ARINC 825 Library

Software Manual

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This manual contains important information and instructions on safe and efficient handling of the ARINC 825 Library. Carefully read this manual before commencing any work and follow the instructions.
The manual is a product component, please retain it for future use.

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* See order information, page 104.

Document History

The changes in the document listed below affect changes in the hardware as well as changes in the description of the facts, only.

Revision	Chapter	Changes versus previous version	Date
1.3	-	RTX/RTX64 support	2014-09-29
	7.12 - 7.15	New chapters describe **arincRxStart**, **arincRxStop**, **arincTxStart** and **arincTxStop** functions as alternative for **arincScheduleStart** **arincScheduleStop**	
	9.	Order Information revised	
1.4	8.5.11	New chapter: ArincRxStart	2015-11-23
	8.5.12	New chapter: ArincRxStop	
	8.5.20	New chapter: ArincTxStart	
	8.5.21	New chapter: ArincTxStop	
1.5	all	Added CAN FD support for ARINC825-4	2022-05-03
1.6	6.2	len - Number of data bytes corrected to: (0..64)	2025-04-01
	8.5	Chapter revised, ARINC constants (.ctl) and native ARINC Vis (…X.vi) added	

Technical details are subject to change without further notice.

Table of Contents

1 Overview

[Top] [Generics]

NAME

```
   ARINC825 Library

 FILE NAME
   arinc825.h

 BRIEF MODULE DESCRIPTION
   Header for ARINC825 support library
```

AUTHOR

```
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```

CREATION DATE

```
   25-May-2009
```

PORTABILITY

```
   ANSI-C
   VxWorks, Linux, Windows, RTX/RTX64, QNX Neutrino
   Depends on NTCAN- and PSYS-library
```

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```

2 NTCAN

[Top] [Generics]

DESCRIPTION

esd provides a general API to program CAN interfaces, called **NTCAN**. ARINC825 library makes heavy use of **NTCAN** and could be seen as an extension on top of **NTCAN**. Thus you'll see lots of references to **NTCAN** in this documentation, as for example standard **NTCAN** error codes might be returned by ARINC-825 functions. Where feasible (and noted within this documentation) you can also use the respective **NTCAN** defines as parameters.

NTCAN documentation can be found on esd's website (www.esd.eu) or can be requested directly from esd's support team (support@esd.eu).

3 ARINC-Time

[Top] [Generics]

DESCRIPTION

In general time is handled as "time ticks". Depending on your CAN hardware the frequency of these ticks differs. Once you open an ARINC825 handle via arincHandleOpen() you can retrieve the tick frequency in use for this CAN bus. In this way it is very well possible to have different CAN boards with differing time tick frequencies in your system.

The timestamp is monotonically increasing (please see notes below). Times can be added or subtracted without problems.

NOTES

esd also delivers special CAN hardware, which provides connection to e.g. IRIG-B. Whenever such hardware is used, you need to take care, that your timebase is stable, before ARINC825 scheduler is started. Please see documentation accompanied with such hardware on how to accomplish this.

SEE ALSO

arincHandleOpen()
arincTimeGet()

4 CAN-errors

[Top] [Generics]

DESCRIPTION

```
Basics:
-------
On CAN bus there are sophisticated error handling techniques, which
not only allow to detect errors, but also help to remove defective hardware
from a CAN bus in order to keep the remaining system working. This is called
CAN error confinement.
It is accomplished via two error counters (RX + TX, called RX Error Counter
(REC) and TX Error Counter (TEC)) and a ruleset related to these, defining
when these counters need to be in- or decremented. This won't be discussed
in all details here, as there's lots of literature written and web resources
published on this topic.
Depending on these error counters every CAN node is in one of four states:

BUS OK (REC < 96 and TEC < 96)
Normal state of a CAN node, when everything is ok. This does NOT necessarily
mean the absence of errors on CAN bus, though. The node is also said to be
"error active", as it will actively propagate (or globalize) any detected
error.

BUS WARN (96 >= REC < 128 or 96 >= TEC < 128)
At least one error counter has reached "error warning limit", there's a
significant number of errors on CAN bus, yet overall function doesn't seem
to be affected. The node remains "error active" in this state.
Note: This state is not described in ISO11898, yet most CAN controllers
support it.

ERROR PASSIVE (128 >= REC <= 255 or 128 >= TEC <= 255)
Contary to the first two states a CAN node goes "error passive" (opposed
to "error active") by exceeding the next threshold with any of its error
counters. The node is still able to transmit and receive CAN frames, but it
will not any longer propagate detected errors over the CAN bus.

BUS OFF (TEC > 255)
Lastly a node enters bus off state, where it will no longer take part in
CAN communication.

In general, the error counters will be incremented, whenever an error is
detected on CAN bus. Most CAN controllers provide special means to further
investigate the circumstances of such errors. Amongst other information the
type of error and position of the error condition within a CAN frame are
stored in an error code capture register (ECC).

Means of error detection:
-------------------------
ARINC825 library provides several different means to detect CAN errors or
to be notified about them.

(A) Polling:
At any given time, the CAN status can be polled using arincStatus() or with
NTCAN-API call canIoctl(NTCAN_IOCTL_GET_CTRL_STATUS). The ARINC_STATUS
structure returned from arincStatus() also contains ECC information of the
last CAN bus error (see below).

(B) Asynchronous notification with error handler:
By means of arincErrorHandler() an asynchronous error handler function can
```

be registered. On occurrence of certain errors (amongst others CAN bus errors) the registered handler will be called and is also passed an ARINC_STATUS structure with ECC information.

(C) Asynchronous notification by virtual CAN events:
There're two CAN events related to errors on CAN bus (see NTCAN documentation).
These events are received as virtual CAN frames via canRead()/canTake(), if the respective CAN IDs have been enabled with canIdAdd(). The first one is the CAN error event, which is generated on every state change in a node's CAN state machine. The second one, called extended error event, is generated on every CAN error frame on CAN bus. There's no guarantee to receive one event per error frame, as the driver analyzes the ECC information and tries to prevent IRQ floods by disabling the interrupt for certain time periods if heavy load is detected. Nevertheless, in real world scenarios chances are quite good, you'll receive an event for every CAN error frame.

There are data structures defined in NTCAN to ease evaluation of these events (EV_CAN_ERROR and EV_CAN_ERROR_EXT), these can be simply mapped to the data section of the respective CAN event frames.

Additionally canFormatEvent() (again from NTCAN) can be used to convert the contained information into human readable strings.

ECC Byte

In order to further analyze a CAN bus error, the ECC (error code capture) is of special importance. This information is heavily hardware dependent, and you may need the documentation of the involved CAN controller to make full use of this feature.
The two most common CAN controllers in esd products are esd's esdACC and NXP's SJA1000. Both controllers share the same bit encoding, so decoding of the ECC byte works exactly the same way and shall be described in more detail here:

Bit	Symbol	Name	Value	Function
ECC Bit 7 (MSB)	ERRC1	Error Code 1	-	-
ECC Bit 6	ERRC0	Error Code 2	-	-
ECC Bit 5	DIR	Direction	1	RX; error occurred during reception
			0	TX; error occurred during transmission
ECC Bit 4	SEG4	Segment 4	-	-
ECC Bit 3	SEG3	Segment 3	-	-
ECC Bit 2	SEG2	Segment 2	-	-
ECC Bit 1	SEG1	Segment 1	-	-
ECC Bit 0 (LSB)	SEG0	Segment 0	-	-

Error type

ERRC1	ERRC0	Function
0	0	bit error
0	1	form error
1	0	stuff error
1	1	other type of error

Error position

SEG4	SEG3	SEG2	SEG1	SEG0	Function
0	0	0	1	1	start of frame
0	0	0	1	0	ID.28 to ID.21
0	0	1	1	0	ID.20 to ID.18
0	0	1	0	0	bit SRTR
0	0	1	0	1	bit IDE
0	0	1	1	1	ID.17 to ID.13
0	1	1	1	1	ID.12 to ID.5
0	1	1	1	0	ID.4 to ID.0
0	1	1	0	0	bit RTR
0	1	1	0	1	reserved bit 1
0	1	0	0	1	reserved bit 0
0	1	0	1	1	data length code
0	1	0	1	0	data field
0	1	0	0	0	CRC sequence
1	1	0	0	0	CRC delimiter
1	1	0	0	1	acknowledge slot
1	1	0	1	1	acknowledge delimiter
1	1	0	1	0	end of frame
1	0	0	1	0	intermission
1	0	0	0	1	active error flag
1	0	1	0	0	stuff bit counter
1	0	1	1	0	passive error flag
1	0	0	1	1	tolerate dominant bits
1	0	1	1	1	error delimiter
1	1	1	0	0	overload flag
1	1	1	0	1	bit FDF (flexible data rate format)
1	1	1	1	0	bit BRS (bit rate switch)
1	1	1	1	1	bit ESI (error state indicator)

New flags!!

SEE ALSO

ARINC_STATUS
arincStatus()
arincErrorHandler()

5 Defines

[Top] [Generics]

DESCRIPTION

Documentation of symbol definitions:

5.1 CAN-IDs

[Top] [Defines] [Definitions]

DESCRIPTION

Whenever **CAN-IDs** are involved and are used as input parameters and/or return values, all CAN-ID defines from NTCAN can be used.

NOTES

Although ARINC825 is specified only for 29-Bit **CAN-IDs**, it is possible to set up ARINC825 schedules with objects with 11-Bit CAN-ID. This is an option for your convenience, but shouldn't be used on strict ARINC825 busses (it wouldn't make much sense there anyway...).

SEE ALSO

ARINC_CMSG_T
ARINC_CMSG_X

5.2 CAN-Length

[Top] [Defines] [Definitions]

DESCRIPTION

```
The CAN Data Length Code (DLC) does not only contain the number of data bytes
contained in a CAN frame, but there might be additional information encoded
into this field (e.g. RTR frames).
All defines from NTCAN-API apply here and may be used as input parameters
as well as to evaluate return values.
ARINC825 library extends these defines by one more: ARINC_OLD_DATA

ARINC_OLD_DATA    -- Marks old data
                     When using arincPollX() this flag can be used to quickly
                     identify data objects, which haven't changed since last
                     call of arincPollX().
```

SEE ALSO

ARINC_CMSG_T
ARINC_CMSG_X

5.3 CAN-Baudrate

[Top] [Defines] [Definitions]

DESCRIPTION

In order to communicate on CAN bus a CAN node needs to have a baud rate set. This can be accomplished via arincBaudrateSet() and arincBaudrateGet(). For CAN FD baudrates use arincBaudrateSetX() and arincBaudrateGetX() NTCAN API contains a whole bunch of defines to set predefined baudrates recommended by CiA, as well as defines to set baud rate numerically (in bits per second) or program the bit timing registers of the CAN controller directly.

NOTES

Please beware, configuring a wrong baud rate will severely affect the CAN communication. It is advised to check, if another application or another handle in the same application has already set a baud rate (via arincBaudrateGet() or arincBaudrateGetX()). If absolutely unsure you can make use of auto-baud feature of esd CAN drivers. See NTCAN documentation for further information on baudrates and auto-baud.

SEE ALSO

arincBaudrateSet()
arincBaudrateGet()
arincBaudrateSetX()
arincBaudrateGetX()

5.4 Status-Busstates

[Top] [Defines] [Definitions]

DESCRIPTION

Defines to decode CAN bus status as delivered by arincStatus(), arincErrorHandler() or NTCAN_EV_CAN_ERROR and canIoctl(NTCAN_IOCTL_GET_CTRL_STATUS) can be found in NTCAN header.

SEE ALSO

CAN-errors
arincErrorHandler()
arincStatus()

5.5 CAN-Controller

[Top] [Defines] [Definitions]

DESCRIPTION

The type of CAN controller is returned from arincStatus(). NTCAN provides more means to determine the controller type (canIoctl(NTCAN_IOCTL_GET_CTRL_STATUS) and canIoctl(NTCAN_IOCTL_GET_BITRATE_DETAILS) as well as defines to decode the controller type.

SEE ALSO

arincStatus()
ARINC_STATUS

5.6 Errorcodes

[Top] [Defines] [Definitions]

NAME

Error codes generated by ARINC825 library functions

ERRORS

```
ARINC_ERRNO_BASE              -- Whenever possible, ARINC825 library uses
                                 system error codes (e.g. under Linux the
                                 error values will be used) or NTCAN error
                                 codes. For errors, which can't be mapped
                                 to these system codes, ARINC_ERRNO_BASE is
                                 used as offset to avoid ambiguities.

ARINC_SUCCESS                 -- No error

ARINC_ERROR_TXSLICE_TIMEOUT   -- The next TX slice was not triggered.
ARINC_ERROR_TXSLICE_INCOMPLETE -- A TX slice wasn't transmitted completely.
ARINC_ERROR_SCHED_DISABLED    -- The scheduling hasn't been enabled, yet.
                                 Use arincScheduleStart() or arincTxStart()
                                 first.
ARINC_ERROR_SCHED_ENABLED     -- The scheduling is currently enabled.
                                 Use arincScheduleStop() or arincTxStop()
                                 first.
ARINC_ERROR_ID_BUSY           -- There's already an object added with the
                                 same CAN ID.
ARINC_ERROR_COL_BUSY          -- There's already an object with the same
                                 group-m-n combination.
ARINC_ERROR_ID_NOT_FOUND      -- A referenced ARINC object was not found
                                 (e.g. with arincTxObjUpdateX()).
ARINC_ERROR_TIME_NOT_SET      -- Failure while configuring start time and/or
                                 time slice duration for scheduling.
ARINC_ERROR_NO_INTERVAL       -- Attempt to start scheduling without a valid
                                 time slice duration.
ARINC_ERROR_NOT_TX            -- Attempt to update data of an RX object.
ARINC_CAN_STATE_CHANGE        -- CAN bus state transition has occurred
                                 (which is not necessarily an error
                                  condition).
ARINC_CAN_ERROR               -- A CAN error frame has occurred on bus.
ARINC_ERROR_INTERVAL_LOW      -- Attempt to configure a time slice duration
                                 equal or below 1 ms.
```

NOTES

These error codes are unique to ARINC825 functions, nevertheless as documented with each function all NTCAN error codes may occur as well.
Whenever ARINC library makes use of functions provided by the underlying operating system, the respective system error codes are passed to the user. Since it is not always well documented, which error codes might be thrown in these cases, these codes might not always be documented below.
You can use arincFormatError() to get a string representation for the described errors.

SEE ALSO

arincFormatError()

5.7 Errorformats

[Top] [Defines] [Definitions]

DESCRIPTION

NTCAN defines special values to select the output type of arincFormatError().

SEE ALSO

arincFormatError()

5.8 Thread-Priority

[Top] [Defines] [Definitions]

NAME

Special values to be used with the priority parameters of arincScheduleStart()

DESCRIPTION

```
ARINC_PRIO_HIGH          -- Use a high priority for maximum accuracy of
                            scheduling
ARINC_PRIO_INHERIT       -- Inherit the priority of the calling application
ARINC_PRIO_SET           -- Set system dependent thread priorities
```

SEE ALSO

arincScheduleStart()
arincRxStart()
arincTxStart()

6 Datatypes

[Top] [Generics]

DESCRIPTION

Definitions of data types:

- ARINC_CMSG_T
- ARINC_CMSG_X
- ARINC_BAUDRATE_X
- ARINC_STATUS
- ARINC_ERROR
- ARINC_RESULT
- ARINC_HANDLE
- ARINC_GROUP
- ARINC_ERROR_HANDLER

6.1 ARINC_CMSG_T

[Top] [Datatypes] [Structures]

NAME

ARINC_CMSG_T -- CAN object structure for use with ARINC825 functions

DESCRIPTION

Stores ARINC825 and CAN frame data

SYNOPSIS

```
struct _ARINC_CMSG_T {
  INT32        id;
  UINT8        len;
  UINT8        msg_lost;
  UINT8        reserved[2];
  UINT8        data[8];
  UINT64       timestamp;
  ARINC_GROUP  group;
  INT32        m;
  INT32        n;
  INT32        countTx;
  INT32        countRx;
}
```

ATTRIBUTES

