## ACARS INTRODUCTION

Aeronautical Radio, Inc. (ARINC) maintains a huge worldwide VHF and HF voice network to provide operational radio communications for the aircraft industry. In the early eighties they developed an addressable, digital data link for commercial and business jets known as ACARS. ACARS stands for **Aircraft Communications Addressing and Reporting System**. It was produced to reduce the flight crew's work-load by using modern computer technology to exchange many routine reports and messages.
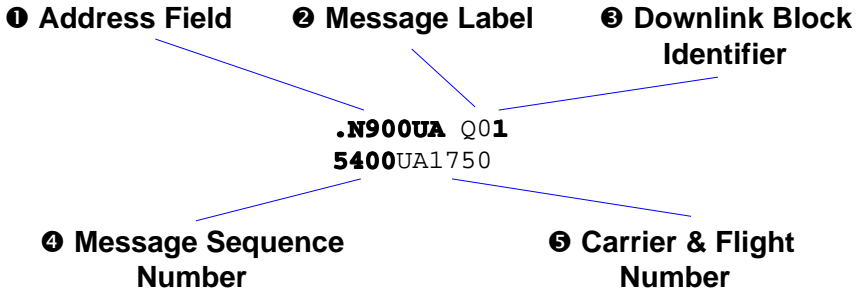
ACARS uses the AM mode because the same airborne VHF radio is often also used for voice communications. Burst transmissions are used with a limit of 220 characters per message. Transmissions often last less than one second! To monitor ACARS transmissions you will need a VHF scanner or receiver capable of tuning the VHF (AM) aircraft band 118 to 136 MHz. Leave the receiver's Squelch off.

Frequency	Function
131.550 MHz	**Primary channel for the USA & Canada**
130.025 MHz	Secondary channel for the USA
129.125 MHz	Tertiary channel for the USA
131.725 MHz	Primary channel for Europe
131.450 MHz	Primary channel for Japan
131.550 MHz	Primary channel for Pacific Rim
131.475 MHz	Private company channel for *Air Canada*

ACARS Coverage
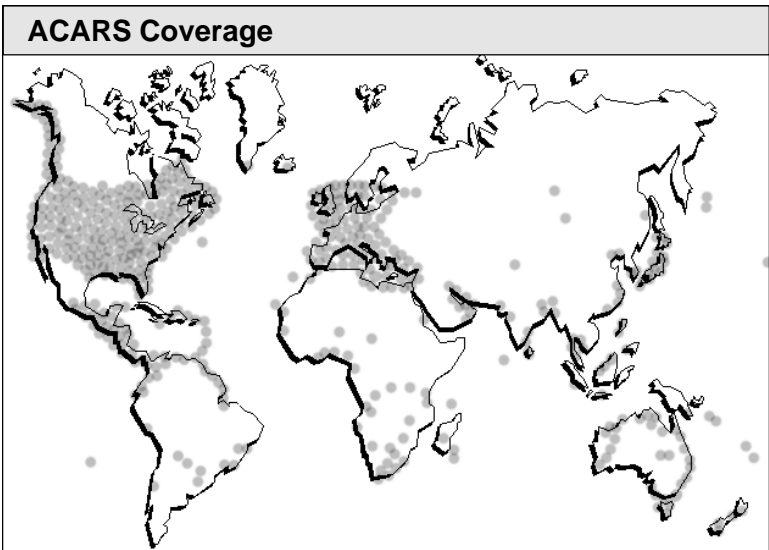
ACARS messages are very structured. Each position in the message has a specific function. The common **Q0 Link Test** and **QG Out/Return In Reports** are shown as examples:

◆ Q0 - LInk Test

❶ Address Field **❷ Message Label** **❸ Downlink Block Identifier**

```
            .N900UA Q01
            5400UA1750
```

❹ Message Sequence Number **❺ Carrier & Flight Number**

❶ Address Field *Line 1* *Length = 7 characters*
The address field identifies the aircraft with which the ground station is communicating. For the uplink (ground to air) messages it will be either the aircraft's official registration mark or the flight number of the service operating the aircraft. For downlinks (air to ground) messages it must always be the aircraft's official registration mark. By international agreement, the official registration marks are coded according to a county of origin one or two letter ICAO prefix. The single letter "N" is the prefix for all American aircraft. Other prefixes include: "C" for Canada, "G" for Great Britain, "F" for France, etc.

