

## **Austin Quadruplex Perforator and Roll Player Mechanisms**

Article posted to Facebook by Allen Miller, December 2021; Reformatted April 2026

(contains reminiscences by Bill Petty, with addenda by Allen Miller and Mark Schmalz)

### **THE FABULOUS QUAD**

by William E. Petty

This article originally appeared in THE DIAPASON, Jan 1969

Edited with corrections by Allen Miller Feb 2017 and Dec 2020

This is the story of the Fabulous Quad, short for the "Austin Premier Quadruplex Player," a name as large and euphonious as the time in which it was invented, the Roaring '20's. Unlike Gibbon's famous work on the Roman Empire, this story has a happy ending. The Quadruplex was resurrected with original concepts intact, but clothed in modern dress and utilizing some of today's modern technology. First, a little history to set the stage. It all began in 1923 when John T. Austin, founder and longtime president of the Austin Organ Co., turned his attention to inventing and perfecting a player mechanism that would automatically record and reproduce the playing of an organist, with complete fidelity. At this date there were a number of automatic players on the market. Nearly, all of the major organ companies had designed their own systems, but All used a relatively short tracker bar, with a limited number of holes. All required some sort of "arrangement" of the music to fit the short compass and all had serious limitations. It was to overcome these limitations completely, not just make improvements, that John T. Austin invented a whole new system of recording and reproducing. When John T. and his brother, Basil, put their heads to inventing you can be assured that the result would be novel, marvelously effective and would exhibit what I have come to call the disarming simplicity of the Austin approach. Dr. William H. Barnes, in his book, *The Contemporary American Organ*, pays the inventiveness and the resourcefulness of the Austins high praise indeed. I might digress here to say that having rebuilt an Austin Player, and Perforator, and a console, I too, have a very healthy respect for their mechanical ingenuity.

John T. Austin's efforts culminated in the granting of a basic patent, which provided for a revolutionary means of controlling the expansion of the paper, a five section tracker bar having four movable sections which automatically expanded and contracted to compensate for the swelling and shrinking of a wide paper roll. The expansion was controlled through a continuous series of holes in the paper sheet toward one end. This invention overcame the fundamental weakness of all previous devices, permitting the use of a wide roll with close scaling for the perforations, and provided extreme accuracy in tracking. In 1924 the first "Quadruplex Player" was built. This wonderful, yet unbelievably simple player mechanism operated over the entire roll punched with 232 holes to play a pipe organ of three 61-note manuals, full pedal compass of 32 notes, two expression pedals, crescendo pedal, and the complete registration capabilities of an organ with 30 ranks of pipes - a range unequalled by any other organ player before or since.

The most unique part of the Quadruplex system was not the player mechanism itself, but the machinery used to perforate the rolls. Since the player was conceived to control a somewhat "standard" three manual residence organ which the Austin company offered at the time, a small studio was built in the

factory where one of these instruments was set up in a typical home atmosphere. Of course, a player was included, and an adjoining room held the roll perforating facilities.

The recording was made by the artist on this studio organ through the mere process of playing, and keys being electrically connected to a device that punched in a traveling sheet of paper, the exact duration of each note held. The selection and change of stops, as well as the various opening and closing of the expression shutters and movements of the crescendo pedal, were likewise so recorded. Within a few minutes after the final note had been played, the completed record roll was brought back to the recording and reproducing console and played back to the recording artist. So photographically accurate and convincing was the reproduction that many organists used it as a means of criticizing and correcting their own playing in much the same way as recording tape is used today. They were also often embarrassed by the obvious presence of wrong notes.

One of the unique features of the Austin recording studio was the use of multiple consoles enabling several organists to play the individual orchestral parts of symphonic transcriptions. It was also possible to overdub rolls, that is, play-back a completed roll and play along with it while cutting a new roll. The original would be faithfully reproduced along with the added parts. But unlike over-dubbing with tape recorders, any number of copies or over-dubs could be made with no loss in quality. We put the "sleigh bells" in "Brazilian Sleigh Bells" this July. It sounds very realistic. The Quadruplex roll of William Fearnley playing Sousa's "Stars and Stripes, Forever", roll #554, is thought to be the first example of multiple recording.

