Chapter 60

Using the AXN/TCG/401

TEC/NOT/091



The AXN/TCG/401/B is a time-code generator with GNSS/IRIG input with voice-to-digital converter (CVSD).

This technical note introduces the AXN/TCG/401/B module, and describes how to set it up, as well as troubleshooting GNSS. This paper is divided into the following sections:

- "60.1 Module overview" on page 1
- "60.2 Setting up the AXN/TCG/401 using DAS Studio 3" on page 1
- "60.3 Example configurations" on page 6
- "60.4 Troubleshooting GNSS" on page 11
- "60.5 Tips" on page 12

NOTE: The AXN/TCG/401 only functioned as a voice-to-digital converter (CVSD); that is, it did not feature time code generation functionality. This technical note only applies to the AXN/TCG/401/B and later. Any mention of AXN/TCG/401 in this technical note is referring to AXN/TCG/401/B or later.

60.1 Module overview

The AXN/TCG/401 can accept time from an IRIG-B time source, from its onboard GNSS receiver (external antenna required), or from an external GNSS receiver outputting NMEA messages and a one PPS signal.

The AXN/TCG/401 also has two channels of audio-to-digital conversion. The encoding scheme used is Continuously Variable Slope Delta (CVSD) modulation.

60.2 Setting up the AXN/TCG/401 using DAS Studio 3

You can use DAS Studio 3 software to configure the AXN/TCG/401. DAS Studio 3 is used to create a configuration file which contains the various elements which make up your data acquisition system. You then use this configuration file to manage and program these elements. To see how hardware is represented in the DAS Studio 3 graphical user interface, see Figure 1 in the DAS Studio 3 User Manual.

The module can concurrently receive up to two GNSS systems GPS together with GLONASS.



60.2.1 Settings tab

The Settings tab as shown in the following figure, shows available parameters for the module. The parameters shown in the Settings tab are defined in the AXN/TCG/401 data sheet.

Settings	Process	es Pa	ickages	Algorithms	Documentation				
Name =	lype		Name		· ·	-			
Audio-In(0)	VoiceCh	annelData	a(0) ▼ P_M	IyAXN_TCG_40	1_B_Audio-In(0)_VoiceChannelData(0)	16			
Audio-In(1)	VoiceCh	annelData	a(1) ▼ P_M	IyAXN_TCG_40	401_B_Audio-In(1)_VoiceChannelData(1) 16				
Source 😾		Paramete	er 😾		Parameter				
Name "		Туре			Name u				
MyAXN_TCO	G_401_B	Status			 P_MyAXN_TCG_401_B_Status 				
MyAXN_TCO	G_401_B	LeapSeco	onds		P_MyAXN_TCG_401_B_LeapSecond	ī			
MyAXN_TCO	G_401_B	ControlFu	unction		P_MyAXN_TCG_401_B_ControlFunc	tion			
GNSS-In		Latitude			P_MyAXN_TCG_401_B_GNSS-In_Lat	titude			
GNSS-In		Latitude :	LatitudeHi		•				
GNSS-In		Latitude :	LatitudeLo		•				
GNSS-In		Latitude :	LatitudeMie	croMinutes	•				
GNSS-In		Longitude	e		▼ P_MyAXN_TCG_401_B_GNSS-In_Loi	ngitude			
GNSS-In		Longitude	e : Longitud	eHi	•				
GNSS-In		Longitude	e : Longitud	eLo	•				
GNSS-In		Longitude	e : Longitud	eMicroMinutes	•				
GNSS-In		Altitude			P_MyAXN_TCG_401_B_GNSS-In_Alt	itude			
GNSS-In		Altitude :	AltitudeHi		•				
GNSS-In		Altitude :	AltitudeLo		•				
GNSS-In		VelocityIn	пКрh		P_MyAXN_TCG_401_B_GNSS-In_Ve	locityInKph			
GNSS-In		VelocityIn	۱Kn		P_MyAXN_TCG_401_B_GNSS-In_Ve	locityInKn			
GNSS-In		Heading			P_MyAXN_TCG_401_B_GNSS-In_He	ading			
GNSS-In		Heading	: HeadingHi		•				
GNSS-In		Heading	: HeadingLo		•				
GNSS-In		DilutionC	ofPrecision		P_MyAXN_TCG_401_B_GNSS-In_Dil	utionOfPrecision			
GNSS-In		StatusGN	ISS		P_MyAXN_TCG_401_B_GNSS-In_State	tusGNSS			
GNSS-In		Satellites	InView		P_MyAXN_TCG_401_B_GNSS-In_Sat	ellitesInView			

Figure 60-1: Settings tab showing available parameters

NOTE: To see module settings, the module must be in context in the Navigator. Refer to the DAS Studio 3 User Manual for more information.



