

As-Built Note 9: Arduino SCADA Module

Purpose

This as-Built note captures the design and build details of the Arduino SCADA Module.

References

SCADA Units Service Manual 20170301 (pages 2, 5, 13, 13,15,24, 25, and 26).

The use of the Arduino SCADA Module represents a change to the original design concept and should ultimately trigger an amendment to the SCADA Units Service Manual based on the information in this “As-Built Note 9”.

Design Concept of the Arduino SCADA Module

The concept followed was to contain the Arduino Mega 2560 and associated expansion boards within a metal box (Arduino SCADA Module) that is separate from the **SCADA Unit** boxes at each end of the Remote Station overall setup.

The SCADA Unit vs Arduino SCADA Module roles.

The SCADA Unit at the remote site is really an interface to all the bits of equipment requiring control or monitoring at the site. It is a central interconnection point at the site and contains all the opto isolators and relays that facilitate connection to the Arduino Computer boards and their expansion modules.

The SCADA Unit at the Node site is an interface to the bits of equipment at the Node and is a central interconnection point at the Node and contains all the opto isolators and relays that facilitate connection to the Arduino Computer boards and their expansion modules.

The SCADA Units have been renamed accordingly to “**SCADA Interface Unit**”

The actual Arduino computers are housed in separate boxes (**Arduino SCADA Modules**) to improve protection from any potential RF interference and make servicing and adjustment easier.

Requirements

The **Arduino SCADA Modules** meet the following requirements:

1. The module for each end (Remote Site and Node Site) contain both the Control and Supervisory Arduinos in the one metal box.
2. The Arduinos in the box are labelled respectively as “**Send**” for outgoing data and “**Receive**” for incoming data.
3. The Arduino Module boxes for the Remote site and the Node site are physically and electrically identical apart from the labelling. (A common spare could be interchangeable at either end of the system)
4. The power supply has a 12V-24 DC input jack (2.1mm) and self contained 5V regulator to operate the Arduino computers and the many front panel LEDs.
5. The IO ports are wired to DB 37 pin female connectors labelled “Send” and “Receive”

6. Corresponding Female DB37 are fitted to the SCADA Unit at the Remote site and Node Site.
7. Provision for Analogue I/O is made with a DB15 female connector. The pins are not assigned at this stage.
8. Interconnecting data cables use custom male to male DB37connectors.
9. Test LED indications are provided for each of the 36 numbered **Send** IO ports and 36 numbered **Receive** IO ports. A total of 72 LEDs.
10. A switch to turn off all test LEDs is supplied on the front panel (for power conservation and confusion reduction during operations)
11. Two rear panel RJ45 outlets for connection to a router are provided.
12. Two USB program jacks provide access to the Arduino for software uploading.
13. Access to hard resets of the computer boards without having to remove covers is provided.
14. All electrical connections to the Arduino SCADA Module must be via the SCADA Unit including the DC Power. There are no connections to any other devices except a laptop computer during software uploads.
15. The maximum width dimension is 430mm to meet the rack standard. Height is 50mm, Depth 200mm.

For emphasis of clarity: the opto couplers and relays that provide earth isolation between the computers and other site equipment are all housed within the **SCADA Interface Unit** and not the **Arduino SCADA Module**.

Computer Hardware Specification

Arduino Mega 2560

Ethernet shield

8-port expansion board

Bill of Materials (BOM)

Per Arduino SCADA Module

Item	Description	Each	Approx Cost
1	Enclosure custom made: Aluminum 430wx200dx50h	1	\$50.00
2	Arduino Mega 2560	2	\$24.00
3	Expansion board PCF 8574/PCF 8574T 8 port	2	\$5.00
4	Ethernet shield	2	\$16.00
5	Red LEDs and clips	73	\$30.00
6	Toggle switch	3	\$2.50
7	DB15 analogue Connector	2	\$5.00
8	DB37 Digital Send and Receive data connectors	2	\$11.20
9	Power LED green	1	\$1.00
10	Power Supply 9V and 5V Linear Regulators (LM137T)	1	\$6.00
11	2.1mm power plug (12v connection)	1	\$2.50
Total:			\$153.20

