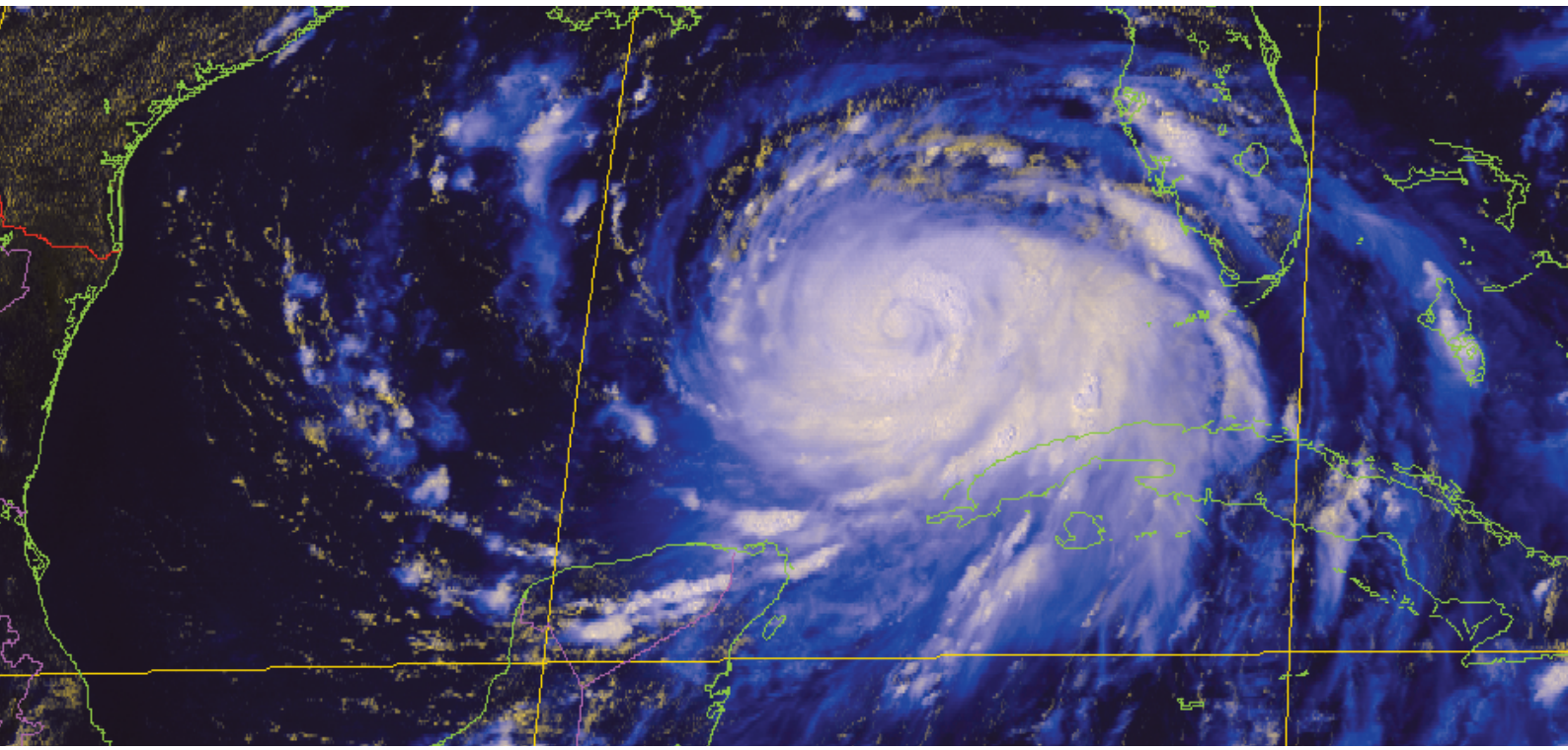
DARTCOM

GOES HRIT SYSTEM



INSTALLATION AND SETUP GUIDE

Dartcom GOES HRIT system

Installation and setup guide

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SECTION

1

Introduction

Overview

The Dartcom GOES HRIT system is a high-performance, high-reliability solution for ingesting HRIT data in real-time from the GOES series of satellites. It also provides full display and processing facilities for the resulting images, charts and products.

The key features of the Dartcom GOES HRIT system are:

- Full support for all HRIT data from GOES East and GOES West.
- High-resolution digital data with no A/D conversion.
- Calibrated temperature read-outs from infra-red and water vapour images and albedo from visible images.
- Easy installation, with the antenna mounted on a single post or patio mount and one cable feed to the receiver.
- Direct read-out of the HRIT data stream for interference-free images.
- Data transferred from the receiver to the host PC via a USB connection to ensure high speed and data integrity.
- High-quality, high-reliability hardware and software for trouble-free, long-term, continuous operation.
- Fully automatic Windows-based XRIT Ingester data ingest and archiving software.
- Fully automatic Windows-based MacroPro post-ingest processing and product generation software.
- Powerful, easy-to-use Windows-based iDAP display and processing software.
- Ideal for aviation weather information systems, storm warning systems, forecasting, agriculture, oceanographic studies and environmental and meteorological programmes.

A block diagram of the Dartcom GOES HRIT system is shown in figure 1.1.

It is important that you read and understand sections 2, 3 and 4 of this manual before and during installation. If the hardware and software are not installed correctly, the system will not function properly.

At all times during installation, ensure safety regulations are followed, such as not letting cables and connectors get wet (especially mains cables) and not overloading ladders. Dartcom cannot accept responsibility for any injuries caused during installation of the system.

If you have problems during installation, or are unable to make the system function properly after installation, please contact Dartcom for technical support. Details are given at the front of this manual.

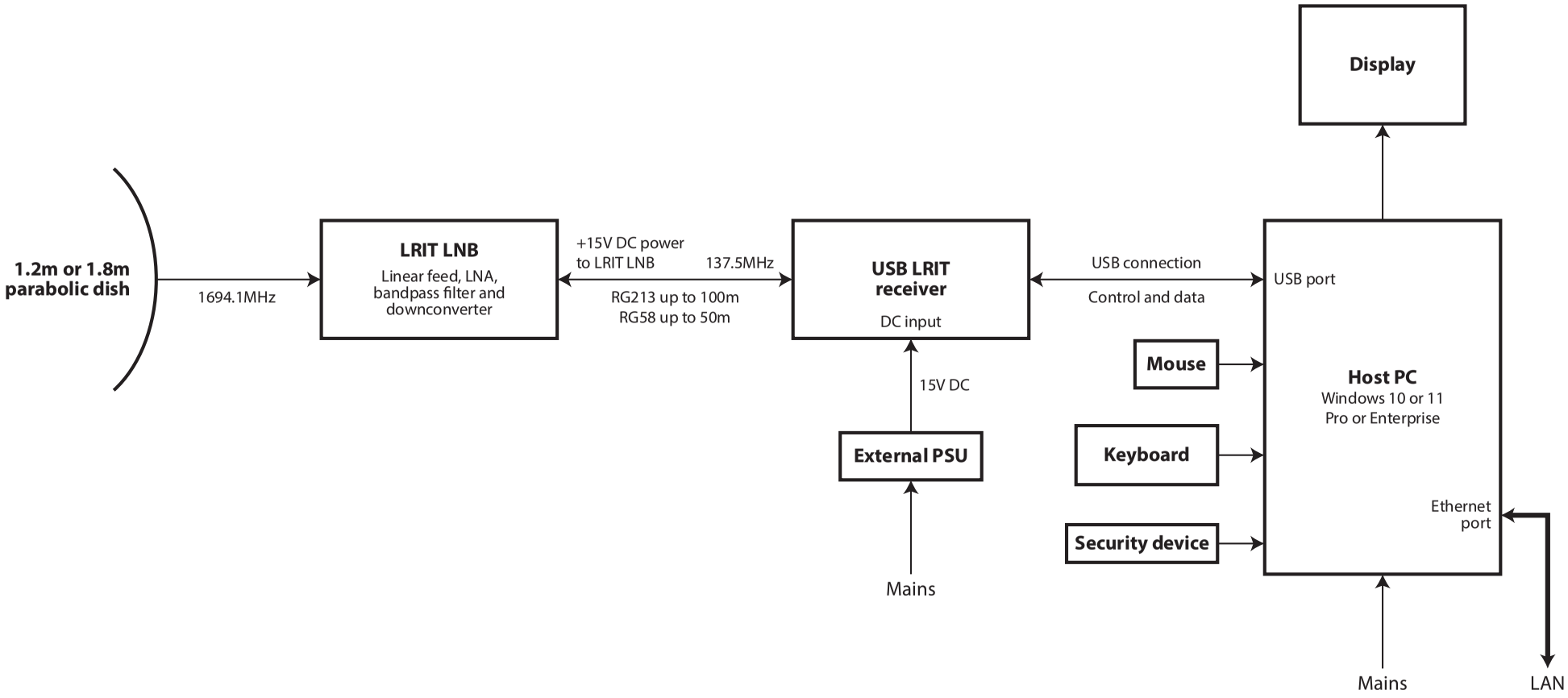


Figure 1.1 • Block diagram of the Dartcom GOES HRIT system

SECTION

2

Installing the software

Introduction

The Dartcom GOES HRIT system includes software used to ingest GOES HRIT data and provide facilities for displaying and processing it on the host PC.

This section guides you through setting up the host PC and installing the software.

Preparing to install the software

Minimum PC specifications

Before installing the software, ensure the host PC meets or exceeds the following specifications.

- 8-core processor.
- 8GB RAM (16GB recommended).
- 500GB SSD, plus optional 1TB SSD or RAID for archiving.
- Dedicated graphics card (not on-board graphics) with display capable of at least 1152×864 resolution.
- 100Mbit Ethernet.
- 2 available USB ports.
- Windows 10 or 11 Pro or Enterprise.
- English language pack and regional format.

Windows settings

Check that the Windows time zone is configured correctly for your location. Ensure also that automatic adjustment of the PC clock for daylight saving time is switched on.

If you want to use UTC rather than local time, set the PC clock to UTC and the time zone to "(UTC) Coordinated Universal Time".

Ensure the graphics resolution for your display is set to at least 1152×864.

Installing the software

The software which ingests GOES HRIT data and allows it to be viewed and processed is as follows:

- **XRIT Ingester**. This is the GOES HRIT data ingest software. It controls the USB LRIT Receiver, performs live USB-based data ingest, archives ingested data and outputs it in various formats.
- **iDAP**. This is the viewing and processing software. It allows you to view, process and print many different types of images, charts and products.
- **MacroPro**. This is the automatic processing software. It can be set up to perform a sequence of processing operations on an image each time it is updated by the XRIT Ingester software. The available processing operations include enhancement, exporting, printing, archiving, reprojection, product creation and animation.

Follow the instructions below to install the software.

❶ Connect the Dartcom software security device to an available USB port on the host PC.

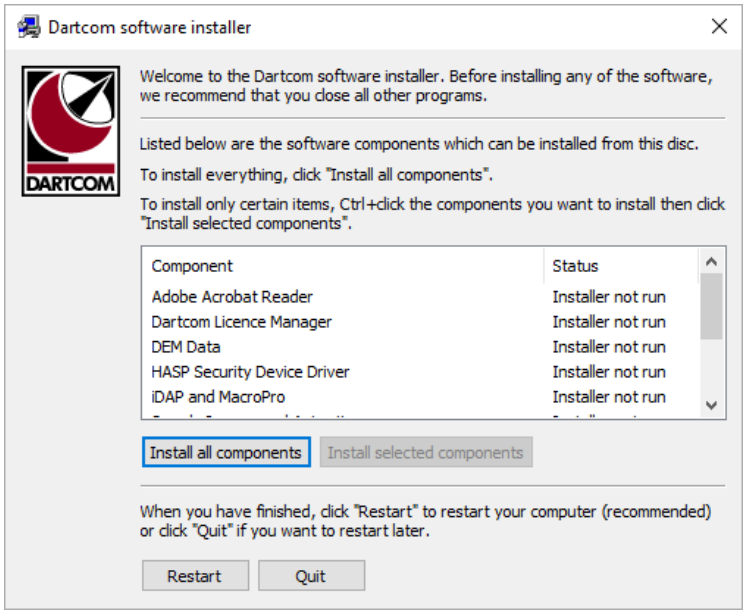
If your Dartcom security device is not connected to the host PC, none of the above programs will run.

❷ If your system was supplied with a USB drive containing the Dartcom software installers, connect that to an available USB port on the host PC (USB 3.0 ideally). Choose the **Open folder to view files** option, then double-click the icon labelled **Dartcom_installer.exe**.

If your system was supplied with a **Dartcom LRIT/HRIT System** disc, insert that into the host PC's CD/DVD drive. The **Dartcom software installer** program should start automatically. If it does not, right click the **Start** icon, choose **Run**, click **Browse…**, find and select **Dartcom_installer.exe** on the disc, click **Open**, then finally **OK**.

❸ The **Dartcom software installer** window (figure 2.1) is displayed. Install all the components in the list by clicking the **Install all components** button.

Figure 2.1
The **Dartcom software installer** window



The software is installed in the C:\Program Files (x86)\Dartcom folder by default. You can install it to a different location if required by changing the paths during the installation process, though this is not recommended.

❹ Click **Restart** to restart the host PC before running any of the software.

Summary

The host PC and operating system should now be set up correctly and the GOES HRIT ingest and processing software installed but not yet configured.

The next section guides you through assembling and installing the antenna.

SECTION

3

Assembling and installing the antenna

Introduction

The antenna manufacturer's instructions for constructing the mounting base, assembling the reflector, feed and support structure and installing the antenna are included in a separate manual which you should refer to now.

You can skip this section if you are upgrading an existing system and the antenna is already installed and the RF cable run.

Do not tighten the azimuth and elevation adjustment bolts fully during the installation process. The antenna needs to be aligned with the satellite before this is done.

Running the RF cable

Once the antenna is assembled and installed, run the RF cable between the antenna and the host PC location.

The cable should be securely clipped to walls and run through ducting where necessary to prevent damage. Where it enters buildings, ensure you leave generous drip loops to prevent water ingress.

Do not waterproof the external connections until the antenna has been aligned (see section 4).

S E C T I O N

4

Aligning the antenna

Introduction

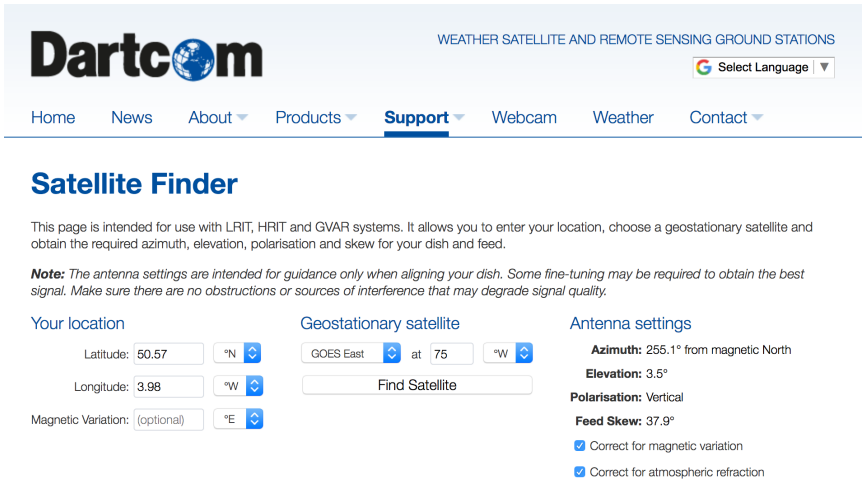
Due to the narrow beamwidth of the antenna, it is critical that it is aligned towards the satellite very accurately to ensure the best signal (and therefore the best data quality) is obtained. This section guides you through that process.

You can skip this section if your antenna is already correctly aligned on your chosen satellite (GOES East or GOES West).

Calculating the antenna settings

Before commencing the antenna alignment, you need to calculate the correct azimuth, elevation and feed skew for your location. You can do this using the **Satellite Finder** page in the **Support** section of the Dartcom website (figure 4.1).

Figure 4.1
The **Satellite Finder** on the Dartcom website



Enter the latitude, longitude and magnetic variation (if known) at your location, choose the required satellite (GOES East or GOES West) and click **Find Satellite**. The calculated

azimuth, elevation, polarisation and feed skew are displayed on the right-hand side of the page. Make a note of them for later.

Aligning the antenna

The USB LRIT Receiver contains a dedicated alignment receiver which simplifies the process of aligning the antenna towards the satellite. The receiver needs to be taken to the antenna location and connected to the LNB output. It does not need to be connected to the host PC yet.

Using the USB LRIT Receiver at the antenna location requires a mains extension lead to be run outside temporarily. This should be connected via an RCD and the alignment procedure carried out in dry conditions only to minimise the risk of electrocution.

The antenna alignment procedure is as follows:

❶ Using a compass and inclinometer, adjust the azimuth and elevation of the antenna to approximately the angles calculated earlier. Information on adjusting the antenna azimuth and elevation is given in the manufacturer's instructions for the antenna system.

❷ Set the feed polarisation to vertical.

❸ Using the supplied 3m RG58 adaptor cable, connect the LNB output to the **LNB** socket on the back panel of the USB LRIT Receiver.

Ensure your LNB will accept +15V from the receiver to power it via the co-axial cable. If not, you will need to use an external Bias "T" to power the LNB.

❹ Connect the DC jack from the receiver power supply unit to the **POWER** socket on the back of the receiver. Connect the IEC plug of the mains lead to the IEC socket on the power supply unit. Connect the other end to your mains extension lead, then switch on the mains supply.

❺ The receiver has an LED bar display on the front panel which shows the signal level. On the back panel is a 10-turn preset control labelled **INPUT ATTENUATION**. Using the supplied trimming tool, adjust the preset so the display reads about half scale. Turning the preset clockwise increases the attenuation, which reduces the display reading, and vice versa.

