

Date: 12-June-07
Authors: Ignacio Ruiz , Juan Peñalver
Subject: **New Alarm System**

Introduction

The New Alarm System (NAS) consists of a centralized group of alarms that supervise critical areas or systems of the observatory. The observatory needs a continuous monitoring of these critical systems in order to get the operator immediate response in case of failure, avoiding higher damages or a degrading of the observation.

The development of this NAS was motivated by the need of reforming the previous alarms system due to its limited number of monitored alarms (less than necessary at the moment), implementing a modular design that permits the communication with computer for logging. So, this NAS is more flexible and can adapt to the observatory operation properly.

The NAS can supervise 32 inputs alarms. The trigger of any alarm is caused when both wires associated to that alarm are CC (close circuit). A sound device is ON and a visual signal is activated (red led) in the front panel of the NAS when one or more alarms are produced.

Every alarm can be programmed as disabled or enabled. If it's enabled a green led notify this status, if it's disable there's no lights.

Apart of these 32 alarm signals, there are 4 additional power signals. The power signals are used to supervise the electrical power supply to the observatory, which could be from the external company or the generators of the observatory, indicating which one is available and on duty.

The status of the 32 alarm signals, if they are disabled or enabled, the 32 alarm bits and the 4 power bits can be read by the computer.

There's also a program running continuously reading this information every second (polling). Only in case of variation of any status (alarm, enable or disable), the program writes that information in a file in ASCII format including the time when this variation occurs.

Current alarms implemented

Each alarm has associated a bit number that corresponds with the bit number of the input signal associated to the VME input register used for reading.

1- Diesel Generators.

It sounds if any alarm of the diesel generators is produced.

2- No break system.

It sounds if there is any failure of the UPS (No break) or the power supply is out of range.

3- *Low voltage distribution.*

It sounds in case of any failure in the low voltage distribution of the observatory. This alarm centralizes other 20 alarms. If this alarm is produced is necessary to go into the garage to check which of the low voltage 20 alarms has the problem.

4- *Power supply comp. spiral cable.*

It sounds if any problem occurs with the power supply of the receiver compressors at the spiral cable area

5- *Water supply tank.*

It sounds in case of problems in the water supply system. Possible problems considered are low level of water and pumps failure.

6- *Air conditioning computer Room.*

It sounds if the temperature of the computer room is out of the limits or there's a malfunction of the air conditioning machine.

7- *Air conditioning antenna.*

It sounds if the temperature of the antenna is out of the limits or there's a malfunction of control system.

8- *VME alarms.*

It sounds if programs or processes that must run in VME fail. Processes like the monitoring of the antenna temperatures, inclinometer measurements, weather data, ...

9- *Receivers out of lock.*

It sounds if any receiver is out of lock by any reason.

10- *Granada office.*

It sounds in case of a fire in Granada office.

11- *Power supply receivers.*

It sounds if the power supply of the receivers fails.

12- *NCS alarms.*

It sounds if there's a NCS programs failure. For example, a problem with the parameters sent or another software problem, this alarm is produced.

13- *Man in danger.*

There's a device to be taken by a worker when is working alone that in case it loses its verticality during more than half a minute produces an alarm to prevent that in case of a "Man in danger" he continues alone for a long period.

14- *Rain alarm.*

If it's raining or snowing, the observation must be aborted and the antenna taken to a safe position. This alarm notifies to the operator this status.

15- *Cloudsat.*

The satellite Cloudsat could produce interferences with the observation. This alarm sounds when its orbit is close to the vertical of the observatory or close to the direction where the antenna is pointing to.

