (assuming V_{rail} is 30 VDC) in 7.4mV steps.

- c. Analog output signals

This is designed to generate a precise voltage on the output, an example being to control a DC motor or light intensity. These outputs also occur in 62 steps (default setting). The PSoC processor is capable of driving 40 mA analog output but the protection fuses will limit this to 25 mA. Analog output is available on the ports TTL1, TTL2, RX2, TX2.

- d. Serial communication.

This is needed to communicate to a variety of devices, including other radios, GPS, X-10 automation units, security systems, industrial PLC control systems and medical devices. Serial communication commonly uses either RS-232 levels (+/- 3 to 25 VDC) or TTL (0 to +5 VDC). The device has a serial port dedicated to each interface. The RS-232 interface uses the common DB-9 female connector (as used on PCs) and the TTL interface uses a RJ-12 connection (commonly available for phone systems). The RJ-12 connector also has +5VDC and ground on the innermost pins, allowing it to power a small device (such as a RS-232 to TTL daughterboard or GPS) and on the DB-9 pin 9 supplies +5VDC at 250 ma to power external devices.

There are two status lights, both containing two color LEDs, capable of displaying one of three colors (e.g. Red, Green and Orange (Red+Green)). The first light is used to indicate system or application status. It will normally be off unless a sensor action or reading is in progress, at which time it will be a Red color for sending out messages and Green for processing received commands. If an error occurs in the system the LED will flash Orange to indicate the error condition. During system initialization and boot up the LED will flash Red to indicate progress. The second light is used to indicate radio status. When the radio is in range, the light will be Green and flash Red for transmit. If the radio is out of range it can display an alternating Red and Orange color (1 second each), not authorized by the carrier (3 seconds Orange), and if the radio is turned off, the LED display will be off.

Power Supply Design

The telemetry terminal is designed to operate within a vehicle, device (e.g. vending machine) or from batteries or an external power supply. It features a fault tolerant voltage regulator design to withstand voltage spikes, load dumps and other hostile electrical environments. It operates with input power from 8 to 16 volts and will not be damaged by higher voltages (it may shutdown or blow a fuse above 28 V) or if it is connected in reverse. System power is provided using a Phoenix connector that latches to the device to ensure a secure lock.

The device uses only linear power supplies for the primary voltage regulation to ensure RF noise is not generated that would affect the receivers. The board has a large heat sink area to provide thermal conduction of the regulator's heat.

Environment Design

The AVIDdirector-M2M's allowable operating temperature range is limited by the Wavenet Boomer modem that has an operating temperature range of -20°C to $+60^{\circ}\text{C}$ (Extended temperature range). The Imsys Cjip, Cypress

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PSoC, RAM, Flash and all other components are available in Industrial temperature (−40°C to +85°C) versions, which would allow the device to operate at these temperatures with a suitable modem.

The case is constructed from rugged polystyrene plastic. It is not water or dust tight but should not allow contaminants to enter with normal use.

WatchDog Timer Technical Notes

Release: 1.6.0

A WatchDog timer (WDT) is used to monitor mission critical aspects of a computer system and determine if the system is not operating correctly and take steps to put the computer back into a correct operating mode. A WDT is often used in embedded systems to ensure the system continues to operate correctly regardless of any system fault or if part of the hardware/software has stop working. A WatchDog typically requires the various pieces it is monitoring to "check-in" or "pet the watch dog" at regular periods and if a program doesn't check in, the WatchDog will try to restart the program, or restart the computer system so it can start from a known condition.

The Java processor and Imsys Technologies has an internal WatchDog in the Java execution engine (or JVM) and if the system stop executing the Java opcodes it will force a hardware reset of the system. This detects hardware problems or a bug in the JVM, but it doesn't often detect application problems (loops, block threads, or dead-lock conditions) since the JVM is executing correctly.

In release 1.6.0 of the AVIDdirector Application Framework (M2MApp) a separate Watch Dog thread is added that monitors the multiple threads in M2MApp. If one of these threads stops responding then it will log the thread, which has stopped responding and reset the AVIDdirector-M2M. The Watchdog timer is implemented in the class `com.avidwireless.avidirector.WatchDogTimer`, which is part of the `ADM2MLib.jar` file and whose source is located in `AVIDirector-Software/Adlibrary/source/com/avidwireless/avidirector/WatchDogTimer.java`. It provides methods for a thread to register itself to be monitored, un-register itself and "pet" the watch dog (sorry for the "Pet" references but they are hard to resist when describing a WatchDog). Specifically the common methods are:

```
watchDogTimer.registerWatchDogMonitoredItem(this," ", 60000); // tell the dog to start watching and
                                                                // check in every 60 seconds (60000 ms)
watchDogTimer.resetWatchDogTimer(this);                       // pet the watch dog
watchDogTimer.removeMonitoredItem(this);                      // remove from threads to check
watchDogTimer.startMonitoringItem(this);                      // start monitoring again use old period
watchDogTimer.startMonitoringItem(this, 60000);               // start monitoring this again checking
                                                                // every 60 seconds
watchDogTimer.stopMonitoringItem(this);                       // stop checking
```

Unless a thread registered itself with the WatchDog is not monitored. Along with system threads, user written Device drivers and M2Mlets can be registered with the WatchDog to be monitored.

The WatchDogTimer is implemented as a separate Java thread that is started with a defined periodic interval for checking for dead threads. This is normally 60 seconds. The time period for the threads it monitors can be as long as required, but the WatchDog will check on them every 60 seconds. This period can be made shorter but then you have the risk of the WatchDog's processing time impacting the overall available processor time.

The WatchDogTimer is enabled by an entry in the M2MApp.ini file called "SYSTEM.WATCHDOG". The default is "true" to have the WatchDog time run but it can be disabled by setting this entry to "false". When initialized, the WatchDogTimer class first calls "SNAP.setWatchdogTimeout(period + MARGIN)". This enables the SNAP JVM to check that the method call "SNAP.feedWatchdog()" is called by the WatchDogTimer at least once each period time plus the MARGIN time. The MARGIN time is currently set to 30 seconds to prevent false WatchDog

resets. If the WatchDogTimer thread doesn't call "SNAP.feedWatchdog()" then a hardware reset of the AVIDirector is performed without a logging notification - **this means that the WatchDogTimer cannot run and the system will spontaneously reboot itself.**

The WatchDogTimer maintains a list (Java Hashtable) of threads it is monitoring. Each thread must implement the Java interface "WatchDogMonitoredClass" to identify that it will implement the WatchDogTimer contract. Each period the WDT checks for the last time the WatchDogMonitoredClass thread checked in (by calling "resetWatchDogTimer") to verify that it is greater than the contracted period set by "registerWatchDogMonitoredItem". If so, then the thread is deemed to have timed out and the WatchDogTimer calls the AVIDirectorApp.fatalError method, which writes an entry to the system Log (and turns on writing the Log to the file system if this is not enabled), writes a special entry to the file "/LastFatalError.log" and performs a hardware reset by calling "Ish.reboot". AVIDirectorApp.fatalError(int errorCode, String errorMessage) is used in multiple places whenever an object has detected a fatal error (e.g. a Radio class cannot establish a PPP connection 5 times in a row) and the Object wants to log a fatal error and reset the system.

A WatchDogMonitoredClass can permanently remove itself from the WDT's list by calling "watchDogTimer.removeMonitoredItem(WatchDogMonitoredClass this)". It will be no longer checked when it does this and it must call registerWatchDogMonitoredItem(WatchDogMonitoredClass this,String name, int period) to register itself again. This is done if a thread is terminating and if it is run again then a new thread instance is created. If a thread is running continuously in a loop but will be idle for an extended period of time, it can temporarily turn off the WatchDog time from monitoring it by calling "stopMonitoringItem(WatchDogMonitoredClass this)". The WDT will then ignore checking this class after this is called. The WatchDogMonitoredClass thread needs to call "startMonitoringItem(WatchDogMonitoredClass this)" to return to being checked by the WDT. There is a version of this call with the time period (in milliseconds) that can be called if the thread wants to modify the time it is checked.

In M2MApp the items that are monitored are:

1. AVIDirectorApp - This is the main application thread for M2MApp. It handles the startup, normal operation and shutdown of the system. When AVIDirectorApp starts one of the first things it does is to create the WatchDogTimer instance with an internal polling time of 120 seconds. During the initial loading of classes, due to the time to read from the serial Flash memory chip and uncompress the Jar files, extra time is allowed for the WatchDog timer. Once the AVIDirectorApp has completed initializing all the IODevices, Communicators and Radios, it sets the WatchDogTimer to a 60 second polling time.

In AVIDirectorApp it performs a single continues loop consisting of:

- a. Check for messages to send to the M2MXML Portal. If a messages exists it will use the Communicator to send the messages. It adds the message to the Communicator's outbound queue and waits for an acknowledgement from the M2MXML portal. If a message is sent out then the TXMessage timer is reset.

- b. Check for incoming messages from the M2MXML portal. If it is waiting for an acknowledgement to a send message that is check and if present, the sent message is marked as being sent correctly and the next messages will be sent the next time the loop reaches (a). If it is not an acknowledgement but an error message (e.g. the device is not registered with the M2MXML portal, this is logged and the message is discarded. Otherwise the packet is parsed to see if it contains a valid M2MXML message, and if so, it is then parsed and passed to the appropriate IODevice or M2Mlet. If a message is received, valid or not, the RXMessage timer is reset.

- c. Check if the available memory is low and perform a garbage collection.

If more than time specified by the M2MApp.ini M2MXML.MAX_NOCOMM_TIME parameter goes past with out a TX or RX message, then a fatal error is reported. This time is longest you will expect your application to be without communication to the M2MXML platform.

If the AVIDirectorApp doesn't check in with the WatchDogTimer every 60 seconds then the WDT will flag this set.

2. Communicator. A Communicator is instantiated for each Radio class in the system. It performs the interface between the M2MXML packets the calling the appropriate method for the radio to send and receive messages. When a message is sent, the Communicator ensures the Radio has sent the message correctly or tracks retry attempts by the Radio. Each Communicator has a queue of 25 outgoing and incoming messages. If this queue becomes full then either the AVIDirectorApp isn't handling the messages correctly or the Radio cannot send out the messages and a fatal Error condition is raised. This thread is monitored every 120 seconds to allow for a long retry time for a Radio. If the Radio doesn't respond, or is hung, or the serial communication dies, then the Communicator thread won't update the WDT and will trigger a fault condition.

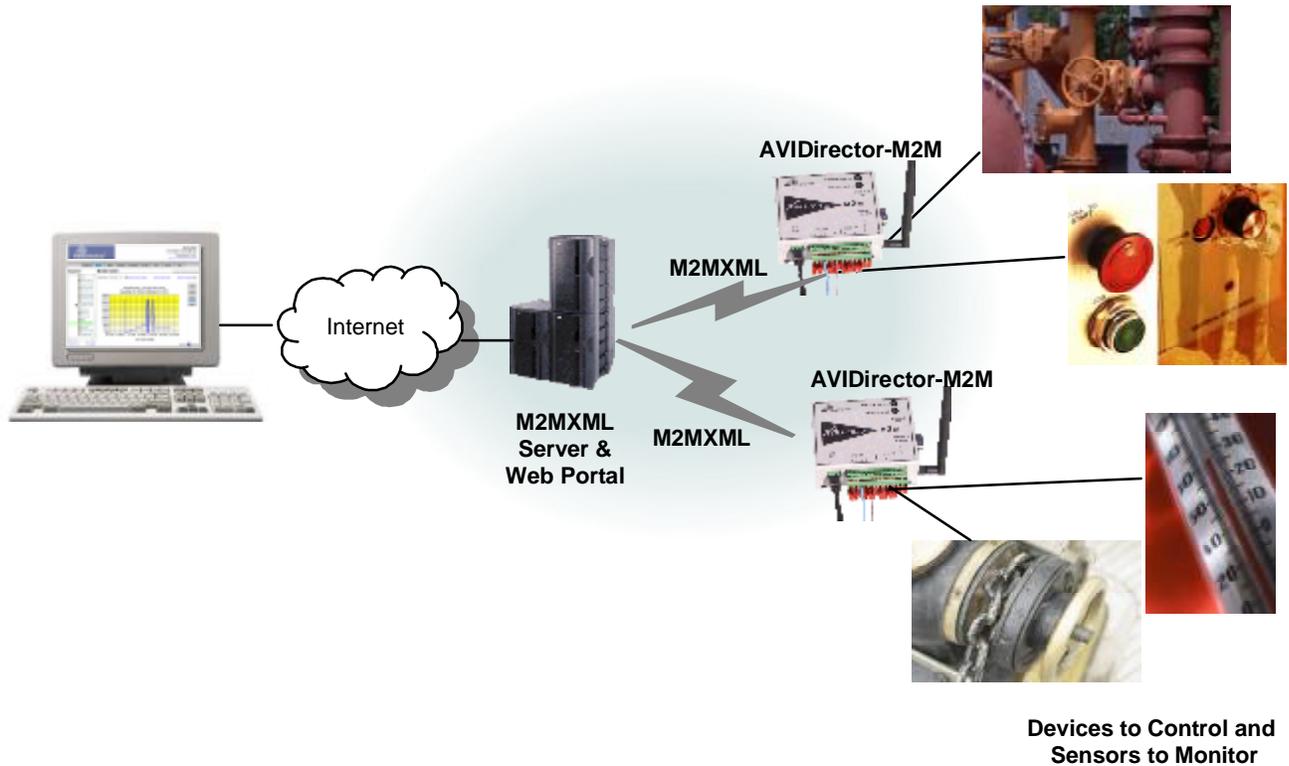
3. Radio. Within the Radio, there may be threads that need to be monitored. Not all Radios require this. For example, in the AT_Radio_Modem class, the super class for all PPP type radios (GPRS, CDMA, iDEN, XPORT Ethernet), when the PPP link thread is alive it is monitored. When the PPP thread dies at the end of communication, then the thread is no longer monitored and removed the list of monitored threads. Each Radio class also monitors its own state and will raise a Fatal Error when it cannot continue correctly. For example, if the AT_Radio_Modem class cannot establish a PPP link 5 times in a row, or the modem doesn't respond to commands, then it wants the device to be reset.

4. IODevice. This handles all the internal I/O Devices on AVIDirector-M2M (TTL, HVC lines) and additional I/O devices (RFID, GPS, etc.). Each I/O device is supposed to perform its operation in a minimal amount of time, or it needs to start a thread to handle longer operations. The I/O Device drive will start to be monitored when it starts an I/O operation and stop monitoring when the I/O operation is complete. These operations should take less than a second, but a 60 second window is currently set to allow for longer I/O operations such as reading an RFID tag or acquiring a GPS lock.

M2M Application Framework Software Design

AVIDdirector-M2M comes complete with AVIDWireless' M2M Application Framework (M2MApp) to facilitate rapid development and deployment of M2M and Telemetry applications. It provides far more power than the J2ME Midlet environment since it provides most of the communication, device and system management functions that a developer would normally have to write and test. When we use the term framework, we refer to an object-oriented framework defined Ralph Johnson and Brian Foote³ as: "A set of classes that embodies an abstract design for solutions to a family of related problems". M2MApp will allow developers to generate applications enabling higher productivity and shorter development time. The framework deals with the network infrastructure that handles the communication between M2M device and M2MXML server, management of sensors and I/O devices on the AVIDdirector-M2M and provides an applications interface for fast and easy development.

