

ARC-EVS

ARCNET Evaluation System

User Manual

TD020200-0MA

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Disclaimer

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Warning — This is a Class A product as defined in EN55022.
In a domestic environment this product may cause radio interference
in which case the user may be required to take adequate measures.

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1 Introduction

1.1 Description

The ARCNET Evaluation System (ARC-EVS) is a very useful tool for exploring embedded ARCNET. The system contains:

- one ARCNET Evaluation Board (ARC-EVB)
- one PCI22-485X ARCNET network interface module (NIM)
- one wall-mount power supply
- one null-modem cable
- one modular cable
- one RJ-11 modular cable terminator
- one RJ-45 modular cable terminator
- one CD-ROM

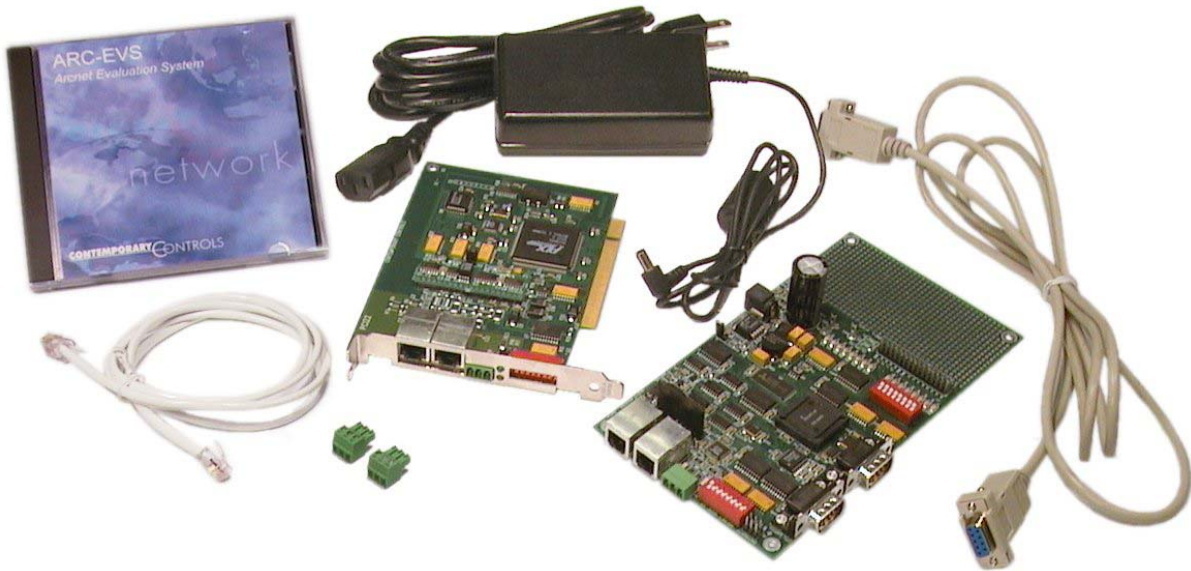


Figure 1 —ARC-EVS Components

The ARC-EVB contains a microcontroller that allows users to upload their firmware into FLASH and execute it. It also works with the Keil compiler, which allows users to debug their ARCNET code on the board. The CPU is provided with external RAM to allow users to load up to 30 KB of firmware. The PCI22-485X is a PCI-based COM20022 ARCNET card. When the card is installed in a computer and connected to the ARC-EVB via the provided modular cable, a complete ARCNET network is created.

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1.2 Kit Features

- ARCNET compliant (ANSI/ATA 878.1)
- Industrial temperature range (-40°C to $+85^{\circ}\text{C}$)
- Employs standard TTL signal levels
- Dual RJ-11 jacks for EIA-485X ARCNET
- Dual D-Sub 9 plugs for serial communication
- Prototyping area with dual resettable fuses for Vcc
- Linear power supply
- One 8-pole DIP switch for Node ID
- One 8-pole DIP switch for data input
- 8 LEDs for input indication
- 8 LEDs for output indication
- LED for power indication

1.3 ARCNET Evaluation Board Specifications

Electrical

Power Requirements:

<i>Power Consumption:</i>	1.8 W, maximum (with all LEDs lit)
<i>Voltage:</i>	9–24 VDC
<i>Current:</i>	commensurate with applied voltage

Environmental

<i>Operating Temperature:</i>	0°C to+60°C
<i>Storage Temperature:</i>	–40°C to+85°C

Data Rates

10 Mbps, 5 Mbps, 2.5 Mbps, 1.25 Mbps

Dimensions

7" x 4" (178 mm x 102 mm)

Functional

<i>Digital Signals:</i>	<i>Number</i>	<i>Type</i>
<i>Input or Output:</i>	8	TTL, 5 V
<i>Input Signal Voltage:</i>	0–5 V	
<i>Maximum Output Low:</i>	450 mV, 1.6 mA	
<i>Minimum Output High:</i>	4.5 V, 10 μ A	
<i>Serial Port:</i>	TTL, 5 V	
<i>ARCNET Compliance</i>	ANSI/ATA 878.1	

LED Indicators

<i>Function</i>	<i>Number</i>	<i>Color</i>
<i>Power</i>	1	Green
<i>CPU Access</i>	1	Yellow
<i>Fieldbus Data Received</i>	1	Green
<i>Input Signals</i>	8	Red
<i>Output Signals</i>	8	Red

1.4 PCI22-485X Specifications

Environmental

Operating Temperature: 0°C to+60°C

Storage Temperature: -40°C to+85°C

Data Rates

10 Mbps, 5 Mbps, 2.5 Mbps, 1.25 Mbps

Dimensions

4.20" x 5.5" (107 mm x 140 mm)

I/O Mapping

Requires 16 bytes of I/O space for COM20022 controller

Interrupt Lines

Supports PCI INTA

Compatibility

Fully compatible with all of Contemporary Controls ARCNET products and PCI bus computers.

Regulatory Compliance

CE Mark

FCC Part 15 Class A

Power Requirements

Voltage: +5V

Current: 400mA

LED Indicators

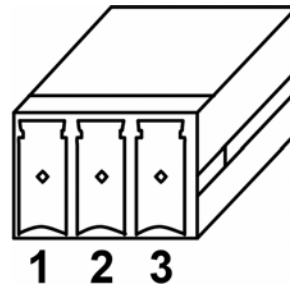
<i>Function</i>	<i>Number</i>	<i>Color</i>
<i>Host CPU Access</i>	1	Yellow
<i>Fieldbus Data Transmitted</i>	1	Green

1.5 Fieldbus Connectors

Two cabling methods are provided for the fieldbus and differ by their connector type.

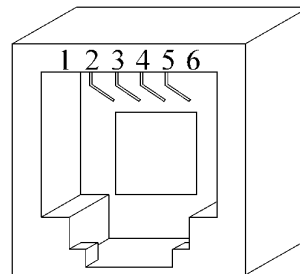
Identical open-wire, 3-terminal connectors are available on both the ARC-EVB and the NIM:

Open-Wire Connector Pin Assignments	
Pin	Usage
1	Signal
2	Signal
3	Shield



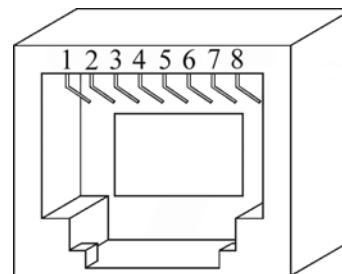
The ARC-EVB modular connector is of the RJ-11 type:

RJ-11 Modular Connector Pin Assignments	
Pin	Usage
1	Not Installed
2	Not Used
3	Signal
4	Signal
5	Not Used
6	Not Installed



The NIM modular connector is of the RJ-45 type:

RJ-45 Modular Connector Pin Assignments	
Pin	Usage
1	Not Used
2	Not Used
3	Not Used
4	Signal
5	Signal
6	Not Used
7	Not Used
8	Not Used



2 ARC-EVB Description

The core of the ARC-EVB is an Atmel T89C51 CPU which contains 16 KB of FLASH memory to hold the provided test application (Modbus-over-ARCNET)—or the user’s firmware. The FLASH memory can also hold the Keil monitor, allowing it to work with the Keil compiler/debugger.

The ARC-EVB also contains an SMSC COM20022 ARCNET controller (backward compatible with the COM20020) which can support data rates from 156 kbps to 10 Mbps using a 20 MHz crystal. This chip offers enhanced features over earlier generation chips. New features include command chaining, sequential access to internal RAM, duplicate Node ID detection and variable data rates up to 10 Mbps.

An 8-bit DIP switch (**S1**) is provided as the input device and 8 associated LEDs report the state of each input. An additional 8 LEDs indicate the states of the output signals. LED 7 in each array is the MSB.

Another 8-bit DIP switch (**S2**) is used for setting the ARCNET Node ID. Switch 8 is the MSB.

The data rate is set by jumpers at jumper block **J8**.

The ARC-EVB uses an HYC4000 transformer-coupled ARCNET transceiver. This provides balanced EIA-485 signaling so that either a straight-through or a crossover cable can be used.

ARCNET fieldbus connections are provided by either a 3-terminal open-wire connector or an RJ-11 jack for standard twisted-pair cable. An extra RJ-11 jack is provided for installing the modular terminator provided in the ARC-EVS. The extra jack can also be used for daisy-chaining a twisted-pair bus if the ARC-EVB is configured with more than one ARCNET adapter.

