XPS-Q8

Universal High-Performance Motion Controller/Driver

Software Drivers Manual

V1.3.x

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Preface

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XPS
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1.0 C / C++

1.1 Using C / C++ with XPS DLL

To create a C/C++ program for the XPS, the following files are necessary:

"XPS_Q8_drivers.h" : Header file to declare function prototypes

"XPS_Q8_drivers.lib" : XPS-Q8 driver library

"XPS_Q8_drivers.dll" : XPS-Q8 dynamic link library

They are located in the /Admin/Public/Drivers/DLL folder of the XPS controller.

The first two files "XPS_Q8_drivers.h" and "XPS_Q8_drivers.lib" have to be added to your C++ project. (For Microsoft Visual C++, include *XPS_Q8_drivers.h and XPS_Q8_drivers.lib* in the Header Files section)

The last file "**XPS_Q8_drivers.dll**" must be in the same folder as your application or in the WINDOWS directory to be able to execute your program.

Please refer to the XPS Programmer's Manual for the descriptions of the DLL function prototypes and detailed description of what the function does. Please also read section 1.2 about memory handling of string parameters.

1.2 Memory allocation of function parameters

In the XPS Firmware Version V4.2.0 Precision Platform, memory handling has been improved to avoid over-use of memory on the stack. Now big buffers are allocated on the heap. The XPS supposes that all parameters received have already been allocated, including char*. To optimize the size and to have a useable system, we defined four standard sizes, and char* parameters must be allocated accordingly with these sizes.

SIZE_SMALL = 1024

SIZE_NOMINAL = 1024

SIZE_BIG = 2048

SIZE_HUGE = 65536

By default, the size is SIZE_SMALL. Unless the function is listed below:

1. SIZE_NOMINAL:
   - EventExtendedAllGet
   - GatheringDataGet
   - GroupStatusStringGet
   - HardwareInternalListGet
   - HardwareDriverAndStageGet
   - PositionerDriverStatusStringGet
   - PositionerErrorStringGet
   - PositionerHardwareStatusStringGet
   - PositionerWarningStringGet
2. SIZE_BIG:
   - ActionExtendedListGet
   - ActionListGet
   - EventExtendedConfigurationTriggerGet
   - EventExtendedConfigurationActionGet
   - EventExtendedGet
   - EventGet
   - EventListGet
   - GatheringExtendedListGet
   - GatheringExternalListGet
   - GatheringListGet
   - PositionerDriverStatusListGet
   - PositionerErrorListGet
   - PositionerHardwareStatusListGet
   - ReferencingActionListGet
   - ReferencingSensorListGet
3. SIZE_HUGE:
   - APIExtendedListGet
   - APIListGet
   - ErrorListGet
   - GatheringConfigurationGet
   - GatheringExternalConfigurationGet
   - GatheringDataMultipleLinesGet

- GroupStatusListGet
- ObjectsListGet

Example: `GatheringListGet (int socketId, char gatheringList[SIZE_BIG]);`

1.3 Example of C++ programs

1.3.1 Management of the errors

For safe program execution and convenient error debugging, it is recommended to check the return value of each API. One way of doing this is by using a “display error and close” program as described below. This program can be added to the project, with calls of this function after each API execution. In the event of an error, it will indicate the name of the function at which this error occurred, the error code and the corresponding description of the error. It will also close the working socket.

Display error and close procedure in C++

```
void DisplayErrorAndClose(int error, int SocketID, char* APIName)
{
int error2;
char strError[250];
// Timeout error
   if (-2 == error)
   {
      printf ("%s ERROR %d: TCP timeout\n", APIName, error);
      TCP_CloseSocket(SocketID);
      return;
}
   // The TCP/IP connection was closed by an administrator
   if (-108 == error)
   {
printf("%s ERROR %d: The TCP/IP connection was closed by an
administrator\n",APIName,error);
      return;
}
// Error => Get error description
error2 = ErrorStringGet(SocketID, error, strError);
// If error occurred with the API ErrorStringGet
if (0 != error2)
// Display API name, error code and ErrorStringGet error code
printf ("ErrorStringGet ERROR => %d\n", error2);
else
      // Display API name, number and description of the error
      printf ("%s ERROR => %d:  %s\n", APIName, error, strError);
// Close TCP socket
TCP_CloseSocket(SocketID);
return;
}
```

This function is called in all the following examples.

1.3.2 VersionGet

Description

This example opens a TCP connection with the XPS at the IP address specified in the variable *pIPAddress*. It obtains the firmware version, prints it and closes the TCP socket.

Please see the section *1.3.1 Management of the errors* for the code of the *DisplayErrorAndClose()* function.

C++ code

```
int   error = 0;
char  buffer [SIZE_SMALL] = {'\0'};
//////////////////////////////////////////////////
// TCP / IP connection
//////////////////////////////////////////////////
char pIPAddress[15] = {"192.168.33.236"};
int  nPort = 5001;
double dTimeOut = 60;
int  SocketID = -1;
SocketID = TCP_ConnectToServer(pIPAddress, nPort, dTimeOut); //
Open a socket

if (-1 == SocketID)
{
printf ("Connection to @ %s, port = %ld failed\n", pIPAddress,
nPort);
return;
}
printf ("Connected to target\n");
//////////////////////////////////////////////////
// Get controller version
//////////////////////////////////////////////////
error = FirmwareVersionGet (SocketID, buffer); // Get controller
version
if (0 != error)
{
DisplayErrorAndClose(error, SocketID, "FirmwareVersionGet");
return;
}
else
printf ("XPS Firmware Version: %s\n", buffer);
//////////////////////////////////////////////////
// TCP / IP disconnection
//////////////////////////////////////////////////
TCP_CloseSocket(SocketID);  // Close Socket
printf ("Disconnected from target\n");
```

1.3.3 Gathering with motion

Configuration

Group type	*Number*	*Group name*	*Positioner name*
Single axis	1	SINGLE_AXIS	SINGLE_AXIS.MY_STAGE

Description

This example opens a TCP connection, kills the single axis group, initializes and homes it. Then, it configures the parameters for gathering (data to be collected: setpoint and current positions). It defines an action (GatheringRun) and an event (SGamma.MotionStart). They are linked together. When the positioner moves from 0 to 50, the data is gathered (with a divisor equal to 100, data is collected every 100th servo cycle, or every 12.5 ms). At the end, the gathering is stopped and saved in a text file (*Gathering.dat* in /Admin/Public directory of the XPS). Finally, the program ends by closing the socket.

Please see the section *1.3.1 Management of the errors* for the code of the function *DisplayErrorAndClose()* function.