The overall view of how the AVIDdirector-M2M, M2MXML and the M2MXML portal fit together is:



AVIDdirector-M2M device performs the actual control and monitoring of remote devices and sensors. They can be programmed to do this either by:

- § M2MXML. M2MXML provides a robust, extensible language to specify both direct remote control of the M2M devices and also on-board intelligent behavior. This allows a M2MXML Server to automatically configure AVIDdirector-M2M devices to the particular device or situation and perform complex tasks without writing a custom application on the device. The M2MXML Server can be written in any language (.NET, Java, PHP) since the sole specification and interface between the AVIDdirector-M2M device and the Server is the M2MXML specification⁴.
- § Writing a custom M2Mlet. M2Mlets are small applications that handle the direct control and monitoring of devices and performing operations either too complex for M2MXML or on-device behaviors which are

³ See <http://st-www.cs.uiuc.edu/users/johnson/frameworks.html> for links to other frameworks

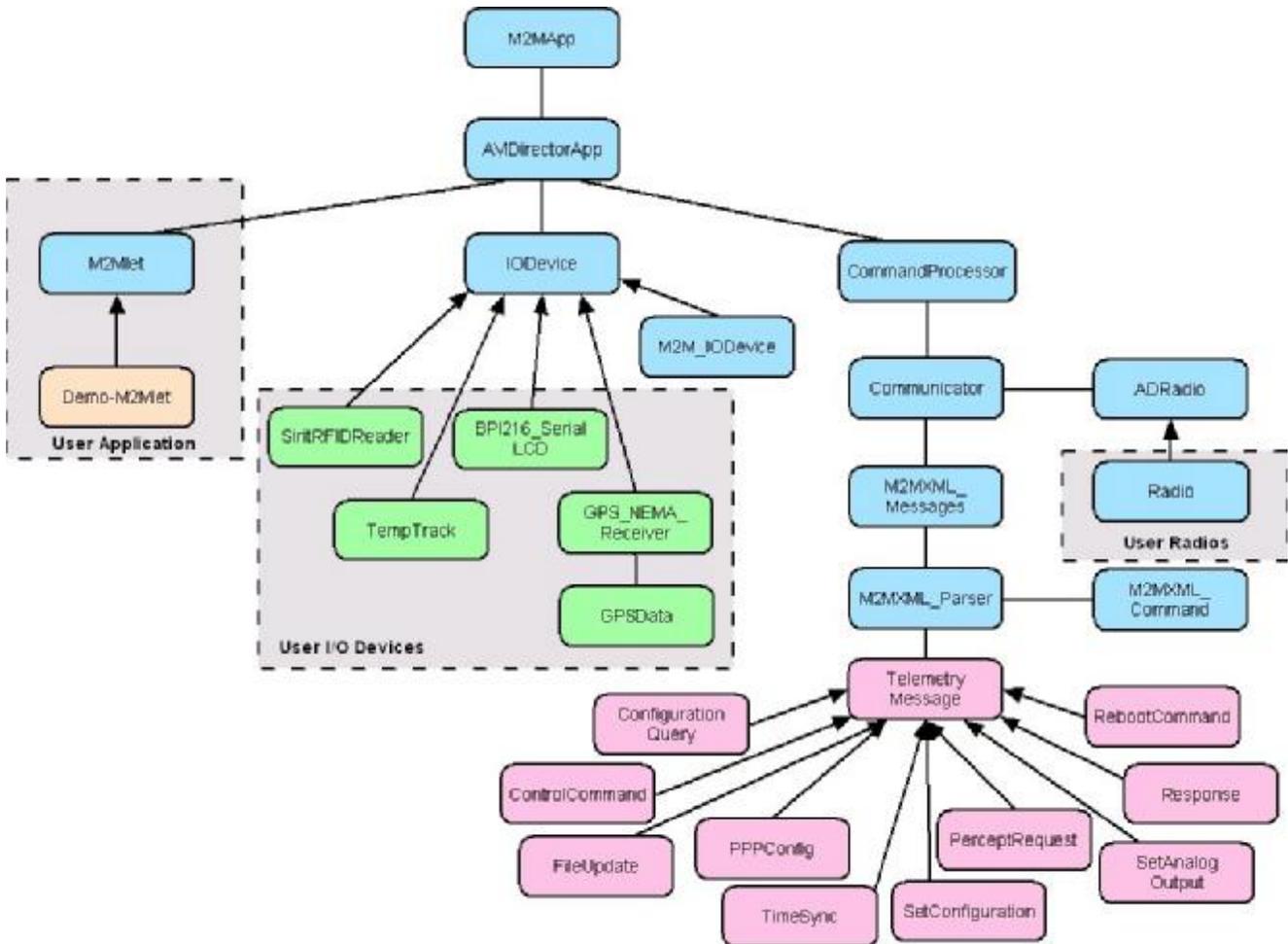
⁴ See Appendix 5 and <http://www.m2mxml.org> for further details and specifications.

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currently not implemented via the existing M2MApp. A developer needs to program in Java and will need a basic understanding of the M2MApp APIs in order to write an M2Mlet.

M2MApp is the main program running on the device. It controls the execution of the IODevices, the communication devices (Radios), any user written application (M2Mlet), parsing and generation of M2MXML messages to and from the M2MXML server / portal. This is an extensible framework that can be easily adapted to each customer's unique device and control application without having to make changes to the framework's infrastructure. Since M2MApp handles all the communications, input and output control, message passing and error control, users can develop M2MApplications in a fraction of the time it would take them if they had to design and implement the protocols, communications mechanisms, M2MXML parsing and device drivers. M2MApp is written in Java and uses the Java concepts of dynamical class loading, inheritance, interfaces and method overriding to implement its functionality.

The M2MApp is designed as follows:



Key concepts and features of the M2M Application Framework are:

M2Mlet

If a custom user application is required, the developer writes a "**M2Mlet**", similar to a Midlet in J2ME or an Applet in J2SE. An M2Mlet has start() and stop() methods that must be implemented in the user application. If the program requires background processing it must start a Thread to perform the processing until the stop() method is called. M2MApp loads the user written M2Mlet specified in the M2MApp.ini⁵ configuration file.

⁵ See Appendix 6 "Sample M2MApp.ini Configuration File"

The user M2Mlet inherits from the abstract class `com.avidwireless.AVIDdirector.M2Mlet` and implements the `start` (AVIDdirectorMain adApp) and `stop()`. All M2MXML messages not addressed to a particular transducer are directed towards the M2Mlet and methods corresponding to each M2MXML message are called depending on the M2MXML message received. The user M2Mlet can override each of these methods if they wish to. The methods are:

- § `processControlCommand`(ControlCommand message). The default action is to return a `Response.UNRECOGNIZED_COMMAND_RESULT_CODE` message to the portal.
- § `processConfigurationQuery`(ConfigurationQuery message). This will return the value of any property in the configuration file `M2MApp.ini`. For example, a query of “**AVIDDIRECTOR.MODEL**” will return which AVIDdirector-M2M model this is (the normal response is “**M2M**”). There are special predefined Queries that may be inquired that are not `M2MApp.ini` values. These are:
 - § **STATUS**. This returns the software version, how long the M2MApp has been running, the SNAP and PSoC version, radio type and last log message.
- § `processSetConfiguration`(SetConfiguration message). If not overridden this will set the specified property in the `M2MApp.ini` file and also invoke the method `processSetConfigurationItem` (`String propertyName, String oldValue, String newValue, String seqNum`). The user M2Mlet will typically implement the `processSetConfigurationItem` method to respond to specific property settings and update any operation because of the property changes.
- § `processFileUpdate`(FileUpdate message). The default action is to return a `Response.UNRECOGNIZED_COMMAND_RESULT_CODE` message to the portal.
- § `processPPPConfig`(PPPConfig message). The default action is to return a `Response.UNRECOGNIZED_COMMAND_RESULT_CODE` message to the portal.
- § `processRebootCommand`(RebootCommand message). This will send out the acknowledgement and shutdown the M2MApp and reboot the processor once the confirmation message has been sent to the portal.
- § `processResponse`(Response message). The default action is to return a `Response.UNRECOGNIZED_COMMAND_RESULT_CODE` message to the portal.
- § `processTimeSync`(TimeSync message). This updates the device's real-time clock to the time specified in the message.

Each message returns a `String` which is a M2MXML message to send back to the portal, which are typically Command Response messages. If the M2Mlet needs to send a message separately to the portal it can call `app.sendMessageToPortal(String)` to send the M2MXML message to the portal by placing the message in the outgoing message queue.

Radio

M2MApp manages the radio's and the M2MXML packets sent and received over each radio. It allows multiple radios to be dynamically loaded via the `M2MApp.ini` file and switching between which radio will be used for communications based on parameters such as least cost routing, signal strength and geographical location.

Each radio class implements the **ADRadio** class that provides a standard interface to allow M2MApp to control and work with each radio. This allows easy development of customer and network specific radio devices. A “Radio” may be any device that M2MApp uses to communicate with the M2MXML port, so an Ethernet port may also be a Radio. The `com.avidwireless.radio.ADRadio` class specifies methods for:

- § `start`(AVIDdirectorMain mainApp). Called with the Radio class is loaded, it initializes powers up the Radio, resets it, initializes the Radio communications channel, establishes contact with the network and any other items to make the radio ready to communicate.
- § `stop()`. Called when the system is shutting down, it disconnects the radio from the communications channel and powers down the radio.
- § `resetRadio()`. Resets the radio hardware.

- § `receiveDataString()`. This will return a String from the Radio, which is normally a M2MXML string.
- § `receiveDataString(int timeout)`. Like `receiveDataString()` except it will return a null if it times out without receiving a M2MXML string from the radio.
- § `receiveDataByteArray(byte[] buffer, int offset, int length)`. Allows receiving binary data from the radio.
- § `receiveDataByteArray(byte[] buffer, int offset, int length, int timeout)`. Receives binary data from the radio but will return no characters if it times out before data is received.
- § `sendDataString (String dataStr)`. Sends the specified string, which is normally a M2MXML packet, to the Radio.
- § `sendDataByteArray (byte[] buffer)`. Sends the binary array to the radio.
- § `isInNetworkContact()`. Returns true if the radio is in network contact, false if it is out of network contact.
- § `getRadioNetworkAddress()`. Returns the radio's current network address as a String. This may be the MAN number, IP address or other network specific address.

There are other methods a Radio class must implement to be supported by M2MApp.

IODevices

The `com.avidwireless.AVIDdirector.iodevice.IODevice` class provides the framework for all I/O devices. It defines methods to start and stop each device and handle transducer specific messages addressed to the `IODevice`. Each `IODevice` has several important attributes:

- § **DeviceName**. This is a standard name for the device. If there are multiple devices of the same type (e.g. RFID Readers) each has the same `DeviceName`.
- § **KeyName**. `IODevice`'s are uniquely specified by their `KeyName`. In the `M2MApp.ini` file each `IODevice` class (except the standard `M2M_IODevices`) are specified by a property "`keyname.CLASSNAME`" with the fully qualified Java classname for the device specified for the class. Each `IODevice` must have a unique `KeyName`, e.g. multiple devices of the same type will have unique `KeyNames`. This allows the configuration properties to be separately specified for each device, and the `KeyName` is the default M2MXML address for the device.
- § **M2MXML_Address**. Each `IODevice` may specify a M2MXML device different from the `KeyName`. For example, when using the Simulator board TTL1 is addressed as `TTL1.AIN` to distinguish this as an analog input transducer.

`com.avidwireless.avidirector.iodevice.IODevice` is the parent class for all I/O devices. The configuration parameters it supports are implemented by each child `IODevice` if it makes sense for the IO device. If the `IODevice` is a serial device it will use the serial port parameters. Each configuration parameter is appended to the device name in the `M2MApp.ini/M2MApp.ini.default` files. So `GPS.CLASSNAME` has a device name and M2MXML address of "GPS".

IODevice

<code>.CLASSNAME</code>	Specifies the Java class used to implement this device. The internal M2M IODevices do not need this.
<code>.LOAD</code>	For IO Devices loaded via <code>CLASSNAME</code> , this needs to be set true to load the <code>IODevice</code> . In <code>M2MApp.ini</code> this defaults to False for most IO Devices. If not true for <code>M2MIODEVICE</code> then none of the internal M2M IODevices (<code>TTLn</code>) will be loaded.
<code>.ENABLE</code>	True to enable the IO device, false to disable it operating. Mainly used by the internal <code>M2MIODEVICES</code>

.NUM_AVG_READINGS	Number of reading to average over to get a reading
.M2MXML_ADDRESS	The M2MXML address for this device. Defaults to the device name (the prefix name before the .CLASSNAME.) This can be a comma separated list of different M2MXML address this will respond to. The first name is used when we send a percept reading.
.REPORT_AT	Absolute time(s) as a set of comma delimited strings in the form of "hhmmss" that we will report the readings. This calls the <code>getSensorReading</code> method for the IO Device (not used for M2M IO Devices. Use <code>ABSOLUTE_REPORT_TIME</code> and <code>PERIODIC_REPORT_TIME</code>
.POLLTIME	Base time in milliseconds this device is polled at for readings.
.RDD_PWR_ON	Turns power on to the Radio board. Needed for the GPS or other IO Devices on the Radio board.
.SERIAL_PORT	Name of the serial port to use. serial1, serial2, serial3. serial0 can be used if the serial server is disabled
.SERIAL_PORT_BAUD_RATE	Baud rate for the serial port
.SERIAL_PORT_TIMEOUT	Timeout parameter for serial communications
.MAPSERIALPORT	Mapping of the physical serial port to one of the 16 hardware serial connections.

In addition to the standard built-in input devices (which are supported by the `M2M_IODevice` class) additional `IODevices` classes are available for the following sensors and devices:

§ **GPS_NMEA_Receiver.** The

`com.avidwireless.AVIDdirector.iodevice.GPS_NMEA_Receiver` class implements a GPS receiver supporting the GLL, GGA, RMC and VTG NEMA formats. Parameters that may be set via either the `M2MApp.ini` file or over the air using `M2MXML SetConfiguration` portal commands are:

- § `KeyName.SERIAL_PORT = serial1`
- § `KeyName.SERIAL_PORT_BAUD_RATE = 4800`
- § `KeyName.SERIAL_PORT_TIMEOUT = serial1`
- § `KeyName.ENABLE = true`

On the GPS device we have these configuration parameters above the ones from the parent `IODevice`:

.CONTINUOUS	true false. If set true then this will continuously read the GPS data looking for variations or changes. If false we will only read the GPS on either the <code>POLLTIME</code> or <code>FASTPOLLTIME</code> . Default false
.SEND_TO_PORTAL	true false. Defaults to true to send the data to the portal
.REQUIRED	Required NMEA strings to get a valid reading. Defaults to "GPGGA, GPVTG" which will give is position, altitude, speed and direction

- .MATCH_TIMESTAMPS** true|false. Defaults to false but if set true then the all NMEA sentences must have the same time stamp or we won't send their data to the portal. This ensures accurate GPS data for position, altitude, speed and direction.
- .UPDATE_RTC_TIME** true|false. Defaults to true to update the AVIDdirector RTC with the GPS timestamp.
- .UPDATE_RTC_TIME_INTERVAL** How often to ensure the AVIDdirector RTC is updated? Defaults to once a day.
- .MAX_ALLOW_GPS_RTC_DIFFERENCE** Maximum time between the RTC and GPS time before we reboot the system when updating the RTC. Defaults to 30 minutes. If the time correction is greater than this then we could lose readings or not respond correctly.
- .ENHANCED_GPS** true|false. If set true the M2MXML includes altitude, speed and direction. Defaults to false
- .SPEED_UNITS** Can be MPH for miles per hour, KPH for Kilometers per hour. If blank defaults to Knots
- .TRIGGER_FASTPOLL_SPEED** If the speed is above this value we report readings at the FASTPOLLTIME rate. If slows below this rate then the standard POLLING rate.
- .TRIGGER_FASTPOLL_METERS** If the distance moved between GPS readings is more than this distance in meters, we move to the FASTPOLLTIME rate. If below then drops to standard polling rate.
- .FASTPOLLTIME** Time in milliseconds to report when we have exceeded the TRIGGER_FASTPOLL_SPEED or TRIGGER_FASTPOLL_METERS

§ **Sirit_OEM400_RFIDReader.** (Also - Sirit_OEM200_RFIDReader) Class

`com.avidwireless.AVIDdirector.iodevice.Sirit_OEM400_RFIDReader` implements the Sirit (see <http://www.sirit.com>) OEM-400 RFID reader for HF (13.5 Mhz) RFID tags and `com.avidwireless.AVIDdirector.iodevice.Sirit_OEM400_RFIDReader` implements the OEM-200 UHF reader. This allows reading the Tag ID and Data blocks, either as a String or byte array, and writing the Data blocks as a String or byte array. Parameters that may be set via either the M2MApp.ini file or over the air using M2MXML `SetConfiguration` portal commands are:

- § `KeyName.SERIAL_PORT = serial1`
- § `KeyName.SERIAL_PORT_BAUD_RATE = 4800`
- § `KeyName.SERIAL_PORT_TIMEOUT = serial1`
- § `KeyName.TAGTYPE = ISO (HF) or 0,1 or 2 (UHF)`
- § `KeyName.READ_REPEAT = 4`
- § `KeyName.ENABLE = true`

§ **BPI216_SerialLCD.** This class is for the Scott Edwards (see <http://www.seetron.com>) BPI-216 Serial LCD Module. The BPI-216 is a 2-line by 16-character LCD with a serial interface for easy use. This allows sending messages to the display to show progress or to ask the operator to perform settings of a device. The BPI -216 has a switch selectable baud rate that must be set to 9600 baud for communication with this class. This is implemented using the `com.avidwireless.AVIDdirector.iodevice.BPI216_SerialLCD` class. Parameters that may

be set via either the M2MApp.ini file or over the air using M2MXML `SetConfiguration` portal commands are:

§ `KeyName.SERIAL_PORT = serial2`

§ **TempTrack.** This device has two Analog to Digital converter inputs that are accessed by sending an ASCII 'G' character to the serial port and it returns a two character strings with the values from 0.0 to 999.9 This is best used as a sample of a user written IODevice class. This implements the Parameters that may be set via either the M2MApp.ini file or over the air using M2MXML `SetConfiguration` portal commands are:

§ `KeyName.SERIAL_PORT = serial1`

§ `KeyName.SERIAL_PORT_BAUD_RATE = 9800`

§ `KeyName.SERIAL_PORT_TIMEOUT = serial1`

User written I/O device driver classes subclass `IODevice` and must implement `start(AVIDdirectorMain adApp)` and any of the `IODevice` methods the device needs to implement or override. All M2MXML messages addressed to this particular transducer are directed towards the instance of `IODevice` with the `KeyName` or `M2MXMLAddress` corresponding to the M2MXML address. `IODevice` has a default method implementation for each M2MXML message appropriate for transducers/sensors. The method corresponding to each M2MXML message is called depending on the M2MXML message received. The user `IODevice` class can override each of these methods if they wish to. The methods are:

§ `processControlCommand(ControlCommand message)`. The default action is to return a `Response.UNRECOGNIZED_COMMAND_RESULT_CODE` message to the portal. Any digital transducers should implement this method.

§ `processPerceptRequest(PerceptRequest message)`. The default action is to return a `Response.UNRECOGNIZED_COMMAND_RESULT_CODE` message to the portal. Almost every `IODevice` will implement this method to return the current sensor reading to the M2MXML portal on demand.

If the sensor or transducer takes a significant amount of time to perform a reading (more than 200 ms) then it is recommended that the sensor call `startPerceptRequestThread(PerceptRequest perceptRequest)` to start a background thread to perform this `PerceptRequest`. This requires the `IODevice` to implement `processPerceptRequestThread(PerceptRequest message)` method that will perform the actual reading.

§ `processConfigurationQuery(ConfigurationQuery message)`. This will return the value of any property in the configuration file `M2MApp.ini` for this transducer. For example, a query of "SIRIT_OEM200_RFID_READER.TAGTYPE" will return which RFID tag type (ISO, Tag-IT, Epic class 0, 1 or 2) this sensor is set to receive. By default, `IODevice`'s implementation will prefix the property name with the keyname and return that value (if set) or `Response.BAD_ARGUMENT_RESULT_CODE` if this is not set. Most `IODevice` implementation do not need to implement this method.

§ `processSetConfiguration(SetConfiguration message)`. If not overridden this will prefix the property with the `IODevice`'s keyname, set the specified property in the `M2MApp.ini` file and invoke the method `processSetConfigurationItem(String propertyName, String oldValue, String newValue, String seqNum)`. The user `IODevice` will typically implement the `processSetConfigurationItem` method to respond to specific property settings and update any operation because of the property changes.

M2M_IODevice

The standard AVIDdirector-M2M devices are implemented by the `com.avidwireless.AVIDdirector.iodevice.M2M_IODevices` class. This handles all the portal messages to the devices, configuration settings and implements the on-device behaviors.

Through M2MXML the user can program on device behavior such as trigger limits, sensor dead-zones, polling modes, scheduled execution, and I/O control. This means that for many M2M applications no embedded device programming is required and all device behavior and operation can be specified by M2MXML commands sent over-the-air (OTA) to the device.

M2M_IODevice implements a nominal 200ms polling of the input devices and each AVIDdirector-M2M device can be added to the polling loop by setting the POLLING attribute in the M2MApp.ini configuration file or by a **SetConfiguration** command to the M2M_IODevice with the property **POLLING** set to **true**. When polling, each device is set to input mode and any transitions are sent as PerceptReadings to the M2MXML portal.

For the internal M2MIO Devices (the 22 TTL devices) these parameters can be used for each of the TTLn ports:

.IOTYPE=type, where type is AIN, DIN, AOUT or DOUT

.POLLING=true

.READING_PROCESSOR_CLASSNAME=classname of IODeviceReadingProcessor instance to use. An IODeviceReadingProcessor has methods called for initialize, startReading, processControlCommand, processDigitalPerceptRequest, processAnalogPerceptRequest, processSetDigitalOutput, processSetAnalogOutput and endReading

.ABSOLUTE_REPORT_TIME=nnn Set an absolute GMT time to report the current reading value. Time is in GMT seconds for each day.

.PERIODIC_REPORT_TIME=nnn Set an periodic time to report the current reading value. Time is in milliseconds

.REPORT_MINIMUM_INTERVAL_TIME=nnn Set period of time, in milliseconds, to wait before we report a change in a value

.DIGITAL_TRIGGER_HIGH=true|false Report if the input goes from a low to a high. For digital inputs.

.DIGITAL_TRIGGER_LOW=true|false Report if the input goes from a high to a low . For digital inputs.

.INVERT=true|false If set true this will invert the reported value. For digital inputs.

.PULLUP_INPUT=true|false Set the port to have an active pull-up using the PSoC. For digital inputs.

.PULLDOWN_INPUT=true|false Set the port to have an active pull down using the PSoC. For digital inputs.

.PULSEHIGH_TIME=nnn Set the time to pulse the output high. Time in milliseconds. For digital outputs.

.PULSELOW_TIME=nnn Set the time to pulse the output low. Time in milliseconds. For digital outputs.

.ANALOG_OFFSET=dd.dd Sets offset applied to the analog input or output. For Analog I/O.

.ANALOG_FACTOR=dd.dd Sets factor (multiplier) applied to the analog input or output. For Analog I/O.

.ANALOG_ABSOLUTE_HIGH=dd.dd Sets absolute high value for the analog input to report a reading to the portal. For Analog In.

.ANALOG_ABSOLUTE_LOW=dd.dd Sets absolute low value for the analog input to report a reading to the portal. For Analog In.

.ANALOG_DEADBAND_HIGH=dd.dd Sets delta high value for the analog input to report a reading to the portal. For Analog In.

.ANALOG_DEADBAND_LOW=dd.dd Sets delta low value for the analog input to report a reading to the portal

.AUX_DEVICE=TTLn digital device to turn on or off or set value before and/or after the reading has taken place.

.AUX_DEVICE_START_VALUE=n Value to set the device to before the reading begins

.AUX_DEVICE_DELAYTIME=nnn Time to delay after setting the Aux device to the startDeviceValue before reading

.AUX_DEVICE_END_VALUE=n Value to set the device to after the reading is complete

In addition for the M2MIODevice which is the overall class for all the internal M2M IODevices, these parameters can be used:

.LOADALL By default, only TTLn devices that are specified in the M2MApp.ini file are loaded (TTL1 to TTL6). You cannot send commands or percept requests to TTL devices unless they are loaded. Setting LOADALL to true will load all the TTL1 to TTL22 devices.

.USE_TTL2023 If set true then TTL20 to TTL23 are available for control. This is set false if these are used for a serial port. The M2MApp.ini.default sets this true.

.USE_EXT14 If set true then EXT1 to EXT4 (lines on the Radio board) can be used for M2M IODevices. This is typically set false since these lines are used for Radio2

The Configuration files

Under the root directory for your device will notice various system configuration files, these files are used to configure your AVIDdirector handle various parameters set on AVIDdirector.

The M2MApp.ini.default file is the main configuration file. It contains all standard AVIDdirector options. Developers should not modify this file but should instead utilize the other file to override parameters set in the M2MApp.ini.default file. For example the M2MApp.ini file is used to set parameters and override values set in the M2MApp.ini.default file. Below you will see examples of each of the configuration files and examples of how to use these files to handle your application.

When you start developing your own m2mapp, there is the -c filename option to specify the configuration file to use (defaults to M2MApp.ini, that uses M2MApp.ini.default), and m2mapp - C config=nnnn allows manual

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override of a config file entry. There can be multiple -C config=nnn -C config2=mmm -C config3=xxx entered on the same line.

M2MApp.ini.default

```
# Config File: M2MApp.ini Updated: 10/22/2008 9:59:12PM
# M2MApp M2MApp Ver:2.0.0(Build:2008102101)[57.10.19.7.10.50.15.39.12]
#
# Master M2MApp.ini file. This contains all IODevices, Radios and standard M2Mlets.
# Most of them have the .LOAD=false to prevent them from loading. The M2MApp.ini file
#
# Specify the device type, 100 (Rev A or B) or 200 (Rev C)
AVIDIRECTOR.MODEL=200
#
##### System Settings #####
#
SYSTEM.APP_NAME=M2MApp
SYSTEM.DEBUG=0
SYSTEM.LOGGING=0
SYSTEM.OPTIONS=0
# AVIDirector Unique number (if not set uses device's serial # or phone#)
# SYSTEM.DEVICE_UUID=
# Maximum time without communications with the portal before we auto-reboot - 1 day
# SYSTEM.MAX_NOCOMM_TIME=86400000
# Level below which we do a GC
SYSTEM.GC_WATERMARK = 100000
SYSTEM.GC_RUN_INTERVAL=60
# Watchdog timer reset
SYSTEM.WATCHDOG=true
#
##### M2MXML Settings #####
# Version of M2MXML. Use 1.1, 1.0 or Beta
M2MXML.VERSION=1.1
# M2MXML Server Settings
M2MXML.SERVER_IP_ADDRESS=aviddashboard.com
M2MXML.SERVER_PORT=8088
M2MXML.SERVER_HTTP_SEND_PAGE=/AVIDirector/Host?msg=
M2MXML.SERVER_HTTP_POLL_PAGE=/AVIDirector/Host?uuid=
# M2MXML.SERVER_POLL_TIME=180000
# UDP Port received the Messages or Shoulder taps from the server
# M2MXML.SERVER_UDP_PORT=4321
#
##### M2MLET APPLICATION CLASSES #####
#
# Jumpstart Demo Board M2Mlet
DEMO_M2MLET.CLASSNAME=com.avidwireless.avidirector.Demo_M2Mlet
DEMO_M2MLET.LOAD=false
DEMO_M2MLET.DEMO_ENABLED=true
# Update specifies when to send data automatically to the Server
# DEMO_M2MLET.DEMO_UPDATE_INTERVAL=60000
#
# Modbus Reader application class to load
MODBUS_M2MLET.CLASSNAME=Modbus_M2Mlet
MODBUS_M2MLET.LOAD=false
# How often we will be reporting in 5 minutes
MODBUS_M2MLET.UPDATE_INTERVAL=120000
# Serial Port Settings
MODBUS_M2MLET.SERIAL_PORT=serial1
MODBUS.SERIAL_PORT_BAUDRATE=9600
MODBUS.SERIAL_PORT_DATABITS=8
MODBUS.SERIAL_PORT_PARITY=None
MODBUS.MODBUS_ASCII=false
MODBUS.MODBUS_RETRY_COUNT=2
MODBUS.MODBUS_POLL_DELAY=1
# MODBUS device address
MODBUS_M2MLET.MODBUS_DEVICE=1
# Starting address for floating analog 32 bit registers we are reading
```

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```
MODBUS_M2MLET.MODBUS_START_ADDRESS=800101
# Names of the Floating values we are reading
MODBUS_M2MLET.MODBUS_NAMES=MOD1.AI1,MOD1.AI2
MODBUS_M2MLET.MODBUS_FLOATING=true
# Starting address for digital discrete registers we are reading
MODBUS_M2MLET.MODBUS_START_ADDRESS1=100001
# Names of the Digital values we are reading
MODBUS_M2MLET.MODBUS_NAMES1=MOD1.DI48,MOD1.DI87
# Starting address for floating analog 32 bit registers we are reading
# MODBUS_M2MLET.MODBUS_START_ADDRESS2=800001
# Names of the Short values we are reading
# MODBUS_M2MLET.MODBUS_NAMES2=MOD1.AO25,MOD1.AO51
#
#
##### M2M_IODEVICES (On board Devices) #####
#
# Possible arguments for the TTL devices are
# TTLn.M2MXML_ADDRESS=TTLn.subdevice
# TTLn.IOTYPE=type, where type is AIN, DIN, AOUT or DOUT
# TTLn.POLLING=true
# TTLn.READING_PROCESSOR_CLASSNAME=classname of IODeviceReadingProcessor instance
# TTLn.NUM_AVG_READINGS=n Number of readings to be used for getting an average reading
# TTLn.ABSOLUTE_REPORT_TIME=nnn Set an absolute GMT time to report the current reading
value. Time is in GMT seconds for each day.
# TTLn.PERIODIC_REPORT_TIME=nnn Set an periodic time to report the current reading value.
Time is in milliseconds
# TTLn.REPORT_MINIMUM_INTERVAL_TIME=nnn Set period of time, in milliseconds, to wait before
we report a change in a value
# TTLn.DIGITAL_TRIGGER_HIGH=true|false Report if the input goes from a low to a high
# TTLn.DIGITAL_TRIGGER_LOW=true|false Report if the input goes from a high to a low
# TTLn.INVERT=true|false If set true this will invert the reported value
# TTLn.PULLUP_INPUT=true|false Set the port to have an active pullup using the PSoC
# TTLn.PULLDOWN_INPUT=true|false Set the port to have an active pulldown using the PSoC
# TTLn.DURATION=nnn Set the time interval to set the output. Time in milliseconds
# TTLn.PULSEHIGH_TIME=nnn Set the time to pulse the output high. Time in milliseconds.
# TTLn.PULSELOW_TIME=nnn Set the time to pulse the output low. Time in milliseconds.
# TTLn.ANALOG_OFFSET=dd.dd Sets offset applied to the analog input or output.
# TTLn.ANALOG_FACTOR=dd.dd Sets factor (multiplier) applied to the analog input or output
# TTLn.ANALOG_ABSOLUTE_HIGH=dd.dd Sets absolute high value for the analog input to report a
reading to the portal.
# TTLn.ANALOG_ABSOLUTE_LOW=dd.dd Sets absolute low value for the analog input to report a
reading to the portal
# TTLn.ANALOG_DEADBAND_HIGH=dd.dd Sets delta high value for the analog input to report a
reading to the portal
# TTLn.ANALOG_DEADBAND_LOW=dd.dd Sets delta low value for the analog input to report a
reading to the portal
#
# M2M On device address which match the Jumpstart board
TTL1.M2MXML_ADDRESS=TTL1.AIN
TTL1.IOTYPE=AIN
TTL1.ANALOG_DEADBAND_HIGH=60.0
TTL1.ANALOG_DEADBAND_LOW=60
TTL2.IOTYPE=AOUT
TTL3.IOTYPE=DOUT
TTL4.IOTYPE=DOUT
TTL5.M2MXML_ADDRESS=TTL5.DIN
TTL5.IOTYPE=DIN
TTL6.M2MXML_ADDRESS=TTL6.DIN
TTL6.IOTYPE=DIN
#
# M2M_IO Device common settings
# M2MIODEVICE.POLLTIME=20000
# Enable the Serial2 (TTL20-23) and Ext1-4 lines (RadioB) for direct control
M2MIODEVICE.USE_TTL2023=true
# Load the M2M_IODEVICES or Load ALL the M2M_IODEVICES (ones not listed here)
M2MIODEVICE.LOAD=true
```

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```
M2MIODEVICE.LOADALL=false
#
##### IODEVICES #####
#
# NMEA GPS Receiver to load
GPS.CLASSNAME=com.avidwireless.avidirector.iodevice.GPS_NMEA_Receiver
GPS.LOAD=false
GPS.SERIAL_PORT=serial1
GPS.MAPSERIALPORT=GPS
GPS.RDD_PWR_ON=true
GPS.SERIAL_PORT_BAUD_RATE=4800
GPS.SERIAL_PORT_TIMEOUT=5000
GPS.SONY=false
GPS.USGLOBSAT=true
GPS.ENHANCED_GPS=true
GPS.SPEED_UNITS=MPH
# Send GPS readings once every 8 hours unless we are moving
GPS.POLLTIME=28800000
GPS.CONTINUOUS=false
# GPS.GPS_INIT_STRING=$PSRF103,00,00,10,01~$PSRF103,04,00,10,01~$PSRF103,05,00,10,01
# GPS.GPS_START_READING=$PFST,START,0
# GPS.FASTPOLL_TIME=nnn Time in milliseconds to report when FASTPOLL criteria met
# GPS.TRIGGER_FASTPOLL_SPEED=mmm Speed in MPH (or KPH) that trigger the FASTPOLL update rate
# GPS.TRIGGER_FASTPOLL_METERS=mmm Distance in meters moved that triggers a FASTPOLL update
Rate
GPS.FASTPOLL_TIME=60000
GPS.TRIGGER_FASTPOLL_SPEED=10
GPS.TRIGGER_FASTPOLL_METERS=1000
GPS.REQUIRED=GPRMC,GPGGA
#
# BPI216 SerialLCD to load
LCD.CLASSNAME=com.avidwireless.avidirector.iodevice.BPI216_SerialLCD
LCD.LOAD=false
LCD.ADDRESS=LCD
LCD.SERIAL_PORT=serial1
#
# SIRIT UHF INFINITY 210/OEM200 RFID Reader class
SIRIT_OEM200_READER.CLASSNAME=com.avidwireless.avidirector.iodevice.SIRIT_OEM200_READER_RFI
DReader
SIRIT_OEM200_READER.LOAD=false
SIRIT_OEM200_READER.M2MXML_ADDRESS=RFIDReader
SIRIT_OEM200_READER.SERIAL_PORT=serial1
SIRIT_OEM200_READER.TAGTYPE=0
SIRIT_OEM200_READER.READ_REPEAT=1
SIRIT_OEM200_READER.POLLTIME=200
SIRIT_OEM200_READER.ENABLE=true
#
# SIRIT OEM-400 HF RFID Reader
SIRIT_OEM400_READER.CLASSNAME=com.avidwireless.avidirector.iodevice.Sirit_OEM400_RFIDReader
SIRIT_OEM400_READER.LOAD=false
SIRIT_OEM400_READER.M2MXML_ADDRESS=RFIDHFReader
SIRIT_OEM400_READER.SERIAL_PORT=serial2
SIRIT_OEM400_READER.MAPSERIALPORT=RadioB
SIRIT_OEM400_READER.RDD_PWR_ON=true
SIRIT_OEM400_READER.TAGTYPE=ISO
SIRIT_OEM400_READER.POLLTIME=200
SIRIT_OEM400_READER.ENABLE=true
#
# AVIDSmartSensors
SMARTSEN.CLASSNAME=com.avidwireless.avidirector.iodevice.SmartSensors
SMARTSEN.LOAD=false
SMARTSEN.CONTINUOUS=TRUE
SMARTSEN.SEND_ALL_READINGS=TRUE
SMARTSEN.DISPLAY_ALL_READINGS=TRUE
SMARTSEN.SERIAL_PORT=serial2
SMARTSEN.MAPSERIALPORT=RadioB
SMARTSEN.RDD_PWR_ON=true
```

