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UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

March 1, 1990

MEMORANDUM FOR: C.Y. Cheng, Chief
Materials and Chemical Engineering Branch
Division of Engineering Technology

FROM: Robert A. Hermann, Section Chief
Materials and Chemical Engineering Branch
Division of Engineering Technology

SUBJECT: Feb. 1, 1990 Meeting With H.A.F.A. International Incorporated Regarding Instrumented Inspection Technique

A meeting with H.A.F.A International Incorporated was held on February 1, 1990 to discuss the scope of staff approval of Topical Report H.A.F.A. 135 (P-A), implementation of IIT Leak Testing, and questions regarding the validity of the IIT Leak testing method. H.A.F.A. presented a technical discussion on both their Leak Measuring Device and Acoustic Leak testing methods. Further H.A.F.A. stated that they considered the IIT Leak Testing they have performed to date to be in accordance with their topical report. H.A.F.A. stated that mass or flow balance was not a part of their IIT Leak Testing method; they contend that measurement of inlet flow into the system by an leak measuring device with a visual examination of the pressure boundary constitutes a minimally acceptable test. No new information was provided on how acoustic monitors were utilized to locate leakage in piping. The staff and H.A.F.A. agreed that acoustic only leak detection was outside the scope of the currently approved topical report. H.A.F.A. stated they intended to submit a separate topical report on acoustic leak detection and that the work done previously was done under plant specific approval. The staff's consultant presented a technical discussion on acoustic leak detection criteria evaluation from some simulation studies he performed. A copy of his slides are attached as Enclosure 1. The staff stated that acoustic only leak testing has not been approved and therefore is not currently suitable for use and that implementation of IIT Leak Testing to date has not been found to be satisfactory. We understand that H.A.F.A. will provide a written response to our letter of December 21, 1989 and a revision to their topical report on IIT leak testing on or before March 19, 1990.

A copy of the list of meeting attendees is attached as Enclosure 2. A copy of the transcript of the non-proprietary portion of the meeting is attached as Enclosure 3.

Robert A. Hermann

Robert A. Hermann, Section Chief
Metallurgy Section
Materials and Chemical Engineering Branch
Division of Engineering Technology

Enclosures: as stated

Enclosure 1

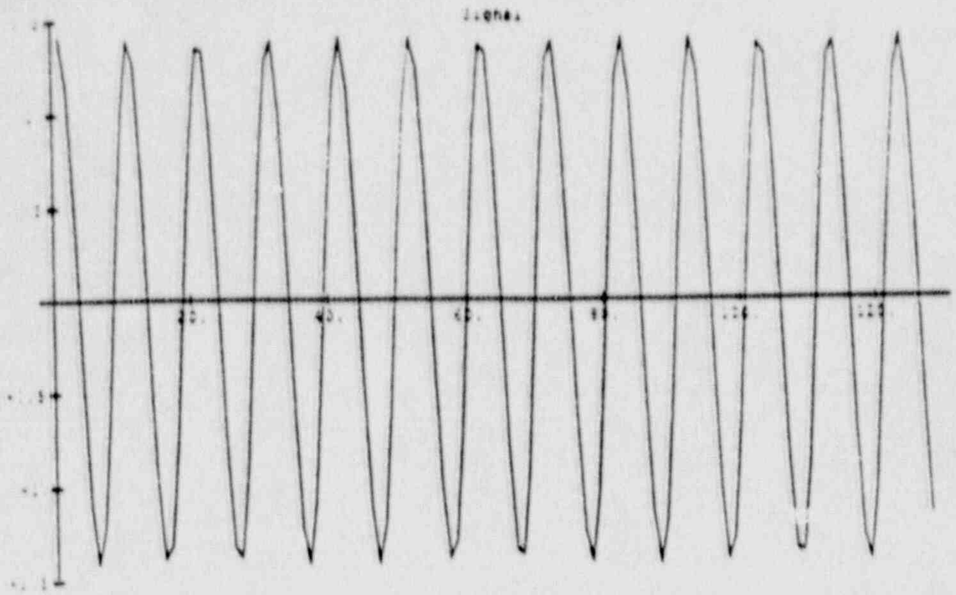


Figure 1(a). Signal Waveform - Vertical Scale = Volts;
- Horizontal Scale = Microseconds

