



# Wireless Intercom Systems

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## Speech Intelligibility and Sound Quality

### Competitive Comparison

3M Commercial Care Division contracted with Orfield Laboratories, Inc.<sup>1</sup>, a sound testing company, to independently compare the audio of the 3M™ Wireless Intercom, C1060 analog intercom system to a competitive digital intercom system. Testing focused on inbound intercom intelligibility performance, specifically in the presence of a uniform background noise field at the menu post.

For the tests, Speech Transmission Index (STI) was calculated in accordance with International Electrotechnical Commission (IEC) 60268-16; Objective rating of speech intelligibility by speech transmission index. System frequency response was also measured.

For speech intelligibility testing, a broadband noise signal (pink noise) was used at the menu order post to provide various background noise conditions. This noise was used to simulate typical environmental sound levels found in real intercom installations. For all tests, system inbound and outbound levels were calibrated to provide identical levels (dBA). Background noise levels were also calibrated and monitored.

The relationship between reported STI scores and “subjective evaluation” can be described as shown in Table 1.

STI	“Subjective Evaluation”
0.0 – 0.3	Bad
0.31 – 0.45	Poor
0.46 – 0.60	Fair
0.61 – 0.75	Good
0.76 – 1.00	Excellent

**Table 1: STI Score vs. “Subjective Evaluation”**

## TEST RESULTS

Table 2 summarizes the results of the intelligibility testing. Sample results are also shown in the bar graphs, below.

System	Noise Reduction Setting	Low Noise (<25dBA)	Medium Noise (70dBA)	High Noise (80dBA)
3M™ C1060 (Analog)	Off	0.86	0.55	0.26
Competitive Digital	Off	0.84	0.58	0.28
3M™ C1060 (Analog)	On (-6dB)	0.76	0.69	0.49
Competitive Digital	On (-6dB)	0.82	0.71	0.46

**Table 2: Speech Intelligibility Index (STI) Test Results, Inbound**

The relationship between reported STI scores and “subjective evaluation” can be described as shown in Table 1.

## Low Background Noise (<25dBA)



3M™ System, Model C1060 without Noise Reduction, Competitive Digital System with Noise Reduction, per out-of-box configurations.

Based upon test performed by independent laboratory with limited sample.

3M is a trademark of 3M Company.

## Medium Background Noise (70dBA)

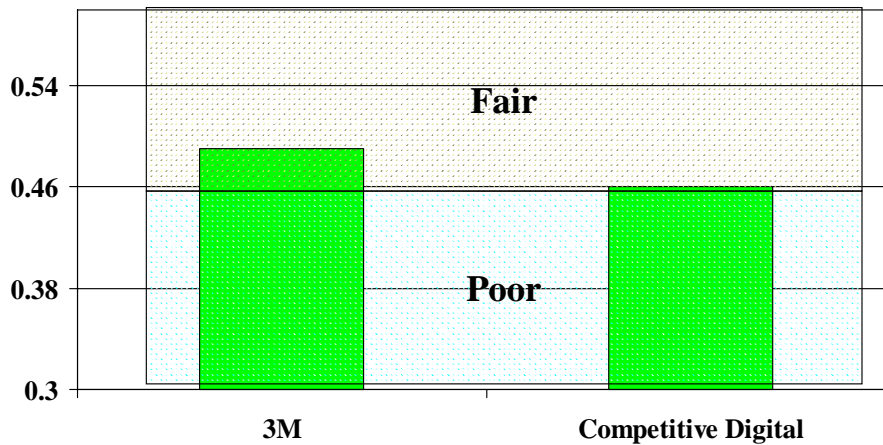


3M™ System, Model C1060 with Noise Reduction,  
Competitive Digital System with Noise Reduction.

3M is a trademark of 3M  
Company.

Based upon test performed by independent laboratory  
with limited sample.

## High Background Noise (80dBA)



3M™ System, Model C1060 with Noise Reduction,  
Competitive Digital System with Noise Reduction.

3M is a trademark of 3M  
Company.

Based upon test performed by independent laboratory  
with limited sample.

## SOUND/LISTENING SURVEY

Objective measurements do not necessarily reflect perceived intercom sound quality; therefore, 3M conducted an initial survey of QSR employees familiar with using intercom equipment, rating their sound preference of the 3M™ Wireless Intercom System, C1060 as compared against the competitive digital intercom system. The audio recordings prepared by Orfield Laboratories, Inc. were used for this survey; the 3M™ Wireless Intercom System, C1060 did not include noise reduction; the competitive digital intercom system did include noise reduction. Results showed that 91% of the QSR employees surveyed preferred the 3M™ Wireless Intercom System, Model C1060 over the competitive digital intercom system.

## SYSTEMS TESTED

Two manufacturers' systems were tested:

	Model	Base Station Serial #
3M	3M C1060 Wireless C922AA	0922005932
Competitive Digital	Wireless IQ 6000	07F00339

**Table 3: Models Tested**

### Conditions:

- Manufacturers' new, standard, out-of-box intercom systems
- Systems installed per manufacturers' recommendations
- Demonstration recordings used in the survey above were fully calibrated and created under identical conditions by Orfield Laboratories, Inc.<sup>1</sup>, an independent sound testing company.

## CONCLUSIONS

In terms of speech intelligibility scores in the presence of background noise and similar noise reduction settings, 3M's system performed similarly (i.e. neither significantly better or worse) to the competitive digital intercom tested. All units had excellent intelligibility when tested in the absence of noise. The sound/listening survey results concluded that 91% preferred the 3M™ Wireless Intercom System, Model C1060..

<sup>1</sup> Orfield Laboratories, located in Minneapolis, MN, is a multi-disciplinary laboratory serving North American and international clients. They provide services in acoustics vibration, vision, lighting, architecture and market research. Orfield is unrivaled in the extensive use of objective and subjective methods, offering design, research and testing services and solutions for corporate and architectural clients since 1971. The firms' projects and research have been broadcast on television and featured in the Wall Street Journal, Architecture, Sound & Communications, Sound & Vibration, Lighting Design + Application, Contract and Appliance Manufacture Magazine.