C++ code

```
int   error = 0;
char  buffer [SIZE_SMALL] = {'\0'};
/* TCP / IP connection */
char pIPAddress[15] = "192.168.33.236";
int  nPort = 5001;
double dTimeOut = 60;
int  SocketID = -1;
SocketID = TCP_ConnectToServer(pIPAddress, nPort, dTimeOut);
if (-1 == SocketID)
{
printf ("Connection to @ %s, port = %ld failed\n", pIPAddress,
nPort);
return;
}
printf ("Connected to target\n");
/* Initialization */
char* pGroup;        // Group name
char* pPositioner;        // Positioner name
char* pDataTypeList; // Types of data to be collected during the
gathering
char* pEvent;        // Event
char* pAction;       // Action triggered on the event
char* pNbPoints;          // Number of data acquisition of the
gathering
char* pDiv;               // Divisor, defining the frequency of
the gathering
char* pZero;              // Null parameter
double pDisplacement[1];  // Target displacement
int nTypes = 2;      // Number of types of data to be collected
int nAxes = 1;       // Number of axes of the group
int* eventID;        // Event ID for gathering
pGroup = "SINGLE_AXIS";
pPositioner = "SINGLE_AXIS.MY_STAGE";
pDataTypeList = "SINGLE_AXIS.MY_STAGE.SetpointPosition
SINGLE_AXIS.MY_STAGE.CurrentPosition";
```

```
pEvent = "SINGLE_AXIS.MY_STAGE.SGamma.MotionStart";
pAction = "GatheringRun";
pNbPoints = "1000";
pDiv = "100";
pZero = "0";
pDisplacement[0]=50;
/* Kill group */
error = GroupKill (SocketID, pGroup);
if (0 != error)
{
DisplayErrorAndClose(error, SocketID, "GroupKill");
return;
}
/* Initialize group */
error = GroupInitialize (SocketID, pGroup);
if (0 != error)
{
DisplayErrorAndClose(error, SocketID, "GroupInitialize");
return;
}
/* Search home group */
error = GroupHomeSearch (SocketID, pGroup);
if (0 != error)
{
        DisplayErrorAndClose(error, SocketID, "GroupHomeSearch");
        return;
   }
   /* Configure gathering */
   error = GatheringConfigurationSet (SocketID, nTypes,
pDataTypeList);
   if (0 != error)
   {
        DisplayErrorAndClose(error, SocketID,
"GatheringConfigurationSet");
        return;
}
   /* Configure gathering event: trigger */
   error = EventExtendedConfigurationTriggerSet
(SocketID,1,pEvent,pZero,pZero,pZero,pZero);
   if (0 != error)
   {
        DisplayErrorAndClose(error, SocketID,
"EventExtendedConfigurationTriggerSet");
        return;
}
   /* Configure gathering event: action  */
   error = EventExtendedConfigurationActionSet
(SocketID,1,pAction,pNbPoints,pDiv,pZero,pZero);
   if (0 != error)
   {
        DisplayErrorAndClose(error, SocketID,
"EventExtendedConfigurationActionSet");
        return;
}
   /* Configure gathering event: start */
   error = EventExtendedStart (SocketID, eventID);
```

```
   if (0 != error)
   {
         DisplayErrorAndClose(error, SocketID,
"EventExtendedStart");
         return;
   }
   /* Move positioner */
   error = GroupMoveRelative (SocketID, pGroup, nAxes,
pDisplacement);
   if (0 != error)
   {
         DisplayErrorAndClose(error, SocketID,
"GroupMoveRelative");
         return;
}
   /* Stop gathering and save data */
   error = GatheringStopAndSave (SocketID);
   if (0 != error)
   {
         DisplayErrorAndClose(error, SocketID,
"GatheringStopAndSave");
         return;
}
/* TCP / IP disconnection */
TCP_CloseSocket(SocketID);
printf ("Disconnected from target\n");
```

1.3.4 External gathering

Configuration

5	*Number*	*Group name*	*Positioner name*
Single axis	1	SINGLE_AXIS	SINGLE_AXIS.MY_STAGE

Description

This example opens a TCP connection, kills the single axis group, initializes and homes it. Then, it configures an external gathering (data to be collected: ExternalLatchPosition and GPIO2.ADC1 value). It defines an action (ExternalGatheringRun) and an event (Immediate), then links them. Each time the trigger in receives a signal; the data is gathered (with a divisor equal to 1, gathering takes place every signal on the trigger input). During gathering, the current gathered data is displayed every second. At the end, the external gathering is stopped and saved in a text file (*ExternalGathering.dat* in /Admin/Public directory of the XPS). Finally, the program ends by closing the socket.

Please see the section *1.3.1 Management of the errors* for the code of the function *DisplayErrorAndClose()* function.

C++ code

```
int   error = 0;
char pIPAddress[15] = "192.168.33.236";
int  nPort = 5001;
double dTimeOut = 60;
int  SocketID = -1;
/* TCP / IP connection */
SocketID = TCP_ConnectToServer(pIPAddress, nPort, dTimeOut); //
Open a socket
if (-1 == SocketID)
```

```
{
   printf (buffer, "Connection to @ %s, port = %ld failed\n",
pIPAddress, nPort);
   return;
}
printf ("Connected to target\n");
/* Initialization */
char* pGroup;        // Group name
char* pPositioner;        // Positioner name
char* pDataTypeList; // Types of data to be collected during the
gathering
char* pEvent;        // Event name
char* pAction;       // Action triggered on the event
char* pNbPoints;          // Number of data acquisition of the
gathering in char*
int nNbPoints;       // Number of data acquisition of the
gathering in int
char* pDiv;               /* Divisor, defining every Nth number
of trigger input
     * signal at which the gathering will take place
     */
char* pZero;              // Null parameter
int nTypes = 2;      // Number of types of data to be collected
int pCurrent[1];          // Number of current acquired data
point
int pCurrentPrevious[1];  // Number of previous current acquired
data point
int pMax[1];              // Number of maximum data points per
type
int* eventID;        // Event ID for gathering

CString strResults;       // Variable for display
pGroup = "SINGLE_AXIS";
pPositioner = "SINGLE_AXIS.MY_STAGE";
pDataTypeList = "SINGLE_AXIS.MY_STAGE.ExternalLatchPosition
GPIO2.ADC1";
pEvent = "Immediate";
pAction = "ExternalGatheringRun";
pNbPoints = "20";
nNbPoints = atoi(pNbPoints);
pDiv = "1";
pZero = "0";
pCurrent[0] = 0;
pCurrentPrevious[0] = 0;
pMax[0] = 0;
/* Kill group */
error = GroupKill (SocketID, pGroup);
if (0 != error)
{
DisplayErrorAndClose(error, SocketID, "GroupKill");
return;
   }
/* Initialize group */
error = GroupInitialize (SocketID, pGroup);
if (0 != error)
{
```

```
        DisplayErrorAndClose(error, SocketID, "GroupInitialize");
        return;
}
/* Search home group */
error = GroupHomeSearch (SocketID, pGroup);
if (0 != error)
{
DisplayErrorAndClose(error, SocketID, "GroupHomeSeach");
return;
   }
   /* Configure external gathering */
error = GatheringExternalConfigurationSet (SocketID, nTypes,
pDataTypeList);
   if (0 != error)
   {
        DisplayErrorAndClose(error, SocketID,
"GatheringExternalConfigurationSet");
        return;
   }
   /* Configure gathering event: trigger */
error = EventExtendedConfigurationTriggerSet
(SocketID,1,pEvent,pZero,pZero,pZero,pZero);
   if (0 != error)
   {
        DisplayErrorAndClose(error, SocketID,
"EventExtendedConfigurationTriggerSet");
        return;
}
/* Configure gathering event: action */
error = EventExtendedConfigurationActionSet
(SocketID,1,pAction,pNbPoints,pDiv,pZero,pZero);
if (0 != error)
   {
        DisplayErrorAndClose(error, SocketID,
"EventExtendedConfigurationActionSet");
        return;
}
/* Configure gathering event: start */
error = EventExtendedStart (SocketID, eventID);
if (0 != error)
{
        DisplayErrorAndClose(error, SocketID,
"EventExtendedStart");
        return;
   }
   ////////////////////////////////////////////////
   // Push on TRIG ON button...
   // And wait end of external gathering
   ////////////////////////////////////////////////
   while (pCurrent[0] < nNbPoints)
   {
        /* Get current number realized and display it */
        error = GatheringExternalCurrentNumberGet (SocketID,
pCurrent, pMax);
        if (0 != error)
        {
```

```
            DisplayErrorAndClose(error, SocketID,
"GatheringExternalCurrentNumberGet");
            return;
}
else
       {
            if (pCurrentPrevious[0] < pCurrent[0])
      printf ("Current gathered point: %d\n",pCurrent[0]);
     else
                  pCurrentPrevious[0] = pCurrent[0];
       }
       Sleep(1000);
  }
  /* Stop external gathering and save data */
error = GatheringExternalStopAndSave (SocketID);
  if (0 != error)
  {
       DisplayErrorAndClose(error, SocketID,
"GatheringExternalStopAndSave");
       return;
  }
  /* TCP / IP disconnection */
  TCP_CloseSocket(SocketID);
  printf ("Disconnected from target\n");
```

1.3.5 Position Compare

Configuration

Group type	*Number*	*Group name*	*Positioner name*
Single axis	1	SINGLE_AXIS	SINGLE_AXIS.MY_STAGE

Description

This example opens a TCP connection, kills the single axis group, then initializes and homes it. With an absolute move, the positioner moves to the start position –15. Then, it configures the parameters for the position compare (enabled from –10 to +10 with step position of 1 unit). It enables the position compare functionality and executes a relative move of 25 (positioner final position will be –15+25 = +10). During this move, between positions –10 and +10, pulses are sent by the trigger output when crossing each 1 unit incremental position. The position compare mode is then disabled and the program ends by closing the socket.