```
id        -- CAN ID, defines priority on CAN bus, can be combined
             with CAN ID defines (see CAN-IDs and NTCAN docs)
len       -- Number of data bytes contained within CAN frame (0..8)
             (see CAN-Length and NTCAN docs for additional defines to be
             used with this field)
msg_lost  -- On reception the number of lost RX frames is returned here.
             With modern CAN hardware this should be zero. Nevertheless it's
             recommended to evaluate this field if you rely on streams of
             data for example.
data      -- Up to eight data bytes
timestamp -- 64-Bit timestamp (frequency is returned from arincHandleOpen())

Additional ARINC information:
group     -- ARINC825 group, see ARINC_GROUP
m         -- ARINC825 column, it's the m'th object within its group
             (this needs to be unique for a given "group-n" combination)
n         -- ARINC825 slice index, for groups > 0 the object is located
             in the n'th time slice
countTx   -- Number of times this object was transmitted
             Positive values: The last n times the object was transmitted
                              successfully
             Negative values: n failures to send this object
countRx   -- Number of times this object was received
```

NOTES

see ARINC_CMSG_X

SEE ALSO

- arincPollX()
- arincTxObjUpdateX()
- arincTxObjDisableX()
- arincObjAddX()
- arincObjDeleteX()

6.2 ARINC_CMSG_X

[Top] [Datatypes] [Structures]

NAME

ARINC_CMSG_X -- CAN object structure for use with ARINC825 functions

DESCRIPTION

Stores ARINC825 and CAN frame data

SYNOPSIS

```
struct _ARINC_CMSG_X {
  INT32        id;
  UINT8        len;
  UINT8        msg_lost;
  UINT8        reserved[1];
  UINT8        esi;
  UINT8        data[64];
  UINT64       timestamp;
  ARINC_GROUP  group;
  INT32        m;
  INT32        n;
  INT32        countTx;
  INT32        countRx;
  INT32        reserved2;
}
```

ATTRIBUTES

```
id        -- CAN ID, defines priority on CAN bus, can be combined
             with CAN ID defines (see CAN-IDs and NTCAN docs)
len       -- Number of data bytes contained within CAN frame (0..64)
             (see CAN-Length and NTCAN docs for additional defines to be
             used with this field)
esi       -- error state indicator, on reception this provides information
             about the error status of the sender:
             0 indicates an error active state, 1 indicates error passive
             state
msg_lost  -- On reception the number of lost RX frames is returned here.
             With modern CAN hardware this should be zero. Nevertheless it's
             recommended to evaluate this field if you rely on streams of
             data for example.
data      -- Up to 64 data bytes
timestamp -- 64-Bit timestamp (frequency is returned from arincHandleOpen())

Additional ARINC information:
group     -- ARINC825 group, see ARINC_GROUP
m         -- ARINC825 column, it's the m'th object within its group
             (this needs to be unique for a given "group-n" combination)
n         -- ARINC825 slice index, for groups > 0 the object is located
             in the n'th time slice
countTx   -- Number of times this object was transmitted
             Positive values: The last n times the object was transmitted
                              successfully
             Negative values: n failures to send this object
countRx   -- Number of times this object was received
```

NOTES

It is advised to evaluate countTx on ARINC825 TX objects and countRx on RX objects. Although both counters are kept up to date for both types of objects and a comparison might be used to reveal certain error conditions, one needs to take a possible deviance of one frame into account. This is caused by the fact, that transmission and reception of the transmitted frame do not happen simultaneously, reception always follows transmission. Although it would be technically possible to synchronize both events and atomically increment both counters at the same time, the performance impact of a rather long locked path would be drastic. Another workaround would be incrementing the RX counter on the event of successful transmission. Since this would forego the chance of an extra step of verification, the deviation of both counters is deliberately accepted. Nevertheless, if everything works correctly both counters shouldn't differ by any more than one frame.

SEE ALSO

arincPollX()
arincTxObjUpdateX()
arincTxObjDisableX()
arincObjAddX()
arincObjDeleteX()

6.3 ARINC_BAUDRATE_X

[Top] [Datatypes] [Types]

NAME

ARINC_BAUDRATE_X -- Type of CAN baud rate

DESCRIPTION

Configuration of arbitration and data phase baud rate.
See NTCAN docs for all details

SEE ALSO

arincBaudrateSetX()
arincBaudrateGetX()

6.4 ARINC_STATUS

[Top] [Datatypes] [Structures]

NAME

ARINC_STATUS -- Status structure for use with arincStatus()

DESCRIPTION

Stores version-, status- and error information.

SYNOPSIS

```
struct _ARINC_STATUS {
  UINT16   hardware;
  UINT16   firmware;
  UINT16   driver;
  UINT16   dll;
  UINT32   boardstatus;
  UINT8    boardid[14];
  UINT16   features;
  UINT16   dllarinc;
  UINT16   reserved;
  UINT64   time;
  UINT32   rxCount;
  UINT64   rxLastTime;
  UINT32   txCount;
  UINT64   txLastTime;
  UINT32   errorCount;
  INT32    errorLast;
  UINT64   errorLastTime;
  UINT32   errorCode;
  UINT64   errorCodeTime;
  UINT32   reserved2;
  UINT8    canStatus;
  UINT8    canErrorCountRx;
  UINT8    canErrorCountTx;
  UINT8    reserved3;
  UINT32   errorLostFrames;
}
```

ATTRIBUTES

```
hardware        -- Hardware version of CAN hardware
firmware        -- Firmware version of CAN hardware (if applicable,
                   zero otherwise)
driver          -- CAN driver version
dll             -- NTCAN API library version
boardstatus     -- Overall status of CAN hardware
                   Most significant byte contains type of CAN controller
                   (see CAN-Controller)
boardid         -- 14-Byte long string, containing the name of the CAN
                   hardware
features        -- 16-Bit wide flag field, specifying features supported by
                   CAN hardware (see defines in NTCAN to decode these)
dllarinc        -- Version of this ARINC825 library
reserved        -- Reserved for future use, aligns structure
time            -- Current time
```

```
rxCount          -- (*) Number of ARINC825 objects received on a certain
                        handle/CAN bus (including those sent by the node
                        itself)
rxLastTime       -- (*) Time of last reception
txCount          -- (*) Number of ARINC825 objects transmitted on a certain
                        handle/CAN bus
txLastTime       -- (*) Time of last transmission
errorCount       -- (*) Overall number of errors on a certain handle/CAN bus
errorLast        -- (*) The last error, which occurred (see Errorcodes)
                        (Note: These are not necessarily CAN bus errors)
errorLastTime    -- (*) Approximated time of last error
errorCode        -- (*) Detailed info on the last CAN bus error
errorCodeTime    -- (*) Time of last CAN bus error
canStatus        -- Status of CAN bus (see Status-Busstates)
canErrorCountRx -- CAN RX error counter (see "Rules of error confinement"
                    in chapter 13.1.4 of ISO 11898-1)
canErrorCountTx -- CAN TX error counter (see "Rules of error confinement"
                    in chapter 13.1.4 of ISO 11898-1)
errorLostFrames -- (*) Frames lost by either CAN controller or CAN driver
```

NOTES

```
(*) - Special ARINC825 status-/error information. These fields can be reset to
      zero using arincStatusReset()

Version information (hardware, firmware, driver, dll, dllarinc) is returned
in the following format:
0xXYZZ with 0xX = major version, 0xY = minor version and 0xZZ = change level
A format string to print version info for example could look like this:
("%d.%d.%d", (v >> 12), ((v & 0x0F00) >> 8), (v & 0x00FF))
```

SEE ALSO

CAN-errors
arincStatus()
arincStatusReset()

6.5 ARINC_ERROR

[Top] [Datatypes] [Structures]

NAME

ARINC_ERROR -- Error structure passed as an argument to an error handler

DESCRIPTION

If the user connects an error handler function, this will be called asynchronously on occurrence of an error. The argument of this handler points to an **ARINC_ERROR** structure, which contains more details on the type and the circumstances of the error.

SYNOPSIS

```
struct _ARINC_ERROR {
  void   *userParam;
  UINT32  rxCount;
  UINT64  rxLastTime;
  UINT32  txCount;
  UINT64  txLastTime;
  UINT32  errorCount;
  INT32   errorLast;
  UINT64  errorLastTime;
  UINT32  errorCode;
  UINT64  errorCodeTime;
  UINT32  reserved;
  UINT8   canStatus;
  UINT8   canErrorCountRx;
  UINT8   canErrorCountTx;
  UINT8   reserved2;
  UINT32  errorLostFrames;
}
```

ATTRIBUTES

```
userParam       -- When registering an error handler, the user may specify
                   a pointer, which is passed to the error handler without
                   modification. This provides the user with the means
                   to pass any kind of data to the error handler
                   (e.g. some way to synchronize the error handler with the
                   rest of an application).
rxCount         -- Number of ARINC825 objects received on a certain
                   handle/CAN bus (including the ones send by this node
                   itself)
rxLastTime      -- Time of last reception
txCount         -- Number of ARINC825 objects transmitted on a certain
                   handle/CAN bus
txLastTime      -- Time of last transmission
errorCount      -- Overall number of errors on a certain handle/CAN bus
errorLast       -- The last error, which occurred (see Errorcodes)
                   (Note: These are not necessarily CAN bus errors)
errorLastTime   -- Approximated time of last error
errorCode       -- Detailed info on the last CAN bus error
errorCodeTime   -- Time of last CAN bus error
canStatus       -- Status of CAN bus (see Status-Busstates)
canErrorCountRx -- CAN RX error counter (see "Rules of error confinement"
```

```
                    in chapter 13.1.4 of ISO 11898-1)
   canErrorCountTx -- CAN TX error counter (see "Rules of error confinement"
                    in chapter 13.1.4 of ISO 11898-1)
   reserved        -- Reserved for future use, aligns structure
   errorLostFrames -- Frames lost by either CAN controller or CAN driver
```

SEE ALSO

ARINC_ERROR_HANDLER
arincErrorHandler()

6.6 ARINC_RESULT

[Top] [Datatypes] [Types]

NAME

ARINC_RESULT -- Return type of all functions within this library

DESCRIPTION

On success functions within this library return ARINC_SUCCESS, otherwise one of the error codes above (Errorcodes and NTCAN error codes).

6.7 ARINC_HANDLE

[Top] [Datatypes] [Types]

NAME

ARINC_HANDLE -- Handle to address a certain CAN bus

DESCRIPTION

A handle needs to be created using arincHandleOpen(). Every function within this library needs to be passed a valid handle. By this means the functions are connected to a certain physical CAN bus.

NOTES

ARINC_HANDLES can be imagined as virtual CAN nodes. It is possible to open multiple handles and each handle might have its own parameter set. A handle can be shared by multiple threads, in such a case some restrictions need to be observed. Foremost only one thread should configure and start an ARINC825 scheduling. Further restrictions will be noted together with the function descriptions below.

If multiple handles are used on the same CAN node, care must be taken, that only one handle configures the ARINC825 scheduling with arincIntervalSet() and starts it with arincScheduleStart().
It is NOT possible to have multiple differently configured ARINC825 schedulers on a single CAN node. The results will be undefined.

When a handle is no longer needed, it should be disposed using arincClose(), in order to free system resources allocated by the handle.

SEE ALSO

arincHandleOpen()
arincClose()

6.8 ARINC_GROUP

[Top] [Datatypes] [Types]

NAME

ARINC_GROUP -- Type of ARINC groups

DESCRIPTION

Use for member "group" of ARINC_CMSG_T/ARINC_CMSG_X struct.
Generally speaking, an ARINC group specifies the rate by which ARINC objects get repeated in (group+1) multiples of time slice intervals.

For example:
Setting group to zero leads to objects within this group being transmitted every time slice.
Setting group to four leads to objects within this group being transmitted every fifth time slice.
There's one special group value: ARINC_GROUP_RX
Using this as group value, defines the object as "receive only".

SEE ALSO

ARINC_CMSG_T
ARINC_CMSG_X
arincTxObjUpdateX()
arincPollX()
arincObjAddX()
arincObjDeleteX()

6.9 ARINC_ERROR_HANDLER

[Top] [Datatypes] [Types]

NAME

ARINC_ERROR_HANDLER -- Function pointer type for asynchronous error handler

DESCRIPTION

A function of this type can be registered using arincErrorHandler(), in order to be asynchronously notified of any errors.

SEE ALSO

ARINC_ERROR
arincErrorHandler()

7 Functions

[Top] [Generics]

DESCRIPTION

Library function descriptions

- arincHandleOpen()
- arincClose()
- arincBaudrateSet()
- arincBaudrateSetX()
- arincBaudrateGet()
- arincBaudrateGetX()
- arincStatus()
- arincStatusReset()
- arincFormatError()
- arincErrorHandler()
- arincTimeGet()
- arincIntervalSet()
- arincIntervalGet()
- arincRxStart()
- arincRxStop()
- arincTxStart()
- arincTxStop()
- arincScheduleStart()
- arincScheduleStop()
- arincPollX()
- arincTxObjUpdateX()
- arincTxObjDisableX()
- arincWaitForTimeslot()
- arincObjAddX()
- arincObjDeleteX()

NOTES

CAN FD has been introduced with ARINC825-4. The new functions with an appended X are fully downward compatible and should be used for all future projects, even if only CAN classic or previous ARINC825 versions are used.
Internally, the previous functions are based on the X functions.

7.1 arincHandleOpen

[Top] [Functions] [Functions]

NAME

arincHandleOpen

SYNOPSIS

```
EXPORT ARINC_RESULT PSYS_CALLTYPE arincHandleOpen(INT32          net,
                                                  ARINC_HANDLE *pHnd,
                                                  UINT64       *pFreq)
```

FUNCTION

Opens a handle to access a certain CAN bus.

PARAMETERS

```
net -- IN:
  The net number assigned to the desired CAN bus.
pHnd -- OUT:
  Points to an ARINC_HANDLE variable, which will be used to store the newly
  created handle.
pFreq -- OUT:
  Points to an UINT64 variable, which will be used to store the time tick
  frequency. This can be set to NULL, if the frequency is not needed.
```

RESULT

```
Success: ARINC_SUCCESS
Error:   NTCAN_INVALID_PARAMETER      - pHnd is NULL or one of the other
                                        parameters out of range
         NTCAN_INSUFFICIENT_RESOURCES - Not enough memory to allocate all
                                        resources needed for the new handle
         NTCAN_NET_NOT_FOUND          - The specified net wasn't found
```

SEE ALSO

arincClose()
For some more notes on handles, have a look at ARINC_HANDLE.

7.2 arincClose

[Top] [Functions] [Functions]

NAME

arincClose

SYNOPSIS

```
EXPORT ARINC_RESULT PSYS_CALLTYPE arincClose(ARINC_HANDLE hnd)
```

FUNCTION

Closes a handle, which was previously opened by arincHandleOpen().
All resources allocated by this handle will be freed, ARINC objects
will be deleted.

NOTES

A baud rate configured with this handle using arincBaudrateSet(),
won't be reset on **arincClose**(). This has to be done explicitly using
arincBaudrateSet().

PARAMETERS

```
hnd -- IN:
  The handle, that needs to be closed.
```

RESULT

```
Success: ARINC_SUCCESS
Error:   NTCAN_INVALID_HANDLE - An invalid handle was used
```

SEE ALSO

arincHandleOpen()

7.3 arincBaudrateSet

[Top] [Functions] [Functions]

NAME

arincBaudrateSet

SYNOPSIS

```
EXPORT ARINC_RESULT PSYS_CALLTYPE arincBaudrateSet(ARINC_HANDLE  hnd,
                                                   UINT32        baud)
```

FUNCTION

Configures the baud rate for the CAN bus belonging to the given handle. Several defines can be used (see CAN-Baudrate) in order to ease configuration of a certain baud rate.

NOTES

Baud rate obviously is an attribute of the underlying CAN node and not of the handle itself. In order to have other handles asynchronously notified about the change in baud rate, one can make use of the "baud rate change event" in NTCAN (please have a look at NTCAN docs).

PARAMETERS

hnd -- IN:
  A valid handle, which is associated with the CAN bus to be reconfigured.
baud -- IN:
  The desired baud rate. It can be set in many ways (e.g. using indices for predefined baud rates, specifying baud rates numerically or programming the BTRs of the CAN controller directly), please see NTCAN docs.

RESULT

Success: ARINC_SUCCESS
Error: NTCAN_INVALID_HANDLE - An invalid handle or baud rate was used

SEE ALSO

CAN-Baudrate
arincBaudrateGet()

7.4 arincBaudrateSetX

[Top] [Functions] [Functions]

NAME

arincBaudrateSetX

SYNOPSIS