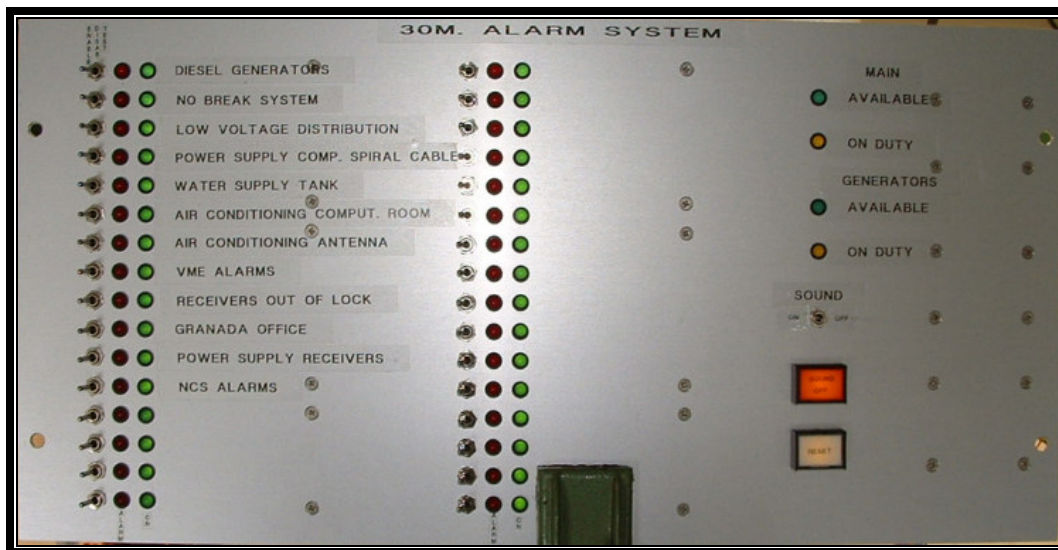
16- *Faulty O2 in RX.*

There's an O2 detector in the receiver room. For security considerations if there a faulty of O2 in the receiver room, due to a helium leak, this alarm sounds.

Current power signals.

- 1- *Main available.*
- 2- *Main on duty.*
- 3- *Generators available.*
- 4- *Generators on duty.*

Only one, Main or Generators, can be on duty.