Please see the section *1.3.1 Management of the errors* for the code of the function *DisplayErrorAndClose()* function.

C++ code

```
  int   error = 0;
  /* TCP / IP connection */
  char pIPAddress[15] = "192.168.33.236";
  int  nPort = 5001;
  double dTimeOut = 60;
  int  SocketID = -1;
  SocketID = TCP_ConnectToServer(pIPAddress, nPort, dTimeOut);
// Open a socket
  if (-1 == SocketID)
  {
```

```
        printf ("Connection to @ %s, port = %ld failed\n",
pIPAddress, nPort);
        return;
   }
   printf ("Connected to target\n");
   /* Initialization */
   char* pGroup;      // Group name
   char* pPositioner;      // Positioner name
   double pStartPosition[1];    // Diplacement to start position
   double pDisplacement[1];     // Target diplacement

   double dMinPos = -10;   // Minimum position for which the
output compare is activated
   double dMaxPos = 10;    // Maximum position for which the
output compare is activated
   double dStepPos = 1;    // Step position of the pulses during
the output compare
   int nAxes = 1;          // Number of axes of the group
   pGroup = "SINGLE_AXIS";
   pPositioner = "SINGLE_AXIS.MY_STAGE";
   pStartPosition[0]=-15;
   pDisplacement[0]=25;
   /* Kill group */
   error = GroupKill (SocketID, pGroup);
   if (0 != error)
   {
        DisplayErrorAndClose(error, SocketID, "GroupKill");
        return;
}
/* Initialize group */
   error = GroupInitialize (SocketID, pGroup);
   if (0 != error)
   {
        DisplayErrorAndClose(error, SocketID, "GroupInitialize");
        return;
}
/* Search home group */
   error = GroupHomeSearch (SocketID, pGroup);
if (0 != error)
{
        DisplayErrorAndClose(error, SocketID, "GroupHomeSearch");
        return;
   }
   /* Move positioner to start position */
   error = GroupMoveAbsolute (SocketID, pGroup, nAxes,
pStartPosition);
   if (0 != error)
   {
        DisplayErrorAndClose(error, SocketID,
"GroupMoveAbsolute");
        return;
   }
   /* Set position compare parameters */
   error = PositionerPositionCompareSet (SocketID, pPositioner,
dMinPos, dMaxPos, dStepPos);
   if (0 != error)
```

```
   {
         DisplayErrorAndClose(error, SocketID,
"PositionerPositionCompareSet");
         return;
   }
   /* Enable position compare mode */
   error = PositionerPositionCompareEnable (SocketID,
pPositioner);
   if (0 != error)
   {
         DisplayErrorAndClose(error, SocketID,
"PositionerPositionCompareEnable");
         return;
   }
   /* Move positioner */
   error = GroupMoveAbsolute (SocketID, pGroup, nAxes,
pDisplacement);
   if (0 != error)
   {
         DisplayErrorAndClose(error, SocketID,
"GroupMoveAbsolute");
         return;
   }
   /* Disable position compare mode */
   error = PositionerPositionCompareDisable (SocketID,
pPositioner);
   if (0 != error)
   {
         DisplayErrorAndClose(error, SocketID,
"PositionerPositionCompareDisable");
         return;
   }
   /* TCP / IP disconnection */
   TCP_CloseSocket(SocketID);
   printf ("Disconnected from target\n");
```

1.3.6 Master-slave mode

Configuration

Group type	*Number*	*Group name*	*Positioner name*
Single axis	1	SINGLE_AXIS	SINGLE_AXIS.MY_STAGE
XY	1	XY	XY.X and XY.Y

Description

This example opens a TCP connection, kills the singles axis and XY group, then initializes and homes them. It sets the parameters for the master slave mode (slave: single axis group, master: X positioner from XY group). Then, it enables the master slave mode and executes a relative move of 65 units on the master positioner. Simultaneously, the slave positioner executes the same move as the master. The master slave mode is then disabled and the program ends by closing the socket.

Please see the section *1.3.1 Management of the errors* for the code of the function *DisplayErrorAndClose()* function.

C++ code

```
   int   error = 0;
   /* TCP / IP connection */
   char pIPAddress[15] = "192.168.33.236";
   int  nPort = 5001;
   double dTimeOut = 60;
   int  SocketID = -1;
   SocketID = TCP_ConnectToServer(pIPAddress, nPort, dTimeOut);
// Open a socket
   if (-1 == SocketID)
   {
printf ("Connection to @ %s, port = %ld failed\n", pIPAddress,
nPort);
return;
}
   printf ("Connected to target\n");
   /* Initialization */
   char* pSlaveGroup;      // Slave single axis group name
   char* pXYGroup;         // XY group name
   char* pMasterPositioner;     // Master positioner name
   double pDisplacement[1];     // Target displacement
   int nAxes = 1;          // Number of axes of the group
   double dMasterRatio = 1;     // Ratio defining the slave copy:
Slave = ratio * Master
   pSlaveGroup = "SINGLE_AXIS";
   pXYGroup = "XY";
   pMasterPositioner = "XY.X";
   pDisplacement[0]=65;
   /* Kill single axis group */
   error = GroupKill (SocketID, pSlaveGroup);
   if (0 != error)
   {
         DisplayErrorAndClose(error, SocketID, "Single axis
GroupKill");
         return;
   }
   /* Initialize single axis group */
   error = GroupInitialize (SocketID, pSlaveGroup);
   if (0 != error)
   {
         DisplayErrorAndClose(error, SocketID, "Single axis
GroupInitialize");
         return;
   }
   /* Search home single axis group */
   error = GroupHomeSearch (SocketID, pSlaveGroup);
   if (0 != error)
   {
         DisplayErrorAndClose(error, SocketID, "Single axis
GroupHomeSearch");
         return;
   }
   /* Kill XY group */
   error = GroupKill (SocketID, pXYGroup);
```

```
   if (0 != error)
   {
        DisplayErrorAndClose(error, SocketID, "XY GroupKill");
        return;
   }
   /* Initialize XY group */
   error = GroupInitialize (SocketID, pXYGroup);
   if (0 != error)
   {
        DisplayErrorAndClose(error, SocketID, "XY
GroupInitialize");
        return;
   }
   /* Search home XY group */
   error = GroupHomeSearch (SocketID, pXYGroup);
   if (0 != error)
   {
        DisplayErrorAndClose(error, SocketID, "XY
GroupHomeSearch");
        return;
   }
   /* Set slave (single axis group) with its master (positioner
from any group) */
   error = SingleAxisSlaveParametersSet (SocketID, pSlaveGroup,
pMasterPositioner, dMasterRatio);
   if (0 != error)
   {
        DisplayErrorAndClose(error, SocketID,
"SingleAxisSlaveParametersSet");
        return;
   }
   /* Enable slave-master mode */
   error = SingleAxisSlaveModeEnable (SocketID, pSlaveGroup);
   if (0 != error)
   {
        DisplayErrorAndClose(error, SocketID,
"SingleAxisSlaveModeEnable");
        return;
   }
   /* Move master positioner (the slave must follow the master in
relation to the ratio) */
   error = GroupMoveRelative (SocketID, pMasterPositioner, nAxes,
pDisplacement);
   if (0 != error)
   {
DisplayErrorAndClose(error, SocketID, "GroupMoveRelative");
return;
   }
   /* Disable slave-master mode */
   error = SingleAxisSlaveModeDisable (SocketID, pSlaveGroup);
   if (0 != error)
   {
        DisplayErrorAndClose(error, SocketID,
"SingleAxisSlaveModeDisable");
        return;
   }
```

```
   /* TCP / IP disconnection */
   TCP_CloseSocket(SocketID);
   printf ("Disconnected from target\n");
```