```
EXPORT ARINC_RESULT PSYS_CALLTYPE arincBaudrateSet(ARINC_HANDLE      hnd,
                                                   ARINC_BAUDRATE_X *pBaud)
```

FUNCTION

Configures the arbitration and data phase baud rate for the CAN bus belonging to the given handle. Several defines can be used (see CAN-Baudrate) in order to ease configuration of a certain baud rate.

NOTES

Baud rate obviously is an attribute of the underlying CAN node and not of the handle itself. In order to have other handles asynchronously notified about the change in baud rate, one can make use of the "baud rate change event" in NTCAN (please have a look at NTCAN docs).

PARAMETERS

```
hnd -- IN:
  A valid handle, which is associated with the CAN bus to be reconfigured.
pBaud -- IN:
  The desired baud rate. It can be set in many ways (e.g. using indices for
  predefined baud rates, specifying baud rates numerically or programming the
  BTRs of the CAN controller directly), please see NTCAN docs.
```

RESULT

```
Success: ARINC_SUCCESS
Error:   NTCAN_INVALID_HANDLE - An invalid handle or baud rate was used
```

SEE ALSO

CAN-Baudrate
arincBaudrateGetX()

7.5 arincBaudrateGet

[Top] [Functions] [Functions]

NAME

arincBaudrateGet

SYNOPSIS

```
EXPORT ARINC_RESULT PSYS_CALLTYPE arincBaudrateGet(ARINC_HANDLE  hnd,
                                                   UINT32       *pBaud)
```

FUNCTION

Returns the baud rate configured for the CAN bus, which is associated with the given handle.

NOTES

The baud rate is returned in the same format as it was formerly set by arincBaudrateSetX().
Since baud rate is an attribute of the underlying CAN node and not of the handle itself, this function can be used to detect changes of the baud rate of the CAN bus or to prevent re- and/or misconfiguration.

PARAMETERS

```
hnd -- IN:
  A valid handle, which is associated with the CAN bus in question.
pBaud -- OUT:
  The baud rate is returned within the variable pointed to by pBaud.
```

RESULT

```
Success: ARINC_SUCCESS
Error:   NTCAN_INVALID_HANDLE    - An invalid handle
         NTCAN_INVALID_PARAMETER - An invalid baud rate was used
```

SEE ALSO

CAN-Baudrate
arincBaudrateSet()

7.6 arincBaudrateGetX

[Top] [Functions] [Functions]

NAME

arincBaudrateGetX

SYNOPSIS

```
EXPORT ARINC_RESULT PSYS_CALLTYPE arincBaudrateGetX(ARINC_HANDLE     hnd,
                                                    ARINC_BAUDRATE_X *pBaud)
```

FUNCTION

Returns the arbitration and data phase baud rate configured for the CAN bus, which is associated with the given handle.

NOTES

The baud rate is returned in the same format as it was formerly set by arincBaudrateSet().
Since baud rate is an attribute of the underlying CAN node and not of the handle itself, this function can be used to detect changes of the baud rate of the CAN bus or to prevent re- and/or misconfiguration.

PARAMETERS

```
hnd -- IN:
  A valid handle, which is associated with the CAN bus in question.
pBaud -- OUT:
  The baud rate is returned within the variable pointed to by pBaud.
```

RESULT

```
Success: ARINC_SUCCESS
Error:   NTCAN_INVALID_HANDLE    - An invalid handle
         NTCAN_INVALID_PARAMETER - An invalid baud rate was used
```

SEE ALSO

CAN-Baudrate
arincBaudrateSetX()

7.7 arincStatus

[Top] [Functions] [Functions]

NAME

arincStatus

SYNOPSIS

```
EXPORT ARINC_RESULT PSYS_CALLTYPE arincStatus(ARINC_HANDLE  hnd,
                                              ARINC_STATUS *pStatus)
```

FUNCTION

Returns information about the current state of the CAN bus, software versions and special ARINC825 information (e.g. last error and time of occurrence).

PARAMETERS

hnd -- IN:
A valid handle, which is associated with the CAN bus in question.

pStatus -- OUT:
A pointer to an ARINC_STATUS structure, which will be filled with status information.

RESULT

```
Success: ARINC_SUCCESS
Error:   NTCAN_INVALID_HANDLE    - An invalid handle
         NTCAN_INVALID_PARAMETER - pStatus is NULL
```

SEE ALSO

CAN-errors
ARINC_STATUS
arincStatusReset()

7.8 arincStatusReset

[Top] [Functions] [Functions]

NAME

arincStatusReset

SYNOPSIS

```
EXPORT ARINC_RESULT PSYS_CALLTYPE arincStatusReset(ARINC_HANDLE hnd)
```

FUNCTION

All dynamic status information stored within ARINC_STATUS structure is reset (s. ARINC_STATUS description, fields are marked with (*)).

PARAMETERS

hnd -- IN:
A valid handle, which is associated with the CAN bus in question.

RESULT

Success: ARINC_SUCCESS
Error: NTCAN_INVALID_HANDLE - An invalid handle

SEE ALSO

ARINC_STATUS
arincStatus()

7.9 arincFormatError

[Top] [Functions] [Functions]

NAME

arincFormatError

SYNOPSIS

```
EXPORT ARINC_RESULT PSYS_CALLTYPE arincFormatError(ARINC_RESULT  error,
                                                   UINT32        type,
                                                   char         *pBuf,
                                                   UINT32        bufsize)
```

FUNCTION

Returns a string representation of the given error code.

PARAMETERS

```
error -- IN:
  An error code returned by any of the functions contained in this library,
type -- IN:
  Select between two string representations, a rather short one and a
  verbose one (see Errorformats, types are defined in NTCAN).
pBuf -- IN/OUT:
  A pointer to a buffer, where the string is copied to.
  Note:
  If the buffer is too small, the string might get truncated.
bufsize -- IN:
  Size of the target buffer.
```

RESULT

```
Success: ARINC_SUCCESS
Error:   NTCAN_INVALID_PARAMETER - pBuf is NULL, bufsize is zero or
                                   type is no known output type
```

SEE ALSO

Errorformats

7.10 arincErrorHandler

[Top] [Functions] [Functions]

NAME

arincErrorHandler

SYNOPSIS

```
EXPORT ARINC_RESULT PSYS_CALLTYPE arincErrorHandler(ARINC_HANDLE            hnd,
                                                    ARINC_ERROR_HANDLER     Callback,
                                                    void                    *pParam,
                                                    ARINC_RESULT            errorCode)
```

FUNCTION

This function can be used to register an error handler function, which will be called asynchronously on occurrence of certain error conditions in combination with ARINC825 scheduling.

NOTES

You can specify only one single error handler per ARINC_HANDLE.
The handler will only be triggered for the error codes listed below:
- ARINC_CAN_STATE_CHANGE
- ARINC_CAN_ERROR

For the error handler to work, scheduling needs to be started on the same handle.

PARAMETERS

hnd -- IN:
A valid handle.
pCallback -- IN:
Function pointer of type ARINC_ERROR_HANDLER. Set to NULL to disable error handler.
pParam -- IN:
A pointer size argument, which will be passed as user parameter together with other error information in ARINC_ERROR structure to the error handler.
errorCode -- IN:
Specify an error code, you want the handler to be called for (to be chosen from the list of supported codes above). Set to zero, in order to have it called for all supported calls.

RESULT

Success: ARINC_SUCCESS
Error: NTCAN_INVALID_HANDLE - An invalid handle

SEE ALSO

CAN-errors
ARINC_ERROR_HANDLER
ARINC_ERROR

7.11 arincTimeGet

[Top] [Functions] [Functions]

NAME

arincTimeGet

SYNOPSIS

```
EXPORT ARINC_RESULT PSYS_CALLTYPE arincTimeGet(ARINC_HANDLE  hnd,
                                               UINT64       *pTime,
                                               UINT32       *pStatus)
```

FUNCTION

Returns the current time and optionally its status.

NOTES

If you have a special CAN hardware (for example with an IRIG-B receiver), the status of your time source will be returned via pStatus. In order to decode the status correctly please refer to the respective documentation of your IRIG-B hardware or of the accompanied library.

PARAMETERS

hnd -- IN:
  A valid handle of type ARINC_HANDLE.
pTime -- OUT:
  Pointer to a UINT64, wherein the current time will be stored (s. ARINC-Time).
pStatus -- OUT:
  Pointer to a UINT32, wherein the status of time will be returned.
  This may be set to NULL, if the status is of no interest or is not available.

RESULT

```
Success: ARINC_SUCCESS
Error:   NTCAN_INVALID_HANDLE    - An invalid handle was used
         NTCAN_INVALID_PARAMETER - pTime is NULL
```

SEE ALSO

ARINC-Time

7.12 arincIntervalSet

[Top] [Functions] [Functions]

NAME

arincIntervalSet

SYNOPSIS

```
EXPORT ARINC_RESULT PSYS_CALLTYPE arincIntervalSet(ARINC_HANDLE  hnd,
                                                   UINT64        time,
                                                   UINT64        timeStart)
```

FUNCTION

Configures the ARINC825 scheduling interval and an optional start time.

NOTES

This function can not be called, when scheduling has already been started, in such case call arincScheduleStop() or arincTxStop() first. Scheduling won't be activated by this function, regardless of whether the optional start time is used. Scheduling always needs to be activated by arincScheduleStart() or arincTxStart().

Beware:
Technically it is possible to call **arincIntervalSet**() with one ARINC_HANDLE, while scheduling has already been started by another. This will lead to undeterministic scheduling behaviour and is generally not advised.

PARAMETERS

hnd -- IN:
  A valid handle of type ARINC_HANDLE.
time -- IN:
  Duration of an ARINC825 time slice (see ARINC-Time).

timeStart -- IN:
  Time, when the first time slice begins.
  If set to zero, the scheduling will begin immediately after arincScheduleStart() or arincTxStart() has been called.

RESULT

```
Success: ARINC_SUCCESS
Error:   NTCAN_INVALID_HANDLE      - An invalid handle was used
         ARINC_ERROR_SCHED_ENABLED - Scheduling needs to be stopped
         ARINC_ERROR_TIME_NOT_SET  - Failed to configure interval or start
                                     time
         ARINC_ERROR_INTERVAL_LOW  - time too small (below 1ms)
```

SEE ALSO

ARINC-Time
arincIntervalGet()

7.13 arincIntervalGet

[Top] [Functions] [Functions]

NAME

arincIntervalGet

SYNOPSIS

```
EXPORT ARINC_RESULT PSYS_CALLTYPE arincIntervalGet(ARINC_HANDLE  hnd,
                                                   UINT64       *pTime,
                                                   UINT64       *pTimeStart)
```

FUNCTION

Reads the currently configured ARINC825 scheduling interval.

NOTES

In *pTimeStart the start of the next time slice is returned. This is equal to timeStart configured with arincIntervalSet() as long as scheduling has not started, yet. When the start time has passed, the start of the next time slice is returned.

PARAMETERS

hnd -- IN:
  A valid handle of type ARINC_HANDLE.
pTime -- OUT:
  Pointer to UINT64, wherein the currently configured interval is returned.
pTimeStart -- OUT:
  Pointer to UINT64, wherein the configured/current start time of the next time slice is returned.

RESULT

```
Success: ARINC_SUCCESS
Error:   NTCAN_INVALID_HANDLE    - An invalid handle was used
         NTCAN_INVALID_PARAMETER - pTime or pTimeStart is NULL
```

SEE ALSO

ARINC-Time
arincIntervalSet()

7.14 arincRxStart

[Top] [Functions] [Functions]

NAME

arincRxStart

SYNOPSIS

```
EXPORT ARINC_RESULT PSYS_CALLTYPE arincRxStart(ARINC_HANDLE hnd,
                                               INT32        prioMode,
                                               INT32        prioRx)
```

FUNCTION

Starts the RX daemon thread independent of the TX daemon thread.

NOTES

Alternatively, use **arincRxStart**() and arincTxStart instead of arincScheduleStart().

PARAMETERS

```
hnd -- IN:
  A valid handle of type ARINC_HANDLE.
prioMode -- IN:
  Use one of the Thread-Priority defines to choose between high priority or
  priority inheritance (both modes system independent) or manual
  configuration of system dependent priorities.
prioRx -- IN:
  Specify the priority of the RX daemon thread.
  This parameter is used only, if prioMode is set to ARINC_PRIO_SET.
  The priority value is system specific. Special care needs to be taken to
  write a system independent application.
```

RESULT

```
Success: ARINC_SUCCESS
Error:   ARINC_INVALID_HANDLE     - An invalid handle was used
         ARINC_INVALID_PARAMETER  - Invalid value for prioMode or prioRx,
                                    prioTx are out of range for current host
                                    system
```

SEE ALSO

arincRxStop()
arincTxStart()
arincTxStop()
arincScheduleStart()
arincScheduleStop()
Thread-Priority

7.15 arincRxStop

[Top] [Functions] [Functions]

NAME

arincRxStop

SYNOPSIS

```
EXPORT ARINC_RESULT PSYS_CALLTYPE arincRxStop(ARINC_HANDLE hnd)
```

FUNCTION

Deactivates the RX daemon thread.

NOTES

Alternatively, use **arincRxStop**() and arincTxStop instead of arincScheduleStop().

PARAMETERS

```
hnd -- IN:
  A valid handle of type ARINC_HANDLE.
```

RESULT

```
Success: ARINC_SUCCESS
Error:   ARINC_INVALID_HANDLE  - An invalid handle was used
```

SEE ALSO

arincRxStart()
arincTxStart()
arincTxStop()
arincScheduleStart()
arincScheduleStop()

7.16 arincTxStart

[Top] [Functions] [Functions]

NAME

arincTxStart

SYNOPSIS

```
EXPORT ARINC_RESULT PSYS_CALLTYPE arincTxStart(ARINC_HANDLE hnd,
                                               INT32 prioMode,
                                               INT32 prioTx)
```

FUNCTION

After a scheduling table has been defined (using arincObjAddX()) and time slice duration has been configured (using arincIntervalSet()), the actual TX scheduling is activated with this function.

NOTES

Even if a start time has been configured with arincIntervalSet() it is still needed to call **arincTxStart**().

If you want to develop an application, which non intrusively works within a schedule configured by another application; you can use arincIntervalGet() to gather the needed timing information on this handle and avoid the otherwise needed arincIntervalSet() call.

Alternatively, use arincRxStart() and **arincTxStart** instead of arincScheduleStart().

PARAMETERS

```
hnd -- IN:
  A valid handle of type ARINC_HANDLE.
prioMode -- IN:
  Use one of the Thread-Priority defines to choose between high priority or
  priority inheritance (both modes system independent) or manual
  configuration of system dependent priorities.
prioTx -- IN:
  Specify the priority of the TX daemon thread.
  This parameter is used only, if prioMode is set to ARINC_PRIO_SET.
  The priority value is system specific. Special care needs to be taken to
  write a system independent application.
```

RESULT

```
Success: ARINC_SUCCESS
Error:   ARINC_INVALID_HANDLE     - An invalid handle was used
         ARINC_INVALID_PARAMETER  - Invalid value for prioMode or prioRx,
                                    prioTx are out of range for current host
                                    system
         ARINC_ERROR_NO_INTERVAL  - Scheduling can not be started,
                                    because there's no valid time slice
                                    interval configured, call
```

arincIntervalSet() before
arincTxStart()

SEE ALSO

arincRxStart()
arincRxStop()
arincTxStop()
arincScheduleStart()
arincScheduleStop()
arincIntervalSet()
arincIntervalGet()
Thread-Priority

7.17 arincTxStop

[Top] [Functions] [Functions]

NAME

arincTxStop

SYNOPSIS

```
EXPORT ARINC_RESULT PSYS_CALLTYPE arincTxStop(ARINC_HANDLE hnd)
```

FUNCTION

Deactivates TX scheduling.

NOTES

If reconfiguration of scheduling table is needed, this function needs to be called first.

Alternatively, use arincRxStop() and **arincTxStop**() instead of arincScheduleStop().

PARAMETERS

```
hnd -- IN:
  A valid handle of type ARINC_HANDLE.
```

RESULT

```
Success: ARINC_SUCCESS
Error:   ARINC_INVALID_HANDLE  - An invalid handle was used
```

SEE ALSO

arincRxStart()
arincRxStop()
arincTxStart()
arincScheduleStart()
arincScheduleStop()

7.18 arincScheduleStart

[Top] [Functions] [Functions]

NAME

arincScheduleStart

SYNOPSIS

