Hardware connections description

CTIO 60 inches CHIRON

CHI60H-9.7

La Serena, September 13, 2019

Contents

Overview

The present document is just a brief summary of the cable connections between the different parts of the instrument hardware. Note that some of this information is also included in the specific parts (hardware) document/manual. It will be stated where the specific documentation can be found.

In the first diagram (***Figure 1***) there is a general view of the connections. Then, in each appendix, stated with bold capital letters in the main diagram, there is a detail of the specific cable or part. The labels stated in a black circle ( ) are references to the physical location of that device in the rack (see **Appendix C**)

In ***Figure 1*** we can see, starting from the left, the connections between the instrument body and the RTD/data IO box (instrument temperatures through a DB25 cable, and iodine cell motor control signal through a lemo connector). This box is described in document CHI60HF-7.X. In appendix **(A)** pf the present document there is a description/diagram of the cable. This box is connected to the network through the Ethernet hub that appears at the top of the diagram. The cable that drivers the signal for the iodine motor (lemo) is merged with the signals and control for the temperature control of the iodine cell. This control is done by an Omega controller that is connected directly to the network through the same hub.

Then we have the connection between the instrument body and the motor control box through two DB15 cables (slicer and focus motors). The motor control box is in turn connected to the first Lantronix terminal server using two serial connectors (DB9, RS-845), one for the slicer and one for the focus motors. These cables are described in appendix **(B).** The motor control box itself is described in the document CHI60HF-8.X.

The other two ports of the first Lantronix terminal server are used by the DPM7885 environmental pressure (port 2) and the Pfeiffer SingleGauge dewar pressure (port 4). Both devices are connected through DB9, RS-232 interfaces. The pins cable description is in appendix **(C)**

From the Torrent controller there are several connections. The shutter control signal (TTL) goes from one of the 12-pins Lemo connectors in the front panel, and from here is split into two female lemo connectors. The first (2 pins) goes to the shutter-box (under the instrument) and then to in the instrument body, the second (three pins) goes to the exposure meter control box located in the computer room. This cable/connector is described in appendix **(D).** The shutter signal can be re-plugged into the LED cable which switches on the LED inside CHIRON instead of opening the shutter; this is used for detector study.

The other connection from the Torrent described here is the Lakeshore temperature controller. This carries the CCD and temperature sensor signals from the dewar (going through the dewar connectors) to the Lakeshore, and the heater control signal from the

Lakeshore through the dewar. Then the Lakeshore controller is connected through a serial port (DB9, RS-232) to the acquisition computer in the computer room (ctioe1). This is described in appendix **(E).**

In appendix **(E)** is also described the cable for the second Lakeshore controller, which is in charge of the instrument body temperature control. This Lakeshore is connected to the second Lantronix terminal server, on port 1. Settings of this 2nd Lakeshore and other aspects of themperature control (warm room, iodine cell) are covered in the document "CHIRON temperature control".

The other ports of the second Lantronix are used in the Omega room temperature controller (port 2), and the Grauville-Phillips pressure gauge controller that is measuring the pressure in the vacuum echelle enclosure (port 4). The remaining port (3) is available for future use. The connections for this two cables (Omega and Phillips gauge) are described in appendix **(F).**

In appendix **(G)** there is the description of the two Lantronix (terminal servers) port settings for all four ports of each (focus, slicer, Pfeiffer, DPM7885; and Lakeshore, none, Omega, Phillips).

In Appendix **(H)** there is the software config files for each of the devices in the instrument, and the IP address of all subsystems involved

In appendix **(I)** we can see the actual -physical- location on the Coude equipment rack and the hardware connections.

Finally, in Appendix **(J)** we can see the physical network and serial connections and its correspondent physical locations

