Recommendation WG 21.99.051

FORMAT FOR THE ELECTRONIC TRANSFER of RADIO EQUIPMENT DATA

www.nsma.org

January 1999

Source: Working Group 20

NSMA
National Spectrum Manager's Association
RECOMMENDATION
WG 21.99.051

Sources: Working Group 21
Subject: Equipment Specification
Title: Standard Format for the Electronic Transfer of Radio Equipment Data

A. Purpose & Transmittal
B. Introduction
C. Header & Trailer Records
D. Data Records

Attachments

1. Radio Capacity
2. Modulation Types
3. Electronic Field and Size Definitions
4. Radio Manufacturer Codes
5. Example of an Electronic File

A. Purpose:

The National Spectrum Managers Association (NSMA) convened WG21 in 1997 to establish a standard for radio equipment specifications and a format for electronically conveying such information. The Working Group (WG) herewith is directing this document to the NSMA Board of Directors for approval.

Date: May 19, 1999

Michael J. Shepherd

Approved by the Board August 6, 1999.

B. Introduction

This document describes the recommended format for the electronic transfer of Radio Equipment Data. This format is initially established for the transfer of terrestrial point-to-point microwave equipment, but should be adequately all encompassing to handle base station equipment and remote site equipment as used in Wide Area Local Loop or LMDS systems.

The recommended format is designed to be easily read by both people and computers. Each data item (or small group of items) is placed on a separate line, similar to the electronic format defined for antenna files. Each line (or record) is started with the specific name of the item(s) on that line. In addition, the name and data items are separated with commas (,), so the file can easily be imported into a spreadsheet such as Excel and printed as a paper report with minimal changes.

Each text field is enclosed in double quotes (“) to ensure that the embedded commas can be included in data fields, if needed. Numeric values are not enclosed with quotes, and must not contain any embedded commas.

Each radio configuration may be in one file, with multiple "BRANCHING" lines. Alternatively, separate data files for each configuration may be used, i.e., Non-Protected (NP), Monitored Hot Standby (MHSB), etc., with its significant characteristics.
This document has been constructed to be Y2K compliant.

C. Header and Trailer Records

The first and last lines of the file are used to indicate the start and end of equipment data. This supports software integrity checks when the file is read. The format of the header record is shown in the following diagram. Each field is shown in its own cell. The actual fields would be separated by commas, as shown in the sample of Attachment 4.:

This File Type indicates the data contained, the format and the version of the format. For version 1.0 of the Equipment format, this value must be “EQUIP1.0”.

“$HDR”	File Type	“$”

The format of the Trailer Record is

“$TLR”	File Type	“$”

D. Data Records

The data elements (also called fields) are defined as part of this specification. They must appear in the file in order as listed. If no value is provided for the field, a record must be included with the name of the field and a blank (empty) value. If multiple values appear (e.g. for a curve), they must be grouped together. Each record is identified with the Record Type, which is an abbreviated name for the field. The exact text for the Record type is provided in the tables below. Attachment 3 gives the maximum characters for each field.

Note that most records have two fields, the Record Type and the value for the associated field. The record layout is described with each field or group of fields.

The curve points when defined for T/I, Transmit Spectrum and Filters, must be continuous, in that there shall be no two points at the same frequency separation for a distinct curve.

- Manufacturer

  Equipment manufacturer with no abbreviations.

"EQUIP_MFG"	Equipment Manufacturer

- Manufacturer Model No.

  Full manufacturer's model number with all dashes or exceptions included.

"MFG_MODEL"	Model Number

- Document Revision Number

  Revision number of this document.

"REV_NUM"	Document Revision Number

- Document Revision Date

  Revision date of this document. Date format: yyyy-mm-dd

"REV_DATE"	Document Revision Date

- Radio Identification or FCC Type Number

  Radio Identification Number as filed with or issued by the FCC. Under current FCC rules, this number is assigned by the manufacturer. If the number assigned by the Manufacturer does not begin with the appropriate manufacturer code, the manufacturer code should be added as a prefix. Radio manufacturer codes are listed in Attachment 4. Therefore, this number is formatted as follows: xxxyyyyy. The first three characters in the field are the radio manufacturer code (xxx). The remaining characters in the field are the Radio Identification Number (yyyyy).

