LASER INTERFEROMETER GRAVITATIONAL WAVE OBSERVATORY
- LIGO -
CALIFORNIA INSTITUTE OF TECHNOLOGY
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LIGO Naming Conventions

LIGO Systems Engineering Group

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LIGO Project

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TABLE OF CONTENTS

List of Figures

List of Tables

1 Purpose

This document defines the naming conventions for all LIGO hardware elements in the LIGO project. This covers names for systems, subsystems, assemblies, subassemblies, and components. The purpose of the naming scheme is to make communication easier and to avoid misinterpretations.

2 Nomenclature and Acronyms

ASC	Alignment Sensing/Control
ASCII	American Standard Code for Information Interchange
BSC	Beam Splitter Chamber
BT	Beam Tube
BTE	Beam Tube Enclosure
CBI	Chicago Bridge & Iron
CC	Civil Construction
CDS	Control and Data System
COC	Core Optics Component
CP	Chiller pad
FCMS	Facility Control and Monitoring System
HAM	Horizontal Access Module
HVAC	Heating, Ventilation and Air Conditioning
HWCI	Hardware Configuration Item list
IF	Interferometer
IOO	Input/Output Optics
LA	Louisiana
LIGO	Laser Interferometer Gravitational Wave Observatory
LOS	Large Optics Suspension
LSC	Length Sensing/Control
LVEA	Laser Vacuum Equipment Area
ME	Mechanical Equipment
OSB	Operations Support Building
PG	Power Grid
PSI	Process Systems International
PSL	Prestabilized Laser
SEI	Seismic Isolation
SOS	Small Optics Suspension
SUS	Suspension
VE	Vacuum Equipment
VEA	Vacuum Equipment Area
WA	Washington

3 Introduction

Defining unique names for all components of all systems within LIGO is essential. Long names have to be uniquely defined in order to avoid confusion in documentation; short names (aliases) have to be defined in order to be able to handle them in a number of different contexts: databases, cabling, equipment inventory, field installation. Both names are based on the same structured view of the LIGO system: LIGO is hierarchically subdivided into sites, locations, systems, subsystems, assemblies, subassemblies, and components.

4 Coordinate Systems

4.1. Physical coordinate systems

Global and local coordinate systems[1] have been defined. The global coordinate system provides the frame of reference for locating buildings and critical lengths which span across buildings (e.g., vacuum chamber separations and interferometer optics locations). The local coordinate systems help to provide a means for locating the position of equipment within the buildings, such as racks, electrical stub-ups, etc. The definition of the LIGO coordinate systems is specified in the LIGO System Specification (E950084) and is shown in Figure 1.

Documentation generated in the course of project development, including various contractor drawings, have used different names for the arms at the two sites. The LIGO preferred naming convention is "X-Arm" and "Y-Arm" for the arms as indicated in Figure 1. The "X-Arm" is along the global X-direction (i.e., is to the right if one stands at the vertex and looks along the bi-sector of the acute angle of the "L" formed by the two legs). The "Y-Arm" is along the global Y-direction (i.e., is to the left of one stands at the vertex and looks along the bi-sector of the acute angle of the "L" formed by the two legs). A cross-reference to alternate names for the two arms used in some of the project documentation is given in Table 1.

4.2. Modeling coordinate systems

The optical models developed to design the LIGO control systems have adopted a coordiante system convention more appropriate to optical design applications. Typically in these coordiante systems, the propagation direction is always defined as the z axis; reflections off mirrors rotate the coordiante systems accordingly. The details for the LIGO models are described in the ASC DRD, T952007.

1. W. Althouse & G. Stapfer to A. Lazzarini, LIGO Coordinate System, LIGO-L950128, 15 Feb 95.
A. Lazzarini, Derivation of Global and Local Coordinate Axes for the LIGO Sites, LIGO-T950004-A-E, 3 July 95.