Wiring and miscellaneous hardware is not included in this BOM

Node Site SCADA Interface Unit with Arduino Module on top



Remote Site SCADA Interface Unit with Arduino Module on top



Updated Drawings List:

Drawing 10 Schematic of SCADA System amended to show Arduino SCADA Modules

Drawing 11 Base Node SCADA Unit Block Diagram (Deleted)

Amended:

Drawing 11a renamed: **Drawing 11a Base Node SCADA for Controls**

Drawing 11b renamed: **Drawing 11b Base Node SCADA for Supervisory**

Drawing 11c renamed: **Drawing 11c Base Node SCADA Interface Unit Power Supply**

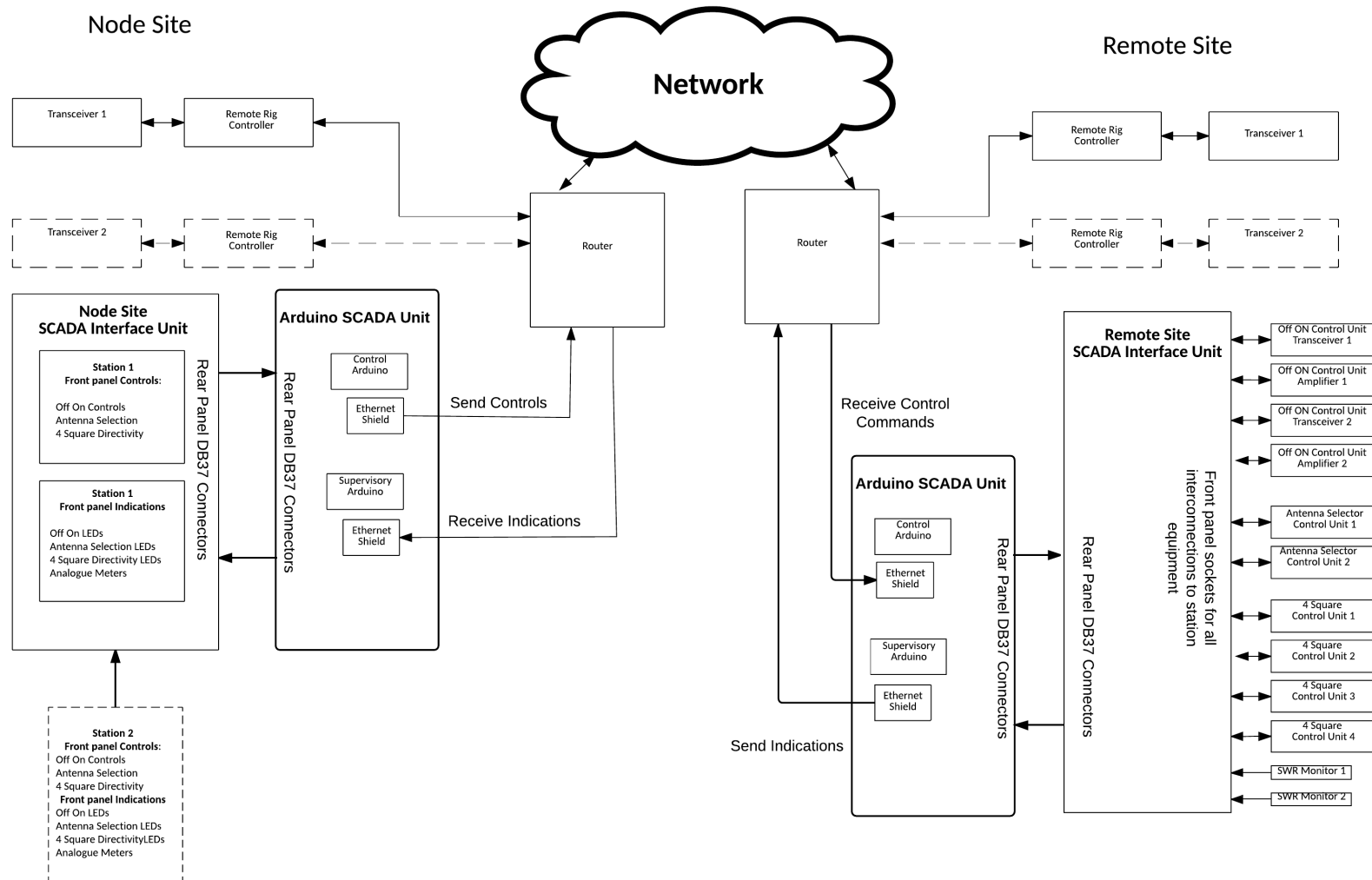
Drawing 12a renamed: **Drawing 12a Remote Site SCADA for Controls**