  Under the old FCC rules, this number was called the FCC Type Number and was assigned by the FCC as part of the type acceptance process.

  This number will be used to identify the radio in an EPCN.

"RADIO_ID"	Radio ID Number

- FCC Code

  6-character code as issued by the FCC until 1992. The FCC issued alphanumeric codes beginning with a 2 or 3.

"FCC_CODE"	FCC Code

- Equipment Data Date

  Date equipment data was recorded by manufacturer. Date format: mm-dd-yyyy.

"EQ_DATE"	Equipment Data Date

- Emission Designator

  Code designating the bandwidth and modulation type. Coding convention is defined by the FCC, ITU, or other countries.

"EMISSION"	Emission Designator

- Number of Voice Circuits

  Equivalent voice circuits. Traditional FDM voice circuits or digital 64 kbit/sec DS0 lines (voice equivalents).

"MAX_LOADING"	Number of Circuits

- Data Rate. Digital Radios Only.

  Payload data rate in Mbits/second, without forward error correction or overhead circuits, e.g., 155.5 Mbit/sec, 44.7 Mbit/sec, 34.4 Mbit/sec, etc.

"DATA_RATE"	Data Rate

- Radio Capacity

  The Number of Lines is the number of installed DS1's, DS3's, etc. The Signal Standard is a text field for the type of interface (e.g., DS3). Examples of radio capacity are shown in Attachment 1.

"RADIO_CAP"	Number of Lines	Signal Standard

- Modulation Type

  The type of modulation for the particular radio equipment is to be described. Examples of modulation types are listed in Attachment 2.

"MODULATION"	Modulation Type

- Frequency Deviation. Analog Radios Only.

  RMS Per Channel Deviation in kHz.

"DEVIATION"	Deviation

- Frequency Range in MHz

  Frequency range over which this model of radio will function. Specify the low frequency and high frequency in MHz.

"FREQ_RANGE"	Low Frequency	High Frequency

- Transmit Power Options in dBm

  Transmitter power at the top of the rack in dBm, including all ACU losses. Show all available power options for radios with discrete power levels. Any number of power options may be shown.

"POWER_OPTION"	Power #1	Power #2	. . .	Power #n

- Transmit Power Range in dBm

  Transmitter power at the top of the rack in dBm, including all ACU losses. Show the minimum and maximum power levels for radios with adjustable power levels.

"POWER_RANGE"	Transmit Power Low	Transmit Power High

- Transmitter Stability in Percent of Carrier Frequency

  Tolerance of transmitter output frequency expressed as a percent of carrier frequency.

"STABILITY"	Carrier Stability

- ATPC Power Reduction

  If equipped with ATPC (Automatic Transmitter Power Control), specify the amount of power reduction during normal operation in dB. The power reduction should be specified at the top of rack, including all ACU losses.

"ATPC_POWER"	Power Reduction in dB

- ATPC Step Size

  Size of Steps in dB when power increases to compensate for reduction in Receive Level

"ATPC_STEP"	Step Size in dB

- ATPC Trigger Point

  Receiver level in dBm at which ATPC first activates

"ATPC_TRIG"	Level in dBm

- Receiver Threshold in dBm

  Digital Radios

"THRESH_DIG"	Threshold for 10^{-6} BER	Threshold for 10^{-3} BER

  Analog Radios

"THRESH_ANA"	Threshold for 30 dB S/N FM-FDM	Threshold for 37 dB S/N FM-Video

  Threshold in dBm to be provided at the specified Bit Error Rate (BER) or analog signal to noise level. Measured at the top of the rack for non-protected radios.

