PRESENTATION

OF

ACKNOWLEDGEMENT PAGING TEST RESULTS

David I. Odom
Vice President, Engineering
Dial Page
September 11, 1992

Acknowledgement Paging Test Overview

During the month of August, 1992, a series of laboratory tests were completed at Dial Page engineering facilities in Winston Salem, North Carolina. These tests were conducted as outlined in Pages 9 & 10 of Section 4 of our "Supplement to Petition for Rulemaking".

The objective of these tests was to demonstrate the technical feasibility of the Dial Page Acknowledgement Paging system. This proposal relies on low power (2 watt) FSK transmission of acknowledgement messages in the 930 MHz range to a network of proprietary receivers developed by Dial Page. Our original system design required reliable transmission over a three mile radius with no degradation from high power transmitters operating on adjacent transmitters.

In May the necessary equipment was ordered including 2 FSK portable transceivers and a 250 watt 900 MHz base station. The lab tests were completed in August and presented below. The field test is awaiting equipment delivery and is expected to be completed in October.

The results of this technical feasibility test are presented below. While final conclusions await our field test, the lab test results presented below demonstrate the effectiveness of our proprietary receiver and meet the criteria required to implement our proposed Acknowledgement Paging system.

Laboratory Test #1:

Experimental Setup:

A modified RF transmitter capable of producing FSK FM modulation in the 900 MHz band is used to produce a coherent intelligence on the carrier. Said intelligence is a bit stream generated by a personal computer running a standard BERT/BLRT error analysis protocol. A second modified RF transmitter identical to the first is used to produce an interfering carrier offset by standard channel frequency spacing from the intelligent carrier and producing unit normal power. A standard receiver modified to produce RS-232c output will baseline the digiceiver's performance.

Experimental Goal:

Establish quantitative advantage of digiceiver augmented reception in the presence of unit normal strength narrow band interference.

Laboratory Test #2:

Experimental Setup:

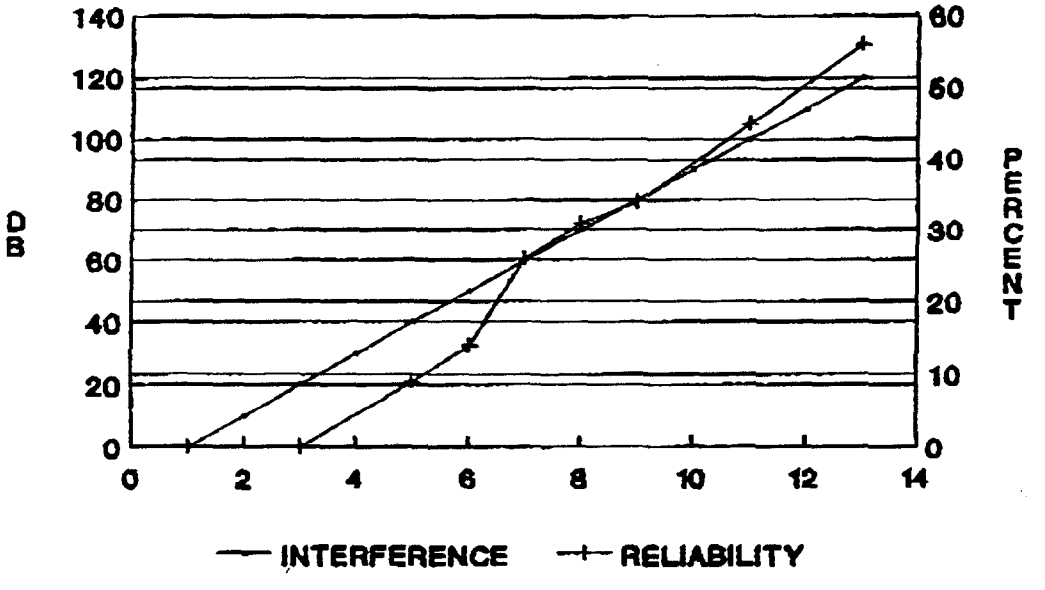
Identical to test #1 except for presence of passive attenuator in the RF output line of the signal transmitter. The attenuator allows a simulation of increased distance between the transmitter and the receiver while the interfering carrier's power level is increased above unit normal level relative to the intelligent signal.