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```
SMARTSEN.SERIAL_PORT_BAUD_RATE=19200
SMARTSEN.SERIAL_PORT_TIMEOUT=10000
# Individual AVIDSmartSensors are identified with a name and the _SNUM trailer specifying
the address.
# Parameters for the device names are .SEND, .MIN, .MAX, .THRESHOLD, .THRESHOLD2, .DELTA,
# .DELTA2, .FACTOR, .FACTOR2, .OFFSET, .OFFSET2, .IODEVICE_READING_PROCESSOR_CLASS.
# Next is an example for a magnetic sensor 'DOOR' at E9DE0A00
# SMARTSEN.DOOR_SNUM=E9DE0A00
# DOOR.SEND=TRUE
#
# STATUS Class to provide Device Status
STATUS.CLASSNAME=com.avidwireless.avidirector.iodevice.Status
STATUS.LOAD=true
STATUS.MESSAGE_AT_STARTUP=yes
#
# SHOULDERTAP Class to handle Shoulder Tap requests
SHOULDERTAP.CLASSNAME=com.avidwireless.avidirector.iodevice.ShoulderTap
SHOULDERTAP.LOAD=false
#
#
##### RADIOS #####
#
# To load a Radio, change the nnnn.LOAD=false to true to load the Radio class
#
# MultiTech GPRS Radio
MT_GPRS.CLASSNAME=com.avidwireless.radio.GPRSMultiTechWavecom
MT_GPRS.LOAD=false
MT_GPRS.MODEM_MODEL=GPRS
# MT_GPRS.PHONENUM=
MT_GPRS.SERIAL_PORT=serial3
MT_GPRS.SERIAL_PORT_BAUDRATE=57600
MT_GPRS.SERIAL_PORT_TIMEOUT=3000
MT_GPRS.CONNECTION_TYPE=TCPIP
MT_GPRS.KEEP_CONNECTION_UP=false
# MT_GPRS.PPP_DNS_PRIMARY=205.166.226.38
# GPRS Specific information
MT_GPRS.CARRIER=Crossbridge
MT_GPRS.GPRS_APN=
MT_GPRS.SMSC=
MT_GPRS.PPP_USERNAME=
MT_GPRS.PPP_PASSWORD=
MT_GPRS.PPP_AUTHENTICATION=PAP
MT_GPRS.PPP_HANGTIME=10000
# M2MXML Portal Information
MT_GPRS.SERVER_IP_ADDRESS=aviddashboard.com
MT_GPRS.SERVER_PORT=8088
MT_GPRS.SERVER_HTTP_M2MXML_SEND_PAGE=/AVIDdirector/Host?msg=
MT_GPRS.SERVER_HTTP_M2MXML_POLL_PAGE=/AVIDdirector/Host?uuid=
MT_GPRS.SERVER_M2MXML_POLL_TIME=600000
# MT_GPRS.SERVER_M2MXML_UDP_PORT=4321
MT_GPRS.SERVER_SMS_NUMBER=76001
MT_GPRS.MAX_RETRY_COUNT=3
MT_GPRS.MAX_QUEUE_SIZE=100
MT_GPRS.MAX_FATAL_ERRORS=10
MT_GPRS.RESTORE_NETWORK_DNS=true
MT_GPRS.TEST_NETWORK_CONNECTIVITY=0
# Information for Dynamic DNS lookup
MT_GPRS.DYNDNS_AUTOUPDATE=N
MT_GPRS.DYNDNS_HOSTNAME=demo1.avidm2m.com
MT_GPRS.DYNDNS_USERNAME=
MT_GPRS.DYNDNS_PASSWORD=
MT_GPRS.DYNDNS_DNS_TYPE=custom
#
# MultiTech CDMA Radio
MT_CDMA.CLASSNAME=com.avidwireless.radio.CDMAMultiTechWavecom
MT_CDMA.LOAD=false
MT_CDMA.MODEM_MODEL=CDMA
```

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```
MT_CDMA.SERIAL_PORT=serial3
MT_CDMA.SERIAL_PORT_BAUDRATE=57600
MT_CDMA.SERIAL_PORT_TIMEOUT=3000
MT_CDMA.CONNECTION_TYPE=TCPIP
MT_CDMA.KEEP_CONNECTION_UP=false
#MT_CDMA.PPP_DNS_PRIMARY=205.166.226.38
# CDMA Specific Information
MT_CDMA.CARRIER=
MT_CDMA.PPP_USERNAME=
MT_CDMA.PPP_PASSWORD=
MT_CDMA.PPP_AUTHENTICATION=PAP
MT_CDMA.PPP_HANGTIME=10000
# M2MXML Portal Information
MT_CDMA.SERVER_IP_ADDRESS=aviddashboard.com
MT_CDMA.SERVER_PORT=8088
MT_CDMA.SERVER_HTTP_M2MXML_SEND_PAGE=/AVIDdirector/Host?msg=
MT_CDMA.SERVER_HTTP_M2MXML_POLL_PAGE=/AVIDdirector/Host?uuid=
MT_CDMA.SERVER_M2MXML_POLL_TIME=600000
# MT_CDMA.SERVER_M2MXML_UDP_PORT=4321
MT_CDMA.MAX_RETRY_COUNT=3
MT_CDMA.MAX_QUEUE_SIZE=100
MT_CDMA.MAX_FATAL_ERRORS=10
MT_CDMA.RESTORE_NETWORK_DNS=true
MT_CDMA.TEST_NETWORK_CONNECTIVITY=0
# Information for Dynamic DNS lookup
MT_CDMA.DYNDNS_AUTOUPDATE=N
MT_CDMA.DYNDNS_HOSTNAME=demo1.avidm2m.com
MT_CDMA.DYNDNS_USERNAME=
MT_CDMA.DYNDNS_PASSWORD=
MT_CDMA.DYNDNS_DNS_TYPE=custom
#
# Motorola IO270 Radio
IO270.CLASSNAME=com.avidwireless.radio.IO270
IO270.LOAD=false
IO270.MODEM_MODEL=CDMA
IO270.SERIAL_PORT=serial3
IO270.SERIAL_PORT_BAUDRATE=57600
IO270.SERIAL_PORT_TIMEOUT=3000
IO270.PPP_USERNAME=
IO270.PPP_PASSWORD=
IO270.PPP_AUTHENTICATION=PAP
IO270.PPP_HANGTIME=10000
IO270.CONNECTION_TYPE=TCPIP
IO270.KEEP_CONNECTION_UP=false
#IO270.PPP_DNS_PRIMARY=205.166.226.38
IO270.MAX_RETRY_COUNT=3
IO270.MAX_QUEUE_SIZE=100
IO270.MAX_FATAL_ERRORS=10
# M2MXML Portal Information
IO270.SERVER_IP_ADDRESS=aviddashboard.com
IO270.SERVER_PORT=8088
IO270.SERVER_HTTP_M2MXML_SEND_PAGE=/AVIDdirector/Host?msg=
IO270.SERVER_HTTP_M2MXML_POLL_PAGE=/AVIDdirector/Host?uuid=
IO270.SERVER_M2MXML_POLL_TIME=600000
# UDP Port received the Shoulder taps from the server
# IO270.SERVER_M2MXML_UDP_PORT=4321
IO270.RESTORE_NETWORK_DNS=true
IO270.TEST_NETWORK_CONNECTIVITY=0
# Information for Dynamic DNS lookup
IO270.DYNDNS_AUTOUPDATE=N
IO270.DYNDNS_HOSTNAME=demo1.avidm2m.com
IO270.DYNDNS_USERNAME=
IO270.DYNDNS_PASSWORD=
IO270.DYNDNS_DNS_TYPE=custom
#
# Boomer 3 Mobitex Radio
BOOMER3.CLASSNAME=com.avidwireless.radio.Boomer3
```

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```
BOOMER3.LOAD=false
BOOMER3.SERIAL_PORT=serial3
BOOMER3.SERIAL_PORT_BAUDRATE=9600
# Maximum time to send a message
BOOMER3.MAX_RETRY_COUNT=3
BOOMER3.MAX_QUEUE_SIZE=100
BOOMER3.MAX_FATAL_ERRORS=10
# Mobitex Specific network information
BOOMER3.MOBITEX_GATEWAY_ADDRESS=103087
BOOMER3.MOBITEX_GATEWAY_HPID=137
BOOMER3.ENCRYPT_MPAK = false
#
# Lantronix XPORT PPP Ethernet adapter
XPORT.CLASSNAME=com.avidwireless.radio.XPort
XPORT.LOAD=false
XPORT.SERIAL_PORT=serial3
XPORT.MAPSERIALPORT=XPORT
XPORT.RDD_PWR_ON=true
XPORT.SERIAL_PORT_BAUDRATE=57600
XPORT.SERIAL_PORT_TIMEOUT=3000
XPORT.PPP_HANGTIME=10000
XPORT.CONNECTION_TYPE=TCPIP
# XPORT.PPP_DNS_PRIMARY=205.166.226.38
XPORT.MAX_RETRY_COUNT=3
XPORT.MAX_QUEUE_SIZE=100
XPORT.MAX_FATAL_ERRORS=10
# M2MXML Portal Information
XPORT.SERVER_IP_ADDRESS=aviddashboard.com
XPORT.SERVER_PORT=8088
XPORT.SERVER_HTTP_M2MXML_SEND_PAGE=/AVIDdirector/Host?msg=
XPORT.SERVER_HTTP_M2MXML_POLL_PAGE=/AVIDdirector/Host?uuid=
XPORT.SERVER_M2MXML_POLL_TIME=60000
# UDP Port received the Shouldertaps from the server
XPORT.SERVER_M2MXML_UDP_PORT=4321
XPORT.RESTORE_NETWORK_DNS=true
XPORT.TEST_NETWORK_CONNECTIVITY=0
# Information for Dynamic DNS lookup
XPORT.DYNDNS_AUTOUPDATE=N
XPORT.DYNDNS_HOSTNAME=demo1.avidm2m.com
XPORT.DYNDNS_USERNAME=
XPORT.DYNDNS_PASSWORD=
XPORT.DYNDNS_DNS_TYPE=custom
#
# Lantronix WIPORT PPP Ethernet adapter
WIPORT.CLASSNAME=com.avidwireless.radio.XPort
WIPORT.LOAD=false
WIPORT.SERIAL_PORT=serial3
WIPORT.MAPSERIALPORT=RADIOB
WIPORT.RDD_PWR_ON=true
WIPORT.SERIAL_PORT_BAUDRATE=57600
WIPORT.SERIAL_PORT_TIMEOUT=3000
WIPORT.PPP_HANGTIME=10000
WIPORT.CONNECTION_TYPE=TCPIP
# WIPORT.PPP_DNS_PRIMARY=205.166.226.38
WIPORT.MAX_RETRY_COUNT=3
WIPORT.MAX_QUEUE_SIZE=100
WIPORT.MAX_FATAL_ERRORS=10
# M2MXML Portal Information
WIPORT.SERVER_IP_ADDRESS=aviddashboard.com
WIPORT.SERVER_PORT=8088
WIPORT.SERVER_HTTP_M2MXML_SEND_PAGE=/AVIDdirector/Host?msg=
WIPORT.SERVER_HTTP_M2MXML_POLL_PAGE=/AVIDdirector/Host?uuid=
WIPORT.SERVER_M2MXML_POLL_TIME=60000
# UDP Port received the Shoulder taps from the server
WIPORT.SERVER_M2MXML_UDP_PORT=4321
WIPORT.RESTORE_NETWORK_DNS=true
WIPORT.TEST_NETWORK_CONNECTIVITY=0
```

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```
# Information for Dynamic DNS lookup
WIPOUT.DYNDNS_AUTOUPDATE=N
WIPOUT.DYNDNS_HOSTNAME=demo1.avidm2m.com
WIPOUT.DYNDNS_USERNAME=
WIPOUT.DYNDNS_PASSWORD=
WIPOUT.DYNDNS_DNS_TYPE=custom
#
# Local Ethernet adapter
ETHERNET.CLASSNAME=com.avidwireless.radio.Ethernet
ETHERNET.LOAD=false
ETHERNET.MAX_RETRY_COUNT=3
ETHERNET.MAX_QUEUE_SIZE=100
ETHERNET.MAX_FATAL_ERRORS=10
# M2MXML Portal Information
ETHERNET.SERVER_IP_ADDRESS=aviddashboard.com
ETHERNET.SERVER_PORT=8088
ETHERNET.SERVER_HTTP_M2MXML_SEND_PAGE=/AVIDdirector/Host?msg=
ETHERNET.SERVER_HTTP_M2MXML_POLL_PAGE=/AVIDdirector/Host?uuid=
ETHERNET.SERVER_M2MXML_POLL_TIME=60000
# UDP Port received the Shoulder taps from the server
ETHERNET.SERVER_M2MXML_UDP_PORT=4321
ETHERNET.RESTORE_NETWORK_DNS=true
ETHERNET.TEST_NETWORK_CONNECTIVITY=0
# Information for Dynamic DNS lookup
ETHERNET.DYNDNS_AUTOUPDATE=N
ETHERNET.DYNDNS_HOSTNAME=demo1.avidm2m.com
ETHERNET.DYNDNS_USERNAME=
ETHERNET.DYNDNS_PASSWORD=
ETHERNET.DYNDNS_DNS_TYPE=custom
#
# ATMODEM PPP Ethernet adapter
ATMODEM.CLASSNAME=com.avidwireless.radio.ATModem
ATMODEM.LOAD=false
ATMODEM.SERIAL_PORT=serial3
ATMODEM.MAPSERIALPORT=RS232
ATMODEM.SERIAL_PORT_BAUDRATE=19200
ATMODEM.SERIAL_PORT_TIMEOUT=3000
ATMODEM.PPP_DIALNUMBER=2142420020
ATMODEM.PPP_DIALTIME=60000
ATMODEM.PPP_CONNECTTIME=30000
ATMODEM.PPP_USERNAME=
ATMODEM.PPP_PASSWORD=
ATMODEM.PPP_AUTHENTICATION=PAP
ATMODEM.PPP_HANGTIME=30000
ATMODEM.DNS_TIMEOUT=15000
ATMODEM.SOCKET_TIMEOUT=30000
ATMODEM.CONNECTION_TYPE=TCP/IP
# ATMODEM.PPP_DNS_PRIMARY=205.166.226.38
ATMODEM.MAX_RETRY_COUNT=3
ATMODEM.MAX_QUEUE_SIZE=100
ATMODEM.MAX_FATAL_ERRORS=10
# M2MXML Portal Information
ATMODEM.SERVER_IP_ADDRESS=aviddashboard.com
ATMODEM.SERVER_PORT=8088
ATMODEM.SERVER_HTTP_M2MXML_SEND_PAGE=/AVIDdirector/Host?msg=
ATMODEM.SERVER_HTTP_M2MXML_POLL_PAGE=/AVIDdirector/Host?uuid=
ATMODEM.SERVER_M2MXML_POLL_TIME=60000
# UDP Port received the Shoulder taps from the server
ATMODEM.SERVER_M2MXML_UDP_PORT=4321
ATMODEM.RESTORE_NETWORK_DNS=true
ATMODEM.TEST_NETWORK_CONNECTIVITY=0
# Information for Dynamic DNS lookup
ATMODEM.DYNDNS_AUTOUPDATE=N
ATMODEM.DYNDNS_HOSTNAME=demo1.avidm2m.com
ATMODEM.DYNDNS_USERNAME=
ATMODEM.DYNDNS_PASSWORD=
ATMODEM.DYNDNS_DNS_TYPE=custom
```

