

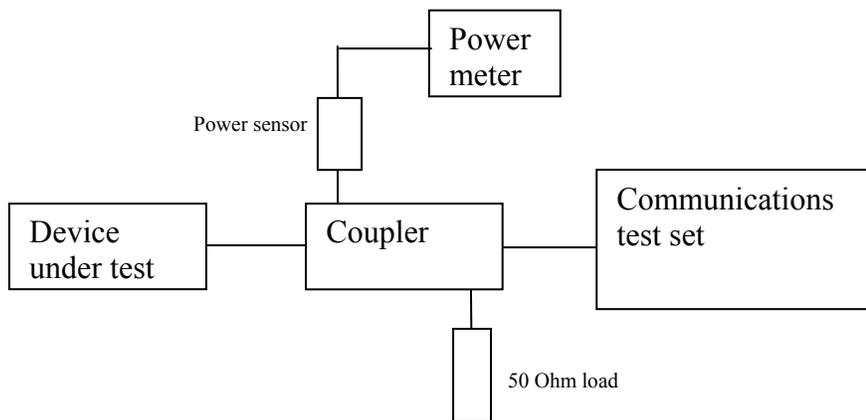
## Exhibit 7: Measurement Procedures -- 47 CFR. 2.947

### 7.1 RF Power -- Pursuant to 47 CFR 2.947(c)

The RF output power of DUT is not adjustable by the user. The PCS transmitter output power level remains under base station control. In order to conduct measurements at maximum power level "All Up Bits" option needs to be selected on the communications test set. The iDEN transmitter output power is controlled by the radio itself, in response to the received signal strength or by special radio service software. The output power in MOTOtalk remains set to maximum at all times.

All conducted measurements were performed via RF test port located at the back of the radio. See section 7.11 for equipment information.

Method of Conducted Output Power Measurement: Adaptation of TIA/EIA-603-A clause 2.2.1 for PCS Measurements



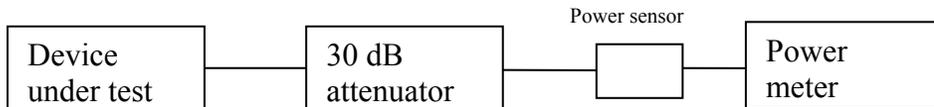
The wireless communications test set is used to maintain the CDMA call during the measurement and control the power level of the device under test. The power readings, corrected for path loss, are obtained from the power meter.

Communications test set settings:

- SID 331
- Registration channel 600 (uplink: 1880 MHz, downlink 1960 MHz)
- Cell power -101 dBm
- MS power control: all up bits ON

Power meter duty cycle: 100 %

Method of Conducted Output Power Measurement: Adaptation of TIA/EIA-603-A clause 2.2.1 for Pulsed Measurements



The power readings, corrected for path loss, are obtained from the power meter.

Power meter settings

- duty cycle:
  - 16.667 % (due to iDEN 6:1)
  - 95.134 % for MOTotalk
- detector mode: average
- number of averages: 64

Method of Measurement for Effective Radiated Power: TIA/EIA-603-B 2.2.17.2

The ERP characteristic was measured while a radio was set to transmit a test signal at the maximum rated output power (+/- 5%) and was vertically mounted on a non-conducting platform/turntable in a Spherical Anechoic Chamber. The power received at an antenna located at the end of the chamber was recorded on a spectrum analyzer for a complete 360-degree rotation. The path loss was measured using a calibrated RF signal source. The RF output power of the radio product was measured via the RF test port.

**7.2 Specific Absorption Rate – Pursuant 47 CFR Part 2.1093**

SAR measurements were performed in the following user configurations, as detailed in Section 7.1 of the RF Exposure report (Exhibit 11):

	Left Ear	Right Ear	Face	Abdomen
<b>PCS</b>	YES	YES	NO	YES
<b>iDEN</b>	YES	YES	YES	NO
<b>MOTotalk</b>	NO	NO	YES	YES

The above configurations are consistent with service options for DUT. For PCS RF exposure testing, the transmitter was operated in a call, using the call box set-up parameters described in Section 7.1 above.

