NCR Corporation
FCC Part 15, Certification Application
Class 7710

July 14, 1999

MEASUREMENT/TECHNICAL REPORT

COMPANY NAME: **NCR Corporation**

MODEL: **7710**

FCC ID: **JEH7710GA2**

DATE: **July 14, 1999**

This report concerns (check one): Original grant___
Class II change__X__

Equipment type: _____

Deferred grant requested per 47 CFR 0.457(d)(1)(ii)? yes_____ No_X_

If yes, defer until:_____
date

__N.A.__ agrees to notify the Commission by__N.A.____
date
of the intended date of announcement of the product so that the grant can be issued on that date.

Report prepared by:

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GENERAL INFORMATION

GENERAL INFORMATION

1.1 Product Description

The Equipment Under Test (EUT) is a NCR Corporation, Class 7710 price label system. The system consists of the following components:

1) Computer (remote location)
2) Communications Base Station (CBS II)
   with 1 transmit antenna, 4 receive antennas, and power supply
3) Shelf Label Tags (remote location)

Each system component is not considered to be located near the other.

The system is designed to operate on the following channels:

Fundamental Frequency (GHz)	Channel Number
2.400410324	174
2.40070295	175
2.400995576	176
2.401288202	177
2.401580828	178
2.401873454	179
2.40216608	180
2.402458706	181
2.402751332	182
2.403043958	183
2.403336584	184
2.40362921	185
2.403921836	186
2.404214462	187
2.404507088	188
2.404799714	189
2.40509234	190
2.405384966	191
2.405677592	192
2.405970218	193
2.406262844	194
2.40655547	195
2.406848096	196
2.407140722	197
2.407433348	198
2.407725974	199
2.4080186	200
2.408311226	201
2.408603852	202
2.408896478	203
2.409189104	204
2.40948173	205
2.409774356	206
2.410066982	207
2.410359608	208
2.410652234	209
2.41094486	210
2.411237486	211
2.411530112	212
2.411822738	213
2.412115364	214
2.41240799	215
2.412700616	216
2.412993242	217
2.413285868	218
2.413578494	219
2.41387112	220
2.414163746	221
2.414456372	222
2.414748998	223
2.415041624	224
2.41533425	225
2.415626876	226
2.415919502	227
2.416212128	228
2.416504754	229
2.41679738	230
2.417090006	231
2.417382632	232
2.417675258	233
2.417967884	234
2.41826051	235
2.418553136	236
2.418845762	237
2.419138388	238
2.419431014	239
2.41972364	240
2.420016266	241
2.420308892	242
2.420601518	243
2.420894144	244
2.42118677	245
2.421479396	246
2.421772022	247
2.422064648	248
2.422357274	249
2.4226499	250
2.422942526	251
2.423235152	252
2.423527778	253
2.423820404	254
2.42411303	255
2.424405656	256
2.424698282	257
2.424990908	258
2.425283534	259
2.42557616	260
2.425868786	261
2.426161412	262
2.426454038	263
2.426746664	264
2.42703929	265
2.427331916	266
2.427624542	267
2.427917168	268
2.428209794	269
2.42850242	270
2.428795046	271
2.429087672	272
2.429380298	273
2.429672924	274
2.42996555	275
2.430258176	276
2.430550802	277
2.430843428	278
2.431136054	279
2.43142868	280
2.431721306	281
2.432013932	282
2.432306558	283
2.432599184	284
2.43289181	285
2.433184436	286
2.433477062	287
2.433769688	288
2.434062314	289
2.43435494	290
2.434647566	291
2.434940192	292
2.435232818	293
2.435525444	294
2.43581807	295
2.436110696	296
2.436403322	297
2.436695948	298
2.436988574	299
2.4372812	300
2.437573826	301
2.437866452	302
2.438159078	303
2.438451704	304
2.43874433	305
2.439036956	306
2.439329582	307
2.439622208	308
2.439914834	309
2.44020746	310
2.440500086	311
2.440792712	312
2.441085338	313
2.441377964	314
2.44167059	315
2.441963216	316
2.442255842	317
2.442548468	318
2.442841094	319
2.44313372	320
2.443426346	321
2.443718972	322
2.444011598	323
2.444304224	324
2.44459685	325
2.444889476	326
2.445182102	327
2.445474728	328
2.445767354	329
2.44605998	330
2.446352606	331
2.446645232	332
2.446937858	333
2.447230484	334