```
EXPORT ARINC_RESULT PSYS_CALLTYPE arincScheduleStart(ARINC_HANDLE  hnd,
                                                     INT32         prioMode,
                                                     INT32         prioRx,
                                                     INT32         prioTx)
```

FUNCTION

After a scheduling table has been defined (using arincObjAddX()) and time slice duration has been configured (using arincIntervalSet()), the actual scheduling is activated with this function.

NOTES

Even if a start time has been configured with arincIntervalSet() it is still needed to call **arincScheduleStart**().

If you want to develop an application, which non intrusively works within a schedule configured by another application, you can use arincIntervalGet() to gather the needed timing information on this handle and avoid the otherwise needed arincIntervalSet() call.

Alternatively, use arincRxStart() and arincTxStart() instead of **arincScheduleStart**().

PARAMETERS

```
hnd -- IN:
  A valid handle of type ARINC_HANDLE.
prioMode -- IN:
  Use one of the Thread-Priority defines to choose between high priority or
  priority inheritance (both modes system independent) or manual
  configuration of system dependent priorities.
prioRx -- IN:
  Specify the priority of the RX daemon thread.
  This parameter is used only, if prioMode is set to ARINC_PRIO_SET.
  The priority value is system specific. Special care needs to be taken to
  write a system independent application.
prioTx -- IN:
  Specify the priority of the TX daemon thread.
  This parameter is used only, if prioMode is set to ARINC_PRIO_SET.
  The priority value is system specific. Special care needs to be taken to
  write a system independent application.
```

RESULT

```
Success: ARINC_SUCCESS
Error:   NTCAN_INVALID_HANDLE     - An invalid handle was used
```

NTCAN_INVALID_PARAMETER	- Invalid value for prioMode or prioRx, prioTx are out of range for current host system
ARINC_ERROR_NO_INTERVAL	- Scheduling can not be started, because there's no valid time slice interval configured, call arincIntervalSet() before **arincScheduleStart**()

SEE ALSO

arincScheduleStop()
arincRxStart()
arincRxStop()
arincTxStart()
arincTxStop()
arincIntervalSet()
arincIntervalGet()
Thread-Priority

7.19 arincScheduleStop

[Top] [Functions] [Functions]

NAME

arincScheduleStop

SYNOPSIS

```
EXPORT ARINC_RESULT PSYS_CALLTYPE arincScheduleStop(ARINC_HANDLE hnd)
```

FUNCTION

Deactivates scheduling.

NOTES

If reconfiguration of scheduling table is needed, this function needs to be called first.

Alternatively, use arincRxStop() and arincTxStop() instead of **arincScheduleStop**().

PARAMETERS

hnd -- IN:
A valid handle of type ARINC_HANDLE.

RESULT

Success: ARINC_SUCCESS
Error: NTCAN_INVALID_HANDLE - An invalid handle was used

SEE ALSO

arincScheduleStart()
arincRxStart()
arincRxStop()
arincTxStart()
arincTxStop()

7.20 arincPollX

[Top] [Functions] [Functions]

NAME

arincPoll/**arincPollX**

SYNOPSIS

```
EXPORT ARINC_RESULT PSYS_CALLTYPE arincPoll(ARINC_HANDLE  hnd,
                                            ARINC_CMSG_T *pCmsg,
                                            INT32        *pNum)
EXPORT ARINC_RESULT PSYS_CALLTYPE arincPollX(ARINC_HANDLE  hnd,
                                             ARINC_CMSG_X *pCmsg,
                                             INT32        *pNum)
```

FUNCTION

By means of **arincPollX**() the current state of any ARINC825 object (regardless, if TX or RX object) can be polled. The state consists of the number of valid data bytes as well as currently contained data bytes, timestamp of last reception/transmission and transmission and reception counters. The length field also contains information if the object has received any data yet (ARINC_NO_DATA) or if the data has been updated since last call of **arincPollX**() (ARINC_OLD_DATA).

PARAMETERS

hnd -- IN:
  A valid handle of type ARINC_HANDLE.
pCmsg -- IN/OUT:
  Pointer to one or more ARINC_CMSG_T/ARINC_CMSG_X structures. These have to be initialized
  with the CAN IDs of the ARINC objects in question prior to calling **arincPollX**().
pNum -- IN/OUT:
  Pointer to an INT32, which determines the number of objects pCmsg is pointing to (and thus the number of objects to poll).
  The value of polled objects (this might be lower, than the number requested, if an error occurred) is returned via pNum.

RESULT

```
Success: ARINC_SUCCESS
Error:   NTCAN_INVALID_HANDLE      - An invalid handle was used
         NTCAN_INVALID_PARAMETER   - Either pCmsg and/or pNum is NULL
```

SEE ALSO

arincObjAddX()
arincObjDeleteX()
arincTxObjUpdateX()

7.21 arincTxObjUpdateX

[Top] [Functions] [Functions]

NAME

arincTxObjUpdate/**arincTxObjUpdateX**

SYNOPSIS

```
EXPORT ARINC_RESULT PSYS_CALLTYPE arincTxObjUpdate(ARINC_HANDLE  hnd,
                                                   ARINC_CMSG_T *pCmsg,
                                                   INT32        *pNum)
EXPORT ARINC_RESULT PSYS_CALLTYPE arincTxObjUpdateX(ARINC_HANDLE  hnd,
                                                    ARINC_CMSG_X *pCmsg,
                                                    INT32        *pNum)
```

FUNCTION

Updates the data of one or more objects formerly added by arincObjectAdd().

NOTES

This function works only for ARINC825 "transmit" objects (group >= 0)
and not on ARINC objects of ARINC_GROUP_RX.

PARAMETERS

hnd -- IN:
A valid handle of type ARINC_HANDLE.
pCmsg -- IN:
Pointer to one or more ARINC_CMSG_T/ARINC_CMSG_X structures. These have to contain the
number of data bytes as well as the bytes themselves and the CAN ID as
reference of the objects (other parts of ARINC_CMSG_T/ARINC_CMSG_X structure are ignored).
pNum -- IN/OUT:
Pointer to an INT32, which determines the number of objects pCmsg is
pointing to (and thus the number of objects to update).
The value of updated objects (this might be lower, than the number
requested, if an error occurred) is returned via pNum.

RESULT

Success:	ARINC_SUCCESS	
Error:	NTCAN_INVALID_HANDLE	- An invalid handle was used
	NTCAN_INVALID_PARAMETER	- Either pCmsg and/or pNum is NULL
	ARINC_ERROR_ID_NOT_FOUND	- The CAN ID of a given object was not found. Call arincObjAddX() first.
	ARINC_ERROR_NOT_TX	- A given object was not configured as a TX object (group >= 0)

SEE ALSO

arincObjAddX()
arincObjDeleteX()
arincPollX()

7.22 arincTxObjDisableX

[Top] [Functions] [Functions]

NAME

arincTxObjDisable/**arincTxObjDisableX**

SYNOPSIS

```
EXPORT ARINC_RESULT PSYS_CALLTYPE arincTxObjDisable(ARINC_HANDLE  hnd,
                                                    ARINC_CMSG_T *pCmsg,
                                                    INT32        *pNum,
                                                    INT32         flag)
EXPORT ARINC_RESULT PSYS_CALLTYPE arincTxObjDisableX(ARINC_HANDLE  hnd,
                                                     ARINC_CMSG_X *pCmsg,
                                                     INT32        *pNum,
                                                     INT32         flag)
```

FUNCTION

Disables or enables an ARINC825 "transmit" object. If disabled, this object won't be transmitted any longer.

NOTES

This function works only for ARINC825 "transmit" objects (group >= 0).
On ARINC825 objects of ARINC_GROUP_RX the call has no effect.

By default, a newly created ARINC object is enabled.

(De-)activation of ARINC825 objects (even if done within one call for more than one object) is NOT atomic. Also, there's no guarantee, the given objects are dis-/enabled within one timeslot. This is done to prevent any disturbance of the scheduling, even if large amounts of objects are dis-/enabled.

PARAMETERS

hnd -- IN:
  A valid handle of type ARINC_HANDLE.
pCmsg -- IN:
  Pointer to one or more ARINC_CMSG_T/ARINC_CMSG_X structures. These have to contain the CAN ID as reference of the objects (other parts of ARINC_CMSG_T/ARINC_CMSG_X structure are ignored).
pNum -- IN/OUT:
  Pointer to an INT32, which determines the number of objects pCmsg is pointing to (and thus the number of objects to dis-/enable).
  The value of dis-/enabled objects (this might be lower, than the number requested, if an error occurred) is returned via pNum.
flag -- IN:
  Setting flag true (unequal zero) disables the referenced ARINC825 objects.
  Setting this flag zero, reenables the objects.

RESULT

```
Success: ARINC_SUCCESS
Error:   NTCAN_INVALID_HANDLE      - An invalid handle was used
         NTCAN_INVALID_PARAMETER   - Either pCmsg and/or pNum is NULL
         ARINC_ERROR_ID_NOT_FOUND  - The CAN ID of a given object was not
                                     found. Call arincObjAddX() first.
```

SEE ALSO

arincObjAddX()
arincObjDeleteX()
arincTxObjUpdateX()

7.23 arincWaitForTimeslot

[Top] [Functions] [Functions]

NAME

arincWaitForTimeslot

SYNOPSIS

```
EXPORT ARINC_RESULT PSYS_CALLTYPE arincWaitForTimeslot(ARINC_HANDLE  hnd,
                                                       INT32         timeout)
```

FUNCTION

Function returns, when a new time slice begins, or when timeout expired.

NOTES

Scheduling needs to be started, before this function is called.

PARAMETERS

```
hnd -- IN:
  A valid handle of type ARINC_HANDLE.
timeout -- IN:
  Timeout in milliseconds.
```

RESULT

```
Success: ARINC_SUCCESS
Error:   NTCAN_INVALID_HANDLE       - An invalid handle was used
         ARINC_ERROR_SCHED_DISABLED - Function called without scheduling
                                      enabled
         NTCAN_RX_TIMEOUT           - Timeout expired without receiving a
                                      new time slice event from hardware.
                                      Either this happens on purpose (e.g.
                                      due to small timeouts) or there's a
                                      severe problem in scheduling.
```

7.24 arincObjAddX

[Top] [Functions] [Functions]

NAME

arincObjAdd/**arincObjAddX**

SYNOPSIS

```
EXPORT ARINC_RESULT PSYS_CALLTYPE arincObjAdd(ARINC_HANDLE  hnd,
                                              ARINC_CMSG_T *pCmsg,
                                              INT32        *pNum)
EXPORT ARINC_RESULT PSYS_CALLTYPE arincObjAddX(ARINC_HANDLE  hnd,
                                               ARINC_CMSG_X *pCmsg,
                                               INT32        *pNum)
```

FUNCTION

Add one or more objects to an ARINC825 scheduling table. The number of objects pointed to by pCmsg has to be specified in pNum.
Every object has ARINC825 attributes, such as group, column (m) and slice index (n). By setting group to ARINC_GROUP_RX a receive object is added (in this case m and n are ignored).

NOTES

Scheduling needs to be stopped, before this function is called.

Objects are referenced by their CAN-IDs. Each CAN-ID can be added once, only. pNum returns the number of successfully added objects. Normally this value shouldn't change, but in case of an error it might be used to determine, which object was cause of the error. Once an object was added, it won't be removed if an error occurs with one of the subsequent objects.

PARAMETERS

hnd -- IN:
  A handle of type ARINC_HANDLE.
pCmsg -- IN:
  Pointer to one or more ARINC_CMSG_T/ARINC_CMSG_X, which will be added to the schedule.
pNum -- IN/OUT:
  Pointer to a INT32, which determines the number of objects pCmsg is pointing to. When returning, it contains the number of successfully added objects.

RESULT

```
Success: ARINC_SUCCESS
Error:   NTCAN_INVALID_HANDLE          - An invalid handle was used
         NTCAN_INVALID_PARAMETER       - Either pCmsg or pNum was NULL, or one
                                         of the objects contained invalid
                                         attributes (e.g. an invalid ARINC
                                         group was specified
                                         or "n" didn't fit group)
                                         Use pNum to find the object
         ARINC_ERROR_SCHED_ENABLED     - arincScheduleStart() or arincTxStart()
                                         has been called before. Scheduling
                                         needs to be stopped, before adding
                                         new objects
         NTCAN_INSUFFICIENT_RESOURCES - Not enough memory to add another
                                         object
         ARINC_ERROR_ID_BUSY           - The CAN ID has already been added
         ARINC_ERROR_COL_BUSY          - The column with the specified group
                                         and slice index is already occupied
```

SEE ALSO

arincObjDeleteX()

7.25 arincObjDeleteX

[Top] [Functions] [Functions]

NAME

arincObjDelete/**arincObjDeleteX**

SYNOPSIS

```
EXPORT ARINC_RESULT PSYS_CALLTYPE arincObjDelete(ARINC_HANDLE  hnd,
                                                 ARINC_CMSG_T *pCmsg,
                                                 INT32        *pNum)
EXPORT ARINC_RESULT PSYS_CALLTYPE arincObjDeleteX(ARINC_HANDLE  hnd,
                                                  ARINC_CMSG_X *pCmsg,
                                                  INT32        *pNum)
```

FUNCTION

Delete one or more objects from an ARINC825 scheduling table. The number of objects pointed to by pCmsg has to be specified in pNum.
The ARINC825 attributes, such as group, column (m) and slice index (n) are ignored by this call.

NOTES

Scheduling needs to be stopped, before this function is called.

Objects are referenced by their CAN ID.
pNum returns the number of successfully deleted objects. Normally this value shouldn't change, but in case of an error it might be used to determine, which object was cause of the error. Once an object was deleted, it won't be readded if an error occurs with one of the subsequent objects.

PARAMETERS

hnd -- IN:
  A handle of type ARINC_HANDLE.
pCmsg -- IN:
  Pointer to one or more ARINC_CMSG_T/ARINC_CMSG_X, which will be deleted from schedule.
pNum -- IN/OUT:
  Pointer to an INT32, which determines the number of objects pCmsg is pointing to. When returning, it contains the number of successfully deleted objects.

RESULT

Success:	ARINC_SUCCESS	
Error:	NTCAN_INVALID_HANDLE	- An invalid handle was used
	NTCAN_INVALID_PARAMETER	- Either pCmsg or pNum was NULL, or one Of the objects contained invalid attributes Use pNum to find the object.
	ARINC_ERROR_SCHED_ENABLED	- arincScheduleStart() or arincTxStart() Has been called before. Scheduling needs to be stopped, before deleting objects.
	ARINC_ERROR_ID_NOT_FOUND	- The CAN ID has not been previously added.

SEE ALSO

arincObjAddX()

8 ARINC825 LabVIEW Library

INTRODUCTION
The included VIs offer you the possibility to use the ARINC825 time slice scheduling on esd CAN hardware. In general, there are two sets of VIs.
One set, called A825 VIs (signal-based VIs), provides a project file-based signal approach, probably most suitable for most LabVIEW users.
The other set, called ARINC VIs (native VIs), offers direct access to the entire ARINC825 library, tailored for the experienced user with programming knowledge, who wants to have control over every detail.

REQUIREMENTS

LabVIEW Version:	LabVIEW 2013 or later
CAN Interface:	esd CAN Interface, best with esd 400 family with IRIG-B Support (e.g. PMC-CAN/400-4 IRIG-B)
CAN Driver:	esd CAN Driver with NTCAN Library Support
ARINC825 Library:	Version 1.1.15 or later
IRIG-B LabVIEW Library (only with CAN Interface with IRIG-B):	Version 13.1.1 or later

8.1 Archive contents

The LabVIEW_ARINC825_VERSION.zip archive contains following folders:

```
.
|-- ARINC825_LabVIEW_Examples
`-- user.lib
    `-- LabVIEW_can_arinc825_esd
        |-- SubVI
        |-- VIs
```

8.2 Installation

- Install CAN SDK from ARINC825 CD or CAN CD.
  (Select IRIG-B Option if you have a CAN interface with IRIG-B option).
- Install ARINC 825 Library from ARINC825 CD.
  Copy the `user.lib` folder from `LabVIEW_ARINC825_VERSION.zip` into your LabVIEW installation.

8.3 Basic Usage Information

In order to use either set of VIs, you must first acquire a handle that must be passed to all successive VIs. There are two different handles, one for each set of VIs.
The ARINC (native) handle is returned from "nativeArincHandleOpen.vi" and can be used with the ARINC VIs only.
The A825 (also called "project handle") is returned from "A825ProjectOpen.vi". It is advised to use this project handle with the set of A825 VIs, nevertheless it can also be used with the set of ARINC VIs.

For further information on general functionality of ARINC825 and/or every single VI please have a look at one or more of the following references:
- Context help of the VIs inside of LabVIEW (probably the easiest and most convenient option)
- Examples included within the archive may give good starting points
- HTML documentation of esd's ARINC825 library (included with the library)
- esd's NTCAN API documentation for further information on CAN (http://esd.eu/en/products/can-sdk)

8.4 A825 VIs (Signal Based VIs)

The A825 VIs (Signal Based VIs) provide a project file-based signal approach, probably most suitable for all LabVIEW users.
These VIs are named with the prefix “A825”. Their VI icons look like this (e.g.):

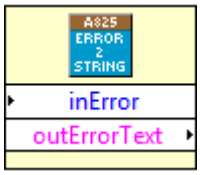
OVERVIEW OF A825 VIs:

A825Error2String
A825Info
A825ObjectPoll
A825ObjectSend
A825ObjectTrigger
A825ProjectClose
A825ProjectOpen
A825ScheduleStart
A825ScheduleStop
A825SignalPoll
A825SignalTrigger
A825SignalUpdate
A825Status
A825StatusReset
A825TimeGet
A825TxObjectDisable
A825TxObjectUpdate

The parameters of the A825 VIs are described in the online help. Click with the right mouse button on a parameter to open the context menu which contains further information about this parameter.

An example of a project file is given in chapter: “Example of a Project File”, page 73.

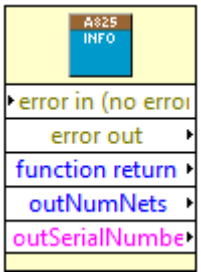
8.4.1 A825Error2String



Convert any error code from the ARINC825 VI's into a human readable string.

EXPORT int CALLTYPE A825Error2String(const int inError, char * const outErrorText);

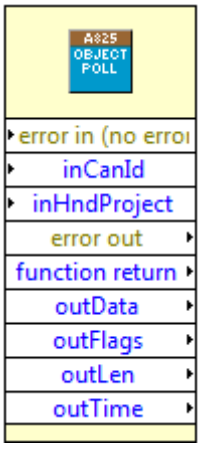
8.4.2 A825Info



Provides information about the esd CAN hardware in the system.

EXPORT int CALLTYPE A825Info(int32_t * const outNumNets, char * outSerialNumbers);

8.4.3 A825ObjectPoll

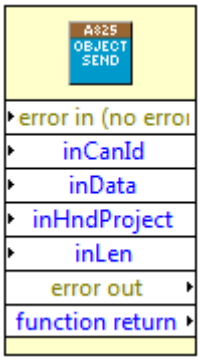


Retrieve the current state of an ARINC825 object, referenced by a CAN ID. This may be an RX as well as TX object.

Note:
One ARINC825 object may contain multiple signals.

EXPORT int CALLTYPE A825ObjectPoll(const uint32_t inHndProject, const int32_t inCanId, uint8_t * const outLen, uint64_t * const outData, uint32_t * const outFlags, uint64_t * const outTime);

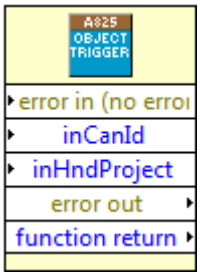
8.4.4 A825ObjectSend



Manually send an ARINC825 object (identical to CAN frame in this case).
If there's an ARINC825 object with the same CAN ID defined in the project, this object will get updated in the process.

EXPORT int CALLTYPE A825ObjectSend(const uint32_t inHndProject, const int32_t inCanId, const uint8_t inLen, const uint64_t inData);

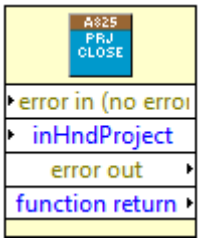
8.4.5 A825ObjectTrigger



Manually trigger the transmission of an ARINC825 object in its current state.

EXPORT int CALLTYPE A825ObjectTrigger(const uint32_t inHndProject, const int32_t inCanId);

8.4.6 A825ProjectClose

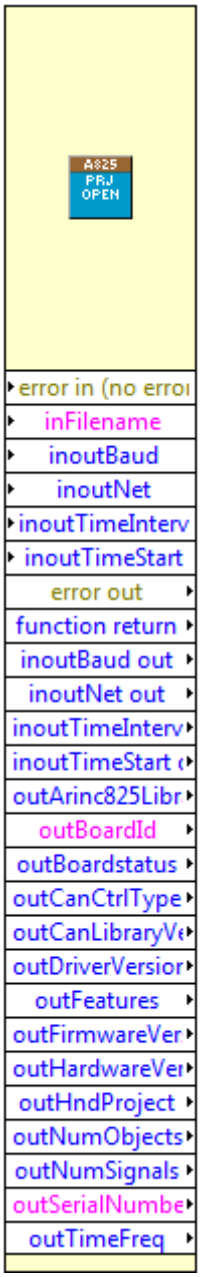


Close a project, formerly opened with "A825 Project Open.vi".

Note: This has to be called BEFORE stopping your LabView application, in order to assure a correct cleanup!

EXPORT int CALLTYPE A825ProjectClose(const uint32_t inHndProject);

8.4.7 A825ProjectOpen



Open a project file and return a project handle as reference for all successive ARINC825 VI's.
The various inputs may be used to override certain parameters of the specified project file.

Note: In contrast to the ARINC825-C-API "A825 Project Open.vi" provides some static information, normally provided by arincStatus().
This is done for the users convenience and should be selfexplanatory in its use.

EXPORT int CALLTYPE A825ProjectOpen(const char * const inFilename, int * const inoutNet, uint32_t * const inoutBaud, uint64_t * const outTimeFreq, uint64_t * const inoutTimeStart, uint64_t * const inoutTimeInterval, uint32_t * const outNumObjects, uint32_t * const outNumSignals, uint32_t * const inoutIrigBInput, uint32_t * const inoutIrigBMode, uint32_t * const outHndProject);

8.4.7.1 Example of a Project File

The VI A825ProjectOpen opens a project file. For example:

```
# LabView ARINC825 project file
#
# Comment lines are allowed everywhere and have to be preceded by a hash character '#'
#
# The project file needs at least a "ARINC825Config" section.
# Sections are defined by section name in square brackets ("[", "]").
#
# There should be only one project file per CAN bus.
#
# All project files on the same CAN board should have the same IRIG-B configuration,
# otherwise, the last one loaded will take effect.
#
# Two more sections may be used:
# "ARINC825Objects" to define ARINC825/CAN objects
# "ARINC825Signals" to map LabView signal names into CAN objects
#
# Numerical values may be specified in decimal or hexadecimal (beginning with "0x")
notation.
#
# To separate values, space as well as tabs may be used.
#

[ARINC825Config]
# Following values may be set (omitted values are set to default):
# Net (default: 0)                                    - Number of CAN bus
# Baud (default: 0 (1MBit/s))                         - Baud rate on CAN bus
# Timeslice (default: 0x0000000080000000 (0.5s))      - Duration of time slice
# IRIGBInput (default: 0)                             - To choose input of IRIG-B signal
#                                                       (0: Analog Front, 1: Digital
Front)
# IRIGBMode (default: 0)                              - To choose evaluation year in
IRIB-B signal
#                                                       (0: No year information,
#                                                        1: Year embedded in IRIG-B
signal)
Net=0
Baud=0
Timeslice=0x1312D00

[ARINC825Objects]
# Each object is defined by CAN ID, ARINC 825 group (G), ARINC 825 column (M),
# ARINC 825 slice index (N), length of CAN frame (LEN) and optionally up to eight
# data bytes (D0-D7)

# At first three RX objects (set G = -1)...
#    CANID  G M N LEN   D0   D1   D2   D3   D4   D5   D6   D7
0x20000100 -1 0 0 1
0x20000101 -1 0 0 8
0x20000102 -1 0 0 8

# ... and then three more TX objects
0x20000000  0 0 0 8   0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00
0x20000001  1 0 0 8   0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00
0x20000002  2 0 0 4   0x00 0x00 0x00 0x00

[ARINC825Signals]
# NAME: Signal name, 16 characters at max (case insensitive, may obviously NOT begin
with '#')
# CANID: CAN ID of CAN object the signal is mapped to
# BitMin: Range [0..BitMax] (beginning with "byte 0, bit 0" up to "byte 7 bit 7")
# BitMax: Range [BitMin..63] (beginning with "byte 0 bit 0" up to "byte 7 bit 7")
```

```
# NAME               CANID       BitMin  BitMax
Temperature1         0x20000000   0      15
Pressure1            0x20000000  16      31
Temperature2         0x20000000  32      47
Pressure2            0x20000000  48      63

CurrentX             0x20000001   0      31
CurrentY             0x20000001  32      63

ButtonA              0x20000002  24      24
ButtonB              0x20000002  25      25
ButtonC              0x20000002  26      26
ButtonD              0x20000002  27      27

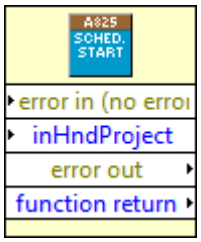
SelectorS            0x20000002   0       7



LED1                 0x20000100   0       0
LED2                 0x20000100   1       1
LED3                 0x20000100   2       2
LED4                 0x20000100   3       3