**7.3 Emission Mask-- Pursuant to 47 CFR 2.947(b)**

Method of Measurement: Per TIA/EIA-603-A clause 2.2.11

- (1) Set the radio for measurement of RF output power using the power test procedure in the service manual which employs a pseudo random data sequence per part 2.1049(h), and attach it to a spectrum analyzer through a 10 dB attenuator. The analyzer is to be set for peak detection with a video bandwidth of 3 times the resolution bandwidth setting, a span of 100 kHz, and a sweep period of 20 seconds.
- (2) Using a 30 kHz resolution bandwidth to assure that essentially all of the transmitted energy is measured, obtain a "rainbow" curve and adjust the analyzer setting so that the crest of the curve lies at the 0 dB reference locations. This is portrayed as blue line on the analyzer display.
- (3) Reduce the resolution bandwidth to 300 Hz to characterize the transmitter emission on-channel and adjacent channels spectral performance characteristic. This is portrayed as yellow line on the analyzer display of the figures.
- (4) Overlay the applicable emission mask on the analyzer display as red line.
- (5) Compare yellow line and red line to ensure that the spectrum never exceeds the applicable emission mask.

**For Quad-16QAM Modulation:**

64K Bits per Second Pseudo-Random Digital Modulation

Vertical: 10 dB/div

Carrier Reference: Carrier Reference 0 dB corresponds to maximum and minimum peak output power settings, respectively.

**7.4 Radiated Spurious Emissions -- Pursuant to 47 CFR 2.947(b)**Test Sites:

1. Open Area Test Site (OATS) of the Motorola EMC Lab, 8000 W Sunrise Blvd, Plantation, Florida 33322 which is accredited to ISO/IEC 25 from the American Association for Laboratory Accreditation (FCC Registration: 91932/Industry Canada: IC3679). The radiated emission testing was performed for minimum and maximum powers in transmit mode.
2. TIMCO Engineering Lab, 849 NW State Road. 45Newberry, Florida 32669
3. FAU EMI Lab, Florida Atlantic University, 3998 N.W. 8th Street (FAU Blvd) Suite #310, Boca Raton, FL 33431.
4. Flom Test Labs, 3356 N. San Marcos Place, Suite 107, Chandler, AZ 85225

Method of Measurement: TIA/EIA-603-A clause 2.2.12

The equipment is placed on the turntable and placed in normal operation transmit mode of operation.

A broadband receiving antenna located 3 meters from the transmitter receives any signal radiated from the transmitter and its operational accessories. The antenna is adjustable in height and can be rotated for horizontal or vertical polarization. A spectrum analyzer covering the necessary frequency range is used to detect and measure any radiation received by the antenna.

The transmitter's modulated pseudo random digital signal is monitored and adjusted to obtain peak reading of received signals wherever they occur in the spectrum by:

- (1) Rotating the transmitter under test.
- (2) Adjusting the antenna height.

The testing procedure is repeated for both horizontal and vertical polarization of the receiving antenna. Relative signal strength is indicated on the spectrum analyzer connected to this antenna. The spectrum analyzer resolution bandwidth was set to 10 kHz for emissions below 1 GHz, and 1 MHz for higher frequency emissions. To obtain actual radiated signal strength for each spurious and harmonic frequency observed, a standard signal generator with calibrated output is connected to an antenna adjusted to in the range from 30 MHz to that harmonic frequency. This antenna is substituted for the transmitter under test. The signal generator output level is adjusted until a reading identical to that obtained with the actual transmitter is observed on the spectrum analyzer. Signal strength is then derived from the generator and appropriate cable losses due to set up. Measured emissions for both maximum and minimum transmit power levels are recorded in tables in Exhibit 6.

MOTOtalk ISM Band Measurement

Source: FCC Public Notice DA 00-705 March 30, 2000. "Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems"

The following spectrum analyzer settings were used:

Span = wide enough to fully capture the emission being measured

RBW = 1 MHz for  $f \geq 1$  GHz, 100 kHz for  $f < 1$  GHz

VBW  $\geq$  RBW

Sweep = auto

Detector function = peak

Trace = max hold

Following the guidelines in ANSI C63.4-1992 with respect to maximizing the emission by rotating the EUT, the emissions were measured at maximum and minimum power output. A pre-amp and a high pass filter are required for this test in order to provide the measuring system with sufficient sensitivity. After allowing the trace to stabilize, the peak reading of the emission is the peak field strength, after applying the appropriate correction factors.