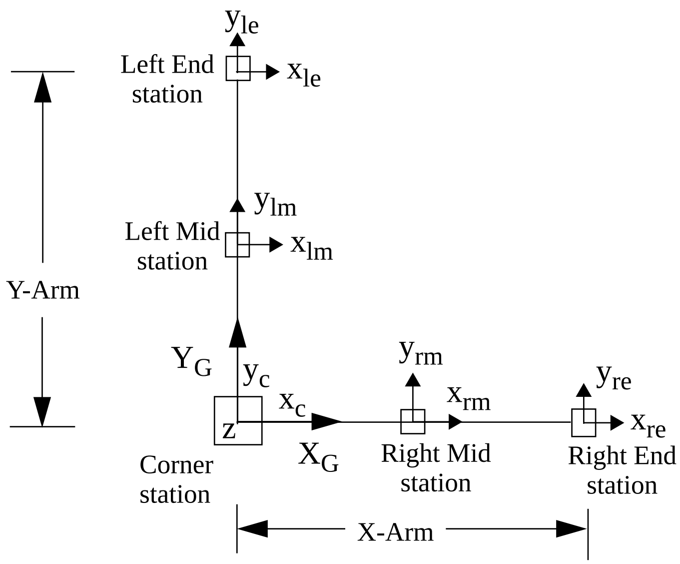

Figure 1: LIGO Coordinate Systems

Figure 1 Notes:

1) All coordinate systems are right-handed, i.e., the z-axis is positive in the “up direction”.
2) The origin of the local coordinate systems for the mid-and end stations coincides with the center of the initial test mass chambers.
3) The corner station local coordinate system $\{x_c, y_c, z_c\}$ is identical to the global coordinate system $\{X_G, Y_G, Z_G\}$.

Table 1: LIGO Coordinate Names and Reference Designations

System ID	Arm (Module/Station) nomenclature	
LIGO Naming Convention	X	Y
WA site	Northwest	Southwest
LA site	Southwest	Southeast
LIGO Info for Potential Contractors, pre-1995 LIGO specifications	Right	Left
CBI (current drawings)	X	Y
CBI (old drawings)	Right	Left
CBI WA module IDs	HX1, HX2	HY1, HY2
CBI LA module IDs	LX1, LX2	LY1, LY2
CBI Alignment Procedure (WA)	Module 3, Module 4	Module 1, Module 2
CBI Alignment Procedure (LA)	Module 7, Module 8	Module 5, Module 6
Parsons arms	Arm 2	Arm 1
Parsons stations	Mid A, End A	Mid B, End B
PSI	Right	Left
LIGO Facilities Schedule (WA)	Arm 2	Arm 1
LIGO Facilities Schedule (LA)	Arm 3	Arm 4

5 Objects To Be Named

The present document deals with the names and codes used to designate the following categories of objects and attributes:

- sites
- stations
- locations
- systems
- subsystems
- assemblies
- subassemblies
- components

Signal and software module definition naming is defined by the CDS group and is not within the scope of this document. A long name (if and as required) is formed by concatenation (using hyphens) of the above categories in the following order: Site-station-location-system-subsystem-assembly-etc. to the level required. A short name is formed by dropping all or some of the proceeding part of the long name.

6 Names and Codes

The naming convention is based on a fixed number of hierarchical layers as set out below. Examples of the use of the naming convention (which is explained in the following sections) are given in Table 2.

6.1. Unit names

Unit names are simply a list of agreed names. The only restriction is that no two units in different parts of LIGO should have the same name. If units are technically identical, the different instances are identified by location.

6.2. Unit codes

The coding is based on mnemonics as far as practically possible and compatible with the character number limits in the relational database (it is the intent that a Hardware Configuration Item (HWCI) List and eventually configuration tracking will be developed using the Access database manager; see section 7). Unit codes are not case sensitive. The length of the code depends on the level of the unit in the hierarchy. The elementary units have the longest code.

The following is the convention for naming, identification and labeling of hardware items. Please note that the sites and the systems are complete in the present version of the document. The other elements given are examples of possible names and codes.

A) Sites
- H (Hanford)
- L (Livingston)
- C (Caltech)
- M (MIT)

B) Stations
- C = corner station
- Ca = corner station on arm “a”, “a” (in ASCII) (where a = “X” or “Y” denotes the beam line arm w.r.t. site global coordinate system).
- CV = corner station, ”V” denotes the vertex of the corner station.
- Ma = mid-station on arm “a” (in ASCII).
- Ea = end station on arm “a” (in ASCII).
- BTMa = Beam Tube Module on arm “a” (in ASCII)

C) Location within stations
- Badddd = position “dddd” (digit in meters) along beam tube arm “a” (in ASCII).
- CP = chiller pad
- CR = cleaning room

CHR = change room
EEA = experiment equipment area
ISR = Inspection, shipping and receiving area
ME = mechanical equipment room
OB = outer buildings
OSB = operations support building
ESS = electrical sub-station
LVEA = laser vacuum equipment area
VEA = vacuum equipment area
VSE = vacuum support equipment room

D) Systems

CC = Civil Construction
BT = Beam Tube
CDS = Control and Data System
PEM = Physical Environment Monitoring
VE = Vacuum Equipment
IFd = Interferometer, where “d” denotes which interferometer at the site: 1 = 4km; 2 = 2km, etc. and is assigned sequentially as the system evolves to more interferometers.

