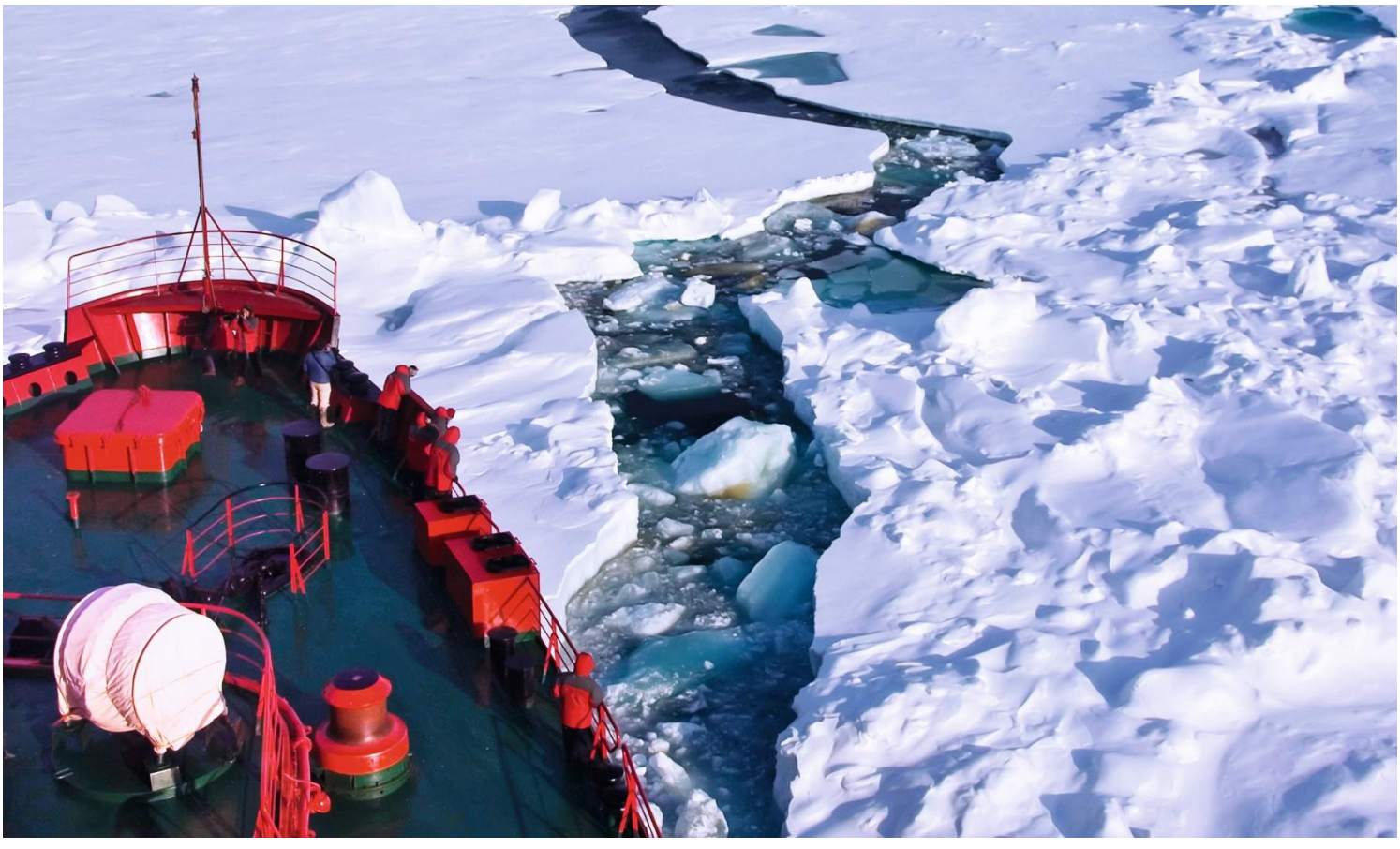
AES-256 Encryption Option

for

P4dragon DR-7X00 HF Modems

(Valid for Firmware versions 2.41.00 and higher)

13/April/2022



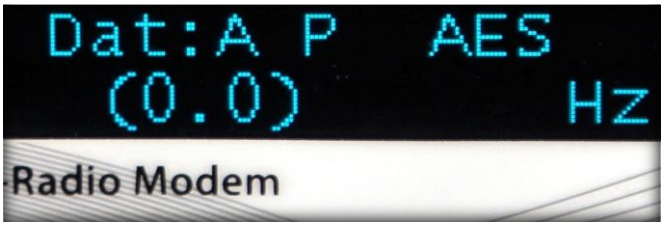
1. Introduction

The Advanced Encryption Standard (AES) allows state-of-the-art data encryption, now also directly on the **SCS** HF modems - i.e. “on the fly” of an on-going PACTOR connection. The application software thus no longer has to provide encryption in the case of secure/classified data that must be passed to the other side of an HF link.