Experimental Goal:

Establish quantitative advantage of digiceiver augmented reception over a conventional receiver in the presence of strong interference and simulated distance.

FIGURE 1

DIALPAGE DIGICEIVER
ADJACENT CHANNEL PERFORMANCE



DIO 08/11/92

Description:

Figure 1 is a graphical representation of experimental data obtained during a laboratory trial of the Dial Page Digiceiver. The experimental set-up consisted of a FSK transmitter serving as a source of signal intelligence and a companion FSK transmitter serving as a source of signal interference on an adjacent channel. The graph plots percentage increase in reliability (right axis) as a function of increasing interference (left axis). The percentage increase in reliability is derived from the error rate in the repetitious closed loop transmission - reception of a data stream. A conventional receiver is compared to the Dial Page Digiceiver.

Analysis: The Dial Page Digiceiver provides only marginally improved increase in data reliability for mild (60 db) adjacent channel interference. This is due in large measure to the ability of the crystal filters in the first if of the conventional receiver to filter the adjacent channel. As the interfering signal strength is increased to higher levels (>60 dB); however, the front end and IF sections of the conventional receiver are over-driven. The spurious signal is passed to the limiter section where it causes uncertainty in the discriminator-limitor output. This is reflected as a considerable increase in bit errors from the conventional receiver. The Dial Page Digiceiver (which does not employ conventional limiter or discriminator sections) is virtually immune to the spurious signal interference. This is reflected in the high percentage of increase in reliability (>50 %).

Conclusion:

The Dial Page Digiceiver provides a marginal increase in reliability for mild adjacent channel interference and a dramatic increase in reliability for strong adjacent channel interference.

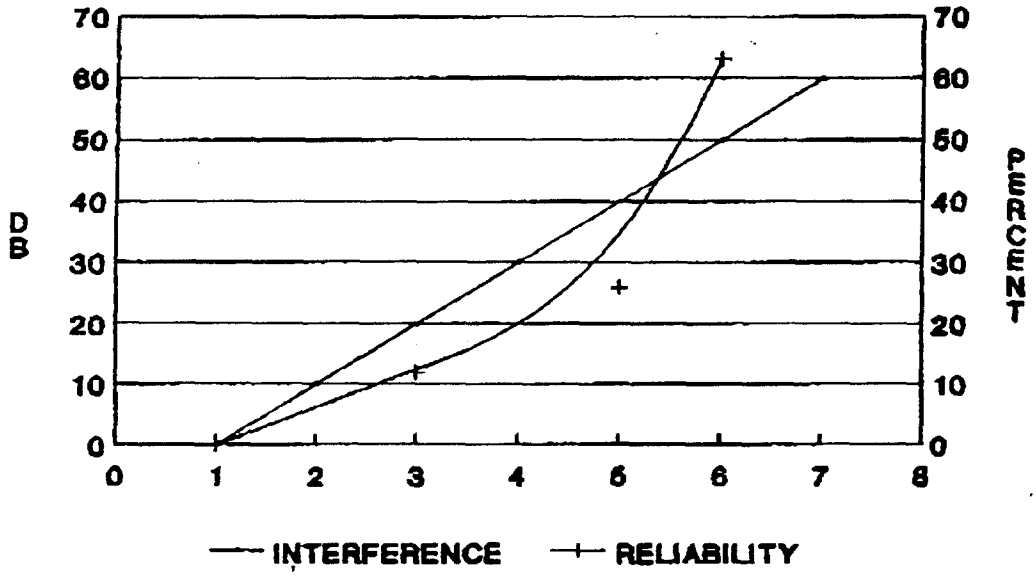
Laboratory Test #3:

Experimental Setup:

Identical to test #1 except for presence of passive attenuator in the RF output line of the interfering transmitter. The interfering transmitter is tuned to produce interfering RF on the same frequency as the intelligent carrier. The attenuator serves to reduce the power level of the interfering carrier to a fraction of unit normal output power.

