EXHIBIT I

Narrative Statement Describing Eligibility and Objectives of Blanket Nationwide Experimental License

Allen-Bradley Company is a major manufacturer of automation controls. The company sells products used in highly automated assembly lines that employ varying levels of robotics. The products are already the subject of FCC Part 90 and experimental licenses. To sell such products to manufacturers, Allen-Bradley relies upon a network of third-party distributors.

Allen-Bradley needs to have its products demonstrated at the facilities of prospective purchasers. To accomplish this task, Allen-Bradley developed a portable demonstration unit. Such units require an experimental license pursuant to Part 5 of the Rules. Allen-Bradley itself has an experimental authorization covering its Milwaukee, Wisconsin, facilities,[1] and one permitting nationwide operation. See 47 C.F.R. § 5.202(a), (d), (f), (g), (h) (1988).

The equipment proposed under this application -- the 2750-EPK1 Demo Case -- is identical to equipment that is currently operating in several facilities under FCC granted licenses.[2] The use of the equipment proposed under this application differs only in that it is intended to be used by an approved Allen-Bradley distributor in sales and marketing demonstrations, conducted in conference rooms, assembly lines

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1 Call Sign KA2X6GO.

2 Call Signs WNDC973, WNDC974.

or laboratories at the location of the potential end user. The purpose of these demonstrations is to show the capability of the equipment to fulfill its intended end use, i.e., highly automated manufacturing. As explained below, the equipment referenced herein is a portable version of the system, with virtually identical characteristics.

A. Program of Experimentation

In large scale, highly automated assembly line manufacturing or assembly operations, products move down a conveyor belt at various speeds and are worked on in differing ways. The work can be accomplished by man or machine; the operation can be parts assembly, or a less intensive activity such as painting or testing. At the end of the assembly line, a product is either completed, scrapped (because it fails to pass quality checks), or sent back for reworking. All this preferably should be done with minimum effort, at minimum cost.

Various companies have investigated techniques in the past that can loosely be described as "field disturbance sensors." These devices provide the ability to track the locations of specific products on the assembly line. The most common method by which this is accomplished uses "tags," small devices attached to each product. When the product moves within the radio frequency field emitted by a transmitter placed in close proximity to the assembly line,

the field is disturbed, producing recognizable harmonics, which can be "read" by a nearby receiver. Thus, any disturbance in the field indicates the movement of the product past a "reader." For ease of attachment and use, these devices initially were developed to rely on batteries.

This well understood approach fails to meet the typical needs of a highly automated assembly facility, because virtually no information about the status of the product other than its location can be derived. For example, although the position of the device could indicate its stage of assembly, it tells nothing about whether the last subassembly was successfully performed. If a product does not pass a quality test, it must be flagged and removed manually.

Major manufacturers thus required a device that not only would indicate the location of the device, but also its status. Furthermore, as a device's status could change during the course of assembly, the tag must be capable both of being read from and written to, with the results fed to some sort of computer controller. Moreover, the tag approach has certain advantages (such as the ability to reuse each tag as it is removed from a completed product and returned to a product at the beginning of the line) that favored its retention. At the same time, the tag could be neither too large (because it might not fit on the product) nor too wasteful (because it might require too frequent replacement

of batteries). Additionally, because of the harsh industrial environments in which the tags are likely to be used (e.g., up to 200°C and in the presence of chemicals), a sealed device without batteries or physical electrical contacts is essential. For these reasons, Allen-Bradley turned to the system involved herein.

B. Description of the Equipment and Theory of Operation

The Allen-Bradley division of Rockwell International has long been investigating the aforementioned problem. To this end, it developed a tag system that would be more useful to large scale manufacturers. Provided below is a summary of system operation.

The device is called a Radio Frequency Identification System, model 2750-EPK1 Demo Case, and consists of two main components: an intelligent antenna unit (IAU) and a tag.

The function of the IAU is to generate interrogation signals for the tags, at 915 MHz, and transmit these towards the items on the production line over a few feet. It is comprised of three basic sections, a transmitter, receiver and processing circuitry. The IAU is connected to a remote computer which serves to interpret received tag details and to initiate robot operations accordingly.

The tags are placed on individual items on the assembly line. There are three tag types presently used,

corresponding to read only, read/write and field programmable.

Allen-Bradley has obtained FCC equipment certification for units known as the 2700 and 2703 series.[3] The unit involved herein, the 2750-EPK1, has higher power emissions and has not been authorized under Part 15. The higher power is generated because the tags themselves can be "reprogrammed" at any stage of the assembly line.

Figure 1 shows the system in operation. The optional object detect switch alerts the controller that an item is on the assembly line. At this point, the controller directs the receive/transmit unit to begin searching for the tag. This "sniff" operation is completed when the tag responds. Once this occurs, the tag can be read from or written to.