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2.44752311	335
2.447815736	336
2.448108362	337
2.448400988	338
2.448693614	339
2.44898624	340
2.449278866	341
2.449571492	342
2.449864118	343
2.450156744	344
2.45044937	345
2.450741996	346
2.451034622	347
2.451327248	348
2.451619874	349
2.4519125	350
2.452205126	351
2.452497752	352
2.452790378	353
2.453083004	354
2.45337563	355
2.453668256	356
2.453960882	357
2.454253508	358
2.454546134	359
2.45483876	360
2.455131386	361
2.455424012	362
2.455716638	363
2.456009264	364
2.45630189	365
2.456594516	366
2.456887142	367
2.457179768	368
2.457472394	369
2.45776502	370
2.458057646	371
2.458350272	372
2.458642898	373
2.458935524	374
2.45922815	375
2.459520776	376
2.459813402	377
2.460106028	378
2.460398654	379
2.46069128	380
2.460983906	381
2.461276532	382
2.461569158	383
2.461861784	384
2.46215441	385
2.462447036	386
2.462739662	387
2.463032288	388
2.463324914	389
2.46361754	390
2.463910166	391
2.464202792	392
2.464495418	393
2.464788044	394
2.46508067	395
2.465373296	396
2.465665922	397
2.465958548	398
2.466251174	399
2.4665438	400
2.466836426	401
2.467129052	402
2.467421678	403
2.467714304	404
2.46800693	405
2.468299556	406
2.468592182	407
2.468884808	408
2.469177434	409
2.46947006	410
2.469762686	411
2.470055312	412
2.470347938	413
2.470640564	414
2.47093319	415
2.471225816	416
2.471518442	417
2.471811068	418
2.472103694	419
2.47239632	420
2.472688946	421
2.472981572	422
2.473274198	423
2.473566824	424
2.47385945	425
2.474152076	426
2.474444702	427
2.474737328	428
2.475029954	429
2.47532258	430
2.475615206	431
2.475907832	432
2.476200458	433
2.476493084	434
2.47678571	435
2.477078336	436
2.477370962	437
2.477663588	438
2.477956214	439
2.47824884	440
2.478541466	441
2.478834092	442
2.479126718	443
2.479419344	444
2.47971197	445
2.480004596	446
2.480297222	447
2.480589848	448
2.480882474	449
2.4811751	450
2.481467726	451
2.481760352	452
2.482052978	453
2.482345604	454
2.48263823	455
2.482930856	456
2.483223482	457

1.2 Related Submittal(s)/Grant(s)

The EUT will be used with part of a system to send/receive data. The system is functionally equivalent to a previously certified system which was granted on 02/10/1998 under FCC ID: JEH7710GA2. The Communications Base Station (CBS II) portion of the product has been redesigned for cost reductions purposes. NCR is submitting this application as a permissive change to the earlier certified system.

The EUT is subject to the following authorizations:

a) Permissive Change to earlier certification of FCC ID: JEH7710GA2

The information contained in this report is presented for the certification (transmitter) & verification (digital device) authorization(s) for the EUT.

SECTION 2

TESTS AND MEASUREMENTS

TEST AND MEASUREMENTS

2.1 Configuration of Tested System

The sample was tested per ANSI C63.4, Methods of Measurement from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz (1992). Conducted and radiated emissions data were taken with the test receiver or spectrum analyzer's resolution bandwidth adjusted to 9 kHz and 120 kHz, respectively. All measurements are peak unless stated otherwise. The video filter associated with the spectrum analyzer was off throughout the evaluation process. Interconnecting cables were manipulated as necessary to maximize emissions. Interconnecting cables were manipulated as necessary to maximize emissions. A block diagram of the tested system is shown in Figure 1. Test configuration photographs for spurious and digital device emissions are shown in Figure 2.