E) Subsystems

E.1) CC Subsystems:

HVAC = Heating, Ventilation and Air Conditioning
FCMS = Facility Control and Monitoring System
Cranes = Cranes
PDP = Power Distribution Panels
PG = Power Ground Grids

E.2) BT Subsystems:

HX1 = Beam tube module on the X-arm between the Corner station and the Mid station at the Hanford site.
HX2 = Beam tube module on the X-arm between the End station and the Mid station at the Hanford site.
HY1 = Beam tube module on the Y-arm between the Corner station and the Mid station at the Hanford site.
HY2 = Beam tube module on the Y-arm between the End station and the Mid station at the Hanford site.
LX1 = Beam tube module on the X-arm between the Corner station and the Mid station at the Livingston site.
LX2 = Beam tube module on the X-arm between the End station and the Mid station at the Livingston site.
LY1 = Beam tube module on the Y-arm between the Corner station and the Mid station at the Livingston site.
LY2 = Beam tube module on the Y-arm between the End station and the Mid station at the

Livingston site.

E.3) CDS Subsystems:
DAQ = Data Acquisition
GCDS = Global CDS

E.4) PEM Subsystems:
TBD

E.5) VE Subsystems:
Bakeout = Bakeout
MON_CNTL = Monitor and Control
Pump = Pumping
Valve = Gate valves
VAC_ENCL = Vacuum enclosure
VAC_PURGE = Vent and Purge

E.6) IFd Subsystems:
PSL = Prestabilized Laser
IOO = Input Optics System
CDS = Control and Data System
COC = Core Optics Component
COS = Core Optics Support
SUS = Suspension
SEI = Seismic Isolation
LSC = Length Sensing and Control
ASC = Alignment Sensing and Control

F) Assemblies
The following are only examples and not a complete listing:

IMC = input mode cleaner (IOO subsystem)
LOS = Large Optics Suspension (SUS subsystem)
SOS = Small Optics Suspension (SUS subsystem)
BC_ISO = BSC Isolation (SEI subsystem)
BS = Beam Splitter (COC subsystem)
TM = Test Masses (COC subsystem)
etc.

G) Subassemblies
Names for subassemblies are defined by the task leaders for subsystems and are defined in appropriate drawings.

H) Components
Names for components are defined by the task leaders for subsystems and are defined in appropriate drawings.

The assembly, subassembly and component fields shall each not exceed 28 characters and could use acronyms or abbreviations (but no hyphens or spaces).

A list of names for each major LIGO system (including its associated subsystems, assembly and components) are provided in Appendix A.

6.3. Complete vs. partial names

The complete name specification is required only to unambiguously identify a component within the entire LIGO system. When the context is clear (e.g., a specific drawing), only that portion of the name is required which suffices to uniquely identify the element. For example in a drawing of the Hanford LVEA layout of vacuum equipment, all such equipment will have 'H-C-LVEA-VE' as common leading identifiers.

6.4. Example: Equipment within the buildings

The equipment that are located in the corner station LVEA or in the mid- and end-station VEAs will be identified by position within the building. This equipment includes (among other components) Vacuum Chambers, Racks, Conduit Runs/Cable Trays, Cable Harnesses, and cabling. We use these as examples.

6.4.1. Vacuum chambers

Vacuum Chambers shall be named in accordance with the PSI nomenclature (used for example on their LVEA and VEA drawings); this will minimize confusion.

PSI refers to Horizontal Access Module (HAM) chambers as:
<site>HAM<number>
where <site>= W or L for Washington or Louisiana
<number>= a sequential number
The specific locations of the WHAMn chambers are indicated in the attached drawing (D960073) of the corner building (LVEA), the mid-station and the end-station building (VEA's).