The Settings tab as shown in the following figure, shows available settings for the module. These settings are defined in the *AXN/TCG/401* data sheet.

Settings	Proc	esses	Packag	jes	Algorith	ms	Documen	itation
Time Server	Y	Primary I	nput 🍸	Allov	v Second	ary 🍸	Control Function	Source 7
Master	~	IRIG-B	~]	-		Zeros	~
Source Name	GN:	SS Source	7	PPS Sou	urce 🍸	Maxi Diluti Preci	mum ion Of 了 sion	Baud Rate 🍸
GNSS-In	On	BoardGNS	s ~	None		5		19200 ~
Source Name	PPS	Rate 🍸	PPS D	isable 🏹	7			
PPS-Out	1	~						
Source Name	Mo	de 7						
RS-422-Out	IRI	G-B ∨						
Source Name		Amplitu	de 🍸					
Analog-IRIG-	-BOut	4.0	~					
Source Name	Terr Ena	nination bled	7					
RS-422-In								
Source Name		PPS Source	e Y					
Analog-IRIG-	Bln	None	~					
IRIG-B-In								
Current Year	Y	IRIG Sou	rce 🍸	IRIG-B	revision	Y		
2015		TTL_A	~	IRIG-	B-200-9x	*		

Figure 60-2: Settings tab showing available settings



60.2.2 Packages tab - setting parser of NMEA packages

The AXN/TCG/401 allows parsing of any of the 15 predefined National Marine Electronics Association (NMEA) messages supported by the module: GGA, GLL, GRS, GSA, GST, GSV0 to GSV6, RMC, VTG and ZDA. For further information regarding NMEA 0183, refer to the latest standard available.

To create an NMEA message, the corresponding predefined package needs to be created. Refer to the following to create the predefined package.

1. On the **Packages** tab of the AXN/TCG/401, click the arrow under **Package Properties**.

The following screen with the 15 predefined NMEA messages supported by the AXN/TCG/401 appears.

😯 Packages Palette							-		\times
	Generic								
a	Name 🍸	Instrument 🍸	Link 🍸	Package Rate (Hz) V	Туре 🍸	Subtype 🍸	Short	Descripti	on 7
	MyNMEA-\$G*GGA			1	NMEA	\$G*GGA			
New Activic Compone	MyNMEA-\$G*GLL			1	NMEA	\$G*GLL			
	MyNMEA-\$G*GRS			1	NMEA	\$G*GRS			
	MyNMEA-\$G*GSA			1	NMEA	\$G*GSA			
6	MyNMEA-\$G*GST			1	NMEA	\$G*GST			
	MyNMEA-\$G*GSV_0)		1	NMEA	\$G*GSV_0			
Import	MyNMEA-\$G*GSV_1			1	NMEA	\$G*GSV_1			
	MyNMEA-\$G*GSV_2	?		1	NMEA	\$G*GSV_2			
	MyNMEA-\$G*GSV_3	1		1	NMEA	\$G*GSV_3			
	MyNMEA-\$G*GSV_4	I IIII		1	NMEA	\$G*GSV_4			
	MyNMEA-\$G*GSV_5	1		1	NMEA	\$G*GSV_5			
	MyNMEA-\$G*GSV_6	1		1	NMEA	\$G*GSV_6			
	MyNMEA-\$G*RMC			1	NMEA	\$G*RMC			
	MyNMEA-\$G*VTG			1	NMEA	\$G*VTG			
	MyNMEA-\$G*ZDA	1		1	NMEA	\$G*ZDA			
	Renaming Rules Use My Renamin Bename To: Prepend Te	g Rules xt To Name(s) recu	irsively:		MyNewl MyPrefu	Package K			>
	 Append Au Use Automatic Research 	tomatically Genera enaming Rules	ated <u>U</u> nique	e ID (if necessar	y)				
	>			Add	Add With	Connections		Cancel	
				-					