1.3.7 Jogging

Configuration

Group type	*Number*	*Group name*	*Positioner name*
XY	1	XY	XY.X and XY.Y

Description

This example opens a TCP connection, kills the XY group, then initializes and homes it. It enables the jog mode and sets the parameters to move a positioner in the positive direction with a velocity of 20 units/s for 3 seconds. Then, during the next 3 seconds, the positioner moves in the reverse direction with a velocity of -30 units/s, and finally stops (velocity set to 0). The jog functionality is then disabled and the program ends by closing the socket.

Please see the section *1.3.1 Management of the errors* for the code of the function *DisplayErrorAndClose()* function.

C++ code

```
   int   error = 0;
   /* TCP / IP connection */
   char pIPAddress[15] = "192.168.33.236";
   int  nPort = 5001;
   double dTimeOut = 60;
   int  SocketID = -1;
   SocketID = TCP_ConnectToServer(pIPAddress, nPort, dTimeOut);
// Open a socket
   if (-1 == SocketID)
   {
         printf ("Connection to @ %s, port = %ld failed\n",
pIPAddress, nPort);
         return;
   }
   printf ("Connected to target\n");
   /* Initialization */
   char* pGroup;      // Group name
   char* pPositioner;      // Positioner name
   int nPositioners = 2;   // Number of positioners in the group
   double pVelocity1[2];   // Velocity demanded during first jog
operation of the pos.
   double pVelocity2[2];   // Velocity demanded during second jog
operation of the pos.
   double pNullVelocity[2];     // Null velocity demanded during
third jog operation of the pos.
   double pAcceleration[2];     // Acceleration demanded during
jog operations of the positioner
   pGroup = "XY";
   pPositioner = "XY.X";
   pVelocity1[0] = 20;          // Velocity of the X positioner
demanded during first jog op
   pVelocity1[1] = 20;          // Velocity of the Y positioner
demanded during first jog op
```

```
   pVelocity2[0] = -30;    // Velocity of the X positioner
demanded during second jog op
   pVelocity2[1] = -30;    // Velocity of the Y positioner
demanded during second jog op
   pNullVelocity[0] = 0;   // Null velocity of the X pos. demanded
during third jog op
   pNullVelocity[1] = 0;   // Null velocity of the Y pos. demanded
during third jog op
   pAcceleration[0] = 80;  // Acceleration of the X positioner
demanded during jog op
   pAcceleration[1] = 80;  // Acceleration of the Y positioner
demanded during jog op

   /* Kill group */
   error = GroupKill (SocketID, pGroup);
   if (0 != error)
   {
        DisplayErrorAndClose(error, SocketID, "GroupKill");
        return;
   }
   /* Initialize group */
   error = GroupInitialize (SocketID, pGroup);
   if (0 != error)
   {
        DisplayErrorAndClose(error, SocketID, "GroupInitialize");
        return;
   }
   /* Search home group */
   error = GroupHomeSearch (SocketID, pGroup);
   if (0 != error)
   {
        DisplayErrorAndClose(error, SocketID, "GroupHomeSearch");
        return;
   }
   /* Enable jog mode */
   error = GroupJogModeEnable (SocketID, pGroup);
   if (0 != error)
   {
        DisplayErrorAndClose(error, SocketID,
"GroupJogModeEnable");
        return;
   }
   /* Set jog parameters to move a positioner => constant
velocity is not null */
   error = GroupJogParametersSet (SocketID, pGroup, nPositioners,
pVelocity1, pAcceleration);
   if (0 != error)
   {
        DisplayErrorAndClose(error, SocketID,
"GroupJogParametersSet");
        return;
   }
   /* Wait 3 seconds */
   Sleep(3000);
   /* Set Jog parameters to move the positioner in the
    * reverse sense => constant velocity is not null
```

```
   */
   error = GroupJogParametersSet (SocketID, pGroup, nPositioners,
pVelocity2, pAcceleration);
   if (0 != error)
   {
        DisplayErrorAndClose(error, SocketID,
"GroupJogParametersSet");
        return;
   }

   /* Wait 3 seconds */
   Sleep(3000);
   /* Set Jog parameters to stop a positioner => constant
velocity is null */
   error = GroupJogParametersSet (SocketID, pGroup, nPositioners,
pNullVelocity, pAcceleration);
   if (0 != error)
   {
        DisplayErrorAndClose(error, SocketID,
"GroupJogParametersSet");
        return;
   }
   /* Disable Jog mode (constant velocity must be null on all
positioners from group) */
   error = GroupJogModeDisable (SocketID, pGroup);
   if (0 != error)
   {
        DisplayErrorAndClose(error, SocketID,
"GroupJogModeDisable");
        return;
   }
   /* TCP / IP disconnection */
   TCP_CloseSocket(SocketID);
   printf ("Disconnected from target\n");
```

1.3.8 Analog position tracking

Configuration

Group type	*Number*	*Group name*	*Positioner name*
XY	1	XY	XY.X and XY.Y

Description

This example opens a TCP connection, kills the XY group, then initializes and homes it. It sets the parameters for the position analog tracking functionality (positioner, analog input, offset, scale, velocity and acceleration) and enables the analog tracking mode. The mode gets activated for 20 seconds. During this time, the stage position follows the voltage of the analog input GPIO2.ADC1. Then, the analog tracking mode gets disabled and the program ends by closing the socket.

Please see the section *1.3.1 Management of the errors* for the code of the function *DisplayErrorAndClose()* function.

