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INTRA

Software Interface Definition Document

(SIDD)

BRUSAG Ref: INTRA/SIDD/1827-BRU Version 1.03 of 18-Jun-2010

Change Record

Date	Version	Who	Description
08-Jul-08	1.00	RB	Draft started
02-Jul-09	1.01	RB	doc updated according to existing soft- and firmware resp.
03-Mar-10	1.02	RB	new parameter sun2rad in IROM – which now gets version 0x101
18-Jun-10	1.03	RB	Additional material on dynamic library Rpc_2.dll added

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1 Introduction

1.1 Scope of this Document

This document defines the software interface between INTRAs controller and a PC resident software. The interface is based on remote procedure calls. We will use and follow as closely as possible – the standards set for remote procedure calls in and by various RFCs.

Our first implementation of the RPC mechanism for the new controller will however not use TCP/IP as transport mechanism, but a much simpler protocol used for serial links. We already used this protocol[1] before for INTRA (firmware version 2.48) and more recently for MetNevis.[1]

Most users will however not be willing to have to deal with the details of the protocol described in this document. They will instead use our dynamic library (presently Rpc_2.dll) which provides a software-interface while hiding all lower level details. But even for these people, this document has something to offer: Descriptions of the in- and outs- of the procedures included in RPC_2.dll. And these are all of the remote procedures specified here plus a PC-local procedure (ResetLink) which allows to select the local COM-interface and its configuration.

1.2 References

ID	Title	Version & Date	Doc-ID
1	MetNivis – Software Interface Definition Document R. Brusa, BRUSAG CH-8712 Stäfa	18-Sep-06	SNOW/SIDD/ 427-BRU
1	AT91 ARM Thumb-based Microcontrollers AT91SAM7X512, AT91SAM7X256, AT91SAM7X128	08-Oct-07	6120G–ATARM
2	Circuit Drawing INTRA Controller Board V2	June 2008	-
3	INTRA Software Definition Document (SDD) R. Brusa, BRUSAG CH-8712 Stäfa	V 1.00 2-Jul-08	INTRA/SDD/ 1826-BRU
4	INTRA Software Interface Definition Document (SIDD) R. Brusa, BRUSAG CH-8712 Stäfa (this doc)	V 1.02 03-Mar-10	INTRA/SIDD/ 1827-BRU
5	Explanatory Supplement to the Astronomical Almanac; Seidelmann, P. Kenneth, Ed. University Science Books Mill Valley CA 94941	1992	ISBN 0-935702- 68-7
6	RPC: Remote Procedure Call Protocol Specification Version 2.; R. Srinivasan, Status: PROPOSED STANDARD	August 1995	RFC 1831
7	XDR: External Data Representation Standard; R. Srinivasan. Status: DRAFT STANDARD	August 1995	RFC 1832
8	Binding Protocols for ONC RPC Version 2; R. Srinivasan. Status: PROPOSED STANDARD	August 1995	RFC 1833
9	Authentication Mechanisms for ONC RPC; A. Chiu. Status: INFORMATIONAL	September 1999	RFC 2695

[1] EDLP ESTEC Data link protocol

2 Remote Procedures

2.1 Overview of Procedures

Name	enum	Description
WhoAmI	0	returns firmware-identifying string
SetROMP	1	upload rom-parameters to ram
GetROMP	2	download rom-parameters from ram
ROMPrw	3	rom parameters ram_copy r<-->w erom
SetDateTime	4	set RTC - date and time of day
GetDateTime	5	get date and time of day from RTC
SetMode	6	set mode INIT, SUN, CLOCK or REMOTE
GetMode	7	get current mode and submode
SetPos	8	set new targets
GetPos	9	get mode and positions (PA,SA) and (az,el)
GetSun	10	get AD-readings of q0..q3 of sun sensor
GetMem	11	get nb bytes starting at adr
SetMem	12	write to memory 1, 2 or 4 bytes
FindZero	13	start search zero mark on specified axis
ChkAxis	14	get status of both axis
GetLog	15	get n-th line of log or clear log.
RunMot	16	disable/enable normal operation, run motors in test-mode
GetADC	17	get all ADC-signals in mode raw, volt or phys
SetLogMode	18	set Log-mode

2.2 Procedures in Rpc_2.dll

All remote procedures shown in 2.1 are callable from Rpc_2.dll – plus a PC-local procedure as follows:

ResetLink	19	local function to select COM-I/F and its configuration

Rpc_2.dll was developed using Delphi 7.0 and we then tested it using VC++ working with Microsoft Development Environment 2003, Version 7.1.3088.