❻ Adjust the azimuth of the antenna slowly and carefully until the maximum reading is obtained on the signal display. If the display reaches full scale, turn the **INPUT ATTENUATION** preset clockwise until the signal level display reads half scale again and continue adjusting the azimuth.

❼ Tighten the azimuth adjustment bolts to lock the azimuth.

❽ Adjust the elevation of the antenna as you did the azimuth in step ❻.

❾ Tighten the elevation adjustment bolts to the lock the elevation.

❿ There will inevitably be some interaction between the azimuth and elevation adjustment, so repeat steps ❻–❾ (loosening each axis's adjustment bolts in turn) until the maximum signal reading is obtained.

⓫ Make a note of the current signal display reading (18 LEDs, for example).

⓬ If the feed cannot be reached safely from the ground, position a suitable stepladder in front of the antenna.

⓭ Using a marker pen, mark the feed's current position by drawing a line from the mounting head plate to the rim of the feed.

⓮ Adjust the feed skew to approximately the angle calculated earlier.

⓯ Remove the stepladder from in front of the dish and check the signal display reading on the receiver.

⓰ Fine-tune the feed skew until the maximum signal reading is obtained, remembering to increase the attenuation if the display reaches full scale. This process can take some time, but is important because the antenna gain needs to be maximised to obtain the best signal.

⓱ Tighten the three Allen screws on the feed mount to lock the skew angle.

Completing antenna installation

When the optimum antenna alignment has been found and image quality testing has been completed, wrap all cable connections with the supplied self-amalgamating tape to ensure they are waterproof.

It is important to waterproof all the cable connections well to prevent damage by ingress of water.

Summary

The antenna should now be installed and aligned on the satellite, and the RF cable run between the antenna and the host PC location.

The next section guides you through installing and operating the USB LRIT Receiver.

S E C T I O N

5

Installing the receiver

Introduction

The Dartcom USB LRIT Receiver turns the RF signal from the antenna into a digital data stream which is sent to the host PC for decoding and processing.

This section guides you through installing the receiver in its operational location.

Installing the receiver

Follow the instructions below to install the USB LRIT Receiver.

❶ Choose a suitable location for the receiver. It is cooled by convection and should therefore be placed out of direct sunlight with sufficient space around it to allow free air circulation.

Do not place books, magazines or other objects around or on top of the receiver as this could hinder the unit's cooling and cause it to overheat.

❷ Connect the cable from your LNB to the **LNB** socket on the back panel of the receiver.

Ensure your LNB will accept +15V from the receiver to power it via the co-axial cable. If not, you will need to use an external Bias "T" to power the LNB.

❸ Connect the DC jack from the receiver power supply unit to the **POWER** socket on the back of the receiver. Connect the IEC plug of the mains lead to the IEC socket on the power supply unit. Connect the other end to a nearby mains power outlet, then switch on the mains supply.

❹ Connect the USB cable from the **USB** socket on the back panel of the receiver to an available USB port on the host PC.

It is best to allocate a particular USB port to the receiver because its control (COM) port number will change if you connect it to a different port.

❺ The Windows hardware setup assistant may appear. If so, allow it to select the correct drivers automatically, and if warnings about driver signing are displayed, ignore the warnings and allow them to be installed.

❻ If the receiver and driver software are working correctly, an icon should appear in the system tray (next to the clock). Double-click it to display a list of the connected devices, which should include **USB LRIT Receiver**.

❼ Using the supplied trimming tool, adjust the **INPUT ATTENUATION** preset control on the back panel of the receiver until all but two or three of the green LEDs are illuminated. Turning the preset clockwise increases the attenuation, which reduces the display reading, and vice versa.

The LED indicators on the front panel of the receiver should now be as shown in table 5.1, in which case it is ready to receive live data.

Table 5.1
States of the USB LRIT Receiver LED indicators after installation

Indicator	State
LNB POWER	Illuminated
SIGNAL LOCK	Illuminated
SIGNAL LEVEL	All green LEDs illuminated except two or three
USB READY	Illuminated
SERIAL RX/TX	Not illuminated
BUFFER	**E** Illuminated
FRAME SYNC DETECTION	Not illuminated

Specifications

The specifications of the Dartcom USB LRIT Receiver are shown in table 5.2.

Table 5.2
USB LRIT Receiver specifications

RF	
Input frequency	135MHz to 144MHz
Input level range	–90dBm to –20dBm preset by adjustable 50dB attenuator
Image rejection	>60dB
Input impedance	50Ω
Signal strength display	20 LED real-time colour bar display with 1dB step per LED (approx)
DSP demodulator	
Type	Digital Costas Loop
Modes	BPSK, QPSK
Baseband filters	Root raised cosine, roll-off factor 0.4
Typical Eb/No performance	6.4dB for 10^{-6} bit errors using Viterbi rate of ½ before R-S decoding
(continued…)	

(continued…)	
Data	
Encodings	NRZ-L, NRZ-S, NRZ-M
Symbol rates	64ksps to 1024ksps
Convolution decoding	Viterbi, rate ½, K=7, G1=171, G2=133
Descrambling modes	V.35 CCITT, IESS 308/309, none
Electrical/mechanical	
Supply voltage	15V DC @ 2A supplied by external mains power supply unit (PSU)
External mains PSU	Input: 100–240V AC 47–63Hz @ 1.2A max Output: 15V DC @ 3.4A
Downconverter power output	14–15V DC @ 0.75A protected by thermal fuse
Power connector	Standard 2.1mm DC jack, centre pin +ve
RF input connector	50Ω BNC female
Size (L×W×H)	240×175×60mm (including connectors)
Weight	1.7kg (including PSU)
Operating temperature	0˚C to 35˚C non-condensing
EMC CE certification	EN55022 class A digital device
Interface	
Host PC	USB 1.1, type B connector
Receiver control	RS-232, 9600bps via USB

The layouts of the front and back panels of the USB LRIT Receiver are shown in figures 5.1 and 5.2 respectively.

Summary

The receiver should now be installed in its operational location and ready to use. You should also be familiar with its various controls and indicators.

The next section guides you through configuring the software according to your requirements.

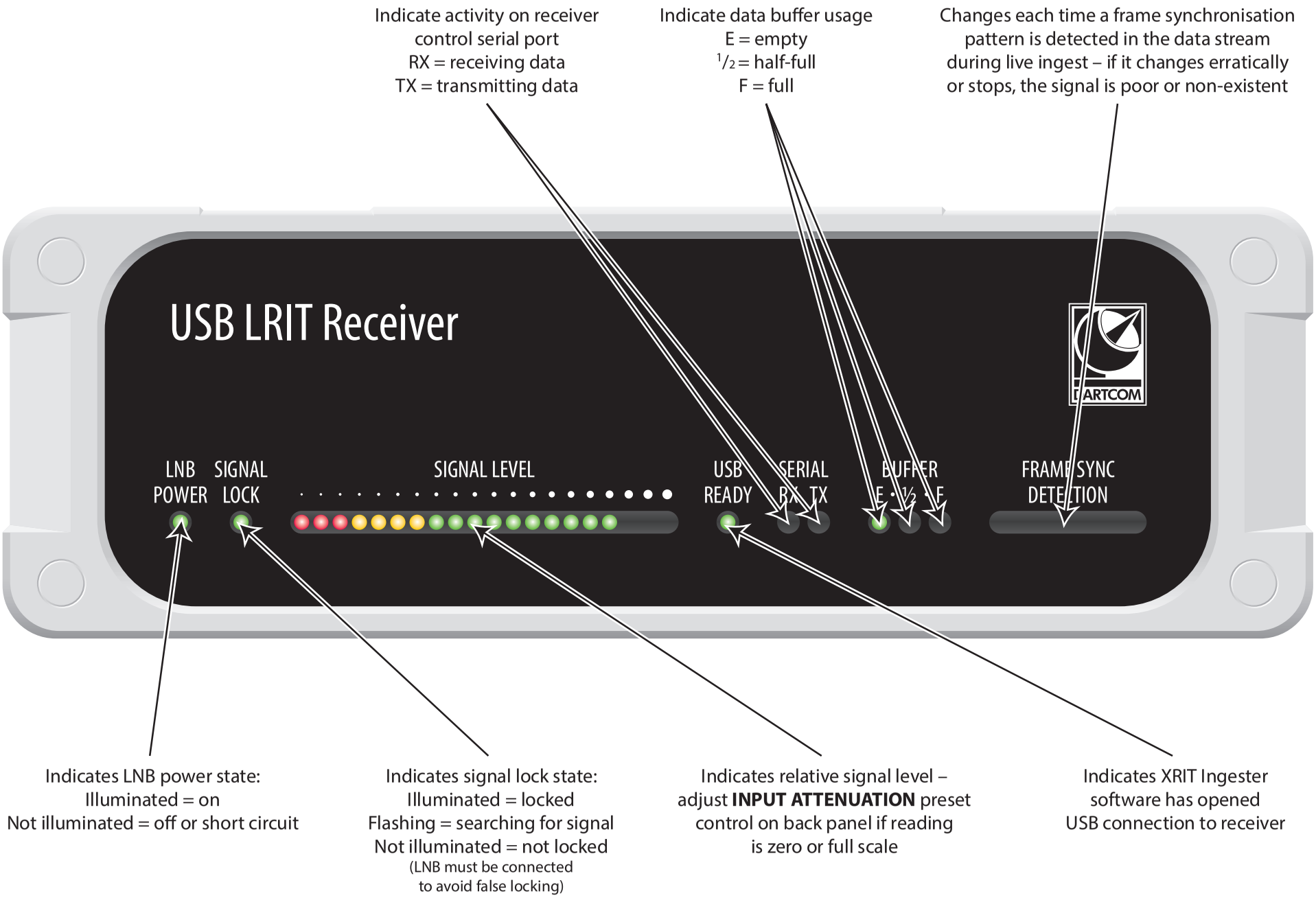


Figure 5.1 • Layout of the front panel of the USB LRIT Receiver

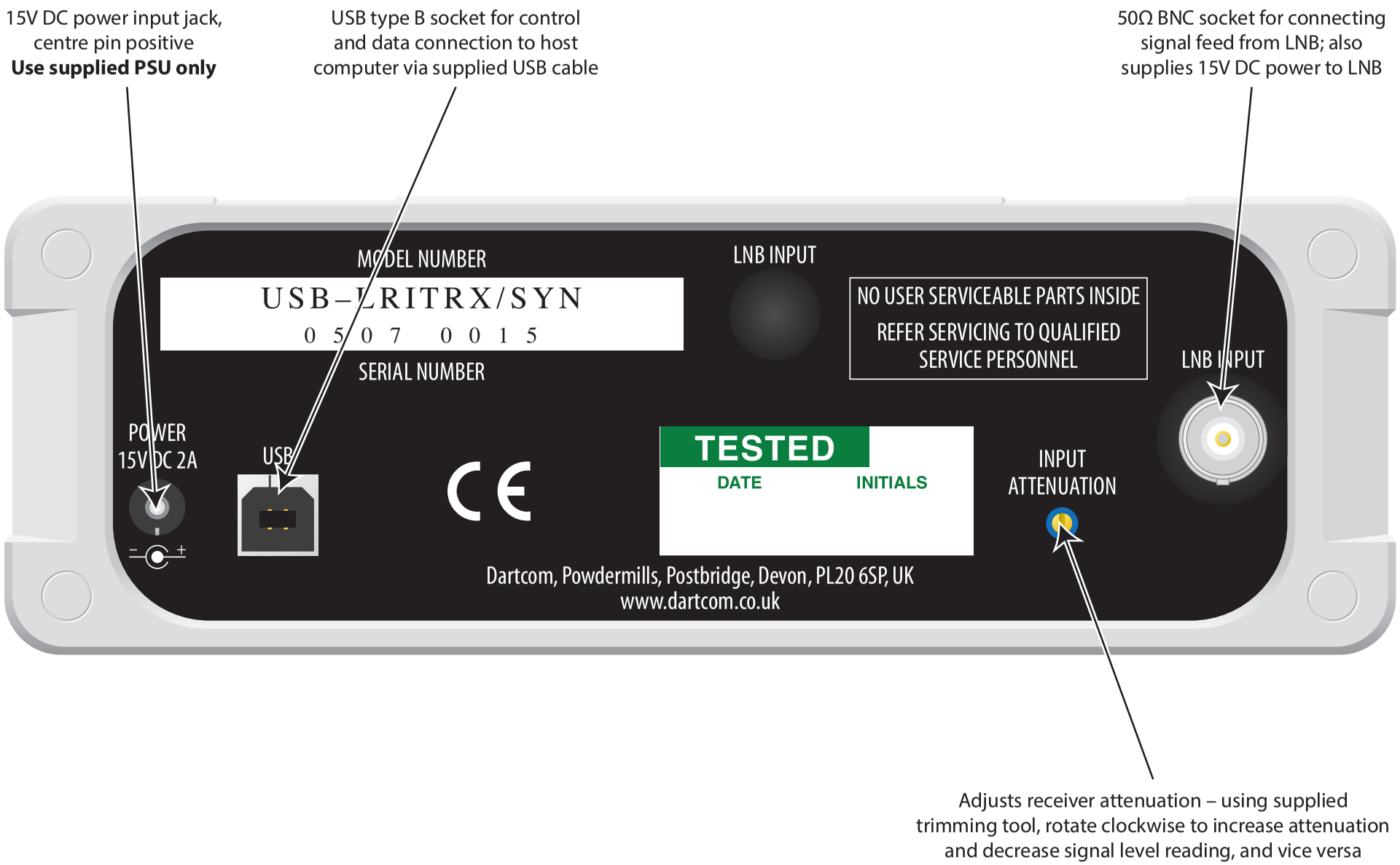


Figure 5.2 • Layout of the back panel of the USB LRIT Receiver

SECTION

6

Configuring the software

Introduction

You should already have installed the software in section 2. This section guides you through initial configuration.

Before you start, ensure your Dartcom security device is connected to the host PC otherwise the software will not run.

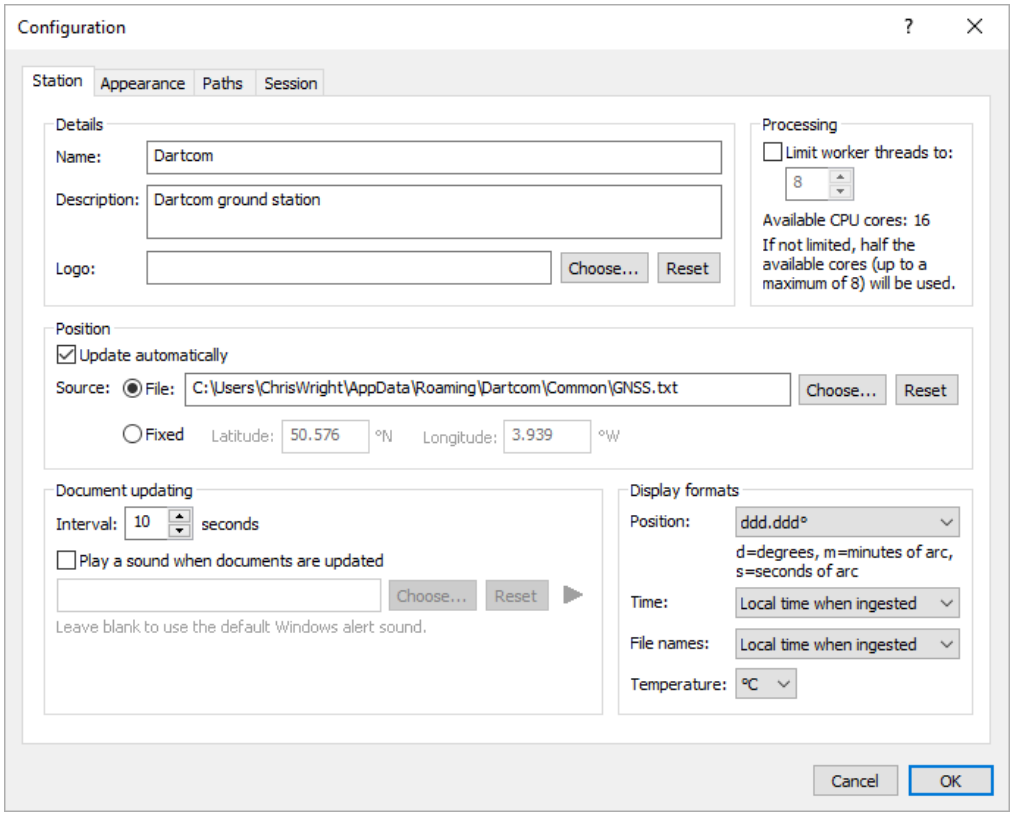
iDAP

Follow the instructions below to configure the iDAP software.

❶ Start the iDAP software from the Windows **Start** menu.

❷ Select **Utilities▸Configuration…**. The **Configuration** window (figure 6.1) is displayed with the **Station** tab selected. In the **Details** area, enter a name and description for your ground station in the **Name** and **Description** boxes respectively. In the **Position** area, switch off **Update automatically**, set **Source** to **Fixed** and enter the latitude and longitude of your station position in the **Latitude** and **Longitude** boxes respectively.

Figure 6.1
The **Configuration** window of the iDAP software



❸ Click the **Paths** tab (figure 6.2) and ensure the paths are configured correctly. The default settings are shown in table 6.1, or you may wish to set them to other folders if you have particular data storage requirements.