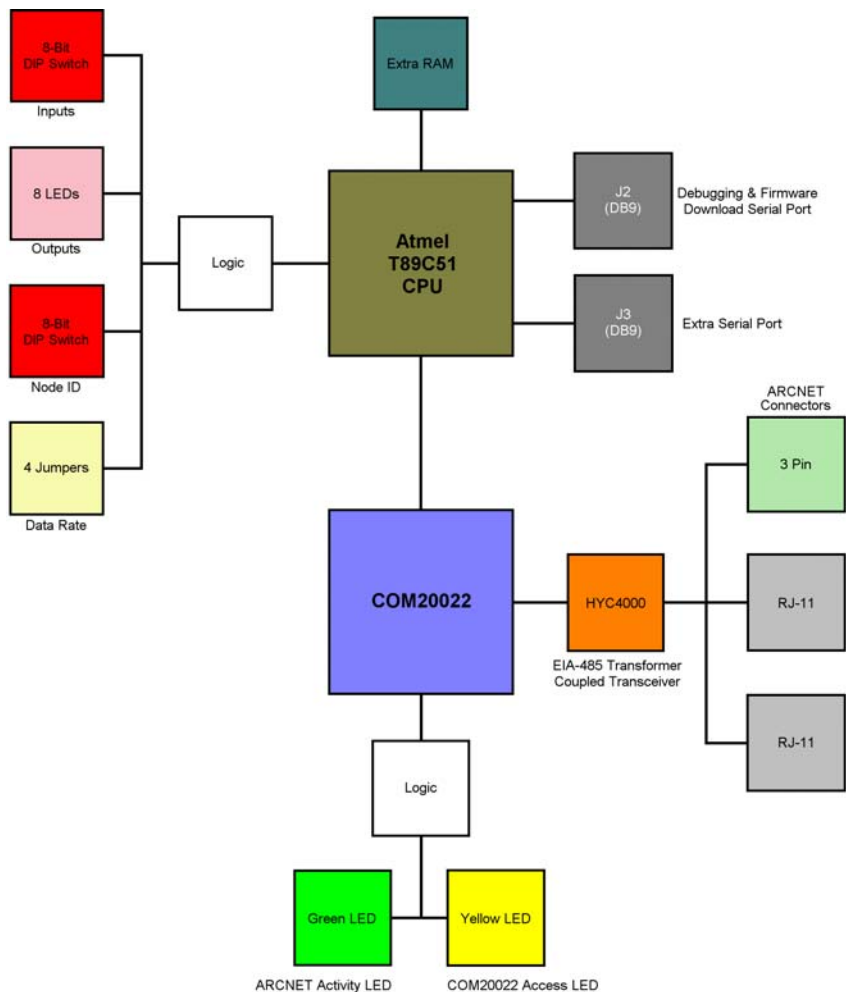


Figure 2 — Evaluation Board Block Diagram

J1	2-pin header	Boot ROM (for FLASH reprogramming)	Leave off in normal operation
J2	D-SUB 9	CPU UART	Firmware upload and debug
J3	D-SUB 9	Extra serial port	Customer SPI development
J4	RJ-11	ARCNET RJ-11 port	Connect to PCI22-485X
J5	RJ-11	ARCNET RJ-11 port	Connect terminator here
J6	Open 3-wire	ARCNET 3 wire port	Extra ARCNET port
J7	30-pin header	Prototyping header	
J8	6-pin header	ARCNET data rate	Set to desired rate (Table 4 — Data Rate (J8))
J9		Power input connector	Using provided power supply

Table 1 — Connectors

	Type	Usage	Comment
S1	8-pin DIP	Data Input	Set to desired data value
S2	8-pin DIP	ARCNET Node ID	Set to ARC-EVB ARCNET node ID

Table 2 — Switches

	Usage
TP1	VCC
TP2	GND
TP3	Pulse1 ARCNET signal
TP4	RXIN received ARCNET
TP5	TXEN transmit enable
TP6	EIA-485 output (Φ B)
TP7	EIA-485 output (Φ A)

Table 3 — Test Points

DR0	DR1	DR2	Data Rate
—	—	—	2.5 Mbps
X	—	—	1.25 Mbps
—	X	—	625 * kbps
X	X	—	312.5 * kbps
—	—	X	156.25 * kbps
X	—	X	5 Mbps
—	X	X	10 Mbps
X	X	X	N/A
(X = jumper installed)			

Table 4 — Data Rate (J8)

* These rates are not supported by the ARC-EVB transceiver, but are available if the user wishes to replace the ARC-EVB transceiver with a custom transceiver.

3 PCI22-485X NIM

3.1 Description

The PCI22-485X is one of a family of Contemporary Controls network interface modules (NIMs), each serving to link a PCI bus compatible computer with the ARCNET local area network (LAN). Each model within the family is identified by a model number ending in a 3- or 4-character suffix. This suffix specifies a transceiver type which matches a particular type of cable. Because the capabilities of each transceiver differ, different models cannot occupy the same LAN segment.

The PCI22-485X supports data rates from 1.25 Mbps to 10 Mbps and operates in a Windows environment with one of our null stack drivers. The driver directory on the CD-ROM provides a selection of null stack drivers from which to choose.

This NIM incorporates the same ARCNET controller chip as used on the ARC-EVB. Bus contention problems are minimized since the interrupt level and I/O base address are assigned through Plug and Play. There is no requirement for wait-state arbitration.

Two LEDs monitor network operation and bus access to the module. An external DIP switch allows node addresses to be easily reassigned without removing the module.

3.2 Hardware Installation

The NIM can be installed in any PCI bus compatible computer bus. With power detached from the computer, remove the computer cover to expose the motherboard and expansion slots (connectors). Care should be taken when installing the card; both it and the exposed motherboard are sensitive to electrostatic discharge. To prevent inadvertent damage, touch the metal case of the internal power supply to discharge yourself then remove the card from its protective ESD package. Remove the backplate of the computer adjacent to the desired slot (connector). Then insert the card into this slot by applying an even downward pressure until it firmly seats in the connector. The card's backplate can be fastened to the computer with the small screw used to attach the original backplate. Hardware installation is completed by replacing the computer's cover.

3.3 Software Installation

Unlike ISA bus computers, PCI bus computers usually have their resources assigned by the operating system. The PCI22-485X NIM requires one interrupt line and a 16 byte I/O range for the COM20022 ARCNET controller.

Once the NIM is inserted and power applied to the computer, Windows will recognize the card and ask the user for the driver location. Point to the folder appropriate to the version of Windows being used. After loading is complete the driver will be active. The driver can be disabled from the Device Manager.

3.4 Indicator Lights

There are two LEDs located at the NIM's backplate. The green LED indicates that the card is transmitting ARCNET traffic to the network. The yellow LED indicates that the card is being accessed from the host computer via its I/O address.

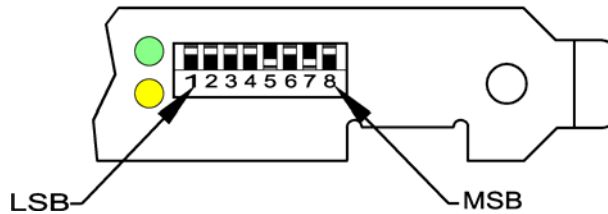


Figure 3 — PCI22-485X Indicator Lights and Node ID Switch

3.5 Node ID Switch

Although not always needed, this NIM has a separate input port that reads an 8-bit DIP switch (SW1) located at the backplate. This switch is meant to serve as a Node ID switch, although it can serve as a general purpose switch if desired. The switch has no connection to the COM20022 controller chip.

The most significant bit (MSB) is switch position 8, and the least significant bit (LSB) is switch position 1. A switch in the open position (off position or away from the printed circuit board) introduces a logic "1." In the example below, the switch is set to hexadecimal address AF.

3.6 Fieldbus Connection

The PCI22-485X NIM supports AC-coupled communication via its daughter board which has a fixed-bias network isolated by a pulse transformer. Unlike DC-coupled devices, bias adjustment is unneeded and wiring polarity is unimportant. Dual RJ-45 jacks and one three-position screw terminal connector are the options for attaching the field bus wiring. For convenience, a modular cable is provided for connecting the NIM to the ARC-EVB.

Each end of the fieldbus wiring must have a proper value of termination resistance. The NIM provides two options to achieve proper termination:

Onboard Termination: Install the E1 jumper on the daughter board to apply an onboard resistance across the twisted-pair. If the jumper is removed, no termination is applied.

External Termination: If you wish to enable or disable termination without removing the NIM from the host computer, external termination can be used. In this case, remove jumper E1 and insert *either* the provided RJ-45 modular terminator in the unused RJ-45 jack *or* a 120 ohm 1/4 watt resistor across pins 1 and 2 on the screw terminal connector.

NOTE: Terminating with a value less than 100 ohms will excessively load the EIA-485 transceivers—so you must only use *one* method of termination at a time. If more ARCNET devices are attached to the NIM and the ARC-EVB in a bus topology, only apply termination to the devices located at the *ends* of the bus.

4 Source Code

The ARC-EVB is provided with Modbus-over-ARCNET example code for both server and client.

When the server example code is executed on the ARC-EVB, it can receive one byte of output data and can transmit one byte of input data when polled by the Modbus client. The 8 LEDs on the ARC-EVB are used to indicate the received output data. The 8-bit DIP switch (**S1**) is used to provide ARC-EVB input data.

The client software executes on a PC in which our PCI22-485X has been installed and requires the version of our Null Stack driver appropriate to the version of Windows being used. The Modbus client will continually request current Modbus data from the Modbus server (ARC-EVB) and will also update server output data when modified by the user.

The ARCNET Control Panel is illustrated in **Figure 4**. The server application causes the current ARC-EVB input data to be displayed in the LED Status section of the panel and can change the ARC-EVB output data in the LED control section of the panel. The 8 output LEDs on the ARC-EVB are used to display its output state.

Also included is a Keil monitor HEX file that (when copied to the ARC-EVB) allows the ARC-EVB to communicate with the Keil debugger. The HEX file for the Modbus-over-ARCNET server is also provided. This allows the user to switch between debugging with the Keil compiler and executing the Modbus-over-ARCNET server.

Updated versions of Modbus-over-ARCNET client and server can be downloaded from www.ccontrols.com.

5 Modbus-over-ARCNET Setup

Confirm that the PCI22-485X NIM has been properly installed in the host computer (as per Sections 3.2 and 3.3) and that the ARC-EVB EEPROM contains the Modbus hex file. The ARC-EVB has been factory programmed with the Modbus firmware—so loading this firmware will only be needed if it has been erased. (See Section 7 for firmware modification).

PCI22-485X NIM Setup:

- Set the NIM's Node ID switch to the desired value (1–255, decimal) as per Section 3.5.
Optionally, the Node ID can be set via the Windows Application below.
- Make sure the NIM has proper cable termination applied as per Section 3.6.

ARC-EVB Setup:

NOTE: The ARC-EVB will initialize with Data Rate and Node ID values existing during power up. Changes to these parameters will have no effect unless power is recycled.

- Set the Data Rate jumpers (**J8**) to the desired data rate as per **Table 4** — Data Rate (J8).
- Set the Node ID DIP switch (**S2**) to a Node ID that *differs* from that set on the NIM.
- Install jumper **JP1** to invoke onboard fieldbus termination.
Optionally, the provided RJ-11 modular terminator may be inserted in the unused RJ-11 jack.
- Apply power.

