Home

S-Pol Technical Wiki

Heading

Technical documentation for S-Pol and Ka-band.

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Attachments

There are currently no attachments on this page.

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Computer and Network Setup

Computer Configuration

Servers

Name	Model	Service Tag	Disk Space	Description	Disk configuration	spare disks?
mgen1	R510		6TB	new	4 - 2TB SATA drives - RAID 5	
mgen2	PE 2950	7SXTFD1		current mgen		
pgen1	PE 2950	9SXTFD1		current pgen	750 GB internal (250GBx5) 12 TB Triton attached	
pgen2	PE 2950	CPF1GF1		current raid2	6 - 2TB SATA drives- RAID 6	
control1	R510		2TB	32 bit	2 -2TB SATA drives - RAID 1	

control2	PE 1850	H58HKB1		32 bit (current ate)	300GB SCSI	
control3	PE 1950	H8VGFD1		old spol-gate		

RVP8 configuration

Building the RVP8 Kernel module

After upgrading the kernel, it may be necessary to build a new kernel module.

As root:

```
cd /usr/sigmet/src/rda/kernelmod
make clean
make install
rdasys stop
rdasys start
```

Updating flash memory

```
rdaflash -program rvp8rx-0
rdaflash -program rvp8rx-1
```

RVP8 support files

Support files for RVP8 are found here

System Administration

Cloning the RPMs from one system to another

(This hint based on a posting by Russ Herrold on freshrpms.net)

```
rpm -qa --qf '%{name}\n' | sort | uniq > /tmp/allpkgs.txt  # list of rpms - copy to another computer
```

```
#!/bin/sh
# /net/adm/scripts/yum_clone
#
# install missing RPMS from a sorted list

# get my list
mine=/tmp/mypkgs.txt
rpm -qa --qf '%{name}\n' | sort | uniq > $mine
# install list of missing RPMS
yum --nogpgcheck -y install `comm -23 $1 $mine`

# check for packages that we couldn't install
rpm -qa --qf '%{name}\n' | sort| uniq > $mine

echo 'Missing Package :' `comm -23 $1 $mine`
```

Configuring Multicast routing for RSM

spol-gate needs the following lines added to /etc/rc.d/rc.local to correctly route multicast packets, so RSM packets can be received by syscon:

```
# route RSM multicasts on internal network
route add 224.0.0.3 eth0
```

Distributing computer configuration files

Files that need to be updated for all computers are found on /net/adm/master. /net/adm/scripts/jengine copies file from /net/adm/master to each computer's '/' directory. This provides an easy mechanism of updating common files on all Linux computers, such as

- /etc/passwd
- /etc/group
- NTP
- Yum
- auto-mounter
- Nagios

In the future, we may use a more sophisticated configuration management tool, like Puppet .

Domain Name Service

spol-gate runs a caching nameserver for the S-Pol network.

Git Configuration

Creating the repository

We use gitosis to create a local Git repository. Add lines like the following to gitosis.conf

```
[group etc-rw]
writable = control1_etc control2_etc
members = root vanandel
```

Note: even if you are logged in as root, you may need to give yourself write permission for these repositories

Tracking changes to /etc

We use etckeeper to track changes to /etc on each server. Install as follows:

```
yum install git-all
cd /net/src/pub/etckeeper
make install  # ignore bzrlib.errors
etckeeper init
cd /etc
git commit -a
git remote add origin  gitosis@spolgit:<HOSTNAME>_etc
git push origin master
```

Local Yum Repository

We maintain our own mirror of operating system updates, in /var/www/html/centos

Our configuration is based on How to setup up a private CentOS mirror

On spol-gate, install:

```
/etc/httpd/conf.d/centos_repo.conf
/usr/local/etc/sync_centos_repo
```

from

```
http://eol-git.guest.ucar.edu/spol_gate_filesys.git
```

and create a crontab entry to update the local repository:

```
5 0 * * *  /usr/local/etc/sync_centos_repo
```

All spol computers can then fetch updates from the local copy of the repository, by disabling the 'mirrorlist' and editing the following line in the 'updates' section of /etc/yum.repos.d/CentOS-Base.repo

```
baseurl=http://spol-gate/centos/$releasever/updates/$basearch/
```

You may find Installing RPMForge helpful for configuring other repositories:

Building and Installing NCAR Software

Building and Installing HAWK

(based on README_LINUX_SETUP.txt by Mike DIxon)

1. Hardware requirements

CPU: 3.0+ GHz 32-bit, or 2.5+ GHz 64-bit.
    Dual- or quad-core are good.

RAM: 4+ GBytes

Disk: 500 GB+

Graphics: 256 MByte, 1600 x 1200 or better

2. LINUX distribution

Most good, up-to date distributions should work.

Recommended distributions are:

  Ubuntu
  Centos
  Debian
  Fedora

For 64-bit systems, Centos-5 is recommended, since you can build
64-bit and 32-bit binaries on the same system. See below.

3. Packages

Required development packages for compiling:

  tcsh
  perl

  gcc
  g++
  gfortran

  libX11-devel (for X)
  imlib2-devel (for CIDD)
  fftw3-devel development (for radar moments)
  bzip2-devel (for NEXRAD decompression)
  jasper-devel (for grib2)

flex
qt4-devel (for Qt apps)
glut-devel (for Open GL)
expat-devel (for udunits)

xvfb (virtual X server)
gufw (firewall - configure to allow ssh in)
sshd (ssh logins)

4. Installing NetCDF 4

HAWK depends on the NetCDF 4 library, which in turn depends on hdf5 and ununits2.

See building_netcdf.howto.txt for compiling and installing these libraries.

5. 32-bit vs 64-bit

The CIDD display must be compiled in 32-bit mode.

The simplest approach is to install a 32-bit OS, even if you have 64-bit hardware.

If you want to use a 64-bit OS, Centos-5 seems the best. This distribution allows you to link against either 32-bit or 64-bit libraries.

6. Setting up 32-bit libraries on 64-bit CENTOS.

If you do have a 64-bit Centos OS, and you want to compile the CIDD display, you will need to get access to some extra packages.

(a) EPEL - Extra Packages for Enterprise Linux

Install the epel package

(b) DAG

Create a new file in /etc/yum.repos.d called dag.repo, with the following contents:

```
[dag]
name=Dag RPM Repository for Red Hat Enterprise Linux
baseurl=http://apt.sw.be/redhat/el$releasever/en/$basearch/dag
gpgcheck=0
enabled=1

[dagi386]
name=Dag RPM Repository for Red Hat Enterprise Linux - 32bit
baseurl=http://apt.sw.be/redhat/el5/en/i386/dag
gpgcheck=0
enabled=1
```

7. Setting up larger shared memory segments for time series work
---

If you set up an advanced HAWK ingest system which reads time series data into a shared memory FMQ, you will need to increase the max size of the shared memory segments, since the default max size is quite low.

Check the shared memory size as follows:

```
cat  /proc/sys/kernel/shmmax
```

To increase the shmem max size at boot time, add the following to your /etc/rc.d/rc.local file:

```
    echo shared_memory_size > /proc/sys/kernel/shmmax
```

where shared_memory_size is the amount of shared memory you want to declare in bytes. Set the max size to say 200Mb, i.e. 200000000.

8. Setting larger UDP packet receive buffers

If your system receives data via UDP, you will probably want to
increase the size of the receive buffers.

To do this at boot time, add the following to
your /etc/rc.d/rc.local file:

```
echo udp_read_buffer_size > /proc/sys/net/core/rmem_max
```

Set udp_read_buffer_size to something like 10 Mbytes, i.e. 10000000.

9. operator account

Create a 'operator' account for running titan.

The login shell should be 'csh' or 'tcsh'.

10. Data area.

On a disk partition with plenty of space, create a top-level
directory for data.

Normally, we call it

```
/d1/operator/data
```

After the titan installation is complete, you can optionally
move projDir/data/* into this area, or link to it.

11. Running java apps from .jar files

If you want to run SysView and/or jadeite, you will at least
need the java run-time environment.

Install either the java 1.6 jre (run-time environment) or the
java 1.6 jdk (development kit) in:

```
/usr/java/latest
```

12. Building java apps

To build the java apps, you will need:

(a) java 1.6 jdk (development kit) in:

```
/usr/java/latest
```

(b) ant build tools in:

```
/usr/local/ant
```

(c) ant contribs:

The following is the link for the ant contribs:

```
http://ant-contrib.sourceforge.net/
```

After download ant-contrib-1.0b2-bin.tar.gz, and untarring, the file

```
ant-contrib*.jar
```

must be manually copied to the:

```
/usr/local/ant/lib
```

Ant will automatically look for it there.