The method of communication with the tags varies for each tag type. The read only tag contains an EPROM which is preprogrammed with a unique identification number. Rectified RF energy received by the tag from the IAU is used to power up the EPROM. The tag responds essentially passively by modulating the second harmonic of the incoming frequency, and re-radiating it through an antenna tuned to that frequency (1830 MHz). The field programmable tag operates in the same manner except for the identification number being stored in EPROM. This is field programmable by the 2750-EPK1 system to

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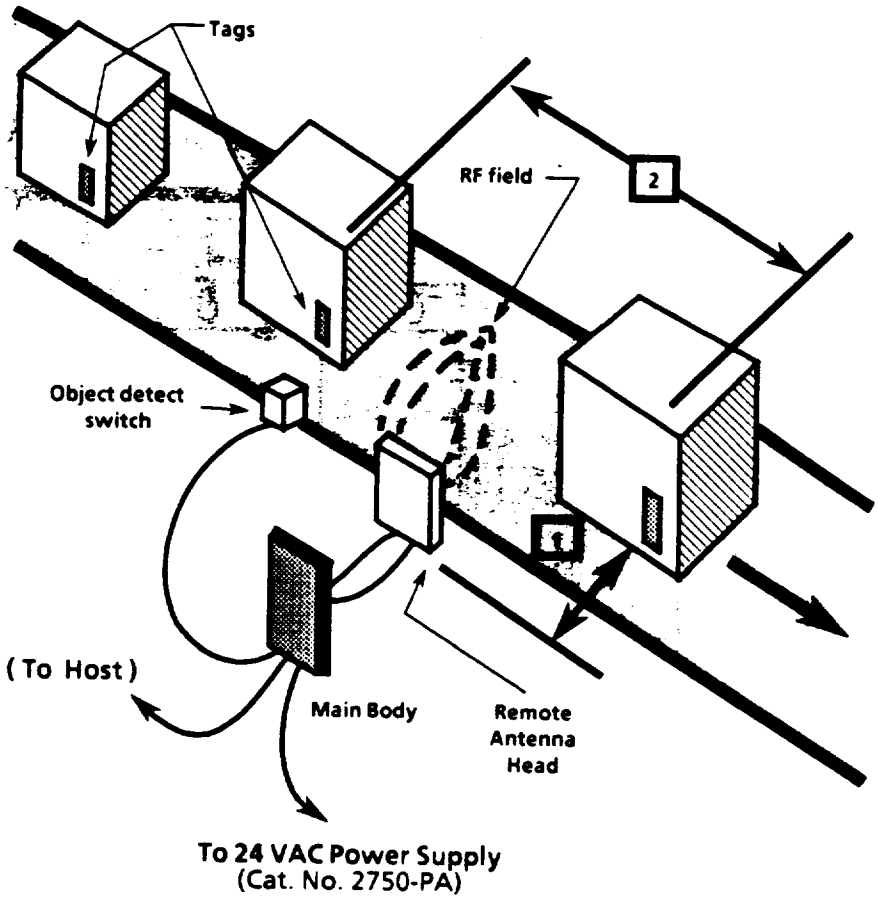
[3] File No. 310101 EQU4-3-3, FCC ID FUN4TM2700.

Figure 1



enable customers to demonstrate the initialization of tags with a customized numbering sequence. The read/write tag contains a microprocessor and RAM. The RAM may be addressed using the IAU to enable assembly operation data to be stored or read.

The digital sequences have the following parameters:

a. Read/Write Only Tags:

1) Update Rates: 100-300 m second (nominal).

2) Bit Sequences: Manchester Code.

3) Rise Time: less than 1u second.

4) Bit Transmission Rates: 62.5k-200k baud.

5) Bit Duration: 6-8u seconds.

6) Interval Between Bits: 6-8u seconds.

b. Field Programmable Tags: (for programming only - for reading, see above)

1) Update Rates: 300 m second (nominal).

2) Bit Sequences: Manchester Code.

3) Rise Time: less than 1u second.

4) Bit Transmission Rates: 800 Hz.

5) Bit Duration: 625u seconds.

6) Interval Between Bits: 625u seconds.

The sequence of operation (sniff, read and write) is controlled by the attached computer. The tags are reused after each item reaches the end of the assembly line.

C. Objective to be Achieved/Contribution to the Radio Art

The grant of the instant application undeniably will serve to advance the radio art. The product involved is targeted towards a specific and critical market need: the improvement of productivity, especially regarding industries that are or could be highly automated. The features of the instant equipment are a "suitcase" version of the production

line gear, which permit simple demonstrations to potential customers. Such customers can be shown the enormous advantage of the system, in cost, speed and efficiency of operation. Use of the system will also allow major companies to improve quality control by more thoroughly taking account of product testing results. The programmable feature will permit industrial and high tech companies to assign, ab initio, each tag with the serial number of the part to which it is attached. The status of the part can be altered continuously throughout the assembly line. At the end of the line, the tag can be reprogrammed with the serial number of the next part moving down the line. The experimentation and demonstration authority requested here will further those possibilities.

