**GOES-East EMWIN Broadcast Service Transition**

(NWS/DST - rev 171106-1330)

1. **GOES-East Satellite Transition Overview**

a. On December 14, 2017, the GOES-East EMWIN satellite broadcast signal format will change. This change is the result of the NESDIS GOES-16 satellite replacing the GOES-13 satellite at 75° W longitude. The new GOES-16 satellite provides the EMWIN data stream on a new HRIT/EMWIN broadcast transmission.

 (1) EMWIN users receiving the broadcast from GOES-East (GOES-13) will need to install a new satellite receiver -- HRIT/EMWIN receiver -- and new antenna system, to receive and decode the new HRIT/EMWIN broadcast signal format.

 (2) Software modifications on local computers or workstations may be necessary to properly process the modified file format and naming convention.

 (a) All EMWIN products on the HRIT/EMWIN broadcast will be received as full, contiguous files – the products will no longer be received in [Quick Block Transfer (QBT)](http://www.nws.noaa.gov/emwin/EMWIN%20QBT%20Satellite%20Broadcast%20Protocol%20draft%20v1.0.3.pdf) multi-packet transmission format.

 (b) The EMWIN products on HRIT/EMWIN broadcast have a new file naming convention described in the [EMWIN GOES-R Filename Convention Document (Draft)](http://www.nws.noaa.gov/emwin/EMWIN_GOES-R_filename_convention.pdf) .

GOES-West (135° W) and GOES-East (75° W) Satellite Coverage (Footprint)



b. **No Impact to GOES-West** . These changes to the EMWIN signal from the GOES-East satellite (GOES-16) do not apply to the GOES-West (135° W) satellite. GOES-West satellite users may continue use their existing receivers, antennas and software to receive and decode the EMWIN broadcast from the GOES-West (GOES-15) satellite.

c. **Using GOES-West**. Users impacted by the GOES-East EMWIN changes and within the GOES-West satellite footprint may reorient their antennas to point at the GOES-West satellite in order to continue to use their existing EMWIN receiving equipment. Users should verify they have a continuous, unobstructed antenna view to the GOES-West satellite, and are able to receive adequate signal strength for the broadcast to be received and decoded.

2. **NESDIS GOES-East Satellite Transition Schedule (GOES-13 to GOES-16):**

|  |  |
| --- | --- |
| 11/30/2017  | GOES-13 : Drift satellite from 75° W to 74.5° WGOES-16 : Begins drift from 89.3° W to 75.2° W at 1800 UTC. During drift, GRB, DCS, HRIT/EMWIN, and SARSAT will be disabled |
| **12/11/2017** | **GOES-16 : Stop drift at 75.2° W** |
| **12/14/2017** | **GOES-13 : Disable EMWIN transponder.****GOES-16 : Activate HRIT/EMWIN transponder.** |
| 1/2/2018 | GOES-13 : Begin drift from 74.5° W to 60.0° W |
| 1/22/2018 | GOES-13 : Stop drift at 60.0° W |

Rev 171005-1600

3. **GOES-16 HRIT/EMWIN Satellite Broadcast Information**

a. **HRIT/EMWIN Broadcast Signal Characteristics**:

• Frequency:  1694.1 MHz
• Coding – BPSK
– Convolutional rate ½ code with constraint length 7 concatenated with Reed
Solomon (255,223) with Interleave = 4
– Square Root Raised Cosine filtering using an Alpha factor of 0.3
• Data Rate:  400 Kbps

• Line Coding Format: NRZ-M

• Pseudo-randomization polynomial: h(x) = x8 + x7 + x5 + x3 + 1[4]
• Modem Required: predicted C/No is in the range of 63-67 dB
• Maximum Demodulator Required is -
– Eb/No is 4.6 dB for a BER of 1x10-8 after decoding
• Minimum Antenna System
– At 5 degree elevation, the minimum antenna is 1.2 meter.
– At 10 degrees or more elevation the minimum size is 1.0 meter
– Using a LNA or LNB with a system noise temperature of about 200 K will
provide a G/T of 1.0 dB/K or -0.3 dB/K respectively

b. **HRIT/EMWIN Broadcast Virtual Channels.** The HRIT/EMWIN broadcast utilizes virtual channels for the transmission of several simultaneous data streams. The table below identifies the current virtual channels assignments. The EMWIN and DCS virtual channels are permanent assignments; the remaining channel assignment may be modified in the future.

