OHIO ROBERT MORTON GOES MODERN WITH COMPUTER

by Gary Harris

Photos by
Gary Harris and Tom Hamilton

The opening concert for the 1974-1975 season, in November, 1974, brought three stars to the Ohio Theatre in Columbus, Ohio. One was the resident star of all concerts, the 4/21 Robert Morton; the second was our organist for the evening. Roger Garrett; the third was a newly installed combination action controlled by a computer. The Robert Morton and Mr. Garrett were in excellent form that evening, and the combination action was in good shape, considering it had been completed at 7 a.m. that Saturday morning. By the middle of December, less than six months after the start of the total project, all the functions of the computer were fully functional.

The project to change the combination action in the Morton from the old setter switch system to the computer system started in late May with some discussion about the feasibility (and probable cost) of such a system. Since the pneumatic action on the tablets was to be replaced with electric action tablets during the summer closing of the Ohio Theatre, the computerization of the action seemed to be much more reasonable. The removal of all pneumatics at one time would make room available for the racks needed to hold the computer electronics and all rewiring could be done at one time. As it turned out this was no small job, and took many more hours than first anticipated.

The specifications of the computer system are the following:

1. Ten pistons per division in each of the five divisions.
2. Six general pistons.
3. Cancels for each division.
4. General cancel.
5. Tremulant cancel.
6. Five interdivisional combination couplers, general, pedal to accompaniment, pedal to great, pedal to orchestral, pedal to solo.
7. All electronic action.
8. Stuck piston will not lock tablets.
9. Capability to add or modify features.

The electronics for the computer are contained on 25 printed circuit cards, of which 20 are used to get information to and from the stop tablets. The remaining 5 are the computer functions; 1 card for memory, both control and piston information; 1 card for the computer and its supporting circuitry, 2 cards for miscellaneous control functions, and 1 card for all piston and coupler switch functions. All this circuitry comprises about 3000 to 4000 parts, all of which were assembled in less than 1½ months. The electronics are all mounted in two 19" x 9" x 6" card racks attached to a cross brace at the rear of the console where the old pneumatic valves of the setter system used to be. The computer used in this design is an INTEL 8008 MICROPROCESSOR, which is a computer in a single integrated circuit that measures only .3" x 1.0". This device was chosen because of its great versatility, ready availability and low cost. The 8008 performs all its operations 8 bits at a time. Think of a bit the same as one pole on a relay. This number 8 is the basis for almost all other card functions, all multiples of 8.

The computer card contains 26 integrated circuits including the 8008. This card takes information from the control memory and performs the necessary operations to determine which of the functions for the combination action will be performed. It is interesting to note that only a few years ago the electronics needed to perform the functions of this one card could not have been

The designer of the system — Gary Harris — with one of the input cards — in the background are the electronics for the computer and the other input cards.

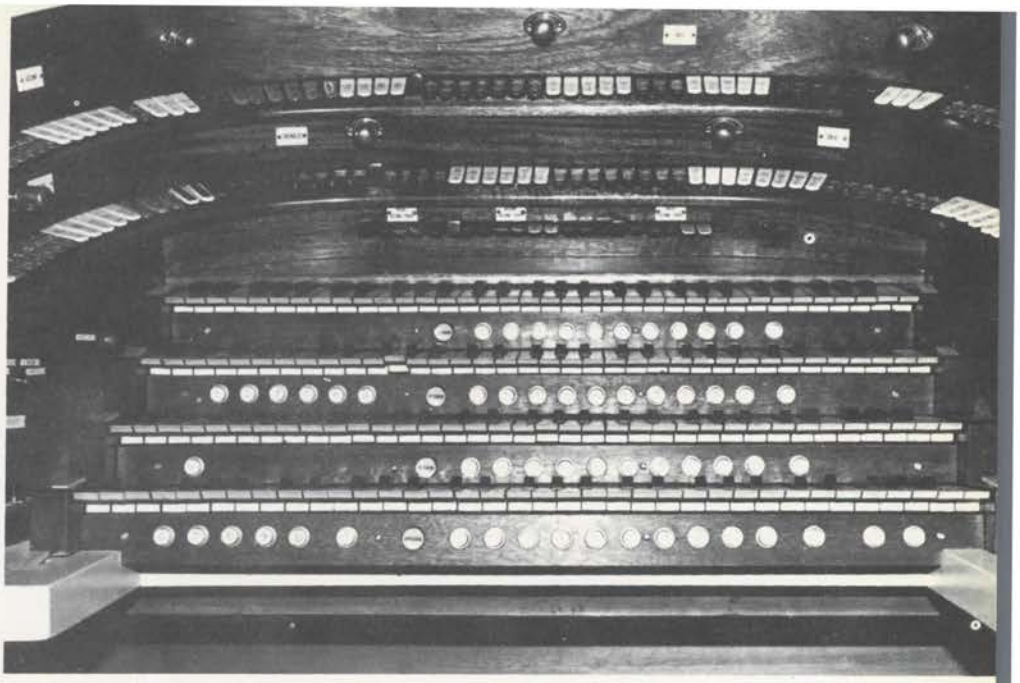
housed in an enclosure much smaller than the Morton console itself.