Fieldbus Setup:

- Connect the NIM to the ARC-EVB with the provided modular cable.
Optionally, any CAT-5 twisted-pair cable may be attached between the open-wire connectors.

Windows Application Setup:

- Launching the application will display the **Control Panel** in **Figure 4**. Until the **Settings Panel** options have been entered, the **Control Panel** features will remain inactive.

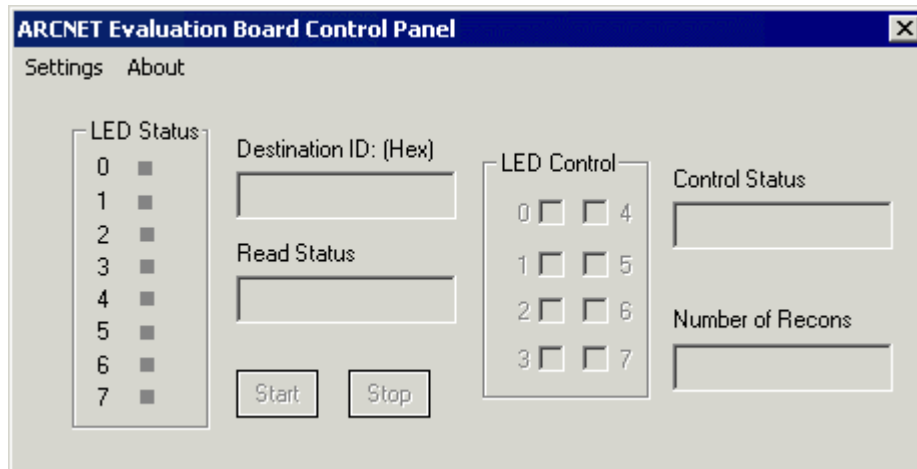


Figure 4 – ARC-EVB Control Panel – Inactive

- Selecting the **Settings** menu item will display the Settings Panel in **Figure 5**.

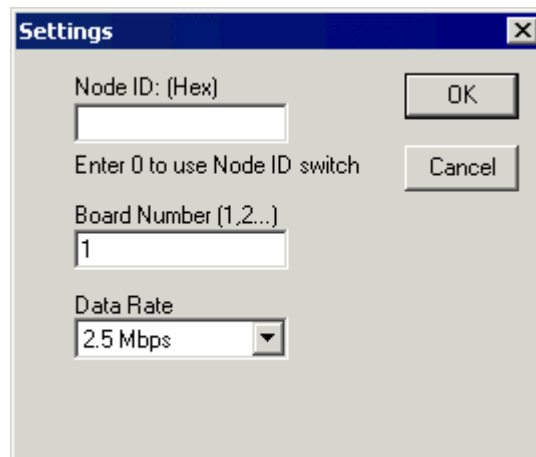


Figure 5 – Application Settings

- In the Node ID box enter the ARCNET Node ID to be associated with the NIM (and its host computer). A zero value causes the Node ID to be read from the NIM's DIP switch.
- The Board Number field specifies how many ARCNET NIMS are installed in the host computer. The default value of "1" rarely needs changing. If more Contemporary Controls PCI-based NIMS are installed, enter that number.
- In the Data Rate box select the data rate which matches that set on the ARC-EVB.

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After completing the settings, the **Control Panel** will appear as in **Figure 6**. Three fields are “dimmed” because they are read-only — *Read Status*, *Control Status* and *Number of Recons*.

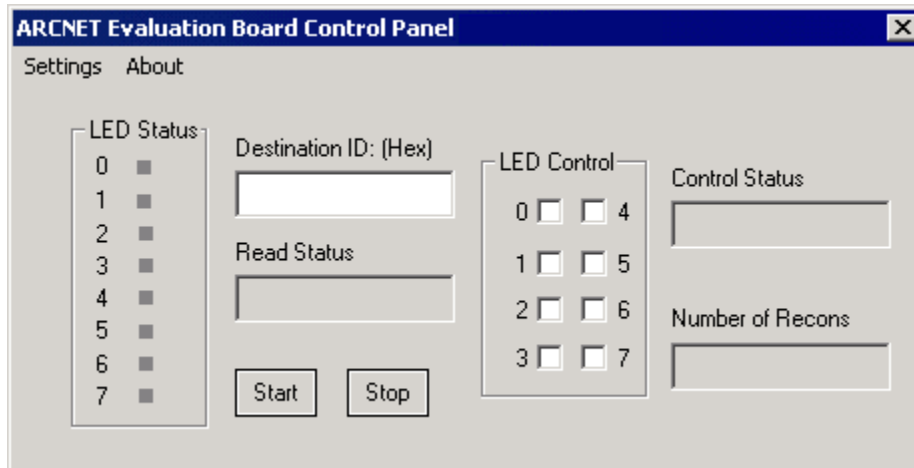


Figure 6 — ARC-EVB Control Panel — Active

- Enter a hex value for the Destination Node ID which agrees with the DIP switch value set on the ARC-EVB. This value *must differ* from the ID value set for the NIM.
- The application is now ready for operation.

6 Modbus-over-ARCNET Operation

When the ARC-EVB and the Windows application have achieved proper communications, the **Control Panel** will affect operation as follows.

Reading LED Status from the ARC-EVB

Clicking the **Start Button**, will initiate the transmission of **Modbus Function 3_H** Query Messages (see [Section 10.1](#)). The application will continually read information from the Input DIP switch (**S1**) on the ARC-EVB. Each time the read action is successful, the message “RX OK!” will appear in the Read Status field. As long as the ARC-EVB is working, each change to the Input DIP switch will instantly appear in the LED Status area of the **Control Panel**. Turning a switch “On” lights its associated LED on the ARC-EVB and causes its associated LED icon in the **Control Panel** to glow red. In the example shown in **Figure 7**, switches 4-7 have been turned on.

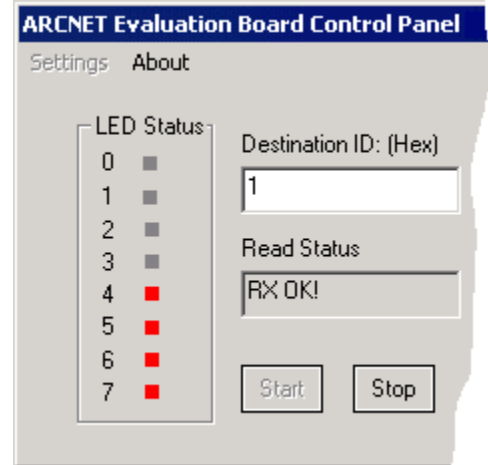


Figure 7 — LED Status

While the **Start Button** is dim, changing the value in the Destination ID field will have no effect on the read action. Clicking the **Stop Button** concludes the read action, but the last data read continues to display. The next time the **Start Button** is clicked, the read function will use the current value in the Destination ID field — but the read action will not be successful unless this new value matches the Node ID value with which the ARC-EVB was *initialized*.

Controlling LEDs on the ARC-EVB

Changes in LED Control will affect the Output LEDs on the ARC-EVB. LED Control has 8 checkboxes. Each time a checkbox is clicked, two things are determined — the Destination ID and the status of *all* 8 checkboxes. The checkbox data are transmitted via a **Modbus Function 10_H** Query Message (see [Section 10.1](#)) to activate the corresponding LEDs on the ARC-EVB. But the transmission will fail unless the Destination ID matches the Node ID with which the ARC-EVB was *initialized*.

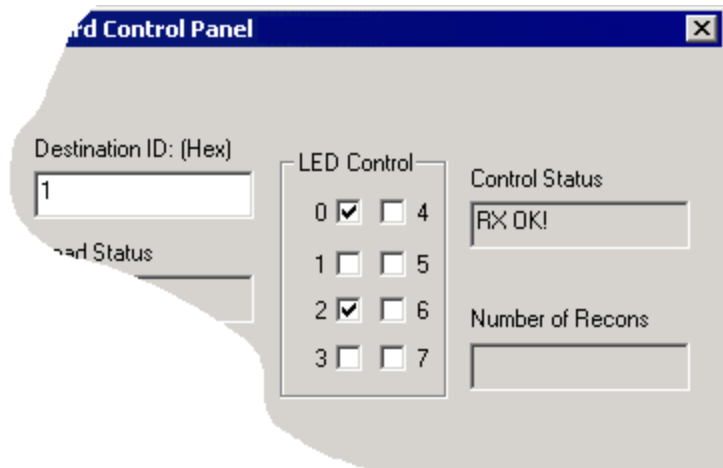


Figure 8 — LED Control

Figure 8 shows a query to activate LEDs 0 and 2 has been successfully sent to Node ID 1. The Control Status message “RX OK!” only means that a properly formatted query and response were exchanged. It does not confirm that the correct data arrived at the destination.

Number of Recons

Network reconfigurations are counted in this field. The count can be reset to zero only by restarting the application.

7 Firmware Modification

The Atmel Flip application included on the CD-ROM is used to modify the ARC-EVB firmware. The application includes detailed online help, but a procedural overview is presented below.

Procedure:

1. Connect the ARC-EVB to a PC via the provided null-modem cable.
2. On the ARC-EVB, install the **J1** jumper to enable firmware modification.
3. Apply power to the ARC-EVB.
4. Launch the Atmel Flip application.