PSI refers to the BSC chambers as follows:
<site>BSC<number>
where <site>= W or L for Washington or Lousisana
<number>= a sequential number
The specific locations of the WBSCn chambers are indicated in the attached drawing (D960073) of the corner building (LVEA), the mid-station and the end-station building (VEA's).

6.4.2. CDS racks clusters and electrical power conduit stub-up regions

CDS racks are grouped into clusters which share a common ("island") ground. These clusters are also serviced with electrical power through embedded conduit which stubs-up in the rear of the stay-clear (aisle) region surrounding the rack cluster. The electrical stub-up regions (i.e. not each individual conduit) is labeled as CDSAC_n, where n is a sequential number and where the locations are as indicated in the attached drawing (D960073) of the corner building (LVEA), the mid-station and the end-station building (VEA's).

Since there is a one-to-one correspondence between the electrical power stub-up locations and the CDS Rack Clusters, the numbering used in the rack cluster labeling should be the same as for the electrical power stub-up, i.e. "Cluster_09" receives its electrical power through the stub-up location "CDSAC_09".

6.4.3. CDS racks

The racks have been labelled according to which interferometer arm the rack (and support) is adjacent. The rack designations in the attached drawing (D960073) are:

Rack_<interferometer number><arm><number>
where <Interferometer number>= 1 or 2 for Washington; 1 for Louisiana
<arm>= X or Y (per the LIGO coordinate system)
<number>= a sequential number from most negative coordinate to most positive
e.g. Rack_1X3

Note that if a rack is added in between the first and last racks, at a later point in time, it is assigned the next highest number; the sequential number order will be upset, but this is acceptable. Likewise is a rack is deleted, then its designation is "reserved" and not re-assigned to another rack; this will create "holes" in the label sequence", but this is acceptable. The specific locations of the racks are indicated in the attached drawing (D960073) of the corner building (LVEA), the mid-station and the end-station building (VEAs).

6.4.4. Embedded conduit runs (power and signal)

There is no perceived need to label embedded conduit runs. They are not currently labeled in the construction drawings. Generally, the labeled items are such as an electrical power circuit per conduit.

6.4.5. Conduit runs/cable trays (signal; above ground)

6.4.5.1 Control and Data System (CDS)

If it is necessary to label conduits or cable trays: Conduit or cable trays expressly for the purpose of running CDS signal lines between rack clusters or to/from a rack cluster and a vacuum chamber(s) should be designated as follows:

CON_<interferometer number><arm><number>
where <interferometer number>= 1 or 2 for Washington; 1 for Louisiana
<arm>= X or Y (per the LIGO coordinate system)
<number>= a sequential number from most negative coordinate to most positive,
e.g., CON_2Y3

6.4.5.2 Vacuum Equipment (VE)

The VE system also employs signal and 24V power above-ground conduit and cabling trays. Conduit or cable trays for running the vacuum equipment power and signals between vacuum chambers and along the beam tube should be designated as follows:

CON_VE_<interferometer number><arm><number>
where <interferometer number>= 1 or 2 for Washington; 1 for Louisiana
<arm>= X or Y (per the LIGO coordinate system)
<number>= a sequential number from most negative coordinate to most positive,
e.g., CON_VE_2X3

6.4.6. Cable harnesses

Cable harnesses will generally be associated either with a specific rack or a specific vacuum chamber (or a specific detector component/subsystem within the chamber). Consequently, the designation of these harnesses should carry the association with the lowest level component, assembly or subsystem,
e.g. BC_LOS-CH_01 refers to Cable Harness (CH) number 1 of the Beam Splitter Chamber (BC) Large Optics Suspension (LOS) installation of the assembly.

E.g., Rack_1X5-CH_03 refers to Cable Harness (CH) number 3 of Rack 1X5 (i.e., the 5th rack along the X-arm of the 1st interferometer)

Cabling “medusae” which are not:
- “point-to-point” (as in the cabling examples below)
- generally associated with a specific rack, vacuum chamber or a specific detector component/subsystem (as in the cable harness examples above)

shall be designated “CDS_CH_n”, where n is a sequential number. In this way the cable is designated as a CDS Cable Harness, not associated generally with a point-to-point connection or a specific subsystem.