Building and Installing UI_Server (CentOS 5.5)

Introduction

The UI_Server task is the web-based application used to control the S-Pol and CHILL radars. It communicates with **syscon.** The source code is located at /net/src/eol/ui_server, or can be checked out:

```
cd /net/src/pub/eol
git clone gitosis@eol-git.guest.ucar.edu:wt_radarcontrol ui_server
```

Build and install prerequisites

- yum --nogpgcheck install scons cmake git-all autoconf automake glib2-devel doxygen sqlite-devel
- yum erase boost # don't want old version installed - it confuses json_spirit

Note - both Wt and Json_spirit depend on Boost. Since we sometimes need to test with a different version of Boost than is used for production, we install Boost, Wt, and json_spirit in versioned directories.

As root, Build and install boost (http://www.boost.org)

```
cd /net/src/pub/boost_1_XX_Y
rm -fr bin.v2  # required if building for a different architecture
./bootstrap.sh --libdir=/usr/local/boost_1_XX_Y/lib --includedir=/usr/local/boost_1_XX_Y/include
./bjam --clean # required if building for a different architecture
# build debug, threaded,shared variant, but omit compiler versions and boost version numbers from
libraries
./bjam --build-type=minimal  --layout=system --without-mpi \
variant=debug link=shared threading=multi runtime-link=shared  \
install
```

As root, build and install Wt (http://www.webtoolkit.eu/wt#/)

```
cd /net/src/pub/wt-3.1.X/build
cmake -DCMAKE_INSTALL_PREFIX=/usr/local/boost_1_XX_Y/wt-3.A.B  \
-DBOOST_PREFIX=/usr/local/boost_1_XX_Y -DCONFIGURATION=/usr/local/etc/wt/wt_config.xml \
../
# you may have to edit CMakeCache.txt to disable PostGres, HARU, and GM
make  -j4
OR
make install     # install already built package
```

As root, build and install Spirit JSON library (http://www.codeproject.com/KB/recipes/JSON_Spirit.aspx).

Please note you must register (free) to download the source code.

```
cd /net/src/pub/json_spirit_v4.0X
mkdir build32; # (or build64) if appropriate
cd build
cmake -DCMAKE_INSTALL_PREFIX=/usr/local/boost_1_XX_Y/json_spirit_v4.0X
-DBoost_INCLUDE_DIR:PATH=/usr/local/boost_1_XX_Y/include ..
mkdir -p /usr/local/boost_1_46_1/json_spirit_v4.0X/lib

cd json_spirit
make
cp -p libjson_spirit.a /usr/local/boost_1_46_1/json_spirit_v4.0X/lib

cd ../..
cp -p json_spirit/*.h /usr/local/boost_1_46_1/json_spirit_v4.0X/include
```

build libnova, used by syscon (http://libnova.sourceforge.net/)

```
cd /net/src/pub/libnovaXXX
make distclean   # if building for a different architecture
./configure
make; make install
```

checkout CHILL's cdp source code

(ui_server uses include files and source from cdp)

```
cd /net/src/chill
git clone  gitosis@lab.chill.colostate.edu:cdp
```

build syscon

```
cd /net/src/chill/cdp/syscon
make distclean   # if building for a different architecture
autoreconf
./configure
make
```

Build and install ui_server

(git clone gitosis@eol-git.guest.ucar.edu:wt_radarcontrol ui_server)

```
cd /net/src/eol/ui_server
# edit buildOptions.py to contain the correct paths to packages
#----------------------------
cdp_path="/net/src/chill/cdp"
doxygenProgram='/usr/bin/doxygen'
wt_path='/usr/local/boost_1_46_1/wt-3.1.8'
boostPath='/usr/local/boost_1_46_1'
boostExtension=''
json_spirit_path='/usr/local/boost_1_46_1/json_spirit_v4.03'
configDirectory='/home/operator/projDir/UI_Server'
#----------------------------
scons
scons install
chown -R operator /home/operator/projDir/UI_Server/ /home/operator/projDir/system/scripts/
```

Installing Display software from EOL rpms

System Monitoring and Control

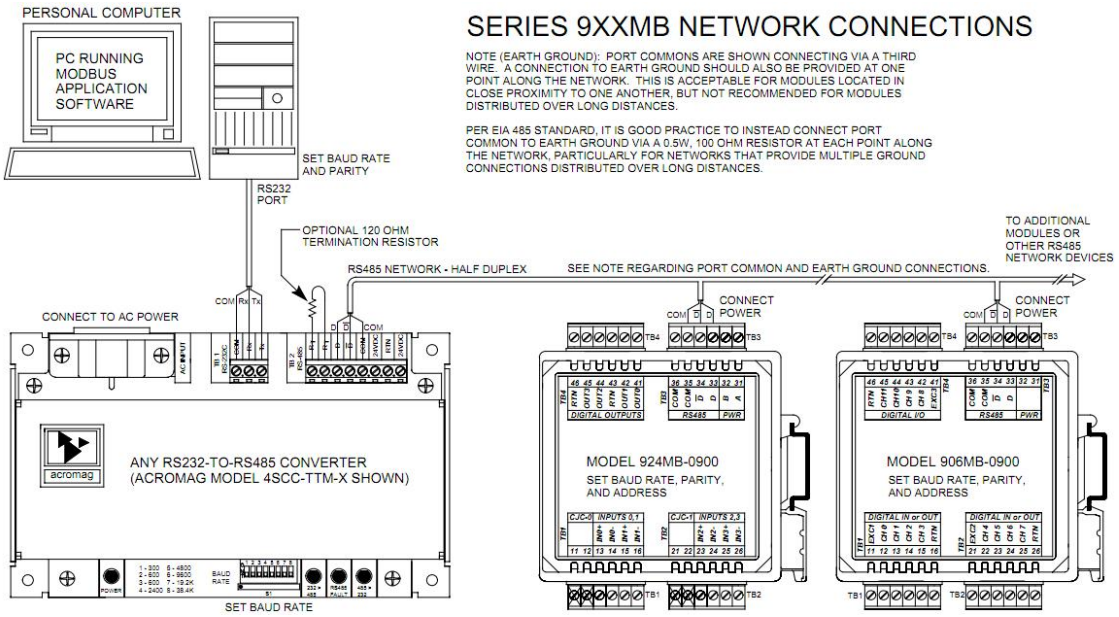
Acromag Pages

Overview

The Model 901MB supports up to 12 digital inputs. The Model 903MB supports up to 12 tandem digital input and output channels. Each 900MB module provides an isolated RS485 network I/O path utilizing the Modbus protocol. Socketed I/O pullup resistors are installed and pull the I/O channels up to the EXC+ terminal. These resistors can be removed or exchanged according to application requirements. The unit can be powered from common 24VAC power. Modules are DIN-rail mounted

Full manual can be found at:
http://www.acromag.com/sites/default/files/901_902_903mb_631h.pdf

Communication Wiring



Configuring Modules

The modules can be configured with the windows software provided from Acromag http://www.acromag.com/resource_finder_result/Drivers%20and%20Updates/382 or any other software capable of sending Modbus protocol commands over an RS485 network.

Default Parameter Configuration

Module Address 247

Baud Rate 9600bps

Parity None

Stop Bits 1 or 2 (When Parity = None)

Response Delay 0 (No Additional Delay)

Watchdog Time (Each Port) 0 (Disabled)

Timeout State (Each Port) 65535 (FFFFH) = No Change

Pullup Resistor To EXC+ 5.6K Installed (In Sockets)

Note: Do not confuse the Default Factory Configuration noted above with the Default Communication Mode, which refers to the fixed baud rate, module address, parity, and stop bit settings achieved by pushing the Default Mode button until the status LED flashes ON/OFF. The Default Communication Mode will temporarily over-ride any factory configuration of baud rate, module address, parity, and stop bits with settings of 9600bps, 247, None, and 1 or 2, respectively. It is provided as a convenient means of achieving communication with a module when these parameters are unknown.