Figure 6.2
The iDAP **Configuration** window with the **Paths** tab displayed

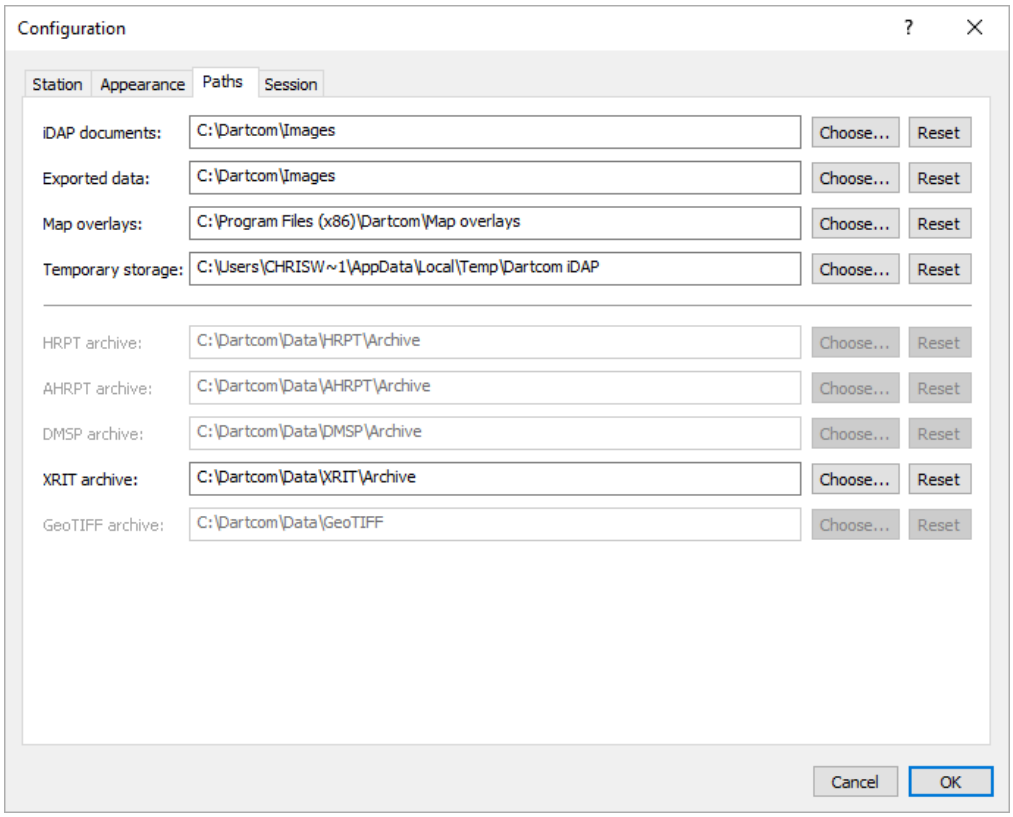


Table 6.1
Paths to configure in the iDAP software

Path	Default folder
iDAP documents	C:\Dartcom\Images
Exported data	C:\Dartcom\Images
Map overlays	C:\Program Files (x86)\Dartcom\Map overlays
Temporary storage	(user's temporary folder)\Dartcom iDAP
XRIT archive	C:\Dartcom\Data\XRIT\Archive

❹ Click **OK** to apply the new configuration.

❺ Ensure **Utilities▸Automatic update** is switched on. This causes open documents to be updated with new data automatically.

❻ Ensure **Utilities▸Start MacroPro automatically** is switched on. This causes MacroPro to be started automatically each time you open iDAP.

MacroPro

Follow the instructions below to configure the MacroPro software.

❶ Start MacroPro by selecting **Utilities▸Start MacroPro…** within iDAP.

❷ By default, MacroPro is configured to minimise itself after opening. Click its icon in the Windows taskbar to restore its window.

❸ Choose **Utilities▸Configuration…**. The **Configuration** window (very similar to figure 6.1) is displayed. Click **Synchronise with iDAP** (in the bottom left corner) and click **OK**.

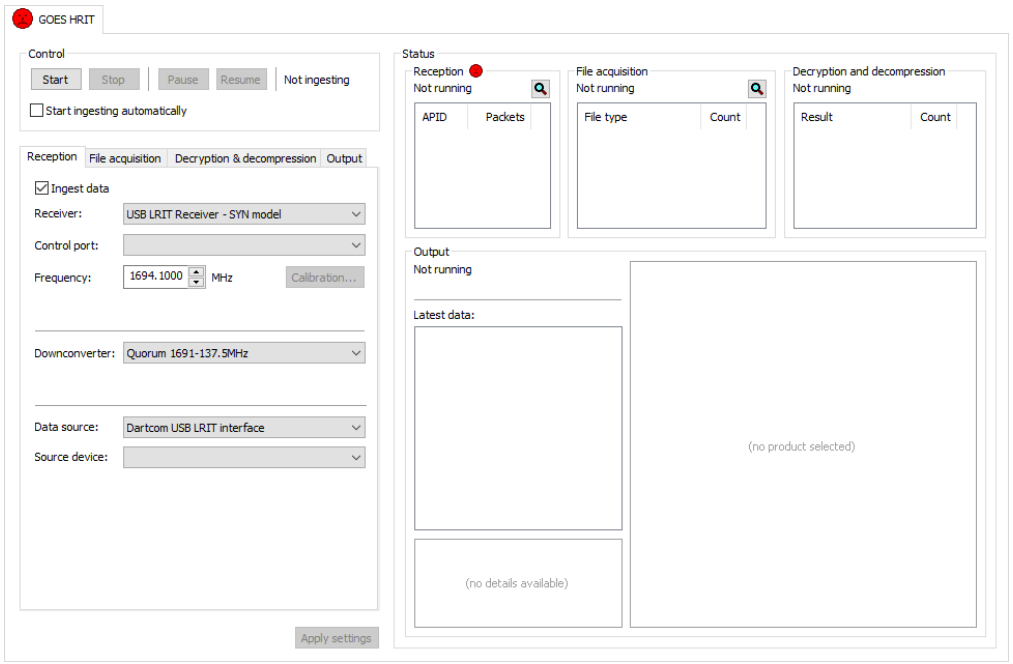
XRIT Ingester

Follow the instructions below to configure the XRIT Ingester software.

❶ Start XRIT Ingester software from the Windows **Start** menu.

❷ Click the **GOES HRIT** tab (figure 6.3).

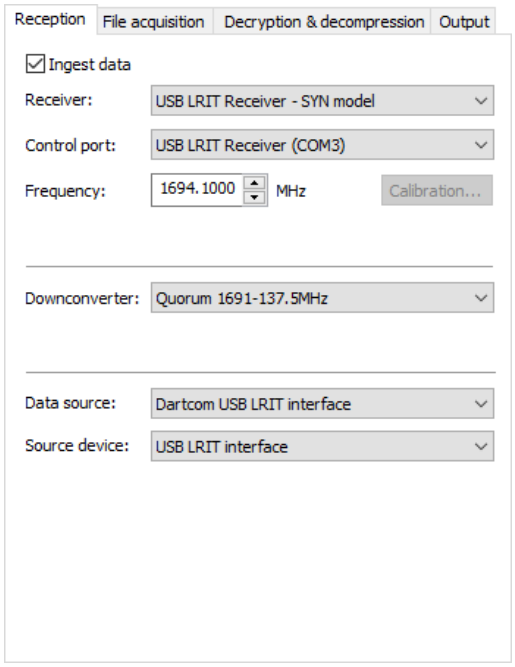
Figure 6.3
The **GOES HRIT** tab of the XRIT Ingester software



❸ In the **Control** area, switch on **Start ingesting automatically**.

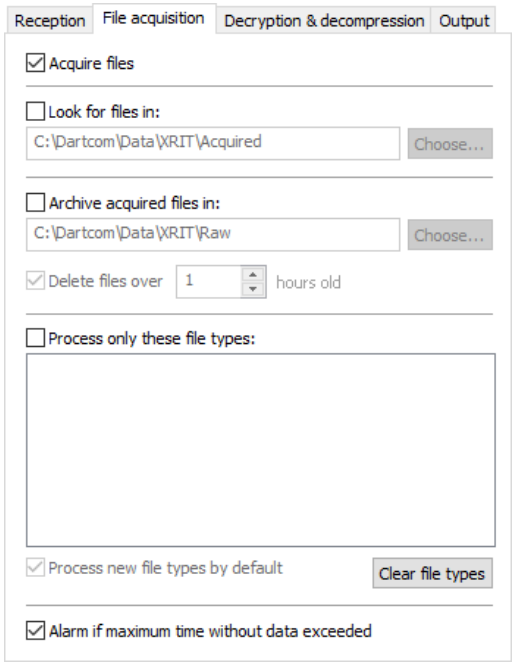
❹ In the **Reception** tab (figure 6.4), ensure **USB LRIT Receiver – SYN model** is selected in the **Receiver** drop-list. Select **USB LRIT Receiver** in the **Control port** drop-list. Ensure **Frequency** is set to **1694.1000**. Select the type of downconverter connected to your receiver in the **Downconverter** drop-list. Ensure **Dartcom USB LRIT interface** is selected in the **Data source** drop-list. Select **USB LRIT Interface** in the **Source device** drop-list.

Figure 6.4
The XRIT Ingester **Reception** tab



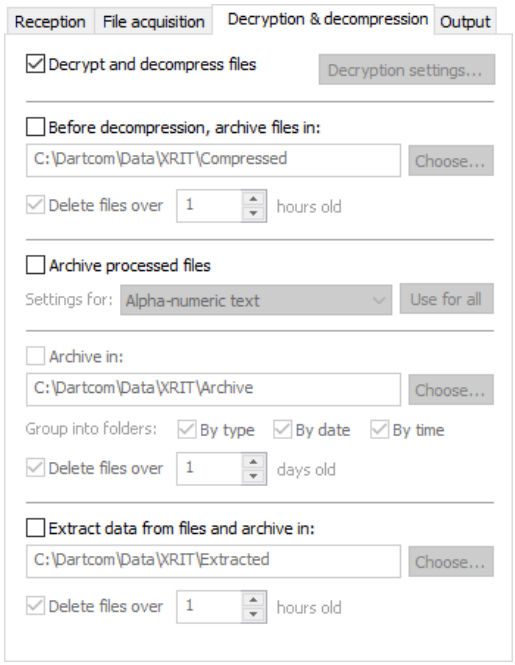
❺ In the **File acquisition** tab (figure 6.5) ensure **Acquire files** is switched on, and **Archive acquired files** and **Process only these file types** are switched off for now.

Figure 6.5
The XRIT Ingester **File acquisition** tab



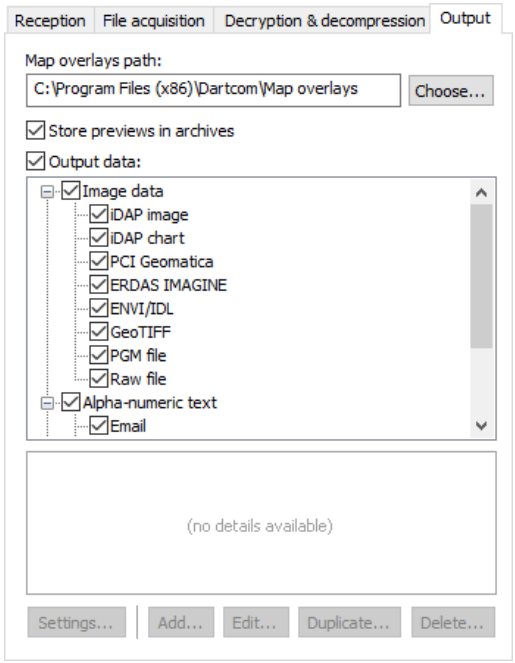
❻ In the **Decryption & decompression** tab (figure 6.6) ensure **Decrypt and decompress files** is switched on, and **Before decompression, archive files**, **Archive processed files** and **Extract data from files** are switched off.

Figure 6.6
The XRIT Ingester **Decryption & decompression** tab



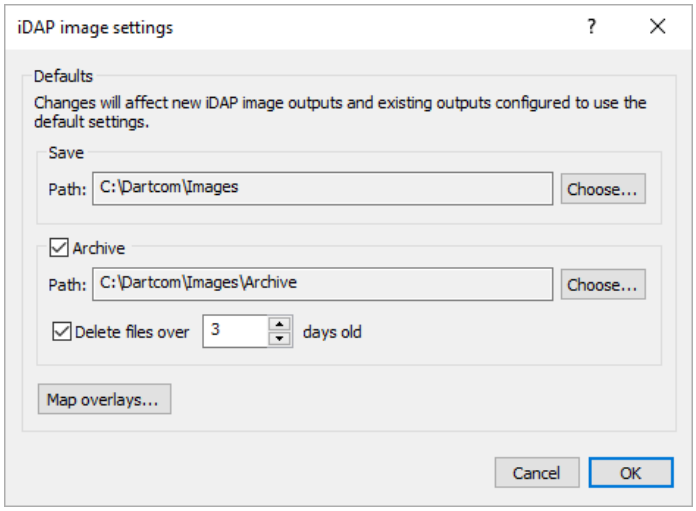
❼ In the **Output** tab (figure 6.7) ensure **Map overlays path** is set to **C:\Program Files (x86)\Dartcom\Map overlays** and **Store previews in archives** is switched on.

Figure 6.7
The XRIT Ingester **Output** tab



❽ Switch on **Output data**. In the list below it, under **Image data** right-click **iDAP image** and select **Settings...**. The **iDAP image settings** window (figure 6.8) is displayed. In the **Save** area, ensure **Path** is set to **C:\Dartcom\Images** (or your chosen iDAP images folder). If you want to create an archive of iDAP images by default, switch on **Archive**, ensure **Path** is set to **C:\Dartcom\Images\Archive** (or your chosen iDAP images archive folder) and set the number of days you want to keep in the archive.

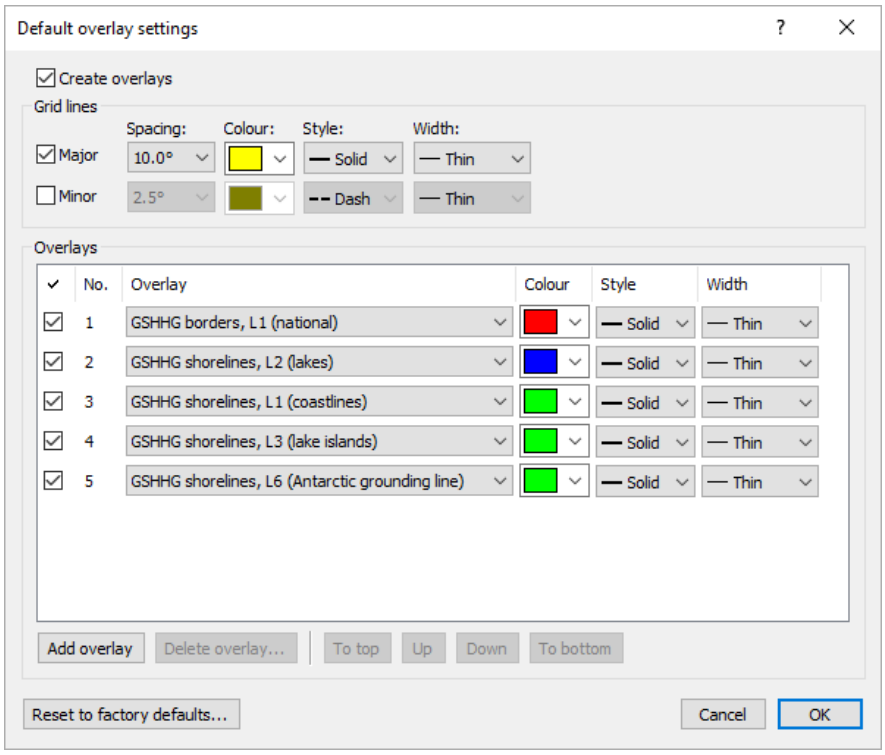
Figure 6.8
The XRIT Ingester **iDAP image settings** window



❾ Click **Map overlays...** to display the **Default overlay settings** window (figure 6.9). nsure that **Create overlays** is switched on, then configure the grid lines and overlays as required. The factory defaults are suitable for most purposes, but you may wish to add state boundaries for individual countries, or alter the colours or line styles. Full reference information for this window is provided in the *Dartcom XRIT Ingester software user guide*.

These overlay settings will be used as the defaults, but they can be customised for individual outputs if required.

Figure 6.9
The XRIT Ingester **Default overlay settings** window



❿ Click **OK** when you have finished configuring the default overlay settings, then **OK** again to close the **iDAP image settings** window.

⓫ At the bottom of the **GOES HRIT** tab, click **Apply settings** to make your changes take effect.

⓬ In the **Control** area, click **Start** to commence live ingest. The receiver will be programmed (notice the **RX** and **TX** LEDs flashing) and after a few seconds the LED indicators on the front panel of the receiver should be as shown in table 6.2.

Table 6.2
States of the USB LRIT Receiver LED indicators during live ingest

Indicator	State
LNB POWER	Illuminated
SIGNAL LOCK	Illuminated
SIGNAL LEVEL	All green LEDs illuminated except two or three
USB READY	Illuminated
SERIAL RX/TX	Flashing very occasionally, otherwise not illuminated
BUFFER	½ flashing regularly
FRAME SYNC DETECTION	Pattern changing smoothly and regularly

⓭ The **GOES HRIT** tab icon should now be green (●) and spinning to indicate that live ingest is in progress. The icon at the top of the **Reception** area within the **Status** area should also be green (●) indicating that frame synchronisation has been achieved.

⓮ In the **Reception** area within the **Status** area, click the 🔍 (detailed reception status) button to display the **Reception status** window (figure 6.10). This shows details of the data being ingested and the status of the receiver. Click **Update** to obtain the current receiver status, described in table 6.3.