C++ code

```
   int   error = 0;
   /* TCP / IP connection */
   char pIPAddress[15] = "192.168.33.236";
   int  nPort = 5001;
   double dTimeOut = 60;
   int  SocketID = -1;
   SocketID = TCP_ConnectToServer(pIPAddress, nPort, dTimeOut);
// Open a socket
   if (-1 == SocketID)
   {
        printf (buffer, "Connection to @ %s, port = %ld
failed\n", pIPAddress, nPort);
        return;
   }
   printf ("Connected to target\n");
   /* Initialization */
   char* pGroup;     // Group name
   char* pPositioner;      // Positioner name
   char* pType;            // Type of analog tracking (position or
velocity)
   char* pAnalogInput;          // Analog input controlling the
tracking
   double dOffset = 0;          // Offset of the positioner moves
during tracking
   double dScale = 1;      // Scale of the positioner moves during
tracking
   double dVelocity = 20;  // Velocity of the positioner during
tracking
   double dAcceleration = 80;   // Acceleration of the positioner
during tracking
   pGroup = "XY";
   pPositioner = "XY.X";
   pType = "Position";
   pAnalogInput = "GPIO2.ADC1";
   /* Kill group */
   error = GroupKill (SocketID, pGroup);
   if (0 != error)
   {
        DisplayErrorAndClose(error, SocketID, "GroupKill");
        return;
   }
   /* Initialize group */
   error = GroupInitialize (SocketID, pGroup);
   if (0 != error)
   {
        DisplayErrorAndClose(error, SocketID, "GroupInitialize");
        return;
   }
   /* Search home group */
   error = GroupHomeSearch (SocketID, pGroup);
   if (0 != error)
   {
        DisplayErrorAndClose(error, SocketID, "GroupHomeSearch");
        return;
```

```
   }
   /* Set tracking parameters */
   error = PositionerAnalogTrackingPositionParametersSet
(SocketID, pPositioner, pAnalogInput, dOffset, dScale, dVelocity,
dAcceleration);
   if (0 != error)
   {
        DisplayErrorAndClose(error,
SocketID,"PositionerAnalogTrackingPositionParametersSet");
        return;
   }
   /* Enable tracking mode */
   error = GroupAnalogTrackingModeEnable (SocketID, pGroup,
pType);
   if (0 != error)
   {
        DisplayErrorAndClose(error, SocketID,
"GroupAnalogTrackingModeEnable");
        return;
   }
   /* Change the amplitude of analog input during 20 seconds */
   Sleep(20000);
   /* Disable tracking mode */
   error = GroupAnalogTrackingModeDisable (SocketID, pGroup);
   if (0 != error)
   {
        DisplayErrorAndClose(error, SocketID,
"GroupAnalogTrackingModeDisable");
        return;
   }
   /* TCP / IP disconnection */
   TCP_CloseSocket(SocketID);
   printf ("Disconnected from target\n");
```

1.3.9 Backlash compensation

Configuration

Group type	*Number*	*Group name*	*Positioner name*
Single axis	1	SINGLE_AXIS	SINGLE_AXIS.MY_STAGE

Description: This example opens a TCP connection and kills the single axis group. It enables the backlash compensation capability (the group must be in the not_initialized state). The group gets initialized and homed. The value of the backlash compensation is set to 0.1. The positioner executes relative moves with the backlash compensation. Finally, the backlash compensation gets disabled and the program ends by closing the socket.

CAUTION

- **The *HomeSearchSequenceType* in the stages.ini file must be different than *CurrentPositionAsHome*.**
- **The *Backlash* parameter in the *stages.ini* file must be greater than zero.**
- **To apply any modifications to the *stages.ini*, the controller must be rebooted.**

Please see the section *1.3.1 Management of the errors* for the code of the function *DisplayErrorAndClose()* function.

C++ code

```
   int   error = 0;
   /* TCP / IP connection */
   char pIPAddress[15] = "192.168.33.236";
   int  nPort = 5001;
   double dTimeOut = 60;
   int  SocketID = -1;
   SocketID = TCP_ConnectToServer(pIPAddress, nPort, dTimeOut);
// Open a socket
   if (-1 == SocketID)
   {
         printf ("Connection to @ %s, port = %ld failed\n",
pIPAddress, nPort);
         return;
   }
   printf("Connected to target\n");
   /* Initialization */
   char* pGroup;      // Group name
   char* pPositioner;      // Positioner name
   double pDisplacement1[1];    // Target positive displacement
   double pDisplacement2[1];    // Target negative displacement
   double dBacklash = 0.1; // New Backlash value
   int nAxes = 1;          // Nuber of axes of the group
   pGroup = "SINGLE_AXIS";
   pPositioner = "SINGLE_AXIS.MY_STAGE";
   pDisplacement1[0] = 10;
   pDisplacement2[0] = -10;
   /* Kill group */
   error = GroupKill (SocketID, pGroup);
   if (0 != error)
   {
         DisplayErrorAndClose(error, SocketID, "GroupKill");
         return;
   }
   /* Enable Backlash
    * Caution: Group must be "Not_Initialized" and Backlash > 0
in "stages.ini"
    */
   error = PositionerBacklashEnable(SocketID, pPositioner);
   if (0 != error)
   {
         DisplayErrorAndClose(error, SocketID,
"PositionerBacklashEnable");
         return;
   }
   /* Initialize group */
   error = GroupInitialize (SocketID, pGroup);
   if (0 != error)
   {
         DisplayErrorAndClose(error, SocketID, "GroupInitialize");
         return;
   }
```

```
   /* Search home group */
   error = GroupHomeSearch (SocketID, pGroup);
   if (0 != error)
   {
        DisplayErrorAndClose(error, SocketID, "GroupHomeSearch");
        return;
   }
   /* Modify Backlash value. Caution: Backlash > 0 in
"stages.ini" */
   error = PositionerBacklashSet (SocketID, pPositioner,
dBacklash);
   if (0 != error)
   {
        DisplayErrorAndClose(error, SocketID,
"PositionerBacklashSet");
        return;
   }
   /* Move in positive direction */
   error = GroupMoveRelative (SocketID, pGroup, nAxes,
pDisplacement1);
   if (0 != error)
   {
        DisplayErrorAndClose(error, SocketID,
"GroupMoveRelative");
        return;
   }
   /* Move in negative direction */
   error = GroupMoveRelative (SocketID, pGroup, nAxes,
pDisplacement2);
   if (0 != error)
   {
        DisplayErrorAndClose(error, SocketID,
"GroupMoveRelative");
        return;
   }
   /* Disable Backlash */
   error = PositionerBacklashDisable (SocketID, pPositioner);
   if (0 != error)
   {
        DisplayErrorAndClose(error, SocketID,
"PositionerBacklashDisable");
        return;
   }

   /* TCP / IP disconnection */
   TCP_CloseSocket(SocketID);
   printf ("Disconnected from target\n");
```

1.3.10 Timer event and global variables

Configuration

Group type	*Number*	*Group name*	*Positioner name*
Single axis	1	SINGLE_AXIS	SINGLE_AXIS.MY_STAGE

Description

The main program opens a TCP connection, configures a timer and uses this timer as an event. The action, in relation to this timer event, executes a second TCL script named *MyScript.tcl*. The main program sets a global variable and closes the socket.

The timer is a permanent event. The frequency of the timer is set by the divisor, in this example 20000, which means that the second TCL script gets executed every 20000th servo loop or every 2.5 seconds (divisor/servo loop rate = 20000/8000 = 2.5 seconds).

The script *MyScript.tcl* reads the global variable, increments it as long as the variable is below 10. When the global variable is equal to 10, the second script deletes the timer event and finally the program ends by closing the socket.

Please see the section *1.3.1 Management of the errors* for the code of the function *DisplayErrorAndClose()* function.