The system is functionally equivalent to a previously certified system which was issued on 02/10/1998 under FCC ID: JEH7710GA2. The Communications Base Station portion of the product has been redesigned for cost reductions purposes. NCR is submitting this application as a permissive change to the earlier certified system. Since no changes were made to the computer portion of the system and it is typically located remotely, no further testing was performed on the computer portion of the system. Due to the nature of the changes, it was deemed necessary to perform a complete retest of the CBS II was performed. The following is a complete list of the changes between the previously approved 7710 CBS II and unit tested:

Mechanical:

- smaller, cost-reduced cabinetry
- reduced circuit board size

Digital/Power:

- changed digital signal processor from 40MHz Lucent 1610 to 50MHz Lucent 1620
- replaced discrete logic & Lucent V32 data pump with programmable logic device
- added FLASH programmability
- changed analog to digital converter from Burr Brown DSP102JP to Analog Devices AD73322
- communication connector changed from circular plastic to RJ45 type
- power connector changed from circular plastic to screw terminal type
- power & communication cable changed from shielded to unshielded type
- changed external AC/DC power supply from 60VDC to 24VDC output
- changed internal DC/DC converter from custom integrated type to separate Power Trends PT6302G plus Burr Brown DCP010505P-U

2.1 Configuration of Tested System – Cont.

RF:

- changed transmit connector from reverse thread TNC to reverse polarity TNC
- changed transmit antenna from quarter wave monopole to patch type
- 1.9GHz VCO changed from Varil VCO190-1900AT to Varil LVCO2522T
- 500MHz VCO changed from discrete Clapp type to Varil VCO190-550T
- power amp feedback loop allows firmware to configure output power level for United States/Canada (2W EIRP) or Europe (500mW EIRP).
- changed power amp pre-driver from Motorola MRFIC2404 to HP MGA851563
- changed power amp driver from Motorola MRFIC2403 to RF Microwave RF2128
- removed power amp reverse power detect circuit
- replaced receiver input Wilkinson combiner with active combiner

2.2 Test Facility

Testing was performed at US Tech's measurement facility at 3505 Francis Circle, Alpharetta, GA. This site has been fully described and submitted to the FCC, and accepted in their letter marked 31040/SIT. Additionally this site has also been fully described and submitted to Industry Canada (IC), and has been approved under file number IC2982.

2.3 Test Equipment

Table 2 describes test equipment used to evaluate this product.

2.4 Modifications

Various modifications were required by NCR in order to bring the EUT into compliance with FCC Part 15, Class B Limits for the transmitter portion of the EUT and the Class A Digital Device Requirements. Please refer to the attached letter (on the next two pages) from NCR regarding these modifications.

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Tim Johnson
US Tech

July 14, 1999

Re: EMC Changes to NCR 7710 CBS II

Tim:
Attached is a list of changes NCR made to our 7710 CBS II (7710-7710) in order to pass EMC testing. NCR will implement these changes before installing this product.

Digital Board Changes

1. Multipart fix:
    a. Added 1.5" length of 0.5" wide copper tape to edge of digital board assembly near J3 & J4.
    b. Soldered 330pf capacitor (item 61, NCR #006-3500623) between pins 1 and 2 of J3. Added similar capacitor for J4.
    c. Soldered 15pf capacitor (item 60, NCR #006-2004776) between copper tape and pin 1 of J3. Added similar capacitor for J4.
    d. Created solder short between copper tape and pin 2 of J3. Repeated for J4.
    e. Added 2" length of EMI adhesive gasket material 006-8602526 to cabinet end plate to make positive contact with copper tape on RF board.
2. Added 100pf capacitor (item 63, NCR #006-8602527) from J2 pin 6 to GNDI (isolated ground). Added a similar capacitor from J2 pin 5 to GNDI (isolated ground).

RF Board Changes

1. Added six die-cut pieces of adhesive-backed RF absorbing foam (R&F Products type "RFLS") to RF board and chassis:

Assy Item #	NCR Part #
122	497-0413793
123	497-0413794
125	497-0414198
126	497-0414197
140	497-0414196
-	497-0414199

2. Changed receive antenna connectors J1, J2, J3, and J4 from plastic body type (NCR #006-8602180) to metal body type (NCR #006-8602524).

