EXHIBIT 12

Transceiver Adjustments

Exhibit Summary:

EXHIBIT 12 contains information pertaining to radio level adjustments that are performed during the manufacturing process.

Contents:

Frequency Adjustment:

In order to guarantee that the AFC algorithm will be able to adjust the transmitter to within the specified 0.1 ppm described in EXHIBIT 3 it is necessary to measure, adjust, and store a compensating value of an un-AFCed carrier. This takes place during the manufacturing process.

The mobile station transceiver is set to transmit on channel number 661 and is keyed. The frequency transmitted is measured and the offset from the desired 1880 Mhz is calculated. The voltage necessary to be applied to the reference oscillator circuit, to cause the transmitted frequency to be within 100 Khz of desired, is calculated, converted to a digital format and stored in non-volatile memory. The resolution of the tuning ability is also verified to be less than 78 Hz increments. This ensures the ability to tune to within the necessary 0.1 ppm.

Transmit Output Power Adjustment:

In order to guarantee that the power control circuitry will be able to adjust the transmitter to within the specified limits shown in the table of EXHIBIT 6 it is necessary to measure, adjust, and calculate calibration values to compensate for manufacturing and component tolerances in the transmitter lineup. This takes place during the manufacturing process.

The mobile station transceiver is set to transmit a pseudo random data sequence on channel number 661 and is keyed. The output power is measured at both highest and lowest power steps. The voltage necessary to be applied to the power control circuitry, to cause the transmitted power to be within the limits of the table in EXHIBIT 6, is calculated. Also, the voltages required to meet specified levels of the intermediate power steps are calculated. This array of values are converted to a digital format and stored in non-volatile memory. Finally, the mobile station transceiver is set to transmit a pseudo random data sequence on channel numbers 512 and 810 and is keyed to power step 6. A further algorithm is run to calculate offset values for the values stored in non-volatile memory above to account for tolerances due to frequency variation. This ensures the ability to control the output power across the USPCS band.

Receive I and Q Balance:

With the aide of a Hewlett Packard 8922 GSM Test Set the relative levels of the demodulated quadrature baseband analog signals I and Q are adjusted to achieve a balance between the two amplitudes.

With the mobile station in a call with the 8922 use the transceiver's internal command to output the power of the I and Q signals. Store the adjusting factors into non-volatile memory to achieve a balance between the amplitudes of the two signals.

Receive Audio Level Adjustment:

With the aid of a Hewlett Packard 8922 GSM Test Set the receive audio level Automatic Gain Control (AGC) circuitry is adjusted to set the demodulated receive audio to calibrated levels. Once calibrated, the receive levels are then used as an indication of receive signal strength.

With the mobile station in a call with the 8922 use the transceiver's internal command to output the power of the I and Q signals. For given RF input power levels from the 8922 compensating gain control values are calculated to maintain a constant amplitude on each of these signals. This procedure is repeated over varying power input levels and over many discrete frequency bands creating a matrix of compensating factors. This matrix is stored into non-volatile memory.