Default Mode Switch

A push-button default mode switch (DFT) and status LED are provided at the front of the module as a convenient way of communicating with the module when its baud rate and address settings are unknown. Push & hold this button until the Status LED flashes ON/OFF to indicate the module is in the Default Communication Mode with a fixed module address of 247, baud rate of 9600bps, no parity, and 1 or 2 stop bits. It is most convenient to configure a module in this mode, then leave the default mode by pressing this button again until the Status LED stops flashing (constant ON or OFF), or by resetting the module. Note that a rapidly flashing Status LED indicates a watchdog timer timeout has occurred and this may temporarily mask default mode indication. The Default Mode is disabled following a software or power-on reset. New communication parameters (for baud rate, address, and parity) will take effect following a reset of the module and the module will leave the Default Mode

Command Set Syntax

Register map can be found in the acromag's user manual (page 6-8).

ADAM Pages

Overview

The ADAM 4000 modules are controlled by ASCII commands from a host computer transmitted via RS 485. Each module is powered individually and operates at voltages +10 VDC to +30 VDC (design for optimal operation at industrial +24VDC). Modules are DIN railed mounted and stackable.

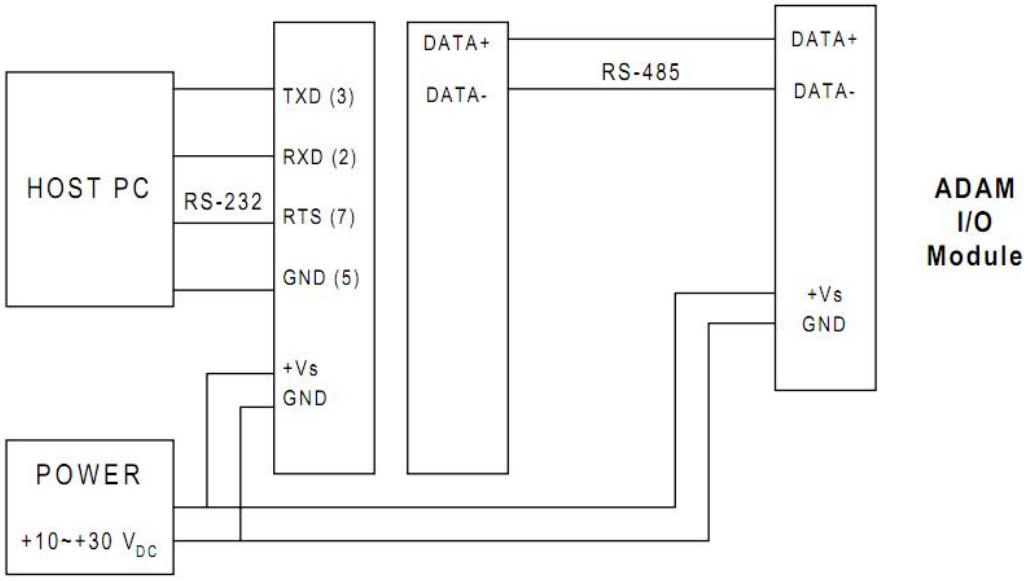
Communication Wiring

Shielded-twisted-pair cables that comply with the EIA RS-485 standard are recommended to reduce interference. Only one set of twisted-pair cables is required to transmit both Data and RTS signals. The following colors are used as standard by the manufacturer for the communication lines:

DATA+ (Y) Yellow
DATA- (G) Green

The ADAM-4018+ has 16-bit, 8-channel thermocouple analog inputs that have programmable input ranges on all channels. opto-isolated inputs provide 3000 VDC isolation between the analog input and the module, protecting the module and peripherals from damage due to high input-line voltages. The ADAM-4018+ uses a 16-bit microprocessor-controlled sigma-delta A/D converter to convert sensor voltage or current into digital data. The digital data is then translated into engineering units. When prompted by the host computer, the module sends the data to the host through a standard RS-485 interface.
Baud rates from 1200 bps to 38.4Kbps can be used with the ADAM modules. All modules in an RS-485 network must have the same baud rate. The factory default setting is 9600 baud, address 01 (hex). A repeater is only needed when the amount of ADAM modules surpassed 256 units (or 32 at above 1200 m/4000ft of communication lines) none of the limitation applies to the spol system.

ADAM Module w. Isolated RS-232/RS485 Converter



() = pin number on EIA – 232-D connector (RS 232)

Manual for the 4000 series can be downloaded from:
http://www.bb-elec.com/bb-elec/literature/manuals/Advantech/ADAM-4000.pdf

Configuring modules

All of the ADAM modules can be configured remotely through their communication ports, without having to physically alter pot or switch settings. Several software configuration and module detection options are available from Advantech. Unfortunately many are dated and not compatible with current systems including the shipped version. Proven to function in this project is “Software ADAM-4000-5000 Utility (Ver 4.00.06) for Windows 95/98/ME/2000/Xp” that can be downloaded at
http://support.advantech.com.tw/support/DownloadSRDetail.aspx?SR_ID=1-9HOC2

The software will at start up scan for available serial ports (real and virtual) and will provide a graphical configuration interface for each found port to easy set up by the user. ADAM modules can also be configured by issuing direct commands from within a terminal emulation program that is part of the ADAM utility software. Every module has an input terminal labeled INIT*. By booting the module while connecting the INIT* terminal with the module’s GND terminal, the modules configuration is forced into a known state. Forcing the module in the INIT* state does not change any parameters in the module’s EEPROM. When the module is in the INIT* state with its INIT* and GND terminals shorted, all configuration settings can be changed and the module will respond to all other commands normally. After reconfiguration, all modules should be powered down and powered up to force a reboot and let the changes take effect.

INIT* state defaults:
Baud rate: 9600

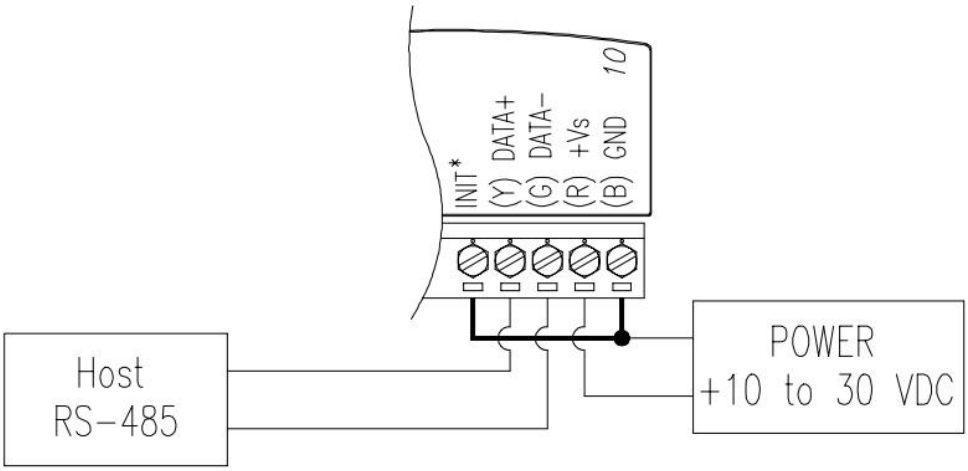
Address: 00h
Checksum: disabled

To alter baud rate or checksum settings you must perform the following steps:

• Power on all components except the ADAM Module.

• Power the ADAM module on while shorting the INIT* and GND terminals (see figure below).

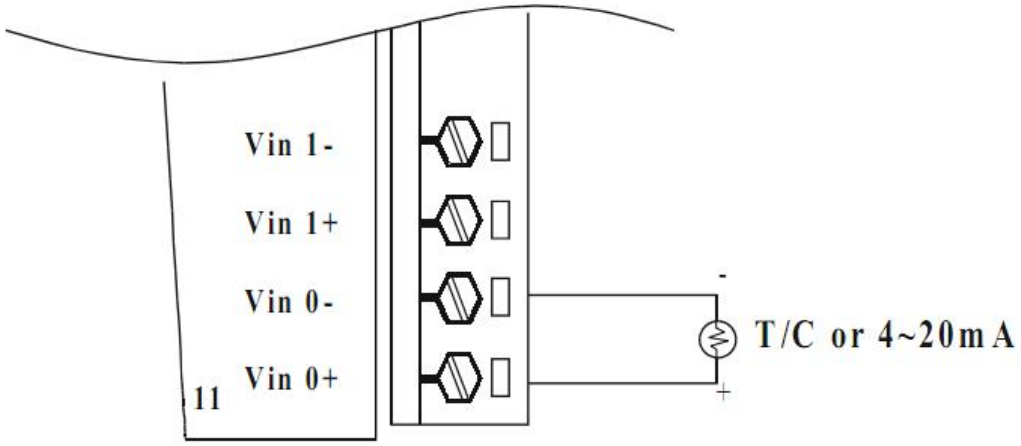
Grounding the INIT* Terminal



Technical specification of ADAM-4018+

Channel	8
Input Type	Thermocouple
T/C type and Temperature Range	J 0 ~ 760 C K 0 ~ 1000 C T -100 ~ 400 C E 0 ~ 1000 C R 500 ~ 1750 C S 500 ~ 1750 C B 500 ~ 1800 C
Isolation Voltage	3000 V_{DC}
Fault and overvoltage protection	Withstands over voltage up to +/- 35 V
Sampling Rate	10 sample/sec (total)
Input Impedance	20 MΩ
Accuracy	+/- 0.1% or better
Power Consumption	0.5 W
I/O Connector Type	10-pin plug-terminal

ADAM-4018+ Wiring Diagram



Thermocouple details
We use 'J' series thermocouples. The red lead is negative.