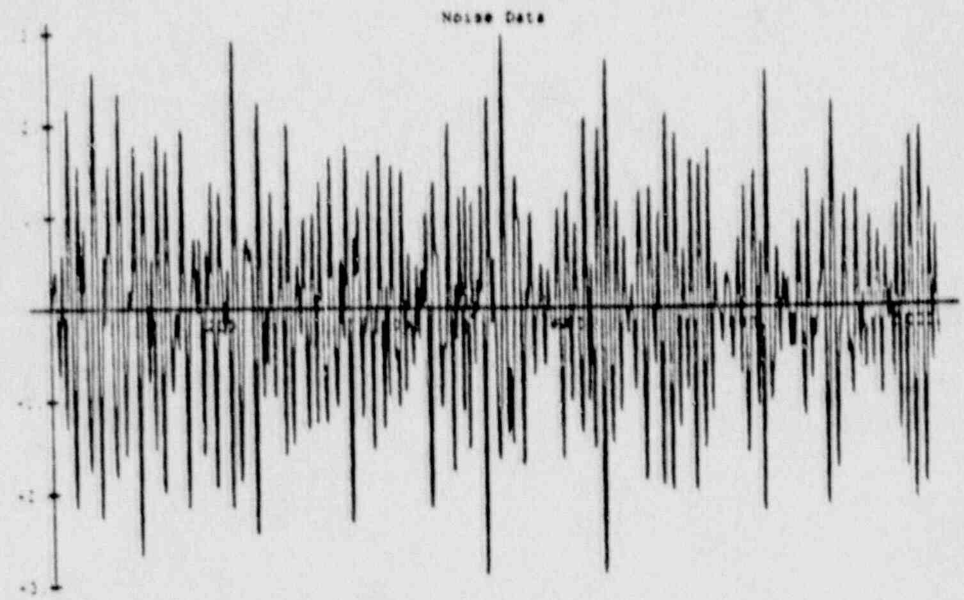



Figure 1(b). Noise Waveform - Vertical Scale = volts
- Horizontal Scale = Microseconds

Figure 1. The signal and the noise waveforms used in simulating a signal plus noise condition where the amplitude variation of the composite signal is 2 to 3 dB. (a) The signal is about 100 kHz with a very narrow bandwidth. (b) The noise is digitized from an AE sensor on a compressed natural gas tank during filling. Both noise and signal are normalized to 1.00 volt RMS. The vertical scale is in volts.

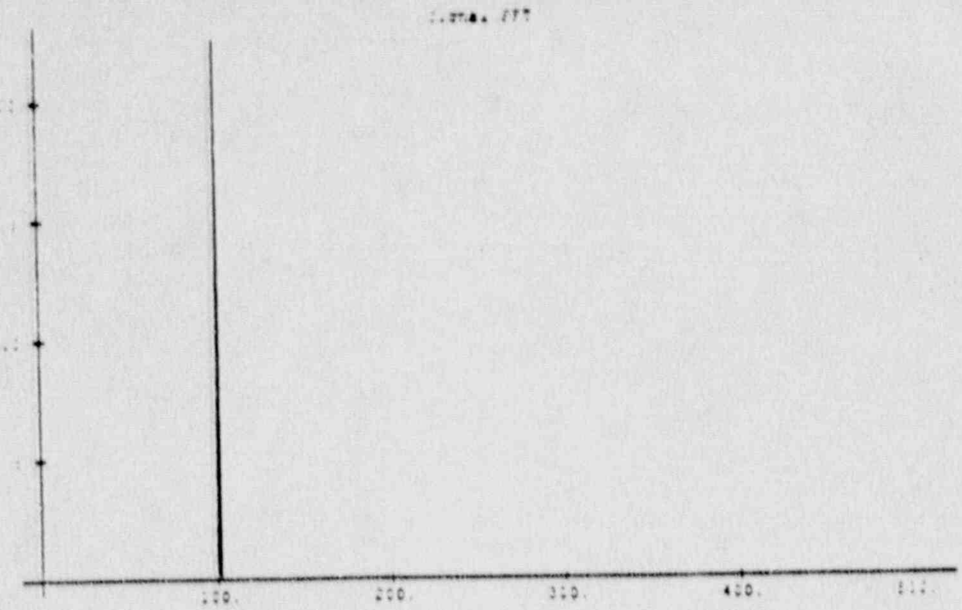



Figure 2(a). Frequency Spectrum of Signal - Vertical Scale = Arbitrary
- Horizontal Scale = kHz