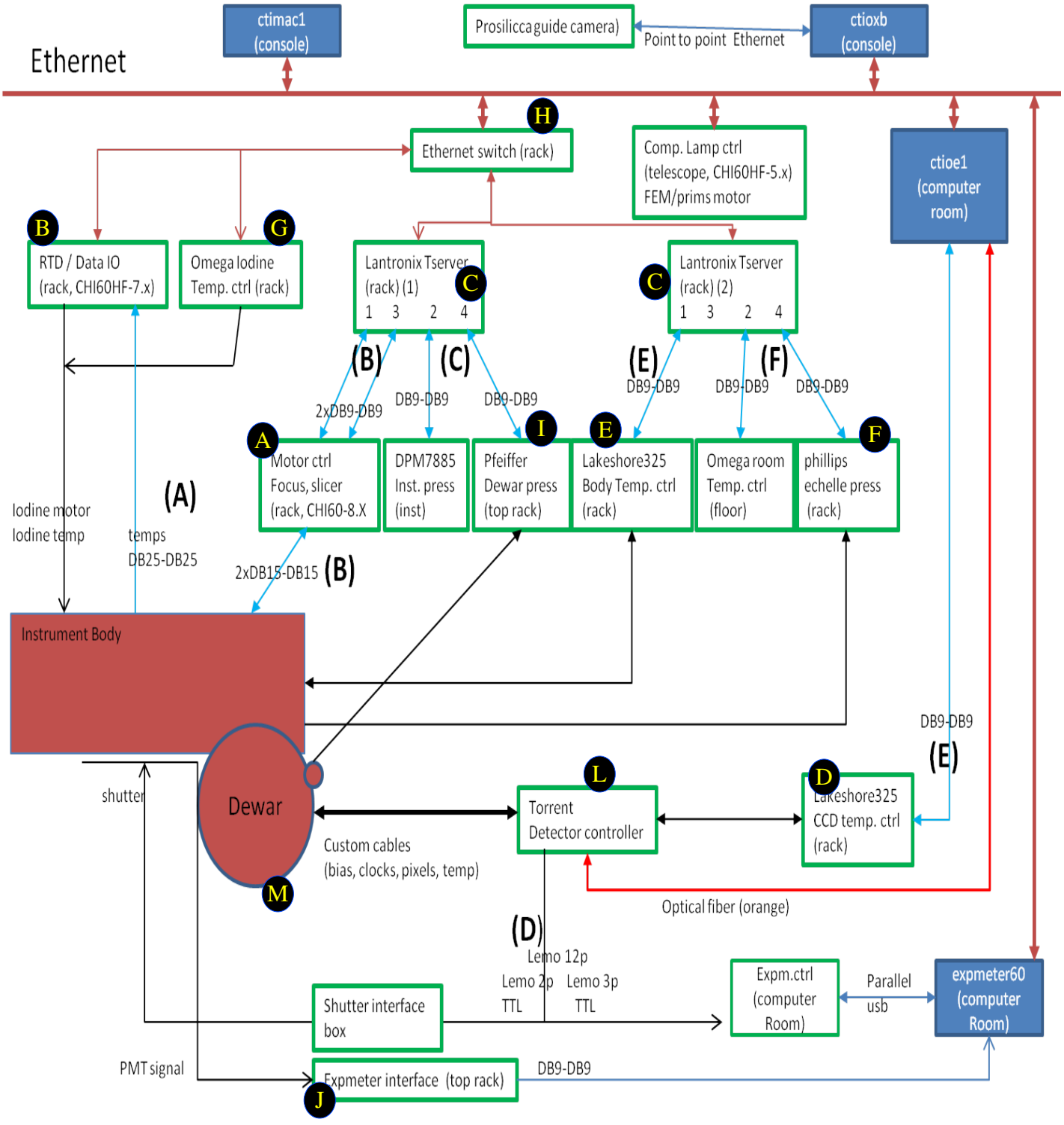


Figure 1: CHIRON connections diagram

References

- *CHI60HF-7.0 RTD and DATA I/O*
  M.Bonati

- *CHI60HF-8.1 Motor Control*
  M.Bonati

- *CHI60HF-4.1 Temperature Control.*
  M.Bonati

- *CHIRON instrument description*
  A. Tokovinin

- *CHIRON temperature control*
  A. Tokovinin, June 2012

Appendix A: RTD and Data I/O cables (Body/RTD box)

a) RTD: DB15-DB15

PIN	RTD	COLOR	Sensor
1	RTD 0 +	ORANGE	Grating
2	RTD 0 -	WHITE	
14	COM	BLACK	
15	RTD1 +	ORANGE	TabLow
16	RTD1 -	WHITE	
3	COM	BLACK	
4	RTD2 +	ORANGE	TabCen
5	RTD2 -	WHITE	
17	COM	BLACK	
18	RTD3 +	ORANGE	Struct
19	RTD3 -	WHITE	
6	COM	BLACK	
7	RTD4 +	ORANGE	Room
8	RTD4 -	WHITE	
20	COM	BLACK	
21	RTD5 +	ORANGE	
21	RTD5 -	WHITE	
9	COM	BLACK	
10	RTD6 +	ORANGE	
11	RTD6 -	WHITE	

b) Data I/O: DB15-DB15

PIN	DESCRIPTION	COLOR
1	DI 0 (feedback)	WHITE
2	DI 1	WHITE
3	DI 2	WHITE
4	DI 3	WHITE
5	DI 4	WHITE
6	DI 5	WHITE
7	DI 6	WHITE
8	DI 7	WHITE
9	DI 8	WHITE
10	DI 9	WHITE
11	DI 10	WHITE
12	DI 11	WHITE
14	DO 0 (iodine)	BROWN
15	DO 1	BROWN
16	DO 2	BROWN
17	DO 3	BROWN
18	DO 4	BROWN
19	DO 5	BROWN
20	GND	BLACK

Appendix B: Slicer and Focus Motors cables

DB15 <-> ***DB15:*** Body to control box for both slicer and focus motors (both cables identical)

DB9 <-> ***DB9:*** motor control box to Lantronix server, ports 1 and 3

DB-15 Female (box)	DB-15 Male (Motor)	Description
2	2	Motor (+)
4	4	+5V (encoder)
5	5	Positive Limit
6	6	GND (Limit)
7	7	Encoder A(-)
8	8	Encoder B(-)
9	9	Motor (-)
12	12	Negative Limit
14	14	Encoder A(+)
15	15	Encoder B(+)
DB-9 Male (box)	**DB-9 Male (T.Server)**	**Description**
2	5	Tx/Rx-
8	7	Tx/Rx+
5	5	GND

Appendix C: DPM and Pfeiffer Pressure meters

For both DPM7885 (environment) and Pfeiffer SingleGauge (Dewar):

DB9-DB9 (null modem)