4055 Technical Spec.

The ADAM-4055 has 8-channels isolated digital input and 8-channels isolated digital output for critical applications. The inputs accept 10~50V voltage, and the outputs supply 5~40VDC open collector.

• Number of Input Channel : 8 (4-channel/group)

• Optical Isolation : 2500 VDC

• Opto-isolator response time : 25 µs

• Over-voltage Protect: 70VDC

• ESD (Electro Static Discharge): 2000 VDC

• Input Voltage:

Dry Contact Logic level 0: Close to GND

Logic level 1: Open

Wet Contact Logic level 1: 10 ~ 50 V

Logic level 0: 3 V

Dry Contact & Wet contact SelectableI/O Modules

3 - 4 4 ADAM 4000 Series User's Manual

• Number of Output Channel: 8 (8-channel/group)

• Optical Isolation: 2500 VDC

• Opto-isolator response time: 25 µs

• Supply Voltage: Open Collector 5 ~ 40 VDC

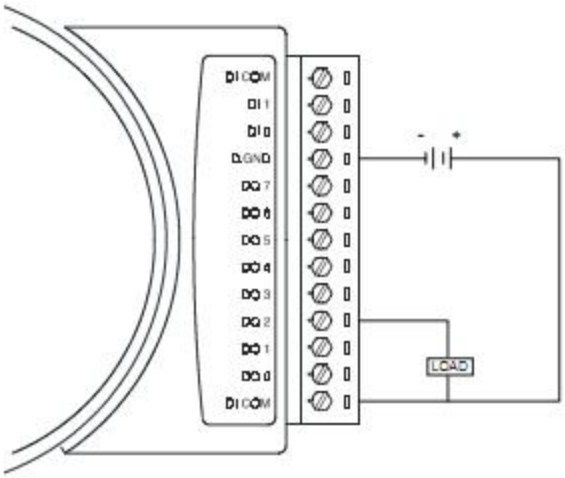
• Sink Current: 200 mA max/channel

• LED Indicator: On: Active Off: Non-active

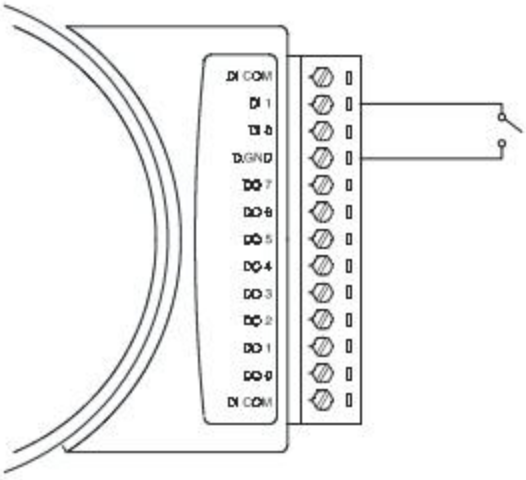
• Power Consumption: 1 W

• I/O Connector Type: 13-pin plug-terminal * 2

ADAM-4055 Wiring Diagram



Digital Output wiring (ADAM-4055)



Digital Input Dry Contact Wiring (ADAM-4055)

Command Set Syntax [Chapter 4-2]

[delimiter character][address][command][data][checksum] [carriage return]

Every command begins with a delimiter character. There are four valid characters: a dollar sign $, a pound sign #, a percentage sign % and an at sign @.The delimiter character is followed by a two-character address (hexadecimal) that specifies the target module. The actual two character command follows the address. Depending on the command, an optional data segment follows the command string. An optional two character checksum may be appended to the total string. Every commands is terminated by a carriage return (cr). All commands are in UPPERCASE.

ADAM 4018+ command set can be found in the user manual, chapter 4-20 (page104)
ADAM 4055 command set can be found in the user manual chapter 4-30 (page114)

Input Range Code (Hex) Input Range for 4011,4011D,4018,4018+,4018M

00 ± 15 mV
01 ± 50 mV
02 ± 100 mV
03 ± 500 mV
04 ± 1 V
05 ± 2.5 V
06 ± 20 mA1
0E Type J Thermocouple 0o to 760o C
0F Type K Thermocouple 0o to 1370o C
10 Type T Thermocouple -100o to 400o C

11 Type E Thermocouple 0o to 1370o C
12 Type R Thermocouple 500o to 1750o C
13 Type S Thermocouple 500o to 1750o C
14 Type B Thermocouple 500o to 1800o C