Figure 6.10
The XRIT Ingester **Reception status** window

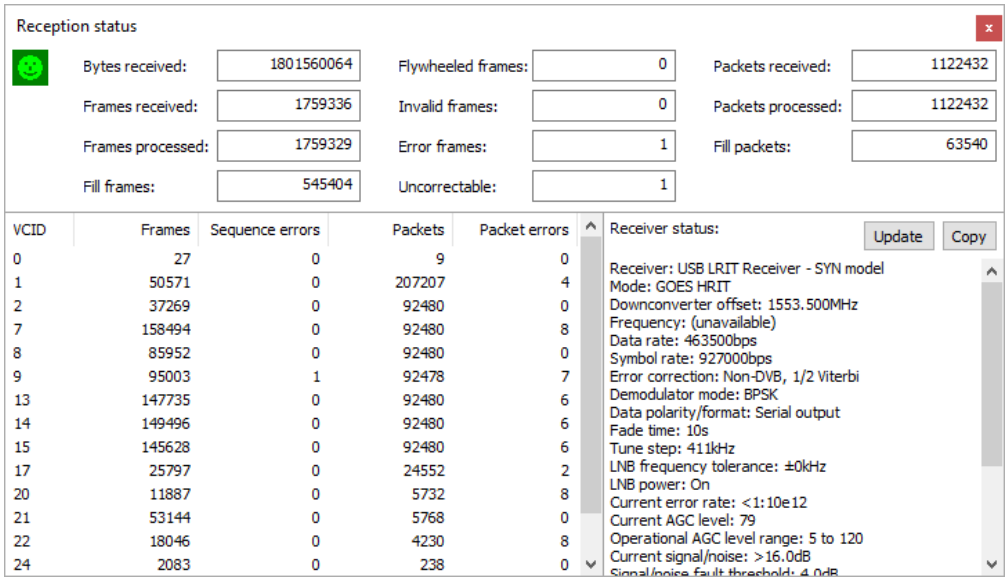


Table 6.3
Status information for the USB LRIT Receiver

Item	Normal value	Description
Receiver	USB LRIT Receiver – SYN model	Dartcom USB LRIT Receiver, synthesised (tuneable) model
Mode	GOES HRIT	Self-explanatory
Downconverter	(depends on selection)	Self-explanatory
Downconverter offset	1553.5MHz	Downconverter LO frequency
Data rate	463500bps	Data rate after Viterbi decoding
(continued…)		

(continued…)		
Symbol rate	927000bps	Channel symbol rate before Viterbi decoding
Error correction	Non-DVB, 1/2 Viterbi	Forward error correction mode
Demodulator mode	BPSK	Self-explanatory
Data polarity/format	Serial output	Receiver output mode
Fade time	10s	Time to wait after loss of signal lock before searching again
Tune step	411kHz	Demodulator frequency step used in signal search
LNB frequency tolerance	±0kHz	LNB frequency stability tolerance
LNB power	On	Self-explanatory
Current error rate	Between $1:10^{12}$ and $1:10^{3}$	Error rate after Viterbi decoding
Current AGC level	Between 0 and 255	Digital AGC level – the lower it is, the weaker the signal
Operational AGC level range	5 to 120	Normal AGC level range – levels outside this are logged as faults
Current signal/noise	Between 3.7dB and 16dB	Current signal/noise ratio
Signal/noise fault threshold	4.0dB	Minimum signal/noise, below which a fault is logged
Logged signal/noise minimum	Between 3.7dB and 16dB	Minimum signal/noise logged since midnight (local time) – reset each day at midnight*
Logged signal/noise maximum	Between 3.7dB and 16dB	Maximum signal/noise logged since midnight (local time) – reset each day at midnight*
Tune status	Locked, fast sweep speed	Demodulator lock status and signal acquire mode
Tune offset	0kHz	Difference between requested frequency and that locked on to by demodulator
Clock	(current local time)	Receiver's internal clock – synchronised to host PC's clock automatically each day at midnight
Faults	(list of logged faults)	List of faults logged by receiver since midnight – cleared each day at midnight†

* When the software is first started, this figure may not be valid because the demodulator takes time to settle down. A more realistic figure will be available when the logged limits are reset at midnight.

† When the receiver is programmed, one or more signal fade faults may be generated. This is quite normal and they will be cleared automatically at midnight.

⓯ Leave the system ingesting data for at least an hour to ensure all available products have been ingested. As new products are received they will appear in the **Latest data** list on the left-hand side of the **Output** area within the **Status** area. Click a product name in the list to view information about it and a preview (if available).

Summary

The antenna, receiver, host PC and software should now be installed, set up and ready to use.

The next section provides a number of tutorials and tips to help you get started using the software. You should also refer to the separate *XRIT Ingester software user guide* and *iDAP/MacroPro software user guide* for further information.

SECTION

7

Using the software

Introduction

You should already have installed the software in section 2 and configured it in section 6. This section describes each program, then shows how to accomplish common tasks and use the core software functions via tutorials and useful tips.

About the software

The Dartcom GOES HRIT software comprises the following programs:

- **XRIT Ingester** ingests GOES HRIT data and **should be left running all the time**. It allows all or part of each product to be output as a Dartcom iDAP image, or other formats for use in third-party image processing software. You will need to set up the outputs to meet your requirements for the geographical area of coverage and range of products. If required, XRIT Ingester can also maintain archives of products that have been output. However, it does not create iDAP animations, which is one of the tasks performed by MacroPro.
- **MacroPro** is an automatic image processing program and **should be left running all the time**. It is effectively an automated version of iDAP and can be set up to perform a list of operations (a *macro*) on each image output by XRIT Ingester every time it is updated with the latest data. The processing operations include enhancement, masking, exporting, printing, animation, reprojection and creation of products. MacroPro will not do anything unless you set up macros for the images you want to process.
- **iDAP** (integrated display and processing) allows you to view, process, print and export images output by XRIT Ingester and processed by MacroPro. You can also play back and edit animations created by MacroPro.

Tutorials

Below are several tutorials designed to show you how to use the core software functions and see some initial results. They are intended to be performed in sequence and therefore follow on from each other.

Having completed the tutorials, we recommend you explore the software further, referring to the separate *XRIT Ingester software user guide* and *iDAP/MacroPro software user guide*.

Tutorial 1: Setting up an iDAP image output

To be able to view ingested GOES HRIT images in iDAP you need to set up outputs in XRIT Ingester. This tutorial will show how to set up a single plane iDAP image output for an area of the GOES HRIT **IR13 FD** product which covers the USA.

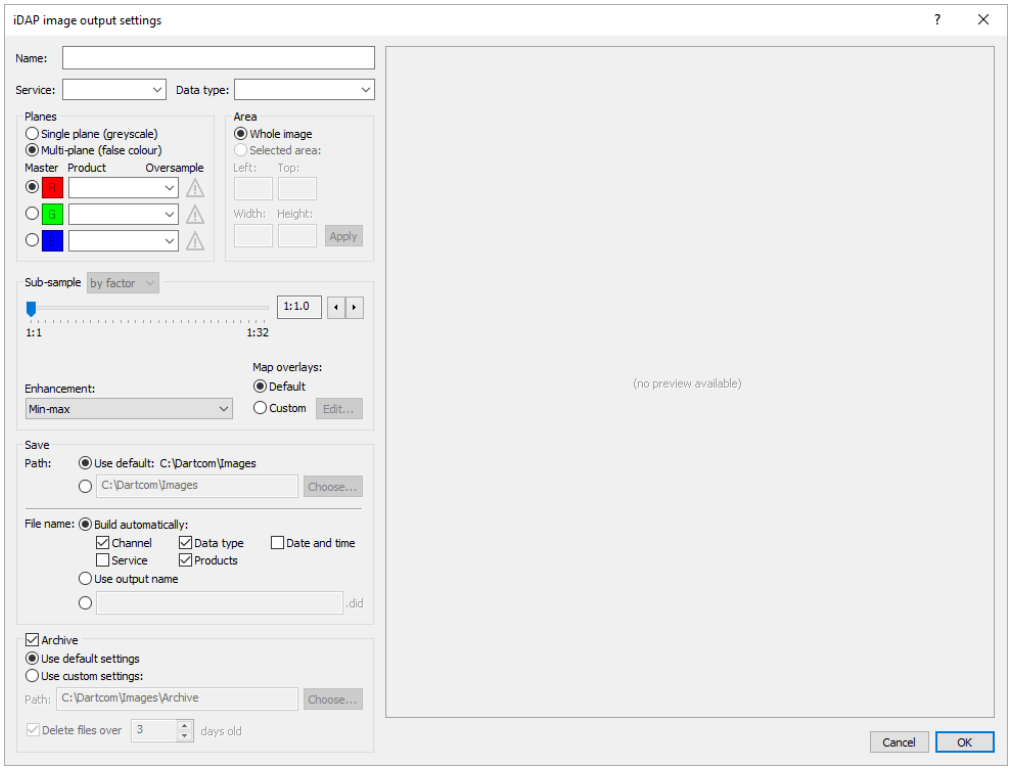
❶ If it is not already running, start XRIT Ingester from the Windows **Start** menu.

❷ Click the **GOES HRIT** tab, then click the **Output** tab.

❸ Ensure **Output data**, **Image data** and **iDAP image** are switched on.

❹ Under **Image data** right-click **iDAP image** and select **Add output...**. The **iDAP image output settings** window (figure 7.1) is displayed.

Figure 7.1
The **iDAP image output settings** window ready to add an output



❺ In this tutorial we will be setting up an output for the 10.3µm infra-red band (channel 13) which covers the USA, so enter **USA IR13** in the **Name** box.

❻ In the **Service** drop-list select **GOES-16** if you receive GOES East, or **GOES-18** if you receive GOES West.

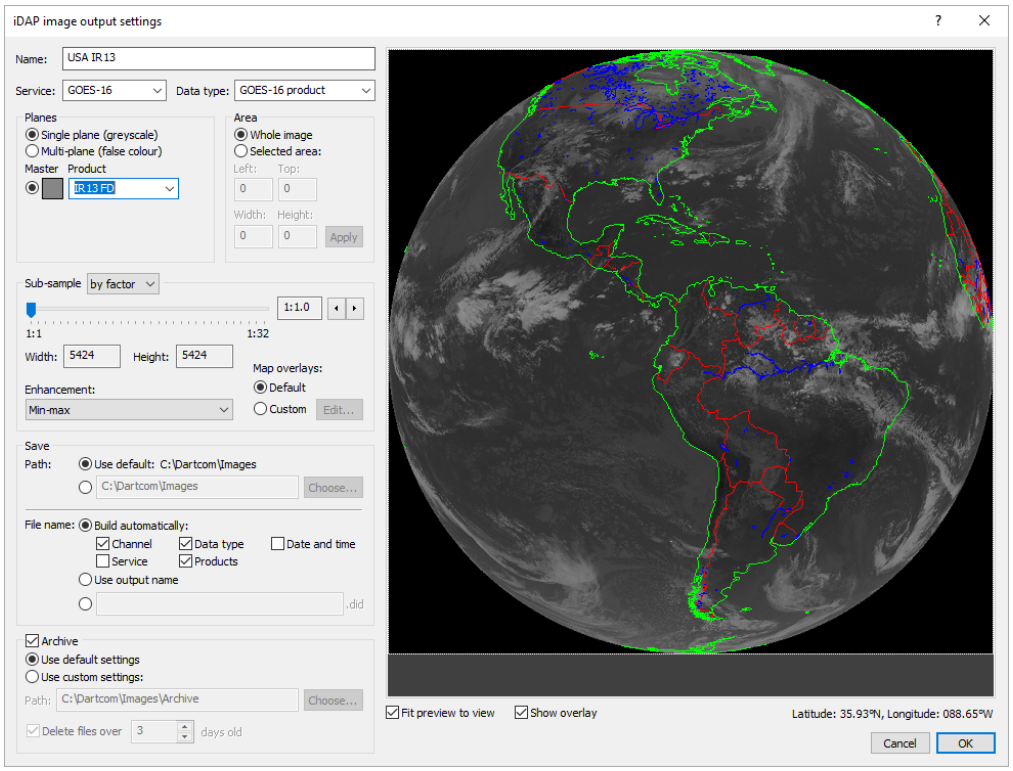
❼ In the **Data type** drop-list select **GOES-16 product** or **GOES-18 product** as appropriate.

If the above items are not listed, click Cancel, leave the system ingesting data for around half an hour, then continue this tutorial.

❽ In the **Planes** area select **Single plane (greyscale)**.

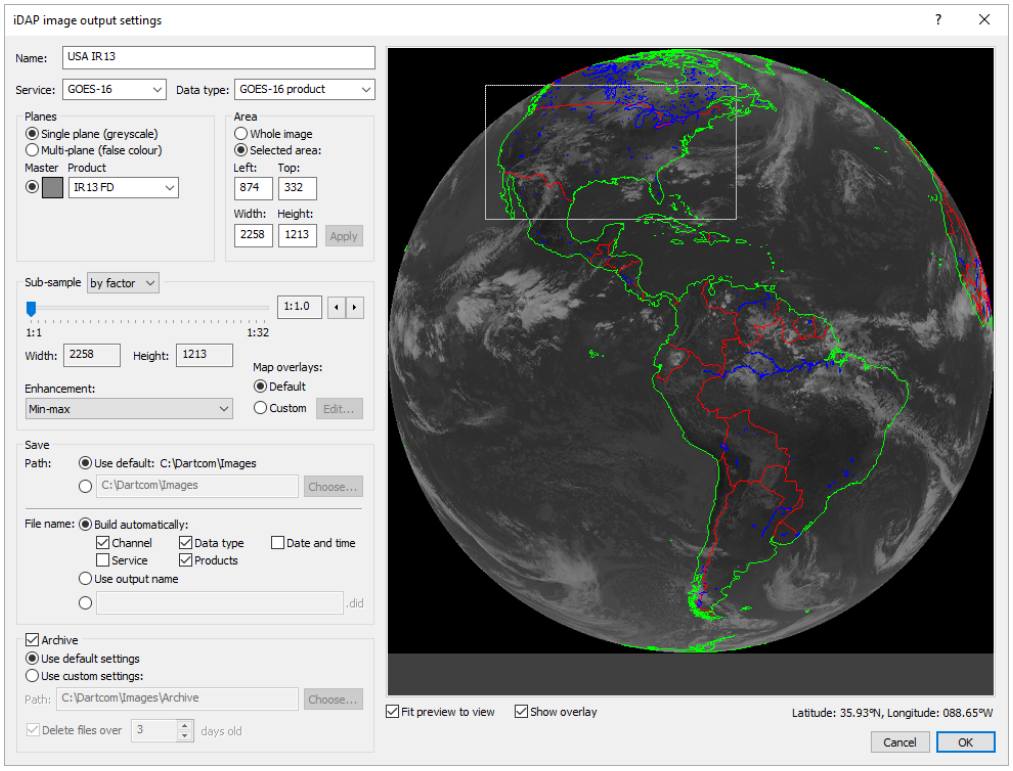
❾ In the **Product** drop-list select **IR13 FD**. A preview is displayed on the right-hand side as shown in figure 7.2.

Figure 7.2
The **IR13 FD** product selected and its preview displayed



❿ In the **Area** area, click **Selected area**, then draw a rectangular box on the preview which covers the USA, as shown in figure 7.3.

Figure 7.3
An area selection box drawn around the USA

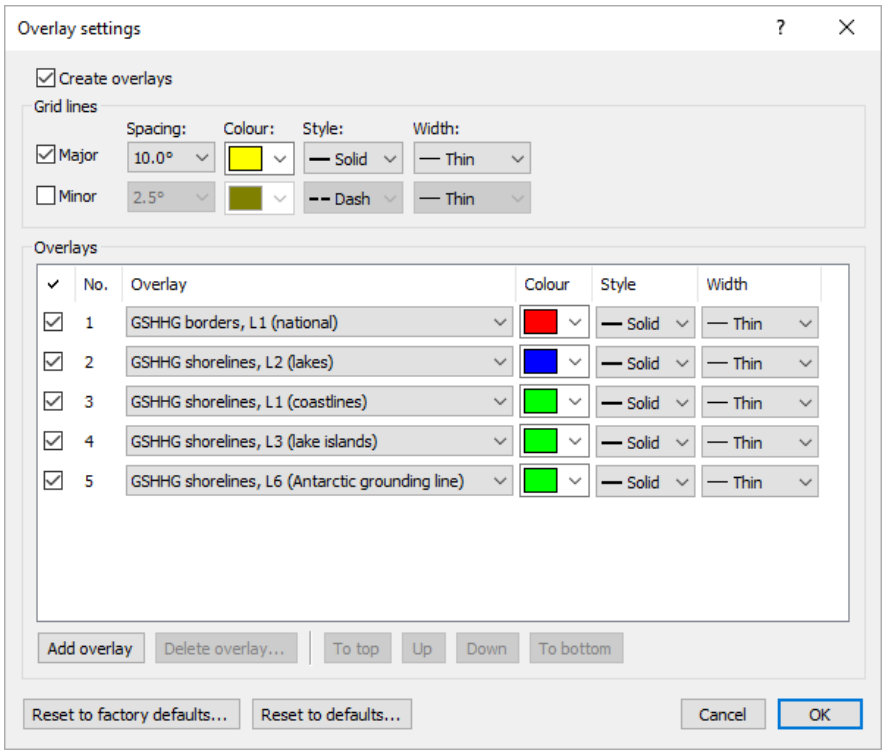


⓫ In the **Sub-sample** area, ensure **by factor** is selected in the drop-list and the slider is set to **1:1**. This will produce a full-resolution image.

⓬ Ensure **Min-max** is selected in the **Enhancement** drop-list.

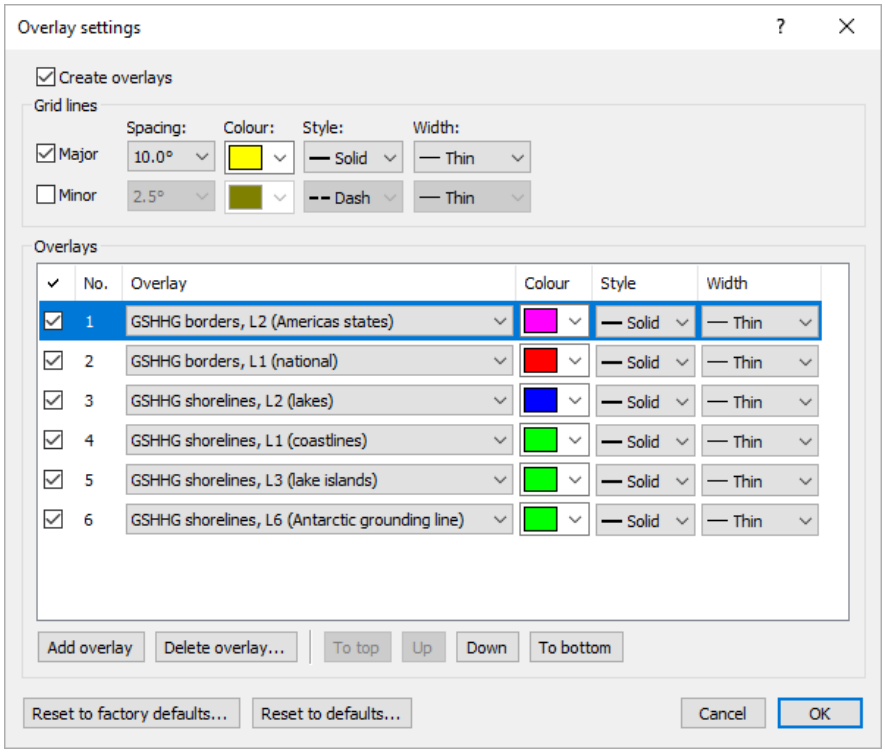
⓭ Set **Map overlays** to **Custom** and click **Edit...** to display the **Overlay settings** window (figure 7.4).