3. Value changes as follows:

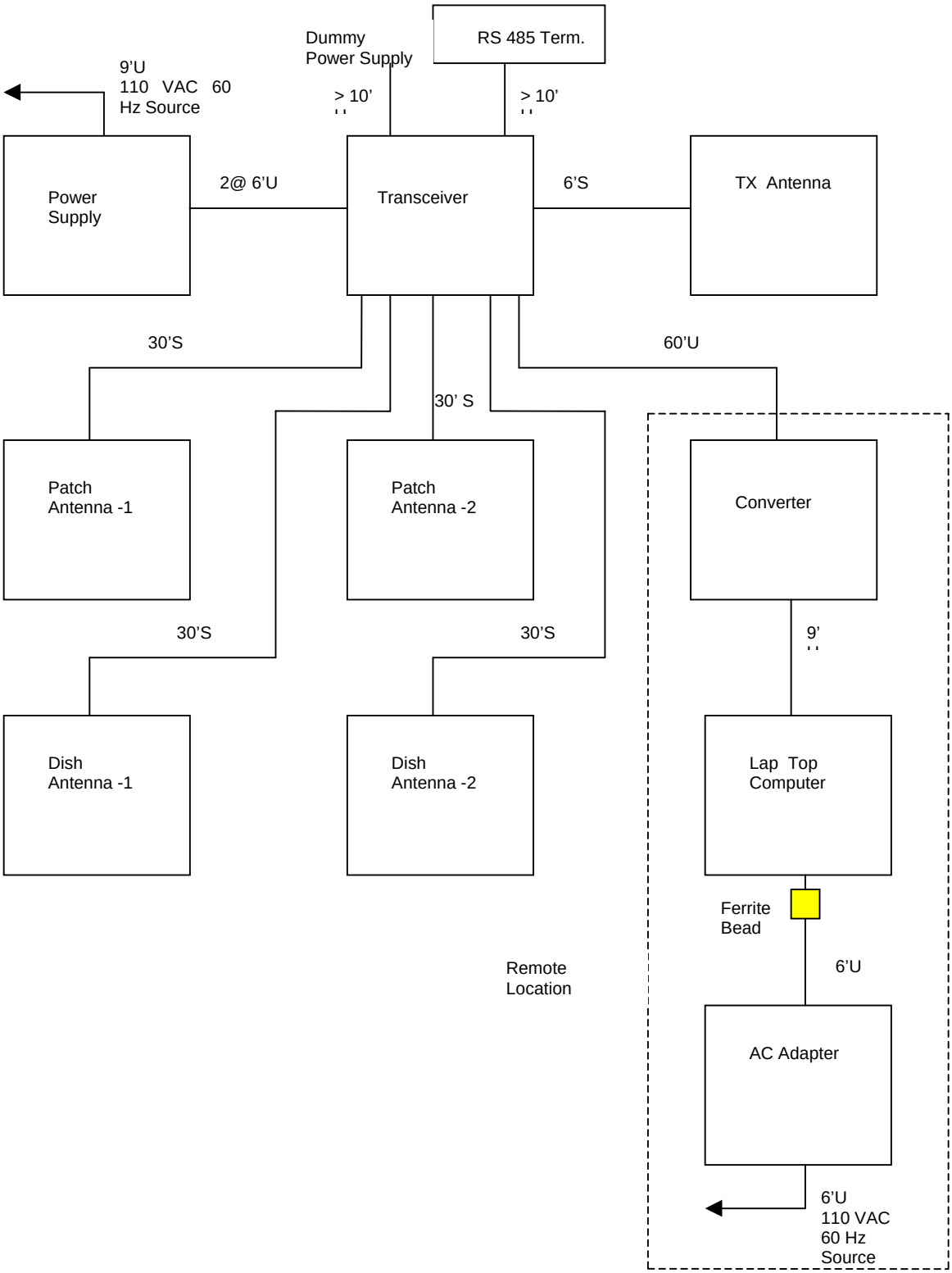
Ref. #	Old NCR Part #	Old Value	New NCR Part #	New Value
C41	006-8602046	1500pF	006-8602614	9pF
C50	006-8601990	0.015uF	006-8602613	4700 pF
C51	006-2004714	0.1uF	006-8602617	0.056uF
C68	006-2004714	0.1uF	006-8602615	.33uF
C70	006-2004714	0.1uF	006-8602616	.47uF
C74	006-2004778	22pF	006-2004784	68pF
L15	006-2002975	390nH	006-2005664	0 ohm
R10	006-2005574	1.2K ohm	006-2005588	4.7k ohm
R173	006-2005580	2.2K ohm	006-8602545	680 ohm
R177	006-2005580	2.2K ohm	006-8602545	680 ohm
R181	006-2005580	2.2K ohm	006-8602545	680 ohm
R185	006-2005580	2.2K ohm	006-8602545	680 ohm
R45	006-8602164	1.2pf	006-8602609	0.5pf
R47	006-2005565	510 ohm	006-2005664	0 ohm
R48	006-2005573	1.1K ohm	006-8602538	1.8K ohm
R52	006-2005665	1.0K ohm	006-8602539	22K ohm
R6	006-8602534	820ohm	006-2005574	1.2k ohm
R71	006-2005669	10K ohm	006-8602542	18K ohm
R75	006-2005584	3.3K ohm	006-2005665	1K ohm
R76	006-2005584	3.3K ohm	006-2005665	1K ohm
R77	006-2005581	2.4K ohm	006-8602541	2.2K ohm
R9	006-2005588	4.7K ohm	006-2005584	3.3k ohm
R90	006-2005543	62ohm	006-8602536	56ohm
R91	006-2005557	240ohm	006-2005562	390ohm
R92	006-2005543	62ohm	006-8602536	56ohm