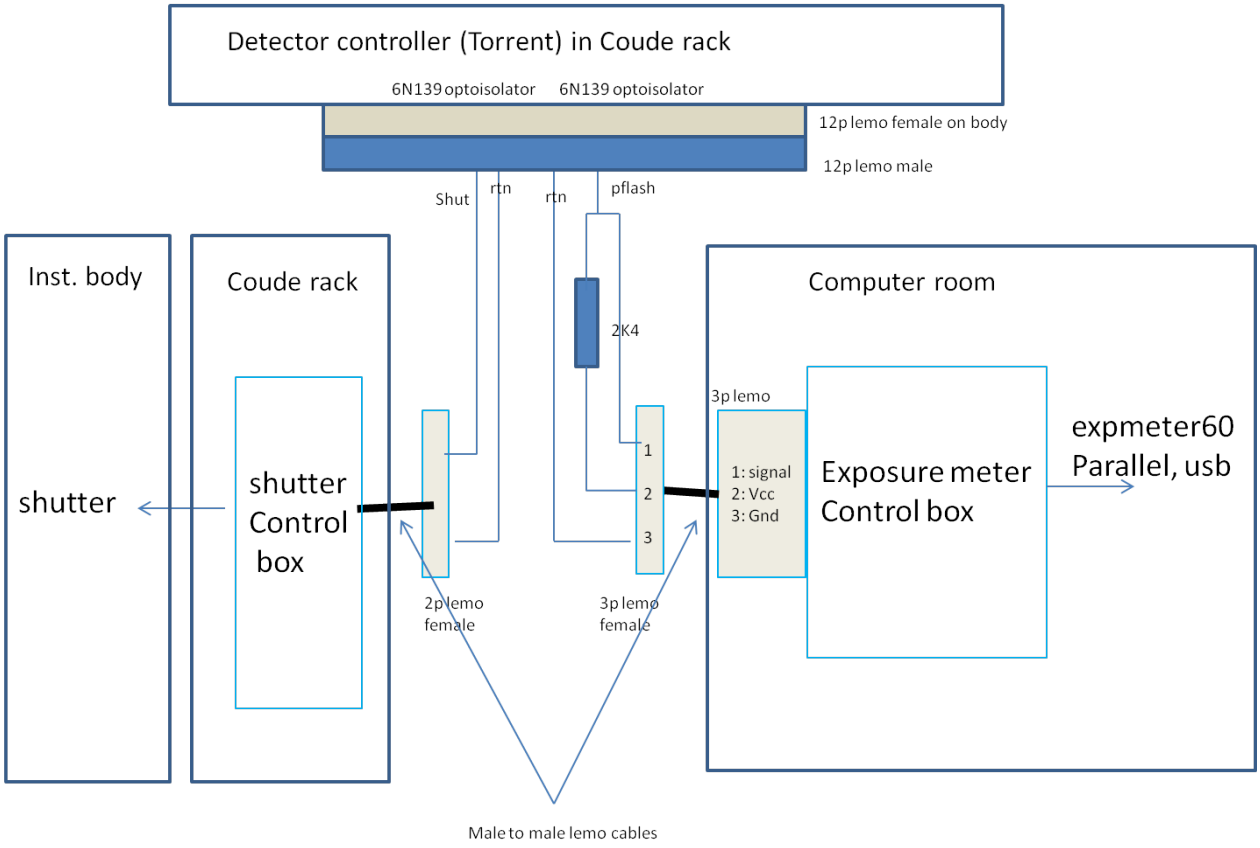
Lantronix: DB9-Female	Instrument (Pfeiffer or DPM): DB9-Female
2: RX	3: TX
3: TX	2: RX
5: GND	5: GND

Serial settings:

See appendix F for Lantronix serial settings of Line 2 and 4

Appendix D: Torrent to shutter and expmeter

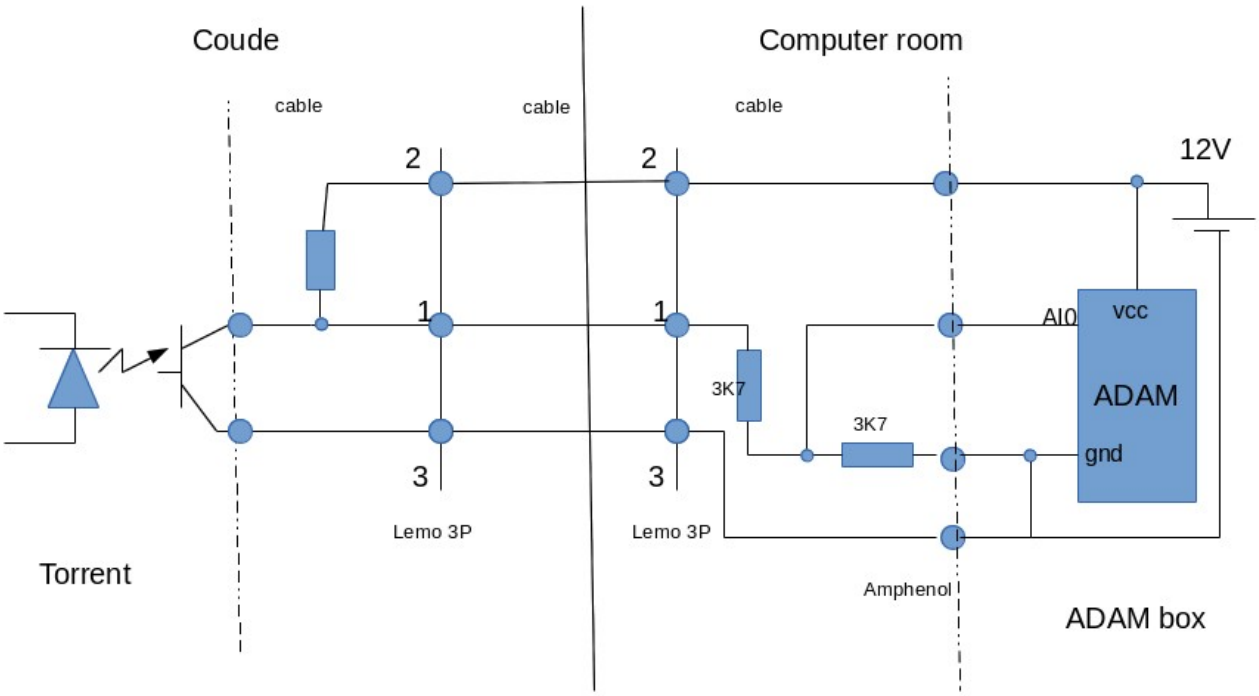
The Torrent controller has a 12-pins Lemo connector on its side. From this connector there is a cable that splits into two female connectors. One goes to the shutter control box (under CHIRON), the other to the expmeter control box in the computer room. The lemo to the shutter carries 2 pins (signal and return from an opto-isolator) and the one to the expmeter carries 3 pins (vcc, ground from the expmeter box to the Torrent opto-isolator, and the signal back to the expmeter control box, interfaced through a simple resistance built in the cable).