In the download area of our website, you find a file yymmdd_dll_tests.zip (where yymmdd stands for the date of the creation of the file). Unpack this file into a folder dll_tests. This folder is a solution folder containing 3 projects named ca01..ca03. Each of these projects (simple VC++ console applications) is a demonstration of the use of some of the routines of Rpc_2.dll. The library is included in the folder \res\ - together with all resources the applications will need at run time. You must include the path to this res-folder into you path variable, otherwise the programs will report errors and crash.

One further hint: The interface to Rpc_2.dll is defined in Intra2Defs.h and implemented in Intra2Defs.cpp. Both these files are in the ca01-folder. You possibly must edit the properties of the other projects to specify the correct path according to your present configuration to include the ca01-folder.

If you are going to use Rpc_2 you may skip the remaining paragraphs of this chapter 2 and continue with the detailed description of the routines given in chapter 3.

2.3 Data Structures and Protocol

The remote procedure calls are all implemented for the program ifw – the firmware that currently runs in INTRAs controller. Note that the controller is an arm processor and as such operated using the little endian convention. On the other hand, RPC specifications require big endian. This will force us to perform some byte inversions.

In line with RPC1831, the program definition for this rpc-application could be written as follows:

```
program ifw {
   /*
    * Latest and greatest version
    */
   version INTRA_RPC {
      void WhoAmI(string progname, int v) = 0;
      void SetRomE(EEPROM prom) = 1;
      /*
       * write prom-data into rom-proxy area in RAM
       */
      void GetRomP(EEPROM* promp) = 2;
      ……and more
   } = 1;
```

The arguments of the call of a procedure are packed into a structure of type rpc_msg as follows:

```
 struct rpc_msg {
   unsigned int xid;  // counter to identify call
   union switch (msg_type mtype) {
   case CALL:
      call_body cbody;
   case REPLY:
      reply_body rbody;
   } body;
};
```

The above and all following definitions in this paragraph follow RFC 1832. We briefly repeat the essentials of these definitions:

- ?? Data are big endian – the MSB precedes the LSB – (but remember: our controller is little endian)
- ?? All data must be assembled (and eventually padded with zeros) into multiples of 4 Bytes.
- ?? The xid of a REPLY must match the xid of the corresponding call.

The structure of the call body is shown below:

```
struct call_body {
   unsigned int rpcvers;        /* must be equal to two (2) */
   unsigned int prog;           /* 20000000h...3fffffffh use 23456789h
                           */
   unsigned int vers;           /* of remote prog */
   unsigned int proc;           /* identifies procedure */
   opaque_auth  cred;           /* credentials : use AUTH_NONE = 0 */
   opaque_auth  verf;           /* verification: use AUTH_NONE */
   /* procedure specific parameters start here */
};
```

and the reply-body is shown here:

```
union reply_body switch (reply_stat stat) {
case MSG_ACCEPTED:
   accepted_reply areply;
case MSG_DENIED:
   rejected_reply rreply;
} reply;
```

and further expanded as:

```
struct accepted_reply {
   opaque_auth verf;
   union switch (accept_stat stat) {
   case SUCCESS:
```

```
            opaque results[0];
            /*
             * procedure-specific results start here
             * use struct rProcName {..}
             */
          case PROG_MISMATCH:    // between program of caller and target
             struct {
                unsigned int low;
                unsigned int high;
             } mismatch_info;
          default:
             /*
              * Void.  Cases include PROG_UNAVAIL, PROC_UNAVAIL,
              * GARBAGE_ARGS, and SYSTEM_ERR.
              */
             void;
          } reply_data;
      };
```

```
      union rejected_reply switch (reject_stat stat) {
      case RPC_MISMATCH:
         struct {
            unsigned int low;        /* lowest protocol version = 2 */
            unsigned int high;       /* highest is 2 as well */
         } mismatch_info;
      case AUTH_ERROR:
         auth_stat stat;
      };
```