Drawing 12b renamed: **Drawing 12b Remote Site SCADA for Supervisory**

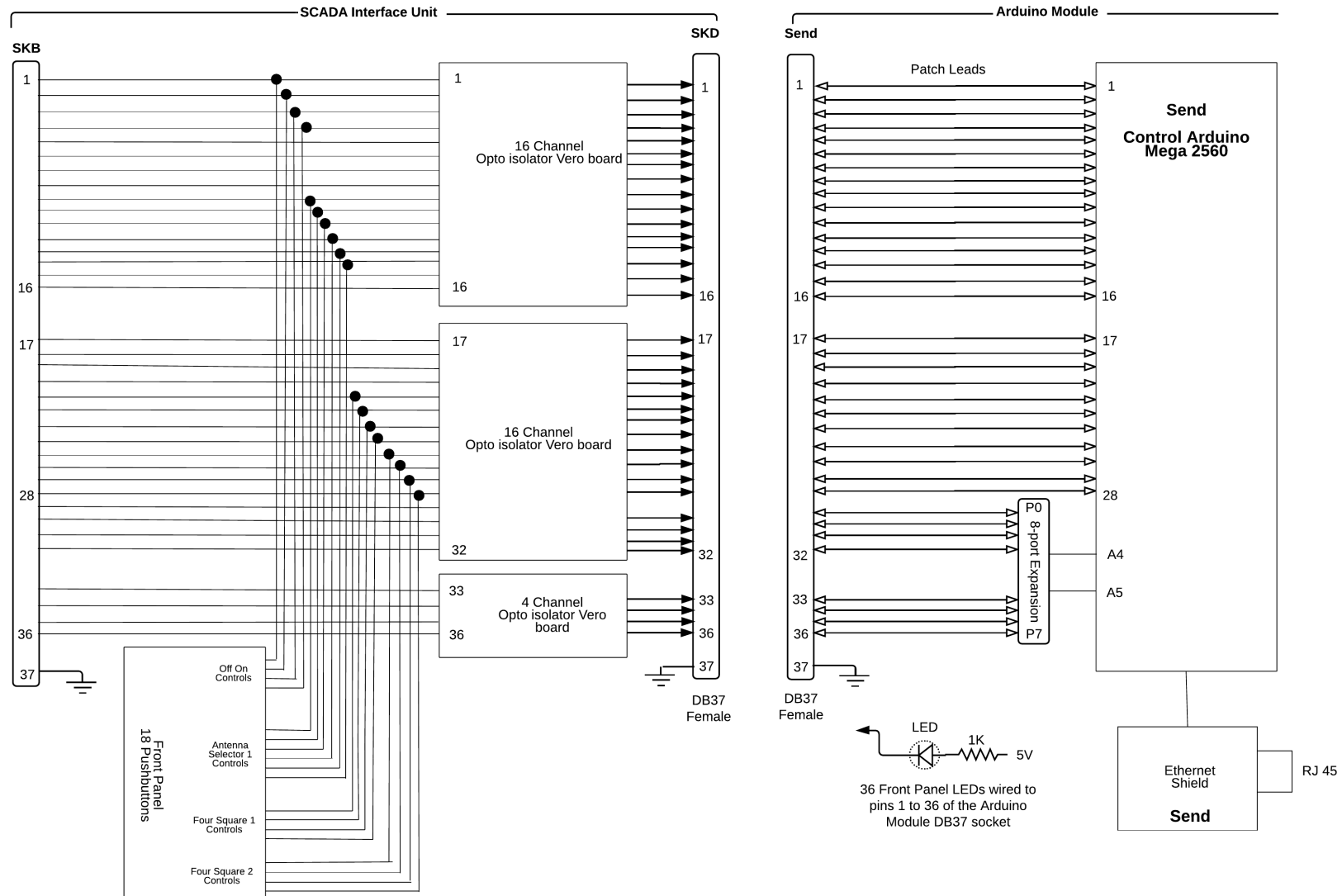
Drawing 12c renamed: **Drawing 12c Remote Site SCADA Interface Unit Power Supply**