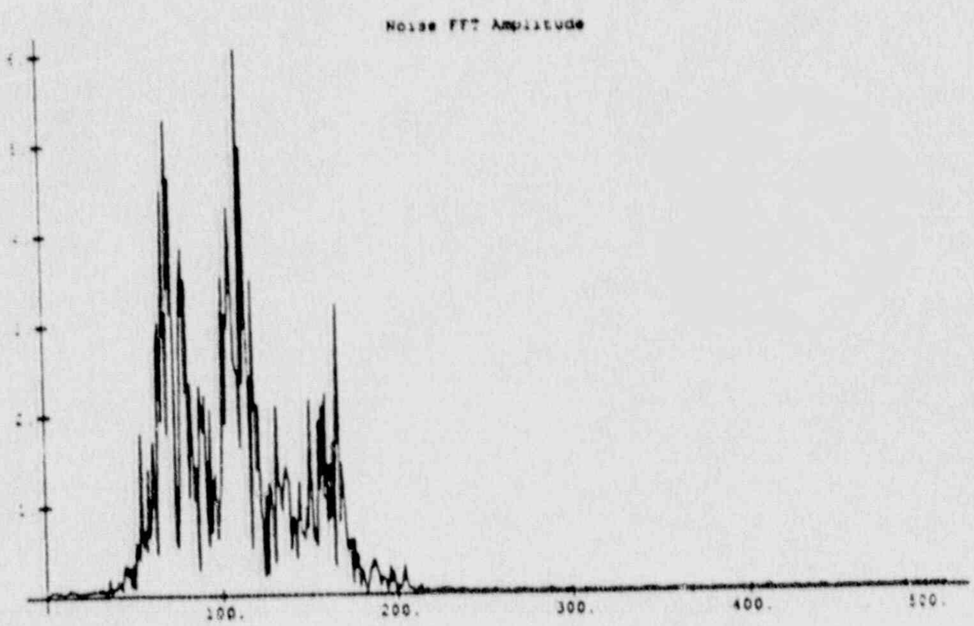



Figure 2(b). Frequency Spectrum of Noise - Vertical Scale = Arbitrary
- Horizontal Scale = kHz

Figure 2. The Fast Fourier Transform of the signal and the noise waveforms. (a) The signal is about 100 kHz. The noise spectrum covers approximately from 50 kHz to 200 kHz. Vertical scale is arbitrary.