6.4.7. Cabling

CDS signal cables between racks or to/from a rack and a vacuum chamber should be designated as follows:
CAB_<rack designation>_<chamber designation>
or
CAB_<rack designation>_<rack designation>
E.g., CAB_2Y3_2Y7 indicates a cable from rack 2Y3 (the 3rd rack along the Y-arm of the 2nd interferometer) to rack 2Y7

E.g., CAB_1X9_BSC2 indicates a cable form rack 1X9 to chamber BSC2.

6.4.8. Electrical Power Circuits

6.4.8.1 Panels

Electrical panels shall be named in accordance with the RMP nomenclature (used for example on their LVEA and VEA electrical drawings); this will minimize confusion. RMP refer to their electrical power panels as power distributions. The electrical power panels are separated into two categories: the vacuum equipment and facility power distribution and the technical power distribution. The power panels designations are as follows:

a) Vacuum equipment and facility power distribution:
<site><building><system>PD<designation number>
where <site> = W or L for Washington or Louisiana
<building>* = Corner, Mid, or End
<system> = CC for Civil Construction, or CDS for Control and Data System, etc.
PD = Power Distribution
<designation number> = vacuum equipment AC power panel sequential number, e.g., VEAC-02

b) Technical power distribution:
<site><station><room number>PD<designation number>
where <site> = W or L for Washington or Louisiana
<station> = CS for Corner-station, MS for Mid-station, or ES for End-station
<room number> = building room number
PD = Power Distribution
<designation number> = CDS AC power panel sequential number, e.g., CDSAC-01

6.4.8.2 Circuits

Circuits shall be named in accordance with the RMP nomenclature (used for example on their LVEA and VEA electrical drawings). The circuits are numbered according to the electrical power panel slots where the load is served.

RMP refer to the circuits as follows:
22/24 VEAC04A = circuit number 22/24 at electrical power panel PD-VEAC-04A slots number 22 and 24.

7 Database

A relational database (Microsoft Access) will be used for collecting information on units. The database will be used to relate the names to:

a) their relative position in the Hardware Configuration Item (HWCI) list (i.e., “next higher level assembly is”)
b) the drawing number(s)
c) the latest (released) drawing revision letter

d) the number required in an assembly
e) the location (defined by multiple fields: site, arm, station along arm or rack number, etc.)
f) the version of each manufactured item
g) the serial numbers associated with the named component, assembly, etc.
h) the signals generated by or received by the component (by linking to the CDS signal database)
i) related document numbers (if any)
j) related Interface Control Drawing/Document (if any)
k) the history of the named component (e.g., repair record, hours of operation, etc.)
l) part number (if any)
etc.

The database schema and implementation will be developed by the systems engineering group.

APPENDIX A: HARDWARE CONFIGURATION ITEM LIST (HWCI)

A.1 CC System

SYS	SUBSYS	ASSEMBLY	SUBASSEM	COMPONENT	Description
CC	HVAC	----	---		Heating, Ventilation & Air Conditioning
CC	FCMS	----	---		Facility Control & Monitoring System
CC	PDP	----	---		Power Distribution Panels
CC	PG				Power ground grids
CC		CDSAC_01			CDS electrical power conduit stub-up 01.
CC		CDSAC_02			CDS electrical power conduit stub-up 02.
CC		CDSAC_03			CDS electrical power conduit stub-up 03.
CC		CDSAC_04			CDS electrical power conduit stub-up 04.
CC					

A.2 BT System

SYS	SUBSYS	ASSEMBLY	SUBASSEM	COMPONENT	Description
BT	HX1				Beam tube module on the X-arm between the Corner Stn and the Mid Stn, Hanford
BT		MODULE_S			Beam tube short section of 240M
BT			FIX_SUP		Fixed support
BT			GUID_SUP		Guided support
BT			BEAM_EXPJ		Beam assembly w/expansion joint
BT			BEAM		Beam assembly
BT			BEAM_VAC		Beam assembly w/vacuum port
BT				BAFFLES	Beam tube baffles
BT				STIFF_RINGS	Beam tube stiffening rings
		MODULE_L			Beam tube long section of 280M
BT	HX2				Beam tube module on the X-arm between the End Stn and the Mid Stn, Hanford
BT	HY1				Beam tube module on the Y-arm between the Corner Stn and the Mid Stn, Hanford
BT	HY2				Beam tube module on the Y-arm between the End Stn and the Mid Stn, Hanford
BT	LX1				Beam tube module on the X-arm between the Corner stn & the Mid-point plumb stn, Livg.
BT	LX2				Beam tube module on the X-arm between the End stn & the Mid-point plumb stn, Livg.
BT	LY1				Beam tube module on the Y-arm between the Corner stn & the Mid-point plumb stn, Livg.