These seven new drawings have been downloaded as .png files and pasted into this word document on the following pages:

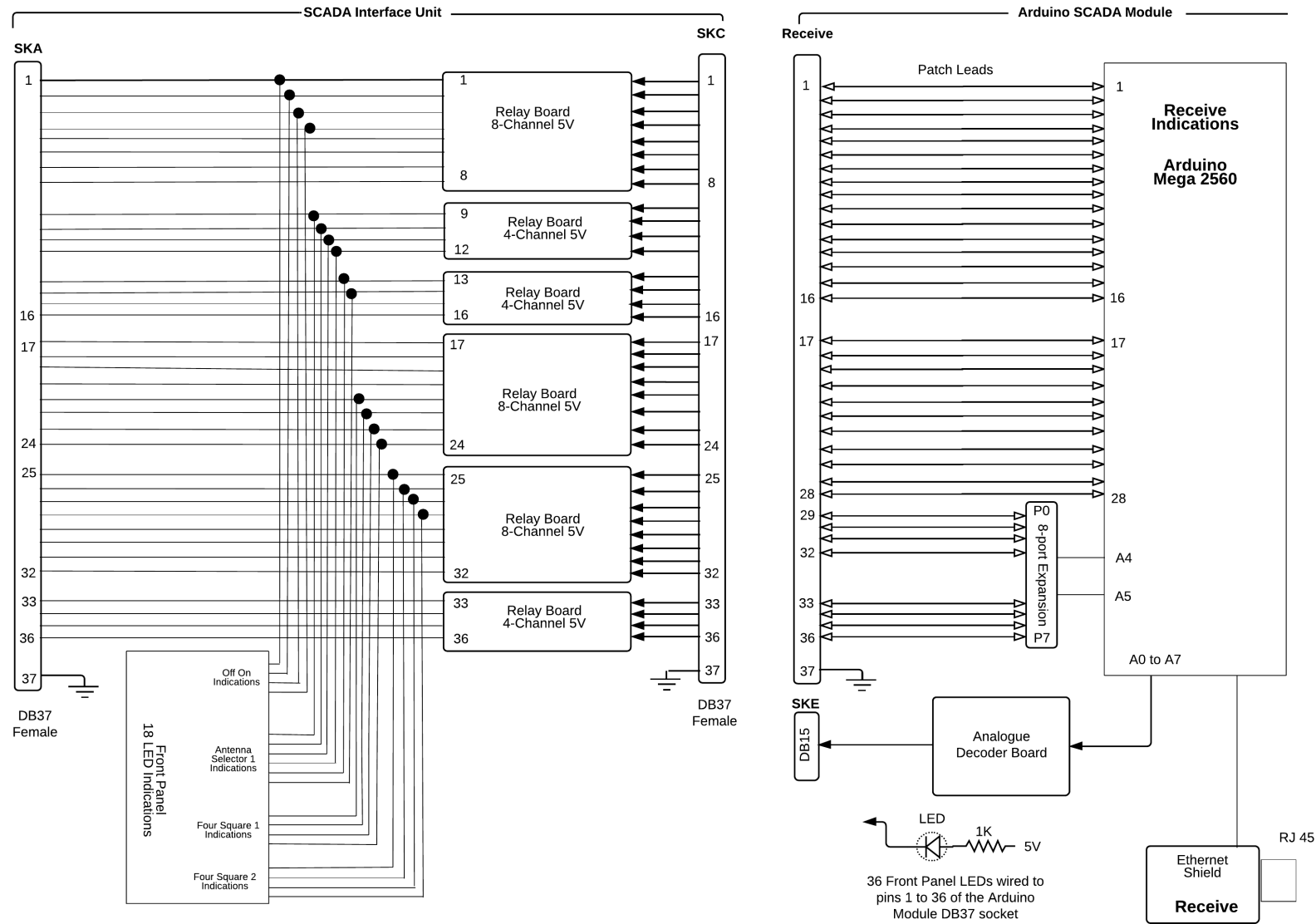
Drawing 10 Schematic of SCADA System
(As-Built 20171123)