M2Mapp.ini

This file is used to over-ride the parameters set in the M2Mapp.ini.default

```
# Config File: M2Mapp.ini Updated: 10/22/2008 9:59:12PM
# M2Mapp M2Mapp Ver:2.0.0(Build:2008102101)[57.10.19.7.10.50.15.39.12]
#
# User specific loading of files
SYSTEM.DEVICE_UUID=
SYSTEM.DEBUG=1 B- Use this to set a different debug level
DEMO_M2MLET.LOAD=true
M2MIODEVICE.LOADALL=true
# M2MIODEVICE.POLLTIME=20000
#
GPS.LOAD=false B- You would set this = true to turn on GPS
GPS.POLLTIME=28800000
GPS.FASTPOLL_TIME=60000
GPS.TRIGGER_FASTPOLL_SPEED=10
GPS.TRIGGER_FASTPOLL_METERS=1000
#
SMARTSEN.LOAD=false B- You would set this = true if you want to connect to
AVIDSmartSensors
#
MT_GPRS.LOAD=true
MT_GPRS.CARRIER=Crossbridge B- Specifies Crossbridge as our wireless carrier
MT_GPRS.SERVER_M2MXML_UDP_PORT=4321
```

ish.ini

This file is used to set user environment parameters such as Class Paths and Alias

```
# Set the Java classpath of the jar files to load
# /root/app.jar is an example of placing user specific jar files in the Classpath
# It is recommended to add jar files to the CLASSPATH and NOT in the command line with the
-classpath option
setenv CLASSPATH $CLASSPATH:/root/app.jar
# set any user aliases here
alias myapp java -w com.user.myapp
```

startup.ini

This is where you would put user application specific processes etc that need to happen at startup time. This is the first file that is executed on startup. In the example below you could start up the XPORT Ethernet session at start up by un-commenting the pppclient line.

When you start the m2mapp, there is the -c filename option to specify the configuration file to use (defaults to M2Mapp.ini, that uses M2Mapp.ini.default), and m2mapp - C config=nnnn allows manual override of a config file entry. There can be multiple -C config=nnn -C config2=mmm -C config3=xxx entered on the same line.

```
# User applications started here
#echo "Starting XPORT Ethernet"
#pppclient -s serial1 -m xport -t -f -o -l
echo "Starting AVIDirector-M2M Application Framework (M2Mapp) in the background."
m2mapp -c M2Mapp.ini
```

Appendix 1 – AVIDdirector Model 100 (see Appendix 9 for Model 200) Pin and I/O Definitions

External Connector Pin Definitions

AVIDdirector-M2M model 100 board has a Phoenix 5.08mm model1757349 for the 12 position GPIO and 1757242 for the 2 position power connector.

Pin	SensorLogic Address	V Range	Features	PSoC Port (Pin)
Digital/Analog Connector				
1	TTL1	5V TTL	Dig I/O; Analog In/Out	P0.2 (77)
2	TTL2	5V TTL	Dig I/O; Analog In/Out	P0.3 (99)
3	TTL3	5V TTL	Dig I/O; Analog In	P0.0 (74)
4	TTL4	5V TTL	Dig I/O; Analog In	P0.1 (3)
5	TTL5	5V TTL	Dig I/O; Analog In (12 bit)	P2.0 (68)
6	TTL6	5V TTL	Dig I/O; Analog In (12 bit)	P2.1 (7)
7		Ground		
8	HVC1	0 to Vsup or Vrail	High Volt & Cur; Dig I/O; Analog In / 4	P2.2 (69)
9	HVC2	0 to Vsup or Vrail	High Volt & Cur; Dig I/O; Analog In / 4	P2.3 (6)
10	HVC3	0 to Vsup or Vrail	High Volt & Cur; Dig I/O	P4.0 (63)
11	HVC4	0 to Vsup or Vrail	High Volt & Cur; Dig I/O	P4.1 (11)
12		Vrail IN or Vsup OUT	J1 in sets Vsup OUT to either 5 or 12 VDC	
Serial Connectors				
	Serial0	TTL (3-wire)	Console port on debug header	P1.2(45); P1.3(29)
	Serial1	RS-232 (6-wire)	DB-9 connector.	P6.0-P6.7 (86-93)
	Serial2	TTL (4-wire)	RJ-12 connector; TX; RX are Dig I/O; Analog In/Out; RTS; CTS are Dig I/O	P0.4(79); P0.5(97); P0.6(81); P0.7(95)
	Serial3	TTL (6-wire)	Radio port	P6.0-P5.7 (20-23; 52-55); P4.6(67); P4.7(8)
Power Connector				
1		8 to 16 VDC	Automotive grade input	
2		Gnd		

Debug / Expansion Connector

This is a 24-position 2mm header (Samtec TMM-112-01-L-D-SM-P or Sullins 122MAMS),

Pin	V Range	Features	PSoC Port
1	3.3 V	Imsys JTAG	
2	3.3 V	Imsys JTAG	
3	3.3 V	Imsys JTAG	
4	3.3 V	Imsys JTAG	
5	3.3 V	Imsys JTAG	
6		Ground	
7		Ground	
8	3.3 V	Imsys JTAG	
9		+ 3.3V	
10		+ 3.3V	
11	5V TTL	Serial0 RXD	P1.3
12	5V TTL	Serial0 TXD	P1.2
13	5V TTL	Serial0 DTR (Reset)	To uP Supervisor
14		+ 5.0V	
15	5V TTL	Ext1	P4.2
16	5V TTL	Ext2	P4.3
17	5V TTL	Ext3	P4.3
18	5V TTL	Ext4	P3.7
19	5V TTL	I ² C Interrupt signal	
20	5V TTL	I ² C SLC clock signal	P1.7
21	5V TTL	I ² C SDA data signal	P1.5
22	5V TTL	PSoC Prog SClk	P1.1
23	5V TTL	PSoC Prog SData	P1.0
24	5V TTL	PSoC Prog XRES	XRES

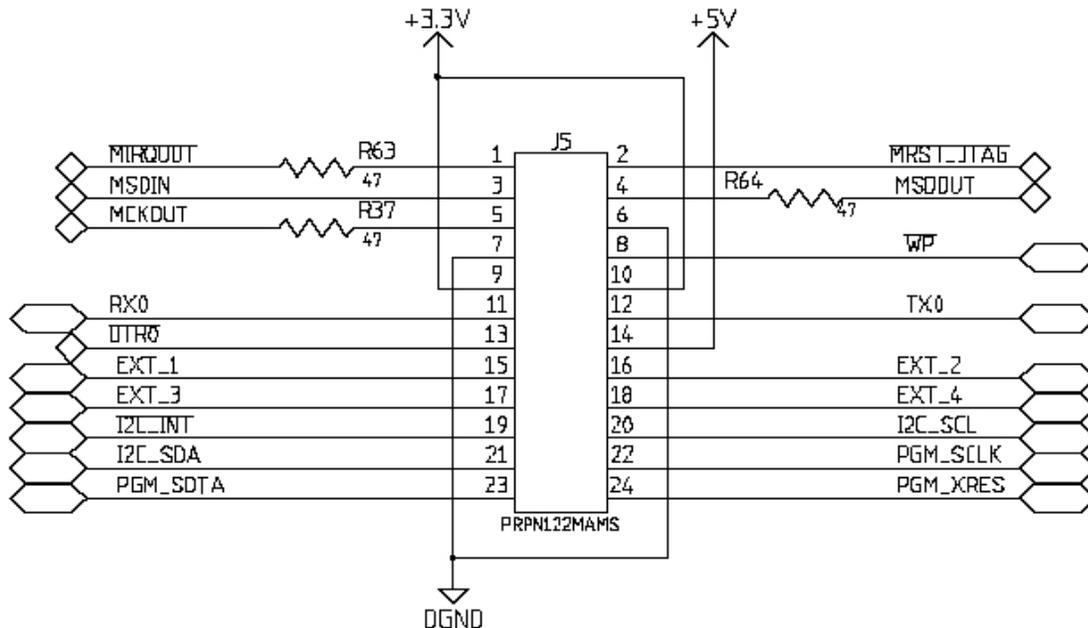


Figure 4. Debug / Expansion Connector

Radio Connector

This is a 24-position 2mm socket, Samtec part number SMM-112-02-S-D-P.

Pin	Function	In/Out	PSoC Port
1	+5VDC Power (2.5 Amp max)	-	
2	+5VDC Power (2.5 Amp max)	-	
3	Radio power on signal (1=on)	OUT	Cjip Port D 5
4	+5VDC Power (2.5 Amp max)	-	
5	/Radio reset (0=reset). Momentary	OUT	Cjip Port D 4
6	/Ring Indicator (0=ring) -	IN	R 5.7
7	/Radio1 serial CTS	IN	P 5.3
8	I ² C SLC clock signal	OUT	P 1.7
9	/Radio1 serial RTS	OUT	P 5.2
10	I ² C SDA data signal	IN / OUT	P 1.5
11	/Radio1 serial DTR	OUT	P 5.4
12	/I ² C Interrupt signal (0=device interrupt)	IN	P 1.6
13	Radio1 serial RX. Data to	IN	P 5.0
14	EXT_1. May be used for Radio2 RX	IN	P 4.2
15	/Radio1 serial DCD	IN	P 5.6
16	EXT_2. May be used for Radio2 TX	OUT	P 4.3
17	Radio1 serial TX	OUT	P 5.1
18	EXT_3. May be used for Radio2 RTS	OUT	P 4.4
19	Radio1 Message Waiting (1=message) -	IN	P 4.6
20	EXT_4. May be used for Radio2 CTS	IN	P 3.7
21	Radio1 Transmit signal (1=transmitting) -	IN	P 4.7
22	Ground	-	
23	Ground	-	
24	Ground	-	

- May be used for other functions specific to individual radios

IN / OUT refers to FROM the Radio. E.g. Pin 13 RX is a signal from the Radio to AVIDdirector-M2M CPU; Pin 17 TX is a signal from the CPU board to the Radio