- Configuration Branching Losses in dB

  Branching losses for a Monitored Hot Standby configuration, without space diversity. Transmitter losses are typically from the switch and receiver losses are from the splitter. For example, a radio using a 1:10 receive splitter may have the following branching losses:

Transmitter loss	*Main Receiver Loss*	*Protect Receiver Loss*
0.2 dB	*0.5 dB*	*10 dB*

Do not show the branching losses here if the losses are included in the transmit power or receiver threshold.

Radio configuration or protection configuration may be: Non-Protected (NP), Monitored Hot Standby (MHSB), Monitored Hot Space Diversity (MHSD), Frequency Diversity (FD), Multiline (1:N), etc.

There may be one or more "BRANCHING" lines listed for each radio.

"BRANCHING"	Configuration	Transmitter Loss in dB	Main Receiver Loss in dB	Protect Receiver Loss in dB

- Maximum Receive Level in dBm (overload point)

"MAX_RSL"	10^{-6} BER or Analog Overload	10^{-3} BER (for Digital Radios only)

- Dispersive Fade Margin in dB. Digital Radios only.

Dispersive Fade Margin at the specified Bit Error Rate (BER)

"DFM"	DFM for 10^{-6} BER	DFM for 10^{-3} BER

- Transmitter Spectrum

The Transmitter Spectrum curve is represented as a TX_SPECTRUM record followed by a number of CURVE_POINT records, which represent the data points. If no curve is included, the Number of Data Points field should be set to zero (0) and no CURVE_POINT records should be included.

"TX_SPECTRUM"	Number of Data Points

"CURVE_POINT"	Frequency Offset	Response (dBm/4 kHz)

Note: Frequency offset values should be normalized such that the center frequency has 0 MHz frequency offset.

- Transmitter Filter curve characteristic

The Transmitter Filter curve is represented as a TX_FILTER record followed by a number of CURVE_POINT records, which represent the data points. If no curve is included, the Number of Data Points field should be set to zero (0) and no CURVE_POINT records should be included.

“TX_FILTER”	Number of Data Points

“CURVE_POINT”	Frequency Offset	Response in dB

Note: Frequency offset values should be normalized such that the center frequency has 0 MHz frequency offset.

- FCC Channel Bandwidth

  Bandwidth used to calculate the FCC spectrum mask in MHz.

“FCC_BANDWIDTH”	FCC Bandwidth

- 99% Power Bandwidth

  Bandwidth occupied by the transmitter in MHz (including 99% of the transmitted power).

“99%_BANDWIDTH”	99% Power Bandwidth

- 3 dB Transmitter Bandwidth

  Bandwidth occupied by the transmitter in MHz (between the 3 dB points).

“3DB_BANDWIDTH”	3 dB Transmitter Bandwidth

- Minimum Frequency Separations

  Minimum required frequency separation between two transmitters in MHz:

“T/T_FREQ_SEP”	Same Antenna & Polarization	Same Antenna & Different Polarization	Different Antenna & Polarization

Minimum required frequency separation between the closest transmitter and receiver in MHz:

“T/R_FREQ_SEP”	Same Antenna & Polarization	Same Antenna & Different Polarization	Different Antenna & Polarization

- Fixed Transmit-Receive Frequency Separations

  Some radios only allow fixed transmit-receive frequency separations. If applicable, show all allowable frequency separations in MHz. Any number of separations may be shown.

"T/R_FIXED"	T/R Spacing#1	T/R Spacing#2	. . .	T/R Spacing#n

- T/I Curve (Like Modulation). Digital Radios only.

  Threshold to Interference Curve #1. The interfering transmitter and victim receiver are the same type of radio, using the same modulation and data rate.

  The T/I curve is represented as a T/I_LIKE record followed by a number of CURVE_POINT records, which represent the data points. If no curve is included, the Number of Data Points field should be set to zero (0) and no CURVE_POINT records should be included.

"T/I_LIKE"	Number of data points

"CURVE_POINT"	Frequency Offset	Response in dB

  Note: Frequency offset values should be normalized such that the center frequency has 0 MHz frequency offset.

- T/I Curve (CW Modulation). Digital Radios only.