Frederic B. Austin, now President of Austin Organs, Inc., collaborated with his uncle in the development of this successful mechanism, and with his father, Mr. Harry W. Austin, who was in charge of the studio and recording production, along with Carl Edson. It was not until near the end of the player era that the "Quadruplex Player" was perfected, and with the decline of the residence organ and reorganization of the Austin Company in the mid 1930's, the player was discontinued and the recording studio eliminated. The player equipment and roll library were put into storage, and most of this was lost in a fire some 20 years ago. (1949) Aside from a phonograph record made by the firm in 1954 of the six rolls recorded by the late Lynwood Farnam, the Premier Quadruplex Player almost slipped into obscurity.

Now this is about where we came in, some 40 years later. I have been an organ buff for more years than I care to remember, but upon moving to Virginia decided to quit all this organ tinkering, so sold the old organ and eventually bought two different electronics. It became very obvious that this was a colossal mistake, and that anyone in their right mind should get rid of these little compact electronics and go back to filling the house to overflowing with good old organ gear.

So with the usual amateur zest and zeal we hunted until we found a 3 manual, 22 rank Estey equipped with their player in Scarsdale, NY. My son and I dismantled it in summary fashion and had it moved to Virginia.

Now my interest in this particular organ, besides the fact that all the basses are Haskell's for which invention he should be eternally blessed, was the fact that this organ had the Estey player together with some 200 rolls. I had wanted a player for years because I am a much better mechanic than performing musician, which is a not very subtle way of saying that "Chopsticks, even on your very own organ, gets pretty monotonous in time. Anyway, we rebuilt the Estey, vintage 1927, got player and everything working and promptly became disenchanted with the player. Especially so, since in the back of our mind was the

idea of building a perforator to make our own rolls. This can't be done directly with Estey's system and I had remembered Austin's set-up having visited the factory in the early 30's.

A letter to Austin elicited a prompt reply from Mr. F. B. Austin, president, indicating that the 4" punch assembly was the only part of the original set-up still in existence and extended a warm invitation to visit and discuss the Quadruplex system. To make a long story short, many helpful hours were spent with Mr. F. B. Austin and Mr. Allen Miller accumulating information on the Quadruplex, how it functioned and how in general the various controls were used. Some prints were still available of trailer bar layouts, etc. We also secured the names of the original player installations and after assiduously searching for a year, located one in Cincinnati, Ohio, which we obtained, along with some 80 rolls. Even more important, Mr. Austin generously made the punch assembly available for our use. So early in 1965, the punch assembly was shipped from Hartford, and then began what turned out to be nearly two years of work designing and building all the equipment and controls necessary to produce rolls directly from an organist's playing. At times, I wondered if we wouldn't get a man on the moon before I got the perforator punching. However, with a great deal of help from Mr. F. B. Austin and especially from Allen Miller we had it going in mid-summer of 1967, with various changes and additions being made since, until now all signals are go! This happy state would never have been realized without the help, encouragement, and suggestions made by Mr. F. B. Austin. To him and his organization we are greatly indebted. And especially do we appreciate the help of Allen Miller. He has the quickest and most inventive mind of anyone I know. He has spent numerous weekends at our house working on the project, and in addition to all this, he is a dandy organist. I have scores of rolls he has made, and the sounds he gets almost make our old Estey sound like a "Wurlitzer."

In honor and to commemorate the first new Quadruplex roll, Bill Fearnley, who used to make rolls for Austin 40 years ago, and who is now organist at the Greenbrier Hotel at White Sulphur Springs came over and made a recording of "Ramona." This was the same song which bore serial number 1 in the original Austin catalog. Since then Bill has made a number of rolls, all with his inimitable arrangements and masterly musicianship.

A few pipe changes have been made so that we now have the same specifications as the original recording organ. Early this year, we disposed of the Estey lighted push-button console and its player and replaced it with an Austin console. This, we completely rebuilt, and thanks again to help from the Austin factory, we incorporated the significant improvements they have made in their consoles over the years. Following is an essential description of major components and their functions. I owe this concise and accurate description together with some of the photos to a very good organist and friend, Ray Brubacher. He also has made a number of rolls which I value very highly.

#### THE CONSOLE

The console is the standard Austin type with All-electric action which plays the organ in the usual way. The console and Austin capture system combination action were completely reconstructed. The essential additions to the console consist of Hold and Play indicating lights to let the organist know when he is actually recording the roll. The console controls the roll perforator in all ways; that is the playing, registration changes, crescendo pedal and swell pedal operation, Tutti, and all couplers.