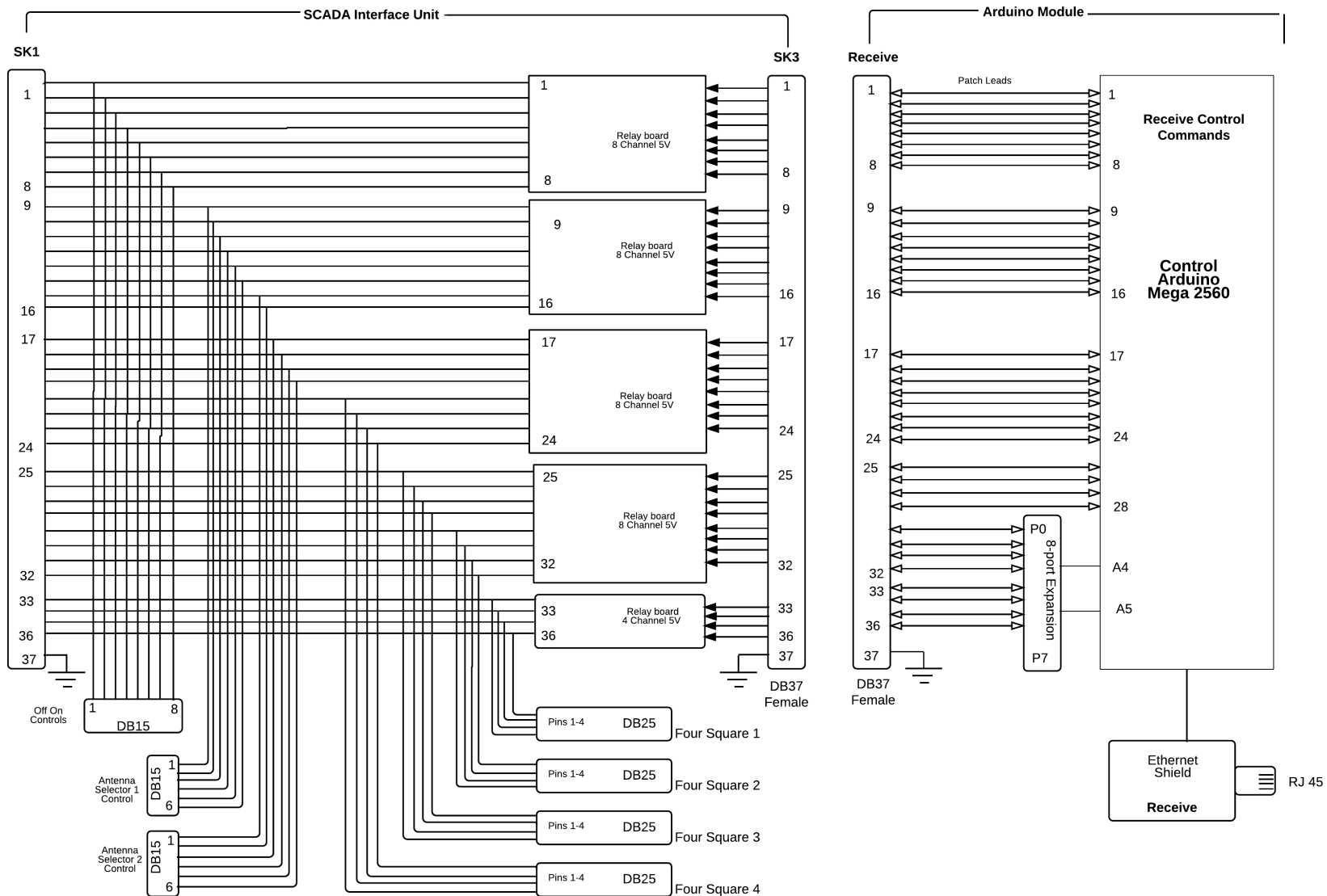
Drawing 11a Base Node SCADA for Controls