|  |  |  |
| --- | --- | --- |
| **HRIT/EMWIN Virtual Channel ID** | **Group** | **Product Name** |
| 0 | Imagery | Admin Text Messages |
| 1 | Imagery | Mesoscale 1km (ch. 2, 7, 13) |
| 2 | Imagery | Band 2 - Red |
| 3 | Imagery | GOES-13 IR |
| 6 | Imagery | GOES-15 IR |
| 7 | Imagery | Band 7 - Shortwave Window |
| 8 | Imagery | Band 8 |
| 9 | Imagery | Band 9 - Mid-Level Trop |
| 13 | Imagery | band 13 |
| 14 | Imagery | Band 14 - IR |
| 15 | Imagery | Band 15 |
| 20 | EMWIN | Priority |
| 21 | EMWIN | Graphics |
| 22 | EMWIN | Other |
| 23 | Imagery | NWS Products |
| 24 | Imagery | NHC Graphics Products |
| 25 | Imagery | GOES-R JPG Products |
| 26 | Imagery | International Graphics Products |
| 30 | DCS | DCS Admin |
| 31 | DCS | DCS Data |
| 60 | Imagery | Himawari |

 (1) **VCID 20 EMWIN Priority - Text Products.** Virtual channel 20 contains EMWIN Priority 1 and 2 text formatted products. Products which are less than 5kb in size prior to transmission are disseminated in alpha numeric text format with a “.TXT”file extension. Products which are greater than 5 kb in size prior to transmission are compressed and disseminated in ZIP file format, with a “.ZIP” file extension. See Section 4 for information on specific products carried on this channel.

*Note: The HRIT/EMWIN broadcast is currently configured to transmit EMWIN priority 1 and 2 products twice on VCID 20, with the second product transmission occurring approximately 5 seconds after the first. The retransmission is intended to help ensure these products are received during marginal and adverse electromagnetic environmental conditions (such as local lightning events).*

 (2) **VCID 21: EMWIN Graphics**. Virtual channel 21 contains all picture (binary) files, also known as graphics files. The file formats/extensions are:

* GIF – Graphics Interchange Format
* PNG – Portable Network Graphics file format
* JPG – Shorter extension for JPEG which stands for Joint Photographic Experts Group.

Products which are greater than 5 kb in size prior to transmission are compressed and disseminated in ZIP file format, with a “.ZIP” file extension. See Section 4 for information on specific products carried on this channel.

 (3) **VCID 22: EMWIN Other.** Virtual channel 22 contains all EMWIN Priority 3 and 4 text formatted products. Products which are less than 5kb in size prior to transmission are disseminated in text format with a “.TXT” file extension. Products which are greater than 5 kb in size prior to transmission are compressed and disseminated in ZIP file format, with a “.ZIP” file extension. See Section 4 for information on specific products carried on this channel.

4. **Products Broadcast by EMWIN**

EMWIN carries three general groups of product: text-formatted US NWS products, text-formatted International products, and graphic or picture products (binary files). On previous GOES satellites, the EMWIN broadcast placed all products on a single channel. The GOES-16 broadcast allocates these products to three separate virtual channels (see Section 3).

A list of all text products, both US NWS and International products, authorized for broadcast on the EMWIN satellite transmission is published in the “EMWIN Broadcast Product Baseline” and available on the public Internet for reference here: [Broadcast Product Baseline](http://www.nws.noaa.gov/iscs/baseline.html). This list will be updated to include the GOES-16 virtual channel assignments in the future. Additional information on text products and graphic products VCID assignments is addressed in the following sections.

a. **US NWS Text Products**. The US NWS issues text product in WMO format but includes an AWIPS Identification (AWIPS ID) code between the WMO Header and bulletin body. The first three characters of the AWIPS ID are known as the Category Code (nnn) and identify a particular type of product (e.g., nnn of TOR = TORnado warning). A listing of the product AWIPS Category Codes, their description and priority, and the HRIT/EMWIN virtual channel on which the products are found, is provided in Section 7, Table 1.

b. **International Text Products**. The International text products available on the broadcast are included in the EMWIN Product Baseline list (link located under “4.” above). The EMWIN Product Baseline list will be updated to include the VCID of each of the International products.