FIGURE 2

DIALPAGE DIGICEIVER
CO-CHANNEL PERFORMANCE



DIO 08/11/92

EXECUTIVE SUMMARY

Laboratory tests were conducted to assess the ability of the Dial Page Digiceiver (Patent Pending) to enhance reception of signals in areas of adjacent channel and co-channel interference.

The conclusions reached were that the Dial Page Digiceiver dramatically increases the reliability of received signals when strong adjacent channel or co-channel interference is present. This will greatly reduce the infrastructure required for Acknowledgement Paging in cities with high intermodulation and other interference.

Tests were also conducted to assess the Dial Page Digiceivers ability to enhance reception of signals in the presence of white noise. The conclusion reached was the Digiceiver could receive a signal 30DB weaker than a conventional receiver in a white noise environment while maintaining the same reliability of reception.

A graphic illustration of the benefits is shown in Figure 3. The inner contour is the area of reception over terrain in the Greenville, S.C. area with a conventional receiver. The outer contour is the predicted coverage with a Dial Page Digiceiver over the same terrain. This computer simulation was done with RSPT 5.2 from John Murray and Associates.

Description:

Figure 1 is a graphical representation of experimental data obtained during a laboratory trial of the Dial Page Digiceiver. The experimental set-up consisted of a FSK transmitter serving as a source of signal intelligence and a companion FSK transmitter serving as a source of signal interference on an adjacent channel. The graph plots percentage increase in reliability (right axis) as a function of increasing interference (left axis). The percentage increase in reliability is derived from the error rate in the repetitious closed loop transmission - reception of a data stream. A conventional receiver is compared to the Dial Page Digiceiver.

Analysis: The Dial Page Digiceiver provides only marginally improved increase in data reliability for mild (60 db) adjacent channel interference. This is due in large measure to the ability of the crystal filters in the first if of the conventional receiver to filter the adjacent channel. As the interfering signal strength is increased to higher levels (>60 dB); however, the front end and IF sections of the conventional receiver are over-driven. The spurious signal is passed to the limiter section where it causes uncertainty in the discriminator-limitor output. This is reflected as a considerable increase in bit errors from the conventional receiver. The Dial Page Digiceiver (which does not employ conventional limiter or discriminator sections) is virtually immune to the spurious signal interference. This is reflected in the high percentage of increase in reliability (>50 %).

Conclusion:

The Dial Page Digiceiver provides a marginal increase in reliability for mild adjacent channel interference and a dramatic increase in reliability for strong adjacent channel interference.

Description:

Figure 2 is a graphical representation of experimental data obtained in a laboratory trial of the Dial Page Digiceiver. The experimental set-up is identical to the set-up of Figure 1 except that the interfering signal is co-channel rather than adjacent channel. The graph's ordinate and abscissa are identical to Figure 1.

Analysis:

Due to the inability of the conventional receiver's front end and IF sections to distinguish the spurious signal from the intelligence a dramatic increase in percentage of reliability is evident at even mild (>20 dB) levels of interference. As the signal strength of the interfering signal is increased to a high level (>50 dB) the conventional receiver is completely incapable of tracking the intelligent signal. The Dial Page Digiceiver is immune to the interference. This is reflected in the asymptotic increase in reliability (>65%) at high levels of interference.

Conclusion:

The Dial Page Digiceiver provides a dramatic increase in reliability in the presence of co-channel interference.

Field Test #1 as noted in our "Supplement to Petition for Rulemaking" was conducted April, 1992. A graphic depiction of the coverage is indicated on Figure 3 by the inner contour. The outer contour is calculated based on the results of a lab test to assess the ability of the Dial Page Digiceiver to enhance the reception of signals in the presence of white noise. The results of this test indicate the Digiceiver can receive a signal 30DB weaker than a conventional receiver in a white noise environment while maintaining the same reliability of reception.