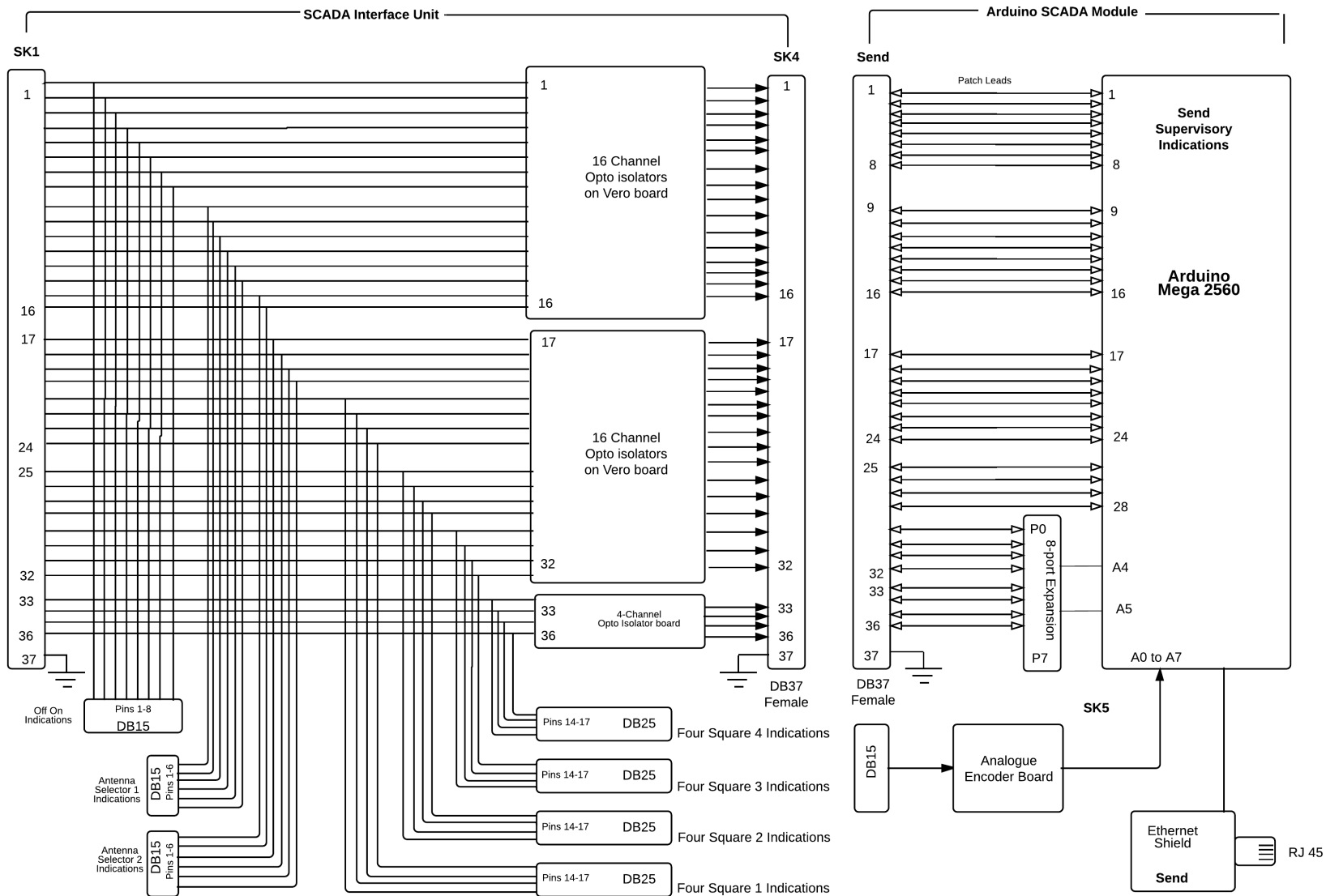
Drawing 11b Base Node SCADA for Supervisory



