MI-NOTE: #0189

MI DEVICE and ACNET Names

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Introduction

To assist Accelerator Operations and ease the integration of the Main Injector and it's associated beamlines into the accelerator complex, a **Device Naming Convention** for devices destined for the tunnel and Service Building is proposed. Whenever possible, this convention should be utilized to label **physical** devices as well as for the creation of ACNET database names to be used in the control system. This will provide commonality between what a device is called in the tunnel and control system. This will also provide some consistency on naming conventions among the various accelerator systems (instrumentation, power supply, vacuum, water, etc.).

Two templates are presented in this document. The first is for the naming of PHYSICAL devices in the tunnel/Service Building and the second will be used for the creation of ACNET database device names. These names should, however, be closely coupled through the device mnemonics. Tables of suggested device mnemonics for physical and database devices are given. Examples for power supply naming and multiwire naming are included. Information on MI application programs and database entry procedures/templates can be found on a Web page managed by the Controls Group. It is located at the following address:

`http:\\adwww.fnal.gov\cr2coop\mi_applications.html`

A link to this document (MI note 0189) is included in the

`mi_applications`

document.

Device Naming Procedure

We are asking that device names and all database **names and descriptions (not database entries)**for the Main Injector project be supplied to a MI Nomenclature Group for approval prior to installation or entry into the database. This can be done by e-mailing the list of names to dej@fnal and still@adcalc for approval.

Main Injector Beamline Names

A description of the naming convention for the Main Injector and its associated beamlines has been presented in MI note #0188. Figure 1 summarizes the cell boundry nomenclature described in that note. In this figure, the MI straight sections are listed in **bold face** and have the form **MI-xx** where xx is the sector number 10 through 60. The straight sections or beamlines which have Service Buildings associated with them are enclosed by a box. The starting and ending quad numbers in each MI ring sector are labeled on the interior of the ring. The four beamlines and the future NuMI beamline (dashed line) along with their starting and ending quad numbering are shown. The existing beamlines and their naming convention are shown as dotted lines. The sectors, straight sections, and cell boundaries will become part of the naming convention.

Device Names

A device naming convention is presented here which allows all physical devices (such as magnets, trims, rf cavities, kickers, valves, pumps, detectors, bells, whistles, etc.) in the ring and beamlines as well as devices in the Service Buildings to have unique, descriptive names. Each of these devices should be clearly labeled as it is installed in the tunnel (or Service Building) such that anyone working in the area may easily identify all devices.