Next the VBW is set to 10 Hz, while maintaining all of the other instrument settings. This peak level is measured and corrected. The dwell time per channel of the hopping signal is less than 100 ms, so the reading obtained with the 10 Hz VBW was further adjusted by a "duty cycle correction factor", derived from  $20 \log(\text{dwell time}/100 \text{ ms})$ :

Dwell time =  $274 \text{ symbols}/3200 \text{ symbols/sec} = 85.625 \text{ ms}$

Correction factor  $20 \log(85.625 \text{ ms}/100 \text{ ms}) = -1.348 \text{ dB}$

Equipment used for radiated emissions measurements (FL08 EMC Lab):

Site	3 Meters
Antenna	Horn 511
Amp	Amp #1
Cables	#101 and #102

## 7.5 Frequency Stability -- Pursuant to 47 CFR 2.947(c)

Measuring the frequency accuracy of the iDEN time division multiplexed (TDM) transmitter needs special procedures for 3 reasons. First is the short (15 ms) nature of its TDM pulses, which preclude the use of an ordinary CW type digital frequency counter. Second, software in the radio prevents the radio from transmitting its TDM pulses unless it is receiving a signal on the trunking system control channel. Third, to maintain the very high stability (greater than that required by part 90 rules) needed for system operation, the radio transmitter frequency is controlled by an automatic frequency control loop in the radio's receiver which locks onto the system forward control channel produced by a compatible FCC certified part 90 base station. This process results in electronic adjustments of the synthesizer section of the radio, which is used for both transmission and reception.

As a result, unlike traditional transceivers which do not frequency lock to a remote base station reference frequency, the transmitter frequency accuracy is essentially independent of the voltage and temperature induced variations of the subject transceiver's frequency reference oscillator. Rather, the transceiver frequency stability is that of the remote base station, but degraded by any inaccuracy in the transceiver frequency locking process.

By locking onto a base station meeting the requirements of 47 CFR 90.213, which is necessary for the transceiver to function, the transceiver transmitter inherits the inherent 1.5 PPM or better stability of the compatible base station. To assure attainment of the frequency accuracy requirement (2.5 PPM accuracy requirement for the 800MHz band and the 0.5PPM accuracy requirement for the 900MHz band) of part 90.213 for this transceiver, the frequency error is measured when locked to a base station simulator.

#### Frequency Error vs. temperature

Frequency measurements are made at the extremes of the temperature range -30° C to +70° C and at intervals of 10° C with the primary supply voltage set to the nominal battery operating voltage. A period of time sufficient to stabilize all components of the equipment is allowed at each frequency measurement. The maximum variation of frequency is measured.

An external power supply was used to provide a continuous 4.0VDC to the unit tested. The sensor leads from the power supply were attached to the input of the DC/RF test fixture in which the radio was placed. A Temperature Chamber was used to control the temperature.

At each set point, a soak time of 20 minutes was used to ensure thermal penetration of the unit tested before each measurement of frequency error was taken. A soak time of 45 minutes was used at -30 degree Celsius to ensure thermal penetration of the unit tested because of the variance from the starting temperature of +25 degree Celsius. Soak cycles of 20 minutes each thereafter were used because of the fact that the set points were incremented at 10 degree (Celsius) steps.

At room temperature, the primary supply voltage is reduced to the battery operating endpoint of the equipment under test. The maximum variation of frequency is measured. A battery eliminator was used for the input supply voltage.

The PCS transmitter stability measurements were made while the phone was on a call using a CDMA Wireless Communications Test Set E5515C, Agilent 8960 Series 10. The equipment under test is placed in an environmental chamber. The antenna port of the equipment under test is directly coupled to the input of the measurement equipment through a specialized RF connector. A power supply is attached as the primary voltage supply.

The iDEN measurement was taken by placing the unit tested into a phone call to the Motorola R2660C. Test on the Motorola R2660C was controlled to facilitate the call. Once the call had been established, a Hewlett Packard Model 89441A gathered measurements of the frequency error and recorded it to a data file.

After having taken measurement at a specific set point in the temperature range previously specified, the iDEN call test on the Motorola R2660C was terminated. The temperature chamber would proceed to its next increment and repeat the test execution process at the end of that particular soak cycle. The process was continued until measurements were made at each of the specified temperatures in the temperature range previously mentioned.