For ACARS purposes, the Address field must be seven characters in length and is always right-justified. If the aircraft's identification is less than seven characters, it must be left-filled with periods. Valid examples:

```
      N1825TU           .C-FDCA           .D-ABXR
      .N123UA           .F-GHGF           .D-ABIT
      ..N1901           .HB-IGC           .G-BNLG
      ...N409           .PH-BFP           .G-DOCV
```

❷ Message Label *Line 1* *Length = 2 characters*
ARINC has defined a series of two character message labels that identify message type. Many airlines have also defined their own sets of labels for company operation purposes.

❸ Downlink Block Identifier *Line 1* *Length = 1 chars.*
The DBI is used primarily as a means of indicating the retransmission of a previously downlinked message. If the DBI suffix is present, it will always be directly appended to the Message Label (without a space).

❹ **Message Sequence Number**   *Line 2   Length = 4 chars.*
For most downlinked messages, the Message Sequence number is a four digit value that represents **the time in minutes and seconds past the hour** that the message was transmitted. (Note that the hour is *not* given).
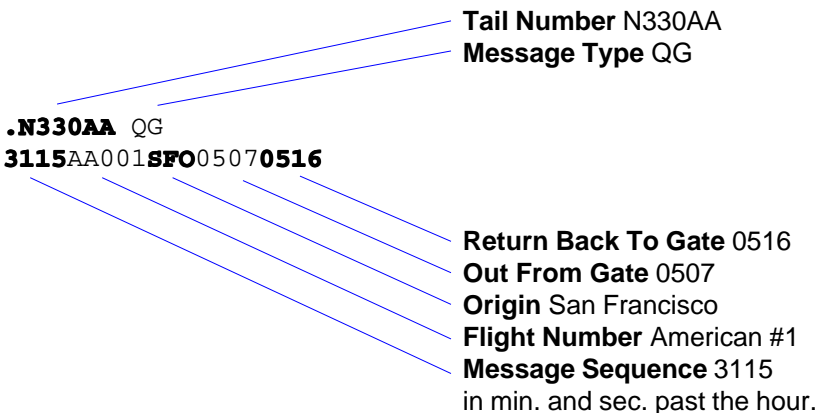
❺ **Carrier & Flight Number**   *Line 2   Length = 6 chars.*
The six character flight number field is comprised of a two-character airline identity code followed by a four-character alpha-numeric flight number. If the flight number is less than four characters in length, it will generally be right-justified and left-filled with zeros. Examples: `AC1030   UA0038 AA0009`

Scheduled carriers may also conduct charter flights. The letter **F** is normally appended to the two-letter airline code to indicate that the flight is a charter. For example, an *Air Canada* charter: `ACF095`. Business jets frequently use the ACARS network. Since these are not scheduled commercial flights, they do not have assigned flight numbers. The general carrier and flight number designation for business jets is always **GS0001**.

◆ QG - OUT/RETURN IN REPORT

The **QG OUT/RETURN IN REPORT**, like many other ACARS downlinks, is transmitted automatically. Many ACARS downlinks are sent automatically as a result of on-board sensor activation, especially during take-off and landings. This report is transmitted by an aircraft that leaves the gate, but for some reason must return back to the gate.

Tail Number N330AA
Message Type QG

`.N330AA QG`
`3115AA001SFO05070516`

Return Back To Gate 0516
Out From Gate 0507
Origin San Francisco
Flight Number American #1
Message Sequence 3115
in min. and sec. past the hour.

There are nearly 100 standard ACARS message formats plus a virtually unlimited number of airline-specific company formated message types. Please refer to **Understanding ACARS** by Ed Flynn for further information on ACARS message types, abbreviations and location identifiers.