View of the NAS front panel

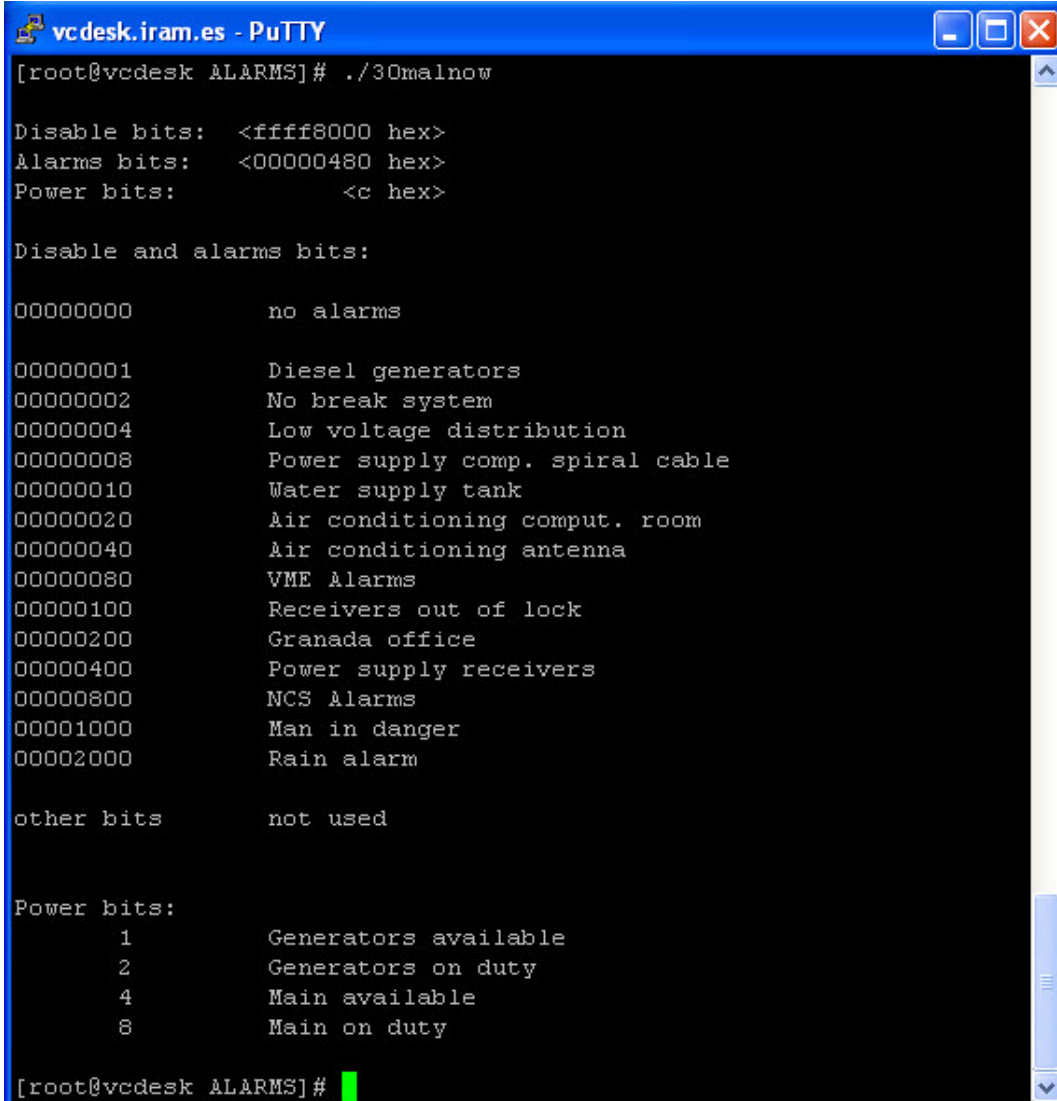
Programs used

The NAS is a hardware design working independently of any software. The following programs give some additional information of the alarms and status of the observatory read by the computer.

Program *30malnow*

Machine to run: *vcdesk*
Login: *root*
Directory: */home/penalver/ALARMS/*

This program reads the current alarms and power signals displaying the information on the terminal screen as shown below.



```
vcdesk.iram.es - PuTTY
[root@vcdesk ALARMS]# ./30malnow

Disable bits: <ffff8000 hex>
Alarms bits:  <00000480 hex>
Power bits:   <c hex>

Disable and alarms bits:

00000000      no alarms
00000001      Diesel generators
00000002      No break system
00000004      Low voltage distribution
00000008      Power supply comp. spiral cable
00000010      Water supply tank
00000020      Air conditioning comput. room
00000040      Air conditioning antenna
00000080      VME Alarms
00000100      Receivers out of lock
00000200      Granada office
00000400      Power supply receivers
00000800      NCS Alarms
00001000      Man in danger
00002000      Rain alarm

other bits    not used

Power bits:
  1      Generators available
  2      Generators on duty
  4      Main available
  8      Main on duty

[root@vcdesk ALARMS]#
```

In the example above you can see:

Disable bits: <ffff8000 hex>
Alarm bits: <00000480 hex>
Power bits: <c hex>

With the Disable bits longword (32 bits) the bit equal to 0 means alarm enable and the bit equal to 1 corresponds to alarm disable. In the previous example the Disable bits are

<ffff8000 hex> = <1111 1111 1111 1111 1000 0000 0000 0000 bin>
that corresponds with alarms 1 to 15 enable and alarms 16 to 32 disable.

With the Alarm bits longword (32 bits) the bit equal to 0 means no alarm and the bit equal to 1 means alarm. In the previous example the Alarm bits are **<00000480 hex> = <0000 0000 0000 0000 0000 0100 1000 0000 bin>** that means alarm is present for bits 8 (VME Alarms) and 11 (Power supply receivers)