#PositionX            0x20000101   0      63
#PositionY            0x20000102   0      63
```

8.4.8 A825ScheduleStart

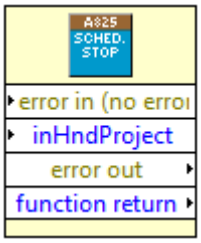


Start the ARINC825 timeslice scheduling, after your project has been loaded and everything is configured as needed.

Note: If you are using CAN hardware with special timestamp sources (e.g. IRIG-B), you need to assure, that your timebase is stable BEFORE starting the scheduler.

EXPORT int CALLTYPE A825ScheduleStart(const uint32_t inHndProject);

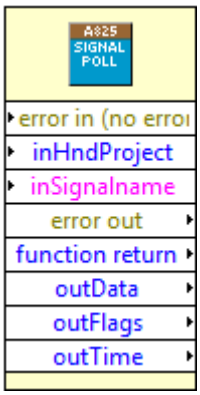
8.4.9 A825ScheduleStop



Stop the ARINC825 timeslice scheduling. This is needed in order to perform configuration changes.

EXPORT int CALLTYPE A825ScheduleStop(const uint32_t inHndProject);

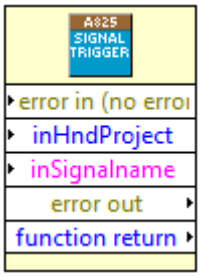
8.4.10 A825SignalPoll



Get the current value of a signal defined in your project. The signal is referenced by its name.

EXPORT int CALLTYPE A825SignalPoll(const uint32_t inHndProject, const char *
const inSignalname, uint64_t * const outData, uint32_t * const outFlags, uint64_t * const outTime);

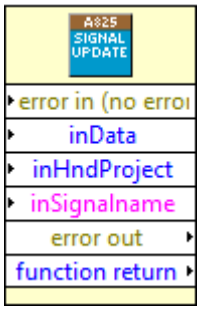
8.4.11 A825SignalTrigger



Triggers the transmission of the entire ARINC825 object the referenced signal is located in.
Of course all other signals located within the same object are transmitted as well (obviously).

EXPORT int CALLTYPE A825SignalTrigger(const uint32_t inHndProject, const char * const inSignalname);

8.4.12 A825SignalUpdate

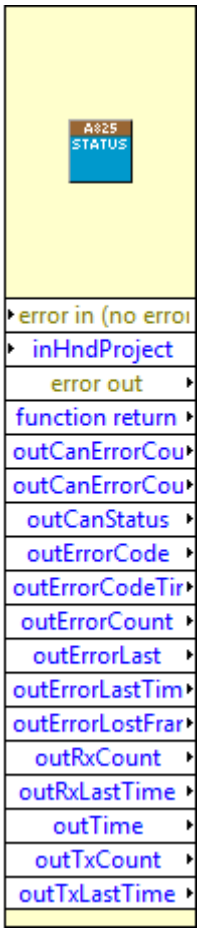


Change the value of a signal. Most commonly used on signals located in ARINC825 objects scheduled for transmission.

Note: This VI does not trigger the transmission itself.

EXPORT int CALLTYPE A825SignalUpdate(const uint32_t inHndProject, const char * const inSignalname, const uint64_t inData);

8.4.13 A825Status

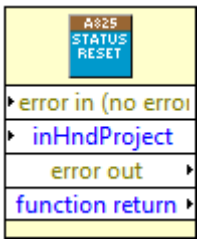


Provides a bunch of status information.

Note: In contrast to the ARINC825-C-API "A825 Status.vi" provides information subject to change,
instead of providing all infos normally provided by arincStatus(). This is done for the users convenience
and should be selfexplanatory in its use. The static information is to be found as output of "A825 Project Open.vi".

EXPORT int CALLTYPE A825Status(const uint32_t inHndProject, uint64_t * const outTime, uint32_t * const outRxCount, uint64_t * const outRxLastTime, uint32_t * const outTxCount, uint64_t * const outTxLastTime, uint32_t * const outErrorCount, int32_t * const outErrorLast, uint64_t * const outErrorLastTime, uint32_t * const outErrorCode, uint64_t * const outErrorCodeTime, uint8_t * const outCanStatus, uint8_t * const outCanErrorCountRx, uint8_t * const outCanErrorCountTx, uint32_t * const outErrorLostFrames);

8.4.14 A825StatusReset

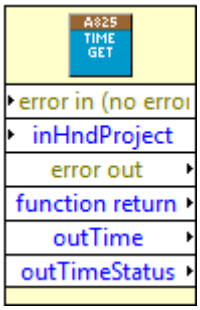


Resets the information delivered by "A825 Status.vi", such as error counters, TX- and RX-frame counters.

Note:
The CAN RX- and TX-error counters will not be reset by this function. This is not even possible with most CAN controllers. With

EXPORT int CALLTYPE A825StatusReset(const uint32_t inHndProject);

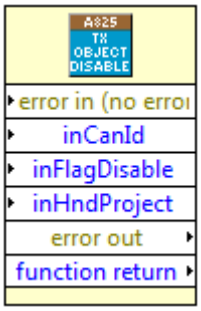
8.4.15 A825TimeGet



Get current timestamp.

EXPORT int CALLTYPE A825TimeGet(const uint32_t inHndProject, uint64_t * const outTime, uint32_t * const outIrigBStatus);

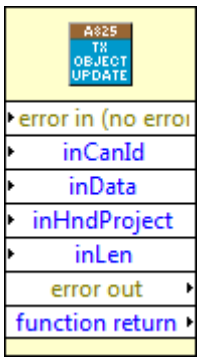
8.4.16 A825TxObjectDisable



While ARINC825 scheduling is in process, this VI can be used to temporarily disable an ARINC825 object,
meaning it will not be scheduled, unless it is reenabled again with this VI.

EXPORT int CALLTYPE A825TxObjectDisable(const uint32_t inHndProject, const int32_t inCanId, const int32_t inFlagDisable);

8.4.17 A825TxObjectUpdate



Update the contents of an ARINC825 object.

Note: This VI does not trigger the transmission itself.

EXPORT int CALLTYPE A825TxObjectUpdate(const uint32_t inHndProject, const int32_t inCanId, const uint8_t inLen, const uint64_t inData);

8.5 ARINC VIs (Native VIs)

The ARINC VIs (Native VIs) offer direct access to the entire ARINC825 library, tailored for the experienced user with programming knowledge, who wants to have control over every detail.
These VIs are named with the prefix “ARINC”.
Their VI icons look like this (e.g.):

OVERVIEW OF ARINC VIs:

ArincBaudrateGet
ArincBaudrateGetX
ArincBaudrateSet
ArincBaudrateSetX
ArincClose
ArincError2String
ArincHandleOpen
ArincIntervalGet
ArincIntervalSet
ArincObjAdd/ArincObjAddX
ArincObjDelete/ArincObjDeleteX
ArincPoll/ArincPollX
ArincRxStart
ArincRxStop
ArincScheduleStart
ArincScheduleStop
ArincStatus
ArincStatusReset
ArincTimeGet
ArincTxObjDisable/ArincTxObjDisableX
ArincTxObjUpdateArincTxObjUpdateX
ArincTxStart
ArincTxStop
ArincWaitForTimeslot

TOOL VIs

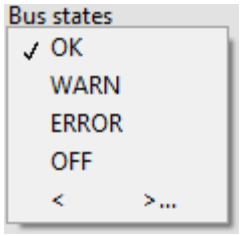
ARINC Length (DLC) Builder

OVERVIEW OF ARINC Controls (Enum / Ring / *.ctl):

ARINC Bus State Constants.ctl
ARINC Controller Type Constants.ctl
ARINC DLC Constants.ctl
ARINC ID Constants.ctl
ARINC Interface Feature Constants.ctl
ARINC Length Constants.ctl
ARINC_CMSG_X.ctl

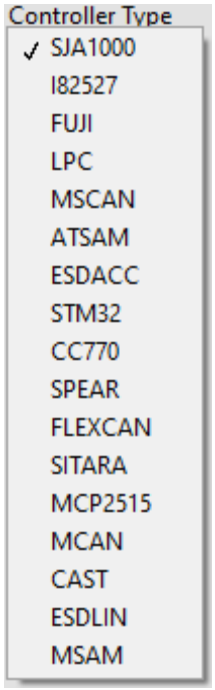
8.5.1 ARINC Bus State Constants.ctl

ARINC / NTCAN_BUSTATE_* constants, returned by arincStatus() / ArincStatus (outCanStatus)



8.5.2 ARINC Controller Type Constants.ctl

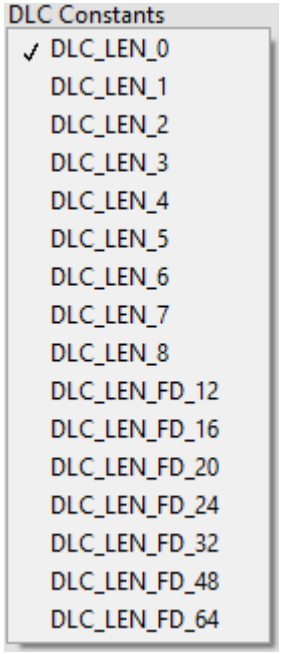
ARINC / NTCAN_ returned by ArincHandleOpen (outCanCtrlType)



8.5.3 ARINC DLC Constants.ctl

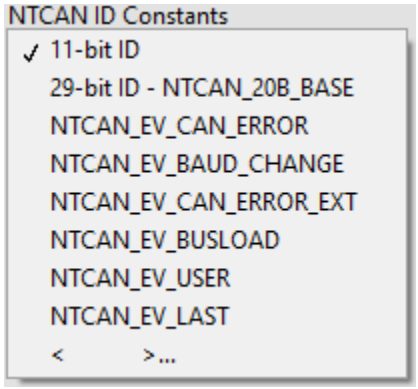
CAN FD DLC constants (Value 0-15) for ARINC_CMSG_X.Length
NTCAN API function description (NTCAN_LEN_TO_DATASIZE)

See 5.2 CAN-Length, page 15.



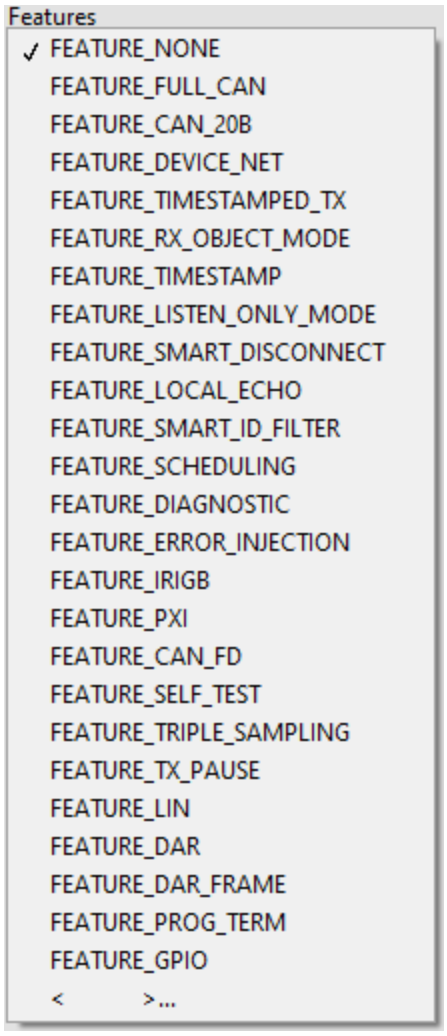
8.5.4 ARINC ID Constants.ctl

Constants for ARINC_CMSG_X.CAN ID -- use NTCAN_20B_BASE = x20000000 (hex.) for ARINC 29-Bit CAN IDs + CAN ID.
NTCAN_EV* is for reference with NTCAN events only.



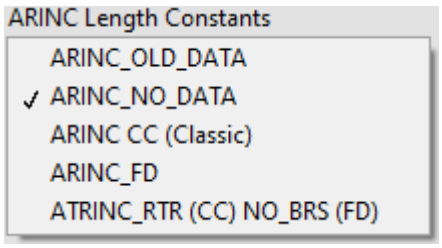
8.5.5 ARINC Interface Feature Constants.ctl

See features 6.4 ARINC_STATUS, page 28



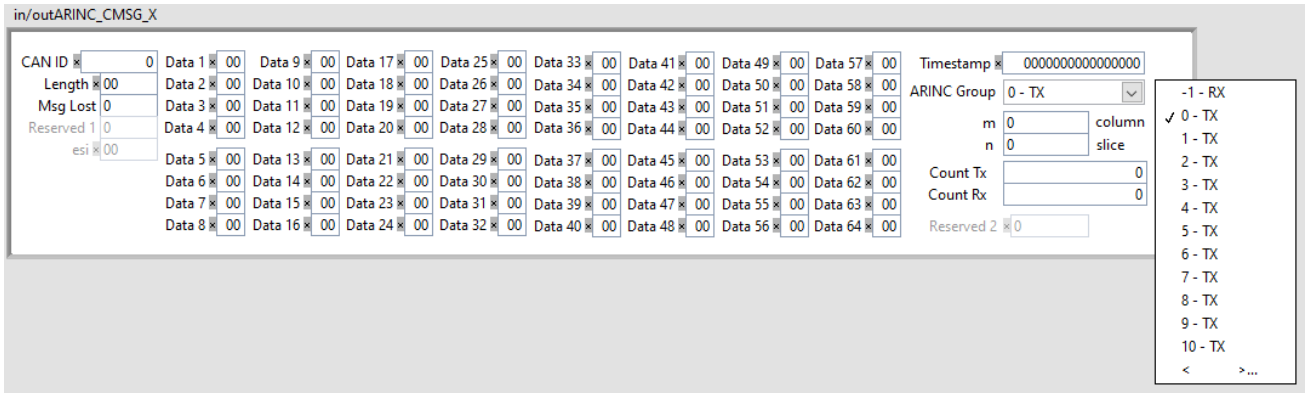
8.5.6 ARINC Length Constants.ctl

See 5.2 CAN-Length, page 15.
Use ARINC_FD (= NTCAN_FD) flag to send CAN FD frames.



8.5.7 ARINC_CMSG_X.ctl

Use as predefined control for input / output type ARINC_CMSG_X.
See 6.2 ARINC_CMSG_X, page 25.

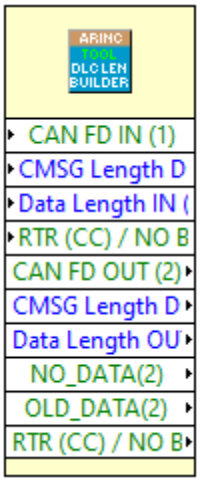


8.5.8 ARINC Length (DLC) Builder

File name of the VI: ARINC Length (DLC) Builder.vi

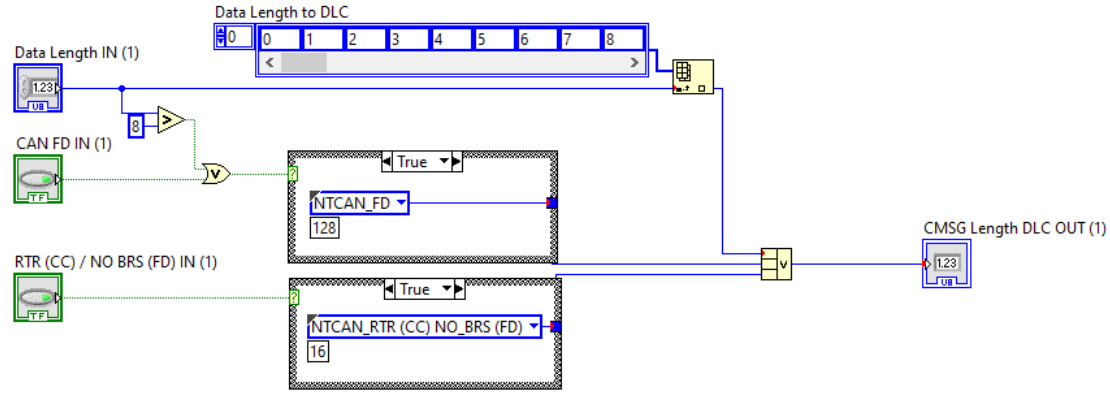
Description: No ARINC API function stored. See 5.2 CAN-Length, page 15

TOOL VI:

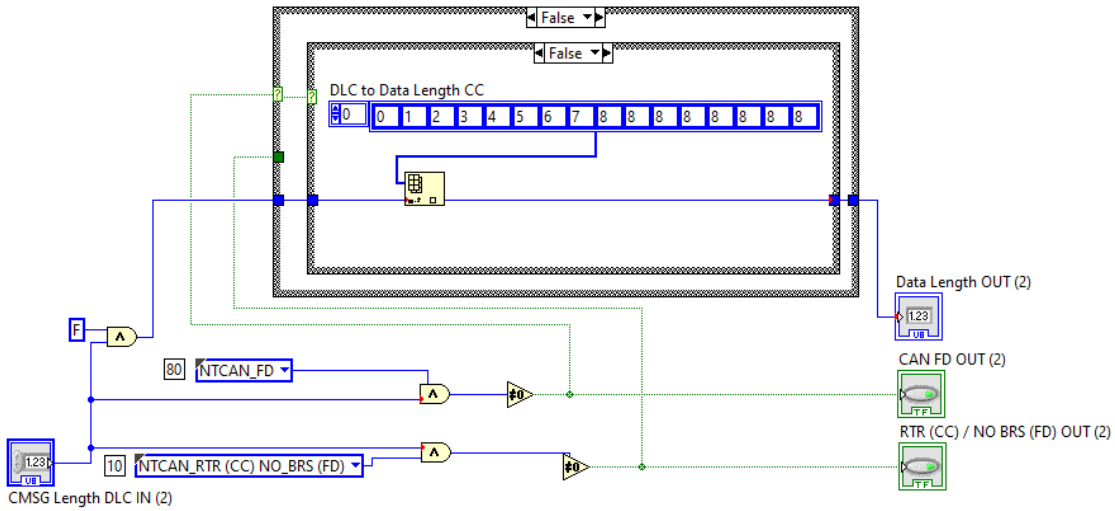


Block diagrams:

- Function (1): Build a CAN message ARINC_CMSG_X.Length field from real data length in bytes and input flags:



- Function (2): Get the real data length in bytes from the ARINC_CMSG_X.Length field of a CAN message:

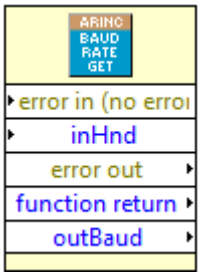


8.5.9 ArincBaudrateGet

File name of the VI: native Arinc Baudrate Get.vi

Description: See page 41 for the ARINC 825 library function description.

ARINC VI:



The "native" VI set directly calls ARINC825 library functions.
Please refer to the documentation of arincBaudrateGet().

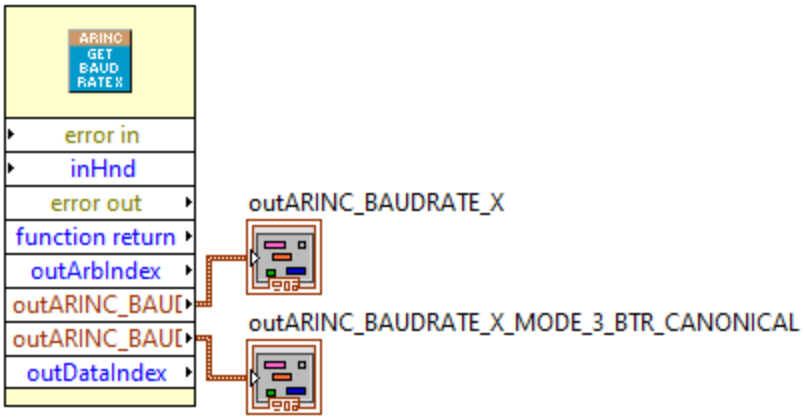
```
EXPORT int CALLTYPE nativeArincBaudrateGet(const uint32_t   inHnd, const uint32_t * outBaud);
```

8.5.10 ArincBaudrateGetX

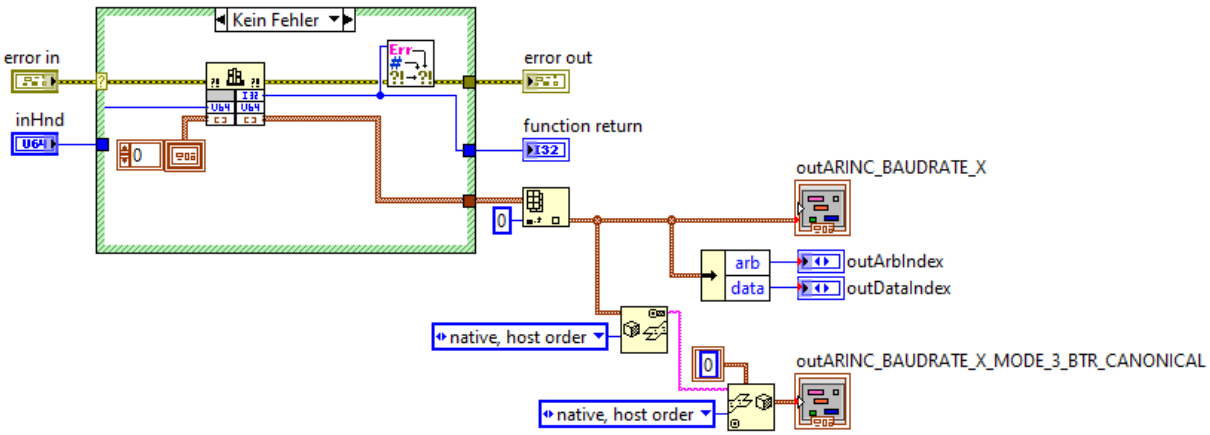
File name of the VI: native Arinc Get Baudrate X.vi

Description: See page 42 for the ARINC 825 library function description.
See page 27 for the ARINC 825 library data type description (BAUDRATE_X).

ARINC VI:



Block diagram:




```
int nativeArincGetBaudrateX(const uint64_t inHnd, ARINC_BAUDRATE_X * const  baudX)

outARINC_BAUDRATE_X :
  Valid for modes: (0,) 1, 2, 4  (,5)

outARINC_BAUDRATE_X_MODE_3_BTR_CANONICAL:
  Valid for mode 3 (NTCAN_BAUDRATE_MODE_BTR_CANONICAL)

outArbIndex, outDataIndex:
  Valid for mode 1 (NTCAN_BAUDRATE_MODE_INDEX)

out*_data, outDataIndex:
Valid for CAN FD (flags = 1)

Mode of NTCAN_BAUDRATE_X:
NTCAN_BAUDRATE_MODE_DISABLE (0) - Remove from bus
NTCAN_BAUDRATE_MODE_INDEX (1) - ESD (CiA) bit rate idx
NTCAN_BAUDRATE_MODE_BTR_CTRL (2) - BTR register settings (Controller)
NTCAN_BAUDRATE_MODE_BTR_CANONICAL (3) - BTR values (Canonical)
NTCAN_BAUDRATE_MODE_NUM (4) - Numerical bit rate bit/s
NTCAN_BAUDRATE_MODE_AUTOBAUD (5) - Autobaud

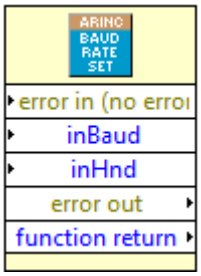
Flags of NTCAN_BAUDRATE_X (Or'ed values):
NTCAN_BAUDRATE_FLAG_FD 1(hex) - Enable CAN FD Mode
NTCAN_BAUDRATE_FLAG_LOM 2(hex) - Enable Listen Only mode
NTCAN_BAUDRATE_FLAG_STM 4(hex) - Enable Self test mode
NTCAN_BAUDRATE_FLAG_TRS 8(hex) - Enable Triple Sampling
NTCAN_BAUDRATE_FLAG_TXP 10(hex) - Enable Transmit Pause
NTCAN_BAUDRATE_FLAG_TDC 20(hex) - TDC configuration valid
```

8.5.11 ArincBaudrateSet

File name of the VI: native Arinc Baudrate Set.vi

Description: See page 39 for the ARINC 825 library function description.

ARINC VI:



The "native" VI set directly calls ARINC825 library functions.
Please refer to the documentation of arincBaudrateSet().

