# e BLOCKS®

## FlowKit in-circuit debug system

# Contents

# About this document

This document concerns the HP299 FlowKit in-circuit debug system.

## 1. Trademarks and copyright

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## 2. Disclaimer

The information provided within this document is correct at the time of going to press. Matrix Multimedia reserves the right to change specifications from time to time.

## 3. Testing this product

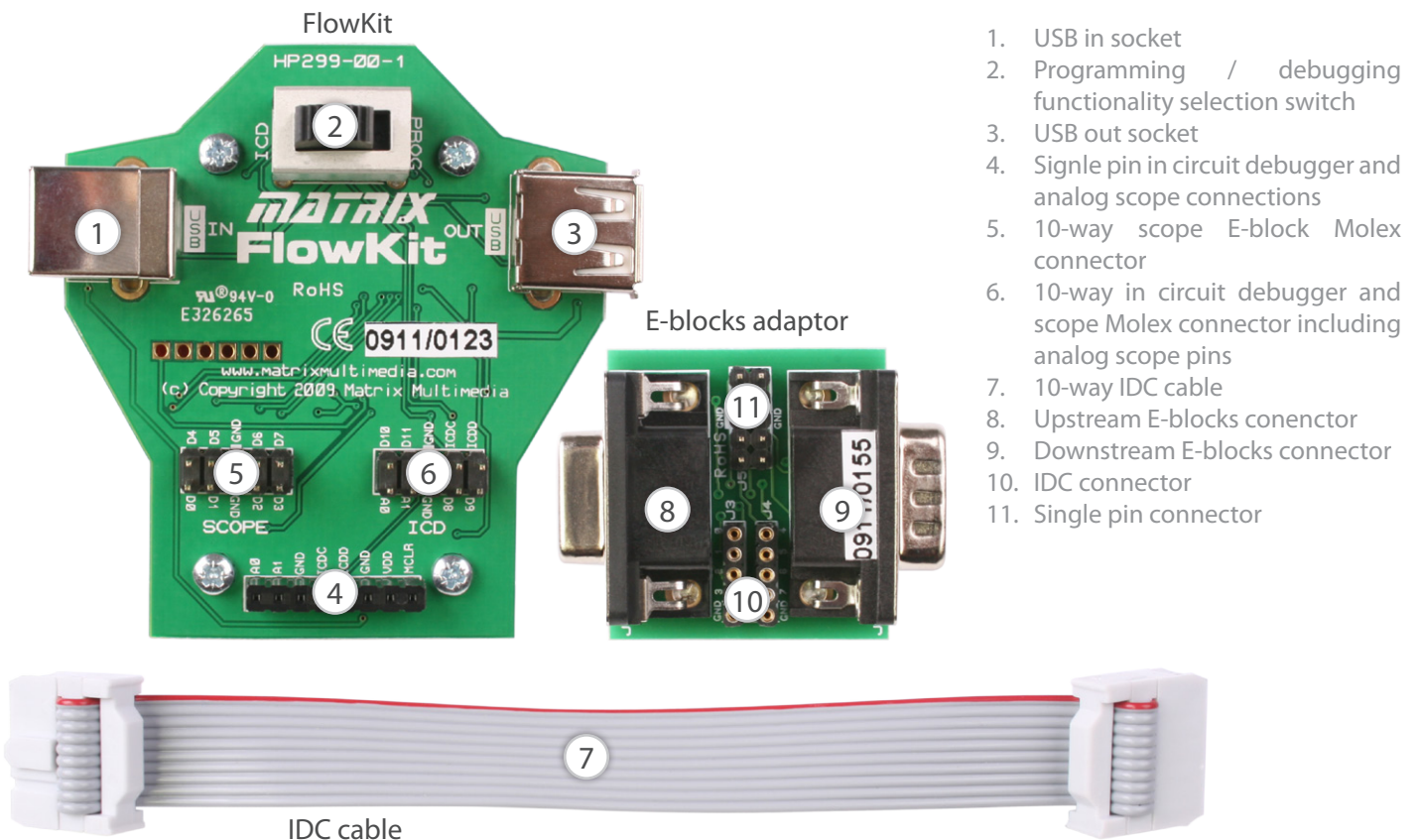It is advisable to test the product upon receiving it to ensure it works correctly. Matrix provides test procedures for all E-blocks, which can be found in the Support section of the website.