For MOTOtalk measurement, a special test mode which is not accessible by user was used. Frequency was set to 915.525 MHz (ISM band frequency) and transmission started after the soaking cycle on the device under test. A Hewlett Packard Model 89441A was used to measure the maximum frequency excursion due to temperature extremes.

After having taken measurement at a specific set point in the temperature range previously specified, the transmission was terminated by sending a command. The Temperature Chamber would proceed to its next increment and repeat the test execution process at the end of that particular soak cycle. The process was continued until measurements were made at each of the specified temperatures in the temperature range previously mentioned.

Frequency Error vs. voltage

The unit tested used a frequency of 858.45/813.45 MHz. A Power Supply was controlled to provide a voltage range of 3.55VDC to 4.2VDC to the unit tested. The sensor leads from the power supply were attached to the input of the battery eliminator of the unit tested.

The measurements were taken by placing the unit tested into a phone call to the Wireless Communications Test Set E5515C

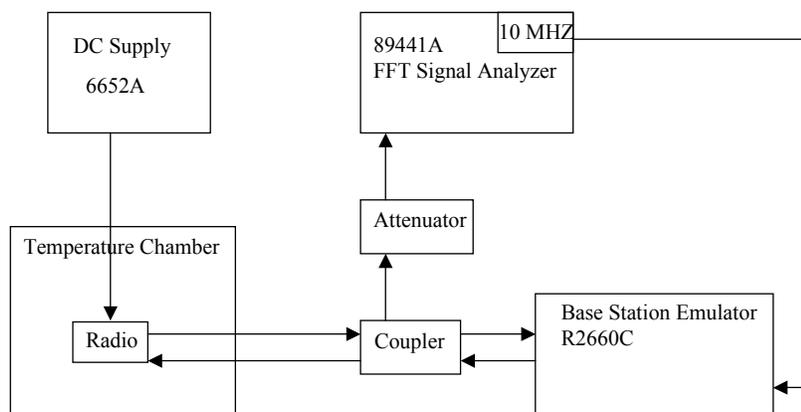
For MOTOtalk measurement, a special test mode which is not accessible by user was used. Frequency was set to transmit at 915.525 MHz (ISM band frequency). A Hewlett Packard Model 89441A was used to measure the maximum frequency excursion due to voltage extremes.

After having taken a frequency error measurement at 4.2V<sub>DC</sub>, the Power Supply's output was reduced by 0.1V<sub>DC</sub>. The measurement process was repeated until Frequency Error measurements were made in 0.1V<sub>DC</sub> steps of each of the specified voltages in the range previously mentioned.

Method of Measurement

Since the transmitter frequency is locked to the frequency of the compatible base station via the receiver in this transceiver, frequency accuracy data was measured with the transceiver locked onto a base station transmitter emulated by a Motorola R2660C Service Monitor as shown in Figure 7-1. This was done using the Quad-16QAM time division duplex (TDD) characteristic of the transceiver wherein it was placed into a TDD mode of transmission as normally used to make a call to a landline phone.

During the test the transceiver was receiving a very high accuracy forward control channel frequency signal from the compatible base station emulator and TDD transmitting a signal on the reverse control channel at a frequency 45 MHz lower in the 800MHz band, corresponding to the normally assigned frequency separation. A Hewlett Packard model 89441A signal analyzer was used to measure the centroid frequency of the emission. The frequency of the transceiver was measured as operating voltage or temperature was varied, and compared to the frequency of the assigned channel.



**Figure 7-1: Transmit Frequency Measurement Setup**

## 7.6 Power Line Conducted Spurious Output Voltage Pursuant 47 CFR 15.107

### Test Site:

Electrical Engineering Screen Room of the Motorola EMC Lab, 8000 W Sunrise Blvd, Plantation, Florida 33322 which is accredited to ISO/IEC 25 from the American Association for Laboratory Accreditation (FCC Registration: 91932/Industry Canada: IC3679).

### Method of Measurement: TIA/TEA-603-A clause 2.1.3

Connect the measuring receiver to the power line through a line stabilization network. A spectrum analyzer of nominal  $50 \Omega$  impedance to one terminal ("neutral") of the line stabilization network. The spectrum analyzer is then tuned to search for spurious outputs from *150 kHz to 30 MHz pursuant 47 CFR 15.107*. All spurious voltages are recorded. Six highest local maxima are noted, measured with a "Quasi-peak" and "Average" detectors, and then tabulated.