Figure 7.4
The **Overlay settings** window with the default overlays



⓮ Click **Add overlay**. A new overlay will be added at the top of the **Overlays** list. In the drop-list in the **Overlay** column, select **GSHHG borders, L2 (Americas states)**. Use the picker in the **Colour** column to set the overlay's colour to magenta. The window should now resemble figure 7.5.

Figure 7.5
The **GSHHG borders, L2 (Americas states)** overlay added

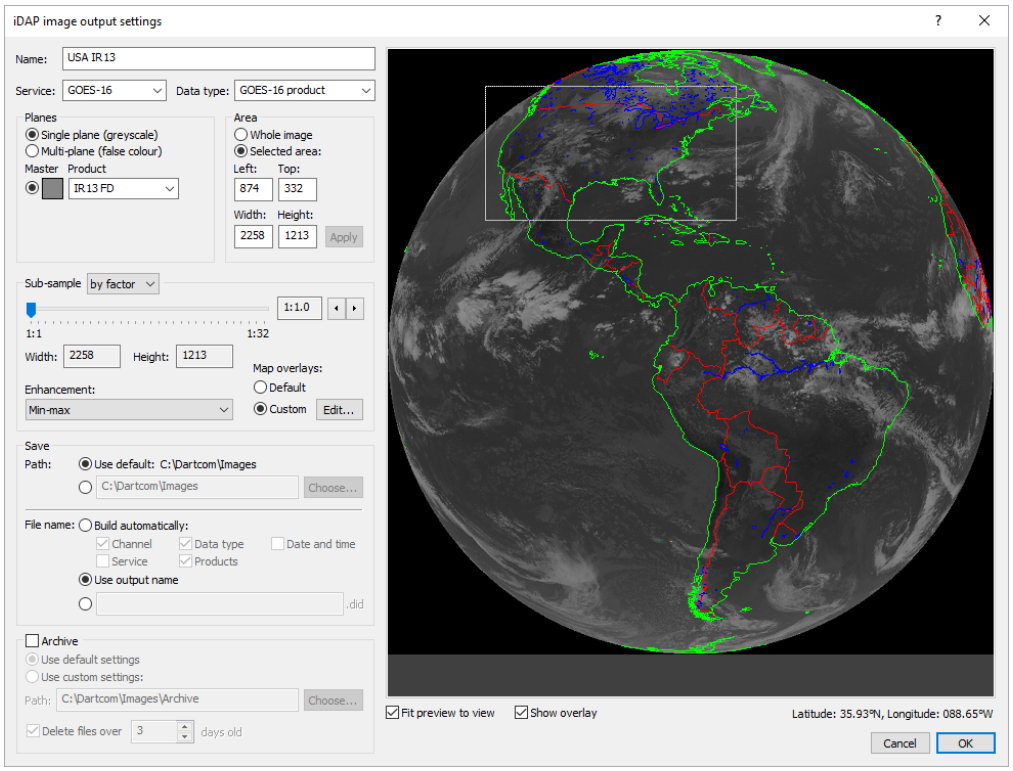


⓯ Click **OK** to close the **Overlay settings** window.

⓰ In the **Save** area of the **iDAP image output settings** window, ensure **Path** is set to **Use default**, then set **File name** to **Use output name**.

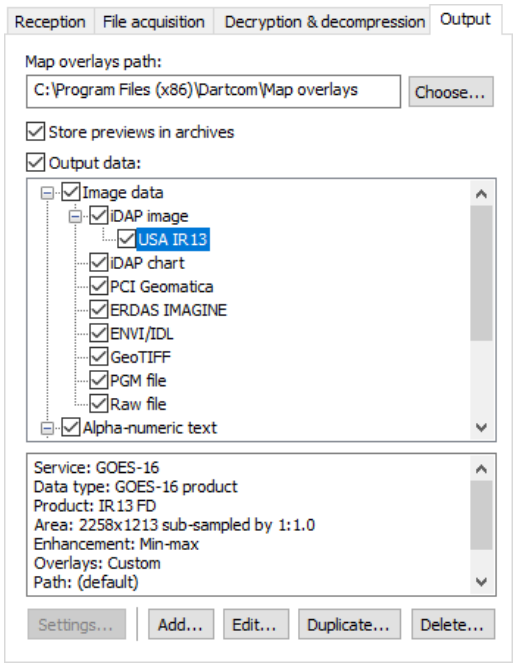
⓱ Ensure **Archive** is switched off. The window should now resemble figure 7.6.

Figure 7.6
The **USA IR13** output fully set up



⓲ Click **OK** to add the output. The **Output** tab should now resemble figure 7.7, with a new output named **USA IR13** listed beneath **Image data▸iDAP image**. Its settings are shown in the box below the **Output data** box.

Figure 7.7
The **Output** tab with the **USA IR13** iDAP image output added



⓳ Click **Apply settings** (below the **Output** tab).

⓴ In the **Latest data** list within the **Output** area in the **Status** area, select **GOES-16/18▸Image data▸GOES-16/18 product▸IR13 FD** as appropriate. Its preview will be displayed on the right-hand side. Wait until all of its segments have been received, then move on to the next tutorial which will show you how to view the resulting image in iDAP.

If all segments had already been received when you clicked Apply settings, you will need to wait for the next transmission of the IR13 FD product before moving on. This is because outputs are produced immediately after the last segment of their corresponding product (or products) has been received.

Tutorial 2: Opening an iDAP image

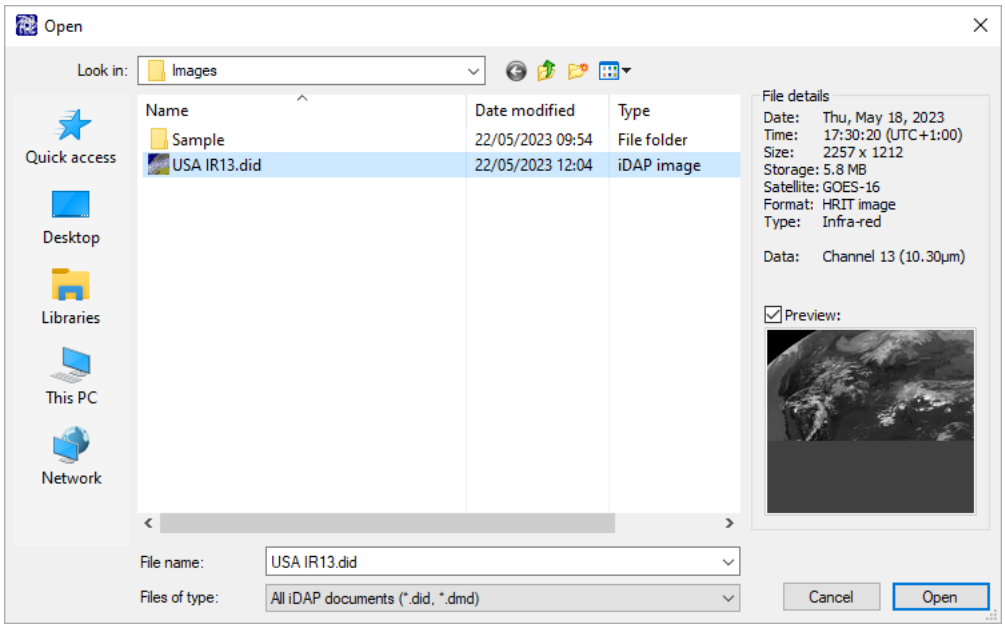
This tutorial will show you how to open and view the iDAP image that was created by the XRIT Ingester output you added in the previous tutorial.

❶ If it is not already running, start iDAP from the Windows **Start** menu.

❷ In the **View** menu, ensure **Palette key**, **Station position**, **Points features**, **Track features**, **Range rings**, **Overlays**, **Lat/lon legends**, **Tool bar**, **Read-outs panel** and **Status bar** are switched on.

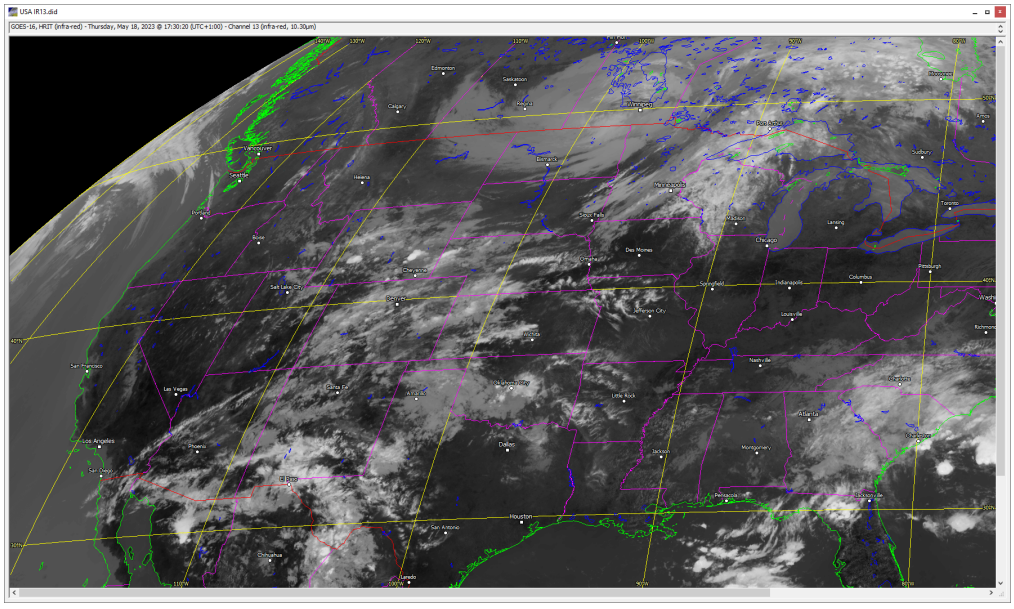
❸ Select **File▸Open…**. The **Open** window (figure 7.8) is displayed. In the **Files of type** drop-list, ensure **All iDAP documents** is selected. Select the **USA IR13** image (icon) and click **Open**.

Figure 7.8
The **Open** window with the **USA IR13** image selected



❹ The **USA IR13** image is opened in a new iDAP image window (figure 7.9). You can move the mouse over the image to see read-outs in the panel on the right-hand side of your screen. There are many processing facilities to explore, but for now move on to the next tutorial which will show you how to create an animation.

Figure 7.9
The **USA IR13** iDAP image



Tutorial 3: Creating an animation

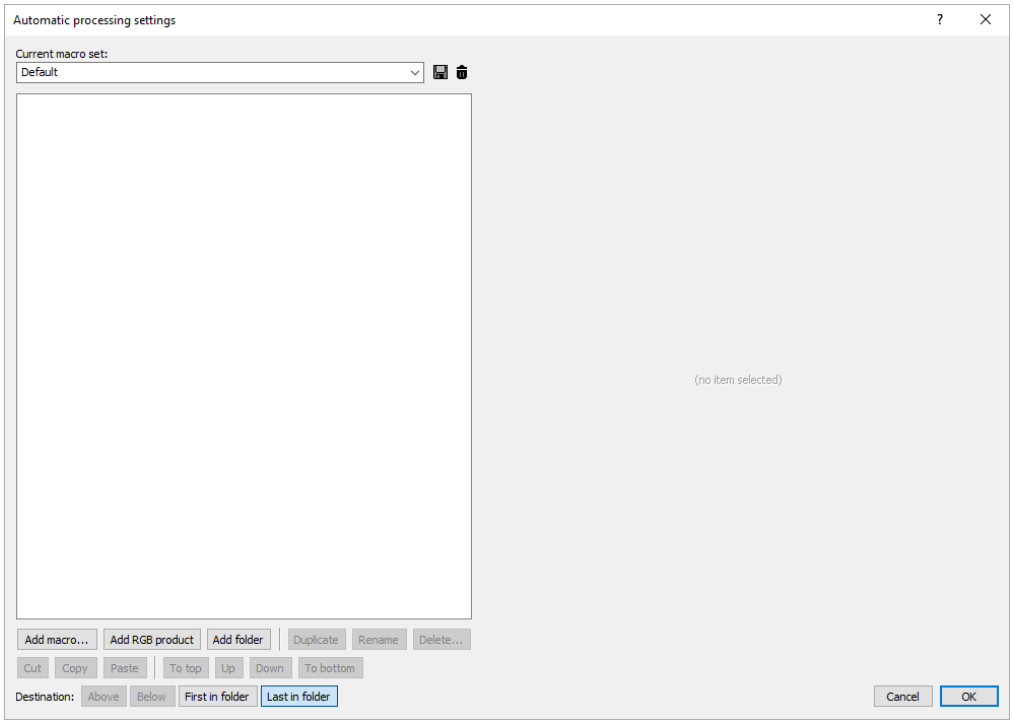
This tutorial will show how to automatically animate the iDAP image output set up in tutorial 1. It will also show how to add a Blue Marble mask to a single-plane (greyscale) image to give it some colour.

❶ If MacroPro is not already running, start it by selecting **Utilities▸Start MacroPro...** within iDAP.

❷ By default, MacroPro minimises itself after opening because it normally runs in the background with no user input required. Click its icon in the Windows task bar to restore it.

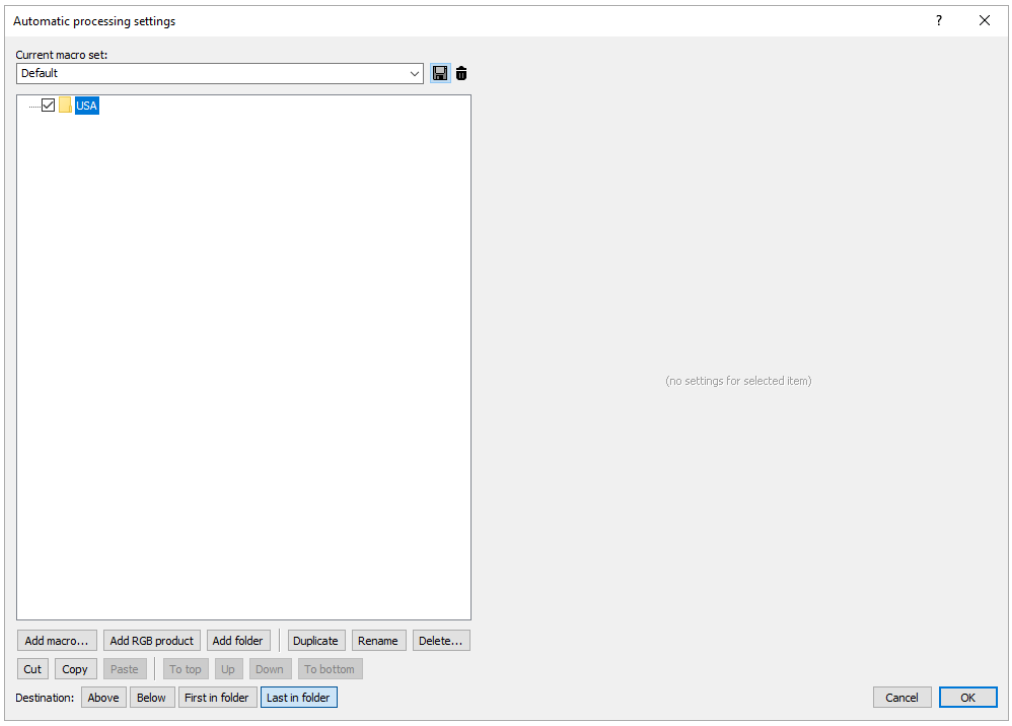
❸ Select **Utilities▸Automatic processing settings...**. The **Automatic processing settings** window (figure 7.10) is displayed. This allows you to set up *macros* which perform processing automatically when new images are output by XRIT Ingester.

Figure 7.10
The **Automatic processing settings** window



❹ Macros can be organised into folders to make them easier to find and manage. Click **Add folder** and name it **USA**. The window should now resemble figure 7.11.