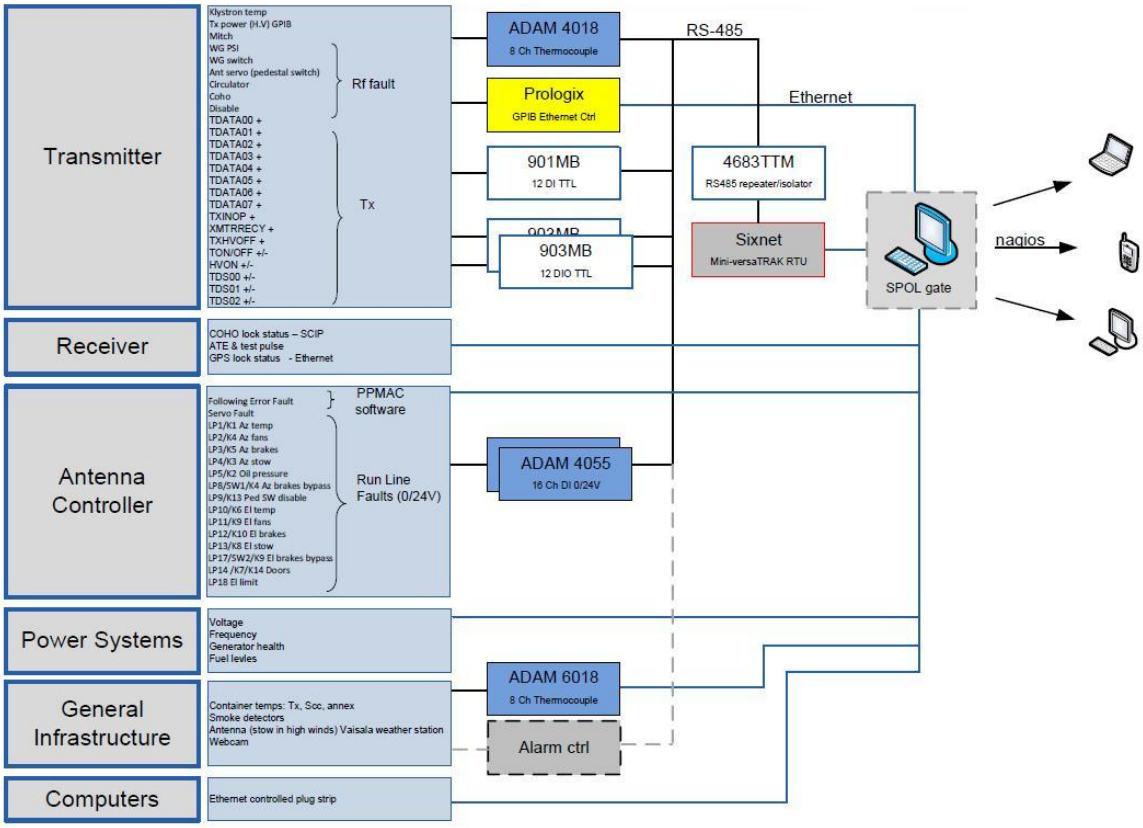
Hardware Overview Pages

Manuals for modules

Cost estimates of IO modules

Transmitter container UPS connections

Overview of Fault Monitored Signals



Cost estimates of IO modules

IOmodules_version5.pdf

COST EXAMPEL AND CONFIGURATION FOR SPOL FAULT MONITORING IO's

List of I/O modules
ADAM 4018 + -BE thermocouple (rs 485/modbus).
ADAM 6018 BE & nbsp; thermocouple (Ethernet/ tcp modbus).
ADAM - 4053 16 Ch DI 0/24V ~~(rs 485/modbus).~~
ADAM - 4055 16 Ch DIO 0/24V (rs 485/modbus).
ACROMAG - 903MB 12 Ch DIO 0-35 V – (true) TTL compatible (rs 485/modbus).
ACROMAG - 901MB 12 Ch DI 0-35 V – (true) TTL compatible (rs 485/modbus).
ACROMAG - 924MB 4 Ch thermocouple (rs 485/modbus).
ACROMAG - 4683 RS 485 isolated rep (rs 485/modbus).
ACROMAG - PS5R-SB24 24V/600mA power supply, din rail, slim line.
Comm-Front HUB-485-4 Isolated RS 485 hub (no protocol).
PortServer TS 1 MEI RS485 to Ethernet
Trendnet 100Base-TX 2 FX (multimode)

- Included in all examples is an isolator/repeater as an extra precaution to protect the sixnet and whatever is behind the sixnet. The cost for this unit is $341 ($682 with a spare).

- Multimode fiber cost is not included.

- **Example 1 and 2** rely on Modbus RS-485 communications, with copper cables going in-between containers. All Acromag modules have isolated outputs, ADAM are mixed hence the added CommFront isolator.

- **Example 3** is a mix of RS 485 and Ethernet (Modbus RS 485/TCP) with fiber in-between containers.

- **Example 4** rely on RS 485 but the communications between containers in via Ethernet and fiber.

- **Example 5** Dynamo configuration

- System cost without spares ranges from $3045.00 (Example 1) - $4160.00 (Example 4)
Spare cost range from $1600-2000.

Example 1 – Acromag dominant RS 485

TX container
1 x ADAM – 4018 ($285)* $0
1 x ADAM - 4053 $125 .00
2 x 903MB (unit $310) $620.00
1 x 901MB $285.00
1x 4683 RS 485 isolated rep.** $341.00
1x PS5R-SB24 Power supply*** $95.00
SSC/Annex
1 x 924MB $415.00
1x PS5R-SB24 Power supply*** $95.00

Generator container
1 x 924MB $415.00
1x PS5R-SB24 Power supply*** $95.00
1x Trendnet 100Base-TX 2 FX $49.00
(For transfer switch)

Fuel tank container
1 x 924MB $415.00
1x PS5R-SB24 Power supply*** $95.00

TOTAL COST: $3045.00

Spares
* *1 x ADAM – 4018 $285.00
1 x ADAM - 4053 $125 .00
2 x 903MB $310.00
1 x 901MB $285.00
1x 4683 RS 485 isolated rep.**$341.00
1 x 924MB $415.00
1x Trendnet 100Base-TX 2 FX $49.00
1x PS5R-SB24 Power supply*** $95.00
Spare cost $1905.00

TOTAL COST w. SPARES: $4950.00

Example 2 – Advantech/ADAM dominant RS 485

TX container
1 x ADAM – 4018 ($285)* $0
1 x ADAM - 4053 $125.00
2 x 903MB (unit $310) $620.00
1 x 901MB $285.00
1x 4683 RS 485 isolated rep.** $341.00
1x PS5R-SB24 Power supply*** $95.00

SSC /Annex
1 x ADAM – 4018 $285.00
1x Comm-Front HUB-485-4 $149.95
1x PS5R-SB24 Power supply*** $95.00

Generator container
1 x ADAM – 4018 $285.00
1x Comm-Front HUB-485-4 $149.95
1x PS5R-SB24 Power supply*** $95.00

1x Trendnet 100Base-TX 2 FX $49.00
(For transfer switch)

Fuel tank container
1 x ADAM – 4018 $285.00
1x Comm-Front HUB-485-4 $149.95
1x PS5R-SB24 Power supply*** $95.00

TOTAL COST: $ 3104.85

Spares
* *1 x ADAM – 4018 $285.00
1 x ADAM - 4053 $125 .00
2 x 903MB $310.00
1 x 901MB $285.00
1x 4683 RS 485 isolated rep.** $341.00
1x Comm-Front HUB-485-4 $149.95
1x Trendnet 100Base-TX 2 FX $49.00
1x PS5R-SB24 Power supply*** $95.00
Spare cost $1639.95

TOTAL COST w. SPARES: $4744.80

Example 3 – Acromag/ADAM RS 485 & Ethernet

TX container
1 x ADAM – 4018 ($285)* $0
1 x ADAM - 4053 $125 .00
2 x 903MB (unit $310) $620.00
1 x 901MB $285.00
1x 4683 RS 485 isolated rep.** $341.00
1x PS5R-SB24 Power supply*** $95.00

SSC/Annex
1x ADAM 6018 $450.00
1x PS5R-SB24 Power supply*** $95.00

Generator container
1x ADAM 6018 $450.00
1x PS5R-SB24 Power supply*** $95.00
1x Trendnet 100Base-TX 2 FX $49.00

Fuel tank container
1x ADAM 6018 $450.00
1x PS5R-SB24 Power supply*** $95.00
1x Trendnet 100Base-TX 2 FX $49.00

TOTAL COST: $3199.00

Spares
* *1 x ADAM – 4018 $285.00
1 x ADAM - 4053 $125 .00
2 x 903MB $310.00
1 x 901MB $285.00
1x 4683 RS 485 isolated rep.** $341.00
1x ADAM 6018 $450.00
1x Trendnet 100Base-TX 2 FX $49.00
1x PS5R-SB24 Power supply*** $95.00
Spare cost $1940.00

TOTAL COST w. SPARES: $5064.00

Example 4 – Acromag/ADAM RS 485 Ethernet Isolated

TX container
1 x ADAM – 4018 ($210)* $0
1 x ADAM - 4053 $125 .00
2 x 903MB (unit $310) $620.00
1 x 901MB $285.00
1x 4683 RS 485 isolated rep.** $341.00
1x PS5R-SB24 Power supply*** $95.00
PortServer TS 1 MEI $364.00

SSC/Annex
1 x ADAM – 4018 $285.00

1x PS5R-SB24 Power supply*** $95.00
PortServer TS 1 MEI $364.00

Generator container
1 x ADAM – 4018 $285.00
1x PS5R-SB24 Power supply*** $95.00
1x Trendnet 100Base-TX 2 FX $49.00
PortServer TS 1 MEI $364.00

Fuel tank container
1 x ADAM – 4018 $285.00
1x PS5R-SB24 Power supply*** $95.00
1x Trendnet 100Base-TX 2 FX $49.00
PortServer TS 1 MEI $364.00

TOTAL COST: $4160.00

Spares
* *1 x ADAM – 4018 $285.00
1 x ADAM - 4053 $125 .00
2 x 903MB $310.00
1 x 901MB $285.00
1x 4683 RS 485 isolated rep.** $341.00
1x Trendnet 100Base-TX 2 FX $49.00
1x PS5R-SB24 Power supply*** $95.00
PortServer TS 1 MEI $364.00
Spare cost $1854.00

TOTAL COST w. SPARES: $6014.00

Example 5 – Acromag/ADAM RS 485 & Ethernet
DYNAMO version

TX container
1 x ADAM – 4018 ($285)* $0
2 x ADAM - 4055 (unit $140) $280 .00
2 x 903MB (unit $310) $620.00
1 x 901MB $285.00
1x 4683 RS 485 isolated rep.** $300.00
1x PS5R-SB24 Power supply*** $95.00

SSC/Annex
1x ADAM 6018 $450.00
1x PS5R-SB24 Power supply*** $95.00

TOTAL COST: $2125.00

Spares
* *1 x ADAM – 4018 $285.00
1 x ADAM - 4055 $140 .00
1 x 903MB $310.00
1 x 901MB $285.00
1x 4683 RS 485 isolated rep.** $300.00
1x ADAM 6018 $450.00
1x PS5R-SB24 Power supply*** $95.00
Spare cost $1865.00