2.4 The transport protocol EDLP

For transmission, a RPC data structure is framed between stx and etx. A byte stuffing mechanism ensures that these two characters do never occur in the transmitted characters. Byte-stuffing for transmission is as follows:

Data		Substitution	
dle	10h	dle ‘D’	10h, 44h
stx	02h	dle ‘S’	10h, 53h
etx	03h	dle ‘E’	10h, 45h

During transmission, a checksum – the sum of all characters of the original packet is computed. The twos complement of this value – possibly with byte stuffing – is then inserted in the data stream and the packet is closed by sending the terminating etx.

Upon reception, the leading stx-character is dropped and the data stream is destuffed according to the above table. A packet is considered complete when the terminating etx-characters is received. The checksum that was previously computed from the destuffed data must now be zero, otherwise, it is considered a checksum error.

A packet with a checksum error is silently trashed. Furthermore – an unexpected stx received during reception of a packet causes the current packet to be silently trashed and a new packet is started.

Transmission is initiated by the host only. If the server does not answer within a specified interval of time, the transmission is repeated 3 times and then a communication timeout error is reported (global flag).

Note that this protocol allows for normal terminal I/O on the same lines as the remote procedure calls. Everything that is not framed between stx/etx is considered normal terminal I/O. The current INTRA firmware uses this to output diagnostics messages.

3 Detailed Description of Procedures

Prior to go into full depth, a remark is in order:IntraCfg.exe is a utility that is available from our web site. It allows a user to communicate with and configure an INTRA for use without having to deal with all these RPC-issues. However, if you want to integrate tracker-supervising or even tracker-handling into your own code, use Rpc_2.dll.

Ok, back to the procedures. All procedure return an integer value of 0 if no errors were encountered. The interpretation of a non-zero result is according to the following enumeration:

```
EStatus =(ok, argerr, chkserr, cmderror, verserror, iderror,
            bcerror, rtimeout, rpending);
```

where

ok:	no error
argerr	there was a problem with one or more arguments
chserr	irrevocable errors during transmission (either way)
cmderr	version error (not used)
iderror	id-error (not used)
bcerror	mismatch of byte-count occurred
rtimeout	no answer within specified interval of time
repending	waiting for answer

In the following description we use a notation that deviates somewhat from standard C in that each argument gets an attribute: in, out or var. Clearly, in-arguments are part of the call only, out-arguments of the answer and var-arguments go both ways. Arguments are always by value – both in the call-list as well as in the answer-list. But this "by value-rule" applies for the transport on the serial link only. Locally (and when using Rpc_2.dll), the call follows C-conventions (or whatever language you are using). This is best illustrated with the WhoAmi-routine below: Both arguments are pointers that tell the called routine where to store the results. When calling the remote implementation of WhoAmI, the calling record is a structure of type call_body without specific user data (empty). The information contained in the calling record is sufficient to tell the remote computer what it should do. It will return a reply-body containing a 32bit integer (the version of the remote program) and an XDRstr (see below), a string that will locally be converted to a null terminated string and be stored to where (the contents of) txt points.

3.1 WhoAmI

```
int WhoAmI (int* v:out char* txt:out);
```

v version of the remote program (interpret it as hex e. g. 0x101 is Version 1.01)

txt a pointer, pointing to the address where the returned zero-terminated string is. It should be copied from there to your local variables:

The calling structure of user data is empty:

```
struct cWhoAmI {void};          // empty used data upon call
```

The returned user data are

```
struct rWhoAmI {
  int v;
  XDRstr txt;
};
```

XDRstr is a 32bit integer specifying the number n of bytes to follow. Then the characters of the string follow and possibly some filler bytes to make the string length a multiple of 4. The number n does not include these filler bytes.