Regards,

John F. Crooks

FIGURE 1

TEST CONFIGURATION

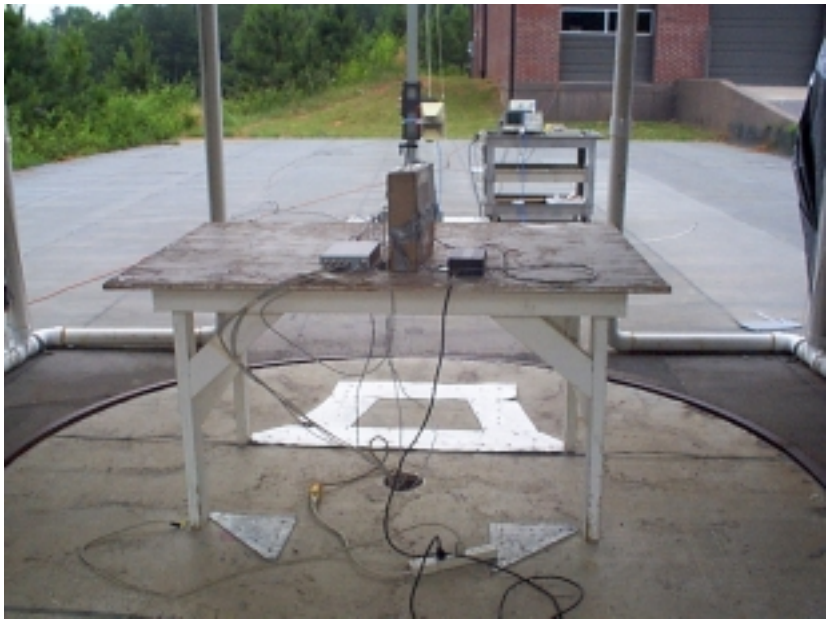


Test Date: May 27, 1999 & June 19, 1999
UST Project: 99-381
Customer: NCR Corporation
Model: 7710

FIGURE 2a

Photograph(s) for Spurious and Digital Device Emissions

Final Photographs are not available as they were lost during a hard-drive failure. The following photograph has been taken from earlier prescan setup. The final scan setup was identical to this photograph with the exception that all four receive antennas were also placed on the table, one in each corner (instead of remotely as pictured here).