Addendum:

on August 2019 the exposure meter computer died. Since it was almost impossible to find another computer witha parallel port, a different arrngement was made:

- The “exposure meter Control Box shown in the previous figure, was replaced by an “ADAM shutter box”. The box has an ADAM 6017 that reads continuously the status of the shutter, so when it changes the exposure meter software produce the actions that were previously produced when a change in the parallel port was measured.



The optoisolator on the Torrwnt side is conected now to a box that has an ADAM module. The same power supply that feeds the ADAM (12V) feeds

the optoisolator. As a consequence, when the transistor is not conducing, it sends back a sigal of 12V. Since the maximum range in the ADAM is 10V, the cable before the box has built-in a tension divisor that takes the input signal to 6V.

The ADAM is bein continuously interrogated (it has a direct TCP connection to the expmeter computer using a local/private network) by the exposure meter software (every 10msecs) about the shutter signal status and its change trigger the photon counting (or stop counting). Note that the only change is that before the signal went into a hardware box that modified the signal a bit (produced a transient) and fed it into the parallel port. So we replaced the hardware and parallel port for the ADAM box.

ADAM address: **192.168.1.10**

Local private ethernet port (eth1): **192.168.1.1**

Appendix E: Lakeshores cable

Dewar (ccd) Lakeshore:

Input A: CCD mount temperature

Input B: Dewar Neck temperature

Body (instrument) Lakeshore:

Input A: chiron body temperature

Input B: none

Serial Cable, for both (null modem)

DB9-DB9

Lakeshore: DB9-Female	Acquisition computer, ctioe1 (comp. room)or Lantronix2, port 1
2: RX	3: TX
3: TX	2: RX
5: GND	5: GND

Lakeshore Serial settings (identical to ctioe1 and Lantronix2, port 1)

Baud Rate: 9600

Parity: Odd

Data Bits: 7

Stop Bits: 1

Flow Control : None

Appendix F: Omega room temperature controller and Gavaulle-Phillips pressure gauge

Phillips gauge (pressure inside vacuum echelle ecnlosure), and Omega (room temp. controller):

Phillips DB9-DB9 (direct)

Lantronix:2 DB9-Female	Phillips gauge: DB9-Female
2: RX	2: RX
3: TX	3: TX
5: GND	5: GND

Omega DB9-DB9 (direct)

Lantronix:2 DB9-Female	Omega Room T. controller assembly: DB9-Female
2: RX	2: RX
3: TX	3: TX
5: GND	5: GND

Serial settings: for both:

Baud Rate: 9600

Parity: None

Data Bits: 8

Stop Bits: 1

Flow Control : None

(See appendix G for Lantronix2 serial settings of Line 2 and 4)

Appendix G: Lantronix and Lantronix2 EDS4100 Terminal Server Settings

The connection between the Lantronix and all connected hardware is through a Female/Female, DB9/DB9 null modem cable (crossed) cable, except for the connection between Lantronix2, port 4 and the Phillips gauge, that used a direct cable (not crossed)

Settings using the Terminal Server Web interface (identical for both)

Login: admin

Password: PASS

Lantronix1: 139.229.12.33

Identical for Line 1 (slicer) and Line 3 (focus). We will show here for Line 1 only.

Line -> Line 1 -> Configuration

Interface: RS485 Half-Duplex

State: Enabled

Protocol: Tunnel

Baud Rate: 9600

Parity: None

Data Bits: 8

Stop Bits: 1

Flow Control : None (disabled)

Xon/Xoff Char (disabled)

Identical for Line 2 (DPM) and Line 4 (Pfeiffer). We will show here for Line 2 only.

Line -> Line 2 -> Configuration

Interface: RS232

State: Enabled

Protocol: Tunnel

Baud Rate: 9600

Parity: None

Data Bits: 8

Stop Bits: 1

Flow Control : None (disabled)

Xon/Xoff Char (disabled)

Lantronix2: 139.229.12.38

Line1: Lakeshore for body temperature control.

Line -> Line 1 -> Configuration

Interface: RS232

State: Enabled

Protocol: Tunnel

Baud Rate: 9600

Parity: Odd

Data Bits: 7

Stop Bits: 1

Flow Control : None (disabled)

Xon/Xoff Char (disabled)

Identical for Line 2 (Omega) and Line 4 (Phillips). We will show here for Line 2 only.