## 7.6 Time of Occupancy (Dwell Time) – Pursuant 47 CFR 15.247(a)(1)(iii)

The RF output port of the DUT is directly coupled to the input of the EMC analyzer through a specialized RF connector. A power supply is used for the supply voltage. The DUT has its hopping function enabled. The following spectrum analyzer settings are used:

Span = zero span, centered on a hopping channel

RBW = 1 MHz

VBW  $\geq$  RBW

Sweep = as necessary to capture the entire dwell time per hopping channel

Detector function = peak

Trace = max hold

Use the marker-delta function to determine the dwell time. Subparagraph 15.247(a)(1)(iii) states "The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed." This equates to a time period of 31.6 seconds.

A single measurement cannot be made over a 31.6 second period due to the coarse resolution in the time domain. A sweep is first made in a 4 second period. The resolution is not fine enough to capture the dwell time in each burst but the periodicity can be seen. The number of time slots occupied (40) can be extrapolated to show the number of time slots occupied within a 31.6 second period ( $40 \cdot \frac{32s}{4s} = 320$ ).

Another sweep is made over a 5 ms period, allowing the measurement of the duration of one time-slot. This active time can be multiplied by the number of transmissions in a 31.6 second period (320) to derive the total dwell time in a 31.6 second period. The specification is 400 ms maximum dwell time.

**7.7 20 dB Bandwidth – Pursuant 47 CFR 15.247(a)(1)(ii)**

The RF output port of the DUT is directly coupled to the input of the spectrum analyzer through a specialized RF connector. A power supply is used for the supply voltage. The DUT must have its hopping function enabled. The following spectrum analyzer settings are used:

Span = 2 MHz (approximately 2 to 3 times the 20 dB bandwidth, centered on a hopping channel)

RBW = 50 kHz ( $\geq$  1% of the 20 dB bandwidth)

VBW = 50 kHz ( $\geq$  RBW)

Sweep = auto

Detector function = peak

Trace = max hold

The DUT transmits at its maximum data rate. The trace is allowed to stabilize. The marker-to-peak function is used to set the marker to the peak of the emission. The marker-delta function is used to measure 20 dB down one side of the emission. The marker-delta function is reset and the marker is moved to the other side of the emission, until it is (as close as possible to) even with the reference marker level. The limit is specified as a maximum of 1 MHz.

**7.8 Peak Output Power – Pursuant 47 CFR 15.247(b)(1)**

The RF output port of the DUT is directly coupled to the input of the spectrum analyzer through a specialized RF connector. A power supply is used for the supply voltage. The DUT must have its hopping function enabled. The following spectrum analyzer settings are used:

Span = 5 MHz (approximately 5 times the 20 dB bandwidth, centered on a hopping channel)

RBW = 1 MHz ( $>$  the 20 dB bandwidth of the emission being measured)

VBW = 1 MHz ( $\geq$  RBW)

Sweep = auto

Detector function = peak

Trace = max hold

The trace is allowed to stabilize. The marker-to-peak function is used to set the marker to the peak of the emission. The indicated level is the peak output power. The maximum level is specified as 1 Watt.

### 7.9 Band-Edge Compliance of RF Conducted Emissions – Pursuant 47 CFR 15.247(c)

The RF output port of the DUT is directly coupled to the input of the spectrum analyzer through a specialized RF connector. A power supply is used for the supply voltage. The following spectrum analyzer settings are used:

Span = 10 MHz (wide enough to capture the peak level of the emission operating on the channel closest to the band edge, as well as any modulation products which fall outside of the authorized band of operation)

RBW = 100 kHz ( $\geq$  1% of the span)

VBW = 100 kHz ( $\geq$  RBW)

Sweep = auto

Detector function = peak

Trace = max hold

The trace is allowed to stabilize. The marker is set on the emission at the band edge, or on the highest modulation product outside of the band, if this level is greater than that at the band edge. The marker-delta function is enabled and then the marker-to-peak function is used to move the marker to the peak of the in-band emission. The marker-delta value displayed must be greater than 20 dB.