C++ code

```
   int   error = 0;
   /* TCP / IP connection */
   char pIPAddress[15] = "192.168.33.236";
   int  nPort = 5001;
   double dTimeOut = 60;
   int  SocketID = -1;
   SocketID = TCP_ConnectToServer(pIPAddress, nPort, dTimeOut);
// Open a socket
   if (-1 == SocketID)
   {
         printf ("Connection to @ %s, port = %ld failed\n",
pIPAddress, nPort);
         return;
   }
   printf ("Connected to target\n");
   /* Initialization */
   char* pPositioner;           // Positioner name
   char* pTimer;          // Timer name
   char* pEvent;                // Event name
   char* pZero;                 // Null parameter
   char* pAction;               // Action triggered on the event
   char* pTCLFile;              // Name of the TCL script to be
executed
   char* pTCLTask;              // Name of the TCL task
   char* pTCLArgs;              // Argument list of the TCL task
   char* pValue;          // Value of the global variable
   double dISRPeriodSec = 0.0001;    // Value of ISR period
   double dTimerPeriodSec = 2;       // Value of timer period
   int nDivisor = 0;            // Frequency ticks of the timer
int nGlobalVarNumber = 1;       // Number of global variable
int* eventID;             // Event ID
   CString strResults;               // Variable for display
   pPositioner = "SINGLE_AXIS.MY_STAGE";
```

```
   pTimer = pEvent = "Timer1";
   pZero = "0";
   pAction = "ExecuteTCLScript";
   pTCLFile = "MyScript.tcl";
   pTCLTask = "MyTask";
   pTCLArgs = "0";
   pValue = "5";

   /* Calculate divisor */
   nDivisor = (int) (dTimerPeriodSec / dISRPeriodSec);
   printf ("Divisor value: %d\n",nDivisor);
   /* Configure Timer */
   error = TimerSet (SocketID, pTimer, nDivisor);
   if (0 != error)
   {
        DisplayErrorAndClose(error, SocketID, "TimerSet");
        return;
}
/* Configure timer event: trigger  */
   error = EventExtendedConfigurationTriggerSet
(SocketID,1,pEvent,pZero,pZero,pZero,pZero);
if (0 != error)
{
        DisplayErrorAndClose(error, SocketID,
"EventExtendedConfigurationTriggerSet");
        return;
}
/* Configure tcl execute action  */
   error = EventExtendedConfigurationActionSet
(SocketID,1,pAction,pTCLFile,pTCLTask,pTCLArgs,pZero);
if (0 != error)
{
        DisplayErrorAndClose(error, SocketID,
"EventExtendedConfigurationActionSet");
        return;
}
/* Start event */
   error = EventExtendedStart (SocketID, eventID);
if (0 != error)
{
        DisplayErrorAndClose(error, SocketID,
"EventExtendedStart");
        return;
   }
   /* Set global variable */
   error = GlobalArraySet  (SocketID, nGlobalVarNumber, pValue);
   if (0 != error)
   {
        DisplayErrorAndClose(error, SocketID, "GlobalArraySet");
        return;
   }

   /* TCP / IP disconnection */
   TCP_CloseSocket(SocketID);
   printf ("Disconnected from target\n");
```

MyScript.tcl

```
# Display error and close procedure
proc DisplayErrorAndClose {socketID code APIName} {
global tcl_argv
if {$code != -2 && $code != -108} {
     set code2 [catch "ErrorStringGet $socketID $code strError"]
     if {$code2 != 0} {
          puts stdout "$APIName ERROR => $code - ErrorStringGet
ERROR => $code2"
          set tcl_argv(0) "$APIName ERROR => $code"
     } else {
          puts stdout "$APIName $strError"
          set tcl_argv(0) "$APIName $strError"
     }
} else {
     if {$code == -2} {
          puts stdout "$APIName ERROR => $code: TCP timeout"
          set tcl_argv(0) "$APIName ERROR => $code: TCP timeout"
     }
     if {$code == -108} {
          puts stdout "$APIName ERROR => $code: The TCP/IP
connection was closed by an administrator"
          set tcl_argv(0) "$APIName ERROR => $code:  The TCP/IP
connection was closed by an administrator"
     }
}
set code2 [catch "TCP_CloseSocket $socketID"]
return
}
# Main process
set TCPTimeOut 0.5
set code 0
set GlobalVarNumber 1
set ReadValue 0
set NewValue 0
set END 10
set Positioner "SINGLE_AXIS.MY_STAGE"
set EventName "Timer1"
set EventPara 0
# open TCP socket
OpenConnection $TCPTimeOut SocketID
if {$socketID == -1} {
puts stdout "OpenConnection failed => $socketID"
return
}
# Read global variable
set code [catch "GlobalArrayGet $socketID $GlobalVarNumber
ReadValue"]
if {$code != 0} {
       DisplayErrorAndClose $socketID $code "GlobalArrayGet"
       return
}

if { $ReadValue < $END } {
       # Increment global variable
```

```
        set NewValue [expr {$ReadValue + 1}]
        # Set global variable
        set code [catch "GlobalArraySet $socketID $GlobalVarNumber
$NewValue"]
        if {$code != 0} {
              DisplayErrorAndClose $socketID $code
"GlobalArraySet"
              return
        } else {
              puts stdout "New value: $NewValue"
}
} else {
        # Delete timer event
        set code [catch "EventRemove $socketID $Positioner
$EventName $EventPara"]
        if {$code != 0} {
             DisplayErrorAndClose $socketID $code "GlobalArraySet"
             return
} else {
        puts "Timer event deleted"
        }
}
# close TCP socket
set code [catch "TCP_CloseSocket $socketID"]
```

1.3.11 Pulse generation on trajectory (with gathering)

Configuration

Group type	Number	Group name	Positioner name
Multiple axes	1	M	M.POSITIONER

Description

This example will show you how to configure the XPS to generate pulses on trajectory and gather data when a pulse occurs. First, the group is killed, initialized and homed. The gathering is then configured to trigger on every pulse (use of event Always together with TrajectoryPulse). Afterwards, the trajectory is executed. When finished, the gathering is saved and the event removed. Finally, the program ends by closing the socket.

Please see the section *1.3.1 Management of the errors* for the code of the function *DisplayErrorAndClose()* function.

Example trajectory: (defines 10 trajectory points)

```
1, 0,   .2
1, .1,  .2
1, .1,  .2
1, .1,  .2
1, .1,  .2
1, .1,  .2
1, .1,  .2
1, .1,  .2
1, .1,  .2
1, .1,  0
```