  Threshold to Interference Curve #2. The interfering transmitter is a CW tone and the victim receiver is a digital radio. This T/I curve is used to model FM transmitters interfering into digital receivers.

  The T/I curve is represented as a T/I_CW record followed by a number of CURVE_POINT records, which represent the data points. If no curve is included, the Number of Data Points field should be set to zero (0) and no CURVE_POINT records should be included.

"T/I_CW"	Number of data points

"CURVE_POINT"	Frequency Offset	Response in dB

  Note: Frequency offset values should be normalized such that the center frequency has 0 MHz frequency offset.

- T/I Curve - Other Capacity Radio into Specified Radio. Digital Radios Only.

  RADIO_ID, the Radio Identification of the interfering transmitter, is defined above. Interferor Bandwidth shall correspond to the FCC or ITU emission bandwidth of the interferor, specified as a real number in MHz.

  The T/I curve is represented as a T/I_OTHER record followed by a number of CURVE_POINT records, which represent the data points. If no curve is included, the Number of Data Points field should be set to zero (0) and no CURVE_POINT records should be included.

"T/I_OTHER"	RADIO_ID	Interferor Bandwidth	Number of Data Points

"CURVE_POINT"	Frequency Offset	Response in dB

  Note: Frequency offset values should be normalized such that the center frequency has 0 MHz frequency offset.

- Baseband frequency range. Analog Radios Only.

  Low end to high end frequency range in kHz. Required for analog radios.

"BB_FREQ"	Low Frequency	High Frequency

- Receiver Filter curve characteristic

  RF Filter

"RX_RF_FILTER"	Number of Data Points

"CURVE_POINT"	Frequency Offset	Response in dB

  IF Filter

"RX_IF_FILTER"	Number of Data Points

"CURVE_POINT"	Frequency Offset	Response in dB

  IF Filter extension: The switch-on point is specified in dBm

"IF_FILTER_EXT"	Switch-on point	Number of Data Points

"CURVE_POINT"	Frequency Offset	Response in dB

Baseband Filter

“RX_BB_FILTER”	Number of Data Points

“CURVE_POINT”	Frequency Offset	Response in dB

- Comments Field

  Field used to describe the radio and its characteristics. Any number of comments may be included.

  The Comments field is represented as a COM_COUNT record followed by a number of COMMENT records. If no comments are required, the Number of Comments field should be set to zero (0) and no COMMENT records should be included.

“COM_COUNT”	Number of Comments (n)

“COMMENT”	Description #1

“COMMENT”	Description #2

“COMMENT”	. . .

“COMMENT”	Description #n

- End of File

Attachment 1: Radio Capacity

The capacity of a radio, as specified by the "RADIO_CAP" field, shall include the Number of Lines and the Signal Standard. Typical Signal Standards are shown in the following table.

Examples of radio capacities are:

"RADIO_CAP", 4, "E1"	(4 E1)
"RADIO_CAP", 3, "DS3"	(3 DS3)
"RADIO_CAP", 300, "FM/FDM Voice"	(300 FM/FDM Voice)

Signal Standard	Signal Type	Number of circuits	Data Rate (Mb/s)
E0	Digital	1	0.064
E1	Digital	30	2.048
E2	Digital	120	8.448
E3	Digital	480	34.368
E4	Digital	1920	139.264
DS0	Digital	1	0.064
DS1	Digital	24	1.544
DS2	Digital	96	6.312
DS3	Digital	672	44.736
DS4E	Digital	2016	139.264
DS4	Digital	4032	274.168
STS-1	Digital	672	51.84
STS-3	Digital	2016	155.52
OC-3	Digital	2016	155.52
STM-1	Digital	2016	155.52
ATSC	Digital Video	1	19.39
FM Video	Analog Video	1	N/A
AM Video	Analog Video	1	N/A
FM/FDM Voice	Analog Voice	1	N/A
AM/SSB Voice	Analog Voice	1	N/A

Attachment 2: Modulation Types

Transmission Type	*Modulation Type*
Analog systems	ANALOG (general) FDMFM FDMSSB DUV DAV
Digital Systems	DIGITAL (general) FSK 4 FSK 7 FSK 8 FSK ASK MSK DMSK OOK PSK QPSK 4 PSK 8 PSK 16 PSK 4 QAM 8 QAM 16 QAM 32 QAM 64 QAM 128 QAM 256 QAM 9 QPRS 25 QPRS 49 QPRS 81 QPRS 225 QPRS 32 TCM 128 TCM
Video Systems	VIDEO (general) VIDFM VIDVSB

Need verification if ULS/FCC limit is 25 characters. D. Campbell to verify.