Test Date: 5/18/99
UST Project: 99-381
Customer: NCR Corporation
Model: 7710

FIGURE 2b

Photograph(s) for Conducted Emissions

Final Photographs are not available as they were lost during a hard-drive failure.

TABLE 1

EUT and Peripherals

PERIPHERAL MANU.	MODEL NUMBER	SERIAL NUMBER	FCC ID:	CABLES P/D
Transceiver NCR (EUT)	7710 CBS II	None	(Pending)	>10' U to Dummy Power Load >10' U to RS 485 Term.
Patch Antenna (TX) Macom (EUT)	None	None	None	6' S
Power Supply Enterprise, Co. (EUT)	S4M04-3 Lead Year	9847	None	2@ 6' U 9' U 110 VAC 60 Hz
Patch Antenna (1) (RX) Macom (EUT)	None	33958015-00489819	None	30' S
Patch Antenna (2) (RX) Macom (EUT)	None	33958015-00489829	None	30' S
Dish Antenna (1) (RX) NCR (EUT)	None	9801/008	None	30' S
Dish Antenna (2) (RX) NCR (EUT)	None	9746/008	None	30' S
Converter RS 232/422/485 Black Box	IC107A	94096272629	None	60' U
Lap Top Computer AT & T	Globalyst 250	15-29240502	83DP52S	9' U 6' U
AC Adapter AT & T	ADP71	4801537GA	None	6'U

TABLE 2
TEST INSTRUMENTS

TYPE	MANUFACTURER	MODEL	SN.
SPECTRUM ANALYZER	HEWLETT-PACKARD	8593E	3205A00124
SPECTRUM ANALYZER	HEWLETT-PACKARD	8558B	2332A09900
S A DISPLAY	HEWLETT-PACKARD	853A	2404A02387
COMB GENERATOR	HEWLETT-PACKARD	8406A	1632A01519
RF PREAMP	HEWLETT-PACKARD	8447D	1937A03355
RF PREAMP	HEWLETT-PACKARD	8449B	3008A00480
HORN ANTENNA	EMCO	3115	3723
HORN ANTENNA	EMCO	3116	9505-2255
BICONICAL ANTENNA	EMCO	3110	9307-1431
LOG PERIODIC ANTENNA	EMCO	3146	9110-3600
BILOG	CHASE	CBL6112A	2238
LISN	SOLAR ELE.	8012	865577
LISN	SOLAR ELE.	8028	910494
LISN	SOLAR ELE.	8028	910495
THERMOMETER	FLUKE	52	5215250
MULTIMETER	FLUKE	85	53710469
FUNCTION GENERATOR	TEKTRONIX	CFG250	CFG250TW15059
PLOTTER	HEWLETT-PACKARD	7475A	2325A65394

2.6 Antenna Description (Paragraph 15.203)

An intentional radiator shall be designed to ensure that no transmit antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

The Model NCR Corporation 7710 incorporates the following antennas:

Function	Type	Model #	Manu-facturer	Gain	Type of Connector
Transmit	passive patch	NCR 497-0414029 Macom 3395-8015-0083	Macom	4.0 dBi	reverse polarity SMA jack
Receive	patch with LNA	NCR 497-0414028 Macom 3395-8015-0084	Macom	4.0 dBi	BNC jack
Receive	patch with LNA	NCR 497-0408705 Macom 3395-8015-0048	Macom	4.0 dBi	BNC jack
Receive	quarter wave monopole with LNA	NCR 230-0135210	NCR	5.5 dBi	BNC jack

Additionally, due to the unique nature of this system, this system requires professional installation.

2.7 Peak power within the band 2400 – 2483.5 GHz per FCC Section 15.247(b)

Peak power within the band 2400-2483.5 GHz has been measured with a spectrum analyzer by connecting the spectrum analyzer directly via a short cable to the antenna output terminals or across the antenna leads on the PCB as specified by the manufacturer. The spectrum analyzer was set for a 50 Ω impedance with the VBW ≥ RBW 6 dB bandwidth. The results of the measurements are given in Table 3 and Figure 3a through Figure 3c.