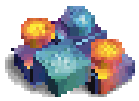
C++ code

```
   #define pGroup "M"                              // Group name
   #define pPositioner "M.POSITIONER"                  // Positioner
name
   #define pTrajectory "trajectory.pvt"                // Trajectory
file name
   #define pEventAlways "Always"                       // Event name
for Always
   #define pEventPulse "M.PVT.TrajectoryPulse"         // Event name
for Trajectory pulses
   #define pActionGatheringOneData "GatheringOneData"     //
Action name for GatheringOneData
   #define pZero "0"                               // Null parameter
   char    pIPAddress[15] = "192.168.33.236";
   int     nPort = 5001;
   double  dTimeOut = 60;
   int     SocketID = -1;
   int    eventID;                                 // Event ID
   int     error = 0;
   char    pGatheredData[32] = "M.POSITIONER.CurrentPosition";
   char    pTrigger[128];
   sprintf(pTrigger, "%s;%s", pEventAlways,pEventPulse);
   /* TCP / IP connection */
   SocketID = TCP_ConnectToServer(pIPAddress, nPort, dTimeOut);
   if (-1 == SocketID)
   {
         printf ("Connection to @ %s, port = %ld failed\n",
pIPAddress, nPort);
         return;
   }
   printf ("Connected to target\n");

   /* GroupKill, GroupInitialize and GroupHomeSearch  */
printf ("Initializing group %s\n", pGroup);
   error = GroupKill (SocketID, pGroup);
   if (0 != error)
   {
         DisplayErrorAndClose(error, SocketID, "GroupKill");
         return;
}
   error = GroupInitialize (SocketID, pGroup);
   if (0 != error)
   {
         DisplayErrorAndClose(error, SocketID, "GroupInitialize");
         return;
}
   error = GroupHomeSearch (SocketID, pGroup);
   if (0 != error)
   {
         DisplayErrorAndClose(error, SocketID, "GroupHomeSearch");
         return;
}
   /* Configure gathering & events */
   printf ("Configure gathering & events\n");
```

```
   error = GatheringConfigurationSet (SocketID, 1,
pGatheredData);
   if (0 != error)
   {
         DisplayErrorAndClose(error, SocketID,
"GatheringConfigurationSet");
         return;
}
   error = EventExtendedConfigurationTriggerSet
(SocketID,2,pTrigger,pZero,pZero,pZero,pZero);
   if (0 != error)
   {
         DisplayErrorAndClose(error, SocketID,
"EventExtendedConfigurationTriggerSet");
         return;
}
error=EventExtendedConfigurationActionSet(SocketID,1,pActionGathe
ringOneData,pZero,pZero,pZero,pZero);
if (0 != error)
{
         DisplayErrorAndClose(error, SocketID,
"EventExtendedConfigurationActionSet");
         return;
}
   error = EventExtendedStart (SocketID, &eventID);
   if (0 != error)
   {
         DisplayErrorAndClose(error, SocketID,
"EventExtendedStart");
         return;
   }
   /* Verify PVT  */
   printf ("Verify PVT: %s\n", pTrajectory);
   error = MultipleAxesPVTVerification (SocketID, pGroup,
pTrajectory);
   if (0 != error)
   {
         DisplayErrorAndClose(error, SocketID,
"MultipleAxesPVTVerification");
         return;
   }
   double minPos, maxPos, maxVel, maxAcc;
   char trajFile[124];
   error=MultipleAxesPVTVerificationResultGet
(SocketID,pPositioner,trajFile,&minPos,&maxPos,&maxVel, &maxAcc);
   if (0 != error)
   {
         DisplayErrorAndClose(error, SocketID,
"MultipleAxesPVTVerificationResultGet");
         return;
   }
   printf("Positioner %s:\n", pPositioner);
   printf("\t-> trajectory file = %s\n", trajFile);
   printf("\t-> minimum position = %d\n", minPos);
   printf("\t-> maximum position = %d\n", maxPos);
   printf("\t-> maximum velocity = %d\n", maxVel);
```

```
   printf("\t-> maximum acceleration = %d\n", maxAcc);
   /* Configure pulses  */
   printf ("Configure pulses\n");
   error = MultipleAxesPVTPulseOutputSet (SocketID, pGroup, 1,
10, 1);
   if (0 != error)
   {
         DisplayErrorAndClose(error, SocketID,
"MultipleAxesPVTPulseOutputSet");
         return;
   }
   /* Execute trajectory  */
   printf ("Execute trajectory\n");
   error = MultipleAxesPVTExecution (SocketID, pGroup,
pTrajectory, 1);
   if (0 != error)
   {
         DisplayErrorAndClose(error, SocketID,
"MultipleAxesPVTExecution");
         return;
   }
   /* Stop and save gathering  */
   printf ("Stop and save gathering\n");
   error = GatheringStopAndSave (SocketID);
   if (0 != error)
   {
         DisplayErrorAndClose(error, SocketID,
"GatheringStopAndSave");
         return;
   }
   /* Remove event  */
   error = EventExtendedRemove (SocketID, eventID);
   if (0 != error)
   {
         DisplayErrorAndClose(error, SocketID,
"EventExtendedRemove");
         return;
   }

   /* TCP / IP disconnection */
   TCP_CloseSocket(SocketID);
   printf ("Disconnected from target\n");
```

2.0 Visual Basic 6 Drivers



2.1 Visual Basic 6 with XPS DLL

To write a program for the XPS with Visual Basic 6, you must add the file "XPS_Q8_drivers.bas" to your Visual Basic project. The file "XPS_Q8_drivers.bas" contains function declarations from the XPS-Q8 drivers. It uses the XPS DLL. Therefore, the required files are:

"XPS_Q8_drivers.bas" : Visual basic interface file to declare function prototypes from XPS-Q8 driver

"XPS_Q8_drivers.lib" : XPS-Q8 driver library

"XPS_Q8_drivers.dll" : XPS-Q8 dynamic link library

They are located in the ../Admin/Public/Drivers/DLL directory of the XPS controller.

The "**XPS_Q8_drivers.bas**" file (Visual basic) is built in relation to "XPS_Q8_drivers.h" (Visual C++).

In Visual Basic, each API prototype is described as follow:

Declare	**Function**	*API name*	**Lib**	"*FileName.dll*"	(*API Parameters*)	**As**	*ReturnedType*
Declare	**Sub**	*API name*	**Lib**	"*FileName.dll*"	(*API Parameters*)		

Example:

Visual Basic (.BAS):

```
Declare Function TCP_ConnectToServer Lib "XPS_Q8_drivers.dll"
(ByVal Ip_Address As String, ByVal Ip_Port As Integer, ByVal
TimeOut As Double) As Long
```

To execute your Visual Basic application, the file "**XPS_Q8_drivers.dll**" must be in the WINDOWS directory or in the current directory of the executed program. Please refer to the XPS Programmer's Manual for the descriptions of the function prototypes and detailed description of what the function does.

2.2 Issue with Boolean

Visual Basic 6 has by default a value of 0 for False and –1 for True. The XPS, uses the same dll as C/C++ and True is 1 by default. This is an issue that cannot be avoided due to Microsoft language definitions.

This should not affect functions that read a Boolean value from the XPS controller, as True is actually defined as "all values different than 0". However, for functions that write a Boolean (for example: PositionerCorrectorPIDFFAccelerationSet), it will cause problems. Therefore, it is advised to always use the absolute value of your Boolean when a Boolean is sent to the XPS (it should look like "Abs(MyBoolean)").

2.3 Example of a Visual Basic program

```
Public Buffer As String
Public IPAddress As String
Public IPPort As Integer
Public SocketID As Integer
Private Sub Form_Load()
    SocketID = -1
    IPAddress = "192.168.33.234"
    IPPort = 5001
    Buffer = String(512 + 1, 0)
End Sub
Private Sub Application_Click()
    Dim error As Integer
```

```
    Dim AnalogValue() As Double
    Dim AnalogNameList As String
    ReDim AnalogValue(4)
    '//////////////////////////////////////
    ' Open TCP IP connection
    '//////////////////////////////////////
    SocketID = TCP_ConnectToServer(IPAddress, IPPort, 10)
    If SocketID <> -1 Then
        '//////////////////////////////////////
        ' Get firmware version
        '//////////////////////////////////////
        error = FirmwareVersionGet(SocketID, ByVal Buffer)
        Message.Text = Buffer
        '//////////////////////////////////////
        ' Set GPIO analog output
        '//////////////////////////////////////
        AnalogNameList =
"GPIO2.DAC1;GPIO2.DAC2;GPIO2.DAC3;GPIO2.DAC4"
        AnalogValue(0) = 1
        AnalogValue(1) = 2
        AnalogValue(2) = 3
        AnalogValue(3) = 4
        error = GPIOAnalogSet(SocketID, 4, AnalogNameList,
AnalogValue(0))
        If (error = 0) Then
            '//////////////////////////////////////
            ' Get GPIO analog output
            '//////////////////////////////////////
            error = GPIOAnalogGet(SocketID, 4, AnalogNameList,
AnalogValue(0))
            If (error = 0) Then
                Message.Text = "DAC1 = " & AnalogValue(0) & "
DAC2 = "&AnalogValue(1) & " DAC3 =
                                "&AnalogValue(2) & " DAC4 =
"&AnalogValue(3)
            End If
        End If
        '//////////////////////////////////////
        ' Get error
        '//////////////////////////////////////
        If error <> 0 Then
            error = ErrorStringGet(SocketID, error, ByVal Buffer)
            Message.Text = Buffer
        End If
        '//////////////////////////////////////
        ' Close TCP IP connection
        '//////////////////////////////////////
        TCP_CloseSocket (SocketID)
        SocketID = -1
    End If
```

3.0 Matlab Drivers

3.1 XPS with Matlab

First, the XPS API library and m files must be unzipped into a folder and set into the Matlab path. After the files are unzipped, click on the menu “File”, submenu “Set path…” in Matlab. Click on “Add folder” button, and browse to your unzipped folder. Click on “OK”, then “Save” and “Close”. You are now ready to use the XPS library for Matlab

First, you have to load the library into Matlab memory. This is done using the following function: “`xps_load_drivers`”. Calling this function more than one time will not cause an issue despite the warning.