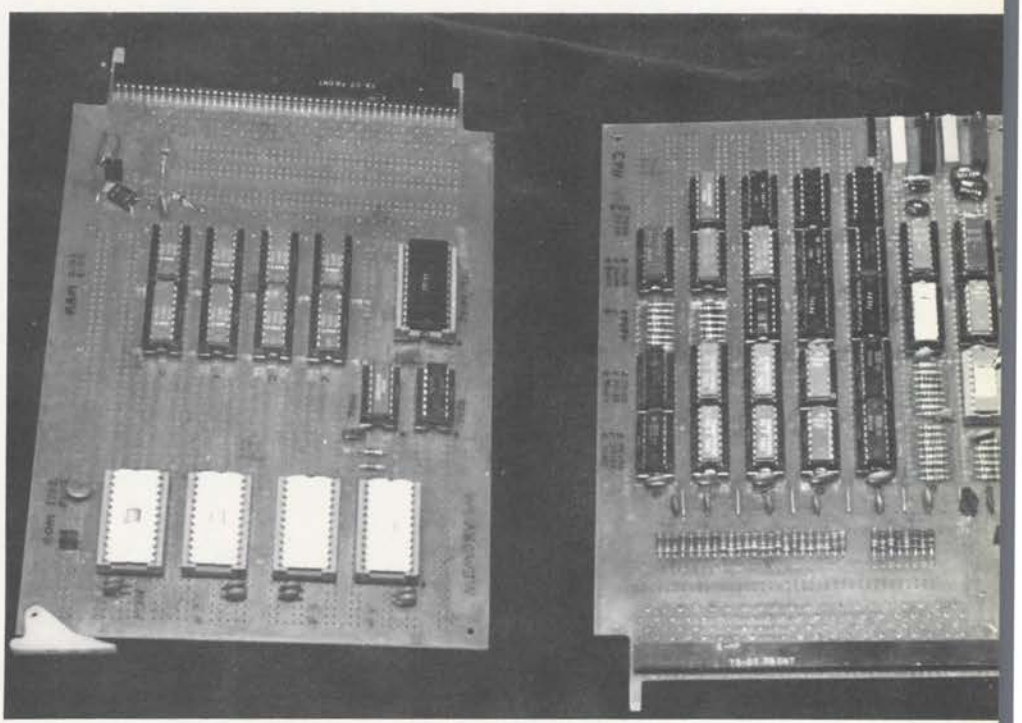
The card which handles the piston pushbuttons utilizes an integrated circuit which scans the buttons as a matrix of 11 lines by 8 lines. This reduces the wiring for the 63 buttons from 64 wires to 19. Each button is monitored about 1000 times a second. When one is pressed the scan stops and the card supplies the computer with a digital language "word" which is unique to the pressed button. This "word" remains as long as the button is held, however, the computer ignores the word if it finds it still to be present after it executes the operation associated with that button. This feature allows for a button to stick but not lock the stop tablets so that they cannot be changed manually.