TOTAL COST w. SPARES: $3990.00

(no shipping, handling or tax included)

*) module already in place
**) Repeater/isolator in front of sixnet in option 1, is an extra precaution to ground/isolate inputs from all modules coming into the sixnet controller.
***) Advantech ADAM equivalent din rail power supply is $112.70

Manuals for modules

Advantech

Datasheets
ADAM-4018_DS.pdf

ADAM4050_52_53.DS.pdf

ADAM-6018_DS.pdf

User Manuals
ADAM-4000_manual_V15.pdf

ADAM-6000 Series_Manual_V3.pdf

Acromag

901/903MB Modules
901_902_903MB Multi-Channel Modbus RS-485 Discrete IO.pdf

Repeater Isolator
4683-TTM.pdf

Power Supply
PS5R-S Slim Line Universal Power Supplies.pdf

Configuration Software
[900C-SIP.pdf|Manuals for modules^900C-SIP.pdf]
configurating softwareIntellipack series 900.doc

Sixnet

Modbus_SIXNET.pdf
mipm manual.pdf

S-Pol TX container UPS connections

UPS #1 - serial number: JS0720007723 (usb connection to MGEN)

- **Rack 3 Avocent “smart” plug strip**

ATE power meter (outlet 1)

ATE multiplexer (outlet 2)

Triton RAID (outlet 3)

PMAC (outlet 7)

PGEN (outlet 8)

MGEN (outlet 10)

- **Rack 2 plug strip**

ATE computer

ATE signal generator

Intercom power supply

Rack mount power meters GPIB to Ethernet converter

UPS #2 - serial number: JS0722004399 (usb connection to PGEN)

- **Rack 4 Avocent “smart” plug strip**

RAID 1 (outlet 1)

RVP8 (outlet 3)

RAID 2 (outlet 8)

Gate (outlet 10)

- **Networking equipment plug strip**

8 port gigabit switch

Net “A” 24 port gigabit switch

ATE network 24 port gigabit switch

Engineering display

UPS #3 - serial number: JS0720007825 (usb connection to S-Pol Gate)

- **Rack 5 DC power supply chassis**
- **Rack 4 plug strip**

KVM switch

KVM monitor

Engineering display video splitter

Trend net fiber to Ethernet converter

Rack mount Test Pulse power meter

Rack mount TX power meter

Rack mount oscilloscope

- **Rack 5 plug strip**

Fans for DC power supply chassis

GPS

Trigger chassis

COHO signal generator

Nagios Pages

Installing Nagios

Install Nagios using the Open Monitoring Distribution (OMD) . The OMD bundles Nagios together with many important addons.

On a 64 bit host, create a symbolic link so apache can find the necessary dynamic libs used by OMD.

```
ln -s /usr/lib64/httpd /usr/lib  # only needed on 64 bit hosts
```

Run the commands:

```
# omd create prod
# omd start prod
```

For each server/workstation being monitored, install the check_mk agent plugin. This allows nagios to efficiently monitor multiple computers.

```
su - prod  # to configure the 'prod' site
```

Follow the instructions for getting started with check_mk, noting that check_mk's configuration is in ~prod/etc, rather than '/etc'. Once you have added hosts to ~prod/etc/check_mk/main.mk, run

```
check_mk -II
check_mk -O
```

Troubleshooting:
If after manually editing nagios configurations files, nagios won't start, run the command

```
/omd/sites/prod/bin/nagios -v /omd/sites/prod/tmp/nagios/nagios.cfg
```

to determine what is wrong with your configuration files.

monitoring RAIDs

Monitor the Dell RAIDs

- Install Dell's Open Manage package
- Install check_openmanage
- Add the following line to /etc/check_mk/mrpe.cfg

```
OpenManage  /usr/lib64/nagios/plugins/check_openmanage  -o 2 -p multiline
```

- Add these checks to check_mk/nagios

```
check_mk -II
check_mk -R
```

Notifications using a USB attached phone

Nagios can be configured to notify users using text messages (SMS) using a USB attached phone.

Install Gnokii (the 0.6.29 RPMs work fine)

Configure the kernel to correctly identify the USB attached phone

The linux kernel needs to know to attach a cellphone to the usbserial device.

First, determine the vendor and product id

```
/sbin/lsusb | fgrep Motorola
Bus 004 Device 003: ID 22b8:4902 Motorola PCS Triplet GSM Phone (AT)
```

and creating the following file containing the vendor and product id:

```
cat > /etc/modprobe.d/motorola_w385.options <<HEREDOC
alias usb:v22B8p4902* usbserial
options usbserial vendor=0x22b8 product=0x4902
HEREDOC
```

Reboot the computer so the kernel loads the usbserial driver.

Once the kernel driver has attached to the phone, the driver creates the USB tty device:

```
ls -l /dev/ttyU*
crw-rw---- 1 root uucp 188, 0 Jun 11 13:43 /dev/ttyUSB0
```

Create /omd/sites/prod/.config/gnokii/config config file, which should contain:

```
[global]
port = /dev/ttyUSB0
model = AT
connection = serial
```

Test the configuration by running

```
gnokii --identify
```

Verify you can send a SMS message:

```
echo "This is a test - OK" | gnokii --sendsms 3035551234 -r
```

Configure Nagios to send notifications

Add a pager to your contact information in Nagios by adding the following to your ~prod/etc/nagios/conf.d/contacts.cfg file

```
define contact{
          contact_name                    nagiosadmn     ; short name of user
          use                             generic-contact ; Inherit default values from generic
-contact template
          alias                           Nagios Admin    ; Full name of user
          service_notification_commands   notify-service-by-email, notify-service-by-sms ;
          host_notification_commands      notify-host-by-email,    notify-host-by-sms ;
          email                           xxxxxxxxx@ucar.edu ;
          pager                           720xxxxxxx     ;
}
```

Add the following lines to your ~prod/etc/nagios/conf.d/spol-commands.cfg file

```
define command {
        command_name notify-service-by-sms
        command_line /usr/bin/printf “Nagios – $NOTIFICATIONTYPE$ : $HOSTALIAS$/$SERVICEDESC$ is
$SERVICESTATE$ ($OUTPUT$)” |
/usr/bin/gnokii –sendsms $CONTACTPAGER$ -r
}
define command {
        command_name notify-host-by-sms
        command_line /usr/bin/printf “Nagios – $NOTIFICATIONTYPE$ : Host $HOSTALIAS$ is $HOSTSTATE$
($OUTPUT$)” |
 /usr/bin/gnokii –sendsms $CONTACTPAGER$ -r
}
```

Power Monitoring Pages

Configuring calsvr and the S-Pol Power Meters

Configuring calsvr and the S-Pol Power Meters

Introduction

S-Pol uses E4419 dual-channel power meters with a PROLOGIX GPIB<->Ethernet interface. The power meters use the EPM441 protocol.

Configuration examples for different devices can be found in defaults.cfg under /net/src/chill/cdp/calsvr. The current configuration file for S-Pol is under /net/src/eol/spol/monitoring/config/spol_powermeter.cfg

Here is a fragment from the **calsvr** configuration file:

```
[pmv]
type=EPM441
interface=PROLOGIX
address=14
channel=1

[pmh]
type=EPM441
interface=PROLOGIX
address=14
channel=2

[pma]
type=EPM441
interface=PROLOGIX
address=13
channel=1

[pmb]
type=EPM441
interface=PROLOGIX
address=13
channel=2

[prologix]
addr=10.1.10.50
port=1234
timeout=500
```

Configure the PROLOGIX GPIB <->Ethernet interface and set its I.P. address.