## 4. Product support

If you require support for this product then please visit the Matrix website, which contains many learning resources for the E-blocks series. On our website you will find:

- How to get started with E-blocks - if you are new to E-blocks and wish to learn how to use them from the beginning there are resources available to help.
- Relevant software and hardware that allow you to use your E-blocks product better.
- Example files and programs.
- Ways to get technical support for your product, either via the forums or by contacting us directly.

# Board layout



FlowKit

E-blocks adaptor

IDC cable

1. USB in socket
2. Programming / debugging functionality selection switch
3. USB out socket
4. Signle pin in circuit debugger and analog scope connections
5. 10-way scope E-block Molex connector
6. 10-way in circuit debugger and scope Molex connector including analog scope pins
7. 10-way IDC cable
8. Upstream E-blocks conenctor
9. Downstream E-blocks connector
10. IDC connector
11. Single pin connector

3

# General information

The FlowKit can be connected to hardware systems to provide a real time debug facility where it is possible to step through the Flowcode program on the PC and step though the program in the hardware at the same time. This function is available with Flowcode 4.2 or later.

1. Benefits
* A fast way to solve programming problems
* Seamless program and debug

2. Features
* Compatible with a variety of hardware systems including PICmicro and AVR E-blocks boards
* Compatible with ECIO, MIAC and Formula Flowcode systems via the USB lead
* Allows start, step and play of programs
* Allows users to see and alter variable values

* Compatible with third party hardware

3. Description
Whilst Flowcode simulation allows debug of a system to a first pass, FlowKit takes debug to a new level by running the program in the hardware and on the screen at the same time. The system is controlled from within the Flowcode environment where controls allow users to start, stop, pause and step through their program one icon at a time. Under user control the Flowcode software shows the location of the program in the flow chart, the value of all variables in the program, and allows users to alter the variable values when the program is paused.

The package includes the main FlowKit board, an E-blocks connection board, a 10-way IDC ribbon cable, and a USB lead.

# Detailed operation

1. The functionality switch
There is a single large switch on the FlowKit device that controls the overall operation of the device. The switch has two positions marked ICD and PROG. When the switch is in the ICD position the USB cable from the PIC is routed to the microcontroller on board the FlowKit device. This allows Flowcode to communicate with the device, which in turn communicates with the development microcotroller via two ICD signals. These two ICD signals carry the data and clock required to drive the ICD and are marked on the boards as ICDD and ICDC.

2. The ICD operation
The in-circuit debugger (ICD) operation is driven from within the Flowcode software (version 4.2 onwards). The ICD feature is activated in Flowcode by going into the Project Options window and ticking the box labelled ICD mode. This then allows some other options to become available.

In the dialogue screen on the right:
* The breakpoint count specifies the maximum number of individual breakpoints you can set in your program

* The callstack depth specifies the maximum stack depth of your program. This should remain at 8 unless you are using the BoostC software stack or a target device with a small or custom hardware stack.
* The communications speed is the amount of time the ICD will wait for communications. If you experience any problems with the ICD communication then you can try upping this value slightly.
* The override ICD pins allows you to define the pins on the target for use by the ICD. When using the EB006
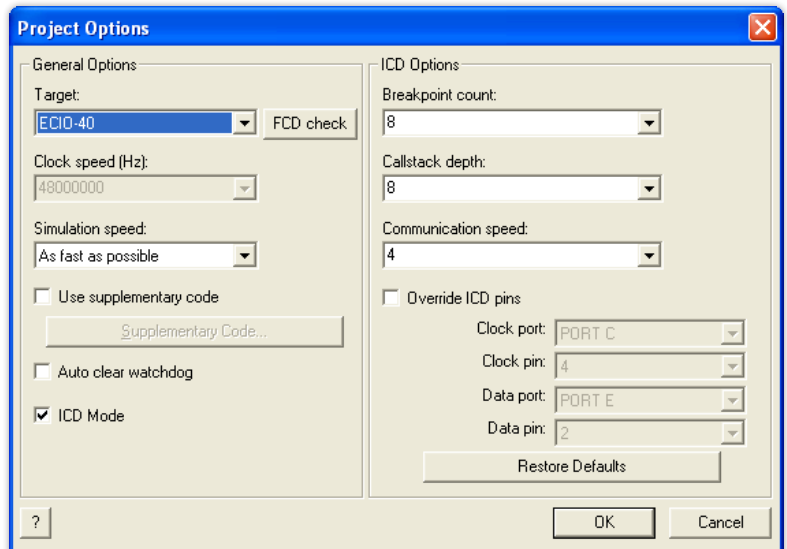
these pins are locked to the default programming pins, normally RB6 and RB7.