2. Select a message to parse (for example \$G*GGA) and then click **Add**. The new NMEA is created.

			inages															
 Channel 	s																	
7 🕈																		
Instrument Name	Y	Channel , Name	7 Bit	Rate 🤉	Cor Nar	nectio ne	n A			Co	nnecte trume	ed T	Cor Cha	nect	ed 7	Pa	ockage ount	Y
MyAXN_TO	G_401_B	GNSS-In	n/a		Link	MyAX	(N_TCG	401_B	GNSS-	n						1		
Package	Propertie	5												*****				
Name 🖓	,	Туре 🍸	Sub T	ype 7	Targ	et Size	In Bytes	Y										
MyNMEA	-\$G*GGA	NMEA	\$G*G	GA	0													
Content																		
Content	2 3	4 5	6	7	89	10	11	12 1	3 14	15	16	17	18	19	20	21	22	23
Content 0 1	2 3	4 5	6 	7	89	10	11	12 1	3 14	15	16	17	18	19	20	21	22	23
Content	2 3 	4 5	6	7	8 9	10	11	12 1	3 14	15	16 	17	18	19	20	21	22	23
Content 0 1 	2 3 	4 5	6	7	89	10	11	12 1	3 14	15	16	17	18	19	20	21	22	23
Content 0 1 Content C	2 3 	4 5 	6	7	8 9 	10	11 		3 14	15	16	17	18	19	20	21	22	23
Content 0 1 Content Placed Dat	2 3 	4 S	6	7	8 9	10	11		3 14	15	16	17	18	19	20	21	22	23
Content 0 1 × Placed Dat	2 3 	4 5	6	7	8 9	10	11		3 14	15	16	17	18	19	20	21	22	23
Content	2 3 	4 5	6	7	8 9	10	11	12 1	3 14	15	16	17	18	19	20	21	22	23