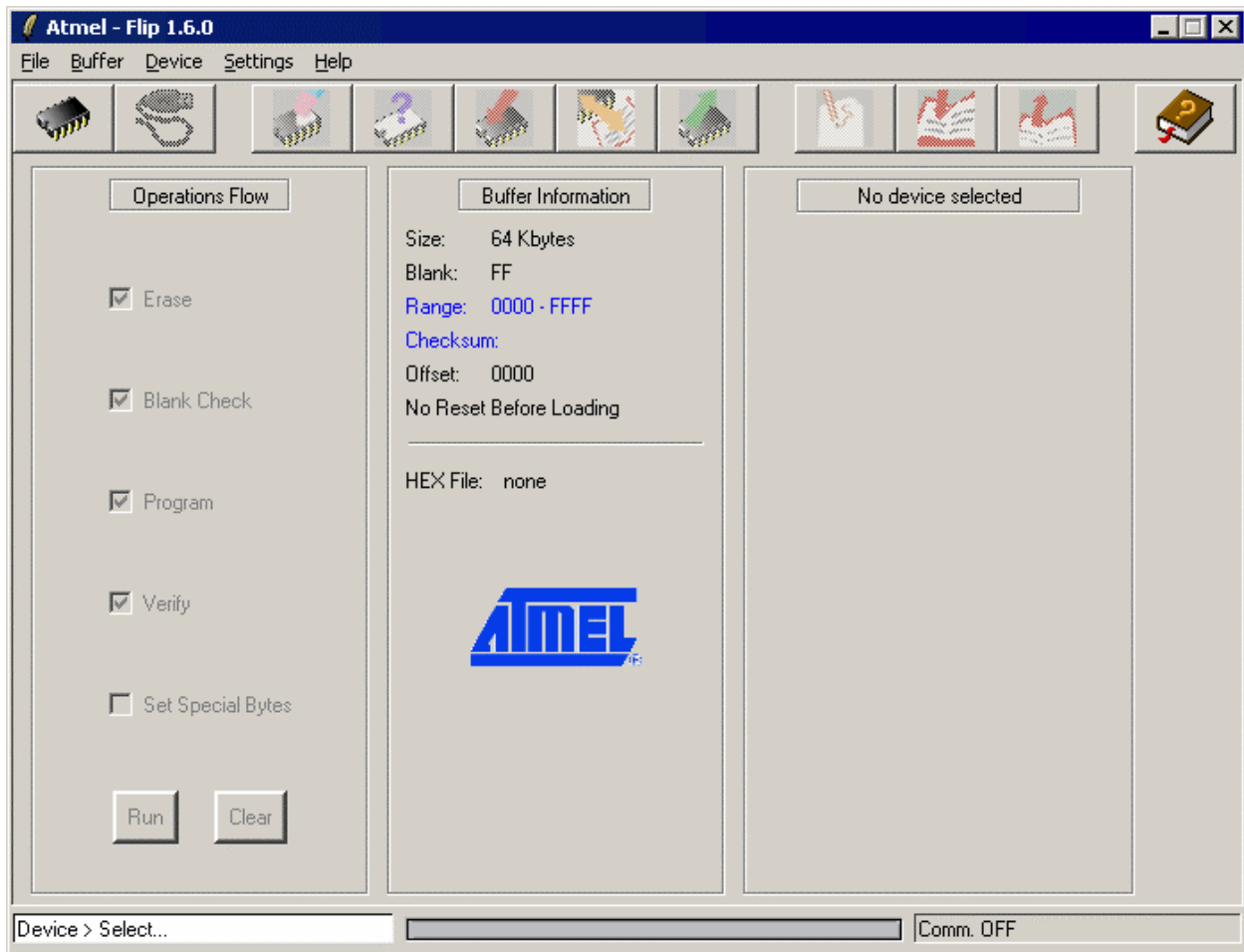


Figure 9 — Atmel Flip Initial Screen

5. The screen of **Figure 9** appears with a lower left corner message prompting you to ...
6. Open the **Device** menu and select a device. Choose the T89C51RB2 and click OK.

- The screen changes to display the device-specific panel with appropriate fields for the T89C51RB2. As shown in **Figure 10**, these fields will remain read-only and the panel will remain “dimmed” until you specify the communication settings.

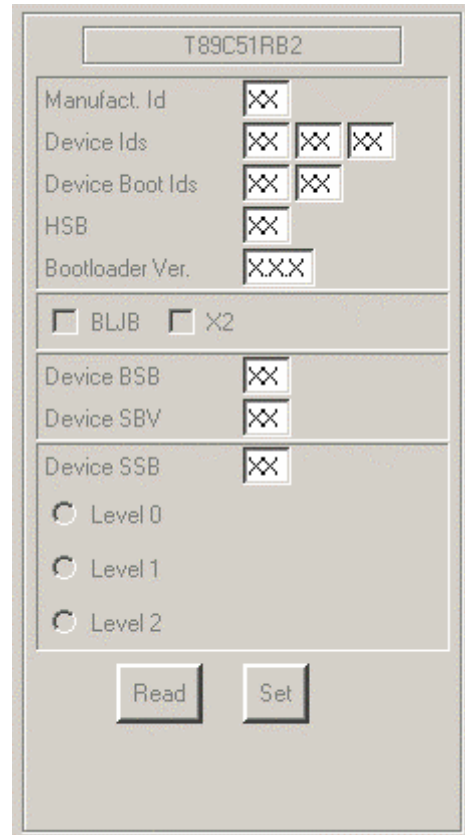


Figure 10 — Device-Specific Panel before Reading the T89C51RB2

- Open the **Settings > Communications** menu option and choose RS232. The RS232 options depicted in **Figure 11** will appear.

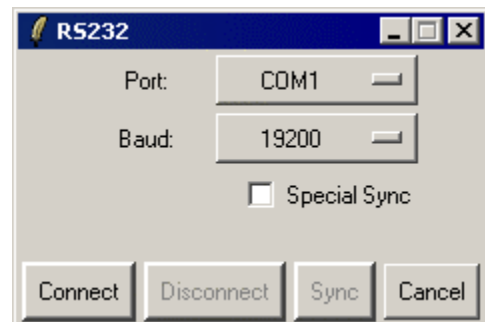


Figure 11 — RS232 Options

- From the RS232 options, choose the Port appropriate to your computer and set the Baud value to 19200. Then click Connect.

10. If the ARC-EVB is working and the signal path between it and the PC is proper, the device-specific panel will be updated with data read from the T89C51RB2 as shown in the example of **Figure 12**. (If communication between the Flip application and the ARC-EVB is improper, a Time Out Error will occur — check the ARC-EVB and the fieldbus cable.) Leave the upper portion of this panel alone, but make sure (as shown in **Figure 12**) that these adjustments are set in the lower portions of the panel:

- De-select **X2** Mode
- Set Device SBV (Software Boot Vector) to **FC**
- Set the Device SSB (Software Security Byte) to **FF**

The screenshot shows a software interface for configuring a T89C51RB2 device. The title bar reads 'T89C51RB2'. The interface is divided into several sections:

- Manufacturer Information:** Manufact. Id: 58; Device Ids: D7 00 00; Device Boot Ids: 00 00; HSB: BF; Bootloader Ver.: 1.1.1.
- Mode Selection:** BLJB, X2.
- Device Settings:** Device BSB: 00; Device SBV: FC; Device SSB: FF.
- Security Levels:** Radio buttons for Level 0 (selected), Level 1, and Level 2.
- Actions:** Read and Set buttons at the bottom.

Figure 12 — Device-Specific Panel after Reading the T89C51RB2

11. To copy a new program to the ARC-EVB ...
 - Select the menu item **File > Load HEX ...** and open the desired file. The filename and size will be verified in the lower center area of the Flip window.
 - Under the *Operations Flow* panel on the left of the Flip window, check these boxes — *Erase, Blank Check, Program* and *Verify*
 - Click Run. The checked *Operations Flow* options should appear green, if successful.

When finished, close the Flip application, remove power from the ARC-EVB and remove jumper **J1**. The next time you power up the board, it should execute the new firmware.

8 Keil Compiler/Debugger

The ARC-EVB has been designed to work with the Keil Compiler/Debugger. An evaluation version of the Keil Compiler/Debugger is included on the provided CD-ROM. This evaluation version is limited as follows:

- The compiler, assembler, linker, and debugger are limited to 2 Kbytes of object code—although source code may be of any size. Programs that generate more than 2 Kbytes of object code will not compile, assemble, or link.
- The generated startup code includes LJMPs and will not work in single-chip devices which are limited to less than 2 Kbytes of program space.
- The debugger supports files that are 2 Kbytes or smaller.
- Programs begin at offset 0x0800 and cannot be programmed into single-chip devices.
- No hardware support is available for multiple DPTR registers.
- No support is available for user libraries or floating-point arithmetic.

The following components are present in the full version, but not in the Keil evaluation software:

- Code-Banking Linker/Locator
- Library Manager
- RTX-51 Tiny Real-Time Operating System

To obtain a full-featured version of the Keil software, use the contact information below:

Keil Software, Inc. 1501 10th Street, Suite 110 Plano, TX 75074 USA	
Toll Free:	800-348-8051
Phone:	972-312-1107
Fax:	972-312-1159
Sales:	sales.us@keil.com
Support:	support.us@keil.com

Keil Elektronik GmbH Bretonischer Ring 15 D-85630 Grasbrunn Germany	
Phone:	(49) (089) 45 60 40 0
Fax:	(49) (089) 46 81 62
Sales:	sales.intl@keil.com
Support:	support.intl@keil.com

The Modbus-over-ARCNET server can be debugged on the ARC-EVB using the Keil Debugger. *Detailed built-in help screens* are included with the Keil Compiler/Debugger, but a helpful general overview of using the Keil tools is presented below:

- Set the PC serial port to a baud rate of 19200.
- Copy the entire Modbus-over-ARCNET server folder to your computer. *
- Use Atmel Flip to copy the Keil monitor from the MON51 directory to the ARC-EVB.
- Remove the **J1** jumper from the ARC-EVB.
- Recycle power to the ARC-EVB.
- Start the Keil compiler.
- Using the **Project > Open Project** menu option, open **arc_eval.uv2**.

- In the **Select Target** box, choose **Debug Image**.



- Use the **Project > Rebuild all target files** option to compile, link and build the project.
- With the **Debug > Start/Stop Debug Session** option, load the target to the ARC-EVB.

- When the download is completed, enter `$=0x8000` in the Command Line Window to set the program counter to 0x8000.



- Use the debugging options under the **Debug** menu to single step, set breakpoints or run the application. When the debugging is finished, terminate the debug activity with the menu option **Debug > Start/Stop Debug Session**. The final firmware to be written to the board is in target **Flash Image**. Use the **Project > Rebuild all target files** option to rebuild the flash image and generate a hex file called **arc_flash.hex**. Use the Atmel Flip application to copy the hex file to the ARC-EVB.

* **NOTE:** When copying files from CD-ROM to hard disk, they will be created as read-only files, but some of these files need to be *updated*. For such files to be used, this read-only property *must be cleared*.