Line -> Line 2 -> Configuration

Interface: RS232

State: Enabled

Protocol: Tunnel

Baud Rate: 9600

Parity: None

Data Bits: 8

Stop Bits: 1

Flow Control : None (disabled)

Xon/Xoff Char (disabled)

Appendix H: Software configuration files and addresses

IP addresses of the devices:

Lantronix1: ***139.229.12.33***

Lantronix2*: 139.229.12.38*

ADAM RTD*: 139.229.12.31*

ADAM Iodine cell control*: 139.229.12.32*

ADAM Comparison lamps (telescope)*: 139.229.12.49*

OMEGA iodine cell temperature*: 139.229.12.36*

ctioe1 ***acquisition computer: 139.229.12.29***

expmeter60 ***exposure meter computer: 139.229.12.37***

The **configuration files** for the software are basically in two directories:

/home/observer/apps/CHIRON/config/

DEV_SLICER.cfg (slicer motor, Lantronix1, port 1):

[COMMS]

params=type tcp, address 139.229.12.33, port 10001

motorID=1

DEV_FOCUS.cfg (focus motor, Lantronix1, port 3):

[COMMS]

params=type tcp, address 139.229.12.33, port 10003

motorID=1

DEV_ECHLAMP.cfg (comparisson lamps)

[SETTINGS]

address=139.229.12.49

port=1024

DEV_IODCELL.cfg (iodine cell motor control)

[SETTINGS]

address=139.229.12.32

port=1024

/home/observer/apps/CHIRTEMP/config/

DEV_TPCTRL.cfg:

[MODS]

(dewar lakeshore, ctioe1, serial port 0)

LKS325_1="init type serial, port 0, brate 9600, parity odd, databits 7"

(instrument temp. Lakeshore, Lantronix2, port 1 -> ***not yet added*** <-)

LKS325_2="init type tcp 139.229.12.38, port 10001”

(All instrument body temperatures, to RTD box)

ADAM6000="init type udp, address 139.229.12.31, port 1024, timeout 5000"

(pfeiffer dewar pressure, Lantronix1, port 4)

PFEIFFER="init type tcp 139.229.12.33, port 10004, timeout 5000"

(room pressure, Lantronix1, port 2)

DPM7885="init type tcp 139.229.12.33, port 10002, timeout 7000, unit hPa"

(Omega room temperature control, Lantronix2, port 2)

OMEGA_1="init type tcp 139.229.12.38, port 10002"

(Omega iodine cell temperature control, direct ethernet, -> ***not yet added*** <-)

OMEGA_2="init type tcp 139.229.12.36, port 2000"

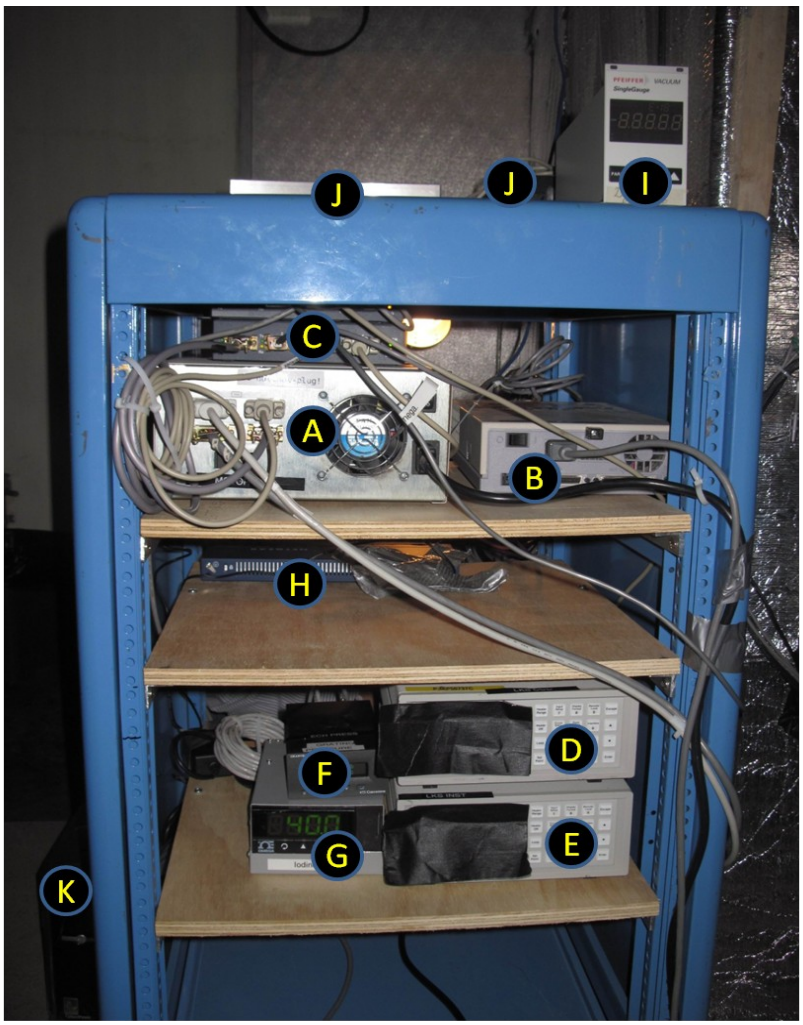
(instrument pressure, phillips gauge, Lantronix2, port 4)

PHIL475="init type tcp 139.229.12.38, port 10004"