All International products issued as Warning bulletins (WMO Header character T1 = “W”) are assigned priority 1, and are found on VCID 20. For further information on the WMO Header alpha-numeric characters, refer to: <http://www.wmo.int/pages/prog/www/ois/Operational_Information/Publications/WMO_386/AHLsymbols/TableDefinitions.html>

c. **Graphic Products**. EMWIN carries several graphic or picture products including satellite and radar imagery and hurricane tracks. All graphic products are carried on HRIT/EMWIN Virtual Channel 21. A listing of the products, their assigned files names, and their place of origin on the public internet is found in the [EMWIN Image and Text Data Capture Catalog Document v1.1](http://www.nws.noaa.gov/emwin/EMWIN_Image_and_Text_Data_Capture_Catalog_table_v1.1_r171002_1350.pdf)

5. **HRIT/EMWIN Satellite Broadcast Receiving Equipment**. The following manufacturers / vendors sell HRIT/EMWIN compatible receivers. The listing below does not imply any particular product or service endorsement or recommendation by the NWS. Customers should consult the vendors to determine product suitability for the customers' specific purpose and environment. (Note – proposed modifications to the manufacturer/vendor lists below may be addressed to: nws.emwin.support@noaa.gov )

a. The following manufacturer(s) sell receiving system(s) and equipment which they identify as including the software necessary to receive and store image and text products found on EMWIN virtual channels 20, 21 and 22, onto a user computer or workstation:

**Global Imaging, Inc.**

3228 N. Twin Oaks Valley Road Unit A,

San Marcos, CA 92069

Contact: Steven Borders

sborders@globalimaging.com

Phone: (858) 481-5750

b. The following manufacturer(s) sell receiving system(s) and equipment which they identify as not including the software necessary to receive and store image and text products found on EMWIN virtual channels 20, 21 and 22, onto a user computer or workstation. The software necessary to receive and store the image and text products onto a user computer or workstation is in development:

**Microcom Design, Inc.**

10948 Beaver Dam Road

Hunt Valley, MD, USA 21030

Contact: Brett Betsill, Perry West

bbetsill@microcomdesign.com

pwest@microcomdesign.com

Tel: (410) 771-1070

**Quorum Communications, Inc.**

3807 Carbon Rd. Irving, TX 75038-3415

Contact: Allan Bundens

allan.b@qcom.com

Phone: (800) 982-9614

**Global –LG**

(Dartcom USA sales)

426 Jolina Way, Encinitas, CA 92024

Contact: Michael Guberek

michael.guberek@global-lg.com

Phone: (619) 301- 0421

6. **Additional Information and References:**

a. [EMWIN Home page](http://www.nws.noaa.gov/emwin/index.html)

b. [NESDIS GOES-16 Satellite Information Page](https://www.nesdis.noaa.gov/GOES-16)

7. **Tables.**

Table 1. US NWS Text Products

(Ref: CATLST\_160819.txt)