The device name should follow the template

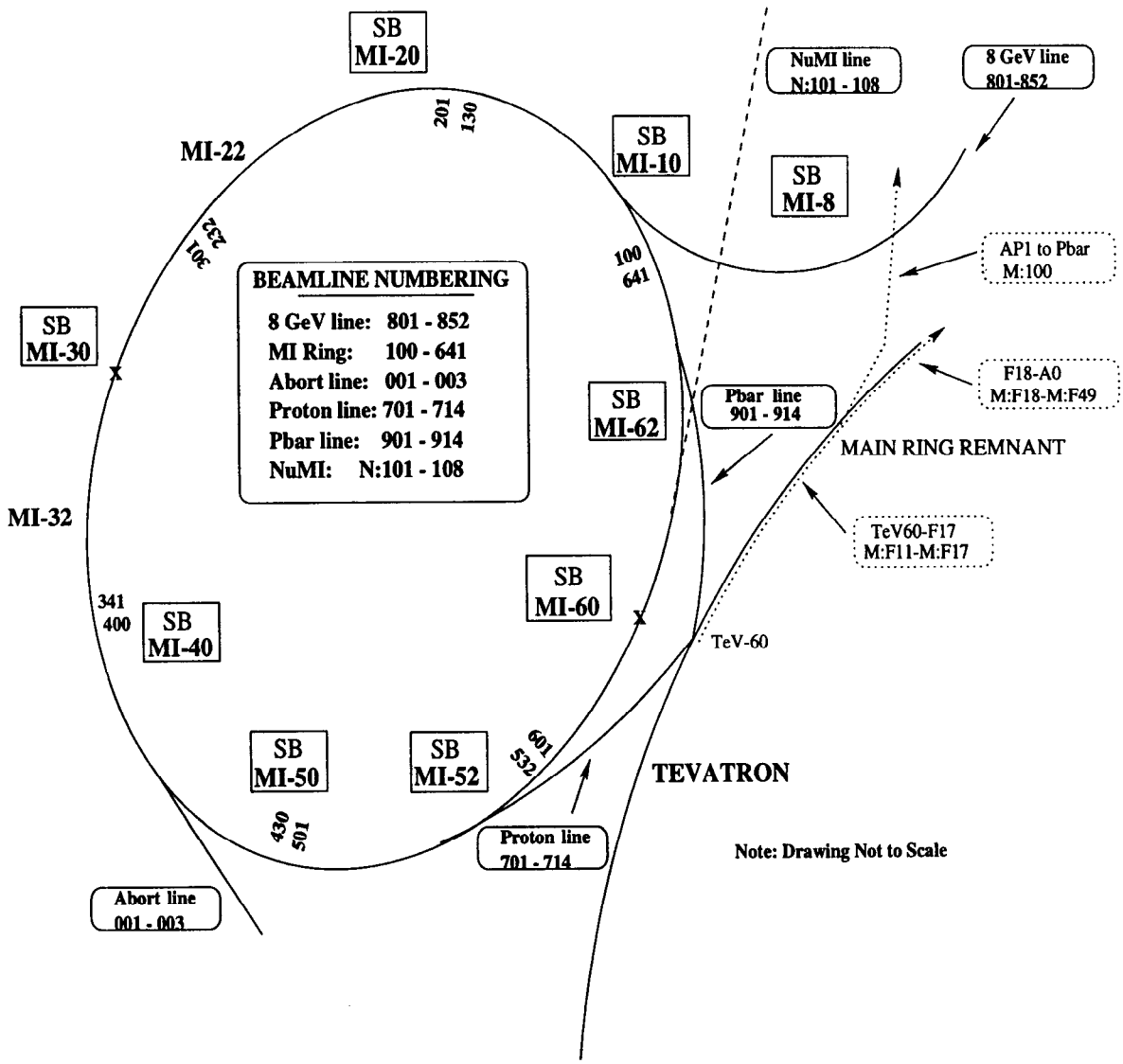

Figure 1: Main Injector Ring and Beamline Cell Naming Convention.

device : location : sequence identifier

where the **device** is a 1 to 3 character mnemonic listed in the following tables, the **location** is 1 to 3 characters given by

- **xxx** where xxx is a tunnel location (613),
- **yy** where yy is a house or straight section (MI)52,
- **z** where z is a ring sector (1xx,2xx,8xx,etc.)
- **H or V** where H/V is horizontal or vertical.

The **sequence identifier (an alphanumeric string)** will allow distinction between multiple hardware devices in the same half cell. Many devices will not have a sequence number. The level to which the location and sequence identifier are specified will depend on how many "devices or systems " are (or will be) installed in the ring. A few a general guidelines for specifying the location and sequence identifier are included to aid in device naming:

- same device type is installed in multiple locations within a sector - the **xxx** location label should be used,
- same device type is installed in multiple straight sections (or houses) - the **yy** house or straight section name should be selected,
- the single character **z** , representing the ring sector, should be avoided unless five or more characters are required for the mnemonic and sequence identifier or property (in the case of ACNET names) or this provides for a clear name (see Eaxmple 3).
- only two devices of the same type are installed in the ring and a single character must be used for the location - the letters **H** or **V** could be used to specify a unique location (i.e. horizontal or vertical location)
- the sequence indentifier may be either a number (as in MI dipole naming) or character (as in beamline naming of multiple quads at a location)

There is not a strict limit on the length of physical device names, however, if the devices will eventually have their readings, settings, or properties monitored or controlled through the ACNET control system, the names, should be sized to allow a property or function suffex to be appended to the name, if required.