3.2 Set ROMP

Configuration parameters of the tracker as well as site and other parameters are stored in a nonvolatile storage area. A working copy of these parameters is maintained in RAM. We thus need three routines: One to upload the parameters to RAM, an other to download these parameters e. g. for editing and finaly a routine that reads or writes the parameters from EROM to RAM or vice versa. The EROM is implemented as a linked list in a block of the flash of the AT91SAM7x512 processor.

The type of the ROM-data is of type IROM (for INTRA-ROM) and is defined as follows:

```
typedef struct irom {
     IROMPtr next;             // is all ones if this irom is valid
     unsigned int Vers;        // identifies version of this structure
     float serno;              // serial number coded as intra.electronics
     int aofs[2];              // offsets of PA and SA  in encoder counts.
     int range[2][2];          //range[axis,low..high]  in encoder counts
     float gears[2];           // ratios of gears PA and SA. Total ratio
                               motors to axis (including worm drive)
     int tcm[2];                // coefficients for target control loop,
                               multiply
     int tcd[2];                // coefficients for target control loop -
                               divide
     int scm[2];                // coefs for speed-control multiply
     int scd[2];                // coefs for speed-control - divide
     float sofs[2];            // offsets [arc] of sun monitor PA and SA
     float Io;                 // extraterrestrial signal of sun sensor
     float sigma;              // coef. of extinction
     float lowelev;            // measurements below are jettisoned
     float sunrange[2];        // lower limit of normalized signal and min
                               // // azimuth- range data must show to be
                               // considered valid
     float sunfrac;            // analize data if more data than fraction in
                               // limits[2]
     float sun2rad             // rwb 100303 converts sunsensor signals to
                               // radians. Vers becomes 0x101 now
     int serpa;                // coded parameters for UART0 and UART1
     float alp[3];             // alignment parameters zenith (zd,az) and
                               // alignment offset of PA. [rad]
     float site[3];            // latitude , longitude both in [rad] and
                               // height [m]. Convention: N > 0, E > 0
     unsigned int tbits;       // bitwise assignment for test-output - see
                               // trackdef.def
     int ChkSum;                // twos complement of all preceding data
} irom;
```

The serial parameters serpa allow to select the baud rate – all other serial parameters are firm and fix: 8 bit data, 1 stop bit, no parity and no handshake. The baud rate for UART0 is coded in bits (0: 19200, 1: 38400; 2: 57600 and 3: 115200). serpa=0 defaults to 9600. Decoding starts with the lsb and the baud rate according to the first nonzero bit is put into effect. Similarely for UART1 which starts at bit 16 for 19200 etc. (Warning: presently only tested for 57600 bps, 8, 1, n)

The function to upload the parameter to the trackers RAM is:

```
int SetROMP(IROM rom:in);
```

rom of type IROM is the structure containing all tracker- and site-specific data

The call-user data are

```
struct cSetROMP {
  IROM rom;
}
```

and upon return

```
struct rSetROMP {
  void;
}
```

3.3 GetROMP

```
int GetROMP(IROM *rom:out, int romstatus:out);
```

when calling GetROMP, rom must point to a memory area that is able to accommodate the type IROM.

The calling structure cGetROMP is empty. The return-structure includes the ROM-data and a status. This status is the result of GetROMP and is coded as follows:

bit	Description
1	Data valid, but defaults only
2	checksum-error. Data not valid.

```
struct cGetROMP {
  void
};
```

and the returned data are:

```
struct rGetROMP {
  IROM rom;
  int romstatus;    //returned as result of GetROMP
}
```

3.4 ROMPrw

```
int ROMPrw(int write:in, int error:out);
```

if write is 1, the working copy of type IROM is written from RAM to ROM (toIROM),
if write is 2, the rom is erased (eraseIROM)
else the direction is from ROM to RAM (fromIROM).
A zero is returned in error if the operation was successful, otherwise the result of the function is 1.

```
struct crROMPrw {  // identical for call and return
  int write_error;   // direction upon call, result of operation upon return
}
```