| AWIPSCat Code | Prioity | Description |
| --- | --- | --- |
| **EMWIN Priority 1 and 2 Text Products -- HRIT/EMWIN Virtual Channel 20** |
| LSH | 1 | LAKESHORE WARNING OR STATEMENT |
| MWW | 1 | MARINE WEATHER WARNING |
| NOW | 1 | SHORT TERM FORECAST |
| NPW | 1 | NON-PRECIPITATION WARNINGS, WATCHES, ADVISORIES |
| NUW | 1 | NUCLEAR POWER PLANT WARNING |
| RFW | 1 | RED FLAG WARNING |
| SEL | 1 | SEVERE LOCAL STORM WATCH AND WATCH CANCELLATION MSG |
| SLS | 1 | SEVERE LOCAL STORM WATCH AND AREAL OUTLINE |
| SVR | 1 | SEVERE THUNDERSTORM WARNING |
| SVS | 1 | SEVERE WEATHER STATEMENT |
| TCD | 1 | TROPICAL CYCLONE DISCUSSION |
| TCM | 1 | MARINE/AVIATION TROPICAL CYCLONE ADVISORY |
| TCP | 1 | PUBLIC TROPICAL CYCLONE ADVISORY |
| TCU | 1 | TROPICAL CYCLONE UPDATE |
| TIB | 1 | TSUNAMI INFORMATION BULLETIN |
| TOR | 1 | TORNADO WARNING |
| TSU | 1 | TSUNAMI WATCH/WARNING |
| VOW | 1 | VOLCANO WARNING |
| WAT | 1 | SPACE ENVIRONMENT WATCH |
| WOU | 1 | TROPICAL CYCLONE SIGMET - XML FORMAT |
| WSW | 1 | WINTER WEATHER WARNINGS, WATCHES, ADVISORIES |
| ADA | 2 | ALARM/ALERT ADMINISTRATIVE MSG (URGENT NOTIFICATION) |
| ADM | 2 | ALERT ADMINISTRATIVE MESSAGE |
| ADR | 2 | NWS ADMINISTRATIVE MESSAGE (EXTERNAL) |
| ADV | 2 | GENERIC SPACE ENVIRONMENT ADVISORY |
| AFD | 2 | AREA FORECAST DISCUSSION |
| AVA | 2 | AVALANCHE WATCH |
| CWF | 2 | COASTAL WATERS FORECAST |
| DAY | 2 | 170 QPE ONE HOUR DIGITAL ACCUMULATION ARRAY ID 170/DAA DS.170aa |
| DMO | 2 | DIGITAL HYBRID REFLECTIVITY 32/DHR |
| EQR | 2 | EARTHQUAKE REPORT |
| ESF | 2 | FLOOD POTENTIAL OUTLOOK |
| FAA | 2 | AVIATION AREA FORECAST (FAIRBANKS, ALASKA) |
| FFA | 2 | FLASH FLOOD WATCH |
| FFC | 2 | FLASH FLOOD WATCH |
| FFG | 2 | FLASH FLOOD GUIDANCE |
| FFH | 2 | HEADWATER GUIDANCE |
| FFS | 2 | FLASH FLOOD STATEMENT |
| FLS | 2 | FLOOD STATEMENT |
| FTM | 2 | WSR-88D RADAR OUTAGE NOTIFICATION / FREE TEXT MESSAGE |
| FWS | 2 | SUPPRESSION FORECAST |
| HYD | 2 | DAILY HYDROMETEOROLOGICAL PRODUCTS |
| LEW | 2 | LAW ENFORCEMENT WARNING |
| LSR | 2 | LOCAL STORM REPORT |
| MIS | 2 | MISCELLANEOUS LOCAL PRODUCT |
| MWS | 2 | MARINE WEATHER STATEMENT |
| OBS | 2 | OTHER AVIATION PRODUCTS |
| OFF | 2 | OFFSHORE FORECAST |
| OMR | 2 | OTHER MARINE PRODUCTS |
| PMD | 2 | PROGNOSTIC METEOROLOGICAL DISCUSSION |
| PNS | 2 | PUBLIC INFORMATION STATEMENT |
| RDF | 2 | REVISED DIGITAL FORECAST |
| RER | 2 | RECORD REPORT |
| RHW | 2 | RADIOLOGICAL HAZARD WARNING |
| SMF | 2 | SMOKE MANAGEMENT WEATHER FORECAST |
| SMW | 2 | SPECIAL MARINE WARNING |
| SPS | 2 | SPECIAL WEATHER STATEMENT |
| SPW | 2 | SHELTER IN PLACE WARNING |
| SRF | 2 | SURF FORECAST |
| SUM | 2 | CANADIAN STORM WARNING |
| SWX | 2 | STATE WEATHER SUMMARY |
| TWD | 2 | TROPICAL WEATHER DISCUSSION |
| TWO | 2 | TROPICAL WEATHER OUTLOOK AND SUMMARY |
| WCN | 2 | WEATHER WATCH CLEARANCE NOTIFICATION |
| **EMWIN Priority 3 and 4 Text Bulletins -- HRIT/EMWIN Virtual Channel 22** |
| CLI | 3 | CLIMATOLOGICAL REPORT (DAILY) |
| ESS | 3 | WATER SUPPLY OUTLOOK |
| FLN | 3 | NATIONAL FLOOD SUMMARY |
| HMW | 3 | HAZARDOUS MATERIALS WARNING |
| HSF | 3 | HIGH SEAS FORECAST |
| LFP | 3 | LOCAL FORECAST |