The current IP address is 10.1.10.50

- Configuration
  To change the IP address using a windows machine:
  - set up a second network for the GPIB on your computer or disconnect your computer from EOL network and attach the GPIB device.
  - On the Prologixwebsite download NetFinder.
  - run NetFinder
  - In the GPIB configuration window, click 'search' then 'Assign IP', change the IP address then click 'done'.
- Set up the Power Meter's address
  On the power meter, push 'System Input', then push:
  - 'Remote Interface'
  - 'Command Set' -> HP 438A
  - 'Select Interface' -> GPIB
  - 'Configure Interface'-> 'GPIB' -> 'GPIB Addr <some address>' , change the address then push 'Done'
  - 'Interface Overview' gives a summary similar to below of all settings.

```
REMOTE INTERFACE OVERVIEW

Interface : GPIB
Commands Set: HP 438A
GPIB Address: 13
```

- Verify the GPIB is setup properly
  - Connect the GPIB-ETHERNET controller to the power meter(s).
  - Connect the GPIB-ETHERNET controller to the network.
  - Using an xterm or console window, telnet into the GPIB to port 1234 at the Prologix's IP address.
  - Verify the GPIB is under controller mode by typing '+mode', if it returns 1 then it is. If it returns 0, then the GPIB can be switched from DEVICE mode to CONTROLLER mode by typing '++mode 1'
  - Verify you can read from the power meters by typing '++addr', this gives the address of the instrument being measured (since the GPIB is under Controller Mode). '++addr <some address>' sets the address you want the controller to read from.
  - The command 'AP' is for channel A and 'BP' is for channel B (these are found under the E4418B/E4419B Power Meters Programming guide)
  - '++read eoi' reads from the assigned channel. Example code:

```
++addr 13
                AP
                ++read eoi
```

- For information on the GPIB-ETHERNET controller's supported commands, please refer to the user manual on Prologix website

Routing configuration for Power Meters

The Power Meters are located on the ATE private network. This isolates the GBIB<->Ethernet converter attached the the power meters from the high traffic levels on the main S-Pol network.

spol-gate needs the following lines in /etc/rc.d/rc.local :

```
# added for access to power meter, via GPIB<=>Ethernet interface
route add -host 10.1.10.50 gw ate
```

Sixnet Pages

Configuring the SIXNET mIpm Controller

Configuring the SIXNET mIpm Controller

Download and install the SIXNET Tool utlity, from sixnet.com (Support->Software & Firmware->Automation Device Software) on a Windows computer.

Import the registration file (spol.git : spol/monitoring/sixnet_tools/NCAR_SIXNET_regfile.6rg). Note, the SIXNET tool will **NOT** let you configure telnet or ftp access to the SIXNET mIpm without a valid license file. Also note that we've never successfully configured over ethernet - always use the serial port, at least until the SIXNET mIpm I.P address has been set.

Connect a serial cable between the Windows computer and the SIXNET mIpm (this is an RJ-45 cable, with a 9 pin adapter on one end). With the SIXNET Tool, open the project file found here: spol/monitoring/sixnet_tools/NCAR_Sixnet_Project. Select the serial port connection and update the configuration on the SIXNET mIpm. Verify that the SIXNET mIpm has the correct I.P. address (192.168.4.51) when you are done.

Select ModBus RTU Master for the SIXNET RS485 protocol.

To access a RS-485 Modbus device from the SIXNET.

1. Right click the Sixnet device in the SIXNET I/O Tool Kit, and select 'Configure'.
2. Using the **I/O Module** tab, select the **Add New Module** button, and create a Virtual I/O Module with the correct Module Type (Virtual DI, Virtual DO)
3. Select the **I/O Transfers** tab
4. Click 'Wizard- Add new Transfer'
5. select specify by station #, and enter the Modbus ID as the Remote Station number.
6. specify the Transfer Name
7. Select Read Modbus I/O or Write ModBus I/O
8. Select RS-485 Port A
9. Select an update interval
10. Select the I/O type
11. Using the **Operations** menu, **Load**, **Load Now (Basic Parameters Only)** , download the configuration to the SIXNET.

Address Map

Module Name	Register Addr	Remote Type	# of Registers	Modbus ID
ADAM-4018-1	120	Analog Input	8	#30
ADAM-4055-1	100	Discrete Input	8	#11
ADAM-4055-2	110	Discrete Input	8	#10
Acromag-901MB	90	Discrete Input	8	#20
Acromag-903MB-1	70	Discrete Input	12	#21

Acromag-903MB-2	50	Discrete Output	12	#22

Software Configuration

We use the check_mk agent framework to report status from the Sixnet-based monitoring system. check_mk/nagios runs on one or more monitoring hosts. check_mk invokes its agent using port 6556 on all remote hosts. The inetd process on the sixnet controller invokes a simplified version of the check_mk_agent, which runs any programs or scripts in /usr/local/lib/check_mk_agent/local. Each of these scripts/programs generates a simple text file in the check_mk format, which can be as simple as:

```
0 AntennaStatus - OK
```

Add the following line to /etc/inetd.conf

```
check_mk stream tcp     nowait  root    /usr/local/bin/check_mk_simple_agent
```

Add the following line to /etc/services

```
check_mk 6556/tcp                       # check_mk agent
```

Copy spol.git/monitoring/sixnet_check_mk/check_mk_simple_agent to sixnet1:/usr/local/bin

Installing Sixnet Cross Tools

Installing Sixnet Cross Tools

- cross compilation tools, include files, and libraries to access the Sixnet registers are found under spol.git:spol/monitoring/sixnet_tools
- Create a new directory /opt/sixnet
- Tools for cross compiling can be found under spol/monitoring/sixnet_tools/sxiadk.tar.gz
- Untar the tools into /opt/sixnet

```
mkdir /opt/sixnet
cd /opt/sixnet
tar zxvf <path_to>sxiadk.tar.gz
```

- Libraries for reading and writing to the Sixnet can be found under spol/monitoring/sixnet_tools/sxlib.tar.gz Install as follows:

```
cd /opt/sixnet
tar zxvf <path_to>sxlib.tar.gz
./install.sh  # create the necessary symbolic links
```

- An "ls" of the **/opt/sixnet** directory should give you the listing below.

```
bin  include  lib  powerpc-linux
```

Compiling code for the Sixnet

spol/monitoring/sixnet_demo is a standalone demonstration program for the Sixnet controller. This example shows how to use the cross-compilation tools to build a simple program for the Sixnet controller.

Reading values with the Sixnet

Reading values with the Sixnet

How to read Analog values

```
#include <iodb.h>
INT16 addr=0;   // zero is the address of our analog Input 1
INT16 regs=4;   // reading from four registers*
INT16 ecode;
INT16 analog_value[4]; // an array to store Analog values
ecode = IODBRead( ANALOG_IN, addr, regs, (void*)&analog_value,NULL);
```

How to read binary (discrete) values from consecutive registers

```
INT16 addr=XX;   // address of our discrete Input
INT16 regs=4;   // reading from four registers*
INT16 ecode;
BYTE discrete_value[4];
ecode = IODBRead( DISCRETE_IN, addr, regs, (void*)discrete_value, NULL);
```

How to read discrete values from referenced registers

```
// Read from the register referenced by doTagOne
char tagname_one[16];
BYTE discrete_value;
INT16 ecode;
strcpy(tagname_one , “doTagOne”) // Set a tag corresponding to one or more registers

ecode = IODBSetTag (tagname_one, DISCRETE_IN, 0,1); //Set name “doTagOne” to register address
starting at 0 for only 1 register
ecode = IODBReadTag (tagname_one, (void*)&discrete_value, sizeof(discrete_value), NULL, NULL);
```

Sixnet has more information about function definitions

Writing values with the Sixnet

Writing values with the Sixnet

Write binary (discrete) values

Set the starting address of the registers by initializing "addr". addr = 0;Set the number of registers to be written to regs = 4;Set which registers to write to discrete_value = 7; //D0 is OFF, D1, D2, D3 are ONWrite to discrete output registers ecode = IODBWrite(DISCRETE_OUT, addr, regs, (void*)&discrete_value, NULL);Sample Code

```
INT16 addr=0;  // starting address
INT16 regs = 1;
INT16 ecode;
BYTE discrete_value=5;
ecode = IODBWrite( DISCRETE_OUT, addr, regs, (void*)&discrete_value, NULL);
```

Writing binary (discrete) values to referenced registers

```
char tagname_one[16];
INT16 addr = 0;
INT16 regs = 1; //write to only one register starting at address zero
INT16 ecode;
BYTE discrete_value = 1;
strcpy(tagname_One, "doTagOne");
ecode = IODBSetTag(tagname_One, DISCRETE_OUT, addr, regs); //DoTagOne corresponds to D0
ecode = IODBWriteTag( tagname_One, (void*)&discrete_value);  //D0 is on
```

Sixnet has more information about function definitions

Antenna Control

Delta Tau Power PMAC Problems and Associated Fixes Eric's HowTo/troubleshooting document.