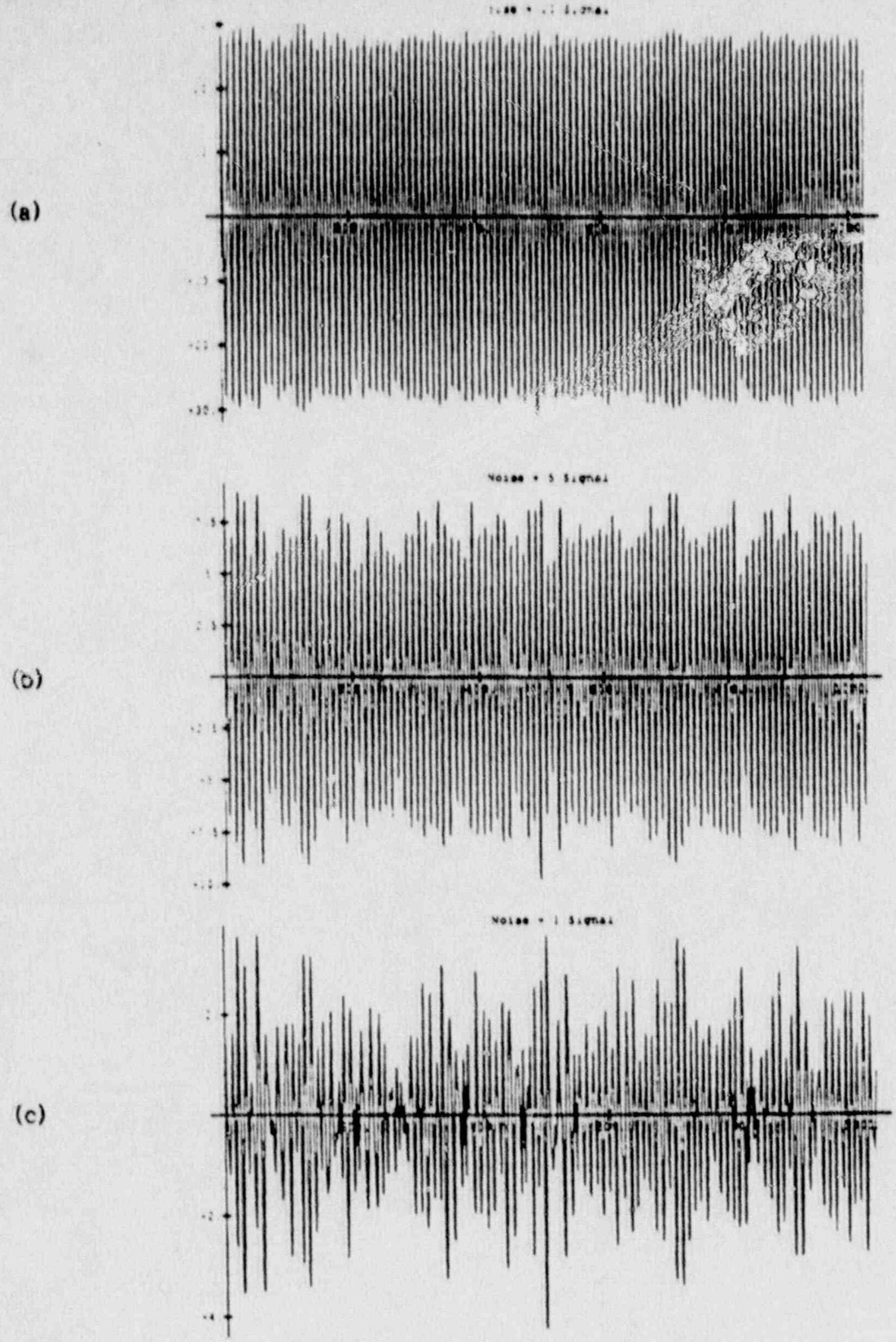
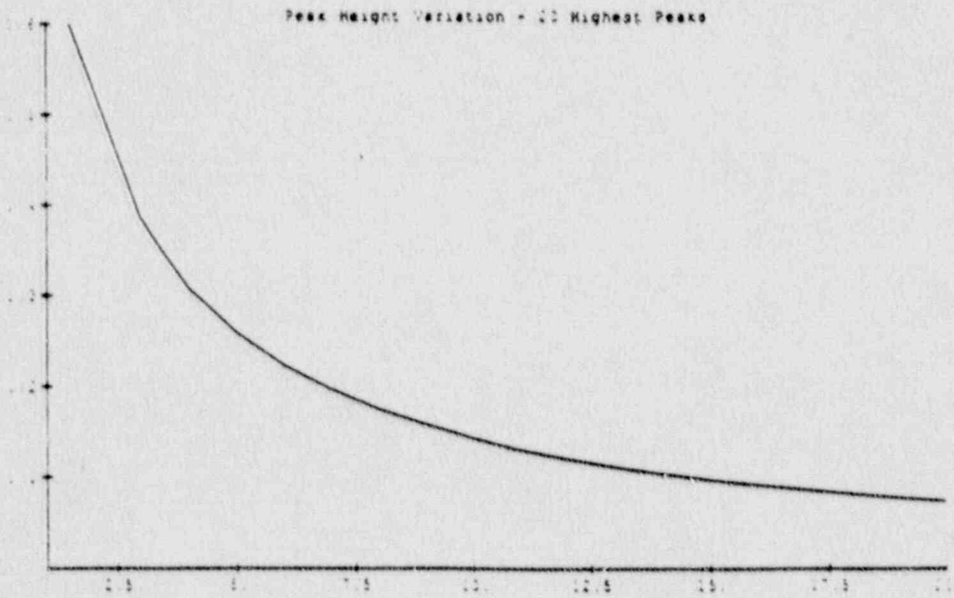



Figure 3. Illustration of adding the signal and noise from Figure 2. The peak variation becomes a smaller portion of the total amplitude as the signal amplitude increases to 20 times the noise amplitude. (a) 1.0 VRMS noise plus 20.0 VRMS signal. (b) 1.0 VRMS noise plus 5.0 VRMS signal. (c) 1.0 VRMS noise plus 1.0 VRMS signal.