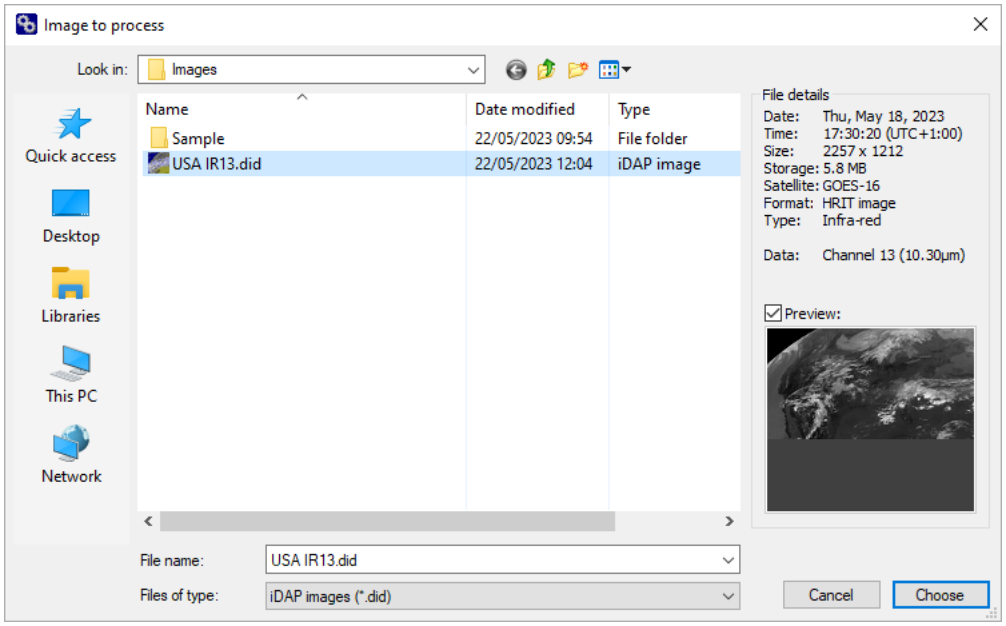
Figure 7.11
The **USA** folder added to the macro set



When adding folders or macros, you can choose its position by either selecting an existing item and using the Destination selector at the bottom of the window, or right-clicking an existing item to display a menu with options for adding a new item inside, above or below it. This tutorial will use the right-click approach.

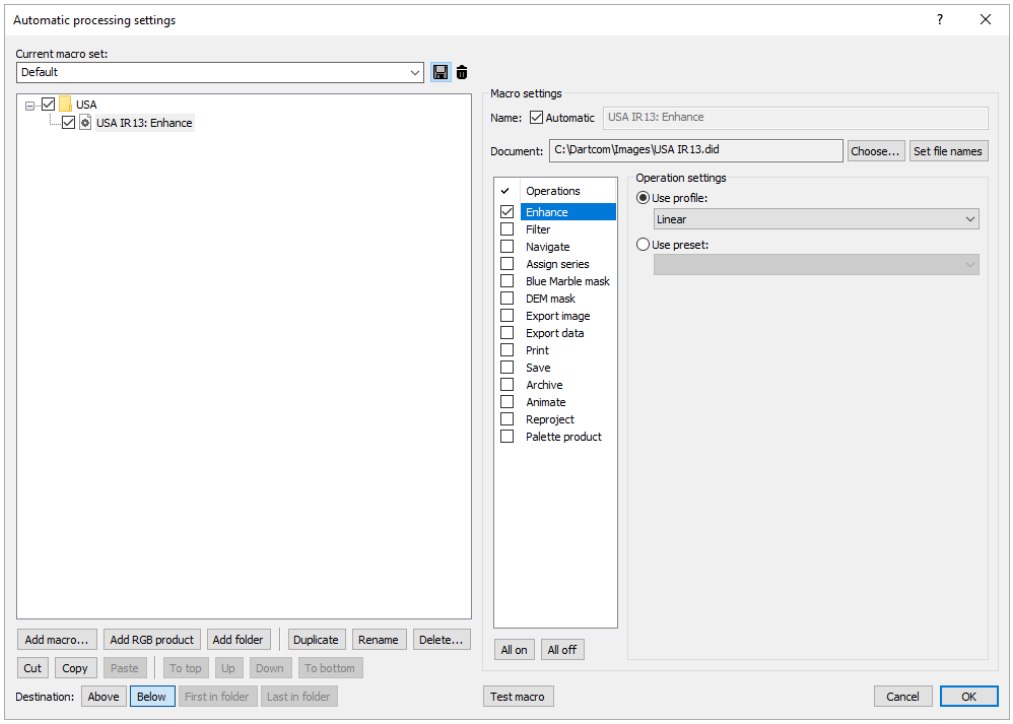
❺ Right-click the **USA** folder and select **Add macro▸Last in folder...**. The **Image to process** window (figure 7.12) is displayed. Select **USA IR13** and click **Choose**.

Figure 7.12
The **Image to process** window



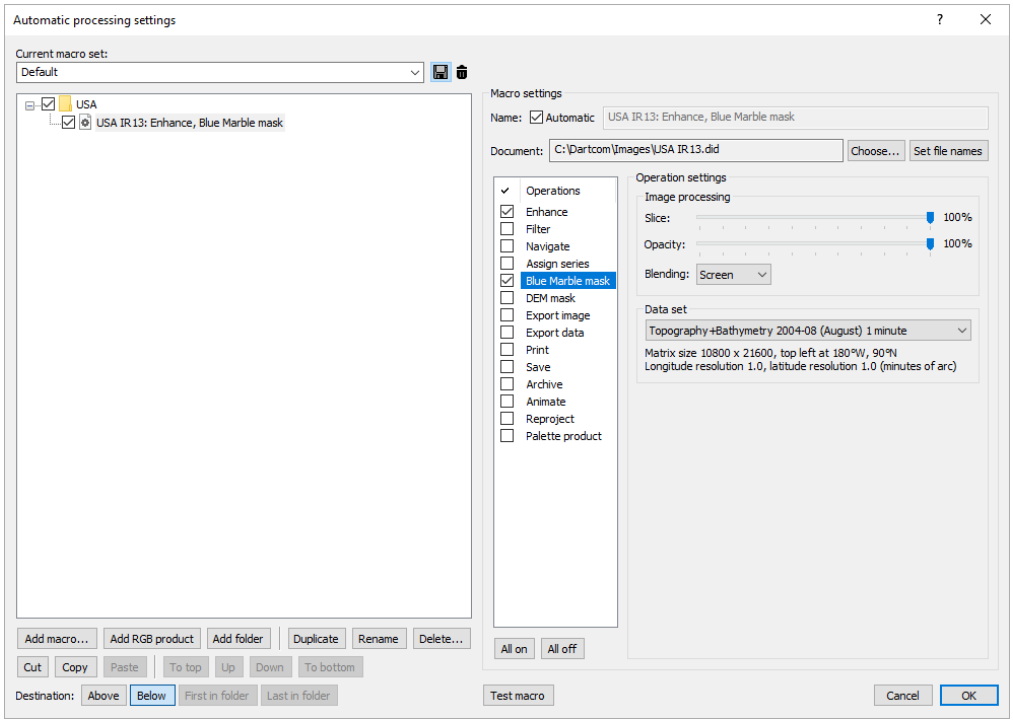
❻ A new macro named **USA IR13** will now have been added to the macro set. In the **Operations** list, switch on **Enhance**. Ensure **Use profile** is selected and **Linear** is selected in the drop-list below it. This will ensure the animation frames have even contrast regardless of the time of day. The window should now resemble figure 7.13.

Figure 7.13
The **Enhance** operation switched on and configured



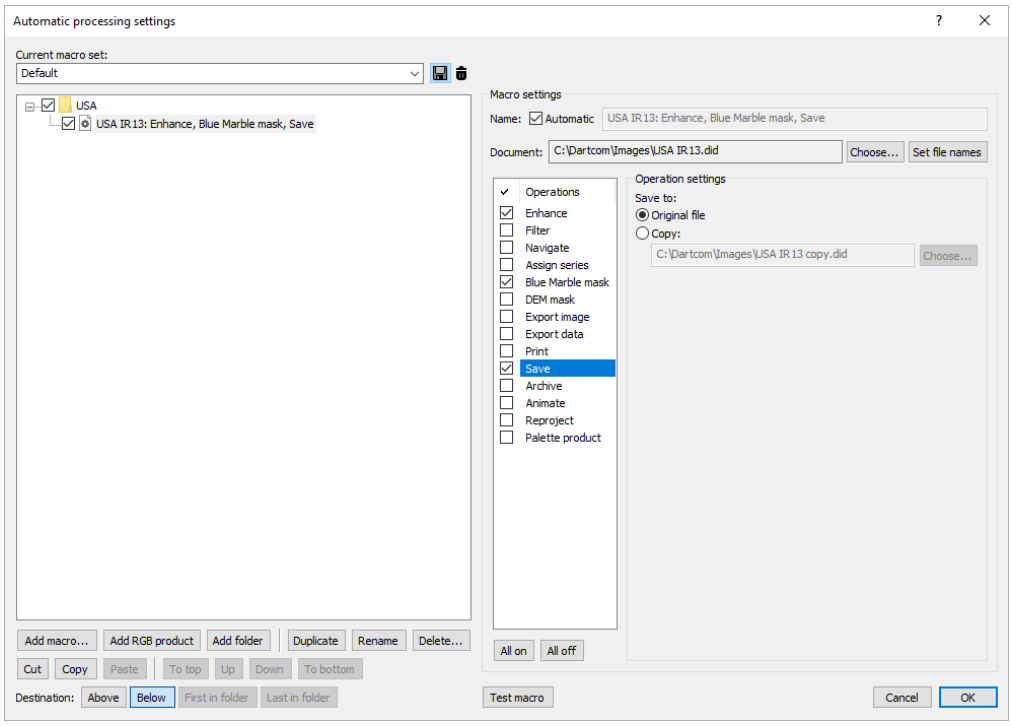
❼ In the **Operations** list, switch on **Blue Marble mask**. Ensure **Slice** and **Opacity** are both set to 100% and **Blending** is set to **Screen**. In the **Data set** drop-list, select **Topography+Bathymetry 2004-08 (August) 1 minute**. The window should now resemble figure 7.14.

Figure 7.14
The **Blue Marble mask** operation switched on and configured



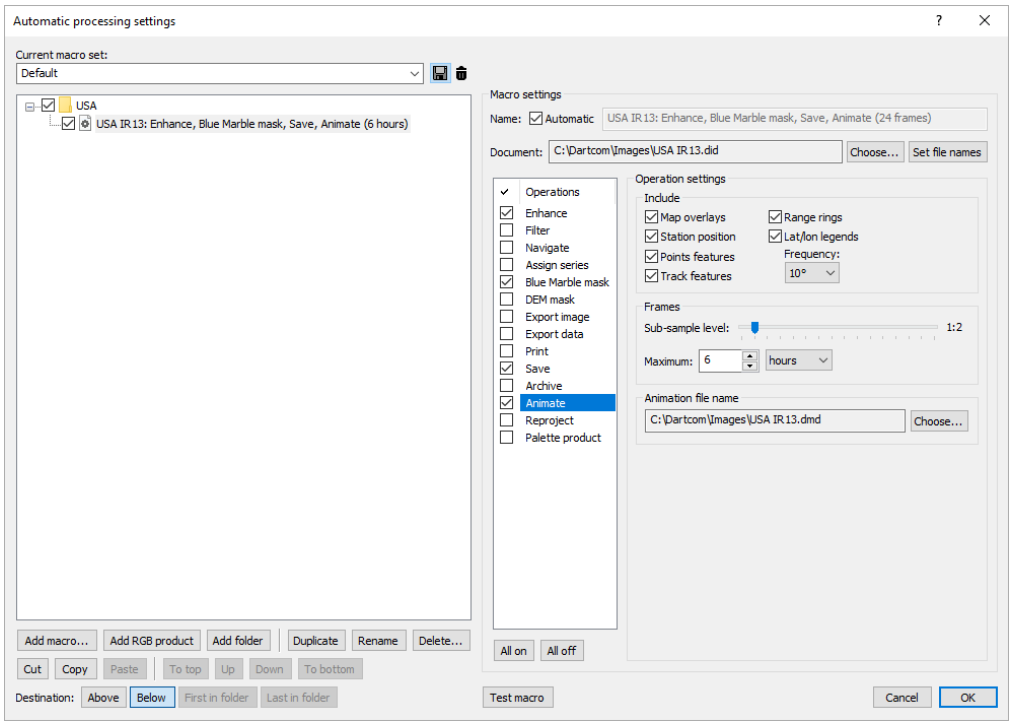
❽ In the **Operations** list, switch on **Save**. Ensure **Original file** is selected. This will cause the enhancement and Blue Marble mask to be saved. The window should now resemble figure 7.15.

Figure 7.15
The **Save** operation switched on



❾ In the **Operations** list, switch on **Animate**. Ensure all the options in the **Include** area are switched on and **Frequency** is set to 10˚. Set **Sub-sample level** to 1:2 so the animation is half the size of the original image. Set **Maximum** to 6 and select **hours** in the drop-list. The window should now resemble figure 7.16.

Figure 7.16
The **Animate** operation switched on and configured



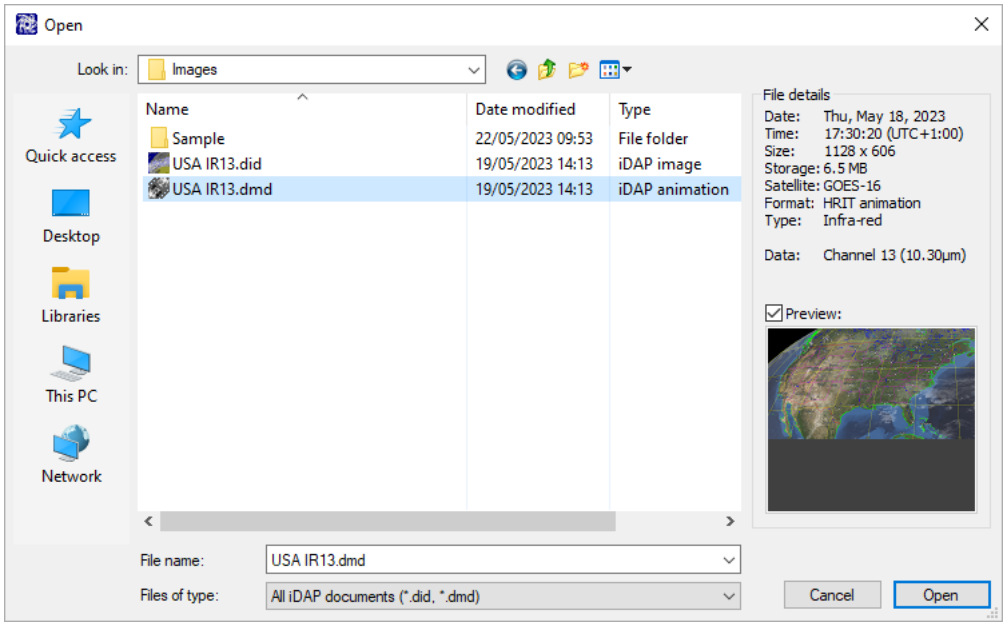
❿ Click 💾 to save the changes to the macro set.

⓫ Click **Test macro** (below the **Macro settings** area). After the test, a message will appear telling you if it was successful, and if not, what the problem was.

⓬ Click **OK** to close the **Automatic processing settings** window.

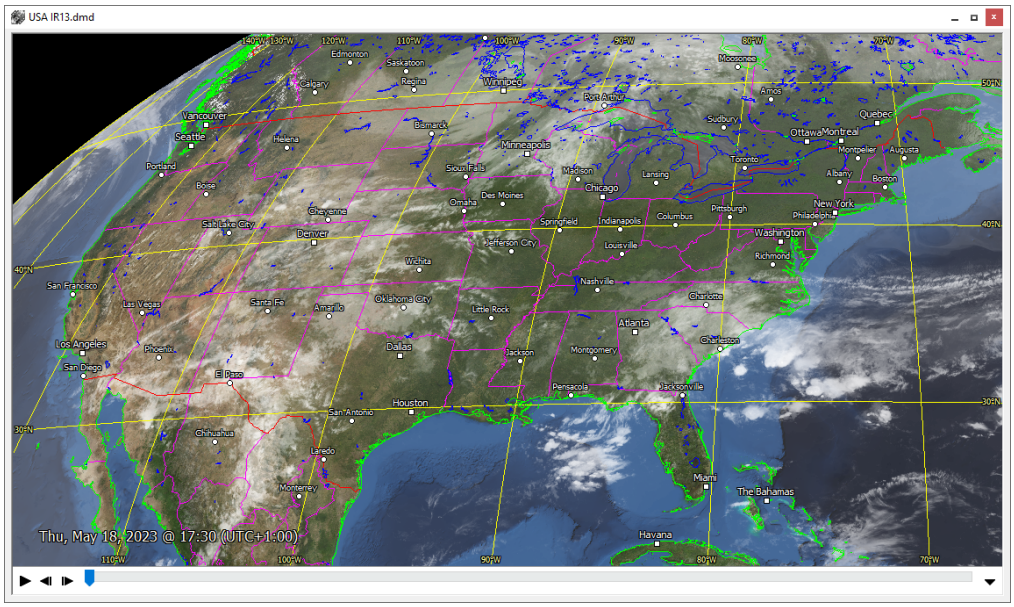
⓭ Select **File▸Open...**. The **Open** window (figure 7.17) is displayed. In the **Files of type** drop-list, ensure **All iDAP documents** is selected. Select the **USA IR13** animation (icon) and click **Open**.

Figure 7.17
The **Open** window with the **USA IR13** animation selected



⓮ The **USA IR13** animation is opened in a new iDAP animation window (figure 7.18). It will only have one frame at this point, but opening it allows you to check the macro's results and alter its settings if needed.

Figure 7.18
The **USA IR13** animation



⓯ Close the animation window, then move on to the next tutorial.