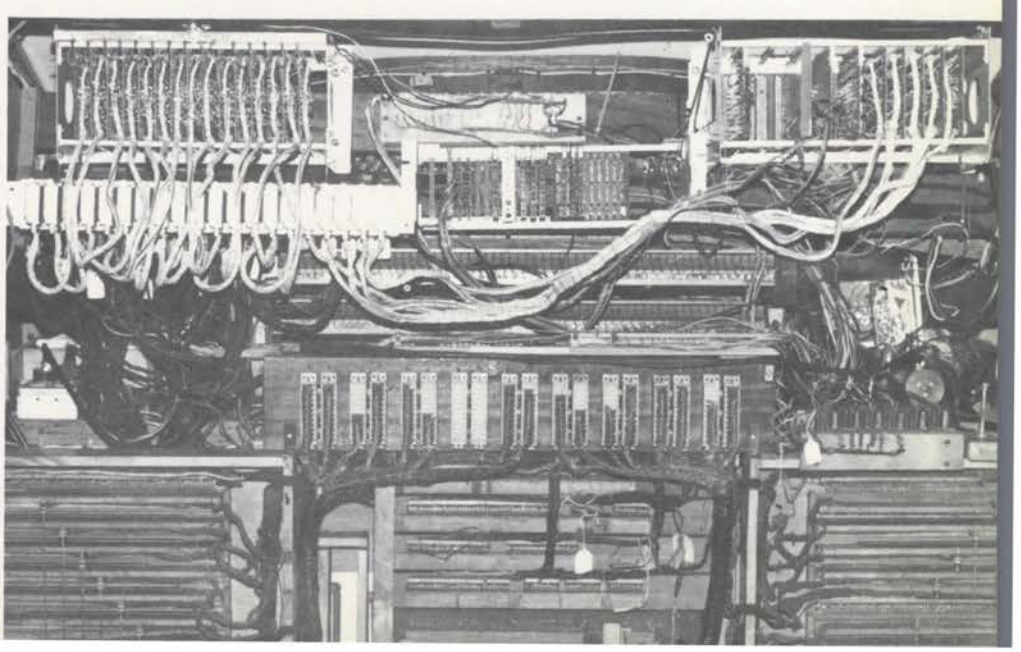
The memory card contains both the control programming and the data storage (stop tablet information). The control program is contained in 4 integrated circuits called "Erasable Reprogrammable Read Only Memories." This means that the program may be written into these circuits by means of a special piece of electronic equipment but cannot be altered by the computer in any way. Because they are erasable the program may be changed to modify features or add new ones. A note of interest is that a program to load the stop tab memory from magnetic tape is to be added later this year.

The data storage section of the memory is contained in 8 integrated circuits which have the capacity to store over 8000 bits (equivalent of 8000 setter switches). The Morton requires only about half of this capacity but the additional is there and available for any future additions of ranks, stops, or computer functions.

There are five identical cards used







TOP PHOTO:
View of the console shows the pistons as they are in the new system – square name plates above the tablets also function as alternate cancels.

MIDDLE PHOTO:
The memory card and the computer card – pen indicates the integrated circuit which is the computer.

BOTTOM PHOTO:
Rear view of the console – upper left shows the card rack containing the output cards, upper right shows the rack containing the computer, the memory, the input and other cards.

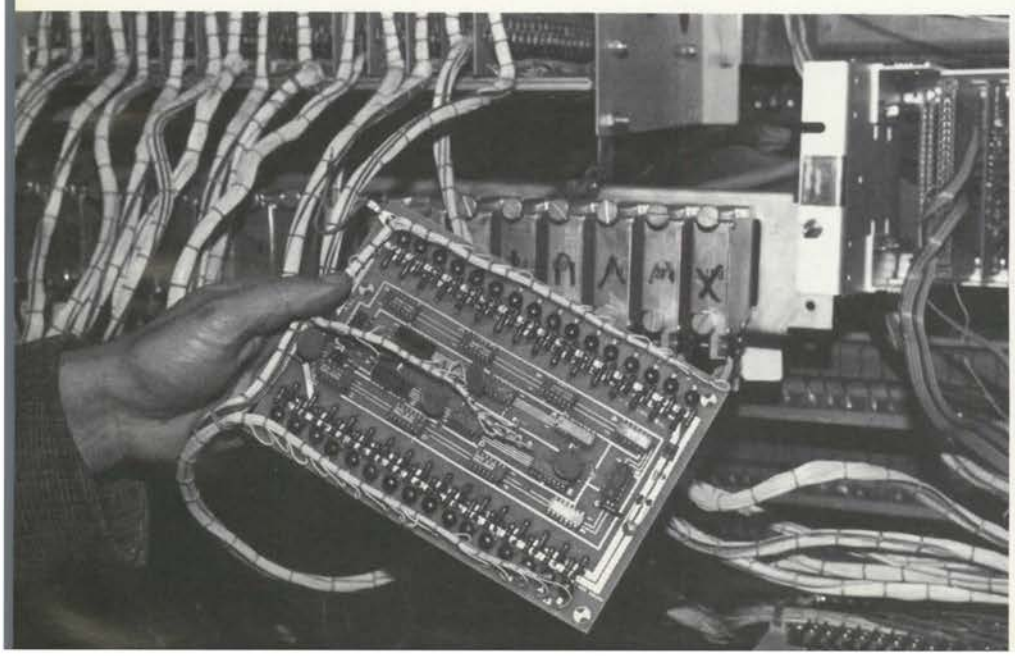
to get the information from the stop tablets to the computer. Each card handles one of the five divisions with 64 tablets being the maximum per division (this is not exceeded by any division). The pedal division card is also used to get the tremulant tabs to the computer. This gives an effective 6th division.