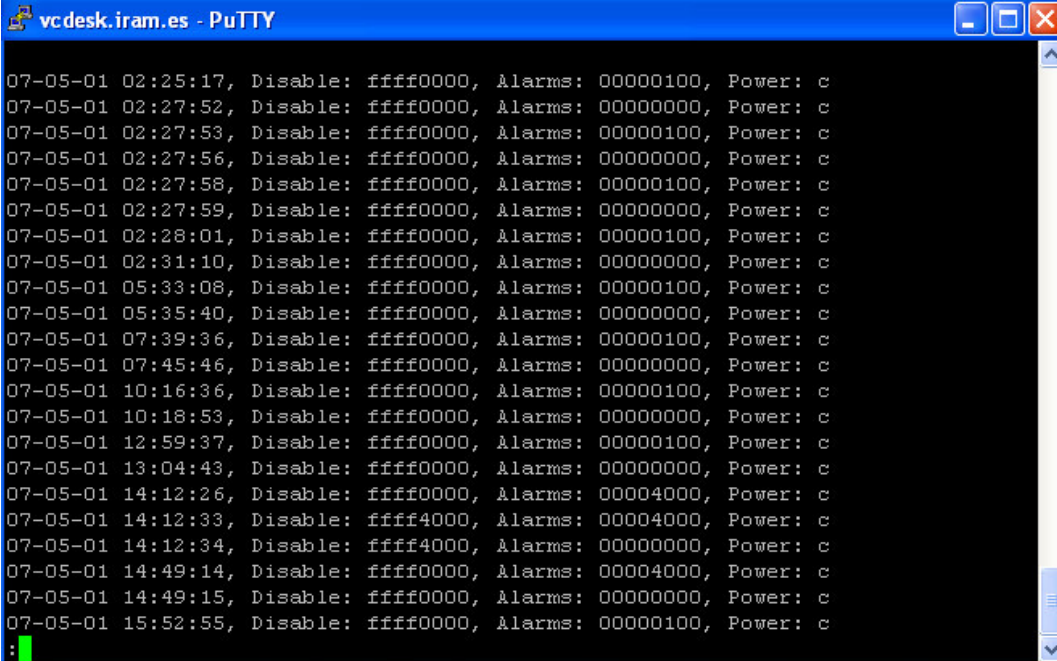
With the Power bits nibble (4 bits) each bit is associated to the available or on duty status. In the previous case the Power bits are: **<c hex> = <1100 bin>**, what means “*Main available*” and “*Main on duty*”.

Program *30malarms*

Machine to run: *vcdesk*
Login: *root*
Directory: */home/penalver/ALARMS/*

This program writes into a file every change of the Disable bits, Alarm bits and Power bits produced. A new file is created every month, and the format of the name of the file is *alaryymm.prn* (for example *alar0705.prn* corresponds to may of 2007), and it's written in */home/penalver/ALARMS/*.

The format of the file is as follows:



```
vcdesk.iram.es - PuTTY
07-05-01 02:25:17, Disable: ffff0000, Alarms: 00000100, Power: c
07-05-01 02:27:52, Disable: ffff0000, Alarms: 00000000, Power: c
07-05-01 02:27:53, Disable: ffff0000, Alarms: 00000100, Power: c
07-05-01 02:27:56, Disable: ffff0000, Alarms: 00000000, Power: c
07-05-01 02:27:58, Disable: ffff0000, Alarms: 00000100, Power: c
07-05-01 02:27:59, Disable: ffff0000, Alarms: 00000000, Power: c
07-05-01 02:28:01, Disable: ffff0000, Alarms: 00000100, Power: c
07-05-01 02:31:10, Disable: ffff0000, Alarms: 00000000, Power: c
07-05-01 05:33:08, Disable: ffff0000, Alarms: 00000100, Power: c
07-05-01 05:35:40, Disable: ffff0000, Alarms: 00000000, Power: c
07-05-01 07:39:36, Disable: ffff0000, Alarms: 00000100, Power: c
07-05-01 07:45:46, Disable: ffff0000, Alarms: 00000000, Power: c
07-05-01 10:16:36, Disable: ffff0000, Alarms: 00000100, Power: c
07-05-01 10:18:53, Disable: ffff0000, Alarms: 00000000, Power: c
07-05-01 12:59:37, Disable: ffff0000, Alarms: 00000100, Power: c
07-05-01 13:04:43, Disable: ffff0000, Alarms: 00000000, Power: c
07-05-01 14:12:26, Disable: ffff0000, Alarms: 00004000, Power: c
07-05-01 14:12:33, Disable: ffff4000, Alarms: 00004000, Power: c
07-05-01 14:12:34, Disable: ffff4000, Alarms: 00000000, Power: c
07-05-01 14:49:14, Disable: ffff0000, Alarms: 00004000, Power: c
07-05-01 14:49:15, Disable: ffff0000, Alarms: 00000000, Power: c
07-05-01 15:52:55, Disable: ffff0000, Alarms: 00000100, Power: c
:
```

The information written is the date, hour (UT), Disable bits, Alarms bits and Power bits. The data are written following the same format as in the *30malnow* program.