Attachment 3: Electronic Field and Size Definitions

Field Name	*Field Type*	*Field Size*	*Field Identifier*
Manufacturer	Text	40	"EQUIP_MFG"
Manufacturer Model Number	Text	40	"MFG_MODEL"
Document Revision Number	Text	30	"REV_NUM"
Document Revision Date	Text	20	"REV_DATE"
Radio Identification Number	Text	40	"RADIO_ID"
FCC Code	Text	6	"FCC_CODE"
Equipment Data Date	Text	20	"EQ_DATE"
Emission Designator	Text	30	"EMISSION"
Number of Voice Circuits	Integer		"MAX_LOADING"
Data Rate	Real		"DATA_RATE"
Radio Capacity - Number of Lines	Integer		"RADIO_CAP"
Radio Capacity - Signal Standard	Text	30	"RADIO_CAP"
Modulation Type	Text	30	"MODULATION"
Frequency Deviation – Analog	Real		"DEVIATION"
Frequency Range - Low End (MHz)	Real		"FREQ_RANGE"
Frequency Range - High End (MHz)	Real		"FREQ_RANGE"
Transmit Power Options (dBm)	Real		"POWER_OPTION"
Transmit Power Range (dBm)	Real		"POWER_RANGE"
Transmitter Stability (percent)	Real		"STABILITY"
ATPC Power Reduction (dB)	Real		"ATPC_POWER"
ATPC Step Size (dB)	Real		"ATPC_STEP"
ATPC Trigger Point (dBm)	Real		"ATPC_TRIG"
Digital Threshold for 10^{-6} BER (dBm)	Real		"THRESH_DIG"
Digital Threshold for 10^{-3} BER (dBm)	Real		"THRESH_DIG"
Analog Threshold for 30 dB S/N FM-FDM (dBm)	Real		"THRESH_ANA"
Analog Threshold for 37 dB S/N FM-Video (dBm)	Real		"THRESH_ANA"
Radio Equipment Configuration	Text	70	"BRANCHING"
Branching – Transmitter Loss (dB)	Real		"BRANCHING"
Branching – Main Receiver Loss (dB)	Real		"BRANCHING"
Branching – Protect RX Loss (dB)	Real		"BRANCHING"
Max Received Signal for 10^{-6} BER or Analog Overload Point (dBm)	Real		"MAX_RSL"
Max Received Signal for 10^{-3} BER (Digital Only)	Real		"MAX_RSL"
Dispersive Fade Margin for 10^{-6} (dB)	Real		"DFM"
Dispersive Fade Margin for 10^{-3} (dB)	Real		"DFM"
<u>Transmitter Spectrum</u>			
Number of Data Points	Integer		"TX_SPECTRUM"
Frequency Offset (MHz)	Real		"CURVE POINT"
Response (dBm/4 kHz)	Real		"CURVE POINT"
<u>Transmitter Filter</u>			
Number of Data Points	Integer		"TX_FILTER"
Frequency Offset (MHz)	Real		"CURVE POINT"
Response (dB)	Real		"CURVE POINT"