The AES-256 option can be added as extra function to the firmware for DR-7800 and DR-7400 modems, i.e. as a customized modem firmware feature. Final activation of those customized items takes place with the help of an activation code, which can be obtained from **SCS** (or authorized vendors) and must be stored in the modem.

The AES-256 option allows all information transmitted via PACTOR to be encrypted, independently of the PACTOR level (PACTOR-1/2/3/4). As soon as fixed key AES is activated, PACTOR connections can only be established with distant modems that also use AES - and the same AES key. Alternatively, dynamic key exchange based on the Dffie Hellman Elliptic Curve (ECDH) algorithm can be used. Then auto-negotiation of encryption is possible, see AES parameter below.

Encrypted data is indicated in the “Dat:” field on the display of the DR-7800. If “AES” appears there, current data received or transmitted is AES encrypted.



AES-256 can also be utilized for other OSI Layer 1 / 2 protocols than PACTOR, like ALE or Robust Packet Radio.

Please contact **SCS** if you need an encryption solution tailored to your needs.

2. Commands required for AES operation

cmd: AES

Value range: 0-3
Default: 0

Value 0:
Encryption is switched off.

Dynamic Key:

Generally, if one of the two participating modems is not capable of AES, or the AES parameter is set to 0, the link will either not be established at all - or will run without encryption. If you are using the modem on amateur radio bands, for example, you have to switch off encryption.
If the AES parameter is permanently set to 0, your modem will never allow encrypted connections.

Value 2:

AES-256 is activated using an automatically negotiated Diffie Hellman (Elliptic Curve, ECDH) key. If the distant station is not capable of Diffie Hellman key exchange, the link establishment will be aborted and the message "DYNAMIC AES KEYS NOT SUPPORTED BY DISTANT STATION" appears on the user interface.

On the other hand, if the own AES parameter is set to 2 but a distant station starts an unencrypted connection, the own modem will accept this unencrypted link request and set up an unencrypted connection. This allows backwards compatibility during migration of the new AES ECDH feature in an existing network. The user must be aware that the modem will also allow unencrypted connections while the AES parameter is set to 2 - but only if a distant unencrypted modem calls the own modem.

Value 3:

Same function as Value 2 but does full auto-negotiation. Even if the "Master" initiating a call using "AES 3" and the "Slave" is not capable of dynamic key handling, the connection will be established (unencrypted).

Fixed Key:

Value 1:

AES-256 encryption is activated. AESKEY command (see below) should first be used to set the desired AES key / key phrase before activating AES, otherwise PACTOR can no longer be used.

As soon as AES fixed key (AES 1) is activated, valid PACTOR connections to other DR-7X00 modems can only be established if the distant modem is also working with activated AES option and using exactly the same AES key (AESKEY command). Otherwise, the establishment of a

PACTOR connection is blocked immediately after first, basic synchronization, i.e. as soon as the first user data is to be exchanged.

In order to store the AES 0/1/2 setting in the non-volatile modem memory, please use the SAP command.

Otherwise, encryption may no longer be activated after power-cycling the modem!

cmd: AESKEY

Value range: alphanumeric key or key phrases, length 1-80 characters

Allows to set the 256 bits long “fixed keye” (AES parameter set to 1) AES-256 encryption key. AESKEY accepts keys or key phrases of length 1 to 80 characters. It always generates a 256 bits long hash value from the key / key phrase and only stores that hash value as actual encryption key. The original key / key phrase is not stored permanently in the modem.

You can never deduce the original key / key phrase with the help of the modem. This reduces the risk of a security breach if very similar passwords are used in a network.

Nevertheless, the key / key phrase should be changed regularly in order to make decryption attempts based on the statistical analysis of long data sets impossible.

Example:

```
cmd: AESKEY This is my new AES Key Phrase!<CR>

NEW AES256 KEY STORED

cmd:
```

The new AESKEY hash value is immediately stored in the non-volatile memory. You need not to use the SAP command for that purpose.

The special keys “kill” or “KILL” cannot be defined as user keys - but lead to full erasure of the AESKEY as well its corresponding hash value.

cmd: FLICENSE

Allows to enter a license code that activates customized modem firmware features and other customized items.

Please ask **SCS** directly or your dealer when you need a license key for special (firmware) features. You always have to send us (or your vendor) the modem serial number. All licenses are tied to the modem hardware. The modem serial number can be found at the label on the modem or can be retrieved by using the “sys sern” command.

Example for retrieving the serial number:

```
cmd: sys sern

Serial number: 0100001417160605
```

Example for entering the FLICENSE command:

```
cmd: FLICENSE 0100001417160605 EABATCGUOOLHCBFACCD5

OK

THANK YOU FOR LICENSING THE P4dragon FIRMWARE!

FLICENSE: 0100001417160605 EABATCGUOOLHCBFACCD5
```

SCS

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