- Once you have selected the ICD mode tick box you can compile your project, and program your device. When you have done this, the device will wait at the start of the program until it is told to begin.

The LEDs on the bottom of the FlowKit device indicate the status of the ICD operation:

| LED activity | ICD status |
|---|---|
| Solid | ICD is currently disabled / Target is stopped |
| Pulsing (rapid) | ICD is active & Target microcontroller is running |
| Pulsing (slow) | ICD is active & Target microcontroller is paused |

### 3.  The ICD operation

The FlowKit tool is capable of connecting to a multitude of different devices.  This section explains the different connections and their usage.

#### 1.  USB Out socket

The USB Out socket is used for communicating with Matrix PICmicro products that contain a USB boot loader (MIAC, Formula Flowcode, ECIO).  When the FlowKit switch is in the PROG position the FlowKit is bypassed and the USB In is connected directly to the USB out.  This allows users to reprogram devices without having to connect and disconnect USB cables.

#### 2.  Molex header and adaptor board

The Molex headers and adapter board provide a means of connecting to an E-blocks system.  There are two double row Molex headers on the FlowKit. One contains the in-circuit debug pins, the analog scope pins and 4 digital scope pins (not implemented in software). The second Molex header provides 8 digital scope pins. The adapter board can simply be used to interface to an upstream programmer board or can be used in between an upstream programmer and a downstream E-Block. The adapter board connects to the FlowKit via a 10-way IDC cable that is supplied with the product.

#### 3.  Single pin wire connections

The third connector on the FlowKit provides a means to connect to any other third party hardware. The connector allows the in-circuit debug pins and the analog scope pins to be freely allocated to any pin on your target system. The connector also provides 5V and ground connections which may also need to be connected to allow the in-circuit debug or analogue connections to work correctly. Microchip PICkit compatible boards, such as the low pin count

demo board, can be powered and debugged by simply plugged the 6-way header directly into this socket.

| Connection type | 1 |
|---|---|
| Product | |
| **Matrix USB**<br>MIAC<br>ECIO<br>Formula Flowcode<br>Locktronics PIC |  |

| Connection type | 2 |
|---|---|
| Product | |
| **E-blocks**<br>HP488 - Dev<br>EB006 - PIC<br>EB019 - AVR<br>EB185 - ARM<br>EB061 - ECIO |  |

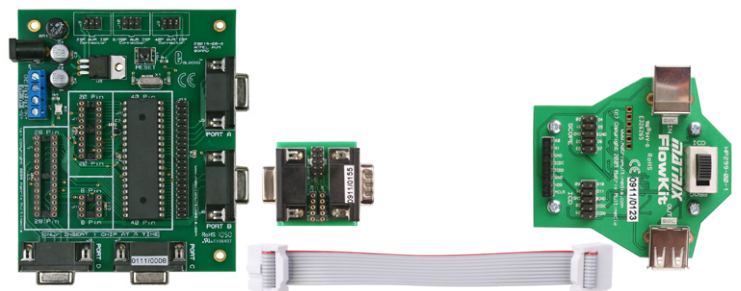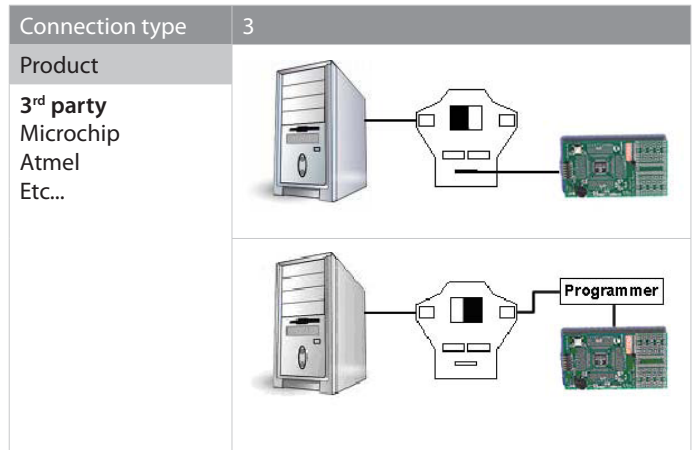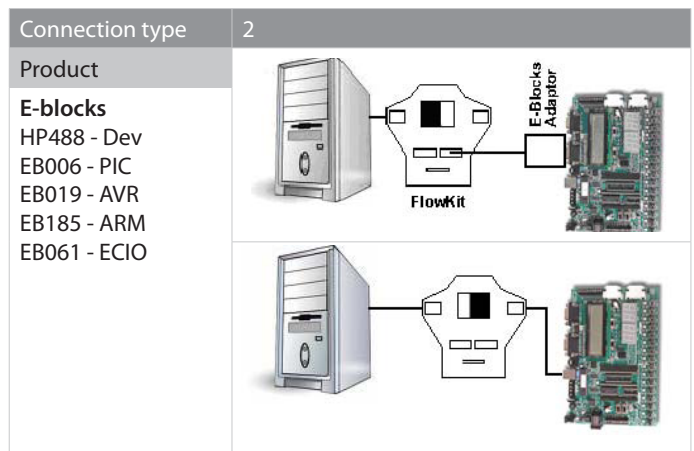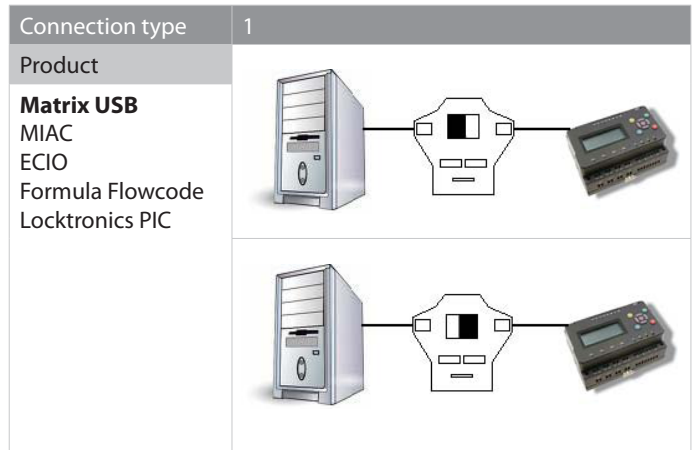| Connection type | 3 |
|---|---|
| Product | |
| **3rd party**<br>Microchip<br>Atmel<br>Etc... |  |