Developing Software for the PowerPMAC

- The source code for the antenna controller can be viewed http://lab.chill.colostate.edu/git or checked out from gitosis@lab.chill.colostate.edu:PowerPmacSuite.git
- On the Windows computer, the current version of the source code is here:

```
F:\\Documents and Settings\All Users\Shared Documents\PowerPmac_SPOL\PowerPmac_Antcon
```

- `Exit from the Power PMAC Suite.  (The Power PMAC Suite gets confused it you update files "behind its back".)`
- Checkout a copy of the PowerPmacSuite on a Linux computer:
- Using WINSCP, copy the following files to their corresponding locations in PowerPmac_Antcon. Do **NOT** overwrite PMAC_ SCRIPT Language\PLC Programs\plc1.plc.
    - antcon/C Language/Background Programs/capp1/capp1.c
    - antcon/C Language/CPLCs/rticplc/rticplc.c
    - antcon/C Language/Include/deltatau.h
    - PMAC Script Language/Motion Programs/prog4.pmc
- Open the Power PMac Suite
- Recompile and install the code using the Power PMAC Suite
    - Right click on the project name in the "Solution Explorer"
    - Select "Build and Download All Programs"
    - when complete - **type 'save' in the terminal window**

Remote Access to Power PMAC IDE

We have installed VNC Server Free Edition on the PC that contains the Power PMAC IDE. At present, we don't forward port 5900 through the S-Pol firewall, so you'll need to forward it via ssh. On Mac OSX/Linux, this is done with a script like:

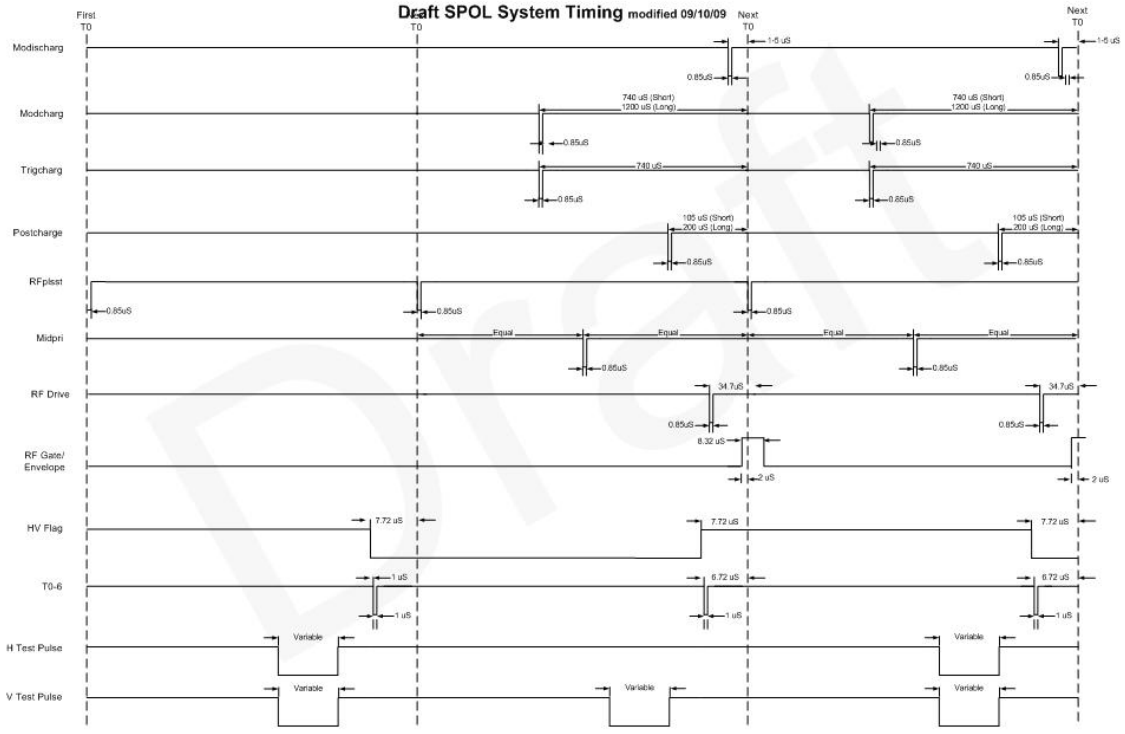
```
ssh -p 20022 -f vanandel@spol-gate.ucar.edu -L 5900:192.168.4.35:5900 -N
```

Once you've started the tunnel, you start a VNC client (Chicken of the VNC works great on Mac OS X), and attach to 'localhost'.

Trigger System

Spol Timing Documentation

spol timing documentation.docx
How to run trigger program from ARM TS.docx
How to run trigger program from ARM TS.pdf
spol trigger board run istructions.pdf



Weather Station

Overview

S-Pol has a Vaisala WXT520 Weather Station. The weather station transmits updates over a 9600, 8N1, serial connection, via Digi Xstream-PKG, X09-009PKI-R 900 Mhz spread spectrum modem. The weather station has a 3 position toggle switch, which is set 'down' for AC power.

Configuring the WXT520.

On a windows computer, install the Viasala Configuration Tool and USB instrument driver. Attach the USB serial cable between the Windows computer and the WXT520.

Load the configuration file

```
spol.git/WXT520/VAISALA_WXT520_config.wxc
```

This configuration produces automatic composite messages of the form:

0R0,Dn=103D,Dm=234D,Dx=324D,Sn=0.2M,Sm=1.9M,Sx=4.2M,Ta=21.3C,Tp=21.8C,Ua=49.0P,Pa=0.8406B,Rc=0.00M,Rd=0s,Ri=0.0M,Hc=0.0M

Software Configuration to process WXT510 output

- Create an eol user and group
- Create a 'nidas' user
- Install nidas-bin, nidas-daq, nc_server, and nc_server-auxprogs RPMs.
- copy the configuration file for the nidas dsm

```
cp /net/src/eol/spol/weather_station/spol_wx510.xml /opt/local/nidas/etc/spol_wxt510.xml
```

- copy the startup scripts for nidas_dsm and nc_server

```
cp /net/src/eol/spol/weather_station/nidas_dsm /net/src/eol/spol/weather_station/nc_server
/etc/rc.d/init.d
```

Add the following lines to /etc/sudoers

```
Defaults:nidas !requiretty
nidas ALL=NOPASSWD: SETENV: /usr/bin/nc_server
```

Start the nidas dsm process

```
chkconfig --add nidas_dsm
service nidas_dsm start
```

Configure nc_server to start at boot time and start it:

```
chkconfig --add nc_server
service nc_server start
```

SynchroToDigital

Tasks

- s2dspol is the main application. It reads antenna angles from the s2d hardware, adds offsets from the thumbwheels, and sends UDP packets containing antenna angles and times to mgen.
- chrony disciplines the clock
- check_chrony verifies the chrony is keeping the clock synchronized, and writes /tmp/nagios.chrony
- check_mk calls /usr/local/bin/check_mk_simple_agent via inetd, which runs /usr/local/lib/check_mk_agent/local/checkStatus, which writes the current status from /tmp/nagios.chrony to stdout.

startup and configuration

- /etc/rc3.d/S95s2dspol is a link to /root/start_s2dspol. /root/s2dspol starts the s2dspol and check_chrony tasks.
- Add the following line to /etc/inetd.conf

```
check_mk stream tcp     nowait  root    /usr/local/bin/check_mk_simple_agent
```

- Add the following line to /etc/services

```
check_mk 6556/tcp                       # check_mk agent
```

Selecting mgen1 or mgen2

The s2d sends time-stamped angles via UDP. If it is necessary to change which mgen computer is used:

```
cp /root/start_s2dspol.mgen1 /root/start_s2dspol
# OR
cp /root/start_s2dspol.mgen2 /root/start_s2dspol
```

After copying the startup file, reboot **s2d**

Diagnostics

To check the angles, go to mgen.

```
cd projDir/mgen/params
SpolAngles2Fmq -params SpolAngles2Fmq.s2d -verbose
```

Weather Cameras

We have 4 StarDot NetCamXL cameras to save images of weather. Each camera's live feed can be viewed through the S-Pol firewall by clicking on the S-Pol home page. On the S-Pol network, the cameras are be viewed by entering their name into a browser.

- northcam
- eastcam
- southcam
- westcam

Each camera is configured to upload images every 60 seconds, and stores its images organized by day and hour. The 'Secondary Path/File' field in the FTP configuration is set to

```
westcam/%m%d/westcam_%Y-%m-%dT%H%M%SZ.jpg
```