These devices also have general benefits in the continuing effort to improve domestic manufacturing skills. The increased automation promised by this system cannot fail to bolster product reliability, and thus provide greater competition in the "high tech" race between the United States and foreign competitors, especially as the U.S. has been accused of falling behind in manufacturing technology.

Grant of the instant license will allow Allen-Bradley's distributors to demonstrate these devices throughout the country to interested persons at their own locations, who might be in the position, after purchase of the full-scale equipment, to improve productivity in assembly line

operations. Such systems, if purchased, will be licensed under Part 90 of the FCC's rules.

Allen-Bradley's distributors will operate the 2750-EPK1 under the control and supervision of Allen-Bradley. No more than 70 such distributors will be authorized at any one time, all of which will be under contract to Allen-Bradley. Allen-Bradley will ensure that each distributor is familiar with the equipment and operates it according to FCC rules. Through contractual arrangements, Allen-Bradley will remain responsible for all aspects of the operation of the 2750-EPK1.

D. Summary of Interference Potential

Briefly stated, it appears unlikely that any interference to existing stations would result. Support for this conclusion is detailed below.

First, the frequencies requested are within a band allocated primarily to industrial, scientific and medical ("ISM") equipment,[4] which exhibits among the highest emissions of any service. Thus, the environment at these frequencies is "noisy" at the outset. More importantly, because ISM devices involve no "communications,"[5] there can be no interference to them. In tests, the instant system

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4 See 47 C.F.R. § 2.106 (1985).

5 See 47 C.F.R. § 18.107(c) (1985).

operated properly even with the ISM interference. Moreover, because these units operate at ISM frequencies, they have the additional advantage of not precluding any other communications systems implemented at other frequencies.

The 2750-EPK1 is capable of 5 watt RF power output. The peak maximum emissions radiated by the 2750-EPK1 unit and tag, in the worst case, are as follows:

Distance	950 MHz	1830 MHz (Second Harmonic)
30 Meters	520.0 mV/m	1.6 mV/m
1000 Feet	52.0 mV/m	160.0 uV/m
1 Mile	9.5 mV/m	30.0 uV/m

Several things should be noted. First, the harmonic and spurious emissions from the RTU are approximately 50 dB below that of the primary. Second, it is important to note that many of the harmonic emissions of the tag are the result of placing a non linear device in the antenna field, much like any field disturbance sensor.

Most importantly, it must be recognized that the above values are <u>maximum</u> values that are unlikely to occur in actual practice. This is because all units in demonstrations or experiments (like those units in actual operating configurations) virtually always are inside a building, and a certain level of shielding and attenuation can be expected

between the units and potentially affected units out-of-doors. The FCC typically figures that a standard wall will provide at least approximately 8 dB of shielding.[6] Multiple walls, such as those present in the manufacturing plants in which the 2750-EPK1 likely would be demonstrated, will further attenuate the signals. Thus, under normal operations, field strength is likely to be more than 8 dB, or close to one order of magnitude less than the values indicated in the above table.

Finally, it should be noted that Allen-Bradley and others have obtained similar experimental licenses.[7] These licenses were utilized to test a similar system in agricultural applications, which operated successfully for years without a single complaint of interference. This is despite the fact that some of the licenses permitted up to 60 Watts RF power, 12 times that of the 2750-EPK1. All other similar Part 90 authorizations facilities that have been granted (including the GM, Ford and Allen-Bradley Milwaukee licenses) are similar to the ones described here, and have caused no known interference to date.

Allen-Bradley recognizes that there may be some government users on frequencies implicated by the instant system. Spectrum at 915 MHz is used by some deep ocean

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6 44 Fed. Reg. 59,530, 59,545 (1979).

7 E.g., call Sign KA2XFN.

shipboard fire control radar; frequencies at the second harmonic emission 1830 are utilized for secure low density point-to-point microwave. However in neither case will the system described herein interfere with those governmental systems. At 915 MHz, those systems typically operate off-shore (in order to be clear of ISM interference) and in any case may be far more powerful than the emissions described herein.[8] At 1830 MHz, the additional shielding provided by the building brings emissions down to a non-interfering level -- the emissions are likely to be no greater than those already authorized for spurious emissions from most ISM equipment operating at 915 MHz.[9]

Thus, it is unlikely that use of the above described system will result in harmful interference to existing stations.

E. Conclusion

For all the above reasons, the instant application fills an important need, makes an important contribution to the radio art, and will not interfere with existing stations. Accordingly, the FCC should grant the instant experimental license.

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[8] Moreover, governmental use of 915 MHz is secondary to non-governmental use in general, and ISM in particular.

[9] See 47 C.F.R. § 18.305(b) (1988).