Field Name	*Field Type*	*Field Size*	*Field Identifier*
FCC Channel Bandwidth (MHz)	Real		"FCC_BANDWIDTH"
99% Power Bandwidth (MHz)	Real		"99%_BANDWIDTH"
3 dB Transmitter Bandwidth (MHz)	Real		"3DB_BANDWIDTH"
T/T Frequency Separation, Same Antenna & Polarization (MHz)	Real		"T/T_FREQ_SEP"
T/T Frequency Separation, Same Antenna & Different Polarization (MHz)	Real		"T/T_FREQ_SEP"
T/T Frequency Separation, Different Antenna & Polarization (MHz)	Real		"T/T_FREQ_SEP"
T/R Frequency Separation, Same Antenna & Polarization (MHz)	Real		"T/R_FREQ_SEP"
T/R Frequency Separation, Same Antenna & Different Polarization (MHz)	Real		"T/R_FREQ_SEP"
T/R Frequency Separation, Different Antenna & Polarization (MHz)	Real		"T/R_FREQ_SEP"
Fixed T/R Frequency Separations (MHz)	Real		"T/R_FIXED"
<u>T/I Curve (Like Modulation)</u>			
Number of Data Points	Integer		"T/I_LIKE"
Frequency Offset (MHz)	Real		"CURVE POINT"
Response (dB)	Real		"CURVE POINT"
<u>T/I Curve (CW Modulation)</u>			
Number of Data Points	Integer		"T/I_CW"
Frequency Offset (MHz)	Real		"CURVE POINT"
Response (dB)	Real		"CURVE POINT"
<u>T/I Curve (Other Radio)</u>			
Interfering Radio Identification Number	Text	43	"T/I_OTHER"
Number of Data Points	Integer		"T/I_OTHER"
Frequency Offset (MHz)	Real		"CURVE POINT"
Response (dB)	Real		"CURVE POINT"
Baseband Frequency Low (kHz)	Real		"BB_FREQ"
Baseband Frequency High (kHz)	Real		"BB_FREQ"
<u>Receiver RF Filter</u>			
Number of Data Points	Integer		"RX_RF_FILTER"
Frequency Offset (MHz)	Real		"CURVE POINT"
Response (dB)	Real		"CURVE POINT"
<u>Receiver IF Filter</u>			
Number of Data Points	Integer		"RX_IF_FILTER"
Frequency Offset (MHz)	Real		"CURVE POINT"
Response (dB)	Real		"CURVE POINT"

Field Name	*Field Type*	*Field Size*	*Field Identifier*
Receiver IF Filter Extension			
Switch-on point (dBm)	Real		“IF_FILTER_EXT”
Number of Data Points	Integer		“IF_FILTER_EXT”
Frequency Offset (MHz)	Real		“CURVE POINT”
Response (dB)	Real		“CURVE POINT”
Receiver Baseband Filter			
Number of Data Points	Integer		“RX_BB_FILTER”
Frequency Offset (MHz)	Real		“CURVE POINT”
Response (dB)	Real		“CURVE POINT”
Number of Comments	Integer		“COM_COUNT”
Comments	Text	70	“COMMENT”

Attachment 4: Radio Manufacturer Codes

These manufacturer codes should be used as the first 3 characters of the Radio Identification Number. It is intended to create a unique identifier when used in a Terrestrial EPCN and in equipment databases. For manufacturers not listed here, notify the chairman of NSMA Working Group 21 of the additions and the desired code, so that this list may be kept current.