| PWO | 3 | PUBLIC SEVERE WEATHER OUTLOOK |
| QPS | 3 | QUANTITATIVE PRECIPITATION STATEMENT |
| RFD | 3 | RANGELAND FIRE DANGER FORECAST |
| RWR | 3 | REGIONAL WEATHER ROUNDUP |
| TCE | 3 | TROPICAL CYCLONE POSITION ESTIMATE |
| TCV | 3 | TROPICAL CYCLONE VTEC |
| TMA | 3 | TSUNAMI TIDE/SEISMIC MESSAGE ACKNOWLEDGMENT |
| AFM | 4 | AREA FORECAST MATRICES |
| AFP | 4 | AREA FORECAST PRODUCT |
| AGO | 4 | AGRICULTURAL OBSERVATIONS |
| AQA | 4 | AIR QUALITY ADVISORY |
| AQI | 4 | AIR QUALITY INDEX STATEMENT |
| ASA | 4 | AIR STAGNATION ADVISORY |
| AWS | 4 | AREA WEATHER SUMMARY |
| AWU | 4 | AREA WEATHER UPDATE |
| CGR | 4 | COAST GUARD SURFACE REPORT |
| CLA | 4 | CLIMATOLOGICAL REPORT (ANNUAL) |
| CLM | 4 | CLIMATOLOGICAL REPORT (MISC, INC MONTHLY REPORTS) |
| CLQ | 4 | CLIMATOLOGICAL REPORT (MISC, INC MONTHLY REPORTS) |
| CLS | 4 | SEASONAL CLIMATE SUMMARY PRODUCTS |
| FWF | 4 | ROUTINE FIRE WX FCST(WITH/WITHOUT 6-10 DAY OUTLOOK) |
| FWL | 4 | LAND MANAGEMENT FORECASTS |
| FWM | 4 | MISCELLANEOUS FIRE WEATHER PRODUCT |
| FWN | 4 | FIRE WEATHER NOTIFICATION |
| FWO | 4 | FIRE WEATHER OBSERVATION |
| FZL | 4 | FREEZING LEVEL DATA (RADAT) |
| HAA | 4 | GENERAL STATUS MESSAGE |
| HAD | 4 | GENERAL STATUS MESSAGE |
| HAF | 4 | GENERAL STATUS MESSAGE |
| HAM | 4 | GENERAL STATUS MESSAGE |
| HAP | 4 | GENERAL STATUS MESSAGE |
| HAS | 4 | GENERAL STATUS MESSAGE |
| HAT | 4 | GENERAL STATUS MESSAGE |
| HAW | 4 | GENERAL STATUS MESSAGE |
| HLS | 4 | HURRICANE LOCAL STATEMENT |
| HMD | 4 | HYDROMETEOROLOGICAL DISCUSSION |
| HYM | 4 | MONTHLY HYDROMETEOROLOGICAL PLAIN LANGUAGE PRODUCT |
| HYW | 4 | WEEKLY HYDROMETEOROLOGICAL PLAIN LANGUAGE PRODUCT |
| NWX | 4 | SEVERE WEATHER PROBABILITY 47/SWP |
| OPU | 4 | OTHER PUBLIC PRODUCTS |
| PFM | 4 | POINT FORECAST MATRICES |
| PLS | 4 | PLAIN LANGUAGE SHIP REPORT |
| PRB | 4 | PROBABILITY OF EXCEED |
| PSH | 4 | POST STORM HURRICANE REPORT |
| RBG | 4 | RED BOOK GRAPHIC \*\* |
| REC | 4 | RECREATIONAL REPORT |
| RRM | 4 | MISCELLANEOUS HYDROLOGIC DATA |
| RTP | 4 | REGIONAL MAX/MIN TEMP AND PRECIPITATION TABLE |
| RVA | 4 | RIVER SUMMARY |
| RVD | 4 | DAILY RIVER FORECASTS |
| RVF | 4 | RIVER FORECAST |
| RVM | 4 | MISCELLANEOUS RIVER PRODUCT |
| RVR | 4 | RIVER RECREATION STATEMENT |
| RVS | 4 | RIVER STATEMENT |
| RWS | 4 | REGIONAL WEATHER SUMMARY |
| SAB | 4 | SNOW AVALANCHE BULLETIN |
| SAW | 4 | PRELIM NOTICE OF WATCH & CANCELLATION MSG AVIATION) |
| SCD | 4 | SUPPLEMENTARY CLIMATOLOGICAL DATA (ASOS) |
| SCS | 4 | SELECTED CITIES SUMMARY |
| SEV | 4 | SPC WATCH POINT INFORMATION MESSAGE |
| SFD | 4 | STATE FORECAST DISCUSSION |
| SFP | 4 | STATE FORECAST |
| SFT | 4 | TABULAR STATE FORECAST |
| STO | 4 | ROAD CONDITION REPORTS (STATE AGENCIES) |
| STP | 4 | STATE MAX/MIN TEMPERATURE AND PRECIPITATION TABLE |
| SWR | 4 | SEVERE STORM OUTLOOK NARRATIVE (AC) |
| SWS | 4 | STATE WEATHER SUMMARY |
| TID | 4 | TIDE REPORT |
| TOE | 4 | 911 TELEPHONE OUTAGE EMERGENCY |
| TVL | 4 | TRAVELERS FORECAST |
| URN | 4 | UPPER AIR SITE PERFORMANCE & LOGISTICS MESSAGE |
| UVI | 4 | ULTRAVIOLET INDEX |
| WWA | 4 | WATCH STATUS REPORT |
| ZFP | 4 | ZONE FORECAST PRODUCT |