3. Click the arrow under **Placed Data**. **Parameters Palette** appears.

Parameters Name マ Bits マ Units マ Data Format マ New ACRA Component My 16-bit BitStream Parameter 16 BitStream BitStream My 16-bit BitStream Farameter 16 BitStream BitStream My 16-bit IEEE-754-Float-Double Parameter 16 Dittess IEEE754FloatDouble My 16-bit IEEE-754-Float-Single Parameter 16 Unitless IEEE754FloatDouble My 16-bit IEEE-754-Float-Single Parameter 16 Unitless IEEE754FloatSingle My 16-bit IEEE-754-Float-Single Parameter 16 Unitless Unitless OffsetBinary My 16-bit IEEE-754-Float-Single Parameter 16 Unitless Unitless	Source Chassis V	•
Name Bits Units Data Format New ACRA Component My 16-bit BitStream Parameter 16 BitStream BitStream My 16-bit BitStream Parameter 16 BitVector BitVector My 16-bit BitVector Parameter 16 BitVector BitVector My 16-bit BitVector Parameter 16 Unitless IEEE754FloatDouble My 16-bit IEEE-754-Float-Single Parameter 16 Unitless IEEE754FloatDouble My 16-bit SignedMagnitude Parameter 16 Unitless SignedMagnitude My 16-bit SignedMagnitude Parameter 16 Unitless SignedMagnitude	Source Chassis V	^
Mew ACRA Component My 16-bit BitStream Parameter 16 BitStream BitStream My 16-bit BitVector Parameter 16 BitVector BitVector My 16-bit BitVector Parameter 16 BitVector BitVector My 16-bit IEEE-754-Float-Double Parameter 16 Unitless IEEE754FloatDouble My 16-bit IEEE-754-Float-Single Parameter 16 Unitless IEEE754FloatSingle My 16-bit SignedMagnitude Parameter 16 Unitless OffsetBinary My 16-bit SignedMagnitude Parameter 16 Unitless SignedMagnitude My 16-bit TraceComplement 16 Linitless SignedMagnitude		^
My 16-bit BitVector Parameter 16 BitVector My 16-bit IEEF-754-Ioat-Double Parameter 16 Unitless IEEE754FloatDouble My 16-bit IEEF-754-Ioat-Single Parameter 16 Unitless IEEE754FloatDouble My 16-bit IEEF-754Float-Single Parameter 16 Unitless IEEE754FloatSingle My 16-bit SignedMagnitude Parameter 16 Unitless SignedMagnitude My 16-bit SignedMagnitude Parameter 16 Unitless SignedMagnitude	÷	
My 16-bit IEEE-754-Float-Double Parameter 16 Unitless IEEE754FloatDouble My 16-bit IEEE-754-Float-Single Parameter 16 Unitless IEEE754FloatSingle My 16-bit OffsetBinary Parameter 16 Unitless OffsetBinary My 16-bit SignedMagnitude Parameter 16 Unitless OffsetBinary My 16-bit SignedMagnitude Parameter 16 Unitless OffsetBinary My 16-bit SignedMagnitude Parameter 16 Unitless SignedMagnitude	;	
My 16-bit IEEE-754-Float-Single Parameter 16 Unitless IEEE754FloatSingle My 16-bit OffsetBinary Parameter 16 Unitless OffsetBinary My 16-bit SignedMagnitude Parameter 16 Unitless SignedMagnitude My 16-bit SignedMagnitude Parameter 16 Unitless SignedMagnitude		
My 16-bit OffsetBinary Parameter 16 Unitless OffsetBinary My 16-bit SignedMagnitude Parameter 16 Unitless SignedMagnitude Wit 16 bit Transformate Parameter 16 Unitless SignedMagnitude		
My 16-bit SignedMagnitude Parameter 16 Unitless SignedMagnitude		
Import My 16 bit TwosComplement Barameter 16 Upitless TwosComplement		
The onliness woscomplement and the onliness woscomplement		
My 32-bit BitStream Parameter 32 BitStream BitStream		
My 32-bit BitVector Parameter 32 BitVector BitVector		
My 32-bit IEEE-754-Float-Double Parameter 32 Unitless IEEE754FloatDouble	÷ .	
My 32-bit IEEE-754-Float-Single Parameter 32 Unitless IEEE754FloatSingle		
My 32-bit OffsetBinary Parameter 32 Unitless OffsetBinary		
My 32-bit SignedMagnitude Parameter 32 Unitless SignedMagnitude		
My 32-bit TwosComplement Parameter 32 Unitless TwosComplement		
MyBooleanSimpleParameter 16 Unitless BitVector		
MyWindowAlarmParameter 16 Unitless BitVector		
P_MyAXN_ABM_401_ARINC-429-In(0)_WordCount 16 Count OffsetBinary		~
	3	>
Renaming Rules		
 Use My Renaming Rules 		
Rename To: MyNewParameter		
Prepend Text To Name(s) recursively:		
Append Automatically Generated Unique ID (if necessary)		
Use Automatic Renaming Rules		
Add With Connections	Cancel	

4. Select a 16-bit parameter such as My 16-bit BitStream Parameter and then click Add. A generic 16-bit parameter with the default message name and offset 0 is created. This can be renamed to a more meaningful name such as GPGGA_W0 (see following screen), which corresponds to the first two bytes of the \$G*GGA message.

Settings	Processe	es	Pack	ages	Algo	rithms		Docum	nentat	ion
 Channels 										
7 7										
$\begin{array}{c} \mbox{Instrument}\\ \mbox{Name} \end{array} & \begin{array}{c} \mbox{Channel}\\ \mbox{Name} \end{array} & \begin{array}{c} \mbox{Bit Rate } \overrightarrow{\nabla} \end{array} & \begin{array}{c} \mbox{Connection}\\ \mbox{Name} \end{array} & \overrightarrow{\nabla} \end{array}$										
MyAXN_TCG_	401_B	GNSS-	In	n/a		Link_l	MyA.	хм_тс	G_401	_ B _
 Package Pr 	roperties									
- 6										
Name 🍸		Туре	Y	Sub Typ	eγ	Target	Size	In Byte	es 7	
MyNMEA-\$	G*GGA	NME	д	\$G*GGA	N	0				
▲ Content										
0 1	2 3	4	5	6	7 8	9	10) 11	12	1:
My 16-bit										
× .										
							_			_
Placed Data										
				_			_			
Nam	eγ				Offset	Words	Y	Bits 5	Y	
GPGG	A_WO			()			16		