```
EXPORT int CALLTYPE nativeArincBaudrateSet(const uint32_t inHnd, const uint32_t inBaud);
```

8.5.12 ArincBaudrateSetX

File names of the VIs: native Arinc Set Bitrate Details.vi
native Arinc Set Bitrate Index.vi
native Arinc Set Bitrate Numeric.vi

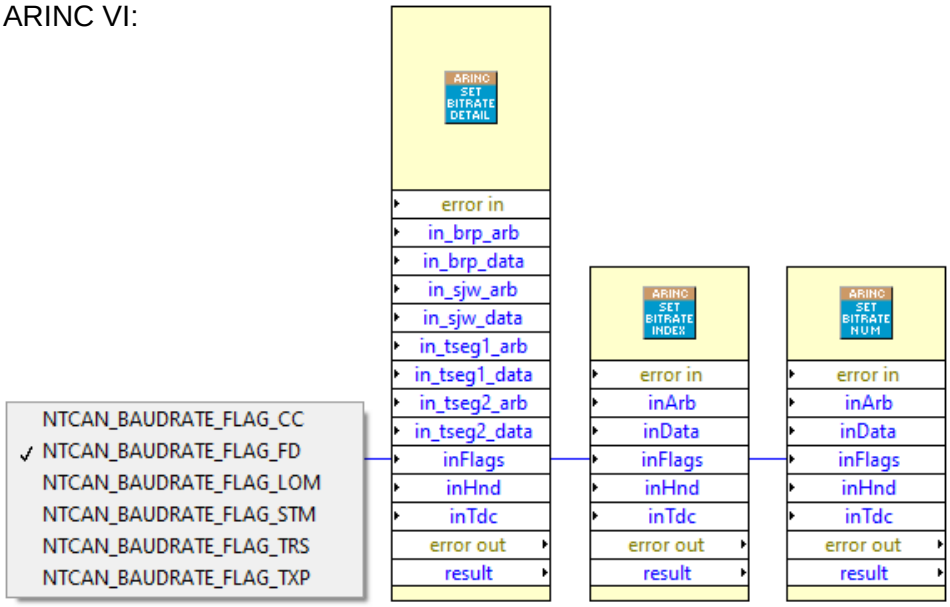
Description:

See page42 40 for the ARINC 825 library function description.

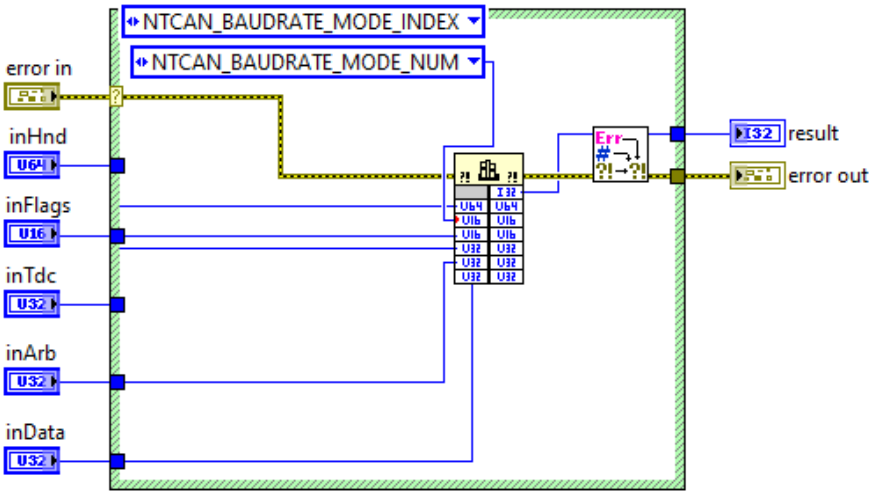
native Arinc Set Bitrate Details.vi – specialized VI for NTCAN_BAUDRATE_MODE_CANONICAL
native Arinc Set Bitrate Index.vi – specialized VI for NTCAN_BAUDRATE_MODE_INDEX
native Arinc Set Bitrate Numeric.vi – specialized VI for NTCAN_BAUDRATE_MODE_NUMERICAL

See NTCAN docs for all details.

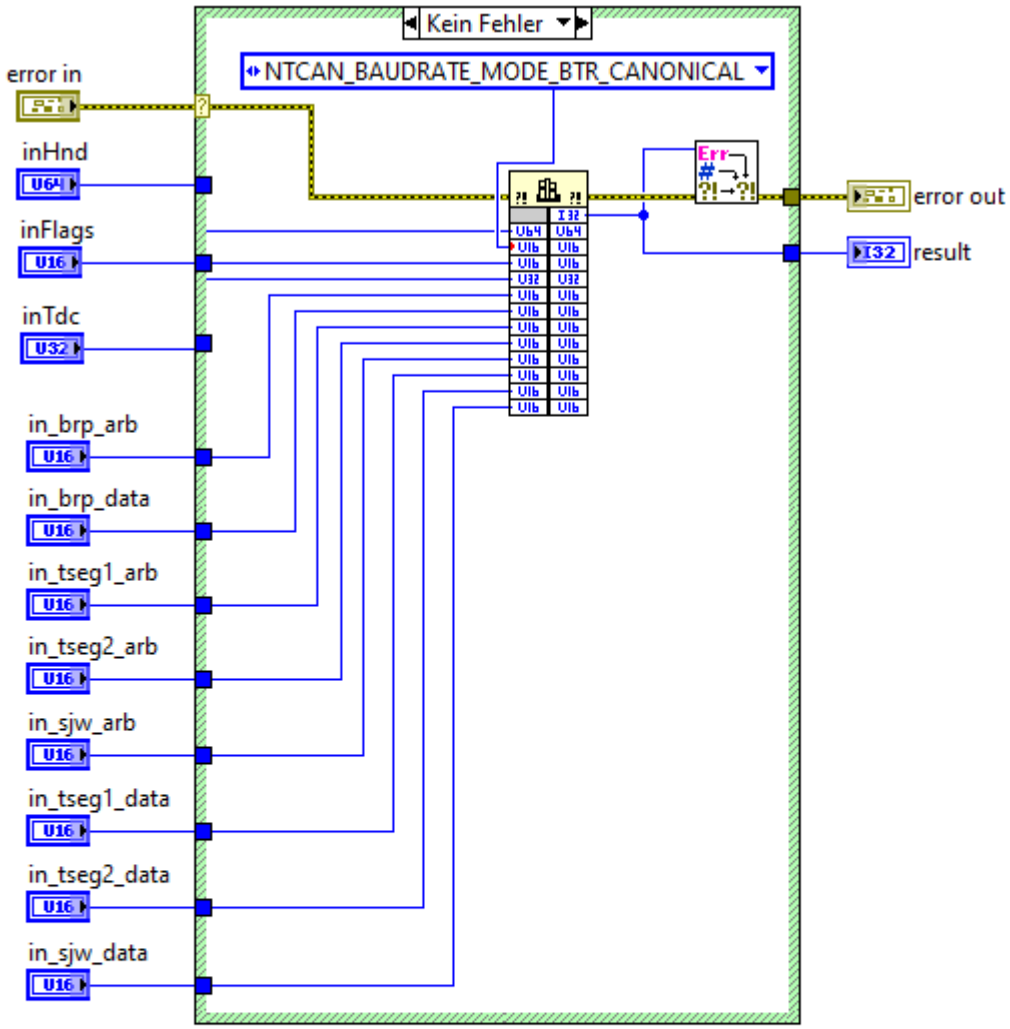
ARINC VI:



Block diagrams:




```
int nativeArincSetBitrateN
  (const uint64_t inHnd,
   const uint16_t inMode,
   const uint16_t inFlags,
   const uint32_t inTdc,
   const uint32_t inArb,
   const uint32_t inData)
```



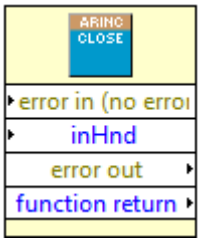

```
int nativeArincSetBitrateB(const uint64_t inHnd,
                           const uint16_t inMode,
                           const uint16_t inFlags,
                           const uint32_t inTdc,
                           const uint16_t in_brp_arb,
                           const uint16_t in_brp_data,
                           const uint16_t in_tseg1_arb,
                           const uint16_t in_tseg2_arb,
                           const uint16_t in_sjw_arb,
                           const uint16_t in_tseg1_data,
                           const uint16_t in_tseg2_data,
                           const uint16_t in_sjw_data)
```

8.5.13 ArincClose

File name of the VI: native Arinc Close.vi

Description: See page 38 for the ARINC 825 library function description.

ARINC VI:



The "native" VI set directly calls ARINC825 library functions.
Please refer to the documentation of arincClose().

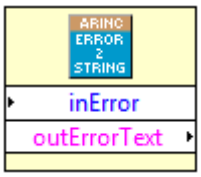
```
EXPORT int CALLTYPE nativeArincClose(const uint32_t inHnd);
```

8.5.14 ArincError2String

File names of the VI: native Arinc Error2String.vi

Description: See page 45 for the ARINC 825 library function description.

ARINC VI:



Convert any error code from the ARINC825 VI's into a human readable string.

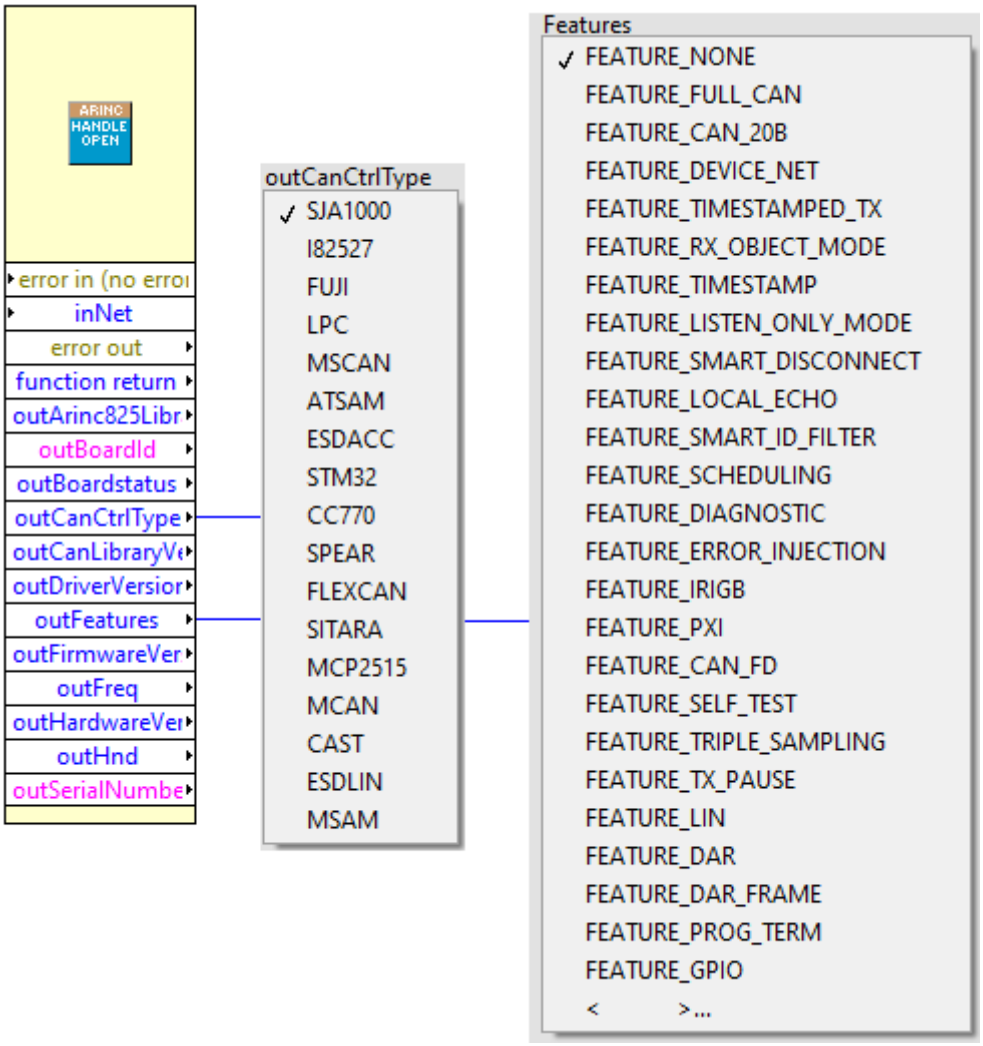
```
EXPORT int CALLTYPE nativeArincError2String(const int inError, char * const outErrorText);
```

8.5.15 ArincHandleOpen

File names of the VI: native Arinc Handle Open.vi

Description: See page 37 for the ARINC 825 library function description.
Some output of arincStatus is added, see page 43 for arincStatus.

ARINC VI:



The "native" VI set directly calls ARINC825 library functions. Please refer to the documentation of arincHandleOpen().

Note: This VI provides some more outputs than the arincHandleOpen() library call.
The ARINC825 library delivers the same information via arincStatus().

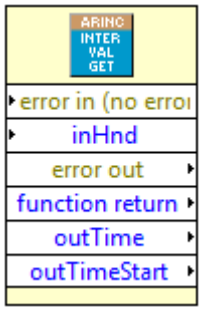
EXPORT int CALLTYPE nativeArincHandleOpen(const uint32_t inNet, uint32_t * const outHnd, uint64_t * const outFreq, uint16_t * const outHardwareVersion, uint16_t * const outFirmwareVersion, uint16_t * const outDriverVersion, uint16_t * const outCanLibraryVersion, uint32_t * const outBoardstatus, char * const outBoardId, char * const outSerialNumber, uint16_t * const outFeatures, uint16_t * const outArinc825LibraryVersion, uint8_t * const outCanCtrlType);

8.5.16 ArincIntervalGet

File names of the VI: native Arinc Interval Get.vi

Description: See page 49 for the ARINC 825 library function description.

ARINC VI:




```
The "native" VI set directly calls ARINC825 library functions.
Please refer to the documentation of arincIntervalGet().

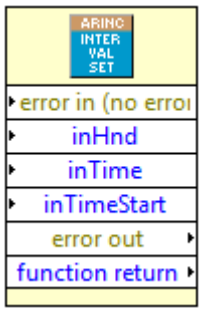
EXPORT int CALLTYPE nativeArincIntervalGet(const uint32_t inHnd, uint64_t * const outTime, uint64_t * const outTimeStart);
```

8.5.17 ArincIntervalSet

File names of the VI: native Arinc Interval Set.vi

Description: See page 48 for the ARINC 825 library function description.

ARINC VI:




```
The "native" VI set directly calls ARINC825 library functions.
Please refer to the documentation of arincIntervalSet().

Note:
May only be used, while scheduling is NOT started.

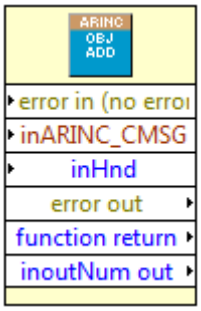
EXPORT int CALLTYPE nativeArincIntervalSet(const uint32_t inHnd, const uint64_t inTime, const uint64_t inTimeStart);
```

8.5.18 ArincObjAdd

File names of the VI: native Arinc Obj Add.vi

Description: See page 63 for the ARINC 825 library function description.

ARINC VI:




```
The "native" VI set directly calls ARINC825 library functions.
Please refer to the documentation of arincObjectAdd().

