How To Configure Dynamic Sequences and Resynch

The “Dynamic Sequences” feature provides the capability for the tool to transmit different sequence strings depending on whether the tool is:

- Not Rotating (RotW=0 / ‘False’)
- Rotating with Uniform Gamma readings (RotW=1 / ‘True’ and GamW=0 / ‘False’)
- Rotating with Non-Uniform Gamma readings (RotW=1 / ‘True’ and GamW=1 / ‘True’)

Dynamic Sequences are enabled when the “DySq” parameter is set to “On”.

The “Resynch” (“Repeat Synch Word”) feature causes the tool to retransmit the synch word prior to repeating execution of any telemetry sequence definition string.

It is strongly recommended that whenever Dynamic Sequences (DySq) is set to “On”, Repeat Sync Word (ReSy) should also be set to “On”.

The following pages give a brief overview of how to enable and configure these two features, and then a portion of the “F1 Help” text is also provided for more detailed guidance.

Remember that while in the xxMWDconfig/PC™ application, you can always click on any parameter and then press the F1 key to get detailed help.

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Within the xxMWD/PC™ Program Suite, xxMWDconfig/PC™, click the “Mode” Block.

Set the Dynamic Sequence parameters (circled below) to the desired values. If there’s no Focused Gamma / “GamW” flag in use in your system, then set UGSq & NGSq to be the same value.
XXT also recommends that whenever Dynamic Sequences are enabled, that Resynch also be enabled. To locate the Resynch configuration parameter, within xxMWDconfig/PC™, click the “Telemetry” Block.

Set the “ReSy” parameter to “On” to enable Resynch.

Be sure to set a non-zero value for “Rotation Warning RPM Threshold” (RotThr) so that Rotation will be detected.
Below are excerpts from the xxMWDconfig/PC™ “F1 Help” content which discuss Dynamic Sequences and Resynch:

“Dynamic Data Sequences” – The BASICS…

The “Dynamic Data Sequences” feature optionally allows changing the content of the telemetry data stream based on whether or not the tool is rotating and whether or not optional focused-gamma instrumentation capabilities (used for Gamma-Steering) indicate uniform gamma count rates while rotating.

⇒ “DySq” (‘On’ / ‘Off’) allows enabling or disabling the “Dynamic Data Sequences” feature. Always set DySq= “Off” to invoke xxMWD & qMWD/QDT Version 1 compatible behavior.

⇒ “NRSq” defines the “Non-Rotating T/L Sequence Number” that is used when the tool is not rotating (RotW= “False”). For qMWD/QDT compatibility use 0 to 4. XXT also allows designating the new TSq5 and TSq6 sequences (“NRSq=5” or “NRSq=6”).

⇒ “UGSq” defines the “Rotating-and-Uniform-Gamma T/L Sequence Number” that is used when rotating (RotW= “True”) and the Focused Gamma Sensor indicates a uniform gamma-rate count – GamW= “False”. For qMWD/QDT compatibility use 0 to 4. XXT also allows designating the new TSq5 and TSq6 sequences (“UGSq=5” or “UGSq=6”). For systems not using a focused gamma sensor XXT recommends setting UGSq=NGSq. However, in such systems, one would anticipate that GamW would remain “False” causing the UGSq value to be active while rotating.

⇒ “NGSq” defines the “Rotating-and-Non-Uniform-Gamma T/L Sequence Number” that is used when rotating (RotW= “True”) and the Focused Gamma Sensor indicates a non-uniform gamma-rate count – GamW= “True”. For qMWD/QDT compatibility use 0 to 4. XXT also allows designating the new TSq5 and TSq6 sequences (“NGSq=5” or “NGSq=6”). For systems not using a focused gamma sensor XXT recommends setting UGSq=NGSq. However, in such systems, one would anticipate that GamW would remain “False” causing the UGSq value to be active while rotating and the “NGSq” to always be inactive.

The “DySq”, “NRSq”, “UGSq” & “NGSq” labels are all compatible with “qMWD/QDT Version 2” components. Always set DySq=“Off” for compatibility with xxMWD & qMWD/QDT Version 1 components.

The G2-compatible version of the “Mode” dialog of the “xxMWDconfig/PC™” utility provides the ability to set the “Dynamic Data Sequences” parameters in “G2” telemetry components.

“Dynamic Data Sequences” – The NOT-SO-BASICS…

CAUTION: The use of the “Dynamic Data Sequences” feature is not going to be appropriate under various conditions and may not be appropriate at all for some service companies. It does add another level of complexity and another set of potential issues.
RECOMMENDATION

Certainly, configuration settings, including sequence definition strings, that are intended to use this feature, should not be designed in the field. XXT always urges all of its customers to design and thoroughly test all telemetry configurations before attempting to put them into service.

CAUTION

While enabling the dynamic sequences feature without enabling resynch is allowed for QDT-compatibility, XXT recommends ONLY using dynamic sequences when resynch is also enabled!

The Timing of Switching Sequences...