ACNET Names

The current ACNET control system forces a limit of eight characters for all control system device names. This is six characters for the root device name plus the single character for the node (I for the Main Injector) and a colon. There are many physical devices that have multiple control and readback database entries to control or describe a device's state, such as the CAMAC 453 cards, ion profile monitors, flying wires, etc. . The different functions or properties in the CAMAC 453 cards are denoted by the addition of a suffix to a root name. This implies that the root name can be a maximum of 5 characters if a suffix is to be added. On the other hand, systems such as the ionization profile monitor require on the order of 30 ACNET devices for control and a single character will not be sufficient. In this case, two (or more) characters are required. This limits the root device name to a maximum of four characters. In Table 4, Diagnostic Devices, the ioniztion profile monitor is denoted by the mnemonic PMHz or PMVz with the location, **z**, specifying the sector. Here since there is only one of each detector in the ring, the "location" is implicit by including the H and V in the root name. This uniquely distinguishes the two devices, although it does not give the monitors physical location.

There will be other systems that have a more complex set of control points which might require 2 or 3 character in which case the location or device mnemonic might have to be compromised. The following template demonstrates the suggested form:

```
node : device | location | suffix (property or function)
      <_________________>
       root device name
```

where the device is a standard 1 to 3 character mnemonic from the following tables The location would generally follow the same comments as those in the section on DEVICE NAMES. The suffix is used to denote the property or function of the ACNET device. Typical suffixes for CAMAC cards with multiple database entries for their various functions are listed in Table 9.

This naming convention is intended to provide a descriptive ACNET name to the magnet current readbacks, individual magnet power supplies, bulk power supplies, trim supplies, power supply shunts, power supply circuits, timing channels, diagnostic readbacks, etc. which are used to control

the accelerator. However, many parts of complex systems such as the LLRF are not suited to fit into this scheme.

Physical /ACNET Device Mnemonic Tables

A set of tables which list a mnemonic, suggested location description, and the device description for various classes of devices (physical and ACNET) are included to aid in the construction of device and ACNET names. Any device which is to be installed in the tunnel or in the database should follow this guide for mnemonics. As new devices are added or device mnemonics are changed, revisions of this document may be required.

Table 1 lists device names for magnetic elements that might appear in the ring or beamlines. Some of the device names appear only in lattice files and are used as markers or in fitting algorithms. Due to current naming convention in the Tevatron and the beamlines, the names of the main bending magnets and the trim or correction dipole magnets are not the same in the ring and beamlines. To remain consistent with the Tevatron the correction dipoles in the Main Injector are called Hxxx and Vxxx where xxx is the location in the ring. To remain consistent with the existing beamlines the correction dipoles are considered to be trims and are called HTxxx and VTxxx. The main dipoles in the beamlines are named according to their function Hxxx, Vxxx, or HVxxx for rolled dipoles.

Table 2 provides guidence or suggestions for the naming of power supplies which appear as ACNET devices. Circuits which have a one-to-one correspondence between the power supply and magnet, such as the correction dipoles, should have the magnet current readback be the same as the device name. Then the power supply attributes, such as voltage, error, reference, etc. are appended to the device name. There are several options for magnet circuits which contain more than one magnet. The circuit may be called by the name of the first element in the string, by the sector the string in located, or by its function.

Table 4 lists device and ACNET names for diagnostic devices. This table is divided in to types of diagnostic equipment such as position monitors, transverse profile monitors, longitudinal RF and beam current monitors, and miscellaneous other monitors.

Table 5 lists device names for various vacuum components. Some will have digital status and control, others will provide readbacks of vacuum levels.