The EUT did not incorporate any antennas of directional gain greater than 6 dBi, therefore the output power has not been reduced as required by 15.247(b)(3).

TABLE 3
PEAK POWER OUTPUT

Test Date: **6/9/99**
UST Project: **99-381**
Customer: **NCR Corporation**
Model: **7710**

Frequency of Fundamental (MHz)	Measurement (dBm)*	Measurement (Watt)*	FCC Limit (Watt)
2400.0	28.0	0.631	1.0
2440.0	27.8	602.6	1.0
2483.5	26.1	407.4	1.0

*** Measurement includes 0.6 db cable loss**
(loss not known for special connector used)

Tester
Signature: _____ Name: Tim R. Johnson

Figure 3a.
Peak Power per FCC Section 15.247(b) (Low)

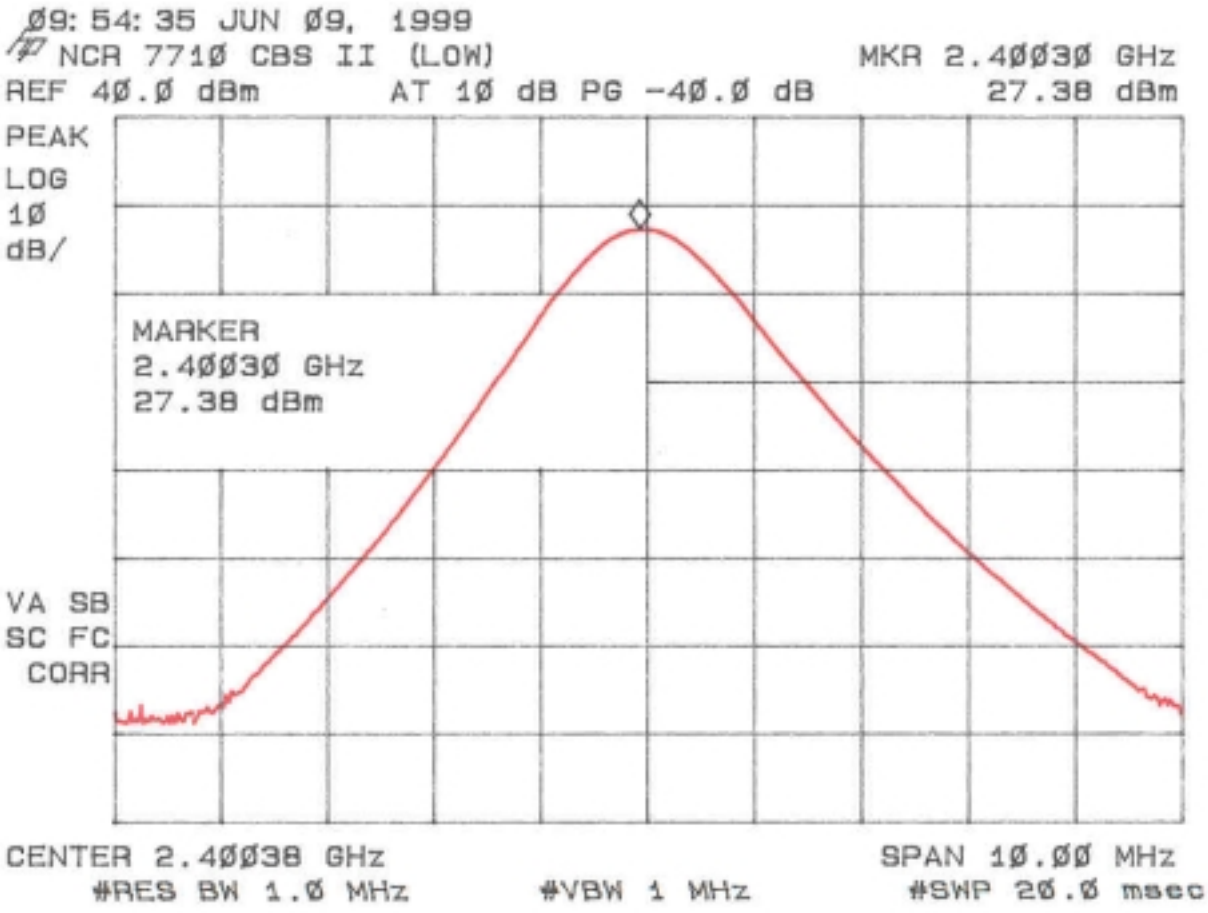


Figure 3b.
Peak Power per FCC Section 15.247(b) (Mid)