3.5 SetDateTime

```
int SetDateTime(datetime_t datetime:in);
```

where

```
typedef struct datetime_t {
     int yy, mm, dd;            // year e. g. 2009, month and day
     int hh, mi, sec;           //hour, minutes and seconds
     int dow;                   // day of the week (not used by firmware)
} datetime_t;                   // dow = [1..7], typically 1 is interpreted as
                                // Sunday
```

The routine sets the RTC according to the arguments specified. Note that the year should be specified as a four digit number, because otherwise, the century-flag of the RTC can not be handled correctly.

```
struct cSetDateTime {
  datetime_t datetime;
}
```

The routine returns nothing, hence rSetDateTime is empty.

3.6 GetDateTime

```
int GetDateTime(datetime_t *datetime:out)
```

The call-structure is empty and for the return data structure, the type cSetDateTime shall be assumed.

3.7 SetMode

```
int SetMode(mode_t mode:in, int *err:out)
```

The type Tmode is an enumeration (`INIT, SUN, CLOCK, REMOTE, TEST`).

If mode > REMOTE an err of 1 is returned – otherwise err of 0 is returned.

Two remarks are in order:

- When the current mode is INIT, the user should firstly verify that the current position is valid prior to commanding any other mode. Failure to do so could result in damages to the tracker, because the axis limit might not work as intended.
- The TEST-mode should not be commanded externally. It is set internally (by the tracker) during special operations. An attempt to set the mode to TEST using SetMode is ignored and err = 1 is returned.

The call- and return data structures are the same – a 32bit-word goes up (mode) and a 32-bit word comes back (err).

3.8 GetMode

```
void GetMode( mode_t *mode:out, subm_t *submode:out);
```

The type subm_t is an enumeration (`DAY, EVENING, WAIT24, WAITZERO, REWIND, MORNING`).

The call-data structure is empty. The reply data are

```
struct rGetMode {
  mode_t mode;        // coded into 32bit word
  subm_t submode;     // 32bit word
}
```

3.9 SetPos

This routine should be called in mode REMOTE. If called in INIT, it has no effect. If called in SUN or CLOCK mode, its effect will be overritten by the program within a rather short period of a few seconds at maximum. (Note: It is for safty reason that this routine does not force REMOTE-mode but leaves current mode untouched).

SetPos sets the target-angles accordingly. The angles are specified either in the astronomical system or in the tracker system – depending on the value of the first parameter.

```
int SetPos(cosys_t cosys:in, float p1:in, float p2:in, int *err:out)
```

typedef enum {ASTRO, TRACKER} cosys_t

SetPos interprets a cosys of 0 as ASTRO and any nonzero cosys as TRACKER.

p1 is the azimuth or primary axis angle, p2 the elevation or secondary axis setting. Angles are specified in radians.

If a position outside the allowed range of an axis is commanded, the target is set accordingly, but the corresponding axis will stop a its limit of range.

```
struct cSetPos {
  Tcosys cosys;
  float p1, p2;
}
```

```
struct rSetPos {
  int err;      // result of function
}
```

3.10 GetPos

```
void GetPos(mode_t *mode, subm_t *subm,
     polarf_t *astro_trg:out,   // target-az,el astro-system [rad]
     polarf_t *track-trg:out,   // target-PA,SA tracker-system [rad]
     polarf_t *astro_cur:out,   // current az,el astro-system [rad]
     polarf_t *track_cur:out,   // current PA,SA tracker-system [rad]
     polari_t *ecounts:out,     // current encoder counts PA,SA [cnts]
     polari_t *hcounts:out)     // current hall-counts PA,SA [cnts]
```

returns mode and submode, target- and current positions in various systems/units.