Appendix I: physical locations in equipment rack

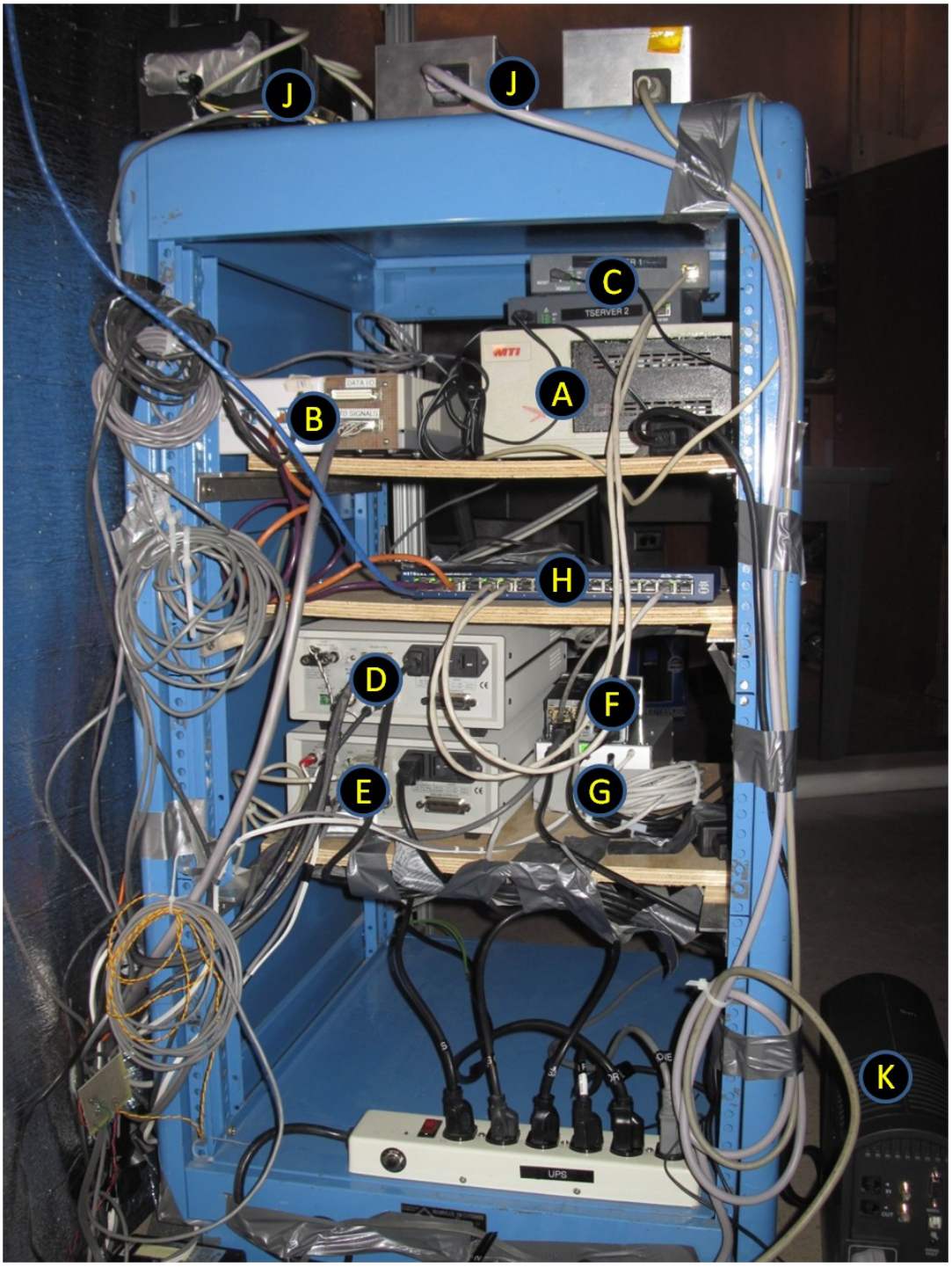
(60 inches Coude room)