SYS	SUBSYS	ASSEMBLY	SUBASSEM	COMPONENT	Description
BT	LY2				Beam tube module on the Y-arm between the End stn & the Mid-point plumb stn, Livg.

A.3 VE System

SYS	SUBSYS	ASSEMBLY	SUBASSEM	COMPONENT	Description
VE	BAKEOUT				Bakeout subsystem
VE	BAKEOUT	---	---	BLANKET	Blanket
VE	BAKEOUT	---	---	CNTL_CART	Control Cart
VE	MON_CNTL				Monitor and Control subsystem
VE	MON_CNTL	---	---	COLD_CATH_GAGE_CNTLR	Cold cathode gauge controller
VE	MON_CNTL	---	---	COLD_CATH_GAGE_TUBE	Cold cathode gauge tube
VE	MON_CNTL	---	---	PIRANI_GAGE_CNTLR	Pirani gauge controller
VE	MON_CNTL	---	---	PIRANI_GAGE_TUBE	Pirani gauge tubes
VE	PUMP				Pumping subsystem
VE	PUMP	---	---	80K_LONG_PUMP	80k long pump
VE	PUMP	---	---	80K_SHORT_PUMP	80k short pump
VE	PUMP	---	---	ANNUL_ION_PUMP	Annulus ion pump
VE	PUMP	---	---	ANNUL_ION_PUMP_CNTLR	Annulus ion pump controller
VE	PUMP	---	---	AUX_PUMP_CART	Auxiliary pump cart
VE	PUMP	---	---	BACKING_PUMP	Backing pump
VE	PUMP	---	---	MAIN_ION_PUMP	Main ion pump
VE	PUMP	---	---	MAIN_ION_PUMP_CNTLR	Main ion pump controller
VE	PUMP	---	---	PORT_ROUG_PUMP	Portable roughning pump
VE	PUMP	---	---	STAT_ROUGH_PUMP	Stationary roughing pump
VE	PUMP	---	---	TURBO_PUMP	Turbo pump
VE	VALVE	---	---	GATE_VALVES	Gate valves
VE	VALVE	---	---	MAIN_ISOL_VALVE	Main isolation valve
VE	VAC_ENCL				Vacuum enclosure subsystem
VE	VAC_ENCL	---	---	ACCESS_COVERS	Access covers
VE	VAC_ENCL	---	---	ADAPTORS	Adapters
VE	VAC_ENCL	---	---	BELLOWS	Bellows
VE	VAC_ENCL	---	---	BLANK_OFF	Blank-off
VE	VAC_ENCL	---	---	BSC	Beam Splitter Chamber
VE	VAC_ENCL	---	---	HAM	Horizontal Access Module
VE	VAC_ENCL	---	---	SPOOL_SECTION	spool section
VE	VENT_PURGE				Vent and Purge subsystem

SYS	SUBSYS	ASSEMBLY	SUBASSEM	COMPONENT	Description
VE	VENT_PURGE	---	---	COMPR_SYS	Compressor system
VE	VENT_PURGE	---	---	PORT_CLEAN_RM	Portable clean room
VE	VENT_PURGE	---	---	PURGE_CNTL_VALVE	Purge control valve
VE	VENT_PURGE	---	---	PURGE_DISTR	Purge distribution