In the previous example, the first data word with offset 0 for \$GPGGA has the following result: \$G, a second word with offset 1 results in PG and so on. Additional data words can be added up to a maximum offset of 41 (the maximum supported length of full NMEA 0183 messages is 82 characters). Full NMEA 0183 messages consist of a maximum of 79 characters between start of message "\$" or "!" and terminating delimiter <CR><LF> (HEX 0D and 0A).

An additional Info register associated with each NMEA message to indicate the status of the message can be added. See "60.2.3.1 Parsers – Setting up MessageInfo" on page 6.



60.2.3 Processes tab

The following Processes tab shows available processes for the module. The processes shown in the Processes tab are defined in the *AXN/TCG/401* data sheet.

Settings	Processes	Packages	Algorithms	Documentation						
Parsers										
Add parser to instrument MyAXNTCG_401_B										
Catch All Pars	ers									
Add parser to	o instrument My	AXNTCG_401_B								

Figure 60-3: Processes tab showing available processes

60.2.3.1 Parsers – Setting up MessageInfo

The MessageInfo register indicates the status of the message as empty (no message), stale (repeated) and skipped. The Parsers process allows you to associate the MessageInfo parameter with one of the 15 predefined NMEA packages previously set in "60.2.2 Packages tab - setting parser of NMEA packages" on page 4.

Refer to the following to create the MessageInfo.

- 1. On the Processes tab, click Add parser to instrument AXN/TCG/401.
- 2. Click Packages and then click Add package reference.
- 3. Select one of the NMEA packages already added in the packages tab and then click **Add reference**. An example of message \$G*GGA is shown below.

Settings	Processes	Packages	Algorithms	Documentation		
Parsers				^		
+ + 14	Add P	arameters	- 1 🗸 F	Remove Parameters	Remaining 14	Maximum 15
Source Name	Packages 🍸	Mess	ageInfo 🍸			
Parser(0)	▼ MyNMEA-S	G*GGA	yMessageInfo			
Catch All Pars	ers					
Add parser to	o instrument My	AXNTCG_401_	3			

NOTE: For further details on how to use a process, refer to the "Processes tab" section in the DAS Studio User Manual.

60.2.3.2 Catch All Parsers

Any package that is not assigned to a parser is sent to this catchall parser where it can be sampled if required. Unlike Parsers, Catch All Parsers automatically sets 41 words and MessageInfo.

This feature is not recommended and should be used as a debug tool only.

60.3 Example configurations

60.3.1 External GNSS receiving NMEA messages over RS-422

The setup for an external GNSS receiving NMEA RS-422 at 19,200 bps is shown in the following two figures.

NOTE: For the following two sample configurations, it is assumed that the secondary input IRIG is not used.







Time Server 🍸 Primary Input		Control Function Source	ce V	
Master Y GNSS	~ √	Zeros	~	
Source V Name	GNSS Source 🍸	PPS Source 🍸	Maximum Dilution Of 🍸 Precision	Baud Rate 🍸
Link_MyAXN_TCG_401_B_GNSS-	In RS-422 ×	TTL_A	5	19200 🗸

Figure 60-5: Example of setup for external GNSS receiving RS-422 in DAS Studio 3

NOTE: ONE_PPS is required for the AXN/TCG/401 to synchronize its time with the minimum set of external NMEA messages.

60.3.2 Active GNSS antenna

The setup for an active GNSS antenna is shown in the following two figures.