Table 6 lists the mnemonics to be used to describe the water system in the Main Injector and beamlines. Most mnemonics are three characters and start with a W to indicate the water system. The second character in the mnemonic is a device "type" such as valve (V), flow meter (F), liquid level meter (L), resistivity meter (R), temperature sensors (T), pressure sensors (P), and pumps (also P). In general the third character in the mnemonic indicates supply (S), return (R), make-up (M), or a water system such as magnet system (M), deionizing system (D), or a cavity system (C). The xx denotes the Service Building number the water system is located. The # may be a sequence identifier and amy be either a number (0-9) or letter (A-Z). For valves or sensors located in the tunnel, a quad number xxx may be substituted for the Service Building - Sequence identifier, yy#.

Table 7 lists the MI ring magnet stand locations for the dipoles and quadrupoles.

Table 8 lists the mnemonics for the MI ring dipole and quadrupole survey positions.

Table 1: MAGNETIC (LATTICE) DEVICES

Mnemonic	Location	Description
CB	xxx	cell boundary (in lattice file)
	xxx	cell boundary
Q	xxx	main quad
D	xxx1	main dipole upstream
D	xxx2	main dipole downstream
S	xxx	sextupole
QC	xxx	quad corrector
SQ	xxx	skew quad
O	xxx	octupole
H	xxx	ring horizontal corrector
V	xxx	ring vertical corrector
LAM	yy	Lambertson
L	xxx	Lambertson
CM	xxx	cmagnet
K	xxx	kicker
P	xxx	pinger
MP	xxx	multipole (lattice device only)
H	xxx1	beamline main H dipole upstream
H	xxx2	beamline main H dipole downstream
V	xxx1	beamline first main V dipole
V	xxx2	beamline second main V dipole
HV	xxx	beamline rolled dipole
HT	xxx	beamline horizontal trim
VT	xxx	beamline vertical trim

Table 2: POWER SUPPLY

Mnemonic	Location	Description
QPS	yy	quad power supply in house yy
QPS	yz	quad power supply in sector y seq. number z
CPS	yz	correction element bulk supply in sector y seq. z
DPSU	y	dipole power supply upper bus at MI 10 (y=1)
DPSL	y	dipole power supply lower bus at MI 10 (y=1)
H	xxx	Hor. power supply for magnet string start @ xxx
SF		sextupole focusing power supply at MI
OD		octupole defocusing power supply
TS	xxx1	load transfer switch 1 for circuit xxx

Table 3: ELECTROSTATIC DEVICES

Mnemonic	Location	Description
ES	xxx	electrostatic septa
RF	zz	RF cavity
HD	xxx	horizontal beam damper
VD	xxx	vertical beam damper

Table 4: DIAGNOSTIC DEVICES

Mnemonic	Location	Description
HP	xxx	horizontal BPM
VP	xxx	vertical BPM
IN	xxx	intensity from BPM plates
LM	xxx	loss monitor
FWH	yy	horizontal flying wire in sector yy
FWV	yy	vertical flying wire in sector yy
WH	xxx	multiwire (horizontal wires) at quad location xxx
WV	xxx	multiwire (vertical wires) at quad location xxx
PMH	z	horizontal (ionization) profile monitor
PMV	z	vertical (ionization) profile monitor
SEM	xxx	SEM at xxx
SWIC	yy	SWIC at yy
RW	xxx	resistive wall detector (hardware)
FBI	—	fast bunch integrator(— ACNET property)
SBD	—	single bunch display (— ACNET property)
TOR	xxx	beam current toroid
DCCT	yy	DCCT beam current monitor
HS	xxx	horizontal Schottky
VS	xxx	vertical Schottky
TH	xxx	tunnel humidity
TT	xxx	tunnel temperature
QT	xxx	quad temperature
ERT	yy	equipment room temperature in SB yy
KL	xxx	klixon status