A.4 Detector System

SYS	SUBSYS	ASSEMBLY	SUBASSEM	COMPONENT	Description
IF1	PSL	FREQ			Frequency
IF1	PSL	FREQ	---	AOM	Acousto-optic modulator
IF1	PSL	FREQ	---	EOPS3	Electro-optic phase sensor 3
IF1	PSL	FREQ	---	FI	Faraday isolator
IF1	PSL	FREQ	---	REFCAV	Reference cavity
IF1	COC	BS	---	---	Beam splitter
IF1	COC	FM	---	---	Fold mirror
IF1	COC	RM	---	---	Recycling mirror
IF1	COC	TM		---	Test masses
IF1	COC	TM	ETM		End test masses
IF1	COC	TM	ETM	2KM_ETM	2 kilometer end test masses
IF1	COC	TM	ETM	4KM_ETM	4 kilometer end test masses
IF1	COC	TM	ITM	---	Input test mass
IF1	IOO	BPCS	---	---	Beam Pointing Control System
IF1	IOO	IF_I_COND_OPTC	---		Interferometer output conditioning optics
IF1	IOO			IO_OUT_BS	IO output beam steerer
IF1	IOO			IO_OUT_TELE	IO output telescope
IF1	IOO			IOFI	IO faraday isolator
IF1	IOO	IF_O_COND_OPTC			Interferometer input conditioning optics
IF1	IOO			B_STR	Beam steerer
IF1	IOO			SIG_TELE	Signal telescope
IF1	IOO	IMC			Input mode cleaner
IF1	IOO		IMC_OPTC		Input mode cleaner optics
IF1	IOO			IMC_MIRROR1	Input mode cleaner mirror1
IF1	IOO			IMC_MIRROR2	Input mode cleaner mirror2
IF1	IOO			IMC_MIRROR3	Input mode cleaner mirror3
IF1	IOO		IMC_SEN		Input mode cleaner sensing

SYS	SUBSYS	ASSEMBLY	SUBASSEM	COMPONENT	Description
IF1	IOO			IOBS	IO beam steerer
IF1	IOO			MC_TELE	MC telescope
IF1	IOO	MOD			Modulation
IF1	IOO			FRQ_SHFTD_SUBC	Frequency shifted subcar-rier
IF1	IOO			IO_PKL_CEL1	IO pockels cell 1
IF1	IOO	OMC			Output mode cleaner
IF1	IOO		OMC_OPTC		Output mode cleaner optics
IF1	SEI	BC_ISO_SYS			BSC Isolation System
IF1	SEI		BC_CABLE_MOUT_SYS		BSC cable mounting sys-tem
IF1	SEI		BC_DRIFT_COMP_SYS		BSC drift compensation system
IF1	SEI			BC_AI	BSC active isolator
IF1	SEI			BC_CA	BSC coarse actuator
IF1	SEI			BC_FA	BSC fine actuator
IF1	SEI		BC_STACK		BSC stack
IF1	SEI			BC_DN_STRU	BSC down structure
IF1	SEI			BC_LME	BSC leg mass elements
IF1	SEI			BC_OMP	BSC optics mounting plat-form
IF1	SEI			BC_SPR_ELE	BSC spring elements
IF1	SEI			BC_STACK_TOP_PLATE	BSC stack top plate
IF1	SEI		BC_SUP_STRU		BSC support structure
IF1	SEI			BC_ECB	BSC external cross beam
IF1	SEI			BC_HADJ	BSC height adjustment
IF1	SEI			BC_ISS	BSC internal support struc-ture
IF1	SEI			BC_SUP_BM_BLOW_FLGE	BSC support beam bellows and flange
IF1	SEI	HC_ISO_SYS			HAM isolation system
IF1	SEI		HC_CABLE_MOUT_SYS		HAM cable mounting sys-tem
IF1	SEI		HC_DRIFT_COMP_SYS		HAM drift compensation system
IF1	SEI			HC_AI	HAM active isolator
IF1	SEI			HC_CA	HAM coarse actuator
IF1	SEI			HC_FA	HAM fine actuator
IF1	SEI		HC_STACK		HAM stack
IF1	SEI			HC_LME	HAM leg mass elements
IF1	SEI			HC_OMP	HAM optics mounting plat-form
IF1	SEI			HC_SPR_ELE	HAM spring elements
IF1	SEI		HC_SUP_PIER		HAM support pier