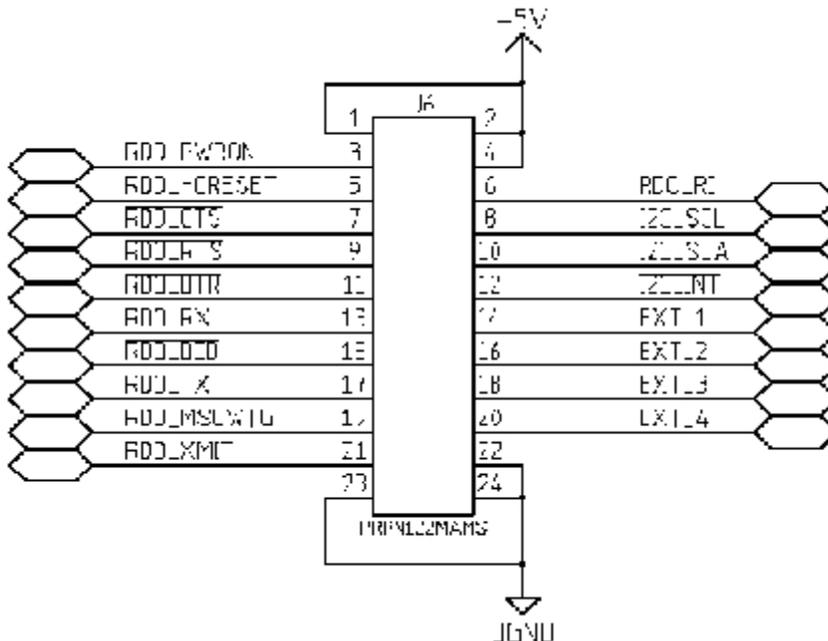


Figure 4. Radio Connector

Appendix 2 - AVIDdirector-M2M Digital and Serial I/O Schematics

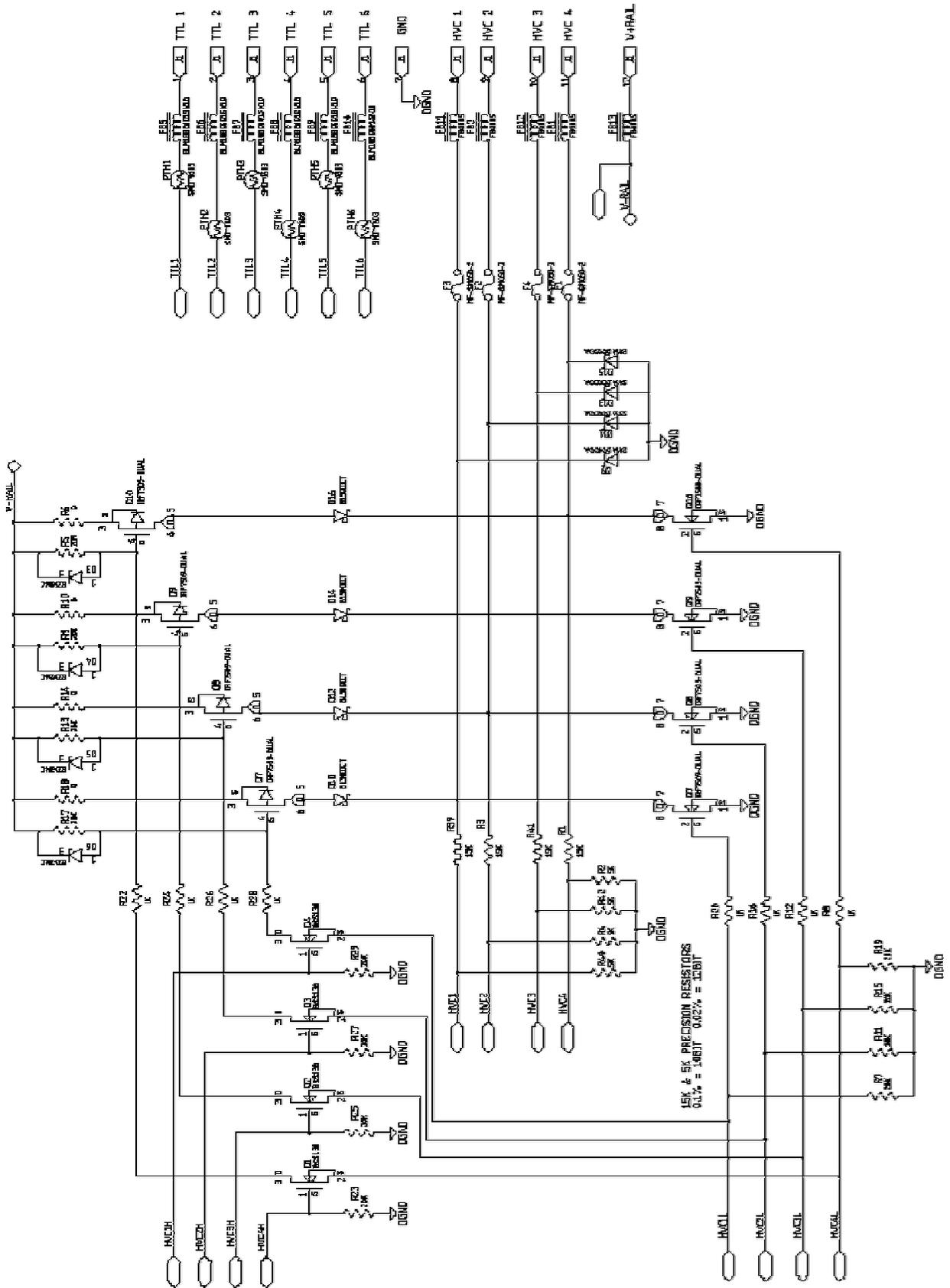


Figure 5. Digital I/O Interface Circuitry

Serial Port Pin Assignments:

Serial 1 – RS-232 DB-9 Connector

Pin	I/O	Function
1	IN	DCD-Data Carrier Detect
2	IN	RX-Received Data
3	OUT	TX-Transmitted Data
4	OUT	DTR-Data Terminal Ready
5		Ground
6	IN	DSR-Data Set Ready
7	OUT	RTS-Return to Send
8	IN	CTS-Clear to Send
9		+5V at 250 ma

Serial 2 – TTL Serial on RJ-12 Connector

Pin	I/O	Function
1	IN	CTS-Clear to Send
2	IN	RX-Received Data
3		+5V at 250 ma
4		Ground
5	OUT	TX-Transmitted Data
6	OUT	RTS-Return to Send

Appendix 4 – Sample M2Mlet for Simulation Board

This is the Demo M2Mlet that is used with the AVIDdirector-M2M Simulation board. The Simulation board has the following port assignments:

Pin	M2MXML Address	Function
1	TTL1.AIN	Potentiometer provides 0 to +5V reading (0 to 4095)
2	TTL2.AOUT	Light bulb glows in proportion to value of 0 to 63
3	TTL3.DOUT	Green LED 1=Turn LED on
4	TTL4.DOUT	Red LED 1=Turn LED on
5	TTL5.DIN	Push Button 1=Push button is pressed
6	TTL6.DIN	Toggle switch, 1=towards connector, 0=rear of board.

The M2Mlet performs these functions:

- § Initializes the TTL1 to TTL6 ports to their specific function.
- § TTL1 (the potentiometer) is set to the value must change by +/-30 units before a new reading is set to the M2MXML portal, and a reading is sent no more than once every 10 seconds
- § Changing the potentiometer will be converted to a level to send to the light bulb, which is a driven by a transistor. Potentiometer readings from 0 to 4095 are converted to Analog output values of 0 to 63
- § TTL3 and TTL4 LEDs correspond to the TTL5 and TTL6 switches.
- § TTL5 switch is set to only send a reading to the portal when pressed. Releasing the button does not send a reading
- § TTL6 toggle switch will send a reading whenever it is switched.
- § The M2MApp.ini configuration property "M2MLET.DEMO_ENABLED" is used to enable or disable the M2Mlet. If the property is set to false or no, then the M2Mlet is not initialized during `start()`. If this is set, such as by using the **SetConfiguration** command, then the M2Mlet is initialized and started running. The method `processSetConfigurationItem` handles dynamically enabling or disabling the M2Mlet. Setting `M2MLET.DEMO_ENABLED` to false allows disabling the demonstration M2Mlet without requiring the user to connect to the debug / console port and manually editing the M2MApp.ini file.

```
package com.avidwireless.AVIDdirector;

// get the AVIDdirector specific classes
import com.avidwireless.AVIDdirector.AVIDdirectorApp;
import com.avidwireless.AVIDdirector.M2Mlet;
import com.avidwireless.AVIDdirector.M2M_IO;
import com.avidwireless.AVIDdirector.iodevice.*;
import com.avidwireless.AVIDdirector.IllegalHardwareAddressException;
import com.avidwireless.AVIDdirector.InvalidHardwareOperationException;
import com.avidwireless.AVIDdirector.AvidUtil;
import com.avidwireless.AVIDdirector.Logger;
// the M2M-XML command types
import com.sensorlogic.messages.M2MXML_Messages;
import com.sensorlogic.messages.TelemetryMessage;
import com.sensorlogic.messages.PerceptRequest;
import com.sensorlogic.messages.Response;
// standard Java classes
import javax.comm.SerialPort;
import javax.comm.CommPortIdentifier;
import javax.comm.NoSuchPortException;
import javax.comm.PortInUseException;
import javax.comm.UnsupportedCommOperationException;
import java.io.OutputStream;
```

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```
import java.io.InputStream;
import java.io.IOException;
import java.util.Hashtable;
import java.util.Enumeration;

/**
 * <b>Demo_M2Mlet</b>
 * <p>
 * This handles the on device hardware IO for the AVIDdirector-M2M device
 * using the simulation board.
 * <p>
 * This is for device initiated or monitored hardware. You have to create a
 * class that implements M2Mlet methods. The configuration file
 * contains classes that are loaded when the device starts polls the device
 * per the polling interval. Each class will report to the M2M-XML portal
 * the results of how it is setup.
 *
 * <hr>
 * Developed by AVIDWireless, division of VoiceDataWare Inc. and SensorLogic Inc. <br>
 * Contains PROPRIETARY/CONFIDENTIAL information. Use is subject to license terms.<br>
 * Copyright 2004, All Rights Reserved
 * <p>
 * @author AVIDWireless <a href="http://www.avidwireless.com">http://www.avidwireless.com</a>
 * @version $Revision: 12 $ $JustDate: 2/21/05 $<br>
 * @since Apr 19, 2004
 *
 */
public class Demo_M2Mlet extends M2Mlet implements Runnable {
    /** Our source safe revision numbers */
    final static String REVISION = "$Revision: 12 $"; // for tracking revisions
    /**
     * $NoKeywords: $ */

    //##### STATIC DATA AND CONSTANTS #####

    /** Configuration file value to enable or disable the demo mode */
    final static String CONFIG_FILE_DEMO_MODE =
CONFIG_FILE_M2MLET_PREFIX+".DEMO_ENABLED";

    //##### INSTANCE DATA #####

    /** Array of our M2M sensors we are using to poll */
    M2M_IODevice[] sensors;

    /** The output devices */
    M2M_IODevice lamp, greenLed, redLed;

    /** Set true if this is enabled */
    volatile boolean demoM2mletEnabled;

    /** Set true of the old demo board */
    private boolean oldDemoBoard;

    /** Variables to manage a background thread to perform the readings */
    private Thread thread;
    private volatile boolean threadRunning;

    //##### CONSTRUCTORS #####

    /**
     * M2Mlets require a null constructor
     */
    public Demo_M2Mlet() {
        // null constructor
    }

    //##### INSTANCE METHODS #####

```

```
/**
 * Starts the M2Mlet for the Simulator board. This creates any initial devices and
 * sets them to defined states.
 *
 * @param adApp Instance of the AVIDdirectorMain application
 */
public final boolean start (AVIDdirectorMain adApp){
    final String NAME = "Demo_M2Mlet.start";
    started = false;
    this.app = adApp;
    try {
        // boolean find out if we are in debug mode
        boolean debugMode = Logger.isDebugEnabled();

        // test if this is enabled or not, and if disable don't bother initializing
        String configDemoM2mletEnabled = app.getConfigurationItem(CONFIG_FILE_DEMO_MODE);
        if (configDemoM2mletEnabled != null) {
            demoM2mletEnabled = AvidUtil.parseBoolean(configDemoM2mletEnabled);
        } else {
            // if no entry then assume it is enabled
            demoM2mletEnabled = true;
        }
        // if enabled then continue the starting
        if (demoM2mletEnabled) {
            /** Populate our M2M_IODevice array with the sensors we have */
            sensors = new M2M_IODevice[3];

            // sensors[0] is TTL1 is analog input with a potentiometer
            sensors[0] = app.getM2M_IODeviceForAddress(M2M_IODevice.TTL1);
            if (sensors[0] != null) {
                if (debugMode) Logger.debugln(NAME,"Setting up "+sensors[0].getDeviceAddress()+
                    " as analog input with +/- 30 trigger");
                // set this for analog input
                sensors[0].setAnalogInput();
                // trigger when changes +/- 30, no more than once every 10 seconds
                sensors[0].setTriggerValueChange(30,30);
                sensors[0].setMinTriggerInterval(10);
            } else {
                Logger.log(NAME,"No TTL1 Device specified");
            }

            // TTL5 is round pushbutton
            sensors[1] = app.getM2M_IODeviceForAddress(M2M_IODevice.TTL5);
            sensors[1].setDigitalInput();
            // If low, then new simulation board.
            // If high, then original board (the LED value was inverted on this one)
            int value = sensors[1].readPinDig();
            if (value == 1) {
                oldDemoBoard = true;
                if (debugMode) Logger.debugln(NAME,"Setting up "+sensors[1].getDeviceAddress()+
                    " for the round pushbutton trigger when 0 (pressed in) - old board");

                sensors[1].setTriggerValueGoesLow(true); // trigger when low
                sensors[1].setTriggerValueGoesHigh(false);
            } else { // new demo board
                if (debugMode) Logger.debugln(NAME,"Setting up "+sensors[1].getDeviceAddress()+
                    " for the round pushbutton trigger when 1 (pressed in)");

                sensors[1].setTriggerValueGoesLow(false); // trigger when high
                sensors[1].setTriggerValueGoesHigh(true);
            }

            // TTL6 is the toggle switch, notify on both high and low
            sensors[2] = app.getM2M_IODeviceForAddress(M2M_IODevice.TTL6);
            if (debugMode) Logger.debugln(NAME,"Setting up "+sensors[2].getDeviceAddress()+
```

```
        " for the toggle switch and trigger on either");

sensors[2].setDigitalInput();
// have it send a percept reading on either trigger
sensors[2].setTriggerValueGoesLow(true);
sensors[2].setTriggerValueGoesHigh(true);

// TTL2 is the light bulb
lamp = app.getM2M_IODeviceForAddress(M2M_IODevice.TTL2);
if (debugMode) Logger.debugln(NAME,"Setting up "+lamp.getDeviceAddress()+
        " as analog output for the lamp");

lamp.setAnalogOutput();

// TTL3 is the Green LED
greenLed = app.getM2M_IODeviceForAddress(M2M_IODevice.TTL3);
if (debugMode) Logger.debugln(NAME,"Setting up "+greenLed.getDeviceAddress()+
        " for the Green LED");

greenLed.setDigitalOutput();

// TTL4 is the Red LED
redLed = app.getM2M_IODeviceForAddress(M2M_IODevice.TTL4);
if (debugMode) Logger.debugln(NAME,"Setting up "+redLed.getDeviceAddress()+
        " for the Red LED");

redLed.setDigitalOutput();

// start this thread running
started = true;
thread = new Thread(this);

// Now wait for a signal that it has started
synchronized (this) {
    try {
        thread.start();
        this.wait(30000); // 30 seconds to get going
    } catch (InterruptedException e) {
        Logger.log(NAME,"InterruptedException starting Thread");
    }
}
} else {
    Logger.log(NAME,"Demo M2Mlet is not enabled");
}
} // try
catch (Exception e) {
    Logger.log(NAME,e);
}
return started;
} // initialize

/**
 * This thread monitors the test box's switches and dials and if something has
 * changed it displays a message on the display and sends a message to the
 * SensorLogic portal
 */
public final void run(){
    final String NAME = "Demo_M2Mlet.run";
    Thread.currentThread().setName("Demo_M2Mlet");
    // notify out start method that we are running
    threadRunning = true;
    synchronized (this) {
        this.notifyAll();
    }
    if (started) {
        Logger.log(NAME,"Thread started");
        //lcd.displayMessage("Monitoring...");
        int value; // currently read value from a sensor
        int lightIntensity; // value of the light (0-62)
        String perceptMessage; // Percept reading to Portal
```

```
boolean    retFlag;                // return status of a command
boolean    triggerResponse;        // set true if there is a change of value
int        ttl1Value = -1, ttl3Value = -1, ttl4Value = -1;
boolean    isDebug = Logger.isDebugEnabled();    // cache the debug value

while(threadRunning && demoM2mletEnabled) {
    isDebug = Logger.isDebugEnabled(); // update the debug value in case it changed
    // go through the sensors and send a new reading if it changed
    for (int device=0; device < sensors.length; device++) {
        if (sensors[device] != null) {
            // sensors are fast to poll, so do them all the time
            try {
                // read the value and set it
                if (sensors[device].isAnalogInput()) { // analog input sensor
                    value = sensors[device].readPinAnalog();
                } else { // digital sensor
                    value = sensors[device].readPinDig();
                }
                // update the value on the sensor and see if we triggered anything
                triggerResponse = sensors[device].updateValue(value);

                // handle any special things for these devices
                switch (device) {
                    case 0: { // Pot
                        // change the Light intensity to 0 to 62 from 0 to 4096
                        if ((value <= (ttl1Value-10)) || (value >= (ttl1Value+10))) {
                            lightIntensity = (value / 66); // 0 to 62
                            lamp.writePinAnalog(lightIntensity);
                            ttl1Value = value;
                        }
                        break;
                    }
                    case 1: { // Round pushbotton, only signal when pushed down
                        if (value != ttl3Value) {
                            // set the Green LED but invert the value
                            if (oldDemoBoard) {
                                greenLed.writePinDig((value==0)?1:0); // old demo board
                                                                    inverting
                            } else {
                                greenLed.writePinDig( value);
                            }
                            ttl3Value = value;
                        }
                        break;
                    }
                    case 2: { // Switch pushbotton, signal either way
                        if (value != ttl4Value) {
                            redLed.writePinDig(value);
                            ttl4Value = value;
                        }
                        break;
                    }
                } // switch

                if (triggerResponse) {
                    if (isDebug) Logger.debugln(NAME,sensors[device].getDeviceAddress()+
                        " value = "+value+" triggered a percept message to portal");
                    // send the correct percept for the device
                    if (sensors[device].isAnalogInput())
                        perceptMessage =
                            M2MXML_Messages.createPerceptString(sensors[device].
                                getDeviceAddress(),
                                    value,PerceptRequest.PERCEPT_TYPE_SIMPLE, null );
                    else
                        perceptMessage =
                            M2MXML_Messages.createPerceptString(sensors[device].
```

