A Brief Introduction of Arbin CTI Protocol

General Description

CTI is an abbreviation Console TCP/IP Interface. It defines the protocol of information exchanges between Arbin MitsPro software and third party applications. MitsPro software will serve as a server (right now the server is embedded in Console.exe) and third party App will be a client.

Authorized Clients are allowed send requests to MitsPro, if it is a legitimated request, MitsPro will respond the request and send the feedback information to the client to let client know how MitsPro will process the request. Both the request and feedback are using TCP/IP communication protocol.

The commands that Client send to MitsPro can be classified into two categories: First category is these need MitsPro to take action to control the cyclers, for example, to assign schedule to channels, start, jump, stop, or resume channels. These commends will trigger MitsPro to send commands to microcontrollers in cyclers, and eventually will change the running status of the related cyclers.

The second category is these require MitsPro to provide the status and other information about cyclers. These commands will not change the running status of cyclers.

Command sets

Commands	Definition
THIRD_PARTY_ASSIGN_SDU	To assign a schedule to on or all channels
THIRD_PARTY_ASSIGN_SDU_FEED_BACK	Return status of assign schedule, if not succeed, return the reason
THIRD_PARTY_START	To start a test on one or all channels
THIRD_PARTY_START_FEED_BACK	Return start status, succeed or not, and the reason if not succeed
THIRD_PARTY_STOP	To stop a test on one or all channels
THIRD_PARTY_SCHEDULE_STOP_FEED_BACK	Return stop status, if not succeed, return the reason
THIRD_PARTY_RESUME	To resume the test on one or all channels
THIRD_PARTY_RESUME_FEED_BACK	Return the resume status, if not succeed, return the reason

NEW THIRD_PARTY_UPDATE_META_VARIABLE	To online change the value of metavariables used to control Arbin cycler
NEW THIRD_PARTY_UDPAE_META_VARIABLE_FEED_BACK	Return status of the update
THIRD_PARTY_GET_CHANNELS_INFO	To obtain status of each channel, for example, if channel is test time, step time, step index, cycle index, charging or discharging, if channel is unsafe
THIRD_PARTY_CHANNEL_INFO_FEEDBACK	Return Channel status, for example, the step index, cycle index, current ,voltage

Connection Rules

    a. In MitsPro software, there is a Client management, any Third Party Client need to be pre-registered with its user name and password

    b. Client will send THIRD_PARTY_CONNECT commend to request connection

    c. Once approved by MitsPro, a connection is established, and THIRD_PARTY_CONNECT_FEEDBACK is returned.

Example for THIRD_PART_START

```
typedef struct
  {
   BYTE      m_bPrefix[8];                 // required to be filled with  eight 0xDD, mandatory.
   DWORD  m_dwLen;                        // size in byte : m_dwCmd + m_dwCmd_Extend + m_dwIvChannelGlobalIndex
   DWORD  m_dwCmd;               // required to be filled with 0xBB310004, mandatory, stating this is a start command
   DWORD   m_dwCmd_Extend;            // required to be filled with 0x000000, mandatory.
   DWORD   m_dwIvChannelGlobalIndex;   // the IV channel index need to be resumed, channel index start from
   BYTE      m_btStartAll;                // filled with 0x00 to start one channel; 0x01 to start all channels
   BYTE     m_ntTestName[50];          // filled with your test name, 50bytes.
   BYTE     m_btReserved1[51];          // reserved, required to be filled with 0x00
   WORD  m_wCheckSum;                 //checksum : add all fields above byte by byte
   } THIRD_PART _START;                    //128 bytes total
```

If the above data package is received by MitsPro's CTI server, it will be interpreted as Start Test Request, and MitsPro will check if it OK to start the test. If OK it will send START commands to cycler's microcontroller, and succeed flag is send back to the Client. If not, it will send the error code back to the client.

```
typedef struct
{
        BYTE      m_bPrefix[8];                    // filled with  eight 0xDD by arbin, mandatory.
        DWORD  m_dwLen;                        // size in byte: m_dwCmd + m_dwCmd_Extend + m_dwIvChannelGlobalIndex
                                               //     + m_btResult + m_btReserved1 + m_wCheckSum
        DWORD  m_dwCmd;                        // filled with 0xBB130004 by arbin,mandatory,stating this is a start command
feedback
        DWORD   m_dwCmd_Extend;            // filled with 0x00000000 by arbin,mandatory
        DWORD    m_dwIvChannelGlobalIndex;  // the IV channel index trying to be started, channel index start from 0
```

```
        BYTE    m_btResult;                    //0x00 stands for one channel started successfully
        BYTE    m_btReserved1[101];            // reserved,filled with 0x00 by arbin
        WORD  m_wCheckSum;                     //checksum: add all fields above byte by byte
} THRID_PARTY _START_FEEDBACK;                 // 128 bytes total
```

If succeed, m_btResult = 0，if not， m_btResult will have the following values

Return Value/code(m_btResule)	Meaning
0x10/CTI_ ERROR_START_INDEX	Channel Index error.
0x11/CTI_ ERROR_START	Execute error.
0x12/CTI_ ERROR_START_CHANNEL_RUNNING	Channel Running.
0x13/CTI_ ERROR_START_CHANNEL_NOT_CONNECT	Channel Not Connect.
0x14/CTI_ ERROR_START_SCHEDULE_INVALID	schedule invalid.
0x15/CTI_ ERROR_START_NO_SCHEDULE_ASSIGNED	Schedule Assign error.
0x16/CTI_ ERROR_START_SCHEDULE_VERSION	schedule version.
0x17/CTI_ ERROR_START_POWER_PROTECTED	Power protected.
0x18/CTI_ ERROR_START_RESULTS_FILE_SIZE_LIMIT	The RESULTS file is too large to open.
0x19/CTI_ ERROR_START_STEP_NUMBER	Step number Error。
0x1A/CTI_ ERROR_START_NO_CAN_CONFIGURATON_ASSIGNED	Not can configuration assign error。
0x1B/CTI_ ERROR_START_AUX_CHANNEL_MAP	AUX channel Map error。
0x1C/CTI_ ERROR_START_BUILD_AUX_COUNT	In Schedule file AUX channel Number error。
0x1D/CTI_ ERROR_START_POWER_CLAMP_CHECK	PowerClamp the difference between the highest and the lowest values is zero。（1e-8）.
0x1E/CTI_ ERROR_START_AI	In Schedule file AUX AI Map IV error.

0x1F/CTI_ ERROR_START_SAFOR_GROUPCHAN	Safor Groupchan.
0x20/CTI_ ERROR_START_BT6000RUNNINGGROUP	Bt6000 running group.
0x21/CTI_ ERROR_START_CHANNEL_DOWNLOADING_SCHEDULE	Downloading schedule.
0x22/CTI_ ERROR_START_DATABASE_QUERY_TEST_NAME_ERROR	Database query text name error.
0x23/CTI_ ERROR_START_TEXTNAME_EXITS	Text name exists.