

SMSB

19 Jan 1966

Col Willie C. Magness
Hqs 3970th Strategic Wing (SU2)
APO New York 09283, New York

Dear Col Magness

Enclosed are parts for a Fascenelli "do-it-yourself" radio telemetry transmitter. We have wired up the RF section since it is a little touchy. The rest of the transmitter can be assembled by a technician who understands transistor circuit construction. Also enclosed is a corrected wiring diagram. The one that appeared in the New England Journal of Medicine contains an error.

I realize that you requested parts for three transmitters but I am somewhat hesitant to send these since this device may not meet your requirements. The transmitter described in Dr. Fascenelli's article has certain technical limitations that are highly important from a medical standpoint. Foremost among these is the fact that the transmitter does not have a modulation frequency response which meets the standards prescribed by the AMA for electrocardiographic machines. The frequency response of the Fascenelli transmitter is shown in Fig. 1. The top curve is the AMA standard expressed in terms of frequency response. As you can see the response of the transmitter at 0.2 cycles per second is down to an unacceptably low value. Actually, the device should provide a good response down to 0.1 cps; i.e., follow the AMA curve. Such a response is needed to properly reproduce P and T waves and to avoid exaggeration of the ST segment.

It is my understanding that the T wave is quite important in reading electrocardiograms, particularly those taken during exercise. I have enclosed an article by Col Bob Johnson that goes into the problem of interpreting electrocardiograms telemetered during exercise. It should be noted that he got questionable results even though he used first class commercial equipment which had a response close to AMA standards.

I have enclosed some sample records made by a physician who compared a conventional electrocardiograph machine record with one obtained through the Fascenelli telemetry system. It can be seen that the "do-it-yourself" transmitter produces a reduced T wave and a distorted ST segment. I feel that your medical people should carefully consider these performance characteristics before they go too far with their plans for telemetering electrocardiograms during exercise.

Actually, the circuit shown in the New England Journal of Medicine was intended to transmit only the R wave of the electrocardiogram so that pulse and cardiac arrhythmias could be recorded during exercise. This point was not quite clear in the article. The comments of the circuit designer, Mr. Prather, are attached and shed some light on this subject. Incidentally, he points out that the amplitude of the QRS complex will be distorted unless one maintains a low electrode impedance. Skin preparation and proper electrode attachment are very important to keep the signal source impedance down to a small fraction of the transmitter input impedance, which is about 50,000 ohms.

We are all looking forward to the return of Col Martindale and I am sorry that you are not joining him for another tour here at Brooks. I guess, however, that your assignment at Barksdale will be welcome since it is close to home. Let me know what your medical people decide to do and if you should need more parts I will be glad to send them.

Sincerely,

ROBERT M. ADAMS
Chief, Biomedical Engineering Branch