Now, using the same instrument settings, the hopping function of the DUT is enabled. The trace is allowed to stabilize. The same procedure listed above is followed to determine if any spurious emissions caused by the hopping function also comply with the specified limit.

### 7.10 Spurious RF Conducted Emissions – Pursuant 47 CFR 15.247(c)

The RF output port of the DUT is directly coupled to the input of the spectrum analyzer through a specialized RF connector. A power supply is used for the supply voltage. The following spectrum analyzer settings are used:

Span = wide enough to capture the peak level of the in-band emission and all spurious emissions (e.g., harmonics) from the lowest frequency generated in the EUT up through the 10th harmonic. Several plots are required to cover this entire span.

RBW = 100 kHz

VBW = 100 kHz ( $\geq$  RBW)

Sweep = auto

Detector function = peak

Trace = max hold

### 7.11 Measurement Equipment List ---- 47 CFR 2.947(d)

#### 1. Spectrum Analyzer

- H.P. 8566B
- H.P. 8563E
- Rhode & Schwarz ES126
- Rhode & Schwarz ESMI
- Rhode & Schwarz FSEB

#### 2. Vector Signal Analyzer

- H.P. 89441A

3. Communications System Analyzer
  - Motorola R-2660 MIRS Digital Communication System Analyzer
  - Agilent 8960 Series 10, Wireless Communications Test Set E5515C
4. Oscilloscope
  - HP 54616B, Oscilloscope
  - Tektronix, Model TCP202, Current Probe
5. RF Signal Generator
  - H.P. 8656A
  - Rhode and Schwarz SMP22
  - H.P. E4420A
6. Power Meter
  - H.P. 437B Power Meter
  - H.P. 8482A Power Sensor
7. Multimeter
  - Keithley 2001 Multimeter
8. Power Supply
  - Motorola Lithium Ion Battery, Kit #: NTN 5705A
  - DC Power Supply, H.P., Model: 6652A
  - DC Power Supply, H.P., Model: 6632A
  - DC Power Supply, H.P., Model: 6032A
  - Battery Charger, Model: NNTN4680A
  - DC/RF Test Fixture, 22000uF shunt capacitor / series .2 ohm resistor
9. RF Load/Couplers
  - Weinschel Engineering, Model: 9305-30, 20 Watt, 30 dB Attenuator
  - Weinschel Engineering, Model: 9305-10, 20 Watt, 10 dB Attenuator
  - Narda, Model: MOD766-30, 20 Watt, 30 dB Attenuator
  - Narda bi-directional coaxial coupler, model 3022 (1.0 to 4.0 GHz)
10. Adapters
  - Hirose RF port to SMC conversion adapter, model MS-156-HRMJ-5

## 11. Filter

- Trilithic, Model: X5HX1612-0-75-AA, High Pass Filter
- Trilithic, Model: R9H1-1G4/8G-28A, High Pass Filter

## 12. Amplifier

- MITEQ AFS5-00101800-25-ULN, 1-18GHz, 25dB Gain Amplifier
- PST 10W Amplifier

## 13. Antenna

- Watkins - Johnson, 0.5 GHz - 12.4 GHz, Model WJ-48010
- Watkins - Johnson, Model: AR122
- A.H. Systems Inc., Model: SAS-200/571, 700MHz - 18GHz, Double Ridge Guide Horn
- EMCO, Model: 3141, 20MHz – 1GHz, Biconilog
- Schaffner-Chase EMC Ltd., Bilog Antenna, Model CBL6112B
- Watkins-Johnson L.P. antenna AR7-17A

## 14. Test Chambers

- Thermotron, Model: S-8.0C
- Howland 3D Anechoic Chamber (custom)

## 15. LISN

- EMCO, Model: 3810/2NM, Line Impedance Stabilization Network

## 16. Antenna Positioning Mast / Turntable

- Sunol Sciences Corp., Model: FM 2011, Turntable
- Sunol Sciences Corp., Model: TLT95, Antenna Positioning Mast
- Sunol Sciences Corp., Model: SC98V, System controller
- Scientific Atlanta Antenna Analyzer System 2083A

## 17. Computers

- Dell, Laptop Computer
- Hitachi MX 166 computer, Hyperlink Terminal
- Dell Precision 420 Computer

## 18. Programming Cable

- USB Data Cable