Table 5: VACUUM SYSTEM DEVICES

Mnemonic	Location	Description
IP	xxx	ion pump
GV	xxx	gate valve
VW	xxx	vacuum window
TC	xxx	thermocouple
PG	xxx	pirani guage
IG	xxx	ion gauge
BV	xxx	sector (beam) valve
PP	xxx	pump-out port

Table 6: WATER SYSTEM DEVICES

Mnemonic	Location	Description
WVS	yy#	water valve supply
WVR	yy#	water valve return
WVM	yy#	water valve make-up (or, water valve mixing)
WVC	yy#	water valve continuous (0-100%)
WVD	yy#	water valve digital (open/closed only)
WFS	yy#	water flow supply
WFR	yy#	water flow return
WFM	yy#	water flow make-up
WLL	yy#	water liquid level
WRM	yy#	water resistivity magnet system
WRC	yy#	water resistivity cavity system
WRR	yy#	water resistivity RF system
WRD	yy#	water resistivity deionizing system
WTS	yy#	water temperature supply
WTR	yy#	water temperature return
WTP	yy#	water temperature pond
WTM	yy#	water temperture miscellaneous
WPS	yy#	water pressure supply
WPR	yy#	water pressure return
WPO	yy#	water pressure other (not supply or return)
WPM	yy#	water pump magnets
WPP	yy#	water pump pond
WPRFC	#	water pump RF cavity
WPRF	#	water pump RF (upstairs equipment)

Table 7: MAGNET STAND LOCATIONS

Mnemonic	Description
xxx1U	xxx1 dipole upstream stand
xxx1D	xxx1 dipole downstream stand
xxx2U	xxx2 dipole upstream stand
xxx2D	xxx2 dipole downstream stand
xxxS1U	xxxS1U first SS device upstream stand
xxxS1D	xxxS1D first SS device downstream stand
xxxU	xxx quad upstream stand
xxxD	xxx quad downstream stand

Note: SS = straight section

Table 8: MAGNET SURVEY POSITIONS

Mnemonic	Description
SxxxU	x,y,z coordinates of quad xxx upstream steel
SxxxC	x,y,z coordinates of quad xxx center fiducial
SxxxD	x,y,z coordinates of quad xxx downstream steel
Sxxx1U	x,y,z coordinates of dipole xxx1 upstream steel
Sxxx1C	x,y,z coordinates of dipole xxx1 center fiducial
Sxxx1D	x,y,z coordinates of dipole xxx1 downstream steel
Sxxx2U	x,y,z coordinates of dipole xxx2 upstream steel
Sxxx2C	x,y,z coordinates of dipole xxx2 center fiducial
Sxxx2D	x,y,z coordinates of dipole xxx2 downstream steel

Table 9: Property Suffix for Various Controls Cards

Card	Suffix	Description
192	A	Area (integral counts on all wires)
	M	Mean of the distribution
	S	Sigma of the distribution
	C	Chi sq of the fit in the 192
453		magnet current readback
	T	F(t) table
	G	G(i) table
	H	H(i) table
	M	Maps
	S	Scale factors
	V	Version, etc.
	F	Reference
	Z	Whole family
	R	Restore family
465		magnet current readback
	T	F(t) table
	G	G(i) table
	H	H(i) table
	M	Maps
	S	Scale factors
	U	Version, etc.
	X	G-abscissa
	Y	H-abscissa
	C	clock events
	D	MDAT
	F	Reference
	Z	Whole family
	R	Restore family

Example 1: 8 GeV Power supplies

Currently, the 8 GeV line quads at the front and end of the line are individually powered for matching between Booster and the transport line and matching between the transport line and the MI. These are powered DC. The quads are grouped into 5 groups according to their expected nominal running currents. Each of these groups will be powered by a bulk power supply and each quad will have its own trim supply.

```
I:Q804 Quad 804 magnet current (=QPS81I-Q804I)
I:Q804I Quad 804 trim supply current
I:QPS81I Bulk PS#1 (801,804,807) supply current
I:QPS81V Bulk PS#1 (801,804,807) supply voltage
I:QPS82I Bulk PS#2 (805,806,808) supply current
I:QPS82V Bulk PS#2 (805,806,808) supply voltage
```