```

        getDeviceAddress(),
        value, PerceptRequest.PERCEPT_TYPE_BIT, null );
    app.sendMessageToPortal(perceptMessage);
    }
}
catch (InvalidHardwareOperationException ihoe) {
    Logger.log(NAME, sensors[device].getDeviceName()+
        " InvalidHardwareOperationException:"+ihoe.getMessage());
}
catch (IllegalHardwareAddressException ihae) {
    Logger.log(NAME, sensors[device].getDeviceName()+
        " IllegalHardwareAddressException:"+ihae.getMessage());
}
catch (NullPointerException npe) {
    Logger.log(NAME, sensors[device].getDeviceName()+
        " NullPointerException:"+npe.getMessage());
}
catch (Exception ex) {
    Logger.log(NAME, sensors[device].getDeviceName()+
        " Exception:"+ex.getMessage());
}
} else {
    // null sensor
    if (Logger.isDebugEnabled()) Logger.debugln(NAME,
        "Device#" + device + " is null. Probably an invalid name");
}
} // sensor loop
// update every 100 ms
if (threadRunning) AvidUtil.waitHereMs(100); // update every 1/10 of a second
} // while thread running
thread = null; // release ourselves
Logger.log(NAME, "Exiting thread");
} else {
    Logger.log(NAME, "Not started so cannot run thread. Exiting");
}
} // run
}

/**
 * When a SetConfiguration command is received, for each configuration item
 * this method is called.
 * Each M2Mlet can override this method to handle processing the configuration command
 * changes.
 * <p>
 * We are looking for the M2MLET.DEMO_ENABLED item changing, and setting the demonstration
 * parameter to this value
 *
 * @param propertyName The Configuration file property name
 * @param oldValue The old value of this item. This is null if there is no old value
 * @param newValue The new value of this item.
 * @param seqNum The sequence number of this command
 * @return boolean true if this was processed successfully, false if an error occurred
 */
public boolean processSetConfigurationItem(String propertyName, String oldValue,
    String newValue, String seqNum)
{
    final String NAME = "Demo_M2Mlet.processSetConfigurationItem";
    boolean returnStatus = false;
    // The M2Mlet must override this to mean anything. The default is to return true
    if (propertyName.equals(CONFIG_FILE_DEMO_MODE)) {
        demoM2mletEnabled = AvidUtil.parseBoolean(newValue);
        Logger.log(NAME, "DemoM2MletEnable = "+demoM2mletEnabled+" starting Demo mode");
        // start the Demo if we didn't when initialized
        if (demoM2mletEnabled && !started) start(app);
        returnStatus = true;
    } else {
        if (Logger.isDebugEnabled()) Logger.debugln(NAME, "Unknown Property "+propertyName);
        // other parameter, return true for now
    }
}

```

```
        returnStatus = true;
    }
    return returnStatus;
}

/**
 * Stops the currently executing Demo_M2Mlet.
 * This will try to do any cleanup possible
 *
 */
public final void stop() {
    final String NAME = "Demo_M2Mlet.stop";
    if (app!= null) Logger.log(NAME,"Stopping");
    threadRunning = false;
    sensors = null;
    lamp = null; greenLed = null; redLed = null; sensors = null;

    thread = null; // release ourselves
    if (app!= null) Logger.log(NAME,"Stopped");
} // stop
}
```

Appendix 5 - M2MXML TM Version 1.0 Specification

See M2MXML Documentation Included.

Appendix 6 – Sample M2MApp.ini Configuration File

The M2MApp's initial behavior is determined by the configuration loaded via the `M2MApp.ini` file. This is a Java properties file that specifies property names and their corresponding values. The Property names have the format `SYSTEM.PROPERTY` to gather common properties for a particular item together and also allow similar properties to be set for multiple devices. Standard `SYSTEM` names are:

- § `AVIDDIRECTOR` – Properties relating to the AVIDdirector-M2M device hardware. Currently just the modem type is specified.
- § `SYSTEM` – M2MApp properties for the device and framework. This includes control over debug, logging and system maintenance (Garbage collection).
- § `M2MLET` – Properties for the M2Mlet application. It is required that the `CLASSNAME` property is specified listing the class to load for our M2Mlet. The M2Mlet may define special properties that it wishes to specify or load. Calling `app.getConfiguratiOnItem` retrieves these parameters and `app.setConfiguratiOnItem` sets the parameters in the `M2MApp.ini` file.
- § `TTLn` and `HVCn` – These parameters refer to the external TTL and HVC ports. The M2MXML address for the port, its on-device behavior settings and device parameters are specified here. If the M2MXML portal changes the on-device behavior then these values are updated so that this latest portal configuration is loaded each time the device is initialized.
- § `M2MIODEVICE` – Parameters common to the M2M I/O Devices, which include the TTL, HVC, Serial2 and EXT ports. The only parameter specified is `POLLTIME` that specifies the time for the polling loop of all the devices. Each device has a `POLL` parameter (Y,N) that specifies if it is to be included as a polled device.
- § `SL` – SensorLogic portal specified properties. The `UID` must match the `UID` specified in the portal for this device.

Radios and user written I/O classes are dynamically loaded by providing a keyword for the device (example, `BOOMER3` or `GPS`) followed by `.CLASSNAME` (example `GPS.CLASSNAME`) and M2MApp will load each Java class file specified with a property ending in `.CLASSNAME`. If the class is an instance of `com.avidwireless.AVIDdirector.iodevice.IODevice` then it is loaded and treated as a `IODevice` or if is an instance of the `com.avidwireless.radio.ADRadio` class then it will be treated as a `Radio`. The difference is `IODevice` can receive M2MXML messages, send M2MXML messages back to the portal, and can be added to the main `M2M_IODevice` polling. A `Radio` class is associated with a `Communicator` class to handle M2MXML messages to and from the portal. Multiple `Radio` classes may be loaded and M2MApp may dynamically switch between these radios by calling `app.setM2MXMLPortal(Communicator)`. Each `IODevice` and `Radio` may retrieve their own properties and must handle setting the properties when specified via M2MXML: `setConfiguratiOn` commands.

When M2MApp is initialized, it looks for the file `M2MApp.ini` and tries to load it. If there is a problem reading the file, M2MApp then tries to load the file `M2MApp.bak`, and if that is found, it is copied to `M2MApp.ini` and an attempt is made to load that file. If there is an error loading both `M2MApp.ini` and `M2MApp.bak`, then the file `M2MApp.default` is read and copied to `M2MApp.ini`. `M2MApp.default` needs to contain a base set of functionality for the device to allow it to communicate with the M2MXML portal where it can be setup again. Each time a configuration property is set in M2MApp, the current `M2MApp.ini` is first copied to `M2MApp.bak` and then the property is set. If there is a loss of power during this operation the device should be able to recover to a known configuration state.

```
#M2MApp.ini
#
# Specify the device type, M2M or XE
AVIDDIRECTOR.MODEL=M2M
#
```

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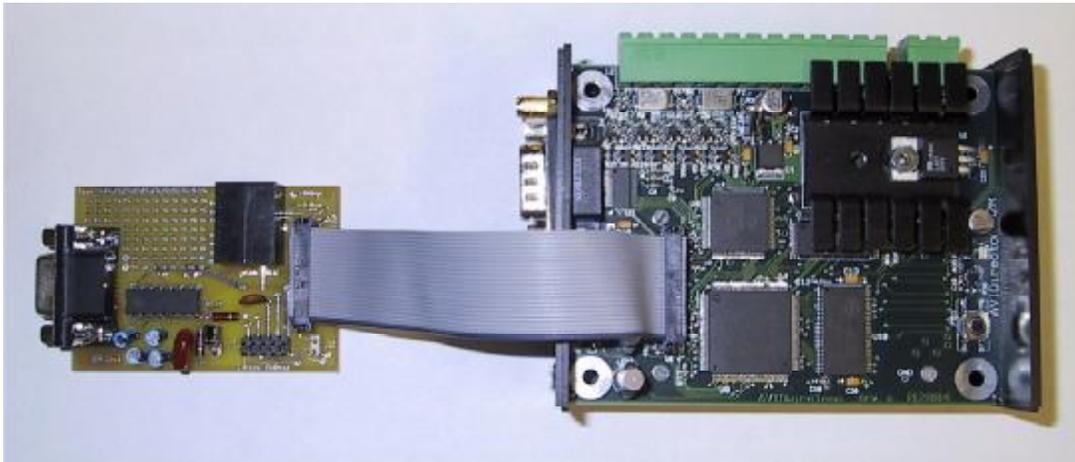
```
# SensorLogic Portal Device UID number for this device
SL.DEVICE_UID=8C71EA041A5741F48A87B314FF02501A
#
# System Settings
SYSTEM.DEBUG=0
SYSTEM.LOGGING=0
SYSTEM.OPTIONS=0
# Level below which we do a GC
SYSTEM.GC_WATERMARK = 100000
SYSTEM.GC_RUN_INTERVAL=3600
#
#
# M2Mlet application class to load
M2MLET.CLASSNAME=com.avidwireless.AVIDdirector.Demo_M2Mlet
#
#
# M2M On device address overriding the default ones
TTL1.M2MXML_ADDRESS=TTL1.AIN
TTL1.IOTYPE=AIN
TTL1.POLLING=Y
TTL2.IOTYPE=AOUT
TTL3.IOTYPE=DOUT
TTL4.IOTYPE=DOUT
TTL5.M2MXML_ADDRESS=TTL5.DIN
TTL5.IOTYPE=DIN
TTL5.POLLING=Y
TTL6.M2MXML_ADDRESS=TTL6.DIN
TTL6.IOTYPE=DIN
TTL6.POLLING=Y
#
# M2M_IO Device common settings
M2MIODEVICE.POLLTIME=200
#
#
# Boomer 3 radio
BOOMER3.CLASSNAME=com.avidwireless.radio.Boomer3
BOOMER3.SERIAL_PORT=serial3
# BOOMER3.SERIAL_PORT_BAUDRATE is not needed - Masc fixed at 9600 baud
BOOMER3.SERIAL_PORT_BAUDRATE=9600
# BOOMER3.SLOT=0 Not needed for M2M
# Maximum time to send a message
BOOMER3.MAX_RETRY_COUNT = 8
# Gateway addresses
BOOMER3.MOBITEX_GATEWAY_ADDRESS=103087
BOOMER3.MOBITEX_GATEWAY_HPID=137
#
# Nextel IO1500 Radio
#IO1500.CLASSNAME=com.avidwireless.radio.IO1500
#IO1500.SERIAL_PORT=serial3
#IO1500.SERIAL_PORT_BAUDRATE=19200
#IO1500.SLOT=1
#IO1500.SERVER_ADDRESS=0.0.0.0
#IO1500.PORTAL_SERVLET=/servlet/rfid?_SMR\=RfidMain.Rfid
#
#
# Other IO Devices to load
#
#NEMA GPS Receiver to load
#GPS.CLASSNAME=com.avidwireless.AVIDdirector.iodevice.GPS_NEMA_Receiver
#GPS.SERIAL_PORT=serial1
#
#BPI216 SerialLCD to load
#LCD.CLASSNAME=com.avidwireless.AVIDdirector.iodevice.BPI216_SerialLCD
#LCD.ADDRESS=LCD
#LCD.SERIAL_PORT=serial1
#
#SIRIT RFID Reader
```

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```
#SIRIT_READER.CLASSNAME=com.avidwireless.AVIDdirector.iodevice.SiritRFIDReader
#SIRIT_READER.M2MXML_ADDRESS=RFIDTAG
#SIRIT_READER.SERIAL_PORT=serial2
#SIRIT_READER.TAGTYPE=ISO
#SIRIT_READER.POLLTIME=200
#SIRIT_READER.ENABLE=true
```

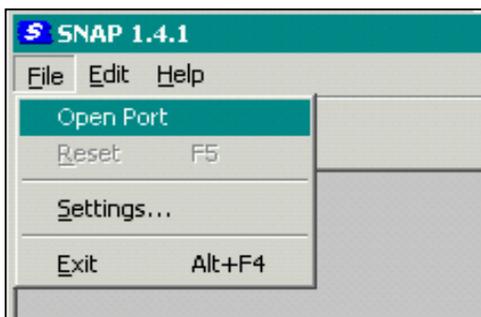
Appendix 7 – Upgrading the M2M Java Firmware

Locate the CD included in the SDK, and then locate the directory “**SNAPDev_Files**” which contains the files needed to reload the device. You may also download the files from the AVIDdirector web site where you will find the latest firmware update. The zip file contains three files with a .snp extension.



You will need to remove the cover of the AVIDdirector-M2M device before attaching the debug pod. Note Remove the antenna before removing the cover. Be sure to match pin 1 on both devices before powering up the device. The black line on the ribbon cable should match to pin one on both boards. Attach the Developer pod to your PC for reprogramming with a standard serial cable. Attach the serial cable to your computer COM Port (you can use a USB to RS-232 adapter). Verify that the COM Port the serial cable is attached to has a baud rate of 57600.

Execute the `SnapDev.exe` file located under the `SNAP/bin` directory to start the Snap Development environment. Then connect with the **File | Open Port**



Power up the AVIDdirector-M2M device and boot up. As the device starts up press the “i” key a couple of times as the startup messages begin to be displayed to prevent the **M2MApp** software from starting (this bypasses execution of the `/system/startup.ini` file)

To determine what version of the firmware your device is currently running, once connected enter the “**info**” command.

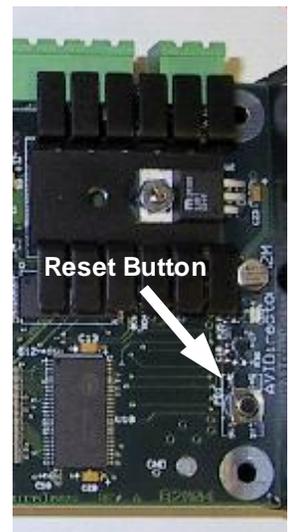
From SnapDev choose **File | Reset F5** or press **F5** to enter loader mode. You should see a progress bar on the bottom status line of SnapDev as it

downloads the initial boot loader. When that is done you should see a prompt like:

```
SNAP loader v 0.1.10 (Build date: Oct 17 2004 01:03:31)
$
```

Note: If you do the **File | Reset** and you don't see the status line start a process bar on the bottom, press the reset button on the board just after starting **File | Reset**.

The AVIDdirector-M2M board has a reset button on the top of the main board. This button can be used for a hard reset of the device while debugging.



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When you are in the SNAP Loader program press "I" (the L key) and it will bring up a directory dialog box.

Select each of the files located in the SnapDev Files directory **IN THIS ORDER**.

AVIDM2M_Baseconfig_x_x_x.snp	B Load this one first
AVIDM2M_Snaplib_x_x_x.snp	B Load 2 nd
AVIDM2M_AVID_Files_x.x.x.snp	B Load last. Contains AVIDdirector-M2M files

x_x_x specifies the current release numbers.

After each load your display should have messages similar to this.

```
Waiting for file
Calculating checksum
Checksum OK
Updating file system
Creating directory /avidwireless
Creating directory /avidwireless/classes
Updating file /system/reboot.ini: 2/2 bytes
Updating file /system/group.ini: 40/40 bytes
Updating file /system/hostname.ini: 25/25 bytes
Updating file /system/ish.ini: 850/850 bytes
Updating file /system/passwd.ini: 108/108 bytes
Updating file /system/access.ini: 68/68 bytes
Updating file /system/snap.ini: 601/601 bytes
Updating file /system/boot.ini: 32/32 bytes
Updating file /system/startup.ini: 69/69 bytes
Updating file /system/boot.ver: 43/43 bytes
Updating file /system/classes/BackGround.class: 1626/1626 bytes
Updating file /avidwireless/ADM2MLib.jar: 140321/140321 bytes
```

When all 3 files have been loaded press 'r' (the R key) to reload the SNAP Java environment.