## THE QUADRUPLEX PERFORATOR

The perforator mechanism consisting of the punching mechanism, paper feed, and take-up spools is driven by a one horsepower single phase motor. The perforator produces 232 holes across the width of the paper at the rate of 30 holes per second, allowing the fastest trills and runs to be faithfully recorded on the paper. The paper speed through the perforator is 113 inches or nine feet five inches per minute. Diameter of each paper punch is .047 inches. Each punch is operated by a standard organ pneumatic operating on ten inches of vacuum, and is electrically parallel to the chest primaries. Besides having a separate hole for each note of the three manuals and pedal, there are three holes for the great-choir box, three holes for the swell box, and three holes for the crescendo pedal. These operate on the binary principle which will be explained later. There is a series of tracking holes in the center of the roll for keeping the roll centered, and another series of holes that runs continuously to operate the five section expanding tracker bar which automatically expands or contracts to compensate for moisture content of the paper. It is interesting to note here that unlike all other roll playing devices, the paper edges are not utilized in any way to control the tracking, which results in longer life for the paper. In addition, the rolls do not have to be spooled tight in order to operate accurately.

The basic principle of operation of the perforator is a notched oscillating bar and a corresponding notch in a punch-holder which engages when any given key is depressed on the console. The number of holes depends on how long the key is held. When a key is released, a spring disengages the punch-holder from the oscillating bar. Therefore, an exact reproduction of the manual and pedal technique of the organist recording the roll is possible.

## ROLL PAPER

The paper used for the new Quadruplex rolls was determined from a chemical analysis of the original Austin roll paper. The paper for the new rolls was manufactured by the Minerva Wax Paper Co. (now out of business) and is their type MG (Machine Glazed) dry silicone waxed bleached kraft 30/35 pound stock, .0025 inches in thickness. The perforator will cut two master rolls plus one on a backing paper, the purpose of the backing paper being to insure a clean cut on all holes. The perforator was built to run 13 sheets of paper, but as far as we know, Austin never cut more than 6 production rolls at a time. Width of the paper as it goes into the perforator is 21-3/4 inches and it is automatically sheared to 21-1/16 inches as it emerges from the perforator. The roll is wound on a spool of which the ends are 2-5/8 inches in diameter. Maximum capacity of each roll is approximately ten minutes playing time. Each feed spool of blank paper will give a minimum of 150 to 200 rolls and is ordered in 300 pound lots.

## EXPRESSION AND CRESCENDO

There are seven active stages of expression on each of the two swell pedals and seven stages of crescendo that are available through binary coded systems. Since three holes are used for each expression pedal, and three holes are used for the crescendo pedal, each pedal operates three sets of binary encoders which through a series of plug-in relays translate the steps into three series of holes punched in the paper in any of the eight following combinations:

**Punches    Expression Level**

0 0 0	0 (closed)
0 0 1	1
0 1 0	2
0 1 1	3
1 0 0	4
1 0 1	5
1 1 0	6
1 1 1	7

During the playback, another three sets of binary decoders translate this information providing the seven steps of expression and crescendo.

**REGISTRATION**

When a stop is drawn or retired, or when any combination piston is used, a momentary pulse of electric current is generated by a pulse generator. This short pulse causes a series of solid-state time delay relays to sequence. The first activates a 36 pole double throw switch which disconnects momentarily the top octave of the pedal and the bottom and top octaves of the choir manual, throwing these 36 circuits from notes and connecting them to whatever stops are on. This action, which takes less than one-quarter of a second, punches two registration holes in the paper and also what stops have been drawn. This action does not affect playing in a normal manner and allows the player to play right through the stop changes. During playback, a similar procedure in reverse, separates the stops and shades. The two registration holes cause another 36 pole switch to change the key circuits to latching relay circuits. These two registration holes precede the stop holes by 1/16 of a second, which allows a break in the key circuit to cause the stop holes to operate the proper latching relay, after which the entire operation returns to normal play.

Now that the perforator is working like a charm, and we have made over 100 new rolls (everything from "Alley Cat" to The Toccata from Widor's Fifth) the question arises, what next? The making of rolls is so simple (now, that is) and much interest has been aroused as word is getting around both by organists who are intrigued with the roll making process and by other amateur organ owners. In fact, a Quadruplex player has been connected with the Beacon Theater Wurlitzer in 1990 by Bon Smith, who reports that our popular rolls sound swell. Allen Miller's [Quadruplex] player was hooked up to a 3/7 Marr and Colton in New Haven with equally successful results.