Example 2: 150 GeV Dipole Power Supply

Both the proton (I:551) and the pbar (I:651) beamline dipole strings share a common dipole power supply for 150 GeV operation. In addition, the proton line has a 500 A power supply required for 8 GeV operation. Three load transfer switches are required to switch operation between magnet strings and power supplies. Both strings are made up of rolled and non rolled dipoles. The dipoles in the proton line would be called HV5531, HV5541, H5542, etc. Since the string bends both horizontally and vertically, the power supply would be named after the first magnet in the magnet string:

```
I:HV553   HV5531-HV5602 Magnet String current
I:HV553I  Power supply current
I:HV553V  Power supply voltage
I:TS553A  Transfer switch for 8 GeV
I:TS553B  Transfer switch for 150 GeV protons
I:TS553C  Transfer switch for 150 GeV pbars
```

```
The load transfer switch configuration for 8 GeV pbar operation would be:
I:TS553A (pbar 8 GeV    )   on
I:TS553B (proton 150 GeV)   off
```

```
I:TS553C (pbar 150 GeV  )   off
The load transfer switch configuration for 150 GeV proton operation would be:
I:TS553A (pbar 8 GeV    )   off
I:TS553B (proton 150 GeV)   on
I:TS553C (pbar 150 GeV  )   off
The load transfer switch configuration for 150 GeV pbar operation would be:
I:TS553A (pbar 8 GeV    )   off
I:TS553B (proton 150 GeV)   off
I:TS553C (pbar 150 GeV  )   on
```

Example 3: MI Main Dipole Power supplies

There are two dipole power supply loops around the MI with half the supplies on the upper and the other half on the lower. This example shows a possible naming for some of the readbacks from the dipole power supply on the upper bus in MI10.

```
I:DPSU1P MI-10 Up Dipole PS Plus V to G
I:DPSU1N MI-10 Up Dipole PS Minus V to G
I:DPSU1V MI-10 Up Dipole PS Filter Voltage
I:DPSU1E MI-10 Up Dipole PS output current error
I:DPSU1R MI-10 Up Dipole PS output current ref
```

Example 4: 8 GeV Multiwire Devices

Up to four multiwire chambers are controlled by a single CAMAC 192 controls module. In this system we have a hardware multiwire chamber, multiple entries of data readback for horizontal and vertical wire planes inside a single chamber, and the control entries for the CAMAC 192 card. All three of these types of names should be consistently linked together via their names. The hardware name will not appear on the ACNET console as a device.

The hardwire chamber device name:

```
MW813 The hardware device name of the multiwire at 813
```

The 192 has several database devices specific to the card and not to the individual chambers controlled by the card. Here the MW is multiwire, the

8 for the 8 GeV line, the 1,2,3,4 represent the controller number in the 8 GeV system, and the "C,R,A,E" represent the various properties.

```
I:MW81C        8 GeV 192 controller#1 clock events
I:MW82R        8 GeV 192 controller#2 raw data
I:MW83A        8 GeV 192 controller#3 average data
I:MW84E        8 GeV 192 controller#4 extended events(?)
```

The 192 writes 4 database parameters for each of the multiwire chambers it controls. Following the existing convention of multiwire database names, the device, DD, for of these readbacks are WH or WH for horizontal or vertical wire, xxx for wire number, and A, M, S, or C for the property.

```
I:WH813A Horiz. multiwire 813 area
I:WH813M Horiz. multiwire 813 mean
I:WH813S Horiz. multiwire 813 sigma
I:WH813C Horiz. multiwire 813 chi sq
```