ASER INTERFEROMETER GRAVITATIONAL WAVE OBSERVATORY

LIGO Laboratory / LIGO Scientific Collaboration

LIGO- E1300430-v1	*advanced LIGO*	2/20/2012

Communication Library Documentation

Sheila Dwyer

California Institute of Technology
LIGO Project – MS 18-34
1200 E. California Blvd.
Pasadena, CA 91125
Phone (626) 395-2129
Fax (626) 304-9834
E-mail: info@ligo.caltech.edu

Massachusetts Institute of Technology
LIGO Project – NW22-295
185 Albany St
Cambridge, MA 02139
Phone (617) 253-4824
Fax (617) 253-7014
E-mail: info@ligo.mit.edu

LIGO Hanford Observatory
P.O. Box 159
Richland WA 99352
Phone 509-372-8106
Fax 509-372-8137

LIGO Livingston Observatory
P.O. Box 940
Livingston, LA 70754
Phone 225-686-3100
Fax 225-686-7189

http://www.ligo.caltech.edu/

Library	
Title	ALSCommunication
Version	
TwinCAT version	
Name space	
Author	Sheila Dwyer
Description	Library that passes information needed to automate the ALS system between different PLCs in the beckhoff system, and from and to the real time system.
Error Code	0x001 Timing system error 0x002 communication lost

Function blocks provided that pass signals needed for ALS communication between PLCs. PLC2 in the corner receives information from the timing system on corner PLC1, and from each end station, and sends information to each end station. PLC1 also sends information from the timing system to the end stations. This library will also implement communication from the real time system to the beckhoff eventually.

There are not hardware in and out data structures in this library, instead there is a structure for each link which will be used as the output structure on the sending side and the input structure on the receiving side. The user interface structure is used for error messages only.

Each send function block generates a keep alive bit, which toggles between 1 and 0 every 100ms. Each receive function block uses a TOF (Off delay timer), which is a standard function block defined in the IEC 1131-3 standard. There is an explanation on pg 234 of the red Programming Industrial Control Systems Using IEC 1131-1 book by R W Lewis, but the timing diagrams for the on delay timer and off delay timer are mixed up. The general function of this part is to check set a flag (KeepAliveTimeout.Q) if KeepAlive has not toggled in the time KeepAliveTimeout (10 seconds), which causes the error 'Communication Lost'. When this happened the values of the variables to be received are set to some values that should be clearly invalid.

Example usage:

CASE IfoId OF

      IfoH1:

            SendtoEndYFB(Request:=Request, VarStruct=>SendtoEndY,

                    VCOFreq:=Ifo.SYS.Timing.Y.FO_A.Port[9].Slave.CFC.Frequency[1],

                    BeatFreq:=Ifo.SYS.Timing.Y.FO_A.Port[9].Slave.CFC.Frequency[2],

                    TimingError:=Ifo.SYS.Timing.Y.FO_A.Port[9].Slave.Error,

                    ALSCommunication:=Ifo.SYS.Communication.C.toEndY);

      IfoL1: ;

END_CASE;

The timing structures are not sent to any other PLC to avoid library dependencies that causing naming conflicts with some of the libraries used by the timing system. This means that each port and each input connector needs to be specified in the PLC, which adds flexibility.

Example usage of send function block:

ReceiveFromCornerPLC1FB(Request:=Request,
ALSCommunication:=Ifo.SYS.Communication.C.fromPLC1,

VarStruct:=ReceiveFromCornerPLC1);

The user interface type is only for error handling.