The type polarf_t is a two-element vector of float elements (see below) and polari_t is a two-element vector of int elements (Both float and int are 32 bits, float is according to IEEE).

```
typedef struct polarf_t {
     float v[2];
} polarf_t;
```

The call structure is empty. The response-structure contains 8 float and 4 integers starting with astro_trg.v[0] and ending with hcounts.v[1];

3.11 GetSun

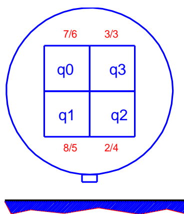

Figure 1
Front view of the quadrants of the sun detector. The numbers indicated are pins of the sensor/connector resp.

```
void GetSun(int *q:out);
```

return intensity-values of the 4 quadrants of the tracker. Units are Volts [0.0..3.3].

The call-structure is empty.

```
struct rGetSun {
  float q[4];
}
```

3.12 GetMem

```
int GetMem(WORD32 adr:in, int n:in, char *bytes:out);
```

GetMem returns n bytes from memory, starting at adr. n must be in the range [0..128]. If it exceeds these limits, it is cut down accordingly.

```
struct cGetMem {
  int adr;
  int n;
}

struct rGetMem {
  char bytes[n];     // n data-bytes
  char filler<>; // 0 to 3 filler bytes to get a multiple of 4 bytes
}
```

3.13 SetMem

```
int SetMem(WORD32 adr:var, int n:var, WORD32 bytes:var);
```

SetMem writes (n=1,2 or4) bytes to the memory, starting at address adr. Independent of n = 1,2 or 4, bytes is always transmitted as a full 32-bit word – but the 8 lsb, 16 lsb or all 32 bits are valid resp. Unused bits are cleared.

Upon return and if invoked with positive n, adr contains the address that it has written to, n contains an errorflag (0 if ok) and bytes contains the value written to adr. The call and response structures are thus the identical:

```
struct c/rSetMem {
  WORD32 adr;
  int n;
  WORD32 bytes;
}
```

A special mode supporting tests is available when n < 0. The argument adr upon call for n < 0 is irrelevant and depending on the value of n, bytes is written to a predefined variable. Upon return, adr then contains the address of this variable, n an error-flag and bytes the (unmodified) value written to the variable. Currently only one such test variable is defined for

n = -1: Heatertest
The value in bytes is written to a variable "testgrad" (value is in degrees C). This alters the flow of the periodic heater-control-task. If it finds testgrad != 0 it uses[2] this value (as temperature in degrees C) instead of the temperature read from the ADC to control the PWM of the heater.

3.14 FindZero

```
int FindZero(int search:in, int error:out);
```

start search of zero marks. Bits in search are used to signal which axis and in which direction the search should be started. The coding of the bits is based on the enumeration type tflags

```
typedef enum tflags {
     PAccwsearch = 1,            // ccw is the standard way
     PAcwsearch = 2,             // will search for a negative edge of the z-
                               signal
```

[2] testgrad is cleared during program startup.

```
      PAzeronotfound = 4,         // moved to end of move-interval
      PAzerofound = 8,            // success - the flag was seen
      PAhe_mismatch = 0x10,       // hall/encoder mismatch
      PAposvalid = 0x20,          // zero-operation was successful or nvv-values
                                  // ok
      // SA uses the same flags - just rotated left 8 bits.
      SAccwsearch = 0x100,        // and the same for the SA
      SAcwsearch = 0x200,
      SAzeronotfound = 0x400,
      SAzerofound = 0x800,
      SAhe_mismatch = 0x1000,
      SAposvalid = 0x2000,
      Force32 = 0x80000000} tflags;
```

Clearly, only a set formed with one or a pair of the search-flags PAccwsearch, PAcwsearch and SAccwsearch, SAcwsearch makes sense for FindZero. If non of these bits is set, the call is a nop, but will return 1. The routine simply triggers the search, forces mode INIT and returns. The axis then start to move in the specified direction until the zero mark is encountered or a path of app. 15° has completed.

```
struct c/rFindZero {
  int search;   //search is replaced by an error-variable upon return
}
```

3.15 ChkAxis

```
void ChkAxis(int *status:out);
```

The status returned is bit-coded as a set of tflags – see also FindZero:

The call-structure is empty, return-structure holds the 4-byte quantity status.