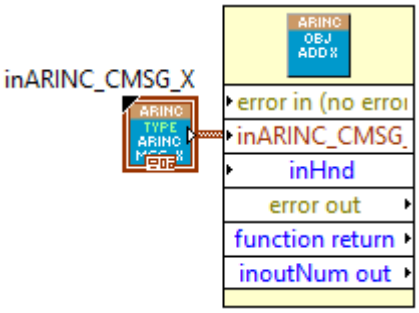
EXPORT int CALLTYPE nativeArincObjAdd(const uint32_t inHnd, ARINC_CMSG_T * const inCmsg, int32_t * const inoutNum);
```

8.5.19 ArincObjAddX

File names of the VI: native Arinc Obj Add X.vi

Description: See page 63 for the ARINC 825 library function description.

ARINC VI:




```
The "native" VI set directly calls ARINC825 library functions.
Please refer to the documentation of arincObjectAddX().

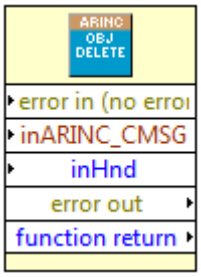
int nativeArincObjAddX(const uint64_t inHnd, ARINC_CMSG_X * const inCmsg, int32_t * const inoutNum)
```

8.5.20 ArincObjDelete

File names of the VI: native Arinc Obj Delete.vi

Description: See page 65 for the ARINC 825 library function description.

ARINC VI:




```
The "native" VI set directly calls ARINC825 library functions.
Please refer to the documentation of arincObjectDelete().

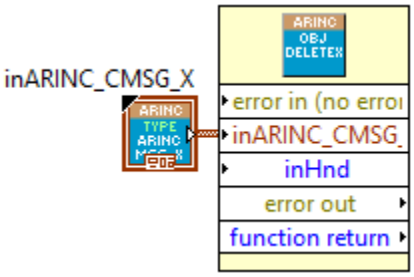
EXPORT int CALLTYPE nativeArincObjDelete(const uint32_t inHnd, ARINC_CMSG_T * const inCmsg, int32_t * const inoutNum);
```

8.5.21 ArincObjDeleteX

File names of the VI: native Arinc Obj Delete X.vi

Description: See page 65 for the ARINC 825 library function description.

ARINC VI:




```
The "native" VI set directly calls ARINC825 library functions.
Please refer to the documentation of arincObjectDeleteX().

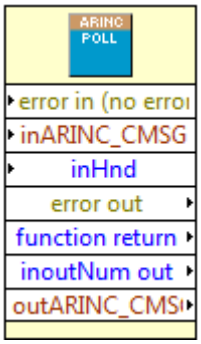
int nativeArincObjDeleteX(const uint64_t inHnd, ARINC_CMSG_X * const inCmsg, int32_t * const inoutNum)
```

8.5.22 ArincPoll

File names of the VI: native Arinc Poll.vi

Description: See page 58 for the ARINC 825 library function description.

ARINC VI:




```
The "native" VI set directly calls ARINC825 library functions.
Please refer to the documentation of arincPoll().

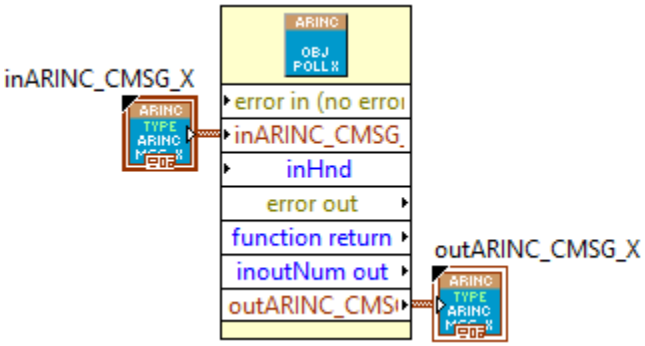
EXPORT int CALLTYPE nativeArincPoll(const uint32_t inHnd, ARINC_CMSG_T * const inoutCmsg, int32_t * const inoutNum);
```

8.5.23 ArincPollX

File names of the VI: native Arinc Poll X.vi

Description: See page 58 for the ARINC 825 library function description.

ARINC VI:




```
The "native" VI set directly calls ARINC825 library functions.
Please refer to the documentation of arincPollX().

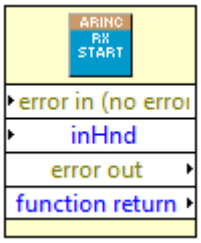
int nativeArincPollX(const uint64_t inHnd, ARINC_CMSG_X * const inoutCmsg, int32_t * const inoutNum)
```

8.5.24 ArincRxStart

File names of the VI: native Arinc Rx Start.vi

Description: See page 50 for the ARINC 825 library function description.

ARINC VI:



The "native" VI set directly calls ARINC825 library functions.
Please refer to the documentation of arincRxStart().

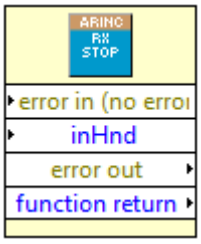
```
EXPORT int CALLTYPE nativeArincRxStart(const uint32_t inHnd);
```

8.5.25 ArincRxStop

File names of the VI: native Arinc Rx Stop.vi

Description: See page 51 for the ARINC 825 library function description.

ARINC VI:



The "native" VI set directly calls ARINC825 library functions.
Please refer to the documentation of arincRxStop().

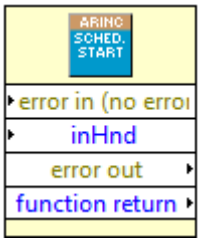
```
EXPORT int CALLTYPE nativeArincRxStop(const uint32_t inHnd);
```

8.5.26 ArincScheduleStart

File names of the VI: native Arinc Schedule Start.vi

Description: See page 55 for the ARINC 825 library function description.

ARINC VI:




```
The "native" VI set directly calls ARINC825 library functions.
Please refer to the documentation of arincScheduleStart().

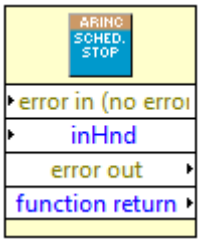
EXPORT int CALLTYPE nativeArincScheduleStart(const uint32_t inHnd);
```

8.5.27 ArincScheduleStop

File names of the VI: native Arinc Schedule Stop.vi

Description: See page 57 for the ARINC 825 library function description.

ARINC VI:




```
The "native" VI set directly calls ARINC825 library functions.
Please refer to the documentation of arincScheduleStop().

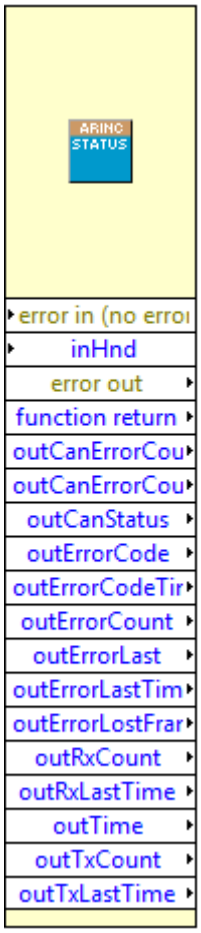
EXPORT int CALLTYPE nativeArincScheduleStop(const uint32_t inHndProject);
```

8.5.28 ArincStatus

File names of the VI: native Arinc Status.vi

Description: See page 43 for the ARINC 825 library function description.

ARINC VI:



The "native" VI set directly calls ARINC825 library functions.
Please refer to the documentation of arincStatus().

Note: This VI provides less outputs than the arincStatus() library call,
instead the missing information is delivered via "native Arinc Handle Open.vi".

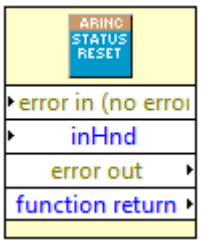
```
int nativeArincStatus(const uint64_t inHnd,
                      uint64_t * const outTime,
                      uint32_t * const outRxCount,
                      uint64_t * const outRxLastTime,
                      uint32_t * const outTxCount,
                      uint64_t * const outTxLastTime,
                      uint32_t * const outErrorCount,
                      int32_t  * const outErrorLast,
                      uint64_t * const outErrorLastTime,
                      uint32_t * const outErrorCode,
                      uint64_t * const outErrorCodeTime,
                      uint8_t  * const outCanStatus,
                      uint8_t  * const outCanErrorCountRx,
                      uint8_t  * const outCanErrorCountTx,
                      uint32_t * const outErrorLostFrames)
```

8.5.29 ArincStatusReset

File names of the VI: native Arinc Status Reset.vi

Description: See page 44 for the ARINC 825 library function description.

ARINC VI:




```
The "native" VI set directly calls ARINC825 library functions.
Please refer to the documentation of arincStatusReset().

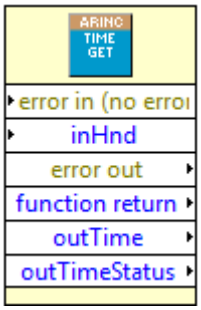
EXPORT int CALLTYPE nativeArincStatusReset(const uint32_t inHnd);
```

8.5.30 ArincTimeGet

File names of the VI: native Arinc Time Get.vi

Description: See page 47 for the ARINC 825 library function description.

ARINC VI:




```
The "native" VI set directly calls ARINC825 library functions.
Please refer to the documentation of arincTimeGet().

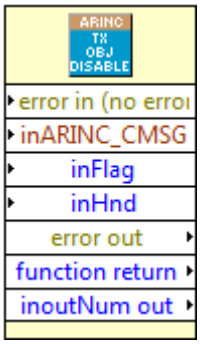
EXPORT int CALLTYPE nativeArincTimeGet(const uint32_t inHnd, uint64_t * const outTime, uint32_t * const outIrigBStatus);
```

8.5.31 ArincTxObjDisable

File names of the VI: native Arinc Tx Obj Disable.vi

Description: See page 60 for the ARINC 825 library function description.

ARINC VI:




```
The "native" VI set directly calls ARINC825 library functions.
Please refer to the documentation of arincTxObjectDisable().

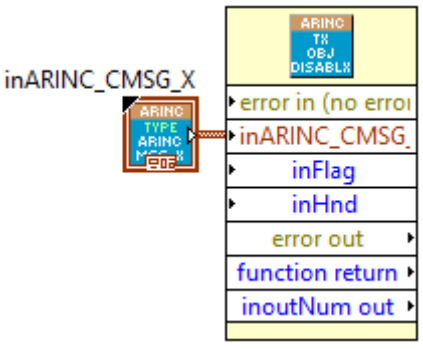
EXPORT int CALLTYPE nativeArincTxObjDisable(const uint32_t inHnd, ARINC_CMSG_T * const inCmsg, int32_t * const inoutNum, int32_t inFlag);
```

8.5.32 ArincTxObjDisableX

File names of the VI: native Arinc Tx Obj Disable X.vi

Description: See page 60 for the ARINC 825 library function description.

ARINC VI:




```
The "native" VI set directly calls ARINC825 library functions.
Please refer to the documentation of arincTxObjectDisable().

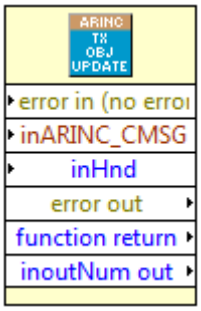
int nativeArincTxObjDisableX(const uint64_t inHnd, ARINC_CMSG_X * const inCmsg, int32_t * const inoutNum, int32_t inFlag)
```

8.5.33 ArincTxObjUpdate

File names of the VI: native Arinc Tx Obj Update.vi

Description: See page 59 for the ARINC 825 library function description.

ARINC VI:




```
The "native" VI set directly calls ARINC825 library functions.
Please refer to the documentation of arincTxObjUpdate().

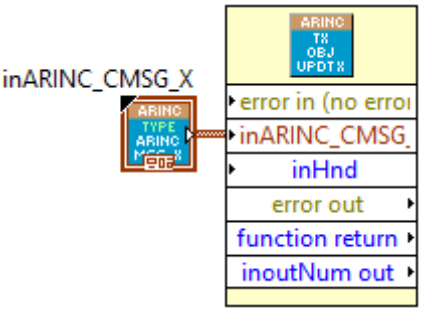
EXPORT int CALLTYPE nativeArincTxObjUpdate(const uint32_t inHnd, ARINC_CMSG_T * const inoutCmsg, int32_t * const inoutNum);
```

8.5.34 ArincTxObjUpdateX

File names of the VI: native Arinc Tx Obj Update X.vi

Description: See page 59 for the ARINC 825 library function description.

ARINC VI:




```
The "native" VI set directly calls ARINC825 library functions.
Please refer to the documentation of arincTxObjUpdateX().

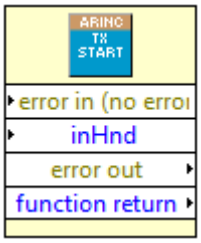
int nativeArincTxObjUpdateX(const uint64_t inHnd, ARINC_CMSG_X * const inoutCmsg, int32_t * const inoutNum)
```

8.5.35 ArincTxStart

File names of the VI: native Arinc Tx Start.vi

Description: See page 52 for the ARINC 825 library function description.

ARINC VI:



The "native" VI set directly calls ARINC825 library functions.
Please refer to the documentation of arincTxStart().

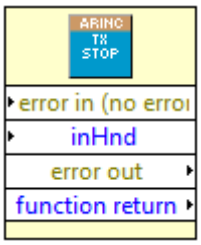
```
EXPORT int CALLTYPE nativeArincTxStart(const uint32_t inHnd);
```

8.5.36 ArincTxStop

File names of the VI: native Arinc Tx Stop.vi

Description: See page 54 for the ARINC 825 library function description.

ARINC VI:



The "native" VI set directly calls ARINC825 library functions.
Please refer to the documentation of arincTxStop().

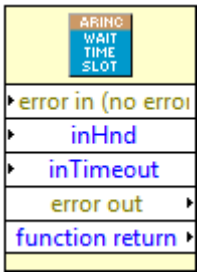
```
EXPORT int CALLTYPE nativeArincTxStop(const uint32_t inHnd);
```

8.5.37 ArincWaitForTimeslot

File names of the VI: native Arinc Wait For Timeslot.vi

Description: See page 62 for the ARINC 825 library function description.

ARINC VI:




```
The "native" VI set directly calls ARINC825 library functions.
Please refer to the documentation of arincWaitForTimeslot().

EXPORT int CALLTYPE nativeArincWaitForTimeslot(const uint32_t inHnd, const uint32_t inTimeout);
```

9 Order Information

Type	Properties	Order No.
ARINC825-LCD Windows/Linux	ARINC 825 object licence for Windows® and Linux® CD+Licence Usable with all esd ACC based CAN interfaces - object licence for Windows/Linux - ARINC 825 dll's/lib's - Lab VIEW VI-Set for ARINC 825 - documentation	C.1140.06
ARINC825-LCD RTX CD+Licence	ARINC825-LCD RTX/RTX64 CD+Licence Usable with all esd ACC based CAN interfaces - object licence for RTX/RTX64 - ARINC 825 dll's/lib's - documentation	C.1140.16
ARINC825-LCD QNX CD+Licence	ARINC825-LCD QNX® CD+Licence Usable with all esd ACC based CAN interfaces - object licence for QNX - ARINC 825 dll's/lib's - documentation	C.1140.17
ARINC825-LCD VxWorks CD+Licence	ARINC825-LCD VxWorks® CD+Licence Usable with all esd ACC based CAN interfaces - object licence for VxWorks - ARINC 825 dll's/lib's - documentation	C.1140.18
For detailed information about the driver availability of your special operating system, please contact our sales team.		

Table 1: Order information

PDF Manuals
For the availability of the manuals see table below.
Please download the manuals as PDF documents from our esd website https://www.esd.eu for free.

Manuals		Order No.
ARINC 825 Library-ME	Software manual in English	C.1140.21

Table 2: Available Manuals

Printed Manuals
If you need a printout of the manual additionally, please contact our sales team (sales@esd.eu) for a quotation. Printed manuals may be ordered for a fee.