Figure 60-6: Setup for active GNSS antenna



Time Server 🍸 Primary Input 🦷	Allow Second	Allow Secondary $ earrow$		ce V			
Master Y GNSS	 ✓ 		Zeros	*			
Source Name	GNSS Source	A	PPS Source 🍸	Maxir Diluti Precis	num on Of 🍸 sion	Baud Rat	e 🍸
Link_MyAXN_TCG_401_B_GNSS-I	n OnBoardGNS	S Y N	lone	5		19200	~
On Board GNSS							
Source Name		Dynamic 🍸					
Link_MyAXN_TCG_401_B_GNSS-In			Airborne with <2g Acceleration \sim				

Figure 60-7: Example of setup for active GNSS antenna in DAS Studio 3

NOTE: Leap Seconds are automatically updated on Axon.

60.3.3 External GNSS receiver using NMEA messages over RS-232 and one PPS TTL

The setup for an external GNSS receiver using NMEA RS-232 at 19,200bps and TTL_IN_A one PPS is shown in the following two figures.



Figure 60-8: Setup for external GNSS receiver using RS-232 and TTL PPS

Master ~ GNSS ~	✓	Zeros	~
Source Name マ	GNSS Source γ	PPS Source γ	Maximum Dilution Of γ Baud Rate γ Precision
Link_MyAXN_TCG_401_B_GNSS-In	RS-232 v	TTL_A ~	5 19200 ~

Figure 60-9: Example of setup for external GNSS receiver using RS-232 and TTL in DAS Studio 3



60.3.4 Analog IRIG-B input

The setup for an analog IRIG-B input is shown in the following two figures.



NOTE: Analog IRIG-B only support 1 PPS signal over pin 9 TTL_IN_B.

Figure 60-10: Setup for analog IRIG-B input with 1 TTL PPS

Time Server 🍸	Primary Input	Y	Allow Sec	condary 🍸	Control Functio	n Source 🍸
Master ~	IRIG-B	~	[✓	Zeros	~
	Source Name	PPS S	ource γ			
	Analog-IRIG-BIn	TTL_	в ~			
	RIG-B-In					
	Current Year 🍸	IRIG	Source 🍸	IRIG-B revisio	on T	
	2023	Ana	llog Y	IRIG-B-200-	9x ¥	

Figure 60-11: Example of setup for analog IRIG-B input with 1 PPS in DAS Studio 3

NOTE: ONE_PPS connection is optional on the previous figure, however it is recommended in order to increase accuracy. When IRIG-B-200-04 is selected, the module decodes the year from the control function (CF) bits, however IRIG-B-200-9x does not contain year information.



60.3.5 Digital IRIG-B input - TTL

The setup for a digital IRIG-B input is shown in the following two figures.



Figure 60-12: Setup for digital IRIG-B input

Master	✓ IRIG-B ✓		Zeros	~
	RIG-B-In		1	
	Current Year 🍸	IRIG Source 🍸	IRIG-B revision γ	
	2023	TTL_A Y	IRIG-B-200-9x ¥	

Figure 60-13: Example of setup for digital IRIG-B input in DAS Studio 3

60.3.6 Digital IRIG-B input - RS-422

The setup for a RS-422 IRIG-B input is shown in the following two figures.



Figure 60-14: Setup for RS-422 IRIG-B input



Master	✓ IRIG-B	~]	Zeros	~
	IRIG-B-In					
	Current Year 🍸	IRIG Sou	irce 🍸	IRIG-B	revision \mathbbm{Y}	
	2023	RS-422	~	IRIG-I	B-200-9x ⊻	
		Source Name 🍸	Terminat Enabled	tion 7		
		RS-422-In				

Figure 60-15: Example of setup for RS-422 IRIG-B input in DAS Studio 3

NOTE: When termination is enabled, a 120-ohm termination resistor is active between input pins RS422_IN(+) and RS422_IN(-). This resistor is not active when the module is powered off.

60.3.7 Voice channels

The module supports Audio. The encoding scheme used is Continuously Variable Slope Delta (CVSD) modulation. IADS supports this encoding. Due to the compression scheme, an Audio-In parameter can be transmitted into different sinks (Ethernet or PCM for example) but it must be transmitted at the same rate. For audio quality versus sampling rate recommendations, see the *AXN/TCG/401* data sheet, "Voice-to-digital converter" section.