3.16 GetLog / Clearlog

```
void GetLog(int n:in, char *txt:out);
```

GetLog returns the nth line of the message-log in string. Linecount starts with zero. The cr – and if present in the log – also the lf are included in string. An empty string signifies the end of the log buffer. For efficiency considerations, this routine should be called in a loop where n grows from zero until an empty string is returned.

When calling GetLog with a negative n, the log-buffer is cleared and an empty string is returned.

```
struct cGetLog {
  int n;
}
```

```
struct rGetLog {
  XDRstr txt;   // see also WhoAmI for an explanation of XDRstr
}
```

3.17 RunMotors

```
int RunMotors(int flag:in, int pamot:in, int samot:in);
```

This routine allows to operate or stop any of the motors. The argument flag is interpreted as a boolean. If it is unequal zero, the mode is set to TEST and the two motors get a dutycycle as specified in pamot and samot. Dutycycles are specified in ppm – including the sign of the motion. Hence pamot and samot should fall in the range [-999999…999999].

If flag is zero, the mode is reset to INIT and both motors are stopped.

The call-structure contains three 32-bit words, flag, pamot and samot. The response-structure is empty.

3.18 GetADC

```
int GetADC(tsig sigmode:in, float *sigs:out);
```

GetADC returns the ADC-values of the 8 channels of the 10-bit ADC of the controller. The data are either in raw AD-counts, Volts or converted to physical signals – according to the channel. The values returned are mean values of a period of 100 ms (50Hz) or 95.24 ms (63 Hz). The routine returns the currently valid readings (which are updated at a rate of 100ms or 95.24 ms resp.). The full scale of the ADC corresponds to 3.3 V.

```
typedef enum tsig {eRAW, eVOLT, ePHYS} tsig;  // mode of signals from adc
```

channel assignments are:

ch	Signal	Units	Description
0:	UPWR	VDC	DC power (24 VDCnom) from a voltage divider
1:	UTEMP	°C	KTY13-6-based temperature sensor of board temperature
2:	UCUR0	mA	current from base-shunt of motor0-driver
3:	UCUR1	mA	current from base-shunt of motor1-driver
4:	q0	V	Signal from sun-sensor quadrant 0
5:	q1	V	Signal from sun-sensor quadrant 1
6:	q2	V	Signal from sun-sensor quadrant 2
7:	q3	V	Signal from sun-sensor quadrant 3

The call-structure of GetADC contains the 32-bit quantity sigmode. The response-structure contains an 8-elelemt array of float-types sigs[0]..sigs[7].

3.19 SetLogMode

```
int SetLogMode(tlogm lognew:in, tlogm *logwas:out);
```

SetLogMode sets the loglevel specified in lognew and return the previous log-level in logwas.

```
typedef enum tlogm {SEVERE, SHORT, EXTENSIVE} tlogm;
```

The call- and response structure are identical: In both cases a single 32-bit variable - lognew upon call and logwas upon return.

3.20 ResetLink (Rpc_2.dll only)

```
int ResetLink(TSerial comsettings:in);
```

This is a strictly local routine. It selects the com-port of the serial link and its configuration. Nothing is transmitted to the remote site. Presently, the function always returns zero – independent of possible problems. The type TSerial is defined as follows:

```
typedef struct TSerial {          // settings for PC, all except comx from
                                  // SerCfg
    int baud;                     // e.g. 57600 bps
    char comx;                    // COM-number 1..8
    char data;                    // number of bits 4..8
    char parity;                  // 0-4=none,odd,even,mark,space
    char stop;                    // 0,1,2 = 1, 1.5, 2
    unsigned int timeout;         // timeout in ms
     } TSerial;
```

4 Glossary

[rad]	arc units (radians) – full rotation is 2 p
[°]	degrees – full rotation is 360 °
[cnts]	dimensionless quantity – typically a counter
PA	Primary Axis (vertical axis of tracker) – loosely corresponding (depending on the quality of the initial alignment during installation) to the azimuth axis.
SA	Secondary Axis (horizontal axis of tracker – moving with the PA) - loosely corresponding (depending on the quality of the initial alignment during installation) to the elevation axis

- end of text -