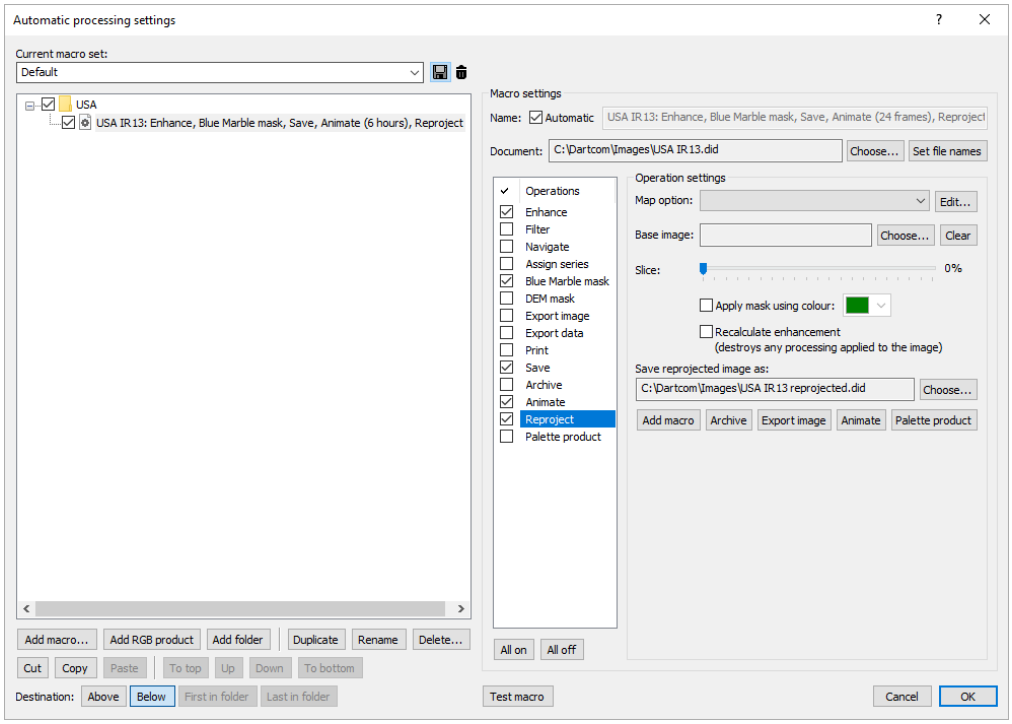
Tutorial 4: Reprojecting an image

This tutorial will show how to automatically *reproject* an image, which is normally done to remove the perspective distortion inherent in a satellite view. Reprojecting an image in iDAP and MacroPro involves warping it into a *map option*, which defines a cartographic

projection (such as Mercator or Polar Stereographic), geographical area, physical image size and overlay settings. The reprojected image is saved as a new iDAP image document.

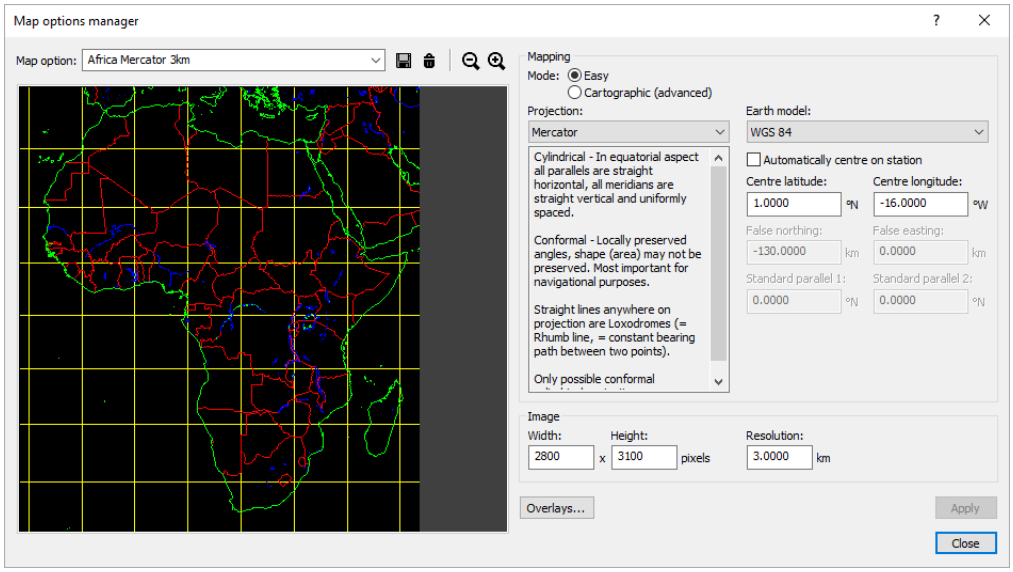
❶ Select **Utilities▸Automatic processing settings...**, then select the **USA IR13** macro. In the **Operations** list, switch on **Reproject**. The **Automatic processing settings** window should now resemble figure 7.19.

Figure 7.19
The **Reproject** operation switched on



❷ Next to the empty **Map option** drop-list, click **Edit...**. The **Map options manager** window (figure 7.20) is displayed with one of the existing map options selected.

Figure 7.20
The **Map options manager** window



❸ In the **Map option** drop-list, select **(new)** to create a new map option. In the **Mapping** area, ensure **Mode** is set to **Easy**, **Projection** is **Mercator**, **Earth model** is **WGS 84** and **Automatically centre on station** is switched off. For **Centre latitude** enter **37** and for **Centre longitude** enter **82**. Note that latitudes south of the equator and longitudes east of 0° must be entered as negative numbers.

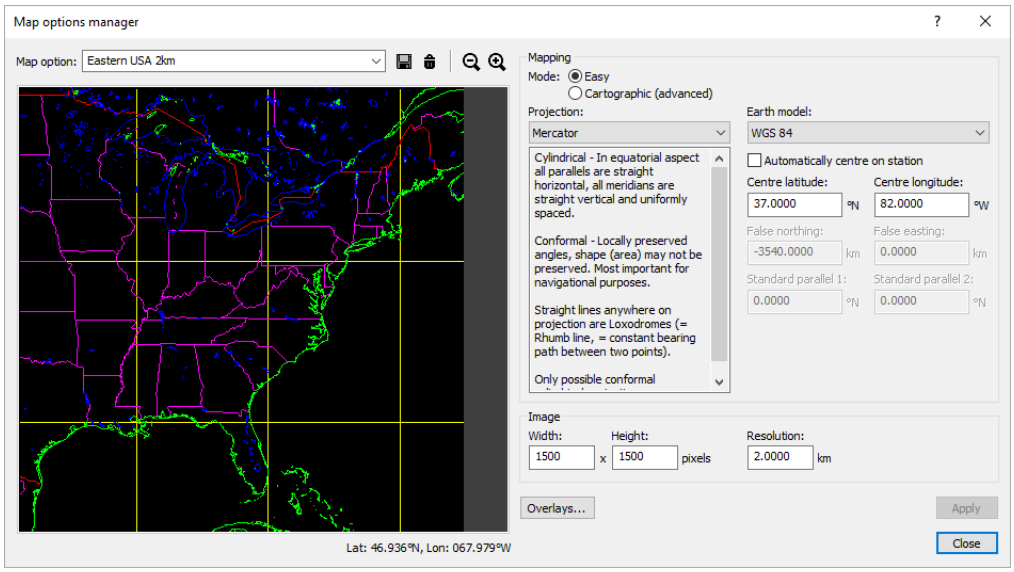
❹ In the **Image** area, enter **1500** for **Width** and **Height**, and **2** for **Resolution**.

❺ Click **Overlays…** and add the **GSHHG borders, L2 (Americas states)** overlay as described in step ⓮ of tutorial 1.

❻ Click **Apply** to redraw the map option.

❼ In the **Map option** drop-list, enter **Eastern USA 2km**, then click the 💾 icon. The window should now resemble figure 7.21.

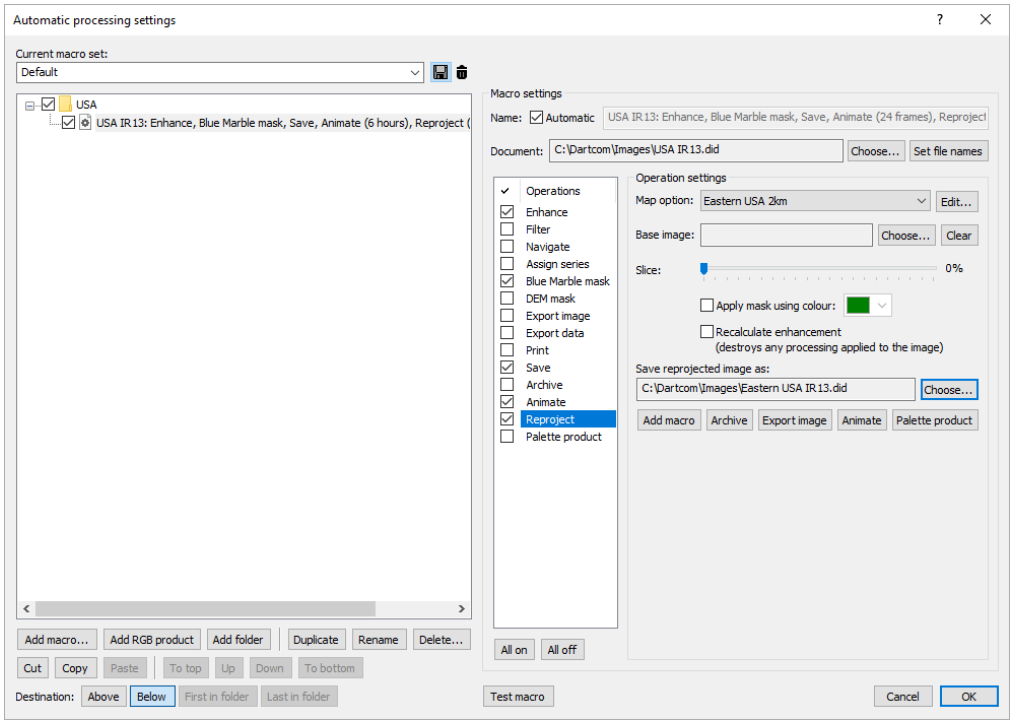
Figure 7.21
The **Map options manager** window configured for eastern USA



❼ Click **Close** to return to the **Automatic processing settings** window. Notice that **Map option** has now been set to **Eastern USA 2km**.

❽ Next to the **Save reprojected image as** box, click **Choose…** and change the name to **Eastern USA IR13**. The **Automatic processing settings** window should now resemble figure 7.22.

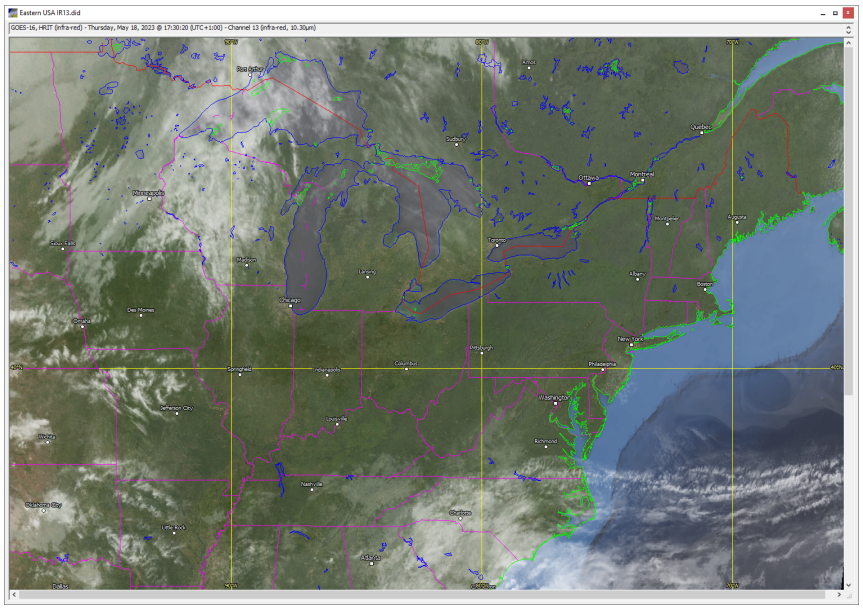
Figure 7.22
The **Reproject** operation configured for eastern USA



❾ Click 💾 to save the changes to the macro set.

❿ If desired, click **Test macro** and open the reprojected image to check it (figure 7.23) then return to the **Automatic processing settings** window as shown in figure 7.22 and continue to the next tutorial.

Figure 7.23
The **Eastern USA IR13** image



Tutorial 5: Creating a palette product

This tutorial will show how to automatically create a *palette product*, which involves calculating a value for each pixel in an image and colouring the image using a palette that corresponds values to colours. The palette product is saved as a new iDAP image document.

For this tutorial, the palette product will be created from the reprojected image produced by the **USA IR13** macro configured in the previous tutorials.

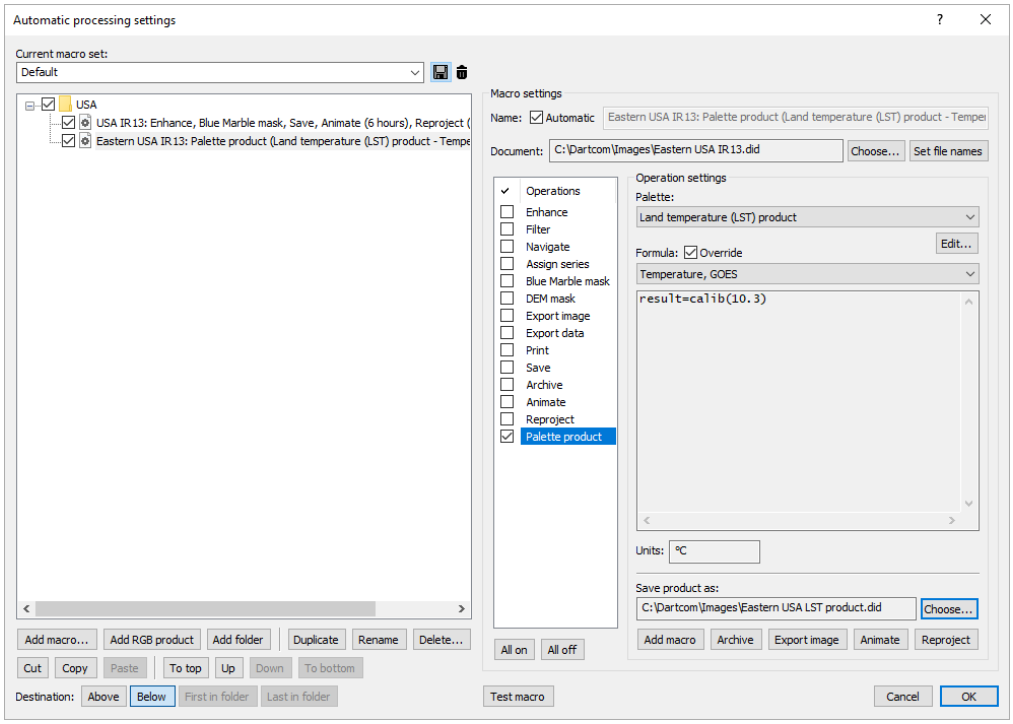
Note that the Palette product operation for the USA IR13 macro will use the original image, not the reprojected one. This is because the Reproject operation produces a new iDAP image document. Therefore to create a palette product from a reprojected image, it is necessary to add a new macro for it.

❶ Assuming you are in the **Automatic processing settings** window and it resembles figure 7.22, in the **Operation settings** area notice the row of buttons under the **Save reprojected image as** box. The **Add macro** button creates a new macro for the reprojected image. The other buttons do the same but also switch on the corresponding operation. So to add a macro that creates a palette product for the **Eastern USA IR13** reprojected image, click the **Palette product** button.

❷ The **Palette product** settings for the new macro will have been displayed automatically. In the **Palette** drop-list, select **Land temperature (LST) product**. To ensure the correct formula is used, switch on **Overrride** and in the **Formula** drop-list, select **Temperature, GOES**.

❸ Next to the **Save product as** box, click **Choose...** and change the name to **Eastern USA LST product**. The **Automatic processing settings** window should now resemble figure 7.24.

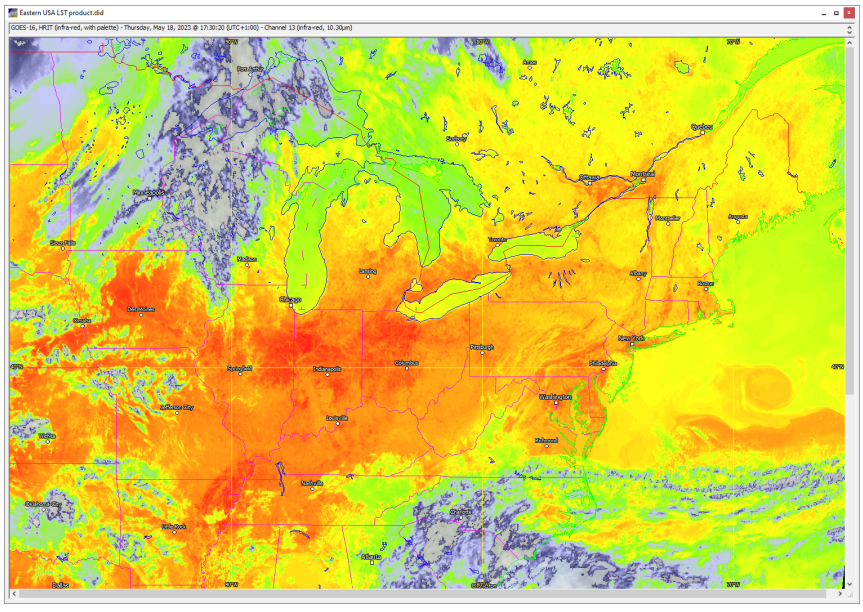
Figure 7.24
The **Palette product** operation configured for land temperature



❹ Click 💾 to save the changes to the macro set.

❺ If desired, click **Test macro** and open the palette product to check it (figure 7.25), then return to the **Automatic processing settings** window as shown in figure 7.24 and continue to the next tutorial.

Figure 7.25
The **Eastern USA LST product** image



Tutorial 6: Masking a palette product

This tutorial will show how to automatically apply a mask to a palette product. This is normally done to obscure irrelevant areas, such as sea in a land temperature product.

❶ Assuming you are in the **Automatic processing settings** window and it resembles figure 7.24, in the **Operation settings** area notice the row of buttons under the **Save product as** box. To add a macro for the **Eastern USA LST product** image, click the **Add macro** button.