Diagram showing the orientation of the IDC cable for the E-blocks adapter board

5

## 4. Troubleshooting the ICD

If your ICD is not starting correctly then here are a few things for you to try:

- If the Flowcode program changes at all then a small star will appear next to the program name on the title bar. This means that the program requires saving and also means that you will have to recompile and reprogram your device before ICD operations can be resumed.
- The ICD pins must be completely untouched by your program to allow the communications to work correctly. For example if you are using an output or an input icon in your program that is on the same port as the ICD pins then you must use the pin masking to ensure that the ICD pins are untouched.
- If you are using the FlowKit tool then make sure that the ICD pins defined in Flowcode are appropriate for your connections.
- If you are using a USB cable in the USB out socket of the FlowKit and you are using a target other than the type 1 targets listed above then you will need to disconnect this USB cable from your device before the ICD will work.
- Check your target device configuration settings. If the program does not run with ICD disabled then it will not work with ICD enabled.
- If any additional hardware is connected to your ICD pins try disconnecting it and trying again. A large pull up current or a short to another signal source will cause the ICD functionality to fail.
- Unplug the USB cable to the FlowKit ICD tool, reset the target device and then re-insert the USB and try running the ICD again.
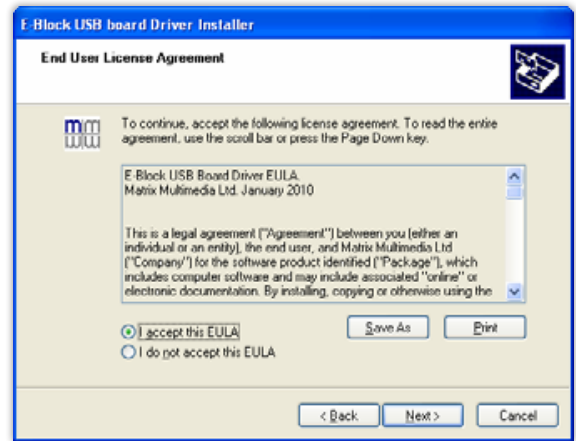
## 5. Installing the drivers