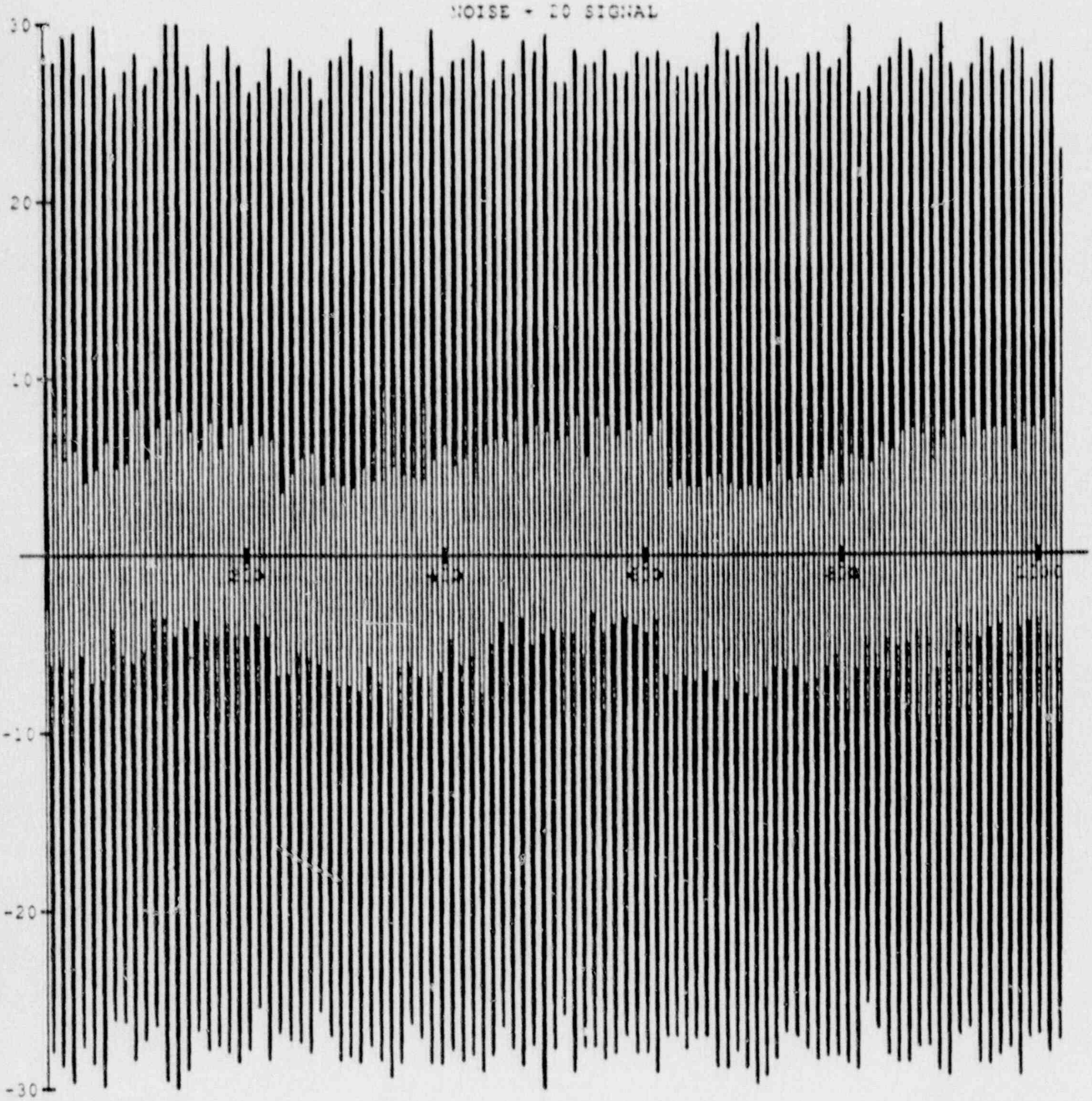


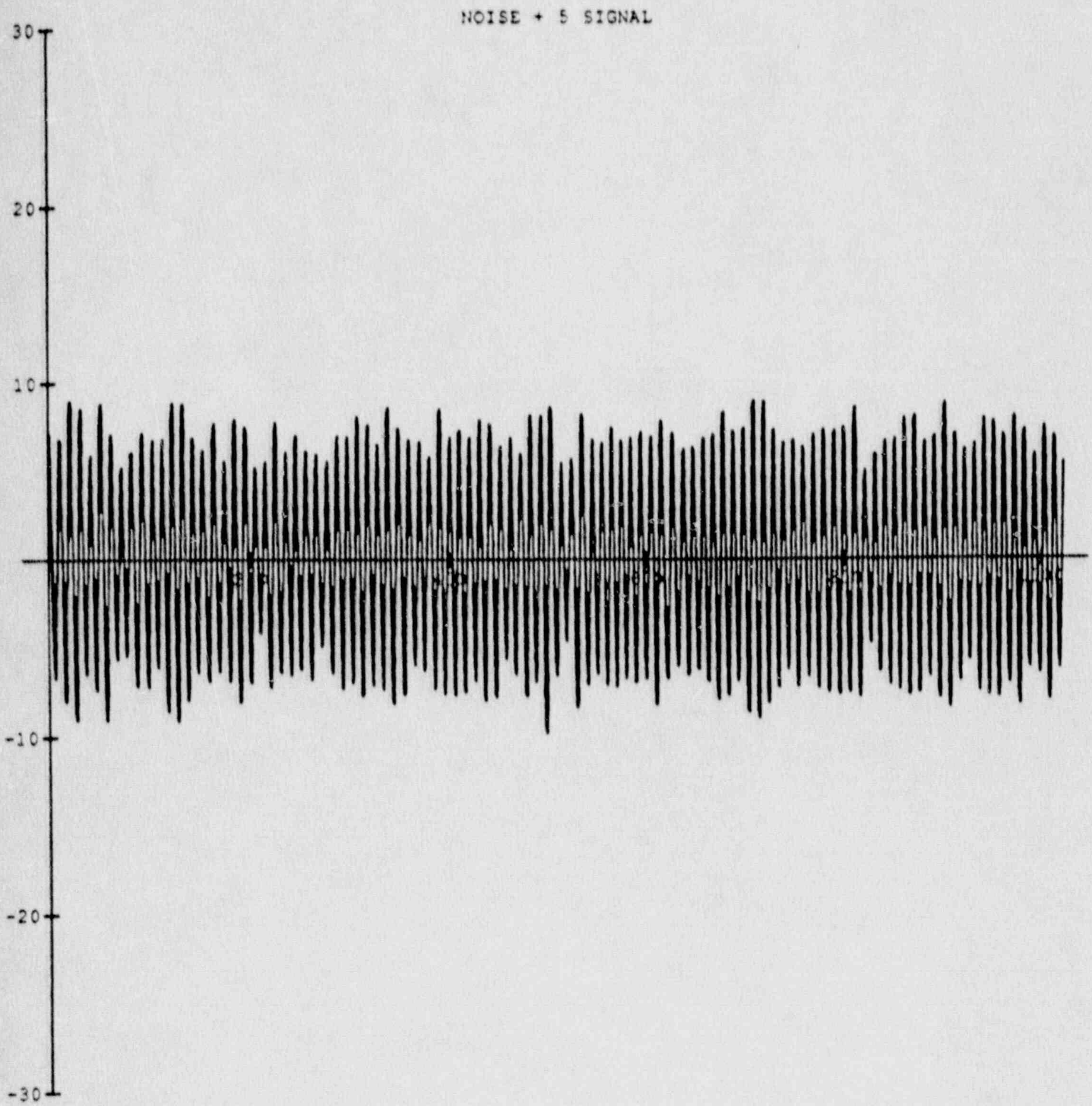

**Vertical Scale = Peak Height Ratio of Signal plus Noise**

**Horizontal Scale = Signal-to-Noise