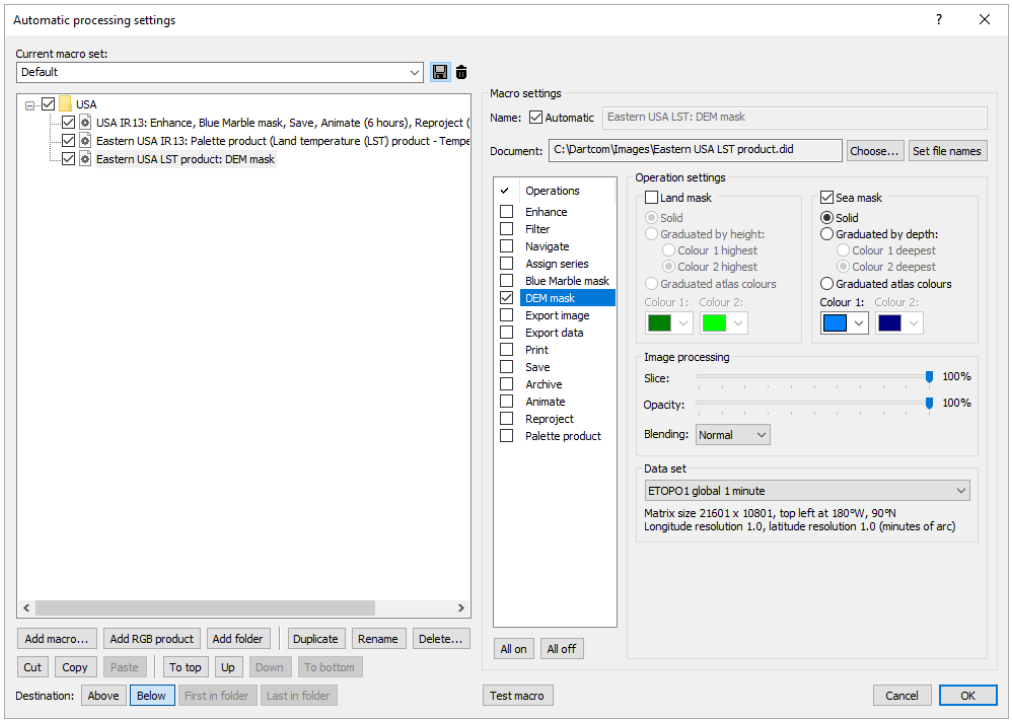
❷ The new macro will have been displayed automatically. In the **Operations** list, switch on **DEM mask**.

❸ In the **Operation settings** area, switch off **Land mask**, switch on **Sea mask** and ensure **Solid** is selected**.**

❹ In the **Image processing** area, set **Blending** to **Normal**.

❺ In the **Data set** area, select **ETOPO1 global 1 minute**. The window should now resemble figure 7.26.

Figure 7.26
The **DEM mask** operation switched on and configured

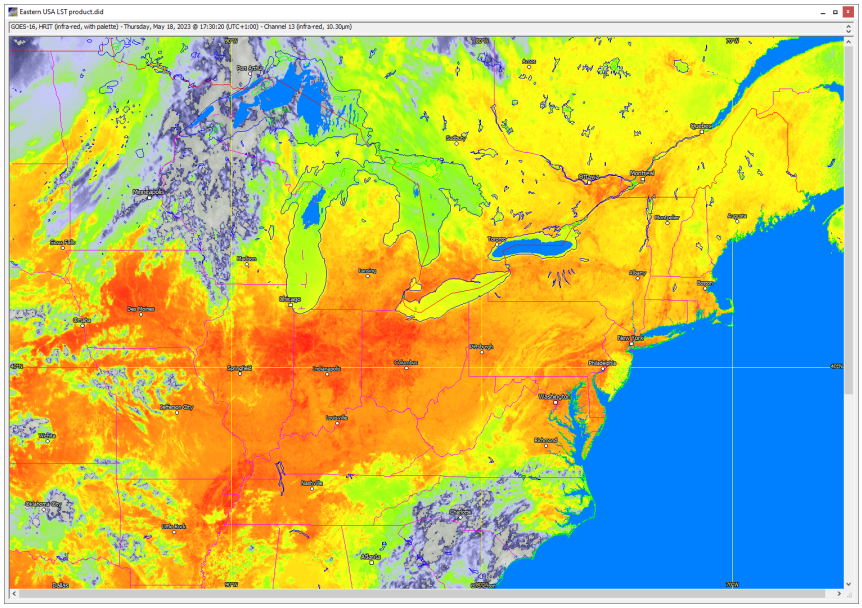


❻ In the **Operations** list, switch on **Save**. Ensure **Original file** is selected. This will cause the DEM mask to be saved.

❼ Click 💾 to save the changes to the macro set.

❽ If desired, click **Test macro** and open the masked palette product to check it (figure 7.27).

Figure 7.27
The **Eastern USA LST product** image with DEM mask applied



Tutorial 7: Restoring colour to a GOES HRIT product

The GOES HRIT service includes a number of level 2+ products that are transmitted as greyscale images, although they would originally have had a colour palette. This tutorial will show you how to set up an output for a GOES HRIT product in XRIT Ingester, then create a palette product from it automatically in MacroPro to restore the original colours and provide a colour scale key.

❶ If it is not already running, start XRIT Ingester from the Windows **Start** menu.

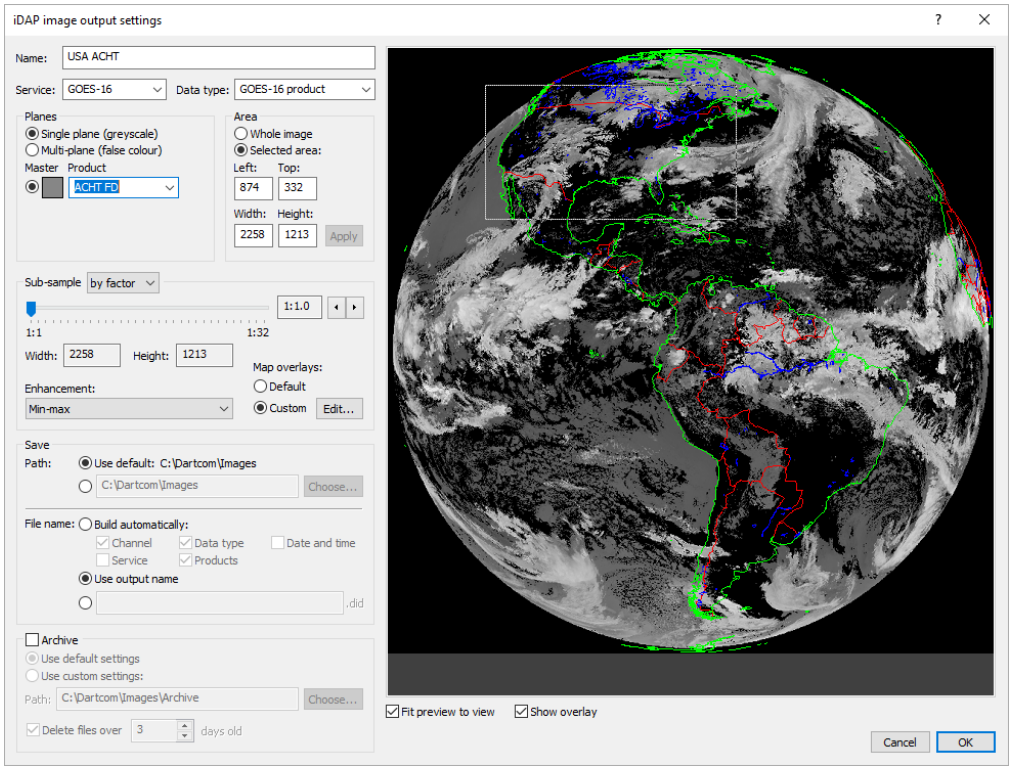
❷ Click the **GOES HRIT** tab, then click the **Output** tab.

❸ Right-click the **USA IR13** output added in tutorial 1 and select **Duplicate output…**.

❹ Change **Name** to **USA ACHT**.

❺ In the **Product** drop-list select **ACHT FD**. A preview is displayed on the right-hand side. The window should now resemble figure 7.28.

Figure 7.28
The **ACHT FD** product selected



❻ Click **OK**.

❼ Click **Apply settings** (below the **Output** tab).

❽ In the **Latest data** list within the **Output** area in the **Status** area, select **GOES-16/18▸Image data▸GOES-16/18 product▸ACHT FD** as appropriate. Its preview will be displayed on the right-hand side. Wait until a new version of the product has been received and the new output has run, then continue to the next step.

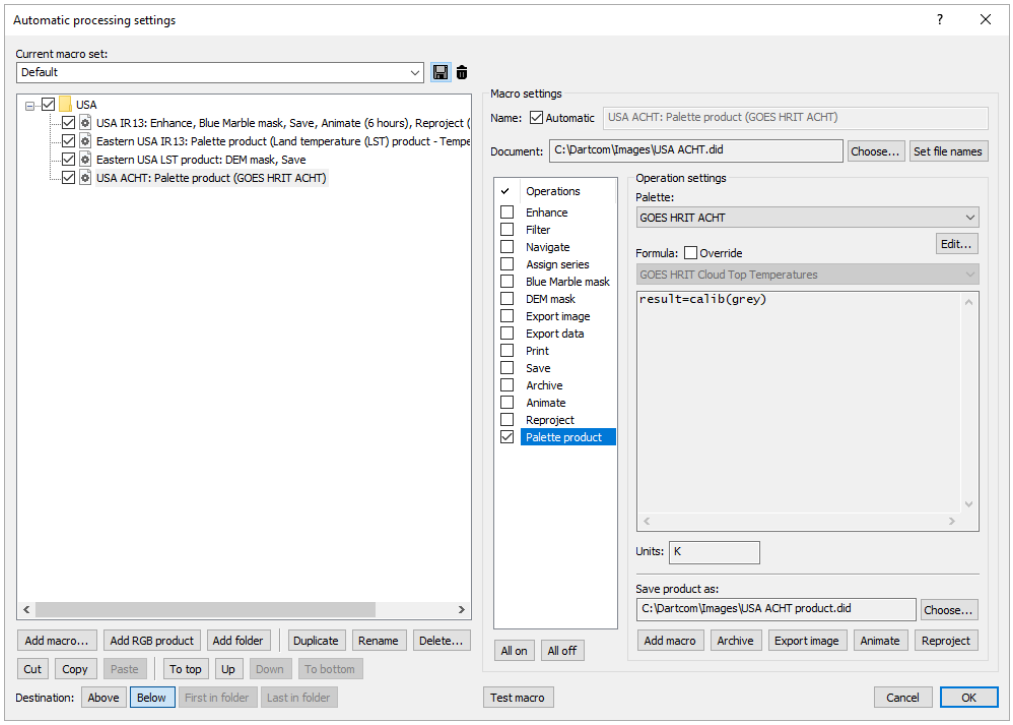
❾ Assuming Macro Pro is already running and its window is visible, select **Utilities▸Automatic processing settings…**. The **Automatic processing settings** window is displayed, resembling figure 7.26.

❿ Right-click the **USA** folder and select **Add macro▸Last in folder…**. The **Image to process** window (figure 7.12) is displayed. Choose the **USA ACHT** image.

⓫ A new macro named **USA ACHT** will now have been added to the macro set. In the **Operations** list, switch on **Palette product**.

⓰ In the **Palette** drop-list select **GOES HRIT ACHT**. The window should now resemble that shown in figure 7.29.

Figure 7.29
The **Palette product** operation switched on and configured for ACHT

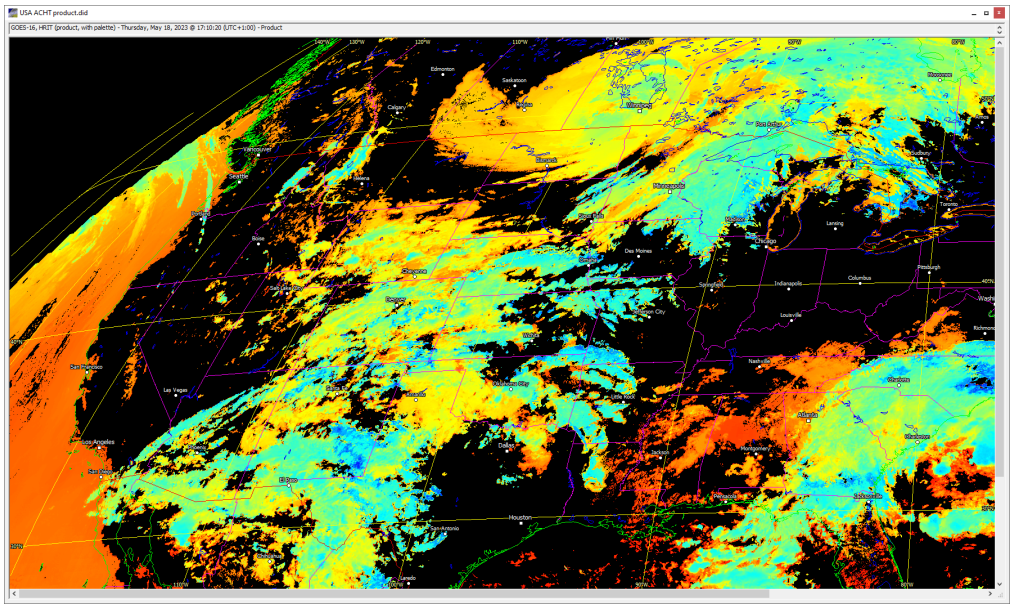


⓱ Note the name that has been automatically set for the resulting palette product (**USA ACHT product**) in the **Save product as** box.

⓲ Click 💾 to save the changes to the macro set.

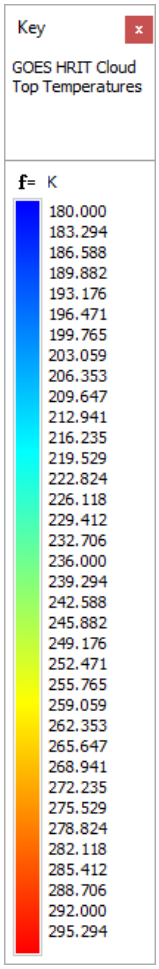
⓳ If desired, click **Test macro** and open the palette product to check it (figure 7.30).

Figure 7.30
The **USA ACHT product** image window



When the image is opened in iDAP, you can display a key (or legend) for the palette colours by selecting **View▸Key…** (figure 7.31). This facility is not available in MacroPro.

Figure 7.31
The iDAP **Key** window for the **USA ACHT product** image



Tips

Below are a number of useful tips, tricks and shortcuts which make many tasks in the software quicker and easier.

XRIT Ingester

- To make XRIT Ingester start up automatically when you switch on the host PC or after a power failure, add its shortcut icon to the Windows **Startup** folder. To display that folder, right-click the Windows **Start** button, select **Run**, then enter **shell:startup** and click **OK**.
- The **Duplicate…** button in the **Output** tab is very useful for quickly creating a number of similar outputs. For example, to create several outputs covering the same area with different products, add the first output, then repeatedly use the **Duplicate…** button, simply changing the name and products as appropriate. All the other settings will be copied from the previous macro.
- When creating a multi-plane iDAP image output, good false colour images can be obtained during daylight hours by assigning a visible product to the red and green planes and an infra-red product to the blue plane.
- To create images of a specific size (for use on a website, for example), use the **to size** sub-sampling method when adding an iDAP image output, then use a MacroPro macro to export the resulting images to JPEG or PNG format via the **Export image** operation.

- Remember to click **Apply settings** after adjusting settings otherwise they will not take effect.
- To prevent changes being made to the settings or the software being closed without authorisation, lock the software using the **Lock…** button. Make sure the password you choose is well known to you or written down and stored somewhere safe, otherwise you will not be able to unlock the software again.

MacroPro

- The **DEM mask** and **Blue Marble mask** automatic processing operations work more consistently with infra-red or water vapour images when slicing out cloud, or if using the **Screen** blending mode. This is because on visible images the pixel values corresponding to cloud vary according to the time of day. It is therefore not possible to set a slice level which works for all images, or obtain a consistent blending level.
- Make sure that you click **OK** when you have finished setting up macros in the **Automatic processing settings** window otherwise none of your macros will run. This is because automatic processing is suspended temporarily while the **Automatic processing settings** window is open.
- MacroPro is not intended for viewing images and animations (unless you are checking the results of a macro). Use iDAP instead because it provides the full range of manipulation and processing facilities whereas MacroPro only provides a very limited subset.
- If you make changes to the iDAP configuration and want to quickly apply the same changes to MacroPro, simply click the **Synchronise with iDAP** button in the MacroPro **Configuration** window (**Utilities▸Configuration…**).
- To prevent changes being made to the macros or the software being closed without authorisation, lock the software using **Utilities▸Lock…**. Make sure the password you choose is well known to you or written down and stored somewhere safe, otherwise you will not be able to unlock the software again.

iDAP

- To make iDAP start up automatically when you switch on the host PC or after a power failure, add its shortcut icon to the Windows **Startup** folder. To display that folder, right-click the Windows **Start** button, select **Run**, then enter **shell:startup** and click **OK**.
- The **DEM masking** (**Navigation▸DEM mask…**) and **Blue Marble masking** (**Navigation▸Blue Marble mask…**) functions work more consistently with infra-red or water vapour images when slicing out cloud, or if using the **Screen** blending mode. This is because on visible images the pixel values corresponding to cloud vary according to the time of day. It is therefore not possible to set a slice level which works for all images, or obtain a consistent blending level.
- A number of additional tools are available for animations by clicking the ▼ button in the bottom right corner of the window. These include playback speed and looping, selection of the part of the animation to play, quick zooming and removal of unwanted frames.
- If you make changes to the iDAP configuration and want to quickly apply the same changes to MacroPro, simply click the **Synchronise with iDAP** button in the MacroPro **Configuration** window (**Utilities▸Configuration…**).

- To prevent changes being made to the macros or the software being closed without authorisation, lock the software using **Utilities▸Lock…**. Make sure the password you choose is well known to you or written down and stored somewhere safe, otherwise you will not be able to unlock the software again.

Summary

You should now be familiar with the core functionality of the software and ready to begin exploring it in detail using the knowledge gained from the tutorials and tips as a basis.

Please refer to the separate *XRIT Ingester software user guide* and *iDAP/MacroPro software user guide* for further information.