Settings	Processes	Packa	ges	Algorithms	Documentation		
Source Name マ	Parameter Type		Parame Name	Parameter 7 Name			Bits Per Word 🍸
Audio-In(0)	VoiceChannelD	nelData(0) P_MyAXN_TCG_401_B_Audio-In(0)_VoiceChannelData(0)		16			
Audio-In(1)	VoiceChannelD	ata(1)	▼ P_M	lyAXN_TCG_401	B_Audio-In(1)_Voice	ChannelData(1)	16

Figure 60-16: Voice channels

60.4 Troubleshooting GNSS

This section explains the most common issues with GNSS. For GNSS antenna recommendations, see the AXN/TCG/401 data sheet.

60.4.1 GNSS not in lock

Check the StatusGNSS parameter. This parameter provides information on the current GNSS status, such as GNSS lock, Dilution of Precision (DOP) in and out of range, and number of satellites in use.

NOTE: Bit 15 of the StatusGNSS parameter defaults to 0, which indicates the module does not have GNSS lock. Bit 15 is only set to 1 when the GNSS receiver has achieved GNSS lock.

If bit 15 remains at 0, the module is unable to achieve GNSS lock and there are problems with satellite coverage. This may be due to poor satellite coverage or issues with the GNSS antenna or cabling.

If bit 15 is set to 1 (GNSS lock) but the position is incorrect, check bit 11. If bit 11 of the StatusGNSS parameter is set to 1, this indicates that the DOP figures are out of range. The actual DOP figures can be read from the DilutionOfPrecision parameter.

Also, check the number of satellites in view (SatellitesInView parameter) and the number of satellites in use (StatusGNSS[3:0]). If the number of satellites in view is less than four, try the other troubleshooting hints in this section.

Note: The antenna must be connected before powering up the Axon chassis with the AXN/TCG/401.



60.4.2 Multipath errors

A multipath environment exists if GNSS signals arrive at the antenna directly from the satellite and also from reflective surfaces, for example water or building walls (see the following figure).



Figure 60-17: Multipath environment

If there is a direct path in addition to the reflected path available, the receiver can usually detect the situation and compensate to some extent. If there is no direct line of sight, but only reflections, the receiver is not able to detect the situation.

Under multipath conditions, range measurement to the satellite provides incorrect information to the navigation solution, resulting in less accurate positioning. If there are few satellites in view, the navigation solution might be wrong by several hundred meters.

Location of the antenna close to a vertical metal surface can be harmful owing to the fact that metal is an almost perfect reflector. When mounting an antenna on top of a reflective surface, the antenna should be mounted as close to the surface as possible. Then, the reflective surface acts as an extension of the antennas ground place and not as a source multipath.

60.4.3 Antenna shortcomings

Although GNSS can work with a weak signal, to have a reliable GNSS system the antenna selection and location should be considered carefully as inappropriate selection and poor location degrades GNSS performance. Factors which degrade the GNSS performance include the following:

- · Inadequate gain of the GNSS antenna
- Poor directivity of the GNSS antenna
- Improper orientation of the antenna to the sky
- Poor matching of antenna, cable, and receiver impedance
- Poor noise performance of the input stage of the antenna amplifier
- · GNSS antenna is connected to the module after the Axon is powered up.

For more information on getting the most from the antenna, see the AXN/TCG/401 data sheet.

60.5 Tips

60.5.1 Power up

The module has no battery backup and cannot be connected to a battery backup. The module will cold power-up each time.

60.5.2 Representing GNSS position in IADS

Contact Curtiss-Wright support (acra-support@curtisswright.com) to obtain a copy of technical document TSD/AC/005 IADS derive equation for TCG Altitude Latitude Longitude Heading.

Latitude/Longitude are specified in degrees/minutes/seconds (DMS) in the AXN/TCG/401 data sheet while some GNSS localization system may express it in Decimal Degrees (DD).



60.5.3 RFE/AEG/001

There are no special accessories required to mount this antenna; it is shipped complete for mounting. The antenna in this series is hard-mounted through a unique single hole feed structure and includes gaskets to prevent air and water leaks. The mounting is a through hole 5/8-18UNC-2A thread.



60.5.4 SMA torque setting

The recommended torque setting for the SMA connector on the AXN/TCG/401 is 0.45 Nm (0.33 foot pound-force).



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