Appendix 8 – Reprogramming the PSoC Firmware

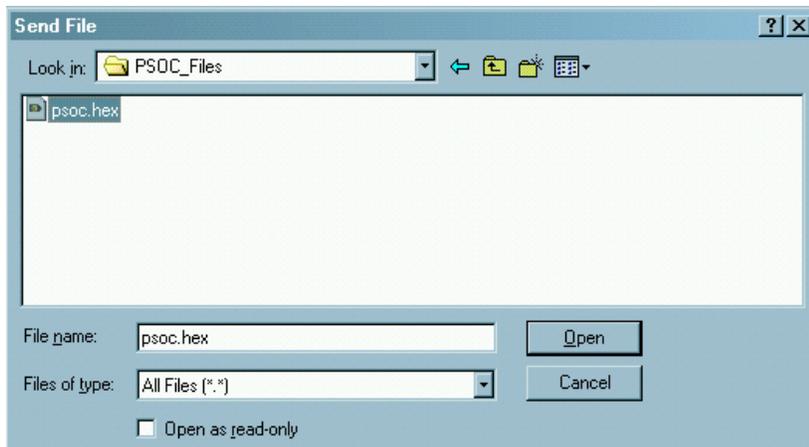
The following procedure is used to reprogram the PSoC Firmware.

NOTE: ONLY DO THIS IF ADVISED BY AVIDWIRELESS TECHNICAL SUPPORT. IF THIS FAILS OR IS INTERRUPTED THEN YOU WILL HAVE TO SEND YOUR DEVICE BACK TO AVIDWIRELESS FOR FACTORY REPROGRAMMING UNLESS YOU HAVE AN IMSYS DEVELOPER TRACE ADAPTER.

1. Download the PSoC HEX file to AVIDdirector-M2M

Connect the AVIDdirector-M2M debug pod as described in Appendix 7 “Programming the M2M Java Firmware” to the device and to your PC. Connect a reliable +12 volt supply to the AVIDdirector-M2M device and enter the lsh shell that give you a .>’ prompt. At that point enter ‘recv’ to download a file to the AVIDdirector-M2M device.

```
> recv
```



```
Receiving file(s)...Done
```

```
> dir
```

```
-rw-r--r--  1 root    root      3373 March  2 13:02 M2MApp.ini
-rw-r--r--  1 root    root      3178 March  2 13:02 M2MApp.bak
-rw-r--r--  1 root    root      3178 March  2 13:02 M2MApp.default
-rw-r--r--  1 root    root     72538 March  3 13:38 psoc.hex
```

2. Run the 'testhw' application to reprogram the firmware.

Ensure your AVIDdirector-M2M device is powered from a reliable 12 volt supply with sufficient amperage. From the lsh shell run 'testhw'. This is a general purpose test program that allow direct user control of the M2M I/O ports and to display information regarding the AVIDdirector-M2M device. One of its functions is to reprogram the PSoC firmware.

```
> testhw
```

```
AVIDdirector-M2M Hardware API Tester Ver. 1.30.13, 3/4/05 12:07p
Enter "command" port pin value where "command" is one of:
read, write, setdin, setdout, setain, setaout [PORT] where
PORT is TTL1-6, HVC1-4, SERIAL2RX/TX/RTS/CTS, EXT1-3 or the PSoC port and pin
Other commands are: program, reset, led [System,Radio], memory, version, quit
```

```
TestHWAPI > program psoc.hex
```

```
Loading PSoC file psoc.hex 72538 bytes
```

B Enter this to reprogram the PSoC with the hex image

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DO NOT INTERRUPT programming the device or it may corrupt the PSoC Flash and require sending your unit back to the factory for reprogramming.

During programming the SYSTEM STATUS light will indicate the progress. It will rapidly blink RED during Flash programming and rapidly blink GREEN when verifying the programming. When done, if successful it will blink GREEN twice or if unsuccessful it blinks the error code using the RED LED three times. It will then reboot your device.

Some Error Codes are:

1 RED blink means the Programming file did not verify correctly.

2 RED blinks means the file had a checksum error in it.

If the RED LED blinks 6 or more times, your PSoC processor is non functional and you will have to contact AVIDWireless for assistance or return the device.

Are you sure you want to reprogram the PSoC using file psoc.hex? Answer Y or N

You entered :**Y**

Programming PSoC using file psoc.hex with 72538 bytes.

You will not see any other message until the device reboots.

The SYSTEM Led will begin to quickly flash Red during the programming, and then quickly flash Green during the verification. The total time should be less than 2 minutes for both operations. If the reprogramming was successful the SYSTEM Led will blink Green twice and then the unit will reboot. If there was an error the SYSTEM Led will slowly blink Red. The number of times it blinks is important and used to indicate the cause of the error. It will blink between 1 to 6 times and then repeat one. It will not reboot the device if unsuccessful.

3. Device reboots

```
Imsys SNAP restarting @ Tue May 3 18:40:21 2005
```

```
Reading /system/ish.ini:      [OK]
Reading /system/snap.ini:    [OK]
Serial server:               [OK]
JVM startup:                 [OK]
Setting host name:          [OK]
TCP/IP startup:              [OK]
FTP server:                  [DISABLED]
Telnet server:               [DISABLED]
Setting timezone to:         CST
Reading /system/startup.ini: [SKIPPED]
```

You may run the 'testhw' program again and the 'version' command to see the version of PSoC firmware on the device.

```
> testhw
```

```
AVIDdirector-M2M Hardware API Tester Ver. 1.31.13, 3/29/05 12:07p
Enter "command" port pin value where "command" is one of:
read, write, setdin, setdout, setain, setaout [PORT] where
PORT is TTL1-6, HVC1-4, SERIAL2RX/TX/RTS/CTS, EXT1-3 or the PSoC port and pin
Other commands are: program, reset, led [System,Radio], memory, version, quit
```

```
TestHWAPI > ver
```

```
AVIDdirector-M2M Hardware API Tester Ver. 1.31.13, 3/29/05 12:07p
M2M_IO Rev. 24.4.8
ADM2MLib Ver. 1.21.7, 2/21/05 8:50p Rev: 31.5.6
PSoC Firmware Ver. 0104          B Version of PSoC Firmware
TestHWAPI > quit
Exiting TestHWAPI
```

Appendix 9 – Model 200 TTL Ports and DB-37 Expansion I/O Connector

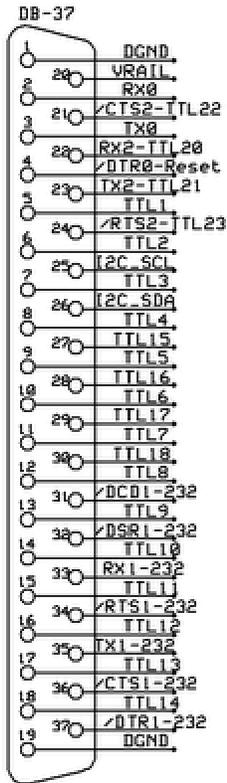
The following is a definition of the Model 200's I/O Expansion Connector. It brings out the console TTL (Serial0), RS-232 (Serial1), TTL Serial that was used for the RJ-12 on the Model 100 (Serial2), and TTL1 to TTL18. TTL7 to TTL18 where used for the HVC1 to HVC4 lines on the Model 100.

Currently on Model 200 TTL1-TTL4 and TTL20-TTL23 (8 ports) can be configured for analog input and 4 of the ports (TTL1, 2, 20 and 21) can be configured for analog output. The inputs can read up to **5 Volts** and give readings of **12** bits per reading. The analog outputs generate 0V to +5V with 6 bit accuracy.

Pin	Connection	PSoC	Function
1	GND		Device Ground
2	RX0	P1_2	Serial0 Data in (console)
3	TX0	P1_3	Serial0 Data out (console)
4	DTR0		Pull low to reset. Normally pulled high
5	TTL1	P0_2	Analog Input/Out, Digital In/Out
6	TTL2	P0_3	Analog Input/Out, Digital In/Out
7	TTL3	P0_0	Analog Input, Digital In/Out
8	TTL4	P0_1	Analog Input, Digital In/Out
9	TTL5	P2_0	Digital In/Out, Switch cap input (Analog)
10	TTL6	P2_1	Digital In/Out, Switch cap input (Analog)
11	TTL7	P2_2	Digital In/Out, Switch cap input (Analog)
12	TTL8	P2_3	Digital In/Out, Switch cap input (Analog)
13	TTL9	P4_0	Digital In/Out
14	TTL10	P4_1	Digital In/Out
15	TTL11	P6_0	Digital In/Out
16	TTL12	P6_1	Digital In/Out
17	TTL13	P6_2	Digital In/Out
18	TTL14	P6_3	Digital In/Out
19	GND		Device Ground
20	+5/12 V		Selectable via jumper JP1 (inside). Either 5V regulated or line voltage in (nominal 12V)
21	TTL22,CTS2	P0_6	Analog Input, Digital In/Out, Serial2 CTS In
22	TTL20, RX2	P0_4	Analog Input/Out, Digital In/Out, Serial2 RX In

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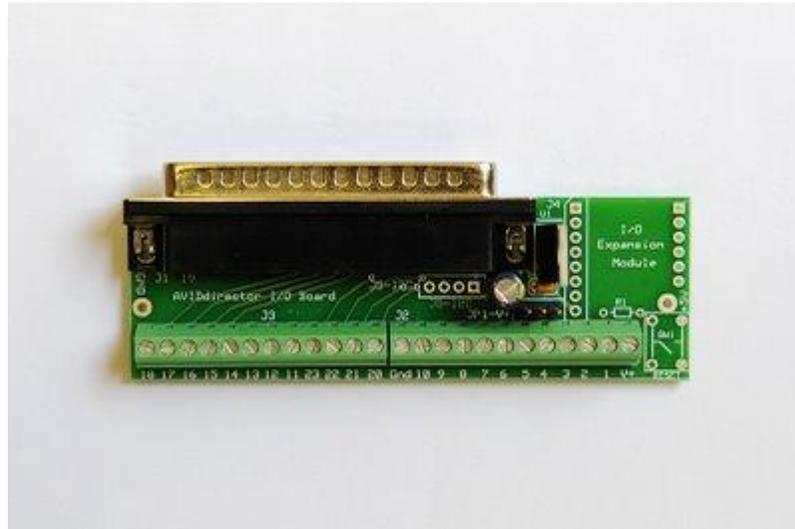
23	TTL21, TX2	P0_5	Analog Input/Out, Digital In/Out, Serial2 TX Out
24	TTL23, RTS2	P0_7	Analog Input, Digital In/Out, Serial2 RTS Out
25	I2C_SCL	P1_7	I ² C Serial Clock, Digital In/Out
26	I2C_SDA	P1_5	I ² C Serial Data, Digital In/Out
27	TTL15	P6_4	Digital In/Out
28	TTL16	P6_5	Digital In/Out
29	TTL17	P6_6	Digital In/Out
30	TTL18	P6_7	Digital In/Out
31	DCD1_232	P3_6	Serial1 RS-232 DCD In
32	DSR1_232	P3_5	Serial1 RS-232 DSR In
33	RX1_232	P3_3	Serial1 RS-232 RX In
34	RTS1_232	P3_1	Serial1 RS-232 RTS Out
35	TX1_232	P3_0	Serial1 RS-232 TX Out
36	CTS1_232	P3_4	Serial1 RS-232 CTS In
37	DTR1_232	P3_2	Serial1 RS-232 DTR Out



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I/O Expansion board:

The I/O Expansion board brings the TTL I/O ports from the DB37 connector to Phoenix connectors.



Below is a list of features and functionality it makes available:

- 1) It provides access to TTL ports 1 through 23, Gnd and V+.
- 2) Access to Serial2 is available through TTL20-TTL23.
- 3) I2C is also available on J5.

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- 4) The Connectors are marked with the TTL numbers on the board.
- 5) There is an optional reset switch also available through the I/O Expansion board.
- 6) The JP1 jumper setting inside the AVIDdirector can allow for +5V regulated voltage or line voltage (+12V) on port TTL20.

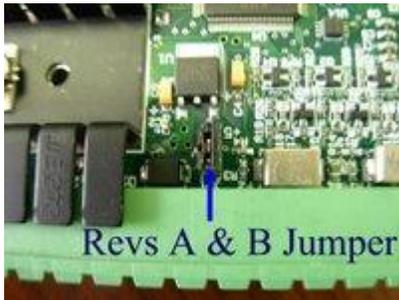
Appendix 10 – AVIDdirector Jumper Settings

The jumper settings on the AVIDdirector main board vary between revisions. Please check your AVIDdirector's revision letter to correspond the correct jumper settings. The 3rd letter of the serial number indicates the revision. Example, A0C17QC00014 is a Revision C board.

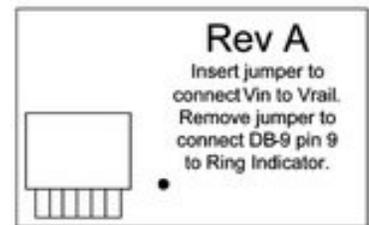
In the descriptions, **Vin** refers to the input voltage to the AVIDdirector, which is between 8 to 18 VDC and normally 12 VDC. **VRail** is the output on pin 12 of the 12-pin Phoenix Connector and pin 20 of the DB-37.

Note: The default setting for Revs C, D, and F are DB-37, pin 20 is Vin. DB-9 pin 9 is +5V.

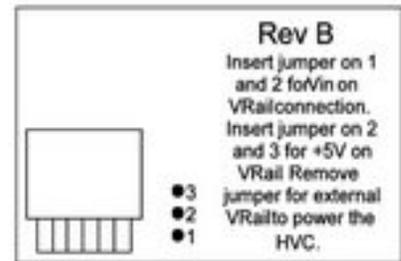
The settings according to revision letter are:



Rev A: 12-pin Phoenix connector has VRail on pin 12. Inserting **JP1** connects Vin to VRail, which also drives the High Voltage / Current (HVC) outputs. With JP1 removed, the VRail (maximum voltage for the HVC was SUPPLIED by VRail pin 12).
DB-9 pin 9 connects to Ring Indicator input.

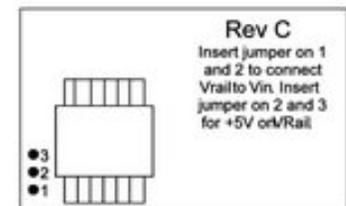


Rev B: 12-pin Phoenix connector. **JP1** on 1-2 provides Vin on the VRail connection. JP1 2-3 provides +5V on VRail. Removing JP1 allows external VRail to power the HVC (like on Rev B). DB-9 pin 9 provides +5V at 200ma.



Rev C: **JP1** is the DB37 pin 20 jumper that supplies the VRail output voltage with maximum current of 0.5A. JP1 1-2 connects VRail to Vin (nominally 12VDC), JP1 2-3 connects VRail to +5V.

DB-9 pin 9 connects to +5V at 200ma.

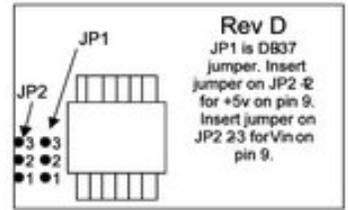


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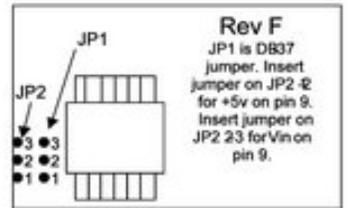
Rev D: JP1 is the DB37 pin 20 jumper that supplies the VRail output voltage with maximum current of 0.5A. JP1 1-2 connects VRail to Vin (nominally 12VDC), JP1 2-3 connects VRail to +5V.

JP2 connect to DB-9 pin 9 to supply voltage at 0.5A (peak 2A) JP2 1-2 provides Vin on pin 9. JP2 2-3 provides +5V on pin 9.



Rev F: JP1 is the DB37 pin 20 jumper that supplies the VRail output voltage with maximum current of 2A. JP1 1-2 connects VRail to Vin (nominally 12VDC), JP1 2-3 connects VRail to +5V.

JP2 connects to DB-9 pin 9 to supply voltage at 0.5A (peak 2A) JP2 1-2 provides Vin on pin 9. JP2 2-3 provides +5V on pin 9.



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