Now you can call a function with:`[returnedValue1, returnedValue2, …] = API (parameter1, parameter2, …)`

3.2 Help

When using a new function, it is recommended to use the the Matlab Help function. A short comment about the function and the complete prototype are available.

Example:

```
>> help EventExtendedConfigurationActionGet
       EventExtendedConfigurationActionGet:  Read the action
configuration

     [errorCode, ActionConfiguration] =
EventExtendedConfigurationActionGet(socketId)

     * Input parameters:
          int32 socketId
     * Output parameters:
          int32 errorCode
          cstring ActionConfiguration
```

To read more about any function prototype or what the action does, see the XPS Programmer’s manual

3.3 Example of a Matlab program

```
% Load the library
xps_load_drivers ;

% Set connection parameters
IP = '192.168.33.234' ;
Port = 5001 ;
TimeOut = 60.0 ;

% Connect to XPS
socketID = TCP_ConnectToServer (IP, Port, TimeOut) ;

% Check connection
if (socketID < 0)
    disp 'Connection to XPS failed, check IP & Port' ;
    return ;
end

% Define the positioner
```

```
group = 'GROUP3' ;
positioner = 'GROUP3.POSITIONER' ;

% Kill the group
[errorCode] = GroupKill(socketID, group) ;
if (errorCode ~= 0)
    disp (['Error ' num2str(errorCode) ' occurred while doing
GroupKill ! ']) ;
    return ;
end

% Initialize the group
[errorCode] = GroupInitialize(socketID, group) ;
if (errorCode ~= 0)
    disp (['Error ' num2str(errorCode) ' occurred while doing
GroupInitialize ! ']) ;
    return ;
end

% Home search
[errorCode] = GroupHomeSearch(socketID, group) ;
if (errorCode ~= 0)
    disp (['Error ' num2str(errorCode) ' occurred while doing
GroupHomeSearch ! ']) ;
    return ;
end

% Make a move
[errorCode] = GroupMoveAbsolute(socketID, positioner, 20.0) ;
if (errorCode ~= 0)
    disp (['Error ' num2str(errorCode) ' occurred while doing
GroupMoveAbsolute ! ']) ;
    return ;
end

% Get current position
[errorCode, currentPosition] = GroupPositionCurrentGet(socketID,
positioner, 1) ;
if (errorCode ~= 0)
    disp (['Error ' num2str(errorCode) ' occurred while doing
GroupPositionCurrentGet! ']) ;
    return ;
else
    disp (['Positioner ' positioner ' is in position '
num2str(currentPosition)]) ;
end


% Close connection
TCP_CloseSocket(socketID) ;
```

4.0 Python Drivers

4.1 XPS with Python

The Python interface to the XPS comes in a file *'XPS_Q8_drivers.py'* that describes a class *XPS*, with all the XPS functions declaration. The file must be placed in the same directory as your Python program. It is located on the XPS in the directory /Admin/Public/Drivers/Python.

To use this class, you need to import it in your program. This is done in the following way:

```
import XPS_Q8_drivers
```

If you need additional information about a function prototype or what the action does, see the XPS Programmer's manual.

4.2 Example of Python program

```
# --------- Python program: XPS controller demonstration --------
#
import XPS_Q8_drivers
import sys
# Display error function: simplify error print out and closes
socket
def displayErrorAndClose (socketId, errorCode, APIName):
if (errorCode != -2) and (errorCode != -108):
     [errorCode2, errorString] = myxps.ErrorStringGet(socketId,
errorCode)
     if (errorCode2 != 0):
          print APIName + ': ERROR ' + str(errorCode)
     else:
          print APIName + ': ' + errorString
else:
     if (errorCode == -2):
          print APIName + ': TCP timeout'
     if (errorCode == -108):
          print APIName + ': The TCP/IP connection was closed by
an administrator'
myxps.TCP_CloseSocket(socketId)
return
# Instantiate the class
myxps = XPS_Q8_drivers.XPS()
# Connect to the XPS
socketId = myxps.TCP_ConnectToServer('192.168.33.235', 5001, 20)
# Check connection passed
if (socketId == -1):
print 'Connection to XPS failed, check IP & Port'
sys.exit ()
# Add here your personal codes, below for example:
# Define the positioner
group = 'XY'
positioner = group + '.X'

# Kill the group
[errorCode, returnString] = myxps.GroupKill(socketId, group)
if (errorCode != 0):
displayErrorAndClose (socketId, errorCode, 'GroupKill')
```

```
sys.exit ()
# Initialize the group
[errorCode, returnString] = myxps.GroupInitialize(socketId,
group)
if (errorCode != 0):
displayErrorAndClose (socketId, errorCode, 'GroupInitialize')
sys.exit ()
# Home search
[errorCode, returnString] = myxps.GroupHomeSearch(socketId,
group)
if (errorCode != 0):
displayErrorAndClose (socketId, errorCode, 'GroupHomeSearch')
exit
# Make some moves
for index in range(10):
# Forward
[errorCode, returnString] = myxps.GroupMoveAbsolute(socketId,
positioner, [20.0])
if (errorCode != 0):
     displayErrorAndClose (socketId, errorCode,
'GroupMoveAbsolute')
     sys.exit ()
# Get current position
[errorCode, currentPosition] =
myxps.GroupPositionCurrentGet(socketId, positioner, 1)
if (errorCode != 0):
     displayErrorAndClose (socketId, errorCode,
'GroupPositionCurrentGet')
     sys.exit ()
else:
     print 'Positioner ' + positioner + ' is in position ' +
str(currentPosition)
# Backward
[errorCode, returnString] = myxps.GroupMoveAbsolute(socketId,
positioner, [-20.0])
if (errorCode != 0):
     displayErrorAndClose (socketId, errorCode,
'GroupMoveAbsolute')
     sys.exit ()
# Get current position
[errorCode, currentPosition] =
myxps.GroupPositionCurrentGet(socketId, positioner, 1)
if (errorCode != 0):
     displayErrorAndClose (socketId, errorCode,
'GroupPositionCurrentGet')
     sys.exit ()
else:
     print 'Positioner ' + positioner + ' is in position ' +
str(currentPosition)

# Close connection
myxps.TCP_CloseSocket(socketId)
#----------- End of the demo program ----------#
```

Service Form

Your Local Representative

Tel.: _____

Fax:_____

Name: _____

Company:_____

Address:_____

Country:_____

P.O. Number:_____

Item(s) Being Returned:_____

Model#: _____

Return authorization #: _____
(Please obtain prior to return of item)

Date: _____

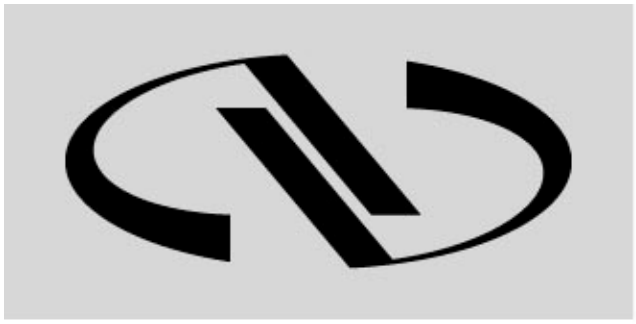
Phone Number: _____

Fax Number: _____

Serial #: _____

Description: _____

Reasons of return of goods (please list any specific problems): _____



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