1. Download the latest drivers from the drivers page on the Matrix website:
   www.matrixmultimedia.com/eblock_datasheets.php
2. Depending on your operating system open the appropriate file:
   - For 32-bit operating systems - dpinst_x86.exe
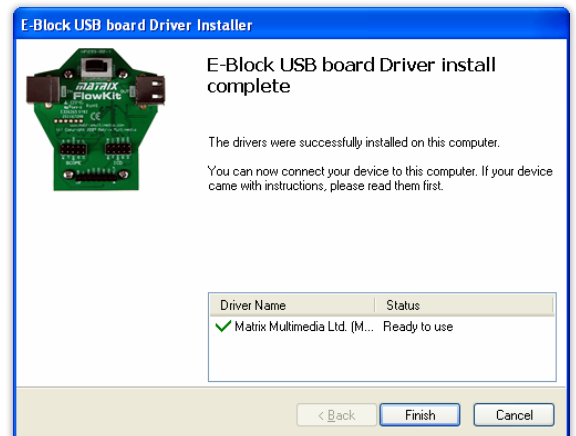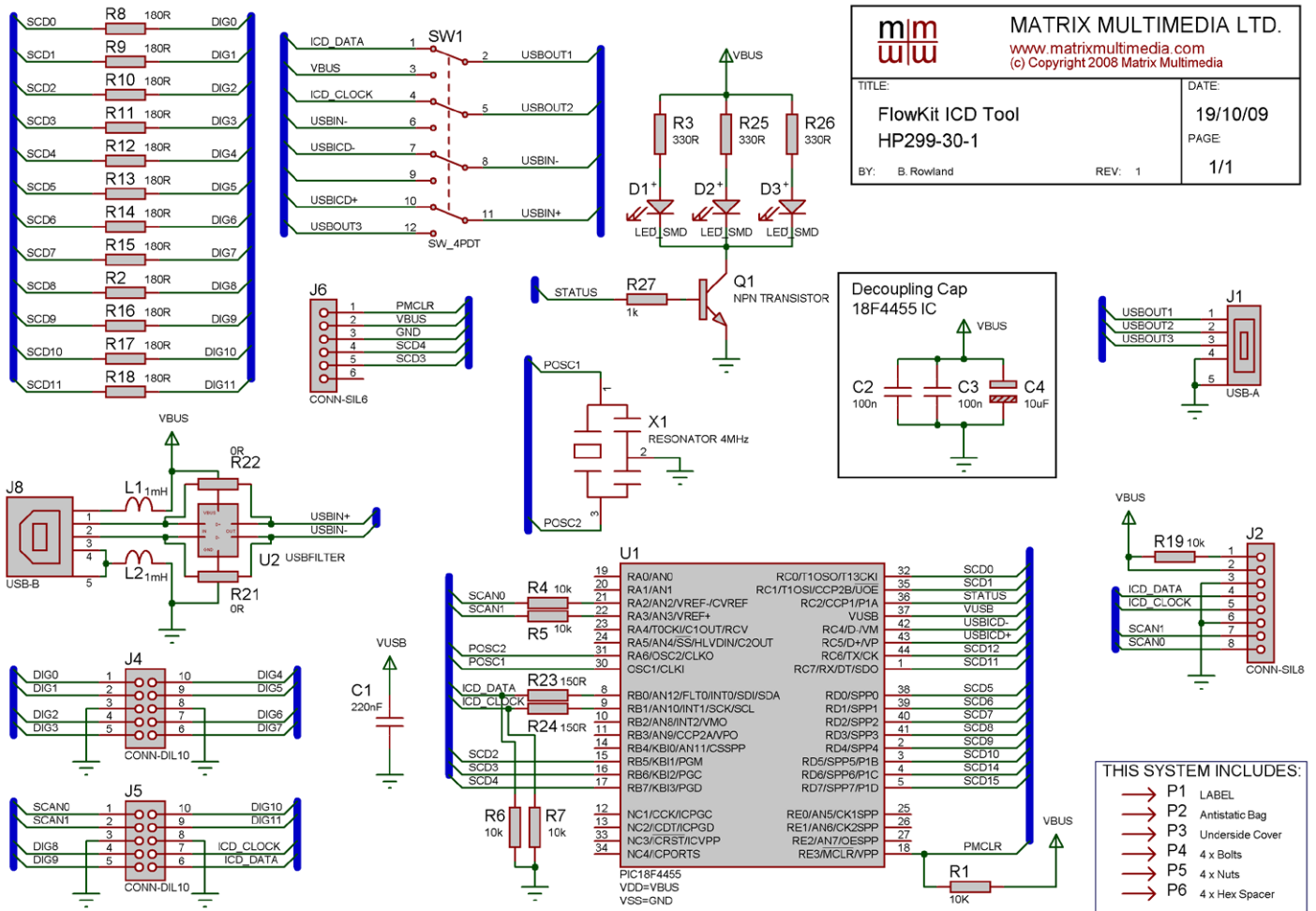   - For 64-bit operating systems - dpinst_amd64. exe or dpinst_ia64.exe
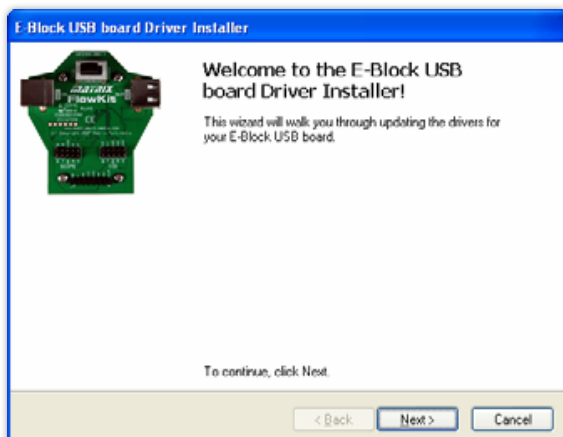