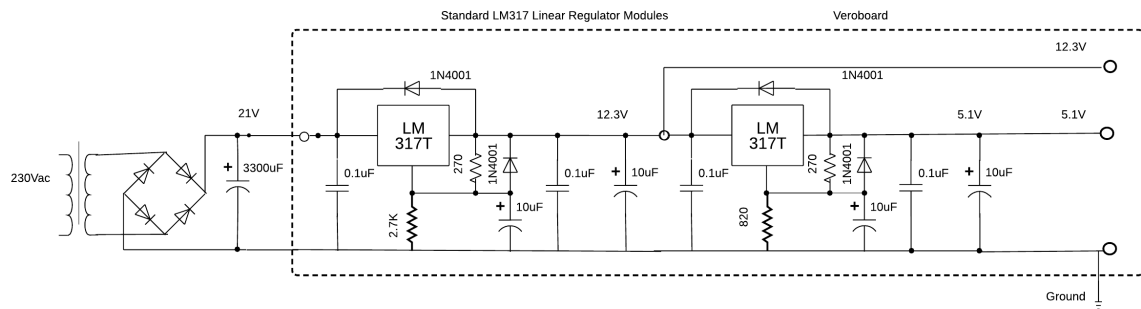
Drawing 12a Remote Site SCADA for Control



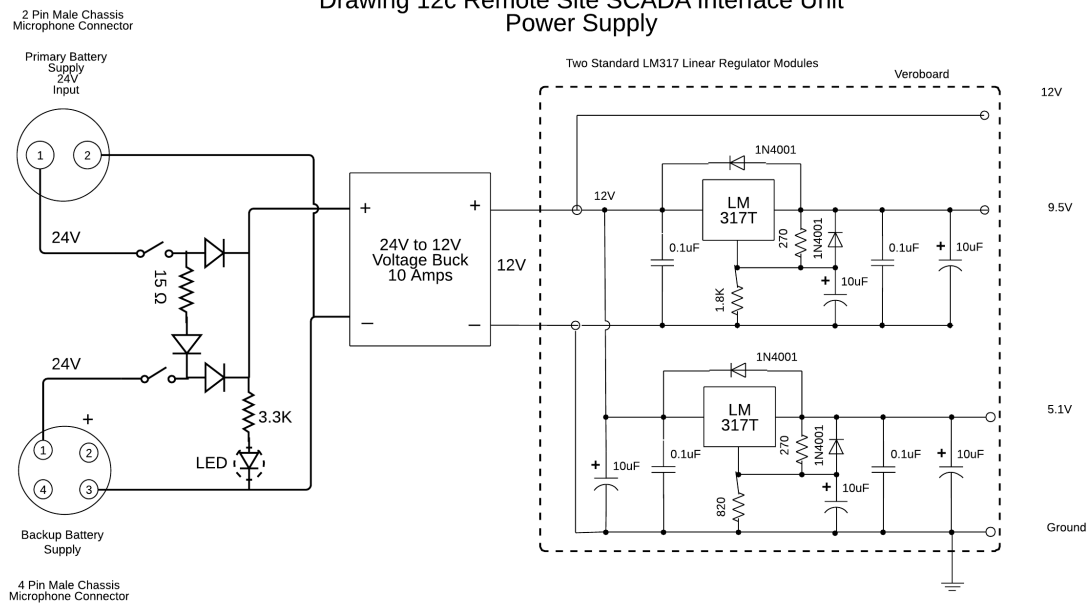
Drawing 12b Remote Site SCADA for Supervisory



Drawing 11c Base Node SCADA Interface Unit
Power Supply



Drawing 12c Remote Site SCADA Interface Unit
Power Supply



Arduino SCADA Module Power Supply