FIGURE 3A

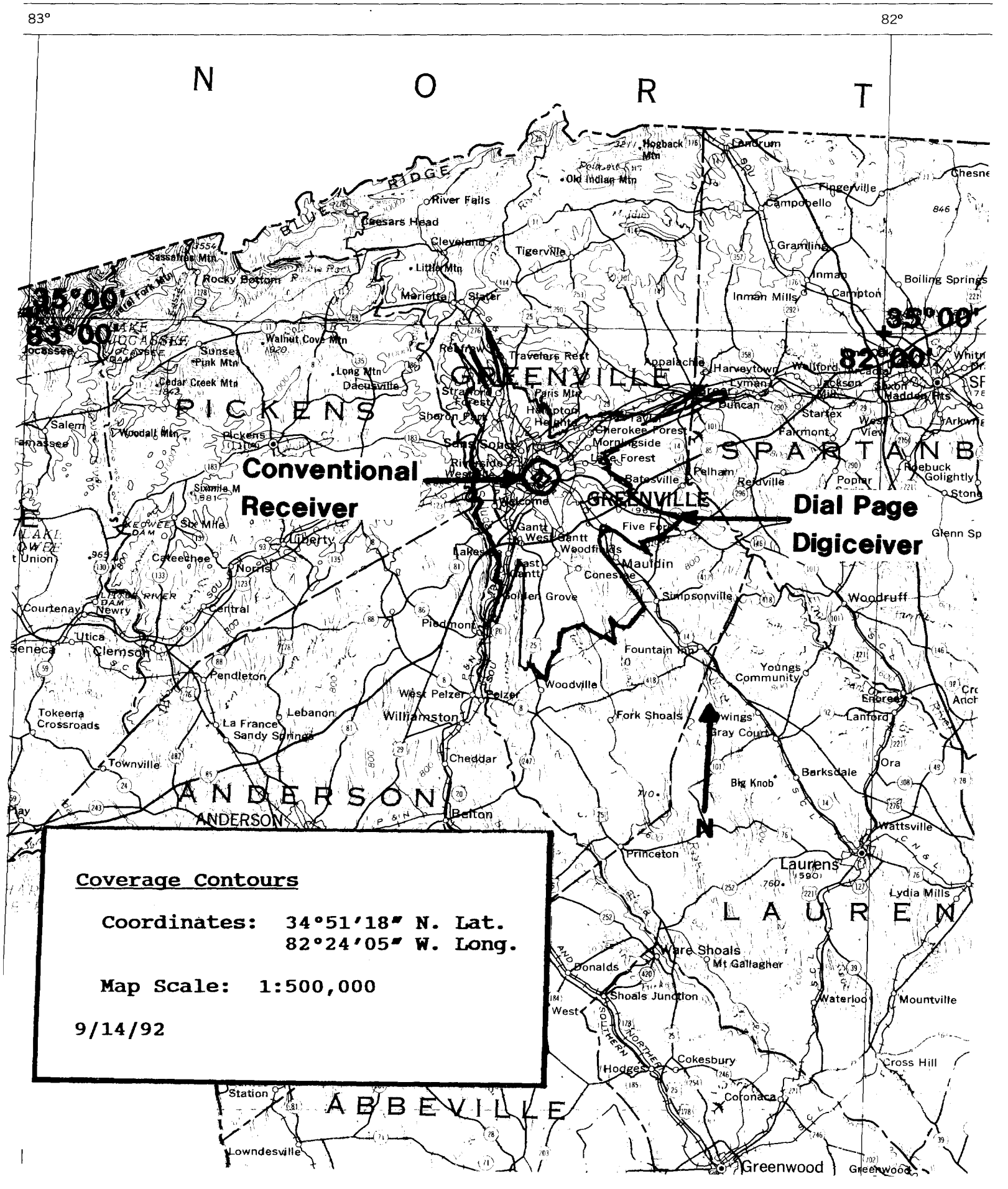
