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Reason   Gross Description
Outline   Details

The electrocardiograph is one of the most useful diagnostic instruments in medicine. The electrical potentials from the heart are ~~so fairly~~ well known both in theory + practice.) This is in spite of the fact that until recently only a relatively few beats of the heart could be recorded from a quiet absolutely still pt. The limitation of this brief record as a measurement of the total activity of the heart in normal situations has long been recognized. Dr. Master developed a standardized exercise test to stress the heart ~~& produce~~ to reveal any abnormalities which might be latent - Exercise is only one stress encountered + again until recently it was necessary to record the EKG only after cessation of exercise -

Others & ourselves have developed telemetry and magnetic tape recording methods to the point that it is now possible to records 1 or more leads of the EKG from pts. indulging in almost any activity for any desired ~~pe~~ length of time -

This has been a boon in both clinical practice + investigation. ~~On details I in order~~ It was impossible to follow a pts. EKG record for long periods of time. The amount of time spent in the analysis ~~of the record~~ or even cursory examination of the record made records of ~~even~~ longer than a few minutes impractical.

It was obviously necessary to resort to some form of automatic ~~analysis. Computer~~ data reduction - Computer analysis of the electrocardiogram has

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been done c̄ more or less success by a variety of methods + investigators. These ~~ranged~~ have ranged from correlation of patterns to known disease patterns c̄ a "diagnosis" resulting thru entirely new lead systems to programming of large digital units to read out a great variety of parameters ~~all of me~~ sometimes ~~usually~~ of more interest to the engineer than physician.

We have strongly felt that in order for a new device to be useful in clinical practice in a well studied field it must be compatible with ~~this~~ the existing practice of the field. Thus ~~for~~ an EKG computer should accept the raw data with as little preparation as possible, ~~and~~ simply operate automatically + reliably s̄ specialized attention + present the data in

terms familar to the user in ~~an~~ immediately usable form. Cost & size limits ~~are~~ also of no small consequence.

With this in mind ~~certain~~ features of the ~~an~~ EKG ~~that~~ are normally manually analyzed were chosen. An ~~analyz~~ simple analyzer was then designed for this specific purpose & the results registered on a time dependent graphic set.

The features chosen were

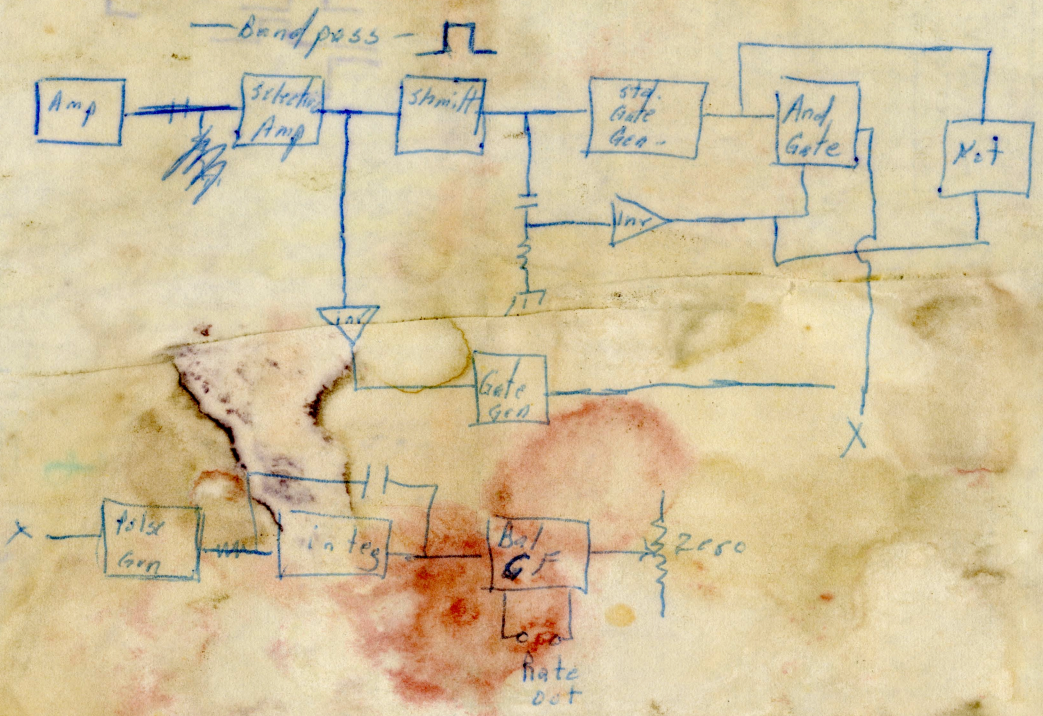
Rate — Ventricular ectopic beats
R-R interval S-T segment level
T level

EKG records are taken from the pt. ~~c~~ either a telemetry arrangement & played on magnetic tape (3⅞ IPS) by a sub carrier or recorded directly from the pt. ~~c~~ a miniature tape recorder again using a sub carrier. After demodulation the EKG has a level of ~~a~~ IV peak-p ~~voltage level~~ (QRS complex).

The ~~single~~ most constant feature of the EKG though it varies greatly from person to person is the QRS complex. It is ~~also~~ normally of the greatest amplitude. ~~For this reason~~ A block diagram is shown in Fig —.

The rate computer consists of a preamplifier V — The gain control is ~~rarely~~ used ~~to~~ only for ~~gain variations~~ in large deviations from

normal amplitude - this is ~~for~~ next amplified by V- +- a band pass amplifier which ~~removes~~ attenuates skeletal muscle ~~artifact~~ noise + low frequency components such as the P + T waves + base line variations - the schmitt trigger is set so that it operates any level ~~above~~ ≥ 1/3 amplitude of the QRS complex - then a ~~wave~~ pulse is produced whose width is ~~that~~ ~~of the QRS~~ + going component of the R ~~wave~~ at ≥ 1/3 the amplitude. The leading edge of this pulse is used to simultaneously trigger ~~another~~ a univib - whose output is a .04 sec. pulse - the trailing edge is differentiated + inverted + ~~compared to~~ & it is now applied to the and ckt. ∴ the ~~std~~ .04 sec. gate - + if it is the .04 ~~and a pulse~~ is passed on to the ~~Q.R.S~~ rate meter to be counted as a normal QRS - this ckt. is a more or less std. ~~pulse~~ ~~circuit~~


Band pass
Amp
Selective Amp
Schmitt
Stg. Gate Gen.
And Gate
Det
Inv
Gate Gen
X
X
Noise Gen
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Zero
Gate out