Radio Manufacturer	***Code***
ADVANCED COMMUNICATIONS	ACM
AID	AID
ALCATEL NETWORK SYSTEMS	ALA
ALLIGATOR COMMUNICATIONS, INC	ALL
AMERICAN MICROWAVE LINK INC	AML
AML SPECIALTIES INC	ASI
AML WIRELESS	AMW
AT&T TECHNOLOGIES INC	ATT
AVANTEK INC	AVA
AYDIN MICROWAVE DIVISION	AYD
BARRINGER TELECOM INC	BAR
BLONDER TOUNGE	BLT
BOSCH	BOS
BROADCAST MICROWAVE SERVICES INC	BMS
BURLE	BUR
CABLE AML	CAM
CALIFORNIA MICROWAVE	CMI
CHANNEL MASTER	CHM
COMMUNITRONICS	CMT
CUSHMAN ELECTRONICS, INC.	CEI
DANIELS ELECTRONICS	DAN
DATARADIO INC	DAT
DETECTION DYNAMICS TEXAS INC	DDT
DIGITAL MICROWAVE CORPORATION	DMC
DSC COMMUNICATIONS CORPORATION	DSC
DUMONT	DUM
E & M DEVELOPMENT, INC.	EMD
E. F. JOHNSON COMPANY	EFJ
ECATEK INC	ECA
EMCEE BROADCAST PRODUCTS	EBP
ERICSSON	ERI
FUJITSU LIMITED	FUJ
GLENAYRE	GLN
GRANGER TELETTRA	GRA
GTECH CORPORATION	GTC
HARRIS CORPORATION	HRS
HOUSEHOLD DATA SERVICE	HDS
HUGHES AIRCRAFT COMPANY	HAC
IKEGAMI ELECTRONICS (USA) INC	IEI
INTERNATIONAL MICROWAVE CORP	IMC
ITT TELECOMMUNICATIONS	ITT
JERROLD ELECTRONICS CORP	JEC
K & F ELECTRONICS CO	KFE
KARKAR ELECTRONICS INC	KEI
LASER VISION INC.	LVI
MARTI ELECTRONICS	MEI

Radio Manufacturer	*Code*
MICRO CONTROLS, INC.	MCT
MICROWAVE ASSOCIATES	MAC
MICROWAVE BYPASS SYSTEMS	MBS
MICROWAVE DATA SYSTEMS INC	MDS
MICROWAVE RADIO CORPORATION	MRC
MICROWAVE SERVICE CO	MSC
MICROWAVE SOURCES CORPORATION	MSO
MOSELEY ASSOCIATES INC	MAI
MOTOROLA	MOT
MULTIPOINT NETWORKS	MPN
NERA	NER
NEULINK	NEU
NEXUS ENGINEERING CORP.	NEX
NIPPON ELECTRIC CO	NEC
NORTHERN TELECOM INC	NTI
NUCOMM	NUC
NURAD INC	NUR
OKI ELECTRIC INDUSTRY CO LTD	OKI
OMNIVISION, INC.	OVI
OPTAPHONE SYSTEM	OPT
P-COM, INC.	PCM
PENINSULA WIRELESS COMMUNICATIONS	PWC
QUINTRON	QNT
R&L MEDIA SYSTEMS, INC	RLM
RACON INC	RAC
RAYTHEON COMPANY	RTN
RCA CORP	RCA
REPCO INC	REP
RF TECHNOLOGY INC	RFT
SAN/BAR CORPORATION	SBC
SIEMENS TRANSMISSION SYSTEMS	SIE
SIERRA DIGITAL COMMUNICATIONS	SDC
SOLADYNE INTERNATIONAL INC	SII
SOUTHWEST MICROWAVE, INC.	SWM
SPECTRUM COMMUNICATIONS CORP	SCC
SPECTRUM DIGITAL CORP	SPD
SR TELECOM INC	STI
STANDARD ELECTRIK LORENZ	SEL
STREETCROSSER	STX
TADIRAN MICROWAVE NETWORKS	TTE
TAIT ELECTRONICS	TEL
TEPCO CORP	TEP
TFT	TFT
THETA COM	THC
TOWNSEND ASSOCIATES	TSA
TRON TEK INC	TRN
TRW VIDAR	TRW
TTI WIRELESS	TTI
TX RX SYSTEMS INC	TRS
WESCOM MICROWAVE INC	WMI
WESTEC COMMUNICATIONS, INC.	WCI
WESTERN ELECTRIC	WEC
WESTERN MULTIPLEX CORPORATION	WMC
WESTERN UNION TELEGRAPH CO	WUT

Radio Manufacturer	*Code*
WINNET MCS, INC	WIN
WIRELESS INC	WLI
WORLD ACCESS, INC	WAI