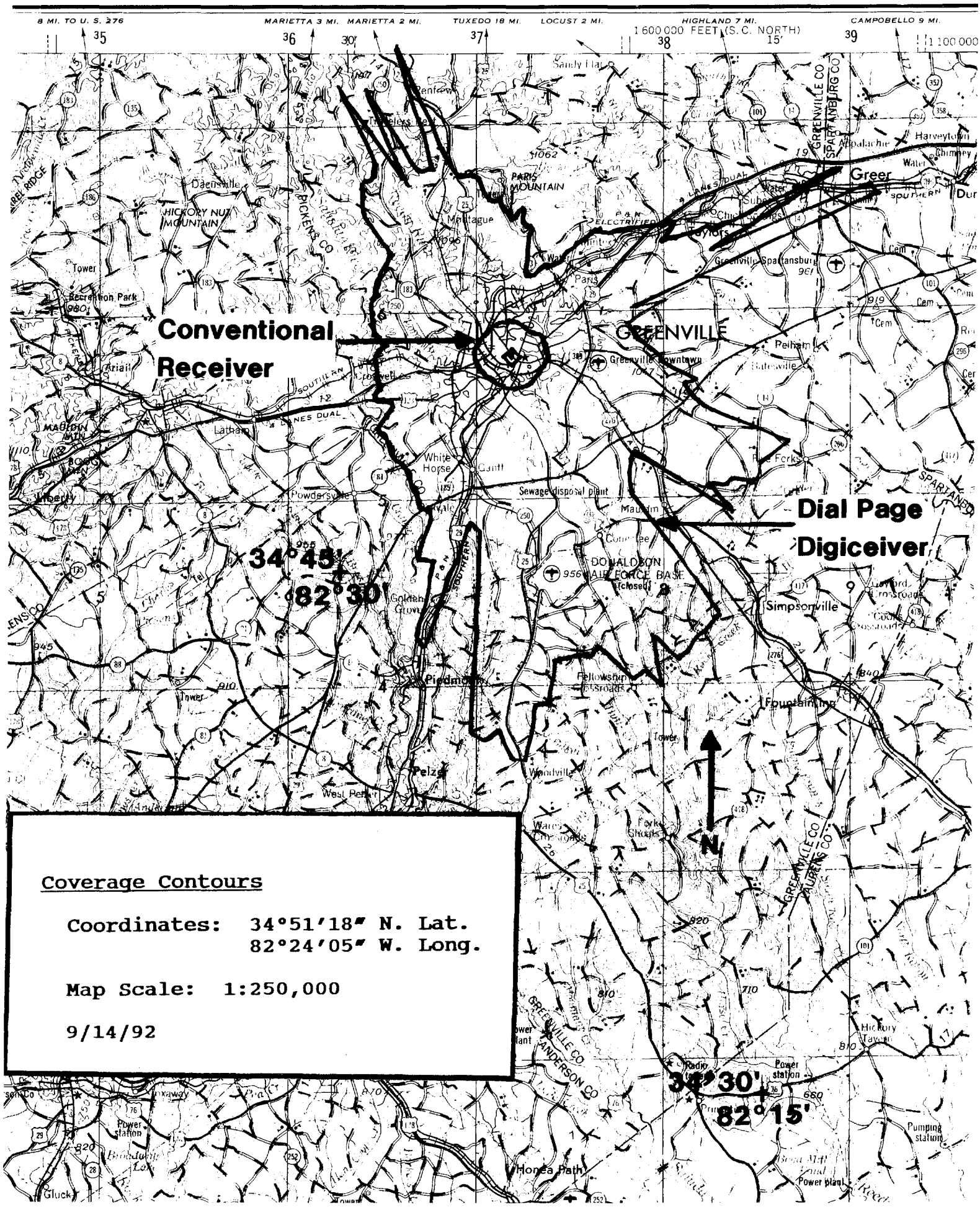