Ratio**

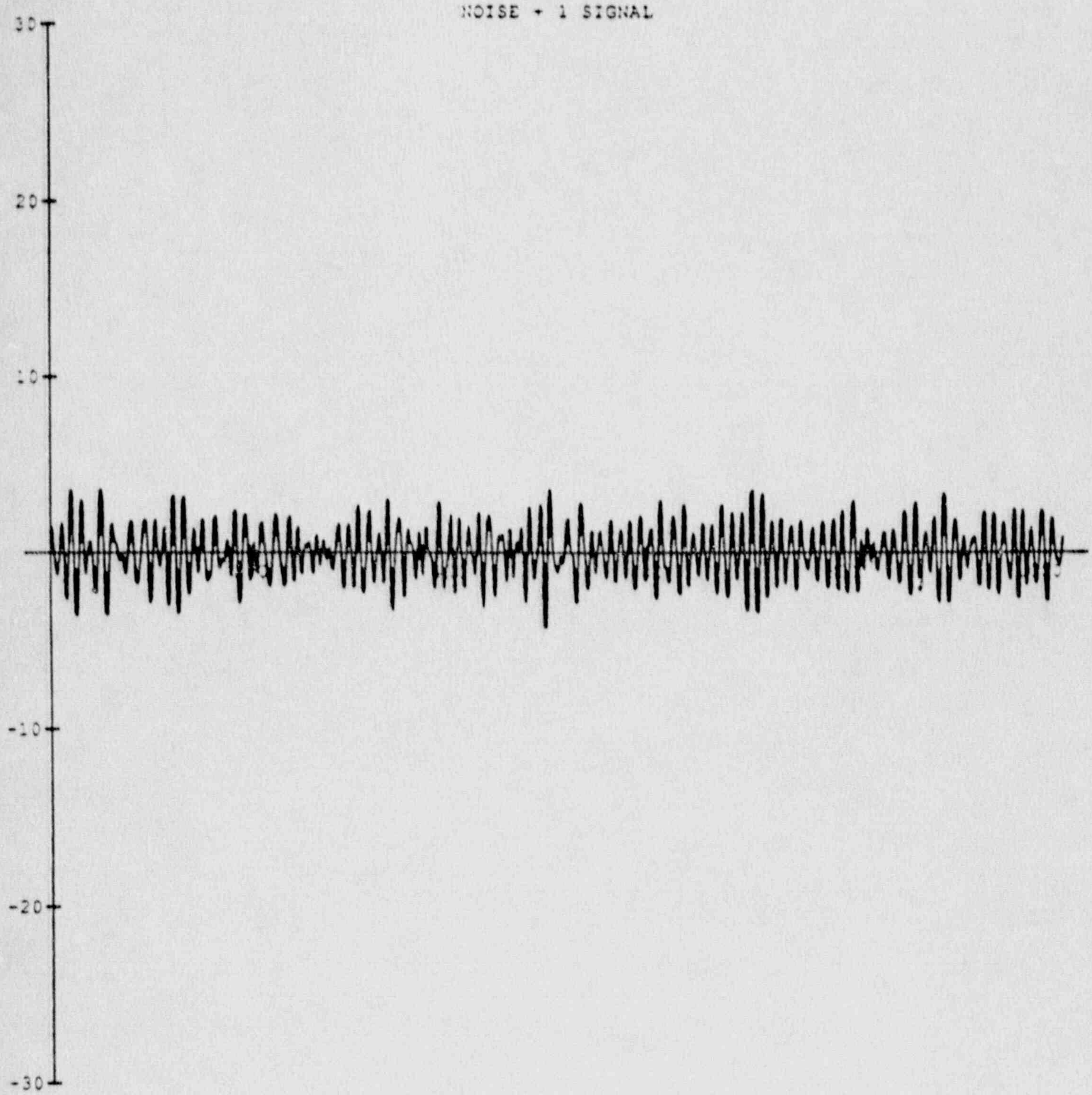
Figure 4. Illustration of the peak height variation as the signal-to-noise ratio is increased from 2.5 to 1 up to 20 to 1. The peak height ratio is defined as the ratio of the highest peak to the 20th highest peak. As the signal amplitude is increased with respect to the noise amplitude, the peak height ratio decreases.