9 Service

9.1 Warranty

Contemporary Controls (CC) warrants its product to the original purchaser for one year from the product's shipping date. If a CC product fails to operate in compliance with its specification during this period, CC will, at its option, repair or replace the product at no charge. The customer is, however, responsible for shipping the product; CC assumes no responsibility for the product until it is received. This warranty does not cover repair of products that have been damaged by abuse, accident, disaster, misuse, or incorrect installation.

CC's limited warranty covers products only as delivered. User modification may void the warranty if the product is damaged during installation of the modifications, in which case this warranty does not cover repair or replacement.

This warranty in no way warrants suitability of the product for any specific application.

IN NO EVENT WILL CC BE LIABLE FOR ANY DAMAGES INCLUDING LOST PROFITS, LOST SAVINGS, OR OTHER INCIDENTAL OR CONSEQUENTIAL DAMAGES ARISING OUT OF THE USE OR INABILITY TO USE THE PRODUCT EVEN IF CC HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES, OR FOR ANY CLAIM BY ANY PARTY OTHER THAN THE PURCHASER.

THE ABOVE WARRANTY IS IN LIEU OF ANY AND ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED OR STATUTORY, INCLUDING THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR PARTICULAR PURPOSE OR USE, TITLE AND NONINFRINGEMENT.

Repair or replacement as provided above shall be the purchaser's sole and exclusive remedy and CC's exclusive liability for any breach of warranty.

9.2 Technical Support

Technical support is available each weekday (except holidays) during the office hours listed below. Outside these hours, voice-mail messages can be left in our mailbox after contacting the main phone number. Requests can also be submitted by fax or by e-mail to the numbers listed below, but please leave a detailed description of the problem. We will contact you the next business day by the method you request. If the problem cannot be resolved by technical support, the customer will be given an RMA number so that the product may be returned to CC for repair.

	Contemporary Controls (USA)	Contemporary Controls Ltd (UK)
Office Hours	8 a.m. – 5 p.m. Central time	8 a.m. – 5 p.m. UK time
Voice	+1-630-963-7070	+44 (0)24 7641 3786
Fax	+1-630-963-0109	+44 (0)24 7641 3923
Email	techsupport@ccontrols.com	support@ccontrols.co.uk
Web Site	www.ccontrols.com	www.ccontrols.co.uk

Contemporary Controls

TD020200-OMA

9.3 Warranty Repair

Products under warranty that were not subjected to misuse or abuse will be repaired at no charge to the customer. The customer, however, pays for shipping the product back to CC while CC pays for the return shipment to the customer. CC normally ships ground. International shipments may take longer. If the product has been determined to be misused or abused, CC will provide the customer with a quotation for repair. No work will be done without customer approval.

9.4 Non-Warranty Repair

CC provides a repair service for all its products. Repair charges are based upon a fixed fee basis depending upon the complexity of the product. Therefore, Customer Service can provide a quotation on the repair cost at the time a Returned Material Authorization (RMA) is requested. Customers pay the cost of shipping the defective product to CC and will be invoiced for the return shipment to their facility. No repair will be performed without customer approval. If a product is determined to be unrepairable, the customer will be asked if the product can be replaced with a refurbished product (assuming one is available). Under no circumstances will CC replace a defective product without customer approval. Allow ten working days for repairs.

9.5 Returning Products for Repair

To schedule service for a product, please call CC Customer Service support directly at +1-630-963-7070 (U.S.) or +44 (0)24 7641 3786 (U.K.). Have the product model and serial number available, along with a description of the problem. A Customer Service representative will record the appropriate information and issue, via fax, an RMA number—a code number by which we track the product while it is being processed. Once you have received the RMA number, follow the instructions of the Customer Service support representative and return the product to us, freight prepaid, with the RMA number clearly marked on the exterior of the package. If possible, reuse the original shipping containers and packaging. In any event, be sure you follow good ESD-control practices when handling the product, and ensure that antistatic bags and packing materials with adequate padding and shock-absorbing properties are used. CC is not responsible for any damage incurred from improper packaging. Shipments should be insured for your protection.

Ship the product, freight prepaid, to the location from which it was purchased:

Contemporary Control Systems, Inc.
2431 Curtiss Street
Downers Grove, IL 60515
U.S.A.

Contemporary Controls Ltd
Barclays Venture Centre
University of Warwick Science Park
Sir William Lyons Rd.
Coventry CV4 7EZ
U.K.

Contemporary Controls

TD020200-OMA

10 Appendix

10.1 Modbus Message Format

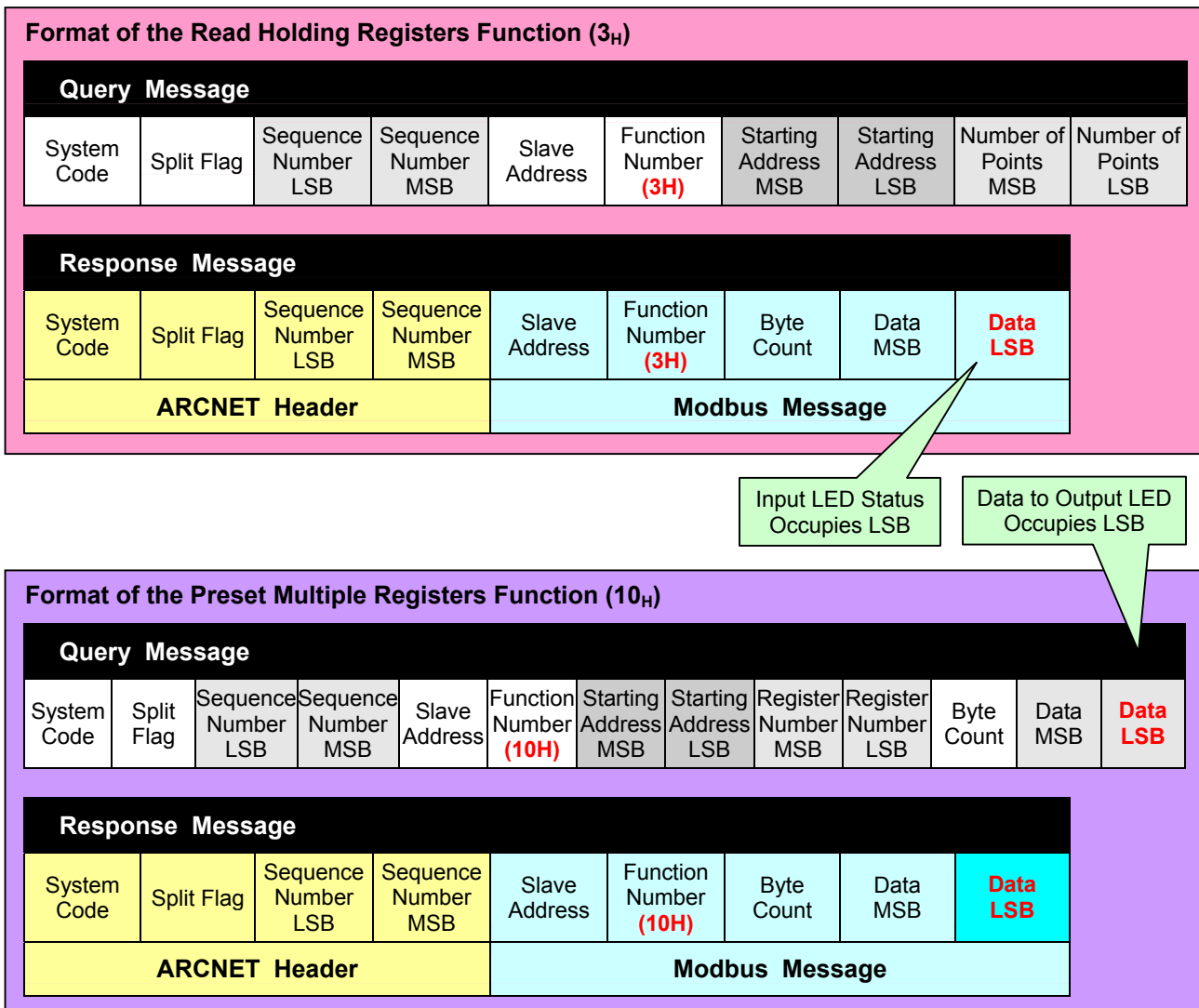
The Modbus protocol uses serial transmission. One Modbus transaction consists of a Query message and a Response message. A Modbus-over-ARCNET message consists of:

- ARCNET Header
- Modbus Message

The ARC-EVS supports the use of two Modbus functions:

- Function Read Holding Registers (3_H) — which reads the status of the input LEDs on the AEB
- Function Preset Multiple Registers (10_H) — which writes a value to the output LEDs on the AEB

The formatting of these two functions is illustrated below:



10.2 ARC-EVB Component Layout

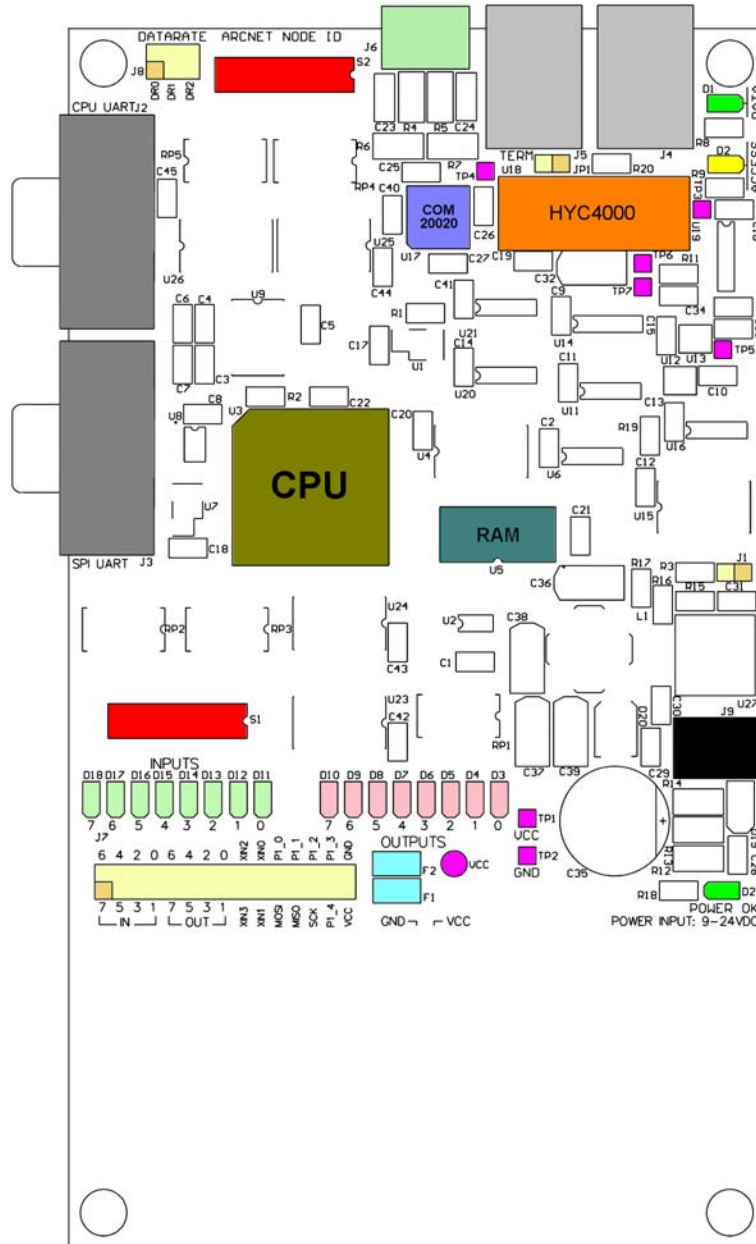
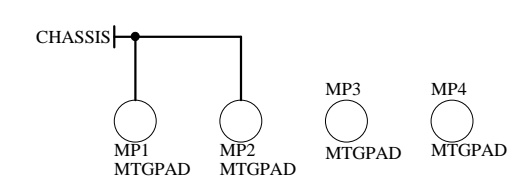
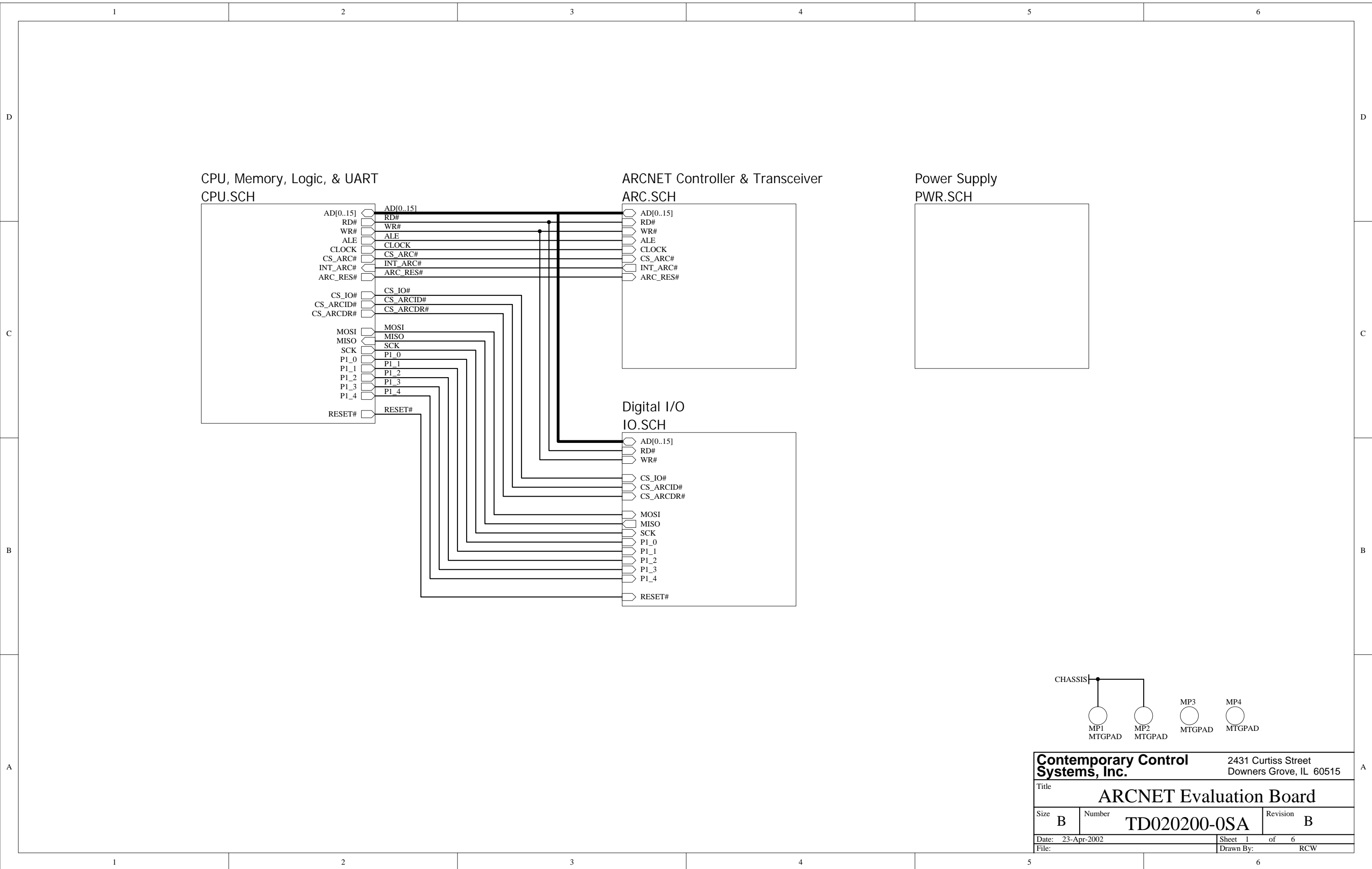


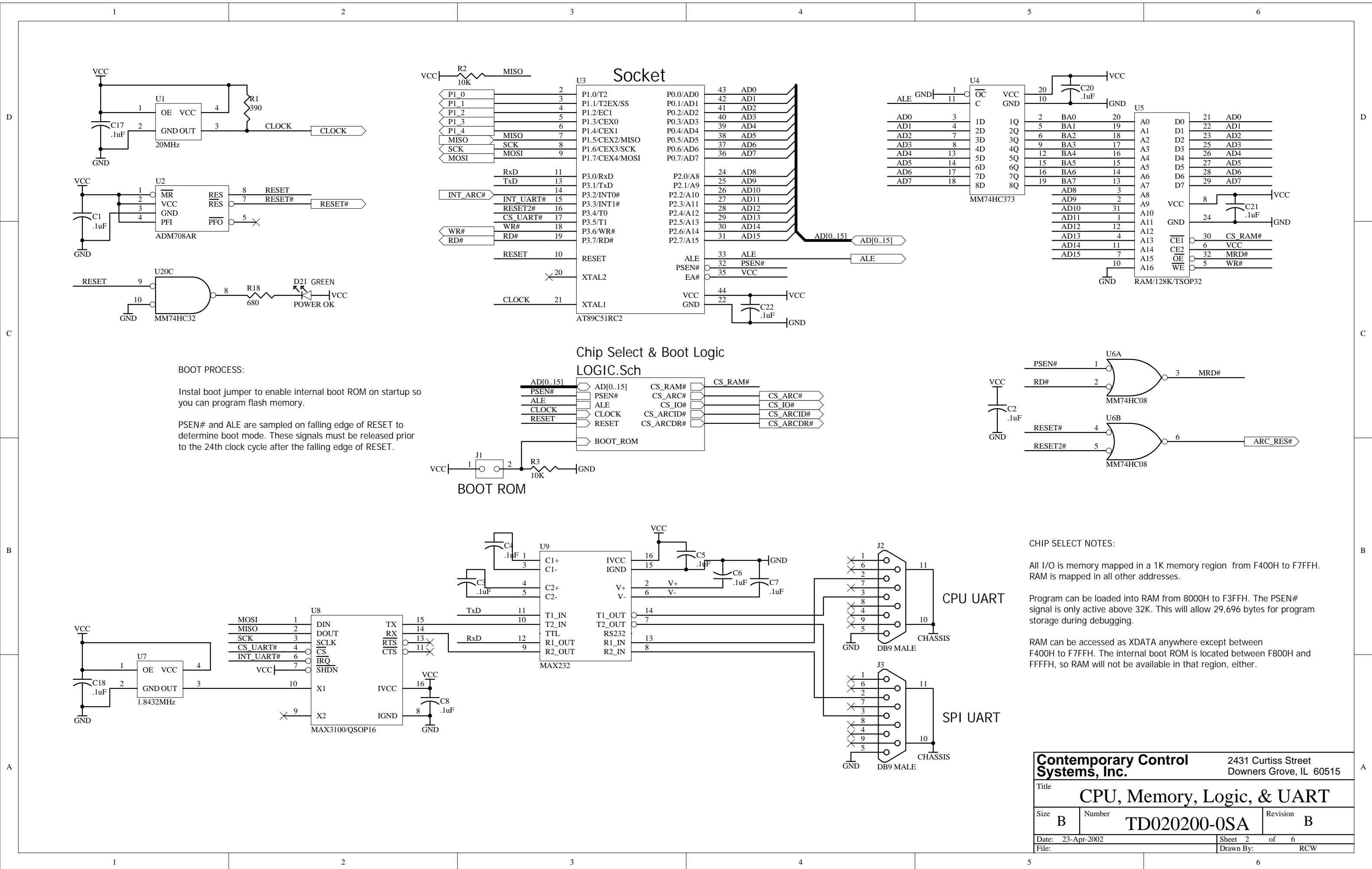
Figure 13 — Evaluation Board Layout

Contemporary Controls

TD020200-0MA



Contemporary Control Systems, Inc.		2431 Curtiss Street Downers Grove, IL 60515	
Title ARCNET Evaluation Board			
Size B	Number TD020200-0SA	Revision B	
Date: 23-Apr-2002		Sheet 1 of 6	
File:		Drawn By: RCW	

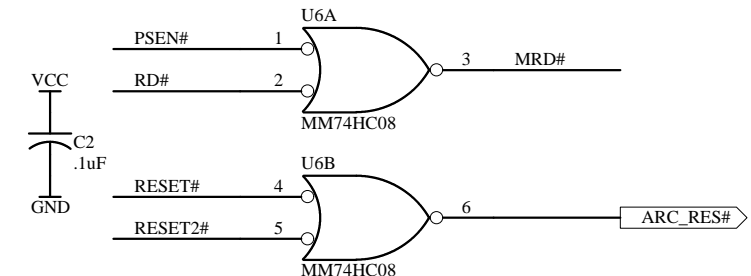
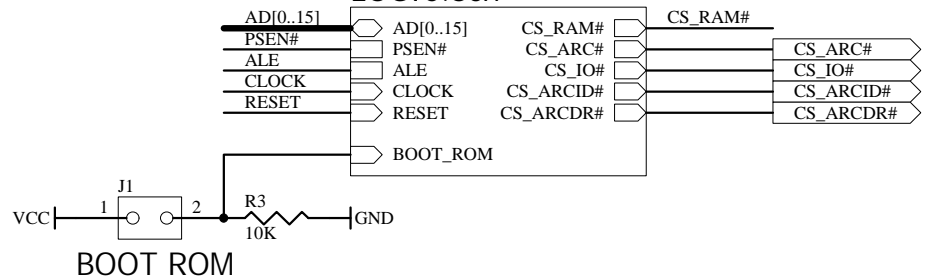


BOOT PROCESS:

Instal boot jumper to enable internal boot ROM on startup so you can program flash memory.