We've come to the conclusion that the 1927 vintage organ, which is pretty theatrical in scaling and voicing, is basically the reason for the easy and happy (?) marriage of the Quadruplex to the typical theatre organ. Because so few (16) Quadruplex players were ever built and so many people have twisted our arm so to speak, we are giving serious consideration to making a Quadruplex player kit available. So far, by using today's modern materials and techniques, it looks very practical. (AM Note:) I did, but the electric drive was damaged by one organ technician who wanted to stop the drive while playing. Instead of cutting the power to the motor, he cut the tachometer feedback line. I decided that the kit would produce too many headaches.

Ed Link, who flew down recently to see and hear what we are doing, insists the first one must be installed on the C. Sharpe Minor Link Organ he rebuilt and donated to the Roberson Center in Binghamton, NY. We furnished parts to Ed, but he never finished the project.

-----

And so ends the current story of the "Fabulous Quad."

-----

#### THE LATER REVISIONS 1970 (by Allen Miller)

The original drive shaft was only cut on a lathe and was fitted with bronze split bearings. Considerable grease was thrown, and was caught by a shield seen in an original photo. Bill Petty replaced the shield with felt wrapped around the shaft. A better solution was desired. In 1970, I machined a new shaft and replaced all bearings with Needle type, requiring only an occasional drop of oil. A broken eccentric follower of Lignum Vitae had been spliced by Bill Petty, but was replaced with Delrin and another needle bearing.

The problem was how to get needle bearings onto the eccentrics. Solved by machining the shaft ends from 1-1/2" down to 1" so the new bearings would slip on. Two tubes having 1-1/2" OD and 1" ID were slipped onto and secured over the reduced shaft ends to build them back up to size. Austin had provided the shaft with counter weights. Never needed and set to oppose each other, they actually caused some vibration, so they were eliminated.

The original punching design was incorrectly machined and redesigned by John T Austin. The result was that the punch holders didn't latch. That caused one hole to be occasionally missed. The answer is to electrically latch the selecting pneumatics with SCRs. An optical switch on the drive shaft unlatches the SCRs at the right point as the punches are being stripped from the paper.

The paper feed was changed from underneath (Petty design) to loading vertically at the feed end. Paper take-up was moved from under the pneumatics to placement vertically at the operation end of the perforator. An added treadle releases the take-up spools so the paper can be spooled to conventional paper cores with molded spool ends. With the paper beginning cut to a vee and roll tabs and title stamp added, the complete roll is ready to play, right off the perforator. This process takes only a couple minutes, allowing a "recording" (as Austin called the rolls,) to be played back "immediately."

We at Z-tronics, have designed a microcontroller operated decoder to separate the stops and expression, allowing a Quad player to be connected to our multiplex relay with only eight wires. We have added a 12-note coupler so that Choir to Pedal coupling does not drop out during a registration change. John T Austin apparently didn't consider that the organist might change stops during playing while using that coupler, resulting in the bottom 12 notes to drop out for a second during a stop change. Most of these modernizations have been accomplished, but the punches removed in 1970 are still being re-installed. Once accomplished, we plan to punch rolls either from originals or MIDI files. During live recording, if a recording is scrapped, a lot of original paper was destroyed if not manually edited. Recording first in MIDI will enable computer editing prior to punching paper.

Since the only original Quad organ is in the Aetna auditorium in Hartford, it might make sense to construct an appropriate console and instrument using Hauptwerk for making new recordings. That plan is for the future.

ARM 12/2020.

-----

Finally, here is a video by Allen Miller with some footage of the Quadruplex player and an explanatory PowerPoint slide show ("as-of" date included for retrieval from the Internet Archive, if necessary...):

<https://www.youtube.com/watch?v=27SMIOyVtDg> (as-of 12 April 2026)

and this video shows the perforator running, as-of 2021/2022:

<https://www.youtube.com/watch?v=dkOOAu61Jh8>

Here is a video of Bob Coe's reminiscence re: the Austin roll production (perforator) and player:

<https://www.youtube.com/watch?v=Df3uK1rf8Ws>

-----