83°
82°
N O R T
35°00'
83°00'
82°00'
Conventional Receiver
Dial Page Digiceiver
N
GREENVILLE
PICKENS
SPARTANB
ANDERSON
LAUREN
ABBEVILLE
Coverage Contours
Coordinates: 34°51'18" N. Lat.
82°24'05" W. Long.
Map Scale: 1:500,000
9/14/92

FIGURE 3B

EDITION 3



Coverage Contours

Coordinates: 34°51'18" N. Lat.
82°24'05" W. Long.

Map Scale: 1:250,000

9/14/92

CERTIFICATE OF SERVICE

I, Patricia Edwards, a secretary in the law offices of Lukas, McGowan, Nace & Gutierrez, Chartered, do hereby certify that I have on the 14th day of September, 1992, sent by first class United States mail copies of the foregoing PETITION FOR PARTIAL RECONSIDERATION OF Dial Page, L.P. to the following:

*Chairman Alfred C. Sikes **
Federal Communications Commission
1919 M Street, NW
Room 814
Washington, DC 20554

*Commissioner James Quello **
Federal Communications Commission
1919 M Street, NW, Room 802
Washington, DC 20554

*Commissioner Andrew C. Barrett **
Federal Communications Commission
1919 M Street, NW, Room 844
Washington, DC 20554

*Rodney Small **
Office of Engineering & Technology
Federal Communications Commission
2025 M Street, NW, Room 7332
Washington, DC 20554

*David R. Siddall **
Office of Engineering & Technology
2025 M Street, NW, Room 7102
Washington, DC 20554

*Thomas P. Stanley, Chief **
Office of Engineering & Technology
Federal Communications Commission
2025 M Street, NW, Room 7002
Washington, DC 20554

*Commissioner Sherry P. Marshall **
Federal Communications Commission
1919 M Street, NW, Room 826
Washington, DC 20554

*Commissioner Ervin S. Duggan **
Federal Communications Commission
1919 M Street, NW, Room 832
Washington, DC 20554

*Franklin H. Wright **
Office of Engineering & Technology
Federal Communications Commission
2025 M Street, NW, Room 7332
Washington, DC 20554

Richard E. Wiley
R. Michael Senkowski
David E. Hilliard
Eric DeSilva
Wiley, Rein & Fielding
1776 K Street, NW
Washington, DC 20006
Counsel for Mtel

Jeffrey Blumenfeld
Glenn B. Manishin
F. Thomas Tuttle
Blumenfeld & Cohen
1615 M Street, NW, Ste. 700
Washington, DC 20036
Counsel for PageMart, Inc.

Carl Northrop
Bryan, Cave, McPheeters & McRoberts
700 13th Street, NW, Suite 700
Washington, DC 20005
Counsel for Pactel Paging

Mark A. Stachiw
Three Forest Plaza
12221 Merit Drive, Suite 800
Dallas, Texas 75251
Counsel for Pactel Paging

Frederick M. Joyce
Joyce & Jacobs
2300 M Street, NW, 8th Floor
Washington, DC 20037
Counsel for Celpage, Inc.

L. Andrew Tollin
Michael Deuel Sullivan
Wilkinson, Barker, Knauer & Quinn
1735 New York Avenue, NW
Washington, DC 20036
Counsel for Mobile Communications Corporation of America

Thomas J. Casey
Jay L. Birnbaum
Skadden, Arps, Slate, Meegher & Flom
1440 New York Avenue, NW
Washington, DC 20005-2107
Counsel for Echo Group, Inc.

Michael A. Menius
Motorola, Inc.
Motorola Government Relations Office
1350 I Street, NW, Suite 400
Washington, DC 20005

Lawrence M. Miller
Schwartz, Woods & Miller
1350 Connecticut Avenue, NW
Suite 300
The Dupont Building
Washington, DC 20036
Counsel for Global Enhanced Messaging Venture

Judith St. Ledger-Roty
Nancy J. Thompson
Kathleen A. Kirby
Reed, Smith, Shaw & McClay
1200 18th Street, NW
Washington, DC 20036
Counsel for Paging Network, Inc.

C.E. Baker, Jr., President
Arch Communications Group, Inc.
110 Turnpike Road, Suite 210
Westboro, Massachusetts 01581

Blooston, Mordkofsky, Jackson & Dickens
2120 L Street, NW, Suite 300
Washington, DC 20036
Counsel for Freeman Engineering Association

Lawrence Movshin
Thelen, Marrin, Johnson & Bridges
805 15th Street, NW
Washington, DC 20005
Counsel for Metriplex, Inc.

Matt Edwards, President
1116 Gray Street, Clemens Center
Elmire, New York 14902
Montauk Telecommunications Company
Skycell Corporation

Patricia Edwards

Patricia Edwards

* Hand Delivered