3. Click Next



4. Click Accept and then click Next
5. There may be a warning displayed for newer operating systems stating that Microsoft has not tested the device. If this appears then click Yes: Install anyway



6. Click finish

6
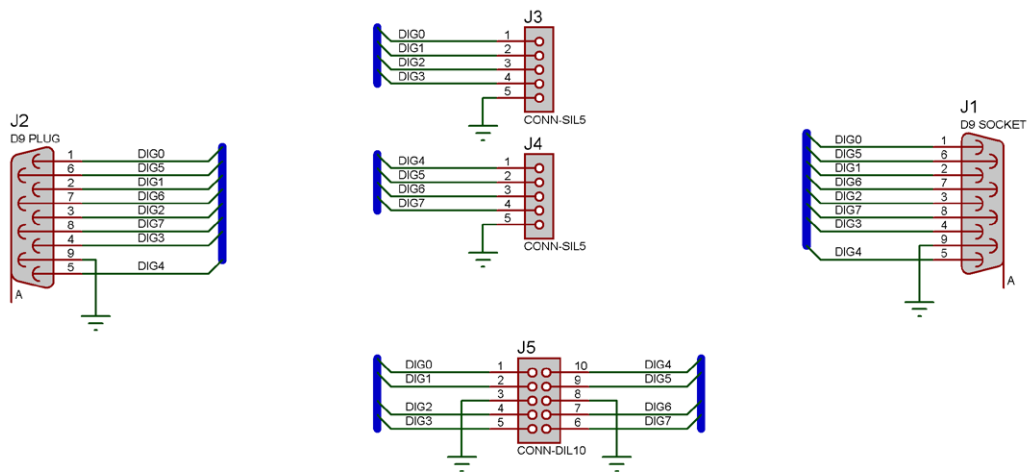
# Circuit diagram



FlowKit ICD Tool — HP299-30-1

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TITLE: FlowKit ICD Tool HP299-30-1
DATE: 19/10/09
PAGE: 1/1
BY: B. Rowland
REV: 1

# Circuit diagram

THIS SYSTEM INCLUDES:-

→ L1  LABEL
→ L2  Antistatic Bag
→ P1  10-way ICD Cable



**J3**

| DIG0 | 1 |
| DIG1 | 2 |
| DIG2 | 3 |
| DIG3 | 4 |
| | 5 |

CONN-SIL5

**J2**
D9 PLUG

| 1 | DIG0 |
| 6 | DIG5 |
| 2 | DIG1 |
| 7 | DIG6 |
| 3 | DIG2 |
| 8 | DIG7 |
| 4 | DIG3 |
| 9 | |
| 5 | DIG4 |

A

**J4**

| DIG4 | 1 |
| DIG5 | 2 |
| DIG6 | 3 |
| DIG7 | 4 |
| | 5 |

CONN-SIL5

**J1**
D9 SOCKET

| DIG0 | 1 |
| DIG5 | 6 |
| DIG1 | 2 |
| DIG6 | 7 |
| DIG2 | 3 |
| DIG7 | 8 |
| DIG3 | 4 |
| | 9 |
| DIG4 | 5 |

A

**J5**

| DIG0 | 1 | | 10 | DIG4 |
| DIG1 | 2 | | 9 | DIG5 |
| | 3 | | 8 | |
| DIG2 | 4 | | 7 | DIG6 |
| DIG3 | 5 | | 6 | DIG7 |

CONN-DIL10

m|m
w|w

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