PSEN# and ALE are sampled on falling edge of RESET to determine boot mode. These signals must be released prior to the 24th clock cycle after the falling edge of RESET.

Chip Select & Boot Logic LOGIC.Sch



CHIP SELECT NOTES:

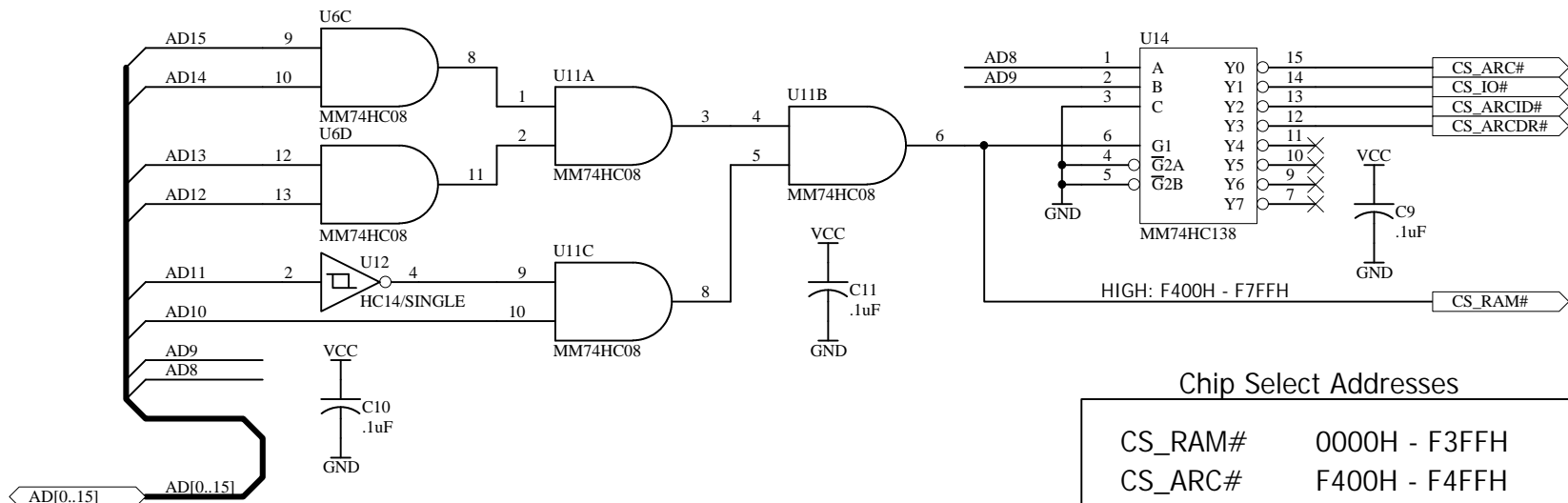
All I/O is memory mapped in a 1K memory region from F400H to F7FFH. RAM is mapped in all other addresses.

Program can be loaded into RAM from 8000H to F3FFH. The PSEN# signal is only active above 32K. This will allow 29,696 bytes for program storage during debugging.

RAM can be accessed as XDATA anywhere except between F400H to F7FFH. The internal boot ROM is located between F800H and FFFFH, so RAM will not be available in that region, either.

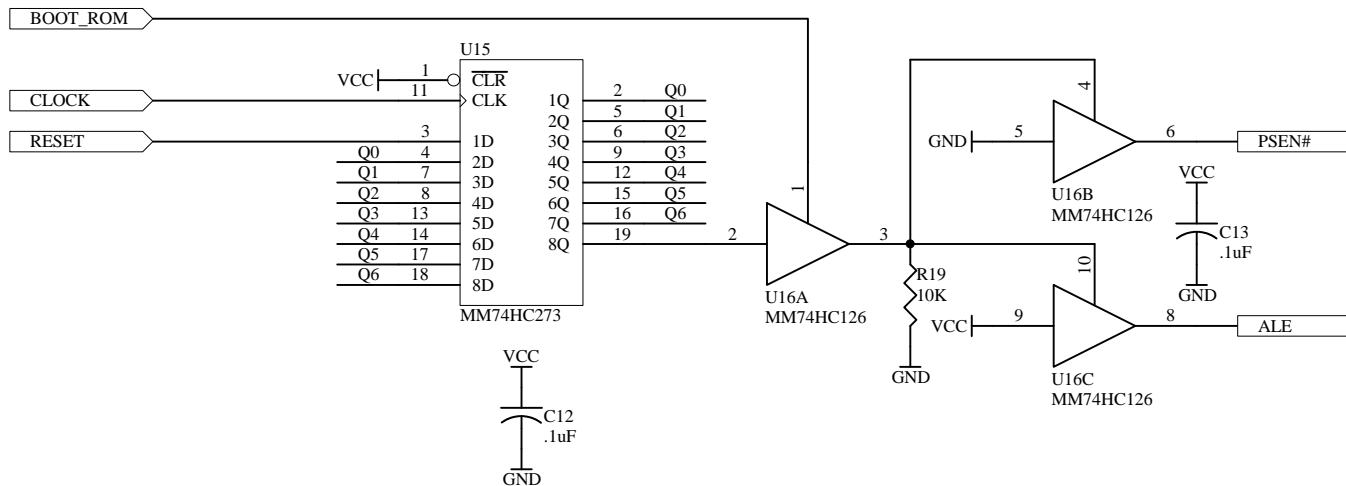
Contemporary Control Systems, Inc.		2431 Curtiss Street Downers Grove, IL 60515	
Title CPU, Memory, Logic, & UART			
Size B	Number TD020200-0SA	Revision B	
Date: 23-Apr-2002	Sheet 2 of 6		Drawn By: RCW

10.3 Schematic Diagram - Sheet 3



Chip Select Addresses

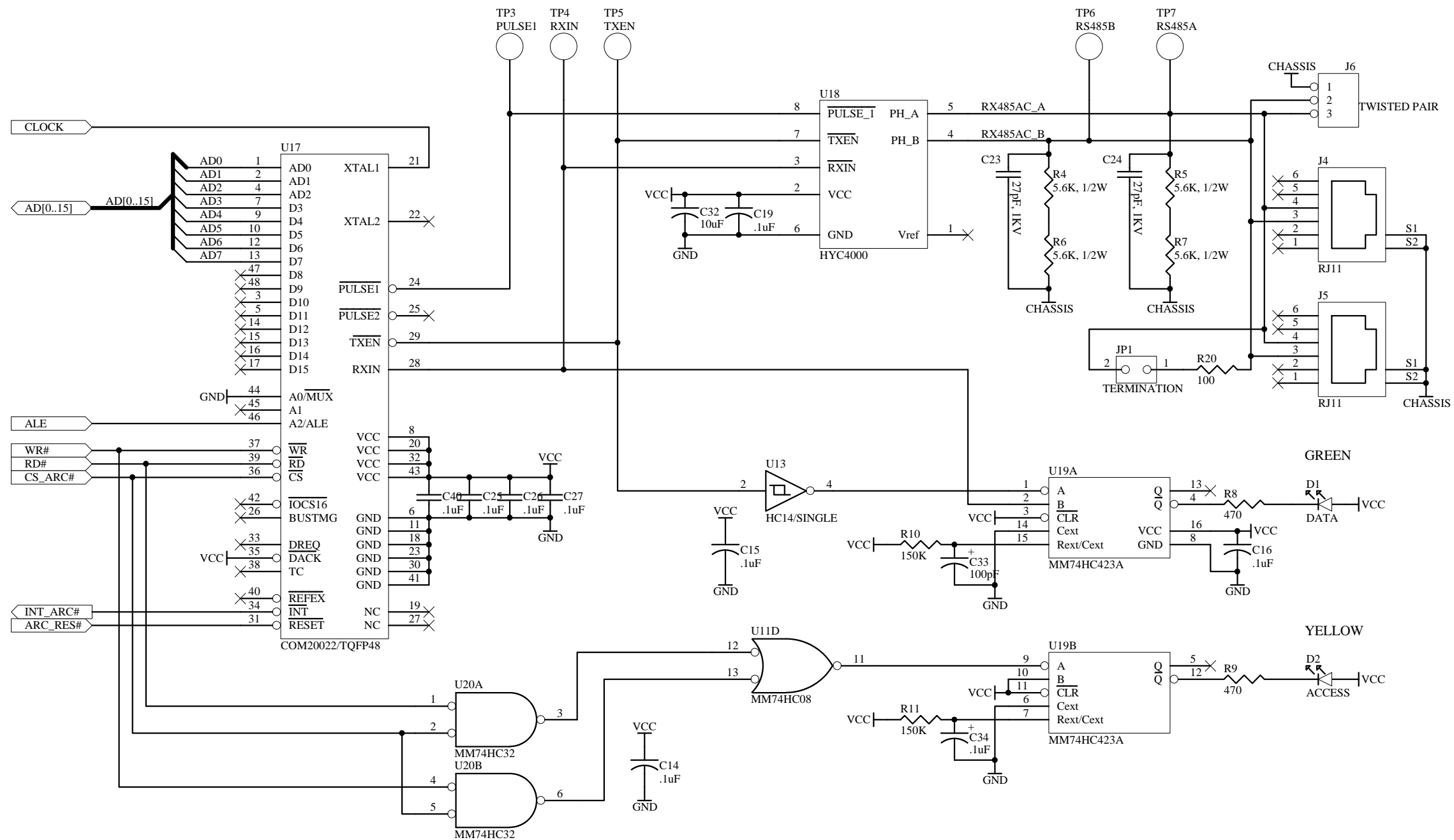
CS_RAM#	0000H - F3FFH
CS_ARC#	F400H - F4FFH
CS_IO#	F500H - F5FFH
CS_ARCID#	F600H - F6FFH
CS_ARCDR#	F700H - F7FFH