NOISE + 20 SIGNAL

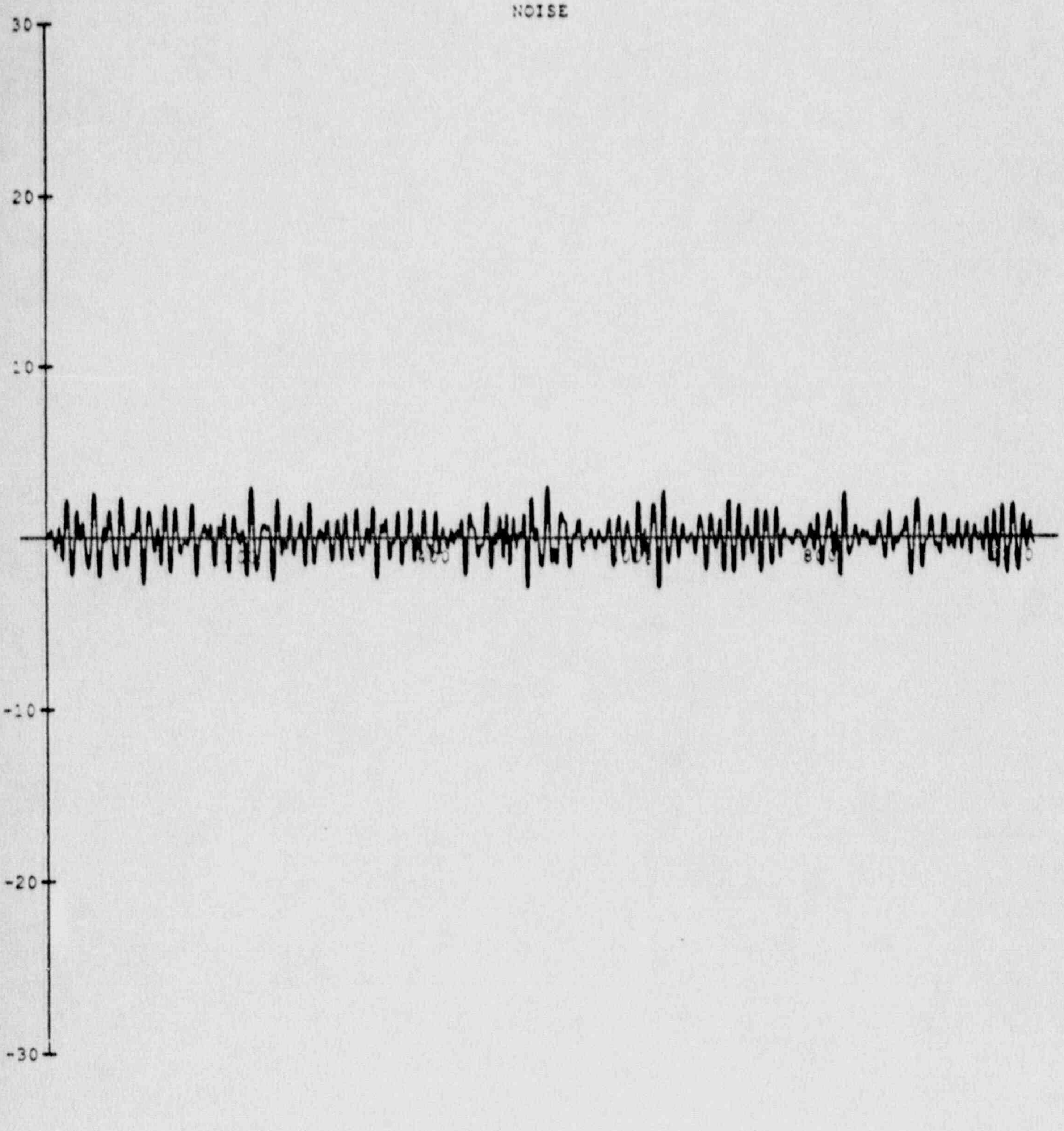



NOISE + 5 SIGNAL
30
20
10
-10
-20
-30

NOISE + 1 SIGNAL



NOISE



Enclosure 2

## List of Attendees

| NAME | TITLE | ORGANIZATION | TELEPHONE NO. |
|---|---|---|---|
| D. Danielson | Sect. Chief, DRS | NRC\RIII | |
| J. Richardson | Director, DET | NRC\DET | |
| C. Y. Cheng | Chief, EMCB | NRC\DET | |
| W. D. Jolly | Inst. Scientist | S. W. Research | |
| J. M. Jacobson | Metallurgist | NRC\RIII | |
| G. S. Mizuno | Counsel | NRC\OGC | |
| M. H. Hum | Materials Eng. | NRC\DET\EMCB | |
| J. A. Gavula | Reactor Insp. | NRC\RIII | |
| W. H. Koo | Sr. Materials Eng. | NRC\DET\EMCB | |
| G. Johnson | Materials Eng. | NRC\DET\EMCB | |
| R. P. Milke | Proj. Mgr. | HAFA | 407-848-5252 |
| C. Domeck | VP, Eng. | HAFA | 407-848-5252 |
| A. E. Wehrmeister | Dir. of Dev. | HAFA | 407-848-5252 |
| F. H. Hess | VP | HAFA | 407-848-5252 |
| J. Silberg | Counsel | Shaw, et. al. | 202-663-8063 |
| M. Hampstad | Prof. of Eng. | U.of Denver | 303-871-3191 |
| W. Williams | ISI Coord. | Duquesne Light Co. | 412-393-7328 |
| E. Caba | Mgr., Perf. Eng. | Toledo Ed. Co. | 419-249-2308 |
| R. W. Schrauder | Mgr., Nuc. Lic. | Toledo Ed. Co. | 419-249-2366 |
| T. E. Hicks | Sr. Consult. Eng. | So. Tech. Serv. | 301-652-2500 |
| R. A. Mc Brearty | React. Eng. | NRC\RI | 215-337-5347 |
| R. A. Hermann | Sect. Chief | NRC\DET\EMCB | 301-492-0911 |