Front view

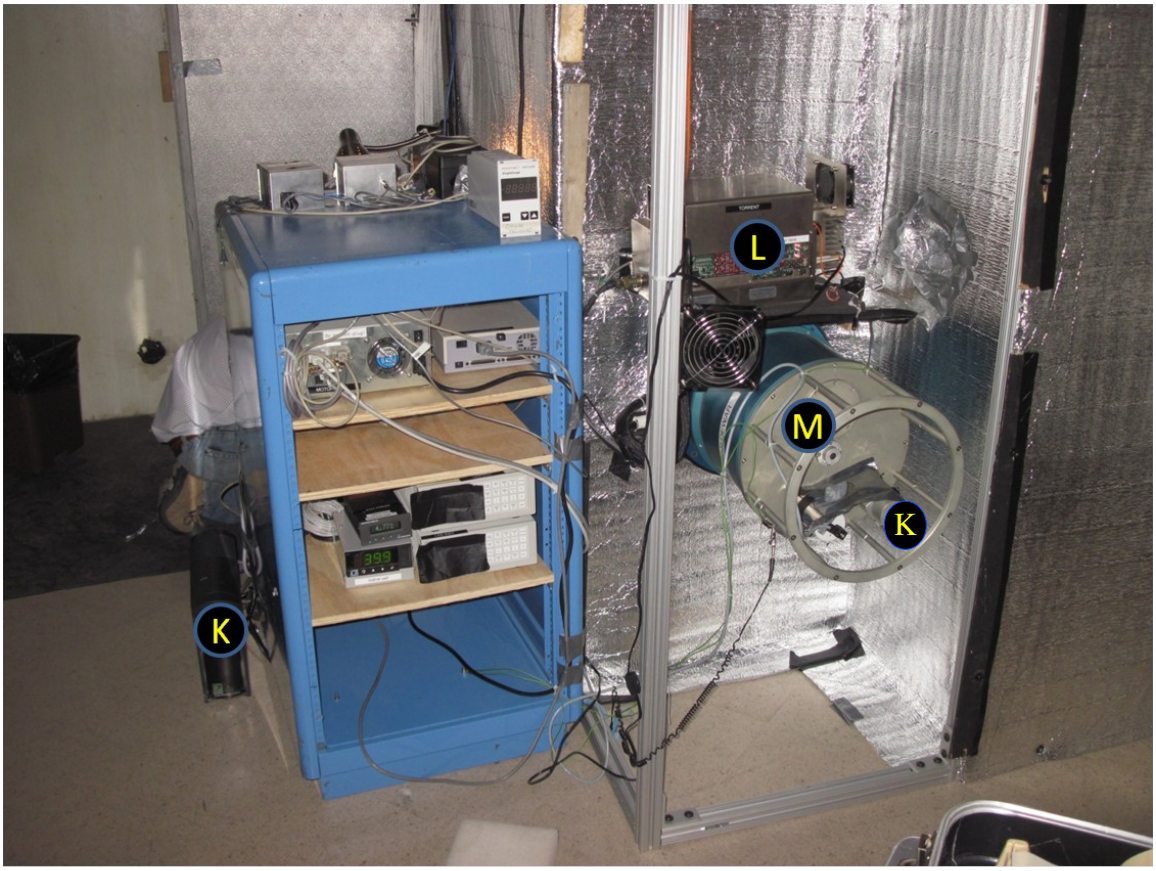


A Motor control (slicer, focus)
B RTD/iodine motor (adam)
C Lantronix Terminal servers (1 and 2)
D Lakeshore 325 CCD temp.
E Lakeshore 325 inst. Body temp.
F Phillips echelle press.
G Omega iodine temp.
H Ethernet switch
I Pfeiffer dewar press.
J Expmeter interface
K UPS