Attachment 5: Example of an Electronic File

"$HDR", "EQUIP1.0", "$"
"EQUIP_MFG", "Alcatel USA"
"MFG_MODEL", "MDR-6706-8"
"REV_NUM", "Version 1.0"
"REV_DATE", "03-01-1999"
"RADIO_ID", "JF6-9406"
”FCC_CODE”,
"EQ_DATE", "02-24-1999"
"EMISSION", "2M50D7W"
"MAX_LOADING", 192
"DATA_RATE", 12.4
"RADIO_CAP", 8, "DS1"
"MODULATION", "128 TCM"
”DEVIATION”,
"FREQ_RANGE", 5850, 7125
"POWER_OPTION", 15, 29, 31
"POWER_RANGE"
"STABILITY", 0.001
"ATPC_POWER", 10
"ATPC_STEP", 1
"ATPC_TRIG", -65
"THRESH_DIG", -79, -81
"THRESH_ANA"
"BRANCHING", "Non-Protected", 0, 0
"BRANCHING", "Monitored Hot-Standby", 0, 0.5, 10
"MAX_RSL", -10, -8
"DFM", 68, 70
"TX_SPECTRUM", 25
"CURVE_POINT", -3.12, -85.65
"CURVE_POINT", -2.63, -83.13
⋮
"CURVE_POINT", -0.77, -27.02
"CURVE_POINT", 0.00, -26.99
"CURVE_POINT", 0.70, -26.74
⋮
"CURVE_POINT", 2.54, -82.43
"CURVE_POINT", 3.12, -85.51
"TX_FILTER", 0
"FCC_BANDWIDTH", 2.5
"99%_BANDWIDTH", 2.48
"3DB_BANDWIDTH", 2.08
"T/T_FREQ_SEP", 49, 2.5, 28
"T/R_FREQ_SEP", 132, 105, 33
"T/R_FIXED"
"T/I_LIKE", 171
"CURVE_POINT", -125.000, -130.7
"CURVE_POINT", -123.000, -130.0
"CURVE_POINT", -121.000, -128.3
⋮ (curve points from -121 MHz to -1 MHz)
"CURVE_POINT", -1.000, 30.0
"CURVE_POINT", -0.400, 34.3
"CURVE_POINT", -0.200, 32.4
"CURVE_POINT", 0.000, 34.0

"CURVE_POINT", 0.200, 33.0
"CURVE_POINT", 0.400, 35.5
"CURVE_POINT", 1.000, 33.0
⋮ (curve points from 1 MHz to 121 MHz)
"CURVE_POINT", 121.000, -131.2
"CURVE_POINT", 123.000, -131.9
"CURVE_POINT", 125.000, -133.0
"T/I_CW", 171
"CURVE_POINT", -125.000, -152.9
"CURVE_POINT", -123.000, -147.6
⋮ (curve points from -123 MHz to -1 MHz)
"CURVE_POINT", -1.000, 29.5
"CURVE_POINT", -.800, 32.0
"CURVE_POINT", -.200, 32.0
"CURVE_POINT", 0.000, 33.8
"CURVE_POINT", .200, 32.0
"CURVE_POINT", .800, 33.0
"CURVE_POINT", 1.000, 30.0
⋮ (curve points from 1 MHz to 123 MHz)
"CURVE_POINT", 123.000, -141.4
"CURVE_POINT", 125.000, -143.0
"T/I_OTHER", "", 0, 0
"BB_FREQ"
"RX_RF_FILTER", 68
"CURVE_POINT", -125, -113.7
"CURVE_POINT", -115, -109.9
⋮ (curve points from –115 to –6 MHz)
"CURVE_POINT", -6, -0.1
"CURVE_POINT", 0, 0.0
"CURVE_POINT", 6, -0.1
⋮ (curve points from 6 MHz to 115 MHz)
"CURVE_POINT", 115, -107.0
"CURVE_POINT", 125, -110.5
"RX_IF_FILTER", 0
"IF_FILTER_EXT", 0
"RX_BB_FILTER", 0
"COM_COUNT", 1
"COMMENT", "T/I Data for 6.425-7.125 GHz band"
"$TLR", "EQUIP1.0", "$"