■ MESSAGE TYPES

Label		SMI	Message Title
_j			No info to transmit. Polled mode [1]
_DEL⇕			General response, Demand mode; no information to transmit[1]
00	⇩	HJK	Emergency situation report
2S			Weather request
2U			Weather
4M			Cargo information
51			Ground GMT request response
52		AGM	Ground UTC request
54	⇕		Aircrew initiated voice contact request
57	⇩	AEP	Alternate aircrew initiated posit. rpt.
5D	⇩	TIS	ATIS request
5P	⇩		Temporary suspension of ACARS
5R	⇩	AEP	Aircraft initiated position report
5U	⇩	WXR	Weather request
5Y	⇩	ETA	Revision to previous ETA
5Z	⇩	AGM	Airline designated downlink
7A	⇩	ENG	Aircraft initiated engine data
7B	⇩	ABM	Aircraft initiated misc.message
80-9	⇩		Aircraft addressed downlinks
A1	⇧	CLX	Deliver oceanic clearance
A2	⇧	CLD	Deliver departure clearance
A4	⇧	RCA	Acknowledge PDC
A5	⇧	RPR	Request position report
A6	⇧	RAR	Request ADS report
A7	⇧	FTU	Forward free text to aircraft
A8	⇧	DDS	Deliver departure slot
A9	⇧	DAI	Deliver ATIS information
A0	⇧	AFN	ATIS Facilities notification
B1	⇩	RCL	Request oceanic clearance
B2	⇩	CLA	Request oceanic readback
B3	⇩	RCD	Request departure clearance
B4	⇩		Ackn. departure clearance
B5	⇩	PPR	Provide position report
B6	⇩	PAR	Provide ADS report
B7	⇩	FTD	Forward free text to ATS
B8	⇩	RDS	Request departure slot
B9	⇩	RAI	Request ATIS information
C0	⇧		Uplink msg. to all cockpit printers
C1	⇧		Uplink msg. to cockpit printer #1
C2	⇧		Uplink msg. to cockpit printer #2
C3	⇧		Uplink msg. to cockpit printer #3
CA			Printer status = error

Label		SMI	Message Title
CB	⇔		Printer status = busy
CC	⇔		Printer status = local
CD	⇔		Printer status = no paper
CE	⇔		Printer status = buffer overrun
CF	⇔		Printer status = reserved
F3	⇓		Dedicated transceiver advisory
H1	⇕		Message to/from terminal
HX	⇓	REJ	Undelivered uplink report
M1	⇓	MVA	IATA Departure message
M2	⇓	MVA	IATA Arrival message
M3	⇓	MVA	IATA Return to ramp message
M4	⇓	MVA	IATA Return from airborne message
Q0			ACARS link test
Q1	⇓		ETA Departure/arrival reports
Q2	⇓	ETA	ETA reports
Q3	⇓	CLK	Clock update
Q4	⇑		Voice circuit busy (response to 54)
Q5	⇔		Unable to process uplinked messages
Q6	⇓		Voice-to-ACARS change-over.
Q7	⇓	DLA	Delay message
QA	⇓	DEP	Out/fuel report
QB	⇓	DEP	Off report
QC	⇓	ARR	On report
QD	⇓	ARR	In/fuel report
QE	⇓	DEP	Out/fuel destination report
QF	⇓	DEP	Off/destination report
QG	⇓	RTN	Out/return in report
QH	⇓	DEP	Out report
QK	⇓	ARR	Landing report
QL	⇓	ARR	Arrival report
QM	⇓	ARR	Arrival information report
QN	⇓	DIV	Diversion report
QX	⇓		Intercept
RA	⇑	RPR	Command aircraft term. to transmit data
RB	⇓		Response of aircraft terminal to RA msg.
:;	⇑		Command aircraft xcvr to change freq.

[1] These are non-printing
characters, and will
not be displayed.

Message Direction	
⇓	Downlink.
⇑	Uplink.
⇕	Uplink or dowlink.
⇔	Ground to ground.