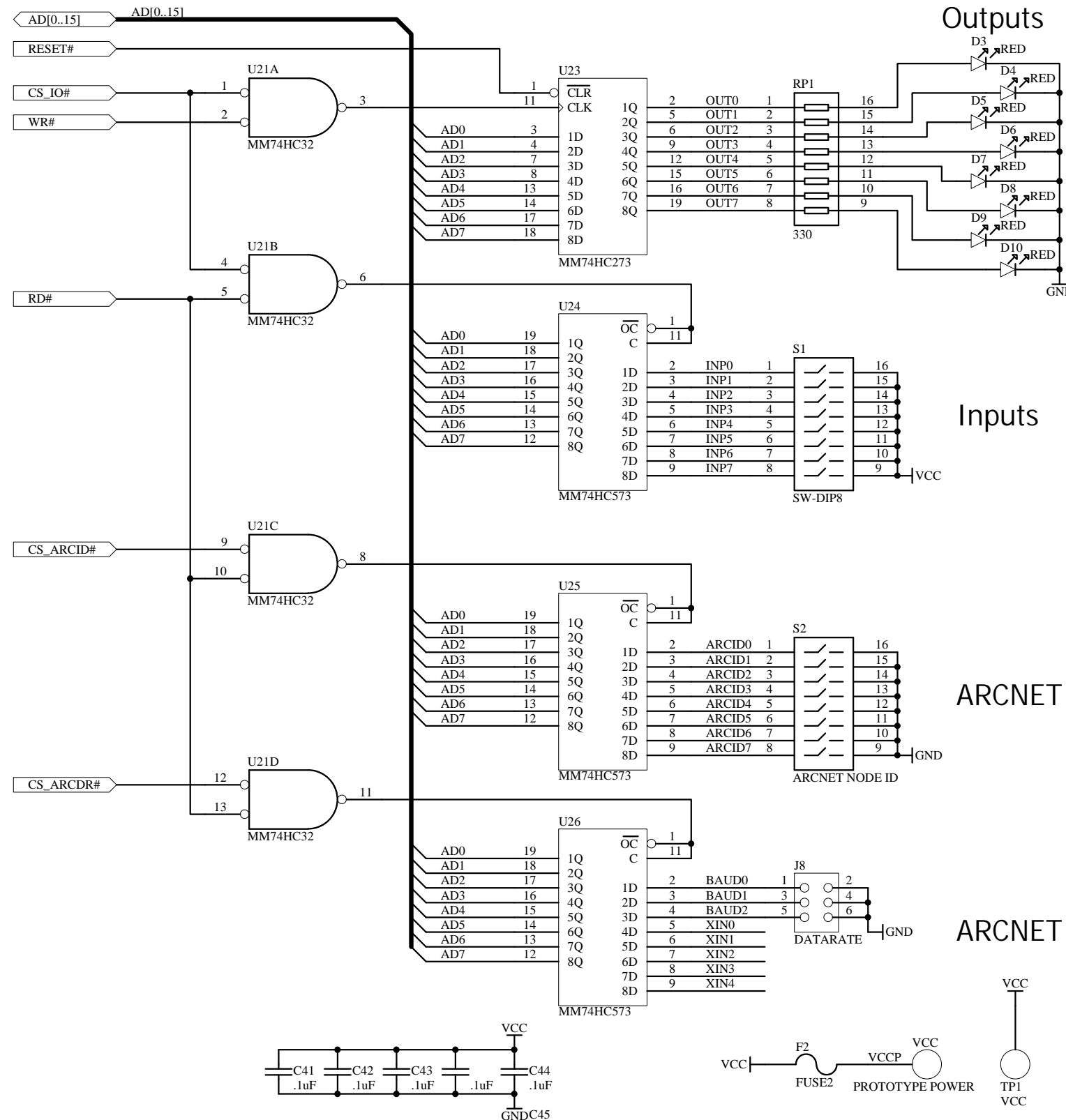
Contemporary Control Systems, Inc.

2431 Curtiss Street
Downers Grove, IL 60515

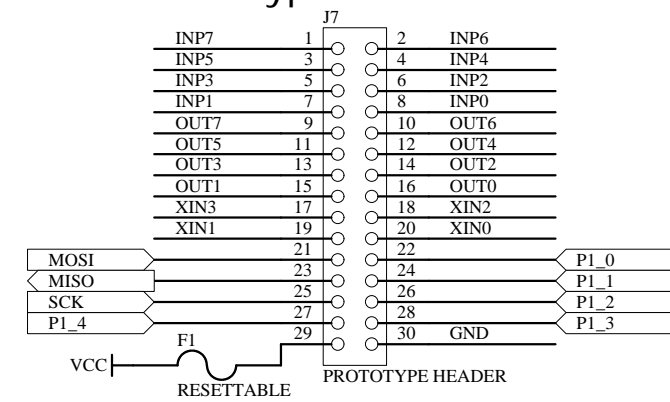
Title		Chip Select & Boot Logic	
Size	A	Number	TD020200-0SA
Date:	23-Apr-2002	Sheet	3 of 6
File:		Drawn By:	RCW



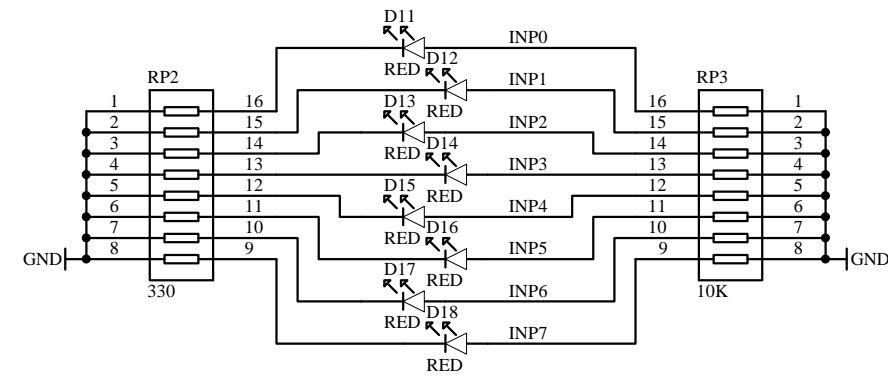
Contemporary Control Systems, Inc.		2431 Curtiss Street Downers Grove, IL 60515	
Title ARCNET Controller & Transceiver			
Size B	Number TD020200-0SA	Revision B	
Date: 23-Apr-2002		Sheet 4 of 6	
File: S3_ARC.SCH		Drawn By: RCW	



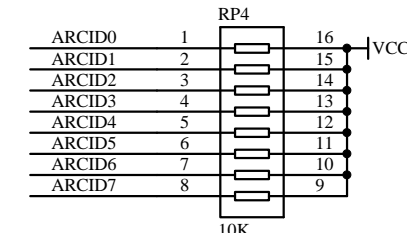
Prototype Area Header



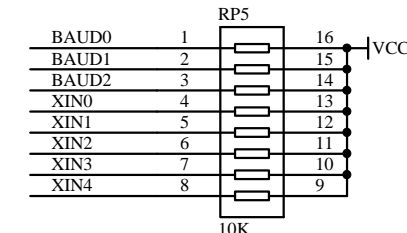
Inputs



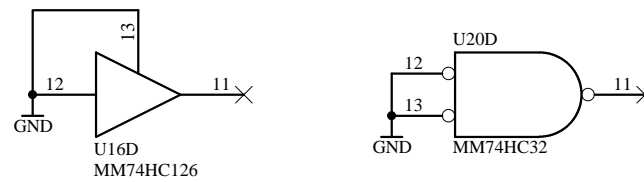
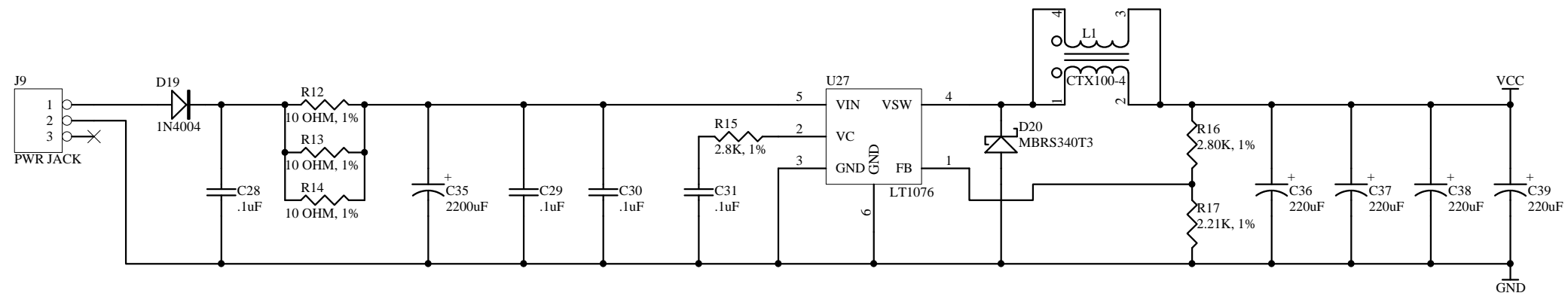
ARCNET ID



ARCNET Datarate



Contemporary Control Systems, Inc.		2431 Curtiss Street Downers Grove, IL 60515	
Title Digital I/O			
Size B	Number TD020200-0SA	Revision B	
Date: 23-Apr-2002		Sheet 5 of 6	
File:		Drawn By: RCW	



Spare Gates

Contemporary Control Systems, Inc.		2431 Curtiss Street Downers Grove, IL 60515	
Title Power Supply			
Size B	Number TD020200-0SA	Revision B	
Date: 23-Apr-2002		Sheet 6 of 6	
File: PWR_SUPPLY.SCH		Drawn By: RCW	