SYS	SUBSYS	ASSEMBLY	SUBASSEM	COMPONENT	Description
IF1	SEI		HC_SUP_STRU		HAM support structure
IF1	SEI			HC_ECB	HAM external cross beam
IF1	SEI			HC_HADJ	HAM height adjustment
IF1	SEI			HC_ISS	HAM internal support structure
IF1	SEI			HC_SUP_BM_BLOW_FL GE	HAM support beam bel-lows and flange
IF1	SUS	BC_SUS_SYS			BSC suspension system
			BC_AS		BSC actuator/sensor
IF1	SUS			BC_HH	BSC head holder
IF1	SUS			BC_MAG_STDOFF_ASS M	BSC magnetic standoff assembly
IF1	SUS			BC_SAH	BSC sensor actuator head
IF1	SUS		BC_LG_AMP_MOT_ LIMT		BSC large amplitude motion limiter
IF1	SUS			BC_SB	BSC safety bar
	SUS			BC_SC	BSC safety cage
IF1	SUS			BC_SS	BSC safety stop
IF1	SUS		BC_STRY_LGHT_PR OTN		BSC stray light protection
IF1	SUS			BS_STRY_LGHT_SHLD	BSC stray light shield
IF1	SUS		BC_SUS_SUP_STRU		BSC suspension support structure
IF1	SUS			BC_CAGE	BSC cage
	SUS			BC_HA	BSC height adaptor
IF1	SUS		BC_WIRE_MOUT_S YS		BSC wire mounting system
IF1	SUS			BC_GR	BSC guide rod
IF1	SUS			BC_SUS_BLK	BSC suspension block
IF1	SUS			BC_WIRE	BSC wire
IF1	SUS			BC_WIRE_STDOFF	BSC wire standoff
IF1	SUS	HC_SUS_SYS			HAM suspension system
IF1	SUS		HC_AS		HAM actuators/sensors
IF1	SUS			HC_HH	HAM head holder
IF1	SUS			HC_MAG_STD0FF_ASS M	HAM magnet standoff assembly
IF1	SUS			HC_SAH	HAM sensor actuator head
IF1	SUS		HC_LG_AMP_MOT_ LIMT		HAM large amplitude motion limiter
IF1	SUS			HC_SB	HAM safety bar
IF1	SUS			HC_SC	HAM safety cage
IF1	SUS			HC_SS	HAM safety stop

SYS	SUBSYS	ASSEMBLY	SUBASSEM	COMPONENT	Description
IF1	SUS		HC_STRY_LGHT_PROTN		HAM stray light protection
IF1	SUS			HC_STRY_LGHT_SHLD	HAM stray light shield
IF1	SUS		HC_SUS_SUP_STRU		HAM suspension support structure
IF1	SUS			HC_CAGE	HAM cage
IF1	SUS			HC_GR	HAM guide rod
IF1	SUS			HC_SUS_BLK	HAM suspension block
IF1	SUS			HC_WIRE	HAM wire
IF1	SUS			HC_WIRE_STDOFF	HAM wire standoff

TABLE 2. Examples

SITE	STN	LOC	SYS	SUBSYS	ASSEMBLY	SUBASSEM	COMPONENT
H	C	LVEA	IF1	PSL	FREQ	---	AOM
H	C	LVEA	IF1	PSL	FREQ	---	EOPS3
H	C	LVEA	IF1	PSL	FREQ	---	FI
H	C	LVEA	IF1	PSL	FREQ	---	REFCAV
H	C	LVEA	IF1	IOO	IF_I_COND_OPTC	---	IO_OUT_BS
H	C	LVEA	IF1	IOO	IF_I_COND_OPTC	---	IO_OUT_TELE
H	C	LVEA	IF1	IOO	IF_I_COND_OPTC	---	IOFI
H	C	LVEA	IF1	SUS	BC_SUS_SYS	BC_AS	BC_HH
H	C	LVEA	IF1	SUS	BC_SUS_SYS	BC_AS	BC_SAH
H	C	LVEA	IF1	SUS	BC_SUS_SYS	BC_AS	BC_MAG_STDOFF_ASSM
H	C	LVEA	IF1	SUS	HC_SUS_SYS	HC_STRY_LGHT_PROTN	HC_STRY_LGHT_SHLD
H	C	LVEA	IF1	SUS	HC_SUS_SYS	HC_SUS_SUP_STRU	HC_CAGE
H	C	LVEA	VE	PUMP	---	---	80K_LONG_PUMP
H	C	LVEA	VE	PUMP	---	---	80K_SHORT_PUMP
H	C	LVEA	VE	PUMP	---	---	ANNUL_ION_PUMP
H	C	LVEA	VE	PUMP	---	---	ANNUL_ION_PUMP_CNTLR
H	C	LVEA	VE	PUMP	---	---	AUX_PUMP_CART
H	C	LVEA	VE	VAC_ENCL	---	---	ACCESS_COVERS
H	C	LVEA	VE	VAC_ENCL	---	---	ADAPTORS
H	C	LVEA	VE	VAC_ENCL	---	---	BELLOWS