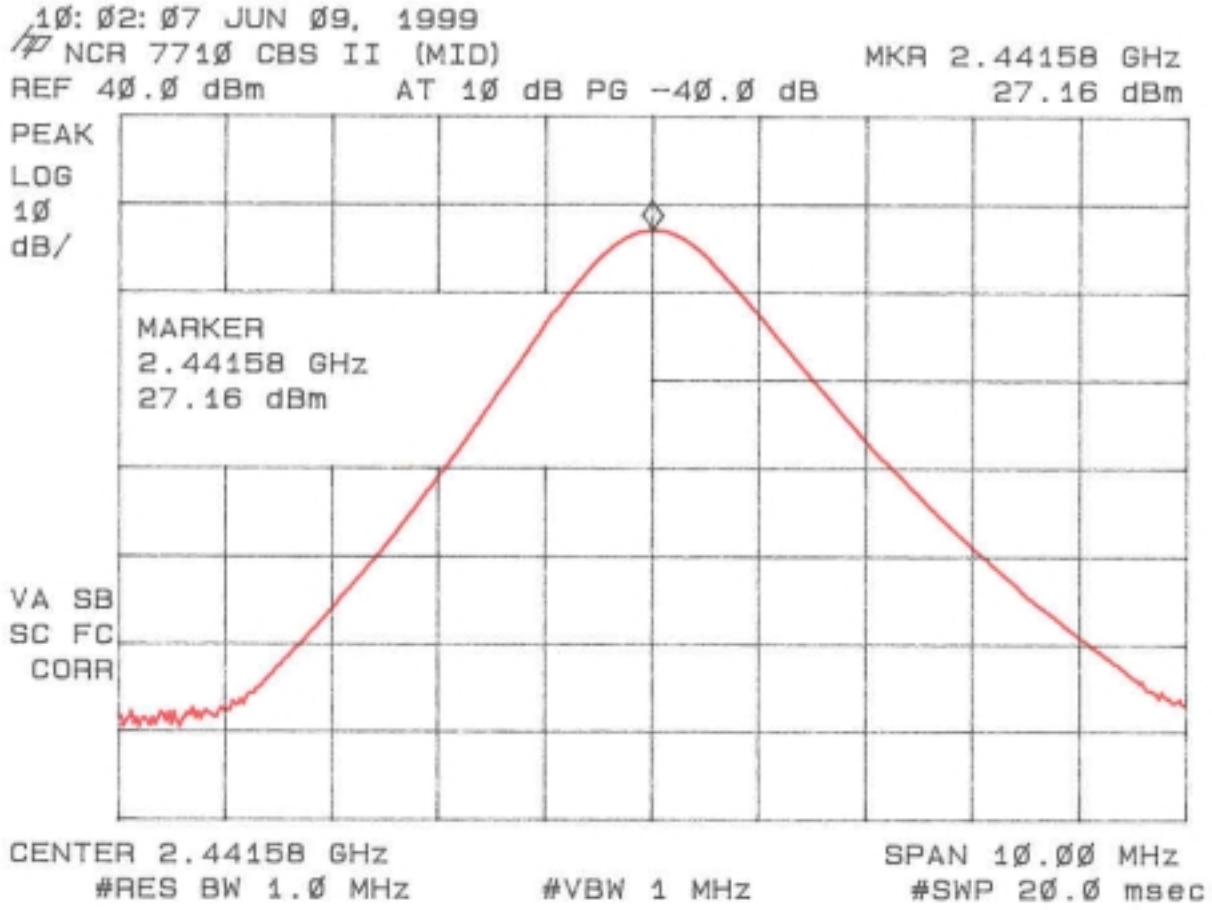


Figure 3c.
Peak Power per FCC Section 15.247(b) (High)