The timing of when Dynamic Sequence Switching will occur is dependent on whether or not the real-time sequence controls (“RotW” and “GamW”) are included in the sequence definition strings and whether or not resynch (“ReSy”) is “On” or “Off”...

⇒ For ReSy= “Off” and the Sequence Controls Are Not in the Sequence: The T/L Sequence String will be determined just prior to the 1st and ONLY transmission of the Toolface/Logging Header and will not / cannot be changed until the next flow off-on cycle. The one exception to this is that if the dynamic sequence controls cause a Toolface/Logging Header value of 0 to be transmitted (indicates “no T/L/Steering data will follow”), and the sequence controls subsequently change, then TM transmission will recommence: Synch Word + Survey Header = 0 (“no survey data will follow”) + T/L Header = N + {T/L Sequence N}. The notation for this type of behavior follows...

Syn + SH=0 + TH=0...<idle>...Syn + SH=0 + TH=n + {TSq_n}

Where the use of the “{...}” braces indicate the sequence will repeat until flow off.

⇒ For ReSy= “On” and Sequence Controls Are Not in the Sequence: The 1st T/L Sequence String will be determined just prior to the 1st transmission of the Toolface/Logging Header and will not / cannot be changed until the selected sequence string has been completely “executed”. When the string execution has completed the transmitter will send: Synch Word + Survey Header = 0 (“no survey data will follow”), + T/L Header = N + T/L Sequence N. Again, just prior to the transmission of the Toolface/Logging Header the T/L sequence number is re-evaluated, which may result in a different T/L header value and data sequence. The notation for this type of behavior is designated as follows...

⇒
{Syn + SH=0 + TH=\_n + TSq\_n}

Where the “{...}” braces indicate the sequence/behavior will repeat until flow off.

⇒ **For Sequence Controls Are in the Sequence:** In this particular case, the “ReSy” option setting is ignored and resynch is inherently on. Again, the 1\text{st} T/L Sequence String (and header value) will be determined just prior to the 1\text{st} transmission of the Toolface/Logging Header. The sequence may change at the end of any dataset in which a sequence control is telemetered and the value of that control indicates a sequence change. Note that a change in the control value does not necessarily indicate a change in the sequence. In the case where a sequence change is indicated and regardless of the “ReSy” option, the receiver will anticipate that the transmitter will send: Synch Word + Survey Header = 0 (“no survey data will follow”), + T/L Header = N + T/L Sequence N. Again, the notation for this type of behavior is designated as follows…

{Syn + SH=0 + TH=\_n + TSq\_n}

Where the use of the “{...}” braces indicate the sequence/behavior will repeat until a telemetered sequence control indicates a new sequence or until flow off.

**CAUTION**

From the perspective that it allows changing the data stream faster, it is preferable to telemeter the real-time dynamic sequence control parameters (“RotW” and “GamW”). However, when utilized in poor decoding conditions, it will most likely cause the receiver to lose synch.

*Please also refer to details on the Receiver Synch Command – “Synch!”…*

**No T/L Data – “Flow-On Idle Mode”…**

Anytime that the transmitters evaluation of the dynamic sequence controls (“RotW” and “GamW”) indicates “No T/L Data” is to be transmitted the transmitter will go into “Flow-On Idle Mode”. The transmitter will send the following prior to entering “Flow-On Idle Mode”…

Syn + SH=0 + TH=0...Flow-On Idle Mode

While in “Flow-On Idle Mode”, the transmitter will continue to evaluate the sequence controls. When and if the controls change and reevaluation of the controls indicate that data is required, the transmitter will enter one of the following loops…

{Syn + SH=0 + TH=n + TSq\_n} (ReSy= “On”)

Syn + SH=0 + TH=n + {TSq\_n} (ReSy= “Off”)

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Where the use of the “{...}” braces indicate the sequence/behavior will repeat until a telemetered sequence control indicates a new sequence (if valid based on the preceding rules) or until flow off.

**Receiver Synch Command – “Synch!”**

The new XXT receiver “Synch!” command will cause the receiver to abandon its current synch timing and force it to look for a new synch word signature. Forcing the receiver into synch mode would be used in lost circulation cases or whenever the receiver has, for whatever reason, lost synch or synchronized incorrectly. Losing synch can easily happen when the Dynamic Sequences feature is enabled (DySq= “On”), sequence controls are included in the telemetry data stream and decoding conditions are marginal. The Version 2 of “xxDRT/PC™” and “xxSAPC/PC™” applications (April 2010) have a “Resynch” button located on the “Receiver Settings” dialog that is accessed from the “Receiver” pull-down menu. The “Resynch” button is only available for compatible “G2” receivers when either Resynch is enabled (ReSy= ‘On’) or Dynamic Sequences are enabled (DySq= ‘On’).
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As always, XXT customers are encouraged to test all fieldable hardware and software configurations, including telemetry sequence definition strings, in the shop prior to using them in the field to ensure that they function exactly as required and anticipated.

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