The 15 identical cards used to get information from the memory to the tabs each control 16 tabs. These cards also contain the driver circuits to energize the coils used on the stop rail magnets. The design of this card was the most troublesome in the whole project and major revisions to it were responsible for the all night session to get the action working for the Garrett Concert.

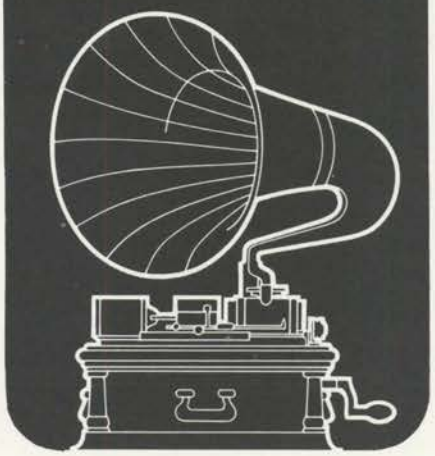
The end result of all this electronic madness is a much more versatile combination action which can be set in a matter of minutes. It is much quieter than the old system, no hissing pneumatics and no "whoosh" when combinations are changed. The console has been freed of its air line. But best of all, the basic organ is musically as it has always been. The addition of the computer has not altered any of the basic operations of the Morton, it is only a more versatile instrument.

The author wishes to thank Carlos Parker and Ed Smith for the marvelous job they did on the console wiring — not a single error, Tom Hamilton for building the input and output cards and wiring the card nest, and to John Winter a special thank you for helping to get the system running. □

One of the output cards — in the background the rack which holds them is visible along with the cable connectors.



For The Records



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REX KOURY PLAYS THE FAMOUS SCOTTY'S CASTLE THEATRE ORGAN. MCR 1130 (stereo). $5.95 postpaid from Rex Koury Enterprises, Box 197, Steamboat, Nevada 89436.

The instrument is a 3/15 (plus piano) Welte installed in 1929 in Scotty's Castle, Death Valley, Calif. "Scotty" was a desert rat/prospector who struck pay dirt in his association with a Chicago financier, Albert M. Johnson, who grubstaked the promotion-conscious Scotty through most of his mature years. Scotty supervised the construction of Johnson's desert residence and it became known as "Scotty's Castle." Johnson wasn't there very much. The Welte organ was purchased and installed by James H. Nuttall (once Hope-Jones' chief voicer). The castle and organ underwent many ups and downs over the years. The Welte is currently maintained by ATOSer Fred Beeks of Reno. It has a solid "round" tone, with stress on ensemble sound, plus a few solo reeds which Rex uses sparingly, notably a fat Tuba. The Tibia has a curious adolescent "teenage" quality as though it hadn't yet developed the sexy huskiness of maturity. It is prominent throughout the program.

Rex Koury. A first recording on an historic Welte. *(Harold Photo)*

Rex Koury needs no introduction. He's a veteran theatre organist at home both in pops or classics, as this set of grooves will prove. He's known all over the land as a top-rank concert artist and film accompanist (his score for *King of Kings* is an annual Easter treat for lucky viewers). One of his good traits is his respect for the intent of the composer, as illustrated on this record by Rimsky-Korsakoff's *Song of India* and Liszt's *Second Hungarian Rhapsody.* They are played mostly as the composers wrote them and there is no effort made to "jazz them up." All to the good; *Song* and *Rhapsody,* as played add up to silent movie music, the first to picture an oriental garden, perhaps, and the