Rear (back) view



overview



K UPS

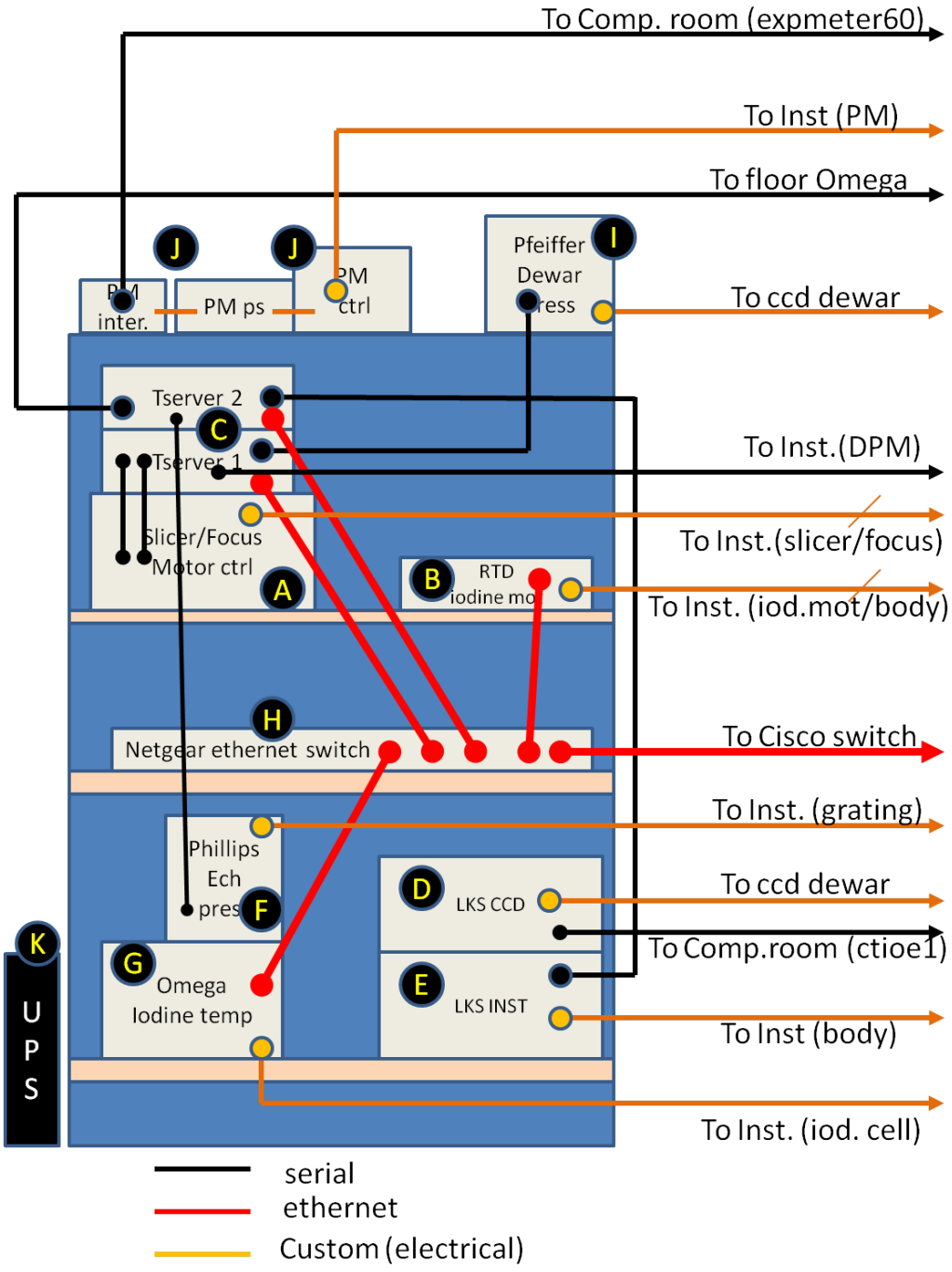
L Torrent

M CCD dewar

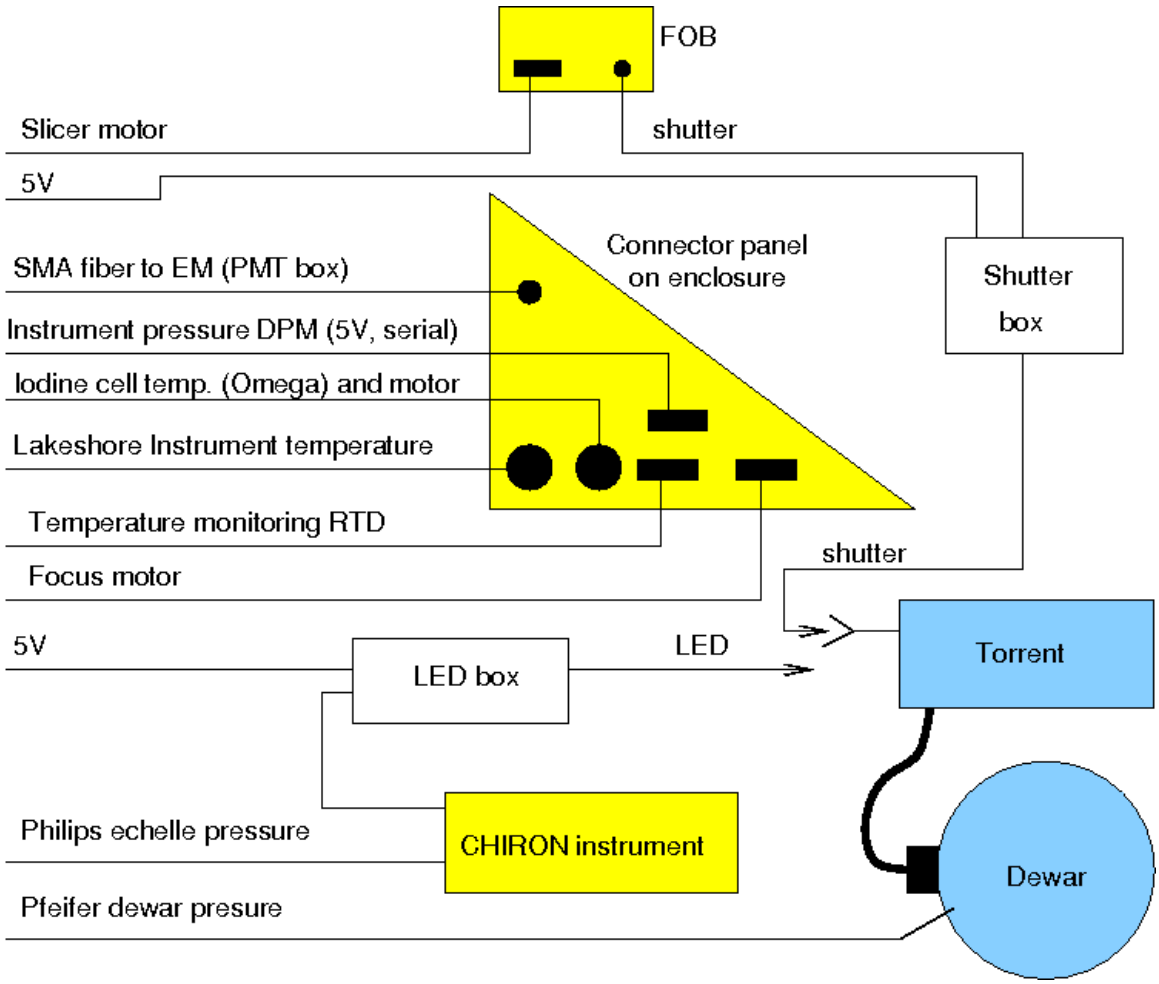
Note that **ALL the equipment in the rack is connected to the UPS**

The Torrent controller L is also connect to the UPS

<u>Connections Diagram (Front View):</u>


To Comp. room (expmeter60)
To Inst (PM)
To floor Omega
To ccd dewar
To Inst.(DPM)
To Inst.(slicer/focus)
To Inst. (iod.mot/body)
To Cisco switch
To Inst. (grating)
To ccd dewar
To Comp.room (ctioe1)
To Inst (body)
To Inst. (iod. cell)
J
J
I
PM inter.
PM ps
PM ctrl
Pfeiffer Dewar
Tserver 2
C
Tserver 1
Slicer/Focus Motor ctrl
A
B
RTD
H
Netgear ethernet switch
Phillips Ech
F
D
LKS CCD
K
G
Omega Iodine temp
E
LKS INST
UPS
serial
ethernet
Custom (electrical)

Connections to the CHIRON



Yellow marks elements located on CHIRON: the FOB plastic enclosure, the triangular connector panel, and cables that go directly out of the instrument through foam